

# INNOVATIVE APPROACH TO COMBAT THE VEHICULAR POLLUTION OF KOLKATA MEGACITY

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**Abstract-** Kolkata, a megacity of 14.7 million people has lagged far behind the basic needs of the citizens due to unexpected growth of population. Comfortable and emission-free transport is one of the needs of the hour. Where as, the primary reasons of traffic congestion are insufficient road access, high vehicular density, population explosion etc the secondary causes are the insufficiency of foot over bridges with the apathy of pedestrians to climb up the same, deployment of scanty traffic personnel at the crossings, violation of traffic rules by the drivers. The traffic congestions are directly or indirectly related to the vehicular pollution of the megacity. The components of vehicular pollution are air pollution and the noise pollution created by the vehicles. In the present urbanization scenario of greater Kolkata one of the vital infrastructures of the megacity is the transport sector which needs to be modernized. It needs no mention that air quality of the Kolkata is deteriorating and the pollution level in and around the metro city is alarming especially during the winter season.

There are various ways and means to combat the emission from vehicles resulting in air pollution of the city. Few of them are building eco-friendly underground corridors for rail or road to cater the overburdened city surface traffic, introducing mass transportation vehicles at premium for the individual car owners, modernization of surface traffic with the introduction of sophisticated signaling system, improvement of the diesel quality, mandatory use of biodiesel in the diesel vehicles and last but not the least encouraging walking or bicycling for covering short distances.

**KEY WORDS;** emission-free, eco-friendly, mass transportation, traffic congestion, vehicular pollution

## 1 INTRODUCTION

Kolkata is the main business, commercial and financial hub of eastern India covering all the north-eastern states. It is also a major commercial and military port and the only city in eastern India to have an international airport. Though it was once a prime city of India, due to unexpected growth of population of the north and the north-eastern flank of Kolkata, the development of the city has lagged far behind the needs of the growing population. The surface traffic access is only 6.2% of the land area compared to 20% plus of the other metro cities of India. The traffic congestion of the city due to this limited access has become a normal feature for the Kolkata's. It is needless to mention that the vehicular air pollution of the megacity occurs predominantly from the acute traffic congestion. So it has become the prime duty of the city authorities to reduce the vehicular pollution by reducing the traffic congestion.

## 2 CAUSES OF TRAFFIC CONGESTION:

2.1 The causes of traffic congestion in Kolkata are primarily due to

- (i) Insufficient road access.
- (ii) High vehicular density.
- (iii) Population explosion.
- (iv) Floating commuters coming to the city for their livelihood.
- (v) Average low speed of vehicles.

- (vi) Rapid growth of car owners not compatible with road space. Existence of huge numbers of 5-way & 4-way traffic crossings in the city not compatible with road infrastructure of the city.
- (vii) Signaling system of all the traffic crossings is not sophisticated. Some are still operated manually.
- (viii) Entry of heavy duty vehicles within the jurisdiction of the megacity.
- (ix) Plying of slow moving vehicles within the business district areas.
- (x) Commercial exploitation by street vendors occupying the foot path and a part of traffic road forcing the pedestrians to walk along the side of the road.
- (xi) Irregular driving of city autos violating traffic rules.

## 2.2 Other secondary causes of traffic congestion are

- (i) Inadequate number of foot-over bridges at the busy crossings forcing the pedestrians to cross the road by zebra crossing holding the running traffic for long in the peak hours.
- (ii) Apathy of pedestrians to climb up the existing foot over bridges for want of comfortable arrangement such as elevator or lift.
- (iii) Deployment of scanty traffic personnel at/near the traffic signals.
- (iv) Poor road conditions.
- (v) Improper diversion of traffic for the congested routes.
- (vi) Violation of traffic rules by rogue drivers of bus and autos.
- (vii) Joy walking on the traffic roads.
- (viii) Talking on mobile while driving cars.
- (ix) Talking on mobile while crossing the traffic road.
- (x) Lack of awareness of the citizen in regard to use of traffic roads.
- (xi) Causing water logging on the traffic road during heavy rain
- (xii) Causing uprooting of trees and falling on the traffic road during cyclonic thunder storm

## 3 CAUSES OF VEHICULAR POLLUTION OF THE KOLKATA MEGACITY:

**3.1** All the causes of traffic congestion are directly or indirectly related to vehicular traffic pollution because

- (i) Due to restricted available road space the automobiles have to move at restricted speed. The fuel of the engine can not achieve their desired combustion resulting in more emission of green house gases (GHG) from the tail pipes.
- (ii) High vehicular density of the city not compatible with road space do not allow the automobiles to attain their normal speed but to move at restricted speed resulting in part combustion of fuel to have more emission than normal.
- (iii) The northern belt of Kolkata city is highly built up from the beginning without any speculation for the wide roads that may be needed in future for the increased population. Before and just after independence people from the rural area used to migrate permanently to the northern part of the city to enjoy the urban life in regard to education, health, communication,

electricity and housing. As a result the north Kolkata becomes congested. Due to horizontal expansion of housing from north to south Kolkata, people from other parts used to settle in south Kolkata. The traffic roads of south Kolkata were however, planned to cater the increased population. So south Kolkata remained less congested than north Kolkata in the pre and early post independence period. But partition of Bengal forced the refugees of East Bengal to settle in the vacant lands of south Kolkata and its outskirts from 1950 onwards resulting in the population explosion. This had worsened the traffic condition of south Kolkata and the city as whole, bringing the access of traffic road of whole Kolkata to six percent only. In the meantime numbers of traffic vehicles are multiplying in the city. Naturally the atmospheric pollution of the megacity has become alarming with the increase of population density and the automobile density. (iv) The vehicular traffic need to wait at the designated 5-way or 4-way crossings and need to move at a very slow speed after green signal before attaining normal speed. The running engines of the automobiles have to remain in the idle condition at or near the traffic crossings and thereby putting a constraint in the effective combustion of fuel to have more emission than the normal. The running engines of the old automobiles, while idling at the traffic crossings emit huge GHG from the tail pipes leading to high level of atmospheric pollution.

## 4 COMPONENTS OF VEHICULAR POLLUTION:

4.1 Vehicular Pollution of the Kolkata Megacity comprises of

- (i) Air pollution
- (ii) Sound pollution

4.2 Air Pollution: Atmospheric pollution of the mega city which has effective contribution in global warming followed by climate change of the world is the composition of vehicular pollution and the industrial pollution of the city. Out of this, vehicular pollution contributes to 50 per cent of air pollution, while industrial pollution contributes to 48 per cent. The remaining 2 per cent is from domestic and other sources viz from solid and liquid wastes. Of the total industrial pollution of the megacity, 53 per cent was caused by the Cossipore thermal plant of Calcutta Electric Supply Corporation (CESC) which went a long way to check industrial pollution. Other 44 per cent of industrial pollution of Kolkata by small units, and three per cent by big industries. The CESC plant is very old and had not installed pollution checking devices. The West Bengal Pollution Control Board (WBPCB) has already issued stricture orders forcing it to take corrective measures. WBPCB have similarly found that 130 small scale units out of a total of 294 are still causing pollution despite their repeated warnings.

**4.21** Various factors like use of kerosene and coal as cooking fuel, use of coal as fuel in thermal plants surrounding the city, large no of automobiles, poor quality of transport fuel, bad condition of city roads, small access of traffic (6.2%), high population density, miserable slum condition of habitation and poor socio-economic status of the chunk of city dwellers are together responsible for the vulnerable air pollution of Kolkata megacity.

**4.22 Sound Pollution:** Sound may be either from musical sound or from noise. Musical sound which has regular and periodic wave length does not create sound pollution because it is sweet to hear. Noise is a sound whose wave length is neither regular and nor periodic creates sound pollution because it is not sweet to hear but distressing to human health. Diesel engines of the trucks/lorries while plying in the city create noise pollution despite fitted with silencer. Air horns and microphones create sound pollution. Besides road freights, goods trains and some airlines create sound pollution. Noise of more than 140 decibel is distressing to human health

**4.23** Types of vehicular pollutants and their characteristics:

**4.24** The exhaust of automobiles functioning in Kolkata city emits green house gases in the form of vehicular pollutants which contribute the lion's share (50%) of air pollution of the city as seen from Para 4.2. These are particulate matter, unburnt hydrocarbons, carbon monoxide, nitrogen oxides and some carcinogenic organic compounds like benzene soluble organic matter (BSOM), heavy metals, polynuclear aromatic hydrocarbons (PAH) which have adverse health impacts among the exposed population.

**4.24** Air pollution becomes acute in Kolkata during winter. Air pollutant cannot disperse easily, mainly due to inversion, low wind speed and high congestion. Although Kolkata is known to be one of the world's polluted cities, available data on overall air pollution of the city are scanty.

Samples were collected from five important street crossings in the core area of the city. The average suspended particulate matter (SPM) concentrations during the winter in 1992, 1993 and 1994 were 982  $\mu\text{g}/\text{m}^3$ , 1007 $\mu\text{g}/\text{m}^3$ , and 1181 $\mu\text{g}/\text{m}^3$  respectively (against permissible 140 $\mu\text{g}/\text{m}^3$ ) High value of SPM in the air also showed high BSOM which was associated with high value of PAH. Twelve PAH compounds were identified and quantified in the air and some of them are suspected carcinogen. Among the ten heavy metals determined, lead concentration in SPM. during winter at Kolkata was high in comparison to other cities of the world. The total organolead concentration for 1992, 1993 and 1994 were 303 $\mu\text{g}/\text{m}^3$ , 299 $\mu\text{g}/\text{m}^3$  and 296 $\mu\text{g}/\text{m}^3$  respectively. The average benzene concentrations during winter in 1992, 1994 and 1996 were 1000 $\mu\text{g}/\text{m}^3$ , 708 $\mu\text{g}/\text{m}^3$  and 491 $\mu\text{g}/\text{m}^3$

respectively (US Environmental Protection Agency's permissible is 0.45  $\mu\text{g}/\text{m}^3$ )

**4.25** In the urbanization scenario of India, one of the vital activities in the Kolkata megacity is the transport problems. Air quality of the Kolkata city (a metro city of India) is deteriorating and the pollution level in and around the metro city is alarming. This is due to the fact that the vehicles older than 15 years old are still plying in the city's road violating the Apex Court's directive not to allow the more than 15 year old commercial vehicles to ply on the metro cities of India. Illegal plying of 3-wheelers autos, (the number of which has reached about 50,000 in the city out of which 10, 000 are registered from vehicle authority) using invariably 'kata-tels' (blending of kerosene with petrol) for extra profit are aggravating the air pollution of the city.

**4.26** The ideal count of Suspended Particulate Matter (SPM) and Respiratory Particulate Matter (RPM) should not exceed 140 and 60 respectively. But Kolkata's average SPM count is 211 and RPM count is 105. The figure becomes worst in the traffic intersections of the city. The counts can be double the city's average during busy office hours. The reason of Kolkata's air pollution is mainly from the horrible high levels of vehicular emissions which the authorities have failed to control so far. If this is not checked with a heavy hand, the impact on the health of the citizen, particularly children will be devastating as opined by a city doctor. Some 70% of the people of the Kolkata megacity suffer from respiratory disorders caused by air pollution, a recent study by a prominent cancer institute of India. Ailments include lung cancer, breathing difficulties and asthma which have been revealed from a study by Chittaranjan National Cancer Institute (CNCI). The study says that 79% of hawkers who spend a long time outdoors have suffered from damaged lungs. The vehicle mechanics working close to car exhaust pipes result in 60% of them have suffered from damaged lungs. The traffic policemen, drivers and cart pullers who are exposed to vehicle fumes for long hours have also suffered from damaged lungs in large numbers.

**4.27** Kolkata has upstaged Delhi as the air pollution capital of India accounting for more deaths due to lung cancer and heart attack than the capital city. More than 18 persons per one lakh people fall victim to lung cancer every year compared to next highest 13 per one lakh in Delhi, according to environmental scientist and advisor of Chittaranjan National Cancer Institute (CNCI).

**4.28** Eighty five per cent vehicles flout emission norms in Kolkata. Only one in every six vehicles in this city gets the emission tested. Till December 2008, around 14 lakh vehicles were registered in the city. Out of these vehicles 8.5 lakh private and 4.5 lakh commercial were required to get the tail pipe emission tested twice a year. In 1989, a nexus between transport officials, operators and police has ensured that polluting vehicles continue to ply on Kolkata's roads unchecked and inhibited.

## 5 WAYS AND MEANS TO REDUCE AIR POLLUTION

**5.1** Though complete elimination of vehicular emission is not guaranteed, but there are ways and means by which emission can be controlled to minimum extent so that the people of Kolkata and the tourists accept the city as a better place to live and breathe in.

**5.2** Increasing the traffic access of the Kolkata:

The traffic access can be increased by widening the traffic roads. Such widening can be done by (a) truncating a portion of wide footpath (keeping comfortable access for the pedestrians); (b) eliminating the island divider available on the center of the existing roads; or (c) demolishing the building/structure on either side of road. Now, question will arise to what extent such widening is practicable and pragmatic. (a) The numbers of wide footpaths in Kolkata are very few and objection may come from the intelligentsia group using those footpaths for their comfortable walks; (b) elimination of central divider island with plantation will affect the beautification scheme of the city; (c) such demolition will invite not only legal complication but also political compulsion.

What are the other options to increase the traffic access barring the above? The option left with the authority is to make access of the traffic either above or below the ground without disturbing the existing surface traffic. The increase of traffic access can be compensated by building one/two storied elevated traffic corridors in the form of flyovers or express ways with need based wings connected with the surface traffic. The traffic access can also be increased by building eco-friendly underground corridors for rail or road to cater the overburdened city surface traffic. In addition the surface traffic need to be modernized by improving the road including maintenance throughout the year to a sustainable condition, by adopting the sophisticated signaling system to reduce the delay of waiting of vehicles at or near the crossings and making one way need based traffic flow and reversing them during peak hours. (This is already in practice in some roads at Kolkata now)

To reduce the overburden of surface traffic, the car owners should be encouraged by introducing more and more mass transportation luxury vehicles at higher premium, so that they can park their cars on the nearest on and off street parking lots created by traffic department (at the feasible site) and avail the mass transportation vehicles to reach their destination and return to their respective parking lots to take their cars back at home. Such practices are available in London, United States and other European countries. The scope of surface traffic can be further facilitated by developing inner and outer ring roads surrounding Kolkata as in Delhi.

By such planning, the congestion of surface traffic will no doubt reduce which in turn reduce the vehicular air pollution of the city.

**5.3** Improvements to be made in the diesel quality:

(i) Increase in Cetane number: Cetane number has been increased from 45 to 48 from April 1, 2000. Presently, diesel

with cetane number of 51 is being sold in the 11 mega cities of India, while for the entire country; diesel with cetane number 48 is being sold from April 1, 2005.

(ii) Reduction of Sulphur content: The sulphur content in diesel has been reduced from 1% maximum as on April 1, 1996 to 0.5% maximum with effect from January 1, 2000. The Indian refineries have installed Diesel Hydro- De-Sulphurisation (DHDS) plants for the sulphur content from 1% max. to 0.25% max at a total cost of Rs.5568.31 crores in June 1997. This has enabled supply of diesel with 0.25% sulphur in India from January 2000. In addition in the 4 metro cities, sulphur content in diesel has been reduced to 0.05% max.

These two improvements in the diesel quality will no doubt minimize automobile emission in Kolkata and the other mega cities of India..

**5.4** Use of Biodiesel in the transport sector:

India has great potential for production of bio-fuels like bio-ethanol and bio-diesel from non-edible oil seeds. India has chosen to grow non-edible oil bio-plants like jatropha, karanja etc in barren lands because India of 1.2 billion populations cannot afford to grow edible oil bio-plants in agricultural land for use in the transport sector at the cost of bringing shortage of essential food crops.

The National Mission biodiesel program consists of two phases. The first phase consists of demonstration projects covering plantation in both forest and non-forest lands in various states across the country. The phase II of the Mission will focus on uncovered areas with a target to achieve 20% blending of bio-oil with mineral diesel. The phase II of National Mission is proposed to be people driven with the government playing the role of facilitator. It aims to expand the program to cover up to 11 million hectare of land for plantation of bio-plants in phase II. The implementation will be done in phased manner. The first step is to achieve a 5% bio-oil blend in diesel in 9 states and next aim of 5% blending all over the country. Later the biodiesel blend will be increased to 10% or more across the country. To achieve the set targets, the National Mission will look into nurseries development, plantation in forest and non-forest lands, seed collection and oil extraction centers, transertification units, blending and marketing arrangements and research and development (R&D) studies. Besides, it needs no mention that the above process will have big potential for rural employment of India.

So to combat the vehicular air pollution of the Kolkata mega city, use of biodiesel in all diesel vehicles plays an important role.

**5.5** Other necessary steps to reduce vehicular air pollution of the city: The land mark high court directives on auto rickshaws have finally led to first step towards pollution free Kolkata. It might not clean the city's air in one stroke, but it is sure to reduce pollution significantly. Vehicles older than 15 years emit 20 times more than the new ones. The court directed that all auto rickshaws, irrespective of their date of

registration, will have to convert to either compressed natural gas (CNG) or liquefied petroleum gas (LPG).

**5.51** The state government has, so far failed to check auto emission and air pollution due to excessive use of fossil fuels. This has resulted in both auto-emission and air pollution is on the rise in the city. The concerned West Bengal Green Energy Development Corporation Ltd (WBGEDCL) is planning to introduce special concessions to those who use vehicles that run on bio-fuels and biodiesel. The move, they believe, will reduce the use of petrol and diesel and cut down the air pollution level of the city.

**5.52** Environmentalists have welcomed the government's tax hike on big cars and sport utility vehicles (SUV), claiming this will help reduce toxic emissions. But they warn that the government has taken no steps to curb the use of subsidized diesel on private diesel cars.

## 6 CONCLUSION

**6.1** Air pollution becomes acute in Kolkata during winter. The ideal count of Suspended Particulate Matter (SPM) and Respiratory Particulate Matter (RPM) should not exceed 140 and 60 respectively. But Kolkata's average SPM count is 211 and RPM count is 105. The figure becomes worst in the traffic intersections of the city. If this is not controlled with a heavy hand, the impact on the health of the citizen, particularly children will be devastating as opined by a city doctor.

**6.2** Pollution under control certificate as per West Bengal Motor Vehicles Act 1989 is to be issued to the polluting vehicles after checking and verifying the standard norms to be followed.

**6.3** Plying of goods vehicles should be restricted during the day, and parking them on the outskirts of Kolkata mega city and allowing their entry at night duly ensuring their travel at night are checked for night pollution..

**6.4** Last but not the least, walking or bicycling need to be encouraged for short distance for which the government authority or non government organizations should arrange necessary campaign through seminars, workshops or street rally so as to reduce the traffic pollution of Kolkata and make it a better place to live and breathe in.

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