Sida Evaluation 06/38

Bangladesh Road Transport Corporation (BRTC) Bus Project in Dhaka

Lennart Olsson
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Department for Infrastructure and Economic Cooperation

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Authors: Lennart Olsson, Marie Thynell.

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SWEDISH INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
Address: SE-105 25 Stockholm, Sweden. Office: Valhallavägen 199, Stockholm
Telephone: +46 (0)8-698 50 00. Telefax: +46 (0)8-20 88 64
E-mail: sida@sida.se. Homepage: http://www.sida.se

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Executive Summary

In 1999 Sida initiated cooperation with Dhaka in the area of urban transportation. The project consisted of financing support for the purchase of 50 high capacity buses (double-deckers) together with a package of technical assistance related to the production, maintenance and operation of the buses, which were put in operation in 2001. In 2003, a request was made by the Government of Bangladesh for the continuation of the Swedish support through the financing of another 95 double decker buses. This would complete the provision in the 1999 National Plan of Bangladesh that stipulated the introduction of a total of 350 such buses in order to relieve congestion and air pollution.

The main purpose of this report is to evaluate the performance of the first 50 buses but also to identify and evaluate other aspects that may have relevance for Sida in the decision as to continue or discontinue the cooperation with Dhaka in the requested form.

There is no doubt that the introduction of the first Swedish double decker buses has been successful. The performance of the buses is remarkably high and above the expectations in terms of the number of buses on road (over 90 percent) and kms produced (over 64 000 kms per bus and year). These are figures comparable with, or better, than European standards and it is evident that, at least so far, the buses have been well maintained and cared for. The number of transported passengers appears to be lower than it could be but this may partly depend on flaws in the fare collection and current reporting systems. Passengers appreciate the Volvo buses (especially women) since they offer safe and comfortable ways of travelling.

It has not been possible to assess in detail the possible impact of the 50 buses on Dhaka's entire urban transport system. However, the concern (mainly by the World Bank) that the project would distort competition and force the private bus sector out of the market has clearly not come true. If anything, the appearance of the new buses seems to have stimulated private operators to operate more buses along the same routes and during the last eighteen months new operators have been stimulated to operate more standard sized buses in general.

At present, the ADB is assisting Bangladesh to exploit the country's natural gas resources and one of the applications is intended to be gas driven buses for urban transport in Dhaka. 300 new gas buses would be financed under the program, of which 200 are intended for BRTC and 100 for private operators.

One of the issues to consider seriously is the role of the BRTC, the Government owned operator. The BRTC, like many similar institutions, has a mixed reputation and many advisors are hesitant to strengthen it – some may even prefer to see it abolished for 'ideological' reasons. However, it is the only operator in Dhaka with the depot capacity and experience required for operation of a fleet of high capacity buses, and it has not misused the 50 first buses. The Minister of Communication wants the BRTC to develop into a standard setter for the public transportation sector in the future but without expanding it too much. The fact that the ADB project will largely be directed towards BRTC can be seen as recognition of this plan.

Another issue that needs to be considered is whether there is any contradiction between the ADB gas project and the Government's parallel intention to introduce an additional 95 double-decker buses (which are only available with diesel propulsion). In our opinion this is not the case. The fundamental and urgent need in Dhaka is to accomplish a transition from thousands and thousands of *small* public transport vehicles to a smaller number of vehicles with *higher capacity*. This is the only policy with a potential to reduce congestion, improve air quality and relieve the pressure for more roads. Buses with Euro III or Euro IV standard engines have extremely good environmental characteristics and are

accepted in all European cities.[1] Although the ADB may take a negative position in this issue, the Government's request for high capacity double decker buses is reasonable against the background of the need of a shift towards high-capacity buses. The former National Transport Plan was formulated and approved of long before the ADB initiative was taken. In Dhaka there is certainly room for both 95 double decker buses and 300 gas driven standard buses and if there is a conflict it is, in our view, an artificial one.

A crucial task for the various institutions involved in the development of Dhaka is to develop a sustainable urban transport system. To accomplish this task in such a fast growing and complex mega city like Dhaka is a true challenge. The Swedish buses can be part of this development and there is an outspoken commitment from the ministries involved to improve conditions for high capacity bus transport, including priority measures like separate bus lanes or priority in traffic signals in crossings.

The analysis and conclusions from the visit and the various meetings held in Dhaka lead to the recommendation that Sida should seriously consider to respond positively to the request from the Government of Bangladesh. However, the need for assistance is not limited to hardware and equipment. In order to maximize the use of buses, assistance to the BRTC should include:

- Technical training in maintenance of buses.
- Management of construction of bus bodies.
- Management training focusing on business economics.
- Advisory to set up a modern bus depot.
- Training of women drivers.
- Infrastructure improvements along Volvo routes

In order to develop cooperation with Dhaka City further, a broader view should be taken, including for example assistance in:

- Overall regional planning of transportation and infrastructure.
- Traffic management including priority measures for public transport.
- Planning and development of BRT systems and other mass transit options.
- How to improve customer relations and increase respect for bus passengers.
- How to make passenger surveys and market researches.
- Establishment of a public transport authority.
- Route network planning and optimisation.
- Monitoring of private bus operators.

[1] Euro III and Euro IV are specifications about emission values from engines in different vehicles combined with specifications about the quality of fuel.

1. Introduction

1. 1 Objectives of Intervention

In 1999 Sida initiated a co-operation with Dhaka in the area of public transport. 50 high capacity buses (double deckers) were financed from Sweden.

Present request from Bangladesh

On the 16th of October 2003, a request from the Government of Bangladesh was sent to the Government of Sweden for a continuation of the co-operation in the form of financing of another 95 double decker buses. The Swedish Government financing would cover 85% the purchasing price of the buses (half as a grant and half as a soft loan) while the remaining 15% is supposed to be commercially financed by the exporting company. Two ministries are involved in the handling of the double deckers: the Ministry of Communications and the Ministry of Finance (the Economic Relations Division).

The allocation of 350 double decker buses in the National Plan

The Bangladesh National Plan of 1999 stipulated that 350 double decker buses would be introduced in Dhaka as a step in transition to high capacity public transport. So far 205 Ashok Leyland buses from India and 50 Volvo buses from Sweden have been delivered. The remaining buses 95 in the Plan are preferred to be Volvos because of their demonstrated high performance and good environmental characteristics.

The World Bank and the ADB support attempts to attract the private sector to operate large buses. It is too early to assess the results of this effort but, generally speaking, there is not much experience in Dhaka regarding fleet operation of large buses.

1. 2 Purpose and scope of evaluation

The purpose of this evaluation is to evaluate the delivery and the performance of the 50 first Volvo buses in Dhaka. The conditions and objectives of the loan agreement between Bangladesh Government and Sida will also be evaluated together with the fulfilment of the objectives of this cooperation initiative. The bus project was expected to fulfil several objectives according to Sida Terms of reference, September 2004: 1–2:

- Improved air quality.
- Demonstration of the potential of high-capacity bus operations.
- Facilitate the establishment of an efficient maintenance system for the public bus fleet in Dhaka.
- Contribute to improved accessibility to public transport for low income (poor) people and for women.
- Development of know-how for complex public transport.

In addition to these objectives other important issues to be covered in this evaluation are for instance rules and restrictions in the institutional framework, financial situation of the BRTC, statistical reporting and estimation of real performance of production and passenger carrying.

1. 3 This Report

After having outlined the background, objectives and scope of the mission in the introduction the following Chapter 2 includes a presentation of urban change in Dhaka together with some other important features related to energy and environment. The 'bus performance evaluation' is presented in chapter 3 and continues with information about organizational framework and sustainable transport in chapter 4. Finally, in chapter 5 conclusions and recommendations are presented.

2. Presentation of Dhaka City

2. 1 Urban Transport in Dhaka

Transportation facilities are a fundamental need in modern societies. Therefore the provision of a transport system that the majority can benefit from is a requirement. Transport contributes to economic growth but also to problems such as traffic congestion, air pollution, accidents and a number of other side effects. Today the basic need of access and mobility is badly provided for in Dhaka. Family members of lower income households need to make long and dangerous walks daily. Almost 50 percent of the population is poor and approximately 60 percent of them use walking as their main mode of transport.

To begin with today's traffic congestion, insecurity and misuse of street space poses serious threats to urban development. Lack of relevant measures and firm decisions to cope with the complexity of traffic has created chaotic conditions. Different types of modes using the same road space characterize traffic environment. Delays have tripled in the last three years. Inadequate traffic management, conflict of jurisdictions, poor coordination among organizations and increasing air pollution are some other main problems.

Dhaka is perhaps the only city of its size that almost totally lacks bus transport with reasonable capacity, let alone other form of mass transport system. Today, public transport based on a multitude of private operators has grown out of control. The combination of a large number of slow-moving cycle rickshaws, approximately some 600.000 and an increasing number of motorized three wheeler auto-rickshaws create serious problems. These vehicles fight for street space and negotiate constantly with cars, buses and pedestrians. It is likely that the problem will grow even worse considering the still low levels of motor vehicles per thousand inhabitants. According to a survey made it is estimated that the number of motor vehicles in Dhaka is 240 000 which means that there are about 30 motor vehicles per 1000 inhabitants. This can be compared to almost 700 per 1000 inhabitants in the US.

So far only 3 percent of trips are made by cars. The majority of the inhabitants are poor but the economy is growing by approximately 4 percent per year. This growth will surely be reflected in a growing fleet of private vehicles in Dhaka as in most other cites. Still, the majority of people will continue to travel by public transport or walk. In 2004 almost 89 percent of trips in Dhaka were undertaken by walking, rickshaw or bus (STPP). According to Fjellström 2004, 60 percent are on foot. According to Louis Berger Group, the number of minibuses and taxis more then tripled between 2000–2003. The need for transport options is reflected in the increasing fleet operated by minor entrepreneurs. Deteriorating traffic conditions have prompted several popular public campaigns to find urgent solutions.

Women and urban poor are particularly and severely disadvantaged in accessing the existing facilities due to extreme over-crowded buses. Bus drivers simply do not let them on the bus. The transport

problems jeopardize the ability of the transport sector to sustain economic growth and contribute to reasonable quality of life.

Congestion and air pollution can be said to be today's main problems in Dhaka. The Government has taken important steps to improve the quality of air by banning the two-stroke engine auto-rickshaws from the central parts to the suburban areas and by promoting high capacity public transport. In 2003 a contract was signed between the Asian Development Bank, ADB, and the Government of Bangladesh, the Ministry of Energy. It stipulates that the ADB will finance 300 CNG buses and that the diesel buses should be eventually phased out. The required CNG infrastructure would be built and operated by private operators. Today 100 standard buses out of an estimated 7100 large buses, minibuses and microbuses run on CNG or equal to 1,5 percent of the vehicle fleet.

In order to improve the conditions a number of different measures could be taken such as the separation of various traffic modes, introduction of bus lanes and other ways to increase the efficiency of the use of street space. Other possible actions include improved drainage, side walks and to banish garbage impeding on access for pedestrians and vehicles. Improvement of road safety is part of poverty reduction and promoting gender. There seem to be a special need to decrease road vulnerability for girl children and women since they suffer from injuries and fatalities. Their modes of trips are dangerous. Road safety could be improved by measures such as the introduction of luminous tags increasing pedestrian visibility, lowering speed in some places, drinking and driving information and drivers training.

2. 2 Urban Change

The urban hierarchy of Bangladesh is strongly dominated by Dhaka, which is the largest, and most industrialized city and also the administrative, commercial and cultural capital. Dhaka also serves as the traditional centre of wholesale trade for the country. In spite of its relative importance in the national economy, acute deficiencies exist in the provision of infrastructure facilities, resulting in a widening gap between supply and demand for urban transport services according to the Strategic Transport Planning (commissioned by the DTCB and carried out by the World Bank consultant Louis Berger). Various local conditions influence transport relations such as the fact that Dhaka is very densely populated and hosts more than 12 million inhabitants. In 1950 Dhaka City had about 250.000 and it is estimated that Dhaka will host 16 million in 2015 and 30 million in 2025. Corresponding organizational and infrastructure improvements have not followed this rapid urbanization. Land motorization became a crucial mean of mobility fairly late and there has not been sufficient planning to guide this development.

Income distribution is uneven and 50 percent are estimated to be poor. (95 percent of those subsist on less than 2 USD a day and out of those 45 percent subsist on less than 1 USD a day according to the Louis Berger Group.) In Bangladesh annual population growth rate is 4.8 percent and life expectancy is 62 years. Women illiteracy makes up to 70 percent.

2. 3 Natural Resources and Energy Relations in Bangladesh

There are important natural gas resources and so far 22 fields have been found. Out of these 12 have been exploited and seven are being prepared for extraction. Bangladesh is believed to an important gas exporter. In this perspective an increased use of CNG seems logical. Today this is stimulated by a price reduction and a litre cost 8 Thaka compared with 20 Thaka per litre diesel. In the future, however, the price of gas must be raised to avoid costly subsidies. The per capita consumption of electricity is about the lowest in world and 86 percent of the electricity comes from natural gas. The remaining comes from hydropower and oil. Industry uses 50 percent of the electricity and 85 percent of the households do not have access to electricity. They continue using traditional energy such as fire wood, cow dung

and rice waste. The per capita consumption of electricity is still very low but will probably increase as an outcome of general economic growth.

2. 4 Emissions

More than 200,000 motor vehicles ply in Dhaka. According to the Department of Environment and the BRTA only 6.8 percent of the vehicles are fit to be driven (2001). Accordingly more than 90 percent o the vehicles in Dhaka are faulty and emit smoke far exceeding the prescribed limit (UNEP 2001) Trucks and buses of old construction are big single polluters as well as minibuses and small public transport vehicles due to sheer numbers. According to the Asian Development Report 1998, Dhaka is the most polluted city of the world, has made a world record, abominably, as a number one pollutant breaking earlier record of Mexico City. "Outburst of airborne disease", a medical study claims, "has swept the city dwellers in mass". It ranges from skin diseases to cancer. Numerous ailments as eye irritant, severe headache, amonexia, disruption of blood circulation, respiratory problem and even death are being seen as a result of present environmental disorder (Rahman, 1998).

The highest acceptable level of sulphur dioxide, S02, is 60 microgram per cubic meter of air. But it has been recorded at 300 to 500 microgram in Dhaka. Near Farmgate in the city centre 385 micrograms was found (DoE, UNEP 2001). The amount of nitrogen is also three times higher than that of normal. Bangladesh Atomic Energy Commission reports that automobiles in Dhaka emit 100 kg lead, 3.5 ton SPM, 1.5 ton sulphur dioxide, 14 ton hydrocarbon and 60 ton carbon monoxide (Ferdous, 1997). The measurement of SPM in the industrial area of Tejgaon showed 1849 micrograms per cubic meter (1997) as opposed to the allowable limit of 500 (DoE, UNEP 2001). There are important variations and during the monsoon season air is cleaner. During the dry season when for instance the brick kilns are active using wood, coals and used rubber wheels as their source of energy the emission increases.

Concentration of lead in ambient air of Dhaka city has been marked as world's record of 463 nanogram per cubic meter offsetting earlier record of Mexico City (383 ng) and other cities like Los Angles (70 ng). Gaseous and particulate emissions removed downwind either by direct adsorption on precipitation or by deposition on surfaces, Many of the pollutants deposited dry on the surface return to hydrological cycle during the next rainfall as they are washed from the surface. The University of Engineering (BUET) found 151 to 210 mg lead per litre in Dhanmondi lake. It is most likely that most of the wetlands surrounding Dhaka city are extremely polluted.

The average suspended particle leads to particulate matter (PM) rises as high as 227 mg per cubic meter, where as according to WHO yearly maximum average value should range between 60–90 mg per cubic meter. There is a great concern about the role of air quality in cancer mortality incidence. A brief description of specific compounds or compound classes very likely constitutes Dhaka air presented below.

In air pollution, air is the vehicle that conveys pollutants to biota (Prior and Lopenz, 1992). The chemistry of the pollutants in air is a dynamic process. For example, SO2 emissions are converted to sulphate, sulphuric acids, ammonium sulphate, ammonium bisulphate, and when inhaled, these compounds have properties of particulate. Hydrocarbon pollutants are oxidised and the oxidation products are important in the production of troposphere ozone. Ambient air of Dhaka has become a deadly pollutant reaching a level of all times and it can be declared as one of the worst polluted cities of the world. Eight million vehicles runs in Los Angles show lead content between 0–70 nanogram (part per billion) lead content in cubic meter, whereas Dhaka with 200,000 vehicles has been marked as world record of 463 nanogram (one part of a billion).

	No. vehicles	Population (million)	SO2	NOx	SPM	Lead
WHO(stand)			60ηg m $^{-3}$	150 g m $^{-3}$	60–90	>1ηg m $^{-3}$
***Dhaka**	**200,000**	**8**	**300–500**	**300–450**	**1000–2000**	**463**
Calcutta	500,000	11,83	104	>150	268–453	11,83
Delhi	1,6 million	8,62	90	40–55	600–1450	8,62
London	2,7 million	10,57	20–30	>75	15–35	10,57
Los Angeles	8 million	12	0,2–10	39–104	94	0–0,17
Mexico	2.5 million	19,37	170	113–207	100–500	>2

Source: WHO, UNEP (1993), DoE (1997).

3. Evaluation of the Project

3. 1 Previous Scenarios

The World Bank and the ADB support attempts to attract the private sector to operate large buses. It is too early to assess the results of this effort but generally speaking there is not much experience in Dhaka regarding the operation of standard or high capacity buses.

In the appraisal document of 1999 for the double decker bus project four scenarios were presented and commented. These scenarios are presented and commented below followed by additional comments from October 2004 in an attempt to follow up the projections that were made five years ago

Scenario 1. The bright scenario
The BRTC operates the buses efficiently and demonstrates the merits of the concept of high capacity buses. Bus ways and institutional reform hereby become politically possible to introduce within the framework of Dhaka Urban Transport Planning, DUTP. The private sector is effectively monitored and controlled and restrictions are imposed on auto rickshaws, tempos and rickshaws. The private sector is gradually transformed into a number of organized bus companies monitored by a Public Transport Authority. BRTC remains one of many actors. Although it may maintain a special status and symbolize the Government's intervention and responsibilities, it operates under the same sound market conditions as the private sector.

Comments from 1999: This is of course the preferred and desired scenario fulfilling the Sida objectives.

Scenario 2. The black scenario
The BRTC does not operate the buses efficiently as a fleet. Either the internal reform process halts or it falls back into general inefficiency or it starts leasing out the buses one by one on a daily basis to individual operators. In the beginning everything looks good but after a few years maintenance is lacking, spare parts are not bought, cannibalising starts and the buses end up as a graveyard.

Comments from 1999: This is the worst-case scenario, which would not fulfil any of the objectives. However it appears to be unlikely. The overall impression is that the BRTC is today a fairly competent operator of buses in the traffic environment of Dhaka. Old buses have been kept in operation for an impressive number of years. Maintenance staff has the skills needed and the company also has the skills to rebuilding buses with new bodies built on old chassis. Management has proven its capability of using

decentralization and market mechanisms such as increased competition and fares related to the level of service to improve the financial performance of the company. It is also considered likely that Government would allow a return to plan economy conditions under which BRTC's previous unsatisfactory performance occurred.

Scenario 3 A. The BRTC succeeds, but institutions fail

BRTC operates the buses efficiently but Government fails to implement institutional reform or do so only slowly. The private sector continues to operate rickshaws and three-wheeler under the umbrella of a corrupt and inefficient framework instead of transforming to bus operations. The bus concept therefore does not spread or does so very slowly.

Comment 1999: The possibility for this scenario to happen can not be excluded. If so, the project would meet many or most of its directives but it would not have the desired effect as a catalyst for a general improvement of the whole public transport sector. BRTC in this scenario would represent a dominant part of organized bus operations and would most likely be the only double-decker operator. In this scenario, the Volvo bus project would still be justified.

Scenario 3 B. The BRTC succeeds, but unfair competition kills private bus concept

In this scenario, which can be seen as a variant of scenario 3 A, the BRTC operates the buses efficiently and it prospers. But since the buses are subsidized and the BRTC does not pay lease for its depots and terminals, it has an advantage over the private sector and can undercut their fares. The private sector therefore fails to develop into the desired structure of a number of organized bus operators.

Comments from 1999. If the project were to distort competition to the degree that it prevents a desirable private sector development process, which would other wise have taken place, then it, would not be justified. This scenario does not appear to be a great risk although this is one of the arguments of the World Bank against BRTC. However, since the issue of subsiding the bus purchase costs for BRTC is likely to be a key issue, it will be further elaborated.

Commenting previous scenarios

An evaluation of the earlier presented scenarios shows that the operation of the 50 double deckers includes some elements of first and some of the third scenario.

The last two years all two-engine stroke auto rickshaws have been relocated to suburban areas. Accordingly air quality in the central areas has been improved. At the same time the ADB is financing an expansion of the network of natural gas to Dhaka and other areas in Bangladesh. The number of large, mini and microbuses are estimated to around 7100 in Dhaka of which more than 99 percent are operated by the private sector. Most of the public transport operators have 1—5 vehicles and approximately 5—6 operators have fleets of 50—100 vehicles. Evidently, the solution is not more privatisation and deregulation but efforts are urgently needed to promote private operators to go for large buses and larger bus fleets.

Some of the new operators have started to buy larger standard buses. This is positive and constitutes a key part in the development of the public transport sector. The introduction of high capacity buses like double-deckers and large standard buses to replace immense number of minibuses and microbuses is seen as an important measure to reduce congestion and has to be done very soon. In this way it is possible to overcome the lack of road capacity. Large fleets of high capacity buses are seen as crucial in Dhaka where the need for more transport facilities is huge.

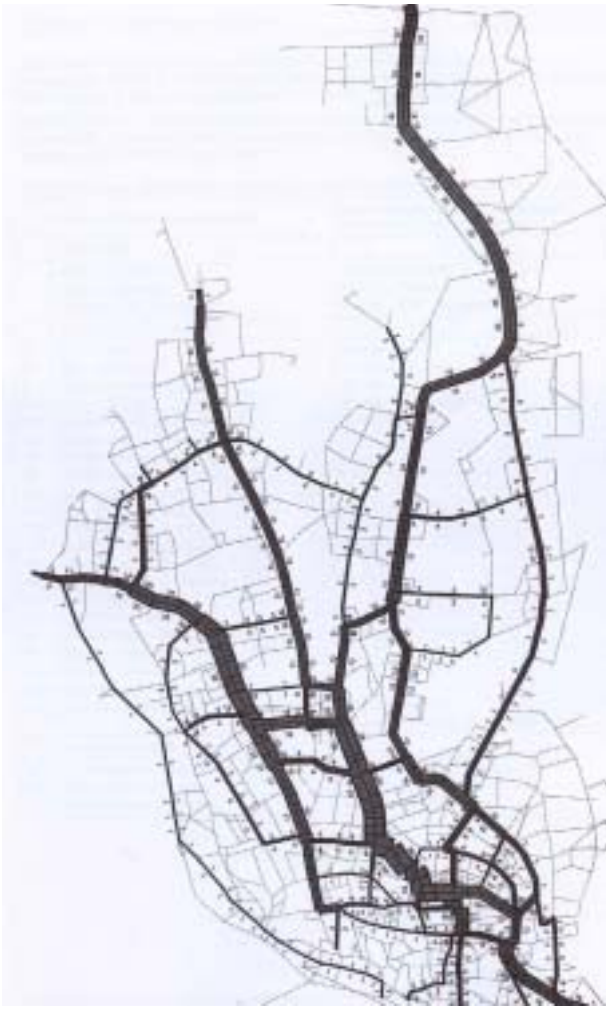
The institutional reforms develop slowly and strong modern leadership to handle the chaotic conditions is still required. The DTCB has been set up to coordinate the investments in infrastructure, planning and transport objectives for Dhaka but it is restricted to planning and analysis. An important step is to establish a strong coordination authority that monitors the public transportation sector in Dhaka.

According to the Ministry of Communication, the BRTC will be a standard setting unit, but the organization will not expand its service substantially. The standard setting mission will be the most important position for the BRTC. Therefore we find that the additional 95 high capacity buses constitute a step in this direction and will support the 'new development' of the BRTC. It is important to set the standards and show the private sector the importance of comfort, maintenance and effective production.

The operation of double decker buses on selected routes has increased the competition along these routes. Therefore the number of private buses operating on these routes is higher today than before when there were no Volvo buses. No sign of destroying the competition of the private sector has been found since the BRTC only run 1 or 2 percent of the buses and minibuses in operating in Dhaka. They carry approximately 1 or 2 percent of all passengers in Dhaka.

3. 2 Public Transport

There are different statistics given about the number of public transport vehicles operating in Dhaka. Licenses are given from BRTA to fixed routes. According to the strategic transport plan it is estimated that there are around 7100 buses operating on fixed routes in Dhaka. The fleet consists of 500 large buses of which 250 buses are high capacity buses and the rest standard buses, 5000 are minibuses and 1600 are microbuses. [2] One of the significant changes in the bus fleet composition during the last eighteen months has been an increase of large standard buses. However, although some new operators are buying large standard buses there are still too few standard buses. The number of high capacity buses has to increase quickly to cope with today's demand.



In March 31, 2004 there were 59 routes issued for operation in Dhaka. But the number of bus routes that is being operated is not known since buses do not operate all the routes that are given licenses for. Instead operators opt for other and more profitable corridors. As there are a few main roads the bus traffic on these roads are very heavy as can be seen on the route net map below. There are only a few main corridors taking care of the traffic in and out of the city centre (Old Dhaka). This means that the congestion of traffic in peak hours is very heavy and conditions are chaotic.

It is evident that the private public transport sector needs to be monitored more efficient if transport conditions will be improved. As long as the organizational framework of decision-making and coordination is not in place obviously there is a risk that transportation problem will get a lot worse.

The fare system in Dhaka is regulated by official government fares per km, today 0,72/0,75 Thaka per km. The fares are reviewed periodically by the

[2] Large buses are defined having more than 32 seats, mini buses are defined having 15–32 seats and microbuses are defined having 9–15 seats.

Government in a negotiating process with the operators. In reality the fares are generally slightly more expensive than the official fares for short trips and less than the official fares for longer trips. The competition on the streets is keeping the fares low rather than government regulations.

Actual fares for each transport mode 2004:

Mode	Actual approx. fare in 2004 (Taka per Km)*
Premium bus	1–1,5
Large bus	0,5 to 1 (depending on distance)
Minibus	0,5–1
Human hauler	0,5–1
Auto-rickshaw	12 flagfall (2 km) then 5
Standard taxi	15 flagfall (2 km) then 6
Rickshaw	20 flagfall (2 km) then 8

* Actual fare, not official fare. Source DTCB, working paper no 6

Fare collection is conducted outside the bus at ticket counters at bus stops for the major bus and mini-bus operators. In that way it can be up to 12 counters depending on the number of major operators serving the route. Large buses and minibus operators under individual ownership usually have conductors who collect the fares onboard the buses. The BRTC Volvo buses do not operate with conductors or helpers. Instead they have ticket inspectors.

Wages are very low compared with western countries. A driver at the BRTC earns maximum 4700 Thaka per month or around $ 80. The people in the counters, conductresses and inspectors earn less.

3. 3 The Bangladesh Road Transport Corporation, the BRTC

The BRTC is owned by the Government of Bangladesh and was formed in 1961. The Company operates both trucks and buses all over the country. The total bus fleet of BRTC consists of 741 buses, of which 306 buses are operating in Dhaka, mostly double decker. The distribution of buses on different brands:

Single decker buses	447
Double decker buses	294
Total number of buses	*741*
Trucks	170
Total number of vehicles	*911*

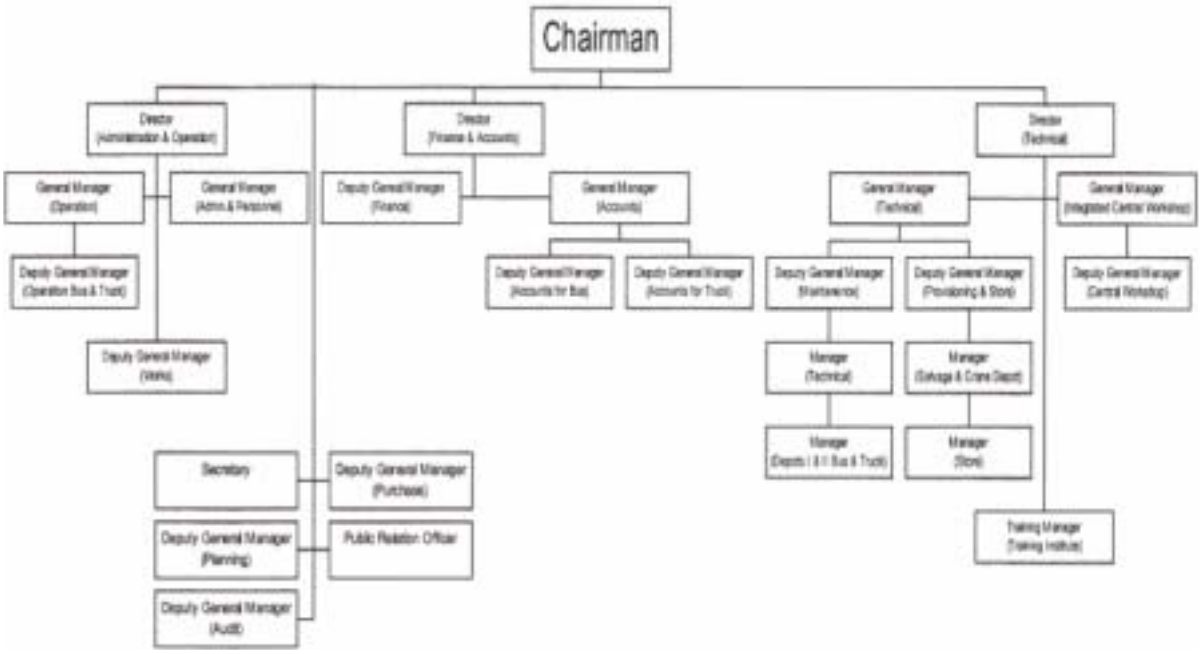
From 1990 to 2004 the number of employees was cut from 4917 to 1688. Additionally there are also people employed on daily basis and personnel in the leased out buses that are employed by other operators.

The organization of BRTC is shown in the organizational chart below.

The organization consists of a Chairman who is the executive officer and three directors, one for administration and operation, one for finance and accounts and one for technical matters. A board of directors manages the company. The Ministries and the Government appoint the board.

The BRTC have 4 depots in Dhaka. The Mirpur depot, see picture below, is dedicated to the Volvo double decker buses. In this depot the people have had special technical training of the Volvo buses.

ORGANIZATIONAL STRUCTURE



An administrative system for reporting vehicle kilometre (vkm) and special reporting per bus has been set up.

The bodies of the 50 Volvo buses were built in the central workshop area called Joydevpur, see picture below, where also special tools and spare parts were stocked. Most of this equipment is still there. In this depot it is possible to start up to build new double decker buses if a positive answer is given to the Government of Bangladesh. The premises are in reasonable good shape. Today the BRTC are using this depot for heavy repair.

3. 4 The Financial Situation of the BRTC

BRTC have since many years a stretched financial situation, even if the situation has become better the last 5 years since they started to lease out their buses for operation. The company has had problems to pay the loans for their infrastructure and vehicles. The pressure on the company will continue from the Government and it is necessary for the BRTC to become profitable and have a positive cash flow to be able to repay its loans.

The table below shows the development of costs and revenue between year 2000 and 2003.

Income, 1000 Taka				**Expenses, 1000 Taka**			
	2000	**2003**	**Change %**		**2000**	**2003**	**Change %**
Operating	205375	549073	267	Maintenance	63896	145882	228
Non-operating	27669	64958	235	Operating costs	86397	248547	288
Repairing	19352	23484	121	Terminals	24130	44408	184
Shop rents	2967	5006	169	Admin & general	24414	41270	169
Total	255363	642521	252	Sub-total	198837	480107	241
				Depr. of buses and trucks	98127	378933	386
				Depr. (excl buses and trucks	9611	13863	144
				Interest on gov´t and foreign loans	52741	154212	292
				Total	**359313**	**1027115**	**286**
				Net loss	**103950**	**384594**	**370**

Source: BRTC, DTCB, working paper 6

Revenues have increased 2,5 times but the total costs have nearly tripled during these three years. It is a *positive* result that operating costs are better in 2003 than they were in 2000. Still the BRTC has to improve the fare ticketing system and the collection of fares in order to increase its revenues.

Even if the BRTC is not a perfect and efficient company it is the only unit having the experience of operating large bus fleets. Therefore this public company can play an important role as a standard setter. The Government will have to support the BRTC in order to increase its management capability and to make it customer oriented.

3. 5 How are the First 50 Buses Taken Care of?

Maintenance and operation

The Volvo-buses were introduced between March 1 and mid September 2002. So far the introduction of Volvo double deckers must be considered as a successful project in terms of production and operation.

The route network is according to the planned system and can be seen on the map below:

The Volvo fleet has up to July 2004 produced 7140 000 vkm. The average availability of the fleet has been 90% although the BRTC operation has been hampered by a number of 'hartals' or political strikes. Approximately 20 full days are lost due to demonstrations.

Availability of 90% must be considered as a high figure well on par with Swedish figures.

The production is reported to have generated 1265 000 official passenger trips per month. The correct number of trips might be higher as there is a leakage and pilfering in the system. The percentage of leakage is very difficult to say but at least 20–30% might be a realistic guess.

Another clear indication of the success of the buses is the fact that the private sector has started to purchase large standard Volvo buses for inter-city operations and is according to the Volvo dealer successful.

It is clear that the maintenance system within BRTC is improving. BRTC Volvo bus depot in Mirpur has improved its performance significantly compared with the old system. An example from the inside of a Volvo double decker bus is shown below

Today the depot is maintaining a system with a complete "history-book" for each vehicle.

The depot keeps a proper record of preventive maintenance and daily service. Preventive maintenance is today done according to what was recommended in the Volvo bus project during second half of year 2002.

The fact is that 49 out of 50 buses are operated full time since introduction and the remaining bus, which was seriously burnt during a political demonstration, will be back in operation beginning of October.

All buses are operated with remarkable small body damages considering the congested environment they operate in.

BRTC to day also keeps a proper record of;

- fuel consumption down to each individual bus.
- tyre consumption
- spare part consumption
- electric material
- oil changes for engine, gearbox, steering, rear axle and coolant.
- accident record
- brake down record
- fitness certificate

The depot is in our opinion over-utilizing the buses. They do not keep more than two buses as spares whereas normal figures would be 8–10% of the fleet as spare vehicles in order to achieve the estimated life span of fifteen year.

Unfortunately the other BRTC depots are not yet of the same standard as the Mirpur depot. If BRTC is given additional 95 Volvo buses at least one more depot must be upgraded to at least the same level as the Mirpur depot. A proposal is that Sida support a construction of a modern bus depot for about 100 buses equipped with tools and other infrastructure.

Productivity

The targets that were originally set for the Volvo double decker bus project suggested 60 000 vkm per bus and year and 720 000 passenger trips per bus and year. The current number compared with these objectives is as follows:

Mode	Objective	Current	Different
Production, vkm per bus and year	60000	64000	+ 4000
Number of passenger trips per year and bus	720000	314800	– 405200

As shown here the number of vehicle kilometre (vkm) is above the targets but the number of passengers is considerably lower than targeted. The reason for this discrepancy might be a combination of two factors: too high target of passenger trips and too low number of current passengers.

The target of passenger trips per single bus trip and day was 67 based on 32 single bus trips per day. Current number of passenger trips per single bus trip is only 43 based on 22 single bus trips per day. Accordingly the cabin factor is 36 percent of the seats instead of 56 percent as was estimated. The estimation of a cabin factor of about 60 percent in 1999 seems to be too high since buses go into the city centre in the mornings and out from the central areas in the afternoons. This means that buses cannot be loaded in both directions. An average cabin factor of 36 percent is rather good but this is not realistic to increase the factor since leakage seems to be high on the buses. The number of passenger trips is calculated with the revenue as a base and not based on the number of actual passengers. Therefore the conclusion of the above table is that the BRTC has done a good job in the operation of the Volvo double decker buses and has a potential to increase the number of paying passengers.

Financial comparison

A comparison is made below between the previous estimations and the actual situation. As can be seen the average speed has been reduced, the cabin factor is much lower than estimated, the vkm production is higher than expected, the availability is higher than expected and the number of seats and capacity in the buses is lower than expected. The conclusion is that the productivity is better than expected but reported ridership is lower and has to be increased or better managed. In order to make it possible for the reader to compare the estimations made in 1999 and the current figures (after two years of operation) following table was made.

Supply parameters	Original calculation	Current calculation	Revenue parameters	Original calculation	Current calculation
Purchase price	7700000	770000	Load factor, of total seat capacity, %	60	36
Seats	150	Average 118	Fare/km	0,5	0,75
Total capacity, passengers	200	168	Fare leakage, %	10	30
Productive vkm/year	61396	64200			
Lifetime, years	15	15	Production parameters		
Insurance, tax, etc	0	0	Average speed, km/hour	15	
Shifts, shifts per day	2	2	Terminal factor, %	10	
Manning, person per shift	3	2,5	Commercial speed, km/hour	14	13

Supply parameters	Original calculation	Current calculation	Revenue parameters	Original calculation	Current calculation
Maintenance per km	4,00	1,02	Service hours per day, hours/day	16	16
Fuel, litres per vkm	0,56	0,61	Days/year	335	335
Tires, cost per km	3,00	2,09	Availability, %	80	90
			Dead vkm, %	5	5

When current parameters were calculated—according to the facts and numbers that we got at the BRTC—the financial result of result of the Volvo bus operations was as follows:

Annual costs and revenues per bus, Thaka	Volvo Bus double decker, estimation 1999	Volvo Bus double decker, current figures
Capital	893 333	900 000
Insurance, tax	0	0
Personnel	324 000	521 800
Maintenance	245 585	65 340
Fuel	441 713	782 360
Tires	184 189	134 300
Other	0	98 460
Cost/year	**2 093 821**	**2 502 260**
Cost/vkm (total)	34,103	38,97
Cost/place-vkm (total)	0,171	0,23
Cost/pass-km	0,298	
Revenue/year	**3 157 527**	**2 434 140**
Revenue/pass-km	0,450	
Profit/pass-km	0,152	
Profit/year	1 063 707	(68 120)

As can be seen the *total* result of the operation of the Volvo double deckers is a small loss of 68 000 Thaka or roughly 9000 SEK but the *operational* result of the buses before depreciation has given a financial surplus last year of just above 800 000 Thaka or roughly 105 000 SEK.

The operational surplus covers 92 percent of the capital cost in spite of the modest cabin factor. Then depreciation and interest costs are not based on the full purchase price of the buses in the table above. The reason for that is the desire to make current calculation comparable with the estimations made 1999.

More paying passengers are required on the buses. In that case the result will be very good since the attitude from the passengers is positive, the fare is low (in average 8 Thaka), the comfort is good and the buses operate with high availability and good comfort.

Another reasons for the low cabin factor is the large distances between stops, increasing and tough competition from the private operators on the same routes and leakage when collecting the fares. A proposal for a next phase is to establish the bus operation within Dhaka as a profit centre either as a separate company or as a division within BRTC.

3. 6 Shift in the Mode of Transport

One of the objectives in the earlier Sida decision document for the financing of the double deckers were defined as follows: "The project shall lead to a shift in mode of transport and in particular pedestrians, woman and travellers by rickshaws will be expected to shift travel by bus". This was supposed to be verified by interviews with bus passengers. The survey, which the BRTC was conditioned to carry out according to the loan agreement, has not been made. No other interviews have been carried out during these two years. In general it can be said that there is a lack of customer sensibility in all parts of the system of transport, motorized as well as non-motorized. The public BRTC is no exception from this. Accordingly, there is a lack of information reflecting the needs and conditions of lower income groups, elderly, children and disabled people. Therefore in order to have some guidance regarding the users points of view we authorized a minor passenger survey October 2004 in Dhaka. During three days spontaneous interviews were made with 50 passengers on the two routes operated by the Volvo double deckers. Amongst other things this showed that the Volvo buses are attractive to the passengers. Despite the fact that there are quit few buses they are well known (today only 50 in a city with about 7000 buses and 12 millions people). There are passengers that always try to travel with the Volvo buses. Women consider that there is more space in them and many prefer to take them. This survey showed that some drivers and controllers stop buses between the stops and board passengers and make them pay twice the price, 20 Thaka. There for the buses have a reputation of having more expensive fares than is the case. Poor passengers and women are not always met with appropriate respect from some BRTC drivers and controllers. In generally it can be said that customer relations within public transport needs to be improved.

The public BRTC is the only transport company providing services of what is called 'women buses'. Mrs Rahina Khatun, whom has taken this up on a leasing contract with the BRTC, manages this service. She organizes the operations of 12 double deckers (Ashok Leyland) on 10 different routes in the city. Her passengers pay between 1–10 Thaka/trip equal to SEK 0,13–1,30. Service is provided during peak hours, from 6 to 10 am and from 3 to 6 pm. Mrs Khatun reported that she often had to operate with buses in bad conditions having brake downs and so on. These buses carry women conductors (in total there are 14 young women working as conductors in this company). Conductresses suffer from harassment from male conductors, from lack of restrooms and toilets and having to spend their recreation time in the busy street. They also have to wait standing in the crowded streets for their next bus to come. In our meeting with the conductresses, October 2004, they reported those low-income women are reluctant to pay their tickets or at least the full price of it. Groups that travel with these special buses are students, industry workers and women of various kinds of professions. A women conductor earns 60 Thaka per day equal to 8 SEK.

The so-called women buses are part of the state commitment to provide service for the public in the area of transport. Another BRTC service is to keep on operating when weather is difficult (flooding ext. heat) and during the days of political unrest the so-called hartals about 20 full days a year.

3. 7 Air Quality

The air quality along the transport corridors has not been measured as was mentioned in the agreement. Anyway the Volvo buses operate with far more effective engines than the older buses. In this perspective they will contribute to a cleaner air. Their main potential, however, is to replace smaller vehicles so that one modern engine is used instead of perhaps 10–20 old engines for the same number of passengers

In industrial countries lead added gasoline driven cars are almost disappearing. This trend will also take place in Dhaka but still lead and sulphur pollution is far too high here. The attempt to use more CNG driven vehicles seems to be correct for a number of reasons. But there is still a need for modern diesel

engines of various sizes running on cleaner diesel like Euro III or Euro IV. Such combined measures are realistic and would help reduce the air pollution. In Europe, Euro 3 was implemented 2000 and Euro 4 will be implemented 2005.

A comparison between Stockholm and Dhaka made in 2000 indicates the following levels of pollution:

Stockholm	**Dhaka**
CO 94 ton	50 000 ton
CH 16 ton	22 000 ton
NOx 11 ton	8 550 ton
Particles 0, 3 ton	3 700 ton

This information is frightening; despite the fact that Dhaka is approximately ten times bigger the degree of motorization is much smaller.

An agreement has been signed between the Ministry of Energy and the Asian Development Bank about financing 300 new CNG buses and development of the infrastructure of tubes and filling stations. In Dhaka there is already around 60 – 70 filling stations and about 100 gas buses in operation.

An introduction of CNG (if massively enforced) can contribute to the reduction of air pollution in Dhaka but it should be noted that Stockholm operates mainly diesel buses of Euro standard and private cars as well as a tube. Evidently, better engines and better fuel in ALL vehicles (not just a few buses) can produce good results.

A comparison of the emissions from a modern diesel bus with clean diesel and CNG is as follows:

Actual emission levels and legal limit

G/kWh	**Volvo, CNG (GH10C)**	**Euro 4, CNG**	**Volvo diesel, Euro 3 (DH12, 340 hk)**
NOx	2,8	3,5	4,7
PM	Less than 0,01	-	0,06
CO	0,02	4,0	0,6
NMHC	0,00	0,55	0,2
CH4	0,40	1,1	-

Source: Volvo, Buses for natural gas and biogas

As shown in the table above there are minor differences between the modern buses operated with clean diesel and natural gas. The diesel being sold in Bangladesh today is not sufficiently clean. Of course this is a problem but according to the Ministry of Energy cleaner diesel could be made available.

Another step to be taken in Dhaka is to ban the motor vehicles from the city centre (Old Dhaka) and only allow high capacity public transport. Other measures to reduce the emissions are to increase the flow of traffic along the main roads by means of constructing separate bus lanes. Such lanes would increase transport efficiency, reduce trip time and reduce vehicle emissions. The most important policy decision, however, is the transition from low capacity public transport to high capacity public transport. This would improve air quality and reduce congestion levels substantially. If, and when, this important step has been taken then the conversion from the extremely clean Euro 3 and 4 engines to CNG propulsion could add further percentage to the environmental effect.

Anyway several measures have been taken to improve air quality in the city. The most important step was to ban the two-stroke auto rickshaws from the central areas of Dhaka. Of course to go for CNG gas driven vehicles and high capacity buses or standard buses with more efficient engines will have positive effects. The opening up of the market for cleaner diesel and to promote this diesel at a lower price—as is done with the CNG gas pricing—is probably an efficient measure. Today the price of ordinary diesel is 20 Thaka per litre and the price of CNG gas 8 Thaka. According to the Ministry of Energy the price of gas will be raised in the future.

3. 8 Demand of Trips

One of the Sida objectives is to "contribute to improved accessibility to public transport for low income (poor) and for women". In Bangladesh this user group is very large since 95 percent of total population subsists on 2 USD/day and approximately 45 percent subsist on less than 1 USD/Day (World Bank 2004).

According to the BRTC web page (Oct. 2004) BUS SERVICE FOR WOMEN is described as follows:

> *"Bus services for the woman plying in different routs in Dhaka City is an unique example of privilege and honour running as a subsidized services for the better half. These services are provided mainly for the school/college students. Women/girls working in different offices and garment factories also. Ladies bus service is welfare oriented in its true sense, because BRTC has to cross subsidize this service from its other profitable routes. But due to lack of buses, many routes can't be covered and due to financial constraints can't be expanded as it should have been. There is a tremendous demand for women bus services from different women organizations. The donor from home and abroad may extend their support to BRTC to uphold and expand these special services for the women.*
>
> **Bus Service for the Blind and the Disabled Person:**
>
> *Blind or disabled persons are allowed to travel BRTC buses without fare. Patronization is required to continue this facility for this unfortunate human being. BRTC with its limited capabilities and capacities is very much willing to offer special services for the same purpose".*

The social aspects are taken into consideration at the top management level and in the rhetorical discourse but on the buses in Dhaka women and girl children are not well seen and fully respected as passengers. Women and poor often suffer from harassment on buses (from drivers, ticket inspectors and other passengers) and are generally discouraged from using buses. Besides, women can wait for long hours before buses stops and let them on. Therefore it is important to actively push for behavioural changes onboard the buses and to improve trip comfort for poor, women, children and disabled. The introduction of five percent reserved seats on the buses for women during the 1980's was an attempt to improve conditions. But this attempt was stopped.

In pace with the increasing demand for public transport the services for women have gradually deteriorated. Women cannot compete with men about the scarce space in private low cost buses on human haulers. Instead women depend on cycle- and auto-rickshaws. In general these means of transport are more costly, less unsafe, unregulated and pose great risk of accidents. To put it briefly, women are forced to use insecure, unreliable, congested and unsafe means of transport. 70 percent of the poor are usually women and this is probably also the case in Dhaka as well. Accordingly, the extreme poor women have difficulties to pay even the low fares that should be guaranteed on public buses as was reported in our meeting with the conductresses on the 3rd of October in Dhaka.

The changing role of women in household, education and production (such as employees in garment factories) indicate that women increase their need for transport facilities. Women in Dhaka strive hard

to be economic active but they earn less money than economic active males. At the same time they have to pay more for transport than males do. The reason for this is that women look fore securer ways to travel than on buses crowded by men. Women cannot defend themselves from physical touching and grosser misbehaviour. They feel uneasy and insecure in the streets and in most public transport facilities (rickshaws, minor buses and so on). Women do not always have access to these buses since they do not let them on. In general Dhaka bus passengers suffer from bad access to public transport (especially outside of peak hours and main arteries). Therefore walking is still common for poor and women. Besides, walking is often both dangerous and difficult. In general women walk longer distances than men. When income rises men are likely to switch to motorized forms of transport as soon as possible meanwhile, women are understood to maintain walking and saving their money. Clearly, in Dhaka where 50 percent of the population is poor/extreme poor there is an important loss of access to social capital for the deprived persons (constraints to access work, education and necessary social integration). In Dhaka improved public transport would be very useful to improve the living conditions for a vast majority of the inhabitants.

In this perspective a few things can be stated, namely, that the Volvo double deckers provide safer and more comfortable trip than most other private buses do. Women are reported to enjoy the modern quality buses. In our survey special comments were made about the comfortable seats and that women enjoy the space on these buses. This is seen as important since they do not like to be pushed and touched by men as is frequent on other buses. The space for women and the comfort on the Volvo buses were reported to be good. The space issue is also one of the reasons why private operators do not let women on board because according to the operators women request three times as much space as men and for this reason they are not attractive as passengers. Besides they are perceived as slow in getting on and of buses and while moving inside of the bus, up and down the stairs. In Bangladesh women wear saris and other traditional dresses together with shawls that need to be lifted and taken care of while walking.

The Volvo double deckers are more reliable than most other buses and do not brakes down as the other Ashok Leyland double decker and other buses. Other comments focused on the cleanness of the Volvo buses compared to the large majority of the fleet which is "predominantly old, extremely dilapidated and often literally falling apart, hot, dirty noisy, uncomfortable and unsafe. Buses and bus users as a consequence have a poor image" (Berger 2004: 57).

Finally, another survey made by an NGO and finished in 1997 was found. This stressed the serious lack of access in the city for the poor and women. In this perspective, the BRTC policy described above is stands out as positive for women passengers.

4. Present Planning for Urban Transport

4. 1 Organizational Framework

Three ministries are involved in issues of transport and managing traffic, namely; 1. the Ministry of Communications, 2. Ministry of Local Government, Rural Development and Co-operatives manages the traffic of Dhaka, and, 3. Ministry of Energy.

The Ministry of Communication is responsible to the Minister for all aspects concerning the operation of roads and railways in Bangladesh. The departments under the Ministry are:

Dhaka Transport Coordination Board (DTCB) – responsible for coordination of the planning and implemen-

tation of transport schemes in Dhaka City and its environs.

The Bangladesh Road Transport Corporation (BRTC) – operates and fleet of trucks and buses particularly on routes of social importance.

The Bangladesh Road Transport Authority (BRTA) – responsible for road transport issues on all roads in Bangladesh such as the licensing of bus routes.

The Roads and Highways Department (RHD) – responsible for construction and maintenance of roads and bridges on the main road network of Bangladesh.[3]

The Dhaka Transport Coordination Board could possible play a crucial role in the up-grading of transport conditions in Dhaka. The aims and objectives of the DTCB are: a) Formulation of Transport Planning and Policy on an integrated and safe traffic and transportation system and to make necessary arrangements to achieve this purpose; b) To coordinate the traffic and transportation infrastructure development plan with the overall development policy and strategy of Dhaka as envisaged in the structure plan. c) To formulate The Strategic Traffic and Transport plan of Dhaka and coordinate inter agency cooperation.

A number of transport planning projects are carried out within the DTCB, such as The Strategic Transport Plan for Dhaka, presented in August 2004, Ministry of Communications.

The Dhaka City Corporation is the prime department, which is carrying out various duties catering to the civic needs of the people. The executive power is exercised by the Mayor assisted by the Chief Executive Officer, who in turn, is assisted by the Secretary, the Heads of Departments and Zonal Executive Officers. There are about 12,200 employees (http://www.dhakacity.org/).

4. 2 Sustainable Transport

So far no thorough and efficient organization reform or transport master plan has been made but the various project under the apex of the Dhaka Transport Coordination Board has outlined different ways to improve traffic and transport conditions. One step has been to identify the following measure:

- To reduce air pollution,
- To reduce the journey time,
- Identification of sustainable feeder routes for non-motorised transport,
- Technology transfer and training,
- To assist the sustainable mass transit facilities,
- Awareness campaign for non-motorised transport users and pedestrians and also training for rickshaw pullers,
- To introduce well design rickshaws where human energy is less,
- To find out sustainable mass transit for the poor, women, school children and disabled people as well as for all city dwellers,
- To ensure accessibility of the city dwellers.

[3] *Jamuna Multi Purpose Bridge Authority (JMBA)* – responsible for the planning construction, operation and maintenance of the Jamuna bridge and other proposed bridges which exceed 1,500 metres in length.

Bangladesh Railways (BR) – responsible for all aspects of railway development and operation and maintenance in Bangladesh.

The Ministry of Communications is mainly concerned with policy issues whilst the executing departments are responsible for day to day operations.

It is a difficult task to improve traffic condition in today's Dhaka. One of the projects aiming at reducing traffic congestions has been financed by The World Bank, namely, The Dhaka Urban Traffic Project, the DUTP. It is coordinated through the DTCB and will be finished this year. Among the many interventions being proposed is the Bus Rapid Transit (BRT) from the outskirts to the central city.
Other proposals consists of the plans: a) to build flyovers for the main road crossings as to create a ring road system in the city, b) relocate the rickshaws from the main roads and turn them into feeder system of the high capacity public transport, c) structure the pedestrian system in a better way and, d) phase out the diesel or petroleum driven vehicles or convert them to CNG driven vehicles. Another point of view is that the various improvements need to be integrated. The various modes of public transport also need to be having a higher degree of integration. The capacity of for instances articulated buses could not be fully explored until there are separate bus lanes, rapid bus streets or BRT system.
Today's mix of traffic (bicycle rickshaws, auto rickshaws, pedestrian and cars) impedes on the efficiency of, for instance, other high capacity buses such as the articulated gas buses.

So far there are no separate bus lanes as was mentioned in the Sida agreement. The Minister of Communication clearly stated that it would be taken care of to diminish the increased congestions and the fact that the average speed reduces every year.

4. 3 Environmental Aspects: Diesel Contra CNG

In Europe and in Sweden tests of CNG in practical public transport operation has been going on for many years. Contacts with Gothenburg Tramways, who currently operate 91 CNG buses, show a positive experience. After a few years of initial and minor problems the experience today is that maintenance cost is somewhat higher but the pricing of the gas compensate for this. The purchase price of a bus is 25—30 percent higher than for a normal standard bus of the same size. One of the initial problems that had been taken care of was the filling procedure. In case the gas bus fleet is huge and needs to be filled every night there has to be refilling ramps with good compressor capacity. Otherwise filling takes to much time. With good capacity it takes around 5—6 hours to refill one bus. When gas buses break down they need to be picked up by a breakdown truck since is difficult to refill a bus along the road. In Gothenburg, Sweden no burning incidents have been reported for the past 10 years. The gas consumption is about the same as for a diesel bus or 5—5, 5 m3 per 10 km but the CNG buses are not optimised for start and stop along the road. Problems might also arise when the temperature is extremely hot therefore it is necessary to have good cooling capacity of the engines.

It should be observed, however, that neither Gothenburg nor any other European big city is even remotely close to replacing all diesel buses with gas buses, although the technology has been available for decades. To expect Dhaka to become the first city in the world to succeed in replacing ALL motor vehicles (buses, trucks, minibuses and microbuses) with CNG over a ten year period is a bold vision.
It is, in our view, more realistic to combine the attempts to introduce CNG propulsion on a broader scale with attempts to improve public transport by introducing bigger and better buses.

5. Analysis and Discussion

5. 1 The Relevancy of Swedish Assistance to Dhaka

The choice of Dhaka for cooperation in the urban transport sector is highly relevant since Dhaka is a multi-problematic city in need of firm and prompt adjustments towards increased transport efficiency and sustainable transport. There are several activities going on in this direction but to achieve changes it seems as continued cooperation and technical support is required. We believe that cooperation in urban transport could be useful also in other cities in Bangladesh.

The Dhaka metropolitan area is facing magnificent challenges. Deteriorating traffic conditions have prompted several popular public campaigns to find urgent solutions. Moreover, the expected addition of another seven million people over the next 15 years will make conditions even more difficult unless urgent measures are taken. The severely polluted air consists of high levels of toxic emissions such as lead and the others. Dhaka has one of the highest population densities, roughly 800 people per square kilometre. Besides there is a considerable amount of what is called floating population maybe as much as 30 percent of total population. The economy is forecasted to expand by 3–4 percent in coming years, which means that the majority of people will continue to subsist on limited income. Income per capita is estimated to 375 USD/2004 (Utrikespolitiska Inst). The public sector and public transport system need to respond to this development in order to improve infrastructure conditions in general and transport facilities in particular. Accordingly public buses should continue to have low fares and the demand of transport facilities is forecasted to be huge in the coming years. In general, public institutions are seen as having huge difficulties to control and guide this development.

5. 2 Ways to Improve Sustainable Transport

Today the introduction of CNG propulsion has begun but it is of course too early to tell what the impact will be in the long run. A sustainable transport system is important for environmental reasons but must address other aspects such as social development (improved access in the city for all user groups, integration of various modes of travelling e t c). As stated in the "National Land Transport Policy Unofficial English Version" dated April 2004 from the Ministry of Communication the Government will prepare a transport plan for Dhaka and strengthen the implementation process. The planned measures will include:

- Formulation of long term plans for a modern public transport system.
- Introduction of greater number of planned bus routes.
- Use of high quality vehicles in the public transport system and improvement of quality of services.
- Creation of new opportunities for participation of private sector bus operators.
- Giving priority to bus services.
- Reduction of pollution from all kinds of vehicles.
- Control of on road parking and unauthorised use of roads.
- Taking up of extensive work programme for improvement of the traffic system.
- Use of modern technology for traffic control.
- Creation of better facilities for pedestrians.

- Evaluation of public transport systems.
- Greater safety systems for all, especially accident prone/vulnerable road users.
- Environmental protection management, and
- Improved land use planning.

There are several bodies working on the planning of these measures such as the Dhaka Transport Co-ordination Board, the DTCB and Dhaka City Corporation, the DCC. The DTCB has described the way towards sustainable transport as presented in the above 4. 2.

5. 3 Conclusions and Recommendations

The evaluation leads to the conclusion that we propose continued support including the approval of the additional 95 buses as requested from the Government of Bangladesh in 2003. The need for high capacity buses is very huge in Dhaka and Bangladesh. A positive answer to the request should be guided by support mentioned in the recommendations below. This option is also in line with the continued ambitions in line with sustainable transport.

There are two possible types of high-capacity buses; high ones (double-deckers) or long ones (articulated). The capacity of articulated buses can be exploited when there are separate lanes, rapid bus streets or full BRT systems. Today's mix of traffic (bicycle rickshaws, auto rickshaws, pedestrian and cars) impedes on the efficiency of gas driven high capacity buses, which only exist, in the form of articulated buses. The separate bus lanes mentioned in the loan agreement 1999 are not yet built but the Minister of Communication has said in an official statement that this will be taken care of.
If necessary, Sida could support the implementation of this. This would increase speed, increase the number of trips per day, reduce emissions and increase profitability. We are also supportive of the goal to increase the number of high capacity-buses and to increase the number of large operators.
The BRTC is today one of the largest operators and the only one operating high-capacity buses.

5.3.1 Technical support

The Joydevpur, where the first 50 buses were put together, could be used to assembly the additional 95. Some of the special tools and machines being brought in 2001 are still there. Today the buildings are used for repairing double deckers (Ashok Leyland and Volvo) but in case there are new buses coming this repair shop could be turned into an assembly hall again. It should not take to much time. In that way the project also contributes to some industrial know how that can be useful in other industrial areas.

The lessons made regarding transfer of know how, related to the former delivery was that maintenance and management of buses in the depot, has been successful. If more buses are to be delivered we recommend the establishment of a modern model depot of a high standard. We also suggest that the depot should be somewhere along the route possibly down town where the BRTC already have a huge depot. This model depot should be sufficiently equipped as to show the private sector how a bus fleet of 100 buses should be maintained. The Ministry of Communication stated officially that the public BRTC should be a standard setter for the private sector. We support this idea and we also suggest that the BRTC bus division in Dhaka should be turned into a profit centre on its own.

5.3.2 Support to the BRTC

As was noticed while visiting the BRTC the company would benefit from support regarding management of public bus company, for instance, in the area of business planning and action plans in short and long terms. At least an analysis could be done about the need for support regarding these issues. See also the Summary below.

5.3.3 Customer relations

Regarding the outspoken need in Dhaka to consider the transport conditions of low income (poor), women and disabled a few things are concluded. Today women do not have the same access to transport as men and their unfavourable conditions have been neglected. In order to make it possible for women and poor to be economic active it is crucial to improve and further develop existing transport opportunities. To improve transport facilities for this very extensive group of the population is also to increase women's productivity and promoting social equity. This is a truly cross cutting issue and the following recommendations are made:

- Increase attention on women's contribution to societal development by means of increasing number of buses dedicated to women.
- To continue and expand the leasing out of women buses.
- Increase the number of routes, buses, frequency and turn into a daylong service.
- Re-introduce reserved seats for physically vulnerable passengers.
- Reduced tickets fares for ext. vulnerable women groups (garment workers, some students for instance).
- Training and employment of female conductresses and drivers.
- Facilities to rest and access to toilets for conductresses at the depots.
- The construction of passengers' sheds in the streets.

In this case Sida could provide support regarding: customer surveys, house hold surveys (for those that are marginalized from public transport today) policy making to reduce poverty, and policies to improve social equity by means of increasing physical access for all user groups. We have also identified additional needs such as finding ways to change behaviour on buses (to reduce misbehaviour amongst drivers and conductors). This indicates that general attitudes need to be worked on. Perhaps in the same way as one of the Sida sponsored NGO's in Dhaka already do but focus on another area.

5.3.4 Sustainable transport

Sustainable transport includes economic, environmental and social aspects. In Dhaka the authorities have studied several transport projects towards sustainable transport. Various plans have been outlined during the last five years (many of them infrastructure-oriented, such as flyovers, BRT-systems, highway ring road and so on). Today time has come to prioritise between different proposals, to decide and to construct. Besides the specific hardware deliveries that have been requested by the Government, Sida could also provide support in transport planning, possibly to draw up a transport master plan.
Our understanding is that continued support and follow up is crucial to make the interventions successful both socially and technically but also management wise.

We consider this kind of cooperation relevant in Dhaka and it could also be adapted to other cities. Today there are networks of cities working on sustainable transport. The different cities can support and inspire each others regarding various kinds of initiative to improve urban transport and to increase sustainability in transport.

5.3.5 Summary

We recommend Sida to consider following proposals (together with the more detailed recommendations above).

In order to maximize the use of buses the assistance to the BRTC should include:

- Technical training in maintenance of buses.
- Management of construction of bus bodies.

- Management training focusing on business economics.
- Advisory to set up a modern bus depot.
- Training of women drivers.
- Infrastructure improvements along the Volvo routes

In order to further develop the cooperation with Dhaka a broader view should be taken, including for example assistance in:

- Overall regional planning of transportation and infrastructure.
- Traffic management including priority measures for public transport.
- Planning and development of BRT systems and other mass transit options.
- How to improve customer relations and increase respect for bus passengers.
- How to make passenger surveys and market researches.
- Establishment of a public transport authority.
- Route network planning and optimisation.
- Monitoring of private bus operators.

Appendix 1. Terms of Reference

1 Background

In response to a request to the Government of Sweden, a concessionary credit for procurement of fifty double-decker buses of Volvo manaufacture was granted in the year 2000. The project entailed in addition to the delivery of bus chassis and and bodywork, also a package of technical and operational assistance provided by Volvo. All buses are in operation since mid 2002 on the streets of Dhaka, on two separate routes that have been designated for the fifty buses. The technical assistance has been completed in full. The client and recipient of the buses is the BRTC (Bangladesh Road Transport Corporation). BRTC is supposed to have the facilities and a functional organisation for the operation of double-deck buses. The organisational set up has recently been subject to a management reform programme. The bulk of Volvo's technical assistance was provided during the six months delivery and body-building and the initial operational phase after which the intention was that the operation should be sustainable.

As part of the loan agreement , the Government of Bangladesh comitted itself to promote constructive competition between bus operators and to allow sufficient tariffs to be set for a sustainable operation. Further it agreed to ensure proper traffic conditions for large buses and to introduce a monitoring system where the availability and performance of the 'Swedish' bus fleet would be reported and followed up.

The BRTC bus project was expected to fulfil several objectives:

- Improved air quality. By replacing some of the many small motorised public transport vehicles, the project in itself is expected to have a direct impact on air quality and on service levels.
- Demonstration of the potential of high-capacity bus operations in Dhaka. The project is expected to stimulate an expansion of the bus transport industry which is considered desirable and necessary.
- Facilitate the establishment of an effcient maintenance system for the public bus fleet in Dhaka.
- Contribute to improved accessability to public transport for low income (poor) people and for women.
- Development of know-how for complex public transport situations.The project has the potential to bring additional value to Sida and other international agencies in the form of a useful case experience. Many cities in developing countries are faced with a similar dilemma as Dhaka. Although it is often agreed that high-capacity public transport is desirable from environmental and road efficiency points of view, the prevailing institutional framework and other conditions often tend to promote a development towards fragmented systems based on very small vehicles. Few countries have managed to reverse this trend and too little is known of the mechanisms that might make it possible.

At an early stage Sida decided to undertake on a long term basis, follow up and evaluation of the bus project. For several reasons the planned long term follow up and evaluation programme was never initiated but replaced with a one time follow up visit.

2 Purpose and Scope of the Evaluation

The rapid growth of Dhaka and consequent traffic congestion not only calls for large investments in infrastructure and equipment. It also calls for investment in human resource development and structural and organisational reforms. Donors, including Sida will continue to play an important role with regards to public tranport in Dhaka, in Bangladesh and in the region as a whole. An evaluation of the

BRTC bus project with some simultaneous review of the overall transport situation and current public transport initiatives in Dhaka at this point, is therefore expected to provide a valuable basis for future Sida involvement in the sector in the region. The findings from this study would be valuable not only for Sida, other doners, the WB, the ADB but certianly also for BRTC, responsible ministries and departments in Dhaka and Bangladesh.

3 The Assignment (issues to be covered in the evaluation)

Three main purposes of the evaluation, attributed to different levels, all with reference to the programme objectives have been identified:

- to assess the success of the bus project itself - are the buses being well used, both from a passenger and from a management point of view
- to assess the impact of the bus project on the development of the whole urban transport situation in Dhaka – in what way does it have a catalytic effect if any?
- to draw conclusions that can be useful for Sida in the appraisal of future projects in similar situations – universal lessons?

Specific tasks with regards to the bus project implementation:

- to review and describe the start of the project including bus chassis deliveries, body-building, preparations of depot and for service and maintenance (this would be done during the first visit)
- to review statistical data provided by the operator
- to propose, if necessary, improved methods for data collection and processing
- to provide estimations of the real performance of the bus fleet in terms of production and passenger carrying (see 2.4 below)
- assess the realism in assumed technical and economical life of the bus fleet and comparison to credit repayment period,
- to report problems and shortcomings – if any – related to the technical specification, spare parts supply, maintenance and operation of the buses

Specific Tasks with regards to transport policy and general development :

- to review the general development of the urban transport situation and related environmental problems as well as the impact of the bus project on the transport situation and the environment,
- to assess whether a continued investment in diesel powered buses is appropriate considering that current plans for introduction of CPG as fule for public tranport buses
- to assess whether Sweden should rather provide assistance to investment in CPG powered bus fleets
- to assess whether large buses are necessary in order to address the urban transport problem of Dhaka? Are double-deckers a good solution?
- to assess whether investment in 'clean' diesel-powered double-decker buses is a cost-effective means to improve air quality in Dhaka, lokked at both in a short and in a longer term perspective.
- to review the structure of the public transport sector in terms of ownership (public/private), organisation and technology, and to describe development trends. Are there any regulations or institutional arrangements which work against the development of adequate public transport services in Dhaka?

If so, how should the regulatory and institutional framework be changed? Which are the important constraints on achieving reform? Are there any regulations or institutional arrangements which work against the development of adequate public transport services in Dhaka? If so, how should the regulatory and institutional framework be changed? Which are the important constraints on achieving reform? Are there any regulations or institutional arrangements which work against the development of adequate public transport services in Dhaka? If so, how should the regulatory and institutional framework be changed? Which are the important constraints on achieving reform?

- to assess whether regulations or institutional arrangements support the development of adequate public transport services in Dhaka? If not how could the regulatory and institutional framework be changed? Which are the important constraints on achieving reform?
- to determine whether the project has had any effect of distorted competition and thereby hampered the growth of a private bus industry or if the project has instead stimulated the private sector to operate buses. The changed mode of operandi, i.e. contrary to its earlier introduced strategy which was the leasing out of its buses to private operators, the double-decker buses are being operated by BRTC in-house. Is this new development appropriate?
- to assess whether and to what extent the Swedish bus project has had an impact on the overall development of the urban transport sector, with particular emphasis on accessability to public transport for low income (poor) people and for women
- to describe the effects on and the reaction of the passengers and the general public, if possible with relation to special groups
- to review the financing and economical situation of the operation including a discussion on fare levels and affordability
- to draw relevant conclusions regarding the applicability of this type of project in other developing cities.

4 Methodology, Evaluation Team and Time Schedule

Method of Work

The Consultant will rely on available literature (see e.g. Appendix 1 to the Sida Decision memorandum[4])[5], as well as interviews in Dhaka. The Consultant is expected to interview staff of BRTC, MOC, MOF, Dhaka Metropolitan Transport Coordination Board, other operators, and other authorities involved in the regulation of public transport in Dhaka. The Consultant will also visit the offices of the World Bank and ADB in Dhaka. Contacts with World Bank desk officers in Washington, D.C. and ADB desk officers in Manila will have to be made by way of email or phone. The Consultant may of course identify other sources as well.

Consulting Team

The Consultant is expected to mobilise a Team comprising three-four senior experts, each with at least 15 years of professional experience. One would be a transport economist, also with some competence in environmental economics. The second should have a background in public transport, with substantial experience of public transport operations in large cities in developing countries. The third member would have technical expertise in buses used in public transport.

Time Schedule and Arrangements

[4] The Consultant will be provided with copies of the relevant Sida reports.

[5] In addition, reference should be made to the document *Transport and Infrastructure, Developing a Policy Agenda for Bangladesh: Civil Society's Task Force Reports 2001.*

The two first-mentioned experts would be engaged for a period of 5 weeks. About 2 weeks would be spent in Dhaka, and about as much to complete the assignment in the home office of the Consultant. One week will be devoted to initial preparations, including a briefing at the Sida HQ in Stockholm before the field work, as well as a debriefing in Stockholm after submission of the draft final report. The field visit would have to commence within one month of contract signing, and a draft final report would be submitted 5 weeks thereafter. After receipt of comments, the Consultant would have to submit the final version of the report within 2 weeks.

The third (and fourth) – the bus – expert would be required for about 1 week, and would not necessarily have to participate in the visits to Stockholm or the mission to Dhaka.

The delegation should report to the Embassy at the outset of the mission in order to update on the latest developments and inform about the schedule. The Embassy may require that a debriefing meeting is held at the Embassy before the departure of the mission.

The Swedish Embassy in Dhaka will have limited capacity only to assist with meeting arrangements etc.. The Consultant will have to provide himself for all practical arrangements and should rely on the assistance from the Embassy only for crucial matters and where the presence of the Embassy could be of particular value.

5 Reporting

The evaluation report shall be written in English and should not exceed 40 pages, excluding annexes. Format and outline of the report shall follow the guidelines in *Sida Evaluation Report – a Standardized Format* (see Annex 1). The draft report shall be submitted to Sida electronically and in 5 hardcopies (air-/surface mailed or delivered) no later than 30 June 2004. Within 3 weeks after receiving Sida's comments on the draft report, a final version shall be submitted to Sida, again electronically and in 5 hardcopies. The evaluation report must be presented in a way that enables publication without further editing. Subject to decision by Sida, the report will be published in the series *Sida Evaluations.*

The evaluation assignment includes the completion of *Sida Evaluations Data Work Sheet* (Annex 2), including an *Evaluation Abstract* (final section, G) as defined and required by DAC. The completed Data Worksheet shall be submitted to Sida along with the final version of the report. Failing a completed Data Worksheet, the report cannot be processed.

Appendix 2. Meetings in Dhaka

Swedish Embassy: The Ambassador Börje Mattsson, two Sida employees Ms Ulrika Hesslind Sjöström and Ms Rehana Kahn.

The Asian Development Bank, ADB, Dhaka: Mr Stefan Ekelund Project Implementation Specialist and Mr Hans G Carlsson, Head Portfolio Management Unit, Mr Shamsuddin Ahmed, Head Energy.

The Bangladesh Road Transport Corporation, the BRTC: Mr Jaimur Alam Khondaker, Chairman, Mr Dr.S. M. Salehuddin, Director Technical, Mr Syed Enamul Hague, Director Finance & Accounts.

Three bus depot managers and several staff persons at the depots at Joarshara, Mirpur, Motijheel and Joydevpur that is also the old assembly work shop used in 2000/2002.

The Dhaka Transport Coo-ordination Board, the DTCB: Executive Director, Mr Quamrul Islam Siddique and ten persons.

A women non-governmental organization Nari Udduq Kendra: Ms Mashuda Kahtun Shefali, Director, a business entrepreneur Ms Rehana Kahtun and seventeen conductresses.

Swedish Motor Limited: Mr Talebur Rahman, Managing Director and Mr Tareq Rahman, Marketing Manager.

The Louis Berger Group working for the World Bank in Dhaka, Mr Marvin Overway and Mr David H. Jarrett.

Ministry of Communication: Minister of Communication, Barrister Nazmul Huda.

Ministry of Energy: the Minister of Energy, State Minister A K M Mosharraf Hossain.

Ministry of Finance, Economic Relations Divisions: Ms Nargis Islam, Joint Chief, Ms Hafiza Khatun, Deputy Chief, and Mr Swapan Kumar Ghosh, Sr. Assistant Chief.

STEPS for Development, a Sida sponsored non-governmental organization dedicated to help establish gender equality e t c. Organizing workshops addressing the Transport Owners Ass. and their employees in 14 districts to initiate behavioural and attitudinal change towards passengers, especially women. STEPS also address the issue of child workers in the transport sector where their health is being risked.

Appendix 3. List of Literature

The Asian Development Bank, Report and Recommendations of the President to the Board of Directors for the Dhaka Clean Fuel Project, October 2002

Bangladesh State of the Environment, 2001, The United Nations Environmental Programme.

Beslut om insatstöd Sida 5 maj 1999, Stockholm

Bruzelius Nils: Double/decker buses for BRTC in Dhaka Report on a monitoring mission Final Report May 2003

Contrans AB and Swedish Development Advisers AB Sida Double/decker Buses for Bangladesh Road Transport Corporation Appraisal of a Project. February 1999.

Fjellstrom Karl, 2004, Sustainable transport in Dhaka and other Asian Cities. Paper prepared as part of the Transport for Development Seminar Series. Transport and Urban Development Seminar, 24 March 2004, Sheraton Hotel, Dhaka, Bangladesh.

Fjellstrom, Karl, "Public Transport and Mass Rapid Transit in Dhaka" The Louis Berger Group, Inc. The Strategic Transport Plan for Dhaka, Draft 31 August 2004, Ministry of Communications. Working Paper no 6. The Louis Berger Group, Inc, and Bangladesh Consultants Ltd. Reviewer David Jarrett.

Gallager Rob, 1992, The Rickshaws of Bangladesh University Press Limited, Dhaka, Bangladesh.

Information material from Gothenburg Tramways

Mashuda Kahtun Shefali, 1997, Gender Dimensions in Transport in Dhaka Metropolitan Area A study prepared for Dhaka Urban Transport Project World Bank, GOB

Meddelande om beslut om U/Kredit och U/kreditgaranti Sida 21 Maj 1999.

Ministry of Communications, National Land Transport Policy, Unofficial English Version April 2004

Passenger survey made in Dhaka 3/6 October on Volvo Double Decker buses. Four questions were answered by 50 passengers on various routes. Survey design Marie Thynell and interviews were on buses by Gazi Mathmad Hassan, Dhaka.

Presentation Strategic Transport Plan for Dhaka Metropolitan Area. A roundtable discussion on Urban Transport Policy.

Request for Swedish concessionary credit for procurement of 95 Double Decker Buses by Bangladesh Road Transport Corporation (BRTC).

Volvo, Information Brochure, Buses for Natural gas and Biogas

Appendix 4.
Press Release from the Minister of Communication

From New Nation Online Edition

City News
95 more Volvo double-deckers for BRTC
By Staff Reporter
Oct 4, 2004, 13:11

Communications Minister Barrister Nazmul Huda has said that 95 more Volvo double-decker buses are being procured for the state-run Bangladesh Road Transport Corporation (BRTC).Barrister Nazmul Huda told this after holding a meeting with a high-powered delegation of the Swedish International Development Agency (Sida), led by Swedish Ambassador to Bangladesh Borje Mattsson, at his ministry yesterday.

The Communications Minister said that 50 Volvo double-decker buses, procured during the reign of present government through the financial support of Sida have already achieved the satisfaction of the commuters of Dhaka city. "These buses have created a unique example in passenger services by ensuring easier, secure and comfortable journey for the commuters," he said. In this regard, he also mentioned that the government had planned to construct separate bus lanes in the capital for smooth running of the World Bank funded CNG-run modern buses and Volvo buses on different roads of the city.

Although data show that even among the very poor there has been significant income growth and improved nutrition, Bangladesh's poverty rate remains high. With nearly half of its 135 million people living below the poverty line, Bangladesh still has the highest incidence of poverty in South Asia and the third highest number of poor people living in a single country after India and China. The challenges are magnified by a population density of roughly 800 people per square kilometre—one of the highest in the world.

Appendix 5. Abbreviations

ADB	The Asian Development Bank
BRTC	Bangladesh Road Transport Corporation
BRT	Bus Rapid Transit
BRTA	Bangladesh Road Transport Authority
CNG	compressed natural gas
DCC	Dhaka City Corporation
DoE	Department of Environment, Bangladesh
DUTP	Dhaka Urban Transport Project
DTCB	Dhaka Transport Coordination Board
ERD	Economic Relation Division, Ministry of Finance
NUK	Nari Uddug Kendra, Centre for Women's Initiatives
Sida	Swedish International Development Cooperation Agency
UNEP	The United Nations Environmental Programme
WB	The World Bank
WHO	The World Health Organization

Appendix 6. Evaluation Team

The evaluation team has consisted of four persons

- Lennart Olsson, MBA, Solvicom AB
- Marie Thynell, Ph D, Göteborg University
- Tore Larsson, Former MD Länstrafiken Örebro
- Hans Örn, ME, Contrans AB

Lennart Olsson and Marie Thynell are responsible for the evaluation in Dhaka and the report.
They have been assisted by Tore Larsson who contributed with technical know how and Hans Örn who provided information about the beginning of the Dhaka intervention and overall experience.
They contributed with four workdays each.

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Department for Democracy and Social Development

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SWEDISH INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
SE-105 25 Stockholm, Sweden
Tel: +46 (0)8-698 50 00. Fax: +46 (0)8-20 88 64
E-mail: sida@sida.se. Homepage: http://www.sida.se