

The Good and Bad of ‘Odd-Even Formula’: Case Study of Delhi and Alternative Measures towards Sustainable Transport

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Abstract—Growing pollution and poor quality of air has been the matter of great concern in urban areas in India. It has adverse effect on environment and human health (third goal of Sustainable Development Goals). With the rapid growth of urbanization in India the situation is bound to get worse, if urgent measures are not taken to curb the pollution. The major content found on air pollution in India are observed to be carbon dioxide (CO₂), sulphur dioxide (SO₂), nitrogen dioxide (NO₂), particulate matter (PM) and RSPM (Respirable Suspended Particulate Matter). Among various source of air pollution, transport sector account for alarming share of around 70% (Shrivastava R. K., 2013) of the total and within it, road transport emits 73% of the total emissions (Central Control Pollution Board, 2010) and vehicle emission accounts around 60% of greenhouse gases (GHGs) in India (Mary Tahir, 2012). This situation is likely to deteriorate in future with growing population and rise of private vehicles, owing to inadequate public transport failing to meet the mobility needs of the urban areas in India.

Delhi has been rated as world’s most polluted city by World Health Organization (WHO) (The Times of India, 2015). To tackle the deadly pollution situation in the city the government has recently implemented odd-even formula in Delhi on four wheeler private vehicles for fifteen days on trial basis. Although the initiative taken by the present government has received mixed reviews, as there are multiple perspectives to a particular issues and even these should be considered. While some reports has observed a decline in the levels of pollution during the implementation period. But the formula has been criticized with loopholes by experts.

This present paper attempts to showcase the different angles on the odd-even formula and its repercussion in the city of Delhi; challenges faced and would suggest innovative solutions from across the world to reduce the vehicular pollution and to provide a sustainable network of transport system to converge to the goals of sustainable development.

Keywords: Vehicle pollution, odd-even formula, sustainable development.

1. INTRODUCTION

Environmental pollution of air, water and land are of serious global concern and has been listed in the United Nation’s

Sustainable Development Goals (SDGs) agenda for 2030. Pollution has been found to be the largest cause of death in low and middle income countries (Global Alliance on Health and Pollution, 2002). Considering the day by day rise of air pollution such as CO₂, SO₂, NO₂, PM and RSPM and its serious ill effects on health, causing respiratory diseases, cardiovascular diseases and as deadly as cancer, the issue of poor air quality is bound to get unnoticed. Therefore, the paper would highlight the issue of air pollution in India.

India has been experiencing rapid growth of population and urbanization which is desirable and inevitable for growth and development. The urban areas are struggling with substandard quality of air. One of the major sources of this pollution is emissions from vehicles in the cities. The estimated volume of road based traffic would rise to 12,546 billion passengers-km in 2030-31 from 3,079 billion passenger-km in 2000-01 the major share would be of private and para-transit modes (55.73%) (Singh, 2006).

Considering the data released by Ministry of Statistics and Programme Implementation which has recorded registration of motor vehicles is growing at Compound Annual Growth Rate of 10.5% in 2002-2012 of which largest growth is recorded by cars, jeeps and taxis of 11 % , two-wheeler of 10.7% and goods vehicles 9.9% during the same period (Ministry of Statistics and Programme Implementation, 2013)- this has undoubtedly been an important contributor to Delhi’s levels of pollution along with other factors such as weather, energy consumption pattern, industries etc. (Sutton, 2015).

2. THE CONSEQUENCES OF ODD-EVEN FORMULA ON MOBILITY

The need of mobility has been growing with rising urbanization, but the modes of mobility are continued to be inclined towards private modes of transport such as two-wheeler, four-wheeler and para-transit modes, whereas public

transport are not considered as preferred choice of mode in urban areas. One of the main causes of this shift is liable to inadequate and unsustainable public transport modes to cater to the travelling demand of the commuters (Singh, 2001); (John Pucher, 2004); (Balachandra, 2010).

As per the study conducted by (Balachandra, 2010) highlights that during 1981 to 2005, vehicle population has increased by 15 times whereas the population has just increased by 1.7 times. The largest number of vehicles was accrued to Delhi, Bangalore and Chennai which is 18%, 9.6% and 9.3% respectively. Delhi also tops as having the highest vehicle population with 7.3 million unit of vehicles, plying in the city out of top six vehicle populated cities (Delhi, Chennai, Hyderabad, Pune, Mumbai and Kolkata), even in the year of 2015 (Gupta, 2015).

However, Delhi tops in the list of being most vehicle populated and world's polluted city (The Times of India, 2015). In order to reduce the vehicle pollution as one of the major source, Delhi government has opted to implement the odd-even formula for a trial of fifteen days starting from January 1st, 2016. Under this, odd number plate's cars are allowed to ride on odd days and even number on even days, applicable from 8am to 8pm except Sundays, violation of the same regulation will be charged Rs 2000 (Government of National Capital, 2015); (IBNLIVE, 2015).

There are various views received for and against of the scheme. However, during the implementation process, it was successful to increase the ridership of public buses from 35 lakh to 40 lakh and metro ridership by two lakh (Bannerjee, 2016). As per the study conducted by the School of Planning and Architecture (SPA), found that, congestion and traffic volume has reduced significantly during the scheme period, while the average speed of vehicles increased to 50 kmph during the plan period from speed of 20-25 kmph on any other day prior to scheme being implemented. Interestingly, the study has also noted that average occupancy in private cars had risen to 2.1 from 1.4 on busy routes during the odd-even scheme period (Dunne, 2016).

Another opinion on the scheme pointed out that the duration was too short to draw any concrete view on the success or failure of the scheme. The reason being, air pollution levels are also influenced by other factors such as winds, rain and temperatures (Ganesan, 2016).

It has been criticized because of the inconvenience caused to commuters as they are left with choices of boarding the existing public transport modes of only 5,000 buses that were already running over crowded in peak hours on regular days and metro that has a frequency of 3-4 minutes as against the frequency 1-1.5 minutes in other leading countries. Even the Supreme Court has criticized the efforts taken by present government as it was not adequate, as they failed to provide ample number of public transport to accommodate the

increased demand during the plan period, inconveniencing citizens suffered during the trips (Mahapatra, 2016).

Thus odd-even scheme needs to be reviewed again and before implementing should considered people's perspective on the same and alternative sustainable modes of options should be made available to them to make the journey smooth and safe.

3. RECOMMENDATIONS

Based on the above outcomes and observations, it is strongly recommended that serious concern needs to be assigned to the provision of a network of transport system which would be sustainable and feasible to implement in a city like Delhi which are as follows:-

1. Public transport/ Mass transit network

Though Delhi has a system of efficient metro which ranked second in 2014 among 18 other metro system globally in terms of customer satisfaction (The Indian Express, 2014). With the metro running into a stretch of 193.26 kms having 143 stations and has 220 train making of total of 1306 coaches (Delhi Metro Rail Corporation Ltd., 2015), but it doesn't rank anywhere in terms of ridership, to merely 26 lakh foot fall per day (Haider, 2015) and is hugely over crowded in the peak hours, whereas its counterparts like Tokyo subway are handling daily 87 lakh commuters (317km), Beijing 75 lakh (336 km) and Seoul 67 lakh (317km) (Ray, 2011). While, Delhi's network is expanding continuously, but it needs to increase the number of metro on each route with duration of less than 1-1.5 minutes to attract more people to travel by metro. Similarly, it is required to increase the count of existing buses along with feeder bus services from metro stations so as to provide convenient network for commuting and to reduce the usage of private modes to metro stations.

2. Right of Way (ROW)

Dedicated right of way infrastructure could be provided to public transport system such as buses popularly known as Bus Rapid Transit (BRT) or to non-motorized transport such as cycles, so as to increase their speed, reduces travel time and make them safer, thus making them more reliable, to provide on time and safe services to the users. This could be done through physical barriers on road or through signage as has been implemented on Bogota, London and England (U.S. Department of Transportation, 2008).

3. Non- Motorised Transport

Modes like cycling and walking could always be used as last mile connectivity to mass transit modes, but provided these infrastructures are safe and reliable. Delhi needs to build footpaths and cycle tracks on both the sides of road. Other steps such as car free zones, or cycle or walk zone could be implemented on busy market areas and rental bicycle could

also be facilitated on such areas. Bike sharing programs is running in London, Barcelona, Oslo, Rome, Berlin etc.

4. Carpooling

This is one of the method which has not been used on a large scale in India, but it has been gaining importance in European countries with the help of facilitating apps such as BlaBlaCar, sidecar, uber, rideshare, zipcar etc. Though the major concern associated with it in a city like Delhi is of safety, nevertheless these apps take special care of credibility of the person registering with them to avail this service and it could be still be used with the office colleagues who are known and are travelling in the similar route as it saves time, cost, reduces commuting stress, reduces congestion on road at peak hours and traffic pollution. It could be motivated at the individual and institute/ company level.

5. Smart Card

Once the infrastructure is created for mass transit and NMT, all these sustainable modes could be linked through one smart card, which provides access to everything and saves time, as has been practiced in Hong Kong through octopus smart card and also in Germany and Canada. This card helps to ensure integrated mobility network across the city and motivated people to opt for public transport over private modes (U.S. Department of Transportation, 2008).

6. Access to all

It is very important to build the infrastructure which is accessible and safe for all- be it children, old age crowd or for physically disabled people. It should inclusive in nature, if it could not serve the purpose of each section of the society, then the infrastructure is not sustainable enough. Therefore, every network of transport should be easily accessible for all.

7. Odd Even scheme

Since this scheme cannot be called as complete failure, it could be used from time to time to reduce the pollution levels, if it is shooting far beyond the normal levels. This will also create a change in mindset among the people and also help in generating awareness regarding environmental issues.

8. Emotional advertisement appeal

Campaign and advertisements could be used to create awareness among the people by using emotional appeal on the targeted crowds (users of private modes), such as highlighting the pollution emitted by their cars and its repercussions of this on their family health affecting their lungs, respiratory system etc. Such appeals would likely to bring greater impact on consumers on long-term basis (Menon, 2010)

9. Incentives or subsidy to the users of public transport and NMT

Introduction of incentives could be used as a measure to encourage usage of public transport to work, by providing

them tax rebate or subsidy on monthly basis for meeting the expenses of public transport. Also, a percentage could be charged from those who are using their private modes to work, as a cost to harming the environment. Such measures have been taken up by cities like Ireland, Canada and the Netherlands and proved to be an effective step towards encouraging public modes to travel across (NSW Ministry of Transport, 2006).

10. Congestion charges

In order to demotivate passengers to not to use private transport modes, taxes like congestion charges could be introduced on tax regime, so as to increase the cost of travelling for private modes users. This could be applicable on 5-6 days in a week from 12-14 hours in a day on few zones that are highly congested on peak hours s it has been done in London charging £11.50 daily which is on driving a vehicle in that particular zone (Transport for London, 2014).

11. Parking charges/ parking fines

These measures can be used to discourage the usage of private modes of transport as has been done in San Francisco, US (Transport Innovation Deployment for Europe). It will help to reduce the parking demand and use the existing parking spaces judiciously. It can be imposed on day basis for certain duration on particular areas that are badly affected by congestion and parking issues. But to implement this it is pre-condition that the targeted area should have effective connection of public transport system, to make this policy a success.

12. Changing the time of offices and schools

Adjustment of timing for each industry or firm could be done by 15-30 minutes, along with the change in weekly holidays of each firm, so as to avoid the congestion on that particular industrial belt. Similarly school or institutes timings could be alter to reduce the congestion of travelling at the same timings. For instance, It has been tried by local administrators of Gautam Budh Nagar in Noida from January 1st and probable benefits from it was estimated as drop of congestion by 20% and pollution by 30-40 % (Scroll.in, 2015); (The Indian Express, 2015).

13. Campaigns to motivate

Awareness campaign plays a very important role in raising concern about particular issue. Campaign drives need to be initiated to make people aware of benefits of travelling through public transport modes and ill-effects of using private modes on individual's health and external cost of it associated to the society. Motivation plays the role of influencing the mindset of the people.

14. Awareness among children

An effective way to put an impact on the society is to educate and sensitize the students regarding traffic pollution effects on

health and measures to reduce it, as they can be easily moulded as compare to adults. They are the one who will be using the resources in future, so they should be sensitized enough to use it judiciously.

4. CONCLUSION

Transport is regarded as the lifeblood of the cities; therefore it is even crucial for every transport provider in the city to ensure a sustainable network of transport to connect every part of the city. The public transport, mass transport and NMT are widely accepted as sustainable form of transport modes. Unfortunately, with the growth of cars and two-wheeler, it is undisputedly required to take immediate steps by government to reverse this trend. One of such measure taken by Delhi government of odd-even number plate on alternative days for fifteen days has received huge debate both for and against it. Though it was successful in reducing peak-hour pollution and congestion, but the period of implementation was too short to arrive at defined conclusion on the same. However, the paper has made an attempt to suggest various other solutions/ measures that can be used by policy makers to reduce the enormous traffic pollution hovering over the city. These measures involve both involving incentives for using public transport modes and at the same time discouraging the usage of private modes. One condition that is prerequisite to future sustainability of cities, is to make provision for an efficient network of public transport and NMT infrastructure, to match up with the growing mobility demand in Delhi and other similar metropolis and Class I cities with the objective of supply preceding demand. This will help us to put in place strategies which are not reactionary but proactive and ahead of its time – keeping in mind usage of predictability models to be applied in the future.

REFERENCES

- [1] Balachandra, B. S. (2010). Dynamics of Urban Mobility: A Comparative analysis of megacities of India. *Indira Gandhi Institute of Development Research, Mumbai*, 15-32.
- [2] Bannerjee, R. (2016, January 1). Odd-even : No major hassles on first working day. *The Times of India*, p. 1.
- [3] Central Control Pollution Board. (2010). *Status of the vehicular pollution control programme in India*. New Delhi: Central Control Pollution Board.
- [4] Delhi Metro Rail Corporation Ltd. (2015). *Annual Report 2014-15*. New Delhi: Delhi Metro Rail Corporation Ltd.
- [5] Dunne, B. (2016, January 22). Week after odd-even, pollution level spikes in the capital, says CSE. *The Indian Express*.
- [6] Ganesan, H. D. (2016, January 19). Pollution spikes during Delhi's odd-even experiment : The odds are even to clean the air in our cities. *The Times of India*, p. 1.
- [7] Global Alliance on Health and Pollution. (2002). *SDG Indicators for Health and Pollution*. Global Alliance on Health and Pollution.
- [8] Government of National Capital. (2015, December 28). *Transport Department*. Retrieved January 22, 2016, from Government of National Capital Territory of Delhi: <http://it.delhigovt.nic.in/writereaddata/egaz20157544.pdf>
- [9] Gupta, N. S. (2015, May 6). Chennai tops in vehicle density. *The Times of India*, p. 1.
- [10] Haider, F. (2015, October 7). Delhi Metro: Steep rise in ridership beats network expansion. *Hindustan Times*, p. 1.
- [11] IBNLIVE. (2015, December 24). Delhi to implement odd-even formula from January 1; single women drivers exempted, defaulters to be fined Rs 2,000. *IBNLive*, p. 1.
- [12] John Pucher, N. K. (2004). The Crisis of Public Transport in India: Overwhelming Needs but Limited Resources. *Journal of Public Transportation*.
- [13] Mahapatra, D. (2016, January 6). SC prods Delhi government on public transport. *The Times of India*, p. 1.
- [14] Mary Tahir, T. H. (2012). Transport sector and air quality in metro cities: A case study of Delhi, India. *International Journal of Geology, Earth and Environmental Sciences*, 1-6.
- [15] Menon, C. B. (2010). The power of emotional appeals in advertising- The influence of concrete versus abstract affect on time-dependent decisions. *Journal of Advertising Research*, 1-5.
- [16] Ministry of Statistics and Programme Implementation. (2013). *India.gov.in*. Retrieved October 12, 2015, from Motor Vehicles: http://mospi.nic.in/Mospi_New/upload/SYB2013/CH-20-MOTOR%20VEHICLES/MOTOR%20VEHICLE-WRITEUP.pdf
- [17] NSW Ministry of Transport. (2006, August). *Tax incentives for public transport users*. Australia: Ernst and Young.
- [18] Ray, S. (2011, December 13). Delhi Metro to become the 7th largest network in 2016. *Hindustan Times*, p. 1.
- [19] Scroll.in. (2015, December 28). *To curb pollution, Noida plans to change work hours for schools, offices, shops and factories*. Retrieved January 2016, from Scroll.in: <http://scroll.in/latest/801076/to-curb-pollution-noida-plans-to-change-work-hours-for-schools-offices-shops-and-factories>
- [20] Shrivastava R. K., S. N. (2013). Air pollution due to road transportation in India : a review on assessment and reduction strategies. *Journal of Environmental Research And Development* , 1.
- [21] Singh, S. K. (2006). The demand for road-based passenger mobility in India:1950-2030 and relevance for developing and developed countries . *European Journal of Transport and Infrastructure Research* .
- [22] Singh, S. P. (2001). *Urbanisation and Urban Transport in India:The sketch for a policy*. Retrieved January 4, 2016, from Transport Asia Workshop: http://www.seas.harvard.edu/TransportAsia/workshop_papers/Padam-Singh.pdf
- [23] Sutton, M. A. (2015, October 29). New study uncovers the underlying causes of Delhi's air pollution problems. *University of Surrey, UK*, p. 1.
- [24] The Indian Express. (2014, September 28). Delhi metro ranked 2nd among 18 international metro systems. *The Indian Express*, p. 1.

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- [25] The Indian Express. (2015, December 28). From January 1: Noida to alter work hours of offices and shops, timings of schools. *The Indian Express*, p. 1.
- [26] The Times of India. (2015, December 2). Delhi is world's most polluted city :WHO. *The Times of India*, p. 1.
- [27] Transport for London. (2014, April). *Congestion charge*. Retrieved January 25, 2016, from Transport for London: <https://tfl.gov.uk/modes/driving/congestion-charge>
- [28] Transport Innovation Deployment for Europe. (n.d.). *Guidelines for implemnters-Implementation of parking charge policies-dynamic parking charges*. Retrieved January 2016, from Transport Innovation Deployment for Europe: http://www.eltis.org/sites/eltis/files/trainingmaterials/t647_tide-policyguideline-6-lite.pdf
- [29] U.S. Department of Transportation. (2008). *World cities best practices -Innovations in transportation*. New York: nyc.gov.