



Transport : Lifeline for Development

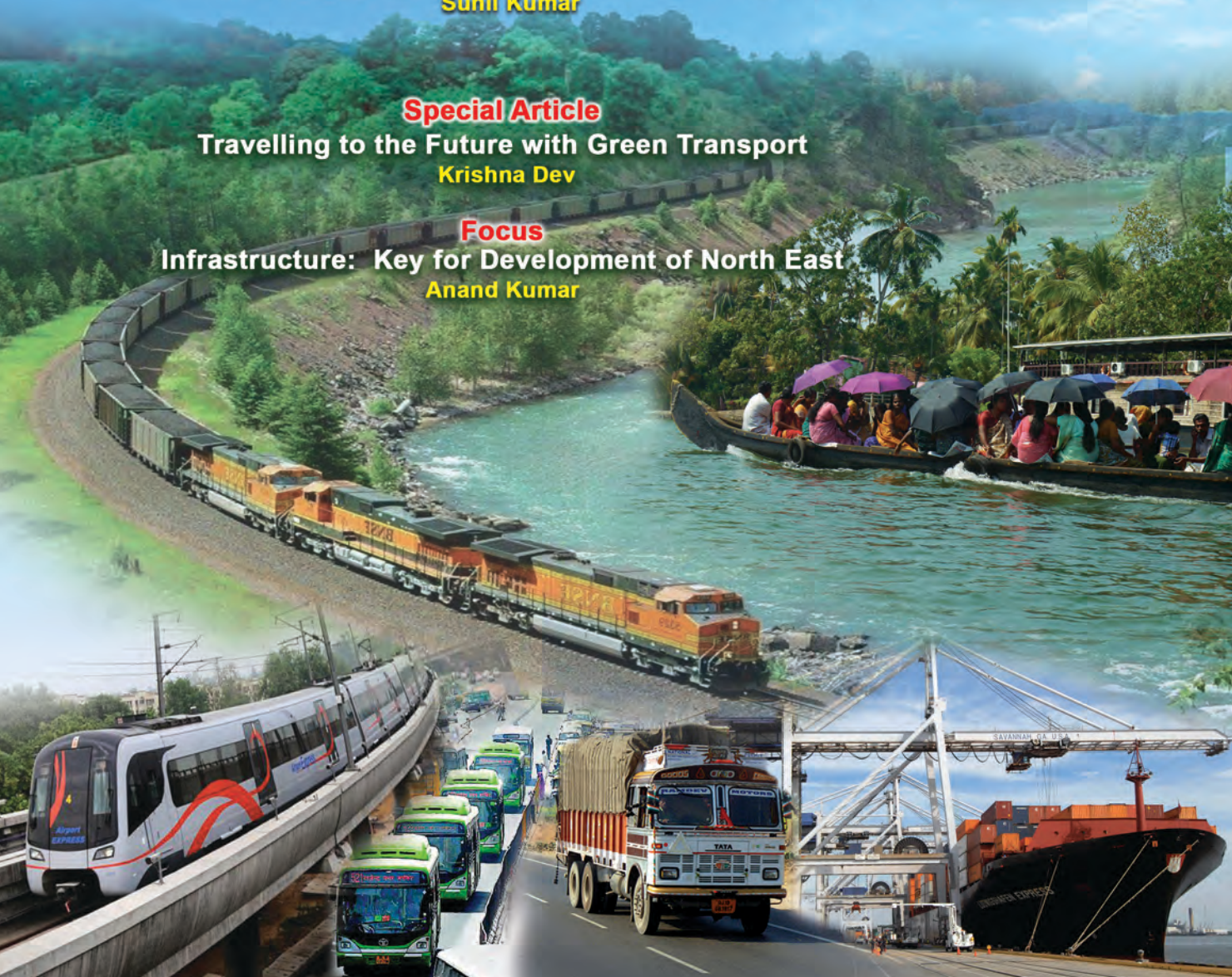
Transport Infrastructure : Way Forward
G Raghuram

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Focus
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Inland Waterways as National Waterways

The Government has approved the proposal for enactment of Central Legislation for declaring 101 additional Inland Waterways as National Waterways for navigation.

Inland Waterways transport has immense potential for passenger as well as domestic cargo transportation. Central Government can undertake development of an Inland waterway for navigation, only when it is declared as National Waterways by an Act of Parliament. Therefore, for the development of additional 101 identified waterways for the purpose of navigation, it become necessary that these inland waterways are declared as NW by an Act of Parliament.



Inland water transport (IWT) is world over recognised as a fuel efficient, cost effective and an environment friendly mode of transport, especially for bulk goods, hazardous goods and over dimensional cargo. The enormous socio-economic and environmental advantages of IWT mode of transportation over other modes such as rail and road can be seen from the following :-

(i) Cost savings :

- 1 HP moves 150 kg on road, 500 kg on rail and 4000 kg on water. ● 1 litre of fuel moves 24 t-km on road, 85 on rail and 105 on IWT. ● Cost of developing waterways is much lower than rail & road.
- Reduces transportation and transition losses.

Inter Modal Comparative Operating Costs Rs/TKM

Mode	VOC/Freight (Rs/TKM)	Taxes	Total Rs/ TKM
Railways	1.36	3.71%	1.41
Highway	2.50	3.09%	2.58
IWT	1.06	NIL	1.06

Source : Railways –Ministry of Railways, Road – TTSS, IWT – IWAI

(ii) Environment friendly:

- Least fuel consumption per tonne – km. ● CO2 emission is 50 percent that of trucks.
- Negligible land requirement. ● Safe mode for hazardous and over dimensional cargo.

(iii) Supplementary mode:

- Reduces pressure on road and rail. ● Reduces congestion and accidents on road.

In view of the large network of inland waterways in India, there is vast potential in IWT to act as an alternate and supplementary mode of transportation. However, so far, in the last 30 years, only the following five waterways have been declared as National Waterways :-

- (i) Allahabad-Haldia stretch of Ganga-Bhagirathi-Hooghly river system (1620 km);
- (ii) Dhubri-Sadiya stretch of River Brahmaputra (891 km);
- (iii) Kottapuram-Kollam stretch of West Coast Canal along with Udyogmandal and Champakara Canals (205 km);
- (iv) Kakinada-Puducherry stretch of canals along with designated stretches of Godavari and Krishna rivers (1078 km); and
- (v) Designated stretches of East Coast Canal, Brahmani river and Mahanadi delta (588 km).

Due to very little investment made so far on development of this mode compared globally and to the road and rail modes in the country, IWT mode remains under developed and its share in overall internal cargo transport remains abysmally low. IWT sector presently has a meagre modal share of 0.4% in India compared to 42% in Netherlands, 8.7% in China and over 8% in USA. This is a great economic opportunity loss to the country.



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Pathway to Progress

The history of humankind is replete with instances of migration - Africa to Asia & Europe; Central Asia to India (the 'Aryan invasion'); across the freezing Atlantic from North America to Alaska & the Arctic regions or visa versa. All this entailed transport of men & material. So, means of transport were always an important factor in human evolution - whether it be on foot, bullock carts, horses, donkeys, yaks, camels or the high flying aircraft carriers which reach you to places across the globe in a few hours.

When we talk of transport today, what we actually mean are highways and super-highways, bullet trains flying by on fast tracks, the metro rail which has metamorphosed urban life, et al. Road transport is still the prime means of conveying people & goods from one place to another. This means that a country needs good, well maintained roads covering the length and breadth of the country, including remote and inaccessible regions. This is a generation of migration again, like our ancestors, when people move away from their hometowns to the big cities in search of livelihoods. Travelling for holidays has also become a big fad nowadays. And, of course, consumer and non-consumer items are also transported from one place to another, whether it be milk & vegetables or refrigerators & washing machines. Roads are, thus, to a large extent the nerve centre of the economy. Planning & building more roadways, connecting the remotest parts of the country is thus, crucial to a developing economy like India, specially with 'Make in India' policies of the government.

The 'chug chug gaadi' has been the metaphor for many a film song sequence - from Ashok Kumar's 'rail gaadi, rail gaadi' in Ashirwad to Shah Rukh Khan's 'Chaiyyan, Chaiyyan' more recently. One of the excitements of travelling during my childhood was to watch through the windows of the train for curves when you could see the entire train. But the railways are not just the kind of things dreams of made of. The railways, with its wide network of goods and passenger trains, is truly the lifeline for a vast country like India. From transporting passengers from Kashmir to Kanyakumari to conveying coal and iron to our factories, railways does it all. India, has perhaps, one of the best and most extensive rail networks in the world, operating 21,000 plus trains per day, though sadly, a highly unsung fact. It is only the accidents and delays that make the news, not the fact that it conveys passengers & goods at such cheap rates.

Shipping and waterways are just as important means of transport in a country with oceans on three sides and a mighty rivers criss-crossing the country. The Sagarmala project of the government aims to make ports engines of growth. So also its decision to make inland waterways national waterways, thus utilising our riverways as tools of development.

You cannot talk of transport without talking of pollution in the same breadth. Both seem to go hand & hand, the one not existing without the other. Green means of transport like the cycle, cycle rickshaws, victorias, hand carts, etc and of course, the daddy of them all, the human foot, should be encouraged as means of transport at least for short distances. Why should one take a bike or car to go grocery shopping at the nearby grocery shop? A morning walk to buy milk and bread is definitely more healthy than zooming over on a bike. Also, green belts around highways and major roads should be planned to create an oxygen belt around them. The government's Green Highway Policy is a welcome step in this direction.

Aviation is still thought of as the rich man's mode of transport. However, that is fast disappearing myth, if one only checks out the airports today. They are full of people of all ages & economic status. This is primarily because people want to travel fast & reach speedily. Civil Aviation has, therefore, become an important means of travel. The government is trying to come to terms with this fact and the civil aviation policy is soon expected.

The English poet Robert Frost said in one of his poems, 'The woods are lovely, dark & deep. And I have miles to go before I sleep'. Our first Prime Minister Pandit Jawarhalal Nehru quoted this often when he talked of development milestones. It is true that the major means of transport - roadways, railways and aircraft carriers - are crucial to development of the nation and issues related to them should be addressed if the government wants to put the nation on the economic map of the world. □





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Transport Infrastructure: Way Forward

G Raghuram



...the directions for transport infrastructure development should be driven by speed with sustainability, safety, security, and stresslessness. I would call this the five 'S's of transport infrastructure development

The trend in transport demand profile in India has been characterised by an increasing share of road transport and increasing share of personalised transport (especially the motorised two wheeler). While the road infrastructure based facilitation of road transport, especially in the 2000-2007 period (NHDP and PMGSY), would have most certainly contributed to the jump in GDP growth, the impact on energy and environment, and safety would be far from desirable. It is important to reverse the trend of increasing market share of road and personalised transport towards more environment friendly transport modes like rail and water.

Transport demand can at the first level, be categorised into international and domestic movement (including for export/import). Ports and airports are the gateways for the export/import traffic. We first examine domestic movement and then international.

At the next level, the transport demand can be categorised into freight and passenger. There are no clear estimates on the relative value, effort or environmental impact of the two domains. However, examining the data

of Indian Railways from a revenue perspective, about 70 per cent of the economic value is generated from freight. Similarly, 80 per cent of interregional road movement would be accounted for by freight vehicles as per toll booth information.

One of the major concerns of transport infrastructure planning is the non availability of authentic data, especially in the road domain. The last attempt at a scientific sample survey based study for freight transport was conducted in 2007-08 at the behest of the then Planning Commission by RITES. Based on this study, the following is the estimated modal share of about 1400 billion net tonne km (btkm) of freight movement in the country.

It is time that we put together a mechanism for a more scientific and periodic collection of road data. It should be noted that this information is available in electronic means with the large number of trucking companies and the shippers.

The National Transport Development Policy Committee (NTDPC) has tried to estimate the overall freight traffic until 2031-32, using a growth rate of 1.2 times the

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Table 1: Modal Share of Freight Traffic		
Mode	2007-08 (RITES)	
	btkm	per cent Share
Road*	706.0	50.00
Rail*	508.0	36.00
Pipelines	105.0	7.50
Coastal Shipping	86.0	6.00
Inland Water Transport (IWT)	3.5	0.24
Airways	0.3	0.02
Total	1408.8	100.00

Source: Total Transport System Study (TTSS) by RITES Limited, as reported in NTDP 2013

*Excluding intra-regional traffic

GDP growth rate. This multiplier is questionable, both based on past traffic growth, which has not exceeded the GDP growth rate, and given that India has about 60 per cent service sector share in the GDP. As per this multiplier of 1.2, the expected freight traffic would be as below.

Table 2: Projection of Rail Freight Traffic	
Year	btkm
2011-12	2053
2016-17	3056
2021-22	4834
2026-27	7856
2031-32	13118

Source: NTDP 2013

The NTDP would like to see an increasing share of rail transport from 35 per cent to 50 per cent. This would imply that the btkm of rail freight would have to go up from 650 in 2013-14 to ten times, ie 6500, by 2031-32. It would also be important to see how water (coastal shipping and IWT) can increase its modal share, with pipelines sustaining their share, bringing these environment friendly modes to at least 20 per cent. If this were possible, then road share can be brought down to 30 per cent, leading to significant savings in carbon impact.

Increasing rail share would not come easy unless the important aspects

of customer orientation and capacity enhancement are addressed. The right direction for this would be to increase separation between infrastructure and services, with services coming under structures that can be more market oriented, including, if need be, through competition and privatisation.

Customer orientation was attempted in opening up container services to the private sector. The experience has not been as anticipated. There are lessons to be learnt in terms of clearly defining the roles of the authority who is also the infrastructure provider and the service provider. Appropriate oversight mechanisms in the form of a commercial regulator would be required. There are huge opportunities to improve customer orientation in the passenger domain.

Capacity enhancements in rail need to come both from additional modernised infrastructure, like the dedicated freight corridors, as well as extracting more from the existing network. There is a lot of opportunity in the second approach through improved signalling and infrastructure to debottleneck junctions.

In the context of passenger, increasing speeds by a quantum jump for interregional movement is essential. While increasing speeds on the existing right of way can be an option, the benefits derived would not be substantial since it would be under mixed traffic conditions. Dedicated high speed corridors would be the way to go. Apart from being a game changer in terms of connectivity, this would also enable significant technology spin-offs.

While being an environment friendly mode in terms of carbon impact, the Indian Railways are far from environment friendly due to their continuing open discharge toilets. There have been concerns in still evolving the appropriate technology. Further, toilets being used for solid waste disposal has created a different problem, requiring an holistic approach to not only design of toilets but also design of more friendly and accessible solid waste disposal system.

Roads continue to need a lot of attention. Apart from four laning all regional corridors, expressways in high density corridors is the way to go. Rural roads, as developed under PMGSY, have contributed a lot to rural connectivity. However, the connectivity needs to penetrate beyond 'villages' to settlements. Such connectivity needs to be motorcycle friendly since motorcycle ownership is significantly on the rise, with nearly 30 per cent of the rural households owning motorcycles.

The PPP route of road development should continue to be emphasised with appropriate viability gap funding, and land acquisition and environmental clearances, being provided by the government. In terms of financing, it may help if land acquisition costs are with the government.

The trucking sector needs due support by the biggest concern of frontline 'corruption' and 'harassment' by various regulatory authorities being addressed. Other commercial deterrents like driver availability, roadside facilities, dual licensing of power cabs and trailers, and electronic tolling, need immediate attention.

India's record on road safety is amongst the poorest in the world. Better road engineering and furniture, and driver training and licensing, should be emphasised. This should be complemented by roadside support for emergency assistance. While there is sensitivity on these services, implementation could be better. The recent initiative to have tree plantations on the land adjacent to highways need caution. As per many international studies, trees are the biggest killers during accidents. This is specially significant when we are trying to increase the average speeds on the roads.

The average productivity of the over eight million trucks in India is under 300 km per day. There is potential to increase this by not only making each journey faster with fewer unwanted stoppages, but also by more efficient reuse of trucks after

each journey. The latter could happen with internet based platforms offering a market place, very much like the application based taxis.

Pipelines are largely driven by the petroleum companies and are used as captive infrastructure. There are pipelines for coal slurry and iron pellets. On similar captive format, there are conveyer belts, especially in the mining areas. Pipelines are also used for water transportation, but don't get recognised in the transportation domain. There is opportunity for more pipeline usage, which would get driven by the respective users as and when volumes justify the investment.

From an environmental perspective, there is opportunity to increase the share of coastal transport, given India's long coastline. However, issues of hinterland connectivity, cabotage, customs, taxation and duties, and berth availability in the larger ports, have held back the usage of this mode. There have been recent initiatives at easing the policy regime and encouraging coastal transportation. The potential shippers and service providers would need greater consistency in policy, with even subsidy based incentivisation in the early years to build the market.

IWT, while seemingly a big opportunity, needs significant investments before it can be a viable mode of transport. In many ways, India missed the boat of the industrial revolution, since by the time 'modern' transport came to India, rail and road were already the viable means of transport. The largest IWT system in India is actually the river Hooghly, right from the mouth of the river until the port of Kolkata and even a little beyond. This does not get recognised as IWT since this comes under the jurisdiction of the port of Kolkata. The rivers in Goa are also used for IWT. The government is investing in significant stretches of the Ganga, rightly so. This could provide an

opportunity for learning, both in terms of infrastructure requirements and commercial viability. Combinations of coastal and IWT also have scope for coal movement from mines to thermal power plants.

Aviation has been growing reasonably, with the 'open skies' policy for the airlines. Non AAI (including private) involvement in the airports has been stopped after six airports. There are a large number of airports which are not profit making. There could be significant potential in increasing their revenues through non aeronautical sources, with appropriate market orientation. Whether AAI should play the role of actually being involved in development and delivery or just oversight to bring in commercial players is an important question. In any case, an essential air services fund to promote smaller aircrafts would be important.

Aviation needs attention on improved safety at world class levels. Our safety standards and the regulation behind them have come in for international notice as being inadequate. A related issue is whether the air navigation services should be separated from airport management of the AAI, not only to provide focus, but also to ensure that there is no conflict of interest between navigation and airport management which has players other than AAI.

In terms of international traffic, airports provide the face of India. It is important that airports that bring in international passengers are of world class standards, which Delhi, Bangalore, Hyderabad and Mumbai have reached. Some of the AAI airports are also in that league. Traditionally, it has been felt that having a hub airport for international transit passengers would be important for India. With the increasing use of long haul aircraft for point to point movement, the need for such airports gets reduced. However, transit between domestic and international segments would

still be important. None of our major airports are truly integrated in terms of handling such transit passengers in a streamlined manner.

Ninety five per cent of international freight traffic by volume is handled at ports. In terms of bulk movement, there are still opportunities to reach world standards in terms of automation and evacuation. For container transport, while we have developed at a national level with largely private involvement, transshipment ports have to still evolve. India is well placed for developing transshipment ports on both the coasts. Often, legal and regulatory issues have delayed projects. Better policies for commercial and security clearances are required.

In conclusion, most transport movement is multimodal, both for passenger and freight. One of the most important structural problem at the highest level is that we have multiple ministries focussed on their own modes of transportation. This does not lend itself to an integrated multimodal perspective for transportation. Structural reforms to help integrate policy making across the ministries. There are larger issues like the creation of logistics parks, goods and service tax which also have a significant bearing on streamlined transportation.

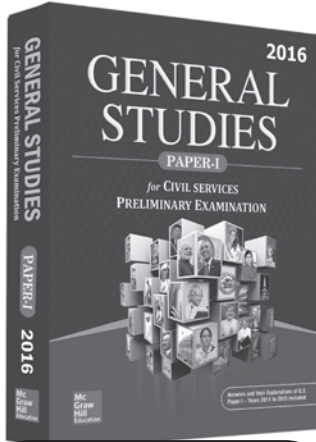
Transport infrastructure development needs a good regulatory framework. Such regulation must address licensing, environmental impact, safety, security, pricing, service levels and dispute resolution. If in any domain, competition is significant, then pricing and service levels would not need regulation. Not all modes have the appropriate regulatory framework.

Given the above, I would like to conclude that the directions for transport infrastructure development should be driven by speed with sustainability, safety, security, and stresslessness. I would call this the five 'S's' of transport infrastructure development. □

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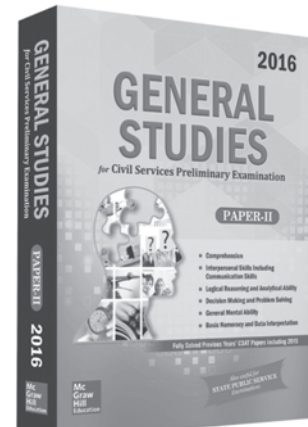
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The last two decades have witnessed India's urban population grow by almost 3 per cent per year and is currently 377 million as per the 2011 Census. It accounts for 31 per cent of the total population and it is projected that by 2026, 38 per cent of Indians will live in cities and the total urban population will rise to 534 million ("Population Projections 2026," 2006).

Cities are referred to as the "engines of economic growth". Despite having only about 30 per cent of the total population, nearly 62-63 per cent of India's Gross Domestic Product (GDP) comes from the urban areas. Future growth is also likely to concentrate primarily in the urban areas, and its estimated contribution to GDP is likely to reach 75 per cent by 2030. Hence, anything that constrains the smooth functioning of cities has the potential to constrain India's economic growth.

Even with the current size of the urban population, Indian cities are facing severe congestion, deteriorating air quality, increasing emission of Green House Gas (GHG) from the transport sector, an increasing incidence of road

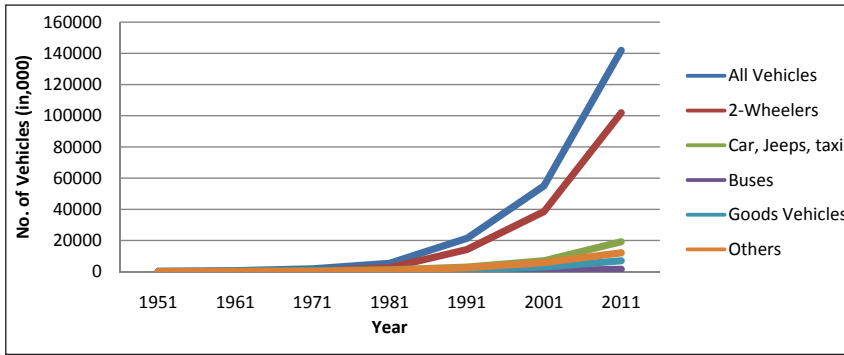
accidents and an exploding growth in the demand for petroleum fuels that threatens the energy security of the country. With the urban population projected to grow more than double in the next one generation, the situation is likely to go completely out of control and may thwart India's economic development efforts unless remedial measures are taken quickly.

As a result of the rapid increase in urban population and economic activity, India has experienced a rapid growth of motor vehicles in the last decade. The total number of motor vehicles in India increased from 52.37 million in 2000 to 121.63 million in 2011 i.e. an average growth rate of 9 per cent per year. Figure 1 shows a huge growth in the number of registered motor vehicles from 1951 to 2011. In fact, the growth rate in the number of vehicles has been much faster than that of population.

The total number of registered motor vehicles in India increased from about 0.3 million in 1951 to nearly 142 million in 2011 (MoRTH, GoI, 2013), registering an increase of 7.7 per cent per annum. as against population increase of 3.8 per cent per annum during the same period. During

The author has more than 12 years of experience in urban transport consulting sustainable urban transport planning and architecture design. She is in charge of GEF SUTP Capacity building project and Urban Mobility India Conference at Institute of Urban Transport (IUT) and has led various studies and guidelines like the revised CMP toolkit, Improving and Upgrading IPT Services and Best Practices in Urban Transport. She has also been providing technical support to MoUD on behalf of IUT. She has presented number of papers in international conferences and has published papers in various journals. During her career she has worked in various project development studies for sustainable urban transport projects and strategic intervention tools and her core experience is in public transport planning, economic & financial planning and transaction advisory services. She is a certified trainer of MoUD, Government of India and has been imparting training on Sustainable Urban Transport.

Figure 1: Category-wise Registered Vehicles in India



2001-2011 the growth was even faster at 10 per cent per annum.

Like the population growth, motorization growth has also not been uniform across cities, with some having grown faster than others. The mega cities like Mumbai and Kolkata seem to have had a slower growth in motorisation as compared to tier II and tier III cities, as seen from Figure 2. This could be partly attributed to the higher population growth rate but mainly it is due to the unabated urban sprawl in these cities over the years. Studies reveal that cities with pre-existing mass transit systems, like Mumbai and Kolkata, showed lower vehicular growth.

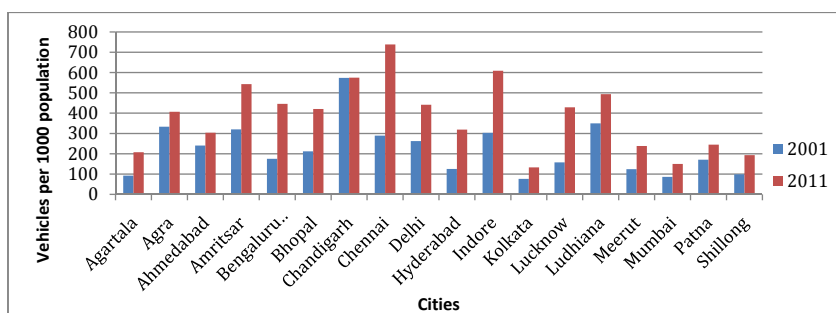
Thus, the smaller cities, which do not have a good public transport system are witnessing very rapid motor vehicle growth. It is essential to arrest this trend quickly before it becomes unmanageable.

Impact of Rapid Motorisation

Rapid motorization has resulted in a number of associated problems as listed below:

- **Congestion** – The number of vehicles in cities has increased by over 26 times since 1981, as against the road space, which has increased by only 3.35 times. Reduced road space for motor vehicles coupled with longer and increased frequency of trips has resulted in severe congestion in cities.
- **Reduced Travel Speeds** – Indian roads are characterized to have heterogeneity in traffic such as bicycles, cycle rickshaws, auto-rickshaws, taxis, motorbikes, two-wheelers, cars and buses and all compete for the same road space. Vehicles capable of travelling at high speeds end up travelling at the speed of the slowest vehicle on the road. In most of our cities, both large and small, travel speeds are slower than most of the international cities. In fact, in many of the Indian cities, the speeds are comparable to average cycling speeds (i.e. 15-16 kmph).
- **Safety** – between 2001 and 2011, the number of road accidents increased by 22 per cent and the worst affected are the pedestrians and two wheelers.

Figure 2: Trends in Vehicles/1000 population in Select Indian Cities



Source: Road Transport Year Book, 2012 (MoRTH, GoI, 2013) and Census of India

- **Air Pollution** - Statistics show that about 70 per cent of the air pollution is caused by road transport. Uncontrolled air pollution has adversely affected the health of the people and the quality of life of city inhabitants. For example, with about 9.0 million registered vehicles, Delhi has acquired the dubious distinction of being the fourth most polluted city in the world. The data on air quality shows that although SO₂ and NO₂ levels are below the National Ambient Air Quality Standard (NAAQS) in most of the cities, the Suspended Particulate Matter (both respirable and non-respirable) is disturbingly higher in many cities.

- **Energy Consumption** - The consumption of petroleum fuels in India went up from 6.6 million tonnes in 1981 to 56.32 million in 2011. Since India is a net importer of petroleum fuels, the steep increase in fuel consumption has resulted in a huge drain on the country's foreign exchange reserves, the import bill having gone up from Rs. 53 Billion (USD 883 Million) in 1980-81 to almost Rs. 7,400 Billion (USD 123 Billion) in 2011-12, i.e. nearly 140 times (Ministry of Petroleum, 2011-12). The rapid motorisation in our cities presents a serious threat to our energy security.

World Bank statistics show that on an average, India has 18 cars per 1000 people (2009), yet Indian cities are congested with vehicular traffic and pollution. The conventional ways to solve transport problems such as construction of flyovers and widening of roads have only fuelled the growth of motorised vehicles, reducing non-motorised transport and public transport use. The increase in private car usage is a major contributor to the growth in Green House Gas (GHG) emissions, and is detrimental to the environment both in India and globally. Most of the nations have already realised that road capacity cannot be provided to cater for the predicted increase in private cars. The answer is to provide improved better quality and efficient public transport as well as Non-Motorised

Transport Networks and reduce need for travel.

Sustainable Urban Transport : Vision Statement

Government of India's vision for providing a Sustainable Urban Transport is contained in the 2006 National Urban Transport Policy (NUTP).

National Urban Transport Policy (NUTP) 2006

The Need

- Major shift from personal vehicles to Public Transport and Non-Motorised Transport.
- Greater public transport capacity, which is of a higher quality and more efficient; as well as high quality Non-Motorised Transport Network.

Achieving sustainable urban transport became a primary objective with the adoption of National Urban Transport Policy (NUTP) by the Government of India (GoI) in 2006. Efforts to reduce or contain environmental risks form an important component of this objective.

The Vision of NUTP is:

- To recognize that people occupy centre-stage in our cities and all plans would be for their common benefit and well-being.
- To make our cities the most liveable in the world and enable them to become the “engines of economic growth” that power India’s development in the 21st century.
- To allow our cities to evolve into an urban form that is best suited for the unique geography of their locations and is best placed to support the main social and economic activities that take place in the city.

Status of Urban Transport in India

City Bus Service

The rapid growth in motor vehicles has had its impact on the share of Public Transport vehicles and obviously on the share of trips made by Public Transport. Share of buses in the total

composition of motor vehicles has decreased drastically from 11 per cent in 1995 to only 1.1 per cent in 1991. It seems to have stabilised at this level thereafter. The number of buses per capita has, however, no doubt gone up as shown in Table 1.

To stop this trend in cities, the Ministry of Urban Development provided financial assistance to cities for purchase of buses. A total of more than 25,000 buses were sanctioned to more than 170 cities, many of which were small and medium size cities that did not have a formal bus service public transport system. Of these, about 17,000 have been procured till date. These buses benefited the cities in the following manner:

1. More number of passengers can be carried per unit road space implying less congestion on road. A bus carries 4.5 times more passengers as compared to a car¹.
2. Buses are safe modes of transport because they have large size and mass than most other road vehicles which reduces the probability of fatality inside a bus.
3. Improved air quality because they pollute less per person mile. Emissions by car are nearly 4 times as compared to buses².

Today, in the country, there are less than 13 buses per lakh of population of which approximately 25 per cent are operating in urban areas. As per the National Transport Development Policy Committee (NTDPC) report

(2012), the estimated growth rate of public transport in urban areas would be 8 per cent in the next 15 years. Assuming that metro would cater to 30 per cent of the public transport demand in 2021 and 40 per cent by 2031, there would be an estimated requirement of about 8 lakh buses by 2021 and 15.5 lakh by 2031.

To meet the demand for buses, the Ministry of Urban Development has included promoting public transport as one of the Smart Cities Feature to promote comprehensive development in the Smart Cities Mission launched in June 2015. The Atal Mission for Rejuvenation and Urban Transformation (AMRUT) has also identified efficient public transport and buses as one of the important component under the urban transport sector.

BRTS

The Bus Rapid Transit System (BRTS) also known as the High Capacity Bus System (HCBS) is increasingly being adopted by cities in India. As per MoUD statistics approx. 580 km of BRT is under various stages of development across 16 cities (Ahmedabad, Bhopal, Delhi, Indore, Jaipur, Pune, Vishakapatnam, Kolkata, Surat, Rajkot, Raipur, Amritsar, Bhubaneswar, Ludhiana, Hubli Dharwad and PimpriChinchwad), of which 200 km are under operation.

One of the most important advantages offered by BRT systems, especially in the context of Indian

Table 1: Share of Buses in Total Motor Vehicles in India

Year	Census Population (million)	Total registered vehicles ('000)	Registered buses ('000)	Buses per Million Population	Share of buses to total vehicles (per cent)
1951	361	306	34	94.2	11
1961	439	665	57	129.8	9
1971	548	1865	94	171.5	5
1981	683	5391	162	237.2	3
1991	846	21374	331	391.3	2
2001	1027	54991	634	617.3	1.1
2011	1210	141866	1604	1325	1.1

Source: Motor Transport Statistics of India, 2001-02, Road Transport Yearbook 2010 – 2011, Registrar General of India 1951-2001 Census



cities, is that it provides reliable and affordable mobility to the people. A well planned BRT takes into account the fact that a user of this system is also a pedestrian. Thus, the infrastructure and components of the system are planned keeping in mind the behavior of the pedestrians rather than the users of motorized vehicles. This results in making the entire transportation network more accessible and safer for the most vulnerable users.

Today, there are 7 BRTS projects operational in the country and these projects have resulted in substantial CO₂ reduction due to shift from non-public transport. BRTS concept has gained momentum during the last couple of years and it is expected that the rate of development would increase during the next decade. The 12th Five Year Plan has estimated a total length of 1,500 km to be built during the Plan period.

Metro RAIL

The Indian Railways, as the traditional provider of rail based systems, built and operates the Kolkata metro, and does the same with a small metro system in Chennai. Apart from this, it operates all suburban rail systems. However, as the railways found their intra-city rail systems to be loss making, they decided to focus on the national network. Accordingly, a pattern of joint ownership of metro rail systems has emerged, with the national

and state governments forming joint ventures to build and operate such systems. Delhi was the first in this direction with the setting up of the Delhi Metro Rail Corporation, which runs the Delhi metro. This company has now expanded its network to connect the satellite cities of Noida, Gurgaon, Ghaziabad and Faridabad with a total network of 185 km. The system has a ridership of 2.6 million passengers per day, which has increased by 156 per cent during the last 5 years. This amounts to reduction of 1.7 million cars from the roads each day.

Learning from the success story of Delhi metro, many cities have initiated similar systems. New metro systems are coming up in 10 cities (Bangalore, Chennai, Kolkata, Mumbai, Cochin, Nagpur, Hyderabad, Jaipur, Kochi, Gurgaon) on a joint ownership model. Some lines in Mumbai and a metro system in Hyderabad are coming up under public-private partnership arrangements. A system in Gurgaon is operating purely as a private initiative. Some sections of Bangalore, Mumbai and Gurgaon Metro rail have already been commissioned and the others are in various stages of planning and construction.

The metro networks are expanding fast across the country and many new cities like Lucknow, Pune, Guwahati, Patna, Agra, Kanpur etc are also planning to adopt it as a mass transit mode in their cities.

Intermediate Public Transport (IPT) Systems

Informal public transport systems like auto-rickshaws, cycle-rickshaws, informal car-pooling systems, etc., also called as Intermediate Public Transit Systems (IPT) form a vital share of the public transit system in any city, ranging from 3- 8 per cent of the total trips in different sized cities. Nearly 75 per cent of the global auto rickshaw population is found in India (“Autorickshaw Sector,” 2012). Their role as a feeder to existing public transit systems, providing the first and last

mile connectivity helps in increasing the coverage of the main/trunk public transit systems like the Metro rail/ suburban rail/bus transit. This is true for cities that are larger and have some sort of public mass transit system available. IPT plays the role of public transit system, especially in small and medium sized cities where formal public transit system is absent. Small towns with low population, small trip lengths, scattered economic nodes, generally cannot justify an efficient public transit systems. Thus, IPT can be seen as an alternative to public transit systems in these cities – it is demand driven and has evolved with the growth of the city. Due to their informal nature, there are issues of planning, organisation, safety, efficiency, and environment friendliness that need to be addressed to improve these systems and more effectively addresses the travel needs of the people in these cities.

Recognizing the important role played by IPT in Indian cities, the Smart Cities Mission has emphasized on promoting the use of IPT to provide last mile connectivity.

Non Motorized Transport (NMT)

The energy consumption share of transport sector is one third of the total consumption and within that the road transport consumes around 80 per cent. Compared to bicycle, the energy consumption per passenger per mile is found to be 2–2.5 times higher for public transport and 3–6 times higher for motorized modes in India. It is 3–4 times higher for public transport and 5–10 times higher for motorized vehicles when compared with walking. Recognizing the benefits of NMT, the National Mission for Sustainable Habitat (NMSH) 2009, one of the eight missions approved under the National Climate Change Action Plan, focuses on the greater use of non-motorised transport as an important strategy for reducing GHG emissions.

Government of India has been supporting NMT. To ensure equitable allocation of road space for pedestrians and cyclists in urban areas, the Ministry of Urban Development has

issued the Code of Practice for Urban Roads in 2012. Based on this concept, city of Chennai has initiated a Street Design Project wherein the city is transforming itself from a car-centric to a people-friendly city. For the first time, the Corporation has begun reimagining the city's arterial roads as "complete streets," taking into account the needs of all street users. The new designs include continuous footpaths, separate cycle tracks (on selected streets), and organized on-street parking. The designs also integrate bus stops, street vending and all other street furniture, locating them carefully so that they do not hinder the walking experience of pedestrians. In phase 1, 26 streets have been developed with wide footpaths and continuous footpaths and work on the 60 streets has commenced as part of the second phase.

NMT facilities however need to be created across cities. The Smart Cities mission and AMRUT mission both emphasize the need for providing pedestrian and bicycling facilities.

The Government of India is also supporting introduction of e-rickshaws in cities. It is estimated that today there are about 2 lakh e-rickshaws in the country. The initiative is being supported by all sectors as ecological means of transport in cities.

ITS

Intelligent transportation systems (ITS) are advanced applications which aim to provide innovative services relating to different modes of transport and traffic management and enable various users to be better informed and make safer, more coordinated, and 'smarter' use of transport networks. Application of ITS improves the utilization of existing transit infrastructure and facilities through better fleet and crew scheduling, deployment and monitoring. It helps in improving access to transit related information through various means such as website, helpline, social media, displays inside transit vehicles and transit stations. The system also improves safety and security environment through use of

CCTV in vehicles and transit stations and provides an overall reduction in pollution and energy conservation.

ITS has been implemented across various cities in the country including Mumbai, Delhi, Ahmedabad, Mysore, Bengaluru, Pune, Kolkata, Chennai and Hyderabad. Some of the key projects implemented are:

- ITS on City bus service, Mysore.
- Mumbai Area Traffic Control System.
- Bangalore Traffic Improvement Project (BTRAC), Bengaluru.
- Integrated Transport Management System through Common Mobility Card for Automated Fare Collection, Jaipur.
- BEST e-ticketing project, Mumbai, etc.

Government of India fully recognizes the importance of ITS contribution to safer, more sustainable and more efficient transport for people and goods. Accordingly, the Smart cities Mission identified Intelligent traffic Management and Smart Parking as Smart Solutions for Urban Mobility. Also the ministry aims to set up and develop a national regional and city level architecture for ITS.

In 2011, the Government of India had launched the National Common Mobility Card "More", which is an important step towards creating a common platform for pricing and fare collection, intermodal operations and seamless connectivity across modes and geographies for all commuters. Interoperability issues of the card are being addressed to make it popular with cities. An "EMV based open loop card with stored value specification" is being developed. The Card based on this model can provide both account based retail applications and stored value based transit services simultaneously. The commuters will therefore not need to carry separate cards for banking and transit requirements, thus making it a real Smart Mobility Payment Card. These cards can also work across

the countrywide EMV enabled retail payment network.

The EMV based contactless stored-value card has already been adopted by Kochi Metro Rail Limited and the model is being circulated to all concerned including metro rail companies as a new business model for exploring the possibility of adopting regional/city level mobility card, which can be integrated at national level later in view of having common standards and specifications.

Analysis

Urban transport has suffered from neglect for several decades. It got attention for the first time in the 10th Five Year Plan when the National Urban Transport Policy-2006 was issued. As a result, there is a huge deficit in UT infrastructure and services (HPEC). Most importantly, the subject was allowed to fend for itself and no institutional set up to manage UT was created.

It has become clear that massive urbanisation and the resultant transport problems present one of the most important challenges in the foreseeable future in India. Recognising the importance of this issue, the Government of India has taken important steps to meet the challenge through a variety of mechanisms primarily through the adoption of a National Urban Transport Policy and launch of the National Urban Renewal Mission. These have led to several important gains, the most important of which has been the realisation that public transport improvement and not road capacity enhancement, is the way forward. However, several challenges still remain. Investments are being made by the central, state and local governments to improve mobility in cities. However, most of the effort in this regard is being done in a piecemeal manner and the emphasis now needs to be on a comprehensive and coordinated approach rather than a fancy for high cost facilities.

Increasing pollution forced the hand of Central and State Governments and some cities took steps to augment

public transport by adding buses and introducing rail and bus rapid transit. This limited attention did not provide benefits commensurate with the huge investment involved. Good mobility requires action on several fronts such as urban growth policy, transport demand management, development of roads infrastructure which is the main base for all modes of city transport and regulation to control environmental pollution and quality of service.

For coordinated development, the need is to improve the governance structures that enable comprehensive planning and coordinated implementation. On the behest of the central government, UMTA has been setup across 11 cities and states across the country. However most of them are essentially committees of influential officials with little function to really take coordinated action. To ensure holistic development of urban transport sector, these institutions need to be empowered with technical support and financial powers that would give it the authority to develop

comprehensive plans and ensure that they get implemented.

To improve mobility in cities and translate the vision of NUTP into reality, huge investments are needed both in terms of capital investment for development of infrastructure and for operations and management. A High Power Expert Committee set up by the Government of India to estimate investment requirements in urban infrastructure has estimated that approximately Rs. 21,783 Billion (approx. \$ 434 Billion) would be needed for investments in transport infrastructure alone in Indian cities over the next 20 years. These are huge requirements and cannot be met from the public budget without seeking additional sources for this purpose. Cities thus need to explore innovative financing methods such as commercial exploitation of land, additional tax on gasoline or through high parking fees etc to generate funds. Additionally, to reduce the bill on fuel, alternate energy like electric vehicles and bio gas need to be encouraged.

To ensure good urban transport planning, it has to be "People" focused rather than "Engineering" focused, and this is being done as part of the AMRUT Mission and Smart Cities Mission.

Way Forward

The way forward is creating an effective institutional set up at the Central, State and City level with professionals with the required skills for comprehensive integrated planning, integrated implementation and coordinated operation of services. Capacity building and creation of a data base for effective planning has been started by MOUD. This should be institutionalized. Financing is a major issue. Central Government cannot be the sole funding agency. Cities should be empowered to generate own resources being the main beneficiary.

Endnotes

- 1 Source: GIZ, 2011
- 2 Source: GIZ, 2011

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Gaurav Agrawal	296/500	(59.20%)	Narendra Kumar	351/600	(58.50%)
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ABHISHEK MEENA
Rank 14, IES 2015

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Neeraj Kumar	IAS	2011	11 th Rank
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Chinmayee Gopal	IAS	2014	16 th Rank
Tanvi Hooda	IAS	2014	33 rd Rank
Surabhi Malik	IAS	2011	51 st Rank
Nitin Singhania	IAS	2011	51 st Rank
Rajan Vishal	IAS	2007	60 th Rank
Kumar Amit	IAS	2007	75 th Rank
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Narender	IPS	2007	155 th Rank
Neeju Gupta	IRS	2008	221 st Rank
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Sanyam Joshi	IAS	2012	228 th Rank
Nandesh Shukla	IRS	2006	238 th Rank
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Patyush Kumar	Rank 14	2011
Abhishek Anand	Rank 15	2014
Bikram Nath	Rank 17	2014
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Smart Ports for Sagarmala

Vishwapati Trivedi



...is imperative to convert our ports into war horses of competitiveness. My concept of a “smart port” is driven by this philosophy, along with the capacity of a port to pull the regional hinterland along, the underlying basis of the ‘Sagarmala’ project

India has 180 ports (small and big), of which, 12 are termed as Major Ports and are Government owned ports under the Major Ports Trust Act, 1963. These Ports operate as Trusts, except the Port of Ennore, which is a Company under the Companies Act. This model of operating a port as a trust is widely believed to be anachronistic and cannot be sustained. And such a model is also the cause for most of the ailments in the Major Ports. The other format of Ports (those that have not been set up under the Major Ports Trust Act) are non-Major Ports (e.g. Mundra, Gangavaram, Krishnapatnam) and some others are purely state Government Ports (e.g. Kakinada, Veraval). Most others, are small ports, more in the nature of fishing harbors and specific product handling. These have been set up under the Indian Ports Act, 1928.

These ports and some others (under planning and implementation), will form the beads of the Sagarmala Project. An ambitious project with the preamble of “port-led-development”.

The main thrust of this article is to stress that port-led-development as

envisaged under Sagarmala (Garland Along the Ocean) Project is only possible if we convert our ports to “Smart Ports”. And this applies most importantly to major ports (government owned) as they are the ‘big beads’ of this ‘mala’.

I believe the word “smart” is a function of time. A “dumb” port of today, was probably a “smart” port during the times it was set up. Such a definition also provides a clue on how to define a “smart” port. The only advantage in defining a “smart” port today is that a longer futuristic vision is possible. This will enable a more durable definition of “smart” port, than was possible ten years back.

The above set up is important to understand the hiatus between the existing and the desired outcomes. At the outset what we need to understand is that the major ports (all of them Government owned) are still driven by legacy issues. They have not kept pace either with the requirements of emerging technology, on-shore or off-shore or with the requirements of international trade, and most importantly the emerging trends in containerisation, size of ships and flexible rules needed in a modern global world.

The author is Chairman, National Shipping Board. He has held various posts in the government like Secretary, Ministry of Shipping, Chairman of Inland Waterways Authority of India, Secretary, Ministry of Mines and Special Secretary/Additional Secretary in Ministry of Home Affairs. He was also the Chairman and Managing Director of Indian Airlines till it was merged with Air India. After that he was Joint Chairman of Air India. He worked in the International Monetary Fund, Washington DC from 1994 to 1998. He has written many discussion papers at London School of Economics as a student of Prof. Amartya Sen, Noble Laureate and renowned journalist in economics.

Sagarmala

Sagarmala is a project that the Government of India has formulated for setting up a vibrant port sector in India. The main plank of the Sagarmala scheme is that it has to be an engine of growth for the Indian economy through a process of "port led development".

According to this project, the entire country has been divided into nine maritime zones, coinciding with the nine maritime states in India. Each maritime zone would plan in details the projects that are considered to integrate with the various activities such as industries, urban development, tourism, environment etc. Such a coordination would need to dovetail all the schemes into a port led development model. In other words, these schemes would use the ports in the state as an anchor and build development models around the ports. It is expected to lead and fulfil the objective of "port led" development.

In the scheme, there is a National Authority which oversees the inter-ministry, inter-state and centre-state coordination. And then, there are state level bodies which coordinate the activities within the various departments of the state.

The Ministry of Shipping has already created a company which will do all the implementation through various kinds of projects under the EPC mode or the Private Public Participation mechanism.

It is also true that these legacies need to be demolished as they have lost their relevance now.

The globalised world today needs a dynamic, flexible, nimble and highly efficient port. Unlike the days of the Greeks, Romans, Cholas, Mauryas, Sui and Ming Dynasties, there are no naval armadas to capture the territory and promote international trade. All current trade is governed by maritime conventions of the International Maritime Organisation, mutually respected and agreed treaties etc. All that matters today is competitiveness.

Economists have been saying from the turn of the century that the 'wave of globalisation' will allow only the most flexible and efficient countries (such as Korea and Singapore) to make the most of it. Those which go into over-drive (Japan and Greece) will be likely to suffer deflationary economies, and the staid and stodgy economies will be facing, 'limits to growth'. We fell in the last category.

Under a firm and progressive Government today, we need to re-invent ports, and completely overhaul and rewrite the maritime sector. Reform of the port sector is a necessary condition, but not sufficient. Here, we confine ourselves to the concept of "port-led-development".

The first and foremost is to be clear that it is imperative to convert our ports

into war horses of competitiveness. My concept of a "smart port" is driven by this philosophy, along with the capacity of a port to pull the regional hinterland along, the underlying basis of the 'Sagarmala' project.

While individual ports will have their idiosyncrasies, I suggest the following framework for a 'smart' port.

The foremost condition is to change the governance structure. The ports should be on a "landlord port model". They should be registered under the Companies Act. The port administration should only look after the provision of infrastructure and safety. They should not be part of the day to day running of the port.

The excess current human resource should be retrained and redeployed. The pensionary liability of the ports, which runs into almost one thousand crores per year, should either be extinguished in one shot, or transferred to New Pension Scheme. The resources for such a step can be raised by unlocking the value of land. Mumbai, Kolkatta and Kandla Ports have large tracts of extremely valuable land not being put to any direct use in these Ports.

Broadly, since we are on a correcting course for the major ports, there should be a conscious effort to see that any disadvantage in a special situation

is compensated by special efforts. Continuance of Kolkata port, which is the only riverine port in India, can only be supported if dredging subsidy is extended. Mumbai and Chennai Ports may have to specialise only in specific types of cargo, else, their historical disadvantage of a city growing around them will have to be compensated by super corridors for evacuation.

The aggressive home market must force the ports to innovate and be efficient. Luckily, the competition from the non-major ports is goading the government ports towards efficiency. There is a crying need to bring accountability in the running of ports. My experience is that while the ultimate responsibility lies with the Chief Executive, he is not sufficiently empowered to hold heads of divisions responsible.

The next level of issues are a result of the lack of flexibility and delegation of authority. The final level of inflexibility is the result of Section 13 (d) of the Prevention of Corruption Act, under which any decision can be challenged if a fine comb is run through it, leading to a fear and freeze. If you rush to a decision, it can be challenged, and if you slow down a decision it could be classified as malafied. The competing private sector ports are relatively differently governed. A perfect solution to this issue is impossible, but there are solutions which will optimise decision making. They are known to the body of fine decision makers.

To be competitive, the major ports need the related partners to provide efficient solutions. Government departments such as the railways, customs, health, and environment should be equally responsible for the implementation.

The others are companies/industries providing services and inputs. Ports have cargo freight stations, logistic providers, agents, transporters and freight forwarders who provide services. They are, internationally, highly regulated to prevent exploitation of the exporters and importers. In India, there is a dire need to introduce transparency and ex-ante declaration of rates for

services. There is still no regulation to control the 'trade practices'. Any "smart port" cannot afford to have an opaque mechanism such as this. The process of rewriting the dynamics of Indian ports under the Sagarmala Project must not procrastinate on this long pending issue.

The role of private sector is also a very important component of smart ports. Introduction of private initiatives,

through build, own and transfer type projects in Major Ports (Government Ports) has been very successful. Port based industries is the crying need. Several ports at Nhava Sheva Mumbai, Adani Port at Mundra and Kandla Port have set up SEZ's to back their industrial demand mechanism and for internationalisation. The Government policy on captive berths has been very helpful. A number of captive berths dealing with specialised items mostly

PET coke oils, chemicals, iron ore have come up on a revenue sharing basis with the concerned ports.

These are structures of a framework of a 'smart port, which will have to be diligently created, accomodating the special needs of the individual ports, to effectively deliver the final product, a model of port-led development, Sagarmala. □

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First of all a heartiest congratulation to you and all your team for such a great work of information and knowledge dissemination that too at such a fordable cost that anyone could avail it. I had been regular reader of Yojana and Kurukehetra for last 10 years. I have always found both these magazines very informative and full of quality work. As a national magazine (or anything which is of national character) it must be the duty of the magazine to inspire the nation ,specially the youth, for national duty and social services. I would like to suggest to include in every issue any story which inspires the youth to work for the society. This will help us making a better society. Inspiration could be like for social unity (Hindu - Muslim unity), women upliftment, stories which are inculcating patriotism (like energy saving, water saving) and anything which will nudge the people to get inspired and start something similar. However, most of the time we are having "Success Stories" coloumn in the magazine but there should be one coloumn like "Inspiration" or "Unsung Heros" or " National Duty" or anything like that which you think prudent.

Sandeep Mishras

Yojana's content is always appreciable but this month's issue on Skill India has caught our attention too much. there is a request from my side...as yojana magazine always contain various govt. schemes and initiatives and also various articles by highly educated personality, it would be highly beneficial for rural people if this magazine will be available to them in their regional languages, means in Hindi, Kannada, Telugu, Bengali etc. and this magazine should be distributed to them either free of costs or at cheapest price. By this magazine many rural and poor people will get many information about various schemes and initiatives of govt.

Saurabh Kumar

I am a regular reader of yojana magazine and it give us a wide based knowledge on each and every sector of life like public health sector, skill development sector etc.. It is a humble request to you please publish a issue on environment and ecology and create some awareness on save the environment to your readers through the above said issue.

Reader

I am a regular reader of yojana monthly journal since june 2013.I find this journal very informative, making us aware about all latest polices of govt. I appreciate Yojana division and all authors who write for this valuable journal.

Rizwan Ul Zaman, J&K

I am grateful to you for the quality of work which you put for yojana, but I have one small suggestion. Sometimes, the topics are repetitive and too narrow. So my kind suggestion is if possible, you can put up diverse topics like environmental changes and India's approach to it, border and security issues in India, maoist and insurgency problems and topics on India's cultures.

Shyamali Jash

Response from Yojana Team

We thank our readers for taking time out to appreciate our work and offer constructive suggestions.

Yojana is being published in 13 regional languages from the State capitals. These can be procured through subscription.

Your suggestions are valuable to us and are being kept in mind while planning future issues. Our forthcoming issue will be on "Climate change and sustainability".

We do carry success stories, space permitting.

Thanks once again!!

For our Readers

No publication is perfect and complete without the suggestions and feedback from its readers. Now you can mail us your valuable suggestions and feedback at yojanafeedback@gmail.com.

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Travelling to the Future with Green Transport

Krishna Dev



...pedestrians should have the same right and entitlement to road space as motorised vehicle riders. Pavements and cycle paths of adequate width should be provided even if it means reducing space for motorized vehicles. It will encourage use of public and non-motorised transport. A suitable mix of such policies has the potential of creating a future, which is not only inclusive, but also one that would result in a lower carbon scenario for the country

Transportation is a major contributor in global climate change. It accounts for almost 23 per cent of the world's total carbon dioxide emissions from fossil fuel combustion. Of these total carbon dioxide emissions, road transport accounts for 75 per cent and this share is increasing every day. Around 95 per cent of all road transportation depends on oil; this corresponds to 60 per cent of world's total oil consumption. All this puts a lot of pressure on the national governments to devise policies to reduce greenhouse gas emissions as well as oil demand.

Transport has impacts in the economic, environmental and social dimensions. Economic efficiency, as often measured by travel time reductions to users, is the principal objective of improved transport. However, transport affects the environment in terms of energy use, greenhouse gas emissions and air pollution. Transport also impacts on the social dimension by promoting (or reducing) social inclusion and generating other co-benefits such as safety. The three dimensions of transport impacts are summarised in Table 1.

A growing concern for environmental sustainability directs

more attention to 'sustainable transport' and 'green transport'. In simple terms, the majority of transport except for walking and other non-motorized modes is not green or sustainable. Most transport uses some form of fossil fuel and is likely to do so for the foreseeable future. Modern urban rail systems use electricity as their motive source that is almost entirely produced by the combustion of fossil fuels.

Although, virtually all motorized transport systems are fossil-fuel based, some systems are greener than others. Conceptually, the 'green' element of a transport system can be measured in three ways: (i) energy-efficiency, (ii) carbon-intensity and (iii) extent to which it produces local pollutants that are harmful to human health. Rail and bus mass transport may achieve 'green' credentials by attracting significant volumes of drivers from cars.

Alternatively, the 'green' effect may arise from the inherent and direct energy efficiency of the mode's motive power such as a use of a hybrid (gasoline/ electric) engine compared to, for example, a conventional gasoline engine. Transport used in an effective way and operated efficiently with high load factors can, therefore, achieve strong economic benefits, reduce energy consumption and emissions.

The author is a transport sector expert currently working as an independent consultant. He has worked as a consultant to the Planning Commission and was closely associated with formulation of 11th Five Year Plan and Annual Plans for the transport sector. He also worked with the High level Committee on National Transport Policy where he helped to formulate the long term policy. Besides this, he also worked for the World Bank as consultant and worked on formulating the Road sector vision & strategy for the state of Bihar. He has also worked with RITES Limited and conducted the 'Total Transport System Study' to project the transport growth and vision for the horizon.

Table 1: Transport's Impacts in Three Dimensions

Dimension	Perspective-impact
Economic Efficiency	Benefits to transport users (i.e. welfare) as the main purpose of transport improvements in mobility, accessibility to jobs and services, and support economic growth.
Environmental Sustainability	Reduce energy intensity
	Reduce green house gas emissions per unit of output (GHS as typically represented by Carbon Dioxide or CO2 equivalent emission) that impact on climate change
	Reduce tailpipe emission that affect human health (e.g. particulate matter or PM)
Social Sustainability	Enhanced access to basic services - covering the transport service enabling access, affordability of these services and physical accessibility to vehicles and facilities.
	Protection form harm - e.g. from safety and security risk, traffic accidents and poor quality air.

What is Green Transport?

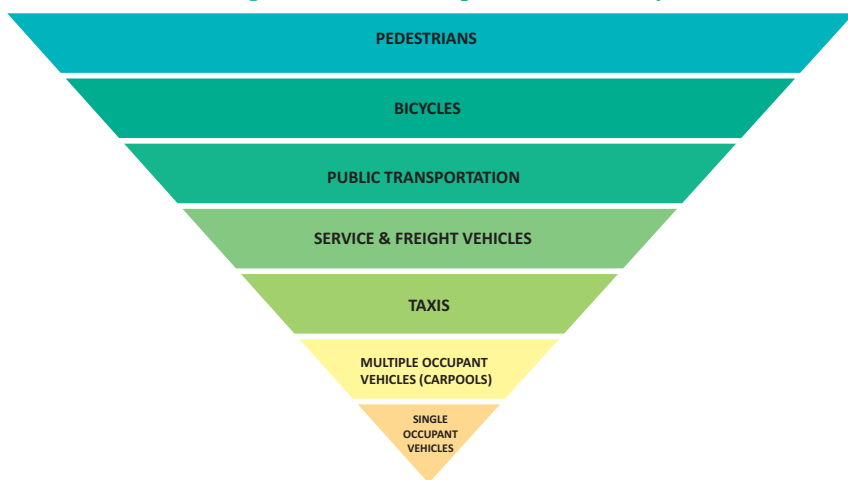
Transportation, being a major contributor to greenhouse gas emissions, is the prime target for reducing air pollution and obtaining sustainable environment. This leads to Green Transportation, which means any kind of transportation practice or vehicle that is eco-friendly and does not have any negative impact on the environment.

Green transportation involves effective and efficient resource utilization, changes in transportation structure and making healthier travel choices. This demands enhanced public awareness and participation, control of private vehicles and development of vehicles powered by renewable energy sources like solar, wind, electricity, biofuels etc.

Though it is much more comfortable and convenient to drive one's own private vehicle to office or market everyday, but being responsible world citizens, we should opt for green transportation modes that are easily accessible to everyone. This is depicted in the Green Transportation Hierarchy in Figure 1:

Green Transportation Hierarchy enlists the modes of green transportation. It is based on the food-pyramid and illustrates an upside-down approach – with the largest portion of pedestrian walking being the most green, the top priority and the smallest portion of single occupant vehicles being the least green, the least priority. Wherever possible, single occupant vehicles should be avoided.

Figure 1 - Green Transportation Hierarchy



Source: Road Transport Year Book (2011-12), M/o Road Transport and Highways, GoI.

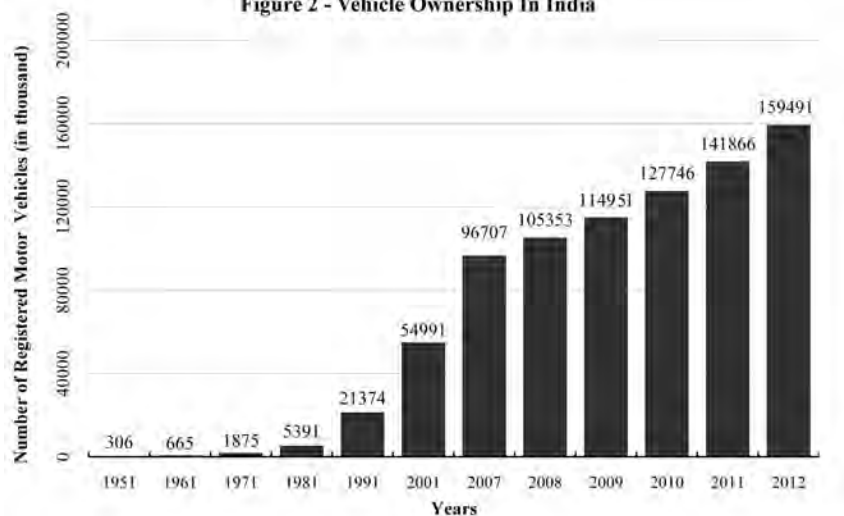
Need for Green Transport

In the Indian context, the rapid economic growth especially over the last two decades has entailed a significant structural transformation of the economy away from agriculture and towards services. At the same time, India's cities have expanded and are likely to grow faster in the future.

As result of this growth, the vehicle ownership has soared in India over the last two decades tremendously. In 1991, according to the Ministry of Road Transport and Highways (MoRTH), the number of vehicles registered in the country was just over 21 million. By 2012, the number had increased to 159 million. During the 11th Five Year Plan (2007-08 to 2011-12), the number increased in a sky rocketing way. This is illustrated in Figure 2.

The result of high growth rate i.e. the new vehicle registrations are expected to continue, at least through the remainder of this decade. India has come a long way over the last two decades in reducing vehicle emission. Still, associated poor air quality and public health problems drive the need for further emission control. Many Indian cities have been ranked among the most polluted in the world. Vehicles are responsible for the majority of urban oxides of nitrogen (NOx) emission and 30-50 per cent of particulate matter (PM) emission, in addition to significant hydrocarbons (HC) and carbon monoxide (CO) emission. The problem is exacerbated

Figure 2 - Vehicle Ownership In India



by the preference for diesel cars in India due to diesel subsidies. Currently, new diesel cars are allowed to emit much more NO_x and PM than gasoline cars.

The continued growth of the transport sector may be vital for further economic development, but it has exacerbated India's critical air pollution problem, vehicular emissions. HC, CO, NO_x, PM, and CO₂ are a critical issue that has to be tackled on a war footing.

In 2008, the Central Pollution Control Board (CPCB) identified around 70 cities, representing over 80 per cent of cities that were being monitored, that were not complying with the NO_x and PM standards. This was before more stringent air quality standards were brought into effect in 2009. An analysis by the Clean Air Initiative (CAI) Asia of PM concentrations in 130 cities in India also indicated that most of the cities exceeded the national standard. Many of these cities have air pollution levels far above the legal limit, have continuously been in non-compliance for many years, and have no tangible plans to drastically improve air quality in the near future.

Increasing vehicular emissions leading to poor air quality have significant negative impacts on public health. Traffic-related air pollution, especially PM and NO_x, has been shown to lead to premature morbidity

and mortality. A study supported by the WHO estimated about 154,000 people died in India in 2005 as a result of ambient fine particulate matter (PM_{2.5}) alone. This number has most likely increased since.

The transport sector accounts for nearly 18 per cent of the total energy consumed in India, second only to the industrial sector. Nearly 98 per cent of the energy needs of transportation are met through petroleum products, and almost half of the total consumption of petroleum products in India occurs on account of transport activities. This demand for energy is expected to grow if no action is taken.

Of the 142 metric tonne (MT) CO₂ emissions released by the transport sector in 2007, 87 per cent were on account of road-based vehicular activities. If no action is taken, overall transport CO₂ emissions can come close to 1000 MT by 2030, a fourfold increase from 260MT in 2010.

India lags behind international best practices in terms of fuel quality and vehicle emission standards. Sulphur levels in fuel remain high, well above the maximum of 10 ppm required for the best clean vehicle technologies to function optimally. Nor does India have any plans of implementing 10 ppm sulphur fuels nationwide any time soon. As a result, vehicle emission standards are not where they can be. Most of India is at Bharat III, with a handful of cities ahead at Bharat IV.

In contrast, the US, Europe, South Korea and Japan have had 10 ppm sulphur fuels for many years now. Europe is in the process of moving to Euro 6/VI. Countries at similar economic levels as India, such as China, Mexico and Brazil are also planning to move ahead on fuel quality and vehicle emission standards.

Way Forward

There is much room for improvement for compliance and enforcement issues in India. Standards are meaningful only if complied with. The US, in particular, has been at the forefront of compliance efforts for over 40 years. By shifting the focus of vehicle emission compliance from new vehicles to in-use testing over time, the onus has been placed on vehicle manufacturers to ensure their products function as designed throughout their useful life. And testing fuel quality at multiple points along the distribution system has incentivised oil companies and fuel handlers to ensure fuel quality is met at all times. Clear, strict recall policies and punitive measures for non-compliant vehicles and fuels compel industry to test its own products.

India can learn from the vast experience of the US and other countries to enhance its own regulatory programmes. Vehicle emission testing is currently limited to new vehicles, meaning, there is little data to analyse the effectiveness of emission control technologies throughout their useful life. Weakest cycles mean that while vehicles pass initial emission testing, they may emit much more in real world situations. While the laws provide for government testing of fuel quality, there is little evidence that this is actually done.

Energy use by the transport sector is increasing dramatically, led primarily by private vehicle use. Studies predict that energy use by the transport sector will increase two-to four-fold over the next 20 years. Unless strong action is taken, the consequences will be dire for India's energy security, economy, air quality and global warming.

Long Term Policy

Various high level and expert

committees have been formed from time to time to suggest long term solutions for these important issues.

In 2003, the Mashelkar Auto Fuel Policy committee had recommended a review of the auto fuel policy every five years. Yet a new Auto Fuel Policy Committee was not formed until 2013, 10 years later, despite the fact that the Mashelkar Committee's mandate was through the year 2010. It should be made compulsory that a new Auto Fuel Policy Committee be formed five years after the previous one completes its work.

With the formation of a new Auto Fuel Policy Committee in January 2013, there is a lot of potential for India to make a headway on all of the points mentioned above. The Committee has made various long term policies separate for Two, Three and Four wheelers and recommended reforms for the year 2025. The recommendations below are a starting point for that committee to reduce long-term vehicle emission and fuel consumption in India.

- 50 ppm sulphur fuels should be mandated nationwide by the middle of this decade, and 10ppm sulphur fuels should be mandated nationwide by 2020;
- Bharat IV fuel quality standard should be implemented nationwide by the middle of this decade, with a target to reach Bharat VI by 2020;
- By mid-decade, India should mandate Stage I controls when retail outlets are supplied with fuel, and Stage II controls for vehicle refuelling.
- India should also mandate all new vehicles to have on-board refuelling vapour recovery (ORVR) systems at the same time.

In April 2014, the expert group on Low Carbon Strategies for Inclusive Growth chaired by Dr. Kirit Parikh mentioned in the report that urban centres should be encouraged to integrate non-motorized transport as an integral component of any urban transport plans. It is highlighted that

the benefits of non-motorized transport would not be limited to achieving a lower carbon scenario for the country, but it would also have larger social benefits. Once non-motorised transport is facilitated and public transport is provided, parking fees should be raised to reflect adequately the social cost of congestion.

Also, pedestrians should have the same right and entitlement to road space as motorised vehicle riders. Pavements and cycle paths of adequate width should be provided even if it means reducing space for motorized vehicles. It will encourage use of public and non-motorised transport. A suitable mix of such policies has the potential of creating a future, which is not only inclusive, but also one that would result in a lower carbon scenario for the country.

In January 2014, the high level committee on National Transport Development Policy chaired by Dr Rakesh Mohan submitted its report and recommended the following on the energy and environment issues:

- India should make world-harmonised test cycles optional when Bharat IV regulations go in to force nationwide and mandatory when Bharat V regulations come into force;
- A new Auto Fuel Policy Committee should be formed five years after each previous one completes its work;
- A National Automobile Pollution and Fuel Authority responsible for setting and enforcing vehicle emission and fuel quality standards should be set up;
- India needs to establish a robust Inspection and Certification (I&C) regime to ensure safety, road worthiness and emission performance of in-use vehicles;

Learning from the global examples, dedicated non-lapsable and non-fungible Urban Transport Funds (UTF) should be set up at the national, state and city levels. The UTFs, apart from meeting capital needs, may also be required to cater support to certain

systems during the operations stage. The UTFs should be funded in a robust manner as per the suggestions below:

- A Green Surcharge of Rs 2 on petrol sold across the country. The rationale behind this is the fact that petrol is consumed exclusively by personalised vehicles.
- A Green Cess on existing Personalised Vehicles at the rate of 4 per cent of the annual insured value both for car and two-wheelers.
- Urban Transport Tax on Purchase of New Cars and Two-Wheelers at 7.5 per cent of the total cost of the petrol vehicles and 20 per cent in case of personalised diesel cars.
- Energy efficiency of vehicles should be improved to decrease impacts of distances travelled and reduce the greenhouse gas footprint.
- Emission and safety standards should be set up under the Motor Vehicles Act.

Green Highway Policy: An Immediate Need

The Indian road network at 52 lakh km is the second largest in the world and consists of about 79,000 km of NHs (Table 2) , which constitute only 1.5 per cent of the road network but carry about 40 per cent of the total road traffic.

Green highway is a new concept that includes a roadway design integrating the functionalities of transport and ecological sustainability. The entire process of planning, design and construction of the roadways comes with the inclusion of an environmental approach. The aim for this concept is that growth and development should go hand in hand with sustainability of the eco-system and public health.

Recently, Union Minister of Road Transport & Highways and Shipping launched the Green Highways (Plantation, Transplantation, Beautification & Maintenance) Policy, 2015. The aim of the policy is to promote greening of Highway Corridors with participation of the community, farmers, private sector, NGOs, and government institutions.

Table 2: India's Road Network Since 1951

Road Category	1950-51	1960-61	1970-71	1980-81	1990-91	2000-01	2011-12	2012-13
National Highways	19811	23798	23838	31671	33650	57737	70934	79116
State Highways	0	0	56765	94359	127311	132100	163898	169227
Other PWD Roads	173723	257125	276833	421895	509435	736001	998895	1066747
Rural Roads	206408	197194	354530	628865	1260430	1972016	2749804	3159639
Urban Roads	0	46361	72120	123120	186799	252001	411679	446238
Project Roads	0	0	130893	185511	209737	223665	281628	310955
Total	399942	524478	914979	1485421	2327362	3373520	4676838	5231922

Source: Basic Road Statistics of India 2012-13, Ministry of Road Transport and Highways, Government of India.

- The agencies performing good will be awarded.
- The suggestions from people for smooth implementation of the policy has also been invited.
- 1200 road side amenities will also be established.

Following are the key features of the policy:

- 1 per cent of the total project cost of all highways projects will be kept for the highway plantation and its maintenance.
- About Rs. 1000 crore per year will be available for plantation purpose.
- The National Highways Authority of India (NHAI) will act as a fund manager for maintaining a green fund and releasing payments based on recommendation of concerned officials and agencies.
- The policy will generate employment opportunities for about five lakh people from rural areas.
- There will be strong monitoring mechanism in place by using ISRO's Bhuvan and GAGAN satellite systems.
- Every planted tree will be counted and auditing will be done.

The Green Highway Policy will help in making India pollution free. It will also help in curtailing the number of road accidents in India. The vision of the policy is to provide dignified employment to local people and communities.

The implementation of new Green Highways Policy can help in bridging the forest gap. The National Forest Policy envisages 33 per cent of the geographical area should be under forest or tree cover, but the notified forest cover is only about 22 per cent. The emphasis is not only on the trees

planted, but also on how many of them survive and are useful for the local communities.

For all new projects, the land that is required for plantation purpose will be part of the detailed project report itself, thus, avoiding land acquisition trouble in future. As the policy states, the vision is to develop eco-friendly national highways with the participation of local communities, NGOs, private sector institutions, and government agencies including forest departments. It also calls for scientific selection of the species that needs to be planted in each patch of the roadside land.

The policy thus opens huge opportunities to a large number of players interested in forestry. There will be incentives and awards to recognise the best agency in terms of performance every year. The green cover will also become one of the parameters to rate the national highway or state highways in future. 12,000 hectares of land have been identified for plantation and the government plans greening of about 6,000 km of roads in the first year of the policy.

Overall, it fits into the country's Green India Mission and is capable of quantifying the reduction in greenhouse gas emissions in a sustained manner. There is no doubt about the fact that this project, though ambitious, is one of the most positive ones of the Government, which aims towards striking a balance between highways development and environmental protection. The successful completion

of the project will surely see a greener India leaving lesser carbon prints.

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YE-189/2015

Indian Railways : Ensuring Last Mile Connectivity

Sunil Kumar



The need of the hour is to undertake a massive infrastructure expansion and decongestion program coupled with up gradation of technology and judicious electrification of tracks along with enhancement of terminal capacity

I Prior to 1850, there were no railway lines in the country. This changed with the first railway in 1853. Today, Indian Railways transport network connects far flung areas of the country.

Indian Railways (IR) is the third largest transportation and logistics network of the world operating 21,000 plus trains per day. It runs around 13,000 trains to carry over 23 million passengers per day connecting about 8,000 stations spread across the sub-continent. It is equivalent to moving the entire population of Australia. It runs more than 8,000 freight trains per day carrying about 3 million tonnes of freight every day. Its network of 65,000 route kilometres is more than one and half times the circumference of the earth. It has joined the select club of countries comprising Chinese, Russian and United States Railways with an originating freight loading of 1008.09 million tonnes (i.e. one billion plus) in 2012-13. During 2013-14, Indian Railways carried 1.05 billion tonnes revenue generating traffic and was expected to carry 1.1 billion tonnes in 2014-15.

Connectivity

Indian Railways is the lifeline of the nation. It traverses the length and

breadth of the country providing the required connectivity and integration for balanced regional development.

In the last 64 years, while the freight loading has grown by 1344 per cent and passenger kilometres by 1642 per cent, the Route kilometres have grown by only 23 per cent and Doubling and Multiple route length by only 289 per cent. The growth story of Indian Railways, over the last 64 years, is shown in Table-1.

Network Expansion

During the last four years, whereas new lines have registered a growth of 74 per cent, 'Doubling and Electrification' have grown at 167 per cent and 21 per cent respectively.

During 2014-15, 1983 kms of lines were commissioned by Railways which is the highest ever and includes 723 kms of doubling.

To improve connectivity and evacuation of coal and steel, a MoU with Ministry of Coal and Govt. of Jharkhand was signed in May to implement identified coal connectivity projects in Jharkhand. Joint Venture companies will be formed under the MoU between Coal companies and Steel companies. 17 States have also given, in principal approval for

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formation of SPVs (Special Purpose Vehicle).

Port connectivity is also being given priority. Project for rail connectivity to Dighi and Jaipur port has been sanctioned.

In principal approval for the ports of Rewas, Chhara, Nargol, Antuna has already been granted. Tuna port line

has been commissioned in July 2015. DPRs for Nargol port has also been prepared.

Quality of Services

The biggest challenge facing Indian Railways today is its inability to meet the demands of its customers, both freight and passenger. Apart from the quantum of investment, quality of

delivery is also an issue. Cleanliness, punctuality of services, safety, quality of terminals, capacity of trains, quality of food, security of passengers and ease of booking tickets are various issues needing urgent attention.

To improve services to its customers in the train (on-board) and on stations, (off-board) Railways have recently taken the following initiatives :

Cleanliness

A new Department of Housekeeping has been created to implement the mission of 'Swachh Rail Swachh Bharat'.

Bio-Toilet Tank

With the total commitment of IR to provide hygienic environment to passengers and to keep the station premises/tracks clean, IR have developed environment-friendly Bio-toilets for use in coaches. The technology has been developed jointly by IR and Defence Research & Development Organization (DRDO).

Table 1: Key Parameters of IR

Items	1950-51			2013-14			Percent Variation
	BG	MG	NG	BG	MG	NG	
Route Kms (All Gauges)	53,596			65,806			23 per cent
	25258	24185	4153				
						229 7	58175
							5334
Running Track Kms (All Gauges)	59,315			89,987			52 per cent
Total Track (Kms)	90,500 (1964-65)			1,14,907			27 per cent
Double & Multiple Route Length (Kms)	5,127			19,887			289 per cent
Freight Carried (Million Tonnes)	73			1,054			1344 per cent
Wagon Turn Round (Days)	11			5.13			(-)54 per cent
Wagon Capacity (Million Tonnes)	4.14			13.65			230 per cent
Passengers Originating (In Millions)	1,284			8,420			556 per cent
Passengers Kms (In Millions)	66,517			11,58,742			1642 per cent
No. of Passenger Trains Run Daily (Base Year 1982-83)	6,392			12,874			102 per cent
Seat/Berth Capacity (Suburban)	87,986			15,28,124			1637 per cent
Seat/Berth Capacity (Non- Suburban)	8,54,678			36,43,423			327 per cent

Source: Year Books of IR

Table 2: Network Expansion During Last 5 Years

	Year	2009-10	2010-11	2011-12	2012-13	2013-14	Total
1	New Lines (km)	258	709	725	501	450	2643
2	Gauge Conversion (km)	1516	837	855	605	404	4217
3	Doubling (km)	448	769	750	705	708	3380
4	Railway Electrification (km)	1117	975	1165	1317	1350	5924

IR is striving for elimination of direct discharge toilet system from all newly manufactured coaches by 2016-17 and to eliminate direct discharge toilet system from entire fleet of passenger coaches in the next few years.

Instructions have been issued to provide disposable bags for garbage collection in all train with OBHS (On-board house-keeping services) facilities. Provision have also been made for dustbins in new Non-AC coaches.

Construction of 100 toilets at 67 stations has been completed up to June 2015. Target is to construct new toilets at 650 stations.

During this year, a policy decision has been taken that all newly manufactured ICF coaches will be fitted with bio-toilets.

OBHS have already been provided in 500 trains and 100 additional trains will be covered during this financial year.

For washing of bedrolls, 3 new mechanized laundries have been started at Kochiveli, Malda town and Santragachhi. 29 more locations have been identified.

Comfort - E-initiatives

To avoid long queues on booking counters for unreserved tickets, a facility for paperless ticket on mobile phones has been launched in selected suburban sections.

E-catering has been introduced in over 1000 trains where a passenger can book a meal of his/her choice through internet.

Online booking of retiring rooms has also been started.

E-concierge services have been started at 22 Railway stations.

Destination alert service has been introduced on all Rajdhani and Duranto trains from July this year.

Wi-Fi has been commissioned at 11 stations and all A1 and A category stations are targeted for completion by Dec. 2016.

A system for passenger complaint redressal through SMS in OBHS trains has also been introduced on Central and South East Central Railways. Proliferation on all zonal railways is expected to be completed by this year end.

Convenience

For clean and cheap water, a policy for water vending machines to be installed by IRCTC at large number of stations has also been issued.

Mobile charging facilities in all new general class coaches will also be provided.

On-board entertainment service has been introduced on New-Delhi Chandigarh Shatabdi Express train.

To reduce waiting list on trains, 460 trains have been identified for augmentation with 1000 coaches.

To improve facilities at 400 stations, cabinet approval has been obtained for station redevelopment through PPP route.

Satellite stations to reduce congestion at main stations have also been planned at New Delhi, Allahabad, Varanasi, Lucknow Guwahati, Jaipur, Pune, Bhopal, Amritsar and Nagpur.

To improve services for customers using parcel services, parcel management system, which enables online tracking has been introduced on Delhi-Howrah and Delhi-Mumbai corridors. Bar coding has also been introduced for quick search and identifications of parcels.

NIFT, Delhi has been assigned with the job of bedroll designing .

Quota for lower berth for Senior Citizens has been increased from 2-4 per coach.

Instructions have also been issued to TTEs to help Senior Citizen/ Pregnant women to get lower berths.

Ladder to climb upper berths is also being redesigned for passengers' convenience.



Help lines (24x7) 138 and 182 have been commissioned.

Punctuality:

Punctuality is the one of significant factors determining overall satisfaction of passengers . Indian Railways run 2558 Mail/ Express train services, including daily and non-daily services (as on 31 December 2014). IT enabled Integrated Coaching Management System (ICMS) helps in online monitoring of the running of trains.

At present, the punctuality of Mail/ Express trains over the Indian Railways is about 80 per cent.

There is continuous effort to improve on- time performance.

Safety Concerns

During 2013-14, on an average, 21598 trains including 12961 passenger carrying trains were run daily. Nearly

23 million passengers were booked daily and 1058.81 (provisional) million tonnes of freight traffic was loaded during the year.

With such a massive utilisation of assets, safety is of paramount importance for operational efficiency. A very high priority is accorded to safety to achieve still greater heights.

Consequential Train Accidents

The term ‘accident’ envelopes a wide spectrum of occurrences with or without significant impact on the system. Consequential train accidents include mishaps with serious repercussions in terms of loss of human life or injury, damage to railway property or interruption to rail traffic in excess of laid down threshold levels and values. These consequential train accidents include collisions, derailments, fire in trains, road vehicles colliding with trains at level crossings, and certain specified types of ‘miscellaneous’ train mishaps (Table 3).

Safety Performance : Global Standards

A comparison of accident statistics of Indian Railways for 2012-13 and 2013-14 with that of entire Europe for 2012 has been carried out. To normalize the data due to variation in traffic density, Index of ‘Accidents per million Train Kilometre’ has been used (Table 4).

It can be seen that the safety record of Indian Railways compares favourably with that of advanced systems of European Railways. The Accident rate per million Train Kilometres over Indian Railways is 0.201 for 2012-13 and 0.147 for 2013-14 compared to 0.210 over Europe as a whole for 2012. Fatalities per billion Passenger km of IR are 0.240 for 2012- 13 and 0.147 for 2013-14, which is also better than that of Europe (1.033). However, there is scope for improvement.

Table 3: Consequential Train Accidents Since 2004-05 To 2014-15

Type of Accident	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
Collision	13	9	8	8	13	9	5	9	6	4	5
	5.56 per cent	3.85 per cent	4.10 per cent	4.12 per cent	7.32 per cent	5.45 per cent	3.55 per cent	6.87 per cent	4.92 per cent	3.39 per cent	3.70 per cent
Derailments	138	131	96	100	85	80	80	55	49	53	63
	58.97 per cent	55.98 per cent	49.23 per cent	51.55 per cent	48.02 per cent	48.48 per cent	56.74 per cent	41.98 per cent	40.16 per cent	44.92 per cent	46.67 per cent
MLC	5	10	7	12	7	5	5	7	5	4	6
	2.14 per cent	4.27 per cent	3.59 per cent	6.19 per cent	3.95 per cent	3.03 per cent	3.55 per cent	5.34 per cent	4.10 per cent	3.39 per cent	4.44 per cent
UMLC	65	65	72	65	62	65	48	54	53	47	50
	27.78 per cent	27.78 per cent	36.92 per cent	33.51 per cent	35.03 per cent	39.39 per cent	34.04 per cent	41.22 per cent	43.44 per cent	39.83 per cent	37.04 per cent
Fire	10	15	4	5	3	2	2	4	9	7	6
	4.27 per cent	6.41 per cent	2.05 per cent	2.58 per cent	1.69 per cent	1.21 per cent	1.42 per cent	3.05 per cent	7.38 per cent	5.93 per cent	4.44 per cent
Misc.	3	4	8	4	7	4	1	2	-	3	5
	1.28 per cent	1.71 per cent	4.10 per cent	2.06 per cent	3.95 per cent	2.42 per cent	0.71 per cent	1.53 per cent	0.00 per cent	2.54 per cent	3.70 per cent
Total	234	234	195	194	177	165	141	131	122	118	135
Accident per million train KMs	0.29	0.28	.023	0.22	0.19	0.17	0.15	0.12	0.11	0.1	0.1

Gradual reduction in train accidents

Decrease in Accidents per million train kms. (APMTKM)

Table 4: Comparison of IR accident statistics with European Rail Systems Average number of accidents in 2012.

SN	Country	Total accidents	Total number of million train km	Accidents per million Train Km
1	United Kingdom	26	535.59	0.05
2	Spain	22	188.73	0.12
3	Germany	139	1038.11	0.13
4	Denmark	10	63.06	0.16
5	France	85	511.9	0.17
6	Netherlands	25	149.77	0.17
7	India	194	963.48	0.20
8	Sweden	33	140.43	0.23
9	Belgium	24	99.26	0.24
10	Austria	44	149.8	0.29
11	Finland	16	50.89	0.31
12	Portugal	13	37.5	0.35

Source: European Railway Agency (ERA)

Although, the number of accidents on IR is less compared to European Railways in terms of per million Train Kilometres, there are some concerns which need to be addressed to make our system safer.

Causes of Accidents

Highest numbers of fatalities over IR occur due to accidents at unmanned level crossings. They take place mainly due to the negligence of road vehicle users in not observing the precautions laid down in the Motor Vehicles Act while negotiating unmanned level crossings. Still, the number of consequential train incidents at unmanned level crossings has come down over the years due to various measures taken by IR including intensive publicity campaigns and social awareness programmes undertaken to educate the road users. Railways are also removing the unmanned level crossings by building Road Over Bridges and Low Height Subways. This is happening in conjunction with other stake holders such as State Governments, NHAI, etc.

Elimination of Railway Crossings

There were approximately 29,487

LC on IR, out of which 19047 (65 per cent) are manned and 10440(35 per cent) are unmanned.

IR needs Rs 39,001 crore to complete all the ongoing works of constructing Road Over Bridges, Low Height Subways and elimination of all the remaining unmanned Level Crossings. This year, initiatives have been undertaken to streamline clearances and procedures to expedite the works.

	By Closure/ Merger/ Subway	By Manning	Total
2010-11	800	434	1234
2011-12	481	777	1258
2012-13	700	463	1163
2013-14	777	325	1102
2014-15	721	427	1148
Total	3479	2426	5905

Elimination of UMLC in last 5 years (as on 01.04.2015)

The aforesaid works are funded almost entirely out of the proceeds of the share of IR from the collections of the Diesel Cess, authorised by the Central Road Fund Act. IR gets only

12.5 per cent of the total amount annually credited to the fund, whereas Roads get 50 per cent of the share, the balance being shared by the States. It, therefore, becomes a limited amount even though IR can absorb much more. IR has been pursuing a higher share from the allocations to the Central Road Fund. This amount needs to be enhanced for faster elimination of level crossings and saving of precious lives.

Track Renewals

IR's network has 1,14,907 kms of total track length. Of this, 4500 km of track should be renewed annually. However, due to financial constraints, the progress in track renewals is constantly coming down over the last six years. As on 01.07.2014, 5300 km track length is due for renewal. The target for the current year is only 2100 km. Arrears of track renewal are accumulating which will result in disproportionately high maintenance effort. This will also result in reduced reliability of assets.

Human Errors

The issue of accidents on account of loco drivers' error is being addressed through technological intervention. Automatic Train Protection (ATP) systems mitigate the safety risk due to loco drivers' error or over speeding leading to collisions. On IR network, this safety area could not be given adequate priority/resource allocation and induction of ATP systems has been mostly limited to suburban sections. Train Protection & Warning System (TPWS) has been equipped on suburban section of Southern Railway and also on the Kolkata Metro covering all EMU rakes. TPWS has also been approved for 3300 Route Km Automatic Signalling Sections on IR network. There has been delay in commissioning TPWS for want of funds. Progress of TCAS, which has features of both Anti Collision Device (ACD) and TPWS, needs to be expedited by RDSO.

Funds For Safety

Special Railway Safety Fund (SRSF) Phase-I which was implemented during the period 2003-2008, involved expenditure of Rs.16,318 crore for improving safety on Indian Railways. It primarily involved replacement of worn out assets relating to Bridges, Signalling systems, Track and Rolling Stock.

A High Level Safety Review Committee under the Chairmanship of Shri Anil Kakodkar was set up in September 2011 and the report was submitted in February 2012. The Committee has estimated that for implementation of all its recommendations, primarily pertaining to rail safety, will require an expenditure of Rs.1,03,110 crore in a period of 5 years, i.e. approx. Rs.20,000 crore per annum for a 5 years period.

IR has requested Ministry of Finance for a grant for a second phase of Special Railway Safety Fund to undertake works recommended by the Kakodkar Committee.

Attention Areas

IR needs to give attention to following areas to improve safety:

- Renewal of tracks and over aged distressed bridges;
- Provision of thick web switches, improved welding technology and weldable CMS crossings;
- Vehicle borne ultrasonic flaw detectors and mechanized maintenance of track;
- Works for provision of isolation of tracks;
- Replacement of over aged

signalling gears, over aged traction distribution assets, masts/portals having critical implantation;

- Train protection systems (TPWS & TCAS);
- Mobile train radio communication;
- Up gradation of mainline coaches with smoke and fire detection system;
- Crash worthy buffers;
- Wagon improvement, train examination facility and disaster management facilities;
- Replacement of fire safety in EMUs/locos;
- Replacement of DG sets in power cars and mid-life rehabilitation of mainline coaches/ EMU;
- Up gradation of training institutes, running rooms and crew lobbies;
- Global Benchmark in Signalling;

Safety Overview: A Summary

1. In terms of global benchmarking, IR's safety record compares favourably with that of advanced systems of European Railways.
2. Highest number of fatalities over IR occur due to accidents at unmanned level crossings. They take place mainly due to the negligence of road vehicle users in not observing the precautions laid down in the Motor Vehicles Act while negotiating unmanned level crossings. These can be minimized with the construction of road over bridge and road under bridge (ROB/RUB).
3. Arrears of track renewal are accumulating which will result into disproportionately high

maintenance effort. This will also result in reduced reliability of assets.

4. Accidents on account of running staff in terms of Signal Passing at Danger (SPAD) are a major cause of concern. Hence, TCAS (Train Collision Avoidance System), an indigenous solution, to avoid collisions and drivers passing signal at danger needs to be expedited.

Conclusion

The need of the hour is to undertake a massive infrastructure expansion and decongestion program coupled with up gradation of technology and judicious electrification of tracks along with enhancement of terminal capacity. It is evident that the real issue today is the lack of physical capacity over IR on key routes due to severe congestion and the incremental traffic is being offered on the saturated routes only. This impacts network expansion, customer satisfaction, project planning and implementation and safety.

Indian Railways has suffered from chronic and significant under-investment as a result of which, the network expansion and modernization has not happened at the requisite pace leading to an erosion of the share in national freight and passenger traffic. There is a clear recognition of the fact that for serving as the lifeline of the nation and making a contribution to the country's growth, the organization needs to become operationally and financially sound. □

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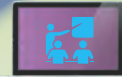
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Infrastructure: Key for Development of the North-East

Anand Kumar



The North-Eastern Region has huge untapped potential by way of land mass, mineral and other resources, services sector and human power which is waiting for being exploited for the economic development of the region and the country. To make that happen, the need of the hour is to have a futuristic unified infrastructure development plans with appropriate inputs on technology, financing, capacity development; clearly identifying short term, mid-term and long term goals

Sure, infrastructure development can be the key for the development of the North Eastern Region of the country as it would unlock the potential of its land, minerals, other resources and human power. Infrastructure development by creating employment for skilled, semi-skilled and unskilled becomes an instrument for inclusive development and main streaming of remote, backward & neglected areas.

Development of infrastructure in the North Eastern Region is not easy. Significant challenges need to be met, leave aside for fast pacing, but even for building infrastructure at normal pace.

The successive Governments, both at the Union and the level of States, have made efforts in the past through various initiatives for speeding up the construction of infrastructure in the Region. Last year, on 18 July 2014, the Ministry of Road Transport & Highways, Government of India, incorporated the National Highways and Infrastructure Development Corporation Ltd. with the objective to fast pace construction of National Highways and other infrastructure in the North Eastern States. This step also aimed at economically consolidating the North Eastern Region with over all benefits flowing to the local population. The enhanced road

connectivity achieved through this initiative would promote cross border trade and commerce besides helping safeguard India's international borders is the hope.

The North Eastern Region supports wide variation in geological features. In this area, the type of soil ranges from hard rock to extremely loose. At one end of the spectrum while cutting the hard rock is a challenge, on the other is stabilising the soil. The geological challenge gets compounded by the limited availability of aggregate, critical for construction of roads and other infrastructure. Security always remains a matter of concern for the infrastructure companies that work in the area.

The North Eastern Region being remote with short supply of construction material, semi and skilled human power and other resources acting as limiting factors; must adopt a unified approach for development of infrastructure to mitigate the challenges. It ought to be examined before planning for infrastructure development if requirements of any two or more sectors can be combined. Rail cum road bridges or tunnels for both road and rail traffic or utility corridors along the roads to facilitate laying of optical fibre, communication, electricity cables at a later date are good examples of unified approach. Development of Tourism and Industrial Parks or other Service Sector facilities

The author is the founder Managing Director of National Highways and Infrastructure Development Corporation (NHIDCL). He belongs to 1984 batch of Indian Administrative Service and has held many important positions at State and Centre in Finance, Infrastructure, Industry, Tourism, Elections and Governance sectors. He was part of the team which launched 'God's Own Country' campaign and planned introduction of House Boats in Kerala. He was instrumental in drafting the first Port Privatisation Policy in India.

along the National Highways can make the whole exercise very purposeful.

If infrastructure requirements of various sectors like Civil Aviation, Communications, Industry, Power, Transport, Tourism etc. are mapped together and planned for development with futuristic perspective of thirty to forty years following a unified approach the economic, environmental and social costs can be reduced to a large extent and pace of infrastructure development enhanced significantly.

While working on unified and futuristic approach, it is essential that due attention is paid to the quality and durability of infrastructure that is being developed in the Region. Pilferage has been often cited as one major reason for the development of poor quality infrastructure in the North East. While implementing various infrastructure projects a strict regime for quality control is required to be followed for ensuring long durability of infrastructure highways & Infrastructure Development Corporation Ltd. (NHIDCL) was incorporated on 1st July, 2014 with authorised capital of Rs. 100 crores and paid up capital of Rs. 5 lakhs became functional on 22nd September, 2014 with first appointment taken place.

The futuristic plans for the development of infrastructure should be made on the basis of social necessity or economy viability. The objectives for infrastructure development should be well defined and well argued. The investment made in infrastructure development should be purposeful.

While doing infrastructure planning for the North Eastern Region, use of new but appropriate technologies is must. It is needless to emphasise that new technologies can enhance durability and efficiency, reduce economic, social and environmental costs and address safety concerns effectively. The effort should also be made to indigenise the useful technologies and also manufacture equipments and materials that are used in infrastructure development. The new technologies can be used

for soil stabilisation, slope protection, quick launch bridges and construction of tunnels. While introducing new technologies for soil stabilisation, care should be taken that the chemicals used are not toxic and leachable.

For working in the North-Eastern sector, easy finance should be made available to the civil contractors and equipment providers. They should be encouraged to employ local human power linking incentives. The finance should be made available for the purpose of infrastructure development at comparatively soft terms and conditions so that in a scenario where whole country is geared up for infrastructure development, the focus on the North-Eastern Region is not lost. Perhaps creation of a North-Eastern Infrastructure Fund may be an answer. To increase the pool of funds available for development of infrastructure in the North East, while conceiving and implementing various infrastructure projects, the responsible agencies must adopt the right mode of project implementation like EPC, Annuity or Hybrid Annuity considering the viability.

For the inclusive development of North-Eastern Region, the efforts of the Union and State Governments should not only be focussed on development of skilled or semi-skill human power like managers, equipment handlers etc, but on the contrary, a serious attempt should be made to enhance the capacity of the local contractors. This effort should be supplemented with preparing suitable packages for them – for which the local contractors can bid. A small step in this direction will enable these contractors from North East to become major players in infrastructure sector in the years to come. The development of local youth and contractors would certainly pay the way for inclusive development of the Region.

While the planning and other administrative issues are tackled adopting futuristic and unified approach by the Union and the States, it is also expected of various implementing agencies like National Highways and Infrastructure Development

Corporation Ltd. (NHIDCL) working in the Region to follow a professional approach.

NHIDCL though incorporated on 18 July, 2014 actually became functional on 22 September, 2014 with first appointment in the company taking place. The vision of the company, as an important stakeholder in development of the North Eastern Region, is to become an instrument for creation and management of infrastructure of highest standard in the country with focus on North East and the mission is to be a professional company which works in most efficient and transparent manner for maximising benefits to all stakeholders including the community.

The infrastructure managing companies or authorities must follow strategies like the ones identified by NHIDCL, the latest entrant in the field. First, they should use e-Tools like e-Office, e-Tendering, e-Monitoring, e-Access for efficiency & transparency. Second, all such stakeholders must revisit various procedures and processes followed today to enhance the ease in doing infrastructure business. Third, they must engage themselves in continuous capacity building of staff and stakeholders including contractors to keep pace with the latest developments. Such entities, as fourth strategy, should facilitate use of new but appropriate technology in materials, design and works for enhancement in quality, durability, execution speed, cost reduction, safety standards and to address environmental concerns. As fifth strategy, all stakeholders like NHIDCL should create a platform to create scientific and innovative temper by involving Experts and Leading Research Institutions for exchange of ideas and becoming a leader in the industry. The commitment of companies like NHIDCL should remain to provide speedy Dispute Resolution Mechanism to avoid unnecessary litigations as sixth strategy and lastly, they all must hold regular consultations with stakeholders in order to create One Vision One Mission as seventh strategic move.

The companies engaged in the North Eastern Region in infrastructure

Projects awarded by NHIDCL during 2014-2015

S. No.	State	No. of packages/ Stretches	Length in Km.	Cost in Crore (Rs.)
1.	Tripura	2	122	879
2.	Assam	10	282	4,008
3.	Meghalaya	1	62	292
4.	Arunachal Pradesh	5	134	1,379
	Total	18	600	6,446

sector in order to cut costs must work on sharing concept – bringing all critical technical resources and equipments in a common pool. NHIDCL, in order to enhance the pace of infrastructure construction in North East has, within a short period, set up its branch offices in Assam, Arunachal Pradesh, Manipur, Nagaland, Tripura, Meghalaya and Mizoram.

As of today, NHIDCL has been entrusted with 108 National Highway projects covering an approx length of 7,400 km. to be executed at a cost of approximately Rs.100,000 crore. During the first year of its inception itself, NHIDCL entered into agreements for the implementation of 18 projects covering approximately 600 km. at a cost of Rs.6,446 crore. The details of these projects are as follows:

During the financial year 2015-16, the company proposes to award projects covering approximately 800 Km. with an estimated cost of Rs. 8,000 crore. During the financial year 2016-17, the company proposes to award projects covering 4,900 km. with an estimated cost of Rs. 50,000 crore.

The infrastructure development is the combined responsibility of the Union and the State Governments. While, the responsibility by enlarge for providing land, clearances like forest and utility shifting remains with the State Government, for major projects like National Highways the cost of the project is met and identification of the agency for implementation of the project is done by the Union Government. Unless, the Union and State Governments work within the

frame of One Vision, One Mission, One Goal the development of infrastructure in the any area, leave aside North East, cannot be fast paced. All stakeholders will have to come together and work out a time bound plan for infrastructure development in the North East with no excuses for delay. For this effective communication between the State Governments, the Union Government and the community would be a pre-requisite.

The North-Eastern Region has huge untapped potential by way of land mass, mineral and other resources, services sector and human power which is waiting for being exploited for the economic development of the region and the country. To make that happen, the need of the hour is to have a futuristic unified infrastructure development plans with appropriate inputs on technology, financing, capacity development; clearly identifying short term, mid-term and long term goals The futuristic and unified approach can be the basis for developing smart cities in North east against a predetermined timeframe. □

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NORTH EAST DIARY

BENGALURU TO HOST 3-DAY NORTH-EAST FESTIVAL

After having successfully showcased North-east in New Delhi and other important towns in North India, the Northeast Showcasing Campaign will be hosted in South India at Bengaluru from 6th of November this year. This 3-day North-east Festival envisages carrying North-east to different parts of the country . The rest of India needs to be familiarized and acquainted better with rich attributes of North-east as well as the people of North-east need to be exposed to the diversities that enrich India from North to South and from East to West. This Bengaluru event is a step in that direction.

This three day event will include cultural programmes, tourism displays, Business summits, seminar discussions, sports slots and arts & craft shows. Each of the sections to be hosted during the 3-day event will have some illustrious luminaries and celebrities from their respective fields. The participants will not only be from different parts of Northeast but also from different parts of India, so as to facilitate a healthy intermingling of different cultures at Bengaluru which is currently a favourite professional and educational hub for youth from the entire subcontinent. This event will also create a stimulating environment for “Startup India” and entrepreneurship.

GUWAHATI TO GET UNDERGROUND AQUARIUM

In a bid to attract domestic and foreign tourists, Assam Tourism has taken up the project to set up an underground aquarium on the outskirts of the city. Such underground aquariums are a big hit among tourists abroad and this will be the first of its kind in the North-east region. The aquarium project would require a vast area of around 50 bighas. Rs 10 Lakh are being spent on the preliminary survey, identification of land and the feasibility study which are expected to be completed this year. This project is going to be big as per the planning of Tourism department , that will have two museums - one on the State's culture and another on tea. □



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Managing Congestion With Public Transport

B I Singhal



Road space in any city is almost fixed and, if at all, can only be marginally improved. Therefore, the available road space must be used in a balanced manner both by low capacity and high capacity modes for efficient urban mobility

Cities in India are faced with growing congestion and declining urban mobility. The consequence is increasing air and noise pollution and lesser road safety. Fossil Fuel, of which a large part is imported, is wasted. GHG emissions are a global concern. There is a general degradation in the quality of life, city efficiency and its economic potential.

All categories of road users are facing problems in commuting. The pedestrians do not get a safe, conflict-free and obstruction free path to walk. The cyclists have to fight for the right of way with fast moving motorized modes of transport, many a times risking their lives. The user of public transport faces long waiting periods, uncertainty in travel time and difficult conditions of travel. Personal motorized modes of transport are slowed down by the slow moving traffic and face significant delays at traffic signals and road junctions. Road users get restless leading to road rage, rash driving and accidents. Worse, urban transport in Indian cities is headed in the wrong direction.

The primary cause of congestion is the prevailing imbalance in the use of road space. The use of high capacity modes of transport i.e. buses and mass rapid transit (MRT) is limited. Instead, use of low capacity modes of transport, both personal and public i.e. cars, 2-wheelers and 3-wheeler tempos is rising. These low capacity modes are uneconomic and socially wasteful in the use of road space and are the primary cause of congestion. Road space in any city is almost fixed and, if at all, can only be marginally improved. Therefore, the available road space must be used in a balanced manner both by low capacity and high capacity modes for efficient urban mobility. Figure-1 shows the road space occupied by cars and a bus to carry the same number of passengers.

The Challenge

Cities face three main challenges. The biggest challenge is the high rate of urbanization; migration from rural to urban areas and from small cities to big cities. The decadal percentage increase of urban population that was 2.26 in 2001 is expected to rise to 4 by 2031 (Ref: The Report of the Working Group

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Fig-1



on UT for the 12TH FYP). By then, the urban population is estimated to double to about 600 million. The challenge is made doubly difficult because there is an existing deficit in urban transport facilities. The High Powered Expert Committee appointed by Ministry of Urban Development, Government of India (March 2011) estimate that the backlog in urban roads ranged from 50 to 80 per cent across all Indian cities. This deficit has to be wiped out before urban transport infrastructure can grow to keep pace with growing demand. Thirdly, there is a need to protect the environment while improving services and infrastructure. All this is not going to be easy because the estimated investment needed is very high.

The report of the 'HPEC' (mentioned earlier), estimates a total expenditure of Rs 39 lac crores on 'Indian urban infrastructure and services' by 2031. The expenditure on urban transport and roads together is more than half the total expenditure at Rs 23 lac crores. Similar estimate is provided by McKinsey Global Institute (MGI). It has estimated a capital outlay of USD 1182 billion (About Rs 53 lac crores) for the next 20 years to build up services in cities to enable them to play their role in the desired economic growth of the country. Urban transport and roads together require half the estimated capex i.e. USD 591 billion (About Rs 26 lac crores).

Apart from the huge funds

requirement, there is an urgent need for an extensive and effective institutional set up to manage such huge expenditure. Unlike other urban services i.e. water, housing and electricity, at present, there is no dedicated agency in most cities to manage urban mobility.

Role of Public Transport

Way forward clearly lies in developing public transport to restore balance in the use of roads. As a rule, small and medium size cities (population less than a million) should introduce or augment city bus services. Large cities (population more than a million) should introduce and/or augment mass rapid transit modes such as the Metro rail, Light rail transit, Bus rapid transit and the Monorail as per demand.

City Bus Service

City Bus service which operates along with other road traffic carries a major share of trips in the city even when rail or other guided transit is provided. Indeed, most small and medium size Indian cities would need only low rise buses and the use of relatively high capacity rail transit if provided would prove to be un-

economic. In large cities, bus services will be a part of the Citywide Public Transport network. Considering the importance of city bus services, Central Government has recently supported the purchase of about 26,000 modern buses in nearly 170 cities to promote public transport. There are, however, two main issues in city bus services that need attention; poor quality of service and financing.

Quality of Bus Services

The bus services are overcrowded, unreliable and not user-friendly. The bus bodies built on truck chassis with floor height of about 1 m make it difficult to board and de-board especially for the aged, women and the less-abled and have a poor image. Hence, bus is not a favoured mode of choice. Commuters who have no other option only patronize it.

The severest criticism of bus



services, is its irregularity and lack of information about the schedules. Even when a service schedule is issued, it is more violated than adhered to. The passengers are further rattled if true and complete information about a delayed or disrupted bus service is not made available to them. Passengers are often understanding and accommodating if they are given information about delay or cancellation of a services time.

A commuter survey conducted (By DIMTS Ltd. in 2006) along the BRT corridor in Delhi revealed that the commuter expects a seamless, safe, convenient, comfortable, reliable, on time service with well-behaved drivers and conductors in reasonable time, cost and speed.

Thus, steps to improve quality of bus services are essential. Cleanliness, Punctuality, Reliability, Regularity, Safety, Ability, Behaviour and training of the Crew Members and improved corridor ambience will go a long way in improving the quality of bus service and hence, its image. The quality of bus services should match the quality of service provided by other modern modes of guided transport such as rail transit. Low floor or semi-low floor buses need to be introduced. A total changeover is essential to change the image of the bus and to promote its acceptability. In addition to the general modernization of existing bus services, premium air-conditioned bus services should be introduced both as a stage carriage and as contract carriage services. This will attract the user of personal transport i.e. cars and two wheelers, that is a major cause of the present road congestion to public transport. It will help cross-subsidize normal bus services.

Financing

Most city bus services operate at a loss and require both capital and revenue subsidy. Many cities introduced bus services in the past, but had to close down mainly because of low financial viability and the need for ongoing subsidy which cities could ill-afford. One of the reasons for these

financial difficulties is the very low fare charged due to low affordability of masses. However, there are examples, though very few, in India where bus services are being operated by the city without any subsidy. In fact, there are some more examples where bus services are being operated on PPP basis and the Government is paid a premium for awarding the lease to the private operator to operate buses in the city. These examples do suggest that a well-planned and well managed bus service can be self-financing.

The Central Government, in its effects to improve financial viability while financing buses for cities, linked it to mandatory reforms as follows:

- Designate a nodal department for urban transport;
- Set up an UMTA to coordinate urban transport activities and for multi-modal integration;
- Set up an SPV to manage bus services;
- Bus prioritization at intersections, dedicated/demarcated lanes for buses;
- Set up an Urban Transport Fund;
- Waive/reimburse state and local taxes on PT;
- Mechanism for periodic revision of PT fares;
- Formulate a policy on advertising and its implementation plan;
- Formulate a policy on Transit Oriented Development;
- Formulate a policy on parking and its implementation plan; and
- Use ITS and Set up a Traffic Information and Management Center;

Some cities brought in private operators to operate bus services. Route permits were issued for a fee and net cost concessions, where the private operators keep all revenue, were awarded. Both failed to provide quality service. Neither were the buses well maintained nor the drivers and conductors, well trained. Since fares cannot be high as a matter of public policy, the fare box revenue can only

sustain a poor quality bus and service. As a result, the ultimate sufferer is the public.

To ensure quality of service, the revenue risk has to be taken by the city and the private service provider should be paid on per kilometre basis (Gross cost model). The model should levy penalties for not achieving the desired key performance indicators and provide incentives for increased ridership. The depots and civil infrastructure facilities in all such cases would have to be provided by the Government as a private operator cannot be expected to pay for the cost of land in urban areas for its 5 to 7 years concession period.

Improvement in quality of city bus service will attract ridership and help to improve the financial viability of the city bus services as well.

Mass Rapid Transit

Policy

The report of the working group on UT for the 12TH FYP lays down guidelines to augment mass rapid transit with part funding from Government of India as follows:

- a) Introduce organized city bus service as per Urban Bus Specifications issued by MOUD in all 2 lac+ cities and State capitals;
- b) Add BRT @ 20 km/1 million population in 51 cities, population > 1 million;
- c) Add rail transit @ 10 km/ million population, start planning rail transit projects in cities with population in excess of 2 million, and start construction in cities with population in excess of 3 million. The estimated financial progress during the 12th plan period is envisaged at 25 per cent of total cost;
- d) Expand rail transit in existing mega cities (4 million +), @ 10 km per/ yr.
- e) Provide suburban rail in urban agglomerations with population > 4 million.

Many cities have/are taking steps to improve mass rapid transit- both road and rail based. At least 19 cities are at different stages of implementation and operation of Metro rail. A monorail project has recently been commissioned in Mumbai. Cities like Kozhikode, Chennai and Delhi are considering the use of Monorail. More than 500 km 'Bus Rapid Transit' is currently under construction and some even operational. Regional connectivity is being improved.

Planning Issues

In order to derive full benefit from the huge projected investment in mass rapid transit, it is incumbent on the city to provide full support to these services. This includes provision of a comprehensive road network, traffic engineering and management, education of road users, enforcement of rules, training of drivers and other road users, removal of encroachments, licensing, vehicle inspection and testing facilities and transport demand management. Of prime importance are road network and traffic engineering and management.

Road Network, Traffic Engineering and Management

Basic infrastructure for city transport is the roads network and associated features such as street furniture, intersections, traffic signals,

round-about, grade-separators, bridges on rivers, drains and railway tracks, road bye-passes, terminals, inter-modal transfer points, parking, pedestrians, bicycles and bus priority schemes. All modes use the road network and each mode has its own operating requirements. Movement of goods vehicles is of special significance as there are a variety of vehicles performing varied tasks related to goods movement. Even though rail transit has its own dedicated tracks and terminals, commuter entry and exit uses road infrastructure. Hence the movement of all other modes of transport should be simultaneously planned. Traffic engineering and management, both area-wise and corridor-wise maintains mobility on the road network and hence should be in sync with the mass rapid transit network.

Future Technology

Technology is advancing very fast. Planning should have flexibility to adopt future technology updates along with special fuelling, operation and maintenance facilities and appropriate regulatory measures. Such technologies will enter the country through joint ventures and collaboration agreements between such technology providers and suitable Indian companies. However, new technologies always find it difficult to

enter an established market. They will need to be offered suitable concessions and benefits that would enable them to compete with established technologies. It is expected that such competition will also encourage established technologies to improve their performance characteristics and compete with the emerging choices.

Promoting Public Transport

Providing a mass rapid transit network is only the first step; it has to be promoted. In this context, the two most important steps are multimodal integration and first and last mile connectivity.

Multimodal Integration

PT is inherently multi-modal. The city has several corridors with demand ranging from a few hundred trips to several thousand trips per hour. Similarly, starting with a mini bus to midi and maxi buses and finally guided and rail transit modes, the capacity of each mode increases. All corridors in a city do not need a high cost, high capacity Metro rail. Similarly, a bus may not necessarily be able to meet the demand on all corridors. For an economic transport network, it is necessary that capacity of the chosen mode matches the demand level in a corridor. Over-provision in a corridor will be uneconomic. Such a multi-modal network will be least costly with best possible financial viability and hence affordable and sustainable.

A multi-modal network means that the commuter has to change mode at the interchange points. A commuter, however, does not like to change modes. It is inconvenient and has a time penalty. While it may not be possible to eliminate the need for interchange completely, it can be made convenient by designing efficient interchange points that impose minimum time penalty. Single ticket for all modes, integrated service schedules and easily available passenger information about connecting services will save commuter time. Indeed, the need to change can be limited to one interchange for most commuters by



Ahmedabad BRT



Delhi Metro rail



Mumbai suburban rail



Mumbai Monorail

introducing the PT network in a grid pattern that covers the entire city. All modes, private, NMT and PT should be integrated into a seamless network.

However, the most important feature to minimize time penalty and most difficult to achieve is physical integration of modes at stations/stops. This requires integrated planning at concept level of alignment and station locations of all modes that will form the multimodal PT network. If various components of the network are planned independently and physical integration is an afterthought, it will neither be effective, nor user friendly. This brings in the importance of institutional integration for effective coordination. The present practice of rail transit and bus services being planned by separate agencies and operation without any mechanism for integration of services is not conducive to making the use of PT convenient.

In recent years, an increasing emphasis has been placed on designing interchange facilities that make such transfers easy and seamless. An intermodal station may service air, rail, and road transport, both urban and inter-city, for example. To encourage car users to make much of their journey by public transport, parking places are provided in the suburbs near

major highways where commuters can leave their cars for the day and take a train or bus into the city.

PT to be Citywide with First and Last Mile Connectivity

For PT to be attractive and effective, it should be citywide so that the commuter is assured that he can complete his journey all the way by PT. One or two corridors of PT in a city will not make a dent into the urban mobility problem. MRT modes, whether road based or rail based, cannot provide door to door service. Other modes i.e. walk, cycle, personal vehicles- cars and 2-wheelers- and para-transit- tempos and autos- have to provide first and last mile connectivity for easy and safe access to public transport. The worry of the 'first and last mile connectivity' compels commuters to use their own vehicle and discourages the use of PT. It will make the network city-wide with door to door service. This is essential for PT to be the favoured choice of the commuter. This will improve ridership and hence financial viability of the PT network.

Setting up an SPV

Planning, operating and financing of quality city bus and MRT service requires the dedicated attention of a team with appropriate skills in route planning, infrastructure planning,

operation and maintenance, use of intelligent transport system, fare fixation, financing and cost benefit analysis. Operation should provide reliable on time service and user friendly service that meets with the aspirations of the commuter which will attract users. The service should be alive to the changing needs of the commuter. Not all cities are equipped with these skills. There is extensive experience in the country in inter-city transport services, both road and rail based. However, city transport services have special requirements and are different from inter-city services. Speed is low, frequency of service is high and passengers can be standing. A special purpose vehicle set up to provide PT services will pay rich dividends in terms of quality of service and financial viability.

Concluding Remarks

Congestion cannot be reduced by increasing the capacity of the road network. Experience shows that congestion returns within a few years. Congestion has to be managed. An efficient citywide public transport network that provides reliable on time service will promote its use and help reduce road congestion. A walkable city, however, is a necessary adjunct to manage congestion. □

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Indian Railway Knowledge Portal

The Indian Railway Knowledge Portal namely www.kportal.indianrailways.gov.in was launched recently. The portal has aggregated most of the available knowledge about Indian Railways at one location and has also tried to encompass as much knowledge as possible, by linking websites, documents etc. for dissemination of knowledge on Indian Railways. This portal is an initiative of the National Academy of Indian Railways (NAIR), Vadodara.

This Knowledge Portal features all subjects of Indian Railways, Railway Research and Development, use of ICT in Indian Railways, listing of major International Railway Journals, linking of existing Indian Railway Libraries and also World Railways in one web page. It has e-access to existing libraries of Railways, and all the libraries are being clustered to have a single interface through e-Granthalaya by NIC. The Knowledge Portal Home Page also gives a brief of all the social media activities of the Indian Railway sites. It has web pages on fan clubs, heritage, and rail museums across the world. In short, it is a 'one stop' arrangement for people who are interested in Indian Railways both from a strictly technical point of view as well as enthusiasts. It is envisaged that it shall be a virtual learning point where people will be able to login to the website and go for off-line or online learning. The website has a modern design, with a very clean and simple layout. It is mobile and tablet friendly and is easily navigable. It has been an in house effort of IT Faculty of the Academy with bare minimum cost for website development, about Rs 70,000.

Issues and Challenges of Rural Roadways in India

Ashoke K Sarkar



...many issues are yet to be addressed primarily with regard to increasing cost of construction of new roads and the maintenance of existing roads....by encouraging the use of locally available materials for road construction and development of a road asset management system. Also, an optimal road network planning technique has to be developed to provide connectivity to all the habitations in the country with minimum cost

Transportation is a vital component of economic development, social progress and quality of rural population. Its inadequacy can deprive the population of accessibility to basic and economic needs making them transportation disadvantaged i.e. making it suffer from reduced cultural and social contacts as well as limiting business and employment opportunities. India is a vast country with 0.6 million villages. The geography and the climate of the country vary widely from region to region. Also, India has a long border with countries such as Pakistan, China, Nepal, Bhutan, Bangladesh and Myanmar. It has hilly terrain in the north, north-east, western and south-western region. Also, there is a large desert area, mainly in Rajasthan and Gujarat and a large coastal region. Some are high rainfall areas and in some areas, rainfall is minimal. Such wide variation in terrain and climate make road construction a challenge in India.

Road Development Plans

The necessity of a proper road network for the development of the country was understood quite early in India. The first road development plan (1943-61), popularly known as Nagpur Plan, looked at the road needs of the

country on a long term basis, and for the first time, classified the road system into a functional hierarchy comprising National Highways (NH), State Highways (SH), Major District Roads (MDR), Other District Roads (ODR) and Village Roads (VR). The last two classes of roads form the rural road system in the country. Sufficient emphasis was given in the subsequent 20-year road development plans to increase the road density in the country by constructing roads of all categories. Total road network in India is about 4.6 million km in which rural roads are of 2.6 million km. The latest road development plan Vision 2021 has emphasized on a planned rural road network development at the district level with a target of connecting all habitations with population over 100 by all-weather roads.

Construction of Rural Roads

Constitutionally, the development of rural roads is the responsibility of the state government in India and thus, the central government was not directly involved in funding rural road projects. However, from the Fifth Five-Year Plan, the Central Government started funding rural road projects through various programmes such as the Minimum Needs Programme (MNP), National Rural Employment plan Programme (NREP), Rural Landless Employment Guarantee Programme

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Rural Accessibility Indicator as per IDA criterion RAI (IDA) is expressed as Eq 1.

$$\text{RAI (PMGSY)} = \frac{\text{Population living within 2.0 km band on both sides of all – weather roads}}{\text{Total population of the block}} \times 100 \quad (1)$$

Rural Accessibility Indicator as per PMGSY criterion RAI (PMGSY) in plain terrain is expressed as Eq 2.

$$\text{RAI (PMGSY)} = \frac{\text{Population living within 0.5 km band on both sides of all – weather roads}}{\text{Total population of the block}} \times 100 \quad (2)$$

Accessibility Indicator as per PMGSY criterion AI (PMGSY) in hilly terrain and desert areas) is expressed as Eq 3.

$$\text{RAI (PMGSY)} = \frac{\text{Population living within 1.5 km band on both sides of all – weather roads}}{\text{Total population of the block}} \times 100 \quad (3)$$

(RLEGP) and Jawahar Rozgar Yojana (JRY). Keeping in view the fact that road connectivity is a prime contributor to enhancing quality of rural life, initiatives have been taken in India to improve accessibility in rural areas. In 2000, it was observed that about 40 per cent of the habitations in the country were not connected by all-weather roads even though efforts had been made at state government level over a period of time. Moreover, a large majority of the rural roads were not in good condition due to the poor quality of construction and maintenance (Sarkar et al., 2007). With a view to improve road connectivity in rural areas, Government of India launched the Pradhan Mantri Gram Sadak Yojana (PMGSY) in 2000. In addition to the budgetary support from the Government of India, the programme is also receiving funding from multi-lateral international agencies such as the World Bank and the Asian Development Bank (ADB). The programme was started with a goal to provide connectivity by all-weather roads (single lane width 3.75m) to all the habitations having population of 1000 and above in the plains (500 and above in hilly, desert and tribal areas) by the end of 2003. And then the next step was to provide connectivity to the habitation of a population of 500 and above in the plains (250 and above in hilly, desert and tribal areas) by the end of 2007. Only new connectivity was to be provided for

habitations, which were unconnected. Out of the total habitations eligible for connectivity, 51 per cent of them have been connected by March 2013. Some of the PMGSY roads constructed in the first phase are more than twelve years old now. Even though the roads were maintained by the concerned contractors for the first five years, it is well known that the functional condition of pavement deteriorates due to increase in repeated loads of the vehicular traffic and other environmental factors. It was also observed that in some of the stretches, traffic had increased far too high from projected value. This necessitated the up-gradation of some stretches of rural roads by widening the pavement width to 5.5 m and strengthening the pavements. This new intervention has been named as PMGSY- II scheme. The states which have completed the construction of roads under PMGSY-I are only eligible for funding for the implementation of PMGSY-II. A quantification technique has been developed to determine the need for up-gradation of links. Even though it is widely acknowledged that the construction of PMGSY roads has improved accessibility in rural areas, not much work has been reported on the quantification of the accessibility and assessment of their impacts.

Rural Roads and Accessibility

The World Bank has developed an indicator, known as Rural Access

Indicator (RAI) to determine the overall accessibility in a region. The internationally established definition of RAI is the proportion of the number of rural people who live within two kilometers (typically equivalent to a walk of 20-25 minutes) of an all-weather road to the total rural population. Under the PMGSY guidelines, a habitation is considered to have connectivity, if there is an existing all weather road within 500 meters of the habitation (in case of Hill area, the path distance is 1.5 km). The formulas are expressed in equations 1, 2 and 3. The populations within the bands are found using the buffer tool in ArcGIS 10.2.

A recent study in five districts of Rajasthan, namely Alwar, Jhunjhunu, Tonk, Churu and Bikaner has shown that the accessibility has improved by 14 to 19 per cent after the construction of the PMGSY roads (Table-1). The maximum impact of PMGSY in terms of RAI has been observed in Alwar district. It is also noted that Alwar has maximum population density. Higher the population density, i.e., more closer the habitations, the lesser roads required to connect the habitations. A relation is plotted between population density and total road length required to connect the habitations (Fig 1). It has also been observed that when the population density is low, the total road network length of that block is high. For example, in the figure, it can be seen that for blocks of Alwar district whose population density is high, the

total road length constructed to achieve present RAI is less as compared to Bikaner district with low population density.

Until the beginning of the 1980s, it was widely accepted that proper motorized road networks would provide adequate accessibility to rural areas in developing countries. However, over the last few decades, limitations of the theory have been highlighted by many researchers. They argue that rather than analyzing the needs of transport system from the point of view of a particular function to be performed, focus should be on the transport needs of communities and individual households. Accordingly, the concept of Integrated Rural Accessibility Planning (IRAP) has been developed in various nations, for example, Tanzania, Philippines, Bangladesh, Malawi, India, Nepal

and Zimbabwe (Affum et al.,1995; Barwell and Jonathan Dawson,1993; Connerly and Larry Schroeder, 1996; Edmonds et al., 1994; Howe,1983; Ahmed et al., 1995; Sieber,1996; Ali-Nejadfard, 1997; ILO-ASIST

AP, 2003;Donnges Chirs et al., 2004; Sarkar, 2005; Sarkar and Ghosh, 2008). In a study carried out in Alwar district in Rajasthan, the level of accessibility to health care facilities was determined in two sets of selected

Fig 1: Relationship between Population Density and Total Road Length

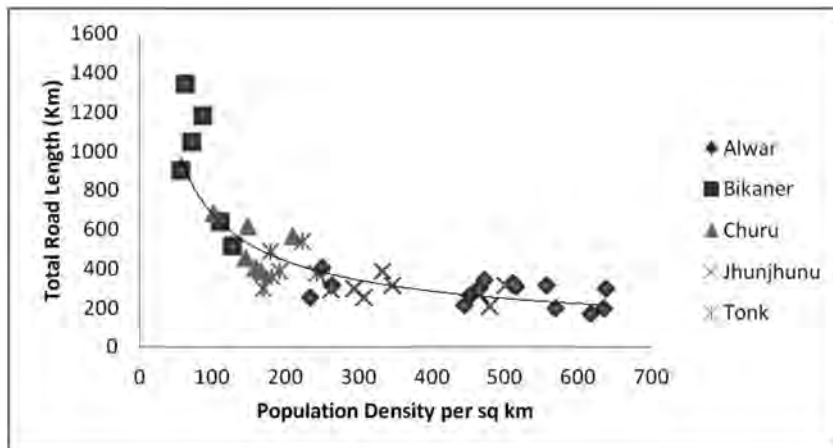


Table 1: RAI (in per cent) in District-wise

District	PMGSY road length constructed (km)	RAI (in per cent)		
		With PMGSY	Without PMGSY	Difference
Alwar	676.5	63.73284	44.59091	19.14193
Jhunjhunu	499.1	64.42531	48.21902	16.20629
Tonk	459.3	57.58115	40.30879	17.27235
Churu	543.4	56.38355	38.56386	17.81969
Bikaner	584.2	53.38355	39.83894	13.54461

Table- 2: Level of Accessibility to Health Care Facilities in the Villages Connected by PMGSY Roads in the study area in Alwar District

Village		Distance	Road type	Road condition	Travel time	Travel cost	Level of accessibility
Adind	Weight	0.27	0.20	0.15	0.30	0.08	3.36
	Score	3.36	3.36	3.36	3.0	4.79	
Bhimsingpura	Weight	0.16	0.27	0.14	0.25	0.18	3.03
	Score	2.08	3.15	3.15	3.0	3.69	
Chawandi	Weight	0.16	0.23	0.27	0.16	0.18	3.29
	Score	2.0	3.86	4.5	1.86	3.14	
Daulatsignpura	Weight	0.17	0.22	0.23	0.15	0.23	3.27
	Score	2.8	3.7	3.8	2.2	3.4	
Dani Chandaswali	Weight	0.19	0.25	0.25	0.19	0.12	3.69
	Score	3.0	5.0	5.0	2.0	2.0	
Kutina	Weight	0.16	0.23	0.15	0.23	0.23	3.68
	Score	3.5	4.0	3.8	3.0	4.1	
Mehatawas	Weight	0.14	0.26	0.29	0.17	0.14	3.28
	Score	2.0	4.0	3.83	3.0	2.43	

Table-3: Level of Accessibility to Health Care Facilities in the Unconnected Villages in the study area in Alwar District

Village		Distance	Road type	Road condition	Travel time	Travel cost	Over all accessibility
Batana	Weight	0.15	0.21	0.26	0.21	0.17	1.42
	Score	1.6	2.0	1.2	1.2	1.2	
Dani Beedlawali	Weight	0.21	0.22	0.22	0.21	0.14	1.78
	Score	2.0	1.0	1.0	2.0	3.6	
Kundansignpura	Weight	0.20	0.25	0.24	0.19	0.12	1.97
	Score	2.0	1.0	2.0	2.0	3.8	
Partapur	Weight	0.20	0.20	0.19	0.21	0.20	2.14
	Score	2.0	1.56	2.0	2.33	2.78	
Sapera Basti	Weight	0.21	0.21	0.21	0.21	0.16	1.32
	Score	1.0	1.0	1.0	1.0	3.0	
Umraogarh	Weight	0.29	0.23	0.23	0.15	0.10	2.54
	Score	2.0	3.6	3.6	1.2	1.2	

villages, one connected by PMGSY roads and the other one was not connected by any road (Kanuganti et al., 2014). The accessibility was defined in terms of distance, type of road, condition of road, travel time and travel cost. Data was collected in the villages and accessibility was measured on a scale with a highest possible score of 5. In all the villages that were connected by PMGSY roads, the level of accessibility was found to be ranging between 3.03 and 3.69 (Table-2) whereas in the unconnected villages, the values ranged between 1.42 and 2.54 (Table-3).

Issues and Challenges

While the construction of rural roads through PMGSY programme has helped in improving the accessibility in the country, there is a long way to go and there are a few challenges that need to be addressed to achieve total connectivity. A few issues are discussed below:

- The present approach of population-based criterion for connecting habitations might not produce an efficient network while connecting villages with low population. Since the construction of rural roads cannot be based on demand, a need-based approach needs to be developed for network planning for India.

- Construction of roads may not necessarily ensure accessibility. The existing norm of the PMGSY that a village may be considered as accessible if it is located within 0.5km and 1.5km band for plain and hilly/ desert region respectively, may not provide actual accessibility. In many cases, especially in desert regions when the habitations are located quite far off, accessibility is not achieved without affordable transport services. Thus, immediate benefits after construction of a road are being enjoyed by those who can afford to have their own vehicles.
- Traffic on a few rural roads constructed a few years ago has increased tremendously and thus might not be considered as rural roads any more. But if they are categorized as MDR or SH, funding might be a problem as the State Governments do not have enough funds to construct and maintain roads.
- While, funding for construction of rural roads is now-a-days available from the central government, maintenance of existing roads is a challenge as most of the state governments do not provide adequate funding. Thus, there is a need to develop a proper maintenance management plan to

judiciously use the little fund that is made available.

- The cost of construction of rural roads is increasing and also the materials for construction are becoming scarce and expensive. Efforts must be made to use locally available materials. How to construct roads with minimum cost using locally available materials is a major challenge.
- In hilly terrains with number of rivers and streams, it is extremely difficult and expensive to provide connectivity. Drainage and stability of slopes are also major challenges.
- With the provision of high quality roads such as PMGSY roads, the traffic on a number of rural roads is increasing and high- speed motorized vehicles have started plying on such roads. In the process, road safety has become an issue.

Conclusions

Rural roads have been given due importance since the year 2000 when the PMGSY programme was launched. Even though, the targets could not be achieved on time, there is no doubt that the overall connectivity in the country has improved considerably. However, the improvement has not been uniform throughout due to various

reasons. Moreover, many issues are yet to be addressed primarily with regard to increasing cost of construction of new roads and the maintenance of existing roads. There is an urgent need to address these issues by encouraging the use of locally available materials for road construction and development of a road asset management system. Also, an optimal road network planning technique has to be developed to provide connectivity to all the habitations in the country with minimum cost.

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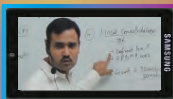
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Air Travel in India: Potential to Fly High Amidst Turbulence

Shishir Sinha



...there is thinking to convert regional airlines into national scheduled airlines in a phased manner. This would make such airlines more commercially viable. There is another proposal to allow non-scheduled operators (NSOPs) to fly scheduled flights across the country but with some conditions. Don't forget that there are 122 such operators with over 400 aircrafts. All these measures aim to provide last mile connectivity through air routes which is turn will benefit not just the aviation industry but overall economy also

Peoples say, flying is no longer a luxury. Many of you will agree with this statement. But current data does not support this. Consider, in a country of over 1.25 billion, on an average 5.6 million people flew on various domestic routes every month during January-August period of 2015. Is this a big number? Certainly not, and do not forget that more than half of the fliers mentioned above are frequent ones. Effectively, this means India is a nation where 1-2 per cent of the population travels by air.

Take another data. According to Census 2011, there are 4,041 statutory towns (All places with a municipality, corporation, cantonment board or notified town area committee, etc.) in India, but of this, only 78 are connected through air route. Even among these 78, over 90 per cent traffic is in top 20 cities. This means a much bigger area is without regular air connectivity. This also means that despite being shifted to the category of necessity from luxury, air traffic is yet to become a popular mode of transportation. So, where is the problem and what is the solution? Before venturing into that, let's first analyse the present situation.

Passenger Air Transport

At present, there are 10 scheduled air passenger carriers (scheduled

carrier means those who fly with fare published on the website and with Government approved time table) comprising of one State owned Air India (including Air India Express and Alliance Air) and 9 privately owned i.e. Indigo, Jet Airways (along with Jet Lite), Spice Jet, Go, Air Asia, Vistara, Air Costa, Air Pegasus, and True Jet. All these together have 417 aircrafts. It is a much smaller number when you compare with China which has over 2,400. Even Singapore has around 200 jets.

Indian carriers can be classified into two categories, full service and low frill. Full service means that the passenger will get complimentary meal/snacks on board along with entertainment, free newspaper and things such as blanket and pillow (on demand only). Air India, Jet Airways and Vistara are in this category. On the other hand, low frill airlines such as Indigo, Spicejet, Air Asia or Go just focus on basic air travel and do not provide free meal, newspaper or any such things. Some of these carriers even charge extra for specific seats such as those near emergency window or first row (because of extra leg space).

Normally, it is expected that low frill carriers will have cheaper tickets than the full service ones. However, on many occasions and especially during festive times, low frill carriers' tickets

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are more expensive than full service ones. This is mainly due to demand-supply mis-match and also because of the dynamic fare pricing (a system where various fare categories have a certain number of seats and sale starts with lowest fare category and as soon as one category is over, next one is made available with higher fare).

Meanwhile, a recent study by Centre for Asia-Pacific Aviation, India (CAPA INDIA) for Vistara Airlines mentioned that India is the cheapest country to fly 100 km amongst 43 countries sampled from across the globe. For other modes of transport (train: 30th, bus: 5th) fares in India were cheap but not the cheapest amongst other countries considered under the study.

The Market Potential

Consider below mentioned factors, according to India Brand Equity Foundation (IBEF), which will be growth drivers for the aviation industry in India:

Working population (aged between 15 and 64 years) is expected to reach 9000 million by 2030 from 812 million in 2014. This is almost three times the US population.

Secondly, middle income population is expected to reach over 260 million next year as against 160 million in 2011. This is more than three times of Germany's population.

Spending on business travel is estimated to increase to \$60.4 billion in 2024 from \$19.1 billion in 2015, while that on leisure travel is forecast to rise to \$224.6 billion from \$96.01 billion in 2015.

The travel & tourism industry is forecast to grow 10.79 per cent to USD349 billion in 2024 from USD125.2 billion in 2014.

All these signal to a robust future but corporate and investors have their own concerns.

Where is the Problem?

The Prime Minister often uses an acronym, '3D' for inviting industrialists to invest. '3D' means, democracy (a vibrant one), demand (a surging one) and demographic dividend (aspiring 65 per cent population). These are basic ingredients for any industry to start or expand and aviation is not an exception. But this industry has some generic problems and some specific problems.

Generic problems mainly relate to setting up a business in India. A common complaint is that it takes too much time and processes to start a business in India. A report on *Doing Business* (2015) by the *World Bank* mentions that in Mumbai, a company needs to complete 13 procedures and to spend almost 30 days just to complete the basic formalities of starting a business. Since, starting an airline business is a much more technical one, some more requirements are to be fulfilled.

"As per the Air Operator Certification Manual published by the DGCA, an applicant may receive an AOP in 90 days if all phases of the certification process are completed as per stipulated guidelines. However, in practice, start-up airlines in India usually take much longer (sometimes more than a year) to obtain an AOP due to the lack of a robust regulatory and legal system where delays can be appealed," CAPA India mentioned in its report.

Even after getting the permit, running an airline has its own specific problems and out of which, very high taxation really hurts. There is an

opinion that since normally air travel is used by affluent section of the society, there is nothing wrong in levying higher taxes.

Consider this Service tax on economy class ticket is levied at the effective rate of 5.6 per cent of the basic fare, while on business class it would be 8.4 per cent of the basic fare.

Average sales tax on aviation fuel (Aviation Turbine Fuel or ATF) is 24 per cent in various states. This along with various Central levies makes fuel much-more costly. Fuel alone contributes up to 50 per cent of the operation cost of an Indian carrier in comparison to 30-32 per cent globally.

Despite all these, if India ranks lowest in airfare among 43 countries, that means basic fare is low and which is why Indian carriers are estimated to have borne a loss of over Rs.7,000 crore during 2014-15, despite 35 per cent reduction in jet fuel cost during the year.

Flying Abroad

The second specific issue is conditions for flying abroad. Rules say that any Indian carrier can start flying abroad, if it has completed five years of domestic flying and has at least 20 aircrafts in its fleet. This is called '5/20' rule. On the contrary, many countries permit their carriers to fly abroad from the day 1 even if they have 4-5 aircrafts. This has impacted Indian air carriers heavily. During April-June quarter of fiscal year 2015-16, Indian carriers carried little over 45 lakh passengers to and from India, while for the foreign carriers, this number was over 76 lakhs.

Regional Connectivity

Although, there are a total number of 476 airports/airstrips

Table 1: Benefit of Aviation Industry

Country	Employment (000s)					GDP (US \$ million)				
	Direct	Indirect	Induced	Tourism	Total	Direct	Indirect	Induced	Tourism	Total
China	900.8	2,624.1	1,335.4	993.5	5,853.8	26,286	28,236	14,369	11,994	80,885
India	121.6	334.2	240.2	5,998.7	6,694.7	1,860	1,354	973	19,121	23,308

Source: Aviation Benefits Beyond Boundaries, April 2014

Table 2 : Domestic Passengers

(In Lakhs)

Year	Air India	Private Carriers	Total
2013 (Jan-Dec)	119.09	495.17	614.25
2014 (Jan-Dec)	124.25	549.58	673.83
2015 (Jan-Aug)	87.14	436.41	523.55

Source: Directorate General of Civil Aviation

(operational and non-operational) airports, airstrips etc. owned by the Airports Authority of India, Defence, State Governments, private parties etc, but air travel is possible only through 78 of them. In order to use such an infrastructure and to promote connectivity from Tier II and Tier III cities, the Government introduced a policy for Regional Airlines in 2007. Anyone with just one aircraft (with a condition to acquire at least two more aircrafts within two years) was permitted to start scheduled service between two smaller cities.

However, at present, there are just three regional airlines, Air Costa, Air Pegasus, and True Jet. Even the Centre's appeal to State Governments for encouraging measures to boost regional connectivity in their own region have not met with much success.

Road Ahead

Amidst all the turbulence, Indian Aviation has all the potential to fly really high but it needs a combination of factors. It would be worth top recall, what Tony Tyler, Director General and Chief Executive Officer of International Air Transport Association or IATA (the global Airlines body) said. "The world

is focused on Indian aviation – from manufacturers, tourism boards, airlines and global businesses to individual travellers, shippers and businessmen. If we can find common purpose among all stakeholders in Indian aviation, a bright future is at hand," he said during an industry meet.

The present Government has realised this and is already in the process of finalising a new Aviation Policy which will focus on boosting connectivity domestically and may ease the process of flying abroad by the airlines which will in turn encourage corporates to set up an airline.

There are reports that there could be cess on each air ticket to promote regional and remote connectivity. Some reports also mentioned that there is thinking to convert regional airlines into national scheduled airlines in a phased manner. This would make such airlines more commercially viable. There is another proposal to allow non-scheduled operators (NSOPs) to fly scheduled flights across the country but with some conditions. Don't forget that there are 122 such operators with over 400 aircrafts. All these measures aim to provide last mile connectivity through air routes which in turn will

benefit not just the aviation industry but overall economy also.

More connectivity will require much better airport infrastructure. Earlier, state run Airport Authority of India (AAI) was the only one to develop, manage and operate the airport. But now with Delhi, Mumbai, Bengaluru, Hyderabad, and Cochin Airports developed under public-private partnership (PPP), things are changing. Now the Government expects private sector investment to increase to \$9.3 billion during 12th Five Year Plan (2012-17) from \$5.5 billion in the previous plan. At the same time, after developing and upgrading 23 airports during last five years, the AAI aims to bring around 250 airports under operation across the country by 2020.

Readings

IBEF's sectoral report on Aviation, August, 2015
 CAPA India's report on Indian Aviation Industry commissioned by Vistara Airlines
 Lok Sabha question-answers
 Directorate General of Civil Aviation
 Various media reports
 Censusindia.gov.in

(E-mail: hblshishir@gmail.com)

Setting up of India Sign Language Research and Training Centre

The Union Cabinet chaired by the Prime Minister has approved the setting up of Indian Sign Language Research and Training Centre (ISLRTC) as a Society under the Societies Registration Act, 1860. The ISLRTC will be under the aegis of the Department of Empowerment of Persons with Disabilities, Ministry of Social Justice & Empowerment. It shall be located initially at the Institute for Physically Handicapped, New Delhi.

This decision will help the five million deaf community of the country. It shall provide for increased accessibility for the hearing impaired in education, in the workplace and in all activities of public life.

The Centre will be a Society consisting of a President and 12 Members in the General Council. There will be an Executive Council consisting of a Chairperson and nine Members, some Ex-officio and others, as experts from National Level Organizations of the Deaf/Universities/Academic Institutions and independent experts in Indian Sign Language (ISL).

The needs of the deaf community for a common ISL and related matters have long been ignored, and problems have been documented by various organizations working for the deaf. The Centre will lead the way in academic development, training and propagation of the Indian Sign Language. Development of sign language interpreters, Research and Development and new technology will be the focus area of the Centre. It will provide equal opportunities to hearing impaired persons to fully participate in every sphere of life.

Passenger and Freight Transport in Indian Railways: Challenges in Capacity Building

Vijay Dutt



Newer initiatives for financing like PPP, Institutional Finance etc. have been adopted in addition to increased allocation of Plan Finance. However, there is still the need to accelerate these efforts to meet the growing expectations of our masses in an environment friendly way by increasing the capacity of the Indian Railways to make the Railways as the most preferred mode again

Indian Railways (IR) is an energy efficient mode of transportation in our country. (Energy consumed is one sixth of corresponding Energy consumed on Road Traffic). At the same time, Railways in India now run primarily on electricity which can be derived from modes other than oil including New and Renewable sources like Wind and Solar. At time when world oil crisis coupled with the fact that bulk of oil used by our country is imported, makes Indian Railways an ideal transportation mode for the country.

Railways use one third of the 'Right of Way' as compared to Road. This is another useful factor for our populous country where land scarcity will always be an issue. The Rail Coefficient (per cent of use by Rail) of Passenger as well as Freight which stands at about 10 per cent and 35 per cent at present is declining as the capacity added to the Rail Sector has been less. Increasing Rail coefficient by expanding capacity is in national interest. IR needs augmentation of infrastructure and needs freedom to rationalize the traffic.

The advantages of Railways over other modes of Transport are very well

described in newly published report of National Transport Committee (April 2014) (Table 1)

Committees on Rail Modernisation

The Committee on Rail Modernisation has considered various aspects of need for Infrastructure Building in Rail Transport in India. 15 key areas have been identified for investment i.e. Tracks, Signaling, Stations and Terminals, PPP, Land, Dedicated Freight Corridors, Information and Communication Technology, Indigenous development, Safety, Funding, Human Resource and Organization. Also, funding of Rs. 560,000 Crores in the next five years has been recommended for investment for Modernisation by the Committee.

Potential of Indian Railways

Indian Railways (IR) is the third largest railway network in the world with 7,083 railway stations, 1,31,205 railway bridges, 9000 locomotives, 51,030 passenger coaches, 2,19,931 freight cars and 63,974 route kilometers. Today, IR operates 19,000 trains each day, comprising 12,000 passenger trains and 7,000 freight trains. It transports 2.65 million tonnes of freight traffic and 23 million passengers every day and 7.2 billion passengers per year. It currently has 1.36 million

The author is former Additional Member (Electrical) Railway Board. He has got 40 years' experience of working in various Areas of Railways with core area of specialization in Electric Traction and Urban Transport. As member of 'Study Group on Alternative systems of Urban Transport' set up by Govt of India in 1987, he was instrumental in setting up of UTMA's and ushering in of Metro Railways in India. He has also worked in Department of Atomic Energy on Nuclear Reactors. Thus his areas of work include Power, Nuclear Energy and Renewal sources of Energy like Solar, Wind and Ocean Thermal Energy Conversion (OTEC).

Table 1 : Comparison of Environmental and Social Sustainability of Rail and Road Transport

Energy Consumption	As compared to road, rail consumes 75 per cent to 90 per cent less energy for freight traffic and 5 per cent to 21 per cent less energy for passenger traffic
Financial Costs	Unit cost of rail transport was lower than road transport by about Rs 2 per NTKM and Rs 1.6 per PKM (in the base year 2000)
Environmental Damage	Rail transport emits 17 gram CO2 equivalent per PKM as compared to 84 gram per PKM in case of road transport Rail transport emits 28 gram CO2 equivalent per NTKM as compared to 64 gram per NTKM in case of road transport
Accident Costs	Accident costs on road are significantly higher than those on rail For passenger transport, road accident costs are 45 times higher than rail For freight transport, road accident costs are 8 times that of rail
Social Costs (All-Inclusive Costs)	In terms of all-inclusive costs or social costs, railways have a huge advantage over road transport (the advantage is more in case of freight traffic) For urban areas, the cost advantage of rail (in the base year 2000) was as much as Rs 2.8 per NTKM and Rs 1.7 per PKM For non-urban areas, the cost advantage of rail (in the base year 2000) was as much as Rs 2.5 per NTKM and Rs 1.7 per PKM

employees and an annual revenue base of Rs.1,64,374 crores as projected on March 31,2015. Clearly, Railways can potentially contribute an additional 1.5 per cent to 2 per cent to GDP.

Following are the major recommendations regarding capacity creation with respect to the key Areas as identified by the committee:

Track & Bridges: 19,000 kms of existing tracks (of routes A, B & D special); freight trains at 25 tonne axle load and at higher speeds of 75/100 kmph; Passenger Speeds of 160/200 kmph; Eliminate level crossings and provide fencing alongside tracks; urban, semi urban and other habitation which need robust fencing. It will cost nearly Rs 40 lakhs per km. In other areas, light fencing is needed to prevent cattle trespass. It will cost Rs 10 lakhs per km. Strengthening 11,250 bridges and 100 per cent Mechanised track maintenance on Routes A and B are other recommendation. These initiatives are estimated as Rs. 33,046 crores and should be completed in 5 years.

Signaling: Automatic Block Signaling on A and B routes with Train Management system etc.; on-board train protection system with cab signaling on A & B routes. These

initiatives are estimated as Rs. 25,000 crores and should be completed within 5 years.

Rolling-stock : New generation locomotives that include Electric locomotives (9,000 & 12,000 HP) and High horse power diesel locomotives (5,500 HP); Traction development for improvement in Fuel Efficiency, Emission & Reliability; High speed potential LHB coaches (160/200 kmph); Upgraded Suburban coaches; Train Sets for High Speed Inter-City travel; Modern high payload to tare ratio wagons; Green toilets on all passenger trains; and Heavy haul freight bogies. The expenditure on these initiatives is estimated at Rs. 72,571 crores and should be completed within 5 years.

Stations & Terminals

There is a need to modernise 100 major stations immediately. A total of 770 stations should be targeted for redevelopment in the next 10 years. Development of 34 multi-modal logistics parks is required.

Railway Freight Terminals- Top 50 terminals should be taken up on priority. Rs. 1,10,000 crores are required for redeveloping the proposed 100 stations excluding stations and terminals and Dedicated

Freight Corridors. These initiatives are estimated as Rs. 97,000 crores.

Land & Airspace

Monetisation of surplus land and airspace could mobilize Rs 50,000 crores for IR.

Dedicated Freight Corridors (DFCs)

Eastern and Western Dedicated Freight Corridors (3,338 Kms) should be constructed in the next 5 years. Construction of North-South, East-West, East-Coast and Southern Dedicated Freight should be taken up. Thus, Corridors of about 6,200 Kms should be made operational in the next 10 years. Upgradation of Feeder Routes to DFCs of about 6,000 kms suitable for 25 tonne axle load train running should be taken up along with construction of Dedicated Freight Rail Corridors. The total cost of this is estimated at Rs. 2,04,000 crores for all the corridors. The proposed timeframe is 5 years for Eastern and Western DFC and 10 years for North-South, East-West, East-Coast and Southern Dedicated Freight Corridors.

High Speed Passenger Train Corridors

Construction of a High Speed railway line between Ahmedabad

and Mumbai with speed of 350 kmph. project has been approved for implementation in the Rail Budget 2015-16. The cost of the high speed line between Ahmedabad and Mumbai is estimated as Rs. 60,000 crores Further, the detailed studies for 6 other High Speed rail corridors already identified are under progress. These include: (1) Delhi-Chandigarh-Amritsar (450 km); (2) Hyderabad-Dornakal-Vijayawada-Chennai (664 km); (3) Howrah-Haldia (135 km); (4) Chennai-Bangalore-Coimbatore-Ernakulam (850 km); (5) Delhi-Agra-Lucknow-Varanasi-Patna (991 km)& (6) Ernakulam-Trivandrum (194 kms). This would lead to increased connectivity, traffic and faster intercity travel.

Review of Projects

Implementation of following 'priority projects' should be expedited:

- 101 projects in advanced stage of completion where 50 per cent to 90 per cent of the investments have already been made.
- Projects already sanctioned-Rail Tracks: Out of a total of 340 rail track projects [new line (129), gauge conversion (45) and doubling (166) projects] of total track length 33,133 km, the following would be taken up as priority projects:
 - 115 doubling projects covering a length of 6643 km.
 - 15 new line/gauge conversion projects covering a length of 700 Km.
 - Electrification of 7,500 RKM implemented should be in the next five years.
 - Addition of 10,000 km of new lines in the next 5 years: These new lines are largely to achieve social inclusion and would not be remunerative.
 - Provision of funds for non-viable projects being implemented purely for social inclusion through a special fund set up by GOI for this purpose. O&M deficit determined through transparent accounting and

agreed to by the regulator should be reimbursed.

- Provision of the 'first' and 'last mile' connectivity by creating appropriate policy framework.

Identification and commissioning in a mini mission mode bypasses at junction stations and rail flyovers for grade separation. The above initiatives would lead to increased access in remote areas, additional effective broad gauge rail trackage of nearly 24,000 track kms in 5 years and additional electrified tracks of 7500 RKM. The cost estimate is Rs. 53,827 crores for 'priority projects' and Rs. 1,00,000 crores for construction of new lines. The proposed timeframe is 5 years.

Information and Communication Technology (ICT)

- The investment is estimated at Rs. 1,315 crores and should be completed in 1 to 4 years.

Indigenous Development

- Development of substantial indigenous capabilities.
- Establishment of Indian Institute of Railway Research.
- Upgradation of existing railway R&D facilities.
- Strengthening of RDSO to build local capabilities.
- Upgradation of indigenous manufacturing (foundry facilities for higher axle load bogies).
- Development of Indian Standards, critical vendors and protocols for Railways.
- Enhancement of University Interface with Railway Laboratories in Academic Institutions. Total cost of these initiatives is estimated at Rs. 464 crores.

Safety

- Deployment of latest track machines for Mechanised maintenance of track.
- Installing of wheel impact load detectors.
- Modernising and Renovation of railway workshops.

- Equipment of trains with Train Protection Warning System (TPWS).
- Installment of vehicle borne digitized and recordable ultrasonic flaw detectors to cover the entire railway system.
- Elimination of unmanned level crossings by manning, closure, merger, construction of over bridges and underpasses.
- Upgradation of coaching depots.
- Upgradation of disaster management facilities & related Services.
- Upgradation of Network Management Centers.
- Use of Social networks/cameras/Videos and other new tools and technologies extensively for safety and Security.

The benefits of these measures would be enhanced safety and security for passengers and railway workers. Total cost of the above initiatives is estimated at Rs. 39,836 crores.

Funding

Total investment requirements of Rs. 5,60,396 crores for the aforesaid proposed modernisation initiatives will be mobilized. Railways has estimated additional requirement of Rs. 4,42,744 crores for various other investments proposed to be undertaken during the next 5 years and not covered under aforesaid modernisation initiatives.

An investment of Rs 8,39,000 crores, during the next 5 years, which includes Rs 3,96,000 crores of Modernisation plan investment recommended . It is a quantum jump from investment levels of Rs 2,03,000 crore in the XIth plan and Rs 84,000 crore in the Xth plan.

Based on the discussion with various stakeholders, the Committee recommended the funding pattern given in Table 2. Funding pattern to bridge the gap of Rs. 16,469 crores has been proposed by measures like Disinvestment in Railway PSUs.

S. No.	Sources of funds	Rs. in crores
1	Gross Budgetary Support	250,000
2	Internal Generation	201,805
3	Leasing/Borrowings	101,000
4	PPPs	229,024
5	Dividend rebate	24,000
6	Road Safety Fund	16,842
	Total	822,671

Sourced through PPP, the balance requirement of Rs 164,000 crore of the modernization plan is to be included in the next 5 years i.e., 5th year onwards. This makes the total PPP funding for the modernization plan as Rs 3,93,000 crores. Also, a separate 'Modernisation Fund' on the lines of SRSF to fund these initiatives in a sustainable manner is to be created.

Recommendation for PPP –

- **PPP Projects by Rail Vikas Nigam Limited (RVNL)** RVNL was formed for undertaking Bankable projects. Following are the projects undertaken by RVNL:-
- **Progress of PPP Initiatives**

Stations and Terminals: A subsidiary of IRCON International Ltd, a PSU of Ministry of Railways 'Indian Railway Station Development' was incorporated in April 2012 jointly with Rail Land Development Authority (RLDA) for development of new Railway Station and for redevelopment of the existing ones.

High Speed Rail Corridors

The construction of First High speed rail corridor between Mumbai and Ahmedabad has been sanctioned in Rail Budget 2015-16. Major highlights of this project are as follows: Broad

gauge (1676mm) ballast less track system has been recommended. The best travel times at 350 Km/h operation speed (without stops) come at 1 H 52 min between Mumbai and Ahmedabad. The full level of interoperability with existing network has been recommended. Basic Construction Cost is Rs 60000 Crore.

Elevated Rail Corridor

Establishing feasibility of building additional corridor of suburban rail transit system, generally elevated, along the existing western suburban corridor from Virar to Churchgate and its possible extensions up to CSTM and also up to Nariman Point/Mantralaya. Similar corridor has been envisaged on Central Railway Suburban Route i.e., CSTM-Kalyan.

● Private Freight Terminals

For this activity, concessions have been granted to CWC, CONCOR and DFCCIL.

Leasing of Wagons

IRFC was set up as a Public Limited Company in December, 1986 with the sole objective of raising money from the market to part-finance the plan outlay of Ministry of Railways and for meeting their development needs. The Company has leased rolling stock assets worth Rs 1,12,266 crore to the Railways up to 31st March, 2014. Assets worth about Rs 14,785 crore were financed during 2013-14. Funding has been made by IRFC in locomotives, wagons and coaches. The Ministry has been making lease payments to IRFC regularly. The Company has also disbursed funds amounting to Rs 2,623 crore to Rail Vikas Nigam Ltd. (RVNL) till the end of fiscal year 2013-14.

Loco and Coach Manufacturing Units

Ministry of Railways proposes

to invest 26 per cent of Equity in JV subject to ceiling of Rs. 100 Cr in setting up of Locomotive Factory and Township at Madhepura (ELF) and Marhowra (DLF) to manufacture 12,000 hp Electric and 4500/6000 hp Diesel Locomotives; setting up of two Maintenance Depots for maintenance and setting up of one Training Institute.

Captive Power Generation

- Bhartiya Rail Bijli Corporation Ltd. is a Joint Venture of Indian Railways (26 per cent) and NTPC (74 per cent).
- 1000 MW Coal Based thermal Power Plant (4x250 MW) at Pit Head Nabi Nagar Bihar on Sonnagar Garwa Line First 250 MW Unit to be commissioned in December 2015. 1660 MW Coal Based Thermal Power Plant (2x830 MW) at Adra West Bengal Pit Head. This is based on Super Critical Boiler Technology.
- 450 MW Gas Based Power Plant at Thakurli Kalyan.

Renewable Energy Projects (solar, wind etc.)

IR has committed to use 10 per cent of above Energy from Renewable energy sources. It has decided to source 200 MW of Solar Power on Tariff Based Bidding mainly in states of Maharashtra and Andhra Pradesh. An additional 50 MW are to be sourced from Solar roof tops for which a subsidy of Rs 60 Cr is envisaged.

In case of wind energy, 10.5 MW wind based Power plant of Railways is working at Tuticorin for last 6 years. Railway Energy Management Company (REMC), a subsidiary of RITES has placed order for 25 MW wind based Plant in Rajasthan in April 2015. Projects in states like AP for an additional 132 MW are in progress. These are proposed under PPP.

Year	Gross earning	Expenditure	Dividend	Profit after dividend	Operating Ratio	Loading
2014-15	1,64,374 cr;	1,49,176 cr	9,135 cr.	3,783 cr	92.5 per cent	1101 MT
2013-14	1,43,742 Cr	127260 Cr			87.8 per cent	1047 MT

Capacity Generation in Freight Business-Dedicated Freight Corridor Project

The Indian Railways' quadrilateral linking the four metropolitan cities of Delhi, Mumbai, Chennai and Howrah, commonly known as the Golden Quadrilateral and its two diagonals (Delhi-Chennai and Mumbai-Howrah), adding up to a total route length of 10,122 km carries more than 55 per cent of revenue earning freight traffic of IR. The existing trunk routes of Howrah-Delhi on the Eastern Corridor and Mumbai-Delhi on the Western Corridor are highly saturated, line capacity utilization is varying between 115 per cent to 150 per cent. The surging power needs requiring heavy coal movement, booming infrastructure construction and growing international trade has led to the conception of the Dedicated Freight Corridors along the Eastern and Western Routes to fulfill the demand of additional capacity of rail freight transportation.

In the first phase, Government of India has approved construction of two corridors – the Western DFC (1500 route km) and Eastern DFC (1800 route km) - spanning a total length of about 3300 route km. The Eastern Corridor, starting from Dankuni in West Bengal will pass through the states of Bihar, Uttar Pradesh, and Haryana and terminate at Ludhiana in Punjab. The Western Corridor will traverse the distance from Dadri in Uttar Pradesh to Mumbai – Jawaharlal Nehru Port (JNPT), passing through the states of Delhi, Haryana, Rajasthan, Gujarat and Maharashtra. Therefore, “Dedicated



DFC-Western Corridor

Freight Corridor Corporation of India Limited (DFCCIL)”, a special purpose vehicle was created to undertake planning and development, mobilization of financial resources and construction, maintenance and operation of the Dedicated Freight Corridors

Future Corridors

Ministry of Railways has assigned RITES to carry out feasibility study for four additional corridors. DFCCIL has been assigned as nodal agency for this work. These corridors are East-West Corridor (Kolkata-Mumbai) approx. 2000 KMs. North-South Corridor (Delhi-Chennai) approx. 2173 KMs; East Coast Corridor (Kharagpur-Vijaywada) approx. 1100 KMs. and southern Corridor (Chennai-Goa) approx. 890 KMs.

Delhi Mumbai Industrial Corridor (DMIC)

Delhi Mumbai Industrial Corridor

(DMIC) has been conceptualized to develop self-sustained industrial townships with world-class infrastructure to tap the opportunities offered by Dedicated Freight Corridor (Western) from Delhi (Dadri) to Mumbai (JNPT). This offers high-speed rail connectivity for High Axle Load Wagons (25 Tonne) of Double Stacked Containers which is one of the most important quality of social infrastructure required for providing a globally competitive environment conducive for setting up businesses.

DMIC aims to achieve economic development by improving employment opportunities, industrial output and exports. This is expected to give fillip to the objective of achieving double digit GDP growth rate.

Capacity Generation in Passenger Segment

In the July 2014 Budget speech, the following main thrust areas were

Table 4 : Annual Plan of Indian Railways in Recent Years

Year 2014-15 (Feb Interim)	Total Investment	Budgetary Support From General Revenues	Internal Generation	Extra Budgetary Support including Market borrowing through IRFC, PPP	Road Safety fund	PPP
2014-15 ₹	65,445 cr	30,100 cr	15,350 cr	11,790 cr	2,200 cr	6,005 cr
2013-14	63,363 Cr	26000 Cr	14260 Cr	15130 Cr+6000Cr(PPP)	2000 Cr	
2012-13	Rs 60,100 Cr	Rs 24000 Cr	18,050 Cr	16050 Cr	2000 Cr	



announced: • The speed on Existing Corridors both of Passenger and Goods Trains, needs to be increased. • For Passenger Trains, a Diamond Quadrilateral with Diagonals up to speeds up to 200 KMPH was announced. • Technology like Bullet trains on select Corridors with indigenous technology should be introduced. • Mumbai-Ahmedabad Corridor was sanctioned as first high Speed Corridor.

Financial Performance of Indian Railways

In fact, for eight consecutive years for the Indian Railways, there was no or negligible rise in freight and passengers fare. In recent times, in case of woman and senior citizens, age has been reduced to 58 years. Concession for handicapped persons has been extended to Rajdhani & Shatabdi trains also.

It will be interesting to look into overall financial performance of IR in recent years. There has been continuous

progress in Railway Performance parameters and indices. While many Departments in Union are dependent on Subsidies, in case of IR, not only the full dividend of 6.25 per cent is paid to the General Revenue amounting to Rs 9135 Crores, but the lowest fares in India and the world are ensured.

Annual Plans

However, one of the biggest problems of this scenario is that there has been inadequate capacity expansion since independence.

In 1947, the Rail Network was 53700 Kilometers and Rail Coefficient (per cent public using Rail Network) was 80 per cent. In our country where 90 per cent of oil is imported, a medium like Railways which is 6 times more energy efficient and can almost fully run on Electricity, the Rail Coefficient has progressively come down to 30 per cent for Freight and 10 per cent for Passenger business. In contrast, in our neighborhood China which had about 45000 RKM network

till 1990, now stands at about 107000 RKM of High Quality network. The solution lies in a fast expansion of our network and faster Electrification as clear from above analysis. This brings us to Annual plan for Indian Railways. Table 4 summaries it for some recent years.

We can contrast it with the Recommendations of Committee on Modernisation of Railways, the report of which came in February 2012. The committee recommended spending of Rs 7.5 Lakhs in next 5 years putting requirement of annual plan as Rs 150000 crores as against only Rs 64305 Cr being spent in current year. Even the Recommendation of Committee on Modernisation of Railways is very modest compared to China where Rs 13 Lakhs are spent in 5 years making the requirement of annual plan as Rs 260000 crores.

Conclusion

In India, Railways is one of the most environment friendly and most affordable modes of mass transport. It is also the most preferred option for the masses. Indian Railways has done impressive work of capacity expansion while keeping the Passenger and Freight Tariffs among the lowest in the world. This has been achieved with almost no external subsidy.

However, inadequate capacity expansion of Railway Network has resulted in drop in share of railways to 10 per cent from 80 per cent in 1947 in Passenger segment and 30 per cent from 80 per cent in 1947 in Freight segment. Various Committees and Groups set up by the Government have addressed this aspect and stressed the need for increased investment in Railways for Capacity Expansion to enable Indian Railways to regain their 1947 share in national interest. Various methods of financing have been suggested.

The Government has also acted on the recommendations and major initiatives in Freight Sector like DFCCIL projects and in Passenger

Sectors like increasing speeds on existing corridors and building high speed corridors have been undertaken. Newer initiatives for financing like PPP, Institutional Finance etc. have been adopted in addition to increased allocation of Plan Finance. However, there is still the need to accelerate these efforts to meet the growing expectations of our masses in an environment friendly way by increasing the capacity of the Indian Railways to make the Railways as the most preferred mode again. □

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Development Roadmap

Programme for Welfare of People in Mining Areas

A new programme 'Pradhan Mantri Khanij Kshetra Kalyan Yojana (PMKKKY)' to provide for the welfare of areas and people affected by mining related operation was launched recently.

The most productive mining areas in the country are largely areas inhabited by scheduled tribes and are also located in the areas covered by the Fifth Schedule of the Constitution. The focus of the PMKKKY is, therefore, to safeguard the health, environment and economic conditions of these tribals and providing them with opportunities to benefit from the vast mineral resources that are extracted from these areas. The objective of the PMKKKY scheme is to a) implement various developmental and welfare projects/programmes in mining affected areas that complement the existing ongoing schemes/projects of State and Central Government; b) to minimize/mitigate the adverse impacts during and after mining on the environment, health and socio-economics of people in mining districts; c) ensure long-term sustainable livelihoods for the affected people in mining areas.

The funds for implementation of this Yojana would be generated from the mandatory contribution payable by miners to District Mineral Foundations (DMFs) under the Mines and Minerals (Development & Regulation) Amendment Act, 2015. It is expected that nearly Rs 6000 crores would be made available for the implementation of PMKKKY.

As per guidelines at least 60 per cent of the funds under the PMKKKY have to be used for high priority areas such as drinking water supply, environment preservation and pollution control measures, primary/secondary health care, education, welfare of women, children, aged and disabled people, skill development & sanitation. Up to 40 per cent of the funds can be used for infrastructure projects such as physical infrastructure, irrigation, energy and watershed development and any other measures for enhancing environmental quality in mining districts.

The DMFs have also been directed to take all major decisions in a participatory mode, in consultation with the 'gram sabhas' of the respective villages.

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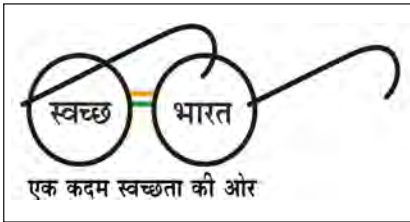
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Gandhiji's Vision on Sanitation

John Chelladurai



As a searcher of Truth, Gandhiji maintained meticulous life style and accorded highest importance to cleanliness. As Father of the Nation, he realized the indispensable place of sanitation in nation building and stated 'Cleanliness is only next to Godliness.'

An young man from the central Maharashtra who cleared ICS preliminary met Gandhiji at his Sewagram Ashram to seek his blessings. Gandhiji asked 'Why do you want to be ICS?' 'To serve India' responded the young man. 'Going to village and doing sanitation work' is the best service to India, advised Gandhiji. And the ICS aspirant Appa Patwardhan turned out to be one of the finest freedom fighters, specializing in the art of 'Safai'.

In the school of freedom struggle, 'safai' and 'swachhata' was the test to graduation. Vinoba Bhave, Thakkar Baba, J C Kumarappa and innumerable youngsters with sparkling brilliance, joined the freedom struggle and took to safai and swachhata root to independence.

As a searcher of Truth, Gandhiji maintained meticulous life style and accorded highest importance to cleanliness. As Father of the Nation, he realized the indispensable place of sanitation in nation building and stated 'Cleanliness is only next to Godliness.'

Development Pre-Requisite

Development has been a faithful companion of human civilization. From a prehistoric hunter gatherer to the sophisticated urbane human, we have improvised life a great deal.

Development is seen as a betterment that innovation brings about in any facet of life. The notion of human development incorporates all aspects of individuals' well-being': food security, clean and fresh air, safe drinking water, health and sanitation, access to wherewithal, to assure all these quality education and freedom of choice.

Much of these components of development can be classified as physiological need fulfillment, as Abraham Maslow would put it.

As developing community, we have taken great pain to build mechanisms to take care of one side of the physiological need, the supply side, to the utter neglect of another side, the disposal. Disposal has scarcely been in the scheme of development agenda.

As the saying goes 'a good beginning is half success.' Concerning the other half, the saying continues 'It is not how you start that is important, how you finish.'

Humanity that masters the art of cooking, making instruments of development should also master the art of disposing what are its by products.

Sadly, be it human excretion, industrial refuse, consumer litter or development junk, humanity continues to give if at all, a reluctant attention.

The author is Gandhian scholar and Associate Dean at the Gandhi Research Foundation, Jalgaon, Maharashtra.

Incivility

This has resulted in our railway stations, bus stand, market, even temple premises appearing to be a junkyard infested with houseflies, mosquitoes and rodent. Gandhiji called it 'stinking den.'² We have turned even the holy Ganga into mega sewage.

About the callous attitude towards public hygiene of city people, Gandhiji commented "it is not comforting to think that people walk about the streets of Indian Bombay under the perpetual fear of dwellers in the storeyed buildings spitting up them."³ He deemed open-air defecation as 'uncivilized', for, "we avert our eyes if anyone happens to pass at that moment."

Truth Realization

For Gandhiji, sanitation is not just a biological requirement; it is a way of life, an integral part of Truth realization. His understanding of cleanliness stems from his realization of the universal oneness of Truth. Gandhiji who worshipped Truth as God, saw the Absolute, the all encompassing Truth as Pure and hence equated 'Cleanliness with Godliness'. He accorded 'sanitation' the status of an essential step to freedom incorporating it into the list of eighteen Constructive Programme.⁴

The seeker after Truth, saw life as the closest manifestation of Truth, therefore he equated life with Truth or God. All the processes that are part of life and its conduct are also part of the Truth realization. In this sense, Gandhiji believed, sanitation, cleanliness of inner and outer self are means of God realization. "We can no more gain God's blessing with an unclean body than with an unclean mind. A clean body cannot reside in an unclean city."⁵

Swaraj

Gandhiji's holistic perspective about freedom of India led him to understand the unique place of sanitation in India's pursuit of swaraj.

Demanding the right of Indian Home Rule, Bal Gangadhar Tilak



Courtesy: Gandhi Research Foundation, Jalgaon, Maharashtra

roared, "Swaraj is my birth right". For Gandhiji, the term Swaraj is more profound in its implication. He stated in *Young India*, "Swaraj is a sacred word, a Vedic word, meaning self-rule, self-restraint, and not freedom from all restraint which 'independence' often means."⁶ Self restraint from all indulgence, not to mention, from littering public places. He went on further, 'Swaraj of my dream is the poor man's swaraj', and the self-restraint need to seep up to the last man.

Addressing the grand audience on the occasion of the inauguration of Banaras Hindu University, he referred to the filth that smothered the holy city. "No amount of speeches will ever make us fit for self-government (freedom). It is only our conduct that will fit us for it."⁷ Cleanliness has been a '*swarajya yajna*' for him.

This 'self-restraint' he evoked in individual conduct of personal and public life, both physical and attitudinal facets of living. Talking on the disposal mechanism Gandhi stated, 'Swaraj is not *Poorna Swaraj*, until all the ordinary amenities of life are guaranteed to every human under it.'⁸

Sanitation An Act of Nation Building

Spearheading freedom struggle, he explained the dimensions of freedom and highlighted the importance of 'clean behavior'. In this context

he stated 'before we think of self-government, we shall have to do necessary plodding.'⁹

From the stand point of health, Gandhiji termed the condition of villages as deplorable. "One of the chief causes of our poverty is the non-availability of this essential knowledge of hygiene."¹⁰ In this sense he stated Swaraj is not 'freeing India merely from the English yoke... but from any yoke whatsoever.'¹¹

On another occasion he stated, Swaraj will be a fruit of incessant labour and intelligent appreciation of the environment.¹²

Sanitation as an Act Sublime Joy

Gandhiji who saw nonviolent living as the best means to worship God, Truth, saw every act that serves life as a way to God. He deemed cleaning as an act of purification and drew immense joy.

Pyarelal, Gandhiji's secretary gives an interesting anecdote on this, from Noakhali where Gandhiji was walking length and breadth to build harmony between Hindus and Muslims.

He writes, "Even for Noakhali, it had been an exceptionally dewy night, and the narrow footpath by which Gandhiji was to proceed had been rendered extremely slippery when on the morning of 19th January 1947 he left Badalkot for Atakara. Twice Col.



Courtesy: Gandhi Research Foundation, Jalgaon, Maharashtra.

Jiwan Singh accustomed to difficult marches, lost his foothold and rolled over. Laughingly Gandhi offered him the end of his walking stick to pull himself up the slippery slope.

The footpath was narrow so that the party could walk on it only in single file. All of a sudden the column came to a dead-stop. Gandhiji was removing excreta from the footpath with the help of some dry leaves. The footpath had again been dirtied by some communal urchins.

“Why did you not let me do it? Why do you put us to shame like this?” Manu asked.

Gandhiji laughed: “You little know the joy it gives me to do such things.”¹³

Gram-Rajya

Village, the centre of all primary produce, sustenance, “is the heart of India.” In the life of villages rests the life of India, Gandhiji believed. Hence, he equated Hind-Swaraj – Indian Home Rule, with ‘Gram-Rajya’.



Visualizing villages of free India, Gandhiji stated, ‘That village may be regarded as reformed, which has every kind of village industries to produce each of her requirements, in which nobody is illiterate, where the roads are clean, there is a fixed place for evacuation, the wells are clean...’¹⁴

Gandhiji proposed “An ideal Indian village will be so constructed as to lend itself to perfect sanitation. It will have cottages with sufficient light and ventilation built of a material obtainable within a radius of five miles of it.”¹⁵

Lamenting over the present despicable state of village, he wrote, “If sanitation in villages can be improved, lakhs of rupees will easily be saved and the condition of people improved to that extent. A sick peasant can never work as hard as a healthy one”.¹⁶

Response to Sanitation Issue

Responding to sanitation woe, he proposed ‘Every village should have the most inexpensive water-closets built at one place.’¹⁷

The whole subject (sanitation) is unexplored; the profession, far from being a dirty one, is a purifying, life-protecting one. Only we have debased it. We have to raise it to its true status.

Gandhiji called Satyagraha and Constructive programme as two wings of the same bird, without one the other has no sense. The irrevocable connection Gandhiji built between constructive programme such as sanitation and freedom struggle was evident all over the country. Toilet cleaning and “sanitation work became the qualification of a *satyagrahi*.” Every public meeting, whether a call for satyagraha against the British or a initiative of social reform, the meeting had ‘village cleaning’ as an inalienable beginning.

A section of Indians known as scavengers were engaged for generations in the task of removing night soil from the old-style basket-type (dry) latrines, and who were therefore looked down upon. Gandhiji



was very concerned with the suffering of these people because he felt that though they were considered to be at the bottom of society, they executed the most important tasks of organizing community sanitation and health.

Following Gandhiji’s vision, innumerable institutes took up on Gandhiji’s call and started ‘safai’ campaign; Safai Vidyalay - Dehu Road, Nirmal Gram Nirman Kendra, Nasik are some of them that took it religiously.

Harijan Sevak Sangh established Safai Vidyalaya (“sanitation institute”) in 1963 at the Sabarmati Ashram, Ahmedabad, Gujarat, with the purpose of liberating the scavengers from this kind of work. The primary objectives of Safai Vidyalaya are: upliftment of sweepers and scavengers; upgradation of rural and urban health and sanitation.

Conclusion

Gandhiji worshipped Truth as God and non-violence as the way. It is the ‘way of living.’ Between the ‘way’ and the ‘goal’, Gandhiji said, because the former is in my command, I would consider the ‘way’ more important in the functional sense, than the end. ‘If you take care of the means the end will take care of itself’, he stated. In that sense, India as a nation that marches towards glory in the world arena must take up the ways of making her pure and clean, and the end ‘glory’ would follow suit. “The splendor of

the spring is reflected in every tree, the whole earth is then filled with the freshness of youth. When the Swaraj spirit has permeated the society, there is an energy in every walk of life." he maintained.

Footnotes

- 1 'Beyond Economic Growth: Meeting the Challenges of Global Development', Book On Line, Oct, 06, 2004, http://www.worldbank.org/depweb/english/beyond/beyondco/beg_01.pdf, P. 04

- 2 CWMG., Vol.13, P.213
- 3 Speech at Banares Hindu University, CWMG, Vol.13, P.213
- 4 Constructive Programme: Its meaning and place, Navjivan, Ahmedabad, 1941.
- 5 Young India 19/11/1925
- 6 YI, 19 -03 -1931,p. 38
- 7 Ibid, P.212
- 8 YI 26 – 03 – 1931, P.46
- 9 Speech at Banares Hindu University, CWMG, Vol.13, P.213

- 10 Shikshan Ane Sahitya, 18 -08 – 1929; 41:295
- 11 YI 12 -06 – 1924, p.195
- 12 YI 05 01 1922, P.4 and YI 27 08 1925, P.297, MoMG P. 319
- 13 Pyarelal – The Last Phase
- 14 Letter to Munnalal Shah, 4-4-1941; 73:421
- 15 Harijan 18-08-1940
- 16 Shikshan Ane Sahitya, 18 -08 – 1929; 41:295
- 17 Harijan, 05 – 12 – 1936: 64:105

(Courtesy: Kurukshetra)

DO YOU KNOW?

Diamond Quadrilateral

The Diamond Quadrilateral is a project of the Indian Railways under which , a High Speed Rail network will be set up in India to connect the four major metro cities and growth centres in India- Delhi, Mumbai, Chennai and Kolkata, to reduce the travelling time between these cities. The project is quite similar to Golden Quadrilateral which was a roadway project connecting the four metros by Express Ways. So far , nine sectors have been identified for Diamond Quadrilateral. These are Delhi-Agra, ii) Delhi-Chandigarh iii) Delhi-Kanpur iv) Nagpur-Bilaspur ,v) Mysore-Bengaluru-Chennai vi) Mumbai-Goa vii) Mumbai-Ahmedabad viii) Chennai-Hyderabad and ix) Nagpur-Secunderabad. The Mumbai-Ahmedabad sector has been identified as the first corridor to start High Speed Trains after the experts from France and Japan conducted their feasibility studies, to check whether it would be viable to cover the distance between these two cities in an hour or so. A major part of the proposed 543 km Mumbai-Ahmedabad High Speed Corridor passes through Gujarat.

While bullet trains would require a completely new infrastructure, higher speed for existing trains will be achieved by upgrading the existing network. Hence, efforts will be made to increase the speed of trains to 160-200 kmph in select sectors to significantly reduce the travel time between these major cities. The High Speed Rail Project will have to be taken up through an appropriate mix of Government support, multilateral/bilateral funding by alternative means of resource mobilization, including Public-Private-Partnership (PPP). The Union Budget has already announced a provision of Rs.100 crore for high Speed project to RVNL/HSRC (High Speed Rail Corridor) to take further steps. The cost of laying per kilometer track of Bullet Train (High Speed Train) is approx. Rs. 80-120 crore, as compared to Rs. 10-12 crore for ordinary track and Rs. 150-200 crore for metro tracks.

E-Hastakshar or E-Sign

'e-Hastakshar' is a citizens' service which allows citizens to sign documents digitally. It is an online electronic signature service which can be integrated with service delivery applications via an open API to facilitate an Aadhaar holder with a registered cellphone number to digitally sign a document. These handwritten signatures can be replaced with an electronic signature, which can be put in documents in an electronic form. This service has been launched as a part of Digital India programme. City-based C-DAC will be the Certifying Authority under the Controller of Certifying Authorities .

Online electronic signature service is facilitated using authentication of the Aadhaar holder through Aadhaar e-KYC service . It is legally acceptable under the Indian IT Act 2000 and its various rules and regulations. With this, it is now possible to quickly replace the handwritten signature with electronic signature for documents, saving time and effort. This online service offers many advantages over the conventional paper and pen system of signing. It saves the time and effort and user can easily apply digital signature anywhere which makes it very convenient and accessible. Since it requires Aadhaar Id , the system is authenticated and the privacy concerns are taken care of. The authentication options for eKYC include biometric (fingerprint or iris scan) or OTP (through the registered mobile in the Aadhaar database).

eSign enables millions of Aadhaar holders easy access to legally valid Digital Signature service. It is flexible and easily integrated with application. Also there are no concerns regarding the key storage and key protection because Aadhaar holders private keys are created on Hardware Security Module (HSM) and destroyed immediately after one time use.

It also includes signer consent, Digital Signature Certificate issuance request, Digital Signature creation and affixing as well as Digital Signature Certificate acceptance in accordance with provisions of Information Technology Act. While authentication of the signer is carried out using Aadhaar e-KYC services, the signature on the document is carried out on a back end server of the e-Sign provider. E-Sign services are facilitated by trusted third party service providers - currently Certifying Authorities (CA) licensed under the IT Act It enforces compliance through API specification and licensing model of APIs. Comprehensive digital audit trail, in-built to confirm the validity of transactions, is also preserved.

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(Contd. from Cover II)

JUSTIFICATION FOR MORE NATIONAL WATERWAYS

Government has undertaken a policy for integrated development of inland waterways for navigation purposes. As per the extant provisions, Central Govt can undertake development of an inland waterway for navigation only when it is declared as a national waterway by an Act of Parliament inline with Entry No 24 in List I of the 7th Schedule of the Constitution. Therefore, for the development of the proposed 101 identified inland waterways for the purpose of navigation, it becomes necessary that these inland waterways are declared as national waterways by an Act of Parliament.

Keeping in view the urgent need for a supplementary/alternate mode of transport on waterways, such a long waiting period needs to be curtailed. One way of reducing this time period is to declare all the identified waterways as national waterways through one legislation and enable the Government to undertake development as and when the need arises and the preparatory work and funding tie up is complete.

On declaration of a waterway as a NW, development and regulation for shipping and navigation by mechanically propelled vessels come under the jurisdiction of Central Government. However, rights over the usage of water, ownership of appurtenant land, minerals, metals, sand etc. continue to be with the State Government.

SOCIO-ECONOMIC BENEFITS

Like National Highways in road sector, there is a concept of National Waterways (NW) in IWT sector as well. Due to large network of feeder State Highways, District Roads and Village Roads, the potential of National Highways gets fully exploited. The absence of such a network for waterways has resulted in gross underutilisation of the potential of Inland Water transport (IWT) sector and it is proposed to build a similar network in collaboration with the States.

This would enable creation of a logistic supply chain with intermodal connectivity. It would positively contribute to the GDP by opening up business opportunities in the area of dredging, barge construction, barge operation, barge repair facilities, terminal construction, terminal operation, storage facilities, providing modern aids to day and night navigation, tourist cruise, consultancy, training of manpower for manning the barges, hydrographic survey, etc. Investment in all these business areas will create numerous opportunities for employment and economic development and reduce the pressure from the already over loaded, congested and costlier other surface modes of transport. Detailed business development studies are being carried out under the Jal Marg Vikas Project for identifying all business opportunities and quantifying the anticipated investments and employment opportunities.

The development of fairway on the proposed National Waterways will lead to a surge in private investment in the following areas:

1. On Barges
2. Creation of storage facilities
3. On ship building facilities.
4. On vessel repair/bunkering facilities
5. On inland Container Depots/Domestic Container Terminals.
6. On industrial units/areas.

One barge operating under double shift operation would normally provide direct employment to about 20 persons. It is expected that in 5 to 6 years time on our Inland Waterways, we would have more than 1000 new barges, This itself will provide direct employment to more than 20,000 people. Besides, barge building facilities, barge repairing and manning of terminals itself has immense employment potential. It is expected that the future development of waterways along with the associated activities would lead to private sector investment of more the one lakh crore and creation of more than 1 lakh direct employment opportunities.

To provide skilled manpower to this emerging employment opportunities in the IWT sector, IWAI will upgrade and enhance the capacity of their training institute at Patna. The National Inland Navigational Institute (NINI) at Patna will provide more courses in different disciplines to train and provide adequate skilled manpower for operation of the barges and to man other activities on Inland Water Transport.

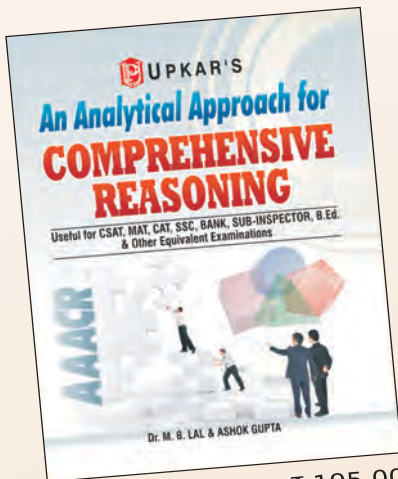
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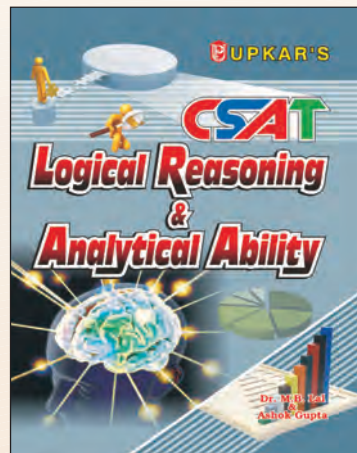
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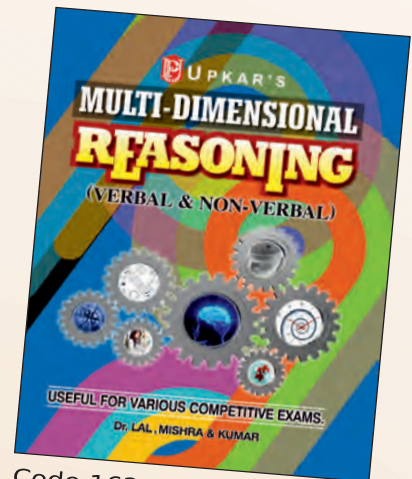
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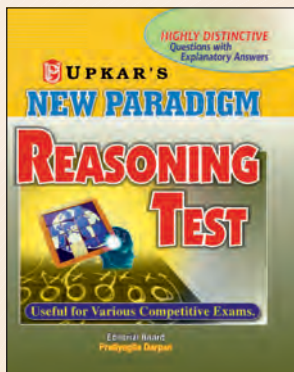
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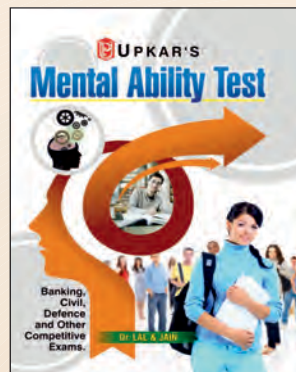
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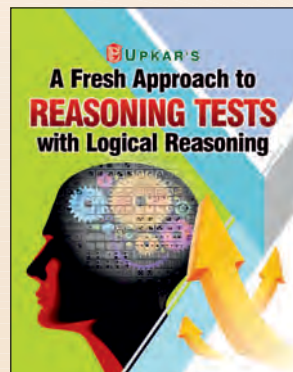
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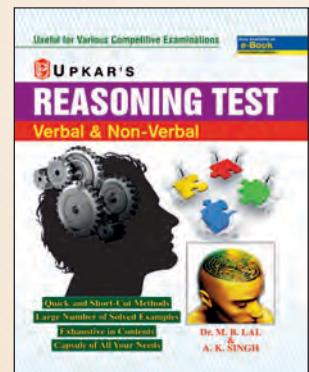
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