Chapter 15

Development and sustainability: conflicts and congruence

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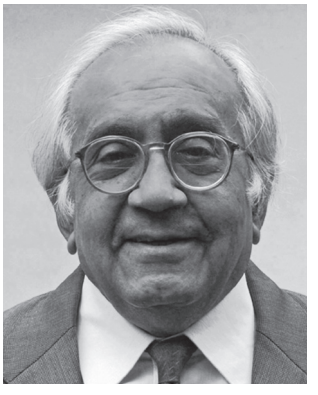

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Note: This chapter is a commentary on chapter 14.

Nitin Desai has described clearly the development challenge that the world faces. The extent of global poverty, ill health, illiteracy and ill-being is such that one cannot question the need for development. As Mahatma Gandhi said, even God would not dare to appear before a hungry person in any form other than food.

The threat to sustainability arises mainly from the unsustainable consumption patterns of the rich. In a paper prepared for the Secretariat of the UN Conference on Sustainable Development at Rio in 1992, Parikh *et al.* (1991) pointed out that the bulk of global resource use was by the people living in developed countries (Annex I countries[1]), who constituted 25% of the global population but consumed more than 70% of most resources (see Tables 1 and 2). Even their consumption of cereals accounted for nearly half of the total global consumption. One would have thought that the human stomach has a limited capacity and food consumption would saturate, but if we count as human consumption the grain consumed by the cow that becomes the hamburger, then food consumption keeps growing with income. Figure 1 shows that while direct consumption of food in terms of calories per person saturates, total use of cereals including for animal feed continues to increase in line with income.

The share of global resource use by developing countries has increased over the years compared to the data in Table 1 as poorer nations aspire to the consumption patterns of the rich. This is clearly seen in Table 3 which provides more recent data on consumption. The disparity ratio of per-capita cereal consumption has changed little while the ratios for milk and meat consumption have been reduced, largely due to economic growth in China and India. In spite of larger populations in developing countries, in 2007 the developed countries still consumed 39% of cereals, 50% of milk, 41% of meat, 40% of round wood, 74% of sawn wood and 71% of paper. The shares of fertilizer and cement use by developing countries have increased due to development of modern intensive agriculture and infrastructure.

Table 4 shows data for primary energy consumption and carbon dioxide emissions in 2005. It shows that disparity ratios of per-capita consumption have come down compared to Table 2 but the developed countries still consume 63% of total primary energy in the world and produce 59% of global carbon dioxide emissions.

Globalization and the communication and information revolution have made people all over the world aware of the lifestyle of the rich. The rapidly growing economies of an increasing number of countries are bringing such consumption within the reach of an ever increasing number of people. Preaching to them to forego goods they have long strived for (to not own cars, to live in small crowded

[1] Annex I countries are industrialized countries and economies in transition that have signed the United Nations Framework Convention on Climate Change (UNFCCC, 1992).

Table 1. *Consumption patterns for selected commodities in 1987: distribution among developed and developing countries. (Source:* Parikh *et al.,* 1991)

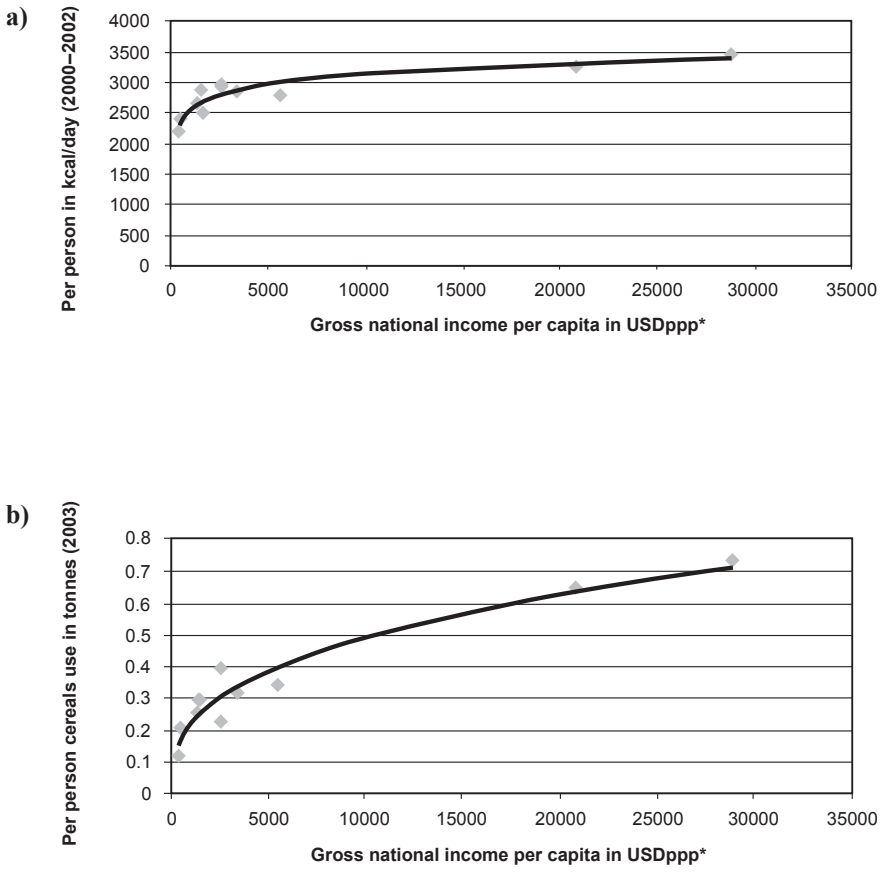
Category	Products	World total (Mt or Mm^3)*	Share of developed countries (%)	Per capita (kg or litre)**		Disparity ratio of per-capita consumption	
				Developed	Developing	Developed/ developing	USA/ India
a) Food	Cereals	1801	48	717	247	3	6
	Milk	533	72	320	39	8	4
	Meat	114	64	61	11	6	52
b) Forestry	Round wood	2410	46	888	339	3	6
	Sawn wood	338	78	213	19	11	18
	Paper, etc.	224	81	148	11	14	115
c) Industry	Fertilizers	141	60	70	15	5	6
	Cement	1036	52	451	130	3	7

* Mt = million tonnes for food and industry, Mm^3 = million cubic metres for forestry, ** kg = kilograms for food and industry; litres for forestry

Table 2. *Patterns of primary energy consumption and related carbon dioxide emissions in 1987.* (*Source:* Parikh *et al.,* 1991)

Item	World total (Mt)	Share of developed countries (%)	Per capita (kg)		Disparity ratio of per-capita consumption	
			Developed	Developing	Developed/ developing	USA/ India
Primary energy consumption (OE*):						
Solid	2309	66	1278	199	6	14
Liquid	2745	75	1720	175	10	61
Gas	1611	85	1147	61	19	227
Total	**7009**	**75**	**4376**	**453**	**10**	**35**
Emissions (CO_2):						
Total emissions	20 984	70	12.5	1.5	8	27
Solid	8848	64	4.8	0.7	6	14
Liquid	8085	70	4.8	0.7	8	54
Gas	3326	82	2.2	0.1	21	228

* Oil equivalent



* purchasing power parity

Fig 1. a) Daily per capita food calorie intake (2000–2002) and b) annual cereals use including for animal feed (2003) as a function of per-capita income. Grey diamonds: data points; black lines: fitted trends. (*Source:* FAO, 2005)

homes, to eat only vegetarian food, etc.), is unlikely to be effective. The greatest challenge facing a world of rapidly developing nations is to convince those people who have become prosperous to consume in a sustainable manner. The conflict here is essentially between development and sustainability.

Population growth on its own does stress the climate. However, the proximate cause is our unsustainable consumption patterns. A global population of six billion emitting greenhouse gases (GHGs) at the average level of US citizens would produce as many as 120 billion tonnes of carbon dioxide. On the other hand, 12 billion people emitting at the rate of the average Indian citizen would produce only 12 billion tonnes of carbon dioxide, well within the Earth's absorptive capacity (see

Table 3. *Consumption patterns for selected commodities in recent years: distribution among developed and developing countries.* (*Sources:* FAO, 2005; Population Reference Bureau, 2007; cement data: http://www.indexmundi.com/minerals/?product=cement&graph=production)

Category	Products	World total (Mt or Mm3)*	Share (%)		Per capita (kg or litre)**		Disparity ratio of per-capita consumption	
			Developed	Developing	Developed	Developing	Developed/ developing	USA/ India
a) Food	Cereals (2007/08)	2 126	39	61	678	240	3	6
	Milk (2007)	677	50	50	279	62	5	3
	Meat (2008)	278	41	59	93	30	3	21
b) Forestry	Round wood (2003)	3 346	40	60	1 112	393	3	5
	Sawn wood (2003)	401	74	26	249	20	12	38
	Paper, etc. (2003)	328	71	29	193	19	10	68
c) Industry	Fertilizers (2002)	142	35	65	41	18	2	4
	Cement (2005)	2 310	23	77	349	357	1	3

* Mt: million tonnes for food and industry, Mm^3: million cubic metres for forestry
** kg: kilograms for food and industry, litres for forestry

Table 4). This is not to argue that the world's population should live like Indian citizens do, but rather to emphasize the importance of consumption patterns. Once we recognize that the poor also aspire to the lifestyle of the rich, it is clear that population growth needs to be contained as much as possible as a larger population will ultimately put greater stress on the Earth's resources.

While most religions preach contentment and restraint, current levels of greed and consumption do not suggest that they have succeeded in modifying the behaviour of most people. There are unfortunately few who follow Mahatma Gandhi, who practised *aparigraha* (i.e., not taking anything more than what one needs). Even when at a river, Gandhi did not use a drop of water more than he needed.

Technological development can reduce the need for resources. However, an attitude of conservation and lifestyle changes can also be very important. Using mass transport wherever possible, walking or cycling for short distances, cutting

Table 4. *Patterns of primary energy consumption and related carbon dioxide emissions in 2005.* (*Source:* EIA, 2005)

Item	World total (Mt)	Share (%)		Per capita (kg)		Disparity ratio of per-capita consumption	
		Developed	Developing	Developed	Developing	Developed/ developing	USA/India
Primary energy consumption (OE*)							
Solid	3087	46	54	935	335	3	10
Liquid	4269	64	36	1812	306	6	33
Gas	2706	74	26	1323	141	9	65
Total	11647	63	37	4860	860	6	24
Emissions (CO_2)							
Total emission	28051	59	41	10.9	2.3	5	20
Solid	11378	46	54	3.5	1.2	3	10
Liquid	10996	63	37	4.6	0.8	6	33
Gas	5666	74	26	2.8	0.3	9	66

* Oil equivalent

consumption of meat, reducing waste, and recycling can be very effective in reducing resource use.

Yet, we cannot preach *aparigraha* to the nearly 300 million people who live below the poverty line in India. In 2007 half of India's children were underweight (moderate to severe undernutrition) or stunted. About 30 % of all adults had a BMI (Body Mass Index) under 18.5, which defines adult malnutrition (Planning Commission, 2008).

If the world is to be socially and politically sustainable, we must deal with poverty and deprivation. Sustainability requires economic development until a sufficient level of wealth is achieved. The poor often depend on natural resources for food, fodder and fuel. As populations grow use of these resources often exceeds their natural regenerative capacity. Natural resources thus become depleted and resource use becomes unsustainable. Development can help arrest such degradation by providing alternatives and by improving the productivity of such resources.

India needs to grow rapidly for a number of years if it is to eradicate poverty and offer its people a satisfactory standard of living. Only rapid and sustainable growth can generate the resources needed to provide the social and physical infrastructure for education, health services, clean water, sanitation, transport and energy. Only a rapidly developing economy can create adequate opportunities for gainful employment for all of India's people. However, India, like most tropical countries, is likely

to face increasing constraints due to global climate change, restricting the attainment of its short- and long-term development goals.

The Government of India has restructured policies to achieve a new vision based on faster, more broad-based and inclusive growth. The key goal is to reduce poverty rapidly and focus on bridging the various divides that continue to affect our society. Inclusive growth is needed for social and political sustainability. India's need and right to develop cannot be denied. India recognizes that development requires an efficient energy sector. To ensure that development is sustainable India will eventually need to make a transition to a largely renewable energy system. Yet it must be accepted that India's emissions will grow and that the required share of the global environmental space must be provided.

An even greater challenge lies in resolving conflict around the use of common global resources. The industrialized countries have emitted two thirds of all cumulated GHG emissions. Table 5 shows the cumulative carbon dioxide emissions from 1950–2005 and 2000–2005. The share of emissions produced by Annex I countries was around 56% in 2000–2005. Over these six years Annex I countries have emitted 85 458 million tonnes of carbon dioxide ($MtCO_2$) compared to India's emissions of 6614 $MtCO_2$. India's emissions were 1020 $MtCO_2$ in 2000 and 1222 $MtCO_2$ in 2005, indicating a growth rate of 3.7% per year. Even with an emissions growth rate of 5% per year the sum total of India's emissions over 30 years from 2006–2035 would be less than what Annex I countries have emitted between 2000 and 2005.

The developed countries, which have occupied a disproportionate share of the environmental space, have a special responsibility not only to compensate the poor on whom they have inflicted heavy adaptation burdens but also to reduce their resource consumption as soon as possible. While adaptation can reduce the burden of climate change it cannot completely eliminate it, nor is it cost-free. A person living in a coastal area adapts when the sea level rises by moving. That saves his life but not his property. In fact, by migrating he may impose cost on others. By delaying action, the rich are occupying more of the global space at the expense of the poor (Parikh and Parikh, 1998). For example, the annual carbon dioxide emissions of the USA alone have increased between 1990 and 2005 by about as much as India's total annual emissions. The USA today emits five times as much as India (see Fig. 2).

The right to the global atmospheric carbon space does not belong to the initial occupiers. Unlike land, which can be fenced, global space cannot be fenced. There is no way to prevent developing countries from emitting GHGs except through a mutually acceptable global contract. This will require that industrialized countries reduce their emissions and make space for developing countries. All countries have a stake in achieving sustainability.

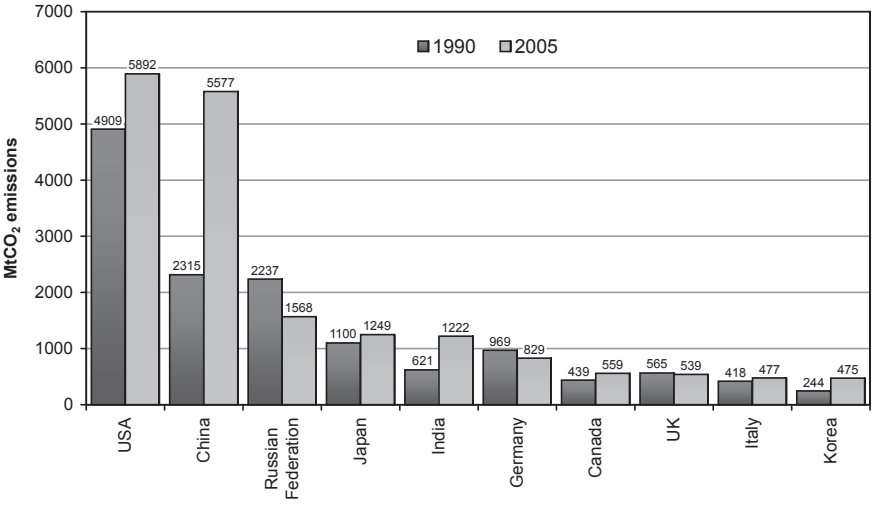


Fig. 2. Annual carbon dioxide emissions from fuel combustion of selected countries in 1990 and 2005. (*Source:* Parikh, 2007)

It is clear that India has not contributed to the threat of climate change and is not responsible for it. India's cumulative emissions over the period 1950–2005 constitute less than 2% of global emissions (see Table 5) and are well within any reasonable share of the global environment's absorptive capacity. Even the rich in India emit less carbon dioxide per capita than the average of developed countries. The per-capita emissions of the richest 10% of India's urban population, which constitutes only 3% of India's total population, was less than 4 tonnes in 2003 (see Table 6), compared with the US average of 19.9 tonnes and the European Union average of 8.5 tonnes. However we should mention that the rich in India would like to consume more but are unable to do so due to lack of infrastructure such as motorways.

India is extremely vulnerable to climate change. As a responsible nation India has taken the initiative to stimulate action on climate change. Prime Minister Manmohan Singh stated at the Heiligendamm G8+5 Conference (Government of India, 2008) that

> 'We are determined that India's per-capita GHG emissions are not going to exceed those of developed countries even while pursuing policies of development and economic growth. […] We must work together to find pragmatic, practical solutions, which are for the benefit of entire humankind'.

Table 5. *Cumulative carbon dioxide emissions from fuel combustion excluding emissions from land use changes.* (*Source:* WRI, 2009)

		Annex I countries	G 77 + China	China	India	Brazil
1950–2005	$MtCO_2$	875 158	518 989	130 067	22 581	69 723
	% of world total	66.8	33.2	10.5	1.8	5.6
2000–2005	$MtCO_2$	85 458	56 333	25 285	6 614	2 023
	% of world total	56	37	17	4	1

The implications of this are worth noting. It implies a huge commitment. If global warming is to be limited to less than 2 °C, this requires the stabilization of GHG concentrations at 450 ppm (parts per million) carbon dioxide equivalents. This, in turn, will require an 80–90 % reduction of emissions in industrialized countries by 2050. Thus, their per-capita emissions would need to be lowered to around 2.5 tonnes of carbon dioxide per year. Given the implementation of ambitious energy efficiency measures and promotion of renewables, India will reach this level of per-capita emission by 2030. Given current growth projection and presently available technologies India runs a risk of exceeding this level by 2050 and thus it will have to take steps to curtail its emissions. The ball, nevertheless, is indisputably in the court of the industrialized countries. The more they reduce their emissions, the lower a limit India will accept on its emissions. India should no longer be used as an excuse by industrialized countries for delaying mitigation action.

An effective agreement on mitigation at a global level is needed and we hope that Copenhagen will produce it. The agreement will have to be based on the principles of equity and differentiated responsibility.

It is sometimes argued that, even though per-capita emissions of India and other non-Annex I countries are low, India's industries compete on the world market and so we should have sectoral standards for emissions. There are many difficulties in implementing sectoral standards. First, we need to decide what should be compared: carbon dioxide per tonne of product, carbon dioxide per dollar value of output, or carbon dioxide per unit value added? Should we take sectoral averages or only consider new capacity? Should we account for the specific circumstances of a country such as ambient air temperature, which affects the fuel efficiency of a machine or a plant? If a country has a relatively large carbon dioxide emissions quota this is part of that country's comparative advantage, just like skilled labour, large capital stock or technological knowledge. Sectoral standards thus contradict the very basis of free trade.

The principle of equal per-capita emissions, at least in the long-run, has been widely accepted. The acceptance of this principle and the immediate allocation of

Table 6. *India's per-capita carbon dioxide emissions of 2003 by expenditure class.*(*Source:* calculated by the author using the Social Accounting Matrix of India for 2003–4 based on emissions from direct consumption of energy as well as indirect emissions embodied in consumption items)

Expenditure class	Poorest	2	3	4	Richest
Rural populations					
(millions)	75	150	293	150	75
(% of total)	7	15	29	15	7
Carbon dioxide emissions					
(tonnes/person)	0.1	0.2	0.3	0.6	1.2
Urban populations					
(millions)	29	57	114	57	29
(% of total)	3	6	11	6	3
Carbon dioxide emissions					
(tonnes/person)	0.3	0.5	0.8	1.5	4.0

tradable emission quotas on a per-capita basis would indeed be fruitful. Not only would it bring about a desired emission reduction, it would also stimulate technology development, reduce the costs of technology, increase incentives to rationalize GHG emission in all countries, and ensure equitability across nations.

Instead of allocating *annual* emission quotas it may be more rational to allocate global environmental space. For example, to ensure stabilization at 450 ppm carbon dioxide equivalents we should estimate the total GHG emissions from 1990–2050 or till 2100 that can be emitted in terms of 'tonne years' of emissions, taking into account how many years the emissions occupy the space. Quotas should be allocated on a per-capita basis in a tradable way. Alternatively, a rent could be charged from all users for every tonne year' of space occupied. This rent could then be distributed on a per-capita basis to all citizens of the world in inverse proportion to their per-capita income and per-capita emissions. This is like a carbon tax levied on a country's cumulative emissions from 1990 onwards.

In addition to mitigation, a further major challenge is posed by the burden of adaptation. Adaptation can help mitigate some adverse impact of climate change. However, adaptation in the form of migration out of submerged areas to urban areas can – as Nitin Desai points out – threaten sustainability. A rise in sea level, changes in the hydrological regime, salination ingress, coastal submergence and resulting migration further aggravate the problems already created by rapid urbanization.

Congestion already causes huge traffic jams in Indian cities leading to wasteful burning of fossil fuels and air pollution. A large proportion of India's population

lives in slums without adequate sewerage facilities. Less than half the effluent from Indian cities is treated before it is discharged into lakes, rivers and oceans. Limited resources make it almost impossible to develop water, sanitation and transport infrastructure in pace with rapid urbanization. Mass migration induced by climate change would be catastrophic. We must find ways to deal with these problems. Mass transport systems must be built in large cities. Anticipating the need for them in smaller cities, long-term transport plans should be developed and rights of way for future mass transport corridors should be acquired now. Private builders and developers must be required to provide proper water and sewerage infrastructure. These, however, cannot be maintained without appropriate user charges.

While the ill-effects of urbanization on air and water quality are all too visible, one should not forget the impact it can have on rural areas. Rural-urban migration relieves the pressure on agricultural land. Farmers who stay behind can have more land to till. Pressure on rural commons for fuel may decrease and some regeneration can take place. On the other hand, more intensive cultivation can also have negative consequences for environmental sustainability. Sustainable urbanization will have to accompany sustainable agriculture.

Viewed from a long-term perspective, in order to sustain consumption at acceptable levels we must develop technologies using renewable resources. New technologies have to be sustainable and that requires multi-disciplinary approaches and involvement of engineers, scientists, ecologists and social scientists, as rightly emphasized by Nitin Desai. The challenge is to develop these technologies and adapt them before we cause irreversible damage to the Earth's biosphere. This will require that such technologies are shared among all as global public goods. 'Public reasoning' at a global level is called for, as suggested by Amartya Sen.

However, technologies, while critical, are by themselves not enough. Lifestyles will also have to be modified. Attitudes to consumption will have to change. As the Indian sages have advised, *'Ten Tyakten Bhunjithah'* ('you must give something up in order to enjoy it'). The rich in developed and developing countries alike will have to set examples of sustainable lifestyles for the poor to emulate. The sooner this happens the better is the chance of avoiding catastrophic climate change.

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