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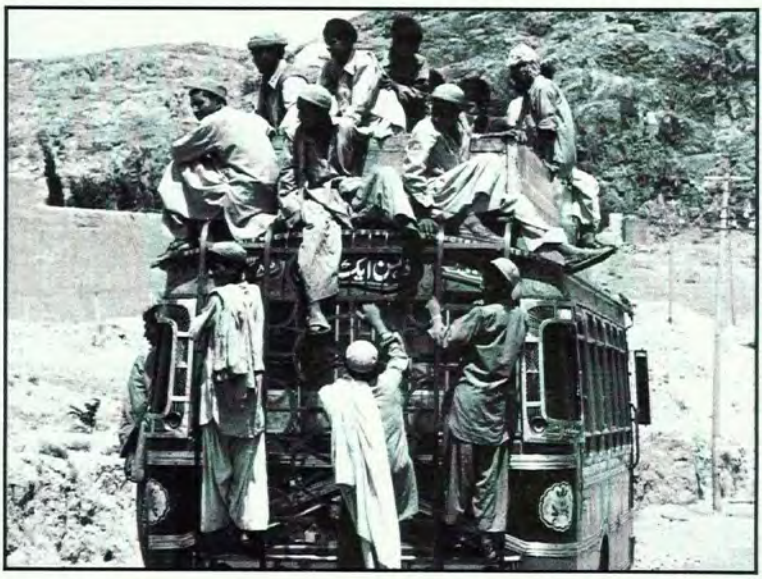
PUBLIC TRANSPORT IN LAHORE

An Evaluation of a Swedish Development Assistance Project.



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SIDA

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PUBLIC TRANSPORT IN LAHORE
an evaluation of a Swedish development
assistant project

This report is the outcome of an evaluation mission during the spring of 1985. The evaluation team consisted of Messrs. Börje Wallberg, SIDA, Stockholm, Bernt Nielsen, SWECO, Gothenburg, Rolf Gillebo, O.J. Dahl A/S, Oslo and Roar Skarböe, NRF, Oslo, subcontracted by O.J. Dahl A/S.

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0. SUMMARY

0.1 BACKGROUND

In 1979 Pakistan was granted SEK 150 million in untied commodity aid. The Pakistan Government chose to use these funds for the reconstruction of the urban transport system of Lahore which had fallen into a deplorable state during the 1970s. A new company, Punjab Urban Transport Corporation, PUTC, was founded with the federal government of Pakistan as its sole owner.

In accordance with Pakistani purchasing regulations, PUTC made direct contact with three large bus manufactures, among them Volvo.

After direct negotiations between PUTC and Volvo, the former decided to purchase 649 bus chassis as well as Volvo's consultancy services in traffic planning, maintenance procedures and training. This soft ware part of the project was estimated at SEK 15 million. In November 1978 an agreement was signed between PUTC and Volvo International Development Corporation (VIDC) in which VIDC was to assist PUTC in a five-year project with the intention of transforming PUTC into a model urban transport organization. After the first part of the project had been completed in 1984, the project was extended for another two years, financed by BITS, Swedish Agency for International Technical and Economic Cooperation, to the amount of SEK 3 million. Further assistance amounting to SEK 2 million has been granted by BITS for the period July 1985-December 1986.

0.2 BUSES ON THE ROAD

In many respects the project evaluated must be considered as very successful though there are indications that progress is reaching its peak and there is a danger that a decline will occur unless action is taken to improve organizational structures, maintenance policies and staff development.

0.21 Out of 649 chassis delivered, 399 buses have now been fitted with locally made bodies and the buses are now in operation. The remaining 250 buses will be completed in 1986, a delay of about one and a half years. The bus bodies are made with their interior framework in steel, which is a new construction method in Pakistan where wooden frameworks predominate. Today 99 % of all components for the bodies are locally made. Some components have to be imported.

0.22 When the Volvo buses were brought into operation PUTC could transfer a number of old buses to Islamabad and Rawalpindi, which improved the urban transport situation in those cities.

0.23 There are a number of figures to illustrate improvements in Lahore's urban transport system. Since the introduction of the first Volvo buses in 1980 the number of passengers has increased by 65 %, passenger kilometers by 65 %, revenue by 70 % but costs only by 38 % and PUTC's deficit by 4 %. Figures for 1984/85, however indicate that this increase in efficiency has levelled out and even decreased somewhat during the last few months before the evaluation. One important reason for this has been a change in the fare structure where fares for short distance travels were considerably increased. This has resulted in a decrease of some 40 000 passengers per day or about 6 %. This decrease is however only expected to be temporary as competing owners of minibuses will certainly also have to raise their fares.

In Lahore PUTC has increased its share of local transport from 18 % in 1979 to 40 %. The reliability of bus transport has increased. In 1980 the ratio between scheduled buses and buses on the road was 40 %. Now it is 90 %.

0.24 Productivity figures from other cities in the Third World show that, from a very problematic state of affairs in 1979, PUTC's urban transport system has now reached a level where it can compare with other urban transport companies.

0.25 Yet transport demands in Lahore cannot by far be met with the present fleet of buses. Estimates show that a full urban transport system would require around 1 400 buses.

0.3 IMPACTS FOR INHABITANTS

In 1980 some 800 000 inhabitants lived beyond reasonable walking distance to public transport, i.e. 500 m. With the existing network this number has decreased to some 500 000. Road conditions in most of Lahore's now unserved areas are not suitable for bus traffic. On the other hand, the opening of new bus routes has forced many of the private minibus owners to move their activities to the less accessible areas which in turn has also improved the urban transport situation. Fares vary according to distance from PKR 1 to PKR 3. A worker earns PKR 700 (minimum) to PKR 1 500 a month. According to city planners in Lahore everybody who needs public transport in Lahore can afford it. Thus the introduction of the new Volvo-buses and new routes have meant a considerable improvement in mobility for the inhabitants of Lahore.

0.4 PLANNING PROCESS

0.41 Though transport planning had been done before in Lahore, Volvo introduced a new, more comprehensive concept as part of a total traffic system. Volvo also introduced new methods and trained Pakistani counterparts who now hold responsible posts in PUTC and the Ministry of Transport. Volvo's proposals on Lahore's route network have been accepted though sometimes with partial alterations. Ten entirely new routes proposed by Volvo have been very successful with a great number of passengers.

This planning will however have to be followed up within 5 to 7 years otherwise present results will become obsolete.

0.42 An important task for Volvo was to improve traffic conditions for buses in Lahore. Therefore efforts were made to analyze the bottlenecks of the route network and to find solutions to the problems. A number of changes have now been made in the street network of Lahore which have considerably improved the traffic situation.

0.43 Volvo has documented its policies and methods in a "Traffic operation manual" which is unique and is now being used both by PUTC and Lahore Planning Authority. The cooperation with Volvo has strengthened the local planners in their work.

0.44 Though the planning process has been a very successful part of the project, the number of qualified Pakistani traffic planners remains dangerously low. This can have a negative impact on the project in the long run.

0.5 TECHNICAL CONDITIONS

0.51 The choice of Volvo's bus-model B57 seems to be appropriate. It is an uncomplicated bus which has proven to be durable under difficult driving conditions. The team would in principle not recommend motors with turbo chargers because of possible maintenance problems. However, Volvo do not deliver bus motors without turbos any more.

0.52 A substantial undercapacity in the production of bodies has led to a situation where chassis have been stored from 11 to 48 months before being fitted with bodies and put into operation. By that time Volvo's guarantee had elapsed, although it was extended to 24 months. Maintenance on stored chassis has not been satisfactory which will probably have negative effects on the life span of the buses.

0.53 The standard of maintenance for the chassis in operation is relatively high but the time between overhauls of some technical components is too low according to European standards. Engines for example are expected to last for only about 150 000 km compared to 350-600 000 km in Europe. There are many possible reasons for this: poor driving, insufficient maintenance and the use of poor quality lubricants. The quality of tyres, hoses and flaps is low. Most breakdowns on the road are caused by punctures. Due to frequent changes of tyres and poor equipment for fastening wheel nuts, wheels are not fastened strongly enough.

0.54 Extensive body damage is beginning to appear on some of the 3-4 year old buses, but no efforts have been made to repair this damage.

0.55 In different manuals Volvo has described how maintenance should be organized and carried out but it has been a major problem to get a positive response to the proposals made. Emphasis is laid more on repairs than on maintenance. Training of mechanics and controllers has not been sufficient.

0.56 Bus depots are very different in lay out, working conditions and equipment. In some depots equipment cannot be used because mechanics have not been trained to use it.

0.57 The variety of spare parts is too small and their supply is uneven. Lack of money is the major problem, but budgets and order routines should also be organized better to enable PUTC to have a steady flow of necessary spare parts. Local production of some spare parts is possible but Volvo has a limited market. Quality control of local spare parts must be of the same level as for imported. A system should be built up for rapid replacement of those components which must be changed often.

0.58 The building of bus bodies is of varying standard but not up to European levels. Bodies are well designed for their purpose but rust protection is inadequate and this will affect their life span.

No decision has been taken on what shall happen to PUTC's body factory at Multan Road after the 250 remaining chassis have been fitted with their bodies. The need for more buses is great but so far there are no funds for any new buses.

0.6 TRAINING

In consideration of the size of the project and the multitude of new techniques which were to be applied, training was given high priority already in the initial phase. A Central Transport Training Institute was established in January 1978. Up to March 1985 CTTI has conducted a total of 484 courses with 5 421 participants.

0.61 Priority has been given to the training of drivers, conductors and mechanics which corresponds well with PUTC's most urgent need: to get the Volvo buses on the road with trained staff.

0.62 Methods of training and training materials are of good standard. Volvo's impact on materials, course construction and the pedagogical approach has been important and positive.

0.63 Instructors were trained thoroughly for periods of up to six months before they started teaching. Today, however, CTTI has an acute manpower problem which is a threat to the present training programmes and a definite obstacle to any further development. The question of recruitment of instructors and incentives to training staff should be solved without delay.

0.64 Premises and equipment are of low standard but have been reasonable for the basic training performed so far. For a further development of training the question of premises and equipment should be looked into more thoroughly.

0.65 A major problem with PUTC/CTTI training is that its training programmes are not in any way based on an analysis of the organization's present needs. Nor are they based on any analysis of the participants' professional levels. Selection of course participants is sometimes made on negative grounds - those who are dispensable are selected. This all reflects a complete lack of a staff development policy which can cause the best training to lose its impact.

0.66 CTTI's position within PUTC is ambiguous. On one hand the Institute can decide almost singlehanded on training policies, programmes and the contents of training courses. On the other hand all sorts of financial and red tape constraints hamper a smooth running of the Institute. It should have been the other way round.

0.67 Since the main objective for CTTI has been to train staff for the new Volvo buses it has cooperated more closely with Volvo than with PUTC headquarters. This has not been altogether advantageous for the Institute's position within the main organization.

0.68 In the future CTTI should lay more emphasis on the analysis of training needs and on the selection of course participants. Courses should be followed up with a close look at the participants' performance after training. Training Officers should be selected at each depot to pursue central training activities and to act as CTTI contacts at the local level.

CTTI has the potential to develop into an efficient tool for staff development but special consideration should be given to how this could be done. Today there are too many problems that will impede such a development.

0.7 SIDA'S ROLE IN THE PROJECT

0.71 In this project SIDA has played a somewhat passive role. The assistance was given as untied commodity aid to the Government of Pakistan at a time when Swedish aid to the country was being discontinued. The government in its turn put the whole amount at the disposal of PUTC which could now start direct negotiations with Volvo and two other bus manufacturers. Since it was untied commodity aid SIDA could neither force PUTC to buy Swedish products nor support Volvo. Volvo worked through a local agent. The agent's commission has naturally considerably decreased the total amount at the disposal of PUTC.

0.72 When the project was decided upon at the end of the seventies no proper analysis was made of the recipient organization's capacity to receive and make good use of development funds. This was quite in line with the rules for commodity aid at that time but unfortunately it has had negative effects on the project, since most of the problems mentioned in this report are related to weaknesses in PUTC's organization. Today all commodity aid projects shall be analyzed in the same way as any other projetcs before they are approved. Therefore this can be seen as criticism of past policies. Volvo, as a direct consultant to PUTC, has had few possibilities to enforce proposed changes. Their position has solely been that of a consultant. Their proposals on the organization of the busfleet, of financial management, planning maintenance and training have not been very successful. At times this has caused great frustration. On the whole Volvo's technical assistance staff have been praised for their technical knowledge and personal behaviour.

0.73 Considering the vast interventions in many different fields of public transport and the money involved the length of the project was originally too short. The decision to extend Volvo's contract for another two years with finance from the Swedish development organization BITS was well-founded. PUTC will probably need further technical assistance for a number

of years to be able to build up a well-functioning maintenance system and a staff development programme which could function as a positive PUTC management tool.

The large investment involved, the results so far achieved, and the risks that can be anticipated merit a major effort by all parties concerned.

0.74 The production of spare parts for Volvos and other makes of buses could be a possible field for future industrial cooperation between Swedish and Pakistani industrialists.

0.75 The project can certainly serve as a model for similar projects in the Third World. In fact any future support to the transport sector should be built up in the same integrated way as the Lahore project.

Though it is an urban transport project it can with some modifications also serve as a model for transport projects in rural areas. During the evaluation period the team also came across the idea that a medium distance transport project - up to 100 kms around the City - could be an effective way to counterbalance the present pressure of immigration into Lahore.

1. INTRODUCTION

1.1 BACKGROUND

Between 1975/76 and 1982/83 a total amount of SEK 225 million was allocated by Sweden for development cooperation with Pakistan.

Part of this amount - approximately SEK 150 million in commodity aid - was allocated by the Government of Pakistan to support the development of the Punjab Urban Transport Corporation (PUTC). PUTC was established in February 1977 with the task of providing improved urban public transport services to the inhabitants of Lahore and Rawalpindi/ Islamabad.

The role and objectives of PUTC as set out in the Memorandum of Articles of Association are, as regards the services and the character of services to be provided, the following:

- To provide an efficient, adequate, economical and properly coordinated system of road transport services in Lahore, Rawalpindi and the Islamabad Federal Capital and in any other extended areas in the Province of Punjab

- To provide any ancillary services

- To provide bus stands and such amenities and facilities for passengers and other persons making use of the services as may appear requisite or expedient

- To provide, manufacture, purchase, maintain and repair rolling stock, appliances, plant, equipment or any other things required for the purpose of any of the activities of the Company

- To provide facilities for training, education and research for the purpose of advancing the skills of its employees

- To provide for its employees living accommodation, places for rest and recreation and other amenities to the extent the Company finds it feasible and expedient

- To do all other acts which, in the opinion of the Company, are necessary to facilitate the proper performance and furtherance of the functions of the Company.

The above, the statutory role and objectives, constitute both a statement of intent and a directive for the benefit of the PUTC Management. During the course of the Project, the following medium term performance objectives and administration were added:

- To carry reliably, without overloading, the largest number of passengers with a given number of buses along the major routes

- To provide, in the long-term perspective, the greatest proportion of on-road buses and to maximize their life-span

- To maximize efficiency throughout the Corporation and thus, to as great an extent as possible, satisfy the legitimate demands of the respective interested parties, i.e., the public, the government and the employees.

After its establishment in 1977, the PUTC inherited a fleet of 600 old buses and 4 depots from the Punjab Road Transport Board (PRTB). The buses as well as the depot areas were in bad condition. PUTC was provided with resources by the Government of Pakistan to carry out a comprehensive development programme. This programme included the procurement of new buses, modernization and expansion of the technical facilities, and the engagement of specialist consultants to assist the PUTC in its development efforts.

An agreement was signed in November 1978 directly between PUTC and Volvo International Development Corporation (VIDC) in which VIDC was to assist PUTC in a five-year project with the intention of transforming the PUTC into a model urban transport organization and of establishing a model that could be followed by other cities and provinces in the country.

Following an initial study of the transport situation in Lahore, the Model Urban Transport System Project was established in September 1979.

The project, jointly drawn up between PUTC and VIDC, was divided into three phases:

- The planning phase
- The development phase
- The rationalization phase

During the course of the five-year assistance period, the first two phases of the project were completed. Some progress was also made on the activities which were to be completed during the third phase. VIDC's input of specialist manpower to the project has been 334 man-months during the five-year period.

Since the Swedish financing of the project has been considerable, and since the project is of general interest for the improvement of public transport systems in densely populated areas in developing countries, SIDA decided that an evaluation should be carried out.

The evaluation was carried out in the normal way with studies of existing reports, meetings and interviews with Volvo staff, PUTC management and trade unions, visits to bus depots and body building factories and last, but not least, extensive travel by bus in Lahore, Islamabad and Karachi.

The evaluation team consisted of the following members:

Name	Organization	Main field of evaluation
Börje Wallberg	SIDA	Training Organization
Bernt Nielsen	SWECO Göteborg	Planning process, Impacts for inhabitants
Rolf Gillebo	O.J. Dahl A/S Oslo	Traffic operation
Roar Skarböe	NRF, Oslo	Workshops, Maintenance, Spare parts, Body Building

Mr Roar Skarböe is in this mission subcontracted by O.J. Dahl A/S.

Mr Lennart Söderstam, SIDA, Industry Division, has acted as contact man.

2. PUTC'S SOCIAL AND CULTURAL ENVIRONMENT

In this report a basically favourable assessment has been made of Volvo's and PUTC's performance and of their use of Swedish commodity aid. Bus services in Lahore have improved considerably. A larger proportion of the buses are on the road than in many other developing countries. Buses seem to be better maintained than in Karachi. PUTC training is of a remarkably high standard. But since there is a number of questions which hamper further development and even endanger activities at present levels, the team has found it important to give a description of the social and cultural environment of PUTC. This has to be considered when planning for the future.

2.1 MANY REORGANIZATIONS AND CHANGES IN MANAGEMENT

PUTC (Punjab Urban Transport Corporation) was broken out of the much larger Punjab Road Transport Board in 1977 since urban public transport facilities in Lahore, Islamabad and Rawalpindi had fallen into a state of permanent crisis with worn-out buses and unreliable service. For PRTB long-range bus services were profitable, whereas urban transport ran at a loss and received low priority. The decision to solve this problem, by forming a separate company for urban transport, was made by the Federal Government, which became the owner of the company. The development of PUTC was given high priority. In 1982, however, the ownership of PUTC was transferred from the Federal Government to the local government in Punjab. Federal Government subsidies had to be replaced by local government funds which were much more difficult to obtain. This had a negative effect on the prospects of PUTC to develop an efficient urban transport system based on long-term planning, preventive maintenance and staff development.

Then, in 1984, plans were made to merge PUTC with PRTB again. One reason for this was that PRTB had changed the structure of its bus fleet. It now leased more vehicles from private owners. This, in turn,

led to a problem of overstaffing which affected some 3 000 employees. Rules relating to job security are very strict in Pakistan and trade unions are powerful. Consequently about 3 000 PRTB employees were receiving salaries without doing any work.

At the time of the team's visit to Pakistan the merger had been decided upon in principle but had not taken place. Some people expressed doubt as to whether this was a wise action to take and whether it would really be possible to merge the two organizations again, considering their past history.

The planned merger has, however, resulted in an employment stop at PUTC and a deficit of some 2 000 staff. The reason why surplus PRTC staff could not be simply taken over by PUTC was explained as a difference in employment conditions and social security regulations. Higher level officers seem to be less disturbed by these difficulties than staff at lower levels. The risk that PRTB once again would let PUTC's urban transport deteriorate were met by the explanation that the two companies would remain as separate wings but under the same top management.

The many changes in PUTC's organization and top management have had a negative effect on the efficiency of the corporation during the project period. Consequently PUTC has not had the strength to make necessary organisatorial changes during the period of the project. Volvo's many proposals on changes in the organisation of maintenance, planning and training have been kept pending. This has caused frustration within the Volvo team and as time passes with more buses on the road present shortcomings will become more acute.

2.2 TOP MANAGEMENT WITH VERY DIFFERENT BACKGROUNDS

An important factor which influences an organization's structure and management is the composition of its top management staff. In Pakistan the Armed Forces play an important role in all public sectors and PUTC is no exception from this rule.

Other top managers are government officers who have been seconded to PUTC on official orders. There are few urban transport specialists at PUTC headquarters. The majority of them are to be found at regional and depot levels.

The planned merger with PRTB has also cast a shadow over the future of PUTC management. It has therefore been difficult to build up a professional team spirit with common goals and management procedures.

2.3 SMALL TOP MANAGEMENT, CENTRALIZED DECISION MAKING ON A DAY-TO DAY BASIS

PUTC top management is small, some ten persons in a total staff of 7 000 employees. Yet much of the daily decision making is centralized to headquarters. This compels the directors of PUTC to concentrate more on PUTC's daily problems than on questions of policy, quality, preventive maintenance, staff development etc. The lack of regular finance and a regular provision of spare parts also make any long-term plannig unrealistic. PUTC management has consequently no choice but to solve problems as they arise. These will naturally become more frequent as the present fleet of Volvo buses gets older and more run-down.

Volvo has obviously not been able to convince the PUTC top management of the needs for strengthening the organization according to the "Organization Manual", for example Maintenance Planning Cell and Traffic Planning Cell, with sufficient personnel.

2.4 "MAINTENANCE IN ARREARS", NO FUNDS FOR NEW BUSES

With inadequate and irregular funds to purchase necessary spare parts, there is a risk that the Volvo buses will become run-down faster than normal which will force PUTC to carry out expensive "maintenance in

arrears". As is the case in almost all urban transport systems in the world, PUTC is running at a loss. It is therefore possible that sufficient funds will not be available for additional purchases or a renewal of the bus fleet unless new development funds can be found. Consequently there is a risk that, towards the end of the life span of the present Volvo buses, the situation will deteriorate again and become similar to what it was in 1977 when PUTC was established.

2.5 STRONG TRADE UNIONS

Another factor which influences the management of Lahore's urban transport system is the trade unions. They are considered by management to be both forceful and belligerant. According to all high level persons interviewed, it is practically impossible to terminate the employment of any member of staff for reasons of improper behaviour or illegal practices.

2.6 MISAPPROPRIATION OF FARES AND OTHER MALPRACTICES

It has been estimated that about 45 % of total passenger fares are not being delivered to PUTC. One reason for this is the fact that passengers in overcrowded buses avoid paying. Most of the loss of revenue, however, is due to the fact that fares go directly into the conductors' pockets without tickets being handed over to passengers. The team has experienced how some passengers, mostly women, payed their fares without getting a ticket in return. These illegal fares are then shared with drivers and inspectors who are the ones that should prevent such malpractices. The system has been well established for many years and it is now very difficult to get rid of it. If somebody should get caught, the risk of dismissal is slight. The present chairman of PUTC Trade Union, a conductor, was recently dismissed in a case that had to go all the way to High Court. The trade union claims that the dismissal was made on political grounds. It is not unlikely that the dismissed conductor's trade union position played a role in the decisiveness of PUTC management to pursue the case.

On the other hand bus-drivers and conductors live an insecure life. Public buses are prime targets in cases of unrest and they experience daily problems with the general order in their buses. Students, who are abundant in Lahore, sometimes enter the women's section in the front of the bus and harass female passengers. Drivers and conductors who try to stop this risk being beaten. Authorities are remarkably weak when it comes to putting an end to injustice. One day during the team's stay in Lahore bus-crews went on strike and surrounded PUTC head-quarter with their buses demanding that action being taken to curb violence against drivers and conductors.

There are many other irregularities that impede the proper management of PUTC. Mechanics dare not use special tools for fear of theft.

Spare parts disappear and have to be repurchased in the open market again. However, it must be emphasized here that since Volvo buses are only run by PUTC this problem is much smaller than it would have been with a more common make of bus.

On the whole corruption is spread all over the society. Politicians and newspapers give daily accounts as to how it should be fought but in practice the system is so well developed that it is difficult to withstand. The borderline between rewards for good service and corrupt behaviour seems to be fragile.

In the long run this all affects PUTC's prospects of running an efficient bus service for the inhabitants of the cities of Lahore, Islamabad and Rawalpindi.

When considering all these negative factors the team cannot but praise the efforts made and results so far achieved - but with a serious premonition about the durability and future development of the urban transport system.

3. FINDINGS

3.1 PLANNING PROCESS

3.1.0 Background for this section

This section deals with questions relating to the planning process, both with the Volvo team and with PUTC and LDA. It is based on interviews with planning and operational members of staff, both in Volvo and in PUTC and LDA. In addition, it is based on reports and notes received from these sources.

3.1.1 Transport planning had taken place before the Volvo team came to Lahore - for example, the Land Use and Traffic Plan, financed by the World Bank, carried out by Halcrow, Fox and Ass. during the last half of the 1970's. This study included some status reports on public transport, such as travelling time and rate of on-road buses, but did not propose any bus network. The study has continued during the 80's.

3.1.2 The Volvo Planning Team took a global view of public transport as part of the total traffic system. This is of great necessity in a town with so many modes of public and private transport available. This method had not been used before in Lahore.

3.1.3 A successful transport planning process requires proper information about land use, census data, traffic demand, road network, road and intersection capacity, existing bus network, congestion consequences for bus performance, etc. Such studies were undertaken, and obviously the background data information for further analysis was of a high and professional level. The weakest point seems to be the traffic demand matrix, which is mainly based on 0,5 % sample of household interviews. However, it seems to be of acceptable quality.

The data collection has given PUTC and LDA a unique and useful data base for future use.

3.1.4 The route network generation was done using Volvo's traffic analysis package, which is based on a sophisticated use of computer methods. The computer output has been checked manually. Obviously the result has been adequate. The proposed network has until now been implemented in the following way:

- 13 routes are exactly the same as before the Volvo study, but proposed by Volvo
- 10 routes are new and exactly as proposed by Volvo
- 22 routes are partly changed, compared to the Volvo proposal

According to the Director Operation, the network proposed by Volvo has been very useful in establishing the new routes. For example, the 10 routes mentioned above have all been successful, with a great number of passengers.

3.1.5 The cooperation between the different planners - PUTC, LDA and Volvo - has been successful. According to the planners in PUTC and LDA, the Volvo team has improved local methods in a remarkable way. The systematic planning scheme - introduced by Volvo - exists in the minds of the local planners, as well as in manuals.

3.1.6 The take-over by the local planning unit in PUTC has worked well. The transfer of one planner from the Volvo team to the PUTC planning cell has been of great value. Another local Volvo team member is now employed by the Federal Government, and has thus brought knowledge of this field into Pakistan's central administration.

3.1.7 Computer methods

It can be discussed whether advanced computer methods should be used in planning in developing countries. The use of models for traffic estimation, traffic distribution and traffic assignment, which have been developed in western urban areas may also be a matter for discussion. However, for the vast amount of data required for a comprehensive route analysis, computer aid is of vital importance.

It is true that the model used here was developed for western cities, but the underlying theories are valid for all forms of public transport. The most important factor is the calibration of the model, which was carried out correctly in relation to locally observated data.

A very realistic example of computer assistance, which has been used in Lahore, is computing the optimal depot for each route to minimize the dead kilometres.

3.1.8 Further use of computer methods

Is PUTC forced to use the Volvo program package in the future,and will they thereby be in the hands of Volvo? The answer is "No". The analysis, carried out by the Volvo team, was comprehensive and most of the results will last for a long period. However, it is recommended that data survey and network analyses are carried out again within 5-7 years, at least those concerning passenger counts, traffic performances in some corridors and estimation of passenger load and route efficiency on the proposed network. The use of computer methods should, even in these cases, be of advantage. But it is up to PUTC to take the decision whether to use Volvo or other consultants or provide themselves in the future with their own experience and tools for computer aid. Both PUTC and LDA have expressed their satisfaction with the Volvo methods and they have not mentioned any wish to change consultant.

3.1.9 Traffic engineering

Good bus performance requires a reasonable traffic environment. The traffic conditions for bus traffic were bad in 1980, and one very important task for the Volvo team was to improve these conditions. Therefore, efforts were made to analyze the bottle-necks of the route network, and to find solutions to the problems. This was the "traffic engineering" part of the project, and comprised primarily design for terminals, intersections and bus stands. For example, the Railway Station Area, the roundabout policy and the demand for physical dividers (medians) in large streets can be mentioned as partly implemented and sucessful ingredients.

In the "Traffic Operation Manual" there is a chapter called "Traffic Engineering for Bus Traffic", which is unique in Lahore, and is used by both LDA and PUTC. Some of the ideas for bus priority (separated lanes, traffic sign priority etc) seem to be too unrealistic, when compared to the present traffic situation. However, to prevent a future collapse of bus traffic, it will perhaps be necessary to implement such improvements. Some of the proposed standards were initially too "western" but after feed-back from local planners they have worked well.

According to the Traffic Planning Wing in LDA, the traffic engineering part of the project has been useful and advantageous. The cooperation between Swedish and local planners has strengthened the self-confidence of the Lahore planners.

3.1.10 Future situation

Population growth in Lahore is almost 4 % per year, which means that the population will double in 20 years. Almost all the new residential areas are located in the southernmost area of Lahore. This will lead to an increasing demand for public transport, with a growth rate of much more than 4 %, say 6 % per annum.

The number of private cars in Lahore is (in 1985) about 28 000, and is increasing by aproximately 10 % per year. Private cars can only absorb the growing transport demand to a very small extent, and will instead create greater traffic congestion in the streets, which will mean worse conditions for the buses.

3.1.11 Future traffic plans

If we take the previous paragraph into consideration, it is of great importance to know something about the actual plans for improving the traffic situation in Lahore.

Five years ago, a traffic plan including 83 different schemes was proposed as a World Bank Project. The total cost was estimated at 200 MPKR. Until now, only 8 small schemes have been implemented.

Today, there are 3 different plans for implementing traffic engineering schemes:

- 4 schemes, 3.5 MPKR (locally financed)
- 12 schemes, 37 MPKR (locally financed)
- A great number of schemes, 1200 MPKR (financed by the Government and World Bank)

If we compare these plans with the plan from 1980, and the rate of implementation, the outlook is not too optimistic. However, according to LDA traffic planners, as the World Bank has allocated funds for the project, there are good chances that almost 50 % of the schemes will be implemented within "a number of years". And, in particular, many of the smaller schemes have a very high benefit ratio for the bus traffic.

It is of greatest importance that traffic engineering improvements for bus traffic continue, at least as rapidly as at present. Otherwise, the increasing traffic demand and the increasing number of private cars will cause a breakdown for bus traffic.

3.2.3 Transport demand and supply

Today, 399 Volvos, 50 Fiats and 40 Isuzus are in operation. It is estimated that the buses as a (total) average are loaded to about 60 % of their capacity. The excessive overloading of recent years has been reduced.

There is an obvious need for far more buses to cover the existing demand. Population growth (including people moving in from the countryside) is about 4 % per year. New housing areas are being built further from the city centre, which means that the increase in transport needs is even greater.

Even when the 250 new buses currently under construction are put into operation, about 25 % of Lahore will have no adequate bus service at all. This is partly due to the fact that the streets in certain areas of the town are unsuitable for buses. LDA is working on this.

3.2.4 Operations control, bus breakdown

There is no centralized traffic control centre. At this stage, when supply is far less than demand, the advantages of more or less advanced traffic control measures do not seem to be as great as in the western world. The main economical point is to keep as many buses as possible running in order to obtain revenue. However, setting up a traffic control centre could be considered in connection with an improved communication system.

The number of breakdowns on the road seems unnecessarily high. At least 25-35 breakdowns per day is equivalent to 6-8 % of all buses dispatched.

Better preventive maintenance should reduce this considerably. More than half of the breakdowns are due to tyres and tubes. This is far too high.

As the number of breakdowns on the road is high, about 30 per day, and as the time between breakdown and arrival in depot seems to be long, improvements should be made to the communication system.

Four suggestions have been forwarded within PUTC to solve this problem:

a) Install radio systems between depots and a limited number of inspectors to call the assistance of breakdown trucks

b) Have one breakdown truck drive along the main bus roads continuously

c) Create a small city center repair lot for the rapid repair of minor defects

d) Mended tubes must not be used.

It is strongly recommended that such measures are carried out as rapidly as possible.

3.2.5 Traffic personnel

The number of traffic personnel, drivers and conductors per bus seems reasonable. There has been a ban on recruitment due to the intended merger of PRTB and PUTC. This has given rise to problems (see 2.1, 2.2 and 2.3 above).

Drivers, conductors and workshop personnel for the remainder of the buses to be delivered have not yet been hired (about 1 000 drivers, 1 000 conductors and 450 workshop people). PRTB has a great surplus of employees as they have changed their policy of running mainly their own buses to contracting out services to private operators during the last few years. Laying off employees is illegal in Pakistan. To be able to use surplus PRTB staff in PUTC is one of the main reasons for the proposed merger. Unfortunately, the time consuming decision making process creates severe problems for PUTC.

There is nothing to say about the general rules for working hours. The discipline of drivers could be improved as regards time keeping on the routes.

Drivers are trained at CTTI. This education should be strengthened to improve driving and bus handling practices (reduced need for maintenance).

3.2.6 Fare system

The fare system was changed on 1985-03-15 into basically a three zone system, PKR 1,-(to approximately 8 km), PKR 2,-(to approximately 15 km) and PKR 2,50. Previously, there was a more graduated stage fare system, with a greater spread between the lowest (PKR 0,50) and highest fares. The change was made mainly for social reasons to make journeys for low income passengers living in outer areas relatively cheaper and to make conductors' work easier (reduce fare evasion).

The new system has overlapping zones to make fares as "fair" as possible for all. PUTC has the freedom to modify details in the system without bureaucratic interference.

Until now, the high initial fare has resulted in a loss of about 40 000 passengers per day, i.e. about 6 %. These passengers now use minibuses or walk. The minibuses have not yet adjusted their fares. It is expected that minibus fares will soon have to be increased. The introduction of a new zone of PKR 1,50 is being contemplated to meet competition. However, as supply is far less than demand, it is not negative that short-distance passengers are lost to make room for some more long-distance passengers.

As a result of a decision of the Federal Government students only pay PKR 0,25. No special subsidies are given to PUTC to cover the loss. If the government find there are special reasons to give reduced fares to groups of passengers, the government should also, in principle, reimburse the transport undertaking for direct losses incurred.

Low student fares give the conductors additional problems as it is tempting for other young people to demand student fares.

The introduction of monthly passes for students is being considered. The team highly recommend this, as proper identification of students should then be possible and the conductors' work should be easier. The introduction of such passes should be accompanied by the abolition of single PKR 0,25 student tickets.

3.2.7 Fare evasion and revenue leakage

One of the big PUTC problems of today is fare evasion and fare money leakage. The total loss due to these is estimated as equivalent to the income from about 45 % of the total number of passengers. A portion of this is partly due to passengers avoiding to pay, and partly due to overcrowding. Most of it seems, however, to be due to conductors who, in different ways, avoid paying all the fare money to the cashiers at the depots. There is reason to believe that part of this money is paid to drivers and others in the PUTC system.

The sums mentioned above are considerable, and would have had a big effect on the PUTC accounts if they could be fully or even partly recovered. Punjab government subsidies could be substantially reduced. This could probably also lead to easier admission to investment funds.

The reasons for the development of this system are complicated.

It is obviously not only a question of devising better technical and organizational systems. The problems will also have to be considered on the basis of their historical background and on how the Pakistani society functions generally. The abrupt introduction of stricter discipline could have serious negative side effects.

The general introduction of passes as contemplated would also undoubtedly yield positive effects, as the cash accounting of a few dedicated booking officers should be easier to control than today's system.

A better and more strict account settlement system for conductors should be considered.

Within PUTC there are now plans to hire out the running of buses to the drivers and conductors in such a way that effective running is encouraged and that a certain amount of income is guaranteed for PUTC. We strongly recommend that such plans should be tried out. If a good system can be found, it will probably be the most suitable solution to the leakage problem.

The financial leakage problem is serious. If SIDA grants had been given under a bilateral agreement it should have been taken into consideration before the grants were given. These problems have an obvious bearing upon the basic question of how to organize public transport in different Third World countries.

3.2.8 Traffic conditions. Punctuality

Although much has been achieved during the last years, punctuality and regularity are not yet satisfactory. In addition to traffic conditions, which is the main obstacle, drivers' time-keeping discipline also could be improved.

As to traffic priority schemes, much remains to be done. An implementation of the planned schemes must be given highest priority. The profit is undoubtedly given. New plans must be brought forward. More specialized measures such as segregated bus lanes and traffic-light priority schemes should be of interest in the future.

As more buses are put into operation and more passengers are attracted, a reduction in the growth of the number of other vehicles should occur. It is to be hoped that the horse drawn tongas will eventually disappear from Lahore streets as they consume much road space. It must, however, be remembered that the increase in car ownership in Lahore is great and will obviously make traffic congestion worse in the years to come.

3.2.9 Administrative capacity

The main problem seems to be that only two persons within PUTC have the knowledge to implement new routes and make route changes based on surveys etc. It is really amazing that they can manage to do their work properly. This personnel base must be extended. PRTB is said to have people who could learn the techniques, but the merger case is still not decided.

3.2.10 Conclusions. Traffic operations

- Supply is far from meeting demand.

- Route network planning procedures and the Traffic Operation Manual are good.

- Network implementation is functioning well.

- Fare evasion and leakage are great problems. New organizational forms should be tried out (hiring out the running of buses), and stricter cash and ticket handling procedures should be implemented. This demands a much more stable and strong administration than exists today.

- Punctuality and regularity are unsatisfactory. More traffic priority schemes must be implemented. Drivers' time-keeping discipline must be improved. 80 buses in a special pool to cover student running would also improve the situation.

- The breakdown rate is too high. Better maintenance should improve this considerably. Better procedures and equipment to bring the buses in for repair should be implemented.

- Only very few persons within PUTC know the appropriate planning techniques. The departments concerned must be strengthened by qualified personnel who are given the necessary training.

3.3 PRODUCTIVITY FIGURES

3.3.1 PUTC developments

Account figures covering all aspects of PUTC's activities are available for the financial years 1977/78-1982/83. 1980/81-1982/83 are covered by very detailed figures. For 1983/84 complete cost and income figures are not available. Annual reports have not been prepared for the last few years. We were also able to study annual reports for PUTC/PRTB's predecessor Lahore Omnibus Service for the years 1956-58.

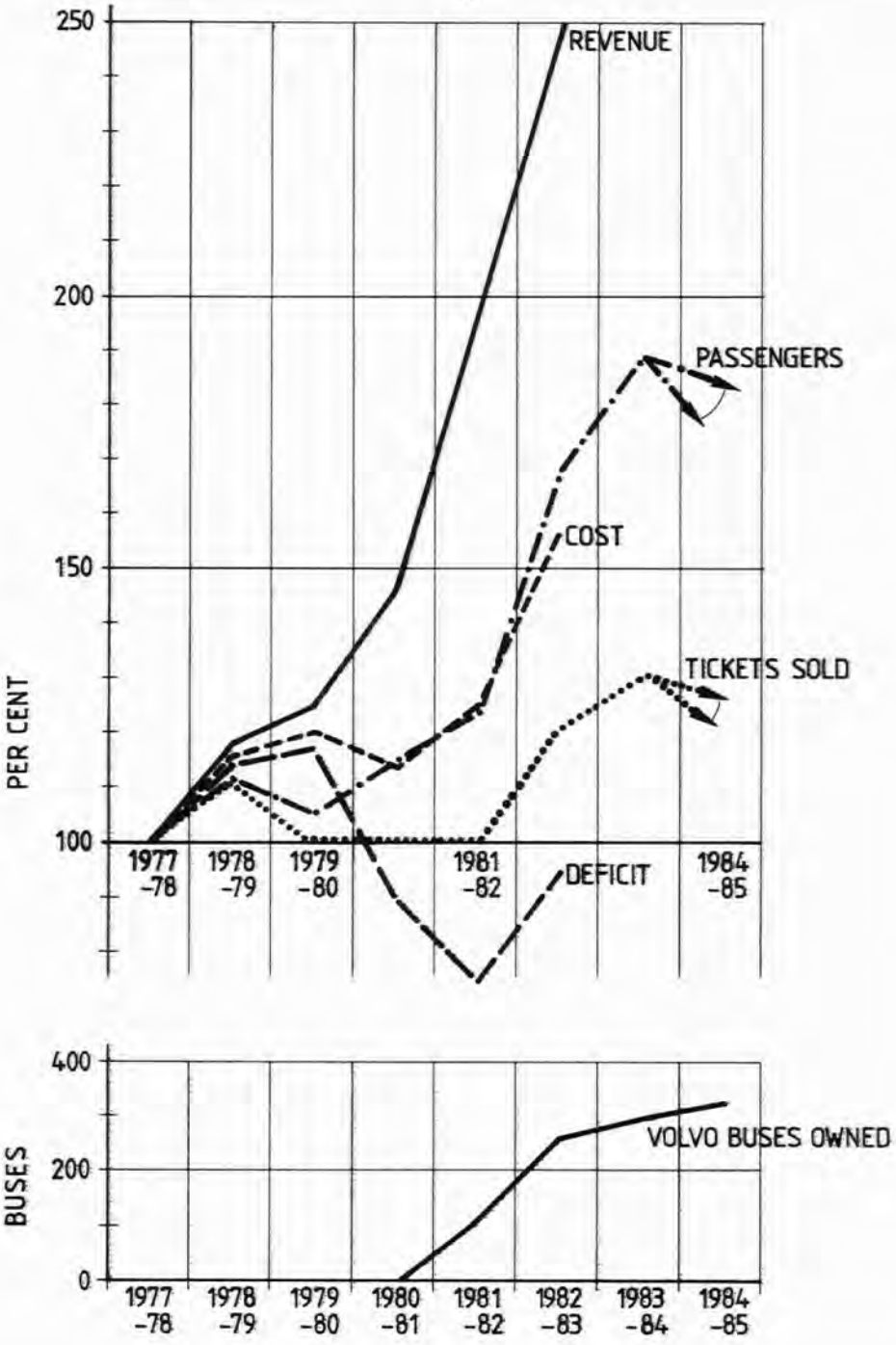

Figure 1 PUTC MAIN AUDIT FIGURES

Dealed numbers of tickets sold are available. It is difficult to ascertain the actual numbers of total passengers, as fare evasion and income leakage are difficult to estimate accurately. There is reason to believe that receipts from about 45 % of the total number of passengers are not accounted for in PUTC's books. In 1978/79 this figure is believed to have been about 25 %.

The PUTC main account figures are listed in table 1, and curves drawn in figure 1.

In the 1983 Volvo report a comparison of traffic between March 1980 and March 1983 was made. This was based on detailed surveys. The figures are listed in table 2.

The picture given here is different from that given in table 1. We have no other material which can give a firm base for conclusions. As mentioned above leakage and fare evasion are extremely difficult to estimate. Other inaccuracies might also be possible. We are inclined to believe that the truth lies somewhere between these two pictures, i.e. the PUTC figures indicate a too low increase in passengers carried whereas the Volvo figures might indicate a too high increase.

When studying the PUTC figures they should therefore be regarded as a lower threshold for the developments and achievements of the last years.

As can be seen, the introduction of Volvo buses and consultancy from 1978/80 have had great effects both on the number of passengers carried and on the economic results.

From 1980/81-1982/83 250 Volvo buses were put into operation. According to the PUTC figures, which are probably on the low side, the following developments took place during this period: Passengers carried increased by 65 %, bus kilometers by 45 %, passenger place kilometers by 65 %, revenue by 70 %, costs by 38 % and deficit by only 4 %.

Table 1 PUTC main audit figures

	1977 /78	1978 /79	1979 /80	1980 /81	1981 /82	1982 /83	1983 /84
Total cost 1 mill PKR	106,4	122,9	127,2	120,7	132,2	166,7	
Revenue 3 mill PKR	42,6	50,0	52,5	62,1	84,1	105,8	
Deficit 3 mill PRK	63,7	72,9	74,7	58,6	48,1	60,8	
Tickets sold mill	90,9	101,0	90,1	90,1	90,1	111,0	118,5
Leakage estimated %	25,0	25,0	30,0	35,0	40,0	45,0	45,0
Total passengers mill	121,0	135,0	129,0	139,0	150,0	202,0	215,0
Bus km mill	30,0	28,8	31,2	26,1	31,0	38,0	38,4
Pass place km mill				1 918	2 483	3 125	
Volvo buses owned 2					120,0	254,0	298,0

1 Depreciation included (between 16 and 20 mill PKR per year)
2 Per 12-31
3 Not adjusted for inflation

Table 2 PUTC traffic March 1980 and March 1983 (1983 Volvo report)

	March 1980	March 1983
Passengers per day, paid	180 000	390 000
Leakage, %	25	45
Passengers per day, total	257 000	735 000
Passengers per year, paid 1	63 mill	137 mill
Passengers per year, total 1	90 mill	257 mill

1 Per day x 350

During the same period, fares were increased by about 35 %.

The indicators available for 1984/85 seem to indicate that both the increase in productivity and in passengers carried have levelled off, even decreased somewhat during the last months.

The reasons for the levelling out in 1984/85 seem to be:

- A number of new buses have replaced older Fiats (transferred to Islamabad) and Isuzus (scrapped/sold)

- The supply of spare parts has been delayed, which has meant that buses have had to be taken out of traffic. The procedures concerning procurement of spare parts are obviously not good enough. This is serious, as it causes negative effects both on revenue earned and maintenance and thereby the life span of the buses.

- The third reason is that the route implementation strategy has been to serve one city sector (main radial road) adequately, before new buses are put in service on the next sector. This means that the severe overcrowding of the last few years has been reduced. This tends to make the increase in passenger related productivity figures smaller.

From 1985-03-15 the fare structure was simplified and the fares for short distance passengers increased considerably. This has led to a decline in the number of passengers, believed to be about 40 000 per day or 6 %. This decline is expected to be temporary, as the minibuses will also, within the near future, have to increase short travel fares.

There is reason to believe that the 1984/85 depression is temporary, as bus body production is now running effectively again. The last 250 buses will most probably be completed within 1986. 50 of these will replace Fiats which will be transfered to Islamabad. The other 200 will increase the supply in Lahore.

Table 3 Productivity. Comparison of PUTC with other bus companies

	Kuala Lumpur 1 3	Delhi 2	3 World cities 1	Other indian cities 2 >3 m	1-3 m	U.K. 2	PUTC 1982 /83	Lahore 1957
Buses/100 000 population	42	47	63	20	24	84	15	17
Route km/100 000 pop. (2 way)	69	200	54	59	103	50	27	
Ann. psgrs/head of pop.	117	142	153	176	107	193	61	36
Ann. psgrs/bus employee	61 300	48 200	42 100	N.A.		200 000	36 000	27 900
Aver. No. of psgrs/bus km	2,9	5,4	5,8	6,4		3,7	5,3	4,6
Ann. bus km/vehicle	96 100	61 000	52 000	65 000		50 000	75 000	42 900
Ann. bus km/employee	21 200	7 000	7 400	N.A.		15 000	6 700	6 300
No. of employees/bus (held)	4,5	8,7	7,4	N.A.		3,3	9-13 4	7,4

1 TRRL 1981 ISSN 0305-1315 Kuala Lumpur
2 TRRL 1981 ISSN 0305-1315 Delhi
3 Minibuses not included
4 Value depending on employee (really working or on salary list)

3.3.2 International comparisons

In table 3 some productivity factors for PUTC and other cities or groups of cities are shown. The figures are taken from different sources. Differences of definition may therefore exist which would mean that one should not put too much weight on single figures, but rather put emphasis on the picture as a whole.

As can be seen, PUTC effectivity compares relatively well with other Third World cities. Bus kilometers per vehicle tend to be better than average. Passenger loading is almost on average, and employee productivity a little bit lower than average.

Transport supply is very low in Lahore compared both to other Third World cities and to western cities. Neither the Lahore figures nor other Third World city figures contain minibuses or other forms of paratransit.

It can be concluded that during the years 1979-1983, PUTC has managed to climb from a problematic state of affairs to a situation where effectiveness can be compared fully to other Third World cities. Transport demand in Lahore is by far still not met.

3.4 TECHNICAL CONDITIONS

3.4.1 Choice of bus model

Volvo's choice of bus model for Lahore seems in many ways to be appropriate. The B57 is an uncomplicated bus, which, in Northern Europe, has turned out to be very resistant to wear and tear under difficult driving conditions (bad dirt roads and rain, snow, cold, dust and uneven surfaces). In many ways, these are conditions which might wear out the equipment as rapidly as the conditions in Lahore. The total loads might, at times, be higher in Lahore, but the roads have no slopes. Therefore the strains on B57 buses in Lahore are not greater than under Scandinavian conditions, but different.

In spite of the fact that the road and usage conditions for the buses in Lahore cannot be said to be extreme, a motor's time between overhauls is only about 50 000-90 000 km. On the newest buses the time is somewhat higher, yet not satisfactory. These low figures are influenced by buses damaged in collisions and otherwise. The "real" value is about 150 000 km, and the goal is, according to Volvo 250 000 km. Corresponding figures in Scandinavia are between 350 000-600 000 km and in some cases even higher.

Those Volvo B57 which have been delivered to Lahore are fitted with turbo chargers. Because of the problems with lubricating oil quality our opinion is that the motors should not have been equipped with turbos. However, Volvo no longer produces bus motors without turbos. Those buses, which today lack turbo parts, can not be driven without turbo.

3.4.2 Standard of maintenance

The chassis were delivered from Gothenburg to Lahore in batches from medio 1979 to medio 1983. A substantial undercapacity in the production of bodies has led to a situation where chassis have been stored from 11 to 48 months before the buses have been fitted with bodies and put into operation. The average time in store has increased during the period and is now approximately 36 months. In turn, this has affected the chassis, as the preventive maintenance has not been satisfactory.

The average age of the Volvo buses is still only about 2 1/2 years. The average distance driven is about 80 000 km per year. The bus fleet is therefore comparatively new, but it has a high driven distance per year. The standard of maintenance for the chassis in operation is, in respect to the points mentioned above, relatively good. The life span of several components has not, however, been satisfactory, and the costs of maintaining the present standard of maintenance for this relatively new bus fleet has been comparatively high.

The overhaul period of, among other things, motors, turbos and clutches is too short. The cause of this is a combination of lack of preventive maintenance, the use of poor quality greasing oils, faulty repairs and lack of sufficient driver training.

The bodies are simple in design. The standard of maintenance appears to vary a great deal from one depot to another. Body damage is not always attended to before it is severe. This has a negative effect on the drivers, who, as a result, do not greatly care if they damage the buses. Extensive body damage is beginning to appear on some of the 3-4 year old buses, and no efforts have been made to repair this damage.

Nor are smashed chairs being exchanged at once. Equipment, such as lights and window wipers, does not always function. The repair costs for the bodies, seen as a total, are unreasonably low and this leads to a decrease in the standard of maintenance.

The quality of tyres, hoses and flaps is inadequate. The tyres are made from a too hard rubber mixture, which causes great segments of the running surface and the sides to be ripped off. The tyres should only be worn down to an extent where they need resurfacing 3-5 times during their life.

Flaps, which are used, are often damaged and this results in increased damage and fractures to the hoses. The rubber quality of the hoses is not good enough. The air pressure in the tyres is often incorrect. There

is no adequate equipment for changing tyres. Therefore, some of the hoses are probably damaged. Punctures in traffic occur too often. The costs of tyres and hoses are unreasonably high.

Due to frequent tyre changes and poor equipment for fastening wheel nuts, wheels are not fastened strongly enough. To improve this situation all depots should be equipped with air pressure tools for wheel nuts.

Since the Volvo buses are relatively new, it has been possible to keep about 80-95 % of them in daily traffic, which is extremely high. As the need for spare parts increases, there are indications that this percentage will decrease. At Ichhra Depot there are more than 20 buses which lack spare parts for the turbo. It is important to improve this state of affairs.

3.4.3 Organization of maintenance

Volvo has, in its "Workshop Manual" and "Organization Manual", described how maintenance should be organized and carried out, and has stressed what is important in order to make maintenance function. Volvo has done a professional job, but it has been a major problem to make PUTC understand the importance of following this up.

Among the important points, which are not being given enough attention, we can mention the following:

- Planning of Maintenance
- Maintenance Training
- Control of Maintenance
- Development of Maintenance
- Service and Maintenance of Buses
- Building Maintenance

There are few indications that PUTC's management is really interested in changing this situation unless they are faced with an acute problem.

The cause of this lack of understanding as regards maintenance might be due to the fact that the results of satisfactory maintenance do not show up until several years after the time when measures should have been taken.

PUTC is recommended to follow Volvo's proposals in this matter. In case there is not enough qualified Pakistani personnel, some of the senior technical positions should be filled by foreign professionals for a period of time.

3.4.4 Preventive maintenance

The need for maintenance arises if:

- The training of drivers is deficient and they use the equipment erroneously
- Preventive maintenance is not followed up by means of established routines, which are planned and followed exactly
- Spare parts and requisites of poor quality are used
- Repairs are not skilfully executed

Volvo has built up a system for preventive maintenance using a supplementary control sheet, which is divided into 4 different control groups. An ideal driven distance between each control is defined. Since the driven distance does not change much over a period of time, time is chosen as the criterion for the control of buses. We have nothing to comment on regarding the way the system is planned, but the system is not followed on all points. The changing of oil and filters appears to be done on time, while several of the other controls appear to be done relatively rarely. We noted several controls which should have resulted in repairs. Several of the body controls were carried out without the results being noted on the control sheet. This may indicate that the controllers do not have the necessary training and that they do not know the tolerances which are acceptable regarding wear and damage. The controllers therefore lack guidance completely. What gets reported as a fault or damage is, therefore, to a great extent, left to chance.

Changed oil filters must not be cleaned and remounted. All used air filters are kept. They must be disposed of so they cannot be renewed and reused.

All technical bus data accompanied by type designation and number of components should be kept on a bus data card. All greater and important repairs which are carried out should be entered in a bus journal. Everything should be kept in a separate file with other necessary information about the buses. Every bus should have a fault report book, and oral reports about faults from the drivers can be entered into the fault report book by the foreman responsible.

The preventive control work must, according to our evaulation, be given immediate priority so that the life span of the bus fleet can be increased. It is also important that this work is done by trained mechanics, who can read and write.

To achieve good preventive maintenance, it is important that repairs are done skilfully. Spare parts and requisites of the highest possible standard must be used. Parts which are not delivered by Volvo, should be approved by Volvo.

We strongly suspect that the short life span of the motors is due to very poor quality oil and oil analyses of both new and used motor oil will be made. Poor quality oil could reduce the life span of the motor to 15-20 %. This will, of course, lead to shorter life spans for the gearbox, transmission and turbo. It is therefore of great importance that these conditions are improved. Volvo should have made far greater demands on the quality of the lubricating oil to be used.

If the oil has the necessary lubricating qualities, it can be of advantage to use a special electro oil filter. Such filters have functioned very well in Scandinavia. The intervals between oil changes have increased up to 150 000 km.

By using such filters it will be economical to use a better and more expensive oil which lubricates motor, turbo and gearbox far better than the oil which now is used.

The quality of the diesel oil is also of great importance to the motor. There is pollution in all diesel oils. If the tanks are old, pollution and water may have sedimented at the bottom of the tanks. Therefore these ought to be checked and cleaned. All diesel tank stations should have two diesel tanks with a capacity big enough for one tank to be left unused for about 10 days. The diesel pollution would thereby sediment and sink to the bottom of the tank.

3.4.5 Component repairs

Due to lack of equipment and skilled personnel, it is not possible to do all component repairs satisfactorily at any of the depots. We approve of the idea to repair, for instance, motors, gearboxes, rear axles, cluches, starters, dynamoes, radiators, brake drums and pumps at a central workshop. We do not necessarily agree that this ought to be done at Multan Road.

It would be better to establish this workshop at one of the depots which has good equipment and skilled personnel. Those depots which have the possibility and conditions to do a satisfactory job on various components can naturally continue to do so. However PUTC's technical management ought to make a thorough assessment of what kind of work that should be allowed to be done at the different depots. The PRTB workshop has the best ability to do most component repairs in a satisfactory way. If PRTB does not have capacity to take on more work, consideration should be given to increasing PRTB's capacity as soon as possible. PRTB has a good professional staff which PUTC should draw on as much as possible.

Some of the depots have equipment to do various repairs, but do not have trained personnel to handle the equipment. At Ichhra Depot many machines are left unused. PRTB has the same kind of machines and they have skilled personnel who are able to use them. The mechanics at Ichhra Depot, therefore, ought to get the necessary training at PRTB.

At present some repairs are done at private garages in Lahore. There is no reason to continue this practice. If these repairs cannot be done at PUTC's depots, PRTB has the competence to do them.

3.4.6 Workshop, layout and equipment

Shalimar and Green Town are the new depots which have been put into use. The special rooms at these depots are situated along the repair lots. The solution is, considered as a whole, satisfactory, but some of the rooms are a bit small. For Volvo B57 a great deal of the repairs can be done on a flat floor without a pit. For inspection and greasing, however, it is necessary to use a pit or a lifter. The pits should be wider, about 1,1-1,2 m. They should have been equipped with 6 tonnes component lifts.

Elimination of the pit edge would be an advantage, as it can easily be driven over. In the pits there is no satisfactory system for collecting used oil. Several of the pits and repair lots are in need of rehabilitation. The floors are, in many places, almost totally damaged by old oil, which is spread in layers several centimetres thick. At several of the depots the roofs seem to be leaking. Garden Town Depot has very poor working conditions and a new workshop should be built.

There are big differences in machine equipment between the various depots. The equipment does not seem to be adapted to the demands and the differences in quality are great. PUTC also has equipment and machinery in stock which has not yet been assembled and put into use. At several of the depots equipment and machinery has been assembled but not put into use because the mechanics did not know how to use it. Tools and equipment are locked in a store-room which the mechanics are prohibited from entering at certain times.

Tools and equipment are not used, because there is a fear that they will disappear. At Green Town Depot, a washing machine is wrongly assembled and does not function. In order that such machines shall function without access to service, they should be very simple. Since there is no problem in procuring manpower, it is still possible to wash the buses by hand.

3.4.7 Rehabilitation

The need for rehabilitation depends on whether it results in a great difference in the life span of motors, chassis, bodies and so on. The chassis will, with sensible maintenance, probably last much longer than the motors and bodies if measures are not taken to lengthen the motors' life span and protect the bodies from corrosion.

A common factor for all the buses which up to now have been put into traffic, is that their bodies probably will need rehabilitation after about 8-10 years. PRTB carries out rehabilitation of bodies which are totally worn down after about 10 years and aims to use the buses for an additional 3-4 years. This costs ca 60 000 PKR. Consequently a cheap bus is made available which can run for some years. Even if the bodies are protected from corrosion, rehabilitation might be necessary, but the work does not have to be so comprehensive and expensive.

By having a better preventive maintenance, better methods and increased quality, the total requirement for rehabilitation will diminish.

3.4.8 Depot personnel and management

Compared to European standards, there are far too many people at the depots and some of them do very little. We got a clear impression that this functioned better at PRTB's garage and at PUTC's depot in Islamabad. Of the Lahore depots, Kot Lachpat Depot seems to function best.

We presume that the present staffing of the depots can be seen in connection with the level of skills of some of the mechanics who lack basic knowledge of how some operations should be carried out.

Fault diagnosis skills are very important in order to be able to detect a fault quickly and to correct it properly. Several of the mechanics seem to lack the ability to use logical consideration in order to find the fault. This implies that the mechanics do not have adequate basic knowledge as regards the product and also that they lack sufficient experience.

The training of depot personnel has to be strengthened on all levels.

PUTC's technical management has to give clear instructions regarding better management of the depots. This is a demand which must penetrate futher down the organization. The demands for thoroughness and quality have to be strengthened and regular quality controls must be performed on work which has been carried out.

3.4.9 Summary technical conditions

Volvo B57 seems to be a bus type which is well adapted to the requirements of Lahore. The life span of the motor and ancillary equipment is, however, too short and the cause of this has to be found. The average time in stock for the chassis in Lahore was 36 months and during this time the guarantee expired before they could be put into traffic. The quality of the repairs carried out is far too low, and the need for training is great.

Machinery is also left unused because of deficient training. The demands on quality and control of work done are not adequate. The organization of maintenance is very deficient and preventive maintenance is only partly carried out. Bus body repairs are usually not carried out before it is absolutely necessary. Those buses which are now built will probably have to be rehabilitated after about 8-10 years.

Several of the workshops should be renewed and at Garden Town Depot a new workshop should be built. PUTC's technical management should be strengthened and enabled to coordinate PUTC's total maintenance.

3.5 SPARE PARTS

3.5.1 Spare part stores

PUTC has built a new central store-house at Multan Road. The position of this store-house is not ideal. When one considers the distribution of the various depots, distances of transportation are unnecessarily long.

The central storehouse has the capacity to store a normal selection of spare parts for more than 1 500 buses of one type. The store for heavier spare parts will then have to be equipped with shelves. The separate depots have their own smaller stores for common spare parts and requisites.

3.5.2 Order routines

The variety of spare parts is too small, and there has been a lack of serveral spare parts for many months. The order for spare parts is effected infrequently and new spare parts are not ordered when the stock has reached a minimum. The order routines for spare parts must be changed so the stores do not become empty before new spare parts arrive. Further, budgets have to be drawn up, which ensure the necessary purchases of spare parts.

3.5.3 Local production

Spare parts purchased are mostly produced by Volvo. There is a desire to buy a greater proportion of spare parts in Pakistan. The relatively small numbers of Volvo buses in Pakistan, however, put a limit on which spare parts it is profitable to produce domestically. Such production will also have to be subjected to an equally rigid quality control as that practised by Volvo. A further increase in domestically produced spare parts should therefore be more thoroughly evaluated. Some of the necessary requisites are produced in Pakistan. Emphasis must be put on satisfactory quality control.

In order to reduce time out of traffic for buses which are going to be repaired, system should be built up for changing those components which are changed relatively often.

3.5.4 Delivery routines

Delivery and selection of spare parts are recorded in a Cardex file which seems to function satisfactorily. The routines for ordering spare parts from the depots are satisfactory. All spare parts stores are open during work hours, and they are staffed by permanent personnel.

3.6 BUS BUILDING

3.6.1 Workshop, layout and production equipment, Multan Road

The body building plant at Multan Road is planned by Duple Metsec, who has also designed the bus bodies. The construction methods introduced have induced improvements and the strengthening of body design also at other Pakistani body building plants, for example the plant run by PRTB.

The layout of the new body building plant at Multan Road is well adapted to the kind of buses which are built there. All ancillary activities are placed between both production lines giving short transportation distances to the spare part store, machines, etc.

The painting of the buses takes place inside one of the big halls, where, in addition, other work takes place. This will have to be changed, and the painting done in a separate room with adequate ventilation. Those who work with painting should have better protective equipment to avoid inhaling paint, dust and exhaust fumes.

The mechanical equipment covers the minimum necessary to build the buses in accordance with an average standard. As the training of production workers improves and the demands for thoroughness and quality increase, it might, however, be appropriate to provide additional equipment. All plate steel comes in big coils which weigh several tons, but there is no lifting equipment which can make handling easier. The steel coils should be placed in robust frames where the plates could be drawn through rollers for straightening and cutting into desired lengths. The best alternative should be to purchase plates in desired size.

3.6.2 Production capacity and quality

When considering the size of the production plant it would, in our opinion, be possible to produce at least about 140-160 buses per year. In spite of this, only about 80 bodies are produced per year. For long periods production has almost come to a total stop. The production capacity at Multan Road is now about 10 buses per month. There are

still 142 chassis which have not been put into production, but 110 chassis are in production. All these shall be fitted with bodies at the four body building plants which have previously built for PUTC.

With existing production capacity, all the 649 Volvo buses should be completed by the end of June 1986. Therefore, a decision must be made, as soon as possible as to what use the body building plant at Multan Road shall be put. The need for new buses is great, but it is by no means certain that the political will exists to buy so many new buses that adequate production can be maintained at Multan Road. An alternative solution can therefore be to build bodies for buses from other traffic companies. The prospects that this shall succeed are, we consider, small, as quality and thoroughness are still not adequate.

The demands on quality and thoroughness in the work done are still not high enough, even if they seem to have improved after the production plant was given new management. Therefore, even higher quality must be demanded.

We have also considered the body building production at PRTB. Thoroughness and quality are here higher than at Multan Road. PRTB has very skilled trained personnel, and the management's demands regarding the quality of the finished work are sensible. If PUTC and PRTB merge, a transfer of PRTB's knowledge and demands to Multan Road should take place.

3.6.3 Method of construction

A bus body for use in Lahore should be constructed for 13-15 years use and for 1,0-1,2 million km. With sensible maintenance, Volvo B57 is a bus which is constructed for this life span. To absorb the forces which the body is exposed to during driving on uneven roads, the construction of the body framework seems to be right. The risers are placed close to where the greatest forces are transferred from the chassis to the body.

The body also seems to have fair strength for overturns sideways. The danger of such accidents is very slight in Lahore.

The body's strength where collisions are concerned also seems to satisfy the demands for buses in urban traffic. Our evaluations are also based on studies of buses damaged in collisions.

The body framework is screwed together and we believe this is better than to weld it together. A screw connection gives a desired soft, but at the same time stable, body. We assume, however, that the screw connection is stable even after being used for several years.

The fastening method of the side panels is also satisfactory, but the panels ought to have been connected in the middle (under the sidelist). This will make it simpler to change damaged sidepanels. Floor panels in steel also seems to be a simple and satisfactory solution. In the passage between the seat rows, better wear cover could have been installed than the flat iron which is welded on.

According to regulations, buses shall have doors. They are, however, not equipped with door openers and therefore are not used properly. All buses are driven with their doors open.

Side windows in plastic is a practical solution, but one should be aware of the fact that it is easy to scratch the plastic. We saw examples of this during trials to remove the protective paper on the plastic. The fittings are simple, but should meet demands. Chairs are cast in glassfiber; the quality could however have been somewhat better as the ability to withstand shocks is not good enough.

The corrosion protection of all steel surfaces is very poor. The method which is used only gives protection for a short time and corrosion starts under the primer.

The most exposed places for corrosion is where water and condensation have difficulty in evaporating quickly. This can be inside tubes, in connections, and where metallic parts meet. This shows clearly along the body framework against the side panels and at the window risers. To solve the problem in the most exposed places, PRTB used corrosion free steel panels. This is a solution which only partly solves the problem.

The best way to protect steel against corrosion, is to treat it with a solution which adheres well to the steel and which does not dry completely after treatment, even after several years. Such products are oil based. Steel tubes must be treated both inside and outside. A treatment lasts for the bus' life span, but, in exposed places, the treatment must be repeated after about 6-7 years.

Another alternative can be to use corrosion free steel in the body framework and in the side panels, but it is assumed that this is a more expensive solution than to protect ordinary steel from corrosion.

3.6.4 Depot personnel

The quality of the work which is done at the body building plant on Multan Road is not satisfactory. It seems as if this is due to a combination of lack of training and experience, and the fact that management does not make strict enough demands on quality. The depots which get buses from Multan Road seem to accept almost everything which is delivered, if only the bus can be driven. Therefore, weight should be put on increasing the training of the personnel until it is on the same level as at PRTB's body building production. This is a project which might take a long time and which demands substantial investments but it is very important in order to get the desired life span of the bodies. When the personnel have basic training, we believe it might be useful that some of them get the opportunity to work at PRTB for a period of time. We believe this is a better solution than to send personnel from PRTB to Multan Road.

3.6.5 Spare parts supplies

Those parts and materials which are necessary in body building production are mainly produced in Pakistan. Preferably everything should be bought from Pakistani manufacturers. However, great emphasis must be put on getting the supplies one is dependent on in time. Delays in supply can lead to great consequences for production.

This is something which has been experienced on several occasions. We therefore recommend alternative suppliers for important parts and materials.

3.6.6 Chassis

The supply of the chassis was not well enough adapted to the capacity which is possible to achieve in Pakistan. The result of this was that chassis were standing for a very long time. Practically none of the chassis had bodies built until after the guarantee had expired, although Volvo several times prolonged the guarantee to 24 months. This development was observed at an early stage and should have resulted in the chassis being stored in Sweden instead of in Pakistan. Most of the chassis have been stored in Lahore for almost 3 years and maintenance during this period has in some aspects been very deficient. The poor storage conditions and the climate would, even with satisfactory maintenance, have affected the chassis after such a long time. On the other hand, PUTC ought to have given more weight to a follow up of the supplies of the chassis, and ensured that these were fitted with bodies at the same speed as the chassis were supplied.

The chassis were supplied over a period of almost 4 years and the average price for the chassis' were about 207 000 SEK. The price, which was paid for the chassis, must therefore be regarded as acceptable at the time they were sold.

3.6.7 Costs

The costs of building a body at Multan Road are estimated to 175 000 PKR. This is probably only material and salary costs.

At PRTB we were told that restoration of old buses cost about 60 000 PKR. For this price everything except the framework was removed, and this was strengthened and fitted with a new body.

A new body from Republic Motors in Karachi costs 175 000 PKR. As we not have been able to make breakdowns of the different cost figures, it is not possible to evaluate the profitability at PUTC's body building plant.

3.6.8 Future operations

The need for new buses in Lahore is very great, but the politicial willingness to increase the number of buses by about 200 each year for 5 years does probably not exist. It is also doubtful whether PUTC can manage to renew the bus fleet without the average age becoming too high. A reasonable renewal of the bus fleet would require that 50-60 buses are supplied to PUTC each year. The future operation at Multan Road is therefore very dependent upon the number of buses which are bought each year. If a gradual renewal of Volvo's buses does not take place, production at Multan Road will probably have to be discontinued.

If the bus fleet is to be renewed by at least 50-60 buses per year, a decision on where to build them has to be made. PRTB has the best skilled personnel and equipment, while the best production facilities are at Multan Road. It could, therefore, be tempting to suggest that PRTB's skilled workers are transferred to Multan Road.

3.6.9 Summary

The capacity at the bus body building plant at Multan Road has been far lower than anticipated, even if it is now increasing. The quality of the work is not satisfactory, as there are great problems connected with corrosion of the bodies. The method of construction seems to be well adapted to the requirements and the desired standard. Additional training of the technical personnel is necessary. The future operation at Multan Road will, to a great degree, depend upon whether PUTC orders more buses during the next few years.

3.7 TRAINING

3.7.1 Background

In the 1957/58 annual report from PUTC's predecessor Lahore Omnibus Service the news can be found that a training school had been inaugurated. However, as time passed and the local transport corporation met with increasing difficulties, the idea of a central training institution disappeared and was not taken up again until the Volvo project surfaced towards the end of the seventies.

It is evident that the size of the project and the fact that new techniques were to be applied in many fields contributed to the interest among all parties to set up the Central Transport Training Institute.

CTTI was established in January 1978. Gradually a comprehensive training programme was developed in consultation with Volvo to support the development of PUTC and its future need of skilled manpower. Priority was given to the training of drivers, conductors and mechanics, which corresponded to PUTC's most urgent needs.

Up to March 31, 1985, the CTTI had conducted a total of 484 courses with 5 421 participants. 75 % of these courses were conductor and driver courses. Technical courses for mechanics and maintenance staff accounted for some 22 % of all training, whereas higher training in management, traffic planning and budgeting covered only some 3 % of the total training programme. Presently CTTI arranges some seventy courses for 1 200 students per year. Instructors at the CTTI have been given an extensive six-month training before taking up their duties. Drivers' instructors have had a one-month training course. There is also a two-year apprentice training course in PUTC with 6 months' training at CTTI and 18 months of practical training at the depots.

Today all Volvo bus drivers have passed either a Volvo-conversion course or a pre-service Volvo course. All new conductors, recruited by PUTC, have been trained by CTTI. Most mechanics have been trained on various courses in Volvo engines, transmissions, brakes and steering systems.

Courses in fuel systems and preventive maintenance have so far only been given to 17 and 37 persons respectively. This low number of participants is due to the fact that in each bus depot only a few mechanics are responsible for those repairs.

3.7.2 Methodology of training and transfer of knowledge

Training activities have been performed with great skill and with the assistance of audiovisual aids and demonstration objects supplied by Volvo. For pedagogical reasons the number of trainees has usually been limited to about five to six in each trade which has enabled everybody to participate actively in the training courses.

Courses are usually run on a two-week basis which is cost-effective at the same time as it creates a minimum of disruption at the depots. The number of courses run at one time is normally not more than five.

The pedagogical methods of training are of a high standard. Volvo's impact on both material, build-up of courses and the pedagogical approach has been important and positive. This part of the project has spontaneously been called "a model" by many and it has undoubtedly resulted in a considerable transfer of technical and pedagogical know-how to PUTC. The team has been very much impressed by the spirit and the joint efforts made by the two parties and the results far achieved by CTTI.

Today, however, CTTI's development has come to a standstill for reasons beyond its control. But the prospects of further improvement are great if priority is given to improve the CTTI staff situation, training facilities, programmes and the standard of training.

This is the reason why the following findings very much concentrate on the future role of the CTTI and its training activities.

3.7.3 Staff questions

The present establishment of CTTI is:

Academic staff	14 (6 posts vacant)
Administrative staff	5
Other staff	6
	25

All instructors have been selected from PUTC staff on the basis of their personal suitability. After a six-month instructor training (one month for drivers' instructors) they have all been able to carry out their instructional duties in a satisfactory manner. There are, however, a number of important problems pertaining to the present staff situation which have to be solved:

- Since the last Instructor Course four instructors have left CTTI and it has not been possible to replace them with instructors of the same high academic standard, both because of difficulties in finding qualified and suitable staff within PUTC, and because of the lack of incentives for possible candidates to take up instructors' posts.

- Instruction duties form no part of career development. Instructors at CTTI instead tend to be isolated from the daily work at the depots and risk to be overlooked where promotion is concerned.

- Though there are inducements for some instructors they have been decided upon on different occasions. This has resulted in different kinds of allowances:

  . Assistant drivers' instructors receive an allowance of 150 PKR a month

  . Drivers' instructors, Senior Instructor and the Principal do not receive any allowances at all'.

  . Technical instructors receive a 30 % allowance over and above their normal pay.

The lack of qualified staff has forced PUTC management to withdraw instructors prematurely from CTTI and to transfer them to depots.

There are no training officers responsible for the follow-up of CTTI training at the depots.

CTTI very much needs to recruit a senior, qualified electrical engineering instructor to be able to build up a well-functioning electrical training wing.

The team has found the staff question a crucial factor for successful future CTTI activities. There is a risk that the Institute's effectiveness and level of instruction will decline considerably within a short time unless its staff problems are solved.

3.7.4 Premises and equipment

Considering that only five years have passed since CTTI came into full operation we find that the Institute is fairly well-equipped. Premises have been of low-standard but reasonable for the kind of basic training that has been undertaken so far. PUTC/CTTI has made good use of existing premises and facilities and the Swedish contribution in training materials etc. has been decisive for the good results achieved.

If, however, efforts shall be made to further improve the standard of instruction and techniques and the level of trained staff, more tools, gauges and training equipment are essential. These are, according to the Principal of CTTI, already on an approved purchasing list and should be purchased without delay.

Improvements could also be made to the premises which are at present not entirely suitable for a full scale training programme. The chassis for demonstrations are now for example placed outdoors where they will rapidly deteriorate on account of climatic conditions.

Office space is insufficient. Library facilities are small. CTTI has built up a library but there is no suitable place for it and no adequate furniture. There is no proper room for showing films, nor is there a canteen which is unfortunate since the Institute is situated some 15 km away from the City of Lahore.

In all certain shortcomings in both equipment and premises are now a limiting factor to any further development of CTTI.

3.7.5 Training policies

The present training has mainly covered the lower ranks of PUTC and has met the immediate needs of the Corporation. With this lower rank training CTTI has been able to work independently of PUTC rather than as a management tool to develop the organization and for staff development purposes. As regards present training policies and practices the team has made the following observations:

- Higher level training as for example in stores and workshop management, budgetary control, traffic planning and body building was conducted in close collaboration with Volvo in 1981/82 in the middle of the project. Since then no such courses have been run by the Institute.

- CTTI is today a centralized training institution to which PUTC headquarters and depots send staff to be trained. Thus the Institute has in many ways become isolated from the daily work. The follow-up of training is lacking. How are the trained drivers performing? Can the mechanics do the repairs they have been trained to do? Will training in preventive maintenance reduce repair costs? Etc.. The Institute needs a regular feed-back from depots on their problems and findings and a flow of defective material with descriptions of what and why something has happened.

Instructors should also be trained in the follow-up of training.

- Present training programmes are decided upon by CTTI without any formal discussion and/or approval by PUTC management. Nor is this programme based on any analysis of the actual needs of the different departments and depots.

- Though maintenance training is being dealt with within each technical training course, this kind of education on a broader basis is very much lacking. On the other hand, since PUTC does not have a comprehensive and effective maintenance system (see section 3) it is very difficult for the Institute to create a valid and reliable training. It is therefore understandable that the Institute has not been in a position to carry out any particular development work on maintenance training. The team considers this to be one of the major weakness of the project. If no action is taken, there is a risk that the life-span of the Volvo buses will be unnecessarily shortened, which will mean substantial losses of financial and material resources for PUTC.

- A weak point in CTTI basic training is the electrical department where the Institute has met with considerable difficulties in finding qualified and suitable instructors. In the long run this will certainly hamper the build-up of an efficient auto-electric department at the depots.

In order to achieve a complete and well-run basic technical training, PUTC should take measures to employ instructors qualified in auto-electrics. This is, however, also a question of service conditions and incentives as has been discussed in par. 3.7.3.

- Certificates are being issued by CTTI. In the beginning they were being handed out to participants after each course, but since the Institute has a good reputation they proved to be valuable in getting work outside Pakistan, mainly in the Middle East. Consequently PUTC has been obliged to stop handing out certificates after courses and now only persons who have already got another job may be given their certificates.

- CTTI administrative and financial administration needs to be strengthened. On the whole within PUTC cost awareness about training expenditures is low. This is due to the fact that the CTTI budget is split up in many accounts which are dealt with separately. So are for example costs for premises and staff salaries paid by PUTC headquarters. CTTI has its own budget for running costs which only amounts to some 6 000 PKR/a month. For depots training facilities are free but they contribute with their participants' time and salaries. The result is that CTTI has got into a situation where it cannot master its own finances and administration. Restraints of all kinds, financial, procedural and staff hamper the development of the Institute. When compared with the absolute freedom which has been given to the Institute as regards training programmes and pedagogical questions this is remarkable.

- Overseas training can, when used well, be an effective instrument for staff development. CTTI has made a thorough analysis of present needs and has presented a proposal to the provincial government for training financed by many organisations such as ILO, World Bank, British Council and BITS. From the provincial government the request will then go to the Federal Government for approval. This lengthy procedure has made it practically impossible for PUTC to send anybody that was not included in the original project document for overseas training. In any future project of this kind the elements of overseas training must be very carefully examined and a good margin included for unforeseen needs.

A new complication has also been brought to the team's attention. The Pakistan government is no longer prepared to pay fares for their overseas students. Since aid organisations in many countries demand this from developing countries this will be a new obstacle for much overseas training. The team was also asked by the Principal to furnish a list of training facilities within Sweden.

- Though there is a staff magazine, edited by Principal of CTTI, which is issued each month, there is no rapid way of spreading information on technical subjects, procedures, directives and policy matters. A more frequent newsletter or regular staff meetings at the depots could enhance the level of information and understanding within PUTC. Another quick way of spreading vital information would be to use a mobile team, a van with instructors and demonstration materials which can give information and training at the depots at short notice.

- Though the collaboration with Volvo always was characterized as "very good" and relations between individuals have usually been most cordial, it was mentioned on some occasions that too frequent changes of Volvo staff did put a mental strain on the local staff which continuously had to build up new relationships with the newcomers.

3.7.6 Conclusions

Central Transport Training Institute is today a well-run, reasonably efficient training institute within its present range of activities. There are, however, a number of problems affecting its actions and diminishing its results. Among these problems the team would like to emphasize the lack of proper policies as a basis for training programmes, staff shortages and the severe fact that until now no studies of manpower development needs has been made.

CTTI was started as a tool to get the 649 Volvo buses into action as fast and smoothly as possible. In good cooperation with Volvo the Institute has been very successful at this. Volvo's intervention in training has meant a considerable transfer of knowledge and skills. On the other hand through this close cooperation the Institute has acquired an independent position to a degree that it appears neglected by PUTC headquarters.

Today CTTI has the possibility to develop beyond the basic training so far performed and to become an instrument for staff development and for PUTC management, but major changes have to take place to enable this to happen.

A major threat to any further development of CTTI might be the proposed merger with PRTB, Punjab Road Transport Board. If the merger takes place, CTTI will be forced back into the training of some 2 500 ex PRTB drivers, conductors and mechanics. Any development of CTTI will have to be postponed for at least two years and the Institute will remain closely linked with the Volvo buses rather than with the development of PUTC and PUTC staff.

4. IMPACTS FOR THE INHABITANTS

4.0 BACKGROUND

This chapter comprises discussions about the impacts for the inhabitants in Lahore, which the Volvo project has caused. The information is based on interviews with leading staff members in PUTC and LDA, on field surveys and on reports from PUTC, LDA, World Bank Consultants and Volvo.

4.1 ACCESS TO PUBLIC TRANSPORT

In 1980, some 800 000 inhabitants lived beyond reasonable walking distance to public transport (500 m). The existing network (1985) has decreased this number to some 500 000. The road conditions in most of these unserved areas are not suitable for bus traffic. Therefore, it is not possible to decrease the number further until new roads have been built.

Thus the project has improved public transport standards, measured in the number of inhabitants within walking distance of public transport.

4.2 CAN PEOPLE AFFORD PUBLIC TRANSPORT?

The fares in PUTC transport vary from 1 to 3 PKR. The guaranteed minimum salary is 700 PKR per month. A worker earns 700-1 500 PKR per month. According to PUTC and LDA, "everyone who needs public transport (i.e. commuters) can afford using the PUTC-buses".

It is obvious that using buses next to walking and cycling is the cheapest way to travel in Lahore, far cheaper than other public and private travel modes.

4.3 COMMUTERS

When designing the route network, special interest was taken in commuter problems. For instance, special interviews were made with industrial workers and employees at other large enterprises. The resulting bus network is better fitted to the home-to-work pattern than previously. The commuters have got a "far better supply" (LDA planner). This has also been confirmed by large employers.

4.4 MORE BUSES ON MAJOR ROADS

One of the major goals for the new bus system was to put a large number of buses on major roads. This concept was implemented road by road. In the heaviest periods, the frequency is now 20-30 buses per hour, one direction. Reliability is also high, so far. Before 1980 the ratio between on-road buses and scheduled frequency was as low as 40 %; now it is above 90 %. Together with the high frequency, this has meant a great advantage for the PUTC buses, compared to the minibuses and other private public transport facilities.

4.5 PUTC EXTENDS ITS ROLE

In 1980 PUTC had about 18 % of the total public transport in Lahore, measured in number of passengers. Today this figure has increased to 40 %.

The number of PUTC passengers during the period 1979-1984 is shown in the following table.

Year	Million pass/year
1979/80	129
1980/81	139
1981/82	150
1982/83	202
1983/84	215
1984/85	(190)

The increase has been 50-60 % during the last 5-year period.

The 1984/85 figure is based on average daily traffic after the fare increase in March 1985. There will probably be an increase in passenger volume when all the data from the entire fiscal year is available.

The number of passenger kilometres per day has increased by 80 % since 1980.

The increase in the number of passengers is also measured by the annual cordon counts. An Inner Cordon around the Central Area was established in 1980. Here, the traffic volume and bus occupancy is counted every year. The figures are as shown below.

INNER CORDON COUNT, ONE-WAY (THOUSANDS/DAY)

Year	Vehicles		Public vehicles		Minibus pass.		Bus pass.	
	Number	Index	Number	Index	Number	Index	Number	Index
1979	508	100	151	100	159	100	268	100
1983	569	112	116	77	143	90	420	157
1984	565	111	112	74	133	84	450	168

The decrease in the number of public vehicles is due to the decrease in richshaws and tongas.

The increase in bus passengers is entirely due to the increased capacity provided by PUTC.

According to PUTC, the cordon count is not representative of the total PUTC passenger level. A great number of passengers do not pass the cordon, and the total increase in passengers is greater than the figures shown in the table above.

4.6 MINIBUSES IN NEW AREAS

As shown in the paragraph above, PUTC has increased its ratio in a remarkable way. To some extent, the new passengers have been taken from the private taxis. However, the greatest loss in passengers is to be found among the minibuses. But the number of minibuses has not changed and the minibuses have moved to other areas with low public transport standards. These areas, which are hard to serve by large buses, have thereby got a far better public transport service.

4.7 THE ROLE OF TAXIS

According to PUTC, some of the new bus passengers were previously taxi passengers. Thus, the new buses and the new routes offer a service which can compete with taxi transportation, at a much cheaper fare.

4.8 TRAVEL STANDARDS

The new Volvo buses are bigger, more comfortable and have greater safety for passengers than the previous Isuzu and Fiat buses. This means a far better travel standard for passengers.

4.9 SUMMARY OF THE IMPACT ON MOBILITY AND TRANSPORT SERVICE

- The Volvo project has resulted in a remarkable increase in mobility for the inhabitants in Lahore.
- The travel standard is fairly good, compared to previous conditions and with other cities in Pakistan.
- The Volvo buses have replaced minibuses that may now serve other, previously unserved, areas.

5. THE PROJECT IN THE DEVELOPMENT ASSISTANCE CONTEXT

5.1 BACKGROUND

In this project SIDA has played a somewhat passive role. The assistance to Pakistan was given as untied commodity aid at a stage when Swedish aid programmes to the country were being discontinued. The Government of Pakistan in its turn put the whole amount at the disposal of PUTC which could now take measures to strengthen its activities by the purchase of the 649 new bus chassis, the construction of a new body building plant, and the introduction of traffic planning and vocational training. This was done by PUTC in the form of direct contacts with three different bus manufacturers which is completely in accordance with Pakistani purchase rules.

The final acquisition of Volvo as the sole consultant for almost all activities was consequently done through negotiations directly between PUTC and Volvo at the same time as negotiations were going on with the other two companies. Before an agreement could be reached, Volvo approached SIDA for their support but was informed that since this commodity aid was not tied to Swedish goods and services no official Swedish support could be given. Consequently Volvo chose to work through a local agent, Swedish Motors.

In the end, however, the very fact that the purchase of buses was to be financed by Swedish development funds was probably of some advantage to Volvo. Another definite advantage with Volvo's project proposal was that it combined the sale of bus chassis with different "soft-ware" components for a total urban transport system that no other competitor could offer.

5.2 THE PROJECT IN THE LIGHT OF SWEDISH DEVELOPMENT GOALS AND OBJECTIVES

The four main goals and objectives for Swedish development assistance are:

- Economic growth
- Economic and social equality
- Economic and political independence
- Development of democracy in society

When the team made the evaluation of the Lahore Urban Transport Project they had some difficulties to assess to what extent this project had met these goals and objectives, since they were never actively considered when it was created. It was a pure commodity aid project and emphasis was laid on the equipment and the performance of PUTC. On the other hand SIDA would certainly have refused to finance the project if it had been contrary to all Swedish development goals. The lack of consideration of these Swedish goals is also reflected in the terms of reference for the team. Nothing was stated about an evaluation where Swedish development goals and objectives would be considered. It can, however, be said that the project has had a positive effect both on the economic growth of the City of Lahore and on the socio-economic situation of the lower wage-earners. As has been stated in chapter 4 more people now have reliable transport of a higher standard to and from their work. PUTC's network of buses has led to stern competition for private transporters and forced them from the main roads into less accessable areas. Fares are not too high for those who have regular work. The fares' structure gives greater subsidies to those who live far out from the center.

The project does, however, only concentrate its activities to the City of Lahore and does not touch upon the surrounding countryside.

As regards the two other goals "politicial independence" and "democracy" the project has had little or no effect at all.

5.3 COMMODITY AID - INSUFFICIENT PROJECT PREPARATION

As stated above, SIDA's role in the project preparation has been marginal. Had this been a normal bilateral project SIDA would have made a thorough analysis of the recipient organisation's capacity to receive and make good use of development funds. Since it was a commodity aid project which was decided upon at the end of the seventies, no such analysis was made. This was also totally in accordance with the rules for commodity aid at that time. The fact that this assistance was also in a way, "final development money" also naturally contributed to a lower degree of interest on the part of SIDA.

This was negative for the project because most of the problems mentioned in this report are related to weaknesses in the recipient's organisation, for example in its administrative and technical strength, in maintenance questions and staff development.

5.4 VOLVO IN A WEAK POSITION

As a result of the lack of analysis of the project's viability and the direct negotiations and contract with PUTC, Volvo found themselves in a position where they, as consultants, could only propose actions to be taken. This is reflected in a number of reports from the project where the frustration of Volvo's local staff in Lahore is clearly distinguishable.

In similar bilateral projects SIDA has the responsibility to ensure that the project is developing as has been agreed and always maintains an active dialogue with all parties involved. In this case circumstances were aggravated by SIDA's withdrawal from Pakistan. There was virtually nobody with whom to carry on a dialogue.

A more active Swedish involvement in this project would probably not have been disputed. Some of PUTC's top managers have spontaneously mentioned that, with regard to the size and technical level of the

project, they would have welcomed some Swedish experts as advisors to central functions within PUTC. This would also have improved the transfer of knowledge and given Volvo a better follow-up at headquarters.

5.5 PROJECT'S DURATION TOO SHORT

As the project was part of the commodity aid, too little thought was given to its duration. Originally Volvo obtained a five-year contract which proved to be insufficient as, for example, not all the buses have been built yet because of delays in the body building factories. Five years is a short time to build up such an extensive urban transport system as that in Lahore. Just to get all the buses on the road will take six years with another year to complete all the basic training of drivers and conductors. It will take even longer to build up a proper maintenance and a functioning staff development system. The life-span of the buses should be between 12-15 years. All this indicates that the project should have been of a longer duration from the beginning. A minimum requirement should have been to have Swedish expertise stationed in Lahore until the last Volvo buses are in operation.

It is therefore encouraging that the Swedish development organisation BITS has provided support to the project amounting to 3 MSEK until 1985 with further support of 2,2 MSEK for the period July 1985-December 1986. Thus BITS has provided PUTC and SIDA with an additional flexibility which is often necessary to ensure successful completion of a project.

5.6 VOLVO'S TECHNICAL ASSISTANCE

In the beginning of the project Volvo had at most twelve persons in Lahore as all the different parts of the project started. Since then the number of long-term personnel has decreased gradually to the two experts who are now assigned to the project, funded by BITS.

The evaluation team has, during its interviews, only heard good opinions about Volvo's technical assistance staff. Both their technical knowledge and personal behaviour have been praised. A few isolated comments on "a few square technicians" and others on "too frequent changes of staff" have, however, been noted.

The team has estimated the software part to about 10 % of the whole project, or about 15 MSEK.

5.7 THE PROJECT - A BASE FOR FURTHER COOPERATION?

The supply of spare parts will remain a crucial problem for the Volvo buses as it has been for the preceeding Isuzus and Fiats. But, on the other hand, Pakistan is a country with a rapidly expanding industrial sector which could certainly be capable of producing some spare parts such as oil and air filters, exhaust systems etc.

This could be a field of cooperation between some of Volvo's subcontractors and local industrialists, possibly in collaboration with Swedfund which hitherto has not had any projects in Pakistan.

5.8 NO CONTACTS WITH OTHER SWEDISH PROJECT

During our stay in Lahore we were invited to visit Ali Institute, a vocational training centre which was set up in the seventies as a joint project between a local industrialist, Mr Babar Ali, and SIDA. The team was very impressed by the training at Ali Institute which is now functioning very well with only local staff. Considering the high quality of training at Ali Institute, the project preparation should have included some plans for further collaboration, for example in the technical training of mechanics.

5.9 AGENT'S COMMISSIONS

An important question to settle before commodity aid is given is whether local agents shall be entitled to full commercial commissions. Some recipient countries have limited such commissions for purchases made with aid money.

Since, however, funds for this project were given as untied commodity aid and SIDA did not consider itself in a position to support the Swedish project proposal, Volvo had no choice but to work through a local agent. Thus the absence of official Swedish constraints or active SIDA support has resulted in a considerable agent's commission which has decreased the value of the aid given.

5.10 CONCLUSIONS

Based on the observations above the team finds that the project has been dealt with in a very superficial way by SIDA. The discontinuation of Swedish development cooperation with Pakistan also contributed to a passive attitude at SIDA. A project of this size should, however, have been more properly analyzed and followed more closely.

Present SIDA rules on commodity aid also prescribe that such projects must be dealt with in the same way as other bilateral projects. Had this been the case when the Lahore Urban Transport project was prepared a lot more attention would have been given to the different factors that are now negatively affecting a good project.

6. THE PROJECT AS A MODEL PROJECT

An important question in the terms of reference for the evaluation was whether this project could be used as a model for other transportation projects in the Third World. The software component, planning, traffic engineering, maintenance and training has consumed about SEK 15 million which is somewhat more than 10 % of the total cost for the project. This must be considered a low figure for the results achieved. The purchase and introduction of 649 buses is a great investment and a difficult organisational task for any transport organisation and it is unlikely that PUTC could have made such fast and good use of the buses as they are now doing without the support of Volvo's consultants.

The team's unanimous viewpoint is therefore that the project has been very cost-effective and it could certainly be used as a model for other public transportation projects - but with some modifications. Future purchases of buses on commodity aid schemes should always be linked with the kind of consultancy services that Volvo has given to PUTC.

The project is an urban transportation project. With present objectives for Swedish development aid where more emphasis shall be laid on development of less developed regions urban transport projects will probably not be too common. But with some modifications the project can also serve as a model for public transport projects in rural areas.

During our stay in Lahore we came across the thought that a medium-distance transport project (- up to 100 km -) could be an effective means of counterbalancing the present immigration of people into the City of Lahore. In the present transport situation many people choose to move closer to the City, where transport facilities are more regular. If they had access to good reliable transportation to the City more people would prefer to stay in their old places of residence.

7. RECOMMENDATIONS

This chapter deals with the team's recommendations, both for a successful continuation of the Lahore project and for other similar Third World projects.

7.1 FUTURE OF THE LAHORE PROJECT

It is of greatest importance that the traffic engineering improvements for bus traffic (road dividers, bus lanes, round-abouts, bus bays) continue, at least as rapidly as up to now. Otherwise, the increasing traffic demand and the increasing private car traffic will cause a breakdown for bus traffic.

The capacity for the planning units in PUTC and LDA has to be increased rapidly.

It is recommended that the consultancy assistance to PUTC should be extended in order to help the implementation of the goals originally set out in the various Volvo plans. The following objectives are of importance:

- Improvement of education, particularly of middle management
- Implementation of better maintenance procedures
- The appropriateness of a programme for extended spare parts production should be considered

Lahore (and other Pakistani cities) definitely need more local transport capacity. This would improve the conditions especially for low income inhabitants. If funds could be found for this, the donor agency should:

- Put up firm demands for the administration of the funds
- For a certain period take part in the administration of the bus company

The motor oil must be of far better quality to be able to increase the life span of several important components to an acceptable level.

Trials with electro oil filters combined with motor oil of acceptable quality should be carried out.

All spare parts bought must be checked to ensure they are of the same quality as original parts.

A sufficient amount of money for acquisition of spare parts must be appropriated annually. Acquisition routines must be established which ensure that important parts are always in stock.

The preventive maintenance system planned by Volvo must be implemented in full in such a way that all controls and checks are carried out at correct times.

All controllers must be able to read and write English. They must be trained in implementing the controls. Inspectors must be trained to visit the depots and check that the maintenance system is carried out exactly as laid down.

The technical administration of PUTC must give top priority to organizing the preventive maintenance system which Volvo has recommended in their "Workshop Manual" and "Organization Manual". To improve the quality of all the work done, far higher demands must be placed on the quality of all mechanics. This is the responsibility of all leading employees. The policy however must be defined by the PUTC technical management. Great emphasis must be put on achieving improvements on this point as this will bring great economical savings in the long run. Visits to other companies in Lahore, among other PRTB, revealed that it is possible to achieve the desired results.

The mechanics must also be given better training in fault-finding to make them more competent in defining the real cause of a defect.

Tyres, tubes and flaps of better quality must be bought. The people employed in this field must be trained better to prevent damage and punctures. Air pressure tools for mounting and removing wheels should be acquired.

In Garden Town depot a new workshop should be built. Most of the other depots should be renovated to enable them to perform better work.

New and old bodies must be protected against corrosion to increase their life span. Air pressure spraying equipment should be utilised.

The Central Transport Training Institute should be given a more independent status with its own budget and administration. The only decisions made by PUTC Headquarter should be on policy matters, training programmes and the yearly budget.

The staffing of CTTI should be revised. The Institute should preferably have a nucleus of very qualified and experienced staff which covers each trade. This staff should be selected among PUTC's best professionals and their assignment to CTTI should be considered as a step forward in their career. The nucleus staff should be allowed to stay for about three to four years before they go back to depots and Headquarters.

CTTI should have officers responsible for liaison in every depot - training officers who can follow up the courses and give on-the-job training. Training officers could also be responsible for apprentices' training and be instrumental in a dialogue between CTTI and the depots. They could also participate in a yearly analysis of their depot's training needs and the selection of course participants.

The training officers at the depots could also function as complementary staff at CTTI which would give greater flexibility. The nucleus staff should primarily be selected among the training officers at the depots.

In cooperation between PUTC Personnel Management and CTTI, a staff development policy should be worked out which shall improve management's capability to select and develop suitable staff for all posts within PUTC.

In collaboration with Volvo, CTTI should work out new training courses at foreman level, on maintenance policies, quality control, supervisory skills and management in order to progress to the next level of staff development.

To provide rapid communication between CTTI and depots a mobile training unit could be considered: A van and an instructor who goes around to each depot - for example to demonstrate and explain an important defect which occurs under certain circumstances.

More emphasis must be laid on the auto-electric side of CTTI activities.

Improvements to premises and equipment should be made continuously.

Internal information could be improved by the use of a more frequent newsletter and/or staff meetings.

7.2 OTHER THIRD WORLD PROJECTS

The Lahore model with "planning, development and implementation phases" should be of great advantage in other Third World urban areas.

The local-counterpart method is necessary for guaranteeing a proper local take-over when the project has been carried out. This should be planned as early as in the initial phase.

Local transport is one of the best ways to improve conditions especially for low income inhabitants, for instance by making it easier to get to a job.

We fully recommend similar projects to be carried out in other developing countries as the benefit of improving all transport supply is of great importance for the gross national product of the countries.

Development of local transport should consist of buses (or other forms of transport), consultancy and education.

The donor agency should at the start of such a program:

- Consider the best organisation model for local transport in that particular country/city.

- Put up firm demands for the administration of the transport development and operation. Preferably the donor agency should take active part in the administration for a certain period.

Buses for developing countries, which have problems with maintenance and lubricating oils, should be as uncomplicated as possible. The motor should be natural aspirated (not turbo).

The duration of such projects must not be too short. In most cases it seems they have been concluded too early, as in Lahore.

Such projects should be implemented in several steps. For each step the possibility should exist to place demands on the receiver of the assistance before the next step is started. The recipient must feel great responsibility for the implementation of such projects.

METHODS USED IN THE EVALUATION

The evaluation has been carried out in the following way:

- Reports produced by Volvo - Initial study (1979), 7 reports (1980), Progress Report (1983), and Progress Report (February 1985) - have been studied

- Interviews and meetings with Volvo staff were held prior to the visit to Pakistan (Göran Kling, Claes Westberg, Tore Larsson, Ingmar Andreasson, Chris Halldin, Bernt Axelsson)

- Meetings were held with the chairman of PUTC, Mr Sajjad-ul-Hassan, and with the Managing Director, Mr Mohammad Afzal Kahut

- Interviews were made and meetings held with the following staff members of PUTC:

  Director of Finance, Mr Tanveer Jaffari
  Director of Procurement, Col. Masood Shaukat Khan
  Director of Operation, Mr Maqbool Ahmad Khan
  Director Technical, Col.(Rtd) Mian Mohammad Aslam
  Senior Planning Officer, Mr Ijaz Ahmed
  Principal of CTTI, Mr Mohammad Asif
  Secretary Personell, Mr Ghias-ud-Din
  Manager - Central Workshop, Mr Mohammad Hanif

- A meeting was held with representatives of the trade union

- Visits were made to all depots in Lahore

- Visits were made to PUTC and PRTB body building factories

- Meetings were held with a representative of the Lahore Development Authority, Director Traffic Engineering, Mr Khushal Khan

- Several meetings were held with Volvo representatives in Lahore (Tore Larsson, Chris Halldin, David Shearman)

- Bus journeys were made on several routes in Lahore

In addition to these meetings and studies in Lahore, some comparative studies were made:

- Bus journeys were made in Karachi, Rawalpindi and Islamabad

- A visit was made to a depot in Islamabad

- A visit was made to the Assar textile factory in Lahore

- A visit was made to the Ali Training Institute in Lahore

Finally prior to departure from Pakistan a brief preliminary report was submitted to the Swedish Ambassador, Mr Sten Strömholm, and to First Secretary, Mr Sven-Olof Johansson, in Islamabad.

The evaluation was also discussed with representatives of the Norwegian Embassy.

The evaluation team would like to take the opportunity here to express its sincere gratitude to all persons involved who have spared no efforts in giving an objective and comprehensive picture of the project and to all those who have showed us such great hospitality during our stay in Lahore.

LIST OF ABBREVIATIONS

PUTC = Punjab Urban Transport Corporation (urban transport)

PRTB = Punjab Road Transport Board (rural transport)

LDA = Lahore Development Authority (town planning etc)

PKR = Pakistan Rupees (0,6 SEK)

SIDA = Swedish International Development Authority

BITS = Swedish Agency for International Technical and Economic Cooperation

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PUBLIC TRANSPORT IN LAHORE

The Swedish deliveries of buses for public transport in Lahore, Pakistan, have been successful. The routes and the number of passengers have increased and the urban transport situation is improving. But certain difficulties in the bus company's organizational structure, maintenance policies and staff training must be solved, all according to this evaluation.

The evaluation team consisted of *Börje Wallberg* from SIDA's Division for Technical Co-operation, and of the external consultants *Bernt Nielsen, Rolf Gillebo* and *Roar Skarböe*, experts in public transportation.

Sweden's bilateral development co-operation, handled by SIDA since 1965, comprises 17 program countries: Angola, Bangladesh, Botswana, Cap Verde, Ethiopia, Guinea-Bissau, India, Laos, Lesotho, Mozambique, Nicaragua, Sri Lanka, Swaziland, Tanzania, Vietnam, Zambia and Zimbabwe.

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