BEFORE THE NATIONAL GREEN TRIBUNAL
SOUTHERN ZONE, CHENNAI

Original Application No. 26/2013(SZ) (THC)
with
Original Application No. 27/2013 (SZ) (THC)
with
Original Application No. 28/2013 (SZ) (THC)
with
Appeal No. 51/2012 (SZ) (THC)
with
Appeal No. 86/2017 (SZ)

IN THE MATTER OF

Janajagrithi Samithi — Applicant(s)

Versus

The Union of India & Ors. — Respondent(s)

With

CSI St. Luke's Church — Applicant(s)

Versus

The Union of India & Ors. — Respondent(s)

With

Ballibettu Alide Deasthana, Yellur & Ors. — Applicant(s)

Versus

The Union of India & Ors. — Respondent(s)

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Janajagrithi Samithi — Appellant(s)

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Rajeswara

Place: (RAJESWARA P N)

05.07.2021 Advocate for 5th Respondent

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RESPONSE / OBJECTION ON BEHALF OF UDUPI POWER CORPORATION LIMITED TO THE REPORT DATED 02.03.2021 OF THE RE-CONSTITUTED COMMITTEE of EXPERTS

I, Santosh Kumar Singh, son of Mr. Bhuwaneshwar Singh, aged about 50 years, Authorized Representative of Udupi Power Corporation Limited having office at Adani Corporate House, Shantigram, S.G. Highway, PIN-382421, Ahmedabad, Gujarat do hereby solemnly affirm and state as under:-

1. That I am the Authorised Representative of Udupi Power Corporation Limited (hereinafter referred to as the "**Answering Respondent**") and I am fully conversant with the facts and circumstances of the present cases and I am, as such, competent to swear and sign this present affidavit. I am duly authorised to file the present response / objection.

2. Pursuant to direction in paragraph 146 of the common judgment dated 14.03.2019, the Hon'ble Tribunal had constituted an Expert Committee of three (3) members (hereinafter referred to as "**former expert committee**") as follows:

No.	Name and Designation	Institute / Department
1.	Dr. H.N. Chanakya	Centre for Sustainable Technology, Indian Institute of Sciences (IISc), Bangalore.

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Udupi Power Corporation Limited

2.	Dr. Zareena Begum, Associate Professor	Department of Economics, Madras School of Economics (MSE), Chennai.
3.	Mr. G. Thirumurthy Additional Director	Central Pollution Control Board (CPCB), Regional Directorate, Bangalore.

3. This Expert Committee had visited and studied the thermal plant site of the project proponent and submitted its report dated 15.07.2019 to Hon'ble Tribunal on 17.07.2019. The committee had assessed and determined the environmental compensation of Rs. 4.89 Cr. This committee report came to be challenged by the applicants / appellants and pursuant to order dated 01.06.2020, the Hon'ble Tribunal had reconstituted Expert Committee comprising three (3) members (hereinafter referred to as "**reconstituted expert committee**") as follows:

No.	Name and Designation	Institute / Department
1.	Dr. R. Srikanth Professor & Dean	School of Natural Sciences and Engineering, National Institute of Advanced Studies (NIAS), Bangalore.
2.	Dr. Krishna Raj, Professor	Centre for Economic Studies and Policy (CESP), Institute for Social and Economic Change (ISEC), Bangalore.
3.	Mr. G. Thirumurthy Additional Director	Central Pollution Control Board (CPCB), Regional Directorate, Bangalore.

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Udupi Power Corporation Limited

4. The reconstituted expert committee had visited and studied the thermal plant site of the project proponent and submitted its report dated 02.03.2021 to Hon'ble Tribunal on 03.03.2021 (hereinafter referred to as the "**said report**"). The Hon'ble Tribunal vide its order dated 03.03.2021, has allowed the Answering Respondent to file their objections, if any on the report of the reconstituted expert committee. Hence, the Answering Respondent is hereby submitting response / objections to the said report.

5. At the very outset, the Answering Respondent submits that the said report and methodology considered for the assessment of the Environmental Compensation are factually incorrect and unscientific and therefore, the findings and recommendations of the reconstituted expert committee in the said report are unreliable, faulty and devoid of merit and hence, the said report be rejected,. Further, any observation and recommendation or any averment of the said report against the Answering Respondent that is not specifically denied, shall not be construed as an admission by the Answering Respondent.

6. The Answering Respondent submits that the reconstituted experts committee had visited the thermal power plant site of the project proponent on 09.12.2020 for the inspection and conducting study of the compliance of the statutory environmental conditions / norms and environmental management. It is pertinent to note that even before

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completing the said study, the reconstituted experts committee had already made their mind with preconceived notion to impose heavy environmental compensation on the project proponent. In this regard, the local press has published the statements of the members of the reconstituted experts committee on 09.12.2021 and same are collectively annexed hereto as **ANNEXURE-R-1**.

7. At the outset it is submitted that the Report of Reconstituted Expert Committee suffers from the vice of violation of principles of natural justice in that it has not called for the response/comments from the project proponent or had any discussion regarding application of the formula to assess the damage to health adopted in respect of illegally run and environmental standards non-compliant stone crushers instead of non-compliance based formula; adopting the cost of illness without reference to Udupi district; number of illness considered; not conducting source apportionment study; and placing reliance on working paper 485: economic examination of health and productivity impacts of traffic congestion: A case of Bengaluru city. If only the principles of natural justice had been followed, the project proponents could have placed the material before the Reconstituted Expert Committee. That the said report submitted by the reconstituted expert committee suffers from many flaws, wrong assumption, methodology and approach which lead to assessment of exaggerated and exponential Environmental Compensation and so, there are valid and substantiable reasons to reject the observations and recommendations of said report and same be rejected,. The

response / objections of the Answering Respondent to the said report are *inter-alia*:

I. **Because direction of the Hon'ble Tribunal under para 145 and 146 of the judgment and order dated 14.03.2019 misinterpreted by the reconstituted expert committee.**

8. That the Hon'ble Tribunal had constituted an expert committee vide its judgment and order dated 14.03.2019 with direction that:

> **"145..... The need of the hour is to explore such measures and steps that would mitigate the harm already caused in addition to ensuring that the plant operates strictly within the environmental norms. We thus invoke the "Polluter Pays" principle under Section 20 of the National Green Tribunal Act, 2010 and hold M/s. Udupi Power Corporation Ltd., the Respondent No. 5, project proponent, liable to pay Environmental Compensation which shall be assessed by a Committee of Experts .....**
>
> **146. The Committee shall assess the environmental damage on account of the environmental violations in the areas of fly ash management, ash pond, ambient air quality, fugitive emissions, etc. which undoubtly has caused severe damage to the**

environment and the ecology of the area and submit its report within three months."

9. The reconstituted expert committee has changed the entire scope and mandate given by the Hon'ble Tribunal to assess the environmental damage on account of the environmental violations. The alleged environmental violations should be limited to alleged violation of environmental norms and permissions such as Consent to Operate and Environmental Clearance. Hon'ble Tribunal has reconstituted the expert committee vide its order dated 20.02.2020 as directed in the order dated 14.10.2019 .....***5. When compensation will have to be assessed in respect of particular industry, the expert must be of such a person that he must have expertise on that field. So we direct the Indian Institute of Science, Bangalore to depute a suitable person who has expertise in thermal power plant and allied subject in dealing with its impact on environment for the purpose of assessing compensation in place of Dr. Hoysala N. Chanakya who is already deputed.....6. The Committee is also directed to get the assistance of Dr. Zareen Bagum, Associate Professor, Department of Economics, Madras School of Economics, Chennai who is not present without whom the Committee should not be said to be completed. So further study will have to be done by the Committee in the presence of these persons and after considering the objection raised by the applicant to the earlier report dated 17.07.2019 and make appropriate exercise in revisiting the compensation fixed...*** There was

no direction by the Hon'ble Tribunal to change in the scope of the assessment of the environmental damages. The scope of the assessment of the environmental damages by the erstwhile expert committee which had submitted its report on 17.07.2019 and the scope of the reconstituted expert committee must remain same. However, the reconstituted expert committee traveled beyond the scope of study, without the mandate from the Hon'ble Tribunal, and arbitrarily changed and enlarged the scope and terms of reference of the assessment of the alleged environmental violation and assessment of environmental damages. This is not permissible and, on this account, alone, the said report is not tenable and liable to be rejected.

10. The erstwhile expert committee which had submitted its report on 17.07.2019 and a response / objection to same was filed by the applicant on following grounds:

10.1. Firstly, the committee inspected the plant on 06.06.2019, which is south west monsoon period. During monsoon, pollution levels will be masked and this effect is called the "washout effect".

10.2. Secondly, out of the 3 member committee, one member from the Madras School of Economics, Dr. Zareena Begum was not even present during the inspections.

10.3. Thirdly, Dr. H. N. Chanakya, who happens to be the expert from IISc is not in any way related to this subject matter. Dr. Chanakya's profile as available on IISC's own website shows that his specialisation is cattle dung

based bio gas utlisation. The report is thus not an expert report and subject matter competence is essential.

11. Considering the objection of the applicant, the Hon'ble Tribunal had reconstituted the expert committee vide order dated 20.02.2020 and 08.06.2020.

12. Upon submission of report by the erstwhile expert committee and filing of the response / objection to same by applicant, the Hon'ble Tribunal had heard the matter on 14.10.2019 and 20.02.2020. The Answering Respondent had filed an affidavit being M.A. No.01 of 2020 and same was heard and disposed of vide order dated 20.02.2020. The extract of relevant part of the orders dated 14.10.2019 and 20.02.2020 are as under:

Extract of order dated 14.10.2019:

"3. The Counsel appearing for the applicant submitted a memo stating that the compensation assessed is not proper; the Committee has not considered a statutory violations in respect of emission norms which a thermal power plant has to comply with. Further one of the Member suggested by this Tribunal was not present when the Committee inspected and submitted its report. It is also mentioned in the memo of objections that one of the Member appointed, namely, Dr. Hoysala N. Chanakya is not an expert on the subject of assessing compensation in respect of Thermal Power Plant but he has done specialization in Biogas, Decentralized/Sustainable rural energy, Water Purification and Appropriate Agricultural Technologies and so he is not a competent person to assess the damage in respect of the industry in question.

.....

6. ..... The Project Proponent as well as applicant are a liberty to submit their views before the Committee in this regard.

.....

9. Merits of the submission made by the Counsel for the applicants in his memo have not been considered by thus Tribunal that has to be gone into by the Committee and take appropriate call on the same in accordance with law."

Extract of order dated 20.02.2020:

"9. The project proponent has filed an application to modify the Order dated 14.10.2019 to the extent that memo filed by the petitioner which is directed to be considered by the committee constituted by this Tribunal expands the scope of terms and reference and that should not be allowed. So they wanted to modify the order to that extent.

.....

12. As regards the objection raised by the project proponent is concerned we have gone through Paragraph No. 146 of the order stating the things to be considered by the committee. It says that environment violations in the area of fly ash management, ash pond, Ambient Air Quality, Fugitive emission etc. which undoubtedly has caused severe damage to the environment and ecology of the area and submit its reports. So, that issue includes violation in respect of fly ash management etc.

13. Counsel appearing for the project proponent submitted that objection raised in the Para. No.6 to 8 is beyond the scope of the committee as it goes against the terms of reference. The prayer in Para. No.7 is to direct the committee to consider the question of recommending closure and prosecution as mandated under Section 21 and 37 of the Air (Prevention and Control of Pollution) Act, 1981 and the committee has proceeded to compute

nominal compensation for the plant that has come into the existence illegally. The committee cannot consider the question as to whether the unit has to be closed and whether the prosecution has to be launched against the unit. It is for the regulating authority to consider independently if they feel that apart from imposing compensation, other penal action will have to be taken against the unit for violation, if any, found by them. So, the committee need not go in to these aspects.

14. As regards objection in Para. No.8 is concerned, that in a way mentions about the violation committed by the unit in respect of fly ash management which according to them likely to affect the environment.

15. So, it cannot be said that the committee cannot go into that question as this is also one of the things to be considered by the committee for the purpose of assessment of environmental compensation considering its impact on environment.

16. So, there is no need to make any modification directing the committee not to consider the objection in Para No. 8 of the memo of objection as claimed in the petition filed by the project proponent. With the above modification this M.A. No.01 of 2020 is disposed of.

17. The committee shall submit the report complying with the direction of this Tribunal within a period of two months."

13. The erstwhile expert committee had already considered the assessment in terms of the para 146 of the judgement and order dated 14.03.2019. The reconstituted expert committee was not required to go=into the environmental damages on account of the violation of environmental norms as the project proponent has been complying with the prescribed norms and submitting the six monthly compliance report with KSPCB and MoEF&CC. The reconstituted expert committee has gone into

assessment of Environmental Compensation on account of health issue, impact on ecology, environment, loss of fish, agriculture crop loss and cattle death and has enlarged the scope of terms of reference and same is not allowed.

II. **Because one of the members from the CPCB, Mr. G. Thirumurthy has difference of opinion and not signed the said report dated 02.03.2021.**

14. That the re-constituted committee has visited the site on 07th, 08th and 09th December 2020 and filed its report on 03.03.2021. One committee member Mr. G. Thirumurthy, Additional Director, Regional Directorate, CPCB, Bangalore has difference of opinion from the other two committee members Dr. R. Srikanth from NIAS and Dr. Krishna Raj from ISEC and therefore, Mr. G. Thirumurthy has not signed the said report AND the covering letter. The committee member from CPCB was one of the committee members of erstwhile expert committee which had submitted earlier committee report on 17.07.2019 and same was signed by Mr. G Thirumurthy. The striking reasons for the dissent opinion are enumerated in the said report. The committee member from CPCB Mr. G Thirumurthy has dissented his opinion on approach and the assessments of the environmental compensation by the other two members of reconstituted expert committee and given his opinions as under:

"11. DIFFERENCE OF OPINION OF THE COMMITTEE MEMBER FROM CPCB

1. The Committee members from NIAS and ISEC have considered total number of patients in the area during plant operation years (however, since Unit 2 instead of Unit 1) for calculation of health based EC. The Committee member from CPCB is of the view that normal prevalence of the diseases which are expected even if the plant was not there may have been considered and accounted to arrive at the incremental number of patients which may be attributed to air pollution from the plant.

2. The Committee members from NIAS and ISEC have informed that the costs of illnesses are as per the working paper - Vijayalakshmi and Krishna Raj 2020, "Economic Estimation of Health and Productivity Impacts of Traffic Congestion: A Case of Bengaluru City" However, it is found that the costs of illnesses considered are not available in the said working paper. The Committee member from CPCB is of the view that the approach used in the reports submitted in O.A.739 of 2018 and O.A. 30 of 2020 (SZ) may have been used.

3. The Committee members from NIAS and ISEC have recommended the health based EC to be in addition to the non-compliance based EC of 4.89 Crores. The Committee member from CPCB is of the view that EC may have been recommended on the basis of only one of the two approaches (the maximum one)".

15. It is respectfully submitted that as the applicant had objected to the earlier committee report mainly on ground that the one member Mrs. Zareena Begum was not present during the inspection and therefore, the report is faulty. Therefore, based on the same principle, the report of the reconstituted expert committee should also be considered as faulty. In view of this

reason alone, the said report is also not maintainable same cannot be considered as report of committee of Experts in terms of the direction under para 146 of the judgement and order dated 14.03.2019 and same be not considered for the assessment of the Environmental Compensation and needs to be rejected categorically.

III. **Because there is gross violation of well settled principles, approach and methodology to assess the Environmental Compensation based on "Polluter Pays Principle" enshrined under section 20 of the NGT Act, 2010.**

16. The erstwhile expert committee had estimated the Environmental Compensation based on "Polluter Pays Principle" under section 20 of the National Green Tribunal Act, 2010 ("NGT Act, 2010") and the approach / methodology / formulae developed by CPCB for non-compliance based environmental compensation and same approach / methodology / formulae is well established and being widely used to assess the environmental damages / compensation in case of non-compliances of environmental norms by the project proponent in various industries. The reconstituted expert committee relied on the methodology prepared by the CPCB for assessing the environmental compensation based on the Hon'ble Tribunal direction in the matter of **O.A. 593/2017 (WP) (Civil) No 375/2012, (Paryavaran Suraksha Samiti Vs Union of India)**. The cases considered for levying the environmental compensation are:

a) Discharge in violation of consent conditions, mainly prescribed standards / consent limits.

b) Not Complying with the directions issued, such as direction for closure due to non-installation of OCEMS, non-adherence to the action plans submitted etc.

c) Intentional avoidance of data submission or data manipulation by tampering the online continuous emission/ effluent monitoring systems.

d) Accidental discharges lasting for short durations resulting into damage to the environment.

e) Intentional discharges to the environment – Land, Water and Air resulting into acute injury or damage to the environment.

f) Injection of treated/ partially treated / untreated effluents to ground water.

17. The norms for the above cases are covered under The Air (Prevention and Control of Pollution) Act, 1981 ("**Air Act**") and The Water (Prevention and Control of Pollution) Act, 1974 ("**Water Act**"). The general conditions as well as special conditions are well embodied in the statutory consents issued to the project proponent under the Air Act and Water Act by the State Pollution Control Board to ensure the compliance of the statutory norms by the project proponent during the establishment and operation of the industrial unit. In present case, MoEF&CC had issued the Environmental Clearance dated 09.09.2009 ("**EC 2009**") and Environmental Clearance dated 01.09.2011 ("**EC 2011**") under the EIA Notification 2006 inserting conditions to compliance the statutory norms as per

The Environment (Protection) Act, 1986 and further, Karnataka State Pollution Control Board (in short "**KSPCB**") had issued Consent for Operation dated 19.05.2010 ("**CFO**") (as extended or renewed from time to time) inserting conditions to comply with the statutory norms as per Air Act and Water Act. The Hon'ble Tribunal had, under para 146 of the judgement and order dated 14.03.2019 directed for the constitution of a Committee of Experts and assessment of the alleged environmental damages on **account of the environmental violations in the areas of fly ash management, ash pond, ambient air quality, fugitive emissions, etc.** For the purpose of the alleged non-compliances of the environmental norms and cast the liability on the Answering Respondent based on the Polluter Pays Principle, the adequacy and sufficiency of conditions under the aforesaid Environment Clearances and Consent to Operate must be compared with the direction of the Hon'ble Tribunal under para 146 of the judgement and order dated 14.03.2019 in order to check whether the proper and adequate safeguards are provided or not. The table below compares the direction of the Hon'ble Tribunal under para 146 of the judgement and order dated 14.03.2019 and conditions / norms embodied under aforesaid Environment Clearances and Consent to Operate.

Sr. No.	Direction under para 146 of the judgement dated 14.03.2019 – committee of experts to assess environmental damage on account of alleged :	Relevant conditions / environmental norms as per EC to ensure the compliances by the project proponent	Relevant conditions/ environmental norms as per Consent to Operate to ensure the compliances by the project proponent
1.	Violations in the areas of fly ash management, ash pond, fugitive emissions	- **EC 2009** Cond. vi "100% fly ash and gypsum utilization shall be ensured from 4th year onwards." – **Complied** - **EC 2009** Cond. viii "Regular monitoring of ground water in and around the ash pond area including heavy metals....." – **Being complied** - **EC 2011** Sp. Condi. viii "Fly ash shall be collected in dry form and storage facility (silos) shall be provided. Unutilized fly ash shall be disposed off in the ash pond in the form of slurry....." – **Being complied** - **EC 2011** Sp. Condi. ix "The transportation of dry fly ash to the ash	- **CFO (2015)** Table Sl. No. 1 "Ash Pond overflow shall meet the Standard Stipulated in Annexure III before discharge in Guard Pond" - **CFO (2015)** Sec II Cond. 8 "The applicant shall not allow the ash pond to dry. Always a film of water shall be allowed to stagnate over the collected ash." - **CFO (2015)** Sec. H. Cond. 2 "The applicant shall provide with water sprinkling arrangement in ash pond area to avoid any fugitive emission due to wind"

		disposal area through closed bulkers……." – **Being Complied** - **EC 2011** Sp. Condi. xi "No leachate shall take place at any point of time from the Coal storage area and Ash Pond and adequate safety measures such as lining with impermeable membrane / liner shall be adopted….." **– Being Complied** - **EC 2011** Sp. Condi. xii "Fugitive emission of fly ash (dry or wet) shall be controlled so that no agricultural or non-agricultural land is affected……."– **Being Complied** - **EC 2011** Sp. Condi. xxii "Green belt of adequate width and density with suitably selected native species should be developed all around the plant area and the ash disposal site." – **Being Complied** - **EC 2011** G. Condi. vii "Regular monitoring of ground	

		water level shall be carried out by establishing a network of existing wells and constructing new piezometers. Monitoring around the ash pond area shall be carried out particularly for heavy metals...." – **Being Complied**	
2.	Violations in the areas of ambient air quality	- **EC 2011** G. Condi. ix "Regular monitoring of ground level concentration of SO2, NOx, PM2.5 & PM10 and Hg shall be carried out in the impact zone and records maintained....." – **Being Complied** - EC 2011 G. Condi. xvi "The proponent shall upload the status of compliance of the stipulated environmental clearance conditions, including results of monitored data on their website and shall update the same periodically....." – **Being Complied**	- **CFO (2015)** Sec. D. Cond. 12 "The applicant shall provide adequate dust control measure for coal handling area and coal transfer points." - **CFO (2015)** Sec. E. (II) Cond. 3 "The applicant shall establish adequate number of ambient air quality monitoring stations both in the core zone and in the radius of impact a representative station to monitor....."

The Answering Respondent has been submitting the six monthly compliance report to MOEF&CC since commissioning of the thermal power plant. If the project proponent is found to be in violation of the conditions, MoEF&CC and KSPCB has the authority to act and levy penalty in accordance the provision of EPC Act, Air Act and Water Act. The Answering Respondent cannot be held liable for the penalty more than what are statutorily prescribed. From the perusal of the above table, it is clear that adequate conditions are prescribed and in place in the EC 2009, EC 2011 and CFO for complying with the environmental norms by the project proponent and same are compiled and being complied with by the project proponent. In this respect, the erstwhile expert committee had considered the cases of non-compliance for direction and accidental discharge to estimate environmental compensation. The erstwhile expert committee had mentioned the direction issued by KSPCB i.e., over the period of time are for (i) proper management and disposal of fly ash, (ii) reducing fugitive dust emission from coal handling by providing wind barriers installation of dry fog system, (iii) drift eliminator for cooling tower to reduce drift loss (iv) proper management of wastewater and desilting of storm water drains (v) proper operation of STP (vi) construction of retaining wall to avoid coal sliding(vii) Rain water harvesting (viii) tree plantation for increase green cover (ix) OCEMS connectivity to CPCB (x) Proper management of ETP sludge (xi) providing oil spill kits with boom to managing oil leakages etc. Accordingly, Environmental Compensation towards

environmental damages on account of the environmental violations was estimated based on the following formula developed by CPCB:

EC=PI*N*R*S*LF

Where,

PI - Pollution Index of industrial sector,

N - Number of days of violation took place

S - Factor for scale of operation

R - A factor of Rupees for EC

LF - Location Factor

* Pollution Index (PI): M/s UPCL is falling under the category of Red, accordingly the average PI suggested is 80

* Number of Days of violation took place (N): The details of noncompliance period are:

Non-Compliance Period		**Number of Days**
From	To	
15.10.2011	08.10.2015	1454
10.02.2016	04.08.2016	176
Total Days		1630

* A factor of Rupees for EC (R): As suggested in the report i.e. Rs.250

* n Factor for scale of operation (S): Large category and the factor is 1.5

* Location Factor (LF): The total population is < 1 Million and the factor is 1.0

According to above factors:

EC=PI*N*R*S*LF =80*1630*250*1.5*1 = Rs. 48,900,000

18. In section 3.0 of the said report, it is stated that .....***the earlier expert committee estimated the Environmental compensation considering violation of consented conditions and noncompliance of the directions and notices, accordingly estimated Environmental Compensation was Rs. 4.89 Crores***.....
The reconstituted expert committee has considered no. of non-compliance days as a factor for calculating the Environmental Compensation. The reconstituted expert committee has in addition to the above Environmental Compensation also considered environmental damage on account of damage to Agricultural / Horticultural Crops and Health of the people in the 10 km surrounding villages from thermal power plant of the Answering Respondent. The reconstituted expert committee decided to estimate the Environmental Compensation based on the incidence of airborne respiratory diseases diagnosed in the Government Primary Health Centres in 15 villages identified by the District authorities to be within 10 km of the thermal power plant of the Answering Respondent. The following formula was used to assess the Environmental damage to Health (Damage H): Damage H (in Rupees) = No of Cases Reported (X) * COI Affected Area. As per section 3.0 of said report, methodology for assessing Environmental Compensation, the reconstituted expert committee relied on the methodology prepared by CPCB for assessing the environmental compensation based on the Hon'ble Tribunal direction in the matter of O.A.

593/2017 (WP) (Civil) No 375/2012, Paryavaran Suraksha Samiti Vs. Union of India. Accordingly, the Environmental Compensation (EC) is estimated considering one of cases (a) Discharge in violation of consent conditions, mainly prescribed standards / consent limits. It is pertinent to mention that the Answering Respondent is complying with the Conditions prescribed in Environmental Clearances and Consent for Operation and their subsequent amendments and renewals since the commission of the thermal power plant. Therefore, just for the sake of justifying the allegations of the applicant, the Answering Respondent should not be penalised discriminately by imposing heavy Environmental Compensation. The approach of reconstituted expert committee is unfair and arbitrary.

19. The approach and methodology developed by CPCB for the assessment of the Environmental Compensation for the non-compliance is applicable to all industries and not distinguished for the thermal power plants and therefore, this methodology for assessment of Environmental Compensation was rightly considered and applied by erstwhile expert committee for the assessment of the Environmental Compensation and assessed same to be at Rs. 4.89 Crores. However, the reconstituted expert committee has assessed and estimated the Environmental Compensation to be Rs. 74.93 Crores which is ex-facie exponential and exaggerated. The reconstituted expert committee cannot be allowed to disregard scope of assessment, direction of Hon'ble Tribunal and well-established norms. The reconstituted expert committee has

adopted and applied the approach / methodology which is neither enshrined in the Statutes nor established or followed principally for the thermal power plants. The Answering Respondent submits that the assessment of environment damages and computation of Environmental Compensation ought to be calculated on the formulae developed by CPCB only as done earlier by the earlier committee of expert.

IV. Because the re-constituted expert committee has not found any serious violation of environmental norms and any breach in the environmental management plan and practices followed by the Answering Respondent.

20. At section 8.0 of the said report, it is stated that the Expert Committee inspected the environmental management practices followed by UPCL with respect coal handling, unloading operations, stacking and reclaiming facilities, fly ash handling system, ash pond, surface runoff management, ground and ambient air quality monitoring, source emission monitoring and fugitive emissions control system etc. The status of the same is tabulated in table 12. On perusal of same, it is clear that the status of the management plan is found satisfactory and complying with the norms and standards. Particularly, the committee has not found any violation in area of fly ash handling and ambient air quality monitoring. Even the committee observed that the unit started achieving 100% fly ash utilization and the unit has closed part of the ash dyke and rehabilitated the same with plantation to

control dust emissions. The committee further observed that the overall ambient air quality monitoring results reveals that SO2, NO2, PM10 and PM2.5 are found complying with the Ambient Air Quality Standards.

21. At section 10.0 of the said report, the reconstituted expert committee has provided observations and recommendations and against same the response of the Answering Respondent is as under:

No.	OBSERVATIONS AND RECOMMENDATIONS BY RECONSTITUTED EXPERT COMMITTEE	RESPONSE OF THE ANSWERING RESPONDENT
1.	The environmental impact on ecology, environment, loss of fish, agricultural crop loss and cattle deaths, data are insufficient and also requires an independent study for estimation of environmental compensation	Department of Agriculture, Horticulture and Animal Husbandry has already provided their data and there is no significant finding or remarkable change in the statistics over the last many years.
2.	M/s UPCL has started operating Plant Load Factor (PLF) of >70% of its installed capacity i.e. 2 X 600 MW from 2012-13 to 2016-17 and has been continuously declining from 2017 -2018 to till date due to lower-cost power is available in the state. The avera PLF during 2019-2020 was just 31.10 % which has further declined to 21 percent during the first nine months (April-December 2020) of the current financial year.	The project proponent operates its thermal power plant as per schedule provided by SLDC. The average PLF during 2019-20 was less because of lesser number of days of operation of plant. But whenever the plant operates it operates on PLF more than 70% most of the times.
3.	The Ambient Air Quality Monitoring carried out in four villages i.e. R&R colony, Admar at 1.9 km towards NW, Mudurangadi at 2.8 km towards NE, Inna village at 4.8 km towards SE and Hejmady at 7.2 km towards SW from the UPCL stack at the Plant Load Factor ranging between 72.5% to 79.97% revealed that ambient air quality monitoring results of SO2, NO2, PM10 and PM2.5 are found well within the prescribed limits and complying with the ambient air quality	ESP and other pollution control system were installed right from the beginning of commissioning of the thermal power plant (and not recently) and are being maintained and operated to comply with all statutory standards. There is no basis to come to the conclusion that the local communities have undeniably suffered major health related impacts in the past

	standards (24 Hours average) of National Standards. This may be due to the improvements in the environmental management system of UPCL in recent years, though the local communities have undeniably suffered major health-related impacts in the past.	
4.	The ground water samples of Open Wells monitored in the villages of Yelluru revealed that the TDS, Chloride, Hardness levels. are high in the Open well located in the Agricultural field, whereas these levels are very low in the Open wells located near the houses. This may be due to entry of agricultural runoff in to the open well located in the agricultural field. However, there is no significant ground water contamination and the ground water quality samples collected from the open wells are conforming to the IS 10500: 2012 standards. This may be due to the improvements in the environmental management system of UPCL or due to the low operation level of the plant in recent years. Nevertheless, these improvements need to be sustained even when the plant generation increases in future.	The project proponent has been and shall continue to comply with statutory standards.
5.	As per the records of Agricultural Department, the area coverage of Kharif (Rain fed paddy) and Rabi (Black gram) was highest during 2009-10 i.e. 3211 ha and 268.64 ha respectively. But, thereafter under rain fed paddy during Kharif and black gram during Rabi has shown	Office of Joint Director of Agriculture, Rajathadri, Manipal, Udupi District has already provided their data and there are no significant finding and no remarkable change in average yield of paddy over last 11 years starting from 2008-2009 to 2019-2020 and also as per yield statistics information

	sharp declining trend till 2014-15. Later, area coverage of Kharif and Rabi increased during 2015 – 2017 and again started reducing. The exact reasons for declining area of cultivation are not evident in the information submitted by the District authorities. On the other hand, it is observed that there is no remarkable change in the productivity of Paddy & Black gram over the last 11 years as per the yield statistics reported by the Department of Economics and Statistics of the Government of Karnataka. Also reported that the decline in the area of paddy and black gram was not only a trend in the surrounding village of UPCL but also this is a phenomenon noticed in the entire Udupi District. The limitation is that the department is not having yield statistics of individual farmers which may be ascertained from the panchayat or through plot-wise crop cutting surveys. Therefore, a separate study is required to assess the crop yield loss in the 10 km radius of the UPCL.	obtained from Department of Economics and Statistics. There is no drastic changes in the productivity of blackgram over a 11 years period of time.
6.	The soil characteristic of Electrical Conductivity (EC) in all 24 villages of Udupi Taluk and Karkala Taluk located in the surroundings of M/s UPCL is found < 2 dS/m, concluding that salinity effect is insignificant and complying with nonsaline Class. Hence, it can be concluded that Soil Electrical Conductivity of soil is found to be normal in villages around UPCL,	The Answering Respondent do not offer any comment.

	and no noticeable impact due to sea water evaporation from the cooling tower which has been retrofitted with a drift eliminator to control the impact of sea water on the crops cultivated in the area around UPCL that was noticeable earlier.	
7.	As per the records of Horticultural Department, there is no crop loss reported in the surrounding areas between 2008-09 to 2019-20 and with the existing data, there is no drastic change in the cropping pattern before and after commencement of M/s UPCL. The limitation is that the Department is not having yield statistics of individual farmers which may be ascertained from the panchayat or through plot-wise crop-cutting surveys. Therefore, a separate study is required to assess the crop yield loss in the 10 km radius of the UPCL.	Office of Deputy Director of Horticulture (ZP), Udupi has already provided their data and there is no significant finding.
8.	The Department of Animal Husbandry & Veterinary Services, Udupi submitted that there was no record of Animal Death due to environmental pollution in the villages/ taluks of Udupi located in 10 km radius of UPCL.	Office of Deputy Director, Animal Husbandry & Veterinary Services, Udupi District has already stated in their letter dated 23.12.2020 that no animal deaths reported from the year 2008 to 2020 (upto 18.12.2020). So, there is no significant findings.
9.	As per the health records of the Government-owned Primary Health Centres in the 33 villages around the UPCL plant, air pollution-related diseases have increased significantly in the villages located within a 10 km radius from the UPCL. As per the Government	There are other sources of pollution in the area of study that have not been considered by the reconstituted Committee of Experts and same cannot be denied. The reconstituted Committee of Experts has not considered source apportionment study of pollution in the 10 Km area

	records submitted to the Committee. The prevalence of air and water-borne diseases are decreasing with increasing distances from the UPCL which demonstrates the impact of UPCL operations on the health of the villagers living within 10 km of the UPCL plant.	of UPCL thermal power plant and the details on the cost of illness are not provided under the study referred by the committee (the working paper - **Vijayalakshmi and Krishna Raj 2020, "*Economic Estimation of Health and Productivity Impacts of Traffic Congestion: A Case of Bengaluru City*") as referred by the reconstituted Committee of Experts.
10.	UCPCL has introduced Adani Aarogya Card / Health Insurance scheme to the Villagers of Yelluru and Mudarangadi / Santoor villages covering more than 9500 villagers for cashless medical treatment (up to a sum insured of Rs. 50,000 per year) in multispecialty hospitals. This was confirmed by a few villagers in one of the villages visited by the Expert Committee inspection.	This is being done under CSR programme of the Answering Respondent and is continuing.
11.	The earlier expert committee estimated the Environmental Compensation (EC) of Rs. 4.89 crores to be paid by UPCL considering the documented violations of consent conditions and noncompliance to the directions and notices issued by KSPCB and/or other Authorities to UPCL. The re-constituted Expert Committee adopted the CPCB methodology and has assessed the Environmental Compensation on the basis of any damage inflicted on Agricultural / Horticultural Crops and the health of the people in the 10 km surrounding villages from UPCL in addition to the EC	The Environmental Compensation of Rs. 4.89 Crores was estimated on the basis of time taken to comply with the directions / observations from the date of direction / observation by the KSPCB. These observation and direction were not a part of Environmental Clearances and Consent for Operation. Hence, directions were issued for improvement in environmental management rather than non-compliance as alleged by the reconstituted Committee of Experts. The reconstituted Committee of Experts has estimated the Environmental Compensation on the

	estimated by the earlier expert committee. Since there is no noticeable loss of Agricultural / Horticultural Crops as per the District Authorities, the committee estimated the EC based on the Health Status of the people in the surrounding villages located within a 10 km distance from UPCL as per the Authorities.	basis of health status of the people without source apportionment and using reference from a study (the working paper - **Vijayalakshmi and Krishna Raj 2020, "*Economic Estimation of Health and Productivity Impacts of Traffic Congestion: A Case of Bengaluru City*"**) where details are not available in the referred study.
12.	Accordingly, considering cost of illness related to air borne diseases, the estimated EC is Rs. 70,04,10,828 (Rupees Seventy Crores, Four Lakhs, Ten Thousand and Eight hundred Twenty Eight only). To this amount, the Committee has added the EC of Rs. 4.89 Crores assessed by the earlier Committee on account of recorded non-compliance of consents/clearances by UPCL in the past which may have resulted in crop damages to the local communities in the past. Therefore, the total Environmental Compensation to be paid by UPCL is estimated to be Rs. 74.93 Crores (Rupees Seventy Four Crores and Ninety Three Lakhs only).	The Environmental Compensation estimated by the reconstituted committee of experts of Rs. 70,04,10,828 is being challenged through this affidavit on the grounds inter-alia (1) source apportionment study of pollution is not considered or conducted in the 10 Km area of UPCL thermal power plant and (2) the details as the cost of illness are not provided under the study (the working paper - **Vijayalakshmi and Krishna Raj 2020, "*Economic Estimation of Health and Productivity Impacts of Traffic Congestion: A Case of Bengaluru City*"**) as referred by the reconstituted Committee of Experts. (3) The formula applied to illegally run stone crushers cannot be applied to legally established thermal power plant complying with norms laid down in EC and CFP
The re-constituted Expert Committee suggest the following for the improvement and better co-ordination of people, department and the industry for the sustainable development of the people living in the area surrounding UPCL:		
13.	All the Environmental Monitoring Data of UPCL shall be made available to the Village panchayats located in the surroundings of	The project proponent has been putting the Environmental Monitoring Data on the Website as part of

22. From the response of the Answering Respondent, it is apparent that the project proponent and the unit are complying with the environment norms and standards. Now the question arises that if the project proponent has been complying with the environmental norms and prescribed statutory conditions then how the project proponent and unit is damaging the environment in violation of the environment norms? This question is not dealt with by the reconstituted expert committee in their report filed on 03.03.2021 with the Hon'ble Tribunal.

V. **Because formula and non-compliance based methodology developed by CPCB for assessment of Environmental Compensation is for improvement of the Environment in case there are violation in statutory conditions under Consents issued by statutory authorities. However, the reconstituted expert committee has adopted and applied mechanism for assessing the damages to health as developed by CPCB in O.A. no. 739 of 2018 (Residents of Gram Panchayat Varahiya vs. State of M.P.) which is primarily dealing with the remedial action against dust pollution by illegal operation of stone crushers and same cannot be applied for thermal power plant.**

23. It is submitted that the non-compliance based formula and methodology developed by CPCB for assessment of Environmental Compensation is for improvement of the

Environment in case there are violation in statutory conditions under Consents issued by statutory authorities. However, the reconstituted expert committee has adopted and applied mechanism for assessing the damages to health as developed by **CPCB in O.A. no. 739 of 2018 (Residents of Gram Panchayat Varahiya vs. State of MP)** which is primarily dealing with the remedial action against dust pollution by illegal operation of stone crushers at Village Tilora, Rausa, Tehsil Mehar, District Satna at NH-7 (New Four lane) in the State of Madhya Pradesh. The facts and circumstances of the case is different from the present case. It is submitted that the mechanism for assessing the damages to health as developed by CPCB in O.A. no. 739 of 2018 cannot be adopted, applied and accepted on following amongst other grounds:

a) The reconstituted expert committee has not laid valid reason as to why the non-compliance based methodology developed by CPCB for assessment of Environmental Compensation as applied by the erstwhile expert committee shall not be applicable.

b) The said report is prepared by reconstituted expert committee members Dr. R. Srikanth from NIAS and Dr. Krishna Raj from ISEC with predisposed mindset that the thermal plant of the Answering Respondent is the only source of pollution and inflicting the health issues in 10 km area.

c) The concentration of pollution and impact area for the stone crusher plant and a thermal power plant are different.

d) There is allegation of illegal operation of stone crusher plants whereas the thermal power plant was established and being operating in compliance with applicable law. The Answering Respondent has been complying with and filing six monthly compliance reports regularly with KSPCB as required under the conditions of the Consent to Operate for compliances under the Air Act and Water Act.

e) The Answering Respondent has been complying with and filing six monthly compliance reports regularly with MOEF&CC as required under the conditions of the Environmental Clearances.

f) The Answering Respondent has been complying with necessary direction issued by KSPCB from time to time.

g) The Answering Respondent has installed and operating online CEMS, ESP, CAAQMS for monitoring and controlling the pollution parameters under their limits.

h) As stated in the section 3.1 of the said report, the reconstituted expert committee relied on the mechanism for Assessment of Health Issues developed by CPCB in O.A. 739 of 2018 (Residents of Gram Panchayat Varahiya V. State of M.P. & Ors) (Air Pollution due to Stone Crushers) and requirement of information to arrive / estimate damage assessment of Health Issues. In this matter of O.A. 739 of 2018, CPCB had filed report dated 30.08.2019 on **mechanism for "*Assessment of***

damage to air quality*", "*damage assessment of health issue*" and "*agriculture production loss*" w.r.t. stone crusher in compliance of order dated 30.05.2019 of Hon'ble Tribunal.** This report dated 30.08.2019 at section 2 states about "Damage Assessment of Health Issues***" and further states about major health issues associated with the pollution caused by the stone crushers are respiratory infections such as aggravation of Asthma, respiratory symptoms and increased in hospital admission and considered damage assessment based on cost of illness approach. This report dated 30.08.2019 does not even mention about Cancer and Bronchitis which are negligently considered by this reconstituted expert committee in their said report dated 02.03.2021. Further, this report dated 30.08.2019 relied upon by the reconstituted expert committee has relied upon the damage assessment of health issues based on cost of illness approach which is adopted from the reference document by **Srivastava, A and Kumar, R (2002) - "*Economic Valuation of Health Impacts of Air Pollution in Mumbai", Environ. Monit. Assess. 75 : 135-143*."** This research / working paper is prepared on air pollution from traffic in Mumbai city and cannot be applicable to the present case of pollution from thermal power plant. The section 2 of the report dated 30.08.2019 provides note which state that "***Note: The sites / areas where many types of the industries are co-existing, % contribution of stone crushers for***

Particulate matter in the ambient air, may be calculated on source apportionment studies. In such cases, the contribution of the stone crusher may be calculated by multiplying the DamageH with the contribution factor for stone Crusher." Similar note is also provided in section 3 for "***Agriculture Production Loss***". The reconstituted expert committee has not considered the impact of other small and big industries, construction of national highways, other construction activities within said 10 km. area and not carried out source apportionment studies as evident from their report dated 02.03.2021. The reconstituted expert committed has assumed the entire liability of damage to health solely due to thermal power plant and has cast upon the Answering Respondent. This is wholly untenable, and the report dated 02.03.2021 may please be rejected. The CPCB report dated 30.08.2019 filed in O.A. No. 739 of 2018 (Residents of Gram Panchayat Varahiya V. State of M.P. & Ors.) is annexed hereto as **ANNEXURE-R-2** and copy of reference document by Srivastava, A and Kumar, R (2002) - "Economic Valuation of Health Impacts of Air Pollution in Mumbai", Environ. Monit. Assess. 75 : 135-143 is annexed hereto as **ANNEXURE-R-3.**

i) All the villages except village namely Adamar as considered by the reconstituted Committee of Experts are located on the nearby vicinity of the Highways which were constructed in last decade (SH-1 construction work was taken up in 2013-14 and

completed in the year 2015-16, NH-66 construction work started during 2014-15 and major works continued till 2017, SH-67 was developed during 2018-19 & 2019-20). The reconstituted expert committee has not considered the pollution effect in the ambient air quality from the construction activities of these Highways.

j) The reconstituted expert committee has not considered the lifestyle habits on the health and only considered the numbers of cases for calculation of compensation on account of damage assessment of health issue.

k) In section 3 of the report dated 30.08.2019 in O.A. No. 739/2018, it is finally held that "...***with the help of the following three equations derived in the above mechanism developed by CPCB and calculation explained in the present document, it is possible to assess the damage caused to air, public health and agricultural crops in an affected site/ area by the stone crushers operating illegally or without complying with the prescribed norms***". The reconstituted expert committee has not applied its mind that the above report is for the damage caused to air, public health and agricultural crops in an affected site/ area by the stone crushers operating illegally or without complying with the prescribed norms which is not a case in the present matter as same is related to thermal power plant. The Answering Respondent is operating the thermal power plant while complying with the prescribed norms.

l) The reconstituted expert committee members Dr. R. Srikanth from NIAS and Dr. Krishna Raj from ISEC have considered total number of patients in the area during plant operation years from 2010 to 2020 for calculation of health-based Environmental Compensation. The Committee members have not considered the normal prevalence of the diseases which are expected even if the plant was not there and may have been considered and accounted to arrive at the incremental number of patients which may be attributed to air pollution from the plant. Further, there is no rational justification given by the committee members for consideration of the period from 2010 to 2020 for calculation of health-based Environmental Compensation. It appears that the committee members had already assumed and preconceived that all the source and reason of all the diseases and pollution in 10 km area are exclusively due to thermal power plant of Answering Respondent.

m) The reconstituted expert committee member Dr. R. Srikanth from NIAS and Dr. Krishna Raj from ISEC were pre-disposed of imposing heavy Environmental Compensation on the Answering Respondent and were finding the reason for doing so.

n) The reconstituted expert committee members Dr. R. Srikanth from NIAS and Dr. Krishna Raj from ISEC have considered cost of illness as per study conducted by one of the Experts, Cost for illness of Asthma, ARI, Bronchitis and Cancer from the working paper - **Vijayalakshmi and Krishna Raj 2020, "*Economic***

Estimation of Health and Productivity Impacts of Traffic Congestion: A Case of Bengaluru City". However, on perusal of the working paper, it is found that the costs of illnesses considered is not available in the said working paper. While giving the difference of opinion, Mr. G Thirumurthy, member from CPCB also noted that the Committee members from NIAS and ISEC have informed that the costs of illnesses are as per the working paper - **Vijayalakshmi and Krishna Raj 2020, "*Economic Estimation of Health and Productivity Impacts of Traffic Congestion: A Case of Bengaluru City*"** However, it is found that the costs of illnesses considered are not available in the said working paper. Mr. G Thirumurthy, member from CPCB further states that he is of the view that the approach used in the reports submitted in O.A.739 of 2018 and O.A. 30 of 2020 (SZ) may have been used.

o) CPCP has filed report on mechanism for "Assessment of damage to air quality", "Damage assessment of health issue" and "agriculture production loss" with respect to stone crusher in compliance of order dated 30.05.2019 of Hon'ble NGT in matter of O.A. No. 739/2018 **(Residents of Gram Panchayant Varahiya Vs. State of M.P.)**. This report concludes that ***"If accepted and approved by Hon'ble NGT, the above mechanism developed by CPCB may be used to assess the damage caused by the stone crushers in the matter O.A. No. 739/2018; Residents of Gram Panchayat Varahiya versus State of MP, by the Joint***

Committee constituted in this matter." It is submitted that the approach and methodology used under this report is to assess the damage caused by the stone crushers and not by the operation of the thermal power plant, therefore, the mechanism cannot be relied upon for damage assessment of health issue caused by the thermal power plant. Surprisingly, though the said report dated 02.03.2021 contains as the copy of working paper - **Vijayalakshmi and Krishna Raj 2020, "*Economic Estimation of Health and Productivity Impacts of Traffic Congestion: A Case of Bengaluru City*"** as Annexure-7 however, same is nowhere referenced or discussed in the entire report dated 02.03.2021.

p) Without prejudice to foregoing, the Answering Respondent submits that the reconstituted expert committee members Dr. R. Srikanth from NIAS and Dr. Krishna Raj from ISEC have estimated cumulative Environmental Compensation of Rs. 74.93 Crores wherein the Environmental Compensation of Rs. 4.89 Crores as estimated by earlier committee is also added. The reconstituted expert committee members have not given any rational in adding the Environmental Compensation as estimated by erstwhile expert committee. Further, Mr. G Thirumurthy, member from CPCB while giving his difference of opinion has also pointed out that "*.....**3. The Committee members from NIAS and ISEC have recommended the health based EC to be in addition to the non-compliance based EC of 4.89 Crores. The Committee member from***

CPCB is of the view that EC may have been recommended on the basis of only one of the two approaches (the maximum one)". Therefore, without admitting the liability even if it is presumed that Environmental Compensation of Rs. 70.04 Crores is tenable even then the Environmental Compensation of Rs. 4.89 Crores is ex-facie double jeopardy, unjust, illegal, and untenable.

q) The said report of the reconstituted expert committee is admittedly not signed by the one of the members from CPCB and therefore, the entire report cannot be said to be a report prepared by the Committee of Expert of three members and therefore, entire report losses the credibility for consideration.

r) The modus for the assessment of the environmental compensation on account of environmental damage by the thermal proper plant of the project proponent should be on the Polluters Pay Principle and principle of equity and that is concept of restitution for the actual damages sustained by the environment (if any) by operation of the thermal power plant of the project proponent. However, the reconstituted expert committee has assessed the damages on the concept of penalty and fine considering the project proponent as the sole and only source of environmental damage and thereby adopting and applying the concept of punishment. This is not correct and so, the entire report be rejected.

VI. Because reconstituted expert committee has not considered the source apportionment studies

24. It is submitted that the reconstituted expert committee has not considered the source apportionment studies while assessing the environmental compensation for damage assessment of health issues etc. The reconstituted expert committee had merely made assumption that the contribution from other sources may be insignificant and therefore, the approach and methodology adopted by the committee cannot be said to be based on scientific principles but are merely based on arbitrary assumption. There has been pollution from other sources and a non -exhaustive indicative list of other industrial and construction activities having source of pollution are annexed hereto as **ANNEXURE-R-4**. These industrial and construction activities having source of pollution was not considered by the re-constituted expert committee to carry out Source Apportionment study.

25. At section 3.1 of the said report, the reconstituted expert committee has accepted that for calculating the Environmental Compensation for Health damage, the methodology demands that the sites/ areas where many types of the industries are co-existing, % contribution of particulate matter from each industry in the ambient air may be calculated based on the Source Apportionment Studies. The methodology demands contribution of each industry /activity may be calculated by multiplying the Damage H with the contribution factor from each source. On the above point, the reconstituted expert

committee members doubted whether it is possible to carry out a Source Apportionment study on the ground today to record the pollution that may have occurred during the heyday of M/s UPCL during FY 2015-16 and FY 2016-17. Hence, the Committee decided to focus on the assessment of the Environmental Compensation based on the health impacts of airborne diseases recorded by the local health centres. The relevant extract of the said report is as under:

"3.1 MECHANISM FOR ASSESSMENT OF HEALTH ISSUES

The Expert Committee had a detailed discussion about the mechanism for Assessment of Health Issues developed by CPCB in O.A. 739 of 2018 (Air Pollution due to Stone Crushers) and requirement of information to arrive / estimate damage assessment of Health Issues. Accordingly, the formula used for assessing the damage to Health due to Respiratory Diseases (Damage H) in Rupees:

Damage H = No of Cases Reported (X) * COI Affected Area

The Committee observed that since there is no separate methodology available to assess the Environmental Damage caused by a Thermal Power Plant. However, the methodology adopted for stone crushers by CPCB may be followed, since both coalfired power generation and stone crushers create airborne pollution. The methodology demands that the sites/ areas where many types of the industries are co-existing, % contribution of particulate matter from each industry in the ambient air may be calculated based on the Source Apportionment Studies. In such cases, the contribution of the each industry /activity may be calculated by multiplying the Damage H with the contribution factor from each source.

On the above point, the Expert Members doubted whether it is possible to carry out a Source Apportionment study on the ground today to record the pollution that may have occurred during the heyday of M/s UPCL during FY 2015-16 and FY 2016-17. Hence, the Committee decided to focus on the assessment of the Environmental Compensation based on the health impacts of airborne diseases recorded by the local health centres."

In view of statements of the said report, the Answering Respondent submits that when the approach, methodology and assumption of reconstituted expert committee members are doubtful, then how the report can be credible and reliable. The committee undoubtedly and unambiguously admitted that it is not possible to carry out a Source Apportionment study on the ground today to record the pollution that may have occurred during FY 2015-16 and FY 2016-17 and hence, entire approach is of the assessment of the Environmental Compensation based on the health impacts of airborne diseases recorded by the local health centres is wrong and not tenable.

26. At section 9.0 of the said report, the reconstituted expert committee states that ***"This methodology demands that the sites/ areas where many types of the industries are co-existing, % contribution of particulate matter from each industry in the ambient air may be calculated based on the Source Apportionment Studies. However, the committee made assumption that the contribution from other sources may be insignificant since there is no other "Red" category industry in the vicinity of the UPCL plant.***

Further, power generation from UPCL has recorded a steep decline from year to year from FY 2015-16 onwards due to the availability of power from other sources in Karnataka. Therefore, it was not possible to conduct a proper source apportionment study under these circumstances. Moreover, the local villages as well as the Additional District Commissioner of Udupi district (who had also served in this area earlier) recalled specific instances of the impact of pollution caused by UPCL on the villages near the plant. Due to these reasons, the Committee has considered UPCL is as single polluter / source for the purpose of estimating Environmental Compensation since the commissioning of Unit 1 of the plant in November 2011". It is submitted that there is other "Red" category industry in 10 Km. area of the UPCL thermal power plant and same are not considered by the rec-constituted expert committee. The list of other "Red" category industry is annexed hereto as **ANNEXURE-R-5**. Hence, the committee did not completely follow the methodology of CPCB and had a predisposed mindset before preparing the said report that all the pollution prevalent in the area is caused by thermal power plant of the Answering Respondent. The Answering Respondent agrees to the Environmental Compensation methodology based on "Polluter Pay Principle" as directed by Hon'ble Tribunal however, it cannot made liable to compensate for the health damage and diseases which admittedly is based on assumption and also without taking into consideration the health damage that has occurred due to cumulative impact of other pollution sources. Further

placing reliance on "specific instances" based on hearsay of some villagers and unnamed official whose claim is not supported by any documents is patently erroneous and manifestly arbitrary.

VII. Because the health status data of the villages surrounding the thermal power plant collected from the Government Health Centres provides number of patients for the diseases like Asthma, Acute Respiratory Infection (ARI), Bronchitis and Cancer already prevalent in the region before 2009 i.e., before commissioning of the thermal power plant of the Answering Respondent

27. At section 7.0 of the said report, the health status of the villages surrounding the thermal power plant of the Answering Respondent are mentioned. Further, the analysis of the health data recorded by the Government Health Centres in these villages are provided in Table 10 of the said report mentions about the number of patients reported for each identified villages located within 10 km, in between 11 to 15 km and between 16 to 20 km of UPCL shown in Table 10 (A, B, and C), Table 10 (D, E, and F) and Table 10 (G, H and I), respectively from the year 2008-2009 to 2019-2020.

i. It is apparent on the reading of the Table 10 that the diseases like Asthma, Acute Respiratory Infection (ARI), Bronchitis and Cancer were already prevalent in the region before 2009 i.e., before even commissioning of the thermal power plant of the Answering Respondent.

The said report is silent on this aspect and does not discuss the reason.

ii. The said report is also silent and does not consider that the diseases like Asthma is hereditary in nature and hence, it is genetically transmitted from parent to offspring. Also, the people fall sick of these diseases due to bad lifestyle and habits and hence, these may be the reasons of continuous spike in Asthma cases. Many studies suggest that Asthma runs strongly in families and is about half due to genetic susceptibility and about half due to environmental factors ***(Reference:https://www.who.int/genomics/about/Asthma.pdf)***. ICMR study suggests that Asthma is a complex disease with both genetic and environmental risk factors ***(Reference: https://www.ijmr.org.in/article.asp?issn=0971-5916;year = 2011 ; volume =134;issue= 2;spage=149; epage=161; aulast= Bijanzadeh)***. The Answering Respondent should not be accused and blamed for causing all Asthma cases in the vicinity of Udupi. The re-constituted Committee of Experts has not considered these factors while considering the health issue of the people for the estimation of the Environmental Compensation. Copy of the study papers are annexed hereto as **ANNEXURE-R-6.**

VIII. Because the working paper on "*Economic estimation of health and productivity impacts of Traffic congestion: A Case of Bengaluru City*" Vijayalakshmi S and Krishna Raj

published by Institute for Social and Economic Change (ISEC), Bangalore, 2020 (annexed as Annexure 7 to the report) deal with the Health effects of Traffic-related Air Pollution and Economic estimation of health cost due to Traffic-related air pollution in Bengaluru city and cannot be compared with the air pollution caused by the thermal power plant of the Answering Respondent at Udupi and same is not tenable.

28. At section 9.0 of the said report, the reconstituted committee has deliberated that they have considered the CPCB methodology for Environmental Compensation developed in O.A. 739 of 2018 & accordingly, following formula was used to assess the Environmental damage to Health (Damage H): Damage H (in Rupees) = No of Cases Reported (X) * COI Affected Area. The facts and issues in the O.A. No. 739 of 2018 are related to illegal operations of the Stone Crushers in the state of Madhya Pradesh and those are operating without valid consents and without installing the appropriate pollution control devices. Also, the pollution intensity, due to illegal operation of Stone Crushers without any pollution control device installed and no provision of chimney/stack as compared with that of thermal power plant with 99% efficient ESP with 275 meter height chimney for proper disposal of pollutant within prescribed standard limits by MoEF&CC, are two different things and hence, same methodology and approach cannot be applied as the source of pollution from thermal power plant and its impacts vary vastly in nature.

29. Most importantly, as stated in the said report in section 9, as per the study conducted by one of the Experts, the Cost of Illness of Asthma, ARI, Bronchitis, and Cancer are Rs. 8,280, Rs. 4,248, Rs. 60,000 and Rs. 1,20,000 respectively. This study by Vijayalakshmi and Krishna Raj (2020) is enclosed as Annexure 7. Accordingly, the EC is estimated as follows:

a)	**Damage H as**	**1204 X Rs. 8280**	**Rs. 99.65 Lakhs**
b)	**Damage H ARI**	**24,201 X Rs. 4248**	**Rs.1028.06 Lakhs**
c)	**Damage H bronchitis**	**9446 X Rs. 60000**	**Rs. 5667.60 Lakhs**
d)	**Damage Hcancer**	**174 X Rs. 1,20,000**	**Rs. 208.80 Lakhs**
		Total Damage H	**Rs. 7004.11 Lakhs**

However, on perusal of the said working paper on ***"Economic estimation of health and productivity impacts of Traffic congestion: A Case of Bengaluru City"*** Vijayalakshmi S and Krishna Raj published by Institute for Social and Economic Change (ISEC), Bangalore, 2020 (annexed as Annexure 7 with report) does reveal the cost of illness of Asthma, ARI, Bronchitis, and Cancer as Rs. 8,280, Rs. 4,248, Rs. 60,000 and Rs. 1,20,000 respectively. The predisposed mind of the Reconstituted Expert Committee is also evident from the fact that the Report is placing reliance on a working paper (Annexure-7) of which one of the Experts is a co-author.

NOTARY TEJAS K. MODI AHMEDABAD CITY OF GUJARAT STATE REGD NO. 1304 EXPIRY DATE 09/02/2025 GOVT. OF GUJARAT (INDIA)

Udupi Power Corporation Limited

The re-constituted expert committee has completely overlooked the health data in respect of Bronchitis, the number of people affected as per the data provided by the health department has significantly reduced during the period 2011-2021. The re-constituted expert committee in its report at Table-10(C) (at page 21) has observed that the cases of Bronchitis have reduced by 27% during this period. It is irrational to impose Environmental compensation for Bronchitis, the cases of which have significantly reduced.

30. It is submitted that as per the said working paper of Vijayalakshmi S and Krishna Raj, the total cost of illness is termed as direct cost and indirect cost. The direct cost comprises of: Cost of medicines and the indirect cost comprises of: Productivity impacts due to illness. Moreover, the working paper is based on the Health Effect of Traffic related Air Pollution, Morbidity Impacts and their Casual Pollutant Relations. The methodology adopted is based on Economic Model, Empirical Findings and mere Economic Estimation of Traffic Pollution and Morbidity of that particular region of Bengaluru city. The working paper (at internal page no. 2) sates that ***".....The rational behind the selection of the city is that being a dynamic city in the Country, its vehicular population is growing at the rater of 10 per cent per annum which contributes around 40 per cent for Respirable Suspended Particulate Matter (RSPM) in the city (TERI, 2015[3]). Further, the city has been ranked among the cities with the worst traffic congestion (IBM, 2011).....***" . Further, the foot note of the working paper (at

internal page no. 2) states that ***"3 As per the report, it is only in Bengaluru that automobiles are the major contributor of RSPM compared to other metropolitan cities in the country".*** It is submitted that chemical transformation of motor-vehicle emission and emission from the thermal power plant are completely different. Hence, such estimation of cost of illness of some different region due to traffic-related air pollution cannot be accepted to finalize the cost of health issue for the assessment of Environmental Compensation on account of alleged air pollution related to operation of thermal power plant of the Answering Respondent at Udupi region and same is wrong and untenable. The working paper (Table 13 at internal page no. 19) provides Traffic – related health issue suffered in the Bengaluru city. The table provides Asthma, Respiratory Infection, Cough, Headache, Stress and BP, Skin allergy. It does not provide Cancer disease. However, the reconstituted committee has assumed Cancer disease as one of the diseases caused by the alleged air pollution from the thermal power plant of the Answering Respondent and same is wrong and misplaced. Further, the density of green cover of the Udupi region and the Bangalore city are completely different. Such important factors are also not considered by the reconstituted expert committee. The ambient air quality data of Bengaluru city is above the prescribed standards (as per NAAQS) for Industrial, Residential, Rural and Other Area. For the purpose of reference, copy of manually monitored ambient air quality data of Bangalore city for the year 2019 and continuous ambient air quality monitored data Bangalore city (station: Peenya, Bengaluru – CPCB) for the period from

01.04.2020 to 24.06.2021 as retrieved from website of CPCB are annexed hereto as **ANNEXURE-R-7.** The Bengaluru city has been classified as Non- Attainment city due to its air pollution level by the CPCB. Whereas the ambient air quality data in and around the Answering Respondent's thermal power plant as is evident from the regular data monitored is less than the standards fixed for Industrial, Residential, Rural and Other Area. It is also submitted that there is no material to show that this study report has been accepted by any competent authority. As such it cannot be taken as the final word. This report further amplifies the assertion of the answering Respondent that the Experts came with a predisposed mind. The list of Non-Attainment cities as provided by the CPCB is annexed hereto as **ANNEXURE-R-8**. In view of above, the said report, ex-facie cannot be said to be a report of committee of experts and same is liable to be rejected.

31. It is submitted that the committee members from NIAS and ISEC have considered total number of patients in the area during plant operation years (however, since Unit 2 instead of Unit 1) for calculation of health based Environmental Compensation. Normal prevalence of the diseases which are expected even if the plant was not there may have been considered and accounted to arrive at the incremental number of patients which may be attributed to air pollution from the plant.

32. It is submitted that the project proponent has introduced Adani Aarogya Card / Health Insurance scheme to the Villagers of Yelluru and Mudarangadi / Santoor villages. The Answering Respondent has informed the same to the committee that more than 9500 villagers of above said villages are covered for Rs. 50,000/- cashless medical treatment in multispecialty hospitals, requiring specialized treatments. While considering the cost of illness, the benefits of health insurance and saving of cost on the treatment of diseases are not factored by the committee while estimating the Environmental Compensation in account of health issues.

IX. Because consideration of duration from October 2010 to March 2020 for Environmental Compensation to compensate for the alleged cost of illness caused by the thermal power plant of the Answering Respondent is unjustified and untenable.

33. The Answering Respondent is already complying the applicable environmental norms as applicable to the thermal power plant under The Air (Prevention and Control of Pollution) Act, 1981 and The Water (Prevention and Control of Pollution) Act, 1974 and The Environmental (Protection) Act, 1986. In present case, MoEF&CC had issued the Environmental Clearance dated 09.09.2009 and Environmental Clearance dated 01.09.2011 under the EIA Notification 2006 inserting conditions to compliance the statutory norms as per The Environment (Protection) Act,

1986 and further, KSPCB had issued Consent for Operation dated 19.05.2010 (as extended or renewed from time to time) inserting conditions to comply with the statutory norms as per Air Act and Water Act. The Answering Respondent has been submitting the compliance reports to MoEF&CC and KSPCB since the commissioning of the thermal power plants. In view of same, consideration of duration from October 2010 to March 2020 for Environmental Compensation to compensate for the alleged cost of illness caused by the thermal power plant of the Answering Respondent is unjustified and untenable. The reconstituted committee of expert have not applied their mind before considering the period for estimation of Environmental Compensation. It would be absurd to consider that there was continuing damage to the environment and health issues on account of violation of the environmental norms by the project proponent due to operation of the thermal power plant. If this proposition is correct, then the project proponent would require paying the environment compensation continuously till the thermal power plant is in operation and when the plant operates strictly within the environmental norms. This is unfair and untenable and there cannot be a duration from October 2010 to March 2020 for estimation of Environmental Compensation and hold the project proponent liable for same.

34. It is submitted that the rational behind the period of non-compliance taken by the erstwhile committee of experts for estimating the Environmental Compensation is correct as same was on the basis of time taken by the project proponent

to comply with the directions / observations from the date of direction / observation by the KSPCB. These observation and direction were not a part of Environmental Clearances and Consent for Operation. Hence, directions were issued for improvement in environmental management rather than non-compliance as alleged by the reconstituted Committee of Experts. The erstwhile committee of experts has provided cases of non-compliance and dates of violation in the Annexure-V of their report dated 15.07.2019 filed with the Hon'ble Tribunal on 17.07.2019. same is reproduced hereunder for reference.

"CASES OF NON `COMPLIANCE WITH DIRECTIONS & ACCIDENTAL DISCHARGES CONSIDERED TO ESTIMATE ENVIRONMENTAL COMPENSATION WITH RESPECT OF M/S UDUPI POWER CORPORATION LIMITED, UDUPI

S. No.	Important Directions of KSPCB	Date of Violation		No of Days
		Observed	Compliance	
1	• Portion of fly ash deposition area has become dry due to non – maintenance of water curtain • No action taken for dumping of fly ash and bottom ash evenly • Stone pitching provided has collapsed at few places	15.10.2011	13.12.2012	425
2	• Fly ash emission and salt drift from the colling tower and fugitive dust	21.11.2011	08.02.2012	79

	from coal yard area affecting the agriculture. • Providing suitable height of barricades all along the compound wall especially on southern and eastern side of the coal yard.	21.11.2011	31.03.2015	1226
3	• Not submitted report of check of submarine pipeline for any damages anchorage from competent authority. • Submitting AAQM report monthly basis.	28.02.2012 28.02.2012	18.09.2012 26.03.2012	203 27
4	• To introduce manifest system for fly ash transportation to confirm that fly ash has reached the allotted destination.	01.07.2012	13.12.2012	165
5	• Coal storage area & settling pond flooded, Retaining wall collapsed at the southern side and substantial quantity of coal has been slided, the overflow joining the nearby drains and colour is brackish and flowing outside the plant premises.	29.08.2012	18.09.2012	20
6	• The oil & grease traps were not in operation, floating oil layer on the storm water drain which discharge outside through drain	02.11.2012	15.12.2012	43
7	• Not complied and submitted action taken on NGRI study report.	02.11.2012	04.02.2013	94
8	• Sludge generated from sludge dryingbed of ETP is stored in Kutcha	20.11.2014	18.12.2014	28

	earthen pit unscientifically.			
9	• ***Oil leakage was observed near boiler area of the industry premises and same was flown along with rain water and discharged into the water drain flowing besides guard pond area.***	***27.08.2015***	***11.09.2015***	***15***
10	• ***Online emission and fluent monitoring data shall be connected and uploaded to Board's and CPCB server in a time bound manner not later than March 31, 2015.***	***31.03.2015***	***08.10.2015***	***191***
11	• ***Seepage observed at the bottom of ash pond towards East side. The open well sample analysis report shows that Iron are exceeding the limits. Non Compliance period from***	***01.02.2016***	***04.08.2016***	***176***

Number of Days Violation took place (N) = 15.10.2011 to 08.10.2015 = 1454 Dyas+

10.02.2016 to 04.08.2016 = 176 Days

Total = 1630 Days"

35. In view of foregoing, the Answering respondent hereby prays that Hon'ble Tribunal may be pleased reject the report which is prepared by members of the reconstituted committee without application of mind while preparing the technical report on pollution impacts, environmental damages on account of environmental violations and estimation of Environmental Compensation. The said report has not been considered in totality by one of the members of the reconstituted expert

committee Mr. G. Thirumurthy from CPCB who was also part in preparation of report by earlier expert committee and has given the difference of opinion as he has thoroughly reviewed the conditions of the thermal power plant of the Answering Respondent. Being a multi member committee if one of the members does not sign the report, then it is no report in the eyes of law. The members as a committee are required to submit the report and are considered as one entity. If one of the committee members has not subscribed to the report then it is not the report of the Committee. On that count also the report is liable to be rejected. The Answering Respondent seeks leave of the Hon'ble Tribunal to make additional submissions, replies, objection and argument at the time of hearing of the case.

36. It is most respectfully prayed that as the said report dated 02.03.2021 of the re-constituted Committee of Experts filed on 03.03.201, suffers from various irregularities, unfairness and arbitrariness and conceived with predisposed mindset of the committee members and fully devoid of merits, may be rejected by this Hon'ble Tribunal in the interest of justice.

Ahmedabad
Dated: 05/07/2021

Udupi Power Corporation Limited
Authorized Signatory

DEPONENT

NOTARY
TEJAS K. MODI
AHMEDABAD CITY
OF GUJARAT STATE
REGD. NO. 1304
EXPIRY DATE
09/02/2025
OF GUJARAT (INDIA)

VERIFICATION

Verified at Ahmedabad on this 5th day of July, 2021 that the contents of my above affidavit are true and correct to the best of my knowledge, information and belief and nothing material has been concealed therefrom.

Udupi Power Corporation Limited

Authorised Signatory

DEPONENT

S.R. No 1060 Dt. 5./7./2021

T. K. MODI
NOTARY
GOVT. OF GUJARAT
- 5 JUL 2021

SOLEMNLY AFFIRMED
BEFORE ME

T. K. MODI
NOTARY
GOVT. OF GUJARAT
- 5 JUL 2021

NOTARY
TEJAS K. MODI
AHMEDABAD CITY
OF GUJARAT STATE
REGD. No. 1304
EXPIRY DATE
09/02/2025
GOVT. OF GUJARAT (INDIA)

NOTARIAL

ಸುರೇಶ್ ನಾಯ್ಕ್, ಜೆಡಿಎಸ್ ಜಿಲ್ಲಾಧ್ಯಕ್ಷ ಯೋಗೀಶ್ ಪಿ. ಶೆಟ್ಟಿ, ಸೌರಭ್ ಬಲ್ಲಾಳ್, ಸುರೇಂದ್ರ ಗಾಣಿಗ, ಕೀರ್ತಿ ಶೆಟ್ಟಿ, ಕವಿರಾಜ್, ಹುಸೇನ್ ಕೋಡಿಬೆಂಗ್ರೆ, ಬಾಲಕೃಷ್ಣ ಶೆಟ್ಟಿ, ವಿಶ್ವನಾಥ ರೈ, ಶಶಿಧರ್ ಗೊಲ್ಲ ಉಪಸ್ಥಿತರಿದ್ದರು.

ಅವಕಾಶ ವಿಸ್ತರಣೆಯಾಗಿದೆ.

ರಸಗೊಬ್ಬರ ಉತ್ಪಾದನೆಯಲ್ಲಿ ಸ್ವಾವಲಂಬನೆ, ಮಣ್ಣಿನ ಫಲವತ್ತತೆ ಕಾರ್ಡ್ ವಿತರಣೆ, ಮಣ್ಣಿನ ಫಲವತ್ತತೆ ಪರೀಕ್ಷಾ ಪ್ರಯೋಗಾಲಯ ಸ್ಥಾಪನೆ, ಸುದ್ದಿಗೋಷ್ಠಿಯಲ್ಲಿ ಶಿವಕುಮಾರ್ ಅಂಬಲಪಾಡಿ, ರೈತ ಮೋರ್ಚಾ ಜಿಲ್ಲಾಧ್ಯಕ್ಷ ಪ್ರವೀಣ್ ಕುಮಾರ್ ಗುರ್ಮೆ, ಶ್ರೀನಿಧಿ ಹೆಗ್ಡೆ, ದಿನೇಶ್ ಹೆಗ್ಡೆ ಉಪಸ್ಥಿತರಿದ್ದರು.

ಯುಪಿಸಿಎಲ್ ಯೋಜನೆಯಿಂದ ಹಾನಿಗೊಳಗಾದ ಪರಿಸರದ ಪರಿಶೀಲನೆ

ಎಲ್ಲೂರಿಗೆ ಕೇಂದ್ರ ಪರಿಸರ ತಜ್ಞರ ತಂಡ ಭೇಟಿ

■ ವಿಕ ಸುದ್ದಿಲೋಕ ಪಡುಬಿದ್ರಿ

ಯುಪಿಸಿಎಲ್ ಯೋಜನೆ ಎಲ್ಲೂರಿನಲ್ಲಿ ಜಾರಿಗೊಳ್ಳುವ ಸಂದರ್ಭ ಪರಿಸರ ಹಾನಿಯಾಗುತ್ತಿದೆ ಎಂಬ ಬಗ್ಗೆ ನಿರಂತರ ಹೋರಾಟ ನಡೆಸುತ್ತಾ ಬಂದಿರುವ ನಂದಿಕೂರು ಜನಜಾಗೃತಿ ಸಮಿತಿಯು ರಾಷ್ಟ್ರೀಯ ಹಸಿರು ಪೀಠದ ಎದುರು 2018ರಲ್ಲಿ ದಾಖಲಿಸಿರುವ ದಾವೆಯ ಅನ್ವಯ ಯೋಜನೆಯಿಂದಾಗಿ ಉಂಟಾಗಿರುವ ಪರಿಸರ ಹಾನಿಗಳ ಬಗ್ಗೆ ಪರಿಶೀಲನೆ ನಡೆಸಿ, ದಾಖಲಿಸಿಕೊಳ್ಳಲು ನೇಮಿಸಲಾಗಿರುವ ಕೇಂದ್ರೀಯ ಪರಿಸರ ತಜ್ಞರ ತಂಡವು ಮಂಗಳವಾರ ಎಲ್ಲೂರು ಗ್ರಾಮದ ಉಳ್ಳೂರು, ಕೊಳಚೂರು, ಮುದರಂಗಡಿ ಭಾಗಗಳಿಗೆ ಭೇಟಿ ನೀಡಿತು.

ಕಳೆದೆರಡು ದಿನಗಳಿಂದ ಉಡುಪಿಯಲ್ಲಿರುವ ಈ ತಂಡವು ಈಗಾಗಲೇ ಸಂಬಂಧಿತ ಇಲಾಖೆಗಳಿಗೆ ಭೇಟಿ ನೀಡಿ ಅಧಿಕಾರಿಗಳಿಂದ ಮಾಹಿತಿ ಕಲೆ ಹಾಕಿದ್ದು, ಮಂಗಳವಾರ ಸ್ಥಳೀಯ ಅಧಿಕಾರಿಗಳ ಜತೆಗೆ ಯುಪಿಸಿಎಲ್ ಸುತ್ತಮುತ್ತ ಪರಿಶೀಲನೆ ನಡೆಸಿದೆ.

ಕೇಂದ್ರೀಯ ಪರಿಸರ ನಿಯಂತ್ರಣ ಮಂಡಳಿಯ ಬೆಂಗಳೂರು ಕಚೇರಿಯ ಜಂಟಿ ನಿರ್ದೇಶಕ ತಿರುಮೂರ್ತಿ, ಬೆಂಗಳೂರಿನ ಪ್ರೊ. ಡಾ. ಶ್ರೀಕಾಂತ್ ಹಾಗೂ ಐಎಸ್‌ಇಸಿ ಬೆಂಗಳೂರಿನ ಡಾ. ಕೃಷ್ಣರಾಜ್ ಈ ತಂಡದಲ್ಲಿದ್ದರು.

ಸಮಿತಿ ಪರಿಶೀಲಿಸಿದ ಅಂಶಗಳ ಬಗ್ಗೆ ಮಾಧ್ಯಮಕ್ಕೆ ವಿವರಿಸಿದ ಡಾ. ಕೃಷ್ಣರಾಜ್,

ಕೇಂದ್ರೀಯ ಪರಿಸರ ತಜ್ಞರ ತಂಡವು ಮಂಗಳವಾರ ಎಲ್ಲೂರು ಗ್ರಾಮದ ಉಳ್ಳೂರು, ಕೊಳಚೂರು, ಮುದರಂಗಡಿ ಭಾಗಗಳಿಗೆ ಭೇಟಿ ನೀಡಿತು.

ಹಸಿರುಪೀಠದ ಆದೇಶದಂತೆ ಪರಿಸರ ಹಾನಿಗೊಳಗಾದವರಿಗೆ ಪರಿಹಾರ ನಿಗದಿಪಡಿಸಲು ಈ ತಂಡವು ರೈತರ ಭೂಮಿಗಳಿಗೆ ತೆರಳುತ್ತಿದೆ. ಪರಿಸರಕ್ಕೆ ಸಂಬಂಧಿಸಿದಂತೆ ಅನೇಕ ತೊಂದರೆಗಳಾದ ಬಗ್ಗೆ ತಂಡವು ಈಗಾಗಲೇ ಮಾಹಿತಿ ಕಲೆ ಹಾಕಿದೆ. ಪರಿಸರ, ಆರೋಗ್ಯ, ಕೃಷಿ ಹಾಗೂ ತೋಟಗಾರಿಕೆ ಇಲಾಖೆಗಳಿಂದ ವರದಿ ತರಿಸಿಕೊಳ್ಳುತ್ತಿದ್ದೇವೆ. ಕೇಂದ್ರೀಯ ಹಸಿರು ಪೀಠಕ್ಕೆ ತಜ್ಞರ ಸಮಿತಿಯು ಜ.31 ರೊಳಗೆ ವರದಿ ನೀಡಬೇಕಾಗಿದೆ. ಆದರೆ ಮತ್ತಷ್ಟು ಅಂಕಿ ಅಂಶಗಳ ಕ್ರೋಡೀಕರಣ ಆಗಬೇಕಿರುವುದರಿಂದ ಈ ದಿನಾಂಕ ಮುಂದೂಡಲ್ಪಡಬಹುದು ಎಂದರು.

ಉಳ್ಳೂರಿನ ಜಗನ್ನಾಥ ಮೂಲ್ಯ ತನ್ನ ಅಸ್ವಸ್ಥ ವೃದ್ಧ ತಾಯಿಯನ್ನು ರಸ್ತೆ ಸೌಕರ್ಯವಿಲ್ಲದಿರುವುದರಿಂದ ಆಸ್ಪತ್ರೆಗೆ ಒಯ್ಯಲು ಪಡುತ್ತಿರುವ ಬವಣೆ, ಕೃಷಿ ನಾಶ, ಬೆಳೆ ನಾಶ ಮುಂತಾದ ತೊಂದರೆಗಳ ಬಗ್ಗೆ ಸಮಿತಿ ಎದುರು ವಿವರಿಸಿದರು. ಎಲ್ಲೂರು ಗ್ರಾಮದ ಜಯಂತ್ ರಾವ್, ಗಣೇಶ್ ರಾವ್ ಮನೆ ಪರಿಸರ, ಕೃಷಿ ಭೂಮಿ, ತೋಟ, ಕುಡಿಯುವ ನೀರು ಹಾಗೂ ಜಾನುವಾರುಗಳ ಆರೋಗ್ಯದ ಮೇಲೆ ಉಂಟಾಗಿರುವ ಹಾನಿಗಳನ್ನು ಈ ಸಮಿತಿ ಪರಿಶೀಲನೆ ನಡೆಸಿದೆ.

ಮುದರಂಗಡಿ ಪ್ರಾಥಮಿಕ ಆರೋಗ್ಯ ಕೇಂದ್ರಕ್ಕೂ ತೆರಳಿದ ತಂಡವು 2007ರ ಬಳಿಕ ಜನತೆಯ ಆರೋಗ್ಯದ ಮೇಲಾಗಿರುವ ಹಾನಿಯ ಮಟ್ಟವನ್ನು ಅಂಕಿ-ಅಂಶಗಳ ಸಹಿತ ದಾಖಲಿಸಿಕೊಂಡಿದೆ. ಎಲ್ಲೂರು ಭಂಡಾರಮನೆ ಮಾಧವ ಶೆಟ್ಟಿ ಮತ್ತು ಹರೀಶ್ ಶೆಟ್ಟಿ ಅವರು ಯೋಜನೆಯಿಂದಾಗಿ ಸುಮಾರು 10 ಕಿ.ಮೀ. ಸುತ್ತಮುತ್ತಲ ಪರಿಸರಕ್ಕೆ ಆಗಿರುವ ಹಾನಿಗಳ ಬಗ್ಗೆ ಸಮಿತಿ ಎದುರು ವಿವರಿಸಿದರು.

ಈ ಹಿಂದೆ ಪರಿಸರ ಕಾನೂನು ಉಲ್ಲಂಘನೆಗಾಗಿ ಸುಮಾರು 5 ಕೋಟಿ ರೂ. ಪರಿಹಾರವನ್ನು ಕೇಂದ್ರೀಯ ಪರಿಸರ ನಿಯಂತ್ರಣ ಮಂಡಳಿಗೆ ಯುಪಿಸಿಎಲ್ ದಂಡ ಪಾವತಿಸಿದೆ. ಸದ್ಯ ಜನತೆಗೆ ಯೋಜನೆಯಿಂದಾಗಿ ಆಗಿರಬಹುದಾದ ಸುಮಾರು 177.8 ಕೋಟಿ ರೂ. ನಷ್ಟ ಪಾವತಿಗಾಗಿ ನಂದಿಕೂರು ಜನಜಾಗೃತಿ ಸಮಿತಿ ದಾವೆಯಲ್ಲಿ ಅಂತಿಮ ಆದೇಶವೂ ಸಮಿತಿ ಪರವಾಗಿಯೇ ಬಂದಿದೆ. ಅದಕ್ಕಾಗಿ ಈ ಸಮಿತಿ ಪರಿಶೀಲಿಸಿ ವರದಿ ನೀಡಲಿದೆ ಎಂದೂ ತಜ್ಞರ ಸಮಿತಿ ಸದಸ್ಯ ಡಾ. ಕೃಷ್ಣರಾಜ್ ತಿಳಿಸಿದರು.

ಈ ಕೇಂದ್ರೀಯ ಸಮಿತಿಯೊಂದಿಗೆ ಕೃಷಿ ಇಲಾಖೆಯ ಜಂಟಿ ನಿರ್ದೇಶಕ ಕೆಂಪೇಗೌಡ, ಉಪ ನಿರ್ದೇಶಕ ಚಂದ್ರಶೇಖರ ನಾಯಕ್, ಸಹಾಯಕ ಕೃಷಿ ನಿರ್ದೇಶಕ ಮೋಹನ್‌ರಾಜ್, ಸಹಾಯಕ ಕೃಷಿ ಅಧಿಕಾರಿಗಳಾದ ವಾದಿರಾಜ ರಾವ್, ಶೇಖರ್, ತೋಟಗಾರಿಕೆ ಇಲಾಖೆಯ ಉಪ ನಿರ್ದೇಶಕಿ ಭುವನೇಶ್ವರಿ, ಉಡುಪಿ ಜಿಲ್ಲಾ ಆರೋಗ್ಯಾಧಿಕಾರಿಗಳ ಕಚೇರಿಯ ಡಾ. ದಿವ್ಯಾ, ಮಂಗಳೂರು ಪರಿಸರ ನಿಯಂತ್ರಣ ಮಂಡಳಿಯ ಹಿರಿಯ ಪರಿಸರ ಅಧಿಕಾರಿ ರಮೇಶ್, ಮುದರಂಗಡಿ ಪ್ರಾಥಮಿಕ ಆರೋಗ್ಯ ಕೇಂದ್ರದ ಡಾ. ಸುಬ್ರಹ್ಮಣ್ಯ ಪ್ರಭು, ಸ್ಥಳೀಯರು, ಎಲ್ಲೂರು ಗ್ರಾಪಂ, ಪಡುಬಿದ್ರಿ ಗ್ರಾಪಂ ಅಧಿಕಾರಿಗಳು ಜತೆಗಿದ್ದರು.

ಕಾಯ್ದುಕೊಳ್ಳಲಾಗುತ್ತಿದೆ ಎಂದರು.

ರಾಮಾಯಣಕ್ಕೂ ತಮಿಳು ನಾಡಿಗೂ ಅವಿನಾಭಾವ ಸಂಬಂಧ ವಿದೆ. ಧನುಷ್ಕೋಟಿ, ರಾಮಸೇತು ತಮಿಳು ನೆಲದಲ್ಲಿ ಇರುವುದು ರಾಮ ಮತ್ತು ರಾಮಾಯಣದೊಂದಿಗೆ ತಮಿಳಿನ ನಂಟಿಗೆ ಸಾಕ್ಷಿಗಳಾಗಿವೆ. ಕಂಬ ರಾಮಾಯಣದಂತಹ ಸಾಹಿತ್ಯ ಕೃತಿಗಳು, ಭರತನಾಟ್ಯದಂತಹ ಕಲೆ, ಜನಪದೀಯ ಸಂಸ್ಕೃತಿಯಲ್ಲಿಯೂ ರಾಮಾಯಣದಹೆಜ್ಜೆಗುರುತುಗಳಿವೆ. ತಮಿಳುನಾಡಿನ ಸಮಸ್ತ ಜನತೆ ರಾಮಮಂದಿರ ನಿರ್ಮಾಣದಲ್ಲಿ ಸಕ್ರಿಯವಾಗಿ ಪಾಲ್ಗೊಳ್ಳಬೇಕೆಂದು ಸ್ವಾಮೀಜಿ ಆಶಿಸಿದರು.

ಯುಪಿಸಿಎಲ್ ನಿಂದಾದ ಪರಿಸರ ಹಾನಿ

ಪರಿಸರ ತಜ್ಞರ ತಂಡದಿಂದ ಪರಿಶೀಲನೆ

ಪಡುಬಿದ್ರಿ, ಡಿ. 8: ಯುಪಿಸಿಎಲ್ ನಿಂದ ಆಗಿರುವ ಪರಿಸರ ಹಾನಿಯನ್ನು ಪರಿಶೀಲಿಸಿ ದಾಖಲಿಸಿಕೊಳ್ಳಲು ನೇಮಿಸಲಾಗಿರುವ ಕೇಂದ್ರೀಯ ಪರಿಸರ ತಜ್ಞರತಂಡವು ಮಂಗಳವಾರ ಎಲ್ಲೂರು ಗ್ರಾಮದ ಉಳ್ಳೂರು, ಕೊಳಚೂರು, ಮುದರಂಗಡಿ ಭಾಗಗಳಿಗೆ ತೆರಳಿ ಪರಿಶೀಲಿಸಿ ಮಾಹಿತಿ ಕಲೆ ಹಾಕಿತು.

ನಂದಿಕೂರು ಜನಜಾಗೃತಿ ಸಮಿತಿಯು ರಾಷ್ಟ್ರೀಯ ಹಸುರು ಪೀಠದ ಮುಂದೆ 2018ರಲ್ಲಿ ದಾಖಲಿಸಿರುವ ದಾವೆಯನ್ವಯ ತಂಡವನ್ನು ಕಳುಹಿಸಲಾಗಿದೆ. ಕೇಂದ್ರೀಯ ಪರಿಸರ ನಿಯಂತ್ರಣಮಂಡಳಿಯಬೆಂಗಳೂರು ಕಚೇರಿಯ ಜಂಟಿ ನಿರ್ದೇಶಕ ತಿರುಮೂರ್ತಿ, ಬೆಂಗಳೂರಿನ ಪ್ರೊ। ಡಾ। ಶ್ರೀಕಾಂತ್ ಹಾಗೂ ಐಎಸ್ ಇಸಿ ಬೆಂಗಳೂರಿನ ಡಾ। ಕೃಷ್ಣರಾಜ್ ತಂಡದಲ್ಲಿದ್ದರು.

ಡಾ। ಕೃಷ್ಣರಾಜ್ ಮಾತನಾಡಿ, ಪರಿಸರಕ್ಕೆಸಂಬಂಧಿಸಿದಂತೆಅನೇಕತೊಂದರೆಗಳನ್ನು ಈಗಾಗಲೇ ಕಲೆ ಹಾಕಿದ್ದೇವೆ. ಪರಿಸರ, ಆರೋಗ್ಯ, ಕೃಷಿ ಹಾಗೂ ತೋಟಗಾರಿಕಾಇಲಾಖೆಗಳಿಂದವರದಿ ತರಿಸಿಕೊಳ್ಳುತ್ತಿದ್ದೇವೆ. ಜ. 31ರೊಳಗಾಗಿ ಕೇಂದ್ರೀಯ ಹಸುರು ಪೀಠಕ್ಕೆ ವರದಿ ನೀಡಬೇಕಿದೆ. ಮತ್ತಷ್ಟು ಅಂಕಿ ಅಂಶಗಳ ಕ್ರೋಡೀಕರಣವು ಆಗಬೇಕಿರುವುದರಿಂದ ಮುಂದೂಡಿಕೆಯಾಗಲೂಬಹುದು ಎಂದು ಹೇಳಿದರು.

ದಂಡ ವಸೂಲಿ

ಈ ಹಿಂದೆ ಪರಿಸರ ಕಾನೂನು ಉಲ್ಲಂಘನೆಗಾಗಿ 5 ಕೋಟಿ ರೂ. ಗಳ ದಂಡವನ್ನು ಕೇಂದ್ರೀಯ ಪರಿಸರ [illegible]

ಉಳ್ಳೂರಿನಲ್ಲಿ ಯುಪಿಸಿಎಲ್ ನಿಂದಾದ ತೊಂದರೆಗಳನ್ನು ತಂಡವು ಪರಿಶೀಲಿಸಿತು.

ತಕ್ಕ ಪರಿಹಾರ ಪಾವತಿಸದಿದ್ದರೆ ಮತ್ತೆ ಹೋರಾಟ

ನಂದಿಕೂರು ಜನಜಾಗೃತಿ ಸಮಿತಿಯ ಗೌರವಾಧ್ಯಕ್ಷ ಬಾಲಕೃಷ್ಣ ಶೆಟ್ಟಿ ದುಬ್ಯಾ ಅವರೊಂದಿಗೆ ವೀಡಿಯೋ ಸಂಭಾಷಣೆಯನ್ನೂ ತಜ್ಞರ ತಂಡವು ನಡೆಸಿತು. ಪರಿಸರ ಹಾನಿಗೆ ತಕ್ಕುದಾದ ಪರಿಹಾರ ಧನ ರೈತರಿಗೆ ಲಭಿಸಬೇಕು. ಇಲ್ಲವಾದಲ್ಲಿ ಮತ್ತೆ ಹೋರಾಟ ಮುಂದುವರಿಸುತ್ತೇವೆ ಎಂದು ಬಾಲಕೃಷ್ಣ ಶೆಟ್ಟಿ 'ಉದಯವಾಣಿ'ಗೆ ತಿಳಿಸಿದ್ದಾರೆ.

ಯುಪಿಸಿಎಲ್ ಪಾವತಿಸಿದೆ. ಸದ್ಯ ಯೋಜನೆಯಿಂದಾಗಿ ಜನತೆಗೆ 177.8 ಕೋಟಿ ರೂ. ನಷ್ಟ ಆಗಿರಬಹುದೆಂದು ನಂದಿಕೂರು ಜನಜಾಗೃತಿ ಸಮಿತಿ ದಾವೆಯಲ್ಲಿ ತಿಳಿಸಿದ್ದು ಆದೇಶವೂ ಸಮಿತಿಯ ಪರವಾಗಿಯೇ ಬಂದಿದೆ. ತಂಡವು ಪರಿಶೀಲಿಸಿ ಅಂತಿಮ ವರದಿ ನೀಡಲಿದೆ ಎಂದು ತಿಳಿಸಿದರು.

ಸ್ಥಳೀಯರಿಂದ ಮಾಹಿತಿ

ಉಳ್ಳೂರಿನ ಜಗನ್ನಾಥ ಮೂಲ್ಯ ಅವರುತನ್ನಅನಾರೋಗ್ಯ, ವೃದ್ಧತಾಯಿಯನ್ನು ರಸ್ತೆ ಸೌಕರ್ಯವಿಲ್ಲದಿರುವುದರಿಂದ ಆಸ್ಪತ್ರೆಗೆ ಒಯ್ಯಲು ಪಡುತ್ತಿರುವ ಬವಣೆ, ಕೃಷಿ ನಾಶ ಮುಂತಾದ ತೊಂದರೆಗಳನ್ನು ವಿವರಿಸಿದರು.

ಎಲ್ಲೂರು ಗ್ರಾಮದ ಜಯಂತ್ ರಾವ್, ಗಣೇಶ್ ರಾವ್ ಮನೆ ಪರಿಸರ, ಕೃಷಿ ಭೂಮಿ, ಕುಡಿಯುವ ನೀರು ಹಾಗೂ ಜಾನುವಾರುಗಳ ಆರೋಗ್ಯದ ಮೇಲುಂಟಾಗಿರುವ ಹಾನಿಗಳನ್ನು ತಂಡವು ಪರಿಶೀಲಿಸಿತು. ಮುದರಂಗಡಿ ಪ್ರಾ.ಆ. ಕೇಂದ್ರಕ್ಕೆ ತೆರಳಿ 2007ರ ಬಳಿಕ ಜನತೆಯ ಆರೋಗ್ಯ ಮೇಲಾಗಿರುವ ಹಾನಿಯ ಪ್ರಮಾಣವನ್ನು ದಾಖಲಿಸಿಕೊಂಡಿತು. ಎಲ್ಲೂರು ಭಂಡಾರಮನೆ ಮಾಧವ ಶೆಟ್ಟಿ ಮತ್ತು ಹರೀಶ್ ಶೆಟ್ಟಿ ಯೋಜನೆಯಿಂದಾಗಿ ಸುಮಾರು 10 ಕಿ.ಮೀ. ಸುತ್ತಮುತ್ತಲ ಪರಿಸರಕ್ಕೆ ಆಗಿರುವ ಹಾನಿಯ ಬಗ್ಗೆ ವಿವರಿಸಿದರು.

ದ.ಕ.: 2 ಸಾವು, 27 ಪಾಸಿಟಿವ್

Udayavani newspaper dated: 9.12.2020

Environmental damage due to UPCL
Inspection by Environment Expert Team

`Padubidri, Dec 8: Central Environment Expert Team constituted to assess the environmental damage caused by UPCL visited the parts of Ulluru, Kolachuru, Mudrangady villages of Yelluru Gram to inspect and collected the information.

The team has been sent due to the case file by Nandikuru Janajagruthi Samithi in Green Tribunal during 2018. Sh.Thirumurthy Joint Director-CPCB, Prof. Dr.Shrikant of Bangalore and Dr.Krishnaraj of ISEC-Bangalore were in the team.

Dr.Krishnaj informed that "This team is visiting the agricultural fields of the farmers for fixing the compensation against the environmental damage. This team has already collected many information regarding the environmental damage caused. It is seeking details from Environment, Health, Agriculture and Horticulture departments. Expert committee has to submit the report within 31st January. But there is need to collect some more data so there are chances of extension of this date.

Collection of Fine
Already UPCL has paid compensation of Rs. 5 Cr to CPCB for violation as per Environment regulations. Presently, the damage to the public as submitted by Janajagruthi Samithi is Rs.177.8 Cr and orders are supporting/ on behalf of the Samithi submissions. Therefore, this Expert Committee will inspect and submit the final report".

Information from Locals
Jaganath Moolya of Ulluru explained regarding his unhealthiness, not able to take his old mother to hospital as there is no road facility, agricultural damage and the other problems faced.

Team inspected the damage to house environment, agricultural land, drinking water and health of animals of Jayant Rao and Ganesh Rao of Yelluru village. Visited Mudrangady Primary Health Center and recorded the quantity of health damage caused to people after 2007. Madhava Shetty and Harish Shetty of Bhandara Mane, Yelluru explained regarding the environmental damage caused in the surrounding 10 km.

Photo Caption: Team inspected the damage caused by UPCL in Ulluru

If proper compensation not paid again agitation/ movement
Video Conference was organized for interaction with Balakrishna Shetty – Dubai, Hon'ble President of Janajagruthi Samithi by Expert Team. Balakrishna Shetty informed 'Udayavani' that, there will be agitation/ movement again if proper compensation to farmers is not paid.

Vijaya Karnataka newspaper dated: 9.12.2020

Inspection of environmental damage caused to UPCL
Environment Expert Team visit to Yelluru

Padubidri: As per the case filed by Nandikuru Janajagruthi Samithi in Green Tribunal during 2018 regarding the environmental damage caused by UPCL, Central Environment Expert Team constituted to assess the environmental damage caused by the project visited the parts of Ulluru, Kolachuru, Mudrangady villages of Yelluru Gram on Tuesday to inspect and collected the information.

The team has stayed in Udupi from past two days and collected the information, visited the UPCL surroundings on Tuesday along with local Officers.

Sh.Thirumurthy Joint Director-CPCB, Prof. Dr.Shrikant of Bangalore and Dr.Krishnaraj of ISEC-Bangalore were in the team.

Dr.Krishnaj explained to the Media regarding the Committee's assessment points that "This team is visiting the agricultural fields of the farmers for fixing the compensation against the environmental damage. This team has already collected many information regarding the environmental damage caused. It is seeking reports from Environment, Health, Agriculture and Horticulture departments. Expert committee has to submit the report within 31st January. But there is need to collect some more data so there are chances of extension of this date."

Jaganath Moolya of Ulluru explained regarding his unhealthiness, not able to take his old mother to hospital as there is no road facility, agricultural damage and the other problems faced. Team inspected the damage to house environment, agricultural land, drinking water and health of animals of Jayant Rao and Ganesh Rao of Yelluru village.

Visited Mudrangady Primary Health Center and recorded the quantity of health damage caused to people after 2007. Madhava Shetty and Harish Shetty of Bhandara Mane, Yelluru explained regarding the environmental damage caused in the surrounding 10 km.

Dr.Krishnaj, Expert Committee member informed that "Already UPCL has paid compensation of Rs. 5 Cr to CPCB for violation as per Environment regulations. Presently, the damage to the public as submitted by Janajagruthi Samithi is Rs.177.8 Cr and orders are supporting/ on behalf of the Samithi submissions. Therefore, this Expert Committee will inspect and submit the final report".

Along with the Committee Kempegowda, Joint Director – Agriculture, Mohanraj, Asst. Director – Agriculture, Vadiraj Rao & Shekar, Asst. Agriculture Officers, Bhuvaneswari, Deputy Director – Horticulture, Dr. Divya of DHO – Udupi, Ramesh, Senior Environment Officer, KSPCB – Mangalore, Dr.Subrmanya Prabhu, PHC – Mudrangady, Locals, Yellur and Padubidri Gram Panchayat Officers were present.

Photo Caption: Central Environmental Expert Team visited parts of Ulluru, Kolachuru, Mudrangady of Yelluru Village

Attested as True Copy
Rajeswara.P.N

ANNEXURE-R2

Annexure-1

Mechanism for "Assessment of Damage to Air Quality", "Damage Assessment of Health Issues" and "Agricultural Production Loss" w.r.t Stone Crushers, in compliance of Hon'ble NGT Order dated 30.05.2019, in the matter of O.A. No. 739/2018; Residents of Gram Panchayat Varahiya versus State of MP

Mechanism for Assessment of Damage:

The requisite mechanism has been developed for the following parameters relevant to stone crushers:

1. Damage to the Air Quality
2. Damage Assessment of Health Issues
3. Agricultural Production Loss.

1. Damage to the Air Quality:

For calculating the damage to air quality, the following details are needed:

i. Total Load of particulate Emissions (**PM_{10}** and **PM $_{2.5}$**) beyond prescribed limitsi.e.**Load $_{PM10}$** and **Load $_{PM\ 2.5}$**
ii. Environmental Price of Particulate Emissions (PM_{10} and **PM $_{2.5}$**)i.e.**EP_{PM10}** and **$EP_{PM2.5}$**
iii. A Formula to calculate Damage to air quality in monetary termsi.e.**$Damage_{AQ}$**

1.1 Calculation of Total Load of Particulate Emissions($Load_{PM10}$and$Load_{PM\ 2.5}$) beyond prescribed standard:

1.1.1 Calculations for Load of PM_{10} Emissions (Load $_{PM10}$):

The load of PM10 emissions may be calculated by using the following details and methodology:

Limit of PM_{10} as per prescribed standard (A): a µg/m3

Average measured Concentration of PM_{10} in the ambient Air in the affected site (B): b µg/m^3. The sampling and analysis of ambient air will be required at various distances from the stone crushers, to determine the affected area and average concentration.

Concentration ofPM_{10} emissions in excess of prescribed limit (C): B-A = cµg/m3

Concentration of PM_{10} emissions in excess of prescribed limit in Kg/m3 (D): d Kg/m3
(e.g. if the Concentration in mg/l i.e C is cµg/m3, the concentration in Kg/m3 is:cE-9)

Mixing height of air in the affected Site (E): e meters

4

Area of the affected site (F): fm2

Volume of Ambient air in Affected area (G): = E x F = g m3

Total Load of PM_{10} in excess of the prescribed limit in the affected site (H): D x G= h Kg

Since depending on the wind speed, the air in a particular area is being replaced continuously with the new air. Since we, need to calculate the total Load of PM_{10} Emissions per day, a replacement factor needs to be derived as follows:

Let's suppose:

Radius covered for ambient air monitoring: 2 Km

Average wind speed: 1 Km/h

Then, Air replacement factor (I) : 1/2 x 24 =12

Total Load of PM_{10}in excess of the prescribed site in the affected site (**Load $_{PM10}$**): H x I = i kg/day

As an alternative to the above method, the load of particulate emissions from the different stone crushers may also be calculated by using emission factor for stone crushers.

1.1.2 Calculations for Load of $PM_{2.5}$ Emissions:

Limit of $PM_{2.5}$ as per prescribed standard (K): jµg/m3

Average measured Concentration of$PM_{2.5}$in the ambient Air in the affected site (L):kµg/m3. The sampling and analysis of ambient air will be required at various distances from the stone crushers, to know the affected area and average concentration.

Concentration of$PM_{2.5}$emissions in excess of prescribed limit (M): L-K = lµg/m3

Concentration of $PM_{2.5}$emissions in excess of prescribed limit in Kg/m3 (N): m Kg/m3
(e.g. if the Concentration in mg/l i.e Mis lµg/m3, the concentration in Kg/m3 is:lE-9)

Mixing height of air in the affected Site (O): n meters

Area of the affected site (P): o m2

Volume of Ambient air in Affected area (Q): = O x P= p m3

Total Load of $PM_{2.5}$in excess of the prescribed limit in the affected site (R): M x Q= q Kg

Since depending on the wind speed, the air in a particular area is being replaced continuously with the new air. Since we, need to calculate the total Load of $PM_{2.5}$Emissions per day, a replacement factor needs to be derived as follows:

Let's suppose:

Radiuscovered for ambient air monitoring: 2 Km

Average wind speed: 1 Km/h

Then, Air replacement factor (S): 1/2 x 24 =12

Total Load of $PM_{2.5}$in excess of the prescribed site in the affected site (**Load $_{PM\ 2.5}$**): R x S = j Kg/day

As an alternative to the above method, the load of particulate emissions from the different stone crushers may also be calculated by using emission factor for stone crushers.

1.2. Environmental Price of Particulate Emissions(EPPM_{10} and EP$_{PM2.5}$):

To calculate the environmental prices of particulate emissions i.e. PM_{10} and $PM_{2.5}$, **"Environmental Prices Handbook EU28 version" Methods and numbers for valuation of environmental impacts, Bruym, S.T. et al,2018, Delft, CE Delft** was referred. The environmental prices are the constructed prices for pollution or social cost per Kg Emissions. In other words, environmental prices represent the loss of economic welfare that one additional Kg. of the Pollutant ($PM_{10}$and **$PM_{2.5}$** in the present case) is introduced into the environment. The Environmental Prices Handbook EU28 version and the associated webtool provide environmental prices for over 2500 pollutants. The value for environmental price given for pollutant level i.e value for emissions on environmentally damaging substances (PM_{10} and $PM_{2.5}$ in the present case) have been considered in the proposed mechanism.

The values for the Environmental Prices for average particulate Emissions (**PM_{10}** and **$PM_{2.5}$**) as reported in the above hand book are as follows:

Pollutant	**Environmental Price for average atmospheric Emissions**(€ /kg Emissions, 2015)		
	Lower	Central	Upper
Particulate Matter (PM_{10})	19	26.6	41
Particulate Matter ($PM_{2.5}$)	27.7	38.7	59.5

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The values per Kg of average particulate emissions were recalculated specific to India by considering the Central values, Exchange rates and inflation factor (2015 to 2019)as follows:

Environmental Price for Average Particulate Emissions (Rs./Kg. Emission)= Environmental Price per Kg Emission x Exchange Rate x inflation factor

1. Environmental Price for Average Particulate Emissions, PM_{10}(**EP_{PM10}**): 26.6 x 79.59 x 1.19= Rs. 2519.34/Kg Emission
2. Environmental Price for Average Particulate Emissions, $PM_{2.5}$(**$EP_{PM2.5}$**): 38.7 x 79.59 x 1.19= Rs. 3665.36/Kg Emission

1.3. Formula to calculate the damage to Air Quality /day ($Damage_{AQ}$)in monetary terms:

The formula/equation for calculating the damage to the air quality ($Damage_{AQ}$) is derived by using the following values:

i. Total Load of PM_{10} in excess of the prescribed site in the affected site in Kg/day(**$Load_{PM10}$**)
ii. Total Load of PM2.5 in excess of the prescribed site in the affected site in Kg/day (**$Load_{PM2.5}$**)
iii. Environmental Price for Average Particulate Emissions, PM_{10}(**EP_{PM10}**): Rs. 2519.34/kg Emission
iv. Environmental Price for Average Particulate Emissions, PM 2.5 i.e.(**$EP_{PM2.5}$**):Rs. 3665.36 /kg Emission

---

Damage to Air Quality in Monetary Terms /Environmental Price Rs. /day:

$$Damage_{AQ}\ (Rs/day) = (Load_{PM10} \times EP_{PM10}) + (Load_{PM2.5} \times EP_{PM2.5}) \quad Eq\ (1)$$

Note:

a) The value obtained from this formula should be multiplied by the number of days depending on the time period for which environmental damage is to be calculated.

b) The sites/areas where many types of the industries are co-existing, % contribution of stone crushers for PM_{10} and $PM_{2.5}$ in the ambient air, may be calculated based on source apportionment studies. In such cases, the contribution of the stone crusher may be calculated by multiplying the Damage AQ with the contribution factor for stone Crushers.

2. Damage Assessment of Health Issues:

The major health issues associated with the pollution caused by stone crushers are respiratory infections such as aggravation of asthma, respiratory symptoms and increase in hospital admissions. PM_{10} and $PM_{2.5}$ emissions have high risk of mortality and morbidity impacts on the human population in the vicinity of stone crushers.

For assessing the damage caused to health by the stone crushers, the data with respect to respiratory illness/symptoms in the affected area, needs to be obtained from the Health Centres serving the affected sites. Since, all the cases of these health impacts are not reported to medical facilities, health survey of the affected area with the help of questionnaire needs to done simultaneously to have realistic data of the affected people.

Once the above data is obtained the damage assessment may be done based on the cost of illness approach. The reference document used for developing the mechanism for damage assessment of health issues is **Srivastava, A and Kumar, R (2002). "Economic Valuation of health impacts of Air Pollution in Mumbai". Environ. Monit. Assess. 75: 135-143.**

The cost of Illness due to respiratory illness/diseases in the affected area is estimated by considering the base estimate reported in the reference study, by using per capita income of both the cities i.e. Mumbai as reported in the reference document and the affected area in question, by using the following details:

No. of cases of respiratory illness/diseases reported based on the data obtained from Medical facilities serving the affected area and health survey: X

Cost of Illness per person in Mumbai area **(COI_{Mumbai})**in Rs.: Rs. 14378 as of 1997

*Per capita income of the affected area for the year 1997 in Rs. (**$Inc_{Affected\ area}$**)

*Per capita income of Mumbai for the year 1997 in Rs. (**Inc_{Mumbai}**)

Cost of Illness per person in the affected area **($COI_{Affected\ area}$)**in Rs:

$$COI_{Affected\ area} = COI_{Mumbai} \times \frac{Inc_{Affected\ area}}{Inc_{Mumbai}}$$

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(Note: if per capita income of both the cities for 1997 is not available, the values of any year having per capita income for both the cities may be taken and the COIMumbai may also be inflated to that year to calculate COI affected area)

The cost of illness determined from the above formula may be inflated to requiredyear.

Damage to the health due to respiratory diseases may be calculated with the following formula/Equation:

Damage to Health due to Respiratory diseases ($Damage_H$) in Rupees:

$Damage_H$ (Rs).No. of cases Reported (X) x $COI_{Affected\ area}$ **Eq (2)**

Note:
The sites/areas where many types of the industries are co-existing, % contribution of stone crushers for Particulate matter in the ambient air, may be calculated based on source apportionment studies . In such cases, the contribution of the stone crusher may be calculated by multiplying the **$Damage_H$** with the contribution factor for stone Crushers.

3. Agriculture Production Loss:

Model sensitivity studies carried out in India has identified NOx as the key pollutant causing as much as 93% of the crop loss. Since, NOx emissions are not directly related to stone crusher operation, it is proposed to attribute 100-93 = 7%(say 10%) of total yield loss to particulate matter emissions (PM_{10} and $PM_{2.5}$) to start with. The formula/equation for calculating the agricultural production loss is calculated by using the following details:

Average production yield for Crop A in Tonnes/Acre **($Yield_{AvgCrop\ A}$)**

Actual Yield of Crop A in the Affected area in Tonnes/Acre **($Yield_{ActCropA}$)**

Affected Area in Acres **($Area_{Acr}$)**

Total Yield Loss (**$Loss_{Yld}$**)=(**$Yield_{ActCropA}$ - $Yield_{AvgCrop\ A}$) x $Area_{Acr}$**

Minimum Sale Price of Crop A in Rs/Tonne**($MSP_{Crop\ A}$)**

Agriculture Production Loss of Crop A (APL_{CropA}) in Rs.:
APL_{CropA}= $Loss_{Yld}$ x $MSP_{Crop\ A}$ Eq (3)

Estimated Percentage Contribution of Stone Crushers in Yield Loss: 10%

Agriculture Production Loss of Crop A by PM_{10} and $PM_{2.5}$ ($APL_{PMCropA}$) in Rs.:
$APL_{PMCropA}$ = APL_{CropA} x 10% **Eq (4)**

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Note:
The sites/areas where many types of the industries are co-existing, % contribution of stone crushers for particulate matter in the ambient air, may be calculated based on source apportionment studies. In such cases, the contribution of the stone crusher may be calculated by multiplying the $\mathbf{APL_{PMCropA}}$ with the contribution factor for stone Crushers.

With the help of the following three equations derived in the above mechanism developed by CPCB and the calculations explained in the present document, it is possible to assess the damage caused to Air, public Health and agricultural crops in an affected site/ area by the stone crushers operating illegally or without complying with the prescribed norms.

Damage to Air Quality ($Damage_{AQ}$) in Rs.:
$$Damage_{AQ} = (Load_{PM10} \times EP_{PM10}) + (Load_{PM2.5} \times EP_{PM2.5})$$

Damage to Health due to Respiratory diseases ($Damage_H$) in Rs.:
$$Damage_H: \text{No. of cases Reported (X)} \times COI_{\text{Affected area}}$$

Agriculture Production Loss of Crop A by PM_{10} and PM $_{2.5}$ ($APL_{PMCropA}$) in Rs.:
$$APL_{PMCropA} = APL_{CropA} \times 10\%$$

If accepted and approved by Hon'ble NGT, the above mechanism developed by CPCB may be used to assess the damage caused by the stone crushers in the matter O.A. No. 739/2018; Residents of Gram Panchayat Varahiya versus State of MP, by the Joint Committee constituted in this matter.

CPCB will keep on updating the mechanism for assessment of the damage caused to the environment, health and agriculture based on the new findings from time to time, to make it relevant and realistic all the time.

Attested as True Copy
Rajeswara.P.N

ANNEXURE-R3

Economic Valuation of Health Impacts of Air Pollution in Mumbai

Article *in* Environmental Monitoring and Assessment · May 2002

DOI: 10.1023/A:1014431729649 · Source: PubMed

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ECONOMIC VALUATION OF HEALTH IMPACTS OF AIR POLLUTION IN MUMBAI

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Abstract. Air pollution leads to serious negative impacts on health. The physical evidence is compelling. An attempt has been made in this paper to establish dose-response relationship of Ambient Air Quality Index and human health, based on time spent by an individual in different microenvironments during one day. Economic valuation of morbidity and mortality has been attempted through lost salary approach. The results show that the avoidance cost is 29% of the total health damage cost.

Keywords: air pollution, Air Quality Index, asthma, economic valuation, health impact, integrated daily exposure, Logit Model, morbidity, mortality, Mumbai

List of Symbols used

Σ	=	Summation
μg	=	microgram
m^3	=	cubic meter
hr	=	hour
log	=	logarithm to the base 10
%	=	percent
δ	=	differential
Δ	=	change in value of parameter
μ	=	micron.

1. Introduction

Urbanization and extensive energy utilization have made urban air pollution a growing problem. Deteriorating air quality in cities is a result of rapid economic expansion, rise in population, increased industrial output and unprecedented growth in the use of passenger vehicles. Emissions from automobiles, factories, domestic sources and refuse burning threaten the wellbeing of city dwellers, imposing not only a direct economic cost for human health but also reducing long term pro-

Environmental Monitoring and Assessment **75:** 135–143, 2002.

ductivity of the population. Physical evidence of serious negative impacts on health has been observed by Kamat (1992), Ostro (1989) and many others.

With development and industrial growth, the environment and its bountiful resources have become scarce. The techniques of environmental economics, therefore, involve specific applications of the general principles of normative economics aimed at assessing which alternative situations and strategies for the management of the environment best promote social welfare.

An attempt has been made here to estimate the air pollution loads and their impacts on health in Mumbai city caused mainly by automobiles and domestic sources in the year 1997. These impacts have also been translated into economic values.

2. Methodology

The health impacts due to different air pollutants can be estimated by ascertaining the exposure level and duration of individuals.

An individual is exposed to air pollution of different levels during the day while travelling, working or staying at home. Various places where an individual is present for a significant period are termed microenvironments.

Therefore,

$$\sum_{i=1}^{n} t_i = 24h \tag{1}$$

Each microenvironment has different air pollutant levels and hence the time spent in each and the level of pollutants play a decisive role in estimating the health impact.

Different pollutants cause different impacts on health, property and ecology (Lee James, 1985). Hence, use of a single Air Quality Index (AQI) incorporating all the adverse impacts of various pollutants is not feasible. An Air Quality Index designed to capture health impact will be different from the one designed to capture impacts on property values. An AQI for respiratory diseases, as developed by Sterling *et al*. (1967), can be presented as

$$AQI = 1 * [NO_x] + 0.02\,[CO] + 0.055\,[HC] + 4.15\,[SO_2] + 2.81\,[RSPM] \tag{2}$$

where NO_x are nitrogen oxides, CO is carbon monoxide, HC are hydrocarbons and RSPM is respirable particulate matter, i.e. particulate matter below 10 μ in size.

The coefficients of the above equations are a function of the pollutant's ability to cause the respiratory disease symptoms. It is assumed that the ability of the pollutant to cause the disease symptom is not likely to alter with location. The concentration of the pollutants will, however, vary with location, altering the AQI.

Integrated daily exposure (DE) of an individual in μg m^{-3} can be estimated as

$$DE = \sum_{i=1}^{n} t_i^* [AQI]_i \tag{3}$$

where

$[AQI]_i$ = Air Quality Index in the i^{th} microenvironment in μg m^{-3}

t_i = Time spent by an individual in the micro environment (hr)

n = Number of microenvironments

Three microenvironments, viz. workplace, outdoor and indoor locations have been considered for a typical individual in Mumbai.

The relationship between DE and health impacts has been established based on the studies conducted by Mahasur *et al*. (1996). The data of Mahasur *et al.* form a cross section of three hundred households, observation having been collected discreetly. The options have been aggregated into two choices, that is presence or absence of a symptom in order, to apply simple logit formulation. Pollutant levels monitored by the National Environmental Engineering Research Institute (NEERI) and Brihanmumbai Municipal Corporation (BMC) have been used to arrive at DE values.

By modelling the air quality and plotting the isoconcentration lines the population exposed to a particular pollutant level has been estimated. A population falling between two contours has been assumed to have been exposed to the average concentration of the bordering isopleths. Exposure to pollutants while cooking has been estimated using the data given by Smith (1989).

The logit model (Demaris, 1992) has been used to analyse the effect of change in air pollution level on the population due to exposure to pollutants. The logit model estimates the probability of occurrence of a certain event, given a certain set of independent variables. We have considered integrated daily exposure, smoking habits and sex to be statistically significant variables in deciding upon the probability of dyspnea.

$$\begin{aligned} \text{logit (Dyspnea)} &= \text{f (integrated daily exposure, smoking, sex)} \\ \text{logit (Dyspnea)} &= (0.012)\text{DE} + (0.477)\text{sex} + (0.901)\text{SM} - (5.682) \end{aligned} \tag{4}$$

Similarly logit for cough was taken as

$$\begin{aligned} \text{logit (Cough)} &= \text{f (smoking, DE, DE}^2\text{)} \\ \text{logit (Cough)} &= (-6.9242) + (1.46575)\text{SM} + (0.015)\text{DE} + \\ &\qquad (0.227 \pm 0.23)\ \text{DE}^2 \end{aligned} \tag{5}$$

To account for days of workloss the following estimates have been made:

$$\begin{aligned} \text{Absenteeism (\%)} &= \text{f(DE)} \\ \text{Absenteeism} &= (0.039) + (0.32085)\text{DE} \end{aligned} \tag{6}$$

$$\text{TDR\%} = (4.1517) - (0.6723)\text{logPop} + (5.77 \times 10^{-6})\text{DENS} + (1.69 \times 10^{-4})\text{slum} + (0.00168)\text{Hosp} + (0.0059)\text{DE} \quad (7)$$

where

TDR%	=	total death rate, percent of
Pop	=	population
slum	=	slum population
DENS	=	population density per sq. km
Hosp	=	persons per health service
SM	=	smoking population

Total death rate rises with the rising levels of DE, slums and population density.

Considering normal death rate in Numbai as 0.76%, (as in the records maintained by Brihanmumbai Municipal Corporation) the number of excess deaths is estimated as 7045. This has been computed by taking a partial differential of the Equation (7) with respect to DE, which gives the excess rate of death attributable to DE

$$\delta\text{TDR}/\delta\text{DE} = 0.0059$$

$$\Delta\text{TDR}\ (\%) = 0.0059 * \Delta\text{DE}$$

Excess death rate = 0.0059 * 10
Normal death rate in Mumbai = 0.76%
Population in Mumbai = 15.6 Million
Number of normal deaths = 0.76 * 15600000/100 = 118560
Number of excess deaths = 0.059 * 118560 = 7045

The Daily Exposures (DE) estimated in the present paper are fairly representative of Mumbai.

Estimation of exposure of various population sub groups has been conducted to aggregate the results. The information used for this purpose is presented in Table I.

Economic valuation of health impact has been based on income lost due to mortality. The value of statistical life (VSL) is estimated as the discounted value of expected future income at the average age, if the average age of the population is 24 yr and the life expectancy at birth is 62 yr.

$$\text{VSL} = \sum_{t=0}^{38} \text{w}/(1+\text{d})^{\text{t}} \quad (8)$$

where,

w	=	average annual income,
t	=	life expectancy – average age of population
d	=	the discount rate (Shin *et al*., 1992).

TABLE I
Population sub groups and vehicle population

Total population of Mumbai[a]	15.6 million
Slum population	60%
Low Activity-based population	
Male workers	15%
Female workers	15%
House-wives	8%
Infants (0–5 yr)	20%
School and College children	35%
Elderly > 65	7%
Vehicular population[b]	
4 wheelers Jeep/Car/Wagons	3,28,259
2 wheelers	3,28,940
Autorickshaws	72,007
Buses	12,809
Delivery Vehicles	48,206

[a] Interntional Institute for Population Sciences, Mumbai
[b] Transport Commissioners Office, Maharashtra State, Mumbai.

Mortality can also be valued by the willingness to pay (WTP) approach. Willingness to pay to prevent a day of illness has not been developed for India. Simply adjusting for wage differentials between India and any other country where relevant data are available, and attributing the resulting number to India, may not provide any useful inference.

Restricted activity days have been valued as 20% workloss and 80% lower productivity. Considering average wage in Mumbai to be Rs. 80.00 per day and lower productivity valued as one third average wage, a restricted activity day is valued to be Rs. 37.50. An emergency room visit (ERV) has been estimated as

$$\text{ERV} = 1 \text{ workday loss} + \text{hospital charge} + \text{medication} + \text{transport} \quad (9)$$

For Mumbai an ERV is estimated to cost Rs. 380 to 430. Here private hospital charge for emergency room visit is considered to be Rs. 15-/– to Rs. 200/– (including medication) and transport as Rs. 150/–. Asthma attack can last for 9.1 days. Accounting for Hospitalisation charges (Rs. 1500 per day in private hospitals) and lost workdays the cost of an asthma attack is estimated at Rs. 300 to 14378. Milder asthma attacks are more frequent and are valued as for ERV. The average valuation is estimated as Rs. 1500/– per attack. Similarly, chronic bronchitis is estimated as Rs. 2,12,600 per incident. Here life expectancy is taken to be 62 yr and the age

TABLE II

Individual exposures of various population sub groups in Mumbai

Category	Daily exposure (μg m^{-3})	Exposure burden %
Male Workers	9	16
Female Workers	15	26
House-wives	10	9
Infants	8	18
School College Children	6	24
Elderly	8	7

at which a patient may become chronically ill with bronchitis to be 35 yr. The costs include 50 loss days per year, valued at Rs. 80/– per day, and an average of 13.1 hospital visits of 10 days each, valued at Rs. 1500/– per day, and a yearly expenditure on medication of Rs. 1500/–. Final estimate is arrived at discounting at 5%.

3. Discussion

It is estimated that exposure in slum area is approximately 16 μgh m^{-3}, while in other places it is 6 μgh m^{-3}. Estimates of exposure burden expressed as a product of population and daily exposure show that slum population, which is 60% of the total population, bear the exposure burden of 80%. Female workers whose population is 15% bear the maximum exposure burden (20%), followed by school and college children. Exposure and percent exposure burden of various population sub groups are presented in Table II.

3.1. Health valuation

The valuation of mortality and morbidity in the present work has been carried out taking into account an average income for different strata of society. So also, willingnes to pay for health damage has also been taken as an average for the different strata of society.

Considering wage in Mumbai as Rs. 80 per day and assuming 200 working days a year and 5% discount rate, the value of statistical life in Mumbai is estimated as Rs. 2,85,000 as per Equation 8.

The estimated impact of air pollutant on health is summarized in Table III.

TABLE III
Estimated impacts of air pollutants on health

Type of health impact	No. of Cases (Thousand)
Chronic Bronchitis	24
Restricted Activity days	20,200
Emergency room visits	87
Bronchitis in children	220
Asthma	901
Respiratory symptom days	75,000
Respiratory hospital admission	5.8

TABLE IV
Valuation of health impacts

Type of health impact	Specific cost Rs.	Total cost million Rs.
Mortality		
Loss in salary approach	2,85,000	2,007.84
Morbidity		
Restricted activity days	37.50	767.50
Emergency room visit	380–430	35.24
Bronchitis children	390	85.80
Asthma attacks	1,500	1,351.50
Respiratory symptom days	24	1,800.00
Respiratory Hospital admission	14,378	83.39
Chronic Bronchitis	2,12,600	5,102.40
Total cost		11,224.17

Valuation of illness is presented in Table IV. Total health cost figures have been evolved combining figures for mortality and morbidity. The costs have been estimated as discussed earlier.

Tables V and VI give the avoidance costs of vehicular pollution in Mumbai and pollution due to fuel wood and kerosene burning during cooking. The avoidance cost for vehicular pollution has been estimated, considering prices of non-noble, metal-based catalytic converters for four and two wheelers and particulate straps for diesel vehicles. To arrive at the avoidance cost due to cooking, the cost incurred in shift of fuel per kg change in emission has been used.

It is seen that total avoidance cost is about Rs. 3281 million, which is much less than the health damage cost of Rs. 11224 million.

TABLE V

Avoidance cost by adopting pollution control methods for vehicles

Vehicle category	Cost per catalytic converter (Rs).	Avoidance cost (million Rs.)
Jeeps/cars/wagons	3960	1299.90
Two wheelers	1980	651.30
Autorickshaws	880	63.37
Buses	6500	83.26
Goods vehicles	6500	313.34
Total		2411.17

TABLE VI

Avoidance cost for emission due to cooking

Measure	Avoidance cost Rs./kg of emission	(million Rs.) (million Rs.)
Fuel wood to LPG	3956.4	869.50
Kerosene to LPG	15.0	0.04
Total		869.54

4. Conclusion

The economic valuation done here has several associated problems. The nature of problems varies from nature of data availability, existence of data gaps, nature of sample studies etc. to the econometric analysis. Mortality and morbidity evaluation in the present work considers an average scenario for the society. Daily wage and average annual income in Mumbai needs to be considered for different income groups of the society for morbidity and mortality evaluation. The valuation methodology adopted gives a good, but conservative, idea of health damage costs. However, inclusion of carcinogenic effects of certain air pollutants and consideration of damage to health due to a greater number of pollutants, will give higher damage costs. Further studies are being aimed at including property damages, carcinogenic effects and ecological damages, and more extensive air quality monitoring both indoors and outdoors. As it is clear that avoidance cost is 29% less than damage cost, the policy and government intervention and public awareness in this regard needs to be created so as to save the individual and government expendit-

ure. The quality of life will also be enhanced if pollution avoidance measures are promoted.

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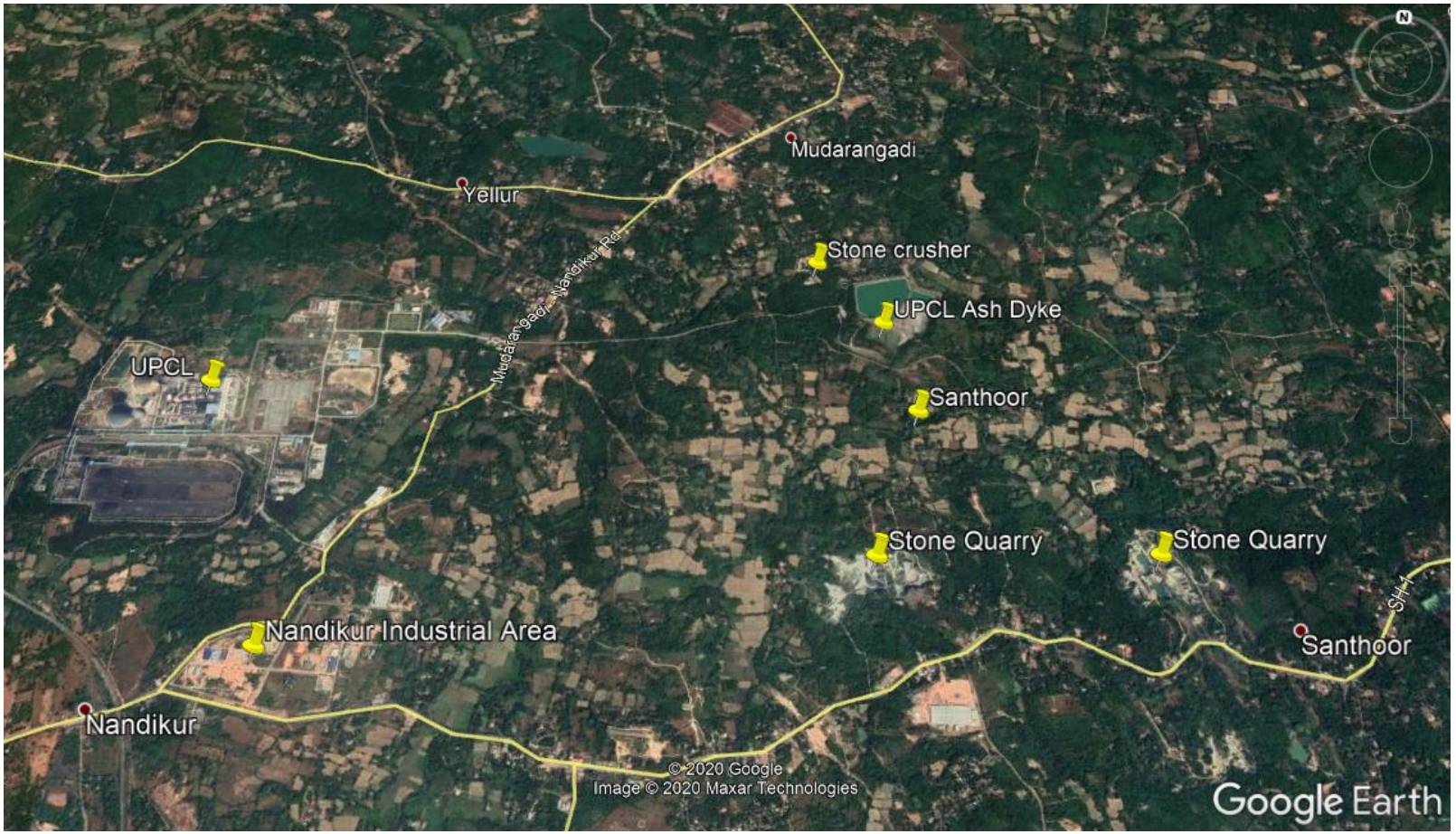
ANNEXURE-R4

Data regarding location of villages and proximity to other activities in the villages:

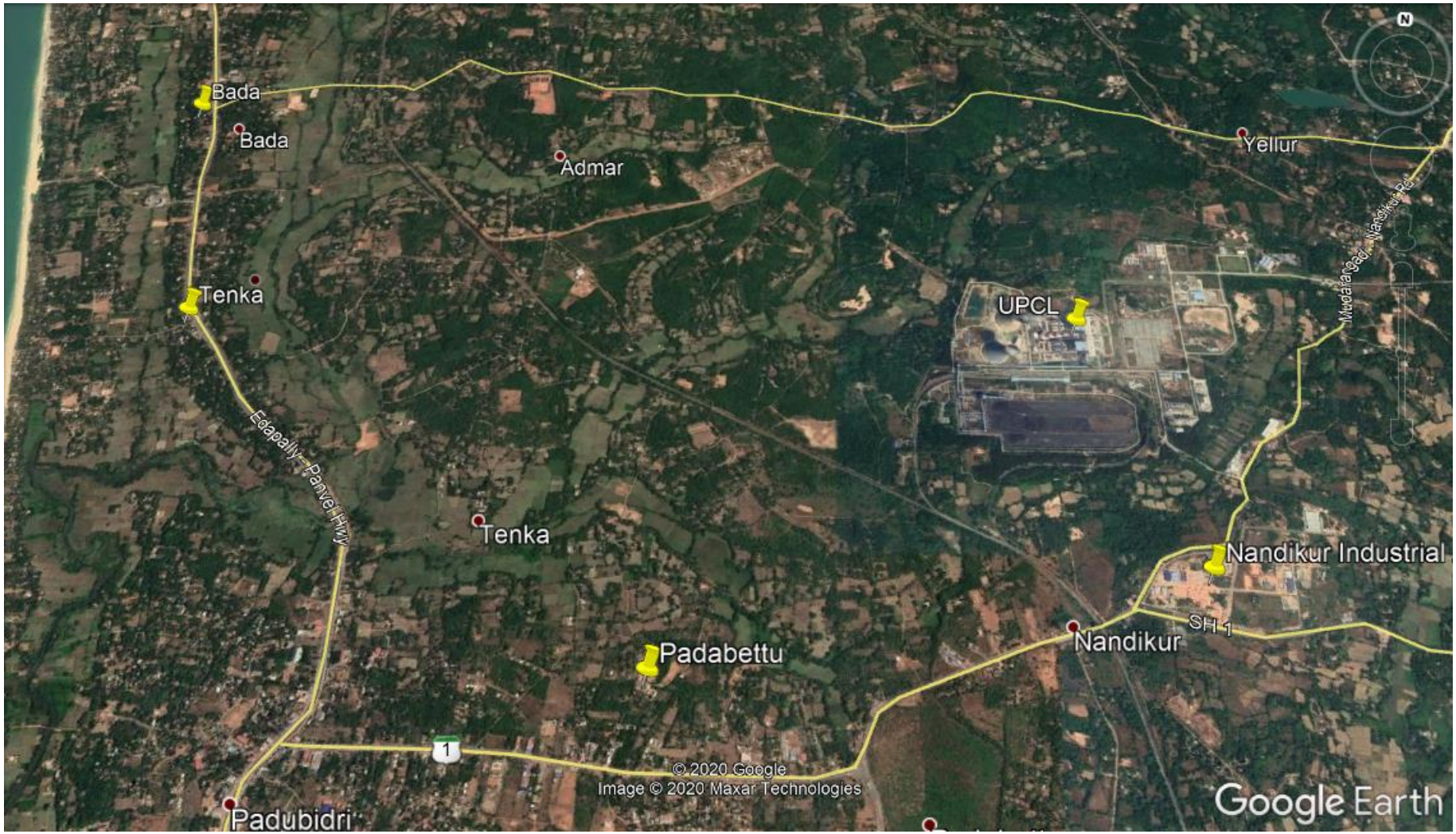
1. Village: Santhoor, Population: 3062.
   Santhoor Village households are spread out in between SH-1 on the south and village road on the North-west side, UPCL main plant & Nandicoor Industrial area on the west side and stone quarry on the east side. Village is 3 km from UPCL chimney towards downwind direction. UPCL ash dyke is in this village.
   Other activities in the village:
   i. Two stone quarries are in operation.
   ii. One stone crusher is in operation.
   iii. Nandicoor Industrial area was constructed during 2014-15 and many industries like Bio-medical waste incinerator, cashew oil processing are in operation which has emission sources.
   iv. SH-1 work was taken up in 2013-14 and completed in the year 2015-16.
   v. ONGC crude oil pipeline work was undertaken from 2015 to 2017 in the village which connects to Underground Oil Storage site at Padoor.



2. Village: Tenka, Population: 4717

   Tenka village is on the NH-66 spreading towards west side. Village is 4 km from UPCL chimney towards upwind direction. UPCL sea water pump house is located in this village.

   Other activities in the village: NH-66 construction work started during 2014-15 and major works continued till 2017.



3. Village: Hejamadi, Population: 8564

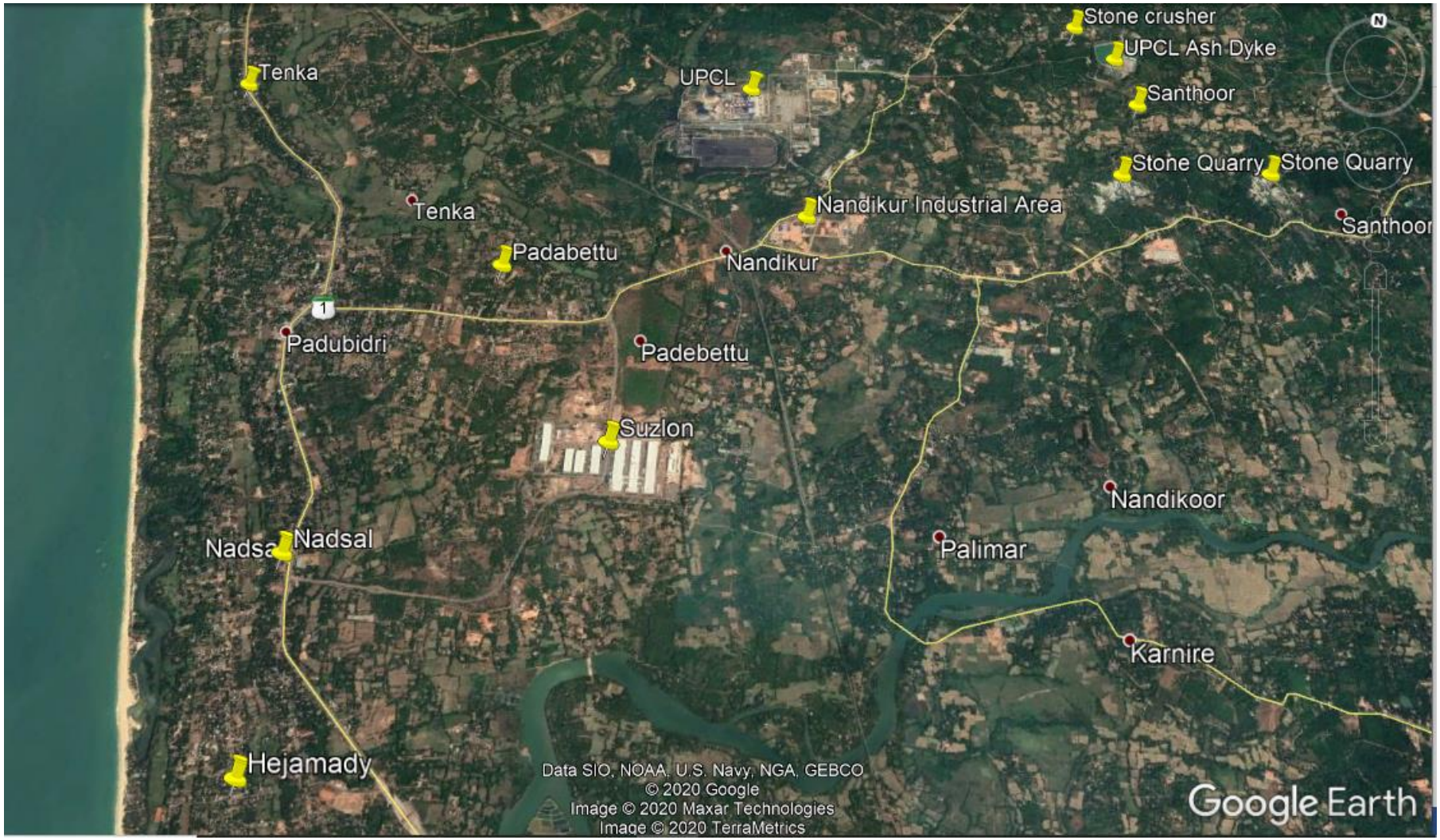
   Hejamadi is on the NH-66 and spreading towards west side. Village is 6.5 km from UPCL chimney towards upwind direction.

   Other activities in the village:

   i. NH-66 construction work started during 2014-15 and major works continued till 2017.

   ii. Hejamadi has a small fishing jetty with majority fishermen population.

   iii. Vehicular traffic due to fish transportation and allied activities.



4. Village: Pilar, Population: 3308

   Pilar village is situated on SH-67 and spreading towards west side. Village is 7.8 km from UPCL chimney towards downwind direction.

   Other activities in the village:

   i. SH-67 was developed during 2018-19 & 2019-20.

   ii. SH-67 is having vehicle traffic of mostly construction materials and public transport.

   iii. One Stone Quarry is on the East of the village.

5. Village: Bada, Population: 9090

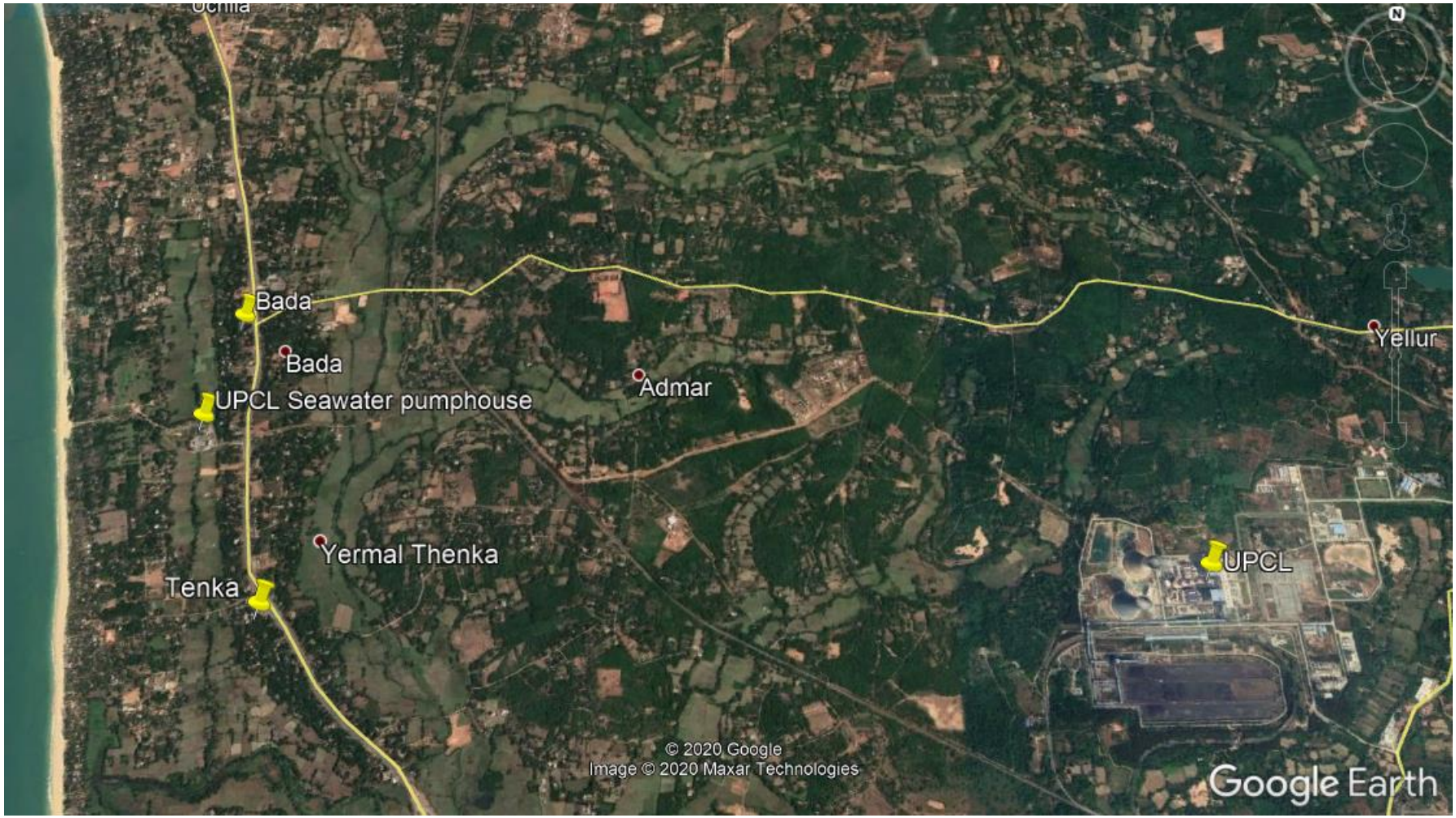
   Bada village is on the NH-66 spreading towards west side. Village is 4.5 km from UPCL chimney towards upwind direction.

   Other activities in the village:

   i. NH-66 construction work started during 2014-15 and major works continued till 2017.

   ii. Petrol Station is located in this village on the NH-66. Heavy vehicles traffic is very high.

   iii. Petrol Station was expanded with construction of gas station during 2018-19.



6. Village: Belapu, Population: 5051

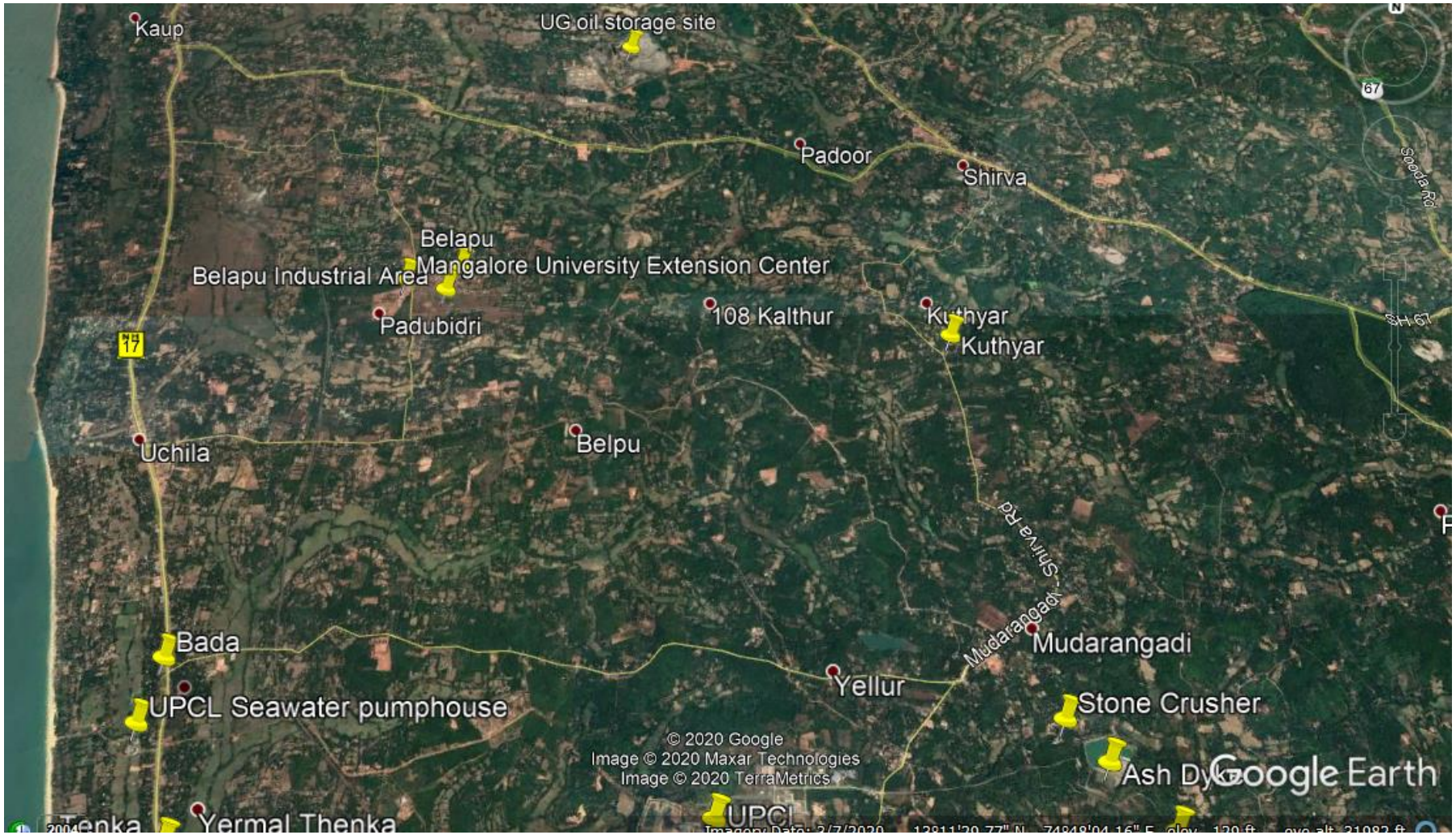
   Belapu village is situated NW of UPCL. Village is 5.5 km from UPCL chimney towards crosswind direction.

   Other activities in the village:

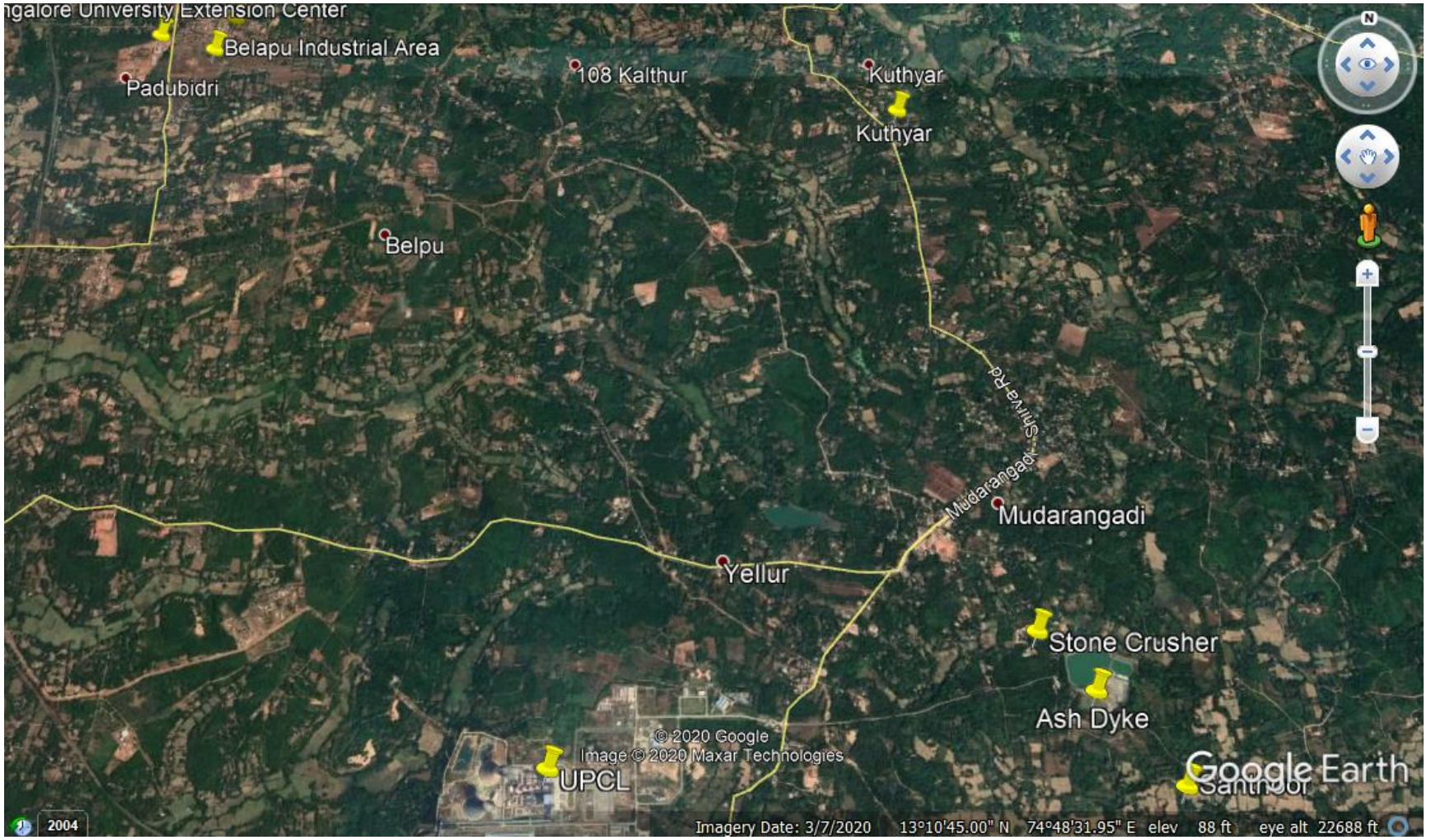
   i. Belapu Industrial Area is constructed during 2014-15.

   ii. Mangalore University Extension Center Campus is being developed in the vicinity of the village.

   iii. ONGC Underground Oil Storage site is located 3 km towards the north of the village. This facility was constructed from 2013-14 to 2018-19.



7. Village: Kuthyar, Population: 6057
   Kuthyar village is on the Mudarangadi- Shirva Road towards north of UPCL. Village is 4.5 km from UPCL chimney towards crosswind direction.



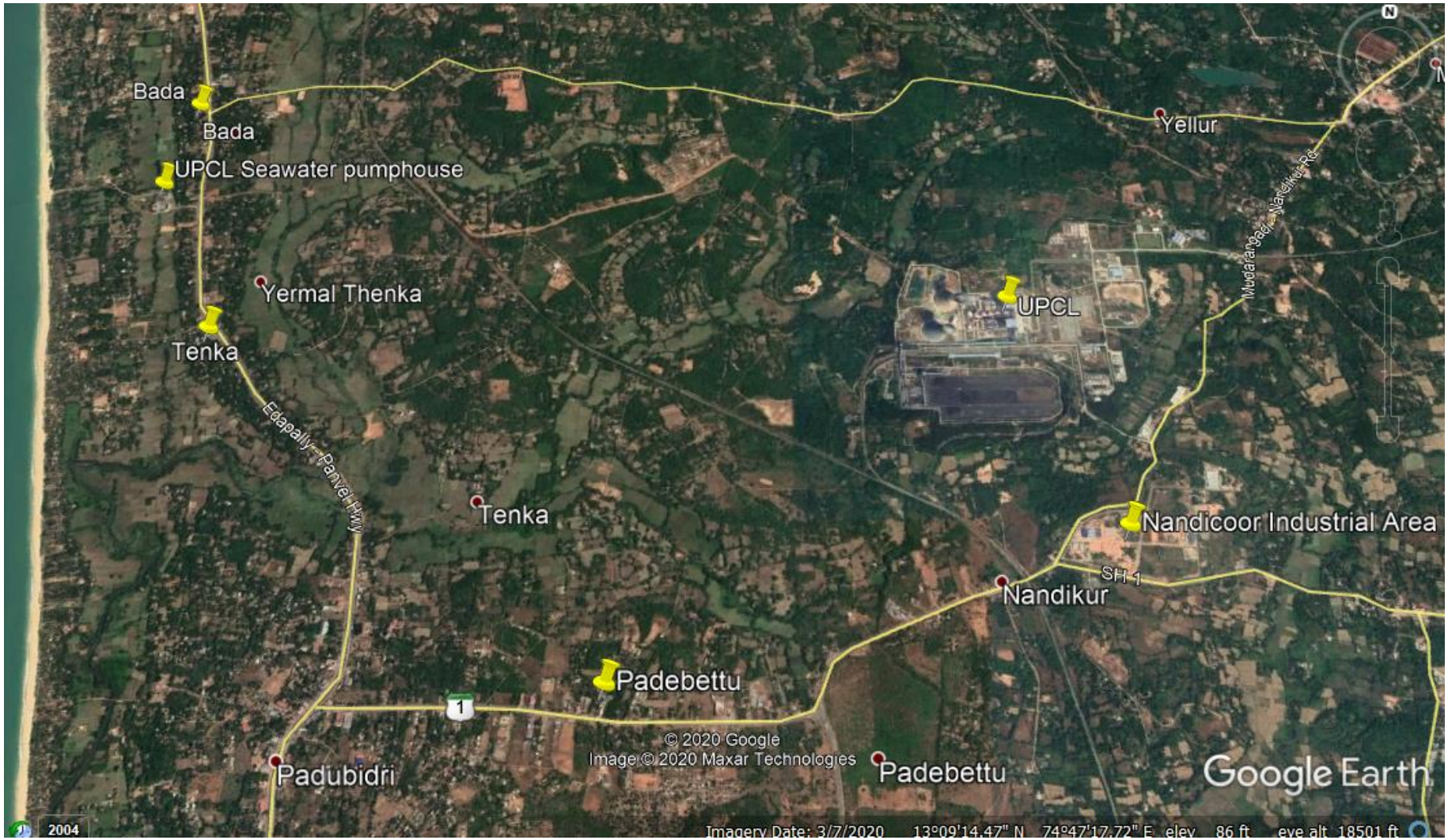
8. Village: Padebettu, Population: 2455

Padebettu village is situated on the SH-1 towards SW of UPCL. Village is 2.75 km from UPCL chimney towards upwind direction.

Other activities in the village:

i. SH-1 work was taken up in 2013-14 and completed in the year 2015-16.

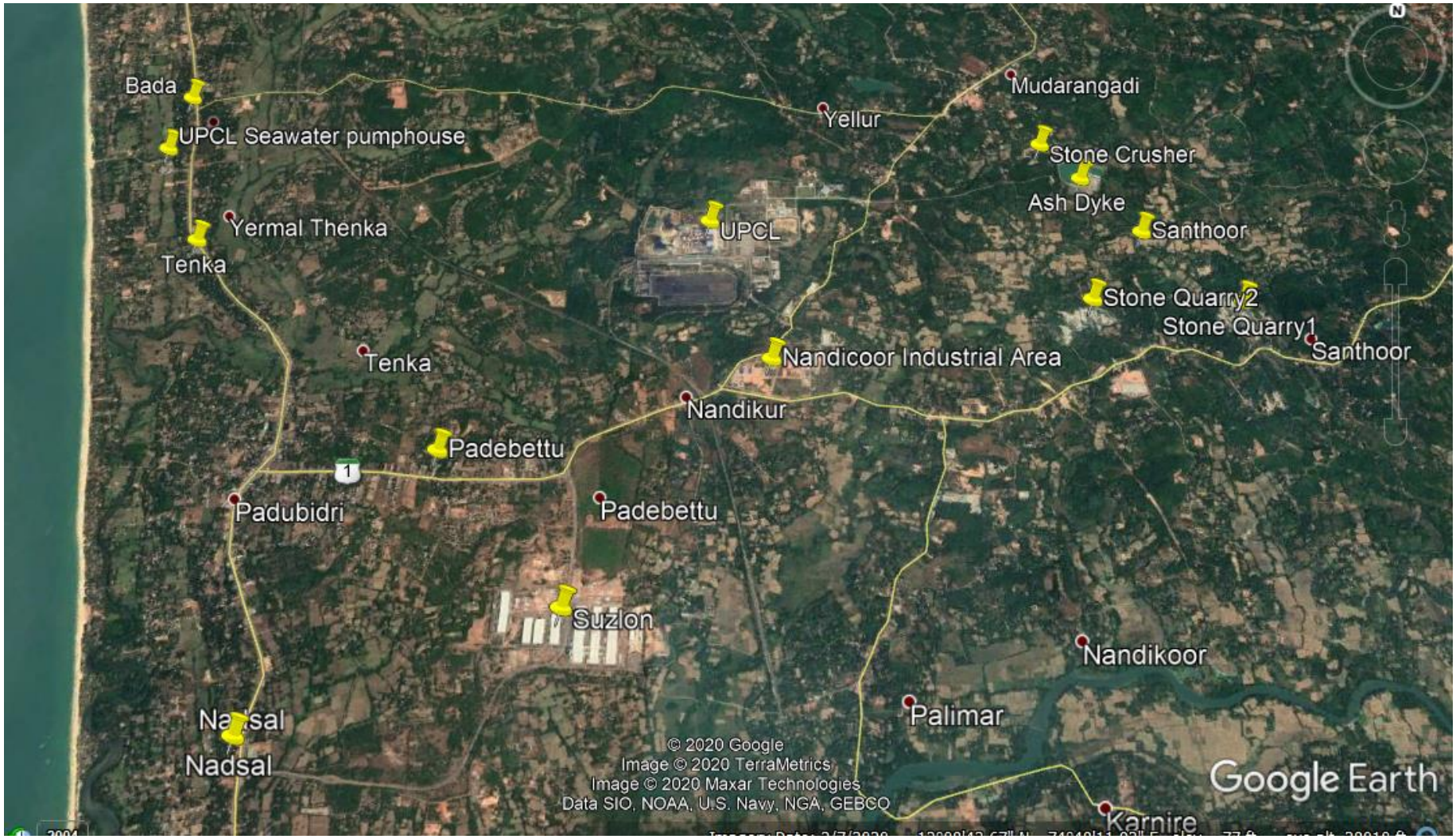
ii. Suzlon Manufacturing industry is situated near to the village.



9. Village: Nadsal, Population: 11900

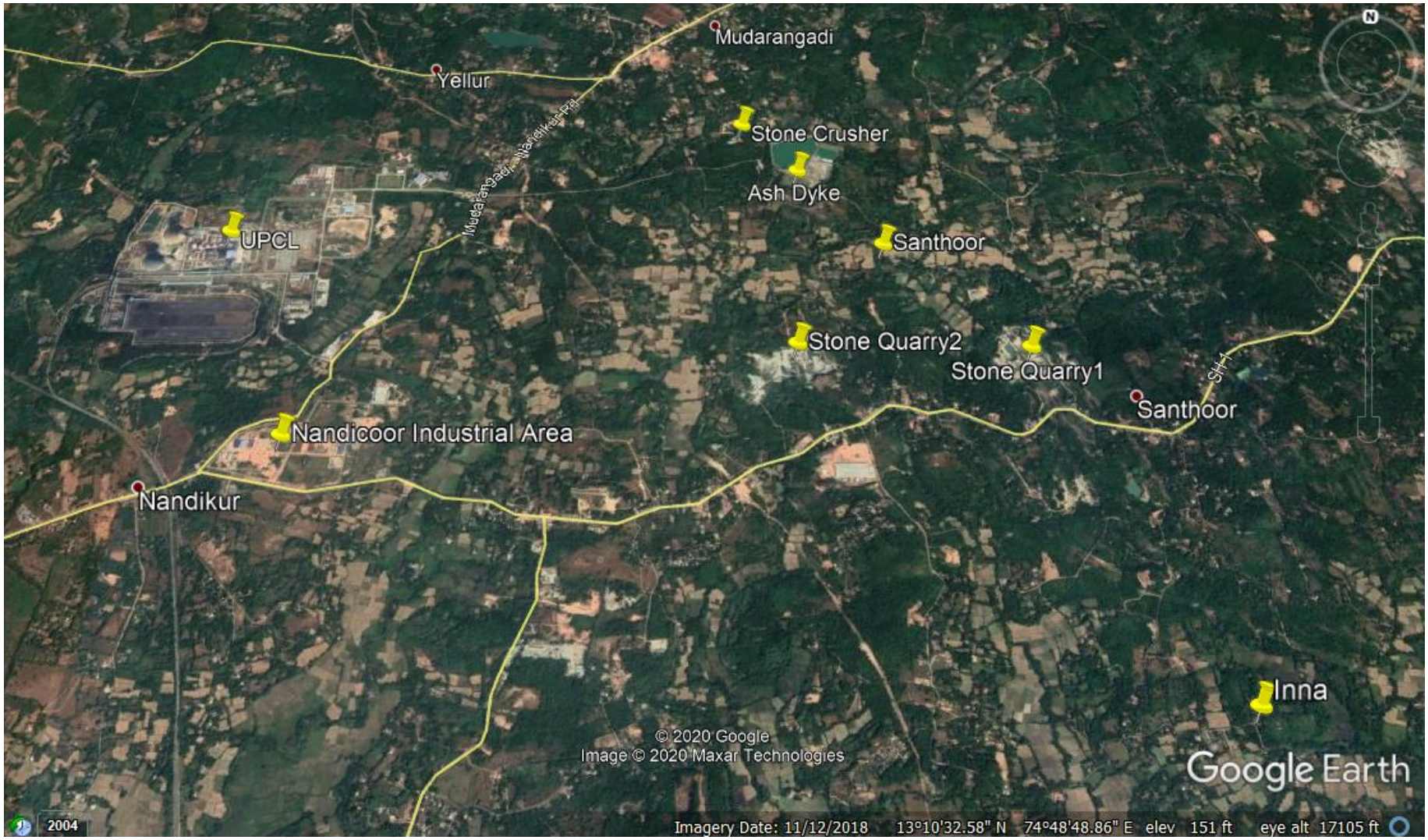
Nadsal village is on the NH-66 spreading towards west side. Village is 5 km from UPCL chimney towards upwind direction.

Other activities in the village: NH-66 construction work started during 2014-15 and major works continued till 2017.



10. Village: Inna, Population: 3523

    Inna village is towards SE of UPCL. Village is 5.5 km from UPCL chimney towards crosswind direction.



11. Village: Nandikur, Population: 2987

Nandikur village is situated on the SH-1 towards SW of UPCL. Village is 2.7 km from UPCL chimney towards crosswind direction.

Other activities in the village:

iii. SH-1 work was taken up in 2013-14 and completed in the year 2015-16.

iv. Suzlon Manufacturing industry is situated near to the village.

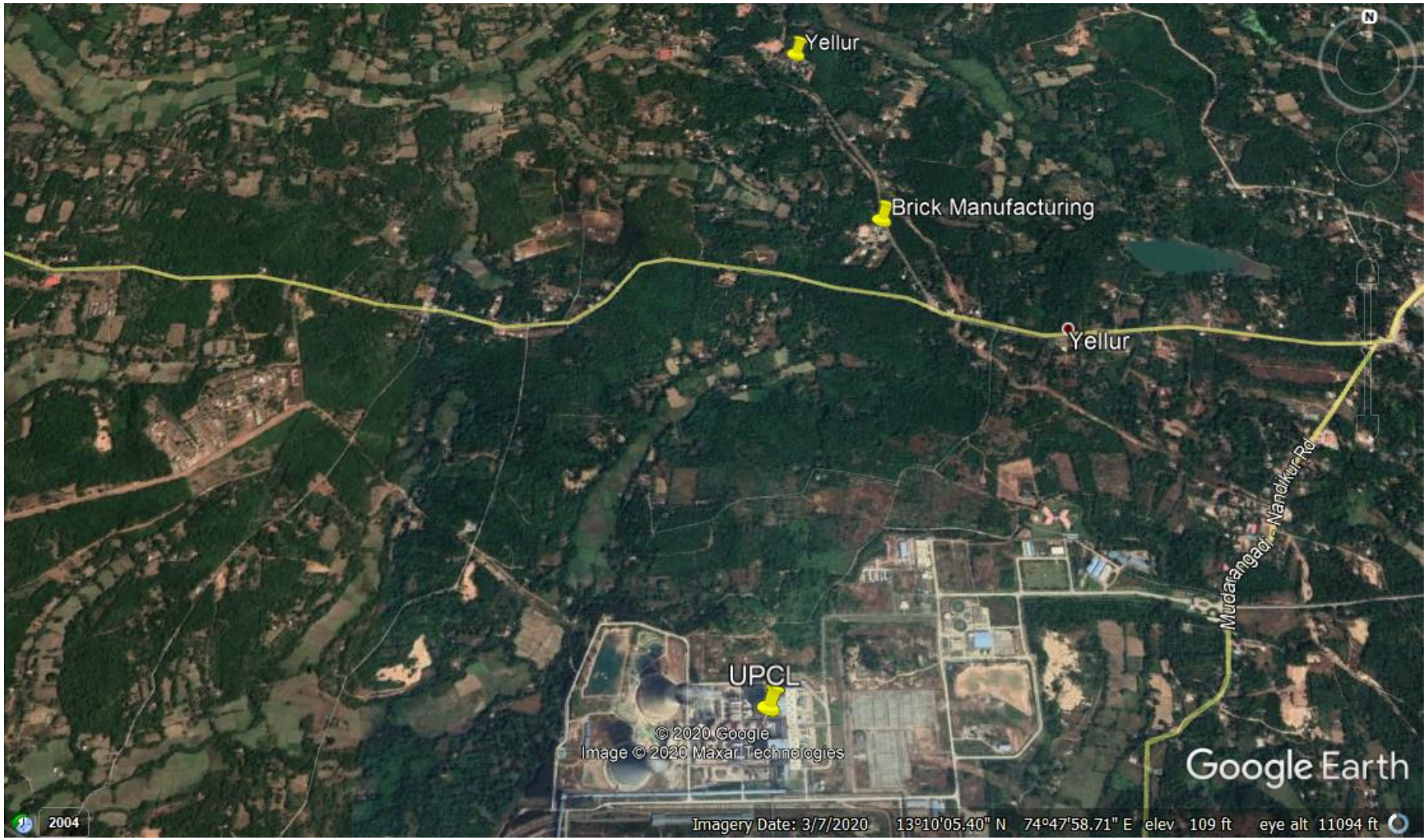
v. One Brick manufacturing unit is in operation.

vi. Nandikur Industrial area was constructed during 2014-15 and many industries like Bio-medical waste incinerator, cashew oil processing are in operation which has emission sources.

12. Village: Yellur, Population: 5453

Yellur village is situated on the Mudrangadi – Uchilla Road towards N of UPCL. Village is 2 km from UPCL chimney towards crosswind direction. UPCL mail plant is situated in the village.

Other activities in the village: One Brick manufacturing unit is in operation.



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ANNEXURE-R5

SL no.	Name of the Industry	Activity
1	New Satish Cashew Indus, Shirva Udupi	Cashew Kernel manufacturing
2	Sri Devi Stone Crusher, Sy,no.366/1, Santhoor village Padubidri, Udupi Tq & Dist	Stone Crusher
3	Aspen Infrastructure Limited, 251, Karkala Road	SEZ
4	Suzlon wind international, Padubidri village, Udupi	Wind Mill fan manufacturing
5	SE Composites, Plot no3, SEZ- Aspen Infrastructure (Suzlon tower international)	Wind Mill fan manufacturing
6	Coelho Construction Pvt Ltd, Ltd, H.No.3-146	Interlocks & Pavers
7	Hindustan Durgs, sy.no.86/8, Nandikoor village, Palimar	Ayurvedic Medicine
8	Ashoka Impex, Unit-II, Sy.no.7/B, Shirva village, Kapu Hobli, Udupi Tq & Dist	Granite Cutting and polishing
9	Vinteck India Corporation, sy.no.127/3 Santhoor	Fly ash bagging
10	Sri Nidhi Blocks, sy.no.275/A5 Yellur village	Hollow Blocks manufacturing
11	Chamundi Stone Crusher,sy.no.428/1 Shirva village	Stone Crusher
12	R.K Stone Crusher,sy.no.183/1, 183/3, 183/13, 183/15, 183/21, Shirva village	Stone Crusher
13	Coastal Plastics, Idustrial Area, Nandikoor	Plastic recycling
14	RRM Coconut Mill, Mudarangadi, Pilar	Coconut oil manufacturing
15	Ayush Envirooteck Pvt Ltd, Plot no. 50 Nandikoor village, KIDB Industrial area Nandikoor, Udupi Tq	CBWTF/ Incinerator
16	Bright Flex International Pvt Ltd, Plot no, 162/B Industrial area Nandikoor, Udupi Tq &District	Plastic Bags Manufacturing
17	Intaglio Engraving Systems, Sy.No.51 Plot No.21 of Nandikoor- 574111, Udupi Tq & Dist	Printing rollers
18	Sarvada Distelleries, Sy.no.49,50 &175,Plot no,29 & 30, Nandikoor, Industrial Estate, Padubidri, Udupi District	IMFL Bottling
19	Sri Chakra Containers Pvt Ltd, Plot no. 40 Nandikoor, Industrial Estate, Padubidri, Udupi District	Plastic Bags Manufacturing
20	Color Park, Sy.no.174/Plot No.54, Nandikoor village, Padubidri, Udupi	Blending/Mixing of colour
21	Ocean Fresh Exports, Plot. No.26 Nandikoor village Industrial area, Udupi tq & District	Fish Freezing only
22	Neeha Laminators, Plot. No.33, KIADB Industrial area Nandikoor village, Udupi tq & District	flexible printed & Laminated packaging material
23	Munna Stone Crushers, Sy. No. 382/1, 383/1 & 385/1, Santhoor village, Inna village, Udupi tq & District	Stone Crusher
24	Ramky Energy and Environment Ltd, KIADB Industrial area, Survey no. 47B, Karnad, Mulki, Dakshina Kannada - 574154	CBWTF/ Incinerator

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An understanding of the genetic basis of asthma

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Abstract

Asthma is the most common chronic childhood disease in developed nations and its prevalence has increased in the world over the last 25 years. It is a complex disease with both genetic and environmental risk factors. Asthma is caused by multiple interacting genes, some having a protective effect and others contributing to the disease pathogenesis, with each gene having its own tendency to be influenced by the environment. This article reviews the current state of the genetics of asthma in six categories, *viz*. epidemiology, management, aetiology, family and twin studies, segregation and linkage studies, and candidate genes and single nucleotide polymorphisms (SNPs).

Keywords: Aetiology, asthma, linkage, prevalence, SNPs

Introduction

Asthma is one of the most serious allergic diseases and the most common chronic childhood disease in developed nations[1]. It has been characterized by increased responsiveness of the tracheobronchial tree to a multiplicity of stimuli[2–4], increased infiltration of various inflammatory cells especially eosinophils into the airway, epithelial damage, airway smooth-muscle hypertrophy[5], constriction, variable airway obstruction usually associated with inflammation in the conducting airways of the lungs[6] and mucous hypersecretion in the bronchiolar walls of the lung[7]. Asthma is critically dependent on a series of cell adhesion molecule-mediated interactions between vascular endothelium and leukocytes[7], leading to symptoms[8] and elevation in total serum IgE[9]. It is manifested physiologically by widespread narrowing of the air passages and clinically by paroxysms of dyspnoea, cough, wheezing and tightness, provoked by one or more triggers such as physical exertion and airway irritants (cold, dry air, smoke, *etc*.)[4,10]. It is an episodic disease, with acute exacerbations interspersed with symptom-free periods. Typically, most attacks are short-lived, lasting minutes to hours, and clinically the patient seems to recover completely after an attack. However, there can be a phase in which the patients experience some degree of airway obstruction daily. This phase can be mild, with or

without superimposed severe episodes, or can be much more serious, with severe obstruction persisting for days or weeks; the latter condition is known as “acute severe asthma”. In unusual circumstances, acute episodes can cause death[4]. Asthma exacerbations are characteristically worse at night and can progress to severe airflow obstruction, shortness of breath, and respiratory distress and insufficiency. Rarely, severe sequel such as hypoxic seizures, respiratory failure, and death can occur[10].

Here we review the latest information on the genetic basis of asthma which is one of the most intriguing diseases affecting people of all ages, gender, race and ethnicities. Familial and segregation studies have an important role in asthma aetiology and several candidate genes on all the human chromosomes play their roles in initiation and/or inhibition of different pathways of asthma disease.

Epidemiology

Epidemiological studies carried out in different countries indicate the prevalence of respiratory allergy as 15-30 per cent[11] and asthma affects in the range of 3.5-20 per cent of the population in any country[12]. The documented increase in asthma prevalence over the last 25 years is likely due to changes in our environment or lifestyle because changes in our genetic makeup would take more than several generations to occur[13]. Worldwide, asthma cases are increasing at a rate of 50 per cent every decade, and according to the World Health Organization, by the year 2020, asthma, along with chronic obstructive pulmonary disease (COPD) will become the third leading cause of death. An estimated 300 million people in the world currently have asthma and there may be an additional 100 million persons with asthma by 2025[14].

Unlike in the case of most other diseases, the prevalence of asthma is the highest in developed countries such as the United States, the United Kingdom, Australia, New Zealand and North-west Europe[8], and the least in Macau[1,14,19] (Table I). About half of the people with asthma develop it before age 10, and most develop it before the age of 30. Among younger children, asthma develops twice as frequently in boys than in girls, however, after puberty it is more common in girls. The prevalence of asthma is higher in urban areas than in rural[1,20]. Poverty and malnutrition exacerbate asthma in children, leading to compromised lung function.

Table I

Prevalence of asthma in different countries

Country	Prevalence/1000	Reference
Scotland	184	14
U.K.	153	14
New Zealand	151	14
Australia	147	14
Canada	141	14
U.S.A.	130	15
Brazil	114	14
Pakistan	108	16
Turkey	74	14
France	68	14
Japan	67	14
Thailand	65	14
Germany	63	17
Iran	55	14
Nigeria	54	14
Malaysia	48	14
Italy	45	14
India	24	18
Russia	22	14
China	21	14
Macau	7	14

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It has been reported that India has approximately 15-20 million asthmatics and 10 to 15 per cent of Indian children between the ages of 5 and 11 yr show symptoms of asthma. In India, there is a median prevalence of about 2.4 per cent in adults of over 15 yr of age[21]. In one of the largest epidemiological multi-centric studies on the prevalence of asthma in Indian adults using a uniform, validated and standardized methodology, a prevalence of 1.69-3.47 per cent was observed[22]. Female gender, increasing age, family history of asthma, history suggestive of atopy, lower socio-economic status and urban residence were significantly associated with asthma[22]. In a study in Mumbai, the prevalence of asthma in adults was 3.5 and 17 per cent when broad definitions including asymptomatic bronchial hyper-responsiveness were used[23]. In rural children in Delhi, parental smoking, paracetamol intake,

current exposure to cat, exposure to traffic pollution were found to be significantly associated with current wheezing[24] whereas in children aged 4-15 yr in Chandigarh, a prevalence of 7 per cent was observed[25]. India accounts for a third of the world's asthma patients[20].

Management

Asthma can be suspected in a patient based on history, patterns of symptoms and physical examination. The gold standard for the diagnosis of asthma remains spirometry demonstrating > 12 per cent and >200 ml improvement in FEV1 after bronchodilation[26]. Bronchoprovocation tests can be used to confirm bronchial hyper-responsiveness. Pulse oximetry and arterial blood gas analysis are used to assess the severity of acute asthma attack and chest X-ray is used to rule out asthma mimickers and related complications such as pneumothorax. Asthma is classified according to the persistence of symptoms and their severity[26]. Asthma treatment includes environmental control and medication. Quick relief medications are intended to open up the airways to improve breathing during an acute exacerbation. Long-term medications are taken even when no symptoms are present, to minimize lung inflammation. Once an individual has been diagnosed with asthma, a physician will develop an asthma action plan to help the patient to monitor the condition. Although the worldwide market for asthma medication is currently worth of US$5.5 billion a year to the pharmaceutical industry[1,27,28], there is no cure for asthma and only the symptoms can be controlled.

Current asthma management is aimed at reducing airways inflammation by using daily “controller” anti-inflammatory medications, minimizing proinflammatory environmental exposures, and controlling co-morbid conditions that can worsen asthma. Less inflammation typically leads to better asthma control, including less need for “quick-reliever” asthma medication (*i.e.*, beta-agonist bronchodilators) and fewer exacerbations[10].

Aetiology

Studies of family history, twins, familial aggregation and segregation studies in asthma have convincingly shown that the disease has a strong genetic component[20]. A heterogeneous condition of asthma may predominate in different geographic locations, and is strongly influenced by environmental factors that may differ among populations and at different ages. However, it is likely that the risk of developing asthma is greatest when both genetic and environmental risk factors are present simultaneously[13].

The inheritance of asthma and allergy does not follow the classical Mendelian patterns of inheritance[6]. However, rarely monogenic cases of atopic disease have been documented and the majority of atopic asthma is likely to be the result of numerous interacting genetic and environmental factors[1]. It is a commonly believed that asthma is caused by multiple interacting genes, some having a protective effect and others contributing to the disease pathogenesis, with each gene having its own tendency to be influenced by the environment.

Family and twin studies

Familial aggregation of asthma was probably first described by Sennertus in 1650[27]. Two large studies were performed the inheritance of atopy, one in 1916[28] and the other in 1924[29]. In the first and second studies 48.4 and 58.4 per cent of family history cases respectively were reported and autosomal dominant inheritance of atopy was suggested. Schwartz[30] reported that the prevalence rates of asthma in the 1,634 relatives of the 161 asthmatic subjects was 6.6 per cent, but, in the 1,790 relatives of the

control group, only 1 per cent. Sibbald *et al*[31] reported that the overall prevalence of asthma in the first degree relatives of asthmatics was 13 per cent and in the relatives of controls only 4 per cent. This indicates that there is a considerable genetic component in the pathogenesis of asthma.

A large twin study reported in 1971 was a questionnaire--based study of 6,996 twin pairs from the Swedish Twin Registry. In this study the monozygotic (MZ) concordance for self-reported asthma was 19 per cent and dizygotic (DZ) concordance was 4.8 per cent. Another large Finnish study investigated 13,888 twin pairs and showed a concordance rate of 0.13 for MZ twins and 0.7 for DZ twins, and under the multifactorial threshold model, the heritability of asthma combining the sexes was 36 per cent[6]. Duffy *et al*[32] in a questionnaire-based study of 3,808 Australian twin pairs showed a correlation of self-reported asthma of 0.65 among MZ twins and 0.24 among DZ twins. The heritability was 60 per cent for females and 75 per cent for males. Harris *et al*[33] studied 5,864 Norwegian twins in a study on health and development in Oslo. The proband-wise concordance for asthma was 0.45 for MZ twins and 0.25 for DZ twins. A population-based twin family study in 16 yr old Finnish twins and their parents[34] presented combined twin/family data on the inheritance of asthma. The heritability of asthma was approximately 79 per cent, whereas 21 per cent was due to unique environmental factors[34]. Huovinen *et al*[35] have studied 262 Finnish twin pairs, and reported that in addition to allergic diseases, educational level and physical activity were associated with adult onset asthma. Nystad *et al*[36] have studied 3334 pairs of Norwegian twins aged 18-35 yr and established that the phenotypic correlation between disease and symptom was 0.67 for asthma and wheezing.

Twin studies have generally shown that concordance rates for asthma are significantly higher in MZ twins than in DZ twins, whether reared apart or together. Broad-sense heritability estimates derived from twin studies range from 36 to 75 per cent[14]. Twin studies have revealed a 0.74 concordance between monozygotic twins and a 0.35 concordance between dizygotic twins, implicating a genetic contribution to asthma development[10].

Segregation and linkage analysis

Segregation analysis can provide insight into the genetics of a trait, *e.g*. the number of genes involved and the genetic model: dominant or recessive, polygenic, and those with environmental effects. Using this type of analysis, the heritability, mode of inheritance, penetrance and frequency of a trait are being estimated and also indicated the involvement of major genes[6].

A large study performed by the European Community Respiratory Health Survey Group analyzed the pooled data from 13,963 families (consisting of 75,392 randomly selected individuals) using complex seg-regation analysis. The results of this study showed further evidence of genetic regulation of asthma and a model with a two-allele gene with codominant inheritance fitted the data best, assuming a major gene has to be involved in the pathogenesis of asthma, but the penetrance of such a gene is low[37]. Jenkins *et al*[38] presented a segregation analysis of 7,394 families in which 15.9 per cent of the index individuals had asthma. A segregation analysis of physician-diagnosed asthma in 3,369 randomly selected individuals from 906 nuclear families done by Holberg *et al*[39] in Tucson, AR, USA, showed evidence of a polygenic or an oligogenic model with some evidence of a recessive gene, explaining only part of the segregation.

Many segregation analyses of total serum IgE-concen-tration in asthma have been studied and most of these studies conclude that IgE levels are highly heritable. Several studies have shown a strong association between atopy and bronchial hyper-responsiveness[40–42]. The complexity of the immunological network involved in the pathogenesis of asthma, atopy, its related traits and the existence of different asthma phenotypes are consistent that different genes may be involved in the pathogenesis of asthma[6].

Ober *et al*[43] conducted a genome-wide screen in the Hutterites, a religious isolate of European ancestry, to identify genes that influence asthma and asthma-associated phenotypes. A primary sample of 361 individuals and a replication sample of 292 individuals were evaluated by a genome-wide screen using 292 autosomal and three X-Y pseudoautosomal markers. Using the semi-parametric likelihood ratio, χ^2 test and the transmission-disequilibrium test, 12 markers in 10 regions were identified that showed possible linkage to asthma or an associated phenotype. They showed markers in four regions (5q23-31, 12q15-24.1, 19q13 and 21q21) with possible linkage in both the primary and replication samples and have also shown linkage to asthma phenotypes in other samples; two adjacent markers in one additional region (3p24.2-22) showing possible linkage were reported for the first time in the Hutterites. Recently, Pillai *et al*[44] have identified five major quantitative asthma phenotypes.

Kleeberger and Peden[45] have studied different environmental factors (physical, chemical, nutritional, behavioral, *etc*.) in isolation which have been shown to affect asthma and related phenotypes but their interaction effects have been missed[46].

Bouzigon *et al*[47] reported that polymorphisms in 17q21 confer higher risk in early onset asthma and the risk increases further when there is exposure to environmental tobacco smoke in early life. This region contains four genes all of which could have potential role in asthma pathogenesis[46,47]. Teerlink *et al*[48] revealed genome-wide significant evidence of linkage to region 5q13 and suggestive evidence for linkage to region 6p21. Both the 5q13 and 6p21 regions were previously identified as regions of interest in other genome-wide scans for asthma-related phenotypes[48].

Table II provides the chromosome regions involved in causing asthma identified by linkage analysis. More than 100 loci on 22 autosomes, X and Y chromosomes have been linked to asthma[8,10,49,50]. Chromosome 12 appears to harbour maximum susceptible genes for asthma than any other chromosome. Interestingly, only one locus has been established on each of chromosomes 3, 15, 18 and 22. Of these loci associated with asthma, some had very strong association.

Table II

Asthma related genes and their location*

Candidate genes and SNPs

Table II shows the list of common candidate genes in asthma with their locations derived from a large number of single nucleotide polymorphisms (SNPs) studies. The following are some of the extensively studied candidate genes and SNPs associated with asthma, with special reference to studies in the Indian population:

1. A Disintegrin and Metalloprotease33 (ADAM 33): This is a member of the "A Disintegrin and Metalloprotease" (ADAM) family proteins with diverse functions that reflect the complex domain structure of these molecules[79]. This gene has been identified by positional cloning and localized on to chromosome 20p13 as a susceptibility gene for asthma[43]. This is the most extensively studied and highly polymorphic gene with 14119 bps, 22 exons and 21 introns. Case-control and family-based association studies have confirmed a link between *ADAM33* and asthma. Its restricted expression to mesenchymal cells as well as its association with bronchial hyper-responsiveness and accelerated

decline in lung functions over time strongly point to its involvement in the structural airway components of asthma. Extensive alternative splicing, expression during branching morphogenesis in the developing foetus, impaired lung function in childhood, the production of a soluble form linked to chronic asthma, and tight epigenetic regulation indicate a level of complexity in the way *ADAM33* influences the disease phenotype. *ADAM33* function includes activation, proteolysis, adhesion, fusion, and intracellular signaling. The crystal structure of the catalytic domain of ADAM33 has been resolved around the nonselective matrix metalloproteinase inhibitor (marimastat) in addition to the zinc binding site[77]. Angela *et al*[80] supported the hypothesis that *ADAM33* polymorphisms influence lung function in early life and epithelial-mesenchymal dysfunction in the airways may predispose individuals toward asthma, being present in early childhood before asthma becomes clinically expressed. *ADAM33* contains over 55 SNPs, some of which play an important role in asthma and related traits. Polymorphisms in the *ADAM33* are associated with an accelerated decline in forced expiratory volume in the first second (FEV1) in the spirometery of general population and these are not only risk factors for the development of asthma, but also for COPD. Thus, polymorphisms in *ADAM33* constitute important risk factors for the development of respiratory diseases in a large subset of the general population[78]. Bijanzadeh *et al*[81] reported that there are not significant association between T1 SNP of the ADAM33 and asthma in an Indian population.

2. Interleukin-4 (IL-4): This is located on chromosome 5 at position q31 with 32675 bps, 10 exons and 9 introns. IL-4 is a cytokine secreted by helper T cell type 2 (TH-2 cells) that stimulates the production of IgE and induces eosinophil-mediated attacks against allergens[82]. Chiang *et al*[83] established that polymorphism in the promoter of the *IL-4* is associated with asthma and is a disease modifier in terms of the severity of airway hyper-responsiveness (AHR). A total of 16 polymorphisms were identified in the *IL4*, of which one in the promoter (C-589T) and other on the 5' untranslated region (C-33T) of the *IL4* have been identified that influence total serum IgE levels and bronchial hyper-responsiveness[84]. Nagarkati *et al*[85] indicated that the promoter of the *IL4* gene is invariant in Indian population and Bijanzadeh *et al*[81] reported that there are no significant association between this SNP of the *IL-4* and asthma in an Indian population.

3. β-chain of the high-affinity receptor for IgE (FcεRIβ): This is localized on chromosome 11q13 with a length of 8.74 kb. This is responsible for immediate reactions and also is found on the surface of mast cells, basophils, eosinophils and Langerhan's cells. The binding of allergen to the receptor-bound IgE leads to degranulation of the cell and the synthesis and release of cytokines (IL-4), and activated inflammatory cells. The β-chain is not essential for *FcεRI* function, but it stabilizes the surface expression of the receptor and acts as an amplifying element within it[1,6,16]. A G/A polymorphism in intron 2, a $(CA)_n$ repeat polymorphism in intron 5, and a C/T polymorphism in 3'-UTR were established as significant association with asthma[86]. A promoter-dependent mechanism with altered transcriptional regulation of *Fc* and epsi; *RI*β may be involved for its association with asthma[87].

4. PDH finger protein 11 (PHF11): This is localized on chromosome 13q14 and contains 10 exons, 9 introns and with 32973 bps. *PHF11* has 17 SNPs associated with asthma[59]. Public databases identified an alternative first exon with multiple overlapping variants that produce alternative start methionines for protein translation[70].

5. IL-4 receptor-α (IL-4Rα): IL-4 uses the α-chain of the IL-4 Receptor (*IL-4Rα*) as a part of the respective receptor systems. This gene is located on chromosome 16 and represents an ideal candidate gene for atopy susceptibility because of its pivotal role in IL-4 signaling and its key role in allergic inflammation by promoting IgE production and Th2 cell development[72,88].

6. G-protein-coupled receptor for asthma (GPRA): This is localized on chromosome 7p with 7 SNPs. A hierarchical genotyping design was used to identify this gene. The data implied that this gene is involved in the pathogenesis of atopy and asthma and may have application in other inflammatory diseases[64].

7. Dipeptidyl-peptidase 10 (DPP10): This is localized on chromosome 2q14-2q32 and shares features with members of the S9B family of DPP serine proteases, which includes DPP4, a widely expressed enzyme that plays a central role in chemokine processing as part of the innate immune system. The locus displays a complex pattern of transcript splicing, with eight alternate first exons; four of which strongly associated with asthma[87].

8. Interferon gamma (IFNG): This locus is localized on 12q21 and established as a candidate gene for asthma on the basis of its role in pathophysiology and positive linkage demonstrated in some populations[69].

9. Inducible nitric oxide synthase (iNOS): This gene is localized in the CC chemokine cluster region on chromosome 17q11.2-q12 and a linkage has been observed to asthma and atopy. iNOS is expressed predominantly from inflammatory cells such as T cells and macrophages and the resultant nitric oxide that is produced causes mucus hypersecretion, upregulation of Th2 and downregulates Th1 responses[49,89,90].

10. Inositol polyphosphate 4 phosphatase type I (INPP4A): The gene for INPP4A lies in the region 2q11.2 and an association to atopic asthma has been demonstrated. INPP4A is a magnesium independent phosphatase which negatively regulates PI3K-Akt signaling important for various pathophysiological pathways in asthma[58].

11. CD 14: The gene for CD 14 receptor is located on chromosome 5q31.1 and this lipopolysaccharide receptor for endotoxin modulates the Th1-Th2 responses during early childhood. An association between C-159T functional polymorphism and asthma has been demonstrated[49,50,91].

12. TNF- α and TNF-β: The genes for TNF- 0α and TNF – β have been localized within the MHC region on chromosome 6p21 and are major pro-inflammatory cytokines important in the pathogenesis of asthma. An association with polymorphisms has been associated with asthma in both atopic and non-atopic subjects and with elevated total serum IgE levels[49,50,92,93].

13. Clara cell secretory protein (CC16): The genes for Clara cell secretory protein is localized on the chromosome 11q13 and encodes a 16kDa protein secreted from the Clara cells in the respiratory system. It is an important anti-inflammatory molecule limiting the synthesis of leucotrienes and prostaglandins and inhibits chemotaxis of inflammatory cells. An association with asthma has been demonstrated in both family-based and case-control studies[50,94].

14. Uteroglobin related protein1(UGRP1): The genes for uteroglobin related protein 1 is localized on the chromosome 5q32 and encodes for a secretory protein in the airways with anti-inflammatory activity. Studies evaluating polymorphisms in *URGP1* have demonstrated both association[61] and lack of association with asthma[62].

15. Transforming growth factor beta 1(TGF β1): The genes encoding for TGF β1 is localized on the chromosome 6q11-q2. TGF β1 is an important protein with both pro-inflammatory and anti-inflammatory properties. An association with asthma has been demonstrated and both increased protection and increased risk is seen with different haplotypes of the *TGF β1* gene[63].

16. Signal transducer and activator of transcription 6 (STAT6): The gene for STAT6 is located on chromosome 12q13. It is a member of the STAT family of transcription factors which plays a central role in IL-4 mediated biological responses. An association with asthma has been demonstrated in the

Indian population[49,95].

17. Mast cell chymase (CMA1): The gene for mast cell chymase is located on chromosome 14q11.2 and encodes for a serine protease expressed in mast cells and is important for inflammation and airway remodeling. An association has been observed with asthma and increased total IgE[96].

18. N-acetyltransferase 2 (NAT2): The gene for NAT2 is located on chromosome 8p22 and is responsible for N-acetylation and influence susceptibility to atopic disorders. An association with asthma, increased total IgE and eosinophilia has been observed in the Indian population[49,97,98].

19. Late cornified envelope like proline-rich1(LELP1): The gene for LELP1 is located in chromosome 1q21 and encompasses a small proline rich protein gene cluster and has been associated with atopy[54].

20. Eotaxin(SCYA11): The gene for eotaxin is located on chromosome 17q21.1-q21.2 and encodes for the chemokine that is a specific attractant for eosinophils and has been implicated in asthma[76].

21. Acid mammalian chitinase (CHIA): The gene for CHIA is localized on 1q13.1-21.3 and is important as an effector response for IL-13, shifts the inflammation towards Th2 and act as a chemo-attractant for inflammatory cell and has been associated with asthma[53].

22. Interleukin-10(IL-10): The gene for IL-10 is located on chromosome 1q31-q32. IL-10 is an anti-inflammatory cytokine primarily produced by monocytes and macrophages and plays a key role in asthma[56].

23. Interleukin -21 (IL-21): The gene for IL-21 is located on chromosome 4q26-q27 and encodes for a multifunctional cytokine which is produced by activated CD4+ T cells and affects growth and survival of numerous immune cells. It is important in asthma as it also regulates IgE production and has been implicated in asthma[60].

24. Chemokine receptor 2 (CCR2): The gene for CCR 2 is localized on chromosome 3p21.31 and encodes for members of a large family of G protein-coupled receptors and plays an important role in asthma pathogenesis and has been implicated in the Indian population[99].

These are the most common genes studied worldwide. The association of asthma with the remaining genes is less established and their study is restricted to a limited population.

Some of these genes may also be involved with other phenotypes such as helminthic infections (*FcεRIβ* and *IL-4*)[1,41], COPD, cardiovascular diseases, congenital thrombotic thrombocytopenia (TTP), Crohn's disease (*ADAM33*)[77,82], renal cell carcinoma, blood malignancies (*PHF11*)[59], tuberculosis (TB), hyperparathyroidism, prostate cancer, insulin dependent diabetes mellitus (IDDM), leprosy and chronic hepatitis B infection (*vitamin D receptor*)[70].

Conclusion and future prospects

Asthma is one of the most serious and intriguing allergic diseases. Asthma aggregates within families and is a complex multifactorial disease with the involvement of environment and genetic components. Our preliminary pedigree analysis revealed that autosomal recessive pattern of inheritance was prominent in asthma; parental consanguinity[100] and serum intracellular cell adhesion molecule-1 (ICAM-1)[101] was significantly associated with asthma, whereas the ABO blood system[102], *IL-4* and *ADAM33* specific gene variants[81], and serum E-selectin[101] were not associated with asthma. More than 100 loci have been reported to be associated with asthma and there are also indications that mutation in a major gene can cause asthma. Due to an increasing number of current studies being done in genetics of asthma, there is an increasing list of inducer and inhibitor candidate genes for asthma. There are more than 100 candidate genes in every chromosome which are identified to have an association with

asthma and the strength of association of these SNPs with asthma varies in different parts of the world. More studies are needed to determine the exact function of these genes, gene-gene interactions and the gene-environment interactions which are undoubtedly complex and remain elusive for the time being even with whole genome-wide association studies.

Further studies on asthma with the genomics data and tools, to map, identify the specific gene/s, and phenotype specific SNPs will help to unravel the pathways involved in asthma aetiology and employ pharmacogenomics to design better drugs for an individualized treatment plan. Thus with a fruitful interaction among researchers involved in pathophysiology, epidemiology, clinical research and genetics of asthma, this century holds promise for a better understanding of the pathology, diagnosis, prevention, treatment and management of asthma.

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Genetics and Asthma

Asthma is an inflammatory disease of the small airways of the lung. It is characterised by intermittent airway narrowing and airflow obstruction that leads to symptoms of wheeze and shortness of breath (1).

The syndrome of asthma is probably due to multiple causes. The asthma of children and young adults is most often associated with allergies (atopic asthma), but the asthma which comes on later in life is less obviously allergic and is more common in women and in smokers. Other variants of asthma may be associated with the presence of severe disease, or brittle disease with sudden intractable episodes of bronchospasm. Asthma also occurs in the industrial setting in response to inhaled proteins such as baker's flour or to particular chemicals, such as paint additives (1).

Atopic asthma is the most common form of the disease, and is predominantly seen in the western world. Asthma affects one child in 7 in some societies, and approximately 15 million individuals world wide (2). However, even within Europe it shows widespread differences in prevalence (2, 3). The reasons for these differences are not known, but almost certainly reflect variable contributions of genetic and environmental factors in different regions.

A rural lifestyle is consistently associated with a low prevalence of asthma. Exposure to farm animals and the drinking of unpasteurised milk is protective in farmers' children (4), and the presence of pets in the house and large family sizes are protective in children reared in an urban environment (3, 5). In Africa a rural environment is also protective against disease (6). These findings suggest that an environment rich in microbial organisms is beneficial in building infants resistance to asthma (the Hygiene Hypothesis) (5).

Although asthma is at present a disease of affluent societies, the increasing westernisation and urbanisation of populations elsewhere in the world are leading to increases in prevalence (2). The possibility exists of an eventual pandemic and thought has to be given to strategies for preventing this. The search for the environmental agents that protect against asthma is extremely important, and probably holds the best chance for successful prevention and control of the disease in the global context.

Asthma is predominantly a disease of the privileged classes and a higher level of education and income is in general associated with a higher prevalence of disease in children. However, some groups, such as impoverished North American individuals of Afro-Caribbean origin living in inner cities are at increased risk of disease (7). This may reflect differences in genetic susceptibility, as well as exposure to particular environmental factors such as cockroach allergens.

Asthma is more common in young boys than in young girls, but late in adolescence the prevalence in young women rises, so that the prevalence of the disease is similar in middle life. Women are more susceptible to adult onset asthma, a variant of the illness which is particularly difficult to treat.

Roll of genetics in the development of asthma

Asthma runs strongly in families and is about half due to genetic susceptibility and about half due to environmental factors (8, 9). The strong familial clustering of asthma has encouraged an increasing volume of research into the genetic predisposition to disease. Although identification of all asthma genes is incomplete, genetic findings are already changing the prevailing view of asthma pathogenesis.

Positional cloning is a process of systematic disease gene identification that begins by finding genetic regions co-inherited with disease. It requires no assumptions about likely disease pathogenesis. Five asthma genes or gene complexes have now been identified by positional cloning, including *ADAM33*, *PHF11*, *DPP10*, *GRPA* and *SPINK5* (10-14). The functions of all of these genes are obscure, but the expression of *DPP10*, *GRPA* and *SPINK5* in terminally differentiating epithelium suggests that they deal with threat or damage from the external environment (15). Many of the genes identified by candidate gene studies may also exert their effects within the cells that make up the mucosa. These include *IL13* which modifies mucus production, *FcεRI-β* which modifies the allergic trigger on mast cells, and microbial pattern recognition receptors of the innate immune system (15).

These findings all suggest that the airway epithelial barrier and its reaction to the microbial environment contain the most important elements of asthma pathogenesis.

The role of genetics in the management and prevention of asthma

It is to be hoped that genetic findings will lead to a better classification of complex diseases such as asthma, and that novel therapies will results from genetic findings.

Most polymorphisms so far identified do not seem to carry risks that would merit their use for the clinical classification of disease, but combinations of genetic polymorphisms may be much more informative.

It is also to be hoped that genetic findings may help identify the environmental factors that protect against asthma. In this context, associations between asthma and innate immune system receptors for microbial products are particularly exciting.

To become relevant to clinical asthma, potential asthma susceptibility genes now need to be tested in cases and controls with different manifestations of disease and disease severity and in representative population samples with different environmental risk factors. Genotype will then become a predictor of disease that can be understood in the same terms as other epidemiological risk factors, and the size and relevance of effects can be judged objectively.

The role of genetics in the treatment of asthma

Several of the asthma susceptibility genes so far identified potential targets for asthma therapy. However, it will take some years to determine if any of these will be the basis for new treatments.

Polymorphisms may also predict the response to asthma therapy. A positive association between common arginine-16 variants in the β-adrenergic receptor gene and the responsiveness of asthmatic patients to β-adrenergic agonists is particularly interesting (16). It's not known whether these differences in response represent a failure of β- agonists in individuals carrying the arginine-16 genotype, or whether therapy in these individuals will be adequate with an upward adjustment of dose.

A proportion of individuals with severe intractable asthma do not respond to inhaled steroids. It is possible that these individuals also carry mutations in some of the genes that control the anti-

inflammatory response of steroids. The pathways are not completely understood, and it is yet known if genetic testing will be helpful in these circumstances.

Gene therapy is of use in some single gene disorders, but gene therapy can only be administered with arduous clinical protocols, and is not without risk of serious side effects such as leukaemia. It is therefore unlikely that gene therapy will be applied to asthma or to related disorders in the foreseeable future.

Future Role of Genetics

Approximately a third of the genetic predisposition to asthma has currently been uncovered. Existing research programmes carried out in several countries are likely to identify the remaining important genetic effects within the next five years. The stage of genetic knowledge will need to be followed by a number of important studies.

Firstly, all genetic polymorphisms potentially contributing to asthma will need to be examined in representative population samples, and in samples of clinical sub-types of asthma taken from different parts of the world. It is likely that different genes will interact with different environmental variables in different places, with different therapeutic implications.

Second, it is desirable that effective strategies be developed for the prevention of asthma. By identifying the genes which interact with a microbial environment, the reasons for the rise in asthma with progressive urbanisation can be clarified, and effective strategies for prevention can be developed.

Thirdly, the genetic predisposition for asthma probably represents an evolutionary adaptation to dealing with helminth infections. If this is the case, then populations which historically have had a high helminth load may be genetically particularly susceptible to asthma as standards of hygiene improve and as societies develop progressively more urbanised lifestyles. This identifies a significant potential public health problem, and it is desirable that research be carried out on the development of asthma in the transition from rural to urban lifestyles in the developing world.

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AMBIENT AIR QUALITY MONITORING DATA FOR THE YEAR 2019
(Manual monitoring under National Ambient Air Quality Monitoring Programme)

Sulphur Dioxide (SO_2):

State / UT	City/ Town/ Village	Location	No. of monitoring days	SO_2 Concentration in µg/m³		
				Minimum (24-hourly average)	Maximum (24-hourly average)	Annual Average
Andhra Pradesh	Anantapur	Kamala Nagar	105	4	15	6
		APIIC Zonl office industrial estate	106	4	10	5
		Cancer Unit. G.G.Hsharada Nagar, JNTU Road	108	4	9	5
		D.No.6/5/545, Ram Nagar Colony	108	4	12	5
	Chitoor	GNC Toll Gate Tirumala	107	2	19	5
		Near Nutrine Confectionery, Palamaner Road	107	4	9	5
		O/O Mines and Geology, Old Collector Office, Greamspet	104	4	6	5
		Sankar Foundary, Industrial Estate, Adjacent of DIC Office	106	4	7	5
		Rangachari street, Shanthapeta.	92	4	6	5
	Eluru	Ashram Diagnostic Centre	108	4	6	5
		District Headquarters hospital	108	4	6	5
		M/s Laxmi Propylene Ltd., Plot.No. 25, Industrial Park, Satrampadu	108	4	6	5
		Somalingeswara nilayam D.N.7B-18-5, Thooru Veedhi, Eastern street, Paidichintaadu	108	4	6	5
	Guntur	Near Hindu College, Market Road	100	4	5	5
		A.P. Pollution Control Board, D.No.4-5-4/5C,4/3, Navabharath nagar, Ring Road	101	4	6	5
		Distirct Industries Center office Buiding Autonagar	100	4	5	5
		Government General hospital	101	4	6	5
	Kadapa	Near ICL Industries, Yerragunta, YSR	108	4	19	6
		Devi Diabetes & Hormone Centre, 7 Roads	106	4	18	5
		DIC Office,Kadapa	108	4	19	5
		Rajiv Gandhi Institute of Medical Sciences	108	4	7	5
		Municipal Primary School	107	4	14	5
	Kakinada	Office Building Ramanayyapeta	102	4	13	8
		Gram Panchayathi building, Suryaraopeta	105	4	13	8
		MEE Seva / MEPMA Office, Sailipeta	105	4	13	9
		Petro Chemical Engineering Block, JNTU , Pithapuram Road	106	4	12	8
	Kurnool	Mourya Inn, Krishna Nagar	108	4	11	5
		APIIC Building Industrial estate, Kallur at IDA Bobbili Growth Center	107	4	13	5
		Rajvihar Circle	108	4	14	6
		Pump House, Venkataramana Colony	108	4	12	5
	Nellore	Venkatareddy Nagar, Vedayapalem	107	4	6	5
		D. No.15-471, James Garden, Venkata Ramapuram, Nellore, SPSR Nellore District	107	4	6	5
		Chandramouli nagar	107	4	6	5
		Dr.P.V. Rama chandra Reddy Hospital, Brindavnam	107	4	5	5
	Ongole	Near Court Center	107	4	6	5
		APIIC, Administrative Office, Growth Centre, Gundlapalli	104	4	5	5
		Ongole Municipal Corporation	106	4	6	5
		Prakasam Milk Product Compay	105	4	6	5
	Rajahmundry/ Rajamahendravaram	Staff Clud Building, A.P. Paper Mill	98	5	14	9
		GAIL Administrative Office, A.V. Apparao Road	104	5	15	8
		MCH Block ,District Hospital, Near Central Prison, Lalacheruvu Road	105	4	12	8
		APEPDCL, Circle Office Godavari Gattu	97	4	16	8
	Srikakulam	SAMKRG Pistons Quarters Bulding, Near IDA, Pydibhimavaram	96	6	12	8
		District cooparative office at SKLM Old	106	5	11	8

State / UT	City/ Town/ Village	Location	No. of monitoring days	SO_2 Concentration in µg/m³		
				Minimum (24-hourly average)	Maximum (24-hourly average)	Annual Average
		L.D. Engg. College	88	14	33	20
		Shardaben Hospital, Saraspur	86	13	34	20
		R.C. Technical High School, Mirzapur	86	13	35	20
		AZL Behrampura, Ahmadabad	87	13	38	20
		Sola L.T. Chanakyapuri Pumping Station	88	11	35	21
	Anklesvar	Rallis India Ltd.	88	13	36	20
		Durga Traders, Bhavanafarm Society	88	12	35	19
	Jamnagar	Fisheries Office	87	11	39	19
	Rajkot	Nr. Sardhara Industrial Corporation	87	13	36	21
		GPCB Regional Offce	87	12	40	19
	Surat	S.V.R. Engg. College	87	12	45	23
		B.R.C. High School, Udhna	83	12	46	26
		Near Air India Office	88	9	41	22
	Vadodara	GPCB Office, Geri Vasahat	87	11	37	19
		Sterling Gelatin Guest House, Vill-Karakhadi Padia	87	11	43	20
		Dandia Bazaar	88	12	41	20
		CETP Nandesari	85	13	46	22
		Lubrizol	87	11	45	21
	Vapi	GEB, IIIrd Phase, GIDC	86	9	38	21
		Vapi Nagar Palika, Vapi	87	9	35	18
Himachal Pradesh	Baddi	Industry Department Office Building	122	2	2	2
		AHC barotiwala	111	2	2	2
		Housing Board	52	2	2	2
	Damtal	Regional Office	120	2	2	2
		Old Road	114	2	2	2
	Dharamshala	Kotwali Bazar Dharamshala	85	2	2	2
		Daari, Dharamshala	122	2	2	2
	Gulaba	Behind green tax barrier	19	2	3	2
	Kala Amb	Kala Amb Industrial Area	166	2	8	3
		Kala Amb Town/Trilokpur	161	2	8	3
	Manali	Nehru Park, Manali, Kullu	88	2	4	2
		HPSPCB, Hadimba Road, Manali, Kullu	72	2	2	2
	Marhi	Behind Police check post	12	2	2	
	Nalagarh	Municipal Council	113	2	2	2
	Paonta Sahib	Paonta Sahib	165	2	8	3
		Gondhpur Industrial Area	120	2	5	3
	Parwanoo	Regional Office, Sector- 4	133	2	4	2
		Asst. Commissioner Building Sector I	121	2	4	2
	Shimla	Bus Stand, Winterfield	203	2	7	2
	Sunder Nagar	HPSPCB, BBMB Colony, Mandi	143	2	2	2
		Muncipal Council, NH-21, Mandi	107	2	2	2
	Una	Regional Office, Una	17	2	3	
	Vashisht	Behind pollution check barrier, Bahang / Station No.-II1, Bahang	44	2	4	2
Jammu & Kashmir	Jammu	Regional Office, Jammu	66	2	5	3
		M.A. Stadium, Jewel Chowk	62	2	5	3
		Bari Brahamana Industrial Area	73	2	4	3
Jharkhand	Barajamda	Barajamda U.M. Office	91	13	35	17
	Dhanbad	R.O. Dhanbad	102	11	16	14
		EMTI, Bastacola	75	11	18	13
		CGM Office, Kusunda	100	10	17	13
	Jamshedpur	Bistupur Vehical Testing Centre	93	30	44	39
		Golmuri Vehicle Testing Centre	91	31	42	38
	Jharia	M.A.D.A.	105	12	17	14
	Ranchi	Albert Ekka Chowk, Main Road	96	11	27	18
	Saraikela	RO Building, Adityapur	91	30	43	37
	Sindri	BIT / PDIL	73	10	16	13
Karnataka	Bagalkote	Bagalkote KSPCB Office Premises	85	2	2	2
	Bangalore	Graphite India, White Field Road	83	2	2	2
		AMCO Batteries, Mysore Road	107	2	2	2
		KHB Industrial Area, Yelahanka	80	2	2	2
		Peenya Industrial Area	52	2	2	2
		Victoria hospital	103	2	2	2
		Yeshwanthpura police station	100	2	2	2
		Jnanabharathi, Bangalore University	102	4	12	7

State / UT	City/ Town/ Village	Location	No. of monitoring days	SO_2 Concentration in µg/m³		
				Minimum (24-hourly average)	Maximum (24-hourly average)	Annual Average
		RV College of Engineering, Mysore Road	1	8	8	
		TERI office, Vital Medi healthcare Pvt Ltd	108	2	2	2
	Belgaum	Karnataka SPCB Office Building	52	2	9	2
	Bidar	KSPCB Office Premises	52	2	4	2
	Bijapur	KSPCB Office Premises	38	2	2	2
	Chitradurga	KSPCB Office Premises	105	2	20	6
	Devanagere	Regional Office building, KSPCB	94	2	20	6
		Mothi Theatre, Gandhi Circle, P.B. Road / Traffic Police Station	80	5	30	20
		HPF Intakewell, Kumarapattnam	102	2	13	5
	Gulburga	Government Hospital	50	2	4	3
	Hassan	KSRTC bus stand building	104	2	5	3
	Hubli-Dharwad	Lakkamanahalli Industrial Area, Dharwad	105	4	6	4
		Rani Chennamma Circle, Hubli	104	4	6	5
	Kolar	KSPCB Office Premises, Kolar	98	2	2	2
	Mandya	KSPCB Building, Bandigowda Badarahe	107	2	9	2
	Mangalore	Baikampady Industrial Area	92	5	9	7
	Mysore	K.R.Circle, Visvesvaraya Bldg	111	2	12	2
		KSPCB Bldg. Hebbal Ind. Area	1	10	10	
	Raichur	KSPCB Office Premises, Raichur	77	2	7	2
	Shimaga	The VISL, Oxygen Plant, Shimoga	100	3	50	24
	Timukuru	KSPCB Office Premises	103	2	2	2
Kerala	Alappuzha	District Office, Alissery Road	107	2	2	2
		DC Mills, Pathirappally	25	2	2	2
		William Goodacre Power House Bridge	71	2	5	2
	Kochi	Eloor I, FACT, Ambalamughal	107	2	5	3
		Eloor II	102	2	5	3
		Irumpanam	105	2	3	2
		Ernakulum South	65	2	2	2
		VYTTILA	105	2	2	2
		MG Road Bank Ernakulum	105	2	2	2
		KALAMASSERY / CSIR Complex	103	2	3	2
		Kuttipadam	42	2	12	5
	Kollam	KSPCB, District Office, Kadappakada	110	2	3	2
		KMML Chavara	110	2	5	3
	Kottayam	Kottayam	119	2	3	2
		Vadavathoor	119	2	4	3
	Kozhikode	Kozhikode City	103	2	2	2
		Nallalam	69	2	2	2
	Malapuram	Kakkanchery, Sijmak oils	107	2	2	2
	Palakkad	SEPR Refractories India Ltd.	98	2	10	2
	Pathanamthitta	KSPCB, Makkamkunnu	100	2	2	2
	Thiruvananthapuram	PRS Hospital/COSMO	105	3	20	9
		SMV School	105	4	22	9
		VELI / HiTech Chackai	105	6	28	10
		PETTAH / Sasthamangalam(plamadou)	105	4	18	8
	Thissur	KSPCB, District Office, Poonkunnam	104	2	12	3
		Thissur/ Peringandoor	74	2	10	3
	Wayanad	Sulthan Bathery	104	2	2	2
		Wayanad	79	2	2	2
Madhya Pradesh	Amlai	HJI	60	10	19	14
		OPM	69	9	16	12
	Bhopal	Hamidia Road, MP Hastshilp Vikas Nigam	71	2	28	11
		CETP Govindpura	88	2	16	9
		Nutan Subhash School, T.T. Nagar	36	2	5	2
		Kolar Thana, Kolar Road, Bhopal	69	2	20	10
		AKVN Office, Industrial Area Mandideep, Raisen	71	8	22	14
		Barkatuallah University, Hoshgabad Road, Bhopal	71	2	13	7
		Main Road, Hemu Colony, Bairagarh, Bhopal	76	2	14	8
		Arera Colony	82	2	11	3
	Chhindwara	HIG -33, Front of Geetanali Park Housing Board Colony, Chadagaon	96	2	6	3
		Hindustan Unileaver, Narsinghpur Road,	87	2	4	3
	Dewas	EID Perry (I) Limited	94	9	33	19

Nitrogen Dioxide (NO_2):

State / UT	City / town / village	Location	No. of monitoring days	NO_2 Concentration in µg/m³		
				Minimum (24-hourly average)	Maximum (24-hourly average)	Annual Average
Andhra Pradesh	Anantapur	Kamala Nagar	105	10	26	18
		APIIC Zonl office industrial estate	106	9	24	14
		Cancer Unit. G.G.Hsharada Nagar, JNTU Road	108	10	16	12
		D.No.6/5/545, Ram Nagar Colony	108	10	24	16
	Chitoor	GNC Toll Gate Tirumala	107	11	105	37
		Near Nutrine Confectionery, Palamaner Road	107	9	23	15
		O/O Mines and Geology, Old Collector Office, Greamspet	105	10	22	15
		Sankar Foundary, Industrial Estate, Adjacent of DIC Office	106	11	21	15
		Rangachari street, Shanthapeta.	92	10	20	14
	Eluru	Ashram Diagnostic Centre	108	15	30	19
		District Head quarters hospital	108	17	30	19
		M/s Laxmi Propylene Ltd., Plot.No. 25, Industrial Park, Satrampadu	108	16	30	19
		Somalingeswara nilayam D.N.7B-18-5, Thooru Veedhi, Eastern street, Paidichintaadu	108	17	25	19
	Guntur	Near Hindu College, Market Road	100	17	25	19
		A.P. Pollution Control Board, D.No.4-5-4/5C,4/3, Navabharath nagar, Ring Road	101	17	25	19
		Distirct Industries Center office Buiding Autonagar	100	16	25	19
		Government General hospital	101	17	24	19
	Kadapa	Near ICL Industries, Yerragunta, YSR	108	10	25	16
		Devi Diabetes & Hormone Centre, 7 Roads	106	10	27	15
		DIC Office,Kadapa	108	10	20	15
		Rajiv Gandhi Institute of Medical Sciences	108	9	19	13
		Municipal Primary School	107	10	23	15
	Kakinada	Office Building Ramanayyapeta	102	11	24	18
		Gram Panchayathi building, Suryaraopeta	105	10	27	19
		MEE Seva / MEPMA Office, Sailipeta	105	10	29	20
		Petro Chemical Engineering Block, JNTU , Pithapuram Road	106	9	27	18
	Kurnool	Mourya Inn, Krishna Nagar	108	9	24	14
		APIIC Building Industrial estate, Kallur at IDA Bobbili Growth Center	107	10	23	15
		Rajvihar Circle	108	11	36	19
		Pump House, Venkataramana Colony	108	10	18	12
	Nellore	Venkatareddy Nagar, Vedayapalem	107	16	25	19
		D. No.15-471, James Garden, Venkata Ramapuram, Nellore, SPSR Nellore District	107	15	25	19
		Chandramouli nagar	107	16	27	19
		Dr.P.V. Rama chandra Reddy Hospital, Brindavnam	107	15	25	19
	Ongole	Near Court Center	107	15	26	19
		APIIC, Administrative Office, Growth Centre, Gundlapalli	104	16	26	19
		Ongole Municipal Corporation	106	16	26	19
		Prakasam Milk Product Compay	105	16	26	19
	Rajahmundry/ Rajamahendravaram	Staff Clud Building, A.P. Paper Mill	98	11	29	19
		GAIL Administrative Office, A.V. Apparao Road	104	10	27	18
		MCH Block ,District Hospital, Near Central Prison, Lalacheruvu Road	105	10	27	18
		APEPDCL, Circle Office Godavari Gattu	97	11	27	18
	Srikakulam	SAMKRG Pistons Quarters Bulding, Near IDA, Pydibhimavaram	96	13	29	18
		District cooparative office at SKLM Old Bridge	106	11	28	18
		APIIC, Kushalapuram	95	12	28	19
		Muncipal corporation Office, Old Bustand	107	13	27	19

State / UT	City / town / village	Location	No. of monitoring days	NO_2 Concentration in µg/m³		
				Minimum (24-hourly average)	Maximum (24-hourly average)	Annual Average
		estate,PiranaDump Site,Narol (previous Dyno Wash)				
		L.D. Engg. College	88	17	52	24
		Shardaben Hospital, Saraspur	86	17	54	25
		R.C. Technical High School, Mirzapur	86	16	48	24
		AZL Behrampura, Ahmadabad	87	16	49	25
		Sola L.T. Chanakyapuri Pumping Station	88	16	46	26
	Anklesvar	Rallis India Ltd.	88	17	46	26
		Durga Traders, Bhavanafarm Society	88	16	45	25
	Jamnagar	Fisheries Office	87	14	43	25
	Rajkot	Nr. Sardhara Industrial Corporation	87	18	46	26
		GPCB Regional Offce	87	16	51	25
	Surat	S.V.R. Engg. College	87	15	50	26
		B.R.C. High School, Udhna	83	15	50	29
		Near Air India Office	88	13	52	26
	Vadodara	GPCB Office, Geri Vasahat	87	14	49	25
		Sterling Gelatin Guest House, Vill-Karakhadi Padia	87	14	47	25
		Dandia Bazaar	88	16	45	25
		CETP Nandesari	85	16	60	27
		Lubrizol	87	14	55	26
	Vapi	GEB, IIIrd Phase, GIDC	86	10	58	26
		Vapi Nagar Palika, Vapi	87	10	45	23
Himachal Pradesh	Baddi	Industry Department Office Building	123	19	44	33
		AHC barotiwala	110	20	38	27
		Housing Board	48	23	49	33
	Damtal	Regional Office	119	5	12	9
		Old Road	113	5	12	9
	Dharamshala	Kotwali Bazar Dharamshala	84	5	10	6
		Daari, Dharamshala	124	5	14	6
	Gulaba	Behind green tax barrier	19	5	7	5
	Kala Amb	Kala Amb Industrial Area	166	10	36	15
		Kala Amb Town/Trilokpur	161	9	20	14
	Manali	Nehru Park, Manali, Kullu	88	7	16	11
		HPSPCB, Hadimba Road, Manali, Kullu	72	5	7	5
	Marhi	Behind Police check post	12	5	11	
	Nalagarh	Municipal Council	114	18	56	25
	Paonta Sahib	Paonta Sahib	165	9	21	13
		Gondhpur Industrial Area	120	11	19	15
	Parwanoo	Regional Office, Sector- 4	133	5	30	6
		Asst. Commissioner Building Sector I	122	5	34	6
	Shimla	Bus Stand, Winterfield	202	11	34	26
	Sunder Nagar	HPSPCB, BBMB Colony, Mandi	143	5	26	8
		Muncipal Council, NH-21, Mandi	107	5	24	9
	Una	Regional Office, Una	17	7	8	
	Vashisht	Behind pollution check barrier, Bahang / Station No.-II1, Bahang	44	5	11	5
Jammu & Kashmir	Jammu	Regional Office, Jammu	66	6	26	17
		M.A. Stadium, Jewel Chowk	62	10	24	17
		Bari Brahamana Industrial Area	73	9	25	17
Jharkhand	Barajamda	Barajamda U.M. Office	91	18	28	23
	Dhanbad	R.O. Dhanbad	102	30	43	36
		EMTI, Bastacola	75	28	44	34
		CGM Office, Kusunda	100	28	43	34
	Jamshedpur	Bistupur Vehical Testing Centre	93	37	54	48
		Golmuri Vehicle Testing Centre	91	37	52	47
	Jharia	M.A.D.A.	105	29	41	35
	Ranchi	Albert Ekka Chowk, Main Road	96	35	121	37
	Saraikela	RO Building, Adityapur	91	39	53	46
	Sindri	BIT / PDIL	73	24	40	33
Karnataka	Bagalkote	Bagalkote KSPCB Office Premises	85	8	32	17
	Bangalore	Graphite India, White Field Road	83	15	41	27
		AMCO Batteries, Mysore Road	107	18	41	28
		KHB Industrial Area, Yelahanka	80	11	39	24
		Peenya Industrial Area	52	18	38	30
		Victoria hospital	103	14	38	25

State / UT	City / town / village	Location	No. of monitoring days	NO_2 Concentration in µg/m³		
				Minimum (24-hourly average)	Maximum (24-hourly average)	Annual Average
		Yeshwanthpura police station	100	14	38	28
		Jnanabharathi, Bangalore University	102	9	32	17
		RV College of Engineering, Mysore Road	1	18	18	
		TERI office, Vital Medi healthcare Pvt Ltd	108	14	40	27
	Belgaum	Karnataka SPCB Office Building	52	9	27	16
	Bidar	KSPCB Office Premises	59	5	16	9
	Bijapur	KSPCB Office Premises	36	9	33	17
	Chitradurga	KSPCB Office Premises	105	5	11	6
	Devanagere	Regional Office building, KSPCB	94	5	14	8
		Mothi Theatre, Gandhi Circle, P.B. Road / Traffic Police Station	80	9	41	19
		HPF Intakewell, Kumarapattnam	102	5	11	7
	Gulburga	Government Hospital	58	8	28	13
	Hassan	KSRTC bus stand building	104	14	27	20
	Hubli-Dharwad	Lakkamanahalli Industrial Area, Dharwad	105	13	23	17
		Rani Chennamma Circle, Hubli	104	14	26	21
	Kolar	KSPCB Office Premises, Kolar	98	17	40	27
	Mandya	KSPCB Building, Bandigowda Badarahe	107	11	27	14
	Mangalore	Baikampady Industrial Area	92	9	11	10
	Mysore	K.R.Circle, Visvesvaraya Bldg	111	12	34	15
		KSPCB Bldg. Hebbal Ind. Area	1	11	11	
	Raichur	KSPCB Office Premises, Raichur	77	5	27	11
	Shimaga	The VISL, Oxygen Plant, Shimoga	100	5	14	6
	Timukuru	KSPCB Office Premises	103	17	42	27
Kerala	Alappuzha	District Office, Alissery Road	107	5	5	5
		DC Mills, Pathirappally	25	5	5	5
		William Goodacre Power House Bridge	71	5	10	5
	Kochi	Eloor I, FACT, Ambalamughal	107	6	31	19
		Eloor II	102	10	43	23
		Irumpanam	105	5	35	11
		Ernakulum South	65	5	32	13
		VYTTILA	105	5	33	12
		MG Road Bank Ernakulum	105	5	31	12
		KALAMASSERY / CSIR Complex	103	5	31	10
		Kuttipadam	42	7	20	13
	Kollam	KSPCB, District Office, Kadappakada	110	5	8	5
		KMML Chavara	110	5	9	7
	Kottayam	Kottayam	119	12	13	12
		Vadavathoor	119	12	14	13
	Kozhikode	Kozhikode City	103	5	13	5
		Nallalam	67	5	11	5
	Malapuram	Kakkanchery, Sijmak oils	107	9	21	15
	Palakkad	SEPR Refractories India Ltd.	98	5	28	7
	Pathanamthitta	KSPCB, Makkamkunnu	100	14	19	17
	Thiruvananthapuram	PRS Hospital/COSMO	105	8	29	15
		SMV School	105	7	32	16
		VELI / HiTech Chackai	105	10	40	18
		PETTAH / Sasthamangalam(plamadou)	105	8	34	16
	Thissur	KSPCB, District Office, Poonkunnam	104	5	20	6
		Thissur/ Peringandoor	74	5	12	5
	Wayanad	Sulthan Bathery	104	5	5	5
		Wayanad	79	5	5	5
Madhya Pradesh	Amlai	HJI	60	15	26	21
		OPM	69	14	22	18
	Bhopal	Hamidia Road, MP Hastshilp Vikas Nigam	72	5	39	21
		CETP Govindpura	88	8	32	17
		Nutan Subhash School, T.T. Nagar	36	5	11	9
		Kolar Thana, Kolar Road, Bhopal	69	5	53	20
		AKVN Office, Industrial Area Mandideep, Raisen	71	9	56	27
		Barkatuallah University, Hoshgabad Road, Bhopal	74	5	30	13
		Main Road, Hemu Colony, Bairagarh, Bhopal	77	5	41	17
		Arera Colony	82	5	24	10
	Chhindwara	HIG -33, Front of Geetanali Park Housing	96	8	21	14

Particulate Matter ≤ 10 µm (PM_{10}):

State	City/ Town/ Village	Location	No. of monitoring days	PM_{10} Concentration in µg/m³		
				Minimum (24-hourly average)	Maximum (24-hourly average)	Annual Average
Andhra Pradesh	Anantapur	Kamala Nagar	106	35	138	85
		APIIC Zonl office industrial estate	107	19	119	62
		Cancer Unit. G.G.Hsharada Nagar, JNTU Road	108	16	96	52
		D.No.6/5/545, Ram Nagar Colony	108	28	128	68
	Chitoor	GNC Toll Gate Tirumala	100	17	117	58
		Near Nutrine Confectionery, Palamaner Road	108	26	95	58
		O/O Mines and Geology, Old Collector Office, Greamspet	108	28	77	53
		Sankar Foundary, Industrial Estate, Adjacent of DIC Office	108	30	84	55
		Rangachari street, Shanthapeta.	95	17	76	47
	Eluru	Ashram Diagnostic Centre	108	49	93	69
		District Head quarters hospital	108	48	73	59
		M/s Laxmi Propylene Ltd., Plot.No. 25, Industrial Park, Satrampadu	108	54	86	64
		Somalingeswara nilayam D.N.7B-18-5, Thooru Veedhi, Eastern street, Paidichintaadu	108	41	102	61
	Guntur	Near Hindu College, Market Road	101	42	181	62
		A.P. Pollution Control Board, D.No.4-5-4/5C,4/3, Navabharath nagar, Ring Road	101	29	192	40
		Distirct Industries Center office Buiding Autonagar	100	35	78	57
		Government General hospital	101	35	162	52
	Kadapa	Near ICL Industries, Yerragunta, YSR	108	19	99	60
		Devi Diabetes & Hormone Centre, 7 Roads	106	19	93	52
		DIC Office,Kadapa	108	24	142	55
		Rajiv Gandhi Institute of Medical Sciences	108	17	121	43
		Municipal Primary School	107	20	91	57
	Kakinada	Office Building Ramanayyapeta	104	18	221	63
		Gram Panchayathi building, Suryaraopeta	106	14	206	66
		MEE Seva / MEPMA Office, Sailipeta	105	18	186	59
		Petro Chemical Engineering Block, JNTU , Pithapuram Road	107	16	176	56
	Kurnool	Mourya Inn, Krishna Nagar	108	17	119	59
		APIIC Building Industrial estate, Kallur at IDA Bobbili Growth Center	108	22	113	64
		Rajvihar Circle	108	29	117	72
		Pump House, Venkataramana Colony	108	16	100	49
	Nellore	Venkatareddy Nagar, Vedayapalem	107	38	80	68
		D. No.15-471, James Garden, Venkata Ramapuram, Nellore, SPSR Nellore District	107	45	80	68
		Chandramouli nagar	107	41	74	64
		Dr.P.V. Rama chandra Reddy Hospital, Brindavnam	107	40	78	63
	Ongole	Near Court Center	107	38	74	62
		APIIC, Administrative Office, Growth Centre, Gundlapalli	104	35	70	57
		Ongole Municipal Corporation	106	35	76	60
		Prakasam Milk Product Compay	104	27	70	58
	Rajahmundry/ Rajamahendravaram	Staff Clud Building, A.P. Paper Mill	99	17	186	64
		GAIL Administrative Office, A.V. Apparao Road	105	15	193	61
		MCH Block ,District Hospital, Near Central Prison, Lalacheruvu Road	106	17	221	64
		APEPDCL, Circle Office Godavari Gattu	98	18	159	58
	Srikakulam	SAMKRG Pistons Quarters Bulding, Near IDA, Pydibhimavaram	96	28	162	72
		District cooparative office at SKLM Old Bridge	106	25	137	60
		APIIC, Kushalapuram	96	26	205	72
		Muncipal corporation Office, Old Bustand	107	23	115	63
	Tirupati	Regional Science Centre, Chittoor Bypass	108	12	66	43

State	City/ Town/ Village	Location	No. of monitoring days	PM_{10} Concentration in µg/m³		
				Minimum (24-hourly average)	Maximum (24-hourly average)	Annual Average
		Dyno Wash)				
		L.D. Engg. College	88	66	339	126
		Shardaben Hospital, Saraspur	86	71	391	128
		R.C. Technical High School, Mirzapur	86	68	295	122
		AZL Behrampura, Ahmadabad	87	71	353	132
		Sola L.T. Chanakyapuri Pumping Station	88	70	381	138
		Rallis India Ltd.	88	59	213	119
	Anklesvar	Durga Traders, Bhavanafarm Society	88	55	239	110
	Jamnagar	Fisheries Office	87	57	267	123
		Nr. Sardhara Industrial Corporation	87	68	256	128
	Rajkot	GPCB Regional Offce	87	56	332	125
		S.V.R. Engg. College	87	66	166	100
		B.R.C. High School, Udhna	83	57	356	151
	Surat	Near Air India Office	85	69	342	132
		GPCB Office, Geri Vasahat	87	47	269	107
		Sterling Gelatin Guest House, Vill-Karakhadi Padia	87	62	378	145
		Dandia Bazaar	88	71	293	120
		CETP Nandesari	85	68	375	151
	Vadodara	Lubrizol	87	65	333	131
		GEB, IIIrd Phase, GIDC	86	44	316	131
	Vapi	Vapi Nagar Palika, Vapi	87	45	284	108
Himachal Pradesh		Industry Department Office Building	125	57	292	157
		AHC barotiwala	102	49	195	125
	Baddi	Housing Board	50	74	327	163
		Regional Office	128	19	86	47
	Damtal	Old Road	121	17	94	50
		Kotwali Bazar Dharamshala	98	16	65	35
	Dharamshala	Daari, Dharamshala	122	16	114	38
	Gulaba	Behind green tax barrier	19	8	62	
		Kala Amb Industrial Area	171	23	233	121
	Kala Amb	Kala Amb Town/Trilokpur	168	18	188	82
		Nehru Park, Manali, Kullu	101	26	217	79
	Manali	HPSPCB, Hadimba Road, Manali, Kullu	83	19	113	49
	Marhi	Behind Police check post	12	18	60	35
	Nalagarh	Municipal Council	120	68	251	125
		Paonta Sahib	165	26	188	79
	Paonta Sahib	Gondhpur Industrial Area	119	17	188	88
		Regional Office, Sector- 4	141	29	191	61
	Parwanoo	Asst. Commissioner Building Sector I	128	32	192	67
	Shimla	Bus Stand, Winterfield	213	19	137	59
		HPSPCB, BBMB Colony, Mandi	144	5	193	69
	Sunder Nagar	Muncipal Council, NH-21, Mandi	107	22	170	76
		Regional Office, Una	164	30	79	60
	Una	DIC Building, Mehatpur, Una	97	51	71	62
	Vashisht	Behind pollution check barrier, Bahang / Station No.-II1, Bahang	44	26	96	48
Jammu & Kashmir		Regional Office, Jammu	91	94	178	140
		M.A. Stadium, Jewel Chowk	82	89	175	136
	Jammu	Bari Brahamana Industrial Area	99	70	186	139
	Pulwama	Khrew	58	43	269	120
		SPCB Office Campus, Srinagar	50	42	237	76
		Khonmoh	55	52	858	136
	Srinagar	Lasjan, Budgam	55	90	362	185
Jharkhand	Barajamda	Barajamda U.M. Office	91	50	98	76
		R.O. Dhanbad	103	73	286	162
		EMTI, Bastacola	75	171	397	275
	Dhanbad	CGM Office, Kusunda	100	77	437	273
		Bistupur Vehical Testing Centre	93	61	197	139
	Jamshedpur	Golmuri Vehicle Testing Centre	91	81	171	138
	Jharia	M.A.D.A.	105	109	427	302
	Ranchi	Albert Ekka Chowk, Main Road	96	73	168	109
	Saraikela	RO Building, Adityapur	91	66	236	135
	Sindri	BIT / PDIL	75	24	204	137
Karnataka	Bagalkote	Bagalkote KSPCB Office Premises	85	16	117	45
	Bangalore	Graphite India, White Field Road	83	56	186	91

Particulate Matter ≤ 2.5 µm ($PM_{2.5}$):

State	City/ Town/ Village	Location	No. of monitoring days	$PM_{2.5}$ Concentration in µg/m³		
				Minimum (24-hourly average)	Maximum (24-hourly average)	Annual Average
Andhra Pradesh	Anantapur	Kamala Nagar	35	12	65	41
		APIIC Zonl office industrial estate	65	10	53	24
		Cancer Unit. G.G.Hsharada Nagar, JNTU Road	34	13	32	20
		D.No.6/5/545, Ram Nagar Colony	72	18	55	34
	Chitoor	GNC Toll Gate Tirumala	80	7	66	24
		Near Nutrine Confectionery, Palamaner Road	87	10	49	28
		O/O Mines and Geology, Old Collector Office, Greamspet	71	12	41	27
	Eluru	Ashram Diagnostic Centre	45	15	33	22
		District Head quarters hospital	39	12	30	16
	Guntur	Near Hindu College, Market Road	63	21	48	29
		A.P. Pollution Control Board, D.No.4-5-4/5C,4/3, Navabharath nagar, Ring Road	75	13	31	18
		Distirct Industries Center office Buiding Autonagar	63	18	38	25
		Government General hospital	49	11	33	19
	Kadapa	Near ICL Industries, Yerragunta, YSR	81	10	48	30
		DIC Office,Kadapa	54	10	42	23
		Rajiv Gandhi Institute of Medical Sciences	70	8	69	24
	Kakinada	Office Building Ramanayyapeta	55	6	107	30
		Gram Panchayathi building, Suryaraopeta	28	6	30	15
		MEE Seva / MEPMA Office, Sailipeta	41	6	59	16
		Petro Chemical Engineering Block, JNTU , Pithapuram Road	41	6	53	18
	Kurnool	Mourya Inn, Krishna Nagar	57	9	55	25
		APIIC Building Industrial estate, Kallur at IDA Bobbili Growth Center	42	13	58	34
		Rajvihar Circle	68	17	56	34
		Pump House, Venkataramana Colony	63	10	41	25
	Nellore	Venkatareddy Nagar, Vedayapalem	77	27	38	33
		Chandramouli nagar	36	26	37	32
	Ongole	Near Court Center	35	8	40	25
		APIIC, Administrative Office, Growth Centre, Gundlapalli	12	15	34	
		Ongole Municipal Corporation	34	8	35	24
	Rajahmundry/ Rajamahendravaram	Staff Clud Building, A.P. Paper Mill	70	8	118	34
	Srikakulam	SAMKRG Pistons Quarters Bulding, Near IDA, Pydibhimavaram	64	10	95	36
	Tirupati	Regional Science Centre, Chittoor Bypass	10	19	31	
		Municipal Office, Tilak Road	44	9	38	26
		Sri Venkateswara Guest House (TTD SV Rest House), Near APSRTC Bus Stand	46	18	46	31
	Vijaywada	Benz Circle	90	15	43	25
		Autonagar	81	20	40	27
		Police Control Room	90	18	43	28
	Vishakhapatnam	Industrial Estate, Marripalem	64	8	80	36
		Panchayat Raj office, Mindi	68	9	75	27
		Police Barracks	89	7	99	36
		INS-Virabahu, Naval Area	55	7	49	27
		Seethammadhara	80	8	91	29
		Ganapuram Area	77	10	127	41
		Pedagantyada (V), Gajuwada (M)	77	7	70	34
		CWMP, RAMKY, Parawada	54	10	73	32
		MVP Raitu Bajar	4	8	84	
	Vizianagaram	Industrial Growth Centre, APIIC Building at IDA Bobbili	50	8	58	35
Assam	Guwahati	Head Office, Bamunimaidam	24	12	51	27
		ITI Building, Gopinath Nagar	25	17	51	30
		Khanapara, Central Dairy, Kamrup	21	10	43	23
Bihar	Begusarai	Begusarai	104	19	114	55
	Muzaffarpur	BSPCB Regional Office, Bela Industrial Area, Bela	104	19	304	101
Chandigarh	Chandigarh	Modern Foods, Industrial Area	124	11	323	74

State	City/ Town/ Village	Location	No. of monitoring days	$PM_{2.5}$ Concentration in µg/m³		
				Minimum (24-hourly average)	Maximum (24-hourly average)	Annual Average
		Dandia Bazaar	88	17	89	34
		CETP Nandesari	85	18	112	41
		Lubrizol	87	17	94	36
		GEB, IIIrd Phase, GIDC	86	17	98	45
	Vapi	Vapi Nagar Palika, Vapi	87	12	89	35
Himachal Pradesh		Regional Office	99	6	43	19
	Damtal	Old Road	97	7	52	22
		Kotwali Bazar Dharamshala	29	8	25	14
	Dharamshala	Daari, Dharamshala	118	7	82	17
		Kala Amb Industrial Area	19	70	113	85
	Kala Amb	Kala Amb Town/Trilokpur	29	14	79	52
		Nehru Park, Manali, Kullu	118	1	76	27
	Manali	HPSPCB, Hadimba Road, Manali, Kullu	31	7	31	17
	Paonta Sahib	Paonta Sahib	49	8	63	39
		Regional Office, Sector- 4	140	6	56	18
	Parwanoo	Asst. Commissioner Building Sector I	108	6	56	19
	Shimla	Bus Stand, Winterfield	118	5	56	26
		HPSPCB, BBMB Colony, Mandi	47	6	75	30
	Sunder Nagar	Muncipal Council, NH-21, Mandi	24	18	86	46
Jammu & Kashmir		Regional Office, Jammu	27	12	63	
		M.A. Stadium, Jewel Chowk	20	16	56	39
	Jammu	Bari Brahamana Industrial Area	26	12	49	35
Karnataka	Bagalkote	Bagalkote KSPCB Office Premises	40	10	68	29
		Graphite India, White Field Road	72	12	70	32
		AMCO Batteries, Mysore Road	96	16	74	36
		KHB Industrial Area, Yelahanka	28	11	47	27
		Peenya Industrial Area	13	17	57	36
		Victoria hospital	71	11	59	23
		Yeshwanthpura police station	88	10	74	35
		Jnanabharathi, Bangalore University	20	20	55	40
	Bangalore	TERI office, Vital Medi healthcare Pvt Ltd	79	11	67	30
	Belgaum	Karnataka SPCB Office Building	50	7	90	38
	Bidar	KSPCB Office Premises	51	5	89	39
	Bijapur	KSPCB Office Premises	16	15	76	
	Devanagere	Regional Office building, KSPCB	85	3	35	16
	Gulburga	Government Hospital	35	23	102	46
	Hassan	KSRTC bus stand building	78	18	36	25
		Lakkamanahalli Industrial Area, Dharwad	105	12	33	20
	Hubli-Dharwad	Rani Chennamma Circle, Hubli	104	15	38	24
	Kolar	KSPCB Office Premises, Kolar	31	12	53	28
	Mangalore	Baikampady Industrial Area	14	15	59	
	Mysore	K.R.Circle, Visvesvaraya Bldg	108	18	41	26
	Raichur	KSPCB Office Premises, Raichur	43	1	34	14
	Shimaga	The VISL, Oxygen Plant, Shimoga	62	3	24	12
Kerala	Kochi	Kuttipadam	43	4	61	32
		Kozhikode City	85	2	38	13
	Kozhikode	Nallalam	87	1	56	14
Madhya Pradesh		Hamidia Road, MP Hastshilp Vikas Nigam	13	35	119	
		CETP Govindpura	7	25	56	
		Kolar Thana, Kolar Road, Bhopal	14	39	122	
		AKVN Office, Industrial Area Mandideep, Raisen	12	37	125	
		Barkatuallah University, Hoshgabad Road, Bhopal	16	25	86	
	Bhopal	Arera Colony	40	12	80	48
	Chhindwara	HIG -33, Front of Geetanali Park Housing Board Colony, Chadagaon	96	12	60	34
		Hindustan Unileaver, Narsinghpur Road,	88	12	60	37
		EID Perry (I) Limited	24	25	59	47
		Dewas Metal Section	26	30	58	45
	Dewas	Vikas Nagar	41	25	86	46
		Dindayal Nagar	89	13	175	57
	Gwalior	Maharaj Bada	93	19	91	58
		M.P. Laghu Udyog, Pologround	94	13	68	39
		Kothari Market, M.G. Road	101	11	63	37
	Indore	Telephone Nagar, 26 A, Kanadia Road	99	12	64	36

CENTRAL POLLUTION CONTROL BOARD

CONTINUOUS AMBIENT AIR QUALITY

Date: Thursday, Jun 24 2021
Time: 04:33:22 PM

State	Karnataka
City	Bengaluru
Station	Peenya, Bengaluru - CPCB
Parameter	PM10,NO,NO2,NOx,SO2,CO,Ozone,RH,SR
AvgPeriod	24 Hours
From	01-04-2020T00:00:00Z 00:00
To	24-06-2021T16:29:59Z 00:00

Peenya, Bengaluru - CPCB						
Prescribed Standards		**0-100**	**0-80**	**0-80**	**0-200**	**0-80**
Exceeding Standards		**NA**	**NA**	**NA**	**NA**	**NA**
Remarks						
From Date	To Date	PM10	NO	NO2	NOx	SO2
01-04-2020 00:00	02-04-2020 00:00	None	1.91	5.98	7.83	3.2
02-04-2020 00:00	03-04-2020 00:00	None	1.97	5.99	7.86	3.73
03-04-2020 00:00	04-04-2020 00:00	None	1.99	5.88	7.81	4.03
04-04-2020 00:00	05-04-2020 00:00	None	1.99	5.98	7.91	3.09
05-04-2020 00:00	06-04-2020 00:00	None	2.35	6.46	8.75	3.12
06-04-2020 00:00	07-04-2020 00:00	None	2.19	5.94	8.04	3.07
07-04-2020 00:00	08-04-2020 00:00	None	2.46	6.79	9.13	3.31
08-04-2020 00:00	09-04-2020 00:00	None	2.2	6.86	8.97	3.71
09-04-2020 00:00	10-04-2020 00:00	None	2.2	6.04	8.12	3.57
10-04-2020 00:00	11-04-2020 00:00	None	2.46	6.55	8.55	3.79
11-04-2020 00:00	12-04-2020 00:00	None	2.39	5.69	7.91	3.92
12-04-2020 00:00	13-04-2020 00:00	None	2.4	6.1	8.38	4.93
13-04-2020 00:00	14-04-2020 00:00	None	2.06	6.72	8.63	3.44
14-04-2020 00:00	15-04-2020 00:00	None	2.03	7.48	9.38	3.6
15-04-2020 00:00	16-04-2020 00:00	None	2.1	6.66	8.55	4.17
16-04-2020 00:00	17-04-2020 00:00	None	2.03	6.51	8.4	3.54
17-04-2020 00:00	18-04-2020 00:00	None	2.31	6.69	8.91	3.75
18-04-2020 00:00	19-04-2020 00:00	None	2.14	6.05	8.14	3.35
19-04-2020 00:00	20-04-2020 00:00	None	2.14	5.37	7.48	2.67
20-04-2020 00:00	21-04-2020 00:00	None	2.2	5.85	8.01	4.16
21-04-2020 00:00	22-04-2020 00:00	None	2.09	7.23	9.26	3.48
22-04-2020 00:00	23-04-2020 00:00	None	2.19	5.75	7.85	3.07
23-04-2020 00:00	24-04-2020 00:00	None	2.36	6.77	9.08	4.34
24-04-2020 00:00	25-04-2020 00:00	None	2.62	7.59	10.14	3.66
25-04-2020 00:00	26-04-2020 00:00	None	2.4	5.83	8.2	4
26-04-2020 00:00	27-04-2020 00:00	None	2.58	5.36	7.83	3.25
27-04-2020 00:00	28-04-2020 00:00	None	3.1	5.96	8.92	3.12
28-04-2020 00:00	29-04-2020 00:00	None	2.48	4.87	7.1	3.55
29-04-2020 00:00	30-04-2020 00:00	None	2.02	5.37	7.33	2.44
30-04-2020 00:00	01-05-2020 00:00	None	2.15	7.7	9.76	3.55
01-05-2020 00:00	02-05-2020 00:00	None	2.11	5.19	7.25	3.29
02-05-2020 00:00	03-05-2020 00:00	None	3.23	5.74	8.7	3.33
03-05-2020 00:00	04-05-2020 00:00	None	None	None	None	None
04-05-2020 00:00	05-05-2020 00:00	None	None	None	None	None
05-05-2020 00:00	06-05-2020 00:00	None	None	None	None	None
06-05-2020 00:00	07-05-2020 00:00	None	3.56	7.57	10.74	3.38
07-05-2020 00:00	08-05-2020 00:00	None	14.89	20.67	29.12	2.5
08-05-2020 00:00	09-05-2020 00:00	None	None	None	None	None
09-05-2020 00:00	10-05-2020 00:00	None	None	None	None	None
10-05-2020 00:00	11-05-2020 00:00	None	None	None	None	None
11-05-2020 00:00	12-05-2020 00:00	None	2.99	7.73	10.42	3.77
12-05-2020 00:00	13-05-2020 00:00	None	2.91	7.8	10.5	3.81
13-05-2020 00:00	14-05-2020 00:00	None	2.69	6.65	9.12	3.39
14-05-2020 00:00	15-05-2020 00:00	None	2.8	6.51	9.12	3.35
15-05-2020 00:00	16-05-2020 00:00	None	3.09	7.87	10.75	3.18
16-05-2020 00:00	17-05-2020 00:00	None	2.95	7.96	10.7	4.4
17-05-2020 00:00	18-05-2020 00:00	None	2.57	5.18	7.64	3.44
18-05-2020 00:00	19-05-2020 00:00	None	2.5	5.66	8.01	3.45
19-05-2020 00:00	20-05-2020 00:00	None	2.65	5.8	8.39	4.02
20-05-2020 00:00	21-05-2020 00:00	None	2.83	6.14	8.75	3.52
21-05-2020 00:00	22-05-2020 00:00	None	2.88	6.5	9.23	3.77
22-05-2020 00:00	23-05-2020 00:00	None	2.8	6.31	8.87	3.51
23-05-2020 00:00	24-05-2020 00:00	None	2.55	6.02	8.39	3.76
24-05-2020 00:00	25-05-2020 00:00	None	2.57	5.14	7.5	3.44
25-05-2020 00:00	26-05-2020 00:00	None	2.9	6.08	8.77	3.2
26-05-2020 00:00	27-05-2020 00:00	None	2.84	5.96	8.6	3.33
27-05-2020 00:00	28-05-2020 00:00	None	3.01	7.11	10.03	3.44
28-05-2020 00:00	29-05-2020 00:00	None	2.77	6.48	9.19	3.15
29-05-2020 00:00	30-05-2020 00:00	None	2.9	7.55	10.41	4.01
30-05-2020 00:00	31-05-2020 00:00	None	2.9	11.26	13.99	2.99
31-05-2020 00:00	01-06-2020 00:00	None	2.75	7.47	10	3.83
01-06-2020 00:00	02-06-2020 00:00	None	2.61	7.1	9.5	3.25
02-06-2020 00:00	03-06-2020 00:00	None	2.53	6.67	9.1	3.66

03-06-2020 00:00	04-06-2020 00:00	None	2.48	5.93	8.38	3.59
04-06-2020 00:00	05-06-2020 00:00	None	2.49	6.3	8.65	4.42
05-06-2020 00:00	06-06-2020 00:00	None	2.7	6.44	8.99	4.76
06-06-2020 00:00	07-06-2020 00:00	None	2.43	7.32	9.63	4.29
07-06-2020 00:00	08-06-2020 00:00	None	2.36	5.82	8.09	4.38
08-06-2020 00:00	09-06-2020 00:00	None	2.53	6.51	8.88	4.26
09-06-2020 00:00	10-06-2020 00:00	None	2.61	6.9	9.41	4.03
10-06-2020 00:00	11-06-2020 00:00	None	2.38	6.97	9.24	4.49
11-06-2020 00:00	12-06-2020 00:00	None	2.62	6.57	9.02	4.26
12-06-2020 00:00	13-06-2020 00:00	None	2.51	6.03	8.26	4.19
13-06-2020 00:00	14-06-2020 00:00	None	2.64	6.96	9.38	4.08
14-06-2020 00:00	15-06-2020 00:00	None	2.41	5.21	7.35	4
15-06-2020 00:00	16-06-2020 00:00	None	2.4	6.08	8.16	4.46
16-06-2020 00:00	17-06-2020 00:00	None	2.31	6.2	8.37	4.69
17-06-2020 00:00	18-06-2020 00:00	None	2.27	6.11	8.29	4.55
18-06-2020 00:00	19-06-2020 00:00	None	2.36	6.31	8.55	4.33
19-06-2020 00:00	20-06-2020 00:00	None	2.22	6.29	8.26	4.17
20-06-2020 00:00	21-06-2020 00:00	None	2.3	6.39	8.66	4.09
21-06-2020 00:00	22-06-2020 00:00	None	2.29	5.18	7.43	4.23
22-06-2020 00:00	23-06-2020 00:00	None	2.25	5.91	8.1	4.16
23-06-2020 00:00	24-06-2020 00:00	None	2.71	6.86	9.53	4.08
24-06-2020 00:00	25-06-2020 00:00	None	2.3	6.38	8.64	4.12
25-06-2020 00:00	26-06-2020 00:00	None	2.38	7.13	9.4	4.47
26-06-2020 00:00	27-06-2020 00:00	None	3.08	8.26	11.29	4.31
27-06-2020 00:00	28-06-2020 00:00	None	3.02	7.93	10.87	4.44
28-06-2020 00:00	29-06-2020 00:00	None	2.57	5.05	7.61	3.9
29-06-2020 00:00	30-06-2020 00:00	None	2.28	7.06	9.32	4.31
30-06-2020 00:00	01-07-2020 00:00	None	2.83	7.26	10.06	3.91
01-07-2020 00:00	02-07-2020 00:00	None	2.65	5.76	8.37	4.34
02-07-2020 00:00	03-07-2020 00:00	None	2.71	5.98	8.53	4.13
03-07-2020 00:00	04-07-2020 00:00	None	2.1	3.88	5.94	4.38
04-07-2020 00:00	05-07-2020 00:00	None	2.12	4.01	6.1	4.19
05-07-2020 00:00	06-07-2020 00:00	None	1.96	3.63	5.54	4.27
06-07-2020 00:00	07-07-2020 00:00	None	2.12	5.36	7.47	4.09
07-07-2020 00:00	08-07-2020 00:00	None	2.18	5.18	7.35	4.08
08-07-2020 00:00	09-07-2020 00:00	None	2.01	4.81	6.81	2.64
09-07-2020 00:00	10-07-2020 00:00	None	1.99	5.3	7.28	3.03
10-07-2020 00:00	11-07-2020 00:00	None	2.15	5.4	7.53	2.84
11-07-2020 00:00	12-07-2020 00:00	None	2.11	5.55	7.63	2.44
12-07-2020 00:00	13-07-2020 00:00	None	2.05	4.26	6.29	2.64
13-07-2020 00:00	14-07-2020 00:00	None	2.03	5.34	7.33	2.85
14-07-2020 00:00	15-07-2020 00:00	None	2.01	5.39	7.39	2.76
15-07-2020 00:00	16-07-2020 00:00	None	2.03	4.91	6.93	2.22
16-07-2020 00:00	17-07-2020 00:00	None	2.17	4.01	6.17	2.28
17-07-2020 00:00	18-07-2020 00:00	None	2.2	4.29	6.49	2.04
18-07-2020 00:00	19-07-2020 00:00	None	2.23	4.24	6.46	2.84
19-07-2020 00:00	20-07-2020 00:00	None	2.05	3.69	5.74	2.4
20-07-2020 00:00	21-07-2020 00:00	None	1.95	3.67	5.61	2.97
21-07-2020 00:00	22-07-2020 00:00	None	2.13	4.63	6.75	2.65
22-07-2020 00:00	23-07-2020 00:00	None	2.11	5.53	7.62	2.55
23-07-2020 00:00	24-07-2020 00:00	None	1.95	5.58	7.52	2.66
24-07-2020 00:00	25-07-2020 00:00	None	2.07	5.34	7.39	2.84
25-07-2020 00:00	26-07-2020 00:00	None	1.98	4.71	6.66	2.87
26-07-2020 00:00	27-07-2020 00:00	None	1.9	4.03	5.9	2.41
27-07-2020 00:00	28-07-2020 00:00	None	1.99	4.58	6.53	2.23
28-07-2020 00:00	29-07-2020 00:00	None	2.09	4.62	6.7	2.64
29-07-2020 00:00	30-07-2020 00:00	None	2.29	7.84	10.12	2.47
30-07-2020 00:00	31-07-2020 00:00	None	2.18	7.27	9.43	2.44
31-07-2020 00:00	01-08-2020 00:00	None	2.1	7.12	9.22	2.19
01-08-2020 00:00	02-08-2020 00:00	None	2.1	7.5	9.58	2.49
02-08-2020 00:00	03-08-2020 00:00	None	79.33	81.97	116.79	2.14
03-08-2020 00:00	04-08-2020 00:00	None	9.9	10.93	19.7	2.07
04-08-2020 00:00	05-08-2020 00:00	None	2.72	6.41	8.94	2.62
05-08-2020 00:00	06-08-2020 00:00	None	2.28	6.2	8.37	2.85
06-08-2020 00:00	07-08-2020 00:00	None	2.39	5.3	7.61	2.5
07-08-2020 00:00	08-08-2020 00:00	None	2.26	4.83	6.95	2.63
08-08-2020 00:00	09-08-2020 00:00	None	2.29	4.55	6.73	2.49
09-08-2020 00:00	10-08-2020 00:00	None	2.01	3.36	5.31	2.93
10-08-2020 00:00	11-08-2020 00:00	None	2.05	4.61	6.61	2.48
11-08-2020 00:00	12-08-2020 00:00	None	2.03	4.66	6.67	2.67
12-08-2020 00:00	13-08-2020 00:00	None	2.13	4.46	6.58	2.52
13-08-2020 00:00	14-08-2020 00:00	None	1.96	4.49	6.43	2.66
14-08-2020 00:00	15-08-2020 00:00	None	2.02	4.97	6.98	2.48
15-08-2020 00:00	16-08-2020 00:00	None	2.01	4.08	6.09	3.08
16-08-2020 00:00	17-08-2020 00:00	None	2.07	4.29	6.36	2.95
17-08-2020 00:00	18-08-2020 00:00	None	1.97	4.59	6.56	2.41
18-08-2020 00:00	19-08-2020 00:00	None	2.03	4.74	6.76	2.68
19-08-2020 00:00	20-08-2020 00:00	None	1.96	5.01	6.95	2.48
20-08-2020 00:00	21-08-2020 00:00	None	2.04	4.87	6.89	2.88
21-08-2020 00:00	22-08-2020 00:00	None	2.03	4.76	6.77	2.4
22-08-2020 00:00	23-08-2020 00:00	None	2.06	4.07	6.11	2.65
23-08-2020 00:00	24-08-2020 00:00	None	2.04	4.24	6.27	2.56

24-08-2020 00:00	25-08-2020 00:00	None	2	4.89	6.87	2.67
25-08-2020 00:00	26-08-2020 00:00	None	2.16	5.5	7.65	2.75
26-08-2020 00:00	27-08-2020 00:00	None	2.01	5.41	7.42	2.55
27-08-2020 00:00	28-08-2020 00:00	None	2.15	5.48	7.61	2.63
28-08-2020 00:00	29-08-2020 00:00	None	3.21	8.5	11.65	2.22
29-08-2020 00:00	30-08-2020 00:00	None	2.81	8.22	11.02	2.86
30-08-2020 00:00	31-08-2020 00:00	None	2.45	6.13	8.58	2.74
31-08-2020 00:00	01-09-2020 00:00	None	2.97	6.31	9.28	2.6
01-09-2020 00:00	02-09-2020 00:00	None	2.62	6.2	8.82	2.52
02-09-2020 00:00	03-09-2020 00:00	None	2.8	6.5	9.3	2.84
03-09-2020 00:00	04-09-2020 00:00	None	3.41	6.55	9.96	2.97
04-09-2020 00:00	05-09-2020 00:00	None	3.07	5.14	8.21	2.7
05-09-2020 00:00	06-09-2020 00:00	None	3.01	4.75	7.74	2.62
06-09-2020 00:00	07-09-2020 00:00	None	2.47	4.72	7.13	2.64
07-09-2020 00:00	08-09-2020 00:00	None	2.49	5.31	7.8	2.91
08-09-2020 00:00	09-09-2020 00:00	None	2.48	5.2	7.68	2.38
09-09-2020 00:00	10-09-2020 00:00	None	2.59	5.51	8.09	2.38
10-09-2020 00:00	11-09-2020 00:00	None	2.35	5.72	8.07	2.6
11-09-2020 00:00	12-09-2020 00:00	None	2.29	5.83	8.11	2.61
12-09-2020 00:00	13-09-2020 00:00	None	2.42	6.26	8.68	2.53
13-09-2020 00:00	14-09-2020 00:00	None	2.14	6.36	8.42	2.57
14-09-2020 00:00	15-09-2020 00:00	None	2.49	7.01	9.52	2.61
15-09-2020 00:00	16-09-2020 00:00	None	2.53	5.86	8.4	2.83
16-09-2020 00:00	17-09-2020 00:00	None	2.63	5.67	8.3	2.91
17-09-2020 00:00	18-09-2020 00:00	None	2.51	5.2	7.71	3.01
18-09-2020 00:00	19-09-2020 00:00	None	2.61	5.66	8.27	2.13
19-09-2020 00:00	20-09-2020 00:00	None	2.72	5.43	8.15	2.64
20-09-2020 00:00	21-09-2020 00:00	None	2.67	5.4	8.06	2.25
21-09-2020 00:00	22-09-2020 00:00	None	2.87	5.41	8.28	2.66
22-09-2020 00:00	23-09-2020 00:00	None	2.76	5.66	8.45	2.37
23-09-2020 00:00	24-09-2020 00:00	None	2.8	6.03	8.82	2.84
24-09-2020 00:00	25-09-2020 00:00	None	2.8	5.91	8.71	2.45
25-09-2020 00:00	26-09-2020 00:00	None	2.79	6.22	9.01	2.99
26-09-2020 00:00	27-09-2020 00:00	None	2.73	5.93	8.58	2.79
27-09-2020 00:00	28-09-2020 00:00	None	2.66	6.38	9.04	2.49
28-09-2020 00:00	29-09-2020 00:00	None	None	None	None	None
29-09-2020 00:00	30-09-2020 00:00	None	6.65	15.54	22.19	2.82
30-09-2020 00:00	01-10-2020 00:00	None	2.85	9.15	12	2.61
01-10-2020 00:00	02-10-2020 00:00	None	2.9	9.87	12.77	2.76
02-10-2020 00:00	03-10-2020 00:00	None	2.7	10.58	13.27	2.56
03-10-2020 00:00	04-10-2020 00:00	None	2.46	10.76	13.22	2.58
04-10-2020 00:00	05-10-2020 00:00	None	2.43	10.71	13.13	2.61
05-10-2020 00:00	06-10-2020 00:00	None	2.76	12.93	15.69	2.22
06-10-2020 00:00	07-10-2020 00:00	None	2.54	12.6	15.11	2.71
07-10-2020 00:00	08-10-2020 00:00	None	2.46	12.39	14.84	2.67
08-10-2020 00:00	09-10-2020 00:00	None	2.62	13.39	16.01	2.33
09-10-2020 00:00	10-10-2020 00:00	None	2.73	11.4	14.11	2.6
10-10-2020 00:00	11-10-2020 00:00	None	2.69	10.59	13.27	2.73
11-10-2020 00:00	12-10-2020 00:00	None	2.4	9.74	12.13	2.5
12-10-2020 00:00	13-10-2020 00:00	None	2.5	10.31	12.8	2.38
13-10-2020 00:00	14-10-2020 00:00	None	2.41	11.24	13.63	2.79
14-10-2020 00:00	15-10-2020 00:00	None	2.27	10.4	12.64	2.47
15-10-2020 00:00	16-10-2020 00:00	None	2.74	11.17	13.91	2.23
16-10-2020 00:00	17-10-2020 00:00	None	3.01	11.52	14.51	2.47
17-10-2020 00:00	18-10-2020 00:00	None	3.1	10.67	13.75	2.36
18-10-2020 00:00	19-10-2020 00:00	None	2.67	10.25	12.91	2.26
19-10-2020 00:00	20-10-2020 00:00	None	2.81	10.31	13.13	2.7
20-10-2020 00:00	21-10-2020 00:00	None	2.23	9.9	12.12	2.57
21-10-2020 00:00	22-10-2020 00:00	None	2.38	10.68	13.05	2.66
22-10-2020 00:00	23-10-2020 00:00	None	2.31	10.7	13.01	3.29
23-10-2020 00:00	24-10-2020 00:00	None	2.17	9.9	12.06	2.83
24-10-2020 00:00	25-10-2020 00:00	None	2.26	10.67	12.93	2.95
25-10-2020 00:00	26-10-2020 00:00	None	2.25	11.19	13.44	2.89
26-10-2020 00:00	27-10-2020 00:00	None	2.24	11.94	14.18	3.14
27-10-2020 00:00	28-10-2020 00:00	None	2.2	12.54	14.73	3.06
28-10-2020 00:00	29-10-2020 00:00	None	2.15	12.83	14.97	2.87
29-10-2020 00:00	30-10-2020 00:00	None	2.21	12.92	15.13	2.44
30-10-2020 00:00	31-10-2020 00:00	None	2.29	14.02	16.3	3.1
31-10-2020 00:00	01-11-2020 00:00	None	2.63	13.89	16.51	2.75
01-11-2020 00:00	02-11-2020 00:00	None	2.07	10.58	12.65	2.88
02-11-2020 00:00	03-11-2020 00:00	None	2.4	10.36	12.75	2.74
03-11-2020 00:00	04-11-2020 00:00	None	2.54	9.3	11.84	3.23
04-11-2020 00:00	05-11-2020 00:00	None	2.44	9.53	11.97	2.77
05-11-2020 00:00	06-11-2020 00:00	None	2.14	8.87	11.01	2.45
06-11-2020 00:00	07-11-2020 00:00	None	2.1	9.42	11.52	3.06
07-11-2020 00:00	08-11-2020 00:00	None	2.16	9.4	11.56	2.32
08-11-2020 00:00	09-11-2020 00:00	None	1.98	9.22	11.2	2.98
09-11-2020 00:00	10-11-2020 00:00	None	2.12	9.94	12.06	3.18
10-11-2020 00:00	11-11-2020 00:00	None	2.22	10.68	12.89	2.87
11-11-2020 00:00	12-11-2020 00:00	None	2.06	10.43	12.49	2.76
12-11-2020 00:00	13-11-2020 00:00	None	2.1	10.77	12.85	3.4
13-11-2020 00:00	14-11-2020 00:00	None	2.46	11.24	13.69	2.54

14-11-2020 00:00	15-11-2020 00:00	None	2.38	10.54	12.92	2.87
15-11-2020 00:00	16-11-2020 00:00	None	2.02	9.42	11.43	3.83
16-11-2020 00:00	17-11-2020 00:00	None	2	9.98	11.98	2.58
17-11-2020 00:00	18-11-2020 00:00	None	2.13	12.3	14.43	3.03
18-11-2020 00:00	19-11-2020 00:00	None	2.2	14.02	16.22	2.99
19-11-2020 00:00	20-11-2020 00:00	None	2.2	14.19	16.39	2.91
20-11-2020 00:00	21-11-2020 00:00	None	2.31	12.36	14.67	2.85
21-11-2020 00:00	22-11-2020 00:00	None	2.86	17.93	20.78	2.99
22-11-2020 00:00	23-11-2020 00:00	None	2.39	18.13	20.53	2.41
23-11-2020 00:00	24-11-2020 00:00	None	3.25	18.85	22.1	2.85
24-11-2020 00:00	25-11-2020 00:00	None	2.47	13.63	16.1	None
25-11-2020 00:00	26-11-2020 00:00	None	2.54	12.59	15.14	2.48
26-11-2020 00:00	27-11-2020 00:00	None	2.38	11.48	13.87	3.01
27-11-2020 00:00	28-11-2020 00:00	None	2.38	13.38	15.76	2.87
28-11-2020 00:00	29-11-2020 00:00	None	2.6	13.94	16.53	3.33
29-11-2020 00:00	30-11-2020 00:00	None	2.58	11.56	14.14	2.74
30-11-2020 00:00	01-12-2020 00:00	140.02	4.76	18.27	22.71	2.89
01-12-2020 00:00	02-12-2020 00:00	188.53	2.87	17.84	20.7	3.68
02-12-2020 00:00	03-12-2020 00:00	79.15	3.37	21.09	24.45	3.33
03-12-2020 00:00	04-12-2020 00:00	57.89	3.19	22.81	26	2.66
04-12-2020 00:00	05-12-2020 00:00	None	3.92	26.5	30.42	3.61
05-12-2020 00:00	06-12-2020 00:00	None	5.29	23.94	29.24	4.43
06-12-2020 00:00	07-12-2020 00:00	None	6.24	45.78	52.01	3.49
07-12-2020 00:00	08-12-2020 00:00	None	6.87	54.32	61.19	4.34
08-12-2020 00:00	09-12-2020 00:00	None	4.9	40.5	45.36	2.36
09-12-2020 00:00	10-12-2020 00:00	None	3.91	37	40.81	2.54
10-12-2020 00:00	11-12-2020 00:00	None	4.41	40.71	45.11	3.11
11-12-2020 00:00	12-12-2020 00:00	None	7.3	42.93	50.21	2.33
12-12-2020 00:00	13-12-2020 00:00	None	5.34	30.69	36.03	2.75
13-12-2020 00:00	14-12-2020 00:00	None	3.9	22.46	26.36	2.56
14-12-2020 00:00	15-12-2020 00:00	None	4.99	25.72	30.7	2.78
15-12-2020 00:00	16-12-2020 00:00	None	5.25	26.07	31.31	2.65
16-12-2020 00:00	17-12-2020 00:00	None	5.19	24.38	29.57	2.76
17-12-2020 00:00	18-12-2020 00:00	None	4.61	21.62	26.23	3.35
18-12-2020 00:00	19-12-2020 00:00	95.5	4.76	22.33	27.08	3.03
19-12-2020 00:00	20-12-2020 00:00	111.46	3.8	20.23	24.03	2.56
20-12-2020 00:00	21-12-2020 00:00	124.3	3.46	18.29	21.75	2.84
21-12-2020 00:00	22-12-2020 00:00	118.17	3.63	19.31	22.95	2.88
22-12-2020 00:00	23-12-2020 00:00	109.87	3.64	18.87	22.5	2.39
23-12-2020 00:00	24-12-2020 00:00	109.95	3.56	18.42	21.99	2.07
24-12-2020 00:00	25-12-2020 00:00	118.56	8.83	27.2	36.03	2.63
25-12-2020 00:00	26-12-2020 00:00	118.69	8.24	27.89	36.12	None
26-12-2020 00:00	27-12-2020 00:00	115.93	8.23	27.59	35.82	None
27-12-2020 00:00	28-12-2020 00:00	118.34	7.91	26.14	34.03	None
28-12-2020 00:00	29-12-2020 00:00	131.84	10.7	33.49	44.18	None
29-12-2020 00:00	30-12-2020 00:00	135.22	10.59	31.06	41.65	4
30-12-2020 00:00	31-12-2020 00:00	105.93	8.08	23.59	31.66	2.48
31-12-2020 00:00	01-01-2021 00:00	75.31	8.32	22.52	30.84	2.23
01-01-2021 00:00	02-01-2021 00:00	97.18	9.22	23.67	32.87	1.96
02-01-2021 00:00	03-01-2021 00:00	98.46	9.4	23	32.4	4.57
03-01-2021 00:00	04-01-2021 00:00	56.45	7.52	18.31	25.82	3.72
04-01-2021 00:00	05-01-2021 00:00	61.71	9.37	21.76	31.13	3.97
05-01-2021 00:00	06-01-2021 00:00	58.57	10.73	23.5	33.8	4.58
06-01-2021 00:00	07-01-2021 00:00	37.61	9.01	19.47	28.4	5.05
07-01-2021 00:00	08-01-2021 00:00	34.37	8.65	18.34	26.99	3.74
08-01-2021 00:00	09-01-2021 00:00	48.98	7.96	19.69	27.66	3.79
09-01-2021 00:00	10-01-2021 00:00	55.22	9.44	23.73	33.16	3.8
10-01-2021 00:00	11-01-2021 00:00	90.4	7.95	21.3	29.25	4.02
11-01-2021 00:00	12-01-2021 00:00	147.41	11.02	25.07	36.09	5.21
12-01-2021 00:00	13-01-2021 00:00	152.33	13.64	26.32	39.96	3.93
13-01-2021 00:00	14-01-2021 00:00	149.91	12.35	24.85	37.2	5.68
14-01-2021 00:00	15-01-2021 00:00	151.15	8.23	18.54	26.77	4.7
15-01-2021 00:00	16-01-2021 00:00	161.81	7.94	18.6	26.54	3.87
16-01-2021 00:00	17-01-2021 00:00	216.28	7.51	19.05	26.55	4.17
17-01-2021 00:00	18-01-2021 00:00	199.54	7.29	17.74	25.03	5.04
18-01-2021 00:00	19-01-2021 00:00	209.45	7.72	20.88	28.61	5.34
19-01-2021 00:00	20-01-2021 00:00	205.76	8.04	23.02	31.05	None
20-01-2021 00:00	21-01-2021 00:00	196.62	8.2	23.51	31.71	4.75
21-01-2021 00:00	22-01-2021 00:00	222.83	7.98	23.45	31.44	5.64
22-01-2021 00:00	23-01-2021 00:00	268.48	7.85	22.89	30.74	None
23-01-2021 00:00	24-01-2021 00:00	175.87	8.25	21.88	30.14	8.56
24-01-2021 00:00	25-01-2021 00:00	239.04	8.19	24.2	32.39	5.49
25-01-2021 00:00	26-01-2021 00:00	261.49	7.76	23.48	31.24	5.92
26-01-2021 00:00	27-01-2021 00:00	224.94	7.33	21.3	28.63	None
27-01-2021 00:00	28-01-2021 00:00	222.66	7.69	22.73	30.42	None
28-01-2021 00:00	29-01-2021 00:00	250.08	8.53	24.52	33.05	6.48
29-01-2021 00:00	30-01-2021 00:00	147.72	7.76	22.62	30.38	6.1
30-01-2021 00:00	31-01-2021 00:00	94.98	8.05	25.05	33.1	6.28
31-01-2021 00:00	01-02-2021 00:00	94.97	7.89	24.04	31.92	6.68
01-02-2021 00:00	02-02-2021 00:00	95.07	8.69	28.2	36.86	5.99
02-02-2021 00:00	03-02-2021 00:00	94.99	7.93	25.2	33.11	7
03-02-2021 00:00	04-02-2021 00:00	95	7.54	23.54	31.09	8.76

04-02-2021 00:00	05-02-2021 00:00	95.05	7.99	26.38	34.37	None
05-02-2021 00:00	06-02-2021 00:00	95	8.19	26.97	35.16	None
06-02-2021 00:00	07-02-2021 00:00	95.04	8.78	29.39	38.17	None
07-02-2021 00:00	08-02-2021 00:00	95.01	8.04	25.95	33.99	None
08-02-2021 00:00	09-02-2021 00:00	95.03	8.57	23.04	36.86	None
09-02-2021 00:00	10-02-2021 00:00	94.93	8.26	29.19	35.55	6.69
10-02-2021 00:00	11-02-2021 00:00	95.06	8.77	29.67	38.44	None
11-02-2021 00:00	12-02-2021 00:00	94.99	8.45	27.65	36.1	None
12-02-2021 00:00	13-02-2021 00:00	94.01	8.71	29.07	37.46	None
13-02-2021 00:00	14-02-2021 00:00	94.96	8.88	30.14	39.02	None
14-02-2021 00:00	15-02-2021 00:00	95	8.34	27.79	36.13	None
15-02-2021 00:00	16-02-2021 00:00	95.02	8.72	29.04	37.76	None
16-02-2021 00:00	17-02-2021 00:00	95.06	8.55	28.44	36.99	None
17-02-2021 00:00	18-02-2021 00:00	94.98	8.23	27.27	35.52	None
18-02-2021 00:00	19-02-2021 00:00	94.99	7.58	23.14	30.73	None
19-02-2021 00:00	20-02-2021 00:00	95.02	7.5	22.85	30.35	6.46
20-02-2021 00:00	21-02-2021 00:00	80.45	8.37	24.04	32.3	5.42
21-02-2021 00:00	22-02-2021 00:00	64.99	6.76	18.25	25.01	5.39
22-02-2021 00:00	23-02-2021 00:00	65.04	7.33	19.7	27.04	4.68
23-02-2021 00:00	24-02-2021 00:00	65	8.62	23.64	32.26	5.64
24-02-2021 00:00	25-02-2021 00:00	61.15	9.19	25.66	34.85	4.34
25-02-2021 00:00	26-02-2021 00:00	61.41	8.72	25.98	34.7	5.1
26-02-2021 00:00	27-02-2021 00:00	67.96	9.18	29.21	38.39	5.91
27-02-2021 00:00	28-02-2021 00:00	68.02	9.51	28.29	37.5	5.61
28-02-2021 00:00	01-03-2021 00:00	67.92	7.81	22.29	30.1	4.78
01-03-2021 00:00	02-03-2021 00:00	67.95	8.99	28.64	37.63	6.02
02-03-2021 00:00	03-03-2021 00:00	68.02	8.62	26.49	35.11	5.41
03-03-2021 00:00	04-03-2021 00:00	130.34	9.53	28.72	38.25	5.53
04-03-2021 00:00	05-03-2021 00:00	110.97	9.15	31.36	40.51	5.52
05-03-2021 00:00	06-03-2021 00:00	87.95	10.18	35.23	45.42	5.75
06-03-2021 00:00	07-03-2021 00:00	98.95	10.48	35.45	45.93	6.84
07-03-2021 00:00	08-03-2021 00:00	86.38	8.87	32.69	41.56	4.06
08-03-2021 00:00	09-03-2021 00:00	71.23	9.12	34.89	44	5.47
09-03-2021 00:00	10-03-2021 00:00	71.82	9.21	34	43.21	5.7
10-03-2021 00:00	11-03-2021 00:00	68.92	9.79	33.04	42.83	6.89
11-03-2021 00:00	12-03-2021 00:00	66.15	9.65	29.06	38.71	6.21
12-03-2021 00:00	13-03-2021 00:00	79.14	10.21	31.65	41.85	5.88
13-03-2021 00:00	14-03-2021 00:00	90.15	11.38	32.1	43.48	5.16
14-03-2021 00:00	15-03-2021 00:00	71.34	10.43	27.85	38.28	5.32
15-03-2021 00:00	16-03-2021 00:00	80.48	11.08	31.17	42.26	6.97
16-03-2021 00:00	17-03-2021 00:00	95.47	12.1	32.96	45.07	5.5
17-03-2021 00:00	18-03-2021 00:00	101.72	12.33	39.72	52.05	5.87
18-03-2021 00:00	19-03-2021 00:00	122.89	12.85	43.49	56.34	5.74
19-03-2021 00:00	20-03-2021 00:00	122.54	13.86	47.61	61.47	5.4
20-03-2021 00:00	21-03-2021 00:00	122.68	13.44	41.94	55.44	6.07
21-03-2021 00:00	22-03-2021 00:00	114.25	12.92	35.82	48.74	5.65
22-03-2021 00:00	23-03-2021 00:00	140.75	13.73	39.37	53.1	6.73
23-03-2021 00:00	24-03-2021 00:00	122.59	12.02	33.01	45.03	4.72
24-03-2021 00:00	25-03-2021 00:00	124.5	11.19	29.94	41.14	4.67
25-03-2021 00:00	26-03-2021 00:00	132.3	10.82	28.77	39.59	5
26-03-2021 00:00	27-03-2021 00:00	162.23	12.4	33.5	45.91	6.23
27-03-2021 00:00	28-03-2021 00:00	150.61	10.75	28.42	39.17	5.89
28-03-2021 00:00	29-03-2021 00:00	147.23	10.72	29.15	39.87	6.2
29-03-2021 00:00	30-03-2021 00:00	148.74	13.24	35.78	49.01	6.26
30-03-2021 00:00	31-03-2021 00:00	129.74	11	30.1	41.1	5.19
31-03-2021 00:00	01-04-2021 00:00	203.39	11.88	35.49	47.37	5.55
01-04-2021 00:00	02-04-2021 00:00	121.43	12.35	32.95	44.81	6.06
02-04-2021 00:00	03-04-2021 00:00	104.64	10.64	29.77	40.41	4.68
03-04-2021 00:00	04-04-2021 00:00	138.16	9.27	25.52	34.79	4.22
04-04-2021 00:00	05-04-2021 00:00	138.91	8.11	20.96	29.07	5.17
05-04-2021 00:00	06-04-2021 00:00	155.87	9.44	24.26	33.7	5.19
06-04-2021 00:00	07-04-2021 00:00	145.3	9.25	23.45	32.7	5.29
07-04-2021 00:00	08-04-2021 00:00	134.4	8.76	25.12	33.88	6.21
08-04-2021 00:00	09-04-2021 00:00	148.13	9.56	28.72	38.27	5.85
09-04-2021 00:00	10-04-2021 00:00	133.72	9.81	27.21	37.02	5.2
10-04-2021 00:00	11-04-2021 00:00	126.03	10	26.77	36.77	5.47
11-04-2021 00:00	12-04-2021 00:00	77.12	9.15	21.36	30.48	4.14
12-04-2021 00:00	13-04-2021 00:00	72.22	9.42	21.94	31.36	5.33
13-04-2021 00:00	14-04-2021 00:00	59.31	9.39	20.95	30.25	5.52
14-04-2021 00:00	15-04-2021 00:00	65.44	11.08	23.75	34.7	6.38
15-04-2021 00:00	16-04-2021 00:00	68.72	10.25	22.88	33.06	5.33
16-04-2021 00:00	17-04-2021 00:00	87.69	9.51	21.79	31.26	6.58
17-04-2021 00:00	18-04-2021 00:00	114.48	11.94	26.95	38.91	6.32
18-04-2021 00:00	19-04-2021 00:00	79.29	8.81	19.22	28.02	4.3
19-04-2021 00:00	20-04-2021 00:00	139.87	9.94	23.72	33.65	7.48
20-04-2021 00:00	21-04-2021 00:00	86.88	9.14	22.33	31.44	6.03
21-04-2021 00:00	22-04-2021 00:00	108.46	9.94	23.55	33.49	5.62
22-04-2021 00:00	23-04-2021 00:00	95.82	8.7	21.24	29.98	6.96
23-04-2021 00:00	24-04-2021 00:00	62.57	7.86	18.1	25.96	5.42
24-04-2021 00:00	25-04-2021 00:00	52.07	7.96	17.16	25.12	5.42
25-04-2021 00:00	26-04-2021 00:00	78.5	8.05	17.01	25.06	5.08
26-04-2021 00:00	27-04-2021 00:00	110.36	8.66	21.15	29.81	6.44

27-04-2021 00:00	28-04-2021 00:00	118.8	8.99	23.35	32.33	6.74
28-04-2021 00:00	29-04-2021 00:00	124.9	8.9	20.9	29.8	6.93
29-04-2021 00:00	30-04-2021 00:00	106.12	7.72	18.42	26.13	7.45
30-04-2021 00:00	01-05-2021 00:00	91.66	7.95	19.14	27.09	6.76
01-05-2021 00:00	02-05-2021 00:00	89.9	7.54	17.23	24.78	4.8
02-05-2021 00:00	03-05-2021 00:00	60.43	6.56	15.24	21.79	4.66
03-05-2021 00:00	04-05-2021 00:00	61.49	6.97	16.73	23.7	5.44
04-05-2021 00:00	05-05-2021 00:00	65.53	6.84	17.02	23.85	4.25
05-05-2021 00:00	06-05-2021 00:00	71.88	7.2	17.09	24.28	4.72
06-05-2021 00:00	07-05-2021 00:00	60.76	6.63	15.87	22.5	5.34
07-05-2021 00:00	08-05-2021 00:00	54.47	6.97	16.75	23.72	5.85
08-05-2021 00:00	09-05-2021 00:00	52.31	6.45	15.45	21.91	5.05
09-05-2021 00:00	10-05-2021 00:00	42.11	6.21	14.67	20.88	6.13
10-05-2021 00:00	11-05-2021 00:00	40	5.89	14.08	19.96	6.34
11-05-2021 00:00	12-05-2021 00:00	47.92	5.96	14.46	20.42	4.66
12-05-2021 00:00	13-05-2021 00:00	45.96	6.04	14.17	20.21	4.97
13-05-2021 00:00	14-05-2021 00:00	29.62	6.1	14.63	20.73	4.36
14-05-2021 00:00	15-05-2021 00:00	26.08	5.57	13.1	18.67	5.58
15-05-2021 00:00	16-05-2021 00:00	14.92	4.74	11.08	15.82	4.82
16-05-2021 00:00	17-05-2021 00:00	14.13	4.7	11.37	16.06	4.53
17-05-2021 00:00	18-05-2021 00:00	22.55	5.1	11.94	17.04	3.75
18-05-2021 00:00	19-05-2021 00:00	25.44	5.07	11.83	16.9	5.19
19-05-2021 00:00	20-05-2021 00:00	23.5	4.99	11.3	16.29	5.2
20-05-2021 00:00	21-05-2021 00:00	24.27	5	11.77	16.77	4.32
21-05-2021 00:00	22-05-2021 00:00	23.61	5.14	12.15	17.27	4.44
22-05-2021 00:00	23-05-2021 00:00	27.61	5.62	13.16	18.78	4.73
23-05-2021 00:00	24-05-2021 00:00	31.68	5.51	12.83	18.34	5.44
24-05-2021 00:00	25-05-2021 00:00	51.17	5.5	12.6	18.1	4.05
25-05-2021 00:00	26-05-2021 00:00	35.93	5.66	12.97	18.62	4.67
26-05-2021 00:00	27-05-2021 00:00	66.65	5.5	13.88	19.38	4.83
27-05-2021 00:00	28-05-2021 00:00	58.14	5.45	14.22	19.67	6.85
28-05-2021 00:00	29-05-2021 00:00	64.93	5.63	13.97	19.6	5.9
29-05-2021 00:00	30-05-2021 00:00	43.51	5.49	13.42	18.78	5.79
30-05-2021 00:00	31-05-2021 00:00	26.6	5.27	12.64	17.91	5.4
31-05-2021 00:00	01-06-2021 00:00	33.49	5.56	13.95	19.5	5.67
01-06-2021 00:00	02-06-2021 00:00	32.96	5.26	12.94	18.2	5.87
02-06-2021 00:00	03-06-2021 00:00	37.13	5.76	14.47	20.23	5.97
03-06-2021 00:00	04-06-2021 00:00	36.54	6.09	15.33	21.23	4.77
04-06-2021 00:00	05-06-2021 00:00	29.41	6.16	14.76	20.93	4.87
05-06-2021 00:00	06-06-2021 00:00	20.02	5.73	14.51	20.24	5.43
06-06-2021 00:00	07-06-2021 00:00	14.98	5.36	14	19.35	4.02
07-06-2021 00:00	08-06-2021 00:00	35.61	5.99	15.99	21.96	5.01
08-06-2021 00:00	09-06-2021 00:00	55.31	5.98	16.07	22.06	4.59
09-06-2021 00:00	10-06-2021 00:00	40.99	6.01	15.76	21.77	4.72
10-06-2021 00:00	11-06-2021 00:00	29.55	6.06	15.68	21.74	5.23
11-06-2021 00:00	12-06-2021 00:00	40.17	6.04	15.72	21.76	4.95
12-06-2021 00:00	13-06-2021 00:00	29.1	5.77	15.33	21.1	5.68
13-06-2021 00:00	14-06-2021 00:00	18.11	5.3	14.49	19.81	4.23
14-06-2021 00:00	15-06-2021 00:00	26.85	5.98	18.08	23.84	5.57
15-06-2021 00:00	16-06-2021 00:00	48.11	5.75	17.61	23.36	5.1
16-06-2021 00:00	17-06-2021 00:00	60.42	5.85	14.94	20.79	4.69
17-06-2021 00:00	18-06-2021 00:00	70.31	5.71	14.02	19.73	4.82
18-06-2021 00:00	19-06-2021 00:00	82.24	6.04	14.82	20.86	6.03
19-06-2021 00:00	20-06-2021 00:00	85.94	5.66	14.03	19.69	4.91
20-06-2021 00:00	21-06-2021 00:00	72.31	5.22	12.57	17.79	4.68
21-06-2021 00:00	22-06-2021 00:00	62.5	5.9	14.78	20.68	5.15
22-06-2021 00:00	23-06-2021 00:00	90.86	6.76	16.52	23.28	5.35
23-06-2021 00:00	24-06-2021 00:00	93.1	6.84	16.29	23.13	5.03
24-06-2021 00:00	24-06-2021 16:29	80.31	6.14	14.37	20.52	5.9
Prescribed Standards		0-4	0-180	NA	NA	
Exceeding Standards		NA	NA	NA	NA	
Remarks						
From Date	To Date	CO	Ozone	RH	SR	
01-04-2020 00:00	02-04-2020 00:00	0.79	None	28.62	187.55	
02-04-2020 00:00	03-04-2020 00:00	0.82	None	34.64	165.16	
03-04-2020 00:00	04-04-2020 00:00	0.84	None	39.6	159.88	
04-04-2020 00:00	05-04-2020 00:00	0.74	None	44.26	186.37	
05-04-2020 00:00	06-04-2020 00:00	0.8	None	50.6	171.61	
06-04-2020 00:00	07-04-2020 00:00	0.89	None	59.47	150.22	
07-04-2020 00:00	08-04-2020 00:00	0.8	None	85.68	12.84	
08-04-2020 00:00	09-04-2020 00:00	0.84	None	None	None	
09-04-2020 00:00	10-04-2020 00:00	0.84	None	None	None	
10-04-2020 00:00	11-04-2020 00:00	0.93	None	None	None	
11-04-2020 00:00	12-04-2020 00:00	1.01	None	None	None	
12-04-2020 00:00	13-04-2020 00:00	0.77	None	None	None	
13-04-2020 00:00	14-04-2020 00:00	0.79	None	None	None	
14-04-2020 00:00	15-04-2020 00:00	0.8	None	None	None	
15-04-2020 00:00	16-04-2020 00:00	0.82	None	None	None	
16-04-2020 00:00	17-04-2020 00:00	0.78	None	None	None	
17-04-2020 00:00	18-04-2020 00:00	0.93	None	None	None	
18-04-2020 00:00	19-04-2020 00:00	0.85	None	None	None	

19-04-2020 00:00	20-04-2020 00:00	0.87	None	None	None	
20-04-2020 00:00	21-04-2020 00:00	0.99	None	None	None	
21-04-2020 00:00	22-04-2020 00:00	0.92	None	27.09	1.82	
22-04-2020 00:00	23-04-2020 00:00	0.93	None	51.15	167.89	
23-04-2020 00:00	24-04-2020 00:00	1.19	None	55.19	141.93	
24-04-2020 00:00	25-04-2020 00:00	0.92	None	69.08	124.96	
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26-04-2020 00:00	27-04-2020 00:00	1.04	None	64.08	133.22	
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03-05-2020 00:00	04-05-2020 00:00	None	None	None	None	
04-05-2020 00:00	05-05-2020 00:00	None	None	None	None	
05-05-2020 00:00	06-05-2020 00:00	None	None	None	None	
06-05-2020 00:00	07-05-2020 00:00	1.05	None	60.91	197.8	
07-05-2020 00:00	08-05-2020 00:00	1.66	None	74.44	27.97	
08-05-2020 00:00	09-05-2020 00:00	None	None	None	None	
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10-05-2020 00:00	11-05-2020 00:00	None	None	None	None	
11-05-2020 00:00	12-05-2020 00:00	1.01	None	39.28	0.91	
12-05-2020 00:00	13-05-2020 00:00	0.94	None	51.74	111.14	
13-05-2020 00:00	14-05-2020 00:00	0.93	None	54.52	143.69	
14-05-2020 00:00	15-05-2020 00:00	0.98	None	53.52	142.11	
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18-05-2020 00:00	19-05-2020 00:00	0.92	None	76.43	115.27	
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21-05-2020 00:00	22-05-2020 00:00	0.85	None	63.92	138.89	
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26-05-2020 00:00	27-05-2020 00:00	0.83	None	72.39	155.89	
27-05-2020 00:00	28-05-2020 00:00	1.1	None	82.32	118.94	
28-05-2020 00:00	29-05-2020 00:00	0.77	None	72.31	158.28	
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03-06-2020 00:00	04-06-2020 00:00	0.68	None	76.12	120.9	
04-06-2020 00:00	05-06-2020 00:00	0.72	None	75.62	106.32	
05-06-2020 00:00	06-06-2020 00:00	0.71	None	70.4	137.78	
06-06-2020 00:00	07-06-2020 00:00	0.73	None	79.97	115.25	
07-06-2020 00:00	08-06-2020 00:00	0.69	None	76.96	129.13	
08-06-2020 00:00	09-06-2020 00:00	0.63	None	65.75	134.43	
09-06-2020 00:00	10-06-2020 00:00	0.74	None	71.23	107.62	
10-06-2020 00:00	11-06-2020 00:00	0.77	None	78.96	86.09	
11-06-2020 00:00	12-06-2020 00:00	0.71	None	81.01	91.34	
12-06-2020 00:00	13-06-2020 00:00	0.67	None	72.94	109.67	
13-06-2020 00:00	14-06-2020 00:00	0.72	None	82.95	95.99	
14-06-2020 00:00	15-06-2020 00:00	0.61	None	80.76	116.85	
15-06-2020 00:00	16-06-2020 00:00	0.96	None	74.32	110.78	
16-06-2020 00:00	17-06-2020 00:00	0.71	None	81.03	87.72	
17-06-2020 00:00	18-06-2020 00:00	0.75	None	82.79	70.3	
18-06-2020 00:00	19-06-2020 00:00	0.7	None	81.55	72.61	
19-06-2020 00:00	20-06-2020 00:00	0.8	None	76.94	102.27	
20-06-2020 00:00	21-06-2020 00:00	0.73	None	72.49	103.17	
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23-06-2020 00:00	24-06-2020 00:00	0.78	None	71.46	130.07	
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26-06-2020 00:00	27-06-2020 00:00	0.88	None	81.29	110.25	
27-06-2020 00:00	28-06-2020 00:00	0.89	None	78.7	94.91	
28-06-2020 00:00	29-06-2020 00:00	0.79	None	80.41	106.8	
29-06-2020 00:00	30-06-2020 00:00	0.75	None	81.3	91.9	
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01-07-2020 00:00	02-07-2020 00:00	0.8	None	73.99	118.25	
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04-07-2020 00:00	05-07-2020 00:00	0.67	None	81.42	94.84	
05-07-2020 00:00	06-07-2020 00:00	0.58	None	81.23	88.14	
06-07-2020 00:00	07-07-2020 00:00	0.75	None	81.75	80.91	
07-07-2020 00:00	08-07-2020 00:00	0.73	None	82.71	106.53	
08-07-2020 00:00	09-07-2020 00:00	0.61	None	85.28	104.43	
09-07-2020 00:00	10-07-2020 00:00	0.62	None	85.04	139.92	

10-07-2020 00:00	11-07-2020 00:00	0.68	None	84.87	96	
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21-07-2020 00:00	22-07-2020 00:00	0.67	None	75.49	166.08	
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28-07-2020 00:00	29-07-2020 00:00	0.55	None	79.95	119.43	
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04-08-2020 00:00	05-08-2020 00:00	0.65	None	84.91	43.22	
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06-08-2020 00:00	07-08-2020 00:00	0.7	None	82.9	92.88	
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08-08-2020 00:00	09-08-2020 00:00	0.68	None	86.29	65.99	
09-08-2020 00:00	10-08-2020 00:00	0.62	None	89.88	76.66	
10-08-2020 00:00	11-08-2020 00:00	0.68	None	85.74	71.72	
11-08-2020 00:00	12-08-2020 00:00	0.7	None	89.22	95.03	
12-08-2020 00:00	13-08-2020 00:00	0.66	None	None	None	
13-08-2020 00:00	14-08-2020 00:00	0.65	None	None	None	
14-08-2020 00:00	15-08-2020 00:00	0.71	None	None	None	
15-08-2020 00:00	16-08-2020 00:00	0.56	None	None	None	
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20-08-2020 00:00	21-08-2020 00:00	0.78	None	84.4	45.1	
21-08-2020 00:00	22-08-2020 00:00	0.65	None	83.05	74.86	
22-08-2020 00:00	23-08-2020 00:00	0.6	None	84.61	96.81	
23-08-2020 00:00	24-08-2020 00:00	0.54	None	93.21	0.91	
24-08-2020 00:00	25-08-2020 00:00	0.68	None	None	None	
25-08-2020 00:00	26-08-2020 00:00	0.74	None	None	None	
26-08-2020 00:00	27-08-2020 00:00	0.71	None	None	None	
27-08-2020 00:00	28-08-2020 00:00	0.64	None	None	None	
28-08-2020 00:00	29-08-2020 00:00	0.85	None	55.05	52.52	
29-08-2020 00:00	30-08-2020 00:00	0.76	None	67.42	168.06	
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31-08-2020 00:00	01-09-2020 00:00	0.67	None	79.62	171.35	
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05-09-2020 00:00	06-09-2020 00:00	1.17	None	78.46	74.51	
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07-09-2020 00:00	08-09-2020 00:00	0.62	None	79.28	161.28	
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16-09-2020 00:00	17-09-2020 00:00	0.71	None	82.06	94.33	
17-09-2020 00:00	18-09-2020 00:00	0.75	None	81.63	86.09	
18-09-2020 00:00	19-09-2020 00:00	0.68	None	80.7	107.96	
19-09-2020 00:00	20-09-2020 00:00	0.65	None	87.75	66.23	
20-09-2020 00:00	21-09-2020 00:00	0.54	None	96.56	34.13	
21-09-2020 00:00	22-09-2020 00:00	0.64	None	86.22	94.96	
22-09-2020 00:00	23-09-2020 00:00	0.62	None	85.96	70.64	
23-09-2020 00:00	24-09-2020 00:00	0.64	None	79.17	109.25	
24-09-2020 00:00	25-09-2020 00:00	0.79	None	80.9	100.13	
25-09-2020 00:00	26-09-2020 00:00	0.73	None	80.34	111.81	
26-09-2020 00:00	27-09-2020 00:00	0.79	None	86.73	64.2	
27-09-2020 00:00	28-09-2020 00:00	0.65	None	80.84	135.32	
28-09-2020 00:00	29-09-2020 00:00	None	None	None	None	
29-09-2020 00:00	30-09-2020 00:00	1.12	None	97.66	1.82	

30-09-2020 00:00	01-10-2020 00:00	0.65	None	86.45	105.17	
01-10-2020 00:00	02-10-2020 00:00	0.68	None	77.26	146.46	
02-10-2020 00:00	03-10-2020 00:00	0.71	None	77.31	159.82	
03-10-2020 00:00	04-10-2020 00:00	0.68	None	84.62	195.41	
04-10-2020 00:00	05-10-2020 00:00	0.57	None	None	None	
05-10-2020 00:00	06-10-2020 00:00	0.66	None	68.93	229.26	
06-10-2020 00:00	07-10-2020 00:00	0.85	None	73.33	163.5	
07-10-2020 00:00	08-10-2020 00:00	0.88	None	75.1	127.81	
08-10-2020 00:00	09-10-2020 00:00	1.08	None	70.41	156.99	
09-10-2020 00:00	10-10-2020 00:00	1.24	None	85.09	102.4	
10-10-2020 00:00	11-10-2020 00:00	0.91	None	84.85	146.81	
11-10-2020 00:00	12-10-2020 00:00	0.83	None	92.6	49.4	
12-10-2020 00:00	13-10-2020 00:00	0.87	None	92.28	64.64	
13-10-2020 00:00	14-10-2020 00:00	0.93	None	92.64	34.16	
14-10-2020 00:00	15-10-2020 00:00	0.67	None	88.32	57.65	
15-10-2020 00:00	16-10-2020 00:00	0.74	None	81.6	104.49	
16-10-2020 00:00	17-10-2020 00:00	0.99	None	77.19	144.92	
17-10-2020 00:00	18-10-2020 00:00	1.12	None	75.76	97.15	
18-10-2020 00:00	19-10-2020 00:00	1.05	None	81.94	67.36	
19-10-2020 00:00	20-10-2020 00:00	1	None	88.95	74.8	
20-10-2020 00:00	21-10-2020 00:00	0.99	None	91.08	47.54	
21-10-2020 00:00	22-10-2020 00:00	0.76	None	92.51	75.21	
22-10-2020 00:00	23-10-2020 00:00	0.92	None	91.93	94.91	
23-10-2020 00:00	24-10-2020 00:00	0.84	None	93.2	82.9	
24-10-2020 00:00	25-10-2020 00:00	0.93	None	78.76	113.87	
25-10-2020 00:00	26-10-2020 00:00	1.02	None	75.98	99.15	
26-10-2020 00:00	27-10-2020 00:00	1.06	None	73.06	196.88	
27-10-2020 00:00	28-10-2020 00:00	1.17	None	67.6	158.83	
28-10-2020 00:00	29-10-2020 00:00	1.17	None	66.36	158.05	
29-10-2020 00:00	30-10-2020 00:00	1.22	None	62.69	91.91	
30-10-2020 00:00	31-10-2020 00:00	1.29	None	57.31	115.77	
31-10-2020 00:00	01-11-2020 00:00	1.5	None	60.59	118.21	
01-11-2020 00:00	02-11-2020 00:00	1.1	None	60.24	127.37	
02-11-2020 00:00	03-11-2020 00:00	1.49	None	67.36	81.31	
03-11-2020 00:00	04-11-2020 00:00	1.37	None	81.22	2.25	
04-11-2020 00:00	05-11-2020 00:00	1.34	None	None	None	
05-11-2020 00:00	06-11-2020 00:00	1.28	None	82.63	33.15	
06-11-2020 00:00	07-11-2020 00:00	1.13	None	78.7	159.3	
07-11-2020 00:00	08-11-2020 00:00	1.01	None	72.45	156.84	
08-11-2020 00:00	09-11-2020 00:00	0.92	None	74.71	111.27	
09-11-2020 00:00	10-11-2020 00:00	1.18	None	69.69	143.91	
10-11-2020 00:00	11-11-2020 00:00	1.3	None	54.47	180.85	
11-11-2020 00:00	12-11-2020 00:00	1.34	None	65.7	148.77	
12-11-2020 00:00	13-11-2020 00:00	1.17	None	78.95	76.84	
13-11-2020 00:00	14-11-2020 00:00	1.28	None	87.99	61.41	
14-11-2020 00:00	15-11-2020 00:00	0.99	None	76.26	163.07	
15-11-2020 00:00	16-11-2020 00:00	0.88	None	89.76	48.13	
16-11-2020 00:00	17-11-2020 00:00	0.92	None	91.9	82.85	
17-11-2020 00:00	18-11-2020 00:00	1.07	None	81.71	136.78	
18-11-2020 00:00	19-11-2020 00:00	1.09	None	76.91	126.68	
19-11-2020 00:00	20-11-2020 00:00	1.15	None	73.13	127.36	
20-11-2020 00:00	21-11-2020 00:00	1.14	None	64.22	183.23	
21-11-2020 00:00	22-11-2020 00:00	1.21	None	50.63	190.26	
22-11-2020 00:00	23-11-2020 00:00	1.07	None	51.92	165	
23-11-2020 00:00	24-11-2020 00:00	1.28	None	66.62	135.83	
24-11-2020 00:00	25-11-2020 00:00	1.32	None	77.49	108.11	
25-11-2020 00:00	26-11-2020 00:00	1.19	None	83.22	64.71	
26-11-2020 00:00	27-11-2020 00:00	7.23	None	98.25	6.45	
27-11-2020 00:00	28-11-2020 00:00	1.29	None	90.34	108.03	
28-11-2020 00:00	29-11-2020 00:00	1.77	None	83.16	105.01	
29-11-2020 00:00	30-11-2020 00:00	1.54	None	85.42	42.19	
30-11-2020 00:00	01-12-2020 00:00	1.75	20.49	76.68	149.64	
01-12-2020 00:00	02-12-2020 00:00	1.6	41.2	64.05	173.63	
02-12-2020 00:00	03-12-2020 00:00	1.69	49.21	74.98	117.73	
03-12-2020 00:00	04-12-2020 00:00	1.57	36.98	90.93	28.42	
04-12-2020 00:00	05-12-2020 00:00	1.8	24.5	93.21	34.55	
05-12-2020 00:00	06-12-2020 00:00	1.72	21.47	91.63	61.53	
06-12-2020 00:00	07-12-2020 00:00	1.28	33.88	89.28	51.66	
07-12-2020 00:00	08-12-2020 00:00	1.38	None	86.25	116.15	
08-12-2020 00:00	09-12-2020 00:00	2.36	25.16	89.29	72.3	
09-12-2020 00:00	10-12-2020 00:00	4.06	43.33	82.47	98.58	
10-12-2020 00:00	11-12-2020 00:00	0.66	73.82	55.05	203.35	
11-12-2020 00:00	12-12-2020 00:00	0.75	77.71	61.45	180.27	
12-12-2020 00:00	13-12-2020 00:00	0.85	92.24	63.76	173.99	
13-12-2020 00:00	14-12-2020 00:00	0.7	101.47	68.61	157.52	
14-12-2020 00:00	15-12-2020 00:00	0.81	98.06	66.18	159.15	
15-12-2020 00:00	16-12-2020 00:00	0.77	88.68	65.57	156.22	
16-12-2020 00:00	17-12-2020 00:00	0.71	73.2	75.25	91.46	
17-12-2020 00:00	18-12-2020 00:00	0.72	61.66	78.64	48.29	
18-12-2020 00:00	19-12-2020 00:00	0.67	61.03	64.24	171.78	
19-12-2020 00:00	20-12-2020 00:00	0.76	62.54	72.53	100.65	
20-12-2020 00:00	21-12-2020 00:00	0.7	74.53	71.72	111.56	

21-12-2020 00:00	22-12-2020 00:00	0.72	87.66	64.72	169.32	
22-12-2020 00:00	23-12-2020 00:00	0.75	100.38	64.96	157.78	
23-12-2020 00:00	24-12-2020 00:00	0.79	92.91	70.64	121.62	
24-12-2020 00:00	25-12-2020 00:00	1.3	76.23	70.04	133.8	
25-12-2020 00:00	26-12-2020 00:00	0.92	74.36	62.29	151.71	
26-12-2020 00:00	27-12-2020 00:00	0.86	71.53	60.24	163.25	
27-12-2020 00:00	28-12-2020 00:00	0.83	65.18	60.51	174.26	
28-12-2020 00:00	29-12-2020 00:00	0.89	65.86	54.87	159.18	
29-12-2020 00:00	30-12-2020 00:00	0.94	67.43	64.06	140.56	
30-12-2020 00:00	31-12-2020 00:00	0.82	69.9	64.83	134.15	
31-12-2020 00:00	01-01-2021 00:00	0.84	50.19	76.66	58.29	
01-01-2021 00:00	02-01-2021 00:00	0.81	72.3	67.04	148.82	
02-01-2021 00:00	03-01-2021 00:00	0.84	66.53	75.48	92.83	
03-01-2021 00:00	04-01-2021 00:00	0.73	70.08	76.08	108.1	
04-01-2021 00:00	05-01-2021 00:00	0.8	50.72	79.95	20.27	
05-01-2021 00:00	06-01-2021 00:00	0.81	50.93	76.86	92.31	
06-01-2021 00:00	07-01-2021 00:00	0.77	39.58	89.45	39.88	
07-01-2021 00:00	08-01-2021 00:00	0.82	82.66	89.75	68.8	
08-01-2021 00:00	09-01-2021 00:00	0.82	70.49	80.58	134.1	
09-01-2021 00:00	10-01-2021 00:00	0.85	15.99	80.98	43.54	
10-01-2021 00:00	11-01-2021 00:00	0.76	14.57	76.95	137.05	
11-01-2021 00:00	12-01-2021 00:00	0.83	2.5	76.27	69.06	
12-01-2021 00:00	13-01-2021 00:00	0.84	1.76	75.33	49.88	
13-01-2021 00:00	14-01-2021 00:00	0.88	2.27	66.92	153.58	
14-01-2021 00:00	15-01-2021 00:00	0.74	3.06	73.69	105.9	
15-01-2021 00:00	16-01-2021 00:00	0.76	3.48	71.19	129.14	
16-01-2021 00:00	17-01-2021 00:00	0.82	4.62	70.74	145.16	
17-01-2021 00:00	18-01-2021 00:00	0.71	4.33	65.48	162.23	
18-01-2021 00:00	19-01-2021 00:00	0.73	4.38	58.47	181.19	
19-01-2021 00:00	20-01-2021 00:00	0.82	3.73	63.91	169.5	
20-01-2021 00:00	21-01-2021 00:00	0.98	4.77	65.36	155.36	
21-01-2021 00:00	22-01-2021 00:00	0.97	4.58	60.38	158.76	
22-01-2021 00:00	23-01-2021 00:00	0.96	3.6	65.15	119.37	
23-01-2021 00:00	24-01-2021 00:00	0.91	4.78	59	156.73	
24-01-2021 00:00	25-01-2021 00:00	0.79	4	44.24	231.35	
25-01-2021 00:00	26-01-2021 00:00	0.82	4.59	55.55	172.78	
26-01-2021 00:00	27-01-2021 00:00	0.73	4.94	48.69	187.32	
27-01-2021 00:00	28-01-2021 00:00	0.75	5.67	49.37	180.2	
28-01-2021 00:00	29-01-2021 00:00	0.93	5.24	55.53	172.73	
29-01-2021 00:00	30-01-2021 00:00	0.8	15.83	62.99	161.17	
30-01-2021 00:00	31-01-2021 00:00	0.84	27.2	54.23	154.89	
31-01-2021 00:00	01-02-2021 00:00	0.76	28.45	53.96	161.95	
01-02-2021 00:00	02-02-2021 00:00	0.8	23.05	50.15	166.11	
02-02-2021 00:00	03-02-2021 00:00	0.78	27.47	57.53	165.2	
03-02-2021 00:00	04-02-2021 00:00	0.8	30.23	60.26	142.11	
04-02-2021 00:00	05-02-2021 00:00	0.82	30.28	43.5	168.82	
05-02-2021 00:00	06-02-2021 00:00	0.79	30.77	48.6	168.58	
06-02-2021 00:00	07-02-2021 00:00	0.87	30.86	46.12	168.53	
07-02-2021 00:00	08-02-2021 00:00	0.74	33.4	34.37	179.3	
08-02-2021 00:00	09-02-2021 00:00	0.82	33.23	40.62	173.14	
09-02-2021 00:00	10-02-2021 00:00	0.81	33.34	49.92	166.84	
10-02-2021 00:00	11-02-2021 00:00	0.87	33.28	43.07	180.26	
11-02-2021 00:00	12-02-2021 00:00	0.85	33.06	46.67	170.63	
12-02-2021 00:00	13-02-2021 00:00	0.81	32.36	41.41	177.36	
13-02-2021 00:00	14-02-2021 00:00	0.9	31.25	46.13	169.06	
14-02-2021 00:00	15-02-2021 00:00	0.87	33.68	44.39	152.02	
15-02-2021 00:00	16-02-2021 00:00	0.86	28.99	42.28	162.2	
16-02-2021 00:00	17-02-2021 00:00	0.91	33.64	41.57	150.85	
17-02-2021 00:00	18-02-2021 00:00	0.87	33.32	42.09	136.78	
18-02-2021 00:00	19-02-2021 00:00	0.77	34.98	58.04	123.15	
19-02-2021 00:00	20-02-2021 00:00	0.74	28.7	68.22	102.03	
20-02-2021 00:00	21-02-2021 00:00	0.72	18.62	78.59	116.94	
21-02-2021 00:00	22-02-2021 00:00	0.67	20.89	80.72	102.93	
22-02-2021 00:00	23-02-2021 00:00	0.74	22.14	70.86	163.73	
23-02-2021 00:00	24-02-2021 00:00	0.84	21.91	55.85	205.39	
24-02-2021 00:00	25-02-2021 00:00	0.83	29.05	50.79	203.3	
25-02-2021 00:00	26-02-2021 00:00	0.89	39.57	42.35	217.74	
26-02-2021 00:00	27-02-2021 00:00	0.92	37.25	35.79	218.32	
27-02-2021 00:00	28-02-2021 00:00	1.01	41.38	37.78	191.97	
28-02-2021 00:00	01-03-2021 00:00	0.71	45.3	29.24	209.01	
01-03-2021 00:00	02-03-2021 00:00	0.83	32.88	30.12	186.65	
02-03-2021 00:00	03-03-2021 00:00	0.84	42.74	35.63	151.97	
03-03-2021 00:00	04-03-2021 00:00	0.77	36.37	33.44	164.81	
04-03-2021 00:00	05-03-2021 00:00	0.76	32.72	31.4	172.78	
05-03-2021 00:00	06-03-2021 00:00	0.77	27.58	39.88	177.38	
06-03-2021 00:00	07-03-2021 00:00	0.86	27.57	39.6	172	
07-03-2021 00:00	08-03-2021 00:00	0.78	38.08	36.19	164.28	
08-03-2021 00:00	09-03-2021 00:00	0.74	31.12	37.32	172.8	
09-03-2021 00:00	10-03-2021 00:00	0.75	30.27	47.15	166.24	
10-03-2021 00:00	11-03-2021 00:00	0.72	26.71	51.47	156.59	
11-03-2021 00:00	12-03-2021 00:00	0.69	30.34	52.2	163.14	
12-03-2021 00:00	13-03-2021 00:00	0.71	31.56	35.07	163.94	

13-03-2021 00:00	14-03-2021 00:00	0.75	33.96	35.19	158.14	
14-03-2021 00:00	15-03-2021 00:00	0.67	38.27	38.92	163.78	
15-03-2021 00:00	16-03-2021 00:00	1.8	39.33	33.18	150.54	
16-03-2021 00:00	17-03-2021 00:00	6.76	35.27	37.6	150.35	
17-03-2021 00:00	18-03-2021 00:00	5.2	38.44	40.66	142.16	
18-03-2021 00:00	19-03-2021 00:00	0.87	41.12	37.05	139.21	
19-03-2021 00:00	20-03-2021 00:00	0.93	36.78	38.18	115.48	
20-03-2021 00:00	21-03-2021 00:00	0.83	40.31	37.95	145.91	
21-03-2021 00:00	22-03-2021 00:00	0.81	41.42	35.15	149.38	
22-03-2021 00:00	23-03-2021 00:00	0.83	31.01	33.13	140.43	
23-03-2021 00:00	24-03-2021 00:00	0.84	32.23	43.23	154.33	
24-03-2021 00:00	25-03-2021 00:00	0.82	28.31	45.18	150.89	
25-03-2021 00:00	26-03-2021 00:00	0.83	26.17	41.43	129.71	
26-03-2021 00:00	27-03-2021 00:00	0.93	31.86	37.06	147.82	
27-03-2021 00:00	28-03-2021 00:00	0.89	38	41.75	135.61	
28-03-2021 00:00	29-03-2021 00:00	0.91	37.18	47.38	96.08	
29-03-2021 00:00	30-03-2021 00:00	0.99	36.01	45.02	102.31	
30-03-2021 00:00	31-03-2021 00:00	0.85	31.46	55.38	112.65	
31-03-2021 00:00	01-04-2021 00:00	1.04	24.44	39.03	106.55	
01-04-2021 00:00	02-04-2021 00:00	0.8	25.82	51.15	135.56	
02-04-2021 00:00	03-04-2021 00:00	0.72	29	44.75	136.95	
03-04-2021 00:00	04-04-2021 00:00	0.72	33.72	53.44	125.3	
04-04-2021 00:00	05-04-2021 00:00	0.58	32.33	49.17	111.69	
05-04-2021 00:00	06-04-2021 00:00	0.79	32.98	55.64	108.88	
06-04-2021 00:00	07-04-2021 00:00	0.91	40.2	54.39	115.71	
07-04-2021 00:00	08-04-2021 00:00	0.83	36.43	38.43	124.09	
08-04-2021 00:00	09-04-2021 00:00	0.9	38.25	41.34	99.79	
09-04-2021 00:00	10-04-2021 00:00	0.93	40.88	44.58	111.14	
10-04-2021 00:00	11-04-2021 00:00	0.86	41.55	42.94	117.59	
11-04-2021 00:00	12-04-2021 00:00	0.7	34.96	48.03	114.53	
12-04-2021 00:00	13-04-2021 00:00	0.7	24.33	59.36	93.68	
13-04-2021 00:00	14-04-2021 00:00	0.57	28.53	58.05	102.78	
14-04-2021 00:00	15-04-2021 00:00	0.62	26.9	70.51	62.68	
15-04-2021 00:00	16-04-2021 00:00	0.67	33.97	71.54	107.2	
16-04-2021 00:00	17-04-2021 00:00	0.8	35.41	65.92	78.25	
17-04-2021 00:00	18-04-2021 00:00	1.04	61.2	61.19	98.2	
18-04-2021 00:00	19-04-2021 00:00	0.66	93.53	59.07	145.2	
19-04-2021 00:00	20-04-2021 00:00	0.82	75.67	59.77	130.81	
20-04-2021 00:00	21-04-2021 00:00	0.7	86.1	70.19	109.2	
21-04-2021 00:00	22-04-2021 00:00	0.81	44.15	67.35	123.89	
22-04-2021 00:00	23-04-2021 00:00	0.78	26.29	72.65	116.01	
23-04-2021 00:00	24-04-2021 00:00	0.62	27.1	76.62	117.71	
24-04-2021 00:00	25-04-2021 00:00	0.66	21.45	67.32	97.55	
25-04-2021 00:00	26-04-2021 00:00	0.7	22.02	63.5	111.05	
26-04-2021 00:00	27-04-2021 00:00	0.83	21.86	53.72	127.7	
27-04-2021 00:00	28-04-2021 00:00	0.91	21.16	54.03	99.63	
28-04-2021 00:00	29-04-2021 00:00	0.88	24.92	48.76	104.27	
29-04-2021 00:00	30-04-2021 00:00	0.7	29.92	59.28	83.74	
30-04-2021 00:00	01-05-2021 00:00	0.7	30.37	59.36	82.01	
01-05-2021 00:00	02-05-2021 00:00	0.41	27	58.08	92.18	
02-05-2021 00:00	03-05-2021 00:00	0.06	27.21	62.67	80.33	
03-05-2021 00:00	04-05-2021 00:00	0.06	21.54	64.74	62.18	
04-05-2021 00:00	05-05-2021 00:00	0.06	24.22	72.12	48.9	
05-05-2021 00:00	06-05-2021 00:00	0.06	26.6	62.08	88.86	
06-05-2021 00:00	07-05-2021 00:00	0.06	25.22	62.46	85.1	
07-05-2021 00:00	08-05-2021 00:00	0.32	20.57	62.28	66.1	
08-05-2021 00:00	09-05-2021 00:00	0.55	23.78	65.44	77.48	
09-05-2021 00:00	10-05-2021 00:00	0.55	23.47	59.5	78.72	
10-05-2021 00:00	11-05-2021 00:00	0.53	24.66	68.41	68.55	
11-05-2021 00:00	12-05-2021 00:00	0.57	24.47	73.23	70.51	
12-05-2021 00:00	13-05-2021 00:00	0.56	22.17	77.84	62.98	
13-05-2021 00:00	14-05-2021 00:00	0.56	23.02	71.62	124.31	
14-05-2021 00:00	15-05-2021 00:00	0.52	25.33	64.97	116.17	
15-05-2021 00:00	16-05-2021 00:00	0.42	28.12	78.96	77.02	
16-05-2021 00:00	17-05-2021 00:00	0.45	25.73	86.73	77.62	
17-05-2021 00:00	18-05-2021 00:00	0.44	23.63	78.79	108.48	
18-05-2021 00:00	19-05-2021 00:00	0.44	20.66	79.5	116.26	
19-05-2021 00:00	20-05-2021 00:00	0.44	22.19	77.92	109.43	
20-05-2021 00:00	21-05-2021 00:00	0.44	19.87	82.48	87.93	
21-05-2021 00:00	22-05-2021 00:00	0.48	15.94	84.73	75.1	
22-05-2021 00:00	23-05-2021 00:00	0.49	19.46	80.81	73.13	
23-05-2021 00:00	24-05-2021 00:00	0.48	22.14	70.87	96.99	
24-05-2021 00:00	25-05-2021 00:00	0.48	22.7	70.62	83.86	
25-05-2021 00:00	26-05-2021 00:00	0.47	22.22	91.52	30.17	
26-05-2021 00:00	27-05-2021 00:00	0.46	24.76	64.15	117.81	
27-05-2021 00:00	28-05-2021 00:00	0.47	23.64	69.7	88.95	
28-05-2021 00:00	29-05-2021 00:00	0.48	22.91	68.13	75.9	
29-05-2021 00:00	30-05-2021 00:00	0.46	24.18	72.73	89.7	
30-05-2021 00:00	31-05-2021 00:00	0.43	23.81	70.92	73.35	
31-05-2021 00:00	01-06-2021 00:00	0.45	23.41	71.21	74.16	
01-06-2021 00:00	02-06-2021 00:00	0.46	22.65	71.99	70.83	
02-06-2021 00:00	03-06-2021 00:00	0.52	20.29	76.38	51.45	

03-06-2021 00:00	04-06-2021 00:00	0.58	18.4	80.42	58.6	
04-06-2021 00:00	05-06-2021 00:00	0.53	26.15	76.87	66.91	
05-06-2021 00:00	06-06-2021 00:00	0.49	53.68	83.71	94.58	
06-06-2021 00:00	07-06-2021 00:00	0.43	55.07	76.1	98.39	
07-06-2021 00:00	08-06-2021 00:00	0.52	58.89	70.77	79.04	
08-06-2021 00:00	09-06-2021 00:00	0.51	57.64	66.38	79.61	
09-06-2021 00:00	10-06-2021 00:00	0.5	53.3	77.42	54.35	
10-06-2021 00:00	11-06-2021 00:00	0.47	54.04	79.38	64.67	
11-06-2021 00:00	12-06-2021 00:00	0.48	51.02	73.5	72.61	
12-06-2021 00:00	13-06-2021 00:00	0.46	45.19	81.72	54.8	
13-06-2021 00:00	14-06-2021 00:00	0.42	40.13	83.41	49.77	
14-06-2021 00:00	15-06-2021 00:00	0.47	21.85	84.36	49.01	
15-06-2021 00:00	16-06-2021 00:00	0.51	20.12	84.02	53.79	
16-06-2021 00:00	17-06-2021 00:00	0.47	19.82	87.34	58.17	
17-06-2021 00:00	18-06-2021 00:00	0.47	21.6	77.32	81.6	
18-06-2021 00:00	19-06-2021 00:00	0.45	21.51	77.6	62.77	
19-06-2021 00:00	20-06-2021 00:00	0.48	22.28	79.18	57.1	
20-06-2021 00:00	21-06-2021 00:00	0.4	23.28	71.64	72.83	
21-06-2021 00:00	22-06-2021 00:00	0.5	22.47	77.06	71.69	
22-06-2021 00:00	23-06-2021 00:00	0.52	20.94	75.82	70.64	
23-06-2021 00:00	24-06-2021 00:00	0.53	21.61	72.38	52.73	
24-06-2021 00:00	24-06-2021 16:29	0.46	None	73.36	86.87	

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Rajeswara.P.N

List of 132 Non-attainment/ Million plus cities in India under NCAP

State	S.No.	City
Andhra Pradesh (13)	1.	Guntur
	2.	Kurnool
	3.	Nellore
	4.	Vijayawada
	5.	Vishakhapatnam
	6.	Anantapur
	7.	Chitoor
	8.	Eluru
	9.	Kadapa
	10.	Ongole
	11.	Rajahmundry
	12.	Srikakulam
	13.	Vizianagaram
Assam (05)	14.	Guwahati
	15.	Nagaon
	16.	Nalbari
	17.	Sibsagar
	18.	Silchar
Bihar (03)	19.	Patna
	20.	Gaya
	21.	Muzaffarpur
Chandigarh (01)	22.	Chandigarh
Chhattisgarh (03)	23.	Bhilai
	24.	Korba
	25.	Raipur
Delhi (01)	26.	Delhi
Gujarat (04)	27.	Surat
	28.	Ahmedabad
	29.	Vadodara
	30.	Rajkot*
Himachal Pradesh (7)	31.	Baddi
	32.	Damtal
	33.	Kala Amb
	34.	Nalagarh
	35.	Paonta Sahib
	36.	Parwanoo
	37.	Sunder Nagar
Jammu & Kashmir (2)	38.	Jammu
	39.	Srinagar
Jharkhand (03)	40.	Dhanbad
	41.	Jamshedpur*
	42.	Ranchi*
Karnataka (04)	43.	Bangalore
	44.	Devanagere
	45.	Gulburga
	46.	Hubli-Dharwad
Madhya Pradesh (07)	47.	Bhopal

	48.	Dewas
	49.	Indore
	50.	Sagar
	51.	Ujjain
	52.	Gwalior
	53.	Jabalpur*
Maharashtra (19)	54.	Akola
	55.	Amravati
	56.	Aurangabad
	57.	Badlapur
	58.	Chandrapur
	59.	Jalgaon
	60.	Jalna
	61.	Kolhapur
	62.	Latur
	63.	Mumbai
	64.	Nagpur
	65.	Nashik
	66.	Navi Mumbai
	67.	Pune
	68.	Sangli
	69.	Solapur
	70.	Ulhasnagar
	71.	Thane
	72.	Vasai-Virar*
Meghalaya (01)	73.	Byrnihat
Nagaland (02)	74.	Dimapur
	75.	Kohima
Orissa (07)	76.	Angul
	77.	Balasore
	78.	Bhubaneswar
	79.	Cuttack
	80.	Rourkela
	81.	Talcher
	82.	Kalinga Nagar
Punjab (09)	83.	Dera Bassi
	84.	Gobindgarh
	85.	Jalandhar
	86.	Khanna
	87.	Ludhiana
	88.	Naya Nangal
	89.	Pathankot/Dera Baba
	90.	Patiala
	91.	Amritsar
Rajasthan (05)	92.	Alwar

	93.	Jaipur
	94.	Jodhpur
	95.	Kota
	96.	Udaipur
Tamilnadu (04)	97.	Thoothukudi
	98.	Trichy
	99.	Madurai
	100.	Chennai*
Telangana (04)	101.	Hyderabad
	102.	Nalgonda
	103.	Patancheruvu
	104.	Sangareddy
Uttar Pradesh (17)	105.	Agra
	106.	Allahabad
	107.	Anpara
	108.	Bareily
	109.	Firozabad
	110.	Gajraula
	111.	Ghaziabad
	112.	Jhansi
	113.	Kanpur
	114.	Khurja
	115.	Lucknow
	116.	Moradabad
	117.	Noida
	118.	Raebareli
	119.	Varanasi
	120.	Gorakhpur
	121.	Meerut*
Uttarakhand (03)	122.	Kashipur
	123.	Rishikesh
	124.	Dehradun
West Bengal (07)	125.	Kolkata
	126.	Asansol
	127.	Barrackpore
	128.	Durgapur
	129.	Haldia
	130.	Howrah
	131.	Raniganj
Haryana (1)	132.	Faridabad*
*Million plus cities but not part of non-attainment cities		

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