

Climate Change in India: Forgotten Threats, Forgotten Opportunities

NEIL PADUKONE

India's growth-inclined position on climate change appears legitimate. But with the potential to radically alter India's economy, and reshape the human security terrain and even the geopolitical order of south Asia, climate change is an issue on which India has perhaps the greatest to lose. Despite the importance of economic growth, "rising India" and inclusive development are not mutually exclusive. Adaptation to inevitable environmental shifts is necessary; political adaptation – including unity amongst the estranged south Asian neighbours – is imperative to manage the political and security-oriented consequences of climate change.

For years, Indian climate negotiators have held steadfast to the notion that India needs to protect its growth.¹ At face value, this is certainly not unreasonable: western countries started industrialising earlier than others and historically contributed the vast majority of the greenhouse gases that are threatening the earth today. Developing countries like India, on the other hand, have only recently begun industrialising, and have contributed relatively little to the aggregate level of carbon emissions. Accordingly, countries like India should not have to sacrifice their present development for the global commons. Given differentiated responsibilities, any legitimate climate mitigation initiative should be just, equitable, and secure developing countries' growth patterns. To that end, India has held out on any compromises on emissions caps until a just agreement is met. This is a legitimate, ostensibly sensible aim. But given the anticipated consequences of climate change for India in particular, it is perhaps not an aim Delhi can afford.

Vulnerabilities

By virtue of demographics, topography and geography, India is ground zero for climate change. With over 1.13 billion people, India has the greatest population in the tropical, equatorial region in which it is located – far more than west Asia's 211 million, south-east Asia's 554 million, or even all of Africa's 922 million (United Nations 2009). India is also home to a third of the world's poor, the population that lives on less than one dollar a day, which constitutes over 40% of India's population (Shaohua and Ravallion 2008). The poor are the most vulnerable to the effects of climate change, having the least recourse from the status quo and minimal physical protection from environmental shifts. Most of India's poor live in rural areas that are directly dependent on climate-sensitive resources such as agriculture, forests, and river water. India's diversity of topography – mountains, rivers, forests, deserts, coastlines – means that climate change would affect different regions in different ways, and single across-the-board responses may not work.

A look at some of the anticipated scenarios for India will put these vulnerabilities in perspective. First, the economic costs of climate change for India are tremendous. Agriculture, which contributes nearly 30% of India's Gross Domestic Product (GDP) (The Energy and Resources Institute 2002), is reliant on seasonal rains, a fertile and non-saline coastline, and river-based irrigation – agricultural requirements that could be harmed by rising heat, rising sea levels, or river depletion, respectively. The Indian Agriculture Research Institute estimates that with every

The views expressed in this paper are the author's own.

Neil Padukone (neilpadukone@orfonline.org) is a visiting fellow at the Observer Research Foundation, New Delhi.

one degree Celsius rise in global temperature, India will lose four to five million tonnes in wheat production (Sharma 2008). “Even a 100 cm sea level rise can lead to coastal welfare loss of \$1,259 million”² (Roy et al 2006). Add to this migration, infrastructure strain, and damage from ecological disasters, and the costs increase.

Second, some of the more consequential effects of climate change will harm human security profoundly. Anomalous weather patterns such as floods, droughts, rising temperatures and heat waves, and river recession are among the environmental scenarios that already harm large numbers of Indians (Parikh 2009). To put this in perspective, India’s Ministry of Home Affairs’ (MHA) disaster management unit reported a countrywide death toll of 2,404 just from flooding in 2008 alone (Singh 2005). Tack on the deaths from droughts and heat waves, their longer-term effects – displacement, disease,³ human trafficking,⁴ and resource-based conflict – and their aggravation due to climate change, and the situation is even more grimmer.

These challenges can also threaten national security. With security scenarios, causal arguments – whether one thing causes another – are contentious.⁵ But causality is an issue that plagues all the sciences, whether physical or social, hindsight analysis or predictive: issues can become coated with preconceived biases and political purposes.⁶ So long as we are human, there is no way out of this. Regardless, it is hard to deny a correlation between resources and conflict: in this respect, the history of humanity, of conquest for territory, water, oil, and means of production, is a telling tale.

What climate change will undeniably do is cause or amplify events that hasten the reduction of resources. Competition over these diminishing resources would ensue in the form of political or even violent conflict. Resource-based conflicts have rarely been overt and are thus difficult to isolate. Instead they take on veneers that appear more politically palatable. Conflicts over resources like water are often cloaked in the guise of identity or ideology. Environmental, resource and climate issues serve as multipliers, if not igniters, of political conflict. As Vandana Shiva highlights in *The Violence of the Green Revolution*, insufficient distribution of water and agricultural profit contributed to the grievances that fuelled the Punjab insurgency of the 1980s (Shiva 2002).

Meanwhile, water is at the core of the Kashmir conflict between India and Pakistan. The Chenab, Sutlej, and Jhelum tributaries of the Indus River system flow from the mountains of the Himalayas, through Kashmir, and continue on to the Punjab provinces of both India and Pakistan. In Pakistan, what is left of the Punjabi river water flows on to Sindh, which has become dependent on this flow as groundwater aquifers have diminished in recent decades (Rehman 1998).

Water-sharing between Pakistani Punjab and Sindh has caused inter-province tension that is deflected onto the source of these rivers, namely Kashmir (Kalpakian 2004). Behind closed doors, many in the Pakistani government confess that the struggle over Kashmir is driven by concerns over water more than anything. Despite the resource-based impetus for conflict over Kashmir, it has become drenched in issues of politics and identity. As the

Strategic Foresight Group has written, “It is more convenient to support the Kashmiris for their cause than openly admit...that Kashmiri youth are being sacrificed to safeguard Pakistan’s lifeline” (Waslekar 2005).

These types of issues could only deteriorate in the wake of some anticipated climate change scenarios. To India’s east, climate change would raise both the temperature of the oceans and the amount of moisture that condenses in the atmosphere, increasing the magnitude and frequency of the typhoons, tropical cyclones and tidal bores to which Bangladesh seems prone. Meanwhile, rising sea levels in Bangladesh will physically reduce the amount of land in the country while salinating agricultural land.

The number of environmental refugees that would be forced – by concerns over food, land, employment, and meteorological disasters – to move further inland and into India would increase dramatically. Even with the relatively few Bangladeshis that have entered India so far (compared with prospective numbers), conflicts have arisen in India; the mere presence of Bangladeshis in India has become an explosive political issue (Swain 1996), while receding insurgencies in India’s north-east have resurged in response to migration from the Ganges delta states (Rahman 2008; Kumar 2009).

Environmental issues can contribute to resource stresses, migration, and conflict within India as well. A lack of development attention and various processes of globalisation – i e, the vulnerability of rural agriculture to global competition and displacement of traditional lifestyles – have put rural areas in a tight bind. These woes would be exacerbated further by climate pressures; environmental shifts can salinate, desiccate, flood, or otherwise render arable land unusable. In turn, competition over scarce land for farming or industrial projects would rise as well; rifts between Jharkhandi tribals and Arcelor-Mittal Steel (Basu 2008) or Essar Steel mineral extraction and adivasi farmers in Chhattisgarh (Srivastava 2008) may be just the tip of the iceberg. These rural tribulations, particularly when contrasted with booming opportunities in parts of cities, can lead to overt conflict against a seemingly negligent mainstream society, as has occurred in Naxal-affected regions of India (Chakravarti 2008).

These difficulties will also force struggling rural populations to cities en masse in search of respite. Migration increases population densities in cities, amplifying competition over the finite resources therein. Even today, distribution of water is biased, however informally, by caste, linguistic, and other identity-based divisions, turning trusting communities into hostile environments. As one Mumbai slum resident explains, “We north Indians are not allowed to draw water from these taps. These people claim that the water is meant only for Maharashtrians” (Sandeep 1998).

When insufficient infrastructure and other problems associated with chaotic urbanisation are compounded with identity-based grievances, the result can be a volatile, violent mix. Migration has already caused social tensions in urban areas; xenophobes have agitated against the perceived overpopulation of their cities by non-natives (Katzenstein 1973). Meanwhile,

those at the receiving end of urban inequities have been solicited by the Naxal movement, through the Communist Party of India (Maoist)'s "Urban Perspective Plan" (Chakravarti 2008; Ramana 2009).

On a larger scale, glaciers in the Tibetan Plateau – which extends as far south as Nepal, northern India and northern Pakistan – source of most of the rivers in Asia. These include the Indus, Ganges, and Brahmaputra river systems, which are the lifelines of the subcontinent, providing drinking water, irrigation, transportation, electricity, and livelihoods to most of the 1.5 billion people of south Asia.

Global temperatures are anticipated to rise by two to five degrees Celsius over the next half a century. The Tibetan plateau, long seen as a barometer of global climate conditions, is no exception. Zheng Guoguang of the China Meteorological Administration (CMA) says that "in Tibet, the (temperature has risen) an average 0.32 degrees Celsius every decade since...1961", compared with the national Chinese average of 0.05-0.08 degrees Celsius rise every 10 years.⁷ Even if current warming trends remain constant, the plateau's glaciers would be reduced by a third in 2050 and by half in 2090, according to a survey conducted by the Remote Sensing Department of the China Aero Geophysical Survey (*China Daily* 2006). As these glaciers melt, the rivers they source will experience massive flooding in the short-term and recede in the longer-term.

In Nepal, as the country generates hydroelectricity and irrigation, management of the Koshi, Gandaki and Karnali river systems and communication with India about their conditions will become a central issue; coordination with Nepal was vital in the Indian response to the north Indian floods of 2008. To the east, the Yarlung Tsangpo (Brahmaputra) River makes its way from southern Tibet, southward into Arunachal Pradesh and Assam, and finally ends in Bangladesh, where it merges with the Ganges. Sudden flooding or drought could complicate Indo-Nepali relations as well as the already tense political situations in the two Indian states, while causing domestic disturbances in disaster-torn Bangladesh that would cascade into India. Meanwhile, although the Indus Water Treaty between India and Pakistan has kept a relative peace over Kashmiri waters since 1960, a large shock to the Indus River may change the course of political events in India's north-west.

In China, control over Tibet and the glaciers and waters therein gives Beijing the power to use, divert or dam the rivers as it sees fit – whether to increase supply to their eastern provinces, to generate more electricity, or even as a punitive measure against south Asia. Even if Beijing simply fails to communicate incidents of concern – such as the bursting of dams that create artificial lakes in Tibet – Delhi may be caught off guard when the incidents strike India (Dharmadhikary 2008). These actions could cause abrupt flooding or drought, ravaging the water supplies on which the subcontinent depends, implicating south Asian geopolitics in the process. Given the inextricability of water with politics and the already tense disputes over its supply throughout the subcontinent, this is no insignificant matter. Climate change strengthens China's hand in south Asia. Any conflicts between China, India, and other south Asian nations in this realm could

make tensions over Arunachal Pradesh (Kawaguchi 2005) pale in comparison.

But while climate change will wreak havoc on countries like India, it is expected to have milder effects on industrialised countries and those in the northern hemisphere. Countries in Europe, north America, and northern Asia have more temperate climates that will be overwhelmed by warming only in the longer-term.⁸ Their bureaucratic and economic capacities enable them to adapt quickly to these sorts of challenges before they turn into large socio-economic problems. Accordingly, they have lesser short-term incentives for preventive action, while countries in the tropical belt suffer the immediate consequences.

There are important differences in how climate change affects even countries like China, whose position on development-versus-emission-reduction is similar to India's. The majority of the Chinese mainland is above the equator; it is not quite as vulnerable to rising temperatures as are countries in the tropical belt. Moreover, with the Tibetan Plateau under its control, China has far more autonomy over the way that climate change affects its populated eastern provinces. This adds a power dynamic to India's existing vulnerabilities: with Chinese control over the water sources in Tibet, south Asia may be beholden to Chinese actions.

Clearly the implications of and the imperatives for action on environmental disasters – which climate change is sure to exacerbate – are particularly urgent for India. It may seem alarmist to emphasise these doomsday scenarios. Securitising climate change – thinking of it as a security issue⁹ – only serves to expand our understanding of the potential challenges faced. But as Sudeep Chakravarti puts it, we tend to "privilege violence: nobody listens until a fire is lit" (Chakravarti 2008: 18). It would not be prudent to wait for those fires to ignite.

Waiting for Others

Despite these foreboding futures, India has emphasised the importance of development over climate action.¹⁰ What this comes down to in international negotiations is: "we won't act unless you developed countries act first".¹¹ As Joachim Spangenberg of the Sustainable Europe Research Institute says, this is like "threatening the west by saying 'if you shoot yourself in the foot, then we'll shoot ourselves in the chest' – southern countries like India are not speaking from a position of power" (Spangenberg 2009).

What about the actual efficacy of any global multilateral commitment? Let us say, hypothetically, that a mitigation plan on which there is across-the-board agreement emerges by 2011. By the time it is implemented, how many more greenhouse gases will be released into the atmosphere? According to *The Economist*, between Kyoto in 1997 and today, global carbon dioxide emissions have grown by 25% (*The Economist* 2009). From the increased hydrocarbons to 2011, how many climate change catastrophes would emerge in India? Moreover, enforcement of the agreement will be an issue. Who is to say that, once an agreement is reached, countries will follow through on them? If countries violate their caps or commitments, what is to stop them?

If individual countries are serious about responding to climate change, they will not wait for consensus and grand idealistic theories of justice as calamities unfold. When the United States obstructed movement over emissions reductions in 1997, Europe and Japan, for example, jumped on their own responses to climate change. They unilaterally imposed caps on their own carbon emissions – Europe has set stringent emissions standards on a number of industries while Japan declared that it would cut emissions by 50% by 2050 – and made plans to realise their goals by developing advanced technologies, transforming their industrial infrastructures, and reconfiguring their growth patterns. Because they started early, they will reap the long-term economic, political, and strategic benefits of proactivity (Yue 2009). India, in particular, cannot afford to wait any longer; it can learn from Europe and Japan's example and take some proactive steps in the right direction.

Mitigation: Smarter Development

Despite the importance of economic development, India can take some key steps towards “smarter” development that would contribute to its mitigation efforts. For starters, the call for global justice in climate change action is a bit disingenuous; the “equity and justice” that India seeks at the global level does not translate on the domestic level. India has pushed for an emphasis on per capita emissions in international climate negotiations,¹² citing India's per capita emissions rate of around 1.2 tonnes per year, compared with the global average of 4.22 tonnes (Agence France Press 2009). But as a recent Greenpeace report (Ananthapadmanabhan et al 2007) puts it, this push is just India “hiding behind the poor”.

One per cent of the country is camouflaged by the 823 million poor of the country who keep the overall per capita emissions below two tonnes of CO₂ per year...Even the richest income class, earning more than Rs 30,000 a month, produce slightly less than the global average CO₂ emissions of five tonnes.

Indian growth concerns centre almost exclusively on the upper socio-economic echelon of society. This is certainly the case in many countries, but the schism is particularly radical in India (Debroy and Bhandari 2007). If that were not the case, why does India have one of the best elite graduate education systems in the world, accessible to only the very best of the best – those with the greatest economic and educational opportunities – and one of the worst elementary education infrastructures?¹³ Why, in the period of 1993-94 to 2004-05, has the Gini coefficient that measures wealth inequality increased from 0.303 to 0.325 in the entire country, from 0.285 to 0.298 for rural areas, and from 0.343 to 0.378 for urban areas? (Topalova 2008) Why is “Shining India” still home to one third of the world's poor and 50% of its children under the age of six malnourished? (Gragnotati et al 2005)

India's business and political elite remain hung up on the “India as a rising power” discourse. Being taken seriously as a business-savvy global power has become the paramount goal. Accordingly, one tiny segment of urban life – of office buildings, malls, and cars – is made the central focus in order to brandish a specific national image. To that end, planners

design urban development models centred on the vectors of western consumerism: cars, plastic, malls, nice buildings. This may be comfortable for the people that have access to it, but it neglects a population that is largely excluded from the consumerist ideal.

Any growth that government officials seek is only supposed to trickle down to the poor, and it is this trickle down that is defended in international forums (Ghosh and Pal 2000; Johns 2009). Admittedly, trickle down in India is not negligible; the technology revolution has enabled even the poorest to engage in the financial sector; while more capital has brought about a rise in even informal sectors, the income of which often makes its way back to the villages that need it (Sengupta 2007). As a result, from the same period of 1993-94 to 2004-05, the incidence of poverty fell from 35.8% to 27.5% in the entire country, from 36.8% to 28% in rural areas, and from 32.8% to 25.8% in urban areas (Topalova 2008).

But is it worth mortgaging the country's ecological, political, economic and social future by adhering to a line on climate change that supports a consumerist model of growth for a few and trickle down to the rest? The growth that elevates GDP-at-any-cost to the level of the divine is not only anachronistic, but self-defeating. In a banal example given by Eric Zencey of Empire State College, “If you let the sun dry your clothes, the service is free and doesn't show up in domestic product; if you throw your laundry in the dryer, you burn fossil fuel, increase your carbon footprint, make the economy more unsustainable – and give GDP a bit of a bump” (Zencey 2009).

This GDP-centred development encourages even unnecessary consumption for a numerical output. In the extreme, India has been moving towards consumerist infrastructure in many parts of the country. Burgeoning social spaces are malls: temples of American suburban consumerism transplanted for Indian cities (Rao 2000). These malls and other consumer-centric infrastructure are connected by transportation infrastructures that are car-centric.

Since the economic development trajectory that was established in 1990, India has had an 88% increase in its CO₂ emissions (World Bank 2008). Such a rise is perhaps understandable, given certain requirements of development. But is this the trajectory of development that is so vital to “raise living standards”? Without drastic consequences for the environment, chaotic urbanisation, and internal security, this model is not sustainable, particularly as the same model is extended to a growing middle class.

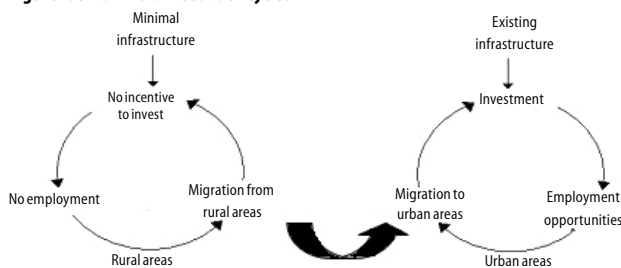
As India has “grown”, its cities and their populations have boomed while rural areas have been forgotten. Urban areas as a whole account for only 30% to 41% of total carbon emissions by conservative estimates (Dodman and Satterthwaite 2009). But the more India continues along its current course, the more urbanisation is projected to increase. Today about 30% of India lives in urban areas. By 2030 that number is anticipated to rise to 40.6% and by 2050, India's urban population is expected to overtake the proportion in rural areas (United Nations 2008). Considering that Indian cities consume more fossil fuels than rural areas even today, these urbanisation projections

would drive up emissions at an exponential rate (McKinsey & Company 2009).

One of the reasons for this large-scale urbanisation is a nationwide feedback loop linking development, migration, and employment opportunities. As the author has written (Padukone 2010),

In rural areas, economic opportunities are scant...This lack of development and infrastructure deters further investment in rural areas, a deficit that compels people to migrate to urban areas in search of employment. As there are fewer people in rural areas, there is even less of an incentive to invest in them, compelling still more people to migrate to cities. This has the end effect of keeping rural areas stagnant and underdeveloped while their residents emigrate. Alternately, in urban areas, economic opportunities and investment exist, compelling people to migrate to urban centres. A greater population, in turn, drives more investment in urban centres, continuing the cycle.

Figure 1: Urban-Rural Feedback Cycles



To disregard this bigger picture in which rural neglect compels urban explosion is to create a whole system that is unsustainable. Urbanisation itself is not, however, necessarily a bad environmental trend. As David Owen writes (Owen 2009),

[Most] urban families live more compactly, do less damage to fragile ecosystems, burn less fuel...and, most significantly, produce fewer children, since large families have less economic utility in densely settled areas than they do in marginal agricultural areas.

But existing infrastructures in Indian cities are not designed to maximise these environmental benefits.¹⁴ Public transport is relatively neglected, such that cars – which only the very rich or powerful can afford – are needed to get around quickly and comfortably. With existing models of urban development in India, motorised vehicle mobility and consumption of the fossil fuels that power it would skyrocket. In the past decade, figures from the Indian Ministry of Road Transport and Highways indicate that the motor vehicle population in India has grown at a rate of 10% per year (Singh 2005).

According to Geetam Tiwari, professor of transport planning at IIT Delhi, only 6% of Mumbaikars travel by car, while 7% travel by bicycle, and the remainder use other transportation modes (Jawed and Mundkur 2008).¹⁵ But most transportation infrastructure focuses on cars – just 6% of the population. The recent Bandra-Worli Sea Link is a case in point. A car-centric infrastructure makes alternative modes of transport (bicycles, trains, buses) less feasible and less desirable, making car ownership a greater necessity and higher ideal.

Rather than fixing problems of mobility, planners fix problems of motorisation – with a problem in traffic congestion, the solution is to ease traffic flow, making driving easier and cars more comfortable and more used: a case of Joven's paradox in which

increasing efficiency increases usage. As Tiwari argues (Jawed and Mundkur 2008), there is “latent demand” that will fill whatever infrastructures are provided;

If you want to improve speeds of cars, eventually you (get) more cars. Similarly, if we improve infrastructure for bicycles and walking, we should see more bicyclists. (Today, those who walk, bicycle, and use public transportation) are not using these modes by choice. These are the people who have no other choice... [But] as incomes improve and infrastructures become more hostile [to bicycles and walking], these people are going to move...to cars and two-wheelers.

It is largely an agent-structure problem: because structures (roads, transport, etc) are so car-centric, agents (people) need and want cars. Conversely, if comfortable, efficient, environmentally-friendly modes of transportation are provided, people will use them.

The greatest source of greenhouse gas emissions in Indian urban areas today is transportation, at nearly 96% by some estimates (Singh 2005).¹⁶ To be environmentally, economically, and logistically sustainable in the longer term, urban development must be more people-centric – focusing on bicycle, pedestrian, and efficient and comfortable mass transport infrastructure. Delhi is taking steps towards this with the burgeoning Bus Rapid Transit (BRT) system. And to this end, the Jawaharlal Nehru National Urban Renewal Mission (JNNURM), India's primary central urban modernisation initiative, is to be credited for its emphasis on public transit. But in places where large-scale transport infrastructure is not needed,¹⁷ the JNNURM or any of its subordinate bodies have not prioritised infrastructure for active, non-motorised modes of transport such as bicycles or walking (Aijaz 2009), even though these carbon-friendly modes are used by a majority of urban India.

“Sustainable development” has emerged in discussions on reconciling climate change with economic growth. Sustainable patterns of development and consumption will have closed-loop, self-regenerating processes of production that feed back into and renew themselves, rather than open-loop, linear ones in which finite resources are used without respect to renewal. India has two important advantages in the move towards sustainability. First, its status as a developing country gives it the freedom to chart its own course of urban development without the traps and path-dependencies of the west, while still learning from others' successes.

Second, India's diversity is often thought of as one of its most valuable resources. But economic diversity – namely, poor people – is a human capital resource that is often forgotten. If India truly seeks a sustainable development model, it must put greater emphasis on the poor – not for the sake of pity or even ethics or morality, but to learn from some of the world's most effective sustainable practices. Most sustainable practices in India are those that have emerged informally from those that need to be thrifty and sustainable – the poor.

One example of an informal, sustainable practice that has emerged from this value of thrift is the *kabaari* industry in Delhi, a closed-loop system of solid waste recycling. In the system, waste pickers sort through discarded waste to extract materials

that can be reused or resold. Meanwhile, itinerant collectors (known colloquially as the bicycle-based “*kabaarivala*”) buy old or broken materials from consumers. Both waste pickers and itinerant collectors sell their materials for a higher price to lower-level neighbourhood kabaari “hubs”, which then transfer the materials to “upper level kabaaris”. The upper-level kabaaris sort the materials for sale either to repair-persons, who resell their refurbished goods at kabaari bazaars, or to reprocessors, who

Figure 2: Closed-loop Cycle of Materials with Informal Kabaari System

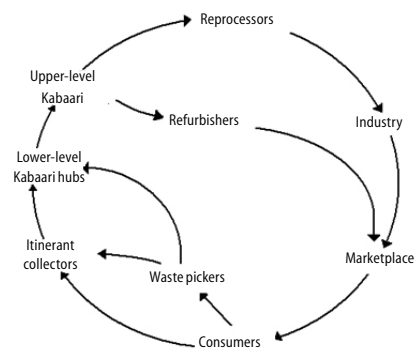


Figure 3: Linear Life Cycle of Materials without Kabaari System



way back into the hands of consumers; and the cycle continues (Chaturvedi 2009).

The informal kabaari industry is a sustainable, cyclical system:¹⁸ the material that is sold to the itinerant collectors (a broken laptop) returns to the market in a different, usable form (the copper wires in a radio that is sold at a kabaari bazaar). The industry reprocesses or reuses materials that would otherwise wind up in landfills, returning discarded materials to the market, effectively saving carbon space. The informal recycling sector in Delhi alone accounts for “greenhouse gas reductions of 9,62,133 tonnes of carbon dioxide each year” – over three times the reductions of the next largest formal sector recycling plant, the Timarpur RDF-WTE plant in Okhla, Delhi. “These savings are the same as removing roughly 1,75,000 passenger vehicles from the roads annually or providing electricity to about 1,30,000 (American) homes for one year” (Chintan 2009).¹⁹

Urban planning can take hints from these sorts of informal processes, with which India is replete. Smaller scale, informal entrepreneurs such as *kabaarivalas*, for example, can be integrated into formal solid waste management programmes. Models bridging formal and informal activity could be exported to other parts of the developing world, while creating business (i.e., reprocessed materials trade) that extends across international borders.

Inclusive development – accounting for rural areas, non-car transportation infrastructure, and the contributions of the poor – would accomplish India’s simultaneous aims of sustainable, equitable growth, poverty alleviation, and climate change mitigation, while enabling India to generate innovative practices and business from which even the west can learn.

Political Adaptation

Despite necessary alterations in growth patterns, environmental shifts are perhaps unavoidable. Out of necessity, India spends over 2.6% of its GDP on adapting to environmental events like flooding (Joshi 2009). The broader discussion on climate change adaptation focuses on technologies, whether geo-engineering to influence the earth’s temperature, climate-resistant agriculture or water management and production techniques. These are seminal, and agreements regarding their equitable sharing must be a central part of any international negotiation (Sanwal 2009).

But in south Asia, in particular, deficiencies in water and other resources may be inevitable. Accordingly, political, economic and security arrangements must occupy a central role in India’s adaptation plan. Pre-emptive water sharing treaties and joint resource management measures at the international, domestic, and local levels, and communication mechanisms to ensure coordinated actions are all vital. Domestically, water-sharing and land control agreements in areas of environmental stress may be required. These agreements should set democratically-generated parameters for resource management, making contingency plans for various water supply and land availability scenarios.

At the regional level, if the Chinese divert Tibetan waters from south Asia without informing Delhi, India would not be able to manage the effects within its own borders or in coordination with Nepal, Pakistan, or Bangladesh in a timely manner. India and China have signed two Memoranda of Understanding and established a “Joint Expert Level Mechanism” – in 2002, 2005 and 2006, respectively – to exchange hydrological information regarding the Brahmaputra and Kashmiri Sulej rivers during annual flood seasons (Government of India 2009).

But given the scale of the emerging challenges, such ad hoc, case-by-case mechanisms may not be sufficient. A broader, effectual treaty with China along the lines of the Indus Water Treaty, complete with formal, protracted and institutionalised information-sharing and coordinated management institutions, may be required to pre-emptively address any management issues. Such a treaty could have the ancillary benefit of enhancing trade relations that mitigate geopolitical tensions.

Any Chinese reluctance to create a formal institution to manage the issue can be counteracted by a bloc of India, Pakistan, Nepal, Bangladesh, and Bhutan, all of which will be harmed tremendously by China’s environmental weapon. Water is an issue on which the estranged south Asian neighbours can and must come together for common survival, reinvigorating an otherwise factious South Asian Association for Regional Cooperation (SAARC). United behind the cause of water flow, the south Asian countries can, in turn, resolve the water disputes that plague their own bilateral relations.

Conclusions

India’s growth-inclined position on climate change appears legitimate. But with the potential to radically alter India’s economy, and reshape the human security terrain and even the geopolitical order of south Asia, climate change is an issue on which

India has perhaps the greatest to lose. It does not help anyone for India to stick to an inert line on climate change just to preserve an unsustainable, inequitable, and ultimately impractical development model.

“Rising India” and inclusive development are not mutually exclusive. Providing rural areas with alternatives to migration would be far-sighted; creating urban spaces for people, and not cars and consumers would be prudent; and learning lessons in sustainability from India’s most forgotten human resource – the

poor – would give India an innovative edge in urban development. To avert the gravest consequences, India must reconcile sustainable growth with climate mitigation and equity at the domestic level.

In the end, adaptation to inevitable environmental shifts is necessary. In addition to vital technology development, political adaptation at the local, national, and regional levels is imperative to manage the political and security-oriented effects of climate change.

NOTES

- 1 For an overview of India’s position on climate change, see, for example, Ministry of External Affairs (2009). India’s position has been summarised succinctly in Sinha (2009). In December 2009, Indian Minister of Environment Jairam Ramesh amended this position with a refocus on carbon intensity (Ramesh 2009).
- 2 At an exchange rate of Rs 48 to the dollar, this is equal to Rs 6,043.2 crore.
- 3 Temperature-related fatalities with respect to heat waves, water-borne diseases brought about by floods (i.e., diarrhoea, cholera, and biological contaminants), malnutrition and starvation from crop failure, and safety and public health infrastructure damaged by environmental disasters are all potential scenarios induced by climate change (Roy et al 2005; Bhattacharya et al 2006).
- 4 “The Kosi Floods (of 2008, for example), proved to be catastrophic in more ways than one as they have opened up a huge ‘market’ of children – close to three lakh – to the merchants of misery who have been buying them for sums as low as Rs 500 from their vulnerable families” (Srivastava 2009).
- 5 A critique of the “securitisation” of climate change is available in, for example, Sinha 2009, pp 97-101.
- 6 As political scientist James Rosenau writes, “It is self-deceptive to believe that one can be fully objective about the materials one probes. In the absence of perfect information (a permanent condition with which we must all contend), we can never tell the whole story about any phenomenon we seek to explain. Perforce we must select some of their aspects as important and dismiss others as trivial, and our bases for making these selections stem from our values, prior experiences, expertise”, biases, and indeed our *purpose* in analysing the phenomenon (Rosenau 2003: 405).
- 7 Compare these figures with the global average of 0.2 degrees Celsius increase in temperature per decade (Xinhua News Agency 2009).
- 8 In December 2009, Indian Minister of Environment Jairam Ramesh announced that India would reduce its carbon emissions intensity by 20-25% of the 2005 level by 2020 (Ramesh 2009). For analyses of the effects of climate change on Europe, North America, and northern Asia, see Chapters 5, 8, and 10, respectively, of Watson et al 2001.
- 9 “Securitisation” refers to the way an issue is framed in order to convert it into a matter of security. The term was coined and explored by Buzan et al 1998.
- 10 For the Indian position on the nexus between growth, energy consumption, emissions, and climate change, see Planning Commission 2006.
- 11 As a press release from the Indian government states, “How can an accord be possible, if...other ‘major emitters’ refuse to accept responsibility in this regard? India has done in this direction more than it requires to do (sic)” (Ministry of Environment and Forests 2009).

- 12 As Montek Singh Ahluwalia, deputy chairman of the Indian Planning Commission states, “Developing countries should be allowed to increase their per capita emission and the developed world should reduce it”. Quoted in Chauhan (2007).
- 13 This is a point highlighted by Varma 2005.
- 14 I am indebted to Faizan Jawed, of Innovative Transport Solutions (iTrans) Pvt Ltd, for enlightening me on some of the issues related to urban transportation in India that have informed the following section.
- 15 For further elucidation on planning for socio-economically diverse populations, see Tiwari 2002.
- 16 “Seventy-two per cent of air pollution in Delhi is caused by vehicular emission. According to studies by the Central Pollution Control Board (CPCB) of India, 76.2% of CO, 96.9% of hydrocarbons, and 48.6% of NOx are caused by emissions from the transport sector in Delhi. The ambient air pollution in terms of Suspended Particulate Matter (SPM) in all metropolitan cities in India exceeds the limit set by the World Health Organisation (WHO). For example, in Kolkata, the average annual emission of SPM is 394 microgrammes per cubic metre, while the WHO standard is 75” (Singh 2005).
- 17 Delhi, Mumbai, Chennai, Kolkata, Bangalore, Lucknow, and Hyderabad are all expanding or developing mass rail systems. “By comparison, very little is being done to improve bus travel, which accounts for over 90% of all public transport use [and needs] in India. Most of the old, decrepit, and dangerous bus fleet in India is in desperate need of replacement by modern, safe vehicles. Thus, the main focus of public transport policy must be on improved bus transport, including more and better buses as well as some degree of traffic priority in mixed traffic to increase average bus speeds” (Pucher et al 2005).
- 18 The “sustainability” of the kabaari system refers exclusively to the life cycle of the materials that pass through the system, not to the individual processes. The latter – namely, reprocessing plants – are often illegal, hence outside of environmental regulation. Without regulations, reprocessing plants can be highly polluting, given the emissions of plastics, glass, and metals combustion.
- 19 Informal recycling systems are not only sustainable, but more efficient than formal mechanisms. By some estimates, informal recyclers spend approximately three euros to dispose of a tonne of waste, while their formal sector counterparts spend ten euros on the same amount (Scheinberg et al 2007).

REFERENCES

- Agence France Press (2009): “India Carbon Emissions to Triple by 2030: Study”, Agence France Press, 3 September.
- Aijaz, Rumi (2009): “Personal Interview with Rumi Aijaz”, Urban Planning Expert at the Observer Research Foundation, New Delhi, 27 July.

- Ananthapadmanabhan, G, K Srinivas and Vinuta Gopal (2007): “Hiding behind the Poor: A Greenpeace Report on Climate Injustice”, *Greenpeace India Society*, October.
- Basu, Moushumi (2008): “Arcelor-Mittal in Jharkhand”, *Economic & Political Weekly*, Vol 43, No 48, 29 November.
- Bhattacharya, S, C Sharma, R C Dhiman and AP Mitra (2006): “Climate Change and Malaria in India”, *Current Science*, Vol 90, No 3, pp 369-75.
- Buzan, Barry, Ole Waever and Jaap de Wilde (1998): “Security: A New Framework for Analysis”, Lynne Rienner Publishers.
- Chakravarti, Sudeep (2008): “Red Sun: Travels in Naxalite Country”, Penguin Press.
- Chaturvedi, Bharati (2009): “Personal Interview with Bharati Chaturvedi”, Director of Chintan Environmental Research and Action Group, New Delhi, 8 October.
- Chauhan, Chetan (2007): “UN Targets Are Flawed, Says India”, *Hindustan Times*, 27 November.
- China Daily* (2006): “Global Warming Threatens ‘World Barometer’”, 30 December.
- Chintan (2009): “Cooling Agents: An Examination of the Role of the Informal Recycling Sector in Mitigating Climate Change”, Chintan Environmental Research and Action Group.
- Dharmadhikary, Shripad (2008): “Mountains of Concrete: Dam Building in the Himalayas”, *International Rivers*, December, available at http://www.internationalrivers.org/files/IR_Himalayas_rev.pdf
- Dodman David and David Satterthwaite (2009): “Climate Change: Are Cities Really to Blame?”, *Urban World*, Vol 1, No 2, March.
- Economist* (2009): “Climate Change: Avoiding a Crash at Copenhagen”, 24 September.
- Ghosh, Sugata and Sarmistha Pal (2000): “On Regional Inequality and Growth in India: Theory and Evidence”, *Econometric Society World Congress 2000*, Contributed Paper, 1391, Econometric Society.
- Gragnotati, Michele and Meera Shekar, Monica Das Gupta, Caryn Bredenkamp and Yi-Kyoung Lee (2005): “India’s Undernourished Children: A Call for Reform and Action”, Health Nutrition and Population Division, World Bank, August, available at http://site.resources.worldbank.org/SOUTH-ASIAEXT/Resources/223546-1147272668_285/IndiaUndernourishedChildrenFinal.pdf.
- Government of India (2008): “National Action Plan on Climate Change”, Prime Minister’s Council on Climate Change, 30 June, available at <http://pmindia.nic.in/Pg01-52.pdf>
- (2009): “International Cooperation”, web site of the Government of India, National Portal Content Management Team, 31 March, available at http://india.gov.in/sectors/water_resources/international_corp.php
- Jawed, Faizan and Ashok Mundkur (2008): *Just Wheels*, Dir Faizan Jawed and Ashok Mundkur, Drishtikon Mediaworks.
- Johnes, Geraint (2009): “It Was All Gonna Trickle Down: What Has Growth In India’s Advanced Sectors Really Done For The Rest?”, Lancaster University Management School, Working Paper,

- available at <http://www.lums.lancs.ac.uk/publications/viewpdf/006104/>
- Joshi, Sunjoy (2009): "Remarks at Inaugural Session, Global Summit on Sustainable Development and Climate Change", Conference organised by the Observer Research Foundation and The Rose-Luxemburg Stiftung, 24 September.
- Kalpakistan, Jack (2004): "Identity, Conflict and Cooperation in International River Systems", Ashgate Publishing.
- Katzenstein, Mary (1973): "Origins of Nativism: The Emergence of Shiv Sena in Bombay", *Asian Survey*, Vol 13, No 4, April, pp 386-99.
- Kawaguchi, Yuki (2005): "Arunachal Pradesh Territorial Dispute between India and China", *ICE Case Studies*, No 161, November, available at <http://www1.american.edu/iced/ice/india-china.htm>
- Kumar, Anand (2009): "Changing Nature of Insurgency in North-east and Role of Bangladesh", paper presented at *IDS Weekly Fellows' Seminar Series*, 24 July.
- Mckinsey & Company (2009): "Environmental and Energy Sustainability: An Approach for India", Magnum Custom Publishing, August, available at http://www.mckinsey.com/client-service/ccsi/pdf/India_Environmental_Energy_Sustainability_final.pdf
- Ministry of Environment and Forests (2009): Press Information Bureau, Government of India "India's Position on Climate Change Issues: India's Specific Targets on GHGs", 4 July.
- Ministry of External Affairs (2009): Public Diplomacy Division, Government of India, "The Road to Copenhagen: India's Position on Climate Change Issues", available at http://pmindia.nic.in/Climate%20Change_16.03.09.pdf
- Owen, David (2009): "Sustainable Cities", *Business Day*, 8 October.
- Padukone, Neil (2009a): "China's Water Weapon", Institute for Peace and Conflict Studies Analysis, # 3020, 7 December, available at <http://ipcs.org/article/china/chinas-water-weapon-3020.html>
- (2010): "Security in a Complex Era: Emerging Challenges Facing India", ORF Monograph, Knowledge World Press.
- Parikh, Jyoti (2009): "Climate Impact, Risk, Vulnerability and Adaptation", remarks at *The Adaptive Response to Climate Change*, Global Summit on Sustainable Development and Climate Change, Conference organised by the Observer Research Foundation and The Rose-Luxemburg Stiftung, 24 September, available at <http://www.orfonline.org/climate-change/J-Parikh.ppt>
- Planning Commission (2006): "Integrated Energy Policy: Report of the Expert Committee", Government of India, Planning Commission, New Delhi, August, Chapter XIII.
- Pucher, John, Nisha Korattyswaropam, Neha Mittal and Neenu Ittyerah (2005): "Urban Transport Crisis in India", *Transport Policy*, Vol 12, pp 185-98.
- Rahman, Mirza Zulfiqur (2008): "Illegal Bangladeshi Migrants: Agitation and Turmoil in Assam", Institute of Peace and Conflict Studies Analysis, # 2652, 19 August 2005, available at http://www.ipcs.org/article_details.php?article_No=2652.
- Ramana, P V (2009): "Maoists' Tactical United Front (TUF) and Urban Movement", Paper Presented at *IDS Weekly Fellows Seminar Series*, Institute for Defence Studies and Analyses, 10 July, available at <http://www.idsa.in/reports/MaoistsTacticalUnitedFrontandUrbanMovement100709.html>.
- Ramesh, Jairam (2009): "Speech of Jairam Ramesh, Minister of State for Environment & Forests, Government of India, at the High-Level Segment of the UN Climate Conference, Copenhagen", Government of India, 16 December, available at <http://moef.nic.in/downloads/public-information/Minister%27s%20speech%20on%2016.12.pdf>
- Rao, S L (2006): "India's Rapidly Changing Consumer Markets", *Economic & Political Weekly*, Vol 35, No 40, 30 September – 6 October, pp 3570-72.
- Rehman, Abdul (1998): "Waterlogging and Salinity Management in the Sindh Province", Pakistan National Programme, International Irrigation Management Institute, December.
- Rosenau, James N (2003): *Distant Proximities: Dynamics Beyond Globalisation* (Princeton: Princeton University Press), p 405.
- Roy, Joyashree, A Ghosh, A Majumdar, P Roy, A P Mitra and C Sharma (2005): "Socio-Economic and Physical Perspectives of Water-Related Vulnerability to Climate Change: Results of Field Study in India", *Science and Culture*, Special Issue, Vol 71, No 7-8, pp 239-59.
- Roy, Joyashree, Anupa Ghosh and Gopa Baruah (2006): "The Economics of Climate Change: A Review of Studies in the Context of South Asia with a Special Focus on India", Report Submitted to The Stern Review on the Economics of Climate Change, available at <http://www.hm-treasury.gov.uk/media/5/0/roy.pdf>
- Sandeep, K M (1998): "Burning issue: Water Dispute Divides a Navi Mumbai Slum", *Indian Express*, 17 December.
- Sanwal, Mukul (2009): "Personal Communication with Mukul Sanwal, former Special Advisor to the UNFCCC Secretariat", New Delhi, 26 August.
- Scheinberg, Anne Michael Simpson, Yamini Gupta and Justine Anshütz (2007): "Economic Aspects of the Informal Sector in Solid Waste", GTZ and the Collaborative Working Group on Solid Waste Management, German Technical Cooperation.
- Sengupta, Jayshree (2007): "A Nation in Transition: Understanding the Indian Economy", Academic Foundation Press.
- Shah Singh, Harmeet (2008): "Flooding Deaths Now 2,400 in Monsoon-hit India", *CNN*, 24 September.
- Shaohua, Chen and Martin Ravallion (2008): "The Developing World Is Poorer than We Thought, But No Less Successful in the Fight Against Poverty", *Development Research Group (DECRG)*, World Bank, World Bank Policy Research Working Paper No 4703.
- Sharma, Kalpana (2005): "Mumbai After the Rain: Piecemeal Policies", *The Hindu*, 9 September.
- Sharma, Ashok (2008): "Climate Change to Impact Indian Agriculture: IARI", *Financial Express*, 28 January.
- Shiva, Vandana (2002): *The Violence of the Green Revolution: Ecological Degradation and Political Conflict in Punjab*, Zed Press.
- Singh, Sanjay K (2005): "Review of Urban Transportation in India", *Journal of Public Transportation*, Vol 8, No 1.
- Sinha, Uttam Kumar (2009): "Geopolitics of Climate Change and India's Position", *Indian Foreign Affairs Journal*, Vol 4, No 2, April-June, pp 104-07.
- Spangenberg, Joachim (2009): "Personal Communication with Joachim Spangenberg", Vice President of the Sustainable Europe Research Institute, New Delhi, 24 September.
- Srivastava, Devyani (2008): "Mining War in Chhattisgarh", Institute for Peace and Conflict Studies, Article # 2577, 23 May 2009, available at http://www.ipcs.org/article_details.php?article_No=2577.
- Srivastava, Amitabh (2009): "Children for Sale", *India Today*, 20 March.
- Swain, Ashok (1996): "Displacing the Conflict: Environmental Destruction in Bangladesh and Ethnic Conflict in India", *Journal of Peace Research*, Vol 33, No 2, May 1996, pp 189-204.
- The Energy and Resources Institute (2002): "TERI Energy Data Directory and Yearbook 2001-02", New Delhi.
- Tiwari, Geetam (2002): "Urban Transport Priorities: Meeting the Challenge of Socio-Economic Diversity in Cities, a Case Study of Delhi, India", *Cities*, Vol 19, No 2, pp 95-103.
- Topalova, Petia (2008): "India: Is the Rising Tide Lifting All Boats?", International Monetary Fund, IMF Working Paper 08/54, March, available at <http://www.imf.org/external/pubs/ft/wp/2008/wp0854.pdf>.
- United Nations (2008): "World Urbanisation Prospects: The 2007 Revision Population Database", Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, available at <http://esa.un.org/unup/>
- (2009): "World Population Prospects: The 2008 Revision", Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, available at <http://esa.un.org/unpp>
- Vaish, Nandini (2008): "Green Heights", *India Today*, 1 February.
- Varma, Pavan V (2005): *Being Indian: Inside the real India*, William Heinemann Ltd.
- Waslekar, Sundeep (2005): "Final Settlement: Restructuring India-Pakistan Relations", Strategic Foresight Group.
- Watson, Robert T, Marufu C Zinyowera and Richard H Moss (2001): *IPCC Special Report on The Regional Impacts of Climate Change An Assessment of Vulnerability*, Intergovernmental Panel on Climate Change, GRID-Arendal Press, available online at http://www.grida.no/publications/other/ipcc_sr/?src=http://www.grida.no/Climate/ipcc/index.htm
- World Bank (2008): *Little Green Data Book 2007*, Development Data Group of the Development Economics Vice Presidency and Environment Department, available at <http://siteresources.worldbank.org/INTDATA/64199955-1178226923002/21322619/LGDB2007.pdf>
- Xinhua News (2009): "Met Chief: Tibet Challenged by Global Warming", Xinhua News Agency, 6 May 2009.
- Yue, Li (2009): "Great Powers Strategy and the Climate Change Discourse", remarks at *Climate Change into the New Millennium: The Shaping of a Discourse*, Global Summit on Sustainable Development and Climate Change, Conference organised by the Observer Research Foundation and The Rose-Luxemburg Stiftung, 24 September 2009.
- Zency, Eric (2009): "GDP RIP", *New York Times*, 9 August.

**INTERNATIONAL CONFERENCE ON
DISPLACEMENT AND REHABILITATION:
SOLUTIONS FOR THE FUTURE**

13-14 November 2010

Organised by

**Department of Humanities &
Social Sciences, National Institute
of Technology
Rourkela, Orissa**

**For details visit: [http://nitrr.ac.in/conference/
conference_welcome.asp?cid=28](http://nitrr.ac.in/conference/conference_welcome.asp?cid=28)**

Contact person: Prof. Nihar Ranjan Mishra
Phone: +91-661 2462698, Mob: +91 9437462037
Email: niharhcu@gmail.com