Monsoons

Sunita Narain's 'What monsoon means'[1] is full of flaws of every kind, in understanding of science, logical, perceptional, arithmetic, and also factual.

1. Questions like 'Do we know why it rains?' and her own reply 'We don't. Not really' are both meaningless. Understanding of natural phenomenon is not a Boolean function that takes a value either TRUE or FALSE. From a school student to a qualified meteorologist, every one understands why it rains, but the level of understanding differs. Likewise, the understanding of meteorologists also continuously improves with time.

2. But even if there was such a thing as achieving complete understanding of a certain phenomenon, there is no way to know whether that the complete understanding has been achieved. Therefore, mankind's perception will always be 'we have understood some, and are trying to understand more'.

3. Scientists are not *squabbling* about the definition of monsoon. They are discussing and debating it. Anil Agarwal, founder of CSE, had a background in S&T and would have known the difference.

4. If mankind is not to use the water in the rivers, and also not in the aquifers, then it is purely rainfed agriculture. Lofty names like 'rainwater harvesting', 'development that is sustainable', or 'decentralized systems', cannot change that fact. Such agriculture may be practiced in some area, because there is no other option. But there is not a single instance anywhere in the world where the farmers have refused canal and groundwater irrigation *even if it was available*, and have opted for rainfed agriculture. Because they know that rainfed agriculture is a recipe for uncertainty, sustainable poverty for the farmer, and sustainable food shortages for the nation. Anyone who has lived through or read about the Indian food shortages before 1975 or so, would know this.

5. We need grasses, trees and forests for several reasons, but it inevitably reduces the water supplies. All vegetation, whether agricultural or natural, consumes water for its physical growth and therefore reduces the quantum of usable water.

6. As regards her comment 'What is not said is that between 60% and 80% of the irrigated area is watered by groundwater, a resource, which needs the rain to recharge and refill its supply', not only the groundwater but all the freshwater, whether stored in aquifers or in dams, large or small, whether stored this year or over past few years, or even longer, comes only from rains. Therefore, over a number of years, human habitation anywhere in the world will continue to be dependent on rains, and for India that means monsoons. In that sense there can be no freedom from dependence on monsoons.

7. However, storage of water enables maintaining some supply of water if the monsoons are delayed, deficient, or interrupted. More the storage, more the supply to fall back on. This reduces the dependence on monsoons on a month to month, and also year to year basis.

1. Narain, Sunita, *Curr. Sci*., 2010, **99**, 1183.

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Public transport for climate change mitigation

Urbanization of a country such as India shows a steep growth in different kinds of transportation facility. Urban transport patterns in general and the growth of private modes of transport in particular, closely follow the urban population. On the other hand, transport is responsible for around a quarter to a third of carbon emissions in most developed economies, and is often the only major sector whose share of emissions is increasing[1,2]. Moreover, while all transport sectors are experiencing growth, those witnessing maximum growth (developing countries such as India) tend to be the most polluting[3].

In India, the number of registered vehicles doubled within the span of about 7 years during 2001–2008, with an average annual growth rate of about 10% (ref. 4). The rapid growth in motor vehicle activity in Indian cities has brought in its wake a range of adverse impacts. In Delhi, the data show that of the total 3000 metric tonnes of pollutants belched out everyday, close to two-thirds (66%) is from vehicles. Similarly, the contribution of vehicles to urban air pollution is 52% in Mumbai and close to one-third (33%) in Kolkata. Regardless of whether a bus is 'clean' or 'dirty', if it is reasonably full it can displace about 5–50 other motorized vehicles, including two-wheelers and cars. In some developing cities, the primary displacement is of high-emission motorcycles and scooters. Fuel savings, CO_2 reductions and air-pollutant reductions from switching to bus travel can be large – possibly much larger than those from making a fuel change or technology upgrade to the bus itself. Figure 1 shows the 1990 data for New Delhi and two possible scenarios for 2020.

There is 100% difference in the city's transport energy use and CO_2 emissions

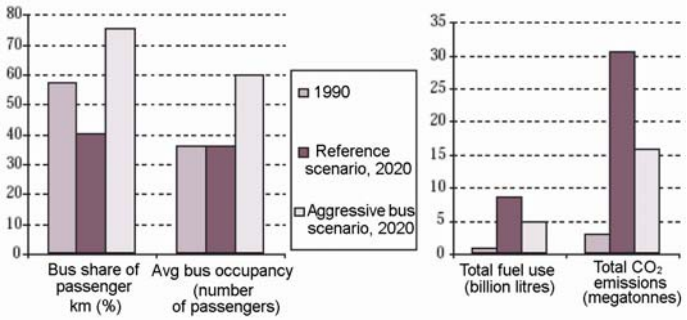

Figure 1. Two future visions for Delhi[5].

depending on whether buses during that year carry 75% of motorized trips, and are large and fairly full (average load of 60 passengers), or if they only carry 40% of motorized trips and are smaller and/or emptier (35 passengers). Not only is an efficient public bus system important for meeting the mobility needs in this rapidly growing economy, but a higher share of bus transport would also reduce pollution, both local and global and energy demand.

1. Ramanathan, R. and Parikh, J. K., *Transp. Policy*, 1999, **6**, 35–46.
2. Anable, J. and Shaw, J., *Area*, 2007, **39**, 443–457.
3. Chapman, L., *J. Transp. Geogr.*, 2007, **15**, 354–367.
4. Government of India, Motor transport statistics; http://morth.nic.in/mts.htm, accessed on 12 January 2011.
5. Bose, R. and Daniel, S., *Transportation in Developing Countries: Greenhouse Gas Scenarios for Delhi, India*, Pew Centre on Global Climate Change, Arlington, VA, USA, 2001.

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Pathetic story of an Indian technology developed for mosquito control

Mosquito-borne diseases have been major contributors to the sufferings and mortality of billions of people, especially in the underdeveloped and developing world. They have been rightly termed as neglected tropical diseases (NTDs). NTDs such as filariasis (elephantiasis) and leishmaniasis, inflict severe social stigma although they may not cause mortality. The battle of mankind with their insect carriers has been going on for decades with the invention of chemical insecticides. But, these arsenals became undesirable and ineffective due to the resistance developed by mosquitoes and concerns about their hazardous effects on man, animals and the environment. This calls for the search for alternate tools which are mosquitocidal, and safe to man and environment. The Vector Control Research Centre, Puducherry, a cell of the Indian Council of Medical Research, which is under the Ministry of Health and Family Welfare, Government of India, isolated an indigenous strain of a bacterium, *Bacillus thuringiensis* var. *israelensis*. This strain was found highly lethal to a variety of mosquitoes that transmit filariasis, malaria, dengue and other vector-borne diseases. The Pasteur Institute, Paris, a WHO collaborating centre for identifying and testing bioefficacy of biocontrol agents, rated this strain as the most toxic.

Over a period of two decades, the Centre worked on aspects such as bioefficacy against a variety of mosquitoes and safety to non-targets organisms, especially economically important insects such as honey bees and silk worms. The bacterium was found highly effective in killing the aquatic stages of mosquitoes and not harmful to any other organisms, except mosquitoes. Scientists continued their efforts towards developing cost-effective production and formulation technologies. The agent was tested in several distant geographical areas with different geoclimatic conditions for its mosquitocidal efficacy, shelf-life, etc. and was found to be fit for an efficient mosquito control operation in those areas. Thus, an indigenous bio-friendly mosquito control agent was developed. Further, the efficacy of this agent was tested independently by other national and international agencies and certified to be highly effective.

Based on these facts a few Indian entrepreneurs came forward to commercialize this product and take it to the public. But, to their dismay, they lost their money. While they struggled to obtain the Central Insecticide Board (CIB) registration, their greatest block was the approval of their product by the National Vector Borne Diseases Control Programme (NVBDCP), another body under the Ministry of Health and Family Welfare. This organization has approved a product imported from Russia, and turned down the product developed by Indian scientists. The reasons given for not approving the indigenous product by NVBDCP have been changing during successive years at the meetings of the Technical Advisory Committee that came out with the recommendations leading to blocking of the indigenous product from marketing. It is to be noted that this product has met all the requirements necessary for obtaining the clearance by the CIB, an apex body which gives approval for use of insecticides in the country. NVBDCP has been successfully blocking the sale of indigenous products because of reasons best known to the health officials of State and Central agencies, including the highest level of health authorities of the country. It appears that all this is to protect the interests of one firm, Biotech International Ltd, New Delhi. This company has been doggedly pursuing the prevention of not only indigenous products, but also other products of similar type, including those of multinational giants such as Sumitomo, let alone the small Indian investors.

It is thus one government organization with the responsibility of public health sabotaging the efforts of another government research organization committed to taking indigenous research to the health of the nation. If this is the fate of an indigenously developed technology by an institute of national importance, the fate of those technologies that are developed at lesser known institutions will end up on papers. When there is a lot of public outcry about public-funded research not reaching the common man, an indigenous product with immense use in combating NTDs is struggling to survive.

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