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Governing Energy Resources
Challenges and the Way Ahead for India

Chandra Bhushan

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Preface

Way back in 1984, in his seminal essay on the 'Politics of Environment', the noted environmentalist Anil Agarwal wrote: "The Third World today faces both an environment crisis and a development crisis, and both these crises seem to be intensifying and interacting to reinforce each other. On one hand, there does not seem to be any end to the problems of inequality, poverty and unemployment, the crucial problems that the development process is meant to solve. On the other, environmental destruction has grown further apace." He went on to add, "India's biggest challenge today is to identify and implement a development process that will lead to greater equity, growth and sustainability".[1]

What Agarwal wrote in 1984 is valid even in 2013 and more so in how India is dealing with its natural resources. Natural resource governance in India is struggling to bring about the much-needed balance between economic growth, inclusiveness, equity and environmental sustainability. The 'challenge of the balance', continues to elude India.

India is a country of myriad complexities and contradictions and it is often difficult to make sense out of many parallel trends being witnessed in the country. In the last few years the governance of natural resources, especially energy resources, has witnessed such varied and confusing trends that the situation can at best be described as chaotic and at worst 'wild west'. To illustrate this, lets consider the following:

- The issues related to allocation of energy related resources have exploded and have become front-page news. India has witnessed coal scam, 'gold plating' in relation to natural gas, mindless development of hydropower and even a solar energy scam. The term 'crony capitalism' is now loosely linked to how energy resources are being given away to private companies to make windfall profits.
- Across the country, we see communities fighting against coal mining, uranium mining, nuclear and hydropower plants (against 'development projects' in general). Most of these protests are related to land acquisition, diversion of forests and water and sometimes pollution. In some cases communities have compromised; in some the projects have been stalled; but in most cases projects have gone ahead despite community protests, with the power of the state backing projects, whether public or private.
- On environment front, we see a greater push from the industry and the government to dilute the existing environmental and forest protection regulations as it is seen to be hampering the economic development of the country.
- On the socio-economic front, however, we see a greater willingness within the government to improve the policies for land acquisition, rehabilitation and resettlement and to allow local community to benefit out of natural resources and developmental projects.
- We also see a greater push by the government to acquire energy resources, mainly coal, oil and gas resources, outside India.

What do these trends tell us? What are the challenges of energy resource governance in India? What a sustainable and secure energy future means for the country? This scoping paper tries to answer some of these questions. The paper essentially maps the state of the play in governance of the energy related natural resources in India by illustrating the experiences and governance challenges in key energy resource sectors: Coal, Uranium and Renewable energy (solar and wind energy). It also covers the issues related to the transnational involvement of Indian companies in energy resource acquisition.

Section one gives an overview of the energy resource governance in India. It illustrates the energy-poverty challenge and the emerging energy scenario in the country. This section also analyses the economic, social and environmental issues emerging out of rapid development in the energy sector and the challenge of sustainable energy access in view of climate change.

Section two, three and four illustrate the resource governance challenges in India separately for Coal, Nuclear Energy and Renewable Energy, respectively. These three have been treated as stand-alone sections to illustrate how different are the challenges for different energy resources.

Section five deals with the issue of acquisition of energy resources by Indian companies abroad. Why the government is pushing for energy resources acquisition abroad? Does India have rules and laws to regulate the conduct of its companies abroad? This section tries to map some of these critical issues.

The engagement and the response of the academia, independent think tanks and NGOs to the emerging energy resource governance issues have been piecemeal and inadequate. There are opposition and critique to government policies and projects, but there is not enough work on 'alternatives'. The paper concludes that energy resource governance in India is still evolving and the civil society needs a whole new

proactive research and advocacy agenda to push for a fair, transparent, participatory and sustainable energy resource governance in the country.

India needs energy for economic development and to meet basic development needs of its growing population. The challenge it faces is how to build an inclusive, equitable and sustainable society without further overstepping the planet's ecological limits or overusing the earth's finite natural resources. The challenge is the work in progress.

Foreword

One of the great challenges of the 21st century is to bring about global equity without further overstepping the planet's ecological limits nor overusing the earth's finite resources. Future generations are not to be deprived of the opportunity - and the resources necessary - for sustainable and equitable development.

As an emerging economy, India has high and expanding energy needs. India currently employs a variety of resources to produce electricity, including conventional fossil fuels like coal, oil and gas; uranium and thorium for nuclear power; and non-conventional, renewable resources such as solar and wind power, etc.

Every type of electricity production requires the use of natural resources – obviously and massively so in the case of fossil fuels, but even renewable energies make demands on resources such as land and water. In all cases, decisions about the acquisition and use of these resources make a huge difference in deciding about the equitable access to opportunities being created by energy production, in all affected sectors of society. Fair, accountable and transparent 'resource governance' with participation by all stakeholders is necessary to ensure that natural resources for energy needs are extracted in as sustainable and socially just manner as possible that also forms the basis of adaptive capacity against climate change impacts.

Civil society actors and energy experts, as well as journalists and a broader interested public, need to have a deeper understanding on the relevance of participative governance of natural resources especially in the energy-related sectors. On this background, the India office of the Heinrich Böll Foundation has commissioned this study with the objective to map the state of play in the use and extraction of natural energy-related resources in India and its governance, i.e. the legal and institutional frameworks that regulate the acquisition and use of energy-relevant resources, including the acquisition of resources for India by companies operating internationally.

I hope that this study will provide a useful, broad and up-to-date entry point and information repository on issues around the governance of energy-related natural resources in India. My thanks go to the author of this study, Chandra Bhushan, for his excellent work in exploring and synthesizing comprehensive information available on this broad field, making it accessible to a broader public.

Axel Harneit-Sievers
Director
Heinrich Böll Foundation, India

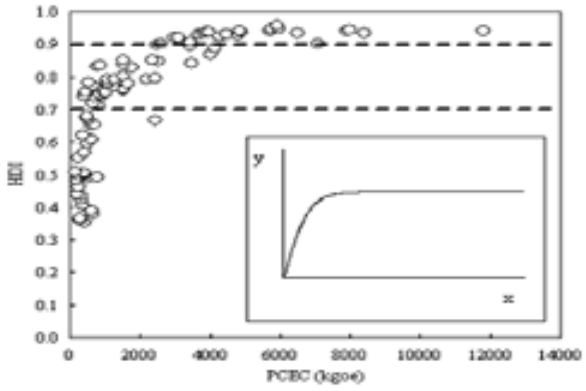
SECTION 1

Energy Resource Governance in India

A. The Energy-Poverty Challenge

There exists a strong relationship between human development index (HDI) and per capita energy consumption (PCEC) for majority of the world. No country has extremely low HDI with PCEC above 800 kilogram of oil equivalent (kgoe) and no country with an HDI above 0.7 has a PCEC below 400 kgoe. However, it is also true that there are no major advantages of using excess energy and many energy advantaged nations are using too much energy without any real improvement in quality of life, as measured by HDI (see Figure 1.1: HDI vs Energy Consumption).[2]

Figure 1.1: HDI vs Energy Consumption



Note: The figure represents UN HDI data versus per capita energy consumption for 90 nations. These data exclude OPEC and many formers Soviet Union nations, as well as Oman, Gabon, and Trinidad and Tobago. A saturation curve is also presented to highlight the similarities between the simplified mathematical function and the dataset.

Source: Daniel M Martinez, Ben W Ebenhack, Understanding the role of energy consumption in human development through the use of saturation phenomena, Energy Policy 36 (2008), 1430–1435

India faces the challenge of meeting the energy needs of all its citizens at affordable prices. The per capita consumption of energy in India is one of the lowest in the world. Compared to the world average PCEC of 1800 kgoe, OECD's 4280 kgoe, China's 1700 kgoe and Africa's 670 kgoe, India's PCEC is 580 kgoe.[3] With HDI of 0.547, India ranks 134 out of 187 countries in the 2011 United Nations HDI, with 37.2 per cent of the national population living below the poverty line of USD 1.25 per day PPP.[4]

Not only is a large chunk of Indian population without access to electricity but even those with access face shortage and poor supply quality. The access to electricity has improved in the last decade but even

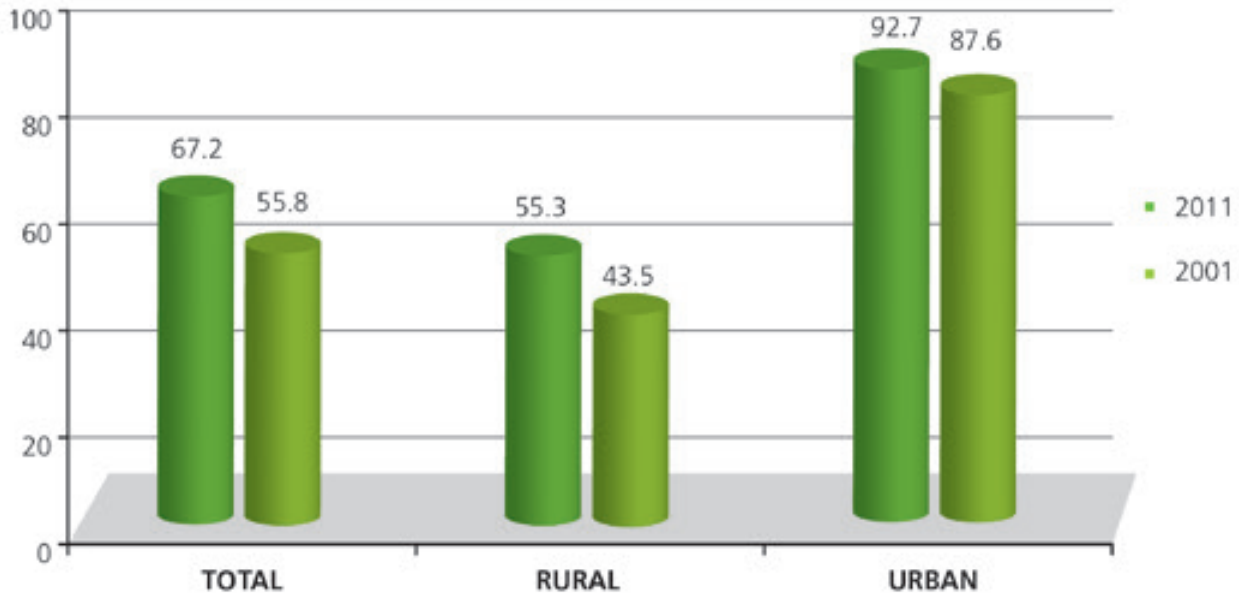
then leaves much to be desired.[5] While 56 per cent households (HHs) in the country had access to electricity in 2001, the level improved to 67 per cent in 2011 (see Figure 1.2: Access to electricity in India – 2001-2011). In comparison to 93 per cent of the urban HHs having access to electricity, only 55 per cent rural HHs had access to electricity. More than 31 per cent households used kerosene as a source of lighting while close to one per cent used other sources and 0.5 per cent had no lighting at all in 2011.[6]

Though during the decade of 2001-11, close to 59 million households were connected to the grid, the availability of electricity supply continues to remain poor with rural consumers getting less than eight hours a day electricity supply in certain states.[7] The per capita consumption of electricity is only around eight kWh per month in rural areas and 24 kWh per month in urban areas.[8]

At present, about 700 million Indians use biomass such as dung, agricultural waste and firewood as their primary energy resource for cooking.[9] The National Sample Survey of 2009-10 shows that the rural HHs mostly use firewood and chips as primary source of cooking (76.3 per cent), followed by LPG (11.5 per cent) and dung cake (6.3 per cent).[10] In urban HHs, LPG is the primary cooking fuel (64 per cent), followed by firewood and chips (18 per cent), kerosene (6.5 per cent), coke and coal (2.3 per cent), dung cakes (1.3 per cent) and 6.5 per cent have no cooking arrangements.[11] These fuels cause indoor pollution and increase the burden of diseases of the women (see Box 1.1: Indoor Pollution). The estimated economic burden of using traditional fuels is estimated to be Rs 300 billion.[12]

India has huge unmet energy demand. With a growing economy and population, India's energy consumption will need to increase manifolds to meet the basic human development needs. The question in front of India is how it is going to meet this energy demand equitably, affordably and sustainably.

Figure 1.2: Access to electricity in India – 2001-2011



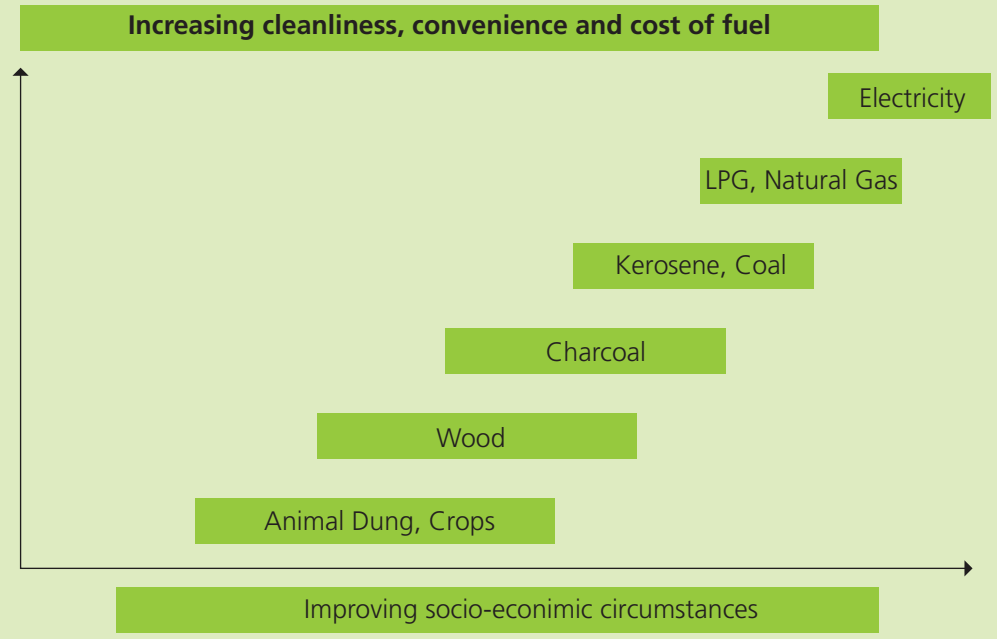
Source: Anon, 2012, Source of Lighting: 2001-2011, Houses, Households and Amenities, Census of India 2011, Registrar General and Census Commissioner, pg. 1

Box 1.1: Indoor Pollution

Indoor air pollution emitted from traditional fuels such as firewood and cooking stoves is a potentially large health threat in rural regions.[13] *Cooking and heating with solid fuels on open fires or traditional stoves results in high levels of indoor air pollution. Indoor smoke contains a range of health-damaging pollutants, such as small particles and carbon monoxide.*[14] *A study done in Gujarat says that in clinical terms, women spending an average of three hours a day on cooking are exposed to 700 µg of particulate matter per m3 (as against a permissible level of less than 75 µg/m3) and inhale benzopyrene equivalent to 400 cigarettes a day.*[15] *Smoke created due to burning of firewood and the resulting indoor air pollution can cause conjunctivitis, blepharo conjunctivitis, upper respiratory irritation/inflammation, acute respiratory infection and chronic obstructive pulmonary disease.*[16]

The energy ladder of India (see Figure: Energy Ladder in India), which describes transitions in fuel use at different levels of economic development, is bottom heavy. The magnitude of indoor air pollution improves from bottom up depending on the source of energy. Households at lower levels of income and development tend to be at the bottom of the energy ladder, using fuel that is cheap and locally available but not very clean nor efficient.[17]

Figure: Energy Ladder in India

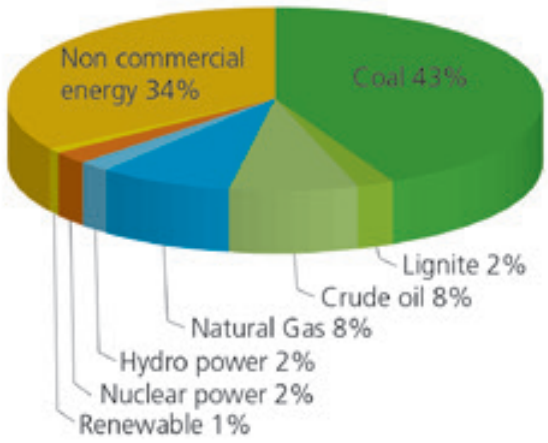


Source: *Siddhartha Sarkar, 2006, Indoor Air Pollution and Women Health in the Informal Sector, Dinhata College, West Bengal*

B. Energy Scenario in India

India is the fourth largest consumer of energy in the world after USA, China and Russia. In 2011-12, India's total primary energy supply was about 711 million tonnes of oil equivalent (mtoe).[18] Of this, coal and lignite contributed 45.3 per cent, oil 7.6 per cent, natural gas and liquefied natural gas 8.3 per cent, hydro power 2.2 per cent and nuclear power 1.6 per cent (see Figure 1.3: India's Primary Energy Supply 2011-12). Renewable energy sources contributed 1.02 per cent and non-commercial energy sources, mainly biomass, contributed 33.9 per cent. Therefore, close to 80 per cent of India's primary energy supply is met by coal and biomass.

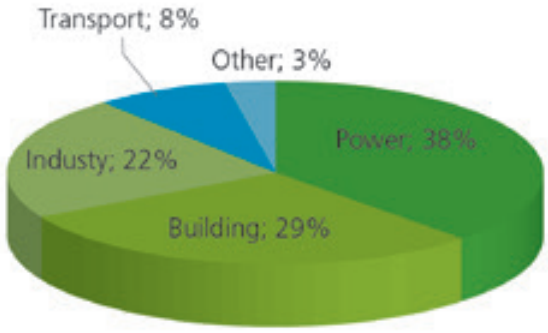
Figure 1.3: India's Primary Energy Supply 2011-12



Source: *Anon, 2012, Twelfth Five Year Plan (2012-2017) – Economic Sectors: Volume II, Planning Commission, New Delhi, pg. 133*

The primary energy consumption in India is dominated by the power sector; close to 38 per cent of the total primary energy is consumed for power generation in the country (see Figure 1.4: Sectoral Energy Consumption 2009). The building sector consumed about 29 per cent of the primary energy, mainly biomass for cooking. Industries share in energy consumption was 22 per cent and that of the transport sector was about eight per cent.

Figure 1.4: Sectoral Energy Consumption 2009

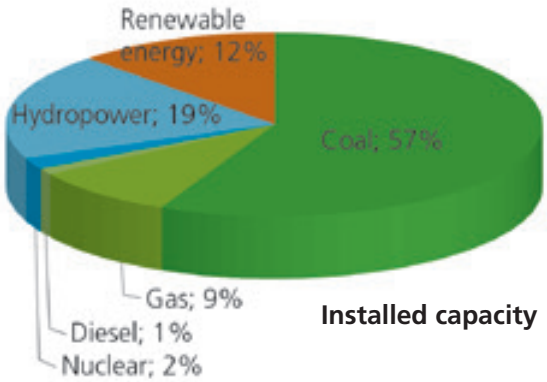


Source: *Anon, 2011, World Energy Outlook, IEA*

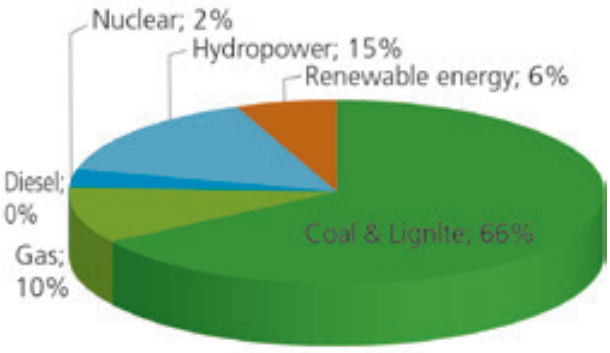
The share of energy consumed by the power and transport sector is projected to increase and that of the building sector is slated to decrease in the next two decades.[19]

India's power sector is dominated by coal. In November 2012, the installed capacity of the power sector was 2,10,937 MW. Of this, 57 per cent was accounted by coal-based thermal power plants and another 10 per cent by gas and diesel-based thermal power plants (see Figure 1.5: Source-wise installed capacity and generation of electricity). So, about two-third of the installed power capacity in India is based on thermal power. The share of hydropower and renewable energy (mainly wind) in the installed capacity was 31 per cent.[20] On the other hand, the share of fossil fuel based thermal power plants in power generation was 76 per cent in 2011-12 and about one-fifth of the total power generation came from hydro and renewable energy like wind and solar.[21]

Figure 1.5: Source-wise installed capacity and generation of electricity



Installed capacity



Generation of Electricity

Source: *CEA, 2012*

C. Future Energy Scenario

According to the Integrated Energy Policy 2008 (IEP, 2008), India needs to sustain a growth rate of eight per cent to 10 per cent if it wants to eradicate poverty and meet the human development goals.[22] For a sustained growth of eight per cent till 2031-32 and also to meet the basic needs of all, India needs to increase its primary energy supply by at least three to four times and its

electricity generation capacity by five to six times of their 2003-04 levels.[23]

The total primary energy supply in India will grow at about 5.5 per cent annually and go up from 711 mtoe in 2011-12 to 1220 mtoe by 2021-22.[24] The total commercial energy supply, however, is projected to grow at a much faster pace of 6.6 per cent annually (see Table 1.1: Primary Energy Supply in India). The growth in supply of various sources of energy between 2011-12 and 2021-22 is projected to be as follows:

- Coal consumption in India is projected to grow at 7.1 per cent annually till 2021-22. In 2021-22, coal will account for 47.5 per cent of the total primary energy supply, up from 40.3 per cent in 2011-12 (see Figure 1.6: Source-wise Projected Supply in India).
- The supply of gas is slated to grow at a much higher rate of 9.3 per cent annually. Gas will account for 11 per cent of the total primary energy supply.
- Oil supply will grow at a much slower pace of 3.4 per cent. The share of oil in the total primary energy supply is projected to reduce from 25.6 per cent in 2000-2001 to 19.4 per cent in 2021-22.
- The fastest growth is projected for the renewable energy sector – 14.3 per cent annually. Despite such rapid growth, the share of the renewable energy is projected to be about 1.6 per cent in 2021-22.
- The energy of the poor – non-commercial energy – will grow at a much slower rate and reduce its share in total primary energy mix.

Table 1.1: Primary Energy Supply in India (in mtoe)

	2000-01	2006-07	2011-12	2016-17	2021-22
DOMESTIC PRODUCTION					
Coal	130.61	177.24	222.16	308.55	400
Lignite	6.43	8.76	10.64	16.8	29
Crude Oil	33.4	33.99	39.23	42.75	43
Natural Gas	25.07	27.71	42.79	76.13	103
Hydro Power	6.4	9.78	11.22	12.9	17
Nuclear Power	4.41	4.91	8.43	16.97	30
Renewable Energy	0.13	0.87	5.25	10.74	20
Total Domestic Commercial Energy	206.45	263.26	339.72	481.84	642.00
Non-commercial Energy 1	136.64	153.28	174.2	187.66	202.16
		1.93%	2.6%	1.5%	1.5%
Total	**343.09**	**416.56**	**513.92**	**669.5**	**844.16**
IMPORTS					
Coal	11.76	24.92	54.00	90.00	150.00
Petroleum Products	77.25	98.41	129.86	152.44	194.00
LNG	0	8.45	12.56	24.8	31.00
Hydro Power	0	0.26	0.45	0.52	0.60
Total Net Imports	89.01	132.04	196.87	267.76	375.60
Total Commercial Energy (growth over the previous five years)	295.46	396.32	536.59	749.6	1017.60
Total Primary Energy	**432.01**	**549.60**	**710.79**	**937.26**	**1219.76**
		4.09%	**5.28%**	**5.69%**	**5.41%**

Source: *Anon, 2006, Integrated Energy Policy – Report of the Expert Committee, Planning Commission, Government of India, New Delhi, pg. 14*

Even though domestic energy supply is set to increase, an increasing trend will also be registered in imports (see Table 1.1). In 2011-12, about 37 per cent of the total commercial energy was imported. This includes an import of 77 per cent of the total petroleum products, 19.5 per cent coal and 23 per cent gas. This import dependence is projected to increase further. The main area of import will be crude oil, where nearly 82 per cent of the demand will have to be met from imports by 2021-22. Import dependence for coal is also estimated to increase 27 per cent by 2021-22. It is estimated that the import dependence for coal, natural gas and crude oil taken together in 2021-22 is likely to be 36 per cent. However, this assumes that India will be able to realise projected domestic production levels of coal, petroleum and natural gas. If this is not achieved, the level of import dependence would increase further if the GDP growth rates projected are to be maintained.[25] For instance, the 11th Five Year Plan (FYP) had a target of 79 GW of additional capacity for grid power but actual realisation has not exceeded 50 GW.[26] The reasons of shortfall are poor implementation, shortage of power equipment, lack of fuel, etc.

What is quite clear from the projected future energy scenario is that:

- In the next 10 years, India's dependence on fossil fuel is likely to grow further and coal, oil and gas will remain the main stay of the energy sector.
- Even with 15 per cent annual growth in the next 10 years, renewable energy will not even meet two per cent of the primary energy supply of the country.
- India's continued reliance on fossil fuels means that its dependence on imported energy will marginally increase by 2021-22.

Is this a sustainable energy pathway for India? What are the social and environmental consequences of pursuing this pathway? What governance challenges such a fossil-fuel dependent pathway will throw up in the future? Some of these questions have been explored in the subsequent sections.

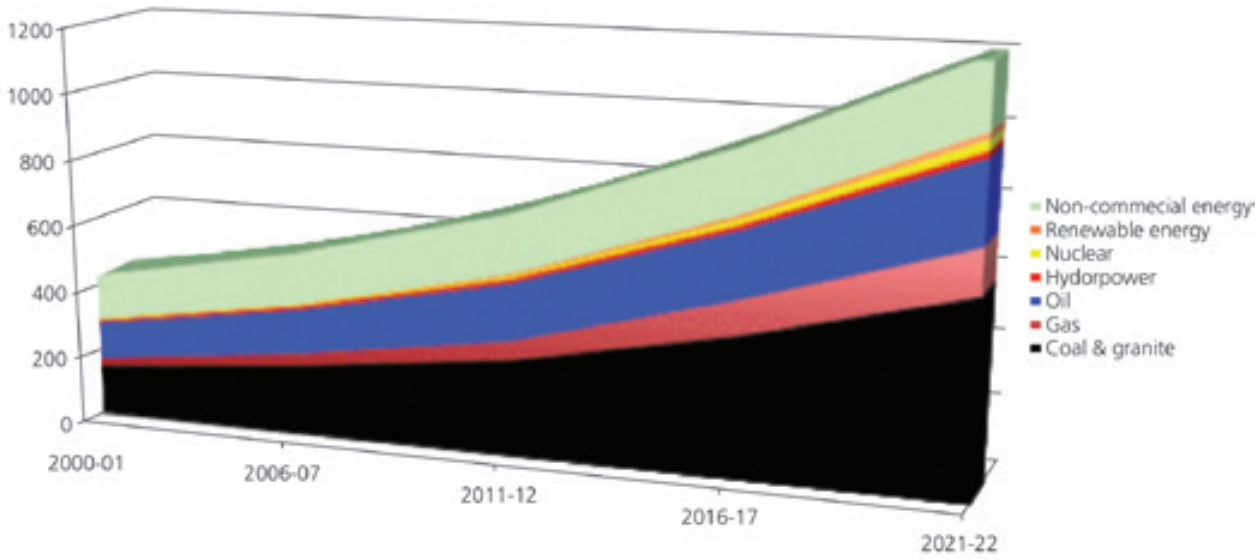
D. The Challenge of Governance

From an economic perspective, the energy situation of any country is defined by how effective, accountable and transparent is its energy resource governance. On the other hand, how these resources are exploited, who controls them and who ultimately benefits from them lies at the heart of social and environmental governance of energy resources.

1. Economic governance

In the last decade, the economic governance of energy resources, especially the allocation of these resources to the private companies and flouting of the norms and regulations by companies for quick profits, has

Figure 1.6: Source-wise Projected Supply in India



Source: Adopted from Anon, 2012, Twelfth Five Year Plan (2012-2017) – Economic Sectors: Volume II, Planning Commission, New Delhi, pg. 133

come under severe criticism. Almost all energy sectors have witnessed scams of one kind or another.

The Comptroller and Auditor General of India (CAG) unearthed the scam in the coal sector in 2011-2012.[27] The audit pointed out the non-transparency in the allocation of coal block to both public and private companies, which has given benefits to companies to the tune of Rs 1,85,591 crore (about US $ 37 billion).[28] Part of this gain could have flown to the national exchequer had the competitive bidding process been in place.

In the oil and gas sector, the CAG audit report has indicated the possible practice of "gold-plating" or artificially inflating the front-end capital expenditures thereby reducing the government's share of revenue, by Reliance Industries Limited, India's largest private-sector gas producer (see Box 1.2: Gold-plating in KG Basin).[29]

Even the renewable energy sector has not been spared. The country witnessed a solar energy scam in which one of India's largest private energy company, Lanco Infratech, put up fictitious front companies and cornered 40 per cent of the solar plants auctioned by the government in the first phase of the Jawaharlal Nehru National Solar Mission. Lanco could pull this off due to lack of any monitoring mechanism with regulators over companies that win contracts and the extremely non-transparent processes involved in bidding for the solar projects.[30]

The wind energy sector has come under scanner for evading taxes. The sector benefitted from the provision of accelerated depreciation (80 per cent in the first year), virtually allowing an investor to write off its capital in a year, and a 10-year tax holiday. In April 2006, the Income Tax (IT) department in Pune began investigating Suzlon Energy, India's largest wind turbine manufacturer and EPC contractor, for evading taxes. Suzlon's wind-farms spanning Gujarat, Rajasthan, Madhya Pradesh, Andhra Pradesh, Tamil Nadu, Daman and Diu, Pondicherry, Delhi and Karnataka were investigated to check for false depreciation claims, and ascertain if equipment suppliers and state electricity boards connived with equipment owners to manipulate such claims. IT authorities believe windmill owners make false depreciation claims to evade taxes to the tune of Rs 700-1,000 crore.[31]

These scams present to us the economic losses that India has faced and the wealth that few individuals and companies have cornered in the wake of skewed natural resource allocation policies and non-transparency coupled with poor or no monitoring.

In the wake of rising cases of scams related to the natural resource allocation, the Cabinet Secretariat constituted a Committee on allocation of natural resources in January 2011. The 13-member committee, headed by the former finance secretary Ashok Chawla, submitted its recommendations in June. Its aim was to suggest a roadmap for enhancing "transparency, efficiency and sustainability in the allocation, pricing and utilisation of natural resources". The Committee made a number of recommendations to avoid corruption and ensure transparency in the system. These include introducing market-based competitive mechanisms into the policy framework governing fossil fuels, minerals, telecom spectrum and ecological resources, including forests, water and land.[32] The committee however, also recommended dilution of the existing green laws (see Box 1.3: Committee on Allocation of Natural Resources).

Box 1.2: Gold-plating in KG Basin

The Krishna and Godavari river basins (KG Basin), spanning over 50,000 sq km are said to be the largest natural gas basins in India. Though ONGC first struck gas in 1983, the subsequent discoveries between 2002-2009, announced by Reliance Industries Ltd (RIL), Gujarat State Petroleum Corporation (GSPC) and Oil and Natural Gas Corporation (ONGC) pegged the total gas reserves discovered in the KG basin to over 64 trillion cubic feet (tcf). The KG basin's reserves were expected to serve up to one-fourth of the total gas supply of India. Today only RIL has begun production while all the others are yet to begin for want of technical and financial resources.

However, RIL is now likely to be investigated for violating the terms of its Production Sharing Contract (PSC) with the Government of India on the basis of the findings by the Comptroller and Auditor General (CAG) of India. The CAG report submitted to the parliament on 8th September 2011, flayed the Directorate General of Hydrocarbon (DGH) for allowing RIL to retain the entire 7,645 sq km of the KG-D6 block designating it as "discovery area", instead of relinquishing 25 per cent of the area outside of the discoveries as per the PSC contract. Additionally RIL has been allowed to amend its development cost, increasing it by almost four times i.e. from US $2.4 billion in May, 2004 to US $8.8 billion in October 2006, by the DGH with barely sufficient scrutiny. The auditor also reports that RIL had no intention of going with their original development plan or figures as indicated by the company's initiation of activities stated in their amended plan prior to its approval.

RIL had justified the above-mentioned inflation on the basis of increasing production capacities, from the previously estimated 40 mscmd (million standard cubic meters per day of gas) to 80 mscmd, but was unable to deliver the same. According to the amendment, RIL was to have begun producing 80 mscmd from 1st July 2011. In stark contrast, the production stood at a woefully low figure of just 27 mscmd as of February 2012 and further reduced to a meager 20.5 mscmd in November 2012. Given the shrinking output RIL has now submitted a revised field development plan, this time lowering both the capital expenditure (to US $6.2 billion) and estimation of gas reserves (to 3.4 tcf from its previous estimate of 11.3 tcf).

By the terms of the PSC, RIL is entitled to recover the cost of capital expenditure, post that the profits will be shared with the government. Therefore the increase in the same will translate into longer waiting period by the government to begin receiving the revenues. The drastically low production figures with extremely high capital expenditure were the primary reasons that CAG was called in for a performance audit by the Ministry.

With the inflated capital investment on one hand and reduced production output on the other it appears that positive prospects on the natural gas front, for both the country and its exchequer, are bleak. Today, with no new plans for natural gas extraction in the country, companies have resorted to the expensive alternative: importing of Liquefied Natural Gas (LNG), resulting in the inevitable hiking of prices. The shortage has led to reduction in supply to gas fired industries like power and fertilizer which have had to cut back on their production and as a consequence have reduced their profitability. Apart from profitability, end users are also hit. A case in point is the fertilizer industry, whose loss in production directly affects the farmers.

Though the loss to the exchequer is not quantifiable as yet, the CAG report questions the inherent nature and design of the contract in general which provides ample scope for contractors to "gold-plate" or artificially inflate front-end capital expenditures thereby reducing the government's share of revenue and has asked for review of the contract's current design.

Source: *Anon, 2012, CAG Report No. 19 of 2011-12: Performance Audit of Hydrocarbon Production Sharing Contracts, Ministry of Petroleum and Natural Gas*

Box 1.3: Committee on Allocation of Natural Resources

The Committee on allocation of natural resources (CANR) was setup to deliberate on measures required to enhance transparency, effectiveness and sustainability in utilization of natural resources and to suggest changes in the existing legal, institutional and regulatory framework on allocation of natural resources. The committee's recommendations are symptomatic of the wider thinking within the government on how to govern the social, economic and environmental aspects related to natural resources exploitation.

On economic front, the committee has largely recommended opening up of the sectors to the private players and introducing market-based competitive bidding mechanism for allocation of natural resources. It has also recommended shifting to market-based pricing for metals, minerals and other fossil fuels.[33] On environmental front, it has recommended speeding-up of green clearances and even dereservation of degraded forests for economic activities. On the social front, on one hand the committee has recommended easy and simple procedure for acquisition of land for project developers, on the other it has recommended the need to ensure that the project affected persons (PAPs) are better off than before and the need for an appropriate mechanism for sharing the gains from the project with these PAPs.

To illustrate, for the coal mining sector, the committee recommended auctioning of captive coal blocks and allowing independent mining companies to take part in the auctions and permitting them to sell the coal in the open market (so far only user industries are allowed captive coal mines for their own use). It also recommended formation of an open platform for transaction of coal (buying, selling, etc.), to bring in transparency in the sector. For the government, it recommended review and proportionate increase in royalty structure and rates and reforms in and capacity building of state mining departments.

On the other hand, the committee recommended expediting green clearances (environment, forest and wildlife clearances) and procedures related to land acquisition, mining leases, etc.[34] It has suggested classifying forests on biological and geo-climatic parameters and accordingly making some of them "inviolate" to improve "predictability of clearances". The catch is declaring a forest "inviolate" does not rule out its diversion; it may still be diverted for what the committee termed "defined set of limited circumstances". Another suggestion is to allow degraded forests to be de-reserved and diverted. The committee found the development status of mineral bearing areas to be poor and backward and recommended that a significant portion of the government revenue generated from mining, such as coal, should be used for the development of the mineral bearing areas.

***Source:** Ashok Chawla et al, 2011, Report of The Committee on Allocation of Natural Resources, Cabinet Secretariat, Government of India, New Delhi*

Though there is resistance from vested interests, India is likely to slowly move towards competitive and transparent mechanism for allocation of natural resources. On 2nd February, 2012 the Ministry of Coal notified the 'Auction by Competitive Bidding of Coal mines Rules, 2012'. This is the first legislative measure in India to introduce competitive mechanism for allocation of coal.

2. Social governance

In his book Rehabilitation Policy and Law in India: A Right to Livelihood, Walter Fernandes wrote, "many socio-economic surveys and other studies clearly establish that it is invariably tribal and poor people who suffer, whereas the fruits of development are enjoyed by richer classes and urban populations. The Indian development model has ensured that large projects result in a transfer of resources from the weaker sections of the society to the already privileged ones." He was largely writing about experiences of coal mining in central and eastern parts of India.

The exploitation of energy resources, especially in coal and hydropower sector, has led to severe and widespread social problems in India. Displacement due to coal mining increased substantially since the 1970s as India's coal production shifted from underground to open cast mining. Operations Research Group, a consultant of Coal India Limited, India's largest coal producer, reported that mining-induced displacement and resettlement was creating a pattern of "gross violation of human rights," and "enormous trauma in the country".[35]

There are no statistics on how many people have been displaced due to coal mining and how many of them were rehabilitated and resettled. The same holds true for hydropower. In fact, the opposition against hydropower in India has largely been due to its poor

rehabilitation and resettlement (R&R) performance (see Box 1.4: Unwarranted R&R practices).

Today in India, displacement of people and usurpation of land of the poor is happening due to rapid increase in the exploitation of all kinds of energy resources including renewable energy (see Box 1.5: Wind Power and Tribal Land). This has led to protests across the country against land acquisition and development activities. Coal companies are now finding it increasing difficult to open new greenfield mines. There are cases filed against nuclear power plants and uranium mines. People have taken hydropower companies to courts for voilation of environmental laws and for non-implementation of R&R package.

The government has recognised this problem and has started to discuss legislative solutions to ameliorate the situation. For instance, considering the poor performance of the mining sector in displacement and R&R, the Ministry of Mines has come out with a new Mines and Minerals (Development and Regulation) Bill, 2011 which for the first time recognises the rights of the communities and specifies a profit-sharing mechanism with project affected people. Under this law, a mining company will have to give an amount equal to 26 per cent of profit after tax (for coal) or a sum equivalent to the royalty paid during the year to a local development fund for the development of the project affected persons.[36] However, the draft bill has still not been passed by the parliament and business as usual continues.

Similarly, the Ministry of Rural Development has also come out with the Draft National Land Acquisition and Rehabilitation & Resettlement Bill, 2011, which was recently approved by the Indian cabinet.[37] The draft Bill is a major improvement over the existing land acquisition bill as it combines the process of land acquisition and R&R and makes R&R compulsory. The draft bill allows land acquisition only for public purpose and has much better compensation and R&R package for the project affected persons. For instance, the compensation for land in urban areas have been fixed at three times the market value and in rural areas at six times. There are also provisions for giving an acre of land to Schedule Tribes and infrastructure development in the affected areas. The bill also provides for Social Impact Assessment for better implementation of R&R.[38]

Box 1.4: Unwarranted R&R practices

The Maheshwaram dam, a 400 MW power project, is being built on the Narmada in Khargone district of Madhya Pradesh by Shree Maheshwar Hydel Power Corporation Limited (SMHPCL). Environmental Clearance (EC) to the project was granted in 1994. Since then, it has been mired in controversies. The recent of these, R&R issues of the Project affected families (PAFs) were raised by Narmada Bachao Andolan (NBA), a people's movement fighting for rehabilitation rights of the oustees, which has been recently accepted by the state government.

The project proponent, till November 2012 has released, only Rs 203.42 crore (27 per cent) of Rs 740 crore, the total cost of rehabilitation. NBA, in their press note earlier in March 2011 had stated that even on completion of 90 per cent of the dam work, only 15 per cent of 60,000 people displaced have got any kind of rehabilitation package while not a single person has been given the two hectare land mandated by the rehabilitation policy. Even more vulnerable condition of PAFs can be perceived by the fact that, state government was aware of the state of play of R&R work performed by project developer. In fact it is believed that state government was" hand in glove" with project developer on this issue.

Another case which too pertains to the Madhya Pradesh is the Omkareshwar dam, a 520 MW project in Khandwa district. As per the R&R policy – incidentally the Madhya Pradesh government policy was once lauded as the most progressive – each family affected by the backwater of the dam is supposed to get two hectares of agriculture land and financial package for rehabilitation As per the Supereme Court laid down norms all these were supposed to be made available six months before the lands of these PAFs were submerged, but till date these issues remain unsettled. In September 2012, over 50 men and women stood in neck deep water for 17 days to demand their rights. The Madhya Pradesh government finally relented and promised action.

Source: *a. http://www.downtoearth.org.in/content/madhya-pradesh-government-lied-about-rehabilitating-people-affected-maheshwar-dam as viewed on November 26, 2012, b. Large Dams in India: Temples or Burial Grounds? Habitat International Coalition, at http://www.hic-net.org/articles.php?pid=1602 viewed on December 20, 2012*

Box 1.5: Wind Power and Tribal Land

Suzlon Energy Limited was embroiled in a raging controversy in Sakhri taluka of Dhule district in Maharashtra, on the issue of forcible land acquisition by the administration for its wind farm. The company was building Asia's largest wind farm of 1,000 MW capacity at Sakhri. After installation of about 550 MW, the rest faced stiff opposition. The state's Renewable Energy Comprehensive Policy, (December 2005) controversially allowed diversion of forestland for establishment of wind farms, but also claimed, "tribals will be suitably compensated and their ownership protected". In a large chunk traditionally used by adivasis, 650 windmill towers came up. People alleged that the government through this policy connived with Suzlon to transfer the land. Since 1980, local tribals had been demanding that land be regularised in their name. The first petition was filed in 1982; the same land, people allege, was been given to Suzlon in a matter of days.

Source: *http://www.downtoearth.org.in/node/4854 as viewed on January 16, 2013*

The reccommendations of the Committee on allocation of natural resources, the Mines and Minerals (Development and Regulation) Bill, 2011 in the parliament and the Draft National Land Acquisition and Rehabilitation & Resettlement Bill, 2011 indicates that there is a greater willingness and wider consensus within the government to improve the land acquisition and R&R practices in the country. There is also a willingness, for the first time in the history of independent India, to share the benefits of development with the local affected communties.

Essentially, today in India, there are opposition to land acquisition everywhere. Even India's largest foreign direct investment project, POSCO's Steel in Orissa, is heldup for the last seven years over land acquisition. A history of poor compensation and poorer R&R has created an atmosphere of acute distrust. People do not trust the government and businesses, who they believe are hand-in-glove. The greater willingness within the government to given better compensation and to share the benefits of development is largely to reduce the distrust and "to bring people on their side".

3. Environmental governance

The environmental performance of the energy sector in India – coal, oil, hydropower and nuclear – has not been up to the mark.

Coal mining has led to large-scale forest destruction in the past and continues to do so. In the past five years, as much 31,500 ha of forestland were diverted for coal mining.[39] Almost all coal mining areas of the country have been declared as critically polluted and most coal companies have been found to be violating the environmental norms.[40] The monitoring of coal mines by State Pollution Control Boards and the Central Pollution Control Board shows that one-third of the operating coal mines are violating environmental norms. The performance of coal mining companies in mine closure is also very poor. There are at least 240 abandoned coal mines where no reclamation has taken place.[41]

The hydropower sector has come under the scanner for unplanned development without consideration of ecology or competing users. Hydropower has been sold as cheap and green power[42] and there is rush to set-up large numbers of hydropower plants with little consideration for their cumulative ecological impact. For instance, in a state like Arunachal Pradesh, which is heavily forested, the state government has signed agreements with developers to erect 104 hydropower plants aggregating a capacity of 56,000 MW, which is one third of India's hydropower potential, without doing even mandatory environmental assessment.[43] On single river basins, agreements have been signed for multiple projects.

The problem of constructing a large number of hydropower projects on one river is now emerging as a major environmental concern. On some of the key rivers of India like the Sutlej, Ravi and Beas Rivers in Himachal Pradesh and the Alaknanda and Bhagirathi rivers in Uttrakhand, tens of hydropower projects have been granted environmental clearances without evaluating their cumulative impacts (see Box 1.6: Environment Impact Assessment and Hydropower). There are major debates happening in the country on ecological flow of rivers and how much length of a river can be used for hydropower development. The Ministry of Environment and Forests has recently setup an Inter-Ministerial Group to look at these issues for river Ganga.[44]

There have not been many independent studies on the environmental performance of the natural gas and the oil sector in India. However, pollution control boards in the northeastern states have cancelled licenses for exploration and drilling for many projects for flouting of environmental norms. The Mizoram State Pollution Control Board stopped oil exploration project of Oil and Natural Gas Corporation (ONGC) in Kolasib district after ONGC's earth-spoil storage, meant to store toxic drilling waste, collapsed and polluted the nearby Chhimulang river. The project had been found operating without an environmental clearance.[45] Similarly, hundred-odd drilling sites in Assam owned by ONGC have been observed to be severely polluting the soil and water of the region. Due to these flouting of environmental norms, the Assam Pollution Control Board refused to give a 'No Objection' certificate for further drilling to the company.[46]

Lately, there has been a greater push from the industry and the government to dilute the existing environmental and forest protection regulations as it seen to be hampering the growth of the industry, especially in the energy sector. Even Prime Minister Manmohan Singh has compared green regulations as license raj on many occasions.[47] Many independent groups, however, have challenged this notion and have come out with facts and figures to show how large numbers of projects have been granted green clearances and that green clearances need major reforms to protect the environment.[48] Despite the protests of the civil society, the government has recently set-up a Cabinet Committee on Investments (CCI), headed by the prime minister, to expedite clearances (especially green clearances) for large projects.[49] CCI is now setting timelines for giving clearances by concerned ministries, which many fear will further dilute the environmental norms in the country.[50]

If media is to be believed then first meeting of the Cabinet Committee on Investment (CCI), which is likely to be held in the second week of February 2013, will largely deal with clearances of projects related to coal, power and petroleum sectors.[51]

Box 1.6: Environment Impact Assessment and Hydropower

India's hydel resource potential is estimated to be 84,000 MW at 60 per cent load factor (equivalent to around 150,000 MW installed capacity based on probable load factor). The assessment was conducted by Central Electricity Authority way back in 1978-1987, when there was no environmental clearance procedure in India and the concept of ecological flow and cumulative impact was not developed. Still, the same assessment is being used today to develop hydropower projects.

Hydropower projects affect the natural ecology of a river in two ways – by diversion and by submergence. In dam projects, the entire landmass including large length of the river is submerged affecting the riverine ecology both upstream and downstream of the dam. In Run-of-the-River projects where a considerable length of river is bypassed and water is discharged back only after the powerhouse, drying of river stretch leads to significant harmful effects on aquatic life and landscape.

India is constructing hydropower while neglecting the ecological impacts and impacts on the competing water users. The classic case is that of Lohit and Bichom river basins, both tributaries of Brahmaputra and Alaknanda and Bhagirathi basins, which are tributaries of Ganges. There are 70 hydropower projects with a cumulative capacity of 9,033 MW planned on the Alaknanda and Bhagirathi basins. Thirteen projects with total installed capacity of 1,851 MW have already been commissioned while 57 projects of 7,182 MW are under different stages of development. All these projects obtained environmental clearances on stand-alone basis. No cumulative impact assessment was done even when many of the projects are cascading projects. If all these projects come up, then 47.3 per cent length of river Bhagirathi and 43.9 per cent length of river Alaknanda would be either submerged or diverted. Similarly, on Lohit River six hydropower plants (in cascade) aggregating an installed capacity 7,450 MW capacity has been planned and on Bichom river 10 projects of total power capacity 1,245 MW are coming up. All these projects were cleared without any basin wise studies to ascertain the cumulative ecological and social impacts. The result is that if all these projects were constructed then 70.6 per cent of Lohit's length and 66.1 per cent of Bichom's length would be submerged or diverted for power generation (See Table: Rivers affected).

Table: Rivers affected

Basin	Total river length (km)	River stretch diverted (km)	River stretch submerged (km)	Affected length (km)	% of river length affected
Lohit	144.2	4.5	97.3	101.8	70.6
Bichom	124.9	64.5	18	82.5	66.1
Bhagirathi	456.5	130.5	85.4	215.9	47.3
Alaknanda	664.5	233.7	58.2	291.9	43.9

The above case clearly indicates the inadequacies of environmental impact assessment (EIA) process in India to deal with hydropower development. EIA was first introduced in India based on the Environmental Protection Act (EPA), 1986. But formally it came in to effect, when Ministry of Environment and Forests (MoEF) passed a major legislative measure under EPA in January 1994 for Environmental Clearance (EC) known as EIA Notification, 1994. The 1994 notification was repealed and a new EIA Notification, 2006 was introduced to allow clearance of relatively smaller projects at the state level. There is sufficient evidence to suggest that, despite legislative, administrative and procedural set-up EIA has not yet evolved satisfactorily in India. This is mainly due to inadequate capacity of EIA approval authorities, deficiencies in screening and scoping, poor quality EIA reports, inadequate public participation and weak monitoring.

Source: *a. Cumulative Impact Assessment of Hydroelectric projects in Alaknanda- Bhagirathi Basins, AHEC, IIT Roorkee, b. Cumulative Impact Assessment for the Lohit and Bichom river basins, WAPCOS Ltd., c. Jitendra K Panigrahi & Susruta Amirapu, An Assessment of EIA in India, Environmental Impact Assessment Review 35, 23-*

E. The Challenge of Climate Change

India has been ranked as the second most vulnerable country, second only to Bangladesh, in a list of countries considered at "extreme risk" from climate impacts. Almost the whole of India has a high or extreme degree of sensitivity to climate change, due to acute population pressure and a consequential strain on natural resources. A high degree of poverty, poor general health and agricultural dependency of much of the populace compound the situation.[53]

India, on the other hand, is the third largest CO_2 emitter in the world, following China and the United States and slightly ahead of Russia. The growth rate of emissions is also much higher than the world's average; India's emissions between 1990 and 2009 grew by a CAGR of 5.2 per cent vis-à-vis 1.7 per cent for the world.[54] But India's per capita emissions is one of the lowest in the world. India's per-capita CO_2 emission of 1.37 tonnes is much lower than the world average of 4.29 tonnes, China's 5.14 tonnes and the United States 16.90 tonnes.[55]

India is a signatory to the United Nations Framework Convention on Climate Change (UNFCC), but is not obliged to contain its carbon emissions as an Annex II country. India's international position on climate change is largely guided by the principles of "equity" and "common but differentiated responsibility and respective capability". In all Conferences of Parties to the UNFCCC, India has maintained that as developed countries have produced most emissions, it is they who should take actions to reduce it. India also put forth the principle of "Equitable Access to Sustainable Development (EASD)". EASD implies the rights of countries to sustainable development and responsibilities to reduce carbon emissions based on the principles of equity. EASD was accepted under Cancun Agreement in 2010.

In the recent years, there has been immense international pressure on India to reduce its carbon emissions. This has prompted the government to take number of steps to reduce emissions. Some of the major initiatives taken are:

- In 2008, India announced its National Action Plan on Climate Change (NAPCC) under which it agreed to improve energy efficiency, increase renewable energy use and move towards efficient use of coal in thermal power plants and industries (see Box 1.7: NAPCC).[56]
- In 2010, under the Cancun Agreement, India pledged to reduce carbon emissions per unit of GDP by 20 per cent to 25 per cent below 2005 levels by 2020.[57]
- In the 2010-11 budget, the Government of India imposed a cess of Rs 50 on per tonne of coal produced domestically and imported.[58] This money is being put in a National Clean Energy Fund (NCEF) to be used for funding research and innovative projects in clean energy technologies.[59]

Even with an aggressive climate mitigation strategy, India's emissions will continue to grow in the next two decades. The question is how much and at what rate?

Box 1.7: NAPCC

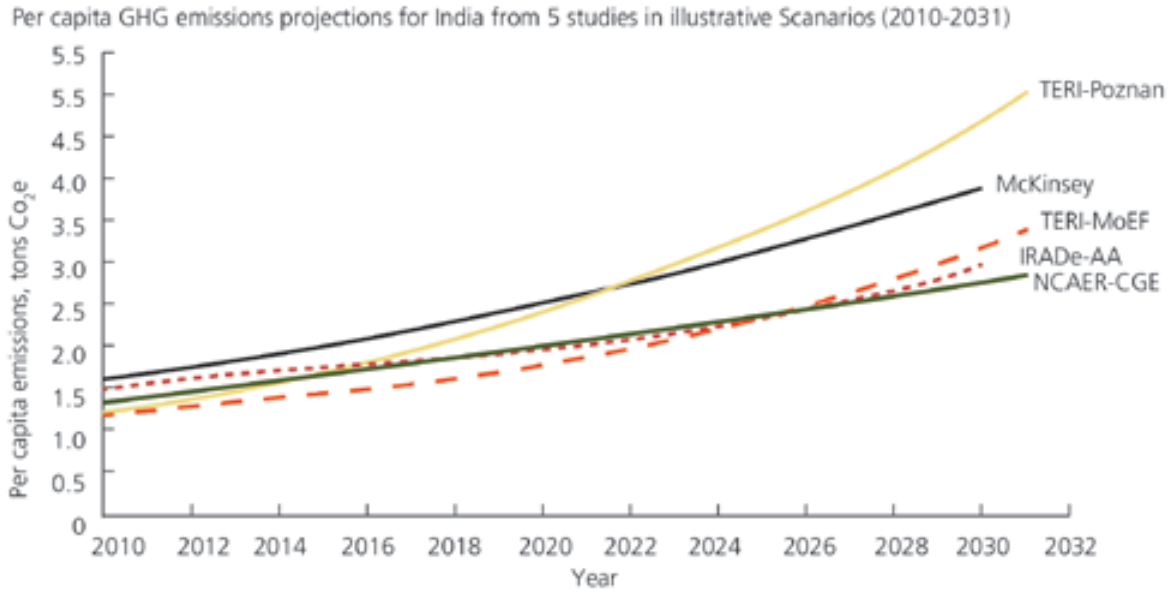
The main objective of the National Action Plan on Climate Change (NAPCC) is to promote development across a path that also results in co-benefits for addressing climate change.[60] *The NAPCC focuses on promoting understanding of climate change, adaptation and mitigation, energy efficiency and natural resource conservation. Eight missions were formalised under the NAPCC:*

1. ***National Solar Mission:*** *The Jawaharlal Nehru National Solar Mission (JNNSM) was launched in January 2010. The mission aims to deploy 20,000 MW of grid-connected solar power by 2022 and to create a strong solar technology-manufacturing base in India.*
2. ***National Mission for Enhanced Energy Efficiency (NMEEE):*** *Under the NMEEE there are four components: to develop a market mechanism that would allow energy savings to be traded, shifting to energy efficient appliances, financing energy efficiency and developing the right fiscal environment for promoting energy efficiency.*[61]
3. ***National Mission on Sustainable Habitat:*** *The mission aims to make cities sustainable through improvements in energy efficiency in buildings, management of solid waste and shift to public transport.*
4. ***National Water Mission (NWM):*** *The NWM drafted by the Ministry of Water Resources was approved in April 2011. The objective of the mission is water conservation, minimising wastage and ensuring equitable distribution.*
5. ***National Mission for Sustaining the Himalayan Ecosystem:*** *The mission focuses on building capacities, assessing and predicting impacts, governance, research, etc.*[62]
6. ***National Mission for Green India:*** *Under the mission, the Ministry of Environment and Forests (MoEF) plans to add five million hectares (ha) of forest cover and improve quality of forests.*[63]
7. ***National Mission for Sustainable Agriculture:*** *Launched in August 2010, the mission focuses on making Indian agriculture climate-resilient through suitable adaptation and mitigation.*[64] *Area of work includes improved seeds, livestock and fish, water efficiency, pest management, agriculture insurance, credit support, etc.*
8. ***National Mission for Strategic Knowledge for Climate Change:*** *The mission launched in July 2010 aims to build a knowledge system to inform and support national action to ecologically sustainable development.*[65] *The mission should essentially be generating information and knowledge for the other seven missions under the NAPCC and at the same time promote research in this field.*

In September 2009, MoEF published India's comprehensive emissions modelling studies under the title: "India's GHG Emissions Profile: Results of Five Climate Modelling Studies".[66] Five institutions – The Energy & Resources Institute (TERI), the National Council of Applied Economic Research (NCAER), Integrated Research and Action for Development (IRADe), Jadavpur University and McKinsey and Company – undertook separate modelling studies and came out with following key results:

- Estimates of India's per capita GHG emissions in 2030-31 vary from 2.77 tonnes to 5.0 tonnes of CO_2e, with four of the five studies estimating that India's GHG emission per capita will stay under four tonnes per capita (see Figure 1.7: Projected Per Capita GHG Emissions). This may be compared to the 2005 global average per capita GHG emissions of 4.22 tonnes of CO_2e. In other words, four out of the five studies project that even two decades from now, India's per capita GHG emissions would be well below the global average 25 years earlier.

Figure 1.7: Projected Per Capita GHG Emissions



Source: Anon, 2009, India's GHG Emissions Profile: Results of Five Climate Modelling Studies, Ministry of Environment and Forests, Government of India, New Delhi

- In absolute terms, estimates of India's GHG emissions in 2031 vary from 4.0 billion tonnes to 7.3 billion tonnes of CO_2e, with four of the five studies estimating that even two decades from now, India's total GHG emissions will remain under six billion tonnes of CO_2e.
- All studies show evidence of a substantial and continuous decline in India's energy intensity of GDP and CO_2 intensity of GDP.

The modelling studies showed that a large part of the increase in emissions in India would be because of increase in fossil fuel based, mainly coal-based, power generation.

The big question in front of India, in fact the world, is how does a country like India meet its energy demand without relying on fossil fuels? Can India on its own leapfrog to low-carbon growth path or do we need a global cooperative mechanism, which will help developing countries to leapfrog? These are important questions that need to be answered if the world wants to solve climate change. What is, however, quite clear is that countries like India provide the world with an opportunity to avoid emissions.

SECTION 2
Coal in India

A. Introduction

India is a coal dependent economy. Coal meets more than 50 per cent of the current commercial energy needs[67] and generates more than 70 per cent electricity.[68] In 2011, 7678 million tonnes (MT) of coal[69] was produced in the world;[70] India with 585 MT was the third largest producer after China (3,471 MT) and USA (1,004 MT).[71]

According to international data, India has the third largest hard coal reserves in the world.[72] In totality, 286 billion tonnes (BT) of coal reserves have been established at present;[73] 114 BT are proven reserves, 138 BT are indicated and 34 BT are inferred reserves.[74] Most of the coal reserves are spread across Jharkhand, Odisha, Chhattisgarh, West Bengal and Madhya Pradesh (see Table 2.1: State-wise Coal Reserves in India). Presently, there is a geographical mismatch between major coal mines being located in the eastern India and high demand markets in western and southern India. This has created a large unmet demand for coal transportation by railroad.[75]

The conventional wisdom is that India has abundant coal reserves, but this is being challenged in many quarters. The abundance theory is most clearly reflected in the 11th Five-Year Plan document, which states that if all resources were to be utilised, the current level of coal production could be sustained for 140 years. The same plan document, however, also states that the extractable coal reserves will run out in approximately 45 years if India's coal production continues to grow at five per cent per year.[76] The Integrated Energy Policy, 2006 goes a step ahead and cautions that "large estimates of total coal resources give a false sense of security because current and foreseeable technologies convert only a small fraction of the total resource into the mineable category".[77] Considering that a large proportion of India's coal reserves are beneath forested areas, on the ground of environment and wildlife protection, many coal reserves will not be opened

Table 2.1: State-wise Coal Reserves in India

State	Coal Reserves (in MT)
Andhra Pradesh	22055
Assam	514
Bihar	160
Chhattisgarh	49280
Jharkhand	78936
Madhya Pradesh	23126
Maharashtra	10533
Odisha	69159
Sikkim	101
Uttar Pradesh	1062
West Bengal	29955
Arunachal Pradesh	90
Meghalaya	577
Nagaland	315
TOTAL	**285863**

Source: http://www.coal.nic.in/welcome.html as viewed on November 3, 2012

for mining. An effort was made by MoEF to delineate certain dense forest areas as 'no-go' areas for coal mining.[78] However, the Group of Ministers (GoM) on coal rejected this proposition.[79] Nevertheless, the GoM did agree to reformulate the parameters to define inviolate and pristine forests where mining would not be allowed; MoEF has set-up a new committee to do this.[80]

In India, public sector companies dominate coal production. Coal India Limited (CIL) is the largest coal producer contributing for more than 80 per cent of the country's production.[81] Another 10 per cent comes from Singareni Collieries Company Limited (SCCL), a public sector company and the rest is contributed by captive coal mines of private power and steel companies and small mines in Meghalaya.[82]

In 2011-12, India produced 554 MT of coal (see Table 2.2: Coal Production in India). Coal production is expected to reach 1,026 MT by 2016-17.

The present coal demand in the country is about 730 MT (see Table 2.3: Coal Demand in India). This implies a demand-supply gap of close to 180 MT that is expected to increase to about 190 MT by the end of 2012-13.[83] If India's GDP grows at a rate of 8-9 per cent, which is the target set by the government, then the coal demand in the country will go up to 2,000 MT in 2031-32, three-fourth of which will be for thermal power plants.

Table 2.2: Coal Production in India

Period	10th FYP		11th FYP				12th FYP
Company	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2016-17
CIL	361.02	379.49	403.73	431	431.32	447	664
SCCL	37.71	40.64	44.54	50	51.33	51	45
Captive	19.29	26	30.03	38	36.3	43	304
Tata Steel	7.04	7.21	8.95	7.2	7.02	7	7
Meghalaya	5.79	5.6	5.96	0.7	6.09	6	6
TOTAL	**430.85**	**458.94**	**493.21**	**526.9**	**532.06**	**554**	**1026**

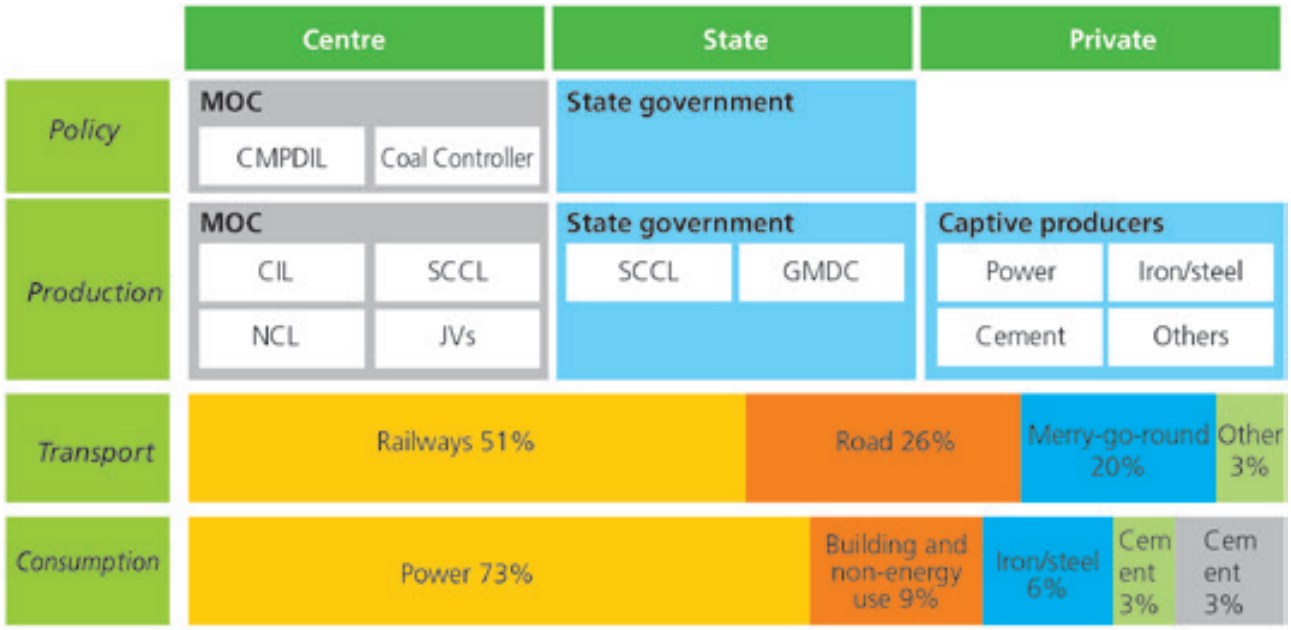
Source: Anon, 2012, World Energy Book 2012, World Energy Council – Indian Member Committee, pg. 3

Table 2.3: Coal Demand in India

Sector	2005-06	2006-07	2011-12	2016-17	2021-22	2026-27	2031-32
Electricity	310	341	539	836	1040	1340	1659
Iron & Steel	43	43	69	104	112	120	150
Cement	20	25	32	50	95	125	140
Other	53	51	91	135	143	158	272
TOTAL	**426**	**460**	**731**	**1125**	**1390**	**1743**	**2221**

Source: Anon, 2012, World Energy Book 2012, World Energy Council – Indian Member Committee, pg. 2

Figure 2.1: Key players involved in Coal Sector in India



Source: Sun-Joo Ahn and Dagmar Graczyk, Understanding Energy Challenges in India: Policies, Players and Issues, International Energy Agency, 2012

Currently, most thermal power plants in India are experiencing coal shortages and therefore producing electricity far below their capacity (see Box 2.1: Coal shortages hampering power production).

Presently, India imports about 90 MT of coal mainly from Indonesia, Australia, New Zealand and South Africa.[84] This quantity is expected to go up to 143 MT by 2012-13 (see Table 2.4: Year-wise Coal Import by India). The increasing gap between the domestic supply and demand has led many Indian companies to invest in overseas coal mines to secure long-term supplies (see Chapter 4).

Table 2.4: Year-wise Coal Import by India

Year	208-09	2009-10	2010-11	2011-12	2012-13
Imports	59	73.25	92	137	143

Source: Anon, 2012, Annual Report 2011-12, Ministry of Coal, Government of India, pg. 29

Box 2.1: Coal shortages hampering power production

Various power plants in the country have been complaining of coal shortage with only a few days coal supply available. This essentially translates into running of these power plants below their full capacity and hence a loss of generation units. The Central Electricity Authority (CEA) states that on account of coal shortage about 11.6 billion kWh of electricity generation loss was encountered for the year 2011-12 which is about 32 per cent of total generation loss for the year.[85] Other factors include poor coal quality, transmission constraints, reserve shut down, etc. Low/delayed production from captive coal blocks is also leading to idling of capacities in the power sector.[86] According to CEA's data, 54 thermal power stations in the country have less than two weeks coal supply out of which 35 have less than even a week's coal supply.[87] The Coal Minister Sriprakash Jaiswal states that all this non availability is not owing to coal from CIL only.[88] He alleges that companies have failed to import adequat coal from abroad.

But importing coal is not looking very bright either. A number of companies in India have bid to set up thermal power plants in the country based on imported coal from countries like Indonesia and South Africa. These countries are increasing the export coal prices causing trouble for Indian players who based their bids considering a certain cost component. Indonesia for example, a few months ago brought in regulations that benchmarked all coal exports to international prices.[89] Indonesia also recently issued a draft decree on imposing a ban on export of coal of lower calorific value.[90] Due to increase in coal prices, companies like Tata Power and Reliance Power have sought for reviewing their tariff structure as the current coal prices would make their projects unviable.[91] There is reported resistance from the state electricity boards to increase tariffs.[92] Owing to the shortage of coal and hence power, prices have gone up.[93] Power prices at the energy exchange have doubled.[94]

The coal sector in India suffers from major governance challenges. The sector has been accused of inefficiencies, as it is not able to meet the increasing domestic demand. The sector also suffers from non-transparency and there are major allegations of corruption and crony capitalism in allocation of coal mines to private companies (see Box 2.2: The CAG report and Mismanagement in Private Coal Blocks).

Coal mining sector has a very poor track record on social and environmental issues. Most coal mining areas of the country have been declared as critically polluted and coal companies including the public sector CIL has poor track record on rehabilitation and resettlement of the displaced population. This has meant a very little local community and civil society support for opening new coal mines or expanding the existing ones. There are protests happening across the country against coal mining.

Box 2.2: The CAG report and Mismanagement in Private Coal Blocks

Comptroller and Auditor General of India (CAG) performed an audit on the coal sector in the country for 2011-2012.[95] *The audit pointed out that the present coal block allocation process through the Screening Committee is non-transparent without any clear guidelines on how a coal block is allocated. CAG specifically pointed out that the present allocation process does not seem to take into account a comparative evaluation of the applicants for a coal block. The report also brought out that the Government of India (GoI) has not yet set out the modus operandi for the competitive bidding of coal blocks that has been talked about since 2004. CAG therefore categorised the allocation of 142 coal blocks, to both private and public-sector companies, post July 2004 as non-transparent and non-objective.*

CAG in the audit report states that delay in the introduction of competitive bid process for allocation for coal blocks has given benefits to private players to the tune of Rs 185,591 crore (about US $ 37 billion). Part of this gain could have flown to the national exchequer had the competitive bidding process been in place. The audit strongly put forth the need for a 'strict regulatory and monitoring mechanism' to ensure that the benefit of cheaper coal is passed on to the consumers. CAG also found the operational performance of these captive coal blocks to be dismal. Out of 86 coal blocks meant to produce 73 million tonnes (MT) of coal in 2010-11, only 28 blocks produced only 35 MT. Fifteen of these were captive coal blocks for private companies. CAG found that the Coal Controller has not performed any physical inspection of coal blocks for checking the progress and nor has the monitoring committee reviewed this progress. The audit recommends a system of giving incentives to encourage production performance from captive coal blocks and disincentives to discourage poor performance.

After the release of the CAG report, many coal blocks have been de-allocated and bank guarantees of companies have been forfeited for failure to develop coal mines within the given deadlines.[96] *The Central Bureau of Investigation has filed cases against companies for alleged criminal conspiracy to get coal blocks by fudging there net worth figures and misrepresentation of facts.*[97]

Captive coal blocks making windfall profits

Lately, there has been a discussion in the country about the undue advantage to companies, which have been allotted captive blocks. The basic reason given is that there is a substantial difference between the price of coal supplied by Coal India and coal produced through captive mining translating into a windfall gain to captive coal block holders.

The government has given captive coal blocks to private thermal power companies to increase the electricity production in the country. The Ministry of Power (MoP) has laid down clear guidelines for allocating captive coal blocks under which the top priority is given to the government-owned companies and least to merchant power plants, who sell electricity at any cost to any consumer.[98] *This has been done to ensure that the consumers get the benefits of cheaper power production from captive coal blocks.*

Presently many power plants that have been given captive coal blocks are selling their entire generation in the market at merchant rates. The retail consumers on the other hand are paying higher tariffs for power from these projects. The selling of entire/bulk of generation through the merchant route is a violation of the National Electricity Policy which states that only 15 per cent of the generation can be sold through the merchant route while the rest has to be by long-term power purchase agreements.[99]

On social and environmental front, the sector is witnessing interesting, but contradictory trends. On the one hand, there is a greater push from the industry and the government to dilute the existing environmental and forest protection regulations as it seen to be hampering the opening up of new coal mines in the country; on the other hand, there is a greater willingness within the government to improve the policies for land acquisition, rehabilitation and resettlement and allow local community to benefit out of coal mining. It seems that the government is trying to win the support of the local community by giving them immediate social and economic benefits while sacrificing their ecological future.

India's heavy dependence on coal has environmental and social costs, however, efficient and sustainable development of the coal sector can mitigate negative externalities to a certain degree, but India needs to develop a more reliable and cleaner energy path for the future.

B. The Regulatory Framework

Coal mining was nationalised in India in 1970s mainly because of unsatisfactory mining conditions prevalent at that time and to meet long-term requirement of coal in the country.[100] Under the Coal Mines (Nationalisation) Act, 1973 coal mining was mostly reserved for the public sector. By an amendment to the Act in 1976, two exceptions to policy were introduced – captive mining by private iron and steel producers and sub-lease for coal mining to private parties in isolated small pockets not amenable to economic development and not requiring rail transport.[101] This act was again amended in 1993 and 2007 to allow captive coal mining in the private sector for power generation, iron and steel, cement, coal washing, coal gasification and liquefaction.[102] Currently, only government-owned companies are allowed to undertake commercial mining, though there are large-scale illigal mining which also feeds the market (see Box 2.3: Illegal Coal Mining).

Coal mining in India is regulated under the following acts/rules:

1 **The Coal Bearing Areas (Acquisition and Development) Act, 1957:** This act proposed stricter public control over coal mining in the country. It lays down the process for acquiring land which has coal deposits and also the compensation to be paid for such acquisition. The compensation is to consider ther market value of the land, damage due to felling of trees/crops/severing from the land, effect on imovable property of the person, etc. It lays down the timeline during which such land is to be acquired and the procedure for filing objections for such acquisition.

2 **The Coal Mines (Nationalisation) Act, 1973:** Under this act all coal mines in the country were nationalised with control to central government. Exception to this rule were companies engaged in power production, production of iron and steel, etc. Also lays down a structure of management of coal mines in the country.

Box 2.3: Illegal Coal Mining

Any mine operating without any of the statutory permissions or flouting any of the laws is said to be operating illegally. Illegal mining besides evading substantial revenue for the government also causes environmental damage due to the absolute disregard to norms and standards. For instance, coal mines in India are usually left without closure once the companies finish extracting the mineral. There are at least 240 such abandoned mines in the country where no reclamation has taken place.[103] *Once companies abandon these mines, coal mafia takes over. The remaining mineral is usually removed without any permissions and in an unscientific manner which may lead to a number of environmental issues; subsidence being one of them. In 2002, about 146 villages in Bardhaman district of West Bengal – inhabited by six lakh people – were threatened by subsidence resulting from rampant illegal mining.*[104] *In 2004, in a public interest litigation, former member of Parliament from Asansol, Haradhan Roy, said that four lakh residents in 56 localities in Asansol's coal belt are endangered due to subsidence caused by illegal mining and underground fires.*[105] *A notification issued by the Directorate General of Mines Safety in 1997 had put the towns of Raniganj, Andal, Asansol, Kulti and Sanctoria in a potentially dangerous subsidence zone.*[106]

Accidents are another common feature of these mines, which are operated illegally putting in danger the lives of people who work there. In November 2006, 150 miners were trapped in an abandoned mine while extracting coal illegally in Gangtikuli, near Asansol.[107] *The mine caved in and was flooded by the overflowing Damodar. Threatened by the coal mafia running the mine, none of the villagers or the kin of the dead miners reported the deaths. A significant number of injuries and casualties in illegal mines are not even reported and hence not compensated for.*

Illegal coal mining operations in Jharkhand, mainly in West Singhbum and Hazaribagh districts, produce and dispatch about 4.0 million tonnes of coal every year.[108] *Illegally mined coal is transported by people on bicylces and people allege that administrations is unable to do anything due to the fear of the Communist Party of India (Maoists).*[109] *These mines employ women and children too which adds to their list of illegalities.*

Meghalaya also suffers from the perils of illegal mining, largely because of the ambiguities in the application of laws due to the land ownership system in state. Meghalaya falls under the Sixth Scheduled Area under the Constitution of India. The land rights in the Sixth Scheduled Areas is vested to the tribal community and they are free to use the land and the mineral resources. Thus, most coal mines in the state are privately owned. However, there is ambiguity about the application of mining, environment and forest related laws to these mines. The result is these mines do not have any clearances under laws regulating mining like the Mines and Minerals (Development and Regulation) Act, Coal Nationalisation Act, Mines Act, etc.[110] *They are also operating in violation of the Forest Conservation Act and the Environment Protection Act.*[111] *In addition to not following important regulations, these mines are also a cause of concern for the way they operate. These coal mines are called rat hole mines which are like a burrow dug underground with an opening near the seam. A person who mines has to be on all fours to be able to access the seam and uses a sickle and hammer to take out the ore. These mines are known as deathtraps as the highly unscientific method of mining leads to subsidence and miners get trapped within and die. Since none of these mines are legal these deaths also largely go unreported. The mines also tend to employ more children since their short stature makes them suitable for mining in these conditions. Also, given the sensitive ecology of the state the mining practice in Meghalaya is a threat as they are lading to forest destruction and acid mine drainage leading to water pollution.*[112]

3 **Mines and Minerals (Development and Regulation) Act, 1957:**[113] The MMDR Act, 1957 is the main regulation governing the mines and mineral industry. Important rules in force under the act include the Mineral Concession Rules, 1960, the Mineral Conservation and Development Rules, 1988 The Act lays down the procedure for granting reconnaissance permit, prospecting licence or a mining lease and sets conditions for operations of all types of mining including coal. The Mineral Concession Rules lay down the procedure for approval of mining plans, while the Mineral Conservation and Development Rules (MCDR) lay down guidelines for ensuring mining on a scientific basis, while conserving the environment at the same time.[114]

4 **Coal Mines (Conservation & Development) Act, 1974 and Rules 1975 and Amendment Rules, 2011:** The Act and the Rules lays down the process and procedure for development of coal

mines and conservation of coal. They also adress the issue of safety and health and mine closure.

5 **Auction by Competitive Bidding of Coal Mines Rules, 2012:** These rules were notified in February 2012 and for the first introduced the concept of competitive bidding for coal mines in India.

6 **Coal Mines (Amendment) Bill 2000:** The bill intends to allow non-captive coal mining by Indian companies on par with the public-sector companies, in order to increase domestic coal production. This bill is still pending as of 2012 after being introduced to Parliament in 2000.

7 **Laws related to environment and forest protection:** All coal mines in India have to comply with the Forest Conservation Act, 1980, the Environment Protection Act and Rules, 1986 and the Environmental Impact Assessment Notification, 2006. Besides they alo have to meet the water and air pollution norms under the the Water (Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act, 1981.

- Under the Environmental Impact Assessment (EIA) Notification, 2006, all coal mines mines of more than 50 hectare mine lease area have to undertake EIA and obtain environment clearance from the Central government.
- Under the Forest Conservation Act, 1980 in case a coal mining proposal involves diversion of forest land, then forestry clearance from the central government, under the provisions of the Act, is mandatory. The act also requires the developers to pay for purchase of an equivalent area of non-forest land as near as possible to the site of diversion, or twice the degraded forest area, for transfer to the state forest department with sufficient funds for compensatory afforestation, which is then declared as protected forest. The act also requires an endorsement from the gram panchayat or the local body for diversion of forestland.
- Under the Wildlife Protection (Amendment) Act, 2002 mining is prohibited in sanctuaries and national parks. Wherever this is inescapable, the consent of the Indian Board of Wildlife is required.
- Under the Air and Water (Prevention and Control of Pollution) Acts, a coal mine has to obtain 'Consent to Establish' before starting of the mining operations from their State Pollution Control Boards (SPCBs). Once the mine is operational, it has to periodically obtain 'Consent to Operate' from the SPCBs.

Lately there have been major push by the industry, and supported by the development-related ministries in the government, to dilute the green norms and allow faster clearances of coal mines (see Box 2.4: Coal Mining and Green Clearances).

Box 2.4: Coal Mining and Green Clearances

There has been an atmosphere in India against environment and forest clearances for coal blocks lately. These green clearances are being blamed for the delay in allocation of coal blocks which ultimately add to delays in setting up thermal power plants or ensuring coal supply to them. The report of the committee constitued by the Group of Ministers on coal and other development issues released in July 2011 also supported this line of thought. The committee, headed by BK Chaturvedi, recommended doing away with forest clearances for coal blocks except in certain cases which need 'dense' forests. The committee was of the view that given the limited reserve of natural resources like coal, being too restrictive is not going to work. It is important to note that the committee clearly did not consider forests as a natural resource and recommends it can be given up for coal. The committee has recommended speeding up the process of grant of forest clearance. The committee also made a recommendation to allow 25 per cent expansion in coal mines without the mandatory public hearing. These recommendations are based on the premise that green clearances are holding up growth in India.

In response to the BK Chaturvedi Report, the Delhi-based NGO, Centre for Science and Environment (CSE) carried out a detailed analysis of environment and forest clearances granted in the 11th five year plan (FYP) period. CSE specifically looked at the thermal power plants and coal mining in its study and found that way more clearances have been given than even those required as per the 12th FYP targets. To illustrate, in the 11th FYP period MoEF gave environment clearance to 184 coal mines with a total production capacity of 589 million tonnes per annum (MTPA) spread across 156,130 hectares (ha) of land. Also during this period, 119 coal mining projects were granted forest clearance (70 received final clearance and 49 received in-principle clearance). These involved forestland diversion of about 31,500 ha.

Similarly, MoEF granted environment clearance to 276 thermal power plants (TPP) in the country during 11th FYP period. There were 206 coal-based TPPs out of these with a capacity of close to 1.82 lakh MW. The annual installation capacity during 11th FYP was 10,600 MW thus clearances have ben granted at a rate of mroe than four times the installation capacity. The projected target capacity during the 12th FYP period is 1 lakh MW which pushes the target to 1.78 lakh MW by 2017 (including the 78,700 MW of 2011). But during the 11th FYP alone clearances have been granted to 1.82 lakh of just coal based TPPs. This clearly brings out the fact that environemnt and forest clearances are anything but holding up growth or hampering development in the country. In fact clearances are being granted to way more capacities than planned raising a question if too many clearances are being granted.

Source: *Anon, 2012, Public Watch – Coal Mining, Centre for Science and Environment, New Delhi*

C. Key challenges

Wealth generated by the mining sector comes at a substantial development cost, along with environmental damages and economic exclusion of the marginalised. This has been exhaustively documented in India. Almost all of the country's minerals, especially coal, are spread in regions that hold its greenest forests and most abundant river systems. These lands are also largely inhabited by India's poorest and most marginalized people – the scheduled tribes and scheduled castes – who depend on the very same forests, lands and watersheds for their survival. In general, India's major mineral-producing areas are characterized by large forest covers, big tribal populations and a high incidence of poverty and backwardness. Most coal mining areas of the country were also declared as critically polluted by the Indian government in 2010.

1 **Coal and displacement:** Mining leads to involuntary displacement of people which has remained a major concern in India. Of the total displacement due to development projects in India, mining alone has accounted for around 12 per cent and not even 25 per cent of these have been resettled. Over 50 per cent of the people displaced by mining are tribals. Displacement, in addition to economic loss, also causes loss of lifestyle, breaking of the cultural bonds, disruption of traditional systems/ways of lives, etc.[115]

Displacement is a bigger concern for coal mines given the usually big size of operation involved. In 1981, CIL opened an open cast mine in Hazaribagh's Parej area in Jharkhand. Close to 250 ha of land was acquired which affected about 1200 people out of which 500 belonged to the traditional Turi tribe. The community once displaced from Parej, has faced

several displacements. In 1998, expansion of Tata Colliery made them shift home one more time from where they were taken to Premnagar and then the relocation centre. In 1997, the World Bank supported the CIL in expanding 25 of its coal mines in Parej with a loan of USD 530 million. It was only in 2002, when a tribal group wrote to the World Bank which attracted attention and a committee was set up to look into the matter. The committee found over 30 violations of the Bank's guidelines.[116]

Similar stories exist in other coal rich parts of the country. Singrauli colafield at the border of Uttar Pradesh and Madhya Pradesh is a case in point. The Singrauli coal project of Northern Coalfields Limited (NCL) started in 1960s and the World Bank associated itself with the project in 1970s with a support of US $120 million.[117] Displacement was a big issue related to the project. Estimates peg displacement figures as high as 300,000 due to the project. A number of these people had already been displaced once when the Rihand dam was built in the area. The large number of coal mines and thermal power plants in the area have also degraded the environment in the region.

Considering the poor performance of the mining sector in displacement, rehabilitation and resettlement (R&R), the Ministry of Mines has come out with a new Mines and Minerals (Development and Regulation) Bill which has some of best provisions in the world on compenstaion and R&R. The bill has also introduced the concept of profit-sharing with project affected people (see Box 2.5: MMDR Bill, 2011).

2 **Forestland destruction:** In India, there exists fatal overlap with mineral states also having large forests, big tribal populations, high poverty and backwardness. Coal is generally found in the country under forests which creates a huge conflict between the scarce natural recource such as coal and another of forests which maybe extremely difficult or impossible to regenerate.

For example, Korba in Chhattisgarh which produces the maximum amount of coal in the country has about 51 per cent of its area under forests. Angul which is the largest coal producing district in Orissa has 42 per cent of its area under forests while Chatra in Jharkhand (second largest coal producer in the state) has 48 per cent of its area under forests. Coalfields in Tinsukia, Assam and Jaintia Hills, Meghalaya have forest cover of 40 and 64 per cent of their areas. Khammam in Andhra Pradesh has forests on 45 per cent of its geographical area and it also is one of the leading coal producers in the state.[118] This essentially translates into a trade off between coal and forests making a forest and environmental clearance extremely important for coal mines in the country. But there is a major push to dilute the green clerance norms (see Box 2.4).

Box 2.5: MMDR Bill, 2011

The Ministry of Mines had put out a draft of the Mines and Minerals (Development and Regulation) Bill, 2010 (MMDR) in the public domain in June 2010. After this, a Group of Ministers (GoM) was constituted under Shri Pranab Mukherjee, former minister of finance to consider draft MMDR Bill, 2010 and give its recommendations. Post GoM deliberations, Ministry of Mines has now come out with a new MMDR Bill, 2011, which has been placed in the parliament. The bill for the for the first time recognises the rights of the communities and specifies a profit-sharing mechanism. The key provisions of the bill are:

What goes to communities/affected people as per the draft:

- *Sub-section 7 of Section 6 of the draft MMDR Bill, allows state government to makes provision for 'preferential' grant of mineral concession, of small deposits in isolated patches, to cooperative of Schedule Tribes in the Schedule V and VI areas.*
- *Section 21 states that the prospecting licence holder has to pay compensation, as notified, to the person holding occupation rights of the surface of land. There is also a provision under which the prospecting licence holder may have to pay compensation for damage to land as prescribed in the licence.*
- *Section 24 states that the mine leaseholder has to pay compensation, as specified under Section 43, to the person holding occupation, usufruct or traditional rights of the surface of land.*
- *Profit sharing concept has been introduced for the first time in mining law in India under Sub-section 2 of Section 43 of this draft Bill. A mine leaseholder is to pay annually to the District Mineral Foundation (DMF), as specified in Section 56, an amount equal to 26 per cent of profit after tax (for coal) or a sum equivalent to the royalty paid during the year (for major minerals). For minor minerals, the state government is to decide the profit sharing percentage in consultation with the proposed National Mining Regulatory Authority.*
- *Under Section 56, the Bill makes provision for the constitution of a trust called District Mineral Foundation (DMF). This trust is to function as a non-profit body and is to be constituted by the state government. Under Sub-section 4, the functions of the DMF are laid down. The primary function is the distribution of monetary benefit to persons/families affected by mining operations in the district. Sub-section 7 says that the fund collected under the DMF will be utilised for payment of monetary benefits to affected persons holding occupation, usufruct or traditional rights in the concerned area. These payments are to be made quarterly or annually. The provisions gives state government the power to decide the amount of monetary benefits to different categories of project affected people.*
- *Under Sub-section 3 of Section 43, the lease holder (if a company) is also to allot at least one share other than cash to each person of the family affected by mining related operations. These shares are to be non-transferrable.*
- *Sub-section 5 of Section 43 makes provision for the leaseholder to provide employment and or other assistance as per the rehabilitation and rehabilitation package of the state government to people/family holding usufruct, occupation or traditional surface rights of the land over which the lease has been granted.*
- *Under Sub-section 7 of Section 43, after the termination of a mineral concession, the state government is to assess damages to the land, if any, and determine the compensation amount payable by the licencee or leaseholder. This compensation is to be paid to person holding occupation or usufruct or traditional rights of the surface of the land and they are to be consulted in the process of deciding the compensation.*
- *Sub-section 10 of Section 43 lays down the responsibility of identifying affected people with the state. The state government is to identify the directly or indirectly affected families by the mining operations, before the mining operations begin. The state government is also to ensure that monetary benefits are distributed to directly or indirectly affected people. Point (c) adds that the amount payable to the affected people maybe decided based on the extent to which they are affected. This amount, on an average daily basis, is to be not less than at least the daily amount entitled to a person under the Mahatma Gandhi National Rural Employment Guarantee Act, 2005 (MNREGA) as per point (d).*

Rights of communities

- *Notification of public lands for inviting applications to bid for prospecting licence, large area prospecting licence or mining lease is to be done in consultation with the gram sabha or district council in fifth and sixth*

schedule areas according to Sub-section 9 of Section 13. In non-schedule areas, the district panchayats are to be consulted.

- *As per Sub-section 11 of Section 13, the gram sabha or the district council is to be consulted before granting mineral concession for minor minerals in a fifth or sixth schedule area. Under the provision of Sub-section 5 of Section 32, the concerned panchayats are to be consulted by the IBM or the AMD or the State Directorate before approving or disapproving the progressive mine closure plan. This is to be done within a period of ninety days from receipt of the plan.*
- *Sub-section 8 of Section 32 specifies that the final mine closure plan be based on the planned land use for the lease area after its closure. For deciding the planned land use, the concerned panchayats are to be consulted as the central government may prescribe. The concerned panchayats are also to be consulted for suggesting modifications to the mine closure plan before approving it as under Sub-section 10 of Section 32. This is to be carried out within a period of one year.*

For environment protection

- *Under Sub-section 2 of Section 46, the central government is to form a National Sustainable Development Framework (NSDF) in consultation with the state governments. The main function of the NSDF is to facilitate and ensure scientific development and exploration of minerals, protection of environment and prevention and control of pollution. Sub-section 3 of Section 46 makes provision for the formation of a State Sustainable Development Framework (SSDF). The same can be formed only after prior approval of the central government.*

Source: *Chandra Bhushan and Sugandh Juneja, Sharing the Wealth of Minerals, Centre for Science and Environment, New Delhi, pg. 30-36*

3 **Pollution:** Most of the coal mining areas of India figure on the list of its most polluted too. In 2009-10, MoEF and Central Pollution Control Board along with IIT Delhi developed a Comprehensive Environmental Pollution Index (CEPI). Based on CEPI, districts in the country were rated on pollution levels and designated as critically polluted areas (CPAs). A moratorium on new or expansion projects was imposed in such areas but they were removed once the states submitted an action plan to reduce pollution.[119,120] As a result, more coal mines and thermal power plants are again coming up in areas that have already been declared as a CPA (see Table 2.5: Environment Clearances granted in CPAs during 11th FYP).

One such CPA is Singrauli region which includes Sonbhadra district in Uttar Pradesh and Singrauli district in Madhya Pradesh. The area currently has close to 10,000 MW of power generation capacity and 80 MTPA of coal mining and more is set to come in. The area is known to have a number of issues pertaining to coal mining like displacement, pollution, poverty, etc. But a matter of great concern is mercury pollution in Singrauli (see Box 2.6: Mercury in Singrauli).

Coal mining and coal-based industries are also responsible for polluting some of the major rivers of the A number of coalfields are also along important river basins and have created a lot of pollution of rivers. Over 80 per cent of the coal in Jharkhand and

Table 2.5: Environment Clearances granted in CPAs during 11th FYP

District	Coal mining capacity (in MTPA)	Thermal Power capacity (in MW)
Korba	77.6	4220
Angul-Talcher	72.7	5734
Hazaribagh-Chatra	97	4135
Singrauli	48.4	10080
Chandrapur	25.6	7260
Raigarh	19.2	4200
Jharsuguda	16.5	5095

Source: *Anon, 2012, Public Watch – Coal Mining, Centre for Science and Environment, New Delhi*

a substantial portion of the Raniganj coalfields in West Bengal lie within the Damodar river basin.[121] Coal is also found all around the Godavari and its tributaries in Maharashtra and Andhra Pradesh and along the distributaries of the Son in eastern Madhya Pradesh and western Chhattisgarh. Damodar River flowing through the states of Jharkhand and West Bengal covers about 25,000 sq km area. The river passes through many coalfields during its stretch – Karanpura, Bokaro, Ramgarh, Jharia and Raniganj, which produce 60 per cent of India's medium-grade coal. A number of other industries including coal washeries are also present in the area. Damodar also happens to be one of the most polluted rivers in India. MoEF has recognized loss of forests and growth of mining as the main threats to the river.[122]

India also has the dubious distinction of having one of the longest and largest undeground fires in coalfields in the world (see Box 2.7: Jharia Coalfields' Fire).

Box 2.6: Mercury in Singrauli

Mercury is one of the natural components of coal and it vaporises during combustion and is released to the atmosphere. Some of it cools down and condenses while passing through the plant's boiler and air pollution control system and enters the environment through soil and water. It also enters the environment through run-off from coal mines.

Pollution in Singrauli is not new as there have been a number of reports establishing the pollution especially that of mercury. A survey done by Electricite de France International states that Singrauli's thermal power plants release about 720 kg of mercury per year.[123] CPCB estimate stated that "17 percent of power plant mercury emissions are from the Singrauli region".[124] In 1998, the Indian Institute of Toxicology Research (IITR) had also carried out a study involving 1200 people from the Singrauli belt and had found mercury in human blood, soil, water, milk, vegetable, grains, etc.

In 2012, Centre for Science and Environment (CSE) carried out an extensive analysis of environmental and biological samples in Sonbhadra and found very high levels of mercury contamination.[125] Tests revealed presence of an average 34.3 parts per billion (ppb) mercury in the blood samples which is six times the safe limit of 5.8 ppb set by the United States Environment Protection Agency. CSE's lab found more than 57 per cent of human hair samples had an average of 7.39 parts per million (ppm) of mercury. According to Health Canada, less than 6 ppm of mercury in hair is safe. CSE also found mercury in groundwater and surface water samples but not in the treated water supply. There was mercury found in soil and fish as well. The study establishes that mercury from coal-based thermal power plants could turn-out to be a major environmental and health problem for India.

Box 2.7: Jharia Coalfields' Fire

Underground fires in coalfields are known to have great ecological, economic and social impact. These fires may continue for many years, as in the case of Jharia in India, and cause subsidence of the area above. These also contribute towards global emissions and 40 tonnes of mercury being added to the atmosphere every year and three per cent of the world's annual CO_2 emissions.[126]

Jharia is a town located in Dhanbad district of Jharkhand. There are 86 coal mines in the region; Jharia has one of the most important coalfields in India because of its metallurgical grade coal reserves. Air pollution is a major problem in Jharia so much so that the State Pollution Control Board (SPCB) has declared the region as a 'problem area'.[127]

Jharaia is also know for its coal fires. Underground fires have been raging here for several decades. More than 90 years ago, when the first major blaze was reported from Jharia, private entrepreneurs were mining in this area. Left unattended and stoked by relentless mining activity, as many as 70 fires have erupted in Jharia since then. Of these, 60 are widespread. The practice of extraction of thick seams by caving at shallow depths damaged the ground surface in the form of subsidence and formation of pot-holes or cracks reaching up to the surface. This, in turn, increased the chances of spontaneous heating of coal seams leading to mine fires. In addition to jeopardising the safety of people living in the area, these fires have eaten into our precious coal reserves. The 21st report of the business advisory committee to the Parliament presented in 1992 had said that 37 MT of coal has already been burnt in Jharia. The value of the damaged coal comes to Rs 1,000 crore.

Some 150,000 miners, truck drivers, loaders and other workers brave this hazard to make a living in Jharia. The fires have not only consumed a huge amount of India's best coking coal, they have also rendered another 1,864 MT out of bounds. Residents, meanwhile, live in constant fear of a major subsidence that can cause the entire town to collapse. Around 35,000 houses in the town are said to be under "immediate threat". A fierce debate rages among scientists, activists and politicians over the ameliorative course that needs to be taken.

In 1992, the Central government had asserted that the Jharia fires should be controlled so that resources could be exploited. In 2004, the ministry had a different take: it said in Parliament that there is no mine fire below Jharia town and therefore, there is no plan to shift the town. But it added that Jharia town is surrounded by mine fires like Kujama, Lodna, Simlabahal, Ena, and Rajapur and that some of these localities have been identified to be shifted for safety of the persons residing there. As per the Master Plan/Action Plan, there is a plan for shifting 65,300 houses (BCCL houses 36,208, private houses 15,571, encroachers' houses 12,719 and others 802) over a 20-year period.

According to an assessment tabled by the Union ministries of coal and mines in Parliament some years ago, Rs 115 crore hasbeen spent to put out the fires since 1976. The lack of authentic data has also impeded progress on thisfront. Immediately after the nationalisation of mining activities in 1973-74, the government was left without even site maps asprivate operators simply vanished with their working plans. Consequently, though many mines in the Jharia coalfields are considered "accident-prone", neither the Union coal ministry nor CIL possess a comprehensive list of such collieries. According to a retired official of CIL, the DGMS had recommended theclosure of 100 unsafe mines long ago. But even today, 20 per cent of the total coal extracted originates from such danger zones.

4 **Carbon emissions and climate change:** CO_2 emissions is a major concern for the coal sector. Even though India is not required to contain its GHG emissions under the UN Framework Convention on Climate Change, there has been a great international pressure on India to reduce its carbon emissions. In 2008, India announced its National Action Plan on Climate Change under which it agreed to improve energy efficiency, increase renewable energy use and move towards efficient use of coal in thermal power plants and industries.[128] In 2010, under the Cancun Agreement, India pledged to reduce carbon emissions per unit of GDP by 20-25 per cent below 2005 levels by 2020.

In the 2010-11 budget, the Government of India imposed a cess of Rs 50 on per tonne of coal produced domestically and imported.[129] This was done with a view to establish the National Clean Energy Fund (NCEF) under the Ministry of Finance.[130] This non-lapsable fund is to be used for funding research and innovative projects in clean energy technologies. Projects are eligible to receive support in the form of loan or a viability gap funding not exceeding 40 per cent of the total project cost. So far the fund has collected Rs 8,200 crore from this cess.[131] An Inter-Ministerial Group (IMG) has been formed to determine the guidelines, eligibility and appraisal criteria and recommending projects for finance.

The dibursement of money from the NCEF has been under fire. Essentially there is a critique that the NCEF money is being used as an adjunct to the general budget rather than financing clean energy projects. Eighty per cent of the corpus is still unutilised as most of the proposals are rejected or not approved completely due to inelegibility.[132] An estimation by the Delhi-based Centre for Science and Environment show that if all of NCEF is utilised fully for 18 years (2013-2032), it would be more than enough to fund the National Solar Mission which plans to install 22,000 MW of solar energy by 2022. CSE has crticised the use of NCEF for purposes other than renewable energy.[133]

5 **Governance of coal sector:** India's electricity demand is increasing every year and so is the demand for coal. It is also clear that the coal sector, which is dominated by public-sector companies, is not able to meet the rising demand. Coal sector, therefore, will be opened to the private sector for commercial mining in the next few years. But the experience for giving coal mines to the private sector even for the captive use has not been very encouraging. There are allegation of corruption and windfall profits. On the other hand, the environmental and social performance of the coal sector has been quite poor. In such a scenario, there is a urgent need to reform the entire governance structure for the sector. This should include a transparent and accountable system for allocating coal mines, to both private and public sector, based on auctioning, a transparent system for fixing coal prices that takes into account the environmental and social costs, a life-cycle approach to environmental management in coal mines and benefit-sharing with the local community.

SECTION 3
Nuclear Energy

A. Introduction

On September 6, 2008 the 45-nation Nuclear Suppliers Group (NSG) – the cartel that controls the export of nuclear fuel and technologies – allowed India to access civilian nuclear technology and fuel from other countries after a gap of 34 years. India is not a party to the Non Proliferation Treaty (NPT) and therefore, this was a major waiver made by the NSG considering that India is a country with nuclear weapons.

To get this waiver, India mounted one of the most extensive diplomatic exercises in its history. It took more than three years for India to get this deal which included signing of the US-India Civil Nuclear Agreement, amendment of the U.S. domestic law, specially the Atomic Energy Act of 1954, a civil-military nuclear separation plan in India, an India-International Atomic Energy Agency (IAEA) that safeguards the agreement and the exemption for India by the NSG. In the process of achieving this, the incumbent Congress government won a narrow no-confidence vote in the Parliament after the Communist Party of India (Marxist) led Left Front withdrew support showing its opposition to the US-India nuclear deal.

The massive efforts made by India to get the NSG waiver exemplifies two things:

- Firstly, the conviction within the higher echelons of the government that nuclear energy is going to play a major role in assuring the energy security of the country; and,
- Secondly, the inability of India to increase nuclear energy substantially without external fuel and technologies.

India's nuclear energy development, based on indigenous technology and fuel, has not been able to achieve much. With 20 operational reactors, the installed capacity of nuclear energy in India stands at mere 4,780 MW[134] and nuclear power currently contributes just 2.3 per cent of the total electricity generation in the country.[135] There are five more reactor units (including a 500 MW Fast breeder reactor) of 3,300 MW aggregate capacities presently under construction based on indigenous technology, which are likely to be commissioned by the end of 2016.[136] Meanwhile, after achieving the NSG waiver, the Government of India (GoI) has identified a coastal location each in Tamil Nadu, Maharashtra, Gujarat and Andhra Pradesh for setting up large capacity reactors (total 10,000 MW capacity) with foreign collaboration. The first of these projects, the Kudankulam Atomic Power Project, which is based on the light water reactor technology and built with the assistance of the Russian Federation, will be commissioned in 2013.

India is poorly endowed with Uranium. Available Uranium supply can fuel only 10,000 MW of the Pressurised Heavy Water Reactors for 30 years[137] (see Table 3.1: Approximate Potential of Nuclear Energy in India based on Domestic Fuel). Further, India is extracting Uranium from extremely low-grade ores (as low as 0.1 per cent Uranium). This makes Indian nuclear fuel 2-3 times costlier than international supplies, apart from huge waste generation and the concomitant environmental costs.

Table 3.1: Approximate Potential of Nuclear Energy in India based on Domestic Fuel

Particulars	Amount	Thermal Energy		Electricity	
		TWh	GW-yr.	GWe-yr	MWe
Uranium-Metal	61,000-t				
In PHWR		7,992	913	330	10,000
In FBR		1,027,616	117,308	42,200	5,00,000
Thorium-Metal	2,25,000-t				
In Breeders		3,783,886	431,950	1,50,000	Very Large

Source: Anon, 2006, Integrated Energy Policy: Report of the Expert Committee, Planning Commission, New Delhi

However, India has substantial Thorium reserves that can theoretically be used to generate unlimited power. But that requires that the fertile Thorium be converted to fissile material. In this context, the nuclear establishment had envisaged a three-stage nuclear power programme[138]:

- The first stage comprises of Pressurized Heavy Water Reactors (PHWR) fuelled by natural uranium. Natural uranium contains only 0.7% of Uranium235, which undergoes fission to release energy. The remaining 99.3% comprises Uranium238 which is not fissile, but in the fission process, a small quantity of Plutonium239 is formed by transmutation of Uranium238.
- The second stage, comprising of Fast Breeder Reactors (FBRs) is to be fuelled by mixed oxide of Uranium238 and Plutonium239, recovered by reprocessing of the first stage spent fuel. In FBRs, Plutonium239 undergoes fission producing energy, and producing Plutonium239 by transmutation of Uranium238. Thus the FBRs produce energy and fuel, hence termed Breeders. FBRs produce more fuel than they consume. Over a period of time, Plutonium inventory can be built up by feeding Uranium238.
- The third stage envisages development of reactors based on the Uranium233-Thorium232 cycle. Thorium232 is not fissile and needs to be converted to a fissile material, Uranium233, by transmutation in a FBR. In the second stage, once sufficient inventory of Plutonium239 is built up, Thorium232 will be introduced as a blanket material to be converted to Uranium233.

If this programme achieves fruition then India can generate 1,000 GWe electricity for 500 years.[139] But the programme is delayed by more than a decade and questions are being asked about the capability of the nuclear establishment to deliver.

The nuclear energy development, in general, has low social acceptance in the country and has faced stiff public protest everywhere. There are protests against operational Uranium mines in Jaduguda in Jharkhand. Every time there is a proposal to setup new mines, be it in Jharkhand or Andhra Pradesh or Meghalaya, the local community is against opening up of these mines (see Box 3.1: Protests against uranium mines). Similar protest is happening across the country against setting-up of nuclear power plants. The setting up of nuclear power project at Jaitapur in Maharashtra and construction, commissioning and operation of Kudankulam plant in Tamil Nadu, are being opposed vehemently by various sections of the population.

In the last few years, there has been a rising demand for transparency and accountability of the Indian nuclear sector. The secrecy with which India's atomic energy department has conducted itself over the decades and its failure to meet commitments has meant that at best most people are indifferent to the activities of India's nuclear establishment and at worst, there is a suspicion of nuclear energy safety and risks of radiation.

In a speech on 30th March 2011, the Indian Prime Minister Manmohan Singh exhorted his government to strive for "accountability and transparency in the functioning of our nuclear power plants."[140] The Central Information Commission (CIC) recently has directed India's nuclear operator to release two reports that detail the safety assessment systems at the nuclear power plant in Kudankulam. The nuclear establishment's prime contention for withholding the report was that it could "…prejudicially affect the sovereignty and integrity of India, the security, strategic, scientific or economic interests of the state, relation with foreign state or lead to incitement of an offence…" CIC ruled that the Nuclear Power Corporation of India could choose to blank out portions of the report that explicated commercial and strategic aspects of these reactors.[141]

There are also concerns about the economic viability of the nuclear power plants. The Civil Liability for Nuclear Damage Act, 2010 (the Nuclear Liability Act) which was passed by the Indian parliament, is likely to make

nuclear energy more expensive. Unlike other liability regimes adopted by nuclear nations, the Indian law allows those corporations that supply nuclear reactors to be held accountable in the event of a meltdown. This 'right of recourse' has made foreign nuclear corporations nervous.

Though there is strong support for nuclear energy within the government including that from the Prime Minister Manmohan Singh who in 2008 staked the future of his government on passage of the Indo-U.S. civilian nuclear agreement, the future development of nuclear energy in India will not be a smooth sail and will largely depend on the social acceptability and the economic viability of the sector.

B. Status and Future Plan for Nuclear Energy in India

India's nuclear power generation is entirely dependent on natural uranium that fuels the PHWRs and all research projects. Currently, there are 20 operating reactors in the country and six are under construction (see Table 3.2: Nuclear Power Plants in India). Nuclear power currently accounts for a mere 2.3 per cent of the total electricity generation capacity of the country.[142] According to the Integrated Energy Policy 2006, even in the most optimistic scenario, nuclear energy will only contribute about 8-10 per cent of the total electricity generation in the country by 2031-32.[143]

India's nuclear energy ambition is linked to the use of thorium as nuclear fuel. The three-stage approach on nuclear energy developed by the Department of Atomic Energy is moving at a very slow pace.

- The first stage programme of PHWR technology has reached maturity, though much delayed than expected. To bolster the first stage nuclear energy production, India has introduced Light Water Reactor technology (LWRs); the first of which is the setting up of Kudankulam project.
- A 40 MWt Fast Breeder Test Reactor (FBTR) was set-up in 1985 at Kalpakkam to gain experience in the technology under the second stage. It has completed 25 years of operation and has provided enough experience for India to embark upon construction of a 500 MW Prototype Fast Breeder Reactor (PFBR). The Bharatiya Nabhikiya Vidyut Nigam Limited (BHAVINI), a public sector undertaking of the Department of Atomic Energy, is implementing the PFBR project at Kalpakkam likely to be commissioned in 2013.
- Research and development on the utilisation of Thorium is also in progress. The Bhabha Atomic Research Centre (BARC) is engaged in R&D activities to develop an Advanced Heavy Water Reactor of 300 MWe capacity that would provide industrial scale experience necessary for the Thorium-based stage three of India's nuclear power programme.

Box 3.1: Protests against Uranium Mines

There is opposition against Uranium mines at all the proposed and operating sites because of varied reasons ranging from issues related to land acquisition, poor rehabilitation and resettlement to the fear of health and environmental contamination. In Jharkhand, after the horrors of Jaduguda, Uranium Corporation of India Limited (UCIL) has faced stiff resistance everywhere; whether it is Banduhurang, Turamdih or Muhaldih. On February 25, 2004 when a public hearing was organized by the Jharkhand State Pollution Control Board (JSPCB) to get environmental clearance for UCIL's Banduhurang mine, the local community reminded UCIL that it still hadn't given them compensations promised in 1985 when lands were taken away for a uranium mine near Turamdih village. Villagers and environmental activists hounded the officials at the hearing. They demanded to know if the new mine would cause radiation like the ones in Jaduguda and what would they get in compensation. "No uranium without compensation", was the call at the meeting. At the public hearing, the residents of three villages refused to be displaced. However, despite huge opposition of the people, the government cleared the open cast uranium mining at Banduhurang, displacing close to 5,000 people.

UCIL has not been able to open its mine in Domiasiat in Meghalaya as well because of public resistance. The Khasi Hills Autonomous District Council, which decides about the community land, has withdrawn the permission it had given to UCIL for exploring the area. "We cannot allow UCIL to start uranium mining and overlook the health hazard this could cause," says Dino D G Dympep, secretary general of Meghalaya People's Human Right Council, a non-governmental organisation. There are similar stories of protest against Uranium mines from across the country. But despite the opposition of the local communities, uranium mines are being opened.

Source: *http://www.downtoearth.org.in/content/red-alert-nuclear-india as viewed on December 9, 2012*

The government of India aims to supply 25 per cent of electricity from nuclear power by 2050.[144] For this to happen, the thorium-based third stage programme has to start by 2020. If this doesn't begin on time, the programme would turn out to be a colossal waste of national resources.

(AMD) undertakes exploration while the Uranium Corporation of India Ltd (UCIL) carries out all the mining and processing of Uranium. Both these organisations are constituent units of the DAE.

As on 30th June 2011, the AMD has established the

Table 3.2: Nuclear Power Plants in India

Plants	State	Number of readers	Total Capacity (MWe)	Date of commercial operation
Narona	Uttar Pradesh	2	440	Since 1991
Kakrapar	Gujarat	2	440	Since 1993
Tarapur	Maharashtra	4	1400	Since 1969
Kaiga	Karnataka	4	880	Since 2000
Kalpakkam	Tamil Nadu	2	440	Since 1984
Rawatbhata	Rajasthan	6	1180	Since 1973
Nuclear Power Plants Projects (under construction)				
Kudankulam Unit 1 Unit 2	Tamil Nadu	2	2000	Unit 1 - Jan-2013 Unit 2 - Aug-2013
Rawatbhata Unit 1 Unit 2	Rajasthan	2	1400	Unit 7 - Jan-2016 Unit 8 - Dec-2016
Kakrapar Unit 3 Unit 4	Gujarat	2	1400	Unit 3 - Jan-2015 Unit 4 - Aug-2015

Source: *http://www.npcil.nic.in/main/AllProjectOperationDisplay.aspx as viewed on December 7, 2012*

C. Uranium resources, mining and imports

In India, only government-owned companies are allowed to explore and mine Uranium. The Atomic Minerals Directorate for Exploration and Research

presence of 1,71,672 tonnes of Uranium (U3O8) in India.[145] Currently, there are eight operational Uranium mines in the country – seven underground mines (six in Jharkhand and one in Andhra Pradesh) and one open pit mine in Jharkhand (see Table 3.3: Operational and Upcoming Uranium Mines in India and Figure 3.1: Uranium Deposits and Mines in India).

Figure 3.1: Uranium Deposits and Mines in India

Source: http://www.world-nuclear.org/info/inf53.html as viewed on December 8, 2012

Table 3.3: Operational and Upcoming Uranium Mines in India

State	District	Mines	Mill	Date of Commission	Production Capacity (tonnes of uranium/year
Underground mines					
Jharkhand	East & West Singhbhum	Jaduguda Bhatin Narwapahar Bagjata Turamdih	Jaduguda Jaduguda Jaduguda Jaduguda Turamdih	1968 1987 1995 2003 2008	200 total from mill 190 total from mill
		Open cast mines			
		Banduhurang	Turamdih	2009	
		Underground mines			
	Saraikela-kharswan	Mohuldih	Turamdih	2012	
Upcoming mines					
Andhra Pradesh	Cuddapah	Tummalapelle Uranium Project	Tummala-pelle	Expected commissioning 2012	220
	Nalgonda	Lambapur Uranium Project	Seripally/ Mallapuram	Pre-project activities are in progress	130
Meghalaya	Killing & Rangam in West Khasi Hills	Kyelleng Pyndengsohing, Mawtahbah (KPM) Uranium Project	Mawthabah	Pre-project activities are in progress	340
Karnataka	Yadgir	Gogi	Diggi / Saidpur	Expected commissioning 2015	130

Source: a. http://www.ucil.gov.in/web/operetions_of_ucil.html as viewed on December 9, 2012, b. http://www.world-nuclear.org/info/inf53.html as viewed on December 9, 2012

The first Uranium deposit was discovered in 1951 at Jaduguda in Singhbhum Thrust Belt in Jharkhand and the mining and processing industry for uranium in the country began in 1968. Till 2005, almost all Uranium in India was produced from the mines in and around Jaduguda. Jaduguda has been enshrined in the collective consciousness of India because of the terrible health and environmental impact this mine has had on the indigenous Santhali and Ho tribals of East Singhbhum district (see Box 3.2: The Story of Jaduguda). In 2004-05, the government cleared proposals to open new mines in Jharkhand at Banduhurang, Bagjata and Mohuldih; in Meghalaya at Domiasiat-Mawthabah (with a mill) and in Andhra Pradesh at Lambapur-Peddagattu in Nalgonda district. Further in August 2007 the government approved a new underground mine and mill at Tummalapalle near Pulivendula in Kadapa district of Andhra Pradesh. The status of these mines is as follows:

- In Jharkhand, Banduhurang was commissioned in 2007 as India's first open cut mine; Bagjata, an underground mine was opened in December 2008 and Mohuldih underground mine was commissioned in 2012. A new mill at Turamdih serving these mines was commissioned in 2008.
- In Andhra Pradesh the northern Lambapur-Peddagattu project in Nalgonda district has obtained all clearances, including environmental clearance, for one open cut and three small underground mines but has not been able to start construction due to huge local opposition. The Tummalapalle project was opened in April 2012.
- In Meghalaya, close to the Bangladesh border in the West Khasi Hills, the Domiasiat-Mawthabah mine project (near Nongbah-Jynrin) despite obtaining all clearances, has not commenced any construction activities because of longstanding local opposition.

Box 3.2: The Story of Jaduguda

Uranium is a radioactive material and can cause radiation-induced diseases including cancers to people exposed to ionising radiation. Radiation from uranium mining is released to the environment through dust as well as through wastewater discharged from the tailing ponds. The tailing pond itself can be a source of radiation and can cause contamination of groundwater. Uranium mining also releases radon, a radioactive gas of natural origin. Radon is found everywhere in the earth's atmosphere, but has low reactivity when it occurs by itself. But in the process of mining, exposure to it causes bronchial and lung cancer.

Uranium miners also face many non-radiation-related hazards. Soluble uranium affects the kidneys if ingested or inhaled because of its chemical toxicity as a heavy metal. The ore in which uranium is found also contains non-radioactive toxic heavy metals. These vary from site to site but may include arsenic, lead, molybdenum, and manganese. These metals can contaminate the environment and affects people's health. The health impacts due to uranium mining in Jaduguda in East Singhbhum region of Jharkhand have been devastating – ranging from respiratory diseases to reproductive disorders.

UCIL commenced operations in Jaduguda in 1967 and houses a processing plant that at one time supplied uranium to all of India's nuclear reactors. Along with Jaduguda, there are two other mines at Narwapahar and Bhatin. These are underground mines and the mine workforce works 1,600-2,000 feet below the surface. It takes more than 1,000 metric tonne of ore to get two metric tonne of uranium (to obtain a typical uranium concentration of 0.2 per cent). More than 998 tonne of waste is generated in the process. This waste, or mill tailings, contains 85 per cent of the radioactivity in the original ore along with heavy metals and chemical toxic materials.

Jaduguda exports yellowcake (U3O8) to the Nuclear Fuel Complex (NFC) in Hyderabad, more than a thousand km away in southern India, for fabrication into fuel rods. Waste from the NFC plant, as well as nuclear wastes from other parts of India, are then returned by road and rail to Jaduguda and thrown into tailings ponds along with mill tailings; these ponds are adjacent to tribal villages.

A survey and scientific testing of samples from the soil and water in and around the Jaduguda mines by Hiroaki Koide of Kyoto University's Research Reactor Institute in July 2002, found high radioactivity. The permissible limit for radiation exposure by any 'artificial factor' is one millisievert per year (mSv/y), or 0.11 microSv/hour. In Jaduguda, there are places where the external gamma dose by only the 'natural factor' exceeds this limit. The most dangerous source of contamination lies in tailings ponds, and here the amount of air-gamma dose exceeds 10 mSv/y (1.1 microSv/h). The same study found high uranium contamination in the areas around the tailings pond and the stream that carries the tailings water to the Subernarekha. Similarly, roads on which trucks carry ore to the mill and the railway station at the Rakha Mines had exceptionally high uranium contamination.

According to the 1998 health survey of seven villages within one km of the tailings dams, organized by the Jharkhandi Organization Against Radiation (JOAR) in conjunction with BIRSA, the Bindrai Institute for Research, Study and Action found out that 47% of the women reported disruptions to their menstrual cycle, and 18 per cent said they had suffered miscarriages or given birth to stillborn babies in the last five years; 30 per cent reported some sort of fertility problem. Nearly all women complained of fatigue, weakness and depression. Overall, the survey found a high incidence of chronic skin diseases, cancers, TB, bone and brain damage, kidney damage, nervous system disorders, congenital deformities, nausea, blood disorders and other chronic diseases. Many other organizations conducted similar studies and found out high uranium contamination in the water bodies.

Another survey of four villages, two in the vicinity of Jaduguda (where a similar plant has been in operation for many years) and two villages some distance away from the plant, conducted by the Gujarat-based Sampoorna Kranti Vidyalaya Vedchhi (SKVV), found that the number of infants born with genetic disorders was six times higher than normal. Of the 70 such cases reported, 60 were born with congenital deformities in villages close to the uranium plant, whereas 10 were born in non-affected areas. Moreover, 16 out of the 60 were mentally retarded, compared to one in other areas. Cases of infants born with polydactyl (extra fingers or toes) and synductyl (fused or missing fingers and toes) are also common in the affected areas.

In September 2000, the Supreme Court admitted a petition submitted by the JOAR, seeking direction to the Centre and Uranium Corporation of India Limited to take stringent safety measures at Jaduguda. However, the petition was dismissed in April 2004. In its judgment, the Court held that in view of an affidavit filed by the Atomic Energy Commission chairperson that adequate steps have been taken to check and control radiation arising out of uranium waste, the Court did not see any merit in the petition.

Source: *Chandra Bhushan et al, 2008, Rich Lands, Poor People – Is 'Sustainable' mining possible?, Centre for Science and Environment, New Delhi, pg. 184-186*

Uranium import

The domestic production of uranium is not sufficient to meet the requirements for even the existing reactors. India, therefore, is going to import an increasing proportion of its uranium fuel needs in the future.

India has signed contracts with companies in Russia, France and Kazakhstan to supply uranium. In September 2009 India signed uranium supply and nuclear cooperation agreements with Namibia and Mongolia. In March 2010 Russia offered India a stake in the Elkon uranium mining development in its Sakha Republic and agreed on a joint venture with ARMZ Uranium Holding Co.[146] From the year 2008-09, India has started receiving uranium from Areva, France (see Table 3.4: Uranium Imports by India). In an answer given to the Indian parliament, the Department of Atomic Energy disclosed that the imported uranium is being used to fuel 10 reactors.[147]

Table 3.4: Uranium Imports by India

Firm/Country	Total Quantity ordered (in MT)	Quantity received so far (in MT)				
		2008-09	2009-10	2010-11	2011-12	2012-13
M/s. AREVA, France	300*	60.49*	239.38*	Nil	Nil	Nil
M/s. TVEL Corporation, Russia	2000**	Nil	150.33	179.79	296.08	59.43
	58@	Nil	58.29	Nil	Nil	Nil
M/s. NAC Kazatomprom Kazakhstan	2100*	Nil	Nil	600	350	Nil

Notes: * Natural Uranium Ore Concentrate; ** Natural Uranium Di-oxide Pellets; @ Enriched Uranium Di-oxide Pellets

Source: http://www.idsa.in/system/files/ParliamentQAonNuclearIssues2012.pdf as viewed on December 10, 2012

D. The Regulatory Framework

1 **The Mines and Minerals (Development & Regulation) Act, 1957:** The MMDR Act and rules made under it like the Mineral Concession Rules, 1960 and the Mineral Conservation and Development Rules, 1988 are the key legislations governing mining of minerals, including atomic minerals, in the country. These acts and rules have provisions for land acquisition, compensation and rehabilitation and resettlement. They also have provisions for environment preservation and protection while carrying out mining operations.[148]

2 **The Atomic Energy Act, 1962:** It is the premier act for the development, control and use of atomic energy in India. It is under this act that most rules related to the mining of uranium like the Atomic Energy (working of the Mines Minerals and Handling of Energy (working of the Mines, Minerals and Handling of Prescribed Substance) Rules, 1984 have been framed. The Act gives power to the central government to produce, develop, use and dispose atomic energy as it deems fit. It gives the central government control over mining of uranium and thorium. The act also provides provision for safety and safe disposal of radioactive materials and wastes.

3 **The Atomic Energy (working of the Mines Minerals and Handling of Energy (working of the Mines, Minerals and Handling of Prescribed Substance) Rules, 1984:** These rules specify the process of obtaining license and provisions for undertaking mining, milling, processing and/or handling of atomic minerals and materials. The rules also specify that adequate protection is provided at all time to safeguard the health and safety of the employees; regular radiation monitoring of the installation as well as of radiation workers is carried out and their records maintained; adequate precautions are taken to prevent environmental pollution due to the operation of the installation.

4 **The Environmental Protection Act, 1986:** This is the premier act for environmental protection in the country. The act imposes certain restrictions and prohibitions on new projects or activities and on the expansion or modernization of existing projects or activities based on their potential environmental impacts and requires these projects to go through Environmental Impact Assessment (EIA). The EIA notification, 2006 issued under this act requires all atomic mineral mines of more than 50 ha lease area to undertake EIA and obtain environment clearance from the central government. All nuclear power projects and processing of nuclear fuel also have to undertake EIA and clearance from MoEF.

In case of mining proposals involving diversion of forestland for non-forest purpose, forestry clearance

under the provisions of the Forest (Conservation) Act, 1980 is also mandatory besides the environmental clearance. No site clearance is required for carrying out test drilling for prospecting and exploration purpose on a scale not exceeding 10 bore holes per 100 sq km.

5 **Other acts, rules and regulations:** The other legislations related to radiological and non-radiological aspects of atomic minerals mining includes:

- Atomic Energy (Safe Disposal of Radioactive Wastes) Rules, 1987
- Atomic Energy (Radiation Protection) Rules, 2004
- Mines Creche Rules, 1996
- The Mines Rescue Rules, 1985.

E. Nuclear Energy Development and Regulatory Agencies

The separation between atomic energy development and regulatory agencies is India is rather ambiguous. The atomic energy regulatory agency reports to the Atomic Energy Commission, which is also involved in promoting atomic energy in the country. There has been a rising demand for an independent regulatory agency. A bill on constitution of an independent Nuclear Safety Regulatory Authority is currently awaiting the nod of the parliament.[149]

1 **The Atomic Energy Commission (AEC):** AEC, set up in 1948, is the apex body of the Government of India for atomic energy and reports directly to the Prime Minister. AEC has executive and financial powers and has powers of the GoI within the limits of approved budget provision. AEC provides direction on policies related to atomic energy. The members of AEC include, among others, some eminent scientists and technocrats, secretaries of different ministries and senior-most officials from the office of the Prime Minister.

2 **The Department of Atomic Energy (DAE):** DAE was set-up in 1954 under the direct charge of the Prime Minister through a Presidential Order. DAE carries out the development and implementation of AEC directions in nuclear power, related nuclear fuel cycle activities and R&D activities.

DAE is divided into four major sectors, viz. R&D sector, industrial sector, public sector undertakings and services and support sector. It is engaged in the design, construction and operation of nuclear power/ research reactors and the supporting nuclear fuel cycle technologies covering exploration, mining and processing of nuclear minerals, production of heavy water, nuclear fuel fabrication, fuel reprocessing and nuclear waste management. DAE comprises of five research centres, three industrial organizations, five public sector undertakings and three service organizations. It has under its aegis two boards for promoting and funding research in nuclear and allied fields, mathematics, and a national institute (deemed university). It also supports seven institutes engaged in research in basic sciences, astronomy, astrophysics, cancer research and education.

3 **Nuclear Power Corporation of India Limited (NPCIL):** NPCIL is a public sector enterprise under the administrative control of the DAE. The Company was registered as a Public Limited Company under the Companies Act, 1956 in September 1987 with the objective of operating atomic power stations and implementing atomic power projects for generation of electricity in pursuance of the schemes and programmes of the GoI under the Atomic Energy Act, 1962. NPCIL has also equity participation in BHAVINI, an organization formed for implementation for FBR programme in the country.

4 **Uranium Corporation of India Ltd (UCIL):** UCIL is a public sector enterprise under the administrative control of the DAE to mine and process uranium ore in the country.

5 **Atomic Energy Regulatory Board (AERB):** AERB, set up in 1983, is the national regulatory body having powers to frame safety policies, lay down safety standards & requirements and powers to monitor & enforce safety provisions in nuclear and radiation installations and practices. AERB reports to the Atomic Energy Commission. The regulatory authority of AERB is derived from the rules and notifications promulgated under the Atomic Energy Act and the Environment (Protection) Act, 1986.

SECTION 4
Renewable Energy in India

A. Introduction

GHG emissions associated with the provision of energy services are a major cause of climate change. The long-term baseline scenarios reviewed for the Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC) show that the expected decrease in the energy intensity of the global GDP will not be able to compensate for the effects of the projected increase in the GHG emissions due to strong increase in primary energy supply throughout this century.[150] In such a scenario, renewable energy (RE) technologies are key for lowering GHG emissions from the energy system, while still providing desired energy services.

RE technologies are diverse and can serve the full range of energy service needs. Various types of RE can supply electricity, thermal energy and mechanical energy, as well as produce fuels that are able to satisfy multiple energy service needs. Unlike fossil fuels, most RE sources produce little or no GHG emissions. However, the scale of deployment of RE technologies will heavily depend on economics and technology innovation and dissemination. Also, the relative environmental (other than climate change) and social impacts of RE technologies will determine their respective scale of deployment.

Globally, it is estimated that RE accounted for 12.9 per cent of the total 492 Exajoule (EJ) of primary energy supply in 2008. The largest RE contributor was biomass (10.2 per cent), with the majority (roughly 60 per cent) of the biomass fuel used in traditional cooking and heating applications in developing countries but with rapidly increasing use of modern biomass as well. Hydropower represented 2.3 per cent, whereas other RE sources accounted for 0.4 per cent. In 2008, RE contributed approximately 19 per cent of global electricity supply (16 per cent hydropower, 3 per cent other RE).[151]

In India, about 37.1 per cent of the primary supply in 2011-12 was from RE. Out of this, 33.9 per cent was biomass, 2.2 per cent hydropower and other RE technologies (mainly wind power) contributed 1.0 per cent.[152] In 2011-12, 19.6 per cent of the electricity supplied in the country was from RE sources (14.1 per cent hydropower and 5.5 per cent other RE sources).[153] Compared to the global average, India has proportionately higher usage of RE; both as primary energy and in electricity mix. What is also interesting to note is that the use of new RE technologies (especially wind and solar) for electricity generation in India is almost double the global average.

The installation of grid-connected renewable energy (excluding large hydropower) in India has grown at an annual rate of about 25 per cent in the last 10 years, rising from about 3.5 gigawatts (GW) in March 2002 to 24.5 GW in March 2012.[154] As of March 2012, the contribution of RE (excluding large hydropower) in total power generation capacity was 12.26 per cent.[155] The 51.226 billion kWh electricity generated from these in 2011-12 was equivalent to the annual electricity requirement of about 60 million people in India.[156]

Wind energy dominates India's renewable energy industry, accounting for 70 per cent of installed capacity for producing electricity. It is followed by small hydropower, biomass power and solar power (see Table 4.1: Installed Capacity of Renewable Energy in India).

Table 4.1: Installed Capacity of Renewable Energy in India

	Installed capacity (in MW) as on 31.10.2012
Wind Power	18274.80
Small Hydro Power	3451.49
Biomass Power	3401.83
Bagasse Co-generation	2175.23
Waste to Power	93.68
Solar Power	1045.16
Total	**26266.96**

Source: *http://www.mnre.gov.in/mission-and-vision-2/achievements/ as viewed on December 10, 2012*

India has set a goal of achieving 15 per cent of grid electricity purchase from renewable energy (excluding large hydropower) by March 2020. During the 12th Five Year Plan (2012-2017), the ministry of new and renewable energy (MNRE) – the nodal policy making and implementation agency for renewable energy in the country – has set a target of installing 30,000 MW of RE (10,000 MW of solar energy, 15,000 MW of wind energy, 2,000 MW of small hydropower plants and 3,000 MW of biomass-based power plants).[157] It is expected that by March 2017, the percentage share of RE (excluding large hydropower) in total generation capacity will increase to 17.12 per cent.

B. Renewable Energy Potential

India has vast renewable energy potential (see Box 4.1: What is Renewable Energy?). In general, the potential of renewable energy in India can be visualised by the fact that setting-up of solar energy plant over 0.75 per cent of India's geographical area would be sufficient to generate the total electricity produced in the country currently. However, India's renewable power potential estimates have not been revised since early 1980s. As per the initial estimates, India has an estimated renewable energy potential of about 80 GW from commercially exploitable sources: wind – 45 GW, small hydro – 15 GW and biomass – 17 GW.[158] In addition, India receives a solar radiation sufficient to generate 35 MW/km2 using solar photovoltaic and solar thermal energy.

Over the period with technological advancements, renewable power potential has changed. There are a number of studies that indicate that India's renewable energy potential is far higher than what has been officially estimated. Lawrence Berkeley National Laboratory, USA, for instance, has estimated that even without using farm and forestland the wind power potential in India would be around 600-1000 GW.[159] Renewable power potential estimates, therefore, require revalidation and re-estimation in India to give impetus to the development of the sector.

Box 4.1: What is Renewable Energy?

What is renewable energy is a matter of debate in India, not because of any difference in scientific opinion, but because of how different renewable energy sources are handled by different ministries/departments in the government. In India, hydropower was historically handled by Ministry of Power. In the year 1992, however, the Ministry of Non-conventional Energy Sources was established (renamed as Ministry of New and Renewable Energy or MNRE in 2006). This ministry was given the responsibility of handling all renewable energy sources including small hydropower but excluding large hydropower projects. Since then, all the statistics on renewable energy in India exclude large hydropower projects. If large hydropower is included than as of 31.10.2012, about 31 per cent of total electricity generation capacity in India was contributed by renewable energy.

Source: *Anon, 2012, Monthly Generation Report - Renewable Energy Sources 2012-13, Central Electricity Authority, Government of India*

C. Regulatory Framework

The renewable power sector in India has grown in the last 10 years because of few key policies and a comprehensive regulatory framework. It could have grown even more, had these policies and regulations been implemented uniformly and strictly across the country. The following are the key statutes/policies regulating/promoting renewable energy in India:

1 **Electricity Act, 2003:** This act mandates State Electricity Regulatory Commissions (SERCs) to (i) promote co-generation and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person, and (ii) fix certain minimum percentages for purchase of renewable power (Renewable Purchase Obligations or RPOs) in the area of each distribution licensee.

2 **The Tariff Policy, 2006:** The policy requires fixation by SERCs of a minimum percentage for purchase of energy from renewable sources taking into account availability of renewable energy resources in the region and its impact on retail tariffs and procurement by distribution companies at preferential tariffs determined by the SERCs. Such procurement for future requirements shall be done, as far as possible, through competitive bidding within suppliers offering energy from same type of renewable energy sources, and in the long-term, these technologies would need to compete with other sources in terms of full costs.

3 **National Action Plan on Climate Change, 2008:** The action plan suggests setting of national renewable purchase obligation/standard. It suggests that starting 2009-10, the national renewables standard may be set at five per cent of total grids purchase, to increase by one per cent each year for 10 years. SERCs may set higher percentages than this minimum at each point in time. This means that by March 2020, the national renewable purchase standard should be 15 per cent of total grid electricity in the country.

4 **Renewable Energy Certificate, 2010:** Terms and conditions for recognition and issuance of Renewable Energy Certificates (REC) were notified in January 2010. REC seeks to address the mismatch between availability of renewable sources and the requirement of the obligated entities to meet their RPO. It allows certificate holders to sell renewable electricity at non-preferential tariff and sell the environmental attribute of renewable electricity through energy exchange to entities with RPOs.

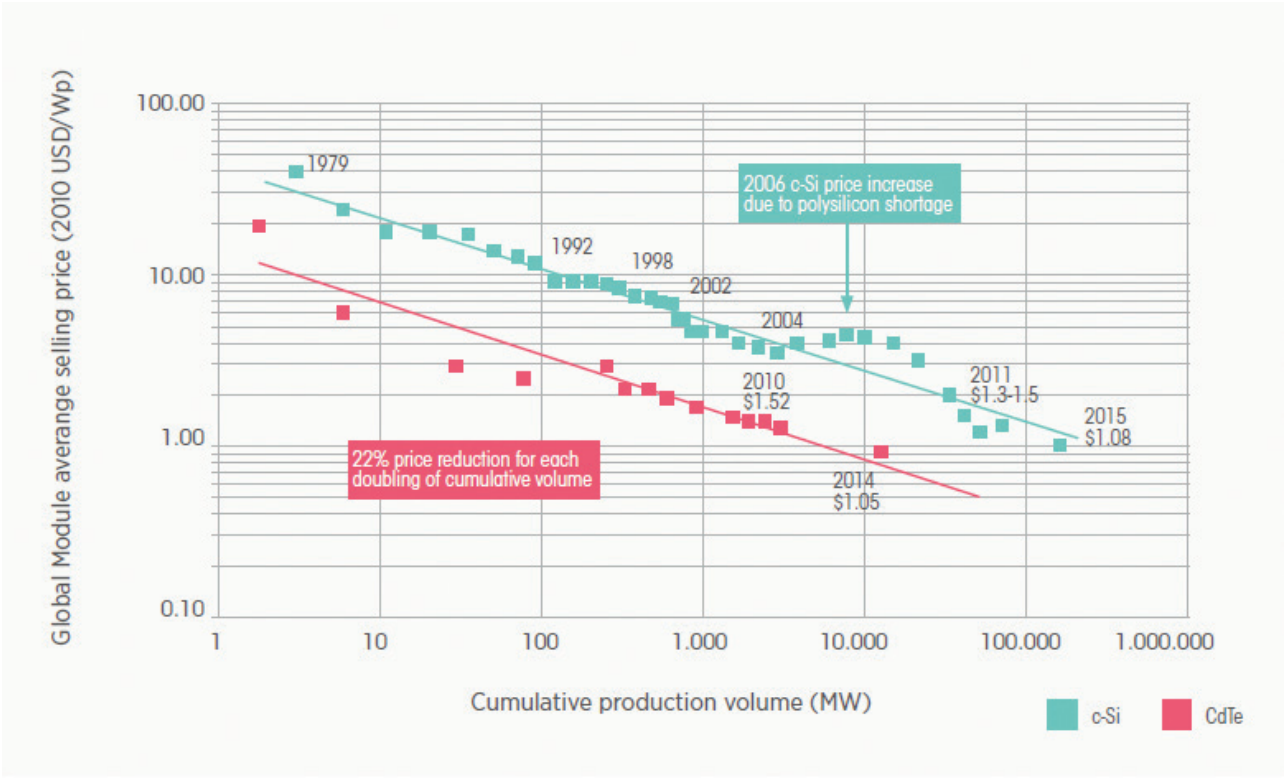
D. Key Challenges

1 **Making renewable energy equitable:** In India, more than 700 million people rely on biomass resources as their primary fuel for cooking and heating.[160] Over 77 million households (about one-third of the total households on the country) depend on kerosene for lighting.[161] Inefficient cooking and lighting have serious adverse consequences for health, the environment and economic development. The question is how do we move these vast number of people, who currently have a very small carbon footprint, to clean and affordable energy. One option is to provide them with modern cooking fuels and electricity technologies, which is fossil fuel based. This has been successfully done across the world, saving lives and boosting economic growth and human development. But this will lead to huge increase in GHG emissions, threatening the very survival of humanity on the planet.

The other option is to leapfrog to more efficient and sustainable use of traditional biomass and renewable electricity technologies. In this option, however, we will be asking the poorest to use and pay for the most expensive energy sources. This is inequitable. The most important challenge of RE in India and in most developing countries is, therefore, how to make it affordable and equitable for the poor.

2 **Funding large-scale deployment for the rest:** The levelized cost of energy for many RE technologies is currently higher than existing energy prices, though in various settings RE is already economically competitive.[162] However, technological developments are reducing the cost of renewable generation. For instance, for each doubling of cumulative volume of solar photovoltaic (PV) installation, prices have reduced by 22 per cent per watt peak (see Figure 4.1: The Global PV Module Price Learning Curve 1979 – 2015).

Figure 4.1: The Global PV Module Price Learning Curve 1979 – 2015



How to fund large-scale renewable power installation in India without compromising the agenda of energy access on one hand, and without increasing the cost of energy for development, is another key challenge.

3 **Getting the policy right:** In short to medium-term, renewable energy deployment will depend on public subsidy. How to use this subsidy effectively, efficiently and equitably remains one of the key challenges for RE development in India. The focus of the RE policy in India, as explained in the subsequent sections, has been to increase the installed capacity of RE technologies. This has led to inefficiency and ineffective use of subsidies. Also, the focus has shifted from energy access and human development towards feeding the electricity to the common grid. This puts a big question mark on the 'equity' dimension of the policies being implemented currently. India is also not investing enough in R&D and in developing the domestic capability for manufacturing and deployment of renewable energy. This might prove to be a big hindrance in the future.

4 **Managing the environmental and social externalities:** Large-scale grid-connected renewable energy projects require a lot of land. Land in India is scarce and heavily contested and therefore, minimizing land usage along with allowing the local communities to benefit from land transfer is key for managing the social externalities.

On the other hand, there are no specific environmental norms for renewable energy projects in India. Most are also exempted from the Environmental Impact Assessment (EIA) procedure. In recent times there have been a great deal of criticism of wind power projects for destroying forest ecology in many parts of India. There are also concerns regarding large solar energy parks that can impact the local water resources and biodiversity. Similarly, there are major concerns regarding the disposal of hazardous materials from the solar energy projects. Development of environmental norms for large-scale renewable energy project is, therefore, key for managing the environmental externalities.

To understand these challenges, the next two sub-sections focus on solar and wind energy to bring out the nuances of renewable energy development in India.

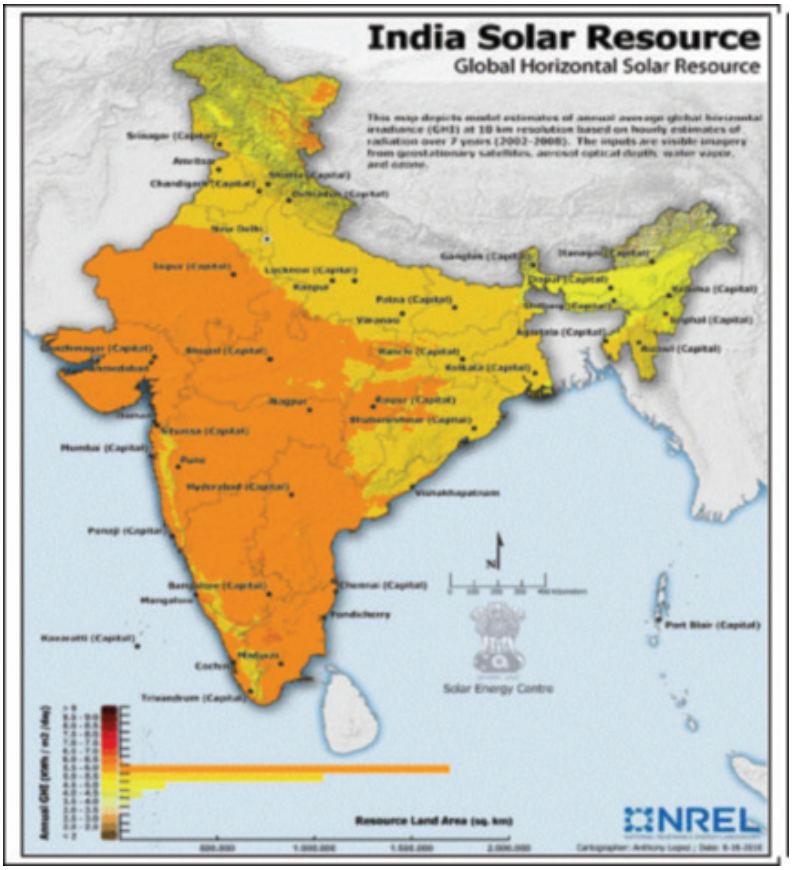
SECTION 4.1
Solar power in India

A. Introduction

In the beginning of 2010, India had less than 20 MW of grid-connected solar power projects; by October 2012, this has exceed the 1 GW mark – 1,027 MW of solar capacity has been commissioned in the country within just two years.[163] This makes solar energy the fastest growing energy sector in the country. If everything goes as per the plan, then by the end of 2014, India will have 2.5 GW worth of grid-connected solar power. This will be sufficient to meet the basic electricity need of about five million households.

India is endowed with abundant solar energy, which is capable of producing 5,000 trillion kW of clean energy. The country on an average has around 300 sunny days in a year and solar insolation of 4-7 kWh/m2/day (see Figure 4.1.1: India's Solar Potential). If this energy is harnessed efficiently, it can will go a long way in reducing India's energy deficit and mitigate carbon emissions.

Figure 4.1.1: India's Solar Potential



Source: MNRE

In January 2010, India launched the Jawaharlal Nehru National Solar Mission (JNNSM) – as part of the National Action Plan on Climate Change – to upscale the solar power generation in the country. The Mission aims at achieving 22 GW of installed solar capacity by 2022 – 20 GW grid-connected and 2 GW small off-grid applications. The JNNSM also aims at creating a strong solar technology-manufacturing base in India. Many states in India too have recognised and identified solar energy potential and have initiated state-level programmes to install grid-connected solar energy projects.

In India, off-grid solar application – to provide electricity to households and businesses in areas where grid has not reached – has much longer history than grid-connected solar power. Since the 1990s, the Ministry of New and Renewable Energy (MNRE) has been supporting the installation of solar home lighting systems and street lighting systems across India. There are also commercial enterprises, social entrepreneurs and NGOs that are involved in providing off-grid solar solutions. But they remain a small player in the larger energy architecture of the country, as their business models are not getting scaled-up. Also, unlike grid-connected solar power, the government programmes on off-grid applications lack vision and ambition (see Box 4.1.5:India's Off-grid Solar Programme: Where is it headed?).

Despite a rapid start of the grid-connected solar programme and a long experience of implementing the off-grid programme, solar energy in India faces a host of challenges which include issues related to institutional structure and processes for a transparent, vibrant and competitive solar sector to issues related to land and community rights and most importantly issues related to funding the solar energy which is significantly more expensive than other energy sources.

B. Grid-connected Solar Programme

1 **The Jawaharlal Nehru National Solar Mission (JNNSM):** The JNNSM was the first programme in India to support megawatt-scale grid-connected solar power projects. JNNSM was launched with the objective of making solar power affordable through its increased use and manufacturing. The ambitious Mission aims for 22,000 MW of installed solar capacity by 2022. It is divided into three phases, which are further subdivided into batches. The first phase extends from 2010 till 2013, with the aim of installing at least 1,000 MW of grid-connected solar capacity. The second phase is from 2013 till 2017, and the third from 2017 to 2022 (see Table 4.1.1: Phase-wise Goals of JNNSM).

Table 4.1.1: Phase-wise goals of JNNSM

Application segmet	Target for Phase 1 (2010-13)	Target for Phase 2 (2013-17)	Target for Phase 1 (2017-22)
Solar collectors	7 million sq m	15 million sq m	20 million sq m
Off-grid solar applications	200 MW	1000 MW	2000 MW
Utility grid power, including roof top	1000-2000 MW	4000-10000 MW	20000 MW

Source: india.gov.in/allimpfrms/alldocs/15657.pdf as viewed on December 6, 2012

The first phase has been split into two batches; the aim is to allow the second batch to learn from the first. Under the first batch of the first phase, concentrated solar power (CSP) or solar thermal projects totaling 470 MW and solar PV projects worth 150 MW were auctioned in November 2010. Under the second batch, 350 MW of solar PV projects were auctioned in December 2011.

Institutions involved

The JNNSM's policy for large-scale grid-connected solar power has been formulated by MNRE. The contracting, buying and selling of solar power, however, is handled by a nodal agency, as assigned by the Union Ministry of Power (MoP). Currently, this nodal agency is the National Thermal Power Corporation's Vidyut Vyapar Nigam (NVVN). The NVVN is also the monitoring agency for assuring that contracts are fulfilled. Ground level monitoring, however, is done by state nodal agencies. Recently, the MNRE has set up the Solar Energy Corporation of India (SECI), which is slated to take over the supervision of implementation and execution of the Solar Mission (see Box 4.1.1: The Solar Energy Corporation of India).

Box 4.1.1: The Solar Energy Corporation of India

The Ministry of New and Renewable Energy (MNRE) has set up a private limited company – Solar Energy Corporation of India (SECI) – to take over the supervision of the implementation and execution of the National Solar Mission. Today, the authorised capital of SECI is stated to be Rs 2,000 crore and its subscribed capital Rs 600 crore with a total number of 10 lakh equity shares. Several officials of the MNRE are directors or nominated directors in the company.

Despite being incorporated almost a year back, there is still no clarity on exactly what functions and specific responsibilities will the company fulfill. When a separate entity to govern solar energy in the country was envisioned a few years back, there were talks of an autonomous commission on the lines of the Atomic Energy Commission. However, what finally emerged was something absolutely different; a company incorporated under section 25 of the Companies Act, 1956, with no specific responsibilities.

Implementation

In the first phase, two innovative policies were used to bring down the cost of solar power and make it affordable: bundling and reverse bidding.

To minimise direct government subsidy, solar power was bundled with coal power and sold to the distribution companies (discoms). For the first phase 1,000 MW of coal power produced by the NTPC Limited – the public sector utility – was bundled with 1,000 MW of solar power. As every MW of coal produces four times more electricity than solar power plants, four units of coal power was bundled with one unit of solar power and sold to state utilities and other consumers for Rs 5.50 per kWh. Though this is costlier than what discoms spend on buying electricity, they are legally bound to source at least 0.25 per cent of their electricity from solar as part of their RPO (see Box 4.1.2: Solar RPO).

Reverse bidding was used to select companies for implementing grid-connected solar power projects. Before the bidding began, the Central Electricity Regulatory Commission (CERC) calculated a benchmark tariff of Rs 17.91/kWh for solar PV projects, giving the approximate costs and reasonable rate of return on the investment (this was reduced to Rs 15.39/kWh for the second batch for solar PV). Each project proponent who cleared the eligibility criteria was asked to give a closing bid – a discount on the benchmark tariff. The lowest bidders got the contract.

In the first batch, each company was allowed to bid for only 5 MW (for PV) and 100 MW (for solar thermal) projects; the aim was to increase the number of players in the market. In the second batch, where only solar PV was auctioned, each company could bid for up to 50 MW.

In the first batch, approximately 300 companies participated in the bidding process for solar PV projects; 30 applications were accepted. Average tariff for selected Solar PV projects was 32 per cent lower than the CERC approved benchmark tariff. In the bidding for the second batch, around 130 companies bid for solar PV projects; 22 were successful. The average tariff was 43 per cent lower than the benchmark tariff approved by CERC. In other words, reverse bidding did bring down the cost of solar power significantly (see Table 4.1.2: Reduction in Solar Energy Tariff under JNNSM). At the same time, evidence of corporate malpractices also emerged during the first phase (see Box 4.1.3: Solar Scam).

Box 4.1.2: Solar RPO

As per the provisions under Section 86(1)(e) of the Electricity Act 2003 and notified Tariff Policy, to encourage the development of solar power across the states, State Electricity Regulatory Commission (SERCs) have to specify solar Renewable Purchase Obligations (RPO) targets in their states and have to notify RPO regulations and to ensure its compliance. National Action Plan on Climate Change and the notified Tariff Policy, envisage increasing trajectory of solar RPO from 0.25 per cent by 2013 to three per cent by 2022. However, many states are yet to notify long-term solar RPO trajectory as envisaged under the Tariff Policy.

Table 4.1.2: Reduction in solar energy tariff under JNNSM

Phase	Benchmark tariff of Central Electricity Regulatory Commission (in Rs. per kilowatt hour)	Weighted average tariff after bidding (in Rs. Per kilowatt hour)
Phase 1: Solar thermal	15.31	11.48
Phase 1: Batch 1 : Solar PV	17.91	12.16
Phase 1: Batch 2 : Solar PV	15.39	8.77 (minimum and maximum tariff is 7.49 and 9.44 per unit)

Source: Union Ministry of New and Renewable Energy, 2012

In December 2012 MNRE released its draft policy document for the second phase of the JNNSM. Under this phase, the government plans to install 9,000 MW of solar energy till 2017 – 40 per cent by the Central Government and 60 per cent by the state governments. However, considering the poor financial health of all state discoms (most are loss making), there is a huge question mark on funding the second phase of the JNNSM.

2. State Level Initiatives

In addition to the JNNSM, several policy initiatives and solar power development programmes have been announced by state governments. Some of these were done to fulfill the solar RPO targets. While seven states in India now have their own solar policies and have announced target for solar power installation, only Gujarat and Maharashtra have commissioned solar power plants under the state policy (see Table 4.1.3: State Initiatives).

Box 4.1.3: Solar Scam

In July 2010, MNRE had issued guidelines for the selection of solar power projects. According to these, the ministry will accept only one application for one 5 MW solar PV project "per Company, including its Parent, Affiliate or Ultimate Parent or any Group Company…". In the case of solar thermal projects, the guidelines specify "total capacity of solar thermal projects to be allocated to a Company… shall be limited to 100 MW". As per the guidelines, therefore, one company was allowed to bid for and win one 100 MW solar thermal and one 5 MW solar PV project. In totality, one company was eligible to get 105 MW worth of projects.

An investigation by the Delhi-based NGO Centre for Science and Environment (CSE) revealed that LANCO Infratech blatantly flouted these guidelines. This company floated front companies and grabbed no less than nine projects worth 235 MW. This is about 40 per cent of the 620 MW worth of projects auctioned by the government during the first batch of the first phase of the JNNSM. CSE investigators point out that LANCO could pull this off because neither the ministry, nor the NTPC Vidyut Vyapar Nigam, have a mechanism to monitor the activities of companies that win a contract. The two agencies do not even provide the details of the projects and company addresses. The ministry's non-transparent processes were responsible for the lapses in the renewable energy programme. This resulted in LANCO winning the bids by unfair means. In doing so, LANCO throttled the competition and stopped genuine players from entering the market. MNRE has instituted an investigation; the findings are awaited.

Source: *Down To Earth, February 1-15, 2012*

Table 4.1.3: State Initiatives

State	Solar-specific Programmes
Gujarat	Announced - 968.5 MW
	Commissioned - 690 MW
Maharastra	Announced - 205 MW
	Commissioned - 40 MW (setup in Rajasthan)
Karnataka	Commissioned - 8 MW, plans for 600 MW
	bids invited - 80 MW
Rajasthan	Announced - 200 MW
Odisha	Awarded - 25 MW
	Announced - 200 MW
Madhya Pradesh	Awarded - 200 MW
Tamil Nadu	Announced - 300 MW
Total	Announced - 5000 MW (Approx)

Source: Anon, 2012, JNNSM Phase-II, Policy Document – WORKING DRAFT, MNRE

2.**1 Gujarat:** Gujarat has shown the most interest in solar energy and has the maximum solar power commissioned under the state's solar policy. It is also the state with the maximum installed capacity – 690 MW in December 2012. It has set-up some innovative projects to maximise the benefits of solar power (see Box 4.1.4: Canal-top Solar Project).

In 2009, the state announced its solar policy and decided on the investment model, where contracts for a fixed capacity were to be given to private developers. These project developers were to have a fixed feed-in tariff for 25 years – Rs 15/kWh for the first 12 years and Rs 5/kWh for the remaining 13 years. Unlike JNNSM, reverse bidding was not considered as the state government felt that there was a risk of developers underbidding and then not setting up plants. So far the state has already allocated 968.5 MW grid-connected solar power. But Gujarat now has no money to set-up more solar power plants.

Gujarat Urja Vikas Nigam Limited (GUVNL) – the state utility – is one of the very few state utilities in India that is profitable. However, installation of 968.5 MW of solar power in the state means that GUVNL will have to shell-out about Rs 2,000 crore per year as feed-in-tariff for solar power. This is likely to make GUVNL a loss making entity.[164] Gujarat Government is now looking at JNNSM to fund further solar projects in the state.

2.2 Tamil Nadu: In November 2012, Tamil Nadu launched one of the most ambitious solar policies by any state in the country. It has mandated that all high-tension consumers source six per cent of their energy usage from solar power by January 2014 through a Solar Purchase Obligation (SPO). High-tension users are those that are connected directly to a high-tension line with a voltage of over 33,000 volts or 33 kV. This includes large industries, special economic zones, colleges, residential schools and buildings with a built-up area of over 20,000 square meters. Domestic users, agriculture and other low-tension consumers would be excluded from the SPO. The six per cent SPO will help the state harness 3,000 MW of solar power by 2015.

After the solar policy was released, many questions are being raised about its financial viability. Tamil Nadu Generation and Distribution Company Limited – the

Box 4.1.4: Canal-top Solar Project

Located in Sadan just outside Ahmedabad on top of the Sadan branch of the Narmada irrigation canal is the Gujarat Solar Canal Project. It is a one MW polycrystalline project. The project is 750 meter long and is supposed to lower water evaporation losses by nine million liters per year. The cost of the project was 17 crore which is high for one MW but the project required special steel structures and innovative R&D, if considered a pilot project the cost must be seen as quite cheap. According to the constructors, the water under the panels cools them giving higher efficiency as PV panels efficiency is lower at high temperatures. Installing solar power plants over canal top will reduce the land requirement as well help reduce the evaporative losses.

state utility – had an outstanding debt of Rs 54,000 crore by the end of 2011-12. It is unable to pay even the relatively cheaper wind power, and its ability to pay for solar power, which is more than double the price of wind power, is now being questioned.

2.3 Madhya Pradesh: Madhya Pradesh announced its solar policy in February 2012. Under it, the state plans to construct 200 MW solar PV power plants. The MP solar policy varies from other state policies in certain ways. It has not specified any geographical constraints on the location of the plants – developers can set up plants in any state they wish (land costs are cheaper in Gujarat and Rajasthan and these states also receive more sunlight than Madhya Pradesh). But the minimum capacity of plants constructed outside the state has been fixed at 10 MW. It has followed reverse bidding for its solar projects.

2.4 Rajasthan: The state wants to sell solar power directly to discoms, and is aiming to do this through a two-phase approach. In phase 1, a total installed capacity of 200 MW – evenly divided between SPV and CSP – is targeted by 2013. In phase 2, which will be in operation till 2017, a total of 400 MW capacity will be installed. The selection of solar projects will be done through a tariff-based competitive bidding process. The deadline for bidding in the state has undergone several postponements. The most obvious reason behind this indecisiveness, say industry watchers and power distributors, is the state's inability to pay for the solar power.

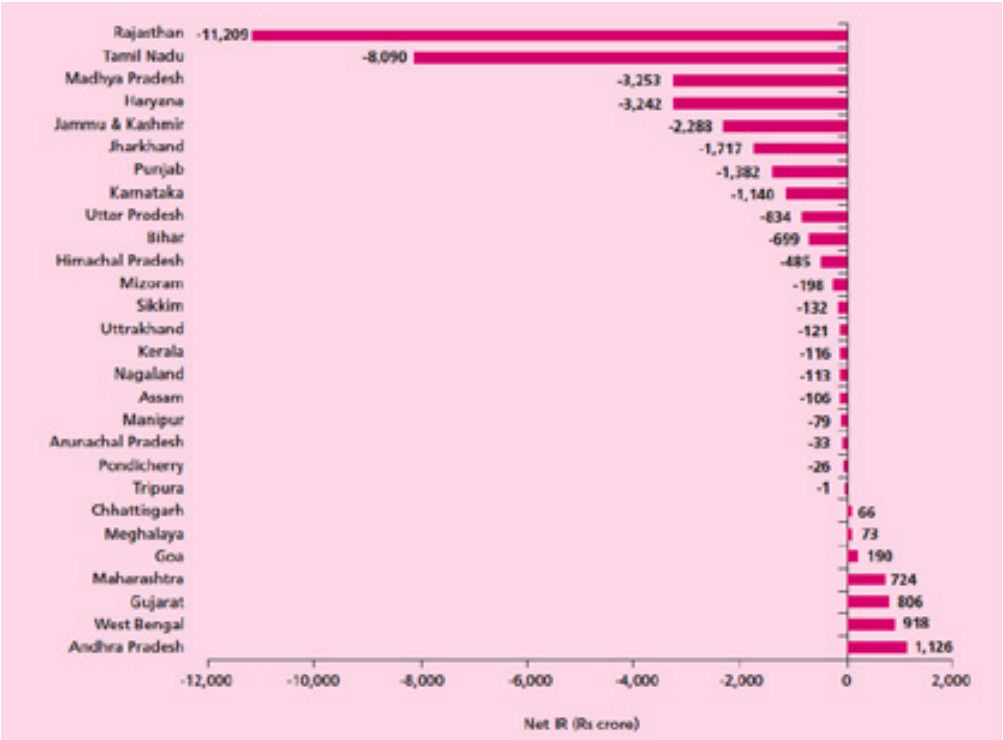
It is quite clear that there is lot of excitement and interest about solar power in most states in the country. This is very good news. The bad news is that most states are not very clear from where they will get money to fund the solar projects. This might prove to be the Achilles heel for solar power in India.

3. Financing Solar Power in India

Despite falling prices, solar energy remains three times expensive compared to conventional energy. The average rate of purchase of power in India in 2011-12 was Rs 2.95/kWh.[165] This is one-third of the average tariff of solar power under the second batch of the first phase of JNNSM (Rs. 8.77/kWh).

Bundling with cheap 'unallocated' coal power and limited feed-in-tariff has allowed India to invest in 2.5 GW worth of solar power. But now there are major concerns regarding future expansion considering the cheap 'unallocated' coal power is not available and most state electricity utilities are in red (see Figure 4.1.2: State-wise Net Internal Revenues 2009-10). The only source of funds for the solar energy is either from the state exchequer or cess on electricity or fossil fuels.

Figure 4.1.2: State-wise Net Internal Revenues – 2009-10



Source: http://planningcommission.nic.in/reports/genrep/arep_seb11_12.pdf as viewed on December 24, 2012

In 2010-11, India put Rs 50 cess on each tonne of coal, lignite and peat produced in or imported into India. The money was put in the National Clean Energy Fund (NCEF) to support development of renewable and clean energy in the country. In 2011-12, the total fund has been estimated at Rs 3,249 crore. However, there are many claimants to this fund. From development of clean coal technology to installation of smart grids, and from development of all renewable energy resources to development of hybrid and electric cars, all government departments are vying for this money. For an ambitious solar energy programme, NCEF will never be sufficient; it can at best provide a bridge.

As far as international funding is concerned, it is too little and cumbersome as of now. Clean Development Mechanism (CDM) cannot support even 10 per cent of the feed-in tariff considering that carbon credits are being sold at less than Euro 3.0 per tonne currently.[166] The Green Climate Fund (GCF) – worth US $100 billion by 2020 – is a possibility. But for that, countries will have to ensure GCF can support feed-in tariff for solar energy in developing countries.

What is quite clear is that all sources of funds will be necessary – domestic as well as international – at least in the next 10-15 years for the expansion of solar power in India.

4. Land, Community and Environment

Large-scale grid-connected solar plants do require a lot of land. The Central Electricity Regulatory Commission (CERC) has set the benchmark for land use at two ha per MW for solar PV plants.[167] The 20,000 MW that is planned under the JNNSM, therefore, will require at least 40,000 ha of land.

Land in India is scarce and heavily contested. Hence, there are three important concerns to keep in mind with respect to land for solar: minimise land usage, ensure that the land being used is not forest or agricultural land and allow local communities to benefit from large-scale solar installations. Unfortunately, some of these issues have been disregarded while developing large solar power plants in the country.

Solar power plants in many parts of the country are presently facing stiff resistance from the communities over acquisition of land. In Askandra, near the Indira Gandhi Canal in northern Rajasthan, where the state government has given more than 800 ha of land for solar power development, the farmers are protesting because they have been waiting for allotment of the same land for over 40 years – but solar plants has now managed to grab it within a few months.[168] To add salt to the injury, the state government has given this land to solar projects at 10 per cent of the market rate.[169] Interestingly, MNRE has recently asked states to copy the Rajasthan model of subsidising land.[170]

In Charanka village in Patan district, northern Gujarat where the state government is building India's biggest solar park of about 500 MW on 2000 ha land, the local community is angry because this solar park is being built on land they have traditionally used for grazing and fuel wood collection. Now both those life-sustaining resources are gone. Apart from this, there was a check-dam on the land, which was demolished by the project proponent.[171]

The fact is that in many parts of the country, solar plants are coming up disregarding many of the community right issues. On top of it communities are not directly benefiting from the solar projects. There is a need to evolve a land policy for solar power that benefits communities. In fact land provides an opportunity to redefine relationships between communities that own the land and solar power developers who want that land. Many civil society organisations are now demanding that land should not be acquired for solar plants; instead land, whether government-owned or private, should be given to companies on lease and companies should pay the lease rent either on the basis of the amount of electricity produced or on the basis of per hectare of land leased.

4.1 Environmental norms: There are no specific environmental norms for solar power projects in India. Solar power has been exempted from the Environmental Impact Assessment (EIA) procedure in India. Similarly, as there is no air and water pollution, solar energy has been exempted from the regulations under the Air (Prevention and Control of Pollution) Act, 1981 and the Water (Prevention and Control of Pollution) Act, 1974.

However, concerns are being raised regarding large solar parks that are coming up in many parts of the country. Such large land conversion projects will have environmental impacts – especially on land, water, biodiversity and common community resources. Solar power plants will also have to plan for the disposal of panels, batteries and other electrical appliances all of which contain toxic and hazardous wastes. It is, therefore, important that some form of environmental assessment is done for large projects.

Similarly, there are major concerns regarding the disposal of hazardous materials from the solar PV modules, especially cadmium telluride modules, when a project is decommissioned or abandoned.

Box 4.1.5: India's off-grid solar programme – Where is it headed?

India has had an active programme in the field of standalone Solar PV applications for more than two decades. The 'solar photo-voltaic (demonstration and utilisation) programme' was initiated way back in 1980 by the central government to develop, test and install solar PV applications like home lighting systems, railway signals, water pumping, etc. A subsidy of 50 per cent of the capital cost was provided.

After the 2001 Census, in which 18,000 remote un-electrified villages were identified, MNRE initiated the Remote Village Electrification Programme (RVEP) to provide basic lighting systems using Solar PV applications to light up these villages by 2012.

By March 30, 2010 close to 800,000 street lighting systems and a little over 600,000 home lighting systems had been installed in the country (see Table: Solar off-grid applications installed till March 2010). Of the 18,000 remote un-electrified villages identified in 2001, 9009 villages were electrified as of March 2012 under RVEP.

Table: Solar off-grid applications installed till March 2010

Type of application	Installed till date
Street lighting system	797,344
Home lighting system	603,307
Solar lanterns	119,634
Power plants (kWp)	2,922
Solar PV pumps (nos)	7,334

Source: *Anon, 2010, MNRE, Government of India*

In January 2010, the newly launched Jawaharlal Nehru National Solar Mission (JNNSM) superseded all the previous off-grid solar schemes, other than RVEP, with new targets of 2,000 MW for off-grid Solar PV applications and 20 million solar lanterns by 2022. The target for off-grid solar under JNNSM is roughly 9 per cent of the solar target of the country. This indicates the low priority the government has given to the off-grid programme, which has the largest potential to supply electricity to the poorest and the unconnected. But the quantum of target is just one aspect of the issue related to government's off-grid solar programmes, its efficacy and implementation poses much bigger challenge.

There are big questions marks on the efficacy of the government supported off-grid solar programmes. Reports indicate that these programmes suffer from poor maintenance, lack of ownership and corruption.[172]

The good news is that the implementation of off-grid solar PV applications in India is not just government business. The unmet electricity demand in large parts of the country has created opportunities for the private sector and social entrepreneurs to sell off-grid solar applications to the consumers directly. Interestingly, unlike the government programmes, many of these market models do not subsidize solar technology. Instead micro-finance is used to pay back the cost of the solar household systems in installments.

Take the example of Aryavart Gramin Bank. It is the first organisation in India to have received carbon credits under the Clean Development Mechanism for providing Solar Housing Systems (SHS) to its customers on credit. Its operation is spread across six districts in Uttar Pradesh. It started operating since 2006 and tapped into its existing client base of farmers to whom it gives short-term credit for agriculture. It now gives loans to these farmers to buy SHS and pay it in affordable installments. For supplying SHS, it has roped in Tata BP solar, one of India's largest solar energy solution companies. Till March 2012, around 55000 customers have been given SHS.[173]

Aryavarta is just one of hundreds of companies/organisations that is involved is giving off-grid solar energy to households and businesses across India. Varied models are being implemented; from installation of solar housing systems to lights few bulbs to installation of few kilowatts mini-grids to supply electricity to few hundred households. Models include fully or partly government-subsidised systems to systems supplied by social entrepreneurs based on micro-credits to systems directly purchased by the consumers from the market.

The problem with the models implemented by companies and social entrepreneurs is that they are designed to limit the usage and potential of the distributed solar energy. Even the most successful model is built on limited opportunity– such as the lantern or the solar panel with a few light bulbs, which works when people are poor. It does not meet the needs or aspirations as people become richer or have more energy needs. In this way, existing solar energy systems have been designed only for the poor and only when they are poor. The model to up-scale energy supply and make off-grid solar a substitute for the grid power is not available.

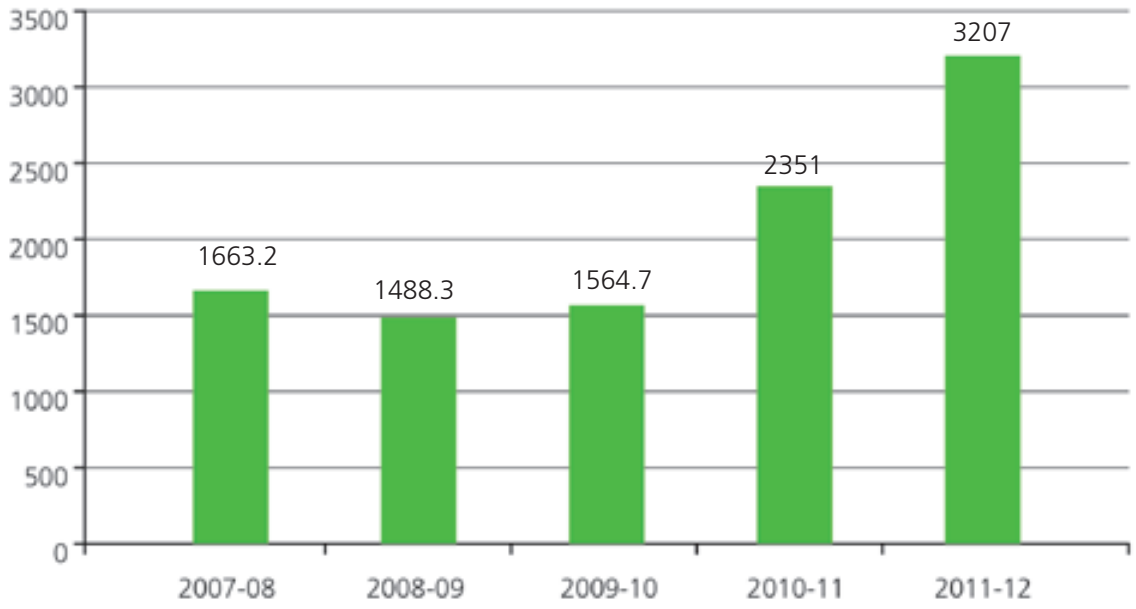
The real challenge for the off-grid solar in India is how do we upscale the distributed energy systems, by reforming the government programmes and by supporting entrepreneurs, to make them the real option in the real world.

SECTION 4.2
Wind Energy in India

A. Introduction

The wind power programme in India was initiated towards the end of the sixth Five Year Plan, in 1983-84. From the very beginning, a broad-based wind power development strategy was adopted which initially included government sponsored demonstration of wind turbines and the identification of windy locations through surveys. A new institution, Center for Wind Energy Technology (C-WET), was also established in 1998 to assess wind resources and to undertake research and development, including performance testing of wind turbines. For commercialization of wind energy, a host of subsidies were given which initially included capital subsidy, accelerated depreciation benefits, preferential tariff, and import and income tax subsidies. The subsidy regime led to rapid installation of wind power projects in the country, but little wind energy generation. In 2007-08, the average plant load factor of wind power projects in India was mere 15.1 per cent.[174] Lately some of the subsidies including 80 per cent accelerated depreciation in the first year and capital subsidy have been removed (see Box 4.2.1: Policy and Regulatory Framework). This has led to installation of better and bigger wind turbines and higher generation of wind energy. The annual installation of wind power has also increased over the years (see Figure 4.2.1: Annual Installation of Wind Power in India).

Figure 4.2.1: Annual Installation of Wind Power in India



Source: http://www.inwea.org/installedcapacity.htm as viewed on December 10, 2012

At present wind power is one of the fastest growing power generation technologies in India. From installed capacity of 41 MW in March 1992, the wind power capacity has reached 17967.15 MW as on 31.08.2012.[175] Wind power accounts for around 70 per cent of total grid-interactive renewable capacity in the country, excluding large hydropower and about 9 per cent of the total electricity generation capacity of the country. More than 95 per cent of the wind energy development to date is concentrated in just five states – Tamil Nadu, Gujarat, Maharashtra, Andhra Pradesh and Karnataka. Tamil Nadu has the highest wind power installation in the country with more than 7,000 MW worth of wind turbines (see Table 4.2.1: State-wise Installation of Wind Power).

According to Wind Energy Outlook 2012, India is expected to have 89 GW of installed wind power capacity by 2020.[176] However, this potential might not be realized considering that the wind energy sector is facing some major challenges.

Table 4.2.1: State - wise installation of wind power

State	Achievement (MW)
Andhra Pradesh	264
Gujarat	3016
Karnataka	2025
Madhya Pradesh	376
Maharashtra	2772
Rajasthan	2079
Tamil Nadu	7072
Others	40
Total	**17644**

Source: http://mnre.gov.in/file-manager/UserFiles/presentation-01082012/Presentation per cent20on per cent20Policy%20Issues%20and%20 12th%20Plan%20Proposals%20by%20JS,%20MNRE.pdfd as viewed on December 2, 2012

Box 4.2.1: Policy and Regulatory Framework

Enactments prior to the Electricity Act, 2003 (EA 2003) had no specific provisions for promotion of wind power in India. Despite this shortcoming, the Ministry for New and renewable Energy (MNRE) attempted to give impetus to the sector by way of policy guidelines in 1994-1995, with mixed results. The real impetus to wind power development was given by the EA 2003 that mandated the State Electricity regulatory Commissions (SERCs) generation of renewable electricity by providing connectivity and creating purchase obligations. This created wind market and volumes in wind resource rich states.

Presently, the policy regime for wind power in India includes the following fiscal and financial incentives:

- *Concession on import duty on specified wind turbine components*
- *80 per cent accelerated depreciation in the first year of commissioning (this was reduced to 35 per cent from 2012-13)*
- *Generation based incentive of Rs. 0.5/kWh in lieu of accelerated depreciation benefits over and above Feed-in-tariff (ended in March 2012; government still undecided for the 12th Five Year Plan)*
- *10-year income tax holiday for wind power generation projects*
- *Excise duty relief on wind turbine components*
- *Feed-in-tariff determined on cost plus basis ranging from Rs. 3.39–5.32 per kWh in different states*

B. Factors affecting the wind power development

1. Loss of interest among the wind resource rich states

In view of exponential wind power capacity addition, wind resource rich states are finding it financially difficult to create power evacuation infrastructure for the existing and also for the future installations. They are already burdened with the high quantum of infirm wind power, which cannot be scheduled, and also have to pay higher feed-in-tariff, which at times has to be sold to neighboring states at much lower pooled price. Expenditure on creating power evacuation facility is the additional investment that the wind resource rich states have to incur. Now instead of going for speedy deployment plans the states have started reducing or freezing their purchase obligations and requests have started pouring to MNRE to meet the cost on power evacuation infrastructure.

Further, in order to balance the grid from the impact of infirm wind power, the states have to create spinning reserves in the form of equivalent firm power capacity. Again it is an additional expenditure on the resource rich states. It is estimated that in Tamil Nadu about 1,000 MW of wind power is installed but not connected to the grid.[177] On top of it, the Tamil Nadu Generation and Distribution Company Ltd (TANGEDCO) owes around Rs 3,500 crore to wind energy developers.[178]

2. Focus on capacity creation not power generation

The prime mover behind wind power development in India has so far been the provision of accelerated depreciation. Under this provision the benefit is linked with the installation cost on which the depreciation is derived. It is such a strong incentive that often the producers are not concerned about functioning of the systems thereby power generation.

The accelerated depreciation benefits was only availed by those companies that have profits from their own or from their sister concerns. A good category of investors like independent power producers (IPPs) and Foreign Direct Investment (FDI) were not able to avail of the accelerated depreciation benefits. In order to include the different category of investors and also to incentivize higher efficiencies with the help of a generation/outcome based incentive, the scheme for Generation Based Incentive (GBI) was introduced in December 2009. Under the scheme the GBI is provided to wind electric producers @ Rs 0.50 per unit of electricity fed into the grid over and above the tariffs fixed by the states. Though the scheme was designed to support 4,000 MW wind power generation, only 700 MW projects came forward to avail this benefit. This clearly shows that the wind power development in India is still highly dependent of tax sops.

3. Wind power potential estimation

The estimation of wind power potential has become a major bottleneck for enhanced ambition for wind power installation in the country.

The estimation of actual wind energy potential is highly debatable as different reports project different potential scenarios. In the latest report published by the US based Lawrence Berkeley National Laboratory the real wind energy potential in India is estimated to be in the range of 600 to 1000 GW with current available technologies.[179] In sharp contrast, the latest wind energy potential estimate by the Center for Wind Energy Technologies, India, used by the Indian government in its policy-making process, is only 103 GW at a hub height of 80 m.

This potential estimate is sending wrong signals to industry and market as a whole, which is detrimental to speedy harnessing of wind power in the country.

4. Cartelization of land and land conflict for wind power

There is no policy to safeguard farmers' interest when their land is procured for wind installations. It has resulted into conflicts at many places. In fact the whole land procurement process suffers from information asymmetry where the developers are having all wherewith about and farmers are virtually blank about the likely benefits. Farmers have never been informed that the value is not only of the land but also of the wind resource, which is at that land.

There are many instances where potential wind sites have been cornered in bulk by some developers/ manufactures. It is a form of cartelization and monopolistic behavior, where the buyer cannot exercise his/her choice in selecting design and make of wind machine, as by default they are compelled to go for the machine make that the land owner company have. It has resulted into sub-optimal market development and has retarded the process of cost reduction.

5. Environmental impact of wind power

Although wind power plants have relatively lower impact on the environment compared to fossil fuel power plants, commercial size wind-power turbines can have multiple impacts on the surrounding area.

Construction of wind-energy facilities has direct influence on the environment. Site preparation activities, transportation of turbine and machineries, and erection of transmission lines that lead from the wind-energy facility to the electricity grid, all require removal of vegetation (in forest areas, large-scale tree felling is common), ecological disturbance, compaction of soil, soil erosion, and changes in hydrologic features.[180]

Wind turbines can have a total height of over 150 meters and many a times are placed on ridge-lines and hills and are therefore visible from long distances, this can have an impact on scenic landscapes. Wind turbines in operation create noise, which can disturb nearby communities. Birds may hit wind turbines (although as pointed out in multiple reports, birds are just as likely to strike power-lines, buildings or vehicles)[181] and bats may be affected by the changing air-pressure around wind turbines.[182] Impacts on bats may be an especially important in India considering that a large number of wind turbines are being installed in forested hilly areas, especially Western Ghats in Karnataka and Maharashtra, which are also home to many threatened species of bats. India has in all over one tenth of all bat species in the world.[183]

A total of 3,315 ha of forestland has been diverted as per the records of the forest clearances granted by the Ministry of Environment and Forests (MoEF). Of this, the maximum forestland diversion has been done in Karnataka at 1908.2 hectares followed by Maharashtra at 1047.6 hectares (See Table 4.2.2: Forestland diversion for wind power in India).

Table 4.2.2: Forestland diversion for wind power in India

State	Total Forest land Diverted (hectares)
Andhra Pradesh	67.0
Gujarat	68.8
Karnataka	1908.2
Madhya Pradesh	223.4
Maharashtra	1047.6
Total forest land diverted	**3315.0**

Source: Anon, 2012, Public Watch – Forest, Centre for Science and Environment, New Delhi

The problem is that wind power projects are not covered under the Environment Impact Assessment Notification, 2006 and is therefore exempt from the EIA process, even if they are coming-up in the forest areas. Guidelines by MoEF exist on how to handle forest clearance for wind power. For instance, guidelines prohibit wind power in natural parks, sanctuaries, national heritage sites etc. The guidelines also mandate a 'safe distance' from these areas but do not define what that distance is. A safe distance of 300 meters from nearest village habitation is suggested in 'normal circumstances', but it has been left undefined.[184]

In recent times there have been a great deal of criticism of wind power projects for destroying forest ecology in many parts of India. Cases of forest and ecological destruction due to wind power have been documented in Kalpavalli region in Andhra Pradesh's Anantapur district.[185] The Western Ghats Ecology Expert Panel (WGEEP) set up by MoEF to assess the current status of ecology of the Western Ghats region and to recommend measures for protection and conservation of Western Ghats, have heavily criticized the wind power developers for destroying the ecology of certain areas in Western Ghats, including one near the Bhimashankar Wildlife Sanctuary in Maharashtra.[186] The WGEEP has recommended cumulative environment impact assessment before their clearance.

SECTION 5

Transnational Involvement of Indian Companies in Energy Resource Acquisition

A. Introduction

Energy security is a growing concern in India. With rising income levels and growing population coupled with unmet energy needs of a large proportion of the population, India's energy supply will need to increase manifolds. According to the projections made by the Planning Commission, India needs at the very least to increase its primary energy supply by three to four times and its electricity generation capacity/supply by five to six times of their 2003-04 levels by 2031-32.[187]

But India is not endowed with enough domestic energy resources (if we exclude renewable energy resources like solar and wind energy) to meet its growing needs. In 2011-12, about 37 per cent of the total commercial energy was imported. This includes an import of 77 per cent of the total petroleum products, 19.5 per cent coal and 23 per cent gas (see Table 1.1 Section 1). Even though domestic production of energy resources is projected to increase, India will continue to depend on import of energy resources to meet its rising demand.

The main area of import will be crude oil, where nearly 82 per cent of the demand will have to be met from imports by 2021-22. Import dependence for coal is also estimated to increase 27 per cent by 2021-22. It is estimated that the import dependence for coal, natural gas and crude oil taken together in 2021-22 is likely to be 36 per cent. However, this assumes that India will be able to realise projected domestic production levels of coal, petroleum and natural gas. If this is not achieved, the level of import dependence would increase further if the GDP growth rates projected are to be maintained.[188]

The rising energy demand in India means that its share in global energy consumption will also grow. In 2003, India's share in global consumption of oil, coal and gas was 3.3 per cent, 6.5 per cent and 1.3 per cent, respectively.[189] If the global fossil fuel supply increases by only 1.7 per cent, as projected by IEA, then India's share in 2030 would range from 5.8 to 8.0 per cent for oil, 2.4 to 4.5 per cent for natural gas and 16.7 to 26.5 per cent for coal.[190]

To secure an increasing share in the global energy supply at an affordable cost has driven India to acquire energy resources, mainly oil and gas resources, outside its borders. Today India has developed partnerships with Russia, Iran, China, Burma and Venezuela to secure oil and gas resources overseas. The country is working with several oil producing countries in Africa and in the Middle East. India's government-owned companies have secured ownership of oil and gas fields and coal mines overseas. Indian private sector companies are also involved in acquisition abroad. But despite all these overseas ventures, India is still a minor player, compared to the US, some European countries and China, in transnational energy resource acquisition. For example, in 2009-10, Chinese companies spent a record US $ 32 billion for acquiring energy assets overseas compared to US $ 2.1 billion by India.[191]

Indian companies have acquired assets in countries that are considered conflict zones; be it civil war or open conflict between countries. Lately, there have been concerns regarding issues related to human rights and transparency about some of the oil fields that ONGC Videsh Limited (OVL), a public sector company, has acquired in Sudan. These oil fields are at the centre of dispute between Sudan and the Republic of South Sudan and there has been ongoing fighting between these two countries.[192] OVL is also operating in Libya, which has gone through a bloody civil war, and the country is still not stable. Similarly, Gas Authority of India Limited has stakes in Shwe Natural Gas Field and in Onshore Natural Gas Pipeline in Burma. Burma's oil and gas reserves are located mainly in the ethnic minority regions, which continue to be areas of conflict.

In 2011, the Ministry of Corporate Affairs came out with National Voluntary Guidelines on Social, Environmental and Economic Responsibilities of Business. The guidelines have enunciated nine principles that all companies operating in India and Indian MNCs operating in other parts of the world should adopt and apply. The principles range from ethical and transparent business practices to protection of environment and respect and promotion of human rights. In 2012, the lower of the parliament also passed the Companies Bill, 2012 that includes a clause on Corporate Social Responsibility (CSR). Under the bill, companies will have to spend at least two per cent of the average net profits on CSR and report on it. The bill is applicable to all companies registered in India.

Though the Companies Bill, 2012 is a good beginning, India will need a more comprehensive law to monitor and regulate the activities of Indian companies operating overseas, on governance, environmental and social issues. This is especially important for Indian companies operating in natural resources sectors in other developing countries.

B. Overseas energy resources acquisition by Indian companies

1. Oil and Natural gas

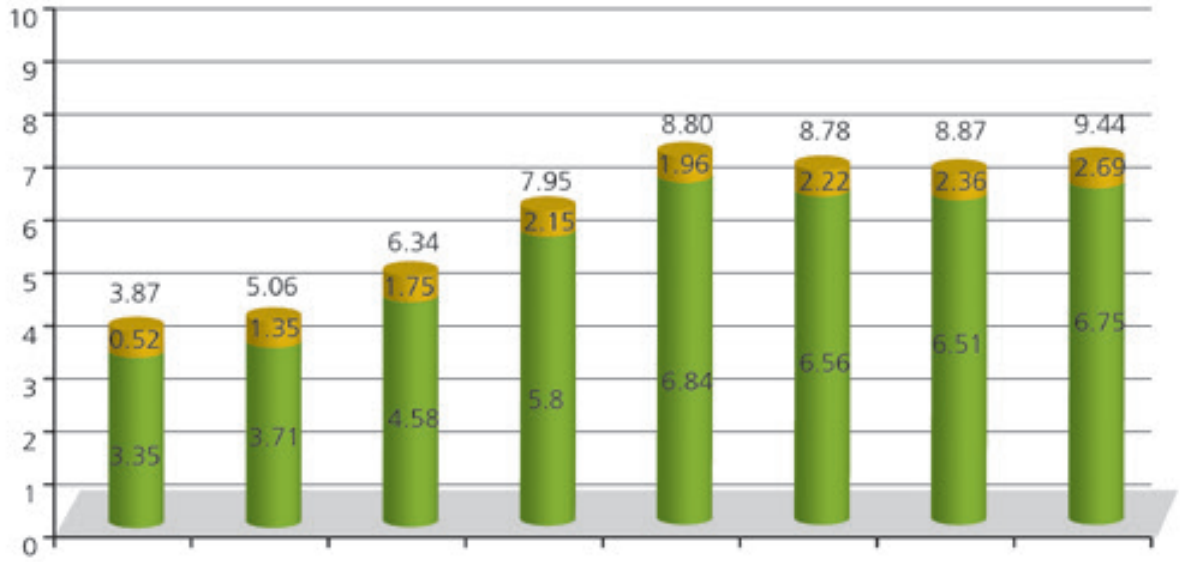
With the overarching objective of enhancing the country's energy security, India's oil and gas public sector companies are being encouraged by the Ministry of Petroleum and Natural Gas to emerge as global energy players by tracking hydrocarbons wherever they exist, acquiring equity in raw material-producing assets abroad and to vigorously pursue acquisition of oil and gas assets overseas. The International Cooperation Division, Ministry of Foreign Affairs is providing support for achieving many of these initiatives through diplomatic support.[193]

India's oil companies are present in 22 countries namely Vietnam, Russia, Sudan, Myanmar, Iraq, Iran, Egypt, Syria, Cuba, Libya, Mozambique, Brazil, Kazakhstan, Gabon, Colombia, Trinidad and Tobago, Nigeria, Venezuela, Oman, Yemen, Australia and Timor-Leste. The total overseas investment by Indian public sector companies operating in oil sector as of 2011 is Rs. 64,832 crores (about US $ 13 billion).[194]

Key Indian player in overseas oil and gas sector

a) ONGC Videsh Limited (OVL): OVK is a wholly owned subsidiary of ONGC is the key player in the business of exploration, production, transportation and sale of oil and gas acreages abroad. Overseas acquisitions and exploration activities by OVL started from late 1990s.[195] Oil and gas production from OVL assets have increased at CAGR of 13.6 per cent since 2003-04 (see Figure 5.1: Oil and Gas Production by OVL). In 2010-11, 9.44 million tonnes of oil and oil equivalent gas (equal to 22 per cent of domestic oil production) was produced by OVL from its assets in Sudan, Vietnam, Venezuela, Russia, Syria and Colombia.[196]

Figure 5.1: Oil and Gas Production by OVL



Source: http://www.ongcvidesh.com/Performance.aspx?tab=0 as viewed on November 29, 2012

OVL currently owns assets in CIS and Far East, Middle East, Africa and Latin America. The company has a combination of producing, discovered and exploration assets. It is working as operator in 17 projects and joint operator in five projects. OVL produces hydrocarbons from Russia (Sakhalin-I and Imperial Energy), Syria (Al-Furat Project), Vietnam (Block 06.1), Colombia (Mansarover Energy Project), Sudan (Greater Nile Oil Project and Block 5A), Venezuela (San Cristobal Project) and Brazil (BC-10); six projects are in development phase and 23 are in the exploration phase.[197]

OVL has developed strong relationships with National/ International Oil Companies of various countries by working with their team and management at project level. Some of the leading alliance partners of OVL are ExxonMobil, Shell, Total, Repsol, Statoil, Petrobras, Rosneft, Petro Vietnam, CNPC, Sinopec, PDVSA, TPOC, Petronas and Ecopetrol.[198] OVL claims to have a policy on Health Safety and Environment and has developed a management system based on internationally recognized standards – OHSAS 18001:2007 for Occupational Health & Safety Management System and ISO 14001:2004 for Environment Management System, to guide its operations worldwide.[199] OVL's operations in Sudan have come under international scrutiny because of the ongoing conflict between the Sudan and the Republic of South Sudan over oil fields (see Box 5.1: OVL in Sudan).

Box 5: OVL in Sudan

ONGC Videsh Limited (OVL) is extensively involved in Sudan's oil industry and potentially associated with numerous concerns about negative environmental and social impacts of exploration and production activities. OVL is involved in exploration, production, and other activities defined as "Oil-Related Activities" under the targeted Sudan divestment legislative model, and is classified as "Scrutinized." Companies are classified as "Scrutinized" if they are involved in the targeted sectors of oil, mineral extraction, power production or weapons and meet the other threshold criteria laid out in the targeted Sudan divestment legislative model. "Scrutinized" companies are subject to divestment measures in states with legislation based on the targeted model.

OVL acquired a 25 per cent stake in the Greater Nile Petroleum Operating Company (GNPOC) from Canada's Talisman Energy Inc. for US $720 million in March 2003.[200] GNPOC operates Blocks 1, 2, and 4.[201] Before the current production shutdown the blocks produced between 180,000 and 200,000 barrels per day (bpd), and there was hope of a 20,000 bpd increase if recently discovered fields in Block 2 came online in 2012.[202]

Block 2 contains several major producing oilfields, including Heglig and Toma South. The block straddles part of the sensitive border between Sudan and the Republic of South Sudan (RSS), specifically between Unity and South Kordofan states. There has been ongoing fighting between Sudan and RSS on the contested Heglig oil field. In April 2012, the conflict escalated and resulted in severe, lasting damage to the Heglig field. Prior to the current production shutdown and damage to the Heglig fields during the April fighting, there was hope of a 20,000 bpd increase when newly discovered fields in Block 2 came online in 2012.

Similarly, Block 4 contains the Neem and Defra (Diffra) fields. The Block 4 concession straddles the sensitive border region between Sudan and the RSS and includes the contested Abyei region.OVL acquired stakes in two additional oil blocks in the RSS from Austria's OMV AG in May 2004: a 24.5 per cent stake in Block 5A and a 23.5%, stake in Block 5B, cumulatively valued at U.S. $134.6 million.[203] The output of Block 5A's Thar Jath and Mala Fields before the production halt was estimated at between 20,000 and 25,000 bpd.[204] Reports in September 2010 projected a 24,000 bpd increase in the output from the Thar Jath field, which would raise the total output of Block 5A to an estimated 44,000-49,000 bpd.[205] Block 5A has been associated with negative environmental and social impacts.

Following several failed exploration efforts; OVL and its consortium partners relinquished their claim to Block 5B in 2009.[206] In April 2011, a performance audit by the Comptroller and Auditor General of India strongly criticized OVL for ignoring significant reservations expressed by the consultant regarding security problems in the Block 5B area when acquiring the stake.[207]

Source: *Personal communication with Kathy Mulvey, Director, Conflict Risk Network*

b) Bharat Petro Resources Limited:[208] Bharat Petroleum Corporation Limited (BPCL) entered the Upstream sector in 2003 with the aspirations of providing partial supply security of crude, hedging of price risks, to become a vertically integrated oil company and to add to the company's bottom line. In 2006, BPCL setup a wholly owned subsidiary company – Bharat Petro Resources Limited (BPRL) - to become a recognized player in the upstream sector.

As of January 2013, BPRL has participating interests in 25 exploration blocks in consortium with other companies. Of the blocks, 11 blocks are in India, 10 in Brazil, and 1 each in Mozambique, Indonesia, Australia and East Timor. BPRL's total acreage holding is around 54,000 sq km of which about 47,000 sq km (approx. 88 per cent) is offshore acreage.

c) Indian Oil Corporation Limited:[209] Indian Oil is India's flagship national oil company with business interests straddling the entire hydrocarbon value chain – from refining, pipeline transportation and marketing of petroleum products to exploration and production of crude oil & gas, marketing of natural gas and petrochemicals. It is the leading Indian corporate in the Fortune 'Global 500' listing, ranked at the 83rd position in the year 2012. To enhance upstream integration, Indian Oil has been pursuing exploration and production activities both within and outside the country in collaboration with consortium partners.

The overseas exploration and production portfolio includes nine blocks spanning Libya, Iran, Gabon, Nigeria, Timor-Leste, Yemen and Venezuela. Indian Oil is associated with two successful discoveries in oil exploration blocks, one each in India and Iran. Commercial appraisal of these blocks is underway. Indian Oil also farmed into an exploration block in Gabon along with Oil India Ltd. (OIL) as the operator. In addition, the Indian Oil-OIL combine has acquired participating interest in a block in Nigeria. The Corporation, in consortium with OIL, Kuwait Energy and Medco Energi of Indonesia has acquired a participating interest in two exploration blocks in Yemen. As part of consortium, Indian Oil has been awarded Project -1 in the Carabobo heavy oil region of Venezuela. To boost E&P activities, Indian Oil has incorporated Ind-OIL Overseas Ltd. – a special purpose vehicle for acquisition of overseas E&P assets – in consortium with Oil India Ltd.

d) Reliance Industries Limited:[210] Reliance Industries Limited (RIL) is the flagship company of the Reliance group -- India's largest private sector enterprise, with businesses in the energy and materials value chain. RIL operates KG-D6, India's single largest source of domestic gas, which accounts for almost one-third of the total gas consumption in the country. Unlike other companies, RIL has focused its attention on overseas acquisition unconventional gas – shale gas.

- RIL, through its subsidiary, Reliance Marcellus LLC, entered into a joint venture with Atlas Energy, Inc. (now owned by Chevron Corporation) under which Reliance acquired a 40 per cent interest in Atlas' core Marcellus shale acreage position. Reliance becomes a partner in approximately 300,000 net acres of undeveloped leasehold in the core area of the Marcellus shale in southwestern Pennsylvania.
- RIL, through its subsidiary, Reliance Eagleford Upstream LP, entered into a joint venture with Pioneer Natural Resources Company under which Reliance acquired a 45 per cent interest in Pioneer's core Eagle Ford shale acreage position in two separate transactions. The joint venture has an approximate net working interest of 91% in 289,000 gross acres implying 263,000 net acres. The joint venture's leasehold, which is largely undeveloped, is located in the core area of the Eagle Ford shale in south Texas.
- RIL, through its subsidiary, Reliance Marcellus II, LLC, entered into a joint venture with Carrizo Oil & Gas, Inc. Under the transaction, Reliance acquired a 60 per cent interest in Marcellus shale acreage in Central and Northeast Pennsylvania. The joint venture will have approximately 104,400 net acres of undeveloped leasehold in the core area of the Marcellus shale in central and northeast Pennsylvania.
- Apart from Shale gas, RIL has 13 blocks in its international conventional oil and gas portfolio, including two in Peru, three in Yemen (one producing and two exploratory), two each in Oman, Kurdistan and Colombia, one each in East Timor and Australia; amounting to a total acreage of over 99,145 sq km.

2. Coal

The gap between the demand and supply of coal is widening in India.[211] To bridge the gap, presently, India imports about 90 million tonnes (MT) of coal mainly from Indonesia, Australia, New Zealand and South Africa.[212] This quantity is expected to go up to 143 MT by 2012-13. Indian companies, both government-owned and private, are working to acquire coal mines abroad to enrich their resource base. So far, private companies have been more successful than government companies in acquiring overseas assets.

a) Public sector companies

None of the public sector companies have acquired any coal mines abroad, though public sector companies have formed consortium and set-up joint venture companies to do so.

- Coal India Limited (CIL), a public sector company and India's largest coal producer, has set up a division, Coal Videsh, to acquire coal assets overseas. It has allocated Rs 6,000 crore for acquisition of mines overseas.
- The Indian government has also promoted a joint venture company, International Coal Ventures Private Limited (ICVPL), with Steel Authority of India Limited, CIL, Rashtriya Ispat Nigam Limited, National Mineral Development Corporation and National Thermal Power Corporation as the promoter companies for securing metallurgical coal and thermal coal assets in overseas territories. The government has given ICVPL a target of acquiring 500 MT of metallurgical coal reserves by 2019-20.[213] Some coal assets have been identified by IVCL and its promoter Indian Public Sector Undertakings in US, Australia and Mozambique for a possible acquisition.
- CIL has also formed a wholly owned subsidiary in Africa called "Coal India Africana Limitada (CIAL) in Mozambique. CIAL has been granted prospecting license for two coal blocks in Mozambique in August 2010. CIL has also signed a memorandum of understanding with the provincial government of Limpopo, Republic of South Africa for exploration and development of coal assets.[214]

b) Private companies

Private companies have acquired coal mines or equity shares in Indonesia, Australia, South Africa and the US.

- The Adani group, which is the largest coal importer of India, has coal mining operations in Indonesia and Australia. In one of the largest coal mines deals by an Indian group, Adani Enterprises bought the Australia-based Linc Energy's coal assets for about Rs 12,600 crore in a cash and royalty deal. It also operates the Bunyu Mines in Indonesia.
- Reliance power through its subsidiary – Reliance Coal Resources Private Limited – has acquired 100 per cent economic interest in two coal companies in Indonesia which own three coal mines in Indonesia. These coal mines are located in South Sumatra in Indonesia.[215]
- Tata Power has acquired 30 per cent stake in BUMI Resources' PT Kaltim Prima Coal (KPC) and PT Arutmin Mines, Indonesia.
- GVK Power has acquired 79 per cent stake in Alpha Coal Project, and associated port & rail projects at Abbot Point, Queensland, Australia
- Essar group acquired Trinity Coal in USA in 2010. However, in 2010, the US Environmental Protection Agency accused Trinity Coal for running illegal surface mines in eastern Kentucky which choked tributaries of the Levisa Fork River with earth, rock and spoil.[216]

3. Uranium

Indian companies have not been able to acquire any uranium assets abroad. However, to acquire uranium assets overseas, public sector companies Nuclear Power Corporation of India Ltd (NPCIL) and Uranium Corporation of India Ltd (UCIL) are jointly bidding for projects. There is also a proposal to setup a joint venture company. The two companies are exploring initial bids for mines in Mongolia, Kazakhstan, Russia and South Africa.[217] In March 2010 Russia offered India a stake in the Elkon uranium mining development in its Sakha Republic, and agreed on a joint venture with ARMZ Uranium Holding Co.[218]

Oil and Natural Gas Corporation (ONGC) has also proposed for overseas uranium exploration in joint venture with UCIL. The shareholding pattern of Joint Venture for ONGC and UCIL has been decided at 74:26 respectively. UCIL will have the option to increase its equity to 49% later. ONGC and UCIL have also planned to take up milling and processing of uranium ore and associated minerals besides exploration and mining of uranium.100% of the project expenditure will be borne by ONGC. Besides technical and managerial inputs, UCIL will also provide the relevant technical expertise to ONGC from in-house knowledge and experience.[219]

C. Law and policy for Indian companies operating overseas

India doesn't have a comprehensive law to monitor and regulate the environmental, social and governance aspects of Indian companies operating overseas. However, India has separate laws to deal with issues of corruption and corporate social responsibility that can be extended to transnational operations of Indian companies. Indian government has also issued a National Voluntary Guidelines on Social, Environmental and Economic Responsibilities of Business, 2011.

a. The Prevention of Corruption Act, 1988: This act is applicable to all citizens of India including those

outside India and corporation established by or under a Central, Provincial or State Act, or an authority or a body owned or controlled or aided by the Government or a Government company. This act can be used to prosecute Indian citizens and government owned companies operating abroad for corruption.

b. The Companies Bill, 2012: This bill includes a clause on Corporate Social Responsibility (CSR) under which every company having net worth of rupees five hundred crore or more, or turnover of rupees one thousand crore or more or a net profit of rupees five crore or more during any financial year shall constitute a CSR Committee of the Board of Directors. This committee with guide the CSR policy and activities of the company. The Bill also mandates the Board to ensure that the company spends, in every financial year, at least two per cent of the average net profits of the company made during the three immediately preceding financial years towards CSR. If the company fails to spend such amount, the Board shall, in its report, specify the reasons for not spending the amount. This Bill is applicable to all companies registered and operating in India. Before this bill was passed, Indian public sector corporations were mandated to contribute two per cent of their turnover to community well being.

c. National Voluntary Guidelines on Social, Environmental and Economic Responsibilities of Business, 2011: In July 2011, the Ministry of Corporate Affairs released the guidelines and "are designed to be used by all businesses, irrespective of the size, sector or location". It is expected that all businesses in India, including multi-national companies that operate in the country, would consciously work towards following the Guidelines. The Guidelines also provide a framework for responsible business action for Indian MNCs planning to invest or already operating in other parts of the world. The guidelines incorporates nine principles to guide the business actions:

- Principle 1: Businesses should conduct and govern themselves with Ethics, Transparency and Accountability
- Principle 2: Businesses should provide goods and services that are safe and contribute to sustainability throughout their life cycle
- Principle 3: Businesses should promote the wellbeing of all employees
- Principle 4: Businesses should respect the interests of, and be responsive towards all stakeholders, especially those who are disadvantaged, vulnerable and marginalised.
- Principle 5: Businesses should respect and promote human rights
- Principle 6: Business should respect, protect, and make efforts to restore the environment
- Principle 7: Businesses, when engaged in influencing public and regulatory policy, should do so in a responsible manner
- Principle 8: Businesses should support inclusive growth and equitable development
- Principle 9: Businesses should engage with and provide value to their customers and consumers in a responsible manner

D. Key Challenges

Not much is known about the environmental and social performance of the transnational operations of Indian companies. There is also very little information that companies put out in public domain. In such a scenario, it is difficult to ascertain how Indian companies are behaving abroad especially in natural resource sectors in other developing countries and in conflict zones. Indian companies operating in natural resources have also not part of initiatives like Extractive Industries Transparency Initiatives (EITI). As India increases its footprint in acquiring energy and other natural resources abroad, there is a need to develop guidelines/frameworks and enact laws to monitor and regulate their environment, social and governance performance.

SECTION 6
Conclusion

To understand India's energy resource governance and its response to climate change, one has to understand the following principles underpinning them:

Self-sufficiency: Self-sufficiency or energy independence is an oft-repeated theme in India. In his Independence Day address to the nation in 2005, the former President APJ Abdul Kalam called for achieving energy independence. He further articulated "We need to graduate from [talking about] energy security to [attaining] energy independence". [220]

Self-sufficiency is the reason why India wants to maximize the utilisation of domestic resources like coal, hydropower and thorium, even if the social and environmental costs are high. The IEP, 2008 expands this theme further when it states "For India it is not a question of choosing among alternate domestic energy resources but exploiting all available domestic energy resources to the maximum as long as they are competitive". This explains, in part, why there is a strong support within the government to dilute green norms. But, self-sufficiency is also the reason why India decided to invest in solar energy and started the Jawaharlal Nehru National Solar Mission.

Affordability: Affordability is one of the most important components in India's energy security vision. "We are energy secure when we can supply lifeline energy to all our citizens irrespective of their ability to pay for it as well as meet their effective demand for safe and convenient energy to satisfy their various needs at competitive prices, at all times and with a prescribed confidence level considering shocks and disruptions that can be reasonably expected". This is how India has defined its energy security.[221] India, therefore, is very conscious of energy costs, as high energy costs not only means higher costs for development but also reduced energy access to the poor.

Energy access and inclusive development: Inclusive development appears in all recent policy documents largely because of the widening income inequality in the country. "Faster, sustainable, more inclusive growth" is the theme of India's 12th Five-Year Plan. Lack of energy has been identified as one of the key reasons for impeding the growth of the poor. India, therefore, has put a very high priority on energy access to all, which is reflected in the rapid rural electrification programmes like Rajiv Gandhi Grameen Vidyutikaran Yojana, which aims to electrify all villages and habitations.[222]

Equity and co-benefit: Both these principles underpin India's policy on energy and climate change. Whereas equity assert India's right to economic development in a world where carbon space is fast constricting, co-benefit defines the strategy that India has adopted to address climate change and energy security together.

What is then the big picture on energy resource governance in India?

- The big picture is the picture of a country that is desperate to meet its unmet energy needs but is finding it difficult to do so. India, therefore, is today in a situation where it will exploit all forms of energy – fossil or renewable, conventional or non-conventional – to meet its growing energy demand. There are no preferences. If fossil fuel is cheap, it will go for fossil fuel. If renewables become competitive, India will go for it.
- India will try and exploit all domestic resources. But it also knows that domestic resources (if we exclude renewable energy) will not be sufficient to meet the energy demand. Thus, India is going outside its borders to acquire energy assets in order to secure supplies.
- The large-scale energy resource exploitation will require huge amount of land, water and forests. India is likely to, therefore, witness massive diversion

of land, water and forests and displacement of people due to exploitation of energy resources. India will witness even more public protest in the future.

- What is quite clear is that in its desperation to satisfy energy needs, the government will be willing to dilute environmental norms. On social front, however, India's policy on displacement, rehabilitation & resettlement will improve.

The big picture is not comforting. A fossil-fuel centric approach will not ensure energy security, affordability or inclusive development. Instead, massive environmental degradation for fossil fuel extraction will hurt India's poorest. In addition, India's current policies do not ensures equity in the use of these resources. A paradigm shift is, therefore, required in the energy resource governance in India.

The role of the civil society and media and of independent research and advocacy, will become even more important in India in the future, given the projected increase in energy demand and the massive resource exploitation it will entail. However, the response of the civil society in grasping, engaging and responding to the energy resource governance challenges has been piecemeal and site/project specific. The narrative here has been one of usurpation of resources and livelihoods and environmental destruction; engagement on alternatives and governance reforms has not been sufficient. On the other hand, researchers, academicians and NGOs working on climate change issues don't engage in energy resource governance issues and vice-versa. This is the reason why narrative on climate change and energy starts with and ends with renewable energy. India needs a new narrative on energy resource governance; a narrative that can marry the objectives of energy access, equity in resource use, environmental protection, transparent and accountable resource governance and climate change.

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