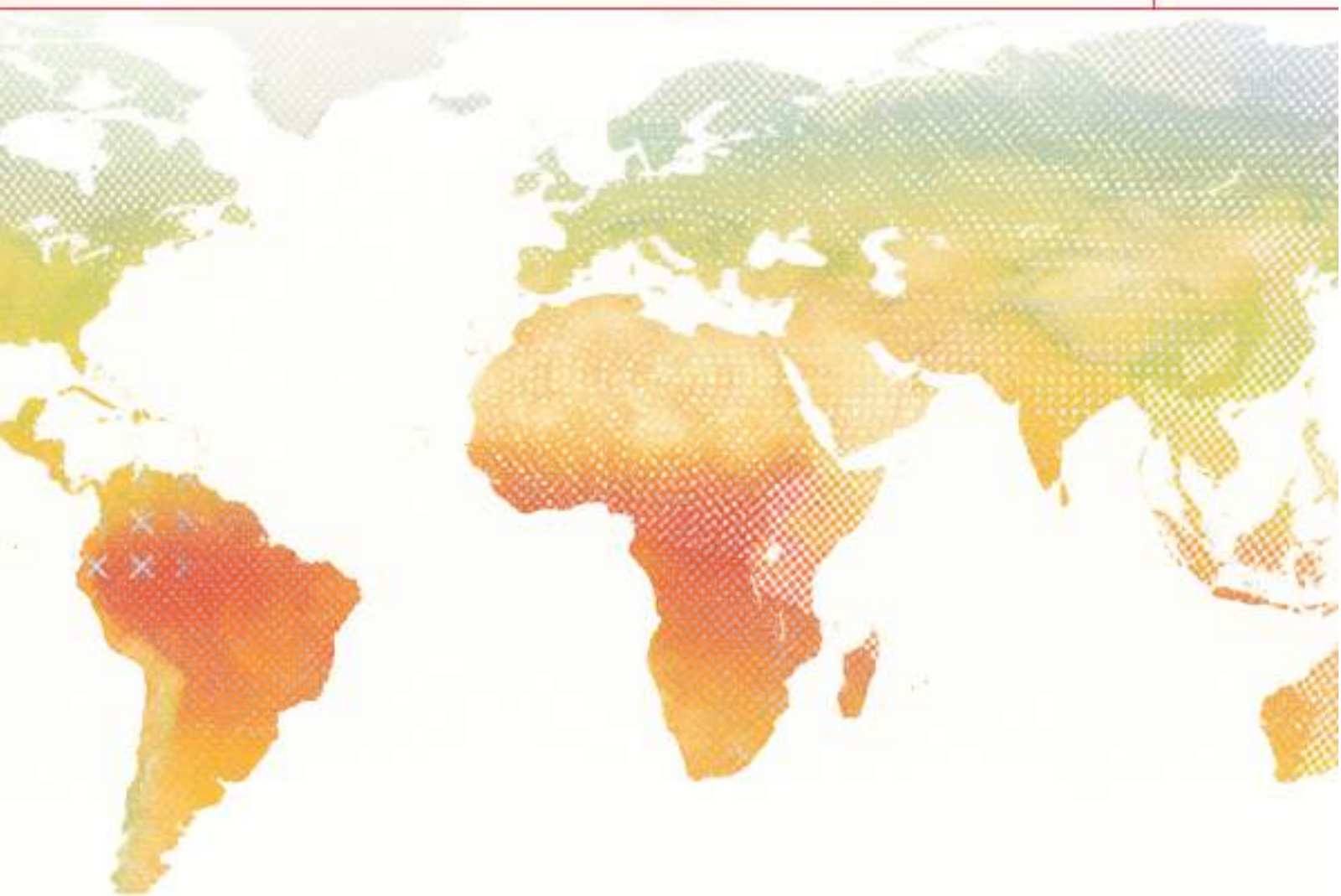
Community-driven Heat Solutions Compendium

Adapting to Extreme Heat from the Ground Up



Transitions Research

About Transitions Research

Transitions Research is a social science collective driving radical transitions at the intersection of technology, society, and sustainability. We aim to ensure these transitions are just, inclusive, and empower people while protecting the planet. Our work focuses on discovering sustainable pathways by generating anticipatory knowledge, co-creating solutions, and building capacities for societal action.

About ARA

The Adaptation Research Alliance (ARA) is a global coalition responding to the urgent challenges faced by vulnerable communities from climate change. Their membership is made up of researchers, funders, policymakers, development bodies and community-based organisations committed to action-oriented research for adaptation that supports climate resilient futures.

Acknowledgements

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Content

Executive Summary

Addressing the Gap in Community Solutions Documentation

Extreme heat is an escalating crisis, yet it remains an overlooked climate risk in many policies and adaptation strategies, particularly in the Global South. Communities on the frontlines of climate change are already implementing innovative, practical, and culturally relevant solutions to mitigate heat impacts. However, these solutions are often undocumented in a consolidated manner, limiting their visibility, replication, and integration into broader adaptation frameworks.

This compendium aims to bridge that gap by systematically documenting community-driven heat adaptation strategies. By compiling a wide range of solutions along with case studies it aims to serve as a resource for policymakers, practitioners, and local leaders seeking to implement context-specific responses to extreme heat. Unlike top-down interventions that may lack local relevance, the solutions featured in this compendium are largely community-driven and tailored to the realities of those most affected by rising temperatures.

Why Focus on Community-Driven Solutions?

Communities are not passive victims of climate change; they are proactive agents of resilience. Across the Global South, people are leveraging local knowledge, social networks, and innovative technologies to adapt to worsening heat conditions. From designing climate-responsive housing and restoring waterbodies to shifting work schedules and developing shade-provisioning strategies, community-led actions are making tangible differences in people's daily lives.

Despite their effectiveness, these solutions often operate in silos, disconnected from national and international adaptation plans. Heat is not always recognized as a distinct "hazard" in disaster risk reduction policies, leaving communities with limited institutional support. As heat waves intensify in frequency and severity, integrating grassroots adaptation measures into formal climate strategies is critical for effective, equitable, and sustainable heat resilience.

The solutions to extreme heat already exist in communities worldwide. By documenting, supporting, and scaling these approaches, we can create a future where no one is left unprotected from rising temperatures. This compendium is a step toward recognizing and institutionalizing community-driven adaptation as a core pillar of climate resilience. We invite all stakeholders to engage with this resource, champion these solutions, and work collaboratively toward a heat-resilient future for all.

CALL TO ACTION

This compendium is not just a documentation effort—it is a call to action. We urge policymakers, funders, community organizations, and practitioners to leverage this resource to scale and institutionalize community-driven heat adaptation.

FOR POLICYMAKERS

Integrating Community-Driven Solutions into Climate Action

- Recognize heat as a serious climate risk and integrate community-led solutions into national and local adaptation strategies.
- Support regulatory frameworks that incentivize decentralized, community-led initiatives such as green infrastructure, nature-based cooling, and local water conservation.
- Foster partnerships between local governments and grassroots organizations to co-create heat adaptation policies that are locally relevant and sustainable.

FOR FUNDERS

Scaling Up Grassroots Initiatives for Heat Resilience

- Increase financial and technical support for community organizations implementing heat adaptation strategies.
- Prioritize funding models that ensure long-term sustainability rather than short-term project-based funding.
- Invest in knowledge-sharing platforms that connect communities, researchers, and adaptation practitioners to facilitate peer learning and replication of successful strategies.

FOR COMMUNITY LEADERS AND PRACTITIONERS

Using and Contributing to the Compendium

- Utilize the compendium as a resource for designing, implementing, and advocating for heat adaptation interventions in your communities.
- Share additional case studies and insights to expand and refine this body of knowledge.
- Strengthen local networks and build capacity for knowledge exchange, ensuring that successful approaches are adapted and applied across different contexts.

Introduction

The growing frequency and intensity of heatwaves worldwide represent one of the most urgent and least addressed consequences of climate change. Extreme heat events are escalating, where communities are often already grappling with the compounded pressures of poverty, poor infrastructure, and limited access to healthcare. These heatwaves disproportionately affect vulnerable populations—especially outdoor workers, children, the elderly, and marginalized communities—who face both immediate health risks and long-term economic instability.

The effects of heat are not confined to health alone. Prolonged heat exposure can lead to disruptions in agriculture, reduced productivity, and increased energy demands, further straining already overstretched infrastructure and resources. These adverse impacts are not only direct but also cascade into longer-term social, environmental, and economic challenges. Given that heat is often overlooked in many climate adaptation strategies, there is a pressing need to address this critical gap in resilience-building efforts. It also underscores the need for more localized, context-specific, and sustainable solutions.

The ‘Community-driven Heat Solutions Compendium: Adapting to Extreme Heat from the Group Up’ emerges as a response to this growing crisis, aiming to document, consolidate, and amplify the valuable, community-based solutions already being implemented on the ground. The compendium focuses on strategies that have been developed by local communities, often working with limited resources but demonstrating high levels of creativity, collaboration, and adaptation to their environments. These grassroots solutions offer innovative, context-specific, and sustainable approaches to managing and mitigating the impacts of heat, emphasizing the importance of local knowledge and expertise in addressing climate challenges.

The compendium includes a wide range of 40 heat adaptation solutions categorized under 5 themes:

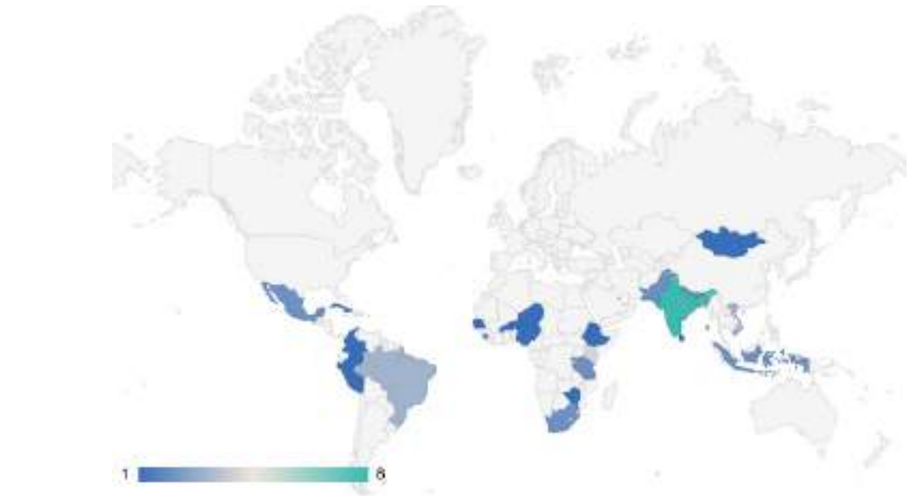
- Nature-Based Solutions
- Technology and Innovation Solutions
- Behavioral and Lifestyle Solutions
- Advocacy, Governance and Capacity Building Solutions.
- Infrastructure and Design Solutions

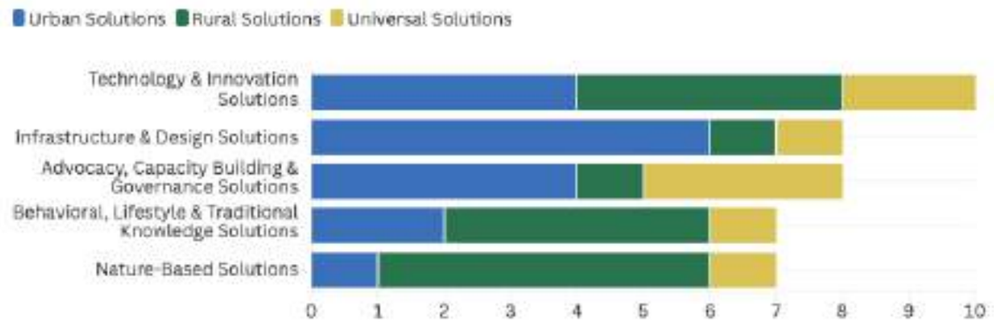
Each solution is presented with case studies that explore not only their practical application but also the challenges faced and the lessons learned from their implementation.

Building the Compendium: A Collaborative Approach

The development of this compendium is rooted in insights gathered from community participants at the CBA18 conference in Tanzania in May 2024. At CBA18, community members shared locally-driven heat-adaptation strategies, shedding light on the urgent need for solutions that are directly informed by the lived experiences of those most affected by heat. These discussions underscored the importance of bottom-up, community-led approaches that are more likely to resonate with local populations and align with their needs, capacities, and contexts.

Building on the valuable contributions from CBA18, we have worked to further refine and document a set of 40 heat adaptation solutions from across the globe. The ‘Community-driven Heat Solutions Compendium’ is therefore not only a collection of strategies but also a reflection of the collective knowledge, resilience, and determination of communities worldwide in facing the escalating threat of extreme heat.





Guide to Read the Document

Title & Theme

The main solution and its thematic category (e.g., Nature-Based Solutions) are highlighted here.

Problem Addressed

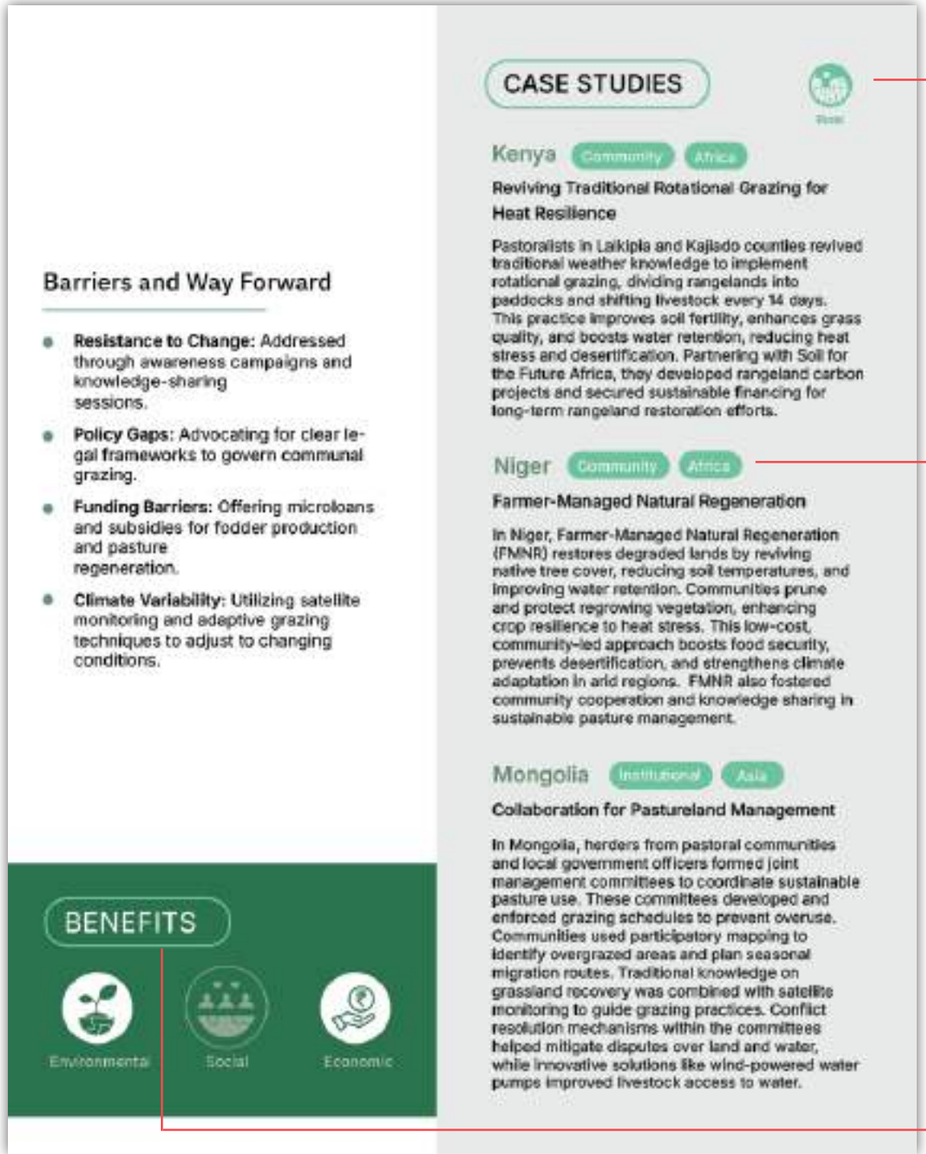
This section outlines the key climate or heat-related issue that the community is trying to solve

The Solution

A concise summary of the adaptation intervention, showing how it addresses the problem through locally relevant, adaptive measures.

Key Stakeholders

Highlights the ecosystem of actors — from communities and NGOs to researchers and governments — critical for design, implementation, and sustainability.



Solution implementation space

Case Studies

Gives real-world examples that applied this approach, including actors involved and impact achieved.

Benefits

Indicates the type of direct benefits realized: environmental (e.g., restored ecosystems), social (e.g., reduced heat stress), and economic (e.g., improved productivity).

Nature Based Solutions

Cultivation of Heat-Resilient Crop Varieties

Natural Waterbody & Aquifer Conservation

Soil Moisture Retention through Composting & Mulching

Reservoir & Canal Restoration for Water Conservation

Urban Farming & Gardening

Sustainable Pasture Management for Livestock

Groundwater Recharge through Percolation Tanks

Sustainable Pasture Management for Livestock

Problem Addressed

Unregulated grazing strips vegetation, increasing soil temperatures and accelerating desertification. This not only exacerbates the impacts of extreme heat but also threatens food security and water availability. Without intervention, livestock and pastoral communities face greater risks, including lower productivity and higher mortality rates due to heat stress.

The Solution

Adopt managed grazing systems with rotational schedules, alternative fodder production, and agroforestry practices. Community-led committees oversee grazing, ensuring sustainable use and regeneration of pastures. This approach restores ecosystems, boosts resilience, and secures equitable resource distribution.

Key Aspects

- **Community Grazing Plans:** Mapping grazing areas, identifying overused zones, and setting rotational schedules for pasture recovery.
- **Alternative Fodder Crops:** Growing drought-resistant fodder like Napier grass and Leucaena to reduce reliance on communal grazing.
- **Water and Shade Management:** Establishing shaded rest areas and solar-powered water sources to protect livestock from extreme heat.
- **Training and Education:** Empowering pastoralists with knowledge on sustainable grazing, fodder cultivation, and pasture restoration.

Barriers and Way Forward

- **Resistance to Change:** Addressed through awareness campaigns and knowledge-sharing sessions.
- **Policy Gaps:** Advocating for clear legal frameworks to govern communal grazing.
- **Funding Barriers:** Offering microloans and subsidies for fodder production and pasture regeneration.
- **Climate Variability:** Utilizing satellite monitoring and adaptive grazing techniques to adjust to changing conditions.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Rural

Kenya — Community — Africa

Reviving Traditional Rotational Grazing for Heat Resilience

Pastoralists in Laikipia and Kajiado counties revived traditional weather knowledge to implement rotational grazing, dividing rangelands into paddocks and shifting livestock every 14 days. This practice improves soil fertility, enhances grass quality, and boosts water retention, reducing heat stress and desertification. Partnering with Soil for the Future Africa, they developed rangeland carbon projects and secured sustainable financing for long-term rangeland restoration efforts.

Niger — Community — Africa

Farmer-Managed Natural Regeneration

In Niger, Farmer-Managed Natural Regeneration (FMNR) restores degraded lands by reviving native tree cover, reducing soil temperatures, and improving water retention. Communities prune and protect regrowing vegetation, enhancing crop resilience to heat stress. This low-cost, community-led approach boosts food security, prevents desertification, and strengthens climate adaptation in arid regions. FMNR also fostered community cooperation and knowledge sharing in sustainable pasture management.

Mongolia — Institutional — Asia

Collaboration for Pastureland Management

In Mongolia, herders from pastoral communities and local government officers formed joint management committees to coordinate sustainable pasture use. These committees developed and enforced grazing schedules to prevent overuse. Communities used participatory mapping to identify overgrazed areas and plan seasonal migration routes. Traditional knowledge on grassland recovery was combined with satellite monitoring to guide grazing practices. Conflict resolution mechanisms within the committees helped mitigate disputes over land and water, while innovative solutions like wind-powered water pumps improved livestock access to water.

Reservoir & Canal Restoration for Water Conservation

Problem Addressed

Heatwaves and rising temperatures accelerate water loss through evaporation, straining irrigation systems and worsening water shortages. Many reservoirs and canals are neglected, causing silt buildup, damaged embankments, and reduced flow. Frequent droughts increase reliance on depleting groundwater, threatening agriculture and livelihoods. Without proactive intervention, communities risk reduced agricultural productivity, food insecurity, and loss of livelihoods, making the need for restoration and maintenance of these systems critical.

The Solution

Community-led restoration and maintenance of reservoirs and canals leverage traditional practices and local expertise. This approach enhances water storage, distribution, and climate resilience, addressing water scarcity effectively while ensuring fair and sustainable access for all.

Key Aspects

- **Reservoir Restoration:** Desilting and deepening reservoirs to increase storage capacity, repairing embankments and spillways to prevent breaches.
- **Canal Maintenance:** Clearing silt and debris to improve water flow, reinforcing canal linings to reduce seepage and evaporation losses.
- **Community Participation:** Mobilizing local communities for regular maintenance, monitoring, and equitable water distribution through water user associations.
- **Integration of Green Solutions:** Planting vegetation around reservoirs and canals to reduce evaporation and support biodiversity.

Barriers and Way Forward

- **Funding Constraints:** Government grants, NGO funding, and community-led microfinance initiatives.
- **Technical Expertise:** Training programs to equip locals with restoration and maintenance skills.
- **Policy Gaps:** Advocacy for stronger water management policies and integration into development plans.
- **Community Resistance:** Awareness campaigns showcasing long-term benefits and success stories.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Rural

India — Community — Asia

Reviving Phad Irrigation for Heat Resilience

In Maharashtra, India, communities have revived the Phad irrigation system, a centuries-old water management practice that diverts river water through canals and embankments to irrigate farmlands. This traditional, community-managed system ensures year-round water availability, mitigating the effects of droughts and rising temperatures. Local farmers, supported by conservationists, have improved water-sharing mechanisms, ensuring sustainable agriculture and heat resilience for future generations.

India — Community — Asia

Revitalizing the Qanat Karez System

In Bidar, Karnataka, communities and conservationists have revitalized the ancient Qanat Karez water system, which channels groundwater through underground tunnels to provide sustainable irrigation and drinking water. This centuries-old method helps cool the surrounding environment, recharge aquifers, and ensure water security in extreme heat. Restoration efforts have revived traditional knowledge, strengthening climate resilience in drought-prone regions

Ethiopia — Community — Africa — ARA

Restoring Degraded Watersheds for Water and Livelihood Security

In Ethiopia, WRI and WaterAid partnered with local communities to restore a degraded watershed, improving water access, soil health, and resilience to extreme heat. Through reforestation, terracing, and sustainable land management, groundwater recharge increased, securing irrigation and drinking water for thousands. These efforts enhanced food security, protected biodiversity, and strengthened climate adaptation, benefiting farmers and vulnerable households.

Soil Moisture Retention through Composting & Mulching

Problem Addressed

Extreme heatwaves accelerate soil moisture loss, degrading soil health and increasing irrigation needs. Smallholder farmers, often without irrigation infrastructure, face declining crop yields and rising food insecurity. Overreliance on chemical fertilizers further harms soil quality. Regenerative solutions are essential to enhance soil moisture retention and reduce dependence on external inputs.

The Solution

Composting and mulching enrich soil structure, boost moisture retention, and curb evaporation. Compost adds organic matter, enhancing water-holding capacity, while mulch shields soil from heat stress. These cost-effective practices improve drought resilience and water security.

Key Aspects

- **Organic Mulching:** Applying crop residues, straw, or wood chips reduces evaporation, regulates soil temperature, and suppresses weeds.
- **Compost Enrichment:** Incorporating compost enhances soil structure, boosts microbial activity, and increases water-holding capacity.
- **Agroforestry & Cover Crops:** Integrating deep-rooted plants (e.g., legumes) improves moisture retention and prevents soil erosion.
- **Localized Water Management:** Compost pits and mulched basins maximize infiltration and reduce runoff in arid areas.

Barriers and Way Forward

- **Knowledge Barriers:** Organize community training and demonstration farms.
- **Resource Availability:** Establish local collection hubs for organic waste and develop community-led composting programs.
- **Adoption Resistance:** Showcase successful local adoption through demonstration plots and farmer-led knowledge exchanges.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Rural

Kenya — Institutional — Africa

Agroforestry-Based Mulching

In Kenya, smallholder farmers participating in the Kenya Agriculture Carbon Project (KACP) adopted agroforestry-based mulching to enhance soil moisture and reduce irrigation costs. By integrating tree planting and applying mulch from pruned branches, farmers improved soil fertility and water retention. This practice led to increased maize yields and reduced the need for chemical fertilizers, thereby promoting sustainable agriculture and improving food security.

India — Institutional — Asia

Women-Led Community Composting

In Kerala, Self-help groups have established decentralized composting units to manage organic waste and improve soil health. The Haritha Karma Sena (HKS), a trained team of women entrepreneurs trained as part of the state Haritha Keralam Mission, collects non-biodegradable waste from households and Institutionals. They also engage in the manufacture of environment-friendly materials, maintenance of waste disposal mechanisms, organic farming, and compost making. The compost produced is utilized in local agriculture, reducing reliance on chemical fertilizers and generating income for the community.

Cultivation of Heat-Resilient Crop Varieties

Problem Addressed

Climate change has intensified heatwaves, severely impacting crop yields. Traditional crop varieties often fail under heat stress, threatening food security especially for smallholder farmers in tropical and semi-arid regions, as their livelihoods depend heavily on climate-sensitive agriculture.

The Solution

Cultivating heat-resilient crop varieties is a sustainable strategy to combat rising temperatures in agriculture. Drought-tolerant maize, millet, and heat-resistant legumes sustain yields with deep roots, shorter growth cycles, and efficient water use. Through selective breeding, community seed banks, and farmer training, this approach enhances food security and economic stability for vulnerable farming communities facing climate change.

Key Aspects

- **Development of Heat-Resilient Varieties:** Agricultural research Institutionals focus on breeding crops that can endure higher temperatures using traditional and biotechnological methods.
- **Promotion of Indigenous Heat-Resilient Crops:** Promoting traditional, heat-adapted crops offers immediate resilience benefits.
- **Farmer Education and Capacity Building:** Training programs are essential to inform farmers about the benefits of heat-resilient crops and best practices for their cultivation.
- **Community Seed Banks:** Establishing local seed banks ensures the availability of heat-resilient seeds, preserving genetic diversity and providing farmers with access to suitable crop varieties

Barriers and Way Forward

- **Seed Accessibility:** Develop community seed banks and provide subsidies or financial assistance to farmers.
- **Farmer Awareness and Training:** Implement comprehensive education and extension programs to demonstrate the benefits and cultivation techniques of heat-resilient crops.
- **Resource Constraints:** Promote integrated farming practices that optimize resource use and provide support for acquiring necessary inputs.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Rural

West Africa

Community · Africa

Adoption of Heat-Resilient Sorghum and Groundnut

In West Africa and the Sahel, over 100 million people rely on sorghum, a heat-tolerant crop. Efforts to increase the heat tolerance of sorghum through breeding programs have led to significant benefits, including improved agricultural production, food consumption, and enhanced smallholder commercialization. Effective extension services and outreach programs have been crucial in promoting the adoption of these climate-resilient crops.

Kenya

Institutional · Africa

Reviving Indigenous Drought-Resistant Crops

In the Kikuyu highlands of Kenya, the Genetic Resources Research Institute collaborates with local farmers to reintroduce indigenous drought-resistant crops. Originally established to conserve traditional seeds, the institute now plays a crucial role in combating food insecurity exacerbated by climate change. By providing farmers with access to resilient seed varieties, the initiative enhances crop yields and resilience against erratic weather patterns.

South Asia

Institutional · Asia · ARA

Heat Tolerant Maize Hybrids

In response to rising temperatures, CGIAR developed 20 heat-tolerant maize hybrids to enhance food security in Bangladesh, Bhutan, India, Nepal, and Pakistan. After a decade of research, these resilient varieties improved yields under extreme heat, benefiting smallholder farmers in South Asia. Adoption has reduced crop failures and enhanced climate resilience in heat-stressed regions.

Natural Waterbody & Aquifer Conservation

Problem Addressed

Water scarcity is intensifying due to climate change, urbanization, and over-extraction. Natural water bodies are often depleted, polluted, or encroached upon, reducing their cooling effects and threatening communities. Alarming drops in groundwater levels endanger agriculture, households, and ecosystems. Poor governance and limited community involvement worsen these challenges.

The Solution

Conserving natural water bodies and aquifers mitigates heat stress and ensures sustainable water access. Community-led initiatives for restoration and protection enhance resilience, regulate microclimates, and support agriculture, drinking water, and biodiversity.

Key Aspects

- **Restoration of Degraded Water Bodies:** Removing encroachments, desilting lakes and ponds, and reviving dried-up streams and wetlands.
- **Sustainable Groundwater Management:** Promoting rainwater harvesting, groundwater recharge wells, and watershed management techniques to prevent over-extraction.
- **Community-Based Water Governance:** Establishing local water conservation groups, empowering communities to monitor, protect, and sustainably manage water resources.
- **Protection from Pollution and Encroachment:** Implementing buffer zones, reforestation, and waste management strategies to prevent contamination of water sources.

Barriers and Way Forward

- **Encroachment and Pollution:** Strict land-use policies, community-led monitoring, and legal advocacy for water protection.
- **Over-Extraction of Groundwater:** Recharge wells, rainwater harvesting, and policies limiting unsustainable pumping.
- **Lack of Awareness & Community Engagement:** Educational programs, capacity-building workshops, and school-based initiatives.
- **Funding Constraints:** Crowdfunding, public-private partnerships, and government conservation grants.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Universal

Nepal, India & Bangladesh

Community · Asia

Floating Treatment Wetlands

In South Asia, communities have implemented Floating Treatment Wetlands (FTWs) to restore polluted lakes. These buoyant platforms, constructed from local waste materials and planted with native vegetation, naturally filter contaminants, improving water quality and availability. Cleaner water bodies help regulate local temperatures, providing cooling effects essential during heatwaves. This low-cost, community-led approach not only rehabilitates vital water resources but also enhances local climate resilience.

Benin

Community · Africa

Sacred Mangrove Conservation

In Benin, West Africa, local communities integrate traditional beliefs with environmental conservation by designating mangrove forests as sacred spaces protected by voodoo deities. This cultural approach has led to the effective preservation and restoration of mangroves, which play a crucial role in cooling coastal areas and mitigating the impacts of heat. The “sacralization method” has expanded mangrove coverage significantly, demonstrating the power of cultural practices in environmental stewardship.

Kenya

Community · Africa

Wetland Restoration

In Kenya’s Lake Naivasha Basin, local communities and conservation groups have collaborated to restore degraded wetlands, reducing water loss and enhancing local cooling effects. Through community-based conservation agreements, wetlands are protected from over-extraction, pollution, and agricultural runoff, improving water availability during droughts and reducing heat stress.

Urban Farming & Gardening

Problem Addressed

Low-income urban communities face food insecurity and intensified heat due to limited green spaces. Densely built areas create urban heat islands, exacerbated by tree loss and climate change. Rising temperatures and erratic rainfall threaten food production, leaving vulnerable groups at higher risk of heat stress, energy poverty, and health issues.

The Solution

Urban farming transforms vacant lots, rooftops, and small plots into green spaces, enhancing local food security and cooling neighborhoods. Growing vegetables, herbs, and fruit trees lowers temperatures, provides shade, and reduces dependence on costly food imports.

Key Aspects

- **Community Gardens:** Shared spaces where residents grow food together, improving food security and creating local cooling hubs.
- **Rooftop and Vertical Farming:** Maximizing limited urban space by growing food on rooftops, balconies, and walls.
- **Climate-Resilient Practices:** Using drought-resistant crops, rainwater harvesting, composting, and efficient irrigation (e.g., drip systems) to reduce water use.
- **Green Infrastructure Integration:** Combining urban farms with trees and shaded seating areas to increase cooling benefits.
- **Training and Knowledge Sharing:** Equipping residents with skills in sustainable farming, composting, and water conservation through community-led workshops.

Barriers and Way Forward

- **Limited Space:** Communities maximize small spaces with vertical farming, container gardens, and rooftop growing.
- **Water Scarcity:** Rainwater harvesting, greywater recycling, and drip irrigation ensure sustainable water use.
- **High Setup Costs:** Low-cost techniques like composting, seed saving, and shared community investments reduce expenses.
- **Regulatory Barriers:** Advocacy groups push for zoning reforms and legal recognition of urban farming.
- **Sustained Participation:** Community-driven governance models ensure long-term engagement and shared responsibility.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Urban

South Africa — Community — Africa

Urban Micro-Farming in Informal Settlements

In Cape Town, South Africa, the Abalimi Bezekhaya initiative supports low-income residents in informal settlements to cultivate urban gardens, reducing local heat stress while enhancing food security. These green spaces provide fresh produce, income opportunities, and strengthen social cohesion. The initiative empowers communities to adapt to climate change through sustainable urban agriculture.

India — Community — Asia — ARA

Green Urban Infrastructure for Climate Resilience in Jaipur

In Jaipur, India, WRI undertook a nature-based initiative to enhance urban resilience to extreme heat by integrating green infrastructure. The project focuses on planting urban forests, restoring water bodies, and creating green corridors to reduce the urban heat island effect. Through community participation and local governance, these efforts lower temperatures, improve biodiversity, and strengthen climate resilience in one of India's hottest cities.

Cuba — Institutional — Latin America

Urban Farming Revolution

In Havana, Cuba, the Organopónicos urban farming movement transformed vacant land into productive green spaces, enhancing food security while reducing urban heat stress. Community gardens and small-scale farms flourished, improving food security while cooling densely populated areas. Government incentives and knowledge-sharing networks helped establish a self-sufficient, community-driven food system.

Groundwater Recharge through Percolation Tanks

Problem Addressed

Prolonged heatwaves and erratic rainfall deplete groundwater, threatening agriculture and water security in the Global South. Overuse of tube wells accelerates depletion, leaving smallholder farmers and rural communities vulnerable. Without effective recharge solutions, wells dry up, water becomes scarce, and food security declines, heightening risks for climate-vulnerable populations.

The Solution

Percolation tanks capture and store excess rainwater, allowing it to gradually recharge underground aquifers. These community-built reservoirs restore drying wells, support ecosystems, and ensure year-round water availability for agriculture, livestock, and drinking needs.

Key Aspects

- **Site Selection:** Identifying suitable locations based on topography, soil permeability, and hydrological needs to ensure efficient groundwater recharge.
- **Tank Construction:** Excavating large shallow reservoirs, reinforcing embankments, and incorporating spillways to prevent overflow and erosion.
- **Community Involvement:** Encouraging local participation in planning, building, and maintaining percolation tanks ensures sustainability.
- **Multi-Purpose Use:** Tanks store water for agriculture, livestock, and domestic purposes, making them versatile community assets.
- **Integration with Other Water Conservation Methods:** Combining percolation tanks with check dams, farm ponds, and rainwater harvesting enhances groundwater recharge efficiency.

Barriers and Way Forward

- **Siltation & Maintenance Issues:** Regular desilting and embankment repairs ensure continued groundwater recharge.
- **Land Acquisition Conflicts:** Community-driven site selection prevents disputes and promotes ownership.
- **Irregular Rainfall:** Diversifying recharge strategies with check dams and farm ponds maximizes efficiency.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Rural

India

Community | Asia

Karnampettai Percolation Pond in Tamil Nadu

In the semi-arid region of Tamil Nadu, the Karnampettai percolation pond was constructed to address water scarcity and declining groundwater levels. This community-led initiative involved building a percolation tank to capture monsoon runoff, facilitating groundwater recharge. Studies indicate that the pond has significantly improved groundwater availability, benefiting agriculture and providing a sustainable water source during heatwaves. The project exemplifies effective community engagement in water resource management.

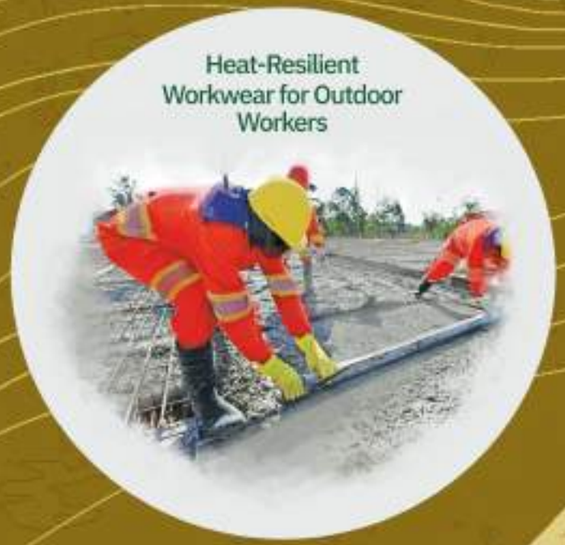
Ethiopia

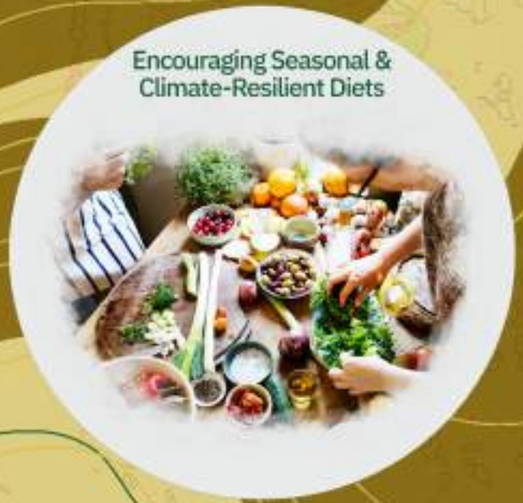
Community | Africa

Percolation Ponds in Tigray Region

In the semi-arid Tigray region of Ethiopia, communities constructed percolation ponds as part of integrated watershed management practices. These ponds capture runoff during the rainy season, allowing water to percolate and recharge groundwater. This approach has improved water availability for irrigation and reduced soil erosion, thereby enhancing agricultural productivity and resilience to climate-induced heat stress.

Behavioral, Lifestyle & Traditional Knowledge Solutions





Reviving Traditional Food Storage Practices

Problem Addressed

Rising temperatures accelerate food spoilage, leading to significant post-harvest losses, especially in rural and resource-constrained areas. The lack of affordable and sustainable cold storage exacerbates food insecurity. The lack of affordable and sustainable cold storage exacerbates food insecurity, increasing reliance on costly and energy-intensive refrigeration. Additionally, food waste from spoilage contributes to higher greenhouse gas emissions, further intensifying climate change.

The Solution

Reviving traditional storage methods—like underground pits, mud granaries, and bamboo silos—preserves food sustainably. These energy-efficient practices use local materials, reduce spoilage, and strengthen food security in heat-prone areas with limited access to modern refrigeration

Key Aspects

- **Underground Storage Systems:** Pits lined with straw, mud, or ash leverage the earth's stable temperatures to store grains and tubers.
- **Mud Granaries and Bamboo Silos:** Locally sourced materials construct ventilated granaries for preserving grains and seeds.
- **Traditional Fermentation:** Drying, pickling, and fermenting techniques extend shelf life for fruits, vegetables, and dairy products.
- **Community Knowledge Exchange:** Elders and artisans share expertise on constructing and maintaining storage systems.
- **Integration with Modern Science:** Combining indigenous methods with modern tools, such as hermetic bags (air tight bags), enhances efficiency and longevity.

Barriers and Way Forward

- **Loss of Knowledge:** Community education programs to preserve and transmit traditional knowledge.
- **Scalability Issues:** Since some methods may require adaptation for larger-scale use, hybrid models integrating traditional methods with modern innovations can be considered.
- **Policy Neglect:** Integrate indigenous storage techniques into government food security programs.
- **Preference for modern systems:** Awareness campaigns on the long-term benefits and sustainability of traditional practices.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Rural

Peru

Community · Latin America

Reviving Ancient Storage Silos

In Peru, farmers store potatoes in raised, ventilated structures called qolqas, a centuries-old practice used by the Inca civilization. These structures allow air circulation and maintain stable temperatures, preserving potatoes for months without refrigeration. Community-led efforts have revived these storage systems, integrating them with modern pest-resistant coatings for enhanced

Ethiopia

Community · Africa

Combining Traditional and Improved Grain Storage for Heat Resilience

Ethiopian farmers use indigenous grain storage techniques to combat post-harvest losses caused by heat and pests. Practices like sun drying, wood ash mixing, and fire-based hanging effectively reduce insect infestations and mold growth. Researchers suggest modifying traditional storage structures with affordable improvements, ensuring longer grain preservation, reduced toxin risk, and food security in heat-prone regions.

India

Community · Asia

Bamboo Silos for Paddy Storage in Assam

In Assam, traditional storage structures made from bamboo, known locally as 'mar,' 'dully,' 'pachi,' and 'tum,' are commonly used for storing paddy. These bamboo structures protect the grains from humidity and pests, ensuring a sustained food supply during adverse weather conditions. The use of bamboo, abundant in the region, reflects the community's adaptation to local environmental conditions.

Promoting Low Water-Use Consumer Choices

Problem Addressed

Water overuse in manufacturing and agriculture exacerbates shortages, especially during heatwaves. Many consumers are unaware of the water footprint of products they buy, while weak policies and limited water labeling hinder informed choices. Promoting low water-use alternatives is crucial to reduce demand, conserve resources, and mitigate water

The Solution

Educating consumers about water footprints and promoting low water-use products can reduce demand for water-intensive goods. Advocacy, water labeling, and support for sustainable businesses encourage responsible consumption and strengthen resilience against climate-induced water stress.

Key Aspects

- **Consumer Awareness Campaigns:** Public education initiatives highlight the water footprint of everyday products, such as fast fashion and processed foods, encouraging mindful consumption.
- **Water-Efficient Dietary Shifts:** Promoting plant-based, locally sourced, and seasonal foods with lower water footprints, such as millet instead of rice, reduces agricultural water demand.
- **Sustainable Product Labeling:** Encouraging certifications and eco-labels for water-efficient products guides consumers toward informed, low-water-use choices.
- **Support for Local & Ethical Brands:** Advocacy for businesses using sustainable water practices ensures demand aligns with conservation efforts.

Barriers and Way Forward

- **Consumer Resistance:** Community-led education programs and peer influence can help normalize sustainable choices.
- **Limited Access to Information:** Partnerships with advocacy groups and universities can bridge this knowledge gap on reliable water footprint data.
- **Economic Barriers:** Water-efficient products may be more expensive initially. Governments and organizations can provide subsidies or incentives for sustainable goods.
- **Low Adoption by Businesses:** Consumer demand and advocacy can push businesses toward more transparent practices.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Universal

Bangladesh — Institutional — Asia

Sustainable Clothing Production in the Apparel Industry

Bangladesh, the world's second-largest garment exporter, has made progress in eco-friendly manufacturing by reducing water consumption in textile production. Initiatives such as EcoCloth Bangladesh promote water-efficient dyeing and fabric processing while ensuring ethical labor practices. These efforts set a global precedent for sustainable fashion.

India — Community — Asia

Sustainable Cotton Farming in Madhya Pradesh

In Madhya Pradesh, India, cotton farmers have transitioned to organic and climate-resilient farming from conventional cotton farming, which is water-intensive. By eliminating chemical pesticides and fertilizers, they have also improved soil health, water retention, and biodiversity, leading to higher yields and lower production costs. This transition not only conserves water but also promotes biodiversity and enhances livelihoods.

The World Economic Forum's Consumer Action initiative educates global consumers about making sustainable food choices with lower water and carbon footprints. By engaging retailers, policymakers, and supply chains, this initiative encourages businesses to provide more

Heat-Resilient Workwear for Outdoor Workers

Problem Addressed

Millions of outdoor workers face severe heat stress without proper protective clothing. Agricultural laborers, construction workers, and street vendors are especially vulnerable to dehydration, organ damage, and heat-related deaths. Weak workplace safety regulations and a lack of affordable solutions leave workers exposed to preventable heat risks.

The Solution

Heat-resistant, breathable, and UV-protective clothing minimizes heat stress for outdoor workers. Community-led initiatives and cooperatives can provide affordable, functional garments, enhancing safety, productivity, and resilience to extreme heat in sectors like agriculture, construction, and street vending.

Key Aspects

- **Breathable Fabrics:** Use cotton, linen, bamboo, or advanced synthetics to enhance airflow, evaporate sweat, and prevent heat buildup.
- **UV Protection:** Light-colored, long-sleeved UV-resistant garments reduce sun exposure and prevent skin damage.
- **Cooling Accessories:** Wide-brimmed hats, cooling towels, and neck guards help regulate body temperature and minimize sun exposure.
- **Functional Design:** Clothes designed for different work environments such as reflective strips for construction workers, lightweight gloves for waste pickers, and water-resistant fabrics for street vendors.
- **Local Partnerships:** Collaborate with local textile manufacturers to produce affordable, heat-resistant workwear tailored to job-specific needs.

Barriers and Way Forward

- **Cost and Accessibility:** Engage local sewing cooperatives and textile businesses to produce affordable workwear; NGOs and unions can offer subsidies or microloans.
- **Lack of Awareness:** Launch education campaigns and worker-led training on heat stress prevention.
- **Cultural Resistance:** Involve local workers in designing practical and culturally acceptable clothing.
- **Informal Sectors:** Use community networks and peer-led initiatives to promote adoption without formal regulations.
- **Durability and Comfort:** Test fabrics with worker feedback to ensure durability and comfort

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Universal

Hong Kong — Asia

Intelligent Soft Robotic Clothing

Researchers at The Hong Kong Polytechnic University have developed intelligent soft robotic clothing that automatically adapts to changing ambient temperatures. This innovative clothing keeps the inner surface temperatures at least 10°C cooler than conventional heat-resistant clothing, even when the outer surface reaches 120°C. While not community-driven, this advancement holds potential for protecting workers in high-temperature environments.

Qatar — Institutional — Asia

Cooling Technology for Migrant Workers

In preparation for the 2022 FIFA World Cup, Qatar introduced innovative cooling suits to protect migrant workers from extreme heat. These suits, developed by Techniche and local partners, incorporate cooling fabrics and phase-change materials to lower body temperatures. Approximately 55,000 suits were distributed, reducing skin temperatures by 6-8°C, thereby enhancing worker safety and comfort during high-temperature conditions.

Heat-Sensitive Work & School Scheduling

Problem Addressed

Traditional work and school hours often coincide with peak daytime temperatures, increasing the risk of heat-related illnesses such as heat exhaustion and heatstroke. Outdoor workers, like those in construction and agriculture, and students in inadequately cooled schools are particularly susceptible.

The Solution

Extreme heat poses significant health risks to vulnerable groups, including outdoor workers and students. By modifying work and school schedules to avoid the hottest parts of the day, communities can reduce exposure to heat stress, thereby enhancing health, safety, and productivity.

Key Aspects

- **Rescheduling Work Hours:** Shifting outdoor labor to early mornings (e.g., 6 AM to 2 PM) or evenings (e.g., 4 PM to 10 PM) to avoid peak heat.
- **Modifying School Timings:** Starting classes earlier or later to prevent exposure during the hottest periods.
- **Introducing Flexible Breaks:** Allowing rest periods in shaded or air-conditioned areas during peak heat times.

Barriers and Way Forward

- **Resistance from Employers or Schools:** Launch awareness campaigns to emphasize health, safety, and productivity benefits of schedule adjustments, highlighting long-term gains.
- **Standardization Challenges:** Introduce pilot programs in select sectors to demonstrate feasibility and benefits before wider adoption.
- **Disruption to Routines:** Provide support systems like adjusted public transport, flexible childcare, and employer accommodations for dependents.
- **Lack of Employer Incentives:** Advocate for tax benefits, subsidies, and public recognition to encourage heat-adaptive scheduling.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Universal

Brazil — Community — Latin America

Night-Time Fishing Adaptation

In response to escalating daytime temperatures, fishers in Óbidos, Brazil, have shifted their activities to night hours to avoid extreme heat. While this adaptation reduces heat exposure, it has led to decreased catches and adverse health effects due to disrupted sleep patterns and increased fatigue. This case underscores the complex trade-offs involved in schedule adjustments as a heat mitigation strategy.

Middle East — Institutional — Asia

Regulated Work Hours for Outdoor Workers

Several Middle Eastern countries, including the United Arab Emirates and Saudi Arabia, have implemented regulations mandating midday breaks for outdoor workers during peak summer months. For instance, the UAE enforces a ban on outdoor work between 12:30 PM and 3:00 PM from June to September. These measures aim to reduce heat-related illnesses among laborers, though enforcement and effectiveness vary across the region.

India — Institutional — Asia

Modified School Hours in Delhi's Heat Action Plan

The Delhi Disaster Management Authority (DDMA) developed a comprehensive Heat Action Plan that includes modifying school timings during heatwaves. The plan mandates that schools avoid operating during peak heat hours, specifically from 12 noon to 4 pm, when a heatwave is declared. This adjustment aims to safeguard students' health by reducing exposure to extreme heat during the hottest part of the day.

Encouraging Seasonal & Climate-Resilient Diets

Problem Addressed

Reliance on imported and water-intensive crops makes food systems vulnerable to rising temperatures. Industrial agriculture displaces heat-tolerant indigenous crops, reducing dietary diversity and increasing resource dependence. Additionally, lack of awareness and market availability of seasonal foods leads to reduced dietary diversity and increased dependence on resource-intensive food systems.

The Solution

Promoting seasonal and climate-resilient diets enhances local food security, reduces resource demands, and supports farmers. Reviving indigenous crops and traditional practices fosters sustainable, heat-resilient food systems that preserve biodiversity and empower communities to adapt to climate challenges.

Key Aspects

- **Identifying and Promoting** Indigenous Climate-Resilient Crops: Mapping local, drought- and heat-tolerant foods (e.g., millet, sorghum, amaranth, tepary beans) and integrating them into local food markets.
- **Community Awareness & Food Literacy Programs:** Educating communities on the nutritional, economic, and environmental benefits of seasonal and local foods through school programs, cooking workshops, and farmer training.
- **Strengthening Local Supply Chains:** Supporting farmers' markets, cooperatives, and farm-to-table initiatives to make seasonal foods more accessible and profitable.
- **Reviving Traditional Food Practices:** Documenting and promoting indigenous knowledge on food preservation, preparation, and storage techniques that enhance resilience to extreme heat.

Barriers and Way Forward

- **Lack of Awareness & Cultural Shift:** Education campaigns, cooking workshops, and community-led food events to promote the benefits of seasonal diets.
- **Limited Market Availability:** Strengthening farmers' markets, cooperatives, and direct farm-to-consumer programs to improve accessibility.
- **Economic Pressures on Farmers:** Subsidies, incentives, and guaranteed procurement schemes to encourage cultivation of heat-resilient crops.
- **Changing Consumer Preferences:** Media campaigns, restaurant partnerships, and school meal programs showcasing seasonal and local food diversity.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Universal

Zimbabwe — Community — Africa

Climate-Resilient Indigenous Crops Revival

Smallholder farmers in Zimbabwe are reintroducing traditional heat-tolerant crops such as finger millet, sorghum, and cowpeas to combat food insecurity. Supported by local agricultural cooperatives and NGOs, this initiative integrates traditional knowledge with modern farming techniques, improving soil fertility and household nutrition while reducing dependence on high-input commercial crops.

India — Institutional — Asia

Millet Mission in Odisha

The Odisha government launched a Millet Mission to promote climate-resilient millet cultivation, offering price support and farmer training. Once a staple, millet had been displaced by water-intensive rice. The project successfully created a proof of concept for farmers to grow millets—hardy, drought-resistant crops suited to Odisha's climate—to improve farm productivity and profitability and create community buy-in. By reviving traditional cropping patterns, raising consumer awareness, and integrating millets into school meals, the initiative has strengthened food security and rural livelihoods while reducing water use.

Mexico — Community — Latin America

Mayan Communities Reviving Agroecology

Through the Milpa for Life project, farmers in Yucatán, Mexico, are reviving traditional agroforestry systems known as milpa, which integrate heat-resilient maize, beans, squash, and chili peppers. These crops are naturally adapted to extreme temperatures and drought. Supported by local cooperatives and research institutes, the initiative fosters sustainable farming and strengthens local food sovereignty.

Infrastructure & Urban Design Solutions

Urban Planning Integrating Green and Open Spaces

Provision of Shade in Public Spaces for Heat Relief

Heat-Resilient Housing & Passive Cooling Design

Retrofitting Buildings for Heat Resilience

Sustainable Urban Drainage Systems

Rainwater Harvesting & Storage

Community Cooling Centers

Water Facilities in Drought-Prone Areas

Rainwater Harvesting & Storage

Problem Addressed

Rising temperatures increase water demand while reducing surface water availability due to evaporation. With climate risks like groundwater depletion due to overuse and evaporation and reduced agricultural productivity caused by water scarcity, communities in arid and semi-arid regions face acute water shortages, exacerbating health risks, food insecurity, and economic instability.

The Solution

Rainwater harvesting systems offer community-driven solutions for water collection and storage, from rooftop structures to underground reservoirs. Using local materials and knowledge, these systems ensure water for drinking, irrigation, and cooling while reducing groundwater pressure and enhancing heat resilience.

Key Aspects

- **Community-Based Collection Systems:** Households and villages install rooftop rainwater harvesting structures with gutters and storage tanks to capture rainfall.
- **Recharge Wells & Percolation Pits:** Diverting excess rainwater to groundwater recharge wells replenishes aquifers and improves water security.
- **Multi-Use Water Storage:** Constructing ferrocement tanks, underground reservoirs, and pond systems ensures stored rainwater is available for drinking, irrigation, and livestock.
- **Community Training & Governance:** Empowering locals through workshops and cooperatives ensures proper maintenance, equitable distribution, and long-term sustainability.

Barriers and Way Forward

- **Technical Barriers:** Capacity-building initiatives train communities in system design, installation, and upkeep.
- **Policy Gaps:** Implement policies that require rainwater harvesting in urban planning and construction codes.
- **Funding Shortages:** Offer microloans, subsidies, and grants to support infrastructure development.
- **Climatic Variability:** Introduce adaptive storage solutions and technology upgrades like improved filtration systems tailored to local conditions.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Universal

India — Community — Asia

Reviving Ancient Water Harvesting Structures

In Rajasthan, communities have revived Khadeen, an ancient water-harvesting system that captures monsoon runoff, allowing water to percolate and recharge groundwater while depositing nutrient-rich silt for farming. This traditional method ensures year-round agriculture, reduces heat stress, and prevents desertification in arid regions. By restoring Khadeens, farmers improve soil moisture retention, supporting crops and livestock in extreme heat conditions.

Brazil — Institutional — Latin America

One Million Cisterns Program

In the semi-arid region of Ceará, Brazil, the One Million Cisterns Program (P1MC) was launched in 2003 to combat water scarcity and enhance resilience to droughts. This community-driven initiative, led by the Brazilian Semi-Arid Articulation (ASA), aimed to construct one million rainwater harvesting cisterns for rural households. By 2014, the program surpassed its goal, building over 1.2 million cisterns and benefiting approximately 4.5 million people. These 16,000-liter cisterns provide sufficient water for a family of five during the eight-month dry season, significantly improving water security and reducing the impacts of ex-

Uganda — Community — Africa

Community Rainwater Harvesting

The Uganda Water Project implements community-based rainwater harvesting, installing large storage tanks on schools and public buildings to capture and store rainwater. This system ensures clean drinking water during droughts and extreme heat, reducing water stress and disease risks. By promoting local ownership and sustainable management, the initiative enhances community resilience to climate change.

Sustainable Urban Drainage Systems

Problem Addressed

Rapid urbanization and impervious surfaces like concrete roads disrupt natural water cycles, worsening urban flooding, waterlogging, and heat buildup. Inadequate drainage leads to flash floods, stagnant water, and pollution. Reduced water infiltration depletes groundwater, increasing dependence on municipal supplies. Without intervention, cities face rising risks of extreme flooding, heat stress, and water insecurity.

The Solution

Sustainable Urban Drainage Systems (SUDS) use nature-based approaches to manage runoff, reduce heat, and enhance water resilience. By integrating green infrastructure, permeable surfaces, and community-led maintenance, SUDS mitigate flooding, lower urban temperatures, and replenish groundwater, strengthening climate adaptation and biodiversity.

Key Aspects

- **Permeable Pavements:** Allow rainwater to seep into the ground, reducing runoff and replenishing groundwater.
- **Green Roofs:** Capture and store rainwater, lowering temperatures and minimizing runoff.
- **Retention Basins and Wetlands:** Temporarily store stormwater, reducing flood risks and enhancing biodiversity.
- **Bioswales:** Vegetated drainage channels that slow, filter, and direct stormwater.
  Rain Gardens – Landscaped areas designed to absorb and filter runoff, improving water quality.
- **Decentralized Drainage Network:** Combines these features to enhance urban water resilience while mitigating extreme heat and flooding.

Barriers and Way Forward

- **Funding Constraints:** Government incentives and subsidies can offset the high initial investment needed for construction expenses.
- **Technical Expertise:** Capacity-building programs for urban planners and communities.
- **Policy Barriers:** Integrating SUDS into municipal development frameworks.
- **Community Engagement:** Public outreach campaigns promoting SUDS benefits.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Urban

Indonesia — Community — Asia

Kampung Tempe Rain Garden Initiative

In Kampung Tempe, Indonesia, frequent flooding and heat stress led to the community-led adoption of rain gardens as a natural cooling and drainage solution. Residents collaborated with urban planners and NGOs to design gardens that capture stormwater, filter pollutants, and provide shaded public spaces. By using locally sourced materials, the project remained cost-effective, reducing flooding, heat buildup, and enhancing neighborhood resilience.

Colombia — Institutional — Latin America

Bogotá's Green Infrastructure for Urban Cooling

To combat heat stress and urban flooding, Bogotá implemented a Sustainable Urban Drainage System (SUDS) strategy, integrating bioswales, green roofs, and retention basins citywide. These nature-based solutions lowered surface temperatures, improved groundwater recharge, and increased urban cooling. Municipal policies required developers to incorporate green infrastructure, ensuring long-term climate resilience for low-income communities.

South Africa — Institutional — Africa

Cape Town's Permeable Pavements in Informal Settlements

Cape Town introduced permeable pavements in informal settlements to mitigate flooding and heat stress. The community-led initiative, supported by local government and NGOs, improved stormwater drainage, reduced surface heat, and enhanced water infiltration. By minimizing standing water and infrastructure damage, this cost-effective cooling strategy improved urban livability for vulnerable populations.

Heat-Resilient Housing & Passive Cooling Design

Problem Addressed

Many homes are poorly adapted to rising heatwaves, with inadequate designs trapping heat and increasing energy demand. Low-income housing lacks passive cooling, heightening risks for marginalized communities. Energy-intensive cooling methods drive emissions, worsening climate impacts. Without affordable interventions, prolonged heat exposure will lead to health risks and economic burdens from high cooling costs.

The Solution

Climate-responsive housing minimizes indoor heat and enhances thermal comfort through strategic orientation, natural ventilation, reflective materials, and green roofs. Community-based approaches incorporating local knowledge ensure sustainable, affordable, and culturally appropriate housing solutions that reduce heat vulnerability and energy dependence.

Key Aspects

- **Building Orientation:** Structures are positioned to minimize solar heat gain and maximize natural airflow.
- **Natural Ventilation:** Strategically placed windows, vents, and courtyards enhance air circulation.
- **Cool Roofs and Walls:** Reflective materials or light-colored paints reduce heat absorption. Green Roofs and Façades: Vegetation provides insulation and creates cooling microclimates.
- **Shading Devices:** Overhangs, pergolas, and louvers block direct sunlight.
- **Insulation Materials:** Locally sourced, cost-effective materials like mud, bamboo, or recycled waste products enhance energy efficiency.

Barriers and Way Forward

- **Initial Costs:** High upfront investment in design and materials can be financed through government subsidies and microfinance options for green housing.
- **Knowledge Gaps:** Community education programs to train local builders and residents on passive cooling strategies.
- **Policy Barriers:** Integration of cooling strategies into urban planning regulations.
- **Scaling Up:** Pilot projects to demonstrate cost-effectiveness and encourage widespread adoption.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Universal

India — Household — Asia

Traditional Bhungas in Gujarat

In Gujarat's arid regions, traditional Bhungas—circular mud houses with thatched roofs—have provided natural cooling for centuries. Built using locally available materials like mud, cow dung, and thatch, Bhungas maintain significantly cooler indoor temperatures, reducing reliance on fans and air conditioning. Communities actively construct and maintain these structures, ensuring their durability through collective labor and knowledge-

Burkina Faso — Community — Africa

Passively Cooled School Facilities

In Gando, Burkina Faso, architect Diébédo Francis Kéré collaborated with the local community to construct a primary school utilizing passive cooling techniques. The design features hybrid clay walls for insulation, vaulted ceilings with perforations for natural ventilation, and an elevated roof that shields the structure from direct sunlight and rain while facilitating air circulation. Steel window shutters allow for adjustable light and airflow. This approach not only provides a comfortable learning environment without reliance on electricity but also fosters community involvement and skill development.

Nigeria — Community

Community-Driven Vertical Greening in Lagos

In Lagos, Nigeria, a community-driven project implemented vertical greening systems to combat urban heat. Residents collaborated to install plant-covered structures on building exteriors, which reduced indoor temperatures by an average of 2.3°C and improved air quality. This low-cost, sustainable approach utilized local materials and labor, fostering community ownership and enhancing resilience to extreme heat.

Urban Planning Integrating Green and Open Spaces

Problem Addressed

Unregulated urbanization has led to heat-trapping concrete landscapes, intensifying urban heat islands. Many cities, especially low-income settlements, lack green spaces and shaded areas, exposing vulnerable communities to heat stress. Poor urban planning limits tree cover and ventilation corridors, worsening heat waves. Exclusion from decision-making further weakens adaptation strategies and community

The Solution

Integrating green and open spaces into urban planning mitigates heat stress, enhances air quality, and fosters social well-being. Parks, urban forests, rooftop gardens, and shaded public areas reduce urban heat, promote biodiversity, and improve resilience, making cities more livable and climate-adaptive.

Key Aspects

- **Expanding Urban Green Infrastructure:**
  - Develop urban forests, parks, and micro-green spaces for natural cooling.
  - Encourage rooftop and vertical gardens to reduce heat absorption.
  - Integrate trees and vegetation along streets, walkways, and transport hubs for shade.
- **Creating Open & Shaded Public Spaces**
  - Design climate-responsive plazas and pedestrian areas with shade structures.
  - Implement cool pavement technologies to lower ground-level heat.
  - Expand community parks with shaded areas and water features.
- **Enhancing Water-Based Cooling Solutions**
  - Restore wetlands and water bodies as natural cooling buffers.
  - Design water-sensitive urban landscapes like rain gardens and bioswales.
  - Install public drinking fountains and misting stations in high-heat zones.

Barriers and Way Forward

- **Limited Space for Green Development:** Promote multi-functional green infrastructure such as rooftop gardens and vertical forests.
- **High Costs of Urban Greening Projects:** Encourage public-private partnerships, green bonds, and incentives for developers.
- **Resistance to Change & Policy Gaps:** Strengthen local governance frameworks and integrate heat adaptation into urban planning laws.
- **Unequal Access to Green Spaces:** Implement community-led greening initiatives in marginalized neighborhoods.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Urban

Nepal — Community — Asia

Floating Treatment Wetlands

In Kathmandu, community-led efforts have focused on restoring polluted urban lakes using Floating Treatment Wetlands (FTWs). These buoyant platforms, constructed from local waste materials and planted with native vegetation, naturally filter contaminants, improving water quality and providing green spaces within the urban setting. The initiative not only rehabilitates vital water resources but also enhances local climate resilience by introducing cooling green areas. Local engagement and education about the benefits of FTWs have been crucial for their sustainability and success.

Brazil — Community — Latin Ameica

Catalytic Communities' Sustainable Favela Network

Catalytic Communities (CatComm), a nonprofit organization, launched the Sustainable Favela Network (SFN) to support and connect sustainable initiatives within Rio de Janeiro's favelas. The SFN focuses on environmental projects such as community gardens, waste management, and green infrastructure. By fostering collaboration among favela residents, the network enhances local capacity to create and maintain green spaces, promoting environmental sustainability and social cohesion.

Pakisan — Community — Asia

Sponge City Initiatives

Architect Yasmeen Lari, founder of Heritage Foundation of Pakistan has been implementing climate-smart designs to protect Karachi from flooding and heat stress. Inspired by the "sponge city" concept, her projects incorporate terracotta pavements, pocket gardens, and stormwater wells to manage stormwater and reduce surface runoff. These community-driven efforts aim to create permeable surfaces and green spaces. While 'sponge cities' have been primarily intended at mitigating urban flooding, they have the unintended benefit of reducing urban heat as well.

Provision of Shade in Urban Public Spaces for Heat Relief

Problem Addressed

Urban areas experience excessive heat due to the urban heat island (UHI) effect, limited vegetation, and heat-absorbing surfaces like asphalt and concrete. This exacerbates health risks, reduces public mobility, and threatens the livelihoods of outdoor workers. Vulnerable populations, including street vendors, the elderly, and low-income communities, are disproportionately affected.

The Solution

Strategic shade provision in public spaces mitigates heat stress and enhances outdoor comfort. Community-led solutions—like canopies, umbrellas, and temporary shade structures—offer immediate relief, while trees, pergolas, and reflective materials ensure lasting benefits. Businesses and governments can expand shade through awnings, sun sheets, and dedicated public cooling initiatives.

Key Aspects

- **Community-Designed Shade Solutions:** Residents identify high-heat areas and co-design shade solutions that align with local aesthetics and cultural preferences.
- **Green Shade Solutions:** Planting native, drought-resistant trees and using vertical greenery such as green walls and shaded walkways.
- **Artificial Shade Structures:** Using locally available materials like bamboo, jute, and reflective fabrics to construct shade canopies and pergolas.
- **Training & Awareness:** Educating the public on the importance of shade structures, urban greening, and sustainable maintenance practices.
- **Water-Sensitive Cooling:** Integrating bioswales and rain gardens under shaded areas to enhance cooling and manage stormwater.

Barriers and Way Forward

- **Limited Funding:** Partnering with NGOs and businesses can secure resources.
- **Space Constraints:** Encouraging compact, vertical greenery solutions.
- **Maintenance Issues:** Establishing local teams for long-term upkeep.
- **Policy Barriers:** Advocating for urban heat mitigation in development plans.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Urban

Colombia — Community — Latin America

Medellín's Green Corridors for Urban Cooling

In Medellín, Colombia, a community-led initiative established 30 interconnected green corridors, planting native trees and creating shaded walkways in key urban areas. These interventions lowered temperatures by 2–3°C, improved pedestrian mobility, and increased urban biodiversity. The project has significantly reduced heat stress, making public spaces cooler and more livable, serving as a model for climate resilience.

Kenya — Community — Africa

Kisumu Shade Project for Market Vendors

In Kisumu, Kenya, Practical Action in collaboration with the local government, equipped women market vendors with shaded stalls in open-air markets to protect them from extreme heat and sun exposure. This initiative improved health, reduced heat stress, and led to an increase in market revenue. By engaging the community in designing heat adaptation measures, the project provides long-term climate resilience for vendors and informal workers.

Retrofitting Buildings for Heat Resilience

Problem Addressed

Poorly designed urban buildings trap heat, worsening indoor temperatures during heatwaves. Many lack insulation, ventilation, or reflective materials, leading to higher cooling costs and energy consumption. Low-income communities in dense urban areas are especially vulnerable, facing increased risks of heat stress, productivity loss, and severe health impacts like heatstroke and dehydration.

The Solution

Retrofitting buildings with heat-resilient designs and energy-efficient technologies improves thermal performance, reducing cooling demand and urban heat stress. Insulation, reflective roofing, ventilation, and passive cooling strategies enhance comfort, lower energy costs, and strengthen climate resilience, particularly for older buildings and low-income communities lacking modern cooling infrastructure.

Key Aspects

- **Passive Cooling Measures:** Installing reflective or green roofs, green walls, improved insulation, and energy-efficient windows to reduce heat absorption.
- **Ventilation Upgrades:** Integrating natural ventilation, cross-ventilation systems, and solar chimneys to enhance indoor airflow.
- **Energy-Efficient Technologies:** Upgrading HVAC systems and incorporating solar panels to reduce energy demand.
- **Use of Sustainable Materials:** Utilizing locally sourced, heat-resistant materials that improve thermal comfort in buildings.
- **Community-Led Retrofits:** Involving local residents and builders in retrofitting efforts, ensuring sustainability and knowledge transfer

Barriers and Way Forward

- **High Upfront Costs:** Introduce subsidies, tax incentives, and low-interest loans to support cost-effective retrofitting.
- **Limited Awareness & Technical Expertise:** Conduct community training programs and incentivize local contractors to adopt best practices in heat-resilient upgrading.
- **Policy & Regulatory Gaps:** Strengthen urban planning policies, mandate heat-resilient standards, and integrate retrofitting into city climate action plans.
- **Access to Sustainable Materials:** Promote local production and distribution of affordable, sustainable materials through public-private partnerships.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Urban

India, Nepal, Bangladesh — Community — Asia

Housing Solutions for Informal Settlements

The Mahila Housing Trust (MHT) introduced cost-effective heat adaptation technologies to improve thermal comfort in informal settlements. Innovations included Mod-Roofs, made from recycled materials, reducing indoor temperatures by 6–8°C, and Air Lite Ventilators, enhancing airflow and cooling. These community-designed housing interventions helped low-income families cope with extreme heat, reducing energy costs, improving health, and increasing productivity in heat-stressed urban areas.

Freetown, Sierra Leone — Institutional — Africa

Reflective Roofing to Combat Extreme Heat

In Freetown's informal settlements, residents faced escalating indoor temperatures due to heat-absorbing corrugated iron roofs. Collaborating with the Freetown City Council and the charity Mirrors for Earth's Energy Rebalancing, the community installed heat-reflective roofing sheets made from recycled plastics. This initiative reduced indoor temperatures by up to 6°C, significantly improving living conditions and demonstrating the effectiveness of community-led thermal adaptation strategies.

Community Cooling Centers

Problem Addressed

Extreme heat disproportionately impacts low-income communities, informal settlements, and outdoor workers who lack cooling infrastructure. Homes built with heat-trapping materials worsen indoor temperatures, while public spaces provide little shade. Vulnerable groups—elderly individuals, children, and pregnant women—face heightened risks of heat-related illnesses, emphasizing the urgent need for accessible, community-driven cooling solutions to prevent fatalities.

The Solution

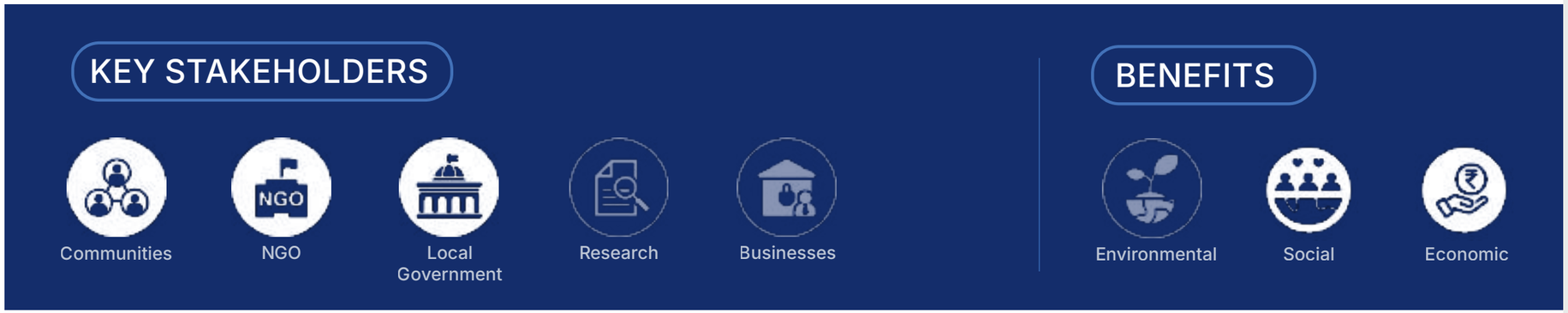
Community cooling centers offer safe, air-conditioned spaces in public buildings like libraries, schools, and community halls. Equipped with water, seating, and medical aid, they provide essential heat relief. Community engagement ensures accessibility and widespread awareness, maximizing their impact during extreme heat events

Key Aspects

- **Strategic Location:** Establish cooling centers in accessible public buildings like libraries, schools, and community halls, prioritizing high-heat areas.
- **Adequate Facilities:** Equip centers with cooling systems, seating, hydration stations, and medical supplies for heat-related illnesses.
- **Targeted Access:** Designate cooling hours for the elderly, pregnant women, and outdoor workers.
- **Localized Outreach:** Use community radio, SMS alerts, and local leaders to inform residents about available centers.
- **Multi-Purpose Use:** Adapt centers for training, public gatherings, and emergency shelters, ensuring year-round functionality.

Barriers and Way Forward

- **Inconsistent Funding & Maintenance:** Secure public-private partnerships, grants, and integrate centers into existing infrastructure for cost efficiency.
- **Limited Awareness & Social Barriers:** Conduct culturally sensitive outreach via trusted local leaders, door-to-door campaigns, and interactive awareness programs.
- **Infrastructure & Energy Constraints:** Implement passive cooling designs, solar-powered ventilation, and decentralized energy solutions to reduce dependence on grid electricity.
- **Policy Gaps:** Advocate for integrating cooling centers into urban resilience policies, ensuring legal and Institutionalal backing for their long-term operation.



CASE STUDIES

Universal

India

Institutional | Asia

Net-Zero Cooling Station

In April 2024, Jodhpur launched its first net-zero cooling station, a community-driven initiative developed by Mahila Housing Trust (MHT) and Jodhpur Nagar Nigam North (JNNN). Using solar-powered fans, mist sprinklers, cooling curtains, and a wind tower, it reduces temperatures by up to 12°C. Located in a high-risk heat zone, it accommodates 40 people, providing water, seating, and first aid, demonstrating an effective, low-cost adaptation model for urban heat resilience.

Vietnam

Institutional | Asia

Community Cooling Centres & Mobile Cooling Buses

In 2019, the Vietnam Red Cross Society, in collaboration with the German Red Cross, established community cooling centers in Hanoi to combat extreme heat. These centers provided shaded areas, hydration, and educational resources on heat-related health risks. The community cooling centres were complemented by Red Cross cooling buses which travelled the main streets of Hanoi and directed vulnerable population to the pre-identified centres. During two heatwave events, the centers served over 2,000 individuals, primarily outdoor workers, demonstrating the effectiveness of anticipatory action in reducing heat-related health impacts.

Guide for Establishment of Community Cooling Centres

The Vietnam Red Cross Society, in collaboration with the German Red Cross, has developed a manual to guide the installation and management of community cooling centres. These centres provide respite from extreme heat, offer educational resources on heat-related risks, and serve as hubs for community engagement during heatwaves. The manual offers step-by-step guidance on setting up these centres, including design, logistics, management, care protocols, and communication strategies.

Water Facilities in Drought-Prone Areas

Problem Addressed

Drought-prone regions face chronic water shortages, worsened by extreme heat and unreliable rainfall. Traditional water sources dry up quickly, forcing women and children to travel long distances for water. This scarcity disrupts agriculture, livestock, and public health, leading to food insecurity, economic instability, and increased heat-related illnesses, requiring urgent interventions.

The Solution

Implementing deep boreholes, underground reservoirs, and solar-powered pumps provides a sustainable, year-round water supply in drought-prone areas. Community water kiosks enhance accessibility, while soil moisture conservation strengthens agriculture. Local governance ensures equitable distribution, securing water access, economic stability, and resilience to extreme heat and climate

Key Aspects

- **Deep Aquifer Boreholes & Solar-Powered Pumps:** Harness underground water using solar-powered extraction, reducing reliance on seasonal rainfall and fuel-dependent systems.
- **Underground Water Storage & Cisterns:** Prevent evaporation by storing water from boreholes and springs in subsurface reservoirs, ensuring year-round availability.
- **Decentralized Community Water Kiosks:** Provide affordable, clean water at localized kiosks, reducing collection burdens on women and children.
- **Community Water Management Committees:** Oversee pricing, maintenance, and equitable distribution to prevent resource depletion and ensure long-term sustainability.

Barriers and Way Forward

- **High Initial Costs:** Securing funding through government grants, NGO partnerships, and microfinance loans makes water projects more affordable.
- **Technical Maintenance Issues:** Training local technicians and water committees ensures long-term system functionality and reduces downtime.
- **Community Engagement Challenges:** Establishing water user committees fosters accountability and equitable distribution.
- **Groundwater Depletion Risks:** Implementing controlled water extraction policies and promoting efficient irrigation methods prevents overuse.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Rural

Peru — Community — Latin America

Traditional Amunas for Water Storage

In the highlands near Lima, Peru, the community of San Pedro de Casta has revitalized ancient water channels known as amunas to combat water scarcity exacerbated by climate change. These pre-Incan structures capture and divert rainwater into the soil during the wet season, allowing it to resurface in springs during the dry months. This restoration effort, supported by organizations like The Nature Conservancy, has enhanced water availability for both local agriculture and Lima's population, demonstrating the effectiveness of combining traditional knowledge with modern conservation practices.

Kenya — Institutional — Africa

Solar-Powered Boreholes in Turkana County

In drought-prone Turkana County, Kenya, 15 rehabilitated boreholes are providing clean, reliable water to thousands of residents facing extreme water scarcity. The rehabilitation efforts included upgrading hand pumps to solar systems, replacing submersible pumps, adding solar panels, repairing storage and distribution tanks, and unclogging waterways to remove blockages in the supply system. Supported by government and development partners, these boreholes reduce reliance on seasonal rivers, improving water access for households, livestock, and agriculture. Rehabilitated with solar panels,

Kenya — Community — Africa

Sand Dams in Kitui County

In Kitui County, Kenya, communities have constructed sand dams to combat water scarcity and adapt to heat stress. These low-cost, sustainable structures trap seasonal river sand, which stores water and recharges groundwater, providing a reliable water source during dry periods. The increased water availability has improved agricultural productivity and reduced the time spent, especially by women and children, fetching water.

Technology and Innovation Solutions

Solar Panel Shade Structures

Low-cost Portable Cooling Devices

Adoption of Clean Cooking Solutions

Solar Powered Cooling Systems for Schools

Early Warning Systems for Heat Risk

Energy Efficient Cooling Technologies

Solar Powered Irrigation Pumps

Water-Efficient Irrigation Techniques

Low-cost Desalination Technologies

Wastewater Recycling Systems

Water-Efficient Irrigation Techniques

Problem Addressed

Rising heatwaves and prolonged droughts worsen water scarcity, reducing crop yields and threatening rural livelihoods. Traditional irrigation methods waste significant water through evaporation and runoff, depleting groundwater. Without efficient irrigation systems, smallholder farmers in arid and semi-arid regions struggle to sustain crops, increasing food insecurity and economic

The Solution

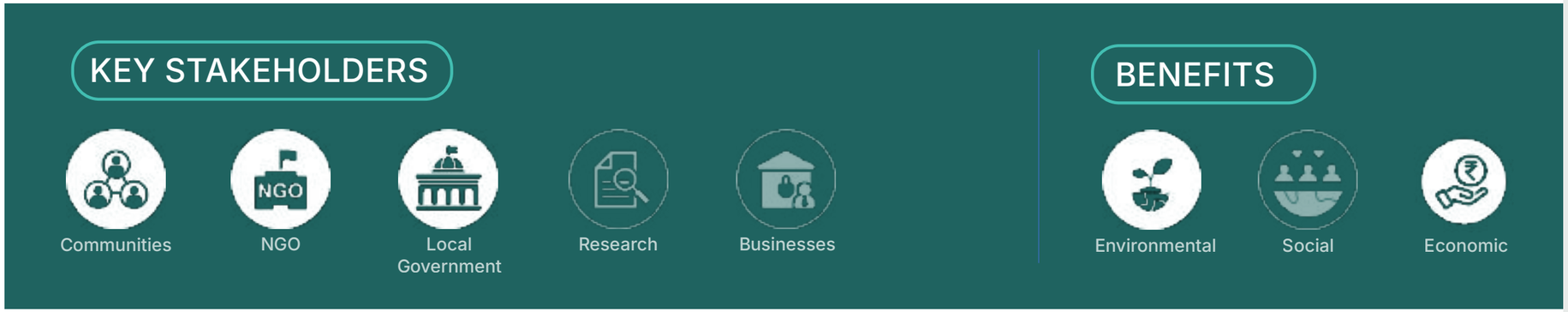
Water-efficient irrigation systems optimize agricultural water use, reducing waste and improving crop resilience in drought-prone regions. Integrating modern technologies with traditional conservation practices ensures sustainable water management, empowering farmers to maintain food production, protect soil health, and enhance climate adaptation.

Key Aspects

- **Drip Irrigation:** Pipes with controlled emitters deliver water directly to plant roots, minimizing evaporation and runoff.
- **Sprinkler Systems:** Evenly distribute water over crops, reducing over-irrigation and improving efficiency.
- **Rainwater Harvesting for Irrigation:** Collect and store rainwater in reservoirs for use during dry periods, reducing dependence on groundwater.
- **Community Irrigation Pools:** Farmer cooperatives manage shared water resources, ensuring equitable distribution and long-term sustainability.
- **Mulching and Soil Moisture Retention:** Organic mulches and soil cover techniques help retain moisture, reducing the need for frequent irrigation and improving soil health.

Barriers and Way Forward

- **High Initial Costs :** Governments, NGOs, and microfinance Institutionals can offer subsidies, grants, and low-interest loans to improve affordability.
- **Limited Technical Knowledge:** Implement farmer training programs, demonstration farms, and peer-to-peer learning initiatives to build capacity.
- **Ongoing Maintenance Needs:** Establish community-led maintenance groups, provide technical support, and ensure affordable spare parts availability to sustain long-term functionality.



CASE STUDIES

Rural

Global

Community | Asia

N-Drip Micro-Irrigation in Arid Regions

NIL Farmers in arid regions across countries have adopted N-Drip, a gravity-powered micro-irrigation system that delivers water directly to plant roots without requiring pumps or filters. This low-cost, water-efficient technology significantly reduces water wastage, increases crop yields, and enhances resilience to heat stress. By making precision irrigation accessible to smallholder farmers, N-Drip supports sustainable agriculture in water-scarce regions, improving food security and climate adaptation.

Andhra Pradesh, India

Community | Asia

RCT for Efficient Irrigation and Water Conservation

In the Indian state of Andhra Pradesh, a randomized controlled trial was conducted to evaluate the potential benefits of smallholder drip irrigation. The study encouraged a group of well-owners to adopt drip irrigation through a subsidy scheme, while a control group continued with traditional practices. After three years, the results indicated that the drip irrigation group experienced significant improvements in water use efficiency and crop productivity. This community-driven approach highlights the effectiveness of efficient irrigation technologies in conserving water and enhancing agricultural outcomes.

Climate-smart irrigation and responsible innovation in South Asia: A systematic

In South Asia, particularly in countries like Bangladesh, India, Nepal, and Pakistan, farmers have initiated water conservation projects to address water scarcity and promote sustainable agriculture. These initiatives focus on improving water-use efficiency, reducing wastage, and enhancing water availability for irrigation.
By adopting climate-smart irrigation (CSI) technologies and practices, such as drip irrigation and rainwater harvesting, these projects aim to sustainably increase agricultural productivity and build community resilience to climate change.

Early Warning Systems for Heat Risk

Problem Addressed

Climate change is intensifying heatwaves, increasing mortality, economic losses, and healthcare burdens. Vulnerable populations, including the elderly, children, and outdoor workers, often lack real-time heat warnings and adaptive strategies. Without early warning systems, communities remain unprepared, heightening the risks of heat-related illnesses, lost productivity, and overwhelmed emergency response systems.

The Solution

Early warning systems (EWS) provide timely heat alerts, enabling proactive measures to reduce health and economic impacts. By integrating meteorological data, risk communication, and community preparedness, EWS enhances resilience, particularly in vulnerable regions, ensuring timely responses to extreme heat events and reducing preventable harm.

Key Aspects

- **Data Collection and Forecasting:** Meteorological agencies track temperature, humidity, and heatwave patterns using satellites, weather stations, and historical data. Climate models predict extreme heat events, ensuring early warnings.
- **Risk Communication:** Heat alerts are disseminated via SMS, community radio, social media, and local networks. Messages are localized and adapted for community needs.
- **Preparedness and Response:** Local governments and NGOs activate heat action plans, including water distribution, shaded shelters, and medical services. Communities adopt preventive measures like hydration, reduced outdoor exposure, and cooling methods.
- **Feedback Mechanism:** Community input helps refine warning systems, improving accuracy, accessibility, and local relevance over time.

Barriers and Way Forward

- **Limited Accessibility:** Deploy low-tech solutions like loudspeakers, community messengers, and public notice boards to ensure widespread reach.
- **Data Gaps & Forecasting Limitations:** Invest in expanding weather monitoring networks, community-based data collection, and integrating indigenous climate knowledge for localized accuracy.
- **Community Trust & Adoption:** Engage communities in co-designing, testing, and refining alerts to enhance credibility, cultural relevance, and response rates.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Universal

India

Community | Asia | ARA

AI-Driven Early Warning System for Heat Adaptation

The Sustainable Environment and Ecological Development Society (SEEDS) has developed an AI-powered early warning system to help vulnerable communities adapt to extreme heat. Using climate data, AI modeling, and real-time weather monitoring, SEEDS generates localized heatwave alerts. Warnings are disseminated via SMS, public announcements, and community networks, enabling timely action. This system has reduced heat-related illnesses by helping communities prepare, hydrate, and access cooling solutions during extreme heat events.

Kenya and Tanzania

Community | Africa | ARA

Community-Driven Early Warning Services

In Kenya and Tanzania, DARAJA bridges the gap between national weather forecasters and underserved urban communities, particularly in informal settlements. By collaborating with residents, media, city authorities and disaster-risk experts, DARAJA simplifies weather forecasts using user-friendly terminology and icons, and disseminates them through access means, such as SMS, radio public notice boards, loudspeakers and schools, ensuring wide access. DARAJA's community-driven approach has significantly improved the understanding and use of weather information. The DARAJA upcoming regional East Africa Scale Up Programme will focus on extreme heat and drought forecasting and reduction.

Energy Efficient Cooling Technologies

Problem Addressed

Rising temperatures and prolonged heatwaves increase dependence on energy-intensive cooling, raising electricity demand and costs. Low-income communities often lack access to affordable cooling, worsening heat stress and health risks. Traditional cooling methods consume excessive energy, straining weak electricity grids and exacerbating climate change through increased carbon emissions.

The Solution

Energy-efficient cooling technologies offer sustainable heat relief while reducing electricity costs and grid dependence. Solar-powered cooling, high-efficiency appliances, and passive cooling techniques lower indoor temperatures. Affordable financing and community-managed cooling hubs ensure accessibility, particularly in regions with unreliable electricity or unaffordable air conditioning.

Key Aspects

- **Solar-Powered Cooling Systems:** Photovoltaic panels power high-efficiency fans, evaporative coolers, and cold storage, reducing energy costs and ensuring off-grid cooling access.
- **High-Efficiency Fans & Appliances:** DC-powered fans, inverter-based coolers, and evaporative cooling systems use up to 70% less electricity than conventional models.
- **Passive Cooling Strategies:** Heat-reflective coatings, green roofs, shaded courtyards, and ventilated facades naturally lower indoor temperatures.
- **Community:** Managed Cooling Hubs – Solar-powered shared cooling centers in schools, markets, and clinics provide heat relief for vulnerable populations.
- **Affordable Cooling Financing:** Pay-as-you-go solar cooling models and microloans for low-income households and small businesses.

Barriers and Way Forward

- **High Upfront Costs:** Expand microfinance options, subsidies, and pay-as-you-go models to improve accessibility.
- **Limited Awareness & Adoption:** Conduct outreach campaigns, demonstrations, and training programs to promote adoption.
- **Weak Market & Supply Chains:** Strengthen local production, distribution networks, and policy incentives to boost market growth of cooling technologies.
- **Infrastructure & Policy Gaps:** Implement regulations promoting efficiency standards, solar incentives, and grid improvements for sustainable cooling solutions.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Universal

Nigeria — Community — Africa

Solar-Powered Cold Storage for Farmers

Ecotutu, a Nigerian cleantech company, provides solar-powered cold storage solutions for small-scale farmers. By offering a 'pay-as-you-chill' service, farmers can affordably preserve perishable produce, reducing post-harvest losses and maintaining food quality. This initiative not only addresses food security but also mitigates heat-related spoilage, empowering communities with sustainable cooling infrastructure.

Nigeria — Community — Africa

Koolboks Solar Powered Freezers for Informal Vendors

In the markets of Lagos, Nigeria, Koolboks solar-powered freezers help vendors overcome irregular and costly power supply, keeping products, such as fish, produce and drinks, fresh for longer. Koolboks engages with informal vendors through outreach (one-on-one sales, telemarketing, market activations, etc.), explaining the cost savings and benefits. Vendors are offered a low-risk trial with a pay-as-you-go financing model, enabling them to test the technology and making sustainable cooling accessible to all.

Adoption of Clean Cooking Solutions

Problem Addressed

Globally over 2.3 billion people rely on biomass fuels like firewood and charcoal for cooking, generating excessive indoor heat and worsening thermal discomfort in hot climates. Women and children face health risks from prolonged smoke exposure, while deforestation-driven heat island effects further exacerbate local climate conditions and environmental degradation.

The Solution

Clean cooking solutions—solar cookers, biogas, and improved biomass stoves—reduce indoor temperatures, improve air quality, and lower fuel consumption. These innovations enhance household comfort, mitigate deforestation, and provide sustainable, culturally adapted alternatives, reducing heat stress in regions already experiencing extreme temperatures.

Key Aspects

- **Heat-Reducing Stove Designs:** Improved biomass stoves with insulated combustion chambers minimize excess heat, keeping indoor spaces cooler.
- **Solar and Ethanol-Based Alternatives:** Solar cookers eliminate heat emissions, while ethanol stoves burn cleaner, lowering ambient temperatures.
- **Localized Fuel Production:** Community-led ethanol and biogas production reduces reliance on firewood, curbing deforestation and heat island effects.
- **Culturally Adapted Stove Innovations:** Designs accommodate regional cooking practices, such as flatbread-friendly surfaces or large pot capacity.
- **Last-Mile Distribution & Financing:** Pay-as-you-go models and women-led sales networks make clean stoves affordable and widely accessible.

Barriers and Way Forward

- **High Cost of Clean Cooking Technologies:** Implement subsidies, microfinancing, and pay-as-you-go models to increase affordability.
- **Limited Fuel Supply (Ethanol, Biogas):** Develop local fuel production hubs and community biogas plants for steady supply.
- **Cultural Resistance to New Cooking Methods:** Customize stove designs to accommodate local cooking styles and conduct community awareness programs.
- **Weak Distribution Networks:** Establish women-led stove distribution networks and integrate clean stoves into existing market supply chains.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Universal

Kenya — Community — Africa

Solar Cooking in Kakuma Refugee Camp

In Kakuma Refugee Camp, home to approximately 200,000 refugees, Solar Cookers International introduced solar cookers to reduce reliance on firewood. This initiative has decreased indoor air pollution and deforestation, while also mitigating indoor heat generation, benefiting communities in arid regions. The use of solar energy for cooking has lessened the environmental impact and improved health outcomes for residents.

Ethiopia — Community — Africa

Ethanol-Fueled Stoves

Project Gaia introduced ethanol-fueled CleanCook stoves in Ethiopia, providing a clean alternative to traditional biomass fuels. This initiative has reduced indoor air pollution and deforestation, while also mitigating indoor heat generation, benefiting communities in arid regions. The use of ethanol, produced from local resources, has also stimulated economic development and reduced reliance on imported fuels.

South Africa — Community — Africa

Wonderbag – Heat-Reducing Cooking Innovation

The Wonderbag, a heat-retention cooker, reduces fuel use and indoor heat exposure by allowing food to continue cooking off-heat. Widely distributed in South Africa, Kenya, and Rwanda, it cuts fuel consumption by up to 70%, lowering carbon emissions and deforestation. By minimizing stove usage, it also improves air quality and reduces respiratory risks. This innovation enhances sustainable cooking practices while reducing heat stress in resource-limited households

Solar Panel Shade Structures

Problem Addressed

Rising temperatures in urban and agricultural areas intensify heat stress, threatening public health, reducing worker productivity, and increasing energy demand. In cities, the lack of shaded spaces exacerbates heat-related illnesses, while in rural areas, excessive sun exposure depletes soil moisture, reduces crop yields, and accelerates water evaporation, worsening food and economic insecurity.

The Solution

Solar panel shade structures provide dual benefits—offering cooling relief while generating renewable energy. Installed in markets, bus stops, parks, and farmlands, they reduce heat exposure, lower cooling costs, and enhance energy resilience, creating a sustainable and cost-effective adaptation to

Key Aspects

- **Public Spaces:** Elevated solar panel canopies at bus stops, markets, schools, and parks provide much-needed shade for people while supplying power for public infrastructure like lighting, fans, and charging stations.
- **Agrivoltaics in Rural Areas:** Solar panels above farmlands reduce crop heat stress, decrease water evaporation, and improve agricultural productivity while generating electricity for farm operations. Studies show agrivoltaic systems can increase crop yields by up to 16% in heat-prone areas.
- **Community-Managed Systems:** Panels are maintained by cooperatives or public-private partnerships, ensuring long-term benefits for residents and farmers.

Barriers and Way Forward

- **High Upfront Costs:** Use blended finance models and subsidies for installation.
- **Limited Technical Capacity:** Train local technicians and cooperatives in solar maintenance.
- **Land Tenure Challenges in Rural Areas:** Work with local governments and farmer unions to secure agreements.
- **Low Community Awareness:** Conduct public demonstrations and link benefits to livelihood outcomes.

CASE STUDIES

Universal

Freetown, Sierra Leone

Community · Africa

Market Shade Cover Project

In Freetown, the Market Shade Cover Project by the Climate Resilience Centre installed semi-translucent covers equipped with solar panels over market areas. These structures provide shade, reducing heat exposure for vendors and shoppers, and generate electricity to power lighting at night, extending market hours and enhancing safety. This initiative improves thermal comfort and supports economic activity in the community.

Brazil

Community · Latin America

Agrivoltaic Systems in Rural Communities

In Brazil, the Ecolume Agrivoltaic System developed by a network of researchers has been implemented in rural areas, combining sustainable agriculture with solar energy production. Elevated solar panels provide shade for crops, reducing heat stress and water evaporation, while generating electricity for local use. This approach enhances agricultural productivity and offers a sustainable energy source for rural communities.

Kolkata, India

Institutional · Asia

Solar-Powered Bus Shelters

In Kolkata, India, solar-panel bus stops were introduced to reduce commuter heat exposure while generating electricity for lighting and ventilation. These structures provided shade and helped reduce urban heat stress, while minimizing reliance on grid electricity. The initiative is part of Kolkata's broader climate adaptation strategy, demonstrating how solar energy can integrate seamlessly into public infrastructure.

Low-cost Portable Cooling Devices

Problem Addressed

Outdoor workers, sanitation staff, vendors, and commuters often endure prolonged exposure to extreme heat without access to cooling infrastructure. This leads to heat stress, dehydration, fatigue, and reduced productivity. Without affordable and portable cooling options, these populations face increased risk of illness, economic loss, and long-term health consequences.

The Solution

Wearable cooling devices—such as vests, scarves, and neckbands—provide mobile, low-cost relief from heat exposure. Designed for outdoor workers and informal sector laborers, these tools help regulate body temperature, improve comfort, and reduce the risk of heat-related illness during intense heat events, especially where fixed cooling infrastructure is lacking.

Key Aspects

- **Material Selection:** Utilizing fabrics with high thermal conductivity or phase-change materials (PCM) that absorb and release heat efficiently.
- **Design and Comfort:** Creating ergonomic designs that ensure comfort during prolonged use, suitable for various occupational and daily activities.
- **Affordability:** Utilizing cost-effective materials and manufacturing processes makes these devices accessible to low-income populations.
- **Energy Independence:** Developing solutions that do not rely on external power sources, such as battery-free designs or those powered by body heat.
- **Cultural Adaptation:** Tailoring designs to align with local customs and clothing practices to encourage widespread adoption.

Barriers and Way Forward

- **High Costs for Mass Distribution:** Subsidize through public health and labor programs.
- **Lack of Awareness of Use/Benefits:** Conduct demos during heat health awareness drives.
- **Durability Issues in Harsh Conditions:** Invest in field-tested, locally appropriate designs.
- **Scaling Constraints:** Support local manufacturing and integrate into city heat action plans.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Universal

India — Community — Asia

Sheetal Kavach: Hybrid Cooling Jacket for Healthcare Workers

In response to the heat stress faced by healthcare workers in India, a novel Hybrid Cooling Jacket (HCJ) named “Sheetal Kavach” was developed. This jacket utilizes dry ice and ventilation fans to provide cooling relief for up to four hours. Field trials demonstrated its effectiveness in reducing heat-related discomfort during extended periods of work in hot and humid conditions.

Qatar — Institutional — Asia

StayQool Suit for Migrant Workers

To combat extreme heat exposure among migrant workers, Qatar introduced the StayQool suit. Developed in collaboration with Techniche and Hamad Bin Khalifa University, the suit features phase-change materials and evaporative cooling fabrics. It effectively reduces skin temperatures, thereby enhancing worker safety and comfort during outdoor labor in high-temperature environments.

UAE — Institutional — Asia

Wearable Technology for Heat Strain Monitoring

Emirates Global Aluminium (EGA) in the United Arab Emirates implemented wearable technology to monitor heat strain among its outdoor workers. The devices continuously report core body temperature, heart rate, and other vital signs in real-time, allowing both the wearer and safety teams to detect heat strain before symptoms manifest. This proactive approach has enhanced worker safety and health in extreme heat conditions.

Solar Powered Cooling Systems for Schools

Problem Addressed

Extreme heat has been shown to disrupt learning environments, particularly in public schools with poor ventilation and no access to electricity. Students face dehydration, fatigue, and heat-related illnesses, leading to absenteeism, loss of concentration, and reduced academic performance—especially in rural or informal areas with unreliable or no

The Solution

Solar-powered cooling systems—such as fans, coolers, and ventilation units—installed in schools provide heat relief without relying on the grid. These systems improve indoor comfort, enable uninterrupted learning, and offer a sustainable solution to heat stress in energy-poor educational settings, particularly during peak temperature months.

Key Aspects

- **Cooling Technologies:** Includes DC solar fans, water-based coolers, and passive ventilation systems.
- **Energy Access:** Systems function independently of unreliable electricity grids. Child-Focused Design: Sized for classrooms; minimizes noise, maximizes airflow.
- **Co-benefits:** Solar power also supports lighting, device charging, and digital learning tools.
- **School Ownership:** Operated by school staff with training on basic maintenance.
- **Community Engagement:** Involves school committees and parent associations in installation and monitoring.
- **Integration:** Potential to link with national education and heat action planning frameworks.

Barriers and Way Forward

- **High Initial Investment:** Pursue funding through government grants, international aid, and partnerships with NGOs to subsidize initial expenses.
- **Maintenance and Technical Expertise:** Implement training programs for local technicians and establish partnerships with technical Institutionals for ongoing support.
- **Weather Variability:** Integrate energy storage solutions, such as batteries, to ensure consistent cooling during cloudy periods or nighttime.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Universal

India Institutional Asia

Solar PV Implementation in Bengaluru Schools

In Bengaluru, India, a project by TERI and Hindustan Aeronautics Limited facilitated the installation of solar photovoltaic (PV) systems in local schools to address unreliable power supply and high energy costs. The initiative enabled schools to generate their own electricity, ensuring a consistent power source for fans and cooling equipment. This not only improved classroom conditions but also provided educational opportunities for students to learn about

Solar Powered Irrigation Pumps

Problem Addressed

Rising temperatures and erratic rainfall patterns are intensifying agricultural water stress. Diesel-powered irrigation pumps are expensive to operate, emit greenhouse gases, and often fail in remote or off-grid areas. Smallholder farmers struggle with energy access, reduced crop yields, and water insecurity, worsening vulnerability to climate-induced heat.

The Solution

Solar-powered irrigation pumps use clean energy to draw groundwater or river water, ensuring reliable access to irrigation during heatwaves and dry spells. These systems reduce dependence on fossil fuels, cut costs for farmers, and improve crop resilience and productivity under extreme heat and shifting weather conditions.

Key Aspects

- **Pump Types:** Includes surface and submersible solar pumps adapted to water depth and terrain.
- **Cost Savings:** Replaces costly diesel or grid-based energy with free solar power.
- **Climate Resilience:** Ensures consistent irrigation during prolonged dry periods and peak heat.
- **Farmer Cooperatives:** Shared solar pump ownership reduces costs and maximizes usage.
- **Water Efficiency:** Integrated with drip or sprinkler systems for optimal use.
- **Scalable Design:** Modular systems expandable based on farm size and demand.
- **Policy Linkages:** Aligned with rural electrification, agricultural resilience, and solar subsidy programs.

Barriers and Way Forward

- **High Upfront Cost:** Use subsidies, microloans, and climate finance mechanisms.
- **Technical Capacity Gaps:** Train rural technicians and provide manuals in local languages.
- **Groundwater Overuse Risks:** Couple with water budgeting and farmer awareness campaigns.
- **Seasonal Demand Fluctuations:** Encourage shared use or solar battery integration.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Rural

South India

Community Asia

Solar Irrigation for Agricultural Resilience

The SoLAR project in Bangladesh, India and Nepal, promotes solar-powered irrigation to enhance climate-resilient agriculture. By replacing diesel pumps with solar alternatives, farmers reduce fuel costs and carbon emissions. The initiative includes training for farmers on sustainable water management and collaborates with local governments to ensure policy support, leading to improved livelihoods and environmental benefits.

India

Community Asia

Solar Pump Irrigators' Cooperative Enterprise (SPICE)

In Dhundi, Gujarat, India, six farmers formed the Solar Pump Irrigators' Cooperative Enterprise (SPICE) with support from the International Water Management Institute (IWMI) and Tata Trusts. They installed solar panels to power irrigation pumps and sold excess electricity back to the grid. This model provided a climate-smart income, incentivized sustainable water use, and reduced reliance on diesel pumps, thereby lowering carbon

Nicaragua

Household Latin America

Solar-Powered Drip Irrigation for the Valle Family

In Matagalpa, Nicaragua, the Valle family transitioned from unreliable grid electricity and costly diesel generators to a solar-powered drip irrigation system. Installed in collaboration with GRID Alternatives and local company Suni Solar, the 370-watt system pumps water from a nearby river into a storage tank, enabling efficient drip irrigation. This shift allowed the family to diversify crops, increase monthly earnings from $25 to $546, and reduce time spent collecting drinking water. The initiative not only improved their livelihood but also provided more locally grown food year-round for the community

Wastewater Recycling Systems

Problem Addressed

Prolonged dry periods strain traditional water sources, affecting agriculture, health, and daily needs. Untreated wastewater worsens pollution and disease risk. Recycling wastewater addresses both scarcity and contamination, reducing reliance on groundwater and rainfall while improving community resilience to rising heat and water stress.

The Solution

Community-driven wastewater reuse systems treat greywater for irrigation, flushing, and cooling. These decentralized solutions reduce freshwater demand, support agriculture, and enhance climate resilience. Tailored to local needs, they ensure safe reuse and help communities adapt to heat-driven water shortages.

Key Aspects

- **Decentralized Design:** Compact systems placed at schools, public toilets, or housing clusters.
- **Greywater Use:** Filters kitchen, bath, and laundry water for reuse in irrigation and flushing.
- **Nature-Based Technologies:** Systems include reed beds, bio-sand filters, or anaerobic digesters.
- **Cooling Co-benefits:** Recycled water supports tree watering and green corridors for microclimate regulation.
- **Community Involvement:** Residents trained to maintain and monitor systems.
- **Policy Linkages:** Integrated into water security and sanitation strategies.

Barriers and Way Forward

- **Perceived Hygiene Risks:** Public education and transparent treatment processes.
- **Operation and Maintenance Gaps:** Train local caretakers and support O&M funds.
- **Lack of Legal Frameworks:** Advocate for inclusion in urban planning and building codes.
- **Low Initial Uptake:** Showcase pilot successes and highlight water cost savings.

CASE STUDIES

Universal

Peru

Community · Latin America

EcoSwell's Wastewater Treatment

In the arid towns of Peru, the NGO EcoSwell collaborates with local communities to implement decentralized wastewater treatment systems. These initiatives include the installation of biodigesters, dry toilets, and greywater reuse projects. The treated wastewater is repurposed for irrigation and reforestation efforts, enhancing water availability and supporting local agriculture, which is crucial during periods of extreme heat. This approach not only addresses water scarcity but also promotes environmental sustainability and community resilience.

New Cairo, Egypt

Institutional · Africa

Public-Private Partnership for Wastewater Reuse

To address water scarcity amidst rapid urbanization, New Cairo implemented a pioneering public-private partnership to construct a wastewater treatment plant. The treated wastewater is reused for agricultural irrigation, reducing the strain on freshwater resources during periods of extreme heat. The project involved collaboration with local communities to ensure acceptance and effective implementation, serving as a model for future initiatives in the region.

India

Household · Institutional · Community · Asia

Greywater Recycling in Auroville

In Auroville, Tamil Nadu, approximately sixty decentralized wastewater treatment systems have been implemented, ranging from small household units to community and small industrial setups. These systems utilize technologies such as horizontal planted filters and bio-sand filters to treat domestic wastewater, producing effluent suitable for reuse in gardening and flushing. This approach reduces groundwater extraction, promotes sustainable water management, and enhances community resilience to water scarcity during heatwaves.

Low-cost Desalination Technologies

Problem Addressed

Rising temperatures and saltwater intrusion—driven by climate change and over-extraction—are making freshwater increasingly scarce in coastal and arid regions of the Global South. Rural and marginalized communities face acute water stress, relying on unsafe sources or purchasing water at high cost, which affects health, livelihoods, and resilience to heat.

The Solution

Low-cost desalination technologies convert brackish or seawater into usable freshwater using affordable, decentralized systems. These include solar stills, reverse osmosis, and electrodialysis powered by renewable energy. Designed for off-grid or low-resource contexts, these systems enhance water access and climate resilience in heat-stressed, saline-affected communities.

Key Aspects

- **Solar Desalination:** Uses solar energy to evaporate and condense water, ideal for off-grid coastal villages.
- **Modular Design:** Portable, scalable systems that can serve households or small communities.
- **Brackish Water Solutions:** Removes salt and contaminants from groundwater in arid inland areas.
- **Energy Efficiency:** Incorporates low-pressure membranes and solar panels to reduce costs.
- **Community Operation:** Trained users manage systems, ensuring affordability and upkeep.
- **Multi-Use Output:** Water used for drinking, irrigation, and hygiene needs.

Barriers and Way Forward

- **High Upfront Investment:** Use subsidies, microfinance, or CSR to reduce costs.
- **Maintenance Complexity:** Train local technicians and use durable, easy-to-maintain materials.
- **Public Skepticism of Safety** Include education campaigns on desalinated water use.
- **Waste Brine Disposal** Pair with safe evaporation ponds or brine reuse solutions.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Rural

India — Community — Asia

Solar-Powered Desalination by Barefoot College in Rajasthan

In Tilonia, Rajasthan, Barefoot College installed the region's first fully solar-powered desalination plant. This system utilizes solar energy to power reverse osmosis processes, converting brackish groundwater into potable water. The initiative empowers local communities by providing access to clean drinking water and training residents, particularly women, in the operation and maintenance of the system, fostering self-reliance and resilience to heat-induced water scarcity.

Kenya — Institutional — Africa

Solar-Powered Desalination in Kitui County

In Kitui County, Kenya, Solar Water Solutions partnered with Climate Fund Managers to install solar-powered desalination units. These systems employ reverse osmosis technology powered entirely by solar energy to treat brackish groundwater, providing clean drinking water to rural communities. The project includes 'water ATMs' for efficient distribution and payment, enhancing water access and community resilience to drought and heat stress

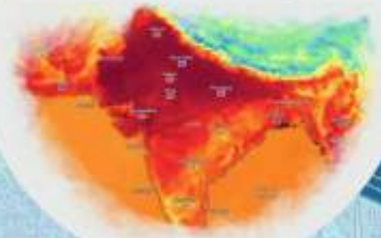
Kenya — Institutional — Africa

GivePower's Solar Water Farm in Kiunga

In 2018, GivePower inaugurated its first Solar Water Farm in Kiunga, Kenya, a coastal village near the Somali border. This innovative project utilizes solar-powered desalination technology to convert seawater into potable water, producing up to 75,000 liters daily—sufficient for 25,000 people. Housed in 20-foot shipping containers, the system operates independently of local power grids, ensuring a sustainable and reliable water source. The initiative has significantly improved health outcomes and quality of life in Kiunga, providing affordable access to clean water and reducing the prevalence of waterborne diseases.

Advocacy, Capacity Building & Governance Solutions

Community-Led Data Collection on Heat Vulnerability



Local Heat Action Plans (HAPs)

Participatory Water Management

Heat Stress Insurance for Vulnerable Workers

Strengthening Local Stewardship for Heat Adaptation

Documenting & Preserving Indigenous Heat Adaptation

Heat Adaptation Solution Compendium

Community Heat Health Check-Ups

Heat Communication Guide

Capacity Building of Informal Workers for Heat Resilience

Community Heat Health Check-Ups

Problem Addressed

Extreme heat poses significant health risks, especially to vulnerable populations such as the elderly, children, pregnant women, and individuals with pre-existing conditions. These vulnerable groups are at heightened risk of heat-related ailments like dehydration, heatstroke, and cardiovascular issues. Often, these individuals lack timely access to medical care, leading to preventable health crises and increased strain on local healthcare systems.

The Solution

Implementing regular health check-ups and community check-ins during heatwaves can prevent heat-related illnesses and enhance community resilience.

Key Aspects

- **Health Camps:** Setting up mobile clinics in underserved areas to provide free or low-cost medical check-ups.
- **Monitoring Systems:** Training community health workers to conduct regular visits to vulnerable households, assessing for heat-related symptoms.
- **Early Warning Alerts:** Utilizing heat warning systems to prioritize health check-ins during extreme temperature periods.
- **Preventive Care:** Distributing hydration kits, oral rehydration salts, and educational materials on managing heat exposure.
- **Digital Health Records:** Maintaining basic health records to ensure consistent care and follow-ups.
- **Referral Services:** Facilitating quick referrals to healthcare facilities when necessary.

Barriers and Way Forward

- **Limited Resources for Health Monitoring:** Train local volunteers and health workers to conduct low-cost check-ups, reducing dependence on overstretched healthcare systems.
- **Lack of Access to Healthcare in Remote Areas:** Use mobile units, community-run cooling centers for care, hydration, and health info.
- **Cultural Barriers & Mistrust in Formal Healthcare:** Involve trusted leaders and influencers to promote check-ups and preventive care.
- **Coordination Issues Between Stakeholders:** Set clear communication among health workers, hospitals, and governments for smooth heat response.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Universal

Vietnam — Community — Asia

Establishment of Community Cooling Centres

The Vietnam Red Cross Society, in collaboration with the German Red Cross, has developed a manual to guide the installation and management of community cooling centres. These centres provide respite from extreme heat, offer educational resources on heat-related risks, and serve as hubs for community engagement during heatwaves. The manual offers step-by-step guidance on setting up these centres, including design, logistics, management, care protocols, and communication strategies.

Bangladesh — Community — Asia

Early Action Protocol for Heatwaves in Dhaka

In April 2024, the Bangladesh Red Crescent Society activated its Early Action Protocol for Heatwaves in Dhaka. Anticipatory actions included establishing cooling centres, distributing drinking water, and providing public awareness campaigns to inform residents about heat-related risks and preventive measures. This proactive approach aimed to support vulnerable populations before the peak impacts of the heatwave were felt.

India — Institutional — Asia

Heat Health Action Plans (HHAPs)

Cities across India have implemented Heat Health Action Plans to address the increasing frequency and severity of heatwaves. These plans involve health outreach programs, establishment of cooling centres, public education campaigns, and regular health check-ups for vulnerable populations. For instance, Ahmedabad's Heat Action Plan includes early warning systems, capacity building among healthcare professionals, and community awareness initiatives, leading to a significant reduction in heat-related mortality.

Documenting & Preserving Indigenous Heat Adaptation Knowledge

Problem Addressed

Traditional and Indigenous Knowledge (TIK) on heat adaptation is disappearing as communities modernize and migrate. Many time-tested strategies—such as cooling architecture, water conservation, and heat-resilient agriculture—are being lost. Formal adaptation plans often overlook these low-cost, practical solutions, leaving resource-scarce regions vulnerable to rising temperatures without accessible, culturally relevant coping methods.

The Solution

Documenting and preserving Indigenous heat adaptation knowledge safeguards centuries-old practices in water conservation, cooling architecture, and agriculture. Community-led efforts, oral histories, and scientific integration ensure these sustainable, low-cost strategies remain accessible, strengthening climate resilience where modern cooling solutions are unaffordable or impractical.

Key Aspects

- **Community Workshops:** Engage elders, farmers, and artisans to share traditional heat adaptation techniques.
- **Oral History & Data Collection:** Record stories and techniques related to cooling, water storage, heat-resilient crops, and dietary adjustments.
- **Collaborative Documentation:** Partner with schools, universities, and cultural Institutionals to create written, visual, and digital archives.
- **Knowledge Dissemination:** Develop guidebooks, podcasts, and exhibitions to ensure widespread accessibility.
- **Integration with Modern Science:** Combine traditional wisdom with modern climate research to create hybrid adaptation strategies, enhancing their applicability in formal climate planning.

Barriers and Way Forward

- **Risk of Knowledge Exploitation:** Establish ethical frameworks to protect intellectual property and ensure fair compensation to knowledge holders.
- **Declining Use of Traditional Practices:** Encourage intergenerational learning programs to pass knowledge to youth.
- **Limited Access to Documented Knowledge:** Use multiple languages and formats (digital, print, oral) to maximize accessibility.
- **Sustainability Concerns:** Secure long-term funding through government and research partnerships.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Universal

Sri Lanka — Community — Asia

Traditional Water Management for Heat Resilience

The Cultural Heritage Risk and Impact Tools for Integrated and Collaborative Learning (CRITICAL) research project explored how cultural heritage—beliefs, traditions, and architecture—supports climate resilience across Sri Lanka, Indonesia, and South Africa. In Sri Lanka, researchers documented tank cascade systems, ancient irrigation structures that store and distribute water efficiently, helping farmers withstand extreme heat and droughts. Women's seasonal foraging knowledge and reliance on these systems ensured food security during harsh conditions. Through community storytelling and digital mapping, the project aims to preserve and integrate these traditional methods into modern climate adaptation

India

Tribal Peoples' Committee on Climate Change Impact in Odisha

In Odisha, the Centre for Development Action worked with tribal communities to build resilience against climate change. A Tribal Peoples' Committee on Climate Change Impact was formed to promote drought-resistant crops, rainwater conservation, and traditional water management techniques. Communities participated in vulnerability assessments, adaptation planning, and natural resource management, benefiting 2,800 people. The project strengthened traditional knowledge, community decision-making, and long-term climate adaptation strategies.

Strengthening Local Stewardship for Heat Adaptation

Problem Addressed

Vulnerable communities, particularly in low-income urban areas and informal settlements, bear the brunt of heat-related illnesses and fatalities due to poor infrastructure, lack of green spaces, and limited access to cooling resources. Many government-led adaptation strategies are top-down, failing to engage local communities or incorporate local knowledge and needs. Without active participation, adaptation solutions often remain ineffective,

The Solution

Empowering communities to take an active role in heat adaptation fosters collective resilience against extreme temperatures, particularly in vulnerable regions. By involving residents in planning, implementation, and monitoring, this approach enhances ownership, reduces costs, and ensures long-term adaptation strategies to mitigate the impact of extreme heat.

Key Aspects

- **Inclusive Planning & Participatory Decision-Making:** Engage residents in mapping heat hotspots and co-designing adaptation strategies tailored to local needs.
- **Community-Led Implementation:** Establish shade corridors with tree planting, install cooling infrastructure like misting stations and water kiosks, and promote cool roofing and reflective pavements.
- **Localized Heat Action Plans:** Develop neighborhood-specific emergency response plans, including hydration points and shaded rest areas.
- **Capacity Building & Knowledge Sharing:** Train community members to monitor heat risks, conduct first aid, and integrate adaptation education in schools, workplaces, and public spaces.

Barriers and Way Forward

- **Community Engagement Barriers:** Implement inclusive outreach strategies and use trusted local networks to encourage participation.
- **Resource Constraints:** Leverage public-private partnerships, crowdfunding, and government grants.
- **Knowledge Gaps:** Establish local training programs and school-based awareness initiatives.
- **Bureaucratic Hurdles:** Strengthen community advocacy for streamlined government support.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Universal

India | Community | Institutional | Asia | ARA

Ahmedabad Heat Action Plan & Community Engagement

Ahmedabad's Heat Action Plan (HAP) is a pioneering initiative that integrates community participation to combat urban heat stress. The plan involves public awareness campaigns, heatwave early warnings, and the development of cooling shelters. The Mahila Housing Trust (MHT) engages local women in cool roof installations, tree-planting projects, and heat resilience training, empowering low-income communities to implement localized heat adaptation measures.

Participatory Water Management

Problem Addressed

Extreme heat exacerbates water scarcity in low-income and informal settlements across the Global South. Unequal access to clean water during heatwaves increases risks of dehydration, poor hygiene, and heat-related illness, especially among vulnerable populations who depend on overstretched or unregulated water systems with limited Institutionalal

The Solution

Community-led water governance ensures equitable distribution, localized storage, and timely access to water during heatwaves. These participatory systems empower residents to monitor supply, coordinate use, and manage infrastructure collectively, supporting resilience, health, and mutual aid in the face of intensifying heat and declining water reliability.

Key Aspects

- **Water Committees:** Locally elected groups oversee access, schedules, and conflict resolution.
- **Decentralized Kiosks:** Community taps and shaded tanks increase access during peak heat.
- **Rotational Supply:** Scheduling fair water usage in extreme heat hours.
- **Rainwater Harvesting:** Reviving and maintaining traditional systems.
- **Monitoring:** Community-led mapping and repair of leaks.
- **Hygiene Kits:** Distributing water-efficient hygiene supplies.
- **Education:** Awareness on heat-health and conservation.
- **Linkages:** Advocacy with local authorities for Institutionalal support.

Barriers and Way Forward

- **Lack of Legal Recognition:** Partner with local governments to formalize community-led systems.
- **Maintenance and Funding Challenges:** Train residents in low-cost repair and tap into local NGO support.
- **Weak Institutionalal Links:** Develop clear coordination mechanisms between water boards and municipal bodies.
- **Gender Exclusion in Decision-Making:** Create inclusive committees with reserved seats for women leaders.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Universal

Kenya — Community — Africa

Water ATMs in Mathare Informal Settlement

In Nairobi's Mathare informal settlement, a public-private partnership introduced card-operated water vending machines, known as water ATMs, in 2015. These machines provide affordable and reliable water access to residents, enhancing equity and reducing conflicts over water resources. The initiative demonstrates how smart technology can serve urban poor communities by improving water security.

India — Community — Asia

Participatory Irrigation Management in Pawla, Maharashtra

In Maharashtra's Nandurbar district, the NGO Development Support Centre facilitated the repair of the Pawla Minor Irrigation Tank through participatory irrigation management. By involving local Water User Associations in canal maintenance and water governance, the initiative restored equitable water distribution, improved soil moisture retention, and enhanced crop yields. This community-driven approach bolstered resilience against heat stress and drought conditions.

Community-Led Data Collection on Heat Vulnerability

Problem Addressed

In the Global South, heat impacts are unevenly distributed and often undocumented in informal and underserved communities. Official data systems fail to capture local heat risks, leaving vulnerable populations invisible in climate planning. Without localized data, resource allocation and targeted interventions during heatwaves remain ineffective and inequitable.

The Solution

Empowering communities to collect, map, and analyze heat vulnerability data enables hy-perlocal understanding of exposure, risk, and needs. These grassroots efforts build collective awareness, inform adaptation planning, and bridge data gaps, making responses more just, inclusive, and responsive to the lived realities of those most at risk

Key Aspects

- **Community Mapping:** Residents identify local heat hotspots using participatory tools.
- **Digital Surveys:** Mobile apps and offline tools capture health, housing, and exposure data.
- **Vulnerability Indices:** Co-created indicators prioritize elderly, women, informal workers. Public Displays: Community heat maps shared in local forums and bulletin boards.
- **Training & Capacity:** Local youth trained in data collection and analysis.
- **Policy Interface:** Data shared with city agencies and planners for targeted response.
- **Privacy & Consent:** Ethical protocols guide data handling and sharing.

Barriers and Way Forward

- **Lack of Technical Capacity:** Partner with NGOs and research Institutionals for training and tools.
- **Data Legitimacy Issues:** Co-develop metrics with government actors for uptake.
- **Digital Divid:** Use paper-based surveys and oral data collection where needed.
- **Burnout or Drop-Off in Engagement:** Provide incentives, recognition, and integrate feedback loops.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Universal

India — Community — Asia

Community-Led Climate Vulnerability Mapping in Mumbai

In Mumbai's informal settlement of Ambojwadi, residents collaborated with the NGO YUVA to conduct climate vulnerability mapping. Through participatory assessments, they identified areas prone to heat stress and flooding, leading to the development of a Community Climate Action Plan. This initiative empowered locals to engage with municipal authorities, resulting in infrastructure improvements like stormwater drains and green spaces, enhancing resilience to extreme heat and flooding.

India — Community — Asia — ARA

Community-Led Heat Vulnerability Mapping in Jodhpur

In Jodhpur, Rajasthan, Mahila Housing Trust (MHT) & NRDC collaborated with local communities to conduct ward-level heat vulnerability assessments. By integrating data on heat exposure, population sensitivity, and adaptive capacity, they identified high-risk areas. This participatory approach informed the city's first Heat Action Plan, enabling targeted interventions like cool roofs and early warning systems to protect vulnerable populations from extreme heat.

Local Heat Action Plans (HAPs)

Problem Addressed

Extreme heat events are becoming more frequent and severe, yet many communities lack structured response mechanisms. Heatwaves disproportionately impact vulnerable populations, including outdoor workers, elderly individuals, and those in informal settlements. Without a coordinated strategy, heat-related illnesses and deaths increase, and communities struggle to access cooling infrastructure, healthcare, and early warning systems.

The Solution

Community-driven Heat Action Plans (HAPs) help local governments and residents prepare for, respond to, and adapt to extreme heat. These plans integrate early warning systems, medical interventions, cooling infrastructure, behavioral change campaigns, and policy frameworks to reduce heat risks. By engaging residents in planning and implementation, HAPs ensure locally relevant, affordable, and effective adaptation strategies.

Key Aspects

- **Community Involvement:** Residents, informal workers, and local organizations contribute to risk mapping and solution design.
- **Early Warning Systems:** SMS alerts, radio announcements, and community messengers provide heat advisories.
- **Public Cooling Strategies:** Establishment of cooling centers, tree shading, and water stations.
- **Healthcare Preparedness:** Training health workers to recognize and treat heatstroke and dehydration.
- **Workplace Adjustments:** Encouraging shaded workspaces, adjusted hours, and hydration breaks.
- **Long-Term Urban Planning:** Integration of nature-based solutions (tree planting, water bodies) and passive cooling designs in buildings.

Barriers and Way Forward

- **Limited Policy Implementation:** Advocacy and partnerships with municipal authorities can enhance policy adoption.
- **Lack of Awareness:** Community workshops and public education campaigns can increase participation.
- **Infrastructure Gaps:** Investing in cost-effective, low-tech cooling solutions like shaded spaces and water dispensers can provide immediate relief.
- **Limited Funding:** Leveraging public-private partnerships and integrating HAPs into existing disaster preparedness programs can ensure sustainability.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Universal

India — Institutional — Asia

Ahmedabad Heat Action Plan

In response to a deadly heatwave in 2010 that resulted in over 1,300 deaths, Ahmedabad implemented South Asia's first comprehensive Heat Action Plan in 2013. The plan includes early warning systems, public awareness campaigns, and capacity building among healthcare professionals to mitigate heat-related health risks. Studies indicate that the plan has significantly reduced heat-related mortality in the city.

Sierra Leone — Institutional — Africa

Freetown's Heat Action Plan

In February 2025, Freetown unveiled Africa's first comprehensive Heat Action Plan during the African Urban Heat Summit. The plan emphasizes community-led initiatives such as tree planting, urban heat mapping, and providing shaded areas in markets to combat rising temperatures and protect vulnerable populations. It also focuses on public education and the development of early warning systems to enhance the city's resilience to extreme heat.

Heat Stress Insurance for Vulnerable Workers

Problem Addressed

Millions of informal and outdoor workers—such as construction laborers, street vendors, and farmers—face severe heat exposure with little financial security. Heatwaves reduce productivity, cause health issues, and lead to income losses. Without social protection measures, workers bear the economic burden of extreme heat, increasing their vulnerability and limiting their ability to invest in heat adaptation measures.

The Solution

Heat stress insurance provides financial protection to workers affected by extreme heat. Microinsurance models ensure workers receive payouts when temperatures exceed safe working limits. Community cooperatives, NGOs, and government partnerships can facilitate the implementation of affordable, accessible insurance models.

Key Aspects

- **Parametric Insurance Models:** Payouts triggered when recorded temperatures exceed a pre-determined threshold.
- **Community-Based Insurance Pools:** Worker collectives or cooperatives organize shared risk models.
- **Integration with Workplace Safety:** Policies promoting cooling breaks, shaded work areas, and hydration.
- **Public-Private Partnerships:** Governments and insurers work together to subsidize plans.
- **Awareness & Training:** Educating workers about heat stress, preventive actions, and claims processes.

Barriers and Way Forward

- **Low Insurance Penetration:** Collaborating with local cooperatives and unions ensures better adoption.
- **Affordability Concerns:** Public subsidies and employer contributions can reduce costs.
- **Data & Verification Issues:** Leveraging weather stations and mobile data tracking enhances accuracy.
- **Limited Trust in Insurance:** Transparent claims processes and community engagement build confidence.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Universal

India Institutional Asia

Parametric Heat Insurance for Women Workers

In 2023, Extreme Heat Income Insurance, a parametric insurance product, was piloted to protect 21,000 informal women workers from heat-related income loss. Developed by Blue Marble, SEWA, and the Adrienne Arsht-Rockefeller Foundation Resilience Center, the insurance automatically compensates women when extreme temperatures exceed predefined thresholds, ensuring financial stability without the need for claims. This initiative not only enhances economic resilience but also raises heat safety awareness, offering a scalable model for vulnerable workers worldwide.

Heat Communication Guide

Problem Addressed

In many parts of the Global South, early warnings and safety messages during heatwaves fail to reach the most vulnerable—especially those in informal settlements, low-literacy communities, or without access to digital infrastructure. Inadequate, unclear, or poorly localized communication increases heat-related risks, illness, and mortality during extreme temperature events.

The Solution

A community-centered Heat Communication Guide can help develop localized, accessible, and inclusive messages that inform people about heat risks, early warnings, and protective actions. By co-creating messaging with community leaders, the guide enhances trust, reach, and timely decision-making during heatwaves.

Key Aspects

- **Co-Creation:** Messaging co-designed with local residents, workers, and health volunteers.
- **Localization:** Adapts content to local languages, dialects, and visual formats.
- **Diverse Channels:** Uses street theatre, WhatsApp, loudspeakers, posters, and radio.
- **Timing Strategy:** Aligns alerts with official forecasts and daily heat peaks.
- **Inclusive Design:** Considers low literacy, disability, and cultural sensitivities.
- **Trusted Messengers:** Engages teachers, shopkeepers, and community health workers.
- **Feedback Loops:** Community responses used to revise messages and strategies.

Barriers and Way Forward

- **Low Trust in Official Messaging:** Work with known and trusted local actors.
- **Digital Divide and Low Literacy:** Use visual, oral, and non-digital tools.
- **One-Size-Fits-All Messages:** Tailor messages by gender, occupation, and neighborhood.
- **Limited Resources for Distribution:** Partner with NGOs, schools, and street vendors

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Universal

South Asia | Institutional | Community | Regional

Heat Communication Guide by ICLEI

ICLEI South Asia, in partnership with the Red Cross Red Crescent Climate Centre, developed a Heat Communication Guide to support South Asian cities in creating inclusive, locally relevant messaging for heatwaves. The guide emphasizes low-tech, multilingual, and community-based dissemination strategies to reach vulnerable populations.. It offers practical recommendations for tailoring messages to local contexts, ensuring that vulnerable populations receive timely and comprehensible information to mitigate heatwave impacts.

Heat Adaptation Solution Compendium

Problem Addressed

Across the Global South, responses to extreme heat are often siloed—split across sectors, geographies, and Institutionals—with valuable practices remaining undocumented, unshared, or disconnected from formal planning systems. This limits the visibility, uptake, and scaling of promising heat adaptation measures, particularly those led by or benefiting vulnerable populations.

The Solution

A Heat Adaptation Solution Compendium curates diverse, context-specific strategies—ranging from grassroots innovations to Institutionalal programs—into an accessible, cross-sectoral resource. By synthesizing localized, evidence-informed responses, the compendium supports knowledge transfer, helps practitioners avoid duplication, informs funding decisions, and advances more equitable and adaptive heat resilience pathways.

Key Aspects

- **Diverse Sources:** Includes policy initiatives, traditional knowledge, tech innovations, and behavioral interventions.
- **Cross-Sectoral Categorization:** Organized around themes like housing, health, livelihoods, and infrastructure.
- **Adaptation Metadata:** Each solution tagged by climate zone, cost, actors involved, and scale.
- **Evaluation Dimensions:** Covers equity, scalability, co-benefits, and implementation challenges.
- **User-Oriented Formats:** Designed for governments, donors, practitioners, and frontline actors.
- **Living Resource:** Updated regularly with new solutions, user feedback, and validation insights.

Barriers and Way Forward

- **Fragmented Knowledge Ecosystems:** Co-create with diverse actors and unify formats across platforms.
- **Uneven Validation Standards:** Integrate community and expert reviews to assess effectiveness.
- **Access Limitation:** Offer offline, multilingual, and simplified formats for broad usability.
- **Lack of Institutionalal Uptake:** Align entries with policy cycles, heat action plans, and investment pipelines.

KEY STAKEHOLDERS

BENEFITS

CASE STUDIES

Universal

Global — Global

Heat Action Platform: Collaborative Heat Adaptation Solutions

The Heat Action Platform, developed by the Adrienne Arsht-Rockefeller Foundation Resilience Center, is a living, engagement-oriented tool for city officials, practitioners, and financial Institutionals to find guidance, both existing resources and tailor-made solutions, on reducing the human and economic impacts of extreme heat at the regional or municipal level. The platform offers opportunities to engage with world-leading experts across a diversity of disciplines to plan, fund, implement, and measure heat resilience actions.

Africa — Community — Africa

CARE's Adaptation Strategies Compendium: Community-Based Heat Resilience

CARE's Adaptation Learning Programme (ALP) in Ghana, Kenya, Niger, and Mozambique documents community-led strategies enhancing resilience to climate-induced heat stress. Initiatives include conservation agriculture, dry-season farming, and climate-informed planning. By integrating traditional knowledge with climate information services, communities improved food security and adaptive capacity. The compendium serves as a practical guide for scaling equitable, locally-driven heat adaptation across sub-Saharan Africa.

Global — ARA

GHHIN: Advancing Integrated Heat-Health Solutions

The Global Heat Health Information Network (GHHIN) serves as a comprehensive platform connecting practitioners, policymakers, and researchers to address extreme heat challenges. Through its extensive resource library, including heat action plans, case studies, and technical guidelines, GHHIN facilitates knowledge exchange and capacity building. Its initiatives, such as masterclasses and regional hubs, promote interdisciplinary collaboration to enhance heat resilience globally.

Capacity Building of Informal Workers for Heat Resilience

Problem Addressed

Outdoor and informal workers—such as street vendors, waste collectors, farmers, and construction laborers—face disproportionate exposure to extreme heat. Yet most lack access to protective infrastructure, formal social security, or training to recognize and respond to heat stress, increasing their vulnerability to health risks and economic losses.

The Solution

Targeted capacity building programs train workers to identify heat illness symptoms, adopt safe work practices, access hydration, and use low-cost protective gear. Conducted through unions, cooperatives, and municipal partnerships, these initiatives can empower workers to adapt on the ground and advocate for structural changes in workplace safety.

Key Aspects

- **Practical Training:** Workers learn to identify heat-related illnesses, access first aid, and adapt routines for hydration and rest.
- **Protective Strategies:** Encourages use of hats, cooling scarves, rest periods, and shade-seeking behavior.
- **Worker-Led Outreach:** Trained workers become peer educators within their sector or region.
- **Co-Designed Measures:** Workers help develop context-specific adaptations—shade structures, breathable clothing, breaks.
- **Engagement with Employers:** Sensitisation to improve ventilation, scheduling, and health supports.
- **Policy Linkages:** Tied to labor rights advocacy and heat action planning.

Barriers and Way Forward

- **Lack of Legal Recognition:** Link with rights-based campaigns and push for informal work protections in climate policy.
- **Limited Employer Incentives:** Use pilot success stories to build buy-in for improved workplace design.
- **Resource Constraint:** Partner with local NGOs and government departments to tap into existing health outreach programs.

CASE STUDIES

Universal

Pakistan — Community — Asia — ARA

Empowering Women Cotton Pickers in Sindh

In Sindh's Matiari district, the Sindh Community Foundation (SCF) enhanced the resilience of over 500 women cotton pickers through climate literacy and occupational safety training. The initiative introduced shaded rest areas and climate safety kits, addressing health issues like heatstroke and pesticide exposure. Advocacy efforts focused on implementing the Sindh Women Agricultural Workers Act 2020, aiming to improve health protections and labor rights for women agricultural workers.

Bangladesh — Community — Asia

Building Heat Resilience Among Garment Workers

In Bangladesh, ICCCAD's project equips garment workers—particularly women—with knowledge to cope with rising workplace heat. Through climate resilience training and dialogue with factory owners, the initiative addresses indoor heat stress, poor ventilation, and the need for worker-centric adaptation. By integrating frontline worker voices into climate planning, it strengthens protections in one of the country's most heat-exposed and economically vital sectors.

India — Community — Asia — ARA

Capacity Building for Women Rice Farmers on Heat Stress in Odisha

In Ganjam district, Odisha, the International Rice Research Institute (CGIAR) and Awaas Sewa Pvt. Ltd. trained women rice farmers to identify and manage heat stress risks. The workshop built capacity through practical sessions on heat-resilient farming techniques, health risk recognition, and adaptation planning. By centering women's experiences and strengthening local knowledge, the initiative empowered farmers to respond proactively to rising temperatures.

Conclusion

As the impacts of extreme heat continue to escalate across the globe, the need for adaptive solutions that are not only effective but also locally relevant has never been more urgent. The ‘Community-driven Heat Solutions Compendium’ highlights the critical importance of community-led approaches in addressing the growing threat of extreme heat. By capturing and showcasing these solutions, we hope to provide a valuable resource for stakeholders across the climate adaptation landscape in rural and urban contexts alike.

This compendium, however, is not a static document. We envision it as a living resource—one that is iterative and ever-evolving incorporating new insights, case studies, and innovations as they emerge. We recognize that the challenges associated with extreme heat are dynamic, and so must be the solutions.

To maintain its relevance and support its growth, we encourage contributions from communities, researchers, and practitioners alike as new solutions are developed and tested. By sharing additional case studies, feedback, and new solutions, we can collectively ensure that this resource remains comprehensive and responsive to the changing landscape of climate adaptation.It is our hope that, over time, this resource will grow into a dynamic platform for knowledge exchange, fostering collaboration and accelerating the adoption of effective, community-led heat adaptation solutions across the globe.

For inquiries, contributions, or further information, please contact us at hello@transitionsresearch.org. Through ongoing collaboration and the continuous expansion of this resource, we aim to build a shared repository of knowledge that can be accessed by all who are working to mitigate the impacts of heat and climate change.

Together, we can ensure that the solutions to extreme heat are not only found but also nurtured, scaled, and integrated into resilient futures for all communities.

Bibliography

Nature-Based Solutions

Council of Governors (CoG), ‘Sustainable Rangeland Restoration through Community-Led Rotational Grazing in Kajiado’, Maarifa Centre, 2023, https://maarifa.cog.go.ke/county-initiatives/sustainable-rangeland-restoration-through-community-led-rotational-grazing.

Climate and Development Knowledge Network (CDKN), ‘From Vulnerability to Resilience: Farmer Managed Natural Regeneration in Niger’, NDC Partnership, 2023, https://ndcpartnership.org/knowledge-portal/good-practice-database/vulnerability-resilience-farmer-managed-natural-regeneration-niger.

Asian Development Bank (ADB), Making Grasslands Sustainable in Mongolia: Herders’ Livelihoods and Climate Change, 2013, https://www.adb.org/sites/default/files/publication/31213/mongolia-making-grasslands-sustainable-herders-livelihoods.pdf.

Sanjiv Phansalkar, ‘Tribute to Champion of Traditional Phad Irrigation System’, Village Square, 2020, https://www.villagesquare.in/tribute-to-champion-of-traditional-phad-irrigation-system/.

Deccan Heritage Foundation, ‘Rehabilitation and Revitalisation of the Qanat/Karez System of Bidar (Karnataka)’, 2022, https://www.deccan-heritage-foundation.org/restoration-projects/rehabilitation-and-revitalisation-of-the-qanat-karez-system-of-bidar-karnataka/.Deccan Heritage Foundation

Vi Agroforestry, Kenya Agriculture Carbon Project (KACP) Final Report, 2019, https://viagroforestry.org/app/uploads/2019/09/kacp_viagroforestry_final.pdf.Vi Agroforestry

National Institute of Urban Affairs (NIUA), ‘Sustainable Cities, Stronger Communities: Kerala’s Army of Green Warriors – The Haritha Karma Sena’, 2023, https://niua.in/blogs/sustainable-cities-stronger-communities-kerala%E2%80%99s-army-green-warriors-haritha-karma-sena.

Zero Hour Climate, ‘Development of Resilient Crop Varieties for Climate Change’, 2024, https://www.zerohourclimate.org/development-of-resilient-crop-varieties-climate-change/.

The Guardian, ‘Kenya’s National Gene Bank Helps Farmers Preserve Indigenous Crops Amid Food Insecurity’, 2024, https://www.theguardian.com/global-development/2024/oct/31/kenya-national-gene-bank-farmers-indigenous-crops-seeds-food-insecurity.ADB+3SNV+3CGIAR+3

CGIAR, ‘Heat-Tolerant Maize Hybrids: A Pursuit to Strengthen Food Security in South Asia’, 2024, https://www.cgiar.org/news-events/news/heat-tolerant-maize-hybrids-a-pursuit-to-strengthen-food-security-in-south-asia/.

Soni Pradhanang, ‘Polluted Lakes Are Being Cleansed Using Floating Wetlands Made of Trash’, WIRED, 2024, https://www.wired.com/story/planet-pioneers-nagdaha-small-earth-nepal-soni-pradhanang-ftws-floating-treatment-wetland-systems-water-cleaning-pollution/.WIRED

Le Monde, ‘Benin’s Voodoo Deities Take Care of Precious Mangroves’, 2024, https://www.lemonde.fr/en/environment/article/2024/09/03/benin-s-voodoo-deities-take-care-of-precious-mangroves_6724551_114.html.

Panorama Solutions, ‘Empowering Communities to Protect and Manage Lake Naivasha Catchment, Kenya’s Aberdare Forest’, 2023, https://panorama.solutions/en/solution/empowering-communities-protect-and-manage-lake-naivasha-catchment-kenyas-aberdare-forest-0.

Abalimi Bezekhaya, ‘Homepage’, 2023, https://abalimibezekhaya.org.za/.

WRI India, ‘Pink City to Green City: Building Jaipur’s Climate Resilience through Nature-Based Solutions’, 2023, https://wri-india.org/blog/pink-city-green-city-building-jaipurs-climate-resilience-through-nature-based-solutions.wri-india.org

The Architectural Review, ‘Cuba’s Urban Farming Revolution: How to Create Self-Sufficient Cities’, 2023, https://www.architectural-review.com/essays/cubas-urban-farming-revolution-how-to-create-self-sufficient-cities.Financial Times+2Bol+2Kerala Kaumudi+2

Metropolis, ‘Micro Gardens in Dakar’, 2023, https://use.metropolis.org/case-studies/micro-gardens-in-dakar.

Indian Geographical Union (IGU), ‘Climate Resilient Urban Development: A Case Study’, IGU Journal, 2023, https://iguonline.in/journal/igu_22-3/Paper%205.pdf.

Springer, ‘Chapter 14: Community-Based Adaptation to Climate Change’, in Climate Change Adaptation in Africa, 2017, https://link.springer.com/chapter/10.1007/978-3-319-66239-8_14.

Behavioral, Lifestyle & Traditional Knowledge Solutions

Liendo Tagle, I., ‘In Peru, Ancient Food Technologies Revived in Pursuit of Future Security’, Mongabay, 2021, https://news.mongabay.com/2021/09/in-peru-ancient-food-technologies-revived-in-pursuit-of-future-security/.

Kalita, M., and Pathak, M., ‘Methods of Paddy Storage in Rural Areas of Assam’, Indian Journal of Hill Farming, vol. 14, no. 2, 2001, pp. 13–16, https://kiran.nic.in/pdf/IJHF/Vol14_2/2.pdf.Kiran+2Kiran+2Kiran+2

Baker, A., ‘How Qatar’s New Cool-Tech Gear Helps Workers in Extreme Heat’, Pulitzer Center, 2022, https://pulitzercenter.org/stories/how-qatars-new-cool-tech-gear-helps-workers-extreme-heat.Alamy+2Pulitzer Center+2Pulitzer Center+2

Yaesmin, F., ‘Managing Heat Stress Among Ready-Made Clothing Workers in Bangladesh’, PrepareCenter, 2022, https://preparecenter.org/wp-content/uploads/2022/12/Bangladesh-RMG-Heat-Perceptions-Research-by-F.-Yaesmin-2022.pdf.PrepareCenter+1PrepareCenter+1

Chitagu, T., ‘Farmers Rediscover Benefits of Traditional Small Grains in Zimbabwe’, Mongabay, 2022, https://news.mongabay.com/2022/03/farmers-rediscover-benefits-of-traditional-small-grains-in-zimbabwe/.

Council on Energy, Environment and Water (CEEW), ‘How Odisha Millet Mission Revived Millets Production’, 2023, https://www.ceew.in/sustainable-agriculture-initiatives/odisha-millets-mission-government-scheme-for-promoting-millets-in-india.TCR Connecting Agriculture+3CEEW+3CEEW+3

Heifer International, ‘Milpa for Life: Indigenous Farmers Strengthen Integrated Farm Systems in the Yucatán’, 2024, https://www.heifer.org/blog/changing-lives-in-the-yucat%C3%A1n.html.

Infrastructure & Design Solutions

Malik, A., and Singh, N., ‘Resurrecting Khadeen, the Ancient Water Harvesting Structure of Rajasthan’, Mongabay India, 2023, https://india.mongabay.com/2023/12/resurrecting-khadeen-the-ancient-water-harvesting-structure-of-rajasthan/.

Future Policy Award, ‘Brazil’s Cisterns Programme’, World Future Council, 2023, https://www.futurepolicy.org/healthy-ecosystems/biodiversity-and-soil/brazil-cisterns-programme/.

Ugandan Water Project, ‘Rainwater Collection System’, 2023, https://ugandanwaterproject.com/rainwater-collection/.

Alinaitwe, C., ‘Elevating the Standard: A Professionalized Approach to Community-Based Rainwater Harvesting Systems in Uganda’, Waterlines, vol. 40, no. 2, 2021, pp. 115–126, https://ugandanwaterproject.com/wp-content/uploads/2021/05/Elevating-the-standard_-a-professionalized-approach-to-community-based-rainwater-harvesting-systems-in-Uganda.pdf.

Down To Earth, ‘A Rural School in Uganda Is Setting an Example with Its Off-Grid Water System’, 2024, https://www.downtoearth.org.in/water/a-rural-school-in-uganda-is-setting-an-example-with-its-off-grid-water-system.

Urban Nature Atlas, ‘Rain Garden and Bioswales in Central Jakarta’, 2023, https://una.city/nbs/jakarta/rain-garden-and-bioswales-central-jakarta.

World Resources Institute, ‘Incorporating Natural Infrastructure in Bogotá’s Water System’, 2023, https://www.wri.org/research/incorporating-natural-infrastructure-bogotas-water-system.

Kaarwan, ‘Kutch Bhungas: Gujarat’s Mud Architecture Unveiled’, 2023, https://www.kaarwan.com/blog/architecture/kutch-bhungas-gujarats-mud-architecture-unveiled?id=169.

Infrahub Africa, ‘Gando Primary School’, 2023, https://www.infrahub.africa/case-studies/gando-primary-school.

Climate-ADAPT, ‘Climate Proofing of Buildings Against Excessive Heat’, 2023, https://climate-adapt.eea.europa.eu/en/metadata/adaptation-options/climate-proofing-of-buildings-against-excessive-heat.

WRI India, ‘The Kawaki Initiative: A Community-Led Tree-Based Intervention for Climate Resilience’, 2023, https://www.nbs4india.org/case-studies/the-kawaki-initiative/.Mongabay-India+9WRI India+9WRI Ross Center for Cities+9

Catalytic Communities, ‘Sustainable Favela Network’, 2023, https://catcomm.org/sustainable-favela-network/.RioOnWatch

Heritage Foundation of Pakistan, ‘BlogPage 68: Newsblog 5’, 2023, https://www.heritagefoundationpak.org/BlogPage/68/newsblog/5.Deltec Homes+28Financial Times+28www.slideshare.net+28

C40 Knowledge Hub, ‘Cities100: Medellín’s Interconnected Green Corridors’, 2023, https://www.c40knowledgehub.org/s/article/Cities100-Medellin-s-interconnected-green-corridors?language=en_US.

Food and Agriculture Organization (FAO), ‘Urban Food Agenda: News Detail’, 2023, https://www.fao.org/urban-food-agenda/news-events/news-detail/en/c/1675337/.

Vois Planet, ‘Models of Climate Resilience in Urban Slums: A Case Study of the Mahila Housing Trust Initiatives in India’, 2023, https://voisplanet.com/public/assets/images/casestudy/Models_of_climate_resilience_in_urban_slums_a_case_study_of_the_Mahila_Housing_Trust_initiatives_in_India.pdf.

The Guardian, ‘Mirror Roofs Cooling Homes in Freetown, Sierra Leone Amid Extreme Heat’, 2024, https://www.theguardian.com/environment/article/2024/aug/16/mirror-roofs-cooling-homes-freetown-sierra-leone-extreme-heat.

Natural Resources Defense Council (NRDC), ‘Jodhpur, India Unveils Its First Net-Zero Cooling Station’, 2023, https://www.nrdc.org/bio/vijay-limaye/jodhpur-india-unveils-its-first-net-zero-cooling-station.

Red Cross Red Crescent Climate Centre, ‘Case Study: Heatwave Early Action Test in Hanoi, July 2019’, 2023, https://www.rcrc-resilience-southeastasia.org/document/case-study-heatwave-early-action-test-in-hanoi-july-2019/.

Anticipation Hub, ‘Community Cooling Centres: An Anticipatory Approach to Mitigate the Effects of Heat Waves’, 2023, https://www.anticipation-hub.org/news/community-cooling-centres-an-anticipatory-approach-to-mitigate-the-effects-of-heat-waves.

The Nature Conservancy, ‘Nature-Based Traditional Water Management Systems in Peru’, 2023, https://www.nature.org/en-us/magazine/magazine-articles/nature-based-traditional-water-management-systems-peru/.

Kenya News Agency, ‘Thousands Benefit from Rehabilitated Boreholes in Turkana’, 2023, https://www.kenyanews.go.ke/thousands-benefit-from-rehabilitated-boreholes-in-turkana/.

Frontiers in Water, 'Article: 10.3389/frwa.2021.676167', 2021, https://www.frontiersin.org/journals/water/articles/10.3389/frwa.2021.676167/full.

Technology & Innovation Solutions

NDrip, 'Homepage', 2024, https://ndrip.com/.

World Bank, Efficient Irrigation and Water Conservation: Evidence from South India, 2021, https://documents1.worldbank.org/curated/en/475611624561753275/pdf/Efficient-Irrigation-and-Water-Conservation-Evidence-from-South-India.pdf.

Jagannathan, K.A., Dhyani, S., and Jain, A., 'Harnessing Nature-Based Solutions and Traditional Wisdom for Urban Heat Risk Reduction in India', Ambio, vol. 53, 2023, https://link.springer.com/article/10.1007/s13280-023-01895-4.

ClimaHealth, 'AI for Resilient Cities: Bringing Together Technology and Community Outreach for Heat-Health Interventions in India', 2023, https://climahealth.info/resource-library/ai-for-resilient-cities-bringing-together-technology-and-community-outreach-for-heat-health-interventions-in-india/.

Resurgence, 'Daraja – Community-Led Weather Forecasting for Urban Informal Settlements', 2023, https://www.resurgence.io/daraja/.

Ecotutu, 'Homepage', 2024, https://ecotutu.com/.

The FutureList, 'Promoting Sustainable Energy Access through Koolboks Pay-As-You-Go Freezer and Carbon Financing', 2024, https://www.thefuturelist.com/promoting-sustainable-energy-access-through-innovative-financing-models-koolboks-pay-as-you-go-freezer-and-carbon-financing/.

Ozone Cell, Ministry of Environment, Forest and Climate Change, India's Journey Towards Sustainable Cooling, 2024, https://ozonecell.nic.in/wp-content/uploads/2024/04/Booklet-on-Indias-Journey-Towards-Sustainable-Cooling-web-version-Final.pdf.

Solar Cookers International, 'Kakuma Refugee Camp, Kenya', 2023, https://www.solarcookers.org/work/kakuma-refugee-camp-kenya-africa.

Project Gaia, 'Clean Cooking Solutions in Ethiopia', 2023, https://projectgaia.com/projects/ethiopia/.

Wonderbag, 'Homepage', 2024, https://www.wonderbagworld.com/.

One Billion Resilient, 'Freetown Market Shade Cover Project', 2023, https://onebillionresilient.org/project/freetown-market-shade-cover-project/.

Mongabay, 'In Brazil's Semiarid Region, Agrivoltaics Show Promise for Food, Energy Security', 2022, https://news.mongabay.com/2022/07/in-brazils-semiarid-region-agrivoltaics-show-promise-for-food-energy-security/.

The Telegraph India, 'Wait for Bus Under Shades, Green and Cool', 2023, https://www.telegraphindia.com/west-bengal/wait-for-bus-under-shades-green-and-cool/cid/1288720.

Singh, S., 'Green Bus Stops as Heat Mitigation Strategy in Delhi', International Journal of Health Science and Research, vol. 4, no. 4, 2022, pp. 97–105, https://terra-docs.s3.us-east-2.amazonaws.com/IJHSR/Articles/volume4-issue4/2022_44_p97_Singh.pdf.

TIME, 'Qatar World Cup Workers and Extreme Heat', 2022, https://time.com/6211360/qatar-world-cup-workers-extreme-heat/.

Safety Solutions, 'Using Wearable Technology to Beat the Heat', 2023, https://www.safetysolutions.net.au/content/personal-protection-equipment/case-study/using-wearable-technology-to-beat-the-heat-82480477/.

TERI, 'HAL Schools: Solar Cooling Case Study', 2018, https://www.teriin.org/sites/default/files/2018-03/HAL-casestudy.pdf.

GIZ, Piloting Solar Irrigation in Ethiopia, 2023, https://energypedia.info/images/2/28/Piloting_Solar_Irrigation_in_Ethiopia_GBE_Case_Study_GIZ_2023.pdf.

weADAPT, 'Solar Irrigation for Agriculture Resilience', 2023, https://weadapt.org/knowledge-base/sdc-network-climate-drr-and-environment/solar-irrigation-for-agriculture-resilience-solar/.

CDKN, 'Dhundi Solar Pumps Case Study', 2023, https://cdkn.org/sites/default/files/files/Dhundi-solar-pumps-case-study-2.pdf.

GRID Alternatives, 'Valle Solar Project Case Study', 2023, https://gridalternatives.org/programs/international-program/projects/valle-case-study.

EcoSwell, 'Water and Sanitation Programmes', 2023, https://www.ecoswell.org/water-sanitation.

World Bank, 'WICER Programme Case Studies', 2023, https://www.worldbank.org/en/programs/wicer/case-studies.

Auroville, 'Wastewater Recycling Systems', 2023, https://auroville.org/page/wastewater-recycling.

Barefoot College, 'Water Programmes for Remote Communities', 2023, https://barefoot.college/impact/water/.

ICAST, 'Solar-Powered Desalination for Coastal Communities', 2023, https://www.icastusa.org/solar-powered-desalination/.

101 | Heat Compendium

Advocacy, Capacity Building & Governance Solutions

Anticipation Hub, ‘Community Cooling Centres: An Anticipatory Approach to Mitigate the Effects of Heat Waves’, 2024, https://www.anticipation-hub.org/news/community-cooling-centres-an-anticipatory-approach-to-mitigate-the-effects-of-heat-waves.

Climate Centre, ‘First-ever Bangladesh Red Crescent Activation of Early Action Protocol for Heatwave’, 2024, https://www.climatecentre.org/13733/red-crescent-activates-early-action-protocol-for-heatwaves-in-dhaka/.BDRCS+3Climate Centre+3Climate Centre+3

International Fund for Agricultural Development (IFAD), ‘The Traditional Knowledge Advantage: Indigenous Peoples’ Knowledge in Climate Change Adaptation and Mitigation Strategies’, 2016, https://www.ifad.org/en/w/publications/the-traditional-knowledge-advantage-indigenous-peoples-knowledge-in-climate-change-adaptation-and-mitigation-strategies.WeAdapt+9IDEAS/RePEc+9IFAD+9

India Water Portal, ‘Participatory Irrigation Management Brings Water Back to Communities’, 2021, https://www.indiawaterportal.org/agriculture/irrigation/participatory-irrigation-management-brings-water-back-communities.India Water Portal

Question of Cities, ‘Margins to Mainstream: Ambojwadi Shows the Way to Climate Vulnerability Mapping’, 2025, https://questionofcities.org/margins-to-mainstream-ambojwadi-shows-the-way-to-climate-vulnerability-mapping/.X (formerly Twitter)+1Question of Cities+1

Natural Resources Defense Council (NRDC), ‘Jodhpur’s First Heat Action Plan Highlights Vulnerable Areas’, 2023, https://www.nrdc.org/bio/vijay-limaye/jodhpurs-first-heat-action-plan-highlights-vulnerable-areas.Nova Publishers+12National Disaster Management Authority+12LinkedIn+12

NRDC, ‘Ahmedabad Heat Action Plan 2018’, 2018, https://www.nrdc.org/sites/default/files/ahmedabad-heat-action-plan-2018.pdf.

Down To Earth, ‘Sierra Leone’s Capital Unveils Africa’s First Heat Action Plan to Tackle Rising Temperatures’, 2025, https://www.downtoearth.org.in/africa/sierra-leones-capital-unveils-africas-first-heat-action-plan-to-tackle-rising-temperatures.

Arsht-Rock, ‘Fighting Extreme Heat with Parametric Insurance’, 2023, https://onebillionresilient.org/2023/03/07/fighting-extreme-heat-with-parametric-insurance/.Arsht-Rock

ICLEI South Asia, ‘Heat Communication Guide for Cities in South Asia’, 2022, https://southasia.iclei.org/wp-content/uploads/2022/03/RCCC-Guidance-Note-Heat-Comm-Plan.pdf.ICLEI South Asia+2ICLEI South Asia+2ICLEI South Asia+2

CARE Climate Change, ‘Adaptation Strategies Compendium’, 2015, https://careclimatechange.org/wp-content/uploads/2019/06/Adaptation-Strategies-Compendium.pdf.

International Centre for Climate Change and Development (ICCCAD), ‘Capacitating Garment Workers for a Greener Transition in Bangladesh’, 2025, https://icccad.net/programmes/just-transition/capacitating-garment-workers/.ICCCAD+1ICCCAD+1

International Rice Research Institute (IRRI), ‘Mitigating the Risks of Heat Stress Among Women Rice Farmers in Odisha’, 2024, https://www.irri.org/news-and-events/news/mitigating-risks-heat-stress-among-women-rice-farmers-odisha.CGIAR+2LinkedIn+2International Rice Research Institute+2

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