



URBAN HEAT VS. GREEN SHADE

A Thermal Comfort Study in Puxinanã, PB
Research by Students of Ecit Plínio Lemos
Science from the schoolyard to the streets.



THE PROBLEM: IT IS GETTING HOTTER.

- **CATALYST:** Neem trees (*Azadirachta indica*) cut down city-wide.
- **REASON:** Roots damaging sidewalks.
- **CONSEQUENCE:** Concrete absorbs heat. The city cooks.



THE QUESTION.

Can bringing trees back actually fix the temperature?

Is the difference measurable?

We used the scientific method to find out.



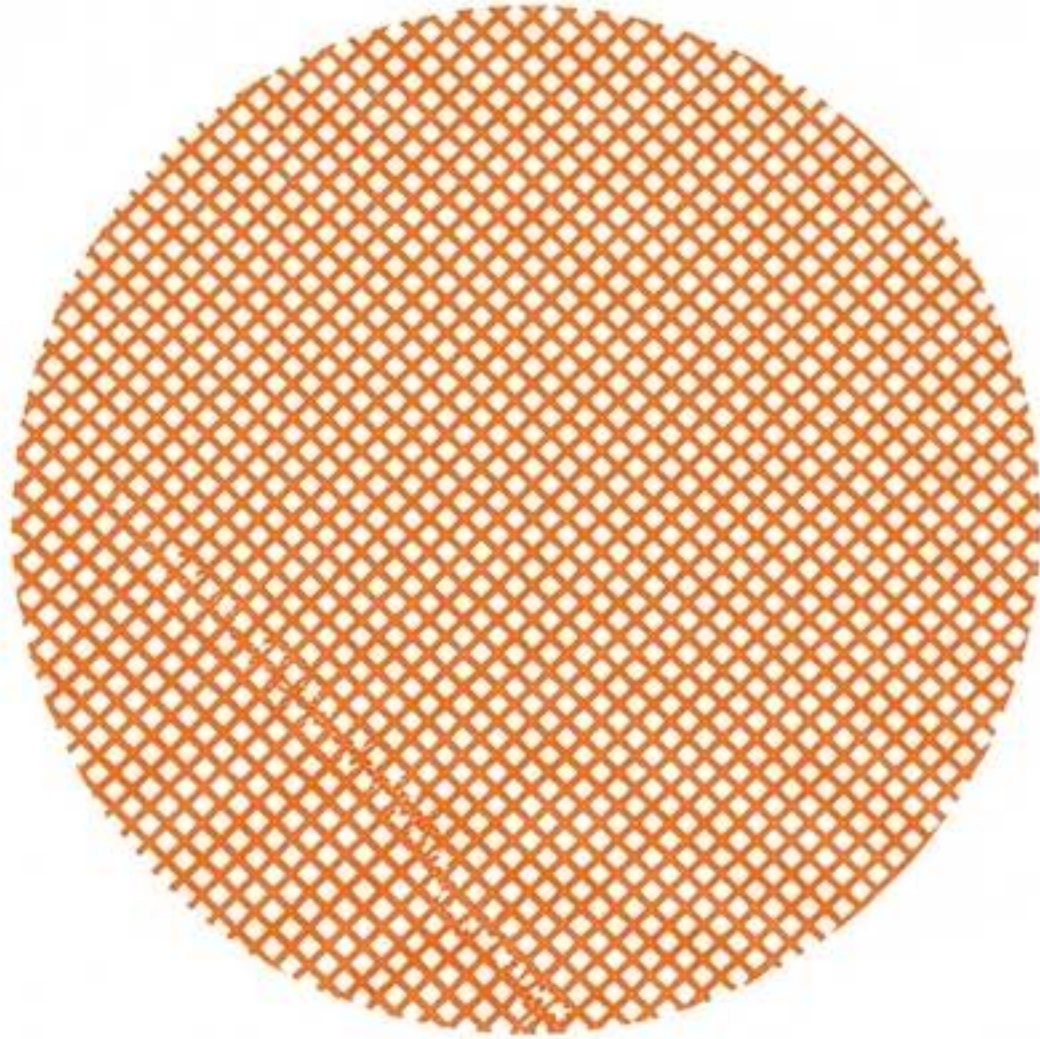
TOOLS OF THE TRADE

PROTOCOL: GLOBE Program
(Atmosphere & Biosphere)

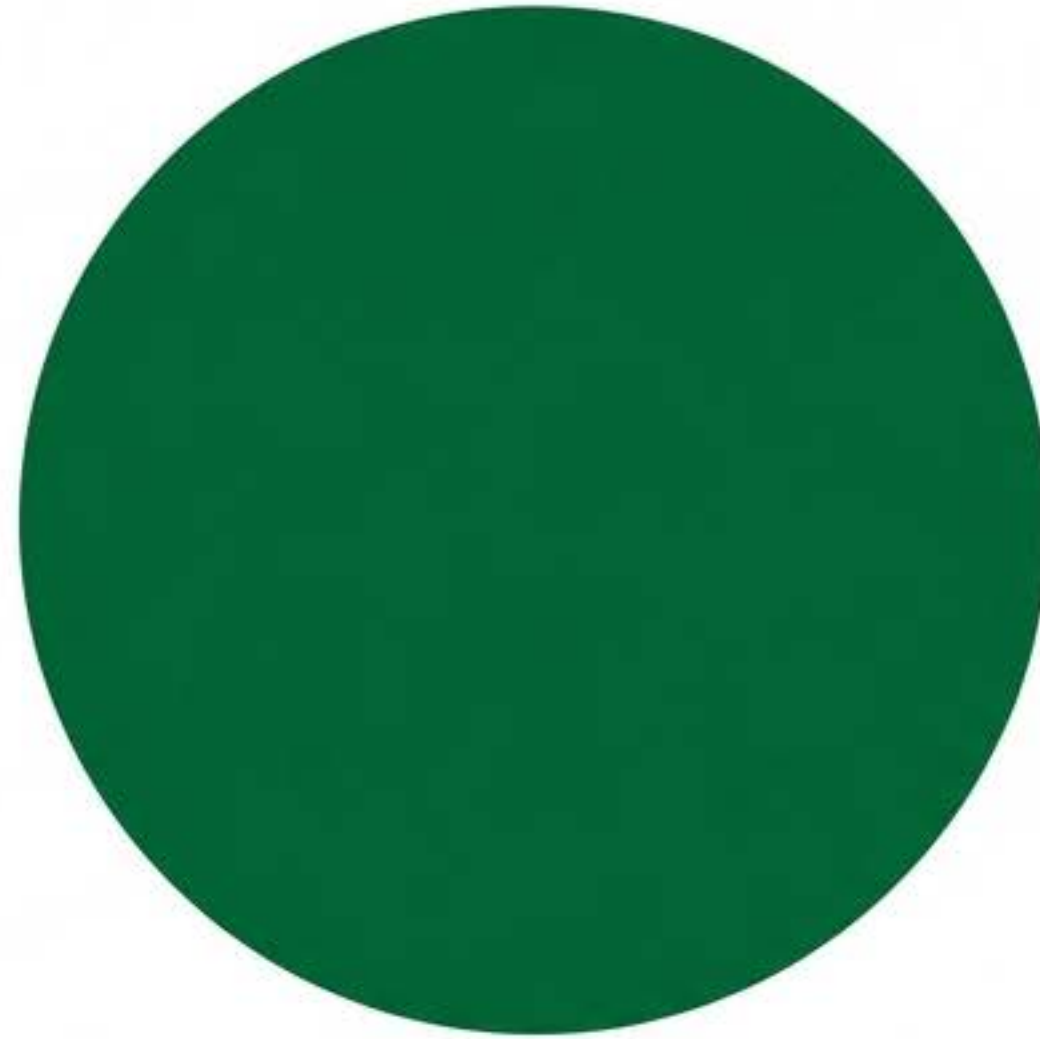
INSTRUMENTS:

- [X] Chemical Thermometers
- [X] Tape Measures (Tree Girth)
- [X] GPS & GLOBE Observer App

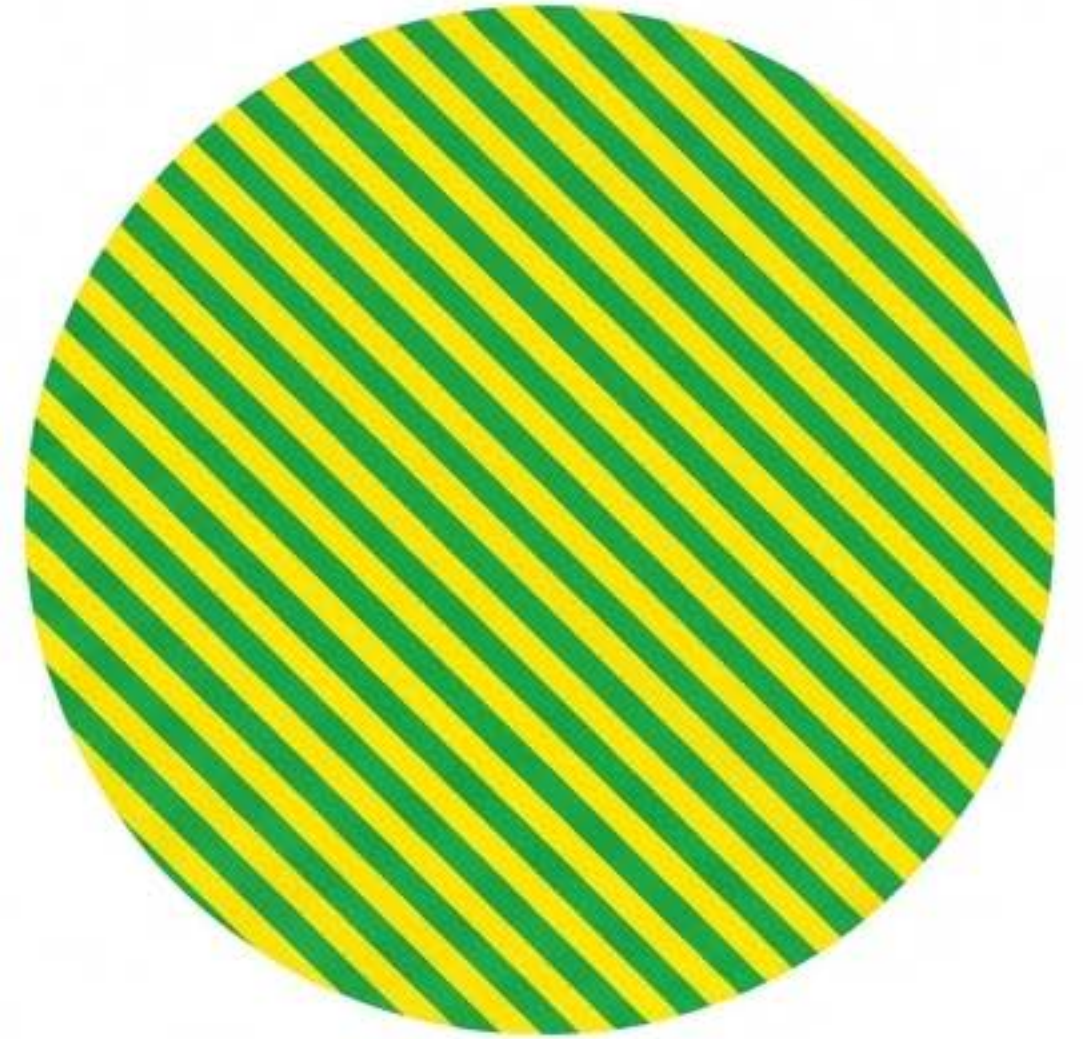
METHOD: Standardized
measurements. Precise timing.



ZONE 1: CONCRETE
(No Trees)



ZONE 2: DENSE CANOPY



ZONE 3: MIXED

THE EXPERIMENT

3 ZONES. 3 DAYS. SAME TIME.



ZONE 1: THE HEAT ISLAND

CONDITIONS:

- Zero vegetation
- Direct sunlight exposure
- Heat radiates from floor & walls

OBSERVATION: The most uncomfortable location.



ZONE 2: THE GREEN OASIS

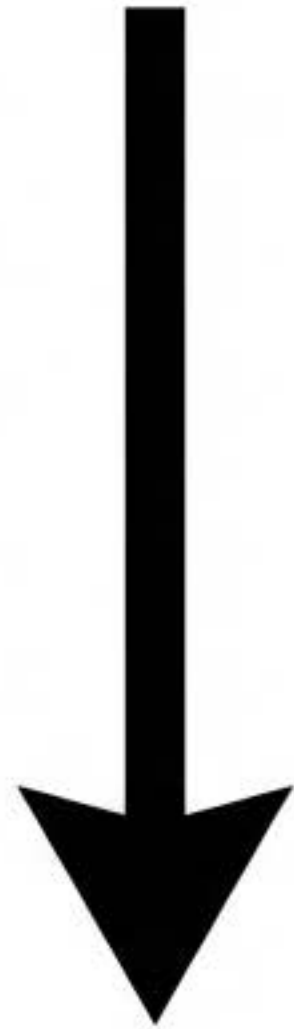
CONDITIONS:

- Dense tree canopy
- Blocked solar radiation
- Nature's air conditioning

OBSERVATION: The coolest spot in the school.

29.0°C

NO TREES



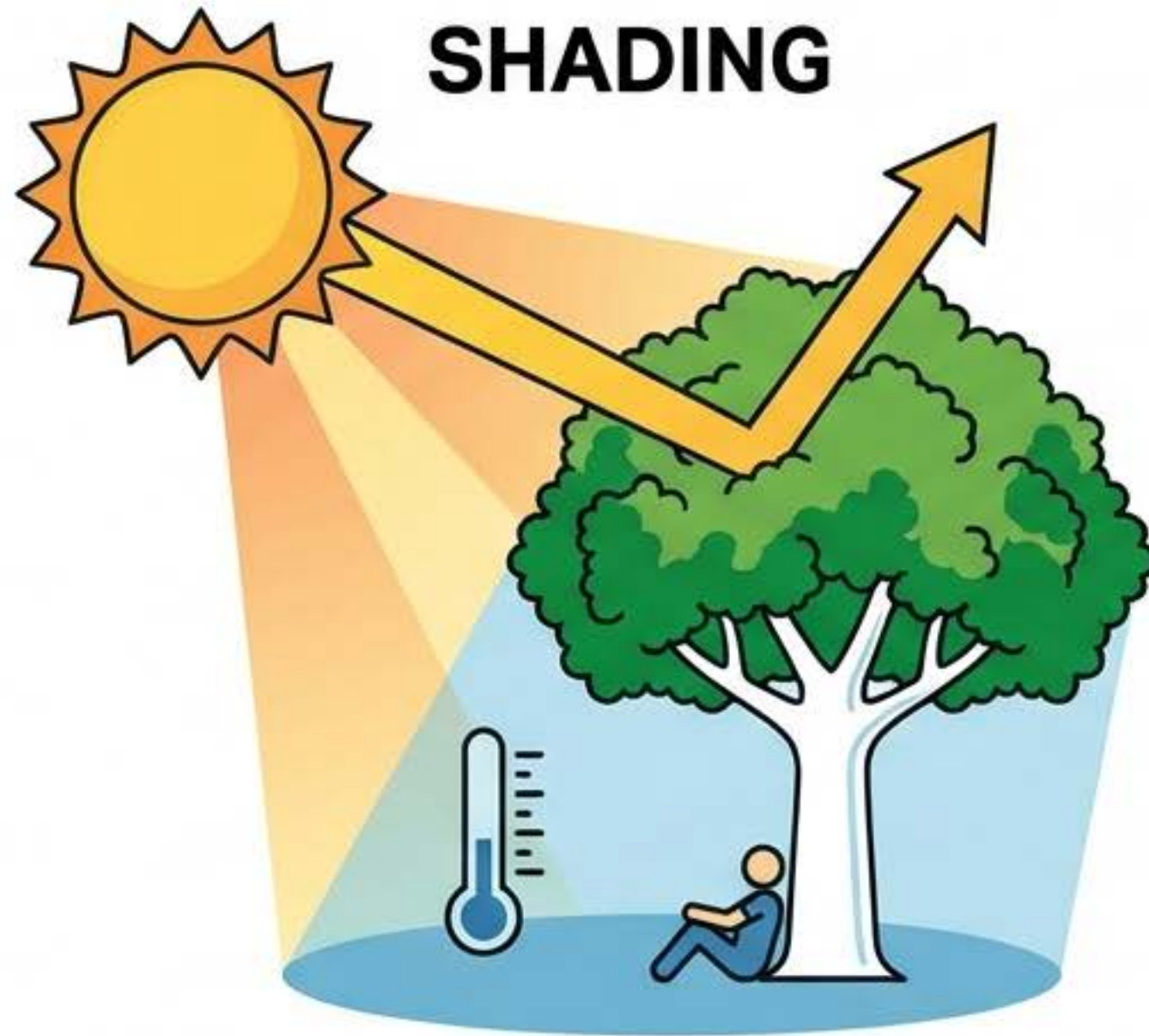
27.0°C

DENSE TREES

THE VERDICT: 2°C DIFFERENCE

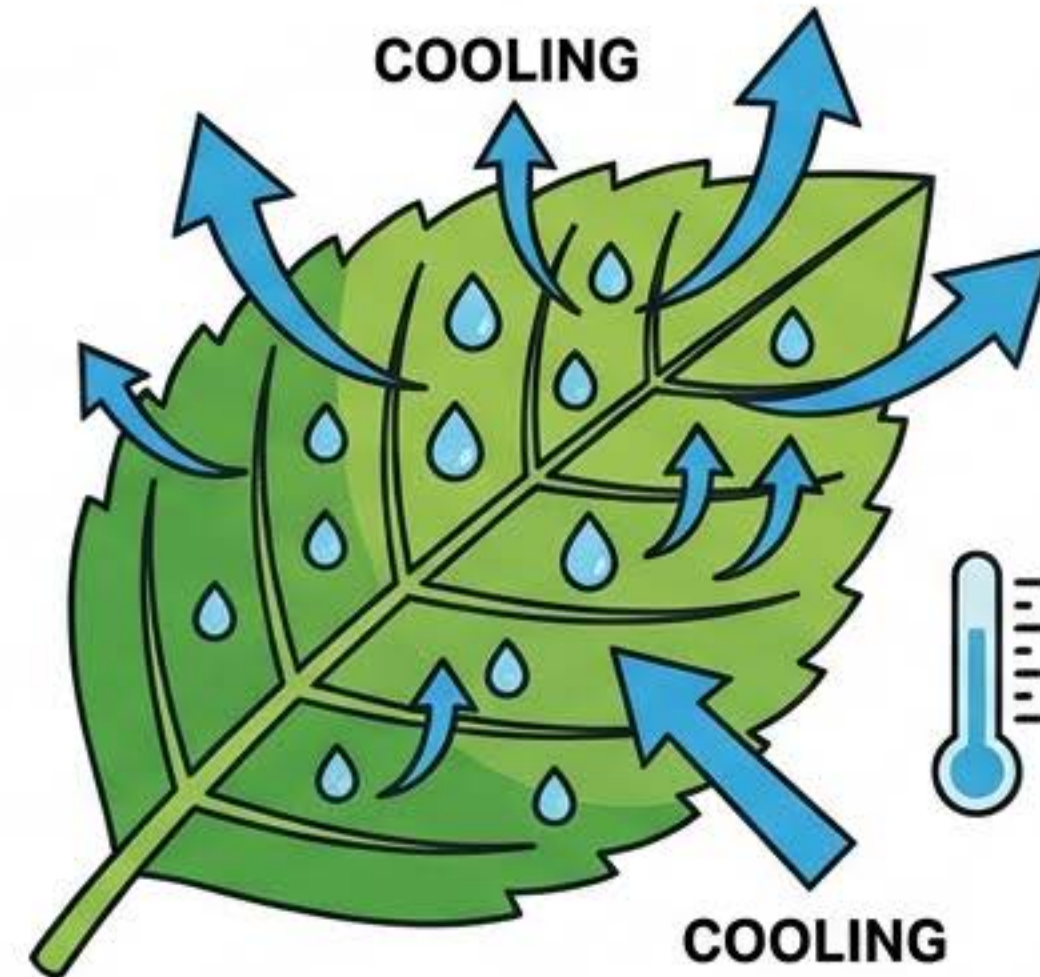
In the semi-arid heat, 2 degrees changes everything.

THE SCIENCE OF COOLING



1. SHADING: Intercepts solar radiation.

EVAPOTRANSPIRATION



2. EVAPOTRANSPIRATION: Releases water vapor to absorb heat.



TREES ARE SOCIAL JUSTICE.

- **THE CRITIQUE:** Ornamental trees look nice but don't feed anyone.
- **THE REALITY:** Vulnerable people need food security.
- **THE GOAL:** Plant Fruit Trees. Feed the community. Cool the city.

THE INNOVATION



PRODUCT: The Carbon-Sequestering Garden Bench

DESIGN: Student Concept / AI Modeled

A micro-solution for macro-problems.

MORE THAN A SEAT.



FUTURE STEPS

PROTOTYPE.
Build the physical
bench.

PLANTING.
Native fruit trees in
Puxinanã public squares.

POLICY.
Influence National Urban
Afforestation laws.





**TREES ARE NOT DECORATION.
TREES ARE INFRASTRUCTURE.**

CONCLUSION: A greener city is a cooler, fairer city.

THE RESEARCH TEAM

STUDENTS:

Raquel Gomes da Silva

Flávia Alexandra Santos de Almeida

Andrea dos Santos Dantas

MENTOR:

Andressa da Silva Guimarães Moura

INSTITUTION:

Ecit Plínio Lemos (Puxinanã, Paraíba)

SUPPORT:

GLOBE Program