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CONFERENCE REPORT

CR 2009-07 May 2009

India: The Impact of Climate Change to 2030

Geopolitical Implications

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India: The Impact of Climate Change to 2030

Geopolitical Implications

Prepared jointly by

CENTRA Technology, Inc. and Scitor Corporation

The National Intelligence Council sponsors workshops and research with nongovernmental experts to gain knowledge and insight and to sharpen debate on critical issues. The views expressed in this report do not reflect official US Government positions.

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Scope Note

Following the publication in 2008 of the National Intelligence Assessment on the National Security Implications of Global Climate Change to 2030, the National Intelligence Council (NIC) embarked on a research effort to explore in greater detail the national security implications of climate change in six countries/regions of the world: India, China, Russia, North Africa, Mexico and the Caribbean, and Southeast Asia and the Pacific Island States. For each country/region we are adopting a three-phase approach.

- In the first phase, contracted research explores the latest scientific findings on the impact of climate change in the specific region/country. For India, the Phase I effort was published as a NIC Special Report: ***India: Impact of Climate Change to 2030, A Commissioned Research Report*** (NIC 2009-03), of April 2009.
- In the second phase, a workshop or conference composed of experts from outside the Intelligence Community (IC) determines if anticipated changes from the effects of climate change will force inter- and intra-state migrations, cause economic hardship, or result in increased social tensions or state instability within the country/region. This report is the result of the Phase II effort for India.
- In the final phase, the NIC Long-Range Analysis Unit (LRAU) will lead an IC effort to identify and summarize for the policy community the anticipated impact on US national security.

In March of 2009, CENTRA Technology, Inc., convened a group of regional experts to explore the socio-political challenges, civil and key interest group responses, government responses, and regional and geopolitical implications of climate change on India through 2030. The group of outside experts consisted of social scientists, economists, and political scientists. While the targeted time frame of the analysis was to 2030, the perceptions of decision makers in 2030 will be colored by expectations about the relative severity of climate changes projected later in the century. The participants accordingly considered climate impacts beyond 2030 where appropriate.

The Central Intelligence Agency's Office of the Chief Scientist, serving as the Executive Agent for the DNI, supported and funded the contract.

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Executive Summary

The National Intelligence Council sponsored workshop entitled *Implications of Global Climate Change in India* on March 27, 2009, brought together a panel of India experts to consider the probable effects of climate change on India from a social, political, and economic perspective. ***The panelists judged the practical effects of climate change on India were uncertain, but they concluded India will most likely be able to manage them out to 2030.***

- ***Agriculture and rural society will face the most severe disruptions from climate change.*** India may need a second “Green Revolution”¹ to deal with these disruptions.
- Climate change will most likely cause mass migrations both within India and from neighboring countries, particularly Bangladesh. Refugee flows from other South Asian states are also possible. Internal migrations will mainly be from rural areas into India’s cities, which are ill-equipped to deal with large influxes of environmental migrants.
- Climate change will in many cases exacerbate existing inequities in India’s society and economy, potentially leading to internal social disruptions.
- ***While a general state failure in India is unlikely, India may accumulate a number of failed constituent states.*** The states most at risk are the densely-populated, under-developed, and politically unstable states of India’s northeastern agricultural heartland.

Beyond 2030, India’s ability to cope is unclear.

The principal regional challenges generated by climate change in South Asia will most likely be cross-border migration and water scarcity. The lack of effective regional institutions, longstanding political disputes, and India’s preference for bilateral regional diplomacy will inhibit regional cooperation in confronting these issues.

- The region has a mixed record on resolving water disputes. As river flows decline, water disputes will intensify, leading to increased tension with Pakistan, Bangladesh, and China.
- Climate change may cause humanitarian crises or state failures in one or more of India’s neighbors, including its nuclear-armed rival Pakistan.

A number of factors nevertheless inhibit India from aggressively pursuing climate change mitigation.

- ***The priority of the Indian state is sustained economic growth, in order to alleviate poverty and keep up with strategic competitors—mainly China. India will not sacrifice growth for the sake of climate change mitigation.***
- India views climate change mitigation as primarily the responsibility of the developed countries.

¹ “Green Revolution” refers to development and deployment of new agricultural products and techniques to improve productivity.

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- Although the state is engaged in planning climate change mitigation policies, India tends to be slow and ineffective in executing such plans due to bureaucratic inertia, lack of political will, and corruption.

Indian foreign policy is focused primarily on enhancing trade, investment, and access to advanced technology, as well as achieving strategic parity with China.

- India prefers that international standards and regulations on climate change mitigation be voluntary and take development targets into account.
- India perceives the United States and other developed countries should have a greater stake in reaching a climate change agreement. ***It has therefore adopted a maximalist negotiating position that will make any agreement very difficult.***
- India's position on climate change equity and responsibility is consistent with the articulated policy of China and most developing countries.
- ***India would be most anxious about any US attempt to strike a private climate change agreement with China.***

India is nevertheless open to persuasion on alternative paths to growth that not only address climate change effectively, but that in the long run will be better for sustainable growth.

- ***India is open to climate change mitigation policies that take its development needs and strategic interests into account. It would accept subsidies and technology transfers in exchange for its compliance on international climate change standards.***

Despite the serious climate related challenges India may be subjected to in the next two decades, India is a large and resilient state and society with considerable coping capacity.

- India has a long history of dealing with crises and has institutionalized methods of handling and mitigating them, even with limited resources.
- Indian economic growth continues to increase both state and private sector capacity. India will have increasing resources and capabilities at its disposal to deal with climate change-induced challenges.
- ***India has institutional buffers which aid in preserving overall stability, such as its democratic and federalized political system.***
- India's well-developed and resilient civil society provides a reserve of institutional capital, expertise, and innovation that can be applied to climate change-induced problems.

Contents

	<i>Page</i>
Scope Note	1
Executive Summary	3
Introduction and Background	7
Social, Political and Economic Challenges	9
Overall Socio-Economic Challenges	9
Agricultural Challenges	10
Energy Challenges	11
Urban Challenges	12
Civil and Key Interest Group Responses	12
Interest Groups in Civil Society	13
Prospects for Civil Conflict	15
State Response	16
State Priorities	16
State Capacity	17
Prospects for State Failure	18
State Climate Change Mitigation Policies	19
Regional Implications	21
Geopolitics in South Asia	21
Regional Water Issues	22
Cross-Border Migration	23
Prospects for Regional Conflict	25
Prospects for Regional Cooperation on Climate Change Mitigation	26
Overall Foreign Policy Implications	26
India's Foreign Policy Stance on Climate Issues	26
Indo-American Relations	27
The Copenhagen Negotiations	29

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Introduction and Background

India is both a major greenhouse gas emitter and one of the most vulnerable countries in the world to projected climate change. The country is already experiencing changes in climate and the impacts of climate change, including water stress, heat waves and drought, severe storms and flooding, and associated negative consequences on health and livelihoods. With a 1.2 billion but growing population and dependence on agriculture, India probably will be severely impacted by continuing climate change. Global climate projections, given inherent uncertainties, indicate several changes in India's future climate:

- Global observations of melting glaciers suggest that climate change is well under way in the region, with glaciers receding at an average rate of 10–15 meters per year. If the rate increases, flooding is likely in river valleys fed by these glaciers, followed by diminished flows, resulting in water scarcity for drinking and irrigation.
- All models show a trend of general warming in mean annual temperature as well as decreased range of diurnal temperature and enhanced precipitation over the Indian subcontinent. A warming of 0.5°C is likely over all India by the year 2030 (approximately equal to the warming over the 20th century) and a warming of 2–4°C by the end of this century, with the maximum increase over northern India. Increased warming is likely to lead to higher levels of tropospheric ozone pollution and other air pollution in the major cities.
- Increased precipitation—including monsoonal rains—is likely to come in the form of fewer rainy days but more days of extreme rainfall events, with increasing amounts of rain in each event, leading to significant flooding. Drizzle-type precipitation that replenishes soil moisture is likely to decrease. Most global models suggest that the Indian summer monsoons will intensify. The timing may also shift, causing a drying during the late summer growing season. Climate models also predict an earlier snowmelt, which could have a significant adverse effect on agricultural production. Growing emissions of aerosols from energy production and other sources may suppress rainfall, leading to drier conditions with more dust and smoke from the burning of drier vegetation, affecting both regional and global hydrological cycles and agricultural production.

Uncertainties about monsoonal changes will affect farmers' choices about which crops to plant and the timing of planting, reducing productivities. In addition, earlier seasonal snowmelt and depleting glaciers will reduce river flow needed for irrigation. The large segment of poor people (including smallholder farmers and landless agricultural workers) may be hardest hit, requiring government relief programs on a massive scale. Finally, migration, especially from Bangladesh, may strain resources and India-Bangladesh relations.

The most important impacts of climate change will likely include the following:

- *Agriculture.* High-input, high-output agriculture will be negatively affected even as demands for food and other agricultural products rise because of an increasing population and expectations for an improved standard of living. Millions of subsistence and smallholder farmers will experience hardship and hunger through being less able to predict climate conditions. To a certain extent, trade may compensate for these deficits.

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- *Water.* Glacier melt may yield more runoff in the short term but less in the medium and long terms. More severe storms (especially cyclones) will cause more damage to infrastructure and livelihoods and exacerbate salt water intrusion in storm surges. Changes in the timing and amount of monsoon rains will make the production of food and other agricultural products more uncertain, so that, even in good-weather years, farmers will be more likely to make decisions leading to lower-productivity.
- *Exacerbation of Inequality.* The welfare of those who are affected by climate change and who have limited means to adapt may act as a force that can change governments, strain public budgets, and foster unrest. About one-third of Indians are extremely poor, and 60 percent depend upon agriculture for their livelihoods.
- *Energy.* As India searches for additional sources of energy to meet rising demand, climate change mitigation efforts may constrain its use of indigenous and imported coal, oil, and gas, while development of nuclear energy will be slow at best and likely to encounter opposition. Other non-emitting technologies will require technology transfer and capacity-building.
- *Migration.* India receives immigrants from a number of countries. Under climate change conditions, it may be flooded with many more, particularly from Bangladesh. Such migration may exacerbate tension between the two countries as well as putting a strain on Indian central and state governments.

Adaptive capacity in India varies by state, geographical region, and socioeconomic status. Studies point to influential factors such as water availability, food security, human and social capital, and the ability of government (state and national levels) to buffer its people during tough times. Where adaptive capacity is low, the potential is greater for impacts to result in displaced people; deaths and damage from heat, floods, and storms; and conflicts over natural resources and assets.

Social, Political and Economic Challenges

India faces an array of formidable existing social, economic, and political challenges such as poverty, low standards of health, and low agricultural productivity that will most likely be intensified by the effects of climate change. While experts are uncertain how climate change will affect India, it is likely to result in increased competition for scarce resources; increased stress on economic, social, and political systems across the board; and greater risk of extreme disruptive events such as severe droughts, floods, or storms. India's decisionmakers will need to balance between sustaining rapid growth, combating poverty, building social safety nets, and building greater capacity to deal with climate crises in order to succeed in the next century.

A particular concern is the emergence of 'tipping points' where worsening climate change impacts surpass the capacity of Indian institutions, infrastructure, and society to handle them. Although in many cases such 'tipping points' may result in serious but incremental worsening of ongoing challenges, they might also result in catastrophic failures.

Overall Socio-Economic Challenges

Poverty. Indians consider poverty the most severe and pressing social challenge to the country. India has achieved significant success in combating poverty beginning in the early 1980s. Almost sixty percent of the Indian population lived in poverty in 1980. That has been cut in half, with the fastest decline in the period since the economy began to grow significantly in the mid-1990s. While anti-poverty programs have helped, the key to bringing down the incidence of poverty on a sustained basis has been rapid growth. India has grown four percent or more in per capita terms since the late 1980s as opposed to less than two percent from 1950-80. During the last five years (2003-08), the per capita growth rate has been as high as 7.3 percent.

Despite the significant improvement, about one-third of the population (about 400 million people) lives on less than a dollar a day. India is thus home to the world's largest number of poor people and climate change is likely to significantly increase the proportion of Indians living below the poverty line. A disproportionate number of the poor are landless workers and marginal farmers who bear the greatest burden from disruptions to agriculture. The rural poor suffer from overlapping disadvantages. These include the growing incidence of casual labor; lack of alternative employment in labor-intensive manufacturing; low educational levels; and inadequate training programs for entry level jobs in the organized industrial and services sectors. Natural calamities such as floods, heavy rains, and droughts will most adversely impact poor populations that are less able to protect themselves from the vagaries of nature.

Inequality. Paradoxically, while India is intensely stratified culturally and economically, inequality receives a great deal less attention in India than in the international community as a whole. The focus in India is on growth rather than distributive justice. Impending climate change may focus much greater attention on inequality. The impacts of climate change in India will be distributed very unequally. In some cases, this may actually reduce existing inequities. For example, flooding may concentrate in more prosperous states such as the southern coastal states, Maharashtra, and Gujarat. Increased temperatures and shifts in rain patterns may increase agricultural yields in previously disadvantaged areas.

Despite the possibility of such optimistic outcomes, the majority of climate change impacts will most likely exacerbate existing inequities. While there is little evidence that climate change will benefit the richer segments of the population, their far greater capacity to handle climate change-

induced challenges will widen the gap between rich and poor. Climate change is expected to have greater adverse effects on agricultural rather than industrial output and it will exacerbate rural-urban inequality. Climatic challenges will obviously be more severe in particular regions, increasing cross-regional inequality. Regional climatic inequalities may coincide with and reinforce existing economic inequities. For example, increased flooding may disproportionately impact poor coastal states such as Orissa and droughts may strike in lower per-capita income states such as Uttar Pradesh and Rajasthan. Furthermore, the burden of hardships and natural disasters such as floods will fall disproportionately on female members of the poor families, contributing to an increased gender gap.

Public Health. The relationship between climate change and health outcomes is complex. If temperature rises in warmer parts of the country, heat waves may become more intense and longer lasting, resulting in increased incidence of heat stroke and related diseases. Warmer climate also worsens air pollution and increases the potency of airborne diseases. Floods and droughts may lead to water contamination and worsen unsanitary conditions, increasing incidence of diseases such as malaria or dysentery.

The government is behind the curve in addressing public health problems. Corruption and inefficiency have been ongoing problems in the healthcare system as well as in other social services such as education. While considerable money and resources have been invested in primary health centers and community health centers in India, studies demonstrate that most of the health services-related money goes to private individuals who often only have a high school diploma. The lack of oversight allows many state-assigned healthcare providers to use the healthcare stipend from the state to supplement other forms of income while not providing healthcare services to the public. As a result, the public is forced to go to willing but sometimes unqualified private individuals to receive healthcare services.

As climate change worsens the public health challenge, India will require renewed vigor in implementing major policy reforms in the health sector. India needs to accelerate medical education at all levels to ensure access to trained medical personnel. It also needs to improve access to medicine and implement public health measures to combat the spread of infectious diseases by ensuring proper drainage and supply of clean drinking water.

Agricultural Challenges

India's agricultural sector—considered the Achilles' heel of the Indian economy—faces a major systemic crisis even without additional stress from climate change. Despite the Green Revolution, significant portions of the agricultural sector are locked in a labor-intensive, inefficient and marginally productive model that is increasingly not viable. To compound the problem, this already stressed sector will suffer the greatest direct impact from climate change. Agriculture generates less than 18 percent of India's GDP, and this figure is rapidly declining. The decline in the economic importance of agriculture as the industrial and service sectors have expanded is misleading when considering the impact of climate change. Seventy percent of Indians live in rural areas and nearly 65 percent of the workforce is engaged in farming, so challenges to agriculture will directly affect the majority of the Indian population.

The Indian agricultural states in which the impact of climate change is likely to be most severe are also those which have the lowest growth rates and the highest concentration of the poor. The states most at risk are in India's northeast, including the most populous states of Bihar and Uttar Pradesh, which have a combined population of 250 million, as well as the adjacent states of West

Bengal and Orissa. As agriculture becomes more difficult and more capital-intensive, marginal and small farmers will be forced to sell their land; economic inequality in the villages is likely to increase; and mid-sized farms will become less economically viable, unless farmers switch to high-end cash crops such as wine grapes and flowers.

Food Security. Gains in productivity from India's successful Green Revolution allowed India to achieve self-sufficiency in food, a source of great national pride. Nevertheless, projected climate change impacts will put pressure on India to make more effective use of its comparative advantages and turn away from self-sufficiency and towards crop specialization and trade on the international markets to maintain its food security. If such a transition does not begin early and achieve success, India could once again face acute food shortages due to more frequent disruptions and overall declines in agricultural productivity as a result of climate change.

The Rural Labor Surplus. Once food security occurred, the principal problem for Indian agriculture was to determine what to do with India's enormous excess rural population. Industry and services will have to take over as the mainstays of Indian employment, but will take time to expand to meet that challenge. In the near term, agricultural employment has to be maintained at high levels in order to keep the migration of labor into urban areas to a rate that Indian industrial expansion can accommodate. The surplus of rural labor has therefore favored the persistence of small, labor-intensive traditional farms. This keeps a larger-than-optimal population in areas at risk from climate change, increasing their susceptibility to marginal disruptions; limits the development of excess agricultural capacity to deal with climatic constraints; and discourages adoption of more efficient technological solutions that could aid in providing a response to climate change. Widespread climate stresses, such as major droughts or floods, could disrupt the village structure across entire regions of the country, putting tens of millions at risk.

Flooding. Flooding generated both by increases in runoff from melting Himalayan glaciers and more frequent severe storms will pose a major threat to India's heavily populated river plains. In low-lying coastal areas, sea level rise and storm surges will create similar challenges, with the added dimension of saltwater intrusion rendering soil infertile. Increased seasonal flooding is already affecting productivity in the state of Bihar, and more frequent major floods could disrupt agriculture and displace millions from the Indian agricultural heartland.

Droughts and Water Scarcity. In the longer term, glacial melting will reach a tipping point where increased river flows from runoff subside, replaced by serious water shortages as the smaller ice mass provides less water to feed India's rivers. The flows of the Indus, Ganges, and Brahmaputra could be dramatically reduced and many other rivers could become seasonal. The Gangetic plain, home to nearly half of India's population, may face a decrease in the water table to levels close to those in arid Gujarat. Such a development would threaten the sustainability of the agrarian economy across the northern Indian plain. In the northwestern states of Punjab, Haryana, and western Uttar Pradesh, depleting water tables, increasing soil salinity, and micro-nutrient deficiencies have already made wheat and rice crops that use intensive irrigation and nitrogenous fertilizer unsustainable. In addition, India will face more frequent and severe droughts long before the transition to sustained water scarcity

Energy Challenges

Just to maintain its current growth rate, India will need to more than double its energy consumption by 2020. The bulk of India's energy comes from fossil fuels, and India is poised to become a major contributor to global warming as emissions from power generation, industry,

and transportation increase. The country remains gravely under-electrified, with over 40 percent of the population without access and another 20 to 40 percent without reliable and regular access. Nevertheless, the use of fossil fuels in electricity generation—about 80 percent of electricity is generated from indigenous and imported coal, oil and gas—has kept electricity relatively cheap. As urbanization and mobility requirements rise apace, the demand for modern forms of power and transportation are bound to rise considerably faster than the combined growth of population and per capita income.

Climate change will impact India's energy needs in several respects. Temperature increases and migration into urban areas can be expected to generate increased demand for electricity and other forms of energy, which is already growing as India's economy grows and becomes more industrial. Climate change will reduce demand for winter heating and raise demand for summer cooling. Hydroelectric capacity could be substantially reduced by a diminution of river flows, reducing the potential for it to substitute for fossil fuels in power generation. Some studies suggest climate change may adversely affect the efficiency of power generation and transmission. In addition, climate change mitigation policies such as caps on emissions and the necessity of developing cleaner energy production could impose greater constraints on the expansion of energy production in India.

Urban Challenges

India's cities will face increased challenges from climate change, although the direct effects on India's cities and towns may be less disruptive than those on rural areas. Overcrowding and poor air quality are already serious problems in India's cities, and these challenges will be worsened by climate change. Indian urban infrastructure is poorly developed and over-stressed in most cities. Floods and heavy rains are likely to collapse or sweep away shanties and makeshift urban dwellings where many of the urban poor live. Water scarcity due to glacial melting and shifts in rain patterns will reduce the supply of drinking water at the same time that migration into the cities increases the demand. Most significantly, the severe rural challenges will most likely be exported to the cities. A mass migration of displaced rural population into the cities could overwhelm critical urban systems such as health, transportation, housing, energy, and water. An influx of environmental refugees from the countryside also raises a serious challenge in terms of employment. Even if economic growth continues at a high rate, urban economies will have a difficult time accommodating large numbers of new workers, particularly if they arrive in surges due to climate change disruptions in rural areas. It is also unclear to what degree rural migrants will be absorbed into India's urban society. Conflicts between established urban populations and rural migrants could become a serious problem, particularly if employment is at issue.

Civil and Key Interest Group Responses

India has developed an impressive and active civil society which will play an important role in the adaptations necessary within the 2030 timeframe. The level of political mobilization and social engagement in India's diverse society of 1.1 billion people is high. Societal actors, ranging from NGOs and think tanks to the expanding middle class, are already playing an increasingly important role in managing India's social, economic, and political challenges, and this role can be fairly easily extended to dealing with climate change. Given the reluctance of India's government to make tough decisions on environmental issues, pressure and lobbying from civil society and NGOs has been critical in generating the will to move forward on

mitigation policies. Strong issue leadership from civil groups may well be critical in altering Indian public opinion and state perspectives on climate change responses.

Interest Groups in Civil Society

The key interest groups in India are modern incarnations of the traditional mass-mobilizing agents of caste, class, and religion. Chambers of Commerce, Trade Unions, womens' groups and student organizations all play a role in society and politics, but they and other associations are secondary to the traditional groups. The interaction between the traditional groups is complex and often contentious. They do not represent monolithic blocks of interests, particularly on issues such as climate change which will have widely differing impacts on different regions and communities. In many localities the political environment is dominated by shifting coalitions between traditional groups, some leading, some supporting, and some marginalized. Traditional distinctions will come into play most forcefully if climate change produces very disproportionate effects on a particular group. Traditional civil groups may provide a reserve of social resilience and support networks that may help Indian society cope with climate change-induced challenges. On the other hand, traditional power structures may undermine state capacity by producing weak coalition governments, corruption of the administration and police, and the breakdown of law and order in some areas.

The Poor. India's poorest citizens are the least equipped to handle climate change-induced challenges but are likely to be the most severely affected by them. The majority of the poor are rural, but an increasing proportion are not tied to the land. The percentage of landless laborers rose from 17 percent in 1961 to 32 percent in 1991. Many of the poor are therefore likely to respond to climate change-induced challenges by migrating out of affected areas. Much of this migration will most likely be into cities and towns rather than into other rural areas. The urbanization of the poor will concentrate the burden on India's inadequate social services but may provide some insulation from the greater effects climate change will have on rural populations. The Indian poor have also tended to rapidly accept environmental innovations because they are acutely vulnerable to negative environmental impacts.

Although disaffection and unrest can be expected to increase as the poor face a more challenging environment, India's democratic system provides an outlet for their frustrations. Indian voting patterns are unique among large democracies in that the poor turn out in proportionately greater numbers to vote than those with higher incomes. Numbers count in a democracy and the poor are learning to use their political clout to make demands on the government. If the Indian poor become persuaded that climate change mitigation is critical to their quality of life, they can become a potent lever to push the state into action.

The Middle Class. A substantial and growing middle class has reinforced the previously small social and political elite. The Indian middle class is a *mélange* of groups from all religions, castes and regions based on income, professional achievements, and status aspirations. The burgeoning middle class and the wealthy in India have tended not to be receptive to environmental tradeoffs. Not only are they somewhat insulated from the worst effects of environmental problems, but they have the greatest stake in continuing economic growth and existing distribution patterns. It may therefore be more difficult to convince them to acquiesce to climate change mitigation policies than to convince the poor.

Farmers. The growing political power of Indian farmers makes them a key constituency in determining India's response to climate change. Indian farmers, like other segments of India's

poor, have shown considerable adaptive capacity, as demonstrated by the success of the Green Revolution. Given proper incentives, they will adopt new agricultural practices and crops that will be better able to cope with climatic changes. For example, the rapid spread of pest-resistant genetically-engineered *Bacillus thuringiensis* cotton happened largely because of demand from farmers. On the other hand, their increasing reliance on irrigation water may seriously hinder efforts at settling regional water disputes and could be a major source of civil conflict within and between agricultural regions as water becomes scarcer.

Think Tanks and Research Institutions. Another important part of civil society that will be much needed as climate change impacts occur are the private organizations that collect and disseminate scientific and social knowledge. India has a great wealth of environmental and other think-tanks and NGOs, and an active print and electronic media network which carries studies and plans of great sophistication.

The Tata Energy and Resources Institute (TERI), New Delhi, led by Dr. Rajendra K. Pachauri, is India's foremost center of research and knowledge about energy and the environment. Recognition of TERI's role grew after Dr. Pachauri was elected Chairman of the Intergovernmental Panel on Climate Change (IPCC) established by the United Nations Environment Program and the World Meteorological Organization. The IPCC shared the Nobel Peace Prize with former US Vice President Al Gore for its work on climate change in 2007. TERI is joined by other world-class research organizations such as the Centre for Policy Research and the Centre for the Study of Developing Societies, national institutions such as the Indian Institutes of Technology, the Indian Institutes of Management, the Bhabha Atomic Research Centre and India's central universities. Many of these research organizations function in partnership with the government, and with international organizations of various kinds. NGOs have taken on the responsibility of dealing with climate change and have been active in efforts such as water conservation and irrigation rights. These national organizations are nevertheless islands of excellence that operate in an ocean of mediocrity. Indian civil society as a whole still lacks the comprehensive infrastructure to support their efforts. In addition, private environmental organizations face the same constraints as the Indian government in terms of uncertain and ambiguous climatic data.

Private Sector Economic and Industrial Interests. Indian industrialization has made private industry an increasingly influential voice in Indian policymaking. Private sector competition has grown during the past two decades even in areas traditionally dominated by state enterprises, such as railroads, airlines, ports, energy resources, banks, the regulatory Reserve Bank of India, and educational institutions at all levels. The Indian private sector in many respects competes with the Indian state. Many of the potential climate change mitigation strategies that India might adopt, while generated at the state level, will have to be implemented substantially by the private sector. The private sector may also play a less constructive role: many of India's industrialists, as in the United States, are lobbying Parliament not to impose carbon caps or adopt other policies to reduce emissions.

The interests of India's major industries may have a substantial if not decisive impact on which solutions India turns to in addressing climate-generated challenges. The automobile industry, for example, is threatening to become as much the backbone of the Indian industrial economy and transportation network as it has been in the US if current trends are any indication. The auto industry can be expected to lobby hard for investment in roads and highways rather than the

more energy-efficient railway system. The industry is also driving a mass displacement of the two- and three-wheeled vehicles that today account for a major proportion of Indian motor vehicles by popular, affordable four-wheelers such as the Nano—a change that may well result in substantial emissions increases. On the other hand, the Indian auto industry has moved rapidly into production of electric cars such as the REVA and other fuel-efficient, low emission vehicles. This may partially mitigate the emissions and energy demand impacts from having more cars on the road.

Prospects for Civil Conflict

It is probable that climate change crises will further energize the discordant elements in India. Competition for dwindling resources and the delineation of scapegoats can provide combustible social and political fodder, but civil society in India has learned from long experience how to confront and live with adversity. To date Indian civil society has been successful in containing, but not eliminating, social and political violence over environmental issues such as water disputes.

Climate change-induced challenges may stress social resilience to the breaking point, particularly in cases where climatic stresses compound existing socio-economic stresses. For example, the concentration of negative climate change impacts on the poorest segments of Indian society is likely to intensify perceptions of inequality. If current growth and distribution patterns persist, this could lead to increased conflicts between social groups. These conflicts may not manifest themselves explicitly as economic or class conflicts. Many identity conflicts in India that are couched in religious or ethnic terms are in fact masked inequality conflicts. Tensions between rural and urban, commercial and laboring, employed and unemployed groups may play themselves out, for example, as Hindu-Muslim conflicts.

India unfortunately has many fault-lines readymade to accommodate such displaced inequality conflicts. Minority religious groups such as Sikhs, Christians in the northeast, and Christians and Muslims in Kerala are very politically active and at times have resorted to insurgent activity. The greatest threat to economic and political stability has been mounted by Maoist revolutionaries, referred to as Naxalities, recruited from among landless laborers and tribes in eastern and central India. They have spread their activities from approximately nine percent of India in 2002 to 30 percent in 2008, across 200 backward districts with high poverty levels, from Nepal to Andhra Pradesh, with the goal of transforming this corridor into a “compact revolutionary region.” The jobless poor in rural and urban areas are a natural recruiting ground for Maoist revolutionaries, as well as extremist Hindu groups who use violence against Muslims and Christians, which fractured states and local governments will find difficult to diffuse.

The overall threat posed by climate change-induced civil conflicts will depend on a number of factors, including the regional extent of the conflict and size of the groups involved; the capacity and response of the local government in affected areas; and the number of conflicts taking place simultaneously. India successfully handled past sequential crises including: the anti-Brahmin movement in Madras (now Tamilnadu), a communist insurgency in Telangana (now part of Andhra Pradesh), the 1970s Naxalite violence centered in eastern India, followed by the Khalistan movement in Punjab. Kashmir violence from 1989-2003 has receded from a major to a minor problem. Today, India is coping with tribal insurgencies in northeast India and Maoist violence in various areas from central through north India. India’s large population, large land

mass and social diversity can sustain these type of challenges so long as too many do not occur at the same time.

State Response

The scale of anticipated climate change-generated challenges in India dictates that much of the response will have to originate at the level of the national government. India has adopted a system of coalition governance emphasizing slow moving consensus and flexibility. This government structure suggests that institutional responses to climate change will be slow, but effective at a moderate level.

State Priorities

Economic Growth. Economic growth has been at the top of the policy agenda of India's government for the past two decades, and is likely to remain the major policy goal of any government that comes to power. Indian policymakers view economic growth as a means to achieve fundamental national values regarding poverty alleviation and national security.

Successive Indian governments have learned that they will face a backlash from the increasingly politicized population if the economy does not grow. They confront two choices when faced with continued low economic growth: give in to the demands of the poor, resulting in the loss of support and violence by the more advantaged, or do nothing, risking the loss of support of and violence by the poor. This provides a powerful political incentive to sustain high economic growth rates. Indian policymakers are committed to sustaining nine to 10 percent growth annually for at least the next 10 to 20 years.

Climate mitigation proposals are more likely to be adopted if India's policymakers can be convinced that such proposals enhance economic growth. When announcing India's first National Action Plan on Climate Change in June 2008, Prime Minister Manmohan Singh emphasized the overriding priority of maintaining high economic growth rates in determining which climate mitigation proposals to adopt. He said the Action Plan "identifies measures that promote our development objectives while also yielding co-benefits for addressing climate change effectively." He went on to state that these measures would be more successful with assistance from developed countries, and pledged that India's per capita greenhouse gas emissions "will at no point exceed that of developed countries even as we pursue our development objectives."

Poverty Alleviation. Reducing poverty is a national mission in India that is ingrained in the political culture. India's policymakers focus on alleviating poverty often to the exclusion of other socio-economic problems, such as inequality.² Indian state planners have adopted the 'rising tide lifts all boats' model, counting on economic growth and increases in state capacity to improve conditions for all, including the most economically disadvantaged. Although economic inequality is becoming a more salient issue due to the inequitable patterns of India's growth, it remains far less of a state priority than poverty alleviation. This prioritization creates a paradox. India is not likely to trade growth for climate change mitigation even if the poor will suffer disproportionately from climate change impacts. Indian policymakers perceive continued growth as a means to reduce the ranks of the poor and shrink the size of the groups most at risk.

² Over one-third of the population (34.3 percent) lives on less than \$1 USD a day.

National Security. The Indian government faces numerous critical national security concerns. The most prominent are the inter-related threats from Pakistan and Muslim fundamentalist terrorism. The national security concern that may have the greatest impact on climate change-related decision-making is India's competition with China for primacy in Asia and, in the longer term, globally. Competition with China is another driver of India's determination to maintain high rates of economic growth, even at the expense of the environment. India's high growth rates started much later than was the case in China, and have been partially curtailed by the global economic downturn. Indian policymakers feel threatened by China due to China's lead in economic development; ambitious defense modernization program; development of new forms of war-fighting, such as information warfare; support to Pakistan; and unresolved territorial claims, including a claim on the Indian state of Arunachal Pradesh. China has developed a deep-water naval base in Pakistan and has similar plans for Myanmar and Bangladesh, raising India's concern regarding strategic encirclement. So long as Chinese economic, political, and military expansion continues, India will feel obliged to strive for parity with China.

Climate Change Policy. Because the observable impact of climate change may continue to appear mild or manageable through 2030, Indian policymakers may not feel the sense of urgency needed to drive sustained commitment to long-term mitigation policies and tough trade-offs with development goals. International pressure by governments and NGOs may therefore play a crucial role in keeping climate change concerns at the fore of India's policy agenda. The principles underlying India's 2006 National Environmental Policy (NEP) are unlikely to be changed. The NEP identifies India's first priority as lifting its citizens out of poverty through development, even if this results in greater energy consumption. To maintain India's current growth rate, energy demand will more than double by 2020. The firm commitment to continued economic growth means that India's room to maneuver on climate change policy is constrained by whether the policy options under consideration hinder growth. India is unlikely to accept solutions that constrain growth unless it is faced with climate change impacts that would pose an even more disruptive effect than the solutions.

The Government of India's June 2008 National Action Plan on Climate Change identifies core national missions to address climate mitigation and adaptation. These include missions for promoting use of solar energy, incentives for decreasing energy consumption, conservation of energy as part of urban planning, improvement in water use efficiency, conservation measures of biodiversity, forest cover and ecological values to protect the Himalayan ecosystem, development of climate resistant crops and a new Climate Science Research Fund. It is not clear how these "national missions" will be implemented, since the government gives equal priority to promoting development while yielding "co-benefits" for climate change.

State Capacity

The Indian state has considerable bureaucratic strength and a long tradition of dealing with crises, disasters, and scarcity. Despite financial and developmental challenges, its capacity to cope effectively has improved over time. Local drought relief, for example, has been managed without severe loss of human and animal life in the post-Green Revolution era. Many existing approaches and response mechanisms available to the Indian state—some dating back to the British colonial period—can be adapted to deal with climate change impacts. Transportation networks have improved greatly, allowing the efficient movement of food to deficit areas. The state has also managed the system of purchasing of grain to be sold in ration shops or stored in

silos and warehouses, albeit with a good deal of corruption. The systems in place allowed India to forego international aid in the wake of the December 2004 tsunami.

In addition, India's sustained economic growth over the last decade has led to an unprecedented increase in both state and private sector capacity. Whereas in prior crises poverty and underdevelopment have limited the response of the Indian state, continued economic growth should increase India's financial capability to handle climate change. Even if India's growth rates were to decline to around six percent, which may reasonably be expected given the global financial slowdown, India will have an increasing array of tools and resources at its disposal in confronting climatic challenges. India will nevertheless require substantial international assistance in dealing with climate change-induced challenges, in terms of money, technology, and technical assistance.

State Planning. Past performance and current trends suggest that Indian state capacity will continue to expand and should be able to manage increased pressures from climate change effects out to 2030. The uncertainty about regional and local climate change effects will nevertheless inhibit the effectiveness of state planning and responses. India's long term prospects for managing climate change impacts beyond 2030 are more doubtful. Uncertainty in climatic trend lines beyond the 2030 timeframe prevents any accurate assessment of the state's capacity to respond over the longer term. If Indian policymakers become preoccupied with mitigating near-term impacts from climate change they will probably not have the leisure to implement measures to deal with more severe effects beyond 2030. Even if climate shifts over the longer term were more certain, the Indian democratic system inhibits administrations from planning beyond the next few election cycles.

Limitations on State Capacity. Although India has undertaken initiatives to plan for anticipated climate change impacts, it has typically had difficulty executing its plans promptly or effectively. On the one hand, the vast and layered Indian bureaucracy is a source of state resilience; on the other it is very slow to adapt and implement new policies. At the policymaking level, there has been a general unwillingness to move on climate change mitigation absent pressure from environmental crises, popular agitation, or lawsuits. Pervasive corruption also inhibits state effectiveness. The problem is especially acute at the local level, where the district court system—the linchpin for the enforcement of rules and regulations and the accountability of the bureaucracy—is fraught with corruption and inefficiency. Policy execution is further inhibited by limitations on access to funding, efficient technologies, and technical expertise.

Prospects for State Failure

Given the moderate projected climate change impacts and India's increasing state capacity, a widespread state failure is unlikely to occur before 2030. Although the challenges facing India are severe, the country has endured for more than sixty years in the face of predictions of impending state failure. Even if an extreme, sustained climate-induced crisis caused the central government to suffer a general failure, some of the state governments would likely retain enough capacity to function autonomously, at least on a temporary basis. The probable economic and humanitarian consequences of such a failure would nevertheless be catastrophic and require a response at the global level—the Indian state is effectively “too big to fail.”

Stabilizing Factors. India has a number of institutional “buffers” that may aid in preserving state stability. The Indian democratic political system, with its broad participation even by the poorest citizens, is a major source of legitimacy for the state. It is also a mechanism to receive

feedback on mitigation policies that should allow India to more effectively hone its responses to climate change over the longer term. India's federal system has been gradually strengthened since independence, reinforced by the emergence of a state-based political system within a centuries-old common market. The social tolerance of inequality, so long as poverty alleviation continues, may insulate the Indian government from popular disaffection due to disproportionate climatic impacts on certain groups. The ability of the state to turn to elements of civil society for assistance as well as feedback and pressure from civil actors and NGOs are further stabilizing factors.

India is not a police state and the number of security forces per capita is low. The repressive elements of the state—military, paramilitary, and police—nevertheless number in the millions. These forces represent an important tool that India can bring to bear in addressing climate change-induced challenges, both in the case of humanitarian response to large-scale disruptive events such as floods or cyclones, as well as in response to internal instability caused by population displacement, unemployment, socio-economic grievances, or resource competition. Indian security forces have shown the capacity to adapt to the requirements of the mission. In Kashmir, for example, the Indian security response was initially clumsy and ineffective, but over time its effectiveness improved. The Kashmir experience, as well as the challenge from terrorism, has led to needed reforms in the centrally-controlled military and paramilitary forces which will be key responders to large-scale climate change-induced disruptions. The local Indian police forces, in contrast, have yet to be reformed and are pervasively abusive and corrupt.

Failure of Constituent States. Even though a failure of the central government is unlikely, India may accumulate a collection of failed constituent states within its federal structure. While the South and West of India have benefited most from recent economic growth, the Hindi-speaking heartland of the East is characterized by low growth and low state capacities. In addition to being the least developed and most dependent on subsistence agriculture, these states are expected to suffer the most severe localized climate change impacts. This poses a serious risk that state governments will be unable to cope with accelerated climate change-induced challenges, even if the federal government is able to manage the challenges at a macro-level. The failure of constituent states will exacerbate interstate migrations and necessitate both greater federal intervention and greater reallocation of financial and other resources between states. The areas that are most at risk for climate change-induced state failure are also those that face the most serious challenge from Maoist-inspired insurgent groups. A positive feedback loop between insurgency and state failure may therefore develop, leading at best to chronic instability and at worst to sustained regional civil war and humanitarian crises.

State Climate Change Mitigation Policies

Agricultural Policies. The success of the Green Revolution demonstrates that India has the capacity for large-scale agricultural adaptation. India may well need a second Green Revolution to meet the challenges brought about by climate change. Such a process would require very substantial planning and subsidies from the Indian state over a sustained period.

Indian policymakers take great pride in having achieved self-sufficiency in food and are determined not to once again have to depend on foreign humanitarian aid to feed the population. This attitude may constrain willingness to compromise on autarkic food security in the face of climate-induced pressures until the problem reaches a crisis stage. India's existing infrastructure,

expanded and improved up to 2030, should nevertheless be able to handle the movement of food and drinking water from surplus to scarce regions, especially in the states of the northern Deccan and Vindhya (Rajasthan, Gujarat, Madhya Pradesh, and Maharashtra in particular), where there is likely to be more urbanization. Maintaining food security requires not only efficient food distribution but also sufficient food production. Average yields of food crops in India are still low by global standards. While increased productivity might ideally be able to keep pace with population growth, in practice climate change impacts on agriculture will make such productivity very difficult to maintain in the longer term. Measures such as expanding the use of drip irrigation, intensifying watershed/water harvesting efforts, and replanting land devoted to cash crops such as cotton and sugar cane with food crops may be able to mitigate some impacts on agricultural productivity. India already possesses the state institutions needed to conduct research on new varieties of crops that will be drought and saline water resistant and can readily expand them.

Autarkic measures will most likely not be sufficient to make up for declining food production and shortages due to extreme weather events such as droughts, floods, or storms. India will need to substantially modernize its agricultural sector and turn to the world market for at least some of its food needs. The Indian government's Planning Commission is already experimenting with different alternative agricultural models, including contract farming, public-private partnerships, and commercial cultivation of high-value crops such as flowers or potatoes. In addition to generating export revenue, high-value commercial agriculture may be a way to accommodate agricultural capacity currently wasted on inefficient subsistence models. Improved agricultural efficiency and mechanization will have the side-effect of displacing many surplus rural laborers. Any Indian agricultural reform strategy must therefore be complemented by an expansion of industrial and service sector employment opportunities. A phased displacement of vulnerable populations out of lifestyles and regions that will experience the greatest negative impacts from climate change could help mitigate those impacts. A long-term program to carry out this movement in an incremental way might allow India the time to put in place infrastructure and create economic opportunities for the displaced rural population, rather than being overwhelmed by sudden migrations due to climate-induced crises.

Energy Policies. India has few good alternative energy options. Programs to advance cleaner forms of power generation have been initiated but remain far from fulfilling their promise in view of fiscal, technological and end-user adaptation constraints, even assuming that they can provide power inexpensively. Given the large projected growth in production and consumption demands, a transition to cleaner but more expensive means of energy production would entail very large financial costs to India. As a result, for the foreseeable future growth will be tied to fossil fuels, particularly coal. Adoption of cleaner alternative methods of energy production will most likely be contingent on foreign technology transfers.

India will likely expand its use of nuclear power to address some portion of its future energy needs, although there is disagreement about the likely extent of the adoption of nuclear power. In the past nuclear development has been slow, but India now has more access to international sources of nuclear fuel and technical assistance. India may be encouraged to step up plans for increased nuclear power generation if domestic climate change mitigation policies and international standards constrain emissions from fossil fuel-based energy production. Notwithstanding a projected seven-fold rise in capacity, nuclear power will represent eight percent of the total power supply by 2030. It is not expected to rise above 15 to 20 percent by

2050, well after the horizon for carbon emissions that will matter for climate change up to 2080 or even beyond.

Hydroelectric power generation may prove less appealing to India for several reasons. It will face constraints due to projected shifts in rainfall patterns and river flows, particularly as the melting of Himalayan glaciers results in sustained diminutions in river flows. In addition, the fact that most of the Himalayan watersheds are outside sovereign Indian territory creates a risk that upstream activities by the controlling states, notably China, could severely compromise Indian hydroelectric power generation, as well as water security more generally.

The Indian government needs to address the energy challenge at least as much from the demand side as the supply side. This may prove very challenging as it is unclear if New Delhi has the ability to monitor, let alone control, energy use throughout the country. To a certain extent, India's delayed industrialization has been advantageous in terms of controlling both energy demand and increased fossil fuel emissions. India has been able to bypass some energy-intensive stages of industrialization, leapfrogging directly to more efficient solutions. In telecommunications, for example, India has moved directly to cellular phone use, avoiding having to create an energy-intensive landline phone system. Energy demand could be reduced through such measures as solar water heating, solar cooking, and greater use of bio-fuels. Green building designs and construction methods could also be implemented. These need not require the application of advanced techniques: for example, mud more efficiently dissipates heat than concrete, allowing Indians in mud dwellings to live comfortably in up to 120 degree Fahrenheit heat even without air conditioning. A move back to mud construction could therefore reduce the need for air conditioning, in turn reducing demand for electricity. On the other hand, if climate change is expected to bring heavy downpours, mud construction makes less sense. These sorts of design tradeoffs need to be considered in light of anticipated climate change impacts.

The expansion of the Indian transportation sector over the next twenty years is projected to account for a large share of growth in energy demand and will potentially be a major source of increased carbon emissions. The Indian state has the opportunity to incentivize more energy efficiency transportation developments. It could subsidize rail transportation and facilitate the expansion of the already extensive Indian railway system. Rail transportation is substantially more energy-efficient than road transportation. Urbanization and increased demand for personal vehicles, however, dictate that substantial expansion of the Indian road and highway system will take place. As previously discussed, India's auto industry has demonstrated the capacity to produce high-efficiency vehicles, and the government could subsidize the production and purchase of such vehicles.

Regional Implications

The regional impact of likely climate changes will affect India in numerous ways, from first-order environmental effects such as diminished river flows, sea level rise, and windborne aerosols to second-order socio-political disruptions such as cross-border migration, humanitarian crises, and possible state failure. The most significant sustained challenges may stem from reduced water availability and increased migration.

Geopolitics in South Asia

Although it is unified geographically, South Asia is a deeply divided region politically. India is by far the leading power in the region, but has preferred to take an almost exclusively bilateral

approach in dealing with its South Asian neighbors. There is a virtual absence of South Asian regional institutions and a low level of intra-regional trade, investment, and other forms of economic interaction. The one regional organization that exists is the South Asian Association for Regional Cooperation (SAARC); both India and its neighbors have deliberately kept it weak. India is reluctant to accord much importance to this regional association due to fears that neighboring states might use it to restrain Indian power. India's neighbors worry that an effective multilateral institution would become an instrument of Indian hegemony. These considerations have kept contentious issues such as water sharing off SAARC's agenda. India is more interested in participating in the Association of Southeast Asian Nations (ASEAN), as the countries of Southeast Asia are far more significant trading, investment, and security partners. The lack of multilateral cooperation and institutions at the regional level is a significant complication to formulating a common response to shared climatic challenges.

India's domestic politics and that of its neighbors act as a further inhibitor to efforts at regional cooperation. The longstanding and intractable tensions and disputes in the South Asian region tend to mobilize aggrieved domestic constituencies and hamper the national governments' ability to make concessions and improve cooperation. A case in point is the dispute between India and Bangladesh over the Farakka Barrage located on the Ganges approximately 15 miles upstream from the border with Bangladesh. The barrage facilitates irrigation in three of India's most populous states—Uttar Pradesh, Bihar, and West Bengal—which provide about one-third of the representatives in the Indian Parliament. No Indian coalition government can afford to agree to any deal that results in a significant reduction of the water available for irrigation.

Instances like the Farakka Barrage dispute have encouraged the Indian government to repeatedly—and successfully—turn to 'stealth diplomacy.' Private consultations are used to keep issues under negotiation from public scrutiny and possible deal-breaking demands. India knows how to conduct quiet diplomacy and has done so with Pakistan on several occasions over the past decade.

The history of regional tension also means that active involvement by external powers may be a necessary ingredient in facilitating regional cooperation in addressing climatic challenges. Although India has followed a longstanding policy of excluding external powers from the region, that policy began to erode slightly with the end of the Cold War. India has realized that the outside world, and in particular the United States, might be helpful in India's relations with neighboring states. India is willing to consent to great power involvement if it is on Indian terms and serves to advance India's interests.

Regional Water Issues

The major rivers of the subcontinent arise in the Himalayas and their courses cross national boundaries. The great South Asian river basins support rich ecosystems and irrigate millions of acres of land, supporting some of the densest populations in the world. The two major South Asian trans-boundary river systems that include India are the Ganges-Brahmaputra-Meghna system (which spans Bangladesh, Bhutan, China, India, and Nepal) and the Indus system (which spans Afghanistan, China, India, Nepal, and Pakistan). Regional cooperation on these transnational river systems has been conducted on a bilateral basis with mixed results. The lack of multilateral regional cooperation has created the paradoxical situation whereby South Asia faces water shortages despite there being ample water in the region. An integrated regional water management program could provide substantial benefits—such as increased hydroelectric and

irrigation efficiency—but the political barriers to doing so have so far been challenging. Increased pressure on the South Asian water systems due to climate change might provide an incentive for increased cooperation, but given the level of mutual suspicion among the parties could also lead to conflict.

Water Issues with Pakistan. The Indus Waters Treaty signed in 1960 between India and Pakistan is the best example of regional cooperation over water. Outside involvement from the United Kingdom and United States was essential in this case, as India and Pakistan could not resolve their differences over sharing the water. The Indus Treaty stipulated the distribution of waters between India and Pakistan, the construction of canals and storage facilities (paid for by the US and the UK) and a Permanent Commission to adjudicate disputes, exchange data, and provide for on-site inspections. The Commission has been able to accommodate the expansion of the irrigation system in both countries and has continued to function over the past five decades, even during the two Indo-Pakistani wars and periodic tensions. Lessons learned from this example of water cooperation between adversaries include the need for external involvement and funding, concrete benefits to both sides, strong national leadership, and some degree of ‘stealth diplomacy.’

In spite of the Indus Waters Treaty, Indo-Pakistani tensions—such as the two-decade old dispute over the Wular Barrage being built by India on the Jhelum River—mean that shared river systems will not be utilized to their full potential, which might become a serious regional problem as river flows diminish. The water dispute could become an increasingly relevant factor in Indian and Pakistani strategic calculations, although resort to military force specifically on the water issue is unlikely.

Water Issues with Bangladesh. India has had a long-standing dispute with Bangladesh over the Ganges-Brahmaputra-Meghna river basin, which includes the Farakka Barrage issue. A series of treaties have been signed since 1975—the latest in 1996—but no solution has been implemented. Bangladesh continues to protest the diminished flow of water and the adverse impact caused by the silting of vital waterways, factors likely to be significantly worsened as the overall river flow diminishes. India is constrained by a lack of funds and by domestic political factors that stall any solution to reduce the water available for irrigation in northeastern India.

Water Issues with China. Unlike India’s other neighbors, China is not part of the South Asian geographic and climatic region, and faces discrete climate change impacts. China nevertheless plays a significant role in hydrologic issues in South Asia, primarily through its control of the Tibetan Plateau and Himalayan watersheds which are the source of several rivers that flow through the eastern quarter of the subcontinent. As glacial melting reduces river flows from the Himalayas, water competition between India and China may intensify. Tension may worsen as China moves ahead on plans to tap into Himalayan hydroelectric potential. The major issue concerns China’s plans for a massive hydroelectric project in Tibet which is expected to be twice as large as the Three Gorges Dam, currently the world’s largest hydroelectric project. The Tsangpo hydroelectric project would divert water from rivers draining from Tibet into South Asia. This is likely to become a major point of contention with India, and may inflame even further the unresolved border claims between the two countries.

Cross-Border Migration

The other major cross-border regional climate change issue facing India is an upsurge in cross-border migration from neighboring countries subjected to severe climate change impacts. There

is already a large-scale movement of people from Nepal and Bangladesh into India for economic reasons, and climate change will most likely result in a significant increase in migration. Increasing cross-border migration has already triggered “sons of the soil” movements that demand the expulsion of these immigrants, most of whom are illegal. Efforts to restrict migration have failed and the Indian government recognizes that the only realistic long-term solution is economic development and increased prosperity in Nepal and Bangladesh. This issue, like that of water, will require a regional approach.

Immigration from Bangladesh. Illegal immigration from Bangladesh into India can be compared to that from Mexico into the United States and has already caused pressure on India’s stretched resources in the Northeast and Bengal. Bangladeshis account for the majority of migrants presently in India. Although estimates on the numbers involved vary, they could amount to between 15 and 20 million people. India is now building a fence around Bangladesh to stop migration and placate anti-immigrant groups, but border control has so far proved ineffective. A 2008 Delhi High Court ruling has paved the way for deporting persons of Bengali origin unable to produce a birth certificate or other evidence of Indian citizenship. In India’s northeastern Assam region, groups that face the threat of being demographically overwhelmed by immigrants have argued that the federal government in New Delhi is unable or unwilling to prevent illegal immigration. They have gone so far as to use the immigration issue as grounds for secession from India.

The majority of Bangladeshi immigrants have been illegal economic migrants from districts adjacent to Indian West Bengal. Anticipated inundation and salt water intrusion in the Ganges delta may displace tens of millions more Bangladeshis, many of whom may cross the border into India. India would not have the resources to cope with Bangladeshi immigrants pushing into West Bengal, Orissa, and the Northeast. On the other hand, Bangladesh has shown increasing capacity to cope with inundation. Up to 70 percent of Bangladesh is under water each monsoon season, but farmers have adapted by cultivating water crops such as rice and farming shrimp for export. Despite these adaptations, Bangladesh will most likely become less able to manage the issue as the loss of arable land continues and the scale of the climatic problems increases. About half of Bangladesh’s population, unable to sustain themselves through agriculture, will migrate to cities by 2050, and much of this migration will probably be to India. In addition, major disruptive events such as cyclones may generate mass refugee movements into India on much shorter timescales than the overall shifts in climate.

Immigration from Nepal and Other South Asian Countries. Immigration from Nepal has so far been a much less contentious issue than the influx from Bangladesh. The number of Nepalese immigrants involved is much smaller—at most two to three million. Unlike Bangladeshis, most Nepalese immigrants enter India legally. The border with Nepal is open and there have been no efforts to erect barriers. India’s concerns about Nepalese immigration are nevertheless likely to increase as climate change-induced pressures increase the flow of immigrants.

Sri Lanka’s coastal areas had a preview of the disastrous effects of rising waters during the 2004 tsunami. Pressure from rising sea levels could cause Tamils from northern and eastern Sri Lanka, about 18 percent of the total population of 20 million, to migrate to Tamilnadu across the Palk straits, as well as to seek assistance from India. The entire country of the Maldiv Islands could disappear due to sea level rise. The population of 300,000 is already experiencing flooding of some islands. India will be expected to assist and could become the host for the

majority of the displaced islanders. Although immigration from Pakistan is not very significant, a climate-induced state failure in Pakistan might result in refugee flows across the Indian border.

Prospects for Regional Conflict

Climate change impacts mean that India, as the leading regional power, will most likely face increased requirements for humanitarian intervention in neighboring countries, either unilaterally or multilaterally. The prospect of climate-induced state failure in Sri Lanka, Nepal, or Bangladesh might necessitate strong Indian intervention. Short of state failure, major disruptive events such as cyclones—which are expected to strike with greater intensity and frequency—could similarly necessitate Indian humanitarian intervention, particularly in Bangladesh, Sri Lanka, or the Maldives. Setting aside humanitarian intervention, it is unlikely that interstate conflicts will be explicitly framed in terms of environmental issues such as water rights or migration. Climatic concerns may instead increase underlying tensions in the region, exacerbating conflicts over other issues.

Pakistan. Pakistan presents a special and particularly troubling case for India. Indo-Pakistani conflict remains a persistent risk, even absent climate-induced pressures. Pakistan might, in extreme circumstances, be pushed to contemplate military action to secure the sources of the Indus river system, which lie in the disputed territory of Kashmir. Given Indian military superiority, such a move is very unlikely and Pakistan's prospects of holding the territory in the long term would be remote. The presence of the Indus Waters Treaty, which has so far successfully guaranteed Pakistan's access to the rivers, even during armed conflict with India, also remains a mitigating factor.

A more likely climate change-induced conflict scenario involves the full or partial failure of the Pakistani state. Pakistan faces a serious risk of state failure even without climatic pressures. Even without details of climate change impacts on Pakistan to 2030 it is clear that climatic stress would intensify Pakistan's pervasive instability. A failure of central military authority could result in Pakistan breaking up into its constituent ethnic and regional sub-units. Climate change-induced challenges could also cause the breakdown of civil order in particularly vulnerable regions of the country, such as Punjab. The inability of the Pakistani government to cope with climate change-induced challenges could also increase support for radical solutions such as Taliban-style fundamentalist movements and prompt a generalized insurgency. Loss of military control would place the security of Pakistan's nuclear arsenal at risk. Any of these scenarios would pose a severe national security threat to India. India would likely feel obliged to intervene given a wholesale state failure in its nuclear neighbor.

China. India's strategic concerns about China may inhibit both the prospects for cooperation on regional or global climate change mitigation as well as India's willingness to sacrifice economic growth or redirect resources from national security needs. The most salient climate-related point of conflict could be China's move to divert the upstream waters of rivers originating in the Himalayan watershed. Tibetan hydroelectric projects could put at risk the tributaries of the Brahmaputra. If China was determined to move forward with such a scheme, it could become a major element in pushing China and India towards an adversarial rather than simply a competitive relationship. Border clashes related to control of the rivers are not out of the question. In 1962, India was defeated by China in a border war in the mountains of Arunachal Pradesh—the same area that would be affected by river disputes.

Prospects for Regional Cooperation on Climate Change Mitigation

Given the likely regional impacts from demographic and climate changes, states in South Asia need to adopt a more cooperative approach to address regional problems. No regional climate mitigation effort will be adopted without India's active support and most likely its leadership. Despite the numerous problems noted above that hinder regional cooperation, several factors may prompt India to take a more active regional stance. Regional cooperation enhances India's goal of playing a more significant role on the world stage. Conversely, tensions with its neighbors, especially with Pakistan, are distracting and make India a less attractive strategic partner. In addition, India's neighbors provide sources of energy that could improve the chances of India maintaining a high rate of economic growth—hydroelectric power in the case of Nepal, gas in the case of Bangladesh, and transshipment routes for Iranian and Central Asian gas in the case of Pakistan.

The biggest challenge, however, will be political leadership. Missing today from the model of the successful Indus Waters Treaty described above are strong national leaders in any of the South Asian states who can stand up to domestic obstructionism. Indian Prime Minister Manmohan Singh, a renowned economist, is probably the only regional leader with the vision to push regional climate mitigation efforts, although he heads a relatively weak coalition government. Regional cooperation on climate mitigation proposals will likely require "stealthy," non-publicized outside involvement and funding, probably led by the United States.

Overall Foreign Policy Implications

Since the adoption of market reforms in the early 1990s, India has radically reoriented its foreign policy. It has moved from an inward-looking security stance to a more outward-looking policy aimed at enhancing trade, investment, and access to technology. It has cultivated relations with countries that can help it achieve economic growth, such as the United States, Japan, and countries of the European Union. Nevertheless, India retains some residual autarkic tendencies and its growth model is far less export-dependent than that of China. If climate change caused an extreme diminution in resources, it might be the catalyst for a shift toward autarkic policies in India.

India's Foreign Policy Stance on Climate Issues

India's industrial growth and size mean that it is becoming one of the primary contributors to climate change, even though its per capita emissions are and will remain low by developed country standards. India therefore needs to reevaluate its strategy and values on climate issues—focusing more on curbing future impacts and less on historical injustices—if it is to assume a responsible global position. This will require reframing the climate debate in terms of India's self-interest in mitigating destabilizing impacts and promoting green economic growth rather than in terms of the global need to limit or moderate industrial development. As a latecomer to industrial development, India is not receptive to the latter argument.

Indian policymakers also remain hostile to what they perceive as high-handed foreign dictates on climate change policies that do not take India's development needs into account. Even as climate change impacts begin to be felt, suspicions remain that the climate issue is being used to protect the economic interests of developed countries. India's policymakers are likely to support issues related to climate change only if convinced that they also advance the goal of economic growth.

While India favors a multilateral approach to managing global climate change mitigation, it prefers that the standards and regulations be voluntary and take development targets into account. India has been consistent in refusing to accept international greenhouse gas mitigation targets, for example, citing equity and economic grounds. India has remained firm on the principle that all countries have a right to equitable emissions in the atmosphere measured by per capita entitlement, an argument so far supported by China and other developing countries. India's view has been that the developed countries have exhausted the global commons and should bear the primary responsibility for responding to climate change. The developed countries should therefore reduce their emissions to start closing the gap in per capita emissions between developed and developing countries.

If the developed countries want India to adopt more climate-friendly policies and technologies, they will have to subsidize it through the large-scale transfer of technology and money. The developed countries have the efficient technologies India needs to effectively deal with the challenges of climate change mitigation, and India believes they have a responsibility to provide such aid. Large-scale transfers of wealth may be a tough sell in the current global economic climate. The acceptance of a per capita distribution of carbon permits in itself would represent a trillion-dollar transfer of wealth from the developed countries.

Indo-American Relations

Since the end of the Cold War, India has largely abandoned its ideological commitment to non-alignment and shown an increased willingness to engage with the United States and even allow US involvement in South Asian regional affairs. The US pressure on Pakistan to withdraw its troops from the Kargil enclave in Kashmir in the summer of 1999 demonstrated that US involvement on the sensitive Kashmir issue could be advantageous. A more recent example of US help was the assistance provided by the Federal Bureau of Investigation and US pressure on Pakistan to cooperate in the investigation of the November 2008 terrorist attack in Mumbai by operatives of the Pakistan-based Lashkar-e-Taiba (LeT). The successful US effort to exempt India from the international restrictions on export of nuclear fuel and technology significantly enhanced US standing in India. Polls over the past several years consistently show that the US is popular in India and that Indians perceive US foreign policy goals as not inconsistent with those of India.

Climate Policy Differences. India and the United States have been on opposing sides of the climate change debate. Although both sides cite equity considerations in support of their stances, India defines equity on a per capita basis while the US defines it in terms of contributions to emissions. India seeks further commitments on reducing emissions from the developed countries, citing the principle of “common but differentiated responses.” India believes that the United States should take the initiative in making disproportionate adjustments to its own energy consumption and emissions before expecting India to take similar action. The United States insists on parity in treatment of all major emitters, an important reason it did not sign the 2005 Kyoto Protocol imposing mitigation targets only on developed countries. Although US-Indian dialogue on climate change continues, it frequently suffers from divergent interpretations by the two sides. Despite the fact that both the US and India endorsed the 2007 Bali Action Plan to advance the climate regime at the Copenhagen Conference of Parties in 2009, each reads the text differently. India, supported by China and the G-77, views the “nationally appropriate mitigation actions” by developing countries as contingent on transfers of technology and infusions of

financing and capacity-building from the developed countries. This is a much more open-ended interpretation than that of the United States.

India considers itself to be in a relatively strong position to persuade the United States and other developed countries to pay for the changes needed to reduce emissions because arriving at an international climate change agreement means far more to them than to India. It has therefore adopted a maximalist negotiating position that the United States may find very difficult to accommodate. India may not fully take into account the difficulty in securing sufficient political support on the US side for substantial financial support to Indian climate change mitigation. Although outsourcing has given India some leverage with the United States by moving substantial supporting elements of US industries to India, this leverage is not at the level enjoyed by China.

Strains in Indo-American Relations. India perceives the United States has downgraded its relationship with India in favor of stronger ties to Pakistan and China. The Hyde Act was a major step backward in relations, nullifying closer cooperation with India on nuclear security and energy. The current lack of enthusiasm in Washington for following through on the terms of the nuclear deal negotiated under the Bush administration has sent a strong signal that nonproliferation concerns have been prioritized over closer ties with New Delhi. As a consequence, India is turning to France and Russia as nuclear energy partners.

The renewed US emphasis on the war in Afghanistan has led to increasing American ties with, and reliance on, Pakistan. Pakistan has extracted a high price in military and development aid from the United States for its cooperation against terrorism and the Taliban. Having been accorded the status of a major non-NATO ally, Pakistan has increased access to advanced US weaponry. Although US aid is intended to facilitate Pakistani engagement on the terrorism front, it has the side-effect of strengthening Pakistan's capabilities vis-à-vis India. Regardless of Washington's motivation, India feels threatened by deepening ties and aid to its main regional rival.

India tends to perceive the US relationship with China in similarly zero-sum terms. India and China to a large extent occupy the same geo-political space as major rising Asian powers and leaders among the world's developing countries. India regards itself as a peer competitor of China and is very sensitive to the greater relative international weight accorded to Beijing—for example, China has a permanent United Nations Security Council seat while India does not. India views any US move that disproportionately favor China with hostility. This applies to climate change as to other international issues. For example, if the United States were to negotiate a bilateral side-deal with China in advance of the Copenhagen negotiations, India's non-cooperation would be virtually assured and US-Indian relations jeopardized. Given India's upcoming elections, such a move would sour the views of the incoming Indian administration regarding the United States, regardless of whether there is a change in government.

To the extent that Indian policymakers perceive the United States is turning away from India and giving aid and comfort to its adversaries, their displeasure may well manifest itself in greater recalcitrance on climate change issues. From India's perspective, the United States has a history of vacillating between granting favor to India or its rivals. New Delhi does not forget past American fickleness and grudges are likely to be carried over into future policy debates.

Opportunities for Engagement. Ample opportunities exist for the United States to incentivize greater Indian cooperation on climate issues. In recent years India has set aside previous ideological divisions with the United States in order to take a more pragmatic approach aimed at furthering its own perceived national priorities. In the longer term, a strategic partnership with the United States offers India a stronger position vis-à-vis China. There is a possibility for a *quid pro quo* if the United States is prepared to offer a long-term security relationship in exchange for Indian concessions such as emissions caps. Indian uncertainty about Washington's commitment to building a partnership may require a demonstration of US bona fides. US actions that accord New Delhi equal prestige and precedence to Beijing may dispose India to greater confidence in US commitments and openness to compromises on climate change issues. A trilateral dialogue between the United States, India, and China in advance of Copenhagen, for example, might be viewed positively by New Delhi, whereas a bilateral US-China dialogue would be viewed negatively.

So long as direct military aid remains limited to counter-terrorism, US ties to Pakistan are not necessarily a disadvantage to India. The close relationship with Islamabad allows the United States to exert more leverage to curtail Pakistani provocations in Kashmir or tacit support to terrorist groups such as LeT, as well as to act as an honest broker in 'stealth diplomacy' between the rival countries.

While India is now taking the implications of climate change seriously, US pressure remains an important factor in sustaining commitment to climate change mitigation policies. India currently perceives its relative stake in climate change mitigation as less than that of the US and other developed countries. Although this is likely to change over time as climate change impacts on India intensify, in the near term securing Indian acquiescence in international mitigation policies may require US persistence and persuasion. This will require a combination of flexibility in accommodating India's developmental priorities and incentives in other areas, such as security, technology transfers, subsidies, and greater diplomatic engagement. In addition, unilateral US initiatives on reducing its own climatic impact would demonstrate US sincerity and resolve on the climate mitigation issue.

The Copenhagen Negotiations

Despite the urgency of the Copenhagen negotiations, a comprehensive agreement on climate change mitigation may not yet be possible. Failure to achieve an effective treaty at Copenhagen would be a major setback in the response to global climate change, but there would still be the opportunity for a side deal with India and/or China. The United States should be prepared to continue the dialogue at other venues and on a bilateral or more constrained multilateral basis. However, the United States should not alienate either of these key powers in the name of short-term diplomatic maneuvering. India remains one of the few countries where the United States maintains a broadly positive image, an advantage which should not be squandered through heavy-handed diplomacy.

The United States should approach India before the negotiations through 'stealth diplomacy' and seek to pre-negotiate a mutually acceptable compromise outside the public and international eye. India is broadly receptive to the idea of climate change mitigation but not at the expense of economic growth. It would be useful to reframe the argument in terms that recognize India's growth priorities and show how cooperation will serve India's economic interests. India would likely be receptive to a sliding scale of climate change mitigation benchmarks for India and other

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developing countries that still need to focus on growth. Such a scale would allow more relaxed standards until they reached levels of wealth and industrialization seen in developed countries. Copenhagen provides an opportunity for the United States to assuage Indian concerns about its commitment to a strategic partnership. The negotiations can be presented to India as one of the first tests of US and Indian resolve to ameliorate policy differences and take a joint lead on a critical global issue. Even limited symbolic US concessions may pave the way for strategic agreements down the road.

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