

## Reduced urban consumerism and enhanced rural bio-enterprises for food, water and climatic security

Rampant urbanization covers 28% of the Indian population<sup>1</sup>. Growing urbanization and consumerism in South Asia are already feared to soon surpass greenhouse gas (GHG) emissions of many developed nations due to high population, though low on per capita basis<sup>2,3</sup>. About 3–4 years ago it was argued by developed countries that the Asian brown cloud resulted from increased Indian industrial emissions, though Indian scientists contested it by showing that such haze occurred regularly elsewhere also<sup>4</sup>. As carbon emissions are responsible for about 80% of the global warming and climate change, carbon sequestration is promoted as a mitigation measure, including afforestation<sup>5</sup>, even in urban and peri-urban areas. We attempt here to depict trends of urban carbon emissions, their driving factors and consequences. Besides data from literature, stakeholder consultations at Pune city have also been used to identify various response options and sketch future scenarios. Pune city ranks the 8th largest market amongst 745 towns in the country with population exceeding 50,000 each<sup>6</sup>.

Pune city with its 2.5 million population and 1 million vehicles, emits an estimated over 100 t of air pollutants per day<sup>7</sup>. Among the three largest cities in the country with over 10 million population, Kolkata and Mumbai have efficient public transport in the form of metro railway and emit 300 and 600 t each respectively<sup>8</sup>. New Delhi, the metropolis emitted 1300 t pollutants per day, before the metro rail service commenced recently. Vehicular pollution constitutes 30, 52 and 64% of the total pollution in these cities. Among the vehicular fleet, 80% vehicles are private, 65% being petrol-driven two-wheelers and 15% being four-wheelers, often petrol-driven, which contribute to over 50% of the urban carbon emissions<sup>8</sup>. The number of two-wheelers has grown by nearly six times and that of four-wheelers by three times during the last 10 years, due to government sops to industry such as tax concessions, besides easy consumer loans from manufacturers and banks, and the false cultural prestige infused by publicity.

Fuel efficiency can be enhanced by 10–30%, including techniques such as catalytic converter and cleaner fuels such as gas, alcohol and biodiesel, while per capita

emissions can be reduced by 85–90% using public transport<sup>9</sup>. Electric cars are touted as ‘emission-free’ by neglecting the carbon emissions at the thermal power plants and 40% transmission and distribution losses<sup>10</sup>. Solar or hybrid vehicles may be cleaner during operation, if not during production and disposal. However, both solar and the much hyped hydrogen fuel mode may not be significant before 2025. Multi-modal Metro Transport System that involves combination of railway and bus vehicles is planned to develop in most cities by 2015, which may reduce some emissions, if found widely accessible and fast. Altogether, carbon emissions (50% of total pollution) may more than double from 50 t at present to 100 t by 2015, largely due to growth in fossil-fuel-driven private vehicles. Sequestration of about 35,000 t of carbon would require 14,000 ha, i.e. 140 km<sup>2</sup> of tree plantation, as 5–10 year-old tree plantations grow about 5 t per year, of which about 50% is atmospheric carbon sequestration<sup>11</sup>. However, this amounts to almost 22% of the present urban area of 700 km<sup>2</sup>, which is untenable since so much vacant land does not exist. Tree plantation areas such as avenues and gardens with fully grown tree canopy comprise about 10% in Pune city<sup>12</sup>, but are not net carbon sequesters as they emit carbon through litter fall and decomposition. Urbanization has wiped out 50% of tree canopy in the last 50 years.

India emits about 700 mt of carbon annually, given its consumption of 500 mt of oil equivalent of fossil fuels as commercial energy and 200 mt of biomass energy<sup>1,10</sup>. Sequestering this emission would need 300 m ha of afforestation, which is almost 90% of the Indian land area, and clearly untenable. Thus reducing emissions at source is inevitable. About 50% of the commercial energy is used by the industry, 24% for transport, and 12% for commercial purpose, irrigation being less than 10%. Over 80% of the energy is consumed by 10% of the population that is rich and resides in cities. This includes direct consumption through luxury appliances such as commuting vehicles, refrigerator, television, fan, air cooler, computer, etc. which is hardly 10%. Indirect emissions are ten times or more, for example, cement and steel manufacture accounts for 50%

of the emissions<sup>1</sup> and another 25% is through transport, say of minerals to factories or transport of rice from Andhra Pradesh to Kerala, as Kerala has converted its paddy fields to commercial crops such as betel nut. Thus, of the 500 mt of annual carbon emissions, at least 50% could be attributed to ten mega-cities, who consume or even export much of these commercial commodities. Nearly 56% of national travel demand in the country is concentrated in just four metropolises<sup>8</sup>! This implies 550 mt per 50 million citizens, and a staggering 5 t per capita annually, seven times the national average of 0.7 mt! The urban rich emit much more per capita for luxury. The indirect annual carbon emissions of 10–100 mt per city (in the rural catchment) are 100 times the visible urban emissions of 0.1–1 mt.

Climate change could reduce<sup>1</sup> food production up to 15–42% by 2050, which may compel food imports, under the ‘virtual water’ economic policy, leading to economic slavery, even if not political, as is happening with the poor South American and African nations. Non-productive urban fancies of IT, BT and outsourcing are highways for globalized monoculture and epidemics. Food-production growth has retarded<sup>13</sup> as soil nutrients are washed down the urban drainage to sea, but not returned to the farms. Already, 20–30% of irrigated farmlands has been sold to the industries for commercial floriculture, etc. or are eroded and saline. Canal water is wasted and groundwater is mostly exhausted due to overuse of bore wells. Thus, any climate change would spell disaster, as evident from the drought during the last four years, which triggered the industry and the government to attempt ‘cloud seeding’ for artificial rains, ignoring the ‘precautionary’ principle, and with potential climatic disturbance. As the irrigation and drainage system remained wasteful, the techno-commercial experiment failed. The last two years were the warmest in 100 years, Himalayan apple production declined massively due to unprecedented cold wave, with Himalayan glaciers receding and coastal villages sinking.

Climate change is a global process and reducing Indian emissions alone will not suffice. However, India can be proactive in reducing urban consumerism, with the help of supportive developed country ini-

tiatives<sup>14</sup>. India has led the world in legislating to share commercial benefits with traditional resource and knowledge providers, with the Biological Diversity Act, 2002. Local biodiversity registers and funds therein can be used to promote biodiversity-based handicraft enterprises of organic food, herbal healthcare, handloom textiles, biogas and biodiesel<sup>15</sup>. This can productively revolve around micro-finance of the women self-help groups, using eco-technology (local resources and traditional skills) as a tool of supply-side management. Besides meeting the subsistence village needs, excess produce can be sold to nearby cities, to avoid bio-cultural pollution from both centralized industrial production and faraway transport. Such near-surface recycling of carbon will maintain village stake and control over eco-culture. India's plant production<sup>16</sup> is annually about 2000 mt, 50% of it being carbon recycling. India's culturable wastelands measure over 50 mha<sup>1</sup>, which can absorb about 125 mt of carbon annually, i.e. 20% of the present emissions, permissible for sustainable development.

Such a 'bio-regional' approach is recommended by the International Convention on Biological Diversity, 1992. The recent electoral defeat of the techno-commercialized National Democratic Alliance reflects public refusal of the export-oriented economic growth statistics using manipulated and misleading Western indices such as Gross Domestic Product and forex reserves, that hide failures on the social equity and well being, evident from the growing hunger, water scarcity and unemployment. In an increasingly uncertain climate, safety and stability lie in diversifying each state or even taluka<sup>17</sup> or panchayat to be self-sufficient in food, water and healthcare. This will enhance long-term savings sustainably rather than short-term and inequitable economic growth ('earn and spend' mania). The Government can earn from luxury, energy-intensive goods and industries through heavy 'carbon tax' as wise demand-side management. Further, agro-based jobs need to be created both by replacing mechanization of farming and creating local value-addition opportunities, as proposed in the recent 'Common Minimum Programme' of the United Progress-

sive Alliance government<sup>18</sup>. This can also de-congest the swelling cities by retrenching much of the stagnant industrial and service sector labour that comprises 40% of the urban population<sup>1</sup>. Cities are already bogged down with crime, violence and suicides, besides an unhealthy society with 20% obese over-consumers, and 23% people who go to bed hungry. Cities cannot infinitely grow parasitising on villages, encroaching on their land, food, water and ploughing back only toxic wastes in to the air, water and soil. Such rural bio-cultural poisoning may only enhance unsustainably by reducing rural self-reliance under the proposed 'Providing Urban Amenities to Rural Areas' plan<sup>19</sup>. Urbanized Greek<sup>14</sup> or Indus valley<sup>20</sup> Civilization did not last long, after agrarian failure due to soil degradation and climate change.

1. Parikh, K. and Radhakrishna, R., *India Development Report*, Oxford University Press, New Delhi, 2002.
2. Wu, J. and Overton, C., *Bull. Ecol. Soc. Am.*, 2002, **83**, 189–194; [http://www.public.asu.edu/~jingle/Asian\\_ecology/Asian\\_Ecology\\_Web.pdf](http://www.public.asu.edu/~jingle/Asian_ecology/Asian_Ecology_Web.pdf).
3. Agarwal, A. and Narain, S., *Global Warming in an Unequal World*, Centre for Science and Environment, New Delhi, 1991.
4. Srinivasan, J. and Gadgil, S., *Curr. Sci.*, 2002, **83**, 586–588.
5. Pandey, D. N., *Curr. Sci.*, 2002, **83**, 593–602.
6. Saran, R., *India Today*, 2004, vol. XXIX, pp. 58–62.
7. Anon, Environmental status report of Pune city: 2001–02, Pune Municipal Corporation, 2002.
8. Agarwal, A., Sharma, A. and Roychowdhari, A., *Slow Murder: The Deadly Story of Vehicular Pollution of India*, Centre for Science and Environment, New Delhi, 1996.
9. Nanjundaiah, M., *Curr. Sci.*, 1998, **75**, 804–811.
10. Anon, *Energy: Enviroscope*, Centre for Environmental Education, Ahmedabad, India and World Resource Institute, Washington, USA, Oxford & IBH, New Delhi, 2000.
11. Ravindranath, N., Somashekhar, B. and Gadgil, M., *Climate Change*, 1997, **35**, 297–320.
12. Kulkarni, M., Dighe, S., Sawant, A., Oswal, P., Sahasrabudhe, K. and Patwardhan, A., In *Tropical Ecosystems –*

*Structure, Diversity and Human Welfare* (eds Uma Shaanker, R., Ganeshaiyah, K. N. and Bawa, K.), Oxford University Press, New Delhi, 2001, pp. 693–695.

13. Swaminathan, M. S. (ed.), *Hunger Atlas of India*. M.S. Swaminathan Research Foundation, Chennai, 2003.
14. Edward, G., The great U-turn: de-industrialize the society, 2000; <http://www.edward-goldsmith.com/key18.html>.
15. Anon, National biodiversity strategy and action plan, India. Kalpavriksha, Pune and Ministry of Environment and Forests, New Delhi, 2003; <http://www.sdnf.delhi.nic.in/nbsap>.
16. Jagdish, K. S., *Energy Sustain. Dev.*, 2003, 28–34.
17. Rajvanshi, A., *Curr. Sci.*, 2002, **82**, 632–637.
18. Anon, Text of the Common Minimum Programme of the United Progressive Alliance, 2004, <http://politics.allindiansite.com/cmp.html>.
19. Kalam, A. P. J. and Rajan, Y. S., *India 2020: A Vision for the New Millennium*, Penguin Books, New Delhi, 1998.
20. Gadgil, M. and Guha, R., *This Fissured Land: An Ecological History of India*, Oxford University Press, New Delhi, 1992.

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