Government of Nepal

Ministry of Forest and Environment

Department of Environment

**Ambient Air Quality monitoring program**

**Report of the year 2017**

**September 2018**

Table of content

[Chapter I. Introduction 3](#_Toc526106963)

[1.1 Background 3](#_Toc526106964)

[1.2 Objectives 3](#_Toc526106965)

[1.3 Parameters of Air Quality Monitored 3](#_Toc526106966)

[1.4 Methods of Data collection and Data analysis. 4](#_Toc526106967)

[2. RESULTS. 7](#_Toc526106968)

[2.1 PM 2.5 7](#_Toc526106969)

[2.1 .1 Annual Average PM 2.5 for 2017 7](#_Toc526106970)

[2.1.2 National Ambient Air quality compliance status 8](#_Toc526106971)

[2.1.3 Monthly Average PM 2.5 at different stations 9](#_Toc526106972)

[2.2 PM 10 14](#_Toc526106973)

[2.2.1 Annual Average PM 10 value for 2017 14](#_Toc526106974)

[2.2.2 National Ambient Air quality compliance status 15](#_Toc526106975)

[2.2.3 Monthly Average PM 10 at different stations 16](#_Toc526106976)

[2.3 Total suspended particulate Matter (TSPM) 20](#_Toc526106977)

[2.3.1 Annual Average TSPM for 2017 20](#_Toc526106978)

[2.3.2 National Ambient Air quality compliance status 21](#_Toc526106979)

[2.3.3 Monthly Average Total suspended particulate Matter (TSPM) at different stations 22](#_Toc526106980)

[3. Conclusion 26](#_Toc526106981)

# Chapter I.Introduction

## 1.1 Background

Establishment and operation of air quality monitoring stations is a basis for air quality management program. Government of Nepal has started to establish air quality monitoring station since 2016. By the end of 2017, 11 monitoring stations came into operation whole over the country. Department of Environment is working in coordination with many organizations like ICIMOD in establishment and operation of these monitoring stations. The main purpose of the establishment of the network of stations is to provide the basis for decision makers to perform air quality management and increase the public awareness. Together with improved quantitative understanding of emissions sources, a modeling framework to simulate and forecast pollution transport and chemistry, and exposure studies it will form the basis for science based air pollution management and policymaking.

 Nepal Government has set and enforced National ambient air quality standard (NAAQS) and has a legal obligation to maintain this standard. This report has been prepared on the basis of analysis of data of the year 2017 from the monitoring stations to know the status of compliance with reference to the National Ambient Air Quality Standard. All the monitoring stations measure PM 1, PM 2.5, PM10 and Total Suspended Particulate Matter. Since we do not have National Ambient air Quality standard for PM 1, this is not included in this report.

## 1.2 Objectives

The overall objective of this report is to present the status of air quality on the basis of data collected from various stations for the year 2017 and the specific objectives are:

* To analyze the PM2.5 data of various stations and compliance status
* To analyze the PM 10 data of various stations and compliance status
* To analyze the Total Suspended Particulate Matter data of various stations and compliance status

## 1.3 Parameters of Air Quality Monitored

Although NAAQS has defined nine parameters for the measurement purpose the monitoring stations whole over the country commonly measures following parameters:

**Total Suspended Particulate Matter(TSPM):** These includes all the solid and liquid droplets particulate present in the air mostly within the range of 0.1µ to 100 µ.

**PM10:** These includes the particulate matter with an aerodynamic diameter less than 10 µdiameter.

**PM2.5:** These includes the particulate matter with an aerodynamic diameter less than 2.5 µ diameter and important in terms of health impacts.

The other parameters in NAAQS like ozone, NOx, Sox, Benzene, lead are not considered for analysis as these parameters are not measured by all stations. Only one station is facilitated to measure ozone and some gaseous pollutants.

## 1.4Methods of Data collection and Data analysis.

 Each monitoring station has Grimm Electronic Dust Monitor(EDM) 180 to measure particulate matter of different sizes. It use the use light-scattering technology fo particle count. A semiconductor-laser serves as the light-source. The particle size analyser/dust monitor determines the dust-concentration (counts/litre) through the optical-light-scattering method directly; however, the mass concentration is determined by extrapolation. All the stations are the real time monitoring stations.

**Monitoring stations**

By the end of 2017, the following 11 monitoring stations came in to operation:

1. Ratnapark :–This station lies in Ratnapark of Kathmandu District.
2. Pulchowak :–This station lies within pulchwok engineering campus premises in Lalitpur District.
3. Dhulikhel :–This station lies on the premises of Kathmandu university high school, Dhulikhel, Kavre district.
4. .Lumbini :– This station lies on the Lumbini, the birth place of Gautam Buddha.
5. Sauraha :–This station lies on the Sauraha, chitwan district.
6. BirendraSchool :–This station lies on the premises of SainikAawasiyaMahabiddhyalayforemerBirendrasainik school, SallaghariBhaktapur district.
7. Bhaisepati :–This station lies on BhaisepatiLalitpur district.
8. Shankhapark :–This station lies within Shankhapark, Maharajgunj Kathmandu district.
9. DHM Pokhara:–This station lies in the premises of western regional climate office, , Department of Hydrology and Meteorology, Pokhara, Kaski District.
10. Pokhara university:–This station lies in the premises of Pokhara University, Pokhara, Kaski District.
11. Gandaki Boarding School :–This stations lies in the premises of Gandaki Boarding School, LamachaurPokhara District.

The first five stations came in operation since 2016 and rest of seven stations came in operation since August of September 2017.

The instrument collects data in every minute. The data collected from the instrument is transmitted to a server located at National information Technology (NITC). Data management software is used for the management and analysis of the data.

The measurement from the monitoring stations is communicated to the public through the website [www.pollution.gov.np](http://www.pollution.gov.np).

For the analysis of the data, daily average data was downloaded from the server. From those daily averages monthly average and annual average was calculated. Only the days that have complete data is chosen for data analysis. The no of days with valid data and the no of days that exceeds national standard was calculated.

Since some of the stations were came into operation only after august it’s not possible to calculate average data that represents the whole year. In Sauraha data for about 5 months is completely absent so it is not possible to calculate annual average in this case too. So annual average value was calculated for Ratnapark, Lumbini, Pulchowak and Dulikhel and for the rest of stations average value for the data available periods were calculated. For this reason Bar diagram of annual average of Ratnapark, Lumbini, Pulchowak and Dulikheland rest stations were presented differently.

**National Ambient Air Quality Standard, 2012(NAAQS).**

The following standard issued by the Nepal government is used to know the compliance status:



# Chapter II. RESULTS

## 2.1 PM 2.5

### 2.1 .1 Annual Average PM 2.5 for 2017

The following figure provides the annual average PM 2.5 concentration in microgram per cubic meter (µg/m3) for the stations that have data for whole year.

**Fig 2.1:Annual average PM 2.5 for 4 stations**

The annual averages ranges in between 31 to 52 µg/m3 with Lumbini having the highest annual average value and Dhulikhel the lowest.

The following figure provides the annual average PM2.5 concentration for rest of the stations:

**Fig2.2:Annual Average PM 2.5 for rest 7 stations**

The annual average value for the above stations ranges in between 20 to 69µg/m3 with highest value at Sauraha and lowest value at Gandaki Boarding. The PM10 concentrations are found relatively low in the Pokhara based stations.

### 2.1.2 National Ambient Air quality compliance status

The following diagram presents the no of days with valid PM2.5 data and the no of days that exceed the national standard for the PM2.5 for four stations that have whole year data.

**Fig2.3:NAAQS compliance status of PM 2.5 for 4 stations**

The following diagram presents the no of days with valid PM 2.5 data and the no of days that exceed the national standard for the PM 2.5 for rest of the stations.

**Fig2.4:NAAQS compliance status of PM 2.5 for rest 7 stations**

### 2.1.3 Monthly Average PM 2.5 at different stations

The following table presents monthly averagePM 2.5 in µg/m3 and also the month wise compliance status.

**Table2.1: Monthly Average PM 2.5 at different stations.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Stations** | **Month** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **June** | **July** | **August** | **September** | **October** | **November** | **December** | **Total** |
| Ratnapark | Monthly Average PM 2.5 (µg/m3) | 80.86 | 79.8 | 45.12 | 67.16 | 42.35 | 29.08 | 18.47 | 15.91 | 24.67 | 25.01 | 30.22 | 41.2 |  |
| Total days with valid data | 24 | 25 | 19 | 26 | 28 | 30 | 31 | 31 | 30 | 31 | 16 | 27 | 318 |
| No of days exceeding National Standard | 24 | 25 | 11 | 24 | 17 | 4 | 0 | 0 | 0 | 1 | 1 | 12 | 119 |
| Pulchowak | Monthly AveragePM 2.5(µg/m3) | 69.61 | 68.4 | 50.49 | 45.64 | 30.07 | 16.63 | 6.07 | 6.74 | 7.73 | 12.04 | 17.67 | 24.58 |  |
| Total days with valid data | 27 | 28 | 29 | 30 | 30 | 28 | 30 | 23 | 5 | 21 | 22 | 26 | 299 |
| No of days exceeding National Standard | 27 | 28 | 26 | 14 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 99 |
| Dulikhel | Monthly AveragePM 2.5 (µg/m3) | 31.8 | 55.81 | 43.58 | 41.52 | 24.87 | 16.3 | 7.04 | - | - | 25.83 | 30.78 | 31.54 |  |
| Total days with valid data | 22 | 20 | 20 | 26 | 19 | 20 | 17 | - | - | 27 | 11 | 28 | 210 |
| No of days exceeding National Standard | 8 | 18 | 14 | 8 | 1 | 0 | 0 | - | - | 6 | 1 | 5 | 61 |
| Lumbini | Monthly AveragePM 2.5(µg/m3) | 108.43 | 91.53 | 49.06 | 44.34 | 29.5 | 20.85 | 10.33 | 13.86 | 19.33 | 55.47 | 84.99 | 94.31 |  |
| Total days with valid data | 30 | 28 | 31 | 27 | 29 | 30 | 31 | 31 | 8 | 15 | 19 | 31 | 310 |
| No of days exceeding National Standard | 29 | 28 | 23 | 11 | 6 | 0 | 0 | 0 | 0 | 12 | 18 | 31 | 158 |
| Birendra school Bhaktapur | Monthly AveragePM 2.5(µg/m3) | - | - | - | - | - | - | - | 16.01 | 29 | 37.86 | 75.46 | 86.85 |  |
| Total days with valid data | - | - | - | - | - | - | - | 12 | 23 | 31 | 18 | 31 | 115 |
| No of days exceeding National Standard | - | - | - | - | - | - | - | 0 | 2 | 14 | 18 | 31 | 65 |
| Sauraha | Monthly AveragePM 2.5(µg/m3) | 77.1 | 79.54 | 64.21 | 123.95 | 19.61 |  | 8.3 | 8.29 | - | - | - | - |  |
| Total days with valid data | 22 | 27 | 31 | 22 | 7 | 1 | 9 | 11 | - | - | - | - | 130 |
| No of days exceeding National Standard | 21 | 27 | 26 | 22 | 0 | 1 | 0 | 0 |  | - | - | - | 97 |
| Bhaisepati | Monthly AveragePM 2.5(µg/m3) | - | - | - | - | - | - | - | - | 40.72 | 37.4 | 47.85 | 59.93 |  |
| Total days with valid data | - | - | - | - | - | - | - | - | 30 | 31 | 29 | 31 | 121 |
| No of days exceeding National Standard | - | - | - | - | - | - | - | - | 13 | 10 | 18 | 31 | 72 |
| Shankhapark | Monthly AveragePM 2.5(µg/m3) | - | - | - | - | - | - | - | 21.28 | 49.86 | 41.38 | 57.01 | 66.6 |  |
| Total days with valid data | - | - | - | - | - | - | - | 13 | 30 | 31 | 30 | 31 | 135 |
| No of days exceeding National Standard | - | - | - | - | - | - | - | 0 | 24 | 15 | 30 | 31 | 100 |
| DHM Pokhara | Monthly AveragePM 2.5(µg/m3) | - | - | - | - | - | - | - | 10.39 | 15.47 | 25.25 | 39.7 | 49.91 |  |
| Total days with valid data | - | - | - | - | - | - | - | 10 | 29 | 31 | 30 | 31 | 131 |
| No of days exceeding National Standard | - | - | - | - | - | - | - | 0 | 0 | 6 | 13 | 28 | 47 |
| Pokhara University | Monthly AveragePM 2.5(µg/m3) | - | - | - | - | - | - | - | 8.92 | 15.16 | 24.91 | 38.27 | 46.93 |  |
| Total days with valid data | - | - | - | - | - | - | - | 16 | 30 | 31 | 30 | 31 | 138 |
| No of days exceeding National Standard | - | - | - | - | - | - | - | 0 | 0 | 5 | 10 | 27 | 42 |
| Gandaki Boarding | Monthly AveragePM 2.5(µg/m3) | - | - | - | - | - | - | - | 6.99 | 11.5 | 17.1 | 24.46 | 30.63 |  |
| Total days with valid data | - | - | - | - | - | - | - | 8 | 25 | 31 | 30 | 30 | 124 |
| No of days exceeding National Standard | - | - | - | - | - | - | - | 0 | 0 | 0 | 2 | 2 | 4 |

## 2.2PM 10

### 2.2.1Annual Average PM 10 value for 2017

 The following diagramprovides the annual average PM 10concentration in microgram per cubic meter (µg/m3) for the stations that have data for whole year.

**Fig2.5:Annual average PM 10 for 4 stations**

The annual average ranges in between 38 to 91 µg/m3 with Ratna Park having the highest and Pulchowk having the lowest values.

The following diagram presents the annual average PM10 concentration for 2017 for rest of the stations.

**Fig 2.6:Annual average PM 10 for rest 7 stations**

The annual average ranges in between 21 to 109 µg/m3 with Birendra School having the highest and Gandaki Boarding School having the lowest values.

### 2.2.2National Ambient Air quality compliance status

The following diagram presents number of days with valid PM 10 data and the number of days that exceed the national standard for the PM 10 for four stations that have whole year data.

**Fig 2.7:NAAQS compliance status for PM10 for 4 stations**

Also the following diagram presents number of days with valid PM 10 data and the number of days that exceed the national standard for the PM 10for rest of the station.

**Fig2.8. National Ambient Air quality compliance status forPM 10 for rest 7 stations**

### 2.2.3 Monthly Average PM 10 at different stations

The following table presents monthly averagePM 10 in µg/m3 and also the month wise compliance status.

**Table 2.Monthly Average PM 2.5 at different stations.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Stations | Month | Jan | Feb | Mar | April | May | June | July | August | September | October | November | December | Total |
| Ratnapark | Monthly Average PM 10(µg/m3) | 108.1 | 112.38 | 87.08 | 270.52 | 120.59 | 98.59 | 59.67 | 41.48 | 64.22 | 50.62 | 48.21 | 46.83 |  |
| Total days with valid data | 24 | 25 | 19 | 26 | 28 | 30 | 31 | 31 | 30 | 31 | 16 | 27 | 318 |
| No of days exceeding National Standard | 6 | 9 | 7 | 23 | 15 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 68 |
| Pulchowak | Monthly Average PM 10(µg/m3) | 82.09 | 82.65 | 64.1 | 58.1 | 38.63 | 19.83 | 6.73 | 7.24 | 8.07 | 12.38 | 18.22 | 25.52 |  |
| Total days with valid data | 27 | 28 | 29 | 30 | 30 | 28 | 30 | 23 | 5 | 21 | 22 | 26 | 299 |
| No of days exceeding National Standard | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| Dulikhel | Monthly Average PM 10(µg/m3) | 48.35 | 94.97 | 78.26 | 77.45 | 40.66 | 32.88 | 10.5 | - | - | 44.98 | 61.16 | 63.52 |  |
| Total days with valid data | 22 | 20 | 21 | 26 | 19 | 20 | 17 | - | - | 27 | 11 | 27 | 210 |
| No of days exceeding National Standard | 0 | 4 | 1 | 4 | 0 | 0 | 0 | - | - | 0 | 0 | 0 | 9 |
| Lumbini | Monthly Average PM 10(µg/m3) | 124.57 | 106.06 | 63.6 | 111.96 | 66.3 | 37.11 | 14.9 | 17.96 | 25.48 | 71.99 | 107.85 | 100.1 |  |
| Total days with valid data | 30 | 28 | 31 | 27 | 29 | 30 | 31 | 31 | 8 | 15 | 19 | 31 | 310 |
| No of days exceeding National Standard | 18 | 5 | 1 | 10 | 1 | 0 | 0 | 0 | 0 | 0 | 8 | 4 | 47 |
| Birendra school Bhaktapur | Monthly Average PM 10(µg/m3) | - | - | - | - | - | - | - | 30.75 | 57.17 | 72.45 | 159.01 | 187.11 |  |
| Total days with valid data | - | - | - | - | - | - | - | 12 | 23 | 31 | 18 | 31 | 115 |
| No of days exceeding National Standard | - | - | - | - | - | - | - | 0 | 0 | 4 | 16 | 29 | 49 |
| Sauraha | Monthly Average PM 10(µg/m3) | 92.84 | 95.16 | 87.91 | 186.43 | 39.1 | 23.15 | 12.43 | 11.47 | - | - | - | - |  |
| Total days with valid data | 22 | 27 | 31 | 22 | 7 | 1 | 9 | 11 | - | - | - | - | 130 |
| No of days exceeding National Standard | 5 | 1 | 8 | 16 | 0 | 0 | 0 | 0 | - | - | - | - | 30 |
| Bhaisepati | Monthly Average PM 10(µg/m3) | - | - | - | - | - | - | - | - | 59.18 | 69.93 | 91.1 | 111.5 |  |
| Total days with valid data | - | - | - | - | - | - | - | - | 30 | 31 | 29 | 31 | 121 |
| No of days exceeding National Standard | - | - | - | - | - | - | - | - | 0 | 0 | 1 | 10 | 11 |
| Shankhapark | Monthly Average PM 10(µg/m3) | - | - | - | - | - | - | - | 44.26 | 79.4 | 81.79 | 117.09 | 98.97 |  |
| Total days with valid data | - | - | - | - | - | - | - | 13 | 30 | 31 | 30 | 31 | 135 |
| No of days exceeding National Standard | - | - | - | - | - | - | - | 0 | 1 | 4 | 15 | 5 | 25 |
| DHM Pokhara | Monthly Average PM 10(µg/m3) | - | - | - | - | - | - | - | 16.55 | 23.92 | 37.68 | 61.51 | 77.71 |  |
| Total days with valid data | - | - | - | - | - | - | - | 10 | 29 | 31 | 30 | 31 | 131 |
| No of days exceeding National Standard | - | - | - | - | - | - | - | 0 | 0 | 0 | 0 | 0 |  |
| Pokhara University | Monthly Average PM 10(µg/m3) | - | - | - | - | - | - | - | 14.39 | 24.31 | 38.59 | 60.11 | 73.35 |  |
| Total days with valid data | - | - | - | - | - | - | - | 16 | 30 | 31 | 30 | 31 | 138 |
| No of days exceeding National Standard | - | - | - | - | - | - | - | 0 | 0 | 0 | 0 | 0 |  |
| Gandaki Boarding | Monthly Average PM 10(µg/m3) | - | - | - | - | - | - | - | 8.33 | 12.56 | 17.96 | 25.47 | 31.6 |  |
| Total days with valid data | - | - | - | - | - | - | - | 8 | 25 | 31 | 30 | 30 | 124 |
| No of days exceeding National Standard | - | - | - | - | - | - | - | 0 | 0 | 0 | 0 | 0 |  |

## 2.3 Total suspended particulate Matter (TSPM)

### 2.3.1Annual Average TSPM for 2017

The following figures provides the annual average data of TSPM in microgram per cubic meter (µg/m3) for the stations that have data for whole year. The data for Lumbini is not available for this analysis.

.

**Fig 2.9:Annual average of TSPM for 4 stations**

The annual average value ranges in between 44 to 227 µg/m3 with Ratnapark having the highest value and Pulchowk the lowest one.

The following diagram presents the annual average TSPM concentration for 2017 for rest of the stations.

**Fig2.10: Annual average TSPM for rest 7 stations**

The annual average value ranges in between 21 to 251 µg/m3 with Gandaki Boarding School having the lowest and Shankapark having the highest.

### 2.3.2 National Ambient Air quality compliance status

The following diagram presents no of days with valid TSPM data and the no of days that exceed the national standard for the TSPM for four stations that have whole year data.

**Fig 2.11:NAAQS compliance status for TSPM for 4 stations**

The following diagram presents the no of days with valid TSPM data and the no of days that exceed the national standard for the TSPMfor rest of the station.

**Fig2.12:NAAQS compliance status for TSPM for rest 7 stations**

### 2.3.3Monthly Average Total suspended particulateMatter (TSPM) at different stations

The following table presents the monthly average total suspended particulatematterin µg/m3 and also the month wise compliance status.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Stations** | **Month** | **Jan** | **Feb** | **March** | **April** | **May** | **June** | **July** | **August** | **September** | **October** | **November** | **December** | **Total** |
| Ratnapark | Monthly Average TSPM (µg/m3) | 136.37 | 141.23 | 200.78 | 714.89 | 350.75 | 306.93 | 208.73 | 142.14 | 202.37 | 134.39 | 106.7 | 53.36 |  |
| Total days with valid data | 24 | 25 | 19 | 26 | 28 | 30 | 31 | 31 | 30 | 31 | 16 | 27 | 318 |
| No of days exceeding National Standard | 0 | 1 | 9 | 24 | 23 | 24 | 8 | 2 | 11 | 0 | 0 | 0 | 102 |
| Pulchowak | Monthly Average TSPM (µg/m3) | 100.1 | 96.99 | 74.01 | 69.06 | 43.68 | 21.05 | 7.27 | 7.53 | 9.09 | 13.03 | 18.67 | 26.28 |  |
| Total days with valid data | 27 | 28 | 29 | 30 | 30 | 28 | 30 | 23 | 5 | 21 | 22 | 26 | 299 |
| No of days exceeding National Standard | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| Dulikhel | Monthly Average TSPM (µg/m3) | 106.17 | 251.77 | 199.21 | 188.58 | 75.82 | 68.69 | 19.47 | - | - | 93.99 | 143.98 | 147.59 |  |
| Total days with valid data | 22 | 20 | 21 | 26 | 19 | 20 | 17 | - | - | 27 | 11 | 27 | 210 |
| No of days exceeding National Standard | 0 | 9 | 6 | 8 | 0 | 1 | 0 | - | - | 0 | 0 | 3 | 27 |
| Lumbini | Monthly Average TSPM (µg/m3) | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total days with valid data | - | - | - | - | - | - | - | - | - | - | - | - | - |
| No of days exceeding National Standard | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Birendra school Bhaktapur | Monthly Average TSPM (µg/m3) | - | - | - | - | - | - |  | 69.29 | 134.78 | 158.88 | 362.41 | 398.18 |  |
| Total days with valid data | - | - | - | - | - | - | - | 12 | 23 | 31 | 18 | 31 | 115 |
| No of days exceeding National Standard | - | - | - | - | - | - | - | 0 | 1 | 7 | 17 | 29 | 54 |
| Sauraha | Monthly Average TSPM (µg/m3) | - | - | 108.85 | 201.15 | 74.35 | 40.77 | 20.29 | 17.13 | - | - | - | - |  |
| Total days with valid data | - | - | 9 | 22 | 9 | 1 | 9 | 11 | - | - | - | - | 61 |
| No of days exceeding National Standard | - | - | 0 | 8 | 0 | 0 | 0 | 0 | - | - | - | - | 8 |
| Bhaisepati | Monthly Average TSPM (µg/m3) | - | - | - | - | - | - | - | - | 144.37 | 219.24 | 249.98 | 272.75 |  |
| Total days with valid data | - | - | - | - | - | - | - | - | 30 | 31 | 29 | 31 | 121 |
| No of days exceeding National Standard | - | - | - | - | - | - | - | - | 2 | 15 | 20 | 27 | 64 |
| Shankhapark | Monthly Average TSPM (µg/m3) | - | - | - | - | - | - | - | 119.8 | 192.72 | 255.22 | 364.49 | 249.47 |  |
| Total days with valid data | - | - | - | - | - | - | - | 13 | 30 | 31 | 30 | 31 | 135 |
| No of days exceeding National Standard | - | - | - | - | - | - | - | 0 | 9 | 18 | 29 | 16 | 72 |
| DHM Pokhara | Monthly Average TSPM (µg/m3) | - | - | - | - | - | - | - | 26.96 | 36.16 | 55.66 | 96.74 | 122.13 |  |
| Total days with valid data | - | - | - | - | - | - | - | 10 | 29 | 31 | 30 | 31 | 131 |
| No of days exceeding National Standard | - | - | - | - | - | - | - | 0 | 0 | 0 | 0 | 0 |  |
| Pokhara University | Monthly Average TSPM (µg/m3) | - | - | - | - | - | - | - | 26.03 | 40.44 | 64.04 | 106.38 | 122.26 |  |
| Total days with valid data | - | - | - | - | - | - | - | 16 | 30 | 31 | 30 | 31 | 138 |
| No of days exceeding National Standard | - | - | - | - | - | - | - | 0 | 0 | 0 | 0 | 0 |  |
| Gandaki Boarding | Monthly Average TSPM (µg/m3) | - | - | - | - | - | - | - | 8.69 | 12.87 | 18.18 | 25.98 | 32.58 |  |
| Total days with valid data | - | - | - | - | - | - | - | 8 | 25 | 31 | 30 | 30 | 124 |
| No of days exceeding National Standard | - | - | - | - | - | - | - | 0 | 0 | 0 | 0 | 0 |  |

# 3.Conclusion

The annual average PM2.5 value for the stations like Ratnapark and Lumbini are found above the National Ambient Air Quality Standard. The annual averages of PM2.5 for the stations like Sauraha, Bhaisepati, Shankapark and Birendra School are also found non-compliance with respect to national standard. The annual average PM2.5 for the stations in Pokhara is found compliance with respect to national standard. The number of days exceeding the standard is found high in Ratnapark and Lumbini along with Bhainsepati, Sankhapark, Birendra School and Sauraha. The monthly averages PM2.5 value of winter months like December, Janaury, February and Pre-monsoon months March, April and May are found high in comparison to remaining summer and autumn months.

The annual average PM10 value for all the monitored stations are found within National Ambient Air Quality Standard but the Ratnapark and Lumbini stations values are found relatively high. The number of days exceeding the PM10 standards is found high in Ratnapark and Lumbini along with Bhainsepati, Sankhapark, Birendra School and Sauraha. The monthly averages PM10 value of winter months like December, Janaury, February and Pre-monsoon months March, April and May are found high in comparison to remaining summer and autumn months.

The annual average TSPM value for Ratnapark is near by the breaching point with respect to the National Ambient Air Quality Standard. The annual averages of TSPM for the stations like Bhaisepati, Shankapark and Birendra School are found non-compliance with respect to the national standard. The annual average TSPM for the stations in Pokhara are found compliance with respect to national standard. The number of days exceeding the standards is found high in Ratnapark along with Bhainsepati, Sankhapark and Birendra School. The monthly averages TSPM value of winter months like December, Janaury, February and Pre-monsoon months March, April and May are found high in comparision to remaining summer and autumn months.

Air quality status of Kathamandu Valley, Lumbini and Sauraha is a matter of serious concern. Pokhara Valley is relatively safe in terms of air quality status.

Waste water report

Industry A

|  |  |  |  |
| --- | --- | --- | --- |
| SN | parameters | standard | value |
| 1 | Total suspended solids | 200 | 357 |
| 2 | pH | 5.5-9.0 | 7.11 |
| 3 | BOD | 100 | 750 |
| 4 | COD | 250 | 2450 |

Industry B

|  |  |  |  |
| --- | --- | --- | --- |
| SN | parameters | standard | value |
| 1 | Total suspended solids | 100 | 584 |
| 2 | pH | 5.5-9.0 | 1.14 |
| 3 | BOD | 100 | 570 |
| 4 | COD | 250 | 2760 |
| 5 | Oil and Grease | 10 | 130 |
| 6 | Iron | 3 | 139.5 |
| 7 | Copper | 3 | 3.73 |
| 8 | Zinc | 5 | 3.65 |
| 9 | Lead | 0.1 | 20 |
| 10 | Nickel | 3 | 0.16 |

Industry c

|  |  |  |  |
| --- | --- | --- | --- |
| SN | parameters | standard | value |
| 1 | Total suspended solids | 100 | 297 |
| 2 | pH | 5.5-9.0 | 6.87 |
| 3 | BOD | 100 | 180 |
| 4 | COD | 250 | 250 |
| 5 | Iron | 3 | 2.64 |
| 6 | Copper | 3 | 0.01 |
| 7 | Zinc | 5 | 0.11 |
| 8 | Lead | 0.1 | 0.08 |
| 9 | Nickel | 3 | 0.005 |

Industry D

|  |  |  |  |
| --- | --- | --- | --- |
| SN | parameters | standard | value |
| 1 | Total suspended solids | 200 | 18 |
| 2 | pH | 5.5-9.0 | 9.7 |
| 3 | BOD | 100 | 780 |
| 4 | COD | 250 | 1420 |

Industry D

|  |  |  |  |
| --- | --- | --- | --- |
| SN | parameters | standard | value |
| 1 | Total suspended solids | 200 | 1335 |
| 2 | pH | 5.5-9.0 | 3.3 |
| 3 | BOD | 100 | 1710 |
| 4 | COD | 250 | 10580 |