

Reengineering Transportation Systems for Sustainable Business and Economy - A Case for Public Transportation System with an Emphasis on High Speed Rail Transport

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ABSTRACT

Sustainable transportation systems are essential to the functioning of societies and economies and provide basic infrastructure for the movement of people and goods with ease. The existence and utilization of sustainable transportation networks are fundamental to the modern age and the negative effects of congestion and pollution are associated with their increasing usage on account of relentless growth in population. Growing interest in sustainability, sustainable development, and sustainable transportation is noteworthy, while the paradigm shift in the perspectives of human beings towards living standards to save the planet is vital factor to be considered as global citizens. The paper's theoretical approach emphasizes the usage of public transport, especially high speed rail transport to save the environment and reap benefits such as decongestion of roads, reduced fuel bills, minimal accidents, strain free travelling, improved health and minimized vehicle pollution. Comparison of private and public transport, pros and cons of various modes of transport, transformative effects of having high speed public rail transport and policy measures to move towards sustainable transport systems with an integrated approach were discussed.

It is suggested to reengineer the existing unsustainable transport infrastructure and pave the way for high speed rail services which significantly benefits. Having sustainable transportation is not by choice but by necessity and no longer can the world afford to have personalized transport facility at a cost of unsustainable environmental impact.

1. Introduction

Increasing globalization marked with society becoming increasingly consumption oriented, has led many economies grow faster and reap the short-term benefits of global economy. Commercial activities have gained momentum and factories have increased in number to support the seven billion world's population which is expected to increase to nine billion by 2050 (Valentí Rull, 2010). However, the transportation systems in many countries are yet to be upgraded and reengineered to support the growing requirements of the world. The pace of economic development in the world economy surpasses the development in the public transportation system. Developments in science and technology, particularly in the transportation have reduced the distance between geographical regions of the world but not the disparities. Good physical connectivity in the urban and rural areas is essential for economic growth (Stephen Gibbons and Stephen Machin, 2004). Since the globalization, many economies have witnessed a rise in demand for transport infrastructure and services. Contrast to these developments, governments has not built up adequate public transport infrastructure, leaving private transport to grow rapidly.

Transport systems are major emitters of greenhouse gases, responsible for 23% of world energy-related GHG emissions in 2004, with about three quarters coming from road vehicles (James Woodcock et al, 2009). Currently 95% of transport energy comes from petroleum. Energy is consumed in the manufacture as well as the use of vehicles, and is embodied in

transport infrastructure including roads, bridges and railways (Wikipedia1. (n.d.).

Today's unsustainable levels of vehicle pollution are the consequence of unreliable public transportation system (Nagurney, A. 2000). Therefore, we need to have not only sustainable transportation but sustainable accessibility and well developed transportation system since it is a nervous system of an economy that touches many aspects of human lives. Moreover, economies highly dependent on fossil fuels had been affected by high inflation due to rising oil prices across the world and global warming on account of high dependence on private transport.

2. Private versus Public Transportation System

Private transport, as opposed to public transport, is transportation service which is not available for use by the general public. Private transport is the dominant form of transportation in most of the world. In the United States, for example, 86.2% of passenger miles travelled occur by passenger vehicles, motorcycles, and trucks. Examples of private transport are automobiles, motorcycles, taxis and private jets. While bicycles, walking, scooters, and roller skating are non-motorized (Wikipedia2. 2009).

Public transport is a shared passenger transportation service which is available for use by the general public, as distinct from modes such as taxicab, car pooling or hired buses which are not shared by strangers without private arrangement

(Wikipedia3. n.d.). Public transport modes include buses, trolleybuses, trams and trains, rapid transit (metro/subways/undergrounds etc) and ferries. In many developing countries, transportation is unsustainable and accessibility to sustainable transportation is a big dream for the common public (Janelle and Hodgek, 2000).

3. Comparison of various modes of transport

For historical and economic reasons, there are differences internationally regarding use and extent of public transport. Transportation is public in under-developed and developing countries. While in developed countries, private transport is widely used. Irrespective of development and nature of economic wealth, time has come to create and use sustainable public transport system.

a) Airline - An airline provides scheduled service with aircraft between airports. Air travel has high up to very high speeds, but incurs large waiting times prior and after travel, and is therefore often only feasible over longer distances or in areas where lack of ground infrastructure makes other modes of transport impossible (Wikipedia3. n.d.). However, Countries such as India has very high tax on air travel, making it very expensive and beyond the affordability of middle class people. Moreover, all new airports that are being built recently in India are very expensive and every passenger is charged a fee for the development of airport. Smaller cities may have comfortable

airports and not the luxury ones to provide transport facility. What is vital factor in transportation is sustainable and quality of transport (Linda Steg and Robert Gifford, 2008).

b) Railways - For many years the whole world has had problems with the issue of traffic congestion that results from the usage of road traffic, especially the traffic of passenger cars, 2-wheelers, 3-wheelers and small 4-wheelers. The average occupancy of passenger cars ranges from 1-2 persons per vehicle, thus making this transport as the least economical regarding fuel consumption, occupancy of traffic areas and negative impact on the environment. Hence, the solution to the problem lies in a different transport policy that will stimulate the usage of public rail passenger transport that has multiple benefits.

High Speed Rail (HSR) is most preferred for heavily populated countries where huge demand for transport service exists (Abramović et al, n.d.). Public funds should be allocated to this mode of transport if its net expected social benefit is higher than in the next best alternative. The case for investing in HSR is strongly dependent on the existing volume of traffic where the new lines are built, the expected time savings and generated traffic and the average willingness to pay of potential users, the release of capacity in congested roads, airports or conventional rail lines and the net reduction of disadvantages of private transport (De Rus, 2008).

Table 1

Modal ratio of railway transport (excluding metro) compared to other modes of transport.							
Sl. No.	Country	Ratio	Year	Sl. No.	Country	Ratio	Year
1	Belgium	6.9	2006	18	Poland	6.7	2006
2	Bulgaria	5.4	2006	19	Portugal	4.4	2006
3	Czech Republic	6.9	2006	20	Romania	9.3	2006
4	Denmark	9.0	2006	21	Slovenia	3.2	2006
5	Germany	7.7	2006	22	Slovakia	5.9	2006
6	Estonia	1.7	2006	23	Finland	4.9	2006
7	Ireland	5.1	2006	24	Sweden	8.2	2006
8	Greece	1.6	2006	25	United Kingdom	5.9	2006
9	Spain	5.3	2006	26	Croatia	4.4	2006
10	France	9.2	2006	27	Macedonia	1.7	2006
11	Italy	5.5	2006	28	Turkey	2.5	2006
12	Latvia	5.1	2006	29	Norway	4.5	2006
13	Lithuania	1.0	2006	30	Switzerland	16.4	2006
14	Luxembourg	3.9	2006	31	United States	0.3	2004
15	Hungary	12.6	2006	32	Japan	27	2000
16	Netherlands	8.3	2006	33	Indonesia	6.3	2005
17	Austria	9.8	2006				

Source: Wikipedia4

The above table 1 shows that there is immense potential for HSR services that have great scope for reduction in pollution and minimize accidents, apart from freeing congested roads.

Moreover, travelling in railways always leads to walk to the office or home from the station which is good for health rather than current model of private transport where people just do not get an opportunity to walk. Therefore, HSR may be preferred all over the world to benefit everyone.

c) Roadways- Good physical connectivity in the urban and rural areas is essential for economic growth of any nation (Worldbank1. (n.d.). However, thickly populated plain areas may

have high speed rail infrastructure to save cost of energy and other associated benefits. In case of private transport, there is a huge demand for skilled drivers (Jagdish Nehul, 2011), whereas in public rail system this issue does not arise. Except, where good rail system is not physically, environmentally and economically viable, road transport may be preferred by the governments. Despite improvement in quality of roads in various countries, the benefits of public transport far exceed the private transport that happens mostly by road (Suneet K. Maheshwari. 2010).

d) Waterways: A waterway is any navigable body of waters which can include rivers, lakes, seas, oceans, and canals.

Navigable waterways may be developed for transportation with modern transport vehicles.

4. Transformative Effects of High Speed Public Transportation System on the Economy

Having high speed transport brings significant changes in the economy from materialistic society to preference towards public transport systems. Few significant benefits include:

a) Comfort and Convenience of Travelling. When there is reliable, effective and efficient public transport, more and more public opt in place of individualized and expensive private travelling. Particularly many Indians opt for private vehicles only to reach their work place in time as public transport is unreliable. In addition, people get tired in driving private vehicles amidst heavily congested roads, traffic and consequently this tiredness will result in loss of productivity in work place.

b) Reduction in Cost and Time of Transportation. Reliable public transportation system reduces each person's travel costs such as fuel costs, tolls, and the stress of driving. Public transport is also a more environmentally friendly and sustainable way to travel as sharing journeys reduces carbon emissions, traffic congestion on the roads, and the need for parking spaces. In addition, accidents will come down as consequence to the less number of vehicles on road.

When international oil prices were increasing few years ago several state Governments made five-day work week and encouraged saving fuel. This practice may be extended to state governments as well in India and other parts of the world where six-day work week is in existence.

c) Increase in Employee Productivity. Currently in many parts of the world, travel time between the home and work place is increasing consequent to the increase in number of vehicles on the road. In most parts of Indian metro cities the travel time to reach work place is an hour and half. This precious time is lost on account of unsustainable transport system. This affects the productivity of people driving vehicles through congested traffic amidst narrow roads and driving vehicles in violation of traffic rules, especially 2-wheelers.

d) Reduction in Environmental Pollution. Transport systems have significant impacts on the environment, accounting for between 20% and 25% of world energy consumption and carbon dioxide emissions. Greenhouse gas emissions from transport are increasing at a faster rate than any other energy using sector. Road transport is also a major contributor to local air pollution and smog (Wikipedia1. n.d.).

e) Reduction in Social Cost. The social costs of transport include road crashes, air pollution, physical inactivity, time taken away from the family while commuting and vulnerability to fuel price increases. Many of these negative impacts fall disproportionately on those social groups who are also least likely to own and drive cars (Wikipedia1. n.d.).

Sustainable public transport system will decrease pollution substantially by way of lesser automobile pollution, less manufacturing of automobiles, less congestion of traffic, less

accidents and health hazards. In addition many those who think of buying a private vehicle will have a second thought as public reliable transport system is in place. The intended investment in automobiles will be diverted in some other avenues.

f) Reorganization of Urban Development. When there is a high speed transport system connecting various cities and suburbs, many new areas will develop and people settled in cities too will move out for better living spaces without affecting their proximity to city centres. In fact, sub urban areas may be well developed so that few years down the line, they becomes centres of economic activity and existing congested city centres will be free to be developed. This will ease pressure on cities automatically. However, government should not regulate too much with respect to the demarcation of urban and rural areas as the investments will differ and distort development.

g) Balanced Regional Development. Development takes place in and around the areas that have transport facilities and well connected with other modes of transport. If there is sustainable public transport system, many rural and semi-urban areas too will develop. Lack of public transport facilities in developing countries, inhibits rural and small entrepreneurs as the cost of logistics is expensive. In fact, if India had well-developed transport sector, its economy would grow three per cent perpetually given its market size.

h) Minimized International Volatility. Restructured transport systems from heavily dependent on roadways to railways will result in huge reduction of vehicles on roads, less fuel consumption, and less prone to international crude price volatility. International crude price is one of the highly contributing factors for the inflation affecting interdependent economies in the increasing globalized world.

5. Policy Measures for a Sustainable Transportation System

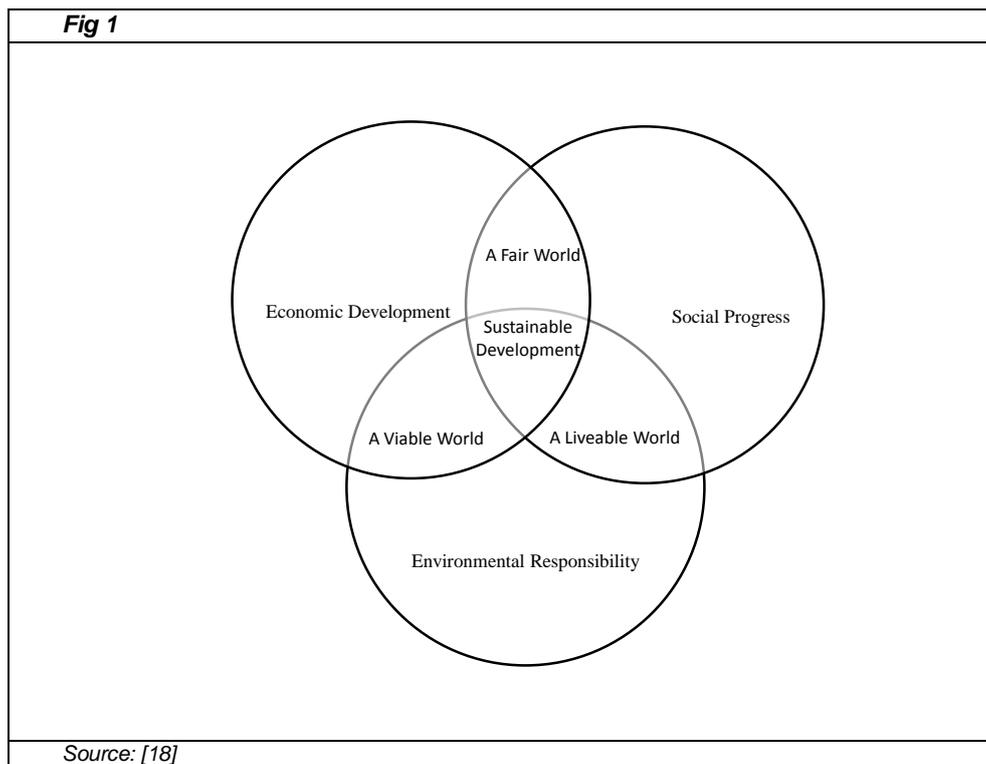
Sustainable transport refers to any means of transport with low impact on the environment, and includes non-motorised transport, i.e. walking and cycling, green vehicles, sharing vehicles, and building or protecting urban transport systems that are fuel-efficient, space-saving and promote healthy lifestyles (Wikipedia1. (n.d.)). Since benefits of sustainable transport are immense, there is an imperative need to have sustainable transportation system as the cost of energy has been rising steadily and is expected to increase as the population is increasing and oil reserves are decreasing.

Countries that have severe traffic congestion and poor public transport system must aim to modernize, expand, and integrate the transport system. Nations must mobilize resources for the noble cause of sustainable transport system and gradually shift the role of government from that of a producer to an enabler.

a) Strategic Policy Measures. The field of sustainable development can be conceptually divided into four general dimensions given in the fig 1: social, economic, environmental and institutional. The first three dimensions address key principles of sustainability, while the final dimension addresses key institutional policy and capacity issues (Wikipedia5, n.d. and

Henry Lamb, 2011). Governments have to take strategic measures with respect to plan, design, implement and review of

sustainable transport systems.



Democratic countries may have disruptive political factions which do not support common agenda, even if it is very beneficial. Therefore, governments must take decisions in the interest of nation and world at large to provide comfortable, reliable, effective and efficient public transportation system.

International bodies such as World Bank, IMF, and WTO must actively support sustainable transport projects around the world particularly in countries that consist of large number of political parties, where decision making is difficult task.

b) Development of Various Modes of Transport Systems. Sustainable transport systems make a positive contribution to the environmental, social and economic sustainability of the communities they serve. Transport systems exist to provide social and economic connections, and people quickly take up the opportunities offered by increased mobility. The advantages of increased mobility need to be weighed against the environmental, social and economic costs that transport systems pose (Wikipedia1. n.d.).

All modes of feasible transport must be developed in order to not only ease traffic on few modes of transport but also to vision for future needs. Long waiting for travel unlike in India, must be done away within a stipulated time. Moreover, congested cities must have circular roads to bypass the city and reach from one end of the city to the other side. These circular roads must be every half a mile so that 80-90 per cent transportation is through public transport.

Governments in emerging and fast developing cities and towns must reserve space for local trains, in such a way that every half a mile a high speed rail line could be developed. Transportation must carry a paramount importance for

government and it must plan sustainable transport system on most priority basis before expensive private properties are built.

In today's modern world of countries such as India, one has to wait for long time to travel between long distances. Railway tickets need to be purchased about a fortnight in normal season and a month in advance in holiday season. Road network is heavily congested and dusty with no appropriate place with washrooms. Given this situation, there is a necessity for Bullet Trains/High Speed Rail Transport. Even if cities have no space for stations new railway stations may be built outside cities with connectivity of roads to cities nearby.

c) An Integrative Approach for the Overall Development of Transportation System. Countries such as India do not have an integrative approach in transportation system. All the modes of transport come under different ministries and have very little in common. Each ministry plans and executes projects independent of another ministry's priorities and implications. This approach costs the nation and the environment and therefore, necessitates an integrative transport development system.

An integrative approach not only reduces the cost of a project but also balances the requirements of public in general. For an example, road between Chennai city Pondicherry city is 85 miles, connected by two highways and a rail network. However, rail network is not encouraged and one of the highways has severe traffic congestion while the other is normal. In all, none is comfortable to the commuters. Simple changes in policy of introducing fast passenger trains at regular intervals will ease traffic and accidents on roads.

Within cities, there is no sustainable connectivity between the various modes of transport. Traffic congestion imposes economic costs by wasting the time of people, delays the delivery of goods and services and increases the health hazards. Moreover, any infrastructure project is implemented; its capacity is far limited by the demand for the usage of the same. Hence, reengineering the transport systems is vital to plan for sustainable transport infrastructure.

d) Alignment of Policies Related to Rural Development.

There are many government incentives to promote development of rural areas. However, there several bottlenecks for development such as poor quality of roads, poor connectivity with nearby towns, etc. In fact Indian Government has given a priority of setting up new IIMs and IITs only in large cities that have better transport systems and other Central Universities in rural areas, largely under developed. This policy has vital implications. First, qualified faculty and employees will settle for jobs in cities with all facilities and lesser qualified will opt for other institutions, making further poor quality in rural areas.

Hence, governments must realize that unless all facilities are well developed in rural areas, they cannot be developed. Well qualified people will move to cities in search of better opportunities. Therefore, to move people out of today's polluted living spaces in many cities, governments must develop infrastructure, particularly very good transport system that encourages people to move out of cities to live in least polluted and congested open places. In addition, all policies related to rural are development need to be rethought and aligned with sustainable transport systems.

e) Sustainability. Sustainable development and sustainable planning may require changing the way people think about and solve transportation problems (Valentí Rull, 2010). Therefore, awareness cannot be created without inclusion in education programs right from high school on the environmental sustainability. Moreover, compulsory awareness programs on sustainability concept must be made for government servants who make decisions in their organizations /institutions. This has to be included as a core subject in high school and may be small units in higher education too.

Industry has huge stake in sustainable development and today's organizations motives of high growth rates must be rethought in the light of redefined strategy of growth and peace of human beings. Corporate activities may be watched for sustainable contribution.

f) Avoidance of Vested Interest. There is growing interest in sustainability, sustainable development, and sustainable transportation (Todd Litman, David Burwell, 2006). However, vital issues on sustainable transport decision include its

definition. Narrow definition may benefit vested interests which always seem to play significant role in projects that aim at cutting fuel use and greener products and services. Policy makers in developing countries often have narrow approach in their planning projects and they will not be able to see beyond horizon. In such cases, international community/bodies must be able to push rigorous awareness campaigns on sustainable transportation not only to save other countries but all humankind by creating more liveable spaces.

6. Conclusion

In the light of changing priorities to save the environment, nations must identify various deficits in transport sector which include inadequate roads/highways, old technology, saturated routes and slow speed on railways, inadequate berths and rail/road connectivity at ports and inadequate runways, aircraft handling capacity, parking space and terminal building at airports and improve public transport systems for significant benefits (World Bank2, 2005).

Traditional transport systems must be reengineered to improve mobility, especially for vehicles, and adequately consider wider impacts. But the real purpose of transport is access - to work, education, goods and services, friends and family - and there are proven techniques to improve access while simultaneously reducing environmental and social impacts, and managing traffic congestion. All nations must successfully improve the sustainability of their transport networks so as that there is more vibrant, liveable, and sustainable cities (Wikipedia6, n.d.). Businesses cannot grow in isolation and they need to be guided by the visionaries in public policy makers to align their economic interests with sustainable development. Existing unsustainable transport systems need to be reengineered to pave the way for high speed rail services which significantly reduces pollution from the transport sector, minimize dependence on fossil fuels which are prone to international crude prices volatility and reduce global warming.

Having sustainable transportation is not by choice but by necessity. No longer can the world afford to have personalized transport facility at a cost of unsustainable environmental impact. Hence, it is an imperative to offer attractive alternative of sustainable public transport that is safe, hygiene, cost-effective, and less pollutant to the public by the governments as far as possible (Feather, (1995).

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