



Government of Nepal  
Ministry of Forests and Environment  
Department of Environment  
Babarmahal, Kathmandu

# **Air quality status of Nepal 2016-2020**

**Volume XXIII**

**Hetauda air quality monitoring station**



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## Table of Contents

1	Hetauda Air Quality Monitoring Station.....	5
2	Air Quality Status of Hetauda station (2020).....	5
2.1	Air quality status, 2020.....	5
2.1.1	Annual average of PM <sub>1</sub> , PM <sub>2.5</sub> , PM <sub>10</sub> and TSP.....	5
2.1.2	Temporal variation of PM <sub>1</sub> .....	6
2.1.3	Temporal Variation of PM <sub>2.5</sub> .....	9
2.1.4	Temporal variation of PM <sub>10</sub> .....	12
2.1.5	Temporal variation of TSP.....	16
	Annex.....	20

## Lists of Figures

Figure 1:	Annual average of PM <sub>1</sub> , PM <sub>2.5</sub> , PM <sub>10</sub> and TSP in 2020 .....	5
Figure 2:	Histogram of PM <sub>1</sub> .....	6
Figure 3:	Daily average of PM <sub>1</sub> .....	6
Figure 4:	Monthly Average of PM <sub>1</sub> .....	7
Figure 5:	Monthly Variation of PM <sub>1</sub> .....	7
Figure 6:	Seasonal variation of PM <sub>1</sub> .....	8
Figure 7:	Diurnal variation of PM <sub>1</sub> .....	8
Figure 8:	Histogram of PM <sub>2.5</sub> .....	9
Figure 9:	Daily average of PM <sub>2.5</sub> .....	9
Figure 10:	Monthly Average of PM <sub>2.5</sub> .....	10
Figure 11:	Monthly Variation of PM <sub>2.5</sub> .....	10
Figure 12:	Seasonal variation of PM <sub>2.5</sub> .....	11
Figure 13:	Diurnal variation of PM <sub>2.5</sub> .....	11
Figure 14:	Compliance status of PM <sub>2.5</sub> .....	12
Figure 15 :	Histogram for the ambient concentration of PM <sub>10</sub> . .....	12

<i>Figure 16: Daily average of PM<sub>10</sub></i> .....	13
<i>Figure 17: Monthly average of PM<sub>10</sub></i> .....	13
Figure 18: Monthly Variation of PM <sub>10</sub> .....	14
Figure 19: Seasonal variation of PM <sub>10</sub> .....	14
Figure 20: Diurnal variation of PM <sub>10</sub> concentration .....	15
Figure 21: Compliance status of PM <sub>10</sub> .....	15
Figure 22 : Histogram for the ambient concentration of TSP .....	16
Figure 23: Daily average of TSP .....	16
Figure 24: Monthly Average of TSP.....	17
Figure 25: Monthly Variation of TSP. ....	17
Figure 26: Seasonal variation of TSP .....	18
Figure 27: Diurnal Variation of TSP .....	18
Figure 28: Compliance status of TSP .....	19

# 1 Hetauda Air Quality Monitoring Station

- Address : Hetauda Sub-metropolitan City, Huprachaur Playground (North-west Corner)
- Location: 27.4226747 latitude, 85.0344161 longitude
- Surrounding of the station
  1. North: Khelkud Bikash samite Building
  2. South: Huprachaur Playground
  3. East: Huprachaur Playground
  4. West: Trangular trail, blacktopped road
- Establish year: 2020 (2077)
- Brief introduction of the instruments installed in the station (should include- brief specification; number of instrument)
  1. PM instrument- GRIMM EDM 180
  2. Met sensor luffth WS 700
  3. Data logging and data transmission and power backup system

## 2 Air Quality Status of Hetauda station (2020)

### 2.1 Air quality status, 2020

#### 2.1.1 Annual average of PM<sub>1</sub>, PM<sub>2.5</sub>, PM<sub>10</sub> and TSP

The annual average of PM<sub>1</sub>, PM<sub>2.5</sub>, PM<sub>10</sub> and TSP of the Hetauda monitoring station was calculated as shown in figure below.

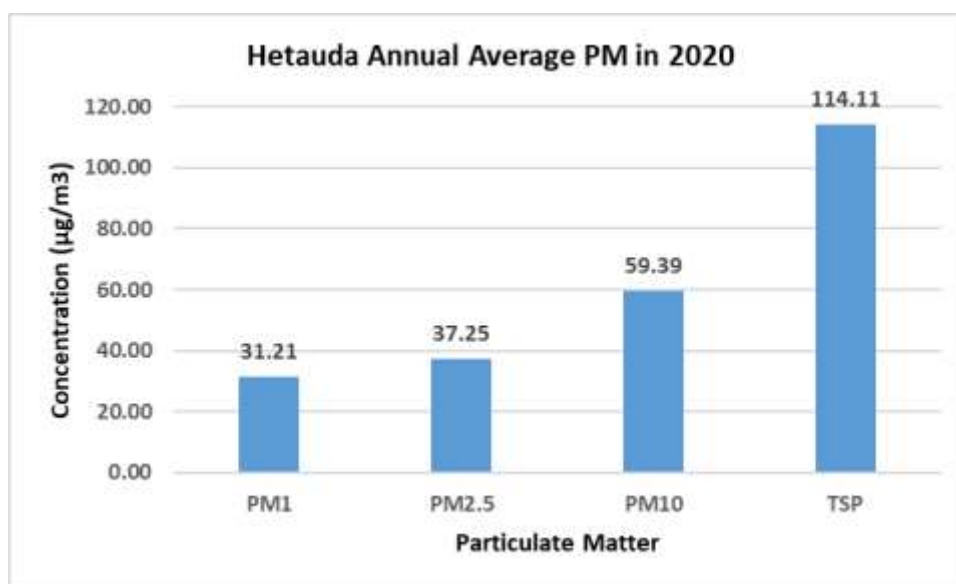


Figure 1: Annual average of PM<sub>1</sub>, PM<sub>2.5</sub>, PM<sub>10</sub> and TSP in 2020

### 2.1.2 Temporal variation of PM<sub>1</sub>

#### Annual average of PM<sub>1</sub>

The annual average of PM<sub>1</sub> at Hetauda station was found to be 31.21 µg/m<sup>3</sup>. Histogram of hourly average PM<sub>1</sub> is shown in the figure below.

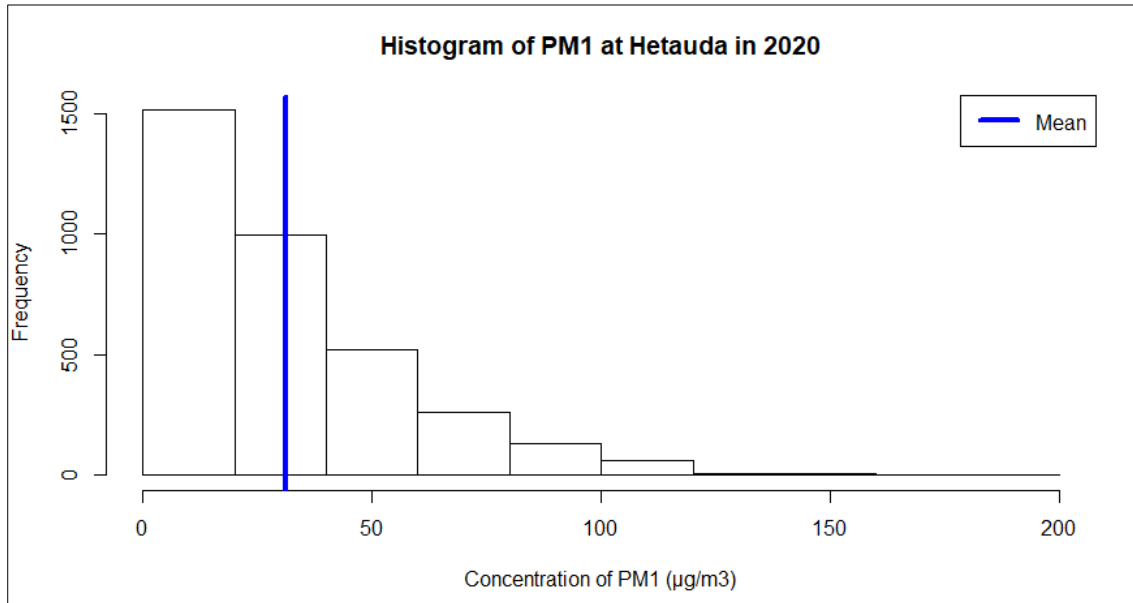


Figure 2: Histogram of PM<sub>1</sub>

#### Daily average of PM<sub>1</sub>

Daily average concentration of PM<sub>1</sub> was found to be high during December and was found low during August.

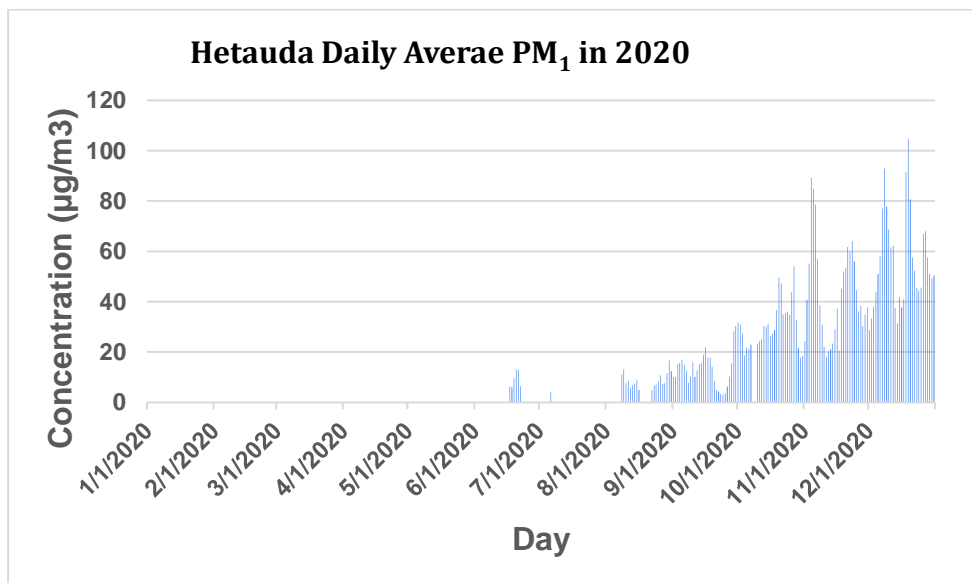


Figure 3: Daily average of PM<sub>1</sub>

### Monthly average of PM<sub>1</sub>

The highest and the lowest monthly average of PM<sub>1</sub> was found during December (56.4 µg/m<sup>3</sup>) and July (4.06 µg/m<sup>3</sup>) respectively.

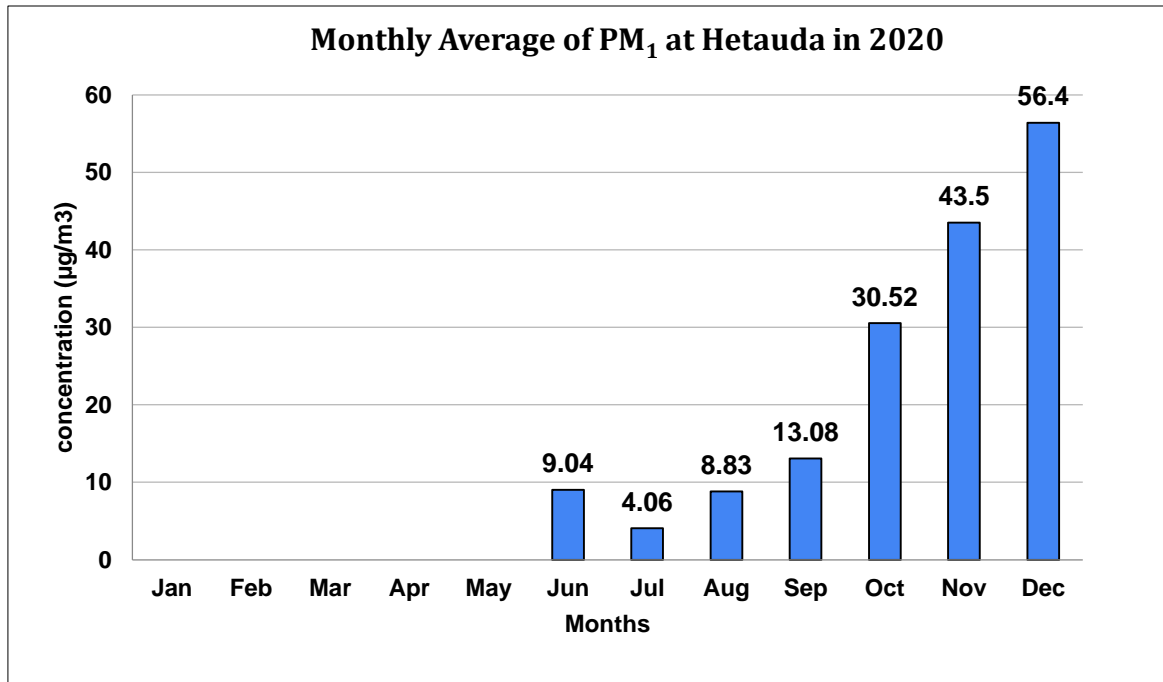


Figure 4: Monthly Average of PM<sub>1</sub>

### Monthly Variation of PM<sub>1</sub>

Variation in concentration of PM<sub>1</sub> was found to be high during December and low during June.

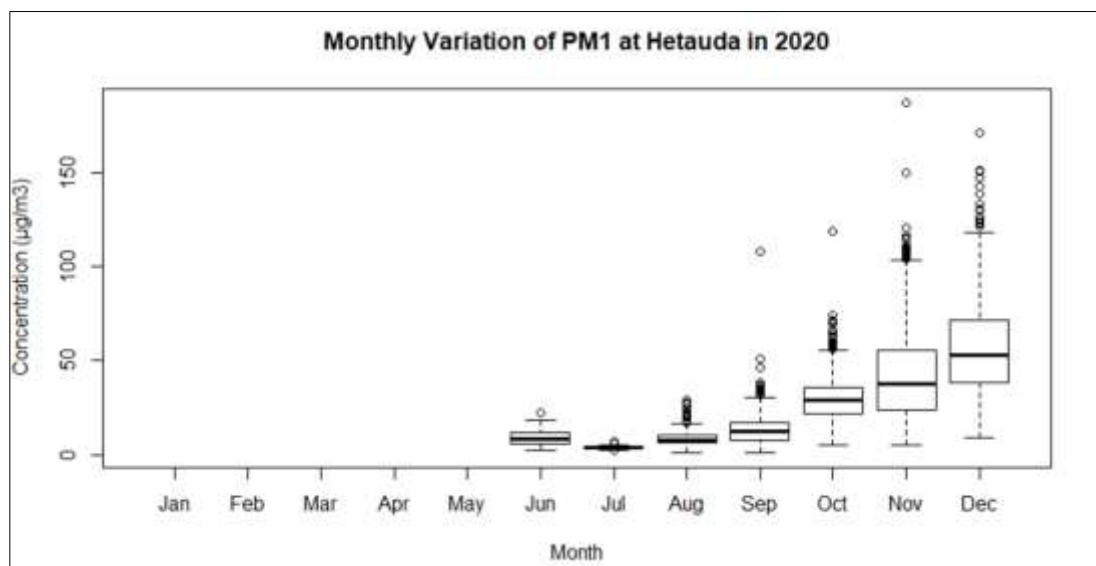


Figure 5: Monthly Variation of PM<sub>1</sub>

### Seasonal variation of PM<sub>1</sub>

Ambient concentration of average PM<sub>1</sub> during monsoon (June-September), and post-monsoon (October-November) can be shown in the figure below. The concentration of PM<sub>1</sub> was found higher during post monsoon (37.01  $\mu\text{g}/\text{m}^3$ ) than monsoon season (8.75  $\mu\text{g}/\text{m}^3$ ).

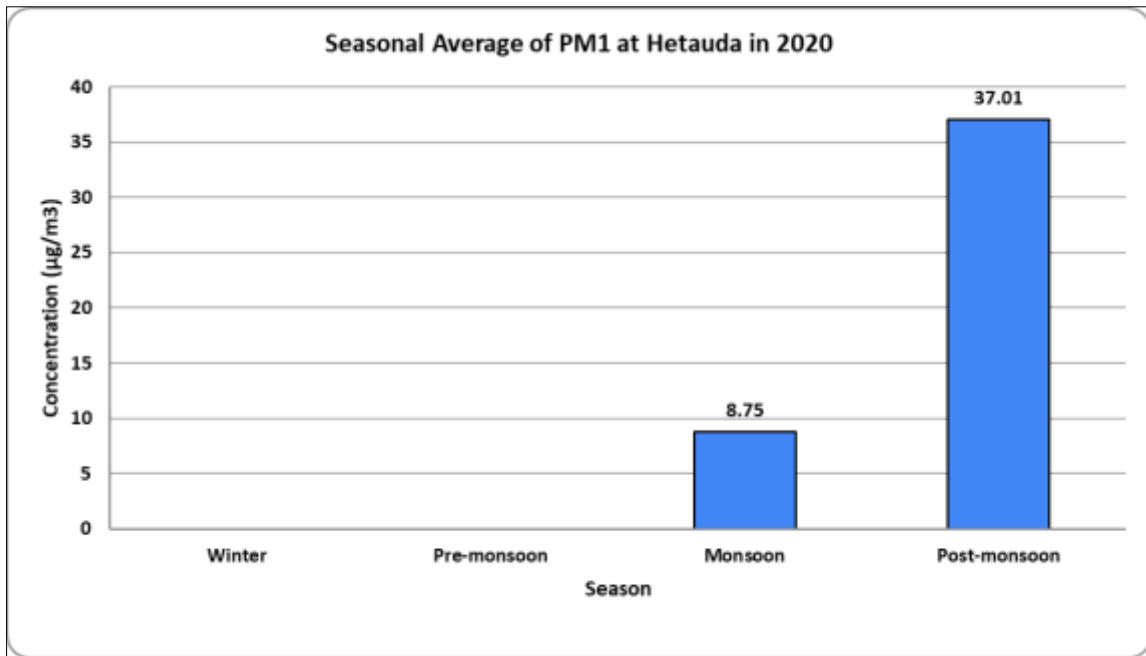


Figure 6: Seasonal variation of PM<sub>1</sub>

### Diurnal variation of average PM<sub>1</sub> concentration

The diurnal variation of average PM<sub>1</sub> concentrations can be shown in the figure below. The variation in PM<sub>1</sub> concentration was high during evening time and low during mid-afternoon.

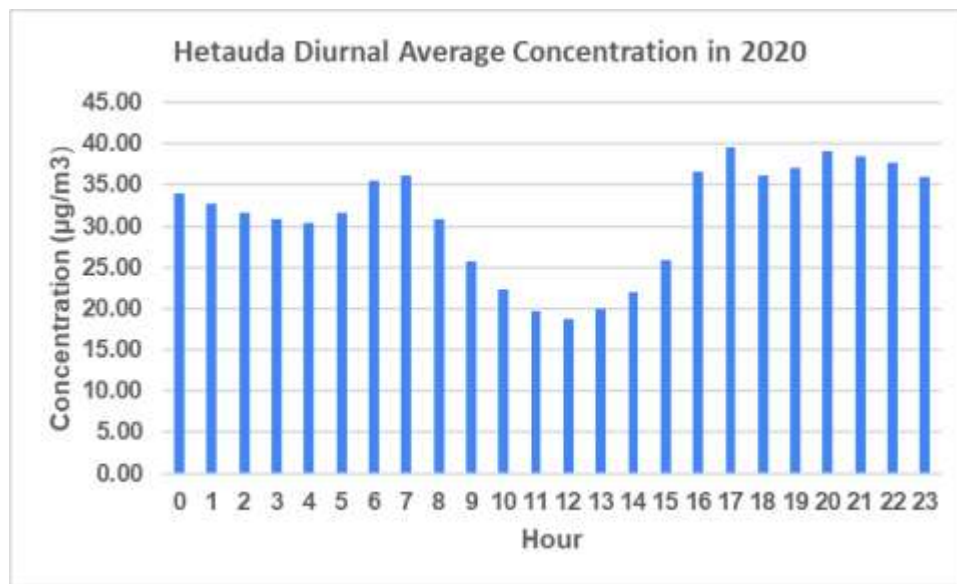


Figure 7: Diurnal variation of PM<sub>1</sub>



### 2.1.3 Temporal Variation of PM<sub>2.5</sub>

#### Annual average of PM<sub>2.5</sub>

The annual average of PM<sub>2.5</sub> at Hetauda station was found to be 37.25 µg/m<sup>3</sup>. Histogram of hourly average PM<sub>2.5</sub> is shown in the figure below.

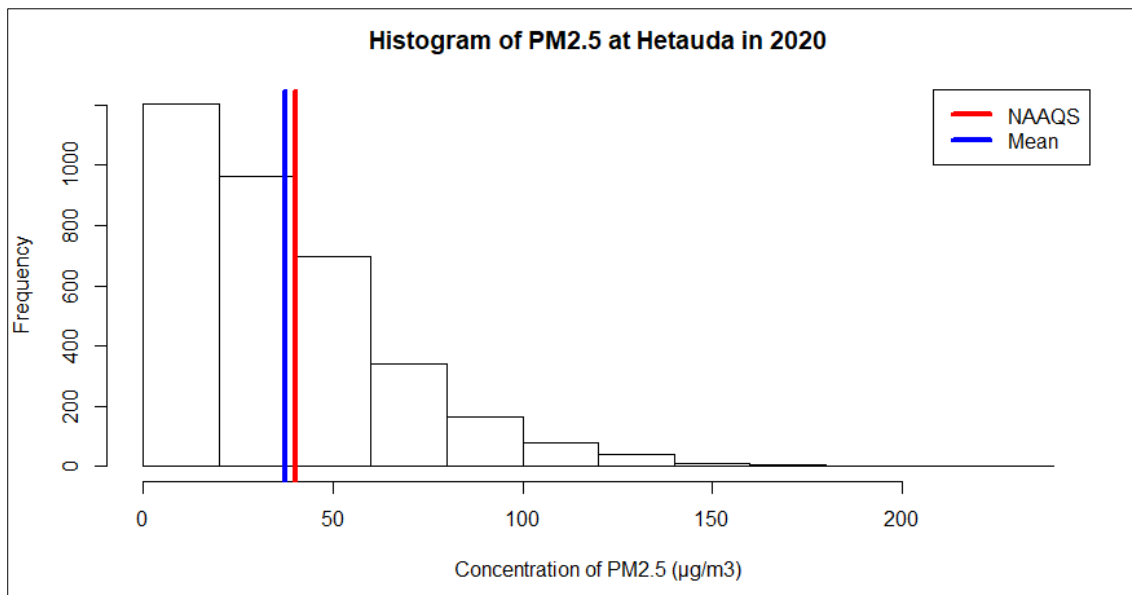


Figure 8: Histogram of PM<sub>2.5</sub>

#### Daily average of PM<sub>2.5</sub>:

Daily average concentration of PM<sub>2.5</sub> was found to be high during December and low during July.

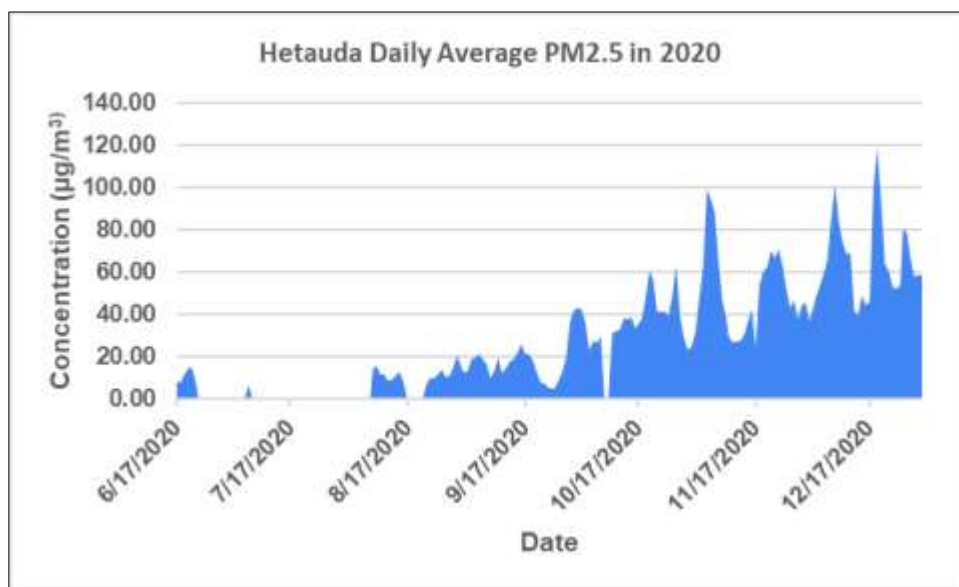


Figure 9: Daily average of PM<sub>2.5</sub>

### Monthly average of PM<sub>2.5</sub>

The highest and the lowest concentration of PM<sub>2.5</sub> was found during December and July respectively. The mean value for those months were found to be 64.59 and 6.56 µg/m<sup>3</sup> respectively.

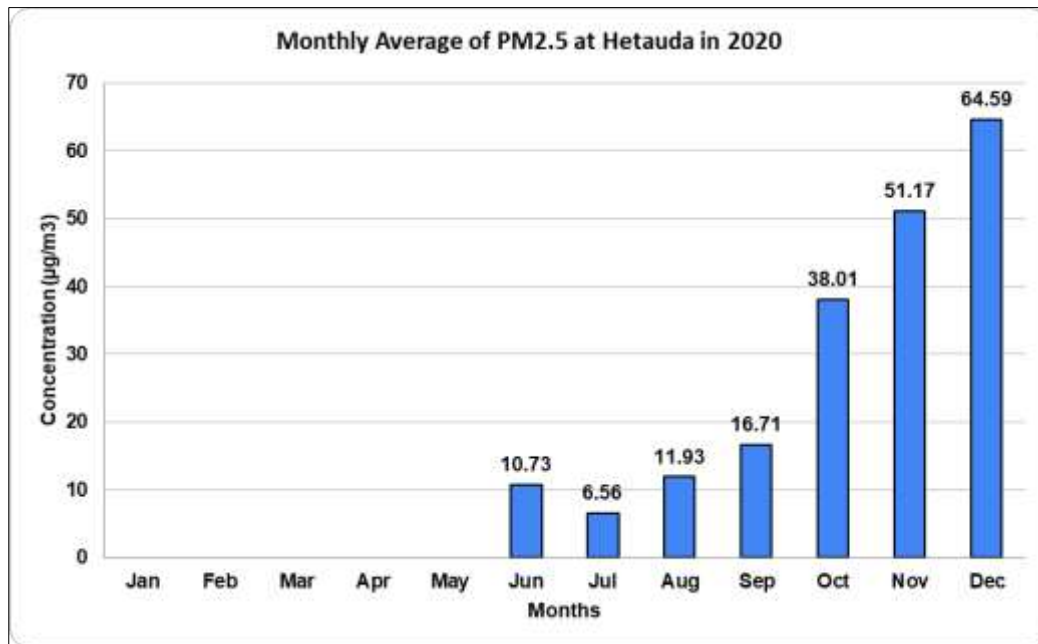


Figure 10: Monthly Average of PM<sub>2.5</sub>

### Monthly Variation of PM<sub>2.5</sub>

Variation in concentration of PM<sub>2.5</sub> was found more during December and less during July.

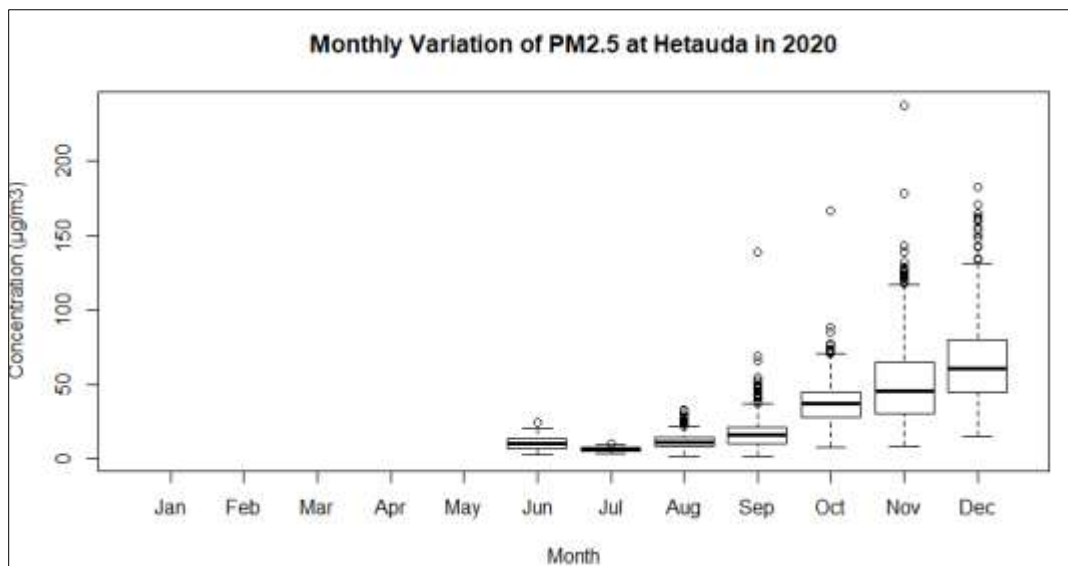


Figure 11: Monthly Variation of PM<sub>2.5</sub>

### Seasonal variation of average PM<sub>2.5</sub> concentration

Ambient concentration of average PM<sub>2.5</sub> during monsoon (June-September) and post-monsoon (October-November) can be shown in the figure below. The concentration of PM<sub>2.5</sub> was found higher during post monsoon (44.59 µg/m<sup>3</sup>) than monsoon season (11.48 µg/m<sup>3</sup>)**Error! Reference source not found..**

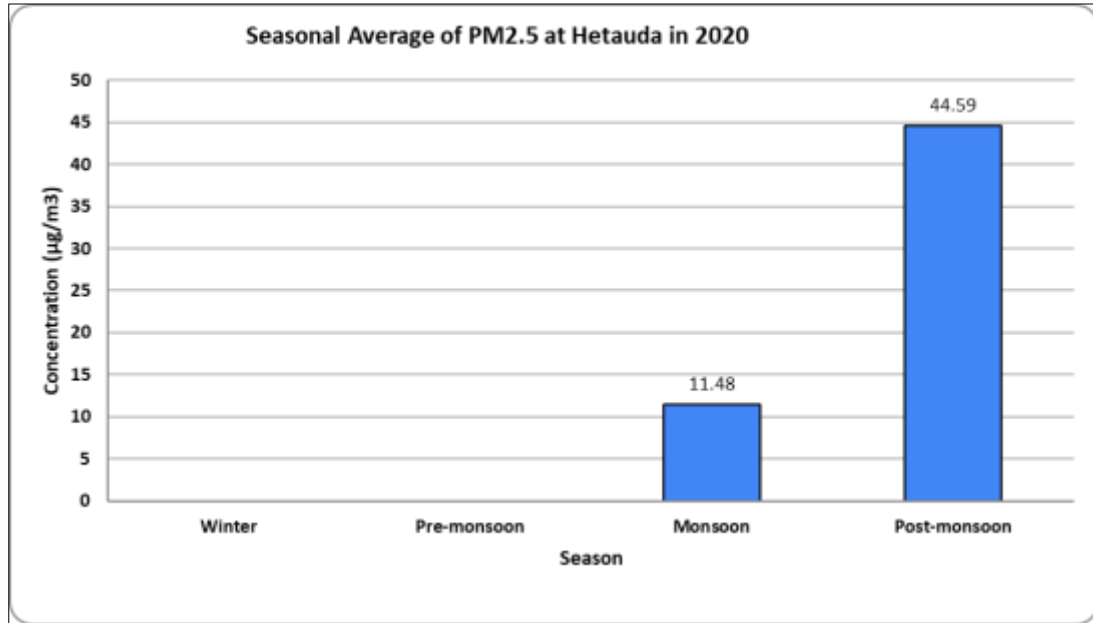


Figure 12: Seasonal variation of PM<sub>2.5</sub>

### Diurnal variation of average PM<sub>2.5</sub> concentration

The diurnal variation of average PM<sub>2.5</sub> concentrations can be shown in the figure below. The variation in PM<sub>2.5</sub> concentrations was high at around 4-10 pm and low at 11 am-3 pm.

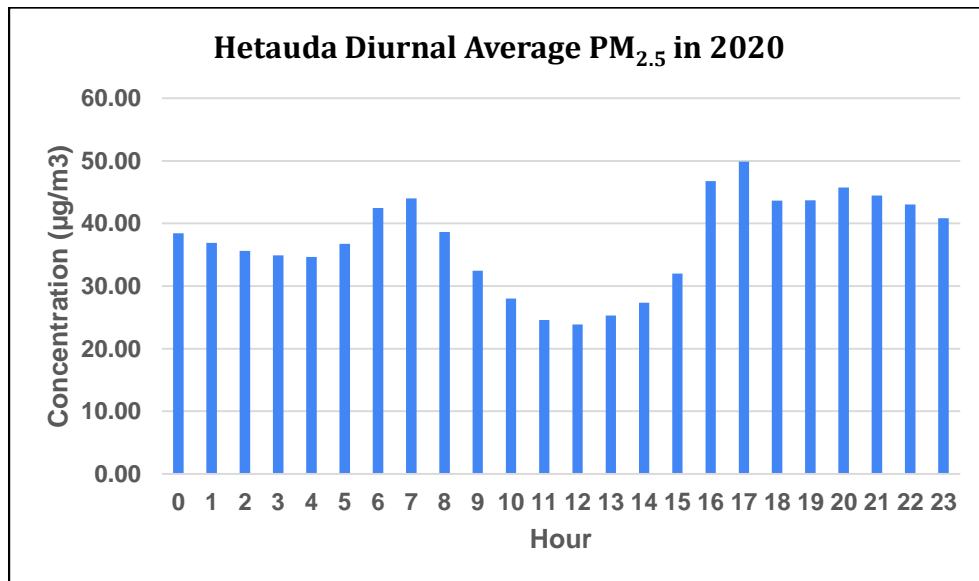


Figure 13: Diurnal variation of PM<sub>2.5</sub>

## Compliance status of PM<sub>2.5</sub>

The total days of PM<sub>2.5</sub> monitored in the year 2020 counts 146, of which 60 days exceeded the NAAQS guideline as shown in figure below.

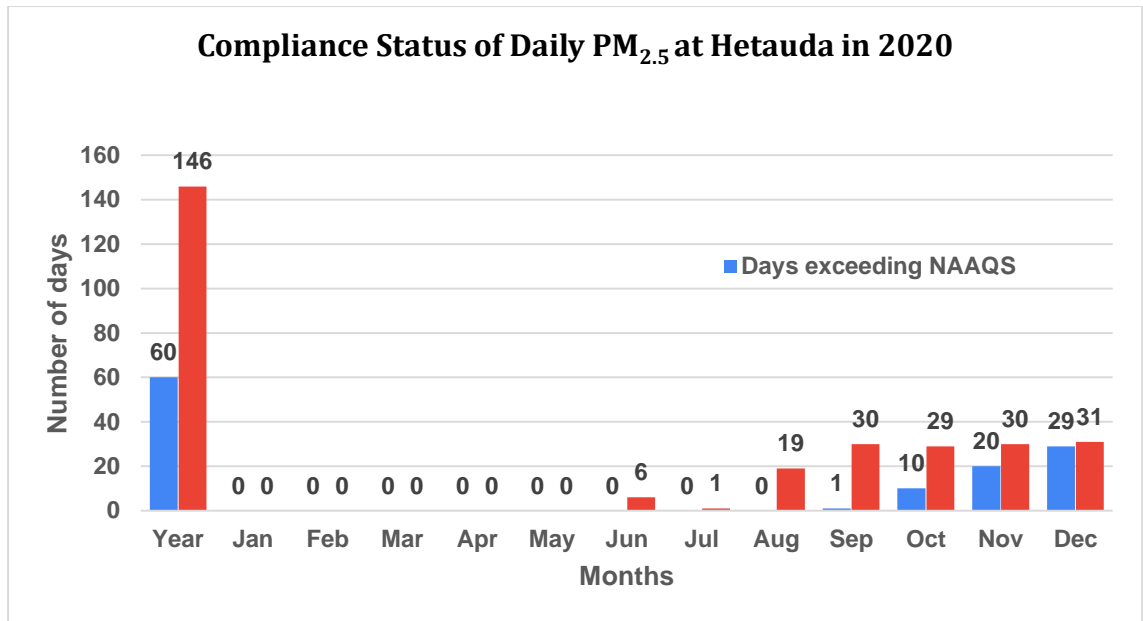


Figure 14: Compliance status of PM<sub>2.5</sub>

### 2.1.4 Temporal variation of PM<sub>10</sub>

#### Annual average of PM<sub>10</sub>

The annual average of PM<sub>10</sub> at Hetauda station was found to be 59.39 µg/m<sup>3</sup>. Histogram of hourly average PM<sub>10</sub> is shown in the figure below.

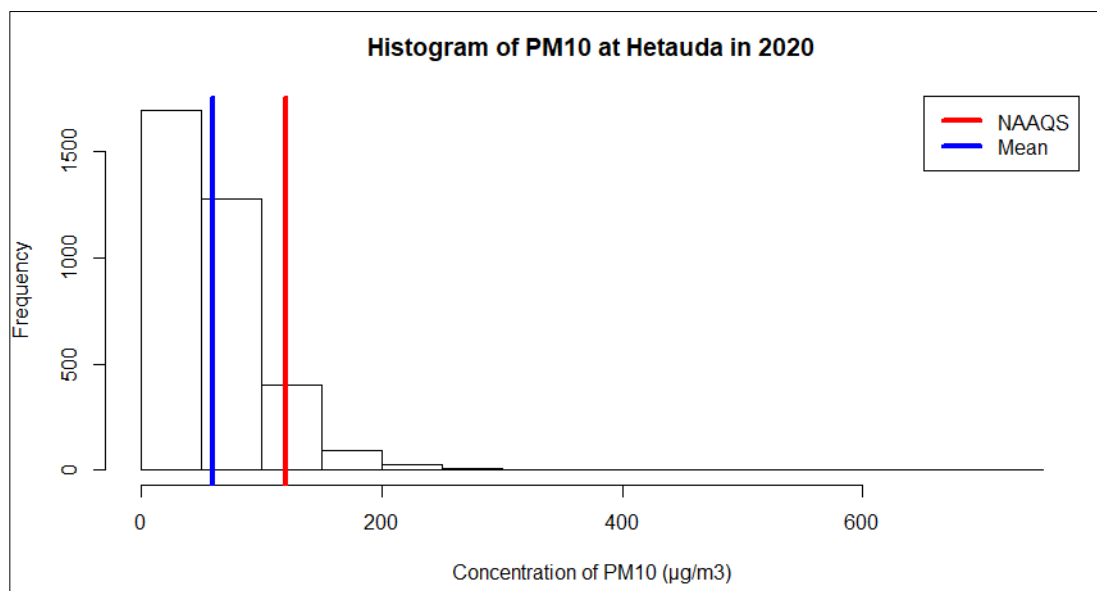


Figure 15 : Histogram for the ambient concentration of PM<sub>10</sub>

### Daily average of PM<sub>10</sub>

Daily average concentration of PM<sub>10</sub> was high during December and was found low during August.

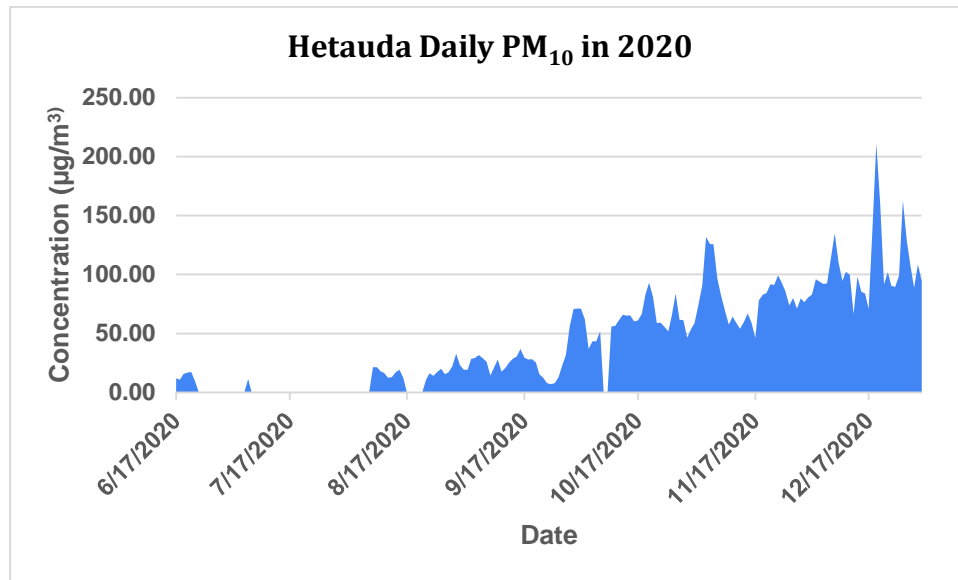


Figure 16: Daily average of PM<sub>10</sub>

### Monthly average of PM<sub>10</sub>

The highest and the lowest concentration of PM<sub>10</sub> was found during December and July respectively. The mean value for those months were found to be 105.57 and 11.25 µg/m<sup>3</sup> respectively.

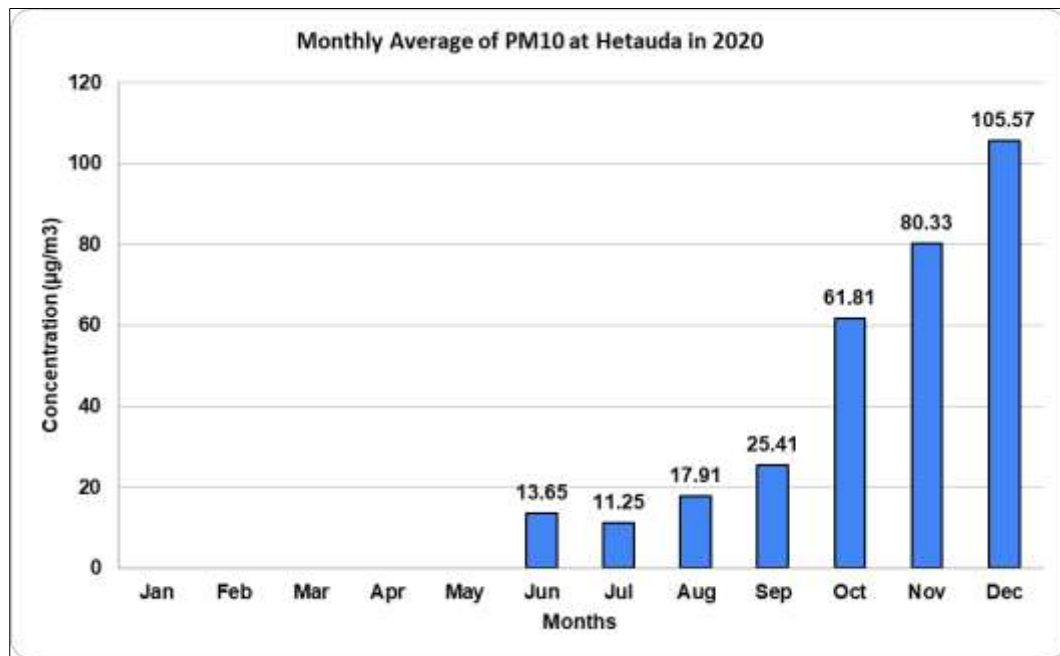


Figure 17: Monthly average of PM<sub>10</sub>

## Monthly Variation of PM<sub>10</sub>

Variation in concentration of PM<sub>10</sub> was found more during November and less during July.

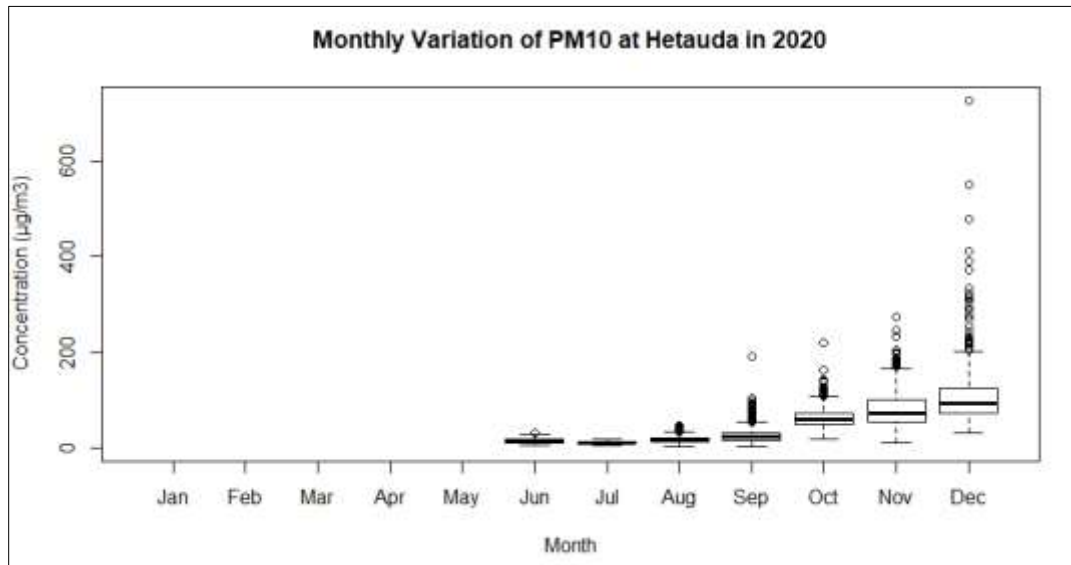


Figure 18: Monthly Variation of PM<sub>10</sub>

## Seasonal variation of average PM<sub>10</sub> concentration:

Ambient concentration of average PM<sub>10</sub> during monsoon (June-September) and post-monsoon (October-November) can be shown in the figure below. The concentration of PM<sub>10</sub> was found higher during post monsoon (92.95 µg/m<sup>3</sup>) than monsoon season (17.06 µg/m<sup>3</sup>).

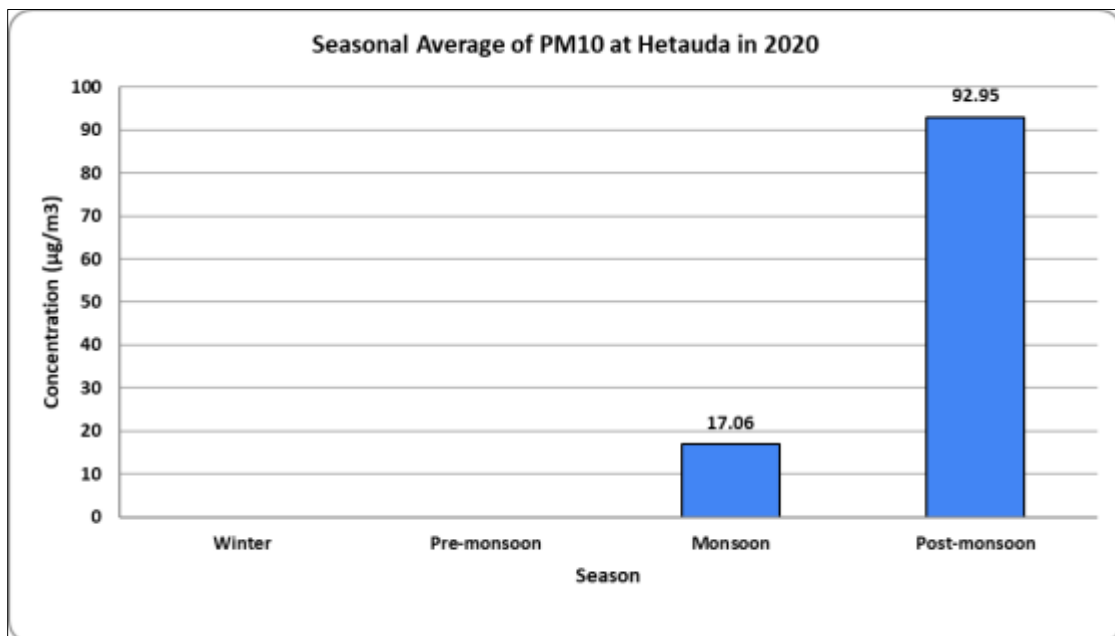


Figure 19: Seasonal variation of PM<sub>10</sub>

### Diurnal variation of average PM<sub>10</sub> concentration

The diurnal variation of average PM<sub>10</sub> concentrations can be shown in the figure below. The variation in PM<sub>10</sub> concentrations was high at around 4-5 pm and low at 2-4 am.

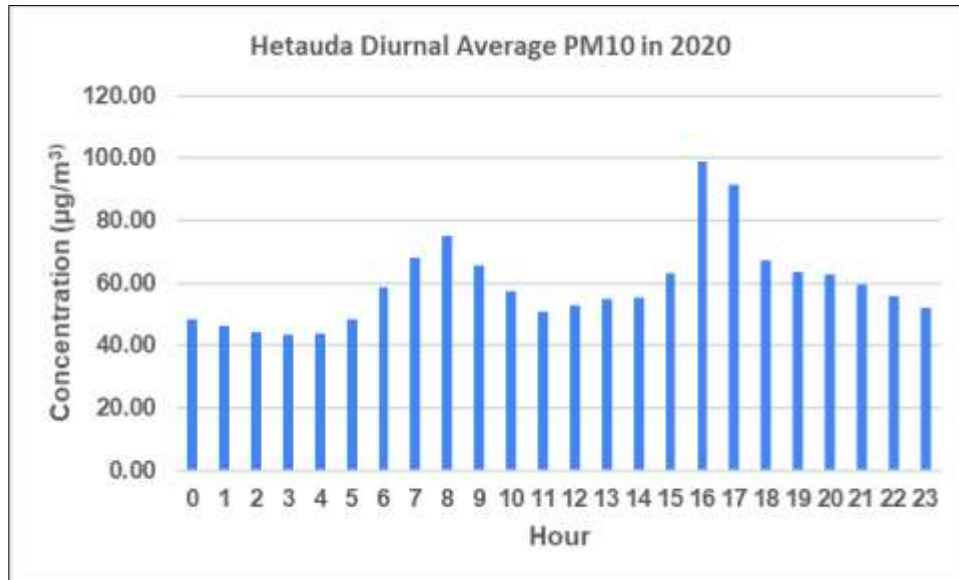


Figure 20: Diurnal variation of PM<sub>10</sub> concentration

### Compliance status of PM<sub>10</sub>

The total days of PM<sub>10</sub> monitored in the year 2020 counts 146 of which 9 of the days exceed the NAAQS guideline as shown in figure below.

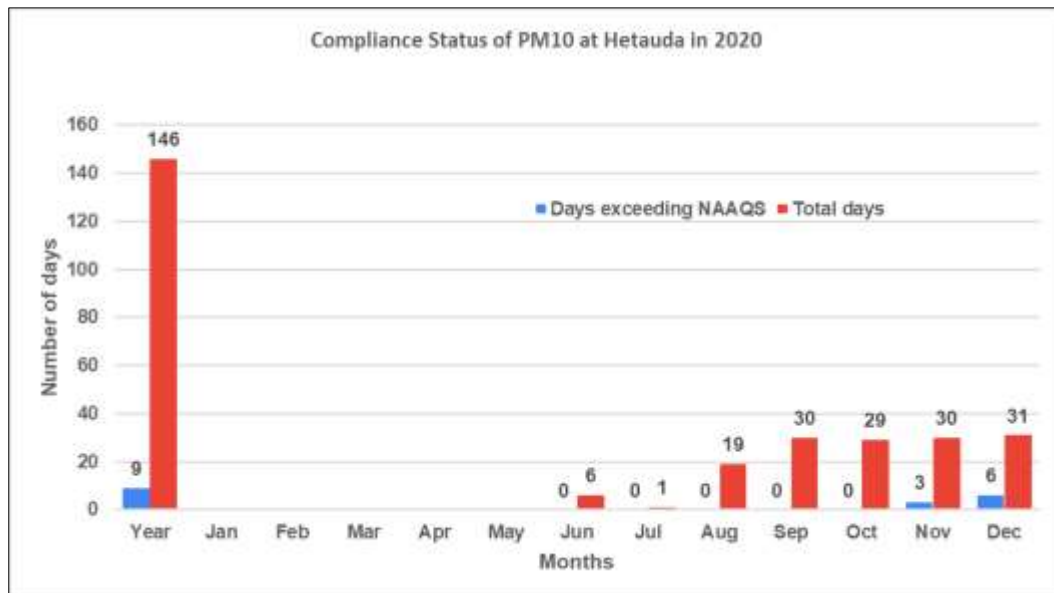


Figure 21: Compliance status of PM<sub>10</sub>

## 2.1.5 Temporal variation of TSP

### Annual average of TSP

The annual average of TSP at Hetauda station was found to be  $114.11 \mu\text{g}/\text{m}^3$ . Histogram of hourly average TSP is shown in the figure below.

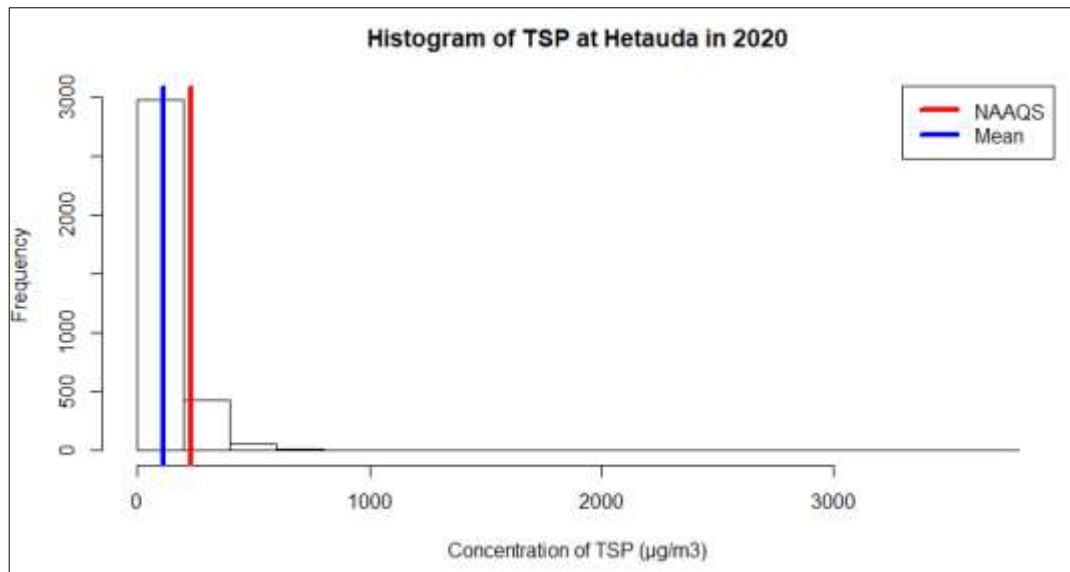


Figure 22 : Histogram for the ambient concentration of TSP

### Daily average of TSP:

Daily average concentration of TSP was high during December and was found low during September.

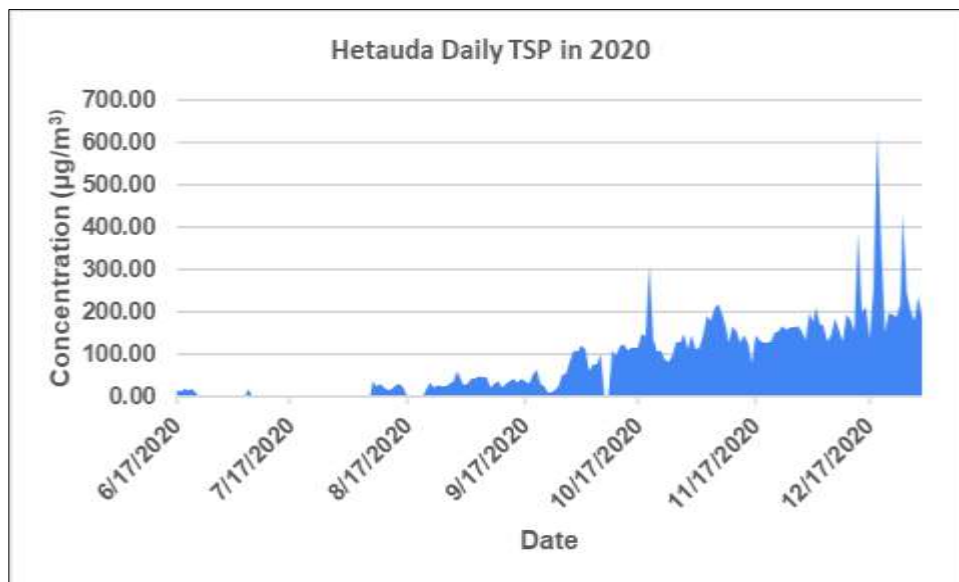


Figure 23: Daily average of TSP



## Monthly average of TSP

The highest and the lowest concentration of TSP was found during December and June respectively. The mean value for those months were found to be 219.91 and 15.21  $\mu\text{g}/\text{m}^3$  respectively.

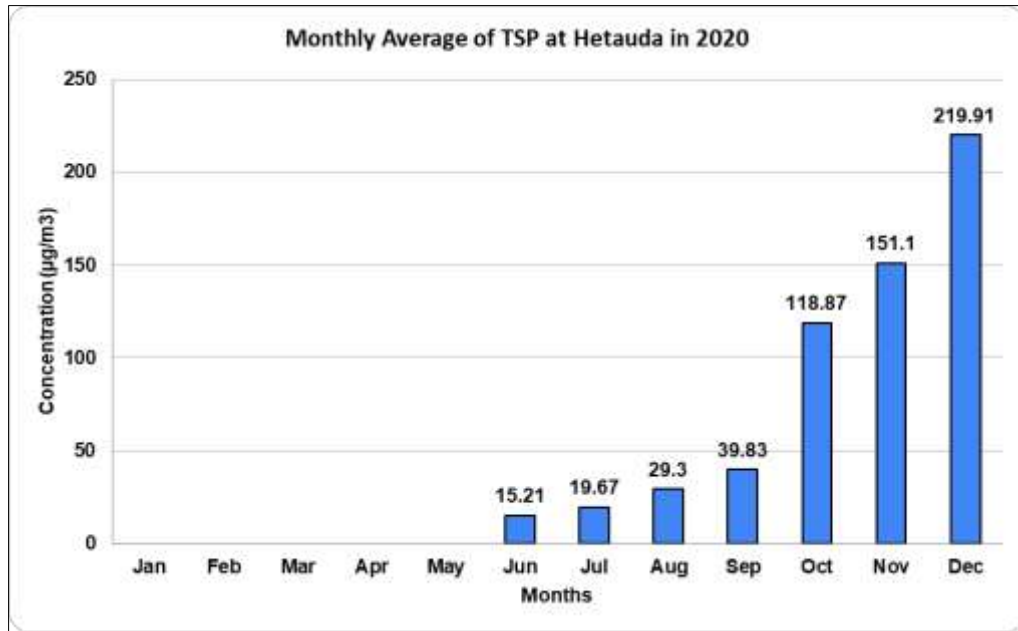


Figure 24: Monthly Average of TSP

## Monthly Variation of TSP

Variation in concentration of TSP was found almost same throughout the year.

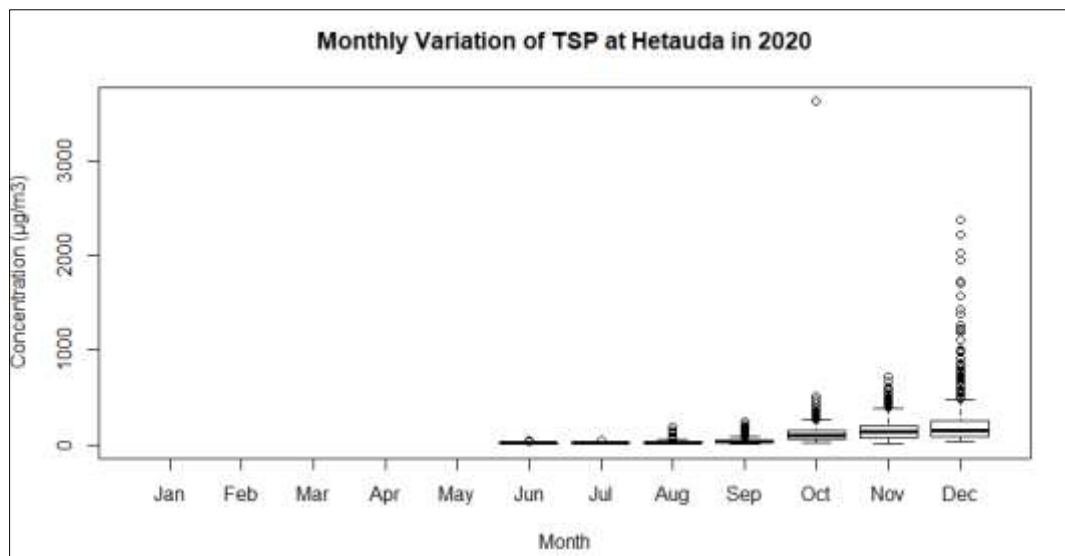


Figure 25: Monthly Variation of TSP

### Seasonal variation of average TSP concentration

Ambient concentration of average TSP during monsoon (June-September) and post-monsoon (October-November) can be shown in the figure below. The concentration of TSP was found higher during post monsoon ( $134.98\mu\text{g}/\text{m}^3$ ) than monsoon season ( $26\mu\text{g}/\text{m}^3$ ).

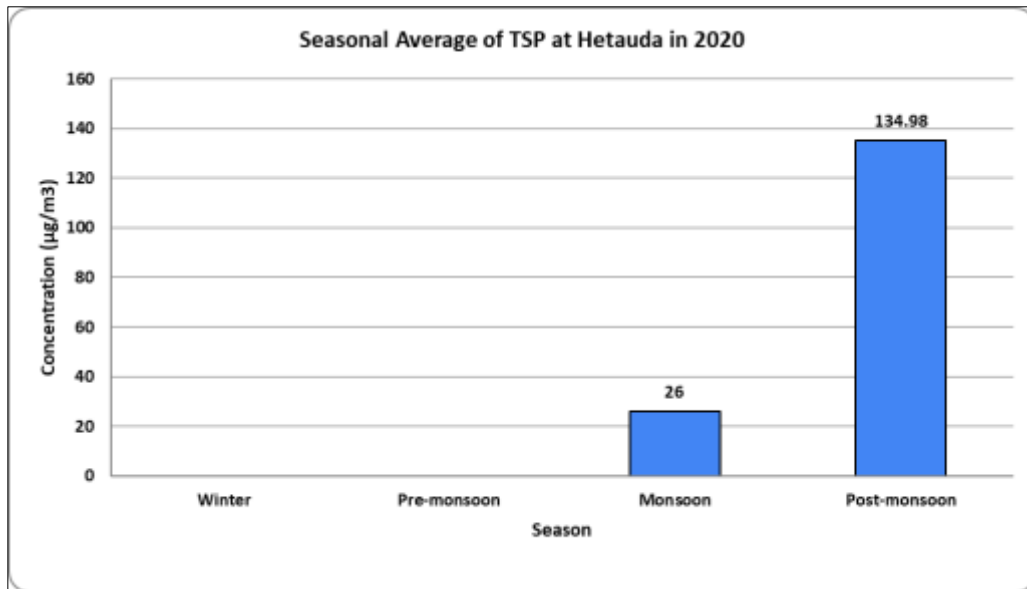


Figure 26: Seasonal variation of TSP

### Diurnal variation of average TSP concentration

The diurnal variation of average TSP concentrations can be shown in the figure below. The variation in TSP concentrations was high at around 1 pm and low during 1-4 am.

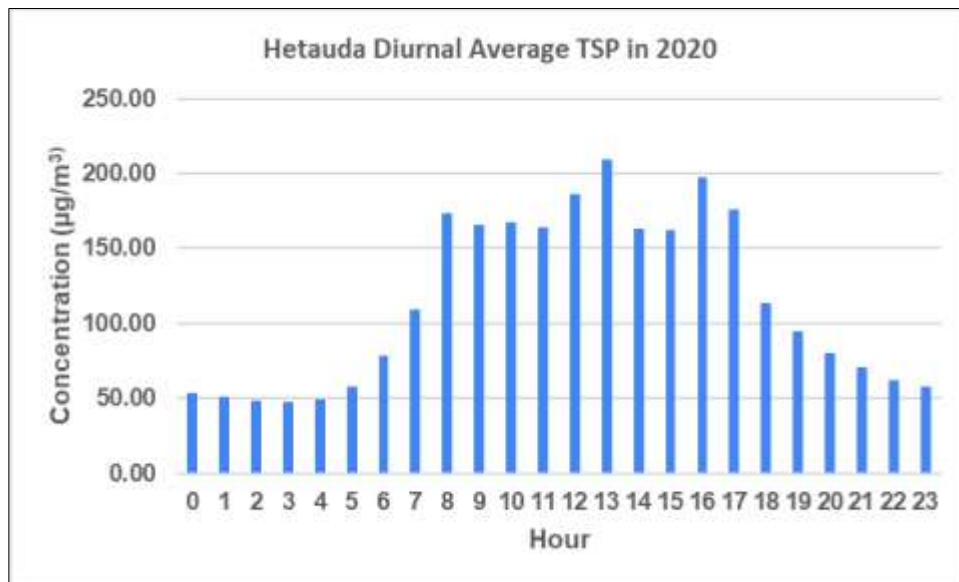


Figure 27: Diurnal Variation of TSP

## Compliance status of TSP

The total days of TSP monitored in the year 2020 counts 146; of which 8 of the days exceed the NAAQS guideline as shown in figure below.

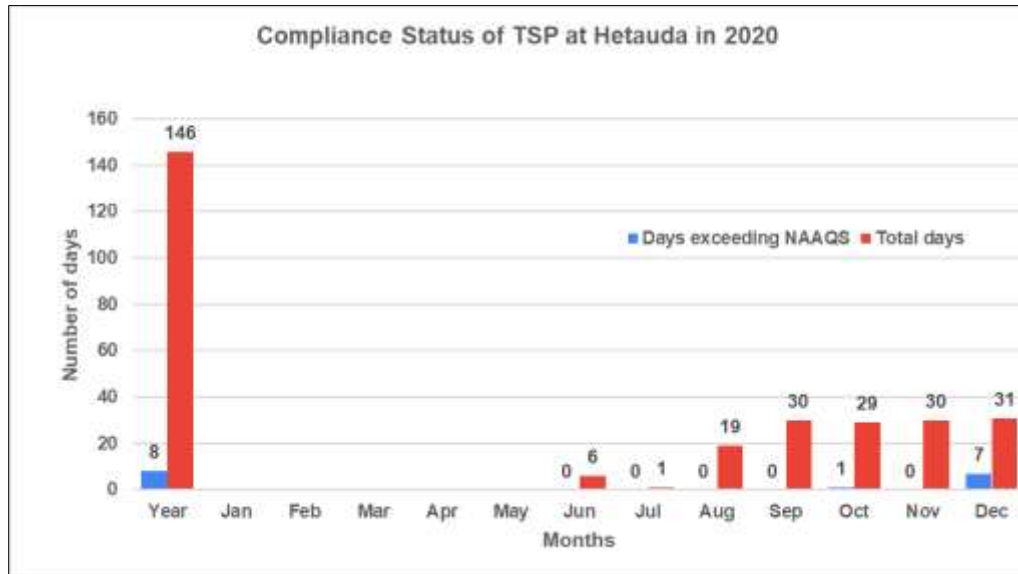


Figure 28: Compliance status of TSP

## Annex

### Daily PM<sub>1</sub>, PM<sub>2.5</sub>, PM<sub>10</sub> and TSP (µg/m<sup>3</sup>)

Date	PM <sub>1</sub> (µg/m <sup>3</sup> )	PM <sub>2.5</sub> (µg/m <sup>3</sup> )	PM <sub>10</sub> (µg/m <sup>3</sup> )	TSP (µg/m <sup>3</sup> )
1/1/2020				
1/2/2020				
1/3/2020				
1/4/2020				
1/5/2020				
1/6/2020				
1/7/2020				
1/8/2020				
1/9/2020				
1/10/2020				
1/11/2020				
1/12/2020				
1/13/2020				
1/14/2020				
1/15/2020				
1/16/2020				
1/17/2020				
1/18/2020				
1/19/2020				
1/20/2020				
1/21/2020				
1/22/2020				
1/23/2020				
1/24/2020				
1/25/2020				
1/26/2020				
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1/31/2020				
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3/29/2020				
3/30/2020				
3/31/2020				
4/1/2020				
4/2/2020				
4/3/2020				
4/4/2020				
4/5/2020				
4/6/2020				
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4/27/2020				
4/28/2020				
4/29/2020				
4/30/2020				
5/1/2020				
5/2/2020				
5/3/2020				
5/4/2020				
5/5/2020				
5/6/2020				
5/7/2020				
5/8/2020				
5/9/2020				
5/10/2020				
5/11/2020				
5/12/2020				
5/13/2020				
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5/31/2020				
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6/5/2020				
6/6/2020				
6/7/2020				
6/8/2020				
6/9/2020				
6/10/2020				
6/11/2020				
6/12/2020				
6/13/2020				
6/14/2020				
6/15/2020				
6/16/2020				
6/17/2020	6.27	8.23	12.04	15.15
6/18/2020	6.00	7.92	10.76	13.56
6/19/2020	9.48	11.61	15.66	18.07
6/20/2020	13.16	14.56	16.71	16.97
6/21/2020	12.78	14.51	17.35	17.65
6/22/2020	6.52	7.57	9.42	9.84
6/23/2020				
6/24/2020				
6/25/2020				
6/26/2020				
6/27/2020				
6/28/2020				
6/29/2020				
6/30/2020				
7/1/2020				
7/2/2020				
7/3/2020				



7/4/2020				
7/5/2020				
7/6/2020	4.06	6.56	11.25	19.67
7/7/2020				
7/8/2020				
7/9/2020				
7/10/2020				
7/11/2020				
7/12/2020				
7/13/2020				
7/14/2020				
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7/26/2020				
7/27/2020				
7/28/2020				
7/29/2020				
7/30/2020				
7/31/2020				
8/1/2020				
8/2/2020				
8/3/2020				
8/4/2020				
8/5/2020				
8/6/2020				
8/7/2020				
8/8/2020	10.98	14.16	21.33	36.20
8/9/2020	13.10	15.90	21.46	26.08
8/10/2020	7.64	11.40	17.81	30.50

8/11/2020	8.59	11.55	16.62	22.65
8/12/2020	5.78	8.71	12.37	16.70
8/13/2020	6.90	9.03	12.91	19.15
8/14/2020	7.53	11.20	17.20	28.75
8/15/2020	9.00	12.65	19.28	30.45
8/16/2020	4.99	7.76	12.19	22.07
8/17/2020				
8/18/2020				
8/19/2020				
8/20/2020				
8/21/2020				
8/22/2020	4.89	7.22	10.85	18.96
8/23/2020	6.72	9.60	16.13	33.79
8/24/2020	7.06	9.54	13.96	22.68
8/25/2020	8.28	11.52	17.35	27.02
8/26/2020	10.77	14.12	20.17	26.45
8/27/2020	7.40	10.21	15.32	24.15
8/28/2020	7.58	11.05	17.04	32.55
8/29/2020	11.56	15.10	22.31	36.26
8/30/2020	16.65	20.70	32.93	62.45
8/31/2020	12.42	15.31	23.02	39.84
9/1/2020	10.00	12.73	19.24	29.05
9/2/2020	10.21	13.08	19.37	29.62
9/3/2020	15.20	19.13	28.51	43.95
9/4/2020	15.71	19.38	29.24	43.85
9/5/2020	16.95	21.11	31.72	49.97
9/6/2020	15.02	18.84	28.90	45.47
9/7/2020	12.74	16.37	25.92	46.95
9/8/2020	7.89	10.06	14.26	22.35
9/9/2020	10.31	13.61	20.76	32.15
9/10/2020	15.82	19.62	27.80	35.66
9/11/2020	10.19	12.47	17.58	23.18
9/12/2020	12.71	14.97	20.96	31.26
9/13/2020	15.27	17.91	25.56	37.78
9/14/2020	15.64	19.10	28.72	42.66
9/15/2020	18.91	22.04	30.41	35.23
9/16/2020	22.00	26.33	36.81	43.89
9/17/2020	17.68	21.28	29.58	37.86

9/18/2020	17.79	21.27	28.01	32.01
9/19/2020	14.16	18.29	28.30	50.73
9/20/2020	8.36	12.64	25.51	65.58
9/21/2020	4.96	8.29	15.52	32.30
9/22/2020	4.28	7.42	12.50	23.75
9/23/2020	3.27	5.70	7.87	9.81
9/24/2020	3.17	5.07	7.01	8.64
9/25/2020	3.53	5.05	7.90	15.01
9/26/2020	6.34	8.46	12.99	24.36
9/27/2020	10.29	13.01	22.54	51.13
9/28/2020	15.54	19.62	31.80	55.84
9/29/2020	28.24	36.46	56.19	84.25
9/30/2020	30.35	41.93	70.80	110.61
10/1/2020	31.80	42.82	71.10	107.92
10/2/2020	31.05	42.20	70.96	122.49
10/3/2020	27.49	36.61	62.20	112.24
10/4/2020	18.69	23.24	36.80	60.52
10/5/2020	21.76	27.41	43.27	75.56
10/6/2020	21.15	26.99	43.45	75.83
10/7/2020	23.03	29.86	51.73	99.48
10/8/2020				
10/9/2020				
10/10/2020	23.34	30.97	55.97	108.55
10/11/2020	24.44	32.04	56.34	97.92
10/12/2020	24.99	32.90	61.25	119.84
10/13/2020	30.30	38.41	66.04	123.83
10/14/2020	30.15	37.78	65.14	109.68
10/15/2020	31.21	38.90	65.36	116.07
10/16/2020	26.25	33.56	60.34	116.54
10/17/2020	27.29	35.06	61.02	116.99
10/18/2020	28.75	37.60	66.41	148.43
10/19/2020	36.71	47.54	83.63	143.03
10/20/2020	49.58	60.44	93.18	311.63
10/21/2020	47.30	56.34	81.04	135.68
10/22/2020	35.00	41.24	58.74	105.35
10/23/2020	35.52	41.44	59.24	108.66
10/24/2020	36.04	41.49	55.62	87.36
10/25/2020	34.75	39.51	51.93	81.23

10/26/2020	43.85	49.34	65.28	98.67
10/27/2020	54.03	62.75	83.88	130.14
10/28/2020	32.73	38.78	61.49	126.27
10/29/2020	21.53	29.17	61.27	149.58
10/30/2020	17.84	23.29	46.27	112.67
10/31/2020	18.48	24.70	53.60	145.02
11/1/2020	24.41	31.55	58.87	111.21
11/2/2020	40.60	48.05	74.16	116.70
11/3/2020	55.12	62.44	90.72	146.86
11/4/2020	89.21	99.14	131.82	191.20
11/5/2020	84.85	94.30	125.77	178.27
11/6/2020	78.54	88.52	125.62	209.00
11/7/2020	57.01	64.59	96.80	219.39
11/8/2020	38.60	46.78	81.93	193.33
11/9/2020	30.87	37.98	69.42	159.98
11/10/2020	22.08	29.59	57.46	128.46
11/11/2020	17.98	26.71	64.23	167.40
11/12/2020	20.14	27.22	59.21	155.14
11/13/2020	21.11	27.64	53.86	127.29
11/14/2020	23.37	30.14	59.71	145.07
11/15/2020	29.14	36.46	67.05	128.45
11/16/2020	37.17	42.66	59.23	78.44
11/17/2020	20.58	24.64	46.20	145.86
11/18/2020	45.07	54.05	78.19	132.93
11/19/2020	51.96	60.03	82.81	126.39
11/20/2020	53.46	62.46	84.45	126.37
11/21/2020	61.76	70.00	91.57	131.34
11/22/2020	60.03	66.72	91.10	150.75
11/23/2020	64.00	71.11	99.24	156.08
11/24/2020	56.01	63.18	93.35	166.79
11/25/2020	44.59	52.42	85.74	158.14
11/26/2020	36.21	43.24	73.78	162.68
11/27/2020	38.21	46.53	80.07	164.29
11/28/2020	30.26	37.66	71.10	166.38
11/29/2020	34.79	44.06	79.76	153.61
11/30/2020	37.78	45.37	76.54	135.25
12/1/2020	28.80	37.04	80.62	198.25
12/2/2020	33.33	43.13	83.13	176.07

12/3/2020	38.05	47.80	96.17	211.22
12/4/2020	43.76	53.13	93.81	173.70
12/5/2020	50.90	58.98	92.03	167.55
12/6/2020	58.23	65.74	92.46	130.97
12/7/2020	77.05	84.68	113.72	146.70
12/8/2020	92.86	101.48	134.94	184.79
12/9/2020	77.84	83.72	110.22	158.62
12/10/2020	68.79	73.69	94.69	129.90
12/11/2020	61.55	68.60	102.37	194.37
12/12/2020	62.28	68.80	99.84	182.33
12/13/2020	37.52	42.16	66.37	155.75
12/14/2020	31.37	39.24	98.15	386.90
12/15/2020	41.85	49.03	85.54	199.78
12/16/2020	37.77	44.50	83.94	212.96
12/17/2020	40.88	45.90	70.88	135.75
12/18/2020	91.53	99.69	139.06	251.19
12/19/2020	104.76	118.74	211.11	624.03
12/20/2020	80.55	92.71	160.49	361.55
12/21/2020	57.58	63.89	91.62	150.62
12/22/2020	52.39	60.37	102.15	196.99
12/23/2020	45.55	52.95	90.29	193.83
12/24/2020	44.28	52.01	89.67	188.46
12/25/2020	45.57	54.17	98.98	219.13
12/26/2020	66.95	80.82	162.92	433.38
12/27/2020	68.02	78.46	129.16	245.08
12/28/2020	57.59	66.11	106.83	203.24
12/29/2020	51.14	57.89	88.77	178.55
12/30/2020	49.13	58.66	108.43	237.14
12/31/2020	50.41	58.24	94.34	188.45