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Confederation of Indian Industry

Fiscal Instruments for Climate Friendly Industrial Development in Tamil Nadu

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Disclaimer

This report is part of Confederation of Indian Industry, CII - Godrej GBC's effort to assist the Government of Tamil Nadu to attain low carbon growth for the future. This publication is being brought out with the support of the United Kingdom's Foreign and Commonwealth Office under its Prosperity Fund India programme and Madras School of Economics.

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Contents

EXECUTIVE SUMMARY

Tamil Nadu has been one of the most progressive states in terms of industrialization and economic growth. The Vision 2023 of Tamil Nadu sets the theme for achieving a six-fold growth in per capita income (in real terms) over the next 11 years to be on par with the Upper Middle Income countries globally. This aims to grow its Gross State Domestic Product at 11% or more per annum. Such aggressive growth strategies obviously will lead to increase in socio economic and industrial activities and hence increase in Green House Gas emissions which in turn will aggravate the climate change issues.

India has committed its support to contribute to climate change mitigation with a voluntary commitment to reduce country's carbon intensity by 20-25% of 2005 levels by the year 2020. In view of this it has become imperative for every state including Tamil Nadu to chalk out appropriate policy instruments for climate friendly Industrial development without compromising on high and accelerated growth.

The carbon foot print study conducted by Confederation of Indian Industry in the year 2012 for the baseline period of 2009-10 indicates that the total Green house gas emission in the state is about 111.86 million tons. The state per capita GHG emission stands at 1.59 tons of CO2 with state population during the period at 70.3 million.

The carbon foot print study has clearly highlighted the high emission sources and the focus areas for reducing the Green House Gas emissions. The energy sector including power generation, Transport, residential / commercial etc contributes about 75.73% of the total emissions and the industry sector contributes for about 16.07% of the total emissions.

Subsequent to the carbon foot print study, Confederation of Indian Industry with the support of British High Commission has taken up the study on identification of Fiscal Instruments for Climate Friendly Industrial development in Tamil Nadu. The study attempted to design fiscal instrument at state level that encourage a switch from high carbon intensity activities to low carbon intensity ones.

The study had been taken up with the consultation of various stake holders including industry representatives, consultants, policy makers, regulators etc. These instruments cover broad sectors which contribute for more than 90% of the green house gas emissions such as Energy sector including power generation, transport and Industries.

Summary of suggested fiscal instruments for climate friendly industrial development are as below.

a. Energy sector

- Green Fund - Green cess on conventional power for financing Green fund and utilize the green fund for the following:
  - Subsidize lending for roof top solar
  - Removal of sales tax & VAT on local manufacture of RE products
  - Subsidize use of Clean technologies for Power Generation
- Solar pumps for Agriculture pumping systems

b. Transport sector

- Congestion tax to finance a city road maintenance fund to reduce use of diesel and petrol per km of use by vehicles
- Green motor vehicle tax to subsidise use of less polluting vehicles

c. Industry

- Subsidy for utilizing solid waste in cement Industry as an alternate fuel
- Cess on solid waste for improving waste management in Industry
- Reduce VAT on energy saving equipment & material

d. Construction sector

- Reducing VAT on energy saving materials accompanied by higher state VAT on high energy using materials used in construction
- Reducing property tax on green buildings accompanied by higher rate on high energy consuming properties (like malls, etc.)

The study on carbon foot print and the subsequent study on identification of the fiscal instruments for low carbon industrial development would assist Tamil Nadu Government in carrying out resilient action for reducing the carbon foot print without compromising on the high and accelerated growth as envisioned in the vision document 2023.

INTRODUCTION

Government of Tamil Nadu has recently come out with "Vision 2023" Strategic Plan for Infrastructure in Tamil nadu. The state aims at increasing its per capita income (at current prices) by 6 times in 2023, in line with per capita income of Upper Middle Income countries. Over the next 10 years, Tamil Nadu, aims to grow its GSDP at 11% or more per annum - about 20% more than the expected growth rate of India's GDP over the same period.

The Government also has proposed many new industrial corridors, Industrial parks, aerospace and logistic parks. It has been proposed to add new power projects of capacity about 20,000 MW with investment of about Rs 1.1 million Crores. It has also proposed investment to the tune of about Rs 3.70 million Crores in transport sector and about Rs 1.50 million Crores in Industrial sector. All these activities are likely to significantly increase the Green House Gas emissions and aggravate the climate change issues.

India, the country as a whole, has committed its support to contribute to climate change mitigation with a voluntary commitment to reduce country's carbon intensity by 20-25% of 2005 levels by the year 2020. This in turn will percolate down to the individual states to contribute to achieving the commitment made by the country. The state Tamil Nadu is equally responsible for reducing the GHG emissions without compromising on high and accelerated growth.

Against this background, Confederation of Indian Industry carried out the carbon foot print study of the state in the year 2012 for the baseline period of 2009-10. The carbon foot print study of the state aimed at

- Identification of major sources of Greenhouse gas emissions, quantification of the emissions and understanding their trends.
- Establish basis for developing climate friendly policies
- Development of strategies for reducing the GHG emissions

The study indicates that the total Greenhouse Gas (GHG) emissions from the state in 2009-10 was 111.86 million tons. This amounts to the state per capita GHG emission of 1.59 tons of CO2.

Out of total GHG emissions, the energy sector accounts for 75.73% of the total CO2 emissions and within energy sector, the power generation alone contributes nearly 46%. While the industrial sector accounts for 16% of the total emissions in the state, the transport sector accounted for

18% and waste accounted for 2%.

The study clearly highlights that the major emitters are the energy sector including the power generators, Transport, residential & commercial users and the Industry sector. There is a need for developing appropriate policy instruments for encouraging above sectors to bring down the GHG emissions.

Hence, subsequent to the Carbon foot print study, Confederation of Indian Industry with the support of the United Kingdom's Foreign and Commonwealth Office under its Prosperity Fund India programme

and Madras School of Economics has taken up the further study for identification of appropriate fiscal instruments in the sectors for facilitating low carbon growth.

Climate friendly development in a state is likely to demand actions related to GHG mitigation as well as adaptation. Since the focus is more on the energy sector and industry, this study includes only actions related to GHG mitigation. The study has identified fiscal instruments for bringing down the GHG emissions in major emitting sectors like energy, transport, industry and construction.

Instead of targeting directly the emissions, one may also target the inputs and outputs which contribute for the emissions for better management. This study adopts the approach of targeting the inputs and the outputs for mitigating the GHG emissions.

The fiscal instruments also have been identified and developed in such way that this creates low or nil financial burdens on the state. The instrument proposes revenue generating mechanism through taxing additionally the non-climate friendly activities and suggests utilizing the revenue for subsidizing the activities which are climate friendly and reduce the GHG emissions.

The choice of instruments depends on either cost benefit analysis, cost effective analysis or environmental effective analysis. This report high-lights the environmental considerations for selection of the instruments. The details of the identified fiscal instruments, design considerations and the proposed implementation strategies are highlighted in this report.

1.0 TAMIL NADU CARBON FOOTPRINT

Tamil Nadu, the southern-most state of India, is among the most industrialized states in the country. Over the last several decades, governments in Tamil Nadu have consciously worked to create a favorable investment climate in the state on all fronts. The state today offers several strategic advantages, preparing it for further growth in years to come.

With ambitious plans for growth, Tamil Nadu is bound to witness several environmental issues. In order to restrict the environmental issues, first the major contributors for those issues needs to identified. Inventorying the Greenhouse Gases (GHGs) emitted to (or removed from) the atmosphere is one of the ways of identifying the major contributors.

CII - Sohrabji Godrej Green Business Centre (CII – Godrej GBC) in its effort to assist the Government of Tamil Nadu to attain low carbon growth for the future inventoried the emissions of various sources in the state. Tamil Nadu's Carbon Footprint report was published by CII – Godrej GBC in 2012. This report has been widely referred to in the following chapters. All the GHG emission figures cited in this report are from Tamil Nadu's Carbon Footprint report (2012).

1.1 Carbon footprint

It is the amount of carbon dioxide released into the atmosphere as a result of the activities of a particular individual, organization, or community.

1.2 State carbon footprint

A state carbon footprint (or greenhouse gas inventory of a state) is an accounting of greenhouse gases (GHGs) emitted to (or removed from) the atmosphere in the baseline year due to the activities of individuals, organizations or communities in the state as a whole.

State government policy makers can use GHG inventories to establish a baseline for tracking emission trends, developing enabling policies & strategies for GHG emission mitigation, and assessing progress on a regular basis. A carbon footprint study is usually the first step taken by state governments that want to reduce their GHG emissions. An inventory can help state governments:

- Identify the greatest sources of GHG emissions within their boundary
- Understand emission trends
- Quantify the benefits of measures that reduce emissions
- Establish a basis for developing policies & tracking progress on actions taken
- Set goals and targets for future reductions

1.3 Immediate benefits to Tamil Nadu

- Readiness for a carbon constrained future
- Recognition as an Environmental Leader – making Tamil Nadu as one of the first few states to take up this initiative
- Making the state an attractive 'Green' Investment destination
- Help the state policy makers address inefficiencies; facilitate in evolving cost-economic options to address increasing GHG Emissions
- Risk Management
- Stakeholder Education: Serves as an excellent opportunity to engage with all segments of society

2.0 TAMIL NADU GHG EMISSIONS OVERVIEW

Study on estimating carbon footprint for Tamil Nadu State estimates the emissions of Carbon dioxide, Methane, Nitrous Oxide. The sectors covered are Energy, Agriculture, Industry, Agriculture, and Land Use Land Use Change & Forestry.

Summary of Emissions in Tamil Nadu, 2009-10

Emission Source	Total Emissions (MT)	Per Capita Emissions	Share of Emissions, %
Energy	84,721,082	1.2	75.73
Agriculture	16,424,465	0.23	14.95
Waste	2,205,323	0.03	2.01
Industry Sector	18,125,505	0.25	16.07
LULUCF	-9,614,084	-0.13	-8.75
Total	111,862,292 1.59		
Population	70,299,535*		

* India census report & CAGR Based

Emission Profile of Tamil Nadu, 2009-10

Emission	Source CO2 Eq. (MT)
Energy	
Power Generation	51,422,878
Transport	20,113,210
Residential/Commercial	5,582,110
Other Energy	6,364,407
Fugitive Emissions	1,238,477
Agriculture	
Enteric Fermentation	9,770,196
Manure Management	439,587
Rice Cultivation	3,655,652
Agricultural Soils	2,253,272
Burning of crop residue	305,758
Waste	
Municipal Solid Waste	1,241,741
Domestic Waste Water	481,405
Industrial Waste Water	482,177
LULUCF	
Forest Land	-3,474,664
Crop Land	-8,816,247
Settlements	NE
Grass Land	110,161
Fuel wood usage	2,566,667
Industrial Sector	
Industries	18,125,505
Total Emissions in baseline year 2009-10	111,862,292

2.1 Tamil Nadu: Emission Sources

The five major sectors whose emissions are documented are explained below:

2.1.1 Energy

The energy requirements of Tamil Nadu are fulfilled by the Tamil Nadu Electricity Board (TNEB). Tamil Nadu Electricity Board has a total installed capacity of 10,214 MW which includes the state and central shares as well as the share from independent power producers.

Industrial sector is the largest consumer of power in Tamil Nadu state, consuming around 33% power from overall generation. Domestic sector consumes around 27%, agriculture consumes 22% and the commercial sector consumes 10%. Public lighting, water works, cottage industries etc. consume less than 3% of overall power consumption.

TNEB has taken several initiatives to avoid transmission & distribution (T&D) losses, and, as a consequence, Tamil Nadu has an estimated T&D loss of around 18% , lower than many other states.

TNEB has taken several initiatives towards energy efficiency, some of which are:

Domestic Sector

- Bachat Lamp Yojana (BLY): Incandescent bulbs were replaced by energy efficient CFL's for 13.5 million domestic consumers
- Energy conservation day/week celebrations
- Displaying energy conservation tips for domestic, industrial and agricultural sector

Industrial Sector

- Energy Audit program for HT industrial and commercial establishments, due to this savings in energy consumption of 221.62 million units was achieved up to May 2007
- State Designated Agency has identified 154 designated consumers that includes TNEB Thermal Station and Gas Turbine stations for conducting mandatory energy audit

Government Buildings

- Energy conservation measures taken in all government buildings, offices, local bodies and public sector undertakings to bring down energy consumption by 20% within 6 months

Carbon Credits

- TNEB is the forerunner (in India) in availing benefits under the Clean Development Mechanism (CDM) as defined by the UNFCCC
- Under Verified Carbon Standard (VCS) scheme, verification is under progress for Valuthur Phase II – Gas turbine project. On successful issuance, the project would fetch revenue of Rs. 3.14 **Crores per annum**

Apart from the initiatives mentioned above, TNEB is the first electricity board in India to introduce the following activities:

- Completed "all village electrification" in India
- Commissioned the highest head hydro turbine at Pykara
- Introduced "Power Line Carrier Communication" (PLCC) in grid operation
- Introduced "Wireless Phone" (VHF) system to attend "Fuse of call" in metro cities
- Commissioned distribution control central with "SCADA" in Chennai in 2000

In 2009-10, the energy sector in Tamil Nadu emitted 84.74 million tons of CO2 Eq. Out of these, 51.42 million tons were emitted by the electricity sector, followed by the transportation sector which was responsible for 20.9 million tons of CO2 Eq. Combustion from residential sector resulted in 6.6% of the total CO2 Eq. emissions, and fugitive and other emissions together caused 8% of the total emissions.

Major sources of emission under energy are:

- Power Generation
- Transport
- Residential/Commercial
- Other Energy
- Fugitive Emissions

Power Generation:

In Tamil Nadu, electricity is generated from a wide variety of fossil fuel sources such as coal, natural gas, lignite, naptha and diesel. Of all these sources, coal combustion is the major contributor towards GHG emissions.

A GHG emission from electricity generation includes TNEB owned power stations, Neyveli Lignite Corporation, Captive Power Plants & Independent Power Producers. Total GHG emissions from electricity generation was about 51.4 Million tons of CO2 Eq. which accounts for 61% of overall energy emissions

Transport:

An efficient transport system influences economic development, population distribution, shape of cities and towns, environmental quality and access to social infrastructure. Tamil Nadu has a highly developed public and private transportation network. Road and rail transportation are the dominant modes of transport in Tamil Nadu. Energy consumed in the transport sector in Tamil Nadu is quite high due to high road density and efficient transportation system.

In 2009-10, around 20.9 million tons of CO2 equivalent emissions were estimated to be emitted from this sector with road transport contributing 18.92 million tons of CO2 equivalents

Residential / Commercial:

Residential energy consumption needs like cooking and lighting are fulfilled by LPG and superior kerosene oil (SKO). Superior kerosene oil is distributed through public distribution system. LPG is distributed through several private agencies.

Emissions from these fuel usages were quantified to around 5.5 million tons of CO2 Eq.

Fugitive emissions:

Fugitive emissions occur mainly due to coal mining, venting, flaring, transport and storage of oil and natural gas. Emissions from Neyveli Coal mining operations, Tamil Nadu refinery operations and natural gas processing have been considered. Total emissions from this source was computed to be 0.4 million tons of CO2 Eq.

2.1.2 Agriculture

Agricultural sector emitted 16.03 million tons of CO2 Eq. emission. Enteric fermentation constituted 60.9% of the total CO2 Eq. emission followed by rice cultivation, which emitted 20.3% of total CO2 Eq. Emission from soil were tantamount to 14.1% of total CO2 Eq. emission. Remaining 4.6% of the emissions were attributed to manure management and burning of crop residues.

2.1.3 Land Use, Land Use Change and Forestry (LULUCF)

In the context of global climate change and sustainable development, forest management activities play a major role in alleviating the effects of climate change. Socio-economically, forests are of prime importance as it provides both tangible and intangible services. Hence, its preservation becomes an activity of prime importance. However, forests are also affected by climate change and their contribution to mitigation strategies is stressed.

The total CO2 sequestered from Tamil Nadu due to forest cover is 9.6 million tons of CO2

2.1.4 Waste

Waste generation is closely associated with population, urbanization and affluence. Today, it has become a major challenge for municipalities to collect, recycle, and treat waste in a sustainable manner. A cornerstone for sustainable development is to establish affordable and effective management practices. Furthermore, it should be emphasized that public health, safety and environmental benefits result from it.

The total GHG emitted from waste sector in 2009-10 in Tamil Nadu was 2.2 million tons of CO2 Eq. Municipal solid waste has been the dominant source of CH4 emission in Tamil Nadu. It accounted for 56% of the total CO2 Eq. emission from waste. Industrial wastewater constituted 22% of the emissions.

2.1.5 Waste

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2.1.6 Industries

Tamil Nadu has a combination of designated and non-designated consumers, as per bureau of energy effieicny (BEE), listed in energy conservation act 2001. Designated consumers include cement, iron and steel, textiles and paper and pulp. Of these cement has broad base with installed capacity of 21 MTPA leading to 12 Million tonnes of CO2 Eq. emission.

Though iron and steel, paper and pulp, chlor-alkali, textile, fertilizer have been designated as high energy consumers, their presence in Tamil Nadu is very low, resulting in lesser process related GHG emissions from the industry sector in Tamil Nadu.

Other sectors like leather, export oriented industries and engineering units, present in high concentrations, as these industries consume large amount of electrical energy than thermal energy, which is accounted previously in energy sector.

The total emission from the industries is around 18.125 2.2 million tons of CO2 Eq of which 12 Million tonnes of CO2 Eq. is from the cement industry alone.

3.0 STRATEGIES TO PURSUE LOW CARBON GROWTH RATE BY 2020

The overall approach for emission reduction strategy of Tamil Nadu should be to pursue an aggressive emissions reduction target. In line with the national commitment of reducing emissions intensity by 20-25% of 2005 levels by 2020, this report explores possible options to help the state of Tamil Nadu achieve similar emissions intensity reduction. Based on the instruments identified, an emissions intensity reduction of 20-25% by 2020 for the state of Tamil Nadu looks feasible.

With over 75% of emissions in Tamil Nadu arising out of energy and power related sources, it is imperative for the state to adopt an overall renewable energy strategy to reduce carbon intensity of power generation and lower its overall emission footprint. With per capita energy consumption in the state bound to rise with increasing urbanization, better standards of life and industrial growth, it is essential for the state to embark on a low carbon power supply to achieve its overall reduction targets.

Research & development play a key role in helping the state understand its emissions portfolio and identify suitable mitigation options. These R & D initiatives should also be adequately supported to convert into deployment and widespread adoption, thereby achieving the results foreseen. In these efforts, significant financial contribution is one of the deciding criteria for effective implementation of the state's low carbon strategies.

For a transition economy like India, and a progressive yet attractive investment destination such as the state of Tamil Nadu, it becomes unviable for the state to fund such climate mitigation measures through its fiscal budgets. Basic competing needs such as eradicating poverty, increasing power availability for creating livelihood opportunities, increasing literacy etc will prevail over the state's environmental concerns.

Creation of a 'Green Fund' and supporting state's climate mitigation efforts through funds raised from larger emission sources could be a viable alternative to meet environmental concerns without compromising on the citizen's fundamental requirements.

Land Use, Land Use Change and Forestry (LULUCF) can significantly act as a carbon sink in the state's efforts to minimize its overall carbon footprint. Increasing urbanization, greater demand of land for industrial, agricultural and residential purposes is resulting in rapid deforestation land use change issues. Carbon sinks in various states are gradually depleting and increasing the overall environmental concerns – water, soil & climate. States pursuing low carbon growth should lay due focus on LULUCF not only from the standpoint of carbon mitigation, but also to address other serious environmental concerns such as biodiversity preservation, prevention of soil erosion, maintaining water balance and the overall green image of the state.

4.0 FISCAL INSTRUMENTS FOR LOW CARBON GROWTH OF TAMIL NADU

As the state is aiming at 11 percent growth for the industrial sector up to 2023, the GHG emission from this sector is likely to further increase unless appropriate policy interventions are made. To facilitate low carbon economic growth and industrial growth in the state, it is imperative that appropriate policy instruments are identified and implemented in the important sectors contributing to the GHG emissions in the state.

As discussed earlier in this report, the major contributors to emission in the sate are energy, transport, waste, cement & construction. To reduce the emissions from these sectors, fiscal instruments for each of the sector have been developed and discussed below:

a. Energy sector

- Green Fund - Green cess on conventional power for financing Green fund and utilize the green fund for the following:
  - Subsidize lending for roof top solar
  - Removal of sales tax & VAT on local manufacture of RE products
  - Subsidize use of Clean technologies for Power Generation
- Solar pumps for Agriculture pumping systems

b. Transport sector

- Congestion tax to finance a city road maintenance fund to reduce use of diesel and petrol per km of use by vehicles
- Green motor vehicle tax to subsidise use of less polluting vehicles

c. Industry

- Subsidy for utilizing solid waste in cement Industry as an alternate fuel
- Cess on solid waste for improving waste management in Industry
- Reduce VAT on energy saving equipment & material

d. Construction sector

- Reducing VAT on energy saving materials accompanied by higher state VAT on high energy using materials used in construction
- Reducing property tax on green buildings accompanied by higher rate on high energy consuming properties (like malls, etc.)

4.1 Energy/ Power Sector

At present Tamil Nadu suffers from a power deficit. Own generation of TNEB is relatively low as compared to Maharashtra, Andhra Pradesh and Rajasthan. Thermal power stations generate majority of the energy, but with aging technology and infrastructure produces excessive pollution and greenhouse gases. Some of the reasons for the continued growth in CO2 emissions stem from the weak monitoring and enforcement frameworks. It is estimated for Tamil Nadu that GHG emissions by energy sector amounted to 84.72 million tonnes of CO2 equivalent, of which power sector generated 51.42 million tonnes.

Tamil Nadu is the only State in India which gets 42.5 percent of its installed capacity coming from renewable source of energy (in 2011-12).Of the total installed capacity of 10256 MW from conventional sources, the thermal plants have the capacity of 2970 MW. The hydel projects have the capacity of 2191 MW. The state has the wind energy capacity of 6697 MW. It has a very good solar potential with almost 300 clear sunny days as it receives very high solar radiation. But currently its capacity is only 10 MW. To meet the ever growing needs of energy, the State Government has to tap the solar energy, which is the single biggest source of renewable energy and offers unlimited potential. The state government has enacted various policies in order to promote renewable energy sources. These are:

Subsidy for Biofuels: Government will give 50 percent subsidy on planting material for Jatropha and other bio-fuel crops and extend the subsidy available to agro-processing industry to bio-fuel and bio-diesel extraction plants. Further, Jatropha seed will be exempted from purchase tax and Jatropha oil will be exempted from VAT for a period of 10 years from the date of commercial production.

Promotion of Renewable Energy Sources through Soft Leans and Subsidies: Soft loans at 2 percent to domestic users and capital subsidies for solar power generation;

- MNRE, Government of India subsidy for Street lighting system is 50 percent of the actual cost or a maximum of Rs.9600/- (whichever is less) is applicable for non-profit organisations in rural areas;
- Subsidy for solar photovoltaic (SPV) power plants: MNRE Government of India provides subsidy of 50 percent of the actual cost or Rs.1.25 lakhs / KWp for up to 10 KWp plant and Rs.1.50 lakhs / KWp for more than 10 KWp plant with distribution line.

Other Fiscal Measures:

Energy Taxes: These taxes are based on the carbon content of the fuel. Finland was the first country to introduce carbon tax in 1990. Its current tax structure divides tax rates between liquid fuels used in transport and heating and those for other fuels and electricity. While the tax on liquid fuel and coal takes account of both the energy content and CO2, electricity tax has no CO2 component. U.K charges climate change levy tax on business use of energy such as natural gas, electricity, LPG and solid fuels with different rates for different fuels. Sweden charges sulphur tax on liquid fuels, coal and fuel oil according to the sulphur content, in addition to carbon tax.

British Columbia levies carbon tax on the purchase and use of fossil fuels such as gasoline, diesel, natural gas, heating fuel, propane, coal, etc based on emissions of CO2 equivalent. A noteworthy aspect of Denmark's carbon-energy taxation program was the earmarking of twenty percent of the revenues to co-finance energy-efficiency measures and upgrade production technology which had marked impacts on energy productivity.

Accelerated Depreciation: The Netherlands uses carbon tax revenues to reduce the general tax burden for individuals and businesses as well as to provide programs to reduce greenhouse gases. Part of the revenue is "recycled" to businesses in the form of accelerated depreciation for environmental equipment and tax-deductibility of energy investments

Subsidies for Emerging Technologies such as Photovoltaic (PV) have the potential to solve some of the drawbacks of the fossil fuel based energy system as well as meet other development challenges such as rural electrification, energy provision and more generally poverty alleviation. Those who generate with roof top systems can consume the power so generated and also feed the surplus to the grid. Under the Rooftop Power and Stand alone Small Grid-connected Power scheme, seven SPV projects, of each 1 MW capacity have been sanctioned for the Tamil Nadu state (TEDA, 2010).

Feed-in Tariffs for supporting renewable energy. These provide a guaranteed price to the producer for the power they feed into the grid;

Feed-in Premium for renewable energy producers that provides a premium, in addition to the electricity market price (that fluctuates based on changes in market conditions);

Green Certificates where the government issues certificates to producers of renewable energy and imposes obligation on consumers to a specific percentage of energy from renewable sources. This system allows competition between renewable producers as the certificate price will depend on demand and supply of green certificates.

Grants and Subsidies to SMEs: Important lessons can be learnt from Norway's Industrial Energy Efficiency Network (IEEN) program which was set up to encourage uptake of energy efficiency measures. Between 1996 and 2006, approximately 600 of the 900 members of the network had received information and/or financial support for lowering their energy consumption. Most of these were SMEs.

Accelerated Depreciation for use of Smart Meters, Electric Grid Systems and Renewable Energy Sources: There are a number of general difficulties with regard to accelerated depreciation. For example they tend to favour large businesses since they tend to be administratively complex, unattractive to profit-oriented firms as they have an impact on business profitability. However, several countries have adopted such measures with varied degrees of success. For example, the Brazilian scheme of accelerated depreciation to encourage energy efficient investment is costly to government, yet induced technological advancement by increasing the expansion of combined heat and power plants (CHPs) by 24% (Koowattanatianchai et al, 2009). In Japan an accelerated depreciation allowance equal to 30% of the acquisition cost for specific energy efficient and renewable technologies as well as other environmentally beneficial products led to increased investment in energy-efficient products from 300 billion yen in 1990 to 800 million yen in 1993.

In the United States, the Emergency Economic Stabilization Act 2008 contains a number of depreciation incentives for increasing energy efficiency. The Act permits accelerated depreciation for smart electric meters and smart electric grid systems. Taxpayers are allowed to recover the cost of this property over 10 years. The Modified Accelerated Cost Recovery System (MACRS) allows tangible property to be depreciated on an accelerated basis according to a schedule specified by the Internal Revenue Service (IRS). Wind, solar and geothermal projects, for example, are classified as five-year property and depreciated at a set rate over the course of six years

Proposed Fiscal Instrument No. 1: Green Cess to finance green fund

Objective: The mail objective is to encourage generation of electricity from renewable sources, green cess could be levied on all generating units excluding those based on renewable energy sources and on electricity consumed for commercial and industrial purposes.

Green cess: A green cess on the generation of electricity can be implemented by the state government of Tamil Nadu, along the lines of the Gujarat government. The subsequent hike in the price of electricity for commercial and industrial consumption has to be worked out by the electricity regulatory authority and does not fall under the purview of the state government.

Gujarat has implemented a producer based green cess on the generation of all kinds of electrical energy including captive energy but excluding solar, wind, hydel, geo-thermal, bio energy and tidel energy. The tax is levied by the state government, at a rate not exceeding 2 paisa per unit of the electricity generated. The funds are credited to the consolidated fund of the state and transferred to Green energy fund after deducting collection charges; and used for the protection of environment and promoting the generation of electricity through renewable sources. Maharashtra has implemented a green cess of 8 paise per unit on commercial and industrial users of energy.

The green cess serves as a resource kept as a common pool (like a Green Fund) that can be used to subsidize the following:

1. Lending for Roof top solar

   Tamil Nadu offer enormous potential for installing roof top solar panels for producing power generation in commercial and residential buildings. Presently the installation of roof top solar panels is subsidized by MNRE.

   Tamil Nadu government may consider encouraging the roof top solar panels by subsidizing the locally manufactured solar PVs and additional incentive for the users installing roof top solar panels. The incentive can be given by encouraging Net metering systems at the end users and higher unit cost for the power generated through the solar panels installed.

2. Removal of sales tax & VAT on Local manufacture of Renewable products

   The presently levied sales tax & VAT are levied on all renewable products. To encourage local manufacturing of renewable energy products the sales and VAT may be removed.

3. Clean technologies for the power generation

   The Green fund can also be utilized for enhancing the energy efficiency of the existing power plants in Tamil Nadu by installing clean technologies. The clean technologies will support the power generating plants for improving the heat rate and reducing the auxiliary power consumption. This will in turn will reduce the cost of power generation.

International Experience: Finland was the first country to introduce carbon tax in 1990. Its current tax structure divides tax rates between liquid fuels used in transport and heating and those for other fuels and electricity. While the tax on liquid fuel and coal takes account of both the energy content and CO2, electricity tax has no CO2 component. The Netherlands uses carbon tax revenues to reduce the general tax burden for individuals and businesses as well as to provide

Proposed Fiscal Instrument No. 2: Solar Pumps for Agriculture Pumping Systems

Objective: To encourage utilization of solar energy for water pumping for the agriculture purpose. This will reduce the electricity demand and also ensure power supply for the agriculture water pumping as per the requirement.

The study estimates that about 5 Lakh water pumps are expected to be in Tamil Nadu by the year 2023.

There are currently 4.8 lakh pending electrical connections in the state. It is estimated that the cost of electrification is around Rs 1.8 lakhs per connection. This would entail a total investment of Rs. 8,640 crores for electrification of all pending connections today. Assuming a conservative growth of demand for electrical connections in the state of 1% annually, the total number of connections that will have to made will be in excess of 5 lakh by 2023. This is equivalent to a cumulative cost of close to Rs. 9,165 crores over this period.

If, in lieu of these new electrical connections, farmers were to be given solar water pumps, the savings to the government will be two fold.

- Firstly, the expenditure for new electrical connections would be saved (Rs. 9165 crores in present day terms).

- Secondly, the recurring expenditure of subsidized electricity in case these connections had been given out would also be saved (as per the current tariff schedule, agricultural connections are exempt from any energy or fixed charges). The revenue subsidy saved through this scheme is estimated to be in excess of INR 1500 crores, recurring annually.

  This scheme would involve availing a 30% capital subsidy from MNRE, with the balance portion of funding being supplied by the farmer. Based on historic evidence and data from adoption of other technologies like drip irrigation, we expect a gradual technology buy in from the farmers. To facilitate adoption, we recommend gradually increasing farmer contribution. In the first batch (2014-2016) we recommend 20% farmer contribution. In the second batch (2017-2019), we recommend 30% farmer contribution and in the third batch (2020-2023) we recommend 40% farmer contribution. The economics at play is shown below. Over the ten year horizon, we anticipate a net inflow of Rs. 1134 crores to the TN government when taking into account the savings attributable to this scheme.

Assumptions	Unit	2014	2023
Pending Connections*		4,80,000	5,24,969
*assuming 1% increase annually			
Cost incurred by Government for activating each pending connection	Rs.	1,80,000	
NPV of Cost of Electrification @ 9.5%	Rs. Crore	9,165	

	Unit Rs.	Batch I (2014 - 2016)	Batch II (2017 - 2019)	Batch III (2020 - 2023)
Number of Pumps Rolled out**		85,294	1,38,603	3,03,268
**assuming 3:2 ratio of 5hp and 7.5hp pumps				
Total Cost of Roll out	Crore	6,000	9,750	21,333
MNRE Contribution		30%	30%	30%
TN Government Contribution		50%	40%	30%
Farmer Contribution		20%	30%	40%
Savings of energising pending electrical connections @ Rs. 180,000 per connection (1)	Crore	1,535	2,495	5,459
Net Savings from Electricity Subsidy Offset (2)	Crore	514	1,606	4,983
Outflow for TN Government's portion of scheme funding (3)	Crore	-3,000	-3,900	-6,400
Total Cash Flow for TN Government (1+2+3)	Crore	-951	201	4,042
NPV of Cash Flows for scheme @ 9.5%	Crore	1,134		

Proposed Path Forward

The aim of the Government should be to reduce the revenue subsidy outflow to the maximum extent possible while providing a means of irrigation to the maximum number of people. This dual objective can be adequately addressed through large scale implementation of Solar Water Pump schemes on subsidized basis targeting pending electrical connections.

In order to make the scheme more effective, the implementing authority can take some measures as described below:

A. Create a special vehicle for implementation

To improve the efficiency of operation, the implementing authorities can create a special vehicle that is responsible for execution of the scheme. This special vehicle can be responsible for all aspects of efficient irrigation in the state including modern irrigation systems and solar water pumps, playing the role of a Green Irrigation Company in the state.

Apart from streamlining operations related to the rollout, this company can also own solar water pump assets and provide irrigation services to farmers that may not be able to afford or may not need a solar water pump on a permanent basis.

B. Back-end the subsidy payout by linking with EMI scheme

There have been cases in other states, where farmers upon receiving government subsidized solar pumps dismantle the system and sell on the expensive solar panels for a hefty profit. In order to prevent this from happening, the farmer has to be incentivized to retain the system for a significant period of time. To make the large capital investment affordable, banks should be brought in to provide EMI schemes for the solar water pumps. The farmer will be liable to make the down payment for the loan and the initial few EMI payments, with the final set of EMI payments being made by the implementing authority. This way, the following aims will be achieved:

- The farmer will be more involved in the purchasing decision due to his up front liabilities (down payment and EMIs).
- Banks will perceive lower credit risk since a large portion of the EMIs will be paid by the Government.
- Since banks are required to meet priority sector lending limits, they will be prepared to offer loans at subsidized rates, thereby improving affordability and reducing requirement for subsidy.

C. Centralized system of certification

At present, there is no centralized system for testing and certifying solar water pump systems either at national level or state level. There can be a large reduction in the transaction cost for tenders, empanelment, vendor selection and so on if the technical aspects of suppliers are tested in a standardized way. Suppliers/ pump models can be certified as conforming to a certain level of performance and can be accordingly certified (a “Gold standard” can be introduced, for instance). This way, customers can easily make informed decisions while purchasing and subsidy will only be provided to systems that are of a certain minimum quality.

As is illustrated in the previous section, the scheme if implemented will be a positive NPV scheme for the TN government; over the horizon of the Vision 2023 period, the NPV is positive Rs. 1134 crores. The NPV can be further improved by introducing measures as described in this section; government contributions can be potentially reduced by EMI schemes and other measures that improve affordability. The amount thus saved can be reinvested in the scheme so that more farmers can enjoy the benefits of solar water pumps while reducing the burden of electricity to farmers on the TN government.

4.2 Transport

Proposed Fiscal Instrument-1: Congestion Tax

Objective: To facilitate a smooth traffic movement during peak hours of traffic and reduce GHG emissions, a cess may be levied on vehicles in urban centers to facility smooth traffic movement.

Benefits: Time savings to vehicle occupants who continue to travel on the roads; improved journey time reliability, over and above direct time savings; reduced fuel and other vehicle costs.

International Experience: In 1999, the Greater London Authority (GLA) Act was passed to create a unique form of strategic citywide government in London. 14 The GLA Act (as amended by the Transport Act 2000) is also the legislative instrument which gives the Mayor the powers to introduce congestion charging schemes in London. For at least ten years all net proceeds from a scheme must be spent upon improving transport in accordance with the Mayor's transport strategy.

In Sweden, the congestion pricing system is implemented as a tax on most vehicles entering and exiting the central Stockholm, Sweden. The Road Administration worked with the federal tax Authority to manage the payment and fee structure, and overall administration. It was proposed that the revenue raised from the reintroduced congestion charge would partly fund a new bypass road and inner city traffic improvements.

In Germany, this tax is based on cylinder capacity of vehicle, over which EURO 2 per gram of CO2 emissions per kilometre (g/km) is charged if those exceed a threshold of 120 g/km.

Central Government/Other State Policies and Applicability to Tamil Nadu: Delhi is the first city in the country that plans to impose congestion tax on motorists. A task force constituted by Delhi High Court had also favored introduction of congestion tax to minimize vehicular traffic.

The Government, in the document, said 'disincentives' for use of personal vehicles may include introduction of congestion charges for entry into certain areas of the city and higher parking fees. The Municipal Corporation of Delhi, the authority charged with providing civic services to the city, hopes to introduce a system to levy a 150-rupee (£2) fee on cars, motorbikes and even rickshaws entering central areas during the day.

Of the four metropolitan cities in the country, Chennai is the most polluted city with the GHG gases and particulate emissions entering the air exceeding the tolerance limits in many parts of the city. Poor traffic flow causes frequent speed cycle changes which increase the average emission rates significantly. Therefore this tax is relevant.

Fiscal Instrument - 2 - Subsidies/ exemptions for Hybrid Vehicles (Electric/battery powered) and

Low Emissions Vehicles

Objective: Exemptions from taxes and excise duties for the hybrid cars and battery powered two-wheelers could bring down pollution levels.

International Experience: An increasing number of countries worldwide offer subsidy programs and tax relief for Electric Vehicles that might encourage higher production and compensate purchasing prices. However, implementing such a policy requires investment in appropriate supporting infrastructure (eg. charging stations) and this may be considered as a medium term proposition.

Central Government/other State Policies and Applicability to Tamil Nadu: Currently, the Motor Vehicle Tax is being levied in all States and Union Territories (UT) except in the UT of Lakshadweep on the basis of engine capacity, or, unladen weight and cost of vehicle. The purpose of motor vehicle tax (MVT) is to defray the costs of road maintenance out of the revenue realized from user charges. In July 2010, the government of India announced an incentive scheme for Electric Vehicles in India. As per this scheme the manufacturers of Electric Vehicles will receive financial incentive for each Electric Vehicle sold in India. The scheme envisages incentives of up to 20 percent on the ex-factory prices of the vehicles, subject to a maximum limit. The scheme was discontinued in April 2012 and has been re-introduced recently by MNRE. Under the MNRE's subsidy scheme announced in November 2010, the government had set up a Rs 95-crore corpus to provide incentives of up to 20 percent on ex-factory prices of vehicles, subject to a maximum limit. The cap on the incentive stood at Rs 4,000 for low-speed electric two-wheelers, Rs 5,000 for high-speed electric two-wheelers and Rs 1,00,000 for electric cars.

MNRE, GOI announced for the implementation of Alternate Fuels for Surface Transportation Programme (AFSTP) for Battery Operated Vehicles (BOVs) with CFA of Rs.4000/- or 20 percent of the cost of the vehicle for low Speed vehicle and Rs.5000/- or 20 percent of the cost of the vehicle for high Speed vehicles. TEDA has promoted 1427 BOVs – two wheelers under the above scheme so far. In 2003, a 'Green tax' under section 3-A of Tamil Nadu Motor Vehicles Taxation act was introduced. This amounted to an additional tax in respect of vehicles specified in the fourth schedule of the Act. For motor cycles of age exceeding 15 years, a sum of Rs. 500 is charged and for other vehicles, a sum of Rs. 1000 is charged.

4.3 Industry

Fiscal Instrument-1: Subsidies for waste derived fuel through co-incineration in the cement industry

Objective: Reduce carbon emissions emitted through coal consumption by integrating cement kilns with an overall waste management strategy that promotes use of alternate fuels like blast furnace slag, coal ashes, by product gypsum, waste oil, wood chips, waste plastics and waste tires etc.

Currently the government of India gives a capital subsidy for WTE programs but not for co-incineration in cement plants. Further, subsidy should be based on the energy efficiency of the program.

Benefits: Utilization of 1 kg of waste plastics in cement kilns, displacing an equivalent amount of fossil fuel in thermal units results in avoiding emissions relating to the mining, handling, transportation and use of coal at the kiln; Specialist waste incinerators are very inefficient converters of the heat content of wastes, whereas a cement kiln approaches 100 percent efficiency. A net decrease in the quantity of CO2 released, relative to a scenario in which waste is combusted in a dedicated incinerator, reduces the environmental impact of the greenhouse effect during the combustion of wastes.

International Experience: In Europe and USA, the cement industry has been using alternative fuels prepared from waste materials for more than 20 years, and high substitution rates are being achieved. The share of alternate fuels in total fuel consumption for cement production is 17.9 percent in the EU-27 countries (CEMBUREAU, 2008). Secondary fuels processed from industrial waste are commonly co-incinerated in cement kilns across Europe. About 105 kilns are reported to co-incinerate more than 2.5 million tpa of secondary fuels, mainly hazardous waste such as spent solvents, used oils and tires. Use of Refuse Driven Fuel in coal power plants and cement plants, due to the effective substitution of primary fossil fuels, shows a large number of ecological advantages when they are compared with the alternative combustion in an incinerator as long as the plants comply with the New Waste Incineration Directive 2000/76.

The waste derived fuel (WDF) projects are driven by: (a) high conventional fuel prices, (b) high landfill tax charges on waste deposits and on fossil (c) CO2 savings in emission trading schemes and (d) subsidy scheme for sustainable energy production. Cement plants are often paid to accept alternative fuels; other times the fuels are acquired for free, or at a much lower cost than the energy equivalent in coal. Thus, the lower cost of fuel can offset the cost of installing new equipment for handling the alternative fuels. Energy normally accounts for 30-40 percent of the operating costs of cement manufacturing; thus, any opportunity to save on these costs can provide a competitive edge over cement plants using traditional fuels (Mokrzycki and Uliasz- Bochenczyk, 2003)

An important EC Directive which has an impact on Refuse Derived Fuel market is the Landfill Directive 1999/31/EC which requires diversion from landfill of biodegradable fraction of MSW and used tires. The other important piece of EC legislation that will impact on coincineration of waste is the new Waste Incineration Directive 2000/76/EC which aims to bring closer the requirements for incineration and co-incineration.

The decision for a municipality or waste management company to produce Refuse Derived Fuel through Mechanical Biological Treatment (MBT) or to rely on MSW incineration to comply with the Landfill Directive will depend on whether the costs of the MBT process are less than that of incineration or thermal treatment.

Netherlands has a subsidy scheme for sustainable energy production ('Stimulering Duurzame Energieproductie', SDE) which compensates the difference in production costs between fossil and sustainable energy. Among the types of sustainable energy for which SDE subsidy is available are electricity from waste incineration and biogas from the digestion of organic waste. For waste incineration plants the subsidy amount is dependent on the energetic efficiency, which should be at least 22 percent. For energy from organic waste the basic subsidy amount is EUR 0.12 per kWh. The actual electricity price (to be determined annually) is subtracted from the basic amount.

In the United States, approximately 5 percent of fuel used in the cement industry comes from renewable and non-renewable waste fuels such as wood, tires and other non-hazardous and hazardous materials. In the U.S.A legislations vary with respect to co-incineration in the various states.

Some states like Montana do not allow co-incineration of tires in cement kilns. The California Portland Cement in Colton is a long dry kiln that is permitted to use coal, petroleum coke; natural gas, fuel oil and whole scrap tires. The Colton plant gets paid to use the scrap tires, and thus gets paid to use the energy thus generated. Also, the use of scrap tires reduces the NOx emissions from the plant, and scrap tires are therefore categorized as a NOx control strategy.

Geo-cycle is a wholly owned subsidiary of Holcim and is responsible for sourcing and processing alternative fuel and raw material feed stocks and supplying the Holcim cement plants with alternative fuels and raw materials. The plant based in Oklahama is primarily a coal-fired plant and includes two wet process kilns. The current plant fuel mix includes: Petroleum coke 25 percent, alternative fuels 20 percent (almost all tires) and remainder coal primarily. Oklahoma runs the tire program, under the Oklahoma Department of Environmental quality (DEQ). Post consumer tires pay $1 per tire; this funds the Oklahoma Tire Fund. The processors, end users, and transporters of tires are all covered by the program, but very confusing legislation and implementation. At the end of each month each tire transporter and tire processor/user sends a report to state and applies to state for funds for tires handled. The State pays out money every month.

Central Government/other State Policies and Applicability to Tamil Nadu:

- Government of India Financial Assistance to Waste to Energy Programs: Currently the central government gives a subsidy of Rs.50 lakh to Rs.1 crore/ MW for industrial waste to energy programs, depending on the technology (20 percent higher subsidy for Special Category States).
- Industrial Waste to Biogas (biomethanation): Capital subsidy of Rs. 0.5 crore to Rs. 1crore/MW.
- Power Generation from Biogas: Rs. 0.8 crore- Rs. 1 crore /MW
- 8 Sago waste based bio gas Projects have been established in the Tamil Nadu by availing CFA from MNRE to a tune of Rs.79 lakh, during the year 2011-12. CFA sanction for Rs.55 lakh has been obtained for establishing another 5 Sago waste based projects. 6 captive biogas based power projects in Agro farms for 3 MW are being commissioned with the financial assistance of MNRE.

Power Generation from Solid Industrial Waste: Rs 0.8 crore/MW

The CPCB has initiated the implementation of co-processing of incinerable hazardous and non-hazardous waste including plastic waste in cement kilns, thermal power and steel plants. The Tamil Nadu Pollution Control Board is directing the cement industries to co-incinerate the plastic waste as

an alternate fuel in the cement kiln. The cement industry at Tirunelveli is utilizing the plastic wastes in the cement kiln regularly. A subsidy for co-incineration will alter the incentives for incineration of wastes vis-à-vis co-incineration in cement plants. The Ultra-tech plant in Tamil Nadu experimented with waste to energy for material such as rubber tire chips, agro wastes and hazardous high calorific materials such as paint sludge from automobile industry and achieved successful safe disposal

Energy Recovery from Municipal Solid Waste:

Financial assistance for setting up of five Pilot projects at a flat rate of Rs. 2 crore per MW, subject to ceiling of 20 percent of project cost and Rs. 10 crore per project, whichever is less. Administrative charge of 1 percent of the MNRE's financial assistance with an upper limit of Rs 5 lakh per project shall be payable to the State Nodal Agencies (SNA) to facilitate the development and implementation of the projects and monitoring for a period of one year after commissioning. The scheme is to be implemented by involving the State Nodal Agencies, Urban Local Bodies / Municipal Corporations. The projects will be taken up by urban local bodies and other Government organizations in Public Private Partnership mode.

Emission Trading:

The Ministry of Finance has launched a concept note on the possibility of establishing a local emission trading scheme for air pollution that might serve as a modelfor future environmental regulation in India and also position industry to benefit for potential tie-ups to global emissions trading schemes. The government has selected two states: Tamil Nadu and Gujarat for the implementation of the pilot scheme. These schemes would further encourage the production of alternate fuels from waste at the state level.

Fiscal Instrument - 2 : Cess on Waste Disposal

Objective: The mail objective is to incentivize safe disposal and recycling of Hazardous/nonhazardous waste. In many countries, there are heavy "polluter pays" taxes and high duties for dumping wastes. Many prefer industries such as cement for disposing the waste safely than pay taxes. Even after facilities have become operational in some states, illegal dumping persists as it avoids the cost of transportation, treatment and disposal. A cess will ensure that companies dispose waste in a safe manner and also ensure a continuous supply of waste to the integrated waste management facilities. In addition to subsidies to recycle waste, a cess can be levied on companies that do not dispose waste in an efficient manner. The MOEF should formulate guidelines for Implementing the principle of 'Polluter to pay' for disposal of wastes (DIPP, 2011).

Benefits: Tax on waste needs to be introduced along with other economic instruments to be effective. A study by the ministry of housing, planning and environment, Netherlands, analyzed the impact of economic instruments for waste disposal and found that an increase in the tax on land filling and the introduction of a non-zero tax rate on incineration will be effective if simultaneous measures are taken which transfer the incentives of the tax on to the producers of waste (i.e. households and the service sector). This can be achieved, for example, by introducing unit-based pricing such as differential and variable rates and stimulating separate collection of waste streams.

International Experience: In EU member states, the Landfill Directive 1999/31/EC (CEC 1999) imposes a phased reduction of biodegradable waste going to landfill from 2006. It also imposes a progressive ban on the disposal of tires to landfill. Since 1995 the Netherlands has a tax on the final disposal of waste which is collected by the local municipal body. This tax is based upon article 23 of the Environmental Taxes Act ('Wet belastingen op milieugrondslag'). Until now, the area of application has been limited to land filling, as the rate for incineration is nil. In 2008, the rate for land filling amounts to •88.21 per tonne, which is relatively high compared to other EU countries that apply a landfill tax. A limited number of waste categories, including waste with a density of more than 1,100 kg per m3, are subject to a reduced rate of •14.56 per tonne. Revenues from waste taxes generally accrue to the general budget, but several countries earmark them for specific waste related or other environmental purposes. This is common practice in the new Central and Eastern European Member States, but waste tax revenues are also earmarked in Austria, Ireland, Italy and Spain (Catalonia).

Central Government/other State Policies and Applicability to Tamil Nadu: The 74th Constitutional Amendment (1992) transferred the responsibility for collection, treatment and disposal of MSW from State Governments to the Urban Local Bodies (ULBs). As per the National policy on hazardous waste (CPCB), there is a need for development of an "environment clean-up fund" at the state/ national level for which industries and municipalities have to make mandatory annual contributions. The contributions may be collected on the lines of water cess following some norms as to be decided by the government. The water cess is collected by state pollution control boards.

The cess rate is specified based on for what the water is consumed and varies from 10 to 15 paise per kilo liter based on extent of bio-degradable pollution in the water. Out of the cess collected and credited to consolidated fund of India (CFI), 80 percent of cess is reimbursed to state pollution control boards to augment the resources of boards. Cess reimbursement to state pollution control boards is also utilized to execute pollution abatement programmes. Industries that comply with effluent standards, are connected to a wastewater treatment plant, and do not consume water in excess of

the prescribed limit are entitled to a 25 percent rebate in the water cess. The rebate scheme thereby encourages compliance.

In the same way the process can be extended for levying tax on emissions from cement industries. At the state level, a waste management cess can levied upon industries based on the bio-degradability of the waste.

Waste Collection Charges in Tamil Nadu: In Namakkal, Tamil Nadu, the Municipal Commissioner in the year 2003 initiated a project especially for solid waste management wherein collection charges and penalties are being introduced. The Tamil Nadu government has prepared a manual on urban municipal solid waste generation based on the Municipal Solid Waste (Management and Handling) Rules 2000.

According to the manual, a garbage collection fee may be collected on need and affordability basis and therefore initially the domestic households and slums are not suggested for garbage collection fee. The garbage collection fee as fixed by the ULB should be collected from the bulk garbage producers while simultaneously ensuring 100% collection of garbage by the Municipal staff / Authorized agency. But council can take a decision to levy garbage collection fee from individual household through bye laws.

Private Public Partnership (PPP) Model in Gujarat: Rajkot Municipal Corporation in the State of Gujarat has developed a model which follows Public Private Partnership (PPP) mode. The Corporation has many primary collection points for collecting waste from various generation points, from where it reaches the secondary collection points and to transfer stations. Half of the city area is privatized for lifting from the collection points (RCC bins) and transportation of the waste. In the other half of the city area, RMC vehicles are used for the purpose of collection, lifting and transportation of the waste. The private operator has invested about Rs.22 Crores for developing the project. The Corporation has made 'tipping fee' payment to the operator for the quantity of rejects and inert supplied at the landfill site (about 20% of the total waste generation).

Currently a solid waste management cess is levied by the Bangalore civic body for solid waste management in the city and disposing them scientifically. According to the municipal authority (BBMP) Bangalore, it spends Rs 200 crore annually for solid waste management in the city. To manage the financial implications for the same, BBMP introduced a Solid Waste Management Cess along with BBMP property tax for property owners in Bangalore.

4.4 Construction / Building

Fiscal Instrument: 1. Reduced VAT on installation of energy saving materials.

Objectives: To encourage energy saving materials in order to reduce energy consumption. Some of the energy efficient products are: innovative lighting controls, photovoltaic solar electricity, solar resistant glass, energy recovery ventilators, energy efficient air conditioners, solar roofing membranes, and light pipe day lighting (capturing the sunlight from rooftops and piping it down through reflective tubing). Other green innovations include horizontally perforated clay hollow blocks (which besides giving excellent sound and thermal insulation save on structural costs); autoclaved aerated concrete blocks, wall form system (a construction system comprising of lightweight panels), cellular lightweight concrete (which reduces consumption of reinforcing and cement and saves energy); heat resistant terrace tiles (replicating the benefits of conventional cool roofing); thermal insulation boards; porous pavement system and Sky ceilings. Green materials also include fly ash cement, fly ash blocks, recycled aluminium, recycled steel, recycled tiles, low VOC paints and bamboo-based products.

International Experience: In the U.K, a 5 percent reduced VAT rate is applied to grant-funded installations of energy saving materials (for insulation, draught stripping, central heating system controls, including thermostatic radiator valves, hot water system controls, solar panels and renewable heating power systems. In China, VAT is exempt on sale of self-produced goods including recycled water, qualified powdered rubber made out of obsolete tires, retrodden tires, and certain construction material made of waste.

Central Government/other State Policies and Applicability to Tamil Nadu: The Bureau of Energy efficiency (BEE) has introduced "The Bachat Lamp Yojana", a programme under which households may exchange incandescent lamps for CFLs (compact fluorescent lamps) using clean development mechanism (CDM) credits to equate purchase price. Some states have made mandatory the installation of solar water heaters in hospitals, hotels and large government and commercial buildings. Subsidy is provided for installation of solar water heaters in residential buildings.

The Standards and labeling programme launched by the BEE insists assigning of star rating to the appliances depending upon their efficiency. Labeling is made mandatory for four appliances refrigerators, air conditioners, tube lights and distribution transformers) for which anything below star one cannot be manufactured or sold as per Section 14 (c) of the Energy Conservation Act, 2001. Energy efficient home lights SPV, is a fixed indoor lighting system available in five configurations under MNRE subsidy scheme. The lights used in the above systems are Compact Fluorescent Lamps (CFL), consuming less energy but equivalent to 25/40/60 W of conventional lamp. MNRE provides subsidy equivalent to 50 percent of actual cost. In addition MNRE gives subsidies for SPV power plants, water pumps and solar street lights.

Fiscal Instrument: 2. Property tax exemptions on Green Buildings / use of renewable energy sources. Such exemption could apply to both new and old constructions.

International Experience: Arizona's property tax exemption was established in June 2006 and originally applied only to "solar energy devices and any other device or system designed for the production of solar energy for on-site consumption.

Central Government/other State Policies and Applicability to Tamil Nadu: The central government has announced the Energy star rating programme, GRIHA Scheme for promoting implementation of energy efficient solar/ green building programme. The incentives are:

- To encourage Architects and Consultants to design buildings on Green Architectural concepts and get them rated under GRIHA, and incentive as per below will be available from MNRE.
- Rs. 2.5 lakh for projects up to 5000 sq.m. built-up area with minimum 3 star rating
- Rs. 5 lakh for projects > 5000 sq.m. built-up area with minimum 4 star rating
- Capital Subsidy for SPV Installations: One of the criteria is to meet 1 percent of total connected load for interior lighting and space conditioning through solar photo voltaics.
- State Government Initiatives Andhra Pradesh: Government of Andhra Pradesh has announced a rebate of 10 percent in property tax on use of solar heating and lighting system, on recycling of waste water and rain harvesting. Tamil Nadu government can also introduce a property tax on green buildings to take advantage of the fiscal incentives available from the central government
- Haryana & NCR region had announced 5% additional Floor Area Ratio for the new constructions adopting the Green building concepts and undergoing rating either in LEED / Griha.

5.0 DESIGN AND EFFECTIVENESS OF FISCAL INSTRUMENTS

5.1 Fiscal Instruments - Design Features

Broadly, the two sets of fiscal instruments used for environmental management are environmental taxes and environmental subsidies. Both are indirect instruments that operate by affecting the market prices. Taxes increase the price while subsidies reduce these. There are a number of critical differences in these two instruments. Some of these are mentioned below.

1. Taxes work as disincentives while subsidies provide incentives;

2. Taxes raise revenues while subsidies draw upon fiscal resources;

3. Taxes can generally be broad based; subsidies allow fine distinctions to be made. Although the more refined the target, the costlier it is to administer a subsidy. Very fine distinctions in tax rates according to different attributes of goods lead to a variety of classification disputes. In general, there is a preference for common tax rates for all goods and services or very broad distinctions

4. Both taxes and subsidies require additional administrative costs.

5. Viewed individually, in the case of taxes, the costs (reduced output, reduced employment) and benefits (environmental benefits, revenue benefits) may both be spread over a long period of time requiring detailed cost-benefit analysis. In the case of

   subsidies, generally costs are front-loaded (support for purchase of new machinery) and benefits (better environment) are spread over time. By using the two instruments jointly, some of the associated assessment risks can be minimized if not altogether neutralized.

With a view to maximizing their impact, all instruments in this study are designed as two part instruments. The first part is a tax and the second part is a subsidy. This strategy addresses several aspects of the design simultaneously. Its basic features are as follows:

Maximizing Environmental Impact

Taxation has a disincentive effect and it acts as a disincentive to an environment damaging activity. But taxation raises revenue, which may become part of the general budget of the government. In order to ensure that this revenue is also used for promoting environment, we develop a counterpart of the tax instrument so that a subsidy can promote environment. This two part strategy will therefore have maximum positive impact on environment both by introducing a disincentive and an incentive.

In India, two of the most significant contributors to pollution are coal and iron and steel. Both of these are part of a list under the central sales tax act (CST Act) called 'declared goods' and referred to as goods of special importance. States cannot increase the tax beyond the limit prescribed by the central government under the CST Act. This limit was fixed at 4 percent15, which has recently been increased to 5 percent. At the same time unless these inputs are taxed relatively more heavily and alongside the use of substitutes for producing energy in the case of coal and shift in the usage of iron and steel to substitutes like cleaner plastics is encouraged, a tangible dent on pollution cannot be made. The options available for this purpose are discussed in further detail later in this chapter.

Financing of Subsidy

One of the major problems in using environmental subsidies is to ensure its financing. Generally, if it is to be financed by the general budgetary resources, it gets under financed and the funding is also not ensured. In the suggestions given in this study, the subsidy is financed automatically from within the sector by raising additional revenue from the environmental tax within the sector. It also ensures sectoral fairness as the funding for the subsidy comes from within the sector. This is not to suggest that general budgetary sources should not be relied on for financing environmental subsidies.

Endogenizing Administrative Costs

Another important aspect is that there are additional administrative costs of administering both a tax and a subsidy that requires to be provided for. In the suggestions that are made here, a part of the additional tax revenue is earmarked for meeting additional administrative costs so that this cost is also met by design.

Minimising Revenue Risks

The success of an environmental fiscal intervention depends on the decision making authority agreeing to assessments of additional revenues that can be raised in the case of taxation. In all such assessments, there are revenue risks as revenues depend on market conditions. However, if programs can be designed such that the revenue risks are minimized, it is easier for decision makers to accept such decisions. A variety of strategies can be used to minimize revenue risks. Thus, a subsidy program can be scaled down in economic slow-down years when revenues fall; a separate fund can be created to neutralize cyclical variations in revenue; and suitable borrowing strategies can be put in place where the subsidy program requires a lumpy investment in the beginning.

Strategy for Cost-Benefit Analysis

Decisions regarding accepting a fiscal intervention are often based on cost-benefit analysis. Such fiscal interventions that can be shown to have a positive net present value (NPV) have positive chances of being accepted if the NPV is positive. But the cost-benefit analyses often require a variety of assumptions that relate to the future and are characterized by obvious uncertainties. Here, the cost benefit analysis is meant to cover both instruments.

Effectiveness of Fiscal Instruments

While multiple instruments can be used to reduce pollution, the choice of 'appropriate' instrument(s) could depend on either, (a) Cost Benefit analysis, (b) Cost Effectiveness analysis, or (c) Environmental Effectiveness analysis.

Cost Benefit Analysis (CBA) requires careful examination of all costs and benefits involved with the implementation of the policy instrument over a chosen time horizon along with appropriate discount rate. When applied to greenhouse gas emissions, due to long time horizons involved the choice of discount rate becomes quite complex.

Further, identifying and valuing all the benefits – including the indirect/secondary benefits – may not be an easy exercise, especially due to paucity of reliable estimates of WTP/WTA in developing countries.

Cost Effectiveness Analysis on the other hand requires careful examination of the costs of implementing various policy instruments to meet a specified environmental objective and choosing the intervention with least cost. While costs are aggregated over time in this approach also, the relatively small time horizons involved pose relatively less difficulty in the choice of discount rate.

Environmental effectiveness attempts to simply compare the environmental outcome(s) under different policy instruments with reference to the business as usual scenario and chooses the one that assures maximum environmental benefit. In the context of global pollution such as carbon dioxide the environmental effectiveness could be simple and appropriate to apply especially due to the uniformly mixed nature of such pollution.

Given the design of the instruments for Tamil Nadu outlined above, the costs of implementation are negligible. The instruments are likely to reduce carbon dioxide equivalent emissions significantly. Given high social costs associated with carbon dioxide equivalent emissions, the emission reductions will lead to substantial social benefits. Thus, on one hand, the costs of intervention are negligible by design and on the other hand the benefits of intervention are high due to avoided greenhouse gas (GHG) emissions. Therefore, the cost-benefit and cost effectiveness analyses under these circumstances will overwhelmingly support the intervention. Hence, it would suffice to assess the avoided GHG emissions under various policy interventions. If the intervention could generate significant GHG emission reduction then the intervention under consideration could be justified.

The rest of this chapter illustrates the effectiveness analysis of some select fiscal instruments – namely, green cess on electricity generation and rebate on property tax for green buildings.

Effectiveness Analysis of Green Cess on Electricity

The methodology adopted for carrying out cost-benefit analysis and environmental effectiveness analysis of the proposed fiscal instrument-green cess on electricity is described here. The basic approach involves the following steps:

- To project various plausible future scenarios of electricity production in Tamil Nadu over the period 2011-12 to 2030-31. This includes assumptions about the future grid-mix in Tamil Nadu that takes into account the state policies on renewable electricity generation such as wind based electricity.
- To estimate the baseline coal consumption under various future scenarios and baseline GHG emissions (in CO2 equivalent terms).
- To assess the potential fund generated through the green cess and the costs associated with its administration.
- To project potential implications of the green fund on, (a) increase in plant efficiency; and (b) greater penetration of renewable in electricity generation, and re-estimate the coal consumption with green-cess in place along with the CO2eq emissions.
- To estimate the present value of the cost of implementation of the green cess and the present value of avoided damage costs associated with reduced GHG emissions resulting from the lower coal consumption.

- To assess the effectiveness of the fiscal intervention by, (a) estimating the overall GHG emission reductions, (b) calculating the ratio of costs to the avoided GHG emissions (cost-effectiveness), and (c) calculating the ratio of the present-value of costs of implementing the fiscal measure to the present-value of the benefits of implementing the fiscal measure (cost-benefit analysis).

Projecting Future Electricity Demand in Tamil Nadu

For the purpose of projecting electricity demand in Tamil Nadu, the elasticity of electricity demand to GSDP has been taken as 0.82 for the entire analysis period. Using the elasticity and the future projections about the GSDP in Tamil Nadu the electricity demand has been estimated. The GSDP projections are based on two possibilities – 8 percent growth (Scenario 1) consistent with the approach adopted by the Integrated Energy Policy Report of the Government of India; and Tamil Nadu State Vision-2023 document, which amounts to 11 percent growth rate (Scenario 2); see chapter 2 for further details. Table 7.2 provides the projected electricity demand in TWh (tera watt hour) for several years under two different scenarios. Chart 7.1 shows these projections graphically.

Electricity demand projection in Tamil Nadu in TWh

Year	Scenario-1 (8% GSDP Growth)	Scenario-2 (11% GSDP Growth)
2011-12	77.2	77.2
2015-16	99.5	109.1
2020-21	136.8	167.9
2030-31	258.2	398.3

Assessing Electricity Grid-mix in Tamil Nadu

As per the Energy Policy Note of the Government of Tamil Nadu, the grid-mix as on June 2012 is: total generation capacity of the state is 7656.22 MW. Of this the thermal capacity is 7617.33 MW, representing 43.14 percent of the grid capacity of Tamil Nadu.

Source	Coal	Gas	Diesel	Total Thermal	Nuclear	Hydro	Renewable	Total
State	2970	523.2	0	3493.2	0	2122.2	118.55	5733.95
Private	250	503.1	411.66	1164.76	0	0	7274.14	8438.9
Central	2959.37	0	0	2959.37	524	0		3483.37
Total	6179.37	1026.3	411.66	7617.33	524	2122.2	7392.69	17656.22

Source: Policy Note, Energy Department, Government of Tamil Nadu.

Given the grid mix of capacity and with plausible load factors for various power plants using different fuels, the percentage share of various fuels in the electricity generation is estimated and shown below.

Share	Coal	Gas	Diesel	Nuclear	Hydro	Renewable*
%	53	9	4	3	11	21

Note: Renewable sources mainly include wind based electricity generation.

Future Scenarios of Electricity Generation in Tamil Nadu

Various future scenarios of electricity generation in Tamil Nadu are assessed with following assumptions:

(1) High Coal Mix Scenarios:

a. 8 percent GSDP growth

b. 11 percent GSDP growth

(2) High Renewable Scenarios:

a. 8 percent GSDP growth

b. 11 percent GSDP growth

For the high-coal mix scenario, the following assumptions are made:

- Gas, Diesel, Hydro capacity stays at the 2011-12 level through-out
- Nuclear capacity increases to reach a capacity of about 1750 MW by 2030
- Renewable increase by 1000 MW per year up to 2015-16 as per the Tamil Nadu Wind Energy Policy; after that the capacity stays at that level
- The balance of the demand is met through coal-based thermal power

For the high-renewable scenario, the following assumptions are made:

- Gas, Diesel, Hydro capacity stays at the 2011-12 level through-out
- Nuclear capacity increases to reach a capacity of about 1750MW by 2030
- Renewable capacity increases by 1000 MW per year through-out the period
- The balance of the demand is met through coal-based thermal power

In the scenario with high coal and 8 percent GSDP growth, the coal power generation capacity is likely to be 205.62 TWh in 2030-31 and the renewable capacity is likely to reach 25 TWh. In the scenario with high coal mix and 11 percent GSDP growth, the coal power generation capacity is likely to reach 346. 95 TWh while the renewable capacity is likely to reach 25 TWh in 2030-31. In high renewable scenarios, the coal power generation is likely to be 172. 61 TWh when GSDP grows at 8 percent. It is likely to be 262.05 TWh when GSDP grows at 11 percent. At the same time, the renewable capacity is likely to reach 58.01 TWh.

(a) High Coal Mix: 8 Percent GSDP Growth (in TWh)

Year	Coal	Gas	Diesel	Nuclear	Hydro	Renewable
2015-16	54.27	6.74	2.70	3.34	8.37	25.01
2020-21	92.10	6.74	2.70	4.65	8.37	25.00
2025-26	140.75	6.74	2.70	6.32	8.37	25.00
2030-31	205.62	6.74	2.70	8.56	8.37	25.00

(b) High Coal Mix: 11 Percent GSDP Growth (in TWh)

Year	Coal	Gas	Diesel	Nuclear	Hydro	Renewable
2015-16	62.88	6.74	2.70	3.34	8.37	25.01
2020-21	120.49	6.74	2.70	4.65	8.37	25.00
2025-26	209.51	6.74	2.70	6.32	8.37	25.00
2030-31	346.95	6.74	2.70	8.56	8.37	25.00

(c) High Renewable: 8 Percent GSDP Growth (in TWh)

Year	Coal	Gas	Diesel	Nuclear	Hydro	Renewable
2015-16	54.27	6.74	2.70	3.34	8.37	25.01
2020-21	81.09	6.74	2.70	4.65	8.37	36.01
2025-26	118.73	6.74	2.70	6.32	8.37	47.01
2030-31	172.61	6.74	2.70	8.56	8.37	58.01

(d) High Renewable: 11 Percent GSDP Growth (in TWh)

Year	Coal	Gas	Diesel	Nuclear	Hydro	Renewable
2015-16	58.41	6.74	2.70	3.34	8.37	25.01
2020-21	99.21	6.74	2.70	4.65	8.37	36.01
2025-26	164.14	6.74	2.70	6.32	8.37	47.01
2030-31	262.05	6.74	2.70	8.56	8.37	58.01

Social Damage Costs of Carbon

Various studies estimated the social damages costs associated with greenhouse gas emissions and the associated climate change. These costs are highly uncertain. For the purpose of our analysis, we have considered the figures shown in Table 7.6, which have been sourced from the literature and these figures are in line with those utilized in studies on West Bengal and Orissa carried out by Eunomia consultants (Hogg et al., 2012).

CO2 Damage Costs, 2011-12 Prices, INR per ton CO2eq

Year	Upper	Central	Lower
2015-16	4341	1725	1070
2020-21	4877	1903	1189
2025-26	5531	2141	1368
2030-31	6185	2379	1546
2030-31	6185	2379	1546

The emission of the local pollutants such as particulate matter, sulfur dioxide and nitrous oxides also decreases with the lower consumption of conventional fuels such as coal. The analysis does not explicitly quantify the health benefits associated with the reduction in local pollutants. If accounted the fiscal intervention would be further favored.

Green Cess on Electricity – Quantity and Fund Generated

The green cess on electricity generation is proposed to collect Re. 0.02 per kwh of electricity generated through conventional fuels such as coal, gas and diesel. This will be equivalent to Rs. 50 per ton of coal. The green fund is estimated as shown in Table below. The estimates shown here and in the rest of the analysis are for high-coal mix and 8 percent growth rate scenario.

Year	Green Fund, in Rs.Crore
2015-16	127
2020-21	203
2025-26	300
2030-31	430

GHG Emission Savings through Plant Efficiency Improvement

For the purpose of assessing GHG emissions, we have used certain assumptions with reference to various hydro-carbon fuels. These are shown below.

Details	Coal	Gas	Diesel
Energy content, MJ/kg	20	40	40
Net plant efficiency (%)	32	50	40
Fuel required, kg/kwh	0.57	0.18	0.22

The green cess could boost the plant efficiency and would lead to reduction in coal consumption. With Green Cess, the Net Plant efficiency is assumed to increase by 2 percent for coal plants in 2030-31; for the intermediate years, the efficiency improvements are linearly interpolated. The associated CO2eq emission reduction savings estimated for High Coal-mix, 8 percent GSDP growth scenario are shown in table given below.

Year	CO_2eq Emission Reductions
2015-16	0.7
2020-21	2.8
2025-26	6.6
2030-31	13.0
Cumulative Emission Reduction, 2012-13 to 2030-31	86.2

GHG Emission Savings through Higher Share of Renewable Resources

The green fund generated through the green cess would be utilized for promoting greater penetration of renewable resources in electricity generation. This can be facilitated through appropriate design of subsidies. Since the BAU scenarios assume capacity additions for renewable resources for the first four years, no additional capacity has been considered till 2015-16. For the period starting from 2016-17 to 2030-31, an additional capacity of 200MW of other renewable resources has been assumed to be added every year. The Table given below illustrates the GHG emission reductions estimated for high coal-mix, 8 percent GSDP scenario.

Year	CO_2eq Emission Reductions
2016-17	0.5
2020-21	2.4
2025-26	4.7
2030-31	7.1
Cumulative Emission Reduction, 2012-13 to 2030-31	56.9

Social Damages Avoided

Using the social damage costs of carbon given earlier and the CO2eq emission reductions estimated, the social damages avoided are calculated. The table below shows the net-present value of the damage costs avoided over the period 2012-13 to 2030-31 in Tamil Nadu due to the introduction of the Green Cess on electricity generation from the conventional resources. For the purpose of calculating the net-present value, we use 8 percent discount rate.

	Upper Estimate	Central Estimate	Lower Estimate
Through Plant Efficiency Improvement	173788	67400	42989
Through Greater Penetration of Renewable Resources	115750	44874	28602

Costs Associated with Green Cess Administration

The costs associated with the administration of the Green Cess are estimated at 0.1 percent of the green fund generated. The net-present value of the administration costs over the period 2012-13 to 2030-31 is estimated as Rs. 20.5 millions.

Cost Effectiveness and Cost-Benefit Analysis

Using the above information on costs and benefits of intervention and the GHG emission reductions achieved the effectiveness of the intervention (namely, Green Cess) are illustrated in the table below.

Details	Upper Estimate	Central Estimate	Lower Estimate
NPV of Costs (Rs. Crore)	2.05	2.05	2.05
NPV of Benefits (Rs. Crore)	28953	11227	7159
NPV of net benefits (Rs. Crore)	28932	11206	7138
Total GHG Emission Reduction, (Million Tons of CO_2eq)	146.1	146.1	146.1
Cost effectiveness (Rs/ton CO_2eq)	0.14	0.14	0.14

Effectiveness Analysis of Rebate on Property Tax for Green buildings

The real estate sector is a major consumer of energy. This sector is the end user of energy as well as consumer of various raw materials that influence the usage of energy. The contribution of construction sector to GDP is 10%, and is a significant contributor to the growth of the economy. However, a higher growth is not favorable unless the composition of the growth is environmentally sustainable. The increasing rate of urbanization poses serious challenges in energy conservation and emission of GHGs. Based on secondary sources, it is estimated that during 2008-12, 80 percent of projected demand in real estate space will come from seven major cities including Delhi, Bangalore, Bombay, Pune, Chennai, Hyderabad and Kolkata. Although the residential sector accounts for 37 percent of energy usage, industry and services together account for 40 percent of primary energy use. According to BEE, most commercial buildings in India have Energy Performance Index (EPI) of 200 kwh/sqm/year or higher. The BEE considers 180 kwh/sqm/year as the typical national average and states that the buildings in North America and Europe have EPI of less than 150 kwh/sqm/year due to overall efficiency gains.

One of the recent McKinsey estimates shows that the national power demand can be reduced by as much as 25 percent in 2030 by improving energy efficiency of buildings and operations. With improved and optimized insulation, highest efficiency electric appliances energy consumption for heating, ventilation and air conditioning, energy consumption can be reduced by 55 per cent – this can cut 150 million tonnes of CO2 by 2030.

For the construction sector, we suggest a policy instrument that includes a rebate of 10 percent on property tax paid by existing as well as new operational units incorporating 'green' measures. The state government would receive lesser revenue from property tax. For the policy to be revenue neutral, we suggest that a green fund be created that can be used to subsidize the green buildings. This can be generated by specifying a threshold energy consumption level and charging a higher tax rate for highly polluting buildings that exceed the threshold energy consumption baseline. Thus revenue is raised by determining a threshold level of energy consumption per square feet and charging a higher tax on buildings exceeding these norms. The mechanism will only operate for the first 5 years of operation of the new building, as the principle aim is to give businesses the financial incentive to invest in new 'green' measures at the design and build stage of the unit, not to provide continuous funding for what could be 20/30 years of operation of an industrial or commercial unit.

The potential list of eligible green / energy efficiency measures could include use of energy efficient lighting throughout the unit; use of rated energy efficient motors, with a rating of EFF1 (as per the rating of the Bureau of Indian Standards, BIS) or higher; use of solar PV for lighting in common areas; use of solar thermal for heating water for non-process use; use of energy efficient equipment; and use of BEE 5-star rated appliances throughout the unit.

Methodology

The effectiveness of the policy intervention would follow the steps outlined below:

- Implications of reduced revenue from property tax;
- Estimation of stock of green and polluting buildings in Chennai; calculation of amount of green fund generated assuming that the percentage of highly polluting buildings reduces from 30 percent to 10 percent during 2012-20 and stays at that level up to 2030. We also assume that percentage of buildings adopting green measures increases from 10 percent to 35 percent during this time period and proportion of other buildings decreases from 60 percent to 55 percent;
- Estimation of administrative costs for implementing the rebate;
- Assuming energy savings of green measures up to 40 percent, reduction in total GHG emission intensity is estimated if 35 percent of buildings adopt green measures by 2015 and remain at that level upto 2030; and
- Estimation of environmental benefits from increased energy efficiency stemming from the green measures.

Estimating the Commercial Floor Space and Energy Consumption in Tamil Nadu

As the database on real estate in India is not available, various secondary sources are used to estimate commercial floor space in India, including McKinsey (2009), USAID, ECO –III and climate works foundation. The estimates of commercial floor space in India are then used to arrive at the commercial floor space in Tamil Nadu by multiplying it with the state's GDP share

Projection	2011-12	2020-21	2030-31
Upper	86	179	405
Central	63	112	213
Lower	42	54	73

An average Energy Use Intensity (EUI) of 70 kWh / m2 was used to estimate the energy consumed by the commercial buildings in Tamil Nadu

Projection	2011-12	2020-21	2030-31
Upper	6	12	26
Central	4	7	13
Lower	3	4	5

Rebate on Green Buildings

To estimate the green fund that can be generated to subsidize the buildings adopting green measures, we estimate the stock of commercial buildings in the capital city of Tamil Nadu, Chennai. In this study, we arrive at estimates of the stock of commercial buildings, green fund generated and administration costs in the following way:

1. The property tax is levied half yearly at the rate of 12.4 percent on the annual value of the property. We estimate the yearly property tax revenue for 2012-2030 @ 10 percent p.a.

Grade	Annual Value	Total
I	Rs.1 to 500	6.62 %
II	Rs501 to 1000	9.92 %
III	Rs.1001 to 5000	11.02 %
IV	Rs.5001 and above	12.40 %

Method of Fixing Annual Value: Example

- Plinth Area x Basic Rate per sq.ft. = Monthly Rental Value (M.R.V.) Rs.100 p.m.
- Annual Rental Value Rs.100 x 12 = Rs.1,200.00 Less 10% for Land Value (Rs. 120.00)
- Annual rental value = 1080 Less 10% depreciation on the building (Rs.108.00)
- Depreciated value of the building = Rs.972.00
- Add :10% of the land value arrived earlier = Rs.120.00
- Annual Value for land and Building = Rs.1,092.00
- For working Annual Value use the factor 10.92; Annual Value = M.R.V x 10.92

2. Estimate the share of taxes attributed by commercial properties @ 19% of total property tax revenue, assuming that property tax revenue is proportional to size of commercial floor space in total floor space available for residential, commercial and retail.

   For Non-Residential Properties, basic rental rate ranges from minimum of Rs.4.00 to maximum of Rs.12.00 per Sq.ft. At an average size of 2000 sq. feet for commercial buildings in Chennai and an average rental rate of 8 per square feet, the rental value works out to Rs. 16000. After deducting the depreciation, the value is Rs.12000. After applying the factor of 10.92, the annual value is Rs.131040

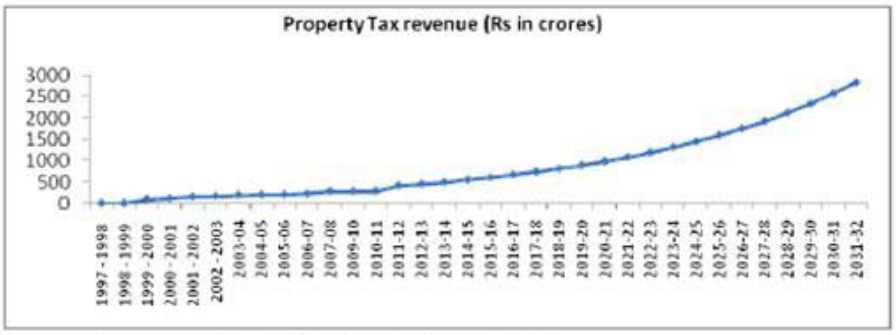
3. Assuming the average annual value of a commercial property in Chennai to be Rs.1,20,000, estimate the number of commercial buildings by dividing (2) by 1.2.We get an approximate figure of 26815 commercial buildings in Chennai for 2011-12, which is close to the estimates by independent studies mentioned in the following paragraph.

4. Next we estimate the green fund @ 10 percent tax rebate assuming the number of green buildings progressively increases from 10 percent to 35 percent in 2020 and stays at that level up to 2030-31.

5. The administration cost of implementing the rebate is assumed to be 1 percent of the rebate. The present value of the administration cost at a social discount of 8 percent p.a., comes to Rs. 3.2 crores for the period 2012-13 to 2030-31.

6. In order for the policy instrument to be revenue neutral, the property tax on buildings that are highly polluting is estimated to increase by 4 percent in 2012-13. As more buildings adopt green measures, the tax is expected to increase by 35 percent by 2020-21 and stay at that level.

Estimated Property Tax Revenue in Chennai by National Institute of Urban Affairs



Source: National Institute of Urban Affairs, March 2011; Own estimates

The Stock of Commercial Buildings

A study done by the Center for Science and Environment estimates that, of the total real estate demand in Chennai for 2012, 60 percent is for residential, 19 percent is for commercial and 21 percent for retail and hospitality

The Chennai office market has witnessed remarkable growth from nearly 10 million sq ft in 4Q05 to 45 million sq ft in 2Q11. Every 13 quarters, Chennai has added 20 million sq ft of office space since 2006. The growth has been mainly led by offices built for the IT industry (as IT Parks or IT Special Economic Zones), which constitute 86 percent of the operational office stock in Chennai. As per this study, residential properties will increase to 70000 units by 2014, making the stock of commercial properties to 22000. Another estimates the number of residential properties for sale in Chennai to be more than approximately 45142 during 2010, which puts the total number of buildings in Chennai, roughly at 57500 (including old as well as new properties in 2010) and commercial properties at 15000.

The urban land buildings (ULBs) in TN have been following the Annual Value Method of property taxation. The annual value is deemed to be the gross annual rent at which they may reasonably be expected from month to month or from year to year less a deduction from the cost of building of 10 percent for maintenance. In case of buildings not ordinarily let, the annual value is deemed to be of the total estimated value of land and the estimated present cost of erecting the building less 10 percent depreciation.

Estimated Benefits

Based on the assumptions above, the savings in total GHG emission intensity, externalities in terms of damage costs and admin costs at 1 percent of green fund generated are given in table below. The three scenarios refer to the proportion of buildings adopting the green measures at 35 percent in the upper scenario, 25 percent in the central scenario and 10 percent in the lower scenario.

Parameter	Upper	Central	Lower
Total GHG Reduction, kt CO2 eq	-46,233	-26,189	-7487
NPV Net Cost of Green Measures, Rs. Crore	0	0	0
NPV Administration Costs, Rs. Crore	3.2	3.2	3.2
NPV Externalities, Rs. Crore	-8,920	-791	-154
NPV Net Costs, Rs. Crore	-8,920	-791	-154
Cost Effectiveness, Rs. / tonne CO2 eq	0.19	0.03	0.02

6.0 CONCLUSION

The Tamil Nadu Carbon Foot Print study clearly indicates that the major contribution for the Green House Gas emissions is from the Energy sector which includes the power generating stations & Transport sector and the industry. The GHG emissions on account of Energy sector and industry accounts for more than 90% of the total GHG emissions from the state.

As per the vision 2023, with the target growing more than 11% GSDP for the next 11 years, the carbon foot print of the state likely to increase significantly. Hence to bring down the carbon emissions without compromising on the high and accelerated growth, the Tamil Nadu Government has to proactively introduce the policy measures.

The study had been taken up considering the Vision 2023 of the state and prioritized the fiscal instruments for facilitating the low carbon growth based on its cost effectiveness for reducing the GHG emissions. The prioritization was done considering the inputs from various stake holders in the state including industry and the government. While implementing the policy measures, the Government need not limit to only the identified fiscal instruments. However, the study strongly recommends the following identified focus sectors for implementing the policy measures for facilitating low carbon growth.

- Energy sector – Power generation & renewable energy
- Transport
- Industry
- Construction / Building

The combination of Tax and Incentive approach will be more effective for encouraging the non-polluters and discouraging the polluters. This will also facilitate the state to attract investments in non-polluting or Green sectors which ultimately will lead to economic growth without significantly increasing the carbon foot print.