Human population: The next millennia

Joel Cohen's article, 'Human population: The next half century' stimulates us to remind others of the possibilities of future home-building technology[1]. The world's population is now ~6000 million, twice what it was during 1964 when John Heaver Fremlin (1913–95) speculated on the ultimate technical limits to human population growth[2]. Cohen forecasts a world average human population density of ~66 persons per square kilometre for 2050, while Fremlin concluded that it could someday reach ~120 persons per square metre. The entire human population will be housed at that time in a 2000-storey building covering the entire surface of the planet. As a consequence, the earth will give-off an entirely anthropogenic radiation signature owing to the encasement of all human civilization. Fremlin subdivided the future of humanity into five main epochs: (i) 400,000 million persons in 260 years; (ii) 3 million million in 370 years; (iii) 15 million million in 450 years; (iv) 1000 million million in 680 years and 12,000 million million 800 years, and (v) 60,000 million million in 890 years. The fifth stage indicates that finiteness of the earth, its humans-only carrying capacity, guarantees that a red-hot ceiling on ultimate human population increases could exist, no matter how much macro-engineering ingenuity is wielded by our wily descendents. Evidentially, Fremlin was stimulated to devise his machine for (only) human living by a 1957 science-fiction novelette. *Build-up*, penned by James Graham Ballard[3].

The thermodynamics of an evanescent maximum human population on earth was recently examined mathematically[4] because Fremlin never seems to have published his own; merely generalizations he derived from them. The maximum human population allowed by the natural earth ranges from 300 million million to 1700 million million and will not exceed 1300 million million if an average ambient temperature of 300 K is accepted. A further increase of population can be forced if the earth is macroengineered, i.e. when a demi-global heat pump driven by solar energy is used to evacuate heat from human living space towards that part of the earth simultaneously acting as a radiator. Then, the maximum world human population ranges between 1600 and 4000 million million for various technological scenarios detailed in the quoted report. The final total (4000 million million) is a full order of magnitude lower than Fremlin's 1964 scenario for a stage five human civilization.

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2. Fremlin, J. H., *New Sci.*, 1964, **24**, 285–287.
3. Cathcart, R. B., *J. Geosci. Educ.*, 2002, **50**, 176–181.
4. Badescu, V. and Cathcart, R. B., *Int. J. Global Energy Issues*, 2006, **25**, 129–140.

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Where is environmental science going in India?

In recent times, industrialization and urbanization have had a strong impact on the environment and all its biotic and abiotic components. Development and pollution have a positive relationship, and may affect the life of human beings, livestock, property, historical buildings, etc. The natural ecosystem may be disturbed due to these anthropogenic activities, and both are essential in the present context. So, it should be necessary to develop and implement various techniques related to pollution control and abatement, with the help of environmental science. Every person should learn about the environment, which may be possible by dispersing the knowledge of environmental science among the public.

Such a beginning has been made by M. C. Mehta, advocate, Supreme Court (SC) in India as well as the SAARC countries. Mehta wishes to make the subject, environmental science, compulsory for every student at school, college and university levels in India, according to the SC. Because during development, a country may not consider the adverse impact of any particular activity on the environment. However, after becoming a developed country, it gives priority to environmental conservation and safety, at a time when much of the environment is polluted. Today, sustainable development is the voice of the era[1]. Thus development should run hand in hand, incorporating pollution abatement and minimization at the same time. So also, in a developing country like India, environmental awareness is essential for all its citizens[2,3].

Nowadays, environmental science is a compulsory subject in most Indian universities, educational institutes, schools, etc. However, in some cases, there are no suitable experts/specialists or teachers of environmental science which makes one ponder what is going on with environmental science and awareness about our environment? Are Indian people really serious about the environment?

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2. Sharma, P. D., *Ecology and Environment*, Rastogi Publication, Meerut, 2002, pp. 660.
3. Kamboj, N., *Environmental Studies*, Pratibha Prakashan, Dehra Dun, 2005, pp. 210.

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