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ACRONYMS

ADB: Asian Development Bank
AFD: French Agency for Development
ATCAG: Automated Tracking and Control of Green Assets
ATCS: Area Traffic Control System
BRT/BRTS: Bus Rapid Transit (System)
CMP: Comprehensive Mobility Plan
FYP: Five Year Plan
DA: Development Authority
GDP: Growth Domestic Product
GHG: Greenhouse Gas
DMRC: Delhi Metro Rail Corporation
GoI: Government of India
HDI: Human Development Index
IPT: Intermediate Public Transport
ITDP: Institute for Transportation and Development Policy (NGO)
ITS: Intelligent Transportation System
IUT: Institute of Urban Transport
JCTSL: Jaipur City Transport Services Limited
JICA: Japanese International Cooperation Agency
JMRC: Jaipur Metro Rail Corporation
JnNURM: Jawaharlal Nehru National Urban Renewal Mission
LRT: Light Rail Transit
NGO: Non-Governmental Organization
NHAI: National Highways Authority of India
NMT: Non-motorized Transport
MoHUPA: Ministry of Housing & Urban Poverty Alleviation
MoORTH: Ministry of Road Transport and Highways
MoUD: Ministry of Urban Development
MRTS: Mass Rapid Transit System (metro)
NUTP: National Urban Transports Policy 2006
PPP: Public-Private Partnership
SUT: Sustainable Urban Transport
TOD: Transit Oriented Development
TTMC: Traffic Transit Management Centre
UMTA: Unified Metropolitan Transport Authority
UMTC: Urban Mass Transit Company
UTF: Urban Transport Fund
INTRODUCTION

The field of urban transport has recently exploded, as more and more people have been shifting from rural to urban areas, creating high mobility issues in most of the cities. Despite a high growth of Indian cities, 70% of the population still lives in rural areas which represents a considerable potential of migration. Cities are unprepared for this, and a lot still has to be done in order to provide adapted, smooth and eco-friendly mobility to the commuters.

The interest in urban transport is quite recent. Previously, Indian Railways was the only entity giving an interest in the transportation field. Now, more and more companies, government bodies and NGO dealing with urban transport are being created in India along with specialized centres in Universities in order to train transport planners. The sector is exploding with comprehensive planning set as a new priority. Transport specialists are now not only technicians but also planners who consider urban transport as a whole and emphasize on planning matters rather than technical ones. Hence, notions like inter-modal plans or urban integration are given a new importance.

The aim of this report is to give a representation of the current situation of urban transport in India and to present the main dynamics and the upcoming trends of urban transport. We consider in this overview only urban transport related to people mobility. Thus, national railways, national highways, and freight transport development are not included.
1 GENERAL CONTEXT

1.1 INDIA AT GLANCE

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<th>China</th>
<th>Etats Unis</th>
<th>Brazil</th>
<th>Thailand</th>
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<td>9,6</td>
<td>9,8</td>
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<tr>
<td>Population (million)</td>
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<td>1356</td>
<td>319</td>
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<td>Urban Population (%)</td>
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<td>2,85</td>
<td>1,14</td>
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<tr>
<td>Literacy Rate (%)</td>
<td>73</td>
<td>95,1</td>
<td>99,00%</td>
<td>90,4</td>
<td>93,5</td>
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<td>5,3</td>
<td>13,39</td>
<td>16,72</td>
<td>2,42</td>
<td>613</td>
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<td>GDP per capita - PPP ($)</td>
<td>4000</td>
<td>9800</td>
<td>52800</td>
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<td>GDP growth rate (%)</td>
<td>4,7</td>
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<td>Gini</td>
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<td>HDI</td>
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<td>0,699</td>
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Table 1: Main figures of India compared to other countries
Data from CIA World Factbook, India Census 2011, The World Bank, UNDP and statistiques-mondiales.com

1.2 A COMPLEX DISTRIBUTION OF URBAN TRANSPORT GOVERNANCE

India’s territory is divided into 29 states and 7 union territories. Union territories are specific areas governed by administrators directly nominated by the president of India. States are divided into districts that count several municipalities. Political governance can be summarized in four levels.

The highest is the national level and is represented by the central government (GoI). Its most important personality is the Prime Minister which oversees the different ministries such as the Ministry of Urban Development (MoUD).

The second is the state level, governed by independent state governments implementing policies coming from the central government.

Then, at the the district level, which is a state’s region, the main official authorities are a Deputy Commissioner in charge of administration, a Superintendent of Police responsible of law and order, and a Deputy Conservator of Forests.

Finally, the local level corresponds to the municipalities governed by Municipal Authorities. There are three types of municipal authorities according to the area profile: Nagar Panchayats in areas in transition between rural and urban; Municipal Councils in small urban areas and Municipal Corporations in larger towns and metropolitan areas.

In the case of urban transport, we only consider the three following levels of governance: the central level, the state level and the local level.
1.2.1 Central level
The entities at the central level are mainly planning authorities.

Urban transport governance was initially divided between the ministry of Railways and the Ministry of Surfaced Transport. In 1986, Urban Transport was considered as a separate subject and was assigned to the Ministry of Urban Development (MoUD). This planning authority is responsible for setting up policies and programs as for coordinating the different projects.

Another planning authority is the Planning Commission, created in 1950 as a part of the central government. This authority was created to develop and manage the Five-Year Plans of India. These general planning programs have been applied since 1951 and the 12th Five-Year Plan (2012-2017) is currently in force.

Secondly, railways and national highways in the country are also under the central government authority. The Ministry of Railways and the MORTH (former Ministry of Surfaced Transport) remain active especially as development and maintenance authorities. The ministry of Railways operates the state-owned organization Indian Railways which has the monopoly on heavy rail. The MORTH manages the development and maintenance of national highways with the help of the NHAI government agency and applies taxes and transports regulations such as the Motorized Vehicle Act or the Road Transport Corporation Act (cf 1.3.4.).

1.2.2 State level
State level entities are planners and regulators. Planning is mainly ensured by the authorities known as State Nodal Agencies under the State Urban Development Transport Departments. They follow national policies and handle infrastructure planning in their urban areas. They have a strong influence on cities’ planning.

Within the state government, the Transport Department is also responsible for permit and license delivering. The additional Regional Transport Authorities manages charging fees, taxes and fines.

1.2.3 City Level
The municipal bodies mainly manage cities affair and don’t have much skills in urban transport development. Municipal Corporations are responsible of the service management though. Some large cities have a Development Authority (DA) for urban planning gathering few inner skills. The DA would be generally responsible for drawing the city plan and preparing infrastructure development projects.

In metropolitan areas, another authority may oversee urban planning. This authority is so-called Metropolitan Development Authority (MDA) and extends its planning boundaries to all the municipalities within the metropolitan area.

1.2.4 Urban transport projects
Urban transport projects are usually initiated at the city level by the DA and the Municipal Corporation. In the case of a heavy project such as a metro rail or a BRT, a SPV entity (Special Purpose Vehicle) should be especially created to gather the necessary skills and carry the planning.

However, nothing can be decided at the city level only. The project has to be submitted to the State Nodal Agency which examines it before confirmation and submission to the MoUD. With the help of
consultancy offices such as IUT, the MoUD considers the project. With MoUD validation, it can get the necessary funds from the government.

The main funds allocated to urban transport projects come from the central government itself, as it generally stands for 70% of the total budget. The remaining 30% are completed by State and City authorities. If the cost goes under 5 billion, the MoUD can finance it with internal funds. More important projects need another submission to the Ministry of Finance for a Cabinet approval.

Foreign investors have been recently giving interest to urban transport and thus started to bring private financial involvement in some important projects. For instance, half of the Delhi Metro funds comes from the Japanese International Cooperation Agency (JICA). This new source of funds tends to reduce the financial hold of the government but enables cities to plan for more important projects. This latest point prevailed as the Government itself has called for international aid on some projects.

1.3 NUMEROUS OFFICIAL PROGRAMS AND STRATEGIES

Several actions have been taken by the central government in order to help regulate urban development. The current most important actions in the field of urban transport are the National Urban Transport Policy (NUTP), the 12th Five-Year master Plan (FYP), and the JnNURM funding program.

1 This is the case for the metro rail project in Lucknow. The GoI – Department of Economic Affairs got involved by evaluating fundings associations like the JICA, the AFD and calling the European Bank (“DEA writes to European Bank to fund Lucknow’s metro », web-article from The Times of India, March 2014)
1.3.1 NUTP 2006

This national policy put in place in 2006 created a paradigm shift in urban transport planning. It is the key guiding policy at the national level for urban transport in India. Here are the main objectives of this Policy:

- People focused & equitable allocation of road space;
- Ensure integrated land use & transport planning;
- Investments in public transport & Non-Motorized modes;
- Strategies for parking space and freight traffic movements;
- Ensure coordinated planning for urban transport;
- Build capacity to plan for sustainable urban transport;
- Projects to demonstrate best practices in sustainable transport;
- Promote ITS, cleaner fuel & vehicle technologies for cities;
- Innovative financing methods to raise resources;
- Establish Regulatory mechanisms for a level playing field.

A review of the policy has been recently taken up by the MoUD through IUT. Thirteen new components will be introduced including TOD, regional connectivity, ITS, CMP, service level benchmarks, road networks and Transport Demand Management.

### UMTAs and UTFs

Urban transport gathers many different elements (public transport, roads, land use, traffic management, ITS...) that are usually under the responsibility of different bodies and departments at different levels (municipality, state, private...) without any supervising entity.

NUTP 2006 recommended for the creation of **UMTA** (Unified Metropolitan Transport Authority) for large cities and state projects. There are now 11 UMTAs in India (Hyderabad, Bangalore, Chennai...). Unfortunately, most of the UMTAs often lack skills, financial power or technical knowledge, and are not very effective.

Another measure proposed by the NUTP is the creation of city or state level **Urban Transport Funds** (UTF). This special fund shall help the cities to manage a transport dedicated capital for investment and centralize revenue related to urban transport such as fares or taxes.

1.3.2 12th Five Year Plan (FYP) - 2012-2017

Since Independence, the Indian economy has been premised on the concept of planning. This has been carried through Five-Year Plans, prepared and monitored by the Planning Commission.

The twelfth plan is currently underway. In the short term, its aim is to revive the current growth rate evolution (6,2% in 2011-2012, 5% in 2012-2013) and reach 6,5-7% for 2013-2014. In the longer term, the goal is to regain a high growth (9% in last two years) with an average target set at 8,2%. Regarding public transport, the plan is to increase the rate of investment in infrastructures at 9% of GDP, and to improve bus services in smaller cities, towns and districts².

---

1.3.3 Jawaharlal Nehru National Urban Renewal Mission (JnNURM)

The most important city modernization scheme in the urban development history of India, called JnNURM, started in December 2005. This seven years program aimed to help the development of infrastructures in Indian cities in order to provide access to basic urban services to all urban residents.

The program is divided into two sub-missions: Urban Infrastructure and Governance administered by the MoUD, and Basic Services to the Urban Poor (slum integrated development) administered by MoHUPA. The MoUD also administers the Urban Infrastructure Development of Small & Medium Towns (UIDSSMT) scheme.

The total budget of this program was 1 200 billion rupees ($20 billion) for over seven years with different funding shares according to the size of the city. The Central assistance is about 35% of projects cost in 4-million plus cities and increases in smaller cities.

JNNURM proposed reforms to improve urban transport planning and management, made conditional to the sanction of the following Urban transport Projects:

✔ Comprehensive Mobility Plan (CMP);
✔ Setting up of Unified Metropolitan Transit Authority (UMTA);
✔ Setting up of Dedicated Urban Transport Fund at state and city level;
✔ Transit Oriented Development Policy, Parking Policy and Advertisement Policy;
✔ Setting up of city specific Special Purpose Vehicle for managing public transport;
✔ Setting up of Traffic Information and Management Control Centre etc.;
✔ Mechanism for periodic revision of public transport fares.

Sixty-three cities were selected, among which seven mega cities (Delhi, Mumbai, Chennai...), 28 Million-plus cities (Bhopal, Jaipur, Kochi...) and 28 cities with less than 1 million population cities (Jammu, Mysore, Pondichery, Chandigarh...).

1.3.4 A diversity of Acts

Despite these efforts, the remaining diversity of laws related to transport is responsible for a very complex legislative field. Many amendments regularly actualize the existing Acts but no initiative to simplify and modernize urban transport legislation has been initiated. Here are some of the most important Acts:

✔ The Tramways Act was created for the Kolkata tram project in 1902 and regulated operations of trams on roads;
✔ The Road Transport Corporations Act written in 1950 in order to regulate the so-called corporations.
✔ The National Highway Act of 1956 regulates the freight transport on roads;
✔ The Metro Railways Act of 1978 concerning the construction of metro railways was also created for the Kolkata metro;
✔ The Railways Act of 1989 regulates the management of the national Indian Railways;
✔ The Delhi Metro Railways Act of 2002 was created for the operation, maintenance and management of the Delhi metro;
✔ The Carriage by Road Act in 2007 is supposed to upgrade regulation about freight transport.
2 URBAN MOBILITY IN INDIA: A SERVICE IN TRANSITION

<table>
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<tr>
<th></th>
<th>Delhi</th>
<th>Mumbai</th>
<th>Kolkata</th>
<th>Chennai</th>
<th>Hyderabad</th>
<th>Bangalore</th>
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<tr>
<td>City Territory (km²)</td>
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<td>603</td>
<td>185</td>
<td>426</td>
<td>650</td>
<td>741</td>
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<tr>
<td>Urban Area (km²)</td>
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<td>1 887</td>
<td>1 189</td>
<td>7 100</td>
<td>1 276</td>
<td></td>
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<tr>
<td>City Population (Million)</td>
<td>16.79</td>
<td>12.48</td>
<td>4.49</td>
<td>4.68</td>
<td>6.80</td>
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<tr>
<td>Urban area Population (Million)</td>
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<td>7.75</td>
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<tr>
<td>City Density (inhab/km²)</td>
<td>11 320</td>
<td>20 694</td>
<td>24 252</td>
<td>10 988</td>
<td>10 477</td>
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<table>
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<td>4</td>
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</table>

Table 2: Comparative figures of mega Indian cities
Data from India Census 2011 and MoUD study on traffic and transportation (2008)

India has been recently experiencing a fast growing urbanization and motorization. While the urban population is growing at a rate of 3.16 % per year, motor vehicles are growing at a rate of 9 %. The increasing demand for mobility in growing urban areas along with the unprecedented growth of private vehicles is generating huge congestion issues, at the origin of a decrease of mobility in cities. Other problems have been identified such as air pollution and road fatalities. While the government early focused on road development, promoting private car use only, the main challenge now appears to be public transport, working at an increase of its capacity and an upgrade of the service quality level.

The main urban public transport modes are presented in Appendix 1.

2.1 THE NEW SUPREMACY OF PRIVATE MOTORIZED VEHICLES

Private vehicle ownership use to be very low until the middle of the 80’s. Since then, a real exponential growth has been noticed, leading to a total of 137 million private motorized vehicles in 2012 – two-wheelers and cars – amongst the 159.5 million motorized vehicle in India. Whereas both categories of vehicles follow a similar growth, two-wheelers are far more expanded than cars. In 2012, more than 115.4 million two-wheelers where registered in the country while there were “only” 21.5 million cars.

It is also interesting to notice that the number of vehicle per inhabitant is also increasing at an important rate touching 0.12 vehicle per inhabitant in 2011. One reason of this growth is the strong increase of the urban mobility demand next to a decline of public transport services.

---

5 Transport Research Wing, Ministry of Road Transport & Highways, “Road Transport Year Book (2011-2012)”, November 2013
2.2 A MASS TRANSIT ORIENTED STRATEGY IN THE FOREFRONT OF THE TRANSPORT PRIORITIES

2.2.1 At first, a keen interest on BRTS

In order to adapt to this demand, mass transit projects started to flourish all over India, starting with the implementation of several Bus Rapid Transit System (BRTS) projects. As BRTS indeed provides a high capacity level of transport, doesn’t need great infrastructure work and requires reasonable costs, it was seen as a great solution on the short term.

However, BRT success was not immediate. The two first BRTS implemented in Pune and Delhi were indeed pointed as two failures.
Pune was the first city to implement a BRTS in 2006. Whereas such a system managed to improve the mobility in the city, many defaults were denounced such as the lack of coordination with the rest of transport and a hasty design (no level boarding, no cross-walks...). Such inadequate planning ensued a bad security level on the corridors causing several accidents.

Delhi BRTS was implemented in 2008 in order to welcome the 2010 Common Wealth Games (CWG). For two years and during the CWG, the BRTS operated properly. After the CWG, the police stopped regulating the corridors. As no road signs were properly set up, personal vehicle started to use BRT corridors causing high congestion. Lack of expansion and integration plan or security improvement quickly led to a situation characterized as “chaos” along BRT corridors and brought accidents and complaints. Today, the BRTS is no longer operating and corridors are used by ordinary city buses.

Despite these failures, another BRTS was successfully implemented at the same time in Ahmedabad and is now introduced as one of the best practices in India. The “Janmarg” BRTS was awarded the “Best Mass Transit Rapid System Project - 2009” from the Government of India, and got many other awards. This system includes fully segregated corridors, level access stations, operations control centre or fare integration. Thus, it efficiently managed to decrease the rate of private car use in Ahmedabad.

Because of this success, many other cities decided to implement a BRTS. Today, five BRTS have been launched in Jaipur, Rajkot, Bhopal, Indore and Vijayawada. Around eight BRTS projects are planned within the next four years (see Appendix 2.1).

Although the funding of these projects largely came from national sources such as central government grants through JnNURM, or state government funds, rare international funds can be noticed, such as the World Bank participation.

2.2.2 An ongoing proliferation of Metro Rail projects

This first wave of BRTS projects is closely followed by a more important wave of metro rail projects. Metro rail has indeed become a very attractive mass transit solution on the long term according to the authorities and has been planned in more than a dozen cities.

The Indian metro story paradoxically started very early with the Kolkata Metro in 1984, which is still running and expanding. At that time, no other metro system was developed. A “Suburban Rail Transport” was implemented in 1999 in Mumbai, but was closer to a commuter rail system than a metro.

The metro era started in Delhi with the launch of the first Indian modern Mass Rapid Transit System (MRTS) in 2002, called the Delhi Metro. This project came up in the mid 80’s and its construction started in 1998. A first line was inaugurated in 2002 which was progressively expanded by four other lines. The project is currently in the phase III consisting in line extensions and new “Ring Road” lines in order to provide circular inter-linkages between the city suburbs (see Appendix 3).

The Delhi Metro was presented as a great success and received awards for its environmental friendly assets. It was notably certified by the United Nations as the first metro rail-based system in the world to get carbon credits. Thanks to its success, this MRTS has become a real example for other cities, as the Delhi Metro Rail Corporation (DMRC) operating company started to provide consulting on several metro projects. Only three other metros are currently running : the old Kolkata metro, the rapid metro of Gurgaon connected to Delhi Metro and the new Namma Metro in Bangalore. More than a dozen of metro
systems are planned all over India (see Appendix 2.2). Some are under construction and soon to be implemented - in Chennai, Hyderabad, Kochi or Jaipur - while others are stuck in the planning part due to funding or DPR validation issues (Detailed Project Report)\(^6\). Delays often happen because of demand evaluation issues raising viability or legitimacy problem of such projects. These problems were raised for example in Chandigarh where debate is still ongoing\(^7\).

Metro projects are slowly coming up because of their required means in term of infrastructure and cost. These massive projects even started to attract some foreign investors like the Agence Française de Développement (AFD), the Asian Development Bank (ADB) or the Japanese International Cooperation Agency (JICA). As the JICA funds more than 50% of the Delhi Metro\(^8\) and is involved in other cities such as Mumbai or Bangalore, it is the most important foreign investor for transport in India. Moreover, local builders are usually called for aerial infrastructure projects for cost reason – local manpower being cheaper – while foreigners are preferred for underground infrastructure as local experience is lesser.

Although metro is seen as one of the most appropriate solution to Indian urban demand growth, it is not a self sufficient solution. Indeed, metro expansion does not only improve urban mobility, but it creates new needs of mobility that also have to be considered. As it enables working population to cover longer distances, the metro participates in the development of new business centres (like Gurgaon or Noida near Delhi), and also encourages the increase of urban expansion. Accordingly, as the offer grows, the demand grows even more.

In the case of Delhi, the majority of the population needs a feeder to reach the closest metro station. This service is usually ensured by rickshaws that can charge up to five times more than a metro ticket. Thus, even though metro defends a public transport democratization through cheap fares (average of 20 Rs.), first and last miles connectivity still remains very expensive, limiting the use of metro to middle class people. While metro is still developing, setting a proper feeder service is the next challenge.

Metro projects are also criticized by international actors such as the World Bank or the kfw German Development Bank. The heavy social and environmental impacts of metro projects are sharply discussed by these organizations who rather defend the BRTS option.

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\(^6\) For example: the Kolkata ageing metro extension has suffered from many delays, the Ahmedabad MetroLink doesn’t manage to complete its funding scheme or the Ludhiana metro project has been replaced by a BRT system project.

\(^7\) “Curious case of Chandigarh Metro”, web-article from Times of India, July 2014

\(^8\) IUT, “Best Practice in Urban Transport”, report, September 2013

Illustration 3: Elevated track of Delhi Metro
2.2.3 Light rail still in the shadows

In parallel of these heavy projects, light rail systems have still not gained importance, neither as modern feeder systems for metro, nor as independent networks.

Several tramway systems were implemented during the British occupation and were all terminated between the 30’s and the 60’s, except for the Kolkata tram. A few projects are emerging but remain anecdotal such as the proposition for a tramway in Old Delhi or the plan of a tram in the station of Shimla. Foreign investors did attempt to introduce modern tramway projects, but without any success. This lack of interest might be due to an ageing perception of tramways crushed by the modern image of elevated rail or BRT systems.

According to this pursuit of modernity, some monorail projects started to appear in parallel of metro projects, and even despite the negative media coverage after accidents on the Skybus monorail in Goa - an employee was killed and three were injured during an operation trial. Thus, the first Indian monorail has been recently implemented in Mumbai. Extension of this monorail is on hold as many issues have been raised about the adequacy of such systems in the Indian context regarding compatibility, flexibility and cost issues. Other projects were proposed in the early 2010’s following a new trend, but most of them remained at the proposition stage like in Chennai, Pune or Aizawl, or were replaced by a LRT system project like in Bangalore. The state of Kerala is an exception as two monorail projects were maintained in Kozhikode and Thiruvananthapuram. The construction should start in November 2014 provided that funds are raised on time.

Next to monorail stands LRT. As LRT needs less investment than metro and provides a higher capacity than BRTS, it is seen as a good compromise for medium cities wishing to modernize their public transport service but not in need of a full metro system. However, as well as monorail, LRT projects remain very expensive compared to BRTS systems or simple bus services, which explains that only few cities recently considered this solution (see Appendix 2.2), and that bus system still remains the backbone of urban transport.

2.3 AN UPGRADE OF THE EXISTING SUPPLY

2.3.1 New Buses put into service under JNNURM

Buses form the backbone of urban transport in most of the cities in India. Only few cities don’t have a conventional bus system (Gangtok, Bikaner, Raipur, Amritsar, Patna, Agra, Varanasi and Surat). It is a cheap and convenient mode of transport for all classes of the society. Services are mostly run by state government owned Transport Corporations.

The service level and quality was recently upgraded thanks to the JnNURM, mentioned above. In the public transport sector, the program mainly financed low-floor and semi low-floor buses in 63 indian cities (15260 all-over India⁹), along with the improvement of bus-shelters. Those buses have the quality of being accessible to the disabled (exclusive space for wheelchair, buzzer for stop request), and to be, for half of them, air-conditioned. It is a way of providing more comfort to the commuters and thus supposedly attracting more private car owners.

⁹ MoUD, “Transforming City Bus Transport in India through Financial Assistance for Bus Procurement under JnNURM”, 2009
However, several complaints have been addressed to the MoUD about the design of these buses. The main problems relate to ventilation and cramped standing space, but also to the massive size of the low-floor buses inappropriate to small cities. Following those complaints, the government has been working on new specifications for the JnNURM buses: single step entry, mini buses...

The other innovation of JnNURM lies in the implementation of Intelligent Transport System (ITS) to improve bus management, efficiency and security. JnNURM buses will be equipped with Passenger Information System (Display Board with indications in English and local language), Automatic Vehicle Location System (GPS and control centre), Security Camera Network System (CCTV cameras), Vehicle Health Monitoring and Diagnostics, Handheld ticketing machine with smart card.

2.3.2 A necessary upgrade of the Intermediate Public Transport (IPT)

2.3.2.1 What is IPT?

Rickshaws in India are referred to as Intermediate Public Transport (IPT). It gathers the private autos and shared autos (Tempos). In cities where there is no reliable and efficient public transport, IPT is a main mode of transport, meeting with the daily mobility needs of the entire population. In bigger cities, where the transport network is more developed, IPT acts as a feeder service to the main modes of transport (metro, bus, tram) and hence provides last mile connectivity to the commuters. It also provides a door-to-door service that no other mean of transport would be able to provide, and is an important source of employment.

The vital role than IPT plays in urban mobility is however seldom recognized. In many smaller cities without any bus service, it is the only public transport mode. However, very little is done to incorporate IPT as a part of an inclusive public transport system, whereas it is an important piece of the puzzle in sustainable urban mobility.

2.3.2.2 A precarious system

The fact that IPT is totally private and informal has led to many issues faced everyday by the commuters as well as the drivers. Drivers don’t get any social benefit or training, they have to pay a high rent to the owner of the vehicle everyday (access to loans and ownership being too difficult), there is no proper infrastructures (stands, parking, rest room, repair workshop, access to drinking water).

Commuters also meet difficulties as the driver often refuses to enforce the legal fares fixed by the Regional Transport Office, by refusing to switch on the meter. Commuters end up paying a higher price for their journey, and using rickshaws become less affordable. Drivers also often refuse to go to a particular place, either because it is too far, or too congested. They prefer going to close by places, or places where they know that they will easily find new clients.

2.3.2.3 Reorganization and upgrade with the help of new technologies

To solve all those problems, the sector needs to be organized, and recognized by the government as a public transport. As soon as drivers get paid a fixed amount (the way bus drivers do) and get social benefits, most of the issues will be solved. But it implies to equip vehicles with new technologies capable of tracking the vehicle and registering the kilometres covered everyday.

Hence, implementation of Intelligent Transport System (ITS) for auto rickshaws can be a way of upgrading the service, by making it more reliable and more efficient. Panic Button, GPS, electronic machines
to issue fines (e-challan), CCTV cameras, smart-card readers, light indicating if the vehicle is available or hired, could be installed in the vehicles and attract much more users. It would also help in formalizing the sector. In Delhi, the installation of GPS in each and every autos has been made compulsory by the government, but so far, only few autos are actually equipped. Drivers claim that they cannot afford such a device, and that they don’t want to be tracked. But even if the implementation will take time, it seems to be the only option to integrate IPT to the public transport network.

2.3.2.4 Initiatives taken by few forerunner companies

Few private companies have worked out special auto-rickshaw schemes. **G-auto** is a scheme which started in Rajkot (Gujarat) in which rickshaws are organized in a branded and marketed fleet leading to a quality and reliable service. The drivers are trained, the fares are regulated by the government, and the users can book it on phone or on the internet. **Rickshawale** (Mumbai), **Three-wheels limited** (Bangalore) and **Autowale** (Pune) also work the same way, but in addition to it, the company acts as a guarantor to help the drivers getting loans to become owner of the vehicle. In Fazilka (Punjab), traditional Indian cycle rickshaw have been reinvented with a new capability: the organization of an entire rickshaw network through telephones called “Ecocabs” where passengers “dial a rickshaw” whenever they want a ride.

2.3.3 Investments in new infrastructure

Transport infrastructure is also widely developing in parallel of public transport. It was first focused on roads development with, for instance, the construction of suburban highways and enormous flyovers promoting the use of private vehicle in large cities such as Delhi, Mumbai, Kolkata, Bangalore and many others. As policies are changing, public transport has been priced, and the infrastructure is getting adapted.

2.3.3.1 A new urban scenery

In Delhi, the metro significantly transformed the face of urban landscape, first with elevated infrastructure, but also with the creation of many parking lots near stations. There are approximately 18000 new parking spaces created at ground level in the whole city.\(^{10}\)

Bangalore is also noticeable as it leads the construction of a dozen of transport hubs called **Traffic Transit Management Centres** (TTMC). These modern TTMC include parking places, bus stands and many commercial facilities. Such project cost was found to be under 500 million rupees.\(^{11}\)

Illustration 6: Double decker flyover in Mumbai

Illustration 7: Yeshwanthpur TTMC in Bangalore

In other cities, while metro projects are ongoing, several modern bus terminals have been developed in order to welcome properly the new bus fleets provided by the JnNURM program. An example of these terminals is the GSRTC Bus Station in Vadorada. The building is the result of a unique infrastructure design with modern facilities and new technologies. Other modern terminals have been raised like the bus terminus of Hassan and the KSRTC bus stand of Mysore in 2010, or the Kashmiri Gate bus stand in Delhi renovated in 2013. The budget for such projects can reach a billion rupees.

\(^{10}\) “Parking cost at Metro Stations set to double”, Web-article from the Times of India, February 2013

\(^{11}\) IUT, “Best Practice in Urban Transport”, report, September 2013
### 2.3.3.2 A modernization of the network

**New technologies** started to be implemented not only in IPT systems, but also for traffic and mass transit management (see Appendix 2.3). In some large cities, ITS implementation programs were set up to better handle urban mobility such as an **Area Traffic Control System** (ATCS) in Mumbai, the Hyderabad Traffic Integrated Management System (HTRIMS) in Hyderabad or the CGRAPS transport control centre of Pune. A few cities also took advantage of their new mass transit system to incorporate such modern tools like an ATCS developed for the BRTS of Ahmedabad, an full ITS integrated in the BRT of Pune.

### 2.3.3.3 Still room for improvement

As a fast upgrading is noticed, there are still many lacks in the urban infrastructure. Footpaths notably remain insufficient causing an important problem of **road safety**. Pedestrian usually don’t have a separated space from the road nor proper road crossing signs implying dangerous situations during walk trips. Road marking in streets and intersections are also usually missing being one reason of a high car accident rate. In 2012, 25000 accidents were registered in Mumbai, 9 000 in Chennai and 7000 in Delhi. However, Delhi registered the highest rate of road deaths with 18500 fatalities while Mumbai registered “only” 500 fatalities.12

Moreover, we can notice an important lack of inter-modal policy for urban transport. While terminals are created, bus stops are upgraded and BRTS are planned, full integration between the different modes is still missing. Delhi is an example of an incomplete integration: metro infrastructure enables to reach bus stops and terminals more or less easily – proximity between stations, but no physical integration – and there is no inter-modal fare or communication integration. Otherwise, most of the cities don't plan for inter-modality as they only have buses or rickshaws systems. With incoming development, integration may become one of the next most important challenges for public transport.

### 2.4 A DEVELOPMENT LEAVING BEHIND THE NON-MOTORIZED TRANSPORT (NMT)

Despite the perceived increased usage of personal vehicles in Indian Cities, there is still a considerable share of the population that commutes by **walking and cycling**. About 56-72% of the daily trips are short trips13 - below 5km trip length - in most of the medium and large cities in India, offering a huge potential for bicycle use. Bicycle use varies from 9-18% in large cities to 13-21% in medium and small cities14. Bicycle ownership is very high in all Indian cities.

Most of the cycling population belongs to **lower income** categories that either cannot afford to use public transport or cannot find suitable public transport on the routes they want to travel on. Hence, reason for NMT infrastructure improvement should not be only the increasing of a clean and carbon-free transport mode share in the city, but also the dependence on cycling for the livelihood of many people.

In 2006, the NUTP laid huge emphasis on the need for increasing the modal share of non-motorized and other low-carbon modes of transport in cities. But despite this policy, the strong car-, fuel-, and road-lobbies being highly influential, continue to dominate the urban transport scenario where more cars and two-wheelers get added to roads daily. Most of the traditional city level planning documents emphasized on public transport and did not incorporate components that include NMT, as a result of which cyclists and pedestrians have been completely neglected in the overall process of city development. This perception of bicycles as a **poor man’s travel mode** hindered the acceptability of programs such as bike sharing.

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12 “Delhi roads Indias most dangerous”, web-article from The Times of India, June 2014
13 Chhavi Dhingra and Santosh Kogukula, “Public Bicycle Scheme, applying the concept in Developing Countries, examples from India”, SUT technical document.
However, it is changing, and some cities like Delhi, Ahmedabad, Bangalore, Nanded and Visakhapatnam (see Appendix 2.3) have started to introduce bicycles on rent or special NMT programs. Indeed, it first needs good and safe infrastructures for people to get attracted by the idea of using bicycles more regularly. NMT also needs awareness raising and campaigning to promote bicycling use in order to raise attractiveness.

2.4.1 Anecdotal bicycle sharing systems

Bike rental situation in India is quite anecdotal. In 2009, Delhi created a network of 2.5 meters wide segregated bicycle lanes around the BRT corridor along with a bike rental scheme called “Green Bike”. But those bikes are heavy, cumbersome, and not very efficient as the bicycle has to be brought back to its origin rental station. Moreover, the lack of extended cycling friendly infrastructures is a real barrier to making local trips by bicycle.

Another attempt was made in Thane, Maharashtra (FreMo – Freedom to move), but was also not successful as the project did not get the government’s support or financial help. Thus campaigning and awareness raising could not be effective.

Bicycle sharing scheme has also been launched at a very small scale in Bangalore, in the main city (ATCAG) and in the campus of the Indian Institute of Science (IISc - Namma cycles). Other projects are in the pipeline in Mysore and Chandigarh.

Debate about bicycle sharing is still going on between planning authorities that prefer to focus on heavy projects such as metro and lack interest or faith in these smaller projects, and other organizations, such as the Institute for Transportation and Development Policy (ITDP), defending the financial interest of such green projects toward mass transit projects and their interest as a very good long term alternative to private motorized vehicles.

The following SWOT analysis summarizes the main features of bicycle sharing:

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Very low cost of travel as compared to other modes for short distance</td>
<td>• Lack of strong political commitment towards sustainable urban transport</td>
</tr>
<tr>
<td>travel;</td>
<td>planning and cycling as main travel mode; hence, governments do not have</td>
</tr>
<tr>
<td>• Good for Health;</td>
<td>much faith in the service providers or first generation entrepreneurs;</td>
</tr>
<tr>
<td>• Environmentally friendly;</td>
<td>• Poor bicycling infrastructures;</td>
</tr>
<tr>
<td>• Low recurring costs (salaries and servicing only);</td>
<td>• Mixed Traffic conditions;</td>
</tr>
<tr>
<td>• Cycling is not a new mode and most people have cycled as children in</td>
<td></td>
</tr>
<tr>
<td>India, which makes the learning curve not too steep;</td>
<td>• Concerns about safety, especially of children of roads are valid;</td>
</tr>
</tbody>
</table>
| • More usage will result in overall reduction of GHG emissions and      | • Poor image of cycling in the society; looked upon as a « poor man’s mod »,
|   bringing down global warming;                                          |   and against rising social status; cost intensive projects like metros, |
| • Public spaces made available to the people, not to vehicles;           |   parking lots and express-ways receive more campaigning, advertising and |
|                                                                          |   popularity as they are perceived as « modern »;                        |
|                                                                          | • Inadequate data on user groups and their needs.                         |

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• With the NUTF, cities in India are in the process of revamping public</td>
<td>• The weather in India is not conducive to cycling and walking too much;</td>
</tr>
<tr>
<td>transport infrastructures and services, and these could be easily</td>
<td>• Most work places do not offer bicycle friendly facilities like bicycle</td>
</tr>
<tr>
<td>tied in with such schemes;</td>
<td>parking, showers, employee incentive to use public transport, etc.;</td>
</tr>
<tr>
<td>• There will be an increased demand for feeder services once more BRT and</td>
<td>• Auto-rickshaws and bicycle rickshaws could offer more innovative and</td>
</tr>
<tr>
<td>metro systems come up; especially Delhi and Mumbai will have lot of</td>
<td>convenient options for short distance trips;</td>
</tr>
<tr>
<td>potential;</td>
<td>• Public transport could offer their own motorized feeder services which</td>
</tr>
<tr>
<td>• New housing complexes, high rise buildings, etc... that are coming</td>
<td>might defeat the feeder purpose of bike sharing schemes;</td>
</tr>
<tr>
<td>up can all make bicycle sharing programs part of their development;</td>
<td></td>
</tr>
<tr>
<td>• People’s interest in cycling for better health and environment may in</td>
<td></td>
</tr>
<tr>
<td>turn also increase public transport patronage is proper integration is</td>
<td></td>
</tr>
<tr>
<td>provided, as also will concessions offered on public transport fares</td>
<td></td>
</tr>
<tr>
<td>for bicycle users;</td>
<td></td>
</tr>
</tbody>
</table>

Table 3: SWOT analysis for implementing bike sharing schemes in India from the GIZ Sustainable Urban Transport Project (GIZ SUTP)

DHINGRA Chhavi, KOGUKULA Santosh, “Public Bicycle Scheme: applying the concept in developing cities/examples from India”, GIZ SUTP Technical Report, September 2010
2.4.2 Which future for the Cycle rickshaws?

Cycle rickshaws are mostly blamed for creating congestion and creating an degrading image. This service actually forms an important feeder service for public transport systems and are the preferred mode of transport for short distances. According to the ITDP, they contribute to the reduction of air pollution and provide honest means of living to 3% of India's population without any financial investment or support from the government. Moreover, most of the rickshaw pullers are unskilled, uneducated or landless farmers who don’t have a choice. Thus, ITDP also defends cycle rickshaws in the Indian context by comparing their working conditions with other jobs such as construction workers, labourers or luggage porters in railways stations.

In some cities, cycle-rickshaws are slowly and steadily being replaced by new electric-rickshaws, which are faster, silent and work on a shared basis. Cycle rickshaws remain active in many small and medium cities and in some particular districts of large cities such as the old city of Delhi where the streets are too narrow for auto-rickshaws and buses.

Only few cities have decided to really consider the upgrade of cycle-rickshaws. An example of best practice are the Ecocabs in Fazilka (Punjab). This “dial-a-rickshaw” system uses the latest IT tools and real time technologies. The vehicles have also been made easier to manoeuvre for the drivers. But still, most of the innovations are made for auto-rickshaws, as it has been explained previously.

According to most of the NGO and research bodies working in the field of NMT, cycle rickshaws won’t disappear, mainly because of its social and environmental importance. But for now, cycling infrastructures along with the upgrade of the cycle-rickshaws don’t represent a priority for the cities, and their development might take some time.

2.4.3 Few initiatives of NMT promotion

In order to encourage the use of bicycling, walking and public transport, some special projects have been implemented in cities like Nanded or Visakhapatnam and some temporary initiatives were taken such as the Raahgiri Day every week in Gurgaon, reserving streets for pedestrian activities only (see Appendix 4).

The city of Nanded (Maharashtra) launched a Street Improvement Strategy. About 50 km of the street have been designed to provide a better level of service to different types of road users. The master plan of the road network includes separate lanes for pedestrians and Non-Motorized Vehicles (NMV). The city of Visakhapatnam (Andhra Pradesh) launched a Low-Carbon Mobility Plan which includes more footpaths and a cycling network, with traffic calming and safe crossing to make road safer.

NMT infrastructures have also been improved along BRT corridors under JnNURM with continuous footpaths separated from the cycle lanes, zebra crossings or bicycle parking. According to a study made by Jain and Tiwari (2011), improving NMT infrastructure in cities is likely to shift to 30% of the trips shorter than 5km from two-wheelers, three-wheelers and buses to NMT.

The MoUD also showed interest in NMT by organizing the first national consultation meeting in June 2011 and constituting four sub-groups: National Policy for promotion of Non-motorized Transport in Indian Cities, Tool-kit for Public Bicycle Scheme Project, Product Design and specifications for the Public Bike Schemes In India and Financing Public Bicycle Scheme.

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17 IUT, “Best Practice in Urban Transport”, report, September 2013
CONCLUSION

As India is a vast country, it is impossible to explain the entire urban transport service with one trend. Some noticeable points can still be mentioned like the increasing development of mass transit with the multiplication of BRTS and metro project, the financial effort for upgrading the bus system in many cities, the appearance of new kind of infrastructure or the remaining vital importance of IPT systems. Behind this energy, many aspects still need a lot of improvement such as roads or non-motorized facilities.

The government’s urban transport strategy is now focused on public transport. According to ongoing studies supervised by the MoUD, some main concerns can be identified. First, the upgrade of IPT represents a very important challenge at many scales as this system is present in all kind of cities, will certainly not disappear and needs technological improvement, regulation and financial model under a proper planning. Then, as new modes are developing mostly in large cities, the notion of inter-modal management is appearing. New operational models, infrastructure or fare management have to be implemented in order to efficiently provide a complete transport network. The integration of first and last mile connectivity is one of the main issues for these upcoming networks. Finally, the MoUD also encourages green initiatives and looks for solutions that can ensure sustainability of future urban transport. Environment protection may not be a pretty hot topic yet – pulled aside by the strong need of economic development – but environmental issues are slowly appearing in mobility plans, and might lead decisions in the development of new transport systems in Indian cities in the incoming years.
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• Hindustan Times, http://www.hindustantimes.com/
• The Hindu Business, www.thehindubusiness.com
• The Economic India Times, http://economictimes.indiatimes.com/
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• The Hub (EMBARQ India), http://embarqindiahub.org/
• The City Fix (EMBARQ), http://thecityfix.com/
### APPENDIXES

#### APPENDIX 1: REVIEW OF URBAN TRANSPORT MODES

<table>
<thead>
<tr>
<th>Public Transport</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>InNURM low-floor buses</strong>&lt;br&gt;They have different characteristics: they are with or without AC (red or green colour buses), they can accommodate wheelchairs and display next stops information on a LED board.</td>
</tr>
<tr>
<td><strong>Local city buses</strong>&lt;br&gt;Local buses have different features, but they are all managed by the State Government owned Transport Corporations.</td>
</tr>
<tr>
<td><strong>BRTS</strong>&lt;br&gt;It has been implemented in 8 cities (Ahmedabad, Jaipur, Rajkot, Surat, Vijayavada, Indore, Bhopal, Pune). Other projects are ongoing.</td>
</tr>
<tr>
<td><strong>Suburban Railway</strong>&lt;br&gt;This heavy commuter rail system is present in most of large Indian cities. It is operated in each case the Indian Railways state-owned enterprise.</td>
</tr>
<tr>
<td><strong>Metro Rail</strong>&lt;br&gt;New mass transit system available in Delhi, Kolkata, Bangalore and Gurgaon. More projects are in the pipeline.</td>
</tr>
</tbody>
</table>
**Monorail**
The only working monorail is in Mumbai. Other projects are on hold in Thane, and under construction in Thiruvananthapuram and Kozhikode.

**Tram**
The only tram network that remained operational in India is located in Kolkata, and runs since 1902.

### Intermediate Public Transport (IPT)

**3-seater auto-rickshaw**
It usually works on a private basis, offering a door-to-door service to the commuter. The colour of the vehicle can change from one city to another. It can use CNG, LPG, diesel, or petrol. Fares are either fixed by the RTO, the unions or the driver himself. Sometimes it has a meter.

**6-seater auto-rickshaw**
Those auto-rickshaws can ply on a shared basis (along fixed routes) or on a private basis, according to the city.

**7-seater Tempo (Tata Magic)**
Those vehicles have fixed fares and fixed routes. They act as a shuttle service in many cities like Chandigarh, Delhi, Alwar, Jodhpur, Bhopal or Indore.
<table>
<thead>
<tr>
<th>Non-motorized Public Transport</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Battery operated vehicles</strong></td>
<td>Also called e-rickshaws, they are quite recent (2011) and tend to replace cycle-rickshaws. They mostly work on a shared basis and act as a feeder service. These are not legal but these are widely used in Delhi and other parts of India.</td>
</tr>
<tr>
<td><strong>Motorcycle Taxi</strong></td>
<td>It is available only in the state of Goa, where motorcycles are a licensed form of taxi.</td>
</tr>
<tr>
<td><strong>Cycle-rickshaws</strong></td>
<td>It is available in almost all the cities, in the areas where buses and rickshaws cannot operate because the streets are too narrow.</td>
</tr>
<tr>
<td><strong>Hand-pulled rickshaws</strong></td>
<td>Hand-pulled rickshaws are still available in Kolkata. It has been banned but the government has failed to impose the law stringently.</td>
</tr>
<tr>
<td><strong>Others</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Radio Taxi</strong></td>
<td>This service runs in the biggest cities such as Delhi, Mumbai, Kolkata, Bangalore or Chandigarh.</td>
</tr>
</tbody>
</table>
Appendix 2.1: Bus funding and BRTS projects

All bus fleet renewals were done in 2009 under the JnNURM program. This map only highlights the most important renewals. Many other cities have benefited from JnNURM to get new buses, rising a total additional amount of 8.34 billion rupees. The following cities were concerned: Agartala, Aizwal, Ajmer, Allahabad, Amritsar, Asansol, Bhubaneswar, Bodhgaya, Chandigarh, Dhanbad, Dehradun, Faridabad, Gangtok, Haridwar, Imphal, Indore, Itanagar, Jabalpur, Jammu, Jamshedpur, Kohima, Ludhiana, Mathura, Meerut, Mysore, Nainital, Nanded, Nashik, Panaji, Patna, Puducherry, Raipur, Ranchi, Shillong, Shimla, Srinagar, Thiruvananthapuram, Tirupati, Puri, Ujjain and Varanasi.
The total amount of investments involved in metro systems exceeds 3 700 billion rupees (approximately 60 billion dollars).

**GSRTC**: Gujarat Road Transport Corporation  
**HMR**: Hyderabad Metro Rail  
**MEGA**: Metro-Link Express for Gandhinagar & Ahmedabad  
**MRTS**: Metro Rapid Transit System  
**NMM**: Navi Mumbai Metro  
**TTMC**: Traffic Transit Management Centre
Appendix 2.3: Alternative transport projects and Intelligent Transport Systems

CGRAPS: transport control center in Pune
ITS: Intelligent Transport System
ATCS: Area Traffic Control System
PIS: Passenger Information System
AVLS: Automated Vehicle Location System
IGVTD: Integrated GIS-based automatic Vehicle tracking and Traffic management + Distress call response management + Critical public place surveillance system
TRMS: Traffic Regulatory Management System
ATCAG: Automated Tracking and Control of Green Assets
HTRIMS: Hyderabad Traffic Integrated Management System
NMT: Non-Motorized Transport
Phase I and II of the Delhi metro have been respectively completed in 2006 and 2011. Currently under the phase III, the first range of orbital lines are being built linking the different axial lines together. The phase IV will consist in a second range of orbital line and additional extensions.
APPENDIX 4: RAAHGIRI DAY IN GURGAON

The idea

Like in Bogota. Clear the streets from motorized vehicle for in day per week.

Inspired from the “Sunday Streets Cyclovia” in Bogota, the concept is to close a selection of streets to cars and motorbikes every Sunday. The city of Gurgaon decided to experiment such event and organized the first “Raahgiri Day” in November 2013. The last one happened in October 2014.

The facts

Gurgaon closed 10 km of roads to cars every Sunday. Bicycles were still free to go and many activities were organized in the streets such as music, yoga or sports.

The city registered 350 000 participants till April 2014, most of them from middle-high class. It was revealed than most of the participants stayed more than 4 hours in the streets.

The impact

Several benefits have been identified for Raahgiri Sundays18.

- Economy: the rise of 29% of sales shows a business improvement mainly for eateries.
- Environment: car prohibition implied an improvement of air quality on Sundays: the exposure to PM2.5 was 99.8 µg/m3 against 147 µg/m3 on a normal Sunday and 194 µg/m3 on a week day.
- Comfort: a diminution of the noise level has also been noted with an average of 74 dB against 88 dB during a normal Sunday.
- Safety: 0 fatalities were recorded in 6 months during Sundays.

What next?

Whereas the event stopped in Gurgaon, the idea spread in India and other cities started to replicate the idea such as Navi Mumbai and Ludhiana. Delhi also recently organised a “revival” of Gurgaon Raahgiri day in Connaught Place.

However, despite the success of Raahgiri Day, the authorities don’t seem to be serious about building cycling tracks now wanted by the population. The Municipal Corporation of Gurgaon still maintain they are working on tracks design while Raahgiri organizers fighting for cycling in Gurgaon regret a lack of interest.

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18 “Impact of Raahgiri Day”, presentation by EMBARQ, June 2014
Pictures from EMBARQ