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The AEI (Asian Energy Institute) is a network of 17 energy institutes from Asian countries. These include Bangladesh, China, India, Indonesia, Iran, Japan, Jordan, Korea, Kuwait, Malaysia, the Philippines, Pakistan, Sri Lanka, and Thailand. Besides, there are 14 associate members, both within and outside Asia. The AEI was formally established in August 1989. Its aims and objectives are to promote greater information exchange; facilitate sharing and dissemination of knowledge; undertake research and training activities that are of common interest to its members; and analyse global energy developments and their implications. TERI hosts the secretariat of the AEI at present. The secretariat publishes a biannual newsletter that informs the readers about the diverse research activities undertaken by the member institutes. Currently, the AEI is hosting the regional secretariat for REEEP (Renewable Energy and Energy Efficiency Partnership) in South Asia.

Editors **Mitali Das Gupta and Deepti Mahajan**

Editorial

*R K Pachauri**

The world is suddenly confronted with a set of very serious inter-related problems, which have the potential for becoming a major crisis. On the one hand, we find global oil prices reaching unprecedented levels of more than $130 per barrel. Just five years ago when prices in the global market were hovering around $10 per barrel no analyst could have predicted that prices would reach such peak levels. Even the foremost leaders of the hydrocarbons industry, till about a year ago, were predicting that oil prices would come down and possibly settle around $40 per barrel in more or less a steady state. Nowhere do we see such an outcome today. Another area in which we have clearly the makings of a crisis today, which would become much more severe in the future, is the problem of climate change, which is manifesting itself in a variety of ways all over the globe. One important aspect of the impacts of climate change is the growing threat in the form of water scarcity in several parts of the world and possible decline in productivity of foodgrains in various locations. Still a third threat that is causing considerable distress and hardship in many countries is the sudden increase in foodgrain prices, resulting from an imbalance between quantities demanded and supply of food in general, foodgrains in particular. These three problems have well-established linkages which require human society to take comprehensive measures by which we can stabilize and meet these threats effectively as quickly as possible.

Clearly, one important element in finding comprehensive solutions lies in information and knowledge exchange by which the benefits of knowledge created in any part of the world can be used for the benefit of other parts of the world. However, while the problems outlined above have universal relevance, one region where they pose a particularly acute challenge is in the Asian region. Asia is not only the most populous continent in the world, it is also experiencing the most rapid rate of economic growth, which clearly leads to a substantial increase in demand for raw materials and a range of goods and services. Inevitably, therefore, the strain that these conditions impose on the ecosystems in this region and the environment in general are becoming quite serious. While there is a clamour on the part of the developed countries asking countries like China and India to reduce the growth of their greenhouse gas emissions, which clearly is not fair and justified for national and local reasons, it is nevertheless essential for the countries of this region to reduce their footprints on the environment and natural resources. Particularly relevant in this context is Mahatma Gandhi's response, 'It took Britain half the resources of the planet to achieve this prosperity. How many planets will a country like India require?'. Several societies succumb to the temptation of short-term measures, which often result in serious long-term problems. Such, indeed, is the case with the current effort to produce biofuels from sources of food. For instance, the conversion of palm oil to products that would substitute petroleum products is not only diverting an important edible oil used for human consumption, but is also leading to felling of trees and clearing of forests in an effort to expand palm oil production. While biodiesel presents enormous opportunities as a future source of energy, there is clearly a need for making the right choice of technologies and feedstock. This would require a significant amount of research and development, which the world has been unable to undertake, lulled perhaps by low oil prices in recent decades. At the same time there has been a notable lack of well-directed and proper research in the field of agriculture by which large parts of the world would have been able to enhance their foodgrain output, particularly where there is overwhelming dependence on rainfed agriculture. The growing threat of more severe and frequent droughts only adds to the importance of this work.

Overall, there is now an enormous urgency in tackling some of these problems on a comprehensive basis, but without compounding the problem in the pursuit of short-term illusory gains. In this, the wisdom of Asia and the solid scientific and analytical capabilities that have been developed in the region provide promise of solutions that are home-grown and which would provide direction to the rest of the world as well. But what is required critically is a change in policies and direction, by which we work collectively in articulating the challenges ahead and meeting them on a collaborative and cooperative basis. This is where the Asian Energy Institute can really start making a difference in the interests of a sustainable pattern of development in Asia.

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Balancing energy and climate concerns: some implications for international politics

Deepti Mahajan and Devika Sharma*

Introduction

The inter-linkage between energy and climate change is one of the fundamental reasons why the lines between the domestic and the international, norms and action, developing and developed are being reformulated in today's world. On the one hand is a purely statist demand for material advancement, and on the other the international norm for arresting climate change that impacts the purely statist pursuit of economic growth. What has resulted is a blurring of lines between the 'absolute' sovereignty of the state in adopting a particular path to secure energy for itself, and the norms and constraints for reducing GHG (greenhouse gas) emissions and shifting to cleaner energy. This has yielded some interesting implications for the tone and tenor of international cooperation — by resurrecting old debates as well as bringing to the fore new challenges. This article highlights three important ways in which engagement in the international system is being influenced by the inter-linkage between climate change and energy, namely, the ascendance of norms, the reconstitution of sovereignty, and the changing dynamics of inter-state relations.

The ascendance of norms

Economic growth is closely tied to the availability of and access to energy. Therefore, enhancement of energy security has emerged as a strategic priority for economic and foreign policy-making. However, the climate change debate has substantively altered the contours of the discourse on energy security. As countries work towards diversifying their energy portfolios, climate change concerns and emission reduction targets determine what choice of fuel is considered acceptable. Given the climate change debate, therefore, nations' understanding of energy security has become amplified in recent times to imply more than the availability, affordability and accessibility of energy, but also the acceptability of fuel choices, along with the domestic feasibility of energy policies. For instance, countries are making an attempt to cut down on coal use and adopt clean coal technologies, or shift to cleaner energy sources such as hydropower, nuclear energy, natural gas, biofuels, and so on. Increasing efficiency of energy supply and end-use consumption has emerged as another important tool to enhance energy security while mitigating climate impacts. Meeting environmental norms in this regard requires states to modify their policies in several key areas of domestic governance, such as transport, infrastructure, industry, buildings, and agriculture.

Therefore, the nature of the problem of climate change has reinforced the ascendance of norms in international politics. The intertwining of energy and climate change concerns has emphasized the fact that states cannot function in isolation from each other, or at cross-purposes. Their sovereign right to chart their own course of development (and hence energy security) must recognize the need for sustainable development and protection of the global environment. The idea of shared responsibility of the 'global commons' has brought about the recognition that inter-state relations are not about wresting absolute gains from the other. Instead, international engagement involves the acceptance of constraints on one's sovereign power in an attempt to move towards a sustainable path of development that ensures human security, above traditional notions of military supremacy. One of the most visible manifestations of this has been the Kyoto protocol requirement of Annex I countries to achieve stipulated reductions in emissions, and the growing pressure on fast developing countries to make efforts toward establishing themselves as low-carbon economies.

The reconstitution of sovereignty

While the twinning of climate change and energy has highlighted the importance of norms in international politics, it does not in any way portend the disappearance of state sovereignty. What we are witnessing is a reconstitution of sovereignty, rather than its dissolution. Karen Litfin calls this 'greening of

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sovereignty' — a process by which the state's power is not eroded but is reconstituted (Litfin 1998). While international pressure and the dominant normative discourse may determine a state's position, a state's decision to pledge its obligation to an international regime is in itself an exercise of choice. Further, the state retains the power to devise policies for the national operationalization of regulations and as Litfin points out, 'only the state possesses sufficient authority, legitimacy, resources and territorial control to enforce environmental rules and norms.'

The state also remains the pivot around which negotiations at the international level take place. 'Sovereign authority' is no longer an asset that needs to be guarded but is perceived as a bargaining tool to assert the interests of states at international forums, and ensure that others too abide by common rules and practices (Keohane 2002). At these forums, negotiating positions are determined by the countries' different socio-economic realities, and the constraints these realities place on their policymaking and their ability to undertake international obligations. In the context of the climate change debate, state positions are determined by their level of development and projected growth trajectories (linked with rising or declining energy demand), as well as their geophysical reality. It is these differences that are responsible for the continued relevance of sovereignty and its use as a tool to leverage special state interests – that is, the developing countries' refusal to accept binding limits on their emissions and the US Senate's unwillingness to ratify any agreement that does not include commitments by the developing countries.

The 'common but differentiated responsibilities' approach to fighting climate change embodies one way in which common international responsibility and the sovereign right of the state to preserve its interests, come together. At the heart of the 'common but differentiated responsibilities' principle lies the recognition that, in the immediate term, the developed countries must shoulder the burden to curb and mitigate climate change. These countries have adopted GHG-intensive energy practices over the past two centuries, and also now stand in a better position to divert resources to climate adaptation and mitigation. Developing countries too need to contribute to carbon-reduction, shifting the terms of the discourse from *whether* developing countries should act to *when* and *how* (Cazorla and Toman 2000). The developed countries might be called upon to cut their emissions by as much as 4% by 2020, while the developing countries will be required to move towards carbon-neutral development programmes. This would imply a re-channelization of both public and private funds towards alternative sources of energy (and compatible processes), and efficient technology. For developing countries like India, such adaptation and mitigation efforts could cost as much as $2.53 trillion in investments to reduce GHG emissions by 9.7% by 2036, if 1990 emissions levels are taken as the baseline (Ghosh, cited in Sethi 2007). This amounts to nearly 2.2% of the country's GDP annually on addressing natural variability to climate change (Ghosh 2008). Country-driven voluntary actions by developing countries therefore must be assisted by technological assistance and financial resources from the developed countries. However, even amongst the developing world, the stances differ based on different geophysical realities and economic realities. Low-lying deltaic regions and island states are the most vulnerable as they face an existential threat from rising sea levels, spread of disease vectors, and frequent droughts and floods. Since the problem of climate change poses unique challenges for them, their international positions are informed by the need to evolve mechanisms to meet these challenges.

The deadlock in the climate change negotiations therefore is primarily the result of the fact that climate change adaptation and mitigation efforts cannot be divorced from the social and economic developmental realities of countries. While the US continues to stand by country-driven voluntary strategies, largely a result of the role of corporate media and campaign finance (Monbiot 2007), sections of opinion in developing countries like India continue to assert that rapid development is perhaps the most effective form of adaptation and mitigation (Dasgupta 2008). Developing countries' efforts, they suggest, need to be charted around win-win strategies and actions that serve to reduce carbon emissions but do not undermine economic growth (Dasgupta 2008).

Sovereignty, in the context of climate change negotiations, is thus employed by different countries to assert their points of view. These differences in terms of national priorities is an important reason why the inter-linkage between energy and climate change is pulling international negotiations in opposite directions, and why states continue to leverage their sovereignty to push for a more 'differentiated' than 'common' responsibility.

The changing dynamics of inter-state relations

Given the fact that states remain pivotal players in the debate on climate change and energy security, what we see in the international arena is a re-alignment of

inter-state dynamics. Because climate change concerns are increasingly determining the path countries can adopt for enhancing their energy security, the international arena is marked by a pattern of inter-state relations and associations that are much more fluid and issue-based in nature than before. In an effort to reduce their GHG emissions, countries need to identify partnerships that might afford them clean technologies and/or less carbon intensive fuel options such as natural gas, solar energy, wind energy, hydropower, biofuels such as ethanol, and nuclear energy.

Climate change concerns, combined with skyrocketing oil prices make it critical for countries to practise a pragmatic 'energy diplomacy', that is, a policy of offering political or economic incentives in order to ensure assured supplies of energy from a diverse set of countries. Allegiances and alliances between countries based on ideology are no longer viable, particularly because states increasingly need to partner countries that can offer them energy or energy-related services, even though there might be a disjuncture between their foreign or domestic agendas.

The re-alignment of inter-state relations because of the inter-linkage between climate change and energy has been exemplified by some recent developments. Nuclear energy has made a comeback in recent times primarily because of its role in GHG abatement.[1] This renewed interest in nuclear power naturally makes countries with nuclear technology and with deposits of uranium logical partners for countries interested in developing their nuclear power sector. India's recent proposal to seek civil nuclear cooperation with China while it works simultaneously towards clinching the civil nuclear deal with the US is a perfect example of how state alignments are becoming more fluid. India needs to cleverly balance its strategic partnership with the US while not allowing its energy interests in Iran to become subservient to the former's interests, primarily because natural gas from Iran would help India address its climate change concerns as well as meet its demand for energy security.[2] Again, renewable energy (solar and wind) and biofuels like ethanol have made countries like India and Brazil important partners for countries interested in shifting to alternative energy sources. India's lead in the manufacture of renewable energy technologies provides it a key to enhancing trade relations with energy deficit countries, including its South Asian neighbours.

Conclusion

Energy and climate concerns, and particularly their emergence as issues of international diplomacy and negotiation, have opened up a vast area of knowledge and practice for exploration. As the paper discusses, the inter-linkages between energy and climate concerns have impacted international engagement in challenging and often paradoxical ways. Normative concerns have become closely intertwined with the material interests of energy security; the 'sovereign' right of countries to secure energy is conditioned by the need to address climate change; and inter-state relations are being charted to ensure access to energy sources.

The negotiation framework under the UNFCCC and the institutionalized practices established for international engagement, even though subject to criticism, have contributed immensely to arriving at a near-universal engagement by states, and furthering the agenda of environmental protection and sustainable development. It has offered space for the articulation of the concerns of low-lying coastal areas and natural resource-dependent economies. Further, as the developed and developing states define their positions, carefully guarding their sovereign interests, the notion of 'common but differentiated responsibility' has laid the groundwork for assessing states' capabilities and constraints. In this framework, the international community has recognized the need for developed countries to assist developing countries through provision of finances, knowledge sharing and technology.

Beyond the multilateral negotiations, countries' mapping of bilateral and pluri-lateral strategic partners is also being determined in large measure by the need to secure energy while reducing carbon emissions. This has reinforced the prevalence of geo-economics over geopolitics, whereby the countries' energy needs to fuel their economies is determining the emerging pattern of political and strategic alignments. The resultant revision of priorities may have a significant influence on international power equations in the coming decades.

The run-up to Copenhagen 2009 will only strengthen the call for building cross-country political will and action plans to tackle climate change in a framework that guarantees a secure energy future. How states, and the international community at large,

[1] Nuclear energy is, however, not a zero-emission option.
[2] The use of natural gas is both less polluting than the use of coal, and far cheaper than procuring oil.

respond to the challenges posed by these new issues, such as the inter-linkage between climate change and energy security, will not only influence world energy and climate futures, but also influence diplomatic practices, mechanisms for international cooperation, and governance of transnational concerns.

References

Cazorla M and Toman M. 2000
International equity and climate change policy
Details available at <http://www.rff.org/rff/Documents/RFF-CCIB-27.pdf>, last accessed 20 April 2008
[Climate Issue Brief No. 27, Resources for the Future, Washington, DC]

Dasgupta C. 2008
Climate change
Paper presented at the *RIC (Russia-India-China) Trilateral Seminar on the 'Evolution of Geo-Political Strategic Trends'*, New Delhi, 28 March 2008

Ghosh P. 2008
Energy, climate, and security: the inter-linkages
[Publication of Conference Proceedings of 2nd TERI-KAF Conference]

Keohane R. 2002
Power and Governance in a Partially Globalized World
London/New York: Routledge

Litfin K. 1998
The Greening of Sovereignty in World Politics
Cambridge: MIT Press

Monbiot G. 2007
We've been suckered again by the US. So far the Bali deal is worse than Kyoto
The Guardian, 17 December 2007

Sethi N. 2007
Emission cut to cost India $2.5 trillion
The Times of India, 16 October 2007

Bibliography

International Energy Agency. 2007
World Energy Outlook 2007
Paris: International Energy Agency

Jones R J Barry. 1998
Review of 'Constituting International Political Economy', by Kurt Burch and Robert A Denemark
International Affairs **74** (3): 658–659

Kaul I. 2006
Blending external and domestic policy demands
In *The New Public Finance*, pp. 73–108, edited by Inge Kaul and Pedro Conceicao
New York: Oxford University Press

Keohane R. 1998
International institutions: can interdependence work?
Foreign Policy 110: 82–96

Müller B. 2002
Equity in Climate Change: the great divide
Oxford: Oxford Institute for Energy Studies

van der Veer J. 2007
Two Energy Futures
Details available at <http://www.shell.com/home/content/aboutshell-en/our_strategy/shell_global_scenarios/two_energy_futures/two_energy_futures_25012008.html>

Vidal J. 2008
Climate change: Bangladesh takes the lead
The Hindu, 27 March 2008

The G8 Hokkaido Toyako Summit and Climate Policy in Japan

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Towards the G8 Hokkaido Toyako Summit

Japan will host the G8 (Group of Eight) Summit for 2008 in Toyako, Hokkaido, from 7 to 9 July, and climate change will be at the top of the agenda. Besides the G8 members (Canada, France, Germany, Italy, Japan, Russia, the United Kingdom, and the United States), an additional 15 countries including China, India, and the Republic of Korea will be invited for extended sessions. The issue of climate change has become a priority for the G8 since the Gleneagles Summit, UK, 2005, where the Gleneagles Plan of Action (climate change, clean energy, and sustainable development) was adopted. The outcome of the Gleneagles Plan will be reported in the G8 Toyako summit. Prior to the summit in July, a series of related meetings are taking place in Japan, including the Gleneagles Dialogue (March) and various ministerial meetings (foreign affairs, finance, science and technology, environment, energy, development, justice and home affairs, labour, and TICAD IV [Tokyo International Conference on African Development IV]). While climate change has been included on the agenda of many of these meetings, the Gleneagles Dialogue and the Environment Ministers Meeting treat climate change as a key issue.

The Gleneagles Dialogue took place from 14 to 16 March 2008 in Makuhari, Chiba, Japan. The participants included all major countries that together contribute about 80% of global GHG (greenhouse gas) emissions. Discussions were held on four themes — 'technology', 'finance and investment', 'adaptation', and 'the post-2012 international framework'. At this meeting, sectoral approaches to GHG mitigation were introduced as the main point of discussion. To arrive at a feasible national GHG emissions target, it is considered useful to aggregate the emission reduction potential of each sector. This method may provide a means for fair burden-sharing, in view of domestic and sectoral circumstances. Sectoral approaches ultimately lead to the development of common standards or benchmarking in domestic or international settings. As industries in a sector share similar characteristics (such as technology), a sectoral approach may make it easier to reach an agreement to adopt an efficient technology standard or benchmark. However, the proposal was met with criticism from both developing and European countries.

Many developing countries understood the proposal as a means to replace national targets of the current climate regime, and were concerned that sectoral approaches may require developing countries to agree to unacceptable standards that would force them to develop or purchase more expensive technologies from developed countries. Although Japan insisted that the proposal offers a fair allocation of burden, developing countries stated that the principle of 'common but differentiated responsibilities' has not been fully considered and factored in. Clearly, the proposal has to be further developed to make it more comprehensive and help bridge the gap between developed and developing countries' perspectives.

The preparatory meeting for the G8 Environmental Meeting was held on 5–6 April 2008. Reflecting on the outcome of discussions at the Gleneagles Dialogue in March, the Japanese Government slightly changed the tone on sectoral approaches to make them more inclusive. The Government of Japan will host a workshop on 8 May 2008 in Paris to enhance the common understanding of sectoral approaches. Further discussions may take place at the G8 Environmental Ministers' Meeting in Kobe from 24 to 26 May 2008. It will be interesting to observe how the discussion on sectoral approaches evolves by the G8 summit in July.

Climate policy of Japan

In May 2007, former Prime Minister Abe announced the proposal 'Cool Earth 50', which became the basis for the recent Japanese position in international negotiations on climate change. The proposal consists of three pillars. First, it aims to share a global goal of halving GHG emissions by 2050. Second, it proposes three principles to establish an effective climate regime beyond 2012 including 'participation of all major GHG emitters including developing countries', 'flexibility and diversity', 'compatibility between environmental protection and economic growth by utilizing energy conservation and innovation'. Third, it includes a national campaign to achieve Japan's Kyoto Protocol target. More recently, Prime Minister Fukuda announced at the Davos World Economic Forum, a new initiative called 'Cool Earth Promotion Programme'. It

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includes a new financial mechanism for addressing climate change, 'Cool Earth Partnership', with $10 billion for 5 years. The mechanism is meant to enhance developing countries' efforts to reduce GHG emissions and adapt to climate change.

Domestically, Japan is finding it difficult to meet its Kyoto target of 6% below the 1990 levels. The total GHG emissions in 2005 were 1261 million tonnes CO_2-equivalent, which is about 7.7% higher than in 1990. This means that the emissions from 2008 to 2012 must be reduced by an average of 13.7% of the 2005 level. The increase in GHG emissions was mainly from transportation (20% of the total), and the business and household sectors. Some circles in Japan argue that the Kyoto target was unfair as energy use in Japan was already the most efficient in the world by 1990. Such concerns led the Japanese government to make a new proposal on setting targets by aggregating the emission reduction potentials in each sector. In order to achieve the Kyoto target by 2012, the Japanese government plans to reduce 8%–9% of the GHG emissions with domestic policies and measures, and about 6% through the use of the Kyoto flexibility mechanisms and enhancement of carbon sinks. For Japan, it is crucial that the actual GHG reductions occur in Japan as much as possible, in order to build momentum for further emission reduction in the future.

Equity as a long-term goal of climate actions

Climate change is a global challenge that requires a global response. To achieve substantial reductions in global GHG emissions, it is necessary to act globally. The formulation of a global action is feasible only if all countries are convinced that there will be tangible 'outcomes' of such action. Actions on climate change, however, impact different countries differently and may have both positive and negative outcomes. Therefore, for the outcomes to be acceptable to all parties, it is critical to set the goal of socio-economic equity in parallel to the goal of establishing a low carbon society. By setting equity as one of the two goals, we may facilitate a more proactive global action on climate change than now. While it may seem that these goals are, in some respects, incompatible, they are equally important for building a sustainable global society. Japan is well-positioned to take the lead in this direction owing to its political neutrality. The G8 Presidency for 2008 is a good opportunity for Japan to show its leadership in aligning actions on climate and development worldwide.

Bibliography

Official website on the G8 Toyako Summit: <http://www.mofa.go.jp/policy/economy/summit/2008/index.html>

Cool Earth 50: <http://www.mofa.go.jp/policy/environment/warm/coolearth50/index.html>

Cool Earth Promotion Programme: <http://www.mofa.go.jp/policy/economy/wef/2008/address-s.html>

Decentralized energy security for development

Mark Runacres*

'India … can be a leader in the world in developing new renewable technologies to combat climate change'
- Al Gore, 15 March 2008

Al Gore is but the latest international figure to bet on India as a world leader in renewable technologies. Those who recall his comments about the Internet may wonder if he is the best qualified to comment on technology futures but his voice certainly lends weight to that of those who believe that this is an area of innovation where India can – and should – be a world leader. Not only does India have the intellectual resources and engineering capacity, along with an urgent need to reduce its energy import bill, it also has a stake in building a sustainable future. India is uniquely positioned to drive the search for and exchange of technologies appropriate for major developing country markets.

A major question remains: is India really interested in developing technologies *to combat climate change*? It was long an article of faith, at least in Indian government circles, that it was not India's job to combat climate change. This was the job of those who created the problem in the first place. However, the stories emanating from the Prime Minister's Council on Climate Change suggest that, without conceding anything in terms of 'differentiating responsibilities', the Council is hoping to sharpen the focus on the development of sustainable solutions in India. The Council is tasked with 'coordinating national action plans for the assessment, adaptation and mitigation of climate change' and '…. advising the government on proactive measures that can be taken by India to deal with climate change.'

Big industry also appears to be running ahead of the Government. In February 2008, the CII (Confederation of Indian Industries) released a persuasive, sector-driven discussion paper on 'Building a low carbon Indian economy,' drawing on a range of successful existing examples as well as looking at technologies of the future.

However, as was evident from the recent joint event on energy technologies organized by the India Energy Forum, World Energy Council – Indian Member Committee, and IRADE (Integrated Research and Action for Development), there is still a massive shortfall in the scale of investment in R&D both by the Government (as often lamented by Science and Technology Minister, Kapil Sibal) and by much of the private sector. And the instability of the markets seems likely to inhibit innovative investment further in the coming months or even years.

So, how bleak are the prospects for Mr Gore's aspirations for India? Probably not as bleak as the litany above might suggest. One of the key areas where comfort can be found – and one that is of critical economic and social importance - is rural electrification and lighting. Everyone now agrees that reliable provision of electricity for rural India is an essential and urgent part of any inclusive growth plan. India's current electricity production of 660 billion KWh is not sufficient for inclusive growth. Over half the country's population, close to 10% of the global population, does not have access to electricity; and many of those who do, cannot rely on it.

The last couple of years have seen a proliferation of schemes - some commercial, some subsidized - designed to bring electricity, or sometimes lighting alone, to those parts of the country which are either off the grid or badly served by the grid connection. Such initiatives bring into sharp focus the centrality of energy solutions for human development and security. In essence, they bring together the demands underlying the much debated ideas of human security and the Right to Development. Could there be such a thing as a Right to Energy Security – never, to my knowledge, contemplated but no more rigorous than many of the existing rights written into multilateral texts.

The head-on clash of this centrality of energy, and in particular hydrocarbon-sourced electricity, with the current concerns about climate change, brings us to the heart of the Rights debate. As ever, one man's opportunity is another man's challenge. Or one country's legitimate aspiration is another country's recurrent nightmare. These rather trite axioms are made more complex by the global reality that the citizens of less developed countries are likely to be

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affected more by the climate change nightmare than those who are most frightened by it. At times it does indeed appear that climate change mitigation is not easily compatible with adaptation to climate change through robust and speedy development, notably when such development is characterized by growth rates approaching double digits.

This conundrum has long led enlightened thinkers in major developing economies to proselytize alternatives to traditional industrialized approaches to development. Seldom are they contradicted; equally seldom are their advocacies given the weight they deserve. In India at least, there is possibly one sector where this is no longer true: distributive clean power generation. Long discussed by development and sustainability advocates, this option is now beginning to emerge in much more concrete form, as one which meets not only sustainability but also developmental concerns, and offers significantly greater security of supply given its local sourcing and control.

If one looks at concrete examples, success has generally not come through high-tech, innovation-driven solutions but more from intense advocacy efforts and persuasion of rural communities, whose lives are precarious at the best of times, to innovate. A good example is the recent effort to use unrefined biodiesel to generate decentralized power. The biofuels sector is currently under intense scrutiny, largely because of the impact of certain biofuel support policies on global food prices. But the heat of this debate risks distracting from the light which biofuels can bring to remote populations in India. Winrock International India has recently announced the success of a project that helped villagers develop a generation system based on straight, unrefined jatropha oil.[1] Slightly customized generators (courtesy Castrol) and government-supplied oil extraction equipment have meant that some seven hundred inhabitants of a remote village in Chhattisgarh (nestling ironically under power lines but without power itself) now have access to electricity, whose flow and tariffs are controlled by the villagers themselves. Jatropha bushes have been planted and the hope is that the villagers will in due course even be able to source their own oil-bearing fruit. The central reality behind the success of this project is not one of highly sophisticated innovation, although some was required in the most basic of engineering fashions. The majority of inputs and resources went into persuading understandably conservative villagers that all of this would make sense, and into keeping them focused on managing their power rationally once it was being produced. And, as with all infrastructure, the bureaucracy also required a lot of management, even if only to make sure it did not decide to obstruct, despite high-level political support.

The nature of inputs into this project was substantially affected by the fact that it does not represent, in practice, a market-driven solution, for all its social attraction. Another recent example of decentralized energy - solar lighting for rural Indian communities, stands a higher chance of working on market principles, despite the much-discussed cost of solar PV-generated power.

Many organizations are now working to 'enlighten' the thousands of villages around India without electricity or at least without reliable electricity after dark. TERI launched a programme to 'Light a Billion Lives' (LaBL) starting with the symbolic gift of a solar lantern to the Prime Minister at Delhi Sustainable Development Summit 2008. Not all lanterns are yet ready to be distributed on a commercial basis. But Cosmos Ignite Innovations, an Indian joint venture with Vinod Khosla-backed, Stanford University spin-off, Ignite Innovations, is developing a viable business model for such solar lighting (and mobile phone charging) in villages across India. Initial sampling looks very promising but it is clear that the scaling of the business will be the major challenge.

C K Prahalad of the University of Michigan has long insisted that market dynamics 'at the bottom of the pyramid' can work and indeed *must* be made to work if poverty reduction is to move at a faster rate. The conclusions one could draw about investing in energy security for development at the local level are:

- Technological innovation – and therefore R&D funding – is clearly vital but only if such efforts are guided by testing 'appropriate' applications;
- Just as important is the social process of persuading conservative communities to accept the fruits of innovation and thus change – lifestyle change is easier in developed economies where options and safety nets exist;
- The Government needs to enable, not over-regulate or actively obstruct, if initiatives go 'off message';
- To tackle poverty and energy-deprivation on the scale on which it is found in, for instance, India, technologies are far more likely to be scaleable (and therefore major contributors to poverty eradication) if

[1] Details available at < http://www.winrockindia.org/act_proj_ene_prom_bio_1.htm.>

they can be applied in a market-driven service or product;
- Climate concerns are clearly going to remain at the periphery of the developing communities' considerations as they contemplate paths to energy security: it will be up to industry, guided by the Government, to ensure that technologies are sustainable;
- This in turn will require the investment community in the developing world to focus far more strongly than hitherto on the need to value sustainability as a core issue in their decision-making.

To return to the Nobel Laureate's assertion: can India take a global lead in this field? The principles above suggest that India has the capacity but is still some way from developing capacity to its full potential. But can others learn from India's current efforts? Of course, so long as local adaptability remains paramount.

Coping with extreme climatic events: adaptation practices in flood-prone and drought-prone regions of selected hotspots in India

Anupa Ghosh*

Introduction

Water is one of the major resources that sustain human societies. A 1997 UN assessment of freshwater resources found that a third of the world population lives in countries with moderate to high water stress, that is, the consumption level in these countries exceeds 20% of available supply (World Resources 1998–99). The high-risk countries are generally developing countries where population growth and industrial and agricultural expansions are the greatest. One of the most vulnerable regions is South Asia consisting of Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka. Absence of planned water management, rapid economic and demographic changes, and increasing demand due to the move to higher standards of living have triggered an imminent water crisis in South Asia. Fresh water availability in the region, particularly in large river basins, is further likely to decrease due to climate change (IPCC 2007). Scientific studies show that the Himalayan glaciers are slowly melting and might become extinct in the foreseeable future. The glaciers, which regulate the water supply to some of the major rivers of Asia, are retreating at a rate of about 10–15m (33–49ft) each year. The glacier melt is likely to increase flooding, rock avalanches from destabilized slopes and affect water resources within the next two or three decades (IPCC 2007). Ultimately, however, with the disappearance of the glaciers, drought-like conditions are expected to prevail in the region.

Global change studies further indicate that climate change will significantly impact the monsoons of South Asia. The monsoons regulate the climate in the region, and a change in the monsoon pattern will increase the vulnerability of the region to water crises and floods (Mirza and Ahmed 2003).

The South Asian developing economies are characterized by agro-based production systems with low levels of income and capital formation, and rapidly growing populations. The economies lack the social and economic capabilities to cope with the adverse impacts of climate change. Extreme events such as floods and droughts will result in decreasing GDP (gross domestic product), rising poverty and food insecurity, large-scale migration, damage to social and physical infrastructure, loss of human life, and environmental damage. The achievement of the United Nations' Millennium Development Goals – reduction of poverty and hunger, and establishment of environmental sustainability – will be affected. Therefore, given the climate change projections, policy-makers in these countries should mainstream climate change impacts into their sustainable development policies.

Climate change policies range from mitigation to adaptation. Mitigation strategies try to stabilize the GHG (greenhouse gas) concentrations in the atmosphere at levels that would 'prevent dangerous anthropogenic interference with the climate system' (IPCC 2001). Though they have more global

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applicability than adaptation policies, the design implementation and success of mitigation strategies require huge investments in time, effort, and funds. The low development indices of most South Asian nations therefore make adaptation the preferred policy option. Adaptation implies modifications in socio-economic and ecological systems in response to actual or expected climate change impacts in order to reduce the vulnerability of the systems. The benefits of adaptation accrue at the local level and adaptation measures can be quickly adopted at this level. Being region-specific, these measures can better address the exact local impacts of climate change and thus enhance the coping capacity of stakeholders. However, being localized in nature, the incidence of cost burden is more for the private individual and local governments.

The IPCC Fourth Assessment Report points to an increase in human adaptation activities in response to observed and anticipated climate change (IPCC 2007). The choice of practices available is extensive. It consists of technological innovations (such as sea defences), behavioural practices (for example, altered food and recreational choices), managerial methods (for example, altered farm practices) and new policy prescriptions (for example, planning regulations). The choice of strategies differs across societies depending on their environmental, economic, informational, social, attitudinal, and behavioural resources and impediments. Therefore, to incorporate the issue of adaptation in development policy decisions, it is important to involve all stakeholders in decision-making.

Methodology and sources of information

This paper adopts a bottom-up approach to identify the major components of an adaptation strategy for flood-prone and drought-prone areas in select river basins in India based on household and community responses. The framework adopted here starts with the premise that adaptive actions of vulnerable groups with a private motive, as well as government and non-government external agencies with social welfare motive, generate both private and public goods and services. Careful analysis of these will provide us with a portfolio of actions.

The smallest unit of vulnerable group in this study is the household and the next larger unit is the local community. The database for the study has been collected through a primary field survey using a preset and pre-tested questionnaire. Besides the household survey, PRA (Participatory Rural Appraisals) and stakeholder workshops have been conducted for validation of findings. Wherever necessary, secondary data from various official documents has been used.

The field survey for socio-economic analysis has been designed following the 'LIFE' approach where L represents livelihood patterns, I stands for institutional presence required to build the social capital base, F stands for food security, and E implies empowerment parameters like education and health. This is based on sustainability and coping capacity indicators.

The hotspots have been identified with the aid of hydrological model results for all river basins in India on climate variability related water availability scenarios (Gosain and Rao 2003, Roy, Mitra, Sharma, *et al.* 2004, Roy, Ghosh, Majumdar, *et al.* 2005). The hydrological models predict rise in water discharge in the Mahanadi basin and decline in the Sabarmati basin. For this study, these two river basins were selected. Basin maps were prepared using district-wise information for 2001, representing population density, intensity of agricultural activity, precipitation pattern, and degree of water stress/abundance. These maps were then overlaid on each other to identify the villages that are hotspots, that is, they lie at the intersection of all these characteristics. The flood basin survey was conducted in the villages of Nandabar, Karabar, and Manitiri of the Nayagarh district of Orissa in the Mahanadi river basin. The drought survey was carried out in the districts of Sabarkantha and Ahmedabad in Gujarat. Eight villages – two each from the *talukas* Himmatnagar and Modasa in Sabarkantha, and Dholka and Sanand in Ahmedabad were selected for the survey. A total of approximately 200 households were surveyed.

Coping capacity assessment

In the Mahanadi basin, the primary source of livelihood for all the surveyed households is agriculture, with majority of them being either small or marginal farmers, or landless agricultural labourers. 80% of land is farmland, and approximately 5% of the farmers are marginal farmers and 30% are small farmers. The soil in the region is slightly acidic and there is soil degradation due to extensive fertilizer use. Paddy, sugarcane, vegetables, pulses, and nuts are the main crops cultivated. A two-year crop rotation strategy is usually followed to maintain the fertility of the soil. Lift irrigation is generally practiced in the region. However, due to lack of maintenance, most of the lift irrigation facilities are unusable. Water harvesting or conservation techniques are rarely practised. The water stress in the area is therefore largely artificial and can be improved with better management practices. Agricultural income is supplemented by raising livestock. Cattle, goat, and

buffalo are the major livestock. Traditionally, fodder for the livestock is either preserved or purchased from the market. However, despite market dependency, adequate food supply for the livestock cannot be guaranteed and health problems due to malnutrition are rampant. The situation worsens during floods when lack of fodder and the floodwater lead to a rapid fall in the livestock population.

The livelihood pattern is more diversified in the Sabarmati hotspot. However, most of the available livelihood options in the region are highly climate dependent. 68% of all the households in the region depend on agriculture for livelihood. 19% of the sample is involved in animal husbandry, while 53% either solely depends on or supplements other activities with agricultural labour work. 31.33% of the agriculturists are either landless or marginal farmers while 63% are medium sized farmers. Due to the existing soil type and rainfall pattern, cotton is the major crop of the region. The other crops cultivated are paddy, wheat, jowar, bajra, castor, cumin, pulses, and maize. Only 12% of the total cultivated area in the surveyed region has access to irrigation (Figure 1a). Persistent drought for three consecutive years (2000/01–2002/03) significantly undermined the coping capacity of the farmers in the area. Almost 18% of surveyed households reported major outstanding debts. The average annual debt burden due to drought was approximately Rs 26 000, payable at an annual interest that varies between 15% to 30%. On an average, each household reported 89% land damage and 96% loss in agricultural output. All crops recorded more than 50% reduction in output during the drought period. The drought also drastically affected the livestock count. The most affected species were cows, bulls, and goats. Approximately 280 cattle heads were affected by water stress and fall in fodder supply.

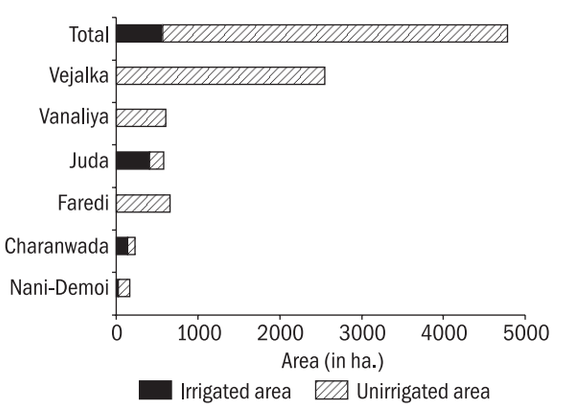

Figure 1a Village-wise irrigation pattern in Sabarmati hotspot

Floods affect water bodies that supply water for domestic use. The village governance structure or *Panchayat* generally supplies drinking water through pipes; but natural water bodies and open wells are also extensively used, and floodwater contaminates all open water bodies. Water purification techniques are not widely practised because of lack of knowledge and resources. A large portion of the community is therefore exposed to health risks through the consumption of contaminated water (Figure 1b).

Besides water supply, an important indicator of sustainability status is food security. Floods cut off transport and communication links and obstruct the movement of government relief and staples to the affected zones. Loss in agricultural output, livestock, and disrupted supply exposes the community to inflationary pressures. The presence of government operated fair price shops, which provide basic staples at subsidized rates, fail to control the ripple effect of agricultural productivity loss on inflationary tendencies. During and after severe floods, individual households have to depend on aid/loans from relatives, friends, local money-lenders, and NGOs (non-government organizations) to cope with the adverse impact of floods.

Fair price shops supplement local agricultural produce in the Sabarmati hotspot. Therefore, food security is maintained during droughts when government relief replaces agricultural output loss. However, this relief is forthcoming only when the area is officially declared to be drought-affected. This official announcement generally comes with a time lag, after the drought has actually set in. Thus, for a considerable period of time, the community is exposed to the impacts of agricultural and livestock productivity loss.

Review of adaptation and recommendations

A common response from the household survey and PRA indicates that early warning systems, that can avert

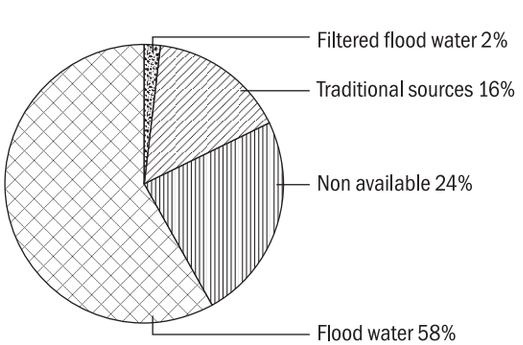

Figure 1b Potable water source during floods in the Mahanadi hotspot

some of the worst impacts of floods, are close to absent. The stakeholders depend on past experiences to predict floods. Generally, heavy rainfall during the monsoon months of August–September result in river overflows and floods. The surveys indicate that floods are also caused by the release of excess water from the Hirakud dam in Mahanadi basin during monsoons. To lessen agricultural output loss, the local community cultivates a flood resistant variety of paddy locally known as 'champeswar.' Usually distributed at government initiative, this crop can withstand almost seven days of submergence. However, the seven days flood-resistant seeds are unable to withstand extreme flood situations when the area experiences submergence for 15 consecutive days or more. Other strategies (Figure 2a) include maintenance of emergency funds; borrowing from friends, relatives, and local money-lenders; cash/food/clothes aid; sale of assets; storage of dry foodstuff and medicines in anticipation of floods; and migration to other areas in search of jobs. Crop insurance, though not widely reported, is also undertaken to hedge the risks from floods. Institutional support in the form of aid from government and NGOs is also available.

In the absence of proper drought forecast warnings, the locals in the Sabarmati hotspot depend on native drought prediction methods. During years when the monsoon is delayed or is less than normal, the community anticipates the advent of a drought. Adverse impact of prolonged droughts on agricultural productivity are addressed through changes in the cropping pattern. During droughts, farmers cultivate less water-intensive crops like cotton. The annual two-harvest mode is brought down to a single harvest. Sale of livestock is also common. In extreme situations, livestock are also given away. Other coping measures (Figure 2b) include large-scale migration, usurious borrowings from friends, relatives, and local moneylenders; sale/mortgage of property; and depletion of savings. Government aid is available once the area is officially declared drought-affected. The government provides financial loans and undertakes the construction of social infrastructure like roads and dams. These operations provide three to four months of employment opportunities in the affected areas. Wages are paid in cash or kind or both. The normal daily wage rate is Rs 25 to Rs 30 along with Rs 25 worth of food grains.

Stakeholders across the hotspots consider government relief operations to be inadequate. Identifying the lacunae in government relief policies, the stakeholders suggested possible strategies that can enhance their coping capacities. In the Mahanadi basin survey (Figure 2c), households emphasized the need for crop compensation; aid in the form of agricultural inputs like seeds, pesticides, and fertilizers; better grain preservation methods; access to safe drinking water; better infrastructure facilities like health services, transport and communications systems, and public distribution systems; improved loan facilities; provision of commodities like food and polythene during floods; dissemination of knowledge on superior coping practices; and introduction of viable agricultural insurance schemes. About 37% of the sample expressed a willingness to pay a premium at approximately Rs 520 per acre for a 5-year insurance against floods. In the Sabarmati hotspot (Figure 2d) almost 75% of the households felt the need for insurance schemes to safeguard against loss due to droughts. 70% of all households surveyed were willing to pay about 51% of agricultural output as premium for a five-year insurance cover. Other requirements include

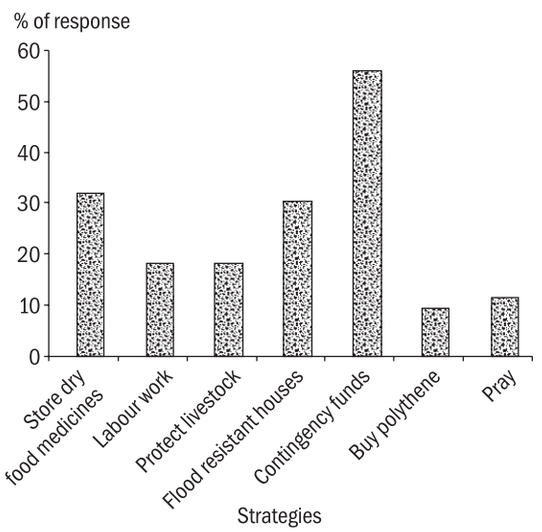

Figure 2a Strategies adopted during floods

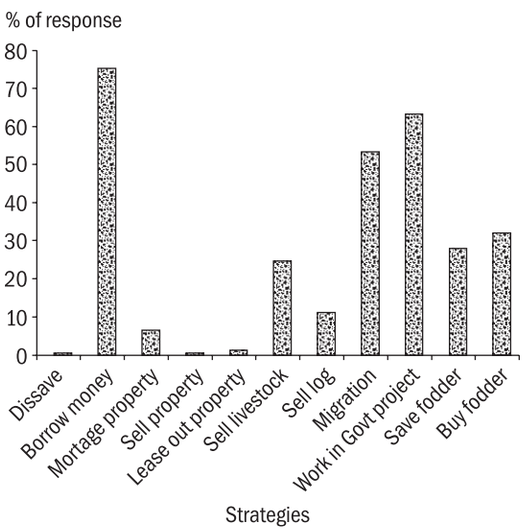

Figure 2b Strategies adopted during droughts

construction of irrigation facilities; better loan facilities; subsidies on food, fertilizers, seeds, and fodder; cattle camps during droughts; and more intensive government relief work with higher wages and for longer durations.

Concluding remarks

The survey reveals that both reactive and proactive measures are required. The challenge is to endogenize the reactive adaptation measures through appropriate institutional arrangements and local capacity building, in order to enhance coping capacity. This will help not only in reducing vulnerability but would lead to sustainable livelihood provisions too. The survey further emphasizes the need for such strategies to simultaneously address the problems of adaptation and development. Coping capacity building policies when developed in the context of traditional welfare issues such as poverty, low level of economic activity, starvation, and health risks have a positive cumulative effect on the adaptation strengths of the affected stakeholders. Clearly, the capacity to adapt to climate change goes beyond income generation to encompass other pre-requisites such as innovative development planning, institutions, economic management, and technology.

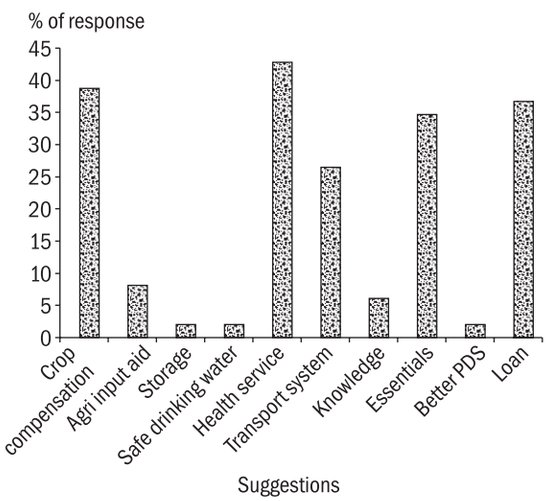

Figure 2c Policy suggestions – Mahanadi

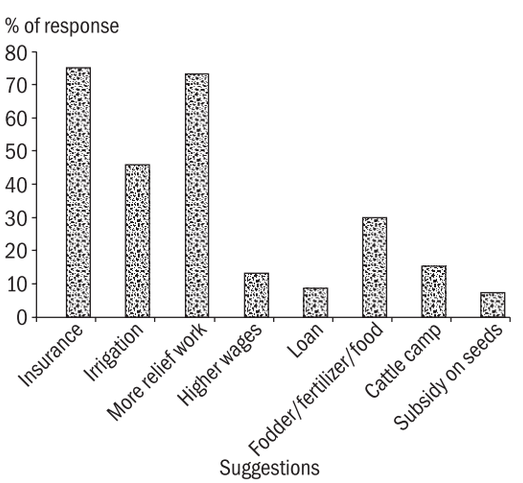

Figure 2d Policy suggestions – Sabarmati

References

Gosain A K and and Rao S. 2003
Impacts of climate change on water sector and climate change and India: vulnerability assessment and adaptation, pp. 159–192, edited by P R Shukla, S K Sharma, N H Ravindranath, A Garg, and S Bhattacharya
Hyderabad: Universities Press (India) Pvt. Ltd

IPCC (Intergovernmental Panel on Climate Change). 2001
Climate Change 2001: impact, adaptation, and vulnerability
In *Climate Change 2001. Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change*, edited by J J McCarthy, O F Canzini, N A Leary, D J Dokken, and K S White. pp. 533–590
Cambridge: Cambridge University Press

IPCC (Intergovernmental Panel on Climate Change). 2007
Summary for policy-makers
In *Climate Change 2007: climate change impacts, adaptation, and vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, edited by M L Parry, O F Canzini, J P Palutikof, P J van der Linden, and C E Hanson, pp. 10–18
Cambridge: Cambridge University Press

Mirza M M Q and Ahmed A U. 2003
Climate change and water resources in South Asia: vulnerabilities and coping mechanisms – a synthesis. pp. 202–225. In *Climate Change and Water Resources in South Asia: Proceedings of Year End Workshop:* Kathmandu, 7–9 January 2003, edited by A Muhammed
Islamabad: Asianics Agro Development International

Roy J, Ghosh A, Majumdar A, Roy P, Mitra A P, and Sharma C. 2005
Socio-economic and physical perspectives of water related vulnerability to climate change: results of field study in India.
Science and Culture **71** (7–8): 239–259

Roy J, Mitra A P, Sharma C, Majumdar A, and Ghosh A. 2004
Climate prediction, adaptation, and coping mechanism: micro analysis of SHUs in India, edited by A Muhammed
Islamabad: Asianics Agro Development International
[Second Year APN Report]

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