

Climate-Sense: Community Hackathons



Foreword

[HeatAware SG](#) told us something uncomfortable: Seniors across Singapore's HDB heartlands are living with indoor heat index conditions that may pose a risk to their health. Despite this, more than half of them had never even heard the word "heatwave" or knew of the heat risks associated with it. They could not name it, and they have no way to act on it before it becomes an actual health risk.

Climate-Sense: Community Hackathons is our answer to the question that finding left us with: What happens when you hand that same data back to the community, not as a warning, but as a design brief? Across four hackathons in four months, more than eighty youths, caregivers, delivery riders, and community volunteers used the findings from [HeatAware SG](#) to co-create simple, low-tech cooling solutions, including but not limited to vests, route-planning apps, cooled benches, and wearables, built with tape, gel packs, and AI coding tools.

None of this would have taken shape without the [Youth Development for Climate Tech's](#) Global Summit lending us a stage, the Community Centre and Voluntary Welfare Organisations across Singapore opening their networks, and every community member who helped spread the word and attended our sessions. Integral to the success of Climate-Sense were my colleagues **Leonardus Adi Prasetya** and **Tze Shan Yap**, for their technical and documentation support, respectively.

The "**Climate-Sense Playbook**" is another document altogether, this canva doc is the "Climate-Sense: Community Hackathons" report, will need a hyperlink to the playbook when completed

Russell,
Project Lead, Climate-Sense

Table of Contents



Executive Summary	1
Introduction	3
Climate-Sense: Community Hackathons	6
Climate-Sense Runs: A Progressive Story	10
Notable Community Solutions	14
Climate-Sense Takeaways	17
References (APA)	19

Executive Summary

Singapore faces a dual crisis: A warming climate and a rapidly ageing population. By 2100, annual mean temperatures could rise by up to 5°C, while the share of citizens aged 65+ is projected to reach one in four by 2030. As ageing bodies lose cooling capacity, this convergence is creating a growing cohort of heat-vulnerable seniors who often do not recognise the risk. Delivery riders and young children face parallel vulnerabilities: Riders through pay structures that reward volume over rest and children through immature thermoregulation and a higher surface-area-to-mass ratio.

Building on [HeatAware SG's](#) household-level findings, where over half of surveyed seniors had never heard the term "heatwave" and that indoor conditions in many HDB homes sit at or above NOAA's "Caution" heat threshold for most of the day, **Climate-Sense: Community Hackathons** was designed to hand that data back to the community as a design brief rather than a warning. Run by Sustainable Living Lab (SL2) over four months, the initiative combined Heat Health Masterclasses with hands-on prototyping, engaging more than 80 youths, caregivers, delivery riders, and community volunteers across four hackathon runs.

Each run built on the last: Run 1 (15 March 2026) proved the single-day masterclass-to-prototype format worked at a small scale; Run 2 (28 March 2026), embedded in the YDCT Global Summit, expanded participation to 53 youths from India, Indonesia, and Singapore; Run 3 (26 April 2026) grounded ideation more deeply in [HeatAware SG's](#) evidence and introduced AI coding tools for digital prototypes; and Run 4 (21 June 2026) formalised an AI-assisted software toolchain (VS Code, Claude, ESP-IDF) for wearable-focused solutions.

Participants translated the three chosen problem statements, one for seniors, delivery riders, and children, respectively, into tangible, low-cost prototypes using tape, gel packs, cardboard, and basic electronics. The various community-driven solutions include, but are not limited to, a heat-aware route-planning app, a cooling vest for riders, a dual-fan cooling stroller retrofit, and a layered cooling wearable set for children.

Key takeaways from the programme include:

- A single masterclass paired with a build activity measurably closes the community's heat-literacy gap;
- Functional prototyping does not require a fully equipped makerspace, and AI tools are now lowering that barrier further for non-programmers;
- Community-sourced ideas surface practical insights that lived experience uniquely provides; and
- The current policy environment: Singapore's 2026 Year of Climate Adaptation creates a timely opening to feed these prototypes into national heat resilience planning, embed heat-health education into existing community touchpoints, and extend the model to underrepresented vulnerable groups such as expectant mothers and outdoor workers.

Introduction

The Weight of Two Curves

The Meteorological Service Singapore (MSS) declared 2024 the country's warmest year on record, with 2025 following close behind as the eighth-hottest, logging its hottest June and November on record, along with 29 days of high heat stress (Qing, 2026). The Centre for Climate Research Singapore's (CCRS) Third National Climate Change Study projects that annual mean temperatures could rise by up to 5°C by 2100, with daily maximum temperatures climbing by up to 5.3°C (Centre for Climate Research Singapore, 2024).

This is not the only exponential curve Singapore is monitoring. The warming curve is intersecting with a second one: Singapore's population is ageing, with citizens aged 65 and above making up 20.7% of residents in 2025, up from 13.1% a decade earlier, and projected to reach one in four by 2030 (National Population and Talent Division [NPTD], 2026).

In recognition of the scale of this convergence, the Ministry of Sustainability and the Environment (MSE) designated 2026 as Singapore's "Year of Climate Adaptation," committing to a National Adaptation Plan and a new SGD 5 million SG Eco Fund package earmarked specifically for community-led projects that drive action on heat resilience (Ministry of Sustainability and the Environment, 2026a). A newly established Heat Resilience Performance Office (HRPO) and an accompanying research investment signal that heat has moved from a seasonal discomfort to a named policy priority. Yet, as the Ministry has repeatedly noted, national infrastructure and policy can only go so far; empowering the community to take the necessary protective measures is treated as a parallel and equally necessary track, not an afterthought (Begum, 2026; Ministry of Sustainability and the Environment, 2026b).

Why Ground-Up Matters

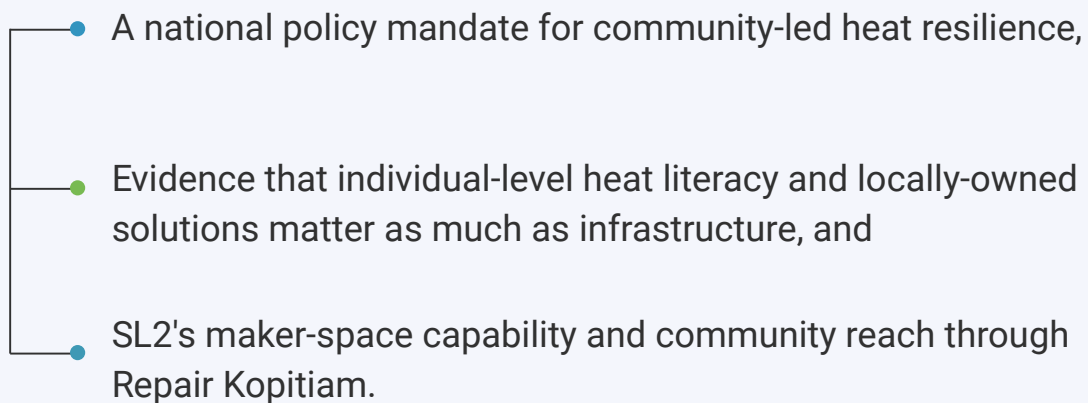
That point is backed by research. A 2025 review of community heat-adaptation projects found that physical fixes, like reflective roof coatings or green roofs, do cool buildings down. But on their own, they are not enough. Things like heat education, warning systems, and helping people change their behaviour matter just as much, not as a bonus, but as an equally important piece (Das et al., 2025). A cooler building does not automatically mean fewer people get sick from heat; people also need to know they are at risk and know what to do about it. Community-engagement literature echoes this: Climate literacy workshops and community-led initiatives are described as essential, not only for raising awareness but also for building local ownership, needed for adaptation measures to be sustained beyond a single campaign (Röhn et al., 2025).

This is precisely the gap that the findings from [HeatAware SG](#) (Fock & Sustainable Living Lab [SL2], 2026) exposed at the household level. Across 201 survey respondents, roughly 56% had never heard the term “heatwave,” and passive cooling measures such as curtains or shading were used by only around a third of households, despite 70% of respondents reporting concern about the heat's impact on their health. Sensor data from 54 households further showed that indoor conditions sit at or above the NOAA “Caution–Extreme Caution” boundary for most of the day, with little nighttime relief. Seniors, in other words, are already living the consequences of heat; what many are missing is the vocabulary and the practical means to act on it.

SL2 in the Maker Space

Sustainable Living Lab (SL2) approaches this gap from a maker-space tradition. Hackathons and community design workshops have increasingly been recognised in participatory design and Human-Computer Interaction (HCI) research as a way to draw non-technical, under-resourced communities into hands-on technology design, lowering the barrier to entry through accessible tools rather than the specialised equipment typical of conventional makerspaces (Vyas et al., 2023). SL2's own history of running [Repair Kopitiam](#), Singapore's largest community repair movement, gave it an existing network of seniors, caregivers, and community volunteers already comfortable tinkering with everyday objects, a natural on-ramp into a hackathon format built around heat.

Our Hackathons brought these three (3) strands together:

- 
- A national policy mandate for community-led heat resilience,
 - Evidence that individual-level heat literacy and locally-owned solutions matter as much as infrastructure, and
 - SL2's maker-space capability and community reach through Repair Kopitiam.

Climate-Sense: Community Hackathons followed naturally as the second phase of the same community heat-health campaign that began with [HeatAware SG](#). Where [HeatAware SG](#) measured and diagnosed the problem, Climate-Sense set out to hand that same data back to the community as a design brief, and see what they built with it.

Climate–Sense: Community Hackathons

Climate–Sense engages the community in co-creating affordable, practical and low-technology solutions to alleviate the impacts of heat on vulnerable groups: Seniors, delivery riders, and children, through a series of hackathons conducted across four months. The project aligns with United Nations Sustainable Development Goal 11 (Sustainable Cities and Communities) and serves as the second part of an ongoing community heat-health campaign, following on from [HeatAware SG](#), which targeted seniors aged 50 and above and their exposure to indoor heat.

Objectives



Raise heat awareness amongst the general public via conduction of Heat Health Masterclasses.



Innovate low-cost heat solutions buildable at the household level for vulnerable individuals.

Intended Outcomes

01

Generate feasible solutions to alleviate heat stress for targeted groups

02

Educate the general community on heat health

Problem Statement Formulation

Heat vulnerability in Singapore is not limited to any one group: Outdoor workers, low-income households, and people with chronic health conditions all face elevated risk alongside seniors, delivery riders, and children. Of these heat-vulnerable groups, seniors, delivery riders, and young children were selected as target audiences of three problem statements, respectively due to:

- Direct reachability through SL2's existing community networks (such as seniors via Repair Kopitiam)
- Clean mapping onto distinct, tangible daily routines such as gardening and outdoor exercise, which a hackathon team could realistically design around within a single day.

Target Group	How Might We...
 Seniors	Enable seniors to enjoy gardening and outdoor exercise during warmer weather safely?
 Delivery Riders	Help delivery riders cool down between deliveries on hot days?
 Children	Redesign preschool outdoor time to build heat acclimatisation in children?

A video interview was conducted with a person from each of the three selected vulnerable groups, which was edited and stitched together to create a problem statement brief shown to participants to provide first-hand insights on the pain points experienced by these groups, before the participants began brainstorming potential cooling solutions for their chosen problem statement.

The remaining three groups: Individuals with chronic conditions, expectant mothers, and outdoor workers were consciously left out of this round's problem statements, not because their risk was judged lower, but because Climate-Sense's community-reach and one-day hackathon format were not yet built to engage them meaningfully.

Outreach Efforts & Communications

The hackathon was open to all community members, with particular outreach to groups with direct experience of heat vulnerability:

- Members with lived experience of heat vulnerability, including delivery riders
- Young Seniors (50+ years) and their family members or caregivers
- Staff and volunteers from Community Centres (CCs) and Voluntary Welfare Organisations (VWOs)
- Anyone passionate about climate adaptation or grassroots innovation

Participants were recruited through a variety of channels, including:

- Messaging platforms, including but not limited to Telegram, WhatsApp, and Instagram, for sustainability and youth-oriented community groups
- Social media posts via LinkedIn
- SL2 programme participants ([HeatAware SG](#), [Youth Development for Climate Tech \(YDCT\)](#), [Repair Kopitiam](#))

This grassroots recruitment approach meant that many participants arrived already embedded in SL2's existing community networks, which in turn shaped the tinkering-first, low-fidelity-first culture of the hackathons themselves.

Hackathon Methodology

Every run followed the same four-part structure:

 Heat Health Masterclass	Grounding participants in heat literacy before any building begins.
 Hackathon Briefing	Introducing the problem statements and the materials on hand.
 Tinkering	Brainstorming and building a tangible prototype in groups.
 Presentations	A one-minute pitch on what was built and why.

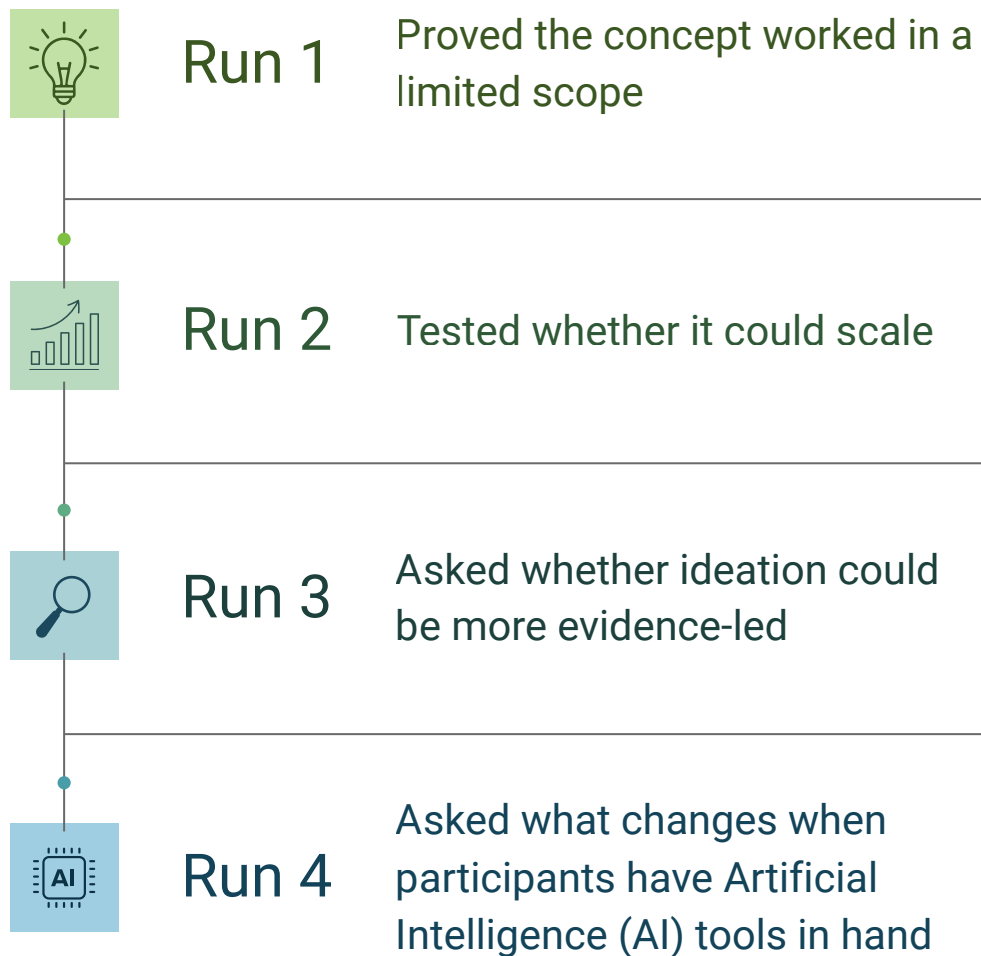
Each hackathon opened with a Heat Health Masterclass, covering why heat matters in Singapore specifically, how to recognise heat stress and counter it, and the limitations of existing cooling solutions. For the third run, this was enriched further with findings from [HeatAware SG](#) itself, turning the Masterclass into a bridge between research and heat literacy rather than a generic primer.

From there, participants moved into their groups, following the same rhythm each time: Brainstorm around the chosen problem statement using flipchart paper, build a tangible prototype from the materials provided, then close with a one-minute pitch covering what the solution is, how it works, and what the next steps would be.

Tape, velcro, and simple cooling gels were the materials of choice throughout, and deliberately so, not for lack of better options, but because speed was the point. A prototype that can be built and pitched within a single afternoon proves an idea is reachable, not just imaginable.

Climate–Sense Runs: A Progressive Story

The four runs are not four repeats of the same format; they are a progression. Each run answered a limitation exposed by the one before it:



Please view [Annex A: Community Prototypes](#) for the full list of community prototype solutions.

01



15 March 2026



8 participants

The first run brought together eight (8) participants spanning young adults, middle-aged community members, and young seniors aged 50 and above. Groups could choose between the senior- or delivery-rider-centred problem statements; both teams that formed chose to tackle the latter, arriving independently at different takes on a cooling vest for riders navigating Singapore's heat between deliveries. The run's smaller scale gave the format its first real test: Could a single-day masterclass-cum-hackathon structure actually produce a workable prototype and a confident one-minute pitch? It did, and well enough that both teams were invited to present their solutions at the [Youth Development for Climate Tech \(YDCT\)](#) Global Summit Showcase on 28 March at the National University of Singapore (NUS) Residential College 4 (RC4) Multi-purpose Sports Hall (MPSH), where they exhibited their prototypes and product posters to the general public as well as Senior Parliamentary Secretary Goh Hanyan.

02



28 March 2026



53 participants

The second run took place on the same day as the YDCT Global Summit Showcase, functioning as an embedded mini-hackathon within the programme. All three (3) problem statements were made available to nine (9) teams consisting of 53 youth participants from India, Indonesia, and Singapore, making this run the largest and most internationally diverse one. The expanded participation pool brought many fresh perspectives to the problems mentioned, and yielded several notable solutions, such as the SolaCool Bench (detailed in the [Climate-Sense Solutions Playbook](#)), as well as the Cooling Stroller and Cooling Wearable Set to aid in children's heat acclimatisation (both detailed in [Notable Community Solutions](#)).

03



26 April 2026



7 participants

The third run shifted the focus back to the community, with a smaller cohort of one (1) young senior and six (6) young adult participants. This run also incorporated an enriched version of the Heat Health Masterclass featuring findings from [HeatAware SG](#), grounding participants' ideation in evidence-based heat literacy. As it was observed that both physical and digital prototypes were proposed in previous runs, AI coding tools such as VSCode and Lovable were introduced to aid in realising ideas falling under the second category, addressing problem statements about seniors or young children. The final product, which was an application meant for parents to check on their children's health and take timely action in the case of a heatwave, possessed functions such as a map displaying the live location of the child and a dashboard including outside temperature and child vitals.

04



21 June 2026



13 participants

The fourth and final run maintained the problem statements about seniors and children for 13 participants, with a focus on utilising artificial intelligence (AI) to design solutions centred around wearables with motion-sensing, Bluetooth, and Wi-Fi features. Building on the digital-prototyping direction explored in Run 3, this run formalised the software toolchain for participants. Visual Studio Code (VSC) served as the main development environment for designing and prototyping solutions, extended with the Claude AI Platform and the Espressif Internet-of-Things Development Framework (ESP-IDF) for device reading. Teams were provided a base file and dedicated Claude login accounts, and worked to brainstorm ideas with the aid of Claude before building their prototypes using VSC.

Please view [Annex A: Community Prototypes](#) for the full list of community prototype solutions.

Participant Demographic Across Runs

Climate-Sense Community Hackathon Runs	Participant Identity			
	Young Senior (50+)	Middle-Aged (30-50)	Young Adult (18-30)	Total
Run 1: 15 March	2	2	4	8
Run 2: 28 March (with YDCT)			53	53
Run 3: 26 April	1		6	7
Run 4: 21 June		1	12	13

Table 1: Participant demographics across the four Climate-Sense hackathon runs



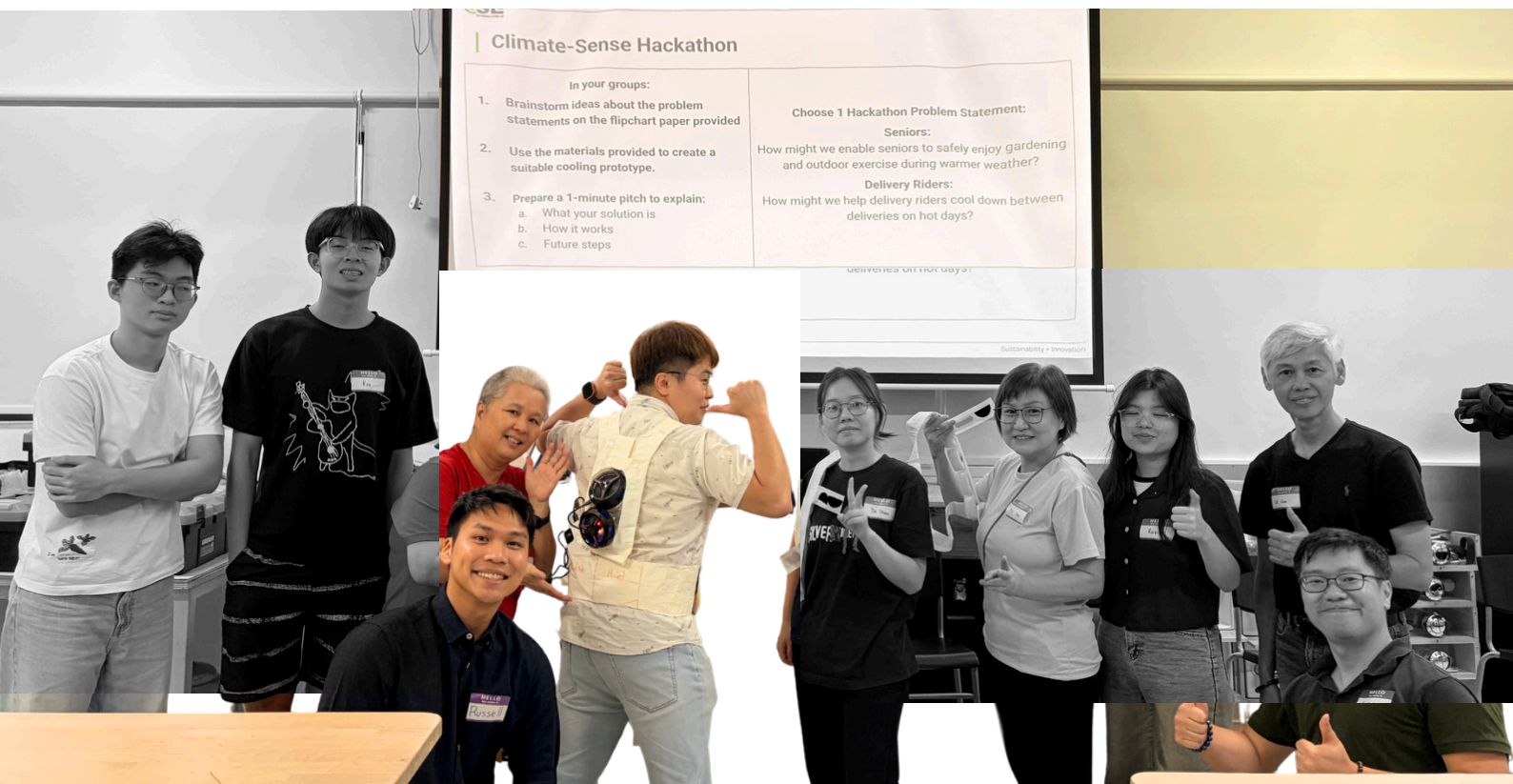
Notable Community Solutions

Notable Solution 1: Anti-Heat SG (Run 1)

When Run 1's two (2) teams sat down with the problem statement, "how might we help delivery riders cool down between deliveries on hot days?", they landed on the same underlying insight from two different directions: Riders are paid by the delivery, not the hour, which pushes them to keep moving even as heat exhaustion creeps closer. One of the resulting team's prototypes, Anti-Heat SG, took the form of a route-planning app that layered two ideas on top of a familiar map interface, surfacing the locations of Community Centres, water dispensers, and current heat hotspots, and calculating routes that reduced a rider's cumulative heat exposure rather than simply minimising distance or time.

The team was candid in their own pitch about where the idea's practicality broke down: Riders under time pressure might rarely stop to check a water-dispenser map. But the route-planning function was flagged as the stronger of the two features, particularly valuable on the city's most extreme-heat days, a reminder that even a single-day hackathon prototype can surface which parts of an idea are worth carrying forward, and which are not.

Please view Climate-Sense: [Annex A: Community Prototypes \(Anti-Heat SG\)](#) for more details.



Notable Solution 2: Cooling Stroller (Run 2)

Facing the children's problem statement at the much larger Run 2, one team looked at preschool outdoor time through a caregiver's eyes: whoever is pushing the stroller is just as exposed to the heat as the child inside it. Their response was a stroller retrofit built around two features: Dual, two-directional fans mounted on the handlebars that cool both caretaker and child simultaneously, and a cooling seat lined with cooling gel that works passively and can be reused.

The prototype itself was built from cardboard, wiring, and a repurposed stroller frame, unmistakably a hackathon build, but complete enough to demonstrate both airflow and seat-cooling working together. The team paired their physical prototype with an AI-generated concept render of a production version, giving judges and other participants a clear sense of what the next iteration could look like beyond the workshop floor.

Please view [Annex A: Community Prototypes \(Cooling Stroller\)](#) for more details.



Notable Solution 3: Cooling Wearable Set (Run 3)

A second Run 2 team tackled the same children's problem statement from a different angle, designing not for the stroller but for the child directly. Their Cooling Wearable Set combined three linked pieces: A slap-on, personalisable detector that reads surrounding temperature and warns the wearer once it crosses a set threshold; a heat-dissipative shirt with strips positioned near the armpit and back to help sweat evaporate faster; and a personalisable, magnetically attached cooler worn on the back for active cooling on the hottest days.

What made this team's pitch stand out was the deliberate separation between passive design (the shirt) and active intervention (the magnetic cooler and the detector's warning), giving caregivers a graduated response rather than a single all-or-nothing device. As with the Cooling Stroller, the team paired their tactile prototype: A cooling shirt and a MagSafe-style back cooler (which snaps on and off using magnets), both worn and demonstrated live at the YDCT Summit, with AI-generated concept imagery exploring what a more polished, child-friendly version of the wearable and detector might look like.

Please view [Annex A: Community Prototypes \(Cooling Wearable Set\)](#) for more details.



Climate–Sense Takeaways

Bridging the Heat–Knowledge Gap

[HeatAware SG](#) found that many people could not tell heat stress apart from heat stroke, or did not know the "feels-like" temperature can be much higher than what the thermometer shows. The Heat-Health Masterclass closed that gap. By the end of each run, participants understood heat-related illness and its warning signs much better. Pairing the lesson with a hands-on activity, instead of just a lecture, seems to be what makes it stick.

Low-Tech, Low-Cost Prototyping Works

Across all four runs, a fully equipped makerspace was not necessary to build something that worked. Masking tape, gel packs, cardboard, and basic electronics were enough to test an idea in a single day. From Run 3 onward, AI coding tools brought that same low-barrier approach to software, letting people with no coding background build working apps. If anything, having limited time and materials pushed participants to focus on what really mattered to the people using their solution.

Bottom-Up Community Idea Generation

Giving the community [HeatAware SG's](#) data as a design brief, instead of just a warning, changed the kind of ideas people came up with. Solutions like the heat-aware route planner, the cooling stroller, and the layered cooling wearable set all came from participants' own experience of the problem: a delivery rider knowing which parts of a cooling app they would actually use mid-shift, or a caregiver knowing a stroller needs to cool the adult as much as the child. This matches wider research showing that community-level solutions are not a weaker substitute for infrastructure; they are a necessary complement to it (Das et al., 2025).

Scaling Impact to Underrepresented Vulnerable Groups

All four runs focused on seniors, delivery riders, and children. Other groups, like expectant mothers and outdoor workers, face similar heat risks but were not yet included in the hackathon's problem statements. Some of the solutions that came out of it, especially the passive-cooling and wearable ideas, could likely be adapted for these groups with only small changes.

Possible Areas for Government-Level Exploration

Singapore naming 2026 the Year of Climate Adaptation, launching a SGD5 million SG Eco Fund package for community-led heat projects, and setting up a Heat Resilience Office all suggest the government is now open to this kind of community input. Three next steps follow from that:

- Use community hackathon prototypes as input for national heat resilience planning, not as finished products, but as an early signal of what actually resonates with the people who would use them.

- Build the Heat-Health Masterclass into existing community spaces (Active Ageing Centres, Community Centres, Voluntary Welfare Organisations) as regular programming, not just a one-off before a hackathon, so the awareness gains last.

- Extend this co-creation approach to other heat-vulnerable groups not yet covered, especially expectant mothers and outdoor workers, potentially as a funded follow-on project under the SG Eco Fund.

There is a lot of room left to explore. New ideas for tackling heat keep surfacing whenever people with different lived experiences of it are given the tools and the trust to build.



References (APA)

1. Azan, A., Nyimbili, S., Babayode, O. O., & Bershteyn, A. (2025). Exceeding the limits of paediatric heat stress tolerance: The risk of losing a generation to climate inaction. *BMJ Paediatrics Open*, 9(1), e002883. <https://doi.org/10.1136/bmjpo-2024-002883>
2. Begum, S. (2026, March 4). Singapore sets up heat resilience office, invests US\$31m in research as part of new adaptation efforts. Asia News Network. <https://asianews.network/singapore-sets-up-heat-resilience-office-invests-over-us31m-in-heat-research-as-part-of-new-adaptation-efforts/>
3. Centre for Climate Research Singapore. (2024). Singapore's third national climate change study. https://www.mss-int.sg/docs/default-source/v3_reports/v3-sr-chap-05.pdf
4. Das, J. K., Kumari, B., Rahman, A. R., Azhar, M., Khan, S., Masood, U., Karan, D., Yasin, R., Burman, C., Augustin, J. L., Bonell, A., & Bhutta, Z. A. (2025). Evaluation of community-based heat adaptation interventions: A systematic review. *BMJ Public Health*, 3(2), e002332. <https://doi.org/10.1136/bmjph-2024-002332>
5. Fock & Sustainable Living Lab (SL2). (2026). HEATAWARE SG. <https://www.sustainablelivinglab.org/reports/HEATAWARE-SG-Report.pdf>
6. Fogarty, D. (2024, October 6). 'Mentally, you just have to push through': Delivery riders endure longer hours, hotter days. The Straits Times. <https://www.straitstimes.com/singapore/mentally-you-just-have-to-push-through-delivery-riders-endure-longer-hours-hotter-days>
7. Ministry of Sustainability and the Environment. (2026a). Year of Climate Adaptation. <https://www.mse.gov.sg/yoca/>
8. Ministry of Sustainability and the Environment. (2026b). Climate Game Changer. <https://www.mse.gov.sg/policies/climate-change/climate-game-changer/>
9. National Population and Talent Division [NPTD]. (2026, July 8). Longevity. <https://www.population.gov.sg/our-population/population-trends/longevity/>
10. Qing, A. (2026, March 24). 2025 a year of weather extremes, with hottest June and November on record logged: Report. The Straits Times. <https://www.straitstimes.com/singapore/environment/2025-a-year-of-weather-extremes-with-hottest-june-and-november-on-record-logged-met-report>
11. Röhn, M., Gourmelon, N., & Christlein, V. (2025, December 16). EcoScapes: LLM-powered advice for crafting sustainable cities. arXiv.org. <https://arxiv.org/abs/2512.14373>
12. Vyas, D., Khan, A. H., & Cooper, A. (2023). Democratizing making: Scaffolding participation using e-waste to engage under-resourced communities in technology design. Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems, 1-16. <https://doi.org/10.1145/3544548.3580759>