Global Scientific JOURNALS

GSJ: Volume 8, Issue 5, May 2020, Online: ISSN 2320-9186
www.globalscientificjournal.com

NATIONSL METEOROLOGICAL AGECY OF ETHIOPIA

LEVELS, TRENDS OF PRINCIPAL POLLUTANTS: CLIMATOLOGY AND SECTORS ACTIVITIES OVER ADDIS ABABA, ETHIOPIA

Tofikk Redi Indris

Directorate of Meteorological Research and Study. Mobile: +251930641963

Email: tofikk858@gmail.com, Addis Ababa, Ethiopia.

Addis Ababa, Ethiopia

June, 2020

ACKNOWLEDGMENTS

Firstly, the components of this study were mainly online journals reference and data from NMA, EAF, US embassy and Addis Air organizations. So, dear authors here all I made a reference in this my paper I thank you so match for your air quality evidence and I would like to say thank you to all organizations for your helping through data providing and posted on your websites.

Secondly, this paper was writing during the spread of coronavirus throughout the world including our country Ethiopia, to reduce the spread of coronavirus my organization was ordered to the servants were must stayed at home, so that, I thank you too coronavirus it was made me the clever one to wrote this review at home and thank you too my organization NMA for included me in your command during the special time of spreading coronavirus.

At the last, but not the list the owner of all things is God, during negative happening he make me always strong and he helps me through translating those negatives to using for good situations. For all my dear lords I thank you more for given me power to using things in balanced manner.

ABSTRACT

The environmental air pollution is mainly due to Agricultural activities, industrial activities, commercial activities, transport sectors and domestics activity. this review study intended that the levels and trends of principal pollutants linked with climatology and sectors activities.

The focused outcomes of the study were assessing and reviewed the gaseous and particle pollution concentration of the city, assessed the climatological effects on air pollution, assessed sectors process that were important to enhanced the air pollution, Identified the resent air pollution related respiratory cases recorded in Addis Ababa health centers and funded and forwarded possible advice to solve the air quality problems.

The main inputs of the study were article reviews from trusted online journal, reports of sectors activities and secondary data from NMA, US embassy, Ethiopian Athletics Federations and Addis Air.

Therefore, through study reviewing and analyzed result showed that in average the levels of $PM_{2.5}$, PM_{10}, CO and O_3 pollutants were exceeded both WHO and US EPA AQG. The review linked with climatology was during dry and wet seasons and temperature inversions showed that the pollution levels and trends was increased. The pollution causes in rural areas of Ethiopia, mainly through change in the trends of pollutants was agricultural sectors and domestic activities. However, in Addis Ababa city mainly through transport sectors. And also the analyzed showed that highest particle pollution $PM_{2.5}$ and PM_{10} was observed over central parts of Addis Ababa city than the side parts of the city. Among each basic gaseous pollutants NO_2 sensor was detected highest concentrations.

Finally, in this study advised that improving air quality, air pollution services and scheduled adaptation protective plan in all sectors are direct indications of achievements to the maintainable and equitable future in the sectors of health, energy, transport, agricultural, environmental and domestics.

Keywords: *Particulate pollution, Gaseous pollution, Climatology and Sector activities*

ABRIVATION AND ACRONOMY

AATA	Addis Ababa Transport Authority
AAEPA	Addis Ababa Environmental Protection Authority
CO	Carbone Mono Oxide
CSA	Central Statistical Agency
FDRECAS	Federal Democratic Republics of Ethiopia Central Statistical Agency
GHG	Green House Gas
GM	Gaga Million
MEFCC	Ministry of Environment Forest and Climate Change
NMA	National Meteorological Agency
IHMEI	Institute for Health Metrics and Evaluation
IAP	Indore Air Pollutant
NO_2	Nitrogen Dioxide
O3	Ozone
ODAP	Out Dore Air Pollutant
$PM_{2.5}$	Particulate Matter aerodynamic diameter less than 2.5µm
PM_{10}	Particulate Matter aerodynamic diameter less than 10µm
PPM	Particle Per Million
TSP	Total Suspended Particle
UNWUP	United Nation World Urban Prospective
USEPA	United State Environmental Authority
WMO	World Health Organization
WHO AQG	World Health Organization Air Quality Guideline

INTRODUCTION

The issues of air pollution have been social concern in the back drop of various developmental activities. This is duo to problem of air pollution is increasing day to day in different sectoral activities throughout the world. Now a day in the urban area of the world the change in air quality were mainly through transport sector this is causes for increase energy consumptions (WHO, 2016). In the other hand the change of surrounding air quality is due to population densities economic growth, agricultural activities, commercial activities, industrial activities and domestic activities.

In rural area the ambient air is the result of agricultural activities and house holed emissions, but the Urban principal pollutants is the result of emissions from a multiplicity of sources, mainly transportation, industrial and domestic activities.

Air quality has been a matter of concern, particularly in urban areas. Furthermore, achievement of a national to improve air quality depends on the support of its countries who are well-informed about local and national air pollution problems.

Thus, Addis Ababa is experiencing a higher population growth due to higher rate of urbanization and rural to urban migration. The immigration of population to the city result to land use change, expansions of the city with demands of transportation services. The current estimated population of the city has a population of 4.8 million with a growth rate of ¼ Ethiopian populations (UN WUP, 2020).

Now a day the coupled to the density of population and expansion of the city, transports investments, inductees, constrictions sectors are increased. As a result, the air quality in the city is highly affected by emissions from transport, dust from traffic road, emission from industrial activities, construction operations, and other overall land use practices. The air quality has become a serious concern in the city. Therefore, knowing separately the source apportionments of air pollution is important to reduce impacts of health, economic activities, environmental damage, impacts of transport sectors.

Through this study, to provide the extent of evidence and advice about air quality level and trend to each sectors, the study was concerned by assessing and analyzing the level, trend of ambient pollutants liked climatology and sectors activists in Addis Ababa city.

Objective

The objective of the study is to assess and review the gaseous and particle pollutant concentrations, climatology and sectors activities, the study explores information about ambient concentrations. To fulfill the general objective of the study:

😐Assess and review the gaseous and particle pollution concentration of the city
😐Assess the climatology and sectors process that are important to enhancing the air pollution.
😐Identify the resent air pollution related respiratory cases recorded in Addis Ababa health centers.
😐Find and forward possible recommendations to solve the air quality problems

Description of the Problem

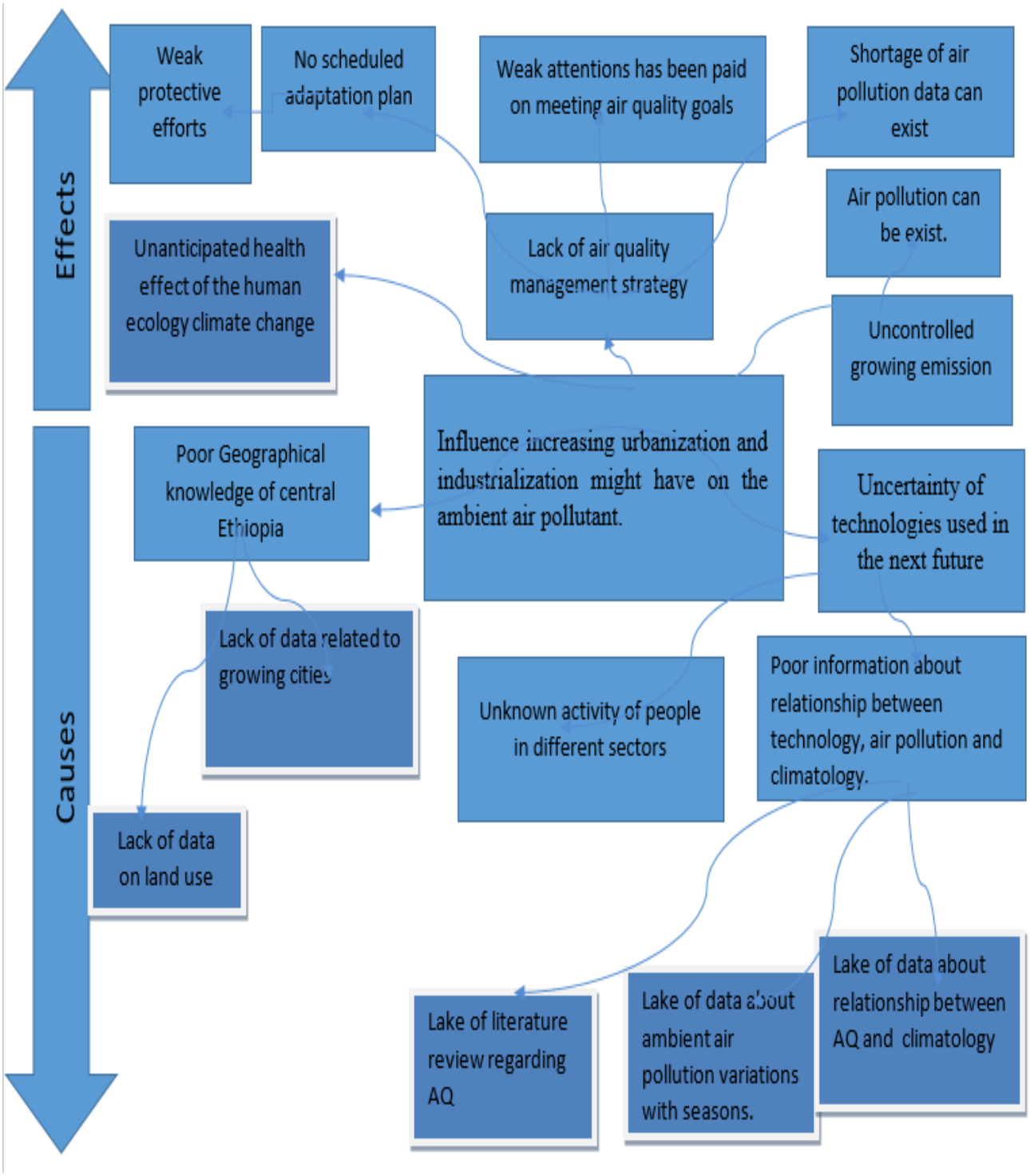
The influence of seriously in developing countries related to the increasing urbanization, industrialization and modernization activities might have on the principal pollutants un known. The first causes of this problem is poor land use of Addis Ababa city duo to lack of data related to growing cities and lack of data on land use.

The second cause is due to uncertainty of technologies used in the next future duo to the increasing population of cities in service sectors like, transportation sectors, industries sectors, commercial sectors and energy sectors. As results of lake of information about the relationship between technology and pollutants due to lake of literature review.

These problems have effect on air quality management strategy as result no scheduled adaptation plan, Weak protective efforts, Weak attentions has been paid on meeting air quality goals, Shortage of air pollution data can exist and uncontrolled growing emissions. The other effects are unanticipated health effect of the human and socioeconomic activity. (Look problem tree 1 that describe the general causes and effects of the main problems on air pollution).

So that, this project is important to solve the problem of increasing urbanization and industrialization might have on the gaseous and particle pollutants. May solving this all causes and effects of air pollution is relevant to improve air quality managements and strategy, reduce the concentrations of air pollutants as a result reduce the effects air pollution on human health, on economic activities, on environments properties and on surrounding air quality.

Problems tree



Problem tree 1 represents the general causes and effects of the main problem of air pollutions

DATA AND METHODOLOGY

To study this review study mainly used:

☺literatures and related peer reviewed articles were from thrusted online journals and sectors reports that were important to aggravated air pollutions,

☺One-year form Jan 2019– December 2019 both particle and gaseous pollutants such as $PM_{2.5}$ and $PM_{10,}$ CO, NO_2 and O_3 these two types of pollutant were taken from Ethiopian Athletics Federation by kunakcloud website represents the area Addis Ababa international stadium,

☺Addis Air-Addis Ababa air quality network used as a source for one year from April 2019 to March 2020 $PM_{2.5}$ and PM_{10} form Addis air website it represents 10 different stations networked,

☺Air-now website was another 1 year from 2017 January to 2018 December $PM_{2.5}$ data source represents for the area Intoto and Bsrategeberel which were monitored by US embassy and

☺National Meteorological Agency was one-year gaseous pollutants NO_2, O_3, CO data source from march 2014- February 2015, the stations represent blackline area.

This article has been done through review of literatures and assess by using related secondary data. reviewed by using a systematic review of relevant research articles. A peer reviews articles have been downloaded online from the reputable journals and assess the level of the principal pollutants through using relevant air quality standard were taken from WHO and US EPA. And also assess the effects of climatology of Addis Ababa and sector activities on air pollutions. analyzed the existing ambient pollutant data from the existing monitoring station by using box plot.

Geographical representations, climatology and air pollution of Addis Ababa

Addis Ababa city is the capital and central of Ethiopia, the city comprises over the area of 54 000 hectares, with diameter 30-40 Kms, the elevation varies between 2,200 and 2,800 meters above sea level with an average of 2,400 meter above sea level with average minimum and maximum temperature were 11.10c and 23.80c respectively (FDRECAS,2009).

The climatology of Addis Ababa city rainy or summer season from Jun to September, little rainy season from February to May and dry and solder night season from October to January, with average annual rainfall is 1175.8. Sites of low lying places that are found behind hills like the

land mass below Terara hotel located on the way to Kotebe could not be effectively ventilated by the air mass around it.

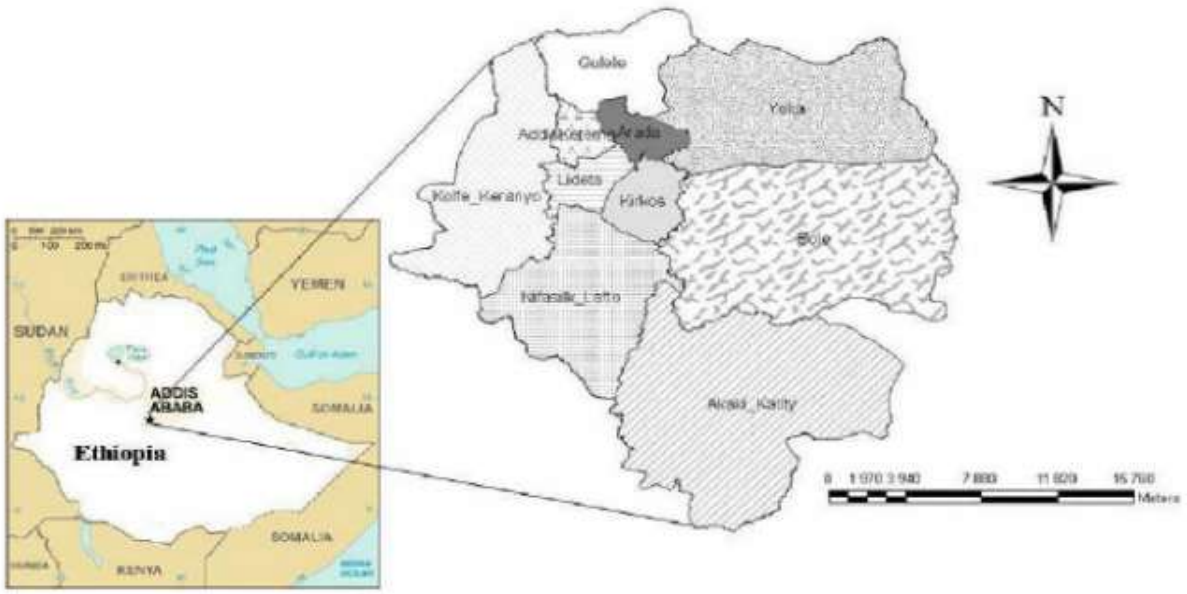
This implies that the residence time for air pollutants is sustained for some times in local air mass. The relative rapid cooling effect of the land mass makes the air around it condense and form fog, usually in the early mornings. This is usually observed in wet season July to August, had few personal observations and during the months of October to January. The fog is sustained until the land gets relatively warmer than the surrounding air. This is the reason that fog collects traffic pollutants and makes visibility very difficult. It is known that peak exposures to air pollutants can happen during the times of fog formation.

The city's vegetation coverage is about 11%, which is much lower than the master plan of 41% coverage (data by courtesy of Addis Ababa Regional Government). This is an indication that the natural cleaning capacity of an inner urban environment in which vegetation is involved is minimal.

During wet and dry seasons of, for 15 minutes moving average CO concentration was 2.1 ppm (GM=1.3) and 2.8 ppm (GM=2.2) respective seasons. The CO temporal and spatial profiles among the wet and dry seasons were similar.

The concentrations of pollutants in the city were vary through each climatology of seasons. Fifteen percent of roadside samples and all on-road samples exhibited more than 50% of the 8-hr CO WHO guideline. Daily CO maxima were observed in early mornings and late afternoons (Ahmend Ali etal., 2010). The study attributed high PM10 concentration during dry season to emissions of dust particles from paved and unpaved road and incomplete fossil fuel combustion, biomass and waste burning activities around the sampling site.

The morning concentration maxima were likely accentuated by stable atmospheric conditions associated with overnight surface temperature inversions. Both PM_{10} and CO concentrations exhibited daily maxima around 7:00 and secondary peaks in the late afternoon and evening, suggesting that those pollutants were emitted during periods associated with motor-vehicle traffic, food preparation, and heating of homes and Ozone concentrations were measured near mid-day on filter sample collection days and were in all cases <45 parts per billion.



Map representations of study aria of Addis Ababa city, Ethiopia

Important process to air pollution

Traffic process is handle the first position to pollute the air in Ethiopia. The Concentrations of pollutants were peak with high transportation process areas of though the days. In Addis Ababa were in early morning the primary concentration of pollutants NO, NO_2, CO and PM_{10}, was observed the first daily maximum, the second maximum was in the last afternoons and early evening (Kumie et al., 2010). Temperature inversion could also be a cause for higher concentration in the early evenings (Etyemezian et al., 2005).

In recent year Addis Ababa has recorded the rapid urbanization and huge investment in transport and other services sectors. Addis Ababa transport Authority report, about 70% of the vehicles are found in the Addis Ababa.

According to the report the rate of vehicles growth in the city is 9.88%. The same report indicated that the rate of asphalt road growth in the city is about 8.28%. In 2016, the city administration has a total of 2626 km of asphalt road,1433 km Gravel road and 1866 km Cobbled road as a total of 5915 km road infrastructure.

However, the total vehicles to asphalt road length ratio of 171, which is very difficult traffic congestion that can create severe air pollution related problems, huge consumption of fuel and toxicity issues of pollutants on humans. Hence, the traffic related pollution issue is a major concern of Addis Ababa city.

Figures 1 and 2 shows that the generation and the prediction of vehicles growth in Ethiopia for respective figures, this implies that the transport processes was and will the major cause to air pollution. The vehicles fuel consumption is anticipated to increase by about 285 percent between 2015 and 2035, with most of that increase coming from diesel (Danyo et al. 2017).

The economy of Ethiopia is mainly focused through agriculture, as a result in rural part of Ethiopia since 79% of air pollution is due to agricultural process, forestry and change in land use, figure 3 *(MEFCC, 2015).*

In the year 2013 19% of air pollution was due to Industrial processes and geological materials, probably from unpaved roads and road shoulders are also possible sources for $PM_{10.}$ According to (Kumie et al. 2010), up to two-thirds (i.e., 34 to 66%) of the total mass of PM_{10} reconstructed chemical composition was derived from geological materials.

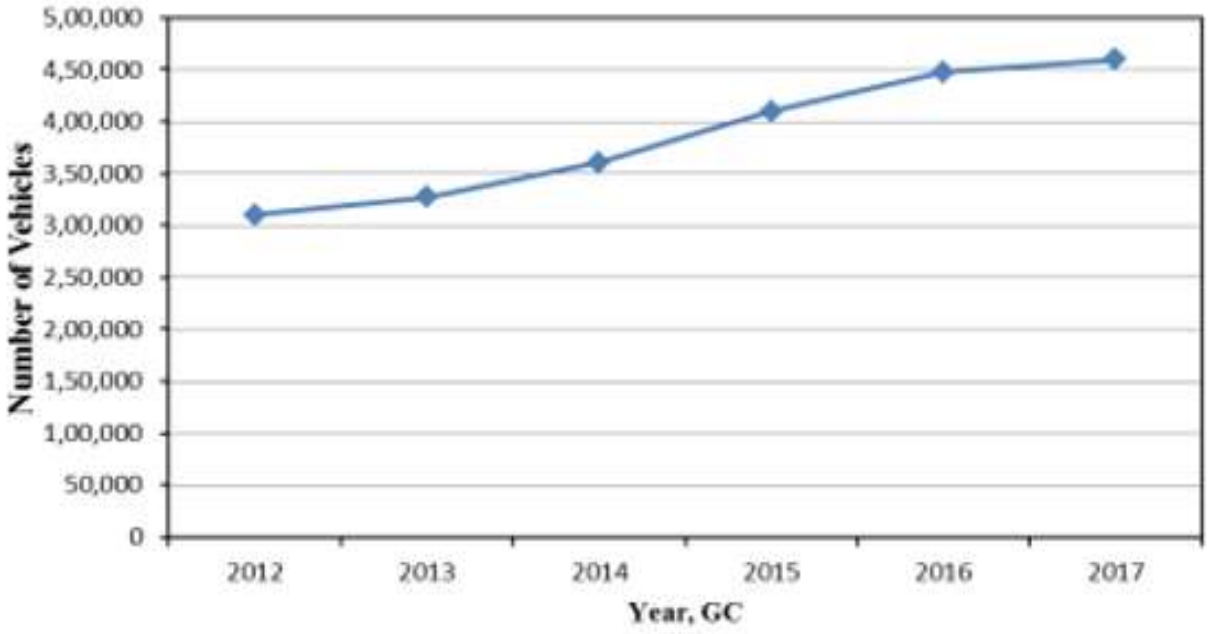


Figure 1 represents vehicle increments trend in Addis Ababa. (AATA,2017)

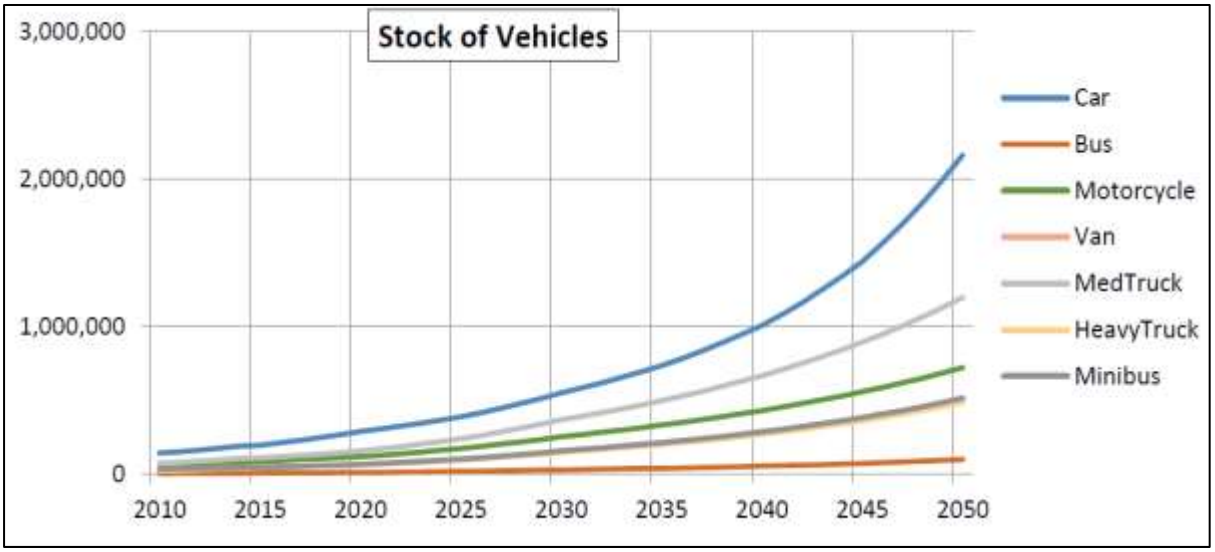


Figure2. Projection of stock of vehicles Source: Danyo et. al (2017)

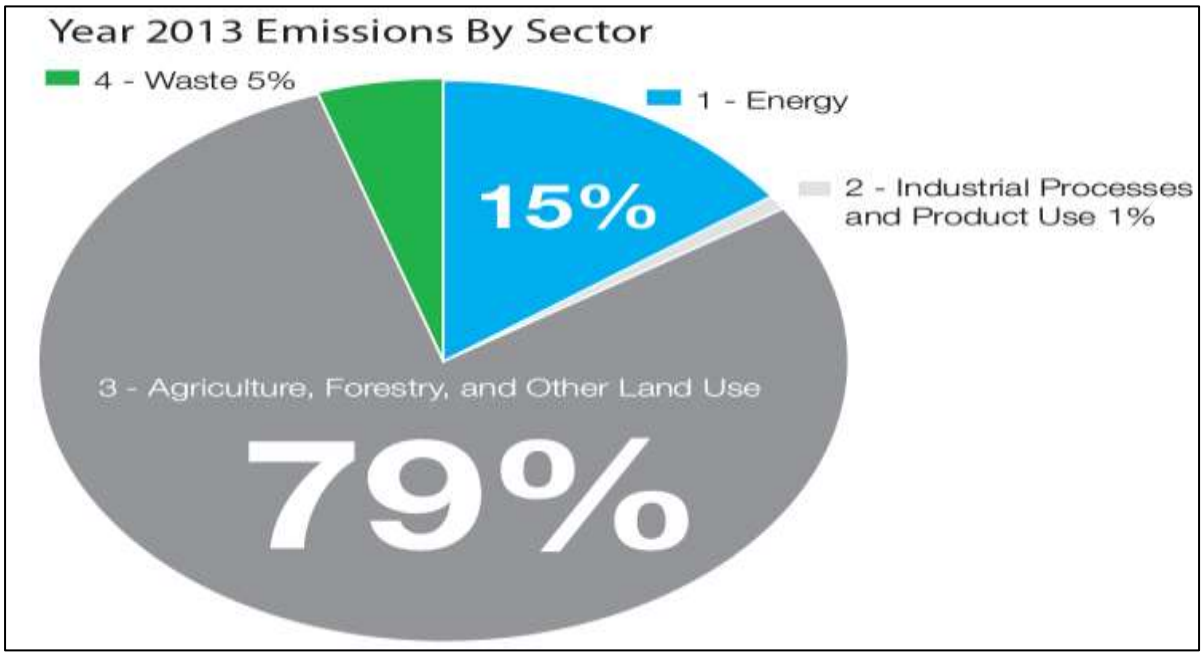


Figure 3 GHG Emission by sector, source: (MEFCC ,2015)

Impacts of air pollutions

Regulations and monitoring of Pollutants are fundamentals of epidemiological researches. Guidelines provide an average exposure that is required to protect the general public from short and long term health effects. National Ambient Air Quality Standards developed by

the Environmental Protection Agency of USA (EPA-USA) and World Health Organizations is widely cited and used by many researchers.

EPA-USA uses two types of air quality guidelines: primary ambient air quality standards which are required to safeguard the health of population, and secondary ambient air quality standards required to protect the public welfare such as buildings, soil, water, visibility, and vegetation table1.

Pollutant	Primary Standard (Health-Based)		Secondary Standard (Welfare-Based)	
	Type of Average	Standard Level Concentration	Type of Average	Standard Level Concentration
PM_{10}	Annual Arithmetic mean	50 $\mu g/m^3$		Same as primary standard
	24-hr average not to be exceeded more than once per year on average over 3 years	150 $\mu g/m^3$		Same as primary standard
$PM_{2.5}$	Spatial and annual arithmetic mean in area	15 $\mu g/m^3$		Same as primary standard
	98^{th} percentile of the 24-hr average	65 $\mu g/m^3$		Same as primary standard
O_3	Maximum daily 1-hr average to be exceeded no more than once per year averaged over 3 consecutive years	$\mu g/m^3$ 0.12		Same as primary standard
	3-yr average of the annual fourth highest daily 8-hr average	0.08 ppm		Same as primary standard
NO_2	Annual arithmetic mean	0.053 ppm		Same as primary standard
SO_2	Annual arithmetic mean	0.03 ppm	3-hr	0.50 ppm
	24-hr average	0.14 ppm		
CO	8-hr (not to be exceeded more than once per year)	9 ppm		No secondary standard
	1-hr (not to be exceeded more than once per year)	35 ppm		No secondary standard
Lead	Maximum quarterly average	1.5 $\mu g/m^3$		Same as primary standard

Source: U.S Environmental Protection Agency. National Ambient Air Quality Standards (NAAQS). Available: http://www.epa.gov/air/criteria.html **(44)**

Table 1. Represents to primary and secondary principal pollutants EPA of USA.

To make it easier to understand, AQI is divided into six levels of health concern (US EPA, 2014) the purpose of the AQI is to help you understand what local air quality means to your health.

Air Quality Index (AQI) Values	Levels of Health Concern	Colors
When the AQI is in this range:	*...air quality conditions are:*	*...as symbolized by this color:*
0 to 50	Good	Green
51 to 100	Moderate	Yellow
101 to 150	Unhealthy for Sensitive Groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very Unhealthy	Purple
301 to 500	Hazardous	Maroon

Table 2. Represents to primary and secondary principal pollutants source: (EPA of USA).

World Health Organization provides international air quality guidelines that can be adopted or modified by each member country based on socio-economic conditions (Table 3.)

Pollutant	Averaging time	Concentration
PM_{10}[1]	Annual mean	20 $\mu g/m^3$
	24-hour mean	50 $\mu g/m^3$
$PM_{2.5}$[1]	Annual mean	10 $\mu g/m^3$
	24-hour mean	25 $\mu g/m^3$
O_3[1]	8-hour mean	100 $\mu g/m^3$
NO_2	Annual mean	40 $\mu g/m^3$
	1-hour mean	200 $\mu g/m^3$
SO_2[1]	24-hour mean	20 $\mu g/m^3$
	10-minute mean	500 $\mu g/m^3$
CO[2]	15 minutes mean	90 ppm
	30 minutes mean	50 ppm
	1-hour mean	25 ppm
	8-hour mean	10 ppm
Lead[2]	Annual mean	0.50 $\mu g/m^3$

Table 3 represents air quality guideline limit (source: WHO, 2005)

Individual countries, depending on their resource and technological feasibilities, have their own standards adopted or modified from the international practice (Table 3).

Pollutants (averaged over a period of)	**Ethiopian guideline ($\mu g/m^3$)**
Sulphur dioxide (10 minutes)	500
Sulphur dioxide (daily)	125
Sulphur dioxide (annual)	50
Nitrogen dioxide (1 hour)	200
Nitrogen dioxide (annual)	40
Carbon monoxide (15 minutes)	100,000
Carbon monoxide (30 minutes)	600,000
Carbon monoxide (8 hour)	10,000
Ozone (8 hours)	120
Particulate matter less than 10 microns (annual)	50
Particulate matter less than 10 microns (daily)	150
Particulate matter less than2.5 microns (annual)	15
Particulate matter less than 2.5 microns (daily)	65
Lead (annual)	0.5

Table 3 represents Ethiopian air quality standards, (source: Addis Ababa EPA,2003)

Air pollution is becoming the main cause of diseases such as acute lower respiratory infection and chronic obstructive pulmonary diseases (WHO, 2007; IHME, 2014). according to Ethiopian ministry of health in 2010/2011 reported that 1,262,908 cases (5% of total) of acute upper respiratory infections and 5% of pneumonia cases (this accounts for 7% of hospital admissions) might have been linked to air pollution.

The deaths in Addis Ababa may due to indoor and outdoor air quality, mostly Non-Communicable Diseases accounted for 51% of the deaths, with asthma being the primary cause, tuberculosis, respiratory tract infections and asthma collectively accounted for about 17% of all deaths. (Misganaw et al., 2012a).

Level, trends of particle pollutant pollutants

The only available time series data on particulate matter is from the World Bank document that has PM10 data from 1991 to 2011. It shows increasing PM10 levels from 1996 till 2009 and decline in 2010 and 2011 (see figure 4: Rising particulate levels).

According to air quality monitoring done by Zerihun Abate of Addis Ababa University of Science and Technology in different areas of central Ethiopia such as Aduwa Square (Megenagna), Arada

(Arada building), Betel, Bob Marley Square (Imperial Hotel), Bole Bridge, Bus Station (Addis Ketema),Central Addis Ababa (St. Mary Church), Kaliti Road Intersection (Traffic light), Lagare traffic light, Mexico Square, Taklehaimanot Square and Urael Traffic Light found $PM_{2.5}$ concentrations to be higher than the WHO guideline (see figure 5: Rising particulate levels)

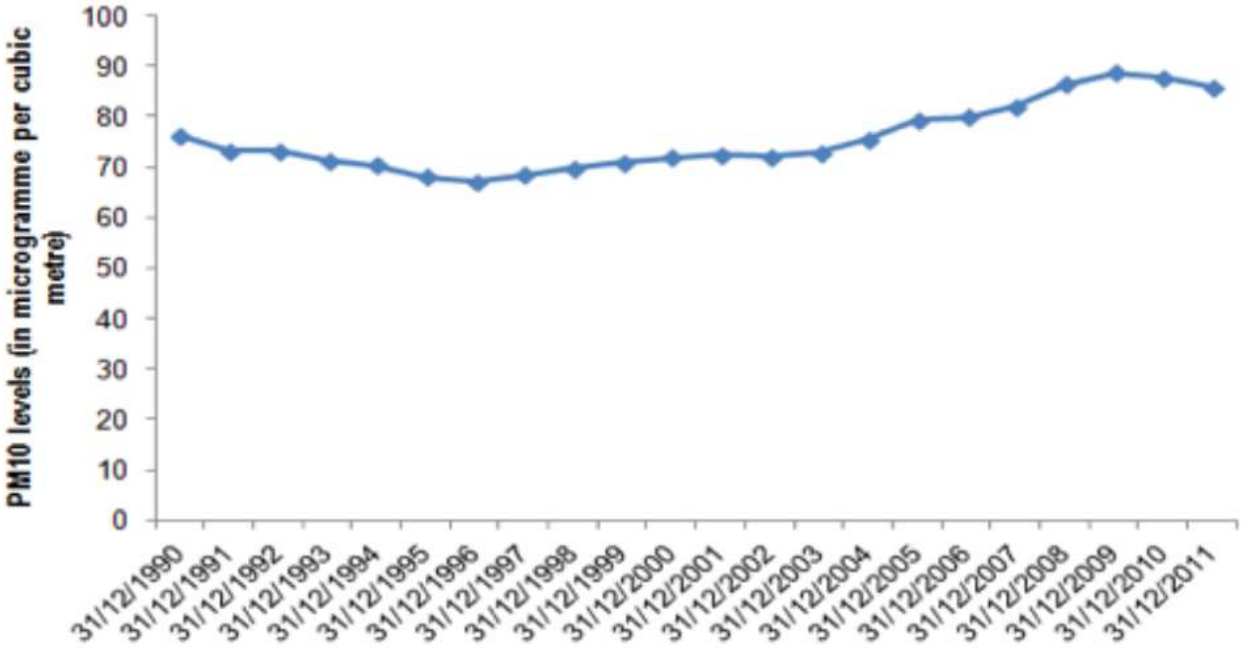


figure 4 represents PM_{10}, country level (micrograms per cubic meter),
Source: *World Bank, Ethiopia:* https://tablr.io/worldbank/9EKZ

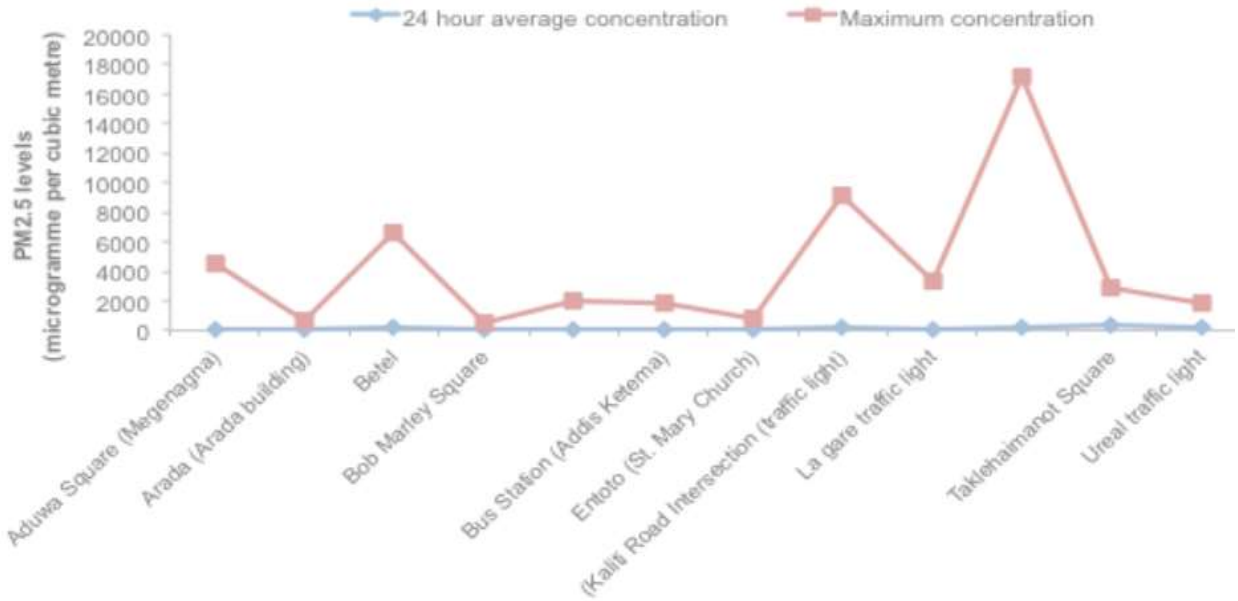


*figure 5 concentration PM2.5 in different locations of Addis Ababa, (*Zerihun Abate, 2015)

Through other study in Addis Ababa reported that the 24-h average concentration of $PM_{2.5}$ from kitchens reached 1,580 µg/m^3 which was more than both US EPA and WHO standards (WHO, 2006). For the years 2007 and 2008 study in the city of Addis Ababa, PM_{10} mass concentrations measured were in the range of 17 to 285 µg/m^3. This was higher than those in sub-urban areas (which was 40µg/m^3); this is below the WHO standard value (Etyemezian et al., 2005). The mean TSP Total Suspended Particle concentration of 195µg/m^3 exceeded the WHO safe standard value (120 µg/m^3).

Figure 6 represents Particle pollutant $PM_{2.5}$ at two stations monitored by US embassy in Ethiopia, the first is from the Northern side of Addis Ababa at Intoto the station is represented by central station in US embassy campus and the second satiation is near to central Addis Ababa at Bsrategeberel represented by community school in community school Campus.

The analyses showed that the monitoring censor was sensed high $PM_{2.5}$ concentrations form near to central pats of the city than Norther side part of city. However, the annual average concentrations $PM_{2.5}$ at both stations was exceeded WHO AQ guideline. This implies that the higher processes that were important to air pollution was takes place at the central part of city.

Figure 7 represents PM_{10} and $PM_{2.5}$ monitored by Ethiopian Athletics Federations EAF, the station was installed in international stadium, Addis Ababa. The analyses showed that the sensor of both parameters PM_{10} and $PM_{2.5}$ was observed highest concentrations 90 µg/m^3 and both Parameters were showed that above the annual average of WHO standers. Figure 8 represents concentrations of PM_{10} and $PM_{2.5}$ analyses, the station was installed over 10 different stations of Addis Ababa. The sensors over 10 stations sowed that the annual average concentrations of the two pollutants PM_{10} and $PM_{2.5}$ was above WHO levels. In general figures 6, 7 and 9 showed that the sensors were installed at middle part of the city sensed high concentration than the side part of the city.

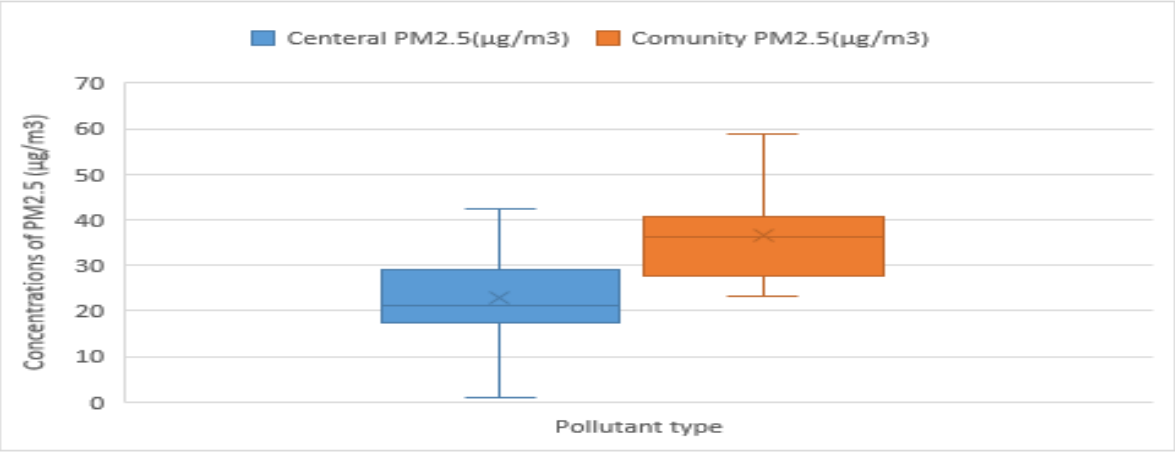


Figure 6 particulate matter pollutant $PM_{2.5}$ at Intoto and Bsrategeberel stations, Addis Ababa.

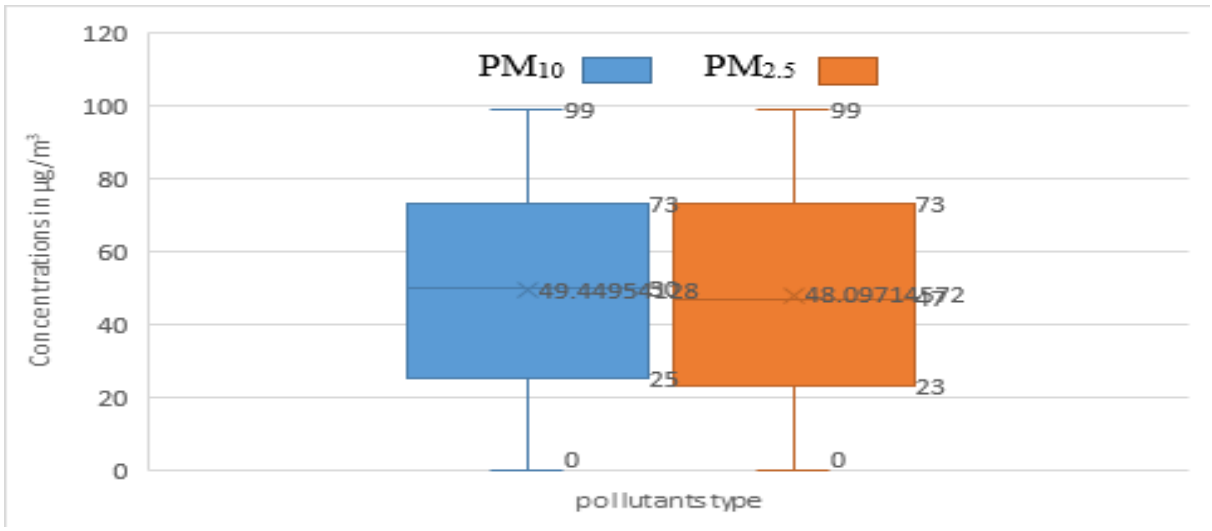


Figure 7 particulate matter $PM_{2.5}$ and PM_{10} at International stadium stations, Addis Ababa.

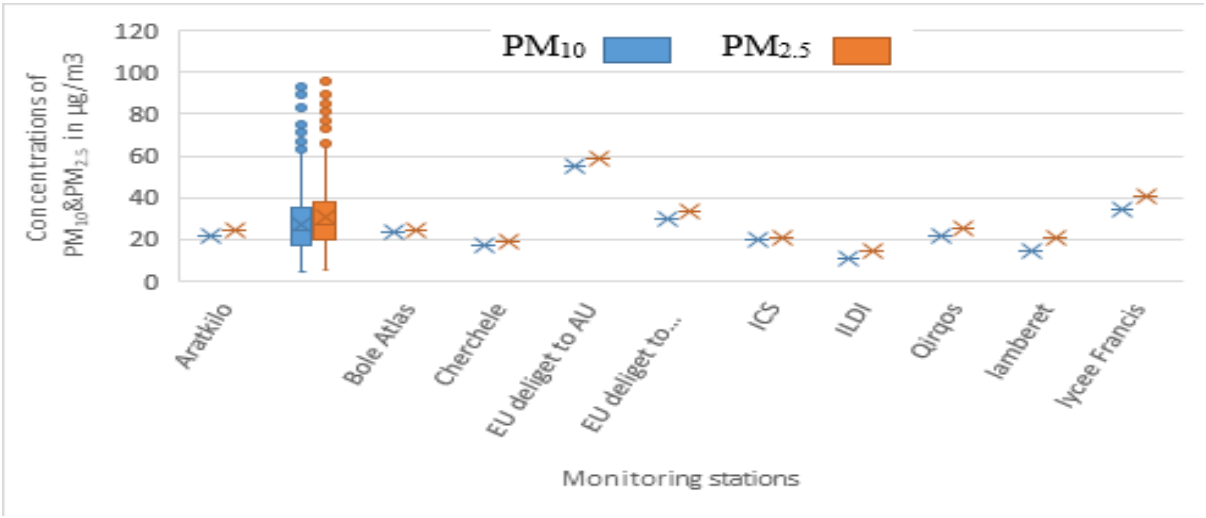


Figure 8 particulate matter $PM_{2.5}$ and PM_{10} at Different 10 stations of Addis Ababa

Level, trends of gaseous pollutants

With regard to carbon monoxide, the mean concentration of all on-road collected samples was 5. 4 ppm. This concentration is more than half of the 8-hour WHO standard value. Similarly study in Addis Ababa homes reported the 8-hr average concentrations of CO as 16 ppm (Range: 0.66 – 69 ppm) (Etyemezian et al., 2005).

The one year from March 2014- February 2015 existing gaseous pollutants data NO_2, O_3 and CO monitored by Ethiopian National Meteorological Agency service campus at Blackline, Addis Ababa. Amongst these pollutants the sensor was measured highest concentrations of NO_2 compared to the sensors of O_3 and CO.

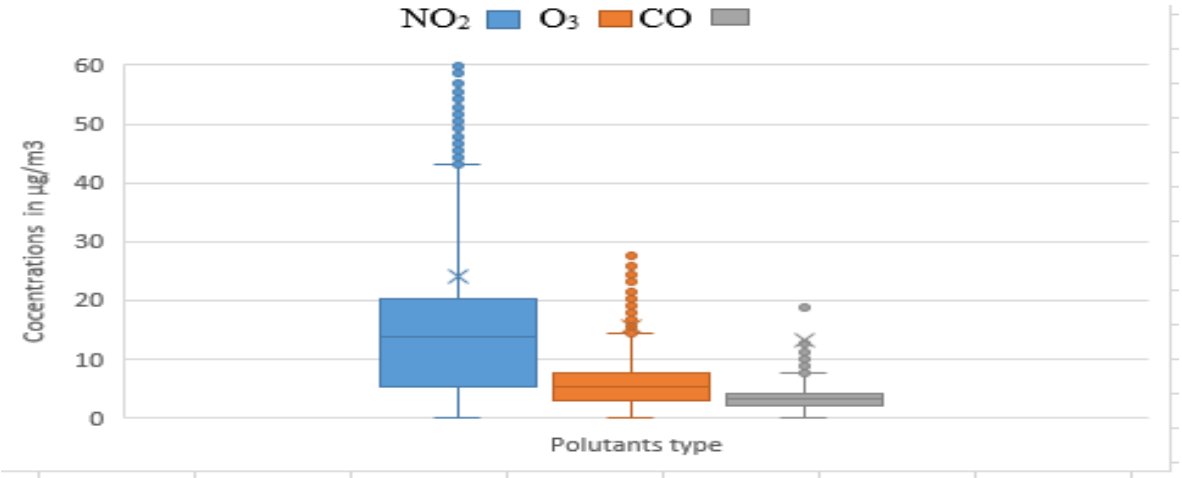


Figure 9 Gaseous pollutant NO_2, O_3 and CO at blackline satiations, Addis Ababa

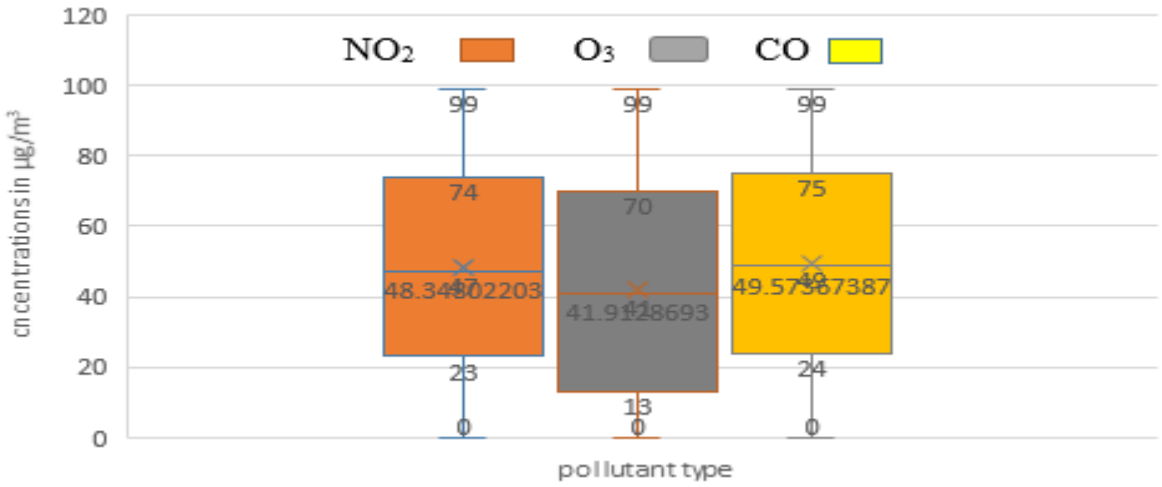


Figure 10 Gaseous pollutant NO_2, O_3 and CO at international stadium stations, Addis Ababa

DISCUSSION AND OUTCOMES

Discussion

The pollution of urban area is manly duo to transportation sector activity as a result the health organization was made an issue throughout the globe.

In this article review and analyses result has been sees through level and trends of criteria pollutants such as NO_2, O_3, CO, $PM_{2.5}$ and PM10. The assessment of this review showed that the major causes of air pollutants in Addis Ababa city was transport activities. Likely, the parts of central Addis Ababa have observed high pollutions in concentrations than side parts of the city, this may duo to the high densities *of* population, high traffic activities, high industrial activity and high economic activity at the central Addis Ababa.

The trends and the projection of vehicle increasing in the city of Addis Ababa. The unbalanced growth in number of vehicles and road construction also aggravates traffic activities and delays in the movement of people and goods, increased fuel consumption, and reduced efficiency of personal and business movement, increased GHG and pollutant emission, and changing the quality of the air. Major pollutants like $PM_{2.5}$, PM_{10}, NO_2, troposphere ozone(O_3) and CO have been recorded for a maximum concentration at the center of Addis Ababa in dry season.

CONCLUSIONS AND RECOMMENDATIONS

According to this Air pollutant article review and assessment study. The intent that leave and trend of the major air pollutants linked with effects of climatology on air pollutants and the effects of sectors activity on air pollutants. The findings of this study can be summarized as follows:

Activities	Outcomes
Activity 1. Does climatology is affect air pollution ,at which season and time the pollutant concentrations is high?	• The main pollutants concentrations level and trend were maximum during dry season, • The morning concentration maxima were likely accentuated by stable atmospheric conditions associated with overnight surface temperature inversions. • The primary principal pollutant concentration exhibited daily maxima around 7:00 and secondary peaks in the late afternoon and evening.
Activity 2. Which sector activities are more important to air pollutions?	• In rural areas of Ethiopia was mainly polluted by agricultural activities. • However Addis Ababa city was mainly polluted by transport sector activities, duo to the high densities *of* population, high

	traffic activities, high industrial activity and high economic activity in the city.
Activity 3. Does pace the level of air quality standard.	• The mass concentrations of $PM_{2.5}$, PM_{10}, CO, and surface ozone O_3 above both WHO and US EPA air quality standards. As result having risk on health and on other sectors like economic sectors.
Activity 4. Does land use activities is affects the trends of pollutants?	• The vehicles fuel consumption is anticipated to increase by about 285 % between 2015 and 2035, with most of that increase coming from diesel. • The economy of Ethiopia is mainly focused through agriculture, as a result in rural part of Ethiopia since 79% of air pollution is due to agricultural process, forestry and change in land use, • In the year 2013 19% of air pollution was due to Industrial processes and geological materials, probably from unpaved roads. • up to two-thirds (i.e., 34 to 66%) of the total mass of PM_{10} reconstructed chemical composition was derived from geological materials.

Table 4 represents the general activities and outcomes of this review

Through these outcomes air pollution study was having greatest risk on human health, risk on economic activity, risk on transport activities, risk on sustainable developments and environmental risk.

Thus, for the first advise, air pollution serves as important indicator for monitoring progress toward collecting historical emission data, healthy life, healthy economic activity, balanced each sectors activities (example, activities of transport sector with road sectors). As a results accomplishing the maintainable and equitable future.

For the second advice, improvements in air quality are a direct indication of achievements in the policies and interventions implemented for sustainable energy sustainable consumption, urban development, climate and infrastructure results effective air quality managements activity and strategies with scheduled adaptation protective plan, meeting air quality goals and the emissions will controlled

Addis Ababa Environmental protection authority,2003. Indoor Air pollutant. Published Addis Ababa Environmental protection authority; Available from: URL: https://www.epa.gov/criteria-air-pollutants/naaqs-table

Abera Kume[1], Keil Charles[2], Yemane Berehane[3], Emmelin Anders[4] and Ahmed Ali[1], 2010. Magnitude and variation of traffic air pollution as measured by CO in the City of Addis Ababa, Ethiopia, [*Ethiop. J. Health Development*;24(3): [156-166].

Danyo, Stephen; Abate, Asferachew; Bekehechi, Mohammed; Kohlin, Gunnar; Medhin Haileselasie; Mekonnen, Alemu; Fentie, Amare; Ginbo, Tsegaye; Negede, Betelehem; Tesfaye, Haleluya and Wikman, Anna (2017). Realizing Ethiopia's Green Transformation: Country Environmental Analysis, Environment and Natural Resources Global Practice. Washington, DC: World Bank.

Etyemezian V, Tesfaye M, Yimer A, Chow JC, Mesfin D, Nega T, (2005). Results from a pilot-scale air quality study in Addis Ababa, Ethiopia. Atmospheric environment. 39(40):7849–7860.

Federal Democratic Republic of Ethiopia Central Statistical Authority. Statistical Abstract, 2009.Addis Ababa, Ethiopia.2007.

Institute for Health Metrics and Evaluation (IHME) (2014). Global Burden of Diseases Database. University of Washington; Seattle, WA.

Gebre et al, 2010, Mass concentrations and elemental composition of urban atmospheric aerosols in Addis Ababa, Ethiopia, Bulletin of the Chemical Society of Ethiopia, Chemical Society of Ethiopia, Vol 24, No 3.

MEFCC (2017). Ethiopia's National Adaptation Plan. Federal Democratic Republic of Ethiopia Addis Ababa

MEF (2015). Ethiopia's Second National Communication to the United Nations Framework Convention on Climate Change (UNFCCC). http://unfccc.int/resource/docs/natc/ ethnc2.pdf

Misganaw A, Haile-Mariam D, Araya T (2012a). The Double Mortality Burden Among Adults in Addis Ababa, Ethiopia, 2006–2009. CDC - Preventing Chronic Disease. 9(11_0142):1–10.

Kebede D.,1997. Socio-demographic characteristics and indoor air pollution as risk factors for acute lower respiratory infections in under-five children in Addis Ababa, Ethiopia. *Ethiop j Health Dev; 11:315-325*.

U.S Environmental Protection Agency. National Ambient Air Quality Standards (NAAQS). Available from: URL: http://www.epa.gov/air/criteria.html.

World Health Organization, 1999. WHO Guidelines for Air Quality. Published World Health Organization, Geneva: Available from: URL: http://www.epa.gov/air/criteria.html

World Health Organization (2005). Indoor Air Pollution: National Burden of Disease Estimates. Published World Health Organization;

Available from: URL: www.who.int/phe/health_topics/outdoorair/outdoorair_aqg/en/

World Health Organization (2007). Indoor Air Pollution: National Burden of Disease Estimates. Published World Health Organization; from: URL: http://www.epa.gov/air/criteria.html

.