

Program Information Sheet

Program Name

National Integrated Heat Health Information System (NIHHIS)

Program Mission

The mission of the National Integrated Heat Health Information System (NIHHIS) is to build understanding of heat risks, to develop science-based solutions, and to improve capacity, communication, and decision-making to reduce heat-related illness and death. NIHHIS envisions a heat resilient nation empowered to effectively address extreme heat and its impacts.

NIHHIS is an integrated information system that was jointly developed by the National Oceanic and Atmospheric Administration (NOAA) and the Centers for Disease Control and Prevention (CDC). The NIHHIS Program is run out of NOAA's Climate Program Office. NIHHIS is guided by an interagency steering committee composed of representatives from NOAA, CDC, OSHA, EPA, FEMA, HHS, NIOSH, SAMHSA, HUD, DOD, the VA, and USFS. For more information about the program, visit [Heat.gov](https://heat.gov).

Foci for FY24

In FY24, NIHHIS is offering funding opportunities under 2 competitions to expand creation and implementation of actionable, place-based climate information for community heat resilience. This funding opportunity was made available through funds appropriated to the National Oceanic and Atmospheric Administration (NOAA) by the Inflation Reduction Act. Competitions 1 and 2 will support the new NIHHIS Centers of Excellence. The first center will provide technical and other assistance in developing community science observations to inform equitable heat resilience action while the second center will focus on technical and other assistance in planning, taking action on, and evaluating equitable heat resilience informed by prior observations and monitoring. Both centers are further defined in the sections below.

Applications to either competition are encouraged to consider how the centers could build on each other, such as by facilitating sequential community applications for support to from centers (e.g. collecting baseline data via center 1, using it to inform decision-making via center 2, collecting additional data for evaluation via center 1, and using it to inform evaluations of effectiveness via center 2). NIHHIS will work with the ultimate awardees to facilitate collaboration between the potential centers and synchronize community application processes via heat.gov. Applicants to this NOFO may write proposals to host a center under either of the competitions herein, but the proposals must be separate and able to stand alone (for example, if proposing to competitions 1 and 2 to create a joint center, a proposal to each competition is still needed).

Applications should build upon NOAA's core capabilities in heat, including foundational research to improve understanding ([Labs](#), [Cooperative Institutes](#), [CPO](#), [WPO](#)), environmental observations ([NESDIS](#)), modeling and prediction ([NCEP](#)), and [community-based capacity](#) - as well upon the capabilities of NIHHS partner agencies above.

1. NIHHS Center of Excellence - Center for Community Climate & Health Observations, Monitoring & Evaluation (Center 1)

Building upon years of [successful citizen science projects to map Urban Heat Islands](#) in over 60 communities, competition 1 will establish a center that provides community climate science support focused on assisting community-serving organizations and their partners in conducting community climate & health studies. This center will provide financial and technical assistance to community-serving and community-based organizations (e.g. environmental justice organizations, local governments, science museums, universities) interested in observing, monitoring, and evaluating the many factors influencing heat risk at a local scale. In particular, this center will support the design and execution of community science projects that deploy new observational technologies and survey instruments, as well as make use of existing observations and datasets in support of community resilience to extreme heat. An important goal for this center will be to implement and advance methods and protocols for community climate science that enable community-based projects to be contributions to the larger evidence base for making decisions that reduce climate risks.

2. NIHHS Center of Excellence - Center for Climate and Health Assessments, Policy, and Practice (Center 2)

Building upon the community-based observations and engagement enabled by the center in competition 1, competition 2 will establish a center to support evidence-based community action for heat resilience decision-making via applied climate and health research and analysis. This center will provide technical assistance to community leaders and decision/policy makers (e.g. local governments) that may lack the capacity or specialized expertise in-house to monitor, model, and assess heat's many impacts as well as to simulate, project, or otherwise evaluate the effectiveness of a collection of potential plans, policies, and other actions to reduce heat risk. In addition to supporting action in communities, an important goal for this center will be to synthesize and share lessons learned and best practices to add to the state of the science on the effectiveness of heat interventions and promote scalable and effective heat action in any community.

Funding for FY24

Depending on the availability of funds and the quality of proposals, funding under each of competitions 1 and 2 will take the form of a 3-year cooperative agreement with a funding floor of \$1M for the first year and \$0.75M for the subsequent two years for a total of \$2.5M per center for the 3-year period. Proposals should be modular and scalable, achieving the requirements articulated below at the stated funding floor. Applications may also indicate what

could be achieved at funding levels as high as \$3M per year (\$9M per center for the 3-year period), but should focus primarily on capabilities at the funding floor level.

Competition Information

Background

Each year in the United States, an estimated 5,000+ excess deaths can be attributed to extreme heat (though official estimates vary greatly)¹. Heat also causes a large number of visits to emergency rooms, reduced labor capacity, and avoidable suffering and healthcare costs. Beyond direct human impacts, heat also cripples critical infrastructure, and results in billions in economic losses for agriculture² and other industries every year. The impacts are projected to increase as climate change drives temperatures higher³.

Communities across the country and around the world are taking action to understand and address heat risk, but a number of gaps remain. Many communities lack basic observations and information on heat exposure and impacts, so heat risk reduction is not prioritized, is difficult to target where needed most, and is difficult to evaluate. Heat impacts disproportionately affect people and communities that have been marginalized or are struggling with stressors such as poverty, but these communities often lack the ability to effectively engage in scientific projects led by research institutions⁴. Heat governance integration is a relatively new idea, meaning most communities do not have a single point of accountability for heat action coordination, nor are their plans and policies coordinated and evaluated for heat impact. Most communities have never conducted heat [tabletop exercises](#) to stress test their heat risk management *and* long-term heat resilience plans. Actions to reduce heat risk may vary in effectiveness by place due to sociopolitical, climate, urban form, and other factors – yet empirical evidence and evaluation of these actions under these varied conditions is still sparse.

The National Integrated Heat Health Information System (NIHHIS) was developed to address issues such as these and to promote a coordinated federal approach to integrate efforts on heat across sectors and disciplines at all timescales. Launched in 2015 as a joint CDC and NOAA initiative, NIHHIS works with federal, Tribal, state, and local governments, researchers, community leaders, environmental justice organizations, NGOs, and the private sector to address multifaceted heat-associated health risks and build equitable heat resilience in communities and institutions.

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- ¹ Weinberger, K. R., Harris, D., Spangler, K. R., Zanobetti, A., & Wellenius, G. A. (2020). Estimating the number of excess deaths attributable to heat in 297 United States counties. *Environmental Epidemiology*, 4(3), e096. <https://doi.org/10.1097/ee9.0000000000000096>
- ² St-Pierre, N. R., Cobanov, B., & Schnitkey, G. (2003). Economic Losses from Heat Stress by US Livestock Industries. *Journal of Dairy Science*, 86, E52–E77. [https://doi.org/10.3168/jds.s0022-0302\(03\)74040-5](https://doi.org/10.3168/jds.s0022-0302(03)74040-5)
- ³ USGCRP, 2018: Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 1515 pp. doi: 10.7930/NCA4.2018
- ⁴ Ottinger, G. (2009). Buckets of Resistance: Standards and the Effectiveness of Citizen Science. *Science, Technology, & Human Values*, 35(2), 244–270. <https://doi.org/10.1177/0162243909337121>

In FY23, NIHHS is running 2 competitions to build community capacity to mitigate, adapt, plan, prepare, respond to, and recover from the impacts of extreme heat on human health, ecosystems, the economy, and critical infrastructure. Both competitions have a dual mission:

- Improve equitable community heat resilience through community science projects.
- Improve the state of the science and practice by learning from, scaling up, and openly sharing approaches, policies, protocols, and lessons to benefit all communities.

1. NIHHS Center of Excellence - Center for Community Climate & Health Observations, Monitoring & Evaluation (Center 1)

For many years, NOAA and NIHHS have supported [citizen science Urban Heat Island mapping campaigns](#) in communities across the country. These campaigns have been critical catalysts for community action on heat, with the resulting [data](#), [maps](#), and [reports](#) promoting and informing actions such as [tree planting](#), [cool surfaces implementations](#), educational projects at [schools](#) and [museums](#), and development of new [plans and policies](#) to support heat resilience. The campaigns have informed NOAA's research and weather & climate service requirements, as well as NOAA's work to develop useful climate data, information, and tools. In FY24, NIHHS seeks to scale up the ambition of this citizen science program to support more communities, more observational methods, integration and hosting of data, and technical support for improved and consistent community science protocols leading to more equitable heat resilient outcomes.

Competition 1 is soliciting proposals to develop a Center for Community Climate & Health Observations, Monitoring & Evaluation that provides community science support to communities seeking to observe and characterize climate and health risks (particularly heat risk) and the effectiveness of actions taken to manage them. In particular, the center should achieve the following objectives: 1) community science project development, execution, and evaluation, 2) scientific community-based observations, and 3) building national capacity with data fusion and open science.

1. Supporting Community Science Project Development, Execution, and Evaluation
Contributory science projects are commonly designed and executed by scientists with subsequent community input and crowdsourced data collection⁵. This center will instead strive to support *community science*, which is co-designed from the beginning to achieve community research needs and “linked to social action with aims including protection of human rights and measurable improvements for communities who face environmental injustices and public health challenges”⁶. Applicants should articulate how the center will support community-based

⁵ Bonney, R., Ballard, H., Jordan, R., McCallie, E., Phillips, T., Shirk, J., & Wilderman, C. C. (2009). Public Participation in Scientific Research: Defining the Field and Assessing Its Potential for Informal Science Education.

⁶ Cooper, C. B., Hawn, C. L., Larson, L. R., Parrish, J. K., Bowser, G., Cavalier, D., Dunn, R. R., Haklay, M. (Muki), Gupta, K. K., Jelks, N. O., Johnson, V. A., Katti, M., Leggett, Z., Wilson, O. R., & Wilson, S. (2021). Inclusion in citizen science: The conundrum of rebranding. *Science*, 372(6549), 1386–1388. <https://doi.org/10.1126/science.abi6487>

scientific project development, execution, and evaluation by empowering communities to take those steps through the guidance of the center.

Projects supported by the center should ensure equitable representation of underserved communities at all stages, be driven by community-identified priorities and research questions, and designed to overcome common challenges in community science projects, such as standards “boundary-policing”⁷. The center should provide scientific and technical assistance in identifying research questions, designing methods to address those questions, training volunteers to follow appropriate data collection protocols, and analyzing data to reach conclusions.

The community projects supported by the center should also be linked so that communities can learn from each other. They should inform NOAA and NIHIS partner research and operational priorities, as well as leverage and contribute to enhancing all available capabilities. They should be organized under a common framework for community-based climate observations and compatible with other established concepts and programs for observation and monitoring, especially the World Meteorological Organization’s Integrated Urban Services^{8,9} and the Department of Energy [Urban Integrated Field Laboratories](#). (An important caveat is that the center need not only focus on urbanized areas - impacts to other communities are also considered in scope.)

The center should employ or develop consistent, repeatable methodologies for processing community-based observations into useful products (e.g. maps, reports, visualizations) that serve community needs while also serving an overarching goal of advancing community-scale observing and modeling methods and practice, taking lessons from approaches that are already in use (e.g. Wilson et al., 2022¹⁰, Shandas et al., 2020¹¹, Shi et al., 2021¹²).

⁷ Ottinger, G. (2009). Buckets of Resistance: Standards and the Effectiveness of Citizen Science. *Science, Technology, & Human Values*, 35(2), 244–270.
<https://doi.org/10.1177/0162243909337121>

⁸ Grimmond, S., Bouchet, V., Molina, L., Baklanov, A., & Joe, P. (2019). *Guidance on Integrated Urban Hydrometeorological, Climate and Environmental Services* (Volume 1:). Geneva, CH: WMO. Retrieved from
https://library.wmo.int/index.php?lvl=notice_display&id=21512#.YcS1sS-B2_U

⁹ Mills, G., Molina, L. T., Schluenzen, H., Voogt, J., Masson, V., Golding, B., Ren, C., Mitra, C., Miao, S., Vogel, F., Christensen, J. H., Baklanov, A., Tarasova, O., & Joe, P. (2021). *Guidance on Integrated Urban Hydrometeorological, Climate and Environment Services Volume II: Demonstration Cities*.
https://library.wmo.int/doc_num.php?explnum_id=10547

¹⁰ Wilson, B., Porter, J. R., Kearns, E. J., Hoffman, J. S., Shu, E., Lai, K., Bauer, M., & Pope, M. (2022). High-Resolution Estimation of Monthly Air Temperature from Joint Modeling of In Situ Measurements and Gridded Temperature Data. *Climate*, 10(3), 47.
<https://doi.org/10.3390/cli10030047>

¹¹ Shandas, V., Voelkel, J., Williams, J., & Hoffman, J. (2019). Integrating Satellite and Ground Measurements for Predicting Locations of Extreme Urban Heat. *Climate*, 7(1), 5.
<https://doi.org/10.3390/cli7010005>

¹² Shi, R., Hobbs, B. F., Zaitchik, B. F., Waugh, D. W., Scott, A. A., & Zhang, Y. (2021). Monitoring intra-urban temperature with dense sensor networks: Fixed or mobile? An empirical study in Baltimore, MD. *Urban Climate*, 39, 100979.
<https://doi.org/10.1016/j.uclim.2021.100979>

2. Supporting Scientific Community-Based Observations

The center should support communities in obtaining, calibrating, siting, operating, retrieving, processing, sharing, and interpreting sensors and data. The center should provide environmental sensors to communities for temporary use at no cost, but may also subsidize or otherwise support community efforts to purchase their own observational equipment for extended use. Applicants are encouraged to consider existing best practices and examples in providing this service ([1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#)), particularly by partnering with NIHHS partners and NOAA centers, labs, and programs that conduct climate observations, monitoring, modeling and prediction.

Proposals should support addressing the impacts of heat on communities by **focusing on core thermal comfort variables** (e.g. temperature, humidity, wind, radiation), but may consider supporting observation of other environmental variables of interest in health studies such as air quality (PM, Ozone). The center may consider supporting many different observation types including:

- Stationary sensors (e.g. sited independently or attached to existing surfaces such as trees, light poles, or bus stops)
- Mobile sensors (e.g. attached to vehicles or bikes or integrated into mobile phones)
- Wearable sensors (e.g. attached to volunteers from populations of interest, including in rural and/or occupational settings)
- Indoor sensors (e.g. smart thermostats, temporary sensors)
- Other sensors such as thermal/infrared cameras

In addition to environmental variables, applicants are encouraged to consider how they may support additional community climate and health data collection and integration, such as social science instruments to understand heat risk perception, or how to incorporate other data including health impact data (mortality, morbidity), socioeconomic data, and built environment characteristics that may be useful in community assessments of heat risk. An emerging need among many community climate science projects is support in understanding how to design and administer social science surveys regarding heat risk perception – including navigating human subjects research requirements. Supporting a consistent approach to heat surveys across many communities would facilitate intercomparison.

3. Building National Capacity with Data Fusion and Open Science

A critical need in community-based climate science is harmonizing and integrating the data collected through myriad different protocols, sensors, communities, and volunteer skillsets – and making this data openly accessible and usable. The center should support fusion and access of community-sourced data as well as data from complementary existing observational networks (e.g. [ASOS/AWOS](#), [COOP](#), [CWOP](#), and [Purple Air](#)).

The center should improve the quality¹³ and utility of data collected by communities through scientifically sound, open, and adaptive research protocols, standards, data fusion, and open access to data and research results across all supported community-level research efforts. All components of the community science process should be transparent and accessible, such as by using an open science workflow and web-based tools (e.g. osf.io).

The center should be guided by the overall goal of evolving and advancing methods for community climate observations as contributions to the collective scientific effort to reduce heat impacts in all communities. To this end, the delivery of standard information products, such as integrated maps and decision-targeted assessments of the observed environmental variables is desired. Integration with and use of established climate services provided by NOAA, NIHHS, and its partners, such as data archiving and visualization provided by NOAA's National Centers for Environmental Information are encouraged.

In addition to the three objectives above, proposals to develop the center must:

- Indicate how they intend to collaborate with the center from competition 2, as well as how they will collaborate with NOAA, the National Integrated Heat Health Information System (NIHHIS) and its partners.
- Provide annual (or more frequent / rolling) opportunities for communities to apply for support in the form of funding or observational equipment rental, technical assistance, and other community science support services that are accessible to community-based organizations and their partners.
- Plan to [open for community support applications](#) no later than April 1, 2024, to support no fewer than 10 communities per calendar year (at least 80% of which are domestic to the United States and its territories), and seeking to support diverse communities – in terms of climate, geography, and demographics.
- Develop a standard set of service offerings for communities to apply to, with a baseline set of standard outcomes and deliverables that applicants can expect. In addition to application-based services, a limited helpdesk function may be included to support inquiries beyond those of successful applicants to the center.
- Maintain a public web presence where communities can learn about and apply for the services of the center, access resources and learn about best practices, obtain open access data and research results, and contact the center for related requests and inquiries. The web presence will be integrated into Heat.gov.
- Have demonstrated success in employing community science models and methods to produce useful products from community-based observations.
- Make all methods open to the community and documented in peer-reviewed literature.
- Adhere to the principles of, and support regular reporting of activities and research results as required by, the authorities and Administration initiatives that cover this program:
 - the [Citizen Science Act \(15 USC 3724 \(e\)\)](#)
 - the [Justice40 Initiative](#) (e.g. by using the [Climate and Economic Justice Screening Tool](#) to prioritize applicants), and

¹³ Aceves-Bueno, E., Adeleye, A. S., Feraud, M., Huang, Y., Tao, M., Yang, Y., & Anderson, S. E. (2017). The Accuracy of Citizen Science Data: A Quantitative Review. *The Bulletin of the Ecological Society of America*, 98(4), 278–290. Portico. <https://doi.org/10.1002/bes2.1336>

- o [America the Beautiful](#), which supports the prioritization of locally led conservation and park projects in communities that disproportionately lack access to nature and its benefits.

Applicants may partner with and establish sub-awards to implementation partners in the interest of providing scalable products and services as well as in supporting volunteer engagement. The instrument for this award will be a 3-year cooperative agreement based upon the expectation of [substantial involvement](#) of NOAA partners. Applicants are strongly encouraged to collaborate with NOAA programs, centers, labs, and cooperative institutes as well as other [Federal agencies that partner with NIHHIS](#) and global partners with the [Global Heat Health Information Network \(GHHIN\)](#).

A partial list of potential NOAA or NIHHIS-affiliated partners will be made available at: <https://cpo.noaa.gov/Funding-Opportunities/NIHHIS-FY2024>

2. NIHHIS Center of Excellence - Center for Climate and Health Assessments, Policy, and Practice

Communities are taking action to manage heat risk, but heat action is routinely stymied by limited heat governance¹⁴ as well as a lack of support in developing foundational evidence, information, and assessments to inform and evaluate policy and practice. Competition 2 seeks proposals to develop a Center for Climate and Health Assessments, Policy, and Practice that provides technical assistance in support of effective science-based heat resilience actions in communities. This center builds upon and extends pilot efforts by NOAA and NIHHIS, including the [NOAA Heat Equity Pilots](#), the [Extreme Heat Risk Initiative projects](#), and the [NIHHIS Urban Heat Island mapping campaigns](#). In particular, the center should support community resilience planning and action through a set of core transdisciplinary scientific research, advisory, and technical services such as supporting:

- Development and facilitation of heat scenarios, situation manuals, and tabletop exercises to stress test plans for heat risk management and resilience
- [Benefit-Cost Analysis \(BCA\)](#) to support prioritization of actions and applications for funding to programs such as [FEMA BRIC](#) and [HUD CDBG](#)
- Development of heat action plans or application of other approaches to heat resilience plan and policy integration (e.g., [Plan Integration for Resilience Scorecard™ \(PIRS™\) for Heat](#))
- Development of metrics and indicators of community resilience to the impacts of heat, potentially in connection to center 1
- Conducting modeling and simulations to target heat resilience actions and evaluate alternatives
- Informing and evaluating heat communication and awareness-raising, particularly among under-served communities

A core component of this center is the application of climate data, modeling, tools, and information to support services such as those indicated in the list above.

This center should aim to increase the effectiveness of heat resilience action by establishing and promoting science-based best practices that are scalable to

¹⁴ Keith, L., Meerow, S., Hondula, D. M., Turner, V. K., & Arnott, J. C. (2021). Deploy heat officers, policies and metrics. *Nature*, 598(7879), 29–31.
<https://doi.org/10.1038/d41586-021-02677-2>

communities across the Nation and around the world. Many of the example support services listed above are novel and do not have widely-accepted best practices for heat (e.g. heat tabletop exercises, heat resilience Benefit-Cost Analysis), so an important goal for this center is to create and build capacity in these new best practices.

In addition, proposals to develop the center must:

- Indicate how they intend to collaborate with the center from competition 1, as well as how they will collaborate with NOAA, the National Integrated Heat Health Information System (NIHHIS) and its partners. (It is not a requirement that communities participate in center 1 in order to receive the services of center 2.)
- Provide annual (or more frequent / rolling) opportunities for communities to apply for support in the form of technical assistance and other community science support services that are accessible to community-serving organizations and their partners.
- Plan to [open for community support applications](#) no later than April 1, 2024, to support no fewer than 10 communities per calendar year (at least 80% of which are domestic to the United States and its territories), and seeking to support diverse communities – in terms of climate, geography, and demographics.
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- Maintain a public web presence where communities can learn about and apply for the services of the center, access resources and learn about best practices, obtain open access data and research results, and contact the center for related requests and inquiries. The web presence will be integrated into Heat.gov.
- Make all methods open and documented in peer-reviewed literature.
- Adhere to the principles of, and support regular reporting of activities and research results as required by, the authorities and Administration initiatives that cover this program:
 - the [Citizen Science Act \(15 USC 3724 \(e\)\)](#)
 - the [Justice40 Initiative](#) (e.g. by using the [Climate and Economic Justice Screening Tool](#) to prioritize applicants), and
 - [America the Beautiful](#), which supports the prioritization of locally led conservation and park projects in communities that disproportionately lack access to nature and its benefits.

Applicants may partner with and establish sub-awards to implementation partners in the interest of providing scalable products and services as well as in supporting volunteer engagement. The instrument for this award will be a 3-year cooperative agreement based upon the expectation of [substantial involvement](#) of NOAA partners. Applicants are strongly encouraged to collaborate with NOAA programs, labs, and cooperative institutes as well as other [Federal agencies that partner with NIHHIS](#) and global partners with the [Global Heat Health Information Network \(GHHIN\)](#).

A list of potential partners will be made available at:

<https://cpo.noaa.gov/Funding-Opportunities/NIHHIS-FY2024>

Open Science Requirements

NIHHIS is guided by the principles of Open Science¹⁵ as defined by the U.S. National Academy of Sciences.

Applicants to this competition will be required to follow the policy guidance outlined in the U.S. Office of Science and Technology Policy [Memorandum on Ensuring Free, Immediate, and Equitable Access to Federally Funded Research](#). Specifically, applicants must indicate how they will “make publications and their supporting data resulting from federally funded research publicly accessible without an embargo on their free and public release”.

Successful awardees must adhere to the policy guidance in the [NOAA Plan for Increasing Public Access to Research Results](#) (S. 7.1), which includes submission of research results to the [NOAA Institutional Repository](#) and [data sharing via the National Centers for Environmental Information](#).

Use of open-standard formats and methods, such as those outlined by the [Open Geospatial Consortium](#), are encouraged. Proposals are permitted to include the cost of open-access publication, data sharing, and archiving in their budgets as needed.

Contact Information

Questions about proposal requirements and the Notice of Funding Opportunity should be directed to grants manager Diane Brown (Diane.Brown@noaa.gov)]. Questions about program priorities in this information sheet as well as Letters of Intent should be directed to NIHHIS Program Manager (“competition manager” for this opportunity), Hunter Jones [hunter.jones@noaa.gov].

¹⁵ National Academies of Sciences, Engineering, and Medicine. 2018. Open Science by Design: Realizing a Vision for 21st Century Research. Washington, DC: The National Academies Press. <https://doi.org/10.17226/25116>.