

STUDY OF AIR QUALITY MONITORING OF NEARBY AREAS OF MUMBAI METRO STATION DURING SOME CONSTRUCTION WORK

Dr. S.K AHMAD¹, SAPNA KUMARI², ITRAT KAMAAL³

¹Department of Civil Engineering Al-Falah School of Engineering and Technology, Faridabad, Haryana, India

²Department of Civil Engineering, Jamia Millia Islamia, New Delhi, India

³Department of Civil Engineering Al-Falah School of Engineering and Technology, Faridabad, Haryana, India

Abstract : A study on air quality has been carried out using air quality monitoring, which is done by one of the Air instruments that is a dual-channel dust sampler. This is 24 hours process it automatically cut off after 24 hours then the reading of 24 hours report fetches up in the lab .and the lab gives the analysis subsequently 3 -4days.The main objective of the study is to find out the concentration of air pollutants of PM2.5, PM10, sulphur dioxide, oxides of nitrogen, carbon monoxide of nearby areas of metro stations in Mumbai. We worked on 3 locations or 3 highly crowded metro stations. And have taken readings of each parameter on each metro station and learned how it's essential to maintain standards parameters and what measures are taken to maintain the standards readings. In addition, I have checked the humidity and airflow of construction sites especially underground using a hydrometer and anemometer

Key words -PM 10, PM 2.5, Monitoring, Construction, Metro Sites

1.INTRODUCTION

Air pollution, release into the atmosphere of various gases, finely divided solids, or finely Dispersed liquid aerosols at rates that exceed the natural capacity of the environment to dissipate and dilute or absorb them. These materials may spread concentrations in the air that cause unwanted health, economic, or aesthetic effects. Clean, dry air consists primarily of nitrogen and oxygen—78 percent and 21 percent respectively, by volume. The enduring 1 percent is a combination of other gases, mostly argon (0.9 percent), along with drop (very small) amounts of carbon dioxide, methane, hydrogen, helium, and more. Water vapour is correspondingly a normal, however quite variable, component of the atmosphere, normally ranging from 0.01 to 4 percent by volume; below very humid circumstances the moisture content of air may be as high as 5 percent. Construction sites are found both within urban and rural areas, often in the close proximity of homes. Due to their propinquity to homes and the resources used, construction sites may create home pollution. This includes air, water, soil, and noise pollution. The air you breathe may be polluted due to the construction work. Apart from the noise, poor air quality is the maximum instantaneous pollution result you may encounter from a construction site. This means that airborne pollutants together with contaminated particulate matter and volatile composites are spreading around (mostly carried by wind) in the nearby neighbourhood (the main wind way will effect the area most exaggerated by air pollution around a construction site). Contaminants scattering around in air can transportable large distances in a short time. The chief construction pollutants that blowout everywhere by wind include PM10 (particulate matter with a diameter less than 10 microns engendering polluted dust) PAHs destined to particulate matter, VOCs (volatile organic compounds), asbestos, gases such as carbon monoxide, carbon dioxide, and nitrogen oxides. The development of new metro undertaking or extension of existing metro frameworks are being arranged in a few thickly populated and profoundly contaminated urban areas of the world. The metro frameworks after development and authorizing will absolutely decrease the contamination level and add accommodation to people in general, yet such undertaking may horribly bother the contamination issue during development stage, particularly in regard of commotion and air contamination which are by and large at their top in the city not long before such projects are taken up for execution. To intensify the issue further, the metro arrangement for the most part goes through thickly populated regions and high vehicular traffic zones; consequently, the development action must be taken up for the most part in the powerless spaces of the city, which are the most thickly populated just as by and large having the most noteworthy contamination level. Presently a-days the venture execution period is getting further packed bringing about additional in tense movement of development and significantly more expansion in contamination level in the more limited time of development.

[[1.] WHO. AirPollution online at: <http://www.who.int/airpollution/en/> (accessed October 5, 2019).]([2.] Saud T, Gautam R, Mandal TK, Gadi R, Singh DP, Sharma SK. Emission estimates of organic and elemental carbon from household biomass fuel used over the IndoGangetic Plain (IGP), India. *Atmos Environ.* (2012) 61:212–20. doi: 0.1016/j.atmosenv.2012.07.030) ([3.] Singh DP, Gadi R, Mandal TK, Saud T, Saxena M, Sharma SK. Emissions estimates of PAH from biomass fuels used in rural sector of Indo-Gangetic Plains of India. *Atmos Environ.* (2013) 68:120–6. doi: 10.1016/j.atmosenv.2012.11.042)([4.] Hesterberg TW, Bunn WB, McClellan RO, Hamade AK, Long CM, Valberg PA. Critical review of the human data on short-term nitrogen dioxide (NO₂) exposures: evidence for NO₂ no-effect levels. *Crit Rev Toxicol.* (2009) 39:743–81. doi:

10.3109/10408440903294945) ([5.] Central Pollution Control Board (CPCB). 2009. Revised National Ambient Air Quality Standards (NAAQS) ([6.] Driscoll, C.T., D. Whitall, J. Aber, E. Boyer, M. Castro, C. Cronan, and C.L. Goodale. 2003. Nitrogen pollution in the northeastern United States: sources, effects, and management options. *Bioscience* 53)([7.] Ali, H., Mishra, V., and Pai, D. S. (2014). Observed and projected urban extreme rainfall events in India. *J. Geophysical Res.* 119, 12–621. doi: 10.1002/2014JD022264)([8.] Balakrishnan, K., Dey, S., Gupta, T., Dhaliwal, R. S., Brauer, M., Cohen, A. J., et al. (2019). The impact of air pollution on deaths, disease burden, and life expectancy across the states of India: the Global Burden of Disease Study 2017. *Lancet Planetary Health* 3, e26–e39. doi: 10.1016/S2542-5196(18)30261) ([9.] Ambient air pollution: Global assessment of exposure and BOD, update 2018. WHO (2020) (In press).)([10.] S. Chowdhury et al Tracking ambient PM2.5 build-up in Delhi national capital region during the dry season over 15 years using a high-resolution (1 km) satellite aerosol dataset. *Atmos. Environ.* **204**, 142–150 (2019). ([11.] Alam DS, Chowdhury MA, Siddiquee AT, Ahmed S, Hossain MD, Pervin S, Streatfield K, Cravioto A, Niessen LW, 2012. September Adult cardiopulmonary mortality and indoor air pollution: a 10-year retrospective cohort study in a lowincome rural setting. *Glob. Heart*

([12.] Kumar R, Sharma SK, Thakur JS, Lakshmi PVM, Sharma MK, Singh T, 2010. Association of air pollution and mortality in the Ludhiana city of India: a time-series study. *Indian J. Public Health* 54 (2), 98–103.)([13.] Awkash Kumar, Indrani Gupta, Jørgen Brandt, Rakesh Kumar, Anil KumarDikshit & Rashmi S. Patil(2016), Air quality mapping using GIS and economic evaluation of health impact for Mumbai City, India, *Journal of the Air & Waste Management Association* 2016, VOL. 66, NO. 5, 470–481 <http://dx.doi.org/10.1080/10962247.2016.1143887>.

2. MATERIAL AND METHOD

In this method we discuss in details about methods used for the measurement of all parameters PM10, PM2.5, sulphur dioxide, oxides of nitrogen, carbon monoxide. We will also discuss about site selection for monitoring and location of monitoring within the study area .this chapter highlights time period for monitoring

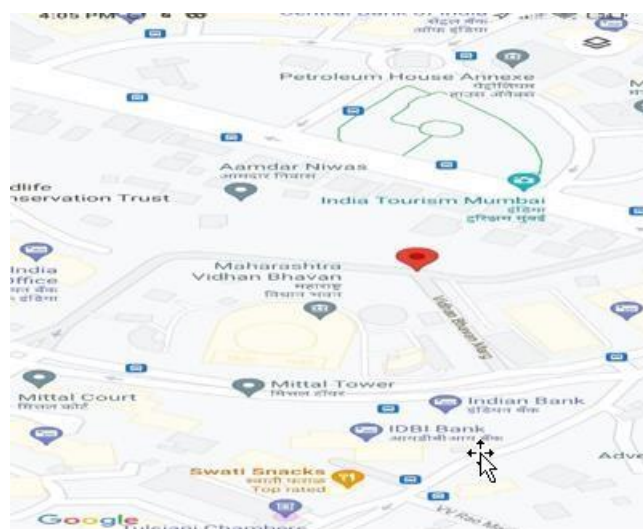
2.1 Site Selection

For present study, I have selected a locations of different construction sites which are mainly metro construction in Mumbai.

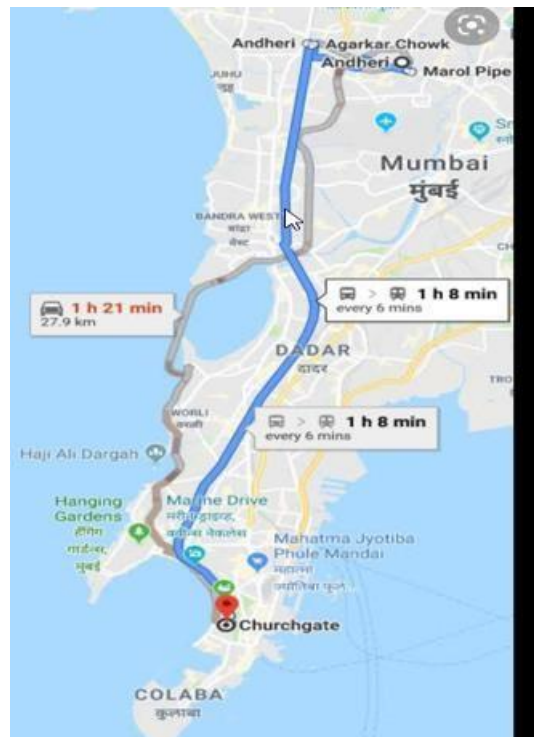
Opening site I nominated for monitoring is Vidhanbhawan, another site is Churchgate near Khrtanbhawan and last is Hutatma Chowk in forward-facing of City Bank

I selected these sites because they were under construction and I wanted to analysis the pollution level on such construction metro sites and how they manage the pollution level.

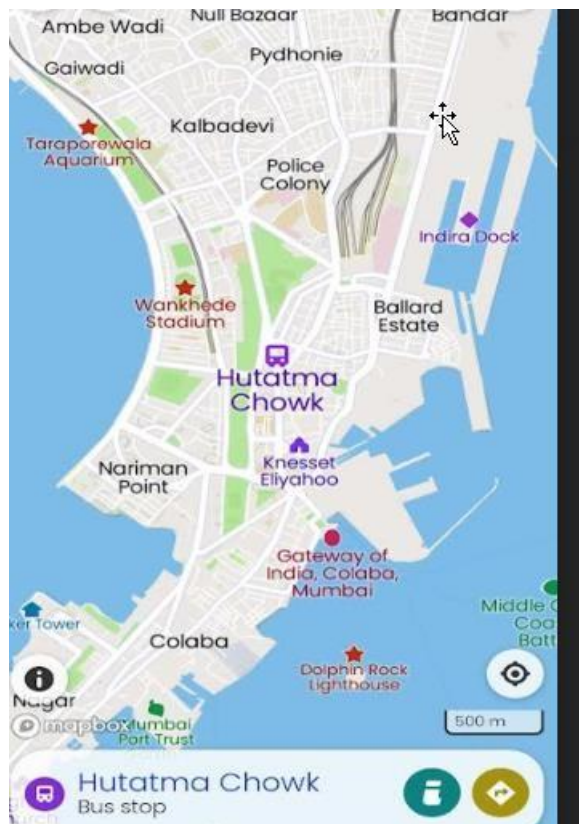
These areas are peak area for living as well as for transportation and construction on such moving area was my interest for selection of these sites .some parts are underground that is tunnel metro line while some were on upper level.



LOCATION 1 VIDHAN BHAWAN



LOCATION 2 CHURCH GATE



LOCATION 3 HUTATMA CHOWK

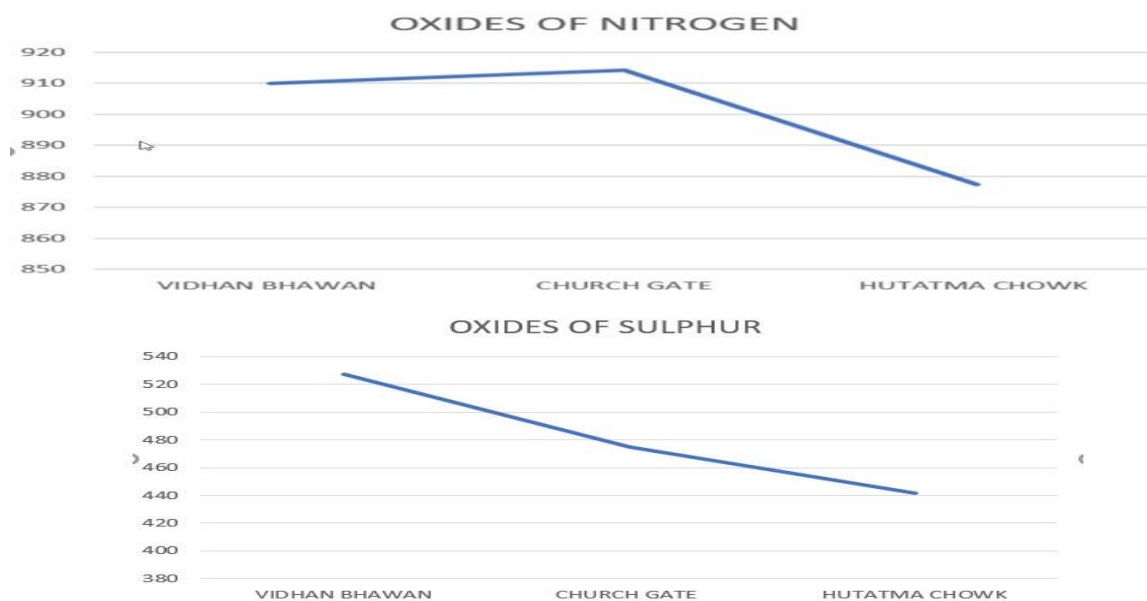
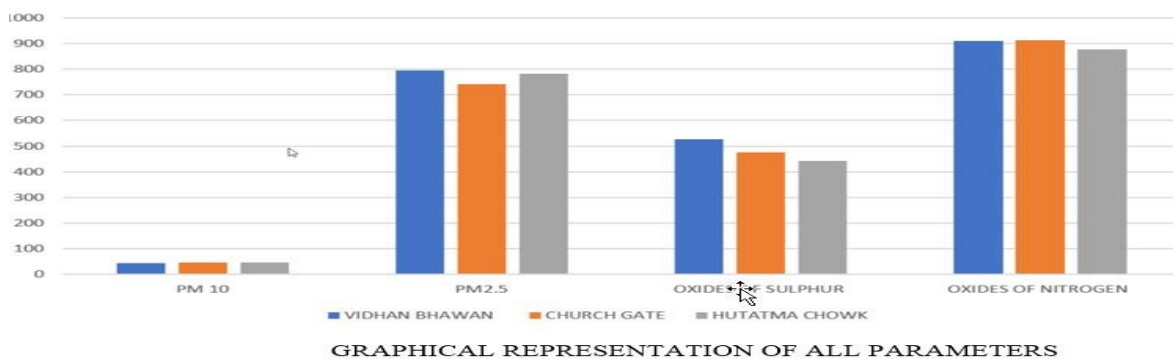
2.2 INSTRUMENT USED

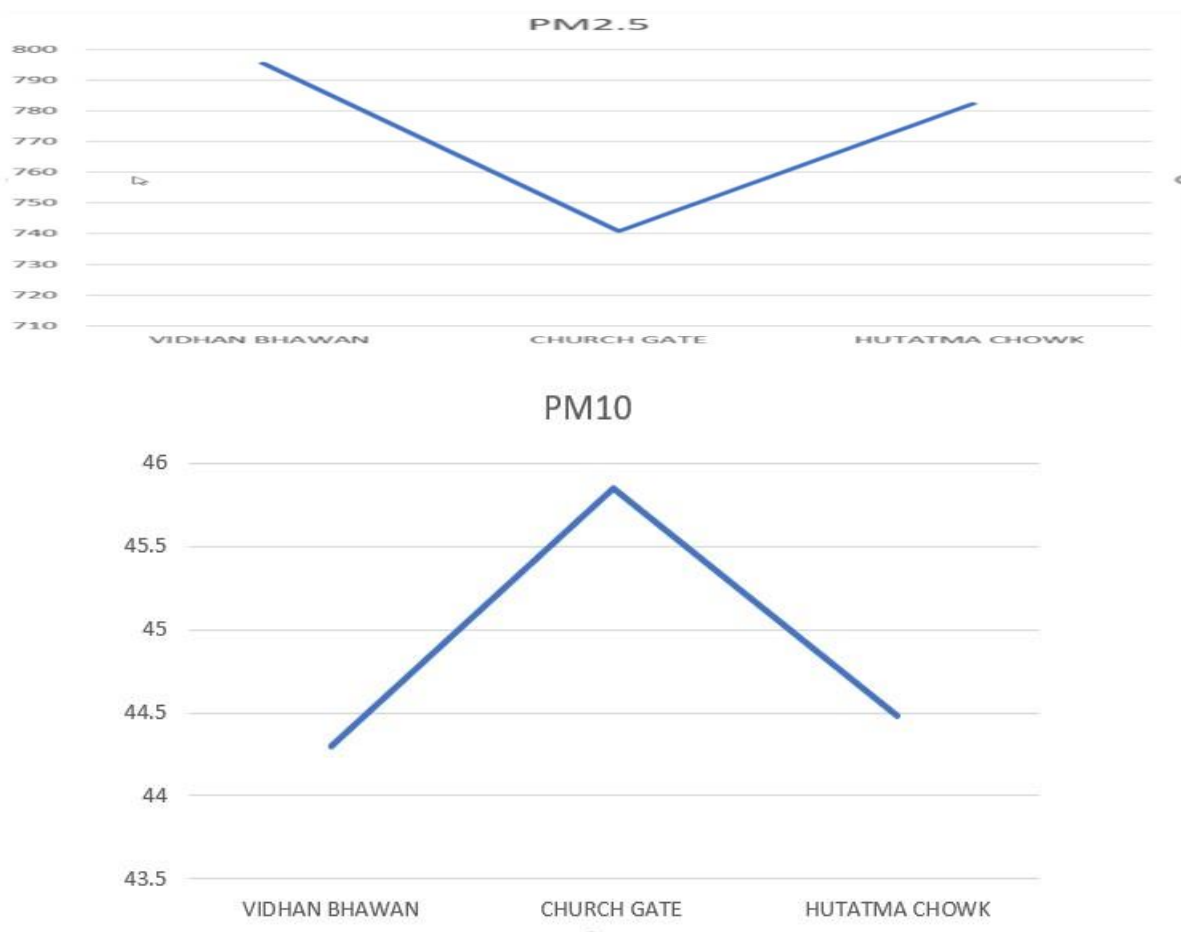
Dual Channel Dust Sampler-(PM10 & PM2.5)I took samples from Mumbai metro construction sites. At first these instruments were placed outdoor and then samples are taken to lab ,With regards to advancement in Ambient Air Sampling innovation, Instrumex has conveyed once more! The most widely recognized issue looked by Consultants to consent to the CPCB standards for Ambient Air Sampling - was utilizing two separate instruments for estimation of PM2.5 and PM10 Dust. Instrument has discovered the answer for this issue - The Dual Channel Sampler for estimation of PM2.5 and PM10 dust fixations in surrounding air – Simultaneously!

The stream control module utilizes the demonstrated innovation utilized in Instrumex's IPMFDS 2.5/10µ Fine residue Sampler that has delighted in more than 400 establishments across India and abroad. The two directs in IPM-FDS-2510 are exclusively constrained by discrete stream control component yet incorporated into a solitary regulator module. In this manner giving exact chip based stream control for two channels. Both the channels exclusively conform to Federal Reference Method of USEPA as depicted in 40 CFR Part-50 Appendix L for assurance of Particulate Matter. It likewise affirms with the CPCB rules for Measurement of Ambient Air Pollutants.

3. RESULTS AND DISCUSSION

In this paper, analysis of monitored results of air quality parameters will be done for every monitoring location. we will organize a tabular learning of each parameter’s daily outcomes in comparison with maximum parameters. We will also analyse why airflow remains contact and why it gets checked daily. And how essential a monitoring is and if it will rise what would happen. The device we have used we get reading every third day or each 6th day (contingent upon the specific site plan) for a time of 24 hours.





4. CONCLUSIONS

Field measurement of air quality were conducted for underground construction sites of Mumbai metro we worked on 3 sites vidhan Bhawan , church gate and hutatma chowk .There were limits for each parameters air quality was measured and compared daily .

Even though there are pollutants such as CO and VOC in the underground passageway, particulate matter is the key pollutant. According to the contrast of contaminant concentration in different locations, it was examined that ventilation is a most important factor disturbing the concentration of pollutants, in accumulation to the effect of pollution sources. It was also resolute that the number of pedestrians also affects the concentration of contaminants. This also approves that pedestrians are the chief foundation of PM2.5 in underground passageways. Quite a lot of situations with extra entrance were built. the concentration of PM2.5 in the underground passageway diminutions with the intensification of inlet wind speed. Therefore, in practice, it is conceivable to rise the intake volume and diminish the pollution in the underground passageway by keeping the entrance unblocked and having the entrance in an open area. Efforts were completed to find the optimum situation of extra entrance by changing its position in simulation. Consequences display that vents should not be built at backward positions, and should be built for each section of the zigzag underground passageway.

ACKNOWLEDGEMENT

The Author gratefully acknowledge the contribution of the staff of Department of Civil Engineering of Al-Falah school of engineering and technology, Faridabad, Haryana, India

REFERENCES

- 1) WHO. AirPollution online at: <http://www.who.int/airpollution/en/> (accessed October 5, 2019).
- 2) Saud T, Gautam R, Mandal TK, Gadi R, Singh DP, Sharma SK. Emission estimates of organic and elemental carbon from household biomass fuel used over the IndoGangetic Plain (IGP), India. Atmos Environ. (2012) 61:212–20. doi: 10.1016/j.atmosenv.2012.07.030

- 3) Singh DP, Gadi R, Mandal TK, Saud T, Saxena M, Sharma SK. Emissions estimates of PAH from biomass fuels used in rural sector of Indo-Gangetic Plains of India. *Atmos Environ.* (2013) 68:120–6. doi: 10.1016/j.atmosenv.2012.11.042
- 4) Hesterberg TW, Bunn WB, McClellan RO, Hamade AK, Long CM, Valberg PA. Critical review of the human data on short-term nitrogen dioxide (NO₂) exposures: evidence for NO₂ no-effect levels. *Crit Rev Toxicol.* (2009) 39:743–81. doi: 10.3109/10408440903294945
- 5) Central Pollution Control Board (CPCB). 2009. Revised National Ambient Air Quality Standards (NAAQS)
- 6) Driscoll, C.T., D. Whitall, J. Aber, E. Boyer, M. Castro, C. Cronan, and C.L. Goodale. 2003. Nitrogen pollution in the northeastern United States: sources, effects, and management options. *Bioscience* 53 (4): 357–74
- 7) Ali, H., Mishra, V., and Pai, D. S. (2014). Observed and projected urban extreme rainfall events in India. *J. Geophysical Res.* 119, 12–621. doi: 10.1002/2014JD022264
- 8) Balakrishnan, K., Dey, S., Gupta, T., Dhaliwal, R. S., Brauer, M., Cohen, A. J., et al. (2019). The impact of air pollution on deaths, disease burden, and life expectancy across the states of India: the Global Burden of Disease Study 2017. *Lancet Planetary Health* 3, e26–e39. doi: 10.1016/S2542-5196(18)30261-
- 9) Ambient air pollution: Global assessment of exposure and BOD, update 2018. WHO (2020) (In press).
- 10) S. Chowdhury et al Tracking ambient PM_{2.5} build-up in Delhi national capital region during the dry season over 15 years using a high-resolution (1 km) satellite aerosol dataset. *Atmos. Environ.* **204**, 142–150 (2019).
- 11) Alam DS, Chowdhury MA, Siddiquee AT, Ahmed S, Hossain MD, Pervin S, Streatfield K, Cravioto A, Niessen LW, 2012. September Adult cardiopulmonary mortality and indoor air pollution: a 10-year retrospective cohort study in a lowincome rural setting. *Glob. Heart* 7 (3), 215–221
- 12) Kumar R, Sharma SK, Thakur JS, Lakshmi PVM, Sharma MK, Singh T, Association of air pollution and mortality in the Ludhiana city of India: a time-series study. *Indian J. Public Health* 54 (2), 98–103.
- 13) Awkash Kumar, Indrani Gupta, Jørgen Brandt, Rakesh Kumar, Anil Kumar Dikshit & Rashmi S. Patil (2016), Air quality mapping using GIS and economic evaluation of health impact for Mumbai City, India, *Journal of the Air & Waste Management Association* 2016, VOL.66NO.5,470–481
<http://dx.doi.org/10.1080/10962247.2016.1143887>.