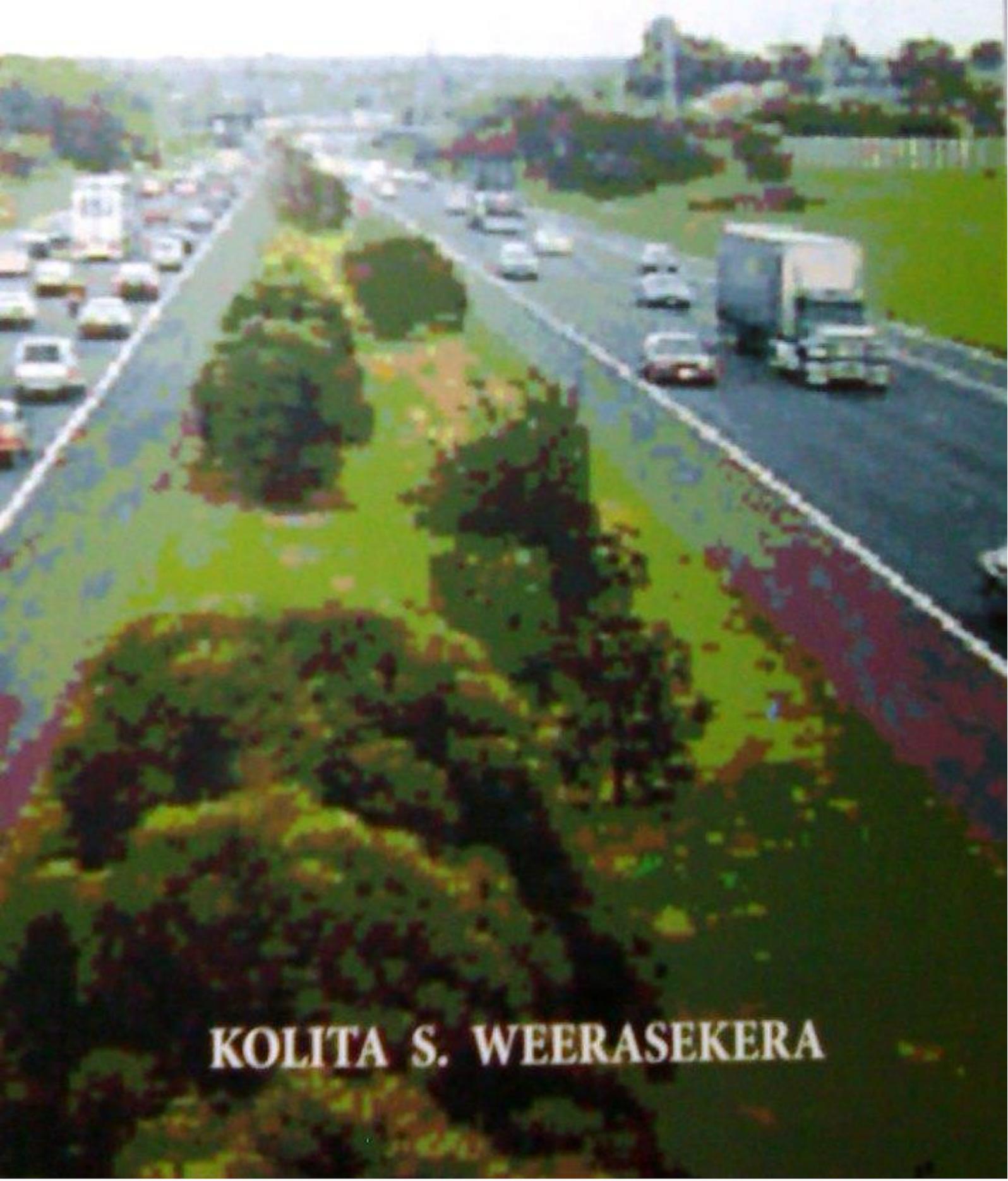


Towards Better Roads



KOLITA S. WEERASEKERA

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I would like to thank all those friends, close family members, colleagues and students who have read my numerous articles published in various news journals and newspapers and encouraged me in publishing this book by giving their interesting comments, feedbacks and views.

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Finally I am grateful to my loving wife Darshi, son Tirath for their continuous support during the writing of the book and my dear parents who gave me all the support and strength throughout my schooling and university days.

Foreword

This book 'Towards Better Roads' makes interesting reading to both highway engineers and the general highway users. In the book it extensively covers some important issues in Sri Lankan transport sector such as road safety, defensive driving, issues regarding three-wheelers & cycles, and many important traffic management and policy issues.

Extensive knowledge of Dr. Kolita Weerasekera's practical and academic background both in and out of the country has helped him in coming out with this valuable textbook. I am sure that this text will be a valuable supplement reading both at university level and for practicing highway and transport engineers.

Mr. Bernard Abeysekera

Former General Manager
Road Development Authority of Sri Lanka

About the Author

Dr. Kolita Weerasekera graduated from University of Moratuwa in 1981 with a B.Sc. degree in Civil Engineering. He obtained his Masters in Engineering, specialising in Transportation Engineering from the University of New South Wales, Sydney Australia. Later obtained his Doctor of Philosophy in Civil Engineering from the same university. Dr. Weerasekera is a chartered engineer and a Fellow of the Institution of Engineers Sri Lanka. He is also a member of the Institution of Engineers Australia, American Society of Civil Engineers, and Institution of Highways and Transport United Kingdom.

After graduating as a Civil Engineer, initially he served in Mahaweli Development Board as a project engineer and as a design engineer, later at the Road Development Authority as a senior traffic engineer. He also served as a traffic engineer attached to the Randwick City Council, Sydney.

Currently Dr. Weerasekera is a Senior Lecturer attached to the Department of Civil Engineering, in the Faculty of Engineering at the Open University of Sri Lanka, involved in teaching of Highway and Transportation Engineering and Civil Engineering Construction.

He has presented his research work in many international conferences in India, Australia, Philippines, Canada, Brunei, South Korea, Pakistan and USA. They have appeared in several research journals.

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Chapter 1

Towards a ‘Road Safety Plan’ - Make Our Roads Safer

There have been numerous efforts by the transport ministry with the collaboration of the Sri Lanka traffic police over the past years to develop strategies to bring down the number of accidents on our national arterial roads to make them safer places for the users. Despite most of these efforts by the traffic police and the transport ministry the number of accidents is on the increase. The recent establishment of the National Road Safety Bureau to look into the road safety aspects is a prudent step towards the road safety improvement. Now it is high time to work on a ‘Road Safety Plan’ on a nation wide basis, towards the development of a long-term road safety programme.

Road accidents cost our community dearly. Past two decades have seen some considerable increase in the accident rates mainly due to the reckless driving pattern of private bus drivers and some heavy vehicle drivers. At the rate the road accidents are increasing it is dreadful to think of the situation in another ten or fifteen years time. It is doubted that whether financial costs and the immense pain and suffering on our community due to these road accidents have ever been estimated. The insurance company figures indicate only a minor component of the real cost.

Looking ahead

There have been many campaigns over the past years aimed at reducing the killing on roads in many countries. Some of the most important campaigns that could be helpful to reduce the number and severity of accidents are; constant speed checks, random breadth testing, road discipline campaigns and probably the introduction of seat belts. In some countries where compulsory seat belt laws are enforced, have been highly successful in bringing down the severity of accidents on the passengers inside the vehicles.

Another important factor is the blackspot treatment programmes. The blackspots are the hazardous road locations (road sections or junctions) which are especially dangerous because of location, excessive speeds, traffic volumes, road type or junction type, surface texture, weather condition etc. The blackspot treatment programme can be carried out gradually by giving priority for the worst locations. Police accident records are much useful in identifying the blackspots.

The National Road Safety Plan should incorporate a comprehensive range of measures to provide safer travel on our roads. The National Road Safety Bureau should work closely with the police, local councils or municipal councils, other relevant government departments, private and public bus authorities, health and education authorities and the insurance companies. The primary objective of the Road Safety Plan should be to reduce all serious road casualties including fatalities. Although this

is a major challenge to achieve this, the Road Safety Plan should target the following three vital areas for improvement:

1. Road user behaviour
2. The standards of vehicles
3. Road conditions

1. Road user behaviour

To encourage improvement in the behaviour of all road users can be done through the media and education programs. It is also essential some kind of a formal training is given to all the private bus drivers stressing the importance of the responsibility that they are entrusted with. The importance of give-way and priority rules should be impinged to the average driver. It could be commonly seen that although there are many roundabouts situated in and around Colombo, majority of the drivers do not have a clear understanding of the roundabout rules. It is seen even at light traffic conditions drivers coming from approaches try to beat the vehicles already in the roundabout causing a hazardous situation to the law abiding drivers. Driver awareness education programmes through media is an effective way of putting across the message. Preschool, primary and secondary school children can be educated to develop responsible attitudes and safer road use. The police and the relevant transport authorities should target higher level of enforcement of the highway rules. This should include the maintenance standards of the vehicles, and particularly private buses and heavy vehicles such as lorries and trucks.

2. Standard of vehicles

Seat belts and child restraints can save many lives and serious injuries. Although there are a considerable number of vehicles with seat belts fitted, no attempt is made to highlight the importance of wearing them. Compulsory laws for wearing seat belts and child restraints may be hard to introduce immediately due to practical difficulties, but it is unfortunate the importance of it is not stressed by any authority concerned of the safety of the general public. In the local context helmets for motor cyclists seems to be a cover from the police and weather rather than a safety measure. It is common to see bare headed children on the pillion with the father in a helmet on the saddle. This commonly observed pathetic scene is a clear example of the general public understanding about the safety provided by the helmet. There is however, enormous potential for protection of people by a Road Safety Plan. Another important aspect is the regular checks on vehicle road worthiness. Initially it may be difficult to check the road worthiness of every single vehicle but at-least a clear policy should be developed to have a rigorous check on the passenger carrying vehicles such as private and public buses and three-wheelers. This should be gradually extend to load carrying vehicles such as lorries and trucks and finally to all vehicles. Systems should be developed to have an annual road worthiness certificates issued to these vehicles which will ensure the proper maintenance of vehicles.

3. Road conditions

Loss of control of vehicles is another major cause of severe accidents. Keeping a vehicle under control is more difficult when a driver comes across unexpected road conditions such as tight bends, narrow bridges and poor surface. Hence better roads do save lives. Unfortunately in this country it is commonly observed when the surface is improved accidents increase (e.g. Colombo–Kandy Road, Colombo-Katunayake Road, High Level Road). This is mainly due to high speeding. The roads may be designed for 70 or 80 kilometres per hour, but the drivers sometimes exceed 100 kilometres per hour, quite naturally the accidents have to happen. Arguing from the driver's point of view, the main lapse by the highway authorities is that the driver rarely sees a speed regulation sign along the road, and when it see a vehicle speeding at 90 kilometre per hour he too quite naturally try to keep up to that speed or even try to be smarter. The speed limits should be painted clearly on the carriageway at regular intervals (say every kilometre) and regulatory signs should be posted on the side of the road to alert the drivers constantly of their speed obligations.

Other important issues that should be addressed in a Road Safety Plan are:

- Lack of overtaking opportunities leading to risk-taking, often ending with tragic results.
- Address the driving fatigue issue.
- Enforcing safety standards at roadside constructions.
- Safe road-side parking.
- Set safe pedestrian crossing points.
- Provision of warning signs for drivers at accident prone locations.
- Try to reduce the severity of run-off-the-road accidents by progressively removing or protecting roadside hazards.
- Address the cyclist's needs by supplying better facilities for them and setting minimum standards for cyclists.

The initiatives outlined in this chapter can be instrumented to represent a new push to reduce road casualties in the country. The issues raised in this chapter can be some food for thought to the newly established National Road Safety Bureau and relevant transport authorities to develop programmes to make our roads safer. It should be mentioned that the authorities may develop programmes to make the roads safer but finally it is the attitude and behaviour of the road user that will determine whether the aimed objectives are attained. Hence it is our collective responsibility to see that the goal is attained.

Chapter 2

Development of a ‘Road Discipline and Safety Education Programme for School Children’

With ever increasing vehicular traffic and accident rates the demand is increasing for a properly designed road discipline and safety education programme for school children. Whether we like it or not our young ones will have to live in a motorised society and they will have to be adequately prepared from their young days to face it properly and share its responsibilities. It is now high time that the country’s education authorities take a course of action to develop a road education curriculum so that school children will gain the necessary skills and knowledge to face the future.

Education on road discipline and safety can be started with children from their early childhood from pre-school centres, Montessori and continue through primary to secondary levels at school, with the support of a variety of organisations. This programme should be a long-term strategy to provide quality road discipline and safety education from early childhood to the senior years of school. A quality road education programme should be supported with good reading materials, visual aids, teaching curricula and competent teaching. Properly trained teachers should be responsible for teaching road discipline and safety education to students. Road safety education consultants and advisers within the education sectors can support the classroom and pre-school teachers, providing professional development and advice.

The key elements of a road discipline and safety education program based on school are:

1. Syllabus development - curriculum materials should be developed for pre-school and teachers from year 1 to year 10 or 13.
2. The education department or school curriculum development centres may get the services of consultants (local and if necessary foreign) and advisers already available within the education sectors to assist teaching staff. In this regard university staff, national road safety unit staff, traffic police and other road safety organisations should be able to offer their services and advice.
3. National Road Safety Unit of the Ministry of Transport may be able to contribute to a greater extent in the curriculum development and teaching programmes of a road discipline and safety education programme at school level.
4. To enhance the ‘school road discipline and safety education programme’ the following organisations may be able to offer their inputs in discipline and safety education aspects.

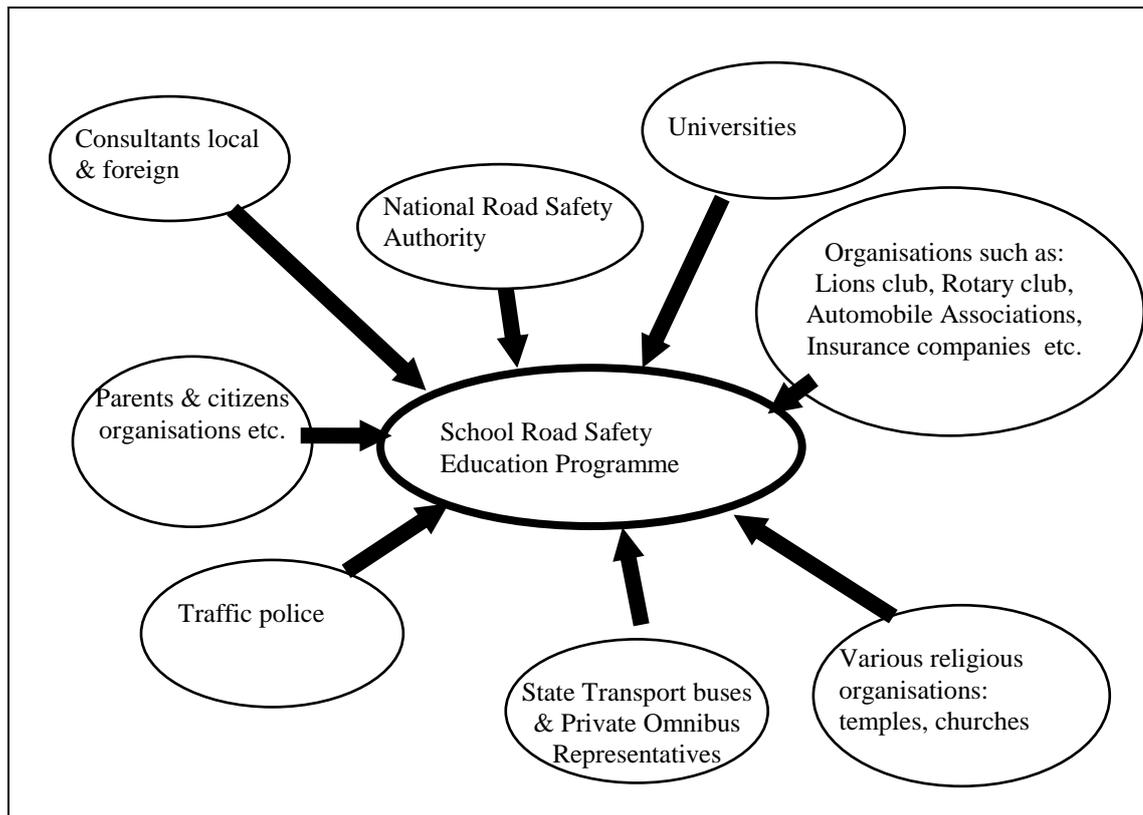


Figure 2.1 - Inputs for a Road Discipline and Safety Education Programme

Stage 1 – Pre-school level

The resources and activity programmes should be designed to reach as many children as possible from 0-5 years. The parents too can be educated through these programmes covering topics such as how to take care of children on roads, transporting children on bikes, motor bikes, education on safety gear such as helmets, seat belts, how to take care of children when in buses etc. Messages on road safety and good practices on road can be conveyed to the children through stickers, colourful posters, simple road care games, through worksheets, simple story books (with illustrations) etc. The TV too can play an effective role on educating the children on road safety practices and road manners.

Stage 2 – Primary school level

Year 1 to Year 6 - at primary schools. At primary school level the road safety and discipline education programmes should be designed to include key learning areas such as personal development, health and physical education etc.

If road safety training and driver education can be introduced to our children from their early childhood and at school level the impact made on them in these formative years will be highly effective and contribute much towards creating a responsible, considerate and courteous society with quality traffic conscious citizens in the future.

At primary school level attention should be given :

1. To sustain a quality road safety programme and policy.
2. To understand the meaning of signs, signals and markings.
3. Know how and where to cross the road.
4. Ability to select safest path to school.
5. The principle of waiting for gaps in the traffic.
6. The laws affecting pedestrians.
7. Traffic laws and citizenship responsibilities - responsibility to other drivers and highway users.
8. Role of public officials and your responsibilities.
9. Different traffic control devices and their functions.
10. Development of judgments - vision and perception, knowledge and analysis of traffic situations.
11. Responsibilities towards the road; no littering, good behaviour without being harassment to the other road users.
12. Pollution; noise, vehicle emissions, defacement of public property etc.
13. Development of decision making skills.
14. Development of most appropriate, curriculum based road safety education programmes with the assistance of consultants and advisers who are able to support pre-school and school staff.
15. Programmes should be properly monitored and regularly evaluated.
16. Programmes should be prepared in collaboration with teachers, parents, educationalists, community, safety organisations and traffic police and other relevant organisations.
17. An effective way of providing road safety education for children and adolescents is through the delivery of developmentally appropriate, curriculum based learning experiences, structured by professional teachers and supported, where appropriate, by parents and community groups committed to reducing the number of young people involved in road accidents.

Stage 3 – Secondary school level

At secondary school level the road safety and driver education curriculum can be developed based on the following factors.

1. Give appropriate knowledge for increasing their efficiency of living in the total traffic environment - physical, social, psychological, moral, and legal.

This should include the responsibility to other drivers and highway users, community, family and self. Attitudes of safe living, courtesy and manners, to obey traffic control devices and co-operate with the public officials.

2. Introduction to fundamental driving skills and establishing basic and correct habits. These can be theoretical lessons on basic habits and manoeuvres, driving in city roads, on rural roads, facing hazardous conditions and meeting emergencies with the ultimate aim of efficient driving.
3. Learning to develop a desirable pattern of behaviour in our society while on the road. Correct driver characteristics; mental, emotional, physical and psychological.
4. Develop the ability to recognise, analyse and respond to traffic situations to improve the efficiency in driving not as individuals but as a whole. Development of judgements such as vision and perception, knowledge and analysis of traffic situations, making decisions, reaction time, physical laws that affect drivers and pedestrians.
5. Understanding of how the society at large may attain efficiency in the operation of its motor vehicle transportation system.
6. Effects of alcohol and drugs. Its effects on driving skills, stress that drink driving is not only bad practice but a crime. Effects of medications.
7. Road safety equipment such as seat belts, air bags, child restraints, infant capsules, helmets. The importance and proper usage of these equipment.
8. Traffic accidents, causes of accidents, human and economic loss, things to do in case of an accident, first-aid etc.
9. The importance and correct attitudes towards the passenger carrying drivers (especially bus drivers). The level of responsibility of bus drivers and when they neglect this responsibility the rights of the passengers over these dangerous drivers etc.
10. Psychology of the good driver. Social and anti-social behaviour.
11. Basics of traffic law and its enforcement.

The Sri Lankans may have luxury homes to live in (with all the modern day luxuries), good cars to drive (with AC, power and all the modern options), luxury office environments (with scenic city and sea views), modern super markets (packed with things to buy) but not stress free and pleasant roads to travel in unless road discipline and safety practices are taught to the people. Road discipline, manners and safety are not things that can be brought in to a society in a short time. It is a continuous process. If the younger members of today's society begin to understand and appreciate the value of road discipline, our efforts at educating citizens for a stress free and safe road environment in the future would not have been in vain.

Chapter 3

Safety at Pedestrian Crossings - How it Can be Improved

Introduction

It is often seen that pedestrian crossings provided on local arterials and streets passing through town centres do not offer the expected safety and convenience to the pedestrians who attempt to cross the streets at these locations. It is an unfortunate fact that these locations where crossings are marked have become more dangerous places to cross the road at, than unmarked road stretches. This is mainly due to the fact that at these legal crossings the pedestrians think that they have the priority over the on-coming vehicles and continue to cross while some drivers do not give any consideration for the pedestrians crossing the road. Some locations where the carriageway is two-way, four-lane type, although a driver in one lane might stop the vehicle and allow the pedestrian to cross, the driver in the second lane might try to pass in a flash threatening the pedestrian's safety. Such crossings can be more dangerous black-spots than normal crossing points.

When planning for pedestrians, there are a number of facilities which can be used to assist the pedestrians to cross roads at mid-block locations. It is important that the facility used be suited to the needs of that location and there is a greater demand by pedestrians to cross at or near the location that is being considered.

The most important criteria that governs the provision of a pedestrian crossing are, the number of pedestrians crossing the road and the traffic volume at that location. The other minor considerations are; road hierarchy and nature of the road cross-section, operating speed of the vehicles at the location, the type of pedestrians who will be using the crossing (e.g. young children, office workers, elderly people etc.), available site distance for both pedestrians and vehicular traffic and the general environment (e.g. urban, rural or town centres).

Types of pedestrian crossings

There are different types of pedestrian crossings that can be adopted for the safe and convenient crossing of roads.

Zebra crossing

These are the most common type of pedestrian crossings adopted in Sri Lanka, and seem to be the favoured type by the road authorities and municipal councils. These crossings are ideal for arterial roads and other less important roads where the interruption they cause to vehicles can be tolerated. They can generally be used where vehicular speeds are reasonably low (say less than 60 km/h). These are suited for use in town areas where high pedestrian volumes are given preferential treatment over vehicular traffic.

Pelican crossing

Although these are not much favoured locally due to high costs involved they are much preferred in some countries. A pelican crossing is a pedestrian crossing at which traffic signals are used to control vehicular traffic to establish pedestrian priority on the crossing. These will indicate the period during which priority continues to be given to the pedestrians on the carriage-way. At these crossings the vehicles are stopped by a red signal to allow pedestrians to commence crossing and later a flashing amber signal warns vehicles to give way to pedestrians but proceed unimpeded. The advantage of this device over pedestrian operated signals is that this causes fewer delays to traffic than the latter.

Pedestrian operated signals

Although these are not much used in Sri Lanka, they help large numbers of pedestrians to cross arterial roads, and roads going through city areas. When the roadway has an adequate median and the route is part of a signal linking system, pedestrians can be served without adversely affecting the route linking. At these signals, if a pedestrian wants to cross the road, he/she has to press the button provided and wait for the green signal for him/her to start crossing the road. Pedestrians should never attempt to cross the road when red (or stop) signal is on. The signal for the pedestrians to cross the road offers only when someone has pressed the button and expressed his/her willingness to cross the road. Hence this does not cause any unnecessary delays on the vehicles if there are no pedestrians to cross the road.

Pedestrian overpass / underpass

These are appropriate treatments where high volumes of pedestrians are required to cross heavily trafficked arterial roads. Although pedestrians overpasses are seen in this country, not many underpasses are seen mainly due to the high costs and operational problems involved. Experience has shown that unless the delays experienced in crossing at-grade are extremely high, these grade separated crossings may not be worthwhile. Pedestrians often prefer to cross the road at-grade rather than using the overpass, unless their at-grade movement is strictly prevented. Some problems usually associated with these structures are; dropping objects into the traffic moving under; security especially at night in underpasses; vandalism; aesthetics (especially for overpasses) etc.

Pedestrian refuge islands

Where other pedestrian crossing facilities are not used, to help them cross the road pedestrian refuge islands can provide a substantial benefit to the pedestrians. They have the following advantages;

- this will allow the pedestrian to cross the road in two stages.
- the number of decisions which need to be made by drivers and pedestrians are reduced.
- provides a refuge and a physical protection for the pedestrian on a wide crossing. This is important at places where elderly people and children are involved in road crossings.

It is very important that these refuge islands are properly designed to be of sufficient size to cater for the needs of pedestrians. These require appropriate signing and street lighting.

School crossing

It is common to see in many European countries the flagged school crossings. These can be used on arterial and secondary roads with low traffic volumes. When vehicle volumes and/or children crossing numbers are high, this may not be a suitable method of crossing.

Towards a more safer type of pedestrian crossing

It should be accepted although there are several types of pedestrian crossings that could be adopted in the local context; the zebra crossing is the more practical oriented due to the financial position of the country. Quite rightly the highway authorities and the municipal councils are on the right path by going for these types of zebra crossings to be used as crossing devices on arterials and streets through town-centres. But there are lot of changes that can be made to improve the function of these crossings and enhance the safety of the pedestrians.

Crossings with raised platforms

These devices allow the pedestrians to cross roads more safely and allow the drivers to see the pedestrians better and force them to bring down their speeds near these crossings. As the Figure 3.1 indicates these devices will have a raised platform across the road where the pedestrians will use to cross the carriageway safely. At these crossings the crossing platform is raised 100 millimetres above the carriageway which will allow the pedestrians to be seen better by the drivers and allow the vehicles to slow down due to the 'hump' effect.

These devices can be constructed at a fairly low cost by using local materials (concrete or block paving can be used to construct the raised platforms). The construction of these devices could be done in stages - one lane at a time.

Advantages of these crossing devices

These devices will have the following advantages over the traditional zebra crossings;

- increased pedestrian safety
- pedestrians are more visible to the drivers
- drivers are forced to slow down at these devices
- low maintenance costs
- forced priority conditions for pedestrians over vehicles

Disadvantages;

- costlier than zebra crossings
- slight discomfort for the through traffic

When these devices are in use the heavy vehicle and bus drivers are forced to abide by the specified speed limit. If the speed limit is exceeded the vertical jerk resulted by the devices may be rough on the vehicle as well as the passengers.

Finally, it can be suggested to try-out these devices on a trial basis at-least in busy town centres (such as Nugegoda, Maharagama, Dehiwala, Wellawatte, Kelaniya) where through traffic is creating hazardous conditions to the road crossers. Before concluding this chapter it should be stressed that these devices may not be the ultimate solution for the pedestrian crossing problem, good manners and proper driver discipline is very important to create pleasant conditions to the road users.

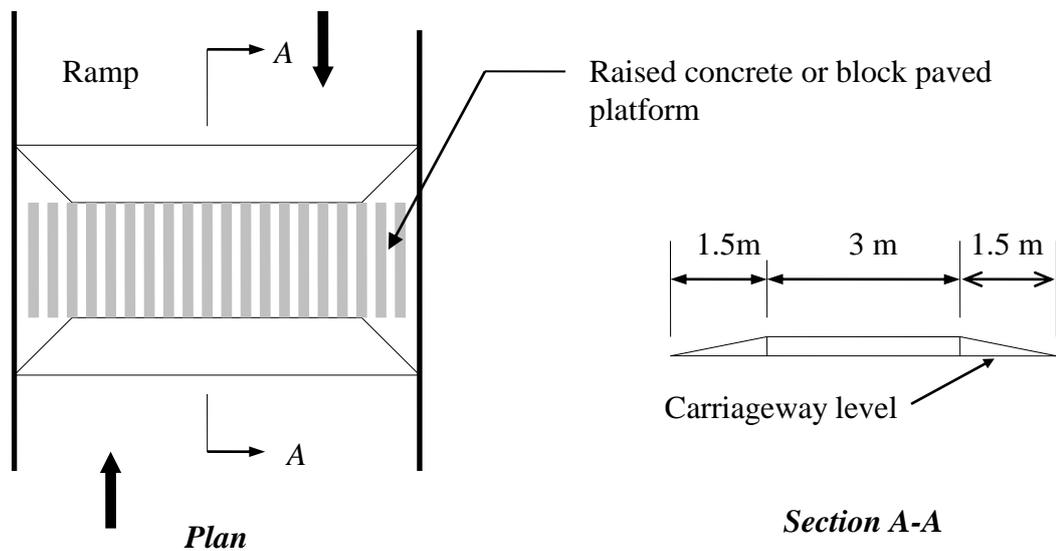


Figure 3.1 - Raised Platform

Chapter 4

Road Accidents

Traffic accidents and collisions cost our nation dearly in both human and financial terms. This can be seen from the statistics put forward by the Sri Lanka Traffic Police recently which was given publicity by the media. According to these statistics, year 2002 is a significant year for us with regard to road accidents. In 2002 the total number of road accidents reached almost 55,000 mark and road fatalities too were over 2,000. These accident statistics show that a Sri Lankan dies on our roads every 4 hours which is an alarming situation. In an era where great improvements in road safety are taking place in developed countries, our country is tied down with law less roads and suicidal driving.

Traffic accidents are expensive. Beside injury and time losses, there is a high cost of vehicle repairs or replacements involving large amount of foreign exchange. Worst of all is the potential for the loss of life (an inestimable cost). On top of monetary cost is the impact of emotional trauma on victims, their families and the inestimable cost of lost lives.

The monetary cost of traffic accidents in relation to the slow economic growth, is high and probably unacceptable to our country. This is evident from the Table 4.1 which shows the increase of persons being killed on our roads and the increase of total number of accidents in the country is on the increase annually.

Table 4.1 - Road Accident Trends in Sri Lanka (1981-2005)

Year	1981	1984	1987	1990	1993	1996	1999	2002	2005
Fatal	1,173	1,258	1,165	1,714	1,346	1,560	1,938	2,038	2,141
Total	24,656	24,534	33,294	34,463	41,495	48,675	53,515	54,911	53,171

(Source: Sri Lanka Traffic Police)

If an attempt is made to investigate the reasons for this high rate of accidents there are five main factors contributing to crashes and injuries on our roads. These need to be addressed carefully in improving the road safety.

- Speeding
- Negligence of road rules
- Drunk driving
- Fatigue
- Poor condition of vehicle and roads

There are many other less significant factors, of course, but these five are of greatest significance.

Speeding

Majority of local road accidents and fatal crashes involve speed as a major factor. Speeding means not only travelling faster than the posted limit, but also travelling faster than appropriate for the road conditions at the time. This can result in crashes. Adverse conditions such as rain, drizzle, night driving, pedestrians on road, bad road stretches or heavy traffic are just some that require drivers to decrease their speed. The general maximum speed limit in most of the local roads is 56 km/h unless specified. But unfortunately it is so common to see local drivers speeding beyond this limit. In any other country the authorities will not hesitate to collect the enormous potential revenue that could be collected from netting these over speeding drivers. But in Sri Lanka, the authorities seem to be less interested in collecting this potential revenue for the government while improving the safety of the people. The authorities must be remembered that mass-scale spot fining the speeding drivers will bring about large revenue to the government while the overall safety on roads will be improved tremendously.

Negligence of road rules

It is an obvious fact that almost all road rules are breached by the local drivers and this happens knowingly and unknowingly by the drivers. Continuous driver education programmes through media and driving schools may be a solution to some extent. It seems that like in some advanced countries we also should encourage programmes such as defensive driving programmes, advance driving programmes, and safe driving programmes for fleet operators and public. Continuous driver education programmes are necessary to improve the road rules and road manners. Safe driving is very much a matter of awareness (of hazards) and behaviour (for safe driving practices). Hence government should place a high priority on defensive driving courses with emphasis on vehicle control skills and knowledge of road rules. At the same time action should be taken to restrict the imports of incompatible vehicles such as three wheelers which help largely to breach the road rules.

Drunk driving

It is sad to note that still some local drivers are under the impression that a small dosage of alcohol improves their driving ability. Still there are drivers who argue that a couple of glasses of alcohol improve their ability to drive. It is disappointing to observe this misconception exist with all the present day research on drink-driving. It is a well proven fact that alcohol affects ones driving skills. Still these misconceptions exist. Even where people look and act as if they are not affected by alcohol they cannot drive as usual. Alcohol is a depressant, it slows your brain functions. It reduces your ability to respond to situations, make decisions and take actions. Police should be responsible for carrying out more frequent road-side tests and penalties should be severe. It should be stressed that drink driving is not only an offence but a crime.

Fatigue

Another major contributor to fatal accidents is driver fatigue. Drivers should avoid fatigue by planning their schedules realistically, by resting before start of a long journey, by stopping for appropriate rest breaks. Avoid driving during normal sleeping hours. Most accidents caused by fatigue occur between 11pm and 7am, the body's normal sleeping time. Another high risk time is early to mid-afternoon. This does not mean that driver fatigue only happens in those periods, but it is when you are most likely to suffer the effects.

To avoid fatigue related accidents watch for the signs of tiredness, restlessness, body aches, lazy steering and sore eyes. At the first sign of these symptoms, pull over at the nearest safe place and rest until you feel completely alert.

Condition of vehicle and condition of roads

Condition of vehicles and the condition of the road itself are two other important factors where road safety is concerned. For minimum accident risk the condition of brakes, lamps and reflectors, tyres, wind-screen wipers, rear vision mirrors should be in good condition. It should be the responsibility of the driver and vehicle owner to get them attended to if they are defective and to have them in good condition all the time. Since no compulsory vehicle fitness tests or road worthiness tests are conducted in this country due to economic restrictions this is an area which is badly overlooked in the country. By looking at the increasing number of accidents it will be advisable for the traffic police to look in to their books to investigate what percentage of accidents are responsible due to the poor condition of vehicles and come-out with their proposals. It is also the responsibility of the highway authorities to look in to the black spots where a lot of accidents are taking place and take action to eliminate them.

Other factors

There are many other contributing factors to road accidents which must be closely watched. Heavy vehicles are a problem on city roads. Proper driver training is fast becoming a must for fleet operators. Every effort should be taken to transfer container movement from road to railway as much as possible to minimise heavy vehicles on national highways. Another problem is the indiscipline bus drivers. They are a main threat to the safety on our roads. Strict rules such as prohibition of a bus to be overtaken by another bus, and to maintain a minimum headway between buses may be introduced.

Goals to be achieved in the next five years

If following goals could be achieved at-least by the next five years, Sri Lanka will have more safer and much pleasant roads in the current millennium.

- Increase the community awareness of road safety
- Change the community attitudes towards safe behaviour

- Better blending of transport and land-use planning
- Shifting road use to other transport modes where appropriate
- Elimination of incompatible vehicles from roads
- Ensuring that road safety is addressed in development of the road network

Strategies to be adopted

Following strategies can be adopted to achieve the above goals.

- High media exposure and wide-spread distribution of information.
- Co-ordinated media campaigns involving Police, National Road Safety Bureau, Department of motor Traffic, Health, Insurance companies, Road Development Authority and Local Government Authorities such as municipal councils.
- Improving the safety of driving in the work environment in public and private sector organisations.
- Encourage community and other groups to become involved in road safety programmes, by establishing links with them and developing mutual understanding.
- Encourage strategies that minimise the amount of travel necessary to move people and goods.
- Encourage land-use developments that minimise the risk to road users, including pedestrians (e.g. multi storey parking, encourage basement and lower floors for parking in multi-storey buildings).
- Support the use of public transport when appropriate.
- Introduce speed limit zones to achieve traffic speeds more appropriate to local conditions.
- Introduce more traffic control systems, such as signals, signs, and line marking, to help road users drive safely.

Chapter 5

If you have Seat Belts in your Vehicle - Why not wear them?

It is a common experience that many local drivers and passengers do not care to wear seat belts even when their vehicles are fitted with them. Sometimes the reason may be the message on the importance of wearing the seat belt has never gone into them, may be they have not got accustomed to the good habit of wearing seat belts or may be they are reluctant because they are not sure whether these belts are sufficiently clean enough not to spoil their clothes. What ever the cause for not wearing them, this article will try to highlight to the public the importance of this safety measure.

Drivers can do little to change the basic design of vehicles to make them and the occupants safe. But they can, however, use a number of safety devices which will improve the chances of survival for themselves and their passengers. Most importantly the drivers always have the option of driving defensively and trying to minimise the chances of accidents, and further by using the available safety measures, reduce the risk of injury and sometimes even the death.

Seat belts save lives and reduce injuries during accidents. There is ample evidence from all over the world that proper seat belts can substantially reduce the chances of serious and fatal injuries to occupants of vehicles involved in collisions. Seat belts operate by preventing the wearer from being thrown out of the vehicle, slowing him/her down more gently, and diverting the crash forces on the stronger parts of your body. Recent research has shown that, in the case of upper torso restraints, the reduction in injuries may be as high as 80 per cent when seat belts are worn.

Although many Sri Lankans do not give much importance to seat belts, a very strict quality controlling is carried-out in the developed countries where the motor vehicles are manufactured. The quality of seat belts and their fitting must meet very strict quality and performance standards specified in these countries. As an example, in Australia the Standard Association's Mark Certification Scheme ensures not only that licensed manufacturers produce an initial belt design which conforms with the standard, but also that a high quality of material and workmanship is maintained. Seat belts which are approved under the scheme are marked with the Standards Association's registered mark and the license number issued to the manufacturer. In spite of all these quality assurances by the manufacturers it is regrettable to see most of the local drivers and passengers often travelling in all models of new vehicles without wearing the available seat belts. It is high time that the authorities bring laws that at-least in the vehicles that are available with seat belts the drivers be made responsible that the occupants wear them. This should mean that the driver and occupants should wear all the available seat belts in the vehicle, and if there is an empty seat with a seat belt, a passenger without a seat belt must move to it and not sit in a seat without a seat belt, otherwise the driver to be prosecuted or fined. The necessary steps should be taken that the seat belt be made compulsory in the future to make our travellers safer.

Types of seat belts for adults

There are four basic types of seat belts available according to the present day vehicle manufacturers.

(1) The lap strap

This consists of a belt passing across the pelvis and anchored to the floor at both ends. This type is cheaper and simple to install. The lap belt prevents ejection from the car if the doors fly open in an accident and it will also reduce the likelihood of being thrown against the hood. This types of belt gives the driver greater chance of retaining control of the vehicle and avoiding further mishap.

(2) The diagonal belt

The diagonal belt is attached to the floor or tunnel at one end and passes diagonally across the body to an anchorage on the door post or other part of the structure at or about shoulder height. Due to lack of pelvic restraint the diagonal belt does not prevent 'sliding' from under the belt. Due to this reason this is an inferior type of arrangement.

(3) Combination of lap and diagonal

This consists of both lap belt and a diagonal sash. This combines the advantages of both the lap and diagonal types; it restrains the wearer's hips firmly in the seat and at the same time prevents the upper part of the body from swinging forward. The upper end is attached to the door post if possible, or to a point directly behind it.

(4) The harness

This comprises a lap belt to which are attached two shoulder straps, the other ends of which are anchored behind the seat preferably at or about shoulder height. For this type to be effective in cars where such a high anchorage is not possible, the shoulder straps must be anchored well back behind the swat which can interfere with the use of the rear compartment.

Protective devices for children

Drivers should make sure children travel in restraints suitable for their size and age. In considering the best means of protecting infants and children from serious injuries in car accidents, their changing needs as they grow larger and stronger have to be taken into account. Children can be grouped into three basic categories:

(1) infants, (2) toddlers and (3) children over about four years.

For infants who are unable to sit up for long periods (babies up to about 6 months) *baby restraints* or *baby capsules* can be used. These have proved to be much safer than baby being carried in the mother's arms.

For toddlers over 6 months up to 4 ¹/₂ years a range of devices are available. They comprise child safety seats, child safety harnesses, booster cushions etc. Child safety seats can be used by children who weigh up to 18kg (i.e. up to about they are 5 years old). Child safety harnesses can be used by children from 14kg to 32 kg (i.e. children from 3 to about 8 years). Booster cushions can be used in the front or rear seats with

an adult lap sash seat belt or coupled with a child safety harness. It is important that these types of approved child safety devices are made available in the country and at least those who are prepared to make use of these safety devices are given the opportunity to use them. Measures should be taken in the right direction that these safety devices are widely used by the public and every encouragement should be provided to import these safety devices with less import restrictions and tax concessions etc.

Responsibility of the driver

The driver should be made liable to see that he and the passengers have worn the seat belts properly adjusted and fastened. As in many developed countries effective results can be achieved by passing this responsibility to the driver (or owner) of the vehicle.

Hence to begin with “If you have seat belts fixed in your vehicle, please do wear them → Do not stop with that → Campaign others to wear them”.

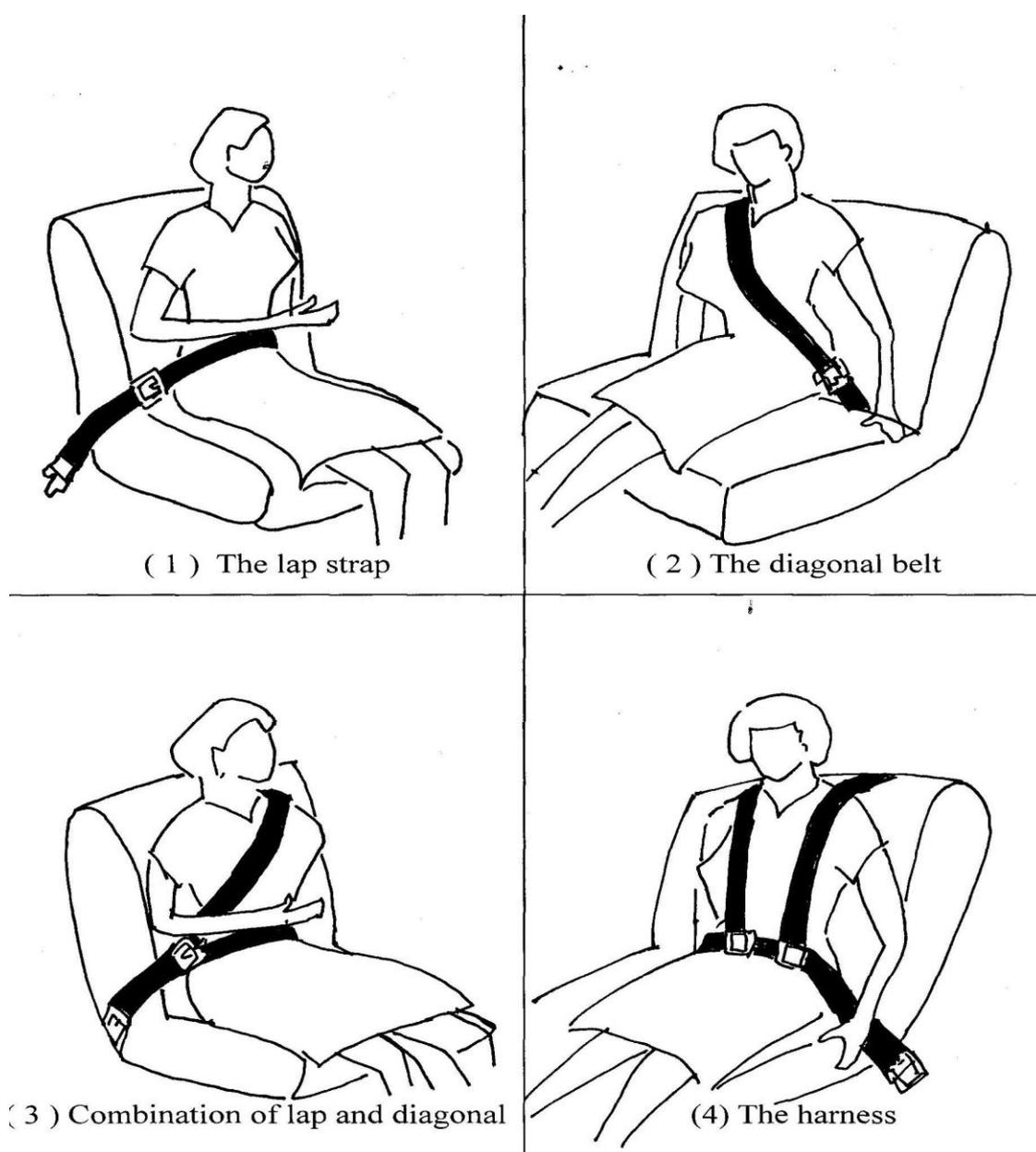


Figure 5.1 - Different types of seat belts available in your vehicle

Chapter 6

Training on ‘*Defensive Driving*’

The concept of defensive driving has been used extensively in USA, Australia and many European countries. These are schemes developed for professional drivers employed by fleet operations. These programmes can be adapted for driver improvement courses organised by road safety councils or other similar organisations aiming at drivers especially for passenger carrying vehicles such as buses, passenger carrying vans and even three-wheelers that are already licensed to carry passengers. In the past similar driver training programme were operated by the Ceylon Transport Board (CTB/SLTB) but now no such organised training programmes are available for the drivers of private and public passenger carrying vehicles. It is unfortunate that due to the negligence, carelessness or ignorance of these drivers it the innocent passengers who have to pay the final prize with their lives. From the high number of accidents occurring throughout the country it is well evident the need of such driver training programmes for the drivers of the passenger carrying vehicles of this country (mainly targeting the bus, private coach and three-wheel drivers).

Defensive driving courses should involve a high degree of knowledge, alertness and foresight in recognising accident-producing situations and exercising the judgment and skill necessary to protect the driver and the others. It is sometimes hard to imagine the rigorous training and the sense of responsibility thrust upon an airline pilot who carries the lives of couple of hundreds of passengers but almost no formal training at all given to a bus driver (mainly private bus drivers) who also is responsible for more than 70 lives which are in his hands.

The defensive driving courses can be mainly based on:

1. training on seeing the hazard in advance
2. then understanding the defence
3. taking timely correct action
4. also a good training on driving on adverse conditions such as:
 - Weather conditions which affect the ability to see or be seen to start, stop and turn such as rain, sun, wind, fleet, fog and smoke
 - Adverse road conditions such as bad curves, crests, pavement narrowing, nature of surfaces, broken or eroded edges, poor lane marking, poor visibility, and wet surface.
 - Traffic conditions such as congested, clear, fast, slow, pedestrians, cycles, animals on road, erratic drivers, large vehicles etc.

- Condition of vehicles such as defective tyres, brakes, steering, lights, windscreen wipers, horn, mirrors, exhaust system and demister.
- Condition of driver such as fatigue, alcohol, drugs, eye sight, hearing, and emotional state.

Driving in lanes

Although most of the roads in the country are not lane marked, the drivers should be stressed to drive in lanes where ever possible. It is common to see that, although lane marking has been carried out in most of the Colombo municipal council roads the lane discipline on these roads are poor. The drivers should follow the following basics to drive in lanes:

1. Drive in the left-hand lane if it is clear of parked vehicles.
2. When overtaking slower vehicles, do so along the right-hand side wherever possible, and avoid overtaking on the left unless the other vehicle is turning right.
3. Plan your route ahead and select the correct lane for turning at intersections well in advance.
4. When lane change is necessary always make a special point to check in the rear vision mirror and be sure there are no other vehicles near by which may be hidden from the view.
5. Always give ample warning of an intending lane change by signalling clearly and in good time.
6. Do not change lanes excessively and unnecessarily. Always stay in one lane and move with the general traffic flow. Unnecessary lane changing creates conflicts and lead to delays.

Overtaking

Special mention should be made of the overtaking manoeuvre because many accidents involve people who commit bad errors of judgment when they proceed to overtake. First of all think to yourself what gain you have by overtaking the vehicle in front. If the vehicle in front of you is going at a slow pace definitely you have to overtake without causing delays to all the vehicles behind you. But if the vehicle in front is running at a reasonable speed (the speed limit of local urban roads is in the order of 60 km/h) why overtake unless you are rushing with a patient to the nearby hospital or may be to the local police station to report a crime. The local drivers should evaluate what time value they may gain by saving few minutes by performing unnecessary overtaking and endangering many lives. An explanation given by an educationalist

was that the local drivers are always so stressed that they are impatient till they reach their final destiny (mostly the home) and relieve their stress. If that is the case the local drivers should cultivate the habit of relaxing while on driving. It is hard to imagine what time value of the local drivers gain by taking this risk (even the drivers in developed countries with very high time values do not bother to perform overtaking and save time). The 'overtaking mania' may be a national attitude problem where medical experts may be able to suggest some physiotherapy to cure it.

According to most experts, in general the ability to judge when it is safe to overtake comes with experience on the road, and it is that new and inexperienced drivers leave a very wide margin of safety. Never attempt to overtake if in any doubt. This is not only putting your life in danger but many others as well.

Following are few suggestions when overtaking is performed in two-lane roads:

1. First of all do not overtake if the vehicle in front of you is running at a steady speed around the speed limit of the road. Do not get used to the bad habit of overtaking every vehicle that you see in front of you (overtaking mania).
2. Remain sufficiently far behind the vehicle in front to ensure adequate visibility before diverging to the right.
3. Check the rear vision mirror and beside you to ensure that you are not being overtaken (a common occurrence on local roads).
4. If the road ahead is clear for an ample distance, signal clearly and diverge to the right.
5. Complete the overtaking manoeuvre as quickly as possible remembering the speed limit (you are liable to be fined for over-speeding even when you are overtaking).
6. Check in the rear vision mirror that you are well clear of the car you have overtaken before returning to the left-hand side of the road.

Offensive driving

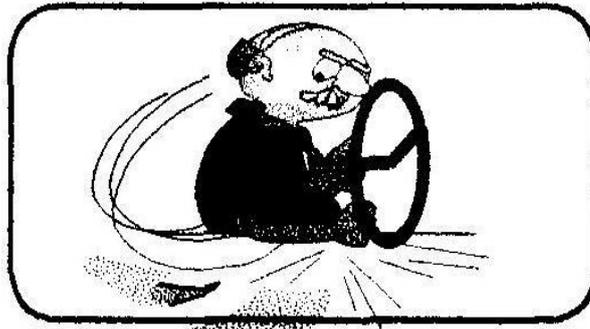
Following are some of the offensive driving practices that are common to see on our roads and should be avoided.

1. Using of the vehicle as a means of gaining attention.
2. Adopts an aggressive attitude towards others and seeks opportunities to antagonise them for no reason.
3. Blasts horn for no valid reason and demand for priority.
4. Try to drive fast to make up time, often when there is no reason to hurry

5. Ignore traffic signs, warnings and lane markings.
6. Sudden braking and acceleration.
7. Violation of priority rules.
8. Sudden stoppage of buses in-between bus stops.
9. Unauthorised parking obstructing the traffic flow.

Enforcement

In conclusion it should be stated that at the same time the defensive driving programmes are conducted the law enforcement campaigns should be geared up stressing the importance of correct driving practices. *Do the wrong - receive the penalty.*



Chapter 7

Some Suggestions for Defensive Driving

Defensive driving has become an important issue in the current context and is vital in providing the safety of drivers, passengers and pedestrians. Defensive driving helps to improve the life span of vehicles, reduces the maintenance costs resulting in savings in foreign exchange, relieves drivers and passengers of stress and fatigue and makes the ride pleasant and relaxing. All these finally contribute towards the country's economic development by way of savings in accidents, wear and tear of vehicles and savings in fuel consumption. Defensive driving skills can be cultivated when young, and as the driver matures a more advanced stage of driving can be reached. Although some mature drivers are keen and want to drive defensively the local traffic conditions make it difficult to practice defensive driving on our roads. Often one is confronted with situations where it is hard to keep from losing one's temper. Tactfully handling these crucial moments while driving, may prevent offensive drivers from spoiling your day.

Ways to handle temper

Following guidelines will help the driver to be calm and control his/her temper in difficult situations:

1. Awareness of the situation can be the first step towards controlling temper.
2. Try to handle the situation in a healthy and wise way.
3. Be conscious of the fact when you are in a temper.
4. It should be remembered that temper may distract attention away from driving and invite trouble.
5. Accept the fact that temper will do nothing to get you out of irritating traffic situations or give you any advantage over the occasional erratic drivers who made you angry. On the contrary, it may get you into accidents or unpleasant situations.
6. Try to examine why temper seems to reach irrational (or high) proportions. Try to think to yourself "why am I getting upset?" Tell yourself to keep cool. You alone cannot change society but certainly can contribute towards its betterment.
7. Try to take positive steps, instead of letting your temper build up.
8. Psychologists advise us to take deep breaths which helps to regain calm in such situations.

Following are some simple practices one may adopt to avoid occurring unpleasant situations :

1. Route planning and selecting the times for the journey is an important part of your planning process. If possible avoid morning and evening rush hours (try to leave 15 minutes early in the mornings and 10 minutes later in the evenings).
2. Try to avoid the kind of traffic you know is likely to make you angry.
3. Smoother the traffic flow, the less the chances for temper, resulting therefore in fewer accidents.
4. If you are angry, remember that the horn is not the answer. This makes the situation worse.
5. There are some drivers who use the horn whenever there is a vehicle in front of them for no apparent reason. It is hard to understand this practice. It may be that the driver is not confident enough to drive or he would have been driving a bullock cart before getting his driving licence. Do not get annoyed at these situations.
6. When the driver is not confident enough the tendency is to blast the horn to say “here I am coming – please get a-side, I am shaky”. There are some bullies who want to scare other road users by blasting the horn. This practice can be seen among drivers of large vehicles.
7. It is also common to see small vehicles such as three-wheelers and motor cycles ride with a continuous blast of the horn. This may be due to being scared of the other big vehicles.
8. Unfortunately we are yet to see any legislature being formulated or any action plan being drafted to keep the noise down, in our roads. Do we consider noise as a source of pollution?
9. If you are converting fear into temper, try to take the necessary steps to overcome the fear.

When angry, drivers may be tempted to take risks they otherwise might not take. Research has shown that many drivers who do this do not recover their skills quickly enough to avoid trouble.

Good driving habits

Driving habits are the daily driving practices from starting the engine and joining the traffic to leaving the traffic and parking the vehicle. Cultivating good driving habits in-between these two end activities invariably makes you a good driver.

Driving off

Before driving off from a road side parking area it is always a good habit to look at the situation of the vehicles behind you by looking at the mirrors of your vehicle, and before driving off always indicate with the signals, of your motive to join the flow.

Road markings

Where ever road markings are painted on roads try to stick to these markings. Do not treat lane marking as mere road decorations. Always drive on the left-hand side of the road, unless it's a one way street. You can only cross on to the right-hand side if you are turning or, if it is safe to overtake. You must not cross the centre line if it is a double unbroken line or if the line closest to you is unbroken.

Changing lanes

Once you are a part of traffic flow, do not change lanes without a reason. Drivers constantly changing lanes make the overall road efficiency drop drastically and also make driving difficult for the good drivers driving within lanes.

If a lane change has to be carried out due to a valid reason, check the rear view mirrors, then look to the rear to ensure that no vehicle is hidden in the blind spot. Signal with the indicators before commencing the lane change. It is important to learn to use these mirrors correctly and to learn to check your blind spot behind you before changing lanes. Attention should be paid to the blind spot especially when your driving speed is over 50 km/h.

If a driver is attempting to change the lane properly for any apparent reason never try to prevent lane change by force. It is important to obey lane markings they are not road decorations.

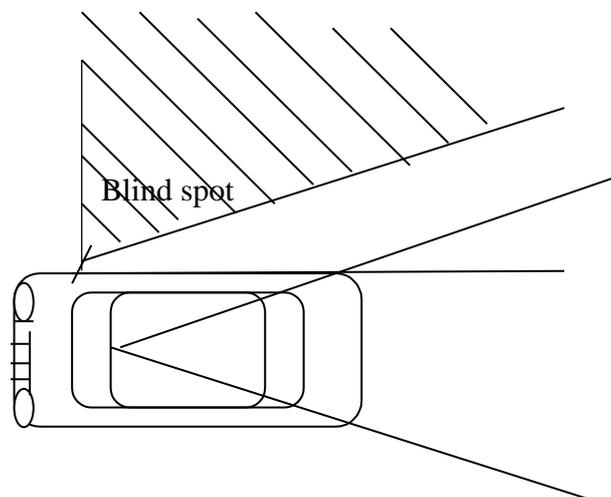


Figure 7.1 – Blind Spot

Stick to one lane

When vehicles are moving slowly along the lanes never try to get in to the front by driving from the wrong side of the road. Three-wheelers are famous for this. This wrong practice worsens the congestion.

Overtaking

Never overtake unless you can do so in complete safety. Don't overtake when you're on a hill, at a bend or corner, at intersections, or on pedestrian or railway crossings. Wait for a long, clear stretch of road. If in doubt, don't overtake.

Speed

The general speed limit on local arterials is 56 km/h. But some roads have their own speed limits. These are shown on signs and must be obeyed. The authorities should be responsible to indicate the speed limits on all roads to remind the drivers of their speed obligations. You should reduce your speed and drive more carefully:

1. When the road surface is not in good condition.
2. High pedestrian activity on the sides of the road.
3. In bad weather (especially in light rain)
4. When there are cyclists on the road.

Especially when travelling long distances do not try to over-speed. It is common to see in this country long distance drivers are vulnerable to over-speeding. Immature drivers tend to drive faster when in high spirit.

Driving through intersections

Always obey traffic lights and traffic signs. Obey 'stop' or 'give way' signs or marks. At controlled intersections, always give way to traffic on your right and on multi-lane roundabouts, make your turns from the correct lane. At roundabouts, you must always travel clock wise and give way to vehicles already on the roundabout. If you intend to turn left or right, remember to signal with your indicators as you approach the roundabout.

Fatigue

When you are driving on a long journey, make sure that you stop and rest every 1½ to 2 hours. Get a good night's sleep before you set out and whenever possible, share the driving with someone else. Watch for the signs of tiredness, restlessness, body aches, lazy steering, and sore eyes. At the first sign of these symptoms, pull over at the nearest safe place and rest until you feel completely alert.

Roadside parking

Generally, you should park parallel and as close as possible to the left-hand kerb. Leave a space or at least one metre between your car and those in front and behind. When you open the kerb-side doors beware it will not hit the bollards planted by the Colombo and nearby municipal councils (the stupidity of these bollards is hard to understand).

Some space is required for angle parking, which means your vehicle should be at 45 degree angle to the kerb. Always obey parking signs. Do not park in areas marked 'no parking', 'no stopping' or 'clearway'. Do not park close to intersections, bus stops, pedestrian crossings, hill or curve where view is obstructed. Do not park in front of driveways.

Who are safe drivers?

Safe drivers are drivers who are;

- ✓ appropriately licensed
- ✓ correctly trained
- ✓ know the current road rules
- ✓ understand and adopt safe driving practices
- ✓ respect the rights of other road users, including cyclists and pedestrians
- ✓ understand the effect of fatigue, alcohol and pharmaceutical preparations
- ✓ have a good knowledge of the condition and capabilities of the vehicle he/she is driving
- ✓ the mind of driver can be the most potent safe driving tool

Is it defensive driving or dodging your way through?

In the past two decades, vehicles have progressed considerably and with the development of new technologies traffic has grown in speed and intensity so dramatically that a far-reaching and complex set of laws and driving ethics have been developed to maintain a semblance of order on roads. Without rules having the authority of the law, the capacity of the road network to carry large volumes of traffic (or road efficiency in other words) in relative safety will disappear, and conditions will rapidly become intolerable. The more the numbers in traffic law violators, the conditions of roads become unpleasant. Hence motorists should remember that it is his/her obligation to follow road rules and avoid being a menace to society.

Finally before ending this chapter it should be mentioned that Sri Lanka is a country with a very high percentage of non-owner driven vehicles. Often it could be seen that some of the vehicles driven by non-owner drivers are so expensive, the replacement cost of a side mirror of the vehicle is more than the monthly wage of the driver who drive the vehicle. On the other hand, due to poor economic state of our country there is no check on the vehicles for their roadworthiness. Hence any object on wheels which can be taken on the road is allowed to run on it. Therefore it can be seen that the importance of defensive driving is increasing and it has come to a stage where driving your own vehicle is like playing a game of dodge ball where you have to constantly dodge yourself from non-owner driven vehicles and unroadworthy vehicles.

Chapter 8

Speeding

Speeding is dangerous and it should be realised that it rarely saves time when roads are congested. It is a wrong impression by most of the local drivers that they can save lot of time by speeding, and in the process taking unnecessary risks and forcing many lives in danger. Speeding is extremely harmful when roads are narrow and lot of pedestrian activities is taking place on the sides of the road. Speeding may have the following harmful effects.

1. It exposes all in the vehicle to danger (not only the driver but all the innocent occupants inside).
2. It exposes the pedestrians and other road users to danger.
3. Creates more air pollution by emitting harmful fumes to the environment when accelerated to overtake. The effect is more with diesel engines.
4. Creates more noise - contributing towards noisy roads.
5. Use more fuel for achieving high speeds.
6. Strain the driver - the driver gets to a competitive and tensed mood where his relaxation is effected. Driving is more relaxing and pleasant if you do it in the right way.
7. Strains the other drivers. Speeding drivers not only strain themselves but strains the other disciplined drivers as well to a great extent.
8. Causes more damage to the vehicle. Not only the accident threat but due to undulations and poor condition of local roads the vehicle lives are shortened by speeding vehicles.
9. Speeding leads to frequent lane changing and use of opposite directional lanes (when overtaking) creating dangerous situations.

Speed limits

Speed limits are provided to help the people to travel safely in urban and rural roads. Speed limits indicate the safe maximum speed that is allowed on the road. This helps to provide a means of deferring those who travel at unsafe speeds. Speed limits prescribe a legal maximum speed permitted. Public should be well aware that exceeding the speed limit is an offence. Speed limits help to save lives. Road fatalities and casualties can be reduced by setting lower speed limits that are appropriate for the conditions. A speed limit of 40 km/h is ideal for urbanised areas where maximum pedestrian activities are present and other areas, and in rural roads 60 km/h is an ideal speed if the road design permits.

Although on national roads the speed limit is around 60 km/h it is commonly seen local drivers speeding over 80 km/h on these roads. The statistics indicate the young drivers 18 - 25 years are the most responsible for speeding offences and this is the age

which enjoys in taking risks. Unfortunately it also can be seen majority of the public transport drivers fall into this category. In most of the developed countries there are probationary periods (ranging from 1 to 3 years) for young drivers to be under scrutiny. During this period although they are provided with the probationary licences they have to drive under strict conditions such as lower speed limits (50 km/h), very strict condition on alcohol, a limit to the passengers they are allowed to carry etc. Violation of these conditions the new drivers loses the chances of obtaining the permanent licence. This type of probationary periods is becoming necessary in this country too in today's context.

Stopping distance

At higher speed it is necessary to maintain larger gaps between vehicles. This is because at higher speeds the braking distance is more than at lower speeds. Braking distance is the distance travelled by the vehicle when the brakes are applied and the wheels locked. The driver will take some time to react towards braking to a situation once he sees a hazard. The distance travelled during this time is the reaction time (for average humans it has been shown the reaction time may vary 0.75 seconds to 1.5 seconds). The total distance covered by the vehicles during the reaction time plus braking distance is the 'stopping distance'.

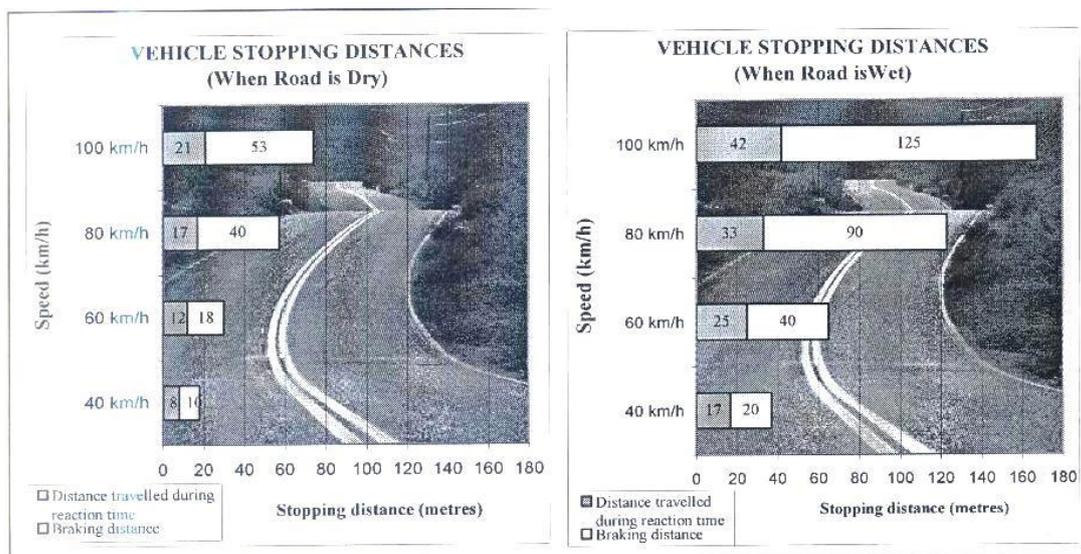


Figure 8.1 - Vehicle stopping distances at dry and wet road conditions

Focussed angle of vision

The recent research has shown that vehicle speed affects the angle of vision of the driver. At high speeds the driver's peripheral vision is narrowly focussed, but at lower speeds the driver can take in much more of what happens in the street space and respond accordingly. This can be seen by Figures 8.2 and 8.3 given below. In Figure 8.2 when the driver is driving at 50 km/h his field of vision is narrowly focussed and any activity outside the focussed area is a potential danger. But in Figure 8.2 at 25 km/h his field of vision is much broad and his effectiveness for close by activities is

much more. Since there is a limit to the brain's capacity to perform according to the observations made by the eyes, so that higher the speed, fewer the observations that can be processed per kilometre or mile. Figures 8.2 and 8.3 clearly shows that at 60 km/h the stopping distance is almost as half of the stopping distance at 80 km/h at both dry and wet conditions. This is a clear indication of the level of safety at 60 km/h compared to 80 km/h.

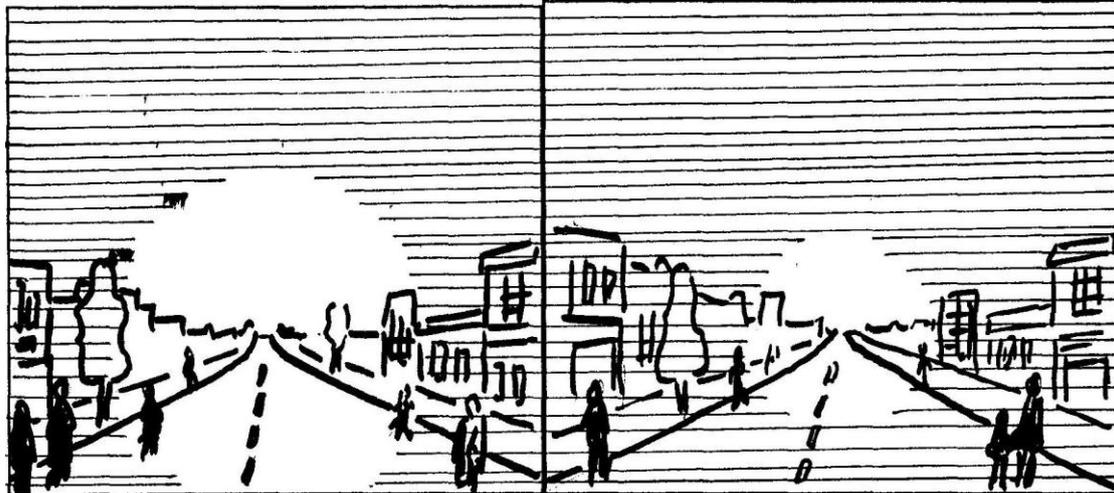


Figure 8.2 - Focussed angle of vision at 25 km/h

Figure 8.3 - Focussed angle of vision at 50 km/h

Display of speed limits

Speed limits should be set by regulation and indicated clearly by signposting. In Sri Lankan arterial roads one main lapse by the highway authorities is that drivers rarely see the speed regulatory signs along the road. More speed regulatory signs should be posted along the sides of the roads and speed limits also can be painted clearly on the carriageway at regular intervals (say every kilometre interval) at-least on the main arterial roads where high rate of accidents takes place. This will constantly remind the drivers of their speed obligations.

A common occurrence happening on our local roads is that once a driver is being overtaken by an over-speeding vehicle, the vehicle being overtaken also tries to keep pace with the vehicle in front. But if constant reminders of speed limit is indicated along the road this might be less.

Physical devices

Speeding can be reduced through integrated strategies including education programs, and introducing physical devices such as speed humps, raised platforms, staggered sections, introduction of mini roundabouts and speed signs etc.

Prevention of speeding near schools

The prevention of speeding is fundamental to road safety around schools where large numbers of children use the roads. If vehicles exceed or ignore speed limits there is less opportunity to accommodate the impulsive behaviour of children, particularly at

the starting and finishing times of schools when they can be excited, distracted or tired. Children learn from adults. Avoid rushing children to and from school. Urgency can transmit itself to children, prompting them to copy adults, get stressed and take risks to save time. It can be seen the recent development of school vans, since they are in a rush to pick-up the children from various points in different routes the drivers hurrying by taking risks by getting a very bad influence on the children. It is prudent to revive the school bus days back into action, where the state owned buses had a definite route and did not have to hurry to pick-up the students like the present day school vans. It is not an easy task to teach the children to be safe passengers, pedestrians, cyclists and drivers in the future with the present set up, unless lot of effort is been put from now a days to educate the young.

Chapter 9

The Need for a National Plan for Cyclists - A Neglected Community

The role of cycling in transport

Cycling currently performs an important transport role within communities in many developing countries. Transport statistics in Sri Lanka in urban and rural areas show clearly that cycling is a popular and alternative mode of transport and is increasing in popularity with the ever increasing fuel prices. This is evident from the Urban Development Authority's feasibility report on traffic management and improvements of roads in Matara, which showed that approximately 50% of vehicle trips in Matara study area are made by cycles. This can be the case in many coastal towns and areas with flat terrain (especially in the dry zone).

However there is relatively fewer data available on national cycle usage to make any conclusive judgements. Nevertheless, various references indicate that approximately around 20% of rural trips are made by cycles and more than 10% urban trips are done with cycles. Furthermore, cycle usage in some national towns is fast growing. It is therefore essential that planners, designers and managers determine what is needed for these road users on all existing and proposed roads in the network and move to provide necessary facilities.

The efficient transportation of people and goods in cities is essential if the economic and social needs of society are to be met. The modes of land transport which play important roles in satisfying these needs include trains, lorries, vans, private motor cars, buses, three-wheelers, motor cycles and cycles. The private motor cars and vans (lately), although preferred, are the most appropriate and favoured mode for many trips (by the community at large) for most trips in local towns. Next to this buses (public and private) play a major role in the national context. It can, however, have undesirable aspects in relation to traffic congestion, road safety, noise and air pollution. These impacts can be tackled to a greater extent with extensive use of local area traffic management techniques (as applied in some of the developed countries) and by giving serious consideration to noise attenuation measures in new road projects. If at all serious consideration is to be given to alleviation of noise; proper driver discipline and enhancement of driver psychology is most needed. As generally discussed by the visitors to the country and also most of us are well aware of - the baffling love of local drivers towards the horn. Probably this can be treated with a public awareness campaign such as a simple TV commercial with the anti-horn message might do the trick.

Quite rightly, there is a realisation in communities these days that it may not be possible or desirable to provide sufficient road space to completely meet the growing demand for travel by private vehicles and buses. Consequently, all over the world many highway planners and local authorities are either examining or implementing

measures which may be used to achieve an acceptable balance between the transport and communication needs of communities and the need to maintain or enhance the amenity of residential areas, towns and cities. Listed below are some of the measures which may be introduced in future:

1. The reduction of travel demand either generally or in specific locations by pricing policy, land use strategies, parking policy or restraints on system capacity.
2. Environmentally adapted through roads which may maintain existing traffic volume but at a reduced speed.
3. Exclusion of motor traffic from town or city centres in favour of pedestrian shopping precincts.
4. Continuing use of local area traffic management schemes and appropriate design of new residential areas to create pleasant and safe neighbourhood environments.
5. Dedication of road space a specific users (e.g. lanes for exclusive use by lorries, buses, car pools or cycles).
6. Cleaner, quieter and more efficient motor vehicles.
7. Home based work utilising computers and telephone lines.

Although the latter two options may be appropriate to countries with more financial stability, the first five options can be given serious thought in the local context. The management of traffic impacts on local towns is likely to require the use of the above measures to some extent. However, improvement in the short to medium term is likely to be achieved through implementing measures such as encouraging people to, use modes of transport other than the motor vehicle.

Cycling is a clean cost-effective and efficient mode of transport which is well suited to many of the trips currently made in cars and buses, particularly in inner urban areas with more level terrains (specially in coastal areas). Many motor vehicle trips, including journeys to work which are less than 10 kilometres - a distance which can be covered in many inner urban areas as quickly on a cycle as in a bus, car or motor-cycle. An indication of the potential for cycling can be obtained from conducting relevant field studies. These surveys can be targeted to obtain information such as:

1. The proportion of all motorised trips less than 5 km or 10 km that could be made easily with cycles.
2. The scopes and possibilities of attracting more school children and the current proportion of school children using cycles for schooling.
3. The possibility of attracting long-distance travellers to the stations or bus-stands on cycles (dual mode travel – e.g. cycles in combination with trains and buses).

4. The percentage of all trips where there is no objective constraint, such as the need for a motor vehicle during the day or to carry luggage, preventing the use of a cycle.

Statistics obtained from such as these surveys could be used to confirm potential for the cycle to provide a clean and efficient alternative mode for many current motor vehicle trips. In view of community concerns about health, about pollution and the environmental damage caused by motor vehicle emissions, the wider use of the cycle should be promoted as a non-polluting form of transport.

If significant numbers of people are to be encouraged to use cycles instead of motor vehicles they need to be convinced that it is a reasonably safe, convenient, healthy and enjoyable way to travel. Moreover they need to feel that they are personally secure. Personal security is related to many aspects of society other than those associated with engineering and planning, but these disciplines should also consider the personal security of cyclists in the design and maintenance of facilities. This may relate to the provision of adequate lighting, maintenance of landscaping along paths, direction signs and the provision of frequent exit points from off-road paths to the street system.

Encouragement of cycling as a means of transport also requires comprehensive planning and the development of complementary programs dealing with education, enforcement, engineering and encouragement so that people chose to cycle. It is also important to provide low interest cycle loans arrange through banks, work places and various other organisations. It will also be more encouraging and attractive to the community in obtaining more modernised cycles available in the outside market instead of the typical old fashioned local cycles which are tougher on legs.

In urban and rural areas cycling also can play an important part in recreation within the community. It contributes to the general health and well being of the community and is an excellent family activity for people of all ages. When provided as part of a system of linear parks cycle paths provide a very good means for the public to take advantage of the recreational experiences offered by open space within metropolitan areas. Cycle path systems also provide an environment in which the young or inexperienced can learn to ride away from motor traffic. Many of these people may then use their cycles for non-recreational trips.

Strategies for developing a cycle plan

Planning for cyclists should occur at many different levels from the development of broad policies and strategies to relatively small local projects. It should involve a commitment from all levels of government and input from the general public, cycle associations and local cycle groups. Every encouragement should be given to form and function local cycle groups or associations at the local or regional level. The main goal of cycle planning is to encourage cycling as a desirable alternative form of transport and to provide community and government programs which will provide for safe and convenient travel by cycle whilst maintaining a satisfactory level of service for all other road users.

The development of strategies is important because they provide a framework and direction for the development and co-ordination of programs throughout government and should constitute a commitment to various initiatives and actions. They also provide for the integration of cyclists needs into all planning and design activities including commercial and industrial building designs, land development plans, subdivision plans, road designs and road maintenance programs.

Cycle planning should therefore include:

1. Development of broad cycle policies and cycle strategies at National and Provincial levels. This should include all aspects of cycling, involves all relevant departments and local councils, and assigns responsibilities.
2. Development of local strategic cycle plans on a local basis which sets local strategies and defines local cycle networks.
3. Regional Cycle Network plans could be established. These plans can be made use to identify local needs for programs, and also for road and path improvements.
4. The traffic-police assistance will be very important in developing the National Cycle Strategy.

These strategies and plans may provide a statement of actions which are based on encouragement, education, engineering and enforcement.

National plan for cyclists

The National Cycle Plan should recognise the contribution which cycling makes to transportation as nation wide and the benefits which will be derived from greater use of the cycle with respect to fuel consumption, traffic congestion, reduction in noise, urban air pollution, greenhouse gas emission, and improved public health.

The objectives of the National Cycle Plan should be to:

1. Integrate cycling into the transport system and into urban planning as a legitimate mode of personal mobility.
2. Encourage safer cycling in the community by targeting to reduce the rate of cycle related crashes and the severity of injury to cyclists.
3. Improve the confidence in average cyclists in making a safe and quick journey.
4. Ensure that planning for cycling is integrated within overall transport and land use planning.

5. Give priority to those areas where demand for cycling is highest.
6. Ensure that cyclists have suitable and legitimate access to road space.
7. Develop behavioural and safety awareness programs aimed at improving cyclist safety in general.
8. Ensure appropriate legislative framework for cycling having regard to safety, good traffic engineering practice and credibility of the law.
9. Encourage cycling for the environmental, recreational and health benefits to cyclists and the wider community.
10. Co-ordinate the provision of cycling facilities and programs across relevant agencies and organisations.
11. Introduction of various insuring schemes for cyclists.
12. Provide guidance to encourage a high level of compliance by cyclists with traffic laws covering both educational and enforcement needs.
13. Investigation of new initiatives and conduct research.

The plan also requires that 'proposals to, achieve these outcomes be assessed against specific criteria, including cost-effectiveness, feasibility and safety'. It also requires that all potential social, environmental and economic factors be considered.

Planning at the local level

At local level these plans could be incorporated in to more in detail. The purpose of these detail plans is to translate many of the aims of the local strategy into practical programs and projects at the local level. Local strategic cycle plans should, however, concentrate on the development of solutions to problems which exist within the local council or region rather than deal with general issues. The issues should be more localised.

The basic aims of the local plans could usually include the following:

1. Survey the extent and nature of cycling within the local council or region.
2. Determine the cycling requirements of the community.
3. Indicate factors that inhibit cycling.
4. Identify a practical bikeway network.
5. Develop engineering measures and programs to overcome problems including estimated costs and an implementation plan.

6. Identify local requirements for behavioural programs which are aimed at improving cyclist safety in general and in relation to specific local problem areas.
7. Develop encouragement programs.
8. Review law enforcement and compliance with local by-laws.

For the community to derive maximum benefit from its local strategic cycle plan it is essential that the plan produce positive and practical affordable outputs. It may also be suggested that the development of these local strategic cycle plans should be a combine effort by a Steering Committee comprised of representatives of; the local councils, council engineering and recreation staff, the relevant road authorities, the police, local schools, cyclists, cycle retailers, the local community.

Chapter 10

Planning of Roads for Cyclists

As indicated and discussed in Chapter 6 the usage of cycles at national level is of high proportion. Especially the cycles are in much demand in low-lying and coastal areas. This is well evident from the Urban Development Authority, Feasibility Report on Traffic Management and Improvements of Roads in Matara which states that approximately 50% of vehicle trips in Matara study area are made by cycles. This is the case in many coastal towns and flat terrain areas especially in the dry zone.

If cycling to be considered as a major means of transport, the proper planning for the future and the necessary groundwork should be carried out in advance. Encouragement of cycling as a means of transport requires comprehensive planning and the development of complementary programs dealing with education, enforcement, engineering and encouragement so that people chose to cycle. In addition to cycling as a means of transport, it also can play an important part in recreation within the community. It contributes to the general health and well being of the people and is an excellent family activity for persons of all ages. Hence for cycling to be a safe and efficient means of transport and also attractive recreation activity the future roads should be designed with the cyclist in mind. When designing roads more favourable to cyclists, certain road design criteria should be followed. This should be irrespective of designing new roads or in carrying out road rehabilitation projects.

Road design criteria for cyclists

In Sri Lanka most of the cycle riding is done on roads which have been designed essentially to provide for the movement of motor vehicles. The vertical and horizontal alignment standard adopted on roads to serve the needs of motorists will normally be satisfactory for cycle riding provided that the following operational aspects of cycling are understood by road planners and designers. When designing roads with the cyclists in mind, the designer should carefully consider the factors such as gradients, cross sections, road surface and cycle lanes etc.

- **Gradients**

Motor vehicles have little difficulty climbing most hills, but cycle riders prefer to avoid hills wherever possible. Cyclists normally select the flattest alternative route to minimise the amount of climbing. In climbing steep hills experienced cyclists work the cycle from side to side whilst the inexperienced tend to wobble. In situations where a steep gradient is unavoidable additional pavement width may be provided to allow for this operating characteristic. Because excessive gradients on hills can be exhaustive to cyclists and act as a deterrent to cycle riding road planners and designers should strive to minimise gradients on all new works including those in new constructions where it may be possible to achieve flatter grades on roads at no additional cost.

- **Cross section**

As some cycle guideline states, on roads carrying less than 300 vehicles per hour, cycle riders and motor vehicles can share the road space. However, where this volume is exceeded and where speeds are high, motor vehicles will constantly pass cycle riders and hence the width of the left lane should be at least sufficient for cars and cycles to travel safely side by side. This requirement applies equally along the road and at intersections.

Proper guide lines should be followed, in determining appropriate lane widths to cater for motor vehicles and in assessing whether inner lanes can be narrowed and kerbside lanes widened to better provide for cyclists. In establishing the minimum width required for the inner lanes, traffic speeds, the number of large vehicles and the road alignment must be taken into account. According to established guidelines in developed countries in congested urban areas, 3.0 metres is generally accepted as the absolute minimum lane width at mid-block locations and 2.7 metres at intersections. In terms of the side “wind” force exerted on cycle riders from heavy vehicles it is desirable that roads be designed to provide satisfactory clearances between the cycle and the vehicle. Suitable clearances to vehicles are desirable in order that cyclists do not feel unduly threatened by general motor traffic. However, the inability to achieve these clearances should not prevent the provision of a facility having a lesser clearance.

A dangerous habit by the local cyclists, when riding in groups or pairs, the tendency to ride abreast has resulted in many nasty accidents with motorists. The risk involved in riding in abreast should be conveyed to the cyclists.

- **Road surface**

Whilst it is not a factor in geometric design the quality of the road surface is critical to the comfort and safety of cycle riders and to the satisfactory utilisation of the space provided. Pot holes, broken surfaces and other surface irregularities put cyclists at risk when they avoid them by swerving toward the adjacent motor traffic. Properly maintained road surfaces are necessary for the safety of cyclists. In preparing designs for cycle facilities a smooth surface such as asphalt, concrete or sand-seal surfaces can be adopted. Drainage grates, exposed man-hole lids and other carriageway furniture should be designed so as to remain flush with the road carriageway.

- **Traffic lanes for cyclists**

Traffic lanes for cyclists should be viewed as part of a cycle network providing the connectivity required enhancing the convenience and safety of journeys by cycles. As per some guidelines, where the total traffic volume on a road is less than 300 vehicles per hour, cycle and motor vehicles can share the available road space. Where the volume exceeds 300 vehicles per hour it is desirable that additional space be provided through one of the following treatments.

Shared cycle/car parking lanes

Installation of shared cycle/car parking lanes provides a means of improving conditions for cyclists where parking occurs. Such a lane should enable a cyclist to ride with adequate clearance to moving vehicles in the adjacent traffic lane and also avoid an opening of a vehicle door without the cyclist having to enter the adjacent traffic lane. Collisions between cyclists and doors of parked cars can cause a significant number of cycle accidents and may result in serious injury to cyclists, therefore measures should be taken to avoid this.

Cycle/car parking lanes are generally used where parallel parking is permitted but may also be used in conjunction with angle parking (although angle parking is rare in this country). Whilst an opening car door does not pose a threat to cyclists in the case of angle parking, cyclists have to be alert to vehicles reversing into their path. It is most important in cases where parallel parking is being converted to angle parking that the needs of cyclists are given adequate consideration. The adjacent road lanes or manoeuvre area should be wide enough to satisfactorily accommodate cyclists.

A cycle/car parking lane is created by carriageway markings, which allocate space for cycling and for car parking, and by signs which give the lane its legal status. Motor vehicles should be prohibited by regulations from traveling within the lane except to access property, to turn at intersections, or to park. Cyclists are required by law to travel in the lane. It is therefore important that the surface is smooth and well maintained including sweeping to remove debris. If the lane is not maintained cyclists are likely not to use it or to swerve suddenly out of the designated lane in order to avoid surface irregularities thus creating a hazardous situation. It is also very important the cyclists should be properly educated the importance of riding within the designated lane.

Cycle/car parking lanes are only appropriate where road space and capacity requirements allow parking throughout the day or where the street is wide and there is a moderate demand for parking (e.g. residents do not have off-street parking or vehicles parked for commercial purposes). They may be achieved by reducing the widths of other traffic lanes where space is available on existing roads. A shared cycle/parking lane should not be provided where parking demand is low unless kerb extensions are built to prevent the use of the lane by through traffic.

Wide kerbside lanes

A wide kerbside lane is a normal traffic lane on the left side of the carriageway of sufficient width to allow cyclists to travel beside the main traffic stream and to permit motorists to overtake cyclists without having to effectively change lanes. This sharing of lanes is generally only appropriate in 60 km/h or more speed zones. Because special signs and pavement markings are not required, wide kerbside lanes are a very cost effective way of providing space for cyclists, particularly on arterial roads where there is limited space available to meet the requirements of all road users, and where clearways apply during peak hours. They are often readily achievable by replacing lane lines in a different location as a part of road marking maintenance operations and hence have potential for large scale usage.

Wide kerbside lanes are appropriate on all major traffic routes, whether divided or undivided, on sections of road where parking is either minimal or prohibited during peak periods.

Sealed shoulders

This will be an appropriate treatment for most of the existing rural roads in the country where high proportion of cycling is taking place. When a road is unkerbed and provision for cyclists is required, a smooth sealed shoulder is a preferred treatment. Sealed shoulders are often provided to reduce road edge maintenance and repair costs and improve safety for motorists, while benefiting the cyclists. Although warrants do not exist specifically for the provision of sealed shoulders for cyclists there are many instances on rural type roads where the sealing of shoulders is justified specifically to make roads safer for cycling.

An edge line should always be marked between the shoulder and the traffic lane. Cycle logos may be painted on the shoulder to warn motorists of the likely presence of cyclists and to suggest to cyclists that they should use the shoulder. If sufficient cyclist demand exists the shoulder may be marked and signed as an exclusive cycle lane so that the shoulder takes on the legal significance of such a lane under the traffic regulations.

Some important aspects relating to the use of sealed shoulders by cyclists are:

- The surface should be at least as smooth as the adjacent traffic lane and free of debris or cyclists may choose to ride in the traffic lane rather than on the shoulder.
- Each section of sealed shoulder should continue over a significant distance, say 500 metres. It is undesirable to have intermittent short sections sealed with cyclists being “squeezed” at the end of each.
- Where a sealed shoulder is closed for maintenance adequate advance warning of the closure should be provided to cyclists. This is especially important on high speed rural roads. Consideration should be given to providing a temporary side track for cyclists or a detour via a reasonable alternative route.
- An initial treatment could be to provide shoulder sealing on vertical crests and tight horizontal curves of two-way roads where double lines prevent motorists from allowing satisfactory clearance to cyclists when overtaking.
- The edge of the shoulder pavement should flush with the adjacent ground.

Exclusive cycle lane

Although some may argue exclusive cycle lanes may be too luxurious for this country, but when new roads are constructed (such as roads in Mahaweli Development areas where a considerable cycle population can be expected) these lanes may be well justified. An exclusive cycle lane is a lane created by pavement marking and signs. It is the preferred treatment where motor traffic speeds exceed 60 km/h. Motor traffic is prohibited by traffic regulations from traveling in the lane except to access property or

to turn at intersections. An exclusive cycle lane may be provided where parking is banned, where the demand for kerbside car parking is minimal or where the facility is mainly required in peak periods and parking is allowed in the off peak period. On high speed roads in rural or outer urban areas sealed shoulders may be utilised but should be appropriately surfaced for use by cycles.

An exclusive cycle lane may be appropriate where:

- Cycle traffic is concentrated, e.g. near schools or along major routes near city or town centres.
- An existing or potential significant demand for cycle travel can be demonstrated, e.g. where present traffic volumes and speeds discourage cyclists from using an otherwise favourable route.
- It is needed to provide continuity of a route within a bikeway network.
- The road is carrying or is likely to carry more than 300 vehicles per hour and/or a significant percentage of heavy vehicles.

Other important aspects relating to exclusive cycle lanes are that they:

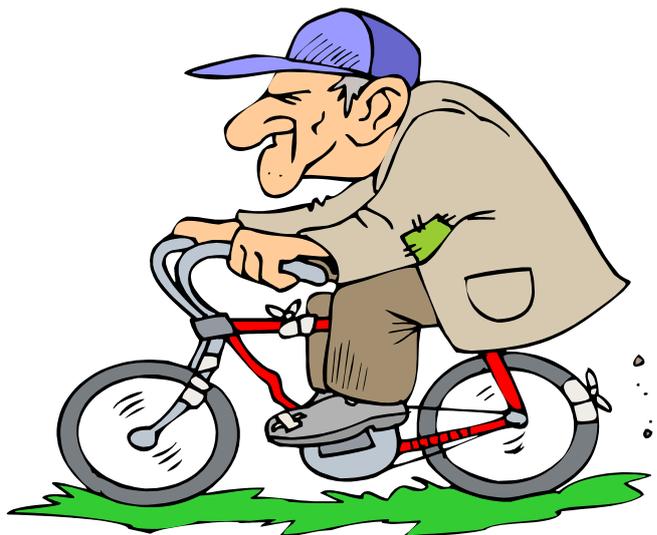
- Should be provided on both sides of the road so that use is in the same direction as motor vehicle traffic.
- Should not be placed between the kerb and parked cars as there is no escape for cyclists should a car door be opened suddenly.
- Should only be used where there is little demand for parking throughout the day or where parking can be prohibited during certain designated hours to suit the peak travel demands of cyclists and motor vehicles (e.g. clearway times, school journey hours).
- Action should be taken under traffic regulations against motorists who disregard parking prohibitions thus placing cyclists in conflict with moving motor traffic. When cyclist demand is mainly in peak periods and parking is required throughout the day the exclusive lane and adjacent traffic lane will provide enough width for the lane to act as a cycle/parking lane;
- Should preferably not be delineated with raised pavement markers or raised barriers as these are hazardous to cyclists;
- Are of considerable advantage on long uphill grades where there is a higher speed differential between motor vehicles and cyclists and cyclists tend to weave about whilst working their way uphill.
- Are also advantageous on long downhill grades where extra room to manoeuvre is desirable.
- Because debris from the adjacent lanes tends to accumulate in exclusive cycle lanes and they are not “swept” by motor traffic traveling in them, it is important that they are regularly swept as part of routine road maintenance.

The width adopted for exclusive cycle lanes will vary depending on the number of cyclists, the speed of motor traffic, the volume of large vehicles and the ability to make space available given the needs of other road user groups, physical constraints and budgetary constraints.

Conclusion

Finally in conclusion, if significant numbers of people are to be encouraged to use cycles instead of cars they need to be convinced that it is a reasonably safe, convenient, healthy and enjoyable way of travel. Further the cyclists need to get the feeling that they are personally secure and the roads are designed in such a way that they provide the necessary protection for the riders from the motorised vehicles.

Personal security and safety is related to many aspects of society in addition to those associated with engineering and planning, but these disciplines should also consider the personal security of cyclists in the design and maintenance of facilities. This may relate to the provision of adequate lighting, maintenance of landscaping along paths, direction signs and the provision of frequent exit points from off-road paths to the street system. It is also very important the cycles on the road should be properly equipped with accessories such as head-lights, reflectors for night visibility, brakes and good tyres for a safer cycling environment. Before concluding this chapter it should be stressed that proper rider discipline and behaviour are very important to create pleasant conditions to the cyclists as well as other road users in addition to well designed roads.



Chapter 11

Three Wheelers among Other Vehicles

If a proper and efficient transport system is to be enjoyed by the people of this country in the future, the relevant transport authorities should act wisely at least now before it's too late. When preparing blueprints for future transport going by the current experience, it can be definitely said that the three wheeler is not the vehicle of the future in this country, and the transport policies should be formulated so as not to introduce more and more of these poor form of vehicles but to take necessary steps to phase out the existing three wheelers from our roads in stages without directly affecting the large population who are already depending on these vehicles.

It is regrettable to come across a new item on a newspaper stating that eight-seater three wheelers to be introduced to Sri Lankan roads in the near future. According to the news item, the launching of these new three wheelers is going to be a remarkable way of approaching the current millennium in the sphere of transport. But on reality it is scary to think that if this is the way we hope to approach the current millennium how desperate our transport situation is going to be in the future. Although it is true that three wheelers are an economic way of transport due to the low fuel consumption and definitely much better form of transport than the bullock cart, unfortunately this poor mode of transport is not a safe and steady method and definitely not a suitable mode for the current millennium.

The three wheelers are not accepted as an efficient and safe way of transport in most of the countries where there is a high standard of transport. Looking back from our own experience of the past ten to fifteen years it is clearly seen that this mode of transport did much harm to the city roads than the good done by them. It is well proved that these three wheelers are very likely to cause accidents and these vehicles have been responsible for breeding an undisciplined generation of drivers which has caused large number of accidents and done much damage to the smooth flow of traffic in the city roads. It is doubtful whether there is a complete record of the accidents involving three wheelers and also whether any attempt has ever been made to estimate the accident costs and human suffering caused by these vehicles. Will anyone dispute the fact that the three wheelers in Colombo roads have become a traffic hazard and the undisciplined driving behaviour of these drivers have become an irritating factor for the disciplined drivers?

Stability and safety

From simple dynamics it can be seen that vehicles with three wheels are much less stable than vehicles with four or more wheels. It is also simple dynamics that the most stable arrangement of the three wheels is when the three wheels are at equal distance.

When one wheel is far distant from the other wheels the stability decreases. Hence one can imagine the position regarding the stability of these new eight-seater three wheelers with increased distance between the front wheel and the rear axle. In the news item it vouched for the technical suitability of these long three wheelers, but I wonder what type of crash tests have been carried out on the performance of these eight-seater three wheelers before introducing them to our roads. Experience shows that, a small impact is sufficient to overturn a standard three wheeler to cause severe injuries to the passengers. Hence it is well evident that these extra-long three wheelers may be even more accident prone and finally result in large financial costs by way of compensation to the injured.

Legal obligations

A driver in a properly covered vehicle (standard vehicles such as cars, vans, buses, lorries etc.) involved in an accident with a three wheeler can quite rightly ask why he/she should pay compensation to the victims in three wheelers, when the victims had travelled in a highly risky and susceptible (weak) vehicle by exposing themselves to great danger taking the risk willingly. The same impact would not produce any victims under the same conditions had the vehicle collided with a properly covered standard vehicle. How does the law look at this? These are some of the questions to be answered before rushing to accept these vehicles as passenger carrying vehicles.

Conclusion

If a proper and efficient transport system is to be enjoyed by the people of this country in the current millennium the relevant transport authorities should act wisely now in order to be prepared for the future. When preparing blueprints for future transport it can be definitely said that the three wheeler is not the vehicle of the future in this country, and the transport policies should be formulated so as not to introduce more and more of these poor form of vehicles but to take necessary steps to phase out the existing three wheelers from our roads in stages without directly affecting the large population who are already depending on these vehicles. It should be stressed that three wheelers are not a good form of passenger carrier although a limited number of these may be used as light delivery vehicles. Let the Sri Lankan passengers of the new millennium be carried on four wheels in a safer and a modest way. It is always better to correct at-least later, rather than not correcting at all.

Chapter 12

Taxi to Three-wheeler — Is it the Pedal Three-wheeler Next?

It can be seen that plenty of road development plans, road rehabilitation schemes, and new road construction projects are under review at the moment. Along with these ground development schemes planners should think of what type of vehicles they are planning to have plying on these national roads. Serious thought should be given when granting permission and especially importing these vehicles to the country (since we are not manufacturing any of these vehicles locally) what consequences these vehicles have on the roads, and what type of vehicles we really need on our roads.

It was barely three decades ago that the ordinary house-wife had the luxury of walking to the nearby market or shopping area buying the weekly provisions and returning home in a Morris-minor taxi, seated quite comfortably and safely. Those taxis were metered and one did not have to bargain for the fare or pretend to be poor to get a reduction in the fare. Those days are gone, and now almost after three decades it is common to see the ordinary house-wife after her weekly marketing trips returning home cramped up in a three-wheeler unsure whether she will be able to make her trip home without breaking a limb. It is wise to bargain with the driver and fix the fare before getting into the three-wheeler because once the trip is done and if you happen to be well-dressed the pinch on the purse will be more. It has become a luxury and only a dream to think of returning home with your weekly provisions in a four-wheel taxi unless you have your own car. This makes a person to wonder whether, this is the way our transport system is heading towards the future. Lot of talking is done on building new expressways, free-ways, super highways, toll roads and access control roads but by looking back at the progress that has taken place from the four-wheel taxis to three-wheel taxis one may not hesitate to think that the day of the pedal three-wheeler as shown in the figure, is not far.

The same reasoning which justifies the use of motorised three-wheelers can be brought to justify the use of these pedal three-wheelers. According to the line of thinking of the present day transport policy makers, the facts such as (listed below), support the idea that pedal three-wheelers are better vehicles than the motorised three-wheelers.

- they are more environmentally friendly
- no fuel is needed (i.e., more economical)
- no harmful fumes
- much less noise
- much cheaper and economical

- can be locally manufactured and large savings in foreign exchange
- since the wheel diameters are large more stability
- provide good exercise for the driver (or peddler) - resulting a healthier nation
- since less powerful, more road discipline
- poor man will embrace this as their vehicle, not the motorised three-wheeler

A long term vision on passenger transportation is an urgent necessity. Again going down the memory lane, two decades ago the ordinary passenger never had to be cramped up in a four and a half feet clearway from floor deck to hood and travel through congested traffic. The CTB buses were sufficiently high for a tall person to stand comfortably as a respectable human being. Those buses moved once gets going from the terminal, but now at each halt the passengers have to wait however uncomfortable they are till the bus is full. Could this be called a development in the transport sphere?

The need for long term transport vision for the country

It can be seen that plenty of road development plans, road rehabilitation schemes, and new road construction projects are under review at the moment. Along with these ground development schemes planners should think of what type of vehicles they are planning to have plying on these national roads. Serious thought should be given when granting permission and especially importing these vehicles to the country (since we are not manufacturing any of these vehicles locally) what consequences these vehicles have on the roads, and what type of vehicles we really need on our roads.

The thinking should be along these lines;

- Are the types of vehicles compatible with type of vehicles already running presently on the roads?
- Are they safe for human transportation?
- Are their moving capabilities compatible with those of other vehicles?
- What degree of safety is given by these vehicles?
- Will the new type of vehicle introduced be a hindrance to the existing types of vehicles and the society at large?
- Will it be an improvement to the overall transportation?
- If unsuitable types of vehicles are already on the roads what corrective actions should be taken from now itself to phase them out from the roads?

- Necessary action should be taken to curtail the substantial growth in the ownership of unsuitable vehicles on roads.
- It is important to always have a long term vision than cheap alternatives. Unless there is a proper vision for the future, Colombo traffic situation will become severe in the near future.

The authorities can hide behind the ready made excuse that the population has increased and the mobility of people has also increased. But one should not forget the fact that the number of vehicles has increased and much road widening and road improvements have also taken place in the course of time. The authorities have only themselves to blame for situations such as,

“Punchi Singho at 30 used to travel standing comfortably in a bus with a 6 feet clearance, but now at 60 he travels cramped up in a 4’ 6” private bus .

or

“Somawathi who was at 25 travelled home from the market with the weekly provisions in a Morris-minor taxi now at 55 travelling in a three-wheeler praying god that this monster will not hit on anything moving and do the usual somersault”.

Chapter 13

Road Safe Vehicles on City Roads

When new cars are manufactured, their safety standards are checked, before permitting them on the roads. Manufacturers of each new model of a vehicle are obliged to carry out a series of crash tests by using human shaped dummies to be affirmed of how safe their vehicles are before allowing them to carry passengers. These test programs are referred to as New Vehicle Assessment Programs (NVAP). Sometimes these tests are repeated in some countries before the vehicles are allowed to be used in those countries irrespective of the manufacturer's guarantees. Although initially these tests seem to be expensive the long-term good to society is immense. Once the vehicles pass these tests, the results are published and the public has access to the results. They can make their own decision which vehicle to purchase depending on safety and of course the price. The vehicles that fail these tests (i.e., unsafe vehicles for human transportation) are not allowed to be imported to the country. In the local context when importing vehicles these crash test results can be looked into before approving the new model to be put on the road.

The New Vehicle Assessment Programs (NVAP) is designed to provide consumers with information about how well vehicle models may protect their occupants in serious frontal crashes. These programs are generally supported by government road and transport authorities, automobile clubs and vehicle manufacturers (or vehicle importers in the local context). NVAP crash tests are conducted in many developed countries and the results can be readily obtained from those countries on request.

NVAP test types

The NVAP crash tests are generally conducted in two ways:

1. The full frontal crash test [Figure 13.1(A)]
2. Offset crash test [Figure 13.1(B)]

1. The full frontal crash test

The full frontal crash test is conducted with test dummies in the vehicles and the vehicles are made to go at around 50 km/h and subjected to one full frontal crash into a solid concrete barrier as shown in Figure 13.1(A). In this test the force of the impact is spread evenly across the front of the vehicle.

2. The offset crash test

The offset crash test is conducted with test dummies in the vehicle and the vehicles are made to go at about 60 km/h and subjected to crash into a barrier with a crushable aluminium face as shown in Figure 13.1(B). The crash forces are made to concentrate on the driver's side of the vehicle. The test standard is 40% of the width of the car is initially made to come in contact with the barrier.

These tests are based on international standards and show up differences in protection from injury to front seat occupants provided by vehicle models of similar size and weight. The overall rating considers the deformation of the passenger compartment, how well the restraint system functioned and injury measures to the head, chest and legs. Leg injuries are not usually life-threatening and are given less weight in the overall rating, as is head restraint position. For an instance in Australia the NVAP test results are given to the vehicle importers and they are given the opportunity to view the crash test and examine their vehicles before and after the crash test. Care should be taken that test vehicles are typical of those available in the market.

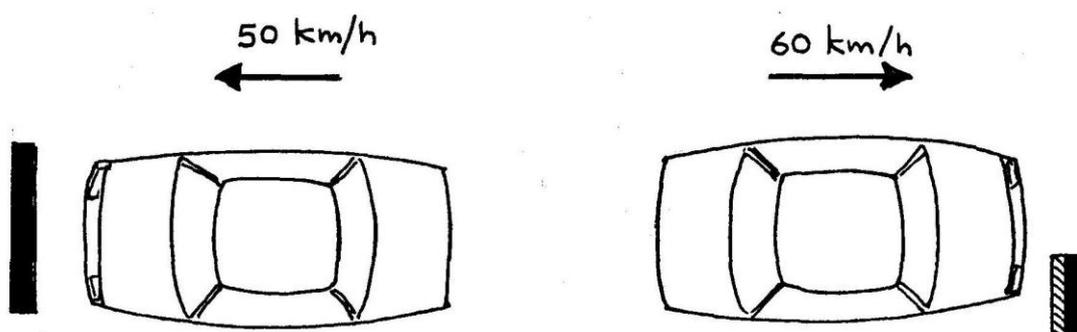


Figure 13.1 (A) - Full frontal crash test

Figure 13.1(B) - Offset crash test

Three wheelers and NVAP tests

By observing the light impact accidents involving three-wheelers resulting with heavy casualty rates one may wonder what sort of road safety tests have been satisfied by these vehicles. As universally accepted the four wheel arrangement in a vehicle is much stable compared to the three wheel arrangement. Hence satisfying of road crash tests by these three wheel vehicles is of vital importance. If these tests have been carried out before approving these vehicles on our roads most of the deaths and injuries taking place due to light impacts involving three wheelers could have been avoided.

Three wheelers and the risk of accidents

Quite rightly a driver of a four wheel vehicle may argue why that person should be allowed to live with the guilt for the rest of his life if an accident involving a three wheeler has cost the life of an innocent passenger in a three wheeler, when the impact is definitely not worth the cost of a life. Had the accident been with a proper four wheel vehicle, the cost would probably be replacement of a tail light. It may be well proved that the impact caused by a vehicle at 20 km/h is quite sufficient to topple the three-wheeler killing a passenger in it (one might wonder how three wheelers will perform against an offset crash test, the most common type of three wheeler accidents). Who is to blame for this situation? Is it the driver of the four wheel vehicle or the authorities who allowed the three wheelers on our roads?

If the three wheelers do not conform to the NVAP safety standards, it is high time research is directed to introduce a four wheel arrangement for these vehicles or develop a phasing out programme of these vehicles from our national road network.

Three-wheeler as a passenger carrying vehicle

According to an Intermediate Technology Publication on Low-cost Vehicles by Gordon Hathway (1985) 'auto rickshaw' or three-wheeled basic motor vehicles based on motor cycle and scooter components are mostly manufactured in India and are used in some South East Asian countries with poor transport standards. They use this vehicle to transport people as a means of replacing the bullock cart or the rickshaw. On the contrary three-wheeled basic motor vehicles are also popular in some Mediterranean countries, such as Italy and Greece, but are only used for haulage of light goods and agricultural produce in rural areas. It should be stressed that the three-wheeler is not a vehicle for passenger carrying and also not a vehicle for city traffic although unfortunately in this country the transport authorities (or decision makers) have still to realise this fact.

Compatibility and lane discipline

If three-wheelers are allowed to ply among city traffic forgetting the fact that it is not a safe passenger carrying vehicle, at least it should be compatible with the road design standards and other vehicles using the city roads. The sharp turning circles, and narrow body widths are the ideal combination to unsettle the lane discipline. If any attempt is made to make the local drivers get used to drive within lanes, three wheelers are the ideal vehicles to confuse the discipline. One may wonder how many local drivers have faced the situation when vehicles are following each other in orderly fashion, suddenly you are surrounded with three wheelers and you get so confused that you do not realise whether you are driving a single, two, three or four lane road stretch. Following the three wheelers you end up with the lane mix-up. The road designs are carried out with a lane width varying from 2.75 to 3.5 metres depending on the expected level of service of the road. Unfortunately the body width and the overall shape of the three wheeler is such that it is able to wedge through these

lanes even when the lanes are occupied, and supported with their sharp turning manoeuvres they can put an end to any stream line flow. Hence the compatibility of these vehicles with the other vehicles is a question to be addressed. To improve on the compatibility the research should be directed to restrict the turning manoeuvres and increase the body widths, or else the road design guidelines will have to be revised to suit the three wheelers forgetting the four wheel vehicles.

At this stage it will be worthwhile to investigate which is the culprit that encourages breaching of the law, whether the driver or the vehicle itself. It is always easy to wash your hands off by putting the blame on the drivers for most of the accidents and three-wheeler based offences. Let us look at how these accidents occur and what the root causes for them are. Figure 13.2 indicates the most common type of offences caused by three-wheeler drivers (operators) threatening the safety of passengers and other road users. By looking at these common offences made by three-wheeler operators one does not have to be a transport expert to realise that the reason for these offences is as mentioned earlier, the sharp turning circles, narrow body width and the overall wedge shape of this vehicle that will tempt any driver or operator to commit these offences.

Low engine capacity four wheel vehicles (800cc or less) as an alternative to three-wheelers.

If safety, road discipline and a respectable ride is the governing criteria 800 cc low powered economical four wheel car may be the future cab with an improved public transport system. It is hard to understand why the authorities do not make an attempt to relieve the import duties on the low engine capacity four wheel vehicles and try to replace three-wheelers with these more economical vehicles.

Has any comparative study ever been carried out on the overall efficiency on the economy, environment, road efficiency, highway aesthetics, accident cost injury and by way of human lives, between low capacity 4 wheel vehicles and the three wheelers? On the face value the three wheeler may seem the winner but from the long term point of view it may be vice-versa.

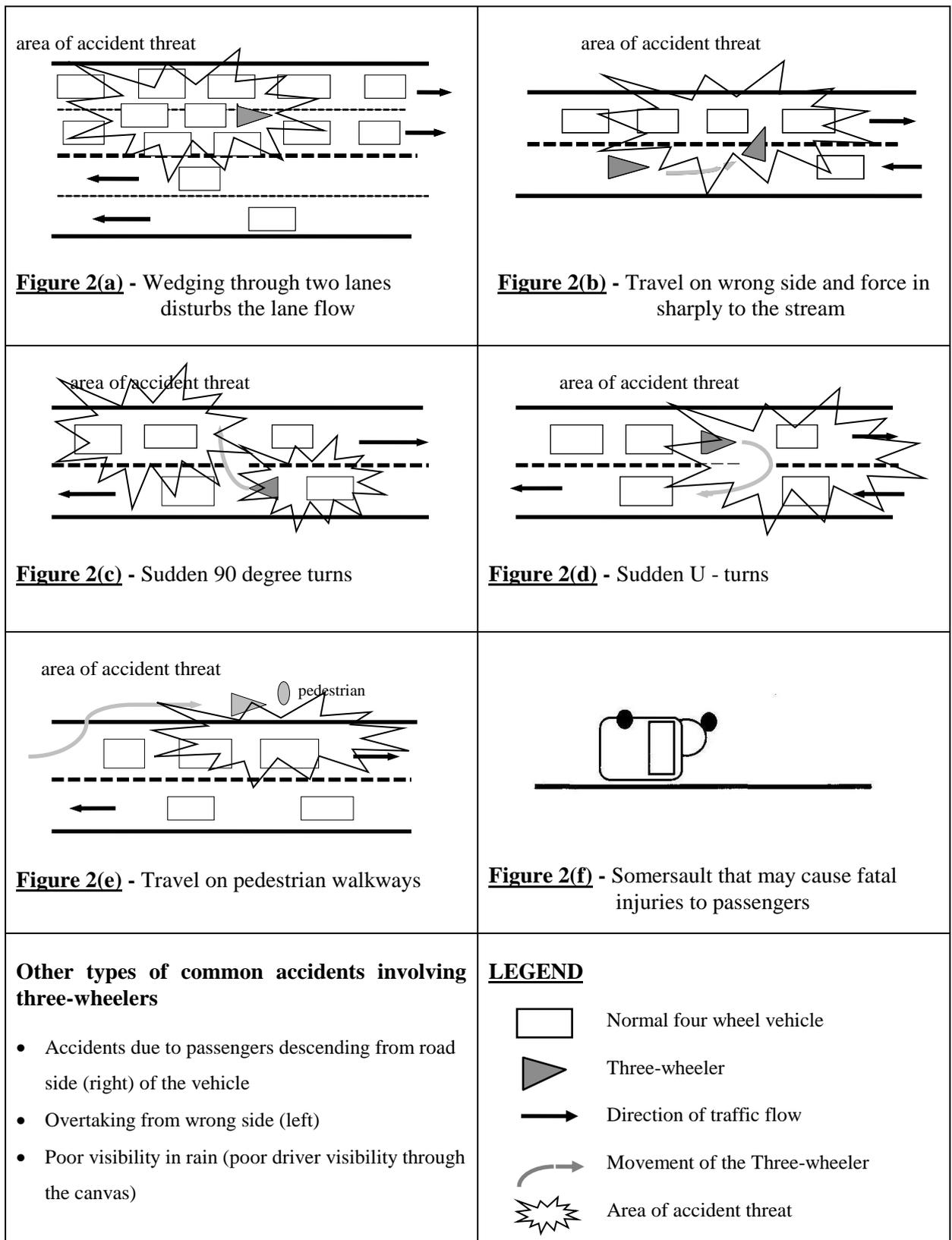


Figure 13.2 - Common offences caused by three-wheeler drivers threatening the safety of passengers and other road users

Phasing out programme for 3-wheelers

It is high time the transport ministry starts preparing them to plan out a phasing out programme of three wheelers while simultaneously concentrating on improving the public transport structure. "Road efficiency" is a term not much used in this country and it is now time the authorities are educated of the importance of this term. If a road is to be improved in its efficiency, the traffic flow has to be improved. To improve the through flow of a road the traffic should be stream lined. To streamline the traffic, (1) lane discipline, and (2) proper intersection management are the two prime criteria. The harmful factors which disturb these main criteria have to be eliminated as much as possible. It is high time the transport authorities and the highway experts start thinking in terms of improving the road efficiency. Road efficiency can be achieved by way of road discipline, educating the people, removing bottle necks, improvements at intersections, encouraging road efficient vehicles, discouraging road inefficient vehicles, planning out parking policies, introducing bus bays, introducing minimum headways between buses, enforcing speed limits and so many available traffic engineering techniques. It is now time for the transport authorities in this country to start addressing more practical issues in the transport industry which need immediate attention, leaving the fanatical ideas of building super highways, motorways, autobahns, freeways, expressways or what ever you may call them.

Chapter 14

Untapped Resources of the Municipal Councils : Parking Fees and Fines

The objective of this chapter is to create a public awareness regarding the problem of vehicle parking, remind the public of their responsibilities regarding road side parking and finally to indicate to the municipal councils of some of the untapped resources which they do not make use of. As an introduction to the subject let us look at the different methods of on-street and off-street parking.

A large proportion of trips in day to day activities involve a driver and passenger using a private motor vehicle to reach a desired destination irrespective of whether the trip is private, official, business or leisure. Parking has an important role to play in helping these activities, and therefore to enhance the transport system. Without appropriate parking areas, drivers cannot stop and park their vehicles before participating in activities. At the most initial level, parking is needed to accommodate vehicles when they are not in use. At the other extreme, provision of parking can be used to encourage or discourage urban development. The priority given for parking in the developing town areas in this country is much less compared to some other countries. Neglecting parking requirements is a classic example of unplanned urban development which finally transfers the burden on the surrounding road network.

The historic development of parking is such that roadways where it contained spare capacity were initially used for parking. This type of parking is referred to as *on-street* parking. A parking area created solely for storing vehicles outside the carriageway of a street is referred to as *off-street* parking. Private off-street parking may range in size from a house owners garage to large industrial, commercial or residential parking structures.

When parking is considered as an environmental issue, parked vehicles can be intrusive and can detract from environmental amenity. Parking can be provided either *on-street* or *off-street* in urban areas. Off-street parking provides considerable opportunities for blending the parking in with the general environment. Underground parking, where land values justify the cost, allows the construction of buildings or open areas over the parking lot. Above ground parking can be blended in by using similar construction materials and architectural features as the surrounding buildings. When parking areas are allocated in rural areas it has to be emphasised that the beauty of these areas should not be adversely affected by inappropriate provision of parking. Care should be taken to shield parking from sensitive views and to avoid confused and unsightly parking arrangements in local towns, particularly where the streetscape is of some historical importance.

Supply and demand for parking

The demand for parking generally relates to the land use or land use served. Parking demand for various land use and development types are generally set down in different countries by various planning authorities to suit the local conditions.

Along with the demand for parking the supply for parking becomes necessary. Whether free or commercial the purpose of parking is to provide a service, enhance local economic values, increase production, reduce street congestion, or attain combinations of these goals. The proper location of new general purpose parking facilities is essential if they are to provide the required services. The amount of existing parking should be taken into account when determining the need for new parking.

Factors that determine appropriate locations for parking.

- expected users
- extent of parking shortage
- the level of facility
- cost
- existing parking and street system

The location and type of major generators of vehicles must be considered if a new facility is to be of maximum service. The location of potential new generators also should be given attention.

Parking facilities are provided for many different people who may be participating in a diversity of activities. Some of these activities may be short term in nature; others may require a longer stay. Some parkers may have particular difficulties that make it difficult for them to walk a considerable distance. Therefore the characteristics of the user need have to be taken into account when determining the location for parking. Provision of parking too far away from the actual area of shortage may result in limited usage. Parking should be provided within a “*convenient walking distance*” from the area of activity. But the definition of “convenient walking distance” may vary with a number of factors such as;

- trip purpose
- activity being undertaken
- the duration of stay
- size of urban centre (or shopping area)

Greater distances may be accepted if the actual walking distance is reduced by the use of moving footways or revelatory as in some developed countries.

Cost of facility

Economic conditions play a major part in the location of off-street parking. It also affects the type of parking facility needed. The main cost of supplying of parking is the development of cost. Once parking is supplied if fees are charged the amount to be charged may be determined by the market demand. The other factors which influence the cost of facility, includes the construction cost and land purchase cost.

Location of parking areas

The location of parking areas relative to the major road system is an important consideration. Parking areas need to be close to, and have good accessibility to the main roads, in order to minimise traffic intrusion to local street areas. In general, parking areas should be near and around commercial centres and have good access to the road system.

On-street parking

As described earlier, on-street parking is when vehicles are allowed to park along the roadway itself on the spare carriageways. There are two different locations for on-street parking.

- (1) Kerbside parking
- (2) Centre of the road parking

Parking also can be arranged at various angles to the kerb line.

Kerbside parallel parking

Kerbside parking is the most common type of on-street parking. The size of parking spaces is dependent on the overall vehicle dimensions. In kerbside parallel parking the vehicles should only be allowed to park so that the front of the vehicle faces the direction of the nearby traffic flow. This avoids a lot of unnecessary traffic conflicts with the main traffic stream when the vehicle is parked or moved away from the parking space. It is very important that the councils should encourage kerbside parallel parking to avoid commonly observed unnecessary traffic conflicts at parking and moving off. To practice kerbside parallel parking the drivers should be encouraged to master the reverse parking techniques which is rarely seen in this country. The parking can also be allowed; 30° degrees, 45° degrees, 60° degrees or 90° degrees to the kerb where the carriage ways are sufficiently wide.

Choice of angle of parking

The most common form of kerbside parking on roadways is parallel parking. It has the least impact on through vehicles and requires less lane width than other parking angles. Other parking configurations can be used to suit particular situations.

Angle parking (i.e. parking at angles other than that for parallel parking) can accommodate up to twice as many vehicles along a kerb than parallel parking. The difference is a function of the angle used; low angles (less than 30⁰ degrees) give little advantage. The maximum advantage is given when 90⁰ degree parking is used. Further, angle parking may be more convenient to the parker since the parking manoeuvre can be easier than with parallel parking. The decision of whether to use angle parking may be based on consideration of:

- width of road
- traffic volume
- type of traffic
- speed characteristics
- vehicle dimensions
- turnover expected
- nature of the neighbourhood or abutting land uses
- road functional classification

Angle parking also has its disadvantages; it requires more road space for parking and unparking manoeuvres than parallel parking configurations. It is also not easily adaptable to commercial vehicle parking as the increased length of these vehicles encroaches into traffic lanes. Reversing out of 'front-in' angle parking spaces involves some of the vehicle protruding into the adjacent traffic lanes before the driver can see oncoming vehicles. This adversely affects traffic safety and also interferes with the free movement of through traffic.

Parking restrictions at intersections

Parking should be designed so as not to interfere with sight distance or impede the flow of turning traffic at intersections. Regulations should prohibit parking within certain distances from the cross road property boundaries for the intersections to have efficient throughputs.

In addition to restrictions at intersections, parking is usually prohibited for specified distances in the vicinity of:

- pedestrian crossings
- bus stops
- railway level crossings
- fire hydrants and on some road bridges unless specific provision has been made.

Centre of the road parking

On roads where conditions are appropriate, parking may be provided in the centre of the road. The combination of kerbside parking and centre of the road parking provides a large number of parking places per unit length. Centre of the road parking can be combined with parallel kerbside parking. It is rarely possible to combine angle kerb parking with centre of the road parking because of the large amount of road space required. Centre of the road parking is usually arranged as 90 degree parking in a single row with drive in and drive out usage. In some situations it may involve parallel parking adjacent to a median kerb.

Centre of the road parking can be arranged such that to separates the two directional traffic and to provide a continuous refuge for pedestrians. The disadvantage is that this type of parking generates additional pedestrian movements across the road. That is, pedestrians leaving and returning to their vehicle have to cross the main traffic stream to reach the footpath. Generally centre of the road parking should only be considered in streets with little through traffic and where all traffic moves slowly. When introducing any type of centre of the road parking it is essential to preserve ample visibility at intersections. Hazardous conditions are brought about by permitting access to centre of the road parking within a median too close to intersections or pedestrian crossings.

Bollards

A recent development in the local municipal councils, as a measure to prevent the vehicles being parked on the kerbs and pedestrian walkways the councils have started constructing concrete stumps of 1 foot high and 6 inch diameter along the kerbs. These series of concrete stumps are called bollards. It can be said that bollards are not the solution to on-kerb parking and on-kerb parking should be discouraged by installing parking signs and enforcing the law. The bollards are dangerous and have the following harmful effects:

1. may injure the pedestrians by accidentally hitting on them
2. these concrete stumps are visually unpleasant, and the roads are given a bad appearance
3. severe accidents may occur to vehicles running off the road

Hence the municipal councils should realise the absurdity of these bollards and take immediate steps to stop fixing these on our roads. The councils should take measures to appoint their own parking enforcement teams to look after the parking offences and collecting parking fees rather than expecting this activity from the traffic police.

Off-street parking

Off-street parking is when a parking area is created solely for storing vehicles outside the carriageways. Off-street parking systems often form an interface between the road network and other land uses. The parking facility would be best located between the main access route and the land use served. Location of the parking system should

consider the major routes on which traffic approaches the area as well as the streets immediately adjacent to the proposed site. Major routes are often located close to the business centre and off-street parking should be placed on the business district side of the routes to minimise the need for pedestrians to cross the major route and to discourage parking on the road.

As discussed earlier, the size of parking spaces is related to the vehicle base dimensions, the type of land use and user characteristics. Clearances are added to the base dimensions to determine the size of a parking space as described previously under on-street parking.

Entrances and exits

The following factors should be considered in setting the location of entrances and exits from parking areas:

1. Locate entry/exits clear of intersections and other locations of complex traffic movement.
2. Locate entry/exits where conflicts with pedestrians and bicyclists are minimised
3. Locate entrances to minimise possible bank up of traffic into the street
4. Locate exits where adequate sight distance to street traffic is available

Parking Controls

Parking controls are enforced with the following objectives

1. to increase capacity by freeing road space for the use of traffic in movement
2. to provide drivers a good vision field and to simplify traffic flow by eliminating parked vehicles
3. to increase parking revenue by having a time control on parking
4. to restrain traffic volume by prohibiting long-time parking
5. to transfer people from private cars to public transport in order to reduce traffic congestion

Disadvantages:

1. increased walking distance
2. circulating vehicles searching for parking spaces
3. effects on environment by increasing through traffic
4. traders losing customers due to lack of on-street parking

No Standing

The no standing situation is different from the no parking situation, and could be explained as follows:

‘Standing’ is halting a vehicle temporarily for a brief interval for receiving or discharging passengers. When a sign indicates no standing, a vehicle is not allowed to have even a brief stop to pickup or discharge passengers.

‘Parking’ is halting other than temporarily with the engine stopped. Hence when a sign indicates no parking, a vehicle may stand for a while to pick up or discharge passengers but not allowed to stop the vehicle with the engine off. Therefore no standing is a more serious restriction to a driver than no parking.

No standing is implemented with the objectives

1. to increase capacity by freeing road space for the use of traffic mobility
2. to secure vision field for driving and avoid weaving manoeuvres by eliminating standing vehicles on carriage way.

Disadvantages:

1. increased walking distance
2. reduced places for loading and unloading

Off-road parking as a solution

Every effort should be made to encourage the opening up of private off-road parking areas. The fare structure should be controlled by the councils so that these new parking areas will not attract additional traffic into the city. Policies should be formulated such that investors to be promoted to build multi-level off-road parking structures and collecting a government regulated fee for the provision of parking. In this respect the councils should be careful to monitor these parking areas. The councils should see that the minimum parking standards, proper entry/exit requirements and internal vehicle circulation standards are maintained in the parking structure. It is important to mention at this stage the meaning of multi-storey off-road parking structures owned by private entrepreneurs does not mean small crowded areas with vehicles touching each other and struggling to take ones vehicle through the circulation course.

Chapter 15

Right Way Round the Roundabouts

When observing the traffic movements near roundabouts in Colombo it is an obvious fact that, there seem to be a complete misconception by most of the local drivers regarding the priority at these intersections. It was not long ago the era of roundabouts where the authorities had no hesitation in introducing roundabouts irrespective of their appropriateness. A roundabout as a traffic controlling device is effective when the approaching roads have a balanced traffic in them and when the traffic is not saturated at these locations.

Traffic balance

Roundabouts operate best when the traffic flows are balanced. This does not mean that all movements must be of the same magnitude. It means simply that the traffic flows at a roundabout should be such that the predominant movements are 'broken up' by circulating traffic so that gaps are provided to allow vehicles waiting on adjacent approaches to enter the roundabout.

Roundabouts operate by gap acceptance, in that the approaching drivers must give way to circulating traffic on the roundabout. Unfortunately in this country it is often seen that most of the drivers think the approaching drivers have the priority over the circulating traffic and it is common to see some drivers on approaches racing their way to beat the circulating traffic causing dangerous situations. This ignorance by some drivers is causing many minor accidents at roundabouts. For this type of erratic driving practices part of the blame should go to the authorities responsible for issuing driving licences. Action should be taken to educate the drivers the correct driving practices near the roundabouts and check their knowledge of them before granting licences.

Advantages

If roundabouts are correctly designed and appropriately used they can be a safe and efficient form of intersection control. When the flows are not saturated they often provide shorter delays than traffic signals, and also pose lower accident rates than traffic signals or give way signs. For unsaturated traffic flows the delays at roundabouts tend to be less than those at traffic signals catering for the same traffic flows. But on other hand, when the correct roundabout rules are not practiced near these traffic control devices they become more accident prone locations than other intersections.

The rules to be observed at a roundabout

There are few simple rules to be observed near roundabouts:

1. You must always give way to all vehicles already in the roundabout, and only enter where there is a safe gap in the traffic.
2. Never try to beat the circulating traffic if still you are approaching the roundabout.
3. Always when approaching a roundabout indicate with signals which direction you are proceeding.
4. Also keep an eye on trucks and large buses within a roundabout. Because of their size, trucks and large buses need to use more room to turn, often taking more than one lane. Hence it is wise to keep clear of these large vehicles within a multi-lane roundabout.

If you obey these few simple rules roundabouts are a very efficient and safe traffic control devices at intersections for traffic up to moderate flows. It is always important to maintain clear visibility of approaching vehicles around the roundabout. The drivers approaching the roundabout should have a clear view of the other vehicles on other approaching roads.

Multi-lane roundabouts

Multi-lane roundabouts are roundabouts which have two or more approaching lanes with two circulating lanes as shown in Figure 15.1. Multi-lane roundabouts are very effective when unnecessary traffic conflicts are avoided. Unnecessary traffic conflicts can be effectively avoided if the drivers respond properly by approaching the roundabout in the correct lane depending on their intended direction. The correct entry to a roundabout should be as follows.

1. If you want to turn left - always approach the roundabout along the left lane.
2. If you want to turn right - always approach the roundabout along the centre lane.
3. If you want to go straight - you may approach the roundabout along any lane.

This correct approach is adopted by the drivers when arriving at a roundabout unnecessary traffic conflicts can be effectively avoided and delays at roundabouts can be minimised.

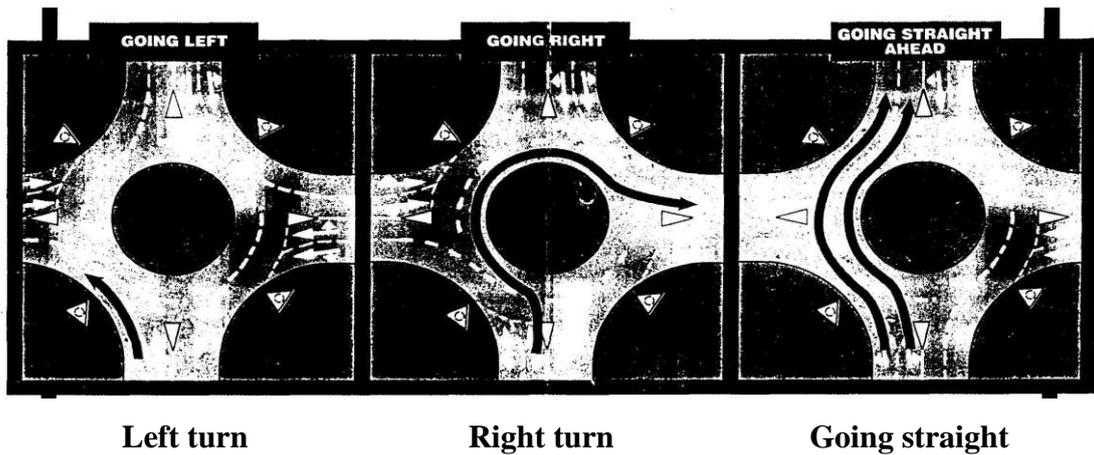


Figure 15.1 - Movement near Multi-lane Roundabouts

It is very important to choose the correct lane when approaching a multi-lane roundabout, and to indicate when both entering and exiting. That way, those drivers around you know exactly where you are heading. If you are turning left, you simply indicate left on approach. If you are going to the right, indicate right as you approach the roundabout and indicate left just before you reach your exit. If you are going straight ahead, you do not need to indicate on approach, but as you come to your exit from the circulating movement you should indicate left to leave the roundabout. In multi-lane roundabouts the left, right and straight movement can be done smoothly without any conflicts if the drivers approach the roundabout in the correct lane.

Public awareness

Proper lane marking and painted arrows on the carriageway will help the drivers approaching the roundabout to stay in the correct lane depending on their desired direction. The highway authorities can facilitate to help the drivers perform their turning manoeuvres correctly by painting the arrows and lane markings on the carriageways near roundabouts as shown in the Figure 15.1. These arrows will help the drivers to stay in the correct lane depending on their intended turn at the roundabout. In conclusion it should be stated that even now it is not too late to start a public awareness campaign and a driver education programme to teach the local drivers the correct way of negotiating a roundabout which is immensely important from the safety point of view.

Chapter 16

The Importance of Public Involvement in Development of Traffic Management Schemes

From the number of criticisms appearing in the daily newspapers regarding newly launched traffic signalling schemes in Colombo and its suburbs, it is evident that before launching such schemes the public consultation has not been carried out extensively. It can be seen some of the obvious criticisms raised by these newspaper articles could have been avoided if proper public consultation had been conducted prior to the implementation of such schemes.

Effective public involvement and consultation in the development of traffic management schemes may be seen as an issue by some local decision makers and planners. However, it is a matter that needs to be resolved early in the investigation stages if there is to be good community support for the eventual proposals. Although most of the countries have a habit of giving a hearing to their communities before implementing such schemes, unfortunately in this country this good practice is much ignored. One may wonder this is due to the fact that the decision makers and planners underestimate the intelligence of the community, and if so they should not forget the fact that it is finally the community that will be getting benefited or affected from these schemes.

Parties who are affected

In the case of main street traffic management projects such as the present Colombo traffic signalling scheme and junction improvement schemes, since the number of parties involved with many of them having high financial interests in the success of the scheme the proper public involvement is utmost important. This magnitude of traffic management schemes are likely to affect shop keepers, owners and tenants, various day to day business, office and shop workers, private vehicle drivers, delivery vehicle drivers, school children, visitors to the city and the average traveller, both young and old.

Striking a balance

Striking a proper balance between the competing and often conflicting interests of all of these groups will therefore require careful consideration. It is also essential to consider carefully the appropriate level of community consultation proportionate with the particular project and to budget for cost of this phase of investigations. This is a matter that is often overlooked in planning the project. If the degree of consultation is not selected carefully and the costs built into the project budget, then restrictions will have to be made during the implementation phase, which may finally lead to lower the quality of the project. This will result in more criticisms after the implementation of the project.

Setting objectives

The most important initial step in minimising problems and gaining acceptance from the local community is to properly identify and clearly define the objectives of the scheme. This will lead to visualise or help to build some vision for what might be finally achieved.

It is important to place these objectives into their relative priority and to reach some kind of agreement with the community on this. Eventually it will provide the basis for comparing and evaluating alternatives later. It should be stressed that without such a clear understanding, assessment of proposals will always be subjective and may be facing to much latter criticisms.

Public consultation

Public participation in traffic management schemes is a multi-staged process. The necessity for a scheme usually comes from community concerns about some aspect of their environment. This is normally made aware to the relevant authorities by way of local members, politicians, through telephone, e-mail, fax, written submissions, and public representations or through newspapers. It is usually a build-up of such representations that generate the need for action. The motivating issues for such representations are the concerns such as, traffic congestion, high accident rates, and lack of parking, deteriorating shopping environment, traffic pollution and traffic noise.

Three steps in public participation process

Step (1) - The first step in public participation process is to gather this initial information which can be used in preparing a broad strategy for the development of a proposal.

Step (2) - The second step in the community participation which is an important and a more formal process. At this stage the following important tasks will have to be carried out.

- 1) Inform the public of the aim, nature and scope of the project.
- 2) Inform the public the proposed investigations and the opportunities of public involvement in the project.
- 3) Inform the public of overall issues involved and the problems expected to be addressed.
- 4) Identify the public concerns and perceived problems.
- 5) List out the solutions given by the public (if any).
- 6) Identify any potential additional data requirements.

At this stage care should be taken not to give over-weightage to the organised vocal groups which might try to over-represent the issues to their advantage. Efforts should be made to establish the views and aspirations of the 'silent' groups in the community.

Properly managed public involvement gatherings may result in much useful information and responses to problems which planners may initially regard as unimportant.

Step (3) - The third step involves the assessment of the completed project to see whether the public concerns have been satisfied and to make sure that the objectives set have been met.

Benefits of public involvement

Effective public consultation is a two way investigation and a learning process between the study team and the community. The public consultation should be always carried out with this basic principle in mind. This is a process of collecting and analysing the relevant facts, presenting the collected data, displaying the results and conclusions to the public and obtaining a feed back from the public before launching the scheme. It has to be careful while the objective should be to ensure the views of all individuals, interest groups, organisations and other bodies are taken into account and it is necessary to balance those views and needs to obtain a clear understanding of the areas of agreement, disagreement and of compromises.

Difficulties

In trying to establish a public consultation process the following difficulties are unavoidable. It will usually be difficult to generate responses in writing and this project component might be a large expenditure from the total budget. Therefore it will be necessary to identify the likely costs of the techniques proposed to be used and allocate the appropriate amount in the budget at the beginning. It is important to decide on the extent to which the solutions are developed with the public involvement and again depends upon the project budget and the degree of public consultation adopted.

In smaller scale traffic management schemes it may be possible to develop the scheme and present it in the form of a public display as solutions to the agreed objectives. This is an economical way of producing a scheme and inviting for public proposals.

Another option is the operation of a representative committee of different public groups to develop the scheme with the authority staff or the consultant. This may be more costly and time consuming but has more likelihood to be accepted as the public solution.

It is important that irrespective of the form of consultation used, the public should be advised of the nature and timing of the proposed schemes, because it is likely that there will be disruption to vehicular and pedestrian traffic patterns and possibly business activities. I think this is an action that is given low priority in this country in the present day context. This action is important whilst the aim will be to keep the disruption due to implementing a scheme is kept to a minimum; the public and the business community must have an opportunity to adjust their operations if possible. If the above detailed measures are considered before development of any new traffic management scheme, there will be fewer letters of criticisms reaching the local newspaper editors tables.



Chapter 17

Traffic Impact Assessments

During the past few decades, large development projects have been commenced without visualization of the amount of vehicular traffic that would be generated by these projects. When a new development activity is begun in a certain area, it attracts additional traffic from outside. There will also be other activities that will generate from the project or support it in some way. All these activities will attract traffic and this should be taken in to account if the existing roads in and around the development site are not to become congested.

In the past when granting approval for various development activities in urban areas, not much advance thought has been given to the potential traffic generation due to the proposed development activity. This has resulted in inappropriate developments at wrong places, congested roads, reduction in amenity in the neighborhood, excessive accidents both vehicular and pedestrian, and finally a heavy burden on the traffic police.

Any development activity, large or small generates traffic. The amount of traffic generated depends on the type of development project, activities that will take place due to the project, location and size of the project and the number of persons that will be making use of the project. The traffic generated due to a development activity affects surrounding activities and the adjacent transport network. This effect should satisfy the current classification and functions of the adjoining network. That is, the impact of the development activity should not cause the adjacent roads to be forced into performing a function of higher road classification. If the impact of the project forces the adjacent roads to perform the function of a higher road classification, unless improvements are conducted on the present road network to absorb this additional traffic, the proposed project should not be given the approval.

It is welcoming news that the Colombo Municipal Council (CMC) has given the lead to stop this unhealthy practice by starting to insist on Traffic Impact Assessment (TIA) reports for new large-scale development projects before approving these projects. CMC should be commended on taking this prudent and bold decision even at this late stage, to investigate whether the proposed development project is at the appropriate place and also to study what additional measures have to be taken if the project is to be given the green light. The CMC should also be warned at this initial stage to be aware of the possible forces political and financial that might have to be considered if they are to do the task correctly.

What is a Traffic Impact Assessment (TIA) report?

Traffic impact assessment is the tool which can be used to ensure that all relevant considerations are taken into account as a part of the decision making process. The relationship of the proposed activity to land use and transport planning issues, future traffic management issues and the consideration of feasible options is addressed in the traffic impact assessment process.

Traffic impact assessment is a useful tool to study these impacts on the surrounding road network. Therefore the necessity of conducting a traffic impact assessment is an important requirement and a mandatory function of the local authorities before approving large-scale new development projects especially in the city areas. If an accurate TIA is not conducted and preparation for the additional traffic generated/attracted in future, due to the proposed project is not considered, before granting approval for large-scale new development projects in traffic congested areas, the future traffic flow in that area is going to be adversely affected. All development projects do not always cause an increase in traffic generation; however more significant sites require a thorough evaluation and application of appropriate management measures.

Congestion created due to roadside parking

One important factor that will come into effect with any development activity is the roadside parking that will take place due to the activity. The current practice adopted by the CMC regarding checking the parking requirement for a new development project is going by the floor area of the proposed development activity and checking with the approved norms. The existing norms approved by the Urban Development Authority regarding parking requirements for new development projects is such that, a new building should provide a single parking bay for every 2000 square feet of working space in the intended building, without giving much thought to, what is going to be the functions that are going to take place in the building. Due to lack of space if it is unable to provide this parking requirement the developer has to pay a nominal amount (Rs. 200,000 for cars, Rs. 250,000 for lorries and buses and Rs. 300,000 for trucks and containers) of levy as the service charge to obtain the clearance. To be realistic it can be said that, this amount is far below the real requirement. If the developer selects the option of payment of the government levy, the problem created is directly transferred to the road itself, and finally the road user has to suffer unless the revenue collected by this levy is used for constructing parking structures in the surrounding area.

The traffic generated and attracted by a development activity depends on the location, the type of land use and the size of the activity. One possible result of an increase in vehicular traffic can be an increase in the number of accidents. Therefore access to the development activity and the road system must be designed to minimise conflicts between vehicles and pedestrians. Safety should be a primary consideration in planning for development projects. If a development project is located in an area with a high accident level then provision must be made to demonstrably reduce the potential for accidents. Also, where a development project generates a lot of pedestrian movement, appropriate remedial measures must be taken to maintain safety standards. Traffic can have an impact in a number of ways such as, impact on traffic efficiency, impact on amenity, impact on safety and impact on road pavement life

Things to look through traffic impact assessment

With the help of a TIA, improvements should be worked out in the areas such as future traffic management strategies, improvements to intersections by way of traffic signals, roundabouts or other measures, site access and smooth circulation of traffic, improvement to pedestrian facilities and their safety, recommendations to public transport measures, reconsideration of shifting or providing new bus stops etc., and finally funding of proposed improvement.

Main Issues that should be addressed in a Traffic Impact Assessment

The *Traffic Impact Assessment (TIA)* submitted by the ‘developer’ or the ‘promoter’ to the local authority should clearly address the issues given below.

1. Purpose and need of the development project – The need of the development project should be justified.
2. Description of existing traffic environment – Give a proper picture of the existing traffic environment around the proposed development project.
3. Description of the actions – Give a clear description of the proposed development activity, identifying the potential traffic impact. Should also include a discussion on other alternatives and ‘do-nothing’ option.
4. A complete assessment of how the ‘in-coming’ and ‘out-going’ vehicles due to the proposed development activity will affect the road network in the vicinity of the development activity and on public transport facilities.
5. Description of expected traffic increase due to the proposed development project – The expected traffic generation due to the proposed development project should be quantified under this section (Information on the evaluation method with calculations carried out during the evaluation should be submitted).
6. Information on ‘fitting’ in to the present policies – How the generated traffic can be incorporated in to the present situation and any proposed traffic management policies.
7. Information on important uncertainties – All the important uncertainties should be genuinely stated.

The *TIA* should be an impartial description of the impact and should outline both positive and negative aspects of the proposed development activity.

Difficulties associated with producing TIA reports

Some of the difficulties that may be confronted when attempting to produce TIA reports:

1. Lack of local norms indicating the traffic generating factors for different types of developments. The local authorities should try to develop norms on daily traffic basis and peak hour traffic basis (morning and evening) traffic factors for different types of developments such as, residential traffic, hotels, commercial, office, hospitals, schools & educational institutions, entertainment, service stations, drive-in take away food outlets, and any other different types of development projects.
2. Difficulty of obtaining information on existing traffic conditions in the area. Local authorities should be supporting the developers in providing the necessary traffic information around the project area.
3. Shortage of local expertise to carry out comprehensive TIA studies. Although at this stage it may seem that there is a shortage of local staff to conduct TIA studies, with adequate measures taken to educate local personnel this can be overcome.
4. Political, market and other influential forces.

Finally it should be stated that TIA should be used as a guide to examine ways in which road systems may best accommodate the increased demands for movement and parking of traffic while safeguarding the interests of the community at large. These include the provision of parking facilities, the improvement of existing roads and traffic management facilities, the consideration of future changes in land use, provision of public transport, increase traffic efficiency, minimise the impacts on amenity, safety and road pavement life etc. It should be remembered that decision making for large-scale development activities is not possible until technical, economical and environmental assessments are available. Traffic impact assessment should be an integral part of the project appraisal. Hence TIA becomes an important tool in the process of decision-making especially when large-scale development projects are considered in the city limits.

Chapter 18

Proposed Colombo - Katunayake Road : Is it to be an Expressway or a Good Arterial Road?

It is unarguably accepted that the present Negombo road which is the main access to the Greater Colombo Free Trade zone has gone beyond its capacity. It is causing a lot of inconvenience to the visitors arriving in Colombo through Katunayake airport, for trucks travelling to and from nearby industrial zones to Colombo port and the ordinary travellers moving between Colombo and Negombo.

As all of us know, staggering amount of public funds has already been invested on this project, and the land has been acquired with Environmental Impact Assessment (EIA) approval, and the construction work is in progress. Even though it's too late, this chapter is devoted to critically look at this project from a different angle.

This proposed expressway connecting Peliyagoda and Katunayake would be 24.6 kilometres long with a total of 4 entry points (including the 2 interchanges at Kerawalapitiya and Ja-ela). Under smoothly operating conditions an interchange will not add any delay to the through traffic on the expressway. Hence it can be assumed that once the expressway is completed and the specified speeds are in operation (say 100 kilometres per hour) under normal conditions a vehicle entering the expressway at Katunayake should be able to reach Peliyagoda which is 24.6 kilometres away within 15 minutes. A good arterial road should be able to cover the same distance in 30 minutes, with a speed limit of 70 kilometres per hour with properly designed signalised intersections. But one may argue this saving of 15 minutes in travel time justifies the high construction cost of the expressway compared to a new arterial road.

All will agree that a new access between Colombo and Katunayake is needed to lessen many of the problems which are now affecting the existing road system. In particular, there is a need to:

- Provide a direct route for trucks and lorries travelling to and from Colombo port to industrial areas between Colombo and Negombo.
- Provide easy and quicker access to visitors and investors arriving at Katunayake airport to reach Colombo. A good access road definitely will give a good initial impression of the country to any outsider.
- Reduce the severe congestion on present Colombo-Negombo road which is causing long delays for both passenger and commercial vehicles.

If a new access is not built, congestion would increase and current problems would worsen. But this new access does not have to be an expressway.

Expressway versus a good arterial road

It is expected that this new expressway will pass through Muthurajawela marshy land is going to cost over Rs. 6,000 million. 75 % of this 24.6 kilometre stretch will be passing through marshy areas. Following are some of the main features of an expressway that does not exist in an arterial road.

- **Community severance**

One of the main features of an expressway is the community severance which is somewhat unacceptable to our closely knit social standards. What is meant by community severance is the fact that an expressway would physically divide the local area and close off some of the paths connecting the two sides. This severance can be minimised by providing sufficient over passes or under passes connecting the two sides. But these over pass and under pass structures are going to be quite costly and since we are compelled to operate within a tight budget we will have to definitely sacrifice many of these crossings. Hence if an expressway is selected this community severance is unavoidable but a good arterial road will not pose this problem.

- **Access control from abutting land**

Another important feature of an expressway is the controlled access from the abutting land between the interchanges. The question one can ask is, why do we need to spend a large amount of money on an access controlled road when the 75% of the road is said to be passing through marshy areas which means definitely there is no need to have a control of access because this vast extent is the Muthurajawela sanctuary where no future development is assured? A good arterial road will not have to bear the access control expenses and also it will be able to serve any future development in the balance 25% of the road.

- **Container movement through railway**

The existing railway facility between Colombo and Katunayake can also be utilised to a greater extent at a much lower cost for the container movement between the Free Trade zone and the Colombo port. If this railway transport mode for container movement is sufficiently developed and combined with a new arterial road the waste of public resources on the expressway can well be avoided.

- **Collecting tolls from the road users**

If the government's intention is to collect a toll from the road users, this too can be accommodated in an arterial road without complications.

Meaning of a good arterial road

A good arterial road is a road with a divided carriageway and with two or three lanes in each direction without costly interchanges or grade separations (it should not be confused that Colombo-Kandy Road or Colombo-Galle Road as good arterial roads). The major crossing roads can be accommodated to the arterials with proper traffic signals, and if necessary the main arterial road can be given priority depending on the traffic flow on this road once it is signalised. If required 24 hour parking bans could be implemented on side lanes (by implementing clearway zones) for continuous traffic flow on the road. This alternative is a far less costly solution than an expressway, which is supposed to be only 24 kilometres long and proposed to have a course through 75% of the stretch running through a protected area.

The advantages of an arterial road

- All types of vehicles can be accommodated (If necessary, bans can be imposed on certain kinds of vehicles)
- Low overall construction costs compared to expressways.
- No additional running will be required to enter the arterial road. In expressways since the expressway route can be accessed only through the interchanges, many miles of additional running will be required adding to the travel time and congesting the surrounding road network.
- No community severance.
- Access from abutting land will not be prevented.
- An arterial road will serve the through traffic as well as local traffic, where as an expressway will serve only the through traffic.
- In expressways if proper standards are not maintained the degree of severity of accidents is very high. If expressway is the option the proper maintenance of carriageway, driver discipline, and the vehicle road worthiness which have been the least concerns in this country will have to be given very high priority, otherwise the consequences might be extremely costly.

Finally dumping well-over Rs. 6,000 million on a 24.6 kilometre stretch of expressway which can be well served by a high quality arterial road (with 4 or 6 lanes) can be seen as a wastage of local resources. Before winding up it should be stressed that a length of 25 kilometres is not a sufficiently long distance to switch driving around 20 kilometres per hour at roads in Colombo and suddenly speeding at 100 kilometres per hour at the expressway for few minutes before switching back to speeds around 30 kilometres per hour in Negombo on a busy week day.

Chapter 19

Measures to Control Air Pollution due to Vehicles

Air pollution occurs when air contains gases, dust, smoke and fumes or odours in such quantities that are harmful to the health or comfort of humans and animals or damaging to plants or other materials. Commonly it is thought that air pollution is a result of human activities. It can also be due to natural causes such as dust storms, forest fires or harmful gases generated from marshy areas. Air pollution caused by such natural sources is difficult to control. However it is possible to control the emissions caused due to human activities.

Pollution of the atmosphere by smoke, fumes and smell emitted by motor vehicles makes the urban environment extremely unpleasant. With the rapid growth of motorised vehicles this problem will worsen. Air pollution can originate not only outdoors, but indoors too. Air pollution from cigarette smoke, cooking appliances, kitchen hearths and dust are some of the indoor sources. However outdoor air pollution is the main risk to human health.

One of the major contributors to the atmospheric air pollution is the transport industry. The pollutants added to the atmosphere by way of exhaust gases emitted by the internal combustion engines of vehicles contribute largely towards air pollution. These exhaust gases mainly consist of Carbon dioxide, unburnt petrol, organic compounds produced from petrol, Carbon monoxide, Oxides of Nitrogen, small Carbon particles and lead compounds. Out of these waste components Carbon Monoxide, Oxides of Nitrogen and lead components have been proved to be harmful to human beings. Although inhaling small amounts of these harmful components may not have an immediate effect, the long term exposure is extremely bad for health.

Harmful effects of emissions from motor vehicles

- Carbon Monoxide (CO) - When exposed to high ambient levels may cause headaches and may even have an effect on lung function.
- Oxides of Nitrogen (NO_x) - In the form of Nitrogen dioxide (NO₂) can have harmful effects on lung functions. Helps to form smog.
- Small Carbon particles - These reactive organic compounds contribute to particulate matter formation causing smog.
- Lead (Pb) - Is harmful to kidneys and intellectual development of children when exposed for longer periods at high exposure levels. As a solution most of the developed countries insist on unleaded petrol. Use of unleaded petrol significantly lowers the ambient lead levels in the atmosphere.

- Air toxics - Air toxics such as benzene, formaldehyde, butadiene and diesel soot can have toxic or cancer causing properties.
- Small particulate matter - Extremely small particles such as carbon, dirt and aerosols (less than 10 micromeres in diameter) can pass between human nasal hairs deep into lungs causing irritation to respiratory system.

It has been accepted that air pollution takes place in three different scales: (1) at global level, (2) at regional level, and (3) at local level. The scales differ in the amount of pollutants involved, their sources and the control measures that can be adopted. Global pollution such as greenhouse gases, ozone exhausting substances and ocean protection measures are being addressed at international level. Much can be done to protect our atmosphere at the regional and local levels. Regional air pollution needs to be addressed at a broad level by controlling total emissions in the region. Vehicle emissions from busy roads, unorganised construction projects where measures are not taken to control environmental pollution, backyard burnings etc. cause pollution at local level. Although not related to motor vehicles, acts such as; burning garbage, lighting excessive amounts of fireworks and crackers may also cause air pollution at local and regional levels.

Suggestions

Following are some of the measures that can be taken to reduce the air pollution at regional and local levels:

1. The quality and type of fuels used in motor vehicles is important in reducing vehicle emissions. Some countries encourage vehicle owners to use unleaded petrol, and reformulated fuels such as highly refined petrol or diesel by selling them at lower prices. Measures should be taken to sell the consumers unleaded petrol and super diesel at a lower cost than ordinary petrol and diesel. But unfortunately in this country if you are environmentally conscious you have to pay more for your unleaded petrol or super diesel than ordinary petrol or diesel. Reformulated fuel in United States had its composition changed specifically to reduce vehicle emissions. Alternative fuels such as LPG (Liquefied Petroleum Gas), compressed natural gas, ethanol and electricity also reduce emissions in specific instances.
2. Vehicle emission monitoring programmes - As already suggested by the Central Environmental Authority vehicle emission testers such as 'breathalyser' should be employed to determine the extent of emissions by the vehicles. Environment pollution fines can be introduced to encourage reduction in vehicle emissions.
3. Vehicle maintenance - Vehicle emission performance deteriorates with age or vehicle use due to factors such as equipment failure, incorrect maintenance and tampering with emission control equipment. Hence it is important to have an inspection and maintenance program as a means to check whether or not the emission control system on a vehicle is working efficiently.

4. Alternative transport - Encourage public transport and discourage private vehicles in urban areas by taking measures to improve the standard of public transport. It has been shown by several previous studies that to expect a higher standard from the public transport sector the fair structure has to be modified. It is also evident that the Sri Lankan public is prepared to pay much more than the existing minimum fare of 6.00 rupees if you observe the fact that they dispense more than double the amount of their bus fare by way of giving beggars and music providers in buses. This shows that the general public is willing to pay more than 6.00 if they are provided with a better public transport system. Encourage schemes such as car and van pooling as in some other countries. Cycling too can be encouraged for short distance travel. All these measures will help to improve the quality of air in the urban areas.
5. Vehicle emission levels - Tougher standards should be maintained on vehicle emission levels for buses and all commercial vehicles.
6. Driving habits - The way the vehicles are used and their frequency of use has a significant effect on emissions and air quality. Careless and aggressive driving is not only unsafe, but also leads to higher emissions because the engine is being overworked. Unnecessary overtaking, sudden accelerations and decelerations, raising the engines at intersections and traffic blocks, unnecessary racing of engines by bus drivers at bus halts pretending that buses are about to go, to deceive the standing passengers and get them in, all these activities contribute towards air pollution. Measures can be taken to control idling engines, by insisting that engines should be stopped during traffic delays. Driver education programs through media (especially TV) can be effectively used. Enforcement and tougher penalties may be imposed on the violators.
7. Implement backyard burning bans or restrictions in urban areas as in some of the developed countries. Have tougher environmental protection standards on industries and factories.
8. Although fireworks and crackers are necessary for celebrations some measures should be devised to control these harmful activities.

It is important that we take measures to protect our environment, since no one else will do it for us. If we take the necessary steps to protect our environment, the quality of air, rivers and surrounding ocean, our contribution towards the environment protection at global level will be significant.

Chapter 20

Road-side Noise – Do Sri Lankans Care?

It is said that noise to some people is only sound to others. One may wonder whether the Sri Lankans even consider their roads noisy. No legislature has yet been enacted to quieting our road users, except the old colonial rule of silence zones near hospitals and courts of law. Even this rule is now obeyed more in the breach. Drivers have become so accustomed to blasting horns that most of them think that it is a part of good driving like changing gears. It is high time the authorities took the necessary steps to educate our drivers on the correct use of the horn and on how to lessen overall traffic noise.

Sound and noise

Sound is the sensation produced in the ear as a result of fluctuations in air pressure, superimposed on the steady atmospheric pressure. The ear responds to these much smaller fluctuations with great sensitivity. The rate at which the fluctuations occur is their frequency. Practically all sounds contain a mixture of frequencies. Screeching such as private bus conductors at the bus halts are composed mainly of high frequency sound which are irritations to the listener and are unwanted sound which can be eliminated if buses are equipped with proper destination boards at the front and back. Noise is often defined as ‘unwanted sound’ and in a civilised society every effort should be taken to eliminate this unwanted sound by taking necessary precautions.

Sound levels are measured in decibels. As an indication, average conversation is around 60 decibels and speech can be understood fairly well with background noise levels up to 55 decibels. It has been shown by road researchers, that street traffic with 40 km/h speed and an hourly volume of 500 vehicles per hour (without horn blasting) will create around 75 decibels at a distance of 7 metres from the road. If the same flow with 5% heavy vehicles at the same speed will create around 85 decibels at a similar distance. With the average rate of blasting of horns in this country it may create a noise level of around 100 decibels under the same conditions. To the human ear an increase of 10 decibels is perceived as a doubling of loudness. Thus a noise measured as 85 decibels will sound twice as loud as which registers as 75 decibels, and so on. Therefore the level of discomfort goes up much more rapidly than the decibels.

Causes of road traffic noise

The amount of noise from roads depends upon many factors such as vehicle type, speed and the attitude of the road users. These can be further factorised as; the traffic volume, traffic speed, percentage of heavy vehicles, the road gradient, the pavement texture and the individual vehicle noise. Individual vehicle noise is a combination of noises produced by; its engine, transmission, exhaust, the interaction of tyres and road

pavement, body and load rattle, movement of air around the vehicle and most importantly the frequency driver uses the horn and its loudness. In developed countries a lot of effort is taken to bring down the level of noise by giving attention to each of these factors. Measures such as tougher vehicle standards, tough penalties for noisy vehicles and inappropriate horn users, awareness programs to improve driving habits, better road design, including quieter road surfaces, noise barriers are some of these. The individual drivers can also help by keeping their vehicles well maintained and driving smoothly so that noise is reduced. It is very important to educate the road users on the harmful effects of increasing noise levels and ways and means of contributing individually towards bringing down the noise factor on roads.

Traffic noise not only occurs on busy roads. Occasional heavy vehicles on quieter roads can be very annoying too. There is no doubt that container movement and trucking is a big business and in fact a big noisy business. It is very hard to shift those big loads across our towns or across our roads without making a big noise. But if we take the appropriate steps to reduce this big noise it will be a great victory. In most of these heavy vehicles the engine and exhaust brakes make a big noise (a big unnecessary noise). The problem is that some drivers use engine or exhaust brakes all the time instead of using the primary braking system on prime mover and trailer. The drivers of these heavy vehicles should be advised not to use noisy engine or exhaust brakes in built up areas and also ensure that mufflers operate properly. As a simple rule of thumb, if the exhaust or engine brakes are noisy, turn them off before entering built up areas.

Road-side noise not only originates from moving traffic but also much noise is generated by road side vendors. In this country it is common to see road side vendors such as sweep ticket sellers; music centres and record bars largely contributing to the noise pollution in busy city centres. Just imagine what the situation it would be if all the road side vendors start to promote their products by shouting through microphones, the way sweep ticket sellers do. Aren't the municipal councils or relevant local councils taking any action to stop this large scale noise pollution by the road-side vendors? If necessary action is not taken immediately, in the coming years all the road-side vendors may use these high-tech devices to promote their business. It is also common to see various religious organisations using public address systems for long hours (sometimes continuously for many days) causing tremendous nuisance to the general public. Laws should be formulated to curb these types of human inconveniences. It should be stressed that loud noise makes people crazy and retards intelligent performance.

Harmful effects of noise

It has been proved that noise can have harmful effects on health and well-being physically, mentally and socially. There is plenty of evidence to prove that high noise levels interfere with speech and communication, decrease learning ability and scholastic performance, cause sleep disturbance, increase stress related hormones, blood pressure changes, increase fatigue, headaches, heart disease, encourage people to take drugs and alcohol etc. Hence to reduce these harmful effects on humans and to bring massive health benefits for the community the Europeans are even considering re-designing their urban transport policies by introducing massive policy changes. By looking at these changes and preparation schemes in the developed countries it is high time that we also take recognise of these harmful effects of noise pollution, and we must educate the road users on how to reduce noise pollution.

Community education

The community should be educated to be increasingly aware and to be concerned about the issue of road traffic noise. It is encouraging to see the community getting involved in road traffic noise debates and suggesting various alternatives and solutions on this issue. Invariably there will be different conflicting views from person to person. For instance a person living near a main road will have a higher level of tolerance on this issue than someone from a quieter area. If people are educated sufficiently on the road traffic noise hazard it will make them think twice when considering buying a house or building a new home near a busy road. In conclusion it can be said that there is so much that can be done on this problem of noise pollution if the relevant agencies such as local councils, environmental protection authorities, transport policy planners and police can be motivated to take an interest. Simultaneously locals can get together through citizens committees and many progressive steps can be suggested to the local authorities and even to the government to reduce the road-side noise pollution.

It is always better to reject than learn to tolerate the road-side noise pollution.