single NSU to be created and located
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The economics of sharing scientific and social information

In a recent article in *Current Science*, Kale *et al*[1] make a case for sharing of information between the industry, government, and the general public. They also emphasize the need for such sharing of information, specifically in connection with introducing new legislations or in enforcing the regulations under the existing legislations. The point that is quite central to the issues raised by Kale *et al.*[1] is the economics of information. There are private and social costs of gathering information, and there are also private and social benefits of using that information[2]. It is not fair to demand a private firm which incurs private cost in collecting information to make such information available free of cost either to the government or to the public, unless such sharing of information freely or at very low cost can enhance its own private benefits. The main point these authors make is that there is, in fact, a possibility that sharing of information can enhance the private benefits to the industry A case in point is that it helps the industry to make such information available for a wider academic audience for a careful scrutiny Such a scrutiny will improve the credibility of the information as scientific evidence to support the industry's case in dealing with the government and the courts

There are some other types of information, such as information on scientific R & D, the cost of generating which is very high, and sharing it with others will entail giving away enormous benefits to others and even possibly reducing the benefits to the persons collecting the original scientific R & D information. Sharing of such information must be done only subject to recovering the cost as well as a major part of the benefits that can accrue to the others Otherwise, where is the incentive for generating scientific R & D? R & D investment is a risky investment. The private corporations in capital-scarce developing countries such as India do not spend, for fairly good reasons, much on R & D in science and technology[3]. However, there are optimistic expectations that in spite of the significant difference between the developed and the developing countries with respect to investment in R & D, the latter can improve their technological capabilities in the near future[4].

If industry protects its own information from public domain, should it not pay for the information it uses from the public domain? Here one is referring to national databases, which impose enormous costs to the exchequer. There is a great potential in them, if only they are properly visualized and utilized! But it is difficult for the government to price its information differently for different users, some receiving much more benefits than the others. One must find alternate ways of recovering costs from potential beneficiaries. A part of the justification for corporate taxes lies in such services the government renders to the corporate sector.

In economic theory there is an extensive discussion on the issue of asymmetry of information and the associated welfare losses[5]. Some simple illustrations will be useful to highlight the issues. Information on a product's adverse quality is available to the firm and not to the consumer. Suppression of such information is advantageous to the producers and disadvantageous to the consumer. Insider's information known to a company executive, and not to a general purchaser of company stocks, can give rise to enormous profits to the company executive Owner of a used car has adverse information on the car, which he suppresses, thus causing losses to the potential purchaser. It is argued in the literature that the welfare losses can be minimized by either reducing the asymmetry of information or through legislations controlling the undue profits people might make, as in the case of insider's information Transparency in the information the government collects and uses as advocated by Kale *et al.*[1] is an attempt to reduce asymmetry in information and thus to improve welfare. This point made by Kale *et al.*[1] is also supported by the theoretical literature on economics of information, and in particular on the welfare loss implications of asymmetric information[6,7].

There is one more mechanism through which scientific and technological information can be made accessible to all. This is through private and public interest litigations on the damage caused to the individuals and to the society by products and services produced using scientific and technological R & D While processing such litigations the judicial system should call experts in the subject as expert witnesses to testify regarding the scientific credibility of the evidence produced by

the two parties. This is what was partly implied when Kale *et al.*[1] said 'certain classes of academicians, particularly those with strong interdisciplinary capabilities, have a ready market for their work in Indian Industry'. There is need to promote the Tort law in our country. With more and more industrialization and globalization we will be going in this direction and there is a need for the kind of interaction between the academic community and the industry that Kale *et al.*[1] refer to.

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On the need to install seismographs in the Himalayas

Plans are underway to install a substantial number of new seismographs in the country. It is my strong conviction that a majority of these should be set up to monitor earthquakes of the Himalayas from within the mountains.

Recent earthquakes of the Peninsula notwithstanding, it is acknowledged that the Himalayas are the most active seismic region of India. Four earthquakes with magnitudes exceeding 8 have occurred in the Himalayas in a span of 53 years between 1897 and 1950, while earthquakes with magnitudes up to about 6 only have been reported from the Peninsula. The energy unleashed in a magnitude-8 earthquake is about 900 times that in a magnitude-6 earthquake. The intensity of effects and the region of destruction are correspondingly larger in the former case than in the latter. The rates of increase with magnitude are nonlinear for both intensity and area of destruction. Forty-four years have passed already since the last earthquake of magnitude greater than 8 occurred in the Himalayas.

While the reports prepared to document the visible effects of the above great Himalayan earthquakes are exemplary, the situation regarding instrumental observations is very unsatisfactory. Hence, quantitative information about the great Himalayan earthquakes is almost nonexistent. In fact, the era of modern long-period seismographs had just dawned with analogue recording when the great 1950 earthquake occurred in the then NE Frontier Agency (NEFA). Even today, the number of continuously recording seismographs in the Himalayas is woefully small. None has the digital recording facility. Moreover, the geographic distribution of instruments is very uneven. Earthquake prediction capability worldwide being what it is, all accessible parts of the Himalayas have to be covered with robust digital recording seismographs to catch the next great earthquake. This is because the threat of a great Himalayan earthquake is not only to the mountainous areas above the buried extended source but also to the contiguous parts of the Indo-Gangetic Plains. With the phenomenal growth in the population of these plains and with no progress towards strengthening of individual houses, the tragedy awaiting us is almost beyond imagination.

There have been efforts in some quarters to downplay the threat of the next great Himalayan earthquake. Of course, it would be unwise to cause a scare among the public on this account. Yet, sober publicity of this threat has to be undertaken for several reasons. Firstly, taxpayers' money is spent on hydroelectric projects and other developmental activities in the Himalayas. Similarly, important facilities, such as nuclear and thermal power plants, major industrial installations, office buildings, hospitals, schools and the like are and will be built in the Indo-Gangetic Plains, where the destructive effects of the great Himalayan earthquakes have been and will be felt. The public should know why the costs of these projects are enhanced if measures are taken against earthquake forces. Secondly, individual members of the public have to be persuaded to strengthen their houses against earthquakes on a priority basis. This has to be done by retrofitting in houses already built and by initial design in those yet to be built. If this is not done then many more Uttarkashis and Laturs will be witnessed in future Himalayan earthquakes.

This is not the place to expound all the reasons why great earthquakes should be expected to continue in the Himalayas. But even by common sense, one may conjecture that if some natural phenomenon has been observed once then it will happen again under similar circumstances. Thus, if four great earthquakes have occurred in the past hundred years in different segments of the Himalayas, then similar earthquakes should be expected in other segments also in the course of time because all lengthwise segments of the Himalayas are more or less geologically similar.

The compelling need of the hour from the viewpoint of earthquake hazards is for intensified seismological investigations supported by copious, high-quality observations from all parts of the Himalayas. Seismographs installed outside the Himalayas will not meet this need adequately. There have to be numerous instruments right in the mountains. Side by side, a campaign should be initiated to get individual houses strengthened. Monetary costs of these activities should be deemed to be recovered if human lives can be saved.

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