Report on Impact of Lockdown on Air Quality in the state of Goa.

In order to combat the threatening spread of COVID-19 pandemic, nationwide lockdown was imposed by the Central Government from 23-03-2020. The result of lockdown has been favourable in terms of Air pollution, which is indicated by significant reduction in AIR Quality reported at most of the states. The major reason being reduction in vehicular and industrial activities.

The major sectors contributing to air pollution are transport, industries, construction activities, road dust resuspension and residential activities.

GSPCB has 18 NAMP locations in the state of Goa and one additional AAQM location at MPT. The NAMP stations are namely Panaji, Mapusa, Baina, Vasco, Margao, Ponda, Assanora, Amona, Bicholim, Honda, Usgao, Sanguem, Codli, Tilamol, Cuncolim, Kundaim, Tuem and the additional AAQM location at MPT.

*Out of 18 NAMP locations Curchorem station is not operational as the permission granting process is underway for installation of station at Ravindra Bhavan, Curchorem.

GSPCB stations were put into operations from 01-04-20 while the NAMP stations operated by M/s Choksi Laboratories were operated from 16-04-20 onwards, In order to do a comparative study, the data generated from these 18 stations before and within the lockdown period is compared.

The comparative study is focused on % reduction in AQI and specific pollutant concentration, for

Pre lockdown period 1st March to 21st March 2020 and

During Lockdown period 1st April to 30th April 2020

Annexure 1 Comparison of Air Quality Index for Pre lockdown and during lockdown

Annexure 2 Comparison of AQI during lockdown period (April 2020) and April 2019

Annexure 3 Comparison of PM10 for Pre lockdown and during lockdown

Annexure 4 Comparison of PM2.5 for Pre lockdown and during lockdown

Annexure 5 Observations and Conclusions

AAQM team:

Mrs. Jenica Sequiera (Sc. C)

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Outsourced NAMP stations monitored by M/s Choksi Laboratories Ltd.

Analysis of Air Quality Data in terms of Air Quality Index (AQI)

Comparison of AQI for Pre lockdown (1st March to 21st March 2020) and during lockdown period (1st April to 30th April 2020) (Annexure I)

To study the impact of lockdown on AQI, the data of AQI for pre-lockdown and during lockdown days was analysed and a comparative statement of AQI of 17 NAMP locations along with additional AAQM location at MPT has been summarized. The table also include comparison of average AQI of each monitoring station for both these periods.

The comparative table along with plot reflects that there has been significant reduction in average AQI at all 17 locations except Panaji where it shows increase in AQI during lockdown compared to Pre lockdown. The % decrease at these 17 stations without Panaji, has ranged between 11% (Codli and Tilamol) to 58% (Baina).

Comparison of AQI for April 2019 and April 2020(lockdown period) (Annexure II)

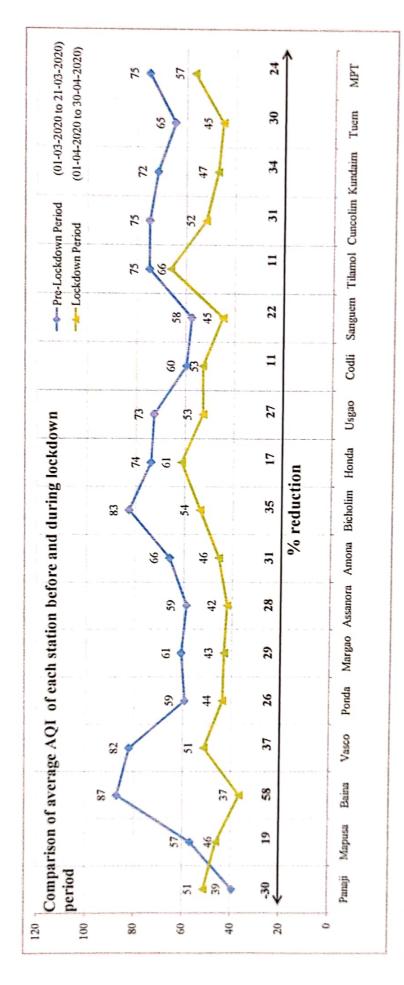
Similarly a comparative table is also prepared for AQI and Average AQI for the month of April 2019 vs April 2020.

The table along with plot also signifies a reduction in average AQI at all the 17 locations. The % decrease at these stations has ranged between 6% (Honda) to 65% (MPT).

AIR QUALITY WITH INDEX AND HEALTH IMPACTS:

Good (G) (0-50)	Minimal Impact	Poor (P) (201–300)	Breathing discomfort to people on prolonged exposure
Satisfactory (S) (51–100)	Minor breathing discomfort to sensitive people	Very Poor (VP) (301–400)	Respiratory illness to the people on prolonged exposure
Moderate (M) (101–200)	Breathing discomfort to the people with lung, heart disease in children and older adults	Severe (SEV) (>401)	Respiratory effects even on healthy people

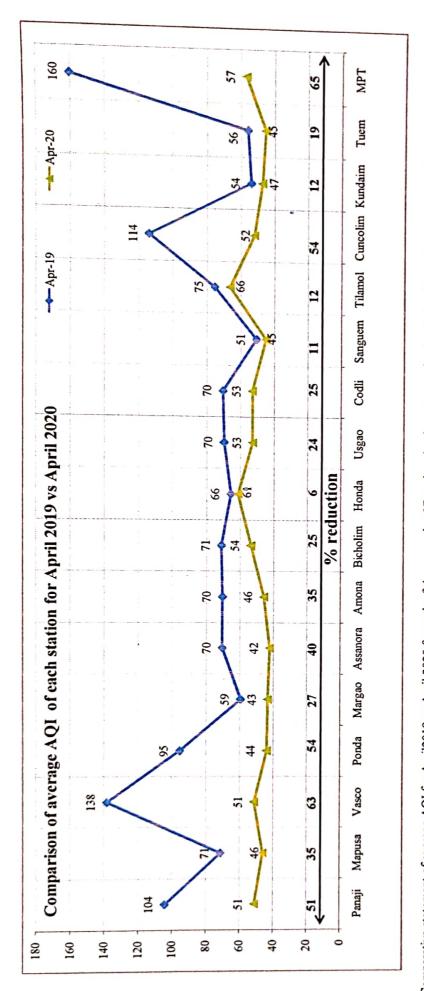
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Comparative statement of average AQI for each of the respective 18 stations has been summarized and placed in the form of chart. The chart reflect significant percent drop at NAMP

reduction	reduction	on	
AREA	AVG	AVG	20070
	BEFORE AFTER	AFTER	%KED
Res/comm	64	45	29
Mining	89	52	23
Industrial	711	50	30

66 70 70	72	100	59 70 70 7
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Comparative statement of average AQI for April 2019 vs April 2020 for each of the respective 17 stations has been summarized and placed in the form of chart. The chart reflect significant percent drop at Residential/Commercial and Industrial NAMP stations. Note: Baina NAMP station was started from September 2019 onwards.

Areawise comparative averages and % reduction	parative ave	rages and %	reduction
AREA	AVG	AVG	0/10/10
	BEFORE	AFTER	WINED.
Res/comm	94	47	20
Mining	89	52	23
Industrial	96	90	48

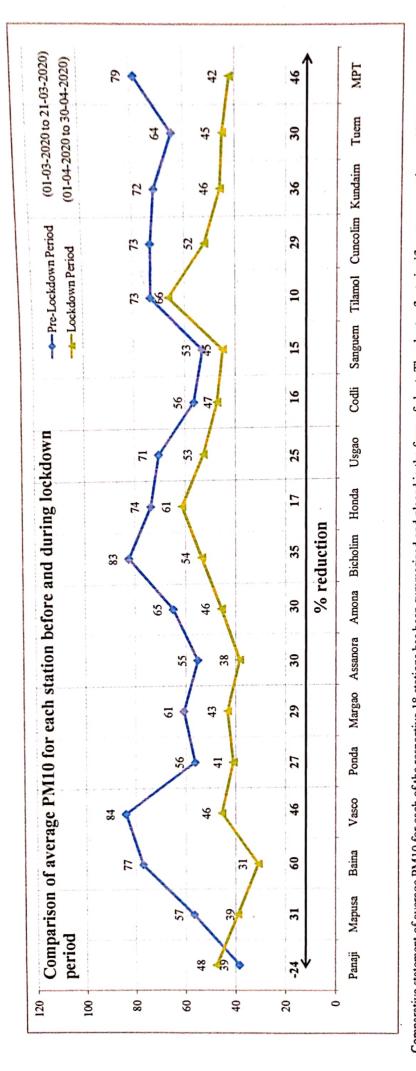
Analysis of air Quality Data in terms of PM10 and PM2.5

An analysis of PM10 and PM2.5 has been also made to compare the impact of lockdown. Data related to average concentration of these parameters for pre lockdown and during lockdown periods is tabulated and plotted. As compared to the period of Pre lockdown significant percentage decrease in air quality parameters like PM10 and PM2.5 has been observed during the lockdown period for most of stations. For PM10 the decrease is for all stations except for Panaji while PM2.5 the decrease is observed for all locations except Panaji, Mapusa and Vasco.

PM10 (Annexure III) - The percentage decrease of PM10 at all the 17 locations except Panaji ranges between 10% (Tilamol) to 60% (Baina)

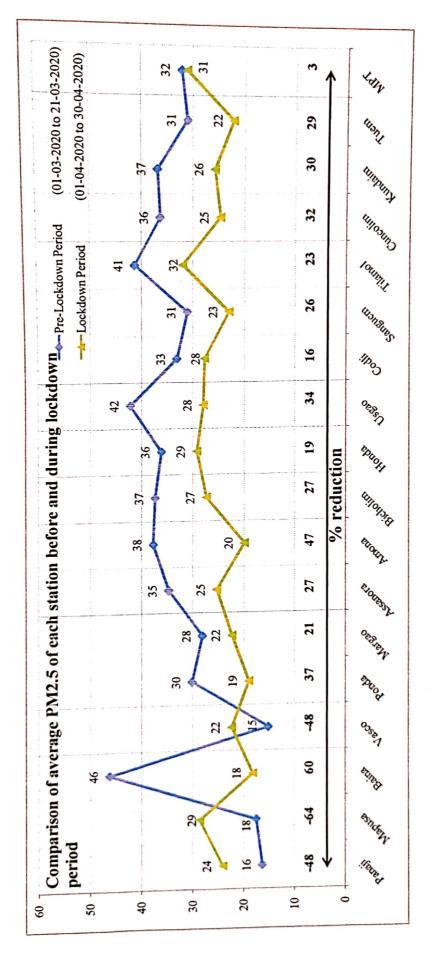
PM2.5 (Annexure IV) - The percentage decrease of PM2.5 at all the 15 locations except Panaji, Mapusa and Vasco ranges from 3% (MPT) to 60% (Baina).

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			Sanguem 1			55			48			94		1	7		0			63	53												47			4		4		
			Codli	63			48			51					15	9	66			65	99									40			20			52		47		
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before and during Lockdown	Mining Areas Location	24 hrly PM10	Honda		89			11			11			78		1	78	77			74											\$0			99		87	8		
before and	M		Bicholim I	98			91			80			7			R		83	3		83							77			51			20		-	Ŷ	_	47	
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	Resider		Mapusa		38		99			72			59				48	29			57	71	47		22	,	ડ દ	-	23				30		32	1	33	-	33	
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Comparative statement of average PM10 for each of the respective 18 stations has been summarized and placed in the form of chart. The chart reflect significant percent drop at NAMP stations except for Panaji. The average of % reduction at all stations is 27. If we seggregate the stations the avg % reduction for Residential/Commercial, Mining and Industrial locations is 34, 23 and 36 rspectively.

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			Tilamol		9	40	37			46			43				2			32	41												4		25				27		33
			Sanguem			30		35			19			32		ě	87			42	31												20			27			22		23
uw.			Codli	43		30	2		35				1	31	,	67				30	33									35			23			22			31		28
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before and during Lockdown	Mining Areas Location	24 hrly PM2.5	Honda	1	29		32	3		35			38		7,	40	27	5		į	36											22			34			32			29
	Min			36		30			38			37		2.4	34		40	2		į	3/							30			28			27			29			23	27
PIMPSIS			Amona Bicholim		39		40			39		1	33		35	CC		30	66	ş	88								15			13			25			26			20
			Assanora	43	2	67			34			34		30	20		17			3.0	ક										27			25			29			20	25
Comparison of			Margao /		6	00		23			22		ļ	/7		35	5		7,	77	97												23			24			20		22
0	ocations		Ponda N	38	1	T	30			21	1	,	07	T	41	7		3,5	3	30	OS.											17			20			21			19
	ercial L	PM2.5	Vasco	1	33	3	15			∞	,	2				20	3	y		4	52	41	15		15		13		23				22		24					8	22
	al/Comm	24 hrly PM2.5	Baina	1	45	2	28			29	90	38				5	3	٠		46	*	*	*		*		*		*				4		41			20		8	18
	Residential/Commercial Locations		Mapusa	1	-	8			28		3.	2			24		13			16	55	35		31		29	28		19				18		14			•		*	29
			Panaji N		=		20			1	20	91	01			0		20		14	57	28		7		30	28		6				23		21			24		14	24
			_	02-03-2020	04-03-2020	05-03-2020	06-03-2020	07-03-2020	09-03-2020	10-03-2020	11-03-2020	13-03-2020	14-03-2020	16-03-2020	17-03-2020	18-03-2020	19-03-2020	20-03-2020	21-03-2020	Average	01-04-2020	03-04-2020	06-04-2020	07-04-2020	08-04-2020	09-04-2020	15-04-2020	16-04-2020	17-04-2020	18-04-2020	20-04-2020	21-04-2020	22-04-2020	23-04-2020	24-04-2020	25-04-2020	27-04-2020	28-04-2020	29-04-2020	30-04-2020	Average
			2	0 0	<u> </u>	0	0	<u> </u>	<u>ା</u>		PRE-	_	_	1			<u> </u>	7	15	<u>'L</u>	٦	L	I.	٥	٥	٦					ᅩ	OWN 2	``	' '	``		.,	ان	ات		3.5



Comparative statement of average PM2.5 for each of the respective 18 stations has been summarized and placed in the form of chart. The chart reflect significant percent reduction at all the stations except Panaji, Mapusa nad Vasco.

Observations and Conclusions:

- The ambient Air Quality during the lockdown has shown significant improvement in the State
 of Goa as is indicated by the data from the NAMP stations which may be attributed to very
 low vehicular density and industrial activities prevailing during lock down period.
- AQI has improved at almost all stations except Panaji. Maximum improvement has been observed at Baina with 58% decrease which could be attributed to reduction in vehicular traffic and re-suspension of road dust.
- 3. Average AQI at Mapusa, Baina, Ponda, Margao, Assanora, Amona, Sanguem, Kundaim, Tuem for the lockdown period is "GOOD", which was "SATISFACTORY" during pre lockdown period, with significant decrease in the AQI ranging from 19% (Mapusa) to 58% (Baina).
- Average AQI for Residential/Commercial areas (Panaji/ Mapusa/ Ponda/ Baina/ Vasco/ Ponda/ Margao), Mining Areas (Assanora/ Amona/ Bicholim/ Honda/ Usgao/ Codli/ Sanguem/ Tilamol) and Industrial areas (Cuncolim/ Kundaim/ Tuem/ MPT) shows an average % reduction of 29%, 23% and 30% respectively.
 - 5. In terms of PM10 and PM2.5 also, Baina has notices very high reduction of around 60% in the concentration for both PM10 and PM2.5 due to lockdown.
 - The AQI data for April 2020 in comparison with AQI for April 2019 shows a very significant %reduction of 50% for Residential/Commercial areas, 23% for Mining areas and 48% for Industrial areas.