

Mobility for ALL

Traffic and Transportation Blueprint



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Section 1. Physical structure of the blueprint

The blueprint will have a few sections and appendices as described in the table on the next page.

Each section will have an Executive Summary and may have a few chapters.

Each chapter will also have its own summary. The chapters will have detailed discussion on various topics.

Depending on the level of interest of the reader, the blueprint can be read in one of the four views: Platinum, Gold, Silver and Bronze.

The four views of the Blueprint are described as follows:

1. Platinum: Read only the following:
 - a. Executive Summary of the blueprint.

This view is for those who want to understand the essence of the blueprint in about half an hour.
2. Gold: Read all of the above and the following:
 - a. Transportation Management: Problem areas identified.
 - b. Solutions for Better Transportation Management in Maharashtra: Only the problems marked Gold.
 - c. Public Transportation: Problem areas identified.
 - d. Solutions for Better Public Transportation in Maharashtra: Only the problems marked Gold.

This view should satisfy most readers.
3. Silver: Read everything except problems & solutions marked “Bronze” to get information on everything discussed in the blueprint.

The more knowledgeable readers would find this view useful.
4. Bronze: Don’t omit everything, read every word. Text marked “Bronze” is for readers who want to know the minutest details regarding the blueprint, whether and how all this can be done, what will be the processes and timeline etc. This text can also help implementers of the blueprint in a variety of ways, including micro-management of various tasks.

Executive Summary of the blueprint

Scope of the blueprint

This blueprint focuses on road based land transportation in Maharashtra, including metro- and mono-rails. It discusses various aspects of transportation management and public transportation. However, it does not discuss construction and maintenance of infrastructure for transportation, e.g. roads and bridges.

Various modes of road based transportation, right from walking and cycling to motorized vehicles are under the purview of this blueprint. These modes maybe used for transporting people as well as goods. The blueprint discusses the following aspects of transportation management in great detail:

1. Basic aspects
2. Acts and rules
3. Organizations , roles and responsibilities
4. Infrastructure
5. Traffic education
6. Discipline
7. Safety
8. Resources

Considering that Maharashtra is a significantly urbanized state and is likely to be urbanized even more, this blueprint lays special importance on public transportation and devotes a section for that purpose and discusses the following objectives of public transportation:

1. Mobility and connectivity for all
2. Safety
3. Affordability
4. Flexibility and sustainability
5. Environment friendliness
6. Integration with the fabric of the city

The blueprint will provide a vision for better transportation management and public transportation in Maharashtra for the next generation. It will establish that this vision can be achieved only when certain policies are put in place and will state a high level framework of these policies.

The blueprint will identify various tasks that need to be carried out: both high level as well as some detailed steps. It will provide a detailed list of steps that need to be taken for each task.

True progress can be achieved only when we measure the progress. Realizing this, the blueprint will describe a system of benchmarking the progress quantitatively.

Transportation Management

The basic objective of transportation management is to achieve movement of humans and goods from point A to point B by using the most convenient mode of transport. While achieving this objective, one has to address the following issues:

1. Address issues arising out of constantly increasing number of vehicles
2. Provide basic connectivity to all people
3. Address issues specific to different locales, e.g. urban, rural and countryside areas
4. Achieve a smooth and safe flow of traffic for all modes of transportation
5. Keep the whole problem in control by employing traffic demand management techniques

The blueprint then takes a look at the important applicable acts and rules and studies roles and responsibilities of concerned authorities, current state of transportation infrastructure, education, discipline, safety and national resources required and consumed by the transportation system.

Vision for transportation management in Maharashtra

The vision for transportation management in Maharashtra is:

A proactively managed, well coordinated, expertly planned and safe transportation system for people.

Public Transportation

The objectives of a public transportation system should be:

1. Mobility and connectivity for all
2. Safety
3. Affordability
4. Flexibility and sustainability
5. Environment friendliness
6. Integration with the fabric of the city

These objectives might apply with different intensity to urban and rural public transportation in Maharashtra. The blueprint studies the current state of urban and rural public transportation in Maharashtra to find that both kinds of PT systems fare just about ok on most counts. However, urban PT fares especially poorly as far as providing mobility and connectivity for all strata of the society, thus leading to the cancerous growth of personal vehicles in urban Maharashtra.

Vision for public transportation

The blueprint puts forth a vision for PT in Maharashtra, which, when achieved, would address all major problems with respect to the objectives of PT stated above. Although this vision is stated in detail in a later paragraph, it can be summarized as follows:

To provide safe and reliable mobility for all people.

Section 2. Scope

Executive Summary

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Various modes of road based transportation, right from walking and cycling to motorized vehicles are under the purview of this blueprint. These modes maybe used for transporting people as well as goods. The blueprint discusses the following aspects of transportation management in great detail:

9. Basic aspects
10. Acts and rules
11. Organizations , roles and responsibilities
12. Infrastructure
13. Traffic education
14. Discipline
15. Safety
16. Resources

Considering that Maharashtra is a significantly urbanized state and is likely to be urbanized even more, this blueprint lays special importance on public transportation and devotes a section for that purpose and discusses the following objectives of public transportation:

7. Mobility and connectivity for all
8. Safety
9. Affordability
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12. Integration with the fabric of the city

The blueprint will provide a vision for better transportation management and public transportation in Maharashtra for the next generation. It will establish that this vision can be achieved only when certain policies are put in place and will state a high level framework of these policies.

The blueprint will identify various tasks that need to be carried out: both high level as well as some detailed steps. It will provide a detailed list of steps that need to be taken for each task.

True progress can be achieved only when we measure the progress. Realizing this, the blueprint will describe a system of benchmarking the progress quantitatively.

Traffic and Transportation

- “Traffic” means “The aggregation of things (pedestrians or vehicles) coming and going in a particular locality.
- “Transportation” means “The act of transporting something from one location to another.”

Modes of Transportation

Before we discuss “traffic” in further detail, let us first have a look at various modes of transportation. A broad classification of modes of transportation can be done based on the media they use.

Media used for transportation

If we categorize the modes of transportation according to their media, we have the following categories:

1. Land transportation
2. Water transportation
3. Air transportation

The scope of the blueprint on Traffic and Transportation is restricted to land transportation.

Modes of land transportation

Two categories of land transportation can be derived from the surface used for transportation: Roads or rails. Among these, railways are governed by the Central Government of India, and are therefore outside the scope of this blueprint. However, this blueprint may discuss railways where their impact on a given aspect of road transportation is significant.

Two modes of “rail” transportation need to be considered differently. They are: metros and monorails. Since these are means of urban public transportation and are not governed by the Central Government of India, they are considered in this blueprint.

Modes of road transportation

The modes used for road transportation can be further categorized based on their source of energy. We thus have two prominent categories of modes of transportation on land: Motorized and non-motorized transportation. The former makes use of fuel in some

form (fossil fuels like petrol and diesel, electricity, solar energy). The latter makes use of animal power in some form: either by domesticated animals or humans.

Considering all these factors, the modes of road transportation are:

Motorized modes of transportation

1. Motor vehicles running on petroleum-generated fuels (Buses, trucks, cars, motor cycles etc)
2. Motor vehicles running on electricity (battery driven vehicles of assorted sizes)
3. Motor vehicles running on alternative sources of energy (solar energy, wind energy etc, as long as they are running on the roads)

Non-motorized modes of transportation

1. Walking
2. Cycling
3. Hand carts, rickshaws pulled by humans
4. Wagons and carts pulled by animals: Bullock carts, tongas etc.
5. Riding on animals like horses, elephants

All modes of road transportation mentioned above (motorized and non-motorized) are within the scope of this blueprint.

Roads

Roads are of various types. They can be made of a variety of materials using various techniques. They are of various widths and are meant to carry different types of vehicles. They pass through different types of terrains and are built on a variety of geological land types.

Roads, their design, construction and maintenance is a vast subject. It is envisaged that a separate blueprint may be needed to address all issues related to roads themselves.

This blueprint does not consider design, construction and maintenance of roads, but confines itself to the traffic carried on roads and its management.

Components of Traffic

All individual units of humans, animals, vehicles using any mode for movement from one place to another collectively form “traffic”. The purpose of this movement may be for transporting people or transporting goods. Since this blueprint is concerned only about road transportation, the “traffic” we will be concerned with consists of all of the following:

1. Pedestrians
2. Cycles and cyclists
3. Animals like horses that are used for carrying people or goods and people and goods carried by them
4. All non-motorized vehicles and people and goods carried by them
5. All motorized vehicles and people and goods carried by them
6. (Just for the sake of completeness) All motorized “unmanned” vehicles and people and goods carried by them

This blueprint covers only road traffic, including traffic that uses motorized modes like buses, trucks, cars, 2-wheelers as well as non-motorized modes like walking, cycling and animal powered modes of various kinds. The blueprint covers transportation of humans as well as goods.

Transportation Management

Traffic needs to be managed properly so that it moves in a safe and smooth manner. Effective management of traffic needs to address the following aspects:

1. Basic aspects
2. Acts and rules
3. Organizations , roles and responsibilities
4. Infrastructure
5. Traffic education
6. Discipline
7. Safety
8. Resources

Basic Aspects

Managing traffic essentially has to deal with all aspects of vehicles of all kinds. A good transportation management blueprint needs to have a handle on the **number of vehicles** in the region today and expected after a certain number of years and reasons behind the expected growth.

Traffic is generated by the human need of going from one place to another. The blueprint will assess the level of **connectivity** for people in cities, towns and villages. It will also look at what sort of basic connectivity any person should have and what it will take for the state to provide that connectivity.

The traffic pattern varies greatly as you go from cities to rural areas. The blueprint will study the needs of the traffic system in **various locales** like urban, rural and countryside

areas. It will also study any seasonal variations in the traffic pattern. Solutions will be suggested to address any problems found.

Traffic flows within cities as well as between cities have certain characteristics. This blueprint will suggest measures to be taken for improving the overall traffic flow management.

Traffic planners worldwide have realized that trying to manage traffic without managing **demand for traffic** in the first place leads to firefighting situations. This blueprint will suggest measures that need to be taken to control the demand for traffic.

All means of traffic move either people or goods (or a combination of both). transportation of people and goods has different needs and presents different challenges. The blueprint will keep both categories in mind and will suggest appropriate solutions as needed.

Acts and rules

Nothing can be managed properly unless there are acts and rules to govern the activities. The **Motor Vehicles Act 1988** governs all aspects of road traffic and transportation in India. **Various rules** based on this act stipulate procedures for obtaining driving licenses, registering and running a transportation company and for all such activities related to transportation. The blueprint will consider such rules and laws and will suggest remedies for any problems found.

Organizations, roles and responsibilities

There are **organizations** with specialized skills to take care of specific tasks regarding traffic, e.g., specifications for infrastructure for traffic, building roads and bridges, overall planning of large metropolitan areas. The blueprint will study such organizations and any overlaps as well as connections in their responsibilities. Any suggestions for improvements will be noted down.

The acts and rules have no meaning unless they are executed efficiently. All concerned officers should have a clear understanding of their respective **roles and responsibilities**. They should also have a support structure like sufficient resources to allow them to do their jobs properly. The blueprint will try to find if there are any lacunae in this area and provide suggestions to fix them.

Infrastructure

Facilities of various kinds needed for using the modes of traffic mentioned earlier fall under “Infrastructure”. The facilities include but may not be limited to: Roads and tracks made of the varied surfaces these modes use, the signage they need, fuelling stations, parking facilities, bridges, pedestrian crossing facilities, footpaths, facilities for food and medical assistance, towing facilities in case of accidents... and other facilities for catering

to a host of such needs. As said above, this list is not exhaustive but only indicative of what falls under “traffic infrastructure”.

Traffic infrastructure needs to address demands of **urban, rural as well as countryside traffic**. It should also address **special needs** of certain groups of people, e.g. young and old, physically challenged etc.

This blueprint will describe various steps that need to be taken to improve the traffic infrastructure in Maharashtra.

Traffic education

Traffic infrastructure will not be useful unless all concerned people are trained regarding the infrastructure. These include **traffic planners, people who install and maintain the infrastructure as well as people who use it**.

Traffic education needs to be disseminated not only among drivers of vehicles, but also among pedestrians, cyclists, bus passengers etc. The whole system of traffic education, examination and licensing needs to be revamped.

The blueprint will discuss various things that need to be done to address this issue.

Traffic safety

A significant number of unsafe traffic situations arise because people do not follow traffic rules. This issue encompasses knowledge of rules, willingness to follow them and punitive measures when they are not followed.

Going much beyond that, safety is a way of life. For example, traffic infrastructure should be built such that it is conducive to following rules and employing safe traffic habits. Apart from addressing merely the “discipline” part of traffic safety, the blueprint will also study latest trends in traffic safety and suggest what should be done in Maharashtra to make our traffic significantly safer than what it is today. Some critical issues related to traffic safety may need special treatment. For example, we may need new laws and rules to make the traffic safer.

A separate section will discuss such critical issues and suggested measures.

Resources

Traffic and its management needs resources. We need **money** and expertise for building roads and bridges, we need **space** for traffic. People spend **time** in traffic. Vehicles need **fuel**. Manufacturing vehicles needs **materials**. **Intellectual resources** are needed for planning and implementing complex traffic systems today.

Such resource requirements will be studied in the blueprint to identify any stress points and measures will be suggested to alleviate them.

Apart from some basic aspects of traffic like number of vehicles, transportation management includes acts and rules, organizations for specific activities, clearly defined roles and responsibilities of officials, effective infrastructure, education, traffic discipline, a focus on safety and effective management of resources consumed. The blueprint will discuss and prioritize measures to be taken over short/ medium/ long term for improvement on all these fronts.

Transportation

As said earlier, “Transportation” means “The act of transporting something from one location to another.” What is being transported includes people as well as goods.

Transportation of people can be categorized in Private and Public Transportation

Private Transportation

Private transportation implies a vehicle or a means of transportation which is owned by a person or a group of persons (companies, institutes, organizations etc, generally called “organization” for this blueprint) and is available for use of a very restricted group of people like friends and family of the owner, top officials of various kinds of groups listed above etc. This means of transportation is not available for use of the general public or employees of the organization even if the user is willing to pay charges for its use.

Needs of private means of transportation are addressed by the generic discussion on transportation management.

Public Transportation

Various attempts have been made to define Public Transportation. Though each of them might be incomplete in some way, they collectively help us understand the meaning. Below are some examples.

- Wikipedia¹: Public transport (also public transportation or public transit) is a shared passenger transportation service which is available for use by the general public, as distinct from modes such as taxicab, car pooling or hired buses which are not shared by strangers without private arrangement.
- Ministry of Transport, New Zealand²: Passenger transport services available to the general public on payment of a fare. The term includes buses, passenger rail services and ferries.

¹ en.wikipedia.org/wiki/Public_transport

² www.transport.govt.nz/ourwork/Pages/Glossary-NewZealandTransportStrategy.aspx

- Green Travel Plans³: Any form of transportation which is not personally owned by the user, e.g., bus, train & light rail.

JNNURM defines the following characteristics for a PT system⁴:

- Public Transport systems are characterized by - fixed origins and destinations; fixed routes and schedules; fixed stoppage points and fixed fares.

As can be seen from these definitions, “Public Transportation” implies a vehicle or a means of transportation generally owned by government or a government established organization and is available for use by general public as long as the user pays charges for its use and agrees to adhere to certain rules of usage. It implies transportation of people only, and not transportation of goods. Such a service may operate within a city and surrounding towns/ villages or may also be a “long distance” service, connecting towns within and across states.

For this blueprint, a few additional means of transportation are included in the scope. They are:

1. Bus services similar to the one described above, but owned and operated by private agencies
2. Buses owned and/or operated for companies, institutes, organizations
3. Contract buses that operate on daily basis for commute between home and work
4. School buses
5. Taxis and rickshaws

Organization owned buses and contract buses are included because they are generally available to a certain large group of people for their daily commute to/ from work, as if they were a public bus service.

School buses, whether owned by a school or hired by school/ parents, are included in the scope of this blueprint.

Taxis and rickshaws are included because although they may be owned by individuals, their fares are controlled by the government and any person can use them as long as the stipulated fare is paid.

Transporting People

Issues related to public transportation concern a very wide section of society. Therefore a separate section, “Transporting People”, is devoted essentially for public transportation.

³ www.greentravelplans.co.uk/content/glossary

⁴ Service Level Benchmarks for Urban Transport at a Glance
(http://www.urbanindia.nic.in/programme/ut/urban_transport.htm)

Transporting Goods

zzz Discuss what is covered

Scope of blueprint: Transporting people and goods on roads.

What will be the output(s) of the blueprint

This blueprint provides the following 4 outputs:

1. Vision, policies
2. List of processes and templates to be developed
3. Major steps to be taken to realize the blueprint
4. Comprehensive Gantt chart

Vision, policies

The blueprint will establish a **vision** for traffic and transportation in Maharashtra.

It will list down certain policies that need to be adopted for the state to achieve this vision. It has not provided the detailed text of each policy; however, it has stated what the policy should contain in order to be effective.

List of processes and templates to be developed

A lot of chaos in transportation management in Maharashtra (or even India) happens because of lack of processes and templates for implementing day to day things. This blueprint will suggest processes and templates that need to be developed and put to use. Here too, it will not provide detailed text of such processes and templates, but will provide a framework and guidelines under which to formulate those.

Major steps to be taken to realize the vision

A zillion things need to be done to transform the traffic and transportation situation in Maharashtra. Some of them address nitty-gritty issues, while some are much more fundamental in nature. It is necessary to separate the two to suit needs of different types of readers. Listing down the major steps to be taken to realize the vision expressed in the blueprint will also enable the reader visualize the process of transformation in time.

Evaluation of progress

The blueprint will also spell out criteria that can tell us whether the traffic and transformation in Maharashtra is improving.

Comprehensive Gantt chart

An even more detailed view of the steps to be taken is presented in the form of a Gantt chart. This lets the reader realize the dependencies of various reforms to be realized.

What kind of solutions will be suggested

Some solutions suggested in the blueprint simply suggest a better way of what we do today. However, some solutions are radically different from the approach adopted today.

What will be described in each solution

Each suggested solution is analyzed according to the following:

1. Cost, difficulty in implementation, difficulty in enforcing, change of mindset, conflict of interest.
2. Importance.
3. Major dependencies.
4. Timeline.

It should be noted that most of such analysis is qualitative and hence may be subjective; but collectively it gives a clearer picture of practicality of each solution.

Should the transportation sector be privatized

Whether the Government should provide the services of a given sector or whether the sector should be privatized, whether the "PPP" (Public Private Partnership) model would be beneficial for a given sector are hotly debated topics of today's era. The socio-economic pros and cons of privatization are well discussed elsewhere, and are out of the scope of this blueprint.

Yet, we would like to state a few issues and aspects to be kept in mind, should the transportation sector be privatized.

Nature of services

The services provided by the transportation sector could be grouped in the following two categories:

1. Creating and maintaining the infrastructure
2. Providing day to day services

The entire range of infrastructure, right from street signs up to large projects like freeways and bridges falls under the first category. Creation and maintenance of infrastructure can be mandated to follow certain norms. Although regular inspection may be necessary, it need not be done every day for any given infrastructure item. For example, unless major problems are found, a bridge could be inspected only once a year.

On the other hand, services like the bus service or good transportation operate every day. Therefore the people expect a higher degree of attention to safety, transparency, consumer-centric attitude from such services.

The following examples describe various degrees of "privatization" that exists in the transportation sector today.

Infrastructure

Street signs, signals etc

Although their installation and maintenance is frequently given on contract, the budget and funds come from the local governing body.

Sometimes maintenance of traffic islands or even a small stretch of a road is borne by private companies, who are given free or concessional rights for advertisements.

Building of roads, bridges

Roads and bridges are built by government agencies like PWD, MSRDC, NHAI with their funds. They are also built by private companies. In the latter case, the private companies are allowed to collect tolls to meet the costs.

Day to day services

Bus services

Some degree of privatization is seen in inter-city as well as intra-city bus services.

Private companies are allowed to operate bus services between cities. More often than not, such companies do not have any proper bus stations. They generally use public spaces to pick up and drop off passengers. While the state operated MSRTC strives to reach even remote villages, the private operators are seen to provide services only on profitable routes. In fact, it is also alleged that they work towards ensuring that MSRTC does not provide sufficient capacity on key routes, so that their buses can always get enough ridership...

Some state-run intra-city bus services augment their capacity by hiring some buses on contract. In some cities, these operators are paid on basis of number of commuters carried. That results in the operators trying to squeeze in as many commuters in the bus as possible, or buses rashly overtaking each other to reach a crowded bus stop to pick up passengers. On the other hand, where the operators are paid on basis of the daily run of

the buses, the operators are seen to ignore passengers waiting on the bus stop, thus saving time to accommodate an extra trip in a day.

Some companies hire buses on contract for the daily commute of their employees.

While the passenger carriage segment is largely run by the state, the goods carriage segment is almost entirely privatized. The railways do provide goods services, but their market share is declining day by day as the country's road network is expanding. Land based goods services are provided by private companies.

Possibilities of further privatization and care to be taken

It may be possible to privatize infrastructure as well as daily passenger carriage services. As seen above, where the infrastructure does not or cannot generate any revenue (street signs and such), the meaning of "privatization" may be limited to the government agencies hiring contractual services for installation and maintenance.

When the service can generate some revenue (toll on roads, tickets for bus services), true "privatization" may be possible. In such cases, the need for such services arises from a combination of reasons like the state's insufficient capacity to provide these services, poor quality or inconvenience of state run services etc. While private operations seem to address some of these issues, their services are also seen to add other problems, like tolls being collected long after recovering the expenses, improperly trained drivers, drivers being pressurized to reach the destination on time, and a general lack of accountability and transparency to the public.

The argument in favour of privatization of services generally hinges on competition leading to better customer focused services. However, examples above suggest that if the framework or rules under which a private company is allowed to provide a service have loopholes, the company exploits the loopholes, focuses on its bottom line alone and consumers suffer. It is also argued that if a company would not be able to satisfy customers, it could lose business or even go out of business. That aspect probably assumes that companies are able to think of their long term future and do not think of making a fast buck alone, and therefore genuinely think of their consumers. Success of privatization could probably hinge on this assumption being correct!

Section 3. Transportation Management

Executive Summary

The basic objective of transportation management is to achieve movement of humans and goods from point A to point B by using the most convenient mode of transport. While achieving this objective, one has to address the following issues:

6. Address issues arising out of constantly increasing number of vehicles
7. Provide basic connectivity to all people
8. Address issues specific to different locales, e.g. urban, rural and countryside areas
9. Achieve a smooth and safe flow of traffic for all modes of transportation
10. Keep the whole problem in control by employing traffic demand management techniques

The blueprint then takes a look at the important applicable acts and rules and studies roles and responsibilities of concerned authorities, current state of transportation infrastructure, education, discipline, safety and national resources required and consumed by the transportation system.

Problem areas identified

The most important problem areas identified in this blueprint are:

1. Basic aspects:
 - 1) Basic connectivity to any village is not defined and there is not clear plan to achieve such connectivity in a reasonable time.
 - 2) Traffic demand management measures are not employed. As a result, the whole problem goes on increasing and we are always in a catching up mode.
2. Roles and responsibilities
 - 1) There is no single official responsible for all traffic & transportation in a city or district, who is finally responsible for all transportation planning, execution and enforcement issues.
 - 2) There is no dedicated and trained traffic police establishment in rural areas as well as small towns.
3. Infrastructure
 - 1) Most of transportation planning and infrastructure focuses on difficulties faced by vehicles than by people.
 - 2) Guidelines recommended by IRC (Indian Road Congress) are not followed.
 - 3) Transportation infrastructure is not usable by physically handicapped people.

4. Education
 - 1) There is a lack of trained transportation planners in smaller towns.
 - 2) Quality of driving tests is very bad.
5. Traffic discipline
 - 1) There are hardly any mobile traffic police patrol doing random checks.
 - 2) Penalties for traffic violations are outdated.
6. Safety
 - 1) Fatalities due to road accidents is rising in Maharashtra
 - 2) Officers and citizens are not accountable for unsafe conditions created by them.
 - 3) There is no system to track drivers' violations and suspend licenses accordingly.
 - 4) There is no system to provide quick and effective emergency help in case of an accident.
7. Resources
 - 1) Allocation of funds focuses on benefits to motorized personal vehicles.
 - 2) There are no landmark projects to revamp public transportation and encourage walking and cycling as modes of transport.
 - 3) Land is not reserved for future transportation needs.
 - 4) Increasing number of vehicles, fuelled by wrong transportation planning practices, increases demand of fossil fuels and stresses our foreign exchange reserves as well as causes health hazards.

Vision and benchmark for modern transportation management

Vision

The vision for transportation management in Maharashtra is:

A proactively managed, well coordinated, expertly planned and safe transportation system for people.

Benchmark

While providing solutions to these and other transportation problems, it is important to first define when we can say that a given problem is fixed or whether the overall transportation management is improving. This blueprint suggests an elaborate scheme to assess the progress we make in transportation management by quantifying the status of certain key issues identified as benchmarks.

Solutions for better transportation management

Solutions to all major and minor transportation issues identified are suggested in detail. The solutions include what needs to be done and suggest a timeframe for taking specific steps. Any pros and cons of the solutions are also discussed, including whether any resistance might be expected by any group of people, whether it could be expensive to implement the solution and any such issues.

While the reader may go through this section and read various problems and solutions suggested, we would like to take this opportunity to state the overarching philosophy of the suggested solutions.

A campaign to revamp the transportation system

It is essential that the state launches a very visible and prominent campaign to revamp the entire transportation system. This campaign must be based on the modern transportation management philosophy of putting people's convenience before the vehicles', thus ensuring that convenience of pedestrians, public transport and cyclists are never compromised while ensuring smooth vehicular movement.

It is extremely important that the vehicle centric transportation management practices that we are so used to are unlearned and discarded.

In the course of suggesting and describing the solutions, the blueprint also suggests certain policies that the state must define and adopt. The most important of these policies focus on safety of pedestrians and two-wheeler riders, and on keeping people in mind while doing transportation planning and not vehicles.

Introduction

All individual units of humans, animals, vehicles using any mode of transportation for movement from one place to another collectively form "traffic". This blueprint considers only road traffic, as explained in the scope earlier.

Transportation Management in ancient times

Until just a little more than hundred years ago, all transportation in India was either on foot or powered by animals. The speeds were low. The journey was difficult. As a result, people travelled only when absolutely necessary. Traffic volumes were naturally low. Transportation management, if any, was restricted to occasional repairs of trails after monsoons.

Transportation Management in modern times

The situation has changed drastically in the last 100 or so years with advent of motorized vehicles. The traffic was essentially pedestrian for a few thousand years. The mankind is

now suddenly faced with a flood of vehicles that are fast, fuel consuming, heavy, complicated to use and therefore risky, unsafe, resource consuming and polluting. Considering that the human brain would not evolve as fast as these vehicles have, managing all this traffic has been becoming an increasingly challenging task for the humans.

As far as traffic and its management is concerned, people's habitat today can be classified in 3 broad kinds. They are:

1. **Urban:** Typically cities and towns with more than 100,000 population. Its traffic's characteristics can be roughly described as tens, or even hundreds of intersections that may need traffic signals, negligible number of animal powered vehicles, a high number of motorized vehicles, a few flyovers and bridges, commute within the town could take 30-60 minutes or even more and perhaps existence of a public transport service.
2. **Rural:** Typically small towns and villages. Its traffic's characteristics can be roughly described as a lower number of motorized vehicles and a higher number of animal powered vehicles than an urban locale, virtually no need for a traffic signal and it seldom needs more than 15-20 minutes to cross the town in a motorized vehicle.
3. **Countryside:** The area between two villages or towns or cities. Its traffic characteristics can be described as National, State and District highways as well as other roads connecting towns and villages, mountain passes, bridges over rivers and railways, no significant residential areas, some establishments like petrol pumps, restaurants.

The terms **Urban**, **Rural** and **Countryside** will be used throughout this blueprint and will have the connotation described above.

Transportation Management in modern Maharashtra

Aspects of Transportation Management in today's Maharashtra

Today's transportation needs to be managed professionally so that traffic moves in a safe and smooth manner. Effective management of transportation needs to address the following key areas:

1. Basic objective - transportation
2. Acts and rules
3. Organizations, roles and responsibilities
4. Infrastructure
5. Education
6. Discipline
7. Safety

8. Resources

The document will now examine the above in detail, with the objective of studying today's situation and of identifying any current and potential issues.

Basic objective - transportation

The objective of transportation of humans and good involves movement from point A to point B using any available mode of transport. At the very basic level, it simply means that there would be a number of vehicles and people using roads connecting different places, and all this traffic needs to be provided adequate facilities. Going a bit deeper, we encounter the following issues while solving the problem of transportation:

1. Increasing number of vehicles
2. Connectivity between two places
3. Traffic patterns in different locales
4. Traffic flow management
5. Traffic demand management

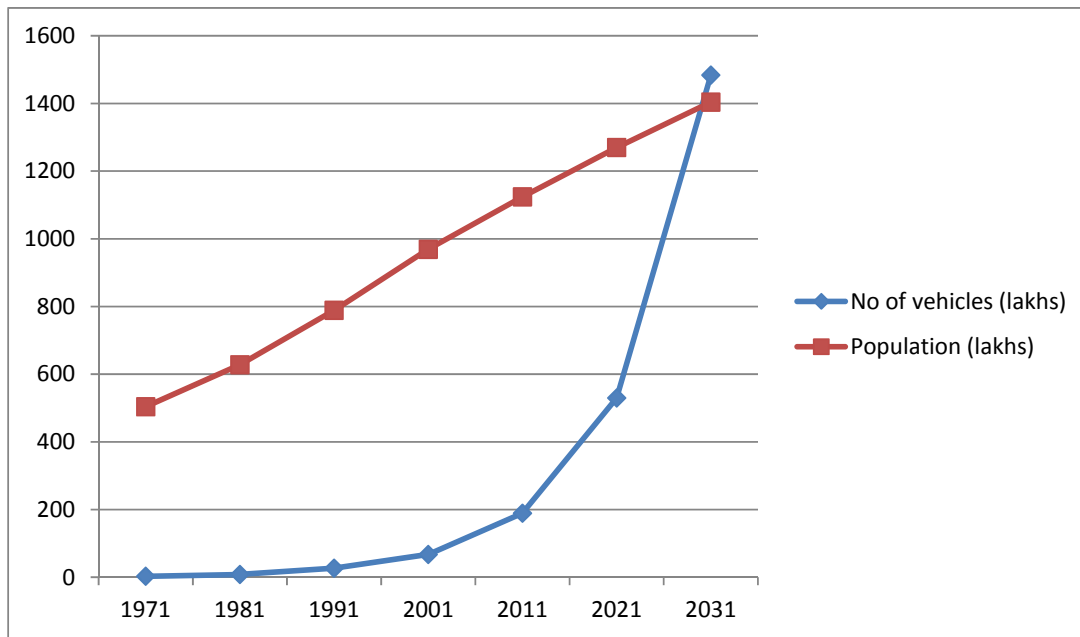
The gravity and importance of the other key areas comes into picture mainly because the human beings' need for transportation has grown manifold and has become very complex.

Increasing number of vehicles

Although "traffic" as a whole considers pedestrians and animal powered transportation as well, most of the issues regarding transportation management arise out of an ever increasing number of vehicles. The following two factors are contributing towards this increase:

1. Increasing standard of living contributes towards higher number of vehicles per 1000 population
2. Increase in population itself

The following graph shows the number of vehicles in Maharashtra. Maharashtra's population is also shown on the same scale for comparison.



The data up to 2001 is real data about number of vehicles⁵ and population⁶. Population data beyond 2001 is as forecast by Population Reference Bureau⁷. Number of vehicles in Maharashtra beyond 2001 are extrapolated under the assumption that their rate of growth, which is about 2.8 times over 10 years, would remain unchanged over the next 20 years. If that happens, there may be more than one vehicle per person in Maharashtra by 2031 and we can expect 7 times as many vehicles as there are today! Even if that might not happen, a more realistic figure could be about 3 to 4 times the number of vehicles today, and that is also a huge number.

Number of vehicles in Maharashtra in 2031 could be at least 3-4 times the number of vehicles in 2010.

Large number of vehicles to manage would lead to problems on multiple fronts like road space, fuel consumption, accidents. A blueprint for Traffic and Transportation needs to anticipate all such problems and plan solutions of various kinds in advance.

Connectivity

Traffic stems from people's basic need to go from one place to another. People not only need to commute within their villages or cities, but also need to go to other places. In

⁵ Motor Transport Statistics of Maharashtra 2007-08, Part 2, Website of Motor Vehicles Department, Government of Maharashtra (www.mahatranscom.in/index.aspx)

⁶ Economic Survey of Maharashtra, 2008-09, Government of Maharashtra

⁷ Population Reference Bureau (<http://www.prb.org/pdf07/futurepopulationofindia.pdf>)

this regard, we need to ascertain whether every village has a “basic” connectivity with the rest of the world.

The National Road Transport Policy (N RTP)⁸ states that the objective of Pradhan Mantri Gram Sadak Yojana (PMGSY) is to link all villages with a population of more than 500 people with all-weather roads by the year 2007. This scheme is being implemented by Ministry of Rural Development.

We would like Maharashtra to be ahead of this objective, and suggest the following:

- As stated in N RTP, all villages with a population of 500 or more must have all weather roads that connect them to the outside world.
- In addition, “small” villages (with a population of between 100 and 500) should have the following level of connectivity:
 - Each small village on flat terrain must have access to an all weather road within 2km.
 - This “access” must be at least a clear walk-able path. This path must be usable throughout the year. If there are any bridges, they must be wide enough for two people to walk side by side, without doing any balancing acts.

zzz Any data on how many villages do not have “basic connectivity”?

There should be criteria of minimal basic connectivity to any village in terms of access to the village on foot and by a vehicle.

There is apparently no systematic plan to ensure basic connectivity to all villages in Maharashtra within a stipulated timeframe.

Traffic patterns in different locales

Urban

Maharashtra is in the middle of an urbanization boom and the boom is expected to last a couple of decades or more. Increasing per capita income in urban Maharashtra is leading to a higher personal vehicle ownership. Coupled with not so satisfactory public transportation, the people are forced to use their vehicles for daily commute to schools and colleges, offices and businesses. Weekend or holiday outings are also increasingly done in personal vehicles or rented vehicles rather than using public transportation.

Exponentially increasing use of personal vehicles has led to problems like congestion, perpetual lack of parking places, air and noise pollution and associated health hazards.

⁸ zzz Source? National_Road_Transport_Policy.pdf.

Higher population densities and higher purchasing power also means that cities attract a much higher volume of goods transport.

Some of the cities are or will soon turn into megapolises. Such cities need infrastructure that is much more complex than roads, rudimentary traffic signs and a handful signals. Characteristics such as flyovers, synchronized signals, bus lanes are becoming increasingly commonplace in these cities.

Urban traffic has a large number of vehicles and complex traffic infrastructure.

Major problems of urban traffic are: congestion, lack of parking space, air & noise pollution and associated health hazards, high volume of goods transportation through urban areas and complex traffic infrastructure. Yet, some of these problems are inherently such that fixing them might lead to a worse problem, e.g. providing more parking spaces would lead to higher use of personal vehicles and congestion.

Rural

Traffic within rural settings is also seeing an increasing dependence on personal vehicles. Bicycles are being replaced with petrol driven two wheelers. Roads within small towns and villages have hardly any room for widening, but an increasing number of four wheelers are seen using them. Quality of roads in rural Maharashtra needs substantial improvement.

Traffic infrastructure in rural areas consists of hardly anything more than a barely drivable road, generally old and dilapidated signs showing distances to nearest towns and an occasional speed breaker. Roads and trails frequented by bullock carts exhibit deep ruts. Several small towns have marketplaces with substantial daily pedestrian traffic, yet almost none have basic facilities like footpaths and safe places for people to cross the roads.

Rural traffic is marked by fewer, slower vehicles and very simple infrastructure.

Though the infrastructure is simple, it is not of acceptable quality and is not maintained year round.

Countryside

Traffic in the countryside consists mostly of vehicles travelling comparatively longer distances. It therefore has a higher percentage of buses and goods carriers rather than personal vehicles. However, the number of personal vehicles is increasing here too.

Insufficient public transport facilities, especially for short distances, has given rise to unauthorized transporters shuttling people in overloaded vehicles at arbitrary fares.

zzz Need to verify the modal share of countryside traffic?

Countryside roads consist of National and State Highways as well as district highways. Overall quality of these roads has improved noticeably over the last couple of decades or so. Roads have become wider and smoother, even divided in some cases. This and availability of modern and more powerful vehicles has led to substantial increase in driving speeds.

Bulk of the countryside traffic uses National and State highways. It is marked by moderate or high number of vehicles moving at high speeds but using relatively simple infrastructure.

Countryside traffic infrastructure is not planned as meticulously as it should be with enough attention to fine details, in order to promote safety in view of high traffic speeds.

Seasonal variations

Traffic pattern virtually all over Maharashtra has seasonal variations. These are caused by a variety of reasons like school holidays during summer and festivals like Diwali. The reasons themselves are sometime very local, in which cases the impact is also restricted to a small locality of a few kilometers.

Traffic flow management

Traffic flows within cities as well as between cities have certain characteristics. Parameters such as volume of traffic flow, directions of flow, time of peak flow need to be studied so that the overall “traffic experience” with respect to time taken, congestion, speed etc can be improved.

Examples of factors that impact traffic flows are:

- Presence of large industrial areas mean large number of heavy vehicles. They could lead to higher percentage of serious accidents.
- Business districts have a lot of cars. They also have distinctively unidirectional flows in rush hours.
- Places of pilgrimage have a high number of contract buses as well as rented vehicles. They need special facilities, e.g., parking lots for buses.

Today we see only isolated examples where the local authorities study traffic flow and take appropriate steps to manage the traffic accordingly.

Specific steps need to be taken for locations with peculiar traffic flow characteristics after studying the flow systematically.

However, there is no standard template or flowchart that a traffic planner could follow to arrive at steps to be taken.

Traffic demand management

Traffic planners worldwide have only recently started realizing the importance of Traffic Demand Management (TDM) to effectively manage the basic objectives of transportation.

They have realized that trying to manage traffic without managing traffic demand leads to firefighting situations. Correctly estimating the amount of traffic a few years from now is necessary but not sufficient. What is required is not only to figure out whether we will be able to manage those traffic volumes, but also whether the estimated traffic volume can be controlled in the first place.

For example, a large mall in some part of the city creates traffic in that part. Instead of trying to manage that traffic later, the city should first figure out whether it will be able to manage that traffic. If the answer is negative, could the mall have been built in some other locality which can accommodate more traffic?

The same reasoning can be applied to inter-city or inter-town traffic as well.

Although TDM measures are becoming more prevalent for urban town and traffic planning, to some extent they can be adopted to countryside traffic as well.

Traffic demand management must precede all transportation management measures. If we have good control over the amount of traffic generated, half of the battle is won!

Traffic demand management today is noticed by its absence. City and town development plans will need to include traffic demand management measures if we want to have any hope of managing traffic properly.

Acts and Rules

Let us now take a look at the acts and rules that govern traffic and transportation in India and thus Maharashtra today. The acts and rules mentioned is not intended to be exhaustive. However, an attempt is made to capture the gist of some of the most important acts and rules.

The Road Transport Corporations Act 1950

This act provides for the incorporation and regulation of Road Transport Corporations. It entitles State Governments to establish and operate Road Transport Corporations for part or whole of the state as well as other states.

The act has clauses that describe the constitution, powers, duties, handling of finances of such Corporations.

The National Highways Act 1956

The State Governments were maintaining the highways passing through the respective states. This led to non-uniform and even very poor quality of some highways in some states. This act allows the Central Government to develop and maintain important highways of the country. It also allows the Central Government to include an existing highway in the list of national highways, or omit a highway from such a list.

Motor Vehicles Act 1988

The Motor Vehicles Act of 1988 (MVA 1988) is the act that governs the following aspects of road traffic and transportation in India:

- Issuing driving licenses
- Licenses for stage carriers
- Registration of motor vehicles
- Regulations for transport vehicles, e.g., rental vehicles, goods carriers
- Provisions for State Transport Undertakings
- Manufacturing and maintenance of motor vehicles
- Traffic control and traffic rules
- Liabilities and third party insurance
- Jurisdictions for claims
- Violations and fines

MVA 1988 came in effect from 1st July 1989.

Motor Vehicles Rules

MVA 1988 grants the Central Government as well as all State Governments authority to make and enforce appropriate rules in order to effectively implement the act. Accordingly, the Central and Maharashtra Governments have formulated the following rules:

- Central Motor Vehicle Rules 1989
- Maharashtra Motor Vehicle Rules 1989

Out of these two, the Central Motor Vehicle Rules are applicable all over the country. In addition to these rules, some states, especially the larger ones, have formulated additional rules in such a way that they are not in conflict with the Central Motor Vehicle Rules. Maharashtra is one of such states who have additional motor vehicle rules. These rules stipulate various procedures and provide specifications for implementing MVA 1988.

Taxation: Acts and rules

Taxation is governed by the following acts and rules:

- Mumbai Motor Vehicles (Passenger Taxes) Act 1958
- Mumbai Motor Vehicles (Passenger Taxes) Rules 1958
- Mumbai Motor Vehicle Taxes Act 1958
- Mumbai Motor Vehicle Taxes Rules 1959

It may be noted that “Mumbai” refers to the erstwhile Mumbai state. These acts and rules are in effect in Maharashtra.

Appropriate amendments have been done from time to time in all of the aforementioned acts and rules.

National Highways Authority of India Act 1998

The objective of this act is to provide for the constitution of an Authority for development, maintenance and management of national highways as well as any other highways as decided by the Central Government.

Control of National Highways (Land and Traffic) Act 2002

The objective of this act is to provide for control of land within the National Highways, right of way and traffic on the National Highways, including removal of unauthorized occupation.

This act allows the Central Government to establish Highway Administrations and Highway Tribunals to discharge functions under this act.

National Highways Fee Rules 2008

These rules are formed under the National Highways Act 1956. Under these rules, the Central Government can collect fees (toll) for use of sections of a national highways, permanent bridges, bypass highways and tunnels.

The rules generally exempt two wheelers, three wheelers, tractors and animal drawn vehicles from such fees, although such tolls may be charged when an alternate route is available.

The prescribed toll rates are stipulated as a function of vehicle class, length of the section of highway for which the toll is charged, and the cost of the project on the section. It also provides a formula for an annual revision of rate of fee.

A list of persons who are exempted from the tolls is also provided. Some are always exempted and some are exempted when traveling in an official capacity. Ambulances are exempted from the toll.

Other acts

A few other acts exist which govern operations like developing and running systems like trams, metros and railways.

Notes on acts and rules

An observation: The toll depends on the size of the infrastructure for which the toll is charged. The National Highways Fee Rules 2008 includes a built in provision for their annual revision.

On the other hand, fines for violating traffic rules do not depend on the size of the vehicle and the amounts can be revised only after amending the rules.

For all rules: Prescribed penalties for violating rules are only monetary. Such penalties do not necessarily address “lack of knowledge” if that is the main reason that a certain rule is violated frequently.

Roles and Responsibilities

Several ministries and government organizations have a role to play in transportation management. The list presented here may not be exhaustive, though an attempt has been made to capture the most important ones and what they do.

Ministries

Ministries of Government of India (GoI) as well as Government of Maharashtra (GoM) play their respective direct and indirect roles in transportation management.

zzz To do: what does each ministry do?

Transport (GoI)

Urban Development (GoI)

The Ministry of Urban Development provides countrywide guidelines for development of urban areas. It can devise and fund schemes like the JnNURM scheme that cover cities across the country.

Transport (GoM)

Urban Development (GoM)

Home (GoM)

The traffic police are a part of the state's police force and hence are under the jurisdiction of the Home ministry.

PWD, Excluding Public Undertaking (GoM)

Public Undertaking (GoM)

Organizations

Various organizations exist that govern specific areas regarding traffic.

IRC

The Indian Roads Congress (IRC) is the premier technical body of highway engineers in the country. The IRC was set up in December, 1934 with the objective of Road Development in India. It was formally registered as a Society in 1937. IRC is based in New Delhi.

Over the years IRC has grown into a multi-dimensional many faceted organization, devoted to the cause of better roads and better bridges in the country. It provides a national forum for sharing of knowledge and pooling of experience on the entire range of subjects dealing with the construction and maintenance of roads, bridges, street signs

etc., including technology, equipment, research, planning, finance, taxation, organization and all connected policy issues.

It is expected that all infrastructure adheres to guidelines laid down by IRC. However, it should be noted that the IRC guidelines are guidelines. The local authorities have flexibility in deviating from the guidelines to a reasonable extent.

NHAI

The development of National Highways is the responsibility of the Government of India. The National Highway Authorities of India was formed explicitly for this purpose under the National Highways Authority of India Act 1998. NHAI has launched major initiatives to upgrade and strengthen National Highways through various phases of National Highways Development project (NHDP). These phases of NHDP are approved by Cabinet Committee on Economic Affairs (CCEA). 7 phases have been approved so far, for projects like the Golden Quadrilateral, the NS-EW Corridor, Port Connectivity, 4-laning and 6-laning of national highways, expressways, bypasses, flyovers and ring roads.

PWD

The Maharashtra Public Works Department is responsible mainly for the following jobs:

- Construction of Government buildings (offices as well as residential)
- Construction of roads, bridges and culverts, improvements in roads
- Periodic maintenance of the above

PWD also has a cell that identifies accident prone spots on roads, suggests and executes remedies to improve these spots so that accidents can be avoided.

MSRDC

The Maharashtra State Road Development Corporation Ltd. has objectives that overlap with PWD to a certain extent. However, MSRDC takes up much larger scale projects than PWD. The objectives of MSRDC are stated as:

- To improve and develop integrated transport infrastructure such as roads, expressways, bridges, flyovers, MRT systems, ports, rail projects, airports etc.
- To raise resources for the identified projects.
- To follow transparent and competitive bidding procedures to ensure quality works at the most economic cost.
- To encourage private sector participation in transport infrastructure.

RTA

The Road Transport Authority is ultimately responsible for enforcement of all traffic laws and rules. The local traffic police head as well as RTO are members of the RTA. Some of the traffic rules are enforced by traffic police and other by RTO.

RTA also determines the fares of rickshaws and taxis as well as decides whether to grant more permits for rickshaws and taxis in the city.

RTO

A network of Road Transport Organization offices exists across Maharashtra. Enforcement of laws and rules regarding taxation, fitness of the vehicles and drivers, overloading of vehicles, illegal transport of goods and people falls under the purview of RTO. They are not responsible for traffic or transportation management and enforcement of traffic rules like not following signals and other roads signs. That is looked after by the local traffic police.

RTO also conducts driving tests. It grants, renews as well as cancels driving licenses as per provisions under concerned rules.

Among various entities discussed here, RTO is perhaps the only entity that a large number of common people come in contact with. Therefore it is necessary to have a closer look at it.

Since the overall level of traffic education is so low in India, and Maharashtra is no exception, it is not surprising that the RTOs, especially in rural areas, are in bad condition. Most of them lack facilities to conduct a written test. The accompanying photographs of the RTO building at Shrirampur and its surroundings say it all. For lack of space, they simply cannot conduct a written test.



RTO building at Shrirampur, dist Ahmednagar.

And it is also not as if they can conduct a proper road test either. This RTO is located in rented premises of the local Markey Yard, and has to live with whatever little space is available in the premises for road tests.



Road test area of RTO Shrirampur

The condition of most other rural RTOs is quite similar. It is only the RTOs in larger cities like Mumbai, Pune that have any "facility" to speak of.

Metropolitan Planning Committees

Maharashtra State passed the Metropolitan Planning Committees Act in 1999. The objective of this act is to be able to form Metropolitan Planning Committees which will do holistic planning of metropolitan regions like Mumbai, Pune. This planning will include not just traffic and transportation, but also include subjects like housing, industrial belts etc. This planning activity would be on top of any focused planning activity done by any local governing bodies, for example any municipal corporations, nagar parishads etc.

Membership of a given metropolitan planning committee would constitute some of the people's representatives of local governing councils falling in the region, members appointed by the state government, chief secretary of Ministry of Urban Development, Municipal Commissioners and Regional Commissioner etc. It can also have specially invited members like some Members of Parliament and Legislative Assembly, Chief Executive Officers of bodies like MIDC, MHADA, officers of railways, BSNL, airport authorities etc.

The main task of the Planning Committee is to develop a development plan for the metropolitan region. This plan is expected to address land use planning, overall transportation planning etc.

The State Government is expected to appoint a "suitable person" as the Chairman of the Planning Committee.

Metropolitan Region Development Authorities

Government of Maharashtra can establish organizations to focus on planned development of a certain metropolitan region. These Development Authorities are

responsible not for any planning activity, but for execution of the plan developed by the Metropolitan Planning Committee.

MMRDA

An example of such an authority is the Mumbai Metropolitan Region Development Authority (MMRDA). As far as traffic is concerned, MMRDA implements only large, key projects like the Mumbai Metro project. It does not handle day to day activities of installing and maintaining traffic infrastructure.

The highest policy making body of MMRDA is called the “Authority”. It supervises and controls all the activities of MMRDA. It consists of 17 members and the Minister for Urban development, Government of Maharashtra is its chairman. Other members include ministers, Mayor of Mumbai, Mumbai Corporation’s Standing Committee members, MLAs and other top administrators and bureaucrats. It is interesting to note that no urban planner/ town planner/ traffic planner is in this apex body.

Area Development Authority

The Maharashtra Regional Urban Development Act was amended in 2010 to allow the State to constitute Area Development Authorities for development of a certain region. It should be noted that the “region” here may not necessarily mean a “metropolitan region”. The Guardian Minister of the concerned district would be the ex-officio Chairman of the Area Development Authorities thus constituted.

It should be noted that a Metropolitan Region Development Authority can thus be formed under any of the two provisions:
a) as an executing arm of the Metropolitan Planning Committee
or 2) as a separately constituted Area Development Authority
under the Chairmanship of the Guardian Minister of the district.

Transport Undertakings

Separate corporations have been formed to look after public transportation. For example, Maharashtra State Road Transport Corporation (MSRTC) looks after providing a bus service to connect all cities, towns and villages in Maharashtra. It also provides services to a handful cities outside Maharashtra, e.g., Indore, Belgaum.

Larger towns and cities have undertakings to provide bus services within the city as well as to connect the city to neighbouring villages. Examples are: BEST for Mumbai, PMPML for Pune.

For towns that do not have such a bus service, MSRTC provides a “city bus service”.

CIRT: To improve State Transport Undertakings

The Central Institute of Road Transport (CIRT) was established in 1967 on the joint initiative of the Association of State Road Transport Undertakings (ASRTU) and the then Ministry of shipping and Transport, Government of India. The following STUs from Maharashtra are members of ASRTU:

- BEST (BrihanMumbai Electric Supply and Transport)
- Kalyan Dombivali MTU
- KMTU (Kolhapur Motor Transport Undertaking)
- MSRTC (Maharashtra State Road Transport Corporation)
- NMMT (Navi Mumbai Motor Transport)
- PMPML (Pune Mahanagar Parivahan Mahamandal Ltd)
- SMTU (Solapur Motor Transport Undertaking)
- TMTU (Thane Motor Transport Undertaking)

The objective of CIRT is to improve the efficiency and productivity of the transport sector, with particular emphasis on State Transport Undertakings (STUs). CIRT is based in Pune. CIRT offers management development programs covering general management, transport operations and maintenance engineering. The programs are meant for practicing managers in STUs.

The Institute also undertakes consultancy and research assignments on transport policy, transportation planning, transportation management, maintenance management, materials management, human resource management and management information systems.

UMTA

The National Urban Transport Policy says:

37. The current structure of governance for the transport sector is not equipped to deal with the problems of urban transport. These structures were put in place well before the problems of urban transport began to surface in India and hence do not provide for the right co-ordination mechanisms to deal with urban transport. The Central Government will, therefore, recommend the setting up of Unified Metropolitan Transport Authorities (UMTA's) in all million plus cities, to facilitate more coordinated planning and implementation of urban transport programs and projects and an integrated management of urban transport systems. Such Metropolitan Transport Authorities would need statutory backing in order to be meaningful.

However, such UMTAs are yet to be formed in several cities in India, and Maharashtra is not an exception. The Maharashtra state government has formed UMTA only for Mumbai region so far. UMTA for Mumbai was established in February 2008⁹, and consists of various officials from establishments related transportation, like various ministries, railways, airport, MTDC, BEST, police, MCGM, MMRDA etc.

⁹ Institute of Urban Transport of India, <http://www.iutindia.org/urban09/031209/O%20P%20A.pdf>

UMTA's role is mainly for coordination and consultation. It is not an implementation authority.

A large number of authorities and organizations are established to focus on several aspects of traffic. The discussion above may not cover all such organizations and is rather indicative.

Day-to-day functions

As far as day-to-day management of traffic is concerned, three functions play the most important role:

1. Planning small and localized actions like 1-ways, diversions and closures
2. Installing and maintaining infrastructure like roads signs, signals
3. Enforcing traffic rules and managing day to day issues like traffic jams

Decision makers and executers of the above actions are typically the local municipal authority and the local traffic police.

Urban areas

In general, any infrastructure related to traffic is installed or modified after consulting traffic police because ultimately the traffic police have to ensure that all rules regarding it can be enforced. The actual civil work is done by the local municipal body if it is very trivial. If the infrastructure is more complex, one of the entities mentioned earlier is given the charge of its installation and/ or modifications.

Citizens can also suggest new infrastructure or changes in existing infrastructure. Such suggestions are jointly evaluated by traffic police and the municipal body and approved or rejected.

The roles and responsibilities in this regard defy common sense. It appears that the urban administrative body, e.g. the municipal corporation, is responsible for all traffic planning. They have departments and officers responsible for urban planning as well as traffic planning. These officers hold degrees in civil engineering and some even have post graduate degrees or specialized training in transportation management. Yet, most of the changes regarding traffic, e.g. whether a certain road needs to be converted to 1-way, whether certain turns should be banned or allowed, are done as per requests from the traffic police. The traffic police are responsible for managing the traffic, not planning it. They do not have any people who are trained in transportation management. However, it seems that since they have to face the brunt of traffic chaos every day, they take some proactive measures to manage the traffic as per their thinking, logic and reasoning. On the other hand, the officers in municipal bodies are frequently seen approving whatever the traffic police say.

Many of these officials (senior traffic police as well as municipal officers) agree that urban areas need one officer who is responsible for all traffic planning. All traffic changes,

ranging from day to day changes in 1-ways and no entries up to changes resulting from any long term planning, whether initiated by local officers or national level entities like NHAI, should be approved by this officer or entity.

This situation and opinion expressed by such officials highlights the need to accelerate the establishment of a body like UMTA.

Rural and countryside areas

Rural and countryside areas do not have a separate traffic police establishment and their local municipal bodies may not also have staff that can plan or evaluate traffic infrastructure. The Public Works Department plans, evaluates and implements infrastructural changes.

zzz confirm the above!

(contd..) As discussed earlier, very large infrastructure like bridges on large rivers, multi-lane highways may be built by MSRDC and not PWD.

For urban, rural as well as countryside areas, there should be a single entity or official who is ultimately responsible for all aspects of traffic, including planning, execution and enforcement.

There is no such single entity or official. Establishing such entity may need changes in administrative and reporting structures, rules and laws.

Infrastructure

Traffic infrastructure consists of things like roads, dividers, footpaths, street lights, traffic signals, road markings and other traffic signs of various kinds, bus stops, bus depots. Modern technology has introduced additional items to this list like remote controlled cameras, sensors for traffic signals. The list is essentially limited by imagination and innovation that can be put to use for improving the infrastructure!

Since the three kinds of traffic patterns identified earlier are so diverse, it is essential to study and evaluate the state of the traffic infrastructure in their respective context.

Urban infrastructure

Vehicle friendly vs. people friendly

As mentioned earlier, Maharashtra is in the middle of an urbanization boom. Urbanization of traffic is characterized by an exponential rise in number of vehicles. Roads in old parts of most cities in Maharashtra had not been designed with such high number of vehicles in mind. Therefore the first “traffic problem” that manifested in most cities was traffic jams in such areas.

One of the obvious solutions that was tried was to widen the roads as much as possible. As seen earlier, the number of vehicles in Maharashtra is increasing at a rate of around 60-70% every 5 years. As a result, most roads thus widened start seeing the same problem in 5 years, or even less in case of cities that are growing faster than others.

Since roads clogged with vehicles is an immediately perceivable problem, a lot of infrastructure is built for alleviating difficulties faced by vehicles. Such solutions are so intuitive that the fact that vehicle friendly infrastructure attracts more vehicles is overlooked - nay, it has not even dawned upon traffic planners of most urban areas.

As a result, it is very common to see:

- Roads being widened at the expense of footpaths
- Signals for vehicles being repaired reasonably promptly while faulty pedestrians' signals on the same signal poles are not even noticed
- Foot overbridges and pedestrian underpasses being considered at prominent junctions, expecting pedestrians to spend more time and energy to cross a road
- Official traffic signs on footpaths with less than 6' clearance from ground, thus posing danger of head injury for people who are taller than 6'



A sign in Nashik with a very small clearance from ground, forcing the pedestrian to get down from the footpath.

The urban traffic planning (and hence traffic infrastructure) today is fast becoming vehicle friendly than people friendly.

The observation above is a problem in itself. Traffic infrastructure must be people friendly.

Installation or creation of infrastructure

IRC has published norms and guidelines and for installing and creating most of the “basic and simple” infrastructure. These guidelines are quite thorough in details like dimensions of road markings, their distance from footpaths and dividers, heights of signal poles and visibility for approaching vehicles, etc.

In most cases, however, these guidelines either do not reach the contractors who actually install the infrastructure, or the workers are not trained to use the guidelines. As a result the infrastructure presents a lot of usability issues, for example:

- Traffic signals are not visible to vehicles approaching them or to vehicles correctly stopped just before the stop line
- Zebra stripes are interrupted by road dividers
- Pedestrians do not get sufficient right of way to cross a road at a signal
- No left/ right turn signs are seen after taking the turn

- Markings and signs intended for use in a particular situation are used in completely different and thus unexpected situations

Quality of infrastructure

A lot of improvement is needed as far as the quality of the infrastructure is concerned. Most day to day infrastructure works reasonably well when installed; however, it breaks down quickly and is not repaired promptly.

Maintenance of infrastructure

Some municipal bodies like Pune Municipal Corporation have taken good steps in e-governance. They provide an interface for citizens to register complaints using internet. However this facility is inadequately supported from the municipal bodies. Most of the officials who are supposed to receive citizens' complaints either do not receive these complaints, or are not net-savvy enough to process them quickly, or are inundated with too many complaints - or a combination of the above.

Changes in infrastructure/ traffic plan

Changes in existing infrastructure or addition of new infrastructure, including changes in traffic plans, tend to ignore its effects on existing infrastructure. Examples of what happens as a result:

- New road signs, lamp posts etc block the view of existing signs or even signals
- Right turn on a road is disallowed but an old sign that says "turn right for XYZ" is not removed

Changes in traffic infrastructure frequently do not follow stipulated guidelines, are poorly planned and are not reviewed meticulously for any side effects.

Rural infrastructure

Rural traffic is typically characterized by relatively lower vehicular densities and slower speeds. The slower speeds are partly because of higher percentage of slower vehicles and also because of significantly poorer road quality, forcing even powerful cars to drive slowly.

The most commonly found traffic infrastructure in rural areas consists of bus stops, roads signs showing directions and distances of nearby towns and speed breakers especially if the village is along a state or district highway.

This infrastructure shares some common properties with the infrastructure found in cities: it works reasonably well when installed; however, it breaks down quickly and neither maintained properly nor repaired promptly.

Rural traffic infrastructure is very simple.

However, even that is not maintained properly.

Countryside infrastructure

There is a significant variety in countryside traffic. At one end we have high speed, high density traffic on prominent National Highways joining populous cities. On the other we have small roads or even dirt tracks joining villages. As a result, a wide variety of infrastructure can be seen on the countryside. This subsection, therefore, examines the infrastructure by category, unlike the way it is treated in the section “Urban infrastructure”.

Roads

Countryside roads consist of National and State Highways (NH and SH), District highways and other smaller roads. The whole topic of roads is very vast and perhaps demands a separate blueprint. However, it is still useful to make some observations in this blueprint.

The surface condition of most NHs and SHs has seen significant improvements over the last two decades or so. Yet, most of these roads (even 2+2 divided NHs) have non uniform, weak, earthen shoulders. At many places, there is a large step between the level of the paved surface and the shoulder.



A step of almost a foot between the pavement and the shoulder, on NH-50.

Heavy vehicles are susceptible to being overturned on such shoulders. As a result, they tend to drive as close to the center of the road as possible, against the preferred practice of “heavy vehicles should keep left”. It is only on the Mumbai-Pune expressway that drivers of heavy vehicles have gained some confidence that it is safe to drive in the leftmost lane; but even that has taken a few years.

Even the National Highways in the state lack basic attributes like road markings. These are especially required where they pass through or near a town. Absence of a good shoulder brings the roadside activity dangerously close to moving vehicles, as can be seen in the photograph below.



Vehicles do not have enough space to stop at the roadside and are stopped in the carriageway of this National Highway.

At most places, roadside properties open directly on National Highways. Even the access roads to roadside properties meet the highway at right angle, leaving no room for the vehicle joining the highway to accelerate sufficiently to safely merge with the traffic. This happens even at the recently laid out NHs with 2+2 lanes, where the traffic routinely moves at 80 kmph or higher.



A lane joining NH-50 at right angle. Also notice the state of the shoulder, forcing pedestrians to walk right on the National Highway!

Very simple road markings and a shoulder, at least in the vicinity of towns and villages with substantial pedestrian activity, can make the National Highways safer.



A clearly marked edge of the road and a proper shoulder makes walking along the NHs safer.

Most SHs are barely wide enough to safely accommodate two wide vehicles at normal speeds. Some NHs also still have just 1+1 lanes, without a divider. To add to it, even large vehicles routinely stop by roadside even when there is not enough shoulder.



A bus stopped on a 1+1 lane undivided National Highway without much shoulder, creating safety hazards.

This poses safety hazards while overtaking, negotiating sharp turns, even simply when oncoming vehicles cross near a pothole. At the same time, it must be noted that wider and smoother roads will very likely increase the number of accidents and proportion of serious injuries and fatalities.

Intersections

Places where two large roads intersect in the countryside, typically SHs and NHs, are very obviously places of importance. Various kinds of facilities are needed at such intersections, frequently called a "फाटा" or a "नाका". People need to change buses or

rickshaws, buy fuel, food and other necessities. Needless to say, these intersections are very busy places.

Yet, it is frequently seen that no planned space is provided for any kind of road user, whether para transit, passing vehicles, or pedestrians. The accompanying photographs taken at the Ale Phata on Pune-Nashik highway (NH-50) are representative of such intersections.



Para-transit vehicles standing haphazardly near the entrance of the MSRTC bus stand.



Ale Phata, completely devoid of any road markings.



No road markings also means no designated safe place for pedestrians to cross.

As said above, these photographs are representative of such intersections, and exhibit a complete lack of planning of any kind, haphazard development and a disregard to safety of human lives, let alone vehicles.

Road signs

Most road signs even along NHs and SHs are alongside the road and not overhead. It is difficult to see such signs if the traffic is heavy. They are also more susceptible to being hit by vehicles and even theft. Many of these signs do not conform to IRC standards of size and colour schemes.



A speed breaker sign on a National Highway, with a non-conforming green background.

Lately more and more overhead signs are seen along the NHs, which is a welcome improvement.

These signs can be broadly grouped in two kinds: Warning signs, e.g., for sharp turns and informational signs, e.g., showing distances or directions to towns.

A good number of these signs need improvement considering that the speed and vehicular density has increased significantly, especially on NHs and SHs. Many of these signs are small, thus can be hidden easily behind another vehicle or branches of trees. They are also positioned just before the intersection etc., thus they do not provide early intimation to the drivers. The drivers frequently have to slow down simply to read a sign.

Road markings

Road markings on countryside roads are mostly limited to

- Lane markings, including turn markings near intersections
- Occasional zebra stripes at intersections
- Markings on speed breakers to improve their visibility

Road markings are subject to intense wear and tear, and thus discouraged except when they cannot be avoided as in examples above. These markings on countryside roads in Maharashtra are found to be erratic in accuracy - sometimes they are done properly and sometimes not. Their maintenance is also erratic. Significant improvement is needed in meticulousness of the painting as well as maintenance work.

The road markings do not only have maintenance issues, but also are not done scientifically. One example is that of divider markings on undivided highways. These divider markings should tell the driver whether it is unsafe to overtake because the oncoming traffic may not be visible because of a hump or a left bend. Such meticulously done road markings virtually do not exist.



The dividing line allows overtaking, though the oncoming traffic cannot be seen easily because of the hump.

Construction signs

Construction signs are used to indicate presence of road work and construction workers ahead. These signs are a combination of plastic construction cones and signs in words

and symbols. The objective of these signs is obvious: to provide sufficient warning to the drivers so that accidents can be avoided.

The signs are generally found to be

- Too close to the construction site. The drivers have to take a hurried, last minute decision to adjust their lane, speed etc. after seeing the sign.
- Too few in numbers. If a driver misses a sign, s/he knows about the construction area when s/he actually approaches the area itself.
- Poor in visibility. Since they are generally temporary in nature, they are painted on poor quality material, on small sheets. They are also frequently displayed rather low on the road surface with a temporary, weak support. They may use reflective material but they seldom emit light. Therefore they are poorly visible during night.

Bus stops

Bus stops for MSRTC buses and also pick up and drop off points of private operators are such that buses frequently have to stop right in the middle of the road. Since traffic on internal roads is generally low, this may not pose any serious problems in remote areas. However, when this happens on NHs and SHs, significant carriageway is taken up by the bus. This slows down other traffic and also leads to hazardous situations when vehicles overtake the stopped bus and passengers hurriedly cross the highway to catch the bus. Hardly any bus stops have bus bays which would keep the highway flowing, provide a safe place for passengers to wait for the bus and also to cross the highway.

Shelters at the stops are also generally in bad shape regarding their cleanliness and overall condition. Their alignment with the road is frequently such that passengers have to come out on the road to see whether a bus is coming. That renders the shelters useless.

Facilities

Countryside traffic generally consists of long distance travelers, some covering several hundred km. These travelers need the following facilities:

1. Drinking water, food
2. Fuel
3. Public telephone booths
4. Overnight accommodation
5. Clean restrooms
6. First aid facilities
7. Emergency services: both for people as well as vehicles
8. Information about the area: regarding all of the above, directions, distances etc.

The state of the first 4 services is generally found a bit below satisfactory but workable. Of course, these facilities, including bottled drinking water, are provided by private providers. Especially for water: Safely potable drinking water (not bottled water, as it is not affordable to the common man) is a problem across the state, not only along highways.

First aid facilities and emergency services can potentially save a lot of lives. Considering their importance, they are discussed in a separate subsection.

Clean restrooms

Clean restrooms are noticeable throughout India by their absence than presence! The reasons for their absence are manifold. Prominent among them are lack of water to keep them clean as well as lack of mindset that restrooms ought to be clean.

Fortunately, Maharashtra receives a decent amount of rainfall to experiment with harvesting the rainwater, which can be used for keeping public restrooms clean.

Most developed countries consider cleanliness as a matter of national pride. Ferociously driven campaigns to ignite the same feeling in Maharashtra could generate a “demand” for cleanliness.

Emergency services

Emergency services consist of first aid facilities, emergency services for people as well as for vehicles. This topic is a part of overall traffic safety, and is therefore treated in detail in the chapter on Traffic Safety.

Information about the area

Finally, simply putting all these facilities in place is not enough. Commuters need to know where these facilities are. Going a step further, there are signs in developed countries that tell the commuters the distance to the next facility, should they miss this one. For example, “Fuelling station: 5 miles. Next fuelling station: 68 miles.” Such extensive and up to date information also helps the region’s tourism.

Clear information easily usable by tourists is grossly missing across the state, barring a handful exceptions.

Countryside traffic infrastructure is relatively simpler than that in cities. However, since the vehicles that use this infrastructure frequently travel at high speeds, it imposes more stringent requirements on meticulous planning and quality.

Countryside traffic infrastructure in Maharashtra is barely workable in some aspects and not even up to that level in some others. Though a lot of new roads are wide and smooth, these looks are deceptive and

even these roads lack the “finesse” that is required to make their use stress free and safe.

Infrastructure issues common to all locales

Some infrastructure issues are common to urban, rural as well as countryside traffic, therefore a separate note is needed to discuss those.

Certain means of transportation may have specific demands from the infrastructure. For example, trailer trucks have a very large turning radius. Places which expect high volumes of such vehicles will need to design intersections such that these vehicles can turn properly and safely. Places of pilgrimage, hill stations are other examples where a high proportion of specific kinds of vehicles is found. Roads, parking lots and any such facilities at these places should be designed with such vehicles in mind.

All traffic infrastructure should be built not only vehicles but also people in mind. Just like different vehicles have different demands, different people also have different demands. It should be our objective to make all traffic infrastructure friendly to physically handicapped. Facilities like bus stops, parking, rest rooms will need to have special provisions for physically handicapped people.

Persons With Disabilities Act stipulates that physically challenged people should be able to use traffic infrastructure¹⁰.

Most of the traffic infrastructure is not usable by persons with disabilities. Systematic efforts with prioritized tasks are needed to enable such citizens move around easily.

¹⁰ Persons with Disabilities Act, 1995, Chapter VIII. Office of The Chief Commissioner of Persons with Disabilities, Ministry of Social Justice and Empowerment (<http://ccdiseabilities.nic.in/chapter8.htm>)

Education

An important part of a successful traffic system is education about the whole system. The people who come in contact with the traffic system can be categorized in the following groups:

1. Traffic planners
2. Implementers of traffic system
3. Users of traffic system

Specific education must be provided to all of the above categories for the whole system to run smoothly.

Transportation planners

Transportation planning in modern era has become a complex problem. There are exhaustive courses that teach transportation planning as a specialized subject. Apart from such courses, degree courses in architecture also cover traffic planning to some extent.

One of the premier courses in transportation planning in India is the M. Tech. course in Master of Planning, with specialization in transportation planning¹¹. This course is conducted by the School of Planning and Architecture (SPA) in Delhi.

CEPT University (Centre for Environmental Planning and Technology) in Ahmedabad also offers post graduate courses in Urban Transport Planning and Management, Infrastructure Planning etc.

There could be more such universities and courses too.

As is true with any profession, the whole subject keeps on changing every day. New developments take place in the world, new problems arise and new solutions are also found and tried. Transportation planners in modern times will have to keep their knowledge up to date about such developments.

Although large cities in Maharashtra have some structure in their administration (either a department or a separate organization itself) that looks after town and transportation planning, such structure is grossly missing in smaller towns. As a result, most of transportation planning happens by trial and error.

Even in cities which have a semblance of transportation planning, the planners seem to be totally out of touch with latest trends in the world. While the world is placing very high importance on mobility and facilities for pedestrians, cyclists and public transport, India is busy spending profusely on flyovers, road widening, parking structures and other

¹¹ Master of Planning (Transport Planning) from SPA University (www.spa.ac.in/transport_planning.aspx)

measures that generate latent demand for vehicles, while facilities for pedestrians and cyclists get a step-motherly treatment.

It may also be possible that today's transportation planners are forced to take certain steps under political influence.

This discussion highlights a need for the following:

All towns larger than a certain size should have formally trained transportation planners,

A process to ensure that their knowledge is up to date, and

Keeping transportation planning free from political influence.

|| The note above mentions the problem we need to fix.

Implementers of traffic system

Creators of infrastructure

This group typically consists of contractors and actual workers. Even though the plan might be perfect, its success depends on how it is implemented. If the implementers are ignorant about traffic engineering, it can lead to serious usability issues.

It is common to see bus stops occupying entire footpaths, parking being provided on very narrow roads, incorrect or inferior road markings etc. There may be norms regarding most of such infrastructure, but the implementation goes wrong because of lack of training for the implementers.

Formal training on matter like IRC norms will need to be provided to the implementers and whether such training is provided or not will need to be tracked as a part of process for awarding contracts.

Enforcers of traffic rules

Traffic police fall in this category. Traffic police are a part of the larger umbrella of Maharashtra Police. Senior officials of traffic police end up with that assignment as a result of their posting in Maharashtra Police, and are transferable to and from other police departments like crime.

When a police officer joins the traffic branch, s/he has to learn various things about traffic, including traffic rules, transportation management etc. Although a training program does exist for such officers, the officers are fully aware that they would not be doing their career in traffic and would be transferred in a few years to other department.

As a result, most of them lack the motivation to master nuances about traffic. Further, by the time various nuances of traffic start getting into their blood by experience, it is time for them to be transferred!

The state today lacks a rigorous training program for traffic police officers. Even though it may be necessary for various other reasons to transfer police personnel to and from traffic branch, they should be given a longer tenure so that the traffic experience they gain can be put to use for a few years before their transfer.

Users of traffic system

There are various kinds of users of the traffic system, including pedestrians, cyclists, drivers of motorized vehicles like cars, drivers of non-motorized vehicles like bicycles and bullock carts, passengers of all kinds of vehicles.

All of them need training in some form or the other. Some of it needs to be formally certified, some might need to be verified if provided or not and some simply provided.

Training for drivers of motorized vehicles

The need for formal training for drivers of motorized vehicles is well understood. There are training facilities for drivers. They need to pass a driving test, obtain a license and only then they are allowed to drive vehicles on roads.

Although this system does exist, the quality of the entire process as well as the seriousness with which the process is looked at needs a major overhaul.

Types of licenses

The following types of driving licenses exist in India (zzz: **back of license**), for driving:

zzz: **check with RTO**

1. Road roller,
2. Heavy passenger motor vehicle,
3. Heavy goods vehicle,
4. Medium passenger motor vehicle,
5. Medium goods vehicle,
6. Light motor vehicle,
7. Invalid carriage,
8. Motor cycle with gear,
9. Motor cycle without gear.

Let us compare this with the types of licenses in Ontario, a province in Canada, as an example.

The following types of driving licenses exist in Ontario, Canada¹², for driving:

1. A: A very large truck,
2. A with condition: A medium truck,
3. B: A large school bus,
4. C: A large regular bus,
5. E: A small school bus,
6. F: A regular bus and ambulance,
7. G: A car or small truck,
8. G1: A car, but only when accompanied by holder of a “G” or higher license,
9. G2: A car, under certain conditions,
10. M: Motorcycles,
11. M1, M2: Motor cycles, under certain conditions.

A few other types also exist. Although the lists look very similar at the first glance, it is easy to notice that the Canadian province places high importance on safety of school children, understands that driving emergency response vehicles needs special skills and the process of learning to drive even a light motor vehicle takes time.

Passing rates of driving tests

In addition, an RTI application in Pune revealed that the Pune RTO did not reject even a single driving license application in 3 years¹³. On the other hand, passing rates of driving tests in countries like UK¹⁴, Singapore¹⁵ are around 40%.

Who can teach driving

Rule no. 24 of Central Motor Vehicles Rules, 1989, stipulates rules to be followed by a driving school. The requirements to be satisfied by an applicant for setting up a driving school are, among others:

- Std X pass
- An approved certificate course as motor mechanic or automobile engineer
- Five years of driving experience
- Knowledge of traffic rules and signs

It is to be noted that these requirements need to be satisfied only by the **applicant who sets up** a driving school. The driving instructor

¹² Ontario Ministry of Transportation website
(<http://www.mto.gov.on.ca/english/dandv/driver/classes.shtml>)

¹³ Times of India, Pune, 30-March-2010

¹⁴ Website of Driving Standards Agency, UK (www.dsa.gov.uk)

¹⁵ Website of Singapore Police Force (learn-to-drive.spf.gov.sg/services/Learn_To_Drive/passingrates)

himself/ herself just needs to possess a driving license in order to teach driving!

It is evident that a lot of work is needed in the area of driving education and licensing.

Training for drivers of non-motorized vehicles

Although drivers of non-motorized vehicles do not need a license in India, they have to share the road space with motorized vehicles. Lack of knowledge of safe traffic practices as well as traffic rules (whether applicable to them or not) can land such drivers as well as others in accidents, leading to serious injuries or even death. Knowledge of traffic system as a whole has become a life saving skill in today's world. It is imperative that this knowledge needs to be imparted to all citizens. The best way to do it is in schools. Although some schools do provide traffic related knowledge to students, it is done voluntarily by the schools and is very superficial. Its seriousness needs to be improved drastically.

Training for pedestrians

Since pedestrians are also a part of traffic, they also need to be trained to use the traffic system in a safe manner. India does not have any traffic rules for pedestrians, and thus there is no provision for fines for pedestrians walking along or on the roads in an unsafe way. India's hitherto low literacy rate also comes in the way of stipulating such rules and imposing fines.

While the question whether there should be rules and fines for pedestrians and cyclists is a debatable one, some level of traffic education for pedestrians is a must. Pedestrians are understood to constitute about a third of all fatal road accidents in cities. Although lack of adequate facilities for pedestrians is one of the main causes for these fatalities, pedestrians crossing roads in an unsafe way are too common a sight.

Traffic training in rural areas

As there are hardly any driving schools in rural areas, most people learn driving from their parents or friends. Although the teaching standard of most driving schools (including those in urban areas) itself leaves a lot to be desired, such informal driving education does not cover even what is covered by these schools. Practically non-existent traffic police coupled with very bad driving education leads to gross ignorance of traffic rules and safe driving practices.

Systematic traffic related training or education is required for all of the following groups:

Traffic planners, Implementers of traffic system (creators of infrastructure, enforcers of traffic rules), Users of traffic system (drivers of motorized and non-motorized vehicles, pedestrians).

Traffic education for rural areas poses further challenges.

|| The note above mentions the problem areas we need to fix.

Discipline

It is very well known that traffic discipline in India ranks amongst the lowest in the world. Traffic discipline, as well as discipline and civic sense in general, is found to improve as a country's per capita income improves, often sparking a debate whether better discipline and civic sense makes a country richer or whether it is the other way around.

As far as traffic discipline is concerned, any society in the world can be categorized in the following three groups of people:

1. Those who always follow rules
2. Those who conditionally follow rules
3. Those who seldom follow rules

The second category is the largest. Whether these people follow traffic rules (and also safe traffic habits) depends on several factors like what most other people are doing, what are the chances of being caught and what the penalty would be. If a vast majority of these can be made to follow traffic rules, the overall traffic could be much more disciplined than it is today. It follows that if these people thought that they can be caught breaking traffic rules and it would cost them significantly, either monetarily or in terms of time they have to spend on formalities, most of them would start following traffic rules, thus allowing traffic police to focus on the third category.

The role of traffic police

Traffic police are a part of the larger police force. However, it is only in larger towns and cities that one sees a separate, dedicated traffic police establishment, generally called the "Traffic Control Branch". A traffic control branch comes into existence when the police department of the city thinks that a separate, dedicated branch is needed for the city. The city police head then sends a proposal to the state government for approval. The existence of the Traffic Control Branch as well as the rank of its head depends on approvals from the state government.

The Traffic Control Branch is responsible for the following:

- Controlling traffic to avoid or reduce congestion
- Penalizing violators of traffic rules

On the other hand, traffic police in developed countries are seldom seen controlling traffic except when the flow of traffic is not normal, e.g., when schools begin or end, or where there is a large gathering of people on a given day. Regular, day-to-day traffic control is left to traffic signals, allowing police to focus on catching violators who do not obey the signals or other traffic rules.

Controlling traffic to avoid or reduce congestion

The most severe day-to-day problem faced by traffic flow in virtually all cities is the same: congestion, especially during morning and evening rush hours. The problem gets aggravated at intersections, especially when the timings of the signal phases are not tuned according to the traffic flow. Tuning the timing is a complex process, and could be effective only when the timings can be programmed for different times of the day or even for different days of the week.

Instead of going through this process, traffic police are generally seen to prefer switching off the signal and controlling the traffic flow manually.

Automatic signals provide a phase for pedestrians to cross the roads. When the police control signals manually, they do not provide such a phase. Since the focus is on clearing the vehicular traffic, some or the other flow of vehicles is granted a right of way at all times. This is another example of pro vehicle policies and practices. However, to their credit, the traffic police are also seen helping needy pedestrians cross the streets.

This kind of manual control of traffic is also seen at smaller intersections without signals when the traffic there becomes excessively jammed.

Traffic police also control and divert traffic during VIP visits to their city.

Penalizing violators of traffic rules

The other important task done by traffic police is spotting and catching violators of traffic rules and taking necessary action. This action is in the form of fines, though occasionally the traffic police impose “out of the book” penalties like asking violators to control traffic for a few minutes.

Additional tasks for traffic police

In India, traffic police are seldom seen taking actions that could prevent, or at least discourage, people from breaking traffic rules, let alone encouraging people who follow rules diligently (as a part of some official program).

In USA, it is common to see traffic police erect a large display by roadside that shows the speed of an approaching vehicle. In such programs the police may not fine a speeding vehicle, or may not even stop it just to issue a warning. However, it makes people aware that they might be speeding and police know it. Speeding drivers who see their vehicles’ speed displayed right in front of them are seen reducing their speed without any warning or fine being imposed.

Traffic police in India are seldom seen undertaking any such activities as a part of their regular work, though occasionally reports of them offering rose flowers to citizens following traffic rules can be found in newspapers.

Since the traffic police are responsible for managing congestion on roads and ensuring free flow of traffic, and since they face the brunt of the congestion, noise and air pollution every day, they are frequently seen taking proactive steps in transportation management. Unfortunately, they are not formally trained in disciplines like civil engineering, urban planning and transportation management. As a result, their recommendations are often based on gut feeling than scientific study, and are aimed at solving the current problem than any long term benefit.

Police patrol

Mobile police patrol equipped with speed guns are a regularly seen on highways as well as inner roads in developed countries, and these measures are known to be successful in keeping speeds in check. Police following a vehicle that has violated some traffic rule, stopping it and taking appropriate punitive action is a virtually non-existent sight in India. Recently in some cities, however, traffic police on motorcycles are sometimes seen leaving their position in an intersection to follow a traffic violator to stop him/ her. Yet, it may be noted that even such traffic police are “posted” at an intersection and they are not inherently mobile.

All in all, the role of traffic police is not as well defined as it should be, or at least not well understood by all concerned. Especially in urban areas, their energy is spent on tasks that can be done using other means. The way they work has hardly changed ever as there is no significant experimentation.

The role of traffic police should be well defined and understood by police and civil officials as well as citizens. Their modus operandi should be revamped to align with this role and to make the most efficient use of this force. If a different way of working leads to better discipline, it should be experimented with and accepted as regular practice.

Penalties for violating traffic rules

The prevalent penalties for most frequently violated traffic rules range from Rs.100/- to Rs.500/-. Although there is a provision in MVA 1988 for terminating a driver’s license for multiple offences, there is virtually no system to track whether a driver has a prior record of traffic violations. In effect, there are no penalties apart from monetary fines, for example, penalties like attending classes to learn traffic rules and/or safe driving practices do not exist. The penalties do not depend on whether the violation was done by a 2-wheeler or a large truck or an expensive car. They do not depend on whether it is a repeat violation of the same or similar rules by the same driver. The case is generally

settled when the driver pays the penalty and does not have any effect when renewing the vehicle's insurance, unless when it involves an accident that leads to a claim from the insurance company.

The amount one has to pay as fine has not been revised since about 1988-89, when the prevailing MVA and the rules formulated under it came in force. Inflation as well as increased per capita income has rendered these amounts rather trivial today. It is only in August 2010 that the Government of Maharashtra has sent a proposal to Government of India for an approximately 3-fold increase in the penalties. Even after this increase, the penalties will still be trivial as compared to those in developed countries.

Yet, it is noticed that even these amounts mean stiff penalties for some people, whereas for the richer class, the time spent on settling the fine is a sufficient deterrent for violating traffic rules. However, the probability that an individual could get caught by a traffic police is so low that people do not pay much attention to following traffic rules.

Penalties for violating traffic rules need to be rationalized and updated periodically. They should also be tied with the vehicle insurance premium. Although the rise in penalties themselves need not be too stiff, their enforcement should be more widespread.

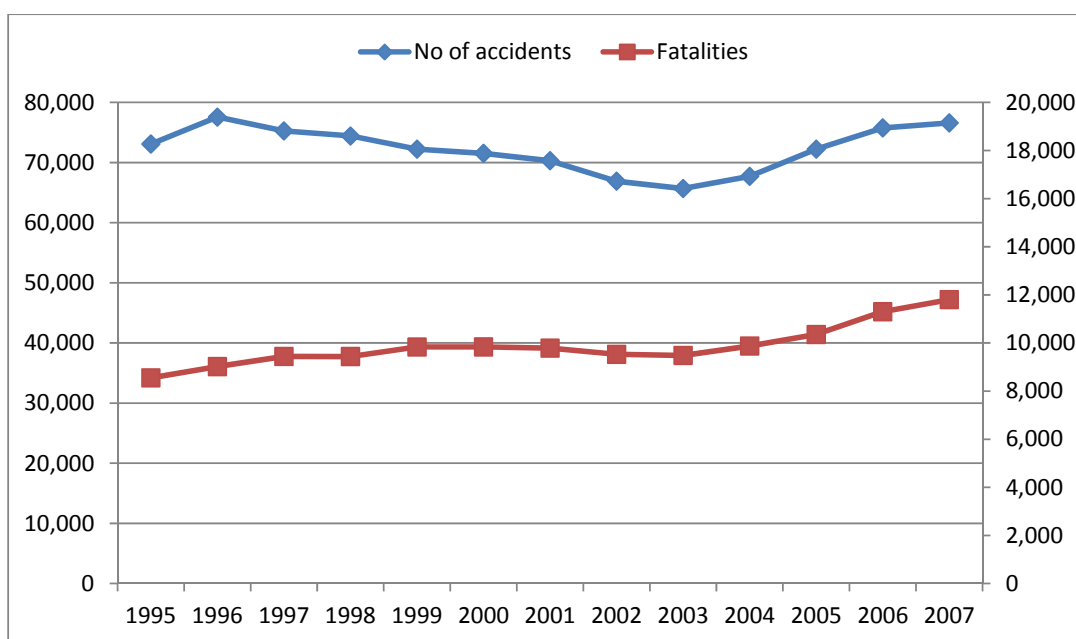
Safety

As they say, safety is a mindset. A safe environment has to be planned as “safety is not by accident”. This chapter studies how safe traffic in Maharashtra is.

It can be generally said that traffic in Maharashtra is not much different from India. There may be some differences but they are not magnitudes apart. The Global Status Report on Road Safety, 2009, published by WHO throws light on state of road safety worldwide.

As per the report¹⁶, road traffic injuries was the 9th leading cause of death in the world in 2004 with 2.2% of all deaths, but is expected to become the 5th leading cause by 2030 with 3.6% of all deaths, overtaking AIDS, lung cancer and tuberculosis. While the number of deaths due to road accidents is continuously declining in the developed countries, on the contrary, it is still increasing in India, and Maharashtra is no exception.

The graph below shows the number of registered accidents and number of persons killed in them in Maharashtra from 1995 to 2007¹⁷. It can be seen that though the number of accidents has virtually remained steady between 60,000 to 80,000 a year, the number of persons killed in them has increased gradually.

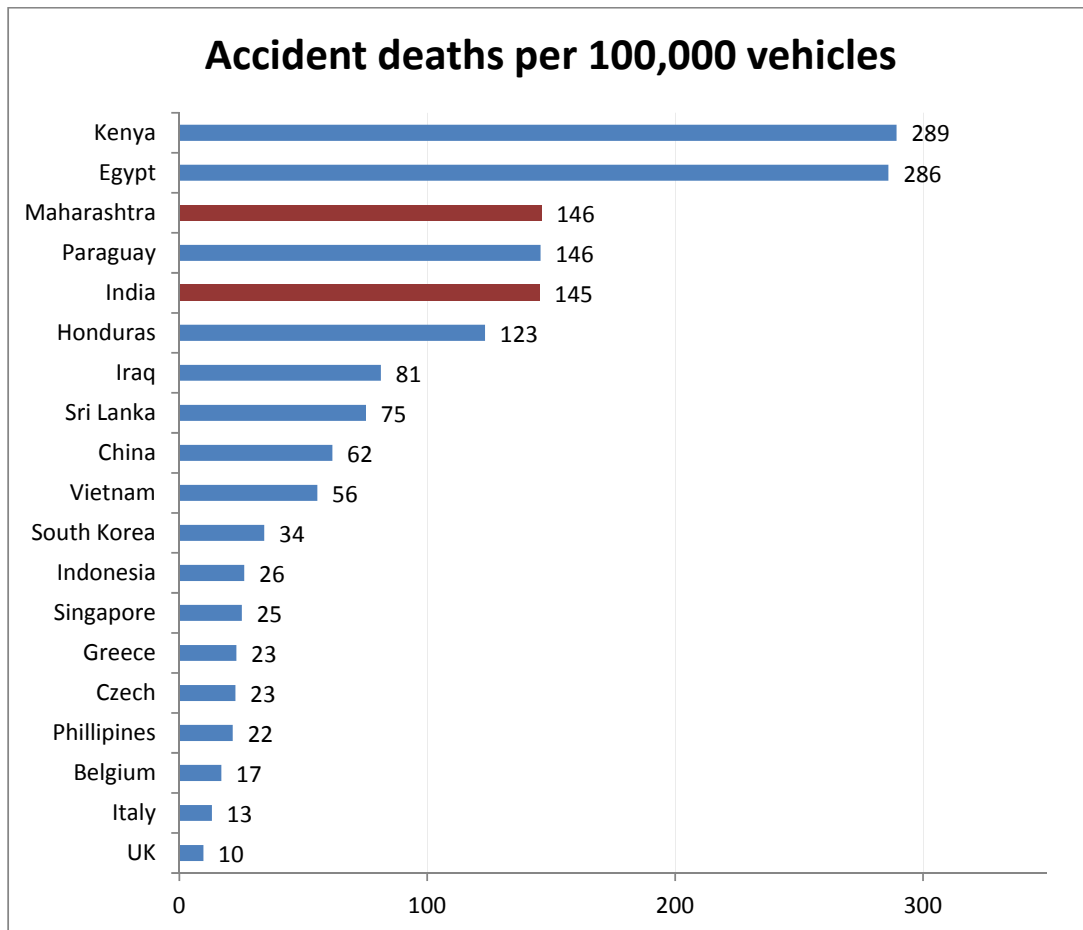


While on this topic, let us have a look at where Maharashtra stands when compared to the world. The comparison is not straightforward because various factors come into play. For example, population density, geographical and climatic conditions, education levels, income level of the country etc. Yet, considering all these factors, it would be fair to

¹⁶ World Health Organization: Global Status Report on Road Safety, Executive Summary, page ix.

¹⁷ Motor Transport Statistics of Maharashtra 2007-08, Part 3, Website of Motor Vehicles Department, Government of Maharashtra (www.mahatranscom.in/index.aspx)

compare the number of deaths per 100,000 vehicles in countries with similar habitation densities as Maharashtra, albeit at various levels of overall development.



Even if one does not consider matching the safety standards set by developed countries at this stage, there is no reason why Maharashtra should not aim at lowering the number of deaths in road accidents to 50 or less per 100,000 vehicles very quickly and to 30 or less in 20 years.

There are various factors that contribute to safety. They are:

1. Awareness about safe practices
2. Awareness about the cost to be paid in case of accidents
3. Increasing this cost deliberately
4. Environment and infrastructure conducive to safe practices
5. Rules and practices to improve safety
6. Emergency help in case of accidents

Let us examine where Maharashtra stands with respect to these factors.

Awareness about safe practices

For most people, traffic safety is same as following traffic rules. While following traffic rules can be looked at as an essential first step of traffic safety, there is gross ignorance and a callous attitude in the general public about basic safety practices.

It is true that some of it can be attributed to lack of money to fix a broken part of a vehicle. However, that in turn can be attributed to not prioritizing vehicles' repairs and a general assumption that driving is a right. Making people aware of the fact that driving is a privilege and supporting it by various actions will perhaps imbibe the seriousness of maintaining one's vehicles in people's minds.

The same ignorance and callousness can be seen in pedestrians, bus passengers etc as well, indicating that lack of money is not the main factor that forces people to choose unsafe practices. Pedestrians can be seen jumping over road dividers barely 10 m from a signaled zebra crossing, bus riders can be seen jumping off the buses when they feel like.

On the other hand, awareness about safety in general (not only traffic safety) comes "in your face" in developed countries. In most cases, it is also because certain people are held accountable for any unsafe situations. They could, and do, face legal action as well as have to pay heavy damages in case of any accidents. These people, therefore, take utmost precautions to either eliminate these unsafe situations or to provide ample warning to people in the vicinity. For example, a municipal officer could be held accountable for not placing signs as prescribed to warn people of any road work ahead.

In such countries, knowledge of the fact that you can be sued as an officer as well as you can sue an officer as an affected citizen seems to have increased the general awareness about safety - not only in officers but also in public.

Awareness about the cost to be paid in case of accidents

People affected by accidents pay a significant cost in terms of damage to their vehicles, medical expenses in case of injuries or deaths, loss of earning potential of an individual or family, and even hardships and trauma faced during the time the vehicle and the accident victim is not in working condition.

In most cases people are either not aware of the entire cost they will have to bear in case of accidents or tend to assume that accidents, being random in nature, will not happen with them. A good number of people, especially in the lower economic strata do not have sufficient insurance cover, when in reality they are the people who would be affected the most in case of accidents.

Increasing this cost deliberately

It is generally the victims and their insurers who end up spending these costs. Persons who are responsible for a given accident at the most has to pay some compensation to the victim, but that ends the matter. S/he does not have to pay any recurring cost simply because s/he was an unsafe user of the traffic system.

In developed countries, on the other hand, there exists an elaborate system of accrual of penalty points on your driving license, apart from any fines one has to pay for the actual violation. These points fade away in 3 to 5 years. One has to pay significantly heavy insurance premiums if one has a few penalty points. There is also a danger of temporarily or permanently losing one's driving privilege if one attracts more than a certain number of points. These measures significantly increase the cost of creating unsafe situations on the road, irrespective of whether an accident actually takes place. These costs have proven to be a compelling reason for people to pay extra attention to safety while using the traffic system.

No such system exists in India as of now. Rule no. 21 of Central Motor Vehicles Rules lists drivers' actions which can lead to cancellation of the driving license. However, most of them are very subjective and hardly ever followed.

Environment and infrastructure conducive to safe practices

Unsafe situations can often lead to accidents. Two prime reasons for such situations are abnormal environment and faulty infrastructure.

Abnormal environment

Traffic environment could consist of prevailing weather conditions as well as manmade conditions like smoke, dust, noise, traffic congestion etc. Most of the times such conditions exist for a short period of a few minutes or an hour or two at the most.

The traffic system should have provisions for warning its users of such conditions so that they can take appropriate decisions. For example, hilly regions frequently encounter excessive fog, which reduces visibility. Such regions should have some system of warning people not only before they enter patches of fog but much earlier so that they can choose an alternate route.

Such systems are found very rarely if at all, and are very skeletal. For example, the Mumbai-Pune expressway has signs that tell drivers that the road surface may be slippery during monsoon. However, such signs are permanently posted and are not dynamic in nature. There is no system that warns drivers that they may expect slippery road conditions **today**, say, 20 or 50 km later. Such warning system can be useful even in case of road getting blocked in case of an accident. This is especially necessary on roads like expressways, where detours are difficult or impossible.

Faulty infrastructure

Faulty or inferior quality infrastructure has often been a cause for accidents. Infrastructure that has developed a temporary problem can be identified and repaired relatively easily, e.g., a malfunctioning signal. However, infrastructure that has some inherent design problem may be difficult to identify as a potential cause of accidents. Examples include bus stops where a bus may obstruct the view of an intersection.

In most such cases, the infrastructure might be according to prevalent norms too, but the norms themselves might not take some cases into consideration. It may be possible that norms regarding the same piece of infrastructure in other countries may have clear mention of some precautions to be taken, which are missing from corresponding norms in India. Ideally there should be an identified process of quickly improving the norms, either when an accident happens and the root cause is traced to a gap in the norms, or even when a citizen notices such a gap that could lead to an accident.

Improved infrastructure but declining safety

A common characteristic of the changing traffic scenario in urban, rural as well as countryside traffic in Maharashtra is increasing number of personal vehicles. Another common fact is that although the total number of road accidents in Maharashtra from 1995 to 2007 has fluctuated between 90% and 110% of the numbers in 1995, the number of fatal accidents has steadily increased by around 40%, both in urban as well as non-urban Maharashtra¹⁸. This can be seen from a graph at the beginning of this chapter.

Overall quality of all roads has improved noticeably over the last couple of decades or so. Roads have become wider and smoother, even divided in some cases. This and availability of modern and more powerful vehicles has led to substantial increase in driving speeds.

It is evident from this example that unless special attention is paid towards improving safety, seemingly better infrastructure could also lead to unsafe conditions.

Rules and practices to improve safety

A similar situation exists with traffic rules. Although following traffic rules greatly improves safety, it is inherently limited by the quality of the rules themselves. Here too, there are examples of rules that exist in other countries but not in India. For example, in USA, one has to turn on the headlights of his vehicle when wipers are on. That is because wipers are used when it is raining and hence visibility is low, and headlights of a vehicle make it easier for others to see the vehicle. This rule does not exist in India. Although some citizens can be seen turning the headlights of their vehicles on when it is raining, it is a mere “good driving practice” in India. If it is converted to a rule, many more citizens would observe it and it could avoid a few accidents.

Police patrol

As mentioned earlier, fatalities in traffic accidents are increasing at an alarming rate. Rash driving, over speeding coupled with powerful vehicles are the main reasons behind this rise.

¹⁸ Motor Transport Statistics of Maharashtra 2007-08, Part 3, Website of Motor Vehicles Department, Government of Maharashtra (www.mahatranscom.in/index.aspx)

Clearly posted speed limits and mobile police patrol equipped with speed guns are a regular site on highways in developed countries, and these measures are known to be successful in keeping speeds in check. WHO acknowledges research that says that a 5% increase in average speed leads to an approximately 20% increase in accidents that cause injuries and a 20% increase in fatal crashes¹⁹. This highlights the need of enforcing speed limits, and mobile police patrol is the only way of enforcing it effectively.

Emergency help in case of accidents

First aid facilities

In case of accidents, first aid facilities are generally provided by nearby residents or people from passing vehicles. It is said that in India there is a large deficit of citizens trained in first aid. That results in below par first aid being available to accident victims on our roads too. In other words, the root cause of this problem lies outside the domain of purely traffic and transportation.

Emergency services for people

A large number of fatalities occur because trained medical help does not reach the victims in the first hour after the accident, often called the “Golden hour”. Information about telephone numbers to be called in case of accidents is not readily available in most cases, barring the Mumbai-Pune expressway and some of the toll highways.

A widely publicized system of trauma centers designed to reach trained medical help to victims in one hour or less will save a lot of lives.

Emergency services for vehicles

Although there may not be any lives at stake when a vehicle breaks down, not getting timely help for their broken down vehicles could lead to safety hazards for people, especially during night. A system needs to be created for reaching help to people in such cases.

Traffic in India is infamous as unsafe. Substantial work needs to be done to make traffic in Maharashtra safer. The work areas can be categorized as under:

1. Awareness about safe practices
2. Awareness about the cost to be paid in case of accidents
3. Increasing this cost deliberately
4. Environment and infrastructure conducive to safe practices
5. Rules and practices to improve safety

¹⁹ World Health Organization: Global Status Report on Road Safety, page 18.

6. Emergency help in case of accidents

Actions need to be taken on all of the above and at a very high priority.

Resources

Traffic consumes resources from people as well as government. If these resources can be saved without compromising on the quality of the traffic and transportation, they can be used for other purposes.

Resources required for traffic mainly include:

1. Financial resources for building and maintaining all infrastructure, buying buses etc
2. Space for building roads, bus depots
3. Time, mostly in terms of time spent on travel by commuters
4. Fuel consumed by vehicles
5. Commodities required for manufacturing vehicles, bridges ... everything
6. Intellectual resources

Financial resources

A significant amount of capital is needed for traffic. Funds are needed for building and maintaining infrastructure like roads and bridges, for buying buses, training officials in various capacities, providing equipment to them, and of course, for salaries and administration. It follows that merely drafting effective policies and plans is not sufficient for good transportation management, since these policies and plans have to be backed by appropriate allocation of funds.

Thoughtful allocation of funds is an effective means for not only better traffic flow management, but also traffic demand management. As discussed earlier, if the demand for traffic is managed properly, managing the traffic itself becomes much simpler. Allocation of funds for traffic and transformation, therefore, has to be in line with TDM principles guided by any applicable national transportation policies.

While there exists a National Urban Transport Policy (NUTP)²⁰, there is no such explicit policy for rural and countryside traffic. Yet, the overarching principles used in NUTP could not be too different from such a policy, if it were to come in existence.

The Central Government has launched the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) in 2005-06²¹, releasing substantial funds under the mission. As far as transportation is concerned, funds could be available subject to certain clauses. These clauses are described in NUTP at various places, and examples are:

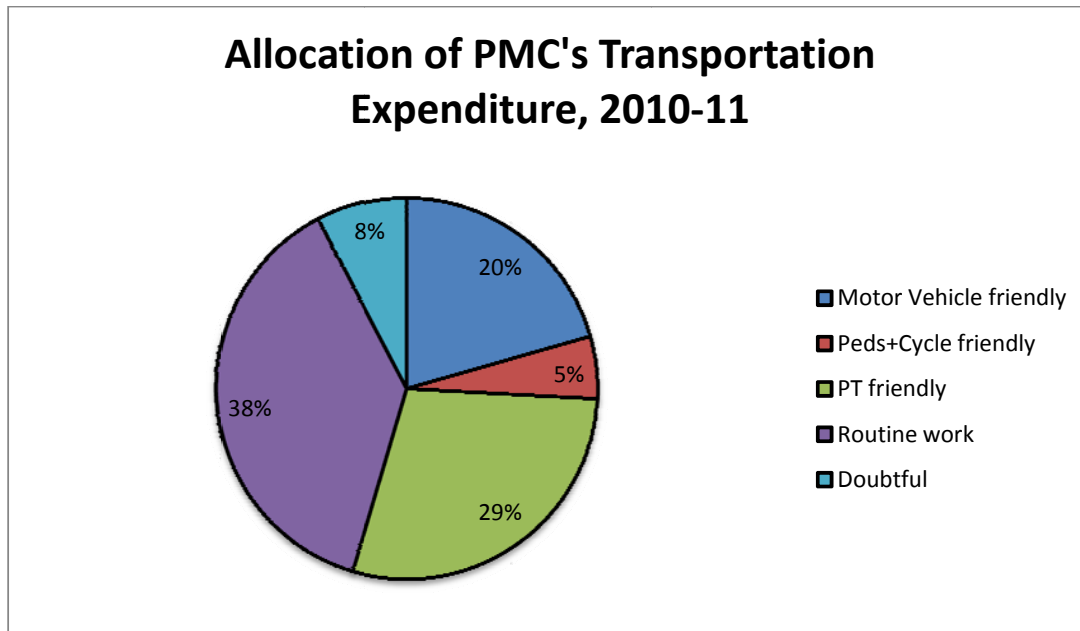
²⁰ National Urban Transport Policy, Ministry of Urban Development, Government of India (www.urbanindia.nic.in/policies/TransportPolicy.pdf)

²¹ JNNURM Overview, Ministry of Urban Development, Government of India (jnnurm.nic.in/nurmudweb/toolkit/Overview.pdf)

- Institutional mechanisms set up by the State government to ensure a well coordinated public transport system
- Willingness to divert funds from projects that add to road capacity towards public transit systems
- Initiatives taken to promote non-motorized transport and improve safe access to public transport

It is heartening to see that the top brass of the country is giving top priority to walking, cycling and public transport as means of transportation. However, it would be interesting to look at a study of the Pune Municipal Corporation's 2010-11 budget in this light. According to this study by Parisar²², PMC plans to allocate the transportation funds for 2010-11 in the following manner:

zzz: [get hold of a fresher version when available](#)



Although the allocation for public transportation (29%) appears to be satisfactory, it is to be noted that bulk of it comes from JNNURM funds. It follows that PMC plans to spend most of its funds for the benefit of motorized personal vehicles.

Unfortunately, PMC's fund allocation happens to be a norm rather than exception and the situation across other municipal bodies in Maharashtra is not likely to be much different. Landmark projects that intend to revamp public transportation, encourage walking and cycling as modes of commuting are conspicuous by their absence.

²² Critical analysis of Pune's transport budget for 2010-11, by Parisar (www.parisar.org)

While on this topic, let us take a look at the costs involved for various infrastructure items. Although the decision to build infrastructure is certainly not to be taken on the basis of cost alone, the following indicative table helps to put things in some perspective.

Item	Rate	Total, Rs. Cr	Beneficiaries per day	Expense per beneficiary, Rs.
Bandra-Worli sea link²³	Rs.300 Cr/km	1,650	37,500 cars, = about 60,000 persons (2010)	2,75,000
Proposed Pune Metro	Rs.300 Cr/km	9,600	4.84 lakh passengers on completion (est)	1,98,000
BRT pilot in Pune	Rs.20 Cr/km	200	3.5 lakh passengers (est) (2010)	5,700
Revamped bus service for a 40 lakh city	Rs.0.25 Cr/bus + other infra	1000	20 lakh passengers (est)	5,000
Footpaths for 400 km	Rs.0.25 Cr/km	200	10 lakh pedestrians	2,000
Zebra stripes at 200 chowks, twice a year for 20 years	Rs. 0.012 Cr/ chowk	96	10 lakh pedestrians	960

Especially for urban transportation management: Judicious expenditure to ensure that the goals of NUTP are met is the need of the hour.

Space

Although space may not be at a premium in rural and countryside areas, it is becoming frightfully expensive in urban areas. Given that 58% of Maharashtra population is

²³ Wikipedia: Bandra-Worli Sea Link (http://en.wikipedia.org/wiki/Bandra-Worli_Sea_Link)

expected to be urban by 2031²⁴, it is very important to consider the amount of space consumed by transportation.

City development plans in India typically earmark about 12-15% land for transportation use. This includes roads, footpaths, land used for bus depots, parking lots etc.

Given that buses use the least space per passenger km., maximum amount of road space must be made available to their movement. A significant amount of road space today is spent on curbside parking instead of movement of vehicles! Although presence of personal vehicles is inevitable, they should not use precious road space for parking. Instead, city development plans should reserve appropriate amount of space for parking lots and these should be developed accordingly. Needless to say, such parking must not be free, but should “Levy a high parking fee, that truly represents the value of the land occupied”, to quote the NUTP.

As far as rural and countryside areas go, it is frequently seen that new highways and railways are delayed because it takes a lot of time to acquire the land needed for such projects. Although it is a very complicated issue, wherever possible, effort could be made to reserve space for future widening of existing roads as well as for building new roads. It is seen that land is either not reserved for future transportation needs, or where it is reserved, it is encroached upon.

Steps need to be taken to ensure that space is available for both urban and rural transportation needs over the years.

Time

Time is another commodity that is getting expensive as the earning potential and cost of labour is rising. Transportation pays for time mainly in terms of time spent by people in commute, as the cost of time required to build any infrastructure is included in the cost of the infrastructure itself.

People have two main expectations while considering time required to commute:

1. The commute should be fast, thus reducing the direct time taken for travel
2. The time needed should be predictable, thus reducing the amount of time “wasted” in traffic

While faster commute is generally desired, on the countryside (between two villages or cities) it comes at a heavy cost. As seen earlier, the percentage as well as absolute number of fatal accidents is rising in Maharashtra, and one reason for the rise is more powerful vehicles driven at higher speeds.

²⁴ McKinsey Global Institute: India’s Urban Awakening: Building inclusive cities, sustaining economic growth, April 2010 (MGI_india_urbanization_executive_summary.pdf)

Faster commute in urban scenario also has a downside. Reduced time to commute within a city makes more and more parts of the city accessible from its periphery, thus increasing its sprawl.

Typical speed of a cyclists in urban traffic is about 15 km/hr. Motorized vehicles generally offer the best fuel efficiency at around 40 km/hr. However, considering stoppages, an average speed of between 25 to 30 km/hr is considered reasonable for urban traffic.

If the average speed of urban traffic is at least 25 km/hr, it indicates low congestion.

City commuters also want their commute predictable in time. It may be ok for a commuter if his daily commute takes long, as long as the time is predictable. However, unplanned delays throw their schedule haywire, and it is becoming increasingly unacceptable to residents of even smaller cities. The prime reason for unpredictability of time is, once again, congestion, thus pointing to one more benefit of better public transportation.

As far as time is concerned, better public transport has one more benefit that has not been sufficiently highlighted till now. Most of the commuters who use a personal vehicle drive the vehicle themselves, and thus remain fully occupied (not to mention, stressed too!) during the entire commute. Switching to public transportation provides them time that can be used for reading, talking to acquaintances etc.

“Predictable time taken by the commute” is more desirable than “less time to commute”.

Fuel

Any drop of fossil fuel consumed has two undesirable effects:

1. It consumes India’s foreign exchange reserves
2. It increases pollution and thus related health hazards

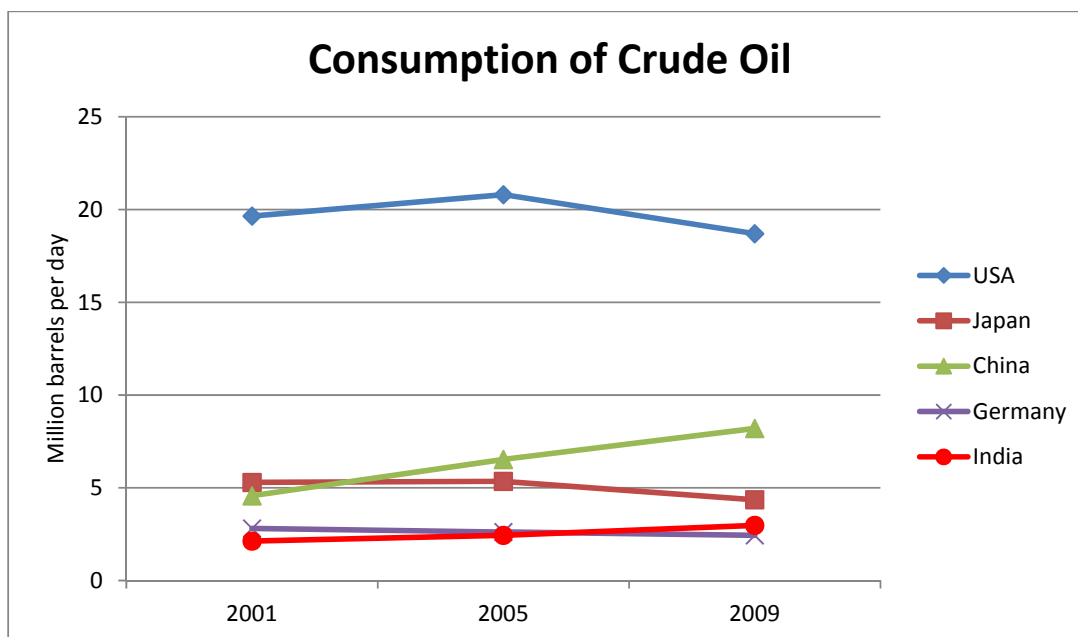
Impact on foreign exchange

Although the cost of the fuel is born by the commuters and not the government, the government has to spend precious foreign exchange to import petroleum. Therefore any saving in fuel consumption would save foreign exchange for India.

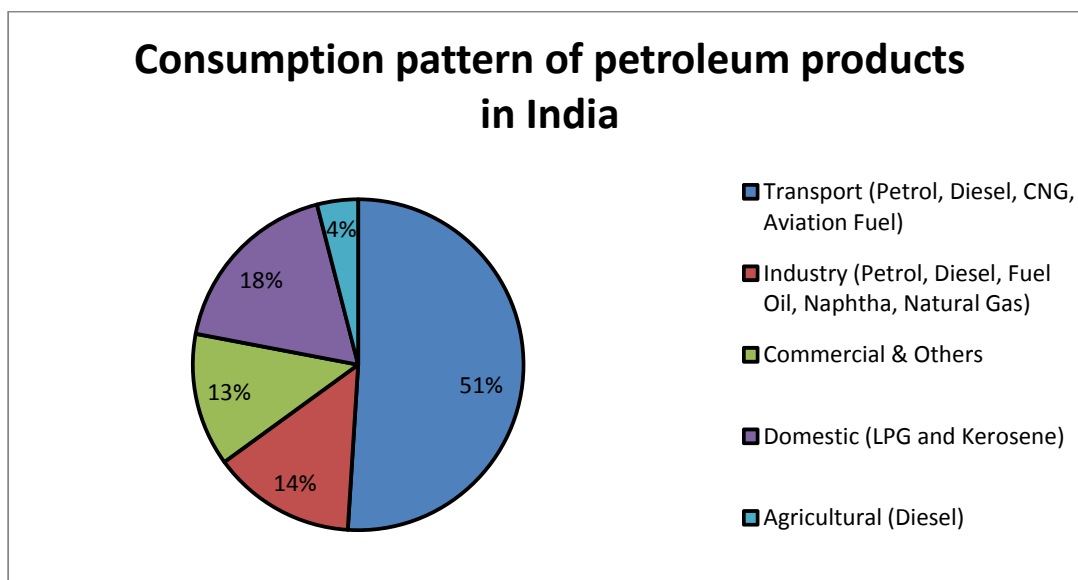
As discussed in earlier chapters, the number of vehicles, their usage is rising significantly in countries like India and China. The graph below shows total crude oil consumed by topmost oil consuming countries in 2001, 2005 and 2009 in millions of barrels per day²⁵. It is to be noted that oil consumption in developing third world countries like China and

²⁵ Based on data from Nationmaster (www.nationmaster.com/graph/ene_oil_con-energy-oil-consumption)

India is increasing rapidly. China and India each have population about 3 to 4 times that of USA. If they were to consume petroleum at the same per capita rate as USA consumes today, it would increase the worldwide petroleum consumption manifold.



The consumption pattern of petroleum products in India is as follows²⁶:



As transportation consumes 51% of the country's petroleum products, any saving in fuel consumed will lead to significant saving of foreign exchange for the country.

²⁶ Petroleum Conservation Research Association (<http://www.pcrs.org/English/education/panindia.htm>)

The following table gives the breakup of petrol and diesel used by various means of transportation in India, along with their fuel efficiency in passenger-km per liter.

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In 2008-09 India spent Rs. 401,631 Cr on imports of crude oil and petroleum products²⁷. Since about 51% of crude oil and petroleum products are used for all transportation²⁸, out of which zzz% is used for road transportation²⁹, just 10% increase in actual “on road” fuel efficiency of vehicles can save zzz% from the foreign exchange bill for crude oil, amounting to \$zzz every year.

Regardless of whether India has enough foreign exchange to spend on petroleum, petroleum itself is becoming an increasingly precious commodity every year. Its prices are rising continuously, and it is widely believed that its sources will run dry in foreseeable future. Alternative sources of energy are not yet commercially viable and commonplace. Significant research is still required before they become so. Conserving petroleum resources would give mankind some breathing time till then!

Emissions and health hazards

Emissions from automobiles is a major source of air pollution in cities.

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About zzz% of fuel is consumed in cities (or vehicle kms driven). One may think that emissions in rural areas and countryside get spread over a large area. Yet, it should be kept in mind that a huge proportion of transportation is concentrated along National and State Highways.

A lot of these emissions, especially in cities, can be reduced if the modal split towards public transportation increases substantially. This is discussed in more detail in the blueprint for Public Transportation.

Other ways of reducing emissions include:

- Increasing fuel efficiency of vehicles
- Encouraging use of alternative sources of energy

The automotive industry is constantly trying to improve the fuel efficiency of the vehicles. In spite of these efforts, it is suspected that any improvements in the fuel efficiency hereafter will only be marginal and it will take a breakthrough invention to make a substantial difference.

²⁷ Basic Statistics on Petroleum & Natural Gas 2008-2009 Ministry of Petroleum and natural Gas, Government of India, New Delhi (Economic Division) <http://petroleum.nic.in/>

²⁸ Petroleum Conservation Research Association website (www.p cra.org/English/education/panindia.htm)

²⁹ zzz?

Vehicles running on alternative energies like solar power, hydrogen cells etc are still in nascent stage. There is some progress in vehicles running on electricity, however, since about 79% of electricity in India is anyway generated from fossil fuels³⁰, effectively these vehicles merely move emission to other areas rather than reducing or eliminating it.

Any and all steps taken to reduce the amount of fuel required per passenger-km or per kg-km transportation will lead to significant saving in foreign exchange as well as reduction in healthcare costs.

Commodities

The transportation sector needs huge quantities of commodities for building roads and vehicles. These commodities include

- Cement, tar, sand etc for building roads and bridges
- Steel, rubber, several synthetic materials for building vehicles

The contribution of automotive sector to India's GDP is expected to grow from about 5% in 2007 to about 10% in 2016³¹. Since the country's GDP itself will grow in this time, the absolute growth in the automotive sector will be much more than twice.

Apart from tar which is a petroleum product, the country is reasonably self sufficient as far as most of the materials required for the automotive industry is concerned. Encouraging these industries in Maharashtra will be useful for Maharashtra's economy. However, their effects on the overall ecosystem should be studied thoroughly before going full steam on these industries.

Intellectual resources

It can be seen from all this discussion that transportation as a whole is a very complex domain and is growing even more complex day by day. This domain is going to need significant intellectual resources in the years to come. Two main areas where such resources will be needed are:

1. Transportation planning
2. Automation and computerization

Transportation planning

As of today only large cities and towns seem to have professionally trained transportation planners. On top of it, it is seen that they are either not supported with trained staff, or

³⁰ Economic Survey of India, 2011-12, Chapter 11, page 3: <http://indiabudget.nic.in>

³¹ Fuel Efficiency in Transport Sector, Petroleum Conservation Research Association (<http://www.pcrs.org/English/education/PDF%20EC/Fuel%20Efficiency%20in%20Transport%20Sector.pdf>)

suffer from constraints like lack of funds. In some cases, even other untrained officials seem to “encroach” upon the domain of transportation planning and take decisions according to their whims (though, with good intentions, to be fair to such officials).

As the field gets more complex day by day, the country and also the state will feel a need of trained transportation planners at various levels.

Automation and computerization

As of now there is not much automation and computerization in this field in India compared to developed countries. A shift in that direction is bound to take place in the next 20 years or so. Once that change starts taking place, it will be quite some time till all necessary reforms take place. Below are some examples of operations where intellectual resources will be required for automation and computerization in traffic and transportation:

- Linking databases of all RTO offices in Maharashtra
- Developing a penalty point system for driving violations
- Linking penalty points with vehicle insurance
- Making penalty points data available to mobile traffic police personnel
- Congestion charge system: implementing the system, automatically deducting congestion charge using smart cards
- Linking driving licenses with upcoming citizens’ identification numbers

Maharashtra will need significant investment towards nurturing intellectual resources for Transportation Management.

Problem areas identified

The table in this chapter lists all problem areas directly or indirectly related to transportation management in Maharashtra, as identified in the discussion earlier in this section. It should be noted that some of these are problem areas than specific problems. Thus each area can manifest in several smaller problems.

Key to the table:

- The column “Aspect” indicates the 8 aspects of modern transportation management discussed in the earlier chapter.
- The column “Imp” is the importance of the problem and is indicated by Gold, Silver and Bronze to match the level of detail in which the user wants to read this blueprint.
- The column “Pr ID” assigns an identification number to each problem. They are not assigned serially and the following mechanism is used:
 - o The digit before the decimal point indicates the broad aspect under which the problem falls.
 - o The first digit after the decimal is 1 for Gold “view”, 2 for Silver and 3 for Bronze.
 - o Within each aspect and importance level, the second digit after the decimal is same for the same problem area.
 - o The last digit is assigned serially for problems in the same area.
- The column “Locale” is marked with U, R and C respectively to indicate problems specific to Urban, Rural and Countryside locales. When not marked so, it can be assumed that the problem is common to all. An ‘X’ indicates that the problem is not related to any locale and is a generic problem, and may require a change in rules, laws, the way we think etc.

Pr ID	Aspect	Problem Caption	Reference	Imp	Locale
1.111	Basic aspects	Basic connectivity to any village is not defined	Connectivity		R
1.112	Basic aspects	No traffic demand management measures seen	Traffic demand management		
1.211	Basic aspects	No plan for ensuring basic connectivity to any village	Connectivity		R
1.212	Basic aspects	Large number of vehicles in Maharashtra: in 2031 there could be 3-4 times that of 2010	Increasing number of vehicles		

Pr ID	Aspect	Problem Caption	Reference	Imp	Locale
1.311	Basic aspects	No template for studying traffic flow to decide steps to be taken	Traffic flow management		
1.322	Basic aspects	Assorted problems with urban traffic	Traffic patterns in different locales: Urban		U
1.323	Basic aspects	Assorted problems with rural traffic	Traffic patterns in different locales: Rural		R
1.324	Basic aspects	Assorted problems with countryside traffic	Traffic patterns in different locales: Countryside		C
2.211	Acts and rules	Penalties are only monetary	Notes on acts and rules		X
2.311	Acts and rules	Fines stipulated in rules are not tied with inflation, hence need to be specifically amended	Notes on acts and rules		X
3.111	Organizations, roles and responsibilities	No single official responsible for all traffic, including planning, execution and enforcement	Day-to-day functions		
3.121	Organizations, roles and responsibilities	No separate traffic police establishment in rural areas	Rural and countryside areas		R,C
3.311	Organizations, roles and responsibilities	Confusion over whether IRC guidelines are mere guidelines or should be treated as rules	IRC		X
3.312	Organizations, roles and responsibilities	MSRDC and PWD objectives have overlaps	MSRDC		

Pr ID	Aspect	Problem Caption	Reference	Imp	Locale
4.111	Infrastructure	A lot of infrastructure focuses on difficulties faced by vehicles than by people	Vehicle friendly vs. people friendly		
4.112	Infrastructure	IRC guidelines are not followed	Installation or creation of infrastructure		
4.113	Infrastructure	Infrastructure not usable by physically handicapped	Infrastructure issues common to all locales		
4.211	Infrastructure	infrastructure breaks down quickly, is not repaired promptly (Urban)	Quality of infrastructure		U
4.212	Infrastructure	Infrastructure breaks down quickly, is not repaired promptly (Rural, Countryside)	Rural infrastructure		R,C
4.213	Infrastructure	Poor road quality, esp. in rural areas	Rural infrastructure		R
4.214	Infrastructure	Ineffective e-governance for maintenance of infrastructure	Maintenance of infrastructure		
4.311	Infrastructure	Roads widened at the expense of footpaths	Vehicle friendly vs. people friendly		U
4.312	Infrastructure	Plethora of foot overbridges and underpasses being considered and planned	Vehicle friendly vs. people friendly		U
4.313	Infrastructure	Maintenance of vehicular signals gets lopsided preference over pedestrians' signals	Vehicle friendly vs. people friendly		U
4.314	Infrastructure	Signs on footpaths could injure people	Vehicle friendly vs. people friendly		U

Pr ID	Aspect	Problem Caption	Reference	Imp	Locale
4.315	Infrastructure	Insufficient right of way timing for pedestrians at signals	Installation or creation of infrastructure		U
4.316	Infrastructure	Misaligned zebra stripes	Installation or creation of infrastructure		U

Pr ID	Aspect	Problem Caption	Reference	Imp	Locale
4.321	Infrastructure	Signs not very conspicuous	Intersections Places where two large roads intersect in the countryside, typically SHs and NHs, are very obviously places of importance. Various kinds of facilities are needed at such intersections, frequently called a "फाटा" or a "नाका". People need to change buses or rickshaws, buy fuel, food and other necessities. Needless to say, these intersections are very busy places. Yet, it is frequently seen that no planned space is provided for any kind of road user, whether para transit, passing vehicles, or pedestrians. The accompanying photographs taken at the Ale Phata on Pune-Nashik highway (NH-50) are representative of such		
			intersections. Traffic and Transport Para-transit vehicles standing haphazardly near the entrance of the MSRTC bus stand		80

Pr ID	Aspect	Problem Caption	Reference	Imp	Locale
4.322	Infrastructure	Improper placement of traffic signs	Installation or creation of infrastructure		
4.323	Infrastructure	Traffic signals not visible to approaching or stopped vehicles	Installation or creation of infrastructure		

Pr ID	Aspect	Problem Caption	Reference	Imp	Locale
4.324	Infrastructure	Difficult to see roadside signs in heavy traffic	Intersections Places where two large roads intersect in the countryside, typically SHs and NHs, are very obviously places of importance. Various kinds of facilities are needed at such intersections, frequently called a "फाटा" or a "नाका". People need to change buses or rickshaws, buy fuel, food and other necessities. Needless to say, these intersections are very busy places. Yet, it is frequently seen that no planned space is provided for any kind of road user, whether para transit, passing vehicles, or pedestrians. The accompanying photographs taken at the Ale Phata on Pune-Nashik highway (NH-50) are representative of such		
			intersections. Traffic and Transport Para-transit vehicles standing haphazardly near the entrance of the MSRTC bus stand		82

Pr ID	Aspect	Problem Caption	Reference	Imp	Locale
4.325	Infrastructure	Signs used for unintended situations	Installation or creation of infrastructure		
4.326	Infrastructure	Road construction: signs do not give adequate warning to drivers	Construction signs		
4.331	Infrastructure	Road markings not planned meticulously, not maintained properly	Road markings		
4.332	Infrastructure	Old signs not changed with changes in infrastructure or traffic pattern	Changes in infrastructure/ traffic plan		
4.341	Infrastructure	NHs, SHs have non-uniform, weak earthen shoulders	Countryside infrastructure: Roads		C
4.342	Infrastructure	SHs can barely accommodate two wide vehicles	Roads		C
4.343	Infrastructure	Special infrastructure is needed for places with high number of certain kinds of vehicles	Infrastructure issues common to all locales		
4.351	Infrastructure	Bus stops on NHs and SHs: No bus bays	Bus stops		C
4.352	Infrastructure	Rural, countryside bus stops are in bad condition	Bus stops		R,C
4.353	Infrastructure	Safe drinking water (not bottled) is rarely available	Facilities		C
4.354	Infrastructure	Clean restrooms are not available	Facilities		C
4.355	Infrastructure	No structure to provide information about the area to commuters, tourists	Information about the area		C

Pr ID	Aspect	Problem Caption	Reference	Imp	Locale
5.111	Education	Lack of trained transportation planners in smaller towns	Transportation planners		R
5.121	Education	Quality of driving tests is very bad	Training for drivers of motorized vehicles		X
5.211	Education	Traffic planners out of touch with latest trends in the world	Transportation planners		
5.212	Education	Traffic planners not free from political influence	Transportation planners		
5.221	Education	Inadequate training for traffic police - also need to look into their tenure and transferability	Enforcers of traffic rules		
5.231	Education	Requirements for driving instructors not stringent	Who can teach driving		X
5.311	Education	Contractors and actual workers not trained in IRC and other applicable norms	Creators of infrastructure		
5.321	Education	No traffic education for drivers of non-motorized vehicles	Training for drivers of non-motorized vehicles		
5.322	Education	No traffic education for pedestrians	Training for drivers of non-motorized vehicles		
5.331	Education	No or poor driving training in rural areas	Traffic training in rural areas		R
6.111	Discipline	Special “traffic police” squad only in larger towns	The role of traffic police		R

Pr ID	Aspect	Problem Caption	Reference	Imp	Locale
6.112	Discipline	Hardly any mobile police patrol doing random checks	Police patrol		
6.121	Discipline	Penalties for violations are outdated	Penalties for violating traffic rules		X
6.211	Discipline	Role of traffic police is outdated, needs to be revisited	The role of traffic police		
6.221	Discipline	Penalties do not depend on size of the vehicle, its speed etc	Penalties for violating traffic rules		X
6.222	Discipline	Fines are only monetary in nature	Penalties for violating traffic rules		X
6.311	Discipline	Urban traffic police are posted mostly only at intersections	Police patrol		U
6.312	Discipline	Regular manual traffic control at signals should be avoided	Controlling traffic to avoid or reduce congestion		U
6.321	Discipline	Timing of traffic signals programmed by trial and error, not systematically	Controlling traffic to avoid or reduce congestion		U
6.331	Discipline	Traffic police seldom take actions to discourage people from breaking rules	Additional tasks for traffic police		
7.111	Safety	Number of deaths due to road accidents is rising in Maharashtra	Safety		
7.121	Safety	Officials/ citizens not accountable for unsafe conditions	Awareness about safe practices		X

Pr ID	Aspect	Problem Caption	Reference	Imp	Locale
7.131	Safety	No system to track drivers' penalty points and suspend licenses	Increasing this cost deliberately		X
7.141	Safety	"Golden hour" needs: Lack of information, bad response time, no system of trauma centers	Emergency services for people		
7.211	Safety	People are not aware that driving is a privilege	Awareness about safe practices		X
7.221	Safety	Vehicle insurance not linked with penalty points on driving license	Increasing this cost deliberately		X
7.231	Safety	Root cause of accidents not correlated to design norms and norms not corrected as a result	Faulty infrastructure		X
7.311	Safety	Many people/ drivers on road do not have insurance cover	Awareness about the cost to be paid in case of accidents		X
7.321	Safety	Person responsible for accident pays only onetime cost (if any) but no recurring cost	Increasing this cost deliberately		X
7.331	Safety	No system for live warning of abnormal environmental conditions	Abnormal environment		C
7.341	Safety	Malfunctioning infrastructure	Faulty infrastructure		
7.342	Safety	Badly designed infrastructure, even if it follows norms	Faulty infrastructure		

Pr ID	Aspect	Problem Caption	Reference	Imp	Locale
7.343	Safety	Improved infrastructure may also compromise safety, needs special attention	Improved infrastructure but declining safety		
7.351	Safety	Some safety rules in developed countries do not exist in India	Rules and practices to improve safety		X
7.352	Safety	Speed limits neither posted, nor enforced	Police patrol		
7.353	Safety	No mobile police patrol to enforce rules	Police patrol		
7.354	Safety	Hardly any citizens trained in first aid	First aid facilities		X
7.355	Safety	No structure for quick help to broken down vehicles	Emergency services for vehicles		C
8.111	Resources	Allocation of funds focuses on benefits to motorized personal vehicles	Financial resources		
8.112	Resources	No major/ landmark projects to revamp public transportation, encourage walking, cycling	Financial resources		U
8.121	Resources	Land not reserved for future transportation needs	Space		U,C
8.131	Resources	Increasing number of vehicles and congestion stress fuel and foreign exchange reserves	Impact on foreign exchange		X
8.132	Resources	Increase in emissions leads to increase in health hazards	Emissions and health hazards		U
8.211	Resources	Lot of road space used for parking vehicles instead of their movement	Space		U

Pr ID	Aspect	Problem Caption	Reference	Imp	Locale
8.212	Resources	Parking rates do not represent the value of land occupied	Space		U
8.221	Resources	Reducing time of urban commute increases a city's sprawl	Time		U
8.231	Resources	No plan to systematically develop intellectual resources needed to support complex transportation systems	Intellectual resources		X
8.232	Resources	Lack of trained transportation planners	Transportation planning		
8.311	Resources	Where land is reserved for future transportation needs, it is not protected from encroachments etc	Space		
8.321	Resources	Higher vehicular speeds lead to higher fatalities	Time		C
8.331	Resources	Congestion makes journey times unpredictable	Time		U
8.332	Resources	People driving their vehicle spend time unproductively, and are stressed	Time		U
8.341	Resources	Hardly any computerization and automation in transportation	Automation and computerization		X

Vision and Benchmark for Transportation Management

The abbreviation “TM” will be used throughout this document and blueprint to mean “Transportation Management in **Maharashtra**”.

Objectives of this chapter

In the preceding two chapters, we looked at what is meant by Transportation Management and also studied Transportation Management in today's Maharashtra. We noted some areas where TM has some problems. While that list may not be an exhaustive list of problems, it does give us an insight into what steps should be taken to improve TM.

Before we list those steps, it will be useful to establish a criteria for determining whether TM has become ideal, or at least improved substantially. And before we do that, it will also be useful to have a vision of what we mean by ideal or excellent TM.

Therefore, the objectives of this chapter are:

To establish a vision for excellent Transportation Management in urban, rural as well as countryside Maharashtra.

and

To develop an indicator that could tell us whether the vision is put in reality.

Vision for Transportation Management in Maharashtra

Let us take this opportunity to summarize and restate a few things.

In context of Maharashtra, we will consider three different domains for Transportation Management:

1. Urban
2. Rural
3. Countryside

In each of these domains, effective management of traffic includes the following components:

1. Basic aspects
2. Acts and rules
3. Organizations, roles and responsibilities
4. Infrastructure
5. Education
6. Discipline
7. Safety
8. Resources

When the vision is fulfilled, traffic in urban, rural as well as countryside Maharashtra would be good with respect to all of the 8 components listed above in the best possible way.

Although we have studied problems in the state's urban, rural and countryside TM separately, the vision for excellent TM should be the same regardless of the locale. Therefore the vision expressed in this chapter applies equally to these 3 locales, unless explicitly stated otherwise in any special condition. It also applies to transportation of goods as well as people.

Basic aspects

Good policies of TM should be put in place to either ensure that TM does not crumble under increasing number of vehicles, or the policies should not allow the number of vehicles to grow to such levels in the first place.

All villages in Maharashtra should have minimal basic connectivity to the rest of the world.

There should be templates and processes to help systematically find solutions to specific local problems.

Rather than trying to manage whatever traffic exists, TM should try to keep traffic volumes within manageable limits by employing traffic demand management techniques.

Acts and rules

The acts and rules that govern the traffic should agree with common reasoning. Any penalties for violating the rules should be designed to ensure that the person does not violate the same rule again.

Organizations, roles and responsibilities

Organizations and officials should have clearly defined responsibilities with no overlaps. There should be a single official responsible for overall traffic planning of a region (city, village, district etc), which should include planning, building the infrastructure, enforcing rules, ensuring education and awareness. This official may coordinate with various entities for specific tasks.

Overall traffic planning should focus on improving movement of people and goods rather than movement of vehicles.

Infrastructure

The traffic infrastructure should be people friendly. Of course, this will happen only if the traffic planning is also people friendly, as said above.

It should conform to rules and guidelines laid down for the purpose. It should be of reasonably lasting quality, maintained promptly and properly.

Special attention should be given to facilities for commuters, including those for tourists as they may be unfamiliar with the area.

Education

Everyone concerned with the traffic system should be imparted specialized training. This includes training for traffic planners, implementers and builders of infrastructure and users of the traffic system, which in turn includes not just drivers of motorized vehicles but also of non-motorized vehicles as well as pedestrians.

Discipline

Traffic should be well disciplined because well disciplined traffic is predictable and hence safer.

Safety

This is perhaps the most important component of the vision for TM. Traffic in Maharashtra must be safe, comparable to or better than the safest in the world.

Resources

Traffic system as a whole should use as few natural resources as possible while achieving its objectives, especially if they are not easily renewable. Special attention should be given to fossil fuels, materials that are not bio-degradable or recyclable, and also to time consumed by commuters without compromising on safety.

Overall vision

The discussion above leads to the following vision for transportation management in Maharashtra:

A proactively managed, well coordinated, expertly planned and safe transportation system for people.

Benchmark for good transportation management in Maharashtra

Why do we need a benchmark?

It follows that all problems identified in the chapter “Problem areas identified” should be solved before the TM can be called excellent. As said earlier, there should be a way to objectively ascertain whether the problems have been solved successfully. The progress with respect to these problems can be used as a benchmark for assessing whether the vision for TM is put in reality and to what extent.

How is benchmarking done?

It is not necessary to consider each and every transportation management problem for the overall benchmark. For example, the objective “traffic infrastructure should be friendly to pedestrians” encompasses problems like “zebra stripes do not exist at many intersections” and “inadequate pedestrian phase to cross a signaled intersection” and maybe a few others. It would be safe to assume that when one of these is fixed, the other would also be in reasonably good state. It should be adequate to include only one of these problems in the benchmark for measuring progress of TM.

The benchmark is developed as follows:

1. About 15 problems from the table in the chapter “Problem areas identified” would be identified as “benchmark problems”. These problems would collectively represent each of the 8 components of TM.
2. The performance of the state of Maharashtra will be evaluated with reference to these benchmark problems.
3. Numerical scores arising out of this evaluation will be put in the table provided in the chapter "Evaluating Transportation Management" . The table then provides a numerical assessment of the state of TM in Maharashtra.
4. Such evaluation may be done annually.

The “benchmark problems” are tagged in the chapter "Solutions for Better Transportation Management in Maharashtra" with the words

This is a benchmark problem.

What sort of problems are chosen as benchmark problems?

The problems chosen as “benchmark problems” have as many of the following properties as possible:

- Progress on solving benchmark problems can be measured with numbers rather than subjectively. Therefore, problems such as “A lot of infrastructure focuses on difficulties faced by vehicles than by people” are not considered for benchmarking. Instead, progress on a problem like “No major/ landmark projects to revamp public transportation, encourage walking, cycling” is measurable, so it is chosen as a benchmark problem.
- Benchmark problems are representative of similar problems in the same aspect/ group of problems. If the benchmark problem is solved, it is very likely that most of the other problems are also solved. For example, if a problem like “Insufficient right of way timing for pedestrians at signals” is solved, it is likely that even vehicular signals and other pedestrian facilities like zebra stripes are also in good condition.
- Benchmark problems are fundamental in nature than specific manifestations of a more fundamental problem. For example, if a problem like “Lack of trained traffic

planners in smaller towns” is solved, it is very likely that due importance is given to public transportation and pedestrian facilities, signals are installed where they are required rather than haphazardly and junctions in industrial areas are designed such that trucks can turn safely and smoothly.

A subsection “Criteria and evaluation” is provided for each benchmark problem. It provides information on how to evaluate the state’s performance with respect to that problem.

Solutions for Better Transportation Management in Maharashtra

This chapter suggests solutions to problems identified in the chapter “Transportation Management in modern Maharashtra”, which are also summarized in a table in the chapter “Problem areas identified”.

As explained earlier, some problems are fundamental in nature, while some are nitty-gritty manifestations of other problems; and there are all shades in between. Some solutions are simple to implement and some are difficult. Some may need a lot of funds. Some problems are very important, but cannot be tackled right away because the society as yet just may not be ready for the suggested solutions. Some solutions depend on other problems being fixed first, hence these other problems need to be given priority, regardless of their importance.

All this makes reading this chapter a bit complicated. Therefore it is important to understand how the solutions are structured, so that the reader knows where to find what he or she needs to find.

Structure of solutions

Solution to each problem will be discussed in 4 parts:

1. Solutions
2. Pros & cons and resistance expected
3. Importance
4. Criteria for success and evaluation system

This discussion will include the following wherever applicable, and in the same fonts and colours.

Pr ID. Problem Caption

The Problem ID and Problem Caption is the same as in the table in the chapter “Problem areas identified”.

A tag is provided for each problem as shown below. The word “Aspect” will be replaced by the aspect that the problem largely pertains to. The words “This is a benchmark

problem” will be there only for those handful problems, based on which a numerical benchmark for evaluating TM is developed later. The last cell will have the same colour (gold/ silver/ bronze) as in the “Importance” column of the table in the chapter “Problem areas identified” and the word “Imp” will be replaced by the respective letter G/S/B.

Aspect	This is a benchmark problem	Imp

Solution

- What needs to be done and by whom, in sufficient detail.
- Any significant changes needed in system (new acts/ rules, establishing new offices, changes in authorities of officials etc).
- Dependencies: Whether any other problem must be fixed before starting work on another problem.
- Estimate of funds needed.

Although an attempt might be made to discuss possible sources of funds or ways to finance the implementation, that may not be discussed for each solution.

Timeline

Suggested timeline for solutions suggested for the corresponding problem(s). These solutions may be divided in phases. The timeline suggests only the duration each phase would need. Most of these figures will be in years, in half-year granularity. The timeline does not suggest the calendar year when the implementation of these solutions should begin.

Depends on

If the suggested solutions cannot be implemented until some other problem is fixed completely or partly, it will be mentioned under this heading.

Pros and cons, resistance expected

The following issues will be discussed where applicable.

- Expenses.
- Any hurdles expected, e.g. legal battles, complex procedures, difficulties in enforcing or monitoring the situation.
- Readiness of society to accept a new thought.
- Possibility that the solution may impact financial interests of certain groups.
- Possibility that the solution may impact certain individuals, though the society as a whole may accept the solution.

They will be summarized in the following table. Values of 2, 1, 0 indicate High, medium and low respectively, thus their sum gives an idea of how difficult it would be to implement the solution.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
2/ 1/ 0	2/ 1/ 0	2/ 1/ 0	2/ 1/ 0	2/ 1/ 0

Difficulty level: Sum of 2/ 1/ 0 values in the table above. Possible values are: maximum 10 (very difficult to implement), minimum 0 (very easy to implement).

Importance

Importance is assigned values of 1, 2, 3, 4 respectively, indicating solutions that:

1. Must be implemented at any cost,
2. Must be implemented,
3. Should be implemented,
4. Are nice to do.

Criteria and evaluation

This heading is provided only for those problems based on which a numerical benchmark for evaluating TM is developed later.

Discussion under this heading suggests how to ascertain whether this problem is fixed and whether progress is being made on this issue.

0. Flag off the “Improve Transportation Management in Maharashtra” Project

Extremely important!		Platinum

Solution

A project with a long term vision to improve transportation management in Maharashtra should be launched in all fanfare. It should have a prominent personality as a brand ambassador, a very strong and openly expressed political will and an assurance that good initiatives will not face shortage of funds.

This project essentially is about implementation of everything that is suggested in this blueprint. A formal announcement of launching an initiative for completely transforming transportation management in Maharashtra, along with a plan that is publicly available will convince people about the seriousness of the Government towards the blueprint.

Numerical assessment of transportation management in Maharashtra

At the heart of this entire blueprint lies the approach that the success of any solution, as well as the state of any aspect of TM should be measurable. Since this approach is considered very important, it is clubbed at the same level of “Task 0”, i.e., launching of the project itself.

A benchmark has been developed for this purpose, and it includes 15 parameters. This benchmark is discussed later, in the chapter “Evaluating Transportation Management”.

Each parameter typically requires 100 to 500 data points, which may include taking observations, evaluating documents, field visits etc. Each data point may require about 2 person-days of effort. Therefore a rough estimate is that this evaluation process itself needs $20 \text{ parameters} * 300 \text{ data points} * 2 \text{ hours} = 12,000 \text{ person days of effort}$.

Adding a 40% overhead for overall management effort and assuming that there are about 250 effective working days in a year, the effort translates to about 70 person years.

Therefore a team of about 70 persons would be needed for annual numerical assessment of TM. This team should be suitably distributed across the state.

It is also important to divide the entire project in several phases, so that only a manageable number of activities are in planning phase at a given time. Once an activity is planned and in motion, it can overlap and continue through a later phase. List of problems to be addressed in each phase can be derived from the Gantt chart of the overall project.

Timeline

1. Launch the project to improve TM in Maharashtra.
2. Launch phase 1 of the project.
3. (0.5 years) Establish and staff a team to assess progress numerically, allocate office space, provide infrastructure like computers etc.
4. (1 year) Launch phase 2.
5. (2 years) Launch phase 3.

Depends on

None.

Pros and cons, resistance expected

Pros and cons

Resistance expected

A dedicated 70-person team just to maintain data and crunch numbers may be considered by some people as “unproductive”. However, its importance will be visible after 3-4 years.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	1	1	1	0

Difficulty level: 3.

Importance

Importance = 1 for announcing the intent to improve TM in Maharashtra.

Importance = 2 for establishing the team and structure to measure progress.

1.111 Basic connectivity to any village is not defined

Basic aspects		G

Solution

Form a committee of 2-3 transportation experts and planners. The committee should study various criteria of connectivity defined in Indian contexts and define a criteria for basic connectivity to villages in Maharashtra. This criteria should be more stringent than any such criteria defined in India, e.g. for any other state or in documents like NRTP (National Road Transport Policy).

The criteria should be granted necessary approvals, should be announced and conveyed to any relevant bodies like planning commissions at various levels, to make sure that cognizance of this criteria is taken while planning transportation management solutions in future.

Timeline

1. (0.5 years) Formation of Committee.
2. (0.5 years) Committee to define criteria for basic connectivity to a village.
3. (1 year) Ensure necessary legislative, legal support for this criteria to be taken in cognizance.

Depends on

None.

Pros and cons, resistance expected

Pros and cons, Resistance expected from

No cons and no resistance expected.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	1	1	0	0

Difficulty level: 2

Importance

Importance = 2 (Must be implemented).

1.112 No traffic demand management measures seen

Basic Aspects		G

Solution

Develop a template for proposing projects to manage traffic at a certain place. Such projects include the following:

For urban settings

- Widening or building a road or building a flyover, in already developed areas as well as areas that are seeing new development.
- Converting major roads from 2-way to 1-way and vice versa.
- Building bridges over or tunnels under railway lines, rivers and creeks, section of sea etc.

For rural or countryside settings

- Widening or building a road or a highway. This includes adding lanes to existing highways (major district roads, state as well as national highways).
- Building bridges over or tunnels under railway lines, rivers and creeks, section of sea etc.
- Any changes that could affect access to a village or a town, especially near destinations like railway stations, major bus stands, tourist destinations etc.

It should be noted that the list above may not be exhaustive.

Project plans based on this template should have estimates of how much traffic there is today and there would be with and without these measures, 3 years after the project is completed. The template should include a section that describes what TDM measures are being taken. If a significant increase in traffic is expected after completion of the project, this section should give reasons for the increase. The project should be approved based on this analysis.

These estimates should be updated if there is any delay in the actual implementation, so that the estimates are valid for 3 years after the completion of the project. Actual traffic volumes should be documented for 3 years after the work is completed. Resources needed for such documentation should be accounted for in the cost of the project.

A project would be termed “complete, on probation” when the implementation is completed, and “fully complete” only after this and any other such documentation is completed. A certain part of the payment to the contractor should be withheld till such documentation is completed and published appropriately.

If the actual traffic volumes are 10% more than the estimated volumes in any of the first 3 years after completing the implementation, the officials who planned the project should give a satisfactory explanation of this deviation.

Timeline

1. (1 year) Prepare a template to be followed by project plans of projects as mentioned above.
2. (parallel) Put in place any rules as needed, regarding such post-implementation surveys and conditional payments to parties involved.

Depends on

Pros and cons, resistance expected

These additional processes may increase the cost of the project, but in most cases the increase may be miniscule compared to the overall cost.

The issue being addressed is an inherently hypothetical situation: “how much would the traffic be with and without the project?” It is very difficult to assess whether the TDM measures suggested and implemented have indeed reduced or controlled the traffic, or whether the figures have been forged to claim that the TDM measures have been successful. Yet, if the figures are available for public consumption, individuals or NGOs can keep a watch on the results of such projects.

Even then, putting in such a section in the template will force concerned parties to think whether any effort is being made to keep the volume of traffic in control in the first place and then managing the traffic, instead of managing whatever traffic we have.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	1	1	1	0

Difficulty level: 3.

Importance

Importance = 3 (Should be implemented).

1.211 No plan for ensuring basic connectivity to any village

Basic Aspects	This is a benchmark problem	S

Solution

Once a criteria for basic connectivity to villages is defined, district and taluka-wise lists of all villages that do not have basic connectivity should be created.

20% of villages in this list should be provided basic connectivity every year. Thus all villages in Maharashtra will get basic connectivity in 5 years.

One of the criteria for basic connectivity is likely to be of the form “the road that connects the village should be usable for 360 days a year”. The monsoon season is probably the only reason why a village would lose connectivity for several days. Therefore, each district and taluka should maintain a list of villages that are susceptible to such loss of connectivity. Until we have enough confidence that villages seldom lose connectivity for more than a day every year, officials at appropriate levels should be required to furnish annual taluka-wise statements of which villages lost connectivity during monsoon and for how many days. These statements should list which villages whose connectivity has been ensured as a part of this program lost the connectivity for 5 or more days that year and why. These statements should be publicly displayed in all villages in the base list.

Timeline

1. (1 year) Form a list of villages that do not have basic connectivity.
2. (5 years) Provide basic connectivity to all villages.
3. (every year) Each district and taluka level officials submit annual statements of connectivity to villages.

Depends on

Define basic connectivity to villages.

Pros and cons, resistance expected

None.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	1	2	1	0

Difficulty level: 5.

Importance

Importance = 2 (Must be implemented).

Criteria and evaluation

The state should have a well documented list of villages that do not have basic connectivity, and a plan to reduce this list every year. Results of this plan should be tracked.

Score = 0 until this list is established. Score = 5 when the list is formed. Then score an additional point for every 20% reduction in the list.

1.212 Large number of vehicles in Maharashtra

Basic Aspects		S

Solution

It should be noted that increasing number of vehicles may not be a “problem” by itself.

Growth in number of vehicles in urban setups leads to problems like congestion, pollution etc and these issues are dealt with in the blueprint on Public Transportation.

As far as the entire state of Maharashtra is concerned, excessive growth in number of vehicles would lead to these as well as other problems, which are discussed as individual problems elsewhere in this document. Therefore, associated solutions are also discussed in corresponding paragraphs.

1.311 No template for studying traffic flow to decide steps to be taken

Basic Aspects		B

Solution

The following types of places have very peculiar traffic patterns.

- Large industrial areas
- Business districts
- Places of pilgrimage and tourism

A standard template and process to manage this traffic will make the traffic smoother and safer. Below we mention issues that should be addressed in the respective templates.

Large industrial areas

- Highways near such areas may consider “trucks only” lanes. This will segregate heavy vehicles from other traffic and improve road safety. Surface of such lanes may need special treatment to withstand the heavy wear and tear.
- A center for handling any formalities with goods vehicles. This center can include facilities like weigh bridges, collection of any taxes, inspection of vehicles etc as applicable.
- All roads should have sufficient turning radius.

Business districts

- Many offices hire a bus service, and many employees commute by public transport buses. Dedicated bus lanes can benefit thousands of people in such cases.
- Space should be reserved for a bus terminus or several, spacious bus stations next to large office buildings.
- Roads going to business districts often have unidirectional traffic in peak hours. Roads leading to such office areas may have lanes with variable direction of flow. For example, instead of a standard 2+2 divided road, it may be useful to have 2 central lanes switch their direction for morning and evening peak traffic.
- Entrances and exits of large office buildings should not open on the main road.
- There is significant pedestrian movement in such areas during morning and evening rush hours as well as lunch hours. Facilities like wider than normal footpaths, a few extra seconds in signal cycles, properly marked zebra stripes and stop lines are needed in business districts.
- All office buildings as well as any shops and restaurants in the neighbourhood should provide ample parking within their premises for their employees and visitors. In no case should such vehicles be parked on roads in the neighbourhood. Commercially operated parking structures may be considered. In any case, it should be ensured that users of personal vehicles pay for the space used for parking. The state or local town/ city administration should not subsidize the space.
- Whether to construct such office buildings in the first place should be determined by, among other factors, whether their approach roads can handle the expected volume of traffic. For example, a 3 lane road with mixed traffic can typically carry a traffic volume of about 6-8,000 pphpd. It follows that such a road can transport about 12-16,000 persons in the morning and evening rush hours. Therefore, if a

business district that is served by 3 lanes in one direction created more than this number of jobs, we could expect daily traffic jams **by design**.

Places of pilgrimage and tourism

As far as issues like road width, existence of footpaths etc are concerned, spaces around places of pilgrimage and old tourist destinations are generally in the state they were decades ago. They are usually very cramped and cope up with several times the number of visitors than they were designed for. Although “correcting” this design is a town planning issue, below we mention a few steps that can be taken immediately.

- The respective town should have a documented transportation management plan for specific destinations in the town, in addition to the overall traffic plan for the town. This plan should pay attention to issues like protecting the heritage and aesthetics of these destinations.
- Such spaces are prime candidates for pedestrian only areas. Vehicles should be allowed only up to a certain point from which they can turn around. One-way roads may be considered to solve the issue of jams created when vehicles turn around to go back.
- Access to these places of interest should be handicapped friendly.
- Conspicuous roads signs in 3 languages (Marathi, Hindi and English) or 2 scripts (Devnagari and Roman) should be installed.
- Sufficient number of parking spaces should be provided.
- Visitor destinations in such towns should be very conveniently accessible by public transport from places like prominent hotels and other tourist destinations. This information should be made known to people, and the template should also include a process to do that. For example, pamphlets of the local bus service may be placed at reception desks of hotels.

More such templates may be needed. These templates should provide concrete guidelines. For example, the template for transportation management for a tourist place should have a table that suggests the number of parking places to be provided from the number of tourists at the peak of the season.

Timeline

1. (0.5 year) Define the types of templates that may be needed, adding to the examples mentioned above if necessary. Appoint committees to develop the templates.
2. (1 year) Complete the templates. Also prepare a list of specific hot spots and locations that these templates should apply to.
3. (1.5 years) Local administrations of respective places should prepare plans that describe the changes that need to be made to ensure that the requirements laid down by the templates are satisfied. This step also includes the time required for discussions with stakeholders including local residents, so that all concerns are addressed.

4. (1.5 year) The whole process may be done in a staggered manner. The same task force may do step 3 above for some talukas in phase 1 and remaining in phase 2.
5. (1.5 years, after #3) Implementation of phase 1.
6. (1.5 years, after #4) Implementation of phase 2.

Depends on

None.

Pros and cons, resistance expected

Implementation plans may go in endless discussions where any establishment needs to be relocated.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	2	2	0	1

Difficulty level: 5.

Importance

Importance = 4 (Nice to do).

1.322 Assorted problems with urban traffic

Basic Aspects		B

Problems mentioned in the paragraph “Traffic patterns in different locales” considered representative than an exhaustive list. Nonetheless, we are mentioning solutions to as many of them as possible.

Solutions are suggested below, separately for each problem.

Congestion and perpetual lack of parking places

Basic Aspects		B

This problem and its solution are highly dependent on a planned transformation of urban public transportation, and are also covered at various places in the chapter “**Solutions for Better Public Transportation in Maharashtra**”.

Solution

Emission norms of vehicles are getting stricter, yet their enforcement leaves a lot to be desired. However, the real issue is not how much pollution a given vehicle causes, but how much pollution is caused by all vehicles collectively.

Even if technological advances halved vehicular emissions in 5 years, if the number of vehicles in a town grew 10-fold in the same period, it is evident that the town would have to cope up with 5 times as much pollutants. To take care of this problem, the town would have to limit the amount of pollutants it can take in. A cost would be associated to the amount of exhaust the town can accept. This cost would be determined by the damage done to the health of its residents, to the ecology of the region etc. Vehicles emitting these pollutants would have to bear this cost by way of a pollution tax.

However, the objective is not merely to recover the cost, but to reduce the pollution. A vehicle may emit pollutants that annually “cost Rs. 1,000 to the city”. The owner of the vehicle might not have any problem in paying Rs. 1,000 annually to the city. That does not reduce the pollution. Therefore, this amount would have to be decided by whether it is acting as a deterrent to buying and keeping a vehicle. In the example above, if the owner of this vehicle needed to pay Rs. 10,000 every year to the city, he might consider buying a smaller vehicle that emits less.

Therefore, a pollution tax should be imposed on all vehicles, which should be in proportion with the amount of pollutants emitted by each vehicle type. Such a tax should not be based on ownership (e.g. if you own a particular model of a vehicle, you pay a certain amount), but on usage. This tax should not be collected for long periods like 10 or 15 years at the time of purchasing a vehicle, because such lumped payment does not pinch the purchaser. It should also not be clubbed with other taxes like the municipal taxes because even once a year payment of such tax pinches the user only once a year. Further, clubbing it with any other tax would involve substantial levels of computerization and associated issues.

It is therefore evident that the pollution tax should be based on actual usage. The simplest way to collect this tax is to collect it at the time of purchasing fuel.

It would be unfair to impose this pollution tax if the town does not provide good public transportation. However, the pollution tax thus collected may be used to establish and run a good PT service. Therefore the pollution tax should be initially small, but should go on increasing as the quality of the PT provided by the town improves.

Timeline

1. (1 year) All towns above a certain size to determine how much vehicular emission they can safely absorb, how much emissions they have to cope up with today and estimate the cost of this excess emission.
2. (parallel) Determine pollution tax from this calculation.

3. Collect the pollution tax along with petrol and diesel sold in the town. Fund the local PT system with the money thus collected.
4. (every year) Measure vehicular emissions and increase the pollution tax.
5. (parallel) Improve the PT, one aspect at a time. Explain to the citizens that this improvement is being funded by the pollution tax.

Depends on

Pros and cons, resistance expected

Such a system might imply that even lower-middle class citizens who are forced to buy a personal vehicle because the town provides none or bad PT. As suggested above, this pollution tax should be tied with improvements in PT.

For this reason, the tax cannot be imposed in small towns where a PT system may not be required/ cannot be supported for lack of critical mass. Then it is likely that purchasers of vehicles provide addresses from such towns while buying vehicles. The system would need to guard itself from this loophole.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	1	2	2	2

Difficulty level: 8.

Importance

Importance = 2 (Must be implemented).

Noise pollution

Basic Aspects		B

Solution

This problem is especially severe in urban areas. In India, there are two components of the noise created by traffic:

1. Noise from the engines of the vehicles, especially from engines that are not maintained properly.
2. Noise from horns of vehicles, whistles and shouts from traffic police trying to control the traffic.

Noise from the first source is difficult to control, and it exists even in developed countries to some extent. However, it should be possible to substantially reduce, if not eliminate the noise from the second component, viz. horns and shouts.

The people most affected by this noise are the traffic police persons themselves, but it is not as if they are unaware of the effect it has on their hearing, blood pressure and health in general. However, they seem to have resigned to this noise and have accepted it as a professional hazard. So it is important to make the traffic police persons understand that it is not only necessary, but also possible to reduce the noise levels.

Rule no. 231 in Maharashtra Motor Vehicle Rules, 1989 prohibits drivers from honking unnecessarily. It is nearly impossible to define when honking is necessary, and maybe it is one reason why the rule is not being enforced strictly. However, the following situations can be easily identified as situations in which honking is not necessary:

1. There is no reason to honk when the signal becomes green and the vehicles start entering the intersection as they do normally. No accident or any other reason why the traffic may be blocked can be seen.
2. In a “quiet zones”, e.g. near hospitals and educational institutes.
3. Some people are seen driving a vehicle at high speed. This happens especially in hours when traffic is lean, and with motorcycles. These drivers seem to take pleasure in honking, rather than alerting any pedestrians or other drivers of their presence on the road.

Such situations will have to be tackled in a step by step manner. It may be easy to start with the first situation mentioned above and then work in the sequence suggested.

A substantial public awareness program will be needed for these actions. It should include all of the aspects below:

- Awareness through newspapers, banners and hoardings.
- Medical tests of traffic police persons, announcing the outcome in papers.
- Make willing citizens simply stand next to a traffic police person in a busy intersection for 15-30 minutes.
- Graded action by traffic police, starting with warnings and then levying fines.

Above all, traffic police will have to give up the habit of blowing whistles at working traffic signals, and announce an intent of reducing the noise caused by honking in urban areas.

Timeline

1. (0.5 years) Stage 1: Stop unnecessary honking at signals. Public awareness, medical tests of traffic police.
2. (parallel) Announce an intention of stopping unnecessary honking at signals, in cities that have about 20 or more signals. Start with warnings and quickly follow up with fines.

3. (0.5 years) Stage 2: Enforce quiet zones. Put up prominent, temporary boards and signs in addition to standard “no honking” signs. These temporary signs should educate people about how a no honking sign looks and how to realize that you are in a quiet zone.
4. (parallel) Random patrolling, warnings to violators, followed by fines. Also try to curtail the menace of high speed bike riders honking at will at odd hours as a part of this task.

Depends on

Pros and cons, resistance expected

This issue is really an issue of lack of civic sense than that of enforcement. Mere enforcement of these rules will not succeed beyond a certain point unless the society imbibes the civic sense. Therefore it is advisable to take up this task only after several other significant improvements are in place.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	1	2	2	0

Difficulty level: 6.

Importance

Importance = 3 (Should be implemented).

High volume of goods transportation in and through urban areas

Basic Aspects		B

Solution

This issue will be discussed in the section “Transporting Goods”.

1.323 Assorted problems with rural traffic

Basic Aspects		B

Problems mentioned in the paragraph “Traffic patterns in different locales” should be considered representative than an exhaustive list. Nonetheless, we are mentioning solutions to as many of them as possible.

Solutions are suggested below, separately for each problem.

Poor quality of traffic infrastructure in rural areas

Basic Aspects	B

Solution

Generally only a handful types of infrastructure items are sufficient in a rural setup. For example:

- Signs showing distances to nearby towns
- Speed breakers
- Road signs to indicate presence of speed breakers, school etc.

Yet, there is no consistency regarding the presence of these items, their specifications and quality.

There should be standard templates that can suggest which items may be needed for a given village or small town. This template should consider the number of schools, major and minor road intersections, places of religious importance etc. and prescribe the infrastructure needed by that town or village.

The administrative head of the town or village should furnish a report to a competent authority every year that takes a stock of prescribed infrastructure and infrastructure actually found.

All infrastructure must comply to IRC guidelines if there are any available guidelines. If there are no IRC guidelines that satisfy the requirement, the state’s Ministry of Transportation should draft its own guidelines and follow up with IRC for adopting them with suitable modifications if needed.

Timeline

1. (1 year) Prepare a template to determine which simple infrastructure items may be needed at what sort of a village or town. This template should be applicable to all villages with a population of less than 10,000.
2. (1 year) Local administration to prepare a report that states which infrastructure items are needed as per the template and which of them are actually in place.
3. (every year) Local administration to furnish compliance reports. These reports should be collated at taluka and district levels.
4. The objective is to reach near 100% compliance with the template in 3 years.

Depends on

Pros and cons, resistance expected

Since an overall sense of following processes and norms is lacking in our country, the tasks above may be labeled as “too much process”.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	1	1	2	0

Difficulty level: 5.

Importance

Importance = 3 (Should be implemented).

No facilities for pedestrians at market places

Basic Aspects		B

Solution

Many large villages or small to medium size towns have a hub or a marketplace that has been developed as a legacy. Such places are frequently near an intersection. The amount of vehicular traffic as well as the number of vendors and customers of the marketplace have increased over the years. Yet, the marketplace cannot be made larger because the road along which the market flourishes cannot be made wider as there exist properties along the road. Such situation endangers pedestrians the most, and most of the customers and vendors in such markets are pedestrians.

Many a times such market places are along a state or even a national highway, and create bottlenecks on these busy roads. Yet the objective here is to first ensure safety of these vulnerable road users while clearing the bottleneck on the highway. Both are equally important.

A criteria to decide whether something needs to be done in such a village or town is to see whether the unobstructed and effectively available carriageway of the main road reduces significantly as the main road passes through the village. This can be determined empirically by looking at the colour of the tarmac. The part of the carriageway that is generally used by vehicles is dark, while the part of the carriageway that is used more by pedestrians has a lighter, gray shade.

If it is observed that the **effectively available** carriageway has reduced by 20% or more because these vulnerable users have to use road space for their movement, it indicates that some changes need to be made. These changes may include some or all of the following:

- Build a wide footpath and a railing. This may slightly reduce the net available carriageway for vehicles, but it will segregate the vulnerable road users and vehicular movement. This will not only protect pedestrians, but also benefit vehicles.
- Traffic calming: Gradually taper down the width of the road and provide a pedestrian crossing facility with a zebra and a refuge. This should be done along with building a footpath and a railing as above.
- If the above steps are not possible at the current market place, consider shifting it by a few hundred meters. The new place would presumably be spacious enough to provide ample space for vendors and customers, proper parking, maybe even an extra lane for people who want to shop or eat while sitting in their vehicles.
- Whether it is decided to move the market place or not, a good footpath should be considered in either case.

Special task forces with sufficient local representation should be formed at taluka levels to identify all such spots, discuss local issues with villagers by taking them in confidence. These task forces will need a training workshop to ensure consistency of solutions across the state.

Timeline

1. (1 year) Form task forces to identify all such places on National and State highways where pedestrians' safety is endangered as the highway passes through a village. Conduct training workshops for them. The task force should then do a survey and prepare recommendations on steps to be taken to address the issues.
2. (0.5 year) Respective villages to discuss the recommendations and finalize.
3. (1.5 years) The whole process may be done in a staggered manner. The same task force may do steps 1 and 2 above for some talukas in phase 1 and remaining in phase 2.
4. (1 year, after #2) Implementation of phase 1.
5. (1 year, after #3) Implementation of phase 2.

Depends on

Pros and cons, resistance expected

Implementation plans may go in endless discussions where any marketplace needs to be relocated, as a change frequently hurts interests of those who are established.

Cost	Difficulty in putting	Difficulty in	Change of mindset	Conflict of interest

	in effect	enforcing		
1	2	2	2	1

Difficulty level: 8.

Importance

Importance = 3 (Should be implemented).

1.324 Assorted problems with countryside traffic

Basic Aspects		B

Problems mentioned in the paragraph “Traffic patterns in different locales” should be considered representative than an exhaustive list. Nonetheless, we are mentioning solutions to as many of them as possible.

Solutions are suggested below, separately for each problem.

Countryside traffic infrastructure needs meticulous planning

Basic Aspects		B

Solution

zzz1 To do

Timeline

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
2/ 1/ 0	2/ 1/ 0	2/ 1/ 0	2/ 1/ 0	2/ 1/ 0

Difficulty level:

Importance

Importance = 1 (Must be implemented at any cost, Must be implemented, Should be implemented, Nice to do).

2.211 Penalties are only monetary

Acts and Rules	B

Solution

Penalties for some rules should be in the form of traffic education/ social service as applicable.

Traffic violations, at least the most frequent violations, should be classified depending on the following:

- Does the violation cause danger to life and property? (For example, vehicles parked in certain “no parking” areas only affect the flow of traffic but don’t generally cause danger to life.)
- Does effect of the violation depend on the size of the vehicle? (For example, a truck jumping a traffic signal is much more dangerous than a 2-wheeler doing so. On the other hand, the type of the vehicle doesn’t matter much for an expired PUC certificate.)
- Is the violated rule a very basic rule or is it a relatively less known rule with relatively less dangerous effects? (“No left turn on red signal” is an example of the former, and “No honking in quiet zones” is an example of the latter.)

The criteria mentioned above are indicative and not exhaustive. More such criteria may be possible. A combination of such criteria may also be possible.

Depending on such criteria, penalties for traffic violations may fall under the following categories:

- Penalty in the form of fines.
- Attend traffic education classes to get certain points clarified. The violator has to take some time off from work for these classes, which acts like a deterrent for violating the rules.
- Fines and/or number and duration of classes may depend on the size of the vehicle.
- In some cases, the penalty may also include social service like helping traffic police control the traffic for some time, or even cleaning a local street.

Timeline

1. (0.5 year) Categorize violations as per various criteria suggested above.
2. (0.5 year) Suggest penalties of various kinds according to the category of the violation.
3. (0.5 year) Draft an amendment to MVA 1988 and applicable rules.
4. (2 years) Create favourable public opinion and follow up with Government of India.

Steps #3 and 4 above should be done along with corresponding steps noted in “2.311 Fines stipulated in rules are not tied with inflation, hence need to be specifically amended”.

Depends on

Pros and cons, resistance expected

Implementation of some of the penalties like attending traffic education classes may need to be supported by certain infrastructure like approving certain traffic schools for the purpose.

It is also likely that the intent behind such penalties would not be understood by the public, thus opening loopholes for malpractices in tracking whether a violator has undergone the prescribed penalty. Yet, it is also likely that many people may actually welcome penalties that do not pinch their pockets.

Penalties like asking a violator to sweep roads may not be acceptable to certain sections of society. Although such penalties are observed in some developed nations, extra care and efforts may be needed to devise such penalties and to execute them, including preparing the public’s mindset for such penalties.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	2	2	1	0

Difficulty level: 6.

Importance

Importance = 3 (Should be implemented).

2.311 Fines stipulated in rules are not tied with inflation, hence need to be specifically amended

Acts and Rules

B

Solution

The rate of tolls mentioned in the National Highways Fee Rules 2008³² includes a built in provision for their annual revision. Likewise, fines for traffic violations should also have a built in provision for a periodic revision. The frequency of such revision should be similar to what is suggested below.

This amendment will need to be included in the Motor Vehicles Act of 1988 and applicable rules.

For convenience of day to day operations of imposing and collecting fines for traffic violations:

- The fines should be in multiples of Rs. 50.
- The applicable fines should be revised from time to time as per these amendments. It is recommended that the fines are revised at least within 5 years from the previous revision. At the same time, once revised, they should not be revised again within 3 years.

Timeline

1. (0.5 years) Draft the amendments in MVA 1988 and applicable rules.
2. (2 years) Create favourable public opinion and follow up with Government of India.
3. (3-5 years) Periodically revise fines as per the amendments.

Depends on

Pros and cons, resistance expected

No resistance and drawbacks are envisaged if the fines are always in multiples of Rs 50 or 100 and if they are revised only after about 3 years of a revision. This solution amends a law and associated rules, which are time consuming and cumbersome processes. Therefore intense follow up will be needed to get the amendment passed.

Cost	Difficulty in putting	Difficulty in	Change of mindset	Conflict of interest

³² Ministry of Shipping, Road Transport and Highways, notification dated 5th December 2008, p 19, article no 5, "Annual revision of rate of fee".

	in effect	enforcing		
0	2	0	0	0

Difficulty level: 2.

Importance

Importance = 2 (Must be implemented).

3.111 No single official responsible for all traffic, including planning, execution and enforcement

Organizations, Roles and Responsibilities	This is a benchmark problem	G

Solution

Responsibility for planning and managing all traffic should vest under a single “traffic officer” in the local administration. There should be a traffic officer at the following levels:

1. Class I towns (towns with a population of 1 lakh and above)
2. Taluka
3. District
4. Zone or Division: typically consisting of 4-5 districts
5. State

In Municipal Corporations, this officer would be the Municipal Commissioner or a very senior officer designated by the Commissioner, directly reporting to the Commissioner. Officers of commensurate stature would have this responsibility at other levels.

All “traffic planning” in the city or town should be done as per the directions and approvals given by the traffic officer. This includes creation and maintenance of all traffic infrastructure as well as traffic control and enforcement of traffic rules done by the traffic police.

It should be noted that a lot of National Highways pass through cities. Certain large infrastructure projects are also executed by agencies other than the local administration. For example, MSRDC may build a large flyover in a city. However, these National Highways and flyovers carry a considerable part of internal city traffic. Therefore, creation and maintenance of all traffic infrastructure within the city or town, even if it is actually done by national or state level authorities like NHAI or MSRDC, should be done not only in consultation with the traffic officer but after getting an approval from him/her.

This process may need changes in current rules or protocols.

The traffic officers should establish a “single window” for addressing citizens’ problems regarding traffic. This single window may internally divert the problem to the concerned department in the city or town administration, collect their replies and respond back to the citizens.

Issues regarding traffic police may or may not be handled by this “single window”, but may be handled by the traffic police department. Even in that case, such a system would make it much simpler for citizens to get their issues resolved.

The “traffic officer” at the state level would be responsible for overall transportation management in the state.

At their respective levels, especially at state and zonal levels, these traffic officers would also have to worry about traffic carried by modes like railways, airways, waterways and how to seamlessly integrate this traffic with the road traffic. For this reason, their approvals would be required for major changes at railway stations, airports and sea or river ports.

Timeline

1. (0.5 year) Identify administrative officers at state, region, district, city, taluka and village level, who would be responsible for all traffic in that area.
2. (0.5 year) The “traffic officers” establish a single window system for addressing citizens’ concerns.
3. (1 year, after #1 above) Establish required processes and protocols so that traffic infrastructure projects executed by agencies other than local administration are executed as per the overall traffic plan of the city or town.

Depends on

Pros and cons, resistance expected

Processes, protocols and interfaces of the traffic officers with other state and national level agencies like NHAI, railways would need to be worked out carefully.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	2	0	1	1

Difficulty level: 4.

Importance

Importance = 2 (Must be implemented).

Criteria and evaluation

A hierarchy of such officials should be established at state, region, district, city, taluka and village level.

Score = 3 when such a hierarchy is established. Score up to 3 more points when all cities with more than 2 lakh population have this official in place. Score 4 more points for all remaining positions. The last two scores to be proportionate to number of positions filled. A statistically sound random sample of cities and smaller towns could be taken for the last two.

3.121 No separate traffic police establishment in rural areas

Organizations, Roles and Responsibilities		S

Solution

It is extremely important that there be a dedicated traffic police force for cities as well as countryside areas. This force must be properly trained in traffic matters. To make the best use of this training and the experience the staff gets, a traffic police personnel generally should not be transferred out of traffic department before completing 6 years of their duty.

Traffic police branches should be established at all Class I cities. District level traffic police branches should be established in all districts. They may have offices at taluka levels. Their area of jurisdiction should cover everything that is not covered by city traffic police branches.

Areas of jurisdictions of traffic police branches should be aligned with their respective police branches. These in turn should be aligned with the respective city administration boundaries. For example, the entire area that falls under Pune Municipal Corporation should fall under Pune City Police as well as Pune City Police's Traffic Branch.

Timeline

1. (0.5 years) Establish a city traffic police branch at all cities with more than 4 lakh population.
2. (0.5 years) Establish a city traffic police branch at all remaining Class I cities (cities with more than 1 lakh population).
3. (parallel) Align areas of jurisdiction of all police branches and traffic police branches to the respective city and town administrations.
4. (parallel to the two tasks above) Establish a district traffic police branch in all districts.

Depends on

Pros and cons, resistance expected

Aligning the areas of jurisdiction could be a laborious task, but should be undertaken unless there is a significant advantage in letting them be misaligned, the way they are today.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	1	0	0	0

Difficulty level: 2.

Importance

Importance = 2 (Must be implemented).

3.311 Confusion over whether IRC guidelines are mere guidelines or should be treated as rules

Organizations, Roles and Responsibilities		B

Solution

A high level delegation of traffic and transportation planners from Maharashtra should discuss the issue with IRC and any other authorities as may be required, to decide whether the IRC guidelines are to be regarded as “norms” and followed to the letter, or whether are to be regarded as “guidelines” and may be modified suitably. This distinction may also be done on a per guideline basis.

For IRC guidelines that are to be regarded only as guidelines and not as norms, Government of Maharashtra should have an additional set of documents that stipulates the deviations from the IRC guidelines that may be acceptable for implementation in Maharashtra. These documents should be made available to the public from a suitable website of Government of Maharashtra.

Periodic audits should be conducted to determine whether all infrastructure (new and old) conforms to IRC guidelines or to deviations acceptable in Maharashtra.

Timeline

1. (0.5 year) Determine the IRC guidelines that must be regarded as “norms” and followed to the letter. Remaining IRC guidelines may be treated as “guidelines”.

2. (1 year) Phase 1, for most important guidelines: Stipulate acceptable deviations from IRC guidelines that are to be regarded as “guidelines”.
3. (1.5 year, parallel) Phase 2, for remaining guidelines: Stipulate acceptable deviations from IRC guidelines that are to be regarded as “guidelines”.
4. (every year, for 4-5 years) Conduct periodic audits, at least till virtually all old and new infrastructure conforms to IRC guidelines or to deviations acceptable in Maharashtra.

Depends on

Pros and cons, resistance expected

This is an effort intensive task that needs to be carried out meticulously. This is a systemic change that must be given high priority. Creation, existence, knowledge and habitual practice of such norms needs to get in the blood of all concerned people, right from transportation planners to the contractors and their labor force. Absence of such meticulous processes should not be acceptable in a modern Maharashtra.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	2	2	2	0

Difficulty level: 7.

Importance

Importance = 1 (Must be implemented at any cost). Such norms form the backbone of all traffic infrastructure.

3.312 MSRDC and PWD objectives have overlaps

Organizations, Roles and Responsibilities		B

Solution

Establish clarity among which of these (and other such) organizations does what sort of projects. Their respective charters should provide this information, but that is not enough. A document or webpage on the Government of Maharashtra website should provide a comprehensive and unambiguous view of what sort of projects are done by which organizations.

Timeline

1. (0.5 years) Set up meetings between concerned officials and develop a document.

Depends on

Pros and cons, resistance expected

These meetings may be considered as superfluous and unnecessary. However, clarity at the highest level would go a long way in managing traffic infrastructure projects. In that sense, this is a fundamental task that must be done.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	0	0	1	0

Difficulty level: 1.

Importance

Importance = 2 (Must be implemented).

4.111 A lot of infrastructure focuses on difficulties faced by vehicles than by people

Infrastructure		G

Solution

The suggested solution for this problem is mostly covered in the solution suggested for problem “11.111 Officials agree to importance of PT but their actions encourage use of personal vehicles”, discussed at length in the section “Section 4. Public Transportation”.

Apart from conducting the workshops suggested in the aforementioned section, objectives of good transportation management in urban areas should be announced. These objectives should include the following:

2. It should be announced unambiguously and unequivocally that traffic infrastructure and transportation management in Maharashtra will be people friendly rather than vehicle friendly.
3. Quality of service offered to pedestrians: all urban roads wider than 24m should have good footpaths so that no people should be found walking on roads.
4. Quality of service offered to pedestrians: pedestrians should get enough time, as per IRC guidelines, to cross roads at signals. All signals should have clean, bright zebra stripes.

5. At least 40%, and preferably 60% of all vehicular trips in cities should be conducted by public transportation.
6. At least 15%, and preferably 20% of all vehicular trips in cities should be conducted by bicycles.
7. City traffic plans should strive to improve the throughput of the roads in terms of number of people transported and not in terms of vehicular speed.
8. A clear focus and objective of reducing serious and fatal accidents should be announced.

These objectives should be announced just before conducting the workshops mentioned in the blueprint for Public Transportation. This announcement should not be a one time, one day activity. Repeated mention of these objectives, along with a thorough public outreach program spread over 6 months is necessary so that all concerned officials as well as citizens understand what these objectives mean.

Timeline

1. (0.5 years) Announce objectives of Transportation Management as above, accompanied by a public outreach program.

Depends on

Pros and cons, resistance expected

All that such an announcement needs is a strong political will and focus. No resistance is expected if that will is present.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	0	0	2	0

Difficulty level: 2.

Importance

Importance = 1 (Must be implemented at any cost). This is perhaps the most important task from the entire blueprint. It is extremely important to set these objectives for transportation management.

4.112 IRC guidelines are not followed

Infrastructure	This is a benchmark problem	G

This observation refers to the contractors and workers who actually install the infrastructure not being well versed with the IRC guidelines. The infrastructure in question mainly includes “simple” infrastructure like the following:

- Road markings: length and width of the markings, their locations with respect to footpaths or intersections. Zebras are not included in this indicator as they need special attention.
- Signal poles: height and location of signal poles.
- Road signs: height and location of signs.
- Signs on or along footpaths and cycle tracks: especially for enough head clearance.

This issue mainly refers to physical dimensions of the signs and posts. It does not refer to “complex” infrastructure like bridges etc.

Solution

Contractors who install such infrastructure should be formally trained in IRC guidelines. There should be two kinds of training:

1. An exhaustive training session for first-time contractors.
2. A refresher course where frequently observed errors and mistakes are discussed. This refresher course should be conducted once every year.

Only trained contractors may be awarded the contracts for installing such signage. In addition, there should be a mechanism where citizens can bring such non-conformance issues to the notice of the local traffic authorities. NGOs of various kinds can play a very vital role here.

After conducting such training, a special project needs to be launched in cities and towns ensure that the signs and road markings are as per IRC norms. The project would have the following stages:

1. Conduct a survey in each city and town to note signs and markings that are not as per IRC norms.
2. Rectify the specific issues by taking appropriate actions.

Timeline

1. (0.5 year) Devise a course in IRC guidelines and make it mandatory for all contractors.
2. (parallel) Devise a system for citizens to bring non-conforming signage to the notice of the authorities.
3. (1 year) Conduct surveys in cities and towns as above.
4. (1 year) Fix all observed problems.

Steps #3 and 4 may be split to focus on signs and markings or in any such suitable way, so that the issues can be prioritized and funds required for fixing issues may be made available over 2 years.

Depends on

Pros and cons, resistance expected

None.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	1	1	0	0

Difficulty level: 3.

Importance

Importance = 3 (Should be implemented).

Criteria and evaluation

Check at least 1000 randomly chosen items from all over the state. They should include

- 250 from cities with more than 25 lakh population.
- 250 from cities with population between 5 and 25 lakh.
- 250 from towns and villages with less than 5 lakh population.
- 250 from NHs and SHs.

In each of these groups, there should be a fair mix of the 4 items mentioned above, as applicable (road markings, signal poles, road signs, signs along footpaths and cycle tracks). Score 1 point for every 10% items that conform to the relevant IRC standard. Deduct 1 point for every 5% inappropriately placed or used sign or marking. Examples of inappropriate placing or usage are:

- A “do not block intersection” marking in an intersection with a signal system.
- A “no entry” or “wrong way” sign that is seen after entering a 1-way from the wrong end. Instead, there should be no left turn/ no right turn signs that can be seen before taking a turn into such a road.
- Signs without enough head clearance, thus likely to cause bodily injury to pedestrians.

The above examples of non-conformance need special attention and deserve heavy negative points because they exhibit a total lack of application of mind than mere non-conformance to IRC guidelines.

4.113 Infrastructure not usable by physically handicapped

Infrastructure	G

To conform to Chapter VIII (Non-discrimination) of PWD act of 1995.

zzz To do: Criteria to decide whether the traffic infrastructure in Maharashtra is friendly to the physically handicapped. There could be international norms to evaluate whether traffic infrastructure is usable by physically handicapped. The criteria should follow such norms.

Solution

zzz1 To do

Timeline

1. (0.5 years)
2. (parallel)

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
2/ 1/ 0	2/ 1/ 0	2/ 1/ 0	2/ 1/ 0	2/ 1/ 0

Difficulty level:

Importance

Importance = 2 (Must be implemented).

4.211 infrastructure breaks down quickly, is not repaired promptly (Urban)

Infrastructure		S

Solution

The infrastructure in question mainly includes “simple” and basic infrastructure like road markings, signals and signal poles, signs etc. This issue does not refer to “complex” infrastructure like bridges etc.

Various steps should be taken to ensure that such simple infrastructure is always in good condition:

1. The contractors providing, installing and marking the signs and markings should also state the life of the signs and markings and should be made to maintain them during that period.
2. This might mean that “extra” budget would need to be provided for the signs and marking; but that is because the budget required for maintenance of this signage was never provided earlier. This budget can be easily provided if the principle of “first do basic things properly and only then go for the next level” is embraced.
3. Road signage is frequently stolen and sold in scrap. Scrap metal dealers should be taken in confidence to catch the suspects. An option is also to see if cheaper material that does not have much scrap value can be used for road signs. It might be worthwhile to go for such material even if it is less durable if the signs would not be stolen.

Timeline

1. (1 year) Process changes to ensure that the contractors are responsible for maintaining signs and markings during their stated life.
2. (parallel) Ensure that cities and towns allocate sufficient budgets.
3. (2 years) Experiment with different materials, follow up with IRC if needed, to eliminate or reduce thefts of road signs.

Depends on

Pros and cons, resistance expected

None.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	1	1	1	0

Difficulty level: 4.

Importance

Importance = 3 (Should be implemented).

4.212 Infrastructure breaks down quickly, is not repaired promptly (Rural, Countryside)

Infrastructure	S

This issue is much like “4.211 infrastructure breaks down quickly, is not repaired promptly (Urban)”. This issue focuses on rural and countryside infrastructure. The infrastructure in question mainly includes “simple” infrastructure like road markings, signs on highways and local roads etc.

This issue does not refer to “complex” infrastructure like bridges etc.

Solution

This issue is much like “4.211 infrastructure breaks down quickly, is not repaired promptly (Urban)”, therefore the steps to be taken to fix the issue are just like the steps mentioned in that issue. The only difference being, this issue focuses on rural and countryside infrastructure.

Timeline

1. (1 year) Process changes to ensure that the contractors are responsible for maintaining signs and markings during their stated life.
2. (parallel) Ensure that cities and towns allocate sufficient budgets.
3. (2 years) Experiment with different materials, follow up with IRC if needed, to eliminate or reduce thefts of road signs.

Depends on

Pros and cons, resistance expected

None.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	1	1	1	0

Difficulty level: 4.

Importance

Importance = 3 (Should be implemented).

4.213 Poor road quality, esp. in rural areas

Infrastructure	This is a benchmark problem	S

Solution

Although there may be norms and standard procedures for preparing and maintaining roads, it is seen that some roads are maintained in very good condition whereas some roads are in very bad condition. An expert consultant should be hired to study such disparity in road conditions, focusing on roads in rural areas.

Recommendations from this consultant should be translated to budget required for maintaining roads. All entities and organizations responsible for maintaining roads in respective areas (cities and towns, villages, countryside roads) should be provided the due share of funds as calculated from a formula suggested by the consultant.

It may be possible that the required amount of funds will turn out to be way too higher than funds “normally” allocated for maintenance nowadays. This is because we have never given any importance to maintaining things that we build and inaugurate. Creating and insisting on this mindset requires a certain political will. The approach taken should be “we will not build anything that we cannot maintain.” Then it should be possible to reduce unnecessary expenses to provide for maintenance of roads.

Annual audit should be performed to evaluate the conditions of the roads. Given the vast magnitude of the work, the audit would have to be random. Yet, it should be structured so that the concerned officer should feel that there is a reasonable (say, 20%) chance that the roads he is responsible for will indeed be audited. Mock or surprise audits may be conducted to keep the officers on their toes.

Appropriate action should be taken on officers who do not maintain the roads above a certain standard.

Timeline

1. (1 year) Study disparity in road conditions and develop guidelines to estimate maintenance budgets.
2. (3 years) If all of the required maintenance budget cannot be provided immediately, achieve the target in 3 years.
3. (every year) Conduct audits of road quality.

Depends on

Pros and cons, resistance expected

Funds required for good maintenance of roads could turn out to be significantly higher than today, and could open floodgates for corruption. The whole process would have to be supervised by efficient and honest officers.

A change of mindset will be required to adopt the approach “we will not build anything that we cannot maintain.”

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
2	1	1	2	0

Difficulty level: 6.

Importance

Importance = 2 (Must be implemented).

Criteria and evaluation

Use pothole counters to count potholes in the roads. In absence of pothole counters, count potholes that can hold 20 liters of water. (A pothole about 45 x 45 x 10 cm can hold 20 liters of water.) Check at least 1,000 randomly chosen one km stretches of roads from all over the state. All roads chosen for this indicator should be less than 24m wide. They should include

1. 100 km from cities with more than 20 lakh population.
2. 200 km from cities with population between 2 and 20 lakh.
3. 300 km from towns and villages with less than 2 lakh population.
4. 200 km each from SHs and district highways.

Count potholes in each stretch. The count should be 3 or less in a one-km stretch for the entire stretch to be called good.

Score 1 point for every 10% good stretches of roads.

4.214 Ineffective e-governance for maintenance of infrastructure

Infrastructure		S

This issue refers only to maintenance complaints and not to requests for new signals or signs etc.

Solution

Cities with e-governance systems should announce SLAs with respect to time taken to fix the issue, inform the complainant and close the case. Competent authorities should be provided sufficient equipment (computers, mobile devices etc) and training to access the complaints filed by citizens.

An annual performance audit of the e-governance system should be performed and its results should be announced on the local administrative body's website. The authorities responsible for addressing complaints received through this channel should be held responsible or incentivized if the performance falls below or above a certain threshold.

Timeline

1. (1 year) Provide sufficient equipment and training to competent authorities.
2. (0.5 year) Announce SLA to citizens as well as performance indicators and implications to authorities.
3. (every year) Conduct an audit of the e-governance system, upload outcome to website.

Depends on

Pros and cons, resistance expected

None.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	1	1	2	0

Difficulty level: 5.

Importance

Importance = 3 (Should be implemented).

4.311 Roads widened at the expense of footpaths

Infrastructure		B

Solution

Any road widening project must ensure that space available for pedestrians is not compromised. To ensure this, a template should be developed for such projects which mandates a survey of pedestrian facilities before and after the project.

A project would be considered as “complete” only when it can be demonstrated that fewer pedestrians have to walk on the road and the number of pedestrians walking on the footpath has increased as a result of the project. Strict departmental action should be taken on the officer approving the project if this condition is not satisfied. In addition, appropriate measures should be taken to not only restore but also improve the facilities enjoyed by pedestrians before the commencement of the project.

Timeline

1. (0.5 years) Develop a template that mandates that pedestrians’ facilities (safety and convenience) would not be compromised in any road project.

Depends on

Pros and cons, resistance expected

Once the mindset is developed or accepted that pedestrians must be provided sufficient facilities to be able to walk safely along the road, no resistance is expected.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	1	1	2	0

Difficulty level: 4.

Importance

Importance = 2 (Must be implemented).

4.312 Plethora of foot overbridges and underpasses being considered and planned

Infrastructure		B

Solution

The criteria for building a FOB/ underpass should not be whether vehicles can wait for pedestrians to cross, but whether the pedestrian flow at that location can safely accumulate on the footpath while waiting for the pedestrian phase, and can clear the intersection in a reasonable pedestrian phase. A FOB/ underpass should be allowed only when the pedestrian flow is found to be that high. Typically very crowded market places or tourist places may find such high pedestrian flows.

Even in that situation, the FOB/ underpass would have to be handicapped friendly. If such a FOB/ underpass cannot be built at the location, a handicapped friendly facility to cross the road should be available within a reasonable distance. For example, at such

places, FOB/ underpasses and at grade signaled pedestrian crossing facilities may be provided at alternate intersections.

A template should be created for proposals of FOB/ underpasses. This template should have a section for studying and recording the pedestrian flow, and demonstrating that such a high pedestrian flow cannot be accommodated and cleared using any of the following methods:

- Widen the footpath as well as zebra stripes
- Integrate pedestrian phase with vehicular phases, instead of providing a dedicated pedestrian phase with “all reds”
- If the number of pedestrians is so high, can the road be converted to a pedestrian plaza?

The FoB/ underpass proposal should be able to demonstrate that such an FoB built elsewhere is gladly used by pedestrians and it will be used here too.

Timeline

1. (0.5 years) Prepare and mandate such a template.

Depends on

Pros and cons, resistance expected

Vehicular traffic in cities must learn to stop and wait for pedestrians to cross roads. Some efforts may be needed to calm down the clamoring of the driver community till people accept this fact.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	0	0	2	0

Difficulty level: 2.

Importance

Importance = 2 (Must be implemented).

4.313 Maintenance of vehicular signals gets lopsided preference over pedestrians' signals

Infrastructure		B

Solution

Government of Maharashtra should issue a mandate that each city or town conduct an annual audit of the condition of the signals. The audit report should mention the following:

1. Number of vehicular signal aspects in the city (total and working).
2. Number of pedestrian signal aspects in the city (total and working).
3. Total number of intersection with a signal system.
4. Number of intersection where all vehicular aspects are working.
5. Number of intersection where all pedestrian aspects are working.
6. Number of intersections with pedestrian phases as per IRC guidelines.

Timeline

1. (0.5 years) Issue a mandate as stated above.
2. (every year) Follow up and publish the audit reports on a suitable website.

Depends on

Pros and cons, resistance expected

No difficulties expected. Such an audit could take about a week's effort, but the effort will highlight issues that would be otherwise left ignored.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	0	1	1	0

Difficulty level: 2.

Importance

Importance = 3 (Should be implemented).

4.314 Signs on footpaths could injure people

Infrastructure		B

Solution

This issue is covered in "4.112 IRC guidelines are not followed".

4.315 Insufficient right of way timing for pedestrians at signals

Infrastructure

This is a benchmark problem

B

Solution

A special project needs to be launched in cities and towns to ensure that pedestrians get sufficient time at intersections with traffic signals to cross the roads safely. This project could be clubbed with the project described in “4.323 Traffic signals not visible to approaching or stopped vehicles” and called a “junction improvement project”.

IRC guideline no. IRC:93-1985 states that the duration of the pedestrian phase should be calculated as the time needed to cross the road at a speed of 1.2m/s plus 7 seconds as reaction time. The objective of this project is to ensure that pedestrians get this much time either to cross the entire road in one go or for each section of the road if individual sections of the road can be crossed safely (for example, from footpath to a pedestrian refuge midway and then from the refuge to the footpath on the other side). It should be noted that a small platform on a divider is not a pedestrian refuge.

The project would have the following stages:

1. Visit each intersection with traffic signals.
2. Check whether pedestrians get sufficient time as stipulated by IRC:93-1985 to cross any of the streets at each intersection.
3. Rectify the specific issues by taking appropriate actions.

Timeline

1. (0.5 year) Conduct a special “crossing roads at signals” survey in all cities.
2. (0.5 year) Fix all observed problems.

Depends on

Pros and cons, resistance expected

None.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	0	1	1	0

Difficulty level: 3.

Importance

Importance = 2 (Must be implemented).

Criteria and evaluation

Check at least 100 randomly chosen intersections with signals from all over the state. They should include

1. 75 from cities with more than 25 lakh population.
2. 20 from cities with population between 5 and 25 lakh.
3. 5 from towns and villages with less than 5 lakh population.

There should be a fair mix of wide and narrow roads, especially for large cities.

Measure the pedestrian phase duration at each of the intersection. Some signals may not have a pedestrian phase common for all roads, but could provide appropriate timing for individual roads integrated with vehicular phases for roads orthogonal to them. Also check if all pedestrian signals are working at the intersection.

An intersection is called “good” when there is sufficient pedestrian phase as per IRC specifications for crossing the road at any of the expected locations and each such location has a working pedestrian signal.

Score 1 point for every 10% good intersections.

4.316 Misaligned zebra stripes

Infrastructure	

	B

Solution

A special project needs to be launched in cities and towns to ensure that the zebras are properly aligned. This project could be clubbed with the project described in “4.323 Traffic signals not visible to approaching or stopped vehicles” and called a “junction improvement project”, or could be executed as a part of “4.112 IRC guidelines are not followed”.

The objective of this project is to ensure that each and every zebra is safely walk-able from end to end, without having to jump over a divider or a fence. Each zebra should start and terminate at a footpath or a good pedestrian refuge. It should be noted that a small platform on a divider is not a pedestrian refuge.

The project would have the following stages:

1. Visit each intersection with traffic signals, and also zebra stripes at places like schools and hospitals.
2. Check whether both ends of the zebras terminate at areas that are safe for pedestrians.
3. Rectify the specific issues by taking appropriate actions.

Timeline

1. (0.5 year) Conduct a “walk-ability at zebras” survey in all cities and towns.
2. (0.5 year) Fix all observed problems.

Depends on

Pros and cons, resistance expected

None.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	0	1	1	0

Difficulty level: 3.

Importance

Importance = 2 (Must be implemented).

4.321 Signs not very conspicuous

Infrastructure		B

Solution

This is included in the paragraph “4.324 Difficult to see roadside signs in heavy traffic”.

4.322 Improper placement of traffic signs

Aspect		B

Solution

This is covered in “4.112 IRC guidelines are not followed”.

4.323 Traffic signals not visible to approaching or stopped vehicles

Infrastructure		B

Solution

Although this issue could have been clubbed under the scope of the issue “4.112 IRC guidelines are not followed”, visibility of traffic signals is more important because signals are installed at intersections and a traffic signal that cannot be easily seen can cause severe accidents.

A special project needs to be launched in cities with traffic signals to ensure that the signals are clearly visible. The project would have the following stages:

1. Visit each intersection with traffic signals.
2. Check whether all signal aspects (vehicular as well as pedestrian) are visible to vehicles and pedestrians coming from respective directions.
3. Rectify the specific issues by taking appropriate actions.

It may be noted that some signals might satisfy the visibility criteria stated in IRC standards, yet they may not be visible because of certain peculiar conditions specific to the site. For example, a signal on a road going due west may not be visible in evening if the Sun is directly behind a signal on a specific day. Therefore such visibility testing needs to take in account the changing position of the Sun through the year as well.

Signals may not be visible also because of obstructing tree branches. A road may have a very high number of buses or trucks, thus increasing the probability that a personal vehicle may find itself behind a tall vehicle, hampering the visibility of signals more frequently.

In addition to all these issues, care will have to be taken to ensure that posters, hoardings, banners etc do not obstruct the signal's view.

Timeline

1. (0.5 year) Conduct a special “signal visibility” survey in all cities.
2. (0.5 year) Fix all observed problems.

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	0	1	1	0

Difficulty level: 3.

Importance

Importance = 3 (Should be implemented).

4.324 Difficult to see roadside signs in heavy traffic

Infrastructure		B

Solution

zzz: To do

Timeline

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
2/ 1/ 0	2/ 1/ 0	2/ 1/ 0	2/ 1/ 0	2/ 1/ 0

Difficulty level:

Importance

Importance = 1 (Must be implemented at any cost, Must be implemented, Should be implemented, Nice to do).

4.325 Signs used for unintended situations

Infrastructure		B

Solution

Examples of inappropriate placing or usage are:

- A “do not block intersection” marking in an intersection with a signal system.

- A “no entry” or “wrong way” sign that is seen after entering a 1-way from the wrong end. Instead, there should be no left turn/ no right turn signs that can be seen before taking a turn into such a road.

The process of fixing such signs could be clubbed with the project described in “4.112 IRC guidelines are not followed”.

Timeline

1. Along with “4.112 IRC guidelines are not followed”.

Depends on

Pros and cons, resistance expected

As per “4.112 IRC guidelines are not followed”.

4.326 Road construction: signs do not give adequate warning to drivers

Infrastructure	This is a benchmark problem	B

Signs that warn drivers of construction zones are especially important for safety of construction workers as well as drivers and passengers in vehicles.

Solution

IRC’s guideline no **zzzx** describes this.

Only construction signs that conform to these norms should be manufactured and used. Surprise checks at sites should inspect these norms and penalize contractors or even cancel the contracts.

Timeline

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
2/ 1/ 0	2/ 1/ 0	2/ 1/ 0	2/ 1/ 0	2/ 1/ 0

Difficulty level:

Importance

Importance = 1 (Must be implemented at any cost, Must be implemented, Should be implemented, Nice to do).

Criteria and evaluation

Conduct surprise checks at minimum 100 construction sites across the state every year. A site is considered “good” if construction signs are present at all required positions and all signs conform to norms.

Score 1 point for every 10% good sites.

4.331 Road markings not planned meticulously, not maintained properly

Infrastructure	B

Since a good amount of countryside traffic moves at high speed, it is important that these markings are accompanied with roadside signs, where appropriate, to provide ample warning to the drivers.

Solution

zzz1 To do

Timeline

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
2/ 1/ 0	2/ 1/ 0	2/ 1/ 0	2/ 1/ 0	2/ 1/ 0

Difficulty level:

Importance

Importance = 1 (Must be implemented at any cost, Must be implemented, Should be implemented, Nice to do).

4.332 Old signs not changed with changes in infrastructure or traffic pattern

Infrastructure		B

Solution

A systematic project plan should be prepared for changes in infrastructure or traffic pattern. There should be a template for preparing such a plan. The template should have sections for changes needed in signage. The work orders should include removing or installing such signage.

Any such project should be approved as “complete” by the traffic officer only after checking that all changes in signage are complete, before making payments to contractors.

Timeline

1. (0.5 year) Prepare a template for changes in infrastructure or traffic pattern.
2. (0.5 year) Make changes in related process to ensure that the template will be put to use effectively.

Depends on

Pros and cons, resistance expected

None.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	1	0	1	0

Difficulty level: 2.

Importance

Importance = 3 (Should be implemented).

4.341 NHs, SHs have non-uniform, weak earthen shoulders

Infrastructure		B

Earthen shoulders of highways cause accidents if they suddenly vary in width, are weak and have a sharp step from the tar/ concrete to the shoulder.

Solution

A district-wise inspection of all NHs and SHs should be conducted to inspect whether the shoulders of the roads are as per specifications. They should be at least as wide as specified in IRC: **zzz**x. At no place should the shoulder have a step more than **zzz**x cm from the surface of the main road.

Each district should then prepare a time-bound plan to fix the issues and execute the plan. They should ideally be fixed in one year, but in two years in any case.

Timeline

1. (1 year) All districts to inspect all NHs and SHs passing through and prepare a plan to fix shoulders.
2. (2 years) Fix all observed issues.

Depends on

Pros and cons, resistance expected

None.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	1	1	0	0

Difficulty level: 2.

Importance

Importance = 3 (Should be implemented).

4.342 SHs can barely accommodate two wide vehicles

Infrastructure		B

Solution

A district-wise inspection of all NHs and SHs should be conducted to inspect whether the width of the road is at least m.

Each district should then prepare a time-bound plan to fix the issues and execute the plan. They should ideally be fixed in one year, but in two years in any case.

This task could be combined with the task described in “4.341 NHs, SHs have non-uniform, weak earthen shoulders” above.

Timeline

1. (1 year) All districts to inspect all NHs and SHs passing through and prepare a plan to widen the roads to at least m.
2. (2 years) Fix all observed issues.

Depends on

Pros and cons, resistance expected

It may not be possible to widen some roads where roadside properties are too close to the roads and also some stretches of roads in hilly region.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	1	1	0	0

Difficulty level: 2.

Importance

Importance = 3 (Should be implemented).

4.343 Special infrastructure is needed for places with high number of certain kinds of vehicles

Infrastructure		B

Solution

A large part of the problem is addressed by “1.311 No template for studying traffic flow to decide steps to be taken”. This section mostly covers the implementation part.

Examples of such locations and vehicles are: factories (trucks), tourist attractions (buses, minibuses, vans). Trucks need a wider turning radius. Buses and vans need special

parking facilities near eating places. It is generally seen that no special effort has been put in place to plan specific facilities for such traffic patterns. In most cases things have happened “with time” and people have learned to live with the chaos such traffic patterns lead to.

Once the templates to address needs of such peculiar traffic patterns are available, each district should use them to list down places with a higher than average number of certain kinds of vehicles. Identify specific needs for such spots, develop and execute plans to address them so that traffic in that area becomes orderly.

Timeline

1. (0.5 year) Use the templates to list locations where special infrastructure is needed.
2. (1 year) Develop plans.
3. (2 years) Implement plans. Steps #2 and #3 may be done in a phased manner.

Depends on

Pros and cons, resistance expected

None.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	1	1	1	0

Difficulty level: 4.

Importance

Importance = 3 (Should be implemented).

4.351 Bus stops on NHs and SHs: No bus bays

Infrastructure		B

Solution

The objectives are:

1. To ensure that the bus passengers have a safe place to stand along a highway as they are waiting for their bus and also to cross the road to and from the bus stop.
2. Flow of traffic on NHs and SHs should not be hampered when a bus has stopped to pick up passengers.

All bus stops along NHs and SHs should have bus bays. This applies to request stops as well as regular stops. The request stops and bays should be designed in such a way that driver of an approaching bus should be able to see from at least 200m whether there are any waiting passengers.

The bus stops should have bright zebra stripes and pedestrian crossing signs to alert other vehicles of possible pedestrian crossing activity. These signs should be placed well ahead of the actual crossing, so that drivers can slow down and even stop their vehicles well in time.

MSRTC should conduct a district-wise inspection along all NHs and SHs to inspect whether all bus stops satisfy the aforementioned objective. It should then prepare a plan to fix the issues and execute the plan. Most crowded bus stops could be addressed in phase 1 and remaining stops in phase 2.

Timeline

1. (1 year) conduct a district-wise inspection of bus stops along all NHs and SHs and prepare a plan to meet the objectives.
2. (1 year) Phase 1 of the plan: most crowded bus stops.
3. (1 year) Phase 2 of the plan: remaining bus stops.

Depends on

Pros and cons, resistance expected

None.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	1	1	0	0

Difficulty level: 3.

Importance

Importance = 3 (Should be implemented).

4.352 Rural, countryside bus stops are in bad condition

Infrastructure		B

Solution

The objective is to ensure that people can and do wait in the bus stops while waiting for their bus. Some reasons why they do not do so are:

- Bus shelters are not clean.
- There may be stray dogs and other animals inside the shelters.
- There is no place inside the stop to sit anyway, so people sit or stand outside.
- One cannot see an approaching bus from inside the stop.
- The driver of an approaching bus cannot see if there are people inside the stop.
- The passengers are not confident that the bus driver will stop the bus if it takes a bit longer for them to come out of the shelter and reach the bus.

The design of the bus stop should be such that it eliminates all applicable reasons from the above. In addition, the drivers' mindset may have to be changed where applicable to make sure that the buses stop at the right place and safely pick up passengers.

A design school should be hired to develop design guidelines to make sure that aspects like mutual visibility of the bus driver and passengers are taken care of. Any benches in the stops should be made of cement for easy maintenance and to avoid theft or vandalism.

Bus stops should be surveyed and stops where people habitually wait outside the shelter should be specially studied to understand why the stops are not used. All identified problems should be fixed, including cleanliness of the stops, stray animals etc. Help may be taken from local villagers if necessary.

Timeline

1. (0.5 year) Survey bus stops and identify stops where people habitually stand outside the stop/ shelter.
2. (1 year) Hire a design school to study the issue and prepare design guidelines.
3. (1 year) Phase 1: Implement the guidelines at important stops.
4. (1 year) Phase 2: Implement the guidelines at remaining stops.

Depends on

Pros and cons, resistance expected

Not only the MSRTC officials but also commuters seem to have a callous approach towards the passengers' rights. As a result, they have probably resigned to the fact that most bus stops are not of any use. They may not consider this a worthwhile task.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest

1	1	1	1	0

Difficulty level: 4.

Importance

Importance = 3 (Should be implemented).

4.353 Safe drinking water (not bottled) is rarely available

Infrastructure		B

Solution

The problem here is limited not only to clean drinking water, but also includes good restroom facilities, “4.354 Clean restrooms are not available”. The solution proposed here addresses both problems.

“Rest area” facilities should be developed along NHs and SHs. These facilities should have free potable drinking water, clean restrooms with a water supply and refreshment facilities that are affordable to the common man. The restroom facilities may be at a nominal or token cost to ensure maintenance and cleanliness.

There should be sufficient parking area so that tired drivers can park their vehicles and take some rest before resuming their journey.

These rest areas should be located about 75-80 km from each other in the countryside. There need not be any rest area within 60 km from a Class I or Class II town.

Such rest areas should be developed on both sides of the highway if the highway is a 2+2 lane or wider divided highway. There can be only one rest area to serve traffic in both directions if the highway is not divided.

When developing two (split) rest areas along divided highways, one for “my” side and the other for the “oncoming” traffic, the rest area for the oncoming traffic should come first and the rest area for “my” side should come within about a km. The following signs should be placed to inform drivers of the rest areas:

- Rest area: 10 km
- Rest area: 1 km (For split rest areas along divided highways, this sign should be placed right where there is a rest area on the opposite side)
- Next rest area: XYZ km

Timeline

1. (0.5 year) Survey all NHs and determine locations of rest areas.

2. (2 years) Build rest areas along NHs
3. (1 year, parallel) Survey all SHs and determine locations for rest areas.
4. (4 years) Build rest areas along SHs. This step may be done in 2 phases.

Timeline

Depends on

Pros and cons, resistance expected

Ensuring water supply, especially for rest rooms, could be challenging in certain parts of the state. However, developing such facilities should be considered a prerequisite for a country that aspires to be considered as a developed country. Developing this mindset is perhaps the biggest hurdle in building the rest areas.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	1	0	2	0

Difficulty level: 4.

Importance

Importance = 2 (Must be implemented).

4.354 Clean restrooms are not available

Infrastructure		B

Solution

Solution to this problem is included in the solution for “4.353 Safe drinking water (not bottled) is rarely available”.

4.355 No structure to provide information about the area to commuters, tourists

Aspect		B

Solution

The rest areas along NHs recommended in “4.25. Safe drinking water (not bottled) is rarely available” should include an information kiosk. This kiosk could be staffed where

material like maps and pamphlets is sold or distributed. Else simple information can be provided by way of maps, charts and notices fixed on the wall.

The information kiosks should provide the following information:

1. A map of Maharashtra that identifies the location.
2. A detailed map of the surrounding area, 100 km from the location. This map should identify tourist attractions, major accommodation facilities, fuel stations, hospitals.
3. Pamphlets of tourist attractions.
4. Pamphlets of commercial facilities like hotels and restaurants, museums, amusement parks etc.
5. Phone numbers of police stations, hospitals and other medical and emergency help.

The rest areas should be located such that the commuters are greeted with the first rest area and information kiosk within 10 km of entering Maharashtra.

Timeline

1. As in “4.353 Safe drinking water (not bottled) is rarely available”

Depends on

Pros and cons, resistance expected

None.

Pros and cons

Resistance expected from

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	0	0	0	0

Difficulty level: 0.

Importance

Importance = 4 (Nice to do).

5.111 Lack of trained traffic planners in smaller towns

Education	This is a benchmark problem	G

Solution

Traffic planning cells should be established at the following levels:

1. Class I towns (towns with population of 1 lakh and above)
2. Taluka
3. District
4. State

The traffic planning cells at Class I town and Taluka levels should have 1 traffic planner per 10 lakh population served. These traffic planners should report to the traffic officer.

(Please see “3.111 No single official responsible for all traffic, including planning, execution and enforcement”). The traffic planners should have received at least 1 year of specialized training in traffic and transportation.

Decisions like which roads should be widened, which roads should be converted to 1-ways or 2-ways, where to allow or ban turns, where to install signals should be taken by the traffic planning cell. All stakeholders, including citizens, traffic police, local public transport service, MSRTC, rickshaws and taxis, may give suggestions regarding all such items in traffic planning to the traffic planning cell. The cell would discuss the changes with all appropriate entities and take a decision.

These decisions should be based on data collected from the field and prevalent theory of transportation management, rather than using “common sense and gut feeling”. It would be the responsibility of the traffic planners to demonstrate that necessary surveys were done and data were collected.

Timeline

1. (1 year) Establish traffic cells at various levels.
2. (1 year) Staff the traffic cells and provide required infrastructure.

Depends on

Pros and cons, resistance expected

Initially there may not be sufficient number of trained personnel for these traffic cells. A suitably diluted set of qualifications may have to be accepted and the recruited traffic planners may have to be trained on the job by way of short term courses at institutes like CIRT.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	1	0	1	0

Difficulty level: 3.

Importance

Importance = 2 (Must be implemented).

Criteria and evaluation

Count cities and towns with sufficient number of traffic planners who have had at least 1 year of full time training on traffic planning. For large cities, there should be minimum 1 such traffic planner for every 10 lakh population.

Score 1 point for every 20% large cities (more than 2 lakh population) with sufficient number of traffic planners as above. Score 1 point for every 20% smaller cities (between 1 to 2 lakh population) with at least one traffic planner.

5.121 Quality of driving tests is very bad

Education	This is a benchmark problem	G

Solution

Driving tests should be made much stricter and much more exhaustive. A few things will need to be put in place before this can be done:

1. Preparing the people's mindset: People will need to be made aware that driving tests will become stricter in the days to come. A sample test facility may be created at a few locations and driving instructors be invited to undergo a mock test.
2. Booklets should be made and sold at a nominal cost to help people prepare for driving tests. Sponsors may be identified to keep the costs low.
3. Large and special testing facilities should be created for driving tests. These facilities would have various road patterns in a closed, controlled environment. For example, signals and signs of various kinds.
4. A large number of inspectors will have to be recruited because each driving test would now take much longer than it does today.

The driving tests should test the drivers' skills regarding the following:

1. Correct use of the equipment: e.g. directional blinkers, hand brake.
2. Knowledge of basic traffic rules: e.g. respecting pedestrians' rights, correctly stopping at red and amber signals.
3. Safety practices: e.g. checking blind spots, smooth lane changes and stops.
4. Not causing hindrance to others: e.g. smooth parallel parking, not blocking intersections.

All in all, a driving test should take at least 10 minutes in an enclosed area. If s/he passes this part of the test, s/he should be asked to drive the vehicle on a normal road for about 5 minutes while undergoing maneuvers instructed.

Timeline

1. (1 year) Build a few sample testing facilities at major RTOs.
2. (parallel) Start informing people that driving tests will become very strict soon.
3. (1 year) Invite driving school instructors for free mock tests, so that they can start teaching their students accordingly.
4. (parallel) Build required testing facilities at all RTOs.
5. (parallel) Sell or distribute information on new tests.
6. (after #4) Start stricter tests for 4-wheelers, heavy vehicles, ambulances etc.
7. (1 year after #6) Start stricter tests for 2-wheelers and all remaining classes of vehicles.

Depends on

Pros and cons, resistance expected

Finding space for testing facilities at RTOs in large cities may be a problem. Stricter tests will increase the cost of driving education and will make it tougher for people to get a license in the first attempt, and may make them feel that the government/ RTO is making their life difficult. A meticulously planned campaign to prepare their mindset is a must.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	2	2	2	1

Difficulty level: 8.

Importance

Importance = 1 (Must be implemented at any cost and against all odds).

Criteria and evaluation

Score points as indicated below for documentary evidence of the following:

3 points: The road test is conducted in protected area instead of on public roads.

2 points: Aspirant driver is tested on at least 20 different aspects of safe and good driving, and is given a scorecard at the end of the test.

1, 2, 3, 4 or 5 points: The success rate of aspirants appearing for the first time is less than 90%, 80%, 70%, 60% and 50% respectively.

5.211 Traffic planners out of touch with latest trends in the world

Education		S

Solution

The traffic planners in the traffic cells at various levels should be well versed in latest traffic planning practices and trends in the world. A course should be designed for this purpose with help of CIRT or some such organization. The course should use examples of traffic planning only from the last 5 or 10 years. The duration of the course should be preferably 5 but minimum 2 days. It may be split in 2 parts.

All traffic planners from the state should undergo this refresher course every year. Therefore the course will have to be redesigned every year, with examples not covered earlier.

Timeline

1. (0.5 year) Develop a refresher course for traffic planners.
2. (1 year) All traffic planners to undergo the refresher course.
3. (parallel) Develop the next refresher course, and so on...

Depends on

Pros and cons, resistance expected

An excuse that may be given to attend a refresher course is “there is too much work and planners cannot spend time for the course”. Attending the course should be made mandatory and integrated in the regular course of work.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	0	1	1	0

Difficulty level: 2.

Importance

Importance = 3 (Should be implemented).

5.212 Traffic planners not free from political influence

Education		S

Solution

The only way to ensure that traffic planning decisions are taken after sound statistical observations and after following traffic planning theories, and not as per politicians' whims is to make such records mandatory.

The traffic officer should maintain a page on an appropriate website or maintain records that list the traffic planning decisions taken and attach justification of each decision. These decisions, including the associated plans, surveys and traffic counts etc. should naturally fall under the purview of RTI, thus ensuring that they are not driven by political influence alone.

Timeline

1. (0.5 year) Create a webpage to announce all decisions by traffic cell.
2. (ongoing) Every transportation management decision to be uploaded on the page, with data.

Depends on

Pros and cons, resistance expected

These processes can be easily labeled as "cumbersome" and "slowing down progress". Additional staff may be needed to adhere to the processes, keep the website up to date.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	1	1	1	0

Difficulty level: 4.

Importance

Importance = 2 (Must be implemented).

5.221 Inadequate training for traffic police - also need to look into their tenure and transferability

Education		S

Solution

Although some training is provided to all traffic police, the contents of the training need to be completely revamped and the courses need to be developed again from scratch. The following training courses should be developed for all traffic police:

1. A 5 day course for staffers at all levels, whether freshly inducted in or transferred to the traffic police force.
2. A 1 or 2 day refresher course for the above.
3. A 2 or 3 day course on traffic planning.

Course #1 should include the following topics, though additional topics may be included:

- Traffic rules
- IRC norms and guidelines on traffic signs, road markings and traffic signals
- Traffic control

Course #2 is for all staffers who have undergone course #1 more than 3 years ago.

Course #3 should be only for senior officers above a certain rank like Police Inspector. The intention of this course is essentially to provide a glimpse of the standards and practices used by traffic planners. Traffic police officials promoted to this rank as well as being transferred in traffic police force at or above this rank should undergo this course within 2 months of them assuming the responsibility.

Under normal circumstances, the tenure of traffic police personnel at all levels should be at least 6 years. They may be transferred to another city if needed, but they should be retained as traffic police for 6 years.

Timeline

1. (0.5 year) Develop a course for traffic police staffers at all levels.
2. (parallel) Develop a refresher course for the above.
3. (parallel) Develop a traffic planning course for senior officers.
4. (parallel) Increase minimum tenure of traffic police personnel to 6 years.

Depends on

Pros and cons, resistance expected

There may be some resistance to redesign the training course because “there already exists one”. Increasing the tenure to 6 years may also meet some resistance if the traffic police department is not the preferred department of the police staff.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest

0	1	0	1	1

Difficulty level: 3.

Importance

Importance = 2 (Must be implemented).

5.231 Requirements for driving instructors not stringent

Education		S

Solution

Any person with a valid driving license can take up a job as a driving instructor at a driving school. It is only up to the driving school to insist on experience or any additional qualifications from a candidate aspiring to become an instructor.

In order to raise the quality of driving and traffic education and thus to produce better and safer drivers, it is imperative that there be strict norms that a person must pass to become a driving instructor. The following norms should be mandatory:

1. The candidate must possess a driving license for at least 5 years.
2. The candidate's driving license must never have been revoked for any reason whatsoever. The candidate must not have any fatal accident as well as a maximum of 2 "moving violations" under his name.
3. The RTO should devise a special written and road test for would-be instructors of various vehicle types. These tests may be derived from similar tests in developed countries and adopted to Indian conditions. These tests should not be very easy. An indicator of difficulty of these tests is how many applicants pass these tests in the first attempt. This indicator should be commensurate with what is observed in developed countries.
4. Certain educational qualifications or extra training in interacting with people should also be required to improve the chances that the instructors are well behaved.
5. These changes will need amendments in MVA, 1988. When the amendments are passed, they should be put in effect immediately. People should not open driving schools and take up jobs as instructors simply because it would be very difficult to do so in 6 months.
6. The amendments should also have a provision to make these norms mandatory even to those already working as driving instructors. This step can be ensured in a phased manner over 5 years (e.g., depending on when the instructor got his/ her driving license or using some such criteria).

Timeline

1. (0.5 year) Announce the intent of extra qualifications for instructors and invite suggestions. Would need to send special letters to driving schools and NGOs working in the area of traffic improvements.
2. (1 year) Analyze suggestions and formulate amendments in MVA, 1988 and related rules.
3. (3 years) Follow up with the Central Government, lobby with other state governments to get the amendment passed.
4. (immediately) Put the amendment in effect immediately.
5. (5 years) All instructors should pass the norms laid forth.

Depends on

Pros and cons, resistance expected

It may be argued that driving instruction is a source of earning bread and butter for some people and the Government is making it difficult for them to earn a living. It may also be argued that this will increase the cost of driving instruction, thus making it difficult for the common man to earn a living.

It may also be argued that the Government should first provide excellent public transportation before making it difficult to get a license to drive one's own vehicle.

While there may be a slight element of truth in the latter point, it does not anyway apply to commercial drivers. Becoming a driving instructor should be treated similar to becoming a doctor, since people's lives are at stake. Such arguments must be firmly refuted.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	1	1	2	1

Difficulty level: 5.

Importance

Importance = 2 (Must be implemented at any cost).

5.311 Contractors and actual workers not trained in IRC and other applicable norms

Education		B

Solution

While the actual work related to infrastructure is the main subject discussed in “4.112 IRC guidelines are not followed”, this issue tracks whether systematic training is provided to the contractors and workers.

Develop a formal training session in IRC standards. This training should be given not only to contractors but also to all workers who actually paint markings and erect signs on roads. There may be different courses for different kinds of infrastructure, e.g. one for signals, one for road markings, one for roadside signs etc. This training should be at cost to the contractors.

Attendance to this course should be well documented. Spot checks should be made to ensure that contractors working on any project have been given required training by the contractors. Citizens should also be encouraged to make spot checks using RTI and such tools.

Timeline

1. (0.5 year) Devise courses for IRC guidelines.
2. (1 year) All contractors are given one year to train all workers.

Depends on

Pros and cons, resistance expected

None.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	0	1	1	0

Difficulty level: 2.

Importance

Importance = 3 (Should be implemented).

5.321 No traffic education for drivers of non-motorized vehicles

Education		B

Solution

While very strict driving tests as well as norms for becoming driving instructors are necessary, even pedestrians and cyclists must be made aware of perils of traffic and should be taught how to use the traffic system safely.

Such education must be provided right from primary school and should continue to S.S.C. level. Such education will in fact make it easier to prepare the mindset for stricter driving tests.

Lesson should be included in the subject “Civics” or “Value Education”, and should focus on the following:

1. Driving is a privilege and walking is a right. Pedestrians and their safety must be respected and ensured.
2. Safety precautions for pedestrians.
3. Safety precautions for cyclists.
4. Importance of being considerate to others and sharing the road.
5. How our acts can pose hazards for others if we are careless.
6. Importance of reaching home safe versus reaching home early.
7. Examples of extreme safety precautions and related laws in other countries. Data on road accident rates in developed countries and the dictum “safety is not by accident but by design”.
8. Traffic habits in villages, cities and on the countryside. How are these environments different from others and what are the correct/ wrong habits in each.

Some of these topics will have to be repeated in multiple standards during school. These topics should have questions of about 2-5% weightage in social studies.

It is recommended that instead of splitting the topic in 10 chapters and including the chapters in textbooks from Std 1 to 10, a single booklet should contain all information. That way, a “reference book” will be available not only for the students in school, but also for their parents and siblings. Also, students who drop out of school for any reason would have the material in their homes.

Timeline

1. (1 year) Devise topics in curriculum at various levels.
2. (1 year) Make the subject mandatory in the school curriculum.

Depends on

Pros and cons, resistance expected

Most of the topics and information would be based on common sense and values, so no special training for school teachers would be needed.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	0	0	2	0

Difficulty level: 2.

Importance

Importance = 2 (Must be implemented).

5.322 No traffic education for pedestrians

Education		B

Solution

This is included in the section “5.8. No traffic education for drivers of non-motorized vehicles”.

5.331 No or poor driving training in rural areas

Education		B

Solution

Driving schools virtually do not exist in rural areas of the state. Most of the people applying for a driving license have merely learnt how to handle a vehicle to some extent and are completely unaware of even basic road safety practices.

The following issues need to be tackled for improving driving training in rural areas:

1. Stress that one cannot easily get a driving license without some proper training.
2. The training should be within financial reach of most people.

It should be noted that these issues apply even to urban areas to some extent!

These issues can be addressed by taking actions on all of the associated fronts, as follows.

1. Stress on people's mind that driving is a privilege and one can get the privilege only after obtaining the required knowledge. It is true that if one does not have a license to drive a vehicle, it hampers one's mobility and also ability to do some business and thus livelihood. However, granting driving licenses left and right is not a solution to this problem. The solution must be to obtain the required skills to get the license.
2. Making driving tests stricter is one step in that direction, and is discussed elsewhere in this document.
3. The state should take special steps to first train high quality trainers to provide driving education.
4. It may be possible to partner with entities like insurance companies to provide quality training at discounted rates in rural areas.
5. Mobile driving schools could bring the training to the doorstep of the populace.

Timeline

1. (1 year) Devise a comprehensive program based on the approach suggested above.
2. (4 years) Cover the state in two stages of 2 years each, in a planned and measurable fashion.

Depends on

5.121 Quality of driving tests is very bad

Pros and cons, resistance expected

Pros and cons

No cons, though it may be a challenge to build a funding model for driving education. The last resort is government subsidies. However, considering the number of lives that could be potentially saved by good driving education, these subsidies would pay off in future.

Resistance expected from

Charging people to provide driving education, even at discounted rates, may be termed as a ploy to benefit driving schools. Such arguments would have to be dealt with by preparing people's mindset.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	2	2	2	1

Difficulty level: 10.

Importance

Importance = 2 (Must be implemented).

6.111 Special "traffic police" squad only in larger towns

Discipline		G

Solution

This issue is covered in "3.121 No separate traffic police establishment in rural areas".

6.112 Hardly any mobile police patrol doing random checks

Discipline		G

Solution

Apart from creating special traffic police squads, it is also necessary to keep them mobile. If people start thinking "You never know where and how traffic police would catch me breaking traffic rules", it will largely address the issue of traffic discipline.

It should be noted that the most popularly cited solution of fixing cameras at strategic locations might work only in urban areas. That solution depends on highly reliable technology in public domain, including 24x7 availability of electricity, which is not India's strength and unlikely to be so in near future.

In urban areas, virtually all roads should be randomly patrolled by the local traffic police.

In rural and countryside areas too, at least all NH and SH and important district roads should have perceptible traffic police presence. An indicator could be that if you drive for about an hour, you should see at least one traffic police vehicle.

Timeline

1. Establish traffic police branches in rural areas, as suggested in "3.121 No separate traffic police establishment in rural areas".
2. (parallel) A large part of the traffic police should be mobile.

Depends on

3.121 No separate traffic police establishment in rural areas.

Pros and cons, resistance expected

Pros and cons

Significant amount of funds may have to be allocated for vehicle and fuel expenses for the traffic police. However, this amount can be easily recovered via the fines collected.

While we strongly recommend a highly mobile traffic police force, we would also like to note our strong apprehension about the corrupt practices such a system could lead to.

Resistance expected from

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	1	0	2	0

Difficulty level: 4

Importance

Importance = 2 (Must be implemented).

6.121 Penalties for violations are outdated

Discipline		G

Solution

The structure of penalties for traffic violations should have the following attributes:

1. The entire structure of monetary penalties should automatically keep pace with inflation. There should be a provision to periodically update the penalties with minimal legal process.
2. The nature of penalty should depend on the type of the vehicle in question. e.g. a truck jumping a red signal is much more dangerous than a 2-wheeler committing the same violation.
3. Violations should be categorized depending on whether they are likely to cause an accident, loss of life and property etc. For example, jumping a red signal and parking in a no-parking area should (generally) be treated differently.
4. Violations should also be categorized according to how commonly known the concerned rule is. Accordingly, penalty for violating the most widely known traffic rules should be monetary and severe, and that for rather obscure rules should be making the violator undergo certain training.

- Violations committed by a person should be tracked in a computerized system by awarding penalty points against the license number. Higher penalty points should lead to higher insurance premiums when renewing the insurance policy.

Such a system would mean several changes to the existing system, some of which would need to be done by the Central Government.

Timeline

- (2 years) Formulate a completely revamped system based on the framework above.
- (5 years) Follow up with Central Government and put the changes in effect.
- (parallel) Do the changes needed to be done at state level.

Depends on

A computerized system to keep track of violations against driving licenses would need to be in place - at least statewide and even nationwide.

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Insurance companies stand to benefit from such a system. Therefore these changes could be called as a ploy to benefit insurance companies. Such arguments would need to be addressed proactively and carefully.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	1	1	2	1

Difficulty level: 6.

Importance

Importance = 2 (Must be implemented).

6.211 Role of traffic police is outdated, needs to be revisited

Discipline		S

Solution

The duties of traffic police are defined rather vaguely today, and they are seen doing all of the following:

1. Traffic control (make traffic flow smoothly, without causing traffic jams).
2. Enforcement of traffic rules,
3. Traffic planning (suggesting and implementing small changes in traffic patterns).

Task no 3 of the above requires specialized training. Therefore it should be decoupled from traffic police and completely moved to the local administrative body, who is supposed to have people with such specialized training.

Among the other two tasks, if day to day traffic control needs manual intervention, there is something wrong with the traffic planning done by the local administration. The traffic police should bring it to the notice of the local administration and control traffic only as a temporary measure.

Most of the day to day work of traffic police should be limited to ensuring that the traffic follows stipulated traffic rules, and controlling traffic only as necessary, e.g. on days of higher than normal traffic because of a local festival or an accident.

Timeline

1. (1 year) Achieve clarity of roles among traffic police and local administrative bodies.
2. (2 years) Identify, on a case by case basis, where traffic police need to do no. 1 and 3 above, and transfer the roles to the local administration.

Depends on

Pros and cons, resistance expected

Pros and cons

Traffic police are frequently seen to take proactive steps in traffic planning because they are the ones who have to bear the brunt of mismanaged traffic. It is commonly seen that the local administration are not sufficiently motivated to proactively plan the traffic. If traffic police are formally instructed not to do any traffic planning whatsoever, whatever traffic planning is being done using their common sense may not also get done. This will have to be addressed by making the local administration answerable to any traffic chaos resulting from bad planning.

Resistance expected from

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest

0	1	1	2	0

Difficulty level: 4.

Importance

Importance = 3 (Should be implemented).

6.221 Penalties do not depend on size of the vehicle, its speed etc

Discipline	This is a benchmark problem	S

Solution

This issue is covered in "6.121 Penalties for violations are outdated" above.

Criteria and evaluation

Penalties for the following violations should depend on parameters like size/ weight of the vehicle, its speed etc:

- Jumping a red signal/ not stopping at the stop line
- Causing an accident
- Driving in the wrong direction (e.g., against as prescribed on a 1-way road)
- Parking in a no parking zone
- Speeding above the speed limit

Score 2 points for each of the rules above if the related penalties vary according to the size/ weight/ speed of the vehicle.

6.222 Fines are only monetary in nature

Discipline		S

Solution

This issue is covered in "6.121 Penalties for violations are outdated" above.

6.311 Urban traffic police are posted mostly only at intersections

Discipline		B

Solution

This issue is covered in "6.112 Hardly any mobile police patrol doing random checks".

6.312 Regular manual traffic control at signals should be avoided

Discipline		B

Solution

This issue is covered in "6.112 Hardly any mobile police patrol doing random checks".

6.321 Timing of traffic signals programmed by trial and error, not systematically

Discipline		B

Solution

Some guidelines by IRC suggest a way to determine the timing cycles of traffic signals. However, the calculations provided there are grossly outdated since the traffic volumes on urban roads have increased several times since these guidelines came in effect.

Therefore we need templates and standard procedures to define a process to determine the signal cycles.

Timeline

1. (1 year) Define a documented procedure to determine signal cycles.
2. (1 year) Traffic signals in all cities should be programmed using this process.

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	1	1	0	0

Difficulty level: 2.

Importance

Importance = 3 (Should be implemented).

6.331 Traffic police seldom take actions to discourage people from breaking rules

Discipline

B

Solution

An example will make this issue clearer. When an accident happens on an undivided road, it is frequently seen that vehicles from both sides come the wrong way and cause a gridlock. When traffic police arrive at the scene to clear the gridlock, they are generally seen clearing the wrong side vehicles first. Although this solves the problem for the time being, it encourages people to go the wrong way when they come across a similar situation the next time! This in turn leads to gridlocks every such time.

In such situations, traffic police are seldom seen taking action on people who first went the wrong way and started the gridlock.

All such situations where traffic police seek only temporary relief can be easily identified with help of transportation experts and NGOs. Counseling and strict orders should avoid recurrences of such situations.

Timeline

1. (1 year) Identify all such situations.
2. (1 year) Counseling and orders.

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	0	1	1	0

Difficulty level: 2

Importance

Importance = 4 (Nice to do).

7.111 Number of deaths due to road accidents is rising in Maharashtra

Safety	This is a benchmark problem	G

Solution

Road safety is a result of several actions listed elsewhere in this blueprint. Therefore there is no single solution that can be spelt out in this section. However, we would most certainly like to abstract out "constant attention to safety" as the direction in which the state should move. We would like to suggest several actions that need to be taken, but it should be noted that the list below is far from complete.

1. Constant monitoring of number of fatalities on all stretches of roads, in all districts. Any rise in fatalities must be immediately analyzed and steps taken. e.g.
 - a. Divided vs undivided roads.
 - b. 2+2 lane vs 3+3 lane roads.
 - c. Road geometries: Wide lanes and straight stretches (enticing high speeds) vs not so wide lanes and casual bends (thus slowing down vehicles).
 - d. Presence or absence of tail lights, especially in heavy vehicles.
 - e. Vehicles overloaded with goods or people.
 - f. Effective emergency response systems.
2. Each district should be given a target number that it must beat. An officer must be assigned the responsibility of and should be held accountable for keeping fatalities below that number. Needless to say, this target must be revised annually.
3. Any examples of reduction in accidents and fatalities due to systematic efforts should be widely publicized and rewarded.

It is also found that a very high number of urban fatalities are riders of 2-wheelers and pedestrians. The state should devise policies for ensuring the safety of these two groups and enforce them very strictly.

Timeline

1. No specific timeline as no specific actions are suggested in this section. However, noticeable flattening of accident fatalities must be observed in 2 years and a decline must be observed in the next 2 years.

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

The state must start holding certain officers accountable for the fatality statistics. This move may meet resistance from the cadre of these officers.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	1	2	2	0

Difficulty level: 6.

Importance

Importance = 2 (Must be implemented).

Criteria and evaluation

Maharashtra should aim at lowering the number of deaths to maximum 30 per 100,000 vehicles. Determine number of deaths per 100,000 vehicles and score points as follows:

0 points	More than 150 deaths
1 points	Between 130 - 150
2 points	Between 110 - 130
3 points	Between 90 - 110
4 points	Between 75 - 90
5 points	Between 60 - 75
6 points	Between 45 - 60
7 points	Between 30 - 45
8 points	Between 20 - 30
9 points	Between 10 - 20
10 points	Between 0 - 10

7.131 No system to track drivers' penalty points and suspend licenses

Safety		G

Solution

This issue is covered in "6.121 Penalties for violations are outdated" above.

7.141 "Golden hour" needs: Lack of information, bad response time, no system of trauma centers

Safety	G

Solution

A network of emergency response centers should be created along all NHs and SHs. The system should have the following attributes:

1. The system may include a specially built medical facility or may have a tie up with an existing hospital.
2. A certain number of doctors and supporting medical staff should always be available in such facilities to address distress calls. The strength of the staff and facilities available should be determined by experienced medical and transportation professionals, depending on the volume of traffic on the said highway.
3. There should be a telephone number the accident victims can call to request help. This number should be widely publicized using mechanisms like roads signs, dashboard stickers etc.
4. When called on this number from a mobile phone, the system should be able to figure out at least the approximate location of the caller by getting required data from the mobile provider.
5. Medical help must reach the accident spot within 30 minutes of the call.

Timeline

1. (1 year) Define the system: Identify existing facilities that can be linked in the system or locations where new facilities need to be built.
2. (1 year) Build the system: Build any facilities needed, create and publicize the phone number to be called, provide any software support needed.

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest

1	2	0	2	0

Difficulty level: 5.

Importance

Importance = 1 (Must be implemented at any cost).

7.211 People are not aware that driving is a privilege

Safety		S

Solution

People not being aware of their responsibilities as a driver is the root cause of several woes, including the implicit demand for granting a license simply because one has become 18 years old. A concerted campaign is needed to drive home the fact that driving is a mere privilege and the privilege must be earned after putting in significant efforts.

The campaign could have typical characteristics like endorsements by movie and sports celebrities etc.

Although we are suggesting a focused campaign for this purpose, which could also be handled by a professional event manager, such a campaign must be visibly supported by other actions like strict licensing procedures. This campaign could precede those actions and could make it easier for people to digest the winds of change.

This campaign must reach the nooks and corners of the state. That involves a change in mindset and is a challenge.

Timeline

1. (2 years or more) Devise and run the campaign.
2. (parallel) Execute changes in driving education and licensing tests.

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

No resistance is expected to the campaign itself, though there may be resistance from people who find it difficult to earn a living because they cannot drive a vehicle as obtaining a license would have become more difficult then.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
2	2	0	2	1

Difficulty level: 7.

Importance

Importance = 2 (Must be implemented).

7.221 Vehicle insurance not linked with penalty points on driving license

Safety	This is a benchmark problem	S

Solution

This issue is covered in "6.121 Penalties for violations are outdated" above. It should include the following:

A person responsible for a road accident should be made to pay recurring costs via a system that includes the following:

- Drivers license attracts penalty points for certain violations.
- Licenses with more than a certain number of points attract penalties including temporary, long term or permanent suspension of driving privileges.
- Increasing insurance premiums with increasing number of penalty points.
- Penalty points fade away gradually in 3 years.

Timeline

1. Included in "6.121 Penalties for violations are outdated" above.

Criteria and evaluation

Score 2 points when a system that addresses all aspects listed above is put in place.

Score 3 points when required computerization and automation is achieved that enables the system to be used.

Then all applicable violations should pass through the system for its effective use.

Score 1 point for every 20% violations being entered in the system.

7.231 Root cause of accidents not correlated to design norms and norms not corrected as a result

Safety		S

Solution

Although a good number of accidents could be happening because IRC and any other norms related to road and infrastructure design are not followed, it is also likely that some accidents happen because the norms are inferior or lack clarity.

For example, IRC 93:1985 mentions that secondary signals be erected on the other side of intersection. Since the drivers waiting at a red signal can see the secondary signal even if they cross the stop line, there is a tendency of inching ahead of the stop line, compromising pedestrians' safety. While many developed countries have now started eliminating the secondary signal, India still follows this guideline written more than 27 years ago.

Therefore, if it is seen that a fatal or severe accident happened in spite of following IRC guidelines, it may indicate that the guideline itself needs improvement. This needs to be investigated and followed up.

Timeline

1. There is no timeline for this task.

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

We first need to establish and follow a practice of doing a root cause analysis of severe accidents. We also have to get over the mental barrier of guidelines set by "learned" people being sacrosanct, and learn to question everything before accepting. These internal resistances in our society will have to be overcome.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	2	2	2	0

Difficulty level: 6.

Importance

Importance = 3 (Should be implemented).

7.311 Many people/ drivers on road do not have insurance cover

Safety	B

Solution

In some sense, this issue also relates to driving being a privilege and not a right. As this fundamental thought starts getting rooted in our society, we will be more willing to buy insurance cover. Yet, since more and more drivers buying insurance has several additional benefits as being able to track vehicles, drivers and their safety record, this task should be taken up on priority.

Data from RTO and insurance companies should be tallied to estimate where we stand today. The state should reach near 100% insurance coverage in about 5 years. There should be intermediate goals for every year.

Traffic police need to regularly check drivers for insurance and take strict action.

All these actions may be initiated after the campaign to address "7.211 People are not aware that driving is a privilege" starts taking root.

Timeline

1. (6 months) Assess current situation by comparing data on today's insurance coverage and total number of vehicles. Set annual targets for achieving 100% coverage in 5 years.
2. (5 years) Regular and relentless checks by traffic police to check insurance cover. The check above to be repeated every year to see if annual targets are met.

Depends on

The campaign to address "7.211 People are not aware that driving is a privilege".

Pros and cons, resistance expected

Pros and cons

As more and more people start getting insurance coverage, it could also lead to higher number of insurance claims. However, in turn it could also prompt insurance companies to take active interest in road safety measures.

Resistance expected from

As frequently happens, a hue and cry could be raised that this move will benefit only the insurance companies. However, this would also very quickly lead to safer roads as people would be careful lest their insurance premium increases.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	1	2	2	1

Difficulty level: 6.

Importance

Importance = 2 (Must be implemented).

7.321 Person responsible for accident pays only onetime cost (if any) but no recurring cost

Safety		B

Solution

The thought of having to pay some hefty cost every year, at least for a few years, if responsible for an accident. contributes to safer behavior on road. This is achieved by putting in place a system where the insurance premiums are increased as well as holding or renewing one's driving license becomes difficult for people responsible for causing traffic accidents.

This issue is covered under "6.121 Penalties for violations are outdated".

7.331 No system for live warning of abnormal environmental conditions

Safety		B

Solution

Regions that occasionally encounter abnormal environmental conditions like heavy fog or rain should have a system that intimates and warns drivers of hazardous conditions ahead. Such a system may also be needed on highways and expressways where U turns are not possible or easy.

Such a system may include any or all of the following:

1. Messages on local radio stations, with signage along the road to inform the station's frequency,
2. Bright LED displays,
3. Designated persons with handheld signs posted at critical spots, etc.

The system should be designed such that drivers get an intimation before they reach the last possible detour or alternate route.

Timeline

1. (1 year) Identify all locations where such a system may be needed, and define the system for each individual location.
2. (1 year) Put the system in place.

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	1	0	0	0

Difficulty level: 2.

Importance

Importance = 4 (Nice to do).

7.341 Malfunctioning infrastructure

Safety		B

Solution

Traffic infrastructure not functioning as expected or designed is a cause of many traffic accidents. Although root cause analysis of accidents can reveal such incidents and they can be fixed, it is necessary to identify and fix malfunctioning infrastructure before accidents happen.

To that end, analysis of accidents should lead to a report of possible causes of accidents. Causes that have contributed to at least 50% severe accidents should be identified

district-wise. A special task force should be created for each district to inspect all major roads for any possible occurrences of the same cause and the cause should be eliminated. For example, if "weak shoulder" is identified as a reason for several severe accidents, a special team should go around the district looking for and fixing weak shoulders.

It should be noted that this is not a one-time task, but a permanent process needs to be established. A measure of its success is continually declining number of severe accidents.

Timeline

1. (1 year) Establish district-wise teams for root cause analysis of severe accidents.
2. (parallel) Establish district-wise teams for inspecting and fixing malfunctioning infrastructure as guided by the report from the analysis team.
3. (continuous) Continually track number of accidents caused by the same reason.

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	1	1	2	0

Difficulty level: 5.

Importance

Importance = 2 (Must be implemented).

Criteria and evaluation

7.342 Badly designed infrastructure, even if it follows norms

Safety		B

Solution

An example of such a case may be a bus stops where a bus may obstruct the view of an intersection. The bus stop may be designed according to prevalent norms, but the norms themselves might not take some cases into consideration.

In most such cases, the root cause may be traced to a deficiency in the norms themselves. To address this issue, there should be a quick and effective way of improving the norms.

The solution to this issue closely follows "7.341 Malfunctioning infrastructure" above, but focuses on improving the norms.

Timeline

1. As in "7.341 Malfunctioning infrastructure".
2. (parallel) Establish a process for speedy improvement in related norms, or to supersede the norms in the interim.

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	1	1	2	0

Difficulty level: 4.

Importance

Importance = 3 (Should be implemented).

7.343 Improved infrastructure may also compromise safety, needs special attention

Safety		B

Solution

A classic case is that of smooth and wide roads designed for high speed driving, modern and safer vehicles using such roads, yet leading to higher number of and more severe accidents.

Any significant project that involves installing modern infrastructure needs to be analyzed for need of any public awareness. Traffic calming practices would need to be employed till people are fully educated about using such infrastructure and accident rates are lowered.

The template for such project plans would need to have a section for mentioning the project planners' views in this matter.

Timeline

1. (1 year) Include an appropriate section in the project plan template.

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	0	1	2	0

Difficulty level: 3.

Importance

Importance = 4 (Nice to do).

7.351 Some safety rules in developed countries do not exist in India

Safety		B

Solution

Transportation experts should be asked to make a special study of all traffic rules in countries where accident rates are very low, to identify rules that do not exist in India. One such example is the rule that demands that your car's headlights be turned on when driving in rain. Or, to get the subjectivity out of the rule, the rule might simply say "your car's headlights must be on when using wipers."

After identifying such rules, a special amendment needs to be made in prevailing act and rules to include them in India. Persistent follow up with the Central Government may be needed for that to happen.

Timeline

1. (6 months) Form a team of experts for this study.
2. (2 years) The team studies traffic rules abroad and makes recommendations.
3. (2 years) Improve/ add new rules, as applicable, for Maharashtra.

4. (parallel) Where applicable, follow up with Central Government to bring the rules in effect countrywide.
5. (parallel) Educate people about the new rules and amendments.

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	1	2	1	0

Difficulty level: 4.

Importance

Importance = 2 (Must be implemented).

7.352 Speed limits neither posted, nor enforced

Safety	This is a benchmark problem	B

Solution

It is important that speed limit signs be posted along all roads, at least NH, SH and major arterial city roads. Considering that such signs are susceptible to theft and then being sold as scrap, they should be made of material that has low or no scrap value, e.g. cement-concrete. If necessary, suitable amendments to applicable IRC guidelines should be pursued.

Speed limits should also be enforced very strictly. All traffic police squads need to be provided sufficient number of radar guns for checking speeds. Mobile traffic police vehicles stopping speeding vehicles should be a routine sight on highways, at least until the tendency for over-speeding prevails.

Timeline

1. (2 years) Install very visible speed limit signs at regular intervals along NHs, SHs and important urban roads.
2. (parallel) Provide radar guns to the mobile traffic police force.

3. (continuous) Take period stock of condition of radar guns and number of speed limit violations. Relate the numbers to accident data. Publicize as appropriate.
4. Steadily install speed limit signs to countryside and rural roads too, where needed. Support them with speed guns and mobile traffic police.

Needless to say, sufficient budget also needs to be allocated for maintenance of the speed guns.

Depends on

"6.111 Special "traffic police" squad only in larger towns" and "6.112 Hardly any mobile police patrol doing random checks".

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	1	1	1	0

Difficulty level: 4.

Importance

Importance = 2 (Must be implemented).

Criteria and evaluation

Audit a sample of NHs, SHs and other urban or countryside roads wider than 3 + 3 lanes for existence of speed limit signs at prescribed intervals. Score 1 point for every 20% roads passing the audit.

Audit a sample of roads with posted speed limits by counting the number of vehicles below and above the speed limit, allowing a 10% leeway (if the speed limit is 50 km/hr, consider a vehicle above 55 km/hr as a speeding vehicle).

Score 1 point for every 20% vehicles at or below the speed limit plus 10% leeway.

7.353 No mobile police patrol to enforce rules

Safety	This is a benchmark problem	B

Solution

This is covered in sections "6.111 Special "traffic police" squad only in larger towns", "6.112 Hardly any mobile police patrol doing random checks" etc.

Criteria and evaluation

Develop a benchmark for number of violations that should be caught by a traffic police squad. Develop a benchmark for the fraction of violations that should be caught at places other than intersections by a city traffic police squad.

Score 2 points each for developing the two benchmarks.

For each benchmark: Score 1 point for 80% success, 2 points for meeting the benchmark and 3 points for beating it by 10%.

7.354 Hardly any citizens trained in first aid

Safety		B

Solution

Citizens trained in first aid can frequently reach accident spots faster than emergency response teams and save lives. The trauma centers described in "7.141 "Golden hour" needs: Lack of information, bad response time, no system of trauma centers" should take special efforts in building squads of citizens trained in first aid. Each such center should have about 10 or so such citizens formally affiliated with it.

Timeline

1. (1 year) Each trauma center to formally train about 50-100 citizens annually in first aid related to traffic accidents.
2. (continuously) Each trauma center to maintain a list of at least 10 citizens from above. These citizens should be generally available on call. This list will have to be continuously refreshed and kept up to date.

Depends on

7.141 "Golden hour" needs: Lack of information, bad response time, no system of trauma centers.

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	2	2	2	0

Difficulty level: 7.

Importance

Importance = 2 (Should be implemented).

7.355 No structure for quick help to broken down vehicles

Safety		B

Solution

This issue is similar to "7.141 "Golden hour" needs: Lack of information, bad response time, no system of trauma centers". A similar structure needs to be created for providing mechanical help to broken down vehicles.

A network of emergency response centers should be created along all NHs and SHs. The system should have the following attributes:

1. The system may include a specially built repair shop facility or may have a tie up with an existing repair shop.
2. There should be a telephone number the person in need can call to request help. This number should be widely publicized using mechanisms like roads signs, dashboard stickers etc.
3. Help must reach the accident spot within 60 minutes of the call on NHs and within 2 hours on SHs.

Timeline

1. (1 year) Define the system: Identify existing facilities that can be linked in the system or locations where new facilities need to be built.
2. (1 year) Build the system: Build any facilities needed, create and publicize the phone number to be called.

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	1	0	1	0

Difficulty level: 3.

Importance

Importance = 4 (Nice to do).

8.111 Allocation of funds focuses on benefits to motorized personal vehicles

Resources		G

Solution

This problem is discussed in detail in the section on Public Transportation.

8.112 No major/ landmark projects to revamp public transportation, encourage walking, cycling

Resources	This is a benchmark problem	G

Solution

This problem is discussed in detail in the section on Public Transportation.

Criteria and evaluation

Cities with more than 2 lakh population in 2001 can get support from Central Government for PT and NMT projects as per NUTP. Therefore only these cities may be considered for this benchmark, until the Central Government revises what kind of cities would be considered eligible.

Count how many cities take up projects that benefit PT and NMT. To be counted as a “good” city, the city should satisfy at least one of the following two criteria:

1. The modal share of PT (not including IPT) and NMT (including pedestrians) should be at least 67%.
2. Until the criteria above is satisfied, the city should spend at least 25% of its transportation expenditure for both PT and at least 25% on NMT projects. Yet, a city can use this criteria towards being counted as a "good" city only for 5 years.

Score 1 point for every 10% good cities.

8.121 Land not reserved for future transportation needs

Resources	This is a benchmark problem	G

Solution

It is frequently found that perhaps the most severe hindrance in implementing a transportation improvement is non-availability of land. Examples of the most frequent situations where this is observed are as under:

1. When a growing city thinks of building a light rail system.
2. When land is needed for building a new bus depot or a bus station in a city.
3. When a city wants to build cycle tracks along certain roads or near schools and colleges.
4. On the countryside, when facilities like a rickshaw stand or a bus station need to be created at places where two important roads meet.

Development plans of cities should ensure that sufficient space is allocated explicitly for PT and NMT projects in the future. It must be ensured that such land allocations are not consumed by projects like road widening that mostly benefit only personal vehicles.

Similar restrictions and reservations should be put in place near intersections of two important roads in the countryside, so that in future people-oriented facilities can be provided the space needed.

Timeline

1. (For urban areas: along with their development plans) Allocate corridors for building a system like light rail. Reserve space for bus depots, bus stations, cycle tracks.
2. (For countryside areas: 1 year) Make a district-wise list of all major intersections and state whether sufficient land is available at the intersection, considering its growth in the next 20 years.
3. (5 years) If sufficient land is not available, initiate and complete any necessary land acquisitions right now, considering that the land is going to be increasingly expensive in the years to come.

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Simple as the steps above may sound, they involve land. Needless to say, land acquisition, any legal issues involved are going to need considerable funds, time and perseverance. Yet, all these should be considered as a wise investment for the future.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
2	2	2	2	1

Difficulty level: 9.

Importance

Importance = 2 (Must be implemented).

Criteria and evaluation

Survey two randomly chosen 5*5 km landmasses from two urban agglomerations with more than 10 lakh population and eight 2*2 km landmasses from eight other class I cities.

Score 1 point if the city has allocated at least 12% of land for transportation and at least 90% of the area identified for transportation in the chosen landmass is free from encroachment.

8.131 Increasing number of vehicles and congestion stress fuel and foreign exchange reserves

Resources		G

Solution

zzz: To do

Timeline

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
2/ 1/ 0	2/ 1/ 0	2/ 1/ 0	2/ 1/ 0	2/ 1/ 0

Difficulty level:

Importance

Importance = 1 (Must be implemented at any cost, Must be implemented, Should be implemented, Nice to do).

8.132 Increase in emissions leads to increase in health hazards

Resources		G

Solution

While it is good that the pollution norms of vehicles are getting stricter day by day, the sheer number of vehicles is so high that the total amount of pollutants released in the air is also increasing day by day. The only solution is to put strict controls on the total amount of pollutants released.

As of today, this problem is very acute for urban areas including even small towns. However, corridors of NHs should also be monitored to see if similar solutions would need to be put in place in the countryside as well.

The total amount of pollutants that can be safely released in a city's atmosphere should be determined considering the city's climate as well as any other industry in the vicinity. This figure could suggest permissible upper limits on any or all of the following:

1. How many vehicles and of which types can be used or sold in the city?
2. If a highway is passing through or on the edge of the city, what is the number of vehicles that can ply on the highway without damaging the city's environment?

Such considerations may suggest measures like the following:

1. Upper limit on the number of vehicles that can be sold every year.
2. Some sort of permit that residents have to buy to allow them to keep a vehicle.
3. A toll or tax on vehicles passing through or near the city.
4. A tax or surcharge on fossil fuel sold in or near the city.

In doing all this, consideration should be given to the amount of pollutants typically emitted per person per km by the vehicle. This would encourage public transport vehicles, electric vehicles and bicycles, and discourage cars and SUVs to some extent. Yet, it should be noted that monetary measures alone may not deter excessive usage of cars and SUVs, because their users frequently have the means to pay whatever the charges may be, yet continue using these vehicles.

Any charges thus collected may be used for the purpose of subsidizing treatment of pollution related ailments for the poor, increasing tree cover in the city etc.

Timeline

1. (1 year) All cities with 2 lakh or more population should do an analysis of the amount of pollutants currently being released in the city annually and their safe limits.
2. (1 year) Devise measures like the ones suggested above. These measures may vary from city to city.
3. (continuous) Set targets for levels of pollutants for the next 5 and 10 years and monitor their levels.

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Stiff resistance is expected from owners of personal vehicles and also from people who aspire to buy personal vehicles.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	2	2	2	1

Difficulty level: 8.

Importance

Importance = 2 (Must be implemented).

8.211 Lot of road space used for parking vehicles instead of their movement

Resources		S

Solution

This problem is already being faced not only in large cities but also in small towns.

Each city with population of 2 lakhs and above should define its arterial roads. Parking should not be allowed on virtually all of the length of these arterial roads. If some section of the road needs parking, the local administration should build parking structures, where space should be given for parking at cost to the owners of personal vehicles. This cost should consider the cost of land, cost of building and operating the structure. Such structures need not be built by the local administrative bodies, but could also be operated commercially, to make people understand the true cost of parking.

In fact, an additional surcharge may also be applied and the amount thus collected can be diverted to strengthen the PT on that road or in vicinity, providing a free shuttle service for the marketplace etc.

Timeline

1. (6 months) Each city with 2+ lakh population to identify its arterial roads. This list may need to be revisited every 2-3 years. Also take a stock of parking provided on these roads today.
2. (1 year) Devise a plan to completely eliminate off street parking on these roads in 5 years and to use the space thus created for strengthening PT and NMT facilities.
3. (5 years) Execute the plan.

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Users of personal vehicles. Very visible improvements in public transportation would be needed to alleviate such resistance.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	1	1	2	1

Difficulty level: 5.

Importance

Importance = 2 (Must be implemented).

Criteria and evaluation

8.212 Parking rates do not represent the value of land occupied

Resources		S

Solution

Each city should write its parking policy, which should be based on the following fundamentals and guidelines.

Fundamentals:

1. Ensuring parking places for personal vehicles encourages their use and adds to traffic congestion.
2. Going to a particular place (destination) is the objective, parking is not the actual objective.
3. Cost of parking should not be borne by the local administration.

Guidelines:

1. Street parking on arterial roads should be steadily eliminated. It can be replaced by built parking structures run on commercial basis.
2. Minimum parking norms for buildings (residential and commercial) should be replaced by maximum parking norms. For example, buildings should not provide at least some parking per 1,000 sq ft built up area, but at the most some parking area. Such norms encourage people to use public transportation.
3. Structures like auditoria, cinema halls and malls should provide enough parking for their clients within their premises or premises rented by them.
4. In general, the approach should be of providing connectivity to the destination in question by public transportation and steadily reducing or eliminating space taken up by parking, and using the space for people (wider footpaths, gardens etc.)

The parking policy of a city should take a stock of how many public parking spaces are available on the date, including free as well as paid parking spaces. It should state objectives for the next 2 to 10 years and track them at least every 2 years.

Timeline

1. (1 year) Provide a template for a parking policy.

2. (1 year) Each city with 2+ lakh population should write its parking policy as per the template.
3. (every 2 years) Revisions of parking policies should be published.

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Owners of personal vehicles.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	1	1	2	1

Difficulty level: 5.

Importance

Importance = 3 (Should be implemented).

8.221 Reducing time of urban commute increases a city's sprawl

Resources		S

Solution

We all want to save the time spent in commute. However, making the daily commute faster than a certain speed contributes to people choosing to stay farther from the city center, thus increasing sprawl and making PT that much less viable.

Unfortunately, there is no "follow these steps and solve the problem" kind of a solution to this problem. All that we can say is, if the daily commute in peak time is "fast enough", no special effort needs to be made to make it faster. What is "fast enough" is very subjective and would depend on the character of each city, for example, "45 minutes for 15 km" could be ok for people in one city but not for another.

8.231 No plan to systematically develop intellectual resources needed to support complex transportation systems

Resources		S

Solution

Urban as well as countryside transportation needs meticulous planning today. The problem is becoming more and more complex with the advent of modern technologies, for example in congestion pricing and toll collection, vehicle tracking using GPS etc.

The state should provide latest educational facilities for generating trained transportation planners, not only for Maharashtra but also to satisfy the nation's needs to some extent.

Timeline

1. (1 year) Determine how many transportation planners the state and the country would need in the next 10 years or so.
2. (2 years) Establish educational institutes for training transportation planners and providing technology support for modern transportation needs.

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	1	0	1	0

Difficulty level: 3.

Importance

Importance = 3 (Should be implemented).

8.232 Lack of trained transportation planners

Resources		S

Solution

This is covered in "8.231 No plan to systematically develop intellectual resources needed to support complex transportation systems".

8.311 Where land is reserved for future transportation needs, it is not protected from encroachments etc

Resources		B

Solution

This issue is partially covered in "8.121 Land not reserved for future transportation needs". However, whatever land is reserved for transportation needs to be protected from encroachments and reclassification without sufficient justification.

In a sense this is an issue with town planning and enforcement and its solution is out of the scope of this blueprint. We have included it here merely to highlight its importance.

8.321 Higher vehicular speeds lead to higher fatalities

Resources		B

Solution

The issue is really with being able to handle higher speeds. It needs to be tackled on the following fronts:

1. Infrastructure for higher speeds needs to be designed and inspected much more meticulously than ever before. It should also be noted that most of the IRC guidelines used for design and inspection are dated in 1990's or even earlier, whereas the vehicles plying on our roads are latest and much more powerful. It may be wise to simply take some of the norms from countries known for much safer traffic and adopt them to Indian conditions.
2. Safe driving has a lot to do with mindset, and a change in mindset is slow. We strongly suggest that we acknowledge this fact and do not allow the infrastructure to leapfrog ahead of our safety mindset. Simply put, if our society cannot use the expressways safely, let us not build them at breakneck speed. Let us spend extra efforts on handholding and educating people how to use them before we build the next expressway.

Therefore, the steps to be taken are as follows:

Timeline

1. (2 years) Understand and adopt norms and guidelines related to high speed roads, signage on such roads.
2. (parallel, continuous) Place special emphasis on accidents on highways and expressways. Each and every severe/ fatal accident must be thoroughly analyzed.
3. (parallel) Conduct special courses on "how to drive on highways and expressways" for people living along and using such highways. Take help from NGOs as needed.

4. Most important: The rate at which new super highways are built must be controlled until fatality rates on highways drops below a certain threshold.

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Not building highways at a rapid pace may be termed as "anti development".

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	1	2	2	1

Difficulty level: 7.

Importance

Importance = 3 (Should be implemented).

8.331 Congestion makes journey times unpredictable

Resources		B

Solution

Reducing congestion, especially on urban streets, would be an effect of implementing several suggestions mentioned in this blueprint. Therefore we are not suggesting a specific solution for that purpose.

8.332 People driving their vehicle spend time unproductively, and are stressed

Resources		B

Solution

This problem would get addressed to a certain extent as the modal share of people travelling by public transportation increases. Therefore we are not suggesting a specific solution for this problem.

8.341 Hardly any computerization and automation in transportation

Resources

B

Solution

While there is virtually no limit to the level of computerization and automation in many fields, the following steps must be taken as far as transportation is concerned.

1. Computerized database of all vehicles registered in Maharashtra (even India).
2. Computerized database of all driving licenses issued in Maharashtra (even India).
3. All traffic police stations and even traffic police staff on the road should be able to retrieve certain information about any vehicle or driving license.
4. Traffic police officers above a certain rank should be able to record violations against driving licenses right from roadside.
5. As computerization is achieved, reduce the validity of a vehicle's registration to 2 years for all vehicles. Every vehicle's registration could be automatically renewed for a further 2 years, but only after the vehicle undergoes simple roadworthiness tests in a certified test center.
6. All insurance companies should be able to access relevant information about drivers and vehicles.
7. All vehicles of certain kinds should have mandatory GPS tracking. These would potentially include PT vehicles, all heavy vehicles, taxis etc.
8. Databases like roads, their types, widths, road work done should be computerized. This will make it easy to find out history of any work done on that road.
9. Details of road accidents should be maintained in a computerized database. This will enable statistical analysis of accidents and suggest preventive measures.

Timeline

1. (2 years) Define a master plan of computerization of the transportation sector. This plan should be divided in about 3 stages of 2 years each.
2. (6 years) Execute the plan.

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest

1	2	1	1	0

Difficulty level: 5.

Importance

Importance = 2 (Must be implemented).

Evaluating Transportation Management

The following table suggests a method for evaluating overall transportation management in Maharashtra. Each problem listed in the table has been identified as "Benchmark problems" in the chapter "Solutions for Better Transportation Management in Maharashtra", and a method to evaluate the state's score with respect to that problem is also suggested earlier. The score is given a weightage depending on the importance of the problem. Filling in the scores in the table below and following the steps suggested would arrive at a score out of 100, which can be considered as an overall assessment of transportation management in Maharashtra.

No	Problem	Weightage W	Score S (out of 10)	Weighted score = WxS
1	3.111 No single official responsible for all traffic, including planning, execution and enforcement	20		
2	4.112 IRC guidelines are not followed	20		
3	5.111 Lack of trained traffic planners in smaller towns	20		
4	5.121 Quality of driving tests is very bad	20		
5	7.111 Number of deaths due to road accidents is rising in Maharashtra	20		
6	8.112 No major/ landmark projects to revamp public transportation, encourage walking,	20		

No	Problem	Weightage W	Score S (out of 10)	Weighted score = WxS
	cycling			
7	8.121 Land not reserved for future transportation needs	20		
8	1.211 No plan for ensuring basic connectivity to any village	10		
9	4.213 Poor road quality, esp. in rural areas	10		
10	6.221 Penalties do not depend on size of the vehicle, its speed etc	10		
11	7.221 Vehicle insurance not linked with penalty points on driving license	10		
12	4.315 Insufficient right of way timing for pedestrians at signals	5		
13	4.326 Road construction: signs do not give adequate warning to drivers	5		
14	7.352 Speed limits neither posted, nor enforced	5		
15	7.353 No mobile police patrol to enforce rules	5		
	Maximum Score			2000

Section 4. Public Transportation

The words “transporting people” and “public transportation” are used interchangeably in this blueprint.

Executive Summary

Objectives of public transportation

The objectives of a public transportation system should be:

1. Mobility and connectivity for all
2. Safety
3. Affordability
4. Flexibility and sustainability
5. Environment friendliness
6. Integration with the fabric of the city

These objectives might apply with different intensity to urban and rural public transportation in Maharashtra. The blueprint studies the current state of urban and rural public transportation in Maharashtra to find that both kinds of PT systems fare just about ok on most counts. However, urban PT fares especially poorly as far as providing mobility and connectivity for all strata of the society, thus leading to the cancerous growth of personal vehicles in urban Maharashtra.

Problem areas identified

Following are identified as the major problem areas:

1. General issues
 - 1) Officials agree to importance of PT but their actions encourage use of personal vehicles
 - 2) Large PT projects being planned for Mumbai and Pune, but no significant investment in other cities
2. Mobility and connectivity for all
 - 1) Today’s traffic planning focuses on ease of movement of vehicles than people, thus hampering mobility of those who do not own or drive a vehicle.
3. Safety
 - 1) Accident rates in Maharashtra are significantly higher than the national average, which itself is higher than several similarly developed countries.
4. Affordability

- 1) City bus services are expected to fend for themselves, thus leading to increase in ticket prices for varied reasons. As a result, PT fares in Maharashtra are on the higher side.
5. Flexibility and sustainability
 - 1) Space for expanding/ building track based MRTs is not reserved and protected while cities are not too large.

Vision and benchmark for public transportation

Vision

The blueprint puts forth a vision for PT in Maharashtra, which, when achieved, would address all major problems with respect to the objectives of PT stated above. Although this vision is stated in detail in a later paragraph, it can be summarized as follows:

To provide safe and reliable mobility for all people.

Benchmark

While providing solutions to these and other public transportation problems, it is important to first define when we can say that a given problem is fixed or whether the overall public transportation is improving. This blueprint suggests an elaborate scheme to assess the progress we make in public transportation by quantifying the status of certain key issues identified as benchmarks.

Solutions for better public transportation

Solutions to all major and minor public transportation issues identified are suggested in detail. The solutions include what needs to be done and suggest a timeframe for taking specific steps. Any pros and cons of the solutions are also discussed, including whether any resistance might be expected by any group of people, whether it could be expensive to implement the solution and any such issues.

While the reader may go through this section and read various problems and solutions suggested, we would like to take this opportunity to state the overarching philosophy of the suggested solutions.

We understand and appreciate that cities are places where a large number of people live together to earn a better living, and thus to enhance the quality of their lives. This is made possible by the critical mass of a city's population. A city provides easier access to places of employment, pleasure and services because of its higher population densities. Therefore it is necessary to optimize urban land use and spend as little space for transportation as necessary, yet provide a high quality, safe and reliable mobility to people from all strata of life.

This is possible only if people are given priority and those modes of transport that use the least possible urban land as well as least possible fuel per person are promoted. Needless to say, it implies that pedestrians, public transportation and cycling should be given the highest priority, at times even inconveniencing personal vehicles if needed.

Essentially the same philosophy applies also to rural public transportation, where we lay importance on providing safe and reliable mobility for all. While optimizing space may not be such an issue in rural settings, the blueprint heavily stresses that people must be considered before vehicles even in rural settings.

The steps to be taken for revamping the PT are essentially a part of the campaign the state should launch for revamping the entire transportation management, which has the same philosophy stated above.

Introduction

The objective of the transportation system is to be able to transport people and goods. This section focuses on the issues regarding providing efficient transportation for people.

Private and Public Transportation

Transportation for people can be broadly categorized in two:

1. Personal transportation
2. Public transportation

Personal Transportation

Personal transportation implies a vehicle or a means of transportation which is owned by a person or a group of persons (companies, institutes, organizations etc, generally called “organization” for this blueprint) and is available for use of a very restricted group of people like friends and family of the owner, top officials of various kinds of groups listed above etc. This means of transportation is not available for use of the general public or employees of the organization even if the user is willing to pay charges for its use.

Public Transportation

Various attempts have been made to define Public Transportation. Though each of them might be incomplete in some way, they collectively help us understand the meaning. Below are some examples.

- Wikipedia³³: Public transport (also public transportation or public transit) is a shared passenger transportation service which is available for use by the general

³³ en.wikipedia.org/wiki/Public_transport

public, as distinct from modes such as taxicab, car pooling or hired buses which are not shared by strangers without private arrangement.

- Ministry of Transport, New Zealand³⁴: Passenger transport services available to the general public on payment of a fare. The term includes buses, passenger rail services and ferries.
- Green Travel Plans³⁵: Any form of transportation which is not personally owned by the user, e.g., bus, train & light rail.

JNNURM defines the following characteristics for a PT system³⁶:

- Public Transport systems are characterized by - fixed origins and destinations; fixed routes and schedules; fixed stoppage points and fixed fares.

As can be seen from these definitions, “Public Transportation” implies a vehicle or a means of transportation generally owned by government or a government established organization and is available for use by general public as long as the user pays charges for its use and agrees to adhere to certain rules of usage. It implies transportation of people only, and not transportation of goods. Such a service may operate within a city and surrounding towns/ villages or may also be a “long distance” service, connecting towns within and across states.

Issues in personal and public transportation

Good facilities for personal transportation include good roads, signage and other supporting infrastructure as well as a few other things. Issues regarding these facilities are addressed by the section on Transportation Management.

Public transportation, on the other hand, involves several other issues.

In addition, when one compares the following parameters per person per kilometer for personal and public transportation, one finds that public transportation is much better to the society as a whole:

- Space consumed for moving and parking vehicles
- Fuel consumption and emissions of pollutants in atmosphere
- Accidents caused to commuters
- ... even social disparity caused

Hence it is important to promote public transportation over personal transportation. Therefore we have devoted an entire section to discuss public transportation.

³⁴ www.transport.govt.nz/ourwork/Pages/Glossary-NewZealandTransportStrategy.aspx

³⁵ www.greentravelplans.co.uk/content/glossary

³⁶ Service Level Benchmarks for Urban Transport at a Glance
(http://www.urbanindia.nic.in/programme/ut/urban_transport.htm)

For this blueprint, a few additional means of transportation are considered as “public transportation”. They are:

1. Bus services similar to the one described above, but owned and operated by private agencies
2. Buses owned and/or operated for companies, institutes, organizations
3. Contract buses that operate on daily basis for commute between home and work
4. School buses
5. Taxis and rickshaws

Organization owned buses and contract buses are included because they are generally available to a certain large group of people for their daily commute to/ from work, as if they were a public bus service.

School buses, whether owned by a school or hired by school/ parents, are included in the scope of this blueprint.

Taxis and rickshaws are included because although they may be owned by individuals, their fares are controlled by the government and any person can use them as long as the stipulated fare is paid.

Objectives of Public Transportation

The objectives of a public transportation system should be:

1. Mobility and connectivity for all
2. Safety
3. Affordability
4. Flexibility and sustainability
5. Environment friendliness
6. Integration with the fabric of the city

Mobility and connectivity for All

Private means of transportation are available to only a certain section of the society. Only those who can afford a vehicle and are able to drive it or spend even more money to hire a driver can use it. Those who cannot afford a vehicle have to depend on PT to go from one place to another beyond walking distance.

Even for those who can afford a vehicle, lack of space to park it in congested city areas affects mobility. Good PT solves this problem also.

The word “all” emphasizes that mobility for people with limited physical abilities is equally important. Chapter 8 of the Persons With Disabilities Act, 1995 stresses that

establishments in the transport sector should take special measures to provide adequate facilities to permit easy access to transport facilities to physically handicapped people³⁷.

Safety

Road traffic injuries was the ninth leading cause of death in 2004, but is expected to move up to the fourth spot by 2030, overtaking AIDS, tuberculosis and respiratory diseases³⁸. Providing a significantly safer mode of transportation to citizens is an objective behind developing a world class PT system.

Affordability

Needless to say, ticket fares of PT systems are much within reach of the common man than buying and using a personal vehicle. Innovative measures have been adopted by PT systems in some cities abroad to ensure that ticket fares are very low without compromising the quality. In fact, there are examples of free public transportation as well³⁹. Cheap ticket fare options are essential for ensuring mobility for truly all sections of the society.

Flexibility and sustainability

The PT system should be such that the people should be able to use it for a long time. Its technology should be proven and should not get easily outdated. It should be flexible so that it can be modified and extended as per the needs.

Space is becoming a scarce resource (esp. for cities). The PT system should reduce the per passenger-km usage of space so that more space is available for people for amenities like gardens, sit-outs etc.

Environment friendliness

Fossil fuels are becoming a scarce resource all over the world, but for cities they have a direct bearing on air quality. Since most of the electricity we produce comes from burning fossil fuels, using electricity merely shifts consumption of fossil fuels elsewhere.

The PT system should be able to reduce the per person-km consumption of fuel.

³⁷ Persons with Disabilities Act, 1995, Chapter VII, Website of Office of The Chief Commissioner of Persons with Disabilities (http://ccdisabilities.nic.in/page.php?s=reg&t=def&p=pwd_act_c8)

³⁸ WHO's Global Status report on Road Safety, 2009
(http://www.who.int/violence_injury_prevention/road_safety_status/2009)

³⁹ Wikipedia: Zero fare public transport (http://en.wikipedia.org/wiki/Zero-fare_public_transport)

Integration with the fabric of the city or country

The PT systems should provide natural transportation options for people to go from origins to destinations of their trips. Esp. for cities, they should not create imposing structures that will hurt the aesthetics and character of the city.

Prioritizing the objectives

Out of the above, the most important objectives are: Mobility for all, safety and integration with the fabric of the locale. These objectives are “absolute” in a sense. Mobility and safety define a vision that can directly impact the day to day lives of the citizens. If the PT system is not integrated with the city’s or country’s fabric, it can permanently damage our heritage and lifestyle. For example, a large bus station should not be built in front of a beautiful botanical garden.

The other objectives (Affordability, sustainability and environment friendliness) can either change over time or can be remedied relatively easily. For example, although a bus system is not very environment friendly compared to a rail based system, buses that run on diesel could be replaced with buses that run on solar energy when they become available.

The blueprint will discuss the PT systems in the state with respect to these objectives and suggest measures to fulfill them.

Public Transportation in modern Maharashtra

What is “Public Transportation”

Being able to go from one place to another is a basic necessity of the human being. It is also a fundamental right granted to citizens by most countries. The word “mobility” adds a few additional aspects to this necessity, viz.,

- Being able to go to near as well as far places
- At any time of the day and any day of the year
- The movement should be safe
- It should be smooth: predictable in time and free from unexpected glitches
- Affordable to most of the population
- Possible for persons with all ages and physical abilities

Modern societies try to develop traffic systems such that all aspects of mobility listed above can be addressed. Such systems provide a way for people to use means of transportations so that most, if not all, of the mobility needs can be met.

These means can be of two broad types:

1. They belong to one person or a small group of persons and are generally for exclusive use by this small group
2. For those who cannot buy such means or are not able to operate those means, modern traffic systems provide a way to rent them for a short time.

This provision for allowing use of a means of transportation for a short time, for an appropriate fee, is nothing but “Public Transportation” (or “PT” for short). The means of PT can still be for exclusive use of one person for a higher fee (e.g., a taxi) or its use can be shared in order to make it affordable (e.g., a bus).

The definition and scope of “Public Transportation” depends largely on the context of the subject matter. The scope to be used for this blueprint is described in subchapter “Public Transportation” under “Section 2, Scope”.

Traditional usage of Public Transportation

Private means of transportation have obvious benefits arising out of exclusive command of their owners over the means (vehicles). Therefore, “public” means of transportation were generally used by people from the following categories:

1. Those who could not afford a vehicle
2. Those who could not operate a vehicle, e.g., senior citizens, physically challenged, young children
3. People travelling to a different land

Groups #1 and #2 above were “weaker” sections of the society. Group #3 was generally small in number and was at the mercy of whatever transportation the unfamiliar city or country provided, and did not have much voice either.

As a result, means of PT have traditionally been useful for weaker sections of the society, not for the rich and powerful. It is not surprising to find that PT had been ignored by the “powers”, both in developed as well as developing countries.

Public transportation has traditionally been the need of the **weaker** section of the society, hence its development was generally neglected.

Public Transportation in modern times

Managing traffic in cities has always been a challenge. Cities have a high population density, which also leads to high vehicle densities, leading to congested streets. A natural solution to this problem has been to build more roads to ease congestion. Vehicle oriented traffic planning, especially in cities, meant wider roads and structures like flyovers, which are inherently people-unfriendly.

However, town planners all over the world have started realizing over the last 2-3 decades that more roads attract more vehicles, and the vicious cycle never eases

congestion. Since that PT uses much less space per passenger per km., town planners have started giving top priority to PT, freeing up precious space for use by people.

Realizing also that a user of PT is essentially a pedestrian at both ends of his trips, this strategy gives a very high importance to walking (and also cycling) as modes of commute. Governments in developed countries have started take pride in ensuring that people of all physical abilities can enjoy quality life. One of the ways to ensure that is to provide extra facilities in PT for such people.

Following the worldwide cues, India too has announced its “National Urban Transport Policy” (NUTP)⁴⁰ in April 2006, which places a high importance on developing world class PT systems. However, it is just a policy as of now and a lot of work needs to be done towards implementation of measures suggested in it.

In modern times, developed countries have started paying special attention to, and even taking pride in, developing good public transportation systems.

In India, the officials agree that PT should be given importance. However, their actions facilitate use and proliferation of personal vehicles and negatively impact PT. This is actually worse than officials being in the dark about why PT should be encouraged!

Public Transportation between cities, towns and villages

Most of the discussion above was with respect to PT within urban areas. In theory it can also apply to transportation between cities, towns and villages. Since PT provides benefits such as lower fuel consumption per passenger km, and can be made available to persons of all ages and physical abilities, a strong PT system can provide improved mobility to people not only in urban but also in rural areas.

Rural areas include both rural settings like villages as well as open, countryside areas that typically connect two cities or towns or villages. For the purpose of discussing PT, this blueprint will generally not make any distinction between rural and countryside areas. Both will be indicated by the term “rural”.

Aspects of modern Public Transportation in Maharashtra

Today’s Public Transportation in Maharashtra needs to address the following:

1. Urbanization of Maharashtra
2. Objectives of Public Transportation and how they apply to Maharashtra
3. Public Transportation in urban Maharashtra

⁴⁰ National Urban Transport Policy, Ministry of Urban Development, Government of India (www.urbanindia.nic.in/policies/TransportPolicy.pdf)

4. Public Transportation in rural Maharashtra

We will now examine the above in detail, with the objective of studying today's situation and of identifying any current and potential issues as regards Public Transportation.

Urbanization of Maharashtra

Mahatma Gandhi described India as a country that lives in villages. It applied to a large extent to Maharashtra also. However, the situation has been changing rapidly in India and Maharashtra alike.

In this context, it is worthwhile to examine

1. What is the share of urban population in Maharashtra
2. Effect of urbanization on traffic

Share of urban population

Maharashtra's population was 9.7 Cr according to the 2001 census. Out of these, 4.1 Cr, or 42% lived in cities⁴¹. 58% of Maharashtra population is expected to be urban by 2031⁴², which means that out of an expected population of 14.04 Cr in 2031⁴³, 8.1 Cr will live in cities.

As can be seen, although the state's population itself is expected to grow by about 60% in 30 years, the urban population will grow by a whopping 200% in the same period.

Effect of urbanization on traffic

The very reason why cities are growing, whether as a result of organic growth or migration, is that they provide better employment opportunities and earning potential. While a rise in per capita income and thus the purchasing power of the citizens is generally a welcome trend, it also means that the number of vehicles in urban Maharashtra will grow at even higher rate. As the land area that can be allocated to transportation cannot increase at this rate, it leads to the single most pronounced effect of urbanization on traffic: Congestion.

The issue is further compounded by lopsided urbanization. While the larger cities have some infrastructure to speak of, the smaller cities are growing merely in population. This makes larger cities more attractive than smaller ones.

⁴¹ Economic Survey of Maharashtra, 2008-09

⁴² McKinsey Global Institute: India's Urban Awakening: Building inclusive cities, sustaining economic growth, April 2010 (MGI_india_urbanization_executive_summary.pdf)

⁴³ Population Reference Bureau (<http://www.prb.org/pdf07/futurepopulationofindia.pdf>)

Causes of congestion

Let us look at the causes of congestion. Two causes are very straightforward:

1. Increasing number of vehicles
2. Limited availability of land

In addition, there are other reasons that contribute to congestion, as discussed below.

Increasing number of vehicles

Though the number of all vehicles in Maharashtra is increasing, the rise is much more prominent in the number of personal vehicles. The number of personal vehicles (2-wheelers, cars, jeeps) in Maharashtra increased by 129% from 2000 to 2008. The number of buses increased by a relatively meager 37% in the same period⁴⁴. As a result, while one bus already had to share the road with 120 personal vehicles in 2000, by 2008 it had to make way through as many as 203 personal vehicles.

Limited availability of land

A city has to allocate a certain portion of its land for transportation. It includes area occupied by roads and footpaths, bus depots, even petrol pumps etc. This allocation is done assuming a certain requirement. The rest of the land is used for other purposes like residential, recreational etc. Once such establishments are built, they restrict reallocation of land use for transportation because it is very difficult to demolish them to widen roads. Naturally, increasing number of vehicles leads to increasing vehicle densities on roads.

Old, inner areas of most of the cities in India were not designed for such high vehicle densities. The planned land usage for transportation for most Indian cities is a modest 15% or so⁴⁵. Cities in the world, like Los Angeles, boast of much higher land usage for transportation⁴⁶. Of course, such high land usage comes from a very high dependence on personal vehicles and that has its own perils. The point to be noted, however, is whether this 15% or so land is actually being used for transportation.

Encroachment, both on footpaths as well as carriageways is estimated to gobble up as much as 20-35% land area⁴⁷. In addition, many cities may not have been able to implement their development plans fully. Pune Municipal Corporation, as an example,

⁴⁴ Motor Transport Statistics of Maharashtra 2008-09, Part 2, Website of Motor Vehicles Department, Government of Maharashtra (www.mahatranscom.in/index.aspx)

⁴⁵ India's Urban Transport Scenario - 2021: Issues and Perspectives, N.Ranganathan, 1999, from Urban Transport - A Book of Readings by CIRT.

⁴⁶ 70%? zzz: To do

⁴⁷ India's Urban Transport Scenario - 2021: Issues and Perspectives, N.Ranganathan, 1999, from Urban Transport - A Book of Readings by CIRT.

has earmarked 13% land usage for transportation, but only 4.46% is actually being used for roads⁴⁸.

Finally, use of any land allocated for transportation is on “first come first served” basis. Anyone who brings a vehicle on the road gets to use that much land area, reducing availability of land for other vehicles.

Policies that encourage use of personal vehicles

As the maxim goes, “Build it and they will come.” Build wildlife sanctuaries and it helps growth of wild animals and birds. Building office space encourages people to start businesses. Likewise, facilities built for vehicles actually encourage people to buy or use more vehicles. For example, a multi-story parking lot in the heart of the city solves people’s problem of parking a car, encouraging them to drive their cars to the heart of the city. Since the roads on which they are going to drive cannot be widened indefinitely, this leads to congestion.

There are quite a few such policies which actually encourage use of personal vehicles, thus increasing congestion.

Inappropriate allocation of road space

Vehicular congestion increases also because the land available for transportation is not allocated appropriately.

Roads are primarily built for movement of vehicles and not for parking vehicles along them. In modern Maharashtra, a significant amount of road space can be seen being used for mostly free parking. Even though some cities are employing “Pay and Park” policies for off-street parking, the charges are as little as Rs.10/- per hour for four wheelers, which are far below what commercial property in the same locality could cost! As a result, more and more road space is lost to parking instead of being used for movement of vehicles.

While on this topic, it is worth studying the amount of road space used by various means of road transportation.

The road space used by a vehicle is measured in terms of Passenger Car Units (PCUs). Experts maintain that the typical occupancy and hence the number of persons carried per PCU is as shown in the table below⁴⁹:

Mode	PCU	Occupancy	Persons per PCU
Car / Taxi	1.00	1.5	1.5

⁴⁸ Pune City Development Plan 2006-2012, Website of PMC (www.punecorporation.org)

⁴⁹ Emerging Transportation Scenario in Delhi, T.S.Chopra, 2000, from Urban Transport - A Book of Readings by CIRT.

2 wheelers	0.50	1.1	2.2
Bicycles	0.33	1.0	3.0
Auto rickshaws	0.50	1.1	2.2
Buses	3.00	60.0	20.0

Buses can carry many more persons for the same road space.

A phenomenal rise in number of vehicles (esp. personal vehicles) has led to congestion in urban traffic. There are various factors that contribute to increasing congestion.

It is important to note that encouraging and enhancing PT is not a way to lower congestion. A good public transport system simply allows people to commute within a city by spending reasonable time and money, in spite of congestion. In fact, lower congestion encourages people to use their personal vehicles, which in turn adversely impacts PT. Since a good PT system provides certain other benefits to the common man and to the city as a whole, a city should take every measure possible to make PT a success. Allowing congestion to exist is in fact one of such measures!

Very important: Lowering congestion is not an objective of a good PT system. On the other hand, some level of congestion is required for a viable PT system!

Yet, a good PT system can keep congestion within control. Bad PT is just one of the reasons contributing to uncontrolled rise in traffic congestion. Some of the other reasons are discussed on the earlier pages.

Traffic congestion will continue to grow regardless of whether the PT system is good, unless specific measures are taken to address all reasons that give rise to it.

Effects of congestion

The most important effects of vehicular congestion are as follows:

1. Increasing pollution
2. Increasing fuel consumption
3. Loss of time as a national resource

Let us discuss these in some detail to understand their gravity.

Increasing pollution

It is estimated that **zzz**% of the urban air pollution is caused by traffic. The pollutants include toxic gases like Nitrogen Dioxide (NO₂) and Sulphur Dioxide (SO₂), suspended particulate matter (SPM), as well as dust from pavements that is raked up by the vehicles.

The table below lists maximum permissible limits of these pollutants from National Ambient Air Quality standards⁵⁰ as well as actual values observed in Kalbadevi, Mumbai, from 2007 to 2009⁵¹:

Pollutant	Limits in NAAQ standards	Kalbadevi, 2007	Kalbadevi, 2008	Kalbadevi, 2009
SO ₂	50 µg/m ³	12	10	9
NO ₂	40 µg/m ³	40	44	54
SPM	60 µg/m ³	251	253	339

Since modern automobile fuels do not have sulphur, it is not surprising to find the SO₂ levels within control. However, it can be clearly seen that the levels of other pollutants are rising continuously and were already above the danger mark in 2007 itself.

A high number of vehicles in our cities means high volumes of exhaust from the vehicles. In addition, since the transportation infrastructure is not adequate to support so many vehicles, roads in Indian cities are commonly found to be congested. This implies that vehicles move at slower speeds and thus in lower gear, consuming even higher amounts of fuel than they would otherwise. This effect contributes to higher values of pollution.

Commonly found effects of higher levels of these pollutants are irritation of eyes, respiratory diseases, high blood pressure and higher risk of heart diseases.

Increasing fuel consumption

As said above, higher number of vehicles, that too moving at slower speeds means higher fuel consumption. Since India imports about 70% of its petroleum needs, it implies stress on India's foreign exchange reserves.

Loss of time as a national resource

Every minute spent by commuters in just sitting in traffic means that they are being deprived of time to spend with family, at work, or simply for relaxation. All of this has a

⁵⁰ National Ambient Air Quality Standards, from Central Pollution Control Board website (http://cpcb.nic.in/National_Ambient_Air_Quality_Standards.php)

⁵¹ AAQM-Mumbai data monitored by NEERI, from Maharashtra Pollution Control Board website (<http://mpcb.gov.in/images/pdf/namp1990to2009.pdf>)

direct or indirect impact on the person's productivity. A study as old as 1988⁵² had estimated that congestion time losses on Subhash Marg in New Delhi, a stretch of 7 km, was estimated to be Rs. 0.14 million per day. Considering much higher levels of congestion, higher value of time today as well as change in the value of rupee since 1988, the total loss to Indian economy over the whole country would be enormous. It is generally estimated that vehicular congestion causes 1% to 5% loss to a country's GDP⁵³.

Vehicular congestion leads to health hazards, loss of foreign exchange as well as loss of productivity. All these effects put together mean a major loss India cannot afford.

Objectives of Public Transportation for Maharashtra

Let us have a look at the objectives of PT in context of Maharashtra.

As stated under the heading "Objectives of Public Transportation", the objectives of a good public transportation system are:

1. Mobility and connectivity for all
2. Safety
3. Affordability
4. Flexibility and sustainability
5. Environment friendliness
6. Integration with the fabric of the city or country

What do these objective mean for people of Maharashtra today?

Mobility and connectivity for all

The definition of "mobility" is very subjective and it could vary depending on the person's financial and social strata. If the PT system is to care for as many citizens as possible, it should, as much as possible, strive to satisfy diverse expectations.

For most citizens, availability of a PT service that reaches nooks and corners of a city and also countryside is important. These people generally are not inclined to spend on taxis and rickshaws. They are also likely to have physical limitations, e.g., retired people with limited sources of income. Therefore the reach of the PT service is important to them.

Bus services of large cities like Mumbai and Pune are more likely to provide connectivity within, say, half a km from any location in the city. The connectivity in smaller towns is even poorer as there is not much PT to speak of. In both cases, availability of a bus within walking distance is also not of much use if the frequency is very low or if the bus is

⁵² Emerging Transportation Scenario in Delhi, T.S.Chopra, 2000, from Urban Transport - A Book of Readings by CIRT.

⁵³ zzz

overcrowded. Urban citizens expect a bus service at least every hour during daytime and for rural locations a service about once to five times a day, within a couple of km, is generally found to be acceptable.

This discussion on mobility and connectivity applies not only to areas where a PT service is available, but should also cover whether a good PT service should be made available if it is not. It can be said that all cities larger than a certain size as well as countryside roads which carry more than a certain number of persons per day should have a PT service. As far as the former is concerned, the service level benchmarks for urban transport defined by Ministry of Urban Development, Government of India⁵⁴ do suggest that all cities with population of more than 2 lakhs should have an organized public transport service.

For financially well off citizens, mobility may mean attractive and perhaps air conditioned buses connecting important cities or important destinations in a city. The buses should be attractive enough for this class of citizens to feel like not using their personal vehicles. These people may not mind paying a premium for the service, including using taxis/ rickshaws for the “last mile connectivity”. Evidently, these bus services will not be frequent. In that case, the target passenger would want a mechanism to find out when the next bus is going to be, e.g., by way of an SMS on his/ her mobile phone.

This applies to long distance/ countryside PT services as well. Some citizens need premium services, especially between select destinations.

Mobility for “all” has another important aspect that needs to be addressed. Chapter 8 of The Persons with Disabilities Act, 1995, states several measures that should be taken by establishments in the transport sector to provide various facilities for Persons with Disabilities. These facilities include specially designed vehicles for easy ingress and egress, bus stops and restrooms that can accommodate wheelchairs, etc.

To summarize, “mobility and connectivity”, in context of PT, would include:

- Reach of PT services in nooks and corners
- Frequency of operation of PT service
- Whether the bus is crowded
- Availability of a punctual premium service, maybe at an extra cost
- Handicapped-friendliness of the service

People need access to PT services within 1-2 km. The service should be usable even for the physically challenged.

Safety

There are two aspects of “safety”, viz., safety related to crime and accidents.

⁵⁴ Service Level Benchmarks for Urban Transport at a Glance
(http://www.urbanindia.nic.in/programme/ut/urban_transport.htm)

Crime

Violent crime on PT is a concern in some cities abroad as well as in India. Such crimes are more likely when buses, trains and platforms are almost empty in late night hours. Locales with repeated occurrences of such crimes will need to make special provisions like alarm systems, security patrols etc.

Accidents

As far as the passengers are concerned, PT offers the safest means of travel⁵⁵. Number of fatalities per million passenger-km are about 20 for riders of 2-wheelers, between 3 and 4 for people using cars. For bus and train passengers, the figures are just 0.4 and 0.001 respectively.

However, a significantly high number of deaths happen because of PT vehicles (buses and trains). This is quite natural because of two reasons:

1. PT vehicles are much heavier than personal vehicles, yet share the same road space and
2. The number of vehicles on the roads is increasing every year (both urban and rural areas), therefore a bus has to make way through a much larger number of vehicles.

In urban PT, bus lanes are slowly being discussed and put in place in larger cities in Maharashtra because of all the advantages they provide for PT. However, empty bus lanes tempt other vehicles' drivers to enter and drive fast through them. The buses themselves go much faster in these special lanes, and there have been incidences where pedestrians jumping over dividers as well as 2-wheelers straying into the bus lanes have been killed by speeding buses.

In case of PT covering rural areas, the vehicles use National and State Highways, roads winding through hilly regions, uneven and narrow rural roads. All of them have their own perils. Bus passengers are especially vulnerable on such roads because the buses generally have only three narrow doors including the driver's, plus at the most one emergency exit and there could be as many as 60 or even more passengers in the bus. As compared to this, cars have 4 doors for 5 passengers. Buses will need to be equipped with more emergency exits designed to help passengers get out of the bus much faster.

Safety of PT passengers has to be addressed with higher priority. In addition, accidents involving PT vehicles give PT services a bad name, regardless of whose fault it is. Measures should be taken to reduce such accidents too.

⁵⁵ Strategic Environmental Assessment Scoping Report: Chapter 2, 2009, Pune Municipal Corporation

Affordability

Since the PT services are meant for the masses, it follows that they should be affordable to virtually everyone.

Since the cost of running the PT service is shared among all passengers, PT is certainly significantly cheaper than a personal vehicle, even at much less than 100% occupancies. Various schools of thought exist as far as affordability is concerned.

No profit no loss

The most intuitive line of thought expects all passengers to pay for what they are using, looking at PT as a “no profit no loss” venture on an average. Fare concessions may be granted to weaker sections like financially not well off, students, senior citizens etc., but they are indirectly recovered from passengers who pay full, regular fares.

Government subsidized PT

Another school of thought says that it is the government’s duty to provide affordable transportation to everyone and it may be ok for PT undertakings to run in loss. The government should provide subsidies for these undertakings to continue operations.

Charge other modes to fund PT

A third way of looking at the financial model of PT considers various intangible benefits offered by PT, e.g., lower emissions and fuel consumption, lower amount of road space consumed per person-km. This model expects other means of transportation to be taxed or charged in some way for not being as efficient as PT in using fuel and road space.

In Maharashtra, most PT operations use the first of the three models mentioned above since they strive to break even. The ticket rates are raised when the operation makes losses, and concessions are given or fare hikes are postponed when it makes profits. In some cases a flavour of the second model is also seen. PT operations are not asked to close down even after making losses for a few years in succession, and the Government provides assistance for their survival. The third model has not been tried out in Maharashtra yet.

It is interesting to note that about 25 cities and towns in the world are known to offer free public transport. A vast majority of them are small European towns with populations ranging between 5000 and 50,000⁵⁶.

It should also be examined whether a given PT system seems affordable just because the costing is not correct. It is possible that a lot of hidden costs have gone in establishing a system, which are either borne indirectly by citizens or they are very difficult to measure in the first place. For example, when roads are narrowed for building a flyover, people bear an indirect cost during the construction phase when they spend more time for the

⁵⁶ Zero-fare Public Transport, Wikipedia (en.wikipedia.org/wiki/Zero-fare_public_transport)

commute. Hidden costs may also be attributable to things like irritation caused by noise, dustiness in the neighbourhood, even to ambulances stuck in traffic jams!

There can be several ways of making PT affordable to people. Hidden costs borne by citizens to build any traffic infrastructure should also be considered while evaluating affordability.

Flexibility and sustainability

A PT system is flexible and sustainable if it adapts well to changing circumstances. There can be innumerable changes a PT system has to encounter. To name a few: Stricter emission norms, changing traffic pattern in some part of the city. Even small changes in the height and width of bus doors could mean changes in all bus stops if the stops cannot adopt to such changes.

In most cases the changes are relatively insignificant and all that takes for the PT service to adopt to it is some money and time. As long as the PT service does not overly depend on any parameter, flexibility and thus sustainability is not much of a problem. A common example that can be cited is that of tramways. While being an excellent, energy efficient PT service, changes in the city's traffic pattern (excessive development in a locality, a road that needs to be converted to one-way) can cause serious problems to a tramway.

A PT service may start encountering sustainability issues as its usage nears or crosses its peak capacity. It may not be very easy to add capacity to a PT service if the roads are already full of buses packed with people or overloaded trains are running every alternate minute. Of course, in most such cases the problem may not lie with the PT service itself but with bad town planning, which could have caused excessive growth in population in the first place.

Space

Space is already at a premium in cities. As an example, Pune has earmarked about 13% of land use for transportation. However, the city has been able to use only 4.46% of its area for roads⁵⁷. Various constraints and problems including encroachment, cost of developing transport infrastructure are making it difficult for more space to be put to use towards transportation.

In this situation, means of transportation that use the least space per passenger km will need to be given high priority. Once again, higher ridership on PT systems means our cities will have sustainable transportation.

Although the space crunch has not yet started affecting countryside transportation, there are reasons why our highways cannot be widened indefinitely. There may be space to widen a countryside road, but doing so for hundreds of km makes the proposition

⁵⁷ Pune City Development Plan 2006-2012, Website of PMC (www.punecorporation.org)

expensive. Wider highways also mean high speeds and higher rates of fatalities. Promoting PT for long distance commute alleviates these problems to a certain extent:

- Higher number of people travelling by PT means fewer vehicles on the roads, thus conserving space and reducing expenses on building roads.
- It also means fewer drivers on highways. If safe driving habits can be imbibed in drivers of PT, it can significantly reduce the number of fatalities on the countryside.

It is clear that promoting PT can make transportation sustainable in various ways.

Care should be taken to make sure that the PT operations can adopt easily to changes and stay flexible. This is essential to make the whole realm of transportation sustainable.

Environment friendliness

It is well understood that Earth's fossil fuel reserves are getting depleted and may not last long, and transportation is a major consumer of fossil fuels.

Modern two-wheelers typically give mileages of 75 kmpl (petrol). For cars, the figure is about 15 kmpl (petrol). Public transportation buses run at efficiencies of about 3.3 kmpl (diesel)⁵⁸. Typical occupancies of these three means are 1.6, 2.9 and 35. Petrol and diesel provide 34.8 MJ/l and 38.6 MJ/l energy respectively⁵⁹ (MJ = Mega Joules). Summarizing this data gives us the following table:

	2-Wheelers	Cars	Bus
Fuel type, energy in MJ/ l	Petrol, 34.8	Petrol, 34.8	Diesel, 38.6
Vehicle's mileage (km/ liter)	75	15	3.3
Typical occupancy	1.6	2.9	35
Typical energy consumed (MJ/ passenger-km)	0.29	0.80	0.33

It is evident that public transportation is significantly more environment friendly as compared to cars. As far as comparison with 2-wheelers is concerned, they occupy significantly more space on roads per person, thus congesting the roads for buses.

⁵⁸ State Transport Undertakings: Profile and Performance 2007-08, CIRT.

⁵⁹ Fuel efficiency: Energy content of fuels, Wikipedia (en.wikipedia.org/wiki/Fuel_efficiency)

If congestion is reduced, the fuel efficiency of buses will increase noticeably.

Integration with the fabric of the city or country

The PT system should “do” what the people in the locality do. It should speak their language, use technology that people of the land can use. Its routes should naturally serve the most favoured origins and destinations. It should be flexible to accommodate temporary needs of travel according to seasons and festivals.

Both urban and rural landscapes have varied characters. There are “showpiece” areas in a city. There are tourists destinations in remote corners of the country. Such destinations attract tourists and have peculiar needs. The PT system in that area should strive to satisfy those needs. For example, there could be special buses with extra luggage holding capacity or buses fitted with sound system to provide recorded information about the tourist destination.

For a PT system to be popular, it is necessary that the people from the area it serves love the system. Therefore a PT system should set some standards with respect to cleanliness, comfort, looks etc., rather than following them. A PT system that scores on such fronts will be considered an icon of the city.

Comfort and cleanliness levels expected by commuters depend on various factors. For example, although all buses and bus stations should pass a certain level of cleanliness standards, those connecting airports need to be much cleaner and in better shape and provide a higher level of comfort (maybe at extra cost) than others.

Public Transportation in Urban Maharashtra

A set of diverse means are used or are being planned for public transportation in urban Maharashtra today. They are operated by both government and private operators. They include:

1. Government operated bus services
2. Buses operated for organizations
3. Contract buses for daily commute between home and work
4. School buses
5. Intermediate PT: taxis and rickshaws
6. Mass Rapid Transit: Track based
7. Mass Rapid transit: Road based

Let us have a look at the state of all these means of PT in Maharashtra today.

Government operated bus services

The following cities have a bus service operated by a government established agency.

In most other cities, MSRTC (Maharashtra State Road Transport Corporation) provides a bus service that covers not only the city or town, but also adjoining villages. Such a bus service is not a separate entity from MSRTC. It is therefore not possible to examine such “city” bus services.

The Ministry of Urban Development, Government of India, has defined service level benchmarks⁶⁰ for urban transportation as a whole. According to the benchmark, the level of service index of PT in a city depends on the following factors:

1. What fraction of the PT system is “organized” (and not subcontracted)?
2. Number of buses/ train coaches per 1,000 population
3. How much of the city area is covered by PT services at frequencies better than one service per hour?
4. Waiting time for PT users
5. Are the buses/ trains overcrowded?
6. Percentage of good buses (i.e., buses as per specifications provided⁶¹)

The same benchmark also states an objective of establishing an organized PT system for all cities in India with 2 lakh plus population as per 2001 census.

Although a detailed audit of service levels of PT systems in Maharashtra is not available, it looks difficult from the specified benchmark that any urban PT system in Maharashtra would qualify as Level of Service = 1. In absence of such an audit, let us look at the state of Government operated city bus services on basis of assorted available information.

Adequacy of buses

The Service Level Benchmarks by Ministry of Urban Development use the following formula to calculate “Availability of PT”:

Availability = (no of buses + 3 times no of train coaches) / population in thousands.

The availability is considered good if this number is more than 0.4.

The table below tries to capture where Maharashtra stands with respect to this recommendation. Since the most recent census was done in 2001, the population figures have been adjusted assuming a growth of 4% p.a.

⁶⁰ Service Level Benchmarks for Urban Transport at a Glance
(http://www.urbanindia.nic.in/programme/ut/urban_transport.htm)

⁶¹ Urban Bus Specifications (http://www.urbanindia.nic.in/programme/ut/urban_transport.htm)

City	Population (2001) lakhs ⁶²	Population (2007 est) lakhs	No of buses (2007) ⁶³	Buses /thousand
Pune Urban Agglomeration	37.61	47.76	933	0.195
Kolhapur	5.05	6.41	116	0.181
Solapur	8.72	11.07	85	0.077
Aurangabad	8.92	11.33	67	0.059
Amravati	5.50	6.99	24	0.034
Akola	4.00	5.08	14	0.028
Nanded	4.31	5.47	14	0.026

In reality, these bus services also serve a significant number of adjacent villages. The effective no of buses per thousand population is therefore even less than what is shown in the table above.

It can also be seen that the number of buses per thousand declines for smaller cities. This observation might indicate that more attention is paid towards development and upkeep of larger cities while smaller cities, towns and villages are deprived of development.

While on this topic, it is worthwhile to look at the number of buses per thousand population in other cities in India as well as some south American cities.

City	Population (2011) lakhs ⁶⁴	Population (est) lakhs	No of buses (same year)	Buses /thousand
Bangalore Urban Agglomeration	84.26	(2010) 81	5593 ⁶⁵	0.69
Chennai Urban Agglomeration	46.81	(2010) 45	3421 ⁶⁶	(*) 0.75
Bogota (2000)⁶⁷				3.60

⁶² Census of India, 2001

⁶³ Economic Survey of Maharashtra, 2008-09

⁶⁴ Census of India, 2011

⁶⁵ Bangalore Metropolitan Transport Corporation, Wikipedia
(http://en.wikipedia.org/wiki/Bangalore_Metropolitan_Transport_Corporation)

⁶⁶ Chennai, Wikipedia (<http://en.wikipedia.org/wiki/Chennai>)

⁶⁷ Study of urban public transport conditions in BOGOTÁ, Dr Arturo Ardila

Curitiba (2000)				0.70
Sao Paolo (2000)				0.60
Quito (2000)				1.00
Santiago (2000)				1.70

(*) It should be noted that Chennai also has a suburban railway system like Mumbai, in addition to the bus service.

It can be clearly seen that the number of buses in urban transport undertakings in Maharashtra is pathetically inadequate.

Performance of urban bus services in Maharashtra

Let us have a look at the performance of urban bus services in Maharashtra, and compare it with average urban bus services in India. Two representative urban PT undertakings are chosen from Maharashtra: the BEST from Mumbai and PMPML from Pune and Pimpri-Chinchwad. The table below lists some performance indicators⁶⁸. These indicators are chosen such that presence or absence of a local train system will not have any effect on them. Cells with reddish background indicate performance 5% or more below the average as compared to that of urban buses in India, whereas cells with dark red background indicate performance 10% or more below the average. Cells with green background indicate performance 5% or more above the average.

	Cost recovery, %	Personnel cost vs. revenue, %	Fleet utilization, %	km run per day per bus	km per employee	km per liter	Breakdowns per 10,000 km	Accidents per 100,000 km
Indian Urban Bus Undertakings	66	66	85	189.6	26.6	3.8	0.77	0.33
BEST	69.7	86	89.7	179.3	19.4	3.1	0.83	0.37

(http://www.ppiaf.org/ppiaf/sites/ppiaf.org/files/documents/toolkits/UrbanBusToolkit/assets/CaseStudies/summy/sum_bogota.html)

⁶⁸ State Transport Undertakings: Profile and Performance 2007-08, CIRT.

PMPML			78.7	187.5	25.8	3.5	2.19	0.34

This table clearly indicates that the performance of urban bus services in Maharashtra is significantly below par even when compared with urban bus services in India.

Buses operated for organizations

Many organizations like large private and public sector companies, educational institutes operate buses to provide convenient daily commute for their employees or members. These buses may be owned by the organization or a service provider may be hired to provide an exclusive service for the organization.

Such bus services are popular among their users for various benefits they provide:

- Comfortable journey: The buses are generally in decent condition. Proper capacity planning ensures sitting place for virtually everyone.
- No hassle of buying a ticket every day.
- Reasonable punctuality: Since the service provider is answerable to the users.
- Point-to-point service: In most cases, the pickup point is within a walking distance from the users' home. The other end point, of course, is within the premises of the organization.

Such services, whether operated by an organization or by a service provider, need a Private Service Permit which is issued by the local RTO office.

This system offers certain advantages today, because it takes away a significant amount of load from the city bus service. Yet, it should be understood that this is mostly a stop gap arrangement that exists because the PT system in that area is not good enough. There are several issues with this arrangement. The companies that operate such buses often focus on margins alone. The training provided to their drivers is debatable. Since they somehow want to maintain a contract they have won, there is excessive emphasis on following meeting the time by which to bring the employees to work. This leads to road safety issues, with drivers put under pressure by their supervisors and employees alike, even by calling them on their mobile phones while they are driving.

We therefore feel that the intra-city PT should be made so strong that even this demand can be supported. PT should be pitched in direct competition with such contract buses and the contract buses should be discouraged.

For a discussion on the possibility of the PT service itself being privatized, the reader is advised to refer to the chapter "Should the transportation sector be privatized".

Contract buses for daily commute between home and work

This means of public transport could be almost like the one discussed above. Conceptually, in this case, people using a given bus may be working for different employers. Going a step further, a number of citizens could hire a pool of buses to provide them flexibility.

Present RTO rules do not allow such bus services. However, it seems some variation of it existed in Mumbai in 1980's and 90's. It is entirely possible that some RTO rules were flouted or loopholes were found to run these bus services. The fact remains that these buses were popular with people as they provided advantages to them similar to those mentioned above.

Such services where, e.g., 500 people hire 10-12 buses and any individual may board a different bus on different days, are perhaps considered a competition for the local, state operated bus service.

In this case too, we feel that the intra-city PT should be made so strong that even this demand can be supported. PT should be pitched in direct competition with such contract buses and the contract buses should be discouraged.

For a discussion on the possibility of the PT service itself being privatized, the reader is advised to refer to the chapter "Should the transportation sector be privatized".

School buses

School buses offer the same benefits to their users as those offered by buses in the two categories mentioned above. However, since a significant capital investment has to be made, very few schools find it viable to run a bus service. The following characteristics of their users (i.e., students) also limit the viability of operation:

- Students generally travel much shorter distances to school, compared to employees travelling to work.
- Many parents prefer to drop and pick up their children to school on 2-wheelers.
- As children grow up, they prefer to walk independently or use bicycles for the commute.
- For financially weaker sections of the society, none of these are viable options anyway. Such children either walk to school, or use the city bus especially if the undertaking provides concessional rates for schoolchildren.

As a result, only those schools with a large number of students from upper financial strata run a bus service (either themselves or by hiring a provider).

There is a lack of stringent norms for vehicles ferrying students. Whatever norms exist are not enforced effectively. This has led to private rickshaw and minivan operators providing their services for school students, with virtually no control on number of students in one vehicle, emergency exits for vehicles with larger capacity, proper training

for drivers of these vehicles etc. This allows such operators to cut costs and provide “affordable” services for ferrying the students. This makes a properly run good school bus service financially not viable.

Unfortunately, even if some operators might be willing to adhere to safety norms, whether stipulated or self imposed, very few parents are willing as well as able to pay higher charges for a school vehicle service that offers better comfort and safety. It is hoped that as the per capita earning continues to grow, parents will be more willing to spend more for a better service, and safety norms which are commonplace for school buses in developed countries will be more acceptable to citizens of India.

City bus services of some cities do offer concessions, or even free services, to students going to school. The financial burden is absorbed by either the rest of the passengers or is taken care of by subsidies received for this reason by the bus service. Needless to say, for such a facility to be effective, the bus routes also have to be rationalized and their timings adjusted according to the timings of schools.

It is surprising that no norms exist as of 2010 for a school bus service, apart from those applicable to a general private service provider. It is only in 2010 that norms are being considered for school buses, which would govern aspects like emergency exits, number of children that can be carried by a school bus, etc.

Privately contracted buses may be being used for daily commute to work and to school. Some of these may be violating certain RTO rules. However, considering that they provide tangible benefits to their users, we need to inspect which rules are being violated and whether they can be suitably amended to protect the interests of all concerned, including PT undertakings.

Intermediate PT: Taxis and rickshaws

Taxis and rickshaws augment the PT services in various sections:

- For “last mile connectivity” between the bus stop and the actual origin or destination
- When commuters have some luggage to carry
- When commuters do not have the capability of catching a crowded bus/ train

Of course, taxis and rickshaws also function like a personal vehicle for people who either cannot drive, or are away from their personal vehicle for some reason.

Urban traffic planners prefer to encourage taxis and rickshaws over personal vehicles because the former do not need dedicated parking places. When one passenger gets off a rickshaw, the rickshaw can be hired by another person. This saves land required for parking, and is thus better for city traffic than personal vehicles like cars or 2-wheelers.

Intermediate PT (IPT) is important for success of PT services. For urban public transportation, they augment PT by providing last mile connectivity. For rural public transportation, passengers frequently carry luggage and using regular PT services is difficult. Use of IPT becomes more or less essential for such passengers.

Even though IPT and PT complement each other, IPT does consume more road space and fuel per passenger-km compared to PT. Cities must therefore ensure that IPT does not overshadow or hinder PT. In reality, however, rickshaws are seen waiting next to bus stops, often making it difficult for buses to halt right next to the stop. In these cases they are not augmenting the services provided by PT but are effectively competing with PT, adversely affecting its revenues and thus financial viability. Making IPT available at bus stops without it affecting the bus service is a tricky problem that will have to be solved with some innovative approach.

The number of rickshaws and taxis that can ply within a city as well as their fare structure is controlled by the Road Transport Authority.

IPT (rickshaws and taxis) complements PT services. Yet, while promoting IPT, care must be taken to ensure that it does not hinder PT itself.

Mass rapid transit: Track based

We have discussed the growth of cities in Maharashtra. It has led to an alarming rise in the number of vehicles in cities and thus to congestion. As the distances travelled by daily commuters in cities are increasing, there is an increasing need to transport a large number of people from one part of the city to another, rapidly and efficiently. Thus the term “Mass Rapid Transit” (MRT).

Most popular MRTs worldwide are track based. The local trains in Mumbai are a form of track based MRT. Other forms of track based MRTs include Metro, monorail, tram, light rail.

All these systems share the following very peculiar characteristics:

- They are very expensive to build
- Their tracks/ corridors cannot be changed easily once they are built
- They can attract users of personal vehicles
- They are very energy efficient

Building cost

These systems have a high building cost because they require dedicated space for tracks, stations. The technology used by these systems is also significantly expensive (which includes cost of laying tracks, coaches, signaling system etc) than a simple bus service that runs on regular roads. Indicative capital costs per km are:

Form	Indicative capital cost per km, in Rs. Cr.	Remarks
Tram	50	Interferes with road traffic.
Light rail	100	Dedicated land, so no interference. But bridges needed for road traffic to cross over.
Monorail	150	Mostly elevated. Modest speed, capacity.
Metro, over ground	150-200	High capacity. Needs complex planning because of larger turning radius.
Metro, under ground	300-400	Most expensive, but can access destinations anywhere.
Surface rail	zzz	Needs large stretch of dedicated land. Not possible unless a city has reserved such land for years.

Flexibility

Since their tracks and corridors cannot be changed easily once they are built, they require significant amount of planning effort. Planning any of these systems encompasses domains like town planning, traffic planning, aesthetics of the city, planning and managing underground utility services like sewage, power cables, telephone lines etc.

Among these three means of PT, the tram shares the road with other vehicles. On one hand, it makes planning simpler, but on the other it increases possibilities of accidents as well as schedules getting upset because of congestion on roads.

Since the other systems require land resources to varying degrees, whether over ground (metro/ monorail) or at grade (light rail/ regular rail), it is very difficult to make provide space for them once a city grows beyond a certain size, unless it has been included in the town's planning and is protected from encroachment.

Although the underground metro does not have this constraint, the very nature of this system involves phenomenal costs and planning efforts.

Moving people away from personal vehicles

Systems like metro, monorail, tram and light rail exude "class". Features that include sleek looks, automatic doors, automatic ticketing facilities, low noise pollution can easily

make them attractive to commuters who otherwise use personal vehicles for their daily commute. Therefore these systems can have a significant impact on reducing congestion.

Energy efficiency

Compared to bus based PT systems, these systems consume much less energy per passenger km. Since the life of these systems is easily in the range of a hundred years or even more, they can more than compensate for their high initial costs by savings in energy.

Track based MRTs in Maharashtra

Mumbai has been using a surface rail based MRT (the “local trains”) for about a century. A skeletal local train service runs between Lonavala and Pune.

A Metro is being built in the city of Mumbai. This Metro will be both over and underground in parts of the city. In addition, plans are being prepared for a Metro in Pune and Pimpri-Chinchwad. None of the above systems are being planned in any other city in Maharashtra.

Track based MRTs are practically not used in Maharashtra. They have a large potential, but also involve substantial capital expenditure. Hence they should be put in use after extremely careful surveys and studies.

All of the track based MRT systems share the following characteristics: Significant capital costs and building efforts. Building these systems takes significant time and disrupts city life, thus adding enormous hidden costs in terms of time lost in traffic jams, irritation, dust and noise pollution etc. Unfortunately, these costs are borne by citizens and are not compensated for.

Mass rapid transit: Road based

Another form of MRT has been built in many cities worldwide which can reduce these hidden costs to a large extent. This form utilizes the existing road network. Although some modifications to existing roads may be necessary, these systems are quick to build and are much less expensive compared to track based MRTs. These are bus based rapid transit systems, called BRT. In one phrase, they can be summarized as “a metro on roads”.

Let us examine the BRT with respect to the same parameters used for the other MRTs.

Building cost

A typical BRT system costs about Rs. 20 Cr/ km (indicative). Since it is built without any digging or significant construction, hidden costs that are borne by citizens are also insignificant.

Flexibility

If it is found that a BRT system is not viable on a certain road, it can be dismantled easily and/ or moved to another corridor. Since it uses buses, BRT tracks do not have serious constraints because of turning radii. Thus it offers a high degree of flexibility.

Moving people away from personal vehicles

BRT is, after all, a bus. It does not exude “class” as much as a metro does. Therefore BRT systems need a serious branding effort to have people stop using their personal vehicles and use BRT.

Energy efficiency

BRTs use about the same energy per passenger-km as a bus. However, if they also manage to move a significant number of people away from personal vehicles, they effectively reduce the fuel consumption of the city.

Bus based MRTs in Maharashtra

Pune has been experimenting with a BRT system for a few years. No other city has planned a BRT.

State of the BRT in Pune

The BRT project is approved for PMC. However, since the BRT pilot is not very successful, its progress is slow.

The BRT is characterized by dedicated bus lanes, pre-boarding ticketing, priority signals, high frequency of buses, a “brand” and a fleet of modern, spacious buses etc. All of these contribute to its success by varying degrees. Any dilution in any of these is likely to lose BRT’s image and reduce its ability to attract users of personal vehicles. That is precisely what has happened to Pune’s BRT.

Even then, it may be noted that Pune’s BRT pilot, even in its current form, has attracted people to PT. The routes that run along the BRT corridor have seen significant increase in revenue and number of commuters. The number of commuters per day has increased

from 2.75 lakh to 3.57 lakh after implementing the BRT pilot⁶⁹. It goes without saying that if the BRT were implemented meticulously, it would be even more successful.

Road based MRTs are also new to Maharashtra. They have an advantage over track based MRTs in terms of cost and flexibility. Hence they too have a large potential in Maharashtra.

Miscellaneous

A few other issues need to be discussed while understanding urban PT.

1. Users of PT generally walk to and from the bus stops at both ends of their trips. Therefore the state of pedestrian facilities has a direct bearing on success of PT.
2. PT systems thrive when people do not depend on motorized personal vehicles. A good infrastructure to support cycling is a step towards reducing this dependence, and thus it complements PT.
3. Good PT can make tourists like a city or a town. Even for tourist towns that are not very large to apparently make a PT system viable, a good PT system could bring more tourism and support its economy. Since tourists are generally not familiar with the town, PT systems in tourist towns must provide all necessary information to tourists to help them move around independently.
4. Good PT can make a city attractive and hence a target for migration. If only one or two cities have good PT systems, it can add to lopsided and uncontrolled growth of those cities, congesting them even further. Therefore it is essential that all towns larger than a certain size have good PT systems appropriate to the respective towns.
5. As discussed in earlier sections, this blueprint considers buses hired by companies for transporting their employees, school buses, private inter-city bus services as various forms of public transportation. It is found that buses used for all these modes of transportation have to pay taxes of various kinds, right from their manufacturing stages up to their day to day usage (e.g. tolls). More often than not, the taxation follows the dictum "more tax for more expensive or heavy vehicles". However, it should be understood that whether they are operated by private or public sector, they are all high occupancy vehicles and thus consume less road space and fuel per person-km, and thus should be encouraged.

Several not-so-obvious factors need to be considered to ensure success of PT, as well as to ensure that PT benefits the city as well as the state/ country as a whole.

⁶⁹ The Times of India, Pune, 8-Aug-2010 (p2)

Public Transport in rural Maharashtra

Why do we need good public transport in rural areas

At the outset, it may be a good idea to compare urban and rural or countryside public transportation, mainly bus services.

Urban bus services have been widely experimented with all over the world. Various kinds of bus services have been put in operation and extensive documentation is available regarding urban bus services, with respect to number of buses needed for serving a population, kinds of buses needed, techniques used for attracting ridership and moving ridership from personal vehicles to public buses etc. This is mainly because the countries where such experimentation has been mainly carried out are highly urbanized. Urban land is a scarce commodity, and it is the main driver behind this experimentation.

The rural population in those countries is financially well off compared to India, and can afford personal vehicles. Since area available for building roads is generally not a problem in non-urban locales, there is not enough motivation for moving ridership from personal vehicles to public transportation in rural areas in those countries.

In comparison, although area available for building roads is not much of a problem in rural or countryside India or Maharashtra, there are two potential drivers because of which Maharashtra needs a good rural public transport. They are:

3. Need to save valuable foreign exchange spent on petroleum
4. Providing mobility to people

Need to save valuable foreign exchange spent on petroleum

This need or objective applies to urban PT also.

Providing mobility to people

Since most people in the countryside cannot afford a personal vehicle, they depend on public transportation for mobility. However, it should be noted that this situation is changing rapidly. As a result, the number of vehicles in rural Maharashtra is increasing. Although it may not cause severe traffic jams as in cities, it does increase the consumption of fossil fuels, stresses our foreign exchange reserves and increases pollution.

It is therefore equally imperative that Maharashtra provides world class public transportation even in rural areas.

Types of public transport in rural Maharashtra

Rural Maharashtra implies villages and small towns as well as the “countryside”, or the region between two villages/ towns/ cities. A set of diverse means are used for public

transportation in rural Maharashtra today. They are operated by both government and private operators. They include:

1. Government operated bus services
2. Privately operated bus services
3. Intermediate PT: taxis and rickshaws

Let us have a look at the state of all these means of PT in Maharashtra today.

Government operated bus services

The Maharashtra State Road Transport Corporation (MSRTC) operates bus services across Maharashtra. Though MSRTC also operates bus services within small cities where no separate city bus service exists, its volume is very miniscule in comparison with the “regular” MSRTC services.

Let us have a look at the performance of MSRTC and compare it with average rural bus services in India. The table below lists some performance indicators⁷⁰. For MSRTC, cells with reddish background indicate performance 5% or more below the average as compared to that of rural buses in India, whereas cells with dark red background indicate performance 10% or more below the average. Cells with green background indicate performance 5% or more above the average.

For year 2007-08	Cost recovery, %	Personnel cost vs. revenue, %	Fleet utilization, %	km run per day per bus	km per employee	km per liter	Breakdowns per 10,000 km	Accidents per 100,000 km
Indian urban bus undertakings	66	66	85	189.6	26.6	3.8	0.77	0.33
Indian rural bus undertakings	98.5	36.4	93.9	346.3	60.73	5.1	0.15	0.17
MSRTC	104.4	32.9	94.8	316.4	48.5	4.9	0.25	0.19

It can be seen that MSRTC fares well when compared to Indian rural bus undertakings as far as its financial performance goes. However, as far as its physical performance is

⁷⁰ State Transport Undertakings: Profile and Performance 2007-08, CIRT.

concerned, it falls way short of its peers across the country. Factors that impact the operative efficiency of a PT system have a direct bearing on its affordability.

The table above also quotes figures for Indian urban bus undertakings. It seems that the overall performance of the rural bus services is far better than that of urban services. Yet, as far as the physical performance indicators are concerned, this difference can be attributed to the very nature of urban transportation, where buses have to move in stop-and-go traffic and at low speeds. To be fair to MSRTC, its low scores in the physical performance indicators can be partly attributed to Maharashtra being a more urbanized state as compared to the rest of the country.

This fact actually throws substantial light on several problems faced by MSRTC. Rapid urbanization of Maharashtra has directly or indirectly led to all of the following:

- Growth in number and size of towns and small cities.
- Need for higher number of MSRTC services between such towns and cities.
- Growth of a city implies that the MSRTC bus station in the city does not have space to expand, yet has to cater to a much larger number of buses, schedules and passengers than it is designed for.
- Such bus stations are difficult to maintain because they cannot be shut down for maintenance, even partly. That has led to the dilapidated condition of bus stations.
- Where bus stations have been moved to the periphery of the city or additional stations have been built, people have to rely on rickshaws for the commute to the bus station. In some cases, this commute costs about the same as, or even more than, the commute to the destination city.

The MSRTC services are also plagued with myriad other issues and problems, examples of which are listed below.

- A constant attempt to drive the costs down forces MSRTC to operate old buses that are barely road-worthy. Tyres that have lost their treads, buses with badly damaged bodies and worn out seats are commonly seen.
- Increasing competition from private operators, para transit, increasing ownership of personal vehicles and even migration to cities mean a constant struggle for ridership, especially in smaller villages.
- Allowances paid to MSRTC drivers and conductors, e.g. when they have to make an overnight stay in another town with the bus, are abysmally paltry.

MSRTC services also seem to lack innovative ideas and experimentation. For example, in areas where there is not enough ridership for a regular bus, a mini bus service or even a van or an SUV-like vehicle could be operated. Also considering that a good number of MSRTC commuters travel long distances and hence carry luggage, the buses could have wider doors and easily accessible luggage racks.

Yet, to MSRTC's credit, they have proliferated their services to nooks and corners of the state, sticking to their motto "रस्ता तिथे एसटी", or "if there is a road, there is ST" (as MSRTC was called earlier). MSRTC's modern services like the Shivneri and MahaBus service have gained popularity in cities, and many people seem to prefer these over the private operators, in spite of the private services being cheaper by 10% or so. This shows the trust and comfort gained by MSRTC in all these years.

Privately operated bus services

A significant number of private operators provide medium to long distance bus services. Since their main objective is to make money, they mostly operate on routes with maximum demand for such services. These routes connect cities and large towns as well as some tourist destinations. Most of these services are run "point to point", barring pick up and drop off points in the origin and destination towns. They generally do not offer services to small villages along the route, even if no detour is needed to serve the village.

The USPs of these services are comfort and speed. Majority of them offer air conditioned travel in buses that are generally in better condition than MSRTC buses. In some cases, their services are faster because they do not spend time on pick up and drop off along towns and villages along the route. Such services are hence becoming popular in certain sectors. In some cases these operators are also able to offer cheaper fares partly because of high turnover and mainly because they operate only along profit making routes and do not serve remote locations which do not generate much revenue. In most cases they do not operate from any bus stations - whether their own or leased. They are generally seen to pick up and drop off passengers from the roadside, even at origin and destination points of their routes. While this saves costs for them, it causes some inconvenience to commuters and a lot of inconvenience to other traffic on the road.

Yet, such private services also have some serious drawbacks. Since they are not answerable to the public, their schedules could be changed at the last minute depending on the demand, at the cost of the commuters' convenience. Their services in the event of breakdowns along the trip also leave a lot to be desired.

In many aspects, the case of such inter-city private bus services is quite similar to the contract bus services provided by companies for the daily commute of their employees, the principal similarity is that this arrangement has come in existence because the PT is not able to support that ridership. These private bus services suffer from most of the drawbacks of the contract buses, listed in "Buses operated for organizations".

We therefore take a similar stand even for privately operated inter-city bus services, which is as follows.

We feel that the inter-city PT should be made so strong that even this demand can be supported. PT should be pitched in direct competition with such contract buses and the contract buses should be discouraged.

For a discussion on the possibility of the PT service itself being privatized, the reader is advised to refer to the chapter "Should the transportation sector be privatized".

Intermediate PT: taxis and rickshaws

Maharashtra also has privately operated taxis for medium as well as long distance travel.

Vehicles of various kinds can be seen ferrying passengers over distances of typically 2-20 km. Such services are commonly seen in rural areas. Although a cheaper MSRTC service may be available, its frequency is very poor. Fares of these services are generally charged on a per seat basis. There is no fixed fare table and the fare depends on mutually understood rates as well as negotiating powers of the provider and the passengers.

Some of these vehicles may be authorized by RTO and bear a black and yellow colour code. Yet, oftentimes these services are not authorized by RTO authorities. These vehicles are also frequently seen carrying many more passengers than permitted for the vehicle.

In spite of all this, they do address the mobility needs of a section of people. We suggest that any improvements in this regard be done not with the intention of stopping their services but improving safety and passenger comfort.

Does PT in Maharashtra satisfy the objectives of PT?

Now that we have studied the state of current urban and rural PT systems in Maharashtra, we will check whether it satisfies the objectives of good PT systems.

As stated earlier, the objectives of a good public transportation system are:

1. Mobility and connectivity for all
2. Safety
3. Affordability
4. Flexibility and sustainability
5. Environment friendliness
6. Integration with the fabric of the city or country

Let us now examine where Maharashtra stands with respect to these objectives. Since PT in both urban as well as rural Maharashtra is still mostly bus based, most of the observations in the discussion below apply to both urban and rural Maharashtra. Any distinction is explicitly stated.

Mobility and connectivity for all

In the chapter "Objectives of Public Transportation", we had seen that the terms "Mobility and connectivity" include the following:

- Reach of PT services in nooks and corners
- Frequency of operation of PT service
- Whether the bus is crowded
- Availability of a punctual premium service, maybe at an extra cost
- Handicapped-friendliness of the service

Mobility and connectivity **for all** assumes a focus on people. Only then can one ensure mobility for people of all ages, physical abilities, financial strata and all cities and villages.

To a large extent, the objective of overall traffic planning has been to ease movement of vehicles rather than people. As a result, the PT in Maharashtra has suffered a lot. Below are some examples.

- The number of buses in any city bus service should be of the order of at least about 40-50 per lakh population it serves. No urban bus service in Maharashtra meets this criteria. As a result, the buses do not reach all parts of the city with adequate frequency and are overcrowded during peak hours.
- A large number of the buses are in dilapidated condition. They fail to attract users of personal vehicles. As a result, far from providing premium services at extra cost, the STUs are not even able to provide basic comforts to the passengers.
- It won't be an exaggeration to claim that not even a single bus in any of the STUs is wheelchair friendly.
- Users of PT are pedestrians at either end of the trips. Most of the roads do not have good footpaths, making it difficult for commuters to reach bus stops easily and smoothly. Roads in southern Mumbai are perhaps an exception, and it should be noted that most of them were planned in the pre-independence era.
- An informal survey of traffic signals in Pune showed that about 60% of the signals for vehicular traffic were functional, but only about 15% of the signals for pedestrian traffic were working. This difference demonstrates that facilities for vehicles are being given a priority over those for pedestrians.
- PT thrives when people do not depend on motorized personal vehicles. Good infrastructure for cycling encourages use of cycles and is a step towards reducing people's dependence on motorized personal vehicles. Such cycling facilities are virtually not existent in Maharashtra.

As stated earlier, the Ministry of Urban Development has set an objective of establishing a PT system in all cities with more than 2 lakh population according to 2001 census.

Following is a list of cities or urban agglomerates (UA) in Maharashtra that had a population of more than 2 lakh in 2001⁷¹ or have an organized bus service⁷².

⁷¹ Census of India, 2001

⁷² Economic Survey of Maharashtra, 2008-09

City or UA	Population in lakhs (2001)	No of buses (2007-08)	No of buses/ thousand
Mumbai UA (Mumbai, Thane, Kalyan, Dombivali, Mira, Bhayandar, Navi Mumbai)	164.3	3651	0.22
Pune UA	37.6	933	0.25
Kolhapur	5.1	116	0.23
Solapur	8.7	85	0.10
Aurangabad	8.9	67	0.07
Amravati	5.5	24	0.04
Akola	4.0	14	0.04
Nanded	4.3	14	0.03
MSRTC City operations, covering following cities: Arnala-Vasai-Nalasopara, Ratnagiri, Sangli-Miraj, Nagpur, Chandrapur, Nashik	43.4	552	0.13
Bhiwandi	6.2	-	
Malegaon	4.1	-	
Jalgaon	3.7	-	
Ahmednagar	3.5	-	
Dhule	3.4	-	
Latur	3.0	-	
Ichalkaranji	2.9	-	
Parbhani	2.6	-	
Jalna	2.4	-	

This table shows that there are at least 9 large towns in Maharashtra which should have a public transport system but don't have one. In addition, Nagpur, Nashik, Sangli and Chandrapur should have an independent PT system instead of using the MSRTC city operations. Only 8 cities and UAs have their own PT system. That makes it a score of just 38% cities. Then too, the number of buses per 1000 population falls way short of the recommended 0.40 in all of the cities except perhaps Mumbai UA. (The table does not consider the suburban railway system in Mumbai and Pune.)

All in all, it can be said that a lot of work needs to be done to improve mobility and connectivity provided by urban PT in Maharashtra.

For rural and countryside PT, MSRTC seems to be doing a better job than urban STUs in Maharashtra. Barring availability of handicapped friendly services, it doesn't score as bad on most other counts. Of course, the buses are crowded during festive seasons and buses serving remote areas of the state are in very bad condition.

Safety

Most of the buses used by the STUs in Maharashtra are old. Therefore they are more prone to failures enroute. Many of them do not have adequate or functional emergency exits. There is an overall apathy in the society regarding safety practices, and it is not a surprise that congested bus stations with inconspicuous firefighting equipment are perceived as unsafe as compared to such facilities even in other developing countries. The condition can be described as one can just about live with, with scope for improvement.

Crime on PT: Fortunately, as far as violent crime on PT buses or bus stations is concerned, the perception is that the situation is not as bad as it is in some other states of India.

Affordability

Most city bus services are expected to fend for themselves. No efforts are made to increase their ridership and throttle the use of personal vehicles. As a result, the STUs are not able to lower bus fares below a certain level.

The following tables compare fares of rural STUs from Maharashtra and neighbouring states⁷³: (zzz need to have latest figures)

STU (State)	paise per passenger km	min fare Rs	min fare up to kms
All fares w.e.f. around June-2006			
MSRTC (Maharashtra)	63	4	6

⁷³ State Transport Undertakings: Profile and Performance 2007-08, CIRT.

GSRTC (Gujarat)	45	3	6
APSRTC (Andhra Pradesh)	38	3	5
KnSRTC (Karnataka)	38	4	3.25
NWKnRTC (Northwest Karnataka)	37	2	3.25

This table clearly indicates that the ticket fares are on the higher side in Maharashtra and there is room for improvement. While a few years have passed since the fares quoted above came in effect, there is no reason to believe that the situation might have improved drastically since then.

In many urban places the bus fare is about a third of the rickshaw fare for the same distance, thus making use of a rickshaw attractive if three people are riding in it.

The bus fare does not depend on the ridership pattern. It is the same for peak hours and non peak hours, and on weekdays as well as weekends.

There can be several ways of making PT affordable to people. Some of them have not at all been tried out in Maharashtra.

Flexibility and sustainability

Most of the PT in Maharashtra is still bus based. The very nature of such a service is flexible as far as modifications to routes is concerned. Most bus services do react to people's demands and start or change services as per their needs. Yet, since most of the planning of bus routes is done using ad hoc methods and trial and error, there is room for improvement if the planning is done using scientific methods.

Environment friendliness

The buses run at lower fuel efficiency even when compared with other bus services in India. This is a result of an old fleet of buses, as well as congestion on roads. Some buses of the BEST bus service in Mumbai run on CNG, which lowers emissions of harmful gases. However, use of CNG is not as commonplace as it is, for example, in Delhi.

Integration with the fabric of the city or country

The STUs in Maharashtra seem to do reasonably ok on some of the counts. Most bus services run special buses on occasions like village fairs or cultural events. Many villages depend on them for their daily newspapers, mail and other such services.

A PT system should be an icon of the city or state. Its overall operations, including operative efficiency, punctuality, looks, usability and maybe other attributes, should make a city proud.

As said earlier, all buses and bus stations should have a certain level of cleanliness, though certain locations and/or commuters may demand a much higher standard. Although the cleanliness does vary depending on whether the bus or bus station serves a rural area, a city or an airport, the overall level of cleanliness needs to be raised substantially.

Maharashtra's PT systems do not score well as far as making a city or the state proud is concerned. The BEST service of Mumbai might be an exception to this observation, although its overall quality still pales when compared with PT systems in developed countries.

Miscellaneous

As far as urban PT systems in Maharashtra are concerned, there are not even a handful cities where a semblance of a usable PT system can be found, viz., Mumbai and Pune. It is also noticed that substantial investment is being planned to improve the PT systems in these two cities, while other medium sized towns have to make do with merely a skeletal bus service, if at all.

This will add to the lopsided growth of large cities, which is already a big problem. A more even improvement of PT systems across the state will help curtail uncontrolled growth of large cities to some extent.

With urban PT in Maharashtra in mind, some comments on issues mentioned in the section "Miscellaneous" would be in order.

1. The state of pedestrian facilities is very bad, which impacts ridership of PT.
2. There is virtually no infrastructure to help urban cyclists. As a result, commuters virtually never think of cycling as a way to commute, thus increasing their reliance on personal vehicles and moving them away from PT.
3. PT systems do not provide basic information even to local residents. Doing something for tourists is a long shot!
4. Even with all this, the condition of PT in Mumbai and to some extent Pune is noticeably better than the rest of the state. This is just one of the symptoms of lopsided development which attracts immigrants to these two cities.

Summary

The following table summarizes how urban as well as rural PT in Maharashtra fares in the objectives of PT, at the risk of generalizations.

The scores are assigned as:

1. Very poor, needs major reforms
2. Not satisfactory
3. Can work with, for now

4. Satisfactory or good
5. Excellent, surpasses expectations

Objectives	Urban PT	Rural PT
Mobility and connectivity for all	1	3
Safety	3	3
Affordability	2	2
Flexibility and sustainability	3	3
Environment friendliness	2	2
Integration with the fabric of the city or country	3	3

Problem areas identified

The table in this chapter lists all problem areas directly or indirectly related to public transportation in Maharashtra, as identified in the discussion earlier in this section. It should be noted that some of these are problem areas than specific problems. Thus each area can manifest in several smaller problems.

Key to the table:

- The column “Objective” refers to the 7 objectives of public transportation discussed in the earlier chapter.
- The column “Imp” is the importance of the problem and is indicated by Gold, Silver and Bronze to match the level of detail in which the user wants to read this blueprint.
- The column “Pr ID” assigns an identification number to each problem. They are not assigned serially and the following mechanism is used:
 - The number before the decimal point indicates the broad aspect under which the problem falls. The numbers start from 11 so that a unique ID is assigned to problems listed in the “Transportation Management” section and those listed in this section on public transportation.
 - The first digit after the decimal is 1 for Gold “view”, 2 for Silver and 3 for Bronze.

- o Within each objective and importance level, the second digit after the decimal is same for the same problem area.
- o The last digit is assigned serially for problems in the same area.

Pr ID	Objective	Problem Caption	Reference	Imp
11.111	General issues	Officials agree to importance of PT but their actions encourage use of personal vehicles		
11.121	General issues	Large PT projects being planned for Mumbai and Pune, but no significant investment in other cities		
11.211	General issues	No audit of service level benchmarks for urban transport		
11.221	General issues	Lopsided development of 1-2 cities attracts immigrants		
11.231	General issues	Insufficient basic norms for private bus operators		
11.311	General issues	Urbanization leads to congestion		
11.312	General issues	Increasing number of vehicles		
11.313	General issues	Time lost in congestion		
11.321	General issues	Multi story parking lots in heart of city encourage personal vehicles		
11.322	General issues	Road space being used for free or cheap parking		
11.331	General issues	Rickshaws waiting next to bus stops hinder movement of buses		
11.341	General issues	Private bus operators not answerable to public		
11.351	General issues	Unauthorized rickshaws ask arbitrary fares		
12.111	Mobility and connectivity for all	Today's traffic planning focuses on ease of movement of vehicles than people		
12.211	Mobility and connectivity for all	Not enough buses per thousand population		

Pr ID	Objective	Problem Caption	Reference	Imp
12.212	Mobility and connectivity for all	Inadequate number of buses: PT cannot reach all parts of city, bad frequency, overcrowded buses		
12.221	Mobility and connectivity for all	Bad pedestrian facilities impact PT usage		
12.231	Mobility and connectivity for all	Many cities with 2+ lakh population do not have an organized PT service		
12.311	Mobility and connectivity for all	Bad or nonexistent footpaths, commuters cannot reach bus stops easily and smoothly		
12.312	Mobility and connectivity for all	Pedestrian signals not working in some cities		
12.321	Mobility and connectivity for all	Bad cycling infrastructure increases reliance on personal vehicles		
12.322	Mobility and connectivity for all	Bad or nonexistent facilities for cycling		
12.331	Mobility and connectivity for all	PT is not handicapped friendly		
13.111	Safety	Number of accidents per 100,000 km in Maharashtra is higher than the national average		
13.211	Safety	Old buses, prone to failures		
13.311	Safety	Firefighting equipment at bus stations is not conspicuous and not in working condition		
13.321	Safety	Inadequate functional emergency exits		
14.111	Affordability	City bus services expected to fend for themselves		
14.121	Affordability	PT fares in Maharashtra are on higher side		

Pr ID	Objective	Problem Caption	Reference	Imp
14.211	Affordability	Performance of urban bus services in Maharashtra is lower than average in India		
14.212	Affordability	MSRTC's performance in some parameters is worse than average in India		
14.221	Affordability	Most track based MRTs have hidden costs that are not accounted for		
14.311	Affordability	Bus fares are static: do not depend on ridership pattern		
14.321	Affordability	Taxes on buses used for various purposes		
15.111	Flexibility and sustainability	Space for expanding/ building track based MRTs is not reserved and protected		
15.311	Flexibility and sustainability	Limited availability of land for transportation		
15.312	Flexibility and sustainability	Bus stations in heart of city cannot expand		
15.321	Flexibility and sustainability	Planning of bus routes is done by trial and error		
15.331	Flexibility and sustainability	Load factor issues		
16.211	Environment Friendliness	Health hazards related to vehicular emissions		
16.221	Environment Friendliness	Stress on India's foreign exchange reserves		
16.311	Environment friendliness	Buses run at lower fuel efficiency than average in India		
16.321	Environment friendliness	Use of CNG not yet commonplace		
17.211	Integration with fabric of city or country	Buses serving remote areas are in especially pathetic condition		
17.221	Integration with fabric of city	BRT does not exude "class", difficult to make people stop using personal vehicle.		

Pr ID	Objective	Problem Caption	Reference	Imp
17.311	Integration with fabric of city and country	Buses in very bad condition, lack basic comfort		
17.312	Integration with fabric of city or country	Level of cleanliness of buses and bus stations is low		
17.321	Integration with fabric of city	Lack of stringent norms and no enforcement of existing norms for school buses		
17.322	Integration with fabric of city	Very few schools provide a school bus		
17.331	Integration with fabric of city or country	PT systems do not provide information to tourists		

Vision and Benchmark for Public Transportation

The abbreviation “PT” will be used throughout this chapter and blueprint to mean “Transportation Management in **Maharashtra**”.

Objectives of this chapter

In the preceding chapters, we looked at what is meant by Public Transportation and also studied Public Transportation in today’s Maharashtra. We noted some areas where PT has some problems. While that list may not be an exhaustive list of problems, it does give us an insight into what steps should be taken to improve PT.

Before we list those steps, it will be useful to establish a criteria for determining whether PT has become ideal, or at least improved substantially. And before we do that, it will also be useful to have a vision of what we mean by ideal or excellent PT.

Therefore, the objectives of this chapter are:

To establish a vision for excellent Public Transportation in Maharashtra.

and

To develop an indicator that could tell us whether the vision is put in reality.

Vision for Public Transportation in Maharashtra

How the vision was developed

The following questions came up while studying the current status of today's traffic in general:

1. What is the objective of a traffic system?
2. Which means are used today of achieving those objectives?
3. What are the limitations of those means?
4. Are there any other means of achieving the objectives?
5. What needs to be done to establish a system based on those means?

This blueprint was born while seeking answers of these very questions. It would help to discuss these questions so that the philosophy behind this blueprint and thus the vision for PT in Maharashtra will become clear.

What is the objective of a traffic system?

The objective of a traffic system is frequently expressed as "to be able to go from one place to another as quickly and comfortably as possible." However, if one thinks further, it becomes clear that it is more important to be able to go "safely" than "quickly". Also, while there is no doubt that the commute should be "comfortable", it is more important that "everyone" is able to commute by the means he or she prefers.

Therefore the objective being considered in this blueprint is "Safe mobility for all".

This objective considers convenience of young and old, rich and poor, residents along arterial roads as well as inner lanes, locals and visitors alike.

Which means are used today of achieving those objectives?

Since the implicitly assumed objective today is "to be able to go from one place to another as quickly and comfortably as possible", traffic systems in Maharashtra (and India in general) today give high priority to needs of personal vehicles.

Several of the social groups mentioned above cannot use personal vehicles because of restrictions imposed not only by their financial abilities, but also by their physical abilities as well as legal restrictions. People with limited financial resources tend to use public transportation; but if they cannot afford even that (and many cannot), they have to resort

to using a bicycle or even walking considerable distances. These modes of transportation do not fall under “quick and comfortable” and hence are not considered in line with the objective of traffic system today. Therefore the traffic systems today do not provide enough facilities for these modes, thus inconveniencing a large section of the society.

What are the limitations of those means?

Since traffic systems today give high priority to needs of personal vehicles as mentioned above, measures taken today to improve the system include things like widening roads, building flyovers, building multi storied parking lots etc. Experience worldwide has shown that such measures actually attract more personal vehicles, leading to traffic congestion.

As a rule of thumb, it is expected that about 15% of urban land be used for transportation. In practice, less than about 8% land is used for transportation in most cities in India. But even 15% land will not accommodate all personal vehicles either, considering the rate at which the number of personal vehicles is increasing.

Pollution levels are already very high in Indian cities. It is obvious that our cities cannot take any more vehicular emissions, and the number of vehicles is increasing by 8-10% every year. Increasing use of fossil fuels for personal vehicles puts an undue pressure on India’s foreign exchange reserves. To make the matters worse, the crude oil prices will always rise because fossil fuel reserves in India and also in the world are limited.

Personal vehicles use much more road space and fuel per person per km compared to other modes of transportation. Since these two resources (space and fuel) are extremely limited, the current traffic system based on personal vehicles must be changed as soon as possible.

Are there any other means of achieving the objectives?

Even after acknowledging that personal vehicles are useful and inevitable to some extent, is it possible to establish a system with the objective of “being able to execute daily chores without using personal vehicles”?

If this objective is to be achieved, it should be possible to commute mainly by choosing one of the three modes below:

- Walk for short distances
- Use a bicycle for medium distances if physical condition permits you to do so
- Use public transportation for longer distances

These three modes use minimal amount of road space and fuel per person per km.

Among the above, it is important to provide excellent facilities for pedestrians also for public transportation to succeed, because commuters of PT are pedestrians at either end of their journey. Further, people prefer to use personal vehicles for medium distances because such commutes take much longer by PT, considering the time taken to walk to

and from the bus stop and waiting period. Once people get used to using personal vehicles, nothing stops them from using such vehicles for longer daily commutes as well.

Therefore it is important to establish viable alternatives to using personal vehicles for all kinds of transportation needs. Bicycles play an important role in such an alternative system.

One system serves all

Such a system based on walking, bicycles and public transport should not be designed only for the poor, but it should be found to be convenient and attractive to people from all strata. Systems designed only for the poor are generally neglected and ill-maintained. Poor people always strive to “graduate” to using a system designed for the well to do. On the other hand, systems designed to benefit all citizens turn out to be the pride of the city and the country.

It is important to note that the system does not forbid use of personal vehicles. Even if the system is designed so that it is possible to execute the daily chores without using personal vehicles, those who insist on using them can always do so. However, such a system will make sure that users of personal vehicles pay the just price of using common resources of the society.

What needs to be done to establish a system based on those means?

The objective of “being able to execute daily chores without using personal vehicles” leads to the following high level steps:

- Ample facilities for pedestrians and cyclists
- State of the art, attractive public transportation system
- Ensuring that personal vehicles pay the fair cost of using common resources

The measures in this blueprint are suggested by keeping these objectives in mind.

Philosophy behind the suggested measures

An important aspect is considered while suggesting these measures: “Manage the demand instead of scrambling to meet the demand.”

In other words, instead of thinking like “The city is anyway going to grow so much. What sort of a transport system would it need?”, the line of thinking used is, “If the growth of the city itself can be controlled and managed, it will be easier to meet the demand.”

Such thinking automatically leads to the following approach:

1. Prepare 10 year plans for public transportation systems

2. As a prerequisite of that, prepare 20 year mobility plans for cities
3. As a prerequisite of that, prepare 20 year development plans for cities

The Ministry of Urban Development, Government of India, has set forth an excellent objective, which is “All 2 lakh plus population cities (as per 2001 census) to establish organized public transport Systems.”⁷⁴ (This objective was to be achieved by the 2nd year of the JNNURM scheme.) The three plan mentioned above should be prepared for all such cities in Maharashtra. If they are prepared, these cities will have a much better planned growth. Such planning would be done only after determining to how many people the city can provide a certain quality of life, considering its resources.

This blueprint pays special attention to such long term planning for small and medium sized towns in Maharashtra. If these cities become attractive places to live considering all aspects, exodus to large cities can be curtailed to some extent and their development can also be managed well.

Let us take this opportunity to summarize and restate that there are three broad components of the vision, viz.

1. Safe mobility for all
 2. Being able to execute daily chores without using personal vehicles
 3. Manage the demand instead of scrambling to meet the demand
-

Vision for public transport

In context of Maharashtra, we will consider two domains for Public Transportation:

1. Urban (public transportation within a city or town)
2. Rural and countryside (public transportation between cities, towns and villages)

In both cases, good public transportation systems should cater to the following:

1. Mobility and connectivity for all
2. Safety
3. Affordability
4. Flexibility and sustainability
5. Environment friendliness
6. Integration with the fabric of the city or country

⁷⁴ Service Level Benchmarks for Urban Transport at a Glance
(http://www.urbanindia.nic.in/programme/ut/urban_transport.htm)

7. There may be some additional issues that can be addressed with good PT

When the vision is fulfilled, PT in urban as well as rural Maharashtra would be good with respect to all of the 6 components listed above in the best possible way.

Although we have studied problems in the state's urban and rural PT separately, the vision for excellent PT should be the same regardless of the locale. Therefore the vision expressed in this chapter applies equally to both locales, unless explicitly stated otherwise in any special condition.

General issues

The Government of Maharashtra should take pride in providing a good public transportation system to all residents for their commute within small and large cities as well as from one town or village to another. Residents should not think of buying a personal vehicle out of sheer necessity to go from one place to another.

The quality of the PT should be uniformly good across the state.

Mobility and connectivity for all

PT should enable one to commute from one place to another in reasonable amount of time and comfort, regardless of one's physical abilities. PT should reach all nooks and corners of a city as well as the state (to the maximum extent possible).

Safety

PT should provide a significantly safer alternative to commute as compared to personal vehicles - safe not only to users of PT but also to other persons and vehicles.

Affordability

PT should be affordable to people from all financial strata.

Flexibility and sustainability

PT systems should be able to grow as per changing needs of the town or the state and adapt to changing patterns of needs to commute.

Environment friendliness

PT systems should not only cause the least damage to environment as compared to personal vehicles, but should also be designed to move people away from personal vehicles so as to reduce the total impact on environment. In the process, they should also reduce the stress on India's foreign exchange reserves.

Integration with the fabric of the city or country

PT systems should blend seamlessly with the culture of the state, serving specific needs of people of all religions, professions, ages, physical abilities and through all seasons.

Vision in a nutshell

The vision stated above with respect to various objectives of PT can be combined and stated as "Vision for public transportation in Maharashtra" as follows:

To provide safe and reliable mobility for all people.

Benchmark for good public transportation in Maharashtra

It follows that all problems identified in the table in the chapter "**Problem areas identified**" should be solved before the PT can be called excellent. As said earlier, there should be a way to objectively ascertain whether the problems have been solved successfully. The progress with respect to these problems can be used as a benchmark for assessing whether the vision for PT is put in reality and to what extent. However, it is not necessary to consider each and every transportation management problem for the overall benchmark. For example, the objective "traffic infrastructure should be friendly to pedestrians" encompasses problems like "zebra stripes do not exist at many intersections" and "inadequate pedestrian phase to cross a signaled intersection" and maybe a few others. It would be safe to assume that when one of these is fixed, the other would also be in reasonably good state. It should be adequate to include only one of these problems in the benchmark for measuring progress of PT.

The benchmark is developed as follows:

1. About 10 problems from the table in the chapter "**Problem areas identified**" would be identified as "benchmark problems". These problems would collectively represent all of the components of PT.
2. The performance of the state of Maharashtra will be evaluated with reference to these benchmark problems.
3. Numerical scores arising out of this evaluation will be put in the table provided in the chapter "**Evaluating Public Transportation**". The table then provides a numerical assessment of the state of PT in Maharashtra.
4. Such evaluation may be done annually.

The "benchmark problems" are tagged in the chapter "**Solutions for Better Public Transportation in Maharashtra**" with the words

This is a benchmark problem.

A subsection "Criteria and evaluation" for each such problem provides information on how to evaluate the state's performance with respect to that problem.

Solutions for Better Public Transportation in Maharashtra

This chapter suggests solutions to problems identified in this entire section “Section 4. Public Transportation” thus far, which are also summarized in the table in the chapter “**Problem areas identified**”.

As explained earlier, some problems are fundamental in nature, while some are nitty-gritty manifestations of other problems; and there are all shades in between. Some solutions are simple to implement and some are difficult. Some may need a lot of funds. Some problems are very important, but cannot be tackled right away because the society as yet just may not be ready for the suggested solutions. Some solutions depend on other problems being fixed first, hence these other problems need to be given priority, regardless of their importance.

All this makes reading this chapter a bit complicated. Therefore it is important to understand how the solutions are structured, so that the reader knows where to find what he or she needs to find.

Structure of solutions

Solution to each problem will be discussed in 4 parts:

1. Solutions
2. Pros & cons and resistance expected
3. Importance
4. Criteria for success and evaluation system

This discussion will include the following wherever applicable, and in the same fonts and colours.

Pr ID. Problem Caption

The Problem ID and Problem Caption is the same as in the table in the chapter “**Problem areas identified**”.

A tag is provided for each problem as shown below. The word “Aspect” will be replaced by the aspect that the problem largely pertains to. The words “This is a benchmark problem” will be there only for those handful problems, based on which a numerical benchmark for evaluating PT is developed later. The last cell will have the same colour (gold/ silver/ bronze) as in the “Importance” column of the table in the chapter “**Problem areas identified**” and the word “Imp” will be replaced by the respective letter G/S/B.

Aspect	This is a benchmark problem	Imp

Solution

- What needs to be done and by whom, in sufficient detail.
- Any significant changes needed in system (new acts/ rules, establishing new offices, changes in authorities of officials etc).
- Dependencies: Whether any other problem must be fixed before starting work on another problem.
- Estimate of funds needed.

Although an attempt might be made to discuss possible sources of funds or ways to finance the implementation, that may not be discussed for each solution.

Timeline

Suggested timeline for solutions suggested for the corresponding problem(s). These solutions may be divided in phases. The timeline suggests only the duration each phase would need. Most of these figures will be in years, in half-year granularity. The timeline does not suggest the calendar year when the implementation of these solutions should begin.

Depends on

If the suggested solutions cannot be implemented until some other problem is fixed completely or partly, it will be mentioned under this heading.

Pros and cons, resistance expected

The following issues will be discussed where applicable.

- Expenses.
- Any hurdles expected, e.g. legal battles, complex procedures, difficulties in enforcing or monitoring the situation.
- Readiness of society to accept a new thought.
- Possibility that the solution may impact financial interests of certain groups.
- Possibility that the solution may impact certain individuals, though the society as a whole may accept the solution.

They will be summarized in the following table. Values of 2, 1, 0 indicate High, medium and low respectively, thus their sum gives an idea of how difficult it would be to implement the solution.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
2/ 1/ 0	2/ 1/ 0	2/ 1/ 0	2/ 1/ 0	2/ 1/ 0

Difficulty level: Sum of 2/ 1/ 0 values in the table above. Possible values are: maximum 10 (very difficult to implement), minimum 0 (very easy to implement).

Importance

Importance is assigned values of 1, 2, 3, 4 respectively, indicating solutions that:

1. Must be implemented at any cost,
2. Must be implemented,
3. Should be implemented,
4. Are nice to do.

Criteria and evaluation

This heading is provided only for those problems based on which a numerical benchmark for evaluating TM is developed later.

Discussion under this heading suggests how to ascertain whether this problem is fixed and whether progress is being made on this issue.

11.111 Officials agree to importance of PT but their actions encourage use of personal vehicles

General Issues		G

Solution

All policy makers, legislators, ministers, administrators etc in the field of or related to transportation planning need to be aware of modern ways of urban transportation planning. They should also be aware that some intuitive solutions to common problems adversely affect PT, encourage use of personal vehicles, which increases congestion and eventually makes the traffic even worse. A series of workshops (not “conferences” or “seminars”) should be organized to create this awareness.

Such workshops should discuss several examples of various actions that taken that impact urban traffic directly or indirectly. Examples of such actions are:

- When construction of a flyover narrows a road temporarily, personal vehicles are allowed to use the narrow road but heavy vehicles, including public buses, are made to take detours.
- Protests to “Pay and park” schemes are conceded to.
- PT buses also need to pay toll.
- Large multiplexes and malls provide ample free parking, but their plans don’t include bus stops.

Each such action should be analyzed for its impact on PT. Top 5 or 10 most commonly taken actions that adversely impact PT and encourage use of personal vehicles should be identified.

This understanding needs to percolate down to officers that take day to day decisions regarding traffic, e.g., junior traffic police officials of the ranks of PSI and API as well as Ward Officers of municipal corporations (or their equivalents). This should not be done by way of orders coming from higher rank officials, but through workshops at junior levels as well.

These workshops should be driven by the state's Ministry of Transportation. People involved should include:

- From political parties: Ministers of the following ministries: **zzz**, leaders of political parties in power at all 2 lakh+ cities. Total: about 50 people.
- From government employees: Secretaries of the ministries mentioned above, Commissioners of municipal corporations as well as their equivalents from cities with more than 2 lakh populations (about 30), traffic and transportation planning officers from these cities (about 30), traffic police officers of the ranks ACP and above (about 1-2 from each city), officers of all public transport undertakings (about 60) . Total: about 200 people.
- From citizens: Representatives of various transport related organizations, NGOs working in the field of transportation. About 2 people for each city with more than 2 lakh population, more for larger cities. Total: about 100 citizens.

Thus these workshops would involve about 350 people across the state. They should be held in groups of about 10 and maximum 20. Each workshop would be of about 2 hours duration and would cover a minimum of 6-8 such "prescribed" situations plus 4-5 "local" situations that the group could think of.

Public should be informed about such analysis through local newspapers, thereby making it easier for people to understand why certain decisions would be taken.

Timeline

1. (0.5 years) Set the structure of the workshop, finalize contents. This should really be done in 1 month. "0.5 years" is stated only because we will generally define timelines in terms of 6 month slots.
2. (parallel) All workshops across the state should be completed in 1 or 2 months.

Depends on

These workshops should be held after a policy announcement regarding all traffic and transportation issues. This policy should state categorically that traffic and transportation in state will be developed with people in mind and not vehicles, and the main objective of transportation management will be "mobility for all kinds of people".

The workshops should start as soon as such a policy is announced.

Pros and cons, resistance expected

These workshops should be conducted at about 20 important cities across the state. It may be difficult to maintain the same structure, “curriculum” in all workshops. It may also be difficult to find enough knowledgeable and interested people to participate in all workshops. Therefore a team of 4-5 people would need to be created to maintain uniformity across all workshops. At least one person from this team must be present at all workshops.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	1	0	2	0

Difficulty level: 3.

Importance

Importance = 1 (Must be implemented at any cost). This is perhaps the most important task from the entire PT section of this blueprint. It is extremely important to set a uniform and progressive vision across the state regarding traffic and transportation.

11.121 Large PT projects being planned for Mumbai and Pune, but no significant investment in other cities

General Issues	This is a benchmark problem	G

Solution

The state of PT in smaller cities is deplorable. Considering that, there is a large backlog of investments that should have been made in smaller cities to create and maintain good PT services. Although it is difficult to estimate and therefore compensate for the backlog, efforts should be made to ensure that all cities get equal treatment in this matter hereafter.

The objective should be to provide a good PT service in all 2+ lakh cities. This should be done in stages, beginning with 10+ lakh cities but quickly including 5+ lakh and then 2+ lakh cities as well.

Care should be taken to make sure that PT services are not “copy-pasted” from one city to other. Each city may have its own characteristics. For example, it may be difficult to operate 50 seater buses in smaller cities, not only because the roads are narrow, but also because smaller cities may not generate sufficient ridership. Therefore minibuses or even vans may be considered in small cities.

The state's objective should not be merely to provide a PT service that "works somehow", but to provide services which are comparable with those in larger cities. Therefore STUs in smaller cities should also have good buses, automated displays etc.

Timeline

1. (0.5 year) Establish independent STUs (i.e., not run by MSTRC) in 10+ lakh cities.
2. (1 year) All these STUs should start with at least 30 buses per lakh population.
3. (1 year, parallel) All STUs in 10+ lakh cities should develop their own DP for 5 and 15 years to address immediate and long term needs.
4. (1 year) Review the new STUs in 10+ lakh cities and strengthen them as appropriate. Number of buses should reach 50 buses per lakh population.
5. (0.5 year) Establish independent STUs in 5+ lakh cities.
6. (1 year) All these STUs should start with at least 25 buses per lakh population.
7. (1 year, parallel) All STUs in 5+ lakh cities should develop their own DP for 5 and 15 years to address immediate and long term needs.
8. (1 year) Review the new STUs in 5+ lakh cities and strengthen them as appropriate. Number of buses should reach 45 buses per lakh population.
9. (0.5 year) Establish independent STUs (i.e., not run by MSTRC) in 2+ lakh cities.
10. (1 year) All these STUs should start with at least 20 buses per lakh population.
11. (1 year, parallel) All STUs in 2+ lakh cities should develop their own DP for 5 and 15 years to address immediate and long term needs.
12. (1 year) Review the new STUs in 2+ lakh cities and strengthen them as appropriate. Number of buses should reach 40 buses per lakh population.
13. (Every 3 years) The short and long term PT DPs should always be valid for the next 2 and 9 years. Thus they need to be revised every 3 and 6 years respectively.

Depends on

Pros and cons, resistance expected

Establishing PT services in all 2+ lakh population cities may need substantial amount of funds. Services in very small towns, if not planned carefully, may not be viable financially and may not be found convenient by people.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
2	2	1	1	1

Difficulty level: 7.

Importance

Importance = 2 (Must be implemented).

Some tasks like extending PT services to 2+ lakh population cities may have Importance = 3 (Should be implemented), depending on the success met by cities between 5 and 10 lakh population.

Criteria and evaluation

List down investment on PT systems over last 2 and next 3 years for each city with population of more than 2 lakh. This should include:

- Actual expenses incurred in the last 2 completed financial years towards creating or significantly enhancing any new or existing PT system in the city. These expenses may be incurred by any sources, e.g., the local governing authority, the state or central governments, the authority or company that governs the PT system, or any private sponsors. Note that “working expenses” by any existing STU or MSRTC city bus service are not considered here, but **investments**.
- Anticipated expenses over current and the next 2 financial years. These should also be “investments” as above. The figures should not be taken merely from approved plans for creating and enhancing PT systems in the city, but should also consider whether it is realistic to assume that the money will be actually spent in the next 2 years.

Divide this number by the city’s population (from 2011 census figures, but corrected appropriately for subsequent years) to arrive at “current” per capita investments on PT systems in that city.

Minimum per capita investment thus calculated should be within 70% of the maximum. Score 9 points if so. Add a bonus point if the three largest cities are in the bottom half of the range of per capita investment on PT, only if the score is 9 points at this stage.

Then deduct 1 point for every 5% less minimum per capita investment observed. (i.e., score would be 8 points if minimum per capita investment is 70%-65% of the maximum, 7 points if it is 65%-60%, and so on.)

11.211 No audit of service level benchmarks for urban transport

General Issues	This is a benchmark problem	S

Solution

Ministry of Urban Development, Government of India, has established benchmarks for level of service provided by PT. Since the first step towards improving the service is to measure its quality, these benchmarks must be used to evaluate PT.

This evaluation should be done at least on annual basis. Half yearly evaluation may be necessary for cities that fare very poorly in this evaluation.

The Ministry has set a goal of establishing organized STUs in all 2+ lakh cities in India. Therefore this evaluation should be done for all such cities in Maharashtra, regardless of whether they currently have a PT service. It is only when several cities will get low scores or zeros that they will take steps towards establishing a PT service.

Results of these audits should be published in leading newspapers, on websites of concerned state ministries as well as in the annual Economic Survey of Maharashtra.

Timeline

1. (1 year) Establish infrastructure needed for collecting data.
2. (every year) Publish SLBs for all 2+ lakh cities.

Depends on

Pros and cons, resistance expected

None.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	1	0	2	0

Difficulty level: 3.

Importance

Importance = 2 (Must be implemented).

Criteria and evaluation

There were about 35 cities in Maharashtra with more than 2 lakh population in 2001. Sort them as per their population. Check if the urban transport of these cities has been audited for each of the last 2 years. Score points as under:

1 point for auditing every 5 of the most 10 populous cities (= maximum 2 points),
Only then: 1 point for auditing every 3 of the next 9 populous cities (= maximum 3 points),
Only then: 1 point for auditing every 2 of the next 8 populous cities (= maximum 4 points),
Only then: 1 point for auditing any 2 of the remaining cities.

11.221 Lopsided development of 1-2 cities attracts immigrants

General Issues

S

Solution

This issue is tightly coupled with uncontrolled urbanization discussed in “11.311 Urbanization leads to congestion”. We will discuss only PT and mobility related aspects at this point.

Creating good PT services in small cities should be as per the city’s DP, which should also identify places of employment, residential areas etc. Development and growth of PT in the city should be hand in hand with the overall development. For example, as a neighbouring industrial area or marketplace is being developed, PT services to that area should be started and enhanced. All this should be included in the DPs of the STUs in that city, which in turn would depend on the CMP of that city.

Timeline

1. (0.5 year) Each 2+ lakh city should state its mobility objectives, which would be used as the basis for developing its CMP. These objectives may be high level and tentative, subject to confirmation after detailed work on CMP begins.
2. (1 year, parallel) Each 2+ lakh city should have a high level CMP.
3. (Immediately after above) Review all CMPs to see whether the state is heading towards lopsided development.
4. (2 years) All 2+ lakh cities should have approved versions of CMPs that consider the next 20 years.
5. (Every 5 years) Conduct reviews of CMPs of all cities to see whether the development is as planned.
6. (Every 10 years) Revise the CMPs to plan for 20 years from that year. Each revision should be completed and approved in the first year of the 20 year span and should lag the DP by maximum one year. Work on revising the CMPs may be started ahead of time to meet his requirement.

Depends on

Pros and cons, resistance expected

Preparing a CMP is a process that requires considerable skills and trained human resources. People like to stay in their comfort zones, and may even resist preparing CMPs, labeling them as an overkill. The process of preparing CMPs, especially for smaller cities, may need to be pushed against some resistance.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest

0	1	2	2	0

Difficulty level: 5.

Importance

Importance = 2 (Must be implemented) for cities larger than 5 lakh in population.

Importance = 3 (Should be implemented) for cities less than 5 lakh in population.

11.231 Insufficient basic norms for private bus operators

General Issues		S

Solution

This issue pertains to private inter-city bus services. On one hand they address the gap between supply and demand at competitive rates, whereas on the other they are free to operate only on profitable routes, do not invest in infrastructure like bus stations and bus stops, and generally do not entertain cancellation and refund requests.

Whether the bus services should be privatized or not is an issue that is outside the scope of this blueprint, as discussed elsewhere. However, it is important that all bus services, whether operated by the government or private operators, compete on level grounds.

Therefore it should be mandatory for all such services to follow a common set of basic norms. These norms should include the following:

1. The buses must stop at designated bus stations and bus stops. The bus stations and stops could either be built and owned the operator or taken on rent or lease.
2. These bus stations and stops should provide certain basic amenities to the commuters, like sitting area, refreshments and rest rooms for bus stations, a shelter at most bus stops etc.
3. The operator should entertain cancellation requests. Rates of deduction and permissible refund should be same for all operators.
4. Likewise, the rules in effect when the operator cancels or cannot operate a certain schedule should also be the same for all operators.
5. The list above is only indicative and not exhaustive. The essence is to create a level ground for all operators. These rules may be brought in effect in a phased manner.

Timeline

1. (1 year) Formulate the rules, stating phases (if needed) in which they would be brought in effect.
2. (3 years maximum) All rules should be brought in effect.

Depends on

Pros and cons, resistance expected

These rules may be looked at as a move to make it difficult for small operators to operate their services.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	1	1	1	1

Difficulty level: 4.

Importance

Importance = 2 (Must be implemented).

Criteria and evaluation

11.311 Urbanization leads to congestion

General Issues	B

Solution

Although this issue is not directly related to PT, some solutions and actions that need to be taken will be mentioned here.

It is observed worldwide that urbanization stabilizes at levels of 60-70%. As long as urbanization is not lopsided, and as long as cities have a good development plan (DP) that is adhered to, this issue need not arise or will not be so severe. Therefore this issue needs to be tackled on two fronts:

- Avoid lopsided urbanization
- Develop good DPs and follow them

The state needs to avoid a scenario where population of large cities like Mumbai - Pune grows at rates of 4 or 5% per annum, but small cities like most district places grow at only 1-2%, and population in small villages is perhaps declining. This sort of a situation indicates that people find it difficult to earn a living in smaller places.

Each city should have a DP that predicts as well as controls its growth within the prediction. If population of large cities grows faster than anticipated while smaller cities fall short of their anticipated growth, it indicates that more than planned amount of employment opportunities are being created in the larger cities.

Such trends should be spotted as early as possible and employment opportunities should be throttled or encouraged as required.

It is observed that today the DPs only try to predict the population of the city in 10 or 20 years, but they do not try to manage the city. For example, a typical DP today says “the city is **expected** to reach a population of 50 lakhs in 20 years”, but it would not say “the city is **planning** for a population of 45 lakhs in 20 years”.

This sort of DPs put the cities in reactive and firefighting mode than in proactive mode and in control of the growth. This situation must be changed.

Cities should have DPs that intend to limit its population, rather than planning to provide for whatever population the city would have.

As far as transportation in the city is concerned, the DPs should earmark 12-18% of the land for transportation purposes. This includes roads, footpaths, bus stations and depots, petrol pumps, parking lots, land that may be needed for a track based mass transit in future etc. Larger cities tend to have higher needs for transportation, so they would be found at the higher end of this range of land use.

As regards public transportation, each city should plan for a service that provides preferably 70, but at least 40 buses or their equivalent per lakh of population. In this case too, larger cities would need more buses per lakh than smaller ones.

The steps to be taken are summarized as follows:

- All 2+ lakh cities should have approved DPs.
- While detailed plans are being prepared, a high level guideline should be prepared quickly, in about 6 months.
- This guideline and the plan itself, should mention the population the city is planning for, in 5 year steps (although the census itself is conducted every 10 years).
- Population objectives should be “upper limits of population”. Population growth objectives of all cities should be compared and tuned. Largest cities should have slowest population growth objectives.
- Each DP should earmark minimum 12% and maximum 18% land for transportation purposes. DPs should specifically recognize the need to provide sufficient land for bus depots.

Timeline

1. (0.5 year) Each 2+ lakh city should state its development objectives, which would be used as the basis for developing its DP. These objectives may be high level and tentative, subject to confirmation after detailed work on DP begins.
2. (1 year, parallel) Each 2+ lakh city should have a high level DP.
3. (Immediately after above) Review all DPs to see whether the state is heading towards lopsided development.
4. (2 years) Each 2+ lakh city should have approved versions of DPs that consider the next 20 years.
5. (Every 5 years) Conduct reviews of DPs of all cities to see whether the development is as planned.
6. (Every 10 years) Revise the DPs to plan for 20 years from that year. Each revision should be completed and approved in the first year of the 20 year span. Work on revising the DPs may be started ahead of time to meet his requirement.

Depends on

Pros and cons, resistance expected

None.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	1	2	2	0

Difficulty level: 5.

Importance

Importance = 1 (Must be implemented at any cost).

11.312 Increasing number of vehicles

General Issues		B

Solution

It should be noted that increasing number of vehicles by themselves may not be a “problem”. It is excessive reliance on personal vehicles and traffic congestion (and pollution) caused by too many vehicles that may be a problem. Then too, it has been found that when traffic congestion eases, people tend to use personal vehicles. Also, since personal vehicles, especially cars, consume much more fossil fuel per passenger-km as compared to PT, stress on fossil fuels is certainly a problem.

As long as a city consumes less than about 15-18% land for transportation and provides a satisfactory PT service, other problems may be ignored. Traffic congestion and PT will eventually strike a balance, and congestion cannot be reduced beyond those levels. In fact,

A certain level of congestion is necessary for a PT service to be successful.

However, this fact will need to be driven home in the minds of the same set of people mentioned in “11.111 Officials agree to importance of PT but their actions encourage use of personal vehicles”. Therefore this issue also needs to be included in the same workshops discussed in that section.

Timeline

Club with and follow timeline of “11.111 Officials agree to importance of PT but their actions encourage use of personal vehicles”.

Depends on

Pros and cons, resistance expected

Improvements in PT are sometimes looked at as “anti personal vehicles”. It should be stresses in the workshop that improvements in PT are essentially aimed at providing an attractive alternative to personal vehicles. If people have to use personal vehicles for daily commute, it implies bad city planning. Use of personal vehicles for tasks like visiting friends and relatives, leisure outings, picking up/ dropping off people to railway stations, taking someone to doctor etc is perfectly fine.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
N/A	N/A	N/A	N/A	N/A

Difficulty level: N/A

Importance

Importance = 3. This issue is a part of the vision, but not the vision itself.

11.313 Time lost in congestion

General Issues		B

Solution

As discussed elsewhere, congestion in urban traffic cannot be eliminated. In fact, a certain level of congestion is necessary for PT to be successful. Therefore, we will not worry about time loss of users of personal vehicles on congested urban roads. However, we do need to worry about congestion faced by PT vehicles.

Since a bicycle can travel at 15-16 km/hr on urban roads, PT should strive to achieve an average speed of 18 km/hr or more. Cities with a PT service should continuously find ways of achieving and maintaining this speed for PT.

The first step in improving the speed is, of course, to measure it. Each STU should measure the average running speed along major routes every month. A half yearly summary of these observations should be published on the website of the STU.

These statistics should also be published in local newspapers, to sensitize the people towards measures that would be taken to improve the speed of PT.

Some or all of the following measures should be considered for roads along which the travel speed is found to be less than 18 km/hr:

- Reduce or eliminate off-street parking even along roads not identified as “arterial”.
- Create bus lanes on roads that are 3+3 lanes wide.
- Provide preferential signals to bus lanes.
- Consider a BRT or a toned down version suitable to the city.
- If buses are found to get stuck on inner city congested roads, consider designating some roads for buses only, diverting all other traffic to alternate roads.

Timeline

1. (0.5 year) Measure average running speed of PT along major routes.
2. (0.5 year, parallel) Plan measures to improve the speed of PT. Sensitize people.
3. (1 year) Phase 1 of measures, which may vary from city to city.
4. (2 years) Phase 2 of measures, which may vary from city to city.
5. (parallel to all of above) Measure average running speed of PT every 6 months.

Depends on

Pros and cons, resistance expected

Measures to improve speed of PT may affect speed of personal vehicles. These measures need to be conscientiously projected as “good for everyone”.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest

0	1	1	2	1

Difficulty level: 5.

Importance

Importance = 3 (Should be implemented). Speed is not a major criteria of good transportation anyway.

11.321 Multi story parking lots in heart of city encourage personal vehicles

General Issues		B

Solution

This problem is just a symptom of a larger problem: The traffic infrastructure is planned without the larger picture in mind and also unscientifically, in an ad-hoc manner.

Any locality of a city attracts commuters. Depending on the demographics of that locality, the modal split of these commuters tells how many of them need to travel by PT, how many would prefer to use their personal vehicles etc. The city should also have a target or desirable modal split.

Availability of parking spaces should be dictated by the desired modal split and not by the perceived need. These days new parking lots are built when the existing facility overflows. Instead, the approach should be as follows:

- Analyze current and forecast no of commuters to the locality.
- Analyze the current and desired modal split.
- Provide parking spaces and/or strengthen PT depending on the gap between current and actual modal splits.

Making this kind of an analysis for every locality is cumbersome and hence impractical. Instead, the city's CMP should integrate this element in it. Localities should be identified as residential, marketplaces, entertainment (parks & grounds as well as cinema theatres), transportation hubs etc. Parking requirements of each locality should be estimated and land should be reserved for parking lots or multi-story structures.

This approach will also reduce the road space occupied by parking, freeing it for other better purposes.

Timeline

1. (0.5 year) Identify localities as residential/ market/ entertainments etc.

2. (0.5 year) Estimate parking requirement for each locality and reserve land for parking lots/ structures, keeping in mind that excessive parking encourages personal vehicles.
3. (0.5 year) Enter this information in the DP.

Depends on

Pros and cons, resistance expected

None.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	2	2	2	1

Difficulty level: 8.

Importance

Importance = 3 (Should be implemented).

11.322 Road space being used for free or cheap parking

General Issues	B

Solution

This problem is mostly about road space on **arterial** roads being occupied by parked vehicles. In order to tackle this issue, cities must first identify some roads as “arterial”. This should be ideally done in city DP and comprehensive mobility plans (CMPs) so that roads are developed as arterial roads, instead of calling important roads as “arterial” later on.

Even if the DP and CMP are in draft state, identification of arterial roads should be done without waiting for these documents to be approved. Any minor adjustments to the status of these roads can always be accommodated later, after discussing with all concerned people.

Once the arterial roads are identified, steps should be taken to make them free of off-street parking. Parking spaces may be provided mostly by way of parking lots, or on some internal roads. Off-street parking on arterial roads may be provided only under exceptional circumstances and on select stretches. Even in this case too, users should have to pay heavily for its use.

In general, small and large cities should have 2 or 3 tiers of parking charges respectively. Off-street parking on arterial roads should be as per the most expensive slab of parking charges.

Timeline

It may take some time to identify space for parking lots or structures because that may be tied with the city's DP. However, off-street parking on arterial roads should be eliminated regardless of it because a few other actions may depend on making arterial road space available for other purposes, especially movement of PT vehicles. Conditioning the people's mindset for this change and elimination of off-street parking as well as providing paid off-street parking under exceptional circumstances should be done within about 1-1.5 years.

1. (0.5 year) All cities to define arterial roads. Prepare people's mindset.
2. (0.5 year) Implement pay and park on these roads.
3. (1 year, parallel) Move most parking to inner roads.
4. (2 years) Establish slabs of parking rates. Off-street parking on arterial roads as exception, as per most expensive slabs.
5. (2-4 years) Space for parking lots identified in DP.

Depends on

Pros and cons, resistance expected

People are used to free or cheap roadside parking. They will have to be provided a good PT service as parking becomes progressively expensive.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	0	2	2	1

Difficulty level: 5.

Importance

Importance = 2 (Must be implemented). One of the essentials for making people use PT.

11.331 Rickshaws waiting next to bus stops hinder movement of buses

General Issues		B

Solution

This issue is mostly related to traffic discipline. However, the following measures may be taken to make it easier for all concerned to follow discipline.

1. Rickshaw bays may be integrated with bus stops so that 2-3 rickshaws can wait there without hindering movement of buses. Of course, care must be taken to ensure that the neighbouring footpath is still wide enough for free and safe movement of pedestrians.
2. A rickshaw stand may be created at a neighbouring by-lane, and the bus stop could be moved towards the by-lane so that it is easier for passengers to catch a rickshaw if needed.
3. Other such ways may be devised on a case by case basis.

In any case, and especially where measures like the above can be taken, rickshaw drivers must be made aware that affecting smooth movement of buses and bus commuter is not acceptable. Frequent and strict action under applicable Motor Vehicle Rules should be taken against errant drivers.

Timeline

1. (0.5 year) Identify stops where this problem is most acute.
2. (1 year) Implement solutions suggested above as applicable.
3. (continuous) Immediate action against errant rickshaw drivers, especially where specific steps as above have been taken.

Depends on

Pros and cons, resistance expected

If not projected correctly, resistance from rickshaw unions may be expected.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	1	2	1	2

Difficulty level: 6.

Importance

Importance = 3 (Should be implemented).

11.341 Private bus operators not answerable to public

General Issues		B

Solution

While state run PT undertakings are bound by published timetables, private bus operators do not seem to be bound by them. They are frequently seen to cancel or alter their schedules depending on demand, which often inconveniences commuters. It is also an unfair way of competing with state run STUs.

zzz1 is there any check on cancelled schedules?

Timeline

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
2/ 1/ 0	2/ 1/ 0	2/ 1/ 0	2/ 1/ 0	2/ 1/ 0

Difficulty level:

Importance

Importance = 3 (Should be implemented).

Importance = 1 (Must be implemented at any cost).

Importance = 4 (Nice to do).

Importance = 2 (Must be implemented).

11.351 Unauthorized rickshaws ask arbitrary fares

General Issues		B

Solution

This problems is mainly found in rural areas, small cities and towns.

The problem at the root of this problem is the existence of unauthorized rickshaws itself. The reasons are a combination of substandard PT as well as insufficient number of

rickshaw permits. The former leads to a demand for alternatives to PT, which is not satisfied by existing number of permitted rickshaws.

Although a strong PT would reduce the demand for any mode of transport that comes along, there will still be a need for rickshaws and taxis in rural areas. This should be satisfied by officially approved rickshaws.

A detailed, RTO-wise analysis of number of trips and their modal splits, along with possibility of rise in modal share of PT as it strengthens, is the most desired way to estimate the number of rickshaws that should be permitted. However, this approach will take significant effort as well as skilled and trained manpower.

Instead, a simpler way to tackle this issue could be as follows:

- Since the overall demand for transportation is increasing, the number of rickshaw permits in a given RTO jurisdiction would generally need to be increased every year. Therefore an annual increase of about 3 to 4% should be granted automatically, in absence of any study of any kind. Such an increase may also be allowed if a substantial number of unauthorized rickshaws are known to be in operation in the area, or if the PT services cannot cope up with the ridership demand.
- If the concerned STUs have implemented or planned substantial reforms in the previous or next years, they would expect a rise in the ridership of PT, which would reduce the demand for rickshaws. In such cases none or only a small number of new rickshaw permits, amounting to, say, 0 to 2% increase, may be granted that year.
- The responsibility of demonstrating such improvements in PT should lie on their management. Being able to do so should be projected as a matter of pride. Not being able to demonstrate for two successive years that PT can cope up with ridership demands should be questioned by higher authorities.
- This approach should not be interpreted as “call them official and there won’t be any unofficial rickshaws.” PT in rural areas should have ridership targets and STU management should be held accountable if those targets are not met. This approach merely suggests that any shortfall in actual, desired demand for number of rickshaw permits should be filled up as quickly as possible.

The other part of this issue is about the fare structure. Since most people in rural areas cannot afford a rickshaw for themselves, shared rickshaws have become a reality. It is difficult to have their fare structure based on rickshaw meters. Yet, their occupancy as well as fare structure needs to be controlled and enforced.

Enforcing the occupancy as prescribed by the manufacturer of the vehicle will be easier once a mobile rural traffic police is established.

Fare structures are usually published in the form of a table that states the relation between distances in km and fare to be charged. However, rural commuters rarely know the distance travelled. Most rickshaws operate within a certain locality. A table that

states distances between most common destinations, which are often marked by temples, intersections of roads, shops or buildings, should be prepared for each locality and fares should be stated in terms of those destinations.

This table or tariff card should be prepared by the local RTO for various localities in its jurisdiction. Photocopies of the table should be made available, maybe at cost, at local shops, police stations and such places. It should be mandatory for rickshaw operators to carry the tariff card.

Timeline

1. (0.5 year) Each RTO should identify localities where unauthorized rickshaws are most commonplace.
2. (0.5 year, parallel) Prepare fare tables in each locality in terms of prominent “stops”, which are generally popular landmarks. Make copies available in local outlets.
3. (1 year, parallel) Establish rural traffic police organizations in all districts.
4. (1 year) STUs in the area should identify test bus routes, measure ridership along these test routes. Set goals for substantial increase in ridership.
5. (every year) Measure actual PT ridership along test routes, compare with targets. Determine whether same test routes should be considered next year.
6. If the PT improvements are on track, convey “objection to increase number of rickshaw permits by 4%” to RTO.
7. (every year) Each RTO should increase number of rickshaw permits by 3 to 4%, but if PT in the area of jurisdiction has conveyed objections as above, this increase should be limited to 0 to 2%.
8. (continuous) Spot checks by rural traffic police in the area on unauthorized rickshaws should continue throughout.

Depends on

Pros and cons, resistance expected

The whole scheme suggested above may be too “academic” and hence difficult to comprehend and implement in typical rural areas. Too much of a “system” in such areas may in fact make people think of bypassing it, leading to unauthorized services, corruption etc. Therefore it may be tried as a pilot in some areas where it is likely to succeed and then spread across the state in phases.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	2	2	1	2

Difficulty level: 8.

Importance

Importance = 3 (Should be implemented). However, some steps like establishing traffic police divisions at all district headquarters could have importance = 2 (Must be implemented).

12.111 Today's traffic planning focuses on ease of movement of vehicles than people

Mobility and Connectivity for All	This is a benchmark problem	G

Solution

This problem is more acutely faced in urban areas. Traffic and mobility plans of cities and towns need to place importance on movement of people rather than vehicles.

Each city that has a DP should also have an associated comprehensive mobility plan (CMP). The CMPs should be based on a template and should have the following characteristics:

1. The plan should measure traffic in terms of number of people and not number of vehicles.
2. The plan should unequivocally stress that PT is given emphasis because it moves more people per unit road area, causes less pollution per person-km, etc.
3. The plan should suggest **all** of the following measures and objectives: a) Objective of PT's modal share of 0.35 or better, b) Bus lanes based on traffic densities, c) Expensive parking, with slabs of parking that consider cost of urban land.

CMPs should present an analysis of road space occupied and fuel consumed by various types of vehicles per person-km travelled, and thus make it abundantly clear that the only way to move so many people safely, reliably and by consuming as few resources as possible is with PT.

CMPs should also go a step further and state that not only would extra facilities be provided to PT (e.g., a bus lane), but also, if needed, personal vehicles would have to be inconvenienced (e.g., a "buses only" road) to meet the city's mobility objectives.

Examples of other measures that should be considered in CMPs and DPs to make cities thriving places for people are: wide and extra wide footpaths, pedestrian plazas, marketplaces with free shuttle buses and no personal vehicles, network of cycling tracks (both along arterial roads as well as along rivers etc., for recreation and mobility) etc.

Any proposals and plans for changes in traffic patterns, e.g., converting 2-way roads to 1-ways, should follow a template. The template should include the following:

- Analysis of impact of the change on pedestrians, PT commuters and cyclists.
- A no objection letter from the PT services in the city.
- Trial period of at least one month.
- Numerical measurements of impact on pedestrians, PT commuters and cyclists during one month before the trial begins and the month of trials.

The traffic planning department of the city administration should not approve any changes in traffic pattern if the template is not followed and if the findings are found to adversely affect pedestrians, PT commuters and cyclists.

Timeline

1. (0.5 year) Develop a template for proposing and planning changes in traffic patterns. This template should apply to all cities in the state.
2. (0.5 year) CMPs of all cities should include a reference to this template and its salient features.
3. (1 year) CMPs of all cities should describe traffic in terms of number of people (e.g., in pphpd) rather than vehicles. Suggestions in CMPs should facilitate movement of pedestrians, cyclists and PT.

Depends on

Pros and cons, resistance expected

None.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	0	2	2	1

Difficulty level: 5.

Importance

Importance = 2 (Must be implemented).

Criteria and evaluation

List cities with municipal corporations and determine their population. Also determine population covered by cities that have a “good” mobility plan (= a plan that exhibits **all** indicators mentioned above).

Score 1 point for every 10% population that is covered by a “good” mobility plan. Deduct 1 point for every 10% population that does not have any mobility plan whatsoever.

12.211 Not enough buses per thousand population

Mobility and Connectivity for All		S

Solution

All existing and planned urban STUs in the state should do a detailed analysis of the following:

- Current modal split of trips, especially during peak hours. The modes should include cycling also.
- Desired modal split. Share of PT in the modal split of motorized trips should be at least 35%. If trips by cycles are included, share of PT should be at least 30%.
- Total number of trips today and forecasts over 5 and 10 years. Although these estimates should be derived from population targets in the city's DPs, they should also consider that the city may not be able to curtail its growth within the plan.

PT plans should attempt to support an appropriate amount of growth in the city's population beyond the objectives of the CDP.

- Effective number of buses in service today. This should be total number of buses minus average number of buses not in service because of breakdowns and routine maintenance.
- Effective number of buses required to be in service to support the desired ridership levels and modal split.

The analysis above would give the number of buses the STU should have. This figure generally turns out to be in the range of 60 or more buses per lakh population.

The population of all 2+ lakh cities in Maharashtra was approximately 150 lakhs excluding Mumbai UA. Assuming a 50% decadal increase, this population is expected to be about 225 lakhs. This population would need 13,500 buses. Most buses in service with the STUs of these cities are in such bad condition that they do not compare with the quality of buses the state should aim for. Therefore let us assume that the state will need to buy 13,500 brand new buses. This would cost approximately Rs. 4,050 Cr. at Rs. 30 lakh/ bus.

These buses will address the immediate need, and is covered in “**Error! Reference source not found.**”. However, the STUs should constantly plan for their needs in the future, which is the focus of this section.

This estimate does not include funds needed for building bus depots, setting up workshops and the overall infrastructure needed for starting the STUs. However, it should be noted that the proposed Pune Metro has an estimated cost of Rs. 5000 Cr. and will carry only 3 lakh passengers/ day.

Each STU should chalk up 5 year plans for purchasing the required number of buses and arrange for suitable finance for the purchase. This information should be included in the DP of the STU.

The DP of the STU should also include an analysis of the number of bus depots today, whether they are able to support the buses (parking space at night as well as maintenance and repairs), and whether the city will need any additional bus depots in the next 10 to 20 years. This information should be fed back to the CDP.

All existing urban bus services as well as new bus services being formed across the state should have their own 5 to 10 year DPs. These plans should include the analysis mentioned above.

Timeline

1. (0.5 year) All 2+ lakh cities to analyze ridership modal splits and determine the number of buses needed in next 5 and 10 years to support the growth.
2. (0.5 year, parallel) Also analyze the need for bus depots for the next 10 years.
3. (0.5 year) Feed depot space needs in to the city DPs.
4. (About 3 years) Buy the required number of buses.

Depends on

Pros and cons, resistance expected

Funds needed for the number of buses to be bought for most cities may turn out to be more than the cities' entire budget for transportation for 2-4 years. Substantial loans would need to be raised to buy the buses.

It is unlikely that the STUs have provision for accommodating all these buses in the existing bus depots. It is also equally unlikely that the cities have reserved land for building bus depots they would need over the next 20 or so years.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
2	2	1	1	0

Difficulty level: 6.

Importance

Importance = 1 (Must be implemented at any cost).

12.212 Inadequate number of buses: PT cannot reach all parts of city, bad frequency, overcrowded buses

Mobility and Connectivity for All		S

Solution

The issue of insufficient number of buses has been addressed in “**Error! Reference source not found.**”.

Although sufficient number of buses would alleviate the severity of issues like bad frequency and overcrowding to some extent, that alone may not be sufficient if the bus routes are not planned properly.

There is a tendency to provide point-to-point routes on popular demand. It is frequently found that most of these routes, especially very long routes among these, regularly operate at less than optimal load factor in some section of the route. The buses are typically relatively empty at either ends, and are overcrowded in between.

All bus services should study if long routes that travel only on arterial roads, combined with short shuttle routes that connect inner, residential areas to hubs on arterial roads could offer a faster and better service to commuters. A systematic route rationalization exercise could lead to a more uniform load factor and also increase in frequency and coverage of service.

Other innovative measures like shuttle vans that act like feeders to long distance “express” routes with large buses should also be tried out.

In parallel, the DP of the bus service should state objectives of quality of service. These objectives could also be stated “progressively”, e.g. provide a bus service

- Within 1 km with a frequency of 30 minutes or better in the first 2 years
- Within 500 m with a frequency of 15 minutes or better in the next 3 years

If the bus routes are rationalized properly, there are enough buses to support the number of commuters and the frequency and reach of the bus service is adequate, buses should not be overcrowded. If significant overcrowding is observed for a substantial part of peak hours, specific measures will have to be taken. Although these measures would depend on specific situations, a consistent measure of “overcrowding” needs to be developed.

The service level benchmarks mentioned above do include a measure of overcrowding. However, that observation may be “lost” as the benchmark of overall LoS is evaluated.

Cities may fare very well in some indicators but very poorly in one. In such situations, the overall LoS may still be satisfactory. This will need to be identified and tackled.

Timeline

1. (0.5 year) Announce objectives similar to as suggested above.
2. (Covered elsewhere) STUs should have sufficient number of buses to support phase 1 of the objectives.
3. (parallel, every year) Measure the LoS in all cities as per the benchmark.
4. (1 year) Test computerized route rationalization in a medium sized city (say, with a population of 10 lakhs).
5. (2 years) Rationalize routes in other cities.

Depends on

Pros and cons, resistance expected

None.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	2	1	1	0

Difficulty level: 5.

Importance

Importance = 2 (Must be implemented) for the objectives.

Importance = 4 (Nice to do) for computerized route rationalization.

12.221 Bad pedestrian facilities impact PT usage

Mobility and Connectivity for All		S

Solution

This is a generic issue. Specific parts are addressed in other issues in this document, viz.

1. Section “**Error! Reference source not found.**”.
2. Section “**Error! Reference source not found.**”, which includes zebra stripes too.

Timeline

Timeline

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
2/ 1/ 0	2/ 1/ 0	2/ 1/ 0	2/ 1/ 0	2/ 1/ 0

Difficulty level:

Importance

Importance = 3 (Should be implemented).

Importance = 1 (Must be implemented at any cost).

Importance = 4 (Nice to do).

Importance = 2 (Must be implemented).

12.231 Many cities with 2+ lakh population do not have an organized PT service

Mobility and Connectivity for All		S

Solution

This issue is covered in the issues “11.121 Large PT projects being planned for Mumbai and Pune, but no significant investment in other cities”, “11.221 Lopsided development of 1-2 cities attracts immigrants” etc.

12.311 Bad or nonexistent footpaths, commuters cannot reach bus stops easily and smoothly

Mobility and Connectivity for All	This is a benchmark problem	B

Solution

The condition of footpaths in all cities is so bad that a well funded project needs to be planned for building footpaths where needed and for improving existing ones.

As is true with the issue “12.331 PT is not handicapped friendly”, both government officials as well as even the general public needs to be sensitized towards needs and rights of pedestrians. The project to improve footpaths will fail if this step is not done.

First, concerned people must be sensitized towards rights of pedestrians.

This sensitization program should stress on the following:

- Pedestrians have right, whereas drivers only have privileges.
- Public transport is the most space and fuel efficient way of moving people.
- If properly planned, it can also be significantly more time efficient than today.
- Most PT users are pedestrians at either ends of their journey. Therefore catering to pedestrians’ needs is essential for making PT successful.

This “conditioning” program itself should be enthusiastically executed for 6 months before embarking on the main objective.

The project to create and improve footpaths should include the following elements:

1. An objective to be able to walk safely anywhere in the cities and towns, and that “footpaths” is one very important step towards this objective.
2. A criteria that decides what sort of roads will be selected to build and improve footpaths. This should be based on:
 - a. Roads will be selected not on basis of their width but depending on how many vehicles ply on the road per hour at peak times.
 - b. Width of footpaths will be decided based on number of pedestrians using the road.
 - c. The entire project may be implemented in 2-3 phases. The criteria to select roads may be graded accordingly.

It is possible that, based on this criteria, some narrow roads may be selected first for building footpaths. It is also possible that the required width of footpaths on some such roads may turn out to be such that there is hardly one lane left for vehicular movement. In such cases, these roads may be strong candidates for converting them to pedestrian streets.

3. A time bound program for the project and any phases of the project.

This project will need to be augmented by steps to ensure that any footpaths (new or existing) are not encroached upon. Two types of encroachments are commonly seen:

1. Shops adjacent to footpaths encroach upon them.
2. All or significant space on the footpaths is occupied by hawkers and vendors who are mobile.

It has been said that the former kind of encroachment is generally because corrupt officials turn a Nelson's eye towards such cases. On the other hand, officials say that they do not have sufficient manpower and police protection to remove such encroachments. If there is any truth in this view, increasing manpower or changing its allocation would help.

In both cases, effective public participation and public pressure should be used to tackle the problem of encroachments. An approach that has seldom, or perhaps never, been tried is to invite citizens and NGOs to measure encroachments on footpaths and publish a "scorecard" per ward, administrative division or electoral constituency. This could deter local administration and corporators from being involved in such encroachments, and in fact would ease the job of the anti-encroachment task forces.

Whatever the reasons or ways may be, such encroachments should be sternly dealt with and promptly removed.

In case of the latter, a significant number of citizens are seen using the services of these hawkers and vendors, indicating that they are, to some extent, an integral part of the fabric of the city. Instead of completely evacuating them, a system needs to be put in place. Places where hawkers may be allowed at all times, or during specific hours, or never need to be marked. This marking needs to be permanent, therefore the system should include some sort of colour coding mechanism, e.g., based on the colour of the tiles used for footpaths.

It follows that such a system be used for all footpaths being built. Renovation/reconstruction of any footpath should consider what sort of a hawkers' zone it falls under, and implement the appropriate coding mechanism.

Timeline

All solutions suggested in this section should be fully executed in phases. Suggested phases and expected duration are:

1. (0.5 years) A program to sensitize officials towards rights of pedestrians.
2. (0.5 years, in parallel) Plan a project to build and fix footpaths across the state, including finances for Phase 1 and 2 below.
3. (0.5 years, in parallel) Devise a policy to accommodate a planned number of hawkers and vendors.
4. (1 year) Phase 1: Cover arterial roads in 10+ lakh cities.
5. (1 year, in parallel) All cities to take stock of where and how the hawkers policy should be implemented, which roads qualify for footpaths, which are candidates for pedestrian plazas etc. Plan Phase 3, including finances.
6. (2 years) Phase 2: Cover all major roads in 2+ lakh cities.

7. (2 years) Phase 3: Cover all remaining qualifying roads.

Depends on

Pros and cons, resistance expected

Footpaths have been neglected for several years. Obviously, they do not have enough mind-share of authorities/ decision makers. Some resistance may be expected to giving this project a top priority.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	1	1	2	0

Difficulty level: 5.

Importance

Importance = 1 (Must be implemented at any cost).

Criteria and evaluation

The Highway Capacity Manual (HCM) 2000, Transportation Research Board (TRB), US has specified levels of service of footpaths⁷⁵ and has categorized them from A to F. LoS of A and B is generally observed at footpaths designed for leisurely walks. LoS of C and D should be observed at footpaths used for commuting. Footpaths that offer LoS of E and F are very congested and irritate pedestrians.

- All footpaths in cities should have an LoS of C or better.
- All footpaths within 100m of bus stops should have an LoS of D or better.
- All footpaths within 500m of bus terminals and large bus stations like BRT should have LoS of D or better.

Randomly choose 80 urban bus stops, 5 urban bus terminals or large bus stations and 5 state transport bus stations in cities with more than 2 lakh population. Count how many of them are easy to reach for pedestrians as per the criteria above. Give double credit for bus stations or terminals (count them as 2).

Score 1 point for every 10% bus stops, stations or terminals that are easy to reach on foot.

⁷⁵ Pune Municipal Corporation, Revised BRT Pilot Project, p21

12.312 Pedestrian signals not working in some cities

**Mobility and
Connectivity for
All**

B

Solution

This issue has a lot more to do with the mindset of administration and people than with any electrical or funding issues. As mentioned in “12.311 Bad or nonexistent footpaths, commuters cannot reach bus stops easily and smoothly”, a focused program to sensitize concerned officials as well as general public towards rights of pedestrians should be conducted.

Lack of such a mindset has resulted in the pedestrian signals in some cities being such a bad state that the city’s regular signal maintenance budget is far too inadequate to fix these signals. Therefore a separate budgetary item will be needed in most cities to fix pedestrian signals.

A typical 4-way chowk has 4 roads approaching the signal. Each road should have zebra stripes, using which pedestrians should be able to cross the road safely. Since each road can be crossed in 2 directions, there are 8 locations where pedestrian signals are necessary.

Many of these pedestrian signal poles are removed for some road work, and are never fixed again. Even the standing pedestrian signal poles do not have working signals in many cases. Where they are working, they may not be programmed to provide sufficient time for pedestrians to cross the road safely.

Therefore the task includes:

- Fixing pedestrian signals on existing poles,
- Installing pedestrian signal poles where necessary,
- Programming them as per IRC:93-1985 to provide sufficient pedestrian phase.

Timeline

This issue should be addressed in 3 phases, in all 2+ lakh cities:

1. (1 year) Phase 1: Fix pedestrian signals on existing poles.
2. (parallel, continuously) Zebras at all signaled intersections should always be bright and clean.
3. (1 year, in parallel) Programming of all pedestrian phases at all intersections as per IRC norms.
4. (1 year) Phase 2: Install uprooted signal poles to cover 50% intersection in the city.
5. (1 year) Phase 3: Install uprooted signal poles at remaining 50% intersection in the city.

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	0	0	2	0

Difficulty level: 3.

Importance

Importance = 1 (Must be implemented at any cost).

12.321 Bad cycling infrastructure increases reliance on personal vehicles

Mobility and Connectivity for All	This is a benchmark problem	B

Solution

On the face of it, facilities for cycling do not seem to be related to PT. However, it should be noted that cycling is a strong facilitator for PT's success.

If one considers the overheads of going to and from the bus stop or train station, it becomes clear that PT, becomes viable only for moderate to long distances, typically beyond 4 or 5 km. This does not change significantly even when PT is supported by dedicated bus lanes etc.

If good footpaths are provided, people prefer walking for trips up to 1 or 1.5 km.

For trips between 1 and 5 km, a personal vehicle remains the only option. Quite a few trips fall in this category, and then people get used to, or even totally dependent on using personal vehicles. Once people develop this dependence on personal vehicles, they start using it for longer daily commutes as well, instead of using PT. If good infrastructure for cycling is provided, many of these short trips can be done with a cycle. Then people get less used to or dependent on personal vehicles, and tend to use PT.

Cycles are strong facilitators for PT's success.

Providing facilities for cycling frequently considers only cycle tracks, stands, parking etc. Although all these things are required, what is more essential is a strong message that the city wants to promote cycling. Unless this message is strongly established, any city will not be able to cope up with the professional marketing onslaught of makers of personal vehicles.

Cities must repeatedly send very strong messages to promote cycling.

This messaging should include publishing statistics regarding number of cycles sold in the city, number of people from various walks of life using cycles for their daily commute etc.

As regards the more straightforward steps that need to be taken up, they are as follows.

Each city should plan to develop a network of cycle tracks which is within, say, 1 or 2 km from any place. Thus, barring about 2 km of the entire trip, typically at both ends of the trip, it should be possible to commute anywhere on cycle tracks.

The most popular choice for cycle tracks is along arterial roads because they are generally wider than most roads in the city. However, cycle tracks need not be restricted to arterial roads, and not every such road may have a cycle track. The objective should be to develop a citywide network of cycle tracks. Whether the tracks need to be built along arterial roads has limited significance. In fact, some tracks should be along riversides, parks etc., to make cycling more enjoyable.

Cycles would need sufficient parking facilities. Each establishment that has some parking facility (offices, residential complexes, cinemas, auditoria etc.) must provide an appropriate number of parking slots for cycles. This number should be determined such that there are generally a few cycle parking slots available, though parking of personal vehicle may be full. This will attract some people to use a cycle instead of a motorized vehicle. Cycle stands in such places should also be provided at the most convenient locations, e.g., near staircases or elevators, instead of in a remote corner of the facility.

Establishments that provide such cycle stands may be given some concession in municipal taxes.

Considering that cycles are heavily used by people with lower incomes, parking for cycles should be free at most places. Examples of such places include all public parking, schools and colleges, marketplaces excluding malls, bus and train stations, government offices. Places like multiplexes, malls etc., where the poorer people seldom go, may charge a nominal parking fee for cycles, if they are charging any parking fees for other vehicles. Yet, it is to be noted that whether these establishments should charge for parking at all is a separate issue in itself.

Some prominent bus stops should also have an integrated cycle parking facility. This will encourage people to come to the bus stop on their cycles, park it there, use PT for their trip and collect the cycle back upon return. Such cycle stands would be more useful if

installed in the morning peak hour direction. Parking stickers may be issued to users at nominal charges to prevent misuse.

Going further, some buses and suburban trains may be fitted with cycle carriers. This will enable people to carry the cycle with them on the buses and use it at the other end of the trip too.

“Rent-a-bike” services funded and/or managed by city administration are becoming increasingly popular across the world. However, these services must be devised with a lot of thought. Such services typically include several kiosks across the city. Each kiosk holds 15-20 cycles. Members of this service are provided smart cards. A member can go to any kiosk, unlock a cycle using his smart card, use the cycle and return it at any kiosk. Members pay as per the usage. Charging schemes could include free usage for 15 to 30 minutes. Short duration for free usage slab encourages people to return the cycle as quickly as possible, thus making it available for the next user.

Several solutions have been suggested in this section, and it is appropriate to prioritize them as follows:

1. Cycle parking should be free at most places.
2. All establishments should provide preferred parking facilities for cycles.
3. Develop a network of cycle tracks, reachable within 1-2 km from any place.
4. Provide cycle stands at important bus stops.
5. Implement “rent-a-bike” services in cities.
6. Fit cycle carriers on buses and suburban trains.

Yet, an unequivocal, “in-your-face” objective of making the city cycling friendly is most important than implementing the above measures just for the sake of it. This objective must be put in place first. The specific measures will follow automatically.

Timeline

1. (0.5 year) All cities should send strong messages that the city will be made cycling friendly in a planned manner.
2. (0.5 year, parallel) Cycle parking should be free and available at most public places.
3. (1 year) All establishments including private companies etc should provide preferred parking facilities for cycles.
4. (2 years, parallel) Develop a network of cycle tracks, reachable within 1-2 km from any place.
5. (2 years) Any other measures suggested above to promote use of cycles.

Depends on

Pros and cons, resistance expected

Many people are seen to argue, “Hardly anyone uses cycles these days, then why provide facilities for cycling?” This flawed argument will have to be repelled by “Just like animals on verge of extinction benefit from facilities and support, so will cycles.”

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	0	1	2	1

Difficulty level: 5.

Importance

Importance = 2 (Must be implemented) for some basics like free parking, a network of cycle tracks in major cities.

Importance = 3 (Should be implemented) for a network of cycle tracks in smaller cities.

Importance = 4 (Nice to do) for items like “rent-a-bike” schemes.

Criteria and evaluation

Cities with more than 2 lakh population should have 5 km cycle tracks per lakh population. At least 90% of these tracks should be usable.

Criteria for decent facilities for cyclists

Score 2 points for an approved statewide criteria for a usable cycle track (a city may modify it).

Each city should have audited its cycle tracks as per the criteria in the past 2 years. A city is counted as “good” if both of the following are true:

- It has more than 5 km cycle tracks per 1 lakh population. The city’s most authoritatively estimated population should be considered if the last census was more than 5 years ago.
- At least 90% of the length of the tracks has been certified as “good” in an audit in the last 2 years.

Score 1 point for every 20% “good” cities.

Score 1 point for every 30% cities where 25% or more trips are done by cycles. (Max 3 points).

12.322 Bad or nonexistent facilities for cycling

Mobility and Connectivity for All		B

Solution

This issue is covered in “12.321 Bad cycling infrastructure increases reliance on personal vehicles” above.

12.331 PT is not handicapped friendly

Objective		B

Solution

Before beginning to address this specific issue, significant awareness needs to be created about rights of people with disabilities. Even if the state announces a well-funded program to provide handicapped accessible transportation facilities, such a program is bound to fail if all concerned government employees are not sensitized to the needs and rights of handicapped persons.

First, people must be sensitized towards rights of handicapped persons.

Such awareness program should include various means, e.g., films and advertisements that demonstrate how accessible facilities are routinely provided in developed countries, focused workshops that make officials aware of their legal duties towards the handicapped, etc.

This “conditioning” program itself should be enthusiastically executed for 6 months before embarking on the main objective.

A clearly worded declaration by the state government should be announced by the Chief Minister, that states that facilities that enable handicapped persons to use our public transport services will get special attention by way of a time-bound project.

Elements of this declaration and project should be:

1. The “handicaps” should include physical and visual disabilities, and address needs of such people who are able to move around independently in a controlled environment.
2. Objective of any such handicapped person being able to go from one public place to another independently.

3. This project should state stages of the above objective being put in place. For example, it could take 2 years to achieve these objectives in cities with more than 10 lakh population, further 3 years for 2+ lakh cities, and 5 more years for the entire state.
4. Definition of what is meant by “achieving” the objective. This definition should state what percentage of PT vehicles would be accessible, which facilities would be made accessible (e.g., steps of buses, rest rooms, staircases, ticket vending machines), what sort of bus and railway stations would be provided accessible facilities, etc.
5. A reminder that the state is bound to provide these facilities by law, and it is not a favour being done to physically handicapped people.

In short, this declaration should be worded so clearly that any reader would be able to tell whether any specific piece of infrastructure is covered by this project. E.g., would “my” bus stop, the bus “I” take, etc be accessible, and in how many years.

This project will need significant funding to make existing PT facilities accessible. Additionally, a criteria for all PT projects being envisaged and planned should be to ensure that the new facilities are accessible from the day they are commissioned. New project proposals in transportation (whether for PT or otherwise) should be passed only when this requirement is met. This step needs to be taken with immediate effect.

Timeline

1. (0.5 year) Announce a declaration as suggested above to provide and maintain facilities to enable the handicapped to use PT services.
2. (parallel) A statewide program to sensitize officials as well as people towards the rights of the handicapped.
3. (1 year) All new transportation projects must include provisions for the handicapped.
4. (2 years) All STUs in 10+ lakh cities should become handicapped friendly.
5. (3 years) All STUs in 5+ lakh cities should become handicapped friendly.
6. (5 years) All STUs in the state should become handicapped friendly.

Depends on

Pros and cons, resistance expected

Pros and cons

Resistance expected from

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest

2	1	1	2	0

Difficulty level: 6.

Importance

Importance = 2 (Must be implemented) for cities with more than 10 lakh population.

Importance = 3 (Should be implemented) for cities with less than 10 lakh population.

13.111 Number of accidents per 100,000 km in Maharashtra is higher than the national average

Safety	This is a benchmark problem	G

Solution

All STUs should analyze their accidents to determine the top 2 causes for their own STU. These could be: Vehicle failure or bad condition of vehicle, bad or faulty infrastructure, STU driver's mistake, other driver or pedestrian's mistake etc.

Yet, it should be noted that even when the cause of an accident is noted as other than driver's mistake, not being able to anticipate the problem can also cause an accident.

All STUs should set targets for lower accident rates.

All drivers should be heavily trained in road safety, considering that the level of traffic education is extremely poor in India. There should be refresher sessions for each driver every year. The basic training program should be at least for two days, and a refresher should be for about half a day. This program should focus primarily on safety, rather than on traffic rules and driving skills. The latter should be incidental and not the focus.

Drivers with good and exceptional records of driving without accident, irrespective of whose fault it is, should be handsomely rewarded. This reward scheme should consider various durations for which the driver has driven without an accident, e.g., 3, 5, 10 years etc. Financial assistance and motivating force for the rewards can be sought from NGOs and private companies as well as celebrities.

Such a reward scheme already exists, but it should be not only substantially enhanced but also made visible among the society. That will need special efforts.

Likewise, STUs which meet or surpass their accident rate targets should be rewarded and felicitated.

These initiatives need to be included in the STUs' DPs.

Timeline

1. (0.5 years) All STUs to analyze accident rates.
2. (0.5 years) Set targets for next 5 years. Set up a rigorous training program.
3. (1 year) Train all drivers.
4. (every year) All drivers should undergo a refresher course on safety.
5. (1 year) Institute annual awards for safe drivers.

Depends on

Pros and cons, resistance expected

None.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	2	2	2	0

Difficulty level: 7.

Importance

Importance = 2 (Must be implemented).

Criteria and evaluation

CIRT publishes data on the STU's fleets. One of the parameters is "number of accidents per 100,000 km travelled". Maharashtra's STUs, both urban and rural, have performed below the national average in this parameter.

This benchmark combines both urban and rural STUs. If this is found problematic, two separate benchmarks for urban and rural STUs will need to be developed.

Compute a national index for accidents per 100,000 km as:

(number of accidents in urban and rural STUs) / (km travelled by urban and rural STUs)

Also compute a state index for Maharashtra.

Score: Use a scale as follows: 0 corresponds to 1.5 times the national index of accidents per 10,000 km. 10 corresponds to no accidents per 10,000 km. Place the index for Maharashtra on this scale. Thus the state will score 3.3 if the state index is the same as the national index, and 6.7 if the state index is half of the national index.

13.211 Old buses, prone to failures

Safety		S

Solution

PT buses are prone to failures because of several reasons. Some of them are:

1. The buses are very old, and are way past their “low-maintenance life”.
2. Makeshift or poor quality spare parts are used to save costs.
3. Traffic jams in cities and poor quality roads in rural areas subject the buses to excessive wear and tear.
4. The STUs lack funds to buy new buses and quality spare parts.

There is also a hushed talk about corrupt practices in maintenance depots of PT services.

The third problem mentioned above may not be under the control of the STU and concerned officials or ministries. As regards the other issues, they seem to boil down to the issue of PT not being supported well financially.

Various financing instruments and options could be discussed and implemented to make sure that the STUs are not starved for money, yet do not have to increase the ticket rates to make ends meet. Some of them are suggested below, and should be thoroughly discussed before implementation:

- Fuel surcharge on personal vehicles and subsidized fuel for PT vehicles.
- A large part of the collection from parking charges should be given to PT services.
- Innovative ways and rates of advertising on PT buses, stops etc. High rates could be charged as the ridership grows.

At the bottom of all these reasons and ways of earning more money lies the root cause of many problems related to PT. The city and state administration must take pride and personal interest in the state of PT. PT should be considered as an essential service, a utility. Condition of buses and the overall state of PT should be one of the parameters to evaluate the performance of the concerned officials, bureaucrats and ministers.

Therefore the following direct and indirect measures are suggested to reduce the rate of failure of PT buses:

- Number of failures, especially enroute, should be diligently monitored. STU management should set targets for failure rates in the 5 year plan of the STU, and they should be held accountable for not meeting them.
- PT should be financed such that it can buy good quality spare parts as well as can phase out old buses much sooner than it does today.

Timeline

1. (0.5 year) Each STU to set targets for number of failures. They should be monitored every year.
2. (0.5 year, parallel) Include these targets in the STU's DP.
3. (1 year, parallel) Find financing and funding options to buy new buses and quality spare parts.

Depends on

Pros and cons, resistance expected

None.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
2	1	2	2	0

Difficulty level: 7.

Importance

Importance = 2 (Must be implemented).

13.311 Firefighting equipment at bus stations is not conspicuous and not in working condition

Safety		B

Solution

Develop standard operating procedures for fighting fires at bus stations. The procedures could focus either on getting people away from the fire as quickly as possible, without panic and stampede, or on how to put the fire out, or both. This needs to be decided by experts in emergency response procedures. Still, all bus stations should have sufficient firefighting equipment.

These procedures should also include norms that can measure whether the bus station's response is quick enough. These norms could be different for various sizes of bus stations, depending on their area and number of passengers handled.

Certain designated staff should be trained to handle fires till firefighters arrive. Citizens as well as any institutions or NGOs working in the field of emergency response, first aid etc. should also be invited to take part in this training.

Unannounced fire drills should be conducted across the state. The number of such drills conducted should be high enough, so that the concerned officials will always want to be prepared for them. STUs or bus depots doing exceptionally well in such drills should be acknowledged and rewarded publicly.

Data regarding the number of people who died inside the vehicles or bus stations because of fire in PT services across the state should be published periodically, along with data on trained drivers and conductors and any such information.

Timeline

1. (1 year) Develop standard procedures to handle fires in bus depots.
2. (2 years) Train designated staff.
3. (parallel, every year) Conduct unannounced fire drills.
4. (parallel, every year) PROs of all STUs should publish relevant data in newspapers.

Depends on

Pros and cons, resistance expected

As above.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	2	2	2	0

Difficulty level: 7.

Importance

Importance = 3 (Should be implemented).

13.321 Inadequate functional emergency exits

Safety		B

Solution

Develop evacuation norms that cover all kinds of PT vehicles. These norms should state the kind of emergency, its effect on the vehicle, and expected evacuation time. For example, a bus being overturned and a bus catching fire could affect the bus differently and different evacuation times may be specified for both emergencies.

All drivers and conductors should be trained to handle emergency evacuations. Citizens as well as any institutions or NGOs working in the field of emergency response, first aid etc. should also be invited to take part in this training.

Unannounced emergency response drills should be conducted across the state. These drills should cover all kinds of vehicles used by the PT services. The number of such drills conducted should be high enough, so that the concerned officials will always want to be prepared for them. STUs or bus depots doing exceptionally well in such drills should be acknowledged and rewarded publicly.

Data regarding the number of people who died inside the vehicles in such accidents in STUs across the state should be published periodically, along with data on trained drivers and conductors and any such information.

Timeline

1. (1 year) Develop evacuation norms to cover all kinds of PT vehicles and emergency situations like fire, accidents.
2. (2 years) Train all drivers and conductors in emergency evacuation.
3. (parallel, every year) Conduct unannounced emergency drills.
4. (parallel, every year) PROs of all STUs should publish relevant data in newspapers.

Depends on

Pros and cons, resistance expected

Procedures to ensure safe environments also need substantial amounts of investment in equipment and training. If no accident happens, many people consider the investment as “waste”. This attitude results in always giving lower priority to safety. It is not easy to tackle and counter this attitude.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	2	2	2	0

Difficulty level: 7.

Importance

Importance = 3 (Should be implemented). A value of 2 is not assigned only because the focus of this blueprint is **PT** and not safety alone.

14.111 City bus services expected to fend for themselves

Affordability		G

Solution

It is important to explore and implement ways to make STUs financially sustainable without substantially increasing ticket prices. There could be several solutions to achieve this objective and all of them should be attempted at appropriate times. Some solutions are suggested below:

1. Substantially increase revenue from sources other than revenue from tickets. These sources are primarily include advertising.
2. Cities should increase parking charges, claiming that the PT service is good, and citizens complaining about high parking charges should use PT. Divert a significant part of collection from parking charges to the STU in the city.
3. A surcharge on petrol and diesel sold to personal vehicles in the city can also be considered, and amount collected could be used to fund the STU.
4. The local and/or state government could provide substantial subsidies to STUs, as a policy, claiming them to be “public good benefitting the society”.

While any or all these measures are being attempted, the STUs must maintain a high quality of service such that the PT in the city becomes and remains a matter of pride for all citizens as well as officials. There should be at least some noticeable improvement in the quality of service offered by an STU before any such measures are taken, rather than high taxes, parking rates and surcharges preceding the improvements.

Timeline

1. (0.5 year) All STUs and local administration of respective cities should announce a program to improve quality of service, increase ridership, followed by advertising revenue and then parking charges, surcharges and taxes **in tandem**.
2. (2 years) This program should be implemented in 2 or 3 phases.
3. (0.5 year) This program and its fundamentals should be included in the DP.
4. (1 year) If the measures above are not sufficient to sustain an STU financially, the shortfall should be met by the state government to maintain a high quality of service.

Depends on

Pros and cons, resistance expected

None.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	1	2	2	1

Difficulty level: 6.

Importance

Importance = 4 (Nice to do). This task is “nice to do” because it may be a policy decision to allow STUs to make losses, arguing that they are a convenience to the society and should not focus on making ends meet.

14.121 PT fares in Maharashtra are on higher side

Affordability	This is a benchmark problem	G

Solution

Various measures suggested elsewhere in this document should make STUs financially sustainable while keeping the tickets cheap. Yet the objective should be to make sure that ticket prices are equal to or cheaper than $1/3^{\text{rd}}$ of the tariff charged by rickshaws for the same distance. In other words, 3 persons travelling together should find it cheaper to travel by a bus rather than by a rickshaw. This could be adopted as a rule of thumb to put an upper limit on ticket rates of STUs.

Timeline

1. (0.5 year, along with start of actions suggested in “14.111 City bus services expected to fend for themselves”) Announce the rule of thumb mentioned above as an objective.
2. (0.5 year) Include the objective in DPs of STUs.

Depends on

Pros and cons, resistance expected

None.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	1	1	2	0

Difficulty level: 4.

Importance

Importance = 3 (Should be implemented).

Criteria and evaluation

For urban PT services: consider 3 km, 6 km and 12 km as short, medium and long distances. Assume that 25%, 50% and 25% trips are for short, medium and long distances

respectively. Find the average ticket price for 3 randomly chosen urban PT services in Maharashtra. Also find the average ticket price for 10 randomly chosen urban PT services in India in a similar way.

For rural PT services: consider 25 km, 50 km and 100 km as short, medium and long distances. Assume that 25%, 50% and 25% trips are for short, medium and long distances respectively. Find the average ticket price for the rural PT service in Maharashtra. Also find the average ticket price for 5 randomly chosen rural PT services in India in a similar way.

The exercise should be done only for bus based systems, as the ridership of systems like metro, monorail, tram etc would always be very insignificant for the foreseeable future.

Use the following table to score points and take their average to arrive at a combined score for all PT fare structures in Maharashtra.

Average ticket in Maharashtra/ average ticket in India	Points
more than or equal to 1.10	0
less than 1.10	2
less than 1.00	4
less than 0.90	6
less than 0.85	8
less than 0.80	10

14.211 Performance of urban bus services in Maharashtra is lower than average in India

Affordability		S

Solution

This problem exists with rural bus services also. The solutions for both are similar (if not identical), therefore, this section suggests solutions for both urban and rural STUs.

Most STUs in Maharashtra need immediate improvements in factors like fleet utilization, km run per employee, fuel efficiency in kmpl, breakdowns per 10,000 km and accidents per 100,000 km. This list is only indicative, and there could be other areas of

improvement too. However, significant improvements in these factors will directly or indirectly show improvements in those areas.

It should be kept in mind that urban and rural STUs may need different solutions for the same problem.

Work on these solutions should begin by setting numerically measurable targets. These targets are suggested below as averaged for all STUs in Maharashtra. Individual STUs should study their own problems and try to set appropriate targets. These targets should be achieved or surpassed in maximum 5 years. They should be mentioned in their DPs and tracked annually. An overall target for Maharashtra should also be set and tracked annually.

Parameter	Today's value: Urban	Suggested target: Urban	Today's value: Rural	Suggested target: Rural
Fleet utilization %	~80-85%	95%	~95%	97%
km run per employee	20-25	28	~50	60
Fuel efficiency	3.0-3.5	4.0	4.5-5.0	5.5
Breakdowns per 10,000 km	1.0-2.0	0.5	0.25	0.15
Accidents per 100,000 km	0.35	0.30	0.19	0.15

Some solutions to meet the recommended targets are suggested below.

Fleet utilization of STUs can be improved if the buses are maintained in good condition. This will become simpler if old buses are replaced with new buses. Not just new, but sleeker and attractive buses will make people of Maharashtra take pride in STUs, which is an additional advantage. This is possible only if innovative ways are found to fund the STUs. Some of the innovative ways may need educating people about importance of PT over personal vehicles, but such education and conditioning of public opinion is a prerequisite for overall improvement in PT.

Such innovative or new ways may include restructuring the tax structures such that vehicles that carry more people for the same road space and fuel consumed get concessions, or even outright tax waivers. Vehicles consuming more space and fuel may be taxed heavily and this money can be used to subsidize PT.

As regards the parameter “km run per employee”, the focus should be on using the same employee base for providing more services rather than reducing the workforce.

It is also found that the office staff of STUs works at poor efficiency. Officers and clerks do not arrive at work even at 11 am. Biometric attendance systems should be installed at such offices and strict action should be taken on inefficient and non-punctual staff.

Opportunities to start conductor-less services should be sought and exploited. MSRTC does have some point-to-point services that operate without a conductor. These could be increased. Such services could be possible even in urban STUs. Reducing number of fare slabs and replacing tickets with tokens can help start such services.

Good and new buses should also help STUs maintain a larger fleet with the same maintenance staff, which should increase not only the fleet utilization, but also km run per employee.

Fuel efficiency of urban STUs can increase substantially if they are provided dedicated bus lanes, preferential signals etc.

For increasing fuel efficiency, it is difficult to employ specific direct measures for rural STUs since a substantial part of their running happens on roads that are not congested. Yet, it is seen that several large MSRTC bus stations are in the heart of the towns, which are congested. Moving them to cities' outskirts would be a bad idea because all passengers will now need to commute to the city's edge with their luggage etc., which will not only burden them financially but also increase traffic within cities as a large number of rickshaws will be needed for this purpose. Therefore, providing bus lanes even in city centers near the bus stations and controlling or reducing congestion by moving some businesses and such establishments out of city centers should be discussed, included in DPs and implemented.

Solutions to reduce number of breakdowns and accidents have been discussed in sections "13.111 Number of accidents per 100,000 km in Maharashtra is higher than the national average" and "13.211 Old buses, prone to failures" respectively.

Timeline

1. (0.5 year) All STUs should set targets for improving their performance in the suggested parameters.
2. (0.5 year) Include the targets in the STUs' DPs.
3. (0.5 year, parallel) Government to propose tax reforms as suggested above.
4. (2 years) Implement the reforms, in 2 phases if appropriate.
5. (2 years, after setting targets) Install biometric systems in STUs offices, increase staff's efficiency.
6. (2 years, parallel) measures like bus lanes, conductor-less trips as appropriate.

Timeline

Depends on

Pros and cons, resistance expected

Bus lanes are likely to be met with resistance.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	1	1	1	1

Difficulty level: 5.

Importance

Importance = 3 (Should be implemented).

14.212 MSRTC's performance in some parameters is worse than average in India

Affordability		S

Solution

The solutions are included in the section “14.211 Performance of urban bus services in Maharashtra is lower than average in India” above.

14.221 Most track based MRTs have hidden costs that are not accounted for

Affordability		S

Solution

This problem might be found in all major projects, especially the ones that need substantial construction and disruption of normal life and traffic during the construction phase. “Track based MRTs” have long construction phases and substantially disrupt traffic during that phase. However, projects like BRTs may also have hidden costs discussed here. Therefore, it is appropriate to say that all “large” projects should include a discussion on hidden costs in their proposals.

Going further, to ensure that this issue is not overlooked, there should be a template for all transportation project plans. Some sections of the template may be optional or mandatory depending on whether the given project is considered small, medium or large as per an approved criteria.

Estimation of hidden costs should include the following aspects:

Time lost in additional traffic jams, dust and noise pollution, illnesses because of such pollution, accident rates, etc. There may be some accepted techniques for estimating these costs. They should be researched and used as appropriate.

All projects under various phases of development (e.g., projects for which proposals or plans have been prepared, plans have been approved, **even projects whose implementation is in progress**) should do this analysis if required by the template.

All MRT or similar projects must be integrated into their respective city's CMP before being considered for implementation.

Timeline

1. (0.5 year) All "large" projects in state "implementation in progress" should be immediately required to estimate hidden costs.
2. (0.5 year, parallel) Prepare a template that must be followed by all future project plans.
3. (0.5 year, parallel) Ensure that all such large MRT-like projects are properly integrated in the respective city's CMP.
4. (1 year) Complete backlog of estimation of hidden costs of large projects in various stages of implementation.
5. (2 years) Complete backlog of estimation of hidden costs of all current projects.

Depends on

Pros and cons, resistance expected

Procedure to estimate hidden costs could be very abstract and thus debatable. Identifying hidden costs could make people not want large projects, which could hurt interests of people pushing for construction-based mega projects.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	1	1	2	2

Difficulty level: 6.

Importance

Importance = 3 (Should be implemented).

14.311 Bus fares are static: do not depend on ridership pattern

Affordability	B

Solution

Dynamic fare structures, if implemented properly, can boost ridership and even generate extra revenue. Fare structures that depend on ridership patterns need to consider the following issues:

1. Initially, while people are not yet confident that a bus service can satisfy their mobility needs, cheaper fares in off-peak hours should be used to attract ridership. This may lead to some losses to the STU, but they should be looked at as an investment: People need to be habituated to PT to reduce their dependence on personal vehicles.
2. As ridership increases as well as quality of the bus service improves, slightly higher than normal bus fares may be introduced to compensate for any losses that the STU might be incurring in off-peak hours. Before this step is taken, people should have already understood that using PT saves them considerable amount of money, and even time, as compared to using personal vehicles.

Structuring dynamic fares would need a lot of data on ridership patterns. It is therefore essential that STUs use electronic ticket vending machines, so that this data can be acquired and used. Data like the following needs to be captured by the electronic system:

- Ridership on individual routes
- Directional ridership patterns on individual routes
- Ridership between pairs of stops on all routes between the pair
- Directional ridership patterns between pairs of stops

Such data needs to be captured on half-hourly basis. This data can throw light on questions like the following, and measures indicated could increase revenue:

- Are buses on some routes overcrowded in one direction during peak hours, but virtually empty in the other? Then a 50% discount in non-peak direction could attract more than twice passengers.
- To what extent does ridership reduce in afternoon hours? A slight increase in peak hours and a slight discount in off-peak hours could distribute the load evenly and make the commute comfortable.

Timeline

1. (1 year) Start using electronic ticket vending machines on all routes of all urban STUs.
2. (2 years) Each STU should analyze the data and experiment with dynamic fares.

Depends on

None, but such tasks need to be started after the PT services attain a certain quality as well as have high ridership.

Pros and cons, resistance expected

Dynamic fare structures may be difficult to comprehend by the common man and may open debates. It may not be very easy to evaluate whether dynamic fare structures are benefitting the STU and the society in general.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	2	1	1	1

Difficulty level: 6.

Importance

Importance = 4 (Nice to do).

14.321 Taxes on buses used for various purposes

Affordability		B

Solution

Regardless of whether a bus is used by a private or a public sector undertaking, whether for an STU or as a school bus, it should be understood that it is a high occupancy vehicle, and consumes less road space as well as fuel per person-km. In order to make usage of bus more competitive, taxation on buses at various stages should be lowered, even abolished where possible.

This also includes tolls charged for buses: both of MSRTC as well as private carriers.

Timeline

1. (1 year) Abolish tolls for buses with more than a certain capacity, say 15 seats and above.
2. (2 years) Substantial discounts in other taxes and duties like excise.

Depends on

None.

Pros and cons, resistance expected

This may result in a certain loss of revenue for the government.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	0	0	1	0

Difficulty level: 2.

Importance

Importance = 2 (Must be implemented).

15.111 Space for expanding/ building track based MRTs is not reserved and protected

Flexibility and Sustainability		G

Solution

DP of all cities with more than 5 lakh population should reserve land for a track based MRT that may be needed in future. This land should be reserved and used as open gardens or playgrounds till the time the city is ready for a track based MRT. Its reservation should not be counted under “gardens”, but under “transportation”. The cities should have other land masses identified as gardens and playgrounds.

Timeline

1. (0.5 year) Ensure that this item is covered in DP of 5+ lakh cities.

Depends on

Pros and cons, resistance expected

Note that this action could mean lifting reservations under other land uses in DPs in force. That could meet stiff resistance as it could reduce the supply of land available for even residential use, thus escalating real estate prices. This issue may be alleviated to some extent by providing marginally higher FSI to localities along corridors designated for mass transit.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
2	1	2	2	1

Difficulty level: 8.

Importance

Importance = 1 (Must be implemented at any cost). Only such foresighted actions can provide land for MRTs when cities grow to 3 or 4 millions. This is therefore one of the “must do at any cost” tasks.

15.311 Limited availability of land for transportation

Flexibility and Sustainability		B

Solution

Urban areas

All 2+ lakh cities should have a DP. The DP should earmark land for the following and these reservations should be clearly put on a detailed map of the city:

- Arterial roads: Today and any scope for widening if appropriate. It should be noted that very wide roads make a city unfriendly to pedestrians, so most arterial roads should generally be not wider than 3+3 lanes.
- Bus depots, bus stations.
- If an elevated metro/ surface LRT system is envisaged, land/ roads that are wide enough to accommodate such a system, taking care of turning radii required.
- Petrol pumps.
- Parking lots, including multi level and automated parking structures.
- Land for expanding facilities at and around central bus and railway stations. Land for building an altogether new central bus/ railway station in future.
- Connectivity with airport/ seaport.
- Truck terminus.
- Rickshaw and taxi stands. At present just a board announces a part of a road as a “rickshaw stand”. This takes away carriage width. Cities should have a certain number of rickshaw stands per sq km., and their locations should be planned as much as possible without using the carriageway (e.g. by creating rickshaw bays).
- Bypass highways.

Yet, the DPs should ensure that all these needs are satisfied under 15% of land use. Consuming more land for transportation would not only make transportation less people-friendly, it would also deprive the city of land for other uses like recreation, even residential, leading to higher real estate prices.

Countryside/ rural areas

At present, intersections of NHs and SHs are frequently marked by authorized and unauthorized eating places and other establishments that eventually lead to bottlenecks. It becomes extremely difficult and time consuming to streamline the traffic once bottlenecks happen. It is also seen that MSRTC bus stops do not get sufficient space near such busy intersections.

MSRTC bus stops should be allocated prime spaces near such intersections, so that passengers who want to change over can easily walk to the other stop with luggage if need be. Note that we are talking about simple **roadside bus stops** here and not bus stands. Stops at such intersections should be given more space and should be designed better.

A stretch of 1 km from each major intersection should be planned meticulously. Space should be reserved so that the intersecting highways can be widened by at least 1 lane in future. Land only beyond this reserved space should be allocated for eating places, petrol pumps, tourist information facilities etc. Development in this area must follow this plan.

Various entities will need to cooperate to ensure that intersections of highways do not become bottlenecks in future. These are: MSRTC, NHAI, local administration, ministries of transport and tourism etc.

Timeline

Urban areas: (1 year) List space requirements and include in the city's DP.

Countryside/ rural areas:

1. (1 year) Identify all "major" intersections.
2. (1 year, parallel) Develop a template of facilities required at intersections of various sizes.
3. (0.5 year) Local administration at each "major" intersection should interact with all concerned entities and develop a skeletal plan that covers 1 km road on all sides of the intersection.
4. (0.5 year) All concerned entities to give consent to/ raise concerns about the plan. Meanwhile, no authorized or unauthorized construction that is not in agreement with the skeletal plan should be allowed.
5. (1 year) Conclude and finalize the plans.

Depends on

Pros and cons, resistance expected

Land use for transportation in cities like Mumbai, Pune, Thane, Nashik is a dismal 2.5% to 8%. It may be possible that DPs that address future expansion of such cities reserve a huge amount of space for transportation, to “bring up the average”. It would imply super broad roads in new localities, inviting an increase in vehicle population and also making it difficult to cross such roads. This trap will have to be avoided.

An alternative is to acquire land to address transportation needs. This may require large funds, which may meet some resistance. Yet, it may turn out that even today is not too late to acquire land even at market rates.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	2	2	2	0

Difficulty level: 7.

Importance

Importance = 1 (Must be implemented at any cost). Proper land use, especially for smaller towns, must be planned right away, before it is too late.

15.312 Bus station in heart of the city cannot expand

Flexibility and Sustainability		B

Solution

The problem ID "15.311 Limited availability of land for transportation" pertains mainly to land not being available for addressing future needs. However, the problem is also faced by existing facilities. This ID pertains mainly to bus stations (typically MSRTC bus stations) in the heart of the city. It is frequently seen that such bus stations do not have the capacity to cope up with the continuously increasing number of bus routes, schedules and passengers. Since they are built right in the heart of the city, there is no space available around the bus stations for any expansion. To address this issue, larger bus stations have been built at the periphery of some cities. However, commuting to these bus stations with luggage generally entails a trip by a rickshaw, which is expensive for most people.

To address this issue, the bus service operators should operate special shuttle buses that connect the bus stations on the periphery to either the conveniently located bus station in the heart of the city, and/ or to other important locations in the city.

These shuttle buses should be specially designed to carry luggage. For example, they should have luggage racks inside the bus, and should have wide doors for easy ingress/ egress with luggage. In other words, they should be much like the buses seen at airport terminals. The fare charged by these buses should be significantly less than what is charged by rickshaws. This service could be used only by commuters who have either arrived at the inter-city bus station or are going there to catch a departing bus.

The large bus stations should have a bay or a location from where commuters could easily and safely transfer to these shuttle buses or city buses. The design and layout of such bays should be integrated in the bus station, with clear signage and safe walkways.

The shuttle buses are not meant to put rickshaws out of business. Even rickshaws should be provided a designated and integrated bay inside the bus stations. This will reduce the chaos seen outside the bus stations today.

It is strongly recommended that a few templates of plans are prepared for bus stations of various capacities and only these plans are used by bus stations. This would make it easy for even visitors to navigate their way around the bus stations and transfer to their desired mode of transport.

Timeline

1. (1 year) Prepare a few (about 5) templates for bus stations of various sizes, preferably based on existing bus stations.
2. (thereafter) Plans of all bus stations built thence should be based on these templates.

Depends on

Pros and cons, resistance expected

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	1	1	2	1

Difficulty level: 6.

Importance

Importance = 3 (Should be implemented).

15.321 Planning of bus routes is done by trial and error

Flexibility and Sustainability		B

Solution

All STUs should first adopt an electronic ticket vending system on all routes. O-D, load factor and other data generated by this system should be stored for 12 months and analyzed using sophisticated computer software.

A given STU may use this data for fine tuning its routes. In some cases, a major overhaul of the routes may be needed. The following guidelines should be used for such an overhaul:

1. Different kinds of services (e.g., air-conditioned, luxury, ladies only etc) and a large number of routes make it difficult to maintain sufficient frequency of buses on the routes. As much as possible, there should be only one class of service. The optimal number of routes per sq km of city area is approximately **zzz**. Deviation of more than 20% indicates that the routes may be rationalized for optimum performance of the STU.
2. Route rationalization may adopt one or more of the following systems:
 - a. Hub and spoke system: “Express” buses connect the hubs at high frequency along arterial roads with long routes. “Shuttle” or “feeder” buses connect residential areas to nearby hubs with short routes. In this system, it may take 2 changeovers to reach the destination, but a large section of the journey is on high speed, high frequency buses.
 - b. Point to point services: Major localities are connected by point to point routes. If the network is large enough, it is generally possible to reach any destination in only 1 changeover. However, all routes are expected to serve all stops, thus the frequency and speed of buses may be low.
 - c. A combination of the two systems above is generally found to be suitable in most cities. Extensive O-D data is needed to decide whether routes in a particular part of the city should follow the hub and spoke or the point to point system.
3. The route rationalization exercise should be accompanied by a plan to make the people accustomed to new routes. This is especially tricky if the city is undergoing a major overhaul of its routes. Therefore it is wise to try a major overhaul in a small city first, and learn from the experience. For that reason, it is recommended that a few small cities switch to electronic ticket vending as quickly as possible.
4. In case of a major overhaul, the new routes should be named entirely differently so as to reduce chances of any confusion. for example, if a city has an entirely numerical bus route numbers, new routes should be alpha-numerical.

Most of the discussion above applies to urban STUs. However, the MSRTC should also switch to electronic ticketing, collect O-D data and see if it needs to rationalize its routes.

Timeline

1. (1 year) STUs in a few small cities (between 5-10 lakh population) adopt electronic ticket vending machines.

2. (1 year) Analyze O-D data and rationalize routes in 2-3 small cities.
3. (1 year, parallel) All STUs, including MSRTC, adopt electronic ticket vending machines.
4. (1 year) Implement results of the analysis in small cities.
5. (1 year, parallel) Analyze O-D data of all cities and come up with recommendations to rationalize routes.
6. (2-3 years) Learn from the experience in small cities and implement in remaining cities.
7. (ongoing) Periodic analysis and fine tuning of routes should be incorporated in the STUs' DPs.

Depends on

Pros and cons, resistance expected

Route rationalization is a very elaborate exercise. It may lead to a set of entirely new routes and route numbers. Although it may collectively benefit all citizens of the city, people used to routes and numbers may resist changes.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	2	1	1	0

Difficulty level: 5.

Importance

Importance = 3 (Should be implemented).

15.331 Load factor issues

Flexibility and Sustainability		B

Solution

This problem pertains to PT in rural and countryside areas. Load factor issues may exist for urban routes also, but are not considered in this particular problem.

Although MSRTC serves remote corners of the state to a large extent and lives up to its motto "रस्ता तिथे एसटी", it also means that buses on some of its routes do not run with enough load factor, leading to losses. Some of these villages are in hilly regions, which puts limitations on MSRTC's reach.

Some innovative ideas can be attempted to address this problem. MSRTC could try using mini buses, or even vans and SUV-like vehicles to reach remote villages. Villages that have only one schedule today could be served with two schedules with a smaller vehicle. These smaller vehicles could have a flat ticket and no conductor, thereby reducing expenses yet increasing revenue.

Timeline

1. (1 year) Identify a few routes (about 20-30) with low load factor. Use mini buses or vans on these routes. Analyze the response.
2. (2 years) Depending on the experience, expand the idea statewide in a phased manner in 2 years.

Depends on

Pros and cons, resistance expected

Resistance may be expected from para transit operators. If SUVs and such vehicles are used, there may be a tendency to overload the vehicles, causing safety issues. Incidents of even small accidents would need to be monitored closely.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	1	1	0	1

Difficulty level: 4.

Importance

Importance = 4 (Nice to do).

16.211 Health hazards related to vehicular emissions

Environment Friendliness		S

Solution

It is estimated that about 40% of the urban pollution is caused by vehicular emissions. Therefore, controlling vehicular emissions can play a significant role in improving living conditions in cities.

Some cities monitor their pollutions levels and also estimate the amounts of various gases from vehicular emissions. However, that alone is far from sufficient to control the pollution. For effective pollution control, cities should first set targets for amount of gases released from all sources, and then also develop a plan to meet those targets.

Since vehicles are a major contributor to urban pollution, such a plan should include specific measures to reduce the total amount of vehicular exhaust from the city. It should begin by calculating the current per capita vehicular emissions in the city and setting that value as the first, immediate target. Citizens who contribute more than their share of emissions should need to pay some significant tax, whereas citizens who do not, should get some credit in municipal taxes.

Needless to say, this step can be implemented only after the PT in the city has improved to a certain level. This level is suggested as 30 buses per lakh population. The city should start discussing such a tax when it attains a level of 20 buses per lakh population. People need to be assured that the city will impose taxes only after providing a satisfactory bus service.

There are several alternatives in which the polluting vehicle tax or surcharge can be put in practice. Each may have its own Pros and cons, resistance expected. Each city should adopt the mechanism most suitable to it. Some alternatives are as follows:

1. A one-time tax could be imposed while registering the vehicle in the city.
2. An annual tax could be added to municipal taxes if one owns a fossil fuel powered vehicle.
3. Fuel sold in the city could be taxed. PT vehicles should be exempted from this tax.

Money collected from these taxes or surcharges should be used for funding the local STU. Such taxation or surcharge should also be accompanied by measures to make PT more fuel efficient. These measures are discussed elsewhere in this document.

Freezing per capita emissions will only halt the growth of urban pollution. The cities are already so polluted that further steps are necessary to reduce the pollution. After achieving the target of keeping per capita pollution level constant, the city should take progressive measures to reduce it. A suggested target is to limit the per capita emission levels by 2020 AD to those found in 2000 AD.

Timeline

1. (stated elsewhere) Improve number of buses in all 2+ lakh cities to 20 per lakh population.
2. (parallel) Determine the current per capita emission levels.
3. (parallel) Propose a taxation scheme, to be put in place once the city has 30 or more buses per lakh population.
4. (stated elsewhere) Improve number of buses in all 2+ lakh cities to 40 per lakh population.
5. (0.5 year) Impose pollution tax on fuel sale or vehicle ownership.
6. (2 years) Monitor emissions per capita and hike the pollution tax if needed.
7. (0.5 year) Steps to improve fuel efficiency and ridership of PT.
8. (0.5 year, parallel) Set annual targets for reducing per capita pollution to 2000 AD levels by 2020 AD. Develop a plan to achieve these targets.

9. (0.5 year, parallel) All these targets and plans should be mentioned in the DPs of the cities.

Depends on

Such measures can be taken only after the PT services attain a certain level, after which people may be suggested not to use their personal vehicles but to use PT instead.

Pros and cons, resistance expected

Some of these measures may lead to higher fuel charges and higher expenses for transporters. This increased burden will be directly passed on to consumers, leading to rise in consumer prices. Although it is extremely important to curtail our fossil fuel consumption, it could lead to putting people's aspirations of affluent lifestyles beyond their reach. Therefore such measures need to be implemented with extreme care, beginning with changing the people's mindset, which is always a very difficult task.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	2	2	2	1

Difficulty level: 8.

Importance

Importance = 2 (Must be implemented). A bitter pill that must be swallowed to save our lives.

16.221 Stress on India's foreign exchange reserves

Environment Friendliness		S

Solution

This problem and the problem discussed in "16.211 Health hazards related to vehicular emissions" are two manifestations of the same root cause: excessive use of fossil fuels. Therefore the solutions discussed in the said problem are also applicable to this issue.

The aspect of pollution discussed earlier considered only the urban scenario because that is where the problem is very acute. However, strengthening non-urban PT and imposing taxes on personal vehicles across the state can reduce the state's per capita fossil fuel consumption too.

It should be noted that it is easier to provide high frequency PT services in urban areas to serve the people's daily commute, and it is also reasonable to expect people to use urban

PT if the quality is good. However, a significant part of countryside, long distance commute using personal vehicles includes people carrying luggage and also for pleasure. Using PT may not be a “reasonable” alternative in such cases. Therefore the “fossil fuel” tax in such case should be lower than the similar tax in urban scenarios, discussed in “16.211 Health hazards related to vehicular emissions”.

Money collected from these taxes or surcharges should be used for funding MSRTC. Such taxation or surcharge should also be accompanied by measures to make MSRTC more fuel efficient. These measures are discussed elsewhere in this document.

Timeline

1. (2 years) Improve the quality of service provided by MSRTC to a certain measurable level.
2. (parallel) Propose a taxation scheme, to be put in place once MSRTC services reach a certain measurable level.
3. Quality of MSRTC services should attain the level mentioned above.
4. (0.5 year) Impose pollution tax on fuel sale or vehicle ownership.
5. (2 years) Monitor the state’s fossil fuel consumption per capita and hike the pollution tax if needed.
6. (parallel) Steps to improve fuel efficiency and ridership of PT.

Depends on

Pros and cons, resistance expected

As above.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	2	2	2	1

Difficulty level: 7.

Importance

Importance = 2 (Must be implemented).

16.311 Buses run at lower fuel efficiency than average in India

Environment Friendliness		B

Solution

The solutions are included in the section “14.211 Performance of urban bus services in Maharashtra is lower than average in India”.

16.321 Use of CNG not yet commonplace

Environment Friendliness		B

Solution

This issue depends on a variety of factors, many of which are not in the realm of traffic and transportation. They are mainly connected with a reliable supply of CNG/ LPG and installing safe fueling stations. The CNG/ LPG conversion kits themselves are available at affordable prices.

Therefore this blueprint will not suggest any solutions to this issue.

17.211 Buses serving remote areas are in especially pathetic condition

Integration with Fabric of City or Country	This is a benchmark problem	S

Solution

Things to be done to ensure that all buses are in good condition are mentioned in “17.311 Buses in very bad condition, lack basic comfort”. While executing those steps, special attention should be given to villages and remote areas.

There is a tendency to assign the best buses to routes serving destinations like airports. While this tendency is justifiable, it should not be at the cost of quality of service provided to remote destinations. The problem is, the former kind of destinations are generally served by urban STUs while the latter are served by MSRTC. It is not possible to say “do not provide sleek and posh buses to airports until buses serving villages meet criteria ‘B’ (from ‘17.311 Buses in very bad condition, lack basic comfort’)”, because the two actions are taken by different STUs.

Therefore the Government should insist that all STUs provide special focus to ensure that all buses meet criteria ‘B’.

Timeline

- These steps are included in the timeline suggested for “17.311 Buses in very bad condition, lack basic comfort”.

Depends on

Pros and cons, resistance expected

Checking and tracking how many buses meet the two criteria will need a significant amount of effort and focus. Buying new buses will also need funds.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
2	1	1	2	0

Difficulty level: 6.

Importance

Importance = 2 (Must be implemented).

Criteria and evaluation

Buses tested for the parameter above should be serving towns and villages with less than 50,000 population.

Score 1 point for every 10% of these buses that meet criteria 'B' described in "17.311 Buses in very bad condition, lack basic comfort".

17.221 BRT does not exude "class", difficult to make people stop using personal vehicle.

Integration with Fabric of City or Country		S

Solution

Special efforts must be made to increase ridership of PT. However, it should be easier to do so for a BRT than a regular bus service.

One of the ways to move people away from using their personal vehicles is also to make the BRT exceptionally attractive. The Ministry of Urban Development has recommended specifications for urban buses. All buses used on BRT routes must surpass these specifications.

The BRT is marked by about a dozen characteristics. They include bus lanes, citywide network, affordable fares, priority in signals, articulated buses where necessary, very high frequency of buses, a special brand name, very attractive buses, wide doors and level boarding for speedy ingress/ egress, wide footpaths, usable cycle tracks, cycle parking at

major bus stops, smart card system for easy ticketing, attractive bus stations with facilities like information kiosks and vending machines, no or restricted off-street parking along BRT corridors.

BRTs in cities worldwide have implemented most of these characteristics. Certain cities may have decided not to implement 1 or 2 of these. Yet, it should be noted that the effectiveness of a BRT decreases with every such compromise.

BRT systems should strive to implement all of these characteristics. Only then will people feel like keeping their vehicles home and will choose BRT as their preferred mode of daily commute.

As of now (January 2011) only Pune has planned a BRT, and discussions are in progress regarding a BRT in Mumbai. These BRTs may be “completed” by the time this blueprint comes in the picture. An add-on plan will be needed for all BRTs to ensure that the BRTs become true BRTs and not mere bus lanes. These add-on plans should discuss each of the dozen or so characteristics and try to implement as many of them as possible, say, at least 10 of them should be implemented. If a particular BRT decides not to implement a certain attribute, it should give detailed justification for not doing so.

Timeline

1. (0.5 year) A high level plan, or memorandum, for each BRT that states which of the characteristics listed above will be implemented, and reasons for not implementing the rest.
2. (1 year, parallel) A detailed plan of implementation.
3. (2 years) Execution of the plan.

Depends on

Pros and cons, resistance expected

None.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	1	1	2	0

Difficulty level: 5.

Importance

Importance = 2 (Must be implemented).

17.311 Buses in very bad condition, lack basic comfort

Integration with Fabric of City or Country		B

Solution

Most buses used by STUs are seen to be in dilapidated condition: both mechanically as well as visually. Also considering that long distance commuters carry some luggage, most MSRTC buses are very inconvenient for boarding with luggage as they have rather narrow doors. Most buses do not have easily accessible luggage racks - the luggage rack on the roof is inconvenient in many ways.

This situation should be turned around with a focused action.

It may seem that it will need substantial funds to repair old buses or simply replace them with new buses. A cost analysis should be done to study whether attractive buses that would lead to substantial rise in PT's modal share, would in turn pay off in other costs like fewer road accidents, pollution, fossil fuel consumption.

In parallel, two sets of criteria should be defined for the condition of buses:

1. Criteria 'B' that must be met by all buses any time for them to be in operation,
2. Criteria 'A' that all buses in the fleet should strive to meet.

Criteria 'A' should be higher than criteria 'B', which in turn should be **substantially** higher than the condition of most buses found to be in operation today.

Rough outlines of the two criteria are provided below. It should be noted that this blueprint is not a place to specify the criteria. The idea here is to give an example of level of detail in which such criteria should be specified. Additional clauses may be added to these outline.

Criteria 'B'

1. Buses assigned for medium or long distance travel (typically 100km or more) should have wider doors and shorter steps for easy ingress and egress with luggage and a small luggage rack inside the bus. Alternatively, a lockable luggage area as found in the Shivneri buses should be provided. Buses used on routes on which passengers do not carry much luggage could continue to have a design like today's (as far as luggage is concerned).
2. Maximum 1 dent on the body including bumpers and maximum 2 minor deformities like scratches on body may be allowed. The body should not have any damaged and hanging parts like metal sheet, indicator lamps.
3. All external lights, including headlights, indicators, tail lights, reverse indicators should be working. The bus should have a working horn.

4. Brakes should be in good condition as prescribed by applicable rules.
5. All windows should have glasses. One should be able to open and close all windows with ease.
6. The emergency door should be in good condition.
7. The bus should have 2 clear boards that indicate its destination, one in front and the other on left side near the boarding door. The boards as well as the windows that house them should be free from any stains, spots and marks. The boards should not be handwritten.
8. The bus should have a uniform coat of paint on its exterior, with maximum 2 minor spots or deformities like peeled paint.
9. At least 90% of the seats should have cushions in good condition (the sponge or foam should not be peeping out of the seat cover).
10. All handrails and grips should be firmly secured and not dangling or rattling.
11. The bus floor should not have any litter or garbage at least before the first trip of the day.

Criteria 'A'

1. Urban buses should be as per the specifications recommended by Ministry of Urban Development, Government of India⁷⁶.
2. Condition of the bus should meet or surpass criteria 'B'.
3. The bus should not have any dent or scratches on the body.
4. The destination boards should be uniformly illuminated and readable at night.
5. The bus should have a uniform coat of paint on its exterior, without any spots or peeled paint.
6. All seats cushions should be in good condition (no sponge or foam peeping out).
7. All handrails and grips should have a non-metallic coating for better grip.
8. Marks of spitting "paan" should be cleaned at least before the first trip of the day.

The cost analysis mentioned above should be followed by allocation of special funds to all STUs to uplift the condition of buses to meet criteria 'A'. Each STU should inspect their existing fleet and prepare a plan to upgrade the entire fleet in 3 years. Sufficient fund allocation should also be made for maintaining the condition of the buses once they are refurbished.

Going further, there should be a continuous process to ensure that all buses are always in excellent condition. This process will include availability of funds, building more workshops, hiring and training adequate staff, and of course, monitoring that the objective is met.

⁷⁶ Urban Bus Specifications by Ministry of Urban Development, Government of India
(http://www.urbanindia.nic.in/programme/ut/urban_transport.htm)

This entire program should be conducted across the state at the same time, instead of starting with Mumbai and Pune and then covering smaller towns and remote areas.

Timeline

1. (0.5 year) Analyze the impact of attractive PT buses in good condition on reduction in costs attributed to road accidents, pollution and health hazards, fossil fuel consumption etc.
2. (0.5 year, parallel) Develop and finalize criteria 'A' and 'B' for condition of buses as mentioned above.
3. (1 year) All STUs should prepare a plan for refurbishing or replacing their entire fleet of buses so that they meet criteria 'A'.
4. (1 year, parallel) Allocate funds to support the plans of all STUs.
5. (1 years) Buses that do not meet criteria 'B' should be fixed first to meet criteria 'A'. Refurbish all buses, buy new buses if necessary. All buses should thus meet criteria 'B' in one year.
6. (2 years, parallel) Develop processes to ensure that the buses are always maintained in good condition.
7. (2 years) All remaining buses should meet criteria 'A'.

Depends on

Pros and cons, resistance expected

Checking and tracking how many buses meet the two criteria will need a significant amount of effort and focus. Buying new buses will also need funds.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
2	1	1	2	0

Difficulty level: 6.

Importance

Importance = 2 (Must be implemented). It could be very tempting to assign a value of 3 ("should be implemented"), but that once again projects PT as a service for the needy. This issue must be addressed, hence a value of 2 is assigned.

17.312 Level of cleanliness of buses and bus stations is low

Objective		B

Solution

The financial analysis recommended in section “17.311 Buses in very bad condition, lack basic comfort” above applies also to maintaining bus stations in spic-n-span condition. Things to be done to ensure that all buses are clean fall under “17.311 Buses in very bad condition, lack basic comfort”.

A problem faced by most bus stations is an unplanned growth in number of passengers handled by the bus station. Facilities like rest rooms, number of dust bins, cleaning staff are normally guided by the number of passengers catered to every day. Bus stations, like several other facilities in India, soon need to support several times the number of passengers they are designed for. This puts an undue stress on the facilities. Once such facilities cross the threshold of the “Broken Windows Theory”⁷⁷, there is no way the situation can be salvaged without taking any drastic steps.

Therefore, each bus station should be studied for whether it has crossed the number of passengers it is supposed to cater to per day. Bus stations may be categorized in the following:

- A. Bus stations that handle less than 80% of the number of passengers they were designed for,
- B. Bus stations that handle 80% to 120% of the number of passengers they were designed for,
- C. Bus stations that handle more than 120% of the number of passengers they were designed for.

Three different programs should be designed for bus stations falling in these categories.

Program ‘A’

The bus station can provide satisfactory facilities for about 3 more years without any major changes. Measures like renovating facilities like rest rooms, cleaning sitting areas, painting the bus station, providing sufficient dust bins, controlled access to vendors of eatables should help uplift the quality of services offered by the bus station.

Program ‘B’

The bus station may have some unused space where additional facilities can be built so that it can serve the needs of passengers for about 10 more years.

If that is the case, they fall in category ‘BA’.

- Plan and complete the expansion of the bus station in 2 years.
- Execute Program ‘A’ for the existing bus station.

⁷⁷ Broken Windows Theory, http://en.wikipedia.org/wiki/Broken_windows_theory

If that is not the case, it means that this bus station can hardly handle more passengers. Such bus stations fall in category 'BC' and should be put under Program 'C'.

Program 'C'

Undue neglect towards planning has led to these bus stations overflowing with passengers and denying them certain basic facilities as well as potentially compromising their safety, e.g. from fire and stampede.

If the bus station has additional unused space and if expanding the facilities by utilizing this space can serve the needs of passengers for 10 more years, the bus station should be put under Program 'B'. Otherwise some drastic measures need to be taken.

The program recommended for these bus stations should consist of the following:

1. Put an immediate cap on the number of schedules operated from the bus station.
2. The city needs to identify space for a new bus station that will absorb load from this bus station as well as cater to requirements for the next 20 years.
3. Build the new bus station (multiple stations, if needed) on war footing in 1-2 years.
4. Balance load from bus stations in category 'C' such that these bus stations as well as the new bus station(s) will remain in category 'A' for the next 5 years, assuming a rise in number of passengers at a CAGR of 5% per annum. What this means is, when the new bus stations are in operation and load balancing is done, the new as well as old bus stations that were in category 'C' should have to cater to less than 60% of the number of passengers they are designed for.

Criteria for cleanliness of bus stations

The following guidelines may be used to determine the criteria:

1. Conspicuous and sufficient number of dust bins in the bus station. The nearest dust bin from any location should not be farther than a certain distance.
2. Clear signs that warn public of the penalty they would face if found littering.
3. Clean ambience of the bus station. Virtually no litter should be found in waiting areas, ticket windows etc. Track record of sufficient number of people being fined for littering, if the bus station is not found clean enough.
4. Sufficient number of clean rest rooms. Conspicuous signs to help people locate the rest rooms. Rest rooms need to be in multiple locations for large bus stations.
5. A feedback book that should be easily accessible to public. The book should have as few complaint entries as possible. All complaints should be attended to within 2 hrs for routine complaints, and within 24 hrs for repairs.

Timeline

1. (0.5 years) Classify each bus station in categories A, BA, BC or C depending on its current passenger load.

2. (parallel) Develop and finalize criteria for cleanliness of bus stations.
3. (1 year) For bus stations in category 'A': Launch a "clean bus stations" program. All bus stations in 'A' should be able to pass the cleanliness criteria in 1 year.
4. (2 years, parallel) For bus stations in category 'BA': Renovate and expand the bus stations in 2 years. The expanded bus station should be able to pass the cleanliness criteria in the same 2 years.
5. (1 year, parallel) For bus stations in category 'BC' and 'C': Identify space for new bus stations, prepare plan for load balancing. This task should be completed in 1 year.
6. (2 years) Build new bus stations. The new bus stations as well as old stations in category 'BC' and 'C' should be able to pass the cleanliness criteria in these 3 years.

Depends on

Pros and cons, resistance expected

Our country does not put much importance on cleanliness. Especially so when it comes to public property, and that too like public transportation buses and bus stations.

Somehow, PT is considered as "service for the poor", which adds to the woes as cleanliness takes a back seat. PT will have to be projected and implemented as "an option for everyone". Only then will such issues be addressed adequately.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	2	1	2	0

Difficulty level: 6.

Importance

Importance = 2 (Must be implemented). It could be very tempting to assign a value of 3 ("should be done"), but that once again projects PT as a service for the needy. This issue must be addressed, hence a value of 2 is assigned.

17.321 Lack of stringent norms and no enforcement of existing norms for school buses

Integration with Fabric of City or Country		B

Solution

The solutions suggested in this section involve two major stages:

1. Amendments or additions to related laws and rules,
2. Enforcement of current and new rules.

Since amendments to laws and rules is a time consuming process, laws and rules regarding the desired improvements should be done in one go. Their enforcement can be done in a staggered manner as their acceptance in the people increases.

It is observed that enforcement of rules takes undue amount of time as people are very reluctant to make any changes as required by the law. Therefore there should be a substantial financial incentive, especially in this case, for people to make required changes. This incentive should be defined in the law/ rules itself.

Amendments or additions to related laws and rules

The following rules and requirements are being considered as this blueprint is being written:

1. Buses older than eight years should not be used to transport students.
2. School-owned buses are to be painted yellow while privately owned ones will have a colourless 8-inch band at the centre.
3. Installation of an emergency exit door on the side opposite the existing door.
4. Presence of a woman attendant on bus.
5. Route map to be pasted inside the bus and a copy submitted to the parents.
6. Yearly check-up of school buses necessary.
7. Driver must have a minimum experience of three years.
8. Fire extinguisher and first aid box a must on school buses.
9. A committee to be formed by every school regarding school buses.
10. School management will be held responsible for any mishap.

In addition to the above, there should be laws and rules that stipulate the following:

11. Vehicles should be specifically approved by RTO as “fit to be used as a school purpose vehicle”.
12. These vehicles should have the following properties in addition to the yellow colour and emergency doors suggested above: no standees allowed, doors that can be closed by the driver, blinking red lights near top of the vehicle (both on front and rear). These lights should turn on and blink when the door is open, thus alerting other vehicles that children may be getting in or out of the school bus. These requirements should be specified for all kinds of vehicles that are likely to be used as school purpose: rickshaws, vans, minibuses and buses.
13. Each school purpose vehicle should be tested for fitness and roadworthiness every year. This test should inspect condition of tyres, brakes, handbrake, horn,

headlights, tail lights, brake lights, reverse lights, turn indicators, hazard indicators.

14. Suggestion #7 above is not sufficient. There should be special driving licenses that allow a person to drive school purpose vehicles of corresponding types. For example, there should be separate licenses that allow a person to drive a school purpose rickshaw, minivan or bus.
15. Requirements for these licenses should include:
 - a. The applicant should have held a regular driving license of the appropriate vehicle class for a minimum of 5 years.
 - b. The applicant's driving license should never have been suspended for any reason.
 - c. The applicant should have an accident free record for the last 3 years.
 - d. The applicant needs to pass a driving test that checks the following: Knowledge of blind spots, use of indicators during drop off-pick up as well as turns, not cutting corners while taking right turns, parallel parking, right of way at intersections without signals (including roundabouts) etc. The passing criteria for this test should be significantly higher than that for the test for a "regular" license.
 - e. Other such requirements may also be included.

Enforcement of current and new rules

All vehicles currently being used as school buses or vans should be given 1 year to make the necessary changes and register the vehicle as school purpose vehicle. This procedure should levy "late penalties" after 12 months. E.g., if the regular changes were Rs. 100, the applicants should be charged Rs. 1,000 extra 12 months after. This penalty may be withdrawn about 2 years after the rules are implemented consistently across the state, which should not take more than 2 years. Even the extra charges collected may be refunded (without interest) after one year, to encourage vehicles to make changes and register them as school purpose vehicles.

Stringent checks on vehicles and drivers are required especially in these 2 years and even thereafter to ensure near 100% compliance of the laws and rules.

Timeline

1. (1 year) Pass the required laws.
2. (1 year) Prepare required rules under the laws. Announce that they will come in effect after 1 year, and vehicles should make required changes till then.
3. (1 year) Build vehicle testing facilities for school purpose vehicles.
4. (1 year, parallel) Expand driving test facilities and staff them adequately.
5. The laws and rules come in force.
6. (1 year) Rs. 1,000 penalty for registering old vehicles as "school purpose", refundable after 1 year.
7. (3 years) Stringent checks on vehicles.

8. (then) Withdraw the Rs. 1,000 penalty.

The requirement for the special driving license should be imposed in a phased manner so as to provide time for all drivers to obtain the special driving license and also to distribute the load on the licensing facility. The following phases are suggested:

- A. (1 year after rules come in force) All drivers who have held a license for 5 years should obtain school purpose driving license in the first year. Other drivers can continue driving school purpose vehicles for the time being.
- B. (5 years after above) Gradually only those who have school purpose driving license can drive a school purpose vehicle.
- C. Stringent checks on drivers as above. The two points mentioned above should not be included in the laws and rules, but should only be considered by traffic police.

Depends on

Pros and cons, resistance expected

People need time to make changes in the vehicles and to obtain new driving license. Especially the former may cost some money, which may be looked at as a financial burden by many vehicle owners. A sustained awareness campaign will be needed to put due focus on safety and to stress that the rules will be enforced strictly. Even the parents of students will need to be told that they should bear some of these costs instead of compromising on safety.

Setting up special testing facility for school purpose vehicles will need some space, which may be expensive in larger cities.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	2	2	1	1

Difficulty level: 6.

Importance

Importance = 3 (Should be implemented). for most items, but 2 for making laws and rules. The laws and rules should be “ready” whenever the situation is ripe for executing other steps.

17.322 Very few schools provide a school bus

Integration with Fabric of City or Country		B

Solution

There are several reasons why children do not travel by school buses. These reasons are discussed in the document “Public Transportation: Today’s Situation”. The root cause of all these reasons is the lack of appreciation of importance of safety in day to day life.

If we want to implement strict norms for school buses and if we expect people to pay for the associated costs, people should first assess the cost of safety. A systematic campaign to make people aware of the benefits offered by school buses will be needed.

This campaign needs to be backed up by data on accidents met by school children. This data and its trends should be compared with similar trends from developed countries.

Schools providing school buses can also be given a notional but not insignificant grant or financial incentive in some form. Other measures like parking restrictions may be used to discourage use of personal vehicles.

Timeline

1. (1 year) Campaign to urge people to send children to school using school buses.
2. (parallel) Financial incentive to schools providing school buses.

Depends on

Pros and cons, resistance expected

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
0	1	2	2	1

Difficulty level: 6.

Importance

Importance = 4 (Nice to do).

17.331 PT systems do not provide information to tourists

Integration with Fabric of City or Country	This is a benchmark problem	B

Solution

The following things need to be done to ensure that even visitors find it convenient to use the PT services.

1. Destinations like railway stations, inter-city bus stations, airports should have a very convenient pick up and drop off location for city buses. These locations should be at least as convenient and conspicuous as pick up and drop off locations for taxis, cars etc.
2. The local bus service should set up information booths at these locations. They may need to be attended 7x24. Such booths may also be needed at select places across the city, e.g. tourist destinations.
3. City buses plying to such destinations should be specially designed to accommodate passengers with luggage. They may ply on routes with special fare structures.
4. Specially designed pocket handouts that provide information about the PT service should be readily available at these destinations as well as tourist destinations, major hotels and restaurants.
5. City PT services should have well known logos, preferably with a similar look for all PT services across the state. Illuminated signs with these logos should be put up at every bus stop, so that tourists can easily locate the nearest bus stop even at night.
6. City PT services would need to run special services at events that attract a lot of outstation visitors, e.g. a city's prominent cultural event. "Combo" tickets that include travel fare along with the event's entry fees may be tried to attract visitors to PT.

Timeline

1. (1 year) Develop convenient bus bays for city buses at railway stations, inter-city bus stations etc. Also start information booths at such places.
2. (parallel) Develop special bus routes with appropriate buses that can accommodate passengers with luggage.
3. (parallel) Handouts to provide information about PT services.
4. (0.5 year) Each PT service to have its own logo.
5. (1 year) Major bus stops to have an illuminated sign with the PT logo.
6. (1 year) Most bus stops to have an illuminated sign with the PT logo.
7. (parallel) other innovative ideas to promote usage of PT among visitors.
8. This objective should be included in the city CMPs.

Depends on

Pros and cons, resistance expected

Attracting visitors and tourists would not fetch much additional revenue to the STUs, so the importance of PT being usable by visitor and tourists is likely to be undermined. It should be realized that it is only when we would strive to make PT **easily usable by visitors** that it will be **very easily usable by residents** of the city.

Cost	Difficulty in putting in effect	Difficulty in enforcing	Change of mindset	Conflict of interest
1	1	1	2	0

Difficulty level: 5.

Importance

Importance = 3 (Should be implemented).

Criteria and evaluation

Randomly select 1,000 tourists and visitors from 3-star hotels across the state and ask them to fill a questionnaire that finds out whether they used that city's PT systems during their stay. The number of tourists who would not use the PT systems during their entire stay should drop every year.

Score = percentage points with which this number has dropped.

(If 8% fewer tourists and visitors did not use PT at all as compared to previous year, score = 8).

Note: This criteria may need to be refined after a few years since the number of tourists who never use PT could stabilize at a certain level. This level should be comparable with the level in cities with good public transportation worldwide.

Evaluating Public Transportation

The following table suggests a method for evaluating overall transportation management in Maharashtra. Each problem listed in the table has been identified as "Benchmark problems" in the chapter "**Solutions for Better Public Transportation in Maharashtra**", and a method to evaluate the state's score with respect to that problem is also suggested earlier. The score is given a weightage depending on the importance of the problem. Filling in the scores in the table below and following the steps suggested would arrive at a score out of 100, which can be considered as an overall assessment of transportation management in Maharashtra.

No	Problem	Weightage W	Score S (out of 10)	Weighted score = WxS
1	11.121 Large PT projects being planned for Mumbai and Pune, but no significant	16		

No	Problem	Weightage W	Score S (out of 10)	Weighted score = WxS
	investment in other cities			
2	12.111 Today's traffic planning focuses on ease of movement of vehicles than people	16		
3	13.111 Number of accidents per 100,000 km in Maharashtra is higher than the national average	16		
4	14.121 PT fares in Maharashtra are on higher side	16		
5	11.211 No audit of service level benchmarks for urban transport	8		
6	11.231 Insufficient basic norms for private bus operators	8		
7	17.211 Buses serving remote areas are in especially pathetic condition	8		
8	12.311 Bad or nonexistent footpaths, commuters cannot reach bus stops easily and smoothly	4		
9	12.321 Bad cycling infrastructure increases reliance on personal vehicles	4		
10	17.331 PT systems do not provide information to tourists	4		
	Maximum Score			1000

Section 5. Transporting Goods

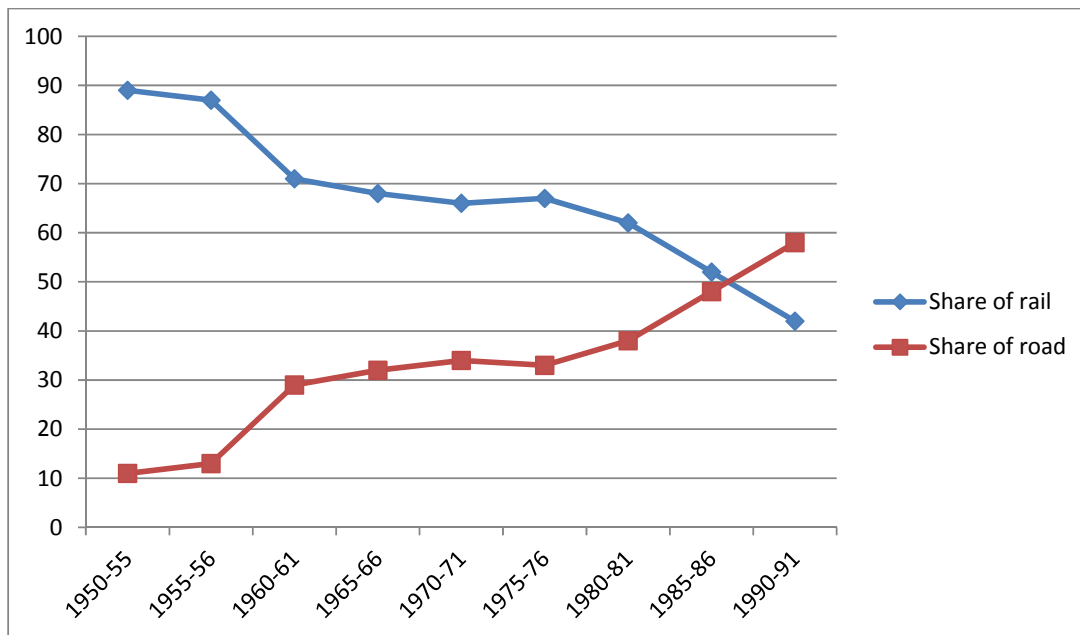
Road goods transport

Goods carriage is a significant component of transportation on roads. The issues, problems and characteristics of this sector are so diverse from transportation of people that it deserves a separate, focused discussion.

The book “Road Goods Transport Industry in India - A Study of its Structure and Organization”, published by CIRT in 1994⁷⁸, provides a comprehensive view of goods carriage on roads in India. Since the study is old, this blueprint will consider trends demonstrated and suggested in the book instead of absolute numbers. It will also be assumed that the study in the book applies to Maharashtra.

Share of rail and road

Railways used to have a lion's share in movement of all freight around the time when India became independent. The graph below shows how the share has shifted over the past half century.



The absolute amount of freight moved by these two modes increased as below:

- Railways, billion ton-kms: 44.1 (1950-51) 242.7 (1990-91) 5.5 times
- Roads, billion ton-kms: 5.5 (1950-51) 331.5 (1990-91) 60 times

⁷⁸ Road Goods Transport Industry in India - A Study of its Structure and Organization: CIRT, 1994

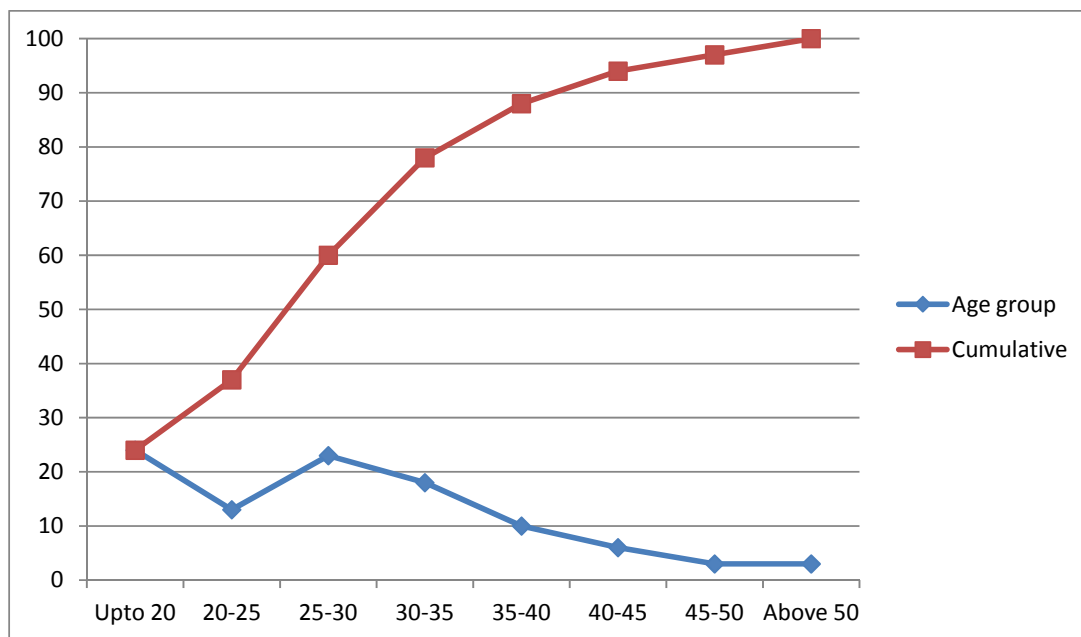
There are various reasons behind roads becoming the preferred mode of goods transport, but we will not get into those.

It suffices to say that since these reasons are not likely to change in near future, roads will continue to carry even more goods than they are today: both as a fraction of total goods movement and in absolute terms. However, a time may come when the cost of fossil fuel consumed per passenger-km (for people) or per kg-km (for goods) may override the cost of all other inconveniences.

It is therefore imperative that the state as well as the country plans heavy investments in building a dense rail network with a 50 year or 100 year horizon in mind.

Profile of truck drivers

Age group



About 60% truck drivers are young, i.e., less than 30 years of age. A further 13% have their heavy vehicle driving license issued in last 12 years.

Education

The survey in 1994 revealed that 80% drivers were under-matriculates and 15% were matriculates.

As far as driving education is concerned, 88% drivers learnt driving on their own, without going to any driving school.

Rest periods

When do the drivers return to their bases?

- Within 1 week 52%
- Within 2 weeks 34%
- Within 4 weeks 14%

Other findings:

- 34% drivers get 1-3 days of rest between duties, and 37% get 4-7 between duties.
- 48% drivers drive between 5-10 hrs per day, 31% drive between 10-15 hrs per day.

Profile of trucks

- 55% trucks are up to 5 years old, 20% are between 5-9 years old
- About 80% trucks are driven up to 400 km per day
- Tyres of 88% trucks are in good condition
- 93% trucks have comprehensive insurance
- Night parking: 44% used roadside, 37% used petrol pumps and 19% used other sites

It is not a surprise that night time accidents caused by vehicles hitting trucks parked on roadside are not uncommon!

Other interesting observations

As per data from 1992, Tamil Nadu and Maharashtra had the maximum number of trucks in India, at about 10.5% each, followed by Bengal (10%) and Bihar (9%).

Large fleet operators account for at best about 15% of truck ownership. They may own about 40-50 trucks. Most operators own at the most 2-3 trucks. Large fleet operators frequently augment their fleet by subcontracting to small operators.

Roughly 70% of all high speed diesel consumed in India is consumed by road transport industry. It is to be noted that this figure is from 1994. Given the very high rate of growth of this sector, this figure is likely to be much higher than 70% now.

Summary

Given the high share of truck ownership from Maharashtra, special attention must be paid to the road good transport.

The following are the major points of concern regarding road goods transport:

- Inadequate formal driving education

- Night parking at roadside
- Fuel efficiency, as this sector consumes most of high speed diesel

Specific steps need to be taken to address the above issues regarding road goods transport. Yet, as stated earlier, a long term plan to transport more goods and people by railways will be required.

Section 6. Appendices

Appendix A. Vision, Policies

Policies

The tables below provide a list of formal policies that need to be written, announced and widely publicized. Drafting the actual policies is not in the scope of this blueprint. However, the tables suggest a framework on which the policies should be based.

Policies with a higher legal standing may either already be in effect or may come in effect after these policies are issued, for example, policies like NUTP issued by the Ministry of Urban Development, Government of India. These policies override the thoughts expressed in this appendix. However, if provisions in some such policies contradict the thoughts below, such conflicts should be judiciously analyzed and efforts should be made for the more progressive thoughts to prevail.

P1	Ref: 11.111 Officials agree to importance of PT but their actions encourage use of personal vehicles
A policy announcement regarding all transportation issues that categorically states that we have people in mind, not vehicles.	
This policy should be based on the underlying thoughts expressed in the NUTP. The policy should go a step further and give explicit examples of vehicle-centric projects that will be discouraged. It should also state that vehicles could be subjected to some discomfort not only to enhance safety of pedestrians but also to discourage their use and thus encourage even the rich people to use public transportation and NMT.	

P2	Ref: 7.111 Number of deaths due to road accidents is rising in Maharashtra
A policy that states the measures to be enforced statewide and on priority to reduce the number of fatalities of 2-wheeler riders.	
This policy should focus on improving traffic discipline and adherence to traffic rules. The policy should stress that driving is a privilege that must be earned and driving licenses cannot be issued just because one's business depends on using a vehicle.	
The policy should explicitly state a quantified goal of reducing 2-wheeler fatalities. These goals should be aggressive and should be of the order of reducing the fatalities to 10% of the levels seen today, in about 3 years. Further, it should state designations of officials who will be held responsible for not enforcing safety rules necessary for reducing 2-	

wheeler fatalities.

P3	Ref: 7.111 Number of deaths due to road accidents is rising in Maharashtra
A policy that mandates local administrative bodies to provide certain stipulated infrastructure for ensuring pedestrians' safety.	
Infrastructure for pedestrians' safety can be broadly categorized in two: 1. Infrastructure for being able to walk along the road safely, 2. Infrastructure for being able to cross a road safely. This policy should state that it is the local administration's responsibility to provide a safe footpath along every urban road (and even some countryside roads with high pedestrian activity). Whether the footpaths are walk-able and whether they are maintained free of encroachments should be judged solely based on whether pedestrians are not seen walking on roads. This policy should also include a section for ensuring safe pedestrian crossing facilities. These facilities should include pedestrian signals with enough pedestrian phase, at grade crossing facilities, mid block crossing facilities - all with pedestrian refuges. These facilities should also be handicapped friendly. Quantified goals of reduction in number of pedestrian fatalities should be stated. These goals should be aggressive and should be of the order of reducing the fatalities to 10% of the levels seen today, in about 3 years. Further, it should state designations of officials who will be held responsible for not enforcing safety rules necessary for reducing 2-wheeler fatalities.	

P4	Ref: 12.311 Bad or nonexistent footpaths, commuters cannot reach bus stops easily and smoothly
A policy to accommodate only a planned number of hawkers and vendors on footpaths.	
zzz: Is there a National Vendors' Policy? A policy for providing good footpaths is considered in P3 above. It is commonly seen that footpaths and roadside space is occupied by vendors, compromising pedestrians' safety. Yet, such vendor's place in our society cannot be eliminated by the stroke of the pen. Their role in keeping the streets safe is also noted by several knowledgeable people. Considering all these factors, a policy that allocates the vendors some space without	

compromising pedestrians' safety, yet providing all benefits to the society should be put in place. This policy should consider the following aspects:

- Vendors should be allowed only on footpaths wide enough to accommodate them, their customers and all pedestrians. Tiles of different colours may be used to ensure that pedestrians get the space they need.
- Peak hour traffic direction, possibility of parking along the streets (not along arterial roads).
- Special days like festivals where the number of vendors increases.
- A mutually honored agreement between the vendors and the local administration to allow vendors only in designated areas under any circumstances.

Appendix B. List of Templates to be Developed

The tables below provide a list of templates that need to be written and followed so that transportation management would be consistent and not ad-hoc. Drafting the actual templates is not in the scope of this blueprint. However, the tables suggest a framework on which the templates should be based.

The Indian Road Congress (IRC) provides several guidelines to streamline the processes for transportation management. As in the case of policies above, IRC may have either already issued similar guidelines to address the problem or may issue guidelines after these templates are written. In that case, IRC guidelines override the templates thus written. However, if provisions in IRC guidelines contradict the thoughts below, such conflicts should be judiciously analyzed and efforts should be made for the more progressive thoughts to prevail.

All these templates should be designed such that they suggests transportation management options that ensures pedestrians' safety, public transportation, NMT etc. For example, if "parking space" comes out as a problem, the template should have a section that suggests whether personal vehicles can be parked at some distance and tourists can be ferried with electrically powered buses.

It should be noted that the templates themselves are not solutions for the problem cited in the caption of each table. The solutions to the problems, discussed earlier, mention the need of such a template. The discussion here suggests what the template should include, not how the given problem can be addressed.

T1	Ref: 1.112 No traffic demand management measures seen
A template for proposing projects to manage traffic in urban, countryside and rural settings. The template for project plan should include a section that describes what TDM measures are being taken.	
There should be a standard template for writing project proposals and detailed project reports (DPRs). This template should include "usual" sections like the objective of the project, details of execution, an estimate of expenses, procedure for quality checks. Apart from these usual sections, this blueprint proposes that it should include the following sections: • A section for a quantitative (non-subjective) evaluation of whether the objective of the project was achieved. The nature of projects for which the period of evaluation could extend to even 5 or 10 years should also be stated in the template. • The template should include a "TDM" section in which the proposal documents the expected impact on traffic - whether on the road in question or in the vicinity, as applicable. Some projects are undertaken to address the needs of increasing traffic, but some projects actually fuel an increase in traffic. This analysis should	

be included in the project proposal and the TDM section should mandate stating measures taken to manage the volume of traffic.

- The template should have a section for mentioning the outcome of analysis of the problem based on the template T2 below.
- Section mentioned in T4 below, for pedestrians' safety and convenience.
- Section mentioned in T5 below, to demonstrate that it is not possible for vehicles to stop for pedestrians at the location in question.
- Section mentioned in T6 below, to list old signage that won't be applicable after the project and should be modified or removed.
- Section mentioned in T8 below, for assessing possible impact on safety. Whether the said project was successful should depend on its impact on number of accidents at and around the project.
- Section mentioned in T11 below, to estimate the indirect cost borne by the society.

T2	Ref: 1.311 No template for studying traffic flow to decide steps to be taken
A template and process to manage traffic at places with peculiar traffic patterns , like industrial areas, business districts, places of pilgrimage etc. The template should provide concrete guidelines for steps to be taken.	
This could either be one comprehensive template or a group of templates. This template provides tools and processes to study and state any peculiarities in traffic patterns in specific locations. Depending on the nature of the location, any or all of the following may have to be considered: • Any out of ordinary nature of vehicle distribution, e.g. too many trucks or buses or mini-vans etc. • Projected number of such vehicles in the next 5 to 10 years. Will this number be too high for the location to handle? What are the alternatives? • Specific demands by such vehicles, e.g. large turning radii, bus stops, parking spaces near places of tourist interests etc. • Can these demands be met in the next 5 to 10 years? e.g. is there any space to widen corners, build a bus stand, a multi-level parking structure etc. • Temporal nature of traffic: e.g. during any manufacturing season, peak office hour, annual festivals etc. The idea is to take this template and fill in all sections, such that possible alternatives of transportation management would present themselves.	

An analysis of the problematic location based on this template should be mandatory before proposing a project to solve the problem. Please see the description for template T1 above.

T3	Ref: 1.323 Assorted problems with rural traffic
A template that provides a flowchart that suggests infrastructure items needed in a village , depending on possible topologies.	
Traffic issues in rural areas are affected by factors like the following. • Narrow NH or SH passing through a village with no space to widen roads (including any property acquisition issues). • An intersection that has transformed in a busy marketplace, with vendors and customers transacting business on or along the road. • A weekly market that leads to traffic congestion. • Presence of school children, animals, para transit vehicles etc leads to unsafe conditions. • Improperly designed speed breakers, blind turns on narrow roads. A template to address such issues, preferably based on success stories, will be useful in ensuring that no aspect is left unattended while solving the problems of a given location. This template would be very similar to T2, though it may demand a much higher level of participation from local villagers.	

T4	Ref: 4.311 Roads widened at the expense of footpaths
A section that makes the proposal demonstrate that any road widening project is not compromising pedestrians' safety and convenience .	
This section should be included in the template T1, for proposing projects.	

T5	Ref: 4.312 Plethora of foot overbridges and underpasses being considered and planned
A section that demonstrates that it is not possible for vehicles to stop for pedestrians	

and this FoB/ underpass will be used by pedestrians.

This template or section should be included in the template T1, for proposing projects. Any FoB/ underpass project should not be sanctioned unless this section is filled.

The section should demonstrate that a continuous flow of pedestrians is found at the location in question, and so many pedestrians cannot be cleared by providing a pedestrian phase in a signal or even by using staggered phases so that pedestrians can cross one road while vehicles on another road have a green.

Even while recommending an FoB/ underpass, the project should include provisions for people with physical weaknesses, e.g. a ramp or escalator or lift. Safety issues should also be address, e.g. by proposing shops in the subway so that ample movement of people can be guaranteed.

T6	Ref: 4.332 Old signs not changed with changes in infrastructure or traffic pattern

A section that makes a plan list down **changes needed in signage after a project is executed**, including removal of signage not applicable after the changes.

T7	Ref: 6.321 Timing of traffic signals programmed by trial and error, not systematically

A template to temporarily substitute the IRC guidelines **for determining signal cycles**, as they are outdated considering the volume of traffic today.

T8	Ref: 7.343 Improved infrastructure may also compromise safety, needs special attention

A section in project plan that forces the proposal **to note whether the new infrastructure could compromise safety**, e.g. if the vehicles' speed is likely to increase.

T9	Ref: 8.212 Parking rates do not represent the value of land occupied

A template for **parking policy of a city**, so that parking policies of all cities are consistent in nature of contents and are in conformance with the NUTP.

The parking policy should be based on the following:

- The objective of the parking policy is not to provide as much parking as possible, but to provide parking only where it is absolutely necessary.
- Another objective should be to see how parking can be reduced progressively as the coverage quality of public transportation improves.
- The parking policy should apply not only to public places, but even to privately owned residential and commercial premises.
- The policy should progressively move from minimum to maximum parking norms. Specifically, the city should specify what is the **maximum** parking that can be built per 1,000 sq ft of built space and not minimum as is specified these days.
- As said in NUTP, parking in congested and expensive localities should be expensive than parking in the outskirts of the city.
- On street parking on arterial roads should be progressively reduced and virtually eliminated.
- Establishments like housing complexes, malls and cinema halls should be built such that they provide parking within their premises to all their visitors.

T10	Ref: 12.111 Today's traffic planning focuses on ease of movement of vehicles than people
A template for Comprehensive Mobility Plans of cities . The CMP should make a reference to template T9 listed above.	

T11	Ref: 14.221 Most track based MRTs have hidden costs that are not accounted for
A section that determines the hidden costs, including the cost borne by the people during construction phase of especially large projects.	
This section of the template could be optional for projects smaller than a certain size. This section should include discussion on the following lines: • Would there be traffic jams because of the construction work? • If so, would it lead to issues like increase in fuel consumption of citizens' vehicles, detours and delays, air pollution, noise pollution? What is the estimated cost to be borne by citizens? • How would the project impact movement of emergency response vehicles, during	

the construction and after?

These cost estimates should be included in the cost-benefit analysis of the project.

T12

Ref: 15.312 Bus station in heart of the city cannot expand

A template for **bus stations of small, medium and large capacities**. The template would ensure consistency in facilities provided, even layouts of bus stations if possible.

The template should suggest how multi-modal transfer points are to be integrated. For example, how can passengers go from the bus station to the nearby railway station with luggage and without crossing any road? Where is the rickshaw stand located and how do commuters reach it?

Evacuation routes and assembly points in case of emergency situations like fire should be mandated.

Large bus stations could have additional facilities like underground parking for people dropping or picking up their friends in cars, locker facilities etc.

Appendix C. Abbreviations

The table below lists abbreviations used in this document.

Abbreviation	Full form
ACP	Assistant Commissioner of Police
API	Assistant Police Inspector
BEST	Brihan Mumbai Electric Supply and Transport
BRT	Bus Rapid Transit
CAGR	Compounded Annual Growth Rate
CIRT	Central Institute for Road Transport
CMP	Comprehensive Mobility Plan
CNG	Compressed Natural Gas
DP	Development Plan
GDP	Gross Domestic Product
IPT	Intermediate Public Transport
IRC	Indian Road Congress
LPG	Liquefied Petroleum Gas
LRT	Light Rail Transit
MRT	Mass Rapid Transit
MSRTC	Maharashtra State Road Transport Corporation
NAAQ	National Ambient Air Quality (standard)
NEERI	National Environmental Engineering Research Institute
NGO	Non-Government Organization
NHAI	National Highway Authority of India
NUTP	National Urban Transportation Policy
O-D	Origin-Destination

PMC	Pune Municipal Corporation
PMPML	Pune Mahanagar Parivahan Mahamandal Limited
PRO	Public Relation Officer
PSI	Police Sub-Inspector
PT	Public Transportation
RTO	Regional Transport Office
SLB	Service Level Benchmarks
SPM	Suspended Particulate Matter
STU	State Transport Undertaking
USP	Unique Selling Proposition