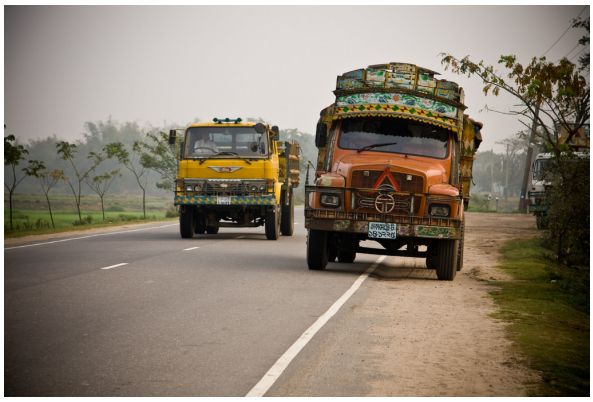
GOVERNMENT OF PEOPLE'S REPUBLIC OF BANGLADESH

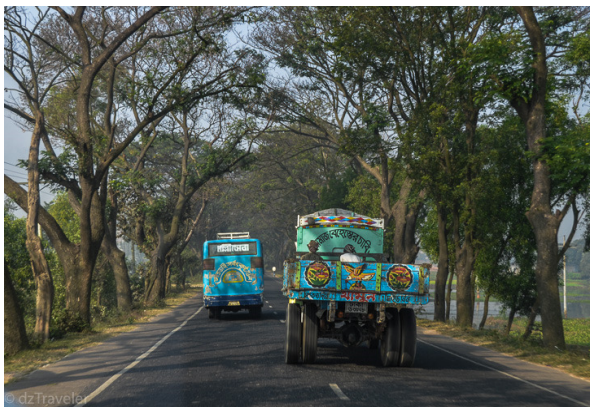
MINISTRY OF LOCAL GOVERNMENT, RURAL DEVELOPMENT & COOPERATIVES

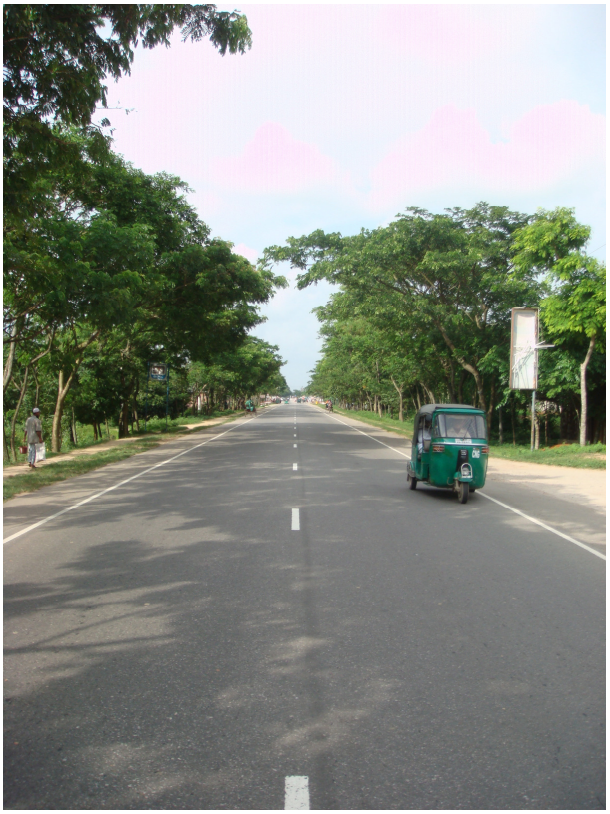
ROAD USER COST STUDY FOR LGED ROADS

Final Report
Phase-1 & 2

June 2018







RESEARCH, DEVELOPMENT AND KNOWLEDGE UNIT
LOCAL GOVT. ENGINERING DEPARTMENT

Table of Contents

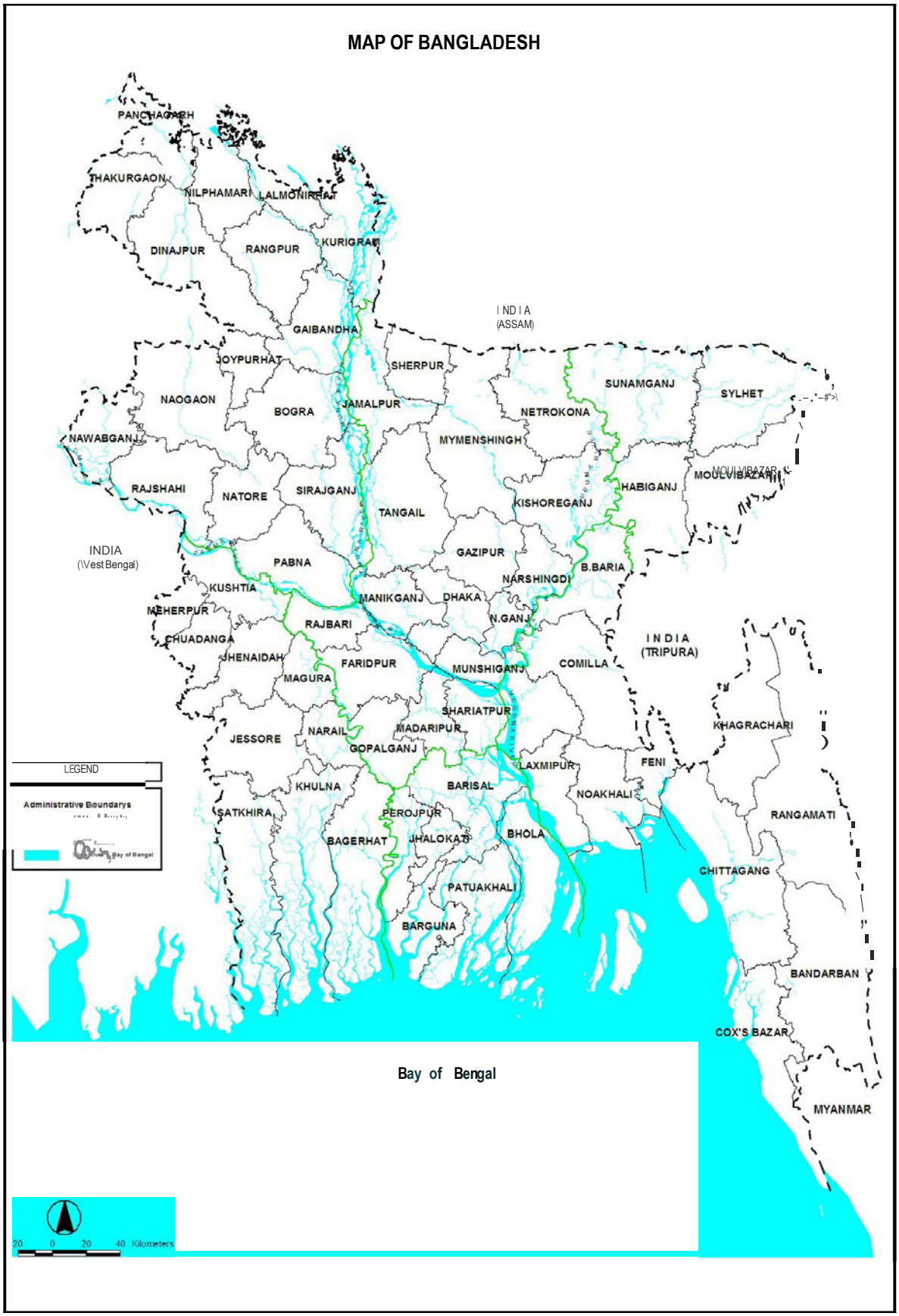
List of Tables

Annexure-A: Comparison of Pre and Post Data
Annexure-B: Vehicle Operating Cost
Annexure-C: Travel Time Cost
Annexure-D: Work-plan and Budget

Abbreviations

AADT	Annual Average Daily Traffic
ACC	Accident Cost
ADC	Additional Deputy Commissioner
ADM	Additional District Magistrate
ADP	Annual Development Programme
BADC	Bangladesh Agricultural Development Corporation
BCR	Benefit Cost Ratio
BME	Benefit Monitoring and Evaluation
BRDB	Bangladesh Rural Development Board
CGC	Control Growth Centre
C.I.	corrugated iron
CPI	Consumer Price Index
CUP	Control Union Parishads
DAE	Department of Agricultural Extension
DOE	Department of Education
DOF	Department of Forest
DC	Deputy Commissioner
DRSC	District Road Safety Committees
D&S	Design and Supervision
EIRR	Economic Internal Rate of Return
FUPM	Female Union Parishad Members
GC	Growth Centre
GCC (road)	Growth Centre Connecting (road)
GoB	Government of Bangladesh
HH	Household
I(R)RI	International (Road) Roughness Index
IST	Institutional Support and Training Component of RIIP
LGD	Local Government Division
LGED	Local Government Engineering Department
LTk.	Lac Taka (= 100,000 Taka)
Md.	Mound (approx. 36 kg)
MES	Monitoring and Evaluation Specialist
MMC	Market Management Committee
MOLG RD&C	Ministry of Local Government, Rural Development & Co-operatives
NPV	Net Present Value
PIC/SIC	Project/Subproject Implementation Committee
PKM	Person kilometer
PL	Pedestrian with Load
PWL	Pedestrian without Load
RCC	Reinforced Cast Concrete
RDP	Rural Development Project
RHD	Roads and Highways Department
RIIP	Rural Infrastructure Improvement Project
RIMMU	Rural Infrastructure Maintenance Management Unit RMP Rural Maintenance Programme
RRMP	Rural Road Master Plan
MT	Metric ton
MUMP	Male Union Parishad Members
NGO	Non-governmental Organization

PGC	Project Growth Centre
PUP	Pilot Union Parishads
TB	Tuberculosis
TBA	Traditional Birth Attendant
THO	Thana Health Officer
Tk.	Taka
TKM	Ton-Kilometer
TTC	Travel Time Cost
UE	Upazila Engineer
UHC	Union Health Centre
UH&FWC	Union Health and Family Welfare Centre
UNO	Upazila Nirbahi (Executive) Officer
UP	Union Parishad (Council)
URSC	Upazila Road Safety Committees
VGD/VGF	Vulnerable Group Development/Vulnerable Group Feeding
VOC	Vehicle Operation Cost
VPD	Vehicles per Day
WADT	Weekly Average Daily Traffic


MAP OF BANGLADESH
PANCHAGARH
THAKURGAON
NILPHAMARI
LALMONIRHAT
DINAJPUR
RANGPUR
KURIGRAM
GAIBANDHA
JOYPURHAT
SHERPUR
NAOGAON
BOGRA
JAMALPUR
NAWABGANJ
MYMENSHINGH
NETROKONA
SUNAMGANJ
SYLHET
MOULVIBAZAR
RAJSHAHI
NATORE
SIRAJGANJ
TANGAIL
KISHOREGANJ
HABIGANJ
PABNA
GAZIPUR
B.BARIA
KUSHTIA
NARSHINGDI
MANIKGANJ
DHAKA
MEHERPUR
N.GANJ
RAJBARI
CHUADANGA
JHENAIDAH
FARIDPUR
MUNSHIGANJ
COMILLA
MAGURA
SHARIATPUR
KHAGRACHARI
JESSORE
NARAIL
MADARIPUR
GOPALGANJ
FENI
LAXMIPUR
KHULNA
BARISAL
NOAKHALI
SATKHIRA
PEROJPUR
RANGAMATI
BAGERHAT
JHALOKATI
BHOLA
CHITTAGANG
PATUAKHALI
BARGUNA
BANDARBAN
COX'S BAZAR
MYANMAR
INDIA (ASSAM)
INDIA (\Vest Bengal)
INDIA (TRIPURA)
LEGEND
Administrative Boundarys
Bay of Bengal
20 0 20 40 Kilometers

Executive Summary

Introduction: Bangladesh has an extensive road network wherein the rural transportation network has connected the rural hinter lands to the National Transportation Network. Although the majority of the rural roads are unimproved, it has the highest road density amongst the developing countries in Asia. They provide local access to farms, social welfare institutions, and rural facilities as well as to markets, to modern agriculture inputs, to local places of employment, etc.

The RHD is responsible for construction, rehabilitation, upgrading and maintenance of 3,812 km of National Highway, 4247 km of Regional Highway, and 13,242 km of Zila Roads. On the other hand, the LGED is responsible, in conjunction with the local government institutions, for the 'rural road network' - Upazila Road, Union Road, and Village Road (Type A and Type B). At present, total length of the Upazila roads reaches 37,520 km and that of the Union road accounts for 41,680 km. Village roads length comprises 271,574 km.

The proposed study has been undertaken to justify the economic feasibility for the investment in rural road network. This will help conduct economic and financial analysis of LGED roads and bridges.

Methodology: Two RUC components such as Vehicle Operating Cost (VOC) and Travel Time Cost (TTC) have been considered in this study. The inputs for the study have been collected mainly through field surveys conducted in various regions of the country. This includes vehicle operator's survey and passenger travel time cost survey while other essential data like vehicle registration, vehicle price, vehicle make and model, tax structure, fuel and tyre price, and accident related data have been collected from concerned public and private agencies. The road related data such as construction cost, maintenance cost and road specifications of LGED roads were collected from Planning Unit of LGED. The study considers both motorized and non-motorized transport costs.

A total of 18 Upazila roads and 06 Union roads have been selected. Many factors were taken into consideration for making a shortlist of Upazila roads such as topographical situation, road networking and connectivity, transportation and communication need, trading facilities, community aspiration and participation, etc. The field Questionnaire was used for data collection. There were 35 sets of Questionnaires covering all components of the proposed project. The data collected by the LGED field level staff in the respective District and Upazila under guidance of the Executive Engineer and Upazila Engineers. In addition website data have also been used.

The LGED Executive Engineer, Planning and Upazila Engineers supervised data collection activities. The filled in questionnaire received from the field were duly checked, verified and reviewed by the study team. In some cases they were validated by the study team in case of errors and omissions and then processed through customized software program to make a database for the study. The outputs generated from the customized software program were analyzed and incorporated in this report through presentation of tables.

All costs in the report are given in financial and economic prices. The financial price is the retail market price of the product. The economic price reflects the true value as well as the scarcity premium of the resource to the economy. The economic price of a factor or a product excludes all tax elements as they reflect mostly a transfer of resources from one sector to another. On the other hand, subsidy elements, if any, are included with the economic price. Furthermore, market distortion or imperfection and government regulations or interventions are also taken into consideration while shadow-pricing a factor or a product. In case of imported inputs, economic costs were based on the border prices plus port handling, transportation, assembling and retail cost (profit margin) duly shadow priced. Shadow exchange rate factor (SERF) has also been considered for foreign exchange component of costs. Local inputs of labour and materials were also shadow priced using the LGED Standard Conversion Factor of 0.907.

Vehicle Operation Costs: Information on vehicle fleet was collected from BRTA and Bangladesh Bureau of Statistics (BBS). Primaty data inputs for the model have been collected through field survey during 2018. A total of 40 field staff including 8 supervisors were selected with 4 investigators in Dhaka, Chittagong, Rajshahi, Khulna, Barisal, Sylhet, Mymenshing & Rangpur areas each.

In Bangladesh commercial vehicles are often intensively utilized. Buses, in particular, are operated around the clock with different sets of crews on daytime and nighttime schedules. Large buses operating on the intercity routes are utilized up to 85% of the time available. Medium truck and mini bus are utilized 69 per cent and 73 per cent respectively. Light vehicles like microbus, jeep, car and motorcycle are less utilized. Distances traveled by large buses are very high reflecting their higher utilization ratios, while the smaller vehicles except baby taxi are driven much less as would be normally expected.

Another important aspect of utilization is the length of time vehicles are operated before they are scrapped. The average life of large vehicles including trucks and buses is higher than those of light vehicles including utility vehicles and cars. Duties and taxes are charged on the "Assessable Value (AV)" of the import, which means the Cost, Insurance & Freight (CIF) value in foreign currency converted into Taka at the prevailing exchange rate set by the Bangladesh Bank. A number of duties and taxes are charged on CIF value: customs duty, development surcharge, supplementary duty, value added tax, advanced income tax and landing permit fees.

Substantial increase in purchase costs has been reported for car, auto-rickshaw, minibus and utility vehicles. For other vehicle types the increase was 12-18%. Tyres are imported from India, Japan, Malaysia, Indonesia and Taiwan with Indian tyres dominating the market. The use of re-treaded tyres is also common. New tyres' prices are on increase. Maximum increase was reported for mini-bus and motor cycle, while for others the increase was between 20-30% during the mentioned period.

Detailed information on fuel and lubricant cost is collected from Bangladesh Petroleum Corporation (BPC). Although fuel price is highly volatile, between the two survey periods fuel price is found to have increased slightly by 1-2%.

The annual costs of maintaining the representative vehicles have been estimated from the operators' survey. Between the two survey periods maintenance costs are found to have increased highest for large buses due to their high utilization, while for other categories the increase was about 2%. As far as crew costs are concerned, their wage costs in financial term in the two survey periods have increased by 38%, while economic value of crew costs by 13% only.

Overhead costs including office administration and rental charge, garaging, insurance, vehicle excise duty/ VAT and tolls/route permit fees were reported high, in part due to ferry and bridge tolls that account for 60% of financial overheads in case of medium trucks and large buses and significant proportions (45%) in respect of small trucks and mini buses. Between the two inter-survey periods, overhead costs are found to have increased by 25-35%.

Vehicle operating costs for all types of motorized vehicle are found to have declined in 2018 compared to 2009 by 10-70%. As RI increases VOC increases. The main reason for this is the lower operation cost of vehicles on improved roads in spite of the fact that the CIF price of some vehicles such as medium truck, microbus, utility and car increases compared to that in previous period. Other costs also were found to have increased. But the utilization of vehicle is increased.

Travel Time Costs: Travel Time Cost (TTC) is based on the fact that time spent on traveling has an "opportunity cost" and could be used in an alternative activity which also produces or may produce some significant utility popularly known as benefit. If the alternative activity can have a monetary value, this can be used as a part of RUC in the economic appraisal of system, particularly of the transport projects having relation with consumption of time in the use of their output.

TTC may vary from country to country, even from project to project in the same country. This depends on the extent of time delays involved as well as the income pattern of the users of the project output. In case of

the construction of a major new bridge to replace a ferry for example, TTC will be immensely significant compared to a road improvement project without any change in its alignment or pavement and/or shoulder capacity. Again, value of time will be much higher in a more developed country than that in a less developed country like Bangladesh or Afghanistan. Similarly this variation in value of time may exist between a more developed region of a country and a relatively less developed part of the same country.

Time costs can be estimated for road users and for freight consignments. Costs may be broken down into "in vehicle time" and "out of vehicle time". The latter may be important to bus passengers waiting for a vehicle, but is specialized in its application and is not considered in the LGED approach which focuses on "in vehicle time" values only.

Time costs will vary between different vehicle types according to the socio-economic characteristics of the occupants, their trip purpose and the type of freight carried. For analysis purposes TTC is expressed as hourly value per vehicle by assuming average occupancies and loading factors for each vehicle type.

In a country like Bangladesh, the income pattern between the users of highly expensive motorized vehicles such as cars and jeeps and those of slow moving non-motorized transport such as rickshaws and bicycles is substantially different and these two categories of road users belong to two completely different economic classes in the society. That's why the approach of uniform TTC has not been adopted in Bangladesh to date. In this study TTC has been estimated according to separate vehicle type.

The main purpose of trips by vehicle occupants was to go for own business (56%), followed by employers' business (21%), journey to/from work (13%), etc. The survey shows their average monthly income at Tk 9,532. Distribution of monthly income shows that 27.4% occupants' monthly income was Tk 6,000 or less, while 43.1% had tk 6,001-12,000 and 26.5% had 12,001-18,000. There are, however a few occupants whose monthly income was reported more than Tk 18,000. Some differences were observed between different types of vehicles and between Upazila & Union Roads.

The average occupancy has increased in all categories of vehicles in 2018 compared to that of 2009. For example the average occupancy for heavy bus and light bus has increased by 12.5% and 31% respectively. On the other hand travel time costs were found to have declined between the two survey periods.

The overall average savings (travel time and vehicle operation costs) due to improvement of road network has increased by 22.3% from Tk 21.60 to Tk 26.39. Maximum saving has been generated by light bus by 25.9% followed by medium truck operators by 25.8%, car (23.8%), small truck (23.7%), etc. The lowest saving was calculated for auto-rickshaw at 18.8%. Thus, there is no substantial savings difference between the operators of different vehicle categories.

Preparation of this study is the outcome of combined efforts of the officers and staff working in the Vehicle, Planning & Maintenance unit of LGED on various levels in such form as data collection, data entry to the computer, data analysis, model run and report writing. The Study team Consist of two experts, Dr Shaker Ahamed, Team Leader, Mohammed Zafar Ullah, Transport Specialist and Principal Investigator, Md Amiruzzaman Ripon & Mr Kazol Supvisors. Over all coordination of the study was supervised by Md. Monzur Shadek, Executive Engineer, Planning Unit, LGED. With special thanks Mr Hafigur Rahman Chairmen & Dibyba, Ex utive, Runner Group, Mr Bhuayan, Sr. GM Navana Group, GM Nitol Group, Mr Mamun, Director, RHD, Mr Mostaque, Retd. Chief Engineer, RHD, Mr Shahid, Retd. Add. Chief Engineer, RHD and Mr Abdul Queddus, Retd. Chief Engineer, RHD, and Mr Abdur Razzak, Sup Chief Engineer, RHD. HDM Circle.

CHAPTER 1: BACKGROUND OF THE STUDY

1.1 An Overview of Rural Infrastructure

Bangladesh is predominantly rural. About 70% of its population lives in rural areas. The rural economy, through Agricultural Sector, substantially contributes to the national economy. In this backdrop, improvement of living standard of the country's majority population is dependent upon boosting up the rural economy. This mainly depends on an improved rural transportation system especially the land transportation system.

Bangladesh has an extensive road network wherein the main and medium road network constitutes of National Highways, Regional Highways and the Zila roads. A huge rural transportation network has connected the rural hinter lands to the National Transportation Network. Although the majority of the rural roads are unimproved, it has the highest road density amongst the developing countries in Asia. These roads serve immensely the rural Bangladesh. They provide local access to farms, social and welfare institutions, and rural facilities as well as to markets, to modern agriculture inputs, to local places of employment and so on. Over the years, through LGED's commitment and best interventions with the financial assistance from GOB and Development Partners, Bangladesh has witnessed a rapid growth in setting up of paved rural roads. The developed road provided the 'first mile' access to all the rural hinterlands that triggered the economic growth of the nation. In the 7th five year plan period (2016-2020) of the country, the country has targeted around 8% growth at the end of the period. The strategy to achieve the growth has also targeted rural farm and non-farm economy to grow further to support the further growth of the nation.

Therefore, the seventh five plan year plan has two broad targets

- Development of Rural Roads ; transformation from rural access to rural transport
- Maintenance of already improved rural roads.

Therefore, there is more investment in rural road sector during the 7th five year plan period. The proposed study has been undertaken to justify the economic feasibility for the investment in the rural road sector. This is a one of the reasons to determine the Economic Internal Rate of Return (EIRR), Benefit Cost Ratio (BCR) etc.

1.2 Rural Road Network and its Impact

LGED has been mainly implementing various rural infrastructure development projects that have resulted encouraging positive impacts. Of them the rural road improvement projects have some common components, which are specifically targeted to improve the rural road network, rural transport and marketing facilities. Improvement of the rural infrastructure facilities tremendously enhanced rural transportation network and as a consequence, activated rural economy attributable to increased agricultural productivity and expanding rural trades. Various studies carried out to this effect have concluded that improved quality of rural road networks has:

- far reaching implications towards poverty alleviation by direct or indirect increase in income;
- reduced cost of marketing and improved operation of both input and product markets through improved linkages with other commercial sectors;
- lowered labor costs significantly in the developed areas;
- significantly increased agriculture production;
- reasonably increased household income;
- Encouraged savings and investment indirectly through the positive effects of increased income.

1.3 The Road Network in Bangladesh

There is well-defined classification, division of responsibility and set of geometric standards for the road network in Bangladesh. At national level responsibility for road network is divided between the Roads and Highways Department (RHD) of the Ministry of Road Transport & Bridges and the Local Government Engineering Department (LGED) of the Ministry of Local Government, Rural Development and Cooperatives (MLGRDC).

Road classification and geometric standards were first adopted in 1984. Under that classification there were three broad road systems viz. Arterial Road System, Feeder Road System and Rural Road System.

Later some changes to classification to roads were made based on the World Bank recommendations. This change was basically made on Feeder Road classification divided into two keeping the geometric design same i.e. Feeder Road Type-A (FRA: road connecting Upazila HQ with the highway system) and Type-B (FRB: road connecting Growth Center with Upazila HQ or the RHD network).

However, in May 2003 under the overall policy for a smooth and integrated communication and transport system and in order to ensure planned and sustainable development of the country's road sector, the Government has identified a few issues/reform measures. Under this broad framework, the issues relating to development of primary (arterial), secondary and rural road network have been reviewed. For the purpose of construction, improvement and maintenance of road and road structures, the road type along with required definitions have been revised and the ownership and clear responsibilities have been reallocated among the RHD, LGED and the concerned Local Government Institutions (LGIs). The reclassification, responsibilities and geometric standards for the road network are summarized in Table 1.1 below.

In 2003, re-classification and definition provided almost same terminology and straight forward definition than the previous (1984) classification except District Roads has been merged into 'Zila Road' classification (i.e., FRA and District Roads combined together and named as 'Zila Road'), FRB renamed as 'Upazila Road', R1 renamed as Union Road' and R2 & R3 combined and renamed as Village Road'.

LGED and LGI both belong to the Local Government Division under the Ministry of LGRD&C. LGED's one of the mandates is to provide technical support to the LGIs. LGED takes the responsibility to construct/re-construct/rehabilitation/maintenance of roads in conjunction with LGIs under the purview of Local Government Division. Implementation of this redressed road construction; improvement and maintenance including management system will improve the efficiency and effectiveness of road operation in the country.

Table 1.1: Road Classification of Bangladesh

Sl. No.	Type	Definition	Ownership and Responsibility
01.	National Highway	Highways connecting National capital with Divisional HQs or seaports or land ports or Asian Highway.	RHD*
02.	Regional Highway	Highways connecting District HQs or main river or land ports or with each other not connected by National Highways.	RHD
03.	Zila Road	Roads connecting District HQs with Upazila HQs or connecting one Upazila HQ to another Upazila HQ by a single main connection with National/Regional Highway, through shortest distance/route.	RHD
04.	Upazila Road	Roads connecting Upazila HQs with Growth Centers or one Growth Center with another Growth Center by a single main connection or connecting Growth Center to Higher Road System**, through shortest distance/route.	LGED*/LGI*
05.	Union Road	Roads connecting Union HQs with Upazila HQs, Growth Centers or Local Markets or with each other.	LGED/LGI
06.	Village Road	Roads connecting Villages with Union HQs, local markets, farms and ghats or with each other. Roads within a Village.	LGED/LGI

1.4 The RHD Road Network

The RHD is responsible for construction, rehabilitation, upgrading and maintenance of 3812 km of National Highway, 4247 km of Regional Highway, and 13,242 km of Zila Roads, a total network of about 21302 km. The RHD also operates vehicular ferry services across un-spanned river crossings on the network.

1.5 The LGED Road Network

The LGED is responsible, in conjunction with the local government institutions, for the 'rural road network', which is sub-divided into three clearly defined classes of road - Upazila Road , Union Road , and Village Road (Type A and Type B). The local government institutions, in particular, the Union Parishads is basically responsible for maintenance of earthen Union and Village roads through earthworks.

The roads under the jurisdiction of LGED play a significant role to serve the vast rural areas in Bangladesh. These provide local access to farms, social and welfare institutions, village facilities as well as to markets where buyers and sellers assemble the trade products of agricultural and rural industries and other consumer goods.

Earlier due to resource constraints and based on local demand the common practice for Upazila Roads and Rural Roads construction was to use Herring Bone Bond (HBB) or Water Bound Macadam (WBM) for pavements. Following some problems with the quality and wear and tear of HBB, at present WBM pavement with a bituminous surface treatment is being followed mostly in LGED.

The objectives of rural road improvement and maintenance capacity building are to promote "sustainable rural development" through securing and improving accessibility in the rural area. Improvement of road network in the Project area will contribute for the sustainable rural development through economic development, social growth and cultural development.

The present extent and the condition of the rural road network, which totals over **352944** km, Table 1.2 are summarized below.

1.6 Rural Road Network

At present, total length of the Upazila road in the country reaches 37,520 km and that of the Union road accounts for 41,680 km. Village roads length comprises 271,574 km. Out of these lengths, 30,903 km

(82.23%) of Upazila road have been paved to the date, while the proportion of improvement for Union road remains only below 57% (23,777 km). For Village road the total improved length is 42142 Km (15.52%). Division wise present condition of upgrading/ improvement for Upazila road, Union road and Village roads are shown in Table 1.3 below.

Table 1.2: LGED Road Network

Road Type	Total Length (km)	Surface Type (Length, km)			
		Earthen	BC	Brick pavement	Rigid
Upazila Roads	37520	6618	28103	2095	703
Union Roads	41680	17902	19086	4026	667
Village Roads-A	127427	98575	19169	8683	1001
Village Roads-B	146316	132958	7090	5690	579
Total :	**352944**	**256053**	**73448**	**20494**	**2950**

A total of 273743 km Village roads - have two categories viz. 'A' and 'B'. Village roads-A category comprises 127427 km and that of Village roads-B category comprises 146316 km, which accounts for about 40% of the network, are 'within villages' and most are in fact footpaths. In transport and trading terms Village roads-B category should arguably excluded from analysis of the rural network.

Table 1.3: Division wise Status of Rural Road Network

Length in km

Name of Division	Upazila Road				Union Road				Village Road			
	Total	Developed		Need to be Developed	Total	Developed		Need to be Developed	Total	Developed		Need to be Developed
	km	km	%	km	km	km	%	km	km	km	%	km
RANGPUR	4,829	3,988	82.59%	841	6,193	2,365	38.19%	3,828	29,254	1,995	6.82%	27,259
RAJSHAHI	5,626	4,727	84.03%	899	5,632	3,411	60.57%	2,220	28,899	4,905	16.97%	23,994
KHULNA	5,458	4,965	90.98%	492	4,930	3,638	73.78%	1,292	40,033	8,550	21.36%	31,483
DHAKA	6,509	5,511	84.66%	999	6,917	4,245	61.37%	2,672	47,918	8,432	17.60%	39,486
CHITTAGONG	6,313	4,940	78.25%	1,373	7,539	4,792	63.56%	2,747	56,079	9,858	17.58%	46,220
BARISAL	3,220	2,653	82.39%	567	4,324	2,448	56.62%	1,876	36,140	4,483	12.41%	31,657
SYLHET	2,694	2,064	76.62%	630	2,700	1,517	56.17%	1,183	17,057	2,734	16.03%	14,323
MYMENSINGH	2,871	2,054	71.53%	817	3,445	1,363	39.55%	2,082	18,364	1,253	6.82%	17,111
Total	**37,519**	**30,902**	**82.36%**	**6,618**	**41,680**	**23,779**	**57.05%**	**17,902**	**273,744**	**42,211**	**15.42%**	**231,532**

Source: XEN LGED Maintenance Dept.

1.7 Selected Roads for the Study

As the factors listed above that affect the road user cost vary in different districts of the country, the sample roads were selected from representative districts from eight divisions of the country.

Table 1.4: List of Roads for Survey

Division	District	Upazila	Road Type	Road ID	Name of Road	Road Length	IRI	AADT
RANGPUR	RANGPUR	RANGPUR-S	UZR	185492006	Upzazila HQ to Centererhat via Panbazar GC	13.80	8.03	3,441
RANGPUR	RANGPUR	RANGPUR-S	UZR	185492017	Syampur, Palichara GC- Ranipukur GC via Value	7.50	5.53	1,014
RANGPUR	RANGPUR	RANGPUR-S	UNR	185493025	Upazila HQ at Mofel house to Monohar High School bazar	8.55	6.75	689
RAJSHAHI	RAJSHAHI	PABA	UZR	181722001	Rajshahi Court RHD -Darusha GC Road	8.33	7.63	3,178
RAJSHAHI	RAJSHAHI	PABA	UZR	181722002	Damkura RHD-Nowhata GC via-Darusha GC.	15.04	9.23	3,042
RAJSHAHI	RAJSHAHI	PABA	UNR	181723005	Kathalbaria (Harupur) RHD-Alimganj R&H	7.30	8.10	1,471
KHULNA	JESSORE	CHOWGACHA	UZR	241112001	Chowgacha hat-Moheshpur hat Road.	9.35	6.84	2,004
KHULNA	JESSORE	JESSORE-S	UZR	241472014	Churamankati GC-Kayemkhola GC via Bagdanga, Jhowdia Bazar, Chandutia Road	12.00	6.93	1,310
KHULNA	JHENAIDAH	JHENAIDAH-S	UZR	244192001	Jhenaidah-Kotchandpur GC	16.95	7.88	1,909
DHAKA	DHAKA	SAVAR	UZR	326722001	Dhaka Aricha highway-Ashulia GC Road	7.10	5.81	2,898
DHAKA	MANIKGANJ	HARIRAMPUR	UZR	356282001	Jhitka G.C-Machain G.C. road.	9.00	5.45	1,223
DHAKA	MANIKGANJ	SINGAIR	UNR	356823001	Rishipara (Singair) R&H-Baldhara UP (paril)	4.60	6.77	259
CHITTAGONG	FENI	FENI-S	UZR	430292001	Dula miah-Sharisadi bazar-Kaikhali-Koresmunshi-Rd	5.70	9.29	1,875
CHITTAGONG	FENI	FENI-S	UZR	430292010	Silonia-Laskarhat Road	5.56	4.45	1,664
CHITTAGONG	FENI	FENI-S	UNR	430293003	Sadar Upazila HQ-Aminbazar-DharmapurUP-Dewangonj Road	8.00	8.53	1,494
BARISAL	BARISAL	BABUGANJ	UZR	506032006	Lakutia-Bazar to Babugonj Hat. (GC.)	5.81	10.52	1,212
BARISAL	BARGUNA	BARGUNA-S	UZR	504282004	Barguna UZ HQ - Patharghata UZ HQ Via Parirkhal GC Road (Sadar Part)	22.68	6.87	2,963
BARISAL	BARGUNA	BARGUNA-S	UNR	504283019	Itbaria Bazar-Kadamtala UP-Purakata Hat	5.46	7.47	452
SYLHET	SYLHET	SYLHET-S	UZR	691622002	Sylhet-Tilagor Gachbari-Kanaighat Rd (Sadar portion).	6.85	10.11	2,436
SYLHET	SYLHET	SYLHET-S	UNR	691623010	Badaghat-Mogalgoan UP office road.	10.80	7.94	939
SYLHET	SUNAMGANJ	JAGANNATHPUR	UZR	690472001	Jagannathpur-Biswanath Road	13.00	8.13	3,085
MYMENSINGH	MYMENSINGH	BHALUKA	UZR	361132003	Dhaka-Mymensingh H/W(Kathali)-Mollikbary GC road	5.87	7.17	1,635
MYMENSINGH	MYMENSINGH	MYMENSINGH-S	UZR	361522002	Shambugonj bazar (R&H)-Ambikagonj GC Rd.	15.60	6.18	1,858
MYMENSINGH	MYMENSINGH	MYMENSINGH-S	UNR	361523001	Parangonj UP - Ramvadrapur Bazar via Kachari Bazar.	12.50	7.57	1,095

Table 1.4A: WADT, AADT of Secreted Roads

24 Road Traffic Count Survey

Results of WADT, AADT

		Motorised Vehicle										Non-Motorised Vehicle					Pedistrian		Total :
Traffic	Vehicle	Heavy Truck	Mediu m Truck	Small Truck	Large Bus	Mini Bus	Micro Bus	Utility	Car	Auto Ricks haw	Motor Cycle	Ricksh aw	Ricksh aw Van	Bicycle	Bullock Cart	Push Cart	Pass With Load	Pass With out Load	Total :
Road-01	Hat Day	0	16	33	0	17	35	35	36	120	33	35	36	120	33	323	120	319	1307
	Non HD	0	16	33	0	17	35	18	19	63	17	18	19	63	17	217	1	1	553
	WADT	0	16	33	0	17	35	35	36	120	22	23	23	79	22	247	35	92	833
	AADT	0	18	70	0	18	40	40	41	139	25	27	27	92	24	287	40	106	996
Road-02	Hat Day	0	16	33	0	17	35	35	36	125	152	35	36	120	319	609	120	319	2002
	Non HD	0	16	33	0	17	35	23	24	83	101	22	22	75	199	418	120	319	1505
	WADT	0	16	33	0	17	35	35	36	120	115	25	26	87	234	472	120	319	1689
	AADT	0	18	70	0	18	40	40	41	139	134	30	30	102	259	549	139	371	1980
Road-03	Hat Day	0	16	33	0	17	35	35	36	103	171	35	36	125	152	446	120	319	1675
	Non HD	0	16	33	0	17	35	29	30	86	142	23	24	83	101	331	120	319	1387
	WADT	0	16	33	0	17	35	35	36	103	150	26	27	95	115	364	120	319	1490
	AADT	0	18	70	0	18	40	40	41	119	175	31	31	110	128	423	139	371	1754
Road-04	Hat Day	0	16	33	0	17	35	35	36	101	33	35	36	120	157	447	120	319	1535
	Non HD	0	16	33	0	17	35	27	27	77	25	25	25	86	112	348	120	319	1290
	WADT	0	16	33	0	17	35	35	36	185	27	28	28	95	125	376	120	319	1472
	AADT	0	18	70	0	18	40	40	41	214	32	32	33	111	138	436	139	371	1734
Road-05	Hat Day	0	16	33	0	17	35	35	36	120	319	35	36	103	171	444	120	319	1835
	Non HD	0	16	33	0	17	35	25	25	85	228	29	30	86	142	387	120	319	1575
	WADT	0	16	33	0	17	35	35	36	103	254	31	31	91	150	403	120	319	1671
	AADT	0	18	70	0	18	40	40	41	119	295	36	36	105	167	468	139	371	1964
Road-06	Hat Day	0	16	33	0	17	35	35	36	125	152	35	36	101	33	304	120	319	1392
	Non HD	0	16	33	0	17	35	25	25	89	108	27	27	77	25	257	120	319	1199
	WADT	0	16	33	0	17	35	35	36	120	121	29	30	84	27	270	120	319	1289
	AADT	0	18	70	0	18	40	40	41	139	140	34	34	97	30	314	139	371	1526
Road-07	Hat Day	0	16	33	0	17	35	35	36	103	171	35	36	120	319	609	120	319	2000
	Non HD	0	16	33	0	17	35	25	25	74	122	25	25	85	228	463	120	319	1611
	WADT	0	16	33	0	17	35	35	36	103	136	28	28	95	254	505	120	319	1757
	AADT	0	18	70	0	18	40	40	41	119	158	32	33	110	282	586	139	371	2058
Road-08	Hat Day	0	16	33	0	17	35	35	36	101	33	35	36	125	152	446	120	319	1535
	Non HD	0	16	33	0	17	35	23	24	67	22	25	25	89	108	347	120	319	1269
	WADT	0	16	33	0	17	35	35	36	185	25	28	28	99	121	376	120	319	1469
	AADT	0	18	70	0	18	40	40	41	214	29	32	33	115	134	436	139	371	1731
Road-09	Hat Day	0	16	33	0	17	35	35	36	120	319	35	36	103	171	444	120	319	1835
	Non HD	0	16	33	0	17	35	23	24	80	213	25	25	74	122	346	120	319	1469
	WADT	0	16	33	0	17	35	35	36	103	243	28	28	82	136	374	120	319	1602
	AADT	0	18	70	0	18	40	40	41	119	282	32	33	95	151	434	139	371	1884
Road-10	Hat Day	0	16	33	0	17	35	35	36	125	152	35	36	101	33	304	120	319	1392
	Non HD	0	16	33	0	17	35	23	24	83	101	23	24	67	22	236	120	319	1141
	WADT	0	16	33	0	17	35	35	36	120	115	26	27	77	25	255	120	319	1254
	AADT	0	18	70	0	18	40	40	41	139	134	31	31	89	28	296	139	371	1485
Road-11	Hat Day	0	16	33	0	17	35	35	36	103	171	35	36	120	319	609	120	319	2000
	Non HD	0	16	33	0	17	35	23	24	69	114	23	24	80	213	439	120	319	1546
	WADT	0	16	33	0	17	35	35	36	103	130	26	27	91	243	488	120	319	1717
	AADT	0	18	70	0	18	40	40	41	119	151	31	31	106	270	566	139	371	2012
Road-12	Hat Day	0	16	33	0	17	35	35	36	103	138	35	36	125	152	446	120	319	1642
	Non HD	0	16	33	0	17	35	23	24	69	92	23	24	83	101	331	120	319	1308
	WADT	0	16	33	0	17	35	35	36	101	105	26	27	95	115	364	120	319	1442
	AADT	0	18	70	0	18	40	40	41	117	122	31	31	110	128	423	139	371	1699
Road-13	Hat Day	0	16	33	0	17	35	834	852	2807	3614	35	36	103	171	444	120	319	9433
	Non HD	0	16	33	0	17	35	627	641	2203	2609	23	24	69	114	329	120	319	7176
	WADT	0	16	33	0	17	35	70	71	239	2896	26	27	78	130	362	120	319	4438
	AADT	0	18	70	0	18	40	81	82	278	3364	31	31	91	145	421	139	371	5179
Road-14	Hat Day	0	128	264	0	132	276	139	142	491	413	278	284	974	1235	3571	956	1914	11196
	Non HD	0	30	63	0	31	66	278	284	974	1235	66	67	230	335	888	227	542	5316
	WADT	0	58	120	0	60	126	66	67	230	1000	127	129	442	592	1654	435	934	6041
	AADT	0	65	255	0	67	146	77	78	267	1162	147	150	514	658	1922	506	1085	7097
Road-15	Hat Day	0	16	33	0	17	35	35	36	101	33	35	36	101	33	304	120	319	1249
	Non HD	0	16	33	0	17	35	23	24	67	22	23	24	67	22	236	120	319	1046
	WADT	0	16	33	0	17	35	26	27	77	25	26	27	77	25	255	120	319	1104
	AADT	0	18	37	0	18	38	31	31	89	29	29	30	85	28	283	133	354	1234
Road-16	Hat Day	0	16	33	0	17	35	35	36	120	319	35	36	185	71	426	120	319	1798
	Non HD	0	16	33	0	17	35	23	24	80	213	45	46	240	91	522	120	319	1821
	WADT	0	16	33	0	17	35	26	27	91	243	42	43	224	85	494	120	319	1815
	AADT	0	18	37	0	18	38	31	31	106	282	47	48	249	95	549	133	354	2036
Road-17	Hat Day	0	16	33	0	17	35	35	36	125	152	35	36	120	319	609	120	319	2002
	Non HD	0	16	33	0	17	35	23	24	83	101	23	24	80	213	439	120	319	1548
	WADT	0	16	33	0	17	35	26	27	95	115	26	27	91	243	488	120	319	1678
	AADT	0	18	37	0	18	38	31	31	110	134	29	30	101	270	542	133	354	1877
Road-18	Hat Day	0	16	33	0	17	35	35	36	103	171	35	36	103	198	471	120	319	1724
	Non HD	0	16	33	0	17	35	23	24	69	114	23	24	69	132	347	120	319	1362
	WADT	0	16	33	0	17	35	26	27	78	130	26	27	78	150	382	120	319	1465
	AADT	0	18	37	0	18	38	31	31	91	151	29	30	87	167	425	133	354	1641
Road-19	Hat Day	0	16	33	0	17	35	35	36	103	138	35	36	125	152	446	120	319	1642
	Non HD	0	16	33	0	17	35	23	24	69	92	23	24	83	101	331	120	319	1308
	WADT	0	16	33	0	17	35	26	27	78	105	26	27	95	115	364	120	319	1403
	AADT	0	18	37	0	18	38	31	31	91	122	29	30	105	128	404	133	354	1571
Road-20	Hat Day	0	16	33	0	17	35	834	852	2807	3614	35	36	120	157	447	120	319	9438
	Non HD	0	16	33	0	17	35	627	641	2203	2609	23	24	80	104	331	120	319	7180
	WADT	0	16	33	0	17	35	686	701	2375	2896	26	27	91	119	364	120	319	7825
	AADT	0	18	37	0	18	38	797	814	2759	3364	29	30	101	132	404	133	354	9030
Road-21	Hat Day	0	16	33	0	17	35	139	142	491	413	35	36	103	171	444	120	319	2511
	Non HD	0	16	33	0	17	35	278	284	974	1235	23	24	69	114	329	120	319	3868
	WADT	0	16	33	0	17	35	238	243	836	1000	26	27	78	130	362	120	319	3480
	AADT	0	18	37	0	18	38	277	283	971	1162	29	30	87	145	402	133	354	3983
Road-22	Hat Day	0	16	33	0	17	35	35	36	103	138	35	36	103	138	411	120	319	1572
	Non HD	0	16	33	0	17	35	23	24	69	92	23	24	69	92	308	120	319	1261
	WADT	0	16	33	0	17	35	26	27	78	105	26	27	78	105	337	120	319	1350
	AADT	0	18	37	0	18	38	31	31	91	122	29	30	87	117	375	133	354	1512
Road-23	Hat Day	0	16	33	0	17	35	35	36	101	33	35	36	103	138	411	120	319	1465
	Non HD	0	16	33	0	17	35	23	24	67	22	23	24	69	92	308	120	319	1189
	WADT	0	16	33	0	17	35	26	27	77	25	26	27	78	105	337	120	319	1268
	AADT	0	18	70	0	18	40	31	31	89	29	31	31	91	117	392	139	371	1497
Road-24	Hat Day	0	16	33	0	17	35	70	71	239	352	35	36	101	33	304	120	319	1777
	Non HD	0	16	33	0	17	35	70	71	244	471	23	24	67	22	236	120	319	1765
	WADT	0	16	33	0	17	35	70	71	243	437	26	27	77	25	255	120	319	1768
	AADT	0	18	37	0	18	38	81	82	282	507	29	30	85	28	283	133	354	2006

1.8 Structure of the Midterm Report

The Final Report consists of 5 (five) chapters and 1 (one) Annex A.

Chapter 1 Background of the study

It contains the overview of the study and sector performance. The chapter provides the situation of Upazila and Union roads along with road classification.

Chapter 2 Methodology of the Study

This huge road user costs can be reduced substantially through proper and timely maintenance of the road network. It contains Methodological framework of the Study. Data collection techniques, Sampling, Questionnaire & Checklist, Orientation of LGED Field Staff.

Chapter 3 The Bangladesh Vehicle Fleet

Information on the Bangladesh vehicle fleet was collected from BRTA, which is responsible for motorised vehicle registrations and renewals in Bangladesh. The organisation does not publish an annual report on registrations but provides data to the Bangladesh Bureau of Statistics (BBS) which is published annually in the Statistical Yearbook of Bangladesh.

Chapter 4 Vehicle Operating Cost

Vehicle Operating Cost (VOC) is a complex procedure, as costs of all relevant components of the vehicle are needed for the entire Bangladesh vehicle fleet consisting of a plethora of vehicle types. It contains the number of Registered Vehicles, Representative Vehicle Types, Vehicle Categories, Annual Utilization of Vehicles, Operational Life of Vehicles, Vehicles Purchase Costs, Representative Vehicle Tyres, Economic & Financial Costs of Fuel & Lubricants, Vehicles Maintenance Costs, Crew Wage Costs and Annual Overhead Costs etc.

Chapter 5 Travel Time Costs

Travel Time Costs (TTC) also referred to as Values of Time are an important component of road user costs. It contains Vehicle Occupants by Trip purpose, Vehicle Occupants by Occupation, Monthly Income, Travel Time Cost of Passengers by Category of Vehicle and Road Classification.

CHAPTER 2: METHODOLOGY

2.1 General

This huge road user costs can be reduced substantially through proper and timely maintenance of the road network. With this understanding, Economics Circle of RHD in collaboration with the IDC Transport Economists developed a methodology to carry out road user cost study during 1995 through 1997. Following this methodology, Road User Cost Annual Report was prepared for 2009 for LGED roads. Using the same methodology a similar study on LGED Roads User Costs has been carried out in 2018. The study was based on 24 rural roads (upazila and union roads) located all over the country. The ultimate objective of the study was to calculate road user costs consisting of vehicle operating costs, travel time costs and accident costs. The study has conducted economic and financial analyses of roads, bridges and culverts. The field work for the study has been conducted in 2018. Thus 9 years have passed since the 2009 Study was undertaken. By this time the total rural road network has increased from 250,892 km in 2008 to 352,944 km in 2018. Due to improvement in road condition the number of motorized as well as non-motorized vehicles has also increased. In this context LGED has felt the necessity to undertake study for updating the previous 2009 Study along with validation of huge investment on LGED roads, bridges and culverts.

The present study has been undertaken with a view to conducting an RUC study of LGED roads. This will help conduct economic and financial analysis of LGED roads and bridges under various projects. Two RUC components such as Vehicle Operating Cost (VOC) and Travel Time Cost (TTC) have been considered in this study. The input parameters have been collected from both primary and secondary. These VOCs along with Travel Time costs are the results of this study which would lay the foundation for economic and financial analysis of LGED roads and bridges.

2.2 Data Collection

The inputs for the study were collected mainly through field surveys conducted in various regions of the country, which include among others vehicle operator's survey and passenger travel time cost survey while other essential data like vehicle registration, vehicle price, vehicle make and model, tax structure, fuel and tyre price, and accident related data were collected from concerned public and private agencies. LGED have a sector named as “Research, Development and Knowledge” who are responsible to collect similar data for their study. They extended full cooperation for data verification. The road related data such as construction cost, maintenance cost and road specifications of LGED roads were collected from Planning Unit of LGED.

2.3 Sampling

Based on a shortlist prepared on the available data, a total of 18 Upazila roads and 06 Union roads have been selected. In addition to economic viability, many factors were taken into consideration for making a shortlist of Upazila roads such as topographical situation, road networking and connectivity, transportation and communication need, trading facilities, community aspiration and participation, etc.

2.4 Questionnaires

One of the instruments used for data and information collection was questionnaire. There were 35 sets of Questionnaires used for data collection covering all components of the proposed project. The data and information collected by the LGED field level staff in the respective District and Upazila under guidance of the Executive Engineer and Upazila Engineers. In addition website data have also been used.

2.5 Orientation of field Staff

A two-day long orientation program prior to the survey was organized for the Surveyors to make them familiar with survey methodology, the questionnaire, and to enable them supervise, monitor and conduct the data collection activities through participatory techniques. A participatory approach has been used involving extensive

consultation with stakeholders and potential beneficiaries down to grass- root level.

2.6 Supervision and Monitoring Data Collection Survey

The LGED Executive Engineer, Planning and Upazila Engineers supervised data collection activities of field staff. The filled in questionnaire received from the field were duly checked, verified and reviewed by the study team.

2.7 Data Analysis

Having receipt of the data from the field, those were reviewed and in some cases validated by the study team in case of errors and omissions and then processed through customized software program to make a database for the study. The outputs generated from the customized software program were analyzed and incorporated in this report through presentation of tables.

2.8 Limitation, Weakness and Issues

This Road User Cost study activity, a comprehensive task has to be performed in a very limited time and as a result, the field worker had to complete the data collection survey very quickly. Besides the number of sample roads is also limited. The Road User Cost study report perhaps could have been richer without these limitations.

2.9 Field Visit and Preliminary Data Collection

The team leader and Transport Economist paid a visit to the field area at Jhitka G C and Machain GC road, Manikganj. We observed the condition of the road and collected some information. The Length of the road is 9 km, IRI of the road is 6.5 and AADT at 1,223. This means, the road condition is overall good. Few vehicles are observed. During the field visit supervision of field workers was done.

2.10 RUC Components

RUC generally consists of following three components:

- Vehicle operating costs (VOC), that is, the physical costs of operating a vehicle such as fuel, spare parts, depreciation, crew costs, etc;
- Travel time costs (TTC), that is, the value of time spent on traveling that could be used in other activities;
- Accident costs (ACC), that is, the physical costs of an accident measuring the value of injuries and fatalities.

The importance of controlling road user costs becomes evident just when it is understood that the Bangladesh transport sector consumes some 1.5 million tonnes of petroleum products annually. And this is only one component of vehicle operating costs, which include among others cost of the vehicle itself, its maintenance parts and tyres. Costs involved in all such major components of VOC are a huge burden to the economy as well as a severe drain on the scarce foreign exchange, which could largely be reduced through proper management and upkeep of the road network.

The report considers both motorized and non-motorized transport costs.

TTC surveys in eight divisions on Upazila & Union Roads in order to develop a greater understanding of the issues involved, and to estimate a common national set of TTC according to vehicle types along LGED roads.

The survey was based on the Average Wage approach whereby the wage rates of vehicle occupants are assessed and then their average rates have been estimated to reflect the value of time of occupants in different vehicles. An assessment of the number of travelers in work time (WT) and non-work time (NWT) is made for each vehicle type. The TTC for WT is then taken as the estimated wage rate.

2.11 Financial and Economic Costs

All costs in the report are given in financial and economic prices. The financial price is the retail market price of the product. The economic price reflects the true value (that is, the real worth) as well as the scarcity premium of the resource to the economy. In the economic jargon, this is termed as a "shadow" or "accounting" price of the resource in the economy. The shadow price of unskilled labour, for instance, may well be lower than the wage to reflect its abundant supply, while that of a skilled professional may be higher than the salary given to him, if his opportunity cost is considered. The economic price of a factor or a product also excludes all tax elements as they reflect mostly a transfer of resources from one sector of the economy to another or from one agency to another within the economy. On the other hand, subsidy elements, if any are included with the economic price. Furthermore, market distortion or imperfection and government regulations or interventions are also taken into consideration while shadow-pricing a factor or a product. In case of imported inputs, economic costs were based on the border prices plus port handling, transportation, assembling and retail cost (profit margin) duly shadow priced. Shadow exchange rate factor (SERF) has also been considered for foreign exchange component of costs and benefits. Local inputs of labour and materials were also shadow priced using the LGED Standard Conversion Factor of 0.907.

CHAPTER 3: THE BANGLADESH VEHICLE FLEET

2.12 Registered Vehicles

Information on the Bangladesh vehicle fleet was collected from BRTA, which is responsible for motorized vehicle registrations and renewals in Bangladesh. The organization does not publish any annual report on registrations but provides data to the Bangladesh Bureau of Statistics (BBS) which is publishes annually in the Statistical Yearbook of Bangladesh.

BRTA is not responsible for non-motorized traffic registrations, which is left with the local authorities to regulate. Non-registration is common and the actual number of NMV is unknown. However, this report has dealt with the operating costs of both motorized as well as non-motorized vehicles.

Table 3.1 shows BRTA figures for vehicles registered in Bangladesh from 2010 to 2018. The BRTA figures indicate that to date about 2.92 million motorized vehicles have been registered in the country. Most frequently available vehicle on Bangladesh road is motor cycle (52.2%), followed by private car (10.3%) and auto-rickshaw (8%).

Vehicles

Table 3.1 Number of Registered Vehicles in Bangladesh

Sl. No	Type of Vehicles	Upto-2010	2011	2012	2013	2014	2015	2016	2017	2017/Jan	2018/March	Inc in % 2017, 2018
1	Ambulance	2793	219	181	243	338	480	378	495	33	172	421.21%
2	Auto Rickshaw	126763	20423	23545	15697	19897	20000	11173	9168	731	2425	231.74%
3	Auto Tempo	14266	175	626	395	500	1095	1322	1592	73	451	517.81%
4	Bus	27778	1761	1439	1107	1488	2391	3833	3760	439	817	86.10%
5	Cargo Van	3522	489	282	687	608	399	1017	1413	79	413	422.78%
6	Covered Van	5658	2354	1421	2271	2869	2354	3340	5176	372	1675	350.27%
7	Delivery Van	17063	1004	774	894	1176	1719	2181	2410	196	715	264.80%
8	Human Hauler	6520	1152	715	385	225	1142	3487	3393	436	497	13.99%
9	Jeep (Hard/Soft)	32286	2134	1569	1314	1870	3601	4892	5425	344	1346	291.28%
10	Microbus	66379	4051	3044	2537	4313	5224	5804	5575	494	1248	152.63%
11	Minibus	25644	276	249	148	256	323	472	492	47	102	117.02%
12	Motor Cycle	759257	114616	101588	85808	90685	240358	332057	326550	30110	94740	214.65%
13	Pick Up (Double/Single Cabin)	32240	10460	7625	6553	9554	10257	11371	13512	1026	3587	249.61%
14	Private Passenger Car	219830	12950	9224	10472	14699	21062	20304	21959	1894	5160	172.44%
15	Special Purpose Vehicle	6371	396	226	227	172	296	620	993	143	305	113.29%
	Total	**1346370**	**172460**	**152508**	**128738**	**148650**	**310701**	**402251**	**401913**	**36417**	**113653**	**212.09%**

Source: BRTA, 2018

2.13 Representative Vehicles

The Bangladesh vehicle fleet is characterized by a large number of different vehicle types spanning up to three decades in age. LGED has derived a classification of motorized vehicles and non-motorized vehicles

for traffic counting which categorizes vehicles into two broad groups: one for eleven standard motorized vehicles and the other for four standard non-motorized vehicles, as set out in Table 3.2.

No data is published on the makes and models of vehicle registered by BRTA. A detailed examination of BRTA registration records was undertaken in 2008 to derive this information. This was supposed to be reviewed for application in the current RUC report in view of the fact that by the time of about 10 years since 2008 there was a lot of change in the pattern of vehicle fleet in Bangladesh. However the idea of reviewing the makes and models of the registered vehicle fleet to adapt the changes in the exercise of selecting the updated representative vehicles category has not been given up. It is published. Meanwhile a summary of the results of 2008 analysis for the two most popular makes of motorized vehicle in each category is shown in Table 3.3. This demonstrates that in all categories over a half of the vehicles consist of two makes and models. But in case of a number of vehicle categories the fleet is dominated by one make only. Toyota in the car group is an example. A brief comparison of costs and characteristics for the principal models demonstrated little variation and it was therefore decided to adopt the leading model in each group as the representative vehicle.

Table 3.2 LGED Vehicle Categories LGED Category Description of Vehicle

LGED Category	Description
Medium Truck	Two or three axle rigid >Five tonne payload
Small Truck	Two axle rigid < three tonne payload
Pickup	Two axle rigid < three tonne payload
Bus	>40 seats and >36 feet chassis
Bus Mini	16-39 seats and <36 feet chassis
Micro Bus	<16 seats
Utility/ Jeep	Four wheel drive Jeeps and Pick-ups
Car	All saloon cars and Taxis
Motor Cycle	All two wheeled Motorized vehicles
Auto Rickshaw/ Mohenro	Three wheeled Motorized vehicles
Nosimon/ Karomon	Three wheeled Motorized vehicles
Tempo/ Human Haller/	Large Passenger & Cargo carrying 3 wheelers
Rickshaw/ Rickshaw Van-Engine	Three wheeled Passenger NMV
Rickshaw/ /Rickshaw Van	Three wheeled Cargo NMV

Source: Secondary data, BRTA,, LGED, 2018

Description of LGED Vehicles

Medium Trick:

Description **LPT 909H Ex2**

ENGINE

Model	:	TATA 497 TURBO INTERCOOLED (Bharat stage-III)
Type	:	Water cooled direct injection Diesel
No. Of Cylinders	:	4 inline
Bore / Stroke	:	97 mm x 128 mm
Capacity	:	3783 cc
Max. Engine Output	:	125Ps (92kW) at 2400 rpm
Max. Torque	:	400 Nm at 1300-1500 rpm
Compression Ratio	:	17.5:1
Fuel Injection	:	Rotary Pump

CLUTCH

Single plate dry friction type Outside diameter of clutch lining : 310 mm (Reinforced)
Friction Area : 1030 sq cm (approx)

GEAR BOX

Model	:	GBS 40 Synchromesh
No. of gears	:	5 Forward 1 Reverse
Gear Ratios	:	1st - 8.02 2nd - 4.77 3rd - 2.75 4th -1.66 5th - 1.0 Rev - 8.29

REAR AXLE

Single reduction hypoid gears fully Floating axle shafts
Ratio : 4.125:1 (Banjo axle)

FRONT AXLE

Heavy duty Forged I beam, reverse Elliot Type.

STEERING

Steering Gear Box Integral hydraulic power assisted
Ratio : 18.8:1

BRAKES

Service Brakes	:	Dual circuit full air S-Cam brake
Brake Drum Diameter	:	325 mm
Lining Area	:	Front - 1442 sq cm Rear - 1442 sq cm Total - 2884 sq cm
Parking Brake	:	Spring actuated parking brake acting on rear wheels
Engine Exhaust Brake	:	Coupled with service brake

FRAME

Depth: 200 mm (max) Width : 60 mm

SUSPENSION

Spring Span Front - 1150 mm Rear - 1220 mm
Leaf Width Front - 70 mm Rear - 70 mm
Shock Absorber Hydraulic double acting telescopic type at front and rear

FUEL TANK

Capacity 160 liters

WHEELS AND TYRES

Tyres 8.25 x 16 -16 PR Front - Rib; Rear - Lug
Wheel Rims 6.00 G x 16 SDC

ELECTRICAL SYSTEMS

Alternator Capacity : 65 amps
Battery : 12 V,100 Ah capacity

PERFORMANCE

Max. Geared Speed in Top Gear (With Std. Rear Axle) 90 kmph
Max. Climbing Ability in 1st Gear (With std. Gear Box and Rear Axle) 32%
Minimum Turning Circle Dia in m as per IS:9435 12.3
Minimum Turning Clearance Circle Dia. in m as per IS: 9435 14.0 9436

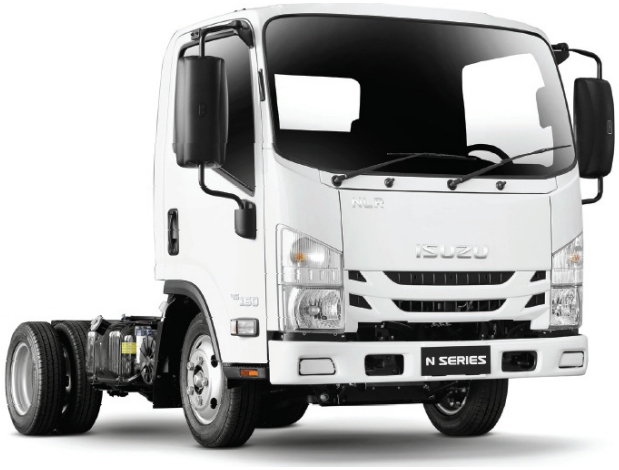
Wheelbase (mm) : 3400

Weights:

Max. Permissible GVW : 7500kg
Kerb Weight with cabin : 3650 kg

Type of Vehicle	Wages/hr	Hrs run/year
Purchase cost of vehicle	2,134	
Cost of new tyre	19,210	
Maintenance labour cost	55	116820
Overhead cost	199	
Crew Wages	34	3105
Fuel cost (Diesel)	44	
Fuel cost (Petrol)	77	116820
Lubricant cost	320	
Utilization		

Small Truck



AUSTRALIA'S TOP SELLING TRUCK BRAND SINCE 1989.

AT A GLANCE

GVM	4,500 kg
GCM	7,000 kg
Power	110 kW @ 2,800 rpm
Torque	375 Nm @ 1,600 - 2,800 rpm

UPGRADE OPTIONS

AMT Pack:
Automated Manual Transmission (AMT)

ADVANCED TECHNOLOGY

- Emissions: Euro V / ADR 80/03
- Meets EEV emissions standard
- Driver and passenger airbag with seatbelt pretensioner
- ECE-R29 compliant cab
- Anti-lock Braking System (ABS)
- Stability Control System (IESC)
- Anti Skid Regulator (ASR)
- Hill Assist - except AMT pack
- Electric mirrors
- Independent front coil suspension
- Cornering lamps

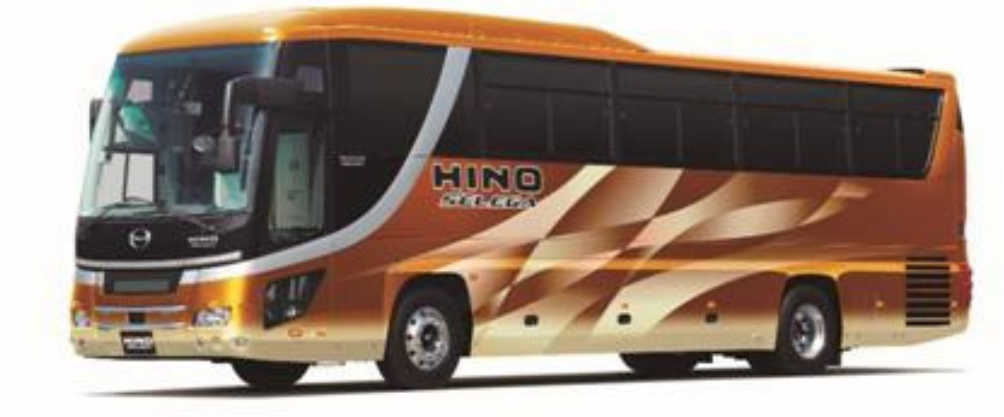
MEMBER TIC

We share the load.

ISUZU
RELIABILITY IS EVERYTHING

Type of Vehicle	Wages/hr	Hrs run/year
Purchase cost of vehicle	1,452	
Cost of new tyre	6,255	
Maintenance labour cost	55	116820
Overhead cost	92	
Crew Wages	22	3105
Fuel cost (Diesel)	44	
Fuel cost (Petrol)	77	116820
Lubricant cost	320	
Utilization		

Bus Heavy



Model	HINO S'elega
Engine model	E13C
Displacement (L)	12.913
Transmission type	Manual transmission, 6 speeds
Dimensions (length x width x height mm)	11,990×2,490×3,750
Seating capacity	46 (44 passenger seats, no auxiliary seats, 2 crew seats)
Gross vehicle weight (Kg)	15,330

Type of Vehicle	Wages/hr	Hrs run/year
Purchase cost of vehicle	2,134	
Cost of new tyre	19,210	
Maintenance labour cost	55	116820
Overhead cost	199	
Crew Wages	34	3105
Fuel cost (Diesel)	44	
Fuel cost (Petrol)	77	116820
Lubricant cost	320	
Utilization		

Bus Mini

ENGINE : TATA 497 TC Fuel Efficient Engine with Inter cooler
No. Of Cylinders/cc : 4 cylinders in line 3784 cc
Max/ Engine Output : 67.5 Kw (90 Ps) at 2400 rpm
Max. Torque : 285 Nm (30 Kgm.) at 1400-1600 rpm
Air Filter : Dry type
Fuel Filter : Two Stage Pre & Fine Filtration

CLUTCH
Outside Diameter of Clutch Lining : 280 mm.

GEAR BOX
No of gears : 5 Forward, 1 Reverse
Gear Ratios : 1ST-6.17, 2nd -3.34, 3rd - 1.89, 4th-1.33, 5th-1.00, Rev. -5.60

REAR AXLE
Type : Single reduction Hypoid Gears, Fully floating axle shafts
Ratio : 3.875:1(31/8)

STEERING : Power Steering
Ratio : 34.2:1

BRAKES
Service Brakes : Dual circuit full air S-Cam brakes
Parking Brake : Spring actuated parking brake acting on rear wheels

FRAME : Ladder type frame with
: Rivetted/bolted cross member.
Side Member Size (mm.) : Depth : 200 (max), Width : 60

SUSPENSION : Semi elliptical leaf spring at front & rear with auxiliary springs at rear only
Shock Absorbers : Hydraulic telescopic double acting at front and rear

WHEELS & TYRES
Tyres : 7.50 x 16-16 PR Diagonal Ply
Wheel Rims : 6.00 G x 16 SDC
No. of wheels : Front : 2, Rear : 4, Spare :1

FUEL TANK : 160 litres

ELECTRICAL SYSTEM
System Voltage : 12V
Alternator (Max. Output) : 35 Amps
Battery : 12 V, 120 Ah

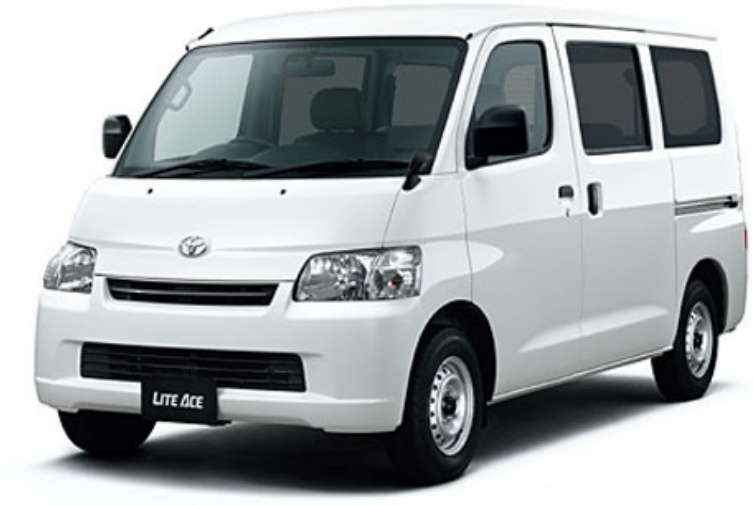
PERFORMANCE
Max. climbing ability in 1st Gear : 20%
Min. turning circle Dia. : 16.9

CHASSIS DIMENSIONS
Wheel base (mm) : 4200
OverallWidth (mm) : 2140
Front Overhang (mm) : 1275

WEIGHTS (Kg)
Max GVW (kgs) : 7450
Max Permissible FAW (kgs) : 2800
Max Permissible RAW (kgs) : 4700

Type of Vehicle	Wages/hr	Hrs run/year
Purchase cost of vehicle	1,452	
Cost of new tyre	6,255	
Maintenance labour cost	55	116820
Overhead cost	92	
Crew Wages	22	3105
Fuel cost (Diesel)	44	
Fuel cost (Petrol)	77	116820
Lubricant cost	320	
Utilization		

Bus Light

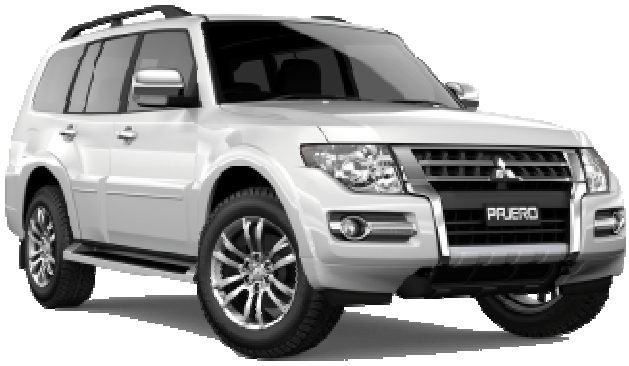


Toyota Literacy Van : Basic Specifications

Maximum power	97ps
Fuel Consumption	11 - 12km/L
Drive Type	AWD/FF/FR
Engine Capacity	1,495cc
Number of Seats	2 - 5

Type of Vehicle	Wages/hr	Hrs run/year
Purchase cost of vehicle	2,202	
Cost of new tyre	3,280	
Maintenance labour cost	55	116820
Overhead cost	162	
Crew Wages	26	3105
Fuel cost (Diesel)	44	
Fuel cost (Petrol)	77	116820
Lubricant cost	320	

Utility/Jeep

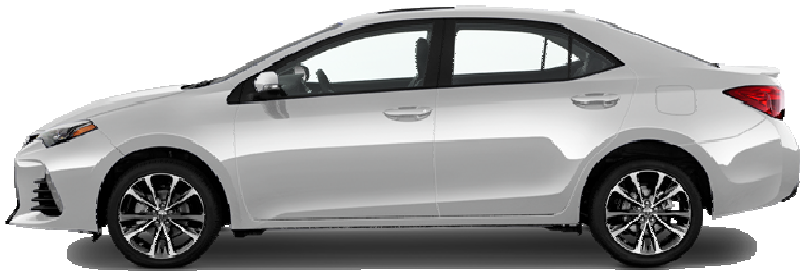


ENGINE

Capacity (L)	3.2L
Bore x Stroke (mm)	98.5mm x 105.0mm
Maximum power (kW@rpm)	141kW @ 3800rpm
Maximum torque (Nm@rpm)	441Nm @ 2000rpm
Compression ratio	16.0:1

Type of Vehicle	Wages/hr	Hrs run/year
Purchase cost of vehicle	3501	
Cost of new tyre	7440	
Maintenance labour cost	55	116820
Overhead cost	28	
Crew Wages	17	3105
Fuel cost (Diesel)	44	
Fuel cost (Petrol)	77	116820
Lubricant cost	320	

Car

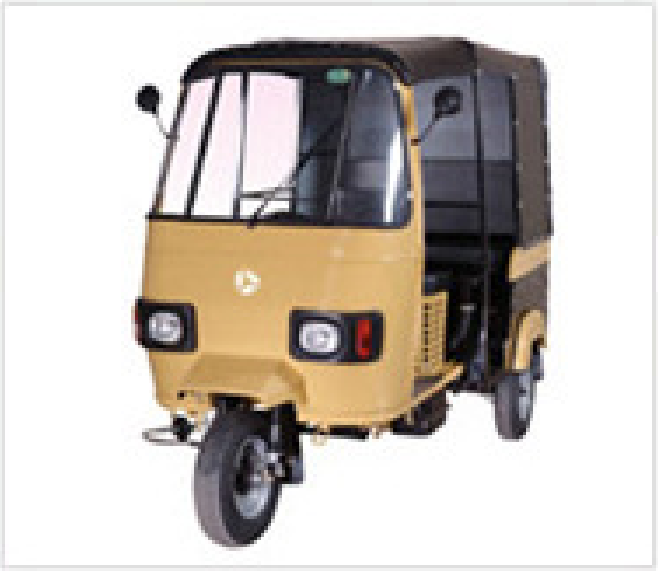


PREVIEW

Fuel Consumption	8.4 (Manual City) 6.5 (Manual Highway)
Engine	1.8L L4 DOHC 16-valve
Power	132 hp @ 6000 rpm
Transmission	Continuously variable transmission
Body	Sedan
Doors	4
Seats	5
Warranties	**Bumper-to-Bumper** 60000/km, 36/Months **Powertrain** 100000/km, 60/Months **Roadside Assistance** 60000/km, 36/Months

Type of Vehicle	Wages/hr	Hrs run/year
Purchase cost of vehicle	2,084	
Cost of new tyre	3,025	
Maintenance labour cost	55	116820
Overhead cost	121	
Crew Wages	28	3105
Fuel cost (Diesel)	44	
Fuel cost (Petrol)	77	116820
Lubricant cost	320	

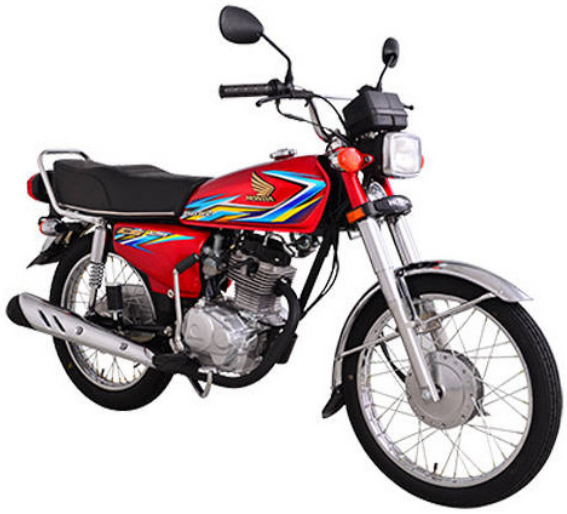
Auto Rickshaw



Specifications		
Overall Dimensions (mm)	1+3	1+6
Overall Width	1120	1270
Overall Length	2800	2800
Overall Height	1885	1885
Wheel Track	1100	1100
Wheel base	2000	2000
Min. Ground Clearance	130	130
Weight (kg)		
Max. GVW	855	855
Kerb Weight	435	435
Seating capacity (including driver)	4	7
* (The above model is available in Petrol, Diesel, CNG and LPG version.)		

Type of Vehicle	Wages/hr	Hrs run/year
Purchase cost of vehicle	210	
Cost of new tyre	829	
Maintenance labour cost	50	116820
Overhead cost	16	
Crew Wages	16	3105
Fuel cost (Diesel)	44	
Fuel cost (Petrol)	77	116820
Lubricant cost	320	

Motorcycle



Honda CG 125 Specifications

Engine	4-Stroke Single Cylinder Air Cooled	Displacement	125 cc
Bore & Stroke	56.5 x 49.5 mm	Compression Ratio	9.0:1
Clutch	N/A	Transmission	4-speed
Starting	Kick start	Frame	Diamond Type Steel
Dimension (Lxwxh)	1911	Ground Clearance	140 mm
Petrol Capacity	9.2 L	Tyre at Front	2.50 - 18
Tyre at Back	3.00 - 17	Dry Weight	99 KG

Type of Vehicle	Wages/hr	Hrs run/year
Purchase cost of vehicle	100	
Cost of new tyre	533	
Maintenance labour cost	50	116820
Overhead cost	22	
Crew Wages	16	3105
Fuel cost (Diesel)	44	
Fuel cost (Petrol)	77	116820
Lubricant cost	320	

Sources of Vehicle

LGED Category	Most Popular Make/Model	Sources of Data
Medium Truck	Tata SE 1612	Nitol Motors
Small Truck	Isuzu NKR55L	ISUZU Website
Bus	Hino AK series	Hino Website
Bus Mini	Tata LP909	Nitol Motors
Micro Bus	Toyota Liteace	Toyota Website
Utility/ Jeep	Mitsubishi Pajero	Mitsubishi Website
Car	Toyota Corolla	Toyota Website
Motor Cycle	Honda 125	Honda Website
Auto Rickshaw/ Mohenro	Bajaj Baby Taxi	Bajaj Website

Table 3.3 Summary of Representative Vehicles by Category

LGED Category	Most Popular Make/Model	%	Second Popular Make/Model	%	Total Two Makes %
Medium Truck	Tata SE 1612	28%	Bedford England	27%	55%
Small Truck	Isuzu NKR55L	46%	Toyota	13%	59%
Pickup	Isuzu NKR55L	46%	Toyota	13%	59%
Bus	Hino AK series	56%	Tata	32%	82%
Bus Mini	Tata LP909	44%	Mitsubishi	19%	63%
Micro Bus	Toyota Liteace	81%	Mitsubishi	13%	94%
Utility/ Jeep	Mitsubishi Pajero	25%	Toyota	23%	48%
Car	Toyota Corolla	74%	Nissan	7%	81%
Motor Cycle	Honda 125	58%	Yamaha	14%	72%
Auto Rickshaw/ Mohenro	Bajaj Baby Taxi	97%	Other	3%	100%
Nosimon/ Karomon	Unknown	97%	Other	3%	100%

Source: Nitol Motors, ISUZU Website, Hino Website, Toyota Website, Mitsubishi Website, Honda Website, Bajaj Website

As Bangladesh has no vehicle manufacturing plant, all vehicles are imported either completely built up (CBU) or completely knocked down (CKD). Most trucks, buses and auto- rickshaws are imported knocked down in the form of chassis and engine, whereas cars, microbuses, motor cycles and utilities are imported whole. The vehicle market is dominated by Japanese and Indian manufacturers and in particular:

- Toyota (Japan) - Microbuses, four wheel drives and Saloon cars
- Honda (Japan) - Motorcycle
- Hino (Japan) - Buses
- Tata (India) - Trucks and Buses
- Bajaj (India) - Auto-Rickshaws/ Motor Cycles

The following section gives a brief description of the vehicles in each of the LGED categories.

Truck Medium

The medium truck market is dominated by three makes: Bedford England, Bedford Hindustan and TATA, which account for some 75 per cent of the market. However, the number of Bedford's has been declining in recent years and the TATA is becoming increasingly popular. During 1994-95 truck imports were dominated by TATA who's most popular model is the 15.6 tonne GVW SE1612.

Truck Small

It is evident that the small truck market is increasing in importance. Previous studies have not identified this as an important category but the 1995/1996 traffic census identified significant volumes on the LGED road network. This increasing trend has been steadily prevailing since then. This increase is symptomatic of the development of the economy and commercial liberalization. New vehicles are being imported mostly from Japan and Isuzu, Toyota and Mitsubishi dominate this small but growing market. The Isuzu NKR55L was selected as the representative model.

Bus

Buses can be divided into luxury categories. Hino of Japan and TATA of India dominate the Bus Heavy market, with some 90 per cent of the total market share. Of these the Hino AK series is by far the most popular and is expected to increase its market share with the introduction of more luxury air- conditioned inter-urban services as the road network improves. In the category of large bus, the chair class bus still dominates and as such has been selected as the representative vehicle for modeling.

Bus Mini

The major brands of minibus are Isuzu, Mitsubishi, Hindustan, TATA, Nissan, Toyota and Eicher. The Japanese makes were popular till the last half of the 1980's but the Indian have been steadily increasing their share and now the TATA LP909 is dominating new purchases. For the last three years its share of the total market was over 70%.

Micro Bus

Microbuses are usually privately owned and small numbers are operated by public transport. Toyota dominates this category with its Hyace and Lightace models and has an 81% share of the market. The Mitsubishi L300 accounts for most of the remainder.

Car

Toyota also dominates the car fleet with 74% of the market. Most imports now consist of the highly popular Corolla Sedan 5 door saloon, which comes in several variants. A mid range variant (1300 GL) was chosen for the representative model. Some cars are imported as re- conditioned second hand vehicles.

Utility/ Jeep (4WD)

The utility vehicle market is dominated by Japanese luxury four wheel drive models, usually referred to as Jeeps. The Mitsubishi Pajero and the Toyota Land Cruiser account for over half this market. The utility category also includes pick ups. But as these vehicles account only for a small proportion of the whole utility market they are not considered for separate modeling. In 1999 a joint venture between Mitsubishi and Progati Industries Ltd Bangladesh started to import Pajeros in knocked down form and manufacture their bodywork locally. The cost of these vehicles is significantly less than the completely built up versions. The proportion of these vehicles in the market is increasing significantly. At the same time the Rangs Limited has been importing Pajero GL V31 VHNDR category of vehicles. These types of middle range Pajeros are dominating the present market share. So, the Pajero GL V31 VHNDR has been chosen for modeling.

Auto-Rickshaw/ Mohindra

The auto-rickshaw market is divided into three categories, which are defined by their respective manufacturers: Mishuk (Atlas), Babytaxi (Bajaj), Tempo (Vespa). In addition auto- vans are built on various chassis. The Mishuk is a locally developed three wheeled vehicle based on a motorcycle engine, manufactured in Bangladesh by Atlas

Ltd. However, only a small number of this variety was constructed so far and the market is still dominated by the Bajaj Babytaxi. The usually Vespa based Tempo is a larger passenger carrying vehicle (up to 15) which has a small but growing share of the auto rickshaw market.

It should be noted that an important development in 2002 was the introduction of CNG (Concentrated Natural Gas) powered auto-rickshaws in Bangladesh. The VOC's for this new category will be assessed in the next RUC studies.

Modified Tempo/ Nosimon/ Karimon

The auto-rickshaw market is divided into three categories, which are defined by their respective manufacturers: Tempo/ Nosimon/ Karimon. In addition auto- vans are built on various chassis. The Tempo is a locally developed three wheeled vehicle based on a motorcycle engine, manufactured in Bangladesh by Atlas Ltd. However, only a small number of this variety was constructed so far and the market is still dominated by the Nosimon/ Karimon. The usually Nosimon/ Karimon based Tempo is a larger passenger carrying vehicle (up to 10) which has a small but growing share of the auto rickshaw market.

Motorcycle

Honda dominates the motorcycle market with 58 percent of the fleet, most of which are 125cc variants. Yamaha, Bajaj and Suzuki account for 14 per cent, 6 per cent and 4 per cent of the remaining market respectively.

Bicycle

Under this category, all two-wheeled NMT are considered. India and China made Bicycles largely dominate in the market. A small proportion of this category is assembled by the vendors combining local and imported parts and accessories. In this study, modeling of bicycles for VOCs are based on a composite of the available models in Bangladesh.

Rickshaw/ Rickshaw-Van-Engine

All three wheeled motorized transports are considered under this group. Rickshaw is a very common mode of transport throughout Bangladesh. The vans are more popular in rural areas. The frames and bodies of this type of vehicle are made locally using both local and imported parts. Rims and chains are generally imported from adjacent areas of the neighboring country, while tyres and bearing are locally manufactured.

Rickshaw/ Rickshaw-Van

All three wheeled non-motorized transports are considered under this group. Rickshaw is a very common mode of transport throughout Bangladesh. The vans are more popular in rural areas. The frames and bodies of this type of vehicle are made locally using both local and imported parts. Rims and chains are generally imported from adjacent areas of the neighboring country, while tyres and bearing are locally manufactured.

2.14 Characteristics of Representative Vehicles

Table 3.4a and 3.4b set out the physical characteristics of the representative vehicle types identified in the previous section.

Table 3.4a Vehicle Characteristics: Engine and Tyres

Category	Make	Importe d as	Fuel	CC	Cylin -ders	Metric HP	No. Tyres	Type of Tyres
Motorized								
Medium Truck	Tata SE 1612/42	CKD	Diesel	5675	6	120	6	10.00x20-16PR
Small Truck	Isuzu NKR55L	CKD	Diesel	2771	4	72	4	7.50x20-12PR
Bus Heavy	Hino AK3HMKA	CKD	Diesel	6443	6	195	6	9.00x20-14PR
Bus Mini	Tata LP909/36	CKD	Diesel	4788	6	112	6	7.50x20-12PR
Bus Light	Toyota Liteace	CBU	Petrol	1800	4	79	4	5.50x13-8PRLT
Utility/Jeep	Mitsubishi Pajero	CBU	Petrol	2400	4	132	4	205 - R16
Car	Toyota Corolla Sadan 1300GL	CBU	Petrol	1300	4	110	4	155 - SR13
Auto Rickshaw	Bajaj Baby Taxi	CKD	Petrol/ 5%Oil	145	1	5.52	3	4.0x8-6PR
Nosimon/ Auto Rick	Bajaj Baby Taxi	CKD	Petrol/ 5%Oil	145	1	5.52	3	4.0x8-6PR
Motor Cycle	Honda CG125	CBU	Petrol	125	1	11	2	Front 2.5 - 4PR Rear 3.0 -4PR

Source: Nitol Motors, ISUZU Website, Hino Website, Toyota Website, Mitsubishi Website, Honda Website, Bajaj Website

Table 3.4b Vehicle Characteristics: Weights and Dimensions

Category	Make	Axles No.	TARE kg	GVW kg	Length mm	Width mm	Height mm
Medium Truck	Tata SE 1612/42	2	4,015	15,660	6,970	2,434	3,625
Small Truck	Isuzu NKR55L	2	2,750	5,200	6,025	1,880	2,220
Bus Heavy	Hino AK3HMKA	2	4,145	12,500	10,005	2,430	1,995
Bus Mini	Tata LP909/36	2	3,300	9,000	5,970	2,159	1,900
Bus Light	Toyota Liteace	2	1,180	2,150	4,453	1,695	1,870
Utility (Jeep)	Mitsubishi Pajero	2	1,930	2,800	4,645	1,695	1,865
Car	Toyota Corolla Sedan 1300GL	2	998	1,510	4,270	1,685	1,380
Auto Rickshaw	Bajaj Baby Taxi	2	200	580	1,900	745	1,020
Nosimon/ Auto Rick	Bajaj Baby Taxi	2	200	580	1,900	745	1,020
Motor Cycle	Honda CG125	2	96	N	1900	745	1020
Bicycle	nc	2	nc	50	nc	nc	nc
Rickshaw / Rickshaw/van Battery	na	2	nc	304	nc	nc	nc
Rickshaw	na	2	nc	304	nc	nc	nc
Animal Cart	na	1	nc	1800	nc	nc	nc

Source: Nitol Motors, ISUZU Website, Hino Website, Toyota Website, Mitsubishi Website, Honda Website, Bajaj Website

Notes:

N = no manufacturers data

TARE = unloaded weight, GVW = gross vehicle weight

CKD = completely knocked down, CBU = completely built unit

CHAPTER 4: VEHICLE OPERATING COSTS

4.1 Introduction

The prediction of vehicle operation cost (VOC) is a complex procedure, as costs of all relevant components of the vehicle are included for the entire Bangladesh vehicle fleet consisting of a plethora of vehicle types. Moreover, the variation of these costs under different operating conditions must also be understood. These operating conditions are normally categorized as:

- Horizontal curvature
- Vertical curvature
- Road Surface Condition
- Traffic Congestion

4.2 Selection of Representative Vehicle Types

The LGED vehicle types are too many. It would be difficult for the traffic survey enumerator to classify and getting sufficient vehicle types to accurately model RUC and traffic effects. This means that some "sub-categories" of vehicles are not recorded (see Table 4.1) especially in the Truck, Bus, Auto Rickshaw, Cycle Rickshaw and Cart categories. The last column of Table 4.2 shows which vehicle belonging to the respective sub category is currently modeled. In each case the most prevalent vehicle is modeled according to current knowledge. The exception is the cart category where human carts may outnumber animal carts.

The modeling could be improved by estimating a weighted average relationship for the vehicles with sub categories. This would have to be based on additional research to identify the proportions of vehicles in each category and to collect the VOC information needed to model them. Alternatively, the sub-categories could be included in an expanded traffic count form and new relationships established. But this is not possible to take into consideration until the current problems with the traffic counting EXEL programme are addressed as enumerators already face a lot of troubles classifying the 15 existing categories.

Table 4.1 LGED Vehicle Categories

LGED Category	Sub Category	Modeled
Truck Medium		
Truck Small		
Pickup		
Bus	Ordinary, Chair, Luxury	Chair
Bus Mini		
Bus Micro		
Utility/ Jeep		
Car		
Auto Rickshaw/ Mohendra	Baby Taxi, Tempo	Baby Taxi, Modified Tempo
Motor Cycle		
Rickshaw/ Rickshaw Van Battery	Passenger and Van	Passenger
Rickshaw/ Rickshaw Van	Passenger and Van	Passenger

***Source**: LGED Vehicle Categories, 2018*

The data inputs for the model have been collected through field survey during 2018. A total of 40 field staff including 8 supervisors were selected with 4 investigators in Dhaka, Chittagong, Rajshahi, Khulna, Barisal, Sylhet, Mymenshing & Rangpur areas each. The data were entered into a computer database. It is understandable that in order to arrive at more realistic results for the country as a whole, field surveys covering more areas are necessary, which calls for more financial and personnel resources as well as time span.

4.3 Utilization

4.3.1 Existing Characteristics

The way in which a vehicle is utilized is a key parameter in estimating VOC. In Bangladesh commercial vehicles are often intensively utilized. Buses, in particular, are operated around the clock with different sets of crews on daytime and nighttime schedules. Table 4.2 shows the Average Annual Utilization of Vehicles. Large buses operating on the intercity routes are utilized for up to 85% of the time available. Medium truck and mini bus are utilized 69 per cent and 73 per cent respectively. Light vehicles like microbus, jeep, car and motorcycle are less utilized.

For modeling VOC it is necessary to estimate how many kilometers on an average a vehicle is driven a year and how many hours the vehicle is operated. The data on vehicle utilization collected through 2018 survey by Economics Circle of RHD are provided in Table 4.2. This shows that distances traveled by large buses are very high reflecting their higher utilization ratios, while the smaller vehicles except baby taxi are driven much less as would be normally expected.

Table 4.2 Average Annual Utilization of Vehicles. 2018

Table 4.2 Average Annual Utilization of Vehicles, 2009

Before Situation-2009				
Category	Annual Driven Km	Annual Hours in Work	Annual Hours Driven	Utilization Ratio (1)
Truck Medium	80,700	3,100	2,036	66%
Truck Small	74,000	3,600	1,748	49%
Bus Heavy	129,800	3,450	2,864	83%
Bus Light	66,700	3,060	2,121	69%
Bus Mini	56,800	3,200	1,171	37%
Utility	22,000	4,700	863	18%
Car	50,000	2,850	1,276	45%
Auto Rick	46,000	1,950	1,695	87%
Tempo	44,000	3,850	2,126	55%
Motor Cycle	13,000	3,950	588	15%
Bicycle *	4,000	260	5040	15%
Rickshaw *	14,000	1,000	17640	15%
Animal Cart *	5,000	1,600	6300	15%

***Source** : Vehicle Operators Survey 2008*
Note: (1) = Hours driven as % of hours in work
* = Non-motorized Vehicle

Table 4.2 Average Annual Utilization of Vehicles, 2018

After Situation-2018				
Category	Annual Driven Km	Annual Hours in Work	Annual Hours Driven	Utilization Ratio (1)
Truck Medium	88,770	3,410	2,240	69%
Truck Small	80,660	3,924	1,905	50%
Bus Heavy	137,588	3,657	3,036	85%
Bus Light	74,704	3,427	2,376	73%
Bus Mini	65,320	3,680	1,347	38%
Utility	23,760	5,076	932	19%
Car	53,500	3,050	1,365	47%
Auto Rick	54,740	2,321	2,017	89%
Tempo	52,800	4,620	2,551	57%
Motor Cycle	15,210	4,622	688	16%
Bicycle *	4,400	286	5,544	16%
Rickshaw *	15,400	1,100	19,404	16%
Animal Cart *	5,500	1,760	6,930	16%

***Source** : Vehicle Operators Survey 2008*
Note: (1) = Hours driven as % of hours in work
* = Non-motorized Vehicle

Table 4.2: Comparison with 2009 & 2018

Change in %				
Category	Annual Driven Km	Annual Hours in Work	Annual Hours Driven	Utilization Ratio (1)
Truck Medium	10.00%	10.00%	10.00%	4.00%
Truck Small	9.00%	9.00%	9.00%	3.00%
Bus Heavy	6.00%	6.00%	6.00%	2.00%
Bus Light	12.00%	12.00%	12.00%	6.00%
Bus Mini	15.00%	15.00%	15.00%	4.00%
Utility	8.00%	8.00%	8.00%	7.00%
Car	7.00%	7.00%	7.00%	4.00%
Auto Rick	19.00%	19.00%	19.00%	2.00%
Tempo	20.00%	20.00%	20.00%	3.00%
Motor Cycle	17.00%	17.00%	17.00%	4.00%
Bicycle *	10.00%	10.00%	10.00%	4.00%
Rickshaw *	10.00%	10.00%	10.00%	4.00%
Animal Cart *	10.00%	10.00%	10.00%	4.00%

***Source** : Vehicle Operators Survey 2008*
Note: (1) = Hours driven as % of hours in work
* = Non-motorized Vehicle

Another important aspect of utilization is the length of time vehicles are operated before they are scrapped or sold, known as the service life. This is a vital component in estimating the depreciation charges attributable to each vehicle. The survey established the average age of vehicles belonging to the operators drivers/owners) interviewed and also to what age operators normally keep the vehicles under their possession (Table 4.3). It also sets out the percentage of vehicles in the sample that were purchased second-hand.

Table 4.3 Age and Operational Life of Vehicles in 2018

Table 4.3 Age and Operational Life of Vehicles in Years, 2009

Before Situation-2009			
Category	Average Age	Normal Service Life	Second Hand Purchases %
Truck Medium	9	9	12
Truck Small	10	8	43
Bus Heavy	7	5	11
Bus Light	10	5	17
Bus Mini	9	6	42
Utility	8	7	9
Car	8	5	31
Auto Rick	4	5	7
Tempo	8	6	16
Motor Cycle	8	5	0
Bicycle *	nc	18	nc
Rickshaw *	nc	12	nc
Animal Cart *	nc	8	nc

***Source** : Vehicle Operators Survey 2009*

Table 4.3 Age and Operational Life of Vehicles in Years, 2018

After Situation-2018			
Category	Average Age	Normal Service Life	Second Hand Purchases %
Truck Medium	9	9	12
Truck Small	10	8	43
Bus Heavy	7	5	11
Bus Light	10	5	17
Bus Mini	9	6	42
Utility	8	7	9
Car	8	5	31
Auto Rick	4	5	7
Tempo	8	6	16
Motor Cycle	8	5	0
Bicycle *	nc	18	nc
Rickshaw *	nc	12	nc
Animal Cart *	nc	8	nc

***Source** : Vehicle Operators Survey 2018*

Table 4.3: Comparison with 2009 & 2018

Change in %			
Category	Average Age	Normal Service Life	Second Hand Purchases %
Truck Medium	0.0%	0.0%	0.0%
Truck Small	0.0%	0.0%	0.0%
Bus Heavy	0.0%	0.0%	0.0%
Bus Light	0.0%	0.0%	0.0%
Bus Mini	0.0%	0.0%	0.0%
Utility	0.0%	0.0%	0.0%
Car	0.0%	0.0%	0.0%
Auto Rick	0.0%	0.0%	0.0%
Tempo	0.0%	0.0%	0.0%
Motor Cycle	0.0%	0.0%	#DIV/0!
Bicycle *	#VALUE!	0.0%	#VALUE!
Rickshaw *	#VALUE!	0.0%	#VALUE!
Animal Cart *	#VALUE!	0.0%	#VALUE!

Source: Nitol Motors, ISUZU Website, Hino Website, Toyota Website, Mitsubishi Website, Honda Website, Bajaj Website

4.3.2 Operators on Road Improvements

As part of the survey, operators were asked what benefits they had obtained from improved roads and bridges. The purpose of this was to establish an idea of the impact of the road improvement programme in general terms and to find out how operators respond to improved conditions of a road. This determines how depreciation is modeled in the economic appraisal system. The results showed that all operators interviewed had benefited from road and bridge improvements (Table 4.4).

Table 4.4 Operators' Opinion on Road Improvements (Percent), 2018

Table 4.4 Operator's Responses to Road Improvements (%), 2009

Before Situation-2009					
Response	Benefited	Change in operation	More trips	Longer trips	Increased load
Truck Med	80	63	36	21	43
Truck Small	43	40	38	25	37
Bus Heavy	48	34	46	54	0
Bus Light	33	30	62	38	0
Bus Mini	38	23	73	27	0
Utility	23	10	67	33	0
Car	13	20	50	50	0
Tempo	25	28	75	25	0
Auto Rick	25	23	63	37	0
Motor Cycle	5	3	100	0	0
Average	**33**	**27**	**61**	**31**	**8**

Source: Vehicle Operators Survey 2009

Table 4.4 Operator's Responses to Road Improvements (%), 2018

After Situation-2018					
Response	Benefited	Change in operation	More trips	Longer trips	Increased load
Truck Med	82	65	37	22	44
Truck Small	45	42	40	26	39
Bus Heavy	49	35	47	55	0
Bus Light	35	32	66	40	0
Bus Mini	40	24	76	28	0
Utility	24	11	70	35	0
Car	14	21	52	52	0
Tempo	27	30	80	27	0
Auto Rick	27	25	69	40	0
Motor Cycle	5	3	106	0	0
Average	**35**	**29**	**64**	**33**	**8**

Source: Vehicle Operators Survey 2018

Table 4.4: Comparison with 2009 & 2018

Change in %					
Response	Benefited	Change in operation	More trips	Longer trips	Increased load
Truck Med	3.00%	3.00%	3.00%	3.00%	3.00%
Truck Small	5.00%	5.00%	5.00%	5.00%	5.00%
Bus Heavy	2.00%	2.00%	2.00%	2.00%	#DIV/0!
Bus Light	6.00%	6.00%	6.00%	6.00%	#DIV/0!
Bus Mini	4.00%	4.00%	4.00%	4.00%	#DIV/0!
Utility	5.00%	5.00%	5.00%	5.00%	#DIV/0!
Car	4.00%	4.00%	4.00%	4.00%	#DIV/0!
Tempo	7.00%	7.00%	7.00%	7.00%	#DIV/0!
Auto Rick	9.00%	9.00%	9.00%	9.00%	#DIV/0!
Motor Cycle	6.00%	6.00%	6.00%	#DIV/0!	#DIV/0!
Average	**0.05**	**0.05**	**0.05**	**#DIV/0!**	**#DIV/0!**

The operators were asked to mention the benefits they have obtained from 3 projects leading to improvement of roads and bridges. The most important benefits are presented in Table 4.5 & 4.6.

Table 4.5 Average Savings in Time and Operation Cost to Operators for Specific Road & Bridge Projects

Table 4.5 Average Saving in Time and Operation Cost, 2009

Before Situation-2009										
Project		Time Saving	VOC Saving		Time Saving	VOC Saving	Dhaka City Roads	Time Saving	VOC Saving	Source: Vehicle Operators Survey 2009
Truck Med	Dhamrai-Dhantara Road (Savar portion) Road	13.00	16.00	Sreepur College-Kapasia	18.00	14.00		0.00	0.00	
Truck Small		20.00	24.00		28.00	15.00		15.00	0.00	
Bus Heavy		24.00	15.00		10.00	5.00		0.00	0.00	
Bus Light		23.00	22.00		14.00	9.00		0.00	0.00	
Bus Mini		25.00	17.00		20.00	10.00		0.00	0.00	
Utility		21.00	14.00		20.00	12.00		0.00	0.00	
Car		48.00	17.00		24.00	13.00		0.00	0.00	
Tempo		19.00	18.00		0.00	0.00		12.00	12.00	
Auto Rick		80.00	0.00		22.00	12.00		16.00	12.00	
Motor Cycle		0.00	0.00		0.00	0.00		0.00	0.00	
Average		**24.00**	**19.00**		**19.00**	**11.00**		**16.00**	**12.00**	

Table 4.5 Average Saving in Time and Operation Cost, 2018

After Situation-2018										
Project		Time Saving	VOC Saving		Time Saving	VOC Saving	Dhaka City Roads	Time Saving	VOC Saving	Source: Vehicle Operators Survey 2009
Truck Med	Dhamrai-Dhantara Road (Savar portion) Road	13.16	16.19	Sreepur College-Kapasia	18.22	14.17	0.00	0.00	0.00	0.00
Truck Small		20.26	24.31		28.36	15.20	0.00	15.20	0.00	0.00
Bus Heavy		24.36	15.23		10.15	5.08	0.00	0.00	0.00	0.00
Bus Light		23.25	22.24		14.15	9.10	0.00	0.00	0.00	0.00
Bus Mini		25.33	17.22		20.26	10.13	0.00	0.00	0.00	0.00
Utility		21.29	14.20		20.28	12.17	0.00	0.00	0.00	0.00
Car		48.58	17.20		24.29	13.16	0.00	0.00	0.00	0.00
Tempo		19.23	18.22		0.00	0.00	0.00	12.14	12.14	0.00
Auto Rick		81.12	0.00		22.31	12.17	0.00	16.22	12.17	0.00
Motor Cycle		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
Average		**24.36**	**19.29**	**0.00**	**19.29**	**11.17**	**0.00**	**16.24**	**12.18**	**0.00**

Table 4.5: Comparison with 2009 & 2018

Change in %										
Project		Time Saving	VOC Saving		Time Saving	VOC Saving	Dhaka City Roads	Time Saving	VOC Saving	Source: Vehicle Operators Survey 2009
Truck Med	Dhamrai-Dhantara Road (Savar portion) Road	1.20%	1.20%	Sreepur College-Kapasia	1.20%	1.20%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Truck Small		1.30%	1.30%		1.30%	1.30%	#DIV/0!	1.30%	#DIV/0!	#DIV/0!
Bus Heavy		1.50%	1.50%		1.50%	1.50%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Bus Light		1.10%	1.10%		1.10%	1.10%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Bus Mini		1.30%	1.30%		1.30%	1.30%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Utility		1.40%	1.40%		1.40%	1.40%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Car		1.20%	1.20%		1.20%	1.20%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Tempo		1.20%	1.20%		#DIV/0!	#DIV/0!	#DIV/0!	1.20%	1.20%	#DIV/0!
Auto Rick		1.40%	#DIV/0!		1.40%	1.40%	#DIV/0!	1.40%	1.40%	#DIV/0!
Motor Cycle		#DIV/0!	#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average		**1.50%**	**1.50%**	**#DIV/0!**	**1.50%**	**1.50%**	**#DIV/0!**	**1.50%**	**1.50%**	**#DIV/0!**

Table 4.6 Average Savings in Time and Operation Cost to Operators for Specific Road & Bridge Projects

Table 4.6 Average Saving in Travel Time and Operation Cost, 2009

Before Situation-2009		
Saving	Time Saving	VOC Saving
Truck Med	17.00	13.00
Truck Small	19.00	19.00
Bus Heavy	20.00	13.00
Bus Light	19.00	12.00
Bus Mini	32.00	17.00
Utility	20.00	12.00
Car	26.00	24.00
Tempo	13.00	11.00
Auto Rick	27.00	9.00
Motor Cycle	23.00	18.00
Average	**21.00**	**14.00**

Source: Vehicle Operators Survey, 2009

Table 4.6 Average Saving in Travel Time and Operation Cost, 2018

After Situation-2018		
Saving	Time Saving	VOC Saving
Truck Med	17.20	13.16
Truck Small	19.27	19.27
Bus Heavy	20.32	13.21
Bus Light	19.32	12.20
Bus Mini	32.42	17.22
Utility	20.30	12.18
Car	26.31	24.29
Tempo	13.22	11.19
Auto Rick	27.49	9.16
Motor Cycle	23.37	18.29
Average	**21.25**	**14.17**

Source: Vehicle Operators Survey,2018

Table 4.6: Comparison with 2009 & 2018

Change in %		
Saving	Time Saving	VOC Saving
Truck Med	1.20%	1.20%
Truck Small	1.40%	1.40%
Bus Heavy	1.60%	1.60%
Bus Light	1.70%	1.70%
Bus Mini	1.30%	1.30%
Utility	1.50%	1.50%
Car	1.20%	1.20%
Tempo	1.70%	1.70%
Auto Rick	1.80%	1.80%
Motor Cycle	1.60%	1.60%
Average	**1.20%**	**1.20%**

Table 4.7 Average Savings in Travel Time and Operation Cost to Operators for Improvement of Network in General

Table 4.7 Percentage Tariffs Applicable to Representative Vehicles and Tyres, 2009 Table 4.7 Percentage Tariffs Applicable to Representative Vehicles and Tyres, 2018 Table 4.7: Comparison with 2009 & 2018

Before Situation-2009								
Category	LPF on CIF	CO on AV	SD on AV+CD	VAT on AV+CD+SD	AIT on AV	IDSE on AV	ATVAT*	PSI on CIF
Truck Medium	1%	25%		15%	3%	4%	1.50%	1%
Truck Small	1%	25%		15%	3%	4%	1.50%	1%
Bus Heavy	1%	12%		15%	3%	4%	1.50%	1%
Bus Light	1%	12%		15%	3%	4%	1.50%	1%
Bus Mini	1%	25%		15%	3%	4%	1.50%	1%
Utility	1%	25%	65%	15%	3%	4%	1.50%	1%
Car	1%	25%	25%	15%	3%	4%	1.50%	1%
Auto Rick	1%	25%	15%	15%	3%	4%	1.50%	1%
Motor Cycle	1%	25%	15%	15%	3%	4%	1.50%	1%
Average	**1%**	**22%**	**30%**	**15%**	**3%**	**4%**	**2%**	**1%**

Source *: Road Network Maintenance and Improvement Project II, 2007 Notes: * on 110% of AV+CD+IDSE.*

After Situation-2018								
Category	LPF on CIF	CO on AV	SD on AV+CD	VAT on AV+CD+SD	AIT on AV	IDSE on AV	ATVAT*	PSI on CIF
Truck Medium	1%	25%	0%	15%	3%	4%	2%	1%
Truck Small	1%	25%	0%	15%	3%	4%	2%	1%
Bus Heavy	1%	12%	0%	15%	3%	4%	2%	1%
Bus Light	1%	12%	0%	15%	3%	4%	2%	1%
Bus Mini	1%	25%	0%	15%	3%	4%	2%	1%
Utility	1%	25%	65%	15%	3%	4%	2%	1%
Car	1%	25%	25%	15%	3%	4%	2%	1%
Auto Rick	1%	25%	15%	15%	3%	4%	2%	1%
Motor Cycle	1%	25%	15%	15%	3%	4%	2%	1%
Average	**1%**	**22%**	**13%**	**15%**	**3%**	**4%**	**2%**	**1%**

Source *: Road Network Maintenance and Improvement Project II, 2017 Notes: * on 110% of AV+CD+IDSE.*

Change in %								
Category	LPF on CIF	CO on AV	SD on AV+CD	VAT on AV+CD+SD	AIT on AV	IDSE on AV	ATVAT*	PSI on CIF
Truck Medium	0%	0%	#DIV/0!	0%	0%	0%	0%	0%
Truck Small	0%	0%	#DIV/0!	0%	0%	0%	0%	0%
Bus Heavy	0%	0%	#DIV/0!	0%	0%	0%	0%	0%
Bus Light	0%	0%	#DIV/0!	0%	0%	0%	0%	0%
Bus Mini	0%	0%	#DIV/0!	0%	0%	0%	0%	0%
Utility	0%	0%	0%	0%	0%	0%	0%	0%
Car	0%	0%	0%	0%	0%	0%	0%	0%
Auto Rick	0%	0%	0%	0%	0%	0%	0%	0%
Motor Cycle	0%	0%	0%	0%	0%	0%	0%	0%
Average	**0%**	**0%**	**#DIV/0!**	**0%**	**0%**	**0%**	**0%**	**0%**

4.4 Vehicle Purchase Costs

Vehicle purchase costs have been derived from a survey of established motor vehicle outlets in Dhaka. In order to derive economic costs the final retail prices (actual cost to the purchaser) are required to be broken down into its constituent parts to identify taxation and foreign currency components.

Duties and taxes are charged on the "Assessable Value (AV)" of the import, which means the Cost, Insurance & Freight (CIF) value in foreign currency converted to Taka at the prevailing exchange rate set by the Bangladesh Bank. If the Cost & Freight (C&F) value only is given, then insurance and a landing fee of 1% each is applied to the C&F cost to give the assessable value. A number of duties and taxes are charged on CIF value, which is set out in Bangladesh Operative Tariff Schedule issued by the National Board of Revenue. The following five duties and taxes are payable on the assessable value (AV):

Customs Duty (CD): Charged at a percentage of the AV. These vary between 14 and 40% for vehicle imports. Duty on micro and car have been reduced from 40 to 25% and 35 to 25% since 2018. On the other hand duty on medium truck, large bus, mini bus, baby taxi and motorcycle have been increased compared to 2009;

Development Surcharge (DS): Charged at a uniform rate of 4% of AV on all types of motorized vehicle;

Supplementary Duty (SD):	Additional charge under the VAT Act on jeep, car, baby taxi and motor cycle charged as a percentage rate on AV;
Value Added Tax (VAT):	Charged almost at a uniform rate of 15% (except mini bus wherein 19% and motor cycle 18%) on the AV inclusive of customs duty and Supplementary Duty, i.e., VAT on CIF+CD+SD;
Advance Income Tax (AIT):	Charged at a flat rate of 3% on AV, except for Government imports;
Landing Permit Fee (LPF):	Charged at a flat rate of 1.5% of AV on imports in excess of Taka 100,000, except for Government imports mainly applicable for large bus type.

Tariffs charged on the representative vehicle categories are set out in Table 4.7. The CIF prices of the vehicle at Chittagong Port are paid either in US dollar or Japanese Yen. Other costs include port dues, transportation, assembling (for knocked down units) and dealers' overheads and margins are paid in Tk. The economic cost is taken as the CIF cost plus all port, transport and assembly costs incurred in getting to the retail price of the vehicle which are shadow priced according to the Standard Conversion Factor (SCF). Table 4.8 provides the breakdown of vehicle purchase costs. The Table shows that the price of all categories of vehicles has increased in 2018 compared to 2009. Substantial increase has been reported for car, auto-rickshaw, minibus and utility vehicles.

Table 4.8 New Vehicle Purchase Costs (Taka in 2018 prices)

Table 4.8 New Vehicle Purchase Costs (Taka in 2009 Prices) | **Table 4.8 New Vehicle Purchase Costs (Taka in 2018 Prices)** | **Table 4.8: Comparison with 2009 & 2018**

SCF 0.907

Before Situation-2009						After Situation-2018						Change in %					
Category	CIF Value	Tariffs	Assembly & Other Cost	Total Financial	Total Economic	Category	CIF Value	Tariffs	Assembly & Other Cost	Total Financial	Total Economic	Category	CIF Value	Tariffs	Assembly & Other Cost	Total Financial	Total Economic
Truck Medium	922,180	380,859	831,860	2,134,899	1,936,353	Truck Medium	1,032,842	426,562	931,683	2,391,087	2,168,716	Truck Medium	12.00%	12.00%	12.00%	12.00%	12.00%
Truck Small	909,800	340,190	202,544	1,452,534	1,317,448	Truck Small	1,055,368	394,620	234,951	1,684,939	1,528,240	Truck Small	16.00%	16.00%	16.00%	16.00%	16.00%
Bus Heavy	2,645,986	403,593	1,175,138	4,224,717	3,831,818	Bus Heavy	3,122,263	476,240	1,386,663	4,985,166	4,521,546	Bus Heavy	18.00%	18.00%	18.00%	18.00%	18.00%
Bus Mini	1,260,000	541,800	400,500	2,202,300	1,997,486	Bus Mini	2,797,200	1,202,796	889,110	4,889,106	4,434,419	Bus Mini	122.00%	122.00%	122.00%	122.00%	122.00%
Bus Light	731,745	319,236	354,019	1,405,000	1,274,335	Bus Light	848,824	370,314	410,662	1,629,800	1,478,229	Bus Light	16.00%	16.00%	16.00%	16.00%	16.00%
Utility	1,154,367	1,575,132	771,769	3,501,267	3,175,649	Utility	2,435,714	3,323,529	1,628,433	7,387,673	6,700,620	Utility	111.00%	111.00%	111.00%	111.00%	111.00%
Car	1,074,000	687,360	322,950	2,084,310	1,890,469	Car	13,446,480	8,605,747	4,043,334	26,095,561	23,668,674	Car	1152.00%	1152.00%	1152.00%	1152.00%	1152.00%
Auto Rick	19,534	64,069	127,261	210,863	191,253	Auto Rick	43,561	142,874	283,792	470,224	426,494	Auto Rick	123.00%	123.00%	123.00%	123.00%	123.00%
Motor Cycle	12,890	35,641	13,772	62,303	56,509	Motor Cycle	13,663	37,779	14,598	66,041	59,899	Motor Cycle	6.00%	6.00%	6.00%	6.00%	6.00%
Average	**970056**	**483098**	**466646**	**1919799**	**1741258**	**Average**	**2755102**	**1664496**	**1091470**	**5511067**	**4998537**	**Average**	**175%**	**175%**	**175%**	**175%**	**175%**

***Source** : Vehicle Dealer's Survey May 2009*

***Source** : Vehicle Dealer's Survey May 2018*

4.5 Consumable Costs

4.5.1 Tyre Costs

Tyres are imported from India, Japan, Malaysia, Indonesia and Taiwan with Indian tyres dominating the market mainly because they are cheaper. The use of re-treaded tyres is common, as is shown in Table 4.9. As shown in this Table, both the usage and the prices of re-traded tyres have been on increase in 2018, compared to 2009. For example the usage and the prices have been increased from 3.1% to 3.9%

Table 4.9 Use of Re-Treaded (RT) Tyres, 2018

Table 4.9 Use of Re-treaded (RT) Tyres, 2009

Before Situation-2009		
Item	% Of RT usage	Cost Tk per RT tyre
Truck Med	57.00	1067.00
Truck Small	9.00	1450.00
Bus Heavy	30.00	2333.00
Bus Light	33.00	2233.00
Bus Mini	50.00	1200.00
Utility	0.00	0.00
Car	20.00	575.00
Auto Rick	19.00	774.00
Average	**27.25**	**1204.00**

Table 4.9 Use of Re-treaded (RT) Tyres, 2018

After Situation-2018		
Item	% Of RT usage	Cost Tk per RT tyre
Truck Med	58.82	1101.14
Truck Small	9.32	1500.75
Bus Heavy	30.93	2405.32
Bus Light	34.10	2307.14
Bus Mini	51.75	1242.00
Utility	0.00	0.00
Car	20.76	596.97
Auto Rick	19.61	798.77
Average	**28.16**	**1244.01**

Table 4.9: Comparison with 2009 & 2018

Change in %		
Item	% Of RT usage	Cost Tk per RT tyre
Truck Med	3.20%	3.20%
Truck Small	3.50%	3.50%
Bus Heavy	3.10%	3.10%
Bus Light	3.32%	3.32%
Bus Mini	3.50%	3.50%
Utility	#DIV/0!	#DIV/0!
Car	3.82%	3.82%
Auto Rick	3.20%	3.20%
Average	**#DIV/0!**	**#DIV/0!**

As far as new tyres are concerned, their prices of different categories of vehicles are on increase between two survey periods. Maximum increase was reported for mini-bus (230%) and motor cycle (220%). For other vehicle the increase was between 20-30% during the mentioned period (Table 4.10).

Table 4.10 Cost of New Tyre (Taka 2018 Prices)

Table 4.10 Cost of New Tyre (Taka 2009 Prices)

SCF 0.907

Before Situation-2009							
Category	Tyre Size	Make	CIF Cost	Tariffs	Other Costs	Financial Cost	Economic Cost
Truck Medium	10.00x20-16PR	India RZ	11023	6040	2147	19210	17423
Truck Small	7.50x20-12PR	Indonesia Dunlop	4485	885	885	6255	5673
Bus Heavy	9.00x20-14PR	India RZ	9991	1555	1555	13101	11883
Bus Mini	5.50x13-6PR	Indonesia Dunlop	2246	517	517	3280	2975
Bus Light	7.50x20-12PR	Indonesia Dunlop	4388	481	841	5710	5179
Utility	205-R16	Japan Dunlop	5614	913	913	7440	6748
Car	155-SR13	Japan Dunlop	2173	426	426	3025	2744
Auto Rick	4.00x8-6PR	India Dunlop	649	90	90	829	752
Motor Cycle	Front 2.5-18 4PR	India Dunlop	544	143	143	830	753
Average			**4568**	**1228**	**835**	**6631**	**6014**

Source *: Vehicle Dealer's Survey May 2009*

Table 4.10 Cost of New Tyre (Taka 2018 Prices)

After Situation-2018							
Category	Tyre Size	Make	CIF Cost	Tariffs	Other Costs	Financial Cost	Economic Cost
Truck Medium	10.00x20-16PR	India RZ	13228	7248	2576	23052	20908
Truck Small	7.50x20-12PR	Indonesia Dunlop	5696	1124	1124	7944	7205
Bus Heavy	9.00x20-14PR	India RZ	12089	1882	1882	15852	14378
Bus Mini	5.50x13-6PR	Indonesia Dunlop	7412	1706	1706	10824	9817
Bus Light	7.50x20-12PR	Indonesia Dunlop	5353	587	1026	6966	6318
Utility	205-R16	Japan Dunlop	7074	1150	1150	9374	8503
Car	155-SR13	Japan Dunlop	2716	533	533	3781	3430
Auto Rick	4.00x8-6PR	India Dunlop	837	116	116	1069	970
Motor Cycle	Front 2.5-18 4PR	India Dunlop	1741	458	458	2656	2409
Average			**6238**	**1645**	**1175**	**9058**	**8215**

Source *: Vehicle Dealer's Survey 2018*

Table 4.10: Comparison with 2009 & 2018

Change in %							
Category	Tyre Size	Make	CIF Cost	Tariffs	Other Costs	Financial Cost	Economic Cost
Truck Medium	10.00x20-16PR	India RZ	20.00%	20.00%	20.00%	20.00%	20.00%
Truck Small	7.50x20-12PR	Indonesia Dunlop	27.00%	27.00%	27.00%	27.00%	27.00%
Bus Heavy	9.00x20-14PR	India RZ	21.00%	21.00%	21.00%	21.00%	21.00%
Bus Mini	5.50x13-6PR	Indonesia Dunlop	230.00%	230.00%	230.00%	230.00%	230.00%
Bus Light	7.50x20-12PR	Indonesia Dunlop	22.00%	22.00%	22.00%	22.00%	22.00%
Utility	205-R16	Japan Dunlop	26.00%	26.00%	26.00%	26.00%	26.00%
Car	155-SR13	Japan Dunlop	25.00%	25.00%	25.00%	25.00%	25.00%
Auto Rick	4.00x8-6PR	India Dunlop	29.00%	29.00%	29.00%	29.00%	29.00%
Motor Cycle	Front 2.5-18 4PR	India Dunlop	220.00%	220.00%	220.00%	220.00%	220.00%
Average			**68.89%**	**68.89%**	**68.89%**	**68.89%**	**68.89%**

4.5.2 Fuel and Lubricants

Detailed information on fuel and lubricant cost is collected from Bangladesh Petroleum Corporation (BPC). The breakdown of unit costs of fuel and lubricants is given in Table 4.11. Although fuel price is highly volatile, between the two survey periods fuel price is found to have increased slightly by 1-2%.

Table 4.11 Economic and Financial Costs of Fuel (Taka per litre in 2018)

Table 4.11 Economic and Financial Costs of Fuel (Taka per litre in 201 **Table 4.11 Economic and Financial Costs of Fuel (Taka per litre in** **Table 4.11: Comparison with 2009 & 2018**

SCF 0.907 SCF 0.907 SCF 0.907

Before Situation-2009						
Vehicle Category	Fuel cost (Diesel)		Fuel cost (Petrol)		Lubricant Cost	
	Fin	Eco	Fin	Eco	Fin	Eco
Truck Medium	89.67	81.33	101.90	92.42	326.08	295.75
Truck Small	89.98	81.61	101.10	91.70	323.52	293.43
Bus Heavy	91.35	82.85	101.50	92.06	324.80	294.59
Bus Light	92.18	83.61	101.30	91.88	324.16	294.01
Bus Mini	93.47	84.78	101.60	92.15	325.12	294.88
Utility	94.58	85.78	101.70	92.24	325.44	295.17
Car	95.79	86.88	101.90	92.42	326.08	295.75
Auto Rick	96.05	87.11	101.10	91.70	323.52	293.43
Motor Cycle	97.06	88.03	101.10	91.70	323.52	293.43
Average	**93.35**	**84.67**	**101.47**	**92.03**	**324.69**	**294.50**

After Situation-2018						
Vehicle Category	Fuel cost (Diesel)		Fuel cost (Petrol)		Lubricant Cost	
	Fin	Eco	Fin	Eco	Fin	Eco
Truck Medium	91.38	82.88	103.84	94.18	332.28	301.37
Truck Small	90.97	82.51	102.21	92.71	327.08	296.66
Bus Heavy	92.72	84.10	103.02	93.44	329.67	299.01
Bus Light	93.38	84.70	102.62	93.07	328.37	297.84
Bus Mini	94.97	86.14	103.23	93.63	330.32	299.60
Utility	96.19	87.24	103.43	93.81	330.97	300.19
Car	97.61	88.53	103.84	94.18	332.28	301.37
Auto Rick	97.10	88.07	102.21	92.71	327.08	296.66
Motor Cycle	98.12	89.00	102.21	92.71	327.08	296.66
Average	**94.71**	**85.91**	**102.96**	**93.38**	**329.46**	**298.82**

Change in %						
Vehicle Category	Fuel cost (Diesel)		Fuel cost (Petrol)		Lubricant Cost	
	Fin	Eco	Fin	Eco	Fin	Eco
Truck Medium	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%
Truck Small	1.10%	1.10%	1.10%	1.10%	1.10%	1.10%
Bus Heavy	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
Bus Light	1.30%	1.30%	1.30%	1.30%	1.30%	1.30%
Bus Mini	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%
Utility	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%
Car	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%
Auto Rick	1.10%	1.10%	1.10%	1.10%	1.10%	1.10%
Motor Cycle	1.10%	1.10%	1.10%	1.10%	1.10%	1.10%
Average	**1.5%**	**1.5%**	**1.5%**	**1.5%**	**1.5%**	**1.5%**

4.6 Vehicle Maintenance Policies and Costs

The large majority of the operators interviewed in the survey reported that they maintained their vehicles by themselves in their own garage (Table 4.12). For example about 91-93% truck perators, 74-79% buse operators and 66-69% car operators are found to have maintained their vehicles in their own garage in 2018. The similar proportions in the 2009 Survey were slightly less, only 1-2%.

Table 4.12 Vehicle Maintenance Policy

Table 4.12 Vehicle Maintenance Policy, 2009

Before Situation-2009				
Policy	Maintained by owners %	Maintained in garage %	Time related %	Use related %
Truck Med	92.00	8.00	80.00	20.00
Truck Small	90.00	10.00	75.00	25.00
Bus Heavy	74.00	26.00	83.00	8.00
Bus Light	78.00	23.00	88.00	13.00
Bus Mini	73.00	28.00	83.00	18.00
Utility	65.00	35.00	68.00	33.00
Car	68.00	32.00	90.00	10.00
Motor Cycle	80.00	20.00	85.00	15.00
Temp	92.00	8.00	95.00	5.00
Auto Rick	95.00	5.00	78.00	22.00
Total	**807.00**	**195.00**	**825.00**	**169.00**
Average	**80.70**	**19.50**	**82.50**	**16.90**

Source: Vehicle Operators Survey 2009

Table 4.12 Vehicle Maintenance Policy, 2018

After Situation-2018				
Policy	Maintained by owners %	Maintained in garage %	Time related %	Use related %
Truck Med	93.20	8.10	81.04	20.26
Truck Small	91.35	10.15	76.13	25.38
Bus Heavy	75.04	26.36	84.16	8.11
Bus Light	79.33	23.39	89.50	13.22
Bus Mini	74.17	28.45	84.33	18.29
Utility	66.17	35.63	69.22	33.59
Car	69.09	32.51	91.44	10.16
Motor Cycle	81.36	20.34	86.45	15.26
Temp	93.75	8.15	96.81	5.10
Auto Rick	96.81	5.10	79.48	22.42
Total	**820.25**	**198.19**	**838.55**	**171.78**
Average	**82.02**	**19.82**	**83.85**	**17.18**

Source: Vehicle Operators Survey 2018

Table 4.12: Comparison with 2009 & 2018

Change in %				
Policy	Maintained by owners %	Maintained in garage %	Time related %	Use related %
Truck Med	1.30%	1.30%	1.30%	1.30%
Truck Small	1.50%	1.50%	1.50%	1.50%
Bus Heavy	1.40%	1.40%	1.40%	1.40%
Bus Light	1.70%	1.70%	1.70%	1.70%
Bus Mini	1.60%	1.60%	1.60%	1.60%
Utility	1.80%	1.80%	1.80%	1.80%
Car	1.60%	1.60%	1.60%	1.60%
Motor Cycle	1.70%	1.70%	1.70%	1.70%
Temp	1.90%	1.90%	1.90%	1.90%
Auto Rick	1.90%	1.90%	1.90%	1.90%
Total	**16.40%**	**16.40%**	**16.40%**	**16.40%**
Average	**1.64%**	**1.64%**	**1.64%**	**1.64%**

The annual costs of maintaining the representative vehicles were estimated from the operators' survey and the relevant data are provided in Table 4.13. Costs are highest for large buses, which appear to be realistic from the point of view of their high utilization. The average maintenance labour cost per month is around Taka 14,000 for all vehicles, assuming a 200 working hours per month, the average financial cost per hour stands at Taka 70 and economic at Taka 63.

Table 4.13 Annual Financial Cost of Vehicle Maintenance (Taka 2018 prices)

Table 4.13 Annual Financial Cost of Vehicle Maint. (Taka 2009)

Before Situation-2009						
Policy	Maintained by owners	Maintained in garage	Time related	Use related	Total Fin	Total Eco
Truck Medium	92.00	8.00	80.00	20.00	200.00	181.40
Truck Small	90.00	10.00	75.00	25.00	200.00	181.40
Bus Heavy	74.00	26.00	83.00	8.00	191.00	173.24
Bus Mini	78.00	23.00	88.00	13.00	202.00	183.21
Bus Light	73.00	28.00	83.00	18.00	202.00	183.21
Utility	65.00	35.00	68.00	33.00	201.00	182.31
Car	68.00	32.00	90.00	10.00	200.00	181.40
Auto Rick	80.00	20.00	85.00	15.00	200.00	181.40
Total	**620.00**	**182.00**	**652.00**	**142.00**	**1596.00**	**1447.57**
Average	**77.50**	**22.75**	**81.50**	**17.75**	**199.50**	**180.95**

Source: Vehicle Operators Survey 2009

Table 4.13 Annual Financial Cost of Vehicle Maint. (Taka 2018)

After Situation-2018						
Policy	Maintained by owners	Maintained in garage	Time related	Use related	Total Fin	Total Eco
Truck Medium	93.20	8.10	81.04	20.26	202.60	183.76
Truck Small	91.53	10.17	76.28	25.43	203.40	184.48
Bus Heavy	187.22	65.78	209.99	20.24	483.23	438.29
Bus Mini	79.43	23.42	89.61	13.24	205.70	186.57
Bus Light	74.10	28.42	84.25	18.27	205.03	185.96
Utility	66.11	35.60	69.16	33.56	204.42	185.41
Car	199.24	93.76	263.70	29.30	586.00	531.50
Auto Rick	81.52	20.38	86.62	15.29	203.80	184.85
Total	**872.33**	**285.63**	**960.63**	**175.58**	**2294.17**	**2080.82**
Average	**109.04**	**35.70**	**120.08**	**21.95**	**286.77**	**260.10**

Source: Vehicle Operators Survey 2018

Table 4.13: Comparison with 2009 & 2018

Change in %						
Policy	Maintained by owners	Maintained in garage	Time related	Use related	Total Fin	Total Eco
Truck Medium	1.30%	1.30%	1.30%	1.30%	1.30%	1.30%
Truck Small	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%
Bus Heavy	153.00%	153.00%	153.00%	153.00%	153.00%	153.00%
Bus Mini	1.83%	1.83%	1.83%	1.83%	1.83%	1.83%
Bus Light	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
Utility	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%
Car	193.00%	193.00%	193.00%	193.00%	193.00%	193.00%
Auto Rick	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%
Total	**3.56**	**3.56**	**3.56**	**3.56**	**3.56**	**3.56**
Average	**44.49%**	**44.49%**	**44.49%**	**44.49%**	**44.49%**	**44.49%**

4.7 Crew Costs

Driver, helper and conductors' costs are presented in Table 4.14. Almost all trucks have a permanent helper in addition to the driver. But most of the buses have conductor in addition to driver and helper. The costs of drivers and helpers for buses are based on two crews per vehicle. As shown in the Table below, between two inter survey period the crew wage costs in financial term are reported to have increased by 38%, while economic value of crew coats by 13% only.

Table 4.14 Crew Wage Costs (Taka 2018 prices)

Table 4.14 Crew Wage Costs (Taka 2009 prices)

Before Situation-2009							
Vehicle Type	Cost Parameters	Driver per month	Helper per month	Driver per hour	Helper per hour	Total financial/hr	Total economic/hr
Truck Medium	Fin	5424	2188	20.86	6.35	27.21	24.68
	Eco	5980	2412	23.00	7.00	30.00	27.21
Truck Small	Fin	3740	1716	12.70	4.54	17.23	15.63
	Eco	4123	1892	14.00	5.00	19.00	17.23
Bus Heavy	Fin	8047	4289	28.12	10.88	39.91	36.20
	Eco	8872	4729	31.00	12.00	44.00	39.91
Bus Mini	Fin	5123	2794	19.95	8.16	28.12	25.50
	Eco	5648	3081	22.00	9.00	31.00	28.12
Bus Light	Fin	4102	1921	15.42	5.44	20.86	18.92
	Eco	4523	2118	17.00	6.00	23.00	20.86
Utility	Fin	5174	0	13.61	0.00	13.61	12.34
	Eco	5704	0	15.00	0.00	15.00	13.61
Car	Fin	3700	1814	15.42	7.26	22.68	20.57
	Eco	4079	2000	17.00	8.00	25.00	22.68
Auto Rick	Fin	4563	1845	14.51	4.54	19.05	17.28
	Eco	5031	2034	16.00	5.00	21.00	19.05
Average	Fin	**4983.97**	**2070.91**	**17.57**	**5.90**	**23.58**	**21.39**
	Eco	**5495.00**	**2283.25**	**19.38**	**6.50**	**26.00**	**23.58**

Table 4.14 Crew Wage Costs (Taka 2018 prices)

After Situation-2018							
Vehicle Type	Cost Parameters	Driver per month	Helper per month	Driver per hour	Helper per hour	Total financial/hr	Total economic/hr
Truck Medium	Fin	6780	3015	28.75	8.75	37.50	34.01
	Eco	6149	2735	26.08	7.94	34.01	30.85
Truck Small	Fin	4712	2365	17.50	6.25	23.75	21.54
	Eco	4274	2145	15.87	5.67	21.54	19.54
Bus Heavy	Fin	10220	5911	38.75	15.00	55.00	49.89
	Eco	9269	5362	35.15	13.61	49.89	45.25
Bus Mini	Fin	6455	3851	27.50	11.25	38.75	35.15
	Eco	5854	3493	24.94	10.20	35.15	31.88
Bus Light	Fin	5210	2648	21.25	7.50	28.75	26.08
	Eco	4725	2401	19.27	6.80	26.08	23.65
Utility	Fin	6622	0	18.75	0.00	18.75	17.01
	Eco	6006	0	17.01	0.00	17.01	15.42
Car	Fin	4662	2500	21.25	10.00	31.25	28.34
	Eco	4228	2268	19.27	9.07	28.34	25.71
Auto Rick	Fin	6160	2543	20.00	6.25	26.25	23.81
	Eco	5587	2306	18.14	5.67	23.81	21.59
Average	Fin	**6352.47**	**2854.06**	**24.22**	**8.13**	**32.50**	**29.48**
	Eco	**5761.69**	**2588.63**	**21.97**	**7.37**	**29.48**	**26.74**

Table 4.14: Comparison with 2009 & 2018

Change in %							
Vehicle Type	Cost Parameters	Driver per month	Helper per month	Driver per hour	Helper per hour	Total financial/hr	Total economic/hr
Truck Medium	Fin	25%	38%	38%	38%	38%	38%
	Eco	3%	13%	13%	13%	13%	13%
Truck Small	Fin	26%	38%	38%	38%	38%	38%
	Eco	4%	13%	13%	13%	13%	13%
Bus Heavy	Fin	27%	38%	38%	38%	38%	38%
	Eco	4%	13%	13%	13%	13%	13%
Bus Mini	Fin	26%	38%	38%	38%	38%	38%
	Eco	4%	13%	13%	13%	13%	13%
Bus Light	Fin	27%	38%	38%	38%	38%	38%
	Eco	4%	13%	13%	13%	13%	13%
Utility	Fin	28%	#DIV/0!	38%	#DIV/0!	38%	38%
	Eco	5%	#DIV/0!	13%	#DIV/0!	13%	13%
Car	Fin	26%	38%	38%	38%	38%	38%
	Eco	4%	13%	13%	13%	13%	13%
Auto Rick	Fin	35%	38%	38%	38%	38%	38%
	Eco	11%	13%	13%	13%	13%	13%
Average	Fin	**27.50%**	**#DIV/0!**	**37.82%**	**#DIV/0!**	**37.82%**	**37.82%**
	Eco	**4.89%**	**#DIV/0!**	**13.38%**	**#DIV/0!**	**13.38%**	**13.38%**

Table 4.15 Crew Wage Costs (Taka per hour in 2017-18 prices)

Table 4.15: Crew Wage Costs (Taka 2009 prices)

Before Situation-2009		
Vehicle Category	**Crew Wage Costs Total Financial**	**Crew Wage Costs Total Economic**
Truck Medium	34.00	30.84
Truck Small	22.00	19.95
Bus Heavy	50.00	45.35
Bus Light	26.00	23.58
Bus Mini	35.00	31.75
Utility	17.00	15.42
Car	28.00	25.40
Auto Rick	24.00	21.77
Total	**236.00**	**214.05**
Average	**29.50**	**26.76**

Source *: Road Network Maintenance and Improvement Project II, 2007*

Table 4.15: Crew Wage Costs (Taka 2018 prices)

After Situation-2018		
Vehicle Category	**Crew Wage Costs Total Financial**	**Crew Wage Costs Total Economic**
Truck Medium	37.37	33.89
Truck Small	24.62	22.33
Bus Heavy	56.95	51.65
Bus Light	30.13	27.33
Bus Mini	40.22	36.48
Utility	18.68	16.95
Car	30.77	27.91
Auto Rick	27.10	24.58
Total	**265.83**	**241.11**
Average	**33.23**	**30.14**

Source *: Road Network Maintenance and Improvement Project II, 2018*

Table 4.15: Comparison with 2009 & 2018

Change in %		
Vehicle Category	**Crew Wage Costs Total Financial**	**Crew Wage Costs Total Economic**
Truck Medium	9.90%	9.90%
Truck Small	11.90%	11.90%
Bus Heavy	13.90%	13.90%
Bus Light	15.90%	15.90%
Bus Mini	14.90%	14.90%
Utility	9.90%	9.90%
Car	9.90%	9.90%
Auto Rick	12.90%	12.90%
Total	**0.99**	**0.99**
Average	**12.40%**	**12.40%**

Overhead Costs

Overhead costs are provided in Table 4.16. These include office administration and rental charge, garaging, insurance, vehicle excise duty/ VAT and tolls/route permit fees. For calculation of economic costs, tax elements and 70% of toll money being treated as transfer payments are excluded from the financial values. Overhead costs are high in Bangladesh, in part due to ferry and bridge tolls that account for 60% of financial overheads in case of medium trucks and large buses and significant proportions (45%) in respect of small trucks and mini buses. Between the two inter-survey period, overhead costs are found to have increased by 25-35%.

Table 4.16 Annual Overhead Costs Taka (2017-18)

Table 4.16 Annual Overhead Costs Taka (2008-09) **Table 4.16 Annual Overhead Costs Taka (2017-18)** **Table 4.16: Comparison with 2009 & 2018**

Before Situation-2009			After Situation-2018			Change in %		
Vehicle Category	Annual Overhead Costs, Total Financial BDT	Annual Overhead Costs Total Economic BDT	Vehicle Category	Annual Overhead Costs, Total Financial BDT	Annual Overhead Costs Total Economic BDT	Vehicle Category	Annual Overhead Costs, Total Financial BDT	Annual Overhead Costs Total Economic BDT
Truck Medium	199460.00	180910.22	Truck Medium	249325.00	226137.78	Truck Medium	25.00%	25.00%
Truck Small	92321.00	83735.15	Truck Small	118170.88	107180.99	Truck Small	28.00%	28.00%
Bus Heavy	430074.00	390077.12	Bus Heavy	546193.98	495397.94	Bus Heavy	27.00%	27.00%
Bus Light	161847.00	146795.23	Bus Light	202308.75	183494.04	Bus Light	25.00%	25.00%
Bus Mini	238782.00	216575.27	Bus Mini	322355.70	292376.62	Bus Mini	35.00%	35.00%
Utility	28494.00	25844.06	Utility	35617.50	32305.07	Utility	25.00%	25.00%
Car	121385.00	110096.20	Car	154158.95	139822.17	Car	27.00%	27.00%
Auto Rick	32597.00	29565.48	Auto Rick	44005.95	39913.40	Auto Rick	35.00%	35.00%
Motor Cycle	9916.00	8993.81	Motor Cycle	12692.48	11512.08	Motor Cycle	28.00%	28.00%
Total	**1115416.00**	**1011682.31**	**Total**	**1435504.19**	**1302002.30**	**Total**	**2.30**	**2.30**
Average	**139427.00**	**126460.29**	**Average**	**179438.02**	**162750.29**	**Average**	**28.75%**	**28.75%**

***Source** : Road Network Maintenance and Improvement Project II, 2009*

Table 4.17 Assignment of Representative Vehicle Types, 2018

Table 4.17 Assignment of Representative Vehicle Types, 200 Table 4.17 Assignment of Representative Vehicle Types, 201 Table 4.17: Comparison with 2009 & 2018

Before Situation-2009				After Situation-2018				Change in %			
LGED Category	HDM Representative Vehicles	HDM Vehicle Type	HDM Vehicle Code	LGED Category	HDM Representative Vehicles	HDM Vehicle Type	HDM Vehicle Code	LGED Category	HDM Representative Vehicles	HDM Vehicle Type	HDM Vehicle Code
Truck Medium	Truck Medium	MT	9	Truck Medium	Truck Medium	MT	9	Truck Medium	Truck Medium	MT	0.00%
Truck Small	Truck Small	MT	8	Truck Small	Truck Small	MT	8	Truck Small	Truck Small	MT	0.00%
Bus Large	Bus Large	MT	15	Bus Large	Bus Large	MT	15	Bus Large	Bus Large	MT	0.00%
Bus Light	Bus Large	MT	14	Bus Light	Bus Large	MT	14	Bus Light	Bus Large	MT	0.00%
Bus Mini	Bus Large	MT	12	Bus Mini	Bus Large	MT	12	Bus Mini	Bus Large	MT	0.00%
Utility	Utility	MT	7	Utility	Utility	MT	7	Utility	Utility	MT	0.00%
Car	Car	MT	4	Car	Car	MT	4	Car	Car	MT	0.00%
Auto Rickshaw	Auto Rickshaw	MT	1	Auto Rickshaw	Auto Rickshaw	MT	1	Auto Rickshaw	Auto Rickshaw	MT	0.00%
Motor Cycle	Motor Cycle	MT	1	Motor Cycle	Motor Cycle	MT	1	Motor Cycle	Motor Cycle	MT	0.00%
Cycle/ Rickshaw	Cycle/ Rickshaw	NMT	2	Cycle/ Rickshaw	Cycle/ Rickshaw	NMT	2	Cycle/ Rickshaw	Cycle/ Rickshaw	NMT	0.00%
Cart	Cart	NMT	3	Cart	Cart	NMT	3	Cart	Cart	NMT	0.00%
Bicycle	Bicycle	NMT	1	Bicycle	Bicycle	NMT	1	Bicycle	Bicycle	NMT	0.00%
Average			**6.42**	**Average**			**6.42**	**Average**			**0.00%**

4.8 VOC Inputs

The summary of VOC inputs required to run the EXEL Program arrived at through the analysis of relevant parameters are presented in Table 4.18.

Table 4.18 Summary of VOC Inputs 2017/18

Table 4.18 Summary of VOC Inputs 2017/18

After Situation-2018																									
Item Cost/Unit Costs	Unit	Table No.	Medium Truck		Small Truck		Bus Heavy		Mini Bus		Bus Light		Utility		Car		Auto Ricksaw		Motor Cycle		Animal Cart		Rickshaw		Bi Cycle	
			Fin	Eco	Fin	Eco	Fin	Eco	Fin	Eco	Fin	Eco	Fin	Eco	Fin	Eco	Fin	Eco	Fin	Eco	Fin	Eco	Fin	Eco	Fin	Eco
Purchase Cost of vehicle	Tk'000 per vehicle	4.8	2,391,087	2,168,716	1,684,939	1,528,240	4,985,166	4,521,546	4,889,106	4,434,419	1,629,800	1,478,229	7,387,673	6,700,620	26,095,561	23,668,674	470,224	426,494	66,041	59,899						
Cost of new tyre	Tk per tyre	4.10	23,052	20,908	7,944	7,205	15,852	14,378	10,824	9,817	6,966	6,318	9,374	8,503	3,781	3,430	1,069	970	2,656	2,409						
Fuel cost (Diesel)	Tk per litre	4.11	90	81	90	82	91	83	92	84	93	85	95	86	96	87	96	87	97	88						
Fuel cost (Petrol)	Tk per litre	4.11	102	92	101	92	102	92	101	92	102	92	102	92	102	92	101	92	101	92						
Lubricant Cost	Tk per litre	4.11	326	296	324	293	325	295	324	294	325	295	325	295	326	296	324	293	324	293						
Driver per month		4.14	6,780	6,149	4,712	4,274	10,220	9,269	6,455	5,854	5,210	4,725	6,622	6,006	4,662	4,228	6,160	5,587	6,352	5,762						
Helper per month		4.14	3,015	2,735	2,365	2,145	5,911	5,362	3,851	3,493	2,648	2,401	0	0	2,500	2,268	2,543	2,306	2,854	2,589						
Driver per hour		4.14	29	26	18	16	39	35	28	25	21	19	19	17	21	19	20	18	24	22						
Helper per hour		4.14	9	8	6	6	15	0	11	10	8	7	0	0	10	9	6	6	8	7						
Total financial/hr		4.14	38	34	24	22	55	50	39	35	29	26	19	17	31	28	26	24	33	29						
Total economic/hr		4.14	34	31	22	20	50	45	35	32	26	24	17	15	28	26	24	22	29	27						
Maintenance Model	Rotation Coefficient	3.3	Tata SE 1612		Isuzu NKR55L		Hino AK series		Tata LP909		Toyota Liteace		Mitsubishi Pajero		Toyota Corolla		Honda 125		Bajaj Baby Taxi							
Imported as		3.4A	CKD		CKD		CKD		CKD		CBU		CBU		CBU		CKD									
Fuel		3.4A	Diesel		Diesel		Diesel		Diesel		Petrol		Petrol		Petrol		Petrol/ 5%Oil		Petrol/ 5%Oil							
CC		3.4A	5675		5675		6443		4788		1800		2400		1300		145		145							
Cylinders		3.4A	6		4		6		6		4		4		4		1		1							
Metric HP		3.4A	120		72		195		112		79		132		110		5.52		5.52							
No. Tyres		3.4A	6		4		6		6		4		4		4		3		3							
Type of Tyres		3.4A	10.00x20-16PR		7.50x20-12PR		9.00x20-14PR		7.50x20-12PR		5.50x13-8PRLT		205 - R16		155 - SR13		4.0x8-6PR		4.0x8-6PR							
Make	Type	3.4A	Tata SE 1612/42		Isuzu NKR55L		Tata SE 1612/42		Tata SE 1612/42		Tata SE 1612/42		Tata SE 1612/42		Tata SE 1612/42		Tata SE 1612/42		Tata SE 1612/42							

Physical Characteristics																	
Manufacturers GVW	Kg	3.4B	15,660	5,200	12,500	9,000	2,150	2,800	1,510	580	580						
TARE weight	Kg	3.4B	4,015	2,750	4,145	3,300	1,180	1,930	998	200	200						
Axles	Number	3.4B	2	2	2	2	2	2	2	2	2						
Length	mm	3.4B	6,970	6,025	10,005	5,970	4,453	4,645	4,270	1,900	1,900						
Width	mm	3.4B	2,434	1,880	2,430	2,159	1,695	1,695	1,685	745	745						
Height	mm	3.4B	3,625	2,220	1,995	1,900	1,870	1,865	1,380	1,020	1,020						
Annual km driven	Kms per annum	4.2	88,770	80,660	137,588	74,704	65,320	23,760	53,500	54,740	52,800						
Annual hours driven	Hrs per annum	4.2	3,410	3,924	3,657	3,427	3,680	5,076	3,050	2,321	4,620						
Annual Hours Driven		4.2	2,240	1,905	3,036	2,376	1,347	932	1,365	2,017	2,551						
Utilization Ratio (1)		4.2	69%	50%	85%	73%	38%	19%	47%	89%	57%						
Average service life	Years	4.3	9	10	7	10	9	8	8	4	8						
Normal Service Life		4.3	9	8	5	5	6	7	5	5	0						
Second Hand Purchases %		4.3	12	43	11	17	42	9	31	7	16						
Utilization																	
% Of RT usage		4.9	59	9	31	34	52	0	21	20	28						
Cost Tk per RT tyre		4.9	1,101	1,501	2,405	2,307	1,242	0	597	799	1,244						
Tyre Size		4.10	10.00x20-16PR	7.50x20-12PR	9.00x20-14PR	5.50x13-6PR	7.50x20-12PR	205-R16	155-SR13								
Make		4.10	India RZ	Indonesia Dunlop	India RZ	Indonesia Dunlop	Indonesia Dunlop	Japan Dunlop	Japan Dunlop								
CIF Cost		4.10	13,228	5,696	12,089	7,412	5,353	7,074	2,716								
Tariffs		4.10	7,248	1,124	1,882	1,706	587	1,150	533								
Other Costs		4.10	2,576	1,124	1,882	1,706	1,026	1,150	533								
Financial Cost		4.10	23,052	7,944	15,852	10,824	6,966	9,374	3,781								
Economic Cost		4.10	20,908	7,205	14,378	9,817	6,318	8,503	3,430								
Maintained by owners %		4.12	93.20	91.35	75.04	79.33	74.17	66.17	69.09	81.36	93.75	96.81					
Maintained in garage %		4.12	8.10	10.15	26.36	23.39	28.45	35.63	32.51	20.34	8.15	5.10					
Time related %		4.12	81.04	76.13	84.16	89.50	84.33	69.22	91.44	86.45	0.00	79.48					
Use related %		4.12	20.26	25.38	8.11	13.22	18.29	33.59	10.16	15.26	5.10	22.42					
Maintained by owners		4.13	93.20	91.53	187.22	79.43	74.10	66.11	199.24	81.52							
Maintained in garage		4.13	8.10	10.17	65.78	23.42	28.42	35.60	93.76	20.38							
Time related		4.13	81.04	76.28	209.99	89.61	84.25	69.16	263.70	86.62							
Use related		4.13	20.26	25.43	20.24	13.24	18.27	33.56	29.30	15.29							
Total Fin		4.13	202.60	203.40	483.23	205.70	205.03	204.42	586.00	203.80							
Total Eco		4.13	183.76	184.48	438.29	186.57	185.96	185.41	531.50	184.85							
Crew Wage Costs Total Financial		4.15	37.37	24.62	56.95	30.13	40.22	18.68	30.77	27.10							
Crew Wage Costs Total Economic		4.15	33.89	22.33	51.65	27.33	36.48	16.95	27.91	24.58							
Annual Overhead Costs, Total Financial BDT		4.16	249325	249325	546194	202309	322356	35618	154159	44006	12692						
Annual Overhead Costs Total Economic BDT		4.16	226138	107181	495398	183494	292377	32305	139822	39913	11512						
HDM- 4 vehicle type	Code	4.18	9	8	15	14	12	7	4	1	1						

Table 4.18a Summary of VOC Inputs 2008/09

Table 4.18a Summary of VOC Inputs 2017/18

Change in %																										
Item Cost/Unit Costs	Unit	Table No.	Medium Truck		Small Truck		Bus Heavy		Mini Bus		Bus Light		Utility		Car		Auto Ricksaw		Motor Cycle		Animal Cart		Rickshaw		Bi Cycle	
			Fin	Eco	Fin	Eco	Fin	Eco	Fin	Eco	Fin	Eco	Fin	Eco	Fin	Eco	Fin	Eco	Fin	Eco	Fin	Eco	Fin	Eco	Fin	Eco
Purchase Cost of vehicle	Tk'000 per vehicle	4.8	12.00%	12.00%	16.00%	16.00%	18.00%	18.00%	122.00%	122.00%	16.00%	16.00%	111.00%	111.00%	1152.00%	1152.00%	123.00%	123.00%	6.00%	6.00%						
Cost of new tyre	Tk per tyre	4.10	20.00%	20.00%	27.00%	27.00%	21.00%	21.00%	230.00%	230.00%	22.00%	22.00%	26.00%	26.00%	25.00%	25.00%	29.00%	29.00%	######	######						
Fuel cost (Diesel)	Tk per litre	4.11	1.90%	1.90%	-10.02%	-10.02%	#DIV/0!	-71.45%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!						
Fuel cost (Petrol)	Tk per litre	4.11	14.49%	14.49%	1.10%	1.10%	#DIV/0!	-68.28%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!						
Lubricant Cost	Tk per litre	4.11	262.31%	262.31%	223.52%	223.52%	#DIV/0!	1.50%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!						
Driver per month		4.14	7350.36%	7350.36%	4611.85%	4611.85%	#DIV/0!	3093.62%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!						
Helper per month		4.14	3177.17%	3177.17%	2265.00%	2265.00%	#DIV/0!	1747.27%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!						
Driver per hour		4.14	-69.09%	-69.09%	-82.50%	-82.50%	#DIV/0!	-87.89%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!						
Helper per hour		4.14	-90.06%	-90.06%	-92.90%	-92.90%	-82.95%	-100.00%	-87.22%	-87.22%	-91.48%	-91.48%	-100.00%	-100.00%	-88.64%	-88.64%	-92.90%	-92.90%	-90.77%	-90.77%						
Total financial/hr		4.14	-62.50%	-62.50%	-76.25%	-76.25%	-45.00%	-45.00%	-61.25%	-61.25%	-71.25%	-71.25%	-81.25%	-81.25%	-68.75%	-68.75%	-73.75%	-73.75%	-67.50%	-67.50%						
Total economic/hr		4.14	-89.37%	-89.37%	-93.27%	-93.27%	-84.41%	-84.41%	-89.02%	-89.02%	-91.85%	-91.85%	-94.69%	-94.69%	-91.14%	-91.14%	-92.56%	-92.56%	-90.79%	-90.79%						
Maintenance Model	Rotation Coefficient	3.3	Tata SE 1612		Isuzu NKR55L		Hino AK series		Tata LP909		Toyota Liteace		Mitsubishi Pajero		Toyota Corolla		Honda 125		Bajaj Baby Taxi							
Imported as		3.4A	CKD		CKD		CKD		CKD		CBU		CBU		CBU		CKD									
Fuel		3.4A	Diesel		Diesel		Diesel		Diesel		Petrol		Petrol		Petrol		Petrol/ 5%Oil		Petrol/ 5%Oil							
CC		3.4A	5675		5675		6443		4788		1800		2400		1300		145		145							
Cylinders		3.4A	6		4		6		6		4		4		4		1		1							
Metric HP		3.4A	120		72		195		112		79		132		110		5.52		5.52							
No. Tyres		3.4A	6		4		6		6		4		4		4		3		3							
Type of Tyres		3.4A	10.00x20-16PR		7.50x20-12PR		9.00x20-14PR		7.50x20-12PR		5.50x13-8PRLT		205 - R16		155 - SR13		4.0x8-6PR		4.0x8-6PR							
Make	Type	3.4A	Tata SE 1612/42		Isuzu NKR55L		Tata SE 1612/42		Tata SE 1612/42		Tata SE 1612/42		Tata SE 1612/42		Tata SE 1612/42		Tata SE 1612/42		Tata SE 1612/42							

Physical Characteristics																	
Manufacturers GVW	Kg	3.4B	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%						
TARE weight	Kg	3.4B	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%						
Axles	Number	3.4B	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%						
Length	mm	3.4B	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%						
Width	mm	3.4B	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%						
Height	mm	3.4B	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%						
Annual km driven	Kms per annum	4.2	10.00%	9.00%	6.00%	12.00%	15.00%	8.00%	7.00%	19.00%	20.00%						
Annual hours driven	Hrs per annum	4.2	67.49%	124.49%	27.69%	61.58%	214.26%	488.18%	138.99%	36.90%	117.31%						
Annual Hours Driven		4.2	24784.44%	18953.20%	43269.14%	23655.20%	14862.78%	11550.50%	16966.50%	50326.25%	31790.00%						
Utilization Ratio (1)		4.2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!						
Average service life	Years	4.3	9	10	7	10	9	8	8	4	8						
Normal Service Life		4.3	9	8	5	5	6	7	5	5	0						
Second Hand Purchases %		4.3	12	43	11	17	42	9	31	7	16						
Utilization																	
% Of RT usage		4.9	59	9	31	34	52	0	21	20	28						
Cost Tk per RT tyre		4.9	1,101	1,501	2,405	2,307	1,242	0	597	799	1,244						
Tyre Size		4.10	10.00x20-16PR	7.50x20-12PR	9.00x20-14PR	5.50x13-6PR	7.50x20-12PR	205-R16	155-SR13								
Make		4.10	India RZ	Indonesia Dunlop	India RZ	Indonesia Dunlop	Indonesia Dunlop	Japan Dunlop	Japan Dunlop								
CIF Cost		4.10	#VALUE!	#VALUE!	456.33%	1639.86%	1156.66%	133.84%	-1.00%	#DIV/0!	#DIV/0!						
Tariffs		4.10	7778.26%	1148.83%	2442.64%	2087.31%	703.86%	1669.82%	683.09%	-100.00%	-100.00%						
Other Costs		4.10	32105.00%	11139.50%	7136.73%	7317.83%	3564.36%	3186.80%	1564.06%	-100.00%	-100.00%						
Financial Cost		4.10	28715.00%	10491.80%	18999.05%	12200.00%	8293.01%	13685.88%	4101.39%	-100.00%	-100.00%						
Economic Cost		4.10	104440.82%	28720.29%	179624.43%	75418.22%	35001.91%	25665.40%	34195.94%	-100.00%	-100.00%						
Maintained by owners %		4.12	1.30%	1.50%	-18.44%	1.70%	1.60%	1.80%	-24.90%	1.70%	#DIV/0!	96.81					
Maintained in garage %		4.12	1.30%	1.50%	1.40%	1.70%	1.60%	1.80%	1.60%	1.70%	#DIV/0!	5.10					
Time related %		4.12	1.30%	1.50%	1.40%	1.70%	1.60%	1.80%	1.60%	1.70%	#DIV/0!	79.48					
Use related %		4.12	1.30%	1.50%	1.40%	1.70%	1.60%	1.80%	1.60%	1.70%	#DIV/0!	22.42					
Maintained by owners		4.13	-53.40%	-54.24%	-1.98%	-60.68%	-63.32%	-67.11%	-0.38%	-59.24%	#DIV/0!						
Maintained in garage		4.13	-95.53%	-94.39%	-62.03%	-87.22%	-84.49%	-80.48%	-48.31%	-88.77%	#DIV/0!						
Time related		4.13	138.35%	246.70%	319.98%	244.66%	140.70%	306.80%	841.79%	260.90%	#DIV/0!						
Use related		4.13	-34.30%	27.42%	-55.37%	-43.86%	-42.45%	117.66%	15.37%	-29.78%	#DIV/0!						
Total Fin		4.13	-99.90%	-99.78%	-99.89%	-99.87%	-99.91%	-99.28%	-99.52%	-99.37%	-100.00%						
Total Eco		4.13	-99.90%	-99.78%	-99.89%	-99.87%	-99.91%	-99.28%	-99.52%	-99.37%	-100.00%						
Crew Wage Costs Total Financial		4.15	315.18%	207.73%	279.67%	115.24%	235.13%	166.90%	669.30%	2609.60%	-100.00%						
Crew Wage Costs Total Economic		4.15	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!						
Annual Overhead Costs, Total Financial BDT		4.16	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!						
Annual Overhead Costs Total Economic BDT		4.16	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!						
HDM- 4 vehicle type	Code	4.18	9	8	15	14	12	7	4	1	1						

4.9 Estimation of Unit Vehicle Operating Cost

4.9.1 VOC Program on Vehicle Categories

VOC Program representing vehicle types was assigned to each of the 10 motorized vehicle types and 3 non-motorized vehicle types on the basis of the vehicle characteristics like number of axles, tyres, type of fuel, GVW, vehicle dimension among others (Table 4.18).

Non Motorized Transport costs have been incorporated in the modeling system of Road User Cost study. In case of economic appraisal this vehicle could be used only when it is confirmed through traffic count survey that the vehicle in question is animal cart. It means that the man drawn cart will not be used in the name of animal cart. In respect of cycle rickshaw only passenger cycle rickshaws are modeled, although it is acknowledged that rickshaw vans are an important component of this market. If it is desired to model the van separately then further research will have to be conducted.

4.10 VOC Modeling

The modeled predictions were validated against fare and tariff data collected during the Vehicle Operating Cost survey. This demonstrated a reasonable correlation.

It was considered that the maintenance parts model was over-estimating in the high roughness range for medium trucks, large buses and utilities. The maintenance model rotation factor was therefore adjusted from 1 to 0.85, which reduced total VOC by 15-20 per cent.

The Optimal Life method was over-estimating depreciation costs by 5-10% and the constant life model was therefore adopted for all vehicle types.

The financial VOC per km resulted in EXCEL run at different roughness levels are presented according to different types of motorized vehicle in Table 4.19 & 4.20.

Table 4.19 Financial VOC of Motorised Vehicle by Road Roughness (Taka/km)

Table 4.19 Sensitivity of Financial VOC of Motorised Vehicle to Road Roughness (Taka/ **Table 4.19 Sensitivity of Financial VOC of Motorised Vehicle to Road Roughness (Taka** **Table 4.19: Comparison with 2009 & 2018**

Before Situation-2009												
Inte Rou Index (IRI)	Medium Truck	Truck Small	Large Bus	Bus Light	Bus Mini	Utility	Car	AutoRickshaw	MotorCycle	Animal Cart	Rickshaw	Bicycle
4	23.80	12.60	76.00	16.85	31.35	17.72	17.87	5.31	3.53	8.91	2.58	1.79
5	25.33	13.29	79.61	17.73	33.05	18.08	18.85	5.54	3.59	9.27	2.71	1.87
6	26.39	13.45	81.63	18.27	34.12	19.32	19.49	5.65	3.65	9.68	2.86	1.97
7	26.85	14.09	81.48	18.35	34.39	19.43	19.66	5.73	3.69	10.21	3.06	2.03
8	26.98	14.19	82.92	17.49	35.20	20.31	19.90	6.34	3.69	11.18	3.41	2.26
9	29.10	15.97	85.78	19.68	37.10	22.85	21.14	6.51	3.71	11.29	3.86	2.38
10	32.33	17.74	90.87	21.86	41.23	25.39	23.48	6.53	3.79	11.37	4.08	2.71
11	33.34	18.41	91.51	24.05	45.35	27.93	25.83	6.67	3.90	12.79	4.19	2.82
12	35.46	18.51	92.15	24.35	46.14	29.36	25.96	6.80	3.93	13.29	4.43	2.90
13	36.02	18.70	92.66	24.95	47.12	29.95	26.07	6.87	4.07	14.02	4.48	3.04
14	36.31	19.30	93.48	25.14	48.26	30.46	26.20	6.95	4.14	15.81	5.54	3.34
15	36.57	19.74	94.04	25.36	49.78	31.03	27.33	7.01	4.27	16.92	5.64	3.84
16	37.12	19.86	100.26	26.10	50.74	33.10	27.41	7.23	4.42	16.98	5.66	3.86
Average	**31.20**	**16.60**	**87.87**	**21.55**	**41.06**	**24.99**	**23.01**	**6.40**	**3.87**	**12.44**	**4.04**	**2.68**

After Situation-2018												
Inte Rou Index (IRI)	Medium Truck	Truck Small	Large Bus	Bus Light	Bus Mini	Utility	Car	AutoRickshaw	MotorCycle	Animal Cart	Rickshaw	Bicycle
4	21.42	11.34	68.40	15.17	28.21	15.95	16.09	4.78	3.18	8.02	2.32	1.61
5	17.73	9.30	55.73	12.41	23.13	12.66	13.19	3.88	2.51	6.49	1.90	1.31
6	15.83	8.07	48.98	10.96	20.47	11.59	11.69	3.39	2.19	5.81	1.71	1.18
7	10.74	5.64	32.59	7.34	13.76	7.77	7.86	2.29	1.48	4.08	1.22	0.81
8	8.09	4.26	24.87	5.25	10.56	6.09	5.97	1.90	1.11	3.35	1.02	0.68
9	17.46	9.58	51.47	11.81	22.26	13.71	12.68	3.91	2.22	6.77	2.31	1.43
10	22.63	12.42	63.61	15.30	28.86	17.77	16.44	4.57	2.65	7.96	2.85	1.90
11	13.34	7.36	36.60	9.62	18.14	11.17	10.33	2.67	1.56	5.12	1.68	1.13
12	17.73	9.26	46.08	12.17	23.07	14.68	12.98	3.40	1.97	6.64	2.22	1.45
13	28.81	14.96	74.13	19.96	37.69	23.96	20.86	5.50	3.26	11.22	3.58	2.44
14	32.68	17.37	84.13	22.63	43.44	27.41	23.58	6.25	3.73	14.23	4.99	3.01
15	32.91	17.77	84.63	22.82	44.80	27.92	24.60	6.31	3.84	15.23	5.08	3.46
16	33.41	17.87	90.23	23.49	45.67	29.79	24.67	6.51	3.98	15.28	5.09	3.47
Average	**20.98**	**11.17**	**58.57**	**14.53**	**27.70**	**16.96**	**15.46**	**4.26**	**2.59**	**8.48**	**2.77**	**1.84**

Change in %												
Inte Rou Index (IRI)	Medium Truck	Truck Small	Large Bus	Bus Light	Bus Mini	Utility	Car	AutoRickshaw	MotorCycle	Animal Cart	Rickshaw	Bicycle
4	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%
5	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%
6	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%
7	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%
8	-70.00%	-70.00%	-70.00%	-70.00%	-70.00%	-70.00%	-70.00%	-70.00%	-70.00%	-70.00%	-70.00%	-70.00%
9	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%
10	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%
11	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%
12	-50.00%	-50.00%	-50.00%	-50.00%	-50.00%	-50.00%	-50.00%	-50.00%	-50.00%	-50.00%	-50.00%	-50.00%
13	-20.00%	-20.00%	-20.00%	-20.00%	-20.00%	-20.00%	-20.00%	-20.00%	-20.00%	-20.00%	-20.00%	-20.00%
14	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%
15	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%
16	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%
Average	**-33.85%**	**-33.85%**	**-33.85%**	**-33.85%**	**-33.85%**	**-33.85%**	**-33.85%**	**-33.85%**	**-33.85%**	**-33.85%**	**-33.85%**	**-33.85%**

Table 4.20 Sensitivity of Economic VOC of Motorised Vehicle to Road Roughness (Taka/km),

Before Situation-2009												
Inte Rou Index (IRI)	Medium Truck	Truck Small	Large Bus	Bus Light	Bus Mini	Utility	Car	AutoRickshaw	MotorCycle	Animal Cart	Rickshaw	Bicycle
4	21.59	11.43	68.93	15.29	28.43	16.07	16.21	4.82	3.21	8.08	2.34	1.62
5	22.98	12.05	72.21	16.08	29.97	16.40	17.09	5.03	3.25	8.40	2.46	1.69
6	23.93	12.20	74.04	16.57	30.95	17.52	17.67	5.13	3.31	8.78	2.59	1.78
7	24.35	12.78	73.90	16.65	31.20	17.62	17.83	5.20	3.35	9.26	2.77	1.84
8	24.47	12.87	75.20	15.86	31.93	18.42	18.05	5.75	3.34	10.14	3.09	2.05
9	26.39	14.48	77.80	17.85	33.65	20.73	19.17	5.91	3.36	10.24	3.50	2.16
10	29.32	16.09	82.42	19.83	37.39	23.03	21.30	5.93	3.43	10.31	3.70	2.46
11	30.24	16.69	83.00	21.81	41.13	25.33	23.43	6.05	3.54	11.60	3.80	2.56
12	32.17	16.79	83.58	22.08	41.85	26.63	23.54	6.17	3.57	12.05	4.02	2.63
13	32.67	16.96	84.04	22.63	42.74	27.16	23.64	6.23	3.69	12.72	4.06	2.76
14	32.93	17.50	84.79	22.80	43.78	27.63	23.76	6.30	3.76	14.34	5.03	3.03
15	33.17	17.91	85.29	23.00	45.15	28.14	24.79	6.36	3.87	15.35	5.12	3.49
16	33.67	18.01	90.93	23.67	46.03	30.02	24.86	6.56	4.01	15.40	5.13	3.50
Average	**28.30**	**15.06**	**79.70**	**19.55**	**37.25**	**22.67**	**20.87**	**5.80**	**3.51**	**11.28**	**3.66**	**2.43**

After Situation-2018												
Inte Rou Index (IRI)	Medium Truck	Truck Small	Large Bus	Bus Light	Bus Mini	Utility	Car	AutoRickshaw	MotorCycle	Animal Cart	Rickshaw	Bicycle
4	19.43	10.29	62.04	13.76	25.59	14.46	14.59	4.34	2.89	7.27	2.10	1.46
5	16.08	8.44	50.55	11.26	20.98	11.48	11.97	3.52	2.28	5.88	1.72	1.19
6	14.36	7.32	44.42	9.94	18.57	10.51	10.60	3.08	1.98	5.27	1.55	1.07
7	9.74	5.11	29.56	6.66	12.48	7.05	7.13	2.08	1.34	3.70	1.11	0.74
8	7.34	3.86	22.56	4.76	9.58	5.53	5.41	1.72	1.00	3.04	0.93	0.61
9	15.84	8.69	46.68	10.71	20.19	12.44	11.50	3.54	2.02	6.14	2.10	1.29
10	20.53	11.27	57.69	13.88	26.18	16.12	14.91	4.15	2.40	7.22	2.59	1.72
11	12.10	6.68	33.20	8.73	16.45	10.13	9.37	2.42	1.41	4.64	1.52	1.02
12	16.08	8.40	41.79	11.04	20.92	13.31	11.77	3.08	1.78	6.03	2.01	1.32
13	26.13	13.57	67.24	18.10	34.19	21.73	18.92	4.99	2.95	10.17	3.25	2.21
14	29.64	15.75	76.31	20.52	39.40	24.86	21.39	5.67	3.38	12.91	4.53	2.73
15	29.85	16.11	76.76	20.70	40.63	25.33	22.31	5.72	3.49	13.81	4.61	3.14
16	30.30	16.21	81.84	21.31	41.42	27.02	22.38	5.90	3.61	13.86	4.62	3.15
Average	**19.03**	**10.13**	**53.13**	**13.18**	**25.12**	**15.38**	**14.02**	**3.86**	**2.35**	**7.69**	**2.51**	**1.67**

Change in %												
Inte Rou Index (IRI)	Medium Truck	Truck Small	Large Bus	Bus Light	Bus Mini	Utility	Car	AutoRickshaw	MotorCycle	Animal Cart	Rickshaw	Bicycle
4	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%
5	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%
6	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%
7	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%
8	-70.00%	-70.00%	-70.00%	-70.00%	-70.00%	-70.00%	-70.00%	-70.00%	-70.00%	-70.00%	-70.00%	-70.00%
9	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%	-40.00%
10	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%	-30.00%
11	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%	-60.00%
12	-50.00%	-50.00%	-50.00%	-50.00%	-50.00%	-50.00%	-50.00%	-50.00%	-50.00%	-50.00%	-50.00%	-50.00%
13	-20.00%	-20.00%	-20.00%	-20.00%	-20.00%	-20.00%	-20.00%	-20.00%	-20.00%	-20.00%	-20.00%	-20.00%
14	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%
15	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%
16	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%	-10.00%
Average	**-33.85%**	**-33.85%**	**-33.85%**	**-33.85%**	**-33.85%**	**-33.85%**	**-33.85%**	**-33.85%**	**-33.85%**	**-33.85%**	**-33.85%**	**-33.85%**

As shown by Tables 4.19 and 4.20, unit operating costs for all types of motorized vehicle are found to have declined in 2018 compared to 2009 by 10-70%. As RI increases VOC increases. The main reason for this is the lower operation cost of vehicles on improved roads in spite of the fact that the CIF price of some vehicles such as medium truck, microbus, utility and car increases compared to that in previous period. This is because of the fact that in the 2018 Study there was decline of the C&F cost of fuel as provided by the BPC. The utilization of vehicle is increased; on the contrary normal service life is decreased.

Individual Vehicle Operating Cost

Road User Cosr of Study for LGED Roads, 2018

Vehicle Operating Cost (Tk) for Large Bus

Model	HINO S'elega
Engine model	E13C
Displacement (L)	12.913
Seating capacity	46 (44 passenger seats, no auxiliary seats, 2 crew seats)

SL No	Item cost	Unit	Wages/hr-4.14-D17	Financial Cost	Kilometrage	Total Tk.
1	Purchase Cost-4.8-D8	000 Tk/piece				4,985,166
2	New Tyre-4.10-D5	Tk/Tyre				15,852
3	Maintenance Cost-4.10-D50	Tk/hour	55	15,852		871,872
4	Overhead Cost-4.16-D64	000/year				546,194
5	Driver Wage Cost-4.14-D13	Tk/month	39	10,220		396,008
6	Helper Wage Cost-4.14-D14	Tk/month	15	5,911		88,669
7	Fuel Cost, diesel-4.11-D10	Tk/lter	91		5	66,813
8	Fuel Cost, Petrol-4.11-D11	Tk/liter	102		5	74,237
9	Fuel Cost, Lubricant-4.11-D12	Tk/liter	325		1	1,187,794
10	Annual km driven-4.2-D35	Km		137,588		
11	Annual hours driven-4.2-D36	Hrs		3,657		
12	Average service-4.3-D39	Yrs		7		
13	Total Financial/hr-4.14-D17			55		
14	Total			654381		8,232,605

Vehicle Operating Cost (Tk) with IRI_Cost/km-2018

4	VOC-IRI-4		12.58
5	Prediction of VOC at IRI 5 =		13.27
6	Prediction of VOC at IRI 6 =		13.43
7	Prediction of VOC at IRI 7 =		14.07
8	Prediction of VOC at IRI 8 =		14.17
9	Prediction of VOC at IRI 95 =		15.95
10	Prediction of VOC at IRI 10 =		17.71
11	Prediction of VOC at IRI 11 =		18.38
12	Prediction of VOC at IRI 12 =		18.48
13	Prediction of VOC at IRI 13 =		18.67
14	Prediction of VOC at IRI 14 =		19.27
15	Prediction of VOC at IRI 15 =		19.71
16	Prediction of VOC at IRI 16 =		19.83

Vehicle Operating Cost (Tk) for Bus Mini

Engine	TATA 497 TC Fuel oolerEfficient with Inter c
CC	6443
Cylinders	4 Cylinders in line 3784 cc
Max/ Engine output	67.5 kw (90 Ps) at 2400 rprs

SL No	Item cost	Unit	Wages/hr-4.14-D17	Financial Cost	Kilometrage	Total Tk.
1	Purchase Cost-4.8-D8	000 Tk/piece				4,889,106
2	New Tyre-4.10-D5	Tk/Tyre				10,824
3	Maintenance Cost-4.10-D50	Tk/hour	39	10,824		419,430
4	Overhead Cost-4.16-D64	000/year				249,325
5	Driver Wage Cost-4.14-D13	Tk/month	28	6,455		177,503
6	Helper Wage Cost-4.14-D14	Tk/month	11	3,851		43,327
7	Fuel Cost, diesel-4.11-D10	Tk/lter	92		5	63,186
8	Fuel Cost, Petrol-4.11-D11	Tk/liter	101		5	69,435
9	Fuel Cost, Lubricant-4.11-D12	Tk/liter	324		1	1,110,961
10	Annual km driven-4.2-D35	Km		74,704		
11	Annual hours driven-4.2-D36	Hrs		3,427		
12	Average service-4.3-D39	Yrs		10		
13	Total Financial/hr-4.14-D17			39		
14	Total			559182		7,033,097

Vehicle Operating Cost (Tk) with IRI_Cost/km-2018

4	VOC-IRI-4		12.58
5	Prediction of VOC at IRI 5 =		13.27
6	Prediction of VOC at IRI 6 =		13.43
7	Prediction of VOC at IRI 7 =		14.06
8	Prediction of VOC at IRI 8 =		14.16
9	Prediction of VOC at IRI 95 =		15.94
10	Prediction of VOC at IRI 10 =		17.71
11	Prediction of VOC at IRI 11 =		18.38
12	Prediction of VOC at IRI 12 =		18.48
13	Prediction of VOC at IRI 13 =		18.67
14	Prediction of VOC at IRI 14 =		19.27
15	Prediction of VOC at IRI 15 =		19.70
16	Prediction of VOC at IRI 16 =		19.82

Vehicle Operating Cost (Tk) for Micro Bus

Maximum power 97ps
Fuel Consumption 11 - 12km/L
Drive Type AWD/FF/FR
Engine Capacity 1,495cc

SL No	Item cost	Unit	Wages/hr-4.14-D17	Financial Cost	Kilometrage	Total Tk.
1	Purchase Cost-4.8-D8	000 Tk/piece				1,629,800
2	New Tyre-4.10-D5	Tk/Tyre				6,966
3	Maintenance Cost-4.10-D50	Tk/hour	29	6,966		200,278
4	Overhead Cost-4.16-D64	000/year				249,325
5	Driver Wage Cost-4.14-D13	Tk/month	21	5,210		110,712
6	Helper Wage Cost-4.14-D14	Tk/month	9	2,648		23,166
7	Fuel Cost, diesel-4.11-D10	Tk/lter	93		5	68,795
8	Fuel Cost, Petrol-4.11-D11	Tk/liter	102		5	74,778
9	Fuel Cost, Lubricant-4.11-D12	Tk/liter	325		1	1,196,442
10	Annual km driven-4.2-D35	Km		65,320		
11	Annual hours driven-4.2-D36	Hrs		3,680		
12	Average service-4.3-D39	Yrs		9		
13	Total Financial/hr-4.14-D17			29		
14	Total			283560		3,560,262

Vehicle Operating Cost (Tk) with IRI_Cost/km-2018

4	VOC-IRI-4		12.56
5	Prediction of VOC at IRI 5 =		13.24
6	Prediction of VOC at IRI 6 =		13.40
7	Prediction of VOC at IRI 7 =		14.04
8	Prediction of VOC at IRI 8 =		14.14
9	Prediction of VOC at IRI 95 =		15.91
10	Prediction of VOC at IRI 10 =		17.68
11	Prediction of VOC at IRI 11 =		18.35
12	Prediction of VOC at IRI 12 =		18.44
13	Prediction of VOC at IRI 13 =		18.63
14	Prediction of VOC at IRI 14 =		19.23
15	Prediction of VOC at IRI 15 =		19.67
16	Prediction of VOC at IRI 16 =		19.79

Vehicle Operating Cost (Tk) for Medium Truck

Model	Tata 497 TURBO INTERCOOLED
Type	Water cooled direct injection Diesel
Cylinders	4 inline
Bore/ Stroke	97 mm x 128 mm

SL No	Item cost	Unit	Wages/hr-4.14-D15	Financial Cost	Kilometrage	Total Tk.
1	Purchase Cost-4.8-D8	000 Tk/piece				2,391,087
2	New Tyre-4.10-D5	Tk/Tyre				23,052
3	Maintenance Cost-4.10-D50	Tk/hour	38	23,052		864,450
4	Overhead Cost-4.16-D64	000/year				249,325
5	Driver Wage Cost-4.14-D13	Tk/month	29	6,780		194,920
6	Helper Wage Cost-4.14-D14	Tk/month	9	3,015		26,381
7	Fuel Cost, diesel-4.11-D10	Tk/lter	90		5	61,156
8	Fuel Cost, Petrol-4.11-D11	Tk/liter	102		5	69,496
9	Fuel Cost, Lubricant-4.11-D12	Tk/liter	326		1	1,111,933
10	Annual km driven-4.2-D35	Km		88,770		
11	Annual hours driven-4.2-D36	Hrs		3,410		
12	Average service-4.3-D39	Yrs		9		
13	Total Financial/hr-4.14-D17			38		
14	Total			219,739.50		4,991,800

Vehicle Operating Cost (Tk) with IRI_Cost/km-2018

4	VOC-IRI at 4		22.72
5	Prediction of VOC at IRI 5 =		24.18
6	Prediction of VOC at IRI 6 =		25.19
7	Prediction of VOC at IRI 7 =		25.63
8	Prediction of VOC at IRI 8 =		25.75
9	Prediction of VOC at IRI 95 =		27.78
10	Prediction of VOC at IRI 10 =		30.86
11	Prediction of VOC at IRI 11 =		31.82
12	Prediction of VOC at IRI 12 =		33.85
13	Prediction of VOC at IRI 13 =		34.38
14	Prediction of VOC at IRI 14 =		34.66
15	Prediction of VOC at IRI 15 =		34.91
16	Prediction of VOC at IRI 16 =		35.43

Vehicle Operating Cost (Tk) for Small Truck

Make	Tata SE 1612/42
CC	6443
Cylinders	6
Maintenance Model	Hino AK series

SL No	Item cost	Unit	Wages/hr-4.14-D17	Financial Cost	Kilometrage	Total Tk.
1	Purchase Cost-4.8-D8	000 Tk/piece				1,684,939
2	New Tyre-4.10-D5	Tk/Tyre				7,944
3	Maintenance Cost-4.10-D50	Tk/hour	24	7,944		188,666
4	Overhead Cost-4.16-D64	000/year				249,325
5	Driver Wage Cost-4.14-D13	Tk/month	18	4,712		82,457
6	Helper Wage Cost-4.14-D14	Tk/month	6	2,365		14,781
7	Fuel Cost, diesel-4.11-D10	Tk/lter	90		5	70,616
8	Fuel Cost, Petrol-4.11-D11	Tk/liter	101		5	79,343
9	Fuel Cost, Lubricant-4.11-D12	Tk/liter	324		1	1,269,492
10	Annual km driven-4.2-D35	Km		80,660		
11	Annual hours driven-4.2-D36	Hrs		3,924		
12	Average service-4.3-D39	Yrs		10		
13	Total Financial/hr-4.14-D17			24		
14	Total			299489		3,647,565

Vehicle Operating Cost (Tk) with IRI_Cost/km-2018

4	VOC-IRI-4		12.18
5	Prediction of VOC at IRI 5 =		12.85
6	Prediction of VOC at IRI 6 =		13.00
7	Prediction of VOC at IRI 7 =		13.62
8	Prediction of VOC at IRI 8 =		13.72
9	Prediction of VOC at IRI 95 =		15.44
10	Prediction of VOC at IRI 10 =		17.15
11	Prediction of VOC at IRI 11 =		17.80
12	Prediction of VOC at IRI 12 =		17.89
13	Prediction of VOC at IRI 13 =		18.08
14	Prediction of VOC at IRI 14 =		18.66
15	Prediction of VOC at IRI 15 =		19.08
16	Prediction of VOC at IRI 16 =		19.20

Vehicle Operating Cost (Tk) for Utility

Capacity	3.2L
Bore x Stroke (mm)	98.5mm x 105.0mm
Maximum power	141kW@3800rpm
Compression ratio	16.1:1

SL No	Item cost	Unit	Wages/hr-4.14-D17	Financial Cost	Kilometrage	Total Tk.
1	Purchase Cost-4.8-D8	000 Tk/piece				7,387,673
2	New Tyre-4.10-D5	Tk/Tyre				9,374
3	Maintenance Cost-4.10-D50	Tk/hour	19	9,374		175,770
4	Overhead Cost-4.16-D64	000/year				249,325
5	Driver Wage Cost-4.14-D13	Tk/month	19	6,622		124,165
6	Helper Wage Cost-4.14-D14	Tk/month	0	0		-
7	Fuel Cost, diesel-4.11-D10	Tk/lter	95		5	96,019
8	Fuel Cost, Petrol-4.11-D11	Tk/liter	102		5	103,246
9	Fuel Cost, Lubricant-4.11-D12	Tk/liter	325		1	1,651,933
10	Annual km driven-4.2-D35	Km		23,760		
11	Annual hours driven-4.2-D36	Hrs		5,076		
12	Average service-4.3-D39	Yrs		8		
13	Total Financial/hr-4.14-D17			19		
14	Total			553907		9,797,505
	Vehicle Operating Cost (Tk) with IRI_Cost/km-2018					
4	VOC-IRI-4					17.69
5	Prediction of VOC at IRI 5 =					18.05
6	Prediction of VOC at IRI 6 =					19.29
7	Prediction of VOC at IRI 7 =					19.39
8	Prediction of VOC at IRI 8 =					20.27
9	Prediction of VOC at IRI 95 =					22.81
10	Prediction of VOC at IRI 10 =					25.34
11	Prediction of VOC at IRI 11 =					27.88
12	Prediction of VOC at IRI 12 =					29.31
13	Prediction of VOC at IRI 13 =					29.90
14	Prediction of VOC at IRI 14 =					30.41
15	Prediction of VOC at IRI 15 =					30.97
16	Prediction of VOC at IRI 16 =					33.04

Vehicle Operating Cost (Tk) for Car

Engine	1.8L L4 DOHC 16 valve
Power	132 hp @ 6000 rmp
Body	Sedon
Doors	4

SL No	Item cost	Unit	Wages/hr-4.14-D17	Financial Cost	Kilometrage	Total Tk.
1	Purchase Cost-4.8-D8	000 Tk/piece				26,095,561
2	New Tyre-4.10-D5	Tk/Tyre				23,052
3	Maintenance Cost-4.10-D50	Tk/hour	31	3,781		118,164
4	Overhead Cost-4.16-D64	000/year				249,325
5	Driver Wage Cost-4.14-D13	Tk/month	21	4,662		99,058
6	Helper Wage Cost-4.14-D14	Tk/month	10	2,500		25,000
7	Fuel Cost, diesel-4.11-D10	Tk/lter	96		5	58,420
8	Fuel Cost, Petrol-4.11-D11	Tk/liter	102		5	62,149
9	Fuel Cost, Lubricant-4.11-D12	Tk/liter	326		1	994,381
10	Annual km driven-4.2-D35	Km		53,500		
11	Annual hours driven-4.2-D36	Hrs		3,050		
12	Average service-4.3-D39	Yrs		8		
13	Total Financial/hr-4.14-D17			31		
14	Total			1561489		27,725,110

Vehicle Operating Cost (Tk) with IRI_Cost/km-2018

4	VOC-IRI-4		17.76
5	Prediction of VOC at IRI 5 =		18.73
6	Prediction of VOC at IRI 6 =		19.37
7	Prediction of VOC at IRI 7 =		19.53
8	Prediction of VOC at IRI 8 =		19.77
9	Prediction of VOC at IRI 95 =		21.00
10	Prediction of VOC at IRI 10 =		23.33
11	Prediction of VOC at IRI 11 =		25.66
12	Prediction of VOC at IRI 12 =		25.79
13	Prediction of VOC at IRI 13 =		25.90
14	Prediction of VOC at IRI 14 =		26.03
15	Prediction of VOC at IRI 15 =		27.15
16	Prediction of VOC at IRI 16 =		27.23

Vehicle Operating Cost (Tk) for Motor Cycle

Engine	4-Stroke Single Cylinder Air
Bore & Stroke	56.5 x 49.5 mm
Starting	Kick start
Dimension (Lxwxh)	1911

SL No	Item cost	Unit	Wages/hr-4.14-D17	Financial Cost	Kilometrage	Total Tk.
1	Purchase Cost-4.8-D8	000 Tk/piece				66,041
2	New Tyre-4.10-D5	Tk/Tyre				2,656
3	Maintenance Cost-4.10-D50	Tk/hour	0	0		-
4	Overhead Cost-4.16-D64	000/year				249,325
5	Driver Wage Cost-4.14-D13	Tk/month	0	0		-
6	Helper Wage Cost-4.14-D14	Tk/month	9	0		-
7	Fuel Cost, diesel-4.11-D10	Tk/lter	97		5	89,680
8	Fuel Cost, Petrol-4.11-D11	Tk/liter	101		5	93,416
9	Fuel Cost, Lubricant-4.11-D12	Tk/liter	324		1	1,494,662
10	Annual km driven-4.2-D35	Km		52,800		
11	Annual hours driven-4.2-D36	Hrs		4,620		
12	Average service-4.3-D39	Yrs		8		
13	Total Financial/hr-4.14-D17			0		
14	Total			112729		1,995,781

Vehicle Operating Cost (Tk) with IRI_Cost/km-2018

4	VOC-IRI-4		17.70
5	Prediction of VOC at IRI 5 =		18.06
6	Prediction of VOC at IRI 6 =		19.30
7	Prediction of VOC at IRI 7 =		19.41
8	Prediction of VOC at IRI 8 =		20.29
9	Prediction of VOC at IRI 95 =		22.83
10	Prediction of VOC at IRI 10 =		25.37
11	Prediction of VOC at IRI 11 =		27.91
12	Prediction of VOC at IRI 12 =		29.33
13	Prediction of VOC at IRI 13 =		29.92
14	Prediction of VOC at IRI 14 =		30.43
15	Prediction of VOC at IRI 15 =		31.00
16	Prediction of VOC at IRI 16 =		33.07

Vehicle Operating Cost (Tk) for Auto Rickshaw

Overall Width	1120 1270
Overall Length	2800 2800
Overall Height	1885 1885
Wheel Track	1100 1100

SL No	Item cost	Unit	Wages/hr-4.14-D17	Financial Cost	Kilometrage	Total Tk.
1	Purchase Cost-4.8-D8	000 Tk/piece				470,224
2	New Tyre-4.10-D5	Tk/Tyre				1,069
3	Maintenance Cost-4.10-D50	Tk/hour	26	0		-
4	Overhead Cost-4.16-D64	000/year				249,325
5	Driver Wage Cost-4.14-D13	Tk/month	20	6,160		123,204
6	Helper Wage Cost-4.14-D14	Tk/month	6	2,543		15,891
7	Fuel Cost, diesel-4.11-D10	Tk/lter	90		5	41,617
8	Fuel Cost, Petrol-4.11-D11	Tk/liter	101		5	46,921
9	Fuel Cost, Lubricant-4.11-D12	Tk/liter	324		1	750,728
10	Annual km driven-4.2-D35	Km		54,740		
11	Annual hours driven-4.2-D36	Hrs		2,321		
12	Average service-4.3-D39	Yrs		4		
13	Total Financial/hr-4.14-D17			26		
14	Total			95979		1,698,979
	Vehicle Operating Cost (Tk) with IRI_Cost/km-2018					
4	VOC-IRI-4					17.70
5	Prediction of VOC at IRI 5 =					18.06
6	Prediction of VOC at IRI 6 =					19.30
7	Prediction of VOC at IRI 7 =					19.41
8	Prediction of VOC at IRI 8 =					20.29
9	Prediction of VOC at IRI 95 =					22.83
10	Prediction of VOC at IRI 10 =					25.36
11	Prediction of VOC at IRI 11 =					27.90
12	Prediction of VOC at IRI 12 =					29.33
13	Prediction of VOC at IRI 13 =					29.92
14	Prediction of VOC at IRI 14 =					30.43
15	Prediction of VOC at IRI 15 =					31.00
16	Prediction of VOC at IRI 16 =					33.07

Vehicle Operating Cost (Tk) for Animal Cart

Make
CC
Cylinders
Maintenance Model

SL No	Item cost	Unit	Wages/hr-4.14-D17	Financial Cost	Kilometrage	Total Tk.
1	Purchase Cost-4.8-D8	000 Tk/piece				0
2	New Tyre-4.10-D5	Tk/Tyre				0
3	Maintenance Cost-4.10-D50	Tk/hour	0	0		-
4	Overhead Cost-4.16-D64	000/year				0
5	Driver Wage Cost-4.14-D13	Tk/month	0	0		-
6	Helper Wage Cost-4.14-D14	Tk/month	0	0		-
7	Fuel Cost, diesel-4.11-D10	Tk/lter	0		5	-
8	Fuel Cost, Petrol-4.11-D11	Tk/liter	0		5	-
9	Fuel Cost, Lubricant-4.11-D12	Tk/liter	326		1	1,111,933
10	Annual km driven-4.2-D35	Km		0		
11	Annual hours driven-4.2-D36	Hrs		3,410		
12	Average service-4.3-D39	Yrs		9		
13	Total Financial/hr-4.14-D17			0		
14	Total			62850		1,111,933

Vehicle Operating Cost (Tk) with IRI_Cost/km-2018

4	VOC-IRI-4		17.69
5	Prediction of VOC at IRI 5 =		18.05
6	Prediction of VOC at IRI 6 =		19.29
7	Prediction of VOC at IRI 7 =		19.40
8	Prediction of VOC at IRI 8 =		20.28
9	Prediction of VOC at IRI 95 =		22.81
10	Prediction of VOC at IRI 10 =		25.35
11	Prediction of VOC at IRI 11 =		27.89
12	Prediction of VOC at IRI 12 =		29.31
13	Prediction of VOC at IRI 13 =		29.90
14	Prediction of VOC at IRI 14 =		30.41
15	Prediction of VOC at IRI 15 =		30.98
16	Prediction of VOC at IRI 16 =		33.05

Vehicle Operating Cost (Tk) for Rickshaw

Make
CC
Cylinders
Maintenance Model

SL No	Item cost	Unit	Wages/hr-4.14-D17	Financial Cost	Kilometrage	Total Tk.
1	Purchase Cost-4.8-D8	000 Tk/piece				0
2	New Tyre-4.10-D5	Tk/Tyre				0
3	Maintenance Cost-4.10-D50	Tk/hour	0	0		-
4	Overhead Cost-4.16-D64	000/year				249,325
5	Driver Wage Cost-4.14-D13	Tk/month	0	0		-
6	Helper Wage Cost-4.14-D14	Tk/month	0	0		-
7	Fuel Cost, diesel-4.11-D10	Tk/lter	0		5	-
8	Fuel Cost, Petrol-4.11-D11	Tk/liter	0		5	-
9	Fuel Cost, Lubricant-4.11-D12	Tk/liter	0		1	-
10	Annual km driven-4.2-D35	Km		0		
11	Annual hours driven-4.2-D36	Hrs		0		
12	Average service-4.3-D39	Yrs		0		
13	Total Financial/hr-4.14-D17			0		
14	Total			14170		249,325

Vehicle Operating Cost (Tk) with IRI_Cost/km-2018

4	VOC-IRI-4		17.59
5	Prediction of VOC at IRI 5 =		17.95
6	Prediction of VOC at IRI 6 =		19.18
7	Prediction of VOC at IRI 7 =		19.29
8	Prediction of VOC at IRI 8 =		20.17
9	Prediction of VOC at IRI 95 =		22.69
10	Prediction of VOC at IRI 10 =		25.21
11	Prediction of VOC at IRI 11 =		27.73
12	Prediction of VOC at IRI 12 =		29.15
13	Prediction of VOC at IRI 13 =		29.74
14	Prediction of VOC at IRI 14 =		30.25
15	Prediction of VOC at IRI 15 =		30.81
16	Prediction of VOC at IRI 16 =		32.87

Vehicle Operating Cost (Tk) for Bicycle

Make
CC
Cylinders
Maintenance Model

SL No	Item cost	Unit	Wages/hr-4.14-D17	Financial Cost	Kilometrage	Total Tk.
1	Purchase Cost-4.8-D8	000 Tk/piece				0
2	New Tyre-4.10-D5	Tk/Tyre				0
3	Maintenance Cost-4.10-D50	Tk/hour	0	0		-
4	Overhead Cost-4.16-D64	000/year				249,325
5	Driver Wage Cost-4.14-D13	Tk/month	0	0		-
6	Helper Wage Cost-4.14-D14	Tk/month	0	0		-
7	Fuel Cost, diesel-4.11-D10	Tk/lter	0		5	-
8	Fuel Cost, Petrol-4.11-D11	Tk/liter	0		5	-
9	Fuel Cost, Lubricant-4.11-D12	Tk/liter	0		1	-
10	Annual km driven-4.2-D35	Km		0		
11	Annual hours driven-4.2-D36	Hrs		0		
12	Average service-4.3-D39	Yrs		0		
13	Total Financial/hr-4.14-D17			0		
14	Total			14170		249,325
	Vehicle Operating Cost (Tk) with IRI_Cost/km-2018					
4	VOC-IRI-4					17.59
5	Prediction of VOC at IRI 5 =					17.95
6	Prediction of VOC at IRI 6 =					19.18
7	Prediction of VOC at IRI 7 =					19.29
8	Prediction of VOC at IRI 8 =					20.17
9	Prediction of VOC at IRI 95 =					22.69
10	Prediction of VOC at IRI 10 =					25.21
11	Prediction of VOC at IRI 11 =					27.73
12	Prediction of VOC at IRI 12 =					29.15
13	Prediction of VOC at IRI 13 =					29.74
14	Prediction of VOC at IRI 14 =					30.25
15	Prediction of VOC at IRI 15 =					30.81
16	Prediction of VOC at IRI 16 =					32.87

4.11 Pedestrian Costs

Pedestrians do get benefit from road development on two accounts. Firstly, a part of their energy is saved due to improved roads. Secondly, they need to spend less time on the improved road to get to their destination. The next best alternative for pedestrians is to use Rickshaw which carries 2 passengers. Therefore, 50% of VOC cost of Rickshaw can be taken as opportunity cost of pedestrians. Economic analysis can be carried out by including this cost until further empirical research is carried out on the issue.

CHAPTER 5: TRAVEL TIME COSTS

5.1 General

Travel Time Costs (TTC) also referred to as Values of Time spent on travelling are an important component of road user costs. The concept of travel time costs is based on the fact that time spent on traveling has an "opportunity cost" and could be used in an alternative activity which also produces or may produce some significant utility popularly known as benefit. If the alternative activity can have a monetary value assigned to it, this can be used as a part of RUC in the economic appraisal of projects, particularly of the transport projects having relation with consumption of time in the use of their output.

TTC may vary from country to country, even from project to project in the same country. This can vary in size from 20 percent to over 80 percent of total RUC in the economic and/or financial appraisal of schemes. This depends on the extent of time delays involved in case of the project under study as well as the income pattern of the users of the project output. In case of the construction of a major new bridge to replace a ferry for example, TTC will be immensely significant compared to a road improvement project without any change in its alignment or pavement and/or shoulder capacity. Again, value of time will be much higher in a more developed country like the USA or Britain than that in a less developed country like Bangladesh or Afghanistan. Similarly this variation in value of time may exist between a more developed region or society of a country and a relatively less developed part or habitation of the same country.

Time costs can be estimated for road users and for freight consignments. Costs may be broken down into "in vehicle time" and "out of vehicle time". The latter may be important to bus passengers waiting for a vehicle, but is specialized in its application and is not considered in the LGED approach which focuses on "in vehicle time" values only.

Time costs will vary between different vehicle types according to the socio-economic characteristics of the occupants, their trip purpose and the type of freight carried. For analysis purposes TTC are expressed as hourly values per vehicle by assuming average occupancies and loading factors for each vehicle type.

Although every vehicle or category of vehicles will have its own total TTC it is sometimes considered appropriate to apply a uniform TTC across all vehicle types to avoid biasing investment towards roads with a dominance of one type of user over another (i.e. a road with many high income car users will generate much higher time savings than a road with many low value rickshaw users: a scenario typically prevailing in Bangladesh). In this case of uniform application the TTC is referred to as an "equity" value. This approach is appropriate mainly for the developed country as income distribution in such country is more or less smooth and even. Users of cars and bicycles may belong to the same economic class as most of them own and use both of the vehicles to suit the convenience of their movement. In a country like Bangladesh on the contrary, the income pattern between the users of highly expensive motorized vehicles such as cars and jeeps and those of slow moving non-motorized transport such as rickshaws and bicycles is substantially different and these two categories of road users belong to two completely different economic classes in the society. That's why the approach of uniform TTC has not been adopted in Bangladesh to date. In this study TTC has been estimated according to separate vehicle type.

As TTC varies geographically according to the socio-economic characteristics of the region, it would be expected, for instance, that road users in Dhaka city will value their time more than those in a remote Jaganthpur Upazila in Sunamgonj. It is usual practice; in this case, to adopt a set of nationally averaged TTC applicable to all analyses to avoid the sort of geographical biases in road investment. This approach will continue to be used in Bangladesh in line with current methodology.

5.2 Summary of Survey Results

A totalof18 Upazila roads and 6Union roads occupants were interviewed. This section provides a summary of the Upazila & Union Road travel time surveys conducted in 2018. Details of TTC data presented in Tables 5.1, 5.2 and 5.3 give the distribution of trip purpose for Upazila & Union Roads respectively. As per these Tables, the main purpose of trips by vehicle occupants was to go for own business (56%), followed by employers' business (21%), journey to/from work (13%), etc.

Table 5.1 Sample Distribution of Vehicle Occupants by Trip Purpose (Upazila & Union Road), 2018

Table 5.1 Sample Distribution of Vehicle Occupants by Trip Purpose (Upazila & Union Road), 2009

Trip Purpose	Bus Heavy	Bus Light	Bus Mini	Car	Utility	Tempo	Auto Rick	Modified Tempo	Motor Cycle	Bicycle	Rickshaw	Rickshaw Van	Animal Cart	Total
Journey to/ From Work	2	3	3	5	4	5	2	6	4	4	2	4	0	**44**
Employers Business	3	4	4	6	4	6	6	6	11	6	7	6	3	**72**
Own Business	6	11	11	15	12	19	14	19	19	24	15	20	6	**191**
Family and Social	0	0	1	2	2	5	2	5	2	2	1	5	5	**32**
Total	**11**	**18**	**19**	**28**	**22**	**35**	**24**	**36**	**36**	**36**	**25**	**35**	**14**	**339**
Average	**3**	**5**	**5**	**7**	**6**	**9**	**6**	**9**	**9**	**9**	**6**	**9**	**4**	**85**

Source *: Travel Time Cost Survey 2007-08, RDP-25, LGED, Time Saving in Developing Countries, JDGF Howe, Journal of Transport Economics and Policy, May 1976. Valuation of Economic Costs: United Kingdom's Transport Research Laboratory (TRL)*

Note: Vehicle Occupants by Trip: LGED Upazila & Union Rd. in 6 Divisions

Table 5.1 Sample Distribution of Vehicle Occupants by Trip Purpose (Upazila & Union Road), 2018

Trip Purpose	Bus Heavy	Bus Light	Bus Mini	Car	Utility	Tempo	Auto Rick	Modified Tempo	Motor Cycle	Bicycle	Rickshaw	Rickshaw Van	Animal Cart	Total
Journey to/ From Work	2	3	3	5	4	5	2	6	4	4	2	4	0	**45**
Employers Business	3	4	4	6	4	6	6	6	11	6	7	6	3	**73**
Own Business	6	11	11	15	12	19	14	19	19	24	15	20	6	**194**
Family and Social	0	0	1	2	2	5	2	5	2	2	1	5	5	**32**
Total	**11**	**18**	**19**	**28**	**22**	**36**	**24**	**37**	**37**	**37**	**25**	**36**	**14**	**345**
Average	**3**	**5**	**5**	**7**	**6**	**9**	**6**	**9**	**9**	**9**	**6**	**9**	**4**	**86**

Source *: Travel Time Cost Survey 2018, RDP-25, LGED, Time Saving in Developing Countries, JDGF Howe, Journal of Transport Economics and Policy, May 1976. Valuation of Economic Costs: United Kingdom's Transport Research Laboratory (TRL)*

Note: Vehicle Occupants by Trip: LGED Upazila & Union Rd. in 6 Divisions

Table 5.1: Comparison with 2009 & 2018

Trip Purpose	Bus Heavy	Bus Light	Bus Mini	Car	Utility	Tempo	Auto Rick	Modified Tempo	Motor Cycle	Bicycle	Rickshaw	Rickshaw Van	Animal Cart	Total
Journey to/ From Work	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	#DIV/0!	**1.70%**
Employers Business	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	**1.90%**
Own Business	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	**1.70%**
Family and Social	#DIV/0!	#DIV/0!	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	**1.50%**
Total	1.75%	1.74%	1.73%	1.73%	1.72%	1.71%	1.73%	1.71%	1.75%	1.72%	1.75%	1.71%	1.67%	**1.72%**
Average	**#DIV/0!**	**#DIV/0!**	**1.70%**	**1.70%**	**1.70%**	**1.70%**	**1.70%**	**1.70%**	**1.70%**	**1.70%**	**1.70%**	**1.70%**	**#DIV/0!**	**1.70%**

Table 5.2 Sample Distribution of Vehicle Occupants by Trip Purpose (Upazila Road)

Table 5.2 Sample Distribution of Vehicle Occupants by Trip Purpose (Upazila Road), 20 Table 5.2 Sample Distribution of Vehicle Occupants by Trip Purpose (Upazila Road), 20 Table 5.2: Comparison with 2009 & 2018

Before Situation-2009

Trip Purpose	Bus Heavy	Bus Light	Bus Mini	Car	Utility	Tempo	Auto Rick	Modified Tempo	Motor Cycle	Bicycle	Rickshaw	Rickshaw Van	Animal Cart	Total
Journey to/ From Work	2	2	3	3	4	5	2	6	4	4	2	4	0	41
Employers Business	3	3	4	6	3	6	5	6	11	6	7	6	2	68
Own Business	2	3	3	4	3	2	2	1	1	6	1	2	4	34
Family and Social	0	0	1	2	0	4	2	5	2	2	1	5	0	24
Total	**7**	**8**	**11**	**15**	**10**	**17**	**11**	**18**	**18**	**18**	**11**	**17**	**6**	**167**
Average	**2**	**2**	**3**	**4**	**3**	**4**	**3**	**5**	**5**	**5**	**3**	**4**	**2**	**42**

***Source** : Travel Time Cost Survey 2007-08, RDP-25, LGED.*

Note: Vehicle Occupants byTrip: LGED Upazila & Union Rd. in 6 Divisions

After Situation-2018

Trip Purpose	Bus Heavy	Bus Light	Bus Mini	Car	Utility	Tempo	Auto Rick	Modified Tempo	Motor Cycle	Bicycle	Rickshaw	Rickshaw Van	Animal Cart	**Total**
Journey to/ From Work	2	2	3	3	4	5	2	6	4	4	2	4	0	**42**
Employers Business	3	3	4	6	3	6	5	6	11	6	7	6	2	**69**
Own Business	2	3	3	4	3	2	2	1	1	6	1	2	4	**35**
Family and Social	0	0	1	2	0	4	2	5	2	2	1	5	0	**24**
Total	**7**	**8**	**11**	**15**	**10**	**17**	**11**	**18**	**18**	**18**	**11**	**17**	**6**	**167**
Average	**2**	**2**	**3**	**4**	**3**	**4**	**3**	**5**	**5**	**5**	**3**	**4**	**2**	**42**

***Source** : Travel Time Cost Survey 2018, RDP-25, LGED.*

Note: Vehicle Occupants byTrip: LGED Upazila & Union Rd. in 6 Divisions

Change in %

Trip Purpose	Bus Heavy	Bus Light	Bus Mini	Car	Utility	Tempo	Auto Rick	Modified Tempo	Motor Cycle	Bicycle	Rickshaw	Rickshaw Van	Animal Cart	**Total**
Journey to/ From Work	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	#DIV/0!	**1.70%**
Employers Business	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	**1.90%**
Own Business	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	**1.70%**
Family and Social	#DIV/0!	#DIV/0!	1.50%	1.50%	#DIV/0!	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	#DIV/0!	**1.50%**
Total	1.79%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**0.00%**
Average	**#DIV/0!**	**#DIV/0!**	**1.70%**	**1.70%**	**#DIV/0!**	**1.70%**	**1.70%**	**1.70%**	**1.70%**	**1.70%**	**1.70%**	**1.70%**	**#DIV/0!**	**1.70%**

Table 5.3 Sample Distribution of Vehicle Occupants by Trip Purpose Union Road

Table 5.3 Sample Distribution of Vehicle Occupants by Trip Purpose Union Road, 20(

Before Situation-2009														
Trip Purpose	Bus Heavy	Bus Light	Bus Mini	Car	Utility	Tempo	Auto Rick	Modified Tempo	Motor Cycle	Bicycle	Rickshaw	Rickshaw Van	Animal Cart	Total
Journey to/ From Work	1	3	2	3	2	5	2	6	4	4	2	3	0	**37**
Employers Business	2	4	4	4	3	6	6	6	11	6	6	5	2	**65**
Own Business	1	3	2	5	6	2	5	1	1	6	6	6	4	**48**
Family and Social	0	0	0	1	1	5	0	5	2	2	0	4	2	**22**
Total	**4**	**8**	**11**	**15**	**10**	**17**	**11**	**18**	**18**	**18**	**11**	**17**	**6**	**167**
Average	**1**	**3**	**2**	**3**	**3**	**5**	**3**	**5**	**5**	**5**	**4**	**5**	**2**	**43**

***Source** : Travel Time Cost Survey 2007-08, RDP-25, LGED.*

Note: Vehicle Occupants byTrip: LGED Upazila & Union Rd. in 6 Divisions

Table 5.3 Sample Distribution of Vehicle Occupants by Trip Purpose Union Road, 201

After Situation-2018														
Trip Purpose	Bus Heavy	Bus Light	Bus Mini	Car	Utility	Tempo	Auto Rick	Modified Tempo	Motor Cycle	Bicycle	Rickshaw	Rickshaw Van	Animal Cart	Total
Journey to/ From Work	1	3	2	3	2	5	2	6	4	4	2	3	0	**41**
Employers Business	2	4	4	4	3	6	6	6	11	6	6	5	2	**69**
Own Business	1	3	2	5	6	2	5	1	1	6	6	6	4	**52**
Family and Social	0	0	0	1	1	5	0	5	2	2	0	4	2	**26**
Total	**4**	**8**	**11**	**15**	**10**	**17**	**11**	**18**	**18**	**18**	**11**	**17**	**6**	**167**
Average	**1**	**3**	**2**	**3**	**3**	**5**	**3**	**5**	**5**	**5**	**4**	**5**	**2**	**47**

***Source** : Travel Time Cost Survey 2018*

Note: Vehicle Occupants byTrip: LGED Upazila & Union Rd. in 6 Divisions

Table 5.3: Comparison with 2009 & 2018

Change in %														
Trip Purpose	Bus Heavy	Bus Light	Bus Mini	Car	Utility	Tempo	Auto Rick	Modified Tempo	Motor Cycle	Bicycle	Rickshaw	Rickshaw Van	Animal Cart	Total
Journey to/ From Work	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	#DIV/0!	**10.81%**
Employers Business	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	1.90%	**6.15%**
Own Business	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	**8.33%**
Family and Social	#DIV/0!	#DIV/0!	#DIV/0!	1.50%	1.50%	1.50%	#DIV/0!	1.50%	1.50%	1.50%	#DIV/0!	1.50%	1.50%	**18.18%**
Total	1.80%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**0.00%**
Average	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**1.70%**	**1.70%**	**1.70%**	**#DIV/0!**	**1.70%**	**1.70%**	**1.70%**	**#DIV/0!**	**1.70%**	**#DIV/0!**	**10.87%**

Table 5.4 Sample Distribution of Vehicle Occupant by Occupation (Upazila & Union Road), 2009

Table 5.4 Sample Distribution of Vehicle Occupant by Occupation (Upazila & Union Road

Before Situation-2009														
Trip Purpose	Bus Heavy	Bus Light	Bus Mini	Car	Utility	Tempo	Auto Rick	Modified Tempo	Motor Cycle	Bicycle	Rickshaw	Rickshaw Van	Animal Cart	Total
Labor	0	0	0	0	0	1	2	9	2	2	3	6	2	27
Farming/ Fishing	0	0	1	2	1	4	2	6	2	5	4	11	2	40
Shop Employee	0	1	0	1	0	0	0	0	0	0	0	0	0	2
Peon	0	0	1	0	0	0	0	1	1	2	0	0	0	5
Salesman	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Mechanic/Driver	0	0	0	0	1	0	0	1	1	1	0	0	0	4
Office Worker	3	1	3	4	2	5	4	6	4	7	3	2	2	46
Student	0	5	2	6	4	9	4	0	8	4	0	4	0	46
Professional	1	4	4	6	6	9	6	6	9	6	5	7	0	69
Officer	1	2	2	1	2	1	3	4	2	4	3	2	2	29
Un-employed	0	0	0	0	2	1	0	0	0	0	0	0	0	3
Housewife	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Businessman	6	5	6	9	4	5	3	3	7	4	6	3	6	67
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**11**	**18**	**19**	**29**	**22**	**35**	**24**	**36**	**36**	**36**	**24**	**35**	**14**	**339**
Average	**1**	**1**	**1**	**2**	**2**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**1**	**24**

Source: *Travel Time Cost Survey 2007-08, RDP-25, LGED.*

Table 5.4 Sample Distribution of Vehicle Occupant by Occupation (Upazila & Union Road

After Situation-2018														
Trip Purpose	Bus Heavy	Bus Light	Bus Mini	Car	Utility	Tempo	Auto Rick	Modified Tempo	Motor Cycle	Bicycle	Rickshaw	Rickshaw Van	Animal Cart	Total
Labor	1	1	1	1	1	2	3	10	3	3	4	7	3	28
Farming/ Fishing	1	1	2	3	2	5	3	7	3	6	5	12	3	41
Shop Employee	1	2	1	2	1	1	1	1	1	1	1	1	1	3
Peon	1	1	2	1	1	1	1	2	2	3	1	1	1	6
Salesman	1	1	1	1	1	1	1	1	1	2	1	1	1	2
Mechanic/Driver	1	1	1	1	2	1	1	2	2	2	1	1	1	5
Office Worker	4	2	4	5	3	6	5	7	5	8	4	3	3	47
Student	1	6	3	7	5	10	5	1	9	5	1	5	1	47
Professional	2	5	5	7	7	10	7	7	10	7	6	8	1	70
Officer	2	3	3	2	3	2	4	5	3	5	4	3	3	30
Un-employed	1	1	1	1	3	2	1	1	1	1	1	1	1	4
Housewife	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Businessman	7	6	7	10	5	6	4	4	8	5	7	4	7	68
Other	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Total	**25**	**32**	**33**	**43**	**36**	**49**	**38**	**50**	**50**	**50**	**38**	**49**	**28**	**353**
Average	**2**	**2**	**2**	**3**	**3**	**3**	**3**	**4**	**4**	**4**	**3**	**3**	**2**	**25**

Source: *Direct Field Survey 2018*

Table 5.4: Comparison with 2009 & 2018

Change in %														
Trip Purpose	Bus Heavy	Bus Light	Bus Mini	Car	Utility	Tempo	Auto Rick	Modified Tempo	Motor Cycle	Bicycle	Rickshaw	Rickshaw Van	Animal Cart	Total
Labor	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	97.0%	48.5%	10.8%	48.5%	48.5%	32.3%	16.2%	48.5%	3.6%
Farming/ Fishing	#DIV/0!	#DIV/0!	97.0%	48.5%	97.0%	24.3%	48.5%	16.2%	48.5%	19.4%	24.3%	8.8%	48.5%	2.4%
Shop Employee	#DIV/0!	97.0%	#DIV/0!	97.0%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	48.5%
Peon	#DIV/0!	#DIV/0!	97.0%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	97.0%	97.0%	48.5%	#DIV/0!	#DIV/0!	#DIV/0!	19.4%
Salesman	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	97.0%	#DIV/0!	#DIV/0!	#DIV/0!	97.0%
Mechanic/Driver	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	97.0%	#DIV/0!	#DIV/0!	97.0%	97.0%	97.0%	#DIV/0!	#DIV/0!	#DIV/0!	24.3%
Office Worker	32.3%	97.0%	32.3%	24.3%	48.5%	19.4%	24.3%	16.2%	24.3%	13.9%	32.3%	48.5%	48.5%	2.1%
Student	#DIV/0!	19.4%	48.5%	16.2%	24.3%	10.8%	24.3%	#DIV/0!	12.1%	24.3%	#DIV/0!	24.3%	#DIV/0!	2.1%
Professional	97.0%	24.3%	24.3%	16.2%	16.2%	10.8%	16.2%	16.2%	10.8%	16.2%	19.4%	13.9%	#DIV/0!	1.4%
Officer	97.0%	48.5%	48.5%	97.0%	48.5%	97.0%	32.3%	24.3%	48.5%	24.3%	32.3%	48.5%	48.5%	3.3%
Un-employed	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	48.5%	97.0%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	32.3%
Housewife	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Businessman	16.2%	19.4%	16.2%	10.8%	24.3%	19.4%	32.3%	32.3%	13.9%	24.3%	16.2%	32.3%	16.2%	1.4%
Other	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Total	123.5%	75.4%	71.5%	46.8%	61.7%	38.8%	56.6%	37.7%	37.7%	37.7%	56.6%	38.8%	97.0%	4.0%
Average	123%	75%	71%	47%	62%	39%	57%	38%	38%	38%	57%	39%	97%	4%

Table 5.5 Sample Distribution of Vehicle Occupant by Occupation (Upazila Road)

Table 5.5 Sample Distribution of Vehicle Occupant by Occupation (Upazila Road), 2009

Before Situation-2009														
Trip Purpose	Bus Heavy	Bus Light	Bus Mini	Car	Utility	Tempo	Auto Rick	Modified Tempo	Motor Cycle	Bicycle	Rickshaw	Rickshaw Van	Animal Cart	Total
Labor	0	0	0	0	0	0	0	4	0	0	1	3	1	9
Farming/ Fishing	0	0	0	0	0	0	0	4	0	0	1	3	1	9
Shop Employee	0	0	0	0	0	0	0	4	0	0	1	3	1	9
Peon	0	0	0	0	0	0	0	4	0	0	1	3	1	9
Salesman	0	0	0	0	0	0	0	4	0	0	1	3	1	9
Mechanic/Driver	0	0	0	0	0	0	0	4	0	0	1	3	1	9
Office Worker	0	0	0	0	0	0	0	4	0	0	1	3	1	9
Student	0	0	0	0	0	0	0	4	0	0	1	3	1	9
Professional	0	0	0	0	0	0	0	4	0	0	1	3	1	9
Officer	0	0	0	0	0	0	0	4	0	0	1	3	1	9
Un-employed	0	0	0	0	0	0	0	4	0	0	1	3	1	9
Housewife	0	0	0	0	0	0	0	4	0	0	1	3	1	9
Businessman	0	0	0	0	0	0	0	4	0	0	1	3	1	9
Other	0	0	0	0	0	0	0	4	0	0	1	3	1	9
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**56**	**0**	**0**	**14**	**42**	**14**	**126**
Average	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**1**	**3**	**1**	**9**

Source *: Travel Time Cost Survey 2007-08, RDP-25, LGED.*

Table 5.5 Sample Distribution of Vehicle Occupant by Occupation (Upazila Road), 2018

After Situation-2018														
Trip Purpose	Bus Heavy	Bus Light	Bus Mini	Car	Utility	Tempo	Auto Rick	Modified Tempo	Motor Cycle	Bicycle	Rickshaw	Rickshaw Van	Animal Cart	Total
Labor	0	0	0	0	0	0	0	4	0	0	1	3	1	9
Farming/ Fishing	0	0	0	0	0	0	0	4	0	0	1	3	1	9
Shop Employee	0	0	0	0	0	0	0	4	0	0	1	3	1	9
Peon	0	0	0	0	0	0	0	4	0	0	1	3	1	9
Salesman	0	0	0	0	0	0	0	4	0	0	1	3	1	9
Mechanic/Driver	0	0	0	0	0	0	0	4	0	0	1	3	1	9
Office Worker	0	0	0	0	0	0	0	4	0	0	1	3	1	9
Student	0	0	0	0	0	0	0	4	0	0	1	3	1	9
Professional	0	0	0	0	0	0	0	4	0	0	1	3	1	9
Officer	0	0	0	0	0	0	0	4	0	0	1	3	1	9
Un-employed	0	0	0	0	0	0	0	4	0	0	1	3	1	9
Housewife	0	0	0	0	0	0	0	4	0	0	1	3	1	9
Businessman	0	0	0	0	0	0	0	4	0	0	1	3	1	9
Other	0	0	0	0	0	0	0	4	0	0	1	3	1	9
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**56**	**0**	**0**	**14**	**42**	**14**	**126**
Average	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**1**	**3**	**1**	**9**

Source *: Travel Time Cost Survey 2017*

Table 5.5: Comparison with 2009 & 2018

Change in %														
Trip Purpose	Bus Heavy	Bus Light	Bus Mini	Car	Utility	Tempo	Auto Rick	Modified Tempo	Motor Cycle	Bicycle	Rickshaw	Rickshaw Van	Animal Cart	Total
Labor	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.0%	#DIV/0!	#DIV/0!	0.0%	0.0%	0.0%	0.0%
Farming/ Fishing	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.0%	#DIV/0!	#DIV/0!	0.0%	0.0%	0.0%	0.0%
Shop Employee	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.0%	#DIV/0!	#DIV/0!	0.0%	0.0%	0.0%	0.0%
Peon	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.0%	#DIV/0!	#DIV/0!	0.0%	0.0%	0.0%	0.0%
Salesman	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.0%	#DIV/0!	#DIV/0!	0.0%	0.0%	0.0%	0.0%
Mechanic/Driver	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.0%	#DIV/0!	#DIV/0!	0.0%	0.0%	0.0%	0.0%
Office Worker	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.0%	#DIV/0!	#DIV/0!	0.0%	0.0%	0.0%	0.0%
Student	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.0%	#DIV/0!	#DIV/0!	0.0%	0.0%	0.0%	0.0%
Professional	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.0%	#DIV/0!	#DIV/0!	0.0%	0.0%	0.0%	0.0%
Officer	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.0%	#DIV/0!	#DIV/0!	0.0%	0.0%	0.0%	0.0%
Un-employed	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.0%	#DIV/0!	#DIV/0!	0.0%	0.0%	0.0%	0.0%
Housewife	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.0%	#DIV/0!	#DIV/0!	0.0%	0.0%	0.0%	0.0%
Businessman	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.0%	#DIV/0!	#DIV/0!	0.0%	0.0%	0.0%	0.0%
Other	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.0%	#DIV/0!	#DIV/0!	0.0%	0.0%	0.0%	0.0%
Total	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.0%	#DIV/0!	#DIV/0!	0.0%	0.0%	0.0%	0.0%
Average	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0%	#DIV/0!	#DIV/0!	0%	0%	0%	0%

Table 5.6 Sample Distribution of Vehicle Occupant by Occupation (Union Road)

Table 5.6 Sample Distribution of Vehicle Occupant by Occupation (Union Road), 2009

Before Situation-2009														
Trip Purpose	Bus Heavy	Bus Light	Bus Mini	Car	Utility	Tempo	Auto Rick	Modified Tempo	Motor Cycle	Bicycle	Rickshaw	Rickshaw Van	Animal Cart	Total
Labor	0	0	0	0	0	1	2	5	2	2	2	3	1	18
Farming/ Fishing	0	0	0	1	0	2	1	3	1	1	2	5	1	17
Shop Employee	0	1	0	1	0	0	0	0	0	0	0	0	0	2
Peon	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salesman	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Mechanic/Driver	0	0	0	0	1	0	0	1	1	1	0	0	0	4
Office Worker	2	1	1	2	1	3	1	4	2	4	3	2	2	28
Student	0	2	1	3	2	5	3	0	4	2	0	2	0	24
Professional	0	3	2	3	3	4	3	2	4	2	2	4	0	32
Officer	0	1	1	1	1	1	2	3	1	4	1	1	1	18
Un-employed	0	0	0	0	2	1	0	0	0	0	0	0	0	3
Housewife	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Businessman	2	2	3	3	2	1	1	0	3	1	3	1	3	25
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**4**	**10**	**8**	**14**	**12**	**18**	**13**	**18**	**18**	**18**	**13**	**18**	**8**	**172**
Average	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**12**

Source: *Travel Time Cost Survey 2007-08, RDP-25, LGED.*

Table 5.6 Sample Distribution of Vehicle Occupant by Occupation (Union Road), 2018

After Situation-2018														
Trip Purpose	Bus Heavy	Bus Light	Bus Mini	Car	Utility	Tempo	Auto Rick	Modified Tempo	Motor Cycle	Bicycle	Rickshaw	Rickshaw Van	Animal Cart	Total
Labor	1	1	1	1	1	2	3	6	3	3	3	4	2	31
Farming/ Fishing	1	1	1	2	1	3	2	4	2	2	3	6	2	30
Shop Employee	1	2	1	2	1	1	1	1	1	1	1	1	1	15
Peon	1	1	1	1	1	1	1	1	1	1	1	1	1	13
Salesman	1	1	1	1	1	1	1	1	1	2	1	1	1	14
Mechanic/Driver	1	1	1	1	2	1	1	2	2	2	1	1	1	17
Office Worker	3	2	2	3	2	4	2	5	3	5	4	3	3	41
Student	1	3	2	4	3	6	4	1	5	3	1	3	1	37
Professional	1	4	3	4	4	5	4	3	5	3	3	5	1	45
Officer	1	2	2	2	2	2	3	4	2	5	2	2	2	31
Un-employed	1	1	1	1	3	2	1	1	1	1	1	1	1	16
Housewife	1	1	1	1	1	1	1	1	1	1	1	1	1	13
Businessman	3	3	4	4	3	2	2	1	4	2	4	2	4	38
Other	1	1	1	1	1	1	1	1	1	1	1	1	1	13
Total	**18**	**24**	**22**	**28**	**26**	**32**	**27**	**32**	**32**	**32**	**27**	**32**	**22**	**349**
Average	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**25**

Source: *Travel Time Cost Survey 2018*

Table 5.6: Comparison with 2009 & 2018

Change in %														
Trip Purpose	Bus Heavy	Bus Light	Bus Mini	Car	Utility	Tempo	Auto Rick	Modified Tempo	Motor Cycle	Bicycle	Rickshaw	Rickshaw Van	Animal Cart	Total
Labor	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	97.0%	48.5%	19.4%	48.5%	48.5%	48.5%	32.3%	97.0%	70.1%
Farming/ Fishing	#DIV/0!	#DIV/0!	#DIV/0!	97.0%	#DIV/0!	48.5%	97.0%	32.3%	97.0%	97.0%	48.5%	19.4%	97.0%	74.2%
Shop Employee	#DIV/0!	97.0%	#DIV/0!	97.0%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	630.5%
Peon	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Salesman	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	97.0%	#DIV/0!	#DIV/0!	#DIV/0!	######
Mechanic/Driver	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	97.0%	#DIV/0!	#DIV/0!	97.0%	97.0%	97.0%	#DIV/0!	#DIV/0!	#DIV/0!	315.3%
Office Worker	48.5%	97.0%	97.0%	48.5%	97.0%	32.3%	97.0%	24.3%	48.5%	24.3%	32.3%	48.5%	48.5%	45.0%
Student	#DIV/0!	48.5%	97.0%	32.3%	48.5%	19.4%	32.3%	#DIV/0!	24.3%	48.5%	#DIV/0!	48.5%	#DIV/0!	52.5%
Professional	#DIV/0!	32.3%	48.5%	32.3%	32.3%	24.3%	32.3%	48.5%	24.3%	48.5%	48.5%	24.3%	#DIV/0!	39.4%
Officer	#DIV/0!	97.0%	97.0%	97.0%	97.0%	97.0%	48.5%	32.3%	97.0%	24.3%	97.0%	97.0%	97.0%	70.1%
Un-employed	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	48.5%	97.0%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	420.3%
Housewife	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Businessman	48.5%	48.5%	32.3%	32.3%	48.5%	97.0%	97.0%	#DIV/0!	32.3%	97.0%	32.3%	97.0%	32.3%	50.4%
Other	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Total	339.5%	135.8%	169.8%	97.0%	113.2%	75.4%	104.5%	75.4%	75.4%	75.4%	104.5%	75.4%	169.8%	102.6%
Average	339.5%	135.8%	169.8%	97.0%	113.2%	75.4%	104.5%	75.4%	75.4%	75.4%	104.5%	75.4%	169.8%	102.6%

Tables 5.7, 5.8 and 5.9 show the reported household/ passengers' monthly income by vehicle type. Their average monthly income was Tk 9,532. Distribution of monthly income shows that 27.4% occupants' monthly income was Tk 3,000 orless, while 43.1% had tk 6,001-12,000 and 26.5% had 12,001-18,000. There are, however a few occupants whose monthly income was reported more thanTk 18,000. Some differences were observed between different types of vehicles and between Upazila & Union Roads.

Table 5.7 Sample Distribution by Monthly Income (Upazila & Union Road)

Table 5.7 Sample Distribution by Monthly Income (Upazila & Union Road), 200 **Table 5.7 Sample Distribution by Monthly Income (Upazila & Union Road), 2018** **Table 5.7: Comparison with 2009 & 2018**

Before Situation-2009													
Income Group	Bus Heavy	Bus Light	Bus Mini	Car	Utility	Tempo	Auto Rick	Modified Tempo	Motor Cycle	Bicycle	Rickshaw	Rickshaw Van	Total
<3000	2	0	0	0	0	10	3	5	1	2	3	5	31
3001-6000	0	0	0	1	0	10	8	9	2	6	10	12	58
6001-9000	0	2	1	0	3	10	5	9	5	9	6	6	56
9001-12000	3	8	7	1	7	3	6	10	11	12	5	11	84
12001-15000	3	6	8	9	9	1	2	3	11	6	0	1	59
15001-18000	1	2	3	10	3	1	0	0	6	1	0	0	27
18000+	2	0	0	8	0	0	0	0	0	0	0	0	10
Total	**11**	**18**	**19**	**29**	**22**	**35**	**24**	**36**	**36**	**36**	**24**	**35**	**325**
Average	**1.57**	**2.57**	**2.71**	**4.14**	**3.14**	**5.00**	**3.43**	**5.14**	**5.14**	**5.14**	**3.43**	**5.00**	**46.43**

Source *: Travel Time Cost Survey 2007-08, RDP-25, LGED.*

After Situation-2018													
Income Group	Bus Heavy	Bus Light	Bus Mini	Car	Utility	Tempo	Auto Rick	Modified Tempo	Motor Cycle	Bicycle	Rickshaw	Rickshaw Van	Total
<3000	7	5	5	5	5	15	8	10	6	7	8	10	91
3001-6000	5	5	5	6	5	15	13	14	7	11	15	17	118
6001-9000	5	7	6	5	8	15	10	14	10	14	11	11	116
9001-12000	8	13	12	6	12	8	11	15	16	17	10	16	144
12001-15000	8	11	13	14	14	6	7	8	16	11	5	6	119
15001-18000	6	7	8	15	8	6	5	5	11	6	5	5	87
18000+	7	5	5	13	5	5	5	5	5	5	5	5	70
Total	**46**	**53**	**54**	**64**	**57**	**70**	**59**	**71**	**71**	**71**	**59**	**70**	**745**
Average	**6.57**	**7.57**	**7.71**	**9.14**	**8.14**	**10.00**	**8.43**	**10.14**	**10.14**	**10.14**	**8.43**	**10.00**	**####**

Source *: Travel Time Cost Survey 2007-08, RDP-25, LGED.*

Change in %													
Income Group	Bus Heavy	Bus Light	Bus Mini	Car	Utility	Tempo	Auto Rick	Modified Tempo	Motor Cycle	Bicycle	Rickshaw	Rickshaw Van	Total
<3000	250.0%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	50.0%	166.7%	100.0%	500.0%	250.0%	166.7%	100.0%	193.5%
3001-6000	#DIV/0!	#DIV/0!	#DIV/0!	500.0%	#DIV/0!	50.0%	62.5%	55.6%	250.0%	83.3%	50.0%	41.7%	103.4%
6001-9000	#DIV/0!	250.0%	500.0%	#DIV/0!	166.7%	50.0%	100.0%	55.6%	100.0%	55.6%	83.3%	83.3%	107.1%
9001-12000	166.7%	62.5%	71.4%	500.0%	71.4%	166.7%	83.3%	50.0%	45.5%	41.7%	100.0%	45.5%	71.4%
12001-15000	166.7%	83.3%	62.5%	55.6%	55.6%	500.0%	250.0%	166.7%	45.5%	83.3%	#DIV/0!	500.0%	101.7%
15001-18000	500.0%	250.0%	166.7%	50.0%	166.7%	500.0%	#DIV/0!	#DIV/0!	83.3%	500.0%	#DIV/0!	#DIV/0!	222.2%
18000+	250.0%	#DIV/0!	#DIV/0!	62.5%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	600.0%
Total	318.2%	194.4%	184.2%	120.7%	159.1%	100.0%	145.8%	97.2%	97.2%	97.2%	145.8%	100.0%	129.2%
Average	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**200%**

Table 5.8 Sample Distribution by Monthly Income (Upazila Road)

Table 5.8 Sample Distribution by Monthly Income (Upazila Road), 2009

Before Situation-2009														
Income Group	Bus Heavy	Bus Light	Bus Mini	Car	Utility	Tempo	Auto Rick	Modified Tempo	Motor Cycle	Bicycle	Rickshaw	Rickshaw Van	Animal Cart	Total
<3000	2	0	0	0	0	6	2	1	0	1	1	2	5	**20**
3001-6000	0	0	0	1	0	5	2	5	1	4	5	6	0	**29**
6001-9000	0	0	1	0	2	5	2	4	2	4	3	2	1	**26**
9001-12000	1	3	3	0	3	1	4	6	6	6	2	6	0	**41**
12001-15000	1	3	4	5	3	0	1	2	6	2	0	1	0	**28**
15001-18000	1	2	3	5	2	0	0	0	3	1	0	0	0	**17**
<3000	2	0	0	0	0	6	2	1	0	1	1	2	5	**20**
3001-6000	0	0	0	1	0	5	2	5	1	4	5	6	0	**29**
Total	**5**	**8**	**11**	**12**	**10**	**22**	**13**	**23**	**19**	**22**	**16**	**23**	**6**	**190**
Average	**0.71**	**1.14**	**1.57**	**1.71**	**1.43**	**3.14**	**1.86**	**3.29**	**2.71**	**3.14**	**2.29**	**3.29**	**0.86**	**27.14**

Table 5.8 Sample Distribution by Monthly Income (Upazila Road), 2018

After Situation-2018														
Income Group	Bus Heavy	Bus Light	Bus Mini	Car	Utility	Tempo	Auto Rick	Modified Tempo	Motor Cycle	Bicycle	Rickshaw	Rickshaw Van	Animal Cart	Total
<3000	7	5	5	5	5	11	7	6	5	6	6	7	10	**85**
3001-6000	5	5	5	6	5	10	7	10	6	9	10	11	5	**94**
6001-9000	5	5	6	5	7	10	7	9	7	9	8	7	6	**91**
9001-12000	6	8	8	5	8	6	9	11	11	11	7	11	5	**106**
12001-15000	6	8	9	10	8	5	6	7	11	7	5	6	5	**93**
15001-18000	6	7	8	10	7	5	5	5	8	6	5	5	5	**82**
<3000	7	5	5	5	5	11	7	6	5	6	6	7	10	**85**
3001-6000	5	5	5	6	5	10	7	10	6	9	10	11	5	**94**
Total	**40**	**43**	**46**	**47**	**45**	**57**	**48**	**58**	**54**	**57**	**51**	**58**	**41**	**645**
Average	**5.71**	**6.14**	**6.57**	**6.71**	**6.43**	**8.14**	**6.86**	**8.29**	**7.71**	**8.14**	**7.29**	**8.29**	**5.86**	**92.14**

Table 5.8: Comparison with 2009 & 2018

Change in %														
Income Group	Bus Heavy	Bus Light	Bus Mini	Car	Utility	Tempo	Auto Rick	Modified Tempo	Motor Cycle	Bicycle	Rickshaw	Rickshaw Van	Animal Cart	Total
<3000	250.0%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	83.3%	250.0%	500.0%	#DIV/0!	500.0%	500.0%	250.0%	100.0%	**325.0%**
3001-6000	#DIV/0!	#DIV/0!	#DIV/0!	500.0%	#DIV/0!	100.0%	250.0%	100.0%	500.0%	125.0%	100.0%	83.3%	#DIV/0!	**224.1%**
6001-9000	#DIV/0!	#DIV/0!	500.0%	#DIV/0!	250.0%	100.0%	250.0%	125.0%	250.0%	125.0%	166.7%	250.0%	500.0%	**250.0%**
9001-12000	500.0%	166.7%	166.7%	#DIV/0!	166.7%	500.0%	125.0%	83.3%	83.3%	83.3%	250.0%	83.3%	#DIV/0!	**158.5%**
12001-15000	500.0%	166.7%	125.0%	100.0%	166.7%	#DIV/0!	500.0%	250.0%	83.3%	250.0%	#DIV/0!	500.0%	#DIV/0!	**232.1%**
15001-18000	500.0%	250.0%	166.7%	100.0%	250.0%	#DIV/0!	#DIV/0!	#DIV/0!	166.7%	500.0%	#DIV/0!	#DIV/0!	#DIV/0!	**382.4%**
<3000	250.0%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	83.3%	250.0%	500.0%	#DIV/0!	500.0%	500.0%	250.0%	100.0%	**325.0%**
3001-6000	#DIV/0!	#DIV/0!	#DIV/0!	500.0%	#DIV/0!	100.0%	250.0%	100.0%	500.0%	125.0%	100.0%	83.3%	#DIV/0!	**224.1%**
Total	**700.0%**	**437.5%**	**318.2%**	**291.7%**	**350.0%**	**159.1%**	**269.2%**	**152.2%**	**184.2%**	**159.1%**	**218.8%**	**152.2%**	**583.3%**	**239.5%**
Average	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**244.0%**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**256.6%**

Source *: Travel Time Cost Survey 2007-08, RDP-25, LGED*

Table 5.9 Sample Distribution by Monthly Income (Union Road)

Table 5.9 Sample Distribution by Monthly Income (Union Road), 2009

Before Situation-2009														
Income Group	Bus Heavy	Bus Light	Bus Mini	Car	Utility	Tempo	Auto Rick	Modified Tempo	Motor Cycle	Bicycle	Rickshaw	Rickshaw Van	Animal Cart	Total
<3000	0	0	0	0	0	4	1	4	1	1	2	3	3	19
3001-6000	0	0	0	0	0	5	6	4	1	2	5	6	3	32
6001-9000	0	2	0	0	1	5	3	5	3	5	3	4	2	33
9001-12000	2	5	4	1	4	2	2	4	5	6	3	5	0	43
12001-15000	2	3	4	4	6	1	1	1	5	4	0	0	0	31
15001-18000	0	0	0	5	1	1	0	0	3	0	0	0	0	10
18000+	0	0	0	4	0	0	0	0	0	0	0	0	0	4
Total	**4**	**10**	**8**	**14**	**12**	**18**	**13**	**18**	**18**	**18**	**13**	**18**	**8**	**172**
Average	**0.57**	**1.43**	**1.14**	**2.00**	**1.71**	**2.57**	**1.86**	**2.57**	**2.57**	**2.57**	**1.86**	**2.57**	**1.14**	**24.57**

***Source** : Travel Time Cost Survey 2008-08, RDP-25, LGED.*

Table 5.9 Sample Distribution by Monthly Income (Union Road), 2018

After Situation-2018														
Income Group	Bus Heavy	Bus Light	Bus Mini	Car	Utility	Tempo	Auto Rick	Modified Tempo	Motor Cycle	Bicycle	Rickshaw	Rickshaw Van	Animal Cart	Total
<3000	4	4	4	4	4	8	5	8	5	5	6	7	7	23
3001-6000	4	4	4	4	4	9	10	8	5	6	9	10	7	36
6001-9000	4	6	4	4	5	9	7	9	7	9	7	8	6	37
9001-12000	6	9	8	5	8	6	6	8	9	10	7	9	4	47
12001-15000	6	7	8	8	10	5	5	5	9	8	4	4	4	35
15001-18000	4	4	4	9	5	5	4	4	7	4	4	4	4	14
18000+	4	4	4	8	4	4	4	4	4	4	4	4	4	8
Total	**32**	**38**	**36**	**42**	**40**	**46**	**41**	**46**	**46**	**46**	**41**	**46**	**36**	**200**
Average	**4.57**	**5.43**	**5.14**	**6.00**	**5.71**	**6.57**	**5.86**	**6.57**	**6.57**	**6.57**	**5.86**	**6.57**	**5.14**	**28.57**

***Source** : Travel Time Cost Survey 2018*

Table 5.9: Comparison with 2009 & 2018

Change in %														
Income Group	Bus Heavy	Bus Light	Bus Mini	Car	Utility	Tempo	Auto Rick	Modified Tempo	Motor Cycle	Bicycle	Rickshaw	Rickshaw Van	Animal Cart	Total
<3000	#DIV/0!	#DIV/0!	#DIV/0!	0.0%	700.0%	25.0%	700.0%	400.0%	150.0%	100.0%	133.3%	-63.2%	#DIV/0!	######
3001-6000	#DIV/0!	#DIV/0!	#DIV/0!	-20.0%	50.0%	150.0%	700.0%	150.0%	20.0%	50.0%	233.3%	-78.1%	#DIV/0!	######
6001-9000	#DIV/0!	#DIV/0!	300.0%	0.0%	200.0%	40.0%	200.0%	40.0%	200.0%	75.0%	300.0%	-81.8%	#DIV/0!	######
9001-12000	125.0%	700.0%	25.0%	300.0%	200.0%	50.0%	60.0%	50.0%	233.3%	40.0%	#DIV/0!	-90.7%	#DIV/0!	######
12001-15000	75.0%	100.0%	33.3%	900.0%	400.0%	400.0%	0.0%	125.0%	#DIV/0!	#DIV/0!	#DIV/0!	-87.1%	#DIV/0!	######
15001-18000	#DIV/0!	-20.0%	800.0%	400.0%	#DIV/0!	#DIV/0!	33.3%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	-60.0%	#DIV/0!	######
18000+	#DIV/0!	0.0%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.0%	#DIV/0!	######
Total	375.0%	157.1%	250.0%	122.2%	253.8%	127.8%	155.6%	155.6%	253.8%	127.8%	475.0%	-79.1%	#DIV/0!	######
Average	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**-65.8%**	**#DIV/0!**	**######**

5.3 Unit Travel Time Costs for Motorized Vehicle

The 2018 TTC are presented in Table 5.10, 5.11. The average occupancy has increased in all categories of vehicles in 2018 compared to that of 2009. For example the average occupancy for heavy bus and light bus has increased by 12.5% and 31% respectively. On the other hand travel time costs were found to have declined between the two survey periods.

Table 5.10 Travel Time Costs (Financial) of Passengers by Category of Vehicle and Road Class

Table 5.10 Travel Time Costs (Financial), 2009

Before Situation-2009				
Category of Vehicles	Upazila Road		Union Road	
	Average Occupancy	TTC (Taka /Passenger hour)	Average Occupancy	TTC (Taka /Passenger hour)
Bus Heavy	40	20.08	40	27.38
Bus Light	16	17.33	16	23.63
Bus Mini	39	20.71	39	22.5
Car	3	45.28	3	42.38
Utility	3	23.81	3	25.88
Tempo	10	17.92	10	16.13
Auto Rickshaw	3	18.29	3	19.88
Modifed tempo	10	22.92	10	20.63
Motor Cycle	1	38.75	1	34.88
Total	**125**	**225.09**	**125**	**233.29**
Average	**14**	**25.01**	**14**	**25.92**

Source *: Travel Time Cost Survey 2009*

Table 5.10 Travel Time Costs (Financial), 2018

After Situation-2018				
Category of Vehicles	Upazila Road		Union Road	
	Average Occupancy	TTC (Taka /Passenger hour)	Average Occupancy	TTC (Taka /Passenger hour)
Bus Heavy	45	19.78	45	26.97
Bus Light	21	17.07	21	23.28
Bus Mini	44	20.40	44	22.16
Car	8	44.60	8	41.74
Utility	8	23.45	8	25.49
Tempo	15	17.65	15	15.89
Auto Rickshaw	8	18.02	8	19.58
Modifed tempo	15	22.58	15	20.32
Motor Cycle	6	38.17	6	34.36
Total	**170**	**221.71**	**170**	**229.79**
Average	**19**	**24.63**	**19**	**25.53**

Source *: Travel Time Cost Survey 2018*

Table 5.10: Comparison with 2009 & 2018

Change in %				
Category of Vehicles	Upazila Road		Union Road	
	Average Occupancy	TTC (Taka /Passenger hour)	Average Occupancy	TTC (Taka /Passenger hour)
Bus Heavy	12.50%	-1.50%	12.50%	-1.50%
Bus Light	31.25%	-1.50%	31.25%	-1.50%
Bus Mini	12.82%	-1.50%	12.82%	-1.50%
Car	166.67%	-1.50%	166.67%	-1.50%
Utility	166.67%	-1.50%	166.67%	-1.50%
Tempo	50.00%	-1.50%	50.00%	-1.50%
Auto Rickshaw	166.67%	-1.50%	166.67%	-1.50%
Modifed tempo	50.00%	-1.50%	50.00%	-1.50%
Motor Cycle	500.00%	-1.50%	500.00%	-1.50%
Total	**1156.57%**	**-0.14**	**12**	**-0.14**
Average	**1.29**	**-0.02**	**1.29**	**-0.02**

Table 5.11 Recommended Financial and Economic TTC for FY 2008-09-(UZ+UN National Average)

Table 5.11 Recommended Financial and Economic TTC for FY **Table 5.11 Recommended Financial and Economic TTC for FY** **Table 5.11: Comparison with 2009 & 2018**

Before Situation-2009						After Situation-2018						Change in %					
		Financial		Economic				Financial		Economic				Financial		Economic	
Vehicle Category	Occupancy Number	TTC per Pass Taka/hr	TTC per Vehicle Taka/hr	TTC per Pass Taka/hr	TTC per Vehicle Taka/hr	Vehicle Category	Occupancy Number	TTC per Pass Taka/hr	TTC per Vehicle Taka/hr	TTC per Pass Taka/hr	TTC per Vehicle Taka/hr	Vehicle Category	Occupancy Number	TTC per Pass Taka/hr	TTC per Vehicle Taka/hr	TTC per Pass Taka/hr	TTC per Vehicle Taka/hr
Motorized						Motorized						Motorized					
Bus Heavy	40	18.53	741.2	29.43	1177.13	Bus Heavy	45	18.25	730.08	28.99	1159.47	Bus Heavy	12.50%	-1.50%	-1.50%	-1.50%	-1.50%
Bus Light	16	20.02	320.32	25.4	406.35	Bus Light	21	19.68	314.87	24.97	399.44	Bus Light	31.25%	-1.70%	-1.70%	-1.70%	-1.70%
Bus Mini	39	21.38	833.88	24.19	943.31	Bus Mini	44	21.06	821.37	23.83	929.16	Bus Mini	12.82%	-1.50%	-1.50%	-1.50%	-1.50%
Car	3	47.38	142.15	45.55	136.66	Car	8	46.48	139.45	44.68	134.06	Car	166.67%	-1.90%	-1.90%	-1.90%	-1.90%
Utility	3	29.13	87.4	27.82	83.45	Utility	8	28.69	86.09	27.40	82.20	Utility	166.67%	-1.50%	-1.50%	-1.50%	-1.50%
Tempo	10	18.41	184.08	17.33	173.34	Tempo	15	18.13	181.32	17.07	170.74	Tempo	50.00%	-1.50%	-1.50%	-1.50%	-1.50%
Auto Rickshaw	3	20.6	61.81	21.37	64.1	Auto Rickshaw	8	20.29	60.88	21.05	63.14	Auto Rickshaw	166.67%	-1.50%	-1.50%	-1.50%	-1.50%
Modifed tempo	10	23.55	235.46	22.17	221.72	Modifed tempo	15	23.22	232.16	21.86	218.62	Modifed tempo	50.00%	-1.40%	-1.40%	-1.40%	-1.40%
Motor Cycle	1	39.81	39.81	37.49	37.49	Motor Cycle	6	39.17	39.17	36.89	36.89	Motor Cycle	500.00%	-1.60%	-1.60%	-1.60%	-1.60%
Sub-Total	**125**	**238.81**	**2646.11**	**250.75**	**3243.55**	Sub-Total	**170**	**235**	**2605**	**247**	**3194**	Sub-Total	36.00%	-1.60%	-1.54%	-1.60%	-1.54%
Non-Moto						Non-Moto						Non-Moto					
Bi-Cycle	1	11.13	11.13	10.48	10.48	Bi-Cycle	6	10.96	10.96	10.32	10.32	Bi-Cycle	500.00%	-1.50%	-1.50%	-1.50%	-1.50%
Rickshaw	2	15.41	30.82	14.51	29.03	Rickshaw	7	15.15	30.30	14.26	28.54	Rickshaw	250.00%	-1.70%	-1.70%	-1.70%	-1.70%
Rickshaw Van	6	17.12	102.74	16.13	96.75	Rickshaw Van	11	16.86	101.20	15.89	95.30	Rickshaw Van	83.33%	-1.50%	-1.50%	-1.50%	-1.50%
Sub-Total	**9**	**44**	**145**	**41**	**136**	Sub-Total	14	**43**	**142**	**40**	**134**	Sub-Total	55.56%	-2.33%	-1.75%	-1.28%	-1.35%
Total	**18**	**87.66**	**289.69**	**82.12**	**272.26**	**Total**	**38**	**282**	**2791**	**292**	**3380**	**Total**	**111.11%**	**221.70%**	**863.44%**	**255.58%**	**1141.46%**
Average	**71.5**	**163.235**	**1467.9**	**166.435**	**1757.905**	**Average**	**104**	**258.49102**	**2698.2024**	**269.37022**	**3286.8608**	**Average**	**45.45%**	**58.36%**	**83.81%**	**61.85%**	**86.98%**

***Source** : Travel Time Cost Survey 2008-09, RDP-25, LGED.*

Note: Road Class: LGED Union & Union Rd in 6 Divisions

***Source** : Travel Time Cost Survey 2018*

Note: Road Class: LGED Union & Union Rd in 6 Divisions

Table 5.12 Travel Time Costs for Non Motorized Vehicles (Upazila+Union Rd)

Table 5.12 Travel Time Costs for Non Motorized Vehicles (Upazila+Union Rd), 2(**Table 5.12 Travel Time Costs for Non Motorized Vehicles (Upazila+Union Rd), 2** **Table 5.12: Comparison with 2009 & 2018**

Before Situation-2009								After Situation-2018								Change in %							
		Journey Characteristics		Travel Time Cost Taka per hour						Journey Characteristics		Travel Time Cost Taka per hour						Journey Characteristics		Travel Time Cost Taka per hour			
Division	Vehicle Category	Occupancy	Journey in-work time	Work time value	Non-work time value	Average per person	Average per vehicle	Division	Vehicle Category	Occupancy	Journey in-work time	Work time value	Non-work time value	Average per person	Average per vehicle	Division	Vehicle Category	Occupancy	Journey in-work time	Work time value	Non-work time value	Average per person	Average per vehicle
Dhaka	Rickshaw	2	13.00%	10.20	3.70	4.30	8.40	Dhaka	Rickshaw	2	13.20%	10.05	3.64	4.24	8.27	Dhaka	Rickshaw	0.00%	1.50%	-1.50%	-1.50%	-1.50%	-1.50%
	Bi-Cycle	1	27.00%	21.20	7.60	10.70	10.70		Bi-Cycle	1	27.41%	20.88	7.49	10.54	10.54		Bi-Cycle	0.00%	1.50%	-1.50%	-1.50%	-1.50%	-1.50%
Chittagong	Rickshaw	2	12.00%	10.17	3.67	4.27	8.37	Chittagong	Rickshaw	2	12.18%	10.02	3.61	4.21	8.24	Chittagong	Rickshaw	0.00%	1.50%	-1.50%	-1.50%	-1.50%	-1.50%
	Bi-Cycle	1	26.00%	21.17	7.57	10.67	10.67		Bi-Cycle	1	26.39%	20.85	7.46	10.51	10.51		Bi-Cycle	0.00%	1.50%	-1.50%	-1.50%	-1.50%	-1.50%
Rajshahi	Rickshaw	2	14.20%	10.23	3.73	4.33	8.43	Rajshahi	Rickshaw	2	14.41%	10.08	3.67	4.27	8.30	Rajshahi	Rickshaw	0.00%	1.50%	-1.50%	-1.50%	-1.50%	-1.50%
	Bi-Cycle	1	28.20%	21.23	7.63	10.73	10.73		Bi-Cycle	1	28.62%	20.91	7.52	10.57	10.57		Bi-Cycle	0.00%	1.50%	-1.50%	-1.50%	-1.50%	-1.50%
Khulna	Rickshaw	2	13.70%	10.21	3.71	4.31	8.41	Khulna	Rickshaw	2	13.91%	10.06	3.65	4.25	8.28	Khulna	Rickshaw	0.00%	1.50%	-1.50%	-1.50%	-1.50%	-1.50%
	Bi-Cycle	1	27.70%	21.21	7.61	10.71	10.71		Bi-Cycle	1	28.12%	20.89	7.50	10.55	10.55		Bi-Cycle	0.00%	1.50%	-1.50%	-1.50%	-1.50%	-1.50%
Barisal	Rickshaw	2	14.20%	10.24	3.74	4.34	8.44	Barisal	Rickshaw	2	14.41%	10.09	3.68	4.27	8.31	Barisal	Rickshaw	0.00%	1.50%	-1.50%	-1.50%	-1.50%	-1.50%
	Bi-Cycle	1	28.20%	21.24	7.64	10.74	10.74		Bi-Cycle	1	28.62%	20.92	7.53	10.58	10.58		Bi-Cycle	0.00%	1.50%	-1.50%	-1.50%	-1.50%	-1.50%
Sylhet	Rickshaw	2	13.00%	10.20	3.70	4.30	8.40	Sylhet	Rickshaw	2	13.20%	10.05	3.64	4.24	8.27	Sylhet	Rickshaw	0.00%	1.50%	-1.50%	-1.50%	-1.50%	-1.50%
	Bi-Cycle	1	27.00%	21.20	7.60	10.70	10.70		Bi-Cycle	1	27.41%	20.88	7.49	10.54	10.54		Bi-Cycle	0.00%	1.50%	-1.50%	-1.50%	-1.50%	-1.50%
Average	Rickshaw	2	13.35%	10.21	3.71	4.31	8.41	Average	Rickshaw	2	13.55%	10.06	3.65	4.25	8.28	Average	Rickshaw	0.00%	1.50%	-1.50%	-1.50%	-1.50%	-1.50%
	Bi-Cycle	1	27.35%	21.21	7.61	10.71	10.71		Bi-Cycle	1	27.76%	20.89	7.50	10.55	10.55		Bi-Cycle	0.00%	1.50%	-1.50%	-1.50%	-1.50%	-1.50%

***Source** : Travel Time Cost Survey 2008-09, RDP-25, LGED.*

(1)"Quantification of the Effects of Non-motorized Transport and Roadside Activities

Note: Road Class: LGED Upazila & Union Rd in 6 Divisions

***Source** : Travel Time Cost Survey 2018*

(1)"Quantification of the Effects of Non-motorized Transport and Roadside Activities

Note: Road Class: LGED Upazila & Union Rd in 6 Divisions

5.4. Unit Travel Time Costs for Non-Motorized Vehicle

Time values for Non-Motorized vehicle has been derived from the "Quantification of the Effects of Non-motorized Transport and Road side Activities in 8 Divisions 2018. These are quantified as work time values. Non-work time values are estimated on assuming standard LGED 35%. The average values per person and per vehicle are estimated using the NMV journey characteristics data from the field survey carried out in 2018 by Road, LGED (Table 5.12).

5.13 Comparison of Average Saving in Travel Time and Operation Cost to Operators for Improvement of Network in General, 2009 & 2018

Road No: All Average		Road No: All Average		Road No: All Average	
Before Situation-2009		**After Situation-2018**		**Change in %**	
Vehicle Type	**Time Saving**	**Vehicle Type**	**Time Saving**	**Vehicle Type**	**Time Saving**
Truck Med	17.00	Truck Med	21.39	Truck Med	25.83%
Truck Small	19.00	Truck Small	23.52	Truck Small	23.77%
Bus Heavy	20.00	Bus Heavy	24.54	Bus Heavy	22.68%
Bus Light	19.00	Bus Light	23.93	Bus Light	25.93%
Bus Mini	32.00	Bus Mini	38.89	Bus Mini	21.53%
Utility	20.00	Utility	24.09	Utility	20.46%
Car	26.00	Car	32.19	Car	23.82%
Tempo	13.00	Tempo	15.69	Tempo	20.68%
Auto Rick	27.00	Auto Rick	32.08	Auto Rick	18.81%
Motor Cycle	23.00	Motor Cycle	27.56	Motor Cycle	19.82%
Total	**216.00**	**Total**	**263.87**	**Total**	**2.23**
Average	**39.27**	**Average**	**47.98**	**Average**	**0.41**

5.5 Overall Savings: The overall average savings (travel time and vehicle operation costs) due to improvement of road network has increased by 22.3% from Tk 21.60 to Tk 26.39. Maximum saving is generated by light bus by 25.9% followed by medium truck operators by 25.8%, car (23.8%), small truck (23.7%), etc. The lowest saving was calculated for auto-rickshaw at 18.8%. Thus, there is no substantial savings difference between the operators of different vehicle categories (Table 5.13).

Table 5.13 Comparison of Average Saving in Travel Time and Operation Cost to Operators for Improvement of Network in General, 2009 & 2018

Before Situation-2009		After Situation-2018		Increase in %	
Vehicle Type	Time Saving	Vehicle Type	Time Saving	Vehicle Type	Time Saving
Truck Med	17.00	Truck Med	21.39	Truck Med	25.83%
Truck Small	19.00	Truck Small	23.52	Truck Small	23.77%
Bus Heavy	20.00	Bus Heavy	24.54	Bus Heavy	22.68%
Bus Light	19.00	Bus Light	23.93	Bus Light	25.93%
Bus Mini	32.00	Bus Mini	38.89	Bus Mini	21.53%
Utility	20.00	Utility	24.09	Utility	20.46%
Car	26.00	Car	32.19	Car	23.82%
Tempo	13.00	Tempo	15.69	Tempo	20.68%
Auto Rick	27.00	Auto Rick	32.08	Auto Rick	18.81%
Motor Cycle	23.00	Motor Cycle	27.56	Motor Cycle	19.82%
Average	**21.60**	**Average**	**26.39**	**Average**	**22.33%**

Table 5.14 Summary of TTC Inputs 2018

Table 5.14 Summary of TTC Inputs 2018

After Situation-2018																										
Item Cost/Unit Costs	Unit	Table No.	Medium Truck		Small Truck		Bus Heavy		Mini Bus		Bus Light		Utility		Car		Auto Ricksaw		Motor Cycle		Animal Cart		Rickshaw		Bi Cycle	
			Fin	Eco	Fin	Eco	Fin	Eco	Fin	Eco	Fin	Eco	Fin	Eco	Fin	Eco	Fin	Eco	Fin	Eco	Fin	Eco	Fin	Eco	Fin	Eco
TTC (Taka /Passenger hour)		5.10	19.78	26.97	17.07	23.28	20.40	22.16	44.60	41.74	23.45	25.49	17.65	15.89	18.02	19.58	22.58	20.32	38.17	34.36	0.00	0.00	0.00	0.00	0.00	0.00
Financial and Economic TTC per Pass Taka/hr		5.11	18.25	28.99	19.68	24.97	21.06	23.83	46.48	44.68	28.69	27.40	18.13	17.07	20.29	21.05	23.22	21.86	39.17	36.89	10.96	10.32	15.15	14.26	16.86	15.89
Financial and Economic TTC per Vehicle Taka/hr		5.11	730.08	1,159.47	314.87	399.44	821.37	929.16	139.45	134.06	86.09	82.20	181.32	63.14	60.88	63.14	232.16	218.62	39.17	36.89	2,605.40	3,193.72	0.00	0.00	10.96	10.32
Financial and Economic TTC (Pass-Taka/hr)		5.12	18.53	29.43	20.02	25.40	21.38	24.19	47.38	45.55	29.13	27.82	18.41	17.33	20.60	0.00	23.55	22.17	39.81	37.49	238.81	250.75	11.13	10.48	15.41	14.51
Financial and Economic TTC (Veh-Taka/hr)		5.12	741.20	1,177.13	320.32	406.35	833.88	943.31	142.15	136.66	87.40	83.45	184.08	173.34	61.81	64.10	235.46	221.72	39.81	37.49	2,646.11	3,243.55	11.13	10.48	30.82	29.03
Utilization																										
Journey to/ From Work		5.1	2.03		3.05		3.05		5.09		4.07		5.09		2.03		6.10		4.07		4.07		2.03		4.07	
Employers Business		5.1	3.06		4.08		4.08		6.11		4.08		6.11		6.11		6.11		11.21		6.11		7.13		6.11	
Own Business		5.1	6.10		11.19		11.19		15.26		12.20		19.32		14.24		19.32		19.32		24.41		15.26		20.34	
Family and Social		5.1	0.00		0.00		1.02		2.03		2.03		5.08		2.03		5.08		2.03		2.03		1.02		5.08	
Journey to/ From Work		5.2	2.03		2.03		3.05		3.05		4.07		5.09		2.03		6.10		4.07		4.07		2.03		4.07	
Employers Business		5.2	3.06		3.06		4.08		6.11		3.06		6.11		5.10		6.11		11.21		6.11		7.13		6.11	
Own Business		5.2	2.03		3.05		3.05		4.07		3.05		2.03		2.03		1.02		1.02		6.10		1.02		2.03	
Family and Social		5.2	0.00		0.00		1.02		2.03		0.00		4.06		2.03		5.08		2.03		2.03		1.02		5.08	
		5.3	1.02		0.00		0.00		1.02		1.02		5.08		0.00		5.08		2.03		2.03		0.00		4.06	
		5.3	2.04		4.08		4.08		4.08		3.06		6.11		6.11		6.11		11.21		6.11		6.11		5.10	
		5.3	1.02		3.05		2.03		5.09		6.10		2.03		5.09		1.02		1.02		6.10		6.10		6.10	
		5.3	0.00		0.00		0.00		1.02		1.02		5.08		0.00		5.08		2.03		2.03		0.00		4.06	
Sample Dist.by Monthly Income (Upazila & Union Road)		5.7																								
<3000		5.7	7		5		5		8		6		8		91		<3000		#DIV/0!		#DIV/0!		1		1	
3001-6000		5.7	5		5		5		13		7		15		118		3001-6000		#DIV/0!		5		1		1	
6001-9000		5.7	5		6		8		10		10		11		116		6001-9000		3		#DIV/0!		1		1	
9001-12000		5.7	8		12		12		11		16		10		144		9001-12000		1		5		2		1	
12001-15000		5.7	8		13		14		7		16		5		119		12001-15000		1		1		5		2	
15001-18000		5.7	6		8		8		5		11		5		87		15001-18000		3		1		5		#DIV/0!	
18000+		5.7	7		5		5		5		5		5		70		18000+		#DIV/0!		1		#DIV/0!		#DIV/0!	
Total		5.70	11,023		4,485		4,485		4,485		4,485		4,485		4,485		4,485		4,485							

Source: Road Network Maintenance and Improvement Project II, RHD 2007, Economic Circle, HDM Circle, MIS, RHD

Note: Data collection from BBS, Vehicle Dealers, Custom office, BRTA Head office, 6 Divisional BRTA Office, Project Director, RDP-25, LGED Maintenance Cell.

CONCLUSION & RECOMMENDATION:

Conclusion

The study shows that both vehicles operating costs and travel time costs decline to a sizable extent in spite of increasing the vehicles purchase costs, crew costs and vehicle maintenance and overhead costs. Due to decline in road roughness frequency of motorized and non-motorized vehicles are also on increase. Previously those who use to walk (pedestrians) along the road, now are habituated to use vehicles. Resultantly their travel time declines. With the rapid growth of national economy, the number of motorized and non-motorized vehicles is on increase. Now drivers and helpers are earning more. Consequently their standard of living has enhanced.

Due to expansion and improvement of rural roads (Upazila, Union and Village) road side villagers' mobility has increased. They are easily getting the union level and upazila level support services. Their access to market for selling agricultural produces and buying agricultural inputs has also increased. Resultantly they get good price for their produces and can easily buy their required inputs from the market at reasonable prices. Their income increases as a result of which poverty level in the country declines.

Due to improvement in rural connectivity, school enrolment, particularly for girls, has almost become universal. Access to primary health care services, such as children's immunization, ante-natal and post-natal care, pregnant mothers' consultation with medically trained personnel, etc. to a great extent increases. Overall it can be said that there is a great positive change in rural Bangladesh due to improvement and expansion of rural roads.

Recommendations:

Rural road network has tremendously increased. This is made for light vehicles. But due to development of growth centers and union markets, heavy trucks ply on these roads. As a results roads are easily damaged. Hence roads' load bearing capacity should be increased. Moreover due to low road maintenance budget, roads could not be maintained timely and properly. Therefore, more budgetary provision should be made.

One of the limitations of the present survey is that the study findings are based on only 18 UZ roads and 06 UN roads. For a national survey like this is too small. For getting representative and solid results the survey should cover at least one UZ and one UN road from each district. It can be mentioned that the 2009 RUC Study was based on 18 UZ and 18 UN roads.

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