



A Green School Program Initiative

Cool Classrooms for Green Future

Passive Cooling Solutions for Tamil Nadu Green Schools



Under the Framework of



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Technical Support



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Passive Cooling Solutions for Tamil Nadu Green Schools



Thiru M.K. Stalin

The Hon'ble Chief Minister of Tamil Nadu

The Green Schools Program of Tamil Nadu transforms all the government schools into environmentally friendly, heat-resilient educational environments through passive cooling methods such as shaded courtyards, green roofs, and natural ventilation, thereby safeguarding students against heat stress. This initiative enhances comfort, safety, and energy efficiency, while advancing climate justice and environmental awareness. By fostering students as change agents, the program builds understanding of the effects of extreme heat on health, education, and biodiversity, and empowers the next generation to develop and implement sustainable solutions to mitigate climate change impacts.



Thiru Thangam Thennarasu

The Hon'ble Minister for Finance & Environment, Climate Change

Tamil Nadu's Green Schools Program prioritizes student health and learning by implementing nature-based cooling solutions like shaded courtyards, green roofs, and natural ventilation to combat extreme heat. These climate-resilient measures reduce heat stress, improve focus and attendance, and create equitable learning opportunities—particularly benefiting girls. The program sets a national benchmark for sustainable, safe educational spaces that protect children from climate impacts while fostering academic success and long-term resilience.



Thiru Supriya Sahu, I.A.S.

The Additional Chief Secretary, Department of Environment, Climate Change & Forests

Tamil Nadu's districts face varying heatwave risks, intensified by urbanization and the Urban Heat Island Effect, with 13% moderately to highly vulnerable. The Green Schools Program, now partnered with the UNEP India Cooling Programme, retrofits schools with passive cooling solutions to protect students and strengthen resilience. By integrating scalable, climate-appropriate measures and empowering students, the program fosters environmental stewardship and ensures classrooms remain cool and healthy.



Mr. A.R. Rahul Nadh I.A.S.

The Chief Mission Director, Tamil Nadu Climate Change Mission, Department of Environment, Climate Change & Forests.

Tamil Nadu's Department of Environment and Climate Change, in collaboration with UNEP and the Cool Coalition, is scaling passive cooling across Government schools to protect students in heat-vulnerable districts. The initiative employs cool roofs, natural shading, and enhanced ventilation to reduce indoor heat stress and improve learning conditions. This climate-resilient education model, successfully demonstrated in Chennai, provides a replicable framework for equitable and climate-responsive schooling across the State.



Dr. Balakrishna Pisupati

Country Head, UNEP India.

The Green Schools Programme in Tamil Nadu is a timely and transformative effort to address rising heat through sustainable and resilient cooling. Supported by the UNEP Cool Coalition, under the Swiss Agency for Development and Cooperation (SDC)-funded BeCool Project, the initiative enhances students' ability to concentrate and learn by keeping classrooms safe. Extreme heat, worsened by the climate crisis, particularly impacts children. This leading effort by the Tamil Nadu Government demonstrates that simple, scalable solutions can significantly improve children's daily lives and serve as a meaningful investment in the future.

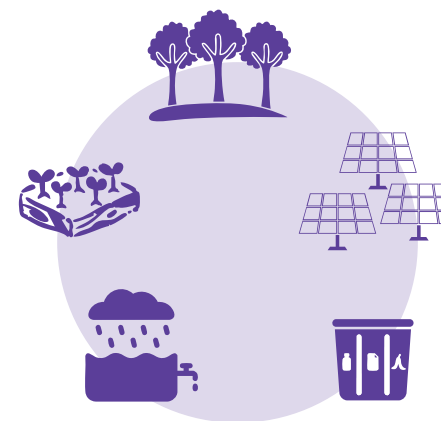
Green School Program

Tamil Nadu's Green Schools:

Pioneering the future of healthy, heat adaptive, and comfortable learning environments

Key Initiatives (Phases I & II) ¹

- Solar panels and water pumps.
- Rainwater harvesting and mini-forests.
- Vegetable gardens and vermicomposting.
- Waste segregation and ban on plastics.
- Sustainable, pollution-free campuses.



Phase III – Passive Cooling

The latest phase introduces passive cooling Solutions like cool roofs, shading, heat resilient building materials and ventilated designs. The initiative is planned to be piloted in eight schools, with subsequent scaling to 100 schools across Tamil Nadu. Initial part of the pilot will focus on cool roof implementation, followed by other passive cooling strategies very soon.

Expected Impact

Greener campuses, cooler classrooms, and improved learning and energy efficiency.

Tamil Nadu's Green Schools are shaping the future with eco-friendly design, cooling solutions, and heat adaptation.

BeCool Project



The BeCool Project, supported by the Swiss Agency for Development and Cooperation (SDC) and led by the United Nations Environment Programme, is working with the Department of Environment, Forest and Climate Change, to accelerate the adoption of passive and nature-based cooling solutions in buildings and cities, making them more sustainably and affordably cooled, and more resilient to rising extreme heat.



Enhancing policy design & implementation

- Strengthening national state and city policies
- Enhancing coordinated national-state-city policy implementation



Accelerating finance

- Financing mechanisms
- Business models
- Bankable project pipelines



Awareness & capacity of real estate sector

- Real estate developer capacity building
- Professional and academic training

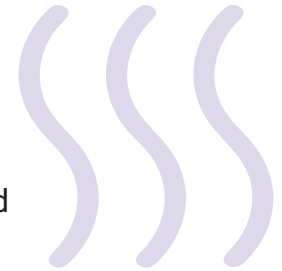
BeCool has developed extensive Urban Heat Island (UHI) assessment methods for Tamil Nadu, based on remote sensing and Geographical Information System (GIS) technologies, to determine hotspots in key cities, index the vulnerability to extreme heat of districts and draw state-level heat mitigation action plans. Key urban centres, including Chennai and four other fast-growing cities, are now being supported in leveraging findings of UHIE studies to revise master plans and devise city-level cooling action plans for introducing nature-based cooling in urban spaces.

BeCool is mainstreaming passive cooling solutions in affordable and worker housing by Tamil Nadu Urban Habitat Development Board and Tamil Nadu Shelter Fund through pilots, training of government engineers, and update of the state's building regulations to enhance comfort for millions of low-income families in Tamil Nadu. BeCool is additionally working with national and multinational financial institutions and social impact investors to mobilize long-term investment in extreme heat adaptation in buildings and cities. The construction industry in Tamil Nadu is being simulated for large-scale construction of passively cooled buildings through extensive capacity building of real estate developers by UNEP and Confederation of Real Estate Developers' Associations of India (CREDAI).

Urban Heat Island (UHI) Effect and Schools

Why Cities Feel Hotter

Concrete, asphalt, and dense buildings trap heat, while fewer trees limit cooling; combined with vehicles and ACs, urban areas in Chennai can feel 10–15°C hotter than nearby vegetated zones, with heat index often exceeding 40°C, making the city's core extremely hot to live in.



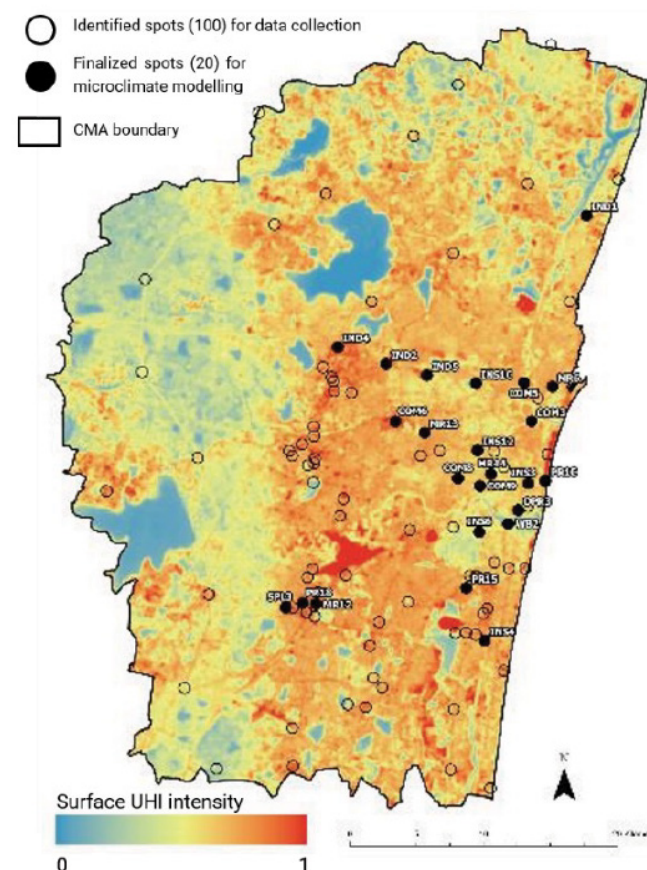
The Impact on Schools

In Chennai hotspots like T. Nagar, Ambattur, and Koyambedu, urban schools face:

- Extreme Heat: Play areas reach 45–50°C due to concrete surfaces and low greenery.
- Indoor Heat: Poor building design traps heat, lowering classroom comfort.
- Health Risks: Increases chances of dehydration, exhaustion, and heat stroke, especially for girls.
- Reduced Activity: Outdoor activities often cancelled.
- Higher Costs: Greater reliance on fans raises energy use and is vulnerable to power cuts.

Why It Matters

Outdoor heat seeps into classrooms, leaving children overheated, with less space for play and reduced focus on learning .²



²<https://www.sciencedirect.com/science/article/abs/pii/S2352710221010676>

Why Cooling Matters in Schools



The Challenge: Heat During Academic Months

From June to September, many parts of Tamil Nadu experience daytime temperatures above 35 °C, exceeding the comfort range of 24–26 °C. Tamil Nadu has also declared heat a state-specific disaster, acknowledging its growing impact on health and livelihoods. Poorly ventilated classrooms with concrete roofs and unshaded windows trap heat, affecting health and learning.

Health issues:

Fatigue, headaches, and dehydration are common during heat waves in Indian schools

Cognitive drop:

At ~32 °C, exam pass rates fall by ~10%

Enhanced awareness:

Children and teachers understand benefits of long term resilience through a deeper “nature for mitigation risks” approach.

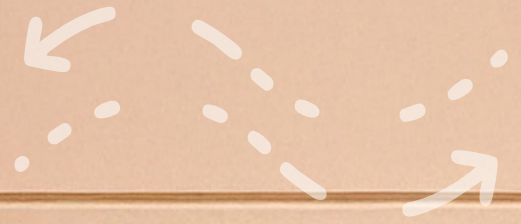


Threshold for comfort:

Above 30–32 °C, learning becomes harder; at 33–34 °C, most students feel discomfort.

**Cool schools mean
healthy, happy, and
productive students.**

Why Passive Cooling?



What It Is?

Passive cooling keeps classrooms comfortable using shade, ventilation, reflective roofs, and greenery—not electricity-hungry ACs.



Active Cooling (ACs, coolers)

High energy use,
higher bills,
more emissions.



Passive Cooling (natural methods)

Saves energy,
lowers costs,
reduces heat naturally.



Why Passive Cooling Works

Cool Roofs: Reflective coatings cut roof temps by 10–15 °C and indoor heat by 2–4 °C.

Combined Measures: A Mumbai school using shading + insulation + cool roofs saved 78% cooling energy

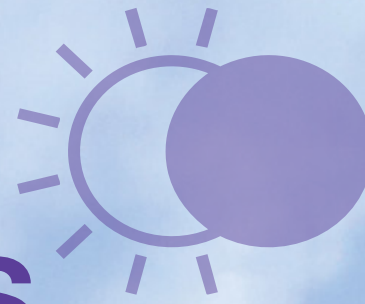
Shading: External devices can reduce energy needs by 20–48%.

Green Cover: Trees and plants lower air temps by 2–3 °C.

BLDC to Brushless Direct Current (BLDC) Fan: Energy-efficient fans improve air circulation, enhance comfort, and use up to 60% less electricity than conventional fans.



Shading Techniques



Natural Shade: Trees, Pergolas & Walkways

Shade—through trees, pergolas, and covered walkways—is an easy, effective way to protect students from the sun and make schoolyards more comfortable.



- **Trees:** Can reduce surrounding air temperature by 2–4 °C and shaded surfaces can be 11–25 °C cooler.



- **Surface Impact:** Shaded ground and walls can be 11–25 °C cooler than sun-exposed areas.



- **Pergolas & Covered Walkways:** Vine-covered pergolas and covered walkways provide breathable shade and safe, cool paths for students.

Built Shade: Climate-Smart Classroom Design



- **Extended Roof Overhangs & Verandas:** Prevent overheating of walls/windows and offer shaded outdoor areas.



- **Louvers, External Shades & Screens:** Control direct sunlight while maintaining natural light.



- **Internal Blinds & Curtains:** Low-cost cooling solutions where external shading isn't possible.



- **Vegetation:** Climbing plants and trees naturally cool classrooms and improve air quality.



- **Energy Efficient Fans:** BLDC fans use less electricity while providing better cooling in classrooms with high air delivery.

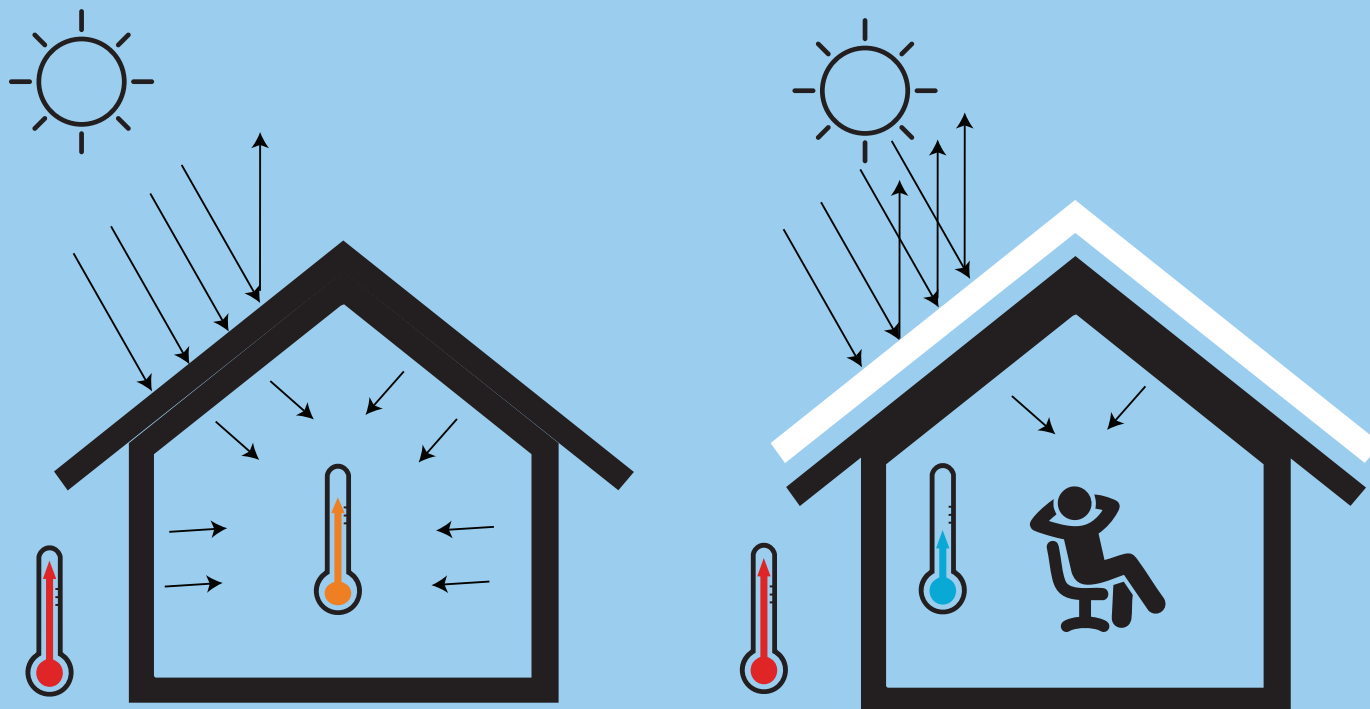
Cool Roof Technologies



What is a Cool Roof?

A cool roof reflects sunlight and absorbs less heat, keeping buildings and classrooms cooler using reflective paints, tiles, or coatings.

Case / Tech	What Was Done	What Was Found / Benefit
IIT Bombay "Thermacool" Coating	Reflective exterior coating	Roof temps ↓15–20 °C; indoor temps ↓ 4–8 °C Thermacool
Cool Roof Coating by IITB (other project)	High reflectance roof coatings.	Roof peaks ↓ 10–20 °C; AC electricity use ↓ 25–30% IIT Bombay
Panache Green "Cool Tops" System	High-SRI roof coatings.	Roof temps ↓ 18–20 °C; indoor temps ↓ 6–12 °C; cooling load reduced The Prakriti Story
"Assessment of Cool Roofs in Rural School Buildings" (India, ScienceDirect)	High-albedo roof paint	Roof-surface heat ↓; indoor air cooler; improved thermal comfort ScienceDirect



Standard Roof

Reflection : Low
Absorption : High
Thermal Comfort : Low

Cool Roof

Reflection : High
Absorption : Low
Thermal Comfort : High

Call to Action



What Schools can Do?

- Apply cool roof coatings or tiles.
- Provide external shading for windows using trees, verandas, and architectural overhangs.
- Design for natural ventilation.



What Teachers & Students Can Do?

- Track classroom comfort with simple audits.
- Use heat-resilient building materials.
- Plant trees, paint roofs, and maintain shaded spaces together.
- Plan and organize school events to raise heat awareness on Environment Day.



What Government Can Do?

- Introduce heat adaptation and cooling strategies in the school curriculum.
- Update building codes to include passive cooling.
- Fund school retrofits for passive cooling.
- Run awareness campaigns with Department of School Education.
- Ensure maintenance of green upgrades and allocate required resources.

**Schools, teachers,
students, and
government all share
the responsibility of
keeping classrooms
cool, comfortable, and
sustainable.**

Summary

5 Steps to a Cooler School

- 1 Cool Roofs** – Light-coloured tiles, reflective paints, or even green roofs keep classrooms up to 4–8 °C cooler.
- 2 Heat Resilient Walls**– Insulated walls, shaded surfaces, and less glass on east–west sides block out excess heat.
- 3 Window Shading** – Overhangs, louvers, or bamboo blinds cut glare and heat while letting in natural daylight.
- 4 Fresh Air & Ventilation** – Cross-breezes, ceiling fans, and roof vents flush out trapped heat and keep air fresh.
- 5 Orientation**– Smart siting, shaded courtyards, verandas, and simple upgrades like reflective paints or roof insulation can transform even older buildings.

Proposed Low-Cost Retrofit Options - We can implement simple measures without major reconstruction.

- Adding jaali (perforated screens) or ventilated brickwork for airflow.
- Installing roof ventilators to release hot air.
- Using light-coloured paints inside rooms to reflect natural light.

Improved ventilation promotes healthier classrooms, reduces electricity costs, and supports greener schools.



Implementing Passive Cooling Solutions Leads to

Thermal Comfort

In Tamil Nadu, surveys show most students stay focused at ease around 29 °C, but performance drops when rooms get hotter.

Environmental Benefits

Less energy use means lower emissions and more heat-resilient campuses.



Productivity

A cooler environment reduces stress and absenteeism, boosting student learning and teacher effectiveness.



Green Schools, Great Future

Health benefits

Reduced heat stress related exhaustion, nausea, fever, muscle cramps, headaches.



Energy Savings

Shading, insulation, and passive cooling lower indoor temps by 2–4 °C and reduce fan/AC use.



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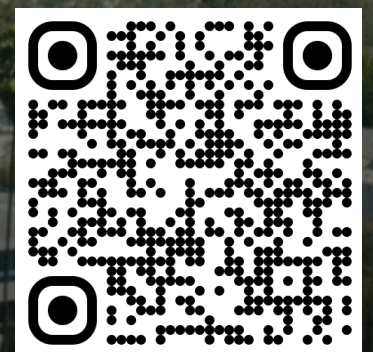
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your school