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TITLE: Public transport safety in four emerging nations

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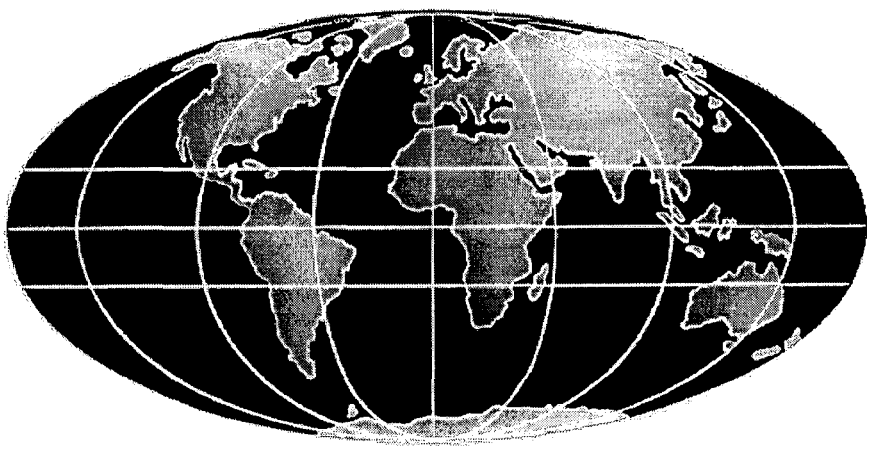

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Public Transport Safety in Four Emerging Nations

By

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Public Transport Safety in Four Emerging Nations

ABSTRACT: Countries of the developing world are characterised by rapid urbanisation, high growth rates in traffic and congestion and decreasing regulation of public transport. Because the majority of the developing world's inhabitants are dependent on public transport services for their mobility needs, the need for safe, effective and efficient public transport is essential to ensure adequate and affordable accessibility and the continuing sustainable development of livelihoods in the rural and urban sectors. The paper highlights the operational environment of the public transport sector in Nepal, India, Tanzania and Zimbabwe, the extent of accidents involving public transport vehicles and their likely causes. Finally, recommendations are made to reduce both the severity and number of public transport accidents.

1 Introduction

Worldwide, there are estimated to be approximately 1 million road accident fatalities and 10 million people injured annually, many with long term disabilities (World Health Report (1999) Tables 2 and 4). Almost 70 per cent of these occur in the developing or emerging world. Whilst there is a general decline in the number of fatalities in industrialised countries the opposite is true elsewhere. If account is taken of levels of motorization by expressing accident statistics as rate per registered vehicle, then less developed countries (LDCs) have rates at least 10 to 20 times higher than the best industrialised countries. The worst countries in these terms have fatality rates 100 times higher (Ghee et al 1997) as shown in figure 1.

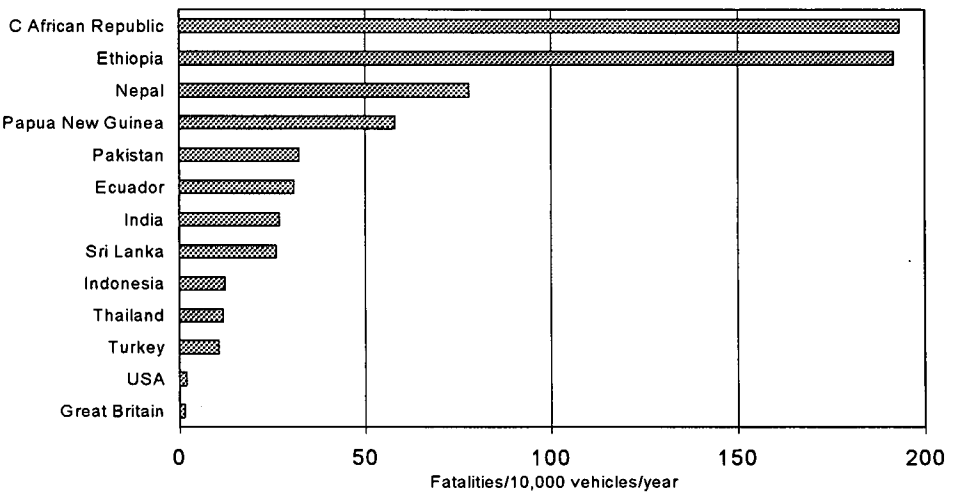

Figure 1 Fatality rates for selected countries

Considerably higher proportions of those (reported as) injured in road accidents consequently die from their injuries in the developing world compared with industrialised countries. Thus, not only is the proportion of people injured per vehicle very high, but also the death rate is higher in developing countries.

Fouracre and Jacobs (1976) calculated that, for any country, the cost of road accidents was equivalent to approximately one percent of its Gross National Product (GNP) although currently it is thought to be between one and three percent. However, using the 1 percent figure gives an estimated annual global cost of road accidents of the order of US$230 billion, with the cost to LDCs being around US$36 billion, a sum that they can ill afford.

Countries throughout the developing world are characterised by rapid urbanisation, high growth rates in traffic and, consequently, congestion and decreasing regulation of public transport. Because the majority of the developing world's inhabitants are dependent on public transport services, the need for safe, efficient and effective public transport services is essential to ensure adequate and affordable accessibility, for sustaining livelihoods and rural and urban development.

The Transport Research Laboratory (TRL), funded by the British Government's Department for International Development (DFID) Knowledge and Research (KAR) Programme, is currently evaluating the safety and roadworthiness of public transport vehicles. The work assesses the scale of the problem and the effect of varying maintenance practices on bus fleets' roadworthiness. The effects of accidents on passenger comfort and safety are also being investigated and recommendations developed for safer public transport services.

The 3 year study, which commenced in July 1997, is being undertaken in a number of countries which are assumed to be representative of the developing and emerging nations. Studies have already been undertaken in Nepal, Zimbabwe, Tanzania and in the Indian State of Maharashtra. Thailand will be the last country to be studied.

This paper aims to establish the current operational environment of the public transport sector in each of the countries, the extent and the likely causes of bus accidents. Accident data have been collected from official sources in the countries and interviews undertaken of police, bus owners, operators, drivers, conductors, passengers and associations to obtain opinions as to the causes of bus accidents. In addition, vehicle condition and driver behaviour were monitored by teams from universities. Conclusions and recommendations are discussed to reduce both the severity and number of public transport accidents in the future.

2 Nepal

2.1 Background

The first bus services in Nepal commenced in 1957 and since then the fleet has grown substantially, especially since 1992. By 1996 there were a total of 7800 conventional buses and 2752 minibuses operating public transport services throughout the country (Maunder et al 1998).

About 95 per cent of buses are owned and operated by the private sector, the remaining 5 percent being owned by the public or semi-public sector. Although vehicles are mainly operated on an individual basis, the "Dial system" predominates as Associations or Syndicates manage routes on behalf of owners. The "Dial system" ensures equal operational trip making for each operator in the Association/Syndicate, as vehicles have to wait in a queue prior to departure. It does however, constrain the number of trips made by each bus. Thus although the supply of permits is liberalised, the actual provision of services is constrained by what amounts to a cartel in districts throughout most of the country. In addition, owners who do not belong to an Association or Syndicate frequently encounter operational difficulties at bus parks.

Vehicles of 6 years or less are operated on long distance night services whereas vehicles aged over 6 years tend to be operated as local buses. The local buses tend to be used within and around urban areas but can include routes over some of the worst maintained roads in the country.

2.2 Accident rates

During the period July 1995-June 1996, a total of 3379 accidents were reported to the police nationwide (urban and long distance) with bus accidents representing 14% of the total. However the 479 serious bus accidents resulted in 365 fatalities and 1751 injured persons. The totals representing 39 percent of all road fatalities during the 12 month period and 60 percent of all road casualties (figures for the 18 month period of November 1996 to April 1998 are similar in terms of the percentage of bus accidents and fatalities). Bus accidents therefore represent a significant proportion of all road accidents and injuries in Nepal.

Figure 2 illustrates the predominance of injuries and accidents caused by bus only accidents in Nepal for 1995/6. Bus-only accidents are defined as those in which the driver loses control and the bus either leaves the road or overturns. These are the most frequently occurring bus accidents resulting in 71% of total injuries and 63% of fatalities. Of the remaining bus

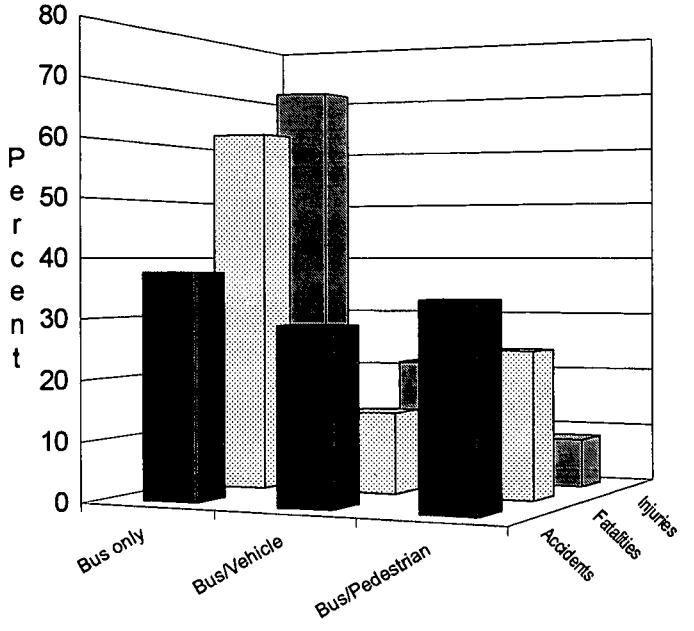

Figure 2 Bus accidents in Nepal [1995/6]

accidents, bus/vehicle collisions resulted in 21% of injuries and 14% of fatalities and bus/pedestrian 8% and 24% respectively. Unsurprisingly, pedestrians are very much at risk and are more likely to die than be injured if hit by a bus.

2.3 Probable Causes

From comments made by the diverse groups interviewed, the likely causes of bus accidents can be categorised as follows:

- Drivers and driving habits
- Vehicle condition
- Road condition
- Other factors

Data for the 18-month period [Nov 1996 - April 1998] recently analysed suggests that driver error was the major factor in 74% of bus accidents, external factors in 18% and vehicle condition in 8%.

Everyone agreed that one single factor was unlikely to cause an accident and that a combination of causes was the likely explanation. The factors raised in respect of drivers and their driving habits were:

- Ease of obtaining an Heavy Vehicle licence
- Lack of knowledge of the Highway Code and road
- Driver fatigue due to long working hours
- Overloading of vehicles to maximise revenue
- Night drivers consuming alcohol or drugs
- Speeding at night or for the road condition.

Because of the "Dial system", most buses are said to be overloaded at certain times on the route as drivers/operators attempt to maximise fare revenue. The queuing makes drivers wait around for hours in the bus park and, consequently, they are tired before driving as they do not sleep but sit around chatting in groups. Interviewees suggested that drivers worked excessive hours in order to make additional trips and obtain extra allowances. Drivers also mentioned the use of drugs and alcohol as ways to keep awake.

In terms of vehicle condition, factors included:

- Lack of maintenance due to cost
- Worn tyres and duplicate parts used to minimise costs
- Irrelevance of the Vehicle Fitness Test.

Surveys of vehicle condition noted that 65% of buses had one or more faults in terms of tyres, wheel fixings, and front/rear lights. Yet all had passed a Vehicle Fitness Test and were legally fit to operate. The condition of the vehicles gives cause for concern and the fact that all had Fitness Test Certificates illustrates the irrelevance of the scheme and the ease of obtaining a certificate whatever the vehicle condition.

The poor condition of roads resulting from deficiencies in maintenance, alignment, traffic signs and safety features were all identified as possible accident causes. Weak enforcement of traffic regulations and a lack of road sense by pedestrians in rural areas especially when herding animals on the road or generally crossing the road were also mentioned as contributory factors.

3 India

Public transport in India is characterised by a wide range of vehicle type from non-motorised modes such as cycle rickshaws to surface rail and metro. Both public and private ownership exists; the scale is immense with 64 public sector road transport undertakings operating a fleet in excess of 110,000 representing just 30% of the national bus fleet.

Because of the size of India [1/4 million reported accidents leading to 60k fatalities and over 1/4 million casualties in 1995] it was decided that the study should be restricted to the State of Maharashtra. Maharastra is in the West of India has a mix of manufacturing industry, agriculture and the bustling financial centre of Mumbai; it is one of the most prosperous states in India. During the period 1961-1996 the registered motor fleet grew by over 40 times whilst the road network increased by 3.5 times; thus the growth in vehicles far outpaced the quantum of road network and other infrastructure. As a consequence, over the two decades 1975/95 the number of road accident fatalities increased by 282% and injuries by 220% and so an average of 200 accidents were reported daily leading to 23 fatalities and 134 injured persons.

During 1991, 23% of accidents occurred on the State Highways that led to 38% of fatalities, State roads accounted for 14% and 27% respectively and other roads 63% and 35%. The

police attributed 66% of accidents and 80% of fatalities to poor driver behaviour. During the same year the registered bus fleet in the State accounted for 1% of the total motor fleet yet buses [including those from other States] were involved in 14% of reported accidents and 12% of fatalities.

Data for 1995 shows that buses and HGV's were involved in 35% of accidents, taxis cars and jeeps in 32%, two wheelers in 22% and other vehicles in 11%. Of these accidents the motorised vehicle driver was at fault in 51% of accidents, non-motorised drivers in 37% and other causes the remaining 12%

Data were obtained from the State-owned Maharashtra State Road Transport Corporation (MSRTC) which operates bus services throughout the State in competition with privately owned and Municipal operated bus companies. The MSRTC is the second largest operator in India with a fleet of 17,073 buses, employing 110,073 staff. It carries 7.5 million passengers a day. Figure 3 illustrates the survey responses of the bus management identifying primary causes of accidents involving its own buses, which during the operational year 1996/7 were involved in 4149 accidents and 688 fatalities.

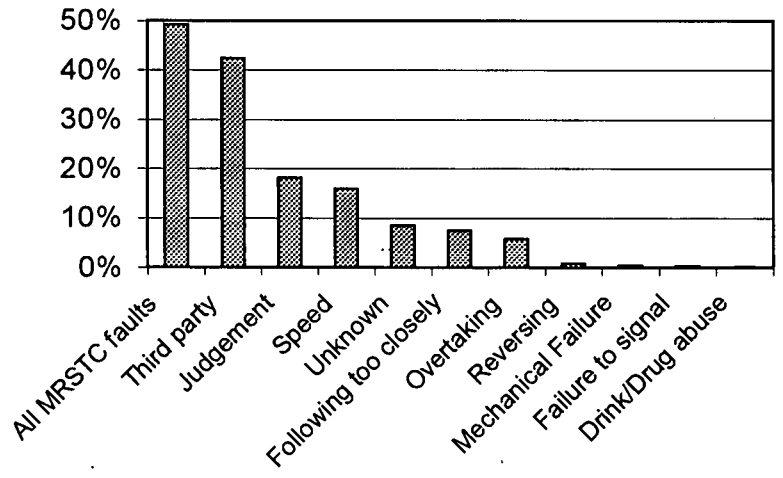

Figure 3 Primary causes of MSTRC bus accidents in Maharastra [1996/7]

The MSRTC bus driver was at fault for almost 50% of accidents with stated causes including 'inaccurate judgement, speeding, following to closely, reckless overtaking and reversing'. Fifty seven per cent of all accidents happened on a straight road and in 70% of cases the road surface was described as 'good'. Sixty nine per cent of accidents occurred in daylight and 78% in fine weather. Driver inexperience appears to be a probable cause as 37% were aged between 24 and 32 and 46% had been driving for less than 4 years.

3.1.1 Probable causes of all bus accidents

The opinions of the various drivers, conductors traffic police, passengers interviewed throughout the State suggested that the same probable causes relate to the Indian situation as they do in Nepal and for the same reasons. For instance, the transport sector is looked upon as an "employment generator" and so the result is that generally raw and untrained persons often having received little or no formal education are employed as drivers. Frequently, the minimum regulations for obtaining licences are not strictly implemented with touts operating outside the offices of RTO's offering licence renewal services. Many Driving Schools in the State offer training and the (guaranteed) granting of licences to learner drivers.

Most private sector buses are repaired and maintained in roadside workshops lacking adequate infrastructure and using duplicate parts to minimise costs. Public sector undertakings enjoy vehicle repair workshops but often these are not well equipped or maintained. Surveys of bus condition produced the results as illustrated in Figure 4.

The high percentage of vehicles without one or both windscreen wipers is alarming especially in view of India's monsoon weather conditions. Equally alarming is the near 50% of vehicles without brake lights, a fifth with at least one front light and approximately one third of vehicles surveyed with one rear light missing. Driving a bus on narrow badly maintained and unlit roads during the night, monsoon or thick smog without a comprehensive lighting system both at the front and rear of the vehicle is clearly dangerous. The other area of concern is that over a quarter of buses had one or more wheel nuts missing

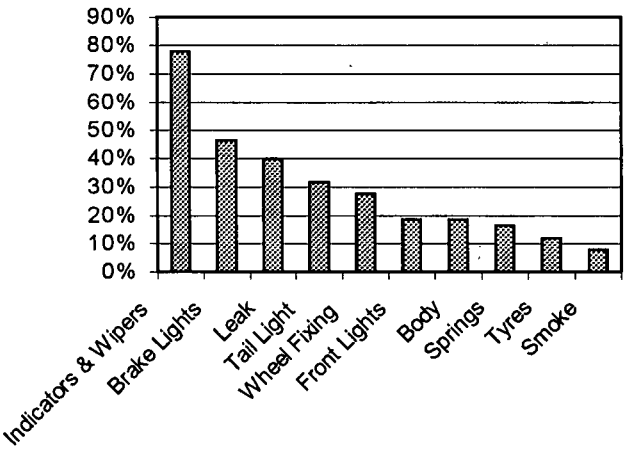

Figure 4 Faults identified during bus surveys in India [1997]

Other related issues include road users generally being unaware of traffic rules and regulations or ignoring them when negotiating the road network. Pedestrians frequently take potentially suicidal actions leading to drivers having to take evasive action and losing control of their vehicle.

4 Zimbabwe

4.1 Operational Background

Urban public transport services are provided by the Zimbabwe United Passenger Company (ZUPCO), now wholly owned by the government, which operates both conventional buses and minibuses (Maunder et al 1993). There are also privately operated commuter omnibuses, introduced in 1993, consisting of various vehicle types and capacity (Maunder et al 1993,1995,1996) which have been allowed to proliferate with few controls. Long-distance bus services (inter-city and rural) are provided by ZUPCO and the private sector.

4.2 Accident Statistics

The police collect accident data in Zimbabwe and the Zimbabwe Traffic Safety Board analyses the data and organises safety education and training programmes on behalf of the government. In 1992 there were a total of 27,150 reported accidents leading to 1,066 fatalities and 13,458 injured persons and by 1996 the totals had increased to 38,777, 1,205 and 18,070 respectively. Table 1 illustrates that, although most bus accidents [and consequently injuries] take place in urban areas, most fatalities result from long distance bus accidents.

	Bus accidents		Fatalities		Injuries	
Long distance/ Rural	1583	28%	69	74%	467	22%
Urban	4166	72%	24	26%	1607	78%
Total	5749	100%	93	100%	2074	100%

Table 1 Bus accidents in Zimbabwe [1996]

4.3 Probable causes of bus accidents

Police statistics of bus accidents in 1996 showed that 58% of bus accidents were classified as blameworthy [i.e. human error] and led to 76% of bus fatalities and 75% of injuries.

Clearly, driver misjudgement, including factors such as excessive and reckless speeding, following too closely, overtaking and reversing errors, failure to give way, etc, is the key element [82%] of blameworthy accidents as apportioned by the police in Zimbabwe with vehicle condition being responsible for 7% of accidents.

As in Nepal, a wide group of individuals and organisations involved in operating, regulating or using public transport services were interviewed as to their opinions of the causes of bus accidents. The same three broad categories evolved from the discussions embracing:

- Driver behaviour
- External factors
- Vehicle condition.

The most frequently quoted factors in respect of driver behaviour included reckless driving, inattention and a lack of judgement, speeding, driver fatigue and the use of unqualified and inexperienced drivers. One long distance operator suggested that "speed is used as a marketing tool" whereas in urban areas "speed is used to maximise earnings". In addition, liberalisation has led to unrestricted numbers of commuter omnibuses in urban areas, in order to maximise their profitability, consideration for other road users is sacrificed for speed and so driver behaviour remains poor.

External factors include road conditions, stray animals, weak enforcement of regulations and adverse weather such as during the rainy season. Observations of vehicles showed that vehicle condition is generally satisfactory and that genuine spare parts are utilised.

5 Tanzania

The organisational structure of the bus industry in Tanzania can broadly be categorised into urban operations and long-distance [including rural services].

5.1 Urban Buses

Urban operations presently comprise conventional buses and minibuses [Daladalas]. The fleet of the state run bus company, "Usafiri Dar es Salaam (UDA)", has dwindled and now comprises few conventional buses and minibuses.

Daladalas operate in almost all municipalities throughout the country. The fleet is diverse in both type and capacity but most have a passenger capacity between 16 - 36. On most routes the Toyota Hiace with a capacity of 16 passengers dominates. The routes operated range from less than 3 kilometres to long routes of approximately 30 kilometres, the latter being peri-urban routes. Services are not scheduled and vehicles only leave a rank when they are full. Daladala drivers usually start work at approximately 0430 - 0500 and finish at 2300 - 2400.

Most drivers employed in the Daladala business are young and staff turnover is very high. Driver remuneration is generally not fixed but is commission based. Some operators stipulate revenue targets to be achieved by their drivers. Both methods of remunerating the Daladala drivers encourage speeding, overtaking, poor parking and frequent vehicle stoppages to pick up or drop passengers on their way to anticipated destinations.

The majority of Daladala operators have an operating fleet of less than 15 vehicles and lack proper maintenance facilities or programmes. Vehicle maintenance for minor repairs is carried out at backyard workshops. Major repairs are undertaken at external workshops, the majority of which belong to friends. The operators alleged that they do not undertake vehicle services regularly due to the high costs of servicing and spare parts. During the study it was found that UDA undertake routine maintenance regularly; whilst major repairs or vehicle services are undertaken quarterly. The difference between the Daladala operators and UDA is stark.

5.2 Long Distance Buses

The Tanzania trunk road network has a total of 3306km of paved roads and 6290km of unpaved roads. The routes operated on trunk roads are long with the longest within the country being Dar es Salaam to Bukoba, approximately 1425 km. Most routes have their origin or destinations in a city/ town. The services operated are:

- Inter-regional, which are services between cities/towns within the country on paved and gravel roads
- Urban-rural comprising a high proportion of services on gravel roads
- Cross-border services

The most common buses are 45 - 65 seat capacities. The majority of successful long distance operators have a proper maintenance programme and an average fleet size of less than 10. Minor repairs are undertaken daily or after long distance buses reach their destinations. Major repairs and services are undertaken weekly for some companies or after 25,000 kilometres for other companies.

The operational environment for long distance services changed recently. Quantity and fare controls on routes have been liberalised and entry into the industry is now very much dependent on the roadworthiness of the vehicle.

Driver turnover is very high as some long distance drivers now prefer to drive Daladalas in urban centres, as they realise that income opportunities are better despite the lack of job security. Due to the increased number of passenger fleet over the last two years, buses compete for passengers by employing touts who often force passengers to board buses not of their choice. It is also alleged that, buses race against each other in order to pick up intermediate passengers along the route. On the other hand, the competition for passengers has resulted in some operators introducing semi-luxury and luxury coaches on selected routes to attract more passengers.

5.3 Accident Statistics

The total number of reported accidents increased from12595 in 1993 to 14335 in 1997 i.e. by 14%. The total number of fatalities increased each year from 1993 to 1996, but declined by approximately 10% to 1625 in 1997. Measurable injuries have remained at a fairly constant level compared to reported accidents. It should be noted that national figures for 1998 have

shown a decline; it is likely that this is due in part to the effects of the global recession as well as increased safety awareness and enforcement.

5.3.1 Bus Accident Statistics

Despite difficulties in collecting data during this study it proved possible to obtain accident fatalities and casualties by vehicle type from Traffic Police records for two complete years, i.e. 1997 and 1998 by manually collating and analysing the data. Table 2 summarises the accident data by vehicle type for 1997 and 1998.

Vehicle Type	1997			1998			Average (97/98) % distribution		
	Vehicles involved	Fatalities	Injuries	Vehicles involved	Fatalities	Injuries	Vehicles involved	Fatalities	Injuries
Private Cars	8903	425	3452	8485	361	3251	50.7	24.5	28.0
Pick-Ups	2814	325	2610	2682	312	1668	16.0	19.8	17.9
PSV Buses[1]	54	242	1974	52	274	2197	0.3	16.1	17.5
PSV Daladala	4140	364	2615	3946	380	2395	23.6	23.2	21.0
Private Hire	27	5	115	26	4	192	0.2	0.3	1.3
HGVs	731	75	575	696	68	516	4.2	4.5	4.6
Motor Cycles	433	122	689	413	97	594	2.4	6.8	5.4
Pedal Cyclists	460	67	460	438	87	568	2.6	4.8	4.3
TOTAL	**17562**	**1625**	**12490**	**16738**	**1583**	**11381**	**100%**	**100%**	**100%**

Table 2 Road accident statistics, Tanzania [1997/8]

In total, conventional buses and Daladalas accounted for 24% of vehicles involved in accidents during 1997/98 but generated 39% of fatalities and injuries [see figure 5]. It can be calculated that on average each long distance bus involved in a road accident resulted in 5 fatalities and 39 injuries while the approximate unit fatalities and injuries for other vehicle classes are insignificant. Within the public transport sector, long distance buses represented 1.3% of vehicles involved in accidents and accounted for 41% of fatalities and 45% of injuries whereas Daladalas represented nearly 98.7% of vehicles involved in accidents and accounted for 59% and 55% respectively. This indicates the lower severity of urban road accidents.

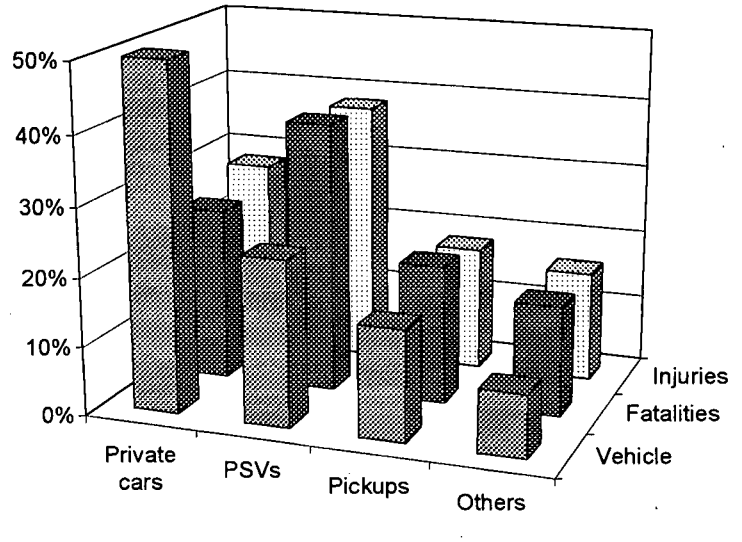

Figure 5 Casualties by vehicle class, Tanzania [1997/8]

[1] It should be noted that, in general, PSV Buses are used for long distance work while PSV Daladalas are used on urban routes.

5.4 Probable Causes Of Road Accidents

5.4.1 Findings from Police Records

The police are not informed of all accidents involving personal injury, especially when minor injuries are involved, and so only fatal accident reporting is complete. Figure 6 presents information obtained from the Traffic Police records, as to the causes of road accidents in Tanzania from 1993 to 1997. The causes of all road accidents [bus accidents reflect the same trends] can be divided into three main categories:

- Human factors = 76%
- Vehicle condition = 17%
- External factors = 7%

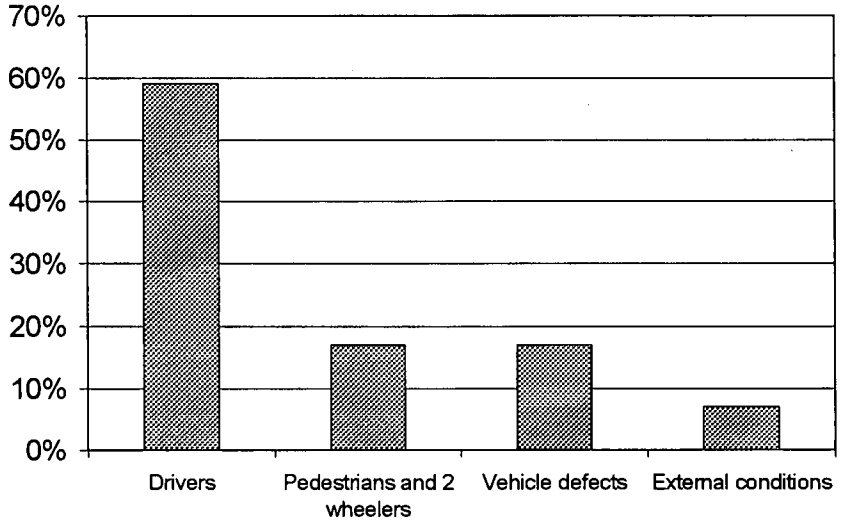

Figure 6 Causes of road accidents, Tanzania [1993-97]

5.4.2 Public Perception of Bus Accidents

A questionnaire survey of 200 randomly selected passengers and drivers of Daladala and long distance buses and interviews of 20 major organisations involved in the public transport industry were carried out in order to ascertain public opinions and perceptions.

It is clear, from both passengers and drivers, that long distance buses are erroneously perceived to have more accidents than Daladalas. Some passengers and drivers also indicated that urban bus accidents are not as serious (i.e. do not result in high rates of casualties/ fatalities) as long distance bus accidents due to lower speeds. One explanation as to why the majority of passengers and drivers think that long distance buses have more accidents than other modes of transport may be due to the fatality rate and the wide reporting of such accidents in newspapers and television. On the other hand, professionals and operators interviewed were correctly of the opinion that urban buses have a higher accident rate. This accident rate [up to 20 times more likely to be involved in an accident than long distance buses], however, results in a lower casualty rate of 0.1 fatalities and 0.6 injuries per accident compared to an average of 5 fatalities and 39 injuries per long-distance bus accident.

The perceptions of all interviewees were that human errors are the principal contributory cause of accidents. The causes of bus accidents as revealed by both sets of respondents can therefore be divided into four main categories as shown below:

- Human factors
- External factors
- Vehicle condition
- Lack of enforcement

5.4.3 Human Factors

The human factor is perceived to be the principal cause of most bus accidents. However there are a number of subfactors within the human factor, which were mentioned by both sets of respondents, and these are listed below.

- Misjudgement
- Alcohol and drugs
- Reckless driving
- Overloading
- Parking errors
- Driver fatigue
- Careless pedestrians, passengers, cyclists and cart pushers

The travelling public blames deregulation of the public transport system for the increased number of accidents occurring on both urban and long distance services. Inevitably this has led to an increase in the number of buses servicing the network although demand has not similarly increased.

Reckless driving, speeding and driving errors were cited as the most common causes of bus accidents in respect to long distance and urban buses. For instance, one of the long distance fatal bus accidents that killed 19 passengers and injured 13 others in Moshi in 1996, was attributed to reckless driving when the 65-seat bus collided head on with another bus.

Some respondents revealed, ironically, that some passengers encourage drivers to speed without considering the increase in accident risk. However, other drivers use speed as a marketing tool to encourage passengers to travel in their buses. Consequently, buses compete for passengers by speeding.

Other factors contributing to accidents include poor parking and stopping of Daladalas, little respect for other drivers shown by Daladala drivers and the influence of drugs and alcohol used to combat tiredness.

The contribution of human error in causing accidents is not only confined to drivers. Passengers and pedestrians also contribute to accidents. It is common for passengers to try to disembark from a bus while it is in motion or to distract the attention of the driver. Pedestrians, especially in the rural areas, are also not very conversant with traffic regulations.

Some fatal bus accidents may occur when drivers take irrational decisions and attempt to cross flooded rivers. For instance, the road accident said to be the worst in recent history occurred in 1998. The accident claimed the lives of about 70 passengers and more than 25 were injured when a bus they were travelling in was swept away by floods overflowing a bridge on the Segera-Tanga road. The bus was supposed to carry 65 passengers but was considerably overloaded (95+). Drivers are often encouraged by passengers to cross flooded bridges and as a result often make errors in judgement resulting in the bus being washed away.

In brief, human error is perceived by most respondents to be the main cause of bus accidents in Tanzania. The survey findings are therefore consistent with police records on causes of bus accidents in Tanzania.

5.4.4 External Factors

The external factors mentioned by both sets of respondents, include:

- Poor road condition
- Poor road engineering and alignment
- Lack of road signs and markings
- Intermittently operating traffic signals

There are signs that the existing infrastructure is being overloaded as the number of vehicles increase. Many roads outside urban areas are in a very poor state of repair. Even those in the urban areas are frequently narrow, ill maintained and lack adequate bus stands. A number of bridges on roads outside urban areas are also very narrow and can only accommodate one vehicle at a time. Potholes and sandy soils on roads were also mentioned as contributing factors. Both individuals and organisations appeared to share the consensus that there is a lack of adequate provision of road signs through the network. In urban areas, power shedding is common and so traffic signals may fail resulting in accidents at high volume intersections.

5.4.5 Vehicle Condition

In 1995, according to statistics from police records, approximately 20% of bus accidents were caused by bus defects. This figure was significantly reduced to approximately 17% in 1997 due, in part, to ongoing economic reform changes that have led to a growth in vehicle sales and hence a younger bus fleet being operated. In order to ascertain the vehicle condition, surveys were undertaken of a number of buses, both urban and long distance, in Dar es Salaam, Tanga and Morogoro regions. Table 3 illustrates the results from the surveys and highlights the generally good condition of long distance buses compared to the Daladalas.

Component	Long distance buses	Daladala
Number of vehicles	30	50
Good bodywork	<5%	10%
Mirrors	<5%	30%
Windscreen wipers	<5%	10%
Tyres	5%	15%
Wheel nuts	5%	12%
Front lights	0%	15%
Rear lights	0%	14%
Brake lights	0%	30%

Table 3 Faults identified, Tanzania [1998]

6 Discussion

In all four countries, where studies have been undertaken by TRL, road accidents are increasing over time. Public transport vehicles appear to be involved in a higher proportion of accidents than their numbers warrant. However, this is principally because buses cover a high annual mileage through their duty cycles. Considering the number of passengers

transported a safety culture should be active and evident however, it does not seem to be the case at the present time. A summary of the results obtained so far is given in Figure 7 below.

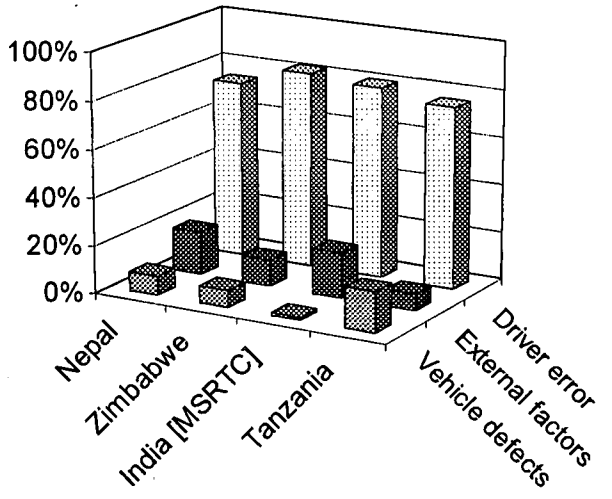

Figure 7 Comparison of bus accident causes by country [1996-98]

Public transport in Nepal has not undergone the same stresses of privatisation as elsewhere in the world but the existing situation does indicate some of its consequences. In India, Zimbabwe and Tanzania, public transport services are increasingly being owned and operated by the private sector as liberalisation is encouraged. This has inevitably led to a philosophy, by the private sector, of profit maximisation by minimising costs rather than increasing efficiency. Driver behaviour also appears to suffer under the auspices of liberalisation and low enforcement.

Figure 8 compares fatality and injury rates across the four countries. The need for high standards of driver behaviour and vehicles in Nepal, where nearly all the public transport sector is privatised, is emphasised by the significantly higher severity of accidents with a fatality rate twice as high and an injury rate over three times as high as Tanzania. Some of this difference may be due to the difficult terrain over which buses are operated.

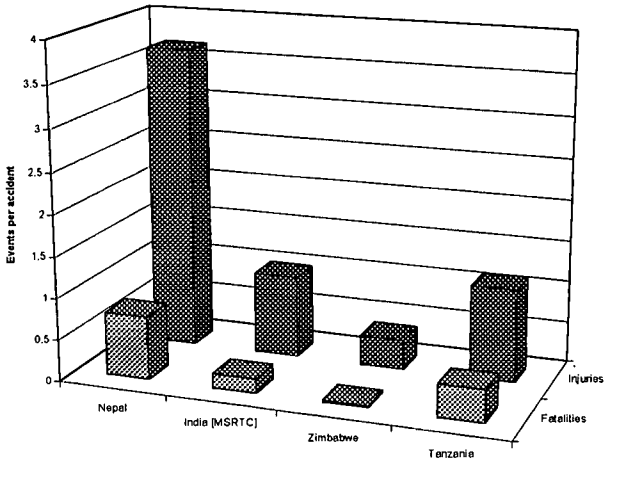

Figure 8 Comparison of fatality and injury rates

Subjectively there does appear to be a link between the degree of privatisation and the amount of regulation or enforcement that is present. Figure 9 attempts to illustrate this by

plotting estimates of privatisation and enforcement for the four countries. It is recognised that these estimates are not quantifiable but they do provoke thought.

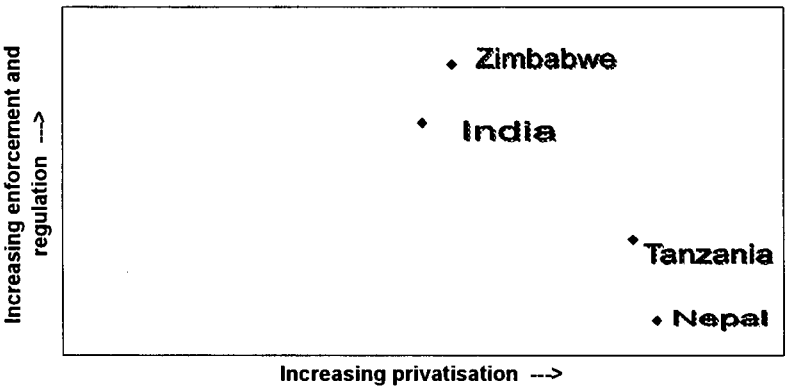

Figure 9 Comparison of privatisation status and enforcement level

7 Conclusions

Clearly the overriding factor to be addressed is how to improve bus driver behaviour. Suggestions to improve bus driver behaviour are listed below. It is clear however that drivers need to be better educated and trained when initially learning to drive but in particular:

- They should be taught not just the technical skills to pass the driving test but also the social and psychological skills required to be a safe and responsible professional driver.
- Bus drivers, like all HGV drivers, should also participate in refresher driver training courses so that the inevitable bad habits acquired can be eliminated at a relatively early stage.
- Owners should be encouraged to provide financial incentives for drivers who have been 'accident free' during the previous 12-month period.
- Medical and health checks need to be provided regularly for drivers, especially ageing drivers.
- Owners and drivers should be encouraged to work within existing legal maximum hours.

These may increase costs but are likely to be less expensive in the longer term than the cost of human tragedy, vehicle replacement and other third party costs.

As well as improving the behaviour of the bus driver, road safety campaigns need to be funded and encouraged so that all road users are better educated as to how to behave when crossing and using the road and when herding animals on the rural road network.

Many owners and operators need to be encouraged to maintain their vehicles to a much higher standard than at present. Preventative maintenance can improve performance and productivity and extend the operational life of the vehicle. A safe, smart vehicle is also more likely to attract passengers than an unsafe and poorly maintained vehicle and also passengers might be encouraged to afford a slightly higher fare for such a vehicle/service. Owners/operators also need to understand that regular vehicle maintenance is a sound, effective business practice which can minimise vehicle downtime and costly, time consuming breakdowns whilst in service.

Improvements in bus safety cannot be achieved by one individual or discipline, they are a collective responsibility and a collective spirit is required of all those involved including:

- Bus owners, drivers, conductors and mechanics
- Operator associations/unions
- Police and government departments
- Road Safety Associations/

- Driver training schools
- Manufacturers and repairers of vehicles, spare parts and tyres
- ALL road users

Hence, whenever liberalisation is being considered in respect of the provision of public transport services, enforcement of existing (and new) legislation in terms of vehicle condition, numbers allowed to operate etc needs to be strictly enforced. Operational regulations and procedures must also be implemented rigorously to ensure that safety and effective service provision prevails for the benefit of passengers.

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