

## **Research opportunities in pandemic lockdown**

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To minimize the spread of coronavirus 2019 (COVID-19), countries such as India have mandated lockdowns of all but essential services. Many research projects have been interrupted because scientists cannot access their equipment or workspace. However, with almost all the industrial businesses shuttered, scientists have an opportunity to collect vital data.

Despite India's stringent laws preventing untreated effluent discharge in rivers and streams (1), a substantial fraction of industrial waste ends up in nearby water bodies or groundwater (2). Therefore, while industries are operating as usual, it is impossible to collect baseline data. Environmental quality data dating from before industrialization are rarely available. The use of sediments deposited before the industrialization, although often used as baseline data, is marred by physical and chemical changes that have taken place over time (3). With the complete shutdown of industrial operations, the effluent discharge is negligible. The water quality of nearby streams, if tested systematically during the lockdown period, could serve as a baseline against which scientists can subsequently track the point source of water pollution.

The lockdown is also a unique opportunity to assess the effect of anthropogenic activities on air quality, atmospheric greenhouse gas concentration, and its influence on global temperature. Several countrywide containment measures have substantially reduced greenhouse gas emissions and thus improved the air quality. The power generation in India has decreased by as much as 26.5% during the countrywide lockdown, including a 33% decrease of coal-based power generation (4). The total diesel consumption by Indian railways [usually close to  $24 \times 10^8$  liters/year, with passenger transport accounting for more than half (5)] has also dropped, as all passenger trains have been halted. With limited train service, the nitrogen oxide and carbon dioxide emissions they normally produce (5) have surely decreased. In addition to these changes, domestic and international flights and vehicular traffic have drastically decreased (6). India has likely substantially reduced anthropogenic greenhouse gas emissions as well as particulate matter concentration in the atmosphere. The effect of this short-term but substantially reduced anthropogenic emissions on global temperature, if quantified, could provide a rare data point for global climate simulation models. Researchers could also use this time to explore the effect

of these disruptions on the onset, strength, and spatial coverage of precipitation during the forthcoming summer monsoon season.

Although large-scale manual data collection by multiple researchers is neither advised nor feasible, scientists should coordinate efforts in key target areas to take advantage of this opportunity. The countrywide lockdowns in India and elsewhere provide a rare opportunity to collect a wealth of data that would otherwise be impossible to obtain.

### References And Notes

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3. P. J. Hanson, D. W. Evans, D. R. Colby, *Mar. Environ. Res.* **36**, 237 (1993).
4. Daily Reports, National Load Dispatch Center, Power System Operation Corporation Limited, Government of India. <https://posoco.in/reports/daily-reports/daily-reports-2019-20/>
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