A Subaltern View of Climate Change

DUNU ROY

In the context of the ongoing debate on climate change and the policies that nation states need to adopt to limit the accumulation of greenhouse gases in the atmosphere, the author poses a relevant question: instead of asking what would happen to the world if everyone were to consume energy at the level of the rich "developed" American, we can now enquire why everyone is not consuming at the level of the above-poor "developing" Indian? He also suggests that the way the poor adapt, migrate and progress provides not just a sustainable approach to climate change but also one that addresses resource use.

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Dunu Roy (*qadeeroy@gmail.com*) is with the Hazards Centre, Delhi; he is a chemical engineer by training, social scientist by compulsion, and political ecologist by choice.

Climate change takes place when the carbon cycle is disturbed. One can address this imbalance either by using more efficient technologies, or by changing the exploitative nature of development. A worldwide analysis shows that it is possible to achieve quality of life indicators at low levels of energy consumption. India's per capita emissions are three times lower than the world average, but what reduces India's average is the very low energy use of the bottom seven deciles of the population. Therefore, theoretically, global climate change would be mitigated if everyone on the planet adapted to consume energy at the level of the working Indian. Microstudies from Delhi, Visakhapatnam, Jaipur, Allahabad and Kolkata illustrate that at a practical level the poor are demonstrating the "best practice" for mitigating and adapting to climate change. And if resource restoration by the poor through their labour is taken into account, then the difference would be even higher.

The Carbon Dioxide Cycle

Climate change, as is well known by now, is a result of the release of greenhouse gases (GHG) into the atmosphere, which act as a kind of a blanket around the earth and do not allow the heat to escape, so that the planet begins to warm up. Most of these gases have been released because of human activity in the last two-and-a-half centuries. These gases largely come from the burning of the coal and oil that were formed in the Carboniferous (producing/containing carbon) period in the earth's geological history (part of the Paleozoic era which, in turn, is part of the present Phanerozoic eon)[1] out of the massive growth in vegetation in the wet and humid tropics of that time. This period extended for roughly 60 million years (from 359 million to 299 million years ago) when the Gondwana supercontinent (of which India is a part) was drifting from the south to the north, and the dying plants were slowly buried under layers of silt, eventually forming coal under extreme pressures and temperatures (National Geographic 2014). Oil also formed under similar conditions from billions of marine organisms. Since it is unlikely that this will happen again soon, coal and oil are referred to as "non-renewable" sources.

The growth of these forests required the transfer of carbon from the air into the vegetation hence they removed enormous amounts of carbon dioxide (CO_2) from the atmosphere, leading to a release of oxygen (O_2) back into the air. Thus the atmospheric CO_2 reduced hugely from 5,500 ppm (parts per million by volume) in the Ordovician period (about 500 million years ago) to about 400 ppm by the end of the Carboniferous period, while the atmospheric O_2 levels correspondingly rose to around 35% (as compared with 21% today). However, a little later in the Mesozoic era (about 251 million years ago), it is believed that—as the earth's plates kept drifting apart and the cracks between them allowed hot magma to come to the surface—volcanic activity under the oceans once again released CO_2 into the atmosphere. It took until the end of the Cretaceous period (about 66 million years ago) for the levels to come down to 680 ppm as the growth of different life forms once again fixed the carbon into their systems. Thus, CO_2 continued to decline to 280 ppm until the beginning of the industrial revolution (Royer 2006) roughly three centuries ago.

During the Industrial Revolution from 1760 onwards there was a dramatic change to machine production, new technologies for manufacturing, and the increasing use of energy. There was also the change from wood and other renewable biofuels to non-renewable oil and coal. A conservative 2013 estimate by a leading petroleum firm is that the proven coal, oil and gas reserves all over the world will last us around 113, 53 and 55 years, respectively, at current rates of production[2] (British Petroleum

2014). In other words, all the carbon fixed into these reserves over a period of 60 million years is likely to be released into the atmosphere within a short span of less than 400 years. It is this extremely rapid release of something that was accumulated over a very long period that is responsible for violently upsetting the natural cycle of the earth and is one of the key ingredients of unsustainability.

Breaking the Cycle

Logically, therefore, there are two ways of approaching this problem of how to bring the cycle back to some sort of balance. One could either try to reduce the requirement of energy and, therefore, the change from solid or liquid carbon to the gas CO_2; or one could extract more from this conversion while finding other sources of energy. The first way would require that the use of energy is reduced drastically and lifestyles changed. The second would mean trying to get more energy out of the nonrenewable sources, finding faster methods of refixing carbon, and developing renewable sources of energy. Obviously, this is quite a complicated business and there are many suggestions that have come from a variety of thinkers and researchers on the subject. The Corner House in the United Kingdom (UK) (Lohmann et al 2013) has come out with an excellent collection of such proposals at the global, regional and local levels (Table 1).

The editors have pointed out from this data that:

- Different proposals are organised around different questions and audiences.
- They rely on different ideas of how energy is and has been used in society.
- They follow different political theories and processes.
- They have different understandings of the relationship between the local and the global.

Trying to show a way towards making an alternative discussion possible, they say that the question "What's your alternative?" must itself be questioned, because the word energy means different things to different people. They describe a struggle over mining and energy as largely a struggle over how words such as "nature" and "plurinationality" are to be translated and that "bureaucracies are accustomed to being able to sidestep dialogue simply by assuming that indigenous or peasant thinkers mean the same thing by 'energy' that they do" (p 73).

Two Perspectives

Thus Table 1 indicates that there are broadly two different sets of responses to the crisis, and these responses may have much to do with the size of the nation as well as its place in the ladder of "development." The first (Col 1 in Table 1), mainly for the larger more "developed" nations or unions, calls for a system of global governance that would try to cooperate to use energy more efficiently and provide more equal access to new technologies. This also keeps in mind how the emerging economies have certain needs that can be met by the export of the new technology. A range of procedures with provisions for technological and financial assistance to use less carbon has been evolved. The challenges of differing national interests; issues of local, regional and global impacts of climate change; of data to take informed decisions; of the choice between growth and health; of rights to resources; and the need for cooperation in knowledge sharing have all been highlighted in international conferences.

Another response (Col 2 in Table 1), generally from the smaller nations where development is lagging, has been based on understanding the exploitative nature of development itself: questioning whether water and other natural materials should be considered as commodities; trying to focus on the life of the human being and not just of the nation; and taking into account the limitations of technology to solve social and environmental problems. These nations realise that using resources cannot continue at the same rate; that enormous military budgets are acceptable for political security and the protection of investments, but not for social welfare. If voices of resistance to this kind of exploitation are not heard, the resolution of conflicts is not possible, as private investment begins to take over the common resources; and climate change offers opportunities to make more disasters a profitable investment, helped along by a state slowly retreating from providing welfare. The question for such nations then becomes how to make decision-making more democratic and directed to serve the needs of the powerless.

India's Position

The Indian government seems to have followed the technological lead provided by the developed nations while pretending to be democratically developing. A good analysis of its policies has been recently provided by Dutta et al (2013) who find that the pursuit of the "neo-liberal model of economic growth has resulted in an alarming increase in…fossil fuel burning and deforestation" and yet the Indian government continues "to talk of substantial emission reductions" (p 116), mainly through the Clean Development Mechanism (CDM) and Renewable Energy Trading (RET) projects. These market mechanisms do not help to reduce the impacts of climate change because they

Table 1: Proposals by Different Countries to Address Mitigation

Technical Concerns	Sociopolitical Concerns
UK: 15% supply from renewables; cut demand by half; more efficient designs, and home heating	Denmark: wind power can supply half energy; undo politically driven reforms that destroyed wind energy
Germany: renewables to supply all demand at a lower cost; with carbon capture and nuclear fuels	Ecuador: processes for better health, agriculture, education, transport and less violence and alcoholism
EU: towns without population growth, cheap energy, efficient cars; renewable energy; less demand; energy tax	Thailand: local subsistence with rice, coconut, more pineapple, fisheries, tourism, renewables, no new power plants
US: growth with renewables; with less gas and GHG; higher efficiency; market forces will drive	Global: pay compensation for overuse; restructure to reduce energy demand, vehicles; decentralise generation, decarbonise supply, reclaim public sphere; simpler lifestyles, non-profit cooperatives, self-sufficient local economies; grow plantations, improve tillage
Global: replace fossil fuels by wind, water, sunlight, nuclear for all power using only 1% more land area; cut demand	

Source: Lohmann et al (2013).

only help developed nations to purchase the carbon credits. The authors argue that *all* technologies—whether renewable or not—begin to show increasing negative impacts when centralised and built at a large scale. Yet, in the name of democratisation, they continue to suggest a technological approach through watershed management, suitable crops, managing floods, and localised water storage.

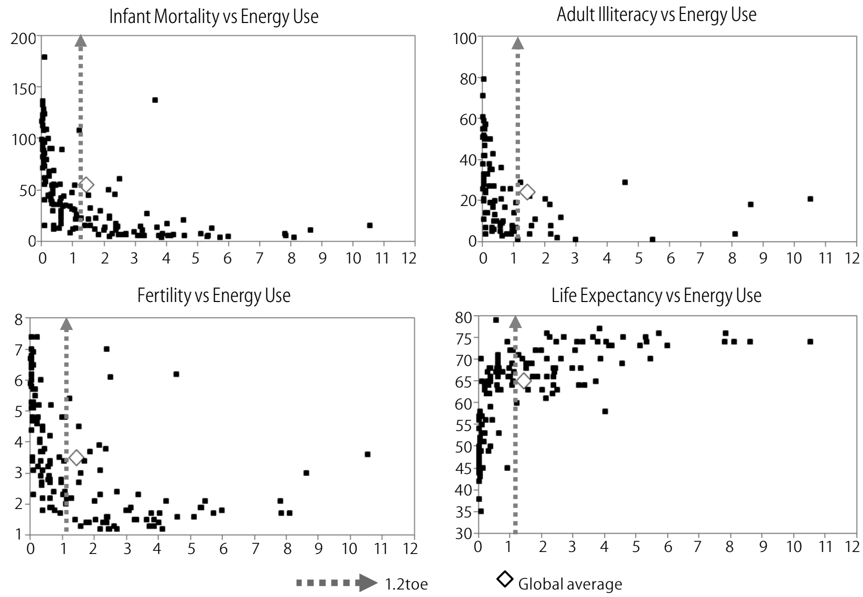
Jackson (2008), on one hand, shows that India is the fifth largest emitter of CO_2 in the world (Table 2), but its average per capita emission per annum (pa) amounts to only one tonne carbon dioxide (t_{CO2}), which places it far below the world average of 4.2 t_{CO2}. He cites a BBC interview to show that for an Indian middle-class household, earning around Rs 55,000 per month (pm), the carbon footprint is 2.7 t_{CO2}/capita; while in a lower (working) class household, earning Rs 7,500 pm, it is less than 0.5 t_{CO2}/capita. In contrast, the Intergovernmental Panel on Climate Change (IPCC) has estimated that the world needs to reduce emissions by 80% over 1990 levels by 2050. This would mean reducing the average annual carbon footprint to well under 1 t_{CO2}/capita. Jackson argues that to live within limits, a global population expected to reach nine billion by 2050 would *have* to change patterns of consumption. So the choice is between "selfishness" that can imprison, make lives poorer, and destroy the environment; and the "common good" so that "lives will be richer, more satisfying, and more fulfilling" (p 57) (note that the words "poor" and "rich"

Table 2: Population and Annual Carbon Dioxide Emissions, Selected Countries, 2004

Country/Region	Population (million)	CO_2 Emissions (million tonnes)	Emissions Per Person (tonnes of CO_2)
United States	294	5,815	19.8
China	1,303	4,762	3.7
Russia	144	1,553	10.8
Japan	128	1,271	10.0
India	1,080	1,103	1.0
Germany	83	839	10.2
United Kingdom	60	542	9.1
France	62	386	6.2
Bangladesh	139	35	0.3
European Union	386	3,317	8.6
World	6,352	26,930	4.2

Source: Jackson (2008) (based on IEA data).

Figure 1: Energy Use (t_{oe}/cap) and Infant Mortality (per 1,000 Births), Adult Illiteracy (%), Fertility (Births/Woman), and Life Expectancy (Years)



Source: Reddy (2004).

are not used in money terms). There has to be a new governance model for sustainable infrastructure, reliable public transport, recycling, energy efficiency, maintenance and repair, re-engineering and reuse. Social biases against these would have to be changed and institutions for regulation and control would have to be set up by government to reduce consumption. Jackson (2008), however, does not analyse the democratic politics necessary for this choice to be made.

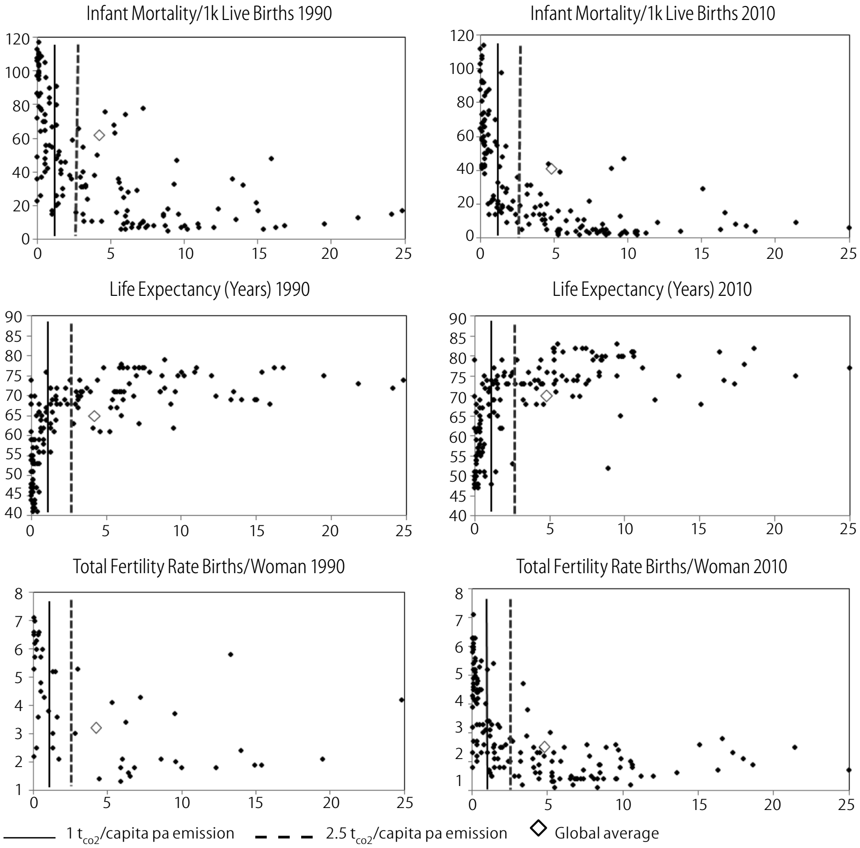
Democratising Decisions

What kind of energy consumption is required to make all human lives richer? Reddy (2004) plotted energy use against quality of life indicators using World Bank data from 1994 to 1995, and argued that "energy can also solve major global problems—particularly those related to poverty, women, population growth, urbanisation, and lifestyles" but for that "it is important to focus on the demand side of the energy system" (pp 40–41). His data shows that most development indicators—low infant mortality, high adult literacy, low fertility and high life expectancy—may be achieved with an annual energy consumption of 1.2 tonnes of oil equivalent (t_{oe}) (Figure 1)—equivalent to an average annual emission of 2.5 t_{CO2}/capita computed over 135 countries.

Following Reddy, we have plotted 1990 and 2008/2010 emissions data from World Bank (2012) for the same nations for three specific indicators of infant mortality, life expectancy and fertility rate (Figure 2, p 34).

What is fairly clear from the plots in Figure 2 is that while global average annual per capita emissions have increased from 4.2 t_{CO2} to 4.8 t_{CO2} between 1990 and 2008; infant mortality has declined from 62 to 41 per 1,000 live births, average life expectancy is up from 65 years to 70 years, and total fertility rate has decreased from 3.2 to 2.5 births per woman from 1990 to 2010. Surprisingly, El Salvador and Sri Lanka have achieved the 2010 averages (of infant mortality, life expectancy and fertility rate) within the IPCC 2050 target of annual per capita emission of 1 t_{CO2}; 13 other nations have also done so within 2.5 t_{CO2} (as suggested by Reddy's data given in Figure 1). Eleven nations have provided their citizens with a similar quality of life while remaining under the 2008 global average of 4.2 t_{CO2}; and nine nations have achieved two indicators while remaining within the above emission levels. Not one of these 35 countries (out of 135) is "developed," yet demonstrates that a better quality of life *is* possible at low energy use levels.[3]

Figure 2: Carbon Emissions (t_{CO2}/cap) vs Infant Mortality, Life Expectancy and Fertility Rate



Source: World Bank (2012).

Urbanisation and Mitigation

But "development" continues to have its own powerful defenders. The Global Commission on the Economy and Climate (GCEC 2014), a global partnership of research institutes, has recently published a report that echoes a central theme adopted by many research institutions and think tanks; that cities have a major role to play in mitigating climate change. The report was produced by a global commission of leaders from government, business and finance, advised by leading economists and supported by major international organisations, and shows that climate action can go hand-in-hand with strong economic growth. It recommends that in order to create better growth and a safer climate, action should focus on cities that generate around 80% of global economic output and around 70% of global energy use and energy-related GHG emissions. According to the report, compact and connected cities are demonstrating that they are economically healthier with lower emissions, as they have used the power of markets.

Many Indian policymakers also argue that development problems may be solved by moving people into the towns, so that growth will increase and the benefits "trickle down" to the masses. The Planning Commission says that India's urban population will go up from 377 million in 2011 to about 600 million in 2031. Even though there will be severe shortages, the commission wants a faster rate of job creation, self-employment, and supply of services in the towns to accommodate the growing population. The plan is to strengthen governance, planning, financing, capacity and innovation. One vehicle for this was the Jawaharlal Nehru National Urban Renewal Mission (JNNURM), launched in December 2005 for a period of seven years in 65 major cities, with the aid of a loan of $6.4 billion from the Asian Development Bank, along with a set of 23 reforms to make the schemes attractive to private investors.

However, the government's own assessments at the end of seven years show that the mission has failed in improving local governance or completing the infrastructure and housing projects, promoting participation and benefiting the poor, or implementing reforms to attract private investment. Even the Swarna Jayanti Shahari Rozgar Yojana (urban employment programme), covering about 4,000 towns, has barely been able to generate 123 million jobs in 15 years at an average cost of Rs 30,000 per job.[4] Yet, without analysing why the performance of JNNURM was so bad, the money was almost doubled by the previous government, and is now being fed into the "Smart Cities" project, even though analysts (even the most sceptical) know that urbanisation increases the per capita energy requirement.[5] At the same time, the government seems to agree with the World Bank's opinion that "poor people living in slums are at particularly high risk from the impacts of climate change and natural hazards" and will suffer the most.[6]

The 'Vulnerable' Poor

This vision, of the poor being the "most vulnerable," runs like a bleeding artery through most discussions on the impacts of climate change. Greenpeace (2007) conducted an extensive survey of 819 households scattered across various income classes in 12 cities and some rural areas, to assess their energy consumption and converted them into CO_2 emissions. They found that the weighted carbon footprint of the rich earning more than Rs 30,000 pm was less than the global average of 5 t_{CO2} but in *excess* of the sustainable global level of 2.5 t_{CO2} needed to limit global warming below 2°C.[7] In fact, the carbon footprint of the 151 million people earning more than Rs 8,000 pm was already exceeding sustainable levels. The only thing that kept the overall

Table 3: Annual Per Capita CO_2 Emissions for Different Income Classes

Monthly Income Class	Population (million)	Share of Global Emissions (%)	Per Capita Emissions (t_{CO2})	Weighted Per Capita Emissions (t_{CO2})
> 30K	9.96	0.15	1.494	4.97
15–30K	18.80	0.17	0.936	3.12
10–15K	53.24	0.43	0.827	2.75
8–10K	69.18	0.56	0.819	2.73
5–8K	155.73	1.05	0.685	2.28
Average	1,129.86	5.60	0.501	1.67
3–5K	390.80	1.79	0.465	1.55
<3K	432.16	1.43	0.335	1.11

Source: Greenpeace; Hiding behind the Poor.

annual per capita emission in India below 2.5 t_{CO2} was the very low energy consumption by 823 million poor earning less than Rs 5,000 pm and emitting less than 1.55 t_{CO2} (Table 3, p 34), in a nation where the official average poverty line in urban India for a family in 2004 was Rs 2,262 pm.[8]

These figures are much higher than those cited by Jackson but we shall place greater value on them as Jackson was depending upon single-household data provided by a BBC team, even though there are obvious problems of multiplying by a weightage of 3.3 across all classes. Based on their data, Greenpeace comment that:

> Being unable to afford any better, the poor are forced to settle in marginal or highly vulnerable areas...With climate change... poor populations are going to be pushed further to, or even over, the edge. The poor lack the resources, and are unaided when it comes to governmental support, to adapt to rising temperatures. Infrastructure like shelters and sea walls to protect poor people from extreme weather events and sea level do not get funding. Economic constraints render the poor incapable of securing their future. The poor's subsistence is dictated by their daily challenges and they don't have the luxury or the facilities to prepare for future risks and to adapt.

A Subaltern View

Let us take another look at the energy consumption figures cited by Greenpeace for electricity, cooking and transport for different income classes (Table 4). Cooking energy does not vary much across classes, but electricity consumption can increase fivefold and transport costs go up sevenfold as incomes increase—hence the weightage of 3.3 is not without bias. It is also clear that the income classes earning less than Rs 8,000 pm are consuming energy within the global sustainable limit of 2.5 t_{CO2}. So, for those earning more than Rs 30,000 pm to also become sustainable they would have to have to halve their total emissions, while the poor earning less than Rs 5,000 pm could almost double their emission load. Specifically, on electricity, cooking and transport the rich would have to cut down by 59%, 0% and 64%, and the poor could increase by 125%, 41% and 158%, respectively, to remain within the boundaries of sustainability. Instead of asking what would happen to the world if everyone were to consume energy at the level of the rich "developed" American, we can now enquire why everyone is not consuming at the level of the above-poor "developing" Indian (or the average El Salvadorian or Sri Lankan).

Table 4: Annual Per Capita CO_2 Emissions in Kg of Different Income Groups for Different Uses

Use Function	Different Income Groups (Rs Per Month)							
	<3k	3 – 5k	5 – 8k	8 – 10k	10 – 15k	15 – 30k	30k+	All
Electricity	198	279	445	549	521	646	1,091	326
Cooking	97	130	137	147	124	131	120	105
Transport	40	56	103	131	174	159	284	70
Total	335	465	685	819	827	936	1,494	501

Source: Greenpeace; Hiding behind the Poor.

The above data suggests that the above-poverty-level Indian earning between Rs 5,000 and Rs 8,000 pm is actually a "best practice" model, along with a possible lifestyle improvement of 40%–150% for the classes whom Greenpeace defines as poor! This, of course, is sustainability only as defined within the framework of climate change, to prevent the planet from tipping over a 2°C increase. The poor, thus, may not be the "most vulnerable" although they do not have access to good land, potable water, healthcare, appropriate services, adequate credit and other resources. But will further impoverishment because of climate change really tip them over the edge? Are they really incapable of securing their still sustainable future with their own knowledge? And if they were to wrest sufficient resources from a reluctant state to improve their access to energy double-fold, would their potential to survive disasters remain at a "low" level? We shall cite here some of the data that has been collected in urban areas to make a case for this interpretation of the working poor—as being extraordinarily adaptable in adversity and as the best practitioners of climate change mitigation.

Delhi's Labour

Researchers of the Hazards Centre (2010, 2011) collected data in Delhi about resource use by 300 families belonging to different income groups, broadly termed as high income (>Rs 30,000 pm), middle income (Rs 10,000–Rs 30,000 pm), and low income (<Rs 10,000 pm) groups (HIG, MIG and LIG), primarily based on the type of house they lived in. They then applied that data to a base survey of 2,800 households carried out in 2008. Of the 100 litres per capita per day (lpcd) water available in the city, the HIG used more than 120 lpcd (as high as 550 lpcd in elite areas), the MIG used 55 lpcd, while the LIG received only 26 lpcd (Figure 3). This also shows how the water is polluted, as 80% flows into sewers and is responsible for wider impacts. The 20% rich are clearly responsible for this. If everyone were to consume as little as the poor, the sources of water would be protected. The energy required for treating the source of water and transporting it over long distances, would also be reduced. In effect, there is enough water for everybody provided it is distributed equally and limits are imposed on high consumption.

Figure 3: Water Consumed by Different Class Families in Delhi

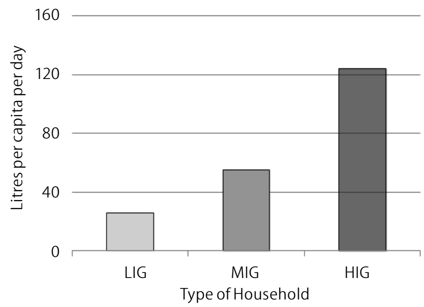
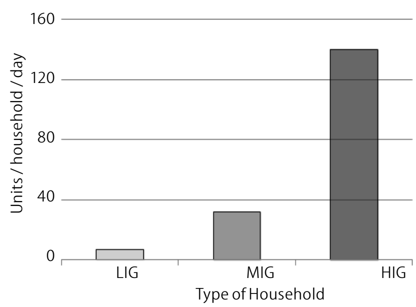


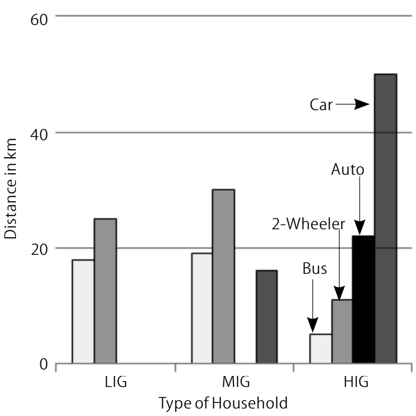
Figure 4: Electricity Consumed by Different Class Families in Delhi



Domestic energy use follows a similar pattern (Figure 4). The surveys revealed that the HIG was consuming 140 units/household/day (uhd) of electricity as compared to seven uhd by the LIG, while an average 30 uhd was available from current energy supply. Increasing the supply by either importing energy from far away or setting up new power plants in the capital city, in order to meet the rising demand from the wealthy, would obviously affect the quantity of non-renewable fuels burnt (since three-fourth of India's energy is generated in coal-burning plants) and the related impacts on land, water and air. It would also leave little energy for consumption by other classes, particularly when global temperatures rise. But if the distribution system is geared towards meeting the needs of the poor and providing a minimum 15 uhd to each family, while higher consumers are also charged at higher rates on a sliding scale, then that could reduce impacts dramatically while leaving aside sufficient energy for multiple other uses.

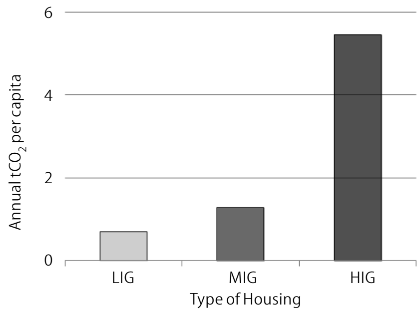
The use of different modes of transport has its inevitable consequences as the HIG tend to use energy-intensive cars for long-distance travel and autorickshaws for short distances; while the MIG and LIG both use buses and two-wheelers, the difference being that the MIG also uses cars for short distances while the LIG tend to use cycles or to walk (Figure 5).

Figure 5: Distance Travelled by Different Modes and Class Families



A consolidated carbon footprint of different classes for electricity, transport, and cooking was also computed (Figure 6) illustrating that the annual per capita energy use of the HIG is more than eight times that of the LIG (compared to 2.5 times in the Greenpeace study, Table 3). It should be remembered here that the discussion so far has only been about resource "use." If resource "restoration" (that is, renewing the material for further use and extracting the CO_2 from the air and fixing it back into hydrocarbons), as is practised by the working poor (in numerous occupations like waste-picking, gardening, animal husbandry, child rearing, etc), is taken into account then the difference would be much higher.

Figure 6: Carbon Footprint of Different Class Families in Delhi



The above discussion on the unsustainable use of natural resources that completely disturbs natural cycles, accompanied by the degradation of resources, the social and environmental impacts that are borne by large populations, and the role of different social classes gives some idea of where sustainability manifests itself. The widely accepted view amongst policymakers that technology and finance can successfully mitigate the impacts of climate change is also called into question given that much "development" in the past has ridden on the back of such financial and technical transfers. In addition, the propaganda that the poor are going to be the "worst" victims is challenged by the data that shows that the working poor are actually the only ones who are living within the carrying capacity of the earth. Arguably, therefore, the best practice of sustainable resource use is demonstrated by the "vulnerable," poverty "stricken" masses of toiling people who have developed the capacity to survive under the "worst" possible conditions, while it is the high consumption addiction of the wealthy which has to be mitigated.

Visakhapatnam Housing

We now turn to the creative labour of urban workers in other cities to understand how that plays a role in mitigation of, and adaptation to, climate change, as revealed by other studies that have been carried out by other groups. The Greater Visakhapatnam Municipal Corporation (GVMC) in Visakhapatnam envisaged in 2005, under JNNURM, to provide 50,000 Domestic Units (DU) for the slum population at a total cost of Rs 500 crore—each DU would cost Rs 1,00,000. From 2005 to 2014, a total of 24,423 flats were approved in 12 multi-storied projects at a total cost of Rs 764 crore—in other words, the cost of each DU climbed to Rs 3,00,000. A study of this pattern of housing by the Association for Rural and Tribal Development (ARTD 2014) revealed that most of these flats had been constructed in the far outskirts of the city, with consequent adverse impacts resulting in lower incomes, loss of employment, rise in transportation expenses, poor quality of water, and increasing costs of health and education.

Hence, in 2013, when the settlement of Surya Tejanagar was to be resettled at a project cost of Rs 10.1 crore for 204 DUs (Rs 5,00,000 per DU), the residents were mobilised by ARTD to design their own housing. Ninety-five percent of the families had migrated to the city more than 15 years ago, and while some were working as drivers, carpenters, masons, plumbers and other skilled occupations, more than half were daily labourers. Their monthly incomes of Rs 5,000–Rs 8,000 placed them in the sustainable range as defined by the Greenpeace study. They commuted up to 10 km to get to work, the majority by bus and the rest cycling or walking. Most families proposed that if they were given legal tenure on 40 m² plots at the same location, they would be able to preserve past investments in homes, retain their livelihoods, and lower the cost of

Table 5: Cost Per DU under Different Plans in Visakhapatnam

Scheme	Year	No of DUs Planned	Investment in Rs Million	Investment per DU in Rs
First Municipal Plan	2005-06	50,000	5,000	1,00,000
Second Plan	2005-14	24,423	7,642	3,13,000
Third Plan	2012	240	113	4,72,000
Fourth Plan	2014	204	101	4,96,000
People's Plan	2014	196	10	51,000

improving services for low-rise houses than what was being proposed by the municipality. A comparison of the costs of the different plans is given in Table 5 (p 36) and shows that the poor are proposing the most optimum solution.

Jaipur Rapid Transit

In Jaipur, the Bus Rapid Transit System (BRTS) is being constructed to improve the public transport system, decrease dependence on private motorised transport modes, improve air quality, road congestion, and journey speeds. In Phase I of the project, 46.7 km length of corridor is being built at a cost of Rs 479.6 crore (a little over Rs 10 crore/km). This cost is half the Rs 20 crore/km generally required for dedicated corridors in a BRTS, as segregated space has not been set aside for cycles and pedestrians. The corridor of Phase I has been functional since 2010, and a survey was carried out by Labour Education and Development Society (LEDS 2014) on this corridor to study whether the project has met the needs of the people. The 95 respondents who were covered under the survey reported a change in the mode of transport (Table 6), but the use of low energy modes such as walking, cycling and rickshaw has reduced significantly, while commuting by bus and car has gone up!

Table 6: Mode of Travel of Respondents in Jaipur

Mode of Transport	Earlier	Present
Walking	4	1
Cycle	26	3
Cycle-rickshaw	9	2
Bus	17	37
Tempo	4	6
Auto	8	2
Chartered bus	1	2
Taxi	6	2
Two-wheeler	15	12
Car	3	11

The BRTS was expected to cater to the needs of the commuting public by shortening travel time and decreasing costs so that more and more people would voluntarily choose to travel by bus. However, most respondents reported that travel time has increased, as had travel distance and expenses on the daily commute. Respondents explain this puzzling aspect of the BRTS by pointing out that the corridor takes an indirect and longer route, bus tickets are expensive, and at times commuters may have to change buses. Yet they take the bus because of ease of travel and the non-availability of other options. The newly-laid carpet of the corridor also invites more private cars. Hence, commuters find it difficult to use non-motorised modes in heavier traffic. So respondents reporting increased space for pedestrians also felt that space for cycles has decreased. In addition, those respondents whose livelihoods were directly affected complained that the space for vendors and for labour markets had also decreased.

This Jaipur data is curiously different from a study conducted in May 2012 on the Delhi BRTS (Hazards Centre 2013)—which has segregated paths for cyclists and pedestrians—that clearly indicated that though the number of buses was less than 6%, they carried up to 66% commuters during peak hours. The study showed that the BRTS had been highly accessible for public transport and police records demonstrated that fatalities declined in the corridor. The air monitoring study indicated that the values of all parameters were considerably lower on the BRTS as compared to a parallel road. And interviews with all types of commuters—the majority were frequent travellers—revealed that 46% felt that travel time had decreased; 45% said pollution had gone down; 50% agreed that lack of lane discipline was a major issue; and 58% were happy that travel is safer. Almost 90% were in favour of continuing the BRTS—particularly 94% of bus users, 92% of pedestrians, and 86% of two-wheeler drivers. The Jaipur and Delhi comparison shows how the same BRTS may respond differently to the needs of working people because of a small change in design.

Allahabad Buses

The city of Allahabad has 5,00,000 registered vehicles but only 36 state transport buses, 226 private minibuses, 995 tempos, and a number of auto- and cycle-rickshaws as public transport. Under JNNURM, 150 buses were approved at a cost of Rs 28.7 crore to decrease the dependence on private motorised transport modes. A public company was formed in 2010 to operate these buses. In 2014, Vigyan Foundation (2014) carried out a survey to assess whether the project has helped meet the needs of the people. One hundred respondents were queried, of whom 54 lived in brick houses, although only 28 owned them, and 64 of the houses were less than 50 m² in size. Sixty were engaged in temporary work, 68 were skilled, 89 were employed in the unorganised sector and 52 earned less than Rs 5,000 pm. The majority travelled by bus, tempo or autorickshaw, although for shorter distances they walked, cycled or took a cycle-rickshaw. In other words, they belonged to that category of people who should have had the lowest carbon footprint in the city, and logically the bus system should have been designed to suit their needs.

However, assessing the new buses that had joined the fleet, 52 were of the opinion that there was no change in the travel time or cost, and some reported that the road is so bad that it does not make any difference what one travels by (Table 7). The biggest problem reported was that of unfixed/unregulated timings of the vehicles. While a few felt that public transport had improved and travel had become more comfortable; the overwhelming majority was

Table 7: Improvements in Public Transport in Allahabad

Question	Yes	No
Increase in no of buses	32	–
Travel has become comfortable	32	–
Improvement in public transport	32	–
Improvement in traffic signalling	–	84
Decrease in traffic congestion	0	100
Crossing a road has become easier	0	100
Decrease in traffic accidents	0	100
Increase in women's safety	0	100
Increase in pollution	84	–
Increase in number of cars	32	–
Has Space on the Road Increased for	**Yes**	**No**
Pedestrians	0	100
Cycle	0	100
Cars and private vehicles	100	0
Buses and public transport	100	0
Hawkers and vendors	64	36
Labour markets	44	36
Autorickshaw stands	44	36
Parking	100	0
Public conveniences and toilets	44	–

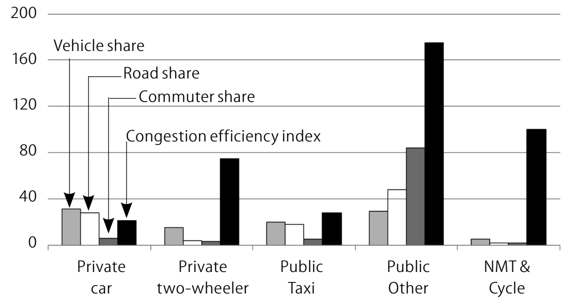
not satisfied with conditions of signalling, congestion, crossings, accidents, women's safety and pollution. In addition, for this class of users, the general perception seemed to be that there was no benefit for pedestrians and cyclists, although cars, parking, and buses had got more space. At the same time, hawkers and vendors, labour markets, autorickshaw stands, and public toilets had made marginal gains. This has to be seen in the context that almost all the respondents reported that the public transport system and the roads in the city have not been designed according to their requirements.

Kolkata's Ban

Kolkata has a long history of how transport corridors have been built to reduce congestion and, in the process, displaced the work and housing of the poor who have earlier occupied that space in a highly dense city. It is also the only large city in India where trips by cycle (11%) outnumber trips by cars (8%); there are more bicycles than either two- or four-wheelers; 50%–75% of informal sector commuter trips are accounted for by cycling or walking; and users include petty traders, suppliers, carpenters, masons, newspaper vendors, office clerks, milkmen and courier delivery boys. Official data shows that only 1.5% of road accidents occur due to the fault of cyclists against 71% due to faults of motor vehicle drivers; cars account for nearly 50% of the air pollution load; and the city's economy is reeling due to an increase in fuel costs. Yet, in 2013, the Kolkata police barred bicycles and all other non-motorised transport (NMT) vehicles on 174 thoroughfares, which includes almost all the major avenues in the centre of the city.

In response, the group Switch ON (2014) mobilised users of NMT and concerned citizens in Kolkata. Five hundred cyclists walked 1.5 km on the central avenue to where 5,000 citizens (including vendors, cart-pullers, rickshaw-pullers, and handicapped in wheelchairs) protested through folk song and street plays highlighting the loss of livelihoods. The media covered the campaign extensively. Switch ON also conducted a congestion survey at key points of the city. Pilot surveys were conducted between nine to 11 in the morning and 11.30 to 1.30 in the afternoon and it was found that there was not much difference in traffic congestion during these two periods. Switch ON researchers then selected five foot-bridges and five crossings where the ban was in force. Traffic counts were conducted at peak hours from nine in the morning to 1.30 in the afternoon, in 10-minute slots, with five-minute gaps in between. The data is shown in Figure 7 and indicates that:

Figure 7: Modal Shares at 10 Key Points in Kolkata (in %)



(a) Private cars and two-wheelers constitute 46% of the vehicles, occupy 32% of the road space, but carry only 9% of commuters.
(b) Public buses, minibuses, etc, are 29% of vehicles, occupy 48% of the road, and carry 84% of commuters.
(c) Comparatively, public taxis are 20% of all vehicles, occupy 18% of the road, but carry only 5% of vehicles.
(d) Non-motorised transport and cycles make up 5% of the vehicles, take up 2% of the road, and carry 2% of all commuters.
(e) Thus, in terms of congestion efficiency,[9] the buses score the highest, followed by NMT and two-wheelers, with taxis and cars coming at the bottom.

Hence, the ban in Kolkata is heavily loaded in favour of the vehicles causing the highest congestion as well as using the highest amount of energy and carrying the wealthiest sections of the population, while discriminating against those who are making the best use of all resources.

Conclusions

An examination of the carbon cycle shows that it took the sun's energy 60 million years to fix the carbon into solid or liquid forms, which human beings are likely to release into the atmosphere within a span of 400 years. It is this disturbance of the cycle that is responsible for climate change and "unsustainable" development. The larger "developed" nations appear to address this imbalance by using energy more efficiently with new technologies; but the smaller "developing" nations seem to better understand the exploitative nature of "development" itself. India's policies though, are mostly sectoral and adaptation has been pushed to the background while mitigation has focused on technology. Democratic decision-making to replace non-renewable sources and control consumption has not been promoted. What also emerges from a worldwide analysis of annual energy consumption is that at 1.2 to_e per capita (equivalent to an annual per capita emission of 2.5 t_{CO_2}), infant mortality, fertility, and illiteracy fall dramatically while life expectancy rises.

India has an average annual per capita emission of 1.67 t_{CO_2} compared to the world average of 5 t_{CO_2}, but a middle class household, earning less than Rs 30,000 pm, has a carbon footprint of 3.12 t_{CO_2} per person. What reduces India's average is the very low energy use of the population earning less than Rs 5,000 pm and emitting less than 1.55 t_{CO_2}. Most policymakers and analysts agree that if everyone in the world lived the way Americans do, annual global CO_2 emissions would be five times the current level by 2050, and that it is the poor who will suffer the most from the impacts of climate change. But should we not be asking what would happen to global climate if everyone were to consume energy at the level of the working Indian? What analysts do not perceive is that it is the power of the poor to use their own labour that provides the springboard from which they adapt, migrate, and progress in a manner that is not only sustainable from the view of climate change but also may be sustainable in terms of overall resource availability and regeneration.

Micro-studies from Delhi illustrate that the resource use of the rich leaves a carbon footprint more than eight times that of the poor. And if resource restoration by the poor through their works is taken into account, then the difference would be even higher. The demand by Visakhapatnam slum dwellers for tenure on 40 m^2 plots, as against the G+4 housing offered by the Municipal Corporation, would not only protect past investments but also significantly reduce the cost of services. The non-participatory design of the bus rapid transit project in Jaipur has reduced the use of non-motorised and non-polluting modes by the poor while commuting by car has gone up. In Allahabad, the poor agree that the public transport system and the roads in the city have not been designed according to their needs of livelihoods and mobility. And in Kolkata low-energy bicycles constitute one-twelfth the number of cars while providing more trips, yet non-motorised vehicles have been banned from most roads in the city for causing "congestion."

Thus, while the data clearly shows that the poor are demonstrating the best practice for mitigating and adapting to climate change, policymakers seem to have a perspective that differs aggressively from this subaltern view. As Miller and Sorrell (2013) have argued, the "most promising mitigation option is to weaken the link between economic growth and liquid fuel demand." Yet the vision of incessant growth continues to drive our society, without any consideration of the energy required to power this growth. GHG emissions, global warming, and climate change will, therefore, continue to haunt the earth as long as this vision persists. The curious thing is that the answer does not lie in a theoretical vision, but in the actual practice of the working poor— this is what needs to be grasped by those who wish to struggle for a better society. As Rosa Luxemburg said on the eve of her murder, "The masses are the crucial factor. They are the rock on which the ultimate victory of the revolution will be built" (1919).

NOTES

[Data for Figures 1 and 2 are given in the first Sheet (World Bank) of the attached Excel Sheet; for Figures 3 to 6 the data are in the second Sheet (Delhi); and for Figure 7 the data is provided in the third Sheet (Kolkata).]

1 The Phanerozoic Eon (meaning "visible life" which has been there for the last 541 million years) was preceded by three other Eons in the Earth's geologic history: the Proterozoic Eon (meaning "earlier life" and roughly 2,000 million years in duration), the Archean ("rock forming" period of about 1,400 million years), and Hadean ("lifeless" for over 1,500 million years from when the Earth was formed).

2 Could be less or more depending on exploitation rates and reserves found!

3 It should be noted that there is still no consensus on what constitutes a "sustainable" per capita t_{CO_2} emission level as different figures are computed depending on estimated fuel mixes, life styles, and population levels. So while IPCC's Working Group III on Mitigation suggests a maximum limit of 1.2 t_{CO_2} by 2100 (http://www.ipcc.ch/ipccreports/tar/wg3/index.php?idp=57, viewed on 15 January 2015), the UN suggests a target set by the Ecology and Development Foundation of 1.6 t_{CO_2} per employee by 2015 (http://sustainabledevelopment.un.org/index.php?page=view&type=1006&menu=1348&nr=475, viewed on 15 January 2015); and the Committee on Climate Change of the UK has accepted a level of 2 t_{CO_2} by 2050 (http://www.theccc.org.uk/tackling-climate-change/the-science-of-climate-change/setting-a-target-for-emission-reduction/, viewed on 15 January 2015).

4 See the Planning Commission's presentation on *Pace of Urbanization in India—Challenges and Strategies in the 12th Five Year Plan* (http://www.slideshare.net/PlanComIndia/urbanisation-in-india-12th-plan-2012–17, Viewed on 15 January 2015).

5 See Satherthwaite, D (2009): *Implications of Population Growth and Urbanization for Climate Change* (UNFPA) 14, viewed on 15 January 2015 (http://www.unfpa.org/sites/default/files/resource-pdf/Satterthwaite%20paper.pdf), who argues that urbanisation is not the driver of climate change but is driven by economic and political change.

6 This sentence is the first one in a study by the World Bank (2012): *Baker, J L Climate Change, Disaster Risk, and the Urban Poor*, which was supported by Cities Alliance and is approvingly cited on many other sites including that of the IPCC (http://www.ipcc-wg2.gov/njlite_download2.php?id=9885, viewed on 15 January 2015).

7 Energy use was assessed for electricity, cooking, and transport, and weighted values computed by multiplying by 3.3 to account for other uses, while accepting the 2030 target of 2.5 t_{CO_2} estimated by World Resources Institute.

8 The poverty wage for a family was computed by taking the all-India Poverty Line of Rs 538.60 per capita per month from the Planning Commission's Poverty Estimates (viewed on 15 January2015, http://planningcommission.gov.in/news/prmar07.pdf) and multiplying by the average family size of 4.2 in urban areas taken from the National Sample Survey Office's Note on Employment and Unemployment Situation in India (viewed on 15 January 2015, http://mospi.gov.in/NSS_Press_note_531_25may10. pdf).

9 The congestion efficiency is computed by dividing the commuter share by the road share.

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