



COP28 PROSPECTUS OF CLIMATE & HEALTH SOLUTIONS



COP28
UAE

ACKNOWLEDGEMENTS

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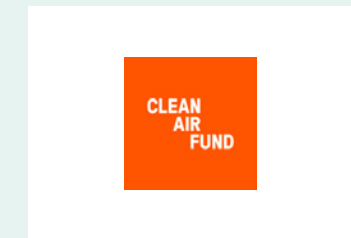
We are grateful to these and many other organizations that have provided case studies for COP28, which are featured on the ClimaHealth website (<https://climahealth.info/>) hosted by the WHO-WMO Joint Office for Climate and Health.

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Images were provided by BBC StoryWorks and by organizations whose case studies are featured.

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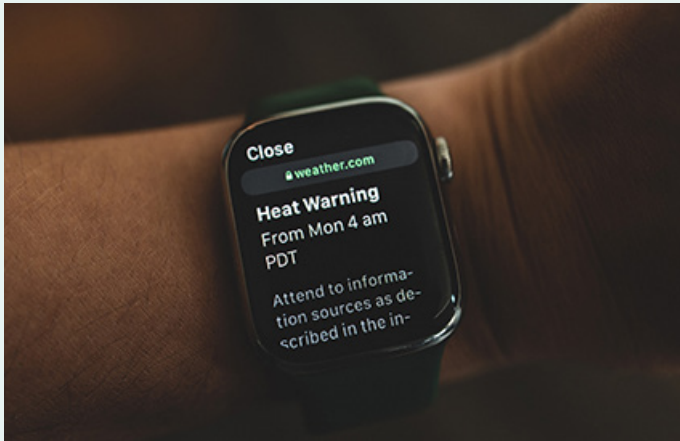


Climate change is one of the greatest health challenges of our time. It is destabilizing health systems, deepening inequities, undermining the social, environmental, and economic foundations of good health. Ultimately, climate change threatens the lives, health, and wellbeing of communities around the world. The Intergovernmental Panel on Climate Change (IPCC) estimates that 3.3 billion people worldwide are highly vulnerable to climate change and face greater health risks as a result. Yet there are profound inequities in the burden of climate health risks and impacts, in the ability to adapt to climate change, and in access to finance – with low- and middle-income countries and vulnerable and marginalized communities being the most deeply affected.

It is imperative that we protect people and communities from the harmful health impacts of climate change. We can do this by pursuing ambitious mitigation and adaptation goals, preventing the worst climate risks, and building climate resilient communities by ensuring critical water, food, and health systems, in line with the Paris Agreement.

There are great opportunities and potential that we can harness across sectors – from health and energy systems to economic development, agriculture, gender, and beyond – to advance climate and health solutions.

This COP28 Prospectus of Climate & Health Solutions presents case studies on a range of high-impact, evidence-backed interventions that can be rapidly scaled up to address climate change while simultaneously achieving health gains. The case studies featured here demonstrate solutions that have been implemented in countries at different levels of health sector performance, resourcing and maturity. The examples included here are neither comprehensive nor exclusive; instead, they aim to illustrate the diversity and scope of climate and health solutions already being implemented.



There is an urgent need to scale up climate and health solutions to save and improve lives now and in the future. Priority areas include:

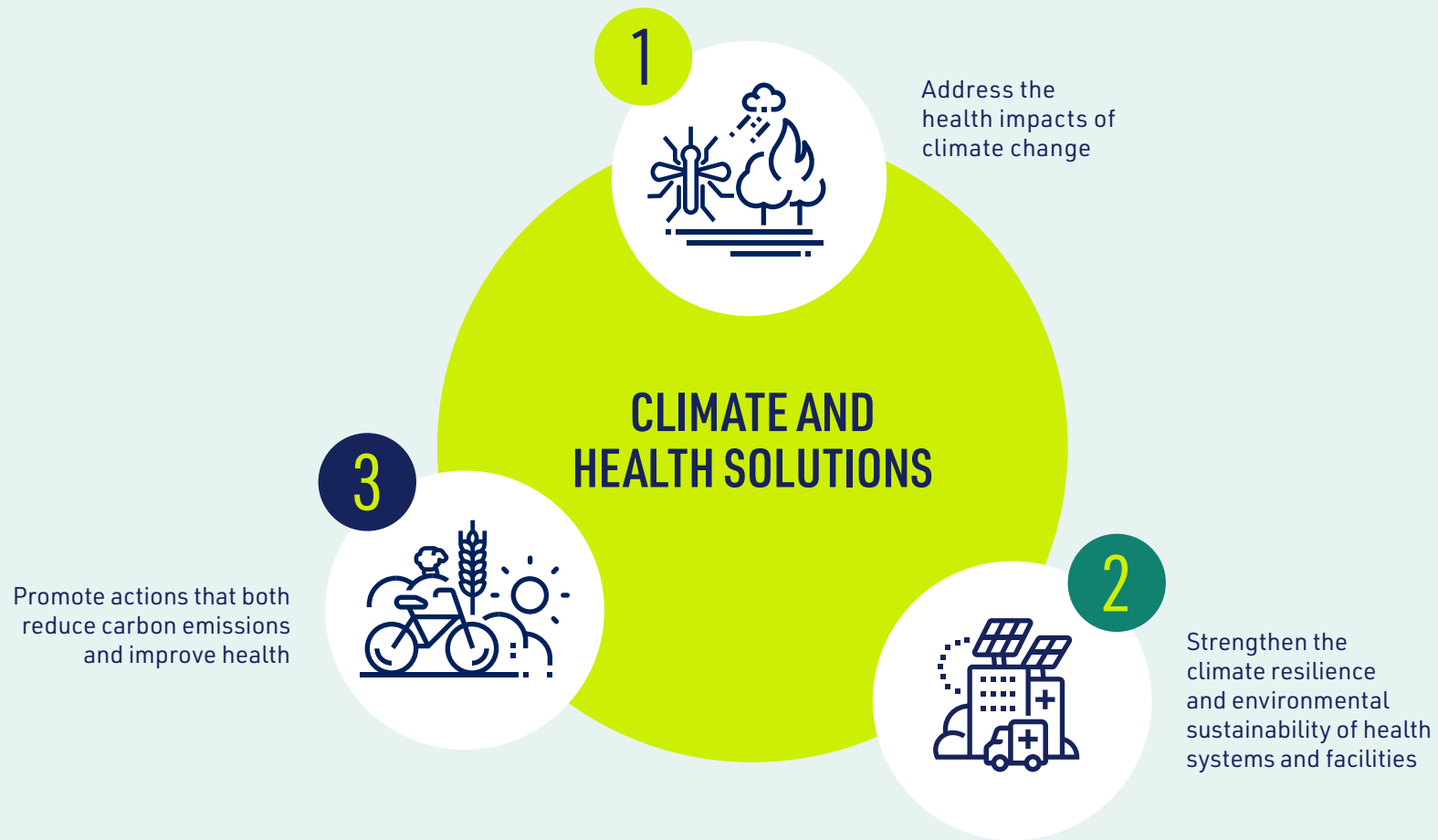
- Rapidly reducing greenhouse gas emissions to improve health, including through rapid transitions away from fossil fuels, lower air pollution, active mobility, shifts to sustainable diets – thereby limiting climate change.
- Implementing proactive public health and adaptation measures to build healthy, resilient, adapted communities – to protect people from the range of climate risks to health, with an emphasis on the most impacted communities.
- Building stronger, resilient, and environmentally sustainable health systems, including by delivering universal health coverage and high-quality care to all in a changing climate – thereby enhancing the sector’s preparedness and adaptive capacity, and aligning the sector with global climate ambition by reducing the climate footprint of the health sector.

This Prospectus report presents a suite of tangible climate and health interventions that are being implemented by partners and communities across the world. The aim of this work is to highlight existing solutions and best practice, and to demonstrate the investment case for health in climate financing, and climate change in health financing.

This Prospectus report presents case studies under three categories of action:

- Address the health impacts of climate change.
- Strengthen the climate resilience and environmental sustainability of health systems and facilities.
- Promote actions that both reduce carbon emissions and improve health.

Additional case studies can be found on the ClimaHealth website (<https://climahealth.info/>) on a dedicated climate and health solutions landing page. The ClimaHealth website is hosted by the WHO-WMO Joint Office for Climate and Health, and will be continuously updated.



CASE STUDIES

CAT.	PAGE	CASE STUDY	ORGANISATION	INVESTMENT AND REACH	REGION	TOPIC	
HEALTH SYSTEMS	8	Strengthening climate resilience of the Lao PDR health system: the first-ever Green Climate Fund project on climate and health	Save the Children	US \$28.2 million	25% of the Lao population (1.85 million people)	South East Asia	Health systems
	10	Solar powered refrigerators for environmentally and operationally sustainable last mile vaccine delivery in India	PATH	US \$1,600 cost per unit, 1 year for return on investment (ROI)	150,000 vaccine doses in hard-to-reach areas	South Asia	Vaccination
	12	Next generation chlorine dispensers for safe water: delivering a climate and health solution at scale in Africa	Evidence Action	US \$37M from 2015 to 2021, an average of \$1.25 per person per year	4.5 million people reached annually	Africa	Water, sanitation & hygiene (WASH)
	14	Cutting the carbon footprint of Greener NHS healthcare estates in England	Greener NHS	US \$970 million	100 projects across 60 local hospital trusts	Europe	Energy efficiency
	16	Healthy Environments and Lives (HEAL): Australia's first national research network at the nexus of climate and health	Australian HEAL National Research Network	AU \$10 million	100+ research investigators, 30 research and practice organizations	Asia-Pacific	Research
HEALTH IMPACTS	18	Preventing climate-driven outbreaks through scalable and cost effective Seasonal Malaria Chemoprevention programs in Africa	Global Fund		45 million children treated in 15 African countries in 2021 alone	Africa	Malaria
	20	Women climate champions fighting heatwaves and reshaping the urban climate agenda in India	Mahila Housing Trust		873 Community-Based Organizations created, consisting of 168,353 women	South Asia	Heat
	22	Engaging across sectors in six cities to realize health benefits of action on air pollution	Clean Air Fund	Six fold increase in air pollution control financing from 2013 to 2017 in China	30% decrease in premature deaths attributable to short-term fine particulate matter air pollution	Multiple	Air pollution
	24	Developing early warning, alert and response systems (EWARS) to combat climate-sensitive diseases in Ethiopia	World Health Organization		Eight sentinel surveillance sites established to monitor 32 reportable diseases	Africa	Infectious diseases
HEALTH CO-BENEFITS	26	Conservation of critical rainforest ecosystems through investment in community-designed solutions in Indonesia	Health in Harmony	US \$5.2 million invested over ten years	120,000 patients treated; 108,044 hectares of rainforest preserved	South East Asia	Rainforest conservation
	28	Promoting active travel while combating climate change through the "More bikes, less emissions" program in Buenos Aires	Pathfinder Initiative, City of Buenos Aires		131% increase in the number of bicycle trips since 2013	South America	Transport
	30	Implementing nature-based solutions through multi-sector, multi-organization collaboration to enhance urban resilience to climate change in Malaysia	Adaptation Fund	US \$10 million funding for urban greening, flood management, vulnerability assessments, social resilience, and knowledge transfer	1.8 million people reached across Penang state	South East Asia	Nature based solutions
	32	Nature exclosures for carbon sequestration to generate revenue, rehabilitate nature and improve agricultural yields in the highlands of Ethiopia	Pathfinder Initiative, International Water Management Institute		Carbon sequestration generated 42% of the current annual income of the entire community	Africa	Agriculture

Strengthening climate resilience of the Lao PDR health system: the first-ever Green Climate Fund project on climate and health

Strengthening the climate resilience of health systems across Lao PDR through the first-ever large-scale Green Climate Fund (GCF) investment across the building blocks of climate resilient and low carbon health systems.

Investment

\$28.2
MILLION

US DOLLARS

Reach

1.85
MILLION

PEOPLE

Author: Save the Children

Implementing Partners:

Save the Children, Government of Lao PDR, World Health Organization

Context

Lao People's Democratic Republic (PDR) faces significant vulnerability to climate change, with projections of heightened climate extremes, 2-3°C increase in temperature by 2050, and a potential 10-30% rise in rainfall, particularly in the southern regions. These anticipated climate shifts are poised to directly impact the healthcare sector by increasing the frequency and intensity of extreme weather events, thereby causing damage to critical health infrastructure, notably the water, sanitation, and hygiene (WASH) services. Additionally, they will also indirectly contribute to the proliferation of diseases such as dengue and diarrheal illnesses, significantly burdening the healthcare system.

Approach

Awarded in October 2023, this project signifies a pioneering endeavour as the first-ever Green Climate Fund (GCF) climate and health initiative. Its primary objective is to reinforce the Government of Laos' commitment to advancing its national climate change and health priorities. The project employs a multi-pronged strategy to bolster both the healthcare system and community resilience to climate change impacts in Lao PDR, including the following:

- **Strengthening climate-resilient leadership and governance** within the healthcare system, including the development and dissemination of guidelines for implementing the Health National Adaptation Plan (HNAP) at provincial, district, and health facility levels.
- **Enhancing health information systems by:**
 - Incorporating climate data relevant to diseases such as dengue and diarrheal diseases in the Health Information Management System (RHIMS)
 - Increasing the capacity of healthcare workers to plan and respond to early disease outbreaks, and
 - Establishing climate-resilient Water, Sanitation, and Hygiene (WASH) standards throughout the healthcare system.



- **Improving health service delivery in health facilities and communities** in climate-vulnerable rural districts to better manage climate-related disease burdens, by:
 - Strengthening the capacity of health workers to detect, reduce risk and treat climate-related diseases
 - Implementing Safe Clean Green Hospitals Initiative and Climate-Resilient WASH standards in health facilities
 - Conducting GHG emissions and infrastructure quality assessments at health facilities
 - Upgrading electrical and WASH services to be climate-resilient in health facilities.
- **Enhancing community knowledge** and capacity to respond to climate-related health challenges through the development of communication channels and early warning messages.

The project was initiated by the Lao Ministry of Health, alongside Save the Children and WHO. The target districts were identified based on a climate vulnerability assessment by the Lao Ministry of Natural Resources and Environment (MONRE), in coordination with MOH, MONRE's Department of Climate Change, international

NGOs, and Lao PDR universities. The project engages communities in activities that will improve health workers' and community knowledge of climate change impacts on health, while also co-developing and implementing context-appropriate strategies to manage and mitigate climate-related health risks, prepare for extreme weather events, and respond appropriately to early warnings.

The project is supported by grants totaling \$28.2 million, sourced from the Green Climate Fund and co-financing contributions from the Government of Laos' Ministry of Health, WHO, and a private donor.

Impact and next steps

The project will help accelerate the paradigm shift for community action and climate-informed advisory and risk management services for diseases like dengue and diarrheal diseases. Additionally, it will also achieve the co-benefit of reduced emissions from health facilities by upgrading infrastructure and enhancing service delivery.

The project aims to reach over 25% of the Lao population (1.85 million people), covering twenty-five of the most

climate vulnerable districts. It places strong emphasis on both national and subnational health sector governance, including tools like the RHIMS, which will directly enhance healthcare governance and facilitate cost-effective service improvements.

The project's subnational activities are purposefully designed to provide the Government of Lao with a proven model, ready for nationwide scaling. Climate-informed sectoral strategies, policies, and guidelines will be made accessible to all healthcare services across the country. Furthermore, the project will disseminate information about this model through global knowledge-sharing and learning events, offering opportunities for neighbouring countries in the Southeast Asia region and beyond to replicate this approach and bolster resilience in their healthcare systems.

Solar powered refrigerators for environmentally and operationally sustainable last mile vaccine delivery in India

Deploying innovative technology in the field with portable solar- and battery-powered refrigerators to support last-mile vaccine delivery in remote and disaster-affected areas in India.

Investment

\$1,600

COST PER UNIT, 1 YEAR FOR RETURN ON INVESTMENT (ROI)

Reach

150,000

VACCINE DOSES IN HARD-TO-REACH AREAS

Author: PATH

Implementing Partners:

PATH with National Health Mission India, State/District Health Authorities, and Family Welfare India, Centre for Cellular and Molecular Platforms (CCAMP) and SELCO Foundation

Context

Global warming-related climate impacts like floods, heat waves, and cold waves can disrupt the supply chain for medical products as they isolate health centres, hindering access to medical supplies for vulnerable populations. Rising ambient temperatures increase the risk of medical supplies being spoiled during transport. Maintaining the effectiveness of vaccines, medicines, and testing samples becomes paramount in delivering care after extreme weather events.

Approach

This project developed and deployed a portable medical-grade refrigerator that can maintain any pre-set temperature for over 15 hours through its battery powered by a 100 W solar panel. This product (“Emvolio”) has been effectively deployed in remote regions with intermittent power supply. It has helped keep primary health centres operational and maintain the cold chain for medicine supplies during extreme weather events (e.g., during the floods in Assam between 2020-2023). The product is currently deployed in 14 states in India, and the deployment of 100 units has commenced in Kenya.

The underlying refrigeration mechanism is solid-state cooling, which ensures accurate temperature control without the danger of harmful refrigerant leaks or cross-contamination. Additionally, it includes a portable solar unit, increasing cooling capacity and promoting renewable, sustainable energy use.

PATH India facilitated the designing and field testing of the product. The following stakeholders were involved during deployment: hospitals (Government and private); non-profit healthcare and livelihood organizations (SELCO Foundation, CINI, TATA Trusts, and Venture Center); the National Health Mission; and Indian state health departments.

After deployment, the team conducted on-site training sessions, familiarising health care workers with

the need for precise temperature control in vaccine distribution, correct cold-chain handling, and the role of data monitoring for enhancing vaccine supply chains. Additionally, regular assessments were conducted to gauge the device performance, community acceptability, and its impact on the system in comparison to traditional ice-based vaccine carriers.

Major funding sources for the projects included grants from the Government of India (DBT BIRAC, Govt of India) and USAID, and impact investments (Venture Center, Social Alpha, Qualcomm, Manipal Foundation). The developer of the technology, Blackfrog, has been able to mobilize more than \$700,000 in grants and investments.

Impact and next steps

Solar-powered refrigerators have been facilitating last-mile delivery of effective vaccines, servicing key population groups such as pregnant women and children. The portable backpack design helped reach remote areas, especially in the mountainous areas of North-East India, where community centres are often a half-day journey from major roads.

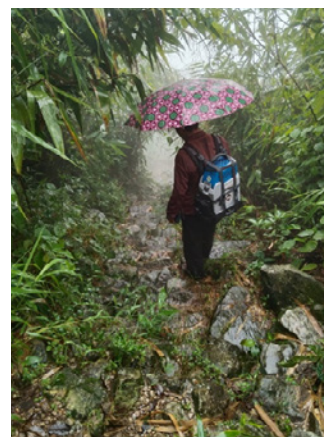
Field doctors reported that with the device's battery performance, they are now able to immunize twice as many children in remote regions, as well as increase routine immunization time.

This technology has been used to administer more than 150,000 vaccination (routine and COVID-19) doses in hard-to-reach areas. Over 800 health centres are now equipped with the device, and around 1,000 health workers were trained in vaccine storage and transport at the optimal temperature.

The initial capital cost of procuring the device is totally recovered within one year, due in large part to the substantial reduction in vaccine wastage. The government or donor agency procures the units to strengthen the last-mile cold chain delivery.

One device costs \$1,600, a cost the end-user recovers from savings on routine vaccine waste reduction. The SVYM Hospital in Mysore (Karnataka), which has been using two devices since 2019, has reported saving INR 13,000 (\$160) every month as a direct consequence of not discarding unused vaccines at the end of the day's field trip. With solar-powered units, they are carrying the unused vaccines back to a health-facility.

The technology is adaptable to multiple healthcare and geographic settings, with the potential for optimizing the vaccine delivery process globally. Any country can improve immunization efforts without requiring policy amendments. Upon approval, the project begins device manufacturing and deployment, and ends once the innovation is assimilated with the national public health system.



Health workers In North-East India carrying vaccines to hard to reach areas in extreme climatic conditions and outreach immunization sessions in rural areas of India

Next generation chlorine dispensers for safe water: delivering a climate and health solution at scale in Africa

Furthering the essential health system building block of water, sanitation and hygiene (WASH) in Africa by distributing point of source chlorine dispensers to generate clean drinking water.

Investment

**\$37
MILLION**

US DOLLARS FROM 2015 TO 2021, AN AVERAGE OF \$1.25 PER PERSON PER YEAR

Reach

**4.5
MILLION**

PEOPLE REACHED ANNUALLY

Author: Evidence Action

Implementing Partners:

Evidence Action, Government of Malawi, Kenya, Uganda, and India

Context

Over 2 billion people globally lack access to safe drinking water, with contaminated water claiming the lives of over 1,000 children every day. Unsafe water causes diarrhea, malnutrition, typhoid, cholera, and hepatitis. Problems with unsafe water are exacerbated by climate change, as rising temperatures and extreme weather events lead to increased microbial contamination, thereby causing spikes in waterborne illnesses. For example, repeated cyclones in Malawi recently created the longest cholera outbreak on record, spanning more than a year. Water quality is a critical pathway through which climate change impacts health, and chlorination serves as a potent preventive measure. Chlorination has an outsized and highly cost-effective impact on health, with studies showing it can reduce under-five child mortality by 25%.

Approach

Evidence Action installs chlorine dispensers at existing rural water points, enabling community members to treat their water for free at the point of collection. Dispensers are installed for free at water points serving more than 10 households. The model is simple: a user goes to their water source, places their bucket under the dispenser, turns the valve to dispense the correct dose of chlorine, then fills their bucket with water. The chlorine disinfects the water during their walk home, and it is safe to drink by the time they arrive.

The program leverages sub-national government support and extensive community engagement including over 100,000 volunteers to ensure local buy-in. Communities help identify suitable water points, provide installation resources, and elect two volunteer “promoters”. These promoters educate their community on water treatment, refill their dispenser, and inform Evidence Action of necessary repairs.

Developing a cost-effective and scalable delivery model was not easy. Success required a complete and efficient supply chain that reached remote areas, supporting a

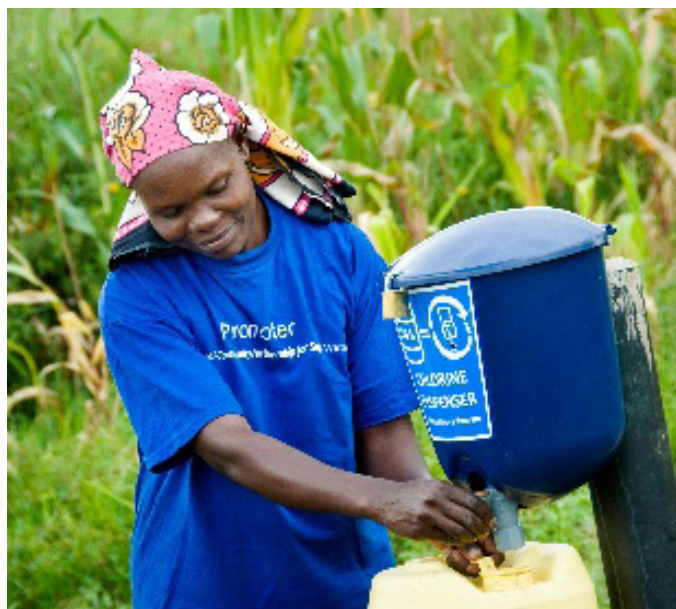
network of tens of thousands of dispensers across three different countries. This endeavor relied on collaboration with communities to ensure active engagement and required Evidence Action to build a large and flexible field staff team, ultimately achieving a less than 72-hour turnaround for dispenser maintenance.

In total, from 2015 to 2021, the program spent \$37 million, an average of \$1.50 per person per year. Funding was secured from many sources, with 20% of the program funded by sale of carbon credits and the remainder provided by philanthropic donors.

Impact and next steps

Evidence Action's chlorine dispensers provided safe water access to over 4.5 million people annually from 2015-2021, preventing an estimated 3 million cases of diarrhea, averting 15,000 child deaths, and saving more than 275,000 disability adjusted life years (DALYs). This translates to a cost of approximately \$3,000 per death averted and \$130 per DALY averted. After receiving significant investment in 2022, the program doubled its impact within 15 months to reach more than 10 million people across Uganda, Malawi, and Kenya. Health improvements resulting from water treatment are particularly significant for children under five living in poor rural communities – one of the most neglected and vulnerable populations in the world.

While existing centralized treatment systems are expensive and prone to failure during extreme weather events, Evidence Action's localized water treatment approach is more resilient to these impacts. Chlorine is already a widely used disinfectant globally, and India's recent adoption of in-line chlorination to provide safe water to rural communities is an encouraging development. Low-cost delivery models have demonstrated their adaptability to meet diverse needs of different communities. Additionally, without chlorine, communities resort to less effective treatment methods like boiling water. By reducing the need for boiling, chlorine dispensers reduce indoor air pollution and generate UNFCCC-audited carbon credits.



The initiative has also sparked innovation, leading to the development of a complementary, next-generation in-line chlorination intervention that leverages learnings from scaling up dispensers. In-line chlorination is a low-tech, low-maintenance solution that can be installed directly into pipes, eliminating the need for behavior change. There is immense potential to expand these chlorination technologies and complementary chlorination interventions to new geographies and contexts. For example, Evidence Action has begun piloting a technical assistance model with the Indian government to scale in-line chlorination across two states, with the goal of reaching 40 million people. The program's scalability and transformative impact hold the promise of reaching countless communities in need worldwide.

Cutting the carbon footprint of Greener NHS healthcare estates in England

Leveraging public sector decarbonization schemes to increase the energy efficiency of the large estates and buildings managed by the English National Health Service (NHS) to cut carbon emissions, improve health and save money.

Investment

**\$970
MILLION**

US DOLLARS

Reach

**100
PROJECTS**

ACROSS 60 LOCAL HOSPITAL TRUSTS

Author: Greener National Health Service (NHS) England

Implementing Partners:

NHS Trusts

Context

Estates and facilities account for 15% of NHS England's carbon footprint. NHS England has committed to decarbonize its estates by 2040, which includes eliminating 3.1 megatonnes of greenhouse gas emissions generated every year from NHS building energy and water use. This will be achieved by investing in buildings and energy efficiency, upgrading heating, lighting, and ventilation systems, installing onsite solar panels to generate renewable energy and by ensuring estates are fully digitally integrated.

Approach

In 2021, the NHS with the support of the Department of Health and Social Care secured £50 million funding for the NHS Energy Efficiency Fund which will install LED lighting across 64 NHS trusts. The NHS has also secured over £800 million (US \$970 million) in investment through the UK Government Public Sector Decarbonization Scheme (PSDS). The PSDS provides grants for UK public sector organizations to fund heat decarbonization and energy efficiency initiatives with the aim of reducing emissions from public sector buildings by 75% by 2037 (against 2017 baseline).

Funding for the NHS from the PSDS is being driven into more than 100 projects across more than 60 local trusts to install innovative energy technologies such as heat pumps, solar panels and LED lighting, leading to significant carbon and financial savings for the NHS. Examples of successful projects include:

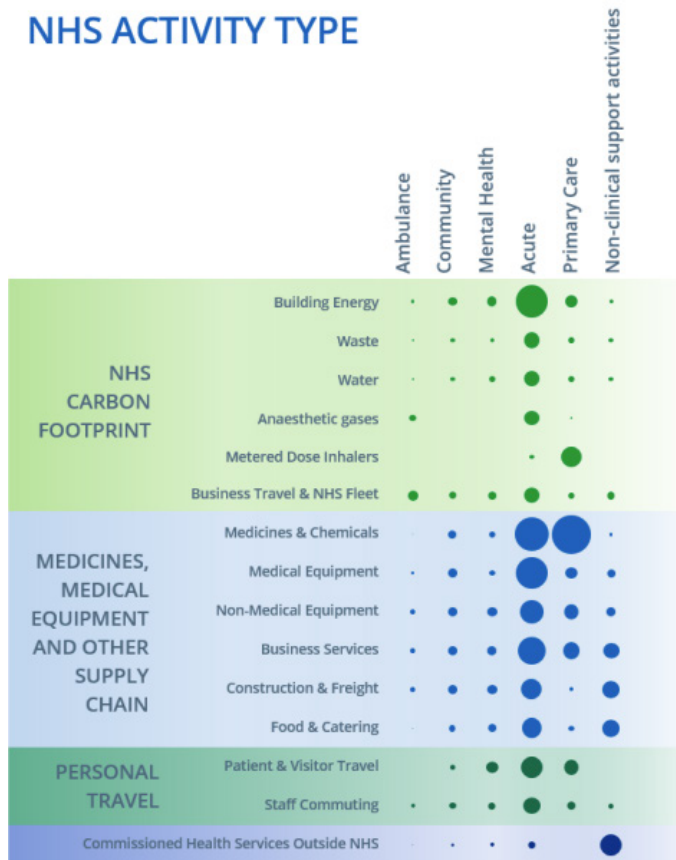
- Milton Keynes University Hospital installed heat pumps and fitted over 2,500 solar panels producing enough energy to power over 200 homes for a year. This will save over £225,000 a year in energy bills.
- Hull University Teaching Hospitals used a £12.6 million grant to install 22,000 LED lights and upgrade inefficient water networks. It also installed 11,000 solar panels opposite the hospital. Through only the electricity generated via the solar panels, the Trust is expected to save on average £300,000 every month in

energy costs and estimated 1,015 tonnes in greenhouse gas emissions every year.

- Bristol and Weston NHS Foundation Trust has used £17.5 million in PSDS funding to make the hospital heating system 18% more efficient, saving £800,000 over the next two years in energy costs.
- Birmingham Women’s and Children’s NHS Foundation Trust received £54.3 million in PSDS funding, part of which is being used to create heat-generating ‘bore hole’ pumps to naturally extract energy to power the hospital and significantly reduce its carbon footprint.



NHS ACTIVITY TYPE



Sources of NHS carbon emissions

Impact and next steps

Improvements to estates funded through the Public Sector Decarbonization Scheme are helping NHS organizations cut carbon, improve health and save money. The separate NHS Energy Efficiency Fund to install LED lighting is expected to save the NHS £11.8 million while reducing emissions annually by 32,941 kilotonnes of greenhouse gas emissions.

Going forward, national NHS teams will continue to promote the PSDS to local and regional colleagues, to help support the submission of effective and high-quality NHS applications. Alongside this, the NHS will continue to ensure projects are delivered by sharing best practices and driving collaboration. Financial and carbon savings will be evaluated following the completion of the PSDS funded schemes.

There may in future be opportunities to explore alternative funding methods, including Power Purchase Agreements (PPA) and Energy Performance Contracts. Energy Performance Contracts allow for capital improvements which permit funding energy upgrades from cost reductions. PPAs ensure any electricity is directly bought and supplied from a renewable generator at a fixed rate over a long contract period. PPAs can involve renewable developers placing assets (such as solar panels) on a buyer’s site and selling the energy generated back to the buyer. This means electricity can be supplied without using National Grid infrastructure systems, avoiding the variable costs for the transmission of energy included in all energy bills.

Healthy Environments and Lives (HEAL): Australia’s first nationally funded research network at the nexus of climate and health

Catalyzing research and translating knowledge into policy and practice at the nexus of climate change and health to improve the health of Australians, the environment and the lives of disadvantaged communities.

Investment

**\$10
MILLION**

AUSTRALIAN DOLLARS

Reach

100+

RESEARCH INVESTIGATORS

30

RESEARCH AND PRACTICE ORGANIZATIONS

Author: NHMRC Healthy Environments and Lives (HEAL) National Research Network

Implementing Partners:

- Australian federal and local government (e.g., National Health and Medical Research Council, Australian Government Department of Health and Aged Care, National Aboriginal Community Controlled Health Organisation, Environment Protection Authority Victoria, and the Commonwealth Scientific and Industrial Research Organisation, NSW Department of Planning and Environment)
- Universities and Institutes (e.g., University of Canberra, Australian National University, University of Sydney, University of Melbourne, Menzies School of Health Research, Griffith University, Telethon Kids Institute, University of Tasmania, University of South Australia, Queensland University of Technology, University of Western Australia, University of New South Wales, RMIT, University of Queensland, Curtin University, Flinders University, Charles Darwin University, University of Newcastle, Australian Institute of Health and Welfare, Lowitja Institute, South Australia Health and Medical Research Institute, University Technology Sydney, Centenary Institute, Deakin University, James Cook University, Murdoch University)
- NGOs (e.g., Doctors for the Environment Australia, Australian Healthcare and Hospitals Association, Climate and Health Alliance, Public Health Association of Australia, Asthma Australia)

Context

Climate change is posing a major threat to the Australian health system and communities. More frequent and intense extreme events, such as the 2019-20 Black Summer bushfires and 2022 eastern Australia floods, are directly harming human health and impairing delivery of healthcare by disrupting medical services and supply chains. Rising

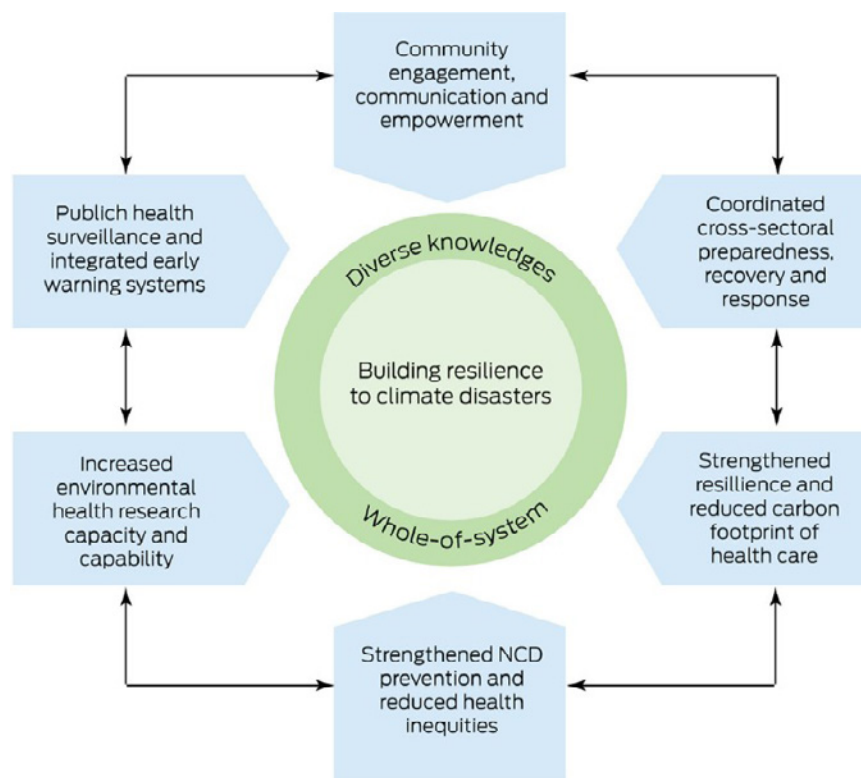
temperature are adversely affecting physical and mental health, while rising sea levels disrupt coastal economies and infrastructure. Changing patterns of air pollution and vector-borne diseases are impacting public health and healthcare delivery. Unevenly distributed, these risks exacerbate inequities across socioeconomic and demographic groups, and widen the health gap between Aboriginal and Torres Strait Islander and non-Indigenous Australians.

Approach

The HEAL Network is embedding systematic co-design processes with policymakers, communities, First Nations, and health consumers and service providers on climate change mitigation and adaptation solutions. During its first year, the HEAL Network consulted with a wide range of stakeholders, including research organization, data providers, communities, advocacy groups, and policymakers from across Australia to identify evidence needs, refine research questions, and implement effective collaborative arrangements. Based on initial gap analyses and stakeholder consultations, the HEAL Network has established ten interdisciplinary research themes, including: Indigenous Knowledge Systems; Data and Decision Support Systems; Science Communication; Health System Resilience; Bushfires and Extreme Events; Food, Soil and Water Security; Biosecurity and Emerging Infectious Diseases; Urban Health; Rural and Remote Health; At-risk Populations and Lifecourse Solutions.

HEAL is also addressing capacity and capability gaps in human health and climate change, by developing a range of training, dissemination and citizen science activities that support communities and nurture early career researchers. One crucial step is the development of the meta-capacity needed to formulate priorities, co-design research, and

translate and implement research findings into policy and practice. This is implemented through training activities, industry placements, fellowships and grants facilitating mobility of early career researchers, stakeholder engagement, and interdisciplinary collaborations. The **HEAL Innovation Fund**, for example, provides seed funding to researchers aiming to develop and scale up novel project ideas involving industry, policymakers and communities.



The HEAL Network received an **AUD \$10 million grant** from the Australian National Health and Medical Research Council (NHMRC). Additional funding to establish the network was raised through co-financing arrangements with university partners, and cash and in-kind contributions from other research organizations and government agencies. This funding is supporting 28

postdoctoral fellows and 17 research students based in 20 Australian Universities. The Network has set up HEAL Communities of Practice in all Australian jurisdictions, and is organizing an annual conference and other events bringing together researchers, policymakers, and communities.

Impact and next steps

The HEAL Network prioritises evidence and capacity needs, and local action with community-led co-design of solutions embedded in a monitoring and evaluation framework. The Network is developing research projects that aim to assess key climate-relevant environmental exposures, health impacts, vulnerabilities and responses through robust indicators that will be incorporated into an online platform: the **HEAL Observatory**. This process involves, identifying, developing and visualising indicators in a meaningful and accessible format for scientists, policymakers, environmental and health practitioners, and communities. These indicators will be updated regularly at national and state level and will inform the implementation of the National Health and Climate Strategy and National Adaptation Plan. The HEAL Observatory will also support knowledge exchange between researchers, communities and policymakers to promote integration of climate and health research into policy and practice, providing state and territory profiles, publications, training materials, factsheets, and other communication tools to support decision-making, health sector adaptation planning, and health system decarbonisation.

The **HEAL Communities of Practice** aims to provide a forum for local knowledge exchange between stakeholders from diverse backgrounds and expertise, comprising researchers, practitioners, Indigenous and other community organizations, businesses, government and NGOs. These open, inclusive, diverse and dynamic Communities of Practice use **participatory action research** methodology to identify evidence needs, co-design research programs, and ensure research is translated into policy and practice.

Preventing climate-driven outbreaks through scalable and cost effective Seasonal Malaria Chemoprevention programs in Africa

Implementing public health programs for Seasonal Malaria Chemoprevention with very large reach across multiple countries in Africa exposed to extreme flooding and unpredictable climate impacts.

Reach

45
MILLION

CHILDREN TREATED

15 AFRICAN
COUNTRIES

REACHED IN 2021 ALONE

Author: The Global Fund

Implementing Partners:

The Global Fund, Health Finance Coalition, Malaria No More

Context

Globally, there were an estimated 247 million malaria cases in 2021 over 84 countries, an increase from 245 million in 2020. Malaria incidence is highly concentrated, with 29 countries accounting for 96% of malaria cases globally, and 4 countries (Nigeria, Democratic Republic of Congo, Uganda and Mozambique) accounting for almost half of all cases globally.

Malaria is one of the infectious diseases most sensitive to climate change. Malaria transmission increases with small changes in rainfall patterns, temperature, and humidity. A study conducted in western Uganda in 2016 showed that living in a flood-prone area increased chance of catching malaria by about 30% after a flood. The rate and severity of extreme weather events has increased at twice the pace for sub-Saharan Africa than for the rest of the world. Relative to the 1970s, there has been a tenfold increase in floods in Sub-Saharan Africa, partly explaining why malaria transmission has worsened in recent years.

Approach

Seasonal Malaria Chemoprevention (SMC) is a proven, cost-effective intervention for preventing malaria cases in highly vulnerable communities living in high-burden countries with strong seasonality of transmission.

Preventive chemotherapy is the use of medicines, either alone or in combination, to prevent malaria infection and its consequences. It requires giving a full treatment course of an antimalarial medicine to vulnerable populations at designated time points during the period of greatest malarial risk, regardless of whether the recipient is infected. Seasonal malaria chemoprevention (SMC) specifically involves giving children under the age of 5 full malaria treatment courses during the malaria season, starting before the onset of rains. In 2022, the WHO endorsed expansion of SMC to new age groups and geographies, creating the opportunity to more than double the population that benefits from SMC. Applying



SMC in acute, flood-prone areas could eliminate the risk of malaria outbreaks following extreme weather events.

Suitability of an area for SMC is determined by the seasonal pattern of rainfall, malaria transmission, and the burden of malaria on the community. Historically, SMC has been recommended for deployment in areas:

- Where more than 60% of the annual incidence of malaria occurs within 4 months.
- Where there are measures of disease burden showing a high incidence of malaria in children (incidence ≥ 10 cases of malaria among every 100 children during the transmission season).
- Where the medications are highly effective (some areas have high levels of resistance to the antimalarial drugs used in SMC).
- SMC can be provided at a cost of approximately \$1.50 per one person-month of coverage, making it highly competitive from a deaths- and disability adjusted life years (DALYs)-averted standpoint.

Impact and next steps

Nearly 45 million children were treated with SMC in 15 African countries in 2021, up from 33.4 million in 2020 and 22.1 million in 2019. About 92% of the increased SMC distributions in 2021 were in Nigeria. The project delivered SMC to Uganda and Mozambique for the first time in 2021.

Randomized controlled trials provide strong evidence that SMC reduces cases of malaria by 75%. At full financing (approximately \$200 million), the project could annually protect 45 million at-risk people with SMC across central and eastern Africa.

The next steps for the project are to expand the number of rounds of SMC given from 3 to 4 in response to longer transmission seasons; expand to new demographics by treating children from ages 6-10; and reach children in new geographies that are highly flood prone and vulnerable to malaria outbreaks.

Novel seasonal strategies like SMC can protect vulnerable populations from malaria outbreaks in areas prone to flood-risk, lengthening rainy seasons, and variable weather patterns due to climate change.

Women climate champions fighting heatwaves and reshaping the urban climate agenda in India

Empowering women to act on climate change and health risks through grassroots collectives of women in the urban informal sector, to influence built infrastructure, heat resilience and sustainable development.

Reach

873

COMMUNITY-BASED ORGANIZATIONS CREATED, CONSISTING OF

168,353
WOMEN

Author: The Mahila Housing Trust

Implementing Partners:
Local government agencies

Context

India is highly vulnerable to climate change. Nearly 75% of its districts are categorized as hotspots for extreme climate events. Impacts of heat stress are higher among India's slum dwellers due to the vulnerable infrastructures made of heat-trapping materials. In addition to creating thermal discomfort indoors, the tightly packed houses get polluted with dust, ash, smoke, and chemicals. Home-based workers face a greater impact of indoor pollutants due to more time spent indoors. They are prone to diseases like pneumonia, stroke, and lung cancer, with women particularly at risk as they are most likely to work or spend time indoors.

Approach

The mission of Mahila Housing Trust (MHT) is to build a sustainable and scalable model of women-led climate change action to push climate solutions cutting across all levels of planning governance and offering affordable products to communities. It collaborates extensively with government bodies (e.g., India's National Disaster Management Authority), local communities, and other organizations. Its work has been globally recognized through various awards such as the UN Global Climate Action Award, UN Sasakawa Award, and Ashden Award.

The community leadership development model of MHT is based on a three-step process. First, MHT organizes all families in a community into a membership group called a Community-Based Organization (CBO). MHT also manages sensitisation campaigns and hosts area meetings with CBO members to identify the needs and aspirations of the community. CBO members are then encouraged to recognize women leaders among themselves as members of the Community Action Group (CAG). The CAG and its women leaders act as the executive committee of the CBO members and lead action on their behalf. The CAG members are then finally trained to interface with government bodies actively. Action at the individual women and household level. Lack of knowledge about the causes and impacts of



Women in urban slums learning about Climate Change by Playing Snakes and Ladders

climate change is the first barrier to building climate resilience in slum communities. MHT has developed a methodology using simplified communication methods (e.g., games, demonstrations, videos) to introduce the concept of climate change and build climate resilience. For example, through a Snakes and Ladders game played during training sessions and community-level meetings in slum settlements, women understand the evidence behind unbearable summers and monsoons. This also helps women develop a future-oriented mindset and plan investments to secure themselves and their communities from climate change impacts.

Action at the community and slum level. MHT partners with local leaders to influence building policies, such as the cool roof program. It targets vulnerable settlements with poor-quality homes that trap heat and become dangerously hot. Cool roofs help keep the indoor temperatures lower by 2°C to 5°C and offer a cost-effective solution, helping prevent heat-related deaths and illnesses. Innovative credit mechanisms like climate loans have been devised to use climate-resilient technologies like cool roof solutions.



Action at the city level. In collaboration with local authorities, MHT helps develop heat action plans (HAPs), enabling cities to better organize local heat actions that protect public health. The HAPs prioritize an enhanced focus on the needs of vulnerable groups identified through the vulnerability assessment by MHT. Jodhpur, an Indian city in Rajasthan, launched its first-ever HAP in 2023 to strengthen local preparedness and resilience to intensifying severe heat hazards. The Jodhpur plan was developed based on local data and community input and enables the city to better organize local heat actions that protect public health.

Impact and next steps

In the last 27 years, MHT has worked in more than 30 cities across South Asia, partnering with communities and local governments to deliver tangible improvements in housing and infrastructure and building climate resilience in lower-income urban settlements. Over 15,000 women climate champions have positively impacted their communities' health and homes while starting to advocate for locally-led adaptation across eight cities in India.



MHT aims to scale its three-phase model to 16 new cities across India, Nepal, and Bangladesh and further deepen its engagement in 11 existing cities. It plans to impact 30 million individuals over the next five years.

Engaging across sectors in six cities to realise health benefits of action on air pollution

Accelerating clean air and climate action by monitoring air pollution and its health impact in six cities across multiple continents, demonstrating the immense health benefits of a range of strategies in urban environments.

Investment

SIX-FOLD

INCREASE IN AIR POLLUTION CONTROL FINANCING FROM 2013 TO 2017 IN CHINA

Reach

30%

DECREASE IN PREMATURE DEATHS ATTRIBUTABLE TO SHORT-TERM FINE PARTICULATE MATTER AIR POLLUTION

Author: Clean Air Fund and Vital Strategies

Implementing Partners:

Clean Air Fund, Vital Strategies, Barranquilla City Government, Energy Foundation China, DKI Jakarta Provincial Government, Kampala Capital City Authority, New York City Department of Health and Mental Hygiene, Accra Metropolitan Assembly and others

Context

Air pollution poses a major threat to health, particularly for vulnerable groups like children. It tends to affect poor and marginalized communities the most, exacerbating global inequality and environmental injustice. The health sector can be a useful lever to persuade decision makers to act on climate policy and air pollution. Air pollution can cause serious health problems, increasing the risk of respiratory infections, heart disease, and lung cancer. Cities that monitor air and climate parameters can track quality improvements and quantify short-term health benefits, which are often more tangible than longer-term climate impacts.

Approach

Vital Strategies assembled the efforts of six cities on utilizing health data and engaging with the health sector in advancing climate and clean air action, illustrating the role the health sector can play in accelerating clean air and climate action. The selected cities represent a diversity in size, socio-economic development, geography, and demographics to show that solutions are possible and attainable in most circumstances. These cities include Accra, Barranquilla, Beijing, Jakarta, Kampala and New York.

Identification and analysis of the sources and impact of air pollution can enable effective policy making. In Beijing, the city government invited public health researchers to collect evidence on the health impact of air pollution from different sources, resulting in skyrocketing numbers of publications (from 685 to 15,200 English language publications) and a nearly six fold increase in air pollution control financing from 2013 to 2017. In New York, the collection of data enabled the vote to enact the Clean Heating Law in 2010 that mandated the use of cleaner fuels for residential building by 2015.

Interventions to tackle air pollution can be further prioritized based on health and economic costs. In Jakarta, the city government found that regular testing of vehicular emissions had the potential to yield the most cost-effective health benefits.



Emphasis on health benefits of tackling air pollution can be an effective way of gaining public support for proposed actions and promoting behavioral change at the community level. In Kampala, the expertise and credibility of the health sector community was used to develop and deliver health-related messaging to raise awareness on household waste burning. In Jakarta, medical students conducted health promotion and education on health impacts of air pollution. They also performed general health assessment, such as checking blood pressure, blood uric acid level, and blood glucose level.

In Barranquilla, Columbia, the city restored 285 public spaces into recreational parks available for community use and health promotion, allowing 95% of the population to reach a park within an 8 minute walk, reducing accidents, greenhouse gas emissions and improving health.

Impact and next steps

Some cities have clear data on the impact of their interventions. For instance, the number of premature deaths attributable to short-term fine particulate matter

(PM_{2.5}) air pollution exposure decreased from 24,700 in 2013 to 17,500 in 2017 in the Beijing-Tianjin-Hebei region during the period when the Beijing Clean Air Action Plan was implemented. The residential coal ban alone is estimated to have averted around 1,000 premature deaths annually.

In the case of New York City, the pollutant levels have declined dramatically since the start of their air quality program in 2008, resulting in an estimated prevention of 290 premature deaths, 80 hospital admissions for respiratory and cardiovascular diseases, and 550 emergency department visits for asthma each year.

To have a lasting tangible impact, climate and clean air action requires the involvement of diverse actors including health, environment, transport, energy, industry and enforcement. Having cross-sector collaboration and coordination is critical to making the multi-stakeholder systems work. Cities need a cooperative setting with well-established mechanisms of knowledge sharing across agencies, so that all stakeholders involved are aware of their roles and responsibilities to achieve the objectives of the programs.

Developing early warning, alert and response systems (EWARS) to combat climate-sensitive diseases in Ethiopia

Implementing early warning, alert and response systems (EWARS) as an important building block of climate resilient health systems, through enhanced information technology infrastructure and sentinel surveillance sites.

Reach

8

SENTINEL SURVEILLANCE SITES
ESTABLISHED TO MONITOR

32

REPORTABLE DISEASES

Author: World Health Organization (WHO)

Implementing Partners:

Ethiopian Public Health Institute, WHO Ethiopia Country Office





Context

Climate change increases the risk of climate-sensitive diseases worldwide, which include a wide range of infectious and non-communicable diseases. In Ethiopia, climate-sensitive diseases such as malaria, yellow fever, dengue fever, meningitis, leishmaniasis and diarrheal diseases pose a significant threat to the population's health. As part of climate adaptation efforts, there is a need for surveillance mechanisms and early warning, alert and response systems (EWARS) that can anticipate risks and trigger early responses to avoid or reduce impact and enhance preparedness. In the context of rapidly changing environments and risks, EWARS are a valuable tool to build the adaptive capacity and climate resilience of health systems.

Approach

The Ethiopian Public Health Institute has developed an EWARS for climate sensitive diseases in Ethiopia with support from WHO. Two key actions have been to establish sentinel sites across the country, and to develop a decision support tool to model and forecast climate-sensitive diseases in key areas during peak seasons, enabling targeted public health interventions and health system preparedness.

A critical enabler of this program has been the early involvement of stakeholders such as national and sub-national health officials, and local focal points at sentinel sites. A series of workshops enabled collaboration with partner organizations such as Resolve to Save Lives, US Centers for Disease Control and Prevention (CDC), United Nations Children's Fund (UNICEF), Family Health International (FHI) 360 and Oxford Policy Management (OPM).

Sentinel sites have been established across different geographic and climatic zones of Ethiopia since 2017 to collect and integrate climate, environmental health and diseases surveillance data for the EWARS. Information technology infrastructure and computers were installed at sentinel sites to enhance their capacity.

Impact and next steps

Following the establishment of sentinel sites, data from these sites was used to validate the EWARS modelling and forecasting tool for malaria and meningitis in several regions of Ethiopia. The incidence and distribution predicted by the model were validated with health data collected from sentinel sites for the modelled period.

The refined modelling and forecasting of malaria and meningitis allowed the implementation of targeted preparedness and public health actions to prevent these climate-sensitive diseases. For example, by using EWARS in 2020, Bahir Dar city administration was able to detect a malaria outbreak that exceeded endemic levels. The tool also provided an alert regarding the probability of a malaria outbreak throughout the year in the area. As a result, the sentinel site implemented an emergency preparedness plan for malaria and reduced the risk of further disease outbreaks.

The Ethiopian Public Health Institute has funded the EWARS program, with support from WHO and external donors. However, further funding would allow the scale up of this program across additional sites. WHO and the Ethiopian Public Health Institute are providing support with data server infrastructure and technical expertise. Another point of support is capacity building at the national and regional levels to improve the utilisation and uptake of EWARS.

EWARS is a highly scalable model that has had success in many parts of the world, both prior to and in the aftermath of climate events. Further financing can help to strengthen climate-sensitive disease surveillance – an important building block of climate resilient health systems.

Conservation of critical rainforest ecosystems and improving health through investment in community-designed solutions in Indonesia

Demonstrating the power of planetary health models through radical listening, community investment and co-design of health services to simultaneously improve the health of humans and ecosystems.

Investment

**\$5.2
MILLION**

US DOLLARS INVESTED
OVER TEN YEARS

Reach

120,000

PATIENTS TREATED;

108,044

HECTARES OF
RAINFOREST PRESERVED

Author: Health In Harmony (HIH)

Implementing Partner: Alam Sehat Lestari (ASRI)

Context

Indonesia's old-growth rainforest ecosystems are at risk of irreversible human-caused degradation. Illegal logging and oil palm plantations fragment forests, causing animals and people to come into more frequent contact. This contact increases the risk of zoonotic diseases spreading into human populations and threatens indigenous forest-dwelling species with extinction. Forest fragmentation has also dried Indonesia's soils, exacerbating the twin risks of wildfires and extreme flooding. Wildfires release stored carbon dioxide into the atmosphere and fill the air with smoke particulates, which have been linked to the growing prevalence of respiratory and cardiovascular disease in Southeast Asia. Restoring and maintaining tropical rainforest ecosystems is critical for preserving biodiversity and the good health of wildlife as well as humans.

Approach

In response to local health care needs and conservation implications, Health in Harmony (HIH) established a health clinic in rural West Kalimantan, Indonesian Borneo in 2007 in close collaboration with the district government and the national park management. The local community designed incentives for those seeking health services to exchange seedlings or manure used in agroforestry programs for discounted medical care. Further health care discounts were given to communities that reported reductions in illegal logging activity, as reported by local liaison officers who regularly monitored trails for logging. A program was also established to provide former loggers with alternative livelihood training, mentorship to start a new business and seed financing. These community members are now skilled agroforestry practitioners, livestock raisers, fishers, small business owners, and beekeepers.

For the project, HIH's sister organization, Alam Sehat Lestari (ASRI), partnered with communities on the island of Borneo in Bukit Baka Bukit Raya (BBBR) and Gulung Palung (GP) National Parks to implement locally designed planetary health programs. The project involved close collaboration with Indigenous People and Local

Communities through Radical Listening methodology. Health In Harmony relied on the expertise of rainforest conservation local community members to identify the drivers of forest loss and co-design solutions. Following these sessions, ASRI began co-designing transdisciplinary solutions for human health and the stewardship of rainforest ecosystems with community members.

HIH invested **\$5.2 million into community-designed health care and environmental conservation solutions over the first ten years** of operation in Indonesia. HIH relied on financial contributions from individuals, governments, corporations, foundations, and innovative financing strategies for the project.

Impact and next steps

Since 2007, ASRI's partnerships with local communities have resulted in providing health services to **120,000 patients and conserving over 108,044 hectares** of carbon-rich, biodiverse rainforest. The programs have reached approximately over 35,000 people around GP and over 3,000 people around BBRR national parks. During a 10-year observation period (2008-2018) in the targeted areas, patient data analyses showed significant declines in diagnosed cases of malaria, tuberculosis, childhood-cluster diseases, neglected tropical diseases (NTDs), chronic obstructive pulmonary disease (COPD), and diabetes. Notably, **infant mortality decreased by 67%**. Simultaneously, across the 21 participating communities, there was a **70% reduction in forest loss**, averting \$65.3 million worth of carbon released into the atmosphere. A 90% drop was reported in households that reported logging as their primary source of income.

Health In Harmony is currently exploring a partnership with the Indonesian Ministry of Health to expand the model to a variety of different conservation settings across the country. Similar replication sites are active in south-eastern Madagascar's Manombo Special Reserve and the Brazilian Amazon.

Pragmatic solutions to address climate change require public and private entities to prioritize investment in Indigenous Peoples and Local Communities. Their knowledge and expertise in rainforest protection and planetary health are the reason for the success of these programmes. Investments in community-designed solutions are upheld by reciprocity agreements and deep, ongoing relationships with communities, all of which are rooted in the shared goal of planetary thriving.



Community members transporting seedlings for reforestation – photo by Aina Eric Andrianarisata



James' sportive lemur – photo by Sarah Graham

Promoting active travel while combating climate change through the 'More bikes, less emissions' program in Buenos Aires

Transforming the transport sector at the city level by investing in clean and sustainable mobility options, thereby reducing greenhouse gas emissions and improving the health of citizens through active travel.

Reach

131% INCREASE

**IN THE NUMBER OF BICYCLE TRIPS
SINCE 2013**

Author: Pathfinder Initiative

Implementing Partner: The City of Buenos Aires

Context

In 2020, the transport sector in Buenos Aires alone emitted around 3.6 megatonnes of greenhouse gas emissions (approximately 30% of city's total emissions). The city is transitioning to clean mobility and sustainable modes of transport, with an aim to become carbon neutral by 2050. Since 2009, the city has encouraged active travel and developed a network of bicycle lanes to create safer and accessible roads for cyclists. In addition to reducing greenhouse gas emissions, the use of bicycles has significant co-benefits for health, as active transport can substantially improve cardiovascular health, reduce metabolic disease, and improve fitness. In addition, creation of dedicated lanes also reduces the frequency and chances of accidents.

Approach

Buenos Aires has a long history of recognising the importance of safe, active travel, which facilitated the development of the "More bikes, less emissions" (Más bicis, menos emisiones) program. This included introduction of EcoBici scheme and creation of a cycle network. EcoBici is a bicycle sharing scheme that allows citizens to rent a bicycle for free 24 hours a day, every day, all year long. There are around 270 EcoBici stations available across 15 Communes in Buenos Aires. The city also offers free instalment loans for bicycle purchases through the local Banco Ciudad. Furthermore, the city is now developing safe storage and parking areas for bicycles throughout the city.

As part of the Protected Bicycle Lanes Network programme which was initiated in 2009, a 286 kilometre long cycle network has been developed throughout the city, connecting the city center with nearby populous neighborhoods. The cycle lanes strategically link key areas and buildings, such as schools, universities, and hospitals, as well as the less densely populated areas to ensure that the bike lanes are accessible to all. The COVID-19 pandemic further amplified the need for cycle lanes and bike sharing, as many citizens avoided crowded public transport and took up cycling instead. To deal with this increase, the cycle lane network was further expanded.



Impact and next steps

Since 2013, there has been a 131% increase in the number of bicycle trips made in Buenos Aires. In 2020, cycling accounted for 10% of all trips made in the city. Based on the survey data on travel mode shifts and cycle trips, it is estimated that the bicycle program resulted in a reduction of 12,155 tonnes of greenhouse gas emissions in 2020. The city aims to reach one million daily cycle trips by 2023.

In addition to the environmental benefits, the cycle program has also helped in creating safer roads for cyclists. The number of cyclists killed decreased from 0.10 per million cycle trips in 2015 to 0.02 per million cycle trips in 2020, with many of the fatal cycling accidents being outside the network of cycle lanes.

There is also some indication that the new cycle lanes encouraged active travel by women; along the newly

developed cycle lanes (Córdoba and Corrientes Avenues) there was a threefold increase in the number of cycle trips made by female cyclists.

However, a bike program alone will not be sufficient to create substantial change. To reduce overall emissions from the sector the city has also implemented actions to reduce the number of cars on the streets. The overall ambition is to establish Buenos Aires as a polycentric city, with multiple city centers where people can work, run errands and carry out leisure activities in their neighborhood. This will transform a street in each of the 48 neighborhoods into a “meeting street”, including a pedestrian zone and multiple recreational activities. This is a similar concept to the “15 minute city”, an urban living concept, where essential amenities can be reached within a 15 minute walk or a bike ride. The aim is to create walkable and bikeable neighborhoods to reduce the need to travel to the city center and to avoid traffic congestion.

For references related to this case study, please visit <https://climatehealthvidence.org/case-studies/more-bikes-less-emissions>

Further case studies from the Pathfinder Initiative show how climate change mitigation actions implemented at global, national and local levels are contributing to greenhouse gas emissions reductions and bringing many benefits to people and the planet. Please visit <https://climatehealthvidence.org/case-studies>

Implementing nature-based solutions through multi-sector, multi-organization collaboration to enhance urban resilience to climate change in Malaysia

Investing in nature-based solutions to enhance urban resilience to climate change impacts and extreme weather events such as flooding, heat waves and loss of biodiversity in Malaysia.

Investment

**\$10
MILLION**

FUNDING FOR URBAN GREENING, FLOOD MANAGEMENT, VULNERABILITY ASSESSMENTS, SOCIAL RESILIENCE, AND KNOWLEDGE TRANSFER

Reach

**1.8
MILLION**

PEOPLE REACHED ACROSS PENANG STATE

Author: Adaptation Fund

Implementing Partners: United Nations Human Settlements Program (UN-Habitat), Ministry of Environment and Water (KASA), Majlis Bandaraya Pulau Pinang (MBPP), Jabatan Pengairan Dan Saliran (JPS) Think City, local government, scientific institutions such as National Water Research Institute of Malaysia (NAHRIM), University of Science Malaysia (USM), River Engineering and Urban Drainage Research Centre (REDAC), and civil society organizations

Context

Due to climate change, Malaysia is projected to experience 200 heat wave days per year by 2050 and a significant increase in floods and storms. This will impact the health and well-being of the population from heat-stress related illness, injury from floods and storms, impact mental health due to loss of property and life, increase allergies due to weather changes, increase vector and water-borne diseases and cause potential malnutrition due to food insecurity.

Approach

The Nature-based Climate Adaptation Programme for the Urban Areas of Penang Island aims to enhance urban resilience and reduce human and ecosystem health vulnerability to climate change impacts and extreme weather events. George Town and Bayan Lepas, two sub-districts in Penang state, have been selected for the project based on a combination of likely climate change impacts, land use and community vulnerabilities.

The project involves the implementation of nature-based solutions aimed at reducing surface temperatures and stormwater runoff. Examples of these solutions include the installation of street trees, rooftop gardens, pocket parks, blue-green corridors, swales, and infiltration wells. The analysis of the impact of climate change



on public health will involve measuring the effects of extreme heat on hospital admissions and mortality rates.

Additionally, climate-sensitive communicable diseases will be correlated with climate data trends. Health professionals and administrators will undergo training to enhance their recognition of relevant symptoms and to shape their community outreach and education programs. Furthermore, the project aims to enhance social resilience and institutional capacity.

The programme is executed by the Ministry of Environment and Water (KASA), Majlis Bandaraya Pulau Pinang (MBPP), Jabatan Pengairan Dan Saliran (JPS) and Think City in collaboration with several stakeholders including the local government, scientific institutions like the National Water Research Institute of Malaysia (NAHRIM), University of Science, Malaysia (USM) River Engineering and Urban Drainage Research Centre (REDAC), and civil societies under the coordination of a steering committee.

The project funding totals \$10 million spread over five sub-themes, including: adaptation to the urban heat island effect through urban greening (\$3.1 million); storm water and flood management (\$2.7 million); comprehensive vulnerability, baseline assessment and action plans in target communities (\$0.16 million); strengthening social resilience (\$1 million); and enhancing institutional capacity and supporting the knowledge transfer platform (\$1.4 million).

Impact and next steps

The project was initiated in 2022 and is currently in its early implementation stage. Its primary objective is to achieve economic, social, and environmental benefits directly impacting some 320,000 people in George Town and Bayan Lepas, and indirectly impacting 1.8 million individuals residing across the entirety of Penang state. Additional projects complementing this initiative

have been launched in Penang, funded by the Penang government. These projects predominantly focus on mitigation measures, such as tree planting in George Town and Bayan Lepas, back lanes greening in Kampung Malabar, and several others. These will be co-funded as part of the nature-based components of the program.

As the program is conceived as a proof of concept, it incorporates a robust knowledge management component. This aspect involves a partnership with the National Water Research Institute of Malaysia for monitoring, modelling, and effective consolidation of knowledge. This approach will facilitate the comprehensive tracking of all adaptation benefits derived from the project. Furthermore, the knowledge management-related activities will serve as a model for replication and scaling of strategies within Malaysia and other regions.

Nature exclosures for carbon sequestration to generate revenue, rehabilitate nature and improve agricultural yields in the highlands of Ethiopia

Developing exclosures and communal grazing lands in Ethiopia to protect biodiversity and improve agricultural yield, while converting these efforts into certified emission reductions credits to supplement community income.

Investment

42%

OF THE CURRENT ANNUAL
INCOME OF THE ENTIRE
COMMUNITY GENERATED BY
CARBON SEQUESTRATION

Author: Pathfinder Initiative

Implementing Partner: International Water Management Institute, Government of Ethiopia



Context

Natural resources are crucial for the livelihoods of people experiencing poverty, and efforts to rehabilitate these resources can significantly improve their quality of life. However, in many developing countries, natural resource conditions have deteriorated over time.

In the highlands of Ethiopia, deforestation, unsustainable agricultural practices, and use of crop residues for energy have led to soil degradation, reduced productivity in agriculture, and loss of biodiversity. Soil erosion is also a significant issue, with steep slopes experiencing soil loss that exceeds the region's maximum tolerable limit. Additionally, overgrazing has resulted in the disappearance of natural vegetation, leaving behind degraded grazing lands with sparse vegetation.

Protecting and preserving natural resources and ecosystems can act as a sink for carbon (and reducing its emission into the atmosphere), and can regulate temperatures (thereby reducing heat stress for local populations). Additionally, ecosystem preservation can counteract the spread of vector-borne and zoonotic diseases caused by climate change and can help improve air quality through vegetation filtration and carbon sequestration. These can also improve climate resilience by increasing food security through agroforestry practices and reducing the risk of waterborne diseases through wetland and floodplain restoration.

Approach

Exclosures are areas closed off or protected from interference from people and domestic animals, with the goal of promoting the natural regeneration of plants and reducing land degradation of formerly degraded communal grazing lands. Studies in Ethiopia's highlands have shown that enclosures can restore degraded ecosystems and provide economic benefits.

The Gomit watershed covers an area of 1,483 hectares with a population of 360 households. The exclosures in Gomit were established in 2006 by a self-organized community association in response to natural resource degradation problems. The management and use of exclosures is run by the Community Watershed Team which includes nine elected community association members. In establishing the exclosures in the communal grazing lands, bylaws were drafted, and approval was obtained from all association members to protect these areas from people and domestic animals, promote natural regeneration and reduce land degradation

Impact and next steps

The International Water Management Institute conducted a study to investigate changes in vegetation composition, plant diversity and above-ground carbon following the creation of exclosures for a period of 7 years. The study also measured economic returns and the perception of local communities.

Carbon stocks were estimated from the aboveground biomass, and were converted to units of carbon dioxide to help calculate the temporary certified emission reductions (tCER). The tradable unit of one tonne of carbon dioxide-equivalent of emissions sequestration

was estimated as \$3.43 per tCER in this study. Within the first seven years, above ground carbon storage in exclosures increased from a tCER of 3.4 to 15.3 tonnes of carbon dioxide per hectare. This number increases to 139.4 tonnes when considering the entire watershed and communal grazing areas, after 3.5 years of implementation.

Carbon storage in the exclosures generated an estimated revenue of \$6.6 to \$37 per hectare. The estimated revenue increases to \$478.3 per hectare when considering the entire watershed, after 3.5 years of implementation. The study estimated that the potential income generation from this program could contribute to nearly 42% of the current annual income of the entire community if the carbon stored in aboveground biomass is traded.

Informant interviews and household surveys also found that restoration efforts increased vegetation cover and rehabilitated large gullies, reducing soil erosion and crop loss and displaying significantly higher plant species richness than the communal grazing land.

Scaling up such interventions to maximize livelihood benefits will require increasing the unit cost of certified emission reductions to improve the economic viability of exclosures as carbon sink projects, surpassing or matching revenue from crop production.

For references related to this case study, please visit

<https://climatehealthvidence.org/case-studies/exclosures-and-communal-grazing-lands-ethiopia>

Further case studies from the Pathfinder Initiative show how climate change mitigation actions implemented at global, national and local levels are contributing to greenhouse gas emissions reductions and bringing many benefits to people and the planet. Please visit <https://climatehealthvidence.org/case-studies>

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