

In this issue

Missing forests? Add some trees

The Trigonometric Survey of India in the 19th century has often been hailed as 'one of the most stupendous works in the history of science'. Never before had a more precise, detailed and extensive survey to map such a large area ever been undertaken. Today, in the age of remote sensing satellites, procedures are simpler. In fact, satellites can help us monitor even the changes in land use. But quite often, definitions come in the way of accurate reporting.

A General Article in this issue (**page 1201**) highlights the discrepancies in the definition of forest cover. Contrary to the UNFCCC and FAO, the current definition adopted by the Forest Survey of India includes all perennial tree cover, including man-made plantations. This leads to a gross overestimation of forest cover and an underestimation of the extent of deforestation. When plantations of coconut, cashew and coffee are also included, the reported forest cover increases by a staggering 142.7%. Even the inclusion of exotic species such as *Eucalyptus*, *Casuarinas* and *Poplar* under forest cover is a questionable practice as it would belie conservation strategies to promote indigenous species. Such practices may mislead national policy makers and conservationists and conflict with the practices of international stakeholders such as FAO and REDD+ during the assessment of forests.

Not a proverbial missing the forest for the trees this, but on the contrary, a case of mistaking trees for forests. The article also suggests a multipronged approach to monitoring necessary for more accurate reporting of forest cover in India.

Iron, cement and blood

Rigorous safety procedures were first implemented during the construction of the Golden Gate Bridge in San Francisco in the 1930s. Such was the sense of security enjoyed by workers that they used to leap off the bridge and land in the safety net, swaying 200 feet above water.

Eighty years down the line, even today, a safe working environment for a construction worker in India is an oxymoron. Workers in ship-breaking yards, for example, live by the maxim, 'One

ship a day, one life a day'. And casualties during the construction of high rises are often considered equivalent in 'merit' to human sacrifice.

The workers involved in the construction of the Okhla bridge, a project undertaken by the Delhi Metro Rail Corporation, also faced safety problems. The construction of a 100 m long span of the bridge over railway tracks posed the danger of collapse onto a passenger train rattling below; this segment was also expected to see-saw precariously during construction.

To measure the angular sway during construction, engineers used two different devices: a LASER pointer and a Light Emitting Inclination Sensor. The LASER pointer exploited the fact that even a slight angular deviation in the inclination of the girdle would result in visible linear displacement of the LASER beam on a screen. This simple idea of measuring angular displacement using a proxy of linear displacement is used in college laboratories for measuring the gravitational constant. The second device was equipped with acceleration sensors which measured inclination angles in two planes. These intelligent sensors translated the changes in displacement, strain and inclination to coloured glows of LEDs to warn workers.

The Research Article on (**page 1280**) cites the implementation of state of the art on site visualization safety systems by Japanese and Indian engineers to monitor the construction of the bridge. Although the construction was completed without any casualties, it was observed that the deviation angles calculated before construction were significantly lesser than the deviation angles measured during construction – an instance where safety procedures generate data for further scientific progress.

Burning biomass

Burning of agricultural waste, forest fires and other biomass releases volatile organic compounds into the earth's atmosphere. Some of these volatiles, especially non-methane compounds are deleterious to human health due to their affinity for other gases in the atmosphere to form O₃. O₃ is known to exacerbate heart disease, bronchitis and emphysema.

Thus it is important to monitor biogas burning from a public health perspective.

The World Fire Atlas provides data on inter-annual variation in fire counts. The data is relayed by satellite sensors and is stored in the global fire emission database. A Research Article on (**page 1270**) in this issue analyses data between the period 1997 and 2009 to study the seasonal and inter-annual variation of fire counts in India. An interesting inference from the data was that biomass burning in India seems to peak before monsoons.

The satellite data has limitations: observations were limited to night time only; the resolution was not enough to distinguish between multiple small fires; and atmospheric noise such as cloud cover interfered with the imaging. Given these limitations, a civil aircraft, equipped with specialized instruments, recorded detailed *in-situ* upper tropospheric content of volatile substances as it flew over India in 2008. Data so recorded is analysed to assess the contribution of different volatiles to the formation of O₃. Again, multiple modalities of measurements are needed to identify actionable programmes.

According to WHO, air pollution accounts for seven million premature deaths every year. Among the Asian countries, India is the second largest contributor of non-methane volatiles. Therefore, it is vital to monitor tropospheric composition of the volatile pollutants and to enable informed action to reduce the risk to public health.

Moral of the stories

From estimating forest cover to executing safety procedures to assessing health risks, data needed for informed decisions come from continuous monitoring. In this issue we examine three distinct studies all underlying this simple but important principle. The focus shifts from definitions of terms, to the tools and techniques of measurement, and then to the critical examination of the data itself. But core message is the same: monitoring.

But that is not all there is to this issue. Turn to the Contents page for more.

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