The Energy Dialogue

Shakti Sustainable Energy Foundation **Annual Report 2011**

SHAKTI
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FOUNDATION

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SHAKTI
SUSTAINABLE ENERGY
FOUNDATION

Cleaner energy.
More power
to India.

Shakti Sustainable Energy Foundation, is the only funding agency in India that works exclusively in the clean energy policy space. It makes strategic grants to aid the design and implementation of policies that encourage energy efficiency as well as renewables. The Foundation belongs to an association of technical and policy experts called the ClimateWorks Network. Being a part of this group helps Shakti connect the policy space in India to the rich knowledge pool that resides within this group.

Dear Friends,

As I write this, we are just a couple of months short of completing our third year.

During this time, I have had the opportunity to meet and speak with people working to strengthen India's energy security. These conversations have been both, enriching as well as reassuring. People with vision and commitment are moving the country's energy agenda, it is a joy to note the rapid pace of change. In times of climate change and depleting resources, India is slowly but steadily building itself on the bedrock of clean energy.

Perceptions, unfortunately, are to the contrary. And that must change.

Part of the problem is that energy is a fragmented conversation in the country. We must mainstream it, making space for different viewpoints so that clean energy practices emerge not just as a matter of policy, but of choice.

I see that as one of the prime objectives of our Foundation in India. Our first annual report is therefore less of what we are doing, than what is being done in this space. I feel especially privileged that this document has been considered important enough to merit contributions from pioneers of India's low carbon economy movement.

A special thanks to Ms. Susan Packard Orr for sharing her views on why philanthropy must lead the clean energy movement across the world.

I would like to end this by saying that 2012 will be archived as a milestone year for Shakti; one in which the baton changed hands. Seema Paul, who ably led the organisation through its initial years, will now hand a more mature team to her successor, Krishan Dhawan. I expect Krishan to add to the momentum.

I would like to end by thanking all of you for having brought us this far. We stay committed to strengthening the future of clean energy in India.

Yours sincerely,

Jamshyd Godrej
Board Chair,
Shakti Sustainable Energy Foundation

"SECURITY"

Seema, former CEO, Shakti

I would like to begin this document in circa 2020 or thereabouts. Ten years is a finite period and there is reasonable chance that one will live through it to see a proposed change. If I were to fast forward my life and walk into the India of 2020, what would I find?

I turn to the Planning Commission's Vision 2020 document for an answer. It is an encouraging one: 'By 2020, the people of India will be more numerous, better educated, healthier and more prosperous than at any time in our long history.'

The Planning Commission's assessment comes with a caveat - uninterrupted, inclusive growth. A Gross Domestic Product growth of 9 per cent per annum will be sufficient to quadruple the per capita income by 2020. Given that all other variables are in place, an India that earns better will live better.

At the crux of the India story, lies the need for an uninterrupted 9% growth. At the core of growth lies the need for energy.

This is where the India dream starts to look a bit distant. Energy powers a nation's industries, vehicles, homes and offices. It also impacts the quality of the country's air, water, land and forest resources. For future growth to be both rapid and sustainable, India needs to be as resource-efficient and environmentally benign as possible. However presently it is neither. When the liberalisation gun went off in the nineties, we shot off our stands ignoring the cardinal rule - if you want to finish first, save your breath for the last.

Today, in the early stages of our race to the top, we are already in the midst of a crisis. We spend a fortune importing fuel because we do not have enough for our own needs. We rely heavily on fossil fuels which have huge climate implications; our energy pool is held to ransom by fluctuating global markets and political variables.

We live in times of depleting resources and climate change; the days of carbon-fuelled economy are numbered. As a nation, we need to make a seamless transition to a clean energy growth path without compromising our growth targets.

At Shakti we are committed to this transition.

Many of you reading this document may not know of Shakti Sustainable Energy Foundation. I would like to take this opportunity to tell you a bit about ourselves. Shakti is the only funding organisation in India that commits its resources exclusively to the clean energy policy space in India. Our organisation aids the implementation of policies that encourage energy efficiency as well as the development of renewable sources.

We work in policy areas that have the maximum potential for energy and carbon savings: power, transport, energy efficiency and climate policy. Each sector has a blueprint that guides its grant making. This blueprint is the result of a comprehensive analysis of the sector. We are also a part of an association of technical and policy experts called the ClimateWorks Network. Being a part of this group helps Shakti connect the policy space in India to the rich knowledge pool that resides within this group.

We began work in October 2009. In these three years, we have had the privilege of interacting with key stakeholders and contributing to some key policies.

In the pages that follow, the Shakti programme team will take you through their vision and their sectors. I am sure what they have to say will make you as optimistic about India, as it makes me. The truth is that, the world's largest democracy is defined not by clichés and complexities but by its ability to move ahead, against all odds.

I would like to end by saying that the first words of a free India were - 'Long years ago we made a tryst with destiny, and now the time comes when we shall redeem our pledge, not wholly or in full measure, but very substantially.' Shakti is uniquely placed to help the nation redeem that pledge. It was a privilege to have had the opportunity to set it up. I leave a committed team in the able hands of Krishan Dhawan, confident that the organisation will reach greater heights. Like India, its time has come.

"EMPOWERMENT"

Chinmaya, Deepak, Natasha and Disha › Power Team

India needs power to be a Power. The 40% that lives in poverty needs it as a lifeline to climb out of the abyss. The rest need it to secure a foothold in the new economy. However power is in short supply. In the context of acute shortage, the term power struggle is beginning to take on a new meaning in India. The Planning Commission of India estimates that to sustain our growth over the next two decades, we will need to increase generation by about seven times the present capacity.

There are two reasons behind this power crisis - inefficient use of power and excessive reliance on nonrenewable sources. India imports most of its fuel, spending money it can ill afford to. Fossil fuel reserves of the world are finite and have serious climate impact. Clearly, we need to evaluate our current energy path. The best way forward for India is to use its existing energy pool judiciously while simultaneously developing alternate and cleaner sources.

This is what our team works towards. We support the government in the implementation of policies that optimise energy efficiency and promote renewable energy.

We work in two sub sectors: Demand Side Management and Renewable Energy.

DEMAND SIDE MANAGEMENT (DSM)

The power sector has ample opportunity to improve its avoided-generation capacity. If consumers use energy efficient appliances, lights and devices, it can add up to very significant savings. But this behaviour change has to be catalysed. Electric utilities, if equipped with an enabling regulatory framework as well as funds, can incentivise this consumer behaviour and become the catalyst. Presently, however, these utilities have neither any compulsion nor any incentive to design and implement such programmes. Consequently, there is little movement in the space. We are working to enable a national mandate on DSM so that these programmes can gain scale.

Our team believes that it can help create a pro-DSM environment by:

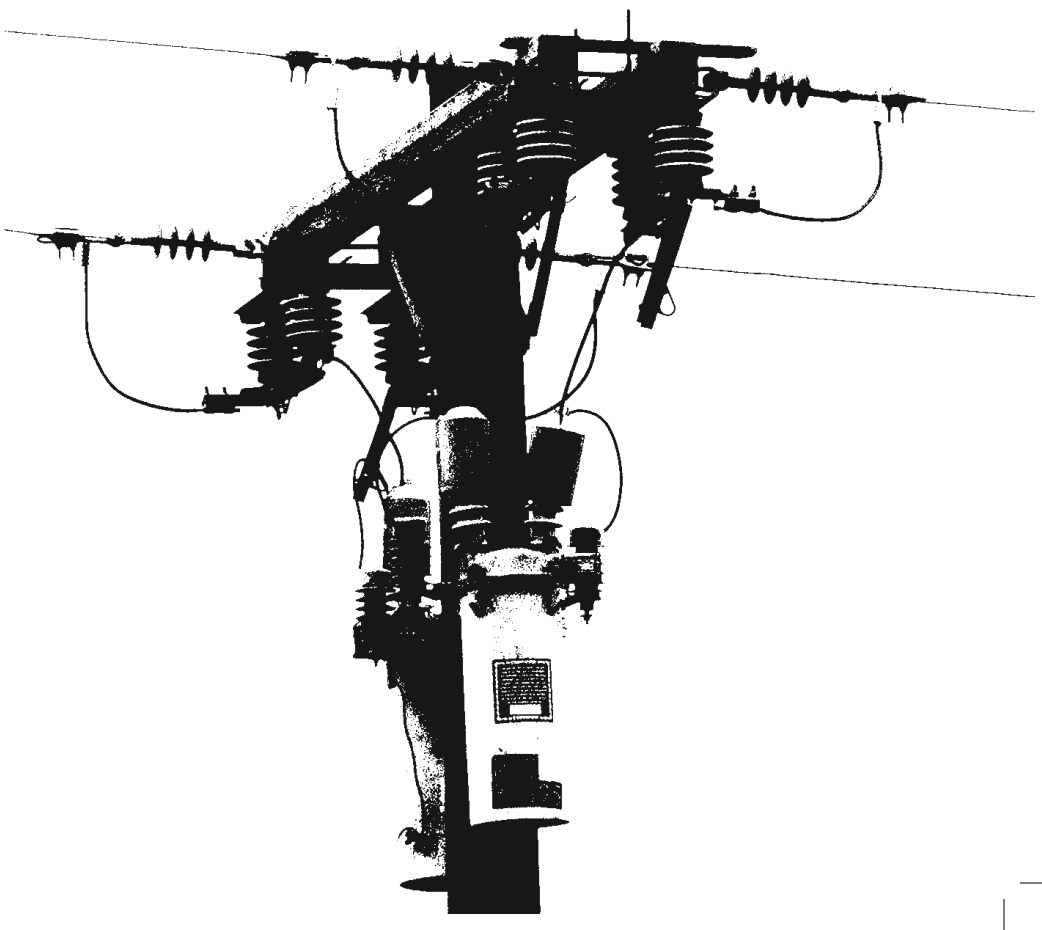
1. enabling good policies at both the central as well as the state level;
2. supporting DSM-friendly regulatory mechanisms;
3. bringing together key stakeholders to advocate for clean energy policies;
4. supporting implementation tools and aids for Industry and policy makers.

The DSM sector in the country has seen some encouraging movements in the year 2011:

THE SUPER ENERGY EFFICIENT APPLIANCES STUDY IS GAINING ACCEPTANCE

We had funded a study to understand the difference that energy efficient appliances could make to India's power situation. The study showed that India can address its energy deficit in five years, add about USD 500 billion to the GDP, reduce local air pollution and prevent 65 million tons of carbon dioxide emissions by migrating appliances such as ceiling fans, light bulbs, refrigerators, air conditioners, televisions, agricultural pumps and industrial motors to their energy efficient versions, through sound policies.

This study is one of the documents that the Bureau of Energy Efficiency (BEE) is referring to while designing the roll out of the Super Energy Efficient Appliances Programme (SEEP).



It intends to begin the programme with ceiling fans. The Central Government is actively considering committing resources to this phase. BEE expects to get more central government funds during the next Five Year Plan for further expansion of the programme.

ENERGY EFFICIENCY PURCHASE OBLIGATION IS NOW BEING RECOGNISED AS AN EFFECTIVE MARKET TOOL

Power distribution companies are given incentives by the State Electricity Regulatory Commissions (SERCs) to implement DSM programmes. However since there is no legal binding, electric utilities may or may not comply. We have therefore been funding initiatives to build a case for Energy Efficiency Purchase Obligation (EEPO) - a provision that will make compliance mandatory.

EEPOs require a utility to raise some of its power through DSM programmes that are undertaken either individually or through Energy Service Companies.

The Electricity Regulatory Commission of Gujarat has shown interest in this model and asked an electric utility company Paschim Gujarat Vij Company Limited (PGVCL) to volunteer for it. We are now in talks with PGVCL and are optimistic that the pilot project will see the light of day and help position EEPO as a strong and effective compliance model for efficiency.

RENEWABLE ENERGY(RE)

India has a rich basket of renewable energy sources as well as the political will to mainstream Renewable Energy in the power mix of the country.
We believe it is possible to have renewable account for 15% of the country's power mix by 2020. In order to strengthen the possibility, we invest in:

1. supporting mechanisms that help in compliance with evolving deployment targets;
2. building policy evidence through research around grid as well as off-grid business models;
3. strengthening the call for clean energy policies through advocacy and awareness building;
4. creating a supportive RE implementation environment.

In 2011 the RE sector in India saw some interesting developments:

REVISION OF WIND POTENTIAL FIGURES IS BEING CONSIDERED

Lawrence Berkeley National Laboratory (LBNL), one of our Best Practice Network Partners, conducted a study to find out how India's wind potential stood in the face of newer and sharper technologies. The study revealed that we can generate 600 to 1000 GW of power using wind- about ten times the existing estimates.

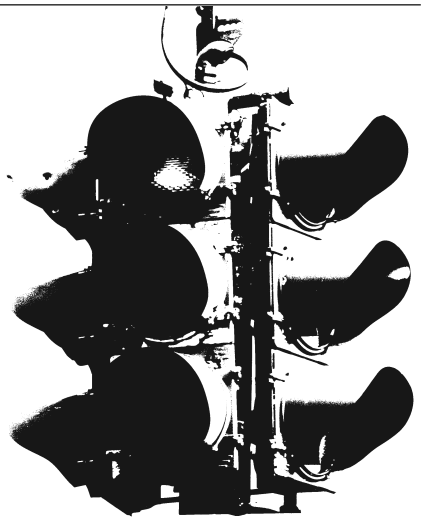
Our team advocated these results extensively at strategic venues such as the Ministry of New & Renewable Energy (MNRE), Ministry of Power and the Planning Commission of India. The study was cited in some key planning documents such as the draft 12th Five Year Plan, the tariff regulations proposed by Central Electricity Regulatory Commission and submissions by MNRE to the Government of India.

Subsequently MNRE revised its estimates from 49 GW to 102 GW. It is also open to validating a higher potential. We are now working with the government to take this forward. If the government does revise the potential further, it will be a shot in the arm for the wind sector in India.

THE FORUM OF REGULATORS HAS AGREED TO BRING OFF-GRID PROJECTS IN THE AMBIT OF REGULATION

The Forum of (FoR) is the apex regulatory body in India. It has brought off-grid projects into the ambit of regulations. We had extended technical support during the process. We are now extending similar support to FoR as it puts together draft regulations for off-grid projects. Such regulations will help sustain off-grid Renewable Energy projects and give the off-grid consumers a fair deal.

"EQUITY"



Himani and Aakriti › Transport Team

The road is an equalizer, a means to an end for every traveller. In the Indian cities however, this is not always true. The mobility equation is fast becoming skewed thanks to the huge surge in private vehicles and the lack of planned infrastructure for Non-Motorized and Public Transport. Following principles of sustainable transport is the first step towards correcting this. These principles focus on cutting travel time and pollution by providing good alternatives to personal vehicles. To make these principles possible, we need policies at both the state, national and local level. Our team works to support the creation of such policies in two broad categories: Systems and Planning and Vehicles & Fuels.

SYSTEMS AND PLANNING

Transport is a state issue in India. While it is the state's prerogative to plan and implement transport systems in its cities, an over arching National Urban Transport Policy (NUTP) serves as a planning guideline. If principles of sustainable transport are incorporated in the NUTP, it can influence the state transport policies (SUTP) to do the same. If a state has an overarching policy on sustainable transport, all urban spaces in the state will be guided by it.

In order to facilitate the creation of SUTPs we are focussing on:

1. advocacy for the creation and adoption of State Urban Transport Policies;
2. creating an enabling environment at the national level for states to adopt SUTP, by targeting JnNURM, NUTP and NMSH;
3. developing city level pilots (demonstrating sustainable principles) as policy evidence;
4. developing capacity of urban managers to implement SUTPs.

2011, saw some important developments in our sector.

THE MINISTRY OF URBAN DEVELOPMENT HAS DRAFTED STANDARDS FOR THE NATIONAL MISSION FOR SUSTAINABLE HABITAT

The National Mission on Sustainable Habitat (NMSH) is one of the eight missions under the National Action Plan for Climate Change. It aims to make cities sustainable through energy efficient buildings and shift to public transport. The subcommittee entrusted with drafting the transport standards for NMSH has included the principles for sustainable transportation in the draft. Our grantee partners had been working towards this end. The recommended standards have now been sent to the Prime Minister's Office. If this draft is passed, it will be a big step forward for the cause of sustainable transport in India.

THE NATIONAL TRANSPORT NETWORK IN INDIA IS NOW COMING INTO ITS OWN

We had supported the formation of an NGO coalition called SumNet, to create a unified civil society voice for equitable transport.

The Institute of Urban Transport (IUT), an autonomous body that conducts technical and outreach work for the government, has worked out a tentative agenda for collaboration with SumNet.

Members of SumNet also sit in the Executive Committee of the IUT. This is very significant because the committee has a say in the formulation of the National Urban Transport Policy.

VEHICLES AND FUELS

India's vehicle manufacturing industry is the sixth largest in the world. By 2050, the country is expected to top the world in car volumes. If India continues on its present energy path, there will be serious economic and environment consequences. A stringent fuel efficiency standard needs to be put in place at the earliest. To this end we work to:

1. support Standards and Labelling Programme to increase efficiency of new vehicles fleet;
2. strengthen advocacy for increasing the efficiency of heavy duty and commercial vehicle fleet;
3. support the improving of fuel quality for all vehicles to Euro VI levels.

For the year 2011 , the following developments were seen in the fuel policy space:

ROAD TAX ON DIESEL CARS IN DELHI HAS BEEN RAISED BY 25%

The Centre for Science and Environment, a Shakti grantee, raised the issue of the deteriorating air quality in Delhi and demanded either curtailment of dieselisation or a quick move to clean diesel. Following this, the Delhi government increased road tax on diesel cars by 25% from the current rates. At the national level, an official proposal for higher taxes on diesel cars has been tabled.

THE FUEL ECONOMY STANDARDS FOR PASSENGER VEHICLES IS AT THE DRAFT STAGE

Shakti and its Best Practice Network Partner, the International Council for Clean Transportation, support the Bureau of Energy Efficiency on fuel economy standards for passenger cars. Draft standards have been created and put through an inclusive stakeholder consultation. They are pending final approval from the Prime Minister's Office. These standards will put India at par with stringent passenger cars standards for 2020; comparable to that of USA and China.

"CONSENSUS"

Kunal and Sriya › Climate Policy Team

The low carbon growth path is a complex debate in India. While the need of the hour is to transition to a low carbon economy, the cost involved gives rise to conflicting viewpoints within the country. We need a well-informed growth strategy that maintains the fine balance between development and climate priorities. This can only happen if there is an inclusive and informed dialogue between all stakeholders. Our team works to facilitate this by:

1. deepening the involvement of all stakeholders in shaping India's climate policy;
2. supporting research in the area of climate change;
3. supporting the development and implementation of low carbon growth plans at the national as well as state level.

In the climate policy space, 2011 has been a year of many firsts:

STUDIES ARE NOW AVAILABLE TO IDENTIFY THE MOST EFFICIENT BRICK KILNS

We had commissioned Clean Air Task Force and its partners to monitor five different brick kiln technologies and recommend how the Indian brick and walling materials industry could be made cleaner.

The study showed that if India converted its estimated 35,000 FCBTK brick kilns to zigzag technology, it could lead to a per year savings of two million tons of coal, 3.9 million tonnes of avoided CO_2 emissions and 40,000 tonnes of avoided black emissions. The capital cost of a new zigzag kiln is only marginally higher than FCBTK and the payback time is between one and two years.

This study, and its reception in the larger stakeholder community, has given us the impetus to pursue large scale adoption of zigzag kilns as an effective emission reduction strategy.

DECISION MAKING IN CLIMATE POLICY IS BECOMING MORE COLLABORATIVE

Any action in the climate space needs to have its roots in hard science and research. Bringing scientists, analysts, non-governmental organisations and policy makers together at one venue is extremely important.

We had supported the efforts of the Centre for Science and Environment, and its partners, to organise a series of National Research Conferences on Climate Change. These conferences, the first of their kind in India, cover the scientific, technical, economic and policy aspects of climate change.

They have had participants such as researchers, NGOs and senior policy makers from across the nation.

THE MADHYA PRADESH GOVERNMENT IS PREPARING A GHG ABATEMENT COST CURVE IN INDIA

States in India are in the process of putting together their State Action Plan for Climate Change. These plans focus on climate change vulnerabilities and adaptation. To complete such state level efforts, we are supporting the efforts of Madhya Pradesh to prepare its first cost curve. This cost curve will promote dialogue on low carbon growth in the state and initiate integration of identified low carbon development opportunities in the planning and policy making processes of various state departments. It will also encourage other states to initiate similar studies independently.

MULTIPLE STAKEHOLDERS ARE MEETING TO REACH A CONSENSUS ON INDIA'S CLIMATE POLICY

The absence of a global deal at COP 15 and, the emergence of a regime based on national pledges, have led the climate policy community in the country to focus on the design and implementation of domestic policies aimed at GHG mitigation.

Our grantee partners Tata Institute of Social Sciences (TISS) and Delhi Science Forum (DSF) held workshops in different parts of India to bring together the stakeholder community to debate on India's climate policy agenda.

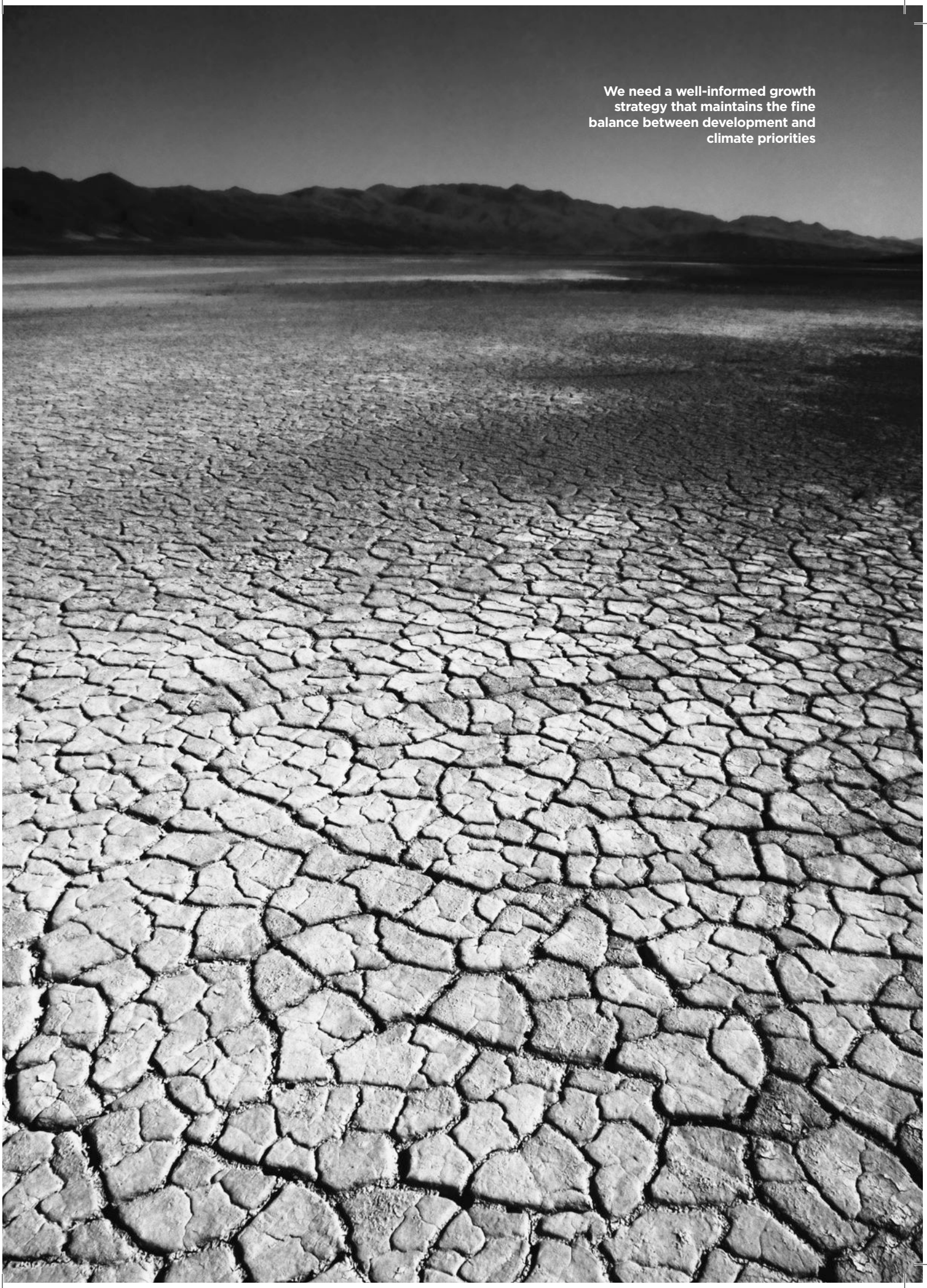
Discussions such as these enable a broad consensus among participants on policy positions and lead to the enabling environment required for positive policy developments in India.

COLLABORATIVE RESEARCH IS BEING PROMOTED

The 2009 Indo-US Memorandum of Understanding (MoU) to enhance cooperation on energy security, energy efficiency, clean energy and, climate change and food security resulted in an initiative called the Joint Clean Energy Research and Development Centre (Centre).

The Centre will promote collaborative (Indo-US) research on potential breakthrough technologies in the areas of solar energy, advanced bio fuels, and buildings efficiency. It has been hailed across all communities of stakeholders as a flagship initiative.

We are helping build the Centre's equity so that it draws the best talent and resources from both India and the US.



We need a well-informed growth strategy that maintains the fine balance between development and climate priorities

"PRUDENCE"

Shashank, Alpana and Smita › Energy Efficiency Team

India's energy situation is critical. Demand is far in excess of supply and fossil fuels dominate the energy mix. This is hardly advisable in times of depleting reserves and climate change. To continue on the present energy path will only escalate the crisis. We must practice stringent energy efficiency and simultaneously develop renewable sources.

The Government has formulated the National Action Plan on Climate Change (NAPCC) to address the situation. This umbrella initiative has eight missions under it of which, the National Mission for Enhanced Energy Efficiency(NMEEE) is one. We work in support of this Mission and cover three important areas: Industry, Appliances and Buildings.

INDUSTRY

Industries account for about 40% of India's energy consumption. Stringent efficiency measures in this sector can result in very significant savings for the country. We believe that, by 2030 the energy consumption bandwidth of Indian Industries can be narrowed down by 15% of 2005 figures through the implementation of the Perform Achieve and Trade (PAT) Scheme. PAT is the flagship initiative of NMEEE and is being implemented by the Bureau of Energy Efficiency(BEE).

We have been supporting PAT Scheme, by facilitating:

1. knowledge support to BEE in development of baselines;
2. the development of Measurement & Verification (M&V) protocols for the scheme;
3. the upgrading of the data reporting system of the designated consumers to BEE;
4. the preparation of technology compendium for the sub-sectors: cement, chlor-alkali, iron & steel, pulp & paper, and textiles.

For the year 2011, we are happy to report the following:

BEE HAS ROLLED OUT THE FIRST PHASE OF THE PERFORM ACHIEVE AND TRADE SCHEME

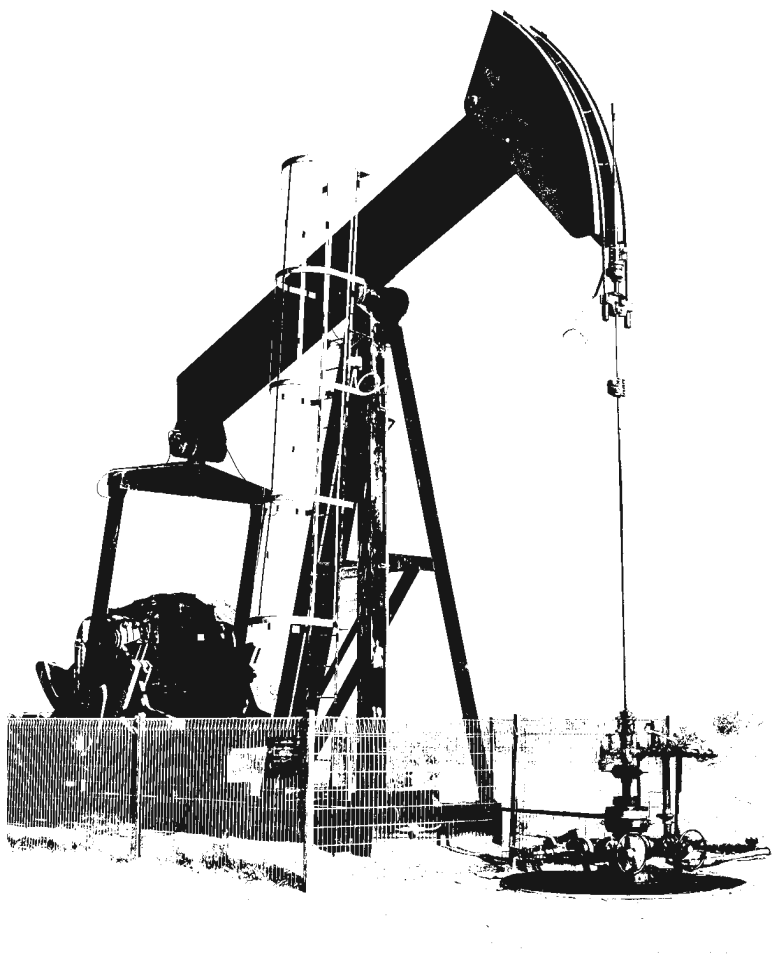
The Bureau of Energy Efficiency has rolled out the first phase of PAT. Eight designated sub sectors- aluminium, cement, chlor-alkali, fertilizer, iron & steel, power, pulp & paper and textile, will adopt this scheme. Investment to the tune of about four billion dollars is expected in the first phase. Energy savings will be to the tune of seven million tonnes of oil equivalent and emissions reduction is expected to be 20-25 million tonnes of CO_2e.

In the first phase we had been supporting BEE in developing various tools, protocols and systems for the effective designing and monitoring of PAT. In the second phase we will be advocating to increase the spread of PAT to newer subsectors as well as to fine-tune targets for the existing subsectors.

BUILDINGS

India is adding the equivalent of one Mumbai to its urban landscape every year. The energy implication of this is huge. Our team believes that India has an excellent solution in its Energy Conservation Building Code (ECBC). If this code is adopted and at least 50% compliance ensured, it can achieve reduction of 15,000 GWh by 2016. But for this to happen we feel it is important to support:

1. the mandatory adoption of ECBC with effective compliance provisions;
2. the development of incentive and penalty mechanisms for effective implementation;
3. the building multi- stakeholder capacity to ensure large scale adoption;



4. the establishing of labelling and certification to support ECBC compliance.

For the year 2011, our team is happy to report the following:

GUJARAT AND TAMIL NADU HAVE STARTED DESIGNING THEIR IMPLEMENTATION ROAD MAP

The Energy Conservation Building Code (ECBC) is expected to roll out in 2013. Gujarat and Tamil Nadu are developing implementation road maps to serve as a blueprint for the same. This is significant because the implementation experience of these states will have a bearing on how other states take to this Code. We are working with our grantees in these two states to ensure a successful launch.

A THERMAL COMFORT STANDARD FOR INDIA IS BEING DEVELOPED

The Energy Conservation Building Code is designed to reduce the use of energy without affecting the comfort, health and the productivity of the occupants. While the ECBC has been broadly developed to cater to five different climatic zones in the country, the government is working to arrive at thermal comfort levels which more closely reflect the comfort requirements in different regions. This will be used to make the Code more relevant. Our team has been supporting the government in the area.

APPLIANCES

In India, the appliances market is riding the crest of an economic boom. A young population, with disposable income and access to easy finance, is proving a prolific buyer. However this has energy implications. The country has an existing Appliances Standards and Labelling Programme for energy efficient appliances. We share the government's belief that making the standards more stringent and bringing more appliances under it, will help India comfortably absorb the energy demands of this sector.

We are supporting the Standards and Labelling Programme by:

1. informing the prioritisation of appliances to be included in the programme;
2. carrying out quality techno-economic analysis of appliances and their markets ;
3. exploring mechanisms that will ensure standards are racheted up in synch with evolving technologies;
4. facilitating a robust Monitoring & Evaluation framework;
5. helping increase the market receptivity of efficient appliances.

For the year 2011, we are happy to report the following:

THE MINISTRY OF POWER WILL DESIGN A NATIONAL LED LIGHT PROMOTION PROGRAMME

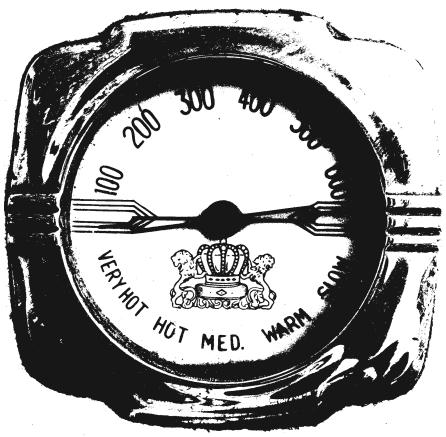
The Ministry of Power believes that transforming the LED market can help manage peak demand and contribute to bettering the power situation of India. It is considering the implementation of a multi- state Demand Side Management programme that will aggregate the demand for LED lighting, thereby stimulating economies of scale and reducing costs and timeframes. Shakti is supporting the government in creating detailed implementation road maps for demand aggregation.

"IMPACT"

Dr. R.K. Pachauri, Director-General, The Energy & Resources Institute (TERI); Chairman, Inter Governmental Panel on Climate Change (IPCC)

The impacts of climate change on India require careful consideration in devising policies by which this challenge can be met effectively. The Prime Minister of India has taken the lead in developing the National Action Plan on Climate Change, which not only covers actions by which India pursues the path of sustainable development and higher levels of efficiency in the use of natural resources, but also takes in hand several measures by which the country can adapt to the impacts of climate change.

The Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC) clearly brought out the impacts of climate change for different levels of temperature increase in the future. Projections provided in the AR4 show that global average surface temperature increase could range anywhere from 1.1˚C to 6.4˚C by the end of this century. In order to help policy makers, the AR4 also came up with two best estimates with 1.8˚C increase at the lower end and 4˚C at the upper end of the scenarios for which projections have been made. In Asia it was projected that by the 2050 fresh water availability in Central, South, East and South-East Asia, particularly in large river basins, is projected to decrease. It was also projected that coastal areas, especially heavily populated mega-delta regions in South, East and South-East Asia will be at the greatest risk due to increased flooding from the sea and, in some mega-deltas, flooding from the rivers. This includes locations such as the city of Kolkata. Overall, climate change is projected to compound the pressures on natural resources and the environment associated with rapid urbanisation, industrialization and economic development. There would also be health implications associated with the impacts of climate change. For instance, endemic morbidity and mortality due to diarrhoeal disease primarily associated with floods and droughts are expected to rise in East, South and South-East Asia due to projected changes in the hydrological cycle. There are also impacts of climate change which need to be taken into account in development policies. For instance, as far as agriculture, forestry and ecosystems are concerned, it has been projected



that there would be decreased yields in warmer environments and an increase in insect outbreaks. The recently completed IPCC Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX) has brought out the major finding of increase in heat waves, to which India like several other parts of world, would be subjected.

Models project substantial warming in temperature extremes by the end of the 21st century. It is virtually certain that increases in the frequency and magnitude of warm daily temperature extremes and decreases in cold extremes will occur in the 21st century on the global scale. It is very likely that the length, frequency and/or intensity of warm spells, or heat waves, will increase over most land areas. Based on specific emissions scenarios, a 1-in-20 year hottest day is likely to become a 1-in-2 year event by the end of the 21st century in most regions, except in the high latitudes of the Northern Hemisphere. The 1-in-20 year extreme daily maximum temperature (i.e., a value that was exceeded on average only once during the period 1981–2000) will likely increase by about 1°C to 3°C by mid-21st century and by about 2°C to 5°C by late-21st century, depending on the region and emissions scenario.

There is also a major finding that the frequency of heavy precipitation or the proportion of total rainfall from heavy falls will increase in the 21st century over many areas of the globe. This is particularly the case in the high latitudes and tropical regions and in winter in the northern mid-latitudes. Heavy rainfall associated with tropical cyclones are likely to increase with continued warming. One of the impacts projected in the AR4 as a result of warm spells/heat waves was that it is very likely that there would be reduced agricultural yields in warmer regions due to heat stress and increased danger of wildfire. Also very likely is the projection that heavy precipitation events and increase in frequency would lead to damage to crops with the likelihood of soil erosion and the inability of farmers to cultivate land due to water-logging of soils.

Another major impact of climate change would lie in respect of water resources. Warmer and fewer cold days and nights, warmer and more frequent hot days and nights could have effects on water resources relying on snowmelt. This could have an effect on some water supplies. This would happen at the same time as warm spells and heat waves would increase the demand for water along with increased problems of water quality such as algal blooms. Heavy precipitation events as projected would also have adverse effects on the quality of

surface and groundwater, as well as contamination of water supply.

Sea level rise would have major implications for those living in coastal areas and islands like those in the Sundarbans. The effect of this would be salinization of water for irrigation, estuaries and fresh water systems. There would also be decreased fresh water availability due to saltwater intrusion. Communities living in some of these areas would also face increased risk of deaths and injuries on account of floods as well as migration related health effects. Policies would need to take into account the cost of coastal protection versus costs of land use relocation. Increased incidence of high sea level would also have potential for movement of populations and infrastructure which would affect communities in these areas.

Overall, the SREX has estimated economic losses from weather and climate-related diseases globally. These estimates of annual losses have ranged since 1980 from a few billion to above 200 billion USD (in 2010 dollars), with the highest value for 2005 (the year of Hurricane Katrina). Loss estimates are lower bound estimates because many impacts, such as loss of human lives, cultural heritage, and ecosystem services, are difficult to value and monetize, and thus they are poorly reflected in estimates of losses. Impacts on the informal or undocumented economy as well as indirect economic effects can be very important in some areas and sectors, but are generally not counted in reported estimates of losses.

Economic, including insured, disaster losses associated with weather, climate, and geophysical events are higher in developed countries. Fatality rates and economic losses expressed as a proportion of GDP are higher in developing countries. During the period from 1970 to 2008, over 95% of deaths from natural disasters occurred in developing countries. Middle income countries with rapidly expanding asset bases have borne the largest burden. During the period from 2001-2006, losses amounted to about 1% of GDP for middle income countries, while this ratio has been about 0.3% of GDP for low income countries and less than 0.1% of GDP for high income countries, based on limited evidence. In small exposed countries, particularly Small Island Developing States, losses expressed as a percentage of GDP have been particularly high, exceeding 1% in many cases and 8% in the most extreme cases, averaged over both disaster and non-disaster years for the period from 1970 to 2010.

Projections of climate change in general indicate that a combination of adaptation and mitigation options is required. There are both synergies and trade-offs between adaptation and mitigation options. Examples of synergies include properly designed biomass production, formation of protected areas, land management, energy use in buildings and forestry. Potential trade-offs include increased greenhouse gas (GHG) emissions due to increased consumption of energy linked with adaptive responses.

Extreme events will have greater impacts on sectors with closer link to climate such as water, agriculture and food security, forestry, health and tourism. Measures that provide benefits under current climate and a range of future climate change scenarios, called low-regrets measures, are available starting points for addressing projected trends in exposure, vulnerability, and climate extremes. They have the potential to offer benefits now and lay the foundation for addressing projected changes. Many of these low-regrets strategies produce co-benefits, help address other development goals, such as improvements in livelihoods, human well-being, and biodiversity conservation, and help minimize the scope for mal-adaptation.

India accounts for a very small share of GHG emissions, and therefore, while transitioning to a low carbon economy will provide India with a substantial range and magnitude of co-benefits, it would have an insignificant effect on the concentration of GHG globally. Mitigation, therefore, has to be seen as a global challenge, while adaptation measures would largely be local in nature. An important aspect of adaptation would lie in creating capacity at the local level not only in respect of actions to be taken, investments to be made and institutional changes to be effected, but in creating knowledge by which communities and local governments can be empowered to take adaptation measures. For instance, the National Action Plan on Climate Change (NAPCC) addresses this requirement, but the knowledge gap for understanding current as well as future impacts of climate change remains very large, and needs to be addressed effectively by governments, business, civil society and research and development institutions. A large amount of modelling activity based on downscaling of global models has to be taken in hand to assess future impacts of climate change in different parts of the country. For a country as large and diverse as India, this is a crucial priority that must precede the formulation of plans and actions dealing with adaptation measures.

"SUSTAINABILITY"

Dr. Ajay Mathur, Director General, Bureau of Energy Efficiency(BEE)

In developing countries, growth is the fuel for development, and energy is the stimulus for growth. Providing adequate energy to all Indian, including those who today do not have access to electricity or to clean cooking fuels, and also ensuring rapid economic growth, suggests that our demand for energy would double by 2030. However, at this very time, the era of cheap coal and oil seems to have become an artifact of the past, forcing us to re-examine our energy alternatives. At the same time, climate change concerns also predicate that our carbon intensity – and energy intensity – are reduced at a fast trot. Energy security concerns, climate change concerns, and local environment concerns as well, push us, and indeed all countries, towards a transition to a low carbon economy. This is where the various strands of sustainability come together, tying the social goals with environmental goals, and hopefully, economic goals as well.

What is the solution? We need to find alternate sources for energy and develop the market to make them viable propositions. But that will take time. The most immediate and achievable goal is energy efficiency. It really is simple: if you use what you have with prudence, it lasts longer and saves you money. There is huge potential for India to become energy efficient especially in the industry sector. Industries in India account for 48% of its energy consumption and have the potential to reduce their share by 25%. I know that there is a perception that efficiency is an expensive proposition, but the truth is that the cost of generating new energy is three times more than the cost of saving it. According to a study by the World Bank, India could reduce its yearly electricity usage by about 193.5 billion kWh by investing USD 10 billion in energy efficiency measures.

India suffers from a power deficit of 10. 5 per cent during peak hours and energy efficiency has the potential to address a large part, if not all, of this shortfall. However the largest incentive for any industry is an increase in its productivity. In an environment of increasing global competitiveness and escalating energy costs it is no rocket science that the way forward for the industry is on the wagon of efficiency. We need to find a way for industries to make this transition.

I understand that there are certain perceived barriers to this transition, primarily the ability to spot and capture efficiency opportunities as well as the capital to make the necessary changes. Here I think we need to make an important distinction: not all industrial segments are equally efficient or inefficient. The efficiency imbalance amidst all the players is what the government is trying to address through myriad ways. Let me first address the Small and Medium Enterprises sector. The Bureau of Energy Efficiency has launched the BEE Small and Medium Enterprise (SME) scheme that aims to improve the energy efficiency of the Indian economy by targeting those SME clusters that together contribute about half of the manufacturing output of the country. The activities under this will include the adoption of energy efficiency technologies and practices within the cluster through knowledge sharing, capacity building and the development of innovative financing mechanisms.
About 60 robust Detailed Project Reports have already been prepared under this scheme and these can be financed from various financial institutions including SIDBI with up to 25 % financial subsidy from the Ministry of Micro Small and Medium Enterprises under National Manufacturing Competitiveness Programme Scheme. Apart from this, the Bureau has also signed a Memorandum of Understanding with a number of private and public financial institutions and Banks to work on BEE's Energy Efficiency Financing Platform with the objective of creating a mechanism towards mainstreaming the financing of energy efficiency projects.

Now let me come to the larger industries. We have some of the most energy efficient cement and fertilizer plants in the world. However to stress the point of unequal efficiency, old plants in this sector need to become better and come closer to the efficiency levels of the most efficient plant. Now the way to do this is by making phased changes so that over a period of time they are able to achieve their efficiency goals. We have introduced the Perform Achieve and Trade scheme for these large, energy-intensive industries. Basically, PAT is a market-based mechanism that sets informed targets for players depending on which level of efficiency they are in. Those who surpass their goals, get energy savings certificates which can then be traded in the market. Thus while you transition to the phase of efficiency, which they will have to anyway, the Industry also gets the opportunity to make the transition profitable.

I have also often been asked about the scope of Public-Private Partner-

ships in the space of energy efficiency. I would like to take this opportunity to say that the role of the government is not so much to take part in the efficiency exercise as to enable it. We want to ensure that all sectors are equally enabled to take part in the efficiency process. For example in the appliances sector, we have the standards and labelling programme which provides the consumer with energy information so that they can make an informed choice. Buildings is another sector that we are looking into. We want to help make buildings, especially the commercial ones more energy efficient, particularly at the design stage. We have therefore introduced the Energy Conservation Building Code (ECBC). We are also trying to manage the risk perceptions that inevitably accompany the adoption of a new technology, especially those around energy efficiency. We are looking at risk finance to make that happen.

However I do not want to make this article only about energy efficiency. Efficiency is undoubtedly one way of taking the load off our natural environment but, there are other facets to sustainable development such as economic and socio -political sustainability.

In this context, efficiency is only half the story, although a very important half. The inequity in terms of energy access puts a question mark on our development intent. As I mentioned above, about 40% of the population has little or no commercial energy access for either living or livelihoods. Those who do have electricity have to cope with poor supply. Not only is electricity a basic human need but a productivity enabler. No electricity means no or very limited livelihood opportunities and that itself is a big challenge for India.

Further, the little energy supply that comes in such areas is from the use of kerosene for lighting and diesel for powering irrigation pumps and small enterprises. Both these are imposing further financial burdens on the economy because of high levels of imports, and add to the problems of energy security. India has undertaken a very ambitious programme of conventional power generation in an attempt to meet these gaps and to leap frog to a higher growth access. The need for secure, affordable, and environmentally sustainable energy is now being acutely felt; this becomes one of the principal economic development challenges for the country. And it is in this context that the role of renewable energy in India has to be seen. It is now no longer 'alternate energy, but has become a key part of these solutions.

India's renewable energy sector is already heading for success. As of June 2010, India has over 17.5 GW of installed renewable energy capacity which is approximately 10% of India's total installed capacity. I think in order to mainstream RE in our power mix; the consumers will play an important role. Informing the consumer to the long term value of RE is important, especially if they have to bear the additional cost. Increased acceptance of this price variance, even by a fraction of consumers, will give the market a much needed boost. However, large-scale and accelerated adoption would require international financial support in order to address the limited ability of the vast majority of consumers to pay the additional costs. Robust carbon revenue programmes can be a great enabler.

I would like to end this piece by widening the scope of what we need to do. Yes we need efficiency and yes we do need renewable energy. These are the fundamental ground solutions. But on another level we need to change our values, institutions, and ways of living. A Hummer carrying one passenger is an overkill, even if it runs on ethanol. After all, human development is more about needs and less about wants; want is a dangerous territory because there is never a horizon in sight.

The global warming challenge would have done us all a useful service if it nudges us into the direction of greater sustainability and global interconnected institutions that can help us forge inclusive solutions.

"COMMITMENT"

Ms. Susan Packard Orr, Philanthropist

My parents launched the Packard Foundation in 1964. David Packard, my father, had prospered in business, and wanted this success to have a further, even greater, impact on the world. So, he and my mother built a foundation that would reflect their core values.

For more than 45 years, the David and Lucile Packard Foundation has worked with partners around the world to improve the lives of children, families, and communities—and to restore and protect our planet. One approach my parents pioneered, and which we have followed, is to focus intensely on a small number of important areas over a long time in order to help non-profit organizations to become a serious force in those realms.

Climate change is one of those areas. A warming planet means potential devastation for the planet and peoples' ability to develop and prosper. Nowhere is this truer than in the developing world. According to the United Nations Development Programme, by mid century, the development progress of the poorest countries will be halted or even reversed if bold steps are not taken to forestall the effects of climate change.

In the interest of future generations, sustainable development is imperative. The goal, in terms of reducing emissions, is clear. We cannot emit more than a trillion tons of carbon if we hope to contain the likelihood of dangerous climate change. A trillion tons of carbon put into the atmosphere corresponds to a probable global average temperature increase of about 2°C, the threshold scientists agree we cannot cross if we hope to avoid the worst impacts of climate change. But if we continue emitting carbon at business-as-usual rates, we will bust our carbon budget in less than 40 years.
What are the solutions to this problem and what is philanthropy's role in advancing them?

As a trustee of the Packard Foundation, I am often asked these questions and about why we invest in policy reform. Why, for example, promote renewable energy policies rather than on-the ground solar projects?

The answer is that the scale of the climate problem is so big that a smattering of individual projects won't bring about the change that is necessary. Public policy, on the other hand, has the leverage that is needed. This is critical because energy patterns are deeply embedded in how our society functions. More than $10 trillion is spent every year on energy-related expenses—that's about 20 percent of global GDP. The right policies can channel this money to low-carbon, sustainable choices.

So what's philanthropy's role in promoting sustainable development policy? There are many elements that go into public policy: research, advocacy, design, implementation, analysis, and the sharing of global best practices, to name a few. Each of these areas requires human expertise and as a results-driven philanthropist, these are wise things to invest in because they contribute significantly to the quality of policies and their chances for success.
I think India will be the next big area for climate philanthropists. It has a very progressive National Action Plan on Climate Change. The National Mission on Enhanced Energy Efficiency, the Mission on Sustainable Habitat, and the Solar Mission that appear under this plan, appear particularly relevant not just in the context of mitigation, but also in the backdrop of India's energy crisis.

These missions are in the process of designing and implementing intelligent efficiency initiatives. The Packard Foundation is supporting the government in this through the Shakti Sustainable Energy Foundation and this space needs many more players—in particular, Indian philanthropists must take the lead within India given that policy is a national issue.

The scale of the climate problem is such that if, as philanthropists, we truly want to make a difference, we must pool our resources, align our strategies, and dare to dream of transformative change. For three generations, the Packard Foundation has been committed to this philosophy. But now, in the face of climate change, it is time to redouble our efforts and reimagine what is possible.

"GROWTH"

Dr. Rajiv Lall, Managing Director and CEO, Infrastructure Development Finance Company (IDFC) Ltd.

An acquaintance who had come to Delhi from the US after a long interval wondered at the mesh of flyovers that the city now boasts of. Interacting with him, it struck me how infrastructure as an indicator of growth is ingrained in our psyche.

It is important to understand this psyche in the context of climate change threats that loom large over all parts of the world.

The International Energy Agency has categorised India as the fourth largest emitter of carbon dioxide in the world. There is wider recognition now within India that, it cannot afford inaction given its vulnerabilities to climate change.

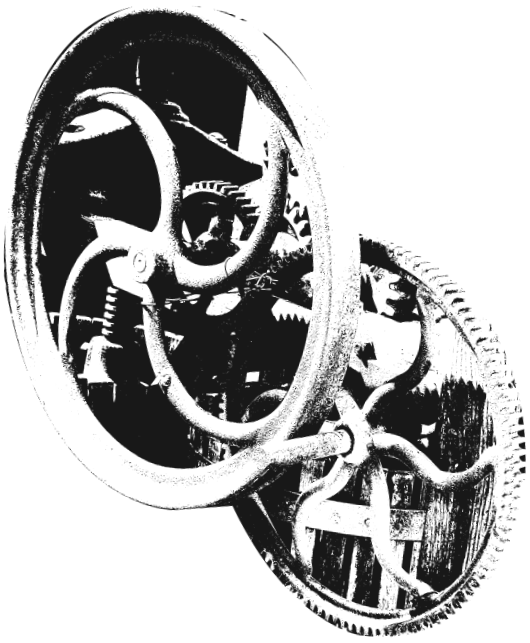
India's decision to reduce emission intensity by 20-25% of the 2005 level by the year 2020 and the pronouncement of National Action Plan on Climate Change (NAPCC) show that the country intends to transition to a low carbon economy. However, the country is also committed to sustaining its growth rate in order to meet its development goals. This necessarily involves infrastructure development and infrastructure development has traditionally been carbon intensive. Right from the manufacturing of raw materials to construction require huge amounts of energy resulting in substantial carbon emissions.

A low carbon growth agenda would therefore mean making the building infrastructure ecosystem less carbon intensive. This means making raw materials like cement and bricks in ways that require less energy, undertaking construction in an energy efficient manner, constructing buildings, transport and other infrastructure that in the long run will require less energy and also looking towards cleaner sources of energy to fuel this growth.

This can only happen through enabling policies across all infrastructure-related sectors. First of all, the country will need an integrated energy policy that mandates efficiency and helps increase the use of a balanced mix of renewable energy. In the industry sector there is need to promote manufacturing of energy efficient building materials. In the construction sector, steps need to be taken to mandate use of low emission raw materials, construction standards like the Energy Conservation Building Code and the use of energy efficient appliances within these buildings. Policies in the transport sector should be designed to promote usage of low carbon transport options like mass transit systems, non-motorised transport systems and high fuel efficient vehicles among people.

Designing policies is not enough. They should be integrated across different departments of the government so that there is no disparity in the targets and timelines projected in different government plans and documents. Co-ordination among the departments and between the state and the centre are essential. Secondly, a regulatory framework backed up with standards and incentives should be put in place for effective implementation of such policies.

Finance is a crucial lever that can determine the direction in which growth moves and it needs to be driven in a manner that funds get prioritised towards low carbon infrastructure. A large part of this finance can come from the private sector. Private sector participation is crucial to low carbon infrastructure development and must be encouraged through enabling regulatory and incentives frameworks.



Banks are the most important players in private financing. In order to solicit their participation, we need policies that encourage finance on the basis of equator principles: credit risk management, framework for determining, assessing and managing environmental and social risk in project finance transactions.

The Indian Bank's Association can be requested to champion this cause to the Reserve Bank of India and Chairmen and Managing Directors open to the idea could be involved in the process. As this is part of the United Nation's mandate, the Finance Ministry can be requested to issue a directive in this direction. India can take a leaf out of the Brazilian experience of banks applying concession financing and involving the Brazilian equivalent of the Planning Commission to push for the principles.

From the public finance perspective, low carbon infrastructure projects can be promoted through subsidies and high carbon ones discouraged through taxes. Institutes and frameworks also have to be set up so that the financial sector supports low carbon technologies for infrastruc-

ture development which are sustainable and are potentially viable. For example, tools and mechanisms can be put in place to ensure that only low carbon infrastructure gets funded through schemes like the Jawaharlal Nehru National Urban Renewal Mission in transport.

Appropriate price signals and provision of viable alternatives are required for infrastructure services, to shift towards lower carbon forms of service provision, and to increase the efficiency of energy/infrastructure. As the India infrastructure Report 2010 says, a key problem is that there is no price on carbon in India. Far from that, the ground reality is that carbon intensive fuels are in fact priced lower. Eliminating economic distortions is an imperative for moving towards a competitive low carbon economy. Prices must reflect costs to avoid wastage. Gradually, environmental externalities should be incorporated in pricing and valuation of resources.

The future of India, given its resource endowments, will depend on technological advancements that can help exploit indigenous resources in a low carbon manner. This would require substantial funds; government support can complement private investment, especially in research and development where the risks for private capital are very high.

Finally, the creation of an enabling environment for private sector participation is also influenced by public opinion. So, even while acknowledging that changing the people's psyche is an uphill task, we need to make efforts in the direction. And the youth is always an important audience to engage with. Students of schools, colleges and universities must be involved in the low carbon conversation. We must give the next generation a new vision of an energy secure and inclusive India.

The foundation on which the India of tomorrow will stand is still being built. To build it on the bedrock of clean energy will ensure that the India of tomorrow be the inclusive and prosperous society that its founding fathers dreamt of. We owe it to them and to those who will inherit this country to make this dream come true.