

## Delhi towards Carbon Neutrality through Sustainable Mobility

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### 1 ABSTRACT

Cities in all parts of the world face mounting challenges such as population shifts, water shortages, air pollution, inadequate or aging infrastructure, land degradation, sprawl, spread of informal settlements and traffic congestion. Metropolitan cities grow beyond imaginable proportions. Concentration of intense economic processes and high level of consumption in cities increase their resource demands. The main problem with cities today is that they have become centres of mobilisation rather than civilisation. The city of the future, to be sustainable, will have to re-establish the concept of civilisation, with sustainable mobility.

### 2 INTRODUCTION

During the Last Century Urban Population of India increased ten folds from 27 million to some 270 million. Cities today are in the centre-stage of environmental pollution, and degradation and loss of bio-diversity. Concentration of intense economic processes and high level of consumption in cities increase their resource demands. Beyond their boundaries, cities affect traditional rural economics and their culture. The main problem with cities today is that they have become centres of mobilisation rather than civilisation. They are nodes of an increasingly intense economic activity, with the volume of travel having reached unprecedented levels in recent years. The urban economic culture has a deep impact on the human mind, which has become too pre-occupied with the pursuit of personal gain. The city of the future, to be sustainable, will have to re-establish the concept of civilisation, with sustainable mobility.

Delhi, the fast growing Capital City of India has presently a population of about 17 million persons and is estimated to grow in a 23 million population Mega City by the year 2021. After Independence Delhi had 1.43 million populations by 1951 and has increased to 8.42 million by 1991. According to 2001 Census of India it has reached to 17 million just 100 percentage increase. Ever increasing population with end lasting demand can be sustained with adopting an integrated approach towards Urban Transport System. The Ministry of Urban Development, Govt. of India formulated National Urban Transport Policy (NUTP), 2006 with broad objective to ensure safe, affordable, quick, comfortable, reliable and sustainable access for public transport within cities. One of the objectives is to “enabling the establishment of quality focused multi-modal public transport systems that are well integrated, providing seamless travel across modes”.

Sustainable mobility is defined as the primary goal of transport policies together with rising importance of environmental quality in the city. The concept of sustainability within transport policies need to accommodate at least three main objectives: economic growth, social equity and environmental sustainability. Usually it is not easy because all three objectives are multi-dimensional themselves.

### 3 NEED OF STUDY

Delhi today is emerging as one of the largest and most populated cities of the world. Out of a total area of 1483 sq km about 50% has already been urbanised and the rest is under heavy pressure of urbanisation. In spite of the plans for decentralisation and to restrict the growth of the city by development of National capital Region (NCR), the runaway growth of Delhi continues. Putting several strain and demands on mobility Delhi has been evolved for creation of a sustainable transportation model for reducing its carbon foot.

Effective and reliable transport systems are crucial for the functioning of the post industrial economies, yet such systems generate significant negative externalities like air pollution, noise vibrations, energy consumption, and emission of greenhouse gases and loss of open space. Worldwide examples show that there is a small reduction of energy consumption and CO<sub>2</sub> emissions in motorized modes of transport. It is proved that reducing CO<sub>2</sub> emissions from the transport sector is much easier than cutting those from the building sector. However it is promising, that any new approach that involves a change in vehicle technology or a shift to different mobility technologies and techniques can be implemented in a relatively short time. Transport, therefore, is a very important element in our race toward sustainable life on earth.

## 4 STRATEGY OF SUSTAINABLE MOBILITY

In the above stated background the following three fold approach and strategy needs to be adopted:

- Multi modal transport system with Pedestrian Policy ( walkable city)
- Motorized Vehicles in Mass Rapid Transit System
- Policy for local environment and safety.
- Institutional /Regulatory Interventions.

## 5 WAY TO CARBON NEUTRALITY THROUGH SUSTAINABLE MOBILITY

### 5.1 Modality and Landuse Efficiency

Urban Form: Delhi city is an assemblage of buildings and streets, system of communication and utilities, places of work, transportation, leisure and meeting places. Delhi had a traditional Urban Design which is reflected in the glory of 17th century the Walled City of Shahajahanabad and New Delhi in 1916, the Central Vista was conceived as a landscaped stretch to form continuity between the ridge and the river Yamuna. The boulevard of Chandni Chowk was its commercial centre piece Red Fort and Fateh Puri Mosque as its two ends. The stretch with the Rashtrapati Bhawan and the India Gate at two ends has tremendous visual quality. The Jama Masjid a dominating feature located on hill top was visually linked with Parliament House, Connaught Place in the same axis. To make city with footstep of carbon neutrality several measures have been taken integrity of land use in urban form.

Delhi, like most Indian cities, has a mixed pattern of land use. This is partly because large numbers of people need to walk between their places of residence and their places of work. No clear-cut concentric zones of different activities exist. Central core areas comprise not only commercial development but also high-concentration housing, and working-class developments are found in the core and vicinity of the city. Manufacturing activity is spread geographically not only in the peripheral zone but also in the intermediate and inner zones.

In Metropolitan Centre and Extension: Connaught Place: Landscape Schemes are prepared to integrate MRTS stations, safe pedestrian walkways, parking areas, recreational and cultural areas, etc. with planting of trees and street furniture. The intermediate public transport such as monorail, battery operated / high capacity buses, sky buses are introduced to increase the mobility within the City Centre. Use of alternative renewable sources of energy is encouraged for new buildings (especially those of commercial or institutional nature), traffic signals, public signages, etc.

In Walled City And Extensions: Conservation approach to retain the overall traditional character of the Walled City. Pedestrian made completely free of vehicular traffic so as to restore the human scale and convenient living, controls considering built to edge typology to enhance environmental state.

In District Centres: The district park adjoining to the district centre proposed in the master plan / zonal plan should be properly integrated with the district centre. The area provided for landscape as part of the district centre should weave through the entire district centre to create a pleasant environment with access to main circulation system. Either ring road or outer ring road.

### 5.2 Management of Natural Resources

Natural Resources: The major natural features and eco-systems of Delhi are the river Yamuna, together with a network of streams/drains that empty into the river, and the Aravalli Range. Both of these are in a state of considerable degradation, and it is of vital importance to conserve and rejuvenate these ecosystems. This has regional carrying capacity, therefore, surrounding states also have to contribute towards their conservation and rejuvenation. Measures for Rejuvenation of River Yamuna is maintain minimum flow in river Yamuna to be ensured by Riparian states by releasing adequate water. The annual rainwater harvesting potential has been carry forward to substantiate the total flow. In this respect all the new bridges/flyovers must have the provision for rain water harvesting.

**Air:** Various initiatives and measures taken over the past few years, like introduction of CNG and EURO II norms etc., the air quality in the city, in terms of pollution levels, has continued to be a matter of concern, and has been responsible for a number of respiratory diseases, heart ailments, eye irritation, asthma, etc. The

three main sources of air pollution in Delhi are vehicular emission (around 70 percent) industrial emissions (around 20 percent) with a major element of this coming from the three thermal power plants, and from other sources such as diesel generator sets and domestic cooking, burning of biomass, etc.

The major area of planning and intervention would relate to transportation planning. With the phenomenal growth in the number of vehicles, almost 8-10 times in the last two decades in absolute terms, the most significant aspect in the context of congestion and pollution, relates to the growth in personalised transport as compared to the availability of public transport. It has been estimated that buses, which constitute barely 1.2 percent of the total number of vehicles, cater to around 60 percent of the total transport load, while personal vehicles –cars and scooters, though almost 93 percent of the total number of vehicles, cater to around only 30 percent of the travel demand. Such a huge share of private vehicles in Delhi, while serving a relatively limited purpose in terms of the transportation modal split, obviously creates tremendous pressure on road space, parking, and pollution directly and through congestion. Public transportation planning must, therefore, drive the future policy. So far public transport is largely seen as the transport mode for the not so well off and poorer sections of the community, who cannot afford to own/use personal transport. An important element of policy would now also have to aim to make public transport a mode for personal vehicle owners and users through a mix of incentives and disincentives. Apart from aspects like frequency, inter-modal integration, a possible single ticketing system, use of parking policy as a means to influence vehicle use, etc., the quality of public transport, particularly buses, would need to be significantly upgraded, inter-alia, keeping the element of clean transport in view. Another issue which has been raised in the context of vehicular congestion and pollution relates to the policy of mixed land use.

The Metro Rail system has a big footstep for reducing carbon footprint. The Metro Rail system has provided a big relief to the city and placed it on higher demand for providing relief to the 100% metro with adequate feeder system. Use of CNG on public transport has experienced a journey of reducing Carbon emission. It is further paving way for utilization in private vehicles. Bus Rapid Transit is meant to be a high quality public transport system, oriented to the user that offers fast, comfortable and low cost urban carbon mobility. The overall green cover in this zone should be enhanced and protected

*MRTS Corridor:* In prior master plans, city structure was thought in terms of hierarchies with CBD, District Center and Community Centres in descending order of importance. But with due course of development and introduction of MRTS, need is felt to connect these scattered districts with more imaginable components. These components with enhanced built up areas and activities form a network by which the experience of various district and commercial centres becomes a part of continued experience.

As per the Government of India Notification, it is mandatory for all construction agencies to use Fly Ash bricks or tiles or clay fly ash bricks along with pond ash in the construction of roads/flyovers embankments and reclamation of low-lying areas. To control the ambient air quality of Delhi, it may be made mandatory that all commercial vehicles (like trucks and tempos) are converted into CNG.

### 5.3 Conservation and Development of Resources

Energy Efficiency:

The concept of energy efficiency should begin with the idea of Zero-fossil Energy Development (ZED) which envisages to reduce the demand for power to the point where it becomes economically viable to use energy from renewable resources. This involves a holistic approach combining the issues and actions at various levels of planning, design, construction and maintenance leading to a sustainable and energy efficient regime. The city geometry, restructuring and zoning with self-contained neighbourhoods could minimise the need to travel and substantial saving of recurring energy/ fuel consumption. Integrated mass transport system, traffic and transit operation and management, better tele-communications, promoting bicycles and NMV transport, is another major area of energy efficient habitat. The introduction of energy audit and design of energy efficient form, construction and materials and reducing energy demand by passive micro-climatic design approach, intelligent energy controls, heat recovery, landscape, opening design, furnishings, etc., are the critical considerations. The key to future is a cybernetic form of sustainable energy, which integrates symbiosis, recycling and energy chains.

Non-conventional energy sources like recovering energy from solar energy, etc. should be used for street lighting, lighting at public spaces, open areas, traffic signals, hoardings, etc.

To supplement part of the estimated growing power requirement, non-conventional sources/solar energy and other actions proposed are as follows:

- Compulsory Solar Panels for public advertising, lighting in open areas, public utilities, streets, etc.
- Adoption of Load Management Technique.
- Tariff restructuring and improved metering arrangement to minimize power thefts/losses.
- Private Sector Participation in different stages for Inter Modality system and adapt of new techniques.
- Incentivising energy savings and use of energy efficient gadgets.
- Public awareness, capacity building and training.

As per Asian Development Bank's report (1997) potential in saving due to better overall efficiency in Transport Sector by adopting following measures:

- Incandescent bulbs, neon tubes and fluorescent lamps are giving way to light-emitting microchips that work longer, use less power and allow the use of light in new ways. The chips, known as light emitting diodes, or LEDs have huge performance advantages in many mundane tasks (such as traffic lights). These consume 80 per cent less electricity than the bulbs and have longer life. Moreover, they have the safety advantage of gradually fading instead of burning out. This eventually results in huge savings in terms of energy and maintenance costs.

## 6 CONCLUSION

Management of logistics in Transport Sector provides an opportunity to use renewable solar energy for saving energy and green Clean Gas for saving gaseous emissions in climate, Mass Transit System for door to destination with inter modality service towards Carbon Neutral City.