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A STUDY ON ECONOMIC IMPACT OF CLIMATE CHANGE AS YOUTH UNEMPLOYMENT AND LABOUR PRODUCTIVITY LOSS IN TAMIL NADU

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Abstract

Climate change is no longer solely an environmental challenge it has emerged as a critical labour market disruptor in the Global South. This study investigates the intersection of climate change and unemployment in Tamil Nadu. India second largest state economy and a front runner in renewable energy transition. Using mixed methods and secondary data from the Tamil Nadu Economic Survey current report a peer reviewed heat stress study of 1,560 outdoor workers across 11 districts Scientific Reports and industry reports on garment and MSME sectors the climate induced heat stress and inconsistent weather are actively exacerbating joblessness. While overall unemployment declined from 7.2 percent to 4.8 percent youth unemployment 15 to 29 years remains at 17.5 to 21.9 percent with graduate unemployment at 16.3 percent exceeding the national average of 14.0 percent. Tamil Nadu has achieved a positive structural shift with agricultural employment share reducing from 32 percent 2015 to 25 percent 2025 to 2026 but this transition is climate induced distress migration rather than productive transformation. The heat stress study provides empirical evidence 61 percent of outdoor workers reported productivity loss in summer versus 39 percent in winter. Exposure to important Wet Bulb Globe Temperature WBGT increased the risk of productivity loss by 1.40 times 95 percent CI and doubled the risk of heat related illness. In brick kilns and salt pans of Thoothukudi and Kanchipuram productivity defeat reach 65 percent. In the garment hub of Tiruppur employing over 3 million workers directly a 2026 climate risk analysis projects 35 million Full Time Equivalent FTE jobs at risk across Indian garment supply chains by 2030 due to unabated heat with 73 percent factories having heat trapping metal roofs and 60 percent lacking clinics. Micro, Small and Medium Enterprises MSME which contribute 30 percent to state GDP and are the largest employer reported 40 percent output loss during recent flood and heat events in stakeholder consultations held in February 2026. Simultaneously 90 percent of Tamil Nadu adults report experiencing global warming indicating high

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awareness but low adaptive capacity due to informality 60 to 80 percent youth in informal jobs and skill mismatch only 25 to 49 percent deemed employable. Relatively Tamil Nadu situation mirrors trends in Bangladesh Vietnam and Mexico where heat reduces labour supply by 10 to 15 percent in peak summer. Though Tamil Nadu is unique as it already generates greater than 50 percent power from renewable and is investing Rs 15,000 crore in off shore wind in Gulf of Manner with green hydrogen integration offering potential for 50,000 add green jobs in marine engineering and turbine maintenance. The study concludes with a five pillar policy framework (i) Heat adapted labour standards including WBGT based work rest cycles (ii) Formalization with climate insurance (iii) Climate smart skilling under Naan Mudhalvan for solar, wind, EV (iv) MSME resilience fund for cool roofs and (v) District Climate Employment Cells. The study contributes to the emerging literature on Climate presently Employment and provides actionable insights for South Asian economies navigating the dual transition.

Keywords: Heat Stress, Labour Productivity, Youth Unemployment, Just Transition, Tamil Nadu, Green Jobs, MSME Resilience, Climate Justice.

Tamil Nadu is often expected as India growth engine. It is the most urbanized state contributes nearly 9% to India GDP ranks first in Gross Enrolment Ratios in higher education and generates more than 50% of its power from renewable sources like wind and solar. The Sustainable Development Goals India Framework SIF 2.0 notes that Tamil Nadu ranks first among states in climate action disaster resilience and coastal restoration and unemployment among working age population has declined from 7.2% to 4.8%. Summer current year saw temperatures reaching 40 degrees Celsius consistently across Vellore, Tiruchirappalli, Madurai, Salem and Chennai. On the other side, educated youth unemployment remains stubbornly high at 17.5%-21.9%, with graduate unemployment at 16.3% higher than the national average. What makes this crisis unique is that these two problems are not separate they are interlinked. Climate change is directly destroying or displacing jobs and joblessness is reducing the capacity of families to adapt to climate change.

Tamil Nadu is witnessing a "positive structural shift." Only about 25% of the population now works in agriculture compared to 32% in 2015. In absolute terms, agricultural production remains stable and horticulture shows progress but its relative share in the economy is declining as other sectors expand faster. This shift is generally considered healthy because workers move from low productivity agriculture to industry and services reducing poverty.

Agriculture faces serious climate challenges, including erratic rainfall, unexpected heat waves, and crop losses during harvest. Overall growth has stagnated. In districts like Vellore with a steady population of 4.5 million there are no large industries. People depend on paddy groundnut and small leather units. When water stress increases these livelihoods collapse. The result is forced migration. Farm workers move to construction sites in Chennai or Tiruppur garment factories. This increases the supply of labour in cities depresses wages and creates informal insecure jobs. Data shows that 60 to 80% of youth are in informal jobs with no social protection. Only 25 to 49% of graduates are considered employable due to skill mismatch. . It surveyed 1,560 workers between 2021 and 2023 across 11 districts of Tamil Nadu, covering agriculture, construction, brick kilns, salt pans, and stone quarries. The findings are alarming nearly 61% of workers reported productivity loss during summer compared to 39% during winter. Workers exposed to elevated heat stress faced a 1.4 times higher risk of reduced productivity while the risk of heat related illnesses such as

dehydration, cramps, headaches, nausea and fatigue more than doubled. For a daily wage worker earning Rs 500 per day, a 20% loss in working hours means Rs 3,000 loss per month. This is not a future prediction it is happening in 2025 to 26. In salt pans of Thoothukudi, workers start at 4 am to avoid afternoon heat but still work 8 hours under direct sun. In brick kilns of Kanchipuram, women carry bricks with body temperature above 38.5°C.

AGRICULTURE

With erratic northeast monsoon and groundwater depletion, the second crop (samba) is failing. Farm labour days reduced from 180 days per year to 120 days in many delta districts. Mechanization is not an alternative because small farmers cannot afford it. Women agricultural labourers are worst affected.

GARMENT AND TEXTILE SECTOR

Tamil Nadu garment sector, centered in Tiruppur, Coimbatore and Erode, employs 45 million workers directly and indirectly, with women forming a majority. A 2026 report by climate and labour researchers warned that extreme heat could cause a loss of 35 million full-time equivalent jobs in the garment sector by 2030. The reasons: 60% of factories have no on-site clinic, 73% have metal sheet roofs that trap heat and raise indoor temperatures to 45°C, and production targets do not reduce in summer. Workers faint, take leave, and lose wages. Brands have not yet included heat protection in their audits.

CONSTRUCTION

Chennai, Coimbatore and Hosur are in a construction boom, but construction workers are the most exposed. No shade, no drinking water, and working at heights in heat increases accident risk. The study found 58% reported productivity loss.

MICRO, SMALL AND MEDIUM ENTERPRISES (MSME)

MSMEs provide the highest employment in Tamil Nadu. In February 2026 stakeholder workshops highlighted that rising temperatures, floods, water stress, and logistics disruptions are directly affecting textiles, engineering, and food processing MSMEs. A 3 day power cut due to floods in 2024 caused 40% production loss in many units. Unlike big industries, MSMEs have no climate insurance.

YOUTH REMAIN JOBLESS DESPITE

If overall unemployment is 4.8%, why youth unemployment is 17.5% This is the jobless growth paradox.

- **First: Skill Mismatch**. Industries need EV technicians, solar installers, wind turbine mechanics, but colleges still teach outdated mechanical engineering. The Naan Mudhalvan scheme is trying to bridge this, but scale is small.
- **Second: Climate Migration.** When agriculture fails, rural youth flood Chennai's job market. Demand for white-collar jobs rises, but supply of such jobs is limited.
- **Third: Health Impact.** Heat stress reduces learning capacity. Students in government schools without fans or with tin roofs perform poorly. This reduces long-term employability.

- **Fourth: Gender Dimension.** Female youth unemployment is higher. In garment factories, pregnant women quit due to heat. In agriculture women lose work first. A survey in 2025 found that 90% of adults in Tamil Nadu say they have personally experienced global warming the highest in India.

GREEN ENERGY

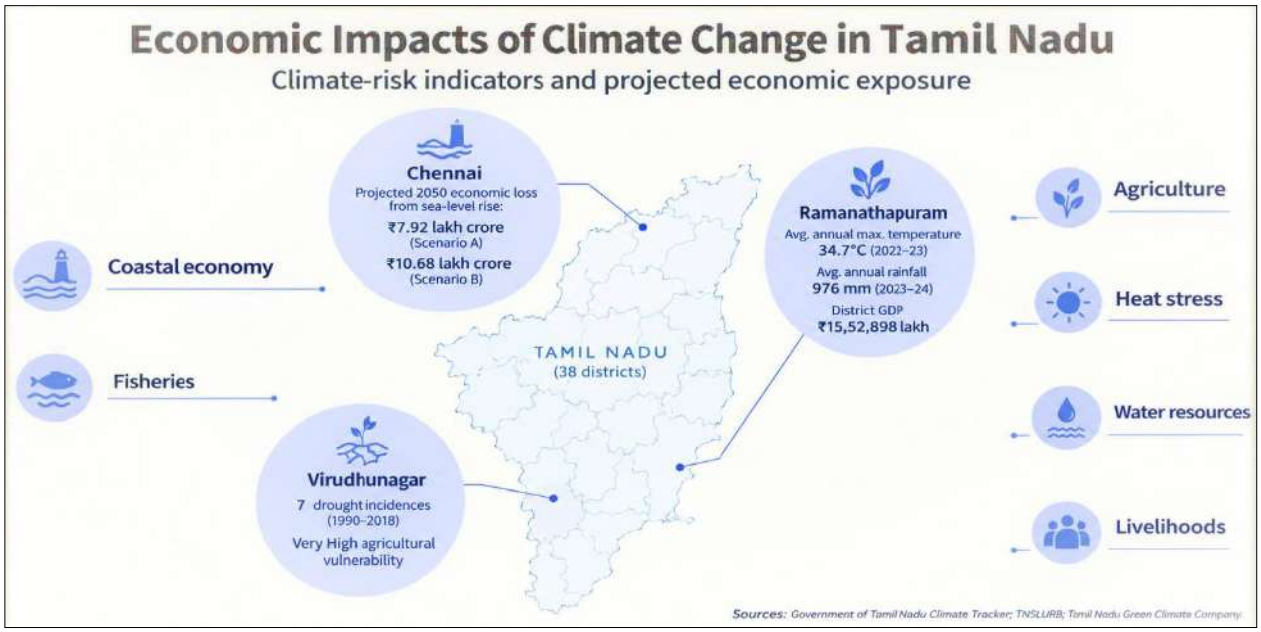
There is hope. Tamil Nadu is betting big on green transition to create jobs. The flagship project is the Rs 15,000 crore offshore wind projects in the Gulf of Manner with evacuation infrastructure to Tuticorin pooling station. It is a public-private partnership with viability gap funding and green bonds. Its strategic significance is fourfold decarburizing industrial hub of Coimbatore, Tiruppur and Madurai supporting green hydrogen export via VOC Port energy security during summer and job creation in marine engineering, specialized vessel operations, and turbine maintenance. It will create thousands of high-skill coastal jobs. Similarly Tamil Nadu already generates over 50% power from renewable. Rooftop solar installation EV manufacturing in Hosur and battery storage offer huge potential. If skilling is aligned 4% of workforce in green jobs in 2025 to 26 can become 12% by 2030. Mandate shaded rest areas drinking water oral rehydration salts, medical clinics in all factories with >50 workers.

Provide social security heat insurance and loss-of-pay compensation for extreme weather days. Climate Smart Skilling under Naan Mudhalvan adds 6 month certificates for solar PV installer, wind turbine technician EV mechanic and sustainable agriculture. Target Vellore, Thoothukudi, Tiruppur.

MSME CLIMATE RESILIENCE FUND

Provide low interest loans for cool roofs, energy-efficient motors, and rainwater harvesting. District Employment and Climate Cells Each district should map climate vulnerable jobs and create local employment plans.

- **Agriculture & Food Prices**: drought, floods and heat reduce crop productivity and increase food prices.
- **GDP & Economic Growth**: climate disasters can reduce output and growth through agriculture, industry and services.
- **Infrastructure Damage**: floods, storms and extreme heat damage roads, buildings, energy and transport systems.
- **Labour Productivity**: extreme heat reduces workers' productivity and increases health-related costs.
- **Government Expenditure**: governments face higher spending on disaster recovery, adaptation and resilient infrastructure.
- **Trade & Supply Chains**: climate-related disruptions can reduce production and international trade flows.
- **India-Specific Impacts**: drought, sea-level rise and extreme weather can affect Indian agriculture, fisheries, infrastructure and tourism.



CONCLUSION

Tamil Nadu 2025 to 2026 climate change is not a distant environmental issue it is a present Economic and employment issue. The data is clear heat is reducing productivity by 1.4 times 61% of outdoor workers lose income and garment sector jobs worth 35 million are at risk. Simultaneously educated youth remain jobless at 17.5%, much above the national average. The Economic Survey rightly calls the movement out of agriculture a positive shift but without climate proofing the new jobs this shift will only move poverty from villages to urban slums. The solution is not to stop industrialization but to make it climate just. Green energy projects like offshore wind show the path where climate action and job creation go together. As Dr A.P.J. Abdul Kalam said "Climate change is a challenge" but it is also an opportunity to reimaging education and employment. For Tamil Nadu to remain a leader it must ensure that no worker loses their job because the planet got too hot.

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