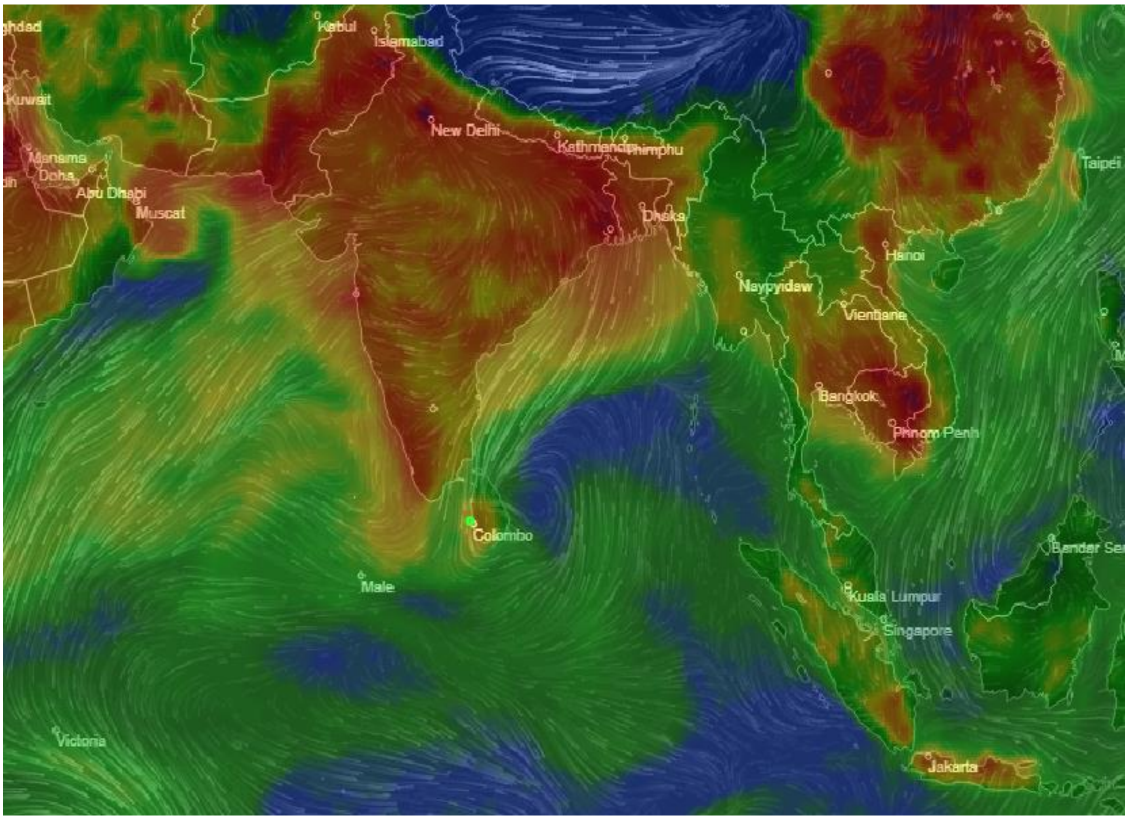
Air Quality Assessments Report for Sri Lanka

Air Quality Assessment Report of the Project on Air Quality Assessments for Health and Environment Policies



Project on Air Quality Assessments for Health and Environment Policies

Air Resource Management & National Ozone Unit

The Ministry of Mahaweli Development and Environment

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Abbreviations

AEA	Atomic Energy Authority
AirMAC	Air Resource Management Center
AQM	Air Quality Management
CEA	Central Environmental Authority
CMR	Colombo Metropolitan Region
CO	Carbon Monoxide
DS	Divisional Secretarial
GDP	Gross Domestic Production
Km^2	Square Kilometers
MEIP	The Metropolitan Environmental Improvement Programme
NAAQ	National Ambient Air Quality
NE	North East
NO_x	Nitrogen oxide
NO_2	Nitrogen dioxide
O_3	Ozone
SSF	Small Scale Funding
SW	South West
UNEP	United Nations Environment Program
VET	Vehicular Emission Testing
WHO	World Health Organization

EXECUTIVE SUMMARY

Most of air quality and its impacts related studies were conducted as personal preferences or partial fulfillments of the research requirements of postgraduate degrees. The outcome of those studies reviles the air pollution trends, health impacts, source contributions and economic impacts etc. Only few air quality studies were conduct to collect continuous air quality data in national interest to developed air quality management policies, strategies and related actions. Some of these studies indicate that the implementation of management strategies, policies and regulations, have positively contributed to improve ambient air quality in urban areas in Sri Lanka.

The outcome of the inception workshop of the project reviled that, many governments; semi-government and private institutions in Sri Lanka were involved in air quality management, only few institutions were involved in air quality monitoring activities to collect data for research of National interest. Some of these monitoring programs are continuous for several years and most of them are short term for research activities. Therefore, there is no proper central data base on air quality as well as other related data to reach quality-controlled data.

The first comprehensive continuous air quality monitoring program in Sri Lanka was started in 1997 by continuous measuring criteria air pollutants in Colombo with automated air quality monitoring system, the monitoring program was dead in 2005 due to unavailability of spare parts and financial assistants for the equipment maintenance. Then after air quality monitoring program was started using passive sampling technology in 2001 with 16 sampling locations to measure SO_2 and NO_2 levels in ambient air in Colombo urban area and the monitoring program was further developed in 2012 by extended to other major urban areas such as Gampaha, Kaluthara, Galle, Horana and Rathnapura. The passive sampling monitoring network was further extended to Kandy urban area in 2014, Kurunegala and Anuradapura urban areas in 2015 and Putttalum in 2018. Thereby, this passive sampling air quality monitoring data were the possible continuous air quality data available in Sri Lanka for considerable time period even it had some limitations. Therefore, the experts participated to the workshop and project proponents agreed to achieve the project objectives by assessing these available continuous passive sampling data.

The air quality assessment methodology of the project was based on the stated objectives of the “Terms of Reference” and scope of the analysis based on the agreement of The Ministry of

Mahaweli Development and Environment with the UNEP. Key sources of air quality, socioeconomic data as well as their strengths and weaknesses were identified in order to make necessary assumptions during the analysis and develop recommendations. As per the decisions made in inception workshop, progress workshops and suggestions made by the experts about available data sources in Sri Lanka. Available monthly based SO_2 and NO_2 passive air quality monitoring network was used for the spatial and time series analysis to observe relationships with socioeconomic, climatic and food security data.

Considering the availability of air quality data, monthly averages SO_2 and NO_2 data collected by passive sampling network during least 5 years at 6 urban areas were considered for the assessment. The socio-economic data such as economics wealth, employments, pre-capita income, population density, housing density, industrial & commercial population, and vehicle population in each selected urban area were collected accordingly of the areas where air quality data were available. The main data source used to collect above mentioned data was Department of Sensors and Statistic of Sri Lanka while meteorological data and the paddy production data was obtained from The Meteorological Department and The Department of Agriculture respectively. All the available data were in annual basis thereby; the analysis was restricted accordingly for the annual conditions which hinders the capacity to elicit broader analysis. The data on the paddy yield were based on the two growing seasons Yala and Maha accordingly and also limits the analyzing capacity of the data.

The trend analysis of air quality data were clearly indicates that the pollutant levels in urban areas are increases with the increasing of urbanization, vehicular fleet and other related factors while decreasing time to time with the implementations of air quality management strategies. The resent monitoring data indicates a gradual reduction of annual average pollutant levels from 2013 to 2015 while showing a slight increasing trend from 2016 onward. According to 2017 data, the highest average NO_2 level was recorded in Colombo urban area while Kandy urban area was 2nd highest. The highest annual average SO_2 level in 2017 was recorded in Colombo urban area and the Gampaha Urban area was the 2nd highest. The spatial analysis indicates that relatively high levels of pollutant (some time exceeds WHO guidelines levels) are recorded at areas with high traffic congested and low pollutants levels at pollution sinks like wetland network with water bodies, green covers, elevated areas and when going away from the city areas.

The time series analysis indicates that the monthly averages of SO_2 and NO_2 were start at relatively high level in January and gradually decrease up to mid-year and again increase at the end of the year. This indicates the pollutant levels are highly subjected to local wind patterns in which shows a high exposure levels during North East monsoon period (November – February) while showing lower exposure levels during the South West monsoon (May- August). The difference of the pollutant levels in the NE monsoon period is about 2 to 3 times than the pollutant levels SW monsoon in each year. This phenomenon is common to almost all urban areas while slit changes with peak months depending on contributing pollutant sources in which make highest contribution by vehicular emission.

The correlation studies of population density with diurnal air pollutants levels of selected urban areas specify that the population density is negatively correlate with NO_2 and positively correlate with SO_2. However, these correlations are not statistically significant with both pollutants except few exceptional cases. However, the correlation studies of population density with spatial air pollutants levels of selected urban areas indicate statistically significant weak positively correlation providing the $P<0.05$. The population of each urban area was slightly increasing annually due to population growth and urbanization, the pollutant levels were varied with the management actions, metrological conditions, fuel usage, vehicular fleet and other related factors. Therefore, the observed correlations of air pollutant with population density cannot be elucidate well since Sri Lanka has taken many stapes to control air pollution in urban areas which change annual pollutant levels in each urban area. The correlation studies of air pollutant levels with Vehicle Density and Climatic data (Temperature, Humidity and Rainfall) are also shown similar correlations as observed in population density. However, according to the outcome of correlation studies on air pollutants with paddy production, it is hard to find any correlation between the paddy yield and pollutant concentration. This may be due to the lack of quality long term air quality data, parameters and limited of area we consider in our study.

Based on the outcome of the study, several policies were identified to develop and implement in priority base to overcome the limitations and gaps identified through the project and assessment in order to further management of air quality in Sri Lanka. The identified areas for policy development are;

1. Policies should be developed to establish a national air quality data base with monitoring network to measure air quality in short term as well as long term covering all Islands.

2. Establishment of policies to develop information and data collecting network of air quality related health, socio-economic and other relevant data and information in the country.

3. Review the existing air quality legislation and develop as necessary to cover short-term and long-term standards and hence developed evidence based air quality index for Sri Lanka.

4. Yearly update the "Clean air action plan" and identify relevant actions in priority order to implement within the target time line while developing relevant policies.

1. INTRODUCTION

1.1. Air Pollution & Air Quality Management

Air pollution has recognized as one of the major global environmental problem that links with global climate change, global warming and biodiversity changes etc. In local contest, it has both direct and indirect environmental, economic and health problem that has high risks on human health, material damage and the productivity. The risk is increasing with the increasing of pollutant sources that emit more pollutant due to the expansion of urbanization, industries, vehicles, domestic and commercial activities, etc.

At present life style, air pollution is identified as one of the major problem faced by both developed and developing countries causing many diseases such as; lung cancer, acute lower respiratory infection, stroke, schaemic heart disease and chronic obstructive pulmonary disease. According to the WHO (2019), it was estimated that air pollution cause for 4.2 million of premature deaths globally per year. Thereby, the ambient Air Quality Management has become one of the most concern tropic in worldwide. The effective air quality management system has several components such as monitoring, assessment, policy development, action and implementation, efficiency assessment as shown in ***Figure: 1***.

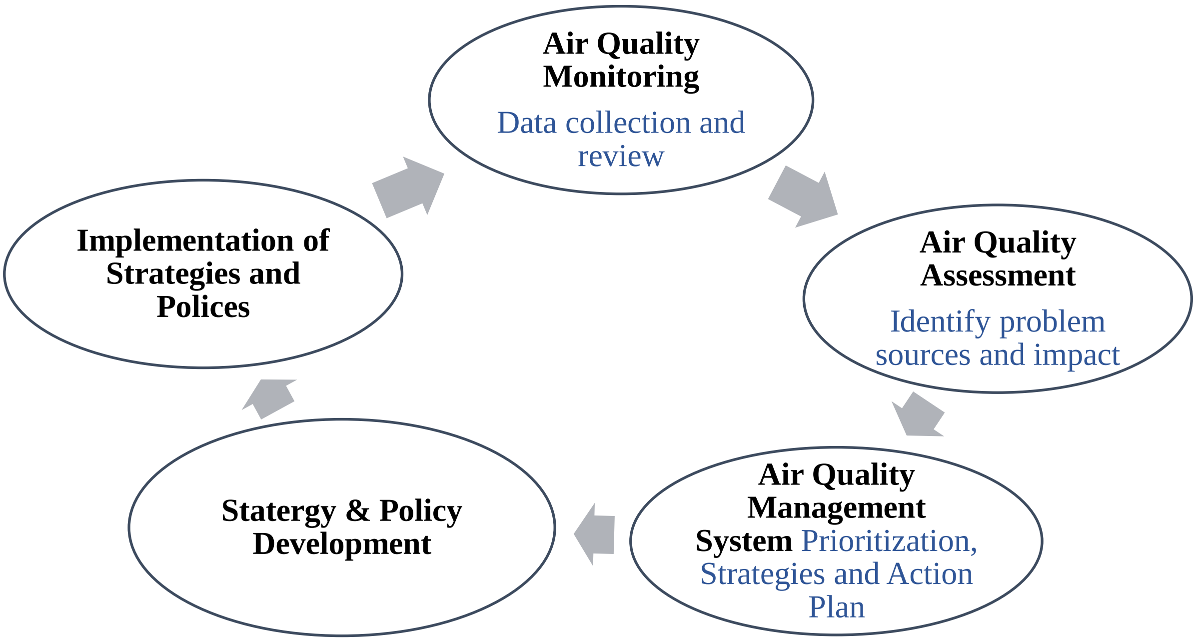


Figure1: *Air Quality Management Cycle*

The initial step towards air quality management system is the implementation of continuous air quality monitoring network for gathering information. Such continuous air quality monitoring system is essential for the assessment of air quality impact, related factors and in policy development etc. in a country. Particular Matter ($PM_{2.5}$ and PM_{10}), Ozone (O_3), Nitrogen Dioxide (NO_2), Carbon Monoxide (CO) and Sulphur Dioxide (SO_2) etc. are the pollutants with strongest evidence for creating public health and environmental concerns (WHO, 2019) and hence they were identified as criteria pollutants. Thereby, it is in need to formulate and establish proper air quality monitoring network to cover significant regions in each and every area of the country at least to measure these criteria pollutants. The action plans, management strategies and policies should be developed by assessing a quality database obtained by the monitoring network.

The project "Air Quality Assessments for Health and Environment Policies in Africa and Asia-Pacific" is a project that is assisted by the United Nations Environment Programme (UNEP) under a Small Scale Funding (SSF) which aim to assist the selected countries; to strengthen their capacities to use data and information; to assess the pollution and health impacts; to support the evidence based policy development on air quality and health. Under the project, UNEP has planned to assess air quality impact on health in selected Asian countries (Sri Lanka, Mongolia, and Thailand). Thereby, in Sri Lanka this project was selected to be conducted in partnership with Ministry of Mahaweli Development and Environment. This report includes the assessment of air quality data and their impacts on socioeconomic, climate change and food security etc. at selected major urban areas in Sri Lanka.

1.2 Air Quality Management in Sri Lanka

Sri Lanka is a tropical country which is situated in the southwest of the Bengal bay of Indian Ocean. Land area of the country is about 62710 Km^2 with population density of 335 per Km^2. According to 2018 statistics, the urban population of Sri Lanka is about 19.7% from the total population. In early 90's air pollution was not considered as a problem is Sri Lanka. However, with the rapid urbanization, expiation of industries, commercial sectors and living standards etc. air pollution become a growing problem in Sri Lanka. The main contributing sources for urban air pollution in Sri Lanka were identified as the fossil fuel combustion in transport and power sectors commercial and domestic emissions. Since urban areas in Sri Lanka are located in different geographical and environmental conditions, the pollution levels also vary with the local climatic and geographical conditions of the urban areas.

There have being very few studies done on air quality and its impacts related to Sri Lankan conditions. Most of them where done as personal preferences or partial fulfillments of the research requirements, which are short term research on selected areas of interest. The outcome of those studies reviles the air pollution trends, health impacts, source contributions, economic impacts and efficiency of implemented management actions etc. which could lead to develop relevant policies and management strategies related to the Air Quality Management in the country.

Thefirst national level intervention for Air Quality Management in Sri Lanka was the amendment of National Environmental Act in 1988 (establishment of the Environmental Act No.47 in 1980) which provide the legalframework for airpollution control in Sri Lanka. In 1992 with the recognizing of growing problem of air pollution in the commercial capital of Sri Lanka "The Metropolitan EnvironmentalImprovement Programme" (MEIP) has developed the strategy and the action plan "Clean Air 2000" for the management of urban air pollution. This has beendeveloped with line Ministries and stakeholder agencies and the action plan was approved by the cabinet of ministers of Sri Lanka to implement from 17th February1993. Afterwards, the action plan was upgraded several times resulting the "Clean Air Action Plan 2007", "2015" and finally "Clean Air Action Plan 2025" to be the presently implementing program which Sri Lanka currently addressed.

In these action plans it has identified and prioritized the actions to manage urban air quality through implementing and responsible agencies etc. Based on above action plans several identified actions were implemented in Sri Lanka for Air Quality Management. Some of the actions can be stated as;

1. Establishment of national environmental (ambient air quality) regulations in 1964and amended on 2008 under the Nation Environmental Act No.47 of 1980
2. Development of capacity building in research institutes, universities and regulation institutes
3. Personal capacities development of officers in government sectors (Research institutes and regulation institutes)
4. Introduction of automated Air Quality Monitoring system in Sri Lanka in 1996
5. Establishment of Air Resource Management Center (AirMAC) under The Ministry of Environment in 2000 (which act as a focal administrative point for the air management in Sri Lanka)
6. Fuel quality improvement programs (by reducing sulfur content in diesel and introducing of unleaded petrol)
7. Introduction of cleaner fuel vehicles

8. Establishment of National Environmental (Air fuel and vehicle importation standards) regulation No:01in 2003, amended in 2008, amended in 2015
9. Implementation of Vehicular Emission Testing (VET) program in 2008,
10. Amendment of National Environmental Act (vehicular importation standards) in 2018

The implementation of the above strategies, policies and regulations, have positively contributed to the improving the ambient air quality in urban areas in Sri Lanka. The results of air quality management outcomes and the research activities have been shown that the SO_2levels in Colombo urban area was decreased by 7% in 2001 and 15% in 2003 respectively due to the reduction of sulfur content in fossil fuel. Furthermore, the SO_2 levels were significantly decreased from 2009 to 2015 by 40 % as the result of implementation of vehicular emission reduction programs (***Figure 2a***). The data also indicates decreasing of NO_2levels were by about 45% from 2012 to 2016 (***Figure2b***) due to those implemented actions specially introduction of cleaner fuel vehicles. Improvement of road surface conditions and walkability in Colombo urban area were also has played a role in this reduction.

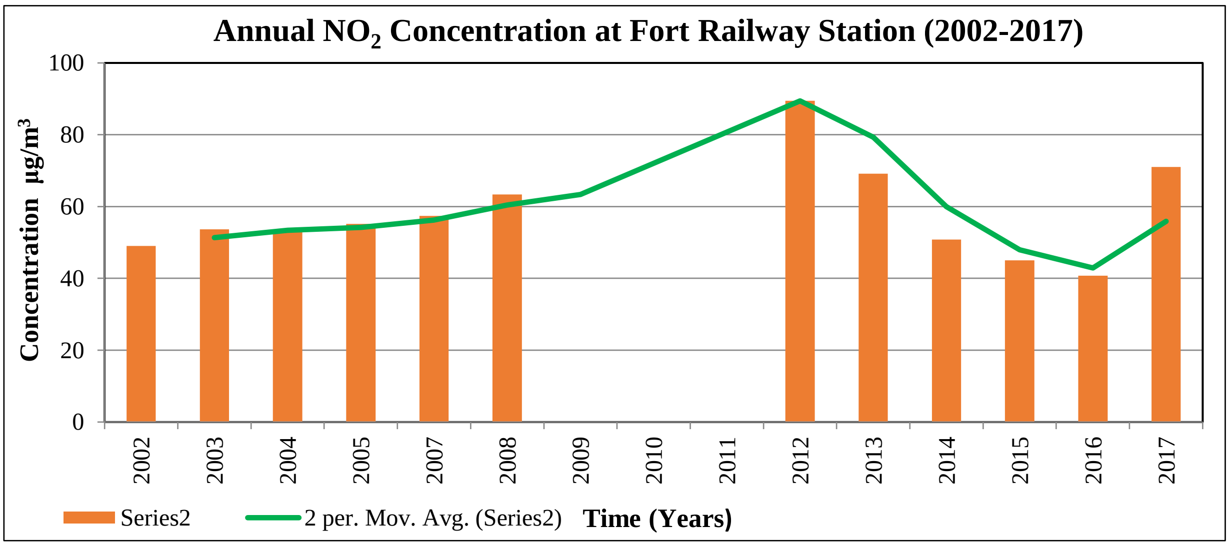


Figure 2a: *Annual NO_2 Concentration at Fort Railway Station from 2012 to 2017 (National Building Research Organization, 2017)*

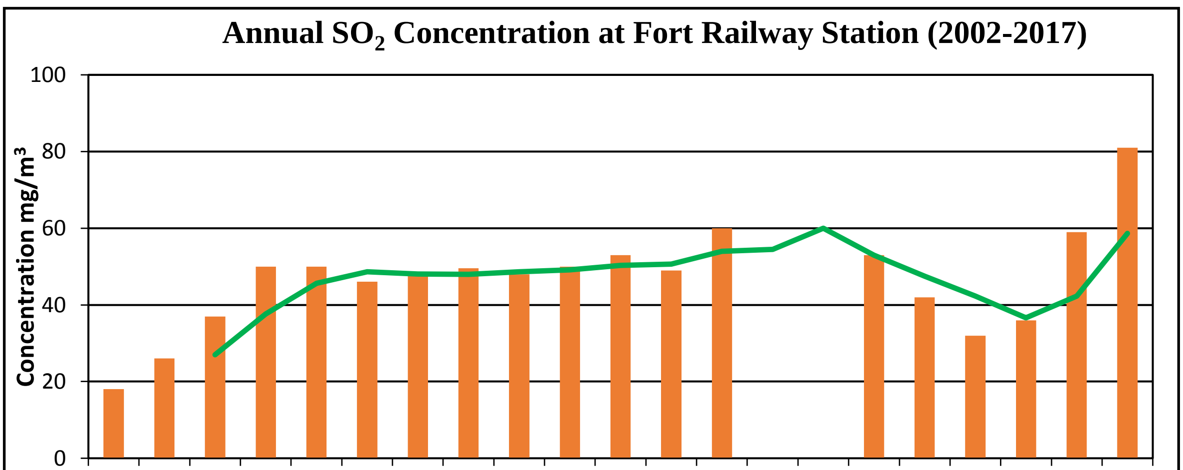


Figure 2b: *Annual SO_2 Concentration at Fort Railway Station from 2002 to 2017 (National Building Reseacrh Organization, 2017)*

It was shown by many studiers that not only the urban area of Colombo, other urban areas in Sri Lanka were encountered the air pollution problem. Kandy, Kurunegala, Galle,Gampaha, Kalutara and Rathnepuraetc. are some of the urban areas that recorded relatively high air pollution situations. The air quality monitoring results that assesses in this study would discuss the pollution trends, variations and problem at those urban areas.

2. AIR QUALITY ASSESSMENT

2.1 Air Quality and Related Data Availability

In Sri Lanka there are many governments, semi-government and private institutions which involve with air quality management sector in different ways including direct monitoring, policy development, enforcement and technical services providers. The institutions that involve in air quality monitoring have air quality data collected for National programs as well as research programs. Some of these monitoring programs are continuous for several years and most of them are short term for research activities, project-based activities to comply the legal requirements. Policy developing and management agencies are mainly the government ministries and institutions under the ministries of environment, transport, power and energy, petroleum, urban development, Industry and road & highway development etc. Enforcement and technical service provider agencies mainly undertaking the activities and research related to implementation of relevant policies.

An “Inception Workshop” was conducted on 12th September 2018 at “Nelum Hall” Waters Edge, Battaramulla with the gathering of most institution representatives in the field of air quality management to identify the relevant stakeholders and data availability related to the project. In this workshop, it was identified the responsibility of each stakeholder institution and a stakeholder map was developed as summarized in ***Table 1***and***Figure 4***. The workshop was also helpful to collect information on air pollution sources, available air quality and related data sources, data type and relevant data formats were discussed and identified. Thereby, understood that air quality data collected by most of the institutions were occasional and short term while only few data sources were in continuous base. Also, the data available in several institutions have used different techniques and method for data collection and processing. Thereby, the reliability of the data was questionable since the collection technique and methodology differs among the institutions. Furthermore, it was understood that there is no proper central data base to reach quality-controlled data sources in which entire air quality assessment depends on secondary data. Availability of the air quality data collected by different agencies are summarized in **Appendix 1**.

Table 1: *Stakeholder responsibility chart - Air Quality Sector*

Department/ Institute or the Person	Responsibility
Relevant Ministry	Facilitation and policy development
Consultant Air Quality, Air quality, noise & vibrations studies unit, NBRO	Consult on air quality assessment part of the entire project

National Building Research Organization.	Provide data for the project
Central Environmental Authority, Laboratory services	Provide data for the project
Ceylon Petroleum corporation& Power Plants	Provide data on fuel consumption in Sri Lanka (Sales Data)
Department of Motor Traffic	Vehicle emission data
Industrial Technical Institute, Testing Services- Environmental Technology Section	Provide data for the project
National Engineering Research and Development Center of Sri Lanka, Department of Energy and Environmental Services	Provide data for the project
Board of Investment& ministry of industries	Provide air quality monitoring data related to industries
Institute of Fundamental Studies	Provide data for the project
National Science Foundation	Provide data for the project
MEPA & Air Mac	Provide data for the project
Ceylon Electricity Board	Provide data for the project
Civil Aviation Authority /Railway department	Providing emission data for the project
Cleanco/ Laugfs	Average Km of running for vehicles and data on active vehicle fleet and vehicle emission data
Clean Air Sri Lanka	Provide data for the project
Universities	Provide data for the project

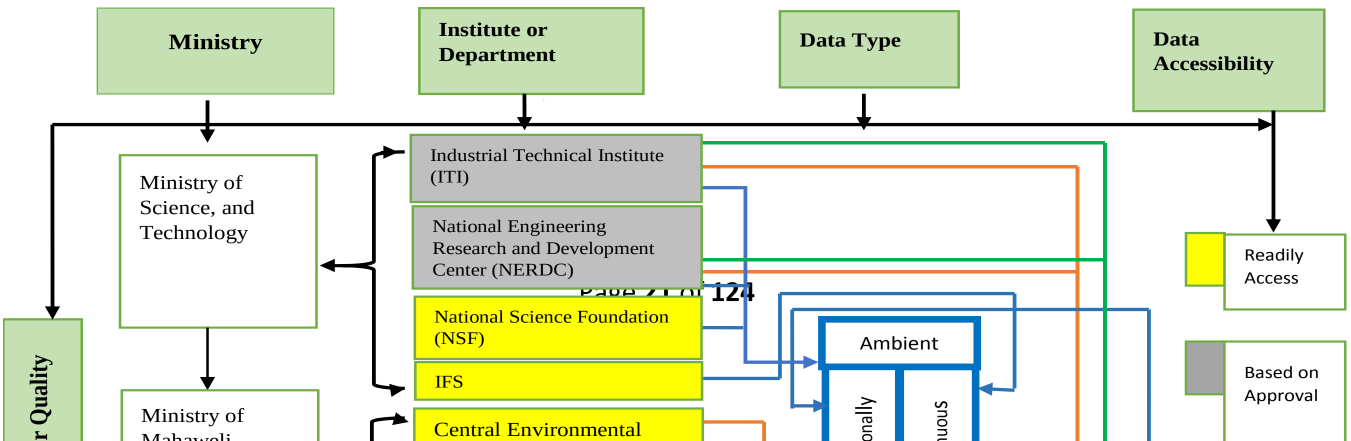


Figure 4: *Stakeholder map for the Air Quality sector*

The first comprehensive continuous air quality monitoring program in Sri Lanka was started in 1997 by continuous measuring criteria air pollutants at two selected locations in Colombo with automated air quality monitoring system. The system collect data in every 5-minute data of criteria pollutants SO_2, NO_2, CO and O_3 along with meteorological parameters and 24-hour PM_{10} data for every seventh day. In addition, air quality in other selected cities were monitored in time to time using similar mobile air quality monitoring stations. Based on the outcome of these monitoring data it was studies the pollution trend and daiyanal variations of air pollutants in Colombo. The data was assessed to study health and environmental impacts and make used to develop policies and strategies related to air quality. This air quality monitoring system became dead in 2005 due to unavailability of spare parts and financial assistants for the maintenance.At the same time the NBRO has developed a passive sampling technology in 2001 for SO_2 and NO_2 levels in ambient air and established an air quality monitoring network with 16 locations in and around Colombo to collect monthly average exposure levels. The program was continued from 2001 to 2009. Later on, in 2012 with the financial assistant of the VET fund, the monitoring program was started again with 19 locations at Colombo urban area and the program was extended to other major city areas of Gampaha, Kaluthara, Galle, Horana and Rathnapura.

The passive monitoring network was further expanded to cover urban area of Kandy in 2014, Kurunegala and Anuradapura in 2015 and Putttalum in 2018 **(Appendix 02)**. With the passive sampling monitoring system only the monthly averages of SO_2 and NO_2 were collected. Later on, monitoring of $PM_{2.5}$ were started in November 2017 at above cities in monthly basis. In addition to this continuous passive sampling monitoring program there are several short-term air quality monitoring activities which were conducted by several institutions and research studies during past few years for individual study preferences. Thereby, those monitored data do not tend to create a continuous data base on air quality. Thereby, finally filtered out this passive air quality monitoring data collected by NBRO as the possible continuous air quality data available in Sri Lanka even it had some limitations. The project requires at least air quality data for the criteria pollutants namely PM_{10}, $PM_{2.5}$, O_3, NO_2, SO_2 and CO, continuous data were only available for NO_2 and SO_2.

Thereby, at the inception workshop it was finalized to achieve the following project objectives.

- To assess air quality and health impacts by using only the secondary data of SO_2, NO_2continuously available for selected urban areas of Sri Lanka and related health data
- To assess spatial and time series analysis of above parameters and their impact on health, socioeconomic, food security and climate change in Sri Lankan context
- To develop reliable air quality monitoring network with centralized data base and evidence-based air quality index for Sri Lanka
- To review current ambient air quality and emission standards to make evidence-based modifications where necessary as policy development

2.2 Assessment Methodology

The assessment methodology was based on the stated objectives of the "Terms of Reference" and scope of the analysis based on the agreement of The Ministry of Mahaweli Development and Environment with the UNEP. Key sources of air quality, socioeconomic data as well as their strengths and weaknesses were identified in order to make necessary assumptions during the analysis and develop recommendations. As per the decisions made in inception workshop, progress workshops and suggestions made by the experts about available data sources in Sri Lanka. Available monthly based SO_2 and NO_2 passive air quality monitoring network was used for the spatial and time series analysis to observe relationships with socioeconomic, climatic and food security data.

The available air quality data sets from the sources identified by the institution in the stakeholder map were collected and reviewed. It was understood most of the data available in many institutions were collected for short term research projects and some continuous monitoring data collected do not represent criteria. There are some data bases which collected each weather seasons but not continuous. The only available continuous monitoring data was the passive sampling data collected by NBRO. The available data frequency is one month and parameters were NO_2 and SO_2. The monitoring network represent 10 urban areas. However, available continuous data for at least 5 years were available only at 6 cities. Therefore, the monthly averages SO_2 and NO_2 data collected by urban areas at least within 5 years were considered for the assessment.

The socio-economic data such as economics wealth, employments, pre-capita income, population density, housing density, industrial & commercial population, and vehicle population in each selected urban area were collected accordingly of the areas where air quality data were available. The main data source used to collect above mentioned data was Department of Sensors and Statistic of Sri Lanka while meteorological data and the paddy production data was obtained from The Meteorological Department and The Department of Agriculture respectively. All the available data were in annual basis thereby; the analysis was restricted accordingly for the annual conditions which hinders the capacity to elicit broader analysis. The data on the paddy yield were based on the two growing seasons Yala and Maha accordingly and also limits the analyzing capacity of the data.

2.2.1 Data Validation and Quality Control

It was understood that air quality data base of each urban area was considered to be reliable, since the data were analyzed in standard methodologies and corrected according to the quality control chart maintained at NBRO laboratory. However, the data base was further validated and quality controlled to avoid outliers by using T-test in SPSS software. Further, predicted values for missing data was filled by regression model using R statistical software package while analysis of time series and annual average for each pollutant. Other related data such as socioeconomic data, meteorology and agricultural data etc. were not further validated since they were taken from annually published in Sensor and Statistical data bases of Sri Lanka. However, in some parameters, the data were not sufficiently available in each year and cannot be assessed with respect to air pollution data. Therefore, those parameters were not considered for the assessment. The data bases developed for the assessments of air quality impact for the project are attached in **Appendix 3**.

2.2.2 Data Analysis

Since continuous air quality data were available in monthly basis, instead of daily basis, it was unable undertake in deep analysis of health impact and short-term analysis. Thereby, the data was statistically analyzed to understand the variation of the air quality levels, trends and to identify pollutant sources throughout 5 years of time period with selected five urban areas within the country. The other data such as socioeconomic, crop production, and vehicular population etc. were available only in annual basis. Thus, the annual data of each Divisional Secretarial (DS) in the districts where the air quality data were available are collected. The air quality data available were analyzed to study special variation within the urban area and then urban area vise to understand the correlation with the socioeconomic data.

2.2.3 Trend Analysis

Since continuous air quality data were available in 6 major urban areas for the period of 2013 to 2017, the trend and spatial distribution analysis in each urban area were performed only for last 5 years. The last year, 2017 data were considered in the comparison of air pollutants among the urban areas. Since continuous data were available only for Nitrogen Dioxide (NO_2) and Sulphur

Dioxide (SO_2), which are two of the main criteria pollutants, those two parameters were used to assess the pollutant trends.

2.2.4 Time Series Analysis

Time series analyses were performed to analyze the trends, pollution sources and climate impact on selected urban areas. Time series analysis was suggested in the study to identify the patterns of the air quality and related health effects over the time. However, in Sri Lankan context, there was have less frequent air quality data which were on monthly and annual basis which are not sufficient enough for time series analysis accompanied with health data. However, air quality variation during last 5 years was defined under 6 urban areas as time series analysis of pollutant variation. Further, to identified the seasonal patterns among urban areas. Analysis outcomes were elicited through graphs, trend lines and values and finally compared with the WHO and National standards.

2.2.5Correlation Analysis

Correlation analysis was conducted to analyze the relationship between air quality and socio economic (Population density, Income levels, Vehicle population), Commercial and Industrial distribution, Meteorological and Paddy production data in each urban area. Those data were available as annual values and thereby, the annual average air pollutant levels in each urban area were used in correlation analysis.

2.2.6Reference Guideline Values

The National Ambient Air Quality (NAAQ) Regulations for Sri Lanka were published under the gazette No.850/4 December 1994 and was amended under the gazette No. 1562/22 in 2008 **(Appendix 4)**. Accordingly, national ambient standard levels for NO_2 (100 µg/m^3, 150 µg/m^3, and 250 µg/m^3) and SO_2 (80 µg/m^3, 120µg/m^3 and 200 µg/m^3) were stipulated for the time period of 24 hours, 8 hours and 1hour respectively. In addition, national standard levels for Ozone (O_3) for 1 hour (200µg/m^3), Carbon Monoxide (CO) for 1 hour and 8 hours (30,000 µg/m^{3}and 30,000 µg/m^3) and annual and 24 hour standards for PM_{10} (50µg/m^3 and 100 µg/m^{3}respectively)& $PM_{2.5}$ (25µg/m^3 and 50 µg/m^3 respectively) were also include in the same NAAQ regulations. However, there are no standard values given for annual averages NO_2 and SO_2. Since, the air quality data available and used in the assessment were in monthly and annual basis for both pollutants, the WHO annual average guideline levels of NO_2(40 µg/m^3) and interim target II level for SO_2 (50 µg/m^3) were considered as reference value for the assessment.

3. URBAN AIR QUALITY TRENDS IN SRI LANKA

Available monthly and annual average levels of continuous air quality monitoring data of 6 major urban areas namely, Colombo, Gampaha, Kandy, Kalutara, Galle and Rathnapura for the period of 2013 to 2017 are used for the trend analysis in each urban area.2017-yeardata were considered in the comparison of air pollutants among the urban areas. Since continuous data were available only for Nitrogen Dioxide (NO_2) and Sulphur Dioxide (SO_2), which are two of the main criteria pollutants, those two parameters were used to assess the pollutant trends.

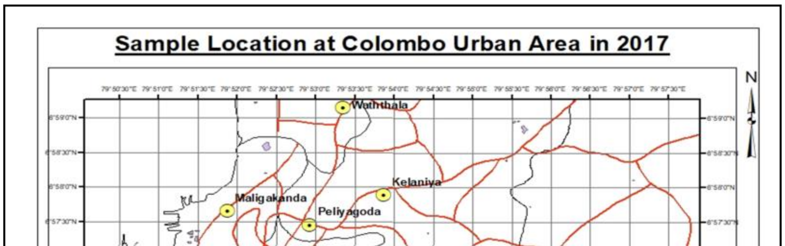
3.1 Spatial Distribution of Air Pollutants

Spatial distribution of air pollutants in Colombo urban area

Colombo, the commercial capital is a coastal city which is the highest urbanized and populated city in Sri Lanka. The population density of the Colombo metropolitan area is about 10103 per/Km^2 and about 578400 number of vehicles are registered with in this area (Dept. Census and Statistics, 2017). In addition, about 500,000 of people and more than 100,000 vehicles are daily coming to the city. Most of the industries thermal power plants and commercial activities are situated within and around the Colombo Metropolitan Region (CMR)and the largest port in Sri Lanka is also within the boundary of CMR. Therefore, air pollutant levels in the area are relatively high due to those emission sources while the highest contributor is vehicular emission.

The air quality data of last two decades at Colombo is summarized in ***Figure 2a & 2b***. Accordingly, the variation of the average pollutants SO_2 and NO_2 levels during last two decades in Colombo Fort clearly reveals that the pollutant levels increases with the increasing urbanization, vehicular fleet. The reductions are due to the results of implementations of air quality management strategies. Presently, there are 19 continuous Air Quality Monitoring locations which measure the air quality by passive sampling technique ***(Figure 5)***.

Code	Location name
CL1	MET Department
CL2	CMC
CL3	Gangarama Temple
CL4	Fort Railway Station



The annual average NO_2 and SO_2levels in different monitoring locations of the passive monitoring network during past 5 years (2013-2017) are given in the ***Figure 6a &6b***. Accordingly, the annual average NO_2 levels at all other locations have exceeded the WHO guide line values in 2013except at Kotte (CL12) location. However, generally the levels are decrease from 2014 to 2015 and increasedover again in 2016 and 2017. According to the 2017 measurements, 9 locations out of 19 locations in Colombo Urban area have exceeded the annual average guideline levels recommended by WHO for NO_2. When considering SO_2, the annual average levels at all other locations except Maradana Railway Station (CL19), were lower than the WHO 2nd Interim Annual Guideline Value for SO_2. However, in 2017, 8 out of 19 locations exceed the WHO 2nd interim target values for SO_2.

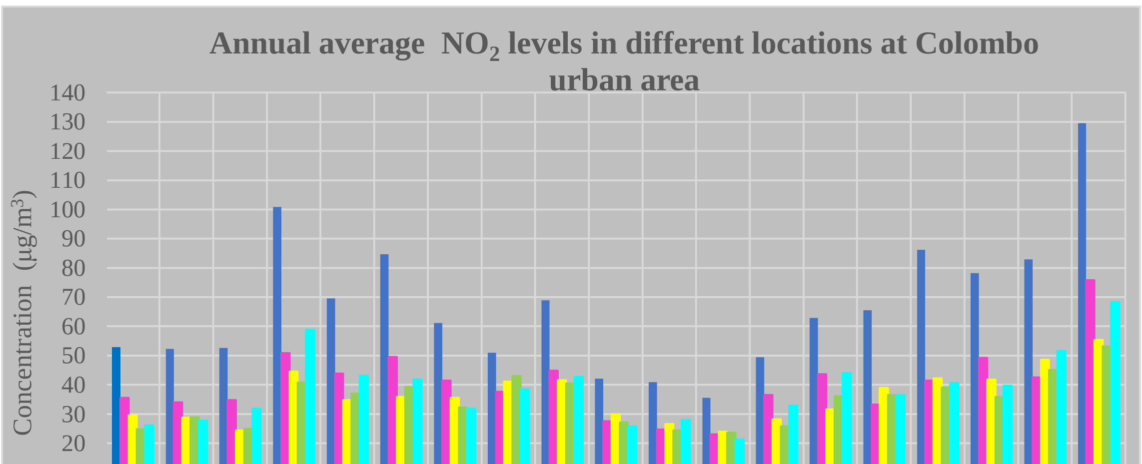


Figure 6a: *Annual average levels of NO_2 at selected location in Colombo urban area from2013-2017*

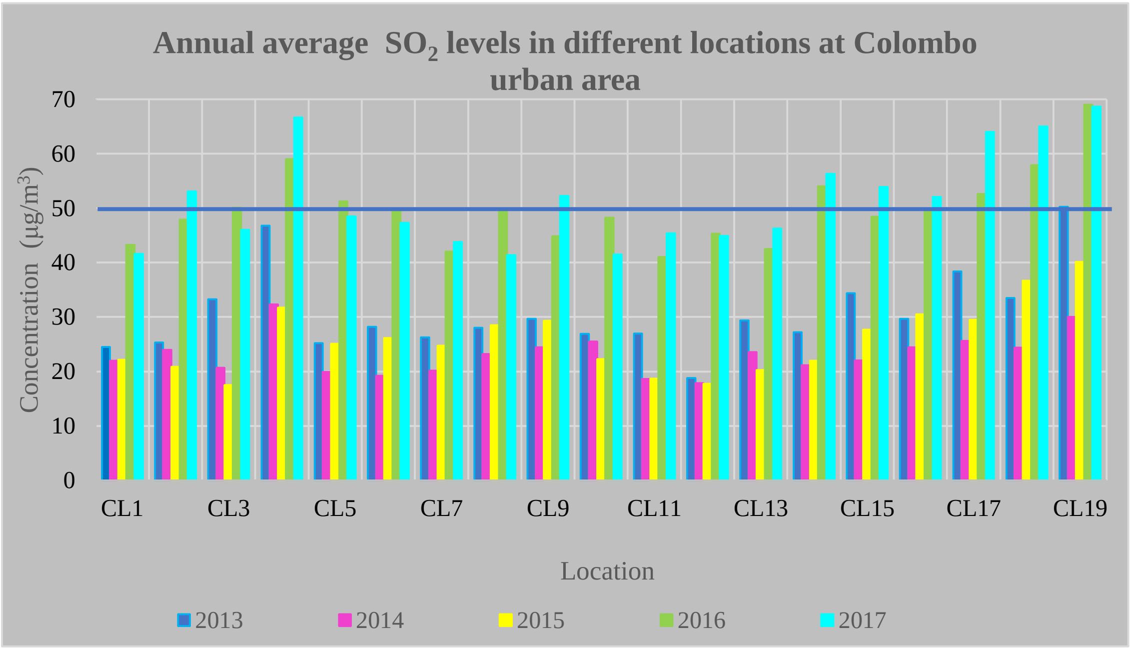


Figure 6b: *Annual average levels of SO_2 at selected location in Colombo urban area from2013-2017*

According to the 2017 results, the highest pollution levels within Colombo urban area was recorded at Maradana Railway Station (CL19) and followed by Fort Railway Station (CL4) while relatively low levels are recorded at residential areas such as Kotte (CL12) and Battaramulla (CL11). Relatively high levels of pollutant that exceeds WHO guide lines are recorded at areas with high traffic congested and low levels of pollutants are recorded in areas with pollution sinks like wetland network with water bodies, green covers and elevated areas which is clearly elicits in GISinterpolated map of NO_2 and SO_2 special variation in Colombo 2017 (***Figure: 7a &7b***).

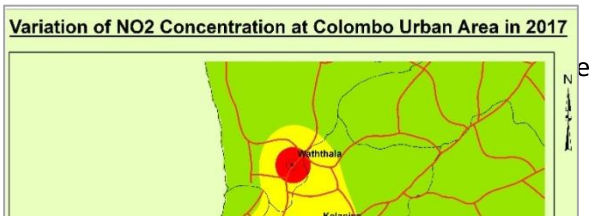


Figure7a: *Variation of NO_2 concentration within Colombo urban area in 2017*

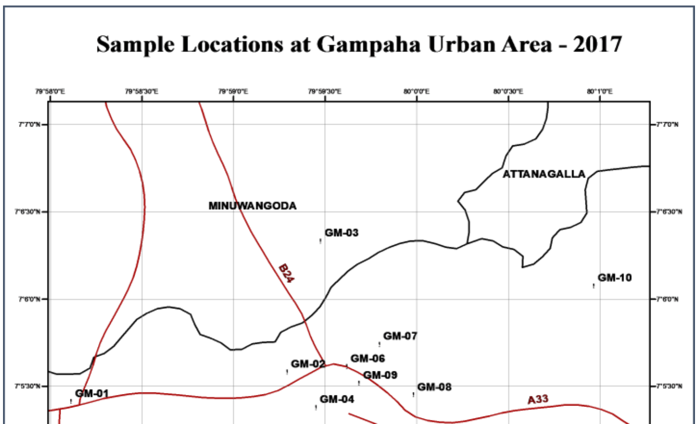
Figure7b: *Variation of SO_2 concentration within Colombo urban area in 2017*

Spatial distribution of air pollutant in Gampaha urban area

The Gampaha city is the capital of the Gampaha District which is the second highest populated district in the country. Gampahaurban area is within the low country wet zone in according to the climatic zone classification and the sixth largest urban area in the country. The highest rainfall is received during the south west monsoon period with having two peak rainfall periods during the months of May and October. The total extant of the Gampaha urban area is about 96 Km^2 and the population density is about 2143 per Km^2 (Senses and Statistics 2017).

Ambient air quality of the Gampaha urban area is measured continuously by the passive sampling monitoring network of 11 sampling locations as shown in ***Figure 8***. The annualaverages of NO_2 and SO_2 concentration levels at each sampling location in Gampaha urban area during the period of 2013 to 2017 is illustrated by ***Figure 9a &9b***.

Code	**Location Name**
GL1	Kirindiwita
GL2	Pahalagama
GL3	Asgiriya
GL4	Oruthota Road
GL5	Oruthota



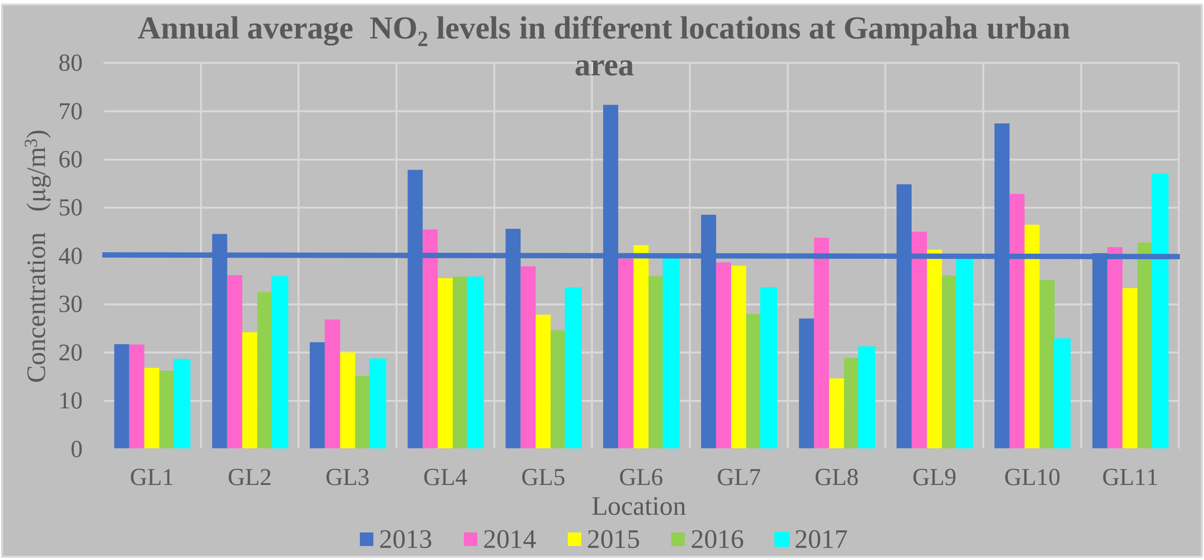


Figure 9a: *Annual average levels of NO_2 at selected location in Gampaha urban area from 2013-2017*

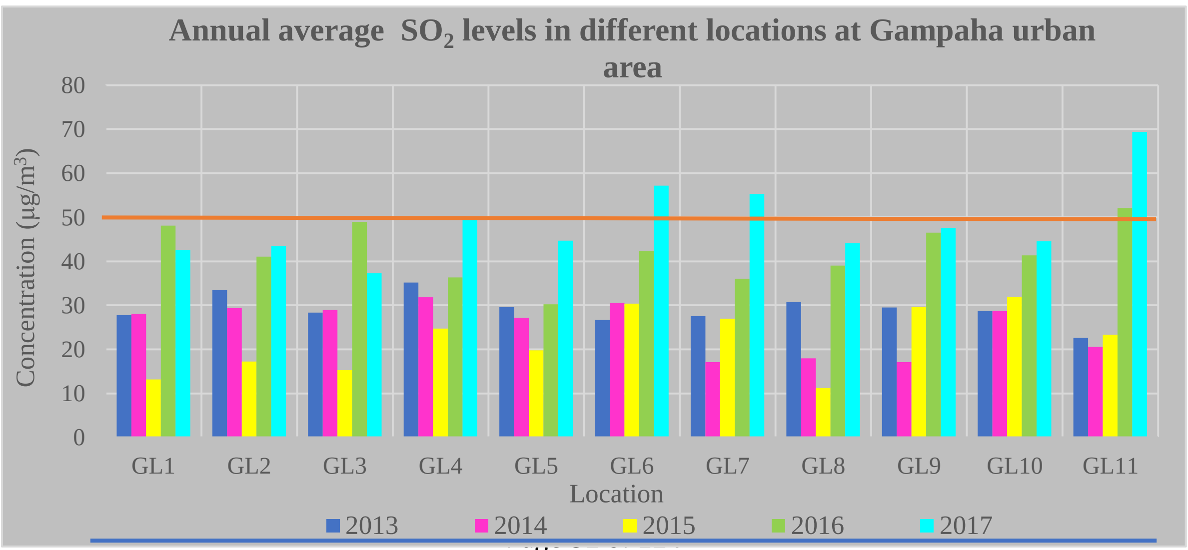
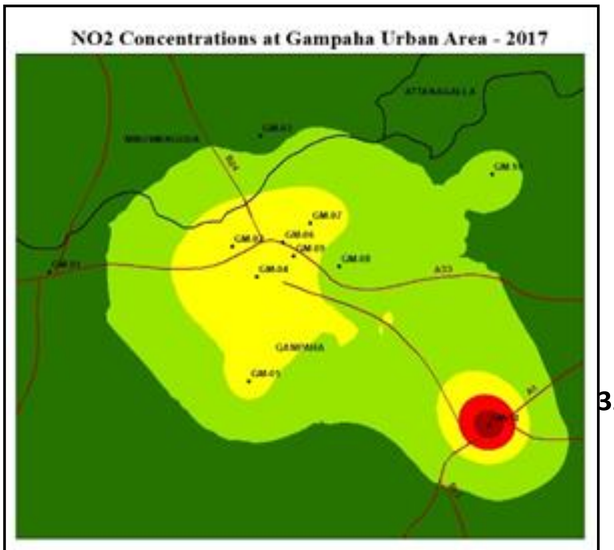


Figure 9b: *Annual average levels of SO_2 at selected location in Gampaha urban area from 2013-2017*

According to the figure 9a, WHO annual average guideline level of NO_2 was exceeded at 8 locations out of 11 inGampaha urban areain 2013. However, in 2017, it was reduced to 3 locations. The highestannual average NO_2 level was recorded at Gampaha Railway station (GL6) site in 2013 and at Miriswatta Junction (GL11) in 2017. At the same time, the maximum pollutant level of NO_2were reduced by about 40% at Gampaha Railway station (GL6) from 2013 to 2017 whereas the NO_2 level at Miriswatta Junction (GL11) was increased by about 30%. These changes could be due to the variation of vehicular fleet due to traffic management, vehicular emission control through VET program, road surface changes etc. at GL6 site and increase of vehicular fleet at GL11 location with the completion of road construction and widening activities of the A1 road at the Miriswatta Junction.

When consider SO_2, none of the selected location exceeded the WHO interim annual average guideline level of SO_2 in 2013. However, 4 locations exceeded the WHO interim annual average guideline level of SO_2 in 2017. The highestannual average SO_2 level was recorded at Oruthota road (GL4) in 2013 and at Miriswatta Junction (GL11) in 2017. The pollution load increases at maximum pollutant location from 2013 to 1017 was about 30% with respect to SO_2 at GL4 location and the increase at GL11 was about 50 %. These changes could be due to the variation of vehicular fleet due to completion of road construction and widening activities at GL11 site. As per the 2017 measuring data, relatively high levels of pollutant that exceeds WHO guide lines are recorded at areas with high traffic congested and low levels of pollutants are recorded in areas away from the main roads and residential areas with green covers. This situation is clearly elicitedbyGIS interpolated map of NO_2 and SO_2 special variation in Gampahafor year 2017 (***Figure: 10a &10b***).



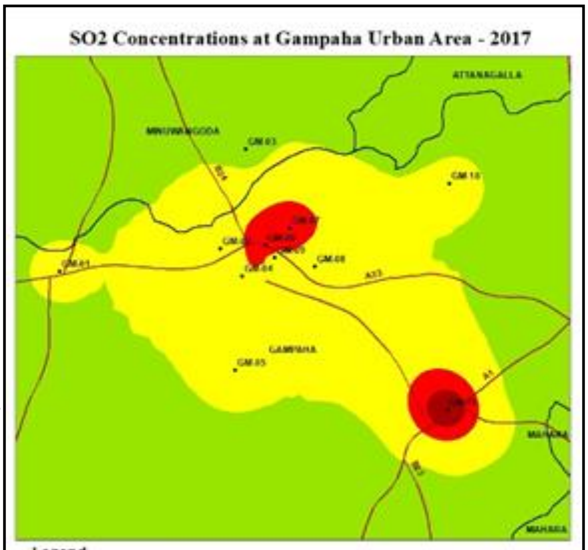


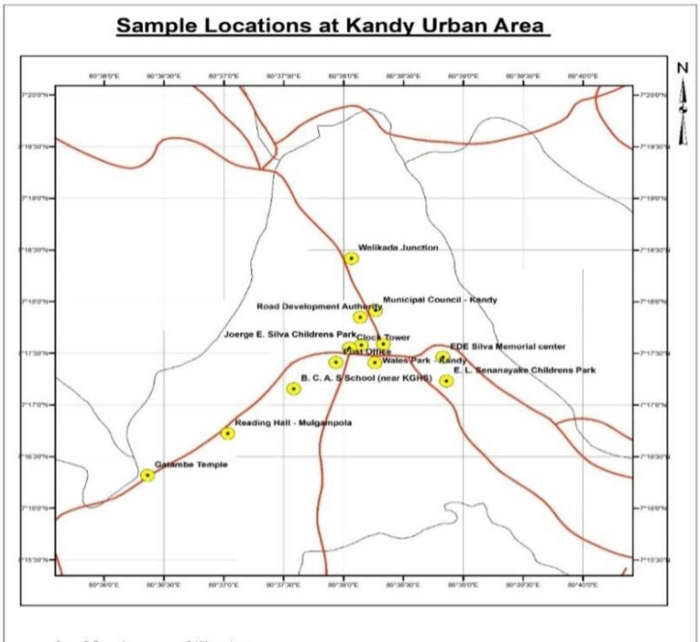
Figure 10a: *Variation of NO_2 concentration within Gampaha urban area in 2017*

Figure 10b: *Variation of SO_2 concentration within Gampaha urban area in 2017*

Spatial distribution of air pollutant in Kandy urban area

Kandy urban area is one of the most attractive tourist destination in Sri Lanka which is a historical city identified as a world heritage due to the presence of Temple of Tooth. It is located at the central hills of the island, surrounded by mountain ranges. The geographical location of the Kandy city makes the city as a major transportation center which can be reached by major motorways in several directions of the city. According to general estimation about 2000 bus trips and more than 3000 further through- survives are operate daily in the city area of Kandy. The total population is about hundred thousand in Kandy Municipal Council areas in addition about hundred thousands of people daily reach to the Kandy city area. The emissions form buses and other vehicles that operate within the limited area of the city deteriorate the air quality of the Kandy urban area in which is not dispersed easily due geographical conditions of the city. Ambient air quality at the Kandy Urban area is measured continuously by passive sampling monitoring network with 10 sampling locations form 2013 as shown in ***Figure 11.*** The annual averages of NO_2 and SO_2 concentration levels at each sampling location in Kandy urban area during the period of 2013 to 2017 is illustrated by***Figure 12a &12b***.

Code	Location name
KD1	Temple of Tooth
KD2	Super Market Junction/Clock Tower
KD3	Ampitiya Junction
KD4	Wels park
KD5	Good shed Junction
KD6	Colombo Street
KD7	Kandy Municipal Council
KD8	High School Junction
KD9	Gatambe Junction



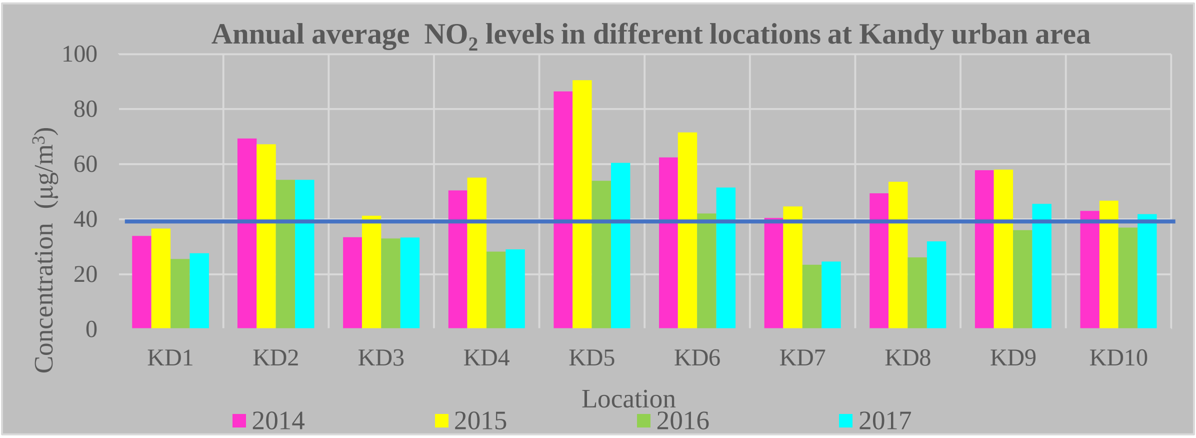


Figure 12a: *Annual average levels of NO_2 at selected location in Kandy urban area from 2013-2017*

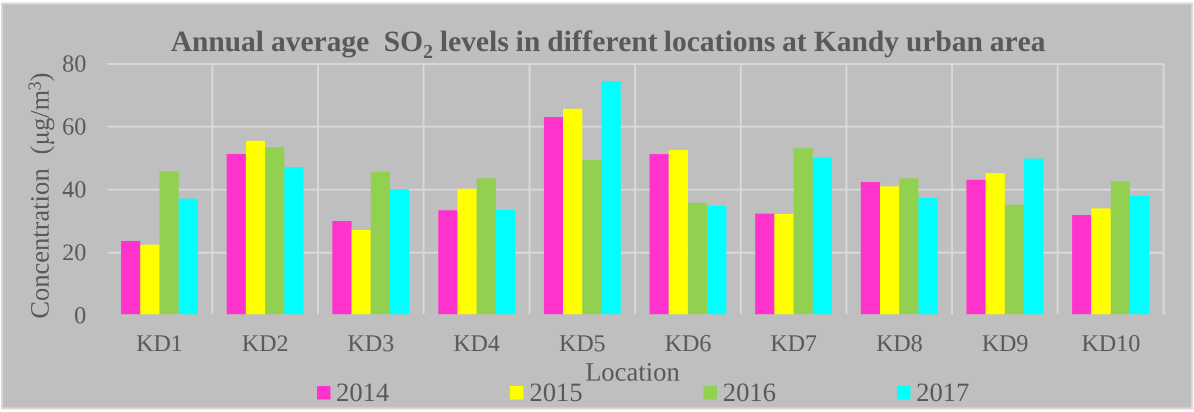


Figure 12b: *Average annual variation of SO_2 in Kandy urban area at each location from 2013-2017*

As per the ***Figure 12a***, 8 locations out of 10 locations in Kandy urban area in 2013 and 5 locations out of same 10 locations in 2017 were exceeds the annual WHO guideline level for NO_2. The NO_2 levels at all monitoring locations were low in 2017 compared to 2013 and the reduction is about 50 % - 30 %. However, the SO_2 levels in Kandy during the past 4 years do not showsignificant changes. The highest pollutant levels in Kandy were recorded at Kandy Good shed area (KD5) and relatively high levels were recorded at KD2 (Colombo Street) and KD6 (Super Market Junction/Clock Tower) location where having high vehicular fleet within the city and exceeded the WHO annual guideline values at both locations. Relatively high SO_2

pollutant level in Kandy Urban areas would be due to the operation of high diesel driven bas and dual propose vehicle services compared to other urban areas. This situation can be observed by the spatial distribution of NO_2 and SO_2levels in 2017 givenin***Figure13a & 13b***. It also indicates high pollutant levels at high traffic areas were relatively high compared to other areas.

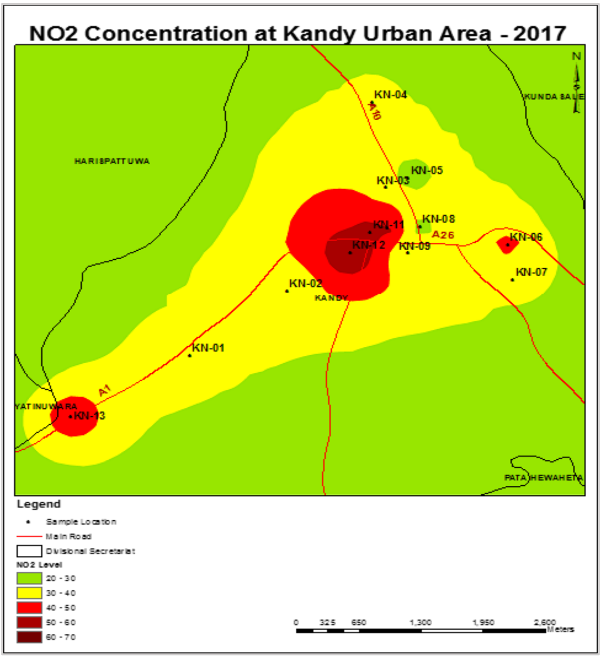


__Figure 13a:__ Variation of NO_2 concentration within Kandy urban area in 2017

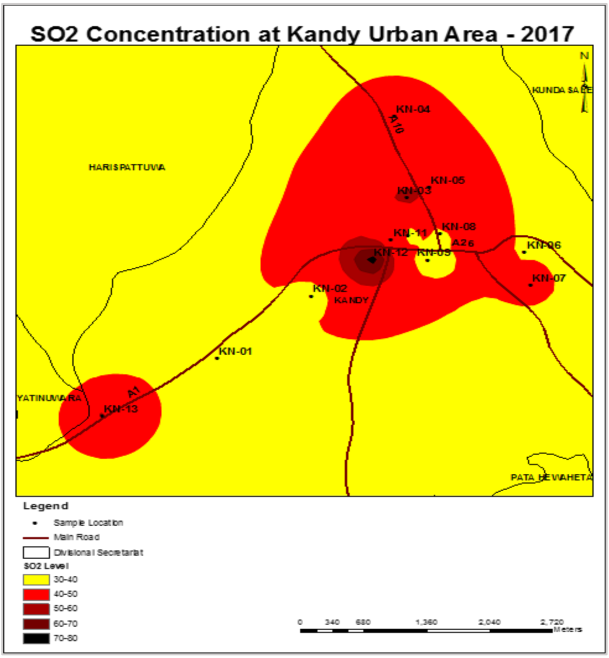


__Figure 13b:__ Variation of SO_2 concentration within Kandy urban area in 2017

Spatial distribution of air pollutant in Kalutara urban area

Kalutara is the administrative capital as well as the largest city in Kalutara District located in Western Province of Sri Lanka. The total extent of the Kalutara urban area is about 69 Km^2 with the population density of approximately 2408 per Km^2. Kalutara urban area is also a coastal city and considerable number of vehicles pass through the city to other areaespeciallysouthern part of the country. Continuous air quality monitoring at Kalutara Urban Area is conduction with 5 passive sampling stations from 2012 as given in ***Figure 14***. The annual averageexposure levels of NO_2 and SO_2 at each measuring location are elicited in ***Figure 15a & 15b.***

Code	Location name
KL1	Kaluthara Bodiya Car Park
KL2	Palathota Junction
KL3	Nagoda Junction
KL4	Katukurunda Junction
KL5	Kaluthara Urban Council

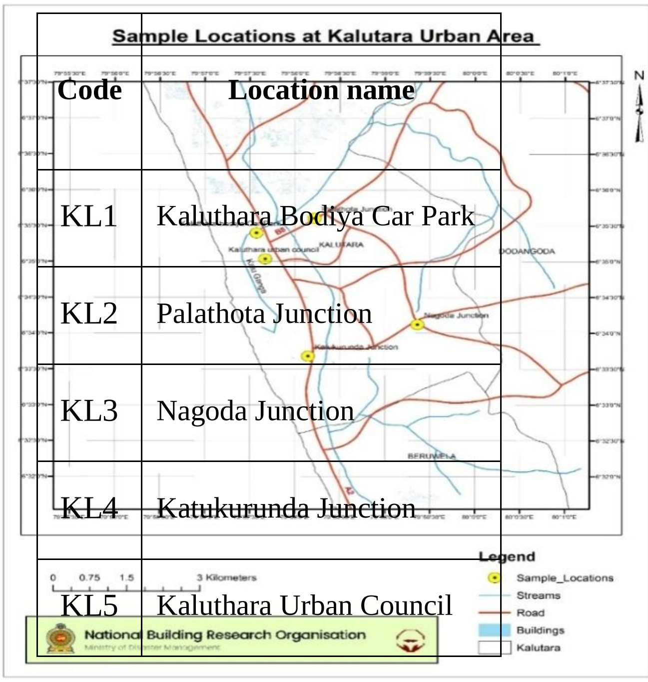


Figure 14: *Sampling locations of the air quality monitoring network in Kalutara urban area*

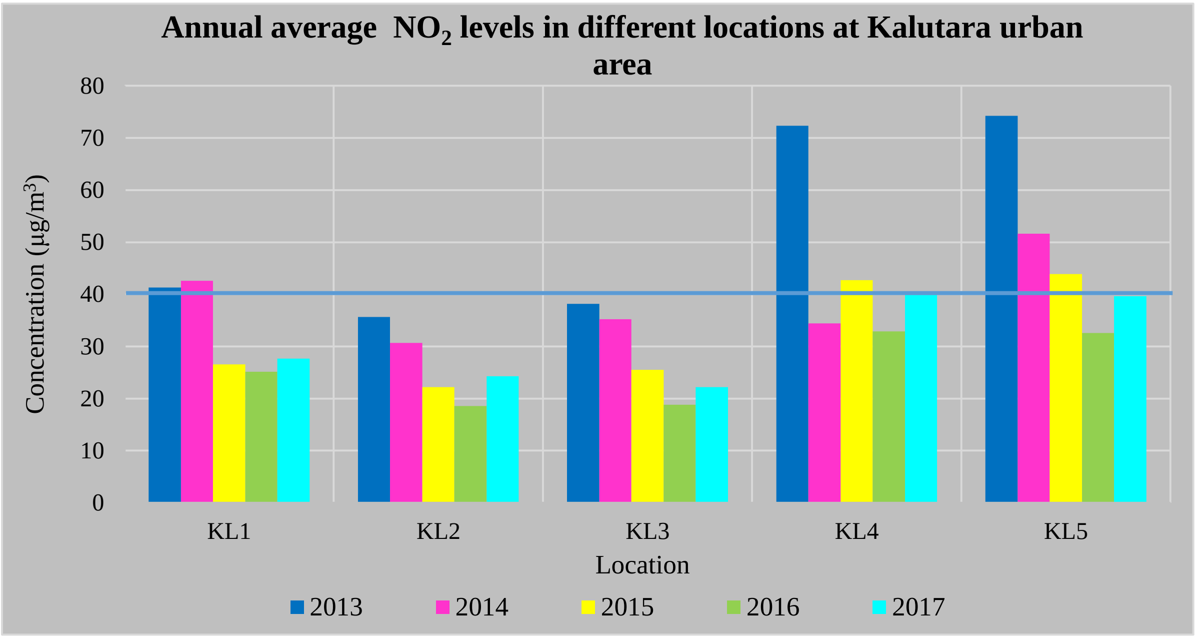


Figure 15a: *Average annual variation of NO_2 in Kalutara urban area at each location from 2013-2017*

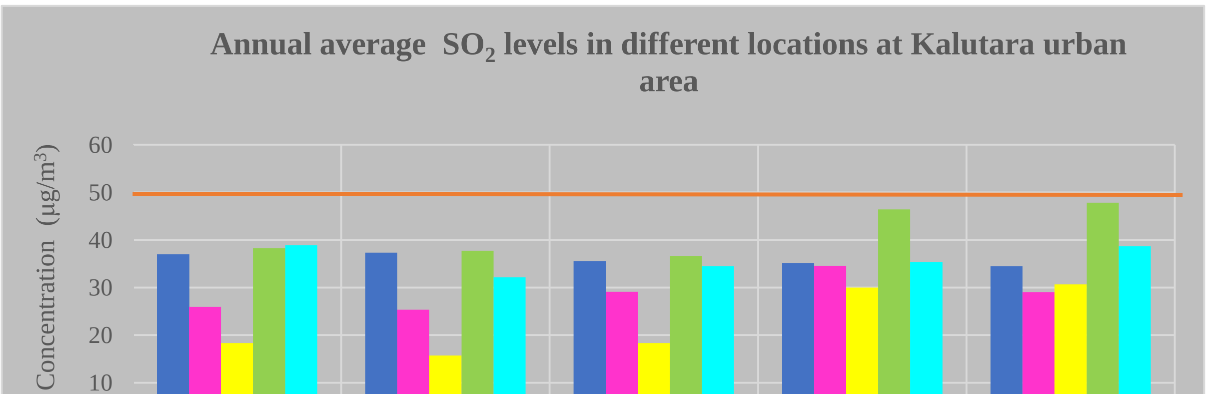


Figure 15b: *Average annual variation of SO_2 in Kalutara urban area at each location from 2013-2017*

According to the 2013 data, the annual average NO_2 levels at two locations, KalutharaUrban Council (KL5) and Katukurunda Junction (KL4) have recorded above 70µg/m^{3}which exceeds the WHO annual average guideline level for NO_2. However,the levels decrease then after and just at the WHO annual guideline level of 40µg/m^{3}in 2017. When consider the $SO_{2,}$ the levels are below the WHO 2nd interim target values. Both pollutant levels were high at high traffic areas confirming the major pollutant source contribute are vehicular emissions. This can be clearly identified by the GIS interpolated spatial pollutant concentration map in ***Figure 16a & 16b.*** The reduction of pollutant levels from 2013 to 2017 would be due to the action taken to air quality management such as traffic management, vehicular emission control through VET program, road surface changes etc.

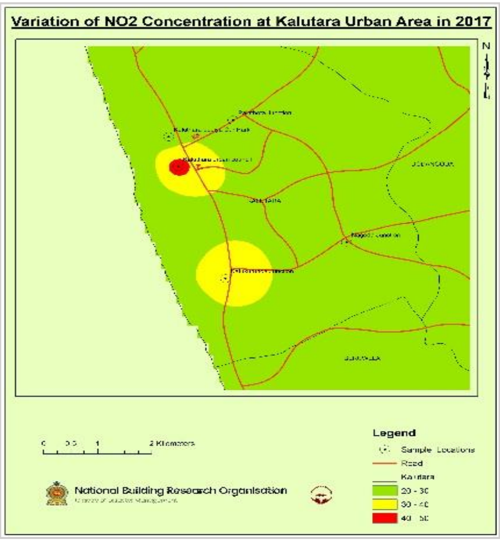


Figure 16a: *Variation of NO_2 concentration within Kalutara urban area in 2017*

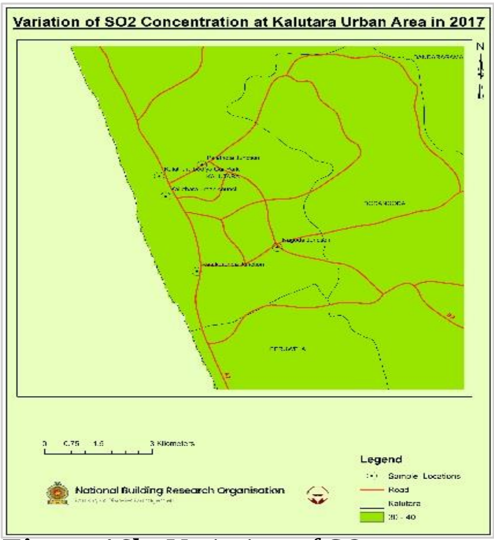


Figure 16b: *Variation of SO_2 concentration within Kalutara urban area in 2017*

Spatial distribution of air pollutant in Galle urban area

The Galle city is the capital city of Southern Province located in south costal belt of Sri Lanka. The city has a World Heritage Site to its name because there are several historical, archaeological and architectural heritage monuments located within the city and those are predominantly responsible for its popularity with tourists. The city area is limited to about 17.4 Km^2(Ministry of Urban Development and Water Supply, 2006)and relatively high number of vehicles operates in the city. The air quality level in Galle urban area is continuously monitored from 2012 by Passive Sampling monitoring network of 6 locations as indicate in ***Figure 17***.

Code	Location Name
GL1	Richmend Hill Road
GL2	Havlock Place
GL3	Galle Bus Stand
GL4	Galle Fort
GL5	Talbort Town
GL6	BandaranayakaPedesa

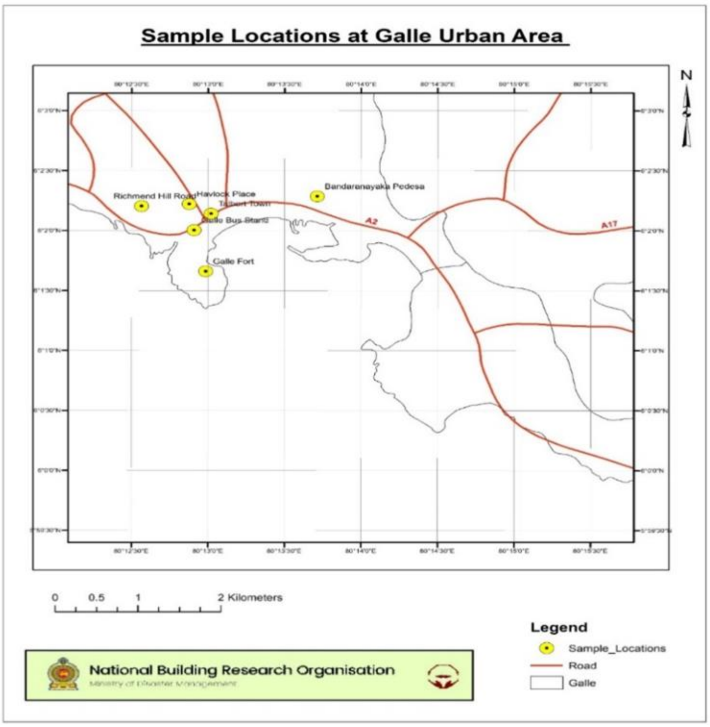


***Figure 17**: Sampling locations of the air quality monitoring network in Galle urban area*

The annual average NO_2 and SO_2 levels at each monitoring locations in Galle urban area are given in ***Figure 18a &18b.***Accordingly, in 2013 and 2014, average annual NO_2 levels at three locations within Galle urban area exceeds the WHO annual average guideline levels for NO_2.The highest NO_2 level recorded was 73µg/m^3 in Galle bus stand (GL3) in which generally observedhigh traffic conjunction and operation of buses etc. However, the NO_2levels were reduced form 2015 and respective years and the highestlevels in 2017 was 40µg/m^3at Galle bus stand (GL3). However, the trend of SO_2 was completely opposite. The SO_2levels in 2013 were well below the WHO 2nd interim guideline levels and the SO_2 levels at three locations exceeded the WHO 2nd interim guideline levels in 2017. The higher recorded annual average level is about 70 µg/m^3 at the Galle bus stand (GL3). Thereby, clearly point out the high values of SO_2 is mainly due to the diesel driven bus with poor maintains. The pollutant levels recorded in side Gall Fort (GL4) shows the lowest levels of NO_2& SO_2in all 5 years of period which can be due to the low vehicle operations and impact of the sea breeze. The situation is clearlyindicates in the GISinterpolated pollutant dispersion map ofannual average level ofNO_2 and SO_2 in Galleurban area in 2017 is elicited in***Figure 19a &19b*** respectively.

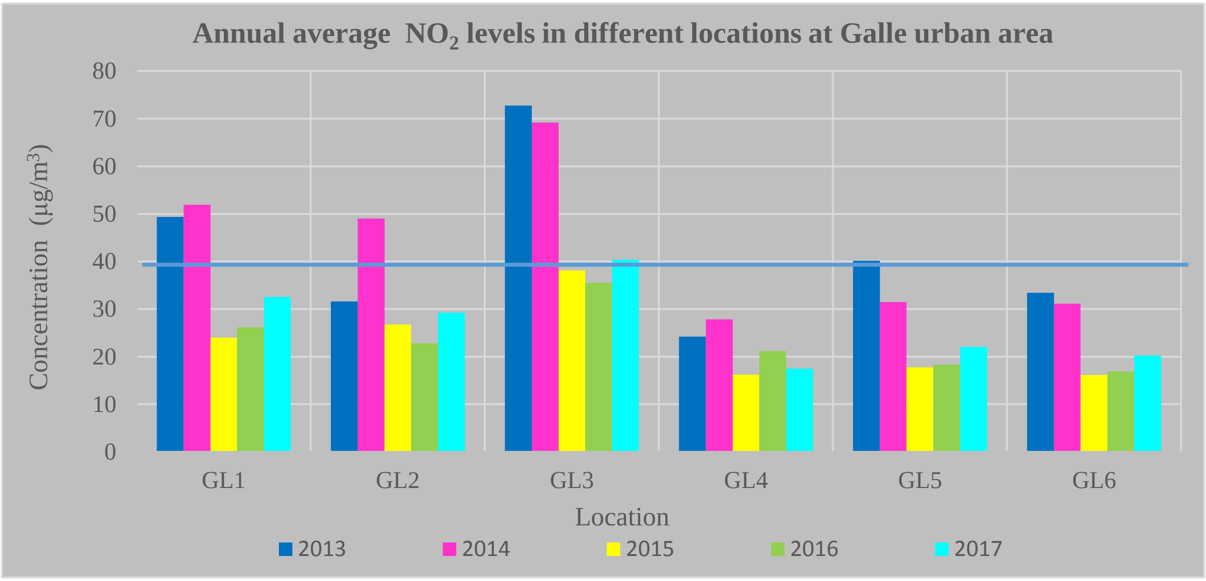


Figure 18a: *Average annual variation of NO_2 in Galle urban area at each location from 2013-2017*

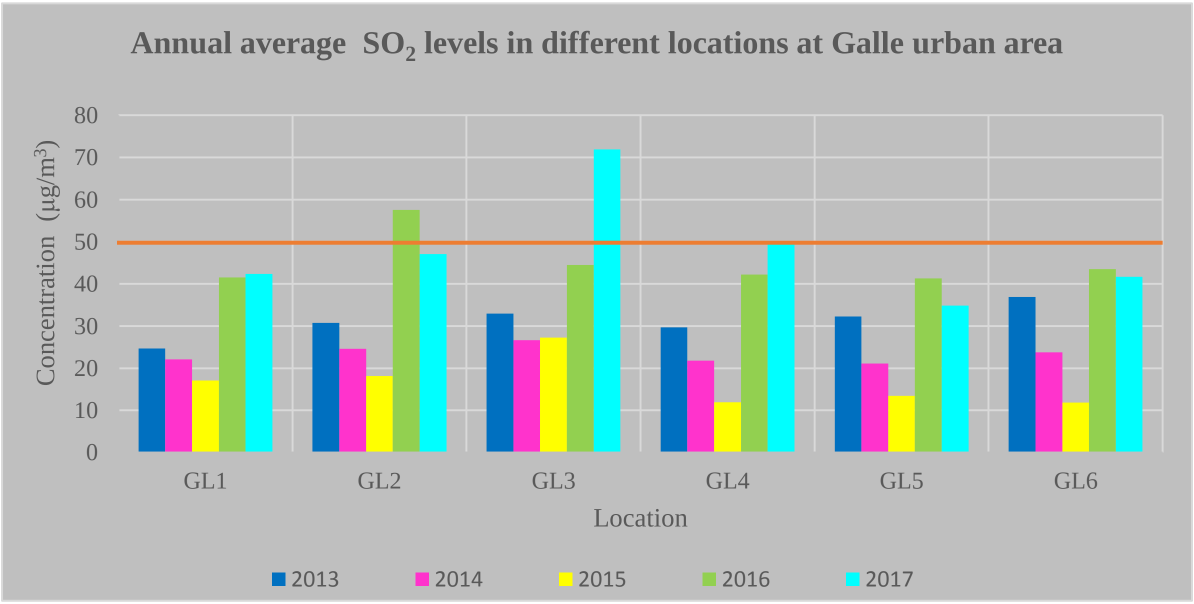
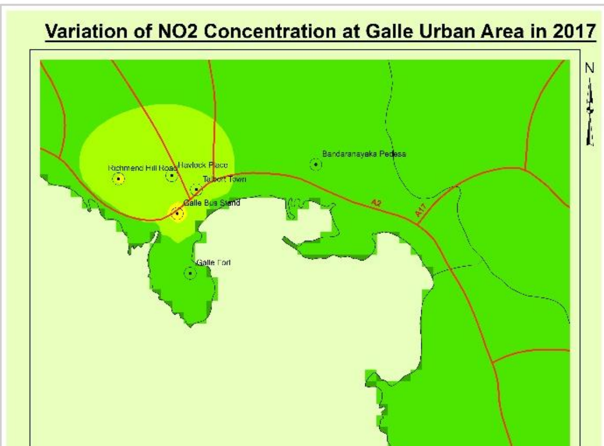


Figure 18b: *Average annual variation of SO_2 in Galle urban area at each location from 2013-2017*



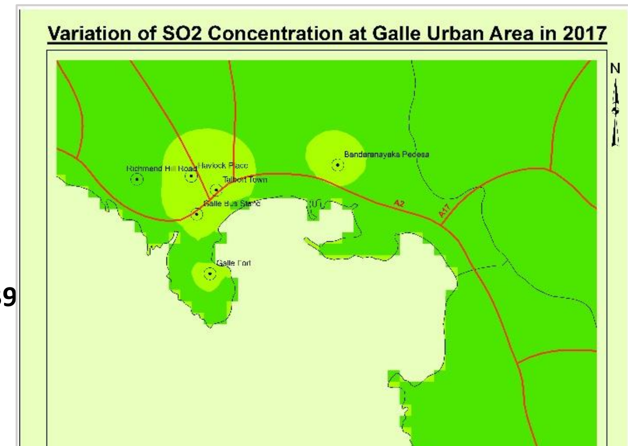


Figure 19a: *Variation of NO_2 concentration within Galle urban area in 2017*

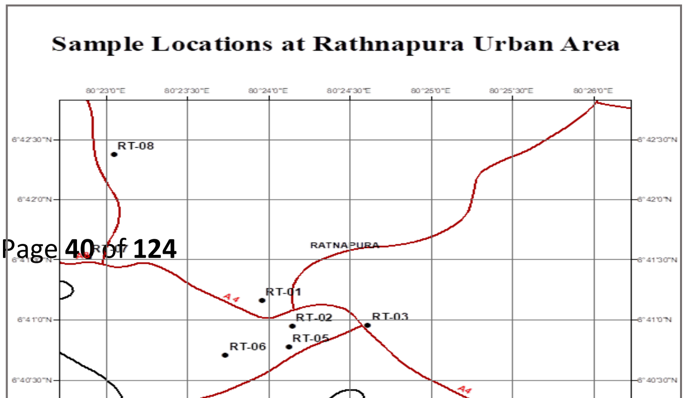
Figure 19b: *Variation of SO_2 concentration within Galle urban area in 2017*

Spatial distribution of air pollutant in Rathnapura urban area

Ratnapura city is the capital city of the Sabaragamuwa Province and the traditional centre for the gem trade in the country. The city is surrounded by green areas of tea and rubber plantations as well as several natural forest areas such as Sinharaja Forest Reserve, Udawalawe National Park, Kitulgala, and Adam's Peak etc. Therefore, the city can be considered as a rainy city with high average rainfall and relatively cold climate. The land area of the Rathnapura urban area is about 324 Km^2 which is 9.9% out of the whole Rathnapura district and the population density of the Rathnapura city area is about 393 persons per Km^2.The geography of the city creates an inland condition and 3 main entry points to and out of the city that gives rise to a bottleneck condition. Generally, around 2500 vehicles enter to the city through A004 road at once in the peak time (Urban Development Authority, 2018).

The continuous air quality was measured by passive sampling monitoring network with 8 sampling locations in the Rathnapura urban area as marked in ***Figure 20***. The annual averages levels of NO_2 and SO_2 levels are elicited in ***Figure 21a &21b*** respectively.

Code	Location Name
RA1	Circular Road
RA2	Good Shed Road
RA3	Kudugalwaththa
RA4	Batugedara



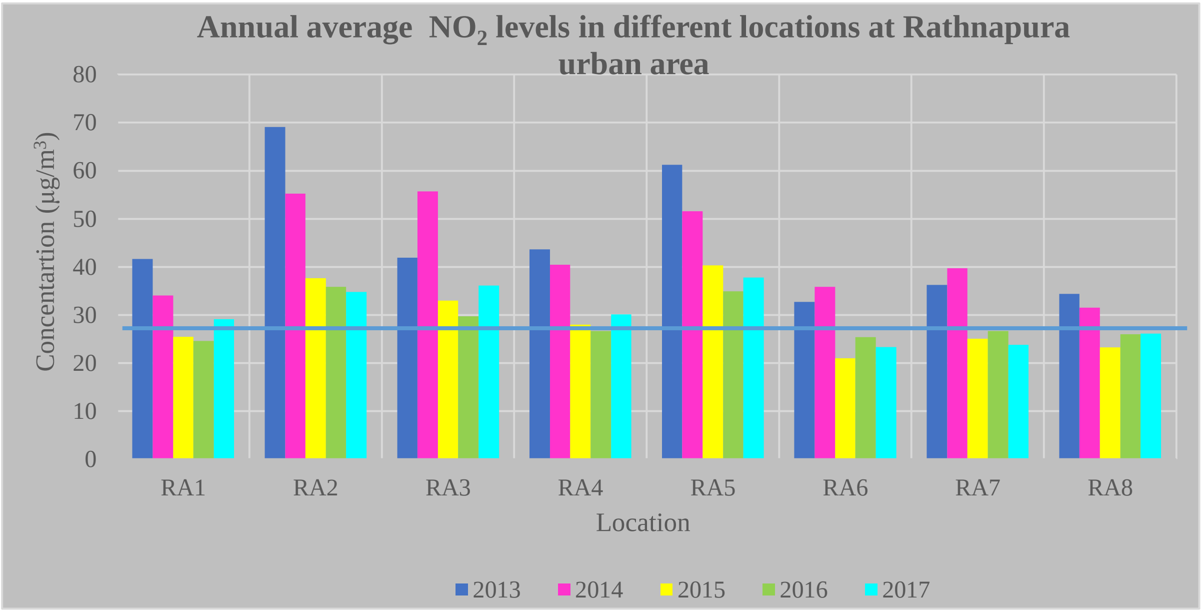


***Figure 21a**: Average annual variation of NO_2 in Rathnapura urban area at each location from 2013-2017*

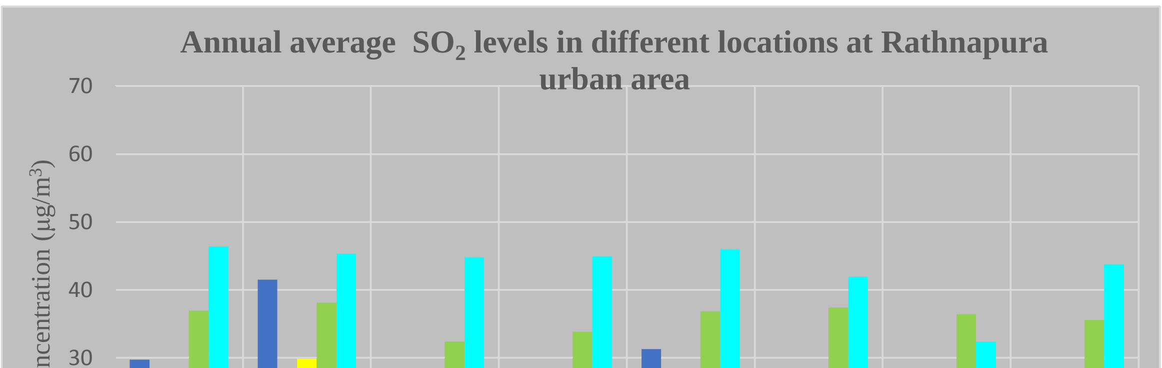
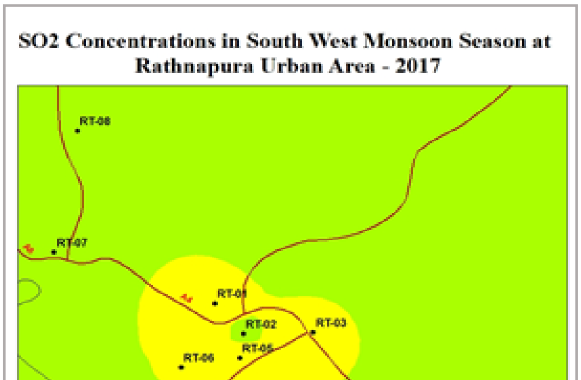


***Figure 21b**: Average annual variation of SO_2 in Rathnapura urban area at each location from 2013-2017*

According to the 2013 air quality data at Rathnepura Urban area, five locations out of eight location monitoring network exceeds the WHO annual average guideline values for NO_2. The locations that exceed WHO guideline values are represent the high traffic areas such as Circular Road (RT1), Good Shed Road (RT2), Kudalawaththa (RT3), Batugedara (RT4) and Police Station (RT5) within the Rathnepura town area. The other three locations represent main entrance to the city which about 2 - 4 kilometres away from the town area. However, the annual average NO_2 levels at measuring location were decrease from 2014 to 2017 and none of the locations exceeds the WHO guideline value for NO_2in 2017. The reduction levels further signify the effectiveness of the actions implemented to manage air quality in Sri Lanka including vehicular emission control through VET program and development of road surface etc.When considerSO_2 levels, the annual average levels are increasing over the timefrom 2013 to 2017 but levels are below the WHO 2nd interim guideline values.

The special distribution of annual average NO_2 and SO_2 in 2017 at Rathnepura urban area clearly indicates the relatively pollutant high levels within the city area compared to surrounding area as shown in the GISinterpolated pollutant dispersion map ofannual average level ofNO_2 and SO_2 in 2017 elicited in***Figure 22a &22b*** respectively.



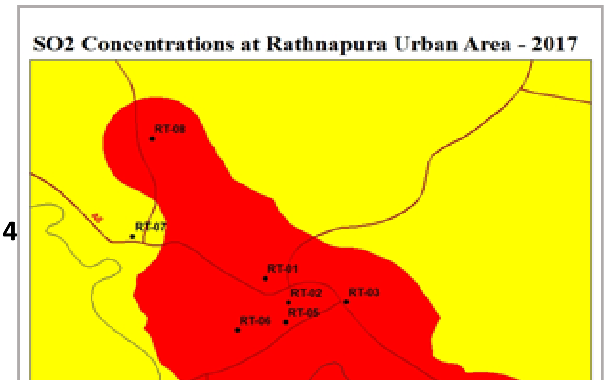


Figure 22a: *Variation of NO_2 concentration within Rathnapura urban area in 2017*

Figure 22b: *Variation of SO_2 concentration within Rathnapura urban area in 2017*

3.2Annual Trends

Average annual trends of NO_2 and SO_2each selected urban areas in Sri Lanka are elaborated in ***Figure: 23*** to ***Figure: 28*** respectively. Accordingly, air pollution levels in urban areas in Sri Lanka shows a gradual reduction of annual average NO_2 levels from 2013 to 2015 while showing a slight increase in 2016 and 2017. However, in contrast, annual average SO_2levels are decreasing 2013 till 2015 and show considerable increasing trends in 2016 onwards. The reduction of pollutant levels up to 2015 can be due to the attempts taken towards control air pollution in Sri Lanka through “Clean air action plans”. As such attempts, initially it was identified major sources of air pollution and implemented relevant actions to curtailed air emissions from identified sources. All air quality studies indicate that the most contribution source for above urban areas is vehicular emission. Therefore, most of actions identified and implemented in Sri Lanka were to control vehicular emissions. Such actions involved were controlling of vehicular emission through the implementation of vehicular emission testing program, fuel quality improvements, use of cleaner fuel vehicles and road surface improvements etc. All above actions implemented were resulted to improve urban air quality levels in Sri Lanka as signified by the monitoring results from 2013 to 2015.

Slight increase of NO_2 in 2016 to 2017 could be due to the increase of vehicle fleet and registration of new vehicles. The considerable increasing of SO_2levels in many urban areas could be due to operation of diesel driven bus and dual propose vehicles within those urban areas.

However, annual average levels of NO_2 and SO_2 in most of urban areas in Sri Lanka were below the WHO annual average guideline levels after 2014, except SO_2 in Colombo urban area in 2017.

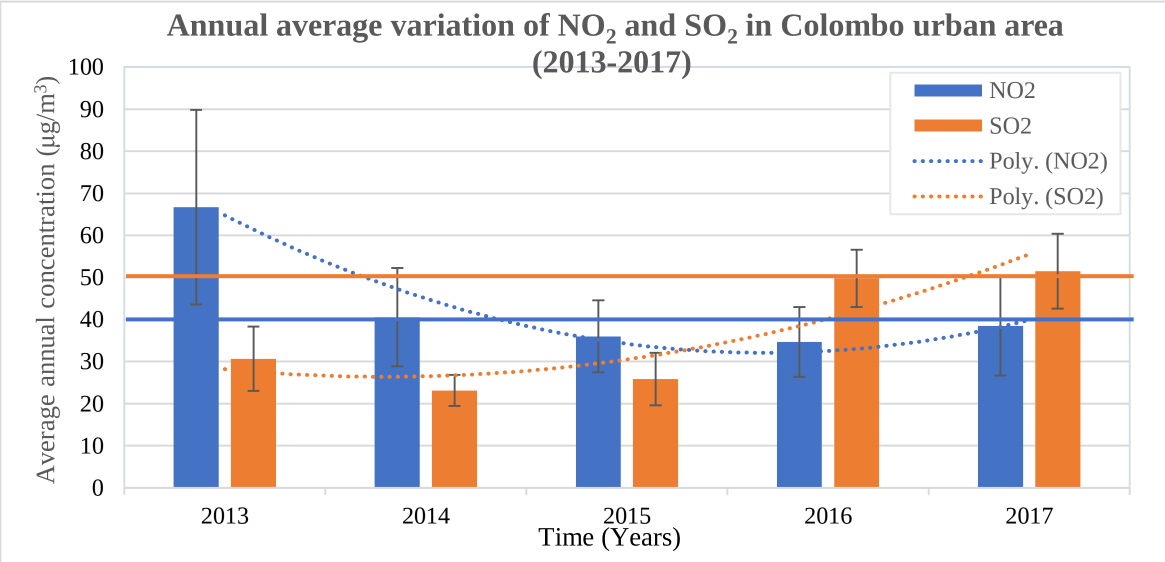


Figure 23: *Annual averages of NO_2 and SO_2 in Colombo urban area (2013-2017)*

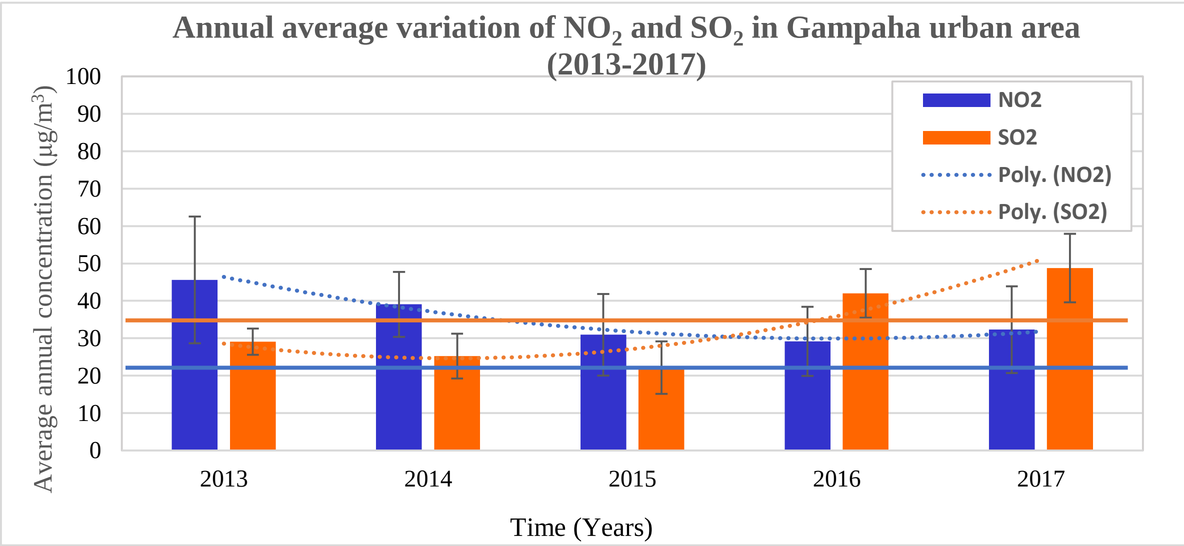


Figure: 24 *Annual averages of NO_2 and SO_2 in Gampaha urban area (2013-2017)*

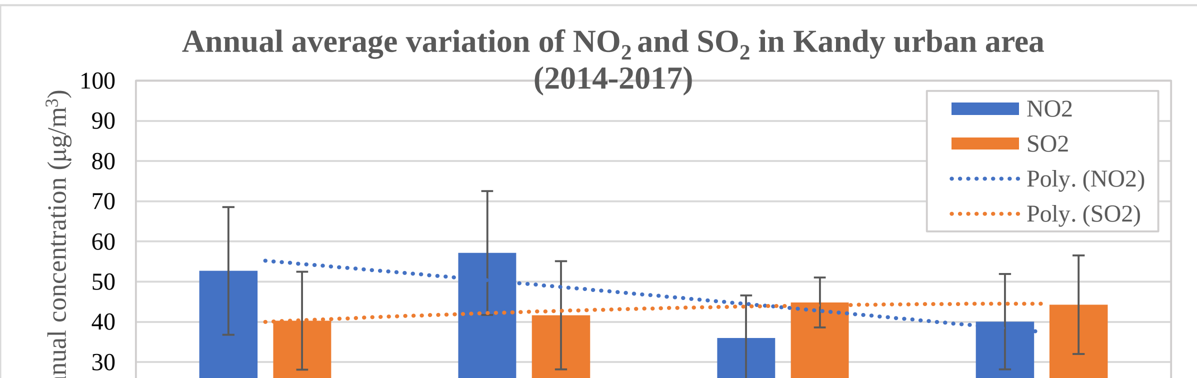


Figure 25: Annual averages of NO_2 and SO_2 in Kandy urban area (2014-2017)

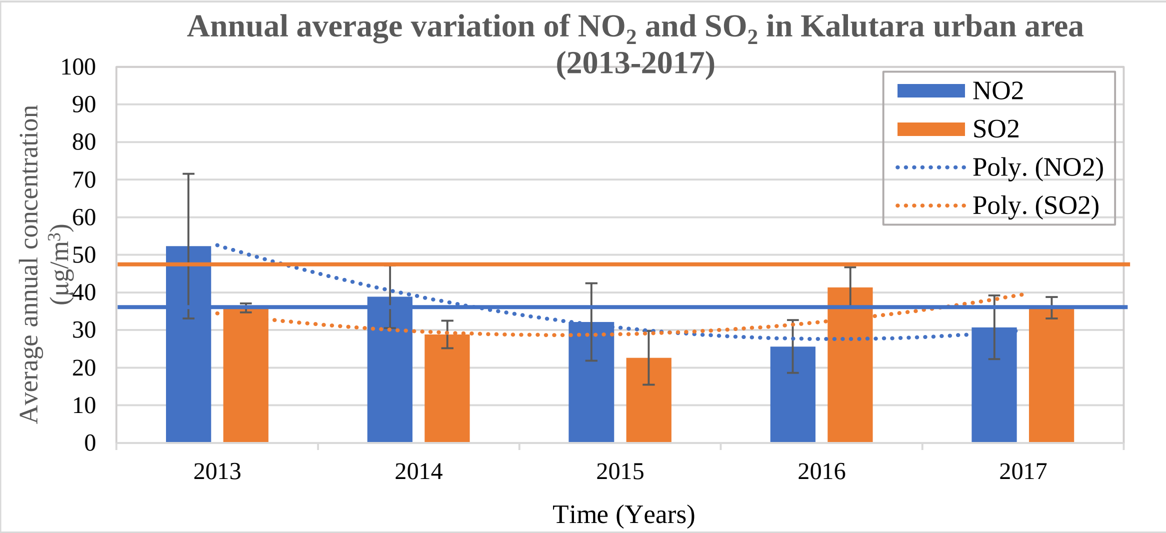


Figure 26: Annual averages of NO_2 and SO_2 in Kalutara urban area (2013-2017)

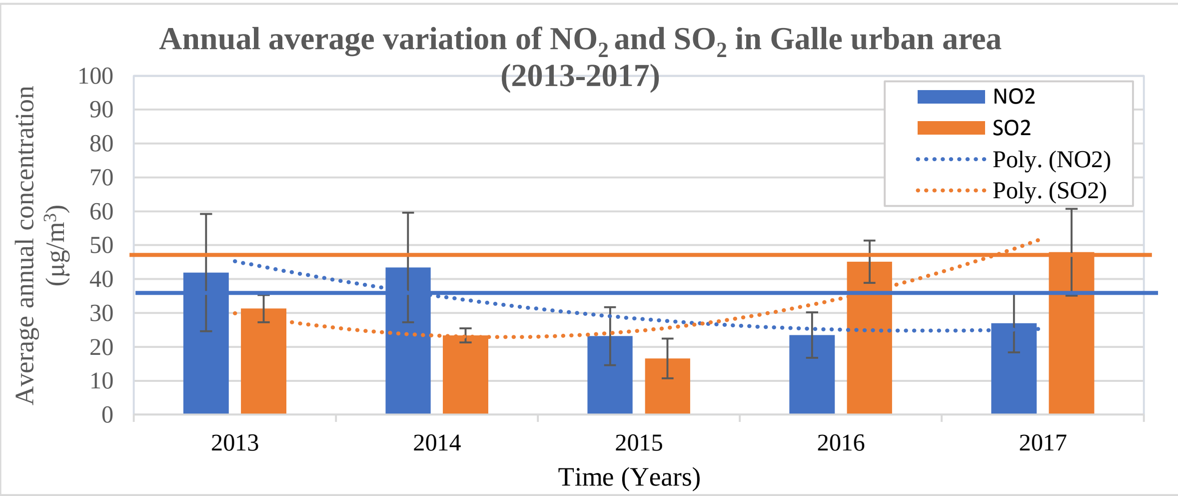


Figure: 27 Annual averages of NO2and SO_2 in Galle urban area (2013-2017)

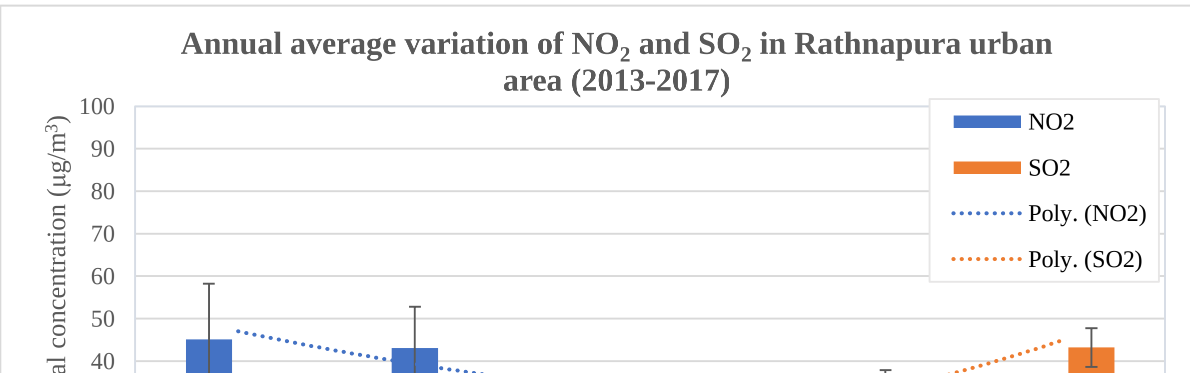


Figure: 28 *Annual averages of NO_2 and SO_2 in Rathnapura urban area (2013-2017)*

The annual average NO_2 and SO_2 levels in major urban areas such as; Colombo, Kandy, Gmapaha, Kaluthara, Galle and Rathnapura show the similar trend. The monitoring results also indicate that the pollution levels in 2017 were relatively high compared to that of 2016 & 2015. This increasing of pollutants could be due to the increase of vehicular population (especially low engine capacity cars) and urbanization impact. The data also shown that annual average of NO_2 concentration in some areas in Colombo and Kandy urban areas exceeded the WHO annual Guideline value for NO_2(***Figure23 & 25***). The annual average levels of SO_2 in some areas of Colombo urban area exceeded the 2nd Interim value for $SO_2$and it was marginal at Gampaha and Gall urban areas (***Figure 23, 24 & 27***).

Annual average NO_2 concentration levels of each selected urban area in 2017 are represented in ***Figure 29***. According to the results, maximum average NO_2 level in the year 2017 was recorded in Colombo urban area. Kandy urban area has next highest average NO_2 level among other urban areas. Out of 6 urban areas Galle urban areas shows lowest average pollution with respect NO_2.Annual average SO_2 concentration levels of each selected urban area in 2017 are represented in ***Figure 30***. According to the results, maximum SO_2 level in the year 2017 was recorded in Colombo urban area where as the minimum SO_2 level was recorded in the Kalutara urban area.

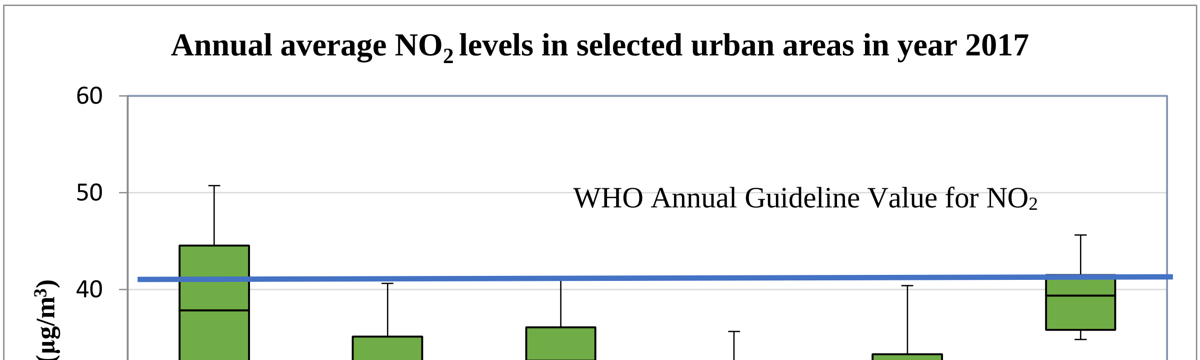


Figure29: *Annual average NO_2levelsin selected urban areas in year 2017*

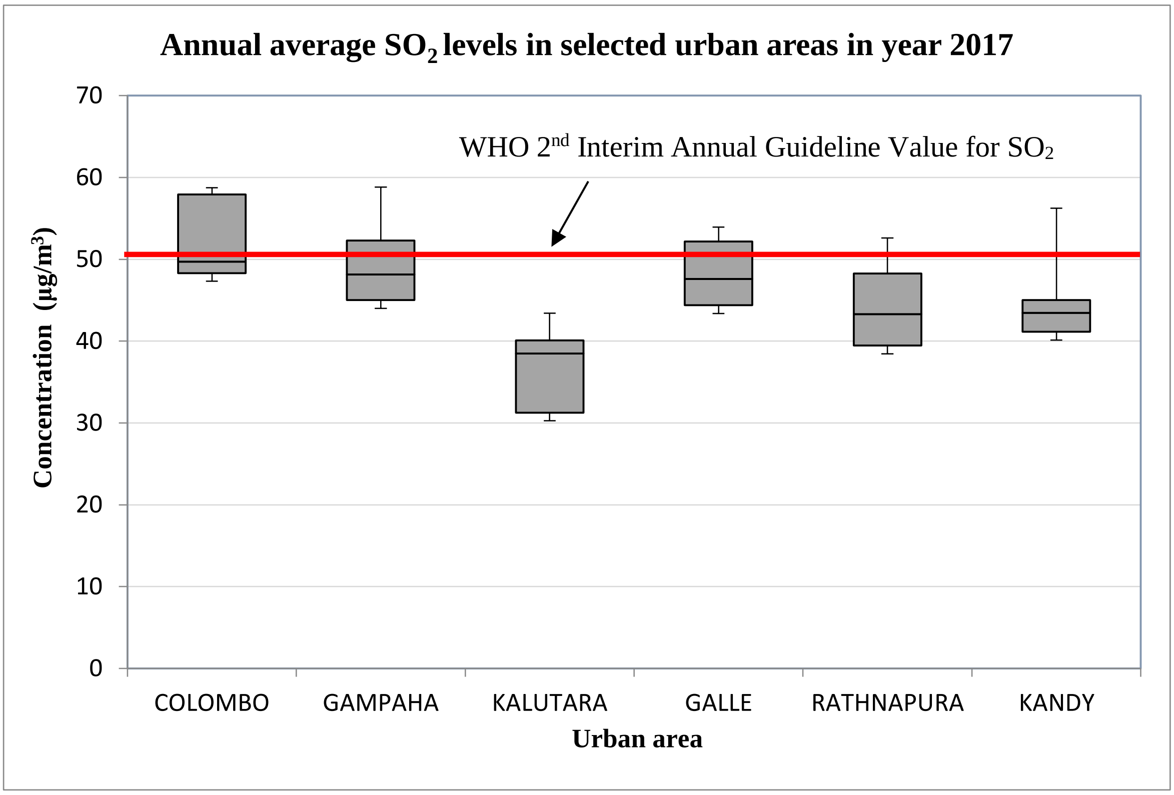


Figure30: *Annual average SO_2levels in selected urban areas in year 2017*

4. TIME SERIES ANALYSIS

The monthly average variation patterns of NO_2 and SO_2 levels from year 2013 to 2017 in Colombo urban area is summarized in ***Figure 31***. Accordingly, monthly averages of SO_2 and NO_2 start at relatively high level in January and gradually decrease up to mid-year and again increase at the end of the year. this indicates the pollutant levels are highly subjected to local wind patterns in which shows a high exposure levels during North East monsoon period (November – February) while showing lower exposure levels during the South West monsoon (May- August). The difference of the pollutant levels in the NE monsoon period is about 2 to 3 times than the pollutant levels SW monsoon in each year. This phenomenon could be due to the low dispersion of pollutant during North East monsoon in which make wind shear by prevailing and sea winds or it may be due to movement of pollutant loads which generate in thermal power plants and in industries which are located Northern part of the Colombo city. However, at some monitoring points in Colombo were deviate from this pattern and may be due to localized wind currents. All these observations clearly indicate the impact of weather condition on air pollutants dispersion in the urban area. Although, there was a significant different in the pollutant levels in these two monsoonal seasons it is unable to assess the health impact due to unavailability of short-term pollutant levels.

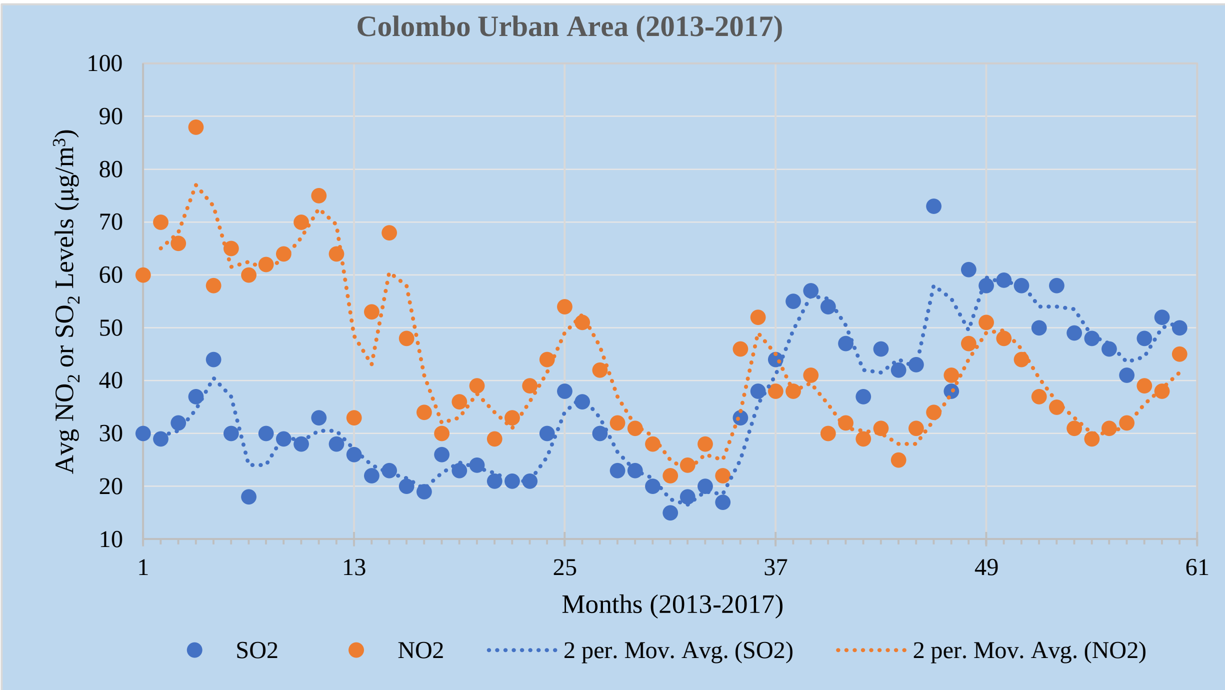


Figure31: *Monthly average SO_2 and NO_2 level trends during 2013-2017 in Colombo urban area*

The time series analysis of air quality data in Kaluthara (***Figure 32***) and Rathnapura (***Figure 33***) urban areas are also shows similar patterns as in Colombo urban area over the time. The difference between the highest and the lowest levels in above two urban areas were not significant and could be due to the absence of industrial areas around those two urban areas.

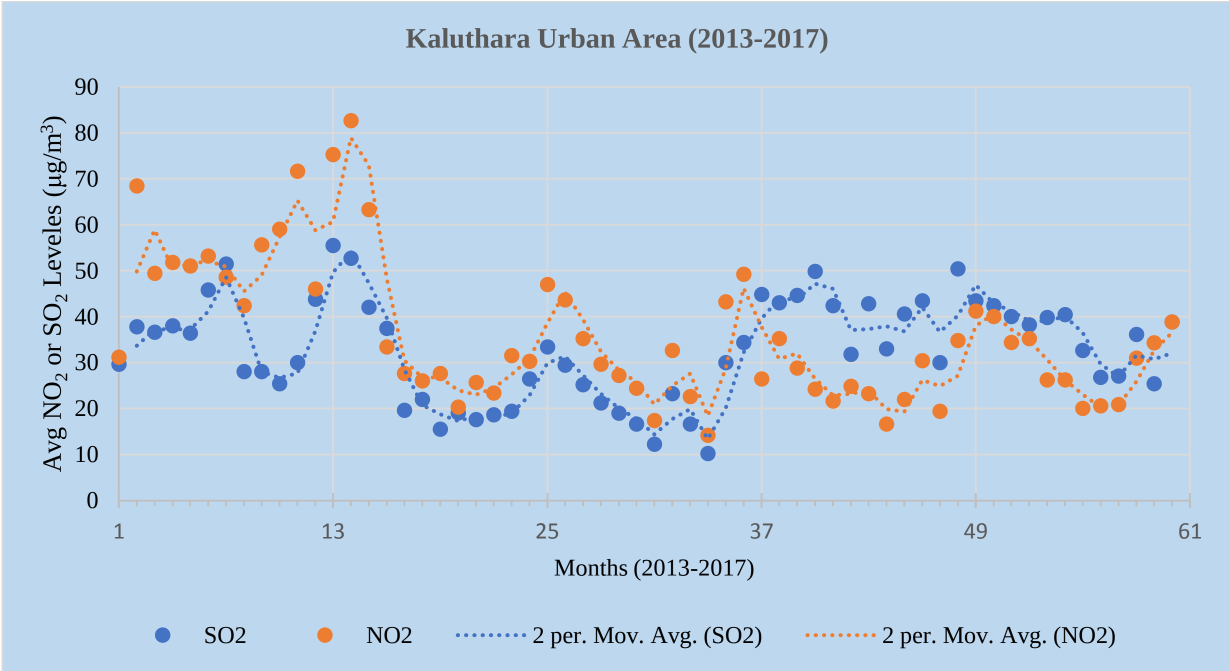


Figure 32: *Monthly average SO_2 and NO_2 level trends during 2013-2017 in Kaluthara urban area*

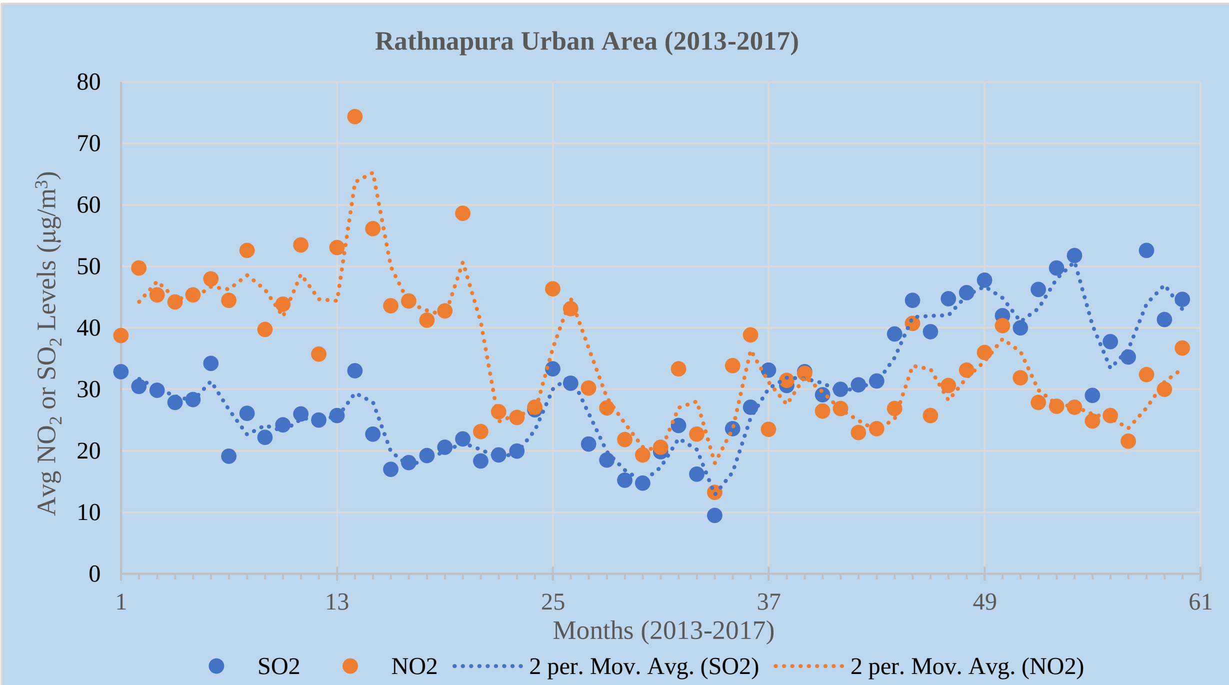


Figure 33: *Monthly average SO_2 and NO_2 level trends during 2013-2017 in Rathnepura urban area*

In Gall and Gampaha urban areas, the peak levels are observed from February to May (1st Intermonsoon) and the difference between the highest and the lowest levels in Gampaha and Gall urban areas are less than two times(***Figure 34 & 35***).

***Figure 34:** Monthly average SO_2 and NO_2 level trends during 2013-2017 in Gampaha urban area*

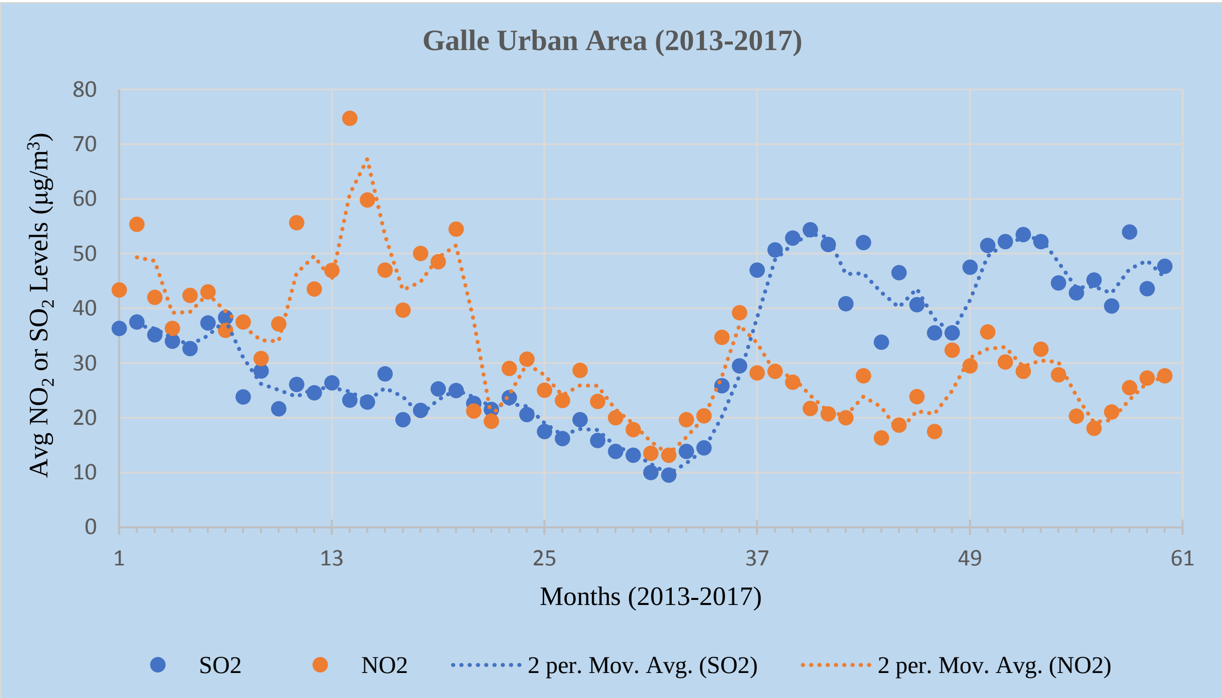


***Figure 35:** Monthly average SO_2 and NO_2 level trends during 2013-2017 in Galle urban area*

Monthly mean values of NO_2 and SO_2 concentrations of monitoring stations at Kandy urban area from 2014 to 2017 was illustrated on ***Figure 36***. In Kandy urban area the time series analysis shows the same pattern as in Colombo urban area by eliciting the peak concentration levels on month of November to February. Which means there is an effect of North East Monsoon for the pollution concentrations? Even though, in the past years from 2014 to 2016 the exposure levels of NO_2 is almost always greater than the WHO standards currently the monthly average is under the WHO annual guideline values.

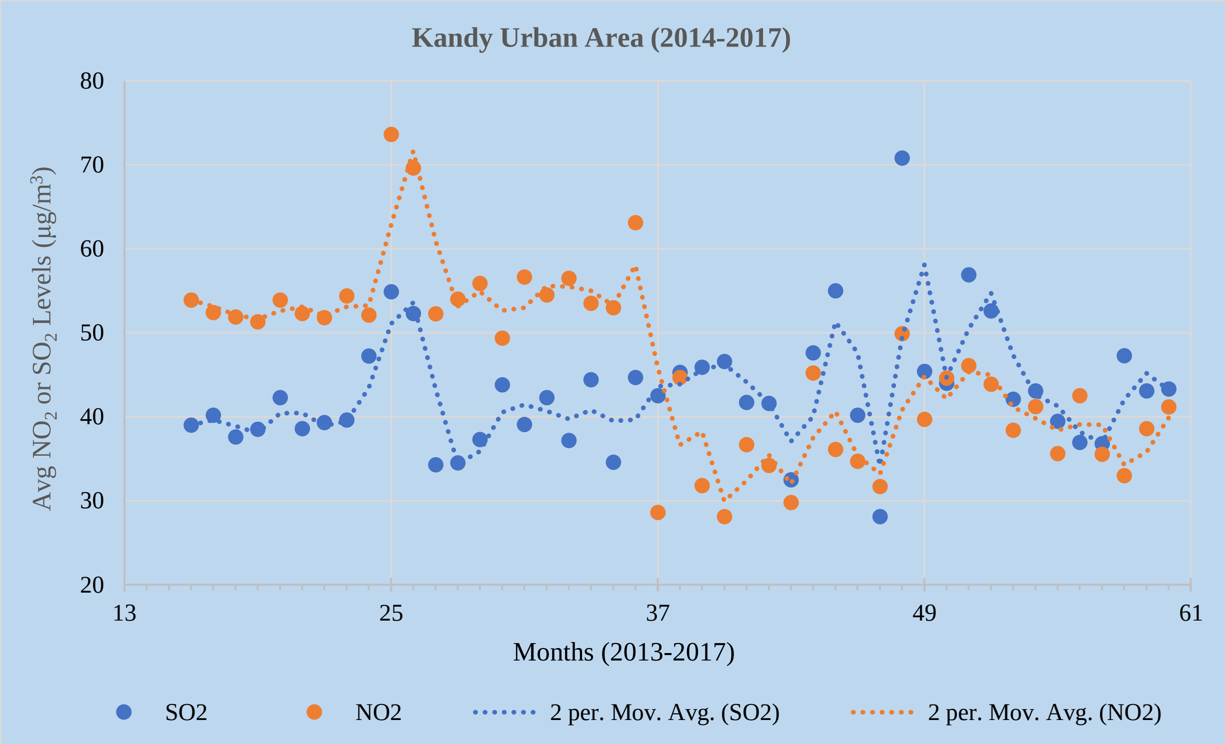


Figure36: *Monthly average SO_2 and NO_2 level trends during 2014-2017 in Kandy urban area*

The time series analysis alsoindicates the NO_2 levels in urban areas were slightly decreasing while increasing the SO_2 levels. This condition leads to convert the dominate pollutant of NO_2 to SO_2 during 2016. This change may be due to use of high polluting passenger and good transporting vehicles in urban areas rather than cleaner fuel light duty vehicles.

5. CORRELATION ASSESSMENTS

Continuous air quality data collected by passive sampling monitoring network of each selected urban area were asses with the Socioeconomic, Crop Production (Paddy production), Climatic, and Vehicular population data of the same urban area to find any correlation with air pollutant

(NO_2andSO_2) levels. The reliable data on above variable were available as an annual average for the limited time period (5 years), it could not able to analyses for longer period by time series analysis and only asses by correlation analysis. Therefore, the outcome of the assessment will some time not at the level of satisfactory due to the limitation of available data.

5.1 Correlation Analysis of Population Density with Air Quality

The correlation analysis of annual population density with the annual average concentration of NO_2 and SO_2 levels in Divisional Secretary (DS) area of Colombo urban area are illustrated in ***Figure 37, 38, 39, 40*** and ***41***. The result indicates that the population densities at all DS areas are negatively correlated with NO_2 levels and positively correlated with SO_2. However, the correlations were not significant for both pollutants since $P>0.05$.

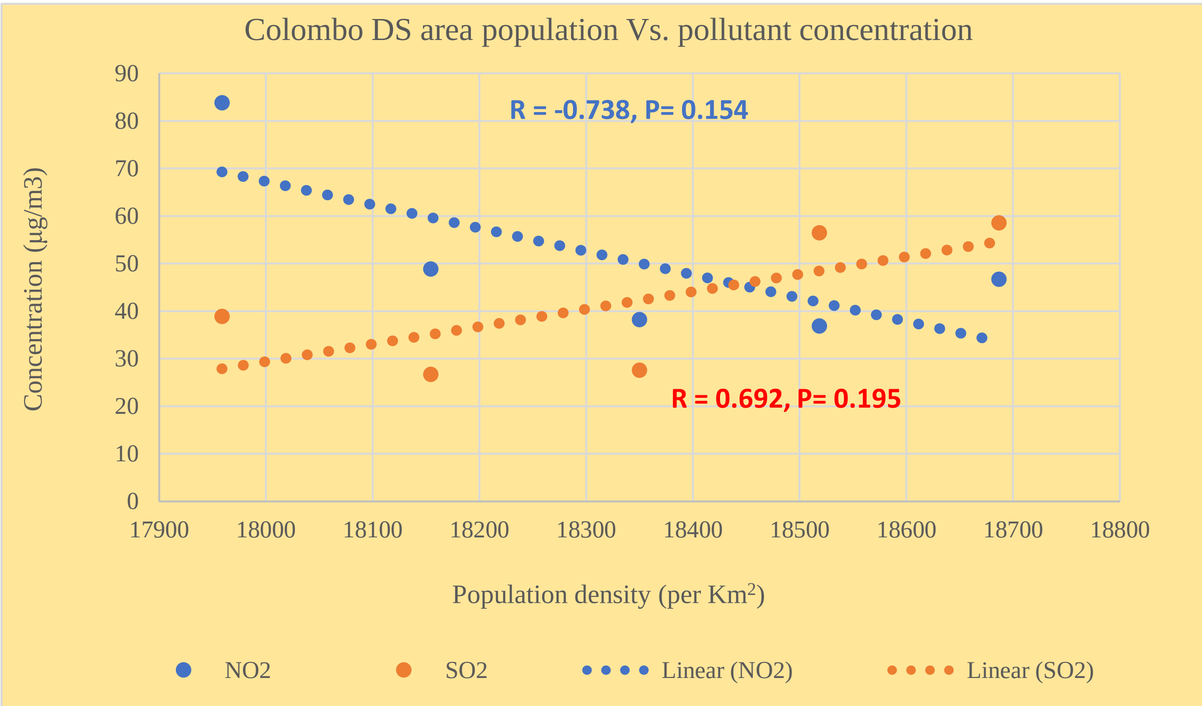


Figure 37: *Scattered plot of population density and pollutants level respect to NO_2 and SO_2 in past five years (2013-2017)in Colombo DS of Colombo Urban area*

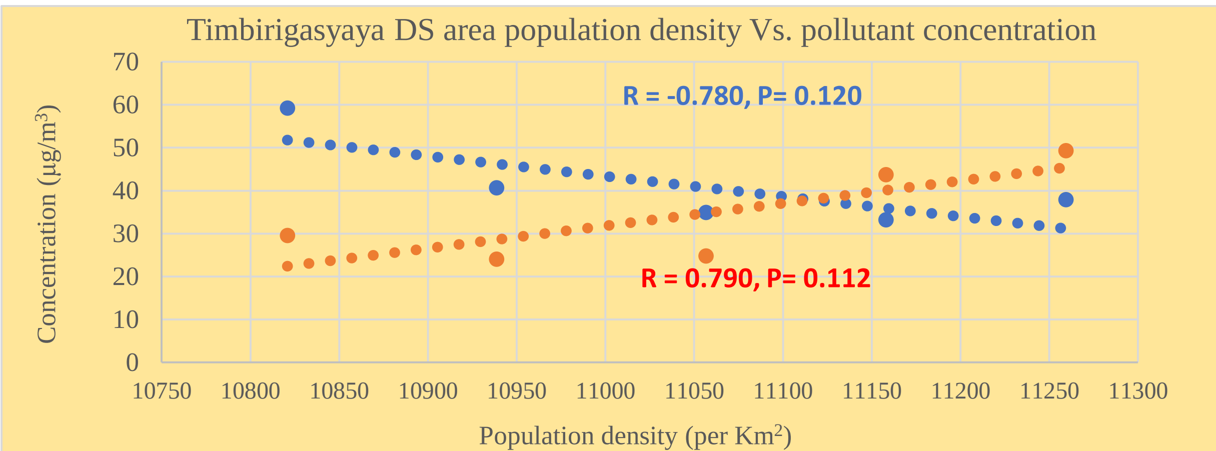


Figure 38: *Scattered plot of population density and pollutants level respect to NO2 and SO2 in past five years (2013-2017) in Thimbirigasyaya DS of Colombo Urban area*

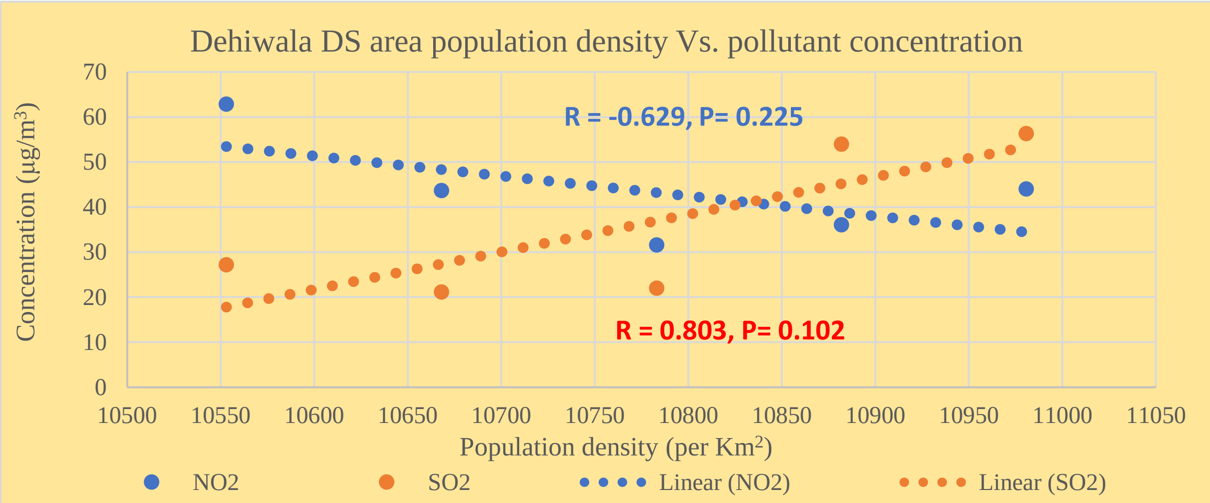


Figure 39: *Scattered plot of population density and pollutants level respect to NO_2 and SO_2 in past five years (2013-2017)in Dehiwala DS of Colombo Urban area*

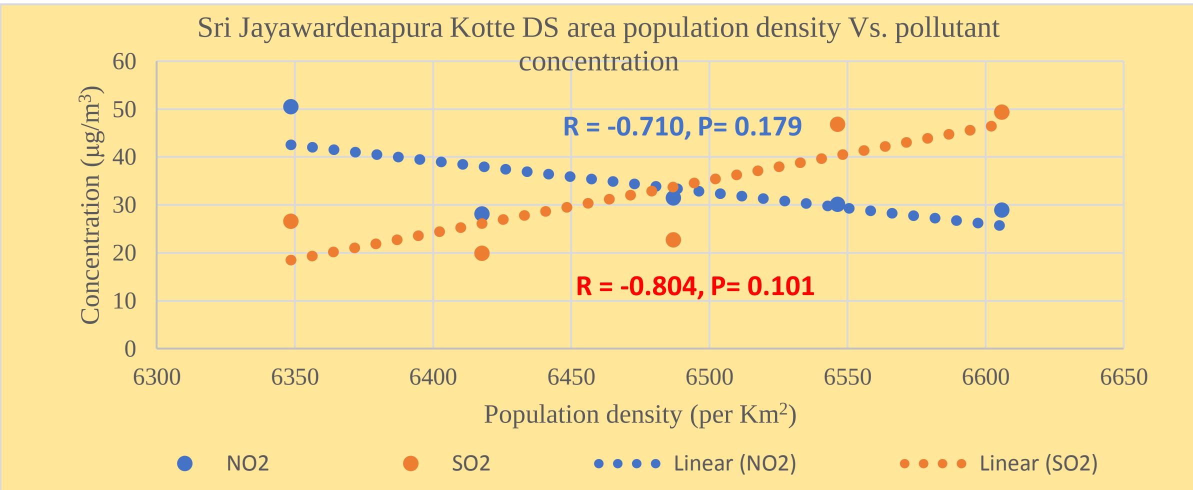


Figure 40: *Scattered plot of population density and pollutants level respect to NO2 and SO2 in past five years (2013-2017) in Sri Jayawardenapura Kotte DS of Colombo Urban area*

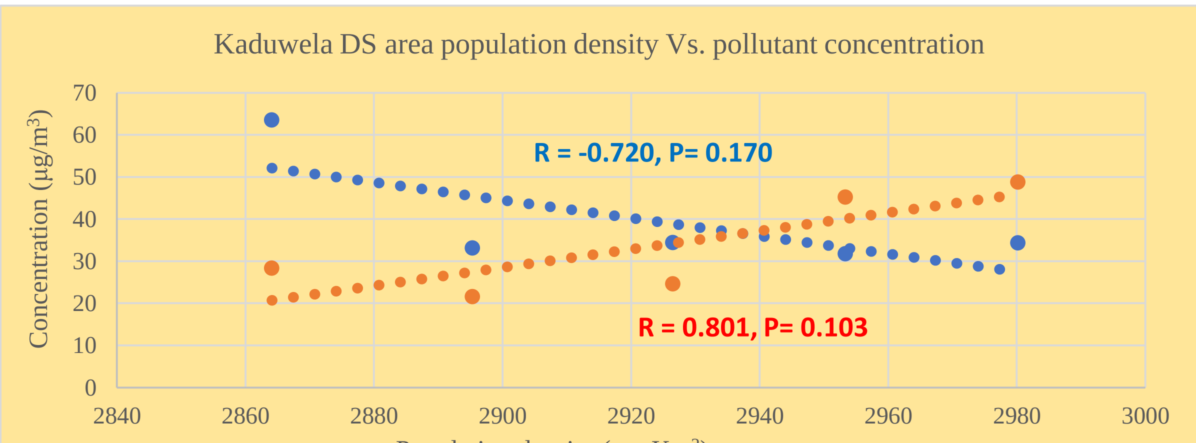


Figure 41: *Scattered plot of population density and pollutants level respect to NO_2 and SO_2 in past five years (2013-2017)inKaduwela DS of Colombo Urban area*

The correlation analysis of annual population density with the annual average concentration of NO_2 and SO_2 levels in Divisional Secretary area of Kelaniya and Gampaha urban areasare illustrated in ***Figure 42*** and ***43***. The result indicates that the population densities at Kelaniya DS areas are shows negative correlation with NO_2 levels and positive correlation with SO_2. However, the correlations were not significant for both pollutants since $P>0.05$. However, at Gampaha DS areas are shows negative correlation with NO_2 levels and positive correlation with SO_2. The correlation was significant with compared to NO_2 where $P<0.05$, and not significant when compared to SO_2 where $P>0.05$.

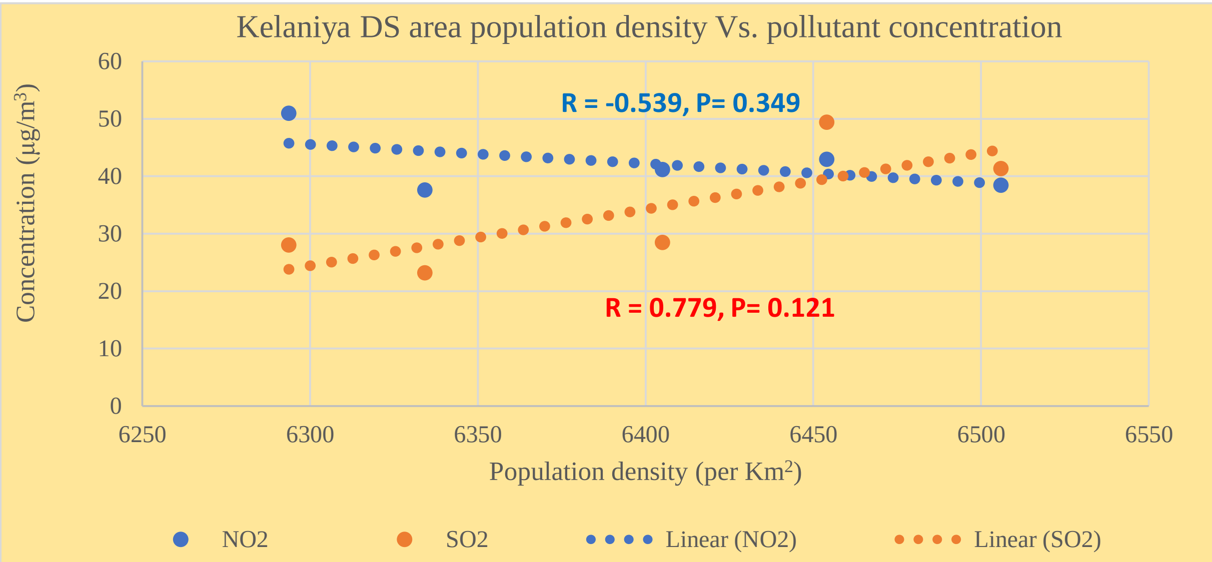


Figure 42: *Scattered plot of population density and pollutants level respect to NO_2 and SO_2 in past five years (2013-2017)in Kelaniya DS of Gampaha Urban Area.*

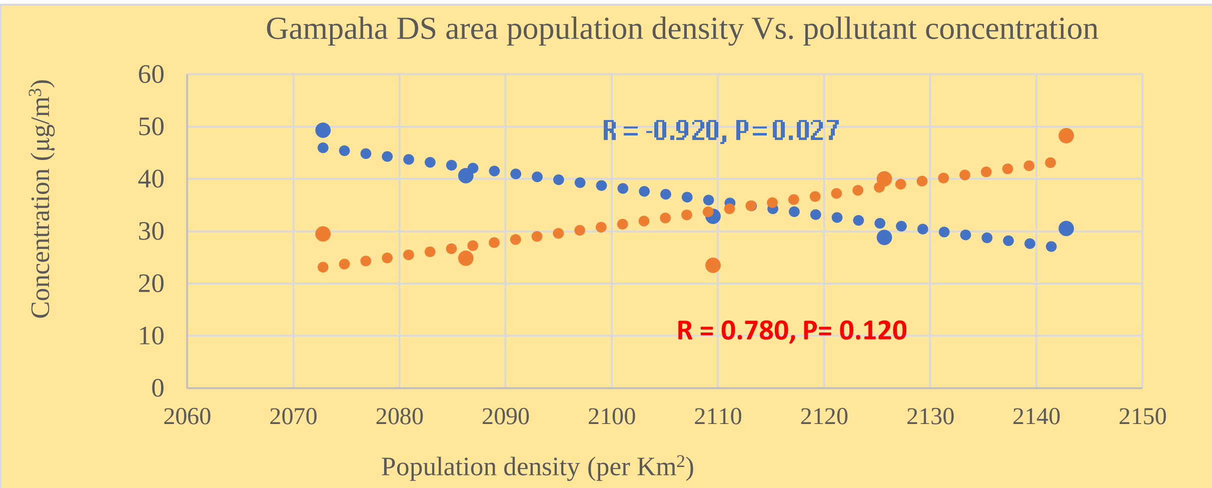


Figure 42: *Scattered plot of population density and pollutants level respect to NO_2 and SO_2 in past five years (2013-2017) in Gampaha DS of Gampaha Urban Area.*

The correlation analysis of annual population density with the annual average concentration ofNO_2 and SO_2 levels in Divisional Secretary area of Pasbagakorale, Kandy urban area are illustrated in ***Figure 44***. The result indicates that the population density at Pasbagakorale DS area shows a negative correlation with NO_2 levels while showing a positive correlation with SO_2. However, the correlations were not significant for both pollutants since P>0.05.

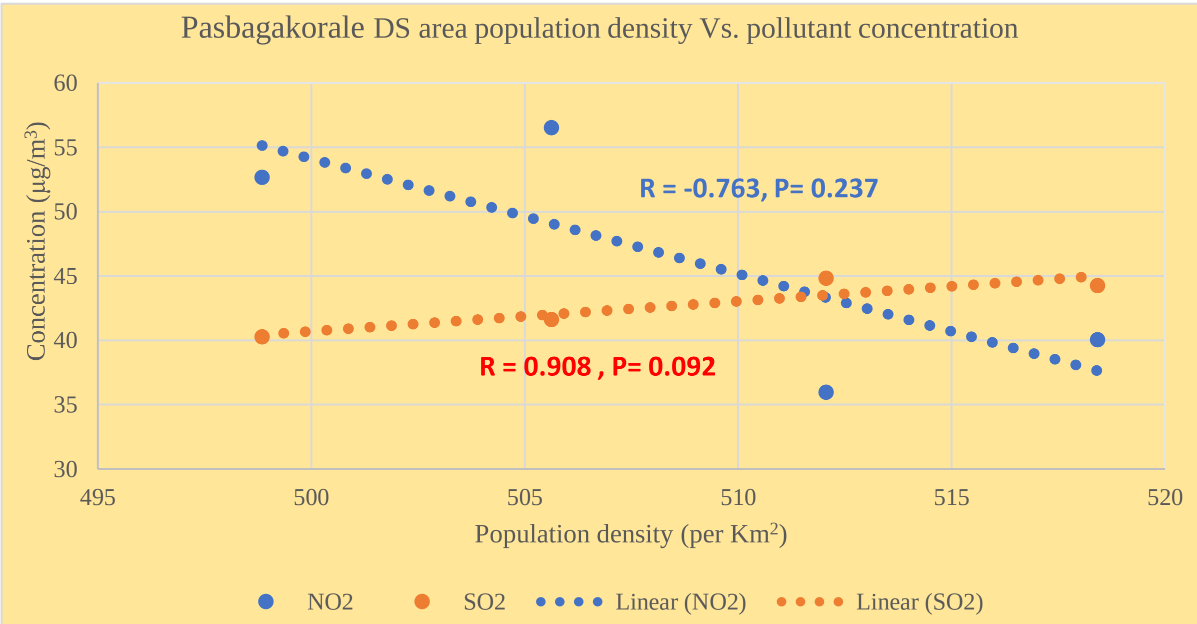


Figure 44: *Scattered plot of population densityand pollutants level respect to NO_2 and SO_2 in past four years (2014-2017)in Pasbagakorale DS, Kandy Urban area.*

The correlation analysis of annual population density with the annual average concentration of NO_2 and SO_2 levels in DS area of Kaluthara and Horana urban areas are shown in ***Figure 45***and ***46***. The result indicates that the population density at Kaluthara DS area shows a negative correlation with NO_2 levels while showing a positive correlation with $SO_2$and the correlations were not significant for both pollutants since P>0.05.

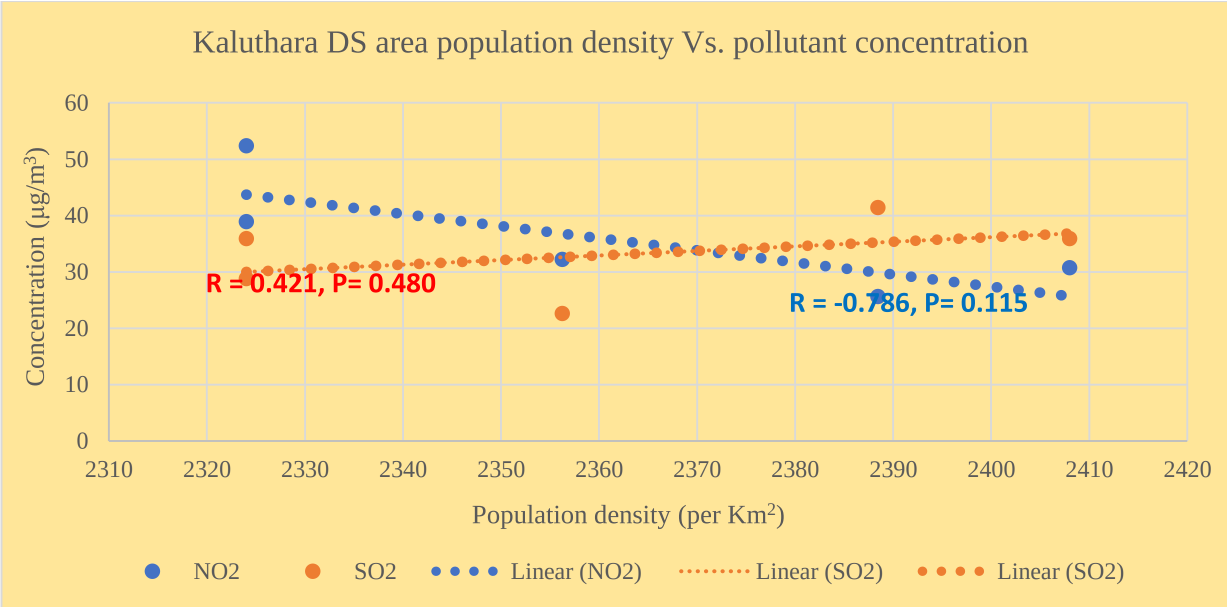


Figure 45: *Scattered plot of population density and pollutants level respect to NO_2 and SO_2 in past four years (2013-2017) in Kaluthara DS of Kalutara urban area*

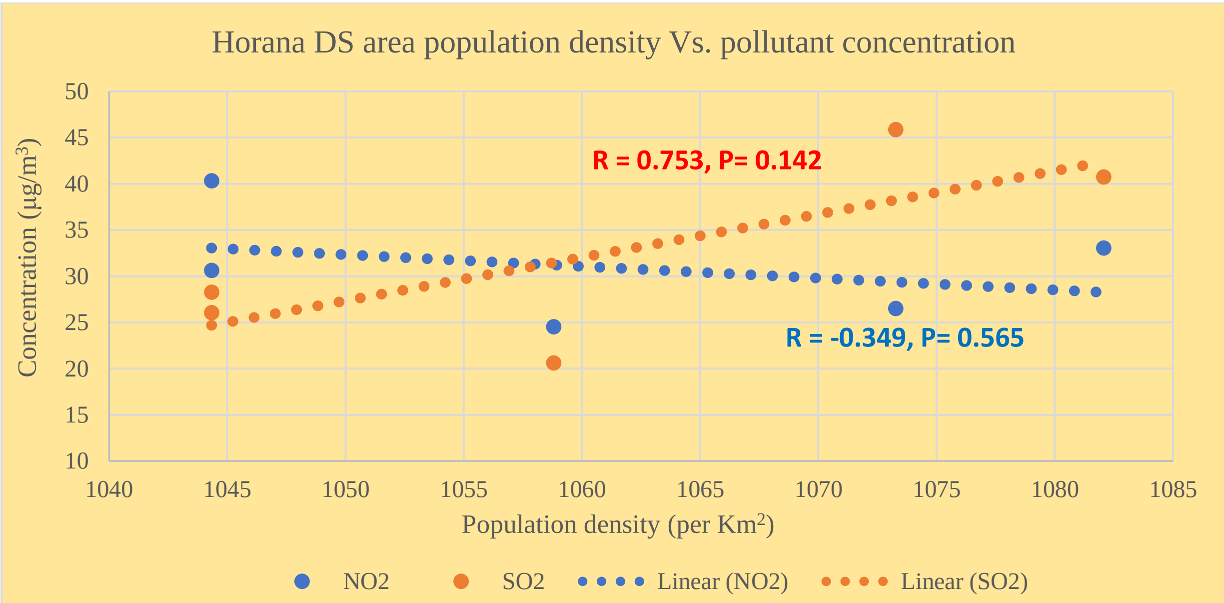


Figure 46: *Scattered plot of population density and pollutants level respect to NO_2 and SO_2 in past four years (2013-2017) in Horana DS of Kalutara urban area*

The correlation analysis of annual population density with the annual average concentration of NO_2 and SO_2 levels in Divisional Secretary area of Rathnapura urban area is shown in ***Figure 47***. The result indicates that the similar correlation as in other urban areas where the negative correlation with NO_2 levels while showing a positive correlation with SO_2. However, the correlation with NO_2 is statistically significant ($P<0.05$) while the correlation with SO_2 is not($P>0.05$) significant.

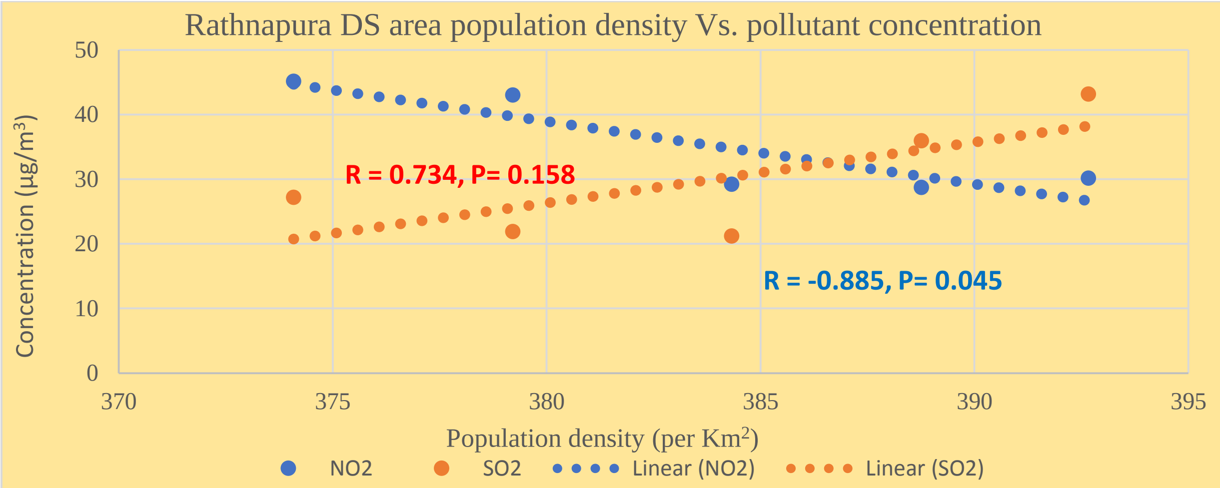


Figure 47: *Scattered plot of Rathnapura DS population density and pollutants level respect to NO_2 and SO_2 in past four years (2013-2017)*

The correlation studies of population density with air pollutants at all most all DS in above selected urban areas specify that the population density is negatively correlate with NO_2 and positively correlate with SO_2. However, these correlations are not significant with bothpollutants except NO_2 levels at Gampaha and Rathnapura urban areas. Although, the population of each urban area was slightly increasing annually due to population growthand urbanization, the pollutant levels were varied with the management actions, metrological conditions, fuel usage, vehicular fleet and other related factors. Therefore, the observed correlations of air pollutant with population density cannot be elucidate well since Sri Lanka has taken many stapes to control air pollution in urban areas which change annual pollutant levels in each urban area. This scenario is further make clear with the study of correlation of annual population density of each urban area with annual average pollutant level in 2017 as shown in Figure 48. Accordantly, the annual population density in each urban area is positively correlated with the respective annual average concentration of NO_2 and SO_2 levels in each Divisional Secretariat regardless of the location for the year 2017. Also the result indicates that the correlations were significant with both pollutants NO_2 and SO_2providing the $P<0.05$.

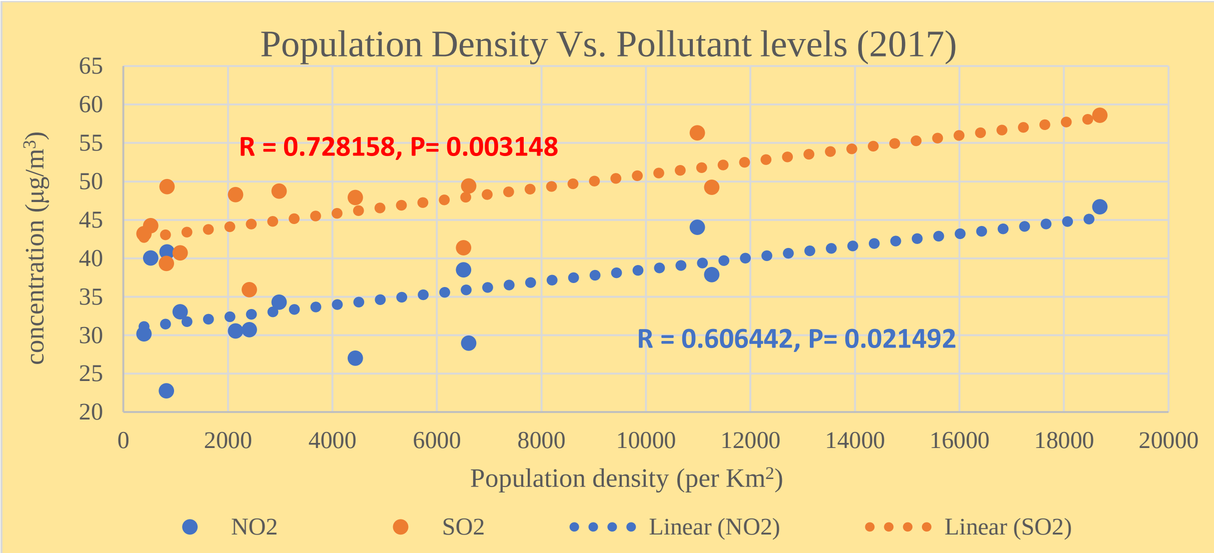


Figure 48: *Scattered plot of population density and pollutants level respect to NO_2 and SO_2 in 2017at each urban area.*

5.2 Correlation Analysis of Registered Vehicle Density with Air Quality

The correlation analysis of annual registered vehicle density with the annual average concentration of NO_2 and SO_2 levels in Divisional Secretary area of Colombo, Sri Jayawardenapura Kotte, Dihiwala and Kaduwela area are illustrated in ***Figure 49, 50, 51*** and ***51***. The result indicates that the registered vehicular densities at other DS areas except Kaduwela DS area were negatively correlated with respective annual NO_2 levels and positively correlated with SO_2. In Kaduwela DS area both NO_2 and SO_2 levels were positively correlate with registered vehicle density in the area. However, all the correlations were not statistically significant providing $P>0.05$.

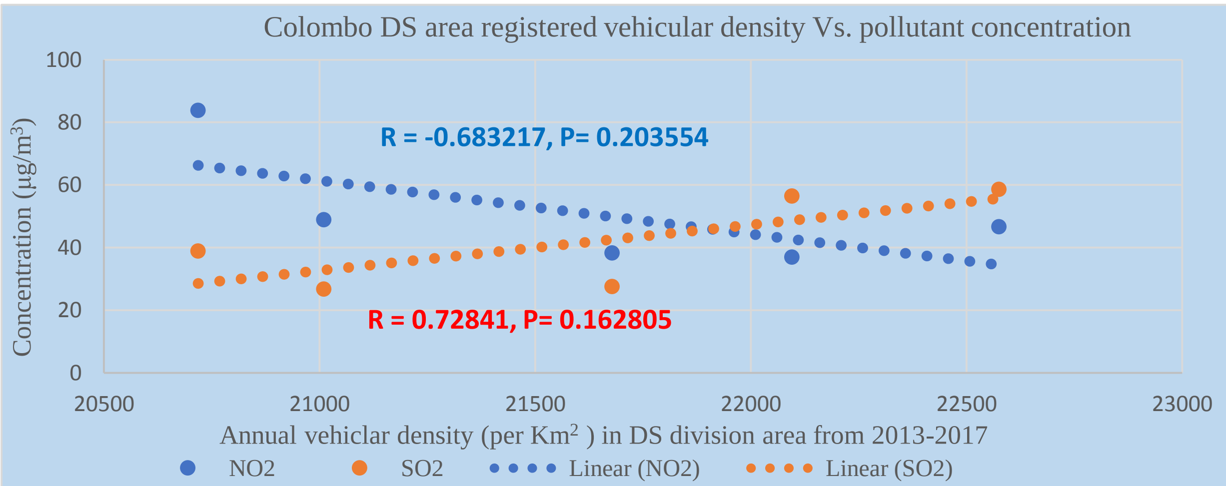


Figure 49: *Scattered plot of registered vehicular density and pollutants level respect to NO_2 and SO_2 in past four years (2013-2017) inColombo DS*

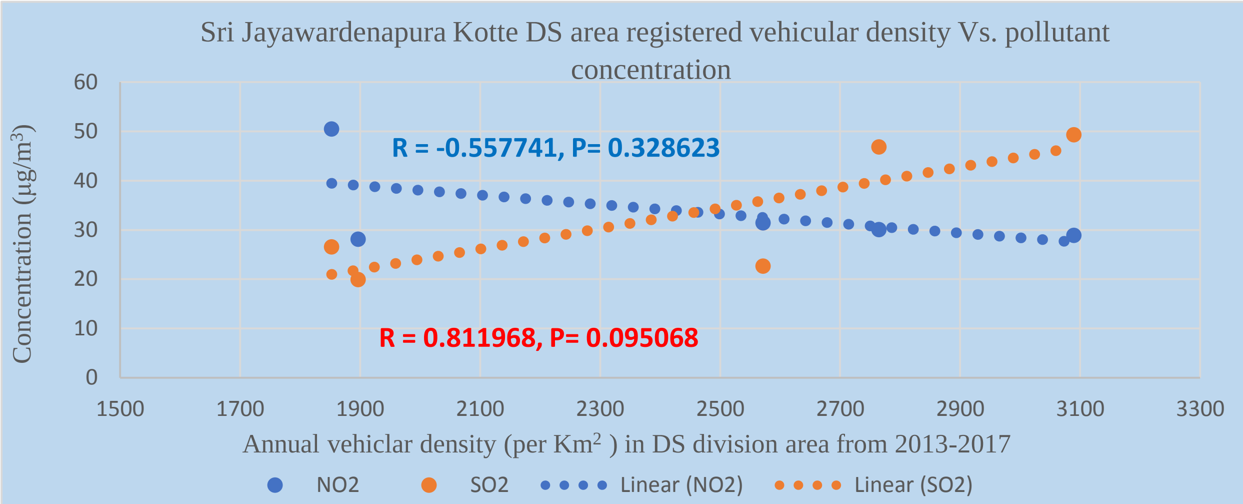


Figure 50: *Scattered plot of registered vehicular density and pollutants level respect to NO_2 and SO_2 in past four years (2013-2017) in Sri Jayawardenapura Kotte DS*

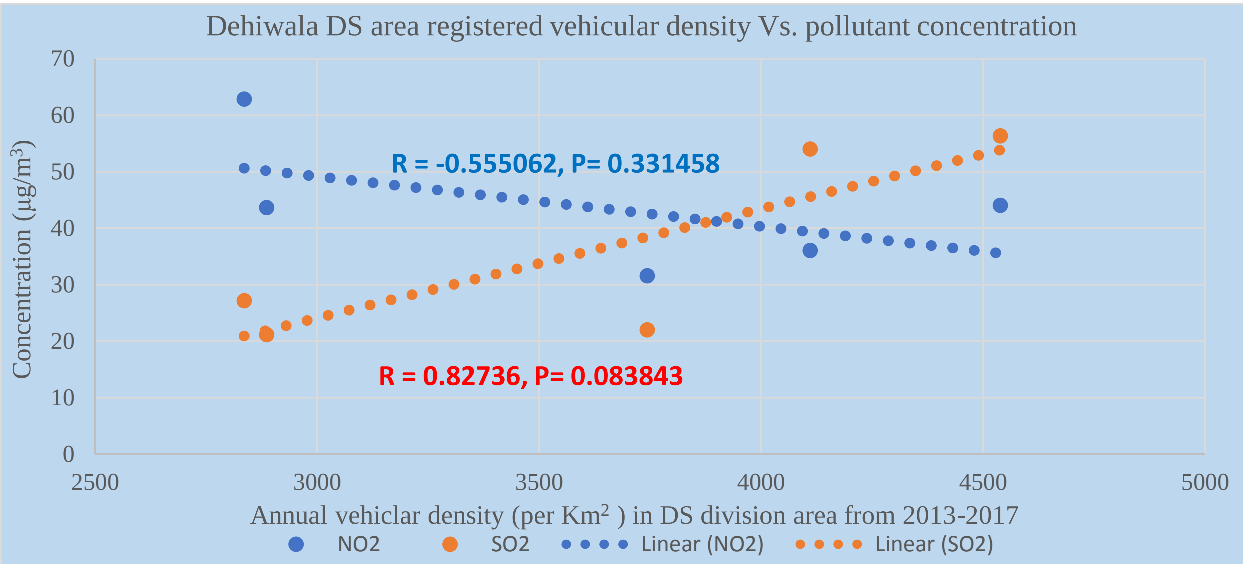


Figure 51: *Scattered plot of registered vehicular density and pollutants level respect to NO_2 and SO_2 in past four years (2013-2017) in Dehiwala DS*

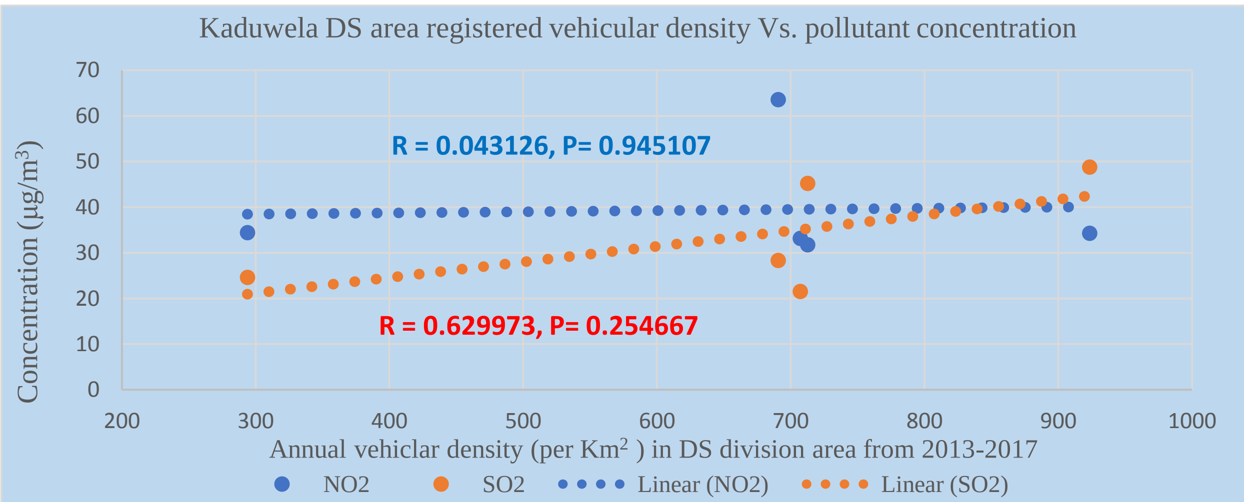
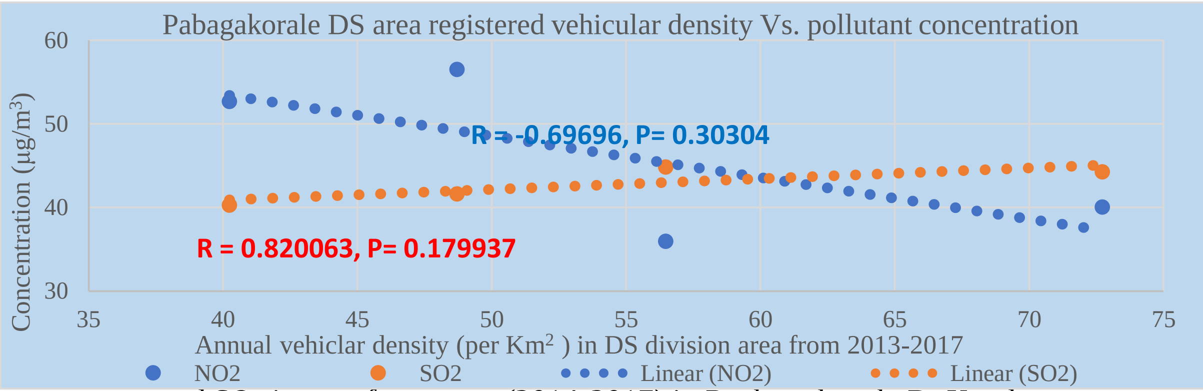


Figure 52: *Scattered plot of registered vehicular density and pollutants level respect to NO_2 and SO_2 in past four years (2013-2017)in Kaduwela DS*

The correlation analysis of annual registered vehicle density with the annual average concentration of NO_2 and SO_2 levels in Divisional Secretary area of Pasbagakorale in Kandy urban area are illustrated in ***Figure 53***. The result indicates that the registered vehicle density at Pasbagakorale DS area shows a negative correlation with NO_2 levels while showing a positive correlation with SO_2. The correlations were not significant for both pollutants since P>0.05.



and SO_2 in past four years (2014-2017) in Pasbagakorale D, Kandy

The correlation analysis of annual registered vehicle density with the annual average concentration of NO_2 and SO_2 levels in Gampaha and Keleniya Divisional Secretaries area of Gampaha urban areas are illustrated in ***Figure 54*** and ***Figure 55***respectively. The result indicates that the vehicular densities at Kelaniya DS area has negative correlation with NO_2 levels and positive correlation with SO_2. However, the correlations were not significant for both pollutants since P>0.05. In contrast, Gampaha DS area shows a high negative correlation with NO_2 levels which is statistically significant whileshowing positive correlation with SO_2that is not statisticallysignificant at p=0.002 (P,0.05) significant level.

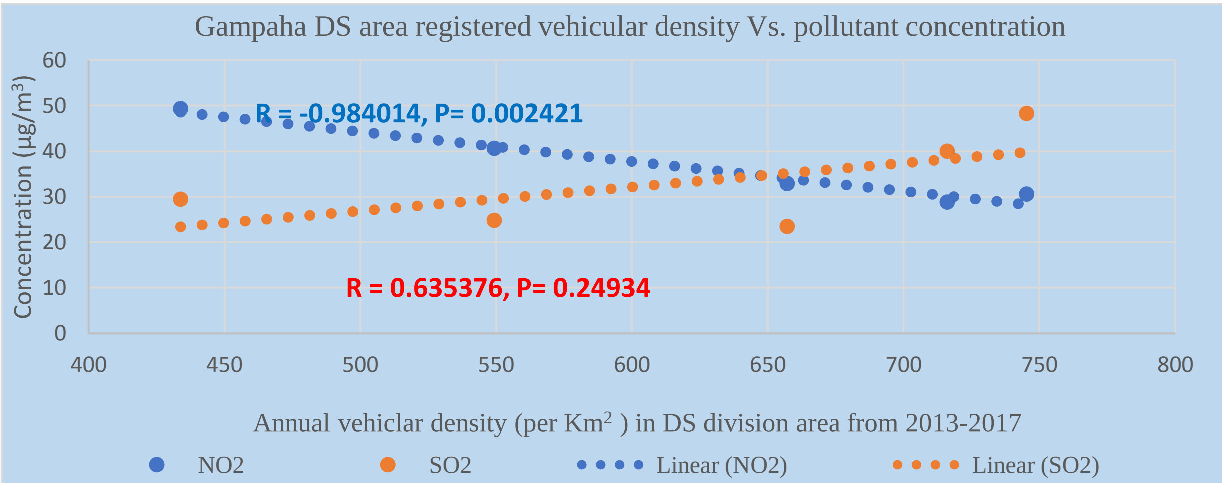


Figure 54: *Scattered plot of Gampaha DS registered vehicular density and pollutants level*

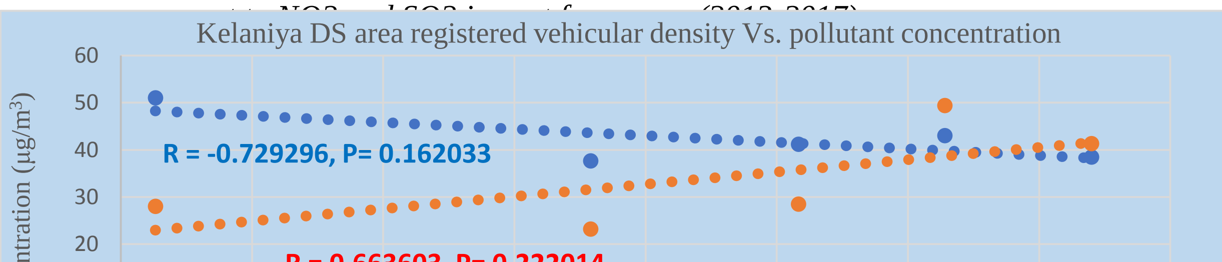


Figure 55: *Scattered plot of Kelaniya DS registered vehicular density and pollutants level respect to NO_2 and SO_2 in past four years (2013-2017)*

The correlation analysis of annual registered vehicle density with the annual average concentration of NO_2 and SO_2 levels in DS area of Kaluthara and Horanaare shown in ***Figure 56***and ***57***. The result indicates weaker correlations which are not significant for both pollutants since P>0.05 in both conditions.

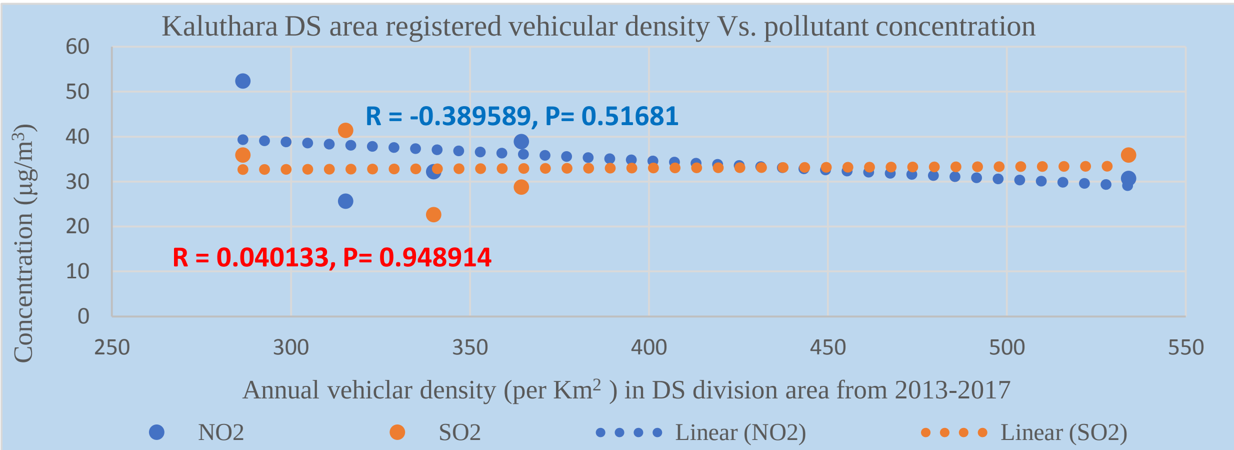


Figure 56: *Scattered plot of registered vehicular density and pollutants level respect to NO_2 and SO_2 in past four years (2013-2017) in Kaluthara DS*

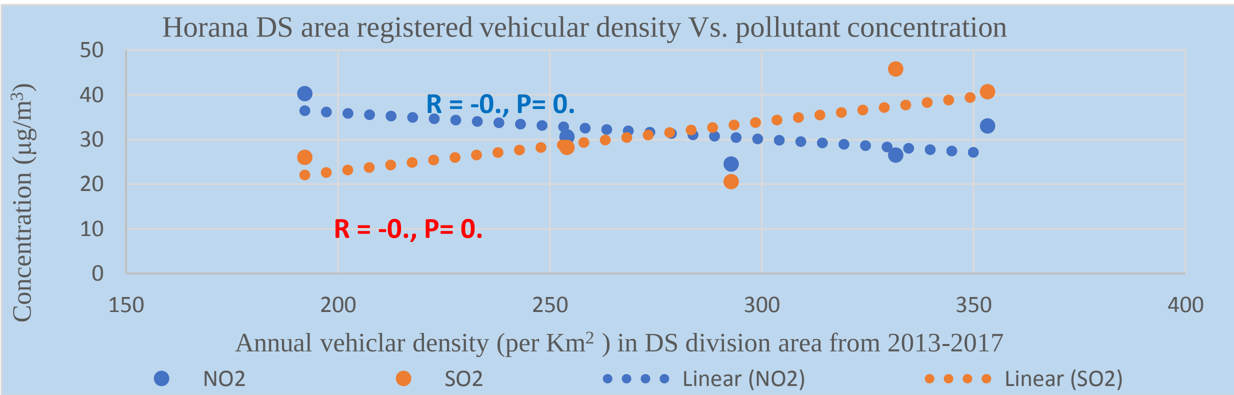


Figure 57: *Scattered plot of registered vehicular density and pollutants level respect to NO_2 and SO_2 in past four years (2013-2017) in Horana DS*

The correlation analysis of annual registered vehicular density with the annual average concentration of NO_2 and SO_2 levels in Divisional Secretary area of Rathnapura urban area is shown in ***Figure 58***. The result indicates that the registered vehicle densities at Rathnapura DS area shows a high negative correlation with NO_2 levels while showing a very weak positive correlation with SO_2. However, the correlations were significant for NO_2 with P=0.05 and not significant for SO_2 since P>0.05.

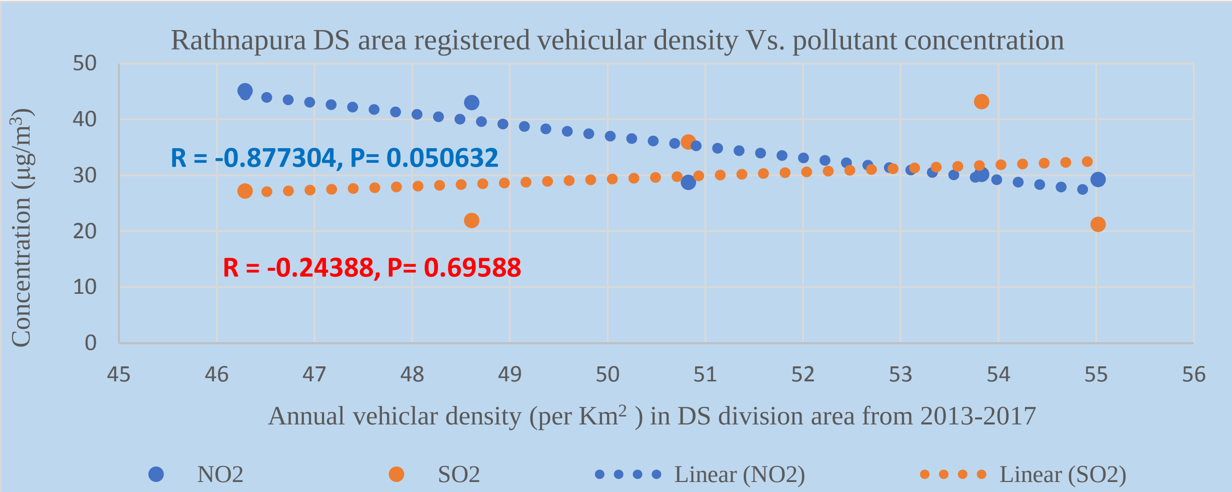


Figure 58: *Scattered plot of registered vehicular density and pollutants level respect to NO_2 and SO_2 in past four years (2013-2017) in Rathnepura DS*

These correlation studies were considered only the registered vehicle density with in the area. It would not represent the vehicles coming to these urban areas from outside areas. Therefore, the actual operation vehicle density of the area would be different and not take for the analysis since there are no such data available. Also pollutant levels of those areas varied with the management actions, metrological conditions, fuel usage, vehicular fleet and other related factors. Therefore, So that, the air pollutants at all most all DS in above selected urban areas shown negatively correlation with NO_2 and positively correlate with SO_2, it will not represent the real condition. This scenario is further explained by the study of correlation of annual registeredvehicle density of each urban area with annual average pollutant level in 2017 as shown in ***Figure 59***. Accordantly, the annual registered vehicle density in each urban area has shown different conditions and positively correlated with the respective annual average concentration of NO_2 and SO_2 levels in each Divisional Secretariat regardless of the location for the year 2017. Also the result indicates that the correlations were significant with both pollutants NO_2 and SO_2providing the P<0.05.

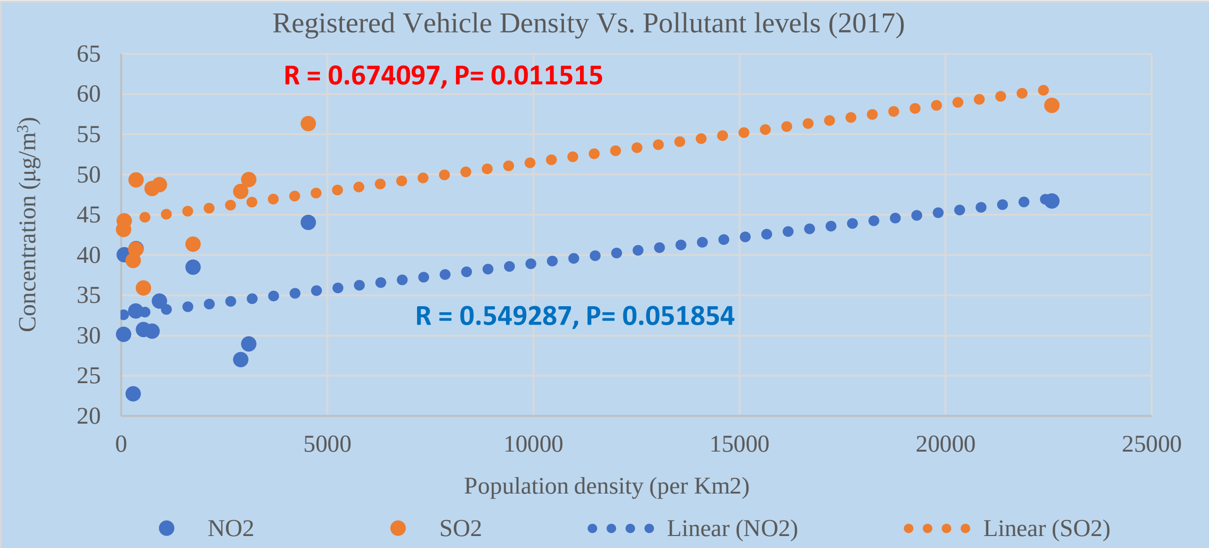


Figure 59: *Scattered plot of registered vehicle density and pollutants level respect to NO_2 and SO_2levels in2017 at different DS area.*

5.3 Correlation Analysis of Air Quality with Agriculture production (Paddy yield)

Sri Lanka is mainly an agriculture based country in which the rice and other agriculture production sector represent considerable fraction of its economy and Gross Domestic Production (GDP). The agricultural sector of the country consists of the domestic sector and the plantation sector. The domestic agricultural sector is synonymous with the rural sector. Although the percent contribution of the agricultural sector to the GDP was around 12% in 2018, its overall contribution to the well being of the country is substantial. Nearly 80 % of the people of Sri Lanka live in the rural areas, and almost all the food crops such as cereals, legumes, field crops, fruits and vegetables produced in the country is meets a substantial amount of the food requirement of the people of the country. Therefore, the assessment of impact of the air pollution on agriculture production is timely needed. However, due to the inadequacy of air quality as well as agriculture production data bases would limit the assessment only to paddy yield. Also, since air quality data were available in urban areas, the assessment is further limited to paddy yield from urban areas which represent less than 20% of the total paddy yield of Sri Lanka.

In Sri Lanka, there are two cropping seasons, Yala and Maha which defines by the different monsoonal seasons. Thereby the paddy yield of those two seasons is analyzed separately to assess the air quality impact on agriculture production in selected urban areas in the study. The scatter plot of air pollutant concentrations of NO_2 and SO_2 levels with the paddy yield of Yala and Maha sessions from the selected urban areas are given in ***Figure 60*** and ***Figure 61*** respectively. Also, the total paddy yield of those two seasons were assess with the air quality levels in urban areas in the study as the scatter plot is given in ***Figure 62***. Accordingly, none of the plot shows correlation between the NO_2 and SO_2 levels with the respective paddy yield.

Although, most of research studies in literatures point out the correlation with crop production and air pollution, our result could not was show such correlation. This may be due to the lack of quality long term air quality data as well as the limited area we consider in our study.

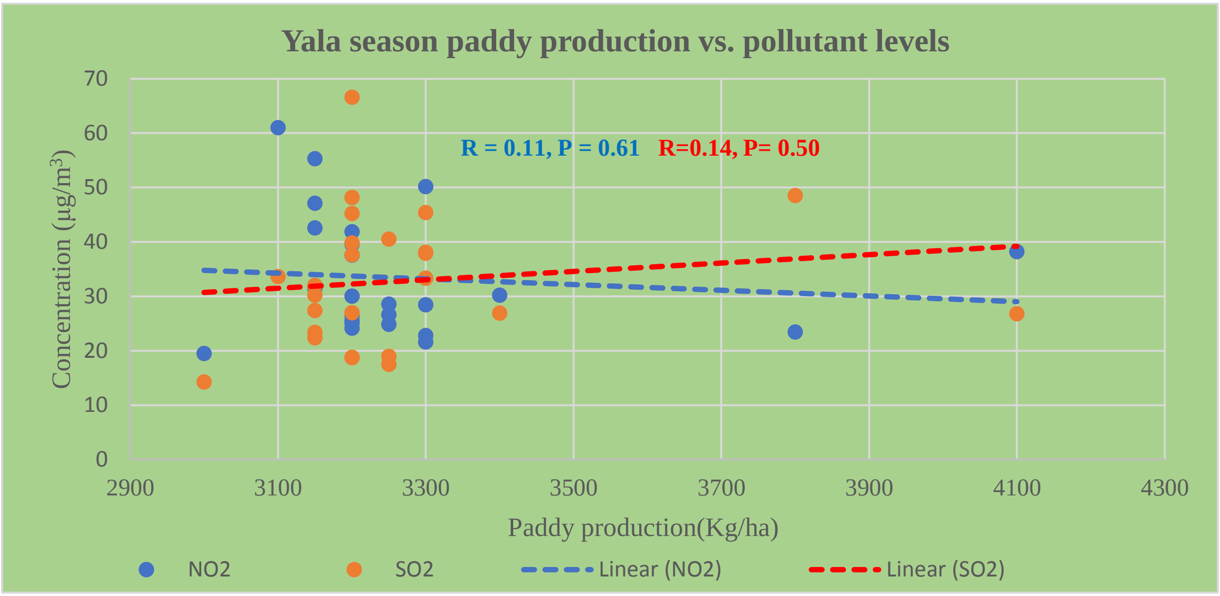


Figure 60*: Scatter plot of paddy production in Yala Season Vs Air pollutant (NO_2& SO_2) levels*

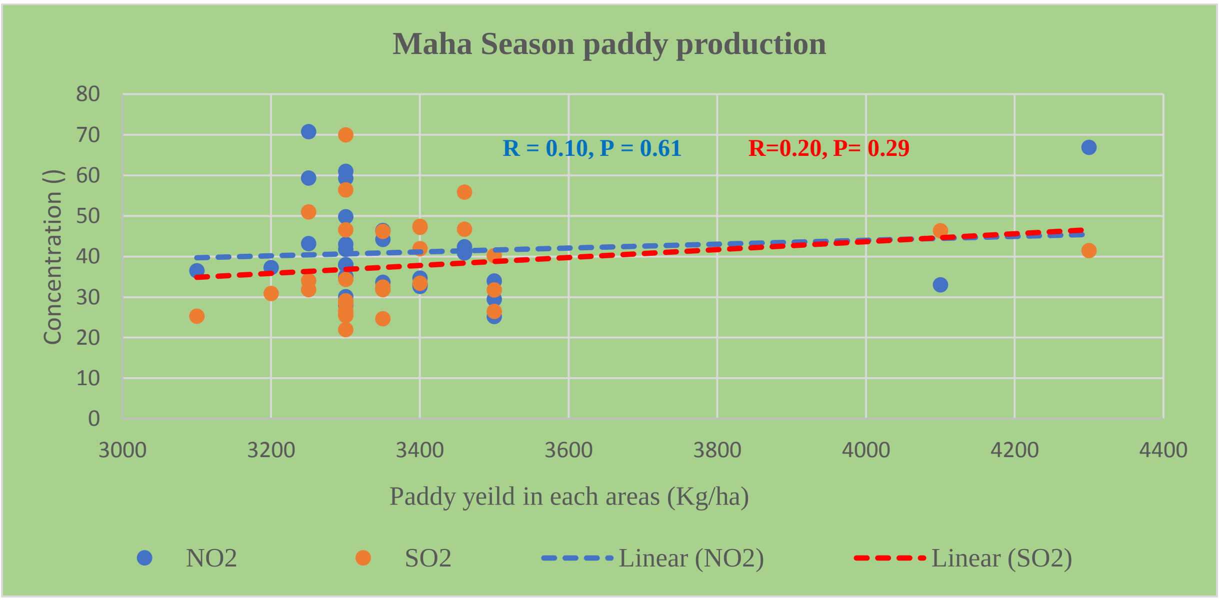


Figure 61: *Scatter plot of paddy production in Maha Season Vs Air pollutant (NO_2 & SO_2) levels*

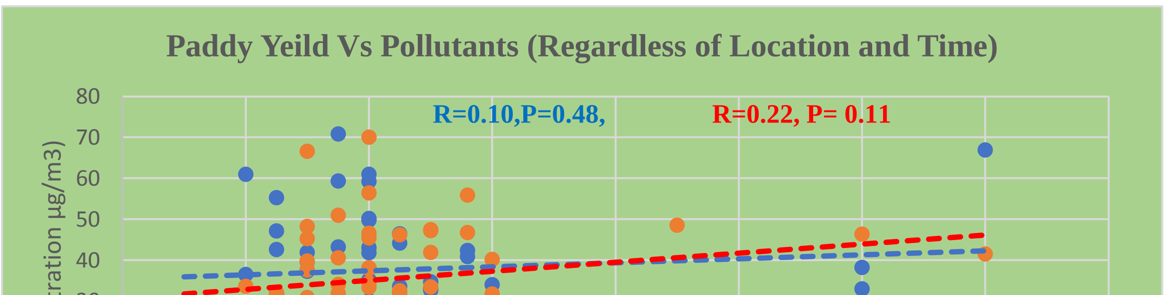


Figure 62:*Scatter plot of total paddy production Vs Air pollutant (NO_2& SO_2) levels*

5.4 Correlation Analysis of Air Quality with Climate Data

Air pollution in an urban area is highly depended on the local climate condition and well as seasonal climate condition. As discussed in time series analysis, it was clearly indicates that the monthly average NO_2 and SO_2 pollutant levels were highly affect by seasonal climatic condition in selected urban areas in Sri Lanka. In addition, the variation of pollutant levels in each selected urban areas were studies with the Temperature, Humidity and Rainfall intensity etc. to assess the impact on local climatic condition.

5.4.1. Temperature

The changes of monthly average NO_2 and SO_2 levels in each urban area with the maximum and minimum temperature of the selected urban area were assessed. The temperature different (different of minimum and maximum) in each urban area was also plotted in same graph to assess any correlation and shown in ***Figure 63 to Figure 73.***

Cording to ***Figure 63***, it is clearly indicated that there is statistically significant weak correlation between NO_2concentrations andthe temperature different at Colombo Urban area. However, there was no correlation with Maximum or Minimum temperature levels and any parameter with SO_2.

In Gampaha urban area, SO_2 levels show statistically significant weak correlation with Maximum temperature of the area as in ***Figure 64***. However, there was no correlation with minimum temperature or temperature different and any parameter with NO_2’

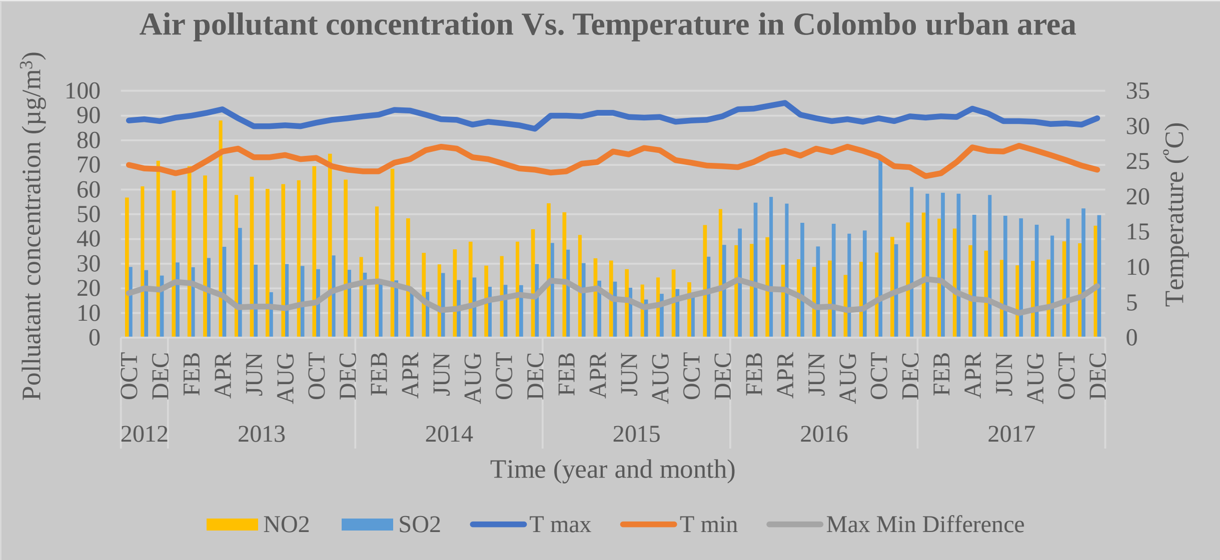


Figure 63: *Air pollution variation with respect to minimum maximum and temperature differences in Colombo urban area from 2012 to 2017*

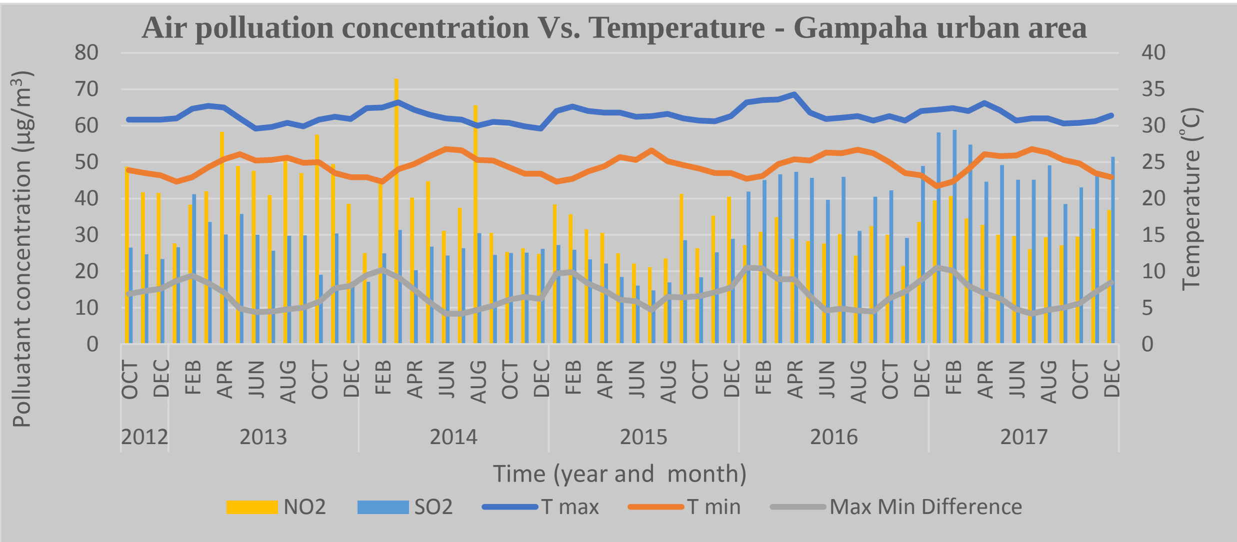


Figure 64: *Air pollution variation with respect to minimum maximum and temperature differences in Gampaha urban area from 2012 to 2017*

According to ***Figure 65***, Bothe NO_2 and SO_2 are shows statistically significant weak correlation with maximum temperature at Kalutara Urban area. However, there was no correlation with Minimum temperature and temperature different.

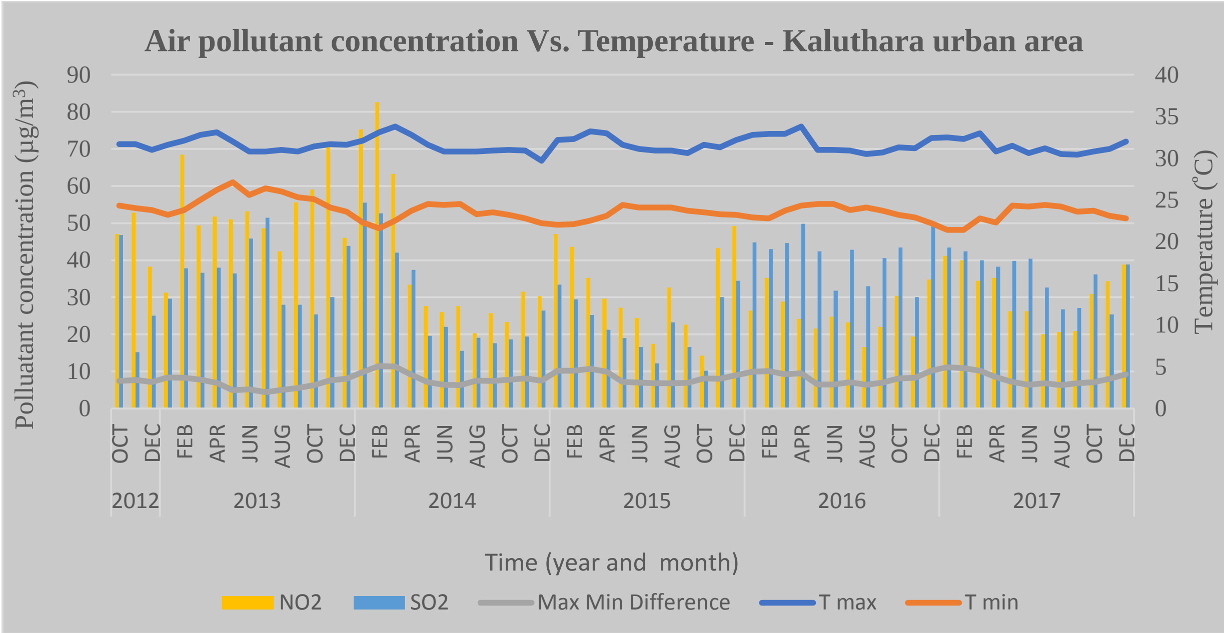


Figure 65: *Air pollution variation with respect to minimum maximum and temperature differences in Kaluthara urban area from 2012 to 2017*

Figure 65 and Figure 66 indicate that NO_2levels in both Galle and Rathnepura Urban areas shows statistically significant weak correlation with Minimum temperature as well as Temperature different in those urban areas. However, there was no correlation with maximum temperature and any parameter with SO_2'

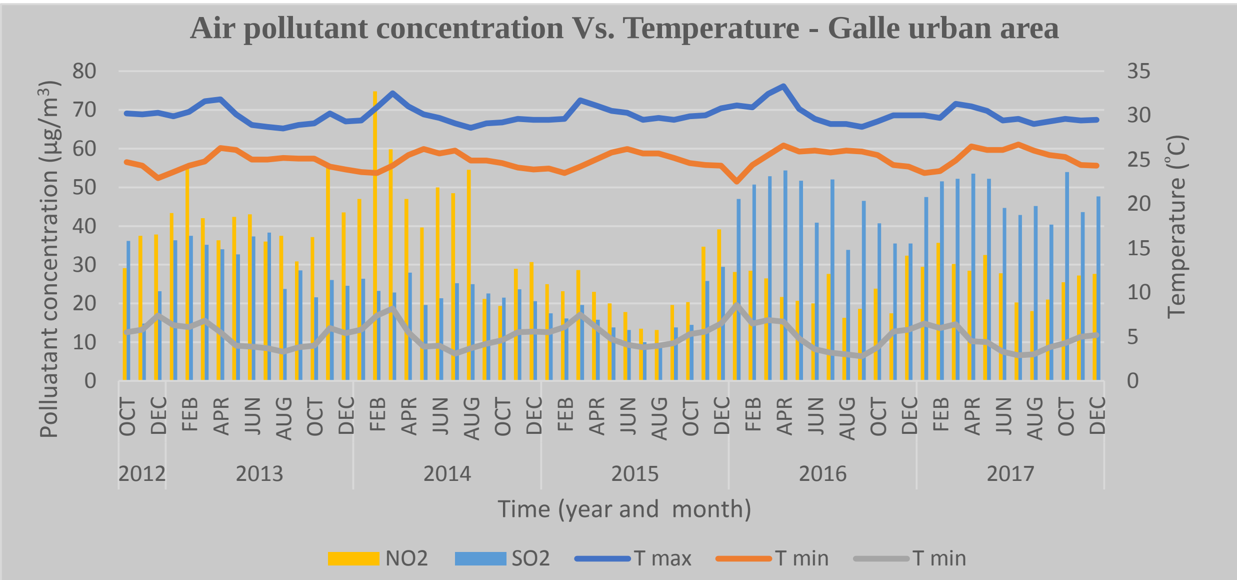


Figure 66: *Air pollution variation with respect to minimum maximum and temperature differences in Galle urban area from 2012 to 2017*

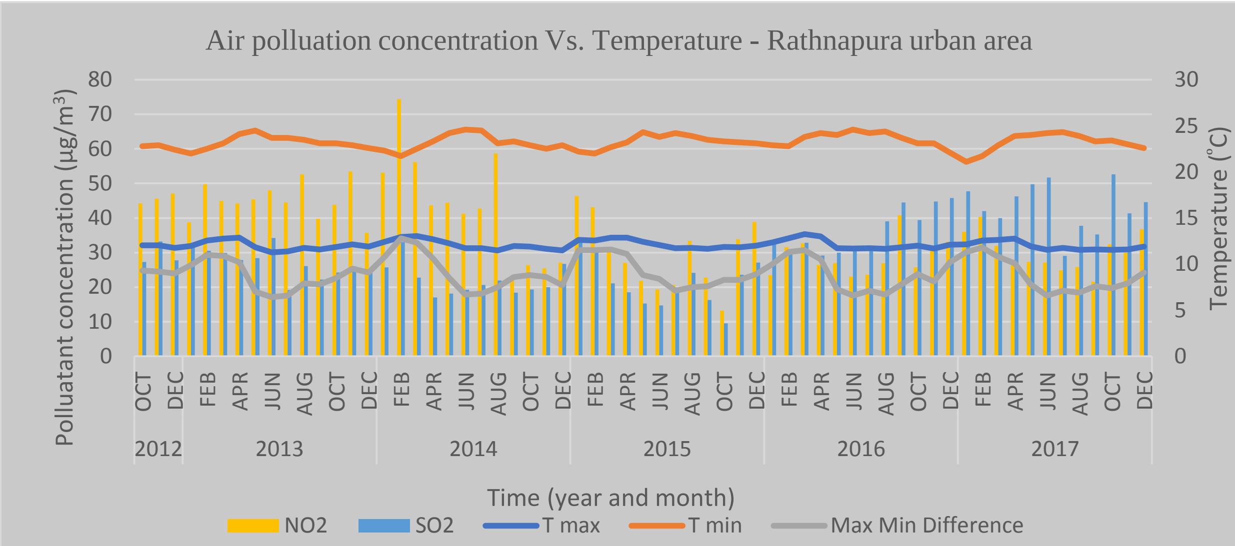


Figure 67: *Air pollution variation with respect to minimum maximum and temperature differences in Rathnapura urban area from 2012 to 2017*

As per the ***Figure 68***, the SO_2 levels in Kandy Urban areas shows statistically significant weak correlation with Minimum temperature as well as Temperature different. However, there was no correlation with maximum temperature and any parameter with NO_2.

According measuring data there is no any correlation with NO_2 as well as SO_2 levels with temperature in Kurunegala Urban area as in ***Figure 69***. The ***Figure 70*** indicates that the NO_2 levels in Anuradapura Urban areas shows statistically significant weak correlation with Minimum temperature as well as Minimum temperature. However, there was no correlation with temperature different and any parameter with SO_2 levels.

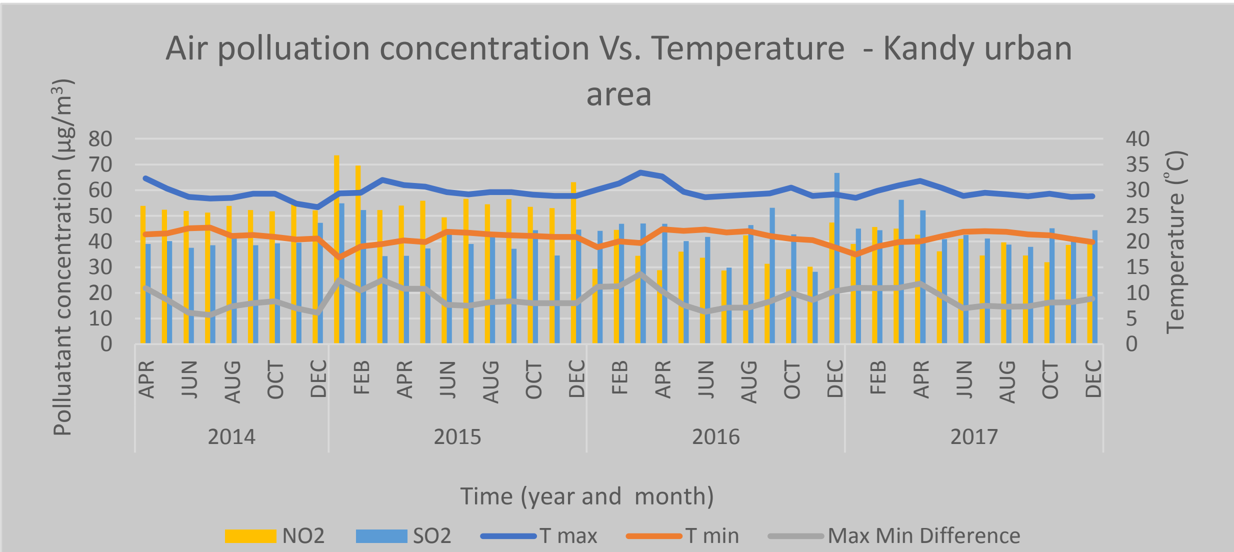


Figure 68: *Air pollution variation with respect to minimum maximum and temperature differences in Rathnapura urban area from 2012 to 2017*

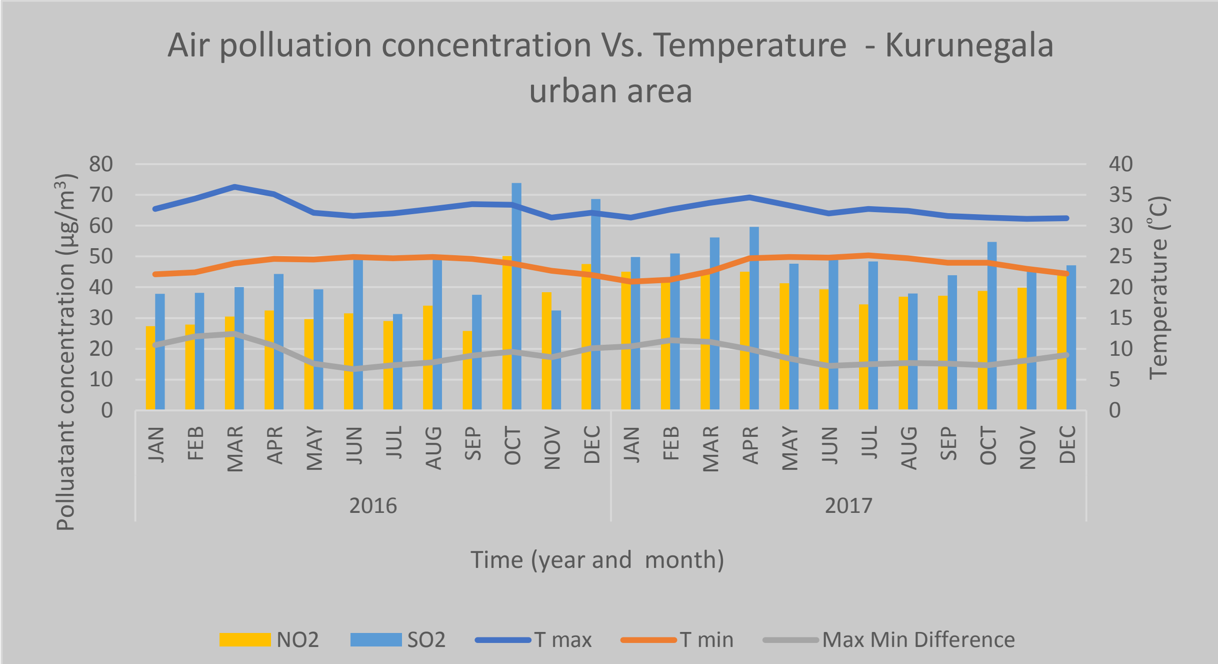


Figure 69: *Air pollution variation with respect to minimum maximum and temperature differences in Kurunegala urban area from 2012 to 2017*

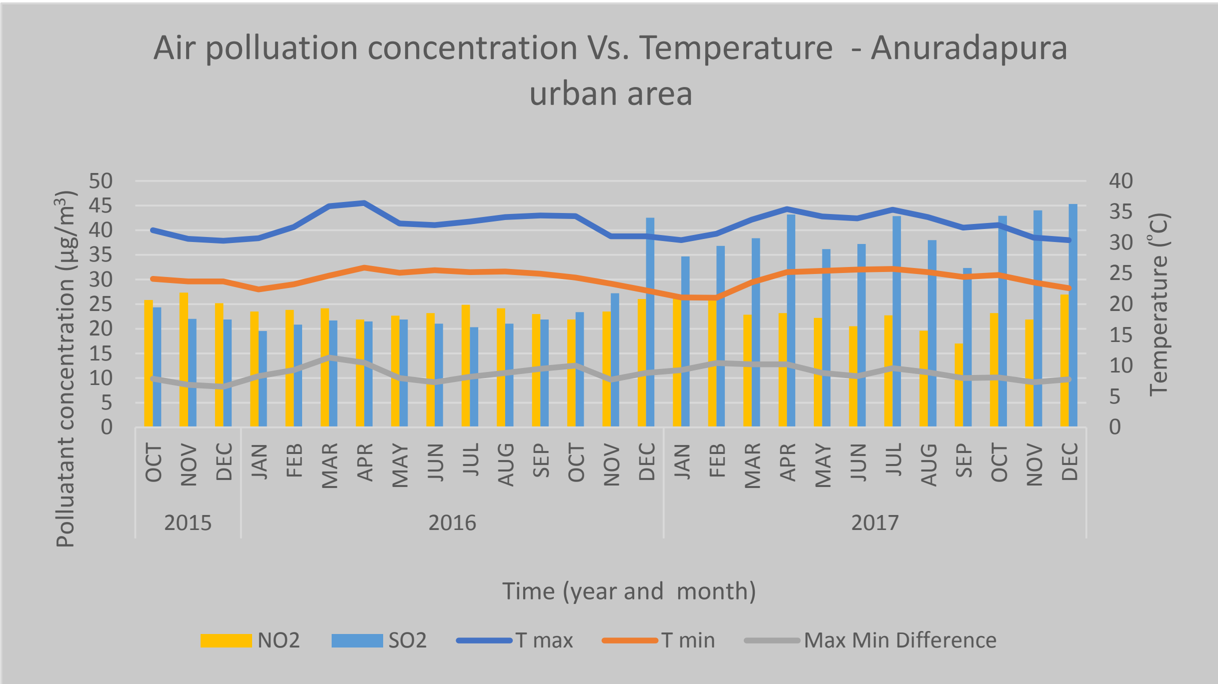


Figure 70: *Air pollution variation with respect to minimum maximum and temperature differences in Anuradapura urban area from 2012 to 2017*

Statistical details such as corelation coefficient (r) and significant levels (p) of air pollutant NO_2 ans SO_2 with Ambient Temperature are presented in ***Table : 03***.

Table 03: *Statistical summary of the Temperature Vs. Air pollutant levels in each urban area*

Urban area	Pollutant	T max	T min	T diff
Colombo 2013-2017	NO2	r =0.023221 p =0.86021	**r =0.387025 p =0.002252**	**r =0.345568 p =0.006845**
	SO2	r =0.236599 p =0.068748	r =0.002696 p =0.983687	r =0.134125 p =0.306924
Gampaha 2013-2017	NO2	r =0.016992 p =0.894842	r =0.095315 p =0.457432	r =0.078275 p =0.542005
	SO2	**r =0.308039 p =0.014047**	r =0.022093 p =0.86354	r =0.184658 p =0.147388
Kaluthara 2013-2017	NO2	**r =0.399254 p =0.001577**	r =0.01491 p =0.909978	r =0.23145 p =0.075184
	SO2	**r =0.424101 p =0.000733**	r =0.118285 p =0.368054	r =0.317748 p =0.013362
Galle 2013-2017	NO2	r =0.141746 p =0.279996	**r =0.324798 p =0.011341**	**r =0.326348 p =0.010934**
	SO2	r =0.176075 p =0.178392	r =0.14587 p =0.266095	r =0.029507 p =0.822913
Rathnapura 2013-2017	NO2	r =0.240811 p =0.063817	**r =0.34865 p =0.006332**	**r =0.343952 p =0.007127**
	SO2	r =0.045966 p =0.727282	r =0.176957 p =0.176192	r =0.046879 p =0.722082
Kandy 2014-2017	NO2	r =0.140779 p =0.35631	r =0.238885 p =0.114022	r =0.061069 p =0.690257
	SO2	r =0.101376 p =0.507596	**r =0.42357 p =0.00374**	**r =0.346202 p =0.019828**
Kurunegala 2016-2017	NO2	r =0.218512 p =0.304984	r =0.352682 p =0.090959	r =0.097933 p =0.648925
	SO2	r =0.029022 p =0.892915	r =0.114053 p =0.595659	r =0.112631 p =0.600283
Anuradapura 2015 OCT-2017	NO2	**r =0.47058 p =0.01324**	**r =0.556216 p =0.002589**	r =0.087309 p =0.664993
	SO2	r =0.079429 p =0.693715	r =0.17561 p =0.380946	r =0.079041 p =0.695141

The study of correlation of monthly maximum temperature of each urban area with monthly average pollutant level in 2017 as shown in ***Figure 70***. Accordantly, the monthly maximum temperature in each urban area does not show a considerable statistical correlation with the respective monthly average concentration of NO_2 and SO_2 levels in each Divisional Secretariat regardless of the location for the year 2017.

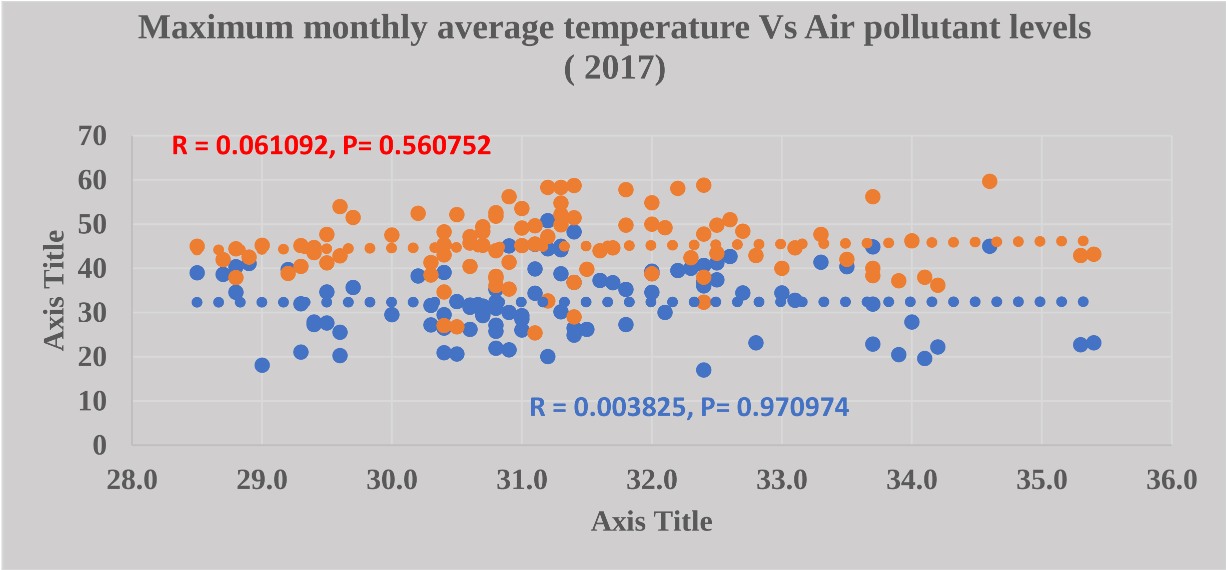


Figure 71: *Scattered plot of maximum monthly average and pollutants level respect to NO2 and SO2 levels in 2017 at different DS area*

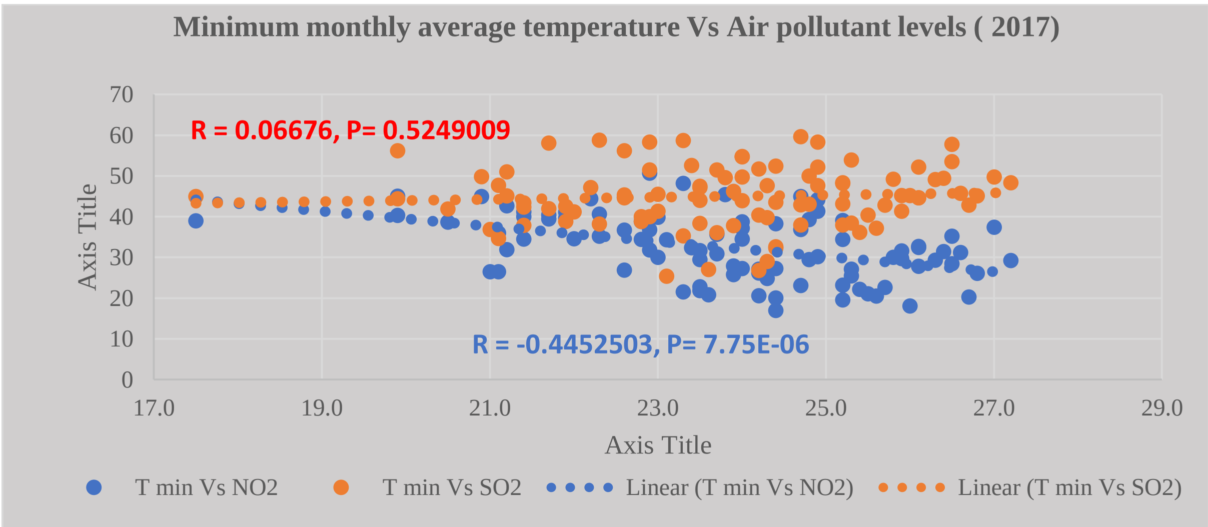


Figure 72: *Scattered plot of registered minimum temperature and pollutants level respect to NO_2 and SO_2 levels in 2017 at different DS area*

However, with the study of correlation of monthly minimum temperature in each urban area with monthly average pollutant level in 2017 as shown in ***Figure 72***. Accordantly, the monthly minimum temperature in each urban area does not show a considerable statistical correlation with the respective monthly average concentration SO_2 levels but shows a considerable correlation with NO_2 levels which is statistically significant where $P<0.05$ in each Divisional Secretariat regardless of the location for the year 2017. The scatter plot of temperature difference with air pollutants levels are given in ***Figure 73*** which indicates positive significant correlation with NO_2 while no any correlation with SO_2 levels.

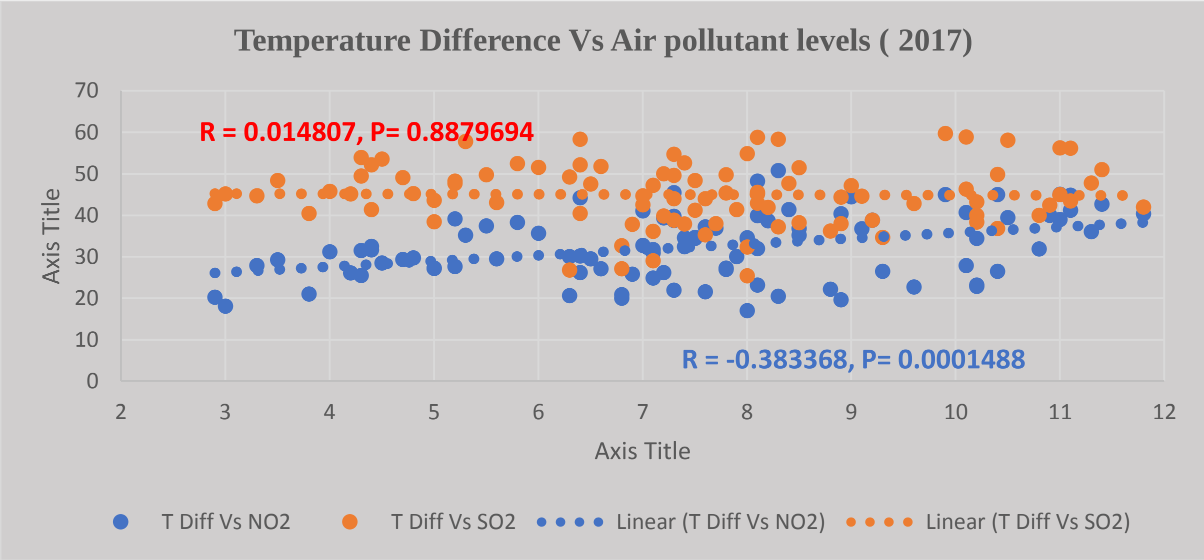
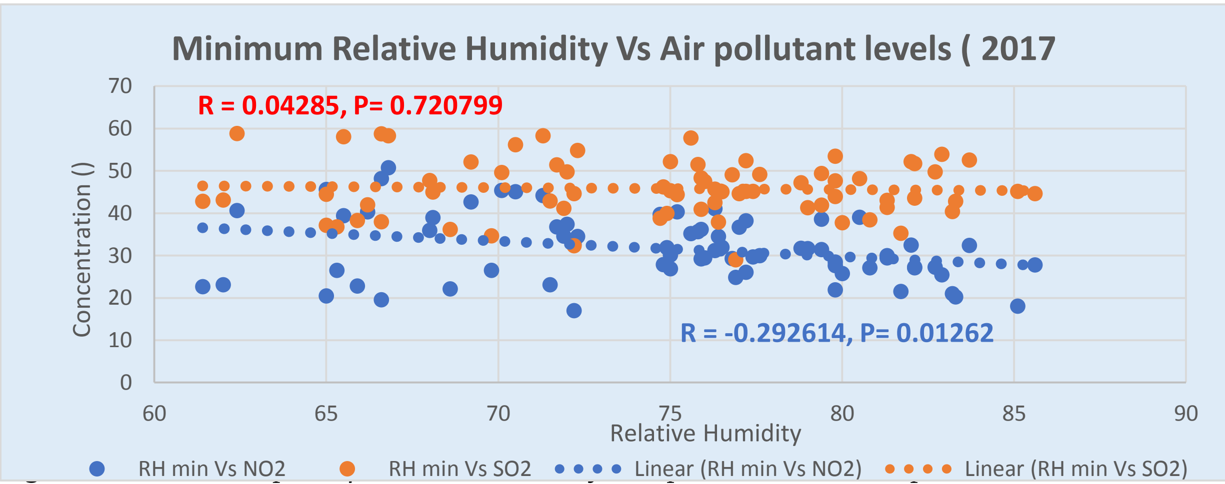


Figure 73: *Scattered plot of temperature difference and pollutants level respect to NO_2 and SO_2 levels in 2017 at different DS area.*

5.4.2. Humidity

Atmospheric humidity is one of the factors that affect air pollutant levels in urban areas. Normally Sri Lankan climatic conditions belongs to high humidity scenarios. Therefore, impact of humidity levels on air pollutant dispersion in Sri Lankan Urban areas is and important factor. The ***Figure 74*** and ***Figure 75*** shows the variation of air pollutant (SO_2 and NO_2) levels with the humidity in selected urban areas. Accordingly, the minimum monthly average humidity levels show a significant weak correlation with NO_2 in selected urban areas in Sri Lanka. However, the maximum humidity levels were significantly corelated to SO_2 levels.



levels in 2017 at different DS area

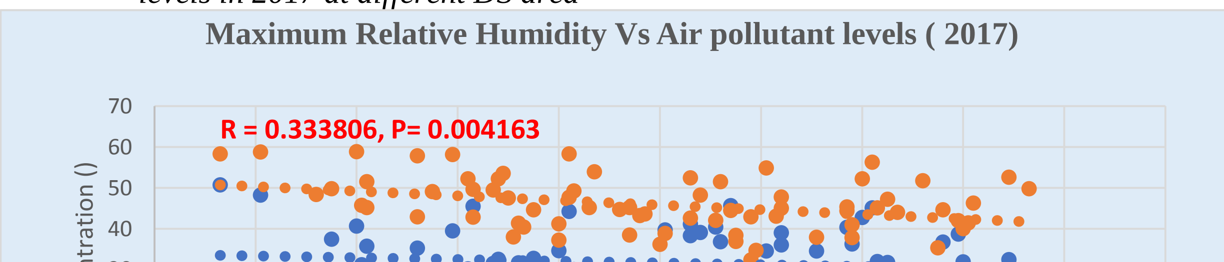


Figure 74: *Scattered plot of maximum humidity and pollutants level respect to NO_2 and SO_2 levels in 2017 at different DS area*

5.4.3. Rain Fall

Rainfall is also a considerable factor when studying air pollutans in uban areas it mainly affect for duct leves rather than gasous pollutants. The time series analysis of rainfall against NO_2 and SO_2 in selected urban areas in sri Lanka were shown in ***Figure 75*** to ***Figuer 82***. According to the results there is no significant corelation of air pollutant levels in each urban area with the rainfall of respective urban areas eccept in Kaluthara Urban area as indicateded in ***Table: 04***. However, the air pollutant levels in 2017 at all considered locations shaows statistically significant negative corelations with monthly rainfall as stipulated in ***Figure 83***.

Statistical details such as corelation coefficient (r) and significant levels (p) of air pollutant NO_2 ans SO_2 with Ambient Temperature are presented in ***Table : 04***.

Table 04:*Statistical summary of the Rainfall Vs. Air pollutant levels in each urban area*

Urban area	Pollutant	Rain Fall
Colombo 2013-2017	NO_2	r =0.101732 p =0.427566
	SO_2	r =0.027708 p =0.829326
Gampaha 2013-2017	NO_2	r =0.040778 p =0.751001
	SO_2	r =0.149555 p =0.242048
Kaluthara 2013-2017	NO_2	**r =0.258875 p =0.040494**

	SO_2	**r =0.263865** **p =0.036652**
Galle 2013-2017	NO_2	r =0.230192 p =0.06953
	SO_2	r =0.12136 p =0.34389
Rathnapura 2013-2017	NO_2	r =0.160598 p =0.208623
	SO_2	r =0.109467 p =0.393082
Kandy 2014-2017	NO_2	r =0.167709 p =0.270815
	SO_2	r =0.124228 p =0.416188
Kurunegala 2016-2017	NO_2	r =0.03071 p =0.889068
	SO_2	r =0.091841 p =0.669516
Anuradapura 2016-2017	NO_2	r =0.089764 p =0.656133
	SO_2	r =0.010374 p =0.959044

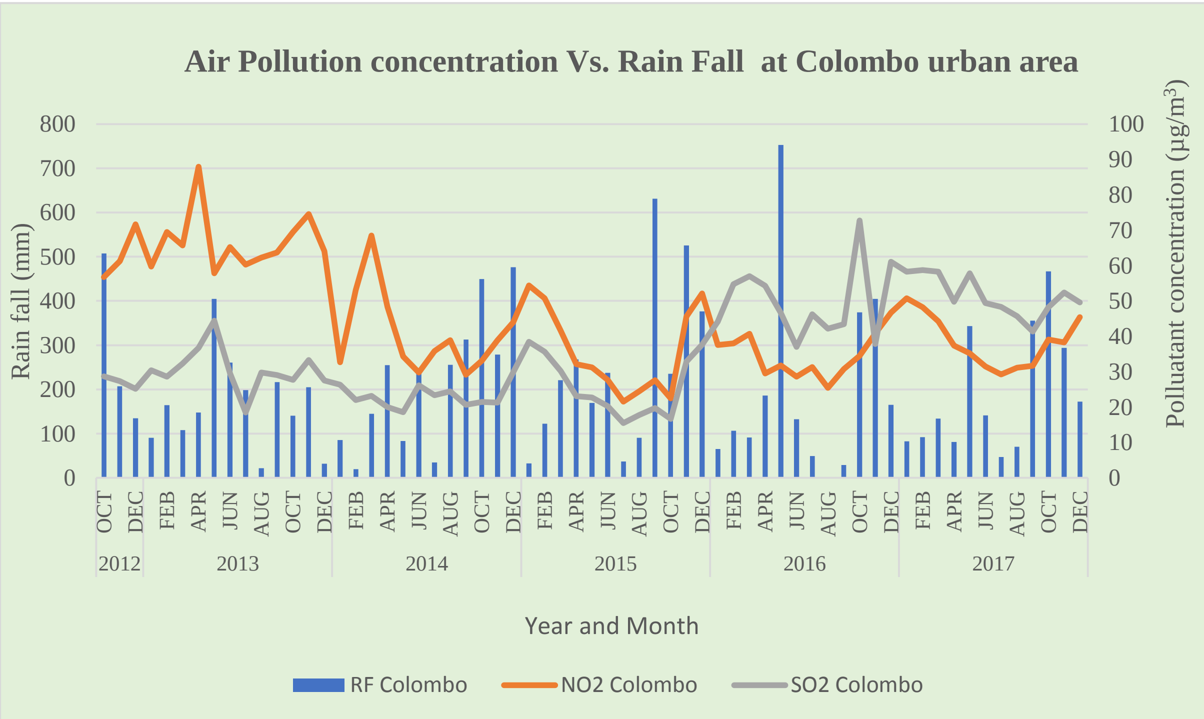


Figure 75: *Air pollution variation with respect monthly rainfall in Colombo urban area from 2012 to 2017*

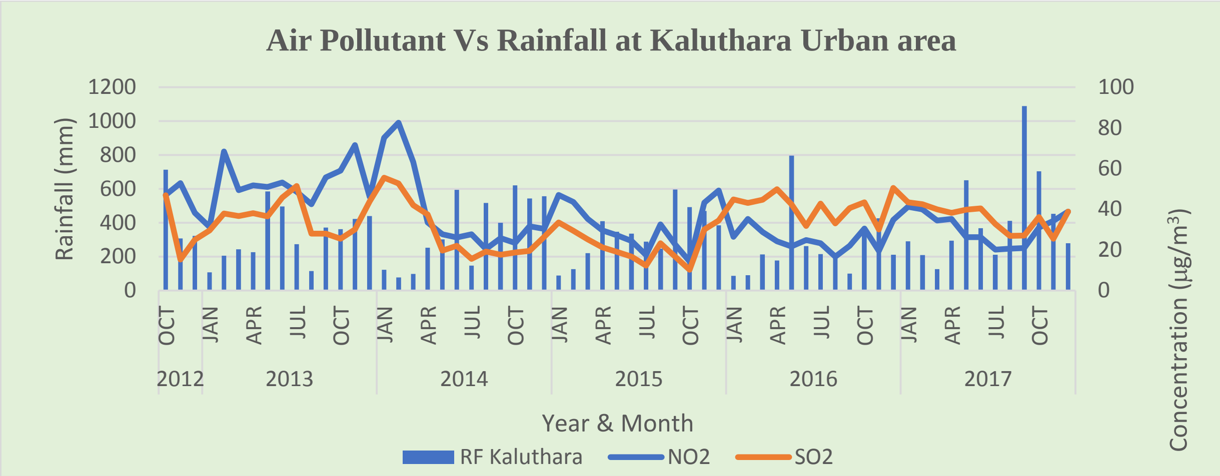


Figure 76: *Air pollution variation with respect monthly rainfall in Kaluthara urban area from 2012 to 2017*

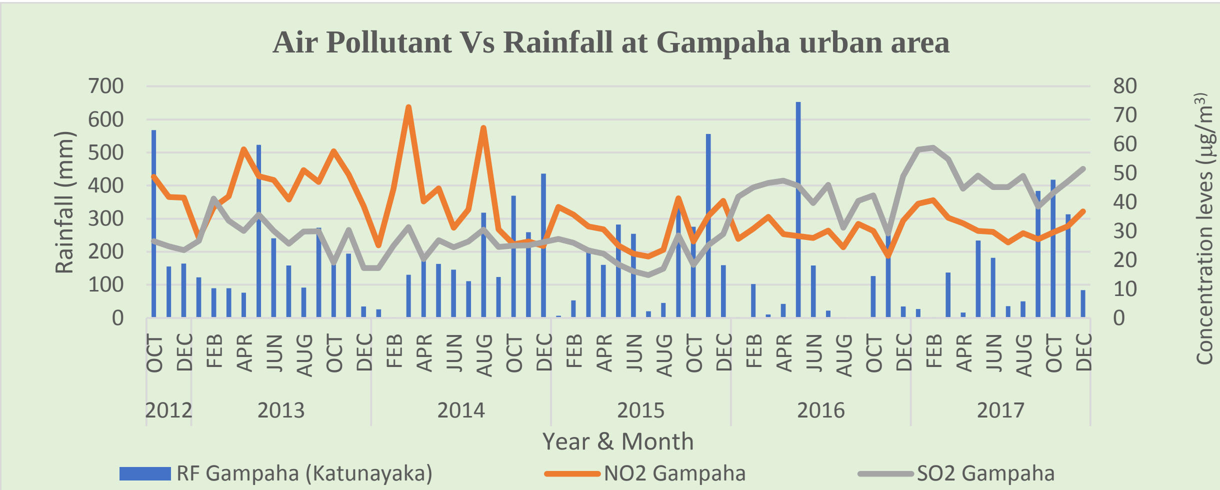


Figure 77: *Air pollution variation with respect monthly rainfall in Gampaha urban area from 2012 to 2017*

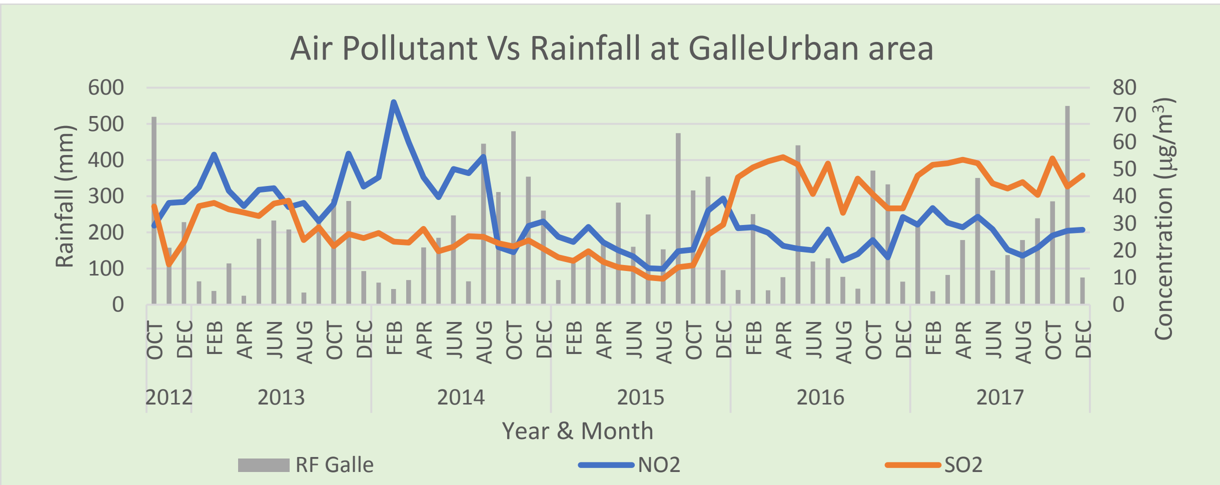


Figure 78: *Air pollution variation with respect monthly rainfall in Galle urban area from 2012 to 2017*

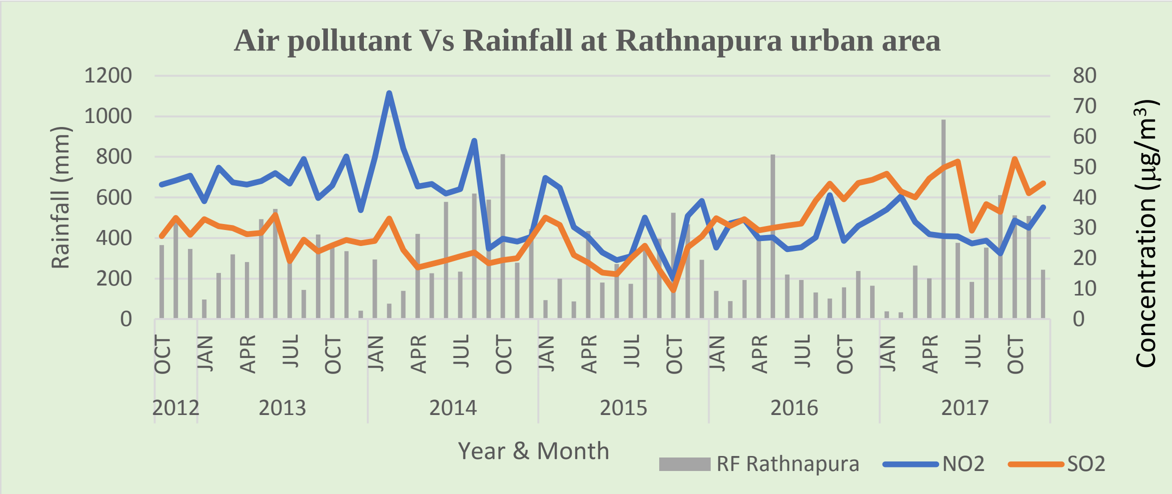


Figure 79: *Air pollution variation with respect monthly rainfall in Rathnepuraurban area from 2012 to 2017*

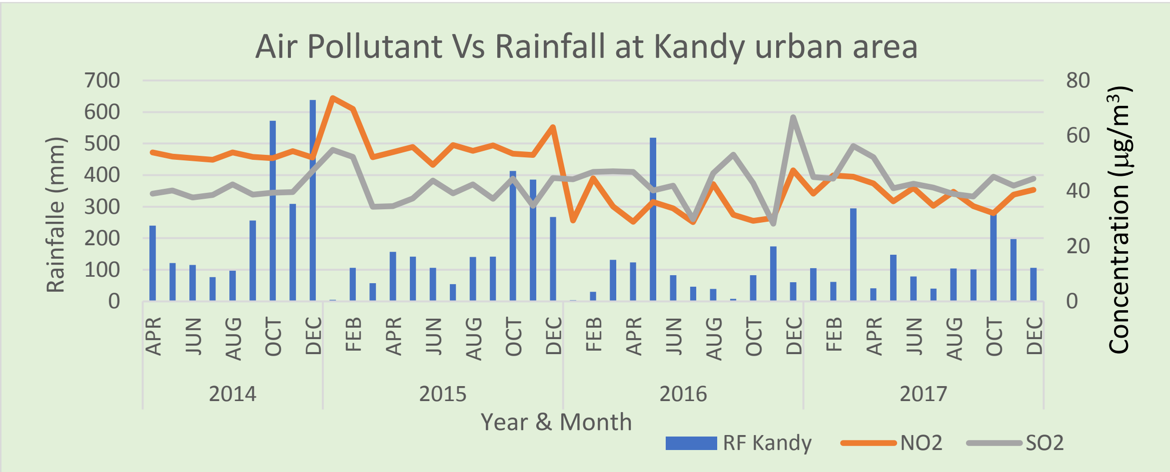


Figure 80: *Air pollution variation with respect monthly rainfall in Kandy urban area from 2012 to 2017*

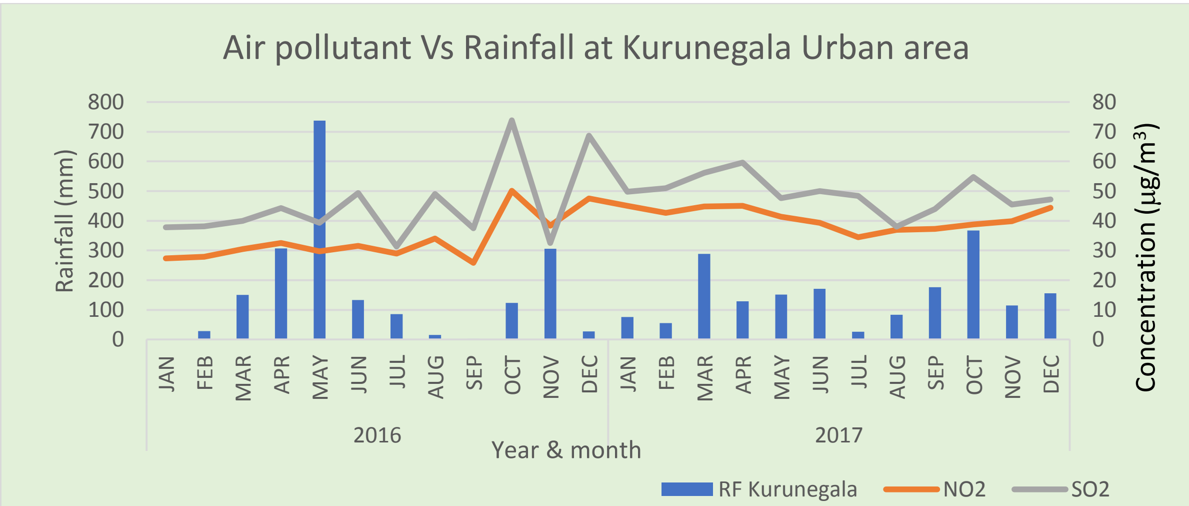


Figure 81: *Air pollution variation with respect monthly rainfall in Kurunegala urban area from 2012 to 2017*

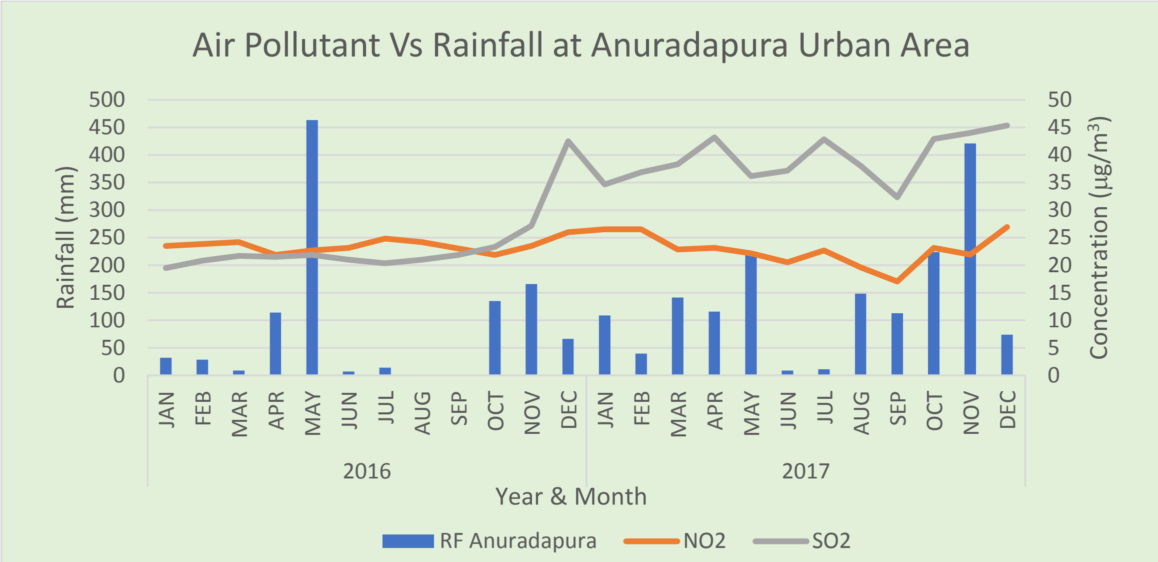


Figure 82: *Air pollution variation with respect monthly rainfall in Anuradhapura urban area from 2012 to 2017*

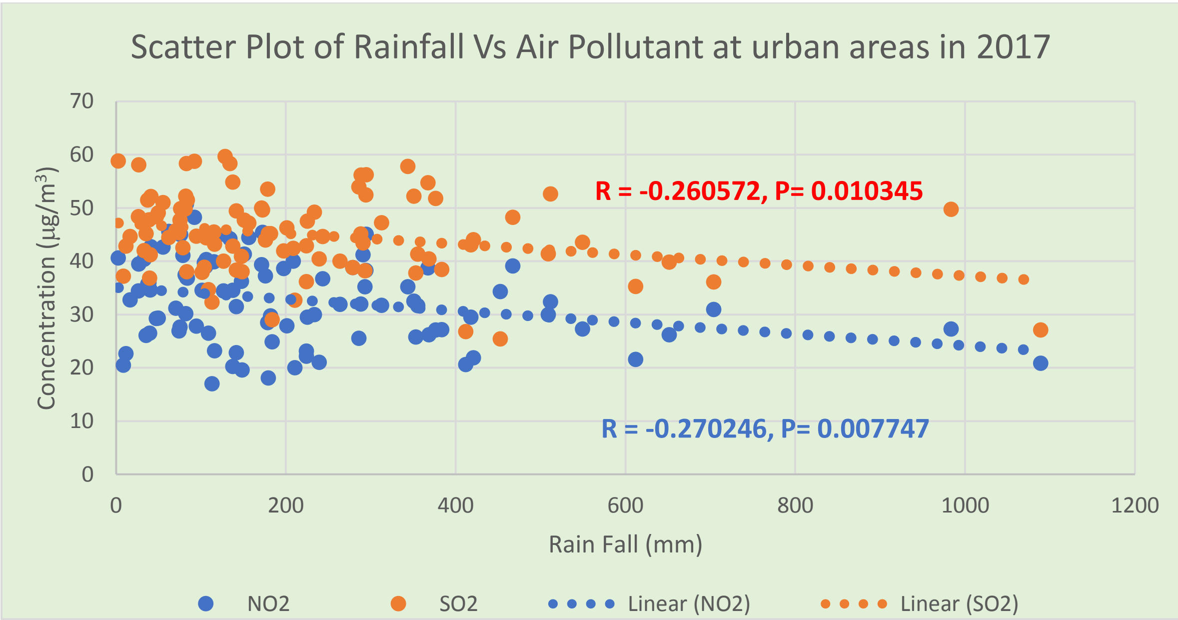


Figure 83: *Air pollution variation with respect monthly rainfall at selected urban area in 2017*

6. OUTCOME OF THE STUDY AND POLICY DEVELOPMENT

Although many governments, semi-government and private institutions in Sri Lanka were involved in air quality management, only few institutions were involved in air quality monitoring activities to collect data for research of National interest. Some of these monitoring programs are continuous for several years and most of them are short term for research activities. Therefore, there is no proper central data base on air quality as well as other related data to reach quality-controlled data.

Although, the first comprehensive continuous air quality monitoring program in Sri Lanka was started in 1997 by continuous measuring criteria air pollutants in Colombo with automated air quality monitoring system, the monitoring program was dead in 2005 due to unavailability of spare parts and financial assistants for the equipment maintenance. Then after air quality monitoring program was started using passive sampling technology in 2001 with 16 sampling locations to measure SO_2 and NO_2 levels in ambient air in Colombo urban area and the monitoring program was further developed in 2012 by extended to other major urban areas such as Gampaha, Kaluthara, Galle, Horana and Rathnapura. The passive sampling monitoring network was further extended to Kandy urban area in 2014, Kurunegala and Anuradapura urban areas in 2015 and Putttalum in 2018. Thereby, this passive sampling air quality monitoring data were the possible continuous air quality data available in Sri Lanka for considerable time period even it had some limitations. Thereby, at the inception workshop of the project finalized to achieve the project objectives by assessing these available continuous passive sampling data. It was understood that the data base of each urban area was reliable, since the data were analyzed in standard methodologies and corrected according to the quality control chart maintained at laboratory. However, the data base was further validated and quality controlled to avoid outliers by using T-test in SPSS software and regression model using R statistical software package.

The trend analysis of air quality data were clearly indicates that the pollutant levels in urban areas are increases with the increasing of urbanization, vehicular fleet and other related factors while decreasing time to time with the implementations of air quality management strategies. The resent monitoring data indicates a gradual reduction of annual average pollutant levels from 2013 to 2015 while showing a slight increasing trend from 2016 onward. According to 2017 data, the highest average NO_2 level was recorded in Colombo urban area while Kandy urban area was 2^{nd} highest. The highest annual average SO_2 level in 2017 was recorded in Colombo urban area and the Gampaha Urban area was the 2nd highest. The spatial analysis indicates that relatively high levels of pollutant (some time exceeds WHO guidelines levels) are recorded at areas with high traffic congested and low pollutants levels at pollution sinks like wetland network with water bodies, green covers, elevated areas and when going away from the city areas.

The time series analysis indicates that the monthly averages of SO_2 and NO_2 were start at relatively high level in January and gradually decrease up to mid-year and again increase at the end of the year. This indicates the pollutant levels are highly subjected to local wind patterns in which shows a high exposure levels during North East monsoon period (November – February) while showing lower exposure levels during the South West monsoon (May- August). The difference of the pollutant levels in the NE monsoon period is about 2 to 3 times than the pollutant levels SW monsoon in each year. This phenomenon is common to almost all urban areas while slit changes with peak months depending on contributing pollutant sources in which make highest contribution by vehicular emission.

The correlation studies of population density with diurnal air pollutants levels of selected urban areas specify that the population density is negatively correlate with NO_2 and positively correlate with SO_2. However, these correlations are not statistically significant with both pollutants except few exceptional cases. However, the correlation studies of population density with spatial air pollutants levels of selected urban areas indicate statistically significant weak positively correlation providing the $P<0.05$. The population of each urban area was slightly increasing annually due to population growth and urbanization, the pollutant levels were varied with the management actions, metrological conditions, fuel usage, vehicular fleet and other related factors. Therefore, the observed correlations of air pollutant with population density cannot be elucidate well since Sri Lanka has taken many stapes to control air pollution in urban areas which change annual pollutant levels in each urban area. The correlation studies of air pollutant levels with Vehicle Density and Climatic data (Temperature, Humidity and Rainfall) are also shown similar correlations as observed in population density. However, according to the outcome of correlation studies on air pollutants with paddy production, it is hard to find any correlation between the paddy yield and pollutant concentration. This may be due to the lack of quality long term air quality data, parameters and limited of area we consider in our study.

With all these outcome of the study, it can be recommended to develop and implement following policy actions in priority base to overcome the limitations and gaps identified through the project and assessment in order to further management of air quality in Sri Lanka.

1. The study outcome clearly indicates the lack of proper air quality data base in Sri Lanka. Therefore, related policies should be developed to establish good air quality data base with monitoring network to measure air quality in short term as well as long term covering the Island.

2. Establishment of policies to develop data collecting network of air quality and related health, socio-economic and other data in the country.

3. As an outcome of the study it reviles that at least one location in each urban area exceeded the WHO annual guideline levels even though the short term (1 hour and 24 hours) air quality levels were within the national standards, However, there is no annual average ambient air quality standards stipulated in Sri Lanka except to PM2.5 and PM10. Therefore, review the existing air quality legislation and develop as necessary to cover short-term and long-term standards and hence developed evidence based air quality index for Sri Lanka.

4. Review the existing air quality action plans in each year and identify relevant actions in priority order to prioritize most important target to develop policies and implemented within the target time line.

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Appendix 01

A summary of Organizational Air Quality Data Availability among different parties

1. **Colombo University** (Lead levels in blood - roadside policemen's)
2. **NBRO - 1989 – 1991** (Passive, DF & SR)
3. **NBRO - 1992 – 1993** (Active, SO_2, NO_2, CO, SPM, Pd).
4. **AEA - 1995 – 1998** (PM10, PM2.5, Black C, Elemental)
5. **NBRO + CEA - 1996 – 2001** (SO_2, NO_2, NO, NO_x, PM10, O_3 and CO and Meteorological parameters such as Wind Direction, Wind Speed, Vertical wind Speed, Rain fall, Solar radiation, ambient temperature etc).
6. **AEA + NBRO 1999 – 2001** (PM10, PM2.5, Black C, Elemental)
7. **CEA - 2001 – onward** (SO_2, NO_2, NO, NO_x, PM10, O_3 and CO and Meteorological parameters such as Wind Direction, Wind Speed, Vertical wind Speed, Rain fall, Solar radiation, ambient temperature etc). (PM10, PM2.5, Black C, Elemental)
8. **University of Peradeniya2001- onward** (Passive, SO_2, NO_2 at kandy)
9. **CEA – 2001 – onward** (Passive, SO_2, NO_2 at Dutuwewa)
10. **AEA + CEA 2001– onward** (PM10, PM2.5, Black C, Elemental)
11. **NBRO - 2001– onward** (Passive, SO_2, NO_2)
12. **NBRO + SWA, WPC – 2008 – 2010** (Passive, SO_2, NO_2 at WP)
13. **NBRO (VET Fund) – 2012 – To date** (Passive, SO_2, NO_2 at Main Cities)

A summary of air quality data availability in all 25 districts of the country

District Center	Data availability	Frequency & parameters		
		Daily	Monthly	Few (Less than 5 data)
Colombo	1997 - 2002	SO2, NO2,PM10, CO	SO2, NO2,PM10, CO	SO2, NO2,PM10, CO
	2002 - 2015	PM10	SO2, NO2	SO2, NO2,PM10, CO
	2015 -todate	PM2.5 (2018)	SO2, NO2	SO2, NO2,PM10, CO
Kandy	2010-todate	PM2.5 (2018)	SO2, NO2	SO2, NO2,PM10, CO
Gampaha	2012-todate	PM2.5 (2018)	SO2, NO2	SO2, NO2,PM10, CO
Kalutara	2012-todate	PM2.5 (2018)	SO2, NO2	SO2, NO2,PM10, CO
Galle	2012-todate	PM2.5 (2018)	SO2, NO2	SO2, NO2,PM10, CO
Matara	2016-todate			SO2, NO2,PM10, CO
Hambantota	2016-todate			SO2, NO2,PM10, CO
Kegalle	2016-todate		SO2, NO2	SO2, NO2,PM10, CO
Rathnepura	2012-todate	PM2.5 (2018)	SO2, NO2	SO2, NO2,PM10, CO
Badulla	2016-todate			SO2, NO2,PM10, CO
Nuwaraeliya	2012-todate			SO2, NO2,PM10, CO
Kurunegala	2016-todate	PM2.5 (2018)	SO2, NO2	SO2, NO2,PM10, CO
Puttalama	2017-todate	PM2.5 (2018)	SO2, NO2	SO2, NO2,PM10, CO
Matale				
Anuradhapura	2016-todate	PM2.5 (2018)	SO2, NO2	SO2, NO2,PM10, CO
Pollonnaruwa				
Batticalo				
Ampara				
Vauniya	2016-todate			SO2, NO2,PM10, CO
Monaragala	2016-todate			SO2, NO2,PM10, CO
Trincomalee	2016-todate			SO2, NO2,PM10, CO
Manar	2016-todate			SO2, NO2,PM10, CO
Mulative	2016-todate			SO2, NO2,PM10, CO
Chilinochchi	2016-todate			SO2, NO2,PM10, CO
Jaffna	2016-todate			SO2, NO2,PM10, CO

Appendix 02

The number of sampling locations in each urban area is given in table and details of selected sampling locations are presented in relevant sections and maps.

Table 4.1.1: Number of Ambient Air Quality Monitoring Locations in each Urban Area

Urban Area	Number of Sampling Locations						
	2012	2013	2014	2015	2016	2017	
	SO_2/NO_2	SO_2/NO_2	SO_2/NO_2	SO_2/NO_2	SO_2/NO_2	SO_2/NO_2	$PM_{2.5}$
Colombo	19	19	19	19	19	19	3
Gampaha	11	11	11	11	11	11	2
Kalutara	5	5	5	5	5	5	1
Horana	5	5	5	5	5	5	1
Rathnepura	8	8	8	8	8	8	1
Galle	6	6	6	6	6	6	1
Kandy			10	13	13	13	3
Kurunegala				6	6	6	2
Anuradhapura				5	5	6	1
Puttalam						10	2
	54	54	64	77	78	89	17

Appendix 03

Air Quality Data

NO_2 µg/m³		COLOMBO																			Colombo District Average (For each month)
Year	Month	Meteorology Department	Colombo MC	Gangarama Temple	Fort Railway Station	Gunasinghepura	Jethawanaramaya	Maligakanda	Kelaniya	Borella Police Station	Ward Place	CEA	Kotte	Kirulapana	Dehiwala Junction	Nugegoda Town	Malabe	Peliyagoda	Waththala	Maradana Railway Station	
GPA Coordinates	North	6.904764	6.91496	6.916971	6.933859	6.935715	6.944195	6.96095	6.957673	6.915138	6.914514	6.901009	6.880868	6.877539	6.851239	6.871717	6.903725	6.986007	6.964796	6.928949	
	East	79.872066	79.863779	79.85462	79.850495	79.857266	79.8654	79.864788	79.882273	79.878171	79.876489	79.92682	79.904444	79.876602	79.86651	79.890763	79.954218	79.889366	79.897976	79.864266	
2013	JAN	37	70	54	130	23	80	21	10	33	50	44	44	28	68	118	118	58	65	83	60
	FEB	30	72	34	140	62	85	38	59	60	57	52	46	36	77	75	88	81	75	154	70
	MAR	47	53	55	119	62	70	55	31	62	45	47	50	38	67	64	99	72	80	132	66
	APR	49	39	58	145	80	115	96	66	92	64	66	34	59	77	52	109	76	197	197	88
	MAY	48	27	76	101	83	19	68	47	67	28	37	57	44	57	54	63	70	27	126	58
	JUN	84	57	72	93	78	115	74	54	81	32	30	43	33	42	50	92	94	27	89	65
	JUL	73	47	61	71	68	94	56	45	65	27	26	35	66	58	46	87	76	43	101	60
	AUG	36	27	36	68	73	97	81	43	68	22	28	21	37	60	40	104	72	107	163	62
	SEP	67	35	30	67	103	77	55	50	77	34	25	21	38	72	38	61	71	101	189	64
	OCT	53	78	57	74	69	81	83	72	81	42	42	18	60	65	51	83	97	112	103	70
	NOV	63	83	60	109	71	104	57	75	78	55	51	30	84	51	106	64	88	83	104	75
	DEC	48	40	38	93	63	79	50	60	63	49	43	28	70	60	92	66	83	78	114	64
	AVG'13	53	52	53	101	70	85	61	51	69	42	41	36	49	63	66	86	78	83	130	67
2014	JAN	28	20	18	33	33	29	60	30	33	19	13	8	30	70	22	26	33	28	87	33
	FEB	49	35	34	64	65	53	48	55	63	35	29	18	58	50	41	47	59	53	153	53
	MAR	64	41	41	89	84	70	65	75	85	41	32	15	80	92	52	61	82	70	163	68
	APR	37	48	61	84	49	70	48	35	61	47	26	30	44	47	18	47	54	30	83	48
	MAY	44	29	37	48	40	59	39	28	42	16	15	22	16	22	25	48	49	27	46	34
	JUN	38	25	32	42	35	51	34	24	36	14	13	19	14	19	22	41	42	24	40	30
	JUL	41	34	34	45	41	59	43	28	41	31	21	20	22	33	27	42	46	28	45	36
	AUG	31	36	37	25	64	46	36	38	43	22	42	40	27	40	41	34	40	41	56	39
	SEP	14	22	30	34	33	28	33	32	33	20	30	18	24	31	29	33	37	37	35	29
	OCT	26	22	22	43	24	57	28	43	34	24	23	16	27	34	34	33	39	43	58	33
	NOV	28	50	34	53	25	37	27	33	33	23	27	51	55	43	36	33	33	51	67	39
	DEC	28	47	37	50	33	35	36	30	34	38	26	20	41	44	50	53	77	78	78	44
	AVG'14	36	34	35	51	44	50	41	38	45	28	25	23	36	44	33	41	49	43	76	41

2015	JAN	36	70	48	58	50	68	49	60	70	51	40	30	50	53	58	56	51	65	71	54
	FEB	34	65	45	54	46	63	46	56	65	47	37	28	47	50	54	53	48	60	67	51
	MAR	34	48	30	57	34	48	34	34	49	32	30	26	37	21	69	49	45	52	62	42
	APR	25	28	32	47	32	10	39	28	28	27	23	17	29	23	35	41	43	45	59	32
	MAY	30	21	19	36	26	9	39	19	33	18	22	21	34	20	24	52	73	48	49	31
	JUN	27	19	17	32	23	8	35	17	30	16	20	19	31	18	21	47	60	43	44	28
	JUL	21	13	7	27	20	23	25	20	24	10	14	19	13	24	31	25	31	25	37	22
	AUG	20	15	16	23	28	36	30	30	28	15	13	14	12	36	19	24	17	45	43	24
	SEP	21	13	19	36	21	33	34	35	35	23	18	18	21	30	26	29	22	52	38	28
	OCT	20	17	15	31	17	26	27	28	26	18	14	14	17	23	21	23	16	41	33	22
	NOV	41	17	21	62	56	50	32	78	52	48	41	38	22	38	51	50	44	50	75	46
	DEC	47	19	24	71	64	57	36	89	59	55	47	44	26	43	58	57	51	57	86	52
	AVG'15	30	29	24	45	35	36	36	41	42	30	27	24	28	32	39	42	42	49	55	36
2016	JAN	29	35	36	51	29	38	16	36	37	31	30	39	40	20	44	48	39	50	65	38
	FEB	17	42	24	32	50	44	29	58	46	35	33	27	29	13	52	36	37	51	67	38
	MAR	28	31	24	55	48	50	32	54	44	27	31	23	28	54	42	49	37	53	64	41
	APR	19	25	20	29	34	37	28	33	34	23	21	24	22	32	29	34	24	42	51	30
	MAY	27	25	30	16	40	24	52	45	43	22	25	26	28	35	33	35	29	12	56	32
	JUN	19	20	15	30	31	41	33	37	28	16	15	29	32	31	30	35	32	33	37	29
	JUL	18	17	14	45	28	34	34	43	53	15	18	27	18	35	26	32	34	49	55	31
	AUG	16	16	15	34	26	30	28	35	35	13	14	14	16	28	23	29	33	41	38	25
	SEP	29	19	14	41	35	40	41	35	38	16	19	14	19	43	26	29	28	53	45	31
	OCT	24	24	18	41	32	45	33	45	40	22	21	6	23	52	43	40	38	49	59	34
	NOV	43	40	39	49	45	40	32	52	42	45	35	8	42	42	39	43	41	48	50	41
	DEC	29	52	50	66	45	48	29	43	46	60	31	47	13	48	52	59	59	60	51	47
	AVG'16	25	29	25	41	37	39	32	43	41	27	24	24	26	36	37	39	36	45	53	35
2017	JAN	39	50	43	78	40	53	26	41	50	43	42	40	55	47	60	40	63	78	76	51
	FEB	35	43	48	43	42	48	33	38	50	51	40	46	35	51	45	58	54	70	86	48
	MAR	31	33	43	73	37	64	43	53	40	31	34	37	31	49	39	48	36	53	65	44
	APR	26	21	23	71	45	45	38	49	39	14	24	23	46	45	30	41	29	43	59	37
	MAY	19	28	28	61	43	39	47	38	42	16	15	11	19	42	45	29	52	39	56	35
	JUN	17	16	29	72	41	33	30	39	34	17	21	11	25	44	26	34	26	37	46	31
	JUL	17	17	12	36	48	34	32	45	38	13	15	14	17	43	21	28	34	31	63	29
	AUG	20	14	15	39	49	34	31	31	46	14	21	12	18	40	27	31	47	44	60	31
	SEP	25	19	20	43	44	36	33	39	38	15	21	15	33	34	26	27	25	47	62	32
	OCT	27	28	35	67	42	43	25	29	49	30	31	12	34	37	35	48	30	63	76	39
	NOV	21	19	25	61	41	38	24	27	44	28	37	15	28	48	40	50	41	57	83	38
	DEC	37	46	62	62	46	36	20	33	44	38	35	20	53	49	45	53	40	57	88	45
	AVG'17	26	28	32	59	43	42	32	38	43	26	28	21	33	44	37	41	40	52	68	39

NO_2 µg/m³		KANDY										
Year	Month	Maligaawa Junction/Temple of	Super Market Junction/Clock Tower	Ampitiya Junction/E.L.Senanayake	Wels park	Good shed Junction/Post Office	Colombo Street/ JoergeE SilvaChildrens	Kandy Municipal Council	High School Junction/ B.C.A.S. School (near	Gatembe Junction/Gatembe	Royal School Junction/E.D.E.Silva	Kandy District Average (For each month)
GPA Coordinates	North	7.2931497	7.292498	7.287171	7.290144	7.290181	7.292968	7.298575	7.285926	7.2719469	7.291038	
	East	80.6388602	80.634137	80.647647	80.637702	80.63228	80.635804	80.637791	80.626404	80.6060491	80.647158	
2013	JAN	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	FEB	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	MAR	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	APR	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	MAY	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	JUN	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	JUL	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	AUG	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	SEP	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	OCT	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	NOV	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	DEC	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	AVG'13	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
2014	JAN	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	FEB	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	MAR	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	APR	33	69	34	48	96	66	40	51	57	45	54
	MAY	32	69	35	51	86	56	39	52	61	43	52
	JUN	35	70	31	51	87	66	42	45	49	43	52
	JUL	34	69	33	50	85	60	41	47	52	42	51
	AUG	35	71	35	52	87	65	41	48	60	45	54
	SEP	33	70	32	51	86	62	40	49	58	42	52
	OCT	32	67	34	50	85	57	40	51	60	42	52
	NOV	36	71	35	52	85	66	41	52	62	44	54
	DEC	35	68	32	49	81	64	40	50	61	41	52
	AVG'14	34	69	33	50	86	62	40	49	58	43	53
2015	JAN	56	82	48	81	132	92	63	65	56	52	74
	FEB	48	80	45	76	123	85	49	62	60	57	70
	MAR	36	67	31	50	84	62	40	49	58	44	52
	APR	33	63	36	55	90	63	39	52	55	42	54
	MAY	32	59	43	52	85	67	42	52	61	45	56
	JUN	32	63	30	47	77	60	38	47	55	41	49

	JUL	27	67	29	48	92	68	45	56	66	49	57
	AUG	29	72	42	51	83	65	41	51	59	44	55
	SEP	37	67	35	48	91	72	45	56	57	48	57
	OCT	30	60	38	52	82	64	40	50	59	43	54
	NOV	34	55	56	49	57	72	42	45	60	43	53
	DEC	45	72	62	52	90	88	52	58	50	53	63
	AVG'15	37	67	41	55	91	72	45	54	58	47	57
	JAN	12	48	24	18	37	55	14	23	28	27	29
	FEB	21	69	35	24	60	69	26	31	61	51	45
	MAR	20	33	32	23	51	32	25	31	28	43	32
	APR	19	48	22	36	41	30	19	25	27	14	28
	MAY	26	57	29	20	59	37	27	32	31	49	37
	JUN	26	40	32	21	53	42	21	30	37	40	34
2016	JUL	26	50	24	17	51	33	21	19	21	36	30
	AUG	37	76	36	29	78	45	22	25	57	47	45
	SEP	32	54	33	34	57	32	18	18	48	35	36
	OCT	20	42	55	47	43	49	11	12	25	43	35
	NOV	30	39	28	41	39	42	12	31	19	36	32
	DEC	37	95	46	29	78	39	65	37	50	23	50
	AVG'16	26	54	33	28	54	42	23	26	36	37	36
	JAN	19	54	36	29	59	57	22	36	51	34	40
	FEB	30	61	37	29	62	60	29	39	50	49	45
	MAR	33	60	33	31	72	62	32	29	52	57	46
	APR	28	63	30	29	74	54	28	31	57	45	44
	MAY	27	60	29	34	60	38	23	23	54	36	38
	JUN	19	44	36	36	84	47	20	39	53	34	41
2017	JUL	33	46	29	26	46	54	26	34	20	41	36
	AUG	27	49	42	34	59	62	23	35	45	49	43
	SEP	25	43	31	22	64	54	22	24	32	38	36
	OCT	25	52	25	25	41	34	21	27	39	40	33
	NOV	49	44	31	29	50	36	23	30	49	44	39
	DEC	14	75	42	24	54	60	25	38	45	35	41
	AVG'17	28	54	33	29	60	52	25	32	46	42	40

NO_2 µg/m³		GAMPAHA												KALUTHARA					
Year	Month	Kirindiwita	Pahalagama	Asgiriya	Oruthota Road	Oruthota	Gampaha Railway	Gampaha Police Station	Vilabada Road	Gampaha Hospital	Miriswaththa	Aluthgama	Gampaha District Average (For each month)	Kaluthara bodiya Car Park	Palathota Junction	Nagoda Junction	Katukurunda Junction	Kaluthara urban council	Kaluthara District Average (For each month)
GPA Coordinates	North	7.090216	7.093038	7.105542	7.089645	7.077857	7.0935426	7.095681	7.090837	7.091953	7.072916	7.101245		6.589989	6.593379	6.568688	6.561324	6.583921	
	East	79.968711	79.988348	79.991392	79.990985	79.990107	79.993763	79.996734	79.999831	79.994905	80.015938	80.016241		79.959596	79.970336	79.989372	79.969141	79.961197	
2013	JAN	5	24	5	41	26	98	21	12	33	12	27	28	13	33	20	39	51	31
	FEB	23	38	20	42	29	93	48	15	19	69	25	38	57	28	55	96	106	68
	MAR	19	41	19	47	39	88	44	25	45	70	28	42	41	36	36	63	71	49
	APR	35	64	30	64	52	83	62	34	67	115	35	58	54	61	38	49	57	52
	MAY	22	41	23	25	40	88	50	60	61	93	35	49	41	36	37	68	73	51
	JUN	21	52	27	67	68	65	46	25	63	63	27	48	51	33	34	79	69	53
	JUL	16	42	20	59	55	59	45	20	54	58	22	41	45	31	35	69	63	49
	AUG	19	39	22	53	50	57	48	24	54	146	50	51	37	29	27	64	55	42
	SEP	21	55	23	83	32	59	54	31	64	32	63	47	30	29	61	62	96	56
	OCT	28	52	28	81	47	89	69	25	81	70	63	58	39	32	36	88	100	59
	NOV	32	42	26	82	50	48	59	26	77	33	69	49	52	48	39	121	98	72
	DEC	20	45	23	50	60	29	37	28	40	49	43	39	36	32	40	70	52	46
	AVG'13	22	45	22	58	46	71	49	27	55	68	41	46	41	36	38	72	74	52
2014	JAN	10	25	13	40	40	19	27	18	30	19	33	25	87	54	75	51	108	75
	FEB	19	47	35	77	39	35	50	38	57	35	59	45	126	35	88	64	100	83
	MAR	30	80	56	125	63	64	84	64	92	83	61	73	68	73	47	35	93	63
	APR	24	34	29	29	37	38	22	74	35	38	82	40	27	34	34	41	31	33
	MAY	31	36	35	37	43	46	47	82	39	40	56	45	31	24	29	27	27	28
	JUN	24	15	29	30	34	39	31	60	30	30	20	31	25	32	17	23	33	26
	JUL	26	28	32	31	38	39	41	62	35	39	41	37	28	29	25	25	31	28
	AUG	36	49	46	53	54	60	51	81	92	111	89	66	23	11	17	22	29	20
	SEP	14	33	14	37	46	46	28	14	33	55	17	31	21	17	18	30	41	26
	OCT	13	32	14	26	19	25	28	12	37	56	18	25	17	12	15	33	40	23
	NOV	18	28	11	29	21	26	32	13	31	65	15	26	33	20	41	21	43	32
	DEC	15	24	10	32	20	37	24	8	29	64	11	25	25	26	16	40	45	30
	AVG'14	22	36	27	45	38	39	39	44	45	53	42	39	43	31	35	34	52	39
2015	JAN	24	34	17	53	38	53	42	16	50	70	25	38	41	30	32	63	69	47
	FEB	22	31	16	49	36	49	39	15	47	65	23	36	38	28	29	59	64	44
	MAR	16	29	17	46	28	43	37	14	42	56	19	32	24	23	24	44	61	35
	APR	14	27	15	36	31	39	35	17	35	69	18	31	23	20	21	39	45	30
	MAY	12	10	25	15	20	33	43	15	29	57	15	25	23	19	42	34	18	27
	JUN	11	9	22	13	18	29	38	13	26	51	14	22	21	17	38	30	16	24

	JUL	8	21	12	25	18	30	27	12	29	39	12	21	17	12	12	24	22	17
	AUG	12	23	20	15	18	32	26	15	32	17	49	24	26	24	24	47	42	33
	SEP	24	46	39	31	35	63	51	30	64	33	38	41	19	14	16	34	30	23
	OCT	13	32	14	26	19	35	28	12	37	56	18	26	12	9	10	21	19	14
	NOV	21	13	20	54	34	47	42	8	49	21	79	35	35	33	27	55	66	43
	DEC	25	15	23	62	39	54	48	9	56	24	90	40	40	37	31	63	75	49
	AVG'15	17	24	20	35	28	42	38	15	41	47	33	31	27	22	26	43	44	32
2016	JAN	15	41	8	32	21	32	20	18	33	15	65	27	25	27	27	25	28	26
	FEB	32	33	11	38	32	21	30	14	71	29	28	31	27	22	26	51	50	35
	MAR	18	45	17	45	32	40	42	17	43	22	63	35	26	16	20	41	41	29
	APR	16	33	18	37	22	38	33	16	31	18	56	29	21	20	17	32	31	24
	MAY	14	17	12	33	24	46	32	18	22	25	68	28	23	12	16	30	27	22
	JUN	11	22	15	31	23	36	46	14	30	29	47	28	23	19	17	35	30	25
	JUL	11	31	16	36	17	37	32	15	34	55	48	30	26	16	17	29	28	23
	AUG	9	27	14	33	20	33	23	22	23	22	42	24	18	13	13	21	18	17
	SEP	14	34	17	33	25	40	21	35	40	57	41	32	21	19	16	28	26	22
	OCT	17	38	19	38	29	40	16	18	41	54	20	30	37	15	18	38	44	30
	NOV	14	27	14	27	20	29	12	13	29	36	15	21	23	16	12	23	23	19
	DEC	24	42	21	46	30	38	29	27	34	58	20	34	32	28	27	42	45	35
	AVG'16	16	33	15	36	25	36	28	19	36	35	43	29	25	19	19	33	33	26
2017	JAN	34	45	20	48	40	43	41	22	47	33	61	39	41	33	24	56	52	41
	FEB	26	44	23	49	46	46	41	27	53	23	69	41	30	32	25	57	56	40
	MAR	19	42	14	31	47	40	38	18	42	22	67	35	31	26	20	44	51	34
	APR	17	38	17	29	48	40	30	25	41	21	54	33	26	23	35	47	45	35
	MAY	14	17	9	37	27	39	34	20	42	22	69	30	17	19	29	33	33	26
	JUN	14	28	17	33	32	37	32	18	37	22	57	30	26	18	16	34	37	26
	JUL	11	29	16	13	27	40	28	18	32	19	55	26	27	18	19	20	16	20
	AUG	12	34	22	37	25	37	32	17	35	20	50	29	23	19	14	26	21	21
	SEP	13	31	27	31	20	35	28	17	29	18	50	27	20	15	15	32	21	21
	OCT	16	33	12	39	23	38	30	23	32	19	59	30	30	21	22	41	41	31
	NOV	19	38	15	39	27	39	33	24	44	27	44	32	31	30	23	42	46	34
	DEC	27	48	31	40	37	46	33	24	44	27	48	37	31	37	25	46	56	39
	AVG'17	18	36	19	36	33	40	33	21	40	23	57	32	28	24	22	40	40	31

NO_2 µg/m³		GALLE							RATHNAPURA								
Year	Month	Richmond Hill Road	Havlock Place	Galle Bus Stand	Galle Fort	Talbort Town	BandaranayakaPedesa	Galle District Average (For each month)	PRP-Rathnapura Town	Good Shed Road	Kudugalwaththa	Batugedara	Rathnapura Police Station	RDA-Muwagama	SamanDewalaya	New Town	Rathnapura District Average (For each month)
GPA Coordinates	North	6.036714	6.037017	6.03337	6.02765	6.03567	6.038086		6.685974	6.682421	6.68253	6.665615	6.679586	6.678407	6.692027	6.706265	
	East	80.209439	80.214618	80.215143	80.216421	80.217003	80.228577		80.399301	80.402418	80.41018	80.431777	80.402037	80.3955637	80.3815	80.384072	
2013	JAN	38	21	101	32	28	40	43	56	32	29	34	63	31	33	32	39
	FEB	56	23	115	42	48	48	55	75	48	42	43	79	34	45	32	50
	MAR	42	19	80	29	43	39	42	50	56	40	43	72	34	35	33	45
	APR	44	30	51	18	51	24	36	37	70	45	48	58	33	25	38	44
	MAY	46	29	76	26	41	36	42	45	64	41	44	66	33	36	34	45
	JUN	40	35	55	25	57	46	43	33	84	34	59	76	36	35	27	48
	JUL	41	34	56	18	44	23	36	28	68	34	47	72	39	33	35	45
	AUG	45	33	53	22	31	41	38	33	98	64	43	64	32	40	47	53
	SEP	41	28	40	16	31	29	31	26	71	52	33	60	27	37	12	40
	OCT	44	27	91	14	26	21	37	33	72	47	27	60	32	37	43	44
	NOV	90	50	63	37	59	35	56	50	97	44	68	40	36	46	47	54
	DEC	65	50	92	12	23	19	44	34	69	31	35	25	26	33	33	36
	AVG'13	49	32	73	24	40	33	42	42	69	42	44	61	33	36	34	45
2014	JAN	66	52	89	22	28	25	47	46	104	63	38	50	50	34	40	53
	FEB	103	79	104	48	61	53	75	49	134	96	55	67	51	93	50	74
	MAR	66	56	87	46	48	55	60	40	84	65	45	69	42	63	42	56
	APR	66	52	89	22	28	25	47	34	35	65	47	58	44	35	31	44
	MAY	50	41	64	25	31	27	40	37	37	68	50	64	32	37	30	44
	JUN	63	51	81	33	38	34	50	35	36	60	45	53	39	34	28	41
	JUL	58	54	80	35	33	31	49	34	36	64	49	56	41	32	30	43
	AUG	59	56	76	42	48	45	54	60	47	83	50	63	56	59	51	59
	SEP	18	39	27	11	15	17	21	19	33	12	30	30	17	26	18	23
	OCT	17	23	38	12	12	14	19	20	35	39	24	42	17	18	16	26
	NOV	31	33	43	21	19	26	29	19	43	21	29	30	19	23	20	25
	DEC	26	52	53	17	15	22	31	16	41	33	23	37	21	22	22	27
	AVG'14	52	49	69	28	31	31	43	34	55	56	40	52	36	40	32	43
2015	JAN	29	30	38	18	17	18	25	42	71	60	29	60	33	41	35	46
	FEB	27	28	35	17	15	17	23	39	66	56	27	56	31	38	32	43
	MAR	35	28	55	19	19	16	29	21	45	38	31	38	20	24	25	30
	APR	25	27	40	17	20	9	23	23	31	39	27	34	19	17	26	27
	MAY	13	42	25	17	8	15	20	14	34	25	22	25	18	17	20	22
	JUN	12	38	22	15	7	13	18	12	30	22	20	22	16	15	18	19

	JUL	13	21	21	5	11	10	14	49	9	24	16	27	11	14	15	21
	AUG	8	16	20	12	8	15	13	24	50	18	35	62	17	29	32	33
	SEP	19	21	34	10	17	17	20	15	30	27	21	29	17	22	21	23
	OCT	22	15	34	14	18	19	20	9	17	16	12	17	10	13	12	13
	NOV	40	26	63	24	34	21	35	27	32	33	45	53	28	33	20	34
	DEC	45	29	71	27	39	24	39	31	37	38	51	61	32	38	23	39
	AVG'15	24	27	38	16	18	16	23	26	38	33	28	40	21	25	23	29
2016	JAN	31	20	53	23	25	17	28	19	25	29	25	30	18	22	20	24
	FEB	31	26	48	21	25	20	29	26	33	39	33	40	24	30	27	32
	MAR	33	28	53	18	12	15	27	26	52	35	33	44	19	27	25	33
	APR	25	18	39	13	19	16	22	21	32	29	27	36	19	24	24	27
	MAY	25	22	38	11	16	12	21	22	30	28	29	35	20	25	26	27
	JUN	31	20	23	16	16	14	20	21	30	27	15	30	20	21	20	23
	JUL	27	31	40	29	21	18	28	17	23	27	19	30	33	21	19	24
	AUG	16	17	23	15	15	12	16	26	29	29	27	34	25	22	23	27
	SEP	16	16	26	27	11	16	19	31	42	37	28	48	44	43	53	41
	OCT	31	23	19	31	19	20	24	21	40	15	24	35	26	25	20	26
	NOV	20	17	14	23	15	16	18	28	63	11	35	27	28	30	23	31
	DEC	28	36	50	27	26	27	32	37	31	51	25	30	29	30	32	33
	AVG'16	26	23	36	21	18	17	23	25	36	30	27	35	25	27	26	29
2017	JAN	37	38	31	22	24	25	30	33	43	40	35	45	25	33	34	36
	FEB	44	35	58	21	27	29	36	35	31	46	39	56	35	37	44	40
	MAR	36	35	48	18	22	22	30	28	45	37	33	37	22	27	26	32
	APR	33	41	45	12	21	19	29	28	28	30	31	31	24	22	29	28
	MAY	37	39	51	15	30	23	33	20	31	35	29	34	17	26	26	27
	JUN	31	39	52	12	16	17	28	19	45	35	26	38	18	16	20	27
	JUL	22	28	28	8	17	17	20	19	27	35	26	38	18	16	20	25
	AUG	19	16	29	10	17	17	18	17	51	38	21	32	13	17	17	26
	SEP	29	22	24	17	19	15	21	25	26	26	23	26	18	15	14	22
	OCT	31	20	33	28	26	16	26	37	28	37	37	32	36	22	30	32
	NOV	35	17	47	22	24	20	27	37	27	34	27	38	25	26	25	30
	DEC	36	21	39	26	22	23	28	51	36	42	34	45	28	29	28	37
	AVG'17	33	29	40	18	22	20	27	29	35	36	30	38	23	24	26	30

SO_2 µg/m³		COLOMBO																			Colombo Distict Average (For each month)
Year	Month	Meteorology Department	Colombo MC	Gangarama Temple	Fort Railway Station	Gunasinghepura	Jethawanaramaya	Maligakanda	Kelaniya	Borella Police Station	Ward Place	CEA	Kotte	Kirulapana	Dehiwala Junction	Nugegoda Town	Malabe	Peliyagoda	Waththala	Maradana Railway Station	
GPA Coordinates	North	6.904764	6.91496	6.916971	6.933859	6.935715	6.944195	6.96095	6.957673	6.915138	6.914514	6.901009	6.880868	6.877539	6.851239	6.871717	6.903725	6.986007	6.964796	6.928949	
	East	79.872066	79.863779	79.85462	79.850495	79.857266	79.8654	79.864788	79.882273	79.878171	79.876489	79.92682	79.904444	79.876602	79.86651	79.890763	79.954218	79.889366	79.897976	79.864266	
2013	JAN	25	30	18	53	26	22	33	26	29	20	21	14	25	25	29	38	54	29	61	30
	FEB	24	28	26	29	21	29	20	27	36	35	24	15	34	16	39	31	41	23	45	29
	MAR	26	26	28	49	27	32	29	32	32	35	29	19	30	26	38	30	42	32	52	32
	APR	26	31	37	54	24	50	35	38	26	40	35	20	41	26	36	32	55	45	48	37
	MAY	47	14	40	69	40	58	42	50	34	42	58	31	37	49	62	19	35	45	73	44
	JUN	20	28	31	59	28	16	21	31	44	23	26	16	19	23	36	26	37	41	37	30
	JUL	11	14	29	28	27	17	14	10	13	14	11	14	20	21	28	25	16	13	26	18
	AUG	24	26	38	59	17	17	14	41	34	23	18	19	28	23	28	29	29	36	64	30
	SEP	18	26	37	39	33	23	37	24	28	19	38	29	18	29	24	24	28	33	45	29
	OCT	27	27	34	32	13	21	18	20	28	23	16	19	34	30	38	40	31	25	50	28
	NOV	26	25	40	47	25	41	31	16	30	22	26	18	36	29	32	38	48	45	58	33
	DEC	20	29	41	43	21	12	20	22	22	27	22	12	31	30	23	24	45	35	44	28
	AVG'13	25	25	33	47	25	28	26	28	30	27	27	19	29	27	34	30	38	34	50	31
2014	JAN	20	29	19	43	21	12	20	22	22	27	22	12	31	29	23	24	45	35	44	26
	FEB	29	26	14	33	15	14	22	33	30	25	14	15	13	16	19	21	23	19	37	22
	MAR	34	28	10	39	11	10	5	38	36	33	10	11	25	15	18	20	28	23	45	23
	APR	20	21	24	15	17	20	21	15	21	25	15	20	21	15	16	15	20	24	35	20
	MAY	20	21	24	15	17	20	21	15	21	25	15	20	14	15	16	15	20	24	15	19
	JUN	20	26	20	36	27	25	29	20	23	22	25	15	28	31	43	34	26	21	26	26
	JUL	21	26	22	38	19	13	18	22	24	24	21	20	27	25	23	30	23	22	25	23
	AUG	20	20	24	37	22	24	22	23	22	27	21	22	27	24	23	30	26	24	27	24
	SEP	20	19	21	33	21	18	17	17	20	21	18	19	23	18	17	25	21	21	24	21
	OCT	19	19	22	33	20	21	19	21	20	23	19	19	24	20	18	24	22	22	23	21
	NOV	19	18	21	30	21	19	20	21	20	24	20	20	22	18	18	24	24	23	23	21
	DEC	23	34	28	36	28	34	28	32	35	30	24	21	28	28	31	31	30	35	37	30
	AVG'14	22	24	21	32	20	19	20	23	24	25	19	18	24	21	22	24	26	24	30	23
2015	JAN	26	50	34	42	35	49	35	43	49	35	27	21	34	38	43	38	35	46	50	38
	FEB	25	45	33	39	32	45	32	40	45	34	24	19	33	34	36	37	33	45	46	36
	MAR	25	34	20	40	22	33	25	22	35	23	21	19	27	16	49	35	33	37	58	30
	APR	17	18	21	35	22	9	27	19	22	19	17	13	20	18	25	30	30	33	44	23
	MAY	23	15	14	25	19	10	27	14	23	14	15	15	28	14	18	37	51	35	34	23

	JUN	19	14	13	24	17	6	26	15	21	13	14	15	21	10	15	30	46	35	31	20
	JUL	15	11	6	19	15	16	15	14	17	7	12	11	9	19	22	18	22	20	26	15
	AUG	15	10	13	17	20	27	21	19	20	13	9	11	10	25	13	20	12	33	30	18
	SEP	17	11	13	25	15	26	24	22	24	18	12	13	16	22	19	21	14	37	26	20
	OCT	15	12	11	22	14	18	20	23	19	13	11	13	11	17	15	16	12	29	25	17
	NOV	32	14	15	43	42	35	21	52	36	36	29	29	16	24	36	39	31	42	52	33
	DEC	37	16	17	50	48	40	24	59	41	42	33	34	18	27	41	45	35	48	60	38
	AVG'15	22	21	18	32	25	26	25	29	29	22	19	18	20	22	28	31	30	37	40	26
2016	JAN	30	45	36	67	44	32	27	36	43	54	41	46	38	64	48	32	34	35	87	44
	FEB	48	38	50	82	61	57	32	49	33	58	52	49	42	64	51	46	63	79	86	55
	MAR	51	56	65	72	71	55	59	59	56	52	46	36	45	59	41	51	63	62	84	57
	APR	54	45	64	69	60	52	45	48	46	51	43	43	54	62	38	53	62	68	74	54
	MAY	47	43	47	70	52	42	64	55	52	52	50	43	25	40	43	44	32	32	52	47
	JUN	25	45	31	34	23	28	20	35	36	26	20	43	32	43	47	46	59	49	61	37
	JUL	30	49	22	25	61	46	44	49	51	46	35	40	27	52	46	70	61	55	69	46
	AUG	25	50	29	35	37	47	30	50	41	46	31	35	43	47	43	36	45	50	81	42
	SEP	26	54	21	40	32	45	29	68	36	32	27	25	36	68	59	39	55	55	79	43
	OCT	90	72	97	88	71	89	67	77	43	64	58	75	80	64	80	68	54	89	57	73
	NOV	31	32	42	65	30	26	35	16	39	42	37	45	31	25	27	52	53	49	42	38
	DEC	62	46	97	61	73	76	52	51	62	56	52	64	57	60	58	55	50	72	56	61
	AVG'16	43	48	50	59	51	50	42	49	45	48	41	45	43	54	48	49	53	58	69	50
2017	JAN	51	68	56	72	60	45	51	52	58	47	59	59	46	65	64	75	53	65	62	58
	FEB	55	67	41	78	61	55	53	52	47	53	47	35	44	59	67	56	80	75	91	59
	MAR	52	62	44	78	53	55	44	46	57	51	52	41	50	63	64	53	77	76	90	58
	APR	20	47	48	73	40	37	41	43	49	35	41	54	52	61	54	54	73	62	62	50
	MAY	53	46	55	67	63	48	48	43	50	32	50	52	58	57	56	60	83	93	84	58
	JUN	51	48	33	60	43	57	49	47	53	38	45	40	50	64	46	51	59	52	53	49
	JUL	36	49	44	71	33	44	44	40	57	33	38	37	43	52	48	40	66	76	68	48
	AUG	32	54	54	54	40	44	43	24	45	39	48	46	38	48	40	47	50	62	61	46
	SEP	24	51	37	56	37	39	35	27	56	32	29	33	39	39	43	44	58	50	55	41
	OCT	43	44	40	53	54	49	43	44	53	40	44	46	48	50	49	47	50	53	65	48
	NOV	40	52	50	67	48	51	37	43	50	49	50	56	43	65	64	48	64	56	64	52
	DEC	42	49	50	70	50	44	38	36	52	49	41	40	44	53	51	50	55	60	69	50
	AVG'17	42	53	46	67	48	47	44	41	52	42	45	45	46	56	54	52	64	65	69	51

SO_2 µg/m³		KANDY										Kandy District Average (For each month)
Year	Month	Maligaawa Junction/Temple of	Super Market Junction/Clock Tower	Ampitiya Junction/E.L.Senanay	Wels park	Good shed Junction/Post Office	Colombo Street/ JoergeE.SilvaChildren	Kandy Municipal Council	High School Junction/ B.C.A.S. School (near	Gatembe Junction/Gatembe	Royal School Junction/E.D.E.Silva	
GPA Coordinates	North	7.2931497	7.292498	7.287171	7.290144	7.290181	7.292968	7.298575	7.285926	7.2719469	7.291038	
	East	80.6388602	80.634137	80.647647	80.637702	80.63228	80.635804	80.637791	80.626404	80.6060491	80.647158	
2013	JAN	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	FEB	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	MAR	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	APR	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	MAY	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	JUN	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	JUL	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	AUG	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	SEP	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	OCT	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	NOV	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	DEC	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	AVG'13	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
2014	JAN	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	FEB	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	MAR	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	APR	21	48	28	29	70	46	31	43	42	32	39
	MAY	25	52	31	33	59	46	34	43	47	32	40
	JUN	22	48	25	30	61	51	30	38	40	31	38
	JUL	21	50	29	31	60	48	33	41	42	30	39
	AUG	24	52	33	34	65	55	34	44	48	34	42
	SEP	22	50	31	32	58	51	31	40	41	30	39
	OCT	23	51	30	33	61	53	30	41	41	30	39
	NOV	23	49	31	33	60	53	32	43	40	32	40
	DEC	33	62	32	45	74	59	37	49	47	37	47
	AVG'14	24	51	30	33	63	51	32	42	43	32	40
2015	JAN	42	75	33	57	88	64	41	54	54	41	55
	FEB	32	70	35	53	88	60	45	42	58	40	52
	MAR	21	51	22	29	59	39	22	34	35	31	34
	APR	19	44	20	34	64	41	25	34	35	29	35
	MAY	21	49	21	36	57	47	29	39	43	31	37
	JUN	21	59	25	43	67	56	34	47	49	37	44

	JUL	18	53	22	39	59	51	29	42	45	33	39
	AUG	17	57	24	41	65	59	32	42	50	36	42
	SEP	12	51	19	37	57	51	29	37	45	34	37
	OCT	11	62	25	44	67	61	36	44	53	41	44
	NOV	24	39	23	34	55	40	29	36	40	26	35
	DEC	32	56	57	36	63	62	36	41	35	29	45
	AVG'15	23	56	27	40	66	53	32	41	45	34	42
2016	JAN	41	40	47	25	36	37	63	51	29	56	43
	FEB	47	47	43	30	45	32	66	55	32	56	45
	MAR	49	46	42	34	44	46	63	47	34	54	46
	APR	42	40	49	39	57	36	65	56	32	50	47
	MAY	62	29	31	58	31	28	69	55	27	27	42
	JUN	30	52	43	45	36	35	54	33	44	44	42
	JUL	47	55	29	22	24	32	24	37	23	32	33
	AUG	46	50	51	36	46	51	53	50	48	45	48
	SEP	38	98	52	92	90	20	36	48	43	33	55
	OCT	49	34	38	50	24	33	58	31	48	37	40
	NOV	30	31	23	21	40	31	24	30	23	28	28
	DEC	68	119	100	70	120	49	62	30	40	50	71
	AVG'16	46	53	46	44	49	36	53	44	35	43	45
2017	JAN	40	41	42	28	81	31	46	51	59	35	45
	FEB	35	51	33	35	81	35	65	28	48	29	44
	MAR	54	60	52	44	92	58	60	43	55	51	57
	APR	55	64	38	44	78	36	59	36	54	62	53
	MAY	38	35	30	29	80	40	46	31	61	31	42
	JUN	29	47	36	24	91	25	40	39	66	34	43
	JUL	27	47	34	22	66	31	52	39	45	32	39
	AUG	23	39	41	18	69	20	51	25	48	36	37
	SEP	30	32	34	20	65	23	55	35	38	35	37
	OCT	37	46	53	40	66	41	53	47	43	45	47
	NOV	39	50	41	50	69	39	40	28	42	33	43
	DEC	38	54	47	48	56	37	35	47	39	32	43
	AVG'17	37	47	40	33	75	35	50	37	50	38	44

SO_2 µg/m³		GAMPAHA												KALUTHARA					
Year	Month	Kirindiwita	Pahalagama	Asgiriya	Oruthota Road	Oruthota	Gampaha Railway	Gampaha Police Station	Vilabada Road	Gampaha Hospital	Miriswaththa	Aluthgama	Gampaha District Average (For each month)	Kaluthara bodiya Car Park	Palathota Junction	Nagoda Junction	Katukurunda Junction	Kaluthara urban council	Kaluthara District Average (For each month)
GPA Coordinates	North	7.090216	7.093038	7.105542	7.089645	7.077857	7.0935426	7.095681	7.090837	7.091953	7.072916	7.101245		6.589989	6.593379	6.568688	6.561324	6.583921	
	East	79.968711	79.988348	79.991392	79.990985	79.990107	79.993763	79.996734	79.999831	79.994905	80.015938	80.016241		79.959596	79.970336	79.989372	79.969141	79.961197	
2013	JAN	12	25	17	32	27	10	29	16	55	39	31	27	35	22	34	23	34	30
	FEB	42	50	27	40	37	38	53	57	23	62	24	41	46	45	40	32	26	38
	MAR	31	37	27	37	32	28	34	36	43	39	25	34	41	39	38	29	36	37
	APR	35	28	20	25	33	35	34	21	38	43	19	30	45	51	32	30	32	38
	MAY	25	45	28	39	29	32	31	75	48	31	10	36	39	38	37	33	35	36
	JUN	37	38	42	42	33	33	17	22	19	15	32	30	48	54	45	35	47	46
	JUL	26	30	29	39	32	32	24	14	21	14	21	26	49	38	53	52	65	51
	AUG	52	41	49	50	30	22	15	21	12	14	22	30	24	28	32	28	28	28
	SEP	27	30	26	41	29	20	34	38	25	23	36	30	16	39	32	28	25	28
	OCT	4	27	22	16	13	19	24	27	14	18	26	19	21	28	20	34	24	25
	NOV	25	31	36	39	34	32	24	30	44	28	11	30	34	30	26	40	20	30
	DEC	17	19	17	22	26	19	12	12	12	19	14	17	45	36	38	58	42	44
	AVG'13	28	33	28	35	30	27	28	31	30	29	23	29	37	37	36	35	35	36
2014	JAN	17	19	17	22	26	19	12	12	12	19	14	17	50	47	66	65	50	55
	FEB	27	31	27	37	20	30	19	19	19	30	16	25	39	45	64	67	49	53
	MAR	36	43	38	48	29	39	16	20	16	42	18	31	33	38	47	52	40	42
	APR	21	19	22	18	26	32	16	18	16	19	16	20	32	33	41	45	36	37
	MAY	26	33	28	28	29	39	16	20	16	42	18	27	20	14	18	22	24	20
	JUN	30	30	34	34	27	27	14	18	16	12	26	24	23	29	18	18	22	22
	JUL	33	31	29	31	28	31	21	19	18	21	28	26	16	16	10	21	15	16
	AUG	35	32	44	38	35	29	20	19	17	32	35	31	20	16	15	24	20	19
	SEP	28	30	28	32	27	30	16	18	16	28	17	25	18	15	15	22	18	18
	OCT	29	29	30	31	27	29	17	18	17	29	19	25	18	16	17	23	19	19
	NOV	30	29	29	30	26	29	18	19	16	30	20	25	19	16	18	23	21	19
	DEC	25	27	22	33	27	33	21	16	27	40	20	26	24	19	21	34	36	26
	AVG'14	28	29	29	32	27	31	17	18	17	29	21	25	26	25	29	35	29	29
2015	JAN	20	24	14	36	27	37	24	12	37	50	19	27	29	21	23	44	50	33
	FEB	16	23	14	35	26	35	28	12	33	46	17	26	25	20	18	41	43	29
	MAR	12	21	13	34	23	30	27	12	30	40	14	23	18	16	18	31	43	25
	APR	11	19	11	26	23	28	26	13	26	48	13	22	18	14	16	28	30	21
	MAY	9	8	18	11	14	25	31	12	21	42	12	18	17	13	28	24	13	19
	JUN	9	7	17	11	13	22	25	10	17	36	10	16	14	12	25	21	11	17

	JUL	8	16	9	18	14	23	20	10	22	15	7	15	11	9	8	17	16	12
	AUG	9	17	14	11	12	23	18	12	23	14	34	17	18	19	16	34	29	23
	SEP	18	32	26	22	22	42	37	21	46	23	25	29	14	10	13	24	22	17
	OCT	10	22	11	18	15	25	22	6	23	39	11	18	11	6	7	14	13	10
	NOV	17	8	17	35	22	35	31	7	36	14	55	25	21	23	22	38	46	30
	DEC	19	10	19	40	26	40	35	8	42	16	63	29	24	26	26	44	52	34
	AVG'15	13	17	15	25	20	30	27	11	30	32	23	22	18	16	18	30	31	23
2016	JAN	53	35	67	48	19	42	31	29	50	38	49	42	30	33	40	57	64	45
	FEB	62	45	62	47	25	35	33	42	53	36	56	45	30	31	41	39	74	43
	MAR	61	50	63	41	25	47	31	47	58	35	55	47	33	36	40	54	60	45
	APR	65	54	63	45	31	40	34	33	57	34	65	47	36	34	44	59	76	50
	MAY	65	54	39	38	31	41	26	38	35	73	62	46	32	58	43	41	38	42
	JUN	38	44	57	37	39	41	20	39	42	30	49	40	28	46	28	40	17	32
	JUL	24	27	44	24	59	53	55	48	56	52	63	46	35	36	36	63	44	43
	AUG	28	30	22	19	30	30	19	26	47	41	50	31	22	33	36	36	38	33
	SEP	27	36	37	43	23	37	22	46	59	38	77	40	41	53	29	42	38	41
	OCT	58	39	42	27	30	51	80	43	28	38	29	42	47	32	42	49	47	43
	NOV	43	29	32	21	22	35	35	32	21	27	24	29	27	30	29	30	34	30
	DEC	53	50	60	46	29	56	47	45	52	54	46	49	98	31	32	47	44	50
	AVG'16	48	41	49	36	30	42	36	39	47	41	52	42	38	38	37	46	48	41
2017	JAN	40	51	49	63	60	62	72	49	58	58	77	58	35	37	47	49	49	43
	FEB	50	59	44	53	57	67	67	57	62	60	71	59	43	36	41	44	48	42
	MAR	49	58	42	51	56	68	58	45	50	55	71	55	42	33	38	43	44	40
	APR	40	42	29	45	35	66	56	40	37	32	69	45	32	39	35	43	42	38
	MAY	42	36	37	58	45	66	52	47	47	40	71	49	45	32	38	35	49	40
	JUN	53	38	38	51	32	64	56	33	33	33	66	45	55	34	36	31	46	40
	JUL	64	36	22	51	31	54	48	49	41	33	68	45	35	27	24	39	38	33
	AUG	29	55	31	58	46	46	56	48	49	47	75	49	24	26	23	23	38	27
	SEP	34	36	30	35	29	40	45	33	42	36	62	38	42	29	26	19	20	27
	OCT	36	35	41	45	39	44	46	40	47	36	65	43	48	34	44	27	28	36
	NOV	32	33	35	45	49	53	53	43	52	55	69	47	32	21	23	26	24	25
	DEC	42	44	49	47	57	56	55	46	53	49	68	51	34	38	39	45	38	39
	AVG'17	43	43	37	50	45	57	55	44	48	45	69	49	39	32	34	35	39	36

SO_2 µg/m³		GALLE							RATHNAPURA								
Year	Month	Richmond Hill Road	Havlock Place	Galle Bus Stand	Galle Fort	Talbort Town	BandaranayakaPedes	Galle District Average (For each month)	PRP-Rathnapura Town	Good Shed Road	Kudugalwaththa	Batugedara	Rathnapura Police Station	RDA-Muwagama	SamanDewalaya	New Town	Rathnapura District Average (For each month)
GPA Coordinates	North	6.036714	6.037017	6.03337	6.02765	6.03567	6.038086		6.685974	6.682421	6.68253	6.665615	6.679586	6.678407	6.692027	6.706265	
	East	80.209439	80.214618	80.215143	80.216421	80.217003	80.228577		80.399301	80.402418	80.41018	80.431777	80.402037	80.3955637	80.3815	80.384072	
2013	JAN	19	41	25	40	48	45	36	51	59	23	10	34	11	37	38	33
	FEB	38	34	41	39	46	27	38	39	41	18	19	39	40	28	20	31
	MAR	21	34	38	35	39	44	35	38	48	24	20	35	20	28	26	30
	APR	48	42	35	26	19	48	34	30	30	33	30	32	18	25	25	28
	MAY	22	32	35	32	35	40	33	33	44	24	21	33	20	26	26	28
	JUN	24	22	45	44	37	52	37	40	50	32	40	36	20	30	26	34
	JUL	19	24	58	10	43	76	38	15	63	11	17	17	7	13	10	19
	AUG	22	27	23	22	22	27	24	29	40	28	12	42	11	18	29	26
	SEP	30	22	35	35	33	16	29	14	33	27	18	35	13	20	18	22
	OCT	31	21	18	30	15	15	22	27	27	19	26	26	26	16	27	24
	NOV	25	34	20	22	25	31	26	16	33	23	18	25	32	28	33	26
	DEC	20	36	22	21	26	22	25	25	30	25	33	21	22	16	29	25
	AVG'13	25	31	33	30	32	37	31	30	41	24	22	31	20	24	26	27
2014	JAN	24	29	24	26	29	27	26	25	30	26	32	25	24	16	28	26
	FEB	29	25	18	23	24	21	23	25	39	28	44	50	24	17	36	33
	MAR	27	26	19	22	21	23	23	26	28	23	31	18	19	10	27	23
	APR	25	31	27	26	31	28	28	15	19	15	21	14	14	17	21	17
	MAY	20	14	18	22	24	20	20	26	20	14	22	18	14	16	15	18
	JUN	25	23	18	17	20	25	21	26	19	13	31	17	20	14	14	19
	JUL	10	25	41	20	15	41	25	24	25	21	20	15	20	21	19	21
	AUG	22	26	42	23	18	19	25	27	26	23	19	14	18	23	25	22
	SEP	20	23	29	22	19	23	23	21	20	19	21	14	15	16	21	18
	OCT	21	24	25	21	17	21	22	23	22	21	20	15	17	15	22	19
	NOV	22	26	31	22	20	21	24	22	21	23	21	15	16	19	23	20
	DEC	21	24	29	18	16	17	21	28	35	33	23	29	19	24	25	27
	AVG'14	22	25	27	22	21	24	23	24	25	22	25	20	18	17	23	22
2015	JAN	20	21	26	13	12	13	18	33	49	42	25	42	22	28	26	33
	FEB	17	20	22	12	14	12	16	30	46	42	19	39	21	26	25	31
	MAR	22	18	38	14	15	11	20	12	31	27	21	27	14	19	18	21
	APR	18	19	26	12	14	6	16	14	22	28	18	24	13	11	18	19
	MAY	9	26	17	13	8	10	14	9	24	17	13	17	13	15	14	15
	JUN	8	27	17	10	8	9	13	9	25	16	14	17	11	13	13	15

	JUL	8	13	15	5	8	11	10	35	45	17	13	19	8	10	12	20
	AUG	6	10	14	11	6	10	10	15	35	16	25	44	13	20	25	24
	SEP	12	14	25	7	12	13	14	10	21	21	15	19	12	15	17	16
	OCT	16	11	22	10	13	15	15	6	12	10	9	13	7	9	10	10
	NOV	32	18	49	17	24	15	26	17	22	21	31	37	24	23	14	24
	DEC	37	21	56	19	27	17	30	19	26	24	36	42	27	27	16	27
	AVG'15	17	18	27	12	13	12	17	17	30	23	20	28	15	18	17	21
2016	JAN	40	66	54	40	43	39	47	31	39	22	33	46	37	21	36	33
	FEB	46	65	53	48	43	49	51	27	35	20	35	43	25	32	28	31
	MAR	47	70	54	55	43	48	53	40	24	27	29	36	39	38	30	33
	APR	41	87	54	54	45	45	54	32	33	30	29	38	20	25	26	29
	MAY	68	40	45	62	43	52	52	34	35	32	29	33	22	28	27	30
	JUN	26	43	44	49	42	41	41	32	31	37	29	29	26	33	29	31
	JUL	59	52	64	40	53	44	52	30	39	39	32	18	28	32	33	31
	AUG	36	32	42	25	40	28	34	30	40	38	43	33	41	43	44	39
	SEP	39	76	50	26	41	47	47	56	34	36	35	50	49	41	55	45
	OCT	37	51	29	41	34	52	41	27	50	25	30	41	72	37	33	39
	NOV	28	59	24	35	30	37	36	52	47	34	42	38	41	58	46	45
	DEC	31	50	21	32	39	40	36	52	50	49	40	37	49	49	40	46
	AVG'16	42	58	45	42	41	44	45	37	38	32	34	37	37	36	36	36
2017	JAN	37	46	74	58	31	39	48	40	57	52	49	55	47	40	42	48
	FEB	44	51	72	57	44	41	52	41	52	43	43	42	33	42	40	42
	MAR	44	52	72	56	44	45	52	48	43	34	44	43	30	36	42	40
	APR	47	42	74	68	41	49	54	49	48	48	45	57	49	39	35	46
	MAY	41	49	79	66	35	43	52	52	58	52	50	62	45	30	49	50
	JUN	48	39	73	47	27	34	45	51	54	40	56	66	52	40	55	52
	JUL	37	47	69	38	28	38	43	35	23	23	34	32	42	23	21	29
	AUG	39	58	66	29	26	53	45	36	39	41	39	43	32	21	52	38
	SEP	40	36	66	32	29	39	40	51	31	39	38	22	40	18	44	35
	OCT	53	50	82	50	42	46	54	59	55	56	61	55	44	37	54	53
	NOV	39	47	71	43	31	30	44	44	49	52	23	36	48	28	51	41
	DEC	38	47	65	53	40	43	48	51	36	58	57	39	41	35	40	45
	AVG'17	42	47	72	50	35	42	48	46	45	45	45	46	42	32	44	43

Socioeconomic Data

Population data District Secretariat vise in selected Districts

	Year		2013		2014		2015		2016		2017	
		LA	P	PD	P	PD	P	PD	P	PD	P	PD
KANDY DISTRICT D.S.Division	Thumpane	54	37875	701	38234	708	38754	718	39246	727	39734	736
	Pujapitiya	59	58280	988	58824	997	59624	1011	60382	1023	61133	1036
	Akurana	31	63798	2058	64393	2077	65269	2105	66099	2132	66921	2159
	Pathadumbara	51	89285	1751	90120	1767	91345	1791	92506	1814	93657	1836
	panvila	93	26462	285	26707	287	27071	291	27415	295	27756	298
	Udadumbara	277	22642	82	22859	83	23170	84	23464	85	23756	86
	Minipe	250	52200	209	52698	211	53415	214	54094	216	54767	219
	Medadumbara	196	61419	313	61993	316	62836	321	63635	325	64427	329
	Kundasale	81	127866	1579	129067	1593	130823	1615	132486	1636	134133	1656
	GagawataKorale	59	159547	2704	161054	2730	163244	2767	165319	2802	167375	2837
	Harispaththuwa	49	88733	1811	89563	1828	90781	1853	91935	1876	93079	1900
	Hatharaliyadda	62	30175	487	30457	491	30872	498	31264	504	31653	511
	Yatinuwara	72	106687	1482	107694	1496	109158	1516	110546	1535	111921	1554
	udunuwara	68	111592	1641	112648	1657	114180	1679	115632	1700	117070	1722
	Doluwa	95	50147	528	50625	533	51314	540	51966	547	52613	554
	Pathahewaheta	84	58550	697	59103	704	59906	713	60668	722	61423	731
	Delthota	49	30538	623	30822	629	31241	638	31638	646	32032	654
	Udapalatha	94	92302	982	93158	991	94425	1005	95625	1017	96814	1030
	Ganga IhalaKorale	94	55598	591	56122	597	56886	605	57609	613	58325	620
	Pasbagekorale	122	60304	494	60859	499	61686	506	62471	512	63247	518
	Total Population	1940	1384000	713	1397000	720	1416000	730	1434000	739	1451836	748
COLOMBO DISTRICT D.S.Division	Colombo	18	323257	17959	326779	18154	330301	18350	333330	18518	336358	18687
	Thimbirigasyaya	22	238057	10821	240651	10939	243245	11057	245475	11158	247705	11259
	Dehiwala	8	88962	10553	89932	10668	90901	10783	91734	10882	92567	10981
	Rathmalana	13	95506	7252	96547	7331	97587	7410	98482	7478	99376	7546
	Moratuwa	20	168280	8414	170114	8506	171947	8597	173523	8676	175099	8755
	Kesbewa	64	245232	3832	247904	3874	250576	3915	252873	3951	255170	3987
	Maharagama	39	196423	4985	198563	5040	200703	5094	202543	5141	204383	5187
	Sri Jayawardenapura Kotte	17	107925	6349	109101	6418	110277	6487	111288	6546	112299	6606
	Kolonnawa	28	191687	6846	193776	6921	195864	6995	197660	7059	199455	7123
	Kaduwela	88	252041	2864	254787	2895	257533	2927	259894	2953	262255	2980
	Homagama	121	237905	1966	240497	1988	243089	2009	245318	2027	247547	2046
	Seethawaka	150	113807	759	115047	767	116287	775	117353	782	118419	789
	Padukka	110	65267	593	65978	600	66689	606	67301	612	67912	617
	Total Population	699	2324349	3325	2349674	3361	2374999	3398	2396772	3429	2418545	3460
GAMPAHA DISTRICT D.S.Division	Aththanagalla	154	180198	1170	181370	1178	183396	1191	184798	1200	186287	1210
	Biyagama	62	187255	3040	188460	3059	190565	3094	192022	3117	193569	3142
	Dompe	178	145018	813	155553	872	157290	882	158493	889	159770	896
	Diulapitiya	202	154554	764	145959	721	147589	730	148717	735	149915	741
	Gampaha	96	198366	2073	199654	2086	201884	2110	203427	2126	205066	2143
	Ja-ela	64	202235	3160	203547	3180	205820	3216	207394	3241	209064	3267
	Katana	108	236118	2194	237656	2209	240310	2233	242148	2250	244099	2269
	Kelaniya	22	137831	6294	138719	6334	140269	6405	141341	6454	142480	6506
	Mahara	99	208522	2111	209871	2124	212214	2148	213837	2164	215560	2182

	Minuwangoda	131	178960	1371	180123	1380	182135	1396	183528	1406	185006	1418
	Merigama	187	165160	885	166234	891	168091	901	169376	908	170741	915
	Negambo	31	142638	4631	143565	4661	145168	4713	146278	4749	147457	4788
	Waththala	55	176144	3226	177289	3247	179269	3283	180640	3308	182095	3335
	Total Population	1387	2312999	1668	2328000	1679	2354000	1698	2371999	1711	2391109	1724
KALUTARA DISTRICT D.S.Division	Panadura	44	183030	4160	183030	4160	185571	4218	188111	4275	189651	4310
	Bandaragama	56	109688	1959	109688	1959	111208	1986	112727	2013	113650	2029
	Horana	109	113832	1044	113832	1044	115410	1059	116987	1073	117945	1082
	Ingiriya	90	54121	601	54121	601	54870	610	55618	618	56074	623
	Bulathsinghala	206	64867	315	64867	315	65766	319	66665	324	67210	326
	madurawala	59	34523	585	34523	585	35002	593	35480	601	35770	606
	millaniya	81	52392	647	52392	647	53118	656	53843	665	54284	670
	kalutara	69	160357	2324	160357	2324	162579	2356	164801	2388	166150	2408
	Beruwala	69	165657	2401	165657	2401	167949	2434	170241	2467	171635	2487
	Dodangoda	114	64224	563	64224	563	65114	571	66004	579	66545	584
	Mathugama	128	81622	638	81622	638	82753	647	83884	655	84571	661
	Agalawattha	88	36819	418	36819	418	37330	424	37841	430	38151	434
	Palindanuwara	276	51014	185	51014	185	51720	187	52425	190	52854	192
	Wallalawita	209	54854	262	54854	262	55614	266	56374	270	56835	272
	Total Population	1598	1227000	768	1227000	768	1244001	778	1261001	789	1271325	796
GALLE DISTRICT D.S.Division	Benthota	74	N.A	N.A	N.A	N.A	51275	693	51792	700	52325	707
	Balapitiya	55	N.A	N.A	N.A	N.A	69186	1258	69884	1271	70603	1284
	Karandeniya	88	N.A	N.A	N.A	N.A	64124	729	64771	736	65437	744
	Elpitiya	150	N.A	N.A	N.A	N.A	66410	443	67080	447	67771	452
	Niyagama	109	N.A	N.A	N.A	N.A	36500	335	36868	338	37247	342
	Thawalama	178	N.A	N.A	N.A	N.A	33457	188	33795	190	34143	192
	Neluwa	155	N.A	N.A	N.A	N.A	29384	190	29681	191	29987	193
	Nagoda	179	N.A	N.A	N.A	N.A	55229	309	55786	312	56361	315
	Baddegama	111	N.A	N.A	N.A	N.A	76959	693	77736	700	78535	708
	Welivitiya-Divithura	60	N.A	N.A	N.A	N.A	30110	502	30414	507	30727	512
	Ambalangoda	52	N.A	N.A	N.A	N.A	58443	1124	59032	1135	59640	1147
	Gonapinuwala	27	N.A	N.A	N.A	N.A	22321	827	22546	835	22778	844
	Hikkaduwa	65	N.A	N.A	N.A	N.A	104566	1609	105615	1625	106703	1642
	Galle FourtGravets	24	N.A	N.A	N.A	N.A	104396	4350	105449	4394	106535	4439
	Bope-Poddala	30	N.A	N.A	N.A	N.A	51640	1721	52161	1739	52698	1757
	Akmeemana	65	N.A	N.A	N.A	N.A	79800	1228	80604	1240	81434	1253
	Yakkalamulla	110	N.A	N.A	N.A	N.A	47141	429	47617	433	48107	437
	Imaduwa	67	N.A	N.A	N.A	N.A	46047	687	46512	694	46991	701
	Habaraduwa	53	N.A	N.A	N.A	N.A	64012	1208	64658	1220	65323	1233
	Total Population	1652	N.A	N.A	N.A	N.A	1091000	660	1102001	667	1113345	674
RATHNAPURA DISTRICT D.S.Division	Ayagama	165	31152	189	31577	191	32001	194	32370	196	32695	198
	Balangoda	271	82233	303	83360	308	84486	312	85461	315	86319	319
	Eheliyagoda	141	71423	507	72401	513	73378	520	74224	526	7497	53
	Elapatha	82	38167	465	38689	472	39210	478	39662	484	40060	489
	Embilipitiya	388	135825	350	137683	355	139541	360	141151	364	142568	367
	Godakawela	155	77098	497	78154	504	79210	511	80123	517	80928	522
	Imbulpe	256	59964	234	60787	237	61609	241	62319	243	62945	246
	kahawatta	103	43656	424	44253	430	44850	435	45367	440	45823	445
	Kalawana	379	51734	137	52440	138	53146	140	53759	142	54299	143
	kiriella	81	32883	406	33333	412	33782	417	34171	422	34515	426
	Kolonna	176	46335	263	46968	267	47601	270	48150	274	48634	276
	Kuruvita	174	96440	554	97757	562	99074	569	100217	576	101223	582
	Nivithigala	156	60629	389	61457	394	62284	399	63003	404	63636	408
	Opanayaka	80	26807	335	27174	340	27540	344	27858	348	28137	352
	Pelmadulla	146	90211	618	91443	626	92675	635	93744	642	94686	649
	Rathnapura	324	121203	374	122862	379	124520	384	125957	389	127222	393
	Weligepola	198	31240	158	31667	160	32093	162	32464	164	32790	166
	Total Population	3275	1097000	335	1112000	340	1127000	344	1140000	348	1076480	329

Land area (Km2) –LAPopulation–PPopulation Density (per Km2) - PD

Number of registered vehiclesin each area (District secretariat vise)

	KANDY DISTRICT																					
	Vehicle type	Thumpane	Pujapitiya	Akurana	Pathadumbara	panvila	Udadumbara	Minipe	Medadumbara	Kundasale	GagawataKora le	Harispaththuw a	Hatharaliyadd a	Yatinuwara	udunuwara	Doluwa	Pathahewahet a	Delthota	Udapalatha	Ganga IhalaKorale	Pasbagekorale	Total for each vehicle type
2013	MC	516	658	657	1680	57	60	141	439	3417	10604	1994	183	2821	60	245	515	63	1081	346	430	25967
	MB	1823	2357	2179	3309	507	793	2774	1674	6084	7810	3600	1588	4550	793	1328	1760	389	2406	1512	1161	48397
	T	1437	2322	1635	3377	745	992	2237	2477	5655	5978	3557	1426	4305	992	2024	2923	1016	2805	1955	1967	49825
	PB	99	54	63	143	12	53	24	136	351	597	193	52	277	53	49	137	52	94	93	67	2599
	DPV	440	659	1184	1074	143	128	356	511	1834	3782	1176	251	1368	128	381	600	212	958	410	519	16114
	ML	353	507	616	883	80	205	567	546	1488	2347	831	205	1237	205	353	578	192	955	336	457	12941
	LV	30	9	20	48	8	42	486	34	98	371	50	21	55	42	16	20	4	50	7	19	1430
	O	5	4	26	65	23	0	35	0	4	24	1	0	3	0	87	55	0	123	0	2	457
	Total	4703	6570	6380	10579	1575	2273	6620	5817	18931	31513	11402	3726	14616	2273	4483	6588	1928	8472	4659	4622	157730
2014	MC	603	788	679	1808	74	80	164	484	3420	11039	2139	157	3009	1930	245	621	53	1193	410	485	29381
	MB	1996	2593	2397	3683	537	886	3154	1882	6091	8271	3990	1722	5055	4500	1328	1910	321	2568	1667	1221	55772
	T	1537	2515	1835	3601	913	1104	2621	2731	5661	6249	3772	1556	4626	4460	2024	3202	794	2805	2209	2125	56340
	PB	46	39	61	143	34	39	31	140	352	635	202	23	265	220	49	211	39	94	93	64	2780
	DPV	454	692	1198	1120	146	146	423	537	1838	3890	1193	260	1390	1352	381	691	128	1017	451	539	17846
	ML	340	534	560	887	84	216	543	546	1498	2305	842	203	1263	1058	353	564	144	998	351	446	13735
	LV	28	18	15	43	5	44	512	30	105	393	36	22	51	25	16	27	2	55	11	19	1457
	O	65	8	25	65	4	0	37	0	0	151	2	28	3	10	87	4	0	143	0	10	642
	Total	5069	7187	6770	11350	1797	2515	7485	6350	18965	32933	12176	3971	15662	13555	4483	7230	1481	8873	5192	4909	177953
2015	MC	788	1063	910	1808	103	64	272	718	4511	12286	2834	307	3975	2664	440	835	107	1697	577	649	36608
	MB	2892	3755	2949	3683	754	905	4066	2942	8384	10319	5575	2576	7046	6363	2086	2827	729	3802	2351	1683	75687
	T	1807	3011	2109	3601	1109	1140	3284	3305	6480	6846	4257	1838	5396	5159	2708	3669	1411	4111	2528	2429	66198
	PB	43	76	62	143	33	35	70	63	388	570	206	67	162	123	88	125	46	119	85	75	2579
	DPV	541	780	1383	1120	171	137	528	645	2101	3701	1422	520	1620	1515	458	765	255	1209	540	622	20033
	ML	378	519	600	887	114	167	551	611	1555	2261	895	226	1290	1103	402	582	228	1026	366	458	14219
	LV	26	11	21	43	6	23	504	45	122	275	44	20	51	18	12	29	1	75	6	21	1353
	O	71	65	32	65	1	0	0	104	0	162	2	4	2	129	51	91	0	83	0	5	867
	Total	6546	9280	8066	11350	2291	2471	9275	8433	23541	36420	15235	5558	19542	17074	6245	8923	2777	12122	6453	5942	217544
2016	MC	875	1108	1125	1757	106	107	346	759	4140	10874	2728	314	4184	216	356	632	112	2090	376	744	32949
	MB	3129	3797	3630	3627	718	960	4545	2263	8027	9961	5308	2434	7146	648	1654	2286	685	5342	1775	2006	69941
	T	1977	3222	2504	3229	1116	1336	3651	3335	6412	6569	4205	1883	5959	402	2022	2654	1374	6262	1912	2663	62687
	PB	95	56	62	64	26	26	71	86	188	312	190	57	147	20	47	51	58	254	31	37	1878
	DPV	590	796	1443	999	146	196	623	652	1982	3524	1427	314	1782	131	361	577	230	1635	399	763	18570
	ML	355	513	956	604	73	170	608	621	1473	1890	856	197	1350	75	304	390	191	1315	244	546	12731
	LV	47	14	21	25	7	27	545	26	88	283	34	17	52	5	7	26	0	52	10	27	1313

	O	2	115	29	877	5	3	0	199	156	390	19	5	4	0	21	603	0	26	0	104	2558
	Total	7070	9621	9770	11182	2197	2825	10389	7941	22466	33803	14767	5221	20624	1497	4772	7219	2650	16976	4747	6890	202627
2017	MC	1196	880	1380	1741	107	122	478	830	3757	11157	2628	321	4660	1969	329	580	106	2092	224	913	35470
	MB	3646	3107	4334	3939	685	940	5273	2930	7945	10853	5232	2459	8800	5285	1332	2203	755	7551	1177	2620	81066
	T	2331	2832	3026	3354	1071	1392	3871	3524	6134	6881	4183	1736	7038	4199	1551	2831	1551	8585	1231	3651	70972
	PB	43	39	123	124	15	27	78	67	319	381	106	21	224	65	55	63	54	225	26	46	2101
	DPV	820	672	1709	1013	136	200	724	714	1874	3519	1477	313	2174	1206	290	580	241	2207	230	873	20972
	ML	424	376	1081	576	74	167	641	665	1413	1687	924	193	1864	660	212	342	277	1724	128	665	14093
	LV	47	15	21	31	9	37	655	34	65	137	36	13	82	19	7	21	0	62	11	26	1328
	O	60	49	6	12	17	12	2	126	12	205	2	32	175	55	17	66	147	155	0	78	1228
	Total	8567	7970	11680	10790	2114	2897	11722	8890	21519	34820	14588	5088	25017	13458	3793	6686	3131	22601	3027	8872	227230

COLOMBO DISTRICT

	Vehicle type	Colombo	Thimbirigasyaya	Dehiwala	Rathmalana	Moratuwa	Kesbewa	Maharagama	Sri Jayawardenapura Kotte	Kolonnawa	Kaduwela	Homagama	Seethawaka	Padukka	Total for each vehicle type
2013	MC	95724	N.A	8114	7,135	6021	7986	10876	12359	3458	12272	5871	1486	991	172293
	MB	105941	N.A	6401	6347	11954	17324	14098	8314	11324	26418	19452	6782	5738	240093
	T	67614	N.A	4869	4231	4897	8672	7315	5002	8173	9894	7866	4989	2,714	136236
	PB	9997	N.A	394	302	541	841	631	414	489	943	714	302	298	15866
	DPV	41981	N.A	2897	2,542	3237	4859	4689	3208	2789	5841	3884	1231	754	77912
	ML	40128	N.A	948	1002	2841	2912	2841	1908	2106	4869	3021	1715	758	65049
	LV	7521	N.A	276	149	489	476	324	275	214	534	305	194	94	10851
	O	4021	N.A	5	5	6	18	19	11	3	5	6	8	5	4112
	Total	372927	0	23904	21713	29986	43088	40793	31491	28556	60776	41119	16707	11352	722412
2014	MC	97312	N.A	8325	7301	6248	8012	10947	12421	3612	13402	5912	1507	1002	176001
	MB	108312	N.A	6541	6658	12031	17895	14288	8414	12118	27321	19558	6847	5941	245924
	T	69201	N.A	4912	4341	4958	8799	7458	5126	8314	9985	7912	5072	2974	139052
	PB	9821	N.A	423	348	572	896	648	458	508	912	768	321	352	16027
	DPV	40878	N.A	2914	2702	3419	4998	4812	3409	2812	5321	3914	1289	846	77314
	ML	41124	N.A	924	1038	2912	3042	2912	2106	2304	4772	3214	1817	798	66963
	LV	7419	N.A	289	152	495	498	356	302	197	521	352	209	102	10892
	O	4108	N.A	4	4	4	12	16	8	2	6	8	10	8	4190
	Total	378175	0	24332	22544	30639	44152	41437	32244	29867	62240	41638	17072	12023	736363
2015	MC	99897	N.A	3752	13402	5912	1607	1158	11208	12782	8714	7541	6874	8347	181194
	MB	111536	N.A	13127	27321	19558	6978	6028	15421	8745	6878	8741	12178	18056	254567
	T	71026	N.A	8579	9985	8114	5148	3047	7845	5489	5014	4758	5108	8896	143009
	PB	11458	N.A	542	912	779	378	398	701	517	789	362	608	912	18356
	DPV	41321	N.A	2918	5321	4078	1319	904	5087	3809	3105	2974	3741	5041	79618

	ML	42108	N.A	2434	4772	3314	1978	807	3015	2438	1008	1124	3021	3471	69490
	LV	7512	N.A	204	521	387	237	157	412	356	341	187	508	571	11393
	O	5348	N.A	3	6	9	14	9	34	8	5	5	5	14	5460
	Total	390206	0	31559	62240	42151	17659	12508	43723	34144	25854	25692	32043	45308	763087
	MC	101817	N.A	12155	9273	N.A	N.A	N.A	17112	N.A	16195	N.A	N.A	N.A	156553
	MB	114191	N.A	10478	13090	N.A	N.A	N.A	14573	N.A	22954	N.A	N.A	N.A	175286
	T	72692	N.A	6843	5977	N.A	N.A	N.A	7148	N.A	11252	N.A	N.A	N.A	103912
2016	PB	11886	N.A	438	355	N.A	N.A	N.A	553	N.A	1121	N.A	N.A	N.A	14353
	DPV	40733	N.A	3295	3289	N.A	N.A	N.A	4868	N.A	6101	N.A	N.A	N.A	58286
	ML	43100	N.A	1172	2225	N.A	N.A	N.A	2239	N.A	4550	N.A	N.A	N.A	53287
	LV	7475	N.A	273	267	N.A	N.A	N.A	470	N.A	517	N.A	N.A	N.A	9001.9
	O	5819	N.A	1	6	N.A	N.A	N.A	41	N.A	21	N.A	N.A	N.A	5887.9
	Total	397714	0	34654	34481	0	0	0	47005	0	62711	0	0	0	576565
	MC	103904	N.A	13881	7877	8153	13902	21057	21237	3699	20633	10981	4359	2418	232101
	MB	116989	N.A	12243	7582	16304	25745	22616	15689	9329	29899	24438	14989	10517	306340
	T	74398	N.A	6457	4382	7296	12636	11754	7305	6478	14688	11716	8470	4975	170555
2017	PB	12617	N.A	389	78	541	796	646	503	177	1340	959	390	317	18753
	DPV	40403	N.A	3578	2419	3838	5557	6941	5124	1736	7795	5868	3150	2249	88658
	ML	44090	N.A	1280	1249	2207	2775	3301	1885	1038	6266	3589	2851	1092	71623
	LV	7471	N.A	304	168	338	275	408	541	80	604	241	289	116	10835
	O	6483	N.A	131	7995	31	0	542	242	1	33	100	221	0	15779
	Total	406353	0	38263	31750	38708	61686	67265	52526	22538	81258	57892	34719	21684	914642

GAMPAHA DISTRICT

	Vehicle type	Aththanagalla	Biyagama	Dompe	Diulapitiya	Gampaha	Ja-ela	Katana	Kelaniya	Mahara	Minuwangoda	Merigama	Negambo	Waththala	Total for each vehicle type
	MC	2968	3831	1545	1726	6523	5032	8183	4347	3854	0	1801	3889	3975	47674
	MB	14666	12106	13569	11249	19794	17818	37007	8503	13612	19121	14232	16170	10675	208522
	T	6615	7036	6647	2796	8300	6957	9778	5193	7066	5941	5574	4681	5800	82384
	PB	367	458	372	239	401	275	742	244	378	486	380	302	77	4721
	DPV	2479	2761	1626	1172	3703	3244	6500	2185	2685	2515	1658	2520	2277	35325
	ML	1635	1815	1436	1261	2214	2131	4872	1829	1693	1729	1511	1432	40	23598
	LV	328	158	235	576	332	217	825	166	159	317	383	208	80	3984
2013	O	77	0	197	0	246	153	285	8	0	3106	0	0	1811	5883
	Total	29135	28165	25627	19019	41513	35827	68192	22475	29447	33215	25539	29202	24735	412091
	MC	4163	4787	1927	1724	8673	6562	7633	6410	4267	3630	2411	5047	4624	61858
	MB	18344	14465	15593	13659	24451	21232	34337	10626	14135	21235	16193	18786	12015	235071
	T	8158	8179	7688	3212	10358	8059	9039	6735	7126	6529	5892	5409	6604	92988
2014	PB	528	439	331	330	572	391	680	381	389	597	431	389	212	5670

	DPV	3326	3221	2170	1732	4930	3998	6017	2979	3007	3166	2115	3086	2691	42438
	ML	1923	2353	1749	1590	2779	2543	4548	2389	1690	2065	1776	1747	1835	28987
	LV	351	140	521	608	460	257	682	219	147	336	384	287	92	4484
	O	11	0	224	0	339	201	256	5	0	4	0	0	160	1200
	Total	36804	33584	30203	22855	52562	43243	63192	29744	30761	37562	29202	34751	28233	472696
	MC	5683	5939	2566	2296	11238	6562	8572	7468	5501	4919	3610	7115	6186	77655
	MB	22157	16603	17973	15517	29171	21232	35597	12216	15880	24628	19303	22442	14600	267319
	T	9534	9084	8764	3744	12177	8059	9222	7371	7615	7427	6739	6653	8214	104603
	PB	495	340	402	283	985	391	813	384	162	206	329	515	254	5559
	DPV	4072	3692	2520	2153	5902	3998	6084	3273	3355	0	2670	3714	3196	44629
	ML	2136	2602	1923	1732	2969	2543	4447	2227	1827	2239	2147	2007	2105	30904
	LV	375	144	292	660	425	257	747	150	112	0	447	315	99	4023
2015	O	45	156	217	124	12	201	17	125	365	0	9	0	186	1457
	Total	44497	38560	34657	26509	62879	43243	65499	33214	34817	39419	35254	42761	34840	536149
	MC	6773	6942	3000	2733	12606	9387	8047	7913	5694	5533	4488	7894	7157	88167
	MB	25386	18932	19821	16714	32623	27973	36000	13811	16163	27479	23360	26377	17009	301648
	T	10526	9865	9354	3908	12508	9703	8860	7804	7299	8162	7992	7348	8805	112134
	PB	459	518	177	403	692	729	802	365	133	678	497	602	354	6409
	DPV	4464	3984	2678	2348	6045	4726	5674	3314	3243	3978	3205	4008	3489	51156
	ML	2321	2780	1964	1909	3084	2825	4169	2126	1795	2368	2293	2246	2354	32234
	LV	457	183	328	728	531	268	805	139	126	433	578	397	129	5102
2016	O	242	4	470	44	439	86	61	183	358	33	0	0	192	2112
	Total	50628	43208	37792	28787	68528	55697	64418	35655	34811	48664	42413	48872	39489	598962
	MC	7172	7534	3145	3070	13520	10266	7964	8650	6780	5786	4630	8490	7623	94630
	MB	26642	20362	20644	16981	34425	31247	35568	15129	18370	28435	23872	28490	18465	318630
	T	10629	10143	9561	16981	12214	10020	8157	7796	8011	8238	8134	7640	9030	126554
	PB	675	565	608	417	354	763	809	405	483	714	511	634	420	7358
	DPV	4766	4288	2870	2393	6257	5022	5420	3480	3601	4255	3407	4233	3548	53540
	ML	2368	2884	1965	1951	3181	3138	4005	2229	2042	2395	2557	2240	2467	33422
	LV	393	184	321	708	515	266	800	165	130	425	538	418	154	5017
2017	O	74	234	83	68	857	126	95	248	111	45	74	0	216	2231
	Total	52719	46194	39197	42569	71323	60848	62818	38102	39528	50293	43723	52145	41923	641382

KALUTARA DISTRICT

	Vehicle type	Panadura	Bandaragama	Horana	Ingiriya	Bulathsinghala	madurawala	millaniya	kalutara	Beruwala	Dodangoda	Mathugama	Agalawattha	Palindanuwara	Wallalawita	Total for each vehicle type
2013	MC	8302	1304	2348	428	275	354	302	2269	1251	471	825	568	166	169	19032
	MB	23426	7906	10617	4202	4158	2800	4531	10412	10919	4476	6324	5756	2903	3737	102167
	T	8366	2680	4368	2002	2500	1155	1599	4312	5113	2208	2986	2829	2088	2080	44286
	PB	958	194	238	132	135	59	111	367	232	149	321	146	44	48	3134
	DPV	5624	1083	1777	591	447	389	355	1258	1126	481	502	689	301	333	14956
	ML	3018	736	1189	481	364	294	301	1012	745	444	632	522	242	209	10189
	LV	3014	94	202	67	131	52	101	141	129	76	133	88	34	55	4317
	O	0	6	203	128	39	4	94	0	219	0	1	8	122	20	844
	Total	52708	14003	20942	8031	8049	5107	7394	19771	19734	8305	11724	10606	5900	6651	198925
2014	MC	NA	1862	3045	572	275	328	311	3196	1791	65	1341	499	217	175	13677
	MB	NA	10322	14364	2336	4158	2630	4989	12822	13715	4609	8826	5501	3360	3661	91293
	T	NA	3513	5572	2336	2500	1098	1617	5424	6260	2158	4727	2785	2177	1826	41993
	PB	NA	171	456	121	135	38	92	263	274	86	186	64	51	40	1977
	DPV	NA	1440	2345	725	447	367	389	2074	1548	550	1454	713	374	353	12779
	ML	NA	952	1669	533	364	280	329	961	883	409	984	433	270	132	8199
	LV	NA	133	227	108	131	47	120	158	159	87	135	107	39	50	1501
	O	NA	4	8	10	39	4	6	244	65	26	138	43	9	16	612
	Total	0	18397	27686	6741	8049	4792	7853	25142	24695	7990	17791	10145	6497	6253	172031
2015	MC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
	MB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
	T	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
	PB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
	DPV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
	ML	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
	LV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
	O	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
	Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2016	MC	8655	3170	4819	1036	395	439	437	2063	2917	803	2588	534	414	342	28612
	MB	20194	14069	18219	6299	4251	2775	5357	14583	18668	4388	13330	4469	4390	4297	135289
	T	9067	4726	7190	2819	2267	1192	1751	3193	8003	1977	7036	2280	2471	1822	55794
	PB	463	261	430	153	86	50	91	164	309	94	248	74	34	27	2484
	DPV	3758	1993	3034	937	576	388	446	1043	2019	579	2202	532	515	489	18511
	ML	1956	3	2023	587	369	312	314	483	1135	360	1182	318	369	132	9543
	LV	159	160	269	156	155	63	126	226	188	64	154	80	61	56	1917
	O	220	112	154	0	24	3	1	0	130	47	225	42	0	14	972

	Total	44472	24494	36138	11987	8123	5222	8523	21755	33369	8312	26965	8329	8254	7179	253122
2017	MC	8878	3559	5303	1185	426	482	473	5411	2969	937	2657	635	472	352	33739
	MB	20755	15350	19562	6861	4584	2672	5083	19169	19284	5061	13884	4524	4924	4527	146240
	T	9094	4887	7395	2892	2272	1175	1605	7407	7839	2121	6974	2298	2518	1825	60302
	PB	648	302	559	158	76	39	93	665	303	103	269	57	43	30	3345
	DPV	3370	2228	3243	1023	589	390	443	2781	2052	650	2315	622	564	483	20753
	ML	1947	1405	2147	646	385	298	286	1236	1088	432	1304	359	314	134	11981
	LV	182	156	257	164	139	60	116	176	163	74	163	68	59	62	1839
	O	53	447	38	11	28	16	0	0	192	57	222	56	32	14	1166
	Total	44927	28334	38504	12940	8499	5132	8099	36845	33890	9435	27788	8619	8926	7427	279365

GALLE DISTRICT

	Vehicle type	Benthota	Balapitiya	Karandeniya	Elpitiya	Niyagama	Thawalama	Neluwa	Nagoda	Baddegama	Welivitiya-Divithura	Ambalangoda	Gonapinuwala	Hikkaduwa	Galle FourtGravets	Bope-Poddala	Akmeemana	Yakkalamulla	Imaduwa	Habaraduwa	Total for each vehicle type
2013	MC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
	MB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
	T	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
	PB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
	DPV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
	ML	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
	LV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
	O	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
	Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2014	MC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
	MB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
	T	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
	PB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
	DPV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
	ML	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
	LV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
	O	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
	Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2015	MC	1235	902	496	1322	300	215	256	316	948	135	1859	320	1018	8897	1753	976	307	319	812	22386
	MB	7659	6040	6714	13986	4353	3417	3162	5996	10443	2591	11313	3266	8662	3651	5871	7192	6557	3723	6103	120699
	T	3422	2564	2174	4738	1271	1578	1620	1921	2838	551	3310	846	3235	28111	1434	2338	1818	1393	2749	67911
	PB	21	45	55	59	37	29	19	58	128	7	159	19	172	303	60	60	85	16	100	1432
	DPV	921	654	765	1522	424	371	416	508	851	155	1294	287	872	1723	60	687	436	351	662	12959
	ML	360	335	393	842	323	232	217	292	580	75	698	177	441	1640	283	344	313	234	329	8108

	LV	114	0	134	135	89	113	151	81	192	46	15	111	177	9402	63	85	156	98	77	11239
	O	4	0	0	2	3	0	1	85	1	1	14	2	0	31	9	0	10	16	0	179
	Total	13736	10540	10731	22606	6800	5955	5842	9257	15981	3561	18662	5028	14577	53758	9533	11682	9682	6150	10832	244913
	MC	1721	1007	552	1574	281	267	274	344	1139	115	2142	312	1023	9865	1827	937	342	496	830	25048
	MB	9652	7300	7133	16829	4506	4366	3132	5831	11825	2321	13702	3011	8666	42220	6271	7411	7201	5355	6439	173171
	T	4083	2895	2197	5715	1179	1926	1452	1906	3065	430	3916	847	3129	10468	1649	2348	1863	2311	2892	54271
	PB	166	93	60	149	34	33	33	44	117	4	170	28	91	412	63	59	83	43	93	1775
2016	DPV	1105	700	715	1765	417	414	431	454	933	124	1481	336	838	3982	676	666	480	462	650	16629
	ML	428	326	406	980	287	245	189	257	592	57	803	186	415	1864	304	312	352	293	295	8591
	LV	152	83	125	170	85	137	158	87	196	39	290	126	164	363	73	80	171	149	84	2732
	O	22	46	21	79	7	10	13	14	19	2	58	20	55	502	33	18	21	29	16	985
	Total	17329	12450	11209	27261	6796	7398	5682	8937	17886	3092	22562	4866	14381	69676	10896	11831	10513	9138	11299	283202
	MC	1919	1009	556	1885	374	299	271	189	1236	100	2355	459	965	11225	1915	970	373	540	848	27488
	MB	10673	6980	7095	17853	6225	5022	3216	3445	12376	1903	15277	4002	7525	39522	6494	7753	7559	5626	5805	174351
	T	4311	2770	2109	5810	1562	2187	1317	1015	3245	342	4224	1069	2633	11227	1699	2282	1986	2310	2757	54855
2017	PB	198	97	61	173	53	45	46	23	133	6	192	48	84	482	75	60	87	57	97	2017
	DPV	1226	699	689	2002	540	534	424	231	944	131	1554	397	724	4361	684	663	535	526	649	17513
	ML	462	296	375	987	328	242	186	139	613	84	844	279	361	1849	345	333	362	308	312	8705
	LV	119	77	130	153	96	130	135	53	173	32	303	131	123	393	73	77	186	138	93	2615
	O	28	38	20	84	16	7	17	9	23	2	70	30	35	474	31	17	19	29	10	959
	Total	18936	11966	11035	28947	9194	8466	5612	5104	18743	2600	24819	6415	12450	69533	11316	12155	11107	9534	10571	288503

		KURUNEGALA DISTRIC																							
	Vehicle type	Giribawa	Galgamuwa	Ehetuwewa	Ambanpola	Kotavehera	Rasnayakapura	Nikaweratiya	Mahawa	Polpithigama	Ibbangamuwa	Ganewatta	Wariyapola	Kobeigane	Bingiriya	Panduwasnuwara	Panduwasnuwara East	Bamunakotuwa	Maspotha	Kurunegala	Mallawapitiya	Mawathagama	Rideegama	Weerambugedara	Kuliyapitiya East
2013	MC	87	309	92	139	86	51	334	801	255	1012	249	616	275	474	653	200	447	959	4627	1411	1117	610	619	416
	MB	4503	7249	3995	3187	3497	2735	5735	14638	9006	8903	4583	8154	5369	8868	8818	4348	4315	3549	10427	4790	5720	9226	4055	5782
	T	814	2025	817	854	634	584	1451	3207	2492	3861	1391	2101	994	1559	1888	882	1315	1407	3781	2186	2196	3630	1276	1559
	PB	37	64	15	22	18	14	25	165	46	238	54	164	29	103	105	57	40	81	250	132	158	241	47	82
	DPV	271	603	229	269	215	184	534	1264	761	1375	494	777	518	928	1003	398	507	670	2459	956	998	1000	641	803
	ML	201	431	131	183	136	164	441	969	561	991	416	919	509	1066	1106	406	460	510	1757	615	871	739	367	728
	LV	264	356	198	134	252	183	521	1545	400	369	299	523	43	402	618	334	227	208	566	204	269	386	283	333
	O	0	1	0	1	0	36	18	6	119	1	0	0	2	50	71	0	70	0	54	12	2	0	10	1
	Total	6177	11038	5477	4789	4838	3951	9059	22595	13640	16750	7486	13254	7739	13450	14262	6625	7381	7384	23921	10306	11331	15832	7298	9704
2014	MC	95	353	104	161	88	60	384	402	291	1012	258	688	316	508	747	310	521	1080	4655	1536	1285	607	698	442
	MB	4846	7894	4287	3462	3448	2995	6122	8277	9846	8903	5003	8390	5757	9349	9510	4908	4743	3909	10932	5332	6338	9226	4489	6024
	T	894	2193	878	927	645	647	1594	2158	2801	3861	1537	2360	1081	1734	2030	1010	1413	1496	10932	2307	2494	3630	1424	1151
	PB	30	67	5	23	17	16	26	78	90	97	48	157	30	97	122	57	45	79	217	57	165	3630	43	39
	DPV	337	713	281	327	221	198	652	713	902	1375	536	931	573	1077	1107	482	609	734	2315	1057	1073	1000	690	930
	ML	192	423	138	174	138	152	448	462	559	998	399	940	482	1027	1121	330	437	489	1675	623	853	739	378	505
	LV	250	349	132	114	230	181	454	473	337	369	266	0	350	382	670	350	241	203	425	179	266	386	298	279
	O	0	1	5	1	0	28	16	123	93	1	0	0	25	97	3	2	62	1	172	84	1	3	8	670
	Total	6644	11993	5830	5189	4787	4277	9696	12686	14919	16616	8047	13466	8614	14271	15310	7449	8071	7991	31323	11175	12475	19221	8028	10040
2015	MC	162	599	167	308	195	NA	661	650	417	1430	363	1080	429	692	989	312	685	1099	5191	1794	1657	737	816	625
	MB	5174	9709	4492	4480	3812	NA	7611	10019	10433	11309	5374	10022	6838	10511	10194	4913	5399	3762	11351	5621	7662	9212	4485	7359
	T	826	2734	1007	1159	826	NA	2051	2779	3139	4956	1786	2943	1338	1913	2261	1018	1580	1435	4216	2439	3084	3686	1440	1898
	PB	24	78	16	34	21	NA	40	86	71	250	43	176	714	145	124	59	102	67	222	130	139	79	50	80
	DPV	427	985	329	440	303	NA	825	1008	1109	1664	629	1334	429	1263	1272	495	707	686	2551	1159	1317	1055	681	1008
	ML	176	464	115	166	123	NA	509	413	497	1148	391	967	482	1017	1119	336	448	451	1622	639	862	669	326	660

	LV	248	394	211	141	231	NA	443	371	410	420	274	512	374	386	629	357	257	185	419	179	284	379	295	299
	O	0	1	0	0	0	NA	56	147	54	1	0	0	10	7	3	2	0	4	339	5	5	128	1	42
	Total	7037	14964	6337	6728	5511	0	12196	15473	16130	21178	8860	17034	10614	15934	16591	7492	9178	7689	25911	11966	15010	15945	8094	11971
	MC	187	671	170	328	152	53	855	672	444	1515	326	1370	374	651	1058	216	490	695	6185	1522	1690	780	561	653
	MB	5497	10498	4258	4491	2943	2096	10234	10295	10593	13794	6096	12609	5767	9633	13749	3758	4710	2771	15119	5155	9776	9196	3443	7435
	T	1074	2833	917	1165	664	461	2554	2860	2904	5370	1874	3693	1111	1603	2747	757	123	973	5166	2093	3543	3635	957	1937
2016	PB	22	85	13	17	10	8	42	88	66	245	43	77	27	87	117	34	33	36	336	44	175	168	25	88
	DPV	445	1160	343	457	252	189	1218	1121	1109	1921	678	1740	612	1136	1646	356	575	491	3167	963	1522	996	461	1043
	ML	174	403	74	139	100	81	507	128	425	1228	341	1341	391	798	1220	203	321	259	1941	963	851	499	230	559
	LV	293	424	213	182	197	190	540	402	533	463	305	649	424	374	840	513	220	152	489	154	305	397	261	342
	O	15	2	2	0	1	18	0	158	2	0	0	119	13	41	1	0	37	5372	112	3	1	0	18	37
	Total	7707	16076	5990	6779	4319	3096	15950	15724	16076	24536	9663	21598	8719	14323	21378	5837	6509	10749	32515	10897	17863	15671	5956	12094
	MC	176	795	171	298	201	58	887	854	451	1651	362	1620	402	679	1155	224	439	594	6958	1607	1864	821	492	645
	MB	5650	11612	4211	4534	2911	2235	11104	11957	10574	15380	6790	14199	5983	9476	14965	3412	4608	2518	17293	5452	11125	9851	3325	7243
	T	1018	2942	865	1078	595	407	2775	2955	2657	5557	1784	3812	1084	1477	2824	684	1080	911	5509	2079	3792	3422	864	1862
2017	PB	40	99	16	31	11	16	56	83	62	257	44	88	15	78	86	31	29	34	434	44	177	78	25	88
	DPV	469	1231	323	461	259	179	1189	640	1096	2211	718	2012	654	1178	1842	347	532	438	3537	1047	1577	1004	420	1115
	ML	163	482	67	144	107	88	483	396	408	1290	351	1503	377	764	1306	183	269	218	2145	617	894	524	215	555
	LV	296	444	215	189	191	162	591	640	540	506	288	640	369	345	836	263	182	129	512	153	294	369	226	331
	O	1	1	N.A	N.A	N.A	N.A	24	N.A	3	N.A	N.A	158	2	32	41	0	29		20	71		179	10	25
	Total	7813	17606	5868	6735	4275	3145	17109	17525	15791	26852	10337	24032	8886	14029	23055	5144	7168	4842	36408	11070	19723	16248	5577	11864

RATHNAPURA DISTRICT

	Vehicle type	Ayagama	Balangoda	Eheliyagoda	Elapatha	Embilipitiya	Godakawela	Imbulpe	kahawatta	Kalawana	kiriella	Kolonna	Kuruvita	Nivithigala	Opanayaka	Pelmadulla	Rathnapura	Weligepola	Total for each vehicle type
2013	MC	83	665	612	264	884	408	289	201	245	257	74	753	381	104	742	1835	62	7859
	MB	1577	3800	3473	1826	11797	2986	2076	1515	2663	1912	2226	4566	3362	1033	3454	5723	1343	55332
	T	1425	3549	3349	1499	7060	3030	2170	1519	1999	1356	1960	4411	2489	1154	3613	5344	1140	47067
	PB	13	125	120	28	96	0	101	47	47	43	27	63	34	58	157	110	24	1093
	DPV	143	748	653	186	1698	491	358	223	411	245	238	740	330	166	539	1083	148	8400
	ML	119	785	365	135	1429	503	411	256	376	178	197	567	330	157	670	813	196	7487
	LV	6	3	43	8	1152	62	13	11	7	37	81	40	19	8	33	20	63	1606
	O	6	0	2	0	264	0	0	25	2	44	2	62	48	0	0	70	70	595
	Total	3372	9675	8617	3946	24380	7480	5418	3797	5750	4072	4805	11202	6993	2680	9208	14998	3046	129439
2014	MC	91	750	678	284	1025	473	347	215	305	287	92	857	414	131	846	1972	73	8840
	MB	1739	4180	3632	1900	13332	3292	2321	1655	3098	2012	2470	4817	3653	1131	3878	5959	1489	60558
	T	1583	3914	3503	1561	7719	3401	2462	1680	2365	1426	2225	4746	2690	1311	3941	5838	1254	51619
	PB	19	44	43	23	304	140	113	37	47	43	29	56	96	27	167	107	28	1323
	DPV	163	789	707	207	1870	535	410	259	487	273	285	802	381	172	555	1115	157	9167
	ML	231	770	352	127	1472	514	412	267	372	178	209	574	325	155	681	736	188	7563
	LV	3	100	28	16	1240	46	14	13	7	29	63	43	14	10	27	19	55	1727
	O	6	90	0	32	0	0	0	25	2	42	20	53	0	0	0	3	3	276
	Total	3835	10637	8943	4150	26962	8401	6079	4151	6683	4290	5393	11948	7573	2937	10095	15749	3247	141073
2015	MC	66	978	968	169	2341	699	526	289	398	381	179	546	547	171	1097	2378	135	11868
	MB	1159	5182	4576	1089	22010	4206	3015	1998	3471	2828	3208	3092	4079	1448	4737	6971	1979	75048
	T	773	3381	4078	626	11182	4033	2868	1887	2530	1627	2811	2180	2905	1437	4497	6461	1555	54831
	PB	10	61	126	14	276	142	127	43	50	93	20	28	101	62	163	96	27	1439
	DPV	118	852	781	98	3171	670	509	295	559	293	356	456	412	193	623	1156	224	10766
	ML	77	743	379	53	2671	550	407	236	375	182	244	309	333	171	681	734	204	8349
	LV	3	97	36	5	2972	61	12	8	4	26	78	19	12	7	36	25	59	3460
	O	175	1018	0	202	449	0	0	26	1	0	22	717	0	0	0	6	1	2617
	Total	2381	12312	10944	2256	45072	10361	7464	4782	7388	5430	6918	7347	8389	3489	11834	17827	4184	168378

2016	MC	114	1278	1174	310	1786	716	433	345	417	448	183	1071	493	199	1090	2251	104	12412
	MB	1751	6924	5317	2008	17032	5019	2526	2296	3540	2955	3305	5570	4073	1501	4756	6666	1589	76828
	T	1374	5564	4327	1443	7653	4378	2256	1943	2043	1896	2642	4733	2628	1423	4069	5773	1138	55283
	PB	19	105	118	24	235	78	57	62	42	89	35	65	25	47	52	113	18	1184
	DPV	180	1108	887	187	2243	740	395	306	527	348	348	818	355	190	577	1070	175	10454
	ML	90	941	386	91	1494	581	310	250	337	221	207	541	254	177	623	572	124	7199
	LV	3	110	29	65	1063	68	14	9	6	28	53	27	3	5	37	19	43	1582
	O	5	199	11	23	1051	63	30	30	35	0	59	190	45	1	0	4	26	1772
	Total	12249	16229	12249	4151	32557	11643	6021	5241	6947	5985	6832	13015	7876	3543	11204	16468	3217	175427
2017	MC	121	1636	1413	297	2126	746	353	316	492	497	153	1022	517	188	1211	2355	99	13542
	MB	1567	8810	6622	1981	19000	5468	1981	2267	4423	3611	3085	5848	4098	1497	5076	7399	1255	83988
	T	1162	6945	5339	1371	9246	4545	1529	1823	2595	2147	2446	4677	2444	1306	4395	5946	860	58776
	PB	20	119	175	23	314	128	53	64	61	82	33	64	43	40	107	126	15	1467
	DPV	176	1331	1011	160	2571	722	330	331	618	386	333	786	363	175	645	1028	154	11120
	ML	71	1167	451	107	1800	586	195	218	356	238	204	492	248	157	712	558	88	7648
	LV	3	97	34	10	1004	65	7	4	8	21	58	13	3	4	27	25	47	1430
	O	4	145	1	25	109	0	9	20	0	21	10	58	194	8	61	3	64	732
	Total	3124	20250	15046	3974	36170	12260	4457	5043	8553	7003	6322	12960	7910	3375	12234	17440	2582	178703

ANURADAPURA DISTRICT

	Vehicle type	Padaviya	Kebithigollewa	Mahavilachchiya	Medawachchiya	N.P.C.	Rambawewa	Kahatagasdigiliya	Horowpathana	Galenbinduuwewa	Mihinthale	N.P.E.	Nachchaduwa	Nochchiyagama	Rajanganaya	Thambuththegama	Thalawa	Thirappane	Kekirawa	Palugaswewa	Ipalogama	Galnewa	Palagala	Total for each vehicle type
2013	MC	NA	52	28	190	513	113	163	75	174	272	2771	195	200	97	283	109	92	423	109	220	148	115	6342
	MB	NA	2365	2326	5102	6877	4006	4663	3390	5758	3448	11005	3617	5995	3718	4996	8224	3216	6105	1297	4889	5189	4076	100262
	T	NA	761	467	1654	2138	1169	1325	1080	1374	1184	2667	839	5995	981	1548	1672	807	2396	478	1254	996	1077	31862
	PB	NA	5	3	31	31	6	36	16	37	10	123	14	40	27	31	23	4	36	24	23	30	16	566
	DPV	NA	160	150	503	683	308	372	305	37	417	1636	317	588	409	460	717	258	884	199	489	464	331	9687
	ML	NA	140	126	439	490	276	294	303	303	287	1368	290	517	373	374	510	193	639	131	335	272	331	7991
	LV	NA	261	175	277	276	292	337	361	330	141	222	94	276	204	284	409	151	405	84	136	212	173	5100
	O	NA	6	5	15	46	13	14	12	18	27	66	8	38	25	27	35	17	35	6	30	15	4	462
	Total	0	3750	3280	8211	11054	6183	7204	5542	8031	5786	19858	5374	13649	5834	8003	11699	4738	10923	2328	7376	7326	6123	162272
20	MC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

	MB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	T	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	PB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	DPV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ML	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	LV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	O	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015	MC	147	136	91	389	940	226	300	159	398	536	4112	349	390	218	552	826	208	759	195	437	345	199	11912
	MB	4759	3153	3333	7205	9164	5331	6296	4746	7809	4983	14098	4494	8079	4992	6466	10769	4243	8031	1734	6497	6712	5168	138062
	T	1063	1064	701	2249	2775	1530	1858	1606	1916	1565	3272	1115	2121	1365	2038	2225	1032	2972	639	1676	1347	1488	37617
	PB	31	6	5	32	34	4	47	11	46	9	113	20	45	33	35	35	7	35	25	12	37	9	631
	DPV	388	240	273	682	990	478	579	468	682	580	2108	423	953	634	738	1098	426	1211	347	754	659	521	15232
	ML	221	126	135	364	494	260	290	301	323	273	1359	301	487	393	397	536	197	638	106	352	306	203	8062
	LV	365	251	183	390	332	306	366	419	383	182	265	125	304	210	302	479	181	425	94	183	238	26	6009
	O	0	0	0	2	1	1	0	0	0	1	2	0	0	0	1	0	0	6	1	0	4	0	19
	Total	6974	4976	4721	11313	14730	8136	9736	7710	11557	8129	25329	6827	12379	7845	10529	15968	6294	14077	3141	9911	9648	7614	217544
2016	MC	184	165	473	113	1147	254	351	31	467	653	4401	385	449	250	626	897	252	874	220	490	414	227	13323
	MB	5213	3502	7831	3676	9964	6117	7157	5448	8489	5451	14573	4952	8723	5589	7170	11671	4625	8571	1877	7146	7192	5681	150618
	T	1137	1138	2283	750	2962	1647	1947	1744	2054	1620	3274	1164	2208	1505	2133	2348	1044	3036	653	1735	1395	1551	39328
	PB	32	5	34	4	35	4	45	11	43	7	88	18	50	31	31	37	8	23	23	13	42	15	599
	DPV	454	303	798	305	1073	569	689	554	834	658	2178	467	1084	709	815	1213	483	1257	388	865	787	611	17094
	ML	219	114	362	116	491	252	278	280	298	280	1374	299	488	374	384	537	183	657	110	345	311	189	7941
	LV	437	332	481	231	387	403	443	520	410	243	260	138	353	240	349	502	225	507	110	194	261	252	7278
	O	10	9	32	9	59	22	31	13	34	41	122	13	40	39	38	54	22	49	15	40	35	33	760
	Total	7686	5568	12294	5204	16118	9268	10941	8601	12629	8953	26270	7436	13395	8737	11546	17259	6842	14974	3396	10828	10437	8559	236941

2017	MC	184	165	113	473	1147	254	351	212	467	653	4401	385	449	250	626	897	252	22	220	490	414	227	12652
	MB	5213	3502	3676	7831	9964	6117	7157	5448	8489	5451	14573	4952	8723	5589	7170	11671	4625	8571	1877	7146	7192	5681	150618
	T	1137	3502	750	2283	2962	1647	1947	1744	2054	1620	3274	1164	2208	1505	2133	2348	1044	3036	653	1735	1395	1551	41692
	PB	32	5	4	34	35	4	45	11	43	7	88	18	50	31	31	37	8	23	23	13	42	15	599
	DPV	454	303	305	798	1073	569	689	554	834	658	2178	467	1084	709	815	1213	483	1257	388	865	787	611	17094
	ML	219	114	116	362	491	252	278	280	298	280	1374	299	488	374	384	537	183	657	110	345	311	189	7941
	LV	437	332	231	481	387	403	443	520	410	243	260	138	353	240	349	502	225	507	110	194	261	252	7278
	O	10	9	9	32	59	22	31	13	34	41	122	13	40	39	38	54	22	49	15	40	35	33	760
Total		7686	7932	5204	12294	16118	9268	10941	8782	12629	8953	26270	7436	13395	8737	11546	17259	6842	14122	3396	10828	10437	8559	238634

Agriculture data base (Paddy yield Kg/ha)

	KADUWELA			WATHTHALA (GAMPAHA)			GAMPAHA			KALUTHARA			HORANA TOWN		
	NO2	YEILD	SO2	NO2	YEILD	SO2	NO2	YEILD	SO2	NO2	YEILD	SO2	NO2	YEILD	SO2
2012/13MAHA	44	3350	46	43	3250	51	28	3300	28	37	3200	31	37	3100	25
2013 YALA	55	3150	27	61	3100	34	47	3150	30	50	3300	38	38	4100	27
2013/14MAHA	46	3350	25	71	3250	32	43	3300	22	67	4300	41	42	3300	29
2014 YALA	32	3150	23	31	3150	22	42	3200	27	25	3200	19	30	3400	27
214/15MAHA	38	3300	27	59	3250	34	30	3300	26	35	3300	25	29	3500	26
2015YALA	26	3200	19	43	3150	32	27	3250	19	25	3250	18	20	3000	14
2015/16MAHA	38	3300	34	50	3300	47	32	3350	32	34	3350	32	25	3500	32
2016YALA	25	3200	40	38	3200	48	29	3250	41	22	3300	38	23	3800	49
2016/17MAHA	41	3460	56	61	3300	70	33	3400	47	33	3400	42	33	4100	46
2017YALA	24	3200	45	40	3200	67	28	3300	45	23	3300	33	30	3200	38
2017/18MAHA	42	3460	47	59	3300	56	33	3400	47	35	3400	33	34	3500	40

Metrological data (Source: The Department of Metrology Sri Lanka)

		RF Kaluthara (Sri Kandur Estate)	RF Anuradapura	RF Kurunegala	RF Kandy (Katugasthota)	RF Gampaha (Katunayaka)	RF Colombo	RF Rathnapura	RF Galle	RH max ANURADHAPURA	Rhmin ANURADHAPURA	RH max Kurunegala
	OCT	713	684	357	596	567	507	366	519	91	73	91
2012	NOV	308	242	208	265	156	207	490	158	92	77	91
	DEC	321	594	564	426	164	135	346	229	94	82	90
	JAN	106	203	195	299	123	91	96	65	93	76	86
	FEB	205	76	53	92	89	164	228	38	92	73	84
	MAR	244	233	160	71	89	108	319	114	90	69	88
	APR	226	79	132	179	77	148	281	24	89	65	89
	MAY	584	57	243	147	523	405	492	182	89	70	88
	JUN	497	0	183	297	241	260	543	233	85	67	88
	JUL	274	13	66	122	158	198	317	208	84	63	87
	AUG	115	64	24	108	91	22	144	34	86	62	85
	SEP	372	42	229	156	272	217	417	230	87	67	88
	OCT	361	125	297	258	165	140	361	292	89	64	88
2013	NOV	423	196	190	113	194	205	335	287	93	75	92
	DEC	439	105	32	83	35	32	41	93	92	77	87
	JAN	122	160	30	73	26	86	293	61	93	76	85
	FEB	76	45	5	33	2	19	77	43	91	66	81
	MAR	97	3	63	8	130	145	139	68	89	59	80
	APR	253	346	576	240	193	255	420	159	91	65	91
	MAY	301	180	160	121	163	83	226	185	91	71	89
	JUN	595	1	75	115	146	239	579	247	86	66	85
	JUL	147	0	53	77	111	35	233	65	83	62	83
	AUG	517	60	167	97	318	255	619	445	87	64	74
	SEP	399	266	293	257	124	313	589	311	89	62	78
	OCT	620	384	527	572	369	450	813	480	94	76	78
2014	NOV	544	372	204	308	259	279	278	354	95	83	81
	DEC	557	666	584	638	436	477	444	260	95	86	82
	JAN	89	16	6	5	6	33	94	68	92	69	83
	FEB	125	161	34	106	53	123	199	115	92	71	84
	MAR	221	26	207	58	212	221	88	138	89	64	86
	APR	409	288	368	157	161	268	434	171	91	68	93
	MAY	347	265	160	142	283	169	180	282	91	73	89
	JUN	336	10	76	106	255	238	272	160	88	68	NA
	JUL	287	0	20	54	20	37	174	249	84	64	NA
	AUG	247	180	74	140	45	91	339	153	87	62	NA
	SEP	596	147	125	142	340	631	397	474	90	67	NA
	OCT	491	389	282	414	276	235	525	316	93	76	NA
2015	NOV	470	452	422	386	556	526	468	354	95	82	NA
	DEC	384	286	275	267	159	377	292	95	94	79	NA
	JAN	87	32	2	4	3	65	140	41	91	72	NA
	FEB	90	29	29	30	102	107	89	250	91	68	NA
	MAR	213	9	151	131	10	91	194	39	88	57	NA
	APR	176	114	306	123	43	186	397	76	88	61	NA
	MAY	797	463	738	519	653	752	811	441	92	74	NA
	JUN	261	7	133	83	159	132	220	119	88	69	NA
	JUL	215	14	85	47	22	49	193	128	86	65	NA
	AUG	199	0	15	39	3	1	132	77	84	61	NA
	SEP	100	0	2	7	1	29	102	44	83	58	NA
	OCT	346	135	123	83	127	374	156	371	87	61	NA
2016	NOV	426	166	306	174	268	405	237	333	93	77	NA
	DEC	212	66	27	61	35	165	164	63	93	71	NA
	JAN	291	109	76	105	27	83	39	225	92	70	NA
	FEB	209	39	55	62	3	92	33	37	92	65	NA
	MAR	126	141	288	294	137	134	264	82	92	66	NA
	APR	293	116	128	41	16	81	201	178	90	62	NA
	MAY	651	224	151	148	234	343	983	350	90	69	NA
	JUN	368	9	171	78	182	141	376	94	88	65	NA
	JUL	211	11	26	40	35	47	184	137	85	61	NA
	AUG	412	148	83	104	49	70	353	179	87	67	NA
	SEP	1089	113	176	101	383	355	612	239	92	72	NA
	OCT	704	224	367	288	418	467	512	286	92	72	NA
2017	NOV	452	421	115	197	313	294	509	549	95	80	NA
	DEC	279	74	156	106	84	172	243	75	94	75	NA

		RH min Kurunegala	RH max Katugasthota (Kandy)	RH min Katugasthota (Kandy)	RH max Gampaha (KATUNAYAKA)	RH min Gampaha (KATUNAYAKA)	RH max Colombo	RH min Colombo	RH max RATNAPURA	RH min RATNAPURA	RH max Galle	RHmin Galle
	OCT	74	96	77	94	77	91	77	96	79	89	80
2012	NOV	76	96	78	92	75	90	74	96	79	91	80
	DEC	76	95	80	91	74	90	75	96	79	90	80
	JAN	72	91	76	86	68	81	67	94	75	88	79
	FEB	68	94	74	87	69	86	71	94	72	89	79
	MAR	67	95	72	89	70	88	72	97	77	90	78
	APR	71	95	73	90	73	86	73	97	76	86	76
	MAY	78	92	78	87	80	87	79	95	83	88	84
2013	JUN	80	89	82	88	82	87	81	93	84	90	86
	JUL	76	86	78	86	80	87	80	92	82	90	85
	AUG	71	91	74	85	77	85	77	92	76	90	85
	SEP	75	92	77	88	80	87	79	95	80	88	84
	OCT	73	95	74	89	77	87	77	97	81	89	83
	NOV	73	94	75	93	76	91	75	97	79	90	79
	DEC	74	94	79	88	71	84	70	94	76	89	81
	JAN	69	92	75	86	65	83	69	94	72	89	80
	FEB	56	91	63	86	63	85	67	91	66	85	72
	MAR	56	88	57	87	67	86	69	93	68	83	70
	APR	70	95	71	92	75	90	75	98	80	87	78
	MAY	74	95	75	91	78	87	77	96	80	89	84
2014	JUN	74	88	77	86	79	86	79	90	80	88	84
	JUL	71	84	75	85	77	85	76	89	76	89	85
	AUG	75	91	77	88	80	88	79	95	82	91	86
	SEP	74	92	76	89	79	88	78	96	81	89	84
	OCT	78	97	80	93	80	92	79	97	85	90	83
	NOV	81	96	84	95	81	92	79	97	83	90	82
	DEC	83	96	86	94	82	92	80	97	84	91	82
	JAN	62	92	68	87	66	84	68	93	69	87	79
	FEB	63	93	71	88	66	86	70	95	71	88	78
	MAR	61	93	65	92	71	89	71	95	72	87	73
	APR	73	95	77	92	74	89	73	97	77	87	77
	MAY	75	95	75	91	79	88	77	96	79	87	82
2015	JUN	75	92	74	91	80	89	79	96	80	85	81
	JUL	69	89	73	84	75	84	76	91	78	87	83
	AUG	70	92	73	86	76	85	76	94	79	86	82
	SEP	75	95	77	91	79	90	82	97	84	88	84
	OCT	78	97	81	94	80	93	78	98	83	89	82
	NOV	79	96	82	95	80	93	78	98	82	90	81
	DEC	77	95	80	92	75	90	75	97	80	89	79
	JAN	63	92	70	87	64	84	68	96	75	87	76
	FEB	59	91	64	88	66	85	69	94	70	85	76
	MAR	58	91	62	88	67	86	70	94	68	84	73
	APR	69	95	72	90	69	86	71	98	77	86	74
	MAY	80	96	82	91	79	90	79	98	87	89	84
2016	JUN	76	88	75	86	78	85	77	90	78	87	85
	JUL	72	89	74	85	76	85	77	89	75	89	84
	AUG	66	86	72	83	74	83	74	89	75	88	83
	SEP	62	88	69	83	74	84	75	91	73	88	83
	OCT	64	93	66	86	73	86	74	96	75	86	81
	NOV	74	95	78	93	78	91	77	97	81	89	81
	DEC	65	94	69	88	67	85	69	95	72	87	77
	JAN	63	92	68	86	66	81	67	92	68	87	76
	FEB	60	91	65	84	62	82	67	91	66	84	76
	MAR	67	94	71	92	72	88	71	96	75	86	75
	APR	67	94	69	88	72	84	72	96	75	87	80
	MAY	73	94	76	88	78	85	76	97	83	87	82
2017	JUN	75	91	76	89	NA	87	79	95	82	89	86
	JUL	71	88	72	84	77	83	76	91	77	86	83
	AUG	71	90	75	86	77	84	76	94	80	89	85
	SEP	76	93	76	89	81	87	79	96	82	87	83
	OCT	78	94	77	92	81	91	81	97	84	89	83
	NOV	77	96	79	95	79	91	77	96	81	90	82
	DEC	71	94	75	91	72	86	70	96	77	88	80

Year	Month	RH max Kaluthara(Sri Kandur Estate)	Rhmin Kaluthara(Sri Kandur Estate)	T max Anuradapura	T min Anuradapura	T Diff Anuradapura	T max KURUNEGALA	T min KURUNEGALA	T Diff KURUNEGALA	T max KATUGASTOTA	T min KATUGASTOTA	T Diff KATUGASTOTA
2012	OCT	91	74	33	24	9	33	23	10	30	21	9
	NOV	90	71	31	23	8	31	22	9	29	21	8
	DEC	90	73	29	23	6	31	22	8	28	20	8
2013	JAN	83	65	30	22	8	30	21	9	27	19	8
	FEB	86	70	32	23	9	32	22	10	29	20	10
	MAR	88	69	33	24	9	34	23	11	31	21	10
	APR	86	69	35	25	10	34	24	10	31	22	9
	MAY	85	76	34	26	8	32	25	7	29	23	7
	JUN	86	77	33	25	8	30	24	6	27	22	5
	JUL	86	77	33	25	8	31	24	7	27	22	5
	AUG	84	74	34	25	10	32	24	8	29	21	7
	SEP	86	75	33	24	8	31	24	7	28	21	6
	OCT	87	73	34	24	10	32	23	8	29	21	8
	NOV	91	72	32	23	9	32	23	10	30	21	9
	DEC	82	67	30	22	8	30	22	8	27	20	7
2014	JAN	71	86	30	22	8	31	22	10	28	19	9
	FEB	60	82	32	21	11	34	21	13	31	18	13
	MAR	61	80	35	23	12	36	23	13	33	20	12
	APR	73	84	36	24	12	34	24	11	32	21	11
	MAY	74	86	34	25	9	33	25	8	30	22	9
	JUN	77	90	34	26	8	32	25	7	29	23	6
	JUL	71	86	34	26	9	32	25	7	28	23	6
	AUG	75	91	34	25	9	31	24	7	29	21	7
	SEP	73	87	35	25	10	32	23	9	29	21	8
	OCT	78	87	32	24	9	32	23	9	29	21	8
	NOV	83	88	30	23	7	30	22	8	27	20	7
	DEC	77	89	29	23	6	29	22	7	27	21	6
2015	JAN	62	86	31	22	9	32	21	11	29	17	13
	FEB	69	86	31	22	9	33	21	11	30	19	11
	MAR	74	84	34	24	10	35	23	12	32	20	13
	APR	93	88	34	24	10	33	23	10	31	20	11
	MAY	84	88	34	25	8	33	25	8	31	20	11
	JUN	82	92	34	25	8	32	25	8	30	22	8
	JUL	83	90	34	25	9	33	25	8	29	22	8
	AUG	82	89	35	25	10	33	25	9	30	21	8
	SEP	86	89	34	25	9	32	24	8	30	21	8
	OCT	82	86	32	24	8	32	23	9	29	21	8
	NOV	78	85	31	24	7	31	23	8	29	21	8
	DEC	77	86	30	24	7	31	23	9	29	21	8
2016	JAN	78	89	31	22	8	33	22	11	30	19	11
	FEB	73	86	33	23	9	34	22	12	31	20	11
	MAR	71	88	36	25	11	36	24	12	33	20	14
	APR	70	83	36	26	11	35	25	11	33	22	10
	MAY	82	92	33	25	8	32	25	8	30	22	8
	JUN	73	86	33	26	7	32	25	7	29	22	6
	JUL	72	87	33	25	8	32	25	7	29	22	7
	AUG	79	88	34	25	9	33	25	8	29	22	7
	SEP	82	84	34	25	10	34	25	9	29	21	8
	OCT	76	85	34	24	10	33	24	10	31	20	11
	NOV	83	86	31	23	8	31	23	9	29	20	9
	DEC	76	85	31	22	9	32	22	10	29	19	10
2017	JAN	NA	79	30	21	9	31	21	10	29	18	11
	FEB	NA	79	31	21	10	33	21	11	30	19	11
	MAR	NA	77	34	24	10	34	23	11	31	20	11
	APR	NA	77	35	25	10	35	25	10	32	20	12
	MAY	NA	83	34	25	9	33	25	8	30	21	9
	JUN	NA	82	34	26	8	32	25	7	29	22	7
	JUL	NA	79	35	26	10	33	25	8	30	22	8
	AUG	NA	82	34	25	9	32	25	8	29	22	7
	SEP	NA	83	32	24	8	32	24	8	29	21	7
	OCT	NA	81	33	25	8	31	24	7	29	21	8
	NOV	NA	79	31	24	7	31	23	8	29	21	8
	DEC	NA	78	30	23	8	31	22	9	29	20	9

		T max KATUNAYAKA	T min KATUNAYAKA	T Diff KATUNAYAKA	T max COLOMBO	T min COLOMBO	T Diff COLOMBO	T max RATNAPURA	T min RATNAPURA	T Diff RATNAPURA	T max GALLE	T min GALLE	T Diff GALLE
2012	OCT	30.8	23.9	6.9	30.8	24.5	6.3	32.1	22.8	9.3	30.2	24.7	5.5
	NOV	30.8	23.5	7.3	31	24	7	32.1	22.9	9.2	30.1	24.3	5.8
	DEC	30.8	23.2	7.6	30.7	23.9	6.8	31.4	22.4	9	30.3	22.9	7.4
2013	JAN	31	22.3	8.7	31.2	23.3	7.9	31.9	22	9.9	29.9	23.6	6.3
	FEB	32.3	22.9	9.4	31.5	23.8	7.7	33.5	22.5	11	30.4	24.3	6.1
	MAR	32.7	24.3	8.4	31.9	25.1	6.8	34	23.1	10.9	31.6	24.8	6.8
	APR	32.5	25.4	7.1	32.4	26.4	6	34.3	24.1	10.2	31.8	26.3	5.5
	MAY	31	26.1	4.9	31.1	26.8	4.3	31.5	24.5	7	30.1	26.1	4
	JUN	29.6	25.2	4.4	30	25.6	4.4	30.1	23.7	6.4	28.9	25	3.9
	JUL	29.8	25.3	4.5	30	25.6	4.4	30.3	23.7	6.6	28.7	25	3.7
	AUG	30.4	25.6	4.8	30.1	25.9	4.2	31.4	23.5	7.9	28.5	25.2	3.3
	SEP	29.9	24.9	5	30	25.3	4.7	30.9	23.1	7.8	28.9	25.1	3.8
	OCT	30.8	25	5.8	30.5	25.5	5	31.6	23.1	8.5	29.1	25.1	4
	NOV	31.2	23.5	7.7	30.9	24.3	6.6	32.4	22.9	9.5	30.2	24.2	6
	DEC	30.9	22.9	8	31.1	23.8	7.3	31.7	22.6	9.1	29.3	23.9	5.4
2014	JAN	32.4	22.9	9.5	31.4	23.6	7.8	33.1	22.3	10.8	29.4	23.6	5.8
	FEB	32.5	22.3	10.2	31.6	23.6	8	34.5	21.7	12.8	30.9	23.5	7.4
	MAR	33.2	24	9.2	32.3	24.8	7.5	34.8	22.5	12.3	32.5	24.3	8.2
	APR	32.2	24.7	7.5	32.2	25.3	6.9	33.9	23.3	10.6	31	25.5	5.5
	MAY	31.5	25.8	5.7	31.6	26.6	5	32.7	24.2	8.5	30.1	26.2	3.9
	JUN	31	26.8	4.2	31	27.1	3.9	31.3	24.6	6.7	29.7	25.7	4
	JUL	30.8	26.6	4.2	30.9	26.8	4.1	31.3	24.5	6.8	29.1	26	3.1
	AUG	30	25.3	4.7	30.2	25.6	4.6	30.6	23.1	7.5	28.6	24.9	3.7
	SEP	30.5	25.2	5.3	30.6	25.3	5.3	31.9	23.3	8.6	29.1	24.9	4.2
	OCT	30.4	24.3	6.1	30.4	24.7	5.7	31.7	22.9	8.8	29.2	24.6	4.6
	NOV	29.9	23.4	6.5	30.1	24	6.1	31.1	22.5	8.6	29.6	24.1	5.5
	DEC	29.6	23.4	6.2	29.6	23.8	5.8	30.6	22.9	7.7	29.5	23.9	5.6
2015	JAN	32	22.3	9.7	31.5	23.4	8.1	33.7	22.2	11.5	29.5	24	5.5
	FEB	32.6	22.7	9.9	31.5	23.6	7.85	33.5	22	11.5	29.6	23.5	6.1
	MAR	32	23.7	8.3	31.4	24.7	6.7	34.3	22.7	11.6	31.7	24.2	7.5
	APR	31.8	24.4	7.4	31.9	24.9	7	34.3	23.2	11.1	31.1	25	6.1
	MAY	31.8	25.7	6.1	31.9	26.4	5.5	33.1	24.3	8.8	30.5	25.8	4.7
	JUN	31.2	25.3	5.9	31.3	26	5.3	32.2	23.8	8.4	30.3	26.2	4.1
	JUL	31.3	26.6	4.7	31.2	26.9	4.3	31.3	24.2	7.1	29.5	25.7	3.8
	AUG	31.6	25.1	6.5	31.3	26.6	4.7	31.4	23.9	7.5	29.7	25.7	4
	SEP	31	24.6	6.4	30.6	25.2	5.4	31.1	23.5	7.6	29.5	25.2	4.3
	OCT	30.7	24.1	6.6	30.8	24.8	6	31.6	23.3	8.3	29.9	24.6	5.3
	NOV	30.6	23.5	7.1	30.9	24.4	6.5	31.5	23.2	8.3	30	24.4	5.6
	DEC	31.3	23.5	7.8	31.4	24.3	7.1	32	23.1	8.9	30.8	24.3	6.5
2016	JAN	33.2	22.7	10.5	32.4	24.2	8.2	32.9	22.9	10	31.1	22.5	8.6
	FEB	33.5	23.1	10.4	32.5	24.9	7.6	34.1	22.8	11.3	30.9	24.4	6.5
	MAR	33.6	24.7	8.9	32.9	26	6.9	35.3	23.8	11.5	32.4	25.5	6.9
	APR	34.3	25.4	8.9	33.3	26.5	6.8	34.7	24.2	10.5	33.3	26.6	6.7
	MAY	31.8	25.2	6.6	31.6	25.8	5.8	31.3	24	7.3	30.7	25.9	4.8
	JUN	30.9	26.3	4.6	31.1	26.8	4.3	31.2	24.6	6.6	29.6	26	3.6
	JUL	31.1	26.2	4.9	30.7	26.3	4.4	31.3	24.2	7.1	29	25.8	3.2
	AUG	31.3	26.7	4.6	31	27.1	3.9	31.1	24.4	6.7	29	26	3
	SEP	30.7	26.2	4.5	30.6	26.5	4.1	31.5	23.7	7.8	28.7	25.9	2.8
	OCT	31.3	25	6.3	31.1	25.7	5.4	32	23.1	8.9	29.3	25.5	3.8
	NOV	30.7	23.5	7.2	30.7	24.3	6.4	31.2	23.1	8.1	30	24.4	5.6
	DEC	32	23.2	8.8	31.4	24.2	7.2	32.3	22.1	10.2	30	24.2	5.8
2017	JAN	32.2	21.7	10.5	31.2	22.9	8.3	32.4	21.1	11.3	30	23.5	6.5
	FEB	32.4	22.3	10.1	31.4	23.3	8.1	33.5	21.7	11.8	29.7	23.7	6
	MAR	32	24	8	31.3	24.9	6.4	33.7	22.9	10.8	31.3	24.9	6.4
	APR	33.1	26.1	7	32.5	27	5.5	34	23.9	10.1	31	26.5	4.5
	MAY	32.1	25.8	6.3	31.8	26.5	5.3	31.8	24	7.8	30.5	26.1	4.4
	JUN	30.7	25.9	4.8	30.7	26.4	4.3	30.8	24.2	6.6	29.4	26.1	3.3
	JUL	31	26.8	4.2	30.7	27.2	3.5	31.4	24.3	7.1	29.6	26.7	2.9
	AUG	31	26.3	4.7	30.6	26.6	4	30.8	23.9	6.9	29	26	3
	SEP	30.3	25.3	5	30.3	25.9	4.4	30.9	23.3	7.6	29.3	25.5	3.8
	OCT	30.4	24.8	5.6	30.4	25.2	5.2	30.8	23.4	7.4	29.6	25.3	4.3
	NOV	30.6	23.5	7.1	30.2	24.4	5.8	30.9	23	7.9	29.4	24.4	5
	DEC	31.4	22.9	8.5	31.1	23.8	7.3	31.7	22.6	9.1	29.5	24.3	5.2

RF- Rail Fall, RH- Relative Humidity, T- Temperature