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The Asian Energy Institute (AEI) is a network of 18 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 13 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. 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 Renewable Energy and Energy Efficiency Partnership (REEEP) in South Asia.

Editorial

*R K Pachauri**

In the first decade of this century, major changes have occurred in the geopolitics of energy and natural resource use across the world. This is a function of changes in economic activity and growth that have been witnessed in the past few decades. In general, growth rates in Asia have been much higher than in other parts of the world and certainly higher than those in the developed countries. As a result, therefore, the consumption of energy now occupies a greater share in Asia relative to, say, the US, Europe, and Australia. At the same time, concerns related to the growing challenge of climate change, and other local environmental impacts of energy production and use, are receiving serious attention from policy-makers and the public at large. As a result, Asian countries would have to find solutions for meeting their growing demand for energy while addressing these concerns.

Asia, therefore, has to look at the future and define its energy strategies not only as a function of growth along pathways that extend the trends of business as usual but as a function of complex yet deliberate choices that must be made now. These choices would reflect a range of considerations including the following.

- Changes in the global energy scenario with respect to global demand for and supply of fossil fuels.
- Technological changes, which would bring about improvements in the efficiency of energy supply and consumption.
- The development of renewable energy technologies and the emergence of non-conventional sources of energy supply as viable options.
- The need for reduction in global emissions of greenhouse gases (GHGs), and concerns related to the security of energy supply, particularly for those countries whose dependence on imports of fossil fuels is growing rapidly.

There is, consequently, an urgent need to review overall energy developments and related issues, and come up with strategic options that would ensure a sustainable energy future globally and for different regions of the world. The urgency of such a review is much greater in Asia since, as mentioned earlier, this is a continent where growth is taking place at a significantly higher rate than most other parts of the world. There is also mounting pressure on at least some countries of Asia such as China, India, and Indonesia to limit the emissions of

GHGs in order to tackle the global problem of climate change. Hence, innovative solutions and new pathways would have to define the energy future of Asia as well as its implications for the global environment and the environment at the local level. Knowledge creation and research, driven by a strong effort to explore the intellectual dimensions of this challenge, would be essential to bring about the changes that are required.

One major area that must form a part of future energy policies and decision-making is the widespread problem of lack of access to energy. A substantial part of the population in a number of developed countries suffers from lack of access to modern fuels and sources of energy. A total of 1.4 to 1.6 billion people have no access to electricity and upwards of 2 billion people are still dependent on biomass as a source of cooking fuel. This is a situation which has major implications for the health of those who are cooking their meals using biomass, largely of inferior quality, and lighting devices and fuels which also cause serious levels of pollution and health problems. The largest number of those lacking access to modern forms of energy currently live in Asia. It is, therefore, important for policy-makers, technology innovators, businesses, and civil society, to come to grips with this challenge. This is not merely a problem of physical access to energy but is rooted in the reality of low incomes, high prices, and unsatisfactory distribution systems. Hence, the intellectual challenge represented by this problem is huge and complex, requiring solutions not only at the level of laboratories and research institutions but along an entire set of institutional arrangements by which they reach the doorsteps of a large and often scattered set of communities. Asia needs to deal with this urgently given its importance as a measure for promoting human welfare, improving health by reducing local pollution, and creating a potential for reduced GHG emissions.

Asia is endowed with several institutions and centres of academic excellence working and researching on a number of these issues. However, given the complexity of the challenge faced individually and collectively by the countries of Asia, it would be most efficient to have all the think-tanks and research institutions of Asia work together, through the sharing of experience and knowledge, to come up with relevant solutions and initiatives to bring about a shift to a sustainable energy future. The AEI, therefore, needs a stronger effort at

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cooperation and collaborative activity to deal with Asia's energy and climate change challenge effectively. And we really do not have the luxury of time because any delay in bringing about major structural changes will only lead to much larger emissions of GHGs and an infrastructure that is locked into energy intensive patterns, which would not serve the interests of society in this region either now

or in the future. Now that we have entered a new decade, it is essential for members of the AEI to activate this network and seize the challenge of working together for a brighter future for every country in Asia individually and collectively, and for the people of this continent.

Climate change and human security: building a framework for action

Samir Saran*

‘Climate and security’ is a narrative with multiple layers and irresolvable complexities. At the very core, it continues to remain a western narrative on a looming and enduring eastern reality. This very comprehension of climate and security lends to discussions an externality that both hemispheres find hard to reconcile.

But before we discuss this inherent paradox within ‘climate security’—a term used to broadly describe situations, discussions, and elements that constitute security within and resulting from climate discourse and global climate action (modest at best), it may be useful to shape the boundaries of what be the core tendencies, trends, and impulses that define it.

The use of the terms ‘climate’ and ‘security’ in popular literature conjures up images of apocalyptic storms, landslides, extreme weather conditions, deluge, rising sea levels, melting glaciers, droughts, floods, cyclones, and similar weather phenomena that will ravage countrysides, inflict loss of life and property on an unimaginable scale, and result in mass exodus of populations. Be it the Hadley Centre Report that feeds this imagery through a more scientific and nuanced approach (Department of Energy and Climate Change) or the Stern Review that deploys this description to urge action by the developed and developing worlds (Stern 2007), the correlation between climate and such threats is unmistakable. This continues to be the defining imagination of security within the climate debate—hotly contested in terms of scale, size, and timelines. Images of death and destruction remain the central argument in the arsenal of a section of the political class, both in the West and East, who are vociferously urging action, incentives, and commitments around green technology, carbon trade, and innovation.

The success of the approach of linking climate action to impending apocalypse is debatable. Also at doubt is its ability to elicit appropriate response from policy-makers and institutions. Deploying images of death and destruction within the climate debate, some argue, is ‘climate pornography.’ It is forcefully stating the obvious, and as some would argue, also the inevitable (Ereaut, Gill, and Segnit 2006). The semantics of this argument are clearly built on the ‘fear for life’ and ‘fear of the

future’, and seek to compel political action on this basis by gaining support in the larger public sphere. This approach seemed to have helped create a surge in the constituency of those seeking climate action, particularly in the Western countries. This has also resonated among a specific constituency in the emerging nations, prior to the Conference of Parties at Copenhagen last year. However, it has been unable to stem the disenchantment of the larger public from matters of climate, and ‘climate fatigue’ is setting in. As per a 26-country survey conducted by GlobeScan, concern for climate change is dwindling both in Europe and North America (GlobeScan 2010). According to the survey, support to climate efforts in the UK fell from 59% to 43%, and in Germany from 61% to 47%. This narrative was also unsuccessful in appealing to large constituencies in emerging countries and the developing world. This was a result of poor communication, hypocrisy, and inherent dichotomy in the construction of the debate. This predominantly western narrative on climate security describes the outcomes (floods, cyclones, and so on) through a matrix of predictive dates and probabilistic scenarios. This was an instance of science attempting to steer policy that, as some argue, failed. Science is comfortable with probability and percentages, but people are not. Communications on the matter often sounded weak and convoluted and the messages lacked clarity. They also lacked a central appeal, but more importantly, they failed to offer a response to the challenge. This was perhaps the biggest failure in the communication of the imminent dangers of global inaction. The articulation lacked considered and feasible global responses without which communications were read as scare mongering or where there were indications of certain action (read technology as the saviour) it was read as lobbying by vested interests. Global inattentiveness to ‘climate and security’, in some sense, is as much about a failure to communicate, as it is about political differences and high economic stakes.

However, the hypocrisy within the narrative surfaces when this debate seeks placing the occurrence of extreme climate events and disasters into the future and when action is urged for the benefit of future generations (such as the US President Barack Obama’s exhortation

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to act on climate change or risk ‘... consigning future generations to an irreversible catastrophe’).¹ If, as climate science suggests, man-made emissions are able to subvert some of earth’s natural systems, then why are the current extreme events also not a result of the last two centuries of industrialization and rampant mercantile capitalist production? To many, the answer is simple yet hypocritical. The rich would have to foot the bill today for having squatted and ravaged the limited carbon space available as a common resource for global citizenry. The impact and solemnity of the climate and security argument would have far greater weight if developed nations were obligated to make good the costs of life and property that are lost in the poorer regions today due to floods, cyclones, hurricanes. Yet while we hear a call for action on pricing carbon (which allows the rich to usurp more carbon space), incentives for technology and securing intellectual property rights, a determined and unequivocal call for damages of past action is missing. Ensuring that the countries with the means to respond to the suffering caused by such climate-related disruptions in poor and emerging countries, are allowed to absolve themselves of any responsibility, adds to skepticism, and weakens the most important argument—that of security—for global action.

Calls for global action sound hollow for another reason—the quantum of commitment made by the affluent nations. While the rhetoric of preserving the planet and human life is pitched high, what we see in terms of response is tokenism. To save the planet, the mightiest nations in the world got together at Copenhagen last year and then at Cancun recently, and committed to a paltry \$100 billion each year by the year 2020.² Let us now place this pledged amount against another recent response by the world community. It is estimated that over \$3 trillion was committed by the US, China, EU, and other countries to help the world economy or as some suggest, to ‘save a few banks and large corporations’ (Barbier 2010). Three trillion to save the financial system and a 100 billion to save the planet—a fact that will undermine any security discourse within the climate narrative.

The other extremity of the climate-security narrative is less popular, but fast shaping as a significant line of thought. It focuses on elements of human security outside of the ‘life and property’ paradigm. This debate places the human right to develop, grow, and aspire for a better life as a primary objective of climate action (Saran 2010). Here, too, the western narrative seeks to focus the

discourse on poverty reduction within the objectives of climate action, thereby reducing the aspirations of billions in the emerging world to that of survival and poverty-line existence. The fact that the industrial economies of the OECD and their high income populations were assisted and subsidized by carbon-intensive fossil fuels is cast aside as an act of ignorance, and the importance of the use of coal and gas in determining the pace at which India and other emerging countries develop is undermined by real but superficial arguments on ethics and shared responsibility. Poverty and growing aspirations are the two imperatives for any political system in emerging economies, and there would be political unrest if the leadership in these nations were to compromise on these.

However, the climate narrative is beginning to exert itself in the development processes of poor countries. Last year, we saw the US EXIM Bank deny a loan to a coal project in South Africa, and dither on a similar proposal for India citing potential emissions as the reason. If climate positions were to become barriers to trade and finance flows, we could perhaps be discussing the most significant and impending security paradigm for the emerging world. The impact of climate negotiations, and green capitalism that is rearing its head, are some elements that will define climate and security for India and other developing countries.

Let me conclude by posing some queries that policymakers in India and other developing countries will need to respond to. Can we ignore the real threat to life and property from extreme climate events? Can the actions of India reduce this threat? How can we compel the West to vacate carbon space, and cap and reduce lifestyle emissions? How will we be able to allow billions in India and the developing world to aspire and, seek homes, cars, holidays and infrastructure? Should we? Why should the first-time users of electricity in India (nearly 500 million) have to make do with token solar lamps that work for only a few hours? Why should the poorer 80% of the world’s population be made to bear responsibility for expensive climate action going forward? How do we ensure continued access to critical finance and technology required to develop infrastructure, and afford prosperity to millions? How do we carve out a global regime that removes carbon squatters and makes them pay for their historical retention of carbon space? Why should the emerging world support or incubate new technologies, when all major economies seek to place green technologies at the centre of their plans of re-industrialization and manufacturing competitiveness?

¹ **Barack Obama’s Speech at the United Nations.** 22 September 2009. *The Sunday Times*. Available at <http://www.timesonline.co.uk/to1/news/environment/article6844525.ece>

² See report on *Outcome of the work of the ad hoc working group on further commitments for Annex I parties* under the Kyoto Protocol at its fiftieth session. Available at http://unfccc.int/files/meetings/cop_16/application/pdf/cop16_lca.pdf

Lastly, can we ignore the ‘green economy,’ and does it really provide India an opportunity to take a position of leadership in this new world?

These are some of the competing dynamics of the ‘climate security’ narrative that we will need to navigate if we are to develop a robust framework that realizes the gravity of the climate and security narrative, and articulates the differentiated needs of the diversely developed regions of the world.

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Energy, climate, and security inter-linkages: leveraging the region

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Introduction

The inter-linkages between energy, climate and security (ECS) pose a unique challenge to our world today. This is primarily due to the negative externalities implicit in addressing concerns arising from one to the exclusion of the other. We live in a world that is characterized by a blurring of boundaries. This is particularly true in the context of resources and security: climate and energy security concerns are trans-national and co-constitutive in nature. Climate and energy security ultimately depend on access to the earth's resources that are not only finite in nature but are also precariously balanced vis-à-vis demand (by human beings) and supply (the natural rate of replenishment). It is for this reason that the inter-linkages between ECS raises the need to revisit traditional notions of security. It also impels us to fashion new modes of governance (multilateral/transnational/cross-border), and identify more sustainable pathways to development.

There are several ways in which the complexities caused by the ECS inter-linkages can be addressed. Indeed, climate and energy security concerns are already being dealt with in multiple ways and at multiple spatial scales. The objective in this article is to pick up one such spatial scale at which countries have focused their attention. The *region*, we suggest, is an appropriate level at which the trans-boundary nature of energy and climate security interests can be addressed, and where policy implementation can be effective. In comparison to multilateral efforts, regional initiatives and processes are more focused, and hence have clearer objectives that can be achieved based on the collective will of the members of the regional grouping. The region also offers a spatial scale at which the will to collaborate across countries, communities, and organizations can be engineered more effectively, and resources utilized and managed in a more efficient manner.

ECS linkages and the region

In today's interconnected world, thinking and acting in hermetically sealed compartments has become more

difficult than ever before. The emergence of the 'human security' paradigm in place of the Cold War security logic has helped expand our understanding of security, thereby making the prioritization of traditional security vis-à-vis non-traditional security threats untenable. We can no longer see economic deprivation and concerns related to food, health, water, and environmental security as distinct from or without ramifications for inter-state conflict and political tensions. Given the fact that these otherwise soft security concerns easily spill across political boundaries, they need to be addressed collectively and across several levels of governance.

ECS are interlinked in two primary ways:

- Across issue or policy spaces and policy levels within the state, that is, addressing one of these concerns (such as energy security) can have implications for the other two (for example, climate change or security); and
- Across territorial spaces; that is, pursuit of either one of these concerns has implications for countries and communities living in a particular region or beyond.
- The specific ways in which ECS concerns are inter-linked are illustrated below.

ECS inter-linkages

The inter-linkages between ECS is one dimension of the growing interconnectedness in our world — across policy domains, political boundaries, and security discourses:

Energy choices → traditional as well as non-traditional security concerns

All countries must have access to affordable energy choices in order to address their security concerns—both in terms of meeting threats to their territorial sovereignty, as well addressing the life and livelihood concerns of their people. Also, the finite and unequal distribution of energy resources in the world impacts international security by creating potential for conflict.¹

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¹ Dispute amongst the littoral countries over the South China Sea and the Caspian Sea is a direct result of the oil reserves that both are said to harbour. Similarly, Africa's energy-rich countries are increasingly seen as a bone of contention between India and China as they seek to enhance their energy security by mapping affordable and secure oil on the continent. The recent claim by Canada, Russia, Norway, the United States, and Denmark over the Arctic Ocean seabed as an extension of their respective continental shelves carries with it the potential of intensifying inter-state rivalries in the future. The Arctic Ocean, according to geologists, has almost 25 per cent of the world's undiscovered oil and gas.

Climate change → energy security

Given the need to cut down on greenhouse gas (GHG) emissions, it is increasingly important for states to factor in the *acceptability* of energy choices in energy policymaking. Both the developed world as well as the fast-industrializing countries of the developing world need to take measures to reduce their carbon footprint by shifting to natural gas and renewable energy options such as wind, solar, and nuclear, while increasing efficiency of energy supply and use.

Climate change → energy choices → security implications

It is vital to recognize the trade-offs and the likely policy and security impacts that each energy choice may have. For example, the shift to nuclear energy because of its smaller carbon footprint² not only comes with the environmental problem of disposing off nuclear waste, but also has the potential of upsetting the security configuration in the world by enhancing the risk of nuclear proliferation and the misuse of fissile material.³ Again, the shift to biofuels carries with it the problem of worsening food and water security in the world.⁴ Similarly, a shift to hydropower may alter the local ecology and cause the displacement of people living in catchment areas or endanger communities living in downstream countries or regions.

Climate change → resource scarcity/ quality → energy security

The ECS inter-linkages would become even more evident if we failed to address climate-change concerns in the coming decades. Climate change is likely to alter the quality and distribution of resources in the world—by suddenly making some areas promising (and, therefore, competitive) in terms of access and availability of energy (for instance Greenland, Siberia, and the Arctic Ocean); while, on the other hand, exacerbating conflict in other parts of the world over resources such as water. According to the IPCC Fourth Assessment Report, low-lying deltaic regions could be inundated, forcing up to 35 million refugees from Bangladesh to flee into neighbouring countries like India by 2050 (The Economist 2008), which could markedly alter the demographic balance in the region.

² Even though nuclear energy is definitely less carbon-intensive than coal and oil, it is not totally free of GHGs. As pointed out by Surya Sethi, ‘the total lifecycle emissions of a nuclear plant involve physical and chemical processes that generate GHG emissions’ (Sethi 2008).

³ All nuclear reactors produce weapons-usable plutonium and highly enriched uranium (HEU).

⁴ Biofuels have been blamed for the current food crisis and the global food price spikes. Commentators have drawn attention to the fact that the biofuel industry has led to the diversion of land and water for growing sugarcane and corn, rather than for providing food to the world’s poor.

⁵ IBSA, however, is not a security community in the way Buzan has defined the term. For more information on IBSA, see http://ibsa.nic.in/about_us.html.

Theorizing the ‘region’

The *region* has been identified here as an important level at which diverse actors can come together to address the challenges emerging from ECS inter-linkages. In other words, region is a space where actors such as the state, business interests, epistemic communities, civil society groups, and other developmental trans-national networks can coalesce for the attainment of specific objectives.

The study of the region as a ‘level of analysis, as an actor, and as a dimension’ is not new (See Hettne 2005). Indeed, the regional scale has been ‘canonized as a “functional space” for economic planning and political governance’ (MacLeod 2001). It has been studied in the context of greater political cooperation, as in the case of the European Union (EU), the Association of South East Asian Nations (ASEAN) and so on; it has been studied in the case of trade blocs such as the North American Free Trade Area (NAFTA), South African Development Community (SADC), the South Asian Free Trade Area (SAFTA), Mercado Común del Sur (MERCOSUR), and the European Community (EC), amongst others; and it has also been studied in the context of alliances and groupings with a security underpinning such as the North Atlantic Treaty Organization (NATO), Southeast Asia Treaty Organization (SEATO), and so on.

Despite these differences, the ‘region’ as a conceptual category comprises certain basic characteristics that make it a useful tool for the analysis of international politics, and for making recommendations for renovation in the system of sustainable-development governance. Broadly speaking, the region represents a delimited geographical space, distinguishable on the basis of geographical contiguity or geophysical cohesiveness (for example, the Himalayan ecosystem). A region also may constitute a space that is not geographically contiguous, but is unique and distinctive either because of strategic reasons or because of economic/ developmental concerns. For example, Barry Buzan refers to a regional security community, that is ‘a group of states whose primary security concerns link together sufficiently closely that their national security cannot realistically be considered apart from one another’ (Buzan 1991). An interesting example of a regional organization that is not based on geographical contiguity or even proximity is the trilateral developmental initiative consisting of India, Brazil, and South Africa, better known by its acronym—IBSA⁵. IBSA

was established on the basis of the fact that the three countries represented rising economies in their respective regions, and thus face similar socio-economic challenges. This group was created to not only enhance trade and cooperation between the three countries, but also to foster greater South-South cooperation. This article's analysis, however, primarily focuses on regional arrangements that align with a delimited geographical space.

Apart from the fact that regional organizations bring together similarly placed (in terms of economic development) member states onto a common platform, they also bring together countries with similar objectives. Regions are, therefore, also formed around meeting functionally specific objectives, as was the case with the European Coal and Steel Community (ECSC), when it was set up in 1951. Functional optimality allows the members of a region to be able to communicate with each other more easily by providing a core around which values and behaviour can converge.

The region is increasingly important in moving towards sustainable development agendas and for fashioning new modes of governance.⁶ Sustainable regions are increasingly seen as a 'necessary element in the transition to a more sustainable planet' (Hudson 2007). The sustainability agenda demands a re-drawing of often overlapping spatial boundaries that go beyond the 'fuzziness' of global system linkages on the one hand, and the sovereign territoriality of the state on the other. The region, therefore, is a vital part of the process of moving towards sustainable development at the global level, primarily because it provides a space for formulating optimum policies, as well as creating networks. The region has attracted 'significant attention as a practical scale of implementation for sustainable development and policies'⁷. Ray Hudson makes a strong statement for a return to the region on three counts: as a sustainable economic space, as a space for sustainable mobility and movement, and as a space for waste disposal and recycling. He argues that the region in the context of sustainable development forces us to think 'seriously about returning to more localized and regionalized ways of living, predicated on a different conception of what constitutes development' (Hudson 2007). In consonance with this, the region is also at the core of the discourse on devising new modes of governance, and particularly the concept of multi-level or 'multi-layered' governance (Held, McGrew, Goldblatt, *et al.* 1999).

⁶ Governance has been defined as 'how one gets to act, through what types of interactions (deliberation, negotiation, self-regulation or authoritative choice) and the extent to which actors adhere to collective decisions' (Kemp, Parto, and Gibson 2005).

⁷ Fourteenth Annual International Sustainable Development Research Conference. 2008. *Track 16: Regional Sustainable Development*, 21–23 September 2008.

The region's relevance: scoping, support, and solutions

The proliferation of regional organizations and their growing 'functional globality' (Suominen 2005) has brought into focus the role that regional arrangements can play in addressing new and emerging global threats such as energy insecurity and climate change. Agreement at the international level remains a more nebulous and far more elusive objective than at a regional scale. The apportioning of diverse levels of responsibilities for climate change mitigation has proven that international cooperative action may not be easy to arrive at, even when the issues on the table straddle countries. In such a situation, global governance structures and international organizations may not bear expected results, and may fail to adequately reflect diversity of interests prevalent in the international system. National responses, on the other hand, may prove to be insufficient, even inappropriate. The region, therefore, emerges as an 'optimal policy level' (Langenhove, Costea, and Gavin 2004). As an intermediate space for intervention between the national and global levels of governance, the region provides a policy space to examine and tackle issues that require cross-country engagement, but for which global engagement may prove too ambiguous or too unrepresentative. This particularly holds true for regional public goods such as water sources, forests, and fisheries (Bilal 2004).

Also, geographical proximity and infrastructural ease make the regional space amenable to energy trade and collaboration. Not only can energy-rich and energy-deficit countries in a region trade/share energy resources, but energy cooperation can also be crucial for regions that are energy-deficit in aggregate. Cooperation between countries within a region can eventually be seen as a stepping-stone for connecting two or more regions. For instance, increased South Asian cooperation can be seen as a pre-requisite for greater energy trade between South Asia and Central Asia.

Three ways in which the region is better placed to address the ECS inter-linkages are:

- Scoping (identification of, and consensus-building on, issues and interests);
- Support (financial, technical, and knowledge support for national and international initiatives); and
- Solutions (joint action and policy implementation to address energy and climate concerns).

Notwithstanding the fact that regional organizations and processes have witnessed limited success at best, we aver that a case for encouraging and strengthening regional initiatives is worth striving for in the light of the potential benefits they offer.

Scoping

First, regional organizations are better able to identify issues of importance for countries in a particular region and define their scope, thereby offering an appropriate space for articulation of interests. They are able to assess countries' level of interdependence, relative strengths (where they can cooperate), and regional deficiencies (where external assistance is required). For instance, with regard to energy resources, both similarities and dissimilarities in energy profiles of countries in a region provide room for a common policy space. For instance, cooperation in oil-rich West Asia not only entails a coordinated oil-pricing policy, but may also provide them a position of advantage in global transactions. On the other hand, a region with diverse energy profiles allows scope for trade in energy and energy-related services. South Asia is a net importer of oil, but there is ample scope for intra-regional cooperation in the area of hydropower development, due to the availability of surplus hydro-electricity in Nepal and Bhutan, and renewable energy/energy technology trade propelled by India's lead in the field.

Second, a global top-down view of realities may fall into the trap of delineating problems and possible responses into water-tight compartments when it is crucial to draw linkages between energy use and climate impacts, and pursue integrated management of land, forests, water, mineral resources, biodiversity, resource rights, and livelihood. Regional organizations are better placed to address this multi-point agenda and recommend/undertake multi-pronged action. Such organizations have increasingly come to recognize their role in addressing these interlinked concerns. For instance, on 21 November 2007, the ASEAN members signed the Singapore Declaration on Climate Change, Energy and the Environment which, while affirming the members' support to the negotiations under the UNFCCC, highlighted issues of salience for the South and South-East Asian region (ASEAN 2007). It also identified the individual and collective actions that can be taken to address energy- and climate-related challenges. In the same vein, the EU's integrated energy and climate policy brings together the group's will to reflect on energy choices and systems (in the light of increasing liberalization, and trans-nationalization of production and financial flows), environmental concerns, technological

challenges, and growing import dependence from countries with high political risk (Murphy, Drexhage, Cosbey, *et al.* 2008).

Third, since the countries in a region often share a common socio-economic milieu, regional organizations are in a suitable position to identify interest groups with regard to ECS, the needs and interests of these groups, and the pressure (or the lack of it) that they can put on policymaking. Vulnerable and marginalized socio-economic groups need additional support, and empowering them to make decisions with regard to their immediate environment is key to a sustainable development policy.

Support

Regional organizations support nations in sustainable policymaking and governance in three important ways. Firstly, regional players as negotiators lend weight to national interests emanating from within the region, and amplify the voices of small countries at international fora. To some extent, this can be seen at the negotiations under the UNFCCC where small island states (mainly from the Oceania and the Caribbean) have come together to represent the interests of countries most vulnerable to sea level rise.

Secondly, regional organizations are in a better position to provide finance and knowledge support, and reinforce state efforts for securing energy supplies, developing alternate sources of energy, and undertaking mitigation and adaptation initiatives. Mitigation and adaptation funds at the regional level present a potential area as countries move towards low-carbon economies. Lastly, knowledge sharing on technology and capacity building are other areas where regional organizations can contribute, to feed into both national and international programmes. In the South Asian region, India's lead in the development of biomass gasifiers, solar panels, and photovoltaic cells places it in a position to export renewable energy technologies to its South Asian neighbours, and offer technical expertise in the area.

Solutions

In meeting challenges such as energy insecurity and climate change, implementation of solutions at the regional level enhances efficiency and allows for burden sharing. Regional initiatives can provide one way of ensuring security of energy supply for member countries. In line with the building of strategic oil reserves by the IEA members, regional initiatives offer the possibility of stockpiling reserves. Such an initiative would involve careful calculations about the optimal quantity of reserves, determination of member countries'

contribution and allocation, identification of sites, and building of extensive infrastructure and storage units. Besides, there are significant incentives to invest in shared energy infrastructure at the regional level, primarily because of geographical proximity. This particularly holds true for extension of electricity transmission lines. In Europe, even power-surplus countries engage in trade amongst themselves as it is often feasible and more efficient to connect border regions of one country to a power grid in a neighbouring country than to a distant grid within the country. ASEAN Vision 2020 also envisages an ASEAN power grid that seeks to establish win-win economic relationships between members, and eliminate the costs of developing new power generating units by allowing trade (ASEAN 2008). The development of hydropower potential is another area for possible regional cooperation. In the case of trans-border rivers, collaborative policymaking serves two purposes: it allows for efficient and just utilization of water for both the upstream and downstream regions, and it helps avoid adverse impacts on the environment.

The geo-physical realities of a region can make it susceptible to various environmental challenges, often leading to large-scale socio-political changes which require concerted, collaborative policymaking. In adapting to climate change, regional organizations provide opportunities for ensuring disaster preparedness and effective management of large-scale demographic changes. Here, sharing of information is crucial; and therefore, regions need to establish extensive and efficient networks for information sharing and employ early warning systems.

According to a Greenpeace report, climate effects could displace millions of people in South Asia alone, particularly those living along the coasts of Bangladesh and India (Rajan 2008). People who are unable to find refuge within their home countries would move to neighbouring countries, particularly to countries with which they share cultural or ethnic ties (Brown 2008). An influx of migrants into the hinterland of the Indian subcontinent can thus be expected. A regional response to such a development is not only preferable, but mandatory.

Overlapping spheres: state, region, and international

To emphasize the importance of regional initiatives in addressing ECS concerns is not to take away the merits of larger multilateral negotiations. Regional cooperation is one way of only deepening inter-state cooperation by looking at geographical areas of focus. It is, thus, not a substitute for international engagement but a complementary process. Since the integrated global governance system to tackle global challenges such as

energy, climate change, and security, must ‘encompass global, macro-regional, national, and micro-regional approaches’ (Langenhove, Costea, and Gavin 2004), linkages between the regional and the international can only enrich the process of tackling global challenges. Any regional policy on energy and climate brings with it an ‘added value for internal policies’ such that national policies on energy and environment do not undermine the interest of the region. It further brings an ‘added value for external policies’, which brings regional values and needs to bear upon international dynamics (Murphy, Drexhage, Cosbey, *et al.* 2008).

The nature of ECS issues, with their global implications, calls for inter-state engagement. Regional organizations are better able to push for national policymaking to fulfill international commitments, and support national governments in the process. In 2002, the Johannesburg World Summit on Sustainable Development (WSSD) defined the United Nations Framework Convention on Climate Change as ‘the key instrument for addressing climate change, a global concern’, but emphasized regional initiatives and partnerships, calling for interaction among the UN Regional Commissions and other regional and sub-regional institutions (Langenhove, Costea, and Gavin 2004). According to Kati Suominen, it is important to build linkages both amongst regional organizations and between regional and international organizations: ‘globalizing regionalism would produce a distinct and unique layer of international cooperation, which like the system of International Organizations (IOs) would inherently involve both inter-governmental interactions and cross-organizational linkages, but which unlike the system of IOs, would also have intricate local expertise in, and a guaranteed long-term commitment to, all regions at all times’ (Suominen 2005).

Conclusion

The ECS interlinkages have added to the challenges already confronting the global community in the 21st century. That these challenges are trans-national in character, and have serious local impacts requires taking into account both the micro and the macro aspects, and the complex interdependence between the two. Policymaking at all levels of governance—from the local to the international—is crucial for addressing energy insecurity and climate change in a holistic manner, and regional mechanisms are an important component of this matrix. Here the region is not seen as a static intermediary between the state and the international, but as a dynamic entity that encompasses, reconstitutes, and interprets state interests as well as international imperatives, while simultaneously being impacted upon by them. Regional

engagement allows for synergies between state policies and optimal utilization of regional resources, while maintaining a focus on local needs. It is clear that the close linkages between energy, climate impacts, security, and economic growth imperatives can hamper inter-state cooperation. Though there may be disagreements in defining energy-trade equations, benefit-sharing mechanisms, and regional responses to climate change, 'shared vulnerabilities of the regional states should be enough impetus... to navigate through contentious waters to urgently address these security threats' (Caballero-Anthony 2007).

The effectiveness of regional initiatives both complements as well as supplements multilateral efforts towards sustainable development governance. The values and material concerns espoused at the international level can be operationalized at the level of the state through regional interventions. In addition, the region can translate state interests to the international agenda. The scale and gravity of energy and climate concerns calls for multi-level action, where the region can emerge as an important pivot.

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Climate change and water security

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Water requirement has undoubtedly emerged as an issue of great concern and urgency. With multiplying demand on water, the availability of which remains constant (unlike oil, water cannot be discovered; it is only circulated), a water crisis is impending. This holds particularly for developing countries where the requirement of water will rise by 50 per cent by 2030. A comprehensive water policy for these states would need to take into account the rapidly changing water conditions, in terms of quality, quantity, and the uneven distribution of water.

Much of the policy understanding on water has been narrowly framed on the principle of 'water management' that entails manipulation of water for specific uses through water-based projects. Clearly, a more comprehensive policy for protection, development, and utilization of water resources—including both surface and underground water—needs to be developed. This would mean a shift to a more rational and integrated 'water resource management' that treats water bodies as one hydrological unit and, in the process, embraces the 'conjunctive use' of both surface and underground water resources and their sustainable development.

While the developmental focus will remain essentially on the socio-economic uses, it must be noted that water is equally necessary for sustaining the ecosystem. The challenge lies in maintaining the balance. Another factor that needs to be incorporated into water policy is the climate change connect. It is now being increasingly understood that the effects of global warming will be felt through changes in the hydrological cycle. An effective adaptation policy cannot be delinked from the way water resources are managed and utilized. At the recent COP 16 meeting in Cancun, a new thrust was noticed on understanding the water-climate link. The Green Group of six countries—Cape Verde, Costa Rica, Iceland, Singapore, Slovenia, and the UAE—encouraged greater emphasis on water management and climate adaptation.

The impact of global warming on water resources is particularly important for the Himalayan states that are highly dependent on glacial sources of rivers in the Hindu Kush. Initial findings of ongoing research indicate increased precipitation in some areas and increased variability of precipitation in others. Changes in precipitation and evapo-transpiration will greatly

influence groundwater recharge. The expected decline in glaciers and snowfields will affect the flow of rivers, and increase the likelihood of floods due to overall increase in intensity of rainy days. A policy that awaits clear evidence may not be prudent. A precautionary approach and alertness to possible changes is a wiser option.

The Himalayan hydrology will be one of the critical frontlines in the global approach to mitigate the impact of climate change on water resources. About 1.4 billion people live in the watersheds of the Hindu Kush Himalayas. Ten major Asian river systems—the Amu Darya, Indus, Ganges, Brahmaputra, Irrawaddy, Salween, Mekong, Yangtze, Yellow, and Tarim—have their sources in the Himalayan glaciers, and contribute almost 70 per cent of the water resources in the region. Unchecked climate variation can lead to unprecedented problems for the waterways of Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, Pakistan, and countries in the Mekong Basin. The Indus system alone comprises 8,000 glaciers. We need to start looking at the Himalayas in ways we have never looked at them before.

Amongst the growing evidence of the impact of climate variation, one issue that requires urgent attention is the phenomenon of 'outburst flooding' in the Himalayas. Lakes form as melted water from glaciers collects behind ridges of loose rock debris (called moraines) that were deposited by the glaciers themselves. Over the last few decades, there has been an upsurge in glacial lake outburst floods (GLOFs) in the Himalayas, resulting in devastation downstream. According to an assessment of the International Centre for Integrated Mountain Development (ICIMOD) in Kathmandu, there are about 200 glacial lakes in the Hindu Kush Himalaya region that are described as 'potentially dangerous'. Of these, 77 are in China, 52 in Pakistan, 30 in India, 25 in Bhutan, and 20 in Nepal. The ICIMOD diligently monitors such trends, and as its website indicates, maintains an inventory of 8,700 glacial lakes in the region.

The GLOF problem needs to be studied further, and correspondingly, a long-term data bank needs to be developed. The current level of knowledge is inadequate for identifying and assessing the magnitude of potential outbreaks of glacial lakes. While research activity has increased, the problem lies in sharing of

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data. Also, GLOF risks have to be properly assessed and not heightened in order to avoid unnecessary fear and misperception. With trust deficit high amongst the Himalayan countries, overstated risks can be misinterpreted particularly by downstream countries and this can stymie regional cooperation.

The combination of rising population, increased urbanization, and rapid economic growth compounds the challenges of securing water in the future. Asia, the most populous continent has also the lowest water per capita in the world. Figures indicate that one in five people in the region do not have access to clean water. With an additional 500 million people expected in the next 10 years in the Himalayan watershed states, the stress on food, energy and water resources will only increase. It is thus important to understand the Himalayan region in terms of 'exponential function'—increasing population leading to greater food demand that increases dependence on water for irrigation and energy. The interconnection of food-energy-water (FEW) is crucial, and if not framed sensibly into state policies, the cascading effect on food production, livelihood, and migration, will impact political stability in the region. What becomes worrisome is the likelihood of competition over water resources. Though the possibility of water being a direct cause of conflict is unlikely given that the Himalayan watershed is fraught with tensions, water can act as a dangerous trigger and destabilize the region.

What makes water a source of instability is the fact that sovereignty over the resource is not determined by formal international law. Water, unlike oil, is a trans-boundary resource. A large volume of water—over 90 per cent, crosses international borders. It is difficult to determine whether water is a 'public good' (defined as non-rival and non-excludable) or 'private good' (defined as rival and excludable). Such amorphous definitional

demarcation subjects trans-boundary rivers to various interpretations. That said, there is, a general view to perceive it as 'collective good' or 'common pool resource.' In spite of the 1997 United Nations Convention on transboundary watercourses, which has yet to be ratified, there exists no legally binding watercourse treaty. In the light of this, the Himalayan region's hydro-politics needs to be oriented in a manner that the optimum development of rivers is possible through mutual cooperation and hydrological observation.

Regional cooperation will need to factor in an enhanced and updated automated early warning system. The cooperative framework would also require upgrading remote-sensing projects, which are critical for improving flood warning systems. Such enhancement will help in detecting small changes in lake levels, and thereby send immediate signals to alarm systems near villages. While building such capacity is important, what is of greater relevance is repeated risk-evaluation at the ground level, leading to thorough risk assessment. Local knowledge and indigenous understanding are immensely important to the overall assessment. Thus a lot of fresh thinking based on evolving hydrological knowledge and understanding is required—thinking that is sincere, evidential, and scientific; and not alarmist, rhetorical, and misrepresented.

Climate variation and its impact on water resources bind the Himalayan region together. Some of the impacts of climate change are already being observed with glacial melt, seismic activity, and unpredictable weather patterns. States would need to reorient their riparian policies on a multilateral basis. While, on the one hand, a shift from merely 'sharing waters' to 'sharing benefits' is necessary, on the other, it is imperative not to lose sight of the ecological consideration.

Perspectives on climate and conflict

Swati Ganeshan*

With the advent of transnational challenges such as climate change, new dimensions have emerged in the geopolitical domain. A gradual shift in international politics appears to be taking place, with rising emphasis on and demand for collective action to deal with climate change. Within this political landscape, the focus on a nation's external and internal security in relation to climate change has become a significant component of the climate change debate. The discourse on the linkages between climate change and conflict is vital within the security debate surrounding climate change. However, any conclusions on the linkage necessitate caution due to the existence of unsubstantiated assumptions and inadequate evidence.

A significant part of the discourse on climate and conflict is derived from research on resources, environmental challenges, and conflicts. It has been put forth that environmental change could heighten the risk of conflict (Homer-Dixon 1991). The current discourse on climate change focuses largely on linking climate and conflict with development and governance, wherein the potential for conflict has been considered to be higher in developing countries and fragile or weak states (Smith and Vivekananda 2009).

Two other key inferences have been made. The first is that climate change may not be the lone cause for conflict but may exacerbate pre-existing stresses and vulnerabilities, and thereby pose risk. Second, further scientific study and evidence would be required to ascertain whether climate change has been the cause for the exacerbation of stress in regions where conflict has arisen. Within this context, this paper highlights the issues that have emerged out of the current debate that draws linkages between climate and conflict.

Climate, security, and conflict

A significant endeavour that brought the climate-security linkage to the forefront was the United Nations Security Council debate in 2007 (UNSC 2007). The discussion on the issue was considered to be vital by European nations; while developing countries were opposed to discussing the linkages between climate change and security on a platform such as the Security Council. Securitization has been considered to be a positive element that serves

the purpose of pressurizing politicians to undertake emission cuts and invest in adaptation (Brown, Hammill, and Mcleman 2007). This is in stark contrast to the perspective of developing countries on the issue, where climate change is considered a socio-economic and development issue. Climate change has trans-border implications, and while a traditional security approach to its understanding may heighten the concern around the issue, it may dilute the focus on people and their vulnerabilities.

The implications of climate change on existing vulnerabilities may act as a catalyst in increasing 'tensions' that may or may not transform into conflicts (Dasgupta 2008). The impact of climate change on environment would also be dependent on the alteration of institutional frameworks—political, economic and social, and their response or resilience to rising tensions. For instance, the melting of the Arctic ice that is home to abundant resources and acts as a frontier for new trade routes has led to emergence of a conflict of interests as resources in the region become accessible. However, such friction may not necessarily intensify into a violent conflict. Defining climate as a tension or stress multiplier may reflect a more nuanced approach.

Research on conflict issues needs to widen and deepen to understand the various causes of conflict in relation to resources and environment prior to its application to climate change. Such research is necessary and relevant as 'the understandable desire to identify a clear causal path between climate change and conflict misses the point that each is a complex phenomenon in its own right' (Lind, Ibrahim, and Harris 2010).

Climate and conflict: Is there a link?

Various instances have been cited to establish the linkage between climate and conflict. For instance, the pastoralists-herder conflict in the Sahel region due to diminishing cultivable land has been believed to be occurring due to climate change (UNEP 2007). Migration from areas that are affected by sea-level rise or water scarcity has been referred to as a climate-change-induced conflict risk. However, some literature reflects that during the time period when global warming impacts were becoming visible, there was a decrease in armed

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conflicts. Also, statistics do not reveal any significant linkages between resource scarcity and civil wars (Buhaug, Gleditsch, and Theisen 2008). In the case of Africa, Buhaug (2010) writes, ‘climate characteristics and variability are unrelated to short-term variations in civil war risk in sub-Saharan Africa.’ The author further states that the causes of civil wars in Africa are political, and not environmental in nature. Even though the study did not focus on long-term security implications, it did reflect the trends visible in the climate-conflict relationship.

Linking climate to conflict is like “jumping the gun” especially when research on climatic events is evolving; when there are overlaps in causes of conflicts which include socio-economic and ethnic factors; and when the nature of conflicts is rapidly involving to include new issues and actors. A single causal relationship is thus difficult to draw.

Various traditional mechanisms and measures, undertaken by the UN under its peacekeeping operations, are already in place to tackle armed conflicts. Traditional peacekeeping and peace-building measures have been instrumental in bringing down the number of armed conflicts across the world besides the rising global consensus to maintain international peace and security. There has been an effort to include environment-related measures within peacekeeping and peace-building activities. The United Nations Environmental Programme (UNEP) has provided training to peacekeepers to address environmental issues. A study conducted by UNEP on conflict and peacebuilding recommends measures to address natural resources and environment related issues at the level of peacekeeping and peacebuilding exercises (UNEP 2009).

Adapting to climate change: moving beyond the climate-conflict dynamic

Climate change would pose significant risks by exacerbating existing vulnerabilities. Nevertheless, the widening research on climate change and the emerging mechanisms to deal with it would have a significant bearing on the mitigation of or adaptation to these threats. The emphasis on greater cooperation to address climate-change-induced challenges would be instrumental in creating an atmosphere conducive to collaboration rather than conflict (that is traced to the global implications of the climate challenge). These factors would play a crucial role in determining how the

climate-conflict linkage will develop and influence policy thinking.

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Commentary

TERI in Africa: working towards a better tomorrow*Debajit Palit**

Rural energization (electrification, in particular) is one of the key components in achieving the Millennium Development Goals (MDG) because it facilitates both economic and socio-cultural development of the target population. Approximately 587 million Africans do not have access to electricity. Additionally, with only 12% of the population connected to the electricity grid and more than a third of on-grid population remaining 'under-electrified', even modest improvements in access to modern energy services can have a big impact in the region. The energy consumption patterns in the rural areas of most African countries are dominated by kerosene and dry cells for lighting, and biomass for cooking. These are low-quality fuels with inefficient end-use technologies (for example lamps, torches, and three-stone stoves). Largely due to these low efficiencies, the unit cost of energy service (such as lighting) is significantly higher for the poor than for the affluent. The key sustainable development issue for the region is: how can 'access to modern energy services' be improved to attain the scale needed to accomplish the MDGs by 2015?

In 2002, the New Partnership for Africa's Development (NEPAD) proposed that regional organizations such as the Economic Community of West African States (ECOWAS), the Communauté Économique et Monétaire de l'Afrique Centrale (CEMAC), and the East African Community (EAC) play a key role in improving access to modern energy services. NEPAD set a target for providing access to electricity for 35 percent of the African population by 2015, and modern energy for cooking such as improved stoves or fuels like liquid petroleum gas (LPG) to half the population. Since then, all of these regional organizations have developed strategies or action plans such as the ECOWAS/UEMOA (West African Economic and Monetary Union) White Paper on Energy Access, the EAC Energy Access Strategy, and the CEMAC Action Plan for Promotion of Energy Access (all three adopted in 2006). These regional strategies are aimed at addressing the following four targets:

- Providing modern energy for cooking to at least half the population;
- Energy for urban and peri-urban areas;



Interview with Mayor, Ganta City, Liberia by TERI professionals

- Energy for social services like energy for lighting, refrigeration, and water pumping; and
- Energy for productive use, particularly motive power for milling and other crop processing.

However, since then, very little development has taken place in implementing the strategies at the local level and enhancing access to clean energy. One of the key reasons could be that the regional or local organizations may not have the requisite capacity to undertake innovative approaches for demonstration projects to enhance energy access, thereby paving the way for large-scale replication. The challenges involved in implementing energy projects in an otherwise new territory include viability of the offered technological solution (a combination of appropriate technology and energy service package), effectiveness of the institutional innovations, robustness of the designed financing models, and effectiveness of the enabling mechanisms for communities to derive direct and indirect benefits from electricity services.

In India, The Energy and Resources Institute has been undertaking variety of projects that deal with these aspects, and is offering relevant solutions. In view of the global emphasis on access and energy security for the rural population, TERI has now actively started working in the African continent in association with UN

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organizations and other local partners. The work is being carried out mainly at four levels:

- **Demonstration projects** to enhance local technical capacity
 - Extending clean lighting through the Lighting a Billion Lives^{ca} Initiative (with UN Habitat and Ajuda de Desenvolvimento de Povo para Povo, Mozambique (ADPP))
 - Biomass gasifiers for lighting and cooking (with the World Bank and local governments)
 - Adoption of energy-efficient cook stoves (with United Nations and Environment Programme (UNEP))
- **Mapping capacity and potential**
 - Of small hydropower projects in Sierra Leone and Liberia (in association with United Nations Industrial Development Organization (UNIDO))
 - To manufacture components for renewable energy systems such as biomass gasifiers and solar PVs locally in East African countries (with UNIDO)
 - Promoting energy efficiency in buildings in Eastern Africa (with UN-Habitat)
 - Promoting energy efficiency in industries (with the Governments of Uganda and Ghana)
- **Strengthening knowledge base of governments, institutions, and NGOs** through
 - Specially designed courses under Indian Technical and Economic Cooperation and Special Commonwealth African Assistance Programme (ITEC/SCAAP) on several sustainability-related topics (through Ministry of External Affairs (MEA), Government of India)
 - Transfer of technical and social knowledge—the Solar Transition Project (with Norwegian and Kenyan partners)
 - Collaboration with Wangari Maathai Institute for Peace and Environmental Studies to address issues of natural resource management, climate change, and community engagement
 - Memorandum of Understanding (MoU) with Ethiopian Institute of Technology-Mekelle and Addis Ababa University to work towards sustainable development issues
- **Supporting regional initiatives**
 - Assisting United Nations Economic Commission for Africa (UNECA), in its climate policy research
 - Supporting ECOWAS, with its Renewable Energy Centre

For instance, some of the recent initiatives undertaken to further the four level activities of TERI are discussed below comprehensively.



Stakeholder consultation in Moyamba, Sierra Leone by TERI and UNIDO

Lighting a Billion Lives initiative

Lighting a Billion Lives (LaBL), initiated in 2008, seeks to make available, affordable solar lighting to a billion people across the globe who currently lack or have only limited or unreliable access to electricity in general, and clean lighting in particular. LaBL provides improved, clean, and affordable lighting through the dissemination of highly efficient solar lanterns that are recharged at solar charging stations (SCS). The initiative is being implemented on the basis of an entrepreneurial model of energy-service delivery innovated and scaled up by TERI. Currently, the campaign reaches out to 570 villages across 15 states in India, impacting more than 1, 65,000 lives by providing 32,000 solar lanterns.

Whilst the primary objective of LaBL is to provide clean lighting to the poor, another important goal is the development of a network of partners to extend solar-lighting facilities at a global scale to energy-impooverished regions. TERI is in the process of extending the initiative to urban slums in select African cities, in collaboration with UN Habitat as part of their pilot programme on renewable energy projects. The UN Habitat’s pilot programme aims at enhancing the clean-lighting system along with the water and sanitation services in select African cities and secondary towns utilizing locally available renewable and clean energy sources, especially for the benefit of the urban poor. In another project, TERI will work with ADPP of Mozambique in setting up 40 SCS to enable rural people access to sustainable small-scale solar power in the Quissanga district of Mozambique.

Promoting mini-grids based on small hydropower for productive uses

The challenges of rural electrification are manifold. One of the major ones relate to the effectiveness (viability,

reliability, and applicability) of offered technology for livelihood-related activities. Given the current rural electrification scenario in Sub-Saharan Africa, expansion of the national electricity grid to rural areas—both for enhancing energy access and creation of livelihood—will be time consuming and cost intensive. Though, small diesel generators are being operated in rural areas, their use is limited by their capacity. Moreover, the cost of power generation is high, besides the emission of greenhouse gases. Decentralized mini-grids, based on locally available sources of renewable energy, which are abundantly available in many countries, seem to be a viable alternative for improving access. TERI is working with UNIDO in the West African countries of Sierra Leone and Liberia to set up two Global Environment Facility (GEF) supported small hydro projects, and develop a market-based approach for promoting small hydropower-based mini-grids to stimulate productive capacities in these countries. These demonstration projects are also expected to lay the foundation for a market environment for renewable energy projects, and assist the respective countries to use the process as a learning exercise towards building their local capacity for scaling up such projects and enhance energy access.

TERI has been working on development and sharing of innovative service delivery models for rural electrification. Innovation, in this context, is understood as the process of improving or developing clean-energy technologies and technological systems, and customizing their delivery mechanisms for maximizing impact. The Decentralized Electricity Solutions division of TERI is working to address the knowledge gap that currently exists in strategies/approaches for enhancing the uptake of clean-energy technologies and catalyze action in this direction. To transfer and share the knowledge, TERI is involved in an action research project titled 'Village-scale solar systems for development: transfer of social and technological innovations between India and Kenya' (briefly termed- 'Solar Transitions'). The inter-disciplinary project, led by the University of Oslo, Norway, has 11 partners from Kenya, India, Austria, and Norway, representing several academic and practical disciplines. This project aims to contribute to the understanding of success factors and lessons learnt in the process of implementation and use of solar power plants in local communities, as well as how such experiences can be transferred and adapted to rural communities across Africa.

Local manufacturing of renewable energy technology components in East Africa

Renewable energy technologies have the potential to meet the energy needs of various segments in Africa due

to abundance of such energy resources in the continent. However, currently most of the renewable energy technologies or technology components are imported into Africa. UNIDO and TERI felt the need to build reliance on local manufacturing of technology components to generate employment that would result in increased self-reliance on indigenous technologies. Accordingly, TERI and UNIDO attempted to assess the potential of local manufacturing of technology components in the East African countries of Ethiopia and Uganda namely of two renewable energy technologies- biomass gasifiers and solar photovoltaic technology applications.

Strengthening knowledge base of governments, institutions, and NGOs

With capacity development and knowledge sharing as the thrust areas, TERI has been attempting to build the local capacity of stakeholders in developing countries. In this direction, TERI has been conducting specially designed courses under ITEC/SCAAP on several sustainability-related subjects with the support of MEA, Government of India. During the last four years, approximately 400 middle management officials from across the world have availed these courses with a considerable number from Africa.

In addition, collaboration with institutes such as the Ethiopian Institute of Technology-Mekelle (EIT-M), Addis Ababa University, Wangari Maathai Institute for Peace and Environmental Studies, Kenya, and GTZ-EnDev (German Technical Cooperation - Energizing Development Programme) is also extending the reach of TERI to various African countries. While the alliance with Wangari Maathai Institute emphasizes on addressing issues of natural resource management, climate change, and community engagement, the MoU with EIT-M intends to facilitate



Village survey in Ikisaya village, Kenya

all exchanges and cooperation in the field of science and technology focusing on climate policy, renewable energy, decentralized energy solutions, natural resource governance, agricultural production, and consumption systems. The TERI and GTZ-EnDev partnership focuses on the development of the sustainable and commercially viable solar sector in African countries, wherein the GTZ-EnDev programme is currently functional.

Regional cooperation with UNECA

To take the South-South Cooperation activities forward in Africa, TERI has been helping the African Climate Policy Centre of UNECA in adaptation-related issues that are relevant for the continent. As part of the cooperation, TERI researchers have also substantially contributed in the deliberations of the African Development Forum organized in October 2010, and have helped in formulation of various policy papers. Additionally, TERI is also acting as a knowledge partner to the African Climate Policy Centre, Ethiopia, and helping UNECA in issues pertaining to sustainable development of the region.

The road ahead

The strategic actions on which India and Africa can collaborate, and where TERI can play an active role is:

- Equitable and sustainable development of the available energy resources;
- Enhance energy access in rural areas, especially by establishing off-grid models based on renewable energy technology;
- Scaling up of power generation capacity through reforms in the energy sector;
- Capacity building and clean technology development;
- Energy efficiency in micro, small, and medium enterprises, as well as in buildings;
- Integrated water and natural resources management; and
- Climate policies, especially adaptation issues related to climate change.

Today, energy poverty and sustainable development are the two biggest challenges faced by developing nations—be it India or the African countries. Hence, it is upon both India and Africa to use cutting-edge scientific and technical knowledge to address the challenges to ensure a better tomorrow.

Commentary

Low carbon energy initiatives in South Asia

Sonya Fernandes*

Energy trends in South Asia have been far from sustainable with the government organizations initially focusing on renewable energy (RE) and energy efficiency (EE) as a climate change mitigation tool since the economic implications and the potential to create several direct and indirect jobs was not forecasted. Today, with growing realization that energy demands can be met through profitable renewable energy, and energy efficiency related business opportunities in South Asia, the governments have to come up with innovative policies in order to drive investments, predominantly from the large private sector.

It was predicted that post 2010, renewable energy and energy efficiency would witness dramatic progress with the introduction of new feed-in tariffs, improved energy laws, financial incentives, and foreign funding in the Asia and Pacific region. Amongst some of the emerging markets in this region, India has initiated certain attractive schemes to deploy private equity capital.

To surpass countries like China and Europe, which constitute more than three-quarters of the total solar thermal market, the Indian government has launched its National Solar Mission, which aims to attain 1 GW of grid-connected solar power by 2013. At the same time, recently introduced feed-in tariffs for wind, solar, and waste-from-energy projects have provided long-term certainty for investors.

Over the next decade, India is expected to invest up to \$30 billion in renewable energy in an effort to keep pace with energy demand that is projected to grow at an annual rate of 8 per cent.¹ Renewable energy is also a key part of the Indian government's Eleventh Five Year Plan to bridge the current supply gap and deregulate the energy industry. As a result, the country is attracting interest from investors keen to cash in on the large number of clean energy projects that are currently at the planning stage.

With its unique economics, India's energy market can provide excellent risk-adjusted return for equity financing of green infrastructure.

Realizing the huge potential in harnessing solar energy and the large market for solar-thermal and Photo Voltaic (PV), the Government of India, under the National

Solar Mission, has set to ensure that there is wide-scale penetration of solar water heating systems (SWHS) in both the domestic and industrial sectors in India. The goal is to achieve 15 million sq. m of solar thermal collector areas by 2017, and 20 million sq. m by 2022. A target of delivering 1,000 MW of grid-connected solar plants, 100 MW of small-scale solar plants, and 200 MW of off-grid solar systems by 2013 has been set, and approximately \$950 million of investment has been approved to help fund these new projects (DIREC Outcome Paper 2010).

The year 2010 also saw plans of feed-in tariff materialize in Malaysia, renewable energy tax credits in South Korea, Taiwan's new renewable energy development act, and a government supported geothermal plan in Indonesia (James 2010).

In South Asia, Renewable Energy and Energy Efficiency Partnership (REEEP) has so far focused on financing, investment, policies, and sparingly on technology to stimulate the use of renewable sources of energy that are abundantly available in the region. With the awareness that government policies can help promote RE and EE while simultaneously reducing volatility in energy prices, REEEP has over the years encouraged governments, local bodies, utilities, and regulators to focus on new financial mechanisms to drive RE and EE through innovative projects and case studies.

About REEEP

Renewable Energy and Energy Efficiency Partnership (REEEP) is an Austrian legal entity with the status of an international NGO. The partnership was conceived at the World Summit on Sustainable Development in August 2002. The International Secretariat is based in Vienna, within the offices of the United Nations Industrial Development Programme (UNIDO). Backed by national governments, businesses, development banks, and NGOs, REEEP is uniquely placed to contribute to international, national, and regional policy dialogues. It has focused on accelerating the integration of renewables into the energy mix, advocating energy efficiency to improve a nation's energy security whilst reducing

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¹ India Briefing magazine. 2010. *Top reasons to invest in India*. Section 2.

carbon and greenhouse gas emission. Additionally, it has emphasized on ensuring further socio-economic benefits by increasing the energy security and reducing the energy poverty in several countries and regions. The partnership (Australia, Austria, Canada, Germany, Ireland, Italy, Spain, the Netherlands, New Zealand, Norway, the United Kingdom, the United States, and the European Commission) has funded more than 80 projects in 40 countries that aim to remove market barriers to clean energy in the developing world and economies in transition. These projects are beginning to deliver new business models, policy recommendations, risk mitigation instruments, and regulatory measures. REEEP has a global network of regional secretariats hosted by highly respected organizations, who share a belief in clean energy, and ensure that all activities are locally relevant and focused.

- 1 It acts as a facilitator and enabler, and is profiled as a change agent towards clean energy systems;
- 2 It aims to reduce market barriers for renewables and energy-efficiency systems in developing countries and economies in transition;
- 3 It believes in action on the ground via project activities that are targeted at policy improvements and innovative finance mechanisms; and
- 4 It is recognized in the international political arena such as, G8, UNFCCC, APEC among others.

In the field of clean energy development, REEEP is fast, experienced, transparent, neutral, and inclusive. The partnership does not promote a specific technology and attaches no strings in implementation.

Every year, REEEP announces a call for project proposals that support the development of markets for renewable energy and energy efficiency, and engages government and financing institutions in its effort to improve the uptake of renewable energy (RE) and energy efficiency (EE) technologies. The seventh call, the largest in REEEP's history, supported 43 new projects in the priority areas of policy and regulation and business and finance. The seventh programme cycle was financed by generous contributions from the governments of United Kingdom, Norway, Australia, Ireland, and Italy. The South Asia secretariat received a total of 90 proposals, out of which eight were selected.

In the South Asian region, REEEP has financed projects that have reduced volatility in energy prices, supported government policies that can help promote renewable energy, observed private sector mechanisms, aided in designing of new business plans and financial models to drive renewable energy and energy efficiency, and discussed possibilities of supporting energy-efficiency

projects by increasing public sector spending.

Through its projects REEEP has succeeded in:

- 1 Sharing successful business and financing models of projects in the region;
- 2 Identifying bankable RE and EE projects; and
- 3 Increasing investor and financier awareness on the significant market opportunities for renewable and energy-efficiency investments in South Asia.

With this backdrop, one of the major areas where REEEP has funded a number of targeted policy and finance interventions is to help promote solar water heater (SWH) market transformation worldwide. Solar water heater sector has shown a steady growth since 1995 and has been possible with strong government support. A recent global study estimates that the sector employs nearly 300,000 people, and that 40 million households make use of the technology already with China accounting for 57% of the installations (FES 2006). The next section offers a broad overview of some of the SWH related projects and activities undertaken by REEEP.

Sharing Project information: case of accelerating penetration of solar water heaters in India

According to Government of India (GoI) sources, a 100-litre capacity solar water heating system (SWHS) can replace an electric geyser in households, and can save approximately 1500 units of electricity annually. Under Indian conditions and 100 litres per day (lpd), an SWHS occupying 2 sq. m of collector area installed in an industry can save close to 140 litres of diesel in a year. Similarly, usage of solar water heater to supply pre-heated boiler feed water can help save 70%–80% on fuel bills (MNRE 2010).

After funding projects for developing a vehicle for mass implementation of solar water heating in South Africa and several other SWHS projects in Uganda, in order to reaffirm its commitment to derive learning from the global programmes and accelerate penetration of SWHS in India, REEEP organized a seminar on 'Solar Water Heating Systems: Global Perspectives' during the Delhi International Renewable Energy Conference (DIREC) 2010. The seminar was organized in association with the Ministry of New and Renewable Energy (MNRE) of Government of India, under the aegis of the Jawaharlal Nehru National Solar Mission.

At this platform, it was acknowledged that despite existing in the market for a number of decades, SWHS still finds limited application in integration with the

energy sector. The reasons for this could be varied with respect to the context and the sector they fall in, however, all of them have a common thread consisting of one or more of the following issues: lack of awareness among potential users, delivery/supply/service chains (including ESCOs), limited availability of SWHS products and components, capital cost, space available to install the collectors (especially in industries and commercial establishments), and efficacy of regulatory interventions.

Learnings from international projects, such as significance of working in areas with high concentration of suppliers, would help in successful uptake of SWHS. Another important lesson that needs to be learnt is that processes can be slow and unpredictable, especially when they involve trying to introduce something new and unexplored.

There is a need to ensure successful implementation of SWHS, which has the potential to be one of the most cost-effective, viable, and sustainable options available for hot water generation today.

REEEP has always included local stakeholders and donors in every stage of the project—from defining the project profile and identifying the trend setters, to their implementation. The activities undertaken aim to accelerate the market on both the supply and demand sides. The project results have been made globally accessible via publications, websites, and toolkits, while specialist sub-networks ensure that the lessons learnt are circulated in research, legal, and energy-efficiency circles.

Over 130 completed, ongoing, and initiated projects have been supported by REEEP that are designed to either:

- Assist governments in the formulation of sustainable energy policy and regulation or
- Create innovative finance and business models to make renewables and energy efficiency a bankable proposition for the private sector.

Through these projects and regional activities, REEEP International and REEEP South Asia Secretariat are committed to reduce barriers that are limiting the uptake of renewable energy technologies in several developing countries.

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