The intent of this document is to review and make recommendations on approaches to Urban Climate Resilience to the Government of Tamil Nadu, based on the work done in the field under the CapaCITIES project, supported by the Swiss Agency for Development Corporation (SDC), particularly in Coimbatore.

In Tamil Nadu, the CapaCITIES project has, with the Coimbatore Municipal Corporation, successfully outlined the Coimbatore Climate Resilient City Action Plan (CRCAP), implemented pilot ‘Quick Win’ projects and developed long term ‘Bankable’ projects in the prioritized themes of solid waste management (SWM), air quality and transportation (AQ & T) and waste and wastewater management (WWM). The actual interventions under each, can be referred in the thematic briefs published separately. This brief looks at the Climate Change projections and impacts on Tamil Nadu, gaps in the current policy and implementation space, and makes policy recommendations at State and City level for scaling and replication of lessons from CapaCITIES across the State.

Introduction: Climate Change in Tamil Nadu and need for Urban Climate Action

The coastal state of Tamil Nadu is naturally endowed with rich biodiversity, it also has the highest level of urbanization in India¹. Coupled with the impacts of climate change and the projected changes (Figure 1, 2), the state faces uncertainty and consequences, creating a significant role for government interventions. Therefore, the role of policy at the state level is an imperative to manage risks and allocate fair distribution of resources to ensure socio economic development while safe guarding the environment.

From 1951 to 2008 the state has seen warming of 0.7 to 0.8°C above normal. Studies in Coimbatore found warming in maximum and minimum temperature up to 0.1 to 2.7°C from 1962 to 1992. The maximum temperature in Tamil Nadu is projected to increase by 1.10C, 2.00C and 3.40C in the years 2040, 2070 and 2100 respectively². District-wise changes indicate a general maximum increase of about 1.30C over North-western districts of Nilgiris, Coimbatore, Tiruppur and western parts of Dindigul (Figure 1).

The analysis of 25 year return period of rainfall shows a large variation from 10 cm in the western parts of Tamil Nadu to 25 cm and more in the northern and central coastal regions of the state². The impacts of climate change are varied, for example, the loss of land as a result of sea level rise is the biggest component of the total damage estimated and it ranges from about 74 - 97% of total minimum and maximum values across all districts respectively. Monetary damages as a result of sea level rise are the highest in the coastal districts of Nagapattinam, Kancheepuram, Thiruvallur and Chennai. Total losses for the Tamil Nadu state as a whole range between Rs. 369 – 6,184 thousand crores¹.

Climate projections indicate a general increase in rainfall by about 7cm for 2040 to 2070, and 9 cm for 2070 to 2100. The principal seasons - South West and North East monsoons are also projected to increase in rainfall, ranging from 1.2 to 1.9 cm for 2040, 2070 and 2100 (Figure 2), with most projections predicting fewer days but with higher intensity of rainfall. The overall number of cyclones are projected to decrease, however, the wind intensity of those occurring may increase. Finally, it is projected that by the end of the century sea level may rise by 1.1 - 1.25m off the Tamil Nadu coast resulting in an increase by 0.19 - 0.83m².

Therefore, it is essential for the State to identify its vulnerabilities from hazards by making the impacts of climate change a priority while planning policies. Policy needs to be updated to be climate smart, seeded in climate projections to take comprehensive, concise decisions especially in the urban scape as they are the socio economic powerhouses of a thriving State such as Tamil Nadu.

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Currently in Tamil Nadu there are a number of policies (Central & State) applicable for the thematic areas of Solid Waste Management, Air Quality & Transport and Water & Wastewater Management. The key agencies legislating and executing policies in the three areas are shown in Figure 4a & 4b. Typically, Central Ministries direct, mandate and support the execution of policies, programmes and schemes, while the State Government in turn works with Urban/Rural Local Bodies to action interventions at the ground level ensuring improvement measures.

**Current Policies in Tamil Nadu and Primary Challenges in Building Urban Climate Resilience**

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**Figure 3** Coimbatore GHG inventory and Vulnerability Mapping in CapaCITIES Project; Source: Coimbatore Climate Resilient City Action Plan

**Figure 4** Organogram of the arrangement and structure of the Centre and Tamil Nadu State works in the various thematic areas

**Figure 5** State level legislation in 1. Solid Waste, 2. Water and Waste Water and 3. Air Quality and Transportation
Solid Waste Management

Solid Waste Management Rules, 2016
As per the rules, citizens are responsible for segregations of house hold waste into wet and dry waste while the local bodies are responsible for the collection, treatment and disposal of solid waste. The Tamil Nadu Pollution Control Board (TNPCB) is the monitoring authority and is responsible for granting authorization to local bodies for processing and disposal of solid waste3.

State Sanitation Strategies under National Urban sanitation Policy (NUSP)
The policy advocates all the cities to become free from open defecation and that all human waste and liquid waste be collected and safely treated. Provision of sustainable sanitation has been identified as a key-driver for economic and sustainable development in general4.

Challenges
In Tamil Nadu there are 12 Corporations, 124 Municipalities and 528 Town Panchayats which collectively generate 14,600 Tonnes/day of solid waste. The Government of Tamil Nadu has been proactive in setting up new biomethanation plants using municipal solid waste in the state. Following the successful testing of the pilot project at Arcot municipality, the Government has proposed to set up 29 new biomethanation plants of 3-5 MT capacity across 5 corporations and 24 municipalities.

As per SWM Rules, 2016, Tamil Nadu has to scientifically cap all its landfills and dumping grounds.
Among the 12 corporations in Tamil Nadu, only six treat their municipal solid waste.
Prime challenges in cities are inadequate segregation of waste at source, and improper disposal in land fill site leading to serious environmental challenges.

Air Quality and Transportation

Air (Prevention and Control of Pollution) Act, 1981
As per the provision of the act, the entire state of Tamil Nadu has been declared as an air pollution control area and TNPCB constituted for the prevention, control and abatement of air pollution empowering TNPCB with laying down emission and ambient air quality standards5.

Transforming Tamil Nadu Project
The Tamil Nadu Commissionerate of Municipal Administration (CMA), with technical assistance from ITDP India, initiated the Transforming Tamil Nadu project to create Complete Streets master plans. It includes state financing of Rs 20,000 crore to redevelop 1,700 km of urban streets to improve safety, accessibility & liveability of road users, while improving pedestrianization and encouraging public transport6.

Challenges
The total number of motor vehicles in Tamil Nadu grew by 125% during 2005-06 and 2013-14. Besides Chennai, Ariyalur and Coimbatore districts have high vehicle densities in excess of 200 vehicles per km.
Over 2008-09 and 2013-14, the average annual SO2 concentrations increased in all locations in Chennai, Madurai and Trichy. The Respirable Suspended Particulate Matter (RSPM) concentrations also saw an increase in all locations in Tamil Nadu over the same period.
The TNPCB monitors the status of air quality in cities and towns of Tamil Nadu. Currently six continuous ambient air quality monitoring stations are in use. More across the State are required.
Strides have been made to widen the public transport facilities and network. However more effort is required to reduce traffic congestion as well as provide alternative modes of transportation that are better for the environment, reduce air pollution, noise and climate change.

Water and Waste Water Management

Tamil Nadu Water (Prevention and Control of Pollution) Rules, 1983
The rules empower TNPCB to lay down standards for sewage / trade effluents. It prohibits the pollution of a stream or well by disposal of polluting matter etc. It also empowers TNCPB to take action on the presence of noxious or polluting matter in any stream or well or sewer or land and issue orders restraining or prohibiting the same including discharge into marine coastal areas7.

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Key Recommendations for building Climate Resilient Policy in Tamil Nadu

1. Need for Integrated Planning

The State Government, ideally through the Commissionerate of Municipal Administration under the Urban Development and Housing Department, must work on a State-wide Urban Climate Resilient Policy and frame the necessary guidelines to steer the ULB actions for all tiers or classes of cities.

As a State matter, this is under the purview of GoTN and therefore must be localized. The policy should bear in mind the major climate change impacts listed above (specially as a coastal state) and set specific targets and responsibilities at regional and city administration levels. The guidelines can:

- Set out easy steps for integrated planning for each type of cities (coastal, forested, industrial, etc.), looking at the major climate change impacts listed in above (specially as a coastal state) and set specific targets and responsibilities at regional and city administration levels. The guidelines can:

- With high levels of urbanization, an estimated 40 million litres per day of water is transported from the peri-urban areas to cities drawing ground water from the riverbed aquifer.
- Tamil Nadu accounts for nearly 9% of India’s slum population, with the five major cities (Chennai, Madurai, Tiruppur, Tiruchirapalli and Coimbatore) accounting for 1/3rd of the total slum population in the state. Sustainable Development Goal 6 of the UN, ‘Access to potable water’, calls for clean water & sanitation for all people, and Tamil Nadu as a progressive state must safeguard water security for all.
- A good portion of potable water is wasted, hence need to curb wastage of non-revenue water (NRW).
- Universal implementation of zero liquid discharge system across all the common effluent treatment plants established in tanneries and textile dyeing processing units in Tamil Nadu.
- Two desalination plants have been established in the state to meet water requirements in Chennai, while three more have been planned to boost drinking water supply in Chennai, Thoothukudi and Ramanathapuram districts.

2. Institutionalizing Climate Action in Urban local bodies

City Governments must augment their capacity with technical positions (specialized in urban / environmental planning), to conduct the following activities:

- Prepare the City Climate Action Plan (pointers in Figure 5) and get approval of the elected body.
- Check for and incorporate climate perspective (from the action plan) into existing detailed project reports (DPRs) of proposed infrastructure projects, so as to enhance climate resilience.

Challenges

Coimbatore tops the list of districts reporting severe water contamination, with over 40% of its tested sources turning out to be contaminated in terms of fluoride, nitrate, iron and faecal contamination in 2011. As of 2013-14, the water supply shortfall has been recorded as 29.5% across the urban areas in the State. Similar shortages are observed with regard to other amenities such as housing and drainage.

- TNPCB is monitoring the inland water quality under the MINARS programme. Under MINARS programme, the rivers Cauvery, Tamirabarani, Palar and Vaigai and the lakes Udthagamandalam, KodaiKanal, Yercaud, Veeranam, Porur, Poondi, Puducherry and Redhills are being monitored.
- The above includes both residential and non-residential / commercial waste (excluding industrial waste). These Operative Guidelines for septage management seek to empower the local bodies with knowledge, procedures and facilities. (Government of Tamil Nadu, 2014)

- The CRCAP methodology is grounded in empirical and sound qualitative data analysis allows cities to design their own strategies in coping with and mitigating negative climate change to foster urban climate resilience. Coimbatore generated its greenhouse gas (GHG) inventory, identified the most vulnerable hotspots, and generated climate fragility statements, based on which the city identified the best interventions to mitigate climate change. (Figure 3)
The City Climate Action Plan should be developed by the City Authorities with inclusion of academia, industry and non-state players of repute in Climate Action and go through a theory of change or revision matrix.

Have a Climate Focus and use-specific targets. These can be GHG emission reduction or improvement in any of the performance metrics or indices by Central or State Governments. Include the three sectors expanded on in this brief as well as additional sectors such as commercial, corporation and residential buildings and open spaces while identifying resilience interventions.

Identify relevant data, through an urban systems analysis (based on a GHG inventory or other climate targets) but which is especially done for the city.

Include a vulnerability mapping exercise identifying wards that are at risk and hotspots for climate induced hazards or extreme events, such as floods and droughts that may hit the city.

Include a fragility statement which indicates the priorities to mitigate and adapt to climate change in the form of climate smart interventions.

As with all plans, finally to have a list of strategic interventions / projects, prioritized based on Climate impacts and benefit analysis.

3. Setting a Financial Approach

City governments must set a financial approach for Climate Action. These can be seen broadly as:

- Generic: related to city-level and systemic actions, including preparation of the plans with necessary background studies, surveys, mapping and analysis. Such pan-city actions can be funded through regular budget lines in city budgets (HR and technical in each department) and through A&OE budget lines of particular Missions / Schemes. The City government can also explore technical assistance funding through bi-lateral and multi-lateral organizations for this purpose.

- Particular: related to specific projects in thematic areas related to Climate Change. These can be classified as per financial size into:
  - those that can be met solely through city project budgets (prioritized annually as per urgency) or under State and Central schemes, and
  - those that need external financial leveraging. These would typically be longer-term, cross-thematic, complex and larger impact projects, needing feasibility studies and detailed workings.

Financial workings should consider capital and recurring (O&M) expenses and indicate budgetary sources and viabilities. Hence, any projects that can show any revenues (e.g., recovery from waste in terms of energy, gas, compost, etc., or water treatment / re-charging) including savings in current expenses should be particularly highlighted. The bankable projects developed under the CapaCITIES project, and inclusion of quick-win projects under city budgets provide a template for the same.

Conclusion

The CapaCITIES project has been a focussed attempt working from the cities level, and working as a demonstrated example, can be easily replicated in other cities of Tamil Nadu (given the similarities and governance systems in Coimbatore). The actual interventions under the project in each sector, can be referred to separately, and equally scaled up to several wards in a city. But looking at the Climate Change projections and impacts on Tamil Nadu, and the gaps in the current policy and implementation space, there is undeniable need for integrated planning with long-term climate resilient thinking. The recommendations and guidelines at State and City level therefore suggest themselves to be of more urgency and importance, than the particular thematic actions. The benefits of local projects are multiplied when seen in the frame of a Climate Resilient City Action Plan, and hence the correct approach is most important. The experiences of the CapaCITIES project, taken further in Coimbatore and taken up across other cities in Tamil Nadu, would surely make the state more focussed, resilient to climate change impacts while at the same time developing along a low carbon pathway.