CLIMATE CHANGE & WATER FUTURE: TAMIL NADU

An Integrated Approach of Adaptative Rural Development Based on Climate Science

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THERE WAS A TIME WHEN CLIMATE CHANGE WAS A SERIOUS THREAT IN THE FUTURE. THAT TIME IS GONE. THE FUTURE IS HERE AND NOW.

WHAT NOW?

We are living through climate change. The seasonal pattern is changing all around us. Extreme weather events are more frequent now.

Temperature rise affects soil moisture, crucial for seed germination, and indirectly impacts water availability. Changes in the amount and intensity of rainfall will directly impact the water regime. Extreme events like floods, droughts, and cyclones will further impact crops, lives, livelihood, and infrastructure. This has grave implications on agriculture and the future socio-economic well-being of small and marginal farmers. The financial implications of climate change are dramatic. For ordinary people, institutions, and the entire nation.

Various government departments make deep and long-term investments in rural development, to generate widespread social and economic well-being. These investment are at great risk due to climate change. **Adaptation** to the impact of climate change is critical to safeguard investments for development programmes.

Since development schemes are affected by climate change, all programmes now need to be tweaked in accordance with the changing climatic scenario. **Science** plays a key role by providing region-specific projections for the future, based on the scenarios for greenhouse gas emissions, by aiding the planners with clues about local hydrology, soil conditions, and economic activities. The planners can determine special vulnerabilities, and focus their programmes to address them.

The planners will need to engage the local communities that are repositories of time-tested, location specific **traditional knowledge** to deal with adverse situations.

THIS IS A BRIEF DESCRIPTION OF DISTRICT LEVEL VULNERABILITY, BOTH BIOPHYSICAL & SOCIO-ECONOMIC, OF HIMACHAL PRADESH, TILL 2050, BASED ON LOW EMISSION MODEL

TAMIL NADU NOW

Area:130,000 sq.km | **Avg. Annual rainfall:** 317.4 mm–1890.5 mm
Mean Temperature (max): 31.2°C–33.2°C | **Mean Temperature (min):** 21.9°C–23.3°C

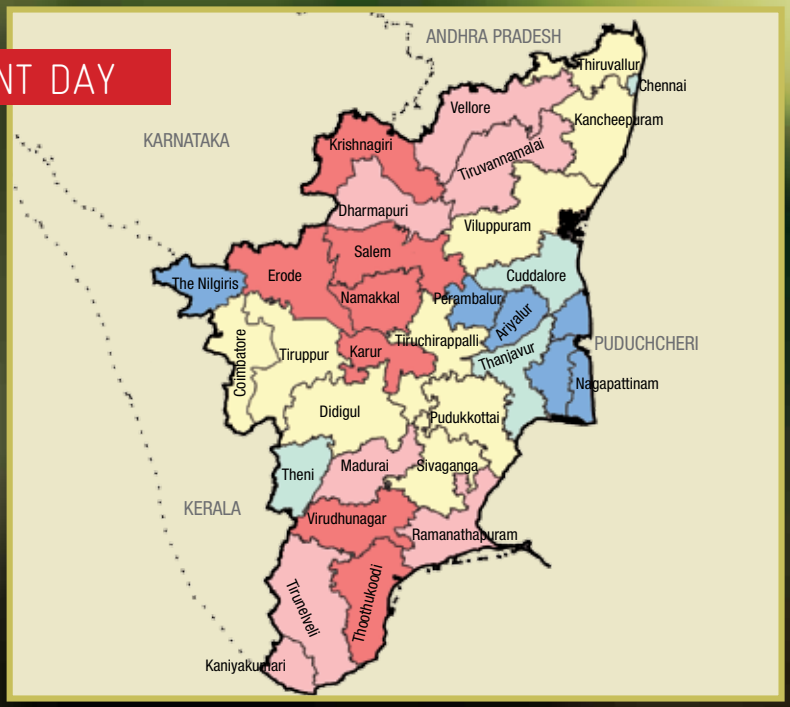
Tamil Nadu is a southern coastal state with a coastline of 1076 km. The state has Bay of Bengal in the east and the southern tip is the meeting point of the Bay of Bengal, Arabian Sea and the Indian Ocean. The land is divided into two natural divisions—coastal plain in the east and the hilly Eastern Ghats in the west. The climate varies from dry sub-humid to semi-arid. The seasonal variation is guided by two distinct monsoons — the South west monsoon of June-September and the North east monsoon between October and December. Rainfall is very important for the state for its water supply and recharging of groundwater. The state is significantly dependent on agriculture.

THE TREND SO FAR

An analysis of 63 years (1951-2013) of data from the Indian Meteorology Department shows that annual maximum and minimum temperatures have been increasing for the state of Tamil Nadu. A statistical analysis confirms a definite increase in temperatures denoting the state has been clearly experiencing overall warming since 1951.

The analysis of annual rainfall also reveals a positive trend indicating that the total amount of rainfall each year has increased. The number of rainy days each year has also decreased. Though both of these trends are not so definite, it suggests that although Tamil Nadu experienced a slight increase in the level of rainfall, it did so in fewer days, with high intensity of rain.

PRESENT DAY

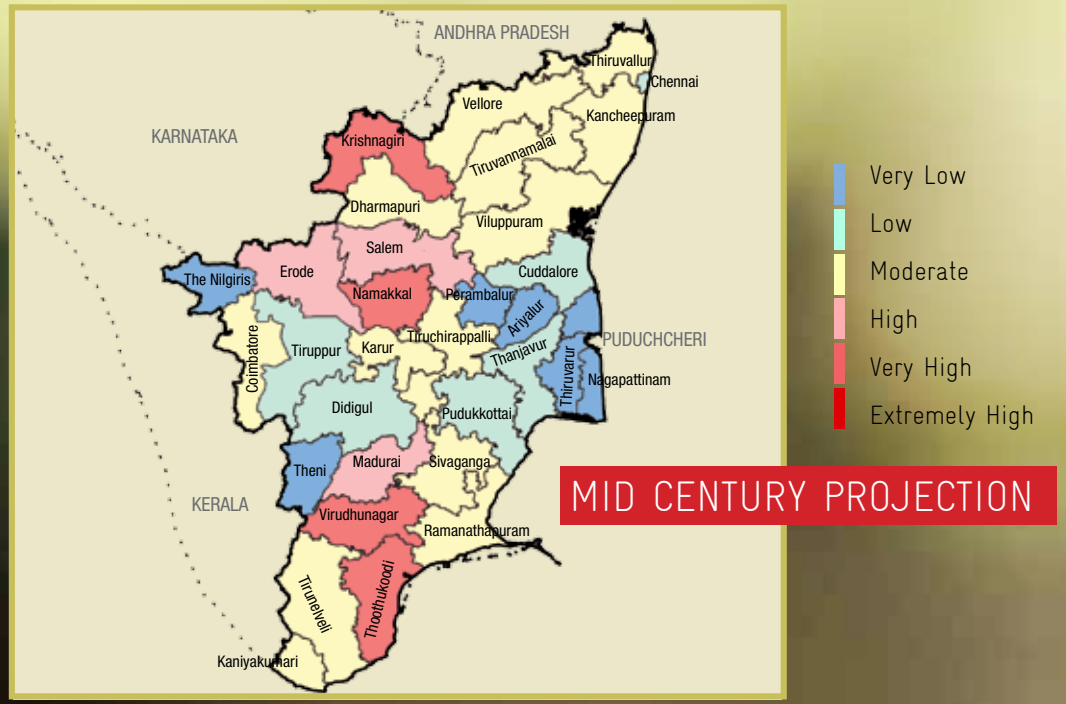


THE PROJECTION FOR 2050

ASSUMING LOW EMISSION SCENARIO:

- MEAN ANNUAL MAXIMUM TEMPERATURE TO INCREASE BY ABOUT 1.0°C
- MEAN ANNUAL MINIMUM TEMPERATURE TO INCREASE BY ABOUT 1.2°C
- MEAN ANNUAL RAINFALL TO INCREASE MARGINALLY BY ABOUT 4.4%
- NUMBER OF RAINY DAYS WILL DECREASE

The Mean maximum temperature is going to increase in all months in the state, with maximum increase of 1.6°C in May. An increase of 12% of rainfall is expected during South west monsoon, with almost no change in groundwater recharge. The state will see decrease in average rainfall during North east monsoon in November and December, with a marginal increase in stream flow and reduction in groundwater recharge. Thiruvallur and Kancheepuram will experience maximum drop in average rainfall. The drought condition in the state will intensify. As the number of rainy days will decrease, more intense rainfall is expected which may create flash flood and soil erosion.



MID CENTURY PROJECTION

SOCIO-ECONOMIC FUTURE

The change in the biophysical regime in the future will have socio-economic implications. The heat stress conditions are likely to increase, particularly in the months of May to September causing heat stroke. An increase in vector borne diseases can be expected. The increase in humidity and temperature, though not dangerous levels, will undermine the well being of livestock.

Drought condition and increased evapotranspiration will affect agriculture sector with increased requiremrent of irrigation. Substantial part of the state's population, dependent on farming and marginal farming will be affected with a drop in income level.

On the economic front, the possibility of flooding will cause disruption of transport and will impact urban life negatively. Vellore and Ramanthapuram districts are categorised as Very High Vulnerable category due to high social, economic and water sector vulnerability.

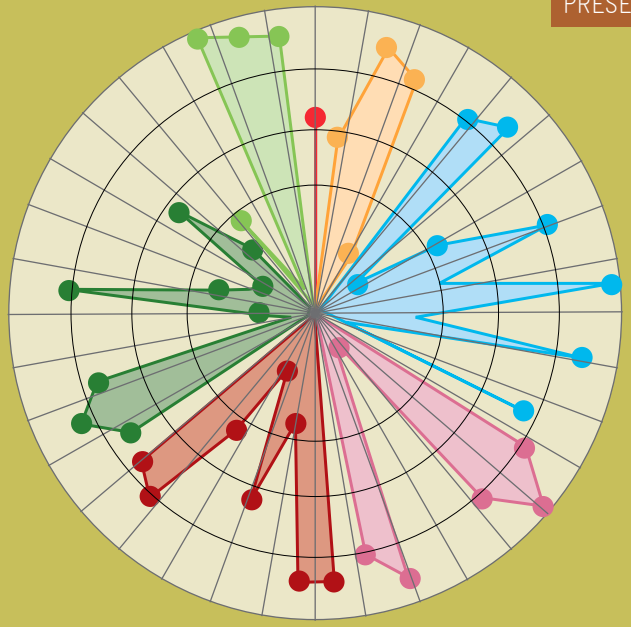
CONCLUSION

This study is an important starting point to look at the future of the state in a scientific manner. The study analyses water availability for a biophysical analysis and then in turn predicts various socio-economic aspects and how they are going to be affected in the future. This is to alert administrative officials to the district wise future of various sectors of the economy in the face of certain climate changes.

The state government and district administration can plan and prioritise adaptation projects using these findings. Moreover, the administration can relook at all development projects and rework them to withstand the onslaught of climate change. This way, the investment for development can be secured for a longer period. Moreover, as the intensity and frequency of extreme events increase, officials can prepare for proper measures for disaster management risk reduction, thereby minimising loss of lives, property, and livelihoods.

TIRUVANNAMALAI

PRESENT SOCIO-ECONOMIC VULNERABILITY



According to the assessment, Tiruvannamalai's vulnerability will remain Moderate in mid century. Taking the risk into account, GIZ has been working on an intervention promoting soil conservation, water harvesting and a change in cropping pattern by introducing millets by the villagers and local government as adaptation intervention.

The district is projected to expect very high vulnerability out of frequency of drought during both South west and North east monsoon. This may reduce agricultural production. The income level of the district currently stand at a very high vulnerability because of climate change. Net area sown and poultry units are already vulnerable.

The temperature will rise making people vulnerable to heat stress. The population will also face increasing incidence of malaria.

METHODOLOGY

Temperature and rainfall data (1951-2013) from India Meteorology Department is analysed to understand the trends in weather patterns of the districts. Then a projection of temperature and precipitation is created using Regional Climate Models (RCMs), of various emission scenarios for two different time periods, 2050 and 2100. These values are analysed through hydrological model SWAT (Soil and Water Assessment Tool) to predict various water balance elements. Future water availability, seen through demographic and economic parameters gives a big picture of vulnerability of each district.

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