

MOSSPHERE - Student- Led Environmental initiative

Reducing particulate matter exposure and urban heat in Jaipur through community-built, nature-based solutions

SDG Covered-

SDG 3

SDG 11

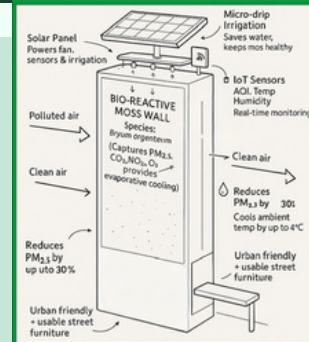
SDG 15

**Team - Kartik Dhingra,
Mehr Singh Takkar, Yashvardhan
Surana, Kavish Agarwal**



OUR AIM: Clean air where it's needed most

MOSSPHERE places solar-powered moss biofilter units in Jaipur's highest-exposure public spaces — school gates, vendor stalls, dense residential lanes — to cut street-level PM2.5 and PM10 and lower local temperatures. We want to prove that low-cost, community-maintained nature-based solutions can close the gap between national clean air policy and daily lived reality, then replicate that model city by city.



THE PROBLEM

Policy doesn't reach street level. People are paying for that gap.

India carries **26% of global air pollution disease** burden despite 18% of world population — Rajasthan among the worst-affected states.. The National Clean Air Programme sets targets; it does not cool a vendor's stall or filter a school courtyard.

A survey of **500+ Jaipur residents** found most had no access to shaded or filtered outdoor space, and many had stopped going outside. Street vendors work 8-10 hour shifts in traffic fumes. Children attend outdoor lessons at 42°C. The most exposed — elderly, pregnant women, street workers — have no way out.



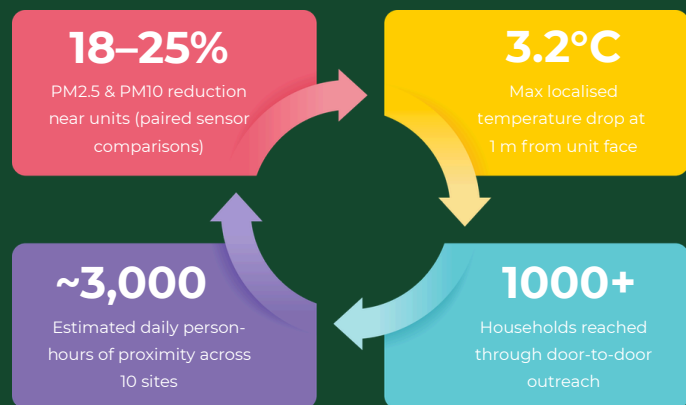
OUR SOLUTION

A solar-powered moss wall that actually works

MOSSPHERE uses **Bryum argenteum** — chosen for three concrete reasons. It binds fine particulate matter through capillary adhesion on leaf surfaces. It survives surface temperatures above 45°C via desiccation tolerance, recovering when re-hydrated. Its compact profile makes high-density panel construction straightforward. Solar-powered airflow and micro-drip irrigation keep running costs low. At **₹10,500 per unit** in materials, it fits into school walls, vendor stalls, and community courtyards — no civil works needed.

Bryum argenteum moss Solar power Micro-drip irrigation
Environmental sensors Modular frame

IMPACT AT A GLANCE



WHAT WE LEARNED

Community ownership made the difference

We didn't pick sites on a map. We found them by walking neighbourhoods with residents. Through **10+ community workshops**, people told us where they felt most exposed — school gates, vendor clusters, lanes with no tree cover. They also shaped unit placement: wind direction, shading, foot-traffic patterns. A cohort of **student Green Monitors** tracks sensors and maintains units. About **80% of users** reported reduced environmental stress in follow-up surveys.

METHODOLOGY & MEASUREMENT

HOW WE MEASURED

All PM and temperature figures come from paired sensor comparisons: each treated site matched with a control on road type, traffic density, and tree cover.

INSTRUMENTS



PM2.5 / PM10 via **low-cost optical particle** counters, cross-checked against nearest CPCB monitoring station. Temperature via digital sensors at 150 cm height; readings at 0.5 m, 1 m, and 2 m from unit face.

MEASUREMENT PROTOCOL



Readings **every 15 minutes over 4 weeks** per site. PM reduction figures reflect mean difference between paired treatment and control readings, averaged across all readings per site.

EXPOSURE ESTIMATE



The **~3,000 daily person-hours** figure is an exposure proximity estimate — manual footfall counts × average dwell time, summed across 10 sites.



HOW WE SCALED

From prototype to 10 sites

1. Surveyed 500+ residents to map high-exposure zones
2. Prototyped and iterated on airflow design and hydration cycles
3. Deployed 10 units with community participation
4. 15+ awareness sessions; 1,500+ individuals reached; booklets to 1,000+ households
5. Paired sensor data collected; third-party validation in planning



VOICES FROM THE GROUND

Real people, real change



"Working outside all day felt relentless — heat and fumes both. After the installation, this corner actually feels bearable."

— STREET VENDOR, ROADSIDE SITE



"Students are going outside again. They used to avoid it. That tells you everything."

— SCHOOL TEACHER, DEPLOYMENT SITE



"We're not just learning about the environment — we're actually fixing part of it."

— STUDENT GREEN MONITOR



BEYOND JAIPUR

Scaling & stakeholder outreach

A **₹10,500 unit** any school can maintain needs a policy pathway, not a multi-crore budget. We've begun talks with municipal and Smart City officials about integrating units at bus stops and pedestrian zones, and are completing a policy brief on micro-level air quality in urban planning.

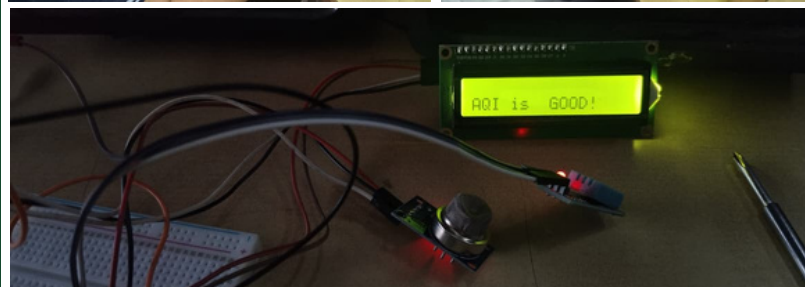
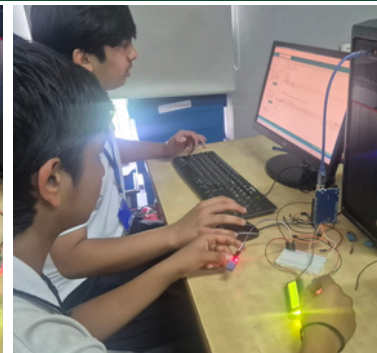
Mature trees take **3-7 years** to deliver shade; MOSSPHERE installs in hours. Expansion runs through MOSSPHERE City Chapters — students in new cities build, deploy, and monitor their own units.

OPERATIONAL SUSTAINABILITY

Maintenance & costs

Moss survival through Jaipur summers (42–47°C) is the key operational question. Units run extra misting April–June; panels rinsed after dust events. After student handoff, maintenance shifts to school staff or community caretakers.

COST COMPONENT	PER UNIT
Materials and Frame	800
Installation Labour	800
Moss	1400
Sensors	2000
Solar Panel with Battery	2500
Water Drip System	1500
Annual Moss requirement	1000
Maintenance and Labour	500
Total	10500



FUTURE ADD ON

The sensor values will be sent in real time to cloud server so that the AQI can be monitored by the authorities. This will help them monitor if moss health is deteriorating. A display screen will be used not only to show current weather state – temperature, humidity, AQI but can also be used as advertising to generate revenue. An exhaust will be added to accelerate the process. A sitting area around the moss wall like the wrap around tree bench can be added to use the space wisely.

WHAT THIS PROJECT TAUGHT US

We came in thinking this was an engineering problem. It turned out to be a trust problem. The survey data, the workshops, the door-to-door booklets, the student monitors — none of those were in the original plan. They emerged because people kept telling us that information and agency mattered as much as filtration efficiency. Technical solutions only stick when communities co-own them. Our next step is independent measurement validation and prospective data registration.

