Criterion for a fares policy and fares index for bus transport in Sri Lanka

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Abstract

The public transport sector in Sri Lanka faces many problems. Most of these problems seem to be related to the absence of a fares policy. Implicit fare policies, which have been followed in the past, have given rise to many problems of a serious nature, which have continued to undermine the quality of bus transport and threaten its continuity as a viable mode of transport. It is evident that even the numerous management changes from time to time have not made much of a difference.

The paper sets out to analyse past fares policies and the consequent impacts that such policies have had on the bus industry both during the period of state monopoly in bus operations as well as during the period of mixed competition. It will be shown how the lack of a well-formulated, explicit fares policy has been a primary reason for the deterioration of the bus industry in Sri Lanka.

The paper then proceeds to set out a criterion for a fares policy and develops a methodology for computing bus fares based on such a policy. Fares under the proposed policy are based on costs, quality of service, and subsidy payment, if warranted. A method for calculating costs and updating them regularly will be developed. Computation of fares is also given in a methodologically, wherein fare stages have been computed together with steps that should be taken to adjust fare anomalies that may contribute to varying and different benefit–costs ratios that presently exist between routes.

Introduction

Public transport is an important sector in the economy of any country, as its performance affects economic and social activities in diverse ways. However, the public transport sector in Sri Lanka, especially the bus transport, suffers from many deficiencies due to the lack of effective and consistent policy to guide the sector as a viable economic venture. It is known and accepted that bus fares have to keep up with rising prices of inputs to the bus industry and therefore fares have to be revised accordingly from time to time, if bus services are to be provided on a commercial basis. However, the lack of a clear policy makes fare revisions vulnerable to decisions aimed at solving or appeasing a section of the stakeholders rather than the planned growth and development of the sector. Sri Lanka's history of bus transport is illustrated by numerous such instances where ad-hoc fare revisions made from time to time have in fact resulted in distortions to the fares structure that has in turn led to numerous imbalances and inefficiencies to the service.

Sri Lanka's bus transport has seen three distinct policy epochs with respect to investment and operations. These are (1) exclusively private sector (1907 to 1957), (2) exclusively state sector (1958 to 1978), and (3) mixed operations (1978 to date).

While fares had been a contentious issue in the early years as well, this paper examines fares policies adopted in more recent times under state sector monopoly and mixed operations.

During the 20-year period of the state-controlled monopoly of bus transport in Sri Lanka, the CTB (Central Transport Board) was the provider of all bus services. It was also a self-regulator with respect to capacity, safety, and fares. Fare structures were set by the CTB and a fares revision was granted only after a government cabinet decision and generally only after much debate. It is noteworthy to mention that during this period, which included the oil price hike in 1973, there were only two fare increases amounting to around 100% (Table 1) The shortfall in operating revenue for the CTB due to the reluctance of the government to increase fares was provided by means of a general government subsidy through the annual appropriation bill.

Suppressing or delaying fare increases led to the CTB being unable to satisfactorily meet the transport demand of the public, which, in turn, was followed by several management changes

Table 1 Revisions in bus fares (1958–2000)

	Fare per km (average fare)			*Fare per 5-km journey (without transfer)*		
Year	*Increase as percentage of former fare*	*At current prices (after increase) (cents)*	*At 1999 prices (after increase) (cents)*	*At current prices (Rs)*	*At 1999 prices (Rs)*	*In US cents*
1958–71[a]	–	2.35	51.48	0.15	3.29	2.8
1971	18	2.77	45.09	0.20	3.26	3.4
1974	69	4.79	58.43	0.30	3.66	4.5
1978	16	5.47	55.47	0.40	4.06	2.5
1980	31	7.18	52.13	0.70	5.08	4.2
1980	61	11.60	84.22	1.20	8.71	7.2
1983	24	14.40	70.09	1.50	7.30	6.4
1983	18	17.00	82.74	2.00	9.73	8.5
1990	48	25.07	61.68	3.00	7.38	7.5
1996	14	28.51	37.16	3.50	4.56	6.3
2000	16	33.07	40.95	4.00	4.95	5.5

[a] average for period

through a process of decentralization in 1978 and 'peoplization' in 1990 (Ministry of Bus Transport and Highways 1998). Even at present, private–public partnerships are under consideration. However, none of these management changes have provided an effective solution, underlining the fact that the continuing lack of a fare policy remains as a critical issue that is progressively undermining the continuity of the state sector bus operations.

The advent of private operators in 1978 did, however, bring about more frequent increases in bus fares, resulting from regular agitation and representation by private operators in the light of double-digit inflation that has been a feature throughout this period. In fact, there have been a total of eight fare increases to date. This is understandable given that the private sector, which does not receive operating subsidies, cannot survive without regular fare increases. Even though this has partly forced the political decision-making, it has been shown that the bus fare increases made under pressure have almost always favoured the operators—in providing short-term relief to their financial difficulties rather than ensuring the systematic growth and development of the sector.

Fares policy under state monopoly (1958–78)

During the days of the state-owned monopoly, the CTB, despite attaining many noteworthy achievements, never formulated a proper fares policy. Such a fares policy would have re-compensated the CTB for the numerous services it provided to achieve socio-economic developmental goals and policies, for which it was not adequately compensated for from fares alone. Neither was there a coherent policy on subsidies where many unidentified cross-subsidies were present. As a result, fare increases as well as the Treasury grants, which covered the shortfalls in revenues, were politically dependent and subject to decisions most often influenced primarily by political agendas. This also gradually opened the door to increased interference of politicians in non-policy matters of bus operations, which also contributed to the eventual downfall of the CTB.

Fares and quality of service

Under state monopoly, fares were not based on cost recovery. Therefore, there was no in-built mechanism for sustaining the fleet and as such capital grants were not regularized and long-term planning for building up a serviceable fleet to meet future demand became increasingly difficult. As shown in Figure 1,

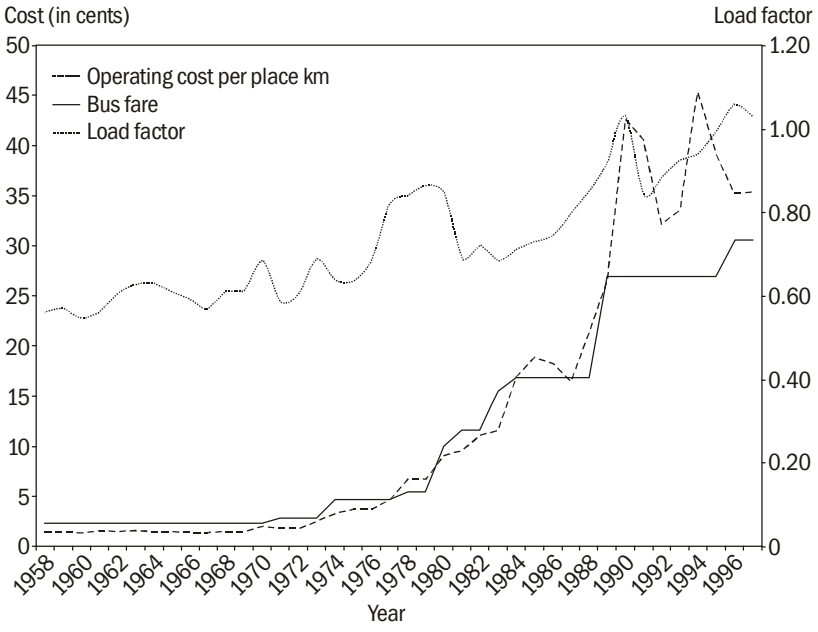

Figure 1 Bus operating costs and fares (at current prices) and load factors in Sri Lanka

fares were increased only infrequently during the past four decades. They were largely to catch up with rising costs, but always with much reluctance and sensitivity to public opinion and as a rule never before an election (Ministry of Transport and Highways 1998). Figure 1 gives fares and bus operating costs per place kilometre (i.e., seats plus 25% standing space) for the period 1958–96. It shows the positive gap between fares and costs closing by the year 1976. Thereafter, costs have steadily overtaken fares. This feature, among other factors discussed below, appears to have caused the load factors to increase from 60% to 100% as the state operator was forced to overload to cover operating costs. Load factors are the single most important measure of the quality of bus services. A load factor of between 60% and 70% could be termed unacceptable and representative of low fares on high operator costs or a combination of both.

Bus fares and capacity

Another consequence of low fares was that the required capacity in a number of buses could not be maintained. This is caused by two different factors. First, low fares increase mobility and travel thereby increasing the capacity requirement. Second, low fares leave less than adequate cost recovery for depreciation and replacement of buses. Further, it discourages new investments for growth in demand as low fares result in the industry being perceived as an unprofitable business. Figure 2 shows how the load

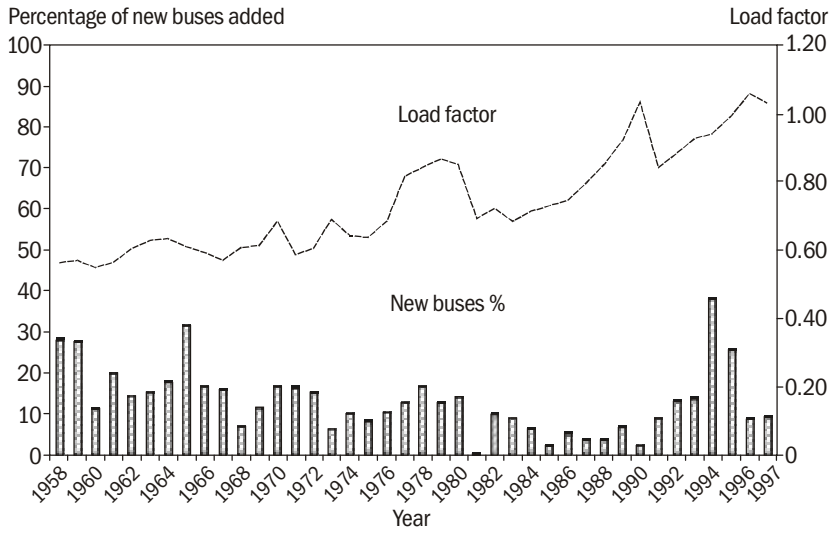

Figure 2 New bus additions and load factors (1958–97) in Sri Lanka

factor in buses increased from 58% in 1968 to 103% in 1997 when the rate of new bus purchases fell below the 10% replacement rate required to keep a constant fleet that has an average 10-year life.

Bus fares and operational efficiency

Table 1 gives the bus fare and operating cost per kilometre, in current and 1999 constant prices. It is observed that the average fares in real terms gradually fell in the first 10 years after nationalization, mostly due to lowering of costs arising from attaining improvements in operational efficiency. However, fares had to be increased to cover rising overheads, loss in productivity (mostly attributed to providing non-essential employment), and also due to the fuel crisis in the early 1970s.

Since fares remained constant in the later part of the 1970s, the 1980s saw the highest ever increases in bus fares—by nearly 100% in a single year. Fares were highest ever in the period soon after private sector entry. This led to the rapid entry and expansion of the private bus industry and capacity problems of the state-owned periods were quickly dealt with. However, there were no enforcement of quality of service, and with poor regulation, oversupply of buses resulted in the lowering of efficiency in bus utilization. As shown in Table 1, fares have come down very rapidly in real terms since 1983 (mostly due to high inflation and reluctance to increase fares due to oversupply and poor quality) so that by 2000, the average bus fares in real terms had reached an all-time low. This clearly shows the trade-off in bus operations among quality, fare, and efficiency. This proves the need for a policy, which combines all three parameters in determining fares.

Frequency of bus fare revisions

During the period of the CTB, fare revisions were made with the concurrence of the ministry and usually following a cabinet decision. More recently, the government has usually increased fares only after private operators have gone on strike or threatened strike action. Even then, fare increases are usually discussed at the cabinet level prior to implementation. As shown in Table 1, there have been 10 revisions to bus fares since nationalization (i.e. over the past 42 years), but 7 of these have occurred in the last 20 years. The table shows that when increases are

delayed, the percentage of increase required also rises, thus forcing the hand of politicians to authorize less-than-required fare increases—the name of affordability. This, in turn, puts pressure to compromise on quality as discussed earlier.

Fares policy under mixed competition (1978 to date)

The fare increases made under mixed competition appear to have had quite different consequences when compared to the situation before 1978. The most noteworthy feature is that fare increases have only considered revenue increases for the operator. The quality of service has been totally absent in the decision-making process. For example, the short-distance tickets have gradually been overpriced since the bulk of the revenue comes from short-distance travel, while the longer-distance travel is now very much underpriced. This has been done to appease in part ruling politicians, who consider it as bad public image to allow high fare increases. They appear to have in the past readily acceded to requests for increasing by large amounts one or two short-distance fare stages, whereas the many stages for long-distance travel are kept low. Perhaps, it is more palatable to the public who are presented with old and new fares side by side to see just one or two of a hundred fare stages having high increases whereas the vast majority has low increase. The operators too are happy as their revenue base increases sharply as the short-distance stages have large proportions of passengers. But this has resulted in many operators truncating their services to increase revenue, which, in turn, has caused inconvenience to the passenger increasing his/her transfers. Such anomalies have caused many aberrations to the smooth functioning of public transport in particular and transport in general. These, in turn, have been the causes of social and economic distress to many aspects of life in Sri Lanka in recent years (Kumarage 1998).

Table 1 shows that the fare of making shorter trips (e.g. 5-kilometre trip with or without a transfer) has increased much more than the average fare. This is an important factor, since many more passengers pay for short-distance trips than longer-distance trips. It is evident that recent revisions have targeted the short-distance passenger in particular (typically the urban passenger). Whereas overall bus fares have reduced, it is seen

that the bus fare with respect to a 5-kilometre journey has increased in real terms.

The higher price of short-distance travel has imposed a high burden, particularly on the urban poor who travel short distances in search of work and trade (Kumarage 2000). On the other hand, long-distance buses scout for shorter-distance passengers thus increasing long-distance travel times and lowering the quality of service provided. They also overload to make up for the loss incurred in the carriage of long-distance passengers. In the short distances, the surplus profits have attracted a surplus of buses, which have reduced productivity and increased traffic congestion.

Criterion for a fares policy

The criterion for a fares policy for bus travel should consider the following factors.

- Passenger profile and affordability
- Efficiency and cost of bus operations
- Fare structure and anomalies
- External benefits and operator subsidy
- Mechanisms for fare revisions and elimination of anomalies

Passenger profile and affordability

If access to social services is considered as a basic human necessity, and as a catalyst to economic growth, then bus fares should be made affordable to different sections of society, especially those in the lowest income category who are considered 'public-transport-captive'. It is, therefore, important to examine the financial affordability for such groups when considering a 'fares policy'. This is clearly demonstrated in Table 2 (Kumarage 2000), which shows the captivity to bus transport of households

Table 2 Distribution of household income groups by expenditure on public transport (2000) in Sri Lanka

Income group (Rs/month)	*Expenditure on public transport as a percentage of expenditure on transport*					
	0–20%	*20%–40%*	*40%–60%*	*60%–70%*	*70%–80%*	*80%–100%*
Less than Rs 3500						100
Rs 3500–6000	3.7	5.6	5.6	18.5	11.1	55.6
Rs 6500–10 000	9.6	1.9	17.3	3.8	7.7	59.6

Table 3 Distribution of household expenditure on public transport by income (Sri Lanka)

	Income group (Rs)							
Expenditure (%)	*0–1000*	*1001–2000*	*2001–3000*	*3001–5000*	*5001–10000*	*10001–25000*	*Over 25000*	*Total*
0	60.0	64.8	59.6	49.6	47.8	44.9	38.4	50.8
0–3	28.2	22.3	21.3	27.0	27.4	28.1	35.1	26.8
3–6	8.6	8.3	12.9	13.4	14.6	11.9	17.2	12.8
6–9	1.4	2.6	3.7	6.1	5.3	6.6	5.4	5.0
9–12	0.9	0.5	1.8	1.5	2.4	4.2	3.9	2.3
12–15	0.9	0.5	0.7	1.3	1.2	1.1	0	1.0
Over 15	0	1.0	0	1.0	1.3	3.1	0	1.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

with incomes lower than Rs 3500 per month. Even though price elasticity for bus fares has been reported at 0.08 (Dheerasinghe *et al.* 1995), it is argued by Kumarage (2000) that while this is the average for all passengers, for the lower income groups, the price elasticity would be much higher. This means that the increase of bus fares will have a severe impact on some households with low incomes, unless affordability of such households was considered in the setting of those fares.

In the higher income groups, the amount in terms of percentage spent on public transport is lower, thus reducing the impact that bus fares have on their expenditure. Thus financial affordability of fares is less of an issue for non-captive passengers particularly those in households having incomes over Rs 10 000 per month. In Table 3, it can be seen that such households spend more on modes of private transport than public transport (Kumarage 2000).

An interesting observation can be made from these tables, that if it is intended that those in the higher income groups are to be attracted to public transport (say in order to reduce traffic congestion or air pollution or reduce overall cost of transport), then it is the quality of bus transport, rather than lower fares that will be the deciding factor. This feature can also be labelled as affordability—more specifically time affordability. Arising from the concept that passengers determine travel based on both financial and time budgets, the higher income groups may be served by ensuring time affordability as much as the lower income groups could be served by ensuring financial affordability.

Efficiency and cost of bus operations

A 'fares policy' must recognize the need to have a scientifically determined basis of calculating the operating cost of buses. The cost of bus operations, if indexed to costs on inputs such as price of fuel, wages, and spares, can be then used for conveniently calculating the variations to costs at different points in time for different routes at different levels of quality and efficiency. This can be called a cost index.

Constructing the cost index

A cost index should be sensitive to the changes in the operating cost of bus service due to changes in the cost components, so that it can be used as a guiding indicator to revise bus fares whenever it is deemed necessary. The index is thus a weighted average of all the individual cost inputs. Accordingly, a cost index is a composite index of all the components of costs under different operating conditions.

This paper sets out the construction of a cost index as a sequential process. The details of each of those stages are summarized below. The first in this process is to identify the different cost components of operating a bus and the many factors affecting the variation in those cost components. The Bus Fares Policy Report (2001) has identified 12 such components for calculating the operating cost of providing bus services in Sri Lanka (National Transport Commission 2001). These components are identified in Table 4.

The second aspect is that the operating cost can also vary according to the different operating conditions, such as type of the bus, type of the route, and speed. Among those different conditions, the type of route has been identified as the prime factor, which affects the costs. For example, road conditions in Sri Lanka are not uniform and hence, fuel consumption varies. Similarly, the passenger demand of different routes varies so that the type of bus required to serve different routes also varies. There are several such dimensions, such as service type, operable days per month, distance, speed, type of bus, and age of bus that determine operating cost on a given route. By considering variations of operating and demand conditions, 10 typical route types have been identified for calculating the costs.

In the process of developing the cost index, the costs of inputs too have to be clearly understood. These in terms of unit prices

Table 4 Bus operational cost for May 2001 by route type and composite (Rs/km)

Operational cost	*Long distance (low country) (A)*	*Long distance (low country) (AC) (B)*	*Long distance (up country) (C)*	*Long distance (up country) (AC) (D)*	*Regional (E)*	*Urban line haul (F)*	*Urban line haul (AC) (G)*	*Urban cross town (H)*	*Urban feeder (I)*	*Rural (J)*	*Weighted composite (A–J)*	%
Fuel cost (diesel)	7.39	8.22	7.81	8.61	7.69	8.57	8.71	9.28	9.67	8.46	8.47	27
Crew cost	3.90	3.76	5.31	5.18	5.26	8.23	6.62	9.93	12.03	6.45	6.97	22
Service and lubricants	0.80	1.17	0.82	1.19	0.81	0.81	1.11	0.80	0.79	0.80	0.82	3
Tyres and tubes	2.51	2.51	3.36	3.36	2.80	2.49	2.48	2.52	2.53	2.85	2.59	8
Air-conditioner (maintenance + overhaul)	0	0.34	0	0.35	0	0	0.26	0	0	0	0.04	0
Repairs	3.86	3.86	3.94	4.02	3.56	3.83	3.46	4.16	4.40	3.32	3.63	12
Daily overheads	0.02	0.02	0.02	0.02	0.04	0.10	0.08	0.15	0.48	0.16	0.13	0
Monthly overheads	1.05	1.06	1.17	1.19	1.25	1.93	1.67	2.57	3.02	1.73	1.75	6
Annual overheads	0.60	0.62	0.67	1.64	0.47	0.58	0.63	0.59	0.50	0.39	0.53	2
Depreciation of bus	3.62	3.78	3.63	3.80	3.64	3.60	3.02	3.63	3.65	2.49	3.24	10
Financing of bus	4.38	4.62	4.90	5.18	3.16	3.50	4.42	2.96	1.67	2.17	2.98	9
Provision for risk	0.57	0.60	0.64	0.67	0.41	0.46	0.57	0.38	0.22	0.28	0.39	1
Total cost	28.70	30.56	32.29	35.20	29.10	34.10	33.02	36.58	38.96	29.11	31.54	100

as applicable for different input items have been identified. After identifying all aspects of determining the cost of operating the bus service, the selected 10 route types are examined with 12 components of cost. The methods of estimating each cost component (e.g. fuel consumption under different route type and bus type) are scientifically determined in this process. For example, the fuel cost is calculated through a process of regression based on empirical data and given by the equation

$$\frac{f_{ac}}{\left[\left(0.15+\frac{2.75}{V}+0.000025V^2\right)\times\left(\frac{7000}{T}\right)^{0.3}\right]}$$

where
V is the route travel speed measured in travel time terminal to terminal including halts, but excluding the terminal loading time and stops for meals;
T is the tare of the bus measured in kilograms; and
the factor f_{ac} is the fuel adjustment factor for air-conditioned buses. This is taken as 0.85 for air-conditioned service routes.
The cost of fuel consumption per kilometre is calculated by dividing the unit cost of diesel by the fuel efficiency, given by the formula:

Fuel cost (Rs/km) = Cost of diesel (Rs/litre) / Fuel efficiency (km/litre)

Based on this, the operating costs of the 10 representative routes for May 2001 are given in Table 4. It can be seen that the cost per kilometre varies from Rs 28.70 for a low country long-distance route to Rs 38.96 for an urban feeder route.

Composite cost index

Since there is only a single fare structure implemented in Sri Lanka (i.e. distance based and varying for mountainous terrain), it is necessary to arrive at a single index to calculate a weighted national operating cost. This has been done as a composite index based on averaging the 10 different cost scenarios using a weight according to the number of buses operating on each of the 10 representative route types. This is the final stage of computing the cost index. Table 4 shows the composite cost as Rs 31.54 per kilometre.

Fare structure and anomalies

The fare structure in Sri Lanka is based on fare sections. Each route has its fare sections. The basis of setting sections on each route has evolved over time. In the first instance, it is based on fares that existed at the time of nationalization. These were never synthesized or rationalized at any time. Thus anomalies exist between routes quite similar in nature. For example, one suburban route may have six fare sections over 12 kilometres, whereas the other would have eight sections for the same distance. In the second instance, the fare rate applied to each section is uniform irrespective of the type of route. For example, the fare structure recognizes one section as approximately 2 kilometres. This does not vary with the type of route, even though the cost varies considerably.

This has caused several anomalies in the fare structure and results in some routes having to cross-subsidize other routes. The fare structure not been linked to actual cost of operating a route was not an issue during the state monopoly as it was considered only an internal revenue transfer. However, with the arrival of the private sector, this meant that routes had different margins as the fare allowed and costs were not matched. This too has contributed to underpriced routes having higher loading and overpriced routes attracting more buses than required.

The different fare structures need to be rationalized with the cost of providing these services. The fare structure also depends on the level of quality that is desired. This was determined by using the cost index and a process of trial and error whereby the adjustments to the fare structure required to level the cost–benefit return on the different routes at a given level of efficiency were found to be as follows.

- *Normal fare structure* One section is set at approximately 2 kilometres.
- *Luxury service factor* A factor of 2 (double of normal) should be applied for luxury services, which have seated only passengers, terminal-to-terminal non-stop travel, and air-conditioned cabins.
- *Up-country factor* In determining fare sections, those routes that are at elevations of over 600 metres require a 17% surcharge on costs. This can be achieved by proportionately reducing the distance per section by 17% so that section lengths in the up-country routes are 1.7 kilometres instead of 2 kilometres.

- *Mid-country factor* In determining fare sections, those routes that are at an elevation of between 300 and 600 metres will have a 11% surcharge on costs. This can be achieved by proportionately reducing the distance per section by 11% so that section lengths are 1.8 kilometres instead of 2 kilometres.
- *Rural services* In order to ensure cost recovery of rural operations caused by a combination of increased costs and reduced revenue due to lower population density and demand, a general surcharge of 30% appears necessary. This also can be achieved by reducing the length of section or by the provision of a subsidy for such routes, as is the practice today.

External benefits and operator subsidy

The Bus Transport Policy 1998 introduces the concept of the *Allowable Fare* (Ministry of Transport and Highways 1998). This is defined therein as 'the maximum fares level that an operator is allowed to charge from a passenger'. This is ideally to be decided by the government after consideration of the fare level at which the working class people can afford to pay. However, if a route requires a higher level of fare for commercially viable operations, then the government may consider a fare subsidy. The alternative that is practised by default is that such routes are overloaded and are provided with a lower quality of service. The quality of services is often so poor that passengers hardly receive a service of any value.

Fare subsidy can then be defined and recommended when there is a difference between the commercially viable fares and allowable fares. When fares are regulated by the government, then this subsidy is payable by the government to operators—both private and public. This is even at present practised in Sri Lanka and continuing fare subsidies may be justified in situations where the bus service provides economic benefits to society through externalities for which the operator is not compensated. For example, in a metropolitan area, as congestion increases and road space becomes scarce, the benefit of bus transport arises as a space-efficient mode of transport.

Mechanisms for fare revisions and elimination of anomalies

Fare revisions should be rationalized and made systematic for a number of reasons. Such a mechanism, if reasonable, transparent,

and accepted by both the passengers and operators, may also protect politicians from adverse public opinion and at the same time protect the bus industry from politicians and unwarranted control they may attempt to impose on the industry in the pursuit of short-term benefits. It also removes unnecessary bargaining and discussions that are most disrupting to smooth bus operations and the excessive canvassing that goes on prior to a fare increase that is generally detrimental to the passenger and the industry in the long term. Such a transparent mechanism requires the following steps.

- A cost revision
- A fare revision
- A fare anomaly adjustment plan
- A subsidy plan.

Using the cost index for cost revision

A very important characteristic of the index calculation is to treat the index value as 100 for the base period. If the base period used is set as May 2001, then the cost may be calculated at any subsequent time and expressed as an index value where the operating cost (e.g. Rs 31.54 in Table 4) was set to an index of 100. The change of this index due to changes in any of the 12 cost components can be taken as a representative change in the cost of operating the bus at that point in time for a given route, service or for the entire network.

This weighted operating cost can be calculated at any point in time by ascertaining the prices of the inputs at that point in time. All 12 cost items shown in Table 4 may be linked to the cost index using unit prices or price levels such as the CPI (Consumer Price Index) or the exchange rate for the US dollar. In this research, these indices have been analysed with respect to each cost input over the time period 1958 to 1997. The index that has the best fit for each cost component is given in Table 5. For example, the crew wages are found to be linked with CPI, while cost of buses is indexed to the US dollar, while fuel is at market prices.

Constructing the fares index

The fares index may be constructed taking into account the fare profile of each route in terms of the percentage of passengers travelling different distances. That is the distribution of the various ticket denominations. The fares index must ensure that the

Table 5 Indices for revision of bus operation cost calculations

Fuel cost (diesel)	Diesel at market price
Crew cost	Wage rate at CCPI
Service and lubricants	Oil at market price, filter at dollars, servicing at CCPI
Tyres and tubes	Both at market price (CEAT new, DAG rebuilt)
Air-conditioner	Repair, refill at market prices
Repairs	Parts at dollars, labour at CCPI
Daily overheads	All Items at market prices
Monthly overheads	All Items at market prices
Annual overheads	All Items at market prices
Depreciation of bus	Value of bus at market price
Financing of bus	Treasury bill rate + prime lending rate
Provision for risk	Fixed percentage

cost of operating the route is recovered from passengers (unless a subsidy is provided) so that the BCR (benefit–cost ratio) for different routes is around 1. This is calculated by taking the number of passenger boardings per trip and the fares collectable from the passengers based on the boarding profile for that route. The BCR can then be calculated for each type of route where the revenues are given as a percentage of the costs of operating the service. Table 6 shows that at the present fares, some routes have BCRs much greater than 1 whereas other routes have routes that have BCRs much lower than 1.

It was found that in Sri Lanka, the short-distance urban routes (usually less than 4 kilometres in length) have a large

Table 6 Benefit–cost ratio for different routes at existing fare structures

Route	*Benefit–cost ratio*	*Load factor*
Long distance (low country)	70	157
Long distance (low country) A/C	83	108
Long distance (up country)	62	177
Long distance (up country) A/C	76	119
Regional	78	141
Urban line haul	94	112
Urban line haul A/C	96	89
Urban cross town	97	108
Urban feeder	135	78

financial surplus, while long-distance, regional, and rural routes have a BCR of less than 1 resulting in loss-making operations. However, surpluses do not in practice remain so in the long term, as more operators are drawn until oversupply results. This pushes down the productivity of buses until equilibrium is reached. This highlights the need for vigilance, awareness, and the ability to calculate the supply level by the regulatory authorities so that oversupply of routes does not occur. As stated earlier, the routes that are unable to cover costs resort to overloading and scouting for short-distance passengers—a more lucrative option. Thus even longer-distance buses slow down and stop incessantly thus reducing the quality of carriage of passengers in their attempt to cover costs.

A fare anomaly adjustment plan

The next most interesting discovery made in the analysis was that the route-wise BCRs are mostly influenced by the unit charge that is levied on bus passengers. If this is calculated in terms of a fixed charge known as the 'step on fare' levied for boarding and a variable cost calculated as a per-kilometre cost, the present fare structure takes the following form.

- Step on fare equivalent of 5 kilometres at 52 cents per kilometre plus,
- Up to 4 kilometres at 52 cents per kilometre
- 5 to 14 kilometres at 50 cents per kilometre
- 15 to 29 kilometres at 22 cents per kilometre, and thereafter
- Over 30 kilometres at 28 cents per kilometre.

This appears quite irrational as the marginal unit fare decreases and then increases with distance. The investigation of benefit–cost analysis of different types of operations shows that the discrepancies in the present BCRs of different routes exit when the following fare structure exists.

- Step on fare – 3 kilometres (at x cents per kilometre)
- Up to 4 kilometres – say x cents per kilometre
- 5 to 14 kilometres – 0.9 times x cents per kilometre
- 15 to 29 kilometres – 0.75 times x cents per kilometre
- Over 30 kilometres – 0.65 times x cents per kilometre.

This follows a systematic formula where the unit charge for a kilometre reduces with the distance of travel.

Adjustment for improving load factors

Fares could also be used as an instrument for improving quality, especially load factors. The fare revision should be based on a gradual improvement of load factors so that every year the cost of bus operations is made on a marginally improved load factor. This will provide a BCR at a lower load factor than the previous year. In fact there could be even a performance indicator tied to the fare equation, where such a component could be added only if the previous year's target load factors are achieved.

Subsidy plan

The subsidy payments should also be calculated based on the increase in costs. If subsidy payments cannot be increased, it may be necessary to cut back services, rather than lower quality of all such services.

Summary of fare revision procedure

Taking into account the above observations and conclusions, when a fare revision is to be made the following procedure could be adopted.

- The cost of bus operation is revised using the cost index.
- The increase in the average operating cost is applied to the fares to obtain the revised fares. That is, the cost index is equated to the fares index.
- The BCR of the different types of routes is brought closer to 100% by gradually eliminating anomalies that may exist.
- Load factors are gradually reduced whereby year on year an extra amount is given for improvement of load factors based on the previous year's performance.
- Bus fares should be annually revised and be published by a set date (e.g. the 1 July every year).
- All public service obligations (e.g. subsidy payments) should also be revised annually and payments changed accordingly.

Table 7 shows a sample calculation of bus fares for three years based on the above procedure at an assumed 10% increase in costs.

Conclusions

The paper arrives at the conclusion that the lack of a fares policy has been a primary factor in the lack of development in the bus industry in Sri Lanka. Deterioration of quality of services in

Table 7 Application of the Fare Revision Policy (2000–04)

Step on factor (equivalent km)			5	4	3	3	3
Luxury fare factor			2	2	2	2	2
Mid-country factor			1.11	1.11	1.11	1.11	1.11
Up-country factor			1.17	1.17	1.17	1.17	1.17
Rural factor			1.1	1.3	1.3	1.3	1.3
Year		*Present*	*1st Inc*	*2nd Inc*	*3nd Inc*	*4th Inc*	
Stages	*km*	*2000*	*2001*	*2002*	*2003*	*2004*	
1 to 2	0 to 4	52	59	65	70	80	100pc
3 to 7	5 to 14	50	59	65	65	72	90pc
8 to 15	15 to 29	22	32	40	45	60	75pc
16 and up	30 and up	28	32	36	40	52	65pc
Cost increase (%)			9.0				
Fare increase (%)			10.5	10.3	11.0	10.9	
Balance for quality improvement (%)			1.5				
Load factor (%)		117	109				

					New fare (Rs)			
Stage	*km*	*% of tickets*	*Present 2000*		*1st Inc 2001*	*2nd Inc 2002*	*3rd Inc 2003*	*4th Inc 2004*
1	1.5	16.0	3	3	3	3	3	4
2	3.5	18.0	4	4	4	4	5	5
3	5.5	13.0	5	5	5	5	6	6
4	7.5	10.0	6	6	6	7	8	8
5	9.5	8.0	7	7	8	8	9	9
6	11.5	5.0	8	7.50	9	9	10	11
7	13.5	4.0	9	9	10	11	12	12
8	15.5	4.5	9	10	11	12	13	13
9	17.5	4.3	10	10.50	11	13	14	14
10	19.5	2.6	10	10.50	12	13	15	16
11	21.5	1.0	11	11.50	13	14	16	17
12	23.5	0.9	11	11.50	13	15	17	18
13	25.5	0.9	12	12	14	16	17	19
14	27.5	0.8	12	12	14	17	18	20
15	29.5	0.8	13	13	15	18	19	21
16	31.5	0.5	13	13	15	18	20	22
17	33.5	0.5	14	14	16	19	20	23
18	35.5	0.5	14	14.50	17	20	21	24
19	37.5	0.5	15	15	17	21	22	25
25	48.5	1.0	18	18.50	21	25	26	31
35	68.5	1.2	23	24	27	32	34	41
45	88.5	2.0	29	30	34	39	42	52
60	119.5	4.0	38	39	43	50	55	68
Weighted fare index		99.9	90		100	110	122	136

particular and interference by elected representatives in non-policy matters appear to arise from the non-existence of a well-formulated fares policy. It has been concluded that this deficiency has given rise to different problems under different periods of management of bus operations in Sri Lanka. During the period of state monopoly, it led to low fares, underinvestment, and eventual high load factors. Under mixed competition, it has given rise to high fares, followed by oversupply and low utilization and increasing load factors

This paper sets out a 'fare revision policy' for the bus sector in Sri Lanka. It is based on a historical analysis of costs and fares and sets out an index of costs that can be revised when the prices of inputs change. A fares index is also computed based on predetermined levels of efficiency in resource utilization and quality of service so that a BCR of 1 is reached when a fare revision is reached. The paper also suggests procedures for adjustment of existing fare anomalies and for the computation of subsidy payments.

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