YOUTH HACKATHON

ADAPTATION TO CLIMATE CHANGE

Evidence-based Innovative Solutions for South Asian Cities

2025

Knowledge and Outreach Partners

Eco-Network| Bangladesh

Gross International Nature| Bhutan

Nepalese Youth for Climate Action| Nepal

Nepal Youth Council| Nepal

Young Leaders for Active Citizenship | India

YouthNet Global | Bangladesh

Youth 4 NDCs| Bangladesh

Youth Ki Awaaz | India

YUVA | India

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Acknowledgements

We sincerely thank all youth participants for their creativity, effort, and commitment in submitting solutions for the Youth for Climate Hackathon organized by ICLEI South Asia. Each entry reflects the innovative spirit and dedication of young changemakers working towards climate-resilient and sustainable cities. We also acknowledge the valuable support of jury members, partners and who made this initiative possible.

Design Contribution: Manasa Garikaparthi (ICLEI South Asia)

Disclaimer

The ideas, concepts, and solutions presented in this compilation are the original work of the respective participants. ICLEI South Asia has compiled these entries for documentation and knowledge-sharing purposes only and does not assume responsibility for the accuracy, feasibility, or implementation of the submissions. The views expressed herein are solely those of the participants and do not necessarily represent the views of ICLEI South Asia or its partners.

Contact

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Foreword

Emani Kumar

Deputy Secretary-General | ICLEI Global
Executive Director | ICLEI South Asia

It gives me great pleasure to present the shortlisted entries of the Youth for Climate Hackathon, a flagship initiative of ICLEI South Asia under the ARISE Cities Forum. Themed "Adaptation to Climate Change: Evidence-based Innovative Solutions for South Asian Cities," this hackathon is a testament to the creativity, determination, and leadership of young changemakers across the South Asia region.

As climate challenges intensify across the Global South, the ideas of youth are vital in shaping resilient, equitable, and sustainable urban futures. This hackathon provides a platform for young innovators to propose locally relevant, scalable, and impactful solutions to real-world urban climate challenges. The diversity of ideas presented here, ranging from eco-innovations and spatial interventions to toolkits, dashboards, and platforms, reflects the ingenuity of the next generation of climate leaders. We are particularly proud that this initiative not only sources solutions but also strengthens youth leadership for the future. The most promising ideas will be spotlighted at the ARISE Cities Forum 2025 ensuring that youth ideas from South Asia are heard at the highest levels of international climate dialogue.

On behalf of ICLEI South Asia, I extend my heartfelt appreciation to all the jury members, partners, mentors and participants who have contributed to making this initiative possible. Together, we are embedding youth leadership at the heart of climate action and creating pathways for sustainable, resilient, and inclusive urban futures. ICLEI South Asia is committed to carrying this momentum forward, continuing the Youth initiatives in the years to come and expanding this vibrant community of young climate leaders across the South Asia region.

The Hackathon Team

Final Jury Members

Aditi Agrawal | Dasra, India

Bedoshruti Sadhukhan | ICLEI South Asia, India

Dr. Monalisa Sen | ICLEI South Asia, India

Lovlesh Sharma | National Institute of Urban Affairs (NIUA), India

Roshni Nuggehalli | Yuva India

Partner-led Poster Evaluation Team

Binchy Choden Jayasuriya | World Food Forum, Bhutan

Fyaj Khan Anam | Youth for NDCs, Bangladesh

Gurkirrat Sachdeva | Youth Ki Awaaz, India

Pema Choden | Gross International Nature, Bhutan

Sadia Jahan Rothi | Eco-Network Global, Bangladesh

Sohini Chakrabarti | Young Leaders for Active Citizenship (YLAC), India

Dechen, Dipak, Manju, Manasa, Satarupa| ICLEI South Asia

ICLEI South Asia Team

Sayli Mankikar | Associate Director, India

Dechen Wangmo |City Project Associate, Bhutan

Dipak Bhowmick | Technical Lead, Bangladesh

Manju Adhikari | Project Officer, Nepal

Manasa Garikaparthi | Senior Project Officer, India

Rick Sarkar |Communications Associate, India

Sankalita Dey | Communications Manager, India

Satarupa Roy | Senior Project Officer, India

Shinjini Saha | Knowledge Management Expert, India

Hackathon Process

Timeline	Submission Format	Evaluation	Award
25th April 2025 - 25th September 2025	A1 Poster Presentation A4 Summary of 500 words	Screening for eligibility Round 1 evaluation (54) to short list 10 posters Round 2 jury presentation of top 10 posters	Award to top 3 ideas Presentation in ARISE Forum 2025

Eligibility Criteria:

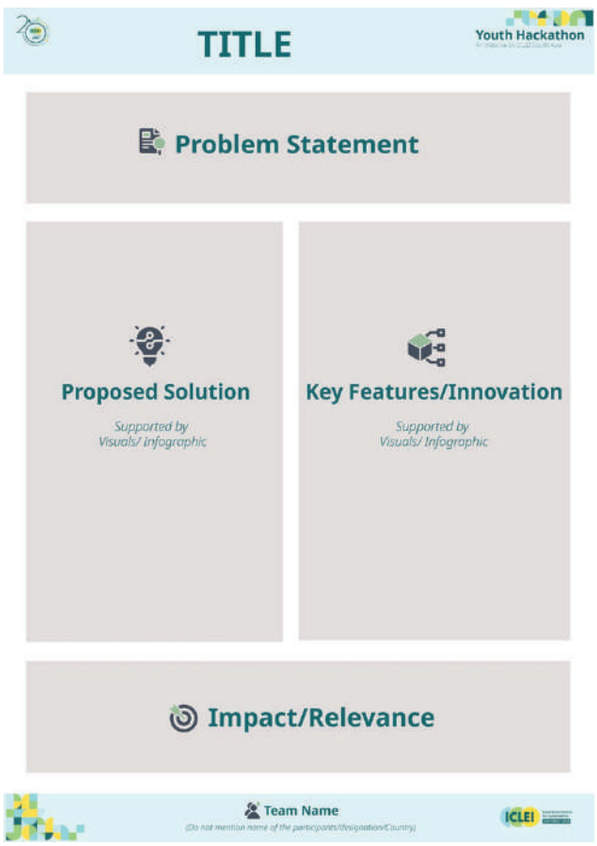
Age Group: Participants aged between 18 to 25 years.

Geographic Eligibility: Open to participants from South Asian countries (Bangladesh, Bhutan, India, Nepal, Sri Lanka)

Team Composition: 1 to 4 members

Evaluation Approach

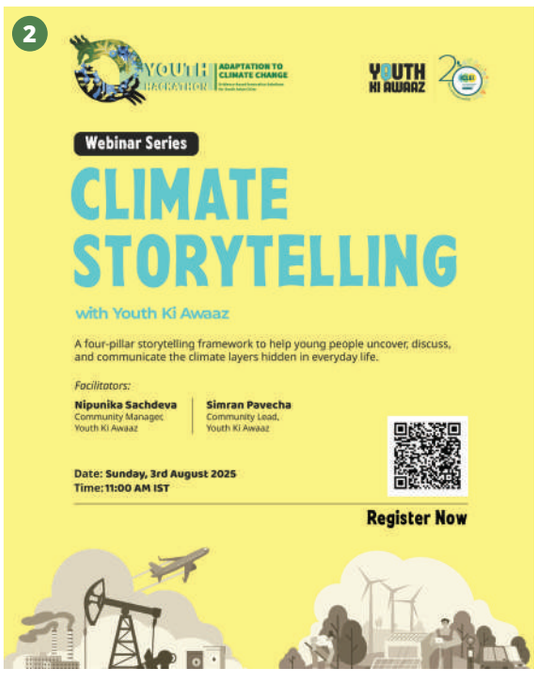
1. **Contextualise the Challenge:** Understand the local climate realities of a city, its vulnerabilities, and urban dynamics.
2. **Data-Driven Solutions:** Design adaptive interventions rooted in science, technology, and verifiable insights
3. **Ensure Scalability & Feasibility:** Ideas that can grow, work in real-world settings, and be sustained locally.
4. **Alignment with Hackathon Theme & SDGs:** Contribution to climate resilience and sustainable urban development.
5. **Uniqueness:** Innovative solution, impactful, and distinct.



Poster Presentation Template

Webinars

Topic	Partner Country	Date
1. Orientation Webinar	ICLEI South Asia, India	08th July
2. Writing on Climate: How Every Story is a Climate Story	Youth Ki Awaaz, India	3rd August
3. Translating Climate Advocacy into Real Action: Stories from Nepalese Youth for Climate Action	Nepalese Youth for Climate Action, Nepal	12th August
4. Youth-Led Civic Action for Inclusive Climate Action: Tools for Changemaking	Young Leaders for Active Citizenship, India	25th August
5. Women Leading Ambitions: Bringing Meaningfulness in NDCs' Adaptation	Youth 4 NDCs, Bangladesh	16th September
6. Hack the Climate: Shape the Future	WFF Bhutan Chapter + Gross International Nature	23rd September



Webinar Coordinators

- Dechen Wangmo
- Rick Sarkar
- Shinjini Saha

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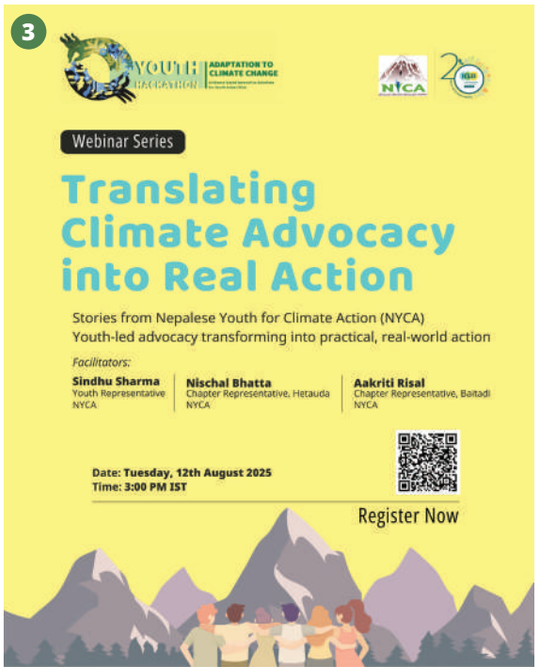
YOUTH ADAPTATION ACCELERATOR
ADAPTATION TO CLIMATE CHANGE
NYCA
Webinar Series
Translating Climate Advocacy into Real Action
Stories from Nepalese Youth for Climate Action (NYCA)
Youth-led advocacy transforming into practical, real-world action
Facilitators:
Sindhu Sharma
Youth Representative
NYCA
Nischal Bhatta
Chapter Representative, Hetauda
NYCA
Aakriti Risal
Chapter Representative, Baitadi
NYCA
Date: Tuesday, 12th August 2025
Time: 3:00 PM IST
Register Now

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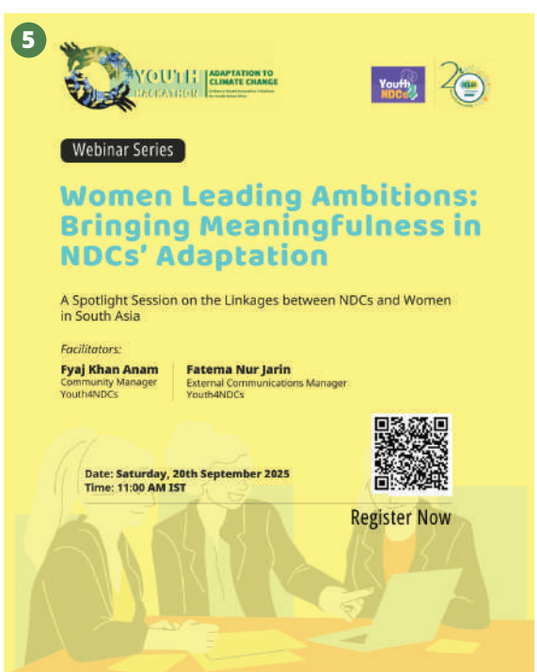
YOUTH ADAPTATION ACCELERATOR
ADAPTATION TO CLIMATE CHANGE
YLAC
Webinar Series
Youth-Led Civic Action for Inclusive Climate Action
Tools for Changemaking
Facilitators:
Venika Menon
Manager – Civic Policy & Partnerships
Young Leaders for Active Citizenship (YLAC)
Sohini Chakrabarti
Officer – Programs
Young Leaders for Active Citizenship (YLAC)
Date: Monday, 25th August 2025
Time: 11:00 AM IST
Register Now

5


YOUTH ADAPTATION ACCELERATOR
ADAPTATION TO CLIMATE CHANGE
Youth NDCs
Webinar Series
Women Leading Ambitions: Bringing Meaningfulness in NDCs' Adaptation
A Spotlight Session on the Linkages between NDCs and Women in South Asia
Facilitators:
Fyaj Khan Anam
Community Manager
Youth4NDCs
Fatema Nur Jarin
External Communications Manager
Youth4NDCs
Date: Saturday, 20th September 2025
Time: 11:00 AM IST
Register Now

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YOUTH ADAPTATION ACCELERATOR
ADAPTATION TO CLIMATE CHANGE
GIN
WORLD FOOD FORUM
Webinar Series
Hack the Climate Shape the Future
Empowering youth to generate solutions and exploring pathways to scale solutions into impactful action.
Facilitators:
Ugyen Yeshi Dorji
Chief Operating Officer
Gross International Nature (GIN)
Binchy Choden Jayasuriya
Chapter Leader
WFF Bhutan Youth Chapter
Date: Tuesday, 23rd September 2025
Time: 11:00 AM IST
Register Now

YOUTH HACKATHON

ADAPTATION TO CLIMATE CHANGE

Evidence-based Innovative Solutions for South Asian Cities

Poster Entries

- Geo tools enabled Localised spatial solutions
- Eco-products
- Climate Action Toolkit and Dashboard

Top 10 Shortlisted Teams

Sr. No	Team Name	Participants	Country
1	SPAnoators	Tanishka Chhabra Aarul Bhalekar Maitreyi C Gyanesh	India
2	DHARA	Arigela Sravani Sai Charan	India
3	ShudhdhoJol	Abhijit Dhali	Bangladesh
4	BlueRoots	Marium Khatun Zim	Bangladesh
5	ECOGRUB	Manish Kumar Chaurasiya Amit Gupta Abhinav Thapa Ashirwad Raj Jha	Nepal
6	Eco Sentinels	Md. Rezwanul Islam Shuvo Antora Das Shabbir Ahammad Sadia Ishrat Nisa	Bangladesh
7	Oasis	Nishitha I Joy Sahaya Varshini Aruna J	India
8	Palamou	Sakif Ahmmed Zarin Tasnim Ikra Momin Abdullah Nadia Binta Aziz	Bangladesh
9	Puri	Ajoy Ghosh	India
10	Zero-Waste Growers	Sayma Siddique Mitu MD. Abdun Nur	Bangladesh

**Please turn over to view the poster entries of the top 10 participants*

1

HACKATHON 2025 — SPAnovators

Empowering Chennai Against Urban Warming and Coastal Threats: Innovative, Evidence-Led Approaches

Aim: To develop innovative, evidence-based adaptation strategies that reduce the impacts of urban heat and sea level rise in Chennai by identifying two climates and proposing nature-based and spatial/innovative planning solutions that align with existing coastal regulations and sustainability goals.

Why Chennai?

India's 4th largest metro
: **8.5 million population**

Aligned with Sustainable Development Goals (SDGs)

At COP26, India pledged **50% renewable energy by 2030** and **net-zero emissions; 2070.**
Chennai, a C40 city since 2016, aims to halve emissions by 2030 and achieve carbon neutrality by 2050.

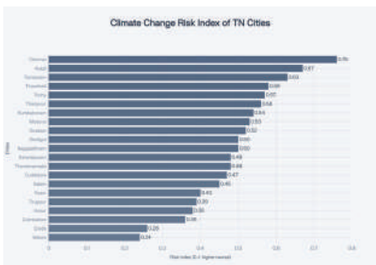
Facts	Source
Global average temperature has already risen by **1.1°C** above pre-industrial levels.	IPCC AR6, 2022
South Asia is one of the world's most **climate-vulnerable regions** due to heatwaves, floods, and sea level rise.	IPCC AR6 Ch. 10
At **2°C warming, 1.5 billion people in South Asia** may be exposed to extreme heatwaves every year.	IPCC AR6 Ch. 10
$4 billion/year is the current economic loss due to urban flooding in Indian cities. Projected to rise to **$30 billion/year by 2070** without action.	World Bank, 2021
Urban areas in India can experience **2–6°C higher surface temperatures** than nearby rural areas due to the urban heat island effect	IMD + ISRO + UN-Habitat

Future Risks of Sea-Level Rise in Chennai

By 2100, Chennai could see a **sea level rise of up to 77.88 cm**
- **Permanent inundation of 71.6 sq. km**, including **1.6 km of coastline** and **16% of the GCC area**

Future Risks Due to Increasing Temperature and Heat Waves

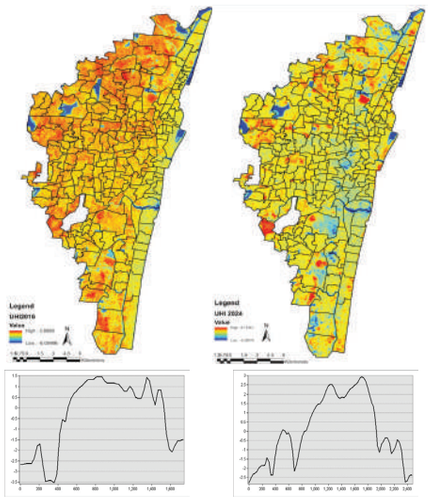
By 2050, Chennai's maximum temperatures are projected to rise by **0.9°C (2020s), 1.9°C (2050s), and 2.9°C (2080s)** compared to the **1970–2000** baseline



Climate Change Risk Index

Chennai has the highest climate change risk index (0.76) among Tamil Nadu cities, indicating it is the most vulnerable to climate impacts, risking heat deaths, blackouts, and displacement of over a million by 2050 if unchecked.

Urban Heat Island Effect



Urban Heat Island: Chennai (2016–2024)
- **UHI intensity increased by ~3 °C.**
- **Built-up area expanded to 74%**, reducing green buffers
- **Green cover dropped below 7%**, worsening heat retention
- **Hottest zones**: Dump yards, informal settlements, and industrial pockets
- **Nighttime temperatures rose**, increasing heat stress risks
- **Cyclone Vardah (2016)** caused major tree loss, intensifying UHI

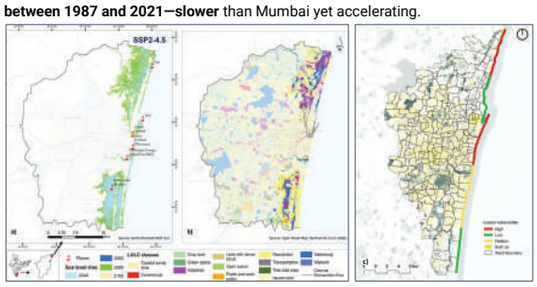
UHI Proposals

Green Corridor & Cool Roof Initiative: **Identify built-up heat islands** → apply **cool roof coating program** for informal housing

Heat-Sensitive Urban Design: **Incorporate microclimate-sensitive planning**

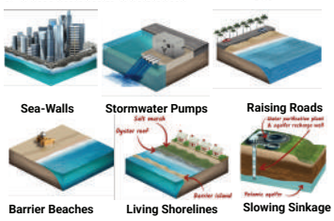
Sea Level Rise

Tide-gauge data show a **0.679 cm rise (0.066 cm yr⁻¹)** along **Chennai coast between 1987 and 2021—slower** than Mumbai yet accelerating.



a) Inundation area for projected SLR in Chennai, Tamil Nadu; The City could see a loss of 86 & 207 sq. km of area due to SLR by 2040-2100 respectively (under SSP2-4.5 Projections). c) Furthermore, studies on coastal vulnerability have indicated that almost **32% of chennai's coast comes under high vulnerability.**

i. Conventional Solutions **vs.** **ii. Innovative Solutions**



i. Traditional techniques of mitigating sea level rise are sea walls and barrier beaches to defend coasts from wave action, constructing living shorelines from natural materials to minimize erosion, slowing down land subsidence through the regulation of groundwater pumping, elevating roads to stay above anticipated flood levels, and the placement of stormwater pumps to drain hastily deposited water during high tide or heavy rainfall.

ii. New methods like "sponges" & "guided flooding" approach to sea level rise work by integrating water into urban spaces instead of fighting it. For example, through the **Room for the River** program in rotterdam rowing course , parks and lakes are designed to act as flood reservoirs. This strategy is more effective and holistic than seawalls as unlike them it doesn't inadvertently floods neighboring areas.

Location of parks and vacant spaces around chennai

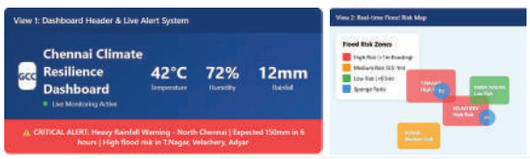
Urban Climate Dashboard or City's Digital Twin:

Urban Climate Dashboard: Real-time **GIS dashboard** with data to **target interventions** and inform **ward-level planning.**

Example: The city of Wellington in New Zealand has created a digital twin, a virtual model of the city, that can show decision-makers and residents how climate impacts like sea level rise will affect it – and crucially, how policy can help.

The dashboard not only strengthens data-driven planning and infrastructure adaptation but also aligns with **SDG 11** by promoting **resilient, inclusive, and sustainable cities.**

Funding Support:
Chennai Metropolitan Development Authority (CMDA) and the **Smart Cities Mission**.

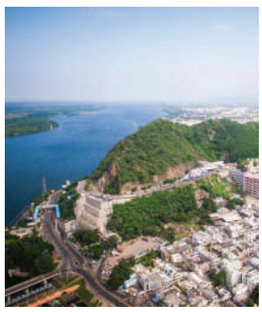


Dashboard allows hyperlocal solutions to be done at this level with **Prioritizing areas for planning infrastructures with Climate-resilient planning**

Source: Generated by Team

Team Members: Tanishka Chhabra, Aarul Bhalekar, Maitreyi C, Gyanesh | India

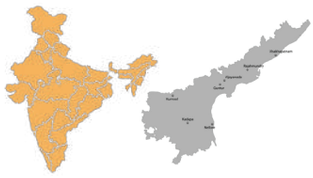
MITIGATING URBAN HEAT THROUGH COOLING STRATEGIES IN NEIGHBOURHOOD OF VIJAYAWADA



Why VIJAYAWADA?

Andhra Pradesh

Vijayawada, a rapidly urbanizing city in southern India, facing extreme heat events due to its tropical climate and urbanization, leading to elevated temperatures and risks to public health and infrastructure.



Alignment with SDGs

SDGs: SDG 11 (Sustainable Cities) and SDG 13 (Climate Action) by mitigating urban heat, enhancing resilience, improving energy efficiency and green urban spaces. It also supports SDGs 3, 7, 9, and 12 by promoting health, reducing energy demand, minimizing waste, and upgrading infrastructure sustainably.

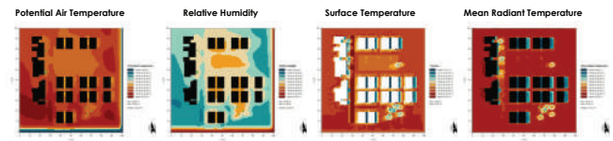
SITE location and Selected CLUSTER for study

Vijayawada has 111 notified slums, with around 26% of the city's population living in these areas. Ajit Singh Nagar is one of the rehabilitated low-income housing settlements.. JNNURM Housing Complex, which was part of a broader effort to improve living conditions for low-income families.

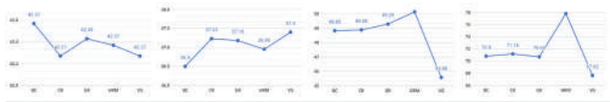
Location: Ajit Singh Nagar
Site Area: 7,500 sqm
LCZ: Compact Mid Rise
Climate Zone (NBC): Warm and Humid

ENVI MET SIMULATION RESULTS

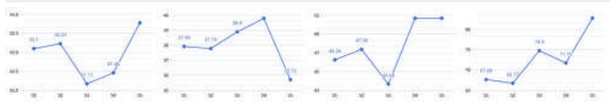
BASE CASE Simulation at 2PM (14:00)



Individual Scenarios Temperature Graphs at 2PM (14:00) for 4 Parameters



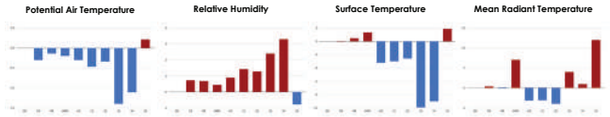
Combined Scenarios Temperature Graphs at 2PM (14:00) for 4 Parameters



IMPACT - Change in MICROCLIMATIC PARAMETERS compared to Base case

The bar graphs represent the variation in four key microclimatic parameters at **1.4m pedestrian height** across both **individual** and **combined retrofit strategies.**

The values are compared against the base case (BC) and were simulated using ENVI-met for peak summer on **May 15th 2024 at 2:00 PM**.



Individual: Vegetation was most effective, reducing surface temperature and MRT through shading and evapotranspiration.

Combined: S1 (Cool Roof + Vegetation) performed best overall; S5 showed poor results due to high reflectivity.

PROBLEM?

01 URBANIZATION: As cities continue to expand and urbanization intensifies, the transformation of natural landscapes into built environments has led to a range of environmental challenges.

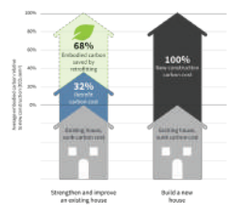
02 URBAN HEAT ISLAND (UHI): One of the biggest challenges cities face is the Urban Heat Island (UHI) effect, where urban areas are much hotter than nearby rural areas. This happens because cities have more heat-absorbing materials like concrete and asphalt, Land Use Change, fewer plants, and a lot of human activities that generate heat.

FOCUS ON RETROFITTING, WHY?

Existing Residential Buildings/Neighbourhoods

Existing residential buildings/Neighbourhoods are a **major portion** of the urban fabric, so they are a **critical focus for retrofitting**.

These buildings in various **Local Climate Zones (LCZs)**, play a major role in shaping **local microclimates.**



SOLUTION: Micro Scale UHI FOCUS - Building Level, Streets and Neighbourhoods

Practical and Scalability Focus: Reflectivity and greenery are among the most effective and implementable strategies.

Envi-MET 5 Software used to analyse the effects and impact of selected strategies.

Conditions Considered for ENVI MET Simulations

TIME FRAME FOR SIMULATION - 24 hours (a day) has been carried out for every iteration to maintain uniformity. Which corresponds to the date **15th MAY (peak summer month).**

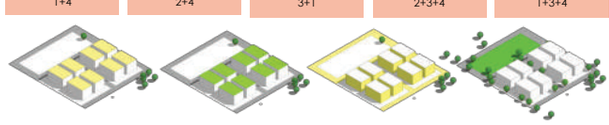
Evaluation Process: SIMPLE SCENARIOS - COMPREHENSIVE SCENARIOS

APPROACH used for analysis

- **Base Case** to benchmark the site.
- Test each **Individual Scenarios** to understand the isolated impact of each strategy and Progress through the **Combined Scenarios**.

INDIVIDUAL SCENARIOS				
Base Case	1 Cool Roof	2 Green Roof	3 High Albedo Materials	4 Vegetation

COMBINED SCENARIOS				
S1 1+4	S2 2+4	S3 3+1	S4 2+3+4	S5 1+3+4



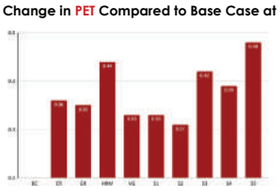
Parameters Considered for Simulations to Analyze

Microclimatic: Air Temperature (Ta), Surface Temperature (Ts), Relative Humidity (RH), Mean Radiant Temperature (MRT, **Thermal Comfort**: PET (Physiological Equivalent Temperature.

Strategies EFFECTIVENESS based on Microclimatic Parameters

Strategy	Effectiveness	Conclusion
Cool Roof (CR)		Minor cooling; limited MRT benefit in narrow streets
Green Roof (GR)		Helps roof insulation; minimal impact on street-level microclimate
High Reflective Material (HRM)		Increases MRT due to canyon reflections
Vegetation (VG)		Best performer improves all parameters
S1 (CR + VG)		Balanced and effective; combines surface cooling and vegetation
S2 (GR + VG)		MRT and RH improvements; strong overall strategy
S4 (GR + HRM + VG)		Effective for surface temp, but MRT rise requires caution
S5 (CR + HRM + VG)		MRT and RH issues; HRM offsets vegetation benefit

Change in PET Compared to Base Case at Pedestrian Level (1.4m)



Higher PET indicates greater thermal stress, while lower values suggest improved thermal comfort.

All strategies show a **Negative PET value**, meaning **none fully reduce PET below the base case**, but the degree of increase varies.

S1, VG, and S2 show the **lowest increases**, indicating better thermal comfort, likely due to the **cooling effects of vegetation and shade**.

Despite implementing cooling strategies, all scenarios resulted in increased PET values relative to the base case. The dense built form and **limited ventilation restricted the effectiveness of passive cooling**, with vegetation-based (VG) and combined strategies (S1, S2) showing the least PET rise (+0.31°C to +0.33°C). Highly reflective strategies (HRM, S5) significantly increased heat stress, underlining the importance of **shade and vegetative cover in compact zones.**

TEAM Dhara

Team Members: Arigela Sravani, Sai Charan | India

ShudhdhoJol: Smart Water Access for Climate-Resilient Coastal Bangladesh

Problem Statement

Coastal communities in Bangladesh face a growing water crisis driven by saltwater intrusion, brackish contamination and recurring climate disasters. Existing technologies, like Pond Sand Filters, are often ineffective in high-salinity areas, while off-grid regions lack the infrastructure and electricity needed for modern water systems. Most families cannot afford high-cost RO units and are forced to rely on unsafe sources. Furthermore, policy-level support is limited, localized R&D is insufficient and coordination among government, NGOs and communities remains weak—leaving millions without reliable access to clean water.

Proposed Solution

ShudhdhoJol introduces a decentralized, climate-smart water system that combines two water sources and a community-driven incentive platform to ensure safe, year-round access to clean water in off-grid, coastal or disaster-prone areas.

1. ShudhdhoJol Tank

A pedal-powered desalination unit operated by trained local youth or women (Jol Pilots) that transforms brackish or saline water into clean drinking water using RO membranes—entirely off-grid and low-cost. Built from recycled bicycles, each unit generates 30–50 liters/day, stored in community tanks for distribution.

Water delivery and pilot earnings are tracked via a QR/app-based system, with community scheduling supported through SMS. The model creates local livelihoods while ensuring water access during dry seasons or post-disasters.

2. MeghDhara Tank

A smart rainwater harvesting system that collects rooftop rainwater into low-cost at household or school level. Equipped with IoT water-level sensors, it monitors tank volume, detects leaks and tracks daily usage.

Water undergoes basic sedimentation and ceramic filtration, ensuring safe quality for non-potable or limited potable uses.

SMS/App alerts notify users when tanks are full, low, or leaking.

The system is maintained through Youth Water Watchers who conduct monthly audits and overseen by a local Water Co-op that handles usage rules and conflict resolution.

3. Jol Rewards Platform

A gamified mobile app + manual logbook hybrid system that rewards actions supporting clean water access and sustainability. Earn Jol Points (also called Water Taka) by engaging in meaningful water-related behaviors.

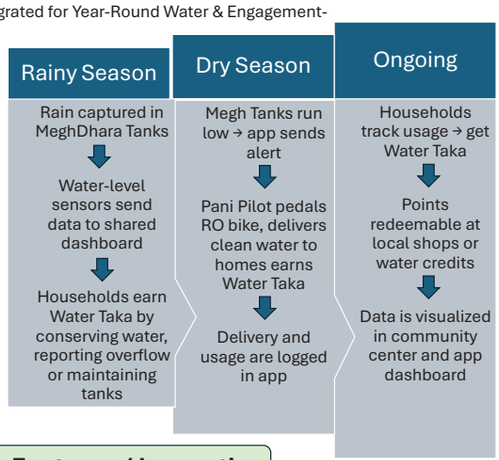
Action	Points
Pedaling the RO bike	+10 pts per 10L of clean water produced
Using less than average water/month	+10 pts
Hosting cleanups or awareness events	+10 pts
Reporting leaks or performing audits	+10 pts

Redeem Jol Points For:
- Soap, hygiene kits
- School supplies
- Water credit or discounts at local shops

Community Role:
- Youth Volunteers: Assist with logging activities for non-app users.
- Local Shops: Act as Redemption Hubs for Jol Points.
- Schools/Clubs: Use Leaderboards to foster healthy competition, pride, and awareness.

The Flowchart of ShudhdoJol:

Integrated for Year-Round Water & Engagement-



Key Features / Innovation

Dual-Source Clean Water Access: Combines desalination and rainwater harvesting with one year-round availability.

Off-Grid, Human-Powered Technology: Fedal-powered RO operations without electricity

IoT-Enabled Rainwater Management: Megh Tanks monitored with sensors and alerts

Gamified Incentive System – Jol Rewards: Water-saving actions rewarded with redeemable points

Youth-Driven Livelihood Creation: Micro-entrepreneurship for trained youth and women

Scalable, Modular & Circular: Made from recycled bicycles and locally sourced parts

Impact / Relevance

The ShuddhoJol System delivers year-round water security to climate-vulnerable coastal communities by combining pedal-powered desalination with smart rainwater harvesting. Through decentralization and off-grid functionality, it ensures access to safe drinking water even during floods or power outages. The system empowers local youth as "Jol Pilots" and "Water Watchers," creating ownership and encouraging behavioral change via a gamified Jol Rewards Platform. Its modular, low-cost design makes it resilient and scalable across South Asia, adaptable for schools, cyclone shelters, and remote areas. Aligned with the UN SDGs—notably SDG 6 (Clean Water), SDG 13 (Climate Action), SDG 11 (Sustainable Communities), SDG 12 (Responsible Consumption) and SDG 8 (Decent Work)—the project offers an inclusive, innovative solution for water justice and climate resilience.

ShudhdhoJol

Team Member: Abhijit Dhali | Bangladesh

GreenShield: Smart Tree Zoning for Climate-Resilient Chittagong

"A Nature-based Solution to Urban Salinity, Heat, and Air Pollution"

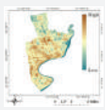
Presented by BlueRoots.

STUDY AREA

PROBLEM STATEMENT

Salinity Intrusion
From the sea into urban areas

Urban Heat Island (UHI) Effects
Due to rapid urbanization and LULC change



Air Pollution
From industrial zones and traffic congestion

CITY-SPECIFIC NEEDS

Requires location-specific adaptation strategies

Limited greenery in critical zones (bare soils, roadside strips, industrial edges)

Needs low-cost, nature-based solutions accessible to local governments

PROPOSED INNOVATIVE SOLUTION: GreenShield

A smart, **satellite-based tree recommendation platform** for:

IDENTIFYING STRESS ZONES

Salinity	UHI	Air Pollution

↓

TREE MATCHING

Salinity Reducer & Resistant	Heat Absorbent	Air Purifier

↓

ACTION MAP

Recommend Trees	Available space	Usable GW Zone	Health Risk Zone

METHODOLOGY

DATA COLLECTION → ZONING → MAPPING SUITABLE PLANTATION SITES → TREE SUITABILITY MATRIX BASED PROBLEM ZONE → WEB-BASED INTERFACE FOR VISUALIZATION & FUTURE EXPANSION

KEY FEATURES

Data-driven
- Uses free satellite data & GIS

Zone-specific
- Different trees for different stress factors

Community & Policy tool
- Easy for city planners and citizens

Nature-based
- Combines technology and ecology

FEASIBILITY & PRACTICALITY

Tech-ready	Uses free satellite tools (GEE), scalable algorithms
Policy-aligned	Can integrate with urban green masterplans
Low-cost	No high infrastructure investment needed
Community-involved	Local participation possible for implementation

SUSTAINABILITY IMPACT

- ❑ Model applicable to other South Asian cities facing salinity, heat, or pollution (e.g., Khulna, Mumbai, Chennai)
- ❑ Creates long-term ecosystem services:
  - Improves urban air & water quality
  - Reduces soil salinity
  - Enhances coastal protection

Aligns with SDGs:

- SDG 11: Sustainable Cities
- SDG 13: Climate Action
- SDG 15: Life on Land

SCALABILITY

Model applicable to other South Asian cities facing salinity, heat, or pollution (e.g., Khulna, Mumbai, Chennai)

POTENTIAL OUTCOMES

1. Lower soil salinity (in coastal fringe)
2. Cooler city through shade and evapotranspiration
3. Improved air and water quality
4. Resilient green infrastructure for climate adaptation
5. Improved livability and climate resilience
6. Better urban cooling and biodiversity
7. A data-driven policy tool for climate-smart urban greening

Tree Suitability Table

Zone Type	Issue	Tree Species	Benefit
Coastal/ Southwest	Salinity	Coconut, Sundari	Salt-tolerant, erosion control
Urban Core	UHI	Rain Tree, Neem	Shade, cooling
Industrial Belt	Air Pollution	Banyan, Neem	Air purifier, CO_2 absorption
Hillside	Erosion	Bamboo, Vetiver	Slope stabilization

REFERENCES:

1. Fig 1- created using ArcGIS by Team BluRoots.
2. Fig 2- http://dx.doi.org/10.13140/RG.2.2.28090.62405
3. Fig 3- https://doi.org/10.1016/j.envc.2021.100107
4. Fig 4- Live Animated Air Quality Map (AQI, PM2.5...) | IQAir

Team Members: Marium Khatun Zim | Bangladesh

Project Harvesting Resilience: Climate-Smart Floating Agriculture for Coastal Bangladesh

Eco Sentinels

Problem Statement

- Over 1.056 million hectares of coastal Bangladesh face salinity intrusion and flooding, rendering traditional agriculture unsustainable(Miah et. al. 2020).
- Bangladesh ranks 7th most climate-vulnerable! (GCRI, 2021).
- By 2050, **(Annual Report IWM, 2012)**
  - Aquifer saline zone : **2.27%** ⇧
  - Fresh water zone : **3.44%** ⇩
  - Severe salinity zone : **14%** ⇧
- Rising climate impacts threaten rural economies, with $9 billion in annual losses (Ministry of Forest, Environment and Climate Change, 2025)
- 10 million farmers, including 24% women, lose livelihoods due to crop failures, leading to food insecurity and migration (BRAC, 2025).

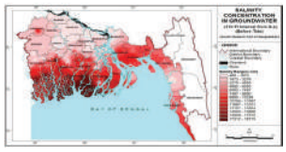


Figure 1: Salinity Concentration in Groundwater at the Coastal Part of Bangladesh (BADC, 2011)

Figure 2: Effects of Salinity Intrusion in South West Coastal Belt of Bangladesh

Proposed Solution

- Nature-Based Innovation: Floating agricultural beds made from agro-waste (water hyacinth, jute sticks) and enriched with halophytes, activated carbon, gypsum, and coco peat.
- Functionality: Enables cultivation of staple crops (rice, wheat) in saline, flood-prone areas, unlike traditional beds limited to vegetables through phytoremediation.
- Community-Led: Women micro-entrepreneurs deliver training, consultation, and sales, fostering local ownership and empowerment.

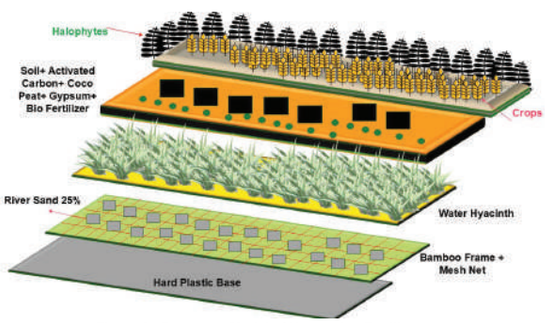
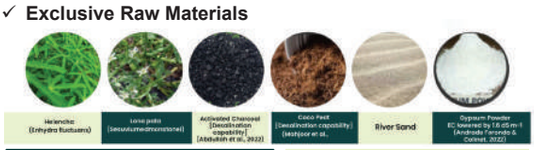


Figure 3 : Prototype Model of Harvesting Resilience

✓ **Exclusive Raw Materials**



Maximum Phyto-desalination capacity of (251.22 kg Na+ ha−1)

Highest sodium adsorption ratio (48%) (M. Islam et al., 2022)

Key Features & Innovation

Figure 4 : Innovation Exclusivity of Harvesting Resilience

Results & Discussion

Table 1: Comparison among different agricultural methods with Harvesting Resilience

Category	Project Harvesting Resilience	Traditional Agriculture	Other Saline-Resistant Methods
Initial Setup Costs	Higher (due to floating bed construction and salinity management)	Lower (ground-based methods)	Moderate (basic infrastructure)
Operational Costs	Comparable (low input costs post-setup)	Higher (more fertilizer, water required)	Slightly higher (specific techniques)
Yield Potential	30% Higher (larger crops like paddy & wheat)	Moderate (vegetables & small grains)	Variable (depends on salinity solution)
Flood Resilience	Excellent (flood-resistant floating beds)	Poor (susceptible to waterlogging)	Good (partial protection, not flood-proof)
Salinity Management	Excellent (halophytes, gypsum, coco peat)	Poor (salinity build-up over time)	Moderate (chemical or bio-based solutions)
Environmental Impact	Positive (nature-based solutions, minimal degradation)	Negative (soil degradation over time)	Neutral (mixed environmental impact)
Community Benefits	High (empowerment, training, better economic resilience)	Moderate (traditional knowledge transfer)	Low (limited community engagement)

✓ **The Cost-Benefit Ratio (CBR) of Project Harvesting Resilience is 0.12 BDT**

Impact & Relevance

- ✓ 4x Rise in Women's Visibility in Farming
- ✓ Boosted yields & income for 200+ coastal farmers - 70% eager to adopt.
- ✓ Restores cultivable land, ensures food security.
- ✓ Empowers women as micro-entrepreneurs, breaking poverty cycles.
- ✓ Scalable for saline, flood-hit regions across South Asia & Africa.
- ✓ SDG Alignment :-

Figure 5 :Success Stories of Harvesting Resilience

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Nepal

ECOGRUB

Team Members:
Abhinav Thapa, Ashirwad Raj Jha, Manish Kumar Chaurasiya, Amit Gupta

EcoGrub: Smart BSF Farming
A Digital Circular Solution for Kathmandu's Organic Waste

The Challenge

- 1,200 t/day of municipal waste, over 60 % organic, ends up in open landfills.
- Leachate contaminates soil & water; methane emissions accelerate climate change.
- Livestock feed imports (soybean, fishmeal) drive high costs and degrade soils via chemical fertilizers.
- Women, youth & informal waste-collectors lack access to green-economy opportunities.

2. Innovative Concept

Our Digital Circular Model (Refined)

1. Decentralized Micro-Hubs
   - Community-level BSF farms processing food scraps, market waste & farm residues.
2. 10–15 Day Bioconversion
   - BSF larvae → 50–55 % protein feed
   - Frass → organic fertilizer
3. IoT-Enabled Optimization
   - Sensors track temperature, humidity & substrate health
   - Mobile/Web app connects generators
   - ▶ collectors ▶ hubs ▶ farmers
4. Traceability & Planning
   - Real-time dashboard for municipal waste-flow management

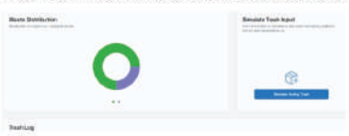
(Insert schematic: waste pickup → hub → larvae feed → farm → frass)

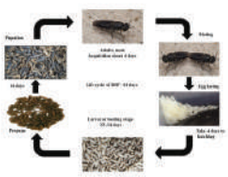
3. Potential Impacts & Outcomes

- Waste Diverted: 50 % of Kathmandu's organic waste by Year 3
- Feed Produced: 2,000 t BSF larvae/year
- Fertilizer Generated: 3,000 t frass/year
- Emissions Cut: Equivalent of 1,500 t CO_2-eq/yr
- Jobs & Inclusion: ≥ 150 new green-jobs for under-represented groups

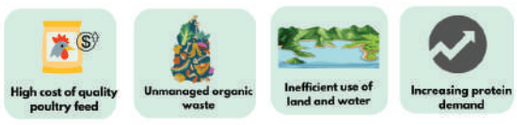
4. Market & Recognition

- Global BSF market: 33.3 % CAGR → USD 1.5 b by 2029
- Nepal Poultry sector: ~NPR 160 b
- 2nd place, Wageningen Food Systems Innovation Challenge 2024
- FAO Youth Food Lab, Rome attendee (Oct 2025)





Problems addressed by EcoGrub



Alignment with National Pathway

Action Track 1: Ensuring Safe and Nutritious Food for All

By providing a sustainable, high-protein poultry feed, EcoGrub boosts agricultural productivity and offers a nutritious, affordable diet, contributing to improved nutrition and zero hunger.

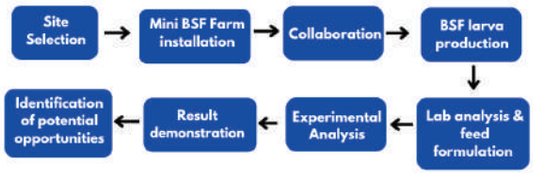
Action Track 2: Shifting to Sustainable Consumption Patterns

EcoGrub supports sustainable consumption by converting organic waste into feed, reducing food waste, and promoting a circular economy through eco-friendly practices.

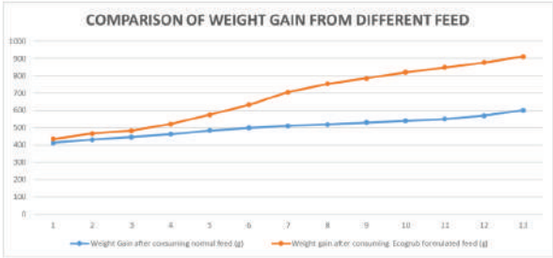
Action Track 4: Advancing Equitable Livelihoods

EcoGrub creates jobs and enhances incomes by developing a new value chain in the feed industry, fostering inclusive food systems, and addressing food insecurity through innovation and entrepreneurship.

Activities by EcoGrub



Results from experiment



Impacts of Project

Testimonials

Dev Shrestha
Rajdevi Agrofarm
"We observed no negative effect in our poultry farm. Chicken feedging on EcoGrub formulated feed had gained more weight than chicken feeding on normal feed simultaneously."

Kamala Shah
K&K Agrofarm
"We discovered that this product, initially designed for poultry feed, not only enhances poultry growth and health due to its high protein and fat content but also significantly reduces feed costs."

Sanjog Gurung
Gurung Poultry farm
"I have decided to use this product in my own farm. We highly hope that EcoGrub will bring this product in the market vey soon."

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Nguyen, T. T. X., et al. (2015). "Insect consumption as a protein source for livestock and humans in Thailand." *Journal of Asia-Pacific Entomology*.

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Sowing Resilience in Peri-Urban Salem: Linking Climate-Resilient Agriculture and Urban Nutrition

Background of the study:

Peri-urban areas are transitional zones between rural and urban landscapes. In Tamil Nadu, the concept of **Composite Local Planning Areas (CLPAs)** under the **AMRUT 2.0 Master Plan** integrates municipalities or municipal corporations with surrounding villages and Nagar Panchayats to promote balanced and inclusive growth. These peri-urban zones exhibit mixed land use, with agriculture often continuing as a dominant economic activity despite urban pressures.

However, the emergence of **climate change**, Irregular rainfall patterns, prolonged droughts, and increasing temperatures have led to **declining agricultural productivity** in these regions. Coupled with this, the **over-extraction of groundwater** often the primary source of irrigation has resulted in aquifer depletion and soil degradation, further undermining farming sustainability.

As cities expand into rural hinterlands, there is an urgent need to reimagine peri-urban agriculture not only as a livelihood source but also as a critical component of **urban resilience**, **food security**, and **climate adaptation.**

This research situates itself at the intersection of climate adaptation planning and peri-urban development, aiming to explore how sustainable strategies can be integrated into CLPA level planning in Tamil Nadu to support the dual goals of regional growth and environmental sustainability.

Problem Statement

The growing climate change impacts, peri-urban agriculture is increasingly threatened by declining crop productivity, unsustainable groundwater extraction, and a lack of diversified livelihood options, posing significant risks to both environmental sustainability and socio-economic resilience in these transitional zones.

Study area: Salem CLPA

Salem CLPA , The Existing context

Diverse Agricultural Landscape in cropped in the case area

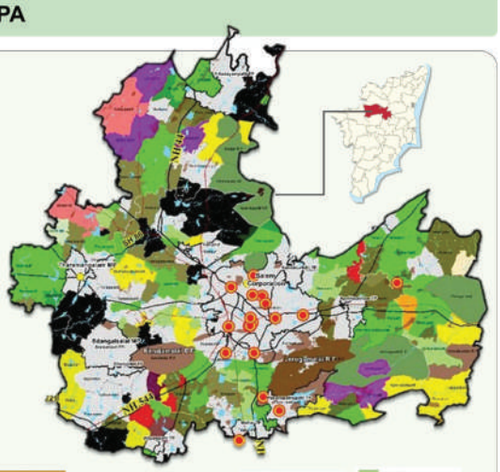
Dominant Crops are Paddy, Maize, Tapioca, Coconut, Sugarcane etc.

The "Urban Area" (grey) is primarily centered around Salem Corporation, with significant agricultural activity surrounding it.

Sago Industry Distribution

Inferences:

1. **Economic Reliance on Agriculture.**
2. **Importance of Tapioca and Sago is seen**
3. **Food crops like paddy and Cash Crops are both equally predominant.**
4. **Agro-Climatic Suitability, imply varying agro climatic conditions (soil types, rainfall, temperature) across the Salem CLPA.**



There is a need for Solution that offers Inclusive Growth, Enduring Impact, Aligned with the Global Goals !

Existing gaps and situation

1 Water consumption

Crop	Water Requirement (mm per crop cycle)
Banana	1200–2200 mm
Bengal Gram	300–400 mm
Betel Nut (Arecanut)	1200–1500 mm
Brinjal (Eggplant)	500–700 mm
Coconut	1000–2000 mm
Coffee	1200–2000 mm
Flowers	500–800 mm
Green Gram	300–400 mm
Ground Nut (Peanut)	500–700 mm
Maize	500–800 mm
Paddy (Rice)	1200–2000 mm
Ragi (Finger Millet)	300–450 mm
Sugarcane	1500–2500 mm
Tapioca (Cassava)	800–1000 mm
Tomato	600–800 mm
Whole Green Gram	300–400 mm

High water consumption
Low water consumption
Moderate water consumption

In the Salem CLPA the dominant crops cultivated **paddy and maize** are highly water-intensive, **paddy is grown on approximately 33,000 ha**, followed by **maize on around 24,000 ha.**

The water consumed by paddy cultivation alone is sufficient to meet the **daily water needs of nearly 3 lakh people**, which is nearly **three times higher** than the water requirement for cultivating millets. This highlights a critical opportunity, **shifting even half of the paddy cultivation area to millet** could free up enough water to **meet the daily water needs.**

2 Groundwater Fluctuation

30% of tested groundwater sources in peri-urban blocks like Omalur, Edappadi, Mecheri, and Kolathur are reported to be **saline or alkaline**, making them **unsuitable for irrigation**, especially for water-intensive crops like paddy or sugarcane.

Groundwater levels sharply decline between January and May, primarily due to **excessive irrigation withdrawals during summer** and **poor aquifer recharge** from erratic rainfall posing long-term risks to agriculture in peri-urban belts.

Average annual groundwater fluctuation in Salem ranges between **2.5 to 7 meters**, with the **deepest declines in dry-season months** especially in agricultural blocks dependent on borewell irrigation like Mecheri and Kolathur.

In peri-urban areas, the rise of urban housing projects and industries is increasing pressure on local aquifers. Combined with climate stress, this leads to **lower recharge rates** and **conflict over water use** between domestic and agricultural needs.

3 Summer impacts

Rising summer temperatures (often above **40°C**) combined with reduced rainfall (below 700 mm/year) have worsened **soil moisture stress** and **crop wilting** especially in **peri-urban zones** like Mecheri, Omalur, and Kolathur.

Dry spells and erratic rainfall have led to failed summer crops like paddy and maize. As a result, farmers are switching to **climate-resilient millets** that require less water and can tolerate heat.

The peri-urban poor farming households are most affected. Many report says **reduced yields**, **increased input costs**, and **greater dependence on groundwater**, forcing either crop shifts or migration to non-farm labor.

4 Rainfall patterns

Rainfall in Salem is highly erratic, with annual averages falling **below 700 mm** in many recent years, leading to stress on rainfed agriculture.

The region depends mainly on the North-East Monsoon (Oct–Dec), so any delay or failure during this short window severely **affects crop cycles.**

Uneven rainfall intensity and short-duration heavy rains reduce percolation, lowering groundwater recharge, especially in peri-urban blocks like Kolathur and Omalur.

Drought-prone zones such as Mecheri and Edappadi face **frequent rainfall deficits, with at least 2–3 drought years** in a decade, impacting traditional crops.

Proposals / Key solutions:

1. Millets in Urban School Lunches via Peri-Urban Linkages

Connect peri urban millet farmers directly with urban school mid-day meal programs. This creates a stable demand for climate resilient crops, improves child nutrition, and supports peri-urban livelihoods.

2. Peri-Urban Farms as Carbon Credit Generators for city

Turn peri urban farmlands into carbon sinks by promoting sustainable, low-input farming (like millets, agroforestry), and then measure and monetize the carbon they sequester. Cities (especially Smart Cities) can buy these credits as part of their net-zero targets.

3. City Adopted Peri-Urban Farms Using Digital Tokens

Each city adopts its surrounding peri-urban region's farms. Citizens or corporations can co-own "shares" in peri-urban farms via digital tokens (blockchain-based, but user-friendly). The returns could be in the form of produce, carbon credits, or even tourism rights.

Impacts of solutions:

How It Works

NUTRITION	REDUCED GHG	FARM LINKS
City municipal corporations or education departments commit to sourcing a **percentage of mid-day meal grains as millets**.	Farmers shift from water intensive, chemical-heavy crops to climate-resilient ones (e.g., millets, mixed cropping, trees). With help from local institutions, the **soil carbon levels, reduced emissions, and green cover** are quantified.These savings are **certified** (using standard methods like Verra or Gold Standard).	A digital platform is created where peri-urban farmers list their land and crops.
Peri-urban farmer cooperatives are identified and trained to supply these in bulk.		Urban citizens, RWAs (Resident Welfare Associations), or companies can invest in these farms through **micro-investments** (tokenized shares).
Millets are introduced into menus in **taste friendly ways** (upma, dosa, snacks).		The farm outputs like millet produce, compost, or even eco-tourism slots are distributed accordingly.
Nutritional data is tracked to show benefits to children's health.	Cities, corporations, or government bodies buy these **carbon credits** to offset their emissions creating a new **income stream for farmers**	Farmers get predictable income; urbanites get farm-fresh food, carbon neutrality, or wellness experiences.

Powerful features

Creates **demand-side security** for millet farmers.	Links peri-urban agriculture directly to **climate finance**.	Builds **urban-rural empathy** and investment. Encourages **community-supported agriculture**.
Tackles **urban malnutrition** and obesity with traditional, wholesome foods.	Gives cities a **local, ethical way** to offset emissions.	Urban citizens, RWAs (Resident Welfare Associations), or companies can invest in these farms through **micro-investments** (tokenized shares).
Integrates peri-urban regions into **urban service delivery systems**.	Empowers farmers financially to protect green cover and reduce groundwater use	Introduces **transparency and traceability** into the food system.
		Can bring tech-based startups.

Team Oasis

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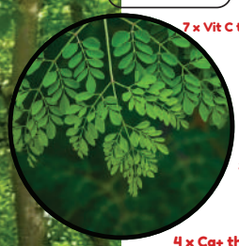
Moringa : The Green Catalyst Turning Carbon into Cure

Seed (pods)

Quercetin, Benzylamine Vitamins: C, E Mineral: Ca

Flowers

Quercetin, Benzylamine Vitamins: C, E Mineral: Ca



7 x Vit C than

4 x Vit A than

3 x K+ than

4 x Ca+ than

Leaves

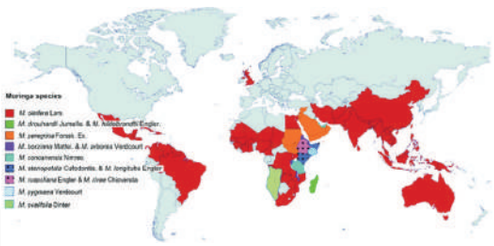
Quercetin, Kaempferol, Benzylamine Vitamin: E Mineral: Ca

Stem

QBenzylamine Vitamin: C Minerals: Fe, Ca

Roots

Benzylamine, Morphine,Morginine Minerals: Fe, Zn,Ca,Mg,Na



BACKGROUND

- Climate change continues to accelerate, with global CO_2 emissions surpassing 39.8 gigatonnes in 2023.
- Nature-based solutions like afforestation and carbon farming are gaining traction in global climate strategies.
- Moringa oleifera, known as the "Miracle Tree," grows rapidly, thrives in arid lands, and captures significant amounts of CO_2.
- Beyond carbon sequestration, moringa supports nutrition, income generation, and land restoration in vulnerable communities.

OBJECTIVE

To promote moringa-based nature-based solutions (NbS) as a viable strategy for climate resilience in South Asia

METHODOLOGY

Location: Semi-arid zone trial plot

Soil: Degraded loamy

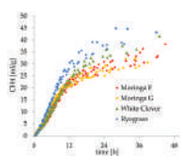
Irrigation: Drip + Rainfed

Control vs. Moringa plots monitored for CO_2 uptake, moisture, and soil health

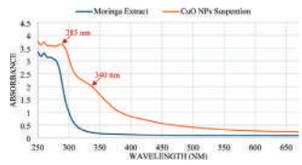
RESULTS

The Moringa plot significantly outperformed the control plot in soil organic carbon, biomass yield, CO_2 sequestration, and leaf protein content after three years

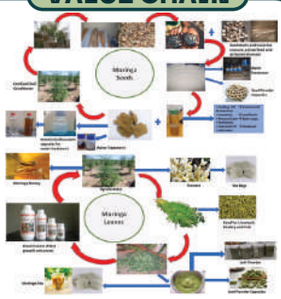
Moringa F and Moringa G produced significantly higher CH_4 emissions compared to white clover and ryegrass over 48 hours



The Moringa extract and CuO NPs suspension show distinct absorbance peaks, with the highest absorption occurring around 350 nm for the Moringa extract



VALUE CHAIN



SCALABILITY & IMPACT

- 1 Million ha of Moringa = ~20 Mt CO_2 offset/year
- Integratable with agroforestry and existing cropping systems.
- Promoted in India, Bangladesh, Sub-Saharan Africa and Egypt.
- Ideal for climate-smart agriculture in vulnerable regions specially drought areas.

CONCLUSION

- Moringa oleifera emerges as a low-cost, high-impact nature-based solution to climate change.
- Its ability to sequester carbon, restore degraded soils, and enhance rural livelihoods makes it a multipurpose climate ally.
- Integrating moringa cultivation into climate adaptation and agroforestry programs can significantly advance sustainability goals in vulnerable regions.
- With the right policy support, awareness, and investment, moringa can help us grow not just trees – but a resilient, greener future.

ALLIGNMENT WITH SDG

- Promoting moringa cultivation to improve food security through nutrient-rich leaves and sustainable income for smallholder farmers.
- Deploying Moringa oleifera agroforestry to sequester carbon, rehabilitate degraded land, and build climate resilience in vulnerable regions
- Creating a circular, zero-waste value chain by using every part of the moringa tree for food, fuel, water purification, and bio-based products.
- Restoring biodiversity and regenerating degraded ecosystems through community-based land reclamation and tree-based farming systems.

REFERENCES

TEAM PALAMOU

Team Members: Sakif Ahmmed, Zarin Tasnim Ikra, Momin Abdullah, Nadia Binta Aziz | Bangladesh

YOUTH HACKATHON | ADAPTATION TO CLIMATE CHANGE

Analysis of Anthropogenic Influences on Climate Change: A Case Study of Puri,Odisha

Ajoy Ghosh, Team Name: Ajoy_IITKgp_CC_Puri

Project Introduction

Climate change is a growing global concern, with anthropogenic activities significantly altering environmental patterns. Rapid urbanization, tourism-related activities, and infrastructure expansion contribute to greenhouse gas (GHG) emissions, land-use changes, and resource depletion, exacerbating climate change impacts. Coastal cities like Puri, Odisha, which attract millions of tourists annually, are particularly vulnerable to these changes. The uncontrolled expansion of tourism infrastructure, vehicular emissions, and rising energy consumption have intensified local climate impacts, including temperature rise, coastal erosion, and air pollution.

Aim

To analyze the spatial impact of anthropogenic activities on climate change in Puri, Odisha, using geospatial techniques, and to develop sustainable urban planning strategies that mitigate environmental risks.

Need of the Study

1. Lack of geospatial analysis on anthropogenic influences.
2. Policy gaps overlook tourism's environmental impact.
3. Need to integrate geospatial, climatic, and tourism data for pattern analysis.

Objectives

Comprehensive Emission Analysis: Insufficient quantification of emissions from all tourism sub-sectors, including transportation, accommodations, and local tourist activities, especially during peak seasons.

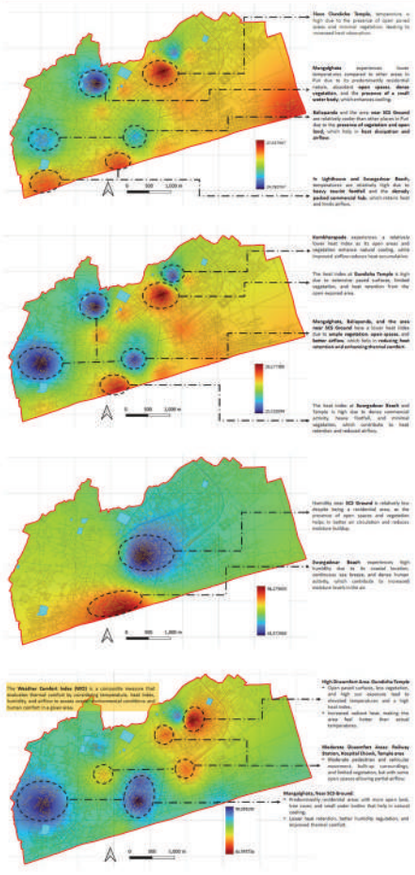
Microclimatic & Ecosystem Effects: Limited research on how tourism alters local climate patterns, such as urban heat islands, and long-term effects on ecosystems like coastal erosion and biodiversity loss.

Geospatial Analysis of Tourism Impacts: Utilize advanced geospatial tools to map and analyze the spatial distribution of tourism-related activities, their environmental impacts, and contribution to climate change mitigation.

Policy and Adaptive Strategies: Lack of integration between tourism-specific emissions and existing climate policies, with minimal research on effective adaptation strategies tailored for tourism-reliant regions.

Study Area

Microclimate Analysis Using Kestrel 5200 Env. Meter & GIS



Field Survey Analysis

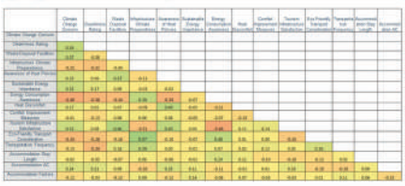
Kestrel 5200 Environmental Meter & Software Used

The Kestrel 5200 measures temperature, humidity, wind speed, and WBGT, helping analyze heat stress, ventilation, and climatic impact.

ArcGIS — For GIS analysis, including heat maps.
QGIS — Heatmap plugin, Interpolation tools.
Imagery analysis & geospatial data interpretation.
Data processing, automation, & spatial analysis.
Statistical modeling, data analysis, & visualization.
Statistical analysis & data interpretation.

Correlation Matrix : (Relationship Between Tourism, Climate Change Concerns, and Infrastructure Factors)

This correlation matrix presents the relationship between various tourism-related and environmental factors, such as climate change concern, infrastructure preparedness, energy consumption awareness, transportation frequency, and accommodation preferences.



Alignment with Sustainable Development Goals

- This study aligns with *SDG 13 (Climate Action)* by quantifying tourism-related CO_2 emissions and proposing low-carbon solutions.
- It supports *SDG 11 (Sustainable Cities)* through green infrastructure, decentralization, and microclimate-based planning.
- *SDG 12 (Responsible Consumption)* is addressed by promoting eco-certified accommodations and energy-efficient mobility.
- Public amenities and heat resilience strategies contribute to *SDG 3 (Good Health and Well-being)*.
- Solar power and energy-saving proposals further align with *SDG 7 (Affordable and Clean Energy)*.

Conclusion

Tourism and Climate Stress

- Excessive energy consumption from transportation and accommodations significantly contributes to CO_2 emissions.

Policy Gaps

- Existing policies, such as the Heat Action Plan, fail to recognize and address tourism's role in climate change.
- Tourism planning and infrastructure development lack climate resilience.

Sustainability Challenges

- Limited adoption of renewable energy sources in accommodations and public facilities increases tourism's environmental impact.
- Limited vegetation and inadequate ventilation in dense tourist zones increase heat retention and thermal discomfort.

Proposal and Recommendations

Decentralization | Environmental Resilience | Policy Interventions

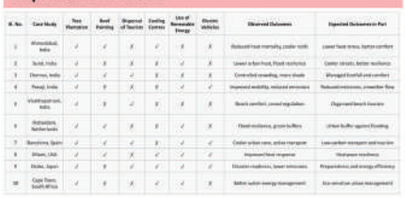
Strategic Decentralization – Malatipatpur as a Tourism Hub

Greening and Cooling Interventions for Climate-Resilient Puri

BALANCED TOURISM

Long-Term Sustainable Tourism & Climate Adaptation Policies

Impact/Relevance



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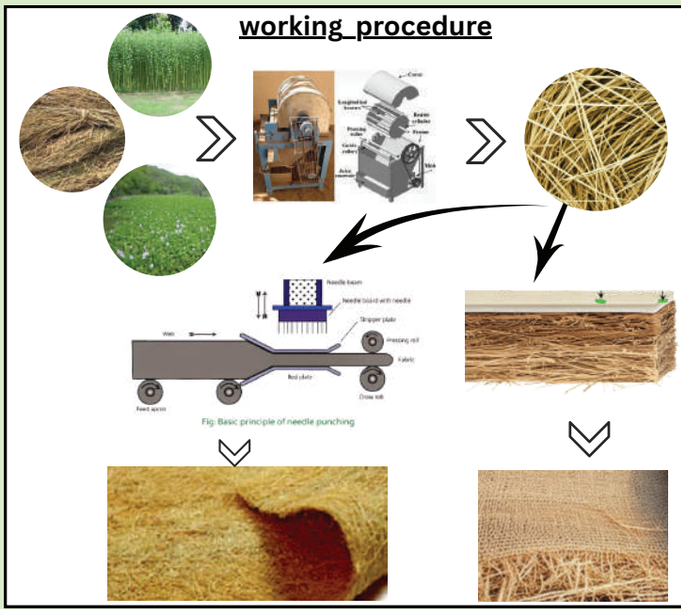
Smart Soil Health Blanket

A Climate-Resilient Agro-Textile Innovation for Urban and Peri-Urban Farming

Problem Statement:
Over 30,000 tonnes of plastic mulch are used yearly in South Asia alone, covering millions of hectares worldwide [Kasirajan & Ngouajio, 2012]. The absence of biodegradable substitutes in Bangladesh results in costly removal procedures and long-term soil damage. Agro-fibers like water hyacinth and jute, which are underutilised, may hold the secret to more environmentally friendly farming.

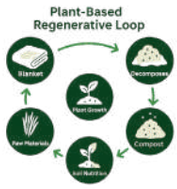
Methods:

1. Fiber Collection (Jute/rice straw/Water Hyacinth)
2. Nonwoven Preparation (Needle punching / air-laid)
3. Binder Coating (PLA or starch)
4. Drying & Cutting



RESULTS & DISCUSSION:

- Retains soil moisture 30–35% longer than plastic mulch (simulated trials).
- Fully decomposes in 6–10 months, enriching soil organically.



- Made from agro-waste: jute, banana fiber, rice straw, water hyacinth.
- Production cost: affordable and accessible.
- Cottage-industry ready – supports rural employment and women/youth empowerment.
- Scalable for rooftop gardens, nurseries, and rice fields.
- Reduces plastic pollution and aligns with SDGs :

- Future upgrades: moisture sensor integration & slow-release fertilizer concept.

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Conclusion:
The Smart Soil Health Blanket offers a climate-smart alternative to plastic mulch, rooted in local materials and circular design. It addresses both environmental pollution and resource equity, especially in underfunded farming regions. Early-stage trials suggest a 15–18% increase in soil microbial activity. With further R&D and field validation, this innovation could reshape Bangladesh's sustainable farming toolkit.

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