Compendium of State Policies from the Perspective of Climate Change Mitigation

In Partnership with the
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A project led by Srinivas Krishnaswamy

CISRS House, 14 Jungpura B
Mathura Road, New Delhi - 110 014
Ph/Fx: +91-11-2437-3680

www.vasudha-india.org

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Abbreviations

BAU	–	Business As Usual
BEE	–	Bureau of Energy Efficiency
BRT	–	Bus Rapid Transit
CDM	–	Clean Development Mechanism
CNG	–	Compressed Natural Gas
DSM	–	Demand Side Management
ECBC	–	Energy Conservation Building Code
EE	–	Energy Efficiency
FiT	–	Feed-in Tariff
GDP	–	Gross Domestic Product
GHG	–	Green House Gas
GoI	–	Government of India
JNNSM	–	Jawaharlal Nehru National Solar Mission
JNNURM	–	Jawaharlal Nehru National Urban Renewal Mission
LPG	–	Liquefied Petroleum Gas
MNRE	–	Ministry of New and Renewable Energy
MoEF	–	Ministry of Environment and Forests
MOSPI	–	Ministry of Statistics and Programme Implementation
MSW	–	Municipal Solid Waste
MW	–	Megawatt
NAPCC	–	National Action Plan for Climate Change
NSSO	–	National Sample Survey Organisation
RE	–	Renewable Energy
RGGVY	–	Rajiv Gandhi Grameen Vidyutikaran Yojana
RPO	–	Renewable Purchase Obligation
RTI	–	Right To Information
SAPCC	–	State Action Plan for Climate Change
SGDP	–	State Gross Domestic Product

EXECUTIVE SUMMARY

India's economy has been growing rapidly in the past few years, with the average GDP being in the region of 7 per cent and touching the 9 per cent mark in 2011. The rapid rate of economic growth is also characterized by the rapid growth of urban centres with vast changes and increases in their consumption patterns. The consumer durables sector has been growing at an average annual rate of 7 per cent and is currently riding on the country's economic boom. Some sectors that have grown annually at 5 per cent or above on average are urban housing and automobiles. The real estate sector, one of the most volatile and keenly watched segments of the Indian economy, contributes 5.9 per cent of the country's GDP and is poised to rise in coming years. The construction industry currently ranks third among the 14 major sectors in terms of direct, indirect, and induced effects in the economy[1]. While all this may be good news for the economy, it increases the burden on an already fragile and inadequate infrastructure (roads, energy) and adds to people's woes. Therefore, while policy makers focus on putting India on a sustainable, double-digit GDP growth path for the next decade or two on the one hand, pressure is increasing on India both internally and externally to pursue a sustainable development pathway on the other hand.

The Government of India has decided to reduce its emissions intensity by 20–25 per cent to 2005 levels by 2020 yet maintain its development objectives and GDP goals. That seems challenging but, considering the various initiatives several states have taken in various sectors in addition to national programmes and schemes, India may meet its emission intensity targets and—with sufficient encouragement and resources— surpass this target. While these state initiatives are not from a climate lens—but purely to address some sector-specific issues and challenges—these have the co-benefit of reducing carbon emissions over the business as usual (BAU) approach.

1 http://mospi.nic.in/mospi_new/upload/nad_pr_7feb13.pdf

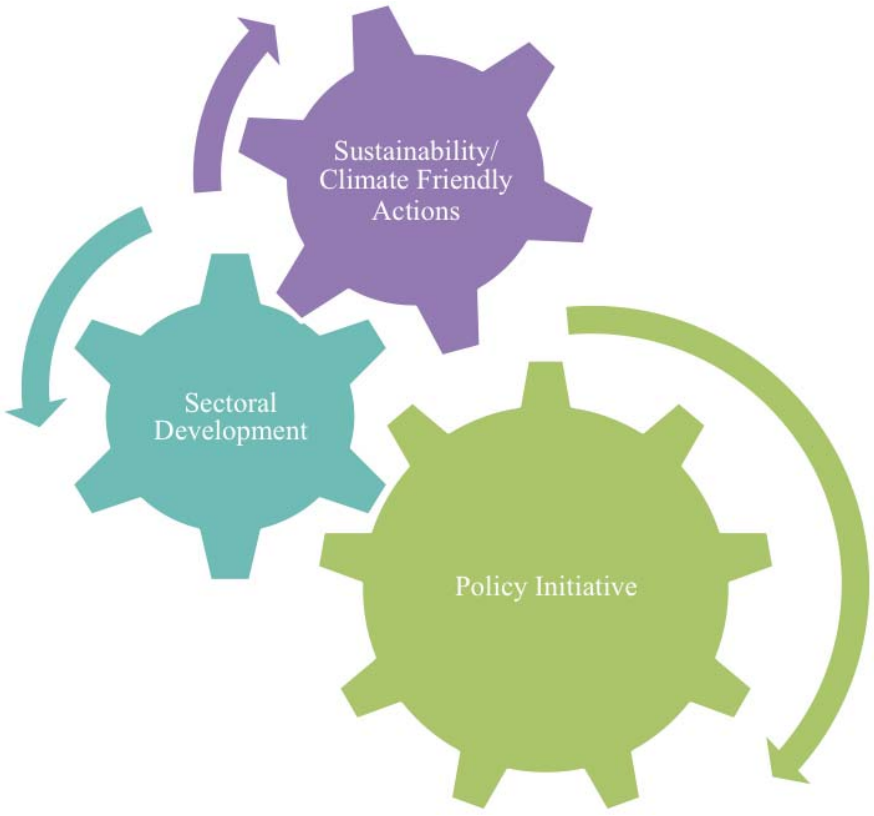
State Initiatives

- Increase in share of renewable energy to address energy security and energy scarcity situation
- Mandatory use of solar water heaters to reduce peak electricity demand
- Mandatory rain water harvesting to address acute water shortages
- Mass rapid public transit systems to ensure access to public transport to all
- Massive reduction in transmission and distribution (T&D) losses to reduce the financial burden of electricity utilities and to bring them out of the current high debt situation
- Energy efficiency programmes to reduce peak and base load electricity demand and to ensure efficiencies in production processes
- Energy labeling programmes for household appliances to ensure conservation of electricity usage

This study primarily looks at the policy framework of six sectors—electricity and energy, urban development, transport, waste management, industry, and water—from a climate change mitigation perspective and aims to

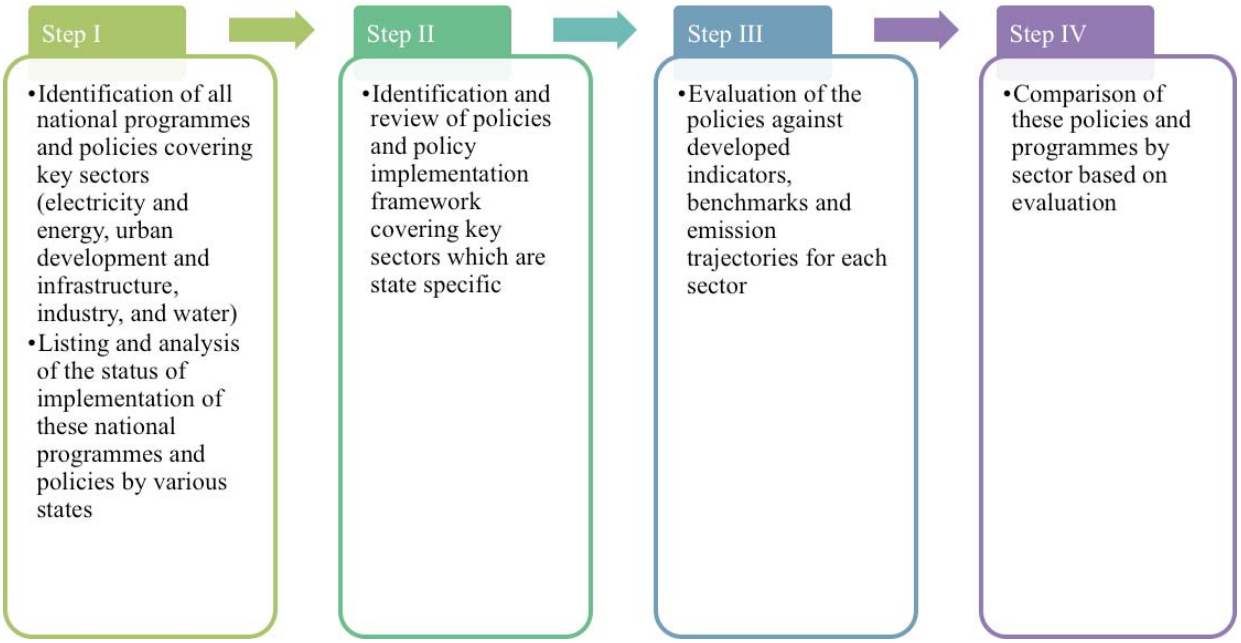
- identify and analyze state-implemented policies and programmes in key carbon emitting sectors (electricity, energy, urban development, transport, industry, and water);
- develop a methodology to rank states on initiatives, various development parameters, topography, natural resources availability, Human Development Index, among others;
- list good policies and programmes, and implementation mechanisms, for states to learn from and implement; and
- rank states on policies and programmes to stimulate their competitive spirit in following a sustainable development pathway.

Figure I: Policy Action Development Conundrum



Source: Compiled by Vasudha Research Team

Figure 2 Research Study Steps



Because Indian states differ in topography and economic status, we assessed them on

- GDP and growth;
- per capita income;
- key sources of GDP (it would be unfair to compare a state where the services sector is the main contributor to the GDP with one where mineral resources is the main contributor);
- size and population of states;
- past trends in growth of states/cities;
- future growth (comparing a city which was relatively new such as Chandigarh with Mumbai or Kolkata could be faulty, since Chandigarh being relatively new would have been built basing itself of learning from the older cities and therefore, any policies will also have to be implemented keeping in view the trends and what is possible and what is feasible);
- topography and geographic location of states; and
- analysis of achievements toward a low carbon approach versus the actual potentials of implementing full low carbon programme (renewable energy (RE) targets and achievements are to be analysed on the renewable energy potentials for the state)

In addition to existing policy frameworks to tackle threats from climate change in the identified sectors, such as the eight missions of the National Action Plan on Climate Change (NAPCC), states are formulating complementary state action plans on climate change (SAPCC). But there is ambiguity and variation in mitigation and adaptation, timelines of implementation, finance, and period of operation. Most SAPCCs read like a list of best possible options or economically viable options that may spur economic development but not necessarily sustainable development. Although the NAPCC is being implemented and the SAPCCs are being formulated, the findings of this research are intended to stimulate and encourage states to adopt best practices for promoting low-carbon development, and can serve as a reference in the analysis of key requirements across identified sectors and as a ready reckoner of available options. This research study also facilitated the formulation of linkages between existing policy actions and the actions proposed as part of the state action plans. The policy compendium demonstrated that although the measures adopted by states can help India achieve its target of reducing its emissions intensity, wider replication of such actions could result in a greater degree of mitigation, and allow India to easily transition into a sustainable low-carbon pathway.

Key Sector Specific Findings

Electricity

- All state governments are developing renewable energy (RE) policies to address the rising energy deficit and to attract private sector investment.
- These RE policies being developed are mainly motivated by incentive mechanisms like renewable purchase obligation (RPOs) and creating incentives through providing industrial status for getting tariff benefits. This has been implemented in states such as Andhra Pradesh, Haryana, Manipur, Rajasthan, Uttar Pradesh, and Punjab. Another motivator is introducing fiscal incentives like tax holidays etc, as followed in Andhra Pradesh, Assam, Arunachal Pradesh, Gujarat, Karnataka, Manipur, Mizoram, Odisha, and Tamil Nadu. A third reason for developing RE policies is providing infrastructural benefits like concessional lands, single window clearances, and grid evacuation.
- Gujarat's solar policy of 2009 is regarded as one of the unique initiatives taken in solar power sector, and it is expected to generate 20,000 million units of electric power annually.

Industry

- Most Indian states have an industrial policy targeted at attracting private sector investment.
- These policies generally classify industries by level of pollution into red (highly polluting), orange (moderately polluting), and green (marginally polluting).
- Energy efficiency measures have been executed for many industries in different states
- Types of industrial policy include tax credits, input, output and R&D subsidies, minimum use requirements, and standards.
- Only seven out of the 29 states encourage the use of renewable energy for meeting the needs of energy intensive processes.
- Delhi's industrial policy has a carbon tax but does not have any provision encouraging RE-based power generation in industries.
- State industrial policies need to prioritize climate change mitigation.

Water

- Few states have a dedicated water policy to promote better water resource management, groundwater management, and water conservation.
- Few states have adopted RE-based water pumping technologies that save a considerable amount of energy.
- Delhi and Ahmedabad are the only cities that charge a cess on water; other states are keener to improve the water supply.
- In India, only 14 of the 29 states have a policy on rainwater harvesting. Of these, only six of the major states have policies that make it mandatory. This is observed in contrast to the fact that eight scheduled states have rainwater harvesting policies.
- Only Assam, Jharkhand, Punjab, and Rajasthan have wastewater and sewage management policies and have a coherent plan for recycling water resources. Most other states have a policy on either sewage or wastewater.
- Water supply to urban areas is a key aspect of urban development, and state governments are looking at it more from the perspective of social equity rather than a climate change. Water shortages in India are becoming chronic and solid efforts are required to increase its availability for the people.

Urban Development

- Most states in India lack a comprehensive urban development policy.
- Urban zoning and green spaces are features that are included mostly in Urban Master Plans. There is a need for a policy that considers these elements of urban planning as they provide ecological services and helps in improving the environmental sustainability in cities.
- Under habitat management policy, the two most important policy instruments have been the building code and energy efficiency building code. The BEE has been undertaking various activities to develop and help states implement these.
- Eight states of the country have implemented and developed initiatives on solar passive architecture, including West Bengal and Himachal Pradesh.

Transport

- Delhi, Orissa, Haryana, Kerala, Gujarat, and Madhya Pradesh are a few states that have formulated a state transport policy; most others have adopted the national transport policy.
- Converting vehicles to run on compressed natural gas (CNG) has improved the pollution control system in many states and helped reduce emissions.
- States still have to improve road conditions, increase rural connectivity, reduce congestion, and promote efficient public transport systems.
- Adoption of the National Urban Transport Policy (2006) at the state level has been erratic.

Waste Management

- Most Indian states lack a comprehensive waste management policy. Meghalaya and Karnataka are two of the few exceptions.
- Most states have adopted central level legislations such as Municipal Handling Rules 2000 and Plastic Waste Management Rules 2011.
- Most states handle, segregate, dispose of, and recycle their municipal solid waste. One noteworthy example of waste management practices is the Clean Kerala mission, launched in 2002 to free Kerala of garbage. The mission, being executed in phases, has achieved partial success.
- Regulations and legislation have been executed for managing plastic waste in states such as Haryana and Himachal Pradesh.
- On a debris management policy, Maharashtra was the stand out state; no other state has one. Several cities promote composting with the involvement of local bodies and resident welfare associations.

The findings of this study indicate that although most policies do not focus directly on mitigating climate change, they have significant potential to facilitate GHG emissions reduction over a BAU scenario. Policy formulation and implementation in almost all states is directed at securing investments (especially in the case of the transport, electricity, and industry sectors) rather than accruing any development benefits. Hence, wherever the need does not arise, state governments have simply adopted the central government's rules and regulations. Additionally, the policies at the sub-national level are predominantly voluntary in nature. This restricts their effective implementation, whereas mandatory policies would allow for an improved dispersal of benefits combined with a strong enforcement.

No single policy framework (like command-and-control mechanism or incentive-based mechanism) works for the states. The states undertaking a mixed approach have been performing better than the others in terms of policy effectiveness.

The following tables rank states in terms of policies that have the most impact on addressing climate change.

Table 1 States with Most Friendly Climate Policies[2]

States	Energy And Electricity	Urban Development	Water	Industry	Transport	Waste Management
Karnataka						
Maharashtra						
Kerala						
Madhya Pradesh						
Tamil Nadu						

Table 2 States that have Moderate Climate Friendly Policies

States	Energy And Electricity	Urban Development	Water	Industry	Transport	Waste Management
Rajasthan						
Gujarat						
Andhra Pradesh						
Himachal Pradesh						
Delhi						

Table 3 States that have Least Climate Friendly Policies

States	Energy And Electricity	Urban Development	Water	Industry	Transport	Waste Management
Uttarakhand						
Sikkim						
Punjab						
Haryana						
Orissa						
West Bengal						
Mizoram						
Nagaland						

Table 4 States with Weakest Climate Friendly Policies

States	Energy And Electricity	Urban Development	Water	Industry	Transport	Waste Management
Assam						
Arunachal Pradesh						
Manipur						
Bihar						
Chhattisgarh						
Uttar Pradesh						
Goa						

2 Dark green indicates that the policies are holistic, cover all the elements these should cover, and have the greatest impact on reducing emissions. Light green indicates that the policies cover many of the elements of a holistic policy. Yellow indicates that the policies are moderate and may address the issues these are required to address. Orange indicates that the policies are inadequate and do not address the issues these are meant to address. Red indicates that there are no policies; where there are, these are completely inadequate and will not address the issues these are meant to address.

States	Energy And Electricity	Urban Development	Water	Industry	Transport	Waste Management
Jharkhand						
Meghalaya						
Tripura						
Jammu & Kashmir						

Many states endowed with rich natural resources and that are naturally very environment friendly do not have "climate friendly" policies. Many states that have the weakest climate friendly policies may actually have very low greenhouse gas emissions, due largely to rich forest cover, vegetation, source of energy supply, low levels of industrialization due to topography and other factors, high level of agro-based industry for the similar reason and so on. However, since this rating is about policies and policy frameworks, states that have low greenhouse gas emissions but no policies that would impact emissions reduction have been ranked low.

Given the challenges of climate change, even low-emissions states should opt for policies and policy frameworks that would address climate change in the medium and long term.

States with relatively high per capita GDP have climate mitigation policies primarily to address the stress on infrastructure from high consumption patterns. For instance, high demand for energy in some states has led to peak energy demand, which in turn has led these states to put in place policies such as mandatory solar water heating. Similarly, states that experience high demand for water have put in place policies for water conservation, harvesting, demand side management, and other relevant practices, which obviously also reduce emissions.

In sum, states have adopted a lot of interesting policies and policy frameworks and some innovative and effective ways to implement the plans. Many of these policies can be replicated in other states, and they can learn how to create an effective implementation framework from each other. We hope that this compendium, intended to serve policy makers, policy analysts, and others as a reference tool, also helps states create policies that help reduce carbon emissions while meeting developing goals and addressing development challenges.

CHAPTER 1

INTRODUCTION

1.1 Introduction and Background

India's GDP has been growing at an average rate of 6 per cent per annum since 1997 and even managed to touch 9 per cent in 2011, at a time when the world was going through a global recession.

The major contributors to India's GDP are the service industry accounting for 59.29 per cent of the country's GDP, with agriculture contributing 13.68 per cent and the industrial sector contributing 27.03 per cent. The industrial sector ranks 14th in terms of factory output in the world. Additionally, the manufacturing sector contributes to 15.24 per cent towards total GDP of the country.[1]

SERVICE INDUSTRY ACCOUNTS FOR **59.29%** OF THE COUNTRY'S TOTAL GDP

India has also been facing a rapid growth in urban centres, due to factors such as increased migration from rural areas to urban areas, rise in disposable incomes,

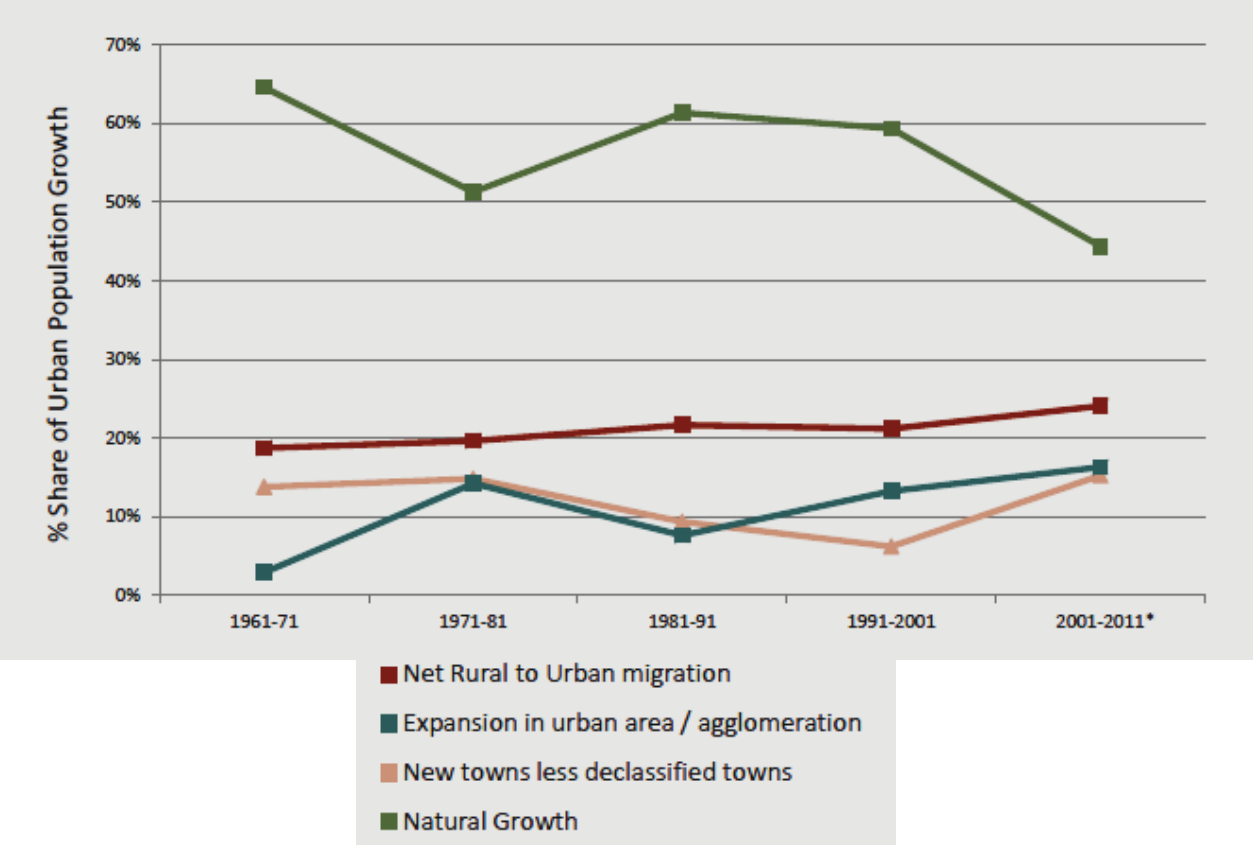
1 http://data.gov.in/dataset/gdp-india-and-major-sectors-economy-share-each-sector-gdp-and-growth-rate-gdp-and-other-sect

higher consumption patterns and many small towns and cities transforming into bustling urban centres.

As per the 2011 census, the urban population in India is 377.10 million having grown from 286 million in 2001, making it the second largest urban population in the world. Increasing population[2] and growing demands puts the development process in a challenging situation, as it continuously needs to meet the demands for infrastructure and energy access. This higher demand for energy in turn puts pressure on the natural resources leading to their over exploitation.

A study[3] on migration patterns in India shows that net rural to urban migration has increased from 21 per cent in 1991-2001 to 24 per cent in 2001-2011.

Figure 1.1: Rural-Urban Migratory Trend



Source: http://www.iihs.co.in/wp-content/themes/education/resources/Migration.pdf

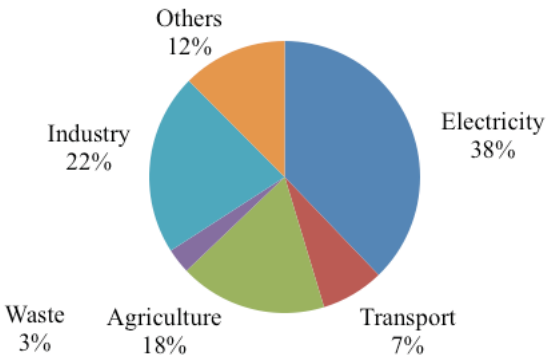
The increase in consumerism and growth also has its impact on carbon emissions. India currently ranks fourth in terms quantum of emissions, behind the US, China and the European Union. According to the greenhouse gas emissions inventory of 2007[4], the bulk of the emissions in India come from the energy sector followed by the industry, agriculture, and transport sectors.

However, despite the fact that India is the fourth largest carbon emitter in the world, its per capita emissions of 1.7 tonnes of carbon are among the lowest globally.

In comparison, that of the EU-27 is 10 tonnes per capita, the US is 17 tonnes, South Africa is 10 tonnes, and China is 5.8 tonnes per capita.[5]

2 http://censusindia.gov.in/2011-prov-results/data_files/india/Final_PPT_2011_chapter3.pdf
3 http://www.iihs.co.in/wp-content/themes/education/resources/Migration.pdf
4 http://mospi.nic.in/mospi_new/upload/Energy_Statistics_2013.pdf
5 http://data.worldbank.org/indicator/EN.ATM.CO2E.PC

Figure 1.2: Sector-wise Carbon Emissions in India



Source: India: Greenhouse Gas Emissions 2007, MoEF

Therefore, the biggest challenge for India is to address development, while also factoring the impacts of climate change on its development trajectory. Most government policies in India are directly positioned to address social and economic issues, and they have an indirect impact in addressing the threats of climate change. In the context of India's National Action Plan on Climate Change, and its commitment to the UNFCCC on reducing its GDP intensity by 20-25 per cent by 2020, this report maps out policies (which have a direct or indirect bearing on climate change) of all Indian states across six key sectors, namely:-

1. Electricity
2. Urban development
3. Industry
4. Water
5. Waste management
6. Transport

A compendium of all the policies has been created with the objective of providing an in-depth understanding of the state level policies and measures. It also serves as a comparative reference point whereby the states can be compared against each other in terms of actions taken to address climate change. This report also identifies a set of unique policy measures existing in some states, which have the potential of being replicated across India.

CHAPTER 2

THE METHODOLOGY OF THE STUDY

2.1 Introduction

The report aims to analyze various policies and programmes undertaken by the states of India, and also being followed as part of the national level programmes in the sectors of energy and electricity, urban development, industry, transport, waste management and water sectors from the perspective of climate change mitigation.

The report focuses on all the states of India and forms a compendium of good practices and legislative framework to stimulate and promote sustainable development policies in all states of India. This study was carried under three phases taking into account a number of states at a time and developing a common format of analysis.

THE REPORT FORMS A COMPENDIUM OF GOOD PRACTICES AND LEGISLATIVE FRAMEWORK TO STIMULATE AND PROMOTE SUSTAINABLE DEVELOPMENT POLICIES IN ALL STATES OF INDIA

We identified the abovementioned six sectors because good policy interventions in these sectors have the co-benefit of mitigating climate change, while the intent of the initiative may not necessarily aim at mitigating climate change.

For developing a better understanding of where states stand in terms of their policy formulation, the report identified key policy elements for each sector that can contribute towards GHG emissions reductions. These elements (considered ideal components of the sectoral policies) were then used to assess the various state level policies. The policy elements identified for each sector are listed below.

Electricity Sector

a) Support to grid-connected renewable energy
b) Support to decentralized renewable energy
c) Measurable targets- RPOs, State renewable purchase targets, Installation targets
d) Financial incentives- Feed-in tariffs, capital subsidies, interest subsidies, low interest loans
e) Fiscal incentives-Tax rebate, VAT exemption, Accelerated depreciation
f) Infrastructure support- grid evacuation, land access, single window clearances
g) Performance based incentives (if any)
h) Energy efficiency and conservation measures including measures to reduce T&D losses

Industry sector

a) Industry classification (into high polluting, low polluting etc.)
b) Pollution norms
c) Technology standards
d) Regulation (Monitoring and Evaluation)
e) Resource utilization norms
f) Energy efficiency
g) Renewable energy use

Water sector

a) Rainwater harvesting
b) Wastewater recycling
c) Urban Demand management
d) Groundwater management
e) Sewage provisions

Urban development

a) Green spaces and master plan- urban zoning and green spaces, urban land use policy, parking regulations
b) Urban habitat management- Building codes (Floor Area Ratio), Energy-efficient building code implementation, solar passive architecture

Transport sector

a) Road development
b) Non-motorized transport- pedestrian pathways, bicycle pathways
c) Public transport promotion- BRT systems, metro, any other initiatives
d) Transport fuel related policies

Waste sector

a) Recycling
b) Waste handling process- collection, transportation, treatment
c) Waste segregation
d) Waste disposal methods

Primary and secondary research was conducted to collect information on state policies and identify the nature of policies adopted (whether mandatory or voluntary), along with an assessment to measure state performances against these ideal policy elements.

2.2 | Methodology

The broad methodology adopted for research consisted of:

a) **Desk Research: The desk research comprised-**
   1. Identifying the various policies, instruments, implementation mechanism which have a direct or indirect bearing on climate change in the following sectors:
      i. *Electricity Sector*
      ii. *Urban development*: Building codes, municipal codes, government procurement policies
      iii. *Industry Sector*
      iv. *Water*
      v. *Transport*
      vi. *Waste Management*
   2. Analyzing the existing policies and legal and implementation framework.
   3. We undertook a holistic assessment of each policy undertaken in different sectors by identifying the elements of each policy. We assessed sectors to understand how holistic the policy was rather than just looking at its broad overview. We have given more weightage to the policies that are implemented as mandatory over the ones that are incentive-based and also voluntary. Based on this criterion, we assess the effectiveness of policies in each sector.

Source of Information for Desk Research:

Secondary research have been undertaken to get information on the policies and programmes of the state governments and those that are being implemented at the state. Our information sources include government orders, legislations and gazetted policy notifications, newspaper archives, and collated materials from surveys and reports.

Primary research component of the study involved analysis of response received from government sources through filing of Right To Information (RTI) applications to government agencies wherever required to gather more information, and interviewing the beneficiaries of the programmes and policies at different levels.

b) Agencies and Departments which were covered in the research:
   1. Agencies and Departments: All relevant government departments and ministries such as environment, energy, water, urban development, rural development, industry, transport
   2. State electricity regulators
   3. Municipal corporations and local civic authorities

4. Electricity distribution boards
5. Water utilities, water regulators (where ever applicable)
6. Pollution control boards
7. City transport service or authority

c) **Assessment Methodology:**

1. In assessing policies, we looked at the various parameters and elements of policies, particularly to understand how holistic the policies are for the said sectors or sub-sectors. The various parameters and elements that we looked in to while assessing policies were,
   i. Coverage of elements
   ii. Compliance mechanism
   iii. Targets if any
   iv. Type of Support for implementation including incentivization and penal systems for non-compliance
   v. Resources allocation
   vi. Implementation framework

2. The requirement for the sector in relation to the ground realities of the states and the appropriateness of the policies to address the same.
3. We developed a colour coding for comparing policies undertaken by states. The coding is as below:
   i. Dark Green indicates that policies address a wide range of elements and are in our view holisitic
   ii. Light Green indicates that policies address a few of the elements and not all of them.
   iii. Yellow indicates that the policies are moderate and may address the issue to a certain extent, but not in an optimal manner.
   iv. Orange indicates that policies are very inadequate
   v. Red indicates either no policies or if policies exist, no adequate framework for implementation.

Color coding adopted for grouping states

	Policies address a wide range of elements and are in our view holistic
	Policies address a few of the elements but not all of them
	Policies are moderate and may address the issue to a certain extent, but not in an optimal manner
	Inadequate policies
	No policies, or if policies exist, no adequate framework for implementation.

CHAPTER 3

OVERVIEW OF STATES

3.1 | Introduction of States under Study

In India, each State is unique in its topography, area, demography, and economic status. A bird's eye view of some of the key statistics of the various states under study is given in Table 3.1. These statistics were also extremely important for us to assess the current level of development of the various states, the development priorities of the various states and importantly, the key sources of GDP in the various states.

Some of the key data and information that we looked into, provided in table 3.1 are:

a) Geographic area and demography
b) GDP per capita
c) Net State Domestic Product (NSDP)
d) Human Development Index
e) Per capita energy consumption
f) Energy basket
g) Transport and mobility (per capita vehicle use)

DELHI HAS THE HIGHEST NUMBER OF ELECTRIFIED HOUSEHOLDS WHEREAS U.P. HAS LOWEST PERCENTAGE OF ELECTRIFIED HOUSEHOLDS

Table 3.1: States under Study at a Glance

	Gujarat	Maha-rashtra	Bihar	Jhark hand	Madhya Pradesh	Karna-taka	Delhi	Tamil Nadu	Kerela	Uttar Pradesh	Andhra Pradesh	Punjab	Haryana	Him-achal Pradesh	Rajast-han	Orissa	Uttara-khand	West Bengal	India
Geographical area (sq. km) (MoSPI)	1,96,024	3,07,713	94,163	79,714	3,08,245	1,91,791	1,483	130058	38863	240928	275045	50362	44212	55673	342239	155707	53483	88752	3,287,263
Population (Million) (2011 census)	60.38	112.37	103.80	32.96	72.60	61.13	16.75	72.14	33.39	199.58	84.67	27.70	25.35	6.86	68.62	41.95	10.12	91.35	1210.19
GSDP Per-capita (INR) (RBI Statistical Review Handbook 2010-11)	60499	68970	15746	25234	25158	48743	127397	59345	62439	20998	48184	56834	70835	61302	29787	32799	54964	37246	43150
NSDP (Billion rupees) (RBI Statistical Review Handbook 2011-12)	3094.09	7028.32	1503.98	726.6	1605.49	2483.54	2016.53	3822.29	1854.34	3671.85	3638.35	1380.61	1619.37	343.79	1781.84	1135.87	479.83	3080.18	39754.29
Human Development Index (India HDR 2011)	0.527	0.572	0.367	0.376	0.375	0.519	0.75	0.57	0.79	0.38	0.473	0.605	0.552	0.652	0.434	0.362	0.49	0.492	0.467
Per-capita Energy Consumption (kWh) (PIB)	1615.24	1028.22	122.11	880.43	602.07	903.24	1651.26	1131.58	525.25	348.37	966.99	1526.86	1222.21	1379.99	736.2	874.26	1112.29	550.16	778.71
Installed Capacity: Conventional Sources (GW) (Mospi Energy Statistics 2013)	15.5	16.72	0.53	2.73	4.51	8.62	1.54	6.78	2.31	7.64	12.11	4.89	4.74	2.07	5.58	4.28	1.65	7.46	175.47
Installed Capacity of Non Conventional Sources (GW) (Mospi Energy Statistics 2013)	3.5	3.63	0.08	0	0.48	3.18	0.02	7.34	0.16	0.69	0.89	0.35	0.12	0.53	2.37	0.1	0.19	0.16	24.49
%age of Non Conventional power in total installed capacity	18.42	17.84	13.11	0.00	9.62	26.95	1.28	51.98	6.48	8.28	6.85	6.68	2.47	20.38	29.81	2.28	10.33	2.10	12.25
Percentage of electrified houses (Census 2011)	90.4%	83.9%	16.4%	45.8%	67.1%	90.6%	99.1%	93.4%	94.4%	36.8%	92.2%	96.6%	90.5%	96.8%	67.0%	43.0%	87.0%	54.5%	67.2%
Motor Vehicles per 1000 People (Ministry of Road Transport 2011)	215	155	26	94	101	162	431	217	182	67	120	190	212	91	116	80	99	36	117

Sources: Compiled by research team based on data and information from various sources identified under each head

	Arunachal Pradesh	Assam	Chhattis-garh	Goa	Jammu & Kashmir	Manipur	Meghalaya	Mizoram	Nagaland	Sikkim	Tripura
Geographical Area (sq.km) (MoSPI)	83743	78438	135191	3702	222236	22327	22429	21081	16579	7096	10486
Population (Million) (2011 census)	1.38	31.16	25.54	1.45	1.54	2.72	2.96	1.09	1.98	0.61	3.67
GSDP Per capita(INR)	490411	92737	99262	29518	48197	8314	13216	5284	10273	4740	15348
NSDP (Billion Rupees)	62213	33633	46573	192652	42220	32284	52971	NA	36638	121440	50750
Human Development Index (India HDR 2011)	0.617	0.444	0.358	0.617	0.529	0.707	0.585	0.79	0.77	0.684	0.608
Per Capita Energy Consumption(kWh) (PIB)	470	204.8	1546.94	2263.63	952.02	240.22	675.19	376.99	218.03	850	335.47
Installed Capacity: Conventional Sources (GW) (MoSPI Energy Statistics 2013)	0.02	0.48	4.01	0.05	0.96	0.05	0.24	0.05	NA	0.01	0.15
Installed Capacity: Non-Conventional Sources (GW) (MoSPI Energy Statistics 2013)	0.02	0.03	0.27	0.03	0.13	0.01	0.03	0.04	0.03	0.05	0.02
% age of Non-Conventional power in total installed capacity	88.88	60	6.29	37.5	11.93	20	11.11	44.44	100	83.33	11.76
Percentage of electrified houses(Census 2011)	65.70%	37%	75.30%	96.90%	85.10%	68.30%	60.90%	84.20%	81.60%	92.50%	68.40%
Motor Vehicles per 1000 People (Ministry of Road Transport 2011)	105	51	108	542	74	76	59	85	138	64	51

For a scientific categorization of states, certain parameters were looked in to, such as Human Development Index, State GDP, key contributors to the GDP, consumerism patterns etc.

Based on the data available in Table 3.1, states were classified in the following manner:

- **GSDP per capita (INR):**
  - High GSDP states (60000- above): Delhi, Maharashtra, Gujarat, Kerala, Haryana, Himachal Pradesh
  - Medium GSDP states (45000-60000): Uttarakhand, Karnataka, Tamil Nadu, Andhra Pradesh, Punjab, Rajasthan
  - Low GSDP states (45000-below): Bihar, Jharkhand, Madhya Pradesh, Uttar Pradesh., Rajasthan, Orissa, West Bengal
- **Human Development Index:**
  - High HDI (0.6- above): Delhi, Kerala, Punjab, Himachal Pradesh
  - Medium HDI (0.41-0.59): Karnataka, Tamil Nadu, Gujarat, Maharashtra, Andhra Pradesh, Haryana, Rajasthan, Uttarakhand, West Bengal
  - Low HDI (0.4- below): Bihar, Jharkhand, Madhya Pradesh, Uttar Pradesh, Orissa
- **Per capita Energy Consumption (kWh):**
  - High energy consuming states (1200-above): Gujarat, Delhi, Punjab, Haryana, Himachal Pradesh
  - Medium energy consuming states (701-1199): Maharashtra, Jharkhand, Rajasthan, Karnataka, Tamil Nadu, Andhra Pradesh, Orissa, Uttarakhand
  - Low energy consuming states (0-700): Bihar, Madhya Pradesh, Kerala, Uttar Pradesh, West Bengal
- **Electrification status:**
  - Delhi has highest number of electrified households followed by Himachal Pradesh and Punjab. Bihar and UP have lowest percentage of household electrified.
- **Mobility access:**
  - Delhi and Haryana have highest number of motor vehicles per 1,000 of people. There are 431 vehicles on road per 1,000 people in Delhi and 212 vehicles per 1,000 of people in Haryana.

CHAPTER 4

OVERVIEW OF STATE ACTION PLANS ON CLIMATE CHANGE

4.1 Introduction

The Ministry of Environment and Forests (MoEF) asked all states to develop action plans (SAPCCs) to address climate change and detail how they would carry out mitigation and adaptation activities. This activity aimed to align the SAPCCs with the NAPCC and help states plan implementation. The drafting of SAPCCs opened new gateways for studying climate change at a more specific level in the country. Most states have drafted the SAPCCs but not formalized them yet in the course of actions and planning. Many of these plans still are dynamic documents and are working towards incorporating other components such as vulnerability assessments, financing and targets. Many of these state action plans still needs to develop holistic climate profiles of their state. Based on these assessments, the states have also come up with possible actions that can be implemented to tackle the imminent threat of climate change.

MOST STATES HAVE DRAFTED THE SAPCCs BUT NOT FORMALIZED THEM YET IN THE COURSE OF ACTIONS AND PLANNING

The following list from the MoEF website[1] mentions the state action plans that have been accepted by the MoEF. These are as follows.

1. Andhra Pradesh
2. Arunachal Pradesh
3. Madhya Pradesh
4. Manipur
5. Mizoram
6. Rajasthan
7. Sikkim
8. Tripura
9. West Bengal
10. Assam
11. Meghalaya
12. Odisha

Delhi was the first state to publish its climate action plan in 2008, followed by Uttarakhand, Karnataka, and Himachal Pradesh. The MoEF also held a consultation workshop[2] inviting representatives from the state governments with the objective of seeking recommendations for finalizing the framework for preparing the state action plans and consolidating the approach. Following this workshop various states began to submit their action plans to the MoEF; however, some states still remain behind. Jharkhand was the most recent state (at the time of writing) to publish its action plan in 2013. In order to understand the nature and focus of these plans, and also to gauge the state's efforts in addressing climate change, a brief analysis of the climate action plans was carried out.

Based on our analysis, there appears to be a certain degree of ambiguity on the role of mitigation in the state climate action plans. Although the states understand that the plans should focus on vulnerability and adaptation, the plans are also meant to complement the mitigation-focused national missions that the states are expected to align with. In the 12 SAPCCs (although 22 states have completed their plans) published on the MoEF website so far, there exists significant variation in the number of proposed mitigation actions by the states. The variation in addressing mitigation can be attributed to the fact that only a few states commissioned GHG inventories (although all states left them out of the purview of the SAPCCs) and the rest had a tendency to follow BAU scenarios without significant mitigation impacts.

Besides the variation in proposed mitigation actions, ambiguity exists in the plans regarding targets, timelines, finance, and period of operation. Karnataka and Orissa have not defined any targets for their proposed strategies. Some states have set targets for some sectors, but the energy sector is one sector where no state has set any targets. For the sectors covered under its plan, Rajasthan is the only state that has defined targets. Most states have attempted to prioritize a list of actions across the various sectors; however, they are mostly dominated by ongoing efforts in the state and other actions proposed by the various departments in the future.

The structure of most SAPCCs appears to be in line with India's overall climate policy, where achieving sustainable development goals are expected to bring about a reduction in GHG emissions as a co-benefit. The biggest criticism of the NAPCC itself is that sustainable development goals have not been specified or prioritized uniformly across the eight missions. Most of the state climate action plans read like a list of best possible options or economically viable options that may spur economic development but not necessarily sustainable development.

4.2 | Institutional Arrangements

In the run up to the exercise of developing climate action plans at the state levels, it has been observed that SAPCC has to be based on scientific assessment of the climate vulnerability to climatic variability and long term climate change. A scientific assessment will help in identifying and prioritizing mitigation/ adaptation strategies, identifying most vulnerable districts/ social groups/sectors (water, forest, agriculture) etc; energy intensive sectors (Industry, transport etc); climate change projections; GHG Emissions (sectors/ regions). In doing this, we would therefore require setting clear goals and targets, prioritization of strategies and actions, inter-departmental

1 http://envfor.nic.in/ccd-sapcc

2 National Consultation Workshop on Preparation of State Level Strategy and Action Plan on Climate Change, Ministry of Environment and Forests, 2010 http://envfor.nic.in/sapcc-workshop

coordination among the ministries of the state governments, capacity building of the manpower in the ministries of the governments.

All of the above measures require robust institutional arrangements and support for these actions. The SAPCCs in the states of India were designed to be developed in a way that creates minimum pressure on creation of separate institutional setups, rather they would use by and large the existing setups and evolve more dynamic inter and intra-departmental co-ordinations. In this regard, the states have set up separate climate change cell for carrying out actions on climate change under different sectors. These cells perform mainly the coordination role and the implementations of the policies mainly lie with the respective departments. So, the challenge for undertaking specific actions as lined up in the action plan would require much of inter-departmental coordination between the climate change cell and the department. The other important observations of the institutional set up is that many of the States have actually established separate climate change division within the departments to ensure better coordination between the nodal climate change cells.

4.3 Financial Obligations

There were concerns raised by the state representatives during various national level interactions with the Centre on the issue of financing mechanisms for taking up activities by the states for the implementation of the SAPCC. It was informed that nodal ministries would have to allocate funds under the respective national missions through the outlays of respective ministries. Other suggested funding options were from bilateral and multilateral agencies. Participants also suggested that MoEF should request for fund allocation from Planning Commission.

Successful implementation of the SAPCCs depend on how well the plans are written clarity of objectives and targets, cost assessments for taking up actions, and prioritization of well defined actions and policies. The centre-state financing synergies need to be established more robustly. To ensure this, mechanisms are required to ensure this disbursement happens smoothly.

4.4 States on Low-Carbon Actions

Low-carbon development has been the thrust area for the SAPCCs. Most states have identified and started prioritizing policies and strategies in this regard. In this regard, the general areas of intervention includes regulating and planning urban expansion and sustainable urban transport, enhancing efficiency and clean options for power generation, and exploring possibilities for carbon neutral villages and hamlets, through combination of clean power and other resilient policies.

Developing these actions, state governments have resorted to either implementing national level targets and policies or developing separate policies in addition to existing policies. For example, states like Gujarat, Karnataka, and many others have separate policies on renewable energies, energy efficiency which are in addition to the national policies on renewables. These clearly show the momentum among states to undertake low-carbon options for addressing the challenges to development.

The nature of these policies is mainly classified into incentive-based ones and regulations in the form of mandatory actions. A large number of policies involved both the private and the public sectors in a partnership mode. Initiatives undertaken by the BEE in the industry sector are also being implemented at the state level that forms an important dimension of the low-carbon actions in the states.

4.5 | Adaptation Plans

The state governments have identified, proposed, and implemented various adaptation plans in the states through different sector specific ministries. In this regard, the most important sector that has experience most of the adaptation related activities have been the agriculture sector. There have been initiatives put forward by the state governments through various non-state actors to undertake pilots and large scale programmes to address the issue of adaptation due to climate change. Many of these plans are focused on preparing the communities to be more climate resilient and create a win-win situation to address the climate change impacts through creation of livelihoods and ensuring climate friendly development.

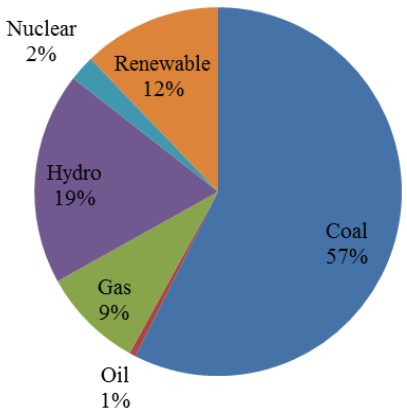
CHAPTER 5

ELECTRICITY AND ENERGY

India, an energy-starved country, depends heavily on fossil fuels to meet its energy requirements. Fossil fuels (coal, oil, and gas—coal contributes 57 per cent) supply 66.91 per cent of its primary energy needs. Hydro, nuclear, and renewable energy sources provide the remaining energy requirement. In rural areas, traditional biomass or wood and cow-dung is the main source of energy supply (MoP, 2013).

FOSSIL FUELS SUPPLY **66.91%** OF INDIA'S PRIMARY ENERGY NEEDS

Figure 4.1: Electricity Mix: Installed Capacity as on January 2013



Source: Ministry of Power, 2013

As is evident from the Figure 4.1, renewable energy currently plays a very minor role in meeting India's energy supply.

India also has to depend on imports to meet much of its fuel requirements. India is only self-sufficient in terms of coal but considering the poor coal quality (i.e., with high ash content, low sulphur content and very low calorific value), much of India's coal requirements are also being met by way of imports. Statistics show that the import of coal has steadily increased from 20.93 MTs during 2000-01 to 102.85 MTs during 2011-12.[1]

India faces formidable challenges in meeting its energy needs and in providing adequate energy of desired quality in various forms and that too both in a sustainable manner and at competitive prices.

Maintaining a growth of 8 per cent till 2031-32, and also fulfill the energy needs of its people, India needs to increase its primary energy supply by 3-4 time and electricity generation by 5-6 times of 2003-04 (Integrated Energy Policy, 2006).

The government projects the need to increase the installed capacity to 800,000 MW by 2031-32 to meet the country's electricity demands by that year[2]. However, it must be pointed out here that the rationale behind these projections is based on an increase in *per capita* consumption of electricity from the current level of 879 kWh to at least 1000 kWh by 2020 and is linked to 8 per cent GDP growth (Planning Commission, 2012). Very clearly, the government's projection of electricity demand is closely connected to GDP growth and is not looking at a sustainable electricity growth pattern.

As on January 2013, the total installed capacity of all electricity generation in India was 211.76 GW out of which conventional power generation contributed to 141.71 GW with the share of renewable energy (hydro, nuclear included) being 70.5 GW.[3]

As far as the domestic and rural sectors are concerned, the demand for energy in India is primarily for cooking, lighting, pumping of water for irrigation and transportation and with regard to other sectors, the demand is primarily to meet the requirements of industries and the transportation needs.

The Indian electricity sector is currently besotted with a number of problems, issues and concerns, such as, poor efficiency, lack of demand side and peak hour power demand management measures, unrealistic pricing systems etc. and yet 'very high' per capita consumption by 'few'.

Role of renewable energy in addressing the challenges:

Government of India has tried to address the challenges of fossil fuel based energy through developing plans and programmes on renewable energy since the 1980s. However, that did not take off well until recently. The real thrust to the expansion in renewables came with liberalization, the opening of markets, and slackening of imports, where India emerged as a formidable player in the wind sector. In recent times, a further thrust came from the government though the programmes dedicated on solar (JNNSM), giving incentives to renewable energy sectors through tariff incentives, creating enabling environment for the component manufactures in the solar sector and also providing tariff concessions to the wind sectors for imports. In the section below, we get into analysis of these programmes in details.

The initiatives and Programme range from enhancing generating capacities to conserving energies. Further, with the view to improve the energy infrastructure, a number of States have taken initiatives over and above those directed by the central government.

1 http://mospi.nic.in/mospi_new/upload/Energy_Statistics_2013.pdf
2 Parikh, 2005, Planning Commission
3 http://powermin.nic.in/indian_electricity_scenario/introduction.htm

Some of the specific sector policies include-

1) Feed in tariffs for renewable energy
2) Mandatory renewable purchase obligation
3) Mandatory solar water heaters in public buildings
4) Mandatory energy-efficient lighting in public buildings, street lights
5) Consumption based electricity tariff structures
6) Electricity rebates to households for the installation of solar water heater
7) Renewable energy policy to create an enabling market for renewable energy and ensure energy security.
8) T&D loss reduction, infrastructure development

Matrix for Renewable Energy Policies:

	State	Policies	Support to grid-connected RETs	Support for Off-grid RE	Measurable targets			Financial Incentives				Fiscal Incentives		Infrastructure support			Energy Efficiency and Demand Side Management			T&D Loss reduction policies and trends	
					Renewable Purchase Obligation	State Renewable purchase targets	Installation targets	Feed-in tariffs	Capital Subsidies	Elec. duty exemption	Interest subsidies	Low interest loans	Tax rebate	VAT exemption	Grid evacuation	Land access	Single window clearances	Lighting Efficiency Programme	Electricity Distribution reforms (Dynamic Tariffs, electricity metering	Other Demand Side Management Programmes such as pump sets	Current loss levels	Regulatory Policy
1	Tamil Nadu	Solar Policy 2012 and Wind Policy	✓		✓	0.1% for solar RPO with overall 9.7% RPO	3000 MW by 2015	✓		✓		✓					✓	✓	✓	✓	13.47%	✓
2	Gujarat	Solar policy 2009 and 2011, Wind Power Policy 213, Renewable energy Policy 2009	✓		✓ (10% of energy from RE sources)	✓ (1% for solar RPO)		✓							✓	✓		✓	✓	✓	19.24%	✓
3	Karnataka	Renewable Energy Policy 2009. Solar Policy 2011	✓	✓	✓	✓ (10% for non-solar RPO)	✓	✓						✓		✓		✓	✓	✓	17.34%	✓

4	Maharash-tra	Non-Convention Energy Policy, Wind Pow-er Policy, Biomass Policy, Co-Gen Policy	✓		✓	✓ (8.5% for non-solar RPO)	✓	✓	✓				✓		✓	✓	✓	20.68%	✓
5	Andhra Pradesh	AP Solar Policy, Policy for promoting of Wind energy by 2012	✓	✓	✓	✓ (0.25%) + 5.7% RPO for wind	✓	In-dus-trial Sta-tus	✓		✓				✓	✓		16.59%	✓
6	Rajasthan	Solar Policy 2011, Non-conven-tional en-ergy policy, biomass policy	✓		✓	✓ (8.2% for non-solar RPO + 1% RPO for Solar	✓	In-dus-trial sta-tus	✓	✓	✓	✓	✓	✓	✓	✓		27.87%	✓
7	Madhya Pradesh	Small Hy-dro power policy, wind pow-er policy, biomass policy, non-con-ventional energy policy	✓		✓	✓ (4.7% for non-solar RPO) + 0.2% RPO for Small Hydro + 0.8% RPO for solar	✓	In-dus-trial sta-tus		✓	✓	✓	✓	✓				37.62%	✓

8	Kerala	Renewable Energy Policy 2002, Solar Policy (draft) 2013	✓	✓	✓	✓ (3.95% for non-solar RPO) + 0.25 for Solar RPO	✓	✓						✓		✓	✓	✓	✓	18.29%	✓
9	Chhattisgarh	Solar policy 2012-2017, Wind Policy	✓	✓	✓	✓ (0.5% for solar RPO) + 4.6% non-solar RPO	✓ 500-1000 MW BY 2017	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	15.06%	✓
10	Haryana	State Renewable Energy Policy 2005	✓	✓	✓	✓ (1% solar, 3% for non-solar RPO)		✓	Industrial status	✓					✓		✓	✓	✓	29.66%	✓
11	Tripura	Draft Policy for Promotion of Electricity Generation through New Renewable Energy Sources	✓		✓	✓				✓	✓	✓		✓	✓					27.36%	✓

12	Uttara-khand	Policy for the promoting generation of electric-ity through Renewable energy sources with Private sector/ community participa-tion 2008	✓		✓	✓ (0.05% for solar, 6% for non-solar)	✓	✓					✓	✓	✓	✓			27.97%	✓
13	Assam	Policy for Small Hy-dropower Develop-ment 2007	✓		✓				✓		✓	✓	✓	✓					34.17%	✓
14	Himachal Pradesh	Hydro Power Policy - 2006 & Amend-ment - JAN 2008, JAN & FEB 2009 (ABOVE 5 MW)	✓	✓	✓	✓ (10% for Non-solar RPO)		✓	✓							✓	✓	✓	22.22%	✓

15	West Bengal	Micro Hydro Policy, Co-Gen Policy, Non-Conventional Energy Policy	✓			✓	✓								✓	✓	✓	✓	✓	✓	22.40%	✓
16	Punjab	New and Renewable Source of energy Policy 2012	✓	✓		✓		✓	✓	Industrial status	✓				✓	✓	✓	✓	✓	✓	25.10%	✓
17	Uttar Pradesh	Energy Policy 2009, Biomass Energy Policy (Draft) 2010, Solar Policy 2013	✓	✓				□(500 MW by 2017)	✓	Industrial Status	✓				✓	✓	✓	✓	✓		34.01%	✓
18	Meghalaya	Non-Conventional Energy Policy and Hydro power Policy	✓			✓	✓ (0.4% solar, 0.6% non-solar, 0.2% wind)						✓		✓			✓			35.77%	✓
19	Orissa	Policy Guidelines on Power Generation from Non-Conventional Energy Sources	✓			✓	✓ (0.2% for solar, 5.8% for non-solar)		✓				✓		✓	✓		✓	✓	✓	42.47%	✓

20	Bihar	Policy for Promotion of New and Renewable energy sources 2011	✓	✓	✓	(0.5% for solar, 4% for non-solar) ✓	✓	✓										50.77%	✓
21	Manipur	Renewable Energy Policy 2006	✓		✓	✓ (0.25% solar, 4.75% non-solar RPO)		Industrial status	✓		✓	✓	✓					50.87%	✓
22	Mizoram	Policy for Power Generation through Non-Conventional Sources of Energy	✓		✓	✓ (0.25% solar, 6.75% non-solar)			✓		✓	✓						45.63%	✓
23	Jhar khand	Jhark hand Energy Policy 2012 and Draft Solar Policy	✓	✓	✓	✓ (3% For non-solar RPO and 1% Solar RPO)	✓		50% exemption				✓	✓	✓	✓		17.07%	✓
24	Delhi	No Policy	✓	✓	✓	5% RPO								✓	✓	✓		20.04%	✓
25	Jammu and Kashmir	Miro Hydro Policy, Solar Energy Policy 2013	✓	✓	✓	✓ (4.75% for non-solar RPO + 0.25% Solar RPO)	✓			✓				✓				63.27%	

26	Arunachal Pradesh	Hydropower policy 2008, Renewable Energy Policy	✓			✓ (0.13% for solar, 3.37% for non-solar)	✓				✓	✓	✓	✓			47.12%		
27	Goa	No Policy	✓	✓	✓	No RPO								✓	✓	✓	15.27%		
28	Sikkim	No Policy	✓	✓	✓	No RPO								✓	✓	✓	33.67%		
29	Nagaland	No Policy	✓			7% RPO								✓	✓	✓	48.24%	✓	

Overview of the policies undertaken by the States:

- Includes Comprehensive policy on Renewable energy, as well as RE source specific policies such as wind energy, solar energy, biomass energy, hydropower energy etc for different states
- The RE policies are shifting towards market-based mechanisms like RPO for the development of the RE sector. Performance based incentives, tax rebates, direct subsidies are less preferred mechanisms for the promotion of the renewable energy sector. This reduces the dependency of the RE developers on government schemes for the project development.
- The RPO has a sub-quota for solar power and other power, for e.g. for Gujarat 10% of the electricity produced by the RE sources of which 1% is to be produced by solar power
- States like Rajasthan, Gujarat, Tamil Nadu have emerged as leading solar, wind energy producers
- Gujarat's solar policy of 2009 has been regarded as one of the unique initiatives taken in solar power sector, and it is expected to generate 20,000 million units of electric power annually. In the year 2008, Gujarat won the award for the best wind developer with the growth rate of 99.64 per cent[4] (Gujarat Energy Development Agency, Govt. of Gujarat) during 2006-07, 2007-08.Gujarat has made numerous efforts for the wind energy development in the state, through policy implementation such as increase of power sale tariff, increase in RPO from 2 per cent to 10 per cent, etc.
- The Feed in Tariffs for most of the Indian states are listed in the annexure which shows that efforts have been taken to accelerate investment in renewable energy technologies
- Most of the policies of the Renewable energy sectors aims at the promotion of private investment in the RE sector

Concluding Observations

There is a difference in the level of nature of policies developed by the state governments. As an example, the thrust here is on the holistic nature of policies that the states have undertaken. In this regard, our analysis suggests a mixed picture. Some of the states have undertaken higher absolute targets for the renewable energy expansion without much policy tools to actually ensure the support, while many states have actually developed various components of the an ideal renewable energy policy.

There is wide variation in RPOs, because there are no standards for fixing state-level targets. This needs to be addressed urgently. Also, state RPOs are unambitious (Greenpeace 2013).

The renewable energy policies have been of mainly three types. (a) They are motivated by incentives mechanism like the RPOs, and creating incentives through providing industrial status for getting tariff benefits. This has been implemented in states like Andhra Pradesh, Haryana, Manipur, Rajasthan, Uttar Pradesh, and Punjab. (b) Introducing fiscal incentives like tax holidays etc, this has been followed in states namely, Andhra Pradesh, Assam, Arunachal Pradesh, Gujarat, Karnataka, Manipur, Mizoram, Odisha, and Tamil Nadu. (c) Providing infrastructural benefits like concessional lands, single window clearances, grid evacuation have been the highlights of the renewable policy.

4 http://geda.gujarat.gov.in/policy_files/Windpower%20Policy%202009_GEDA.pdf, accessed on November 17, 2013

CHAPTER 6

INDUSTRY

Industrial development has always been looked upon as a crucial component for India's development. Coupled with economic liberalization and rapid industrialization policies, India today has several resource–intensive primary manufacturing facilities, such as, iron & steel, cement, and fertilizer. The country's industrial sector is also among the largest CO2 emitters, next only to the power sector. As per the national greenhouse inventory data for the year 2007 compiled by the MoEF (2012), the direct CO_2 emissions from industrial sources accounted for nearly 22 per cent of the total CO_2 emissions from the country.

The industrial sector mainly consists of heavy and light engineering, steel, automotive, biotechnology, drugs and pharmaceuticals, automobile, cement, food processing, mines and minerals, and fertilizers. At present, the manufacturing sector has the highest contribution towards India's GDP, of approximately 16 per cent, followed by the automobile, cement, and fertilizer industries. These industries are also quite energy intensive, with the fertilizer and cement industries consuming large amounts of subsidized natural gas during the production process. Energy intensive industries such as these account for over 45 per cent of commercial energy use in India, to deliver 25 per cent of national GDP, as per the estimate of the Bureau of Energy Efficiency (BEE).

CO_2 EMISSIONS FROM INDUSTRIAL SOURCES ACCOUNTED FOR NEARLY

22%

THE TOTAL CO_2 EMISSIONS FROM THE COUNTRY

According to an assessment by the World Bank, Indian industry has seen greater energy efficiency improvement since the late 1980s than any other sector of the economy. Some of the reasons for this are the rise in competition following liberalization, high energy prices, and the enactment of the Energy Conservation Act, 2001. Additionally, industry itself has been choosing improved, more energy-efficient technologies. To accelerate and incentivize energy efficiency, the Government of India has launched a Perform Achieve and Trade (PAT) Scheme. PAT is a market-based mechanism to enhance energy efficiency in a cost effective way covering energy intensive large industries and facilities. These large industries and facilities are termed as designated consumers (DC). Each DC is given a Specific Energy Consumption (SEC) target to meet over a period. Energy saving certificates are obtained on additional saving of energy which could be traded in the market with DCs who fall short in achieving targets. This trade can be made bilaterally or through exchange.

The scheme was implemented in April 2011 for a target period of three years, with the Ministry of Power notifying 563 industries across nine industrial sectors (identified in the Energy Conservation Act, 2001) such as thermal power plants, fertilizer, cement, pulp and paper, textiles, iron and steel and aluminum, where energy consumption is very high. The industries of these nine sectors account for about 231 million metric tonnes of oil equivalent of energy conservation annually (according to 2007-08 data) which is about 54 per cent of the total energy consumed in the country. By adopting the mechanism, they would be saving about 10 MT oil equivalents in the next three years, along with an estimated carbon dioxide emission reduction of 98.6 MT annually.

Industries across these sectors are also heavily polluting, and are therefore subjected to norms laid down by the MoEF along with Central Pollution Control Board. Emission standards for several industries, air and water pollution norms; combined with the demand for effluent treatment plants and emission control systems, aim at curbing industrial pollution in India.

Policies pertaining to the states were mapped and are presented in the matrix below:

S. No.	State	Industry Classification*	Central Pollution Norms	Regulation (M&E)	Resource Utilization Norms	Energy Efficiency	Renewable Energy
		Red/ Orange / Green		Pollution Control Board etc			as a source of energy
1.	Karnataka	✓	✓	✓	✓	✓	✓
2.	Kerala	✓	✓	✓	✓	✓	✓
3.	Maharashtra	✓	✓	✓	✓	✓	✓
4.	Tamil Nadu	✓	✓	✓	✓	✓	✓
5.	Punjab	✓	✓	✓	✓	✓	✓
6.	Madhya Pradesh	✓	✓	✓	✓	✓	✓
7.	Himachal Pradesh	✓	✓	✓	✓	✓	✓
8.	Arunachal Pradesh	✓	✓	✓	✓	✓	
9.	Assam	✓	✓	✓	✓	✓	
10.	Chhattisgarh	✓	✓	✓	✓	✓	
11.	Bihar	✓	✓	✓	✓	✓	
12.	Delhi	✓	✓	✓	✓	✓	
13.	Goa	✓	✓	✓	✓	✓	
14.	Haryana	✓	✓	✓	✓	✓	
15.	Jammu and Kashmir	✓	✓	✓	✓	✓	
16.	Manipur	✓	✓	✓	✓	✓	
17.	Meghalaya	✓	✓	✓	✓	✓	
18.	Mizoram	✓	✓	✓	✓	✓	
19.	Nagaland	✓	✓	✓	✓	✓	
20.	Orissa	✓	✓	✓	✓	✓	
21.	Rajasthan	✓	✓	✓	✓	✓	
22.	Sikkim	✓	✓	✓	✓	✓	

S. No.	State	Industry Classification*	Central Pollution Norms	Regulation (M&E)	Resource Utilization Norms	Energy Efficiency	Renewable Energy
		Red/ Orange / Green		Pollution Control Board etc			as a source of energy
23.	Tripura	✓	✓	✓	✓	✓	
24.	Uttarakhand	✓	✓	✓	✓	✓	
25.	Gujarat	✓			✓	✓	✓
26.	Andhra Pradesh	✓			✓	✓	✓
27.	Jharkhand	✓			✓	✓	✓
28.	Uttar Pradesh	✓			✓	✓	
29.	West bengal	✓			✓	✓	

* Most policies classify industries into colour-coded categories based on criteria such as energy intensive, heavily polluting, or resource intensive.

Overview of the policies undertaken by the states:

- Majority of the Indian states have a state industrial policy
- The classification of industries according to level of pollution caused into Red, Orange, Green categories representing the Highly polluting industries, Moderately polluting and Marginally polluting respectively
- Pollution norms has been set for each industry as per the rules and regulations of the state pollution control board
- Resource utilization norms have also being imposed, individually
- Energy efficiency measures have been executed for many industries in different states
- financial Incentives for different categories are offered

Types of industrial policy include tax credits, input, output and R&D subsidies, minimum use requirements, standards, and trade restrictions. The usual rationale for industrial policy is that it corrects a market failure while doing actions on climate change through the industries. It has been found in our analysis that there are industrial and pollution control policies being implemented in most of the states through the respective state ministries of industries. But the missing point in this regard is the specific reference to climate friendly actions that are being undertaken, as most of the industrial policies are very much focused on the controlling of the pollution norms.

One important source of comparing the climate friendly actions is reflected in our list that explains the renewable energy policy in the industrial sector. The industries use the renewable energy as their sources of energy. In this regard, we see a real challenge, as only seven of the twenty-nine states have a policy on renewable energy usage as source of energy. This shows the extent of climate friendliness for the industrial sector per se in India.

Concluding observations:

Industry seeks more effective policies on alternative energy installations and environment friendly discharge, especially in states with many urban areas (Delhi, Maharashtra, Karnataka). In Gujarat, the industrial policy defines provisions supporting low-carbon strategies but does not impose any carbon/environmental tax. Delhi's industrial policy has a carbon tax but does not have any provision encouraging RE-based power generation in industries. Tamil Nadu offers subsidy for industries manufacturing bio-fuels. Karnataka and Tamil Nadu do not have energy/ water audits defined in their industrial policies.

A major thrust on efficiency increase has been pushed forward through the PAT system by the BEE for industries. These have positive implications on the increase of efficiency in the sector. In the second phase of PAT, the coverage of the types of industries are going to expand and that present a formidable source of climate actions through the industries by incorporating incentive structures and markets.

Finally, the state of climate friendly policies and programmes need further holistic approach and just not covering pollution aspects but all aspects of climate change challenge and mitigation efforts. Also, the industrial policies in the states are more oriented towards attracting investments (both domestic and foreign) and climate change mitigation is not very high on their list of priorities. A few state policies encourage energy efficiency and seek to promote better resource utilization by the industries, however better efforts are required in terms of enforcement of these policies in the states.

CHAPTER 7

WATER

Water is a crucial natural resource for life. Recent studies have shown that the amount of water available per person in India is decreasing constantly from 3450 cm in 1951 to 1250 cm in 1999 and further likely to go down to 760 cm per person in 2050.[1] One of the primary reasons behind this is the fast growing population and reduction in groundwater recharge. This trend explicates a major awaiting challenge for the country and is exacerbated by climate change. Water security is one of the most important threats in this regard. Water resources will come under increasing pressure in the Indian subcontinent due to the changing climate.

AMOUNT OF WATER AVAILABLE PER PERSON IN INDIA IS LIKELY TO GO DOWN TO **760 CM** PER PERSON IN 2050

The Himalayan glaciers are prime source of fresh waters for perennial rivers of India. In recent decades, the Himalayan region seems to have undergone substantial changes because of extensive deforestation, agricultural practices, and urbanization. These anthropogenic activities have resulted to frequent hydrological disasters,[2] enhanced sedimentation, and pollution of water bodies. There is evidence that some Himalayan glaciers have retreated significantly since the 19th century. Studies have shown that the Himalayan glaciers are retreating at

1 A critical assessment of climate change impacts, vulnerability and policy in India, Vijaya Gupta http://pesd.ro/articole/nr.5/1/02.%20Gupta.pdf

2 http://www.disaster-report.com/2013/06/himachal-pradesh-uttarakhand-flood-2013.html

rates ranging from 10 to 60 metres per year and many small glaciers (< 0.2 sq km) are no longer in existence.[3] Any further warming is likely to increase the melting of glaciers more rapidly than the accumulation. Glacial melt is expected to increase under changed climate conditions, which would lead to increased summer flows in some river systems for a few decades, followed by a reduction in flow as the glaciers disappear. Specifically in Indian side, Gangotri glacier is retreating at the average rate of 18 m per year.[4] Moreover, recent years have witnessed erratic rainfall in few parts of the country, leading to speculations that the pattern of monsoons might have changed. This leads to serious environmental problem. One such is already experienced in the Indo-Gangetic Plain Region (IGP) in the past whereby different rivers (including Kosi, Ganga, Ghaghara, Son, Indus and its tributaries and Yamuna) changed their course a number of times and leading to massive floods in the region.

Such fluctuations and extremities in natural cycle of water are showing troubled patterns of water availability in different regions. Frequent droughts, unusually heavy rainfall, and floods are reported from different parts of country on a regular basis.

Moreover, rise in population and increased urbanization are increasing demand for water at alarming rate. This is leading to faster withdrawal of water from ground and which in turn reduces the recharging time of the water tables. As a result, availability of water is bound to reach critical levels sooner or later. During the past four decades, there has been a phenomenal increase in the growth of groundwater abstraction structures. Growing demand of water to meet requirements of different sectors like industry, urban development and agriculture sectors has resulted into problems of overexploitation of the groundwater resource to the fore. The falling groundwater levels in various parts of the country have threatened the sustainability of the groundwater resources.

The central and state regulatory structures have introduced appropriate pricing and incentives, water-efficient technologies to minimize wastage, ensure equitable distribution, recycling of wastewater, use of ocean water, improving efficiency of irrigation systems, increase storage capacity, recharging under groundwater, water harvesting, water assessments and audits for sustainable water management. The proper industrial waste disposal, improved drainage systems, conservation of wetlands, development of desalination technologies etc. are the instruments that have been implemented in through various national and State specific policies.

At the state level, the key findings of the policy mapping are as follows:

	State	Rainwater harvesting		Waste-water recy-cling	Urban Demand Manage-ment	Rural Demand	Groundwater management		Ground-water manage-ment	Sewage Manage-ment
		Manda-tory	Volun-tary		Tariff	Piped Drinking Water sup-ply	Acts	Rules / Bills		
1	Himachal Pradesh	✓	✓	✓	✓			The Himachal Pradesh Ground Water Draft Rules, 2006	✓	✓
2	Andhra Pradesh	✓	✓	✓	✓	✓	Andhra Pradesh Ground Water-act, 1996		✓	
3	Maharash-tra	✓	✓	✓	✓			Maharashtra Groundwater Bill, 2009	✓	
4	Karnataka	✓			✓		Karnataka Ground Water Act, 2011		✓	

3 http://geoportal.icimod.org/Publication/Files/cf894b1a-d2df-46ca-9e7a-e0577d24ea4f.pdf
4 http://geoportal.icimod.org/Publication/Files/cf894b1a-d2df-46ca-9e7a-e0577d24ea4f.pdf

5	Kerala	✓			✓		The Kerala Ground Water Act, 2002				
6	Jammu and Kashmir (water and regulation act)	✓	✓		✓				✓	✓	
7	Bihar	✓		✓	✓	✓	The Bihar Groundwater Act, 2006		✓		
8	Rajasthan	✓		✓	✓				✓		
9	Orissa	✓		✓	✓				✓		
10	Punjab	✓		✓	✓				✓		
11	Uttar Pradesh	✓		✓	✓		The Uttar Pradesh Groundwater Conservation, Protection and Development Bill, 2010		✓		
12	Chhattis-garh	✓	✓		✓			Chhattisgarh Ground Water Bill, 2012	✓		
13	Jharkhand	✓	✓	✓	✓				✓	✓	
14	Haryana				✓			Haryana State Groundwater Management And Regulation Bill, 2008	✓		
15	Madhya Pradesh	✓			✓				✓		
16	Meghalaya	✓		✓	✓				✓		
17	Assam		✓	✓	✓				✓		
18	Delhi	✓			✓						
19	Gujarat	✓			✓						
20	Manipur		✓		✓						
21	Tamil Nadu	✓			✓						
22	West Bengal	✓			✓						
23	Mizoram		✓		✓						
24	Nagaland				✓						
25	Arunachal Pradesh				✓						
26	Goa				✓						
27	Uttarakhand				✓						
28	Sikkim				✓						
29	Tripura				✓						

Overview of the policies undertaken by the states:

- Few States have their dedicated water policy to promote better water resource management, groundwater management, and water conservation.
- Few States have adopted RE-based water pumping technologies which save a considerable amount of energy.
- Delhi and Ahmedabad were the only cities charging a cess on water, while other States were keener to improve the water supply.

- Almost all States promote rooftop rainwater harvesting especially Karnataka, Tamil Nadu, Delhi; storm-water harvesting (wherever applicable), recycling, and re-use of wastewater technologies, watershed management in the State in water stressed areas.
- Few States like Bihar, Gujarat, Madhya Pradesh, Andhra Pradesh, Karnataka, Orissa, Tamil Nadu, Uttar Pradesh, Rajasthan, and Kerala also have State irrigation policies facilitating efficient irrigation management system.

Concluding observations:

On the water sector, cities that have rivers and lakes have a strong focus on the development of water bodies. According to UNICEF, India's per capita availability of water (on the basis of 2011 census) has fallen below the global threshold, signaling that issues such as groundwater recharge and water conservation need to be addressed amidst rising population and economic expansion.

Water harvesting has been regarded as an important adaptive measure in both urban and rural areas. In India, currently only fourteen of the twenty-nine states have a policy on rainwater harvesting. Of these, only six of the major states have a policy. This is observed in contrast to the fact that eight scheduled states have rainwater harvesting policies. This is a clear reflection of the seriousness of the issue and how it is being dealt with at the state level. Considering the changing trend and increase of high rainy days during the last few years, it would be very important to have the rainwater harvesting policies implemented in states across the country. The state water conservations departments and central water conservations departments should work in tandem to develop the policies for effective conservation and implementation of the same.

Assam, Jharkhand, Punjab, and Rajasthan have addressed the policies around wastewater and sewage management, which reflects that only these states have holistic policies around recycling of the water resources in a coherent manner. Most of the other states have either policy on sewage or on wastewater.

Groundwater management has been the one policy that has been widely implemented across the states of the country. One reason for this has been the mandatory requirements of the central government to the state governments. Most of these policies observed to be undertaken through a mandatory implementation tool, and very few have been observed to be incentive-based.

Water supply to urban areas is a key aspect of urban development, and state governments are looking at it more from the perspective of social equity rather than a climate change. Water shortages in India are becoming chronic and solid efforts are required to increase its availability for the people.

CHAPTER 8

URBAN DEVELOPMENT

The urban development sector mainly focuses upon urban habitat development and planning. Within this sector, some of the key issues include, city planning and zoning, housing and building norms, creating of lung space in urban centres, de-congestion of cities, reducing pollution among others. Indian cities and their population have been growing fast, as can be seen from

KEY ISSUES INCLUDE HOUSING AND BUILDING NORMS, CREATING OF LUNG SPACE, REDUCING POLLUTION

Table 4.1: Growth of Urban Population by City Size

Growth of Urban Population by City Size (per cent per annum)							
	Gross Increase				Adjusted for Reclassification		
	1971-1981	1981-1991	1991-2001	2001-2011	1971-1981	1981-1991	1991-2001
Cities	4.4	3.7	3.5	2.7	3.7	3.2	2.9
Metropolitan Cities	4.2	4.9	4.2	3.5	2.8	3.8	2.9
Class IA	5.5	4.3	4.8	3.3	2.7	3.4	2.8
Class IB	2.7	5.7	3.5	3.8	3.4	4	3.1
Other Cities (Class IC)	4.5	2.6	2.6	1.7	4.2	3.1	3.3
Towns	2.7	2.4	1.5	1.6	3.4	3.2	2.3
Class II	4.1	2.8	1.6	1.6	4.8	3.7	2.5
Class III	2.4	3	1.9	1.6	2.7	3.4	2.3
Class IV+	1.9	1.3	1	1.6	2.3	2.4	2.2

Source: Census of India, 2012

India's urbanization challenge is compounded by the fact that 20.9 per cent of the total urban population still lives below the poverty line as defined officially by the Planning Commission based on survey data from the NSSO. Though, the incidence of urban income poverty declined significantly from 49 per cent in 1973-74 to 32.4 per cent in 1993-94, 25.7 per cent in 2004-05 and 20.9 per cent in 2009-10, the number is rather high particularly from the angle of urban service delivery and coverage of facilities to the urban poor.

The cities of India need to be prepared for playing their new role of hosting rapid growth and providing services for an inclusive society. Not only do cities need much more by way of basic infrastructure but systems have to be put in place so that (i) a socio-economic environment can be created for innovation and investment, (ii) effective delivery of public services of specified standards is assured for all including the poor for whom it should be affordable, and (iii) affordable housing for the poor is also assured. This would require more public financial resources and more public goods, bringing the delivery of services to standard norms for all, greater willingness on the part of citizens and businesses to pay taxes and user charges for services, and a process of complementary urban-rural development.

Some of the initiatives taken in the urban development sector include:

i. Building codes: Energy efficiency, lung space for buildings norms

ii. Open space and parks

iii. Mandatory use of solar water heaters

iv. Master plans and city zoning

At the state level, urban development issues are now beginning to come to the fore due to the pressure of the increasing population. The state policies are presented in the table below:

S. No.	State	Green Space and Master Plan		Road Congestion Policies		Urban Habitat Management			
		Urban Zoning and Green Spaces	Urban land Use Policy	Parking Regulation	Any other	Building Code (Floor Area ratio)	Energy Efficiency Building Code Implementation		Solar Passive Architecture
							Mandatory	Voluntary	
1	Tamil Nadu	✓	✓	✓		✓		✓	
2	Karnataka	✓	✓	✓		✓		✓	
3	Rajasthan	✓	✓			✓		✓	✓
4	Himachal Pradesh	✓	✓			✓		✓	✓
5	Gujarat	✓	✓			✓		✓	✓
6	Delhi	✓	✓	✓		✓		✓	
7	Andhra Pradesh	✓		✓		✓		✓	✓
8	Maharashtra	✓		✓		✓		✓	
9	Uttarakhand	✓	✓			✓		✓	✓
10	Sikkim	✓		✓		✓		✓	
11	Kerala	✓	✓			✓		✓	
12	Madhya Pradesh	✓		✓		✓		✓	
13	Punjab	✓	✓			✓		✓	
14	Haryana	✓				✓		✓	
15	Orissa	✓	✓	✓		✓		✓	✓
16	West Bengal		✓	✓		✓		✓	✓
17	Mizoram	✓	✓	✓		✓		✓	
18	Nagaland	✓	✓			✓		✓	
19	Assam	✓				✓		✓	
20	Arunachal Pradesh	✓	✓			✓		✓	

21	Manipur	✓		✓	✓	
22	Bihar			✓	✓	
23	Chhattisgarh			✓	✓	
24	Uttar Pradesh			✓	✓	✓
25	Goa			✓	✓	
26	Jharkhand			✓	✓	
27	Meghalaya			✓	✓	
28	Tripura			✓	✓	
29	Jammu and Kashmir	✓	✓	✓	✓	

Overview of the policies undertaken by the states:

- Solar passive architecture has been a new dimension in the energy efficiency sector; many states in India have adopted the solar passive architecture for the construction of energy-efficient buildings. One notable example is the construction of India's first solar powered residential complex in Kolkata, West Bengal by incorporating solar passive architecture features.
- Most states in India lack a comprehensive urban development policy.
- Urban zoning and green spaces are features which are included mostly in the Urban Master plans, there is a need for a policy which considers these elements of urban planning as they provide ecological services and helps in improving the environmental sustainability in the cities
- There is a need to enforce strict parking regulations and implement state parking policies, to avoid traffic congestions
- The ECBC has been implemented in majority of the Indian states through their state designated agencies. Many energy-efficient buildings have been constructed in different urban zones such as commercial and residential zones etc.
- The building code has been applied in almost every Indian state, these affect the wind velocity and solar radiation, of an area thus impacting the local air temperature and outdoor thermal comfort of the region.

Concluding observations:

Increasing urban population and the rising rural-urban migration trends indicate that buildings (especially residential buildings) will have to become more and more energy-efficient and environment friendly. Municipal bodies will be required to integrate environmental and climate policy objectives while framing rules for regulating the growing urban spaces. Environmental planning will have to be mainstreamed within this sector if its emissions are to be controlled.

Under habitat management policy, the two most important policy instruments have been the building code and the energy efficiency building code. The BEE has been undertaking various activities to develop and help states to implement the efficiency based building codes across the states.

It is interesting to note that eight states of the country has implemented and developed the solar passive architecture, which addressed the energy efficiency issue to a large extent and a step forward in making a holistic energy efficiency issue. The other most important innovative policy has been parking rules in cities. This would ensure better management of urban space, especially in terms of energy usage. For this to happen, we need strict implementation rules of these policies.

Urban zoning policy has been principally accepted in the policy map of the states, but these figure mostly in the master plans of the states and have not yet really being reflected in the implementation plan. There has to be formidable work to be undertaken by the state governments to materialize this in the future policy formulations.

CHAPTER 9

TRANSPORT

The number of private vehicles in India is on the rise, and the transport needs of the large population are not sufficiently met by the fledgling public transport system. This sector consists of sub-sectors such as roads and flyovers, transportation and traffic management among others.

KEY ISSUES FOR THE TRANSPORT SECTOR ARE CONGESTION REDUCTION, POLLUTION REDUCTION, PROMOTION OF PUBLIC TRANSPORT SYSTEMS AND NON-MOTORIZED SYSTEMS

Some of the key issues of the transport sector that the government is attempting to address are congestion reduction, pollution reduction, promotion of public transport systems and non-motorized systems. Few of the initiatives taken by the government are as follows:

i. Transport and traffic management
ii. Fuel norms
iii. Emission norms
iv. Parking regulation
v. Mass rapid transit corridors (BRT)
vi. Public transportation and mass rapid transit systems
vii. Tax levies on luxury and high end private vehicles
viii. Fuel Cess
ix. Dedicated non-motorized transport corridors
x. Mandatory solar traffic lighting systems

The statistics in the table below indicate that India should take serious action on the rising number of private vehicles.

State/ Union Territory	Total Registered Motor Vehicles India										(In Thousands)
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	2	3	4	5	6	7	8	9	10	11	12
Andhra Pradesh	3966	4389	5002	5720	6458	7218	6367	7208	8059	8923	10189
Arunachal Pradesh	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	145
Assam	542	596	657	727	815	914	1021	1116	1235	1384	1582
Bihar	949	1024	1121	751	1352	1432	1577	1739	1960	2357	2673
Chhattisgarh	857	948	1076	1216	1375	1541	1734	1935	2115	2436	2766
Goa	341	366	397	436	482	529	579	624	674	727	790
Gujarat	5576	6008	6508	7087	7817	8622	9497	10289	10999	11873	12993
Haryana	1949	2122	2279	2548	2854	3087	3528	3973	4425	4792	5377
Himachal Pradesh	217	244	269	289	301	334	342	371	494	538	622
Jammu & Kashmir	330	364	399	439	478	524	570	620	668	739	927
Jharkhand	909	984	1101	1217	1357	1505	1686	1850	2038	2767	3113
Karnataka	3537	3636	3738	3977	5436	6220	5486	6217	6953	9044	9930
Kerala	2112	2315	2552	2792	3122	3559	3957	4430	4860	5398	6072
Madhya Pradesh	3095	3173	3459	3804	4188	4609	5047	5523	6011	6591	7356
Maharashtra	6760	7414	8134	8969	9936	10966	12171	13335	14451	15768	17434
Manipur	77 $	90	97	106	114	124	133	147	147	194	207
Meghalaya	62	67	73	73^	92	104	117	128	142	158	176
Mizoram	31	34	37	42	47	52	61	66	70	80	93
Nagaland	160	177	162	172	172	184	210	226	240	254	273
Orissa	1096	1215	1359	1525	1715	1932	2148	2370	2607	2932	3338
Punjab	2910	3103	3308	3529	3876	4035	4294	4573	4832	5274	5274 #
Rajasthan	2943	3197	3487	3834	4261	4754	5336	5902	6490	7166	7986
Sikkim	12	13	15	17	20	22	25	26	29	34	39
Tamil Nadu	5162	5658	8005	8575	9257	10054	10981	11930	12891	14062	15638
Tripura	50	57	66	76	73	106	120	131	144	160	188
Uttarakhand	364	406	457	516	573	643	643	731	787	831	997
Uttar Pradesh	4921	5171	5928	6460	7344	7989	9086	9826	10779	11988	13287
West Bengal	1690 $	1690 $	2366	2548	2681	2827	3198	2762	3044	2747	3261
TOTAL STATES	50639	54482	62073	67466	76218	83953	89936	98072	107163	119240	132725
Union Territory:											
A. & N. Islands	25	28	28+	28+	37	41	48	53	60	62	69
Chandigarh	386**	386**	562	586	617	647	678	712	747	949	1008
D. & N. Haveli	13*	13*	31	35	40	45	51	58	63	69	76
Daman & Diu	37	41	44	48	51	55	62	68	70	72	78
Delhi	3635	3699	3971	4237	4187	4487	5492	5899	6302	6747	7228
Lakshadweep	4	5	5	5	5	6	7	7	7	8	9
Puducherry	252	270	293	313	347	384	432	484	538	599	673
TOTAL UTs	**4352**	**4442**	**4934**	**5252**	**5283**	**5665**	**6771**	**7281**	**7788**	**8506**	**9140**
GRAND TOTAL	**54991**	**58924**	**67007**	**72718**	**81502**	**89618**	**96707**	**105353**	**114951**	**127746**	**141866**

Source : Road Transport Year Book (2009-2010&2010-2011)

*: Data relates to 1997. +: Data relates to 2002. **: Data relates to 1998.

^: Data relates to 2003. $: Data relates to 2000. (#) :Data relates to 2010

The findings of the policy mapping at the state level for the transport sector are listed below:

S. No.	States	Road Development	Non-Motorized Transport		Public Transportation Promotion		Any other	Other Promotion	
			Pedestrian Pathways	Cycle/ Bike Pathways	BRT	Metro	(Bus Days) etc	Bio Fuel Policy for Public Transport	CNG/LPG Fuel
1	Delhi	✓		On paper yes	✓	✓			✓
2	Kerala	✓	✓	✓		✓			
3	Gujarat	✓	✓	✓	✓	✓			
4	Karnataka	✓				✓	✓	✓	✓
5	Madhya Pradesh	✓			✓			✓	
6	Orissa	✓					✓(MRTS)	✓	
7	Andhra Pradesh	✓			(Master Plan)				✓
8	West Bengal	(Master plan)	(Master plan)			✓			✓
9	Maharashtra	✓	✓			✓			✓
10	Tamil Nadu	✓	(Master plan)			✓			✓
11	Haryana	✓				✓			✓
12	Chhattisgarh							✓	
13	Uttar Pradesh					✓			✓
14	Sikkim		✓ (and rope ways)	✓					✓
15	Arunachal Pradesh								
16	Assam	All these states have detailed plans for the agove sectors in their state climate action plan and in proposed master plans, but no implementation or policy framework as yet							
17	Himachal Pradesh								
18	Manipur								
19	Meghalaya								
20	Mizoram								
21	Nagaland								
22	Punjab								
23	Rajasthan								
24	Tripura								
25	Uttarakhand								
26	Bihar								
27	Goa								
28	Jammu and Kashmir			No Known Plans					
29	Jharkhand								

Overview of the policies undertaken by the states.

- The state transport policy has been framed for few states like Delhi, Orissa, Haryana, Kerala, Gujarat, Madhya Pradesh, most of the states have adopted the national transport policy
- While road development has remained the common feature in all the state policies, efforts have also been made to encourage public transportation in the states to reduce the GHG emissions with the introduction of metro rails, mono rail, BRT systems
- Delhi has a comprehensive state transport policy. The UNFCCC has certified that its metro rail system is the first in the world to receive carbon credits for reducing pollution by 6.5 lakh tonnes every year. It has

helped to encourage public transportation by removing around 91,000 vehicles daily from Delhi. It is estimated that for every 10 km travelled by metro by a person, instead of using bus, car etc. there is a decrease of[1] (Delhi Metro Rail Corporation) approximately 100gm of CO2, which helps reduce global GHG emissions.

- Fuel conversion to CNG has also caused improvement of pollution control system across many states and helped in emission reduction.

Concluding observations:

According to the UNDP, the rate of motor vehicle growth in India stands at 9 per cent. The rising number of private motor vehicles is a major contributor to the growth in GHG emissions. The most viable solution to curb emissions from this sector is to promote increased use of public transport systems. The answer is to provide greater public transport capacity, which is of a higher quality and more efficient; as well as high quality non-motorized transport networks. Although a sustainable urban transport system is the objective of the central government's National Urban Transport Policy (2006), its adoption at the state level has been erratic. Public transport systems in the state continue to be dominated by the use of polluting fuels such as diesel and are highly inefficient.

Some of the key challenges that the states have to address in this sector include improved road conditions, increase rural connectivity, reduction in congestion, and promotion of efficient public transport systems. Although states are making an effort at facilitating the use of sustainable public transport systems, they are also engaging in systems that may not be required for their geographic location. An example that comes to mind is the attempted replication of Gujarat's metro rail and BRT system in all major cities of Gujarat. This kind of blind emulation does not serve as an effective means of emissions reductions, and states need to make rational choices based on objective decisions.

1 http://www.delhimetrorail.com/press_reldetails.aspx?id=746xECETA6Qlld , accessed on November 17,2013

CHAPTER 10

WASTE

Rising population especially in urban centres has also given rise to the problem of increasing waste. Municipal solid waste, industrial waste, and other hazardous waste was the focus of analysis in this sector. Municipal solid waste consists of household waste, construction and demolition debris, sanitation residue, and waste from streets. This garbage is generated mainly from residential and commercial complexes. With rising urbanization and change in lifestyle and food habits, the amount of municipal solid waste has been increasing rapidly and its composition changing. In 1947, cities and towns in India generated an estimated 6 million tonnes of solid waste; in 1997, it was about 48 million tonnes. More than 25 per cent of the municipal solid waste is not collected at all; 70 per cent of the Indian cities lack adequate capacity to transport it and there are no sanitary landfills to dispose of the waste. The existing landfills are neither well equipped nor well managed and are not lined properly to protect against contamination of soil and groundwater[1]. The waste generated by Indian cities is expected to reach anywhere between 17,000-25,000 tonnes per day by 2021.[2]

THE WASTE GENERATED BY INDIAN CITIES IS EXPECTED TO REACH ANYWHERE BETWEEN **17,000-25,000** TONNES PER DAY BY 2021

1 The Energy Resources Institute (TERI)

2 http://timesofindia.indiatimes.com/india/Govt-asks-experts-to-develop-zero-waste-cities/article-show/26012958.cms

Industrial and hospital waste is considered hazardous as they may contain toxic substances. Certain types of household waste are also hazardous. Hazardous wastes could be highly toxic to humans, animals, and plants; are corrosive, highly inflammable, or explosive; and react when exposed to certain things e.g. gases. India generates around 7 million tonnes of hazardous wastes every year, most of which is concentrated in four states: Andhra Pradesh, Bihar, Uttar Pradesh, and Tamil Nadu. In the industrial sector, the major generators of hazardous waste are the metal, chemical, paper, pesticide, dye, refining, and rubber goods industries.[3]

In order to curb this rising problem, the government is undertaking the following initiatives:

i. Efficient solid waste management systems

ii. Waste recycling

The mapping of state policies related to waste management was carried out, the findings of which are presented in the table below:

S. No.	State	Recycling	Waste handling process			Waste segregation	Waste disposal methods
			Collection	Transportation	Treatment		
1	Karnataka	✓	✓	✓	✓	✓	✓
2	Delhi	✓	✓	✓	✓	✓	✓
3	Gujarat	✓	✓	✓	✓	✓	✓
4	Andhra Pradesh	✓	✓	✓	✓	✓	✓
5	Kerala	✓	✓	✓	✓	✓	✓
6	Meghalaya	✓	✓	✓	✓	✓	✓
7	Punjab	✓	✓	✓	✓	✓	✓
8	Himachal Pradesh	✓	✓	✓	✓	✓	✓
9	Tripura	✓	✓	✓	✓	✓	✓
10	Tamil Nadu	✓	✓	✓	✓	✓	
11	West Bengal		✓	✓	✓	✓	✓
12	Maharashtra	✓	✓	✓	✓	✓	
13	Sikkim	✓	✓	✓	✓	✓	
14	Madhya Pradesh		✓	✓	✓	✓	✓
15	Goa	✓	✓	✓	✓		✓
16	Arunachal Pradesh	✓	✓	✓	✓	✓	✓
17	Bihar	✓	✓	✓	✓		✓
18	Chhattisgarh	✓	✓	✓			✓
19	Rajasthan	✓	✓		✓		✓
20	Mizoram		✓	✓	✓	✓	✓
21	Uttar Pradesh		✓	✓	✓	✓	
22	Uttarakhand		✓	✓	✓	✓	
23	Assam		✓	✓	✓		
24	Nagaland		✓	✓	✓	✓	
25	Orissa		✓	✓			✓
26	Jammu and Kashmir		✓	✓			
27	Jharkhand		✓			✓	
28	Manipur		✓				✓
29	Haryana						✓

3 The Energy Resources Institute (TERI)

Overview of policies undertaken by the states:

- Majority of Indian states lack a comprehensive state policy for waste management. Meghalaya, Karnataka are among few states with a state waste management policy
- Several central legislations such as Municipal Handling Rules 2000, Plastic waste Management Rules 2011 have implemented in all the states of India
- Waste handling, segregation, disposal, recycling is widely executed in case of municipal solid waste in majority of the states. One noteworthy example of waste management practices is the launch of the Clean Kerala mission in 2002, with an objective to create a garbage-free Kerala. The mission has been executed in phases and has achieved partial success in Kerala
- The existing management practices for E-waste are poor. One of the problems faced by the waste sector is the lack of adequate policy measures for handling and disposal of E-waste in the country
- For biomedical waste management, introduction of cost effective technologies for recycling, proper segregation of waste, provision of adequate training etc. is required
- For plastic waste management regulations and legislations have been executed in states like Haryana and Himachal Pradesh

Concluding observations:

Waste management that can help curb rising GHG emissions (mostly methane) requires that adequate systems and infrastructure facilities be put in place for a scientific collection, management, and disposal of waste. Agencies at the state level are unable to engage

in sustainable waste management practices due to lack of financial and technical expertise, as well as scarcity of resources such as land and manpower. Despite municipalities in India spending up to 50 per cent of their budgets on SWM, they are often not prepared to address mounting quantities of wastes. Due to the urgency of urban environmental problems and the growing recognition that improper solid waste disposal is a contributor to local disease episodes, regional water resource pollution, and global greenhouse gases; municipal SWM has become a top development and environmental priority in India.[4]

The MoEF, passed the Municipal Solid Waste Management (Management and Handling) Rules, in 2000 under the Environment Protection Act of 1986. The rules mandate, not only class I cities of India, but all municipal authorities (number about 4378), to implement improved systems of solid waste manage. Still, implementation remains extremely weak. All the cities and States are using a combination of State and central schemes for waste management (both anti-plastic and hazardous waste), and promoting recycling. Maharashtra was the stand out State with a Debris Management Policy, whereas no other State was found to have one. Composting with the involvement of local bodies and resident welfare association is also being promoted by several cities.

Increasing consumption of goods is increasing waste, but the existing effort at managing this waste is inadequate. Waste management is infrastructure–intensive, and limited investment at the state level has resulted in practices such as open dumping in landfills, which contribute to high GHG emissions. Besides, unscientific waste management also has significant health hazards. State level policies need to be enforced more strongly to make practices such as recycling mandatory and, at the same time, promote improved waste collection techniques.

4 http://web.worldbank.org/WBSITE/EXTERNAL/WBI/WBIPROGRAMS/ENRLP/0,,contentMDK:22127377~pagePK:64156158~piPK:64152884~theSitePK:460957,00.html

CHAPTER 11

COMPENDIUM OF STATE POLICIES

	State	Sector	State Policy	Key Features
1	Gujarat	**Urban Development and Infrastructure**	Urban Transport Policy, 2005 (Draft)[1]	• The policy develops a comprehensive framework for future action in mitigating the emerging problems of urban transport like road congestion, shortage of public transport, weak vehicular pollution norms etc. for different class of the cities in Gujarat. • It seeks to foster economic development, enhance the quality of the environment, enhance road safety, reduce energy consumption, and allow fair and equitable access by all.
		Electricity & Energy	Wind Power Policy, 2007[2] (Amended 2009)	• GETCO (Gujarat Energy Transmission Company) will provide grid connectivity to Wind farms or permit private producers to lay transmission lines. • 4 per cent wheeling charges applicable • Except in case of third party sale of electricity, the electricity generated from the WTGs shall be exempted from payment of electricity duty. • Exemption from demand cut to the extent of 30 per cent of the installed capacity of WTGs, assigned for captive use purpose, shall be allowed.
			Solar Power Policy, 2009[3]	• The policy is operational up to 31.3.2014, however Solar Power Generators (SPG) commissioned and installed during this policy shall become eligible for the benefits declared under this policy for a period of 25 years from the date of commissioning. • Target capacity is 500MW of SPG installation during this operative period. • It offers exemption from electricity duty and demand cut to the extent of 50 per cent of the installed capacity of SPGs, assigned for captive use purpose, shall be allowed.

1 http://www.gidb.org/cms.aspx?content_id=288
2 http://geda.gujarat.gov.in/policy_files/Windpower%20Policy%202009_GEDA.pdf
3 http://geda.gujarat.gov.in/policy_files/Solar%20Power%20policy%202009.pdf

		Industry	Industrial Policy, 2009[4]	• Financial assistance for energy/water audits and equipment would be given to industries. • The State government aims at zero waste and effluent discharge from specific industrial sectors over a period of 10 years. • For all projects in the area of environment and waste management, the government will reimburse the electricity duty for 5 years.
2	Maharash-tra	**Electricity & Energy**	Non-conven-tional Energy Policy, 2008[5]	• A target has been fixed to commission- o 2000 MW of Wind power projects o 1000 MW of cogeneration projects/electricity generation pro jects based on bagasse o 400 MW of biomass based electricity generation projects o 100 MW of small hydro power projects • For Evacuation arrangement of wind energy project, 50 per cent amount will be given as a subsidy. • 100 per cent expenditure for construction of approach roads. • No electricity duty shall be leviable for first 10 years. • 11 per cent share capital will be provided to cooperative sector through green energy fund.
			Wind Power State Policy, 2008[6]	• A target of 2000 MW of wind power projects has been fixed. • No Electricity duty shall be leviable for first 10 years. • 11 per cent share capital will be provided to cooperative sector through green energy fund. • For evacuation arrangement of wind energy project, 50 per cent amount will be given as a subsidy.
			Bagasse Cogeneration and Biomass Power, 2008[7]	• Targets of 400 MW from biomass and 1000 MW of cogeneration projects/ electricity generation projects based on bagasse have been fixed. • No electricity duty shall be leviable for first 10 years • 11 per cent share capital will be provided to cooperative sector through green energy fund.
			Small Hydro Power Policy[8]	• 100 MW of small hydro power projects is targeted. • No electricity duty shall be leviable for first 10 years. • 11 per cent share capital will be provided to cooperative sector through green energy fund.
		Industry	Industrial Policy of Maha-rashtra, 2013[9]	• The policy is valid until 2018. • 75 per cent reimbursement of cost of energy and water audit is permis-sible. • 50 per cent cost of capital equipment required to conserve water and energy, limited to Rs 5Lc each will be granted to units by State.
3	Bihar	**Electricity & Energy**	Policy for pro-motion of New and Renew-able Energy Sources, 2011[10]	• The electricity generated from the new and renewable energy projects shall be exempted from electricity duty. • Entry tax on new and renewable energy sources devices and or equipment and or machinery shall be exempted. • Loans for the project are available as per State/central guidelines.
		Industry	Bihar Industrial Incentive policy, 2011[11]	• In case of energy produced through non-conventional sources, 60 per cent of the expenditure on plant and machinery will be payable as subsidy. • No ceiling has been fixed for availing this incentive. • This facility will also be available to existing units.
		Water	Bihar State Water Policy, 2010[12]	• Promotes aquifer wise planning based on modern technology for exploita-tion of groundwater for long term recharge potential. • Rooftop rain water harvesting, storm-water harvesting, recycling and re-use of waste waters will be promoted in water stressed areas. • The extraction of groundwater will be suitably regulated through appropri-ate legal framework especially in the water scarce areas. • All effluent will be treated to conform to specification prescribed by Bureau of Indian Standards before discharging into natural streams or to groundwater recharge.

4 http://ic.gujarat.gov.in/wp-content/uploads/2011/01/industrial-policy-2009-at-a-glance.pdf
5 http://www.mahaurja.com/PDF/Newpolicy2008.pdf
6 http://www.mahaurja.com/PDF/Wpoly2008.pdf
7 http://www.mahaurja.com/PG_Bag_State.html
8 http://www.mahaurja.com/PG_Hydro_State.html
9 http://www.midcindia.org/Lists/Policies%20Circulars%20and%20Notification/Attachments/88/Industrial%20Policy%20of%20Maharashtra%20 2013.pdf
10 http://energy.bih.nic.in/docs/REP-2011-English.pdf
11 http://industries.bih.nic.in/Documents/IIP-2011-EN.pdf
12 http://www.cseindia.org/userfiles/bihar%20state%20water%20policy%202010.pdf

4	Jhar-khand	**Electricity & Energy**	Jharkhand Energy Policy, 2012[13]	• Jharkhand State Electricity Board (JSEB) will purchase the power at the tariff approved by Jharkhand State Electricity Regulatory Commission (JSERC), in case the developer wants to sell power to JSEB. • To ensure that the sector gets the required focus, a separate Solar Policy shall be announced shortly with outlining the plan of the State and the incentives. • If the power from RE is being sold to the state utility or consumers within the state, shall also be provided concessional access to the T&D network to encourage renewable power development.
		Industry	Jharkhand Industrial Policy, 2012[14]	• Rainwater harvesting, recycling and re-use of waste water shall remain essential for industries. • New plants will not be liable to pay 50 per cent electricity duty for a period of 10 years. • Mega projects (with investment in fixed assets in excess of Rs 100 crore) will be allowed to have captive power plants, to generate power from waste heat recovery, and to wheel power to sister concerns. Such units will also enjoy 50 per cent exemption from electricity duty for a period of 5 years. • Comprehensive Project Investment Subsidy (CPIS) will be given for investment (20 per cent) made in pollution control equipment and environment friendly alternative power generation equipment.
		Water	Jharkhand State Water Policy, 2011[15]	• Rainwater harvesting, recycling and re-use of water have to be attempted for augmentation of water resources in State. • This will include reclaiming usable water from sewage after necessary effluent treatment which is mandatory for industrial use. • Introduction of efficient drought management system to manage water scarcity during drought.
5	Madhya Pradesh	**Urban Development and Infrastructure**	Madhya Pradesh Transport Policy[16]	• Under the new transport policy, public transport sources will be promoted and arrangement of buses will be made for all the regions especially. • CNG and LPG-based transport will be determined in the metro cities with a view to lessening pollution.
		Electricity & Energy	Policy for Promoting Generation of Electricity through Non-Conventional Energy Sources, 2006[17]	• A green energy fund has been created through a cess of 15 paise per unit collected from power consumers, which is used to promote RE projects in the state. • New and renewable sources of energy (nrse) power projects shall be exempted from open access charges. • The facility of wheeling will be available to the unit through MP Power Transmission Company, as per wheeling charges decided by Madhya Pradesh Electricity Regulatory Commission (MPERC). Subsidy of 4 per cent as per existing policy of Government of MP is available. • NRSE project will be given the status of Industry and will be entitled to get all benefits under Industrial Promotion Policy, 2004.
			Policy for implementation of solar power based projects in Madhya Pradesh, 2012[18]	• All solar power projects (including captive units) will be eligible for exemption from payment of electricity duty and cess for a period of 10 years from the date of commissioning of the project. • 4 per cent wheeling charges applicable. • The equipment purchased for installation of Solar power plants under the policy shall be exempted from VAT and entry tax 23 as per entry number 71, schedule-1 of VAT notification 2002 and entry 1 of schedule-1 of entry tax notification 1976. • In case the developer purchases private land for the project, then they will be eligible for an exemption of 50 per cent on stamp duty.
			Wind Power Project Policy, 2012[19]	• No energy cess shall be payable on the power supplied by wind power projects. • For captive consumption and third party sale, the installed project shall be entitled to receive exemption from payment of Electricity Duty for a period of 10 years. • The exemption from VAT/Entry Taxes for wind power plants shall be available.

13 http://jharkhand.gov.in/energypolicy.pdf
14 http://www.jharkhandonline.gov.in/DEPTDOCUPLOAD/uploads/13/D201213168.pdf
15 http://www.mprenewable.nic.in/policy.html
16 http://jharkhand.gov.in/Jharkhand%20State%20Water%20Policy(English).pdf
17 http://www.mptransport.org/Parivahan%20Neeti.pdf
18 http://ireda.gov.in/writereaddata/compendium/M%20P/MP-Non%20conventional%20energ.pdf
19 http://mnre.gov.in/file-manager/UserFiles/guidelines_sbd_tariff_gridconnected_res/Madhya%20Pradesh%20Solar%20Policy%202012.pdf

			Biomass Policy, 2011[20]	• As per the new policy, the installed capacity on one project will be limited to 15 MW. • Investors of State and outside State can invest up to Rs. 7000 crores. • 4 per cent Wheeling charges applicable. • Exemption from payment of electricity duty and cess for a period of 10 years from the date of commissioning of the project.
		Industry	MP Industrial Promotion Policy, 2010[21]	• The State government will provide a grant of 4 per cent in wheeling charges on the electricity produced by non-conventional energy sources. • All captive power plants will be entitled for total exemption in electricity cess on electricity produced for its own consumption, under Madhya Pradesh Cess (Second Amendment) Act, 2007. • Conditional exemption in electricity charges and cess will be provided up to 5 years from the commissioning of the project, to encourage electricity generation from non-conventional energy sources in private sector.
			Incentive Policy for the Development of Small Hydro Power Projects in Madhya Pradesh, 2006[22]	• The power consumed from the SHPs for the purpose of captive use or third party sale shall be exempted from payment of electricity duty. • All the equipment/plant and machinery brought into the State for use in the SHP shall be exempted from payment of Entry Tax for a period of five years from the date of signing of HPDA.
6	Karnataka	**Electricity & Energy**	Karnataka Renewable Energy Policy, 2009-14[23]	• The policy has a goal of commissioning 4200 MW additional capacity with accumulative renewable energy capacity addition of 6600 MW by 2014 and targeted to conserve about 7901 MU of energy as a cumulative of all the major sectors by 2014. • 'Green Energy Cess' of Rs 0.05 (five paise) per unit would be levied on the electricity supplied to commercial and industrial consumers. It is estimated to generate about Rs 55 crores annually. Out of the Rs 55 crores, 10 per cent of this fund to the tune of Rs 5 crores will be set apart as contribution to Energy Conservation Fund for Energy Conservation activities. The balance Rs 50 crores will be set apart for renewable energy project financing. • Wheeling charges of 5 per cent applicable. • Separate incentives for specific renewable energy project promotions and energy conservation.
			Karnataka Solar Policy, 2011-16[24]	• The policy proposed to install 200 MW of solar power up to 2015-16, for the purpose of procurement by the ESCoMS. • The wheeling charges have to be paid at the rates determined by the Karnataka Electricity Regulatory Commission/Central Electricity Regulatory Commission as the case may be.
		Industry	Karnataka Industrial Policy, 2009-2014[25]	• Appropriate provisions for the protection of environment and to encourage energy & water conservation measures in industry/ projects through go-green strategy. • Generation and utilization of non-conventional energy sources like wind, solar, biomass etc. will be encouraged (Incentive on Use of non-conventional energy sources: 10 per cent of capital cost (maximum. Rs.5 lakh). • Mandatory rainwater harvesting and water recycling units in industries.
		Water	Karnataka Water Policy, 2002[26]	• The policy encourages improved efficiency of utilization of water, fosters awareness about water as a scarce resource and promotes rain water harvesting, watershed development and water conservation. • Water quality problems like degradation from agro-chemicals, industrial and domestic pollution will be addressed. • Conservation consciousness will be promoted through education, regulation incentives, and disincentives.
7	Delhi	**Urban Development and Infrastructure**	Future Transport Policy, 2021[27]	• It primarily encourages mass transport considering increasing population of Delhi. • The policy targets at achieving 245 km of Metro Rail networking, high capacity bus systems on selected corridors for 100 km, electric trolley buses, and light rail transit up to 2021. • Introduction of CNG propelled public transport, improved pollution control system and other climate friendly interventions are planned.

20 http://mpnred.com/Images/pdf/Wind-Policy_ENGLISH.pdf
21 http://mpnricentre.nic.in/governmentpolicy/Industrial%20Policy.pdf
22 http://ireda.gov.in/writereaddata/compendium/M%20P/S%20H%20P-03.pdf
23 http://kredl.kar.nic.in/Index.asp
24 http://mnre.gov.in/filemanager/UserFiles/guidelines_sbd_tariff_gridconnected_res/Karnataka%20Solar%20Policy%202011-16.pdf
25 http://www.karnatakaindustry.gov.in/documents/Karnataka%20Industrial%20Policy%202009-14%20English.pdf
26 http://waterresources.kar.nic.in/state_water_policy-2002.htm
27 http://delhi-masterplan.com/transport-policy/

			Air Ambience Fund[28]	• A cess on diesel of Rs. 0.25 per litre on sale of diesel in NCT of Delhi is imposed to create separate fund called 'Air Ambience Fund'. • The fund will be utilized for development and use of Clean Air Technologies by Department of Environment and Department of Transport. • The fund is used for providing subsidies to battery-operated vehicles and also for refund of VAT for conversion of diesel vehicles to CNG, since a VAT refund of 12.5 per cent is already allowed for conversion of petrol vehicles to CNG.
		Industry	Industrial Policy, 2010-2021[29]	• Objective is to promote non-polluting and clean industries. • It gives guidelines for waste management and recycling of wastewater in industries. • Ensures effective functioning of common effluent treatment plants (CETPs) • In order to save water, the option to install dual piping system where wastewater can be recycled in industrial areas may be explored.
8	Andhra Pradesh	**Electricity & Energy**	AP Solar Power Policy, 2012[30]	• The policy will remain valid until 2017. • There will be no wheeling and transmission charges for wheeling of power generated from the Solar Power Projects within the State. • Exemption from paying electricity duty. • VAT on all the inputs will be refunded.
			Policy on Net Metreing for Solar Grid Interactive Rooftop and Small SPV Power Plants in the State[31]	• The net energy between export of generated energy and import of DISCOM energy for a billing month will be recorded. • This facility shall be allowed only for 3 phase service consumers. Single-phase consumers are not eligible for net metreing to avoid imbalance in the phases.
			Wind Energy Policy, 2007[32]	• Each eligible developer may be allocated available government land to harness up to a maximum of 200 MW of wind power initially. After commissioning of 100 MW capacity Wind farms in the first stage in the allocated government land, the government may allocate land for another 100 MW capacity Wind Farms. • The State government has permitted DISCOMs to offer Rs.3.50/kWh for wind power projects for 10 years from the date of commissioning of the projects.
		Industry	Andhra Pradesh Industrial Investment Promotion Policy, 2010-2015[33]	• The government will provide incentives on specific cleaner production measures adopted in new industries at 25 per cent limited to Rs.5 lakhs. • It will monitor carbon emissions and encourage the industries to go for carbon auditing, will facilitate all industries in obtaining carbon credit and also will facilitate setting up of effluent treatment plants and hazardous waste treatment plants in various industrial estates and cluster with private sector participation.
		Water	Andhra Pradesh Water Policy, 2002[34]	• Encourages integration of new management tools and systems such as the integrated data systems, water demand management, and a new communication system. • It also emphasizes at developing a policy framework for planning water resources with involvement of primary stakeholders for efficient and optimal utilization of water.
9	Haryana	**Urban Development and Infrastructure**	Haryana Transport Policy, 2010[35]	• This policy lays down guidelines to increase public transport in the state, through public-private participation. • It does not mention any fuel efficiency or infrastructure improvement/enhancement measures.
		Electricity & Energy	State Renewable Energy Policy, 2005[36]	• The thrust areas of the policy are biomass, cogeneration, small hydro, solar, wind, and municipal solid waste. • There will be no restriction on generation capacity or supply of electricity to the grid.

28 http://www.delhi.gov.in/wps/wcm/connect/environment/Environment/Home/Environmental+Issues/Ambient+Air+Quality
29 http://www.delhi.gov.in/wps/wcm/connect/doit_industry/Department+of+Industries/our+Services2/Delhi+Industrial+Policy+2010-2021
30 http://nedcap.gov.in/Andhra_Pradesh_Solar_Power_Policy_2012.aspx
31 http://nedcap.gov.in/PDFs/25032013ENY_MS22.PDF
32 http://www.windpro.org/Sector/State%20Government%20Policies%20issued%20by%20IREDA2.pdf
33 http://www.apind.gov.in/Library/go%20ms%20no.%2061.pdf
34 http://www.cseindia.org/userfiles/AndhraPradeshStateWaterPolicy.pdf
35 http://haryana.gov.in/misc/Policy_2010_English.pdf
36 http://hareda.gov.in/?model=pages&nid=90

		Industry	Haryana Industrial Policy, 2011[37]	• The industrial policy States that economic growth and industrial development should be based on the principles of sustainable development. • The government intends to gain carbon credits and reduce carbon footprints in the industrial sectors. The State would set up a Carbon Credit Cell, which would guide the local entrepreneurs to adopt the relevant technology to earn carbon credits. • The HSIIDC would lay dual pipelines for supply of fresh and treated water to target a situation of zero discharge from its specific industrial sectors within a reasonable period.
		Water	Haryana Irrigation Department's in-house Environmental Policy[38]	The policy depicts two prolonged strategies- • Efficient use and conservation of water is to be ensured. • Protection of water quality of surface and groundwater resources is to be achieved.
10	Himachal Pradesh	**Urban Development and Infrastructure**	Himachal Pradesh Town and Country Planning (Amendment) Rules, 2009[39]	• The amended rules added mandatory solar passive design in all public sector institutions and governmental buildings, residential buildings in urban and future-urban areas, commercial complexes, and buildings related thereto including hotels, resorts, lodges and guest houses, industrial buildings and complexes. • Glazing in proportion to total surface area of sought wall shall not exceed more than 50 per cent in mid-altitude regions i.e.,1500 metres to 2200 metres and not more than 70 per cent in high altitude regions i.e. 2200 metres and higher. • Wherever possible and required, SPV panels for lighting should be included in the building design.
		Electricity & Energy	Small Hydro Power Programme[40]	• A goal of 500 MW through small hydel projects by the end of 2014 has been fixed. • The Himachal government offers project sites with potential up to 5 MW capacity for private sector participation.
		Industry	Himachal Industrial Policy, 2004[41]	• The State government is encouraging cooperative sector by reserving sites in the small and micro hydel sectors, which will involve local community and increase the employment opportunities to local people. By all these efforts, the State government plans to get installed capacity addition of 6100 MW by 2010.
		Water	Himachal Pradesh State Water Policy, 2005[42]	• The policy proposes water resource planning through non-conventional methods, gives allocation priority to drinking water and irrigation, water conservation, and using water zoning to manage economic activities in the State.
11	Punjab	**Urban Development and Infrastructure**	Punjab Urban Planning and Development Authority (Building) Amendment rules, 2010[43]	• As per amendment, all buildings located on a plot area of 400 sq. metres and above shall have rooftop rainwater harvesting systems to recharge groundwater.
			State Forest Policy and Strategic Plan, 2008-2017 (Draft)[44]	The components of this policy include: • To increase the tree cover in the State from 6.3 to 15 per cent by promoting social and agro-forestry activities. • To protect, conserve, and improve Wildlife biodiversity and genetic resources of the State by expanding the State's Protected Area Network. • Develop appropriate carbon sequestration methodologies for agroforestry plantations and get it approved from CDM Authority. • A minimum green cover policy should be framed for the industries, colonies, institutions and other projects being established in the State. • Greening Action Plan for the State should be developed by involving other State Departments managing land resources.

37 http://haryana.gov.in/misc/industry-policy-2011.pdf
38 http://hid.gov.in/Environment%20policy%20of%20Irrigation%20Department.pdf
39 http://himachal.nic.in/tcp/TCP_Rules_09.pdf
40 http://himurja.nic.in/smallhydro.html
41 http://himachal.nic.in/industry/newindustrypolicy2004.pdf
42 http://www.hpiph.org/w.polocy/swp.pdf
43 http://puda.nic.in/img/notification_files/puda(21202-4HG1Part-2)_2805).pdf
44 http://www.pbforests.gov.in/Pdfs/policies/Policy%20Acts%20Rules_Punjab%20Forest%20Policy%20Draft.pdf

		Electricity & Energy	New And Renewable Source Of Energy Policy, 2006[45]	• The policy targets an addition of 1000 MW by the year 2020 through RE Sources • Additionally it seeks to motivate all sectors of economy to ensure conservation of energy to the extent of 20 per cent by the year 2020. • The thrust areas of the policy are as follows- o Small/Micro Hydro Projects: Untapped estimate potential of 200 MW to be tapped by the year 2012. o Cogeneration: Sugar, paper, fertilizer, chemical, textiles, and other industries with estimated potential of 220 MW to be exploited by the year 2012. o Power Generation from Biomass/ Agro Residue and Waste: Estimate to be about 22.65 million tonnes for generating decentralized power of more than 1500 MW to be exploited by the year 2020. o Power generation from urban, municipal, and industrial liquids/solid waste: To exploit about 5000 metric tonnes of municipal, urban, and industrial solid waste, which can lead to power generation of 100 MW, through waste energy project. o Power Generation from Solar Energy: The State is endowed with vast potential of solar energy estimated at 4.7 kWh/m2 of solar insulation level and the governments keen to tap this resource by setting up solar energy based power projects. o Wind Power: Self-identified projects in the sector shall be promoted by allowing private developers to set up wind power projects on first come first served basis based on wind data assessment carried out by them. o Energy Conservation: Energy Conservation measures shall be implemented and enforced in the State in accordance with the provisions of Energy Conservation Act, 2001 by Punjab Energy Development Agency.
		Industry	Punjab Industrial Policy, 2009[46]	• The classification of industries will be based on nature / level of pollution irrespective of investment. • It promotes sophisticated hi-tech industries, with special emphasis on high value added items without effluents, smoke, noise, and vibration so that they do not cause pollution and are not hazardous and noxious.
			Draft Chandigarh Industrial Policy, 2009[47]	• The policy lays categories industries as red, orange, green, and non-polluting. The industries falling under the red category are classified as heavily polluting. Industries like cement, fertilizer, dyes etc. come under red category; automobile repair stations, flour mills, hotels etc. are included in orange category; garment industry, electronic equipment, bakery etc. fall under green category. • Each of these categories has different environment norms. • It promotes sophisticated hi-tech industries, with special emphasis on high value added items without effluents, smoke, noise, and vibration so that they do not cause pollution and are not hazardous and noxious. • There will be a ban on setting up of hazardous, obnoxious industries as well as large/heavy industries which involve investment in large/heavy machinery. • Only micro, small, and medium enterprises will be permitted in Chandigarh.
12	Kerala	**Urban Development and Infrastructure**	Kerala State Transport Policy, 2011 (DRAFT)[48]	Key features of the policy includes- • Revamp public transportation system to increase its share from existing 33 per cent of total passenger traffic to 80 per cent in 2025. • Reduce dependence on personal transport and increase share of railways in inter-State and inter-city transport and that of buses in intra-State and intra-city transport. • Encourage growth of rail based mass transit system. • Public transport to get preferential treatment in the tax treatment as compared to personalized transport. • Building permits will only be issued after ensuring adequate in-house parking space for the expected number of vehicles of the inhabitants. • Off-street parking facilities at suitable locations for existing buildings and commercial complexes built without providing adequate parking space. • Promoting inland navigation in the State. • Suitable plans for transport waste management like recycling of tyres, tubes, spare parts, oil etc.
			Kerala Municipality Building (Amendment) Rules 2004[49]	• Rainwater harvesting systems mandatory for all new buildings in State. • The municipality shall enforce workable artificial groundwater recharging arrangements as an integral part of all new building constructions through collection of rooftop rainwater.

45 http://peda.gov.in/eng/Data/pdfs/policies_acts.pdf
46 http://puda.nic.in/img/notification_files/dtcp2-97.pdf
47 http://chandigarh.gov.in/pdf/ind-policy2009.pdf
48 www.kerala.gov.in/docs/policies/32232_11.pdf
49 http://www.rainwaterharvesting.org/policy/img/kerala_govt.pdf

			Kerala State Housing Policy, 2011[50]	• The policy promotes the concept of green buildings incorporating cost effective, environment friendly technologies for modernizing the housing sector to increase efficiency, productivity, energy efficiency, and quality with relevant Rating System promoted by Indian Green Building Council like LEED Rating and appropriate fiscal incentives would be considered for encouraging such initiatives. • Model Green buildings complying with international standards will be set up for creating awareness on energy efficiency and carbon emissions.
		Electricity & Energy	Renewable Energy Policy, 2002[51]	• Large Industries having 2000 KVA and above as connected load, should produce at least 5 per cent of their requirement through captive power plants using RE sources. • Power generation through renewable energy sources, if purchased by Kerala State Electricity Board will be at ceiling rate of Rs. 2.50 per unit from small hydel power plants. • Entry tax/octroi refund is exempted.
			Guidelines for Development of Wind Farms in Private Land and Kerala Wind Power Policy[52]	• These guidelines are issued to give impetus to harness the wind power potential available in the State through private developers. Any developer is free to set up wind power in private lands subject to the provisions in these guidelines.
			Kerala State Energy Conservation Fund Rules, 2010[53]	• The fund is constituted under section 16 of the Energy Conservation Act to meet the expenditure incurred for energy efficiency improvement projects, facilitate R&D projects in field of energy conservation, training and awareness programmes, and energy audits. • The fund will be utilized to implement RE schemes and Programme in the State.
			Kerala Solar Policy, 2013 (Draft)[54]	• Increase the installed capacity of the solar sector in the State to 500 MW by 2017 and 1500 MW by 2030. • The energy generated from the plants under this policy shall be fully exempted from the electricity duty. • Wheeling charges and T&D losses will not be applicable for the Captive Solar generators within the State.
			Kerala Small Hydro Development Policy, 2012, (Draft)[55]	• The policy seeks to create an environment conducive to public/private/ community participation and investment in small hydro projects. • 40 per cent share of RE sources is to be from small hydro projects. • The policy sets a goal of commissioning 150 MW additional capacity from SHP by 2015.
		Industry	Kerala Industrial and Commercial Policy, 2011 (Draft)[56]	• It encourages relocation of polluting industries outside the city/municipal/ metropolitan limits. • Government will not encourage enterprises which use forest wood as raw materials. • Redeemable wood/plantation based wood (bamboo, softwood, plywood etc.) industries should be seen as a green alternative and will be promoted.
		Water	Kerala State Water Policy, 2008[57]	• This policy encourages sustainable water resource development and adopting an integrated and multi-sectoral approach for planning, development, and management of water resources in the State.
13	Orissa	**Electricity & Energy**	Orissa State Energy Conservation Fund Rules, 2011[58]	• The fund is credited from grants and loans that may be made by the State government or central government or given by any autonomous body/ agency/ company/ individual body for the stated purpose. Also, from the proceeds of any tax, levy or duty/ cess imposed by State government for the stated purpose. • The fund is to be used for promoting energy-efficient products, research, and development in the field of energy conservation, training personnel in energy conservation, and establishing awareness Programme in the State.

50 http://www.kerala.gov.in/docs/policies/housingpolicy_11.pdf
51 http://ireda.gov.in/writereaddata/Policy/8%20kerala%20RE.pdf
52 ANERT; http://www.keralaenergy.gov.in/pdf/pd_keralawindpolicy.pdf
53 http://www.keralaenergy.gov.in/pdf/EC%20Fund%20Rule%20Gazette%20Notification.pdf
54 http://re.indiaenvironmentportal.org.in/files/file/kerala_draft_solarpolicy2013.pdf
55 http://www.keralaenergy.gov.in/shp/KERALA%20SMALL%20HYDRO%20DEVELOPMENT%20POLICY.pdf
56 http://www.kerala.gov.in/docs/policies/draftic_policy11.pdf
57 http://www.kerala.gov.in/docs/policies/wp_08.pdf
58 http://orissa.gov.in/govtpress/pdf/2011/337.pdf

			Policy Guidelines on Power Generation from Non-Conventional Energy Sources[59]	• Among the potential sources identified for this policy include solar PV, biomass, wind, tidal, hydro (micro, mini, and small), and geothermal energy. • The incentives for power generation from RE include exemption from electricity duty, allotment of government land, and no transmission charges to be levied for 5 years from the period of commissioning.
			Bhubaneshwar City's Renewable Energy & Efficiency Policy[60]	Bhubaneshwar Municipal Corporation believes in energy conservation as one of the pillars to achieve sustainable development. The aim is to reduce the overall conventional power consumption of the city by at least 2 per cent from 2005 levels by 2012. As part of the policy:- • Incorporating energy efficiency in all its present and future planning (to achieve overall 15 per cent reduction in conventional energy consumption in municipal services and facilities from 2005 level by 2012). • Integrating energy efficiency measures in all its applications such as its street lighting, parks/campus lighting, traffic signals, buildings, etc. • Developing energy conservation and management guidelines for all corporation activities. • Promoting renewable energy sources such as solar water heating systems in all commercial/domestic activities. • Encouraging non-motorized transportation system in the city. Organizing awareness programmes for its citizens, staff, etc. on energy conservation BMC believes in being a model for other cities in the region and around the globe by continuous improvement in its energy conservation drive and promoting renewable energy and energy efficiency.
		Industry	Orissa Industrial Policy, 2007[61]	• The policy says that to make current industrialization process sustainable, maximum emphasis shall be laid on sound environment management practices. • With this objective in mind, the State government among other things is actively promoting investments in new cement plants based on blast furnace slag and fly ash, which would be available in abundance due to the large number of steel and power plants coming up in the State.
		Water	State Water Policy, 2007[62]	• The policy contains directives on development of water resources for irrigation and drainage, industrial water supply, groundwater development, safety of dams, and irrigation management. • As part of the policy, the State has developed a State Water Plan for a period covering up to 2051.
14	Rajasthan	**All Sectors**	Rajasthan State Environment Policy, 2010[63]	The policy identifies the key challenges that the State must address for sustainable and equitable growth. Among the key objectives of this policy are: • Conserve and Enhance Environmental Resources by protecting critical ecosystems and natural and man-made heritage, ensuring equitable access to environmental resources for all sections of society, ensuring judicious use of these resources to assure inter-generational equity, and ensuring their efficient use to maximize productivity and minimize environmental degradation. • Assure Environmental Sustainability of Key Economic Sectors by integrating environmental concerns into policies, plans, programmes, and projects for economic and social development, so that these do not erode the very resource base on which they are dependent. • Improve Environmental Governance and Build Capacity by assuring transparency, rationality, accountability, time and cost effectiveness, participation, and regulatory independence in the process of environmental management and regulation. The policy should also ensure higher resource flow for environmental conservation and promote beneficial multi-stakeholders partnership. The government highlights strategies for water conservation, soil conservation, industries, urban transport etc.
		Urban Development and Infrastructure	Rajasthan State Forest Policy, 2010[64]	• Basic objectives of this policy are protecting, conserving, and developing natural forests of Rajasthan with active participation of local communities for ecological security and undertaking massive afforestation on government and community owned wasteland, privately owned agriculture, and non-farm land for expanding the vegetal cover of the State also to combat desertification and land degradation.

59 http://oredaodisha.com/pdf/policy-guidelines.pdf
60 http://www.bmc.gov.in/Renewable-Energy.asp?lnk=4&PL=4
61 http://orissa.gov.in/e-magazine/orissaannualreference/OR-Annual-2009/pdf/243-264.pdf
62 http://www.orissa.gov.in/waterresources/policy/State_Water_Policy_2007.pdf
63 http://www.rajasthan.gov.in/rajgovt/actnpolicies/showFrame_new.jsp?fileID=/rajgovresources/actnpolicies/environment_policy.pdf
64 http://www.rajasthan.gov.in/rajgovt/actnpolicies/showFrame_new.jsp?fileID=http://rajasthan.gov.in/rajgovresources/actnpolicies/forestpolicy.pdf)

	Electricity & Energy	Policy for promoting generation of Electricity through Non-Conventional Energy Sources, 2004[65]	• The incentives provided by the State government are exemption from electricity duty @ 50 per cent for a period of 7 years from date of commencement. • Generation of electricity from Non-conventional Energy sources shall be treated as eligible industry under the schemes administered by Industries Department and incentives available to industrial units under such schemes shall also be available to the Power Producers.
		Policy for Generating Electricity through Biomass, 2010[66]	• Biomass power project of up to 20 MW capacities are eligible under this policy. • Under the policy, 'Biomass' means forestry based & agro-based industrial residues, energy plantations, forestry and agro-residues. However, the Biomass produced within Rajasthan being utilized as fodder such as Wheat husk, Millet husk, Barley husk etc. shall not be allowed to be used as fuel for Biomass Power Project. The Biomass Power Producers shall be allowed to use fossil fuel (such as coal/lignite/natural gas, municipal waste) up to 15 per cent during the lean period in some years.
		Rajasthan Solar Energy Policy, 2011[67]	• The policy aims to develop a global hub of solar power of 10000-12000 MW capacity in next 10-12 years to meet energy requirements of Rajasthan and India, contributing to long term energy security of Rajasthan as well as ecological security by reduction in carbon emissions. • The Rajasthan State will develop 50 MW SPV and 50 MW Solar Thermal Power Plants through selection of developer(s) by the tariff based competitive bidding process on concept of bundling of Solar Power with equivalent amount of MW capacity of conventional power. • The Rajasthan State will promote setting up of solar power projects for direct sale to Discoms of Rajasthan. The total capacity under this category will be distributed equally between SPV and CSP based power plants. • The total maximum capacity under this category for phase-1 (up to 2013) will be 200 MW and phase-2 (2013-17) will be an additional 400 MW. Rajasthan will also promote Solar Power Producers to set up Solar Power Plants of unlimited capacity for captive use or sale of power to third party/ States other than Rajasthan.
		Policy for Promoting Generation of Electricity from Wind, 2011 (Draft)[68]	• The State will promote setting up of wind power plants of unlimited capacity for direct sale to Discoms of Rajasthan up to year 2011-12 on the preferential tariff determined by Rajasthan Electricity Regulatory Commission. • The targets under this category for the year 2012-13, 2013-14 and 2014-15 will be 400 MW for each year.
	Industry	Rajasthan Industrial and Investment Promotion Policy, 2010[69]	• The policy outlines steps for pollution control and environmental protection. • Department of Industries in close coordination with Department of Environment and Rajasthan Pollution Control Board (RPCB) will build awareness, educate and engage the industry in reducing the environmental footprint. • Green 'environmental standards' would guide their planning and execution. • RIICO would encourage water harvesting and recycling in all its industrial areas existing and new. • State would encourage and incentivize recycling of electronic waste and setting up of e-waste recycling units. • To encourage environment friendly technologies, the State would continue its support for setting up of common effluent treatment plants and recycling and re-use of waste water in industrial areas or by individual units as detailed in MSME policy. Through this policy the government also seeks the promotion of green industry in the State.
	Water	Rajasthan State Water Policy[70]	• The water policy outlines measures related to groundwater development, water quality monitoring, water zoning, participation of water users, water conservation, and efficiency of utilization, flood control and drainage management and drought management.

65 http://www.rrecl.com/PDF/Amendments.pdf
66 http://www.rrecl.com/PDF/Policy_Promoting_Generation_Electricity_Biomass_2010(Web).pdf
67 http://www.rrecl.com/PDF/Solar%20Policy.pdf
68 http://www.rrecl.com/PDF/Draft%20Wind%20Policy_1112011.pdf
69 http://www.rajasthan.gov.in/rajgovt/actnpolicies/showFrame_new.jsp?fileID=http://rajasthan.gov.in/rajgovresources/actnpolicies/Investment_Policy_English.pdf
70 http://www.rajasthan.gov.in/rajgovt/actnpolicies/showFrame_new.jsp?fileID=/rajgovresources/actnpolicies/State%20Water%20Policy.pdf

15	Tamil Nadu	**Urban Development and Infrastructure**	Tamil Nadu District Municipalities Buildings Rules, 1972[71]	• Provision for rainwater harvesting structures has been made as mandatory as per rules 3A of the Tamil Nadu District Municipalities Buildings Rules, 1972. Mandatory rain water harvesting structures in all houses and building plans are sanctioned only if provision is made for rain water harvesting in the plans. • Also a provision has been made to recycle the water from the bathrooms and wash basins and re-use the same as per section 17-A.
		Electricity and Energy	Tamil Nadu Solar energy Policy, 2012[72]	• The policy targets to achieve energy security and to generate 3000 MW of solar energy and grid parity by 2015 subsequently aims to reduce carbon emissions. • Exemption from electricity tax to the extent of 100 per cent of electricity generated from solar power used for self-consumption/sale to utility will be allowed for 5 years.
		Industry	Tamil Nadu Industrial Policy, 2007[73]	• The policy seeks to reduce the dependence of industries on surface and groundwater sources. • Projects for recycling of municipal sewage into water for industrial use would be set up to meet demand for industrial water. • A Tamil Nadu Technology and Efficiency Up-gradation Initiative to be launched under the policy. • A back-ended State Capital Subsidy and Electricity tax exemption on power purchased from Tamil Nadu Electricity Board or generated and consumed from captive sources would be sanctioned for all manufacturing units, based on employment and investment in eligible fixed assets made within 3 years, irrespective of location. • Dedicated Effluent Treatment Plants (ETP) and/or Hazardous Treatment Storage and Disposal Facility (HWTSDF) set up by individual manufacturing units would be eligible for an Environment Protection Infrastructure subsidy of Rs. 30 lakhs or 25 per cent of capital cost of setting up such ETP/HWTSDF, whichever is less.
16	Uttar Pradesh	**Urban Development and Infrastructure**	Building Bye-Laws[74]	• Building bye-laws promote solar active architecture. • Installation of solar-assisted structures for encouraging the non-conventional source of energy is exempted from obtaining the sanctions from competent authority in urban areas. • These laws are under revision to make provision of auxiliary solar-assisted water heating system mandatory in certain category of public/private buildings.
		Electricity & Energy	Uttar Pradesh Energy Policy, 2009[75]	Under this policy, the principle objectives are – • Access to electricity to all households in next five years • Power demand to be fully met by 2014, energy and peaking shortages to be overcome and adequate spinning reserve to be available. • Supply of reliable and quality power of specified standards in an efficient manner and at reasonable rates. • It aims at per capita availability of electricity to be increased to over 1000 units by 2017. • The State will encourage renewable energy wherever feasible in the State. This policy is valid till 31 March 2014.
			Biomass Energy Policy, 2010 (DRAFT)[76]	• Biomass Power Projects (including project based on urban solid waste) only up to 15 MW capacity are eligible for the benefits under this policy. • The policy also reserves areas for biomass plants; and to avoid unhealthy competition among various biomass power projects, no other biomass power project is permitted within the reserved area of existing/approved/earlier registered projects. • It is further provided that no area shall be kept reserved for biomass power project of capacity less than 5 MW.

71 http://www.chennaicorporation.gov.in/departments/storm-water-drain/introduction.htm#rainwater
72 http://www.tnteu.in/pdf/solar_energy_policy_2012.pdf
73 http://www.tidco.com/images/industrialpolicy_e_2007.pdf
74 http://awas.up.nic.in/policies/Solar.htm
75 https://udyogbandhu.com/DataFiles/CMS/file/energy_policy_2009.pdf
76 http://neda.up.nic.in/ALLGO/UPNEDA/POLICY%20ORD/BM-POLICY.pdf

			Solar Policy, 2013[77]	• This policy will come into effect from the date of issuance and shall remain in operation up to 31 March 2017. • Target capacity of 500 MW of Grid-connected solar power plant will be achieved till March 2017. • Expenditure on the construction of transmission line and sub-station will be borne by the State government on all the projects in the Bundelkhand region. • Provision of special incentive will be made by the State Government on case-to-case basis for such solar farms where many power plants based on solar energy are installed and the total investment is more than Rs.500 crores.
		Industry	Infrastructure and Industrial Investment Policy[78]	• Captive power generation would be encouraged for partial power supply to the industries. • State government is taking necessary steps for the generation of power from solar energy. Efforts would be made to provide necessary incentives and facilities to the private sector for establishment of electricity generation projects based on solar energy. • A rebate of 5 per cent will be provided on interest rate applicable on loan taken by industrial associations or group of industries for establishing water drainage and waste and sewage disposal system in industrial estates and areas.
		Water	Uttar Pradesh State Water Policy[79]	• Water for drinking and domestic use has the highest priority while allocating the water resource of the State. • The State has to provide adequate drinking water facilities (both for people and livestock) to the entire population in both urban and rural areas up to the year 2025. • Sanitation facilities for entire population in urban areas and most of the rural areas should also be provided.
17	Uttarakhand	**Electricity & Energy**	Policy for Promoting Generation of Electricity through Renewable Energy Sources with Private Sector & Community Participation, 2008[80]	• Government proposes to harness the following sources by 2020: o Hydro Electric Power – 600 MW o Cogeneration – 220 MW o Biomass/Agro Residue and Waste – 300 MW o Solar Power Projects – To be setup o Wind Power – To Assess and Exploit the available Potential o Urban, municipal, and industrial liquid/solid waste – few projects. • As per the guidelines laid down by the government, energy auditing is to be made mandatory for industrial units where load exceeds 25 kW.
18	West Bengal	**Urban Development and Infrastructure**	Policy on Mini/ Micro Hydro Electric Power Station up to 3 MW[81]	• Under this policy high and extra high voltage industrial consumer can set up mini/micro hydro power stations up to 3 MW. • The industrial undertaking is to develop and maintain the transmission lines to the nearest grid sub-station, and the power generated cannot be sold to a third party.
			Policy on Cogeneration and Generation of Electricity from Renewable Sources of Energy, 2012[82]	By 2017, target of • 120 MW through small and mini hydro projects. • an additional 224 MW of biomass power, rice-husk-based gasifier systems with an aggregate capacity of 20 MW, 50 MW of power from waste-to-energy power projects covering municipal solid waste, municipal liquid waste and industrial waste. • 82 MW of solar power through grid-connected projects and 18 MW of solar power through rooftop and smaller solar installations are fixed. • The State will promote private sector investment and involvement in developing grid-connected RE units and assist the developers in getting different incentives for implementation of RE projects.
		Industry	West Bengal Industrial and Investment Policy, 2013[83]	• Incentives under Power for Industry are administered by the Industry Department under the benefit schemes.

77 http://www.udyogbandhu.com/DataFiles/CMS/file/Solar_Power_Policy_UP_2013.pdf
78 http://www.udyogbandhu.com/DataFiles/CMS/file/Indl_Policy_English.pdf
79 http://swaraup.gov.in/Downloads/up_wp.pdf
80 http://ireda.gov.in/writereaddata/Policy/17%20Uttarakhand%20RE.pdf
81 http://westbengal.gov.in/
82 http://www.wbreda.org/wp-content/uploads/2012/06/policy-renewable-wb.pdf
83 http://www.wbidc.com/images/pdf/Industrial_Policy_Draft_Final.pdf

19	Arunachal Pradesh	**Electricity & Energy**	Hydropower policy[84] 2008	• The policy aims to create a balance between bridging energy gap of the state through hydropower development and ecological development of Arunachal Pradesh. It mainly focuses on hydropower plants with capacity of 25 MW and above. • The mandatory measures are the Social development and Rehabilitation of displaced persons due to the hydropower project, under the provisions of Rehabilitation and Resettlement policy 2008. An additional 1% of the free power allocated by the state towards the Local Area Development fund developed by the power developers. • Encouragement of Private sector involvement, Joint ventures for the development of hydropower through fiscal incentives like duty free import of equipment, tax holiday
		Industry	Industrial policy 2008	Classification of industries into categories by the State Pollution Control Board, "Red" represents highly polluting industries, 'Orange' represents moderately polluting industries and 'Green' represents marginally polluting units
20	Assam	**Electricity & Energy**	Policy[85] for Small Hydro-power Development 2007	• A steering committee has been set up for the single window clearance of the small hydropower projects • The private sector power developers, NGO has been encouraged • Fiscal incentives and concessions such as no entry tax, no royalty for hydro-power projects with capacity of 5MW and below
		Industry	Industrial policy 2008	Classification of industries into categories by the State Pollution Control Board, "Red" represents highly polluting industries, 'Orange' represents
		Water	State Water Policy (draft) 2007	It lays emphasis on Rain Water Harvesting, and conservation practices for recharging ground water
21	Chhattis-garh	**Electricity & Energy**	Policy[86] for promotion of Power Generation from Wind 2006	The policy has both mandatory and incentive measures. The highlights of the policy are as follows: • Provision of incentives to the wind power developers as per the Industrial Policy of the Govt. of Chhattisgarh • Mandatory measures such as Private land acquisition according to Rehabilitation Policy under state govt. land acquisition act
			Solar Policy 2012-2017	• The policy encourages power developers to set up solar power plants through Renewable Energy Mechanisms, which is eligible for all solar plants
				• Fiscal incentives and concessions in the form of exemption from VAT, Electricity duty etc. Solar projects under this policy are eligible for all benefits under the Industrial Policy (2009-2014)
				• An Empowered Committee has been formed under the chairmanship of chief secretary of the state to resolve, monitor policy related issues
				• The policy also includes mandatory measures such as completion and commission of solar projects within 24 months of their approval
		Industry	Industrial Policy of Chhattisgarh 2009-2014	The policy includes mandatory measures for safeguarding the environment such as setting up of Effluent Treatment Plant, hazardous waste management system, solid waste disposal system, recycled water utilization etc.
		Water	State Water Policy(draft) 2012	The policy lays emphasis on the conservation of water and water storing structures, wetlands. It has mandatory measures such as recycling of industrial effluents, waste disposal and re-use of recycled waste water.
22	Jammu & Kashmir	**Electricity & Energy**	Jammu[87] and Kashmir Solar Energy Policy 2013	• The policy focuses on promotion of solar energy and aims to generate employment opportunities. It also encourages private sector investment in the solar energy sector. • Several incentives like exemption from entry tax, exemption from royalty, free power provision for setting up solar projects are been provided • There are mandatory measures in the policy such as requirement of solar license by solar power developers, CDM benefit sharing

84 http://www.arunachalhydro.in/pdf/Monitoring/HydroPowerPolicy2008.pdf , accessed on October 30,2013
85 http://www.apgcl.org/Assam%20SHP%20Policy%20Aug%2016,%202007.pdf, accessed on November 4,2013
86 http://www.ireeed.org/policydetails?id=46# , accessed on November 4,2013
87 http://jakeda.nic.in/Solar%20Policy%20for%20J&K.pdf , accessed on November 4,2013

			Policy for Development of Micro/Mini Hydro Power Projects-2011	The policy aims to bridge the energy gap in the state by the promotion of mini/micro hydel projects. The policy also serves as an instrument to attract private investors for environment friendly power development in remote rural areas, facing the problem of acute power supply. The nodal agency for the policy implementation is the Jammu & Kashmir Energy Development Agency (JAKEDA) for Micro hydel Projects with installed capacity of 2MW, in Jammu and Kashmir state Divisions and Lahore Energy Development Agency (LREDA) / Kargil Energy Development Agency (KREDA) are the Nodal Agencies in Leh and Kargil.
		Water	Jammu & Kashmir Water Resources (regulation and management) Act 2010	The policy has several incentive measures for the development of hydropower in the state. The fiscal incentives includes, measures like exemption from entry tax on power generation equipment and building material, exemption from water usage charges for projects under the policy for a period of 10 years
		Industry	Industrial policy 2002-14	Classification of industries into categories by the State Pollution Control Board, "Red" represents highly polluting industries, 'Orange' represents moderately polluting industries and 'Green' represents marginally polluting units
23	Goa		Investment[88] Policy of Goa (draft) 2013	Reduction of 100% in electricity duty (Govt. of Goa) for installation of renewable power generation equipment subject to the unit meeting at least 25% of its power requirement from renewable sources. The Power Department, Government of Goa will soon announce a policy for renewable energy power generation in the state of Goa. Other features include • Provision of treated recycled waste water for industrial purposes • Supplying potable water through treatment facilities to industries • Lay importance on rainwater harvesting in industries, and encouraging rainwater harvesting through incentives such as : • Reimbursement of 25% (Government of Goa) of the cost of water and energy audit by a recognized institution • Reimbursement of 25% (Government of Goa) of the cost of water and energy equipment subject to a cap of Rs 100,000 / unit
24	Manipur	**Electricity & Energy**	Manipur[89] Renewable Energy Policy 2006	• Relaxation on sale of power to the state by the private developers
				• Encouragement of private investors by providing various facilities like low rate of power purchase, Purchase Power Agreement for a period of 20 years
				• Fiscal incentives like exemption from electricity duty for 5 years, sales tax exemption, are provided also, project developer under this policy are eligible for incentives and concessions under the Industrial Policy for Renewable Energy Development, of India
		Industry	Manipur Industrial policy 2013	Classification of industries into categories by the State Pollution Control Board, "Red" represents highly polluting industries, 'Orange' represents moderately polluting industries and 'Green' represents marginally polluting units
25	Meghalaya	**Electricity & Energy**	Policy for the Promotion of generation of power through Non-Conventional sources of energy	The policy has incentive-based measures where the state government provides incentives like provision of water for power generation, infrastructural facilities, fiscal incentives and concessions like exemption from electricity duty for a period of 5 years
		Water	Meghalaya state water policy (Draft) 2013	Various objectives and policy measures have been devised for all the sectors related to water resources such as water management, rural water supply etc
		Industry	Meghalaya Industrial and Investment Promotion Policy 2012	Classification of industries into categories by the State Pollution Control Board, "Red" represents highly polluting industries, 'Orange' represents moderately polluting industries and 'Green' represents marginally polluting units

88 http://www.goaditc.gov.in/Goa%20Investment%20policy%20draft%2013Aug2013%20v43.pdf , accessed on November 5,2013

89 http://ireda.gov.in/writereaddata/Policy/10%20Manipur%20RE.pdf ,accessed on November 4,2013

26	Mizoram	**Electricity & Energy**	Power[90] Policy for Power through Non-conventional Energy Sources	• The policy aims to attract private/foreign investment to increase state's renewable energy sector investment through a number of fiscal incentives
				• The target group of the policy are all power producers producing energy from Non-conventional sources of power generation like biomass, waste recycling, hydroelectric power plant etc., with installed capacity of 10 kW-25 kW [1](Power and Electricity Dept., Govt. Of Mizoram)
				• Several Incentives are provided to ensure the promotion of New Renewable Energy Sources (NRES) such as exemption from electricity duty for producers, provision of infrastructural supply during construction phase, exemption of state sale tax for RE equipments.
		Industry	Industrial policy 2002	Classification of industries into categories by the State Pollution Control Board, "Red" represents highly polluting industries, 'Orange' represents moderately polluting industries and 'Green' represents marginally polluting units
27	Nagaland	**Industry**	Industrial policy	Classification Pollution of industries into categories by the State Pollution Control Board, "Red" represents highly polluting industries, 'Orange' represents moderately polluting industries and 'Green' represents marginally polluting units
28	Sikkim	**Industry**	Industrial Policy 2012	Classification of industries into categories by the State Pollution Control Board, "Red" represents highly polluting industries, 'Orange' represents moderately polluting industries and 'Green' represents marginally polluting units
29	Tripura	**Electricity & Energy**	Draft policy for the promotion of Electricity generation through New & Renewable sources	Many incentive-based measures are enlisted by the state government to promote private sector involvement, such as, provision of infrastructural facility for setting up of Renewable Energy projects, sales tax exemption, provision of water for power generation
				A monitoring committee to be set up, headed by the Secretary of the State and Principal Chief Conservator of forests for monitoring and reviewing the policy
		Industry	Industrial Policy 2007	Classification of industries into categories by the State Pollution Control Board, "Red" represents highly polluting industries, 'Orange' represents moderately polluting industries and 'Green' represents marginally polluting units

90 http://ireda.gov.in/writereaddata/Policy/10%20Manipur%20RE.pdf ,accessed on November 4,2013

CHAPTER 12

CASE STUDIES OF UNIQUE INITIATIVES

1. Atal Bijli Bachat Yojana (Himachal Pradesh)

Atal Bijli Bachat Yojana (ABBY) is a lighting efficiency project in the State of Himachal Pradesh, India, implemented by Himachal Pradesh State Electricity Board. In 2009, Himachal Pradesh State Electricity Board (HPSEB) provided free of cost about 6.4 million Compact Fluorescent Lamps (CFLs) to about 1.6 million households, i.e. all the domestic consumer connected to the grid in the State at cost of 65 crores. The main feature of the project is that each domestic consumer across the State was given a maximum of 4 CFLs (two of 15W & two of 20W) free of cost as a replacement of an equal number of utilized incandescent bulbs (two of 100W & two of 60W). The expected emission reduction from the project is about 130,384 tonnes of CO2e annually starting from 2009 for 10 years.[1] The observed reasons that may be attributed to the low penetration rate of CFLs in the State are high price of CFL – difference between price of incandescent and CFL is about 10 times and second, lack of awareness about the energy saving benefits in long run. HPSEB claimed energy savings to be 278 MU per annum initially.

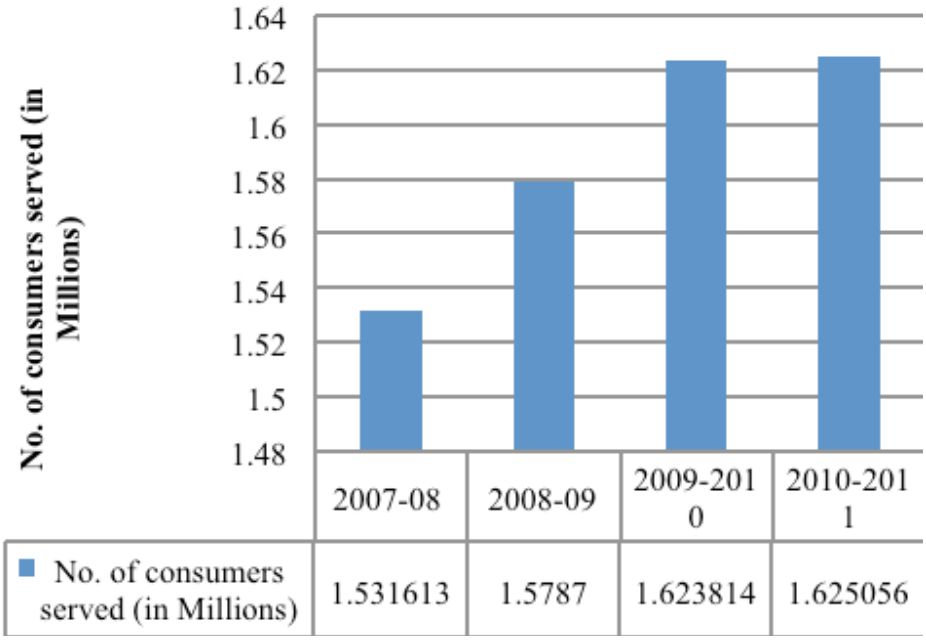
IN 2009, HIMACHAL PRADESH STATE ELECTRICITY BOARD (HPSEB) PROVIDED FREE OF COST ABOUT **6.4 Mn** CFLs TO ABOUT **1.6 Mn** HOUSEHOLDS

1 UNFCCC, 2009http://cdm.unfccc.int/Projects/Validation/DB/NPCWF36YO14KIZFSQDTOICDLK5HGYB/view.html

Calculation of energy savings and emission reduction trajectory[2]

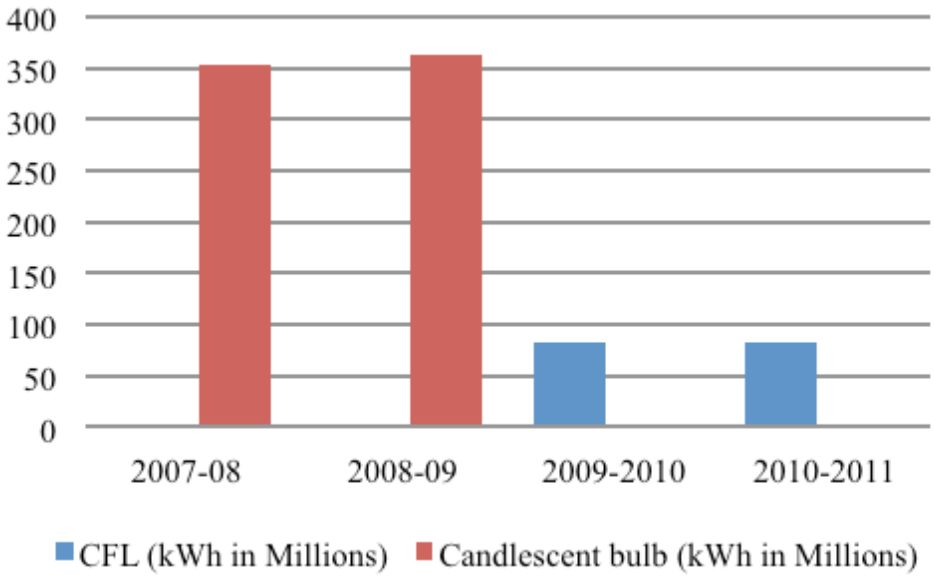
With an assumption that if one consumer uses a lighting device for 4 hours per day for 30 days, using two 60W and two 100W incandescent bulbs will consume 230.4 kWh annually whereas using two 15W and two 20W CFLs, the value drops to only 50.4 kWh annually. Therefore, on an average each consumer saves around 78 per cent of energy annually. Figure 9.1 shows increasing numbers of energy consumers over the years in Himachal Pradesh (Source: HPSEB, www.hpplanning.nic). In Figure 9.2, a significant reduction in energy consumption can be observed during 2009, which is the year the ABBY was implemented. The emission reductions were order of 286440.78 tCO2 eq during 2009-10.

Figure 9.1: Number of consumers served by HPSEB over years



(Source: Compiled by Vasudha Research Team)

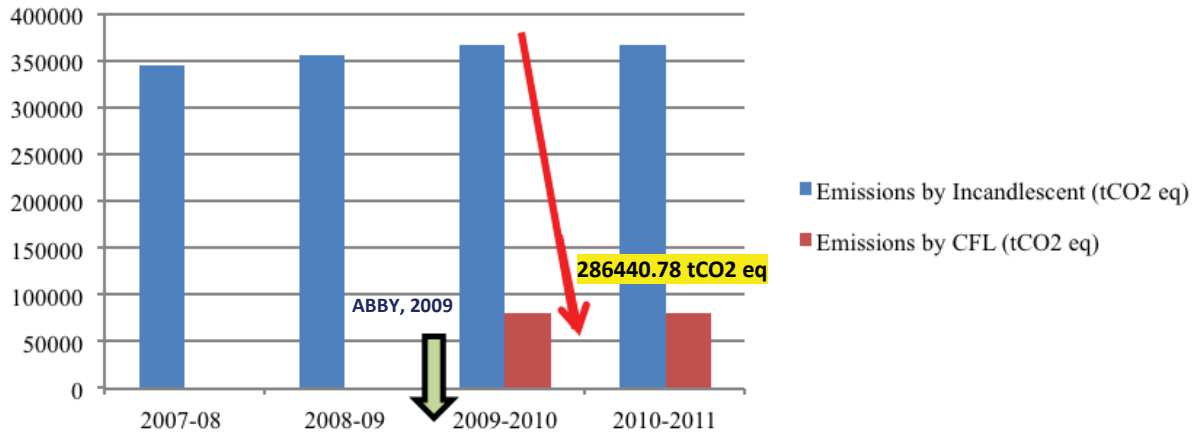
Figure 9.2: Number of Units consumed per year in Himachal Pradesh (Domestic)



(Source: Compiled by Vasudha Research Team)

Figure 9.3: Emission reduction over the years in Himachal Pradesh

2 1 kWh= 0.98 kg CO2 eq (CEA, 2011)



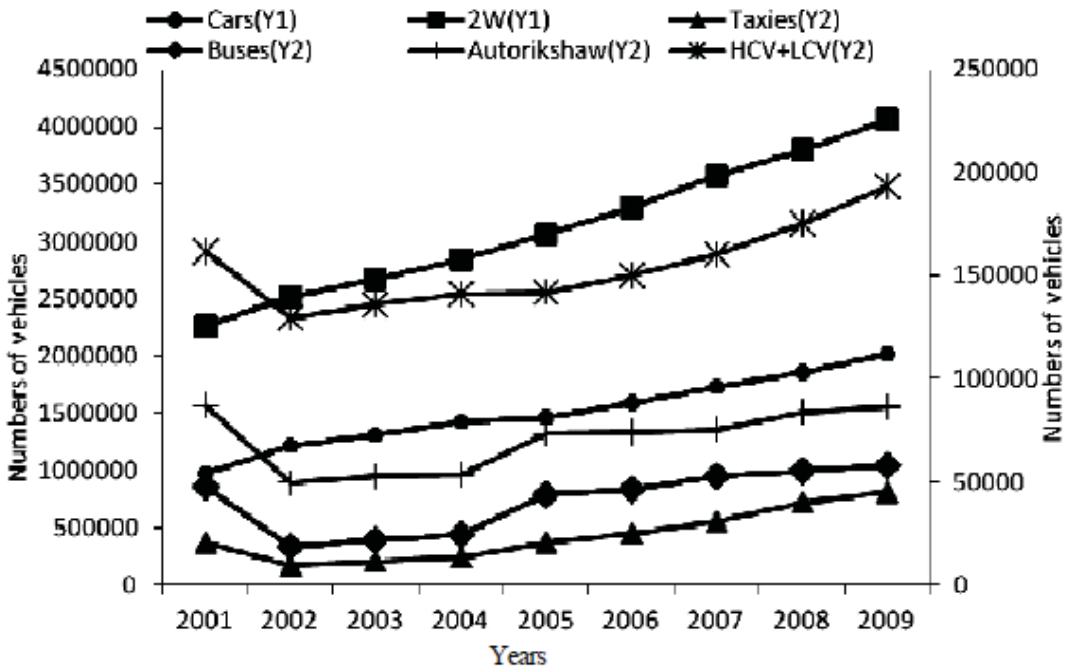
Source: Compiled by Vasudha Research Team

2. CNG Bus Programme Delhi, 2002

The Auto Fuel Policy was framed by the Government of India during 2002-03 when Delhi was mandated by the court to implement a compulsory CNG bus Programme. In Delhi, the number of motor vehicles registered in 2001 is 35,51,690 units which increased to 64,51,883 units in 2009, registering 81 per cent growth rate. Because to this tremendous increase in number of vehicles over the years, a consequent increase in consumption of driving fuels, emission of GHGs and other pollutants is recorded.

In 2002, the programme mandated public transport to run only on CNG. Old vehicles were either phased out or were converted into CNG. There are more than 12,500 buses (both public and private), 87,000 autorikshaw (100 per cent), 15,000 RTVs & Taxis (100 per cent) and 1,50,000 private cars (10 per cent) are running on CNG so far in Delhi- NCR region. Delhi CNG buses are largest operated CNG bus fleet in any single city in the world! (Source: IGL, 2010).

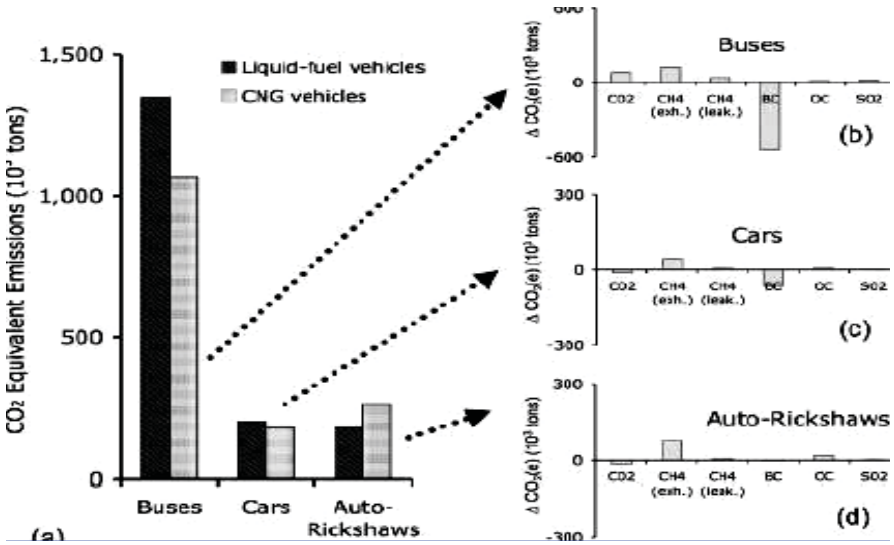
Figure 9.4: Number of Registered Vehicles in Delhi during 2001 to 2009



Source: Singh and Sharma, 2011

Assessments on introduction of CNG in Delhi[3] have revealed that emissions of GHGs per unit of CNG vehicle have increased by 2.4 per cent due to increased consumption of CNG per unit of CNG vehicles during 2001-2009 but CO2 emissions per unit vehicle types for gasoline driven vehicles show a decrease of 2.7 per cent for two-wheelers and 4.3 per cent for cars; while in case of diesel driven vehicles, this reduction is 1.6 per cent, indicating impact of better vehicle technologies introduced. Previous studies affirm that the CO2 emissions from transport sector have increased from 27 per cent to 39 per cent during 1999-2000[4]. In the period from 1990-91 to 1999, CO2 emission from gasoline driven vehicles have shown a rise of 766-1187 Gegagram and 577-9779 Gegagram from diesel driven vehicles (Source: Sharma C & Pundir R, Inventory of greenhouse gases and other pollutants from the Transport sector: Delhi (2008)). To summarize, emissions of CO_2 have increased by 46 per cent during 2001-2009 compared to 65 per cent in 1990-91 to 1999-2000. The Auto Fuel Policy 2003 was implemented between 2001 and 2009.

Figure 9.5: Emissions inventories, demonstrating the change in climate-forcing emissions attributable to the switch from diesel and gasoline-fueled vehicles to CNG vehicles. Units are 1000 tonnes of Carbon dioxide equivalent emissions [CO2(e)].[5]



Source: Reynolds and Kandlikar, 2008

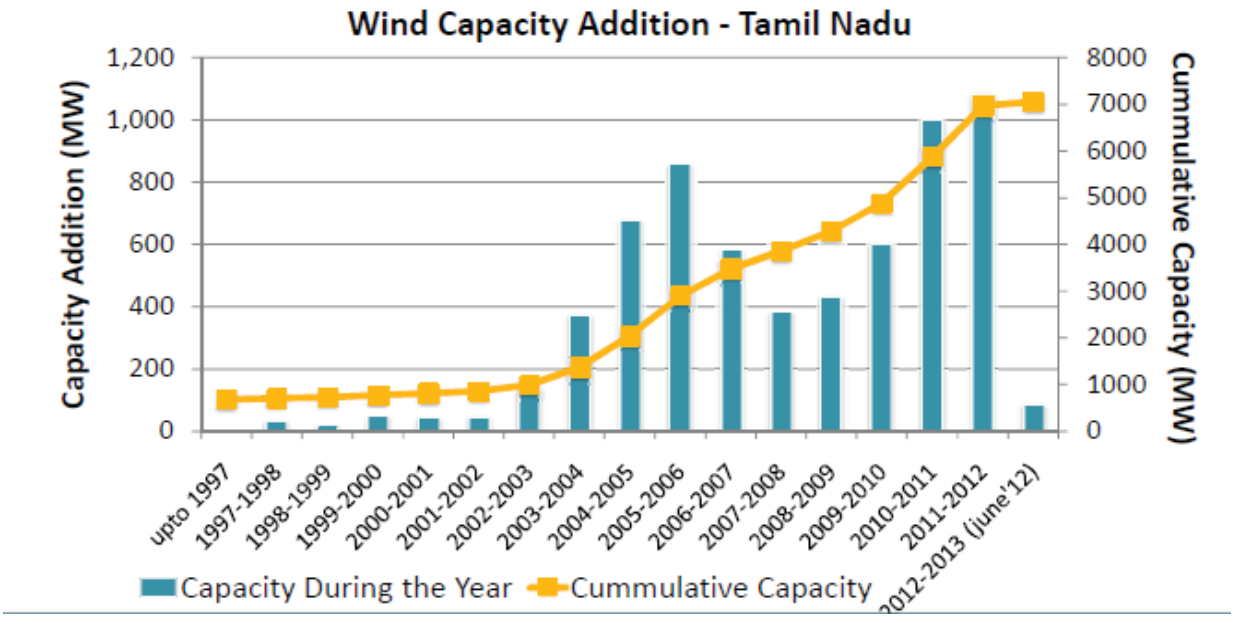
According to Figure 9.5, in 2008, (a) All climate-forcing emissions, including black carbon, particulate organic carbon, and sulphur dioxide (precursor to sulfate particulate) aerosol species, are included. (b)- (d) Change in climate-forcing emissions [ΔCO_2(e)] due to fuel-switching buses, cars, and autorikshaw, respectively. The vertical scale on panel (b) is twice that of panels (c) and (d).

3. Tamil Nadu Wind Power Programme

Total wind installed capacity in Tamil Nadu was 7134 MW as on 30 September 2012 which accounts for 40 per cent of country' total installation capacity. With this, Tamil Nadu has largest wind installation capacity in country. During 2011-12, Wind energy alone contributed to 12.6 per cent of total energy fed into grid in State, contributing to more than 63,000 MU. The State does not have any dedicated wind policy but offers attractive incentives to promote wind power in State under wind power Programme. Wheeling charge of 5 per cent and banking charges of 5 per cent are applicable for grid-connected WEGs (wind energy generators). Moreover, unutilized banked energy is permitted to be sold at rate of 75 per cent of purchase rate.

3 Singh and Sharma, Assessment of emissions from transport sector in Delhi, 2011
4 Gurjar et al. Emission estimates and trends (1999-2000) for megacity Delhi and implications, 2004
5 Reynolds and Kandlikar, Climate Impacts of Air Quality Policy: Switching to a Natural Gas-Fueled Public Transportation System in New Delhi, 2008

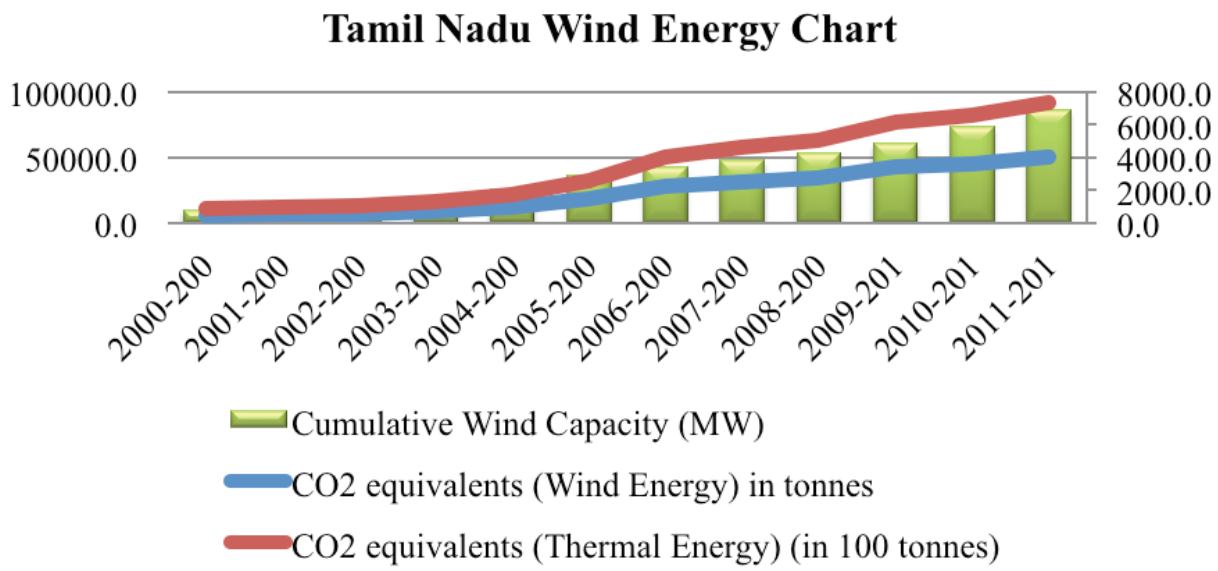
Figure 9.6: Wind Capacity Addition in Tamil Nadu over the years



Source: Ranjan, 2012[6]

Assumptions for Calculations[7]

Figure 9.7: Tamil Nadu Wind Energy Installation and Emission Reduction Chart



Source: Compiled by Vasudha Research Team

With this value of installed capacity, Tamil Nadu has cut down 92.1 M tonnes of carbon emissions during 2011-12.

6 http://mnre.gov.in/file-manager/UserFiles/presentation-01082012/Presentation%20on%20Wind%20Power%20Scenario%20in%20Tamil%20Nadu%20by%20Shri%20Rajeev%20Ranjan,%20Chairman,%20TNEB.pdf

7 a) 1 kWh (thermal) = 0.944kg CO2 equivalent.
b) 1 kWh (wind power {offshore}) = 5.23 g of CO2/kWh during the life cycle of 20 years. [Source:http://www.steel.org/Sustainability/~/media/Files/SRI/Media%20Center/WindEnergyCaseStudy.ashx]

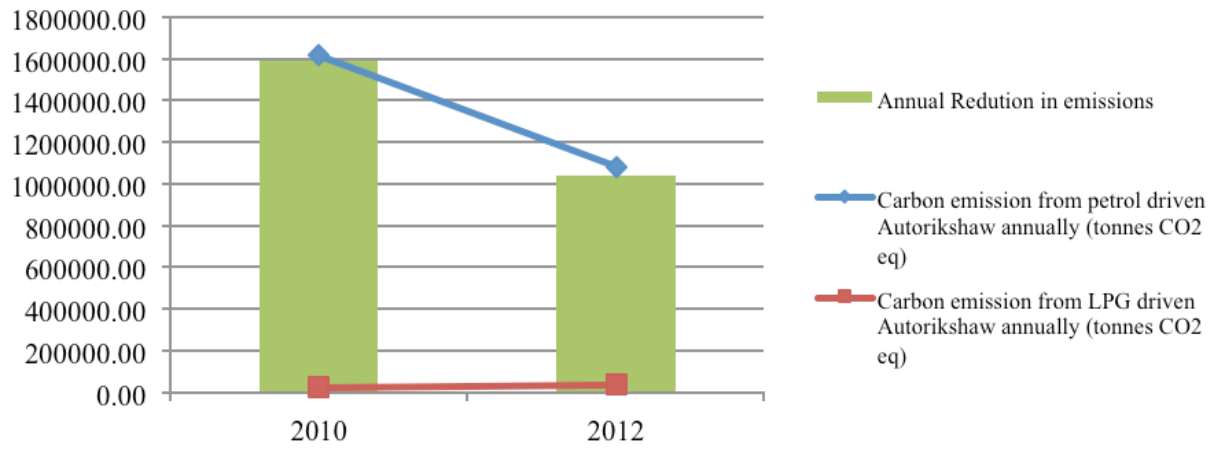
4. Autorikshaw LPG Programme, Chennai

In 2007, Government of Tamil Nadu issued an order that necessitated the conversion of autorikshaw to LPG mode under (Section 87(1) of the Motor Vehicles Act- Central Act 59 of 1988). A subsidy of Rs. 2,000 to every autorikshaw undergoing the conversion was announced in 2008. On 11 September 2008, orders were issued for conversion of existing petrol driven autorikshaw plying in Chennai city into LPG mode in a phased manner with subsidy of Rs 2,000 to be granted by the Tamil Nadu Pollution Control Board. Later in 2008, the Transport Minister announced an additional amount of Rs 1.88 crore to enhance the subsidy from Rs 2,000 to Rs 3,000 for conversion of the existing 28,760 petrol driven autorikshaw to LPG mode. In 18 December 2008, a further amendment was made in which the RTOs of CMA were permitted to grant 2,500 contract carriage permits to LPG driven 3-seater new autorikshaw under loan subsidy scheme and 7,500 contract carriage permits to LPG driven 3-seater autorikshaw without subsidy under the general category.

All these orders were passed in light of the fact that autorikshaw that operated on LPG fuel had 40 per cent lower operational costs.

In 2012, there are 41,700 autorikshaw running on LPG and 25,322 running on petrol in Chennai city. This intervention has resulted into overall reduction of about 1.04 M tonne of carbon emission in 2012 with respect to petrol driven autorikshaw despite of considerable growth in number of autorikshaw in city.

Figure 9.8: Emission Reduction Chart of LPG Programme in Chennai



Source: Compiled by Vasudha Research Team

ASSUMPTION

According to a UNDP Report, an autorickshaw covers an average distance of 18 km with 1 litre of gasoline/ petrol; whereas in case of LPG the autorickshaw travels up to 52 km on an average in 1 litre LPG. Thus, 1 litre LPG is equivalent to 1.346 litres of gasoline; a corollary of which is that with 1 litre of LPG a rickshaw covers 26 km more than the same quantity of gasoline, amounting to huge cost savings.

Let us assume an autorikshaw travels a distance of 100 km per day and drives for 28 days monthly on an average.

Works for

- For petrol: 1 L gives 18 km

  Therefore, 100 km= 1/18*100 will require 5.5L of petrol every day.

  Petrol used in 28 days= 5.5*28= 154 L/month

- For LPG: 1 L gives 52 km

  Therefore, 100 km= 1/52*100 will require 1.9 L of LPG every day.

  LPG used in 28 days= 1.9*28= 53.2 L/month

Conversion units[8]

1 L petrol = 2.31 kg CO2 eq

1 L LPG = 1.49 kg CO2 eq

Table 9.1: Data on Autorikshaw in Chennai in 2010 and 2012

	2010	2012
No. of autorikshaw in Chennai	61,999	67022
no. of LPG Autorikshaw	24101	41700
no. of petrol Autorikshaw	37,898	25,322
Carbon emission from petrol driven autorikshaw annually (tonnes CO_2 eq)	1617820.14	1080965.79
Carbon emission from LPG driven autorikshaw annually (tonnes CO_2 eq)	22925.26	39665.71
Annual reduction in emissions	1594894.89	1041300.09

Source: Compiled by Vasudha Research Team

5. Solar Thermal Extension Programme, Punjab[9]

Punjab energy development agency promotes the use of solar water heating systems by issuing advertisements in the leading newspapers, electronic media like television and radio constantly. It also organized camps and exhibitions in schools, colleges, and important festivals of the State. For practical promotion, a solar water heating system has been fitted on the exhibition Van of Punjab Energy Development Agency to make the people aware of the technology.

To further strengthen the implementation of this green intervention, the Government of Punjab has made the use of solar water heating systems mandatory Vide order No. 2/123/05-STE(3)370, dated 20 January/6 February 2006 and Punjab Government Gazette notification dated 17 March, 2006 in the following type of buildings:

- Industries where hot water is required for processing.
- Hospitals and nursing homes including government hospitals.
- Hotels, motels, and banquet halls.
- Jail Barracks, Canteens.
- Housing complexes set up by group housing societies/Punjab Urban Development Authority.
- All residential buildings built on a plot of size 500 square yards and above falling within the limits of municipal committees/corporations and Punjab Urban Development Authority sectors.
- All government buildings, residential schools, educational colleges, hostels, technical/vocational education institutes, district institutes of education and training, tourism complexes and universities etc.

As per PEDA, a solar water heater of 100 litre capacity can prevent emission of 1.5 tonnes of carbon dioxide per year and use of 1000 SWHs of 100 litres capacity each can contribute to a peak load saving of 1 MW. According to the recent inspection, 25 lakh litres capacity solar water heating systems till 31 March 2013 have been installed in the state, eliminating 3,75,000 tonnes of carbon dioxide.

8 http://www.carbontrust.com/media/18223/ctl153_conversion_factors.pdf
9 http://peda.gov.in/eng/prom_solar.html

6. Himachal Pradesh Town and Country Planning (Amendment) Rules, 2009

The amended rules added mandatory solar passive design in the government, residential, commercial, and industrial buildings. And wherever possible and required, SPV panels for lighting should be included in the building design. Many building infrastructures have implemented these rules so far. This initiative has not only reduced the energy consumption but also reduced the load on firewood which is traditionally used for heating in cold regions.

A successful implementation of these rules is visible in Himachal Pradesh State Government Secretariat building in Shimla. The building has operational schedule of 7 hours, 6 working days in a week. The orientation of the building is made in such a way that it faces NW and SW direction for longest time. The longer NE façade gets a certain amount of daylight and solar heat due early in the mornings and SW facade has more optimum amount of daylight and solar heat in winter months. Windows are glazed and are present with clear glass, which helps in receiving required amount of solar heat gain in early mornings and winter months, which is required in cold climate of Shimla. The building has Annual Consumption of 3,56,044 KWh for lighting and lighting Performance Index – 28 KWh/m^2/annum. Total energy performance index of this building is 70 kWh/m2/annum against 237 kWh/m2/annum of a conventional building. (Source: HPCB). Such kind of green building initiatives can be adopted in all mountain regions in India wherever possible, especially north eastern States. Himachal Pradesh is the first State in the country to implement solar passive architecture across all categories of buildings.

7. Programme Piyush, Orissa

Government of Orissa brought out amendments to the Orissa Water Works Rules by launching a Programme called 'Piyush' with the objective of providing Universal Access to Safe Drinking Water in Urban Local Bodies. The proposed scheme would enable an urban poor to avail drinking water supply connection by paying Rs. 500 only in five equated monthly installments (EMIs). This action is an evidence of State Government's commitments towards achieving Millennium Development Goal VII. Low levels of coverage also results in low revenue generation, which affects the sustainability of the service provision. Similarly, Poor coverage of households with drinking water supply has an adverse effect on equity, health and hygiene and quality of life of the entire urban population. The prevailing charges (scrutiny fee) Rs.3000 per each connection (domestic) to be paid in one installment, was not affordable for many consumers including the urban poor. Similarly, those who paid the fees also had to wait for a number of days to actually get a connection. Such uncertainties encouraged theft or illegal water connections in all urban areas of the State. The prevailing charges (scrutiny fee) for a new water supply service connection (domestic) at Rs.3000 per each connection were modified into multiple installments with simple annual interest rate @ 8 per cent. Accordingly, the EMI for 36 monthly equal installments comes to Rs.100, for 24 monthly equal installment comes to Rs.150 and for 12 monthly equal installments comes to Rs.270.For urban poor people, a scheme namely, 'Piyush' was launched for providing one tap in every household. Under this scheme, domestic water connection fees for BPL consumers was fixed at Rs. 500 only (a non-refundable connection fee of Rs.440 plus a refunded deposit of Rs.60) which can be paid either one-time or in 5 (five) interest-free EMIs of Rs. 100 each. Water tariffs in case of BPL will be of Rs.30 per tap per month for each connection with usual increase at the rate of 5 per cent in each year. The maximum time allowed for according sanction should not exceed seven working days from the date of receipt of application.

Several beneficiaries applied for this scheme and a huge rise in number of households with water connections in urban is observed since past decade. In 2001, only 18 per cent of the urban households had access to water supply network or having water supply house service connection which has increased to 42.1 per cent in 2011 (Census of India, 2011).

8. Eco-friendly Housing complex, West Bengal

West Bengal Renewable Energy Development Agency (WBREDA) introduced a programme to establish one eco-friendly housing complex at New Town, Kolkata, where 25 Nos. of homes are being built up with solar passive and active concept. The integrated solar buildings are being constructed under this Programme. This complex consumes 60 per cent less energy than the conventional buildings cutting equal share of carbon emissions.

The building is named 'Rabi Rashmi Abasan' in Bengali. This is the first solar housing complex of the country. It is powered by solar electricity supplied in buildings through solar thermal system. The entire complex derives its power supply from the grid, which is renewable as the power is again exported back to the same grid. This is indeed a unique concept and can revolutionize the power system in India.

9. Bio-Gas and Bio-Gasifiers Programme, Jharkhand

India is leading the world in the area of small-scale biomass gasification, and this is due to the significant technology development work. Biomass gasifiers of a few KW to 1 MW capacity have been successfully developed indigenously. In Jharkhand, the Jharkhand Renewable Energy Development Agency has undertaken many installations to provide power to small-scale industries and to electrify a village or group of villages.

To bring about better quality and cost effectiveness to promote biomass power, a biomass gasifier programme has been introduced. A total capacity of 55.105 MW has so far been installed in the State, mainly for stand-alone applications. These installations have succeeded to cut down about 91250 tonnes of CO2 emissions against emissions produced from same amount of electricity generated conventionally.

10. Gandhi Nagar Solar City Project, Gujarat

The Gujarat solar project has a huge mix of sustainable solar ideas which includes phasing out of incandescent bulbs (GLS) and Ordinary Tubular Fluorescent Lamps (TFL), installation of Solar Street Lighting and Stand-alone Systems on main roads and Solar PV on Rooftops, Solar /LED-based Traffic Signals on main roads. Several Solar Energy technologies installed in the solar city are-

- 170 kW grid-connected solar photovoltaic systems installed at 17 Government of Gujarat buildings. (210 kW Solar PV/wind-solar hybrid power plants at Udyog Bhavan and 1310 kW Solar PV power plants at various blocks of the Sachivalaya.
- 125 Solar-Wind Hybrid Rooftop Systems (capacity: 1 kW) at government bungalows.
- 250 kW grid-connected Solar PV Power Plant on government land.
- 205 Solar Water Heating Systems (capacity: 250 lpd) on government residential bungalows
- Solar Water Heating Systems (capacity: 15,000 lpd) on government buildings – Civil Hospital 1,000 pld. Staff Training College 5,000 lpd, Circuit House 6,000 lpd, Rest House 3,000 lpd.
- 65 Solar Photovoltaic Street Lights in 9 Public Parks.
- Energy-Efficient Pumps at Charedi Water Works.
- 590 Energy-Efficient Street Lights as a Demonstration Project & Energy-Efficient LED Lighting on 'Ch' and 'J' Roads, Ministers Enclave, Gandhinagar.
- Reaching out to Schools for to generate awareness on renewable energy technologies through the Mobile Demonstration Unit.
- Replaced 3,750 bulbs with CFLs and replaced 10,000 ordinary tube lights with T-5 tube lights.

The energy efficiency initiatives have already been taken at an investment cost of Rs 12.8 million, savings of Rs 4.96 million per year (or 1683 MWh) have already been achieved. The project targets at renewable based power generation of 47 MW and substantially reducing 2,37,944 tonnes of GHG emissions till 2015.

CONCLUSION

In India, policies addressing different aspects of climate change are initiated through a set of institutional arrangements. Some policies have been implemented through national entities, some directly through state initiatives, and some through specialized entities like the BEE etc. to specific sectors. Most policies do not focus directly on mitigating climate change, and therefore can significantly reduce GHG emissions over a BAU scenario. Almost all states direct the formulation and implementation of policy at securing investment (especially in the transport, electricity, and industry sectors) rather than at accruing any development benefit. Hence, wherever the need does not arise, state governments simply adopt the central government's rules and regulations. Additionally, sub-national level policies are predominantly voluntary, which restricts effective implementation; mandatory policies would allow for an improved dispersal of benefits and strong enforcement.

No single policy framework currently underway in various states is effective. Policies to mitigate climate change perform better in states that mix the command-and-control mechanism with the incentive-based mechanism. If suitably modified and planned, many policies (such as mandatory housing norms and RPOs) can be successful in states with similar sectoral characteristics. Some policies (if implemented where appropriate) could not only meet India's aspirational targets of 20-25 per cent emission intensity reduction by 2020 of 2005 levels but even surpass them. Key sectors that could lead the way in reducing emissions are renewable energy and energy efficiency, followed closely by transport (through mass rapid transport systems). Gujarat, Maharashtra, Karnataka, Tamil Nadu, and Kerala are some states that can take the lead in reducing emissions trajectories.

Many states endowed with rich natural resources and that are naturally very environment friendly do not have "climate friendly" policies. Many states that have the weakest climate friendly policies may actually have very low greenhouse gas emissions, due largely to rich forest cover, vegetation, source of energy supply, low levels of industrialization due to topography and other factors, high level of agro-based industry for similar reasons, and so on. However, since this rating is about policies and policy frameworks, states that have low greenhouse gas emissions but no policies that would impact emissions reduction have been ranked low.

States with relatively high per capita GDP have climate mitigation policies primarily to address the stress on infrastructure from high consumption patterns. For instance, high demand for energy in some states has led to peak energy demand, which in turn has led these states to put in place policies such as mandatory solar water heating. Similarly, states that experience high demand for water have put in place policies for water conserva-

tion, harvesting, demand side management, and other relevant practices, which obviously also reduce emissions. States have adopted a lot of interesting policies and policy frameworks and some innovative and effective ways to implement the plans. Many of these policies can be replicated in other states, and they can learn how to create an effective implementation framework from each other. Given the challenges of climate change, even low-emissions states should opt for policies and policy frameworks that would address climate change in the medium and long term.

The table below ranks states on policy framework across the sectors analyzed in this study.[1]

States	Energy And Electricity	Urban Development	Water	Industry	Transport	Waste Management
Karnataka						
Maharashtra						
Kerala						
Madhya Pradesh						
Tamil Nadu						
Rajasthan						
Gujarat						
Andhra Pradesh						
Himachal Pradesh						
Delhi						
Uttarakhand						
Sikkim						
Punjab						
Haryana						
Orissa						
West Bengal						
Mizoram						
Nagaland						
Assam						
Arunachal Pradesh						
Manipur						
Bihar						
Chhattisgarh						
Uttar Pradesh						
Goa						
Jharkhand						
Meghalaya						
Tripura						
Jammu & Kashmir						

In sum, there is a need to identify development and mitigation co-benefits while developing climate-friendly policies for states. As development challenges are deeply intertwined with state policies, a strong development co-benefit will be very effective in ensuring states actually adopt climate change policies, as only effective implementation can ensure that India embarks upon a truly sustainable low-carbon pathway.

1 Dark green indicates that the policies are holistic, cover all the elements these should cover, and have the greatest impact on reducing emissions. Light green indicates that the policies cover many of the elements of a holistic policy. Yellow indicates that the policies are moderate and may address the issues these are required to address. Orange indicates that the policies are inadequate and do not address the issues these are meant to address. Red indicates that there are no policies; where there are, these are completely inadequate and will not address the issues these are meant to address.

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ANNEXURE

Table A1: State-wise Feed in Tariff Rates (Rs./kWh) for RE-based Power in India

	State	Wind Tariff (Rs/kWh)	Solar PV Tariff (Rs/kWh)	Solar Thermal Tariff (Rs/kWh)	Biomass Tariff (Rs/kWh)	Small Hydro Tariff (Rs/kWh)
1	Andhra Pradesh	For first 10 years-3.5 For next 10 years-determined thereafter	17.91 (without AD) 14.95 (with AD)	15.31 (without AD) 12.85 (with AD)	NA	No Tariff/Parameters Defined
2	Bihar	N.A	10.9 (without AD) 09.85 (with AD)	13.11 (without AD) 11.87 (with AD)	FC - 2.08/kWh VC - 3.34/ kWh with 5per cent annual escalation in fuel cost	No Tariff Order/Regulations available
3	Delhi	N.A			N.A	No Tariff Order/Regulations available
4	Gujarat	Gross Tariff - Rs 4.23/ kWh Depreciation- Rs 0.38/kWh Net Tariff-Rs 4.23/ kWh	For MW Scale Plants: Jan 2012-March 2013: 10.37 (without AD), 09.28 (with AD), FY 2013-14: 9.64 (without AD), 8.63 (with AD), FY 2014–15: 8.97 (without AD), 8.03 (with AD) For kW scale Plants Jan 2012-March 2013: 12.44 (without AD), 11.14 (with AD), FY 2013-14: 11.57 (without AD), 10.36 (with AD), FY 2014-15: 10.76 (without AD), 9.63 (with AD)	12.91 (without AD) 11.55 (with AD)	4.49 (with AD) 4.54(without AD)	No Tariff Order/Regulations available
5	Haryana	Wind power density Tariff(Rs /kWh) 200-250 = 6.14 250-300 = 4.91 300-400 = 4.09 >400 = 3.84	9.18 (SPV Crystalline) 8.90 (SPV Thin film)	12.17	5.59 (for water cooled) 5.88 (for air cooled condenser)	Case-to-Case basis
6	Himachal Pradesh	N.A	N.A	N.A	N.A	N.A
7	Jharkhand	N.A			N.A	N.A

8	Karnataka	Average tariff for first 10 years from signing of PPA= Rs 3.70/kWh	14.5 (including rooftop and small solar PV plants)	11.35	NA	Rs 3.40/kWh for the first 10 years after signing the PPA
9	Kerala	3.64	15.18 (including incentives)		No tariff Order	Rs 2.94/kWh
10	Madhya Pradesh	4.35	10.44 (capacity >2 MW),10.70 (capacity upto 2 MW)	12.65		Refer Table A2
11	Maharashtra	Wind Power Density Tariff(Rs /kWh) 200-250 5.67 (including AD of 0.81/kWh) 250-300 4.93 (including AD of 0.70/kWh) 300-400 4.20 (including AD of 0.60/kWh) >400 3.78 (including AD of 0.54/kWh)	Lev -11.16 (11.66 - RT & SSPGP) AD -1.65 (1.65) after AD -9.51 (10.01)	Lev - 13.44 AD - 1.97 After AD - 11.47	5.41	NA
12	Orissa	Rs 5.31/kWh (without AD) & Rs 4.48/kWh (with AD)	Lev-17.80 AD-3.03 After AD-14.77	Lev-14.73 AD- 2.41 After AD-12.32	4.09	Rs 3.91/kWh (<=5 MW) & Rs 3.64/kWh (5-25 MW) without AD and Rs 3.31/kWh & Rs 3.09/kWh respectively with AD
13	Punjab	Provisions akin to CERC, 5.96 (without AD) 5.36 (with AD)	Lev - 10.39 AD - 1.04 After AD - 9.35	Lev - 12.46 AD - 1.24 After AD - 11.22	5.83	Rs 4.88/kWh (<=5 MW) &Rs 4.16/kWh (5-25 MW) w/o AD and Rs 4.5/kWh &Rs 3.82/kWh respectively with AD
14	Rajasthan	5.18 (without AD) 4.90 (with AD)-for projects in Jaisalmer, Jodhpur and Barmer districts 5.44 (without AD) 5.14 (with AD)-for other districts	9.63 (Plant commissioned by 31 March 2014) with AD- 10.45; 9.63 (Rooftop and SSPG commissioned by 31 March 2014)	11.95 (without AD) with AD - 10.45 11.95 (Small Solar thermal power generator commissioned by 31 March 2015	FY 2012-13 Revised Tariff-4.96 for water cooled / 5.42 for Air cooled	Parameters and tariffs to be determined through suo motu petition or on case-to-case basis
15	Tamil Nadu	3.51 Rs/kWh	Lev - 18.45 AD - 4.11 After AD - 14.34	Lev - 15.51 AD - 3.35 After AD - 12.16	4.694	Parameters are defined on case-to-case basis
16	Uttarakhand	Zone-1 (5.15 Rs/kWh without AD, 4.75 with AD) Zone-2 (4.35 Rs/kWh without AD, 4.00 with AD) Zone-3 (3.65 Rs/kWh without AD, 3.35 with AD) Zone-4 (3.20 Rs/kWh without AD, 2.90 with AD)	Lev - 17.70 AD - 1.65 after AD - 16.05	Lev - 12.95 AD - 1.15 after AD - 11.80		
17	Uttar Pradesh	Rs.3.21/Kwh with an escalation of 5.72 per cent p.a.	15 (commissioned by Dec 2011, not covered under GOI incentive scheme)	13 (commissioned by December 2011, not covered under GOI incentive scheme)	5.02	UPERC specifies 'year of operation' based fixed cost and financial year based tariff. It does not specify the parameters for tariff determination.
18	West Bengal	Tariff cap of 5.70 for 10 years from effectiveness of Regulations	10 (Capacity ranging 100 KW to 2 MW availing GBI) 10 (Grid-connected plant not eligible for any incentive and commissioned upto 2012-13) 10 (Projects commissioned after FY 2012 till FY 2015	NA	5.00	4.4

Source: MNRE, 2013

Table A2: Tariffs of SHP in Madhya Pradesh

Year	Run of the River Projects				Canal Based Projects			
	Tariff without considering Government of Madhya Pradesh (GoMP) free power policy (Rs./kWh)	Tariff considering (GoMP) free power policy (Rs./kWh)			Tariff without considering GoMP free power policy (Rs./kWh)	Tariff considering GoMP free power policy (Rs./kWh)		
		<5 MW	5-10 MW	10-25 MW		<5 MW	5-10 MW	11- 25 MW
1	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
2	5.22	5.22	5.22	5.8	5.22	5.22	5.22	5.8
3	5.04	5.04	5.48	5.6	5.04	5.04	5.48	5.6
4	4.86	5.12	5.28	5.4	4.86	5.12	5.28	5.4
5	4.68	4.93	5.09	5.2	4.68	4.93	5.09	5.2
6	4.5	4.74	4.9	5.01	4.5	4.74	4.9	5.01
7	4.33	4.56	4.71	4.81	4.33	4.56	4.71	4.81
8	4.16	4.37	4.52	4.62	4.16	4.37	4.52	4.62
9	3.98	4.19	4.33	4.43	3.98	4.19	4.33	4.43
10	3.81	4.01	4.14	4.23	3.81	4.01	4.14	4.23
11	2.30	2.42	2.50	2.56	2.30	2.42	2.50	2.56
12	2.34	2.46	2.54	2.6	2.34	2.46	2.54	2.6
13	2.38	2.51	2.59	2.64	2.38	2.51	2.59	2.64
14	2.42	2.55	2.63	2.69	2.42	2.55	2.63	2.69
15	2.46	2.59	2.68	2.74	2.46	2.59	2.68	2.74
16	2.51	2.64	2.73	2.79	2.51	2.64	2.73	2.79
17	2.56	2.69	2.78	2.84	2.56	2.69	2.78	2.84
18	2.60	2.74	2.83	2.89	2.6	2.74	2.83	2.89
19	2.65	2.79	2.88	2.95	2.65	2.79	2.88	2.95
20	2.71	2.85	2.94	3.01	2.71	2.85	2.94	3.01
21	2.76	2.91	3.00	3.07	2.76	2.91	3.00	3.07
22	2.82	2.96	3.06	3.13	2.82	2.96	3.06	3.13
23	2.88	3.03	3.13	3.19	2.88	3.03	3.13	3.19
24	2.94	3.09	3.19	3.26	2.94	3.09	3.19	3.26
25	3.00	3.16	3.26	3.33	3.00	3.16	3.26	3.33
26	3.07	3.23	3.33	3.41	3.07	3.23	3.33	3.41
27	3.14	3.3	3.41	3.48	3.14	3.3	3.41	3.48
28	3.21	3.38	3.49	3.56	3.21	3.38	3.49	3.56
29	3.28	3.45	3.57	3.65	3.28	3.45	3.57	3.65
30	3.36	3.54	3.65	3.73	3.36	3.54	3.65	3.73

Source: MNRE, 2013