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A Research Paper on Land Utilization and Transport Interaction

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Abstract: *The road network in many countries are not well designed which leads to many traffic problems, mainly traffic congestion. In order to avoid such traffic problems and have a smooth traffic flow properly designed networks should be adapted for both public and private vehicles for an ideal modal share between them. The network design problem is one of the most significant problem faced by traffic management official. This transportation problem belongs to the class of difficult combinatorial optimization problem, whose optimal solution cannot be found by available analytical method, but swarm intelligence could provide feasible solution. The swarm algorithm is a stochastic, random-search technique that belongs to multi-agent algorithms. Swarm intelligence, inspired by behavior of insects, is a name given to a new set of nature-inspired computing paradigms which are being successfully applied to optimization problems in a variety of field. Social insect colonies show that very simple organisms can form system capable to performing high complex tasks by dynamically interacting with each other. Swarm intelligence (SI) can be used to model complex traffic and transportation processes, which can be successfully analyzed by analytical models. The concept of agent-based modeling is applied to problems of complex behavioral pattern, this approach based on the idea that a system is composed of discrete individuals and each individual interacts with others according to localized knowledge and with the aggregation of the individual interactions, the overall image of the system emerges. The primary goal of this paper is to acquaint readers with the basic principles of Swarm Intelligence and its uses in network design problems of transportation. The paper also presents a various branches of Swarm Intelligence.*

I. INTRODUCTION

A. General

Number of traffic accidents and many the raising of modal share of public transit in the cities one of the major activities to be performed by traffic planners and the city authorities in order to reduce traffic congestion. This could be done by proper design of public transit networks, expansion of existing lines, increasing the availability of direct service among various origin-destination pairs, frequencies increase, development of the bus system separated from the rest of the traffic network improving passenger's etc. the bus network shape and frequencies, highly depend on passenger demand, number and size of available buses, and budgets available.

In developing countries like ours available budgets is a major constraint due to weak economic conditions. This transportation problem belongs to the class of difficult combinatorial optimization problem, whose optimal solution cannot be found by available analytical method, but proper system of LUTI (Land Utilization and Transportation Urban road network in many countries are extremely congested Many of the factors that should be taken into account when designing bus network are mutually in conflict, that is why this problem belongs to the class of difficult optimization problems.

For examples, for shorter waiting times of passengers, higher number of buses will be needed so that frequency is higher, etc. due to the conflicting nature if these interests, we treat the bus network design problem as a multi-criteria decision making problem.

We try to maximize the number of satisfied passengers and to minimize the total travel time of all served passengers

II. LITERTURE REVIEW

A. General

The references studied and explained and the literature review stated below is very important for the project work and from the analysis purpose.



B. China Road Transport Policy

The World Report on Road Traffic Injury Prevention (the “World Report”) predicts that the East Asia and Pacific Region will bear the highest number of road traffic fatalities between 2000 and 2020, with 28% of global road traffic fatalities in 2020. According to the Ministry of Public Security (MPS), there were officially 104,372 road traffic fatalities in China in 2003. However, different approaches in calculating these fatalities may mean that the number has been underestimated

C. Policies and Strategies

A draft National Road Traffic Safety Plan (RTSP) was prepared by the Inter-Ministerial Road Safety Forum for the period of the 11th Five-Year Plan (2006 – 2010). A summary plan²¹ based on this draft has been adopted by the State Council and is currently under implementation. This Plan can be viewed as a significant effort to place emphasis on achieving targets. As a result, clear targets have been set for a reduction in the number of road traffic fatalities. This can be summarized as follows:

1. During the period of the 11th Five-Year Plan (2006 – 2010), the annual number of road traffic fatalities²² is required to be less than the average annual number that occurred during the period of the 10th Five-Year Plan (i.e. 105,100).

D. Implementation Arrangement

- 1) *Legislation: implementation of the Road Traffic Safety Law (2004)*
- 2) *Leadership and Coordination*
 - a) Establishment of the Inter-Ministerial Road Safety Forum – which entrusted national leadership for road safety to the Ministry of Public Security (2003)
 - b) Establishment of Provincial and Municipal Road Safety Councils (2004)
- 3) *Funding (keyprograms)*
 - a) Transport: National Highway Safety Enhancement Program (2004 – 2007)
 - b) Health: (i) development of the National Emergency Rescue System (2004 – ongoing) and (ii) Injury Prevention Programs (2005 – ongoing)
 - c) Road Safety Campaign: “Protecting Life, Traveling Safely” (2006 – 2008)
- 4) *Monitoring and Evaluation*
 - a) Establishment of the National Injury Surveillance System (2006)
- 5) *Research*
 - a) The National Injury Prevention Study (2005 – 2007)
 - b) The National Science and Technology Action Plan for Road Traffic Safety (2008)
 - c) Road safety programs of the National Research Institutes. The MOC Highway Research Institute will house the most sophisticated driving simulator in China (2009)

E. Pattern Of Land Utilization In India:

Land is a scarce resource, whose supply is fixed for all practical purposes. At the same time, the demand for land for various competing purposes is continuously increasing with the increase in human population and economic growth.

Land use pattern at any given time is determined by several factors including size of human and livestock population, the demand pattern, the technology in use, the cultural traditions, the location and capability of land, institutional factors like ownership pattern and rights and state regulation. The land use pattern besides having economic implications has also important ecological dimensions, which if ignored can have disastrous consequences

Land utilization in India

| Use | Area (Million Hectar) |
|--|-----------------------|
| (1) Area under non-agricultural uses | 23.57 |
| (2) Barren and uncultivable land | 19.26 |
| (3) Net sown area | 141.10 |
| (4) Forest lands under good tree cover | 69.41 |
| (5) Miscellaneous tree crops and groves | 3.37 |
| (6) Cultivable wastelands | 13.66 |
| (7) Current fallow (i.e. land currently left unutilised) | 14.80 |
| (8) Old fallow | 10.19 |
| (9) Permanent pastures and grazing grounds | 10.90 |



F. Combating Traffic Congestion In Mumbai:

Every urban Indian probably has a traffic horror story, one he/she initially thinks is so terrible it deserves an audience of sympathizers, only for subsequent experience or casual conversation to prompt a reevaluation. Indian cities, those sprawling vortices of life, have oft been touted as the “engines” of future growth, going by the role that similar agglomerations like New York and London have played and continue to play for their and the global economy.

The average growth rate of vehicular traffic in Mumbai was 7% over the past seven years, with 300-350 new vehicles entering service every day. Crippling congestion requires alleviatory measures like tolls, which are discussed from a theoretical and practical perspective.

A recent proposal motivated by this agenda was a **200% increase in tax** on an additional (i.e. beyond the first) automobile owned by a family in Mumbai.

It was felt that this would help congestion, rather bluntly, by reducing the potential number of vehicles plying the roads of the city. While the proposal received meagre press coverage, it and the abysmal state of roads in Mumbai today, excavated and reduced to strips, highlight the growing realization that the present situation is untenable. Congestion is by no means an Indian, or even emerging or poor country

Phenomenon, and many developed countries have increasingly resorted to certain forms of incentivized traffic control that suggest the way forward.

G. Traffic Noise

ANTHONY P. CLEVENGER (author, “Safe Passage”, Montana State University, Bozeman)

There are multiple emission from highway that might explain its density- depressing effect, including pollution, roads accident, visual disturbance, mechanical vibrations, but traffic noise is probably the most influential at larger distances. While traffic noise is suspected to be the major cause for decreased breeding bird diversity near road, there may be confounding factor such as edge effect direct evidence that chronic anthropogenic noise negatively impact bird population is lacking but there is increasing evidence, Slabberkoorn and Trimester 2008. In a recent study that isolated chronic industrial noise from other potential confounding variables. Ovenbird pairing success and age structure were affected by chronic noise. Pit is hypothesized that background noise interferes with song amplitude and/or quality such that female may avoid or not hear males in habitats with high noise levels, result from this industrial noise study provide support for road avoidance studies that concluded chronic noise negatively influence habitat quality and the breeding activities of certain bird population

III. METHODOLOGY

- 1) The very prior step of this project work is to prepare the sheet and to decide the questions to be asked to the civilians,
- 2) The next and very important step of the project is to decide the area to be surveyed,
- 3) After that the household sample survey is to be done by the team members,
- 4) After the survey data is collected the next step is to study the data collected by the survey,
- 5) After analyzing the data it is necessary to suggest the solutions to every problem of the civilians related to transportation, Some new concepts which are not implemented yet are to be used as the implementation in the surveyed area

A. General

After the Discussions and the analysis of the survey data of around 1000 houses or families we were able to find out the core issues in the public transport interaction in the surveyed area and those issues are:

- 1) TIME issue
- 2) ROUTE issue
- 3) COMFORT & CONVINIENT issue
- 4) OTHER issue
 - a) Uneconomical
 - b) Uncomfortable public buses
 - c) No health issue
 - d) Old bus system

B. Preparation Of Opinion Sheet

The very prior step of our project work was to prepare the sheet which contains the points regarding the survey in tabular format as shown below which defines the number of samples surveyed, the name of the driver person in the house and the vehicles he had own and the type of the vehicle as two wheelers and four wheelers also the total distance he cover by travelling per day and the purpose of his travelling (Job, Business, Service, College, Household Work, and for other purpose) and the specially asked question to the civilians asking the pole towards the public transportation system like do they use public transportation system and if not then what is the reason behind their unused transportation system.

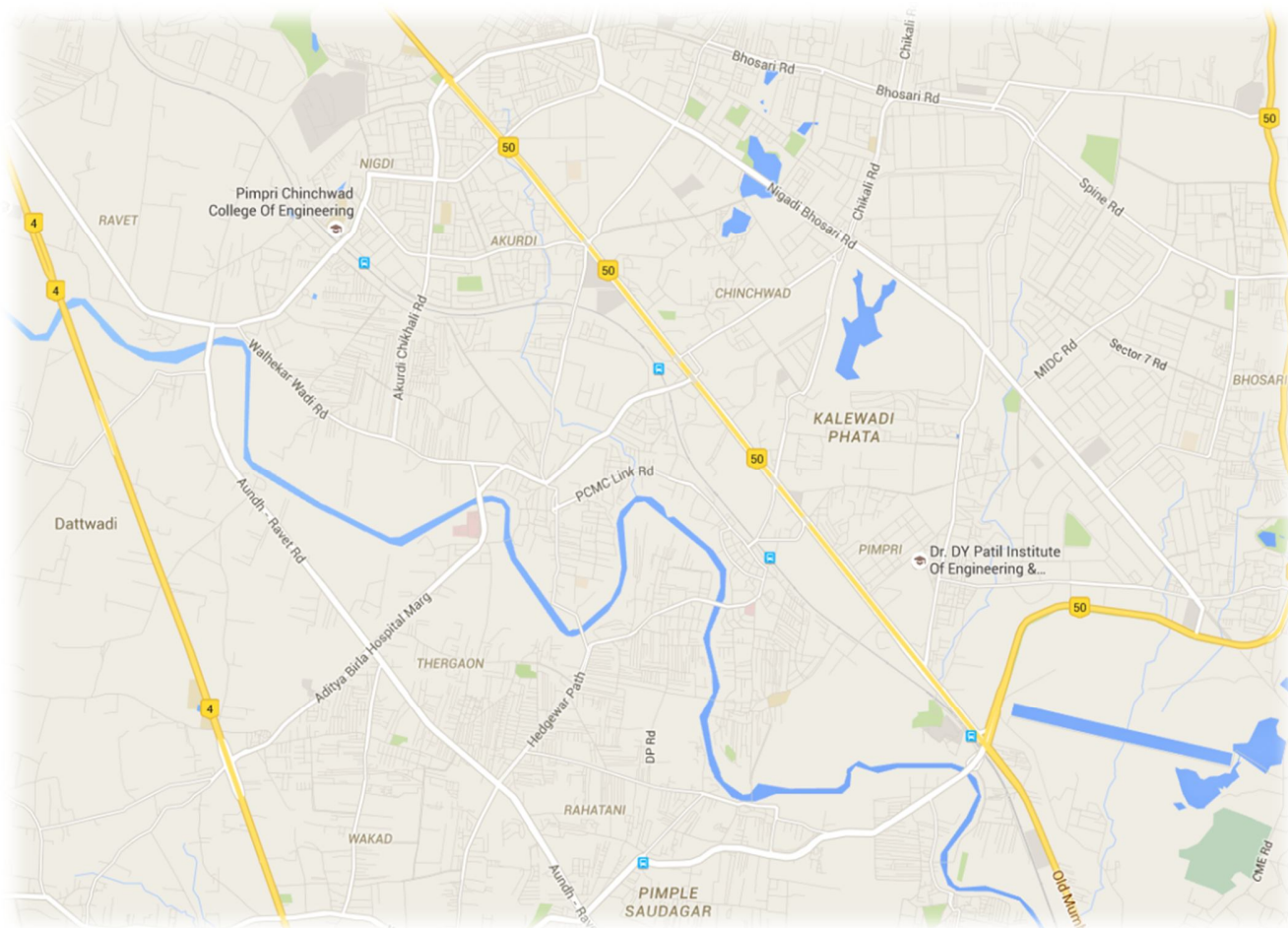
Format of opinion sheet

| SR NO. | NAME | VEHICLE | | DISTANCE TRAVELLED | PURPOSE OF TRAVELLING | OPINION |
|--------|------|---------|----|--------------------|-----------------------|---------|
| | | 2W | 4W | | | |
| | | | | | | |

C. Selection Of Area To Be Surveyed:

After preparing the tabular sheet the next step was to choose the area which was to be surveyed by our team members our ambition was to choose such area which is slum as well as sufficiently developed and for that sake we have been chosen the area of Nigdi Pradhikaran, ChinchwadGaon , some part of Pimpri, and the survey is started from the sector no. 28 from Nigdi area and then we all the team members spread all over the area individually and in that way the Household survey of our team is in the form of the samples required for our survey.

1) Area surveyed with Local Road System



D. Data Collected

| Sr. no. | Name of sector/area | No. of sample | Opinion of Peoples | |
|---------|--------------------------------|---------------|--------------------|----|
| | | | Yes | No |
| 1 | Sector no. 28 | 45 | 13 | 32 |
| 2 | Sector no. 27 A | 28 | 7 | 21 |
| 3 | Gurudwara colony, AKD RI.St | 28 | 5 | 23 |
| 4 | Green park society AKD | 30 | 13 | 17 |
| 5 | AKD KandobaChouk | 27 | 7 | 20 |
| 6 | Sector no. 20 | 30 | 9 | 21 |
| 7 | Sector no. 26 | 24 | 4 | 20 |
| 8 | Sector no. 24 | 29 | 9 | 20 |
| 9 | Sector no. 25 | 25 | 9 | 16 |
| 10 | Sector no. 29 | 28 | 6 | 22 |
| 11 | Ravet | 28 | 3 | 25 |
| 12 | Sector no. 30 | 27 | 5 | 22 |
| 13 | Thergaon phase 1 | 28 | 7 | 21 |
| 14 | Sector no. 34 Thergaon phase 2 | 24 | 6 | 18 |
| 15 | Kalewadi | 28 | 10 | 18 |
| 16 | Tathawade | 20 | 4 | 16 |
| 17 | Punawala | 23 | 5 | 18 |
| 18 | Walhekarwadi | 26 | 5 | 21 |
| 19 | Talawade | 28 | 9 | 19 |
| 20 | Dattanagar, Rahatani | 28 | 10 | 18 |
| 21 | Nigdigaonthan | 26 | 6 | 20 |
| 22 | Bhagyalaxmi colony, nigdi | 26 | 11 | 15 |
| 23 | Balajinagar | 26 | 9 | 17 |
| 24 | Dattanagar, chinchwadgaon | 25 | 3 | 22 |
| 25 | Indira nagar, chinchwad | 26 | 8 | 18 |
| 26 | Lalbahaddurshashrinagar,CNC | 30 | 12 | 18 |
| 27 | Yamuna nagar | 29 | 8 | 21 |
| 28 | Ganga nagar, Pimpri | 26 | 9 | 17 |
| 29 | Masulkarnagar,kalewadiphata | 28 | 4 | 24 |

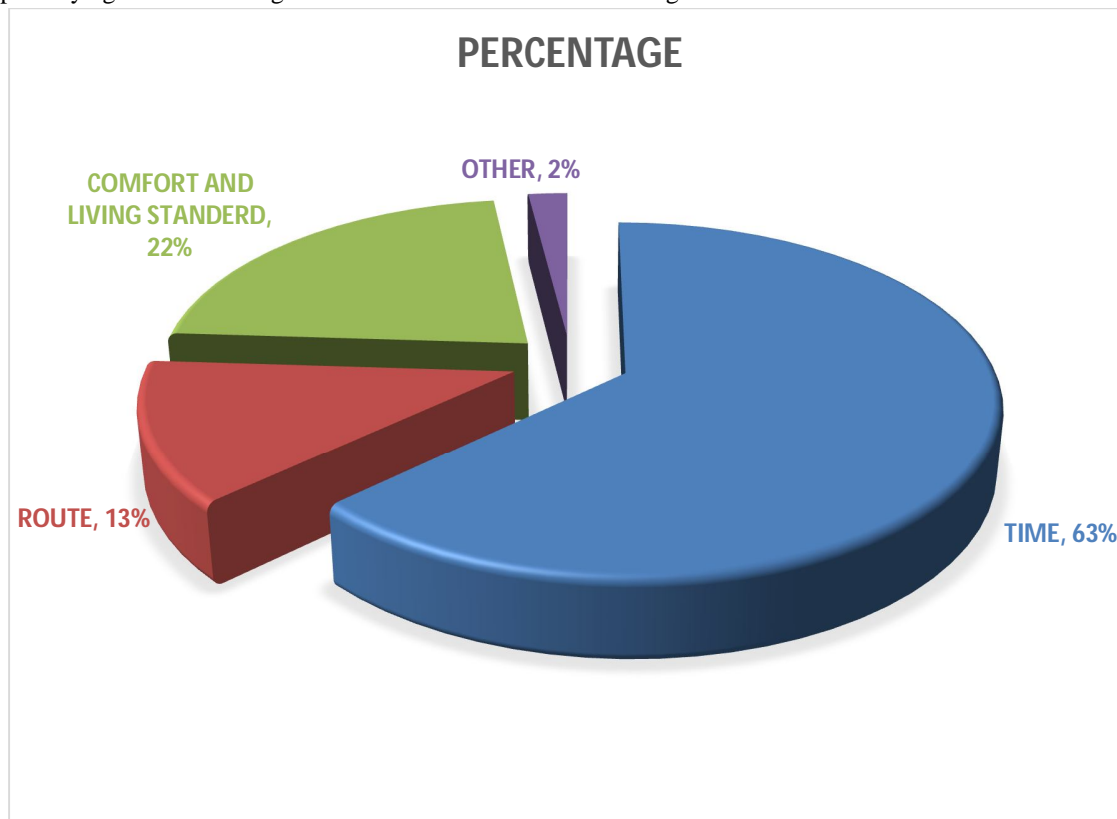
E. Graphical Review

From the 1000 household people opinion on using of public transportation system for their daily purposes or work is

Percentage of opinion

| OPINION | |
|---------|--------|
| Yes | No |
| 25.42% | 74.58% |

The peoples saying NO was having the various issues of which following are the issues we found



F. Explanation Regarding The Issue

- 1) **Time Issue:** Generally the time issue occurs due to the late arrival of the buses or trains but we found that the people were saying that the timing of the offices, colleges and companies doesn't match.
 - a) For example, there is a company which leaves the workers at 6pm but there is no any bus or train available till 7:30pm then the 1:30 hr. of the workers day wastes daily. Obviously for that reason the workers use to buy his own vehicle and saves his time.
- 2) **Route Issue:** Sometimes the routes of public transport are not available to the destination places or offices
 - a) For example, an office is of 5 km from the house of the employer when he travels by his vehicle but when he travels by bus the same office becomes 9-10 km long because of the long route of buses, and this thing also creates the time problem also.
- 3) **Comfort and Living Standard Issue:** During the survey we found some results pointing the issues in the comfort level of the public transportation system and also some people said that their living standard doesn't match to the public transportation system and hence they don't use this transportation system. For example, travelling for 2 to 4 hrs. Daily without the comfort creates irritation, dullness and the laziness in the overall work period of the day and hence the passenger prefer to travel by his own car or any other vehicle. Also there were some persons who were directly saying that their living standard doesn't match with the buses or to use the public transportation system. For example, there was a person who was a businessman and having 3 four-wheelers and 2 two wheelers but he only uses the one four-wheeler for him only and no one other in his car and having the attitude that using the branded cars is a status symbol where as not to use the public transport system.
- 4) **Other Issues:** Other issues consists of the issues like uneconomical travelling, bad behavior of the conductors and drivers, inconvenience, bad or dirty surrounding of the buses or the trains also the women were having their own issue related to woman safety and so on. There were some peoples in the slum area saying that the public transportation system is not economical for them as compared to the own vehicle, and some were saying that the atmosphere in the public buses is not good and also the behavior of the conductor and the rush driving is also an issue which effect the use of public transport. Women were having their own issues related to their safety and convenience coz to travel by bus or train in night is not that much comfortable or safe to be travelled.



G. Human Psychology

Yes, human psychology is most difficult and abnormal issue in our project work. Mainly in that case people are not helping each other, there is conflict in bus, and they want to maintain their living standard as there society. Examination of the operator plays a large role in transportation psychology, while many external factors influence traffic safety, internal factors are also significant same factors include:

- 1) Decision-making
- 2) Demographics
- 3) Distraction
- 4) Stress and panic
- 5) Driving training and experience
- 6) and environment
- 7) In attention
- 8) Fatigue
- 9) Response to the unexpected
- 10) Risky behaviors, and the last is -
- 11) Alcohol and drugs

H. Solutions on Issues faced by People

1) *Time Issue*

| | ISSUES | SOLUTIONS/SUGGESTIONS |
|--------|-----------------------------|---|
| Buses | Late arrival | Punctuating the buses timing and keeping it coordinating with the office timing |
| | Traffic | Separating the route of public vehicles and the private vehicles |
| | Less number of buses | Providing more number of buses minimizing the time span between the buses |
| | Greater lap between buses | |
| | Long Routes | Providing and designing the efficient routs within the cities |
| | Narrow Roads | Expanding the road width as more as possible |
| Trains | Less number of trains | Increasing the number of trains |
| | Greater Laps between Trains | Minimizing the time span between two successive trains |
| | Unmatched timing | Keeping the timing of trains coordinating to the office timing |
| | | |

2) *Route Issue*

| ISSUES | SOLUTIONS/SUGGESTIONS |
|---|---|
| <ul style="list-style-type: none"> • Long route: For the long route there is many no. of buses are required and also they need to change buses to reach their destination • No. of bus stops are less • Zigzag route occupy more time and distance • No. buses till dead end • To many halts (bus stops) | <ul style="list-style-type: none"> • For long route: Buses minimum halts or straight approach (for KATRAJ, HADAPSAR, CHAKAN, NIGDI, HINJEWADI, etc.) • Mini buses should be provided in core of city. It will minimize halts of buses. • Mini buses delete dead-end, too many halts of buses problems. |



Route issue will be solved by the sub-group, which work with us. In their project they mention the routes which are should be providing in total Pune map. We shows them a people's needs of destination of their purpose of work. Many of people who are job worker are daily goes toes to HINJEWADI, KATRAJ, HADAPSAR, CHAKAN, and somethose goes to PUNE, VIMAN NAGR for their duty or job purposes.

From our surveyed analysis and conclusion our coordinate group will find out a new route, road, pavements, arrangement of NH, SH, MDR, ODR and also VR in Pune district.

3) Comfort and Standard Issue

| Issues | Solutions/suggestions |
|--|---|
| <ul style="list-style-type: none"> • Living standard issue • Congested atmosphere in buses • Bad driving skill • No proper maintenance • No entertainment • Bad condition of public transport <ul style="list-style-type: none"> ○ No proper seat ○ Faulty windows ○ Hard suspension ○ No details about place in bus • Lots of crowd • No proper waiting area for bus stops | <ul style="list-style-type: none"> • Provide high class buses for business class man for industrial area e.g. IT park- HINJEWADI, CHAKAN • Well trained, educated, experience drivers • Wi-Fi, Radio, Air Ventilator, for long provide T.V • Proper facilities on bus stops • For maintain health issue, high fine to the person who spiting or smoking in public vehicle • Improve condition of buses • Improve seat, window, suspension, and increase in no. of seats • Route maintenance of public transport • Characterize buses for college student, business person, tourisms • To protect from thief there is provide C.C.T.V camera |

Peoples should have change their human or psychology tendency. If they change it then comfort and convenient issue are automatically solved. There is no need the above solution or suggestion.

4) Others Issue:

| ISSUE | SOLUTIONS/SUGGESTIONS |
|--|--|
| <ul style="list-style-type: none"> • Un economical, charges are too much high • Inconvenient • Uncomfortable public buses and railway system <ul style="list-style-type: none"> ○ Harsh driving ○ Bad impression of peoples ○ Views of buses ○ Behavior of conductor • Health issue | <ul style="list-style-type: none"> • Prove them difference between private vehicle expenditure/public vehicle expenditure for travelling • Improve the standard of buses • Driver should complete the course of driving about 3- 6 month • Conductor should complete humanity, politely talking to the passenger |

IV. CONCLUSION AND FUTURE SCOPE

A. Problems Faced Related to Transportation in Surveyed Area

The collection of data, Survey, and other work is done and the analysis of the collected data also has been done, the existing planning of the surveyed city is partially developed and that unplanned or undeveloped part of the city is having more traffic related problems such as Traffic Jams and hence these areas are facing more air pollution, noise pollution and the Traffic Jams developed in those areas is creating the problems to the people staying in the developed areas. While doing the survey we found various traffic issues faced by the peoples staying in the planned area while using the public transportation such as: Time issue, Comfort or inconvenience issues, Living standards, Unviability of Routes. The main problem of the people staying in the unplanned area is: Less punctual transportation, Smaller Roads causing Traffic jams, High Noise pollution, Increase in Air pollution, Uneconomical and the major problems faced by the people staying in the previously planned city: Less punctual transport system, Less Comfortable, Doesn't match to the living standards, Uneconomical. To tackle above problems we suggested following aspects.



B. Improvements in the Transportation Ministry System in Municipalities

- 1) Providing more number of Buses and increasing the circulation of buses by providing more routes at the morning and the evening period, on Sunday the number of Buses on the roads should be 30 percent only,
- 2) Enlarging the sizes of the roads and using more number of Traffic Signals.
- 3) Use of Lithium Buses to reduce air pollution,
- 4) Improve the standards of the Buses and the comfort level of Buses,

C. Improvements in the Public Behavior

- 1) One family should have maximum 1 two wheeler and 1 four wheeler, four wheeler should be used only at the time of emergency and Sunday only,
- 2) People must use the public transportation system as far as possible, reducing the use of private vehicles,

Hence from the above introduced results and the analysis of the survey it should be concluded that, in order to save the fuel consumption, pollution, traffic jams, time delay, reduce air pollution, reduce noise pollution and to develop the city the above project concept is totally feasible

D. Future Scope

- 1) Survey can be done at state level,
- 2) Industrial employees survey can be done,
- 3) Public sector area (Mall, College, Community park) also can be done,
- 4) Computerized high techniques for signal system should be improved,
- 5) Highway survey for per hour vehicle that comes and goes in city,
- 6) Considering the people opinion reshuffling should be done by E-pole or E-election,
- 7) Each government sector should have their own app for enhancing their system,

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