Acid Rain & Atmospheric Pollution

Indian Institute of Tropical Meteorology, Pune

ENVIS NEWSLETTER

(A Project of the Ministry of Environment and Forests, Govt. of India)

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Contents

Editorial Team

Editorial

"Indian Institute of Tropical Meteorology (IITM) Pune, an autonomous body under the Ministry of Earth Sciences, Government of India will spearhead the country's first major initiative towards predicting air quality levels during the 2010 Commonwealth Games (CWG) in New Delhi. The project is entitled as "SAFAR (System of Air Pollution Forecasting & Research)". It aims at preventing health hazards due to air pollution. Thus as the project lies in the interest of IITM- ENVIS thematic area of "Acid Rain & Atmospheric Pollution" we have dedicated this issue on Air Pollution Forecasting.

The issue conveys the necessity towards air & weather forecasting. It also covers the recent news & views related to forecasting as well as give a brief understanding about the SAFAR project."

Importance of Air Quality & Weather Forecasting

Air pollution is one of the major growing problems all over the world. Many different sources such as factories, power plants, automobiles and even from natural causes such as windblown dust, smoke from bush fires and volcanic eruptions are responsible for the pollution. The air quality can get affected in many ways due to the pollutants emitted from these sources. The deterioration of air quality thus results into a corresponding increase in health problems, eventually inducing the monitoring of air quality as a prime necessity in day to day life.

There is a growing awareness of the linkages between human health, the weather and climate. Timely air quality information can assist the public in coping with health problems caused by ground-level ozone, sulphur dioxide, nitrous oxide, particulate matter and other pollutants. Air quality advisories or alerts issued when predetermined pollutant thresholds exceeds should result in actions to reduce pollution levels and encourage people to avoid polluted areas thereby alleviating adverse effects on health. Briefly, in response to the air quality advisories people can try to take actions against the increased pollution themselves like:

- Use public transportation
- Stagger work hours or even stay indoors.
- Industry and regulatory agencies may decide on temporary shutdown of polluting factories, thermal power plants.

Apart from the so far mentioned pollutants/gases resulting from human activities there are other pollutants and radiations as well which affect human health and harm the environment as well. For example the pollen season that is reasonably well known by many people who are allergic to it. The presence of pollen, its density and trajectory, as well as the possibility of being removed from the atmosphere by showers, all depend on the day-to-day weather. Also, the amount of UV radiation which not only leads to increase in skin diseases and eye cataracts in humans but also affect plants, aquatic organisms and other natural systems depends on the day-to-day weather conditions. Weather thus plays an important part in the development, dispersion and transportation of particulates, ground-level ozone, pathogenic germs and gases. (A few weather factors which are supposed to affect the changes in air quality include air temperature, amount of cloud cover, humidity, pressure, wind speed and the presence of temperature inversion). Thus all the factors discussed above are sufficient enough for proving the importance of forecasting in day-to day life. Thus in conclusion, the ultimate goal of air quality and weather forecasting is to improve the public understanding of relevant environmental issues and enable people to take actions in

minimizing the adverse environmental effects or stress. (Table 1 shows the source and possible health effects of various pollutants).

Table 1: Source and possible health effects of various pollutants

Pollutant	Source	Health Effects
Carbon Monoxide	Automobile exhaust, industrial processes and fuel combustion in boilers and incinerators	Reduces the amount of oxygen delivered to the body's organs and tissues. It can cause nausea, dizziness, headaches, visual impairment, poor learning ability and difficulty in performing complex tasks. People with cardiovascular disease are more at risk.
Nitrogen dioxide	Motor vehicle exhaust and stationary sources such as electric utilities and industrial boilers.	Irritates the nose, throat and lungs especially in people with asthma. Lowers resistance to respiratory infections such as influenza. Nitrogen oxides contribute to ozone formation that have adverse effects on terrestrial and aquatic ecosystems.
Ozone	Not emitted directly into the air by specific sources but created by sunlight acting on Nitrogen Oxides and Volatile Organic Compound from motor vehicles and stationary sources.	Irritates the lungs causing coughing and pain in the chest and throat. Induces respiratory inflammation and reduces the ability to exercise. Long-term exposure may lead to permanent scarring of lung tissues and lower lung efficiency.
Particulate Matter	Diesel cars, trucks and buses, power plants, industry, bush fires, volcanic eruptions and many other sources	Affects breathing and respiratory system, changes the body's defense against inhaled materials, damage to lung tissues, cancer and premature death.
Sulphur dioxide	Burning fuel containing sulphur (mainly from coal and oil) are burned, power plants, large industrial facilities, diesel vehicles and metal smelting.	Constricts the breathing passages, causes wheezing, shortness of breath and coughing. It also alters pulmonary defenses and aggravates existing cardiovascular diseases.
Toxic air pollutants including dioxins, benzene, arsenic, mercury and vinyl chloride	Types of sources include motor vehicles and stationary sources such as manufacturing plants.	Can cause cancer, poisoning and rapid onset of sickness such as nausea or difficulty in breathing. Other effects include immunological, neurological, reproductive and developmental effects. Toxic air pollutants deposited into soil and rivers and lakes affect ecological systems and human health through consumption of contaminated food.

Air Quality Forecasting in India: A Dream Come True - SAFAR

It is widely known fact that "Health is strongly affected by environmental pollution". Among all the existing pollutants, few pollutants which are of major concern from human health point of view includes: Ozone (O_3), Oxides of Nitrogen (NOx), Carbon Monoxide (CO), Suspended Particulate Matters (PM10 /PM2.5), Black Carbon (BC) and Benzene. From these, particulate pollution and ground-level ozone are the most widespread health threats for India. Exposure to all these pollutants is associated with numerous effects on human health such as: increased respiratory symptoms, hospitalization for heart or lung diseases, and even premature death. Ground-level ozone can damage lung tissue, and is especially harmful for people suffering with asthma and other chronic lung diseases. Airborne particles, the main ingredient of haze, smoke, and airborne dust, present serious air quality problems in many areas of India. The size of particles is directly linked to their potential for causing health problems. Hence more concern is about those particles which are 10 µm in diameter or even smaller (PM10 or PM2.5). These are the particles that generally pass through the throat and nose and enter the lungs. Once inhaled, these particles can affect the heart and lungs. The most important volatile organic carbon compounds that are present in ambient air include benzene, as potential leukemia-inducing agent which seems to increase rapidly. However, to understand the immediate health hazard and to take systematic measures, we need to know the current level of air quality and its future projections well in advance. In short, need of forecasting the air quality arises here.

Air quality is now being observed seriously in many countries due to the global warming issue. However, the issue only remains as a scientific question unless a general awareness in public is built. Such awareness can be brought upon easily if such forecasts are done during some major events. In the recent past, only a few developed countries have demonstrated the strength to develop this kind of air quality forecasting system during major games like during the Olympic Games in Beijing, China and Melbourne, Australia.

In India, for the first time, such an attempt will be made during the Common Wealth Games - 2010. The "development of the Air Pollution Forecasting System" is thus a very prestigious scientific achievement for our country which is being accomplished by the Ministry for the first time in India related to the highly priority area of "Climate Change" of Government of India.

One of the important official responsibilities of the Commonwealth Games Delhi 2010 is that it promises to be Green Games, with a

commitment to ensure that the negative environmental impact of the Games is minimised and that they are completely consumption neutral. As the true representative of India, the CWG-2010 logo SHERA is a reminder of the fragile environment he lives in.

In this regards for fulfilling the above critical objective during this event, a "**SYSTEM OF AIR POLLUTION FORECASTING & RESEARCH" (SAFAR-2010**) is being built up. The system will display the current level and forecasted level (24 hours in advance) of air quality at various key locations of CWG-2010 through wireless LCD display panels. This system will greatly help to better plan the air quality management system. It will tell the quality of the air we will be breathing during the CWG-2010 and also the impact of various environmental friendly steps we are committed to take-up for betterment of air quality.

In general it is being perceived by a common man that the air quality of Delhi is relatively inferior but with the implementation of rapid transport system, CNG and concept of green environment, the fact is that the air quality has been reasonable as simulated by our own scientists and a group led by Dr. Beig of IITM, Pune of our Ministry using air quality models. Thus, with the resolve of CWG as green games we are sure that the air quality of Delhi is likely to be much better and healthy during the CWG which we wish to proudly demonstrate practically to our guests from different countries and citizens which may have developed other impressions in absence of above information.

The SAFAR system is supposed to be established at least 3-4 months in advance for monitoring and predicting the level of air quality which will greatly help and may guide the environmental team of CWG in mitigation strategies to achieve the motto of CWG. In case, we observe the detracting air quality at any important location due to some reason, we will be in a position to identify the source of pollution and can take immediate measure to help improve better air quality.

By demonstrating this system practically running we will be among a few countries to achieve this foot in the frontier of environmental research. Hence, the SAFAR system will be a value addition for CWG and showcase our commitment with confidence to keep up the motto of green games. The significant amount of data collected during SAFAR project will be further utilized in scientific research.

News, Views, Media & Outreach

IITM's "SAFAR" for CWG -2010

IITM's SAFAR to keep air clean at CWG 2010 venue

Anuradha Mane Wadhwani

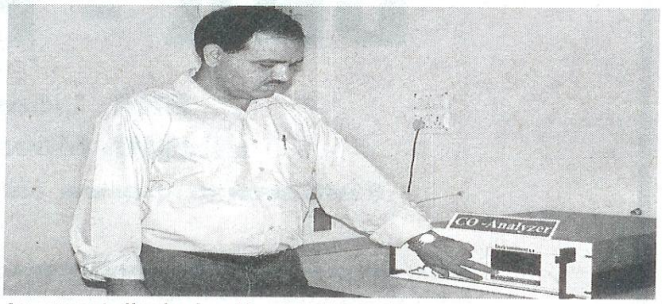
In keeping with the green games philosophy of the Commonwealth Games (CWG) Delhi 2010, the Indian Institute of Tropical Meteorology (IITM) has designed a special air quality forecasting system to understand the immediate health hazards.

System of Air Pollution Forecasting and Research (SAFAR-2010) will help organisers know the current levels of air quality and its future projections at 10 different locations around the CWG area in Delhi well in advance.

"In the recent past, only a few developed countries have developed this kind of system during major games like the Olympics in Beijing and Melbourne. Knowledge about the air quality is very important to the participating athletes as well," said advisor and scientist at the ministry of earth sciences Swati Basu.

"The SAFAR will provide and display the information on air quality on real time basis (hourly) and forecast the levels of pollution 24 hours in advance through wireless true colour digital display panels," said IITM's senior scientist and program director Gufran Beig.

Beig along with a team of scientists at the IITM are currently working on the model.



An expert displaying the SAFAR-2010.

The SAFAR will forecast the levels of air pollutants such as ozone, oxides of nitrogen (NOx), carbon monoxide (CO), suspended particulate matters (PM2.5, PM10), black carbon and benzene.

Studies show that particulate pollution and ground-level ozone are the most widespread health threats. Ground-level ozone can damage lung tissue and is especially harmful for those with asthma and other chronic lung diseases.

"Airborne particles (the main ingredient of haze, smoke, and airborne dust) that are 10 micrometres in diameter or smaller can pass through the throat and nose and enter the lungs. The most important volatile organic carbon compounds that are present in ambient air include benzene as the potential leukaemia-inducing agent which is increasing in Delhi," Beig said.

"The SAFAR will be established at least 3-4 months in advance to guide us in planning the pollution mitigation strategies. We will also be able to identify the major sources of air pollutants and recommend measures for improved air quality to the environmental team of the CWG," he said.

The SAFAR will also help citizens know the efficacy and impact of various environmental-friendly steps that the government takes for the betterment of air quality.

CWG 2010 WILL BE GREEN, COURTESY IITM PUNE

City-based Indian Institute of Tropical Meteorology (IITM) will develop the System of Air Pollution Forecasting and Research (SAFAR-2010) to predict the level of air pollutants and showcase the current level of air quality during Commonwealth Games (CWG) 2010 to be held in New Delhi.

"As a motto, Commonwealth Games Delhi 2010 promise to be Green Games, with a commitment to ensure that the negative environmental impact of the Games is minimised. Hence, demonstrating the status of air quality and skill of its forecasting will complement our efforts, an achievement itself on the environmental front," Advisor/ scientist-G in central ministry of earth sciences, the sponsoring ministry, Swati Basu told Sakaal Times from New Delhi.

In the recent past, only a few developed countries have demonstrated the strength to develop this kind of system during major games like during the Olympic Games in Beijing, China and Melbourne, Australia.

"SAFAR will provide and display the information on air quality on real time basis (hourly) and forecast the future level of pollution 24 hours in advance at various key locations of CWG-2010 through wireless true colour digital display panels. The real time and forecasting will include the following air pollutants: ozone, oxides of nitrogen (Nox), carbon monoxide (CO), particulate matters (PM2.5, PM10), black carbon and benzene," Basu said.

BENEFITS OF SAFAR

- Help in better planning of air quality management system and to release advisory for health
- The system will tell quality of air people breathing today and likely to breathe tomorrow
- It will advise us in selecting pathways for next day to avoid immediate exposure to bad air
- Check the impact of various environmental friendly steps on air quality during CWG-2010

The SAFAR system is planned to be established at least 3 to 4 months in advance to monitor and also to predict the level of air quality. This is expected to help and guide IITM in planning the mitigation strategies to identify the major sources of air pollutants.

"This system will help to plan the air quality management system. It will tell us the quality of the air we will be breathing during the CWG-2010 and also the impact of various environmental friendly steps we are committed to take-up for betterment of air quality," programme director at IITM, Gufran Beig said.

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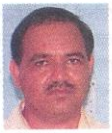
प्रदूषणाची स्थिती सांगणारी यंत्रणा

दिल्लीतील राष्ट्रकुल क्रीडा स्पर्धा स्पर्धेसाठी यंत्रणेचा उपयोग होणार

सकाळ वृत्तसेवा



डॉ. गुफरान बेग

पुणे, ता. २ : पुढील वर्षी दिल्ली येथे होणाऱ्या राष्ट्रकुल क्रीडा स्पर्धा प्रदूषणमुक्त, स्वच्छ वातावरणात पार पडाव्यात यासाठी पुण्याच्या भारतीय उष्णकटीबंधीय हवामानशास्त्र संस्थेतर्फे (आयआयटीएम) प्रदूषणाची सद्यःस्थिती आणि अंदाज सांगणारी देशातील पहिली यंत्रणा विकसित केली आहे. 'सिस्टिम ऑफ एअर क्वालिटी फोरकास्टिंग अँड रिसर्च' (सफर) या यंत्रणेद्वारे दर तासाला दिल्लीच्या विविध भागांमधील प्रदूषणाची माहिती स्पर्धेच्या ठिकाणी प्रसिद्ध केली जाणार आहे.

'आयआयटीएम'चे संचालक डॉ. बी. एन. गोस्वामी आणि वरिष्ठ शास्त्रज्ञ डॉ. गुफरान बेग यांच्या पुढाकाराने ही यंत्रणा विकसित करण्यात आली आहे. प्रदूषणाचा अंदाज वर्तविण्याचा प्रयोग डॉ. बेग यांनी याआधी पुण्यात केला होता. असा प्रयोग आंतरराष्ट्रीय स्तरावर फक्त बीजिंग आणि मेलबर्न ऑलिंपिकदरम्यान करण्यात आला असल्याची माहिती डॉ. बेग यांनी दिली. या यंत्रणेबाबत ते म्हणाले, "राष्ट्रकुल क्रीडा स्पर्धेदरम्यान हजारो परदेशी स्पर्धक आणि नागरिक दिल्लीत येणार असताना शहराचे प्रदूषण नियंत्रित ठेवून स्वच्छ वातावरणात या स्पर्धा पार पाडण्याचे लक्ष्य ठेवण्यात आले आहे. 'आयआयटीएम'तर्फे गेली अनेक वर्षे आम्ही प्रदूषणकारी वायू आणि हवेचा दर्जा यांवर संशोधन करीत आहोत. या स्पर्धेदरम्यान दिल्लीच्या विविध भागांतील प्रदूषणाची नोंद घेणारी यंत्रणा आम्ही १० ठिकाणी बसवणार असून, त्या नोंदींच्या आधारे प्रदूषणाची स्थिती आम्ही दर तासाला स्पर्धेच्या ठिकाणी लावलेल्या 'मॉनिटर'वरून जाहीर करू."

ते म्हणाले, "या नोंदींमध्ये नायट्रस ऑक्साईड, ओझोन, कार्बन मोनॉक्साईड, बेन्झीन, हवेतील धूलिकणांचे प्रमाण यांचा समावेश आहे. नोंदी घेणाऱ्या उपकरणांतून ही माहिती 'वायरलेस' यंत्रणेद्वारे सतत मुख्य केंद्राकडे पाठवली जाईल. तेथून ती स्पर्धांच्या ठिकाणी प्रसारित केली जाईल. मिळालेल्या माहितीवरून प्रदूषणाचा अंदाज वर्तवणारे 'मॉडेल' आम्ही विकसित केले असून, पुढील काही तासांत ठराविक भागातील प्रदूषणाचे प्रमाण काय असेल हेसुद्धा या यंत्रणेद्वारे सांगितले जाईल. ही यंत्रणा आम्ही स्पर्धेच्या तीन महिने आधी बसवणार असून, त्याद्वारे प्रदूषण कमी करण्यास अथवा त्यावर उपाय योजण्यास प्रशासन आणि आयोजकांना मदत होईल."

या प्रकल्पासाठी सुवर्णा फडणवीस आणि कौशर अली यांचे मुख्य सहकार्य लाभले असून, सरोज साहू, एस. घुडे, एच. आर. त्रिंबके या संशोधकांचा या प्रकल्पात सहभाग असल्याचे डॉ. बेग यांनी सांगितले.

ENVIS-IITM In Media Limelight

City-based environmental info centre widens scope

Also To Cover Climate Change & Atmospheric Environment

Focus on climate change

- The ENVIS centre of IITM is providing linkages to all information sources and creating data bank on selected parameters in the climate change and air pollution
- At the ENVIS site (kid's corner), visuals, graphics and animations have been used to make it interesting and explain the basic aspects of pollution, clouds, rain and acid rain, climate and atmosphere, ozone, greenhouse effect, EL Nino, air pressure, floods and drought, among others
- The site depicts a map showing the level of pollution in the country
- For details, mail to pollution@tropmet.res.in/ call: 2589-3825/ 2590-4212. The website is www://envis.tropmet.res.in.

Dipannita Das | TNN

Pune: The Environmental Information System (ENVIS) centre at the Indian Institute Of Tropical Meteorology (IITM), Pune, which has been disseminating information about acid rain and atmospheric pollutant modelling so far, has widened its scope to include the topic of climate change and atmospheric environment.

There are more than 40 ENVIS centres across the country that cover different subjects. The role of the centre is to ensure integration of national efforts in environmental information collection, collation, storage, retrieval and dissemination to all concerned.

The high-level committee that monitors ENVIS, which come under the ministry of environment and forest, have recommended the Pune centre at IITM to change its subject profile. The ENVIS website is also being revamped accordingly to have additional inputs on climate change.

Gufran Beig, scientist and coordinator of the centre at IITM, said, "Looking into the public interest and data requirement, this decision was taken by the committee of ENVIS. Climate change is drawing more attention these days and people want to know more about it and its impact. There is no other ENVIS centre in the country addressing the issue of climate change and atmospheric pollution together."

The website that was launched to promote awareness among the students and common public, is in Marathi and Hindi language, apart from English. It is an interactive site where one can ask questions related to environment and the queries are replied by experts of IITM in 24 hours, he said.

Beig said since the last few weeks the website is being revamped to provide information related to climate change in addition to acid rain and atmospheric pollutant. The new link is 'data repository' that divulges details on weather and rainfall stations in India, secondary rainfall data sets, all-India temperature, district wise rainfall, time series data, total rainfall in India, among others.

"The idea is to educate the public about the impact of acid rain, air pollution and related aspects that lead to climate change in elaborate and simple language. There are also newsletters, journals and CDs available for public. The answers to some of the basic and fundamental questions like why and how pollution can affect our lives, can be found here," said Beig.

More than 2,155 visitors have visited the site in the last one year. Majority of questions are from students and senior citizens, he added.

VISIT OUR WEBSITE

All queries and feedback regarding this newsletter should be addressed to:

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