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State Level Urban Low Carbon Policy Notes: Tamil Nadu

Project: "Integrating Urban Climate Guidelines through Clean Technologies (RE & EE) at the State and City level to build sustainable low carbon cities, Rajasthan & Tamil Nadu"

Note to the Readers

State Level Urban Low Carbon Policy Notes: Tamil Nadu, is prepared by ICLEI -South Asia, under project **"Integrating Urban Climate Guidelines through Clean Technologies (RE & EE) at the State and City level to build sustainable low carbon cities"** supported by **Government of Tamil Nadu,** and funded by **British High Commission**. These policy notes suggest the Tamil Nadu State government regarding suitable policy recommendations for low carbon urban growth by integrating the clean technologies to build sustainable low carbon cities.

State government officials and concerned departments are invited to use these policy notes to frame the state level urban low carbon policy. Other stakeholders are welcome to give their comments. All feedback should be sent to iclei-southasia@iclei.org.

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1.0 Introduction & Objectives

It is estimated that eighty percent of global Green House Gases (GHGs) are linked to the urban areas. By 2030 urbanization is expected to increase to 60 percent of the global population, resulting in further contribution of urban areas to global greenhouse gas emissions. Therefore there arises a need to take urgent decisions on how to reduce global emissions. An important step towards achieving these reductions is the switch to low carbon and climate resilient development path. Therefore, urban low carbon policies are an essential element to reduce GHGs.

Policy level interventions such as introducing renewable energy and clean technologies in residential & commercial sector, use of energy efficient technologies in buildings, or other municipal activities, use of low carbon fuels in transportation sector, can bring about significant reduction in carbon emissions from the city with no or little investment from municipal governments. In fact, cities can also link reduction of carbon emissions with initiatives to improve economic and environmental aspects in different sectors, so as to leverage funds from global support to climate change initiatives. India's economy is expected to grow at a rapid pace over the next 20 years. Estimates suggest that three fourths of the infrastructure that will be used in India in 2030 is yet to be built. Therefore, India is presented with a unique opportunity to continue on its rapid economic growth trajectory and develop its infrastructure through a low carbon pathway. The benefits of a low carbon economy will include meeting the objectives of fast paced economic growth and also address the challenge of climate change.

Low carbon growth opportunities exist across a range of sectors, in particular water, waste management, clean energy, urban design, buildings and transportation. The successful formulation of urban low carbon policies in these sectors at state level would set an example for other Indian states and cities to follow. ICLEI South Asia with support from British High Commission, India, has developed low carbon policy notes for the state of Rajasthan and Tamil Nadu under the project on "Integrating Urban Climate Guidelines through Clean Technologies (RE & EE) at the State and City Level to build sustainable low carbon cities". This document focuses on the low carbon policy recommendations for low carbon urban growth. It aims to:

- Provide an understanding of existing low carbon policies on RE and EE for Indian urban sector at national and state level.
- Provides brief on successful case studies at the city, state and national level for the implementation of low carbon policies.
- Engage the stakeholders in dialogue and processes that will enable good policies and guidelines for low carbon development.
- Suggest the most suitable low carbon policy notes on RE and EE for the urban sector for the state of Rajasthan and Tamil Nadu.

2.0 Methodology

One of the major outputs of the project is to come out with guidelines for Low Carbon Policies on RE and EE for urban sector for state of Rajasthan and Tamil Nadu in India including analysis of existing policies at national and state level. The basic methodology adopted for this Study consists of four main stages:

1) Desk Study – a detailed assessment of various low carbon policies available at the central and state level for urban low carbon activities. All relevant policies were analyzed. The major sources of information included the internet and all available published literature.

2) Primary information collection – Meetings were conducted with relevant state government departments to identify the gaps in existing policy implementation.

3) State level Stakeholder Consultation conference - Tamil Nadu State level Stakeholder consultations on Policy recommendation were done on 3rd April 2013, in Chennai. The key persons who have attended the workshop were Joint Commissioner of Municipal Administration (JCMA), Commissioner of Trichy, Secretary general for Madras Chamber of Commerce & Industry (MCCI), Former Secretary of MoEF, GOI, Director PCRA along with representatives from entrepreneurs, civil society, academic institutions, innovators and practitioners, non-governmental organizations.

4) National level Stakeholder consultation on policy recommendations was done on 18th April 2013, in New Delhi. The stakeholder meeting was attended by stakeholders from MNRE, Dept of Science & Technology (DST), Planning Commission, Govt. of NCT of Delhi, Rajasthan & Tamil Nadu States, Trichy, Coimbatore & Tirunelveli corporations, Rajasthan Renewable Energy Corporation Limited (RRECL), CEPT Ahmadabad , CEE and from different NGOs, institutions, technology providers etc.

5) Policy notes recommendation – The information collected through the Desk Study, one to one meetings and state level stakeholder consultation meetings are analyzed. Brief case studies on success stories are also collected and presented in later sections. Based on the analysis and identified gaps, policies are recommended.

3.0 Renewable Energy (RE) and Energy Efficiency (EE) Programmes and Policies at National Level

3.1. Programmes & Policies Targeting both RE and EE

National Action Plan on Climate Change (NAPCC)

On 30 June 2008, India released its first National Action Plan on Climate Change (NAPCC) outlining existing and future policies and programmes directed at climate change mitigation and adaptation. This plan, aims at assessing and developing strategies to combat climate change related effects in India, envision creation of eight missions which would run till 2017. Each of these missions represents multi-prolonged, long-term, and integrated strategies for achieving key goals in the context of climate change.

Policy Target: Framework/ Multi-sectoral Policy

Salient Features

Name of mission	Salient features
National Solar Mission	Seeks to deploy 20,000 MW of solar electricity capacity in the country by 2020.
National Mission for Enhanced Energy Efficiency	Creates new institutional mechanisms to enable the development and Energy Efficiency strengthening of energy efficiency markets.
National Mission on Sustainable Habitat	Promotes the introduction of sustainable transport, energy-efficient buildings, Sustainable Habitat and sustainable waste management in cities.
National Water Mission	Promotes the integrated management of water resources and increase of Mission water use efficiency by 20 per cent.
National Mission for Sustaining the Himalayan Ecosystem	Establishes an observational and monitoring network for the Himalayan Ecosystem environment so as to assess climate impacts on the Himalayan glaciers and promote community-based management of these ecosystems

Name of mission	Salient features
National Mission for Green India	Seeks to afforest an additional 10 million hectare of forest lands, wastelands and community lands.
National Mission for Sustainable Agriculture	Focuses on enhancing productivity and resilience of agriculture so as to reduce vulnerability to extremes of weather, long dry spells, flooding, and variable moisture availability.
National Mission on Strategic Knowledge for Climate Change	Identifies challenges arising from climate change, promotes the development Knowledge on Climate Change and diffusion of knowledge on responses to these challenges in the areas of health, demography, migration, and livelihood of coastal communities.

The Energy Conservation Act, 2001

The Energy Conservation Act 2001 was passed by the Indian Parliament in September 2001. This Act requires large energy consumers to adhere to energy consumption norms; new buildings to follow the Energy Conservation Building Code; and appliances to meet energy performance standards and to display energy consumption labels. The Act also created the Bureau of Energy Efficiency to implement the provisions of the Act.

Policy Target: Framework/ Multi-sectoral Policy, Energy Sector, Electricity Generation, Renewable, Buildings, Residential Appliances, Industry

Salient Features

- specify energy consumption standards for notified equipment and appliances;
- direct mandatory display of label on notified equipment and appliances;
- prohibit manufacture, sale, purchase and import of notified equipment and appliances not conforming to energy consumption standards;
- notify energy intensive industries, other establishments, and commercial buildings as designated consumers;
- establish and prescribe energy consumption norms and standards for designated consumers;
- prescribe energy conservation building codes for efficient use of energy and its conservation in new commercial buildings having a connected load of 500 kW or a contract demand of 600 kVA and above;

Electricity Act, 2003

This act consolidates the laws relating to generation, transmission, distribution, trading, and use of electricity. It takes measures to promote competition within the electricity and industry sectors and protect the interest of consumers. Key goals of the Act are to provide electricity to all areas of India, rationalize an electricity tariff, ensure transparent policies, and promote energy efficiency and environmentally-friendly energy practices.

Policy Target: Framework/ Multi-sectoral Policy, Energy Sector, Energy Utilities, Electricity Generation, Transmission, Distribution and Storage

Salient Features

- Generation has been de-licensed and captive generation freely permitted
- Transmission utility at the central and state level to be a government company-with responsibility of planned and coordinated development of transmission network
- Open access in transmission with provision for surcharge for taking care of current level of cross subsidy, with the surcharge being gradually phased out.

- The state government required to unbundle State Electricity boards. However they may continue with them as distribution licensees and state transmission utilities
- Setting up state electricity regulatory commission (SERC) made mandatory
- An appellate tribunal to hear appeals against the decision of (CERC's) and SERC's
- Metering of electricity supplied made mandatory
- Provisions related to thefts of electricity made more stringent
- Trading as, a distinct activity recognized with the safeguard of Regulatory commissions being authorized to fix ceiling on trading margins
- For rural and remote areas stand alone system for generation and distribution permitted

Green Buildings Rating System

Over the years, ratings systems have developed that evaluate green buildings according to their performance on a number of set parameters. The buildings follow rating criteria to achieve one or more objectives like energy and water conservation, thermal comfort, internal air quality standards, and provision of sufficient amenities and resource conservation with low life-cycle costs of construction, operation, maintenance and demolition of the building. At present, there are two rating system offered in India i.e. LEED developed by IGBC and GRIHA developed by TERI.

Policy Target: Buildings across sectors like Residential, Commercial, Industrial, Institutional etc.

Salient Features:

Leadership in Energy and Environmental Design (LEED) developed by IGBC

- IGBC – LEED offers rating system for residences, multi-family high-rise buildings, factory, offices, retail malls, institutions, hotels, hospitals, landscaping, health-care facilities, SEZ's and landscaping.
- The LEED rating system broadly comprises of five different environmental categories— sustainable sites, water efficiency, energy and atmosphere, materials and resources and indoor environmental quality (IEQ). Additionally, it also emphasizes on the innovation and design process to address sustainable building expertise and other design measures that are not previously covered in the five environmental categories.
- Based on the points earned, buildings are awarded as Certified, Silver, Gold or Platinum.
- IGBC offers 100% refund of certification fee for government building projects on achieving its Platinum rating.

Green Rating for Integrated Habitat Assessment (GRIHA) developed by TERI

- Except for industrial complexes, all buildings – offices, retail malls, institutions, hotels, hospitals, health-care facilities, residences, and multi-family high-rise buildings – in the design stage are eligible for certification under TERI-GRIHA.
- The GRIHA rating system broadly comprises of nine different environmental categories— site planning, health & well-being, building planning & construction stage, water, energy - end use, energy - renewable, recycle recharge and reuse of water and waste management.
- GRIHA rates green buildings with one star, two star, three star, four star and five star rating based on the points earned.

3.2. Renewable Energy Programmes & Policies

Jawaharlal Nehru National Solar Mission (JNNSM)

The Indian Solar Mission is a large scale solar energy programme that will run from 2010 to 2022. The objective of the National Solar Mission is to establish India as a global leader in solar energy, by creating the policy conditions for its diffusion across the country as quickly as possible. The immediate aim of the Mission is to focus on setting up an enabling environment for solar technology penetration

in the country both at a centralized and decentralized level.

Policy Target: Multi-Sectoral Policy, Energy Sector, Electricity Generation, Renewable, Solar Thermal, Solar Photovoltaic

Salient Features:

- The mission has a twin objective - to contribute to India's long term energy security as well as its ecological security.
- The Solar Mission would be implemented in 3 stages leading up to an installed capacity of 20,000 MW by the end of the 13th Five Year Plan in 2022. It is envisaged that as a result of rapid scale up as well as technological developments, the price of solar power will attain parity with grid power at the end of the Mission, enabling accelerated and large-scale expansion thereafter.
- Mission will establish a single window investor-friendly mechanism, which reduces risk and at the same time, provides an attractive, predictable and sufficiently extended tariff for the purchase of solar power for the grid.

Solar Cities Development Programme

To cope with chronic power shortages in cities, improve air quality and reduce India s dependence on oil imports, the government enacted the Guidelines for the creation of Solar Cities across India in the year 2011. The solar city plan will be evaluated in 2013 at the end of the 11th five year plan.

Policy Target: Solar, Urban Local Bodies (ULBs)

Salient Features:

- The programme will support urban local authorities of medium size towns, from 50, 000 and 500, 000 inhabitants, in assessing the needs and potentials for large deployment of solar technologies in the coming years.
- In a first phase, the programme will create ten pilot solar cities by 2012, with an INR 50 million crore budget. If successful, Solar Cities should then be developed in each Indian state.
- Solar cities would be organized around Solar City Cells promoting solar technologies and providing for training activities.
- Solar technology projects will also be deployed in smaller geographic entities such as campuses and townships.

National Tariff Policy, 2006

In January 2006, the Ministry of Power announced the Tariff Policy, in continuation of the National Electricity Policy of 2005. The Tariff Policy included certain provisions regarding renewable energy and cogeneration.

Policy Target: Power, Multiple RE Sources, CHP

Salient Features:

- The appropriate electricity commission is to fix a minimum percentage for purchase of energy from renewable sources, taking into account resource availability and impact on tariffs.
- Procurement by distribution companies is to be done at preferential tariffs, determined by the appropriate commission, to encourage non-conventional energy technologies to eventually compete with conventional ones. Such procurement is to be done through a competitive bidding process. In cases where procurement is not through competitive bidding, the Central Commission is to lay down guidelines for pricing non-firm power, particularly from non-

conventional sources.

Off-grid Solar Photovoltaic Programme
The programme is a major initiative under JNNSM and was launched in the year 2009 by MNRE. This programme supports various off-grid solar photovoltaic applications such as solar lanterns, solar home lights, street lights, water pumping systems and stand alone power projects.

Policy Target: Multi-Sectoral Policy, Households, Urban Local Bodies (ULBs), Electricity generation

Salient Features:
- The applications are supported primarily in project mode through State Renewable Energy Development Authority, State and Central government organizations, PV system integrators, Banks and PSUs etc.
- MNRE will provide 30% subsidy and/or loan at 5% on 50% benchmark cost.

Off-grid Solar Water Heating Programme
The programme is another major initiative under JNNSM and is governed by MNRE. This programme promotes the use of solar water heating systems in domestic, industrial, commercial and institutional sectors.

Policy Target: Multi-Sectoral Policy

Salient Features:
- The applications are supported primarily in project mode through State Renewable Energy Development Authority, State and Central government organizations, PV system integrators, Banks and PSUs etc.
- MNRE will provide 30% subsidy and/or loan at 5% on 50% benchmark cost.

Renewable Energy Certificates (REC)
As of 2011, the Indian government launched the Renewable Energy Certificates (RECs) system to rapidly increase the share of renewable energy in total energy mix. RECs will become essential for states and utilities in meeting their respective Renewable Portfolio Obligation targets. As of March 2011, the National Load Dispatch Center (NLDC) responsible for certifying RE projects had issued 100 RECs to 6 renewable energy projects representing 51.6 MW of total generation capacity, and 23 projects are waiting for NLDC s approval.

Policy Target: Multi-Sectoral Policy, Power

Salient Features:
- Eligible projects must represent a minimum installed capacity of 250 kW, commissioned no earlier than April 2010, and are not eligible for a feed-in tariff. India Energy Exchange (IEX) will conduct auctions on the last Wednesday of each month.
- Renewable energy generators have two options i) either to sell the renewable energy at preferential tariff or ii) to sell electricity generation and environmental attributes associated with RE generations separately.
- REC is issued to the RE generators for 1 MWh of electricity injected into the grid from renewable energy sources.
- Grid connected RE Technologies approved by MNRE is eligible under this scheme.
- REC is exchanged within the forbearance price and floor price determined by CERC.

3.3. Energy Efficiency Programmes & Policies

National Mission for Enhanced Energy Efficiency (NMEEE)
The Union Cabinet in April 2010 approved the implementation framework of the National Mission for Enhanced Energy Efficiency (NMEEE), which seeks to strengthen the market for energy efficiency by creating conducive regulatory and policy regime. NMEEE has been envisaged to foster innovative and sustainable business models for the energy efficiency sector. The NMEEE is one of the eight national missions under the National Action Plan on Climate Change.

Policy Target: Multi-Sectoral Policy, Buildings, Residential Appliances, Industry, Energy Utilities

Salient Features:
- A market based mechanism to enhance cost effectiveness of improvements in energy efficiency in energy-intensive large industries and facilities, through certification of energy savings that could be traded. (Perform Achieve and Trade)
- Accelerating the shift to energy efficient appliances in designated sectors through innovative measures to make the products more affordable. (Market Transformation for Energy Efficiency)
- Creation of mechanisms that would help finance demand side management programmes in all sectors by capturing future energy savings. (Energy Efficiency Financing Platform)
- Developing fiscal instruments to promote energy efficiency (Framework for Energy Efficient Economic Development) Market-based approaches to unlock energy efficiency opportunities, estimated to be about Rs. 74,000 crore.

National Mission on Sustainable Habitat (NMSH)
NMSH was launched by the MoUD to promote energy efficiency as a core component of Urban Planning. The NMSH stresses the need for awareness, incentives for wide-spread adoption of energy efficiency programmes, promoting a mix of voluntary guidelines and mandatory rules for energy efficiency in buildings, and capacity building of state and city-level bodies for implementing and enforcing these rules.

Policy Target: Multi-Sectoral Policy, Residential & Commercial Buildings, Water Sector, Urban Transport, Water management

Salient Features:
- Financial incentives like tax rebates and soft loans for increased adoption of efficiency measures are mooted.
- MoUD aims to integrate ECBC, NBC and EIA norms for spatial and urban planning and to integrate these standards in the Building Bye-laws.

The National Building Code (NBC)
NBC is India's model Building Code meant for adoption by local bodies, Public Works Departments, other government construction departments and private construction agencies. The NBC, revised in 2005, recommends that municipalities and development authorities should incorporate energy efficiency elements like daylight integration, electrical standards and heating, ventilation and air conditioning standards in their design norms.

Policy Target: Energy performance standards, building material, construction technologies, building and plumbing services

Salient Features:
- Inclusion of a complete philosophy and direction for successfully accomplishing the building

projects through Integrated Multidisciplinary Approach right through conceptual stage to planning, designing, construction, operation and maintenance stages.
- Inclusion of detailed town planning norms for various amenities such as educational facilities, medical facilities, distribution services, police, civil defense and home guards and fire services.
- Provisions to ensure and certification of safety of buildings against natural disaster by engineer and structural engineer.

Energy Conservation Building Code (ECBC)

The BEE introduced the Energy Conservation Building Code (ECBC) in India in 2007. This was the first real effort in the country to set a minimum performance standard that enables energy efficient design and construction of buildings/ major renovations if the connected load exceeds 110 kVA or if peak demand is greater than 100 kW. ECBC draws from standards set by the BIS, NBC, ISO 15099, and ASHRAE.

Policy Target: Buildings, Building Code, Energy performance

Salient Features:
- ECBC, considering five climatic zones in India, sets the minimum energy performance standards for large commercial buildings that have a connected load of 500 kW or greater or a contract demand of 600 kVA or more, having conditioned area of 1000 sq. m. or more.
- ECBC encourages energy efficiency for all building components and systems such as building envelope, lighting, heating ventilation and air conditioning (HVAC), service water heating, and electric power and motors within the building facilities, while enhancing the thermal and visual comforts and productivity of the occupants.
- ECBC mandates/prescribes U-factor and R values of insulation assembly for five climatic zones in India, Solar Heat Gain Coefficients and Visible Light Transmission levels for fenestration, energy efficiency levels of air conditioning systems, and number of other parameters for ECBC compliance in commercial buildings.

Standard & Labeling Programme of BEE

Standards and labelling (S&L) programme has been identified as one of the key activities for energy efficiency improvements, was launched on 18th May 2006. A key objective of this scheme is to provide the consumer an informed choice about the energy saving and thereby the cost saving potential of the relevant marketed product.

Policy Target: Residential Appliances, Energy Utilities, Demand-side management/End-use services

Salient Features:
- Currently applicable for 12 equipments/appliances, i.e. ACs, Tube lights, Frost Free Refrigerators, Distribution Transformers, Induction Motors, Direct Cool Refrigerator, Geysers, Ceiling fans, Colour TVs, Agricultural pump sets, LPG stoves and Washing machine, of which the first 4 have been notified under mandatory labelling from 7th January, 2010. The other appliances are presently under voluntary labelling phase.
- Prohibit manufacture, sale and import of such equipment, which does not conform to the standards.
- Disseminate information on the benefits to consumers

Demand Side Management Programme

The Demand Side Management and increased electricity end use efficiency can together mitigate power shortages to a certain extent and drastically reduce capital needs for power capacity expansion.

Bureau of energy efficiency (BEE) initiated Agriculture Demand Side Management (Ag DSM) scheme in the XI five year plan period as a key strategy to address the existing inefficiencies in the end use segments of agriculture sector. The objective of the programme was to create appropriate framework for market based interventions in agricultural pumping sector by facilitating conducive policy environment.

Similarly, BEE initiated nation-wide Municipal DSM (MuDSM) programmes in 2007 to address EE in water pumping, sewage pumping, street lighting and public buildings across ULBs in the country. The basic objective of the project is to improve the overall energy efficiency of the ULBs, which could lead to substantial savings in the electricity consumption, thereby resulting in cost reduction/savings for the ULBs

Policy Target: Agriculture, Urban Local Bodies (ULBs)

Salient Features:

Agriculture Demand Side Management (Ag DSM)

- Reduce the total amount of electricity consumed by the end-user in the agriculture sector, primarily by replacing inefficient pumps with high efficiency pumps.
- Improve groundwater extraction efficiencies and reduce the subsidy burden on the government without sacrificing its service obligation to the sector.
- Ag DSM project funding has to be from ESCO mode with repayment over time from the stream of project benefits.
- BEE has prepared six Detailed Project Reports (DPRs) in 5 states viz. Maharashtra, Gujarat, Punjab, Haryana and Rajasthan. Five more DPRs are in pipeline in the states of Karnataka, Madhya Pradesh and Andhra Pradesh.

Municipal Demand Side Management (Mu DSM)

- Municipal DSM programme is first of its kind and will be implemented across the country for 171 ULBs.
- This programme is divided into 5 different phases. Phase 1 covers 24 ULBs, phase 2 covers 55 ULBs, Phase 3 covers 33 ULBs, Phase 4 covers 31 ULBs and remaining ULBs will be covered in the 5th phase.

Bachat Lamp Yojana (BLY)

The Bachat Lamp Yojana is a scheme developed by the Bureau of Energy Efficiency (BEE) to promote energy efficient lighting for households in India. The "Bachat Lamp Yojana" aims at the large scale replacement of incandescent bulbs in households by CFLs. It seeks to provide CFLs to households at the price similar to that of incandescent bulbs i.e. Rs 15.

Policy Target: Households, Energy Conservation

Salient Features:

- Up to four self-ballasted CFLs can be provided to a household consumer as direct substitutes for ICLs. Only CFLs with electronic ballasts are to be used.
- ICL of 100, 60 and 40 W can be replaced by 14 W CFL
- The CDM small scale methodology AMS-II.J shall be applied. A fixed value of 3.5 hours of CFL use per day to estimate the GHG emission reductions under the CDM project.
- Approximately 6,00,000 to 8,00,000 CFLs can be distributed within a single CPA small scale CDM limit of 60 GWh.
- The participating households will need to sign an agreement with the SSC-CPA Implementer

for binding them not to re-sell the CFLs.

Perform, Achieve & Trade (PAT) Scheme
The Government of India (GOI) launched the Perform Achieve and Trade (PAT) Scheme under National Action Plan on Climate Change (NAPCC) in 2007. The scheme mandates the award of Specific Energy Consumption (SEC) reduction targets to Designated Consumers (DC) to achieve mandatory reductions in energy use in range of 2-10% during a period of 3-years. The implementation phase to achieve the targets starts from April 2012.

Policy Target: Multi-Sectoral Policy, Industry, Energy performance

Salient Features:
- The Government, in March 2007, notified units in nine sectors, namely aluminium, cement, chlor-alkali, fertilizers, iron and steel, pulp and paper, railways, textiles and thermal power plants, as Designated Consumers (DCs).
- Designated Consumers (DCs) in 8 industrial sectors will have mandatory participation in the 1st cycle of PAT scheme which will be implemented during 2011-12 to 2013-14. It is estimated that the total energy consumption by about 462 DCs in 8 energy intensive sector is about 165 million tons of oil equivalent (MTOE) with Power Plant sector having the lion's share (i.e. 64%).
- Among the 23 MTOE set as target from NMEEE, implementation of PAT scheme do focus on achieving 8.97 MTOE by the end of first PAT cycle.
- In an effort to provide an online platform to operationalize the PAT scheme, development of an internet based system (PATNET) is under process and work-order on PATNET has been awarded to NIIT to develop the e-platform of entire PAT scheme.

National Energy Conservation Awards (NECA)
The Ministry of Power instituted National Energy Conservation Awards in the year 1999, and is coordinated by the Bureau of Energy Efficiency, to recognize industrial units that have made special efforts to reduce energy consumption.

Policy Target: Multi-Sectoral Policy, Industry, Energy performance, Buildings, Zonal railways, Thermal Power Stations, State designated agencies, Aviation; manufacturers of BEE star labelled appliances and municipalities

Salient Features:
- In the last 12 years of Award Scheme of the period 1999-2010, the participating units have collectively saved Rs 13,399 crores and the investment made on energy efficiency projects was recovered back in 20 months. In energy terms, 14535 Million kWh of electrical power, 27 lakhs kilolitre of oil, 91 lakhs metric tonne of coal and 22 billion cubic metre of gas was saved, through the energy conservation measures of the participating units.
- The responses among the industrial and commercial units have become very encouraging as is evident from the increasing participation level (from 123 in 1999 to 592 in 2010).

4.0 Renewable Energy (RE) and Energy Efficiency (EE) Programmes and Policies of Tamil Nadu Government

4.1. Renewable Energy Programmes and Policies

Tamil Nadu Solar Energy Policy - 2012
Tamil Nadu Solar Energy Policy was launched in the year 2012, with an objective to generate 3000 MW

of Solar Energy by 2015. The 3000 MW of Solar Power will be achieved through Utility Scale Projects, Rooftops, and under REC mechanism.

Policy Target: Multi-Sectoral Policy, Energy Sector, Electricity Generation, Renewable, Solar Thermal, Solar Photovoltaic

Incentives / facilities provided by Government of Tamil Nadu

- The State will mandate 6% SPO (starting with 3% till December 2013 and 6% from January 2014) for the selected category of consumers.
- All domestic consumers will be encouraged to put up roof-top solar installations. A generation based incentive (GBI) of Rs 2 per unit for first two years, Re 1 per unit foe next two years, and Re 0.5 per unit for subsequent 2 years will be provided for all solar or solar-wind hybrid rooftops being installed before 31 March, 2014.
- All new Government/Local Body buildings shall necessarily install solar rooftops.
- Existing Government/Local Body buildings will be provided with solar rooftops in a phased manner.
- All Street Lights and Water Supply installations in local bodies will be energized through solar power in a phased manner.
- The Government of Tamil Nadu has issued amendments to the Building Rules through the two different Government Orders, making the use of solar water heating systems mandatory for all designated new Houses/buildings/Marriage halls/hotels etc.
- Installation of Solar water heating systems will be made mandatory for industries having hot water boiler/steam boiler using fossil fuel.
- Utility scale solar parks may comprise 250 MW in sizes of 1 to 5 MW, 600 MW in sizes of 5 to 10 MW and 650 MW of sizes above 10 MW. Solar Power projects will be developed through competitive/reverse bidding. Solar Parks with a capacity of about 50 MW will be targeted in 24 districts.
- Guaranteed single window clearance will be provided through TEDA in 30 days so that the plants can be commissioned in less than 12 month.
- The Government of Tamil Nadu will promote integrated solar generation and manufacturing parks which will house the entire ecosystem for solar manufacturing including wafer, cell and module making, and Balance of System (BoS) component manufacturing.

Chief Minister Solar Powered Green House Scheme (CMSPGHS)

- TN has envisaged to build 3 lakh houses by 2015-16 under Solar powered Green Houses scheme.
- As part of the programme 60,000 green houses will be provided with solar lights during 2012-13 at a cost of Rs.180 crores.
- The houses will also be provided with grid back up.
- The State government grants Rs.1.50 lakh for constructing the houses and another Rs.30,000 for installing solar powered lighting system to manage five terminals.

Energisation of Street Lights with Solar Energy (ESLSE)

- The State will be energizing 1 lakh street lights through solar energy by 2015-2016, with 20,000 street lights during the year 2011-12.
- The existing lights will be replaced with LED lamps with auto dimming provision after 10 PM.
- During 2012-13, 20000 more street lights will be energized with solar power at a cost of Rs.50 crores.

Solar Water Heating Systems

- Capital subsidy equivalent to upfront interest subsidy @ Rs.3300/- per sq.m. of collector area

will be available for flat plate collectors and Rs 3000 for evacuated tube collectors
- 100% subsidy for Govt. run institutions such as hospitals, hostels etc.

Policy Instruments under Solar Policy

Policy Instrument	Description
Net Metering	Net metering facility will be extended to Solar power systems installed in commercial establishments and individual homes connected to the electrical grid to feed excess power back to the grid with "power credits" accruing to the Photovoltaic energy producer.
Wheeling and Banking Charges	The wheeling and banking charges for wheeling of power generated from the Solar Power Projects, to the desired locations for captive use/ third party sale within the State will be as per the orders of the Tamil Nadu Electricity Regulatory Commission.
Exemption from Payment of Electricity Tax	Exemption from payment of electricity tax to the extent of 100% on electricity generated from Solar Power projects used for self-consumption/sale to utility will be allowed for 5 years.
Tax Concessions	Tax concessions as per the Tamil Nadu Industrial Policy will be provided.
Exemption from Demand Cut	Exemption from demand cut to the extent of 100% of the installed capacity assigned for captive use purpose will be allowed

Wind Energy

Incentives / facilities offered by Government of Tamil Nadu

- TNEB buys surplus energy at the rate of Rs.2.75 per unit from the existing wind mills commissioned before 15.5.2006 from the date of renegotiation of the existing agreement and Rs.2.90 per unit from the Wind Mills Commissioned after 15.5.2006 as per the new tariff order issued by the Tamil Nadu Electricity Regulatory Commission.
- Concessional wheeling charge is levied at 5% for captive use of power under which industries can draw the power produced anywhere in the state at the point of consumption.
- Banking facilities within the same financial year are allowed subject to 5% charges.
- Providing wind data and power potential at potential sites based on the study conducted by TEDA.

Bio Energy

Incentives / facilities offered by Government of Tamil Nadu

- TEDA is implementing the installation of Institutional and Night soil based biogas plants through the Government approved agencies under KVIC models. This programme has been transferred from Central Government to State Government and hence there is no subsidy from Central Government. State Government had provided subsidy at 1/3rd cost of limited quantities for installation of Toilet linked (night soil based) biogas plants in the State for 2003-04 and 2004-05.
- To help the entrepreneurs, TEDA has completed Biomass Resource Assessment Studies in 49 taluks which assessed the potential of surplus biomass waste/materials to serve as a guide to private entrepreneurs willing to set up biomass based power projects, biomass gasifiers etc.
- TNEB buys surplus power at the rate of Rs.3.15 per unit concessional wheeling charges of 3% for distance upto 25 km and 6% for distance beyond 25 Km for captive use of power.
- TEDA is implementing the installation of gasifier system and arranging for the Government grants for the systems installed.

Water Mills & Micro Hydel Projects

Incentives / facilities offered by Government of Tamil Nadu

- Mechanical output only - Rs. 35,000/- per Watermill
- Electrical output (up to 5 kW) - Rs. 1,10,000/- per Watermill
- Both mechanical & electrical output (up to 5 kW) - Rs. 1,10,000/- per Watermill
- Micro Hydel Projects up to 100 kW Capacity - Rs.40,000/- per KW

4.2. Energy Efficiency Programmes and Policies

Energy efficiency and conservation has become the most essential steps to be taken wherever the energy use is involved, in the present context of Global Warming and the need to reduce green house gas emissions caused by the increasing use of fossil fuels. The State Government has sanctioned an amount of Rs.6.5 lakhs towards replacement of 1000 Nos. Conventional Tube lights in the Street lights in local bodies by the Compact Fluorescent lamps (CFLs) which consume at least 60% less energy than the tube lights during the year 2007-08. The scheme will be extended to more Panchayats in the coming years. The state government of Tamil Nadu has not developed any exclusive programmes or policies related to energy efficiency and largely it implements the schemes developed by various agencies at national level.

4.3. Achievements of Tamil Nadu under Various National Schemes

Following are the achievements of State of Tamil Nadu under the various programmes, policies and schemes of central government, national level bodies and institutions:-

- The installed capacity of power generation in Tamil Nadu from the Renewable Energy sources, which was 3834 MW as on 31.3.2007 has now reached 7979 MW as on 30.02.2012 representing about 32% of the country's capacity renewable capacity. The major contribution is from Wind which is 7134 MW. The others are Bagasse based Co-generation 659 MW, Biomass Power 167 MW and small hydro (upto 25 MW) 90 MW.
- Tamil Nadu stands No.1 in the Country and No.5 in the world with more than 7134 MW of installed Wind mills, which forms around 41% of National installed capacity of wind energy. Wind constitutes over 88% of total renewable energy installed capacity in the state.
- The installed capacity of Wind power has grown considerably from 857 MW in 2001 to 7134 MW in 2011-12. There is also further scope for adding 10,800 MW by various promoters. For the year 2011-12, TANGEDCO had targeted a capacity addition of 1000 MW, and achieved 1083 MW.
- Capacity addition of around 5000 MW at the rate of about 1000 MW per year is expected through the newly proposed Private Wind Electric Generators (WEGs) in Tirunelveli, Theni and Udumalpet area in the next 5 years.
- Renewable Energy Parks are being set up in various institutions to create awareness among public on the uses of Renewable energy devices. Government of India (MNRE) provides subsidy at 75% cost of equipments for the first District level park and 50% for the second park in the same District. So far, 19 Energy Parks are functioning in 18 Districts in Tamil Nadu. Further a State Level Energy Park is being set up at Tamil Nadu Science and Technology Centre, Kotturpuram in Chennai with Rs.89.00 lakhs provided by MNRE towards the cost of the equipments and Rs.52.00 lakhs provided by the State Government for civil works.
- State Government has issued orders to provide Compact Fluorescent Lamps (CFL) without cost to 14.62 lakhs huts replacing incandescent lights at a cost of Rs.14.62 Crores. This is expected to result in a saving of 45 MW of power. Further TANGEDCO has also programmed to distribute CFLs to the domestic metered services in phased manner to offset the peak demand by availing loan from financial Institutions.
- The Government of Tamil Nadu has issued Government Order on the energy conservation in buildings of all Government offices, including local body and Public Sector Undertakings.

- The Government of Tamil Nadu has also issued orders to ban the usage of Incandescent Bulbs in all Government Departments, Public Sector Undertakings, Boards, Societies, Local Bodies and Government aided institutions.

British
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New Delhi

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Policy Notes for

Renewable Energy & Energy Efficiency

1.0 Solar Water Heaters (SWH)

1.1. Background

Currently, water heating needs in urban households are being met with the help of electric water geysers of different energy efficiencies. This demand for electricity can be offset with the help of renewable energy technology like solar water heating systems, a commercially viable and technologically mature product which has existed in the country for many years. Yet, against a technical potential of 45 million sq. km. of collector area, only a little over 2.5 million sq. km of collector area has been installed.

1.2. Existing Policies

The Government of Tamil Nadu has made suitable amendments to the building rules through the Government Orders (GOs).

- G.O. Ms. No.112, Municipal administration and water supply (MA1 Dept. dated 16.8.2002.
- G.O. Ms. No. 227, Housing and Urban Development (UD -1) Dept. dated 14.11.2002

As per the above GOs, the installation of Solar Water Heaters has been made mandatory for the below given target groups.

Public buildings

- Mandatory in Chennai for: new hospitals; marriage halls; hotels/lodges greater than 500 Sq.m; hostels greater than 50 rooms
- Mandatory in all districts & municipal corporations for new Commercial establishments; individual houses/buildings

Industries

Mandatory for industries having hot water boilers/steam boilers using fossil fuel.

In Tamil Nadu Solar Energy Policy, 2012 it has been proposed to promote Solar Water Heating systems by suitably amending the relevant Acts of Municipalities/Corporations.

Further, Tamil Nadu Energy Development Agency (TEDA) would create mass awareness on SWH usage in the State of Tamil Nadu.

1.3. Policy recommendations

- 5 to 10% of property tax rebate could be provided at the city level in the cities of Tamil Nadu
- A capital subsidy of INR 5000 shall be provided by the State government for domestic users in the state. Either a property tax rebate or a capital subsidy shall be availed.
- Even though SWHs have been made mandatory to the above-mentioned target groups, the

enforcement is not yet effective. It is thus necessary to verify the compliance by the target group and levy penalty for non-compliance on a monthly basis. Electricity connection shall be disconnected in case of non-compliance for more than three months period.

- Compliance has to be ensured in new buildings under the target group during the initial stages determining property tax. A Completion Certificate would be issued only after the ensuring compliance by the target group.

1.4. Techno-economic feasibility

A solar water heater consists of a collector to collect solar energy and an insulated storage tank to store hot water. Based on the collector system, solar water heaters can be of two types: i.e Flat Plate Collectors (FPC) based Solar Water Heaters or Evacuated Tube Collectors (ETC) based Solar Water Heaters.

Power Savings: A 100 liters capacity SWH can replace an electric geyser for residential/commercial use and can save an average of 1500 units of electricity annually.

Avoided utility cost on generation: The use of 1000 SWHs of 100 liters capacity each can contribute to a peak load shaving of 1 MW.

Environmental benefits: A SWH of 100 liters capacity can prevent emission of 1.5 tonnes of carbon dioxide per year. This takes into account the emissions during transport of the coal used and losses due to transmission and distribution. Considering that every unit of power produced uses an average of 3 liters of water, one SWH will save an average of 4500 liters of water a year.

Life: 15-20 years

Approximate cost: INR15000- 25,000 for a 100 liters capacity system and INR110-150 per installed liter for higher capacity systems

Payback period[1]**:** 3-4 years (considering the cost of electricity at Rupees 3.33)

1.5. Successful Case Studies

State government Subsidy for Solar Water Heater (SWH) : In Delhi, a subsidy scheme is available in the domestic sector for the promotion of Solar Water Heating systems. Through this scheme, the Govt. of Delhi is providing rebate/ incentive of INR 6000 for the installation of 100 LPD solar water heaters in the domestic sector. The subsidies extend to INR 60000 for the installed systems of capacity 1000 LPD for Non Commercial Institutions (NCI); NCIs include colleges, hostels, old age homes, orphanages, religious establishments, group housing societies and all charitable institutions.

Property tax rebate: Some Municipal Corporations in India including Thane, Amravati, Nagpur and Durgapur are providing property tax rebates of 6 to 10 % for the installation of Solar Water Heaters for domestic users.

1. Depends on the site of installation, utilization pattern and the cost of electricity

2.0 Solar Water Pumping Systems

2.1. Background

A large amount of electricity is spent in commercial areas for pumping water for domestic purposes (drinking and sanitation). A study done by ICLEI for ten major cities in India found an average per capita electricity consumption of 14.5 units to treat and supply water. With a rising urban population, the total electricity consumption would be substantial. Electric pumps generally used to supply water can be replaced by solar water pumping systems, which could reduce the electricity needs and cut down the demand for fossil fuels.

2.2. Existing Policies

- The Ministry of New & Renewable Energy (MNRE) provides a subsidy of Rs 50 per Wp, up to a maximum of 50,000 (on pumps ranging from 200Wp to 3000Wp)
- There is a total subsidy of 86% in Tamil Nadu on water pumping systems, with 56% coming from the ministry of agriculture and 30% from MNRE
- Indian Renewable Energy Development Agency (IREDA) provides loans at 5% interest rate to purchase Solar water pumps.

2.3. Policy recommendations

- A 10% Capital subsidy shall be provided by the State government on Solar Pumping Systems for increasing the number of users in the state. Either property tax rebate or Capital subsidy shall be availed.
- Considering that high costs are often a deterrent awareness on the long term benefits of using this technology should be increased, to promote its spread.
- Solar water pumping systems shall be displayed in public places, to overcome the lack of awareness due to the unavailability of these systems on the open market. . For instance, they can be displayed in Solar Resource Centers and RE Resource Centers (which has been proposed as part of this policy recommendation study)

2.4. Techno-economic feasibility

Solar water pumping systems include a pump set and a series of solar PV modules. These are mainly of two types:

Surface Pumps: These are suitable for areas where the water table is shallow (up to 7m). A surface pump is normally placed at ground level and can be used for pumping water from shallow bore holes, open wells, reservoirs, lakes & canals. The solar pump driven by a permanent DC motor is connected directly to an array of solar panels. These pumps are designed for high flow rates.

Submersible Pumps: A submersible pump is one that is immersed in water and it is suited both to deep well and to surface water sources, pumping water by displacement. These pumps are costlier but have a greater life span and reliability than surface pumps. They are composed of a high efficiency micro computer based inverter (converting DC power into AC power), that optimizes the power input and thus enhances the overall system efficiency. These pumps are designed for medium flow.

Power Savings[2]:

a) A 900 Wp, 1hp, surface pump (less than 75,000 lpd at less than 7 meters depth) results in power savings of approximately 2.4MWh of electricity per year.

b) A 1800 Wp, 2hp, submersible pump (about 140,000 lpd, at up to 50 meters - submersible) results in power savings of 3.6 MWh of power per year.

Environmental benefits[3]: A 900 Wp, 1hp, surface pump (less than 75,000 lpd at less than 14m) results in carbon emissions savings of 2.11 million tons of carbon dioxide per year. A 1800 Wp, 2hp, submersible pump (about 140,000 lpd, at up to 50m) results in carbon emissions savings of 3.17 million tons of carbon dioxide per year.

Life: 15-20 years; life cycle cost of both pumps would be 3-4 times lower than electric pumps.

Approximate cost: A 900 Wp, 1p surface pump would cost approximately 2.2 lakhs and a 1800Wp, 2hp submersible pump would cost approximately, 4.5 lakhs.

Payback period[4]: Surface pumps have a payback period of about 4 years and the submersible pump has a payback period of 4.5 -5.5 years.

2.5. Successful case study

The residential school for disabled children Amar Seva Sanagam is situated in the small village of Ayikudi in the Tirunelveli district of southern Tamil Nadu. The unreliability and high cost of electricity encouraged the school to buy a solar pump under the government subsidy. Now the school hostels have a reliable water supply; the pump supplies water to more than 100 residents of the school, including children, trainees and their teachers. The only limiting factor is the lack of storage facility, currently 7300 liters, which is much lower than the pump's potential.

2. Usage of five hours a day, 300 days a year is assumed
3. Emission factor of 0.965 kg carbon dioxide per KWh is assumed (if fuel changed to diesel, different values will be found)
4. Depends on site of installation, utilization pattern and the cost of electricity

3.0 Solar Cookers for large scale cooking

3.1. Background

Cooking solutions have a large potential in India, with most of the urban population using fossil fuels like LPG to cook their food. With the urban population growing rapidly, the aggregate amount of fossil fuel used for cooking needs is quite substantial. LPG cylinders also cost the government billions of rupees every year in the form of subsidies, which can be reduced with the help of cookers fuelled by renewable energy. Solar cookers are fast emerging as a safe, convenient technology, which can replace LPG cook stoves, fire woods and other forms of fossil fuels.

3.2. Existing Policies

- Manufacturers get 50 % fee reimbursement for obtaining Bureau of Indian Standards (BIS) approval
- MNRE provides 30% of total cost, limited to INR 1500/- per dish solar cooker
- MNRE also provides support to reputed NGOs, Universities, Institutions, Regional Test Centres, etc. up to a maximum of Rs.1.50 lakhs, towards the organization of promotional activities like publicity, cooking demonstrations/competitions, seminars/ workshops, evaluation studies, development of improved models, etc. on solar cookers based on specific proposal received from them in the prescribed format.

3.3. Policy recommendations

- Make it mandatory for canteens operating within a city to derive energy from solar for cooking purpose by 5 to 10 %.
  The indicative target group includes:
  - Food chains
  - Hotels
  - Educational institutions including schools, colleges & training centers
  - Industrial canteens

  Eligible criteria for the entities shall be based on
  - Energy consumption
  - Turnover per annum
  - Number of meals per day
- State governments shall allocate special funds for the provision of soft loans to fund the project.

Note: The equivalent target energy of 5 to 10% shall also be derived from other forms of renewable Energy including Solar Water Heaters, Biogas systems, etc

3.4. Techno-economic feasibility

Scheffler Solar Cookers: They consist of a large automatically tracked parabolic reflector standing outside the kitchen, that reflects the sunrays into the kitchen through an opening in its North wall. A secondary reflector further concentrates the rays on to the bottom of the cooking pot painted black. A solar steam generating system using these dishes may not be suitable for cooking food for less than 250 people. As a thumb rule 3 to 4 dishes of 16 sq. m. each should be sufficient for cooking food for around 250-300 people depending on site.

Fuel Savings: A typical solar steam system (excluding cooking vessels & conventional boiler) comprising of 96 sq.m of Scheffler dish area (6 dishes each of 16 sq. m) can save around 4,500 liters of diesel in a year. It may generate about 150 to 200 kg of steam in a day.

Environmental benefits: Solar cookers are emission free, therefore allowing for a more pleasant and pollution free kitchen atmosphere. They also lead to carbon emission savings of 12 tons of carbon dioxide per year.

Life: The Scheffler solar cookers have a total life-span of about 20 years.

Approximate cost: Scheffler cooker with 3 dishes would cost around 7 Lakh INR. (One Sq.m of dish area costs around 12,000 to 16,000 rupees. One Scheffler dish has 16 Sq.m aperture area.)

Payback period[5]**:** The payback period is 4-5 years (with MNRE subsidy)

3.5. Successful Case Studies

Tirumala Tirupathi Devasthanam (TTD) at Tirumala in Andhra Pradesh: The world's largest solar steam cooking system has been installed by the Tirumala Tirupathi Devasthanam (TTD) at Tirumala in Andhra Pradesh. The system has a capacity to prepare food for 15,000 people/ day and employs automatic tracking solar dish concentrators, which convert water into high pressure steam. The steam thus generated is being used for cooking purposes in the kitchen of TTD. It has been hooked up with the existing boiler working on diesel so as to make the system reliable under all climatic conditions.

Brahmakumari's Ashram Mount Abu: One of the world's largest Scheffler cookers is at the Brahmakumari's Ashram at Mount Abu. Set up with financial assistance from the German Government, this system consists of 24 Scheffler paraboloid reflectors, two each of which are installed to focus sunlight on a square type insulated fin and tube receiver, with24 reflectors focusing on twelve of such receivers. This has a capacity to cook for 10,000 persons daily.

5. Depends on site of installation, utilization pattern and the cost of LPG cylinder

4.0 Rooftop Solar PV

4.1. Background

Buildings are a major source of greenhouse gases, more than 20 % of global GHG emissions being attributed to them. There is approximately one million square meters of urban rooftop area (as estimated by studies done in major cities in India), that could be utilized for rooftop solar systems. The use of this technology can lead to a reduction in the load on the regional grid and save on fossil fuel consumption, thus reducing greenhouse gas emissions. Solar PVs can also serve to reduce the usage of diesel generators and power inverters when the grid is offline.

4.2. Existing Policies

- Implementation of the program on 'Rooftop PV & Small Solar Power Generation Programme' (RPSSGP) for the first phase of the Jawaharlal Nehru National Solar Mission (JNNSM) till 31st March 2013 by the Government of India
- The Tamil Nadu government has recently introduced subsidies for household generation of solar power. This is to the tune of Rupees 2 per unit for the first two years, Rupees 1 per unit for the next two years and Rupees 0.50 per unit for the following two years.
- The MNRE provides Central Financial Assistance (CFA) for rooftop SPV systems at the rate of INR 75 per watt of SPV panels to a maximum of 30 per cent of the cost of the systems to profit making bodies availing depreciation benefits, and at the rate of INR 100 per watt to a maximum of 40 per cent of the cost of systems to non-profit making bodies (with or without grid interaction) limited to 100 kW capacity mainly for daytime use.
- MNRE offers financial support in a combination of 30% subsidy and /or 5% interest loans:
  - Non-commercial entities: capital subsidy and interest subsidy.
  - Industrial/commercial entities: capital subsidy or interest subsidy.
- The Government of Tamil Nadu has mandated 6% SPO (starting with 3% till December 2013 & 6% from January 2014) for the following category of consumers:
  - Special Economic Zones (SEZs)
  - Industries guaranteed with 24/7 power supply
  - IT Parks, Telecom Towers
  - All Colleges & Residential Schools
  - Buildings with a built up area of 20,000 sq.m. or more

4.3. Policy Recommendations

- The rooftop spaces available in all public/government buildings shall be used to install Solar PV by Rooftop leasing scheme. The rooftops shall be provided to private companies to develop Solar PV power projects. The revenue earned by the sale of power shall be shared between the entity providing space and the project developer.
- While in Tamil Nadu tt has been mandated in for Government buildings to install Solar PV, the direction on the minimum capacity of the Solar PV system that has to be installed has not yet been given. The minimum capacity of the Solar PV system shall be determined in such a way that it caters to 10 to 15% of the overall energy consumption.
- An effective monitoring committee has to be introduced for the enforcement of Solar Power Obligations in the State of Tamil Nadu.

4.4. Techno-economic feasibility

Power Savings: A 1 KW \PV system running for 5-6 hours every day can save about 1.5 MWh every year.

Environmental benefits: A 1 KW PV systems would lead to a reduction of 1.22 tons of carbon dioxide every year.

Life: 25-30 years

Approximate cost: The cost of a 1 KW PV system is about 2.1 Lakhs

Payback period: The payback period for a 1 KW PV system is 5-6 years

4.5. Successful case study

The Government of Gujarat has launched the pilot project "Gandhinagar Solar (PV) Rooftop Programme". The project aims at encouraging public participation for the generation and utilization of clean and everlasting energy sources like solar energy. A Solar PV of 5 MW capacity will be installed as part of the project, which is divided in two sub-projects having 2.5 MW each. Out of 2.5 MW, 2.0 MW Capacity SPV systems will be installed on government rooftops and 0.5 MW will be installed on private rooftops. The individual capacity of the SPV systems ranges from 1kW to 500kW.

5.0 Solar Street Lighting

5.1. Background

About 33.7 KWh of energy is consumed per capita for lighting purposes in India. This number is likely to increase with more and more households being electrified and with the growth in income taking place in a growing economy like India. The total electricity consumption for street lighting in India is 4,400 MW (21 billion units per annum). This consumption puts a large amount of stress on the available installed capacity for electricity in the country. Employing Solar Street Lighting could reduce the stress on the present installed capacity.

5.2. Existing Policies

- MNRE provides a subsidy of 30% of the cost, subject to a maximum of Rs.81/- per watt peak for the installation of solar street lights in the General Category States.
- The government. of Tamil Nadu has proposed to energise 1 lakh street lights in the village of Panchayats through solar power over a period of 5 years up to 2016. This is the first time in India that street lights previously powered from grid supply are now being powered with solar energy, with provision for grid backup, ie., battery charges from EB supply only during Cloudy/Rainy days.
- Further, all street lights in local bodies will be energized through solar power in a phased manner.

5.3. Policy recommendations

- One third of all street lights in cities should be solar street lights in the state of Tamil Nadu.
- The State government shall provide 20% capital subsidy for funding Solar PVs for street lighting.
- 50% of all traffic signals should be powered by Solar PVs in all the cities pertaining in Tamil Nadu.

5.4. Techno-economic feasibility

A 74 Wp Solar PV panel would achieve the following results,

Power Savings: Grid electricity could be displaced to the extent of 100 kWh

Environmental benefits: Around 90 kg of carbon dioxide reduction could be achieved by displacing grid electricity

Life: 25-30 years

Approximate cost: Cost of solar street lighting system is Rs.20,000 to 30,000 in India depending upon the configuration.

5.5. Successful Case Studies

Nagpur Municipal Corporation (NMC) took part in ICLEI's Local Renewables Programme and has commissioned renewable energy and energy efficiency measures including installation of 20 solar lights in NMC premises, 20 solar lights in the premises of high court and 60 solar lights in gardens and parks. These installations have resulted in the 5256 kWh of electricity savings per year and emission reduction

of 4.25 tCO2/year.

6.0 Energy Audit for Corporations

6.1. Background

In Corporations, electricity is consumed in several sectors including water supply and pumping systems, sewage treatment plants and sewerage systems, street lighting and building utilities. A small percentage of energy saving in each sector will result in an overall significant electricity reduction. There lies the significant opportunity for cities to conserve energy and make electricity available for a maximum number of users. Some Corporations undertake energy audits on their own and implement the recommendations to make significant energy savings. Greater results could be achieved by embedding energy efficiency practices within the Corporation system.

6.2. Existing policies

- The Government of Tamil Nadu has issued a Government Order on energy conservation in buildings of all Government offices, including local bodies and public sector undertakings.
- The Government of Tamil Nadu has also issued orders to ban the usage of incandescent bulbs in all Government departments, public sector undertakings, boards, societies, local bodies and government aided institutions.
- State Electricity Conservation Fund (SECF) has been constituted by the state government in accordance with the provisions under Sub Section (1) of Section 16 of the Energy Conservation Act, 2001. The funds would be utilized to carryout waste heat recovery projects.
- The Bureau of Energy Efficiency under the Ministry of Power has allocated funds under the scheme "Annual Action Plan", to carry out the following set of activities:

a) Organization of workshops/training programmes to designated consumers and various stakeholders
b) Preparation of promotional material such as pamphlets, brochures, posters etc.,
c) Organization of awareness campaigns on Energy Efficient products & Services, Constitution of state level Energy Conservation Awards and observance of Energy Conservation Day and publication of state level annual book of Energy Conservation Measures.

6.3. Policy recommendations

- A Mandatory Energy Audit has to be conducted in all the Corporations once every 2 years
- The indicative list of items that shall be covered under Energy Auditing are:
  - Municipal/public buildings
  - Street lighting
  - Water pumping/Sewerage systems
  - Parks, recreational centers, institutions & schools
  - Bus stands
  - Other amenities/utilities under the purview of Corporation
- Budgetary provision to Corporations by State government to carryout Energy Audit
- Forming of an In-house Energy Management Cell in all Corporations to undertake and overlook energy efficiency measures within the City.
- Reporting of energy efficiency study results and sharing of key outcomes publically
- Mandating the use of star rated equipments in public buildings

6.4. Economic feasibility

An energy audit[6] in buildings would cost around 40,000 to 1,00,000 INR. The energy audit of a water pumping system (for 500 pumps) would cost around 4 to 5 lakh INR

6.5. Successful case study

Surat Municipal Corporation has set up an "Energy Efficiency Cell" already in 2001 and a dedicated team of engineers have been appointed to carry out the energy efficiency activities. This establishment

6. This is an indicative estimation based on the actual proposals. Energy audit cost vary depending on the consulting firm, specific site conditions including connected load and other scope of services.

has resulted in cost savings of INR 660 million and energy savings of about 12.4 million kWh. Energy conservation measures in street lighting have accrued a savings of INR 321 million over the years.

7.0 Resource Centers

7.1. Background

Lack of awareness and visibility, and high initial investments are the main obstacles for any technology to become successful. The intervention of subsidies and incentives has helped to remove the barrier to some extent; nevertheless, large portions of these subsidies are still underutilized. Knowledge about RE/EE technology, options, and subsidies has yet to reach the end users. There also needs to be a system to ensure sustenance of a technology even after its installation.

7.2. Existing Policies

MNRE launched the "Development of Solar Cities" programme in 2008. As part of this programme, a "Solar City Cell" will be established in the proposed 60 cities chosen, in order to developing them into Solar Cities. MNRE provides INR 10 lakhs for the establishment and functioning of these Solar City Cells for a period of 3 years. Capacity building and awareness-raising about RE and EE through conferences, seminars and competitions will be some of the key activities.

7.3. Policy Recommendations

- Establishment of Resource Centers in all Municipal Corporations
- Allocation of funds from States government for the establishments of Resource Centers
- Indicative activities undertaken as part of Resource Centers include:
  - Display of RE/EE gadgets
  - Training on renewable energy gadgets
  - O & M support for RE gadgets
  - Knowledge dissemination through stakeholder meetings, conferences, competitions for school/colleges, exhibitions (on technology, subsidies, general consultation for RE/EE)

- The Resource Center space could be rented to private players to display their products, using the revenue generated to make the centers self sustainable.

7.4. Successful case study

Coimbatore[7] established a resource centre in 2008 as a participant city in the Local Renewables Model Communities Network Project supported by BMZ-GTZ. The Centre disseminates information on renewable energy and energy efficiency. Nagpur and Bhubaneswar are other cities having currently functioning Resource Centres.

7. The Coimbatore case study is indicative. The proposed Resource Centre would perform additional activities apart from the ones performed by Coimbatore Resource Centre.

Policy Notes for Building Sector

1.0 Back ground

With rapid growth, **building energy use is increasing by over 9% annually in India.** The commercial building sector in India is expanding rapidly and it has been estimated that 66% of building stock that will be there in the year 2030 is yet to come up in the country (USAID ECO-III Project, Jan 2008). In addition, **residential sector consumes three times the electricity used by the commercial sector;** this is due to the floor area being around 8 times greater (Levine 2012; Kumar, Kapoor, Rawal, Seth & Walia, 2010).

The demand for electricity is continuously increasing due to rapid economic growth in the state of Tamil Nadu. Some of the facts regarding energy consumption in Tamil Nadu are,

- Due to increase in demand, power deficit in Tamil Nadu is increased from 1.4% in the year 2003-04 to 6.2% in the year 2009-10. Despite various government initiatives, power deficit in Tamil Nadu is continuously increasing.
- There has been a sustained average annual growth of 5% in the number of consumers .
- The energy demand in the commercial building sector is drastically increased. It increased from 5.6 per cent in 1998-99 to 9.5 per cent in 2008-09 and further to 20.93 per cent in 2010-11[2].
- The energy demand in the domestic sector in 2010-11 was 27.15%, which is almost three times the one of the commercial sector. Existing policies and measures give little attention to residential buildings. There is an urgent need to understand what the saving potential is and how it can be realized either through codes, incentives or guidelines that can encourage energy efficiency in residential buildings.

2.0 Existing policies

Several of the state government policies are already addressing building energy efficiency. Many of these are the part of national policies or programmes which are implemented under the Energy Conservation Act 2001. Some of the key initiatives are:

- Adoption of the Energy Conservation Building Codes (ECBC) for commercial buildings. The code is applicable to the buildings or building complexes that have a connected load of 100 kW or greater or a contract demand of 120 kVA or greater.
- A Government Order on the energy conservation in buildings of all Government offices, including local body and Public Sector Undertakings.
- Ban on the usage of Incandescent Bulbs (ICBs) in all Government Departments, Public Sector Undertakings, Boards, Societies, Local Bodies and Government aided institutions to reduce lighting consumption load.
- Mandatory energy audit in all High Tension Industrial and Commercial Establishments.

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1. Mitigation potential from India's Building,Global building performance network, 2013
2. Energy Department, Government of Tamil Nadu

- Constitution of a "State Energy Conservation Fund to carry out the activities under energy conservation.

3.0 Policy recommendation

3.1. Mandatory investment grade energy audit in government buildings once every 2 years.

Energy audit studies in buildings have shown 23%-46% potential for energy savings in government buildings[3]. While various energy conservation measures are being implemented in government buildings, through the implementation of an appropriate monitoring mechanism, their impact can be enhanced and efficacy improved, thereby providing a scientific basis for estimating potential and accrued benefits.

3.2. Promotion of Energy Efficient buildings through Incentive

- **Rebate in 5 % property tax for implementing at least 2** and identified energy conservation measures in new multistory residential building**[4]. Indicative energy conservation measures are listed below, **at least one from section A and one from section B

Section	Sr. No	Indicative Energy Conservation measures	
A	1	Building envelope should comply with minimum energy efficiency parameter specified in ECBC prescriptive requirement[5].	Window Glazing 'U' Value
			Overall Roof Assembly 'U' Value
			Wall Assembly 'U' Value
			Cool roof
	2	Use of renewable	Install renewable energy systems for atleast 2.5% of annual consumption of the building
B	3	Use of energy efficient appliances and system[6].	Use of minimum 3 star BEE rated appliances
	4	Energy Efficient lightings	All liner lights sources installed should be T-5 or BEE rated TFL lamps
	5		All the point light sources installed in the building for general lighting should be CFL or LED based

- **Implementing a fast track building approval system for projects that adopt all identified energy conservation measures (indicative energy conservation measures are defined in above table) or comply with ECBC.**

3 BEE, http://beeindia.in/miscellaneous/documents/rti_act/schemes_for_promoting_energy_efficiency_in_India_during_the_%20XI_Plan.pdf

4. Building with G+3 floors , Type -Single or More than one block and No. of Dwelling should be more than 12

5. ECBC compliant building envelope has potential to conserve 22.7% energy compare to conventional building. Source : http://high-performancebuildings.org/energy_saving_potential_whecm2.php

6. The savings potential in urban segment by adopting CFLs and BEE star rated products for domestic sector is 20-25% http://www.emt-india.net/eca2009/14Dec2009/CombinedSummaryReport.pdf

3.3. Mandatory use of solar PVs in new multistory residential buildings.

5% of the energy usage for common amenities should be from on site installed solar PVs[7].

4.0 Successful Case studies

- **Investment grade energy audit**

Gujarat Municipal Finance Board, Gandhinagar

Objective of the Investment grade energy audit is to review the present energy consumption scenario, monitoring and analysis of the use of energy and explore the energy conservation with cost benefit analysis. The Energy Audits was conducted during the period June 2011 by BEE. Summary of Energy Audit is given in the below table[8].

Annual Energy Consumption (kWh)	Annual Energy Bill (Rs.)	Investment Required (Rs)	Annual Energy Saving Potential (kWh)	Annual Cost Saving Potential (Rs)	Payback Period (YEAR)
50616	333695	260450	17530	115698	2.25

- **Incentive programmes for green buildings**

Urban local bodies offer incentives for green buildings and certain good practices like the solar water heating.

1. **Pimpri Chinchwad Municipal Corporation (PCMC).** PCMC has announced rebate in property tax for GRIHA rated buildings. The flat owners of the green building will get a discount of 10% on property tax.

2. **Thane Municipal Corporation (TMC)** offers 10% rebate in property tax is solar water heating system is provided. This initiative has resulted in to installation of 9 Lakh L.P.D. solar water heating systems in municipal corporation area[9].

3. **Amravati, Nagpur and Durgapur** have announced 6-10% rebate in the property tax for users of solar water heaters[10].

- **Kerala Solar Energy policy 2013**

Recently published Kerla solar policy 2013 draft has included few strategies to ensure optimal usage of the available solar potential in its region. Under legal and regulatory framework, they have suggested that all new domestic buildings having a floor area in between 2000 sq.ft to 3000 sq.ft should install at least and 500W solar PV system and all the buildings above 3000 sq.ft should install at least 1000W solar PV system. In the case of residential flats 5% of the energy usage for common amenities should be from solar.

7. Kerala Solar Energy policy 2013 draft, http://ddr.anert.gov.in/images/stories/solar/policy2013/draft_solarpolicy2013-02-24.pdf
8. Source : BEE , http://beeindia.in/
9. http://mnre.gov.in/file-manager/UserFiles/thane_solar_city_master_plan.pdf
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- **The Andhra Pradesh Building Rules – 2012**[11]

Andhra Pradesh provide following Incentives for owners leaving more setbacks / installing solar heating & lighting system / rain water harvesting / recycling of waste water.

(a) Construct the building /blocks by leaving more setbacks than the minimal stipulated in these Rules:

- Leaving 1.5 times the minimum setbacks in all sides: 10% rebate*
- Leaving 2.0 times the minimum setbacks on all sides: 20 % rebate ** The setbacks has to be on all sides to qualify for the rebate. Leaving more on one side and the minimum on other sides would not qualify for such rebate.

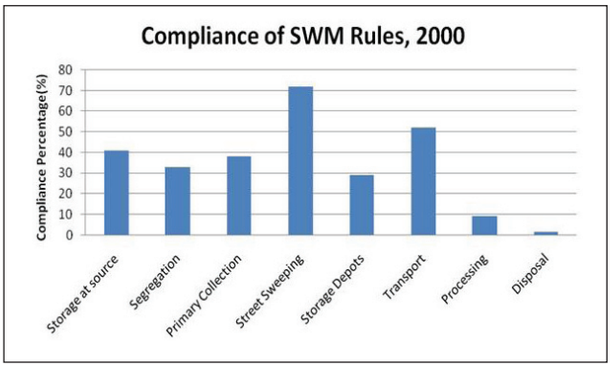
(b) Install and use solar heating and lighting system: 10 % rebate.

(c) Undertake both recycling of waste water and rain water harvesting structures: 10 % rebate.

11. The Andhra Pradesh Building Rules – 2012, http://www.ourvmc.org/tps/GO678.pdf http://www.ghmc.gov.in/tender%20pdfs/GOMsNo168.pdf

Policy Notes for Waste Sector

1.0 Background



Modern society is becoming increasingly industrialized. This has led to an inevitable increase in waste generation. Every year, 68.8 million tons of waste are generated in urban India. This is both a problem and an opportunity for the productive use of waste through effective waste management initiatives. Waste landfills are fast filling up and are a source of greenhouse gas gases like methane. However, effective handling and management of waste, with the help of awareness initiatives, can reduce the environmental impact of these processes as well as allow productive use of municipal solid waste. The MSW rules, 2000 along with the service level benchmarking instituted as part of JNNURM by the government of India attempted to increase awareness of the best practices in the field of solid waste management. However, the compliance of these rules is still lacking, as the above figure shows. The state governments should therefore strive to improve compliance with these rules, thus laying the ground work required for effective implementation of waste to energy operations.

2.0 Existing Policy

- MNRE has instituted incentives and subsidies for waste to energy plants as part of their program to promote renewable energy technologies.
- The state governments in Tamil Nadu and Rajasthan have specific guidelines for the implementation of Solid Waste Management (SWM) Rules, 2000.
- The implementation of these guidelines has been well funded by the central and state governments.
- Under the JNNURM, several projects on integrated waste management have been started in cities in Tamil Nadu and Rajasthan.
- The governments of Tamil Nadu and Rajasthan have also initiated public private partnerships to streamline solid waste management services.
- For the implementation of waste to energy plants, viability gap funding, repayable grants and low cost capital have been proposed during the Union Budget, 2013.
- Waste to energy initiatives have also been given special importance under the 12th five year plan, wherein a target of 2% of all electricity is to be generated through this method.

There is however a need for more comprehensive implementation of SWM rules in the state, including improvements in segregation, disposal and treatment of waste facilities.

3.0 Policy Recommendations

- In the absence of a centralized plant, the construction of a biomethanation / composting unit can be subsidized and made mandatory for establishments that generate more than 250 Kg of waste every day.
- 20% of the waste generated in a city (municipality) should be mandatorily processed through waste to energy or biomethanation methods.
- Biogas units can be mandated for urban cattle sheds of more than 100 cattle.
- Transfer of organic waste from establishments (restraints, hotels, etc) with dedicated organic waste stream to centralized bio-methanation or composting plants should be made mandatory.
- Expedited building and environmental clearances for large waste to energy projects (bio-methanation and thermo-chemical conversion) should be offered to investors.
- Provision of funds by State government to the extent on 15% on the incremental cost for generation of power from biogas being generated at STPs

4.0 Techno-economic feasibility

4.1. Electricity generation from bio-methanation

Biomethanation is the formation of methane by microbes known as methanogens. This technology utilizes bio-degradable waste that has been segregated from municipal solid waste; the methane thus obtained is used to produce electricity.

- **Environmental benefits** – A 1 MW bio-methanation plant can lead to savings of 4950 tons of carbon dioxide annually.
- **Power savings** – A 1 MW bio-methanation plant can have potential electricity savings of 6.1 million units every year.
- **Economic feasibility** – A 1 MW bio-methanation plant would cost around INR 6 crores, taking into account a subsidy of INR 2 crores per MW, the payback period works out be around 18 months.

4.2. Waste to energy (thermo-chemical conversion of waste)

In a thermo-chemical conversion, all of the organic matter (biodegradable as well as non-biodegradable) contributes to the energy output. This is a process whereby waste is treated and the resultant fuel is then used to produce electricity. The use of RDF pellets is perhaps the most feasible technology in an Indian context.

- **Environmental benefits** – A 1 MW waste to energy plant can lead to savings of 4940 tons of carbon dioxide per year.
- **Power savings** - A 1 MW plant can have potential electricity savings of 6.1 million units every year.
- **Economic feasibility** – A 1 MW plant would cost around INR 7 crores, taking into account a subsidy of INR 3 crores per MW, the payback period works out be around 18 months.

4.3. Electricity Generation from Sewage Treatment Plants

The following results have been achieved by assuming treatment of 1 MLD of sewage water using anaerobic waste water treatment methods (namely Up-flow Anaerobic Sludge Blanket (UASB), Activated Sludge Process (ASP))

- **Environmental benefits** – Around 6000 kg of carbon dioxide per annum is avoided by displacing grid electricity alone.
- **Power savings** – Above 5 MWh of electricity could be produced annually
- **Economic feasibility** – around 50 lakh INR is required to treat 1 MLD of sewage water by anaerobic treatment methods.

5.0 Successful Case Studies

5.1. Okhla - Timarpur integrated waste to energy plant, Delhi

This integrated municipal waste processing complex includes two Municipal Solid Waste (MSW) processing plants at Okhla and Timarpur. The Okhla landfill has a 16 MW power plant, where Refuse Derived Fuel (RDF) and biogas derived from the waste is used as fuel to produce renewable electricity. RDF is produced both at Okhla as well as in Timarpur and on an average 225 tonnes per day of RDF is transported to Okhla from Timarpur to augment the need for RDF in the power plant there.

5.2. Sri-Sankar Nagar, Pammal, Chennai

This is a compact and pre fabricated bio-waste to electricity plant at Sri Sankar Nagar, Pammal, Chennai. This plant has been installed in association with Exnora Green Pummal, a well known NGO actively involved in waste management projects. This plant is capable of treating 250 Kg. of organic waste every day. Bio methanization technology is applied for this process and 25-30 cubic meters of biogas are generated every day. This gas is utilized for the generation of 5 KW of electricity daily; it is used for meeting in-house requirements for the project and for street lighting.

5.3. Thiruvananthpuram Composting Plant

This is a plant with a capacity of 300 MT/day that uses waste generated and segregated locally in the city limits. The government also provides 90% subsidy on pipe composting in the city.

5.4. Sri Gobind Goushala- Gorakhpur

The Goushala uses a cryogenic super-cooling method to segregate methane present in biogas and has set up a compressor equipped plant under a tin shade of 400 square feet in the cattle shed complex. It is found that 1 cow could provide energy equivalent to 225 liters of petrol. 1 Kg of Methane can be used to power an old maruti van for 25 Km or an autorickshaw for 45 Kms.

5.5. Anjana Sewage Treatment Plant

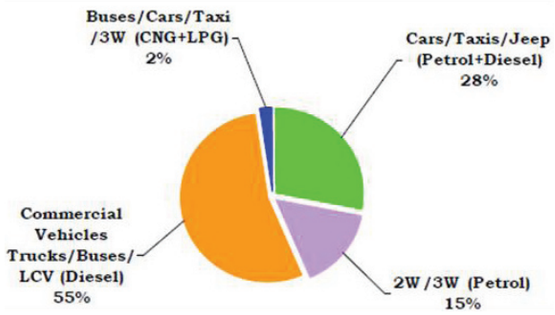
This plant was built by Surat Municipal Corporation & Ministry of New & Renewable Energy, New Delhi jointly took up the Project of Generation of Electricity from Sewage Gas under UNDP & GEF scheme in October, 2003. INR 2.62 crores were spent on this plant with a subsidy of INR 1.2 crores. The plant has an installed capacity of 0.5 MW. Thus far about 920 GWh of electricity has been generated (in about 10 years), this has resulted in an aggregate of savings of INR 4.13 crores.

Policy Notes for Transport Sector

1.0 Background

The present scene of urban transport across India is categorized by sprawling cities; declining share of public transport and non-motorized transport; focus on the supply side yet with low investments; sheer neglect of pedestrians, cyclists and public transport users; and increased motorization leading to pollution and high road fatalities/injuries. The problem is getting further aggravated by the multiplicity of responsible authorities/departments involved in urban transport, often with conflicting agendas as well as by a lack of understanding both from the authorities as well as the general public's side of the various issues related to urban transport. Such a scenario is neither desirable nor sustainable even for the present and needs to be proactively and urgently reversed.

In 2005, India's transport sector consumed 11% of its total primary energy demand. 78% of this demand was consumed by Road Transport, 11% by Aviation, 10% by Rail Transport and 1% by inland water. The transport sector is set to grow at over 6% per annum on the back of rising economic activity and a rapid surge in the vehicle stock. By 2030, the share of transport sector is likely to double to about 20% of the primary energy demand.



Total Road Transport Emissions in India from Different Sources, CRRI 2010

A study recently concluded by ICLEI South Asia as part of one of its projects discloses the state of energy consumption and associated emissions in the transport sector. The project reveals that in urban areas, approximately 30 % to 40% of the total emissions are attributed to transport related activities in the city. Most of the vehicles used are of commercial type, followed by private ones and others running on CNG/LPG etc.

2.0 Brief on Existing Policies

The Government has authorized 248 Private Emission Testing Centers throughout Tamil Nadu as per Tamil Nadu Motor Vehicles Rules 1989 and has made it mandatory to check certificates of Pollution under Control at the time of every transaction with Regional Transport Offices.

The following are some of the other measures taken for the control of vehicular pollution:

- Prescription of a time schedule for converting petrol driven auto rickshaws in Chennai city to auto rickshaws run on Liquefied Petroleum Gas (LPG). Tamil Nadu Pollution Control Board has also agreed to offer a subsidy of Rs.3000/- for such conversion to the vehicle owners. In Chennai city, there are 23 Auto LPG Dispensing Stations for the supply of LPG to Motor Vehicles (MVs).

- Banning of new petrol and diesel auto rickshaw permits.
- In order to improve the air quality management, the use of LPG is permitted as an alternate fuel in motor vehicles. To minimize air pollution, motor vehicles running on petrol are being converted so that they can run on LPG. This is being done in a phased manner as per the directions of the Supreme Court in Metropolitan cities.
- The emission standards have been tightened up and Bharat Stage III emission norms have been introduced for vehicles plying in 11 major cities in the country.

3.0 Policy Recommendations

3.1. Non Motorized Transportation (Public Bicycles)

Capacity: 1-2 persons, 1000 persons per hour per direction

Distance Range: 3-5 km (depends on local climatic conditions), typically 3 km

Cost of Implementation: 1.5 lakh- 2 lakh per km

Strengths: Relatively cheap implementation; zero emissions and reduced noise levels; very low right of way required (typically 1.5 to 2 m); improved accessibility for the poor and social inclusion; good results when integrated with the effective public transport system. It also includes separate well designed foot paths and cycle tracks to segregate slow moving traffic from MV lanes.

Results: Segregating low speed vehicles (non motorized) and pedestrians from high speed traffic (motorized) traffic reduces emissions by allowing MV lanes to operate at the designed speed.

3.2. Parking Measures

Capacity: Reduce the capacity or keep it negligible in Central Business District (CBD) areas

Distance Range: Initially in CBD zones, can then be extended to all busiest roads

Cost of Implementation: depends upon the location

Strengths: Parking fees could be introduced where currently not existent, and increased where demand outstrips offer. Parking fees could be made flexible to reflect the time of day, amount of demand, etc.. The planning phase could consider dedicated residential parking areas, maximum parking standards for new buildings, Park Ride facilities, and parking guidance systems to reduce the need for on-street parking in city centers.

Results: Better planning for parking facilities does not encourage on-street parking and high charges encourage reduced car usage for unavoidable long trips. Reduced on-road parking and use of private cars leads to a reduction of emissions

3.3. Other steps to be taken

- Avoiding subsidies on diesel cars, promoting cleaner fuels, allocating funds for technology improvements in vehicle engines.
- Offering funding towards urban transport and incentives for cleaner fuels; enabling conditions for lowest-emitting modes; preventing shifts from NMT (such as walking and cycling) and

public transport (such as buses, rickshaws etc) to private vehicles by improving the quality of public transport including para transit.

- Promoting private investments in more environmentally efficient vehicles and fuel technologies; ensuring future vehicles/fuels are cleaner; encouraging small efficient vehicles (including motorised 2 wheelers).
- Providing intelligent transport systems for shorter trip lengths and real time information to avoid unnecessary trips.

4.0 Successful Case Examples

- Delhi's approach towards Transit Oriented Developments; Bogota- post Bus Rapid Transit (BRT) compact developments.
- Delhi metro has implemented a bike sharing system in some of the stations; Ahmedabad has provided NMT infrastructure in line with Bus Rapid Transit (BRT).
- Park and Ride options for some Delhi metro stations; parking fees in Delhi (Nehru Place) cheaper for short stays, higher for longer one.

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Disclaimer

The information contained herein has been obtained from sources believed to be reliable. The information contained in sections of the report reflects information that was derived from both public and confidential information collected during the conduct of the study by ICLEI - South Asia and supported by the British High Commission.

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British
High Commission
New Delhi

British High Commission

The British High Commission in India supports projects combating climate change across the country through various funding streams including the Prosperity Fund to promote Low Carbon High Growth initiatives. The Fund will focus on promoting sustainable global growth, consistent with the UK's development objectives of promoting sustainable development and improving welfare.

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ICLEI - Local Governments for Sustainability - South Asia is a non-profit making organisation operating from New Delhi, India. It began its activities in April 2005 and is presently supporting over 40 South Asian cities. ICLEI South Asia supports environmental and other sustainability initiatives at the local level by working with city governments as well as with state, national and international governmental bodies to build appropriate local environment initiatives and policies.

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