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# Raw & Processed Data to Support Energy, Emissions & Air Pollution Analysis in India



(UEinfo) was founded in 2007 with the vision to be a repository of information, research, and analysis related to air pollution. There is a need to scale-up research applications to the secondary and the tertiary cities which are following in the footsteps of the expanding mega-cities. Advances in information technology, open-data resources, and networking, offers a tremendous opportunity to establish such tools, to help city managers, regulators, academia, and citizen groups to develop a coordinated approach for integrated air quality management for a city.

UEinfo has four objectives: (1) sharing knowledge on air pollution (2) science-based air quality analysis (3) advocacy and awareness raising on air quality management and (4) building partnerships among local, national, and international airheads.

This report was conceptualized, drafted, and designed by the members of UEinfo.

All the working papers and more are accessible @ [www.urbanemissions.info/publications](http://www.urbanemissions.info/publications)

Send your questions and comments to [simair@urbanemissions.info](mailto:simair@urbanemissions.info)

# Raw & Processed Data Repository

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This is a repository of links with information directly relevant for energy, emissions, and pollution analysis in India covering

- A. Official national and state level portals; guidelines, acts, and rules documents
- B. Ambient air quality monitoring
- C. Satellite retrievals and tools
- D. Global and regional health impact analysis and tools
- E. Compiled statistics, maps, and other geospatial databases
- F. Compiled databases on energy, emissions, meteorology, and reanalysis fields
- G. Compiled statistics on Indian energy sectors

This document was last updated in January 2021, by Dr Sarath Guttikunda

New resources and links are regularly updated @ <https://www.urbanemissions.info>



## A. Official national and state level portals; guidelines, acts, and rules documents

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### National Clean Air Programme (NCAP)

- Draft NCAP proposal ([2018](#))
- Final NCAP proposal ([2019](#))
- City by city approved action plans are available [here](#) or [here](#)
- NCAP budget and pollution [tracker](#) (by CarbonCopy)
- A [review](#) of the 102 approved action plans – conducted by Urban Emissions and CEEW, July 2020. Final publication [here](#).
- A [review](#) of 10 approved action plans – conducted by NRDC, January 2020

### Official portals

- Ministry of Environment, Forests, and Climate Change ([MoEFCC](#))
- National Green Tribunal ([NGT](#))
- Environment Pollution (Protection & Control) Authority ([EPCA](#))
- Central Pollution Control Board ([CPCB](#))
- State Pollution Control Boards
  - [[Andhra Pradesh](#)] [[Arunachal Pradesh](#)] [[Assam](#)] [[Bihar](#)] [[Chhattisgarh](#)] [[Goa](#)] [[Gujarat](#)] [[Haryana](#)] [[Himachal Pradesh](#)] [[Jharkhand](#)] [[Karnataka](#)] [[Kerala](#)] [[Madhya Pradesh](#)] [[Maharashtra](#)] [[Manipur](#)] [[Meghalaya](#)] [[Mizoram](#)] [[Nagaland](#)] [[Odisha](#)] [[Punjab](#)] [[Rajasthan](#)] [[Sikkim](#)] [[Tamil Nadu](#)] [[Telangana](#)] [[Tripura](#)] [[Uttar Pradesh](#)] [[Uttarakhand](#)] [[West Bengal](#)]
- Pollution Control Committees
  - [[Andaman & Nicobar Islands](#)] [[Chandigarh](#)] [[Dadra, Nagar Haveli, Daman, & Diu](#)] [[Delhi](#)] [[Jammu & Kashmir](#)] [[Ladakh](#)] [[Lakshadweep](#)] [[Puducherry](#)]
- National Environmental Engineering Research Institute ([CSIR-NEERI](#))

### Acts and Rules

- Air (Prevention and Control of Pollution) Act, [1981](#), amended 1987
  - Air (Prevention and Control of Pollution) Rules, [1982](#)
  - Air (Prevention and Control of Pollution) Rules, [1983](#)
- Environment (Protection) Act, [1986](#) and Rules thereunder
- National Green Tribunal Act, [2010](#)
- National Ambient Air Quality Standards, amended [2009](#)

### Environmental Standards

- 17 major polluting industries
  - Aluminium Smelter, Caustic Soda, Cement, Copper Smelter, Distilleries, Dyes & Dye Intermediates, Fertiliser, Integrated Iron &

Steel, Tanneries, Pesticides, Petrochemicals, Drugs & Pharmaceuticals, Pulp & Paper, Oil Refineries, Sugar, Thermal Power Plants, Zinc Smelter

- Effluent emission standards are listed [@CPCB](#) and [@MoEFCC](#). Here is a summary for the heavy industry
  - [\[Bricks\]](#) [\[Cement\]](#) [\[Coal mines\]](#) [\[Coal washeries\]](#) [Copper, Lead, and Zinc [smelting](#)] [\[Fertilizers\]](#) [\[Glass\]](#) [\[Iron and Steel\]](#) [\[Paper and Pulp\]](#) [\[Pesticides\]](#) [\[Petrochemicals\]](#) [\[Sewage Treatment\]](#) [\[Sugar\]](#) [\[Tanneries\]](#) [\[Textiles\]](#) [\[Thermal power\]](#) plants]

## B. Ambient air quality monitoring

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- 101 style [blog piece](#) on air monitoring in India
- Guidelines and technical specifications
  - 2003 – [guidelines](#) for ambient air monitoring
  - 2015 – technical specifications for continuous ambient air quality monitoring stations ([CAAQMS](#))
  - 2018 – technical specifications for continuous emissions monitoring ([CEMS](#))
- Number of monitoring states recommended [by state](#) and [by district](#) (based on the guidelines published by CPCB, 2003)
- National Ambient Monitoring Program ([NAMP](#)) – manual monitoring network operated and maintained by CPCB, India
  - Table of monitoring [stations](#) (as of July 2020)
  - Annual summary of air quality and number of monitoring days ([2013](#), [2014](#), [2015](#), [2016](#), [2017](#), [2018](#))
  - Monthly AQI [bulletins](#)
  - Compiled NAMP air quality [data \(as excel\)](#) for 2011-2015
- Continuous Ambient Air Quality Monitoring System ([CAAQMS](#)) – real-time monitoring network operated and maintained by CPCB, India
  - How to [access](#) real-time and archived CAAQMS data?
- System of Air Quality and Weather Forecasting And Research ([SAFAR](#)) – real-time monitoring network operated and maintained by IITM, Pune, India
- A global [summary](#) of outdoor ambient air quality data by WHO (2018)
  - A [review piece](#) of WHO data included for India (2018)
- openaq.org – aggregator of official real-time monitoring [data](#) across the globe (blog piece on how to [access](#) data)
- IQair – aggregator of official and unofficial [data](#) across the globe
- Breezo.in – aggregator of official real-time monitoring [data](#) in India
- AirVeda – unofficial [network](#) of low-cost sensors
- AQL.in – unofficial [network](#) of low-cost sensors
- Purple Air – unofficial [network](#) of low-cost sensors
- Clarity – unofficial [network](#) of low-cost sensors
- Full resource [links](#) with illustrations

## C. Satellite retrievals and tools

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- Indian National Satellite System (INSAT) series
  - [RAPID](#) portal to visualize real-time INSAT products (IMD, Delhi)
  - Satellite derived [PM2.5](#) (by ISRO, Dehradun)
  - [Radar](#) maps (IMD, Delhi)
  - Customized [satellite maps](#) for the Indian Subcontinent (IMD, Delhi)
- Geostationary Environment Monitoring Spectrometer ([GEMS](#)) – hourly air quality over East Asia and part Indian Subcontinent (new)
- Multi-Angle Imager for Aerosols ([MAIA](#)) (new)
- Tropospheric Monitoring Instrument ([TROPOMI](#)) – NO<sub>2</sub>, SO<sub>2</sub>, Ozone, HCHO, and CH<sub>4</sub>
- Active fire counts database from [VIIRS](#) satellite
- Active burned area product from [MODIS](#) satellite
- Fires visualization [portal](#) by NASA
- [ACE-FTS and MAESTRO](#) – 50+ gaseous species
- Cloud Aerosol Lidar and Infrared Pathfinder Satellite Observation ([CALIPSO](#))
- Global Ozone Monitoring Experiment ([GOME-2](#)) – total column SO<sub>2</sub>, O<sub>3</sub>, NO<sub>2</sub>, and cloud parameters
- Measurement of Pollution in the Troposphere ([MOPITT](#)) – CO and CH<sub>4</sub>
- Total Ozone Mapping Spectrometer (TOMS) – Ozone
- Ozone Monitoring Instrument ([OMI](#)) – near real time SO<sub>2</sub>, O<sub>3</sub>, and AOD
- Moderate Resolution Imaging Spectroradiometer (MODIS)
  - near real time Aerosol Optical Depth ([AOD](#))
  - Leaf Area Index ([LAI](#)) data sets were generated by reprocessing the MODIS version 6 LAI products for 2000 to 2019 at multiple resolutions
- Scanning Imaging Absorption Spectrometer for Atmospheric Chartography ([SCIAMACHY](#)) – multiple gases
- Optical Spectrograph and Infrared Imaging System ([OSIRIS](#)) – O<sub>3</sub> and NO<sub>2</sub>
- Multi-angle Imaging Spectrometers ([MISR](#)) – dust storms and aerosols
- Global Precipitation Measurements ([GPM](#))
- Data centers and access methods
  - World Data Center ([WDC](#))
  - Earth Data ([NASA](#))
  - Data access methods ([NASA](#))
  - Copernicus open access hub ([ESA](#))
  - Aura Validation Data Center ([AVDC, NASA](#))
  - The Wisconsin Horizontal Interpolation Program for Satellites ([WHIPS](#))
  - Atmospheric Tool Box ([ATB](#)) for Sentinel-5P products
  - Google Earth Engine ([GEE](#)) for Sentinel-5P products



## D. Global & regional health impact analysis and tools

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- Visualization portal for 1990-2018 global burden of disease estimates ([IHME-GBD](#))
  - Resource [links](#) to methodology and inputs
- Visualization portal for State of the Global Air ([SOGA](#)) by Health Effects Institute (HEI)
  - India [factsheet](#) and [more](#)
- India [state-level](#) disease burden initiative by ICMR and PHFI (2019)
  - State-level reports ([PHFI](#))
- Burden of disease attributable to major sources of air pollution in India ([GBDMAPS-India](#)) by HEI
- Air Quality Life Index ([AQLI](#)) by U.Chicago
- Health impacts analysis tools
  - Household Air Pollution Intervention Tool ([HAPIT](#))
  - Air pollution health effects online tool by [TERI](#)
  - CO-Benefits Risk Assessment ([COBRA](#)) health impacts screening and mapping tool by USEPA
  - Environmental BENefits MAPping and analysis program ([BENMAP](#)) by USEPA
  - [AirCounts](#) tool by Abt Associates
  - Tool for health risk assessment of air pollution – [AirQ+](#) by WHO
  - FAsT Scenario Screening Tool ([FASST](#)) by EU
  - Greenhouse gas – Air pollution INteractions and Synergies ([GAINS](#)) by IIASA
  - The Long-range Energy Alternatives Planning – Integrated Benefits Calculator ([LEAP-IBC](#)) by SEI
  - Simple Internative Models for better air quality ([SIM-air](#)) by Urban Emissions

## E. Compiled statistics, maps, and other geospatial databases

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### Compiled national and state level statistics

- Census India ([2011](#))
- Indiatats.com ([paid](#) statistics service)
- Statista.com ([paid](#) statistics service)
- Statistical Year Book ([SYB](#)) of India by MoSPI
- Energy Statistics of India by MoSPI
- Directorate of Statistics by state
  - [[Andhra Pradesh](#)] [[Assam](#)] [[Bihar](#)] [[Chandigarh](#)] [[Chhattisgarh](#)] [[Delhi](#)] [[Goa](#)] [[Gujarat](#)] [[Haryana](#)] [[Himachal Pradesh](#)] [[Jammu & Kashmir](#)] [[Jharkhand](#)] [[Karnataka](#)] [[Kerala](#)] [[Madhya Pradesh](#)] [[Maharashtra](#)] [[Manipur](#)] [[Meghalaya](#)] [[Mizoram](#)] [[Nagaland](#)] [[Odisha](#)] [[Puducherry](#)] [[Punjab](#)] [[Rajasthan](#)] [[Sikkim](#)] [[Tamil Nadu](#)] [[Telangana](#)] [[Tripura](#)] [[Uttarakhand](#)] [[Uttar Pradesh](#)] [[West Bengal](#)]

### Compiled GIS data and maps

- Community created maps of India by [datameet](#)
- Openstreetmaps ([GIS](#))
- Mapcruzin.com ([GIS](#))
- Global Human Settlements ([GHS](#)) – urban built areas
- Land cover data 1992-2015 ([ESA](#))
- Gridded Population
  - Global database [GPW](#) from SEDAC
  - Global database [Landscan](#) from ORNL
  - India database for [2011-2050](#) at 0.25° resolution from Urban Emissions

## F. Compiled databases on energy, emissions, meteorology, and reanalysis fields

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### Compiled energy databases

- India energy [dashboard](#) by Niti Aayog
- India Energy Security Scenarios ([IESS](#)) by Niti Aayog
- GHG Platform India ([GPI](#)) by multiple agencies
- International Energy Agency ([IEA](#))
- Greenhouse gas – Air pollution INteractions and Synergies ([GAINS](#)) by IIASA

### Compiled emission databases

- MIX [regional](#) emissions database for Asia
- REAS [regional](#) emissions database for Asia
- EDGAR [global](#) emissions inventory
- CAMS [global](#) emissions inventory
- ECCAD [global](#) compilation of emissions and ancillary data
- SAFAR India emissions inventory by Indian Institute of Tropical Meteorology ([contact](#))
- SMOG-India [emissions](#) inventory by Indian Institute of Technology, Bombay
- OMI-HTAPv2.2 [SO2 global emissions](#) inventory 2005-2019 (NASA)
- Greenhouse gas – Air pollution INteractions and Synergies ([GAINS](#)) by IIASA
- MEGAN [global](#) biogenic emissions
- Forest and agricultural fires
  - Fire emissions Inventory from NCAR ([FINN](#)) by UCAR
  - Global fire emissions database ([GFED](#))
  - Global fire emissions database ([IS4FIRES](#))
  - Blended global fire emissions database ([GBBEPx V3](#)) by NOAA
  - Global quick fire emissions database ([QFED](#)) by NASA
  - Global fire assimilation system ([GFAS](#)) by ECMWF

### Compiled meteorological fields

- Indian Meteorological Department ([IMD](#))
- Climate Explorer by [KNMI](#) for stationwise data
- NCEP [global](#) reanalysis fields (long-term archives)
- Global Forecast System ([GFS](#)) fields (short-term archives)
- Windy (open visualization [portal](#))
- Earth Nullschool (open visualization [portal](#))
- Compiled [meteorological data](#) for Indian districts (from Urban Emissions)

### Compiled modelled reanalysis fields

- MOZART [global](#) model by UCAR
- CAM-chem [global](#) community earth system model by UCAR

- CAMS [global](#) reanalysis model by ECMWF
- MERRA-2 [global](#) reanalysis model by NASA
- SAANS [India](#) reanalysis model by IIT-Delhi
- [Global PM2.5](#) reanalysis by WUSTL
  - Extracted [India](#) database for 1998-2018 from Urban Emissions

## G. Compiled statistics on Indian energy sectors

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### Industry

- Annual Survey of Industries ([ASI](#)) by the Ministry of Statistics and Programme Implementation (MoSPI)
- Annual [reports](#) by MOSPI
- Annual [reports](#) by the Ministry of Steel
- Annual [reports](#) by the Ministry of Chemicals and Fertilizers
- Annual [reports](#) by the Ministry of Mines
- Annual [reports](#) by the Cement Manufacturers Association
- Annual [reports](#) by the Ministry of Micro, Small, and Medium Enterprises
- Annual [reports](#) by the Ministry of Textiles
- Annual [reports](#) by the Ministry of Coal
- Annual [reports](#) by the Ministry of Petroleum and Natural Gas
- Annual [reports](#) by the Department of Heavy Industry
- Annual [reports](#) by the Department of Animal Husbandry and Dairy
- Annual [reports](#) by the Department of Fisheries
- Annual [reports](#) by the Department of Pharmaceuticals
- Annual [reports](#) by the Department of Chemical and Petro-chemicals

### Power Plants

- Official portals
  - Ministry of Power ([MoP](#))
  - Ministry of Petroleum and Natural Gas ([MoPNG](#))
  - Ministry of New and Renewable Energy ([MNRE](#))
  - Ministry of Coal ([MoC](#))
  - Central Electrical Authority (CEA) [daily reports](#)
  - National Power Portal (NPP) [dashboard](#)
  - Merit order dispatch of Electricity for Rejuvenating Income and Transparency ([MERIT](#)) by MoP
- Other portals
  - Coal India Limited ([CIL](#))
  - Gas Authority of India Limited ([GAIL](#))
  - Solar Energy Corporation of India ([SECI](#))
  - National energy policy ([Niti Aayog](#))
  - India Energy Review ([IEA](#))
- Wikipedia
  - Electricity [sector](#) in India
  - Energy [policy](#) in India
  - Renewable [energy](#) in India
  - Solar [power](#) in India
- Regulations
  - Central Electricity Regulatory Corporation – [current regulations](#)

- India Electricity Act ([2003](#))
- Environmental Standards for Ambient Air, Automobiles, Fuels, Industries and Noise ([CPCB, 2000](#))
- Industry effluent emission standards ([CPCB](#))
- Online monitoring of industrial emissions & effluent ([CPCB](#))
- Power plants list
  - Global power plants database ([WRI](#))
  - Global power plants database ([GEO](#))
  - Global power plants database ([Carbon Brief](#))
  - Existing power plants in India ([Wikipedia](#))
  - Existing and proposed power plants in India ([GEM-wiki](#))
  - Existing power companies in India ([GEM-wiki](#))
  - Plant and unit level generation data ([CEEW](#))
  - Hourly load curves 2012-2015 ([CEEW](#))
  - Electricity generation and carbon tracker – [dashboard](#) by Brookings India
- Regional Load Dispatch Centers
  - Northern ([NRLDC](#))
  - Southern ([SRLDC](#))
  - Eastern ([ERLDC](#))
  - Western ([WRLDC](#))
  - NorthEastern ([NERLDC](#))
- State Load Dispatch Centers
  - [[Andhra Pradesh](#)] [[Assam](#)] [[Chhattisgarh](#)] [[Delhi](#)] [[Gujarat](#)] [[Himachal Pradesh](#)]
  - [[Karnataka](#)] [[Kerala](#)] [[Madhya Pradesh](#)] [[Maharashtra](#)] [[Odisha](#)] [[Punjab](#)]
  - [[Rajasthan](#)] [[Tamil Nadu](#)] [[Uttar Pradesh](#)] [[Uttarakhand](#)] [[West Bengal](#)]
- Non-governmental institutions
  - Brookings [India](#)
  - Center for Science and Environment ([CSE](#))
  - Center for Study of Science Technology and Policy ([CSTEP](#))
  - Council for Energy Environment and Water ([CEEW](#))
  - GHG Platform India ([GPI](#))
  - Institute for Energy Economics and Financial Analysis ([IEEFA](#))

## Transport (road)

- National Transport Development Policy Committee ([NTDPC](#)) report – Moving India to 2032
- Annual [reports](#) by the Ministry of Road Transport and Highways
- Annual [reports](#) by the Ministry of Petroleum and Natural Gas
- Urban transport [reports](#) by the Ministry of Housing and Urban Affairs
- AMRUT/JNNURM city development [reports](#)
- Smart Cities Mission – city development [reports](#)
- Google directions API for traffic speeds ([paid](#) service)

- Google mobility [statistics](#) during COVID-19
- Tom Tom traffic index ([paid](#) service)

### **Transport (rail, aviation, and shipping)**

- Shipping – full resource [links](#)
- Aviation [global](#) emissions inventory by EDGAR
- Departures and arrivals information by [AirSewa](#)
- Railway train [schedules](#)
- Departures and arrivals information by flightstats ([paid](#) service)
- Cargo tonnage by rail and aviation by indiastats.com ([paid](#) service)

### **Open waste burning**

- Global trash burning [emissions](#) inventory by UCAR
- waste management in India ([database](#))
- [Gridded](#) open waste burning emissions in India (2019)



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