



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

Air quality status of Nepal 2016-2020

Volume XXI

Biratnagar air quality monitoring station



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1. Biratnagar Air Quality Monitoring Station

- Address: Roadcess Chowk, Biratnagar, Morang inside Mahendra Morang Adarsha Bahumukhi Campus compound
- Location: 26.4450921 latitude, 87.2750912 longitude is possible with map
- Surrounding of the station
 - East: Playground of Campus
 - West: Campus Building
 - North: Campus Children Compound
 - South: Campus Building
- Establish year: 2020 (2076)
- 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 Biratnagar station (2020)

2.1. Air quality status, 2020

2.1.1. Annual average of PM₁, PM_{2.5}, PM₁₀ and TSP

The annual average of PM₁, PM_{2.5}, PM₁₀ and TSP for the Biratnagar station was calculated as shown in the figure below.

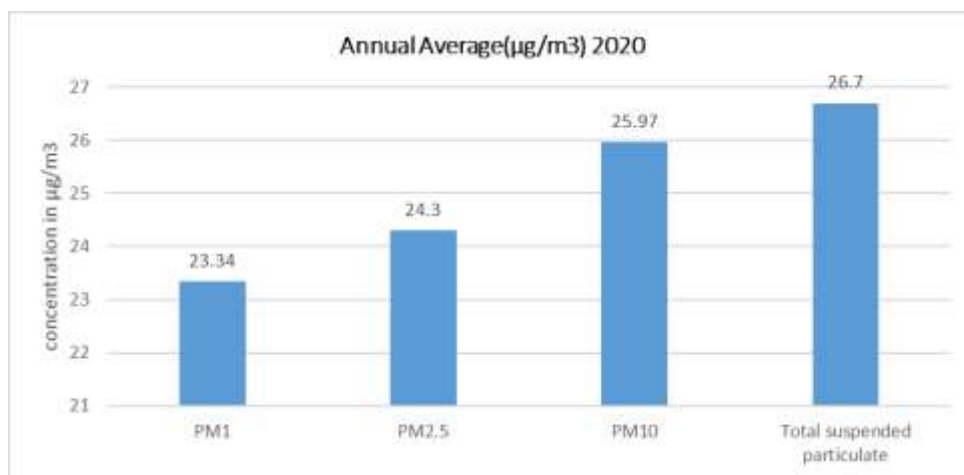


Figure 1: Annual average of PM₁, PM_{2.5}, PM₁₀ and TSP in 2020

2.1.2. Temporal variation of PM₁

Annual average of PM₁

The annual average of PM₁ at Biratnagar station was found to be 23.43 $\mu\text{g}/\text{m}^3$ in 2020. Histogram of hourly average PM₁ is shown in the figure below.

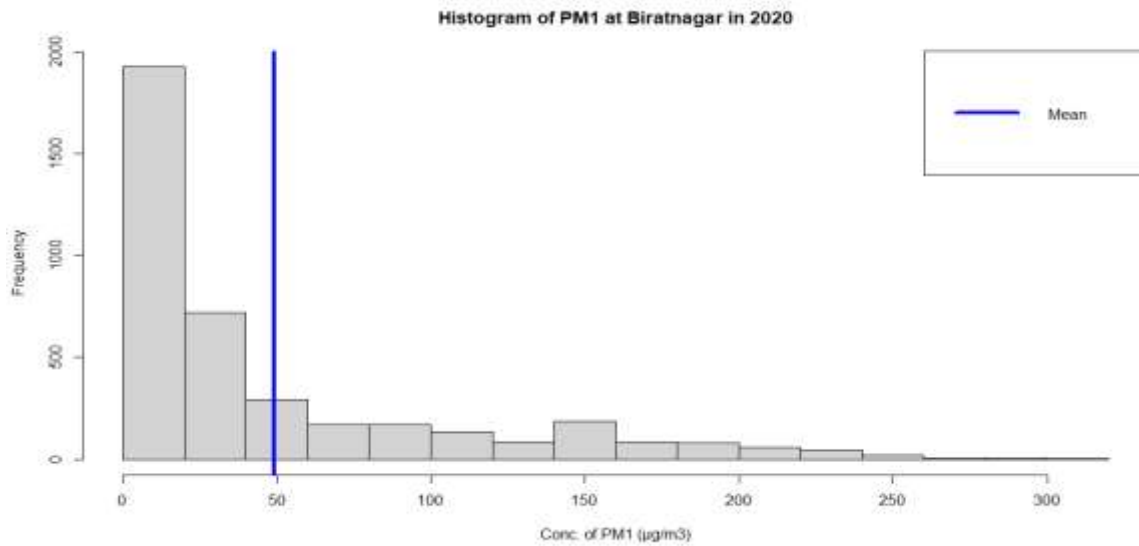


Figure 2 : Histogram for the ambient concentration of PM₁

Daily average of PM₁

Daily average concentration of PM₁ was found to be high during December and low during July.

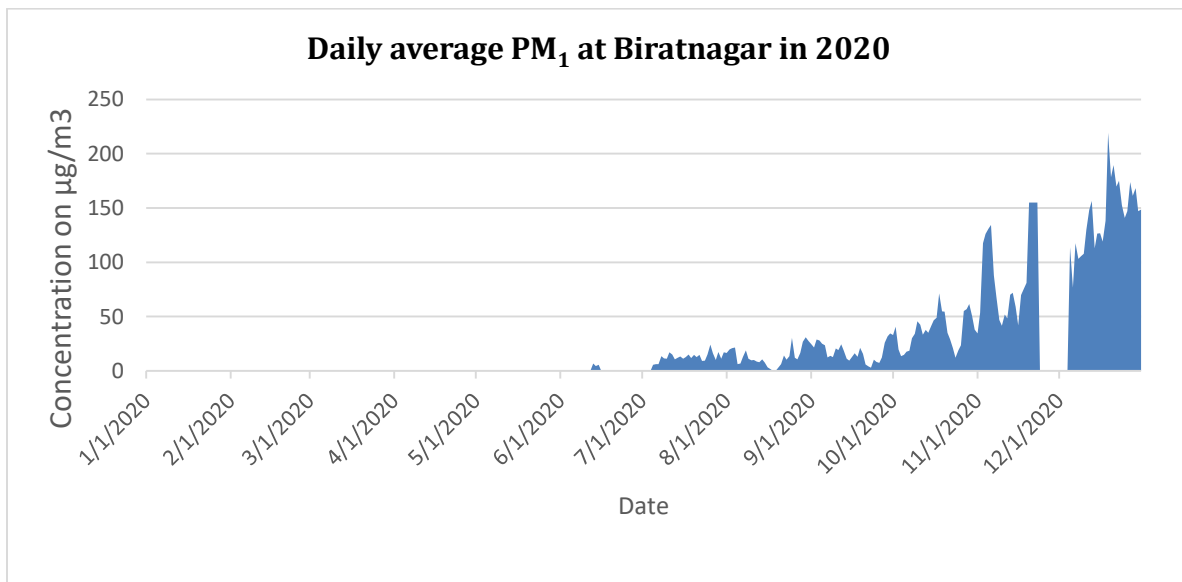


Figure 3: Daily average of PM₁

Monthly average of PM₁

The highest and the lowest concentration of PM₁ was found during December (142.72 $\mu\text{g}/\text{m}^3$) and June (5.48 $\mu\text{g}/\text{m}^3$) respectively.

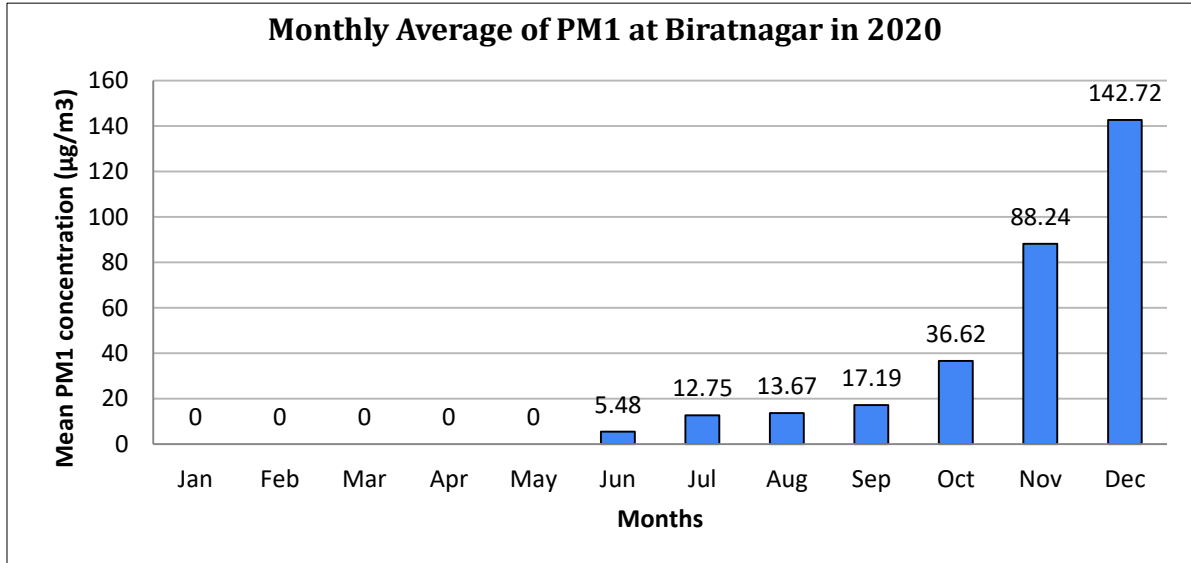


Figure 4: Monthly average of PM₁

Variation in concentration of PM₁ was found more during December whereas low during June.

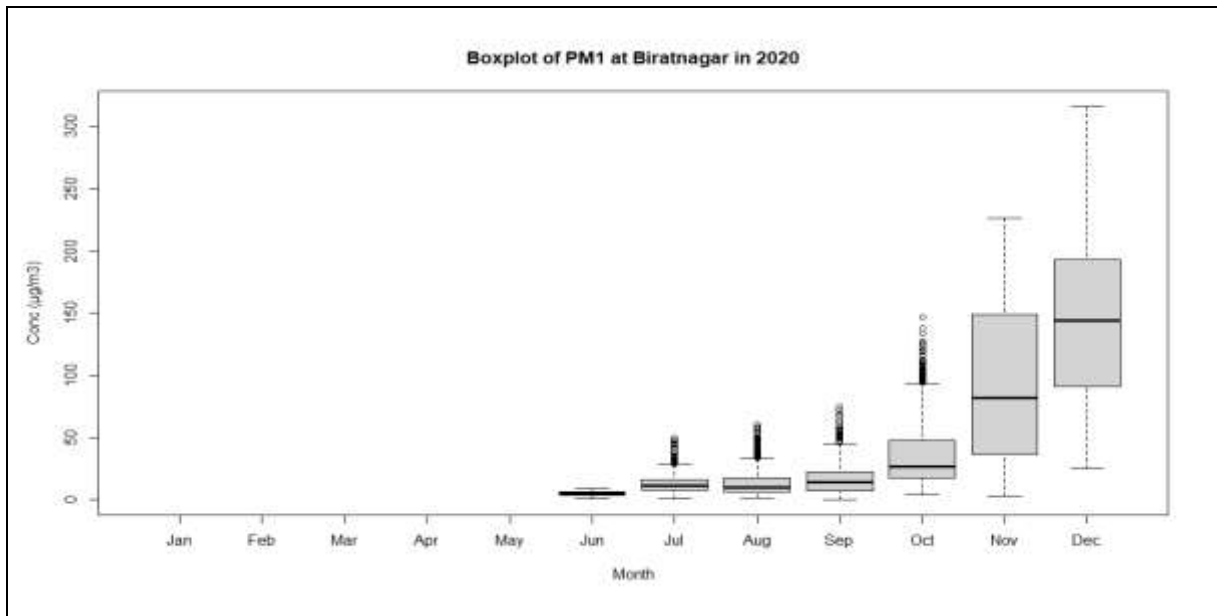


Figure 5: Monthly Variation of PM₁

Seasonal variation of PM₁

Ambient concentration of average PM₁ for monsoon (June-September) and post-monsoon (October-November) can be shown in the figure below. The concentration of PM₁ was found higher during post monsoon (47.35 $\mu\text{g}/\text{m}^3$) than during monsoon (10.63 $\mu\text{g}/\text{m}^3$).

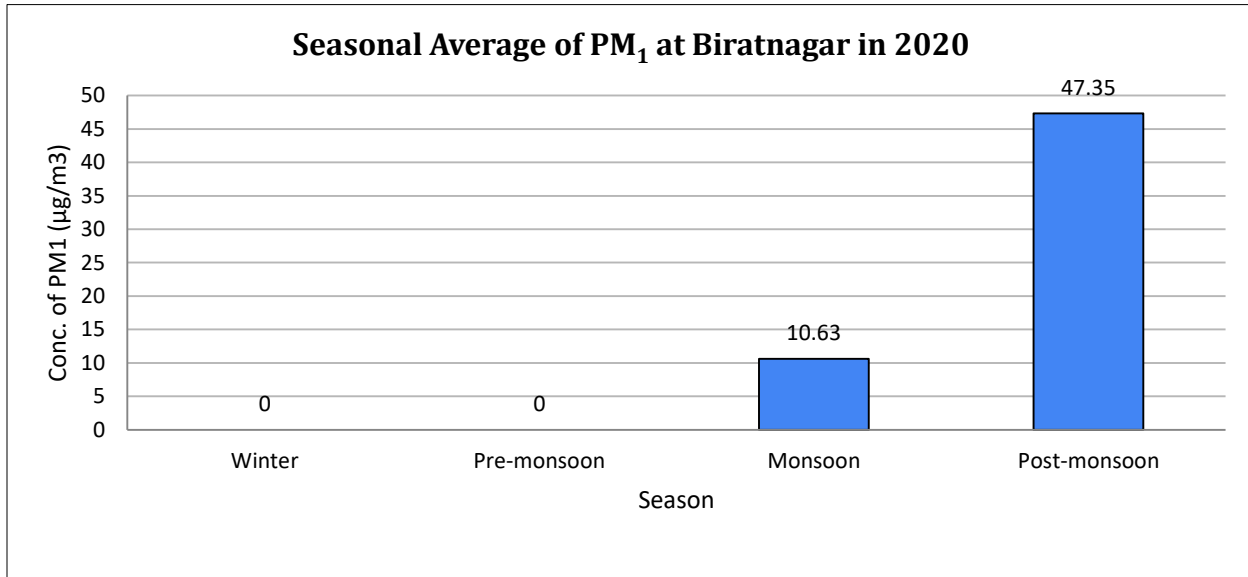


Figure 6: Seasonal variation of PM₁

Diurnal variation of average concentration of PM₁

The diurnal variation of average PM₁ concentration can be shown in the figure below. The variation in PM₁ concentration was almost same with slightly high variation at 5 pm and low at 12 to 2 pm.

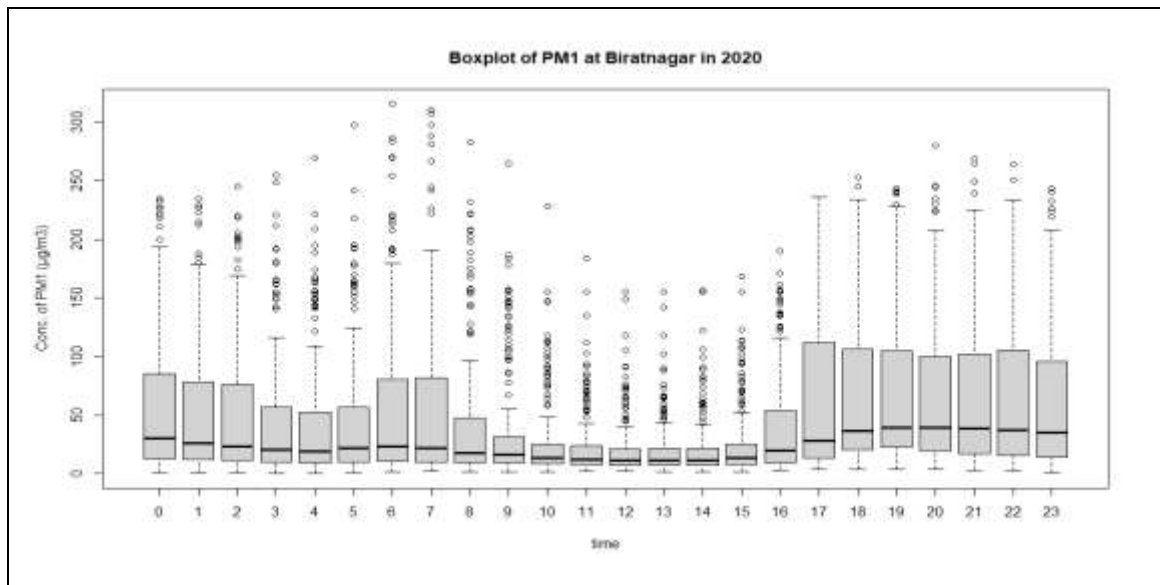


Figure 7: Diurnal variation of average PM₁ concentration

2.1.3. Temporal variation of PM_{2.5}

Annual Average of PM_{2.5}

The annual average of PM_{2.5} at Biratnagar station was found to be 24.3 µg/m³. Histogram of hourly average PM_{2.5} is shown in the figure below.

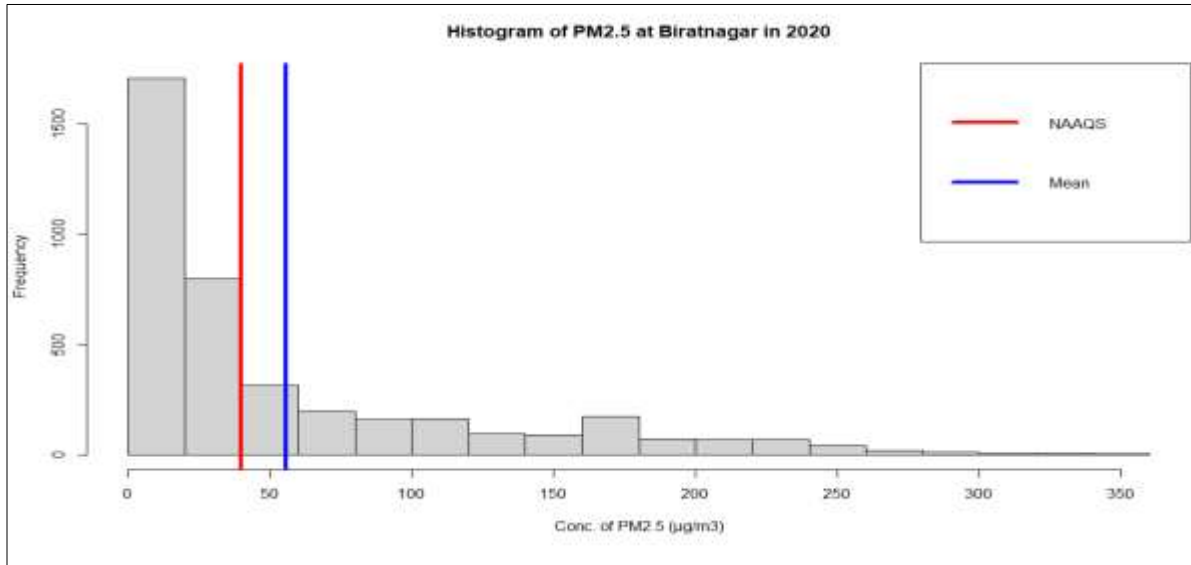


Figure 8 : Histogram for the ambient concentration of PM_{2.5}

Daily Average of PM_{2.5}

Daily average concentration of PM_{2.5} was found to be high during December and low during July.

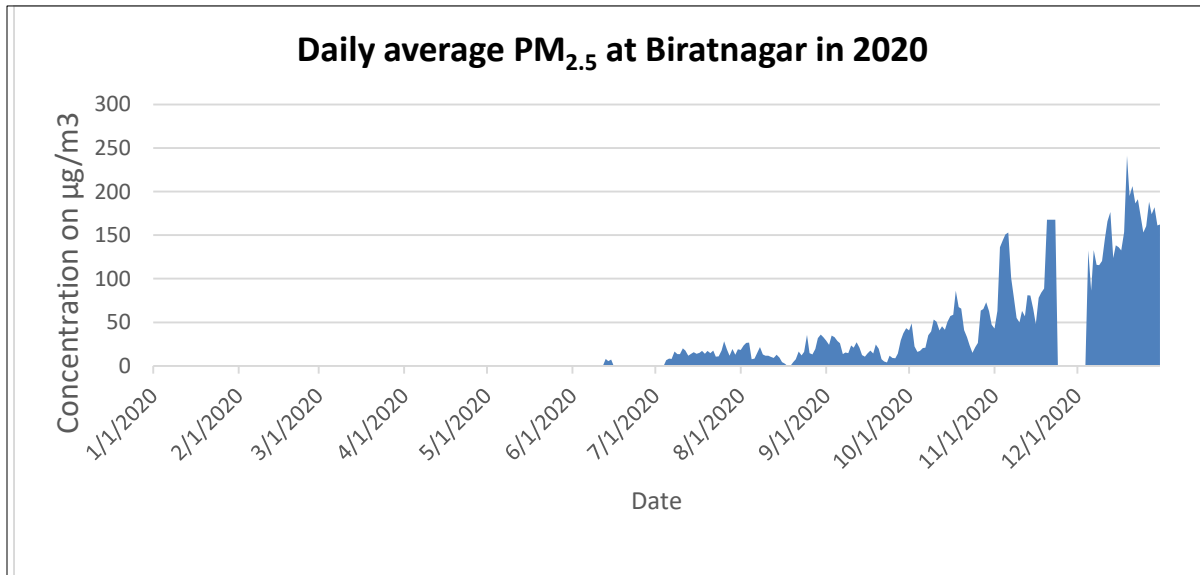


Figure 9: Daily average of PM_{2.5}

Monthly Average of PM_{2.5}

The highest and the lowest concentration of PM_{2.5} was found during December (157.34 $\mu\text{g}/\text{m}^3$) and June (6.82 $\mu\text{g}/\text{m}^3$) respectively.

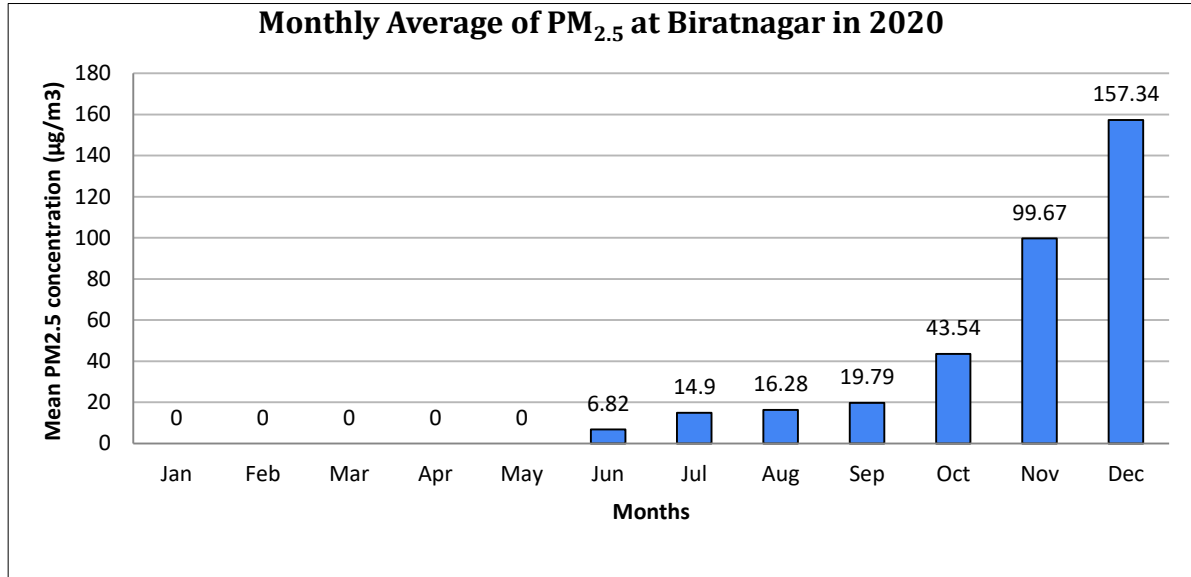


Figure 10: Monthly average of PM_{2.5}

Variation in concentration of PM_{2.5} was found more during December and low during June.

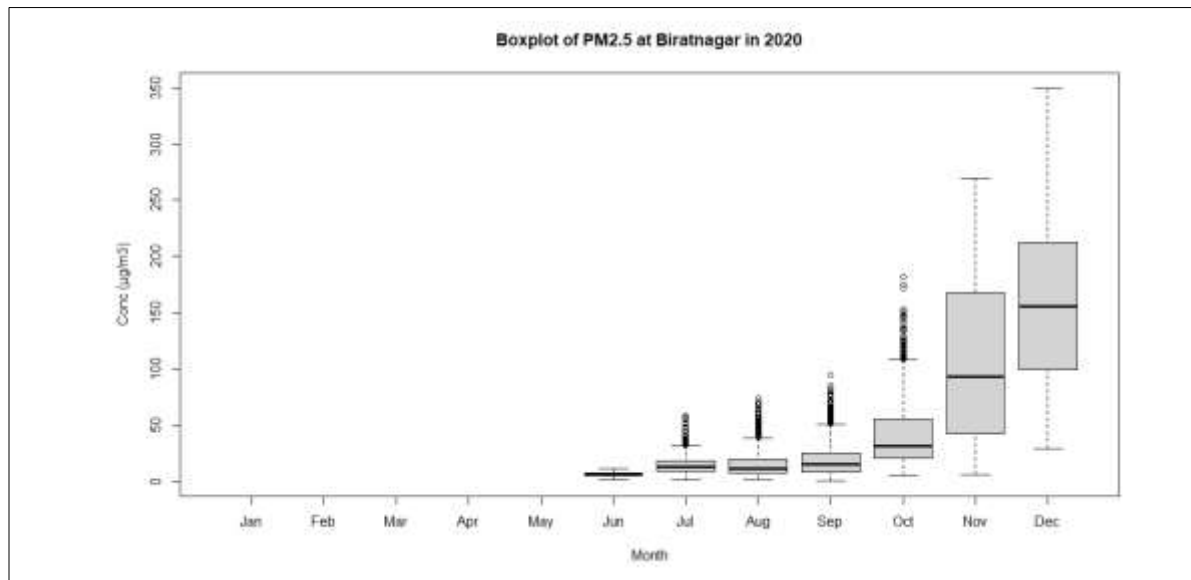


Figure 11: Monthly Variation of PM_{2.5}

Seasonal Variation of Average PM_{2.5} concentration

Ambient concentration of average PM_{2.5} during monsoon (June-September) and post-monsoon (October-November) can be shown in the figure below. The concentration of PM_{2.5} was found higher during post monsoon (54.34 $\mu\text{g}/\text{m}^3$) than during monsoon (12.67 $\mu\text{g}/\text{m}^3$).

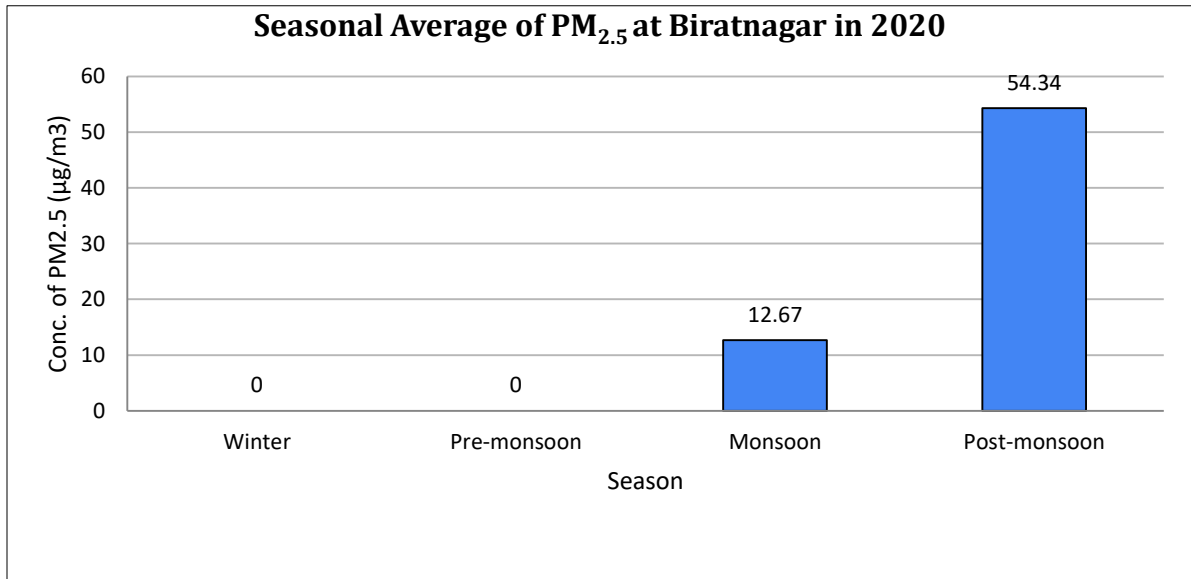


Figure 12: Seasonal variation of PM_{2.5}

Diurnal Variation of average PM_{2.5} concentration

The diurnal variation of average PM_{2.5} concentrations can be shown in the **Error! Reference source not found.** below. The variation in PM_{2.5} concentrations was high at around 5 pm and low at 12 to 1 pm.

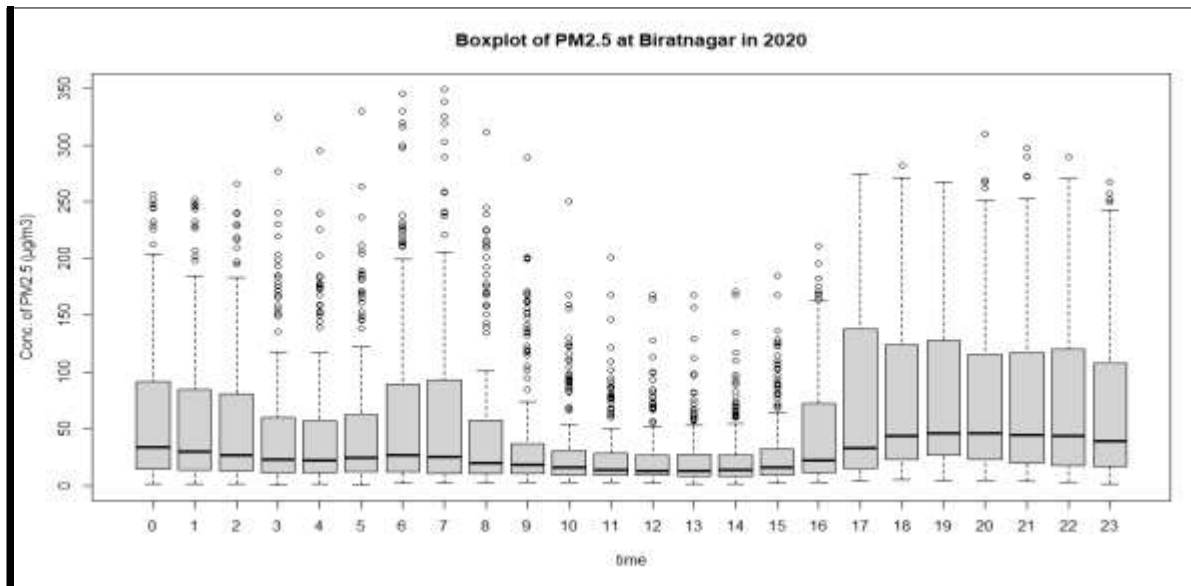


Figure 13: Diurnal variation of average PM_{2.5} concentration

Compliance Status of PM_{2.5}

The total days of PM_{2.5} monitored in the year 2020 counts 169, of which 69 days exceed the NAAQS guideline.

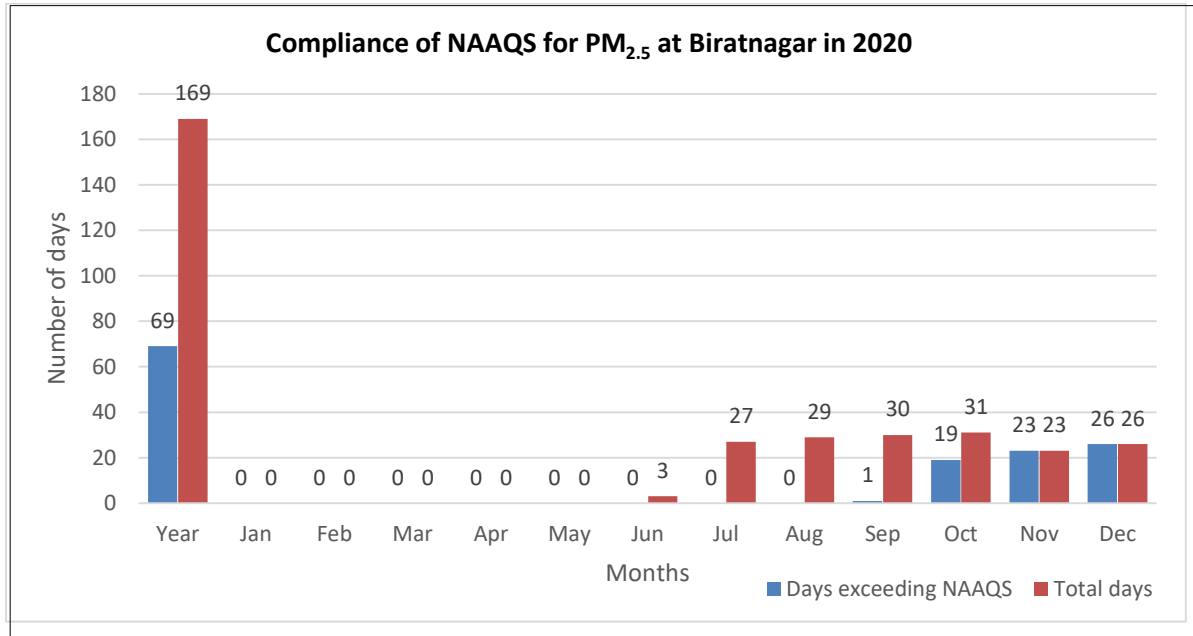


Figure 14: Compliance status of PM_{2.5}

2.1.4. Temporal variation of PM₁₀

Annual Average of PM₁₀

The annual average of PM₁₀ at Biratnagar station was found to be 25.97 µg/m³. Histogram of hourly average PM₁₀ is shown in the figure below.

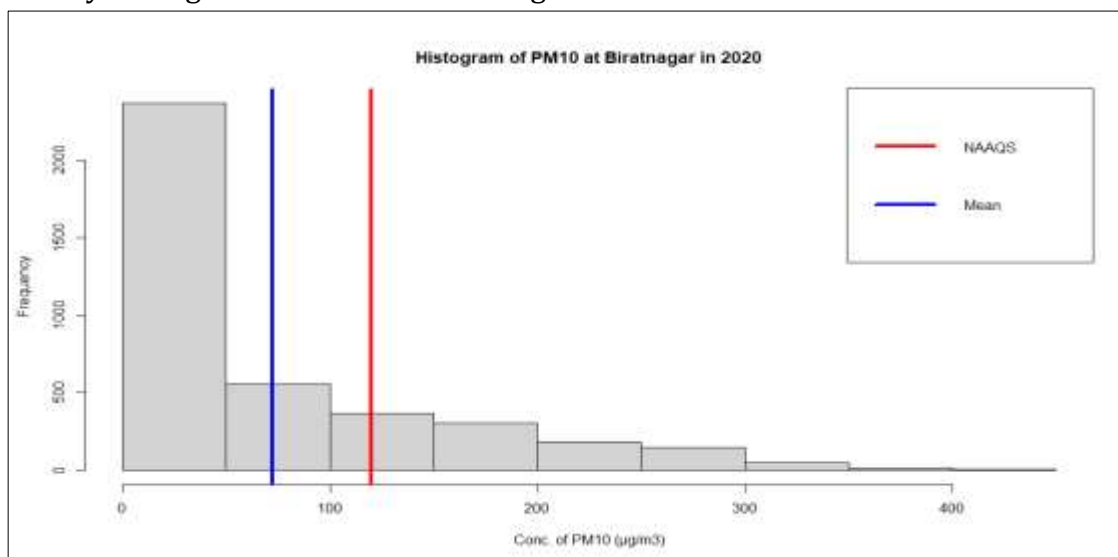


Figure 15: Histogram for the ambient concentration of PM₁₀

Daily Average of PM₁₀

Daily average concentration of PM₁₀ was found to be high during December and low during July.

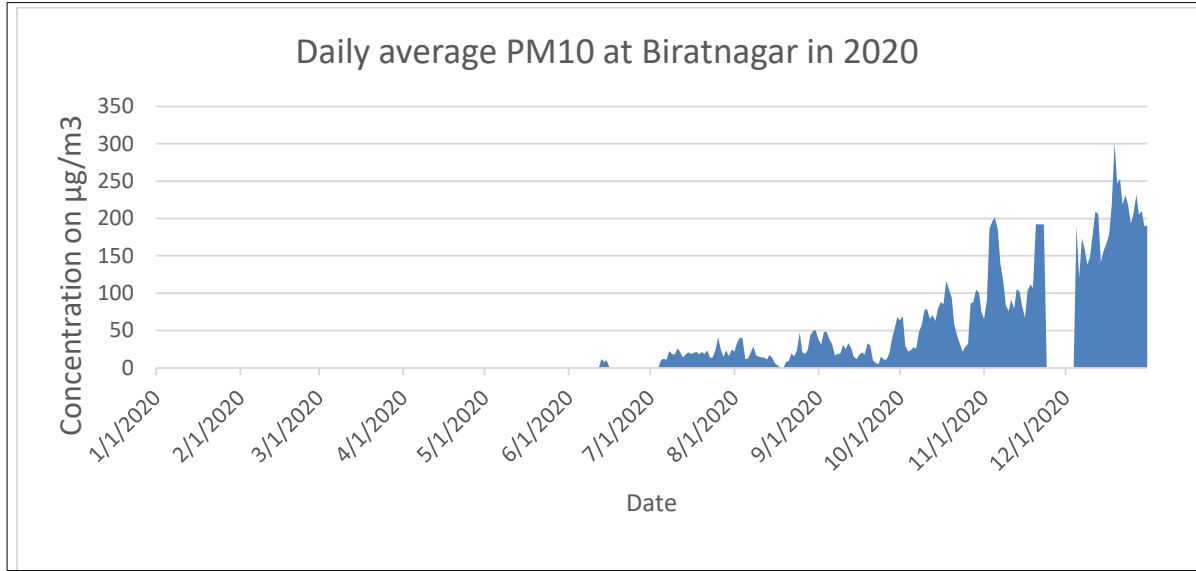


Figure 16: Daily average of PM₁₀

Monthly Average of PM₁₀

The highest and the lowest concentration of PM₁₀ was found during December (195.63 µg/m³) and June (9.96) respectively.

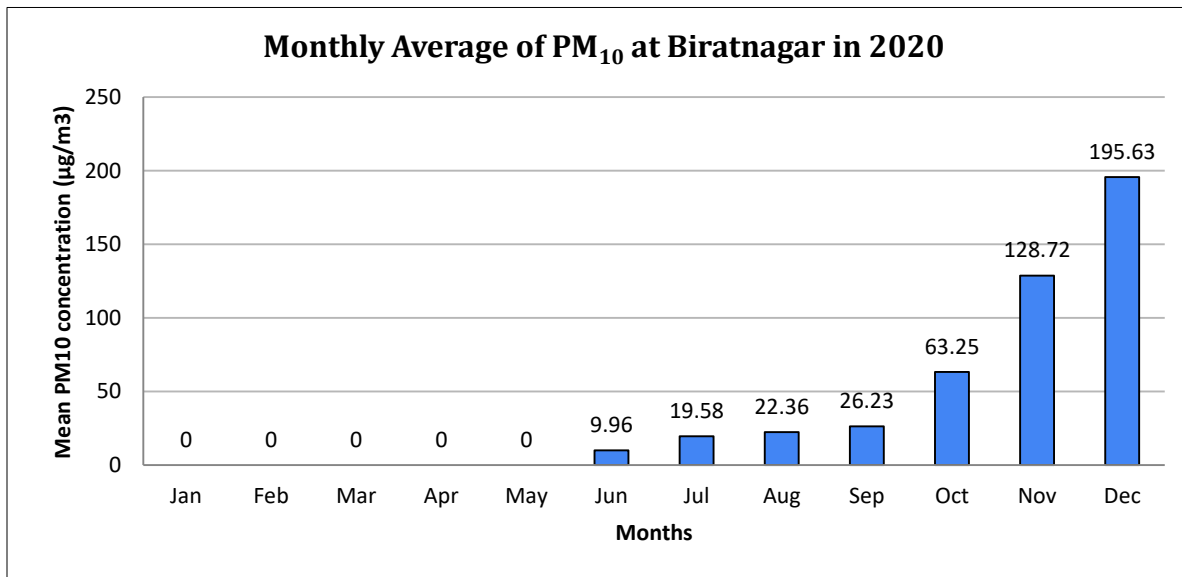


Figure 17: Monthly average of PM₁₀

Variation in concentration of PM₁₀ was found more during December and low during June.

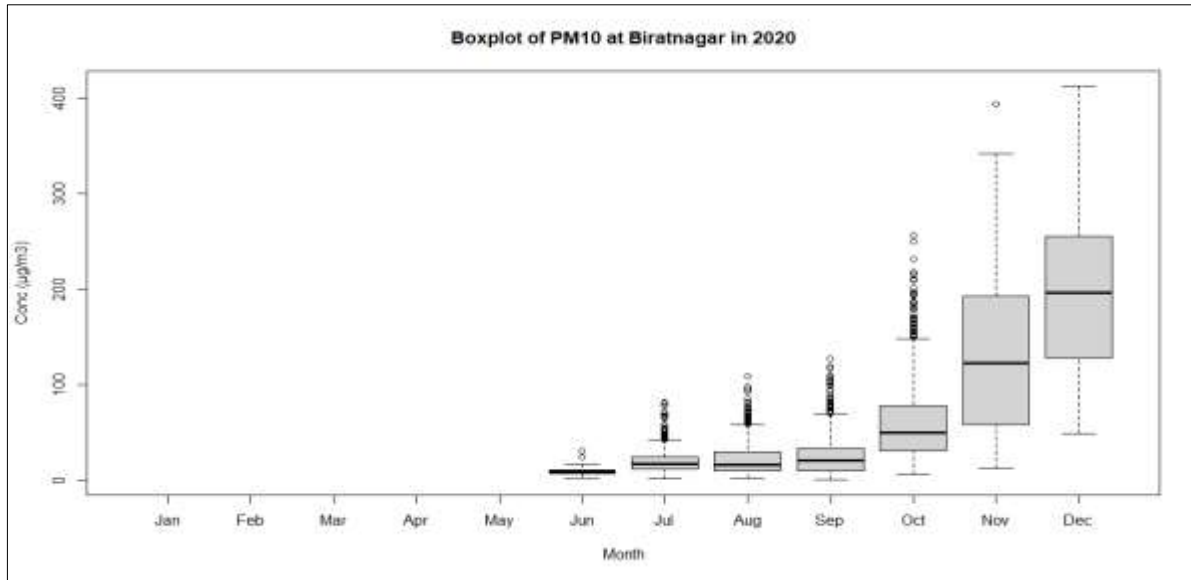


Figure 18: Monthly Variation of PM₁₀

Seasonal Variation of Average PM₁₀ concentration

Ambient concentration of average PM₁₀ during monsoon (June-September) and post monsoon (October–November) can be shown in the figure below. The concentration of PM₁₀ was found higher during post monsoon (72.23 µg/m³) than during monsoon (17.3 µg/m³).

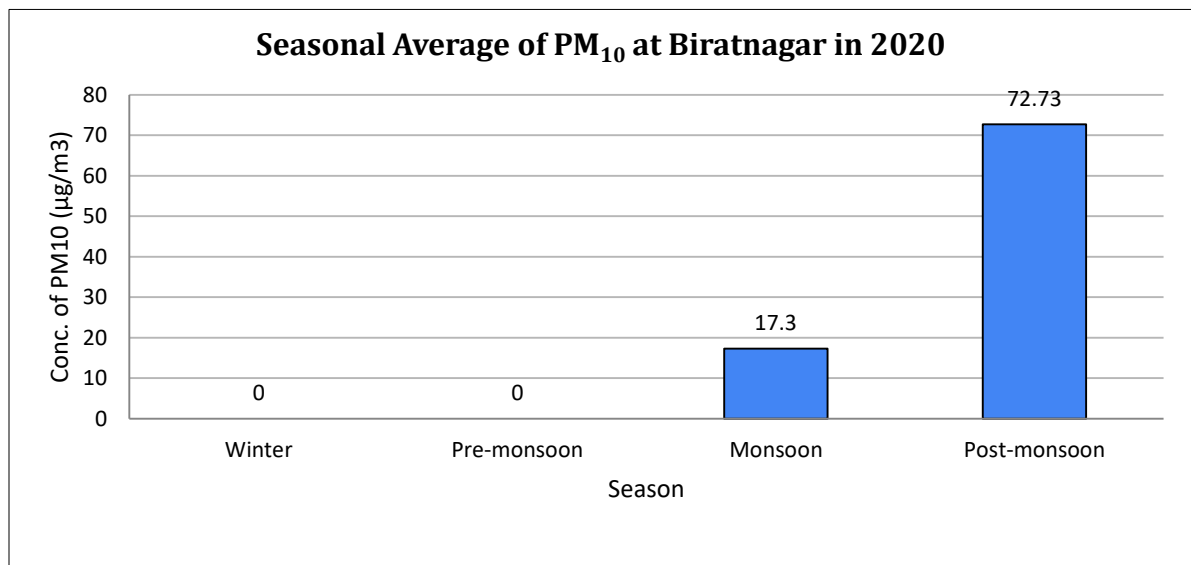


Figure 19: Seasonal variation of PM₁₀

Diurnal Variation of average PM₁₀ concentration

The diurnal variation of average PM₁₀ concentrations can be shown in the figure below. The variation in PM₁₀ concentration was high at around 5 pm and low at 11 am respectively.

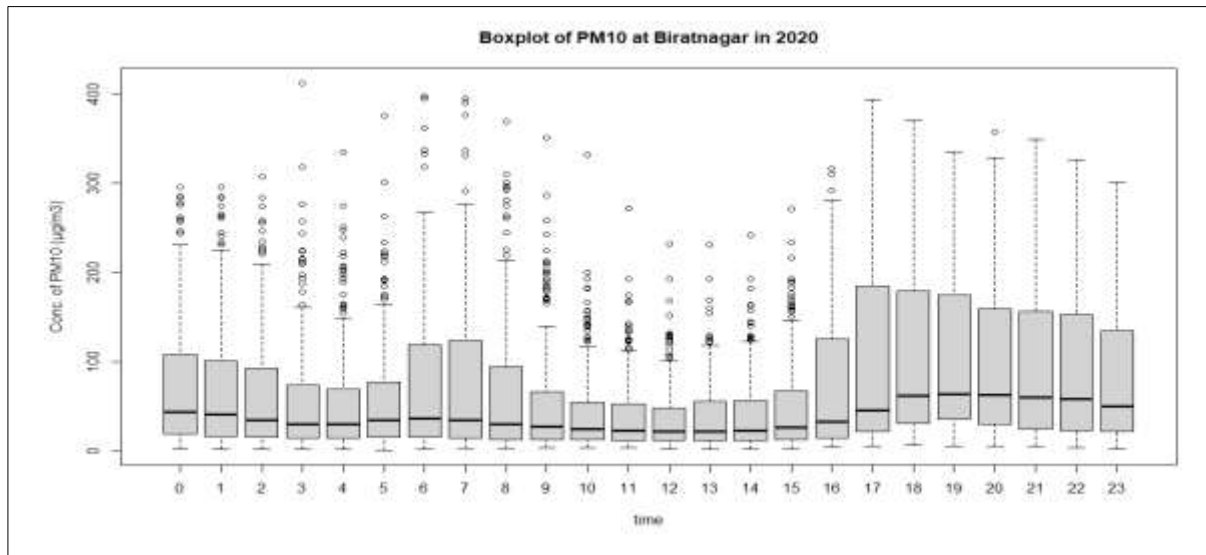


Figure 20: Diurnal variation of average PM₁₀ concentration

Compliance Status of PM₁₀

The total days of PM₁₀ monitored in the year 2020 counts 169 days, of which 35 days exceed the NAAQS guideline.

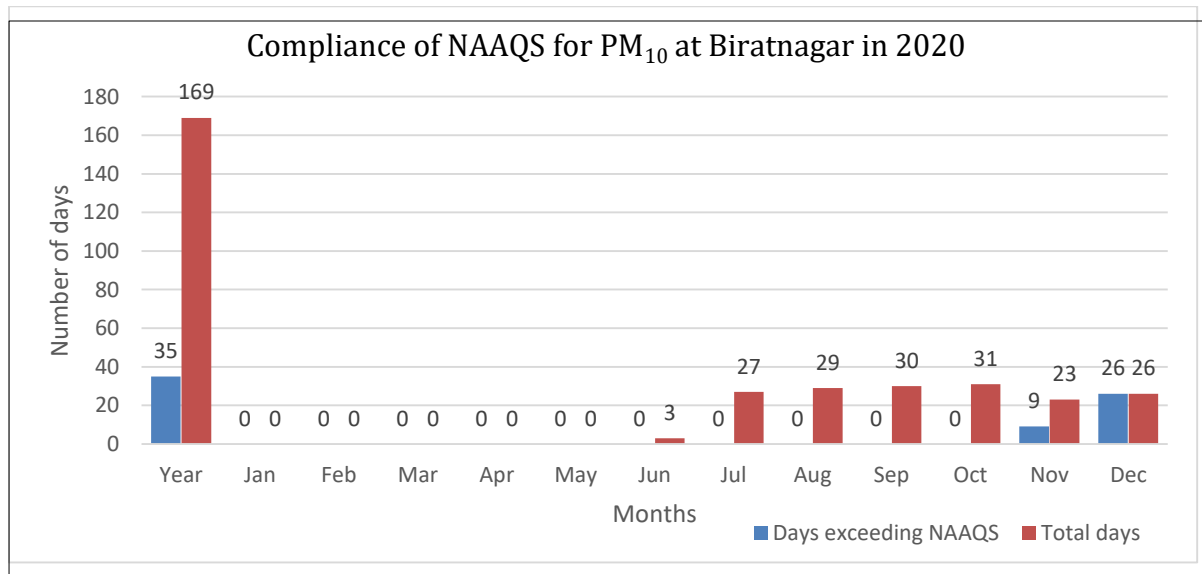


Figure 21: Compliance status of PM₁₀

2.1.5. Temporal variation of TSP

Annual Average of TSP

The annual average of TSP at Biratnagar station was found to be 26.7 µg/m³ in 2020. Histogram of hourly average TSP is shown in the figure below

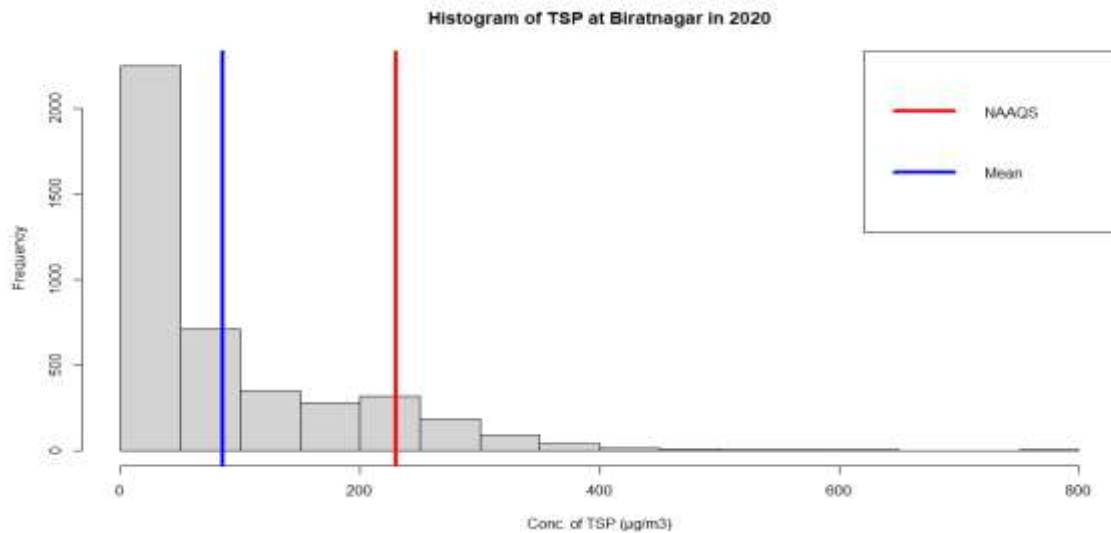


Figure 22: Histogram for the ambient concentration of TSP

Daily Average of TSP

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

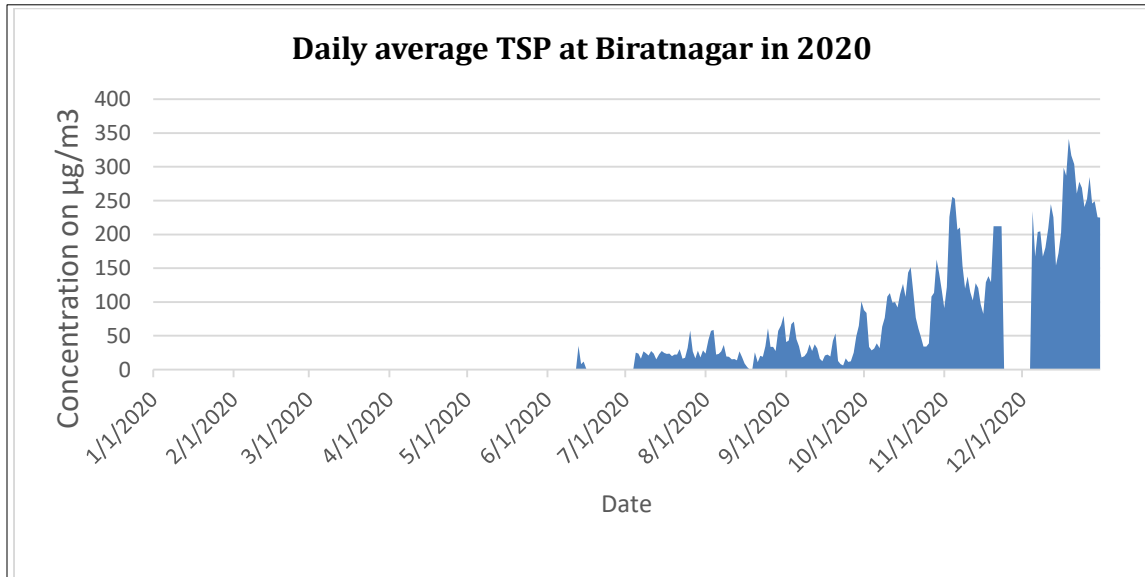


Figure 23: Daily average of TSP

Monthly Average of TSP

The highest and the lowest concentration of TSP was found in December ($236.68 \mu\text{g}/\text{m}^3$) and June ($18.4 \mu\text{g}/\text{m}^3$) respectively.

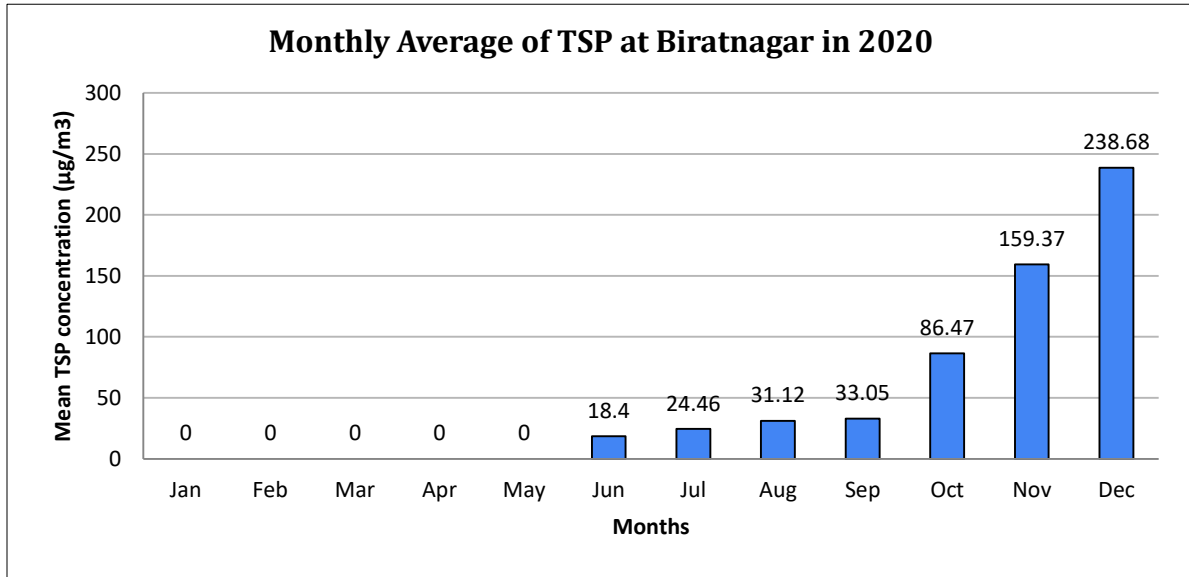


Figure 24: Monthly average of TSP

Variation in concentration of TSP was found more during December and low during June.

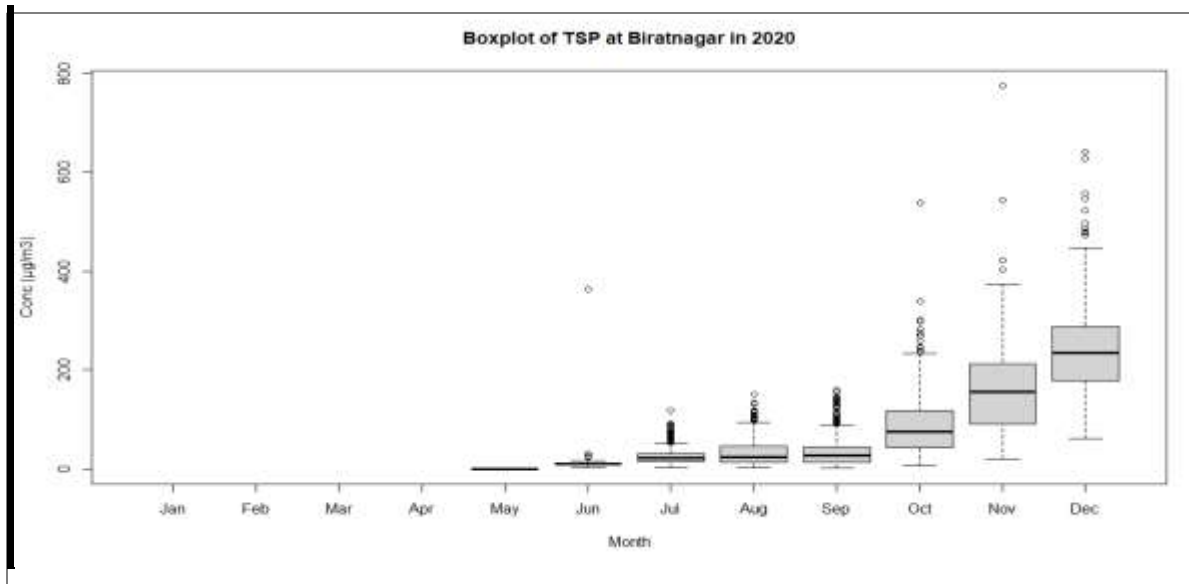


Figure 25: Monthly Variation of TSP

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 pre-monsoon (92.97 µg/m³) than during monsoon (24.66 µg/m³).

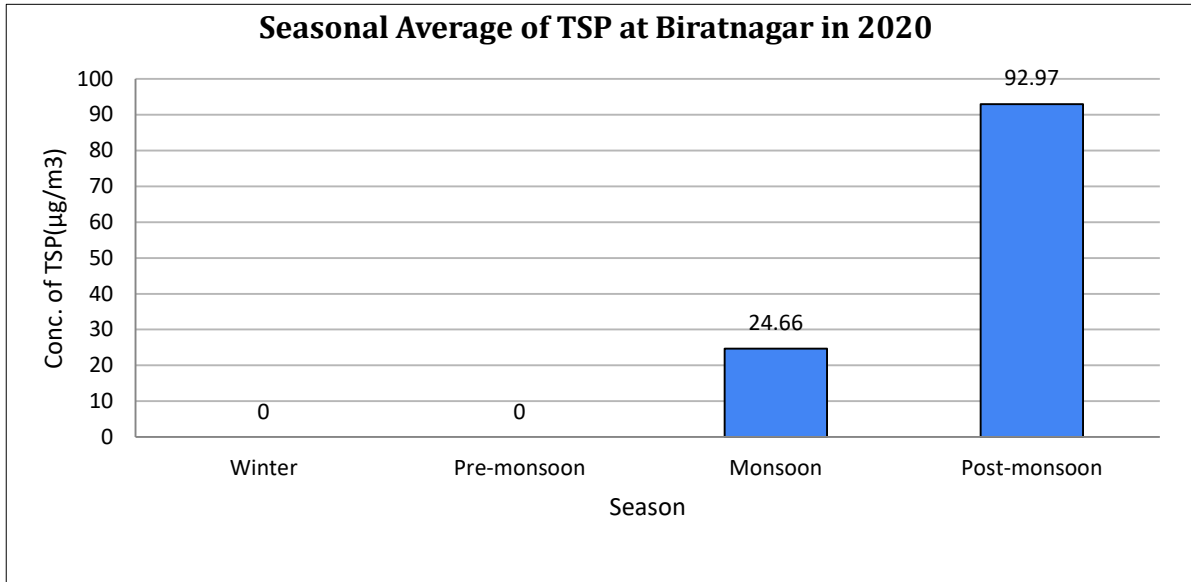


Figure 26: Seasonal variation of TSP

Diurnal Variation of average TSP concentration

The diurnal variation of average TSP concentrations can be shown in the figure below. The variation in TSP was found high at 5 pm and low at 11 am.

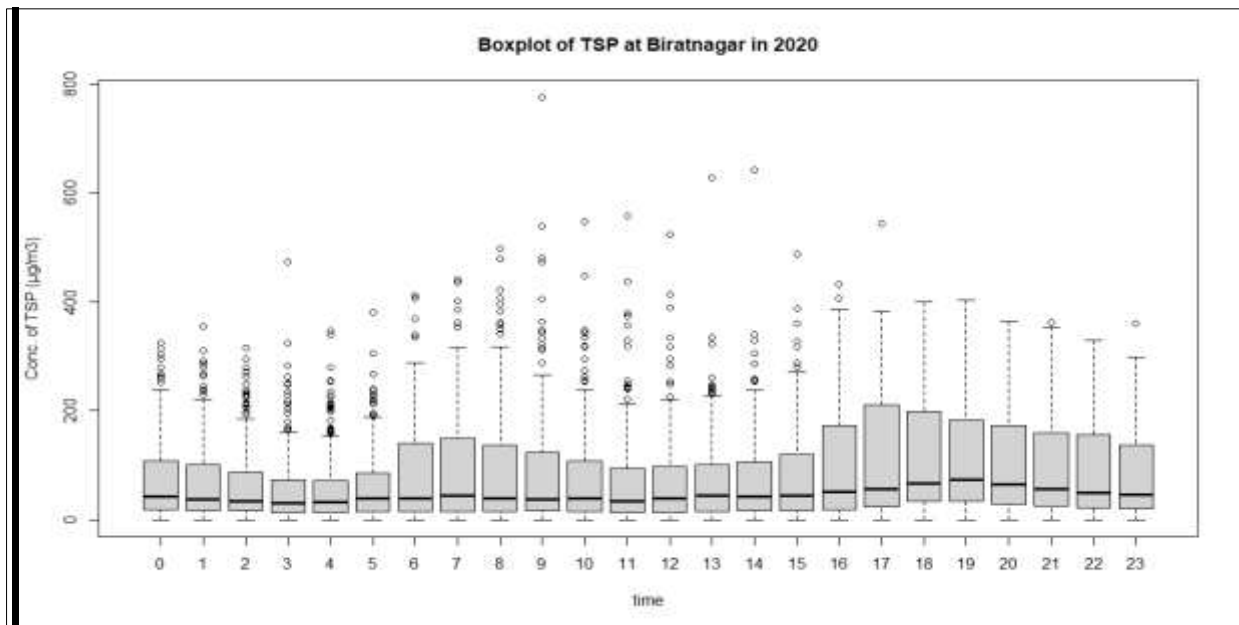


Figure 27: Diurnal variation of average TSP concentration

Compliance Status of TSP

The total days of TSP monitored in the year 2020 counts 182, of which 17 days exceed the NAAQS guideline.

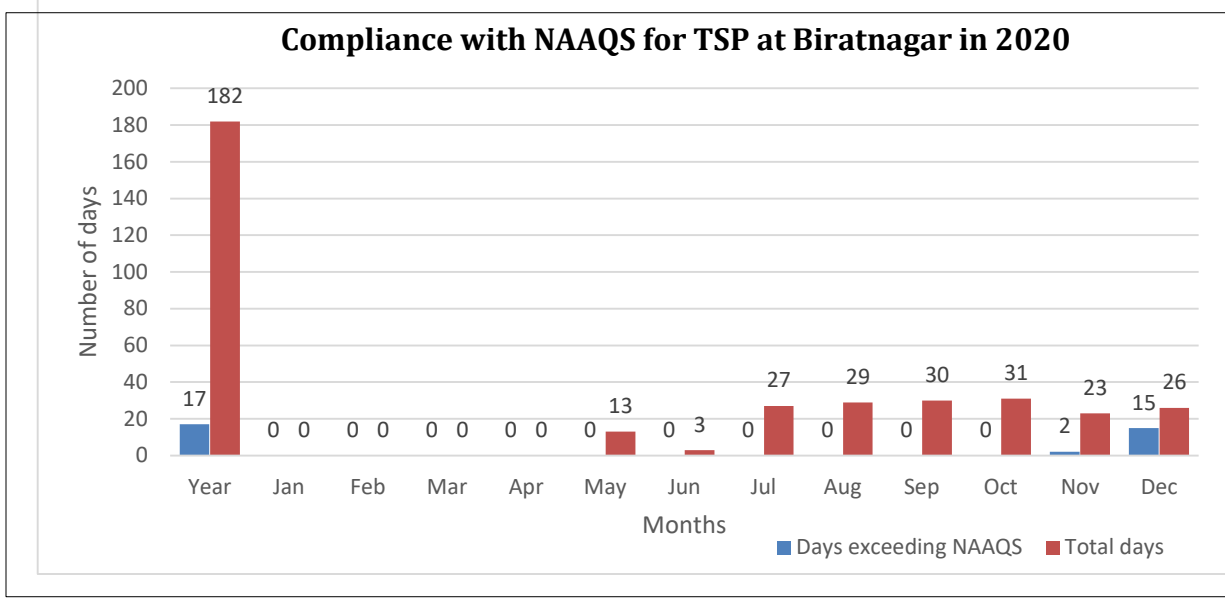


Figure 28: Compliance status of TSP

Annex

PM₁, PM_{2.5}, PM₁₀ and TSP daily average for Biratnagar station in 2020

2020	PM1 daily	2020	PM2.5 daily	2020	PM10 daily	2020	TSP daily
1/1/2020		1/1/2020		1/1/2020		1/1/2020	
1/2/2020		1/2/2020		1/2/2020		1/2/2020	
1/3/2020		1/3/2020		1/3/2020		1/3/2020	
1/4/2020		1/4/2020		1/4/2020		1/4/2020	
1/5/2020		1/5/2020		1/5/2020		1/5/2020	
1/6/2020		1/6/2020		1/6/2020		1/6/2020	
1/7/2020		1/7/2020		1/7/2020		1/7/2020	
1/8/2020		1/8/2020		1/8/2020		1/8/2020	
1/9/2020		1/9/2020		1/9/2020		1/9/2020	
1/10/2020		1/10/2020		1/10/2020		1/10/2020	
1/11/2020		1/11/2020		1/11/2020		1/11/2020	
1/12/2020		1/12/2020		1/12/2020		1/12/2020	
1/13/2020		1/13/2020		1/13/2020		1/13/2020	
1/14/2020		1/14/2020		1/14/2020		1/14/2020	
1/15/2020		1/15/2020		1/15/2020		1/15/2020	
1/16/2020		1/16/2020		1/16/2020		1/16/2020	
1/17/2020		1/17/2020		1/17/2020		1/17/2020	
1/18/2020		1/18/2020		1/18/2020		1/18/2020	
1/19/2020		1/19/2020		1/19/2020		1/19/2020	
1/20/2020		1/20/2020		1/20/2020		1/20/2020	
1/21/2020		1/21/2020		1/21/2020		1/21/2020	
1/22/2020		1/22/2020		1/22/2020		1/22/2020	
1/23/2020		1/23/2020		1/23/2020		1/23/2020	
1/24/2020		1/24/2020		1/24/2020		1/24/2020	
1/25/2020		1/25/2020		1/25/2020		1/25/2020	
1/26/2020		1/26/2020		1/26/2020		1/26/2020	
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1/29/2020		1/29/2020		1/29/2020		1/29/2020	
1/30/2020		1/30/2020		1/30/2020		1/30/2020	
1/31/2020		1/31/2020		1/31/2020		1/31/2020	
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2/2/2020		2/2/2020		2/2/2020		2/2/2020	
2/3/2020		2/3/2020		2/3/2020		2/3/2020	
2/4/2020		2/4/2020		2/4/2020		2/4/2020	
2/5/2020		2/5/2020		2/5/2020		2/5/2020	
2/6/2020		2/6/2020		2/6/2020		2/6/2020	

2/7/2020		2/7/2020		2/7/2020		2/7/2020	
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2/22/2020		2/22/2020		2/22/2020		2/22/2020	
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2/24/2020		2/24/2020		2/24/2020		2/24/2020	
2/25/2020		2/25/2020		2/25/2020		2/25/2020	
2/26/2020		2/26/2020		2/26/2020		2/26/2020	
2/27/2020		2/27/2020		2/27/2020		2/27/2020	
2/28/2020		2/28/2020		2/28/2020		2/28/2020	
2/29/2020		2/29/2020		2/29/2020		2/29/2020	
3/1/2020		3/1/2020		3/1/2020		3/1/2020	
3/2/2020		3/2/2020		3/2/2020		3/2/2020	
3/3/2020		3/3/2020		3/3/2020		3/3/2020	
3/4/2020		3/4/2020		3/4/2020		3/4/2020	
3/5/2020		3/5/2020		3/5/2020		3/5/2020	
3/6/2020		3/6/2020		3/6/2020		3/6/2020	
3/7/2020		3/7/2020		3/7/2020		3/7/2020	
3/8/2020		3/8/2020		3/8/2020		3/8/2020	
3/9/2020		3/9/2020		3/9/2020		3/9/2020	
3/10/2020		3/10/2020		3/10/2020		3/10/2020	
3/11/2020		3/11/2020		3/11/2020		3/11/2020	
3/12/2020		3/12/2020		3/12/2020		3/12/2020	
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3/14/2020		3/14/2020		3/14/2020		3/14/2020	
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3/17/2020		3/17/2020		3/17/2020		3/17/2020	
3/18/2020		3/18/2020		3/18/2020		3/18/2020	

4/29/2020		4/29/2020		4/29/2020		4/29/2020	
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5/6/2020		5/6/2020		5/6/2020		5/6/2020	0
5/7/2020		5/7/2020		5/7/2020		5/7/2020	0
5/8/2020		5/8/2020		5/8/2020		5/8/2020	0
5/9/2020		5/9/2020		5/9/2020		5/9/2020	0
5/10/2020		5/10/2020		5/10/2020		5/10/2020	0
5/11/2020		5/11/2020		5/11/2020		5/11/2020	0
5/12/2020		5/12/2020		5/12/2020		5/12/2020	0
5/13/2020		5/13/2020		5/13/2020		5/13/2020	0
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5/20/2020		5/20/2020		5/20/2020		5/20/2020	
5/21/2020		5/21/2020		5/21/2020		5/21/2020	
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12/7/2020	117.6323	12/7/2020	132.912	12/7/2020	173.2917	12/7/2020	203.4554
12/8/2020	102.9979	12/8/2020	116.0966	12/8/2020	159.8995	12/8/2020	204.7733
12/9/2020	105.3433	12/9/2020	115.594	12/9/2020	137.9665	12/9/2020	167.1826
12/10/2020	107.9035	12/10/2020	120.3151	12/10/2020	148.6254	12/10/2020	180.6261
12/11/2020	130.0516	12/11/2020	146.1028	12/11/2020	180.6218	12/11/2020	209.2824
12/12/2020	148.3034	12/12/2020	165.8362	12/12/2020	209.3322	12/12/2020	244.9074
12/13/2020	156.5953	12/13/2020	176.3765	12/13/2020	205.7888	12/13/2020	225.1946
12/14/2020	112.9328	12/14/2020	123.499	12/14/2020	141.2535	12/14/2020	153.7015
12/15/2020	126.4804	12/15/2020	138.1796	12/15/2020	157.0468	12/15/2020	172.455
12/16/2020	126.5833	12/16/2020	136.1531	12/16/2020	165.5489	12/16/2020	202.7016
12/17/2020	119.0183	12/17/2020	132.4447	12/17/2020	178.8274	12/17/2020	298.7657
12/18/2020	138.1039	12/18/2020	153.5459	12/18/2020	217.3505	12/18/2020	286.914
12/19/2020	219.2581	12/19/2020	241.0823	12/19/2020	301.2562	12/19/2020	341.4006
12/20/2020	178.3151	12/20/2020	194.8856	12/20/2020	247.0626	12/20/2020	316.9301
12/21/2020	189.5855	12/21/2020	206.214	12/21/2020	252.8367	12/21/2020	304.0188
12/22/2020	169.7711	12/22/2020	186.3127	12/22/2020	218.9003	12/22/2020	260.6075
12/23/2020	174.946	12/23/2020	191.3968	12/23/2020	231.1602	12/23/2020	277.7462
12/24/2020	152.661	12/24/2020	171.0458	12/24/2020	218.3606	12/24/2020	269.1036
12/25/2020	140.7173	12/25/2020	153.0174	12/25/2020	193.0919	12/25/2020	240.4228
12/26/2020	147.0365	12/26/2020	160.5344	12/26/2020	206.7172	12/26/2020	252.1877
12/27/2020	173.9494	12/27/2020	188.2381	12/27/2020	232.0165	12/27/2020	284.9423
12/28/2020	161.1913	12/28/2020	174.0391	12/28/2020	205.2399	12/28/2020	245.8007
12/29/2020	168.304	12/29/2020	181.9924	12/29/2020	209.7522	12/29/2020	249.2722
12/30/2020	147.1149	12/30/2020	161.1928	12/30/2020	189.5685	12/30/2020	225.4358

12/31/2020	148.379	12/31/2020	162.2179	12/31/2020	190.2738	12/31/2020	225.009
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