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Building a **Whole-of-Government** Strategy to Address **Extreme Heat**

Comprehensive recommendations from +85 experts to enable a heat-resilient nation

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FEDERATION OF AMERICAN SCIENTISTS

About the Federation of American Scientists

After the devastating bombings of Hiroshima and Nagasaki, a group of atomic researchers, deeply concerned about the use of science for malice, created an organization committed to using science and technology to benefit humanity. The group they created – the Federation of Atomic Scientists – soon became the Federation of American Scientists in recognition of the hundreds of scientists across diverse disciplines who joined together to advance science policy and counter scientific misinformation.

Over 75 years later, the Federation of American Scientists is still working to minimize the risks of significant global threats, arising from nuclear weapons, biological and chemical agents, and climate change. The organization also works to advance progress on a broad suite of contemporary issues where science, technology, and innovation policy can deliver dramatic progress, and seeks to ensure that scientific and technical expertise have a seat at the policymaking table.

About the Authors

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Executive Summary

From August 2023 to March 2024, the Federation of American Scientists (FAS) talked with **+85 experts** to source **20 high-demand opportunity areas for ready policy innovation** and **65 policy ideas**. In response, FAS recruited 33 authors to work on +18 policy memos through our *Extreme Heat Policy Sprint* from January 2024 to April 2024, **generating an additional +100 policy recommendations** to address extreme heat. Our experts' full recommendations will be published in April 2024; this report previews key findings. In total, FAS has collected **+165 recommendations for 34 offices and/or agencies**. Key opportunity areas are described below and link out to a set of featured recommendations. The [accompanying spreadsheet](#) includes the **165 policy ideas** developed through expert engagement.

America is rapidly barreling towards its next hottest summer on record. While we still lack national strategy, states, counties, and cities around the country have taken up the charge of addressing extreme heat in their communities and are experimenting on the fly. California has announced \$200 million to build resilience centers that protect communities from extreme heat and has created an all-of-government action plan to address extreme heat. Arizona, New Jersey, and Maryland are all actively developing extreme heat action plans of their own. Miami-Dade County considered passing some of the strictest workplace heat rules (although the measure ultimately failed). Additionally, New York City and Los Angeles have driven cool roof adoption through funding programs and local ordinances, which can reduce energy demands, improve indoor comfort, and potentially lower local outside air temperatures.

While state and local governments can make significant advances, national extreme heat resilience requires a “*whole of government*” federal approach, as it intersects health, energy, housing, homeland and national security, international relations, and many more policy domains. The federal government plays a critical role in scaling up heat resilience interventions through research and development, regulations, standards, guidance, funding sources, and other policy levers. **But what are the transformational policy opportunities for action?**

OPPORTUNITY	DESCRIPTION
FACILITATE GOVERNMENT-WIDE COORDINATION (WHITE HOUSE CPO, EOP)	THE U.S. NEEDS A GOVERNMENT-WIDE IMPLEMENTATION STRATEGY, AND LONG-TERM SUPPORT FOR IMPLEMENTATION LEADERS LIKE NIHHS AND THE IWG ON HEAT. THE STRATEGIC INITIATIVE WOULD BUILD UPON THE NATIONAL HEAT STRATEGY, AND WOULD DEFINE THE PROBLEMS TO SOLVE, CREATE TARGETS AND GALVANIZING GOALS, SET AND ASSIGN PRIORITIES FOR FEDERAL AGENCIES, REVIEW AVAILABLE RESOURCES FOR FINANCIAL ASSISTANCE, ASSESS REGULATORY AND RULEMAKING AUTHORITY WHERE APPLICABLE, HIGHLIGHT LEGISLATIVE ACTION, AND INCLUDE EVALUATION METRICS AND TIMELINE FOR REVIEW, ADJUSTMENT, AND RENEWAL OF PROGRAMS. THERE SHOULD BE A COMPREHENSIVE REVIEW OF “HEAT EXPOSURE SETTINGS” AND FEDERAL ACTORS THAT CAN SAFEGUARD AMERICANS IN THESE SETTINGS: HOMES, WORKPLACES, SCHOOLS AND CHILDCARE FACILITIES, TRANSIT, SENIOR LIVING FACILITIES, CORRECTIONAL FACILITIES, AND OUTDOOR PUBLIC SPACES.
ACCELERATE RESILIENT COOLING TECHNOLOGIES, BUILDING CODES, AND URBAN INFRASTRUCTURE (EOP, CONGRESS, EPA, DOE, GSA, FEMA, DOT, NIST, IWG-EH)	RESILIENT COOLING STRATEGIES, LIKE HIGH-ENERGY EFFICIENCY COOLING SYSTEMS, DEMAND/RESPONSE SYSTEMS, AND PASSIVE COOLING INTERVENTIONS, NEED POLICY ACTIONS TO RAPIDLY SCALE FOR A WARMING WORLD. THERMAL RESILIENCE OF BUILDINGS MUST ALSO BE CONSIDERED, ESPECIALLY IN EMERGENCY BLACKOUT SCENARIOS. ALSO, AS THE GSA IS RAPIDLY DECARBONIZING ITS BUILDINGS, IT CAN ALSO BE A TEST-SITE FOR NEW TECHNOLOGIES, BUILDING DESIGNS, AND PLANNING AND RESILIENCE METRICS DEVELOPMENT AND ANALYSIS.

OPPORTUNITY	DESCRIPTION
ADAPT TRANSPORTATION TO THE HEAT (DOT, FHA)	TRANSPORTATION INFRASTRUCTURE IS A CONTRIBUTOR TO THE URBAN HEAT ISLAND EFFECT AND IS VULNERABLE TO EXTREME HEAT, AS HOTTER WEATHER MAKES ASPHALT MORE VULNERABLE TO CRACKING AND IMPACTS TRANSPORTATION USER'S HEALTH AND WELLBEING. DOT SHOULD CONSIDER THE LEVERS AVAILABLE TO INCENTIVIZE COOL SURFACES AND COOL MATERIALS AS A PART OF TRANSPORTATION CONSTRUCTION AND SUPPORT PEOPLE-FOCUSED INTERVENTIONS. ALSO, R&D CAPABILITIES SHOULD BE LEVERAGED BY DOT TO DEVELOP AND DEPLOY REFLECTIVE AND COOL MATERIALS AS A PART OF TRANSPORTATION INFRASTRUCTURE IMPROVEMENTS.
CREATE MORE HEAT-RESILIENT SCHOOLS FOR SUSTAINED LEARNING (ED, NOAA, FEMA, EPA, U.S. CPSA, USDA, DOE)	HIGHER TEMPERATURES COMBINED WITH MINIMAL TO NO AIR CONDITIONING IN OLDER SCHOOL BUILDINGS HAVE CAUSED NUMEROUS SCHOOL CLOSURES. EVEN WHEN SCHOOL IS IN SESSION, MANY STUDENTS ARE LEARNING IN CLASSROOMS EXCEEDING 80°F, A TEMPERATURE THRESHOLD STUDIES HAVE REPEATEDLY SHOWN THAT STUDENTS STRUGGLE TO LEARN AND FALL SHORT OF TRUE ACADEMIC PERFORMANCE. SCHOOLS NEED GUIDANCE TO DEAL WITH THE HEAT CRISIS CURRENTLY AT HAND, WHILE BEING SUPPORTED AS THEY PLAN NECESSARY CLIMATE ADAPTATIONS.
MAKE HOUSING AND EVICTION POLICY MORE CLIMATE AWARE AND RESILIENT (CONGRESS, FHFA, HUD, USDA, OMB, CENSUS BUREAU, ACF)	ADOPTION OF THE LATEST BUILDING ENERGY CODES CAN BE A COST-SAVING AND LIFE-SAVING ADVANCEMENT ACCORDING TO RESEARCH BY THE DOE. FOR ALL PROPERTY TYPES, WEATHERIZATION AUDITS, THROUGH THE WEATHERIZATION ASSISTANCE PROGRAM (WAP) AND LOW-INCOME HOME ENERGY ASSISTANCE PROGRAM (LIHEAP), CAN BE EXPANDED TO CONSIDER HEAT RESILIENCE AND COOLING EFFICIENCY OF THE PROPERTY AND THEN IDENTIFY UPGRADES SUCH AS MORE EFFICIENT HVAC, BUILDING ENVELOPE IMPROVEMENTS, COOL ROOFS, COOL WALLS, SHADE, AND OTHER INFRASTRUCTURE. HOWEVER, SOME HOUSING TYPES ARE MORE RISKY THAN OTHERS, PARTICULARLY MANUFACTURED HOMES AND RENTALS. THERE IS A NEED FOR A NATIONWIDE POLICY FOR SECURE ACCESS TO COOLING.
ADDRESS COMMUNITIES' NEEDS FOR LONG TERM INFRASTRUCTURE FUNDING SUPPORT (FEMA, HUD, CONGRESS)	HEAT VULNERABILITY MAPPING HAS ADVANCED SIGNIFICANTLY IN THE PAST FEW YEARS. YET, ADVANCEMENTS IN OUR UNDERSTANDING OF HEAT'S IMPACTS AND POTENTIAL INTERVENTIONS HAVE NOT TRANSLATED TO SUSTAINED RESOURCES TO SUPPORT TRANSFORMATIVE INFRASTRUCTURE DEVELOPMENT. TO INVEST IN RESILIENCE TO THE GROWING RISK OF HEAT, POLICYMAKERS WILL NEED TO CREATE A DEDICATED AND RELIABLE FUNDING RESOURCE.
SET INDOOR AND OUTDOOR TEMPERATURE STANDARDS TO PROTECT HUMAN HEALTH (OSHA, DOL, ED, HUD, OMB, SBA)	OUR UNDERSTANDING OF WHEN HEAT BECOMES RISKY TO HUMAN HEALTH AND IMPACTS DAILY GOVERNANCE IS STILL IN DEVELOPMENT. THERE IS NOT YET CONSENSUS OR AGREEMENT ON THE LOWER THRESHOLD FOR WHEN OUTDOOR AND INDOOR TEMPERATURES RISKS BEGIN AND AT WHAT LEVEL OF EXPOSURE SHOULD THERE BE CAUSE FOR ACTION, SUCH AS IMPLEMENTING BREAKS FOR WORKERS OR DEPLOYING RAPID EMERGENCY COOLING. ENFORCEMENT OF STANDARDS IS NECESSARY FOR REALIZING THEIR FULL POTENTIAL. SMALL BUSINESSES WILL ALSO NEED HELP TO BE PREPARED FOR COMPLIANCE WITH THE UPCOMING OSHA STANDARD.
BUILD THE EXTREME HEAT RESILIENCE WORKFORCE (WH CPO, CMS, U.S. PUBLIC HEALTH SERVICE COMMISSIONED CORPS, DOE, EPA, AMERICAN CLIMATE CORPS)	MANY FIELDS ARE NEEDING TO RAPIDLY ADAPT TO ENTIRELY NEW KNOWLEDGE BASES. FOR EXAMPLE, WITH THE FEDERAL GOVERNMENT BEING THE NATION'S LARGEST SINGLE SOURCE FUNDER OF GRADUATE MEDICAL EDUCATION, THERE ARE MANY LEVERS AT THEIR DISPOSAL TO DEVELOP, INCENTIVIZE, AND EVEN REQUIRE CLIMATE AND HEALTH EDUCATION FOR THE HEALTHCARE WORKFORCE. THE WEATHERIZATION AND DECARBONIZATION WORKFORCE MUST BE MADE READY FOR HEAT'S GROWING IMPACTS AND STRATEGIES FOR BUILDING AND COMMUNITY-SCALE RESILIENCE.
BUILD HEALTHCARE SYSTEM PREPAREDNESS (HHS OASH, CDC, CMS, HRSA, SAMHSA, NIH, ASPR, VHA, DOI, FEMA, OFFICE OF THE NATIONAL COORDINATOR FOR HEALTH IT - ONCIT)"	YEARS OF UNDERINVESTMENT IN PREPAREDNESS HAVE IMPACTED U.S. HEALTH INFRASTRUCTURE'S SURVEILLANCE, DATA COLLECTION, AND WORKFORCE CAPACITY TO RESPOND TO EMERGING CLIMATE THREATS LIKE EXTREME HEAT. CMS, HRSA, AND VHA ALL SUPPORT AND/OR OPERATE HEALTHCARE FACILITIES AND ARE IN DIFFERENT STAGES OF PROVIDING CRITICAL INVESTMENTS TO INFRASTRUCTURE, OPERATIONS, CARE DELIVERY AND THE MEDICAL WORKFORCE. TO BUILD RESILIENCE TO EXTREME HEAT WITHIN HEALTHCARE SYSTEMS, THREE ACTIONS ARE MOST CRITICAL: 1) INCREASING SURVEILLANCE AND TRACKING OF HEAT-RELATED ILLNESS ; 2) LEVERAGING HEALTHCARE FINANCING; AND 3) FOSTERING CAPACITY-BUILDING.

OPPORTUNITY	DESCRIPTION
DESIGN ACTIVATION THRESHOLDS FOR PUBLIC HEALTH, MEDICAL, AND EMERGENCY RESPONSES (CDC, ASPR, NWS, NOAA)	DESPITE THE FACT THAT EXTREME HEAT EVENTS HAVE OVERWHELMED LOCAL CAPACITY AND TRIGGERED LOCAL DISASTER DECLARATIONS, HEAT IS NOT EXPLICITLY REQUIRED IN HEALTHCARE PREPAREDNESS EFFORTS AUTHORIZED UNDER THE PANDEMICS AND ALL HAZARDS PREPAREDNESS ACT (PAHPA), INSUFFICIENTLY INCLUDED OR NOT INCLUDED AT ALL IN LOCAL AND STATE HAZARD MITIGATION PLANS REQUIRED BY FEMA, AND THERE HAS NEVER BEEN A FEDERAL DISASTER DECLARATION FOR HEAT. THIS ALL PREVENTS THE DEPLOYMENT OF FEDERAL RESOURCES TO MITIGATION, PLANNING, AND RESPONSE THAT STATES AND LOCAL JURISDICTIONS RELY ON. THERE NEEDS TO BE BETTER "ACTIVATION THRESHOLDS" FOR HEAT (I.E. MARKERS THAT THE HAZARD HAS REACHED A LEVEL OF IMPACT THAT NEEDS ADDITIONAL CAPACITY AND RESOURCES) DESIGNED AROUND THE MOST HEAT-VULNERABLE POPULATIONS, SUCH AS CHILDREN, THE ELDERLY, PREGNANT PEOPLE, AND THOSE WITH COMORBIDITIES.
REDUCE ENERGY BURDENS, UTILITY INSECURITY, AND GRID INSECURITY (CONGRESS, ACF, DOE, FEMA, DHS, FERC, CDC, ASPR)	THE LOW INCOME HOME ENERGY ASSISTANCE PROGRAM (LIHEAP) EXISTS TO RELIEVE ENERGY BURDENS, YET WAS DESIGNED PRIMARILY FOR HEATING ASSISTANCE (NATIONALLY, FROM 2001-2019, ONLY 5% OF ENERGY ASSISTANCE WENT TO COOLING). TO ADAPT TO A HOTTER WORLD, LIHEAP'S BUDGETS MUST INCREASE AND ALLOCATION FORMULAS WILL NEED TO BE MADE MORE "COOLING"-AWARE AND EQUITABLE FOR HOT-WEATHER STATES. ADDITIONALLY, PURPA REFORMS COULD BE CONSIDERED TO REQUIRE UTILITIES TO HAVE MORATORIUMS ON ENERGY SHUT-OFFS DURING EXTREME HEAT SEASONS. FINALLY, GRID RESILIENCE WILL BECOME EVEN MORE ESSENTIAL IN A HOTTER CLIMATE AS POWER OUTAGES AND BLACKOUTS DURING EXTREME HEAT EVENTS ARE DEADLY.
ADDRESS CRITICAL NEEDS OF CONFINED POPULATIONS FACING HEAT (CMS, DOJ)	CONFINED POPULATIONS, WHETHER BECAUSE OF THEIR MEDICAL STATUS OR LEGAL STATUS, ARE HIGHLY VULNERABLE TO EXTREME HEAT INDOORS. FOR INSTANCE, LONG-TERM CARE FACILITIES MUST GUARANTEE COOLING YET ARE REPORTING CHALLENGES ACTUALLY MEETING RESIDENT'S NEEDS FOR COOLING DURING A DISASTER EVENT, SUCH AS A BLACKOUT. INCARCERATED POPULATIONS ON THE OTHER HAND ARE NOT GUARANTEED ANY COOLING. DESPITE THIS LACK OF SUFFICIENT COOLING BEING "CRUEL AND UNUSUAL" PUNISHMENT, THERE HAS BEEN NO PUBLIC ACTIVITY TO DATE FROM THE DEPARTMENT OF JUSTICE TO SECURE COOLING INFRASTRUCTURE FOR FEDERAL PRISONS OR WORK WITH STATE PRISONS TO EXPAND COOLING INFRASTRUCTURE.
ANTICIPATE AND PREVENT SUPPLY CHAIN DISRUPTIONS (CONGRESS, GSA, USDA)	70% OF GLOBAL AGRICULTURE IS EXPECTED TO BE AFFECTED BY HEAT STRESS BY 2045. RECENT HEAT WAVES HAVE ALREADY KILLED CROPS AND LIVESTOCK EN MASSE, LEADING TO LOWER YIELDS AND EVEN SHORTAGES FOR CERTAIN PRODUCTS - LIKE OLIVE OIL, POTATOES, COFFEE, RICE, AND FRUITS. RISING HEAT IS ALSO POISED TO RESHAPE LOCAL AND STATE ECONOMIES THAT RELY ON THEIR CHANGING CLIMATIC CAPABILITIES TO PRODUCE CERTAIN CROPS. ENSURING ONGOING ACCESS TO CRITICAL COMMODITY AND SPECIALTY AGRICULTURAL PRODUCTS IN A FUTURE OF HIGHER TEMPERATURES IS A NATIONAL SECURITY PRIORITY. FAS' WORK SCOPING THE FEDERAL LANDSCAPE HAS SHOWN THERE ARE FEW FEDERAL RESEARCH AND DEVELOPMENT PROGRAMS, FINANCIAL ASSISTANCE OPPORTUNITIES, AND INCENTIVES FOR HEAT RESILIENCE, AND OUR INTERVIEWEES CONCURRED WITH THAT ASSESSMENT.
CONNECT DROUGHT RESILIENCE AND HEAT RESILIENCE STRATEGIES (USDA, NOAA, CEQ, DOI, USGS, USACE, FEMA, COMMERCE, NOAA, BUREAU OF INDIAN AFFAIRS, CONGRESS)	GLOBAL WARMING IS SHRINKING THE SNOWPACK THAT FEEDS RIVERS, LEADING TO FURTHER GROUNDWATER RELIANCE, STRAINING AQUIFERS TO THE BRINK OF COMPLETE COLLAPSE. WARMER TEMPERATURES ALSO LEADS TO MORE SURFACE WATER EVAPORATING, THUS LEAVING LESS TO REPLENISH OVERSTRESSED AQUIFERS. RISING TEMPERATURES ALSO MEAN THAT PLANTS NEED MORE WATER, AS THEY EVAPOTRANSPIRATE AT GREATER RATES TO KEEP THEIR INTERNAL TEMPERATURES IN-CHECK. ALL OF THESE FACTORS COMPOUND THE NEED FOR A NATIONAL STRATEGY THAT ACCOUNTS FOR THE GROWING RISKS OF DROUGHT AND STRAINS ON WATER ACCOUNTS NECESSARY TO SUSTAIN BOTH AGRICULTURAL PRODUCTION AND HUMAN HABITATION.
REFORM THE BENEFIT-COSTS ANALYSIS (FEMA, OMB, IWG-EH, GSA)	BENEFIT COST ANALYSIS (BCA) IS A CRITICAL TOOL FOR GUIDING INFRASTRUCTURE INVESTMENTS AND IS NOT SET UP TO ACCOUNT FOR THE BENEFITS OF HEAT MITIGATION. RESEARCH WILL BE NEEDED TO GENERATE THE PRE-CALCULATED BENEFITS OF HEAT MITIGATION INFRASTRUCTURE, SUCH AS AVOIDING HEAT ILLNESS, DEATH, AND WAGE LOSSES AND PREVENTING POWER FAILURES. STRATEGIES FOR AN EQUITABLE RESPONSE (I.E. DISTRIBUTIONAL ANALYSIS, SEE OMB'S CIRCULAR A-4) NEED TO BE QUANTIFIED. BCA METHODS SHOULD BE DEVELOPED THAT ACCOUNT FOR BENEFITS TO RESILIENCE TO MULTIPLE HAZARDS (I.E. RESILIENCE HUBS).

OPPORTUNITY	DESCRIPTION
CREATE THE "PLAN" FOR HOW TO RESPOND TO AN EXTREME HEAT DISASTER (FEMA, DHS, ASPR, EOP, CONGRESS)	AN ACUTE FOCUS ON INFRASTRUCTURE DAMAGES BY FEMA HAS BEEN A BARRIER TO ALL PAST ATTEMPTS TO DECLARE EXTREME HEAT AS A DISASTER AND RECEIVE FEDERAL DISASTER ASSISTANCE. FEDERAL RECOGNITION THAT HEAT WAVES ARE DISASTERS WILL ONLY COME WITH EXTENDING THE DEFINITION OF WHAT A DISASTER IS. NEW GOVERNANCE MODELS WILL NEED TO BE CREATED FOR CLIMATE AND HEALTH HAZARDS LIKE EXTREME HEAT, FOCUSING ON AN ADAPTATION FORWARD, PEOPLE-CENTERED DISASTER RESPONSE APPROACH GIVEN THE OUTSIZED IMPACT OF HEAT HAZARDS ON HUMAN HEALTH AND ECONOMIC PRODUCTIVITY. SUCH A SHIFT WILL CHALLENGE THE FEDERAL GOVERNMENT'S EXISTING AUTHORITIES AUTHORIZED UNDER NATIONAL DISASTER LAW, THE STAFFORD ACT, WHICH AT THIS CURRENT MOMENT DOES NOT CONSIDER "HUMAN DAMAGES" BEYOND LOSS OF LIFE.
SPUR INSURANCE AND FINANCING INNOVATION (TREASURY, SEC, FEMA)	THE U.S. DEPARTMENT OF THE TREASURY ACKNOWLEDGED THE LACK OF INSURANCE FOR EXTREME HEAT'S IMPACTS IN ITS REPORT ON HOW CLIMATE CHANGE WORSENS HOUSEHOLD FINANCES. HEAT INSURANCE FOR INDIVIDUALS COULD MANIFEST IN A VARIETY OF WAYS: SECURITY FROM UTILITY COST SPIKES, REAL-ESTATE ASSESSMENT AND SCORING FOR FUTURE HEAT-RISK, "WORKER WAGE SAFETY" COVERAGE, PROTECTIONS FOR HOUSEHOLD ITEMS LOST DUE AN EXTENDED BLACKOUT OR POWER OUTAGE, AND COVERAGE FOR HEALTHCARE COSTS DUE TO HEAT ILLNESS. IT IS ALSO IMPORTANT THAT INVESTMENTS MADE TODAY ARE RESILIENT FOR THE CLIMATE CONDITIONS OF TOMORROW. FOR EXAMPLE, THE MUNICIPAL BOND MARKET COULD PRICE CLIMATE RISK WHEN DECIDING ON INTEREST PAYMENTS, AND GIVE BENEFICIAL RATES TO JURISDICTIONS THAT HAVE ANALYZED RISKS AND MADE STEPS TOWARDS RESILIENCE.
INCORPORATE FUTURE CLIMATE PROJECTIONS INTO PLANNING AT ALL LEVELS (EOP, OMB, CEQ, FEMA, NOAA)	RECENT RESEARCH HAS SHOWN THAT CITIES AND COUNTIES ARE BARRELING TOWARD TEMPERATURE THRESHOLDS AT WHICH IT WOULD BE DANGEROUS TO OPERATE MUNICIPAL SERVICES, AFFECTING THE OPERATIONS OF DAILY LIFE. YET LITTLE OF THIS FUTURE RISK IS ACCOUNTED FOR IN THE VARIOUS PLANNING ACTIVITIES DONE BY LOCAL AND STATE GOVERNMENTS. TECHNICAL ASSISTANCE AND DECISION-MAKING TOOLS THAT SUPPORT PLANNERS IN MAKING PREDICTIVE ANALYSES BASED ON FUTURE EXTREME TEMPERATURE CONDITIONS CAN INFORM THE DESIGN OF RESILIENT TRANSPORTATION SYSTEMS, GRIDS, AND OTHER INFRASTRUCTURE AS WELL AS PUBLIC HEALTH ACTIVITIES, AND ENSURE ACCURATE ESTIMATIONS OF COST EFFECTIVENESS.
SET STANDARDS FOR DATA COLLECTION AND ANALYSIS (CDC, OSHA, DOL, ED, FEMA, EPA, NOAA, NIH, NSF, CMS, HRSA, AHRQ, CONGRESS)	WHILE OFFICIAL CDC-REPORTED DEATHS FROM HEAT, APPROXIMATELY 1670 IN 2022, EXCEED THOSE FROM ANY OTHER NATURAL HAZARD, EXPERTS WIDELY AGREE THIS NUMBER IS AN UNDERCOUNT. MANY FACTORS COMPOUND THIS SYSTEMATIC UNDERCOUNT: HOSPITALS OFTEN DO NOT CONSIDER EXTREME HEAT IN THEIR HAZARD PREPAREDNESS PLANS, THERE'S A LACK OF AWARENESS AROUND ICD-10 CODING FOR HEAT ILLNESS, DEATH ATTRIBUTION EXACERBATED/ CAUSED BY HEAT IS OFTEN ATTRIBUTED TO OTHER CAUSES. DECISION MAKERS NEED BETTER DATA AND SURVEILLANCE SYSTEMS TO ADDRESS THIS GROWING PUBLIC HEALTH CRISIS. THERE IS ALSO A BIG OPPORTUNITY TO DEVELOP A STANDARD DATA SET FOR EXTREME HEAT RISKS AND VULNERABILITIES IN FUTURE ANTICIPATED CLIMATE CONDITIONS.
CREATE REGULATORY OVERSIGHT INFRASTRUCTURE FOR EXTREME HEAT (CONGRESS, OMB, HUD, NOAA, EPA, ONCIT)	THERE WILL NEED TO BE EXPANDED ENFORCEMENT OF THE REGULATIONS, INCLUDING BETTER MONITORING OF TEMPERATURES OUTDOORS AND INDOORS. FUTURE REGULATIONS FOR MITIGATING EXTREME HEAT EXPOSURE CAN BE CONCEPTUALIZED IN THE FOLLOWING THREE WAYS: TECHNOLOGY STANDARDS, THE REQUIRED PRESENCE OF A COOLING SYSTEM OR DEVICE, BEHAVIORAL GUIDELINES AND EXPECTATIONS, REQUIRED ACTIONS TO AVERT OVEREXPOSURE, AND PERFORMANCE STANDARDS, REQUIREMENTS THAT HEAT EXPOSURE CANNOT CROSS A CERTAIN THRESHOLD.

Our Research: Sourcing Opportunities and Ideas for Policy Innovation

During Fall 2023, FAS engaged **+85 experts** in conversations around federal policies needed to address extreme heat. Our stakeholders included: 22 academic researchers, 33 non-profit organization leaders, 12 city and state government employees, 3 private company leaders, 2 current or former Congressional staffers, 3 National Labs leaders, and 10 current or former federal government employees. Our conversations were guided by the following four questions:

- What work are you currently doing to address extreme heat?
- What do you see as some of the opportunity areas to address extreme heat?
- What are the existing challenges to managing and responding to extreme heat?
- What actions should the federal government take to address extreme heat?

Our conversations with experts sourced **20 high-demand opportunity areas for policy innovation and 65 policy ideas**. To go deeper, FAS recruited **33 authors** ([see appendix for names and affiliations](#)) to work on **+18 policy memos** through our Extreme Heat Policy Sprint, **generating an additional +100 policy recommendations** to address extreme heat's impacts and build community resilience. Our policy memos from the [Extreme Heat Policy Sprint](#), published in April 2024, provide a more comprehensive dive into many of the key policy opportunities articulated in this report. Overall, FAS' work scoping the policy landscape, understanding the needs of key actors, identifying demand signals, and responding to these demands has generated **+165 policy recommendations for 34 offices and/or agencies**.

Opportunity Areas for Policy Innovation

The following 20 “opportunity areas” are not exhaustive, yet can serve as inspiration for the building blocks of a future strategic initiative.

Facilitate Government-Wide Coordination

The first opportunity is an overarching call to action: the need for a **government-wide extreme heat strategic initiative**. This can build upon the National Integrated Health Health Information System’s (NIHHIS) National Heat Strategy, set to release this year. This strategy would define the problems to solve, create targets and galvanizing goals, set and assign priorities for federal agencies, review available resources for financial assistance, assess regulatory and rulemaking authority where applicable, highlight legislative action, and include evaluation metrics and timeline for review, adjustment, and renewal of programs. In creating this strategy, one interviewee recommended there should be a comprehensive review of “heat exposure settings” and federal actors that can safeguard Americans in these settings: homes, workplaces, schools and childcare facilities, transit, senior living facilities, correctional facilities, and outdoor public spaces. Through scoping potential regulations, standards, guidelines, planning processes, research agendas, and financial assistance, the federal government will then be prepared to support its intergovernmental actors and communities.

INFRASTRUCTURE AND THE BUILT ENVIRONMENT

Accelerate Resilient Cooling Technologies, Building Codes, and Urban Infrastructure

On average, Americans spend 90% of their time indoors, making the built environment a critical site for heat exposure mitigation. To keep cool, especially in places of the U.S. not used to extreme heat, buildings are increasingly reliant on mechanical cooling interventions. While a life-saving necessity, air conditioning (AC) consumes significant amounts of electricity, putting high demands on aging grid infrastructure during the hottest days. Excess heat from air conditioners can lead to higher outdoor temperatures and even more AC demand. Finally, ACs are useless interventions if there’s no power, an increasing risk due to growing energy poverty and grid failure. In these scenarios, our current construction is likely to widely “fail” in its ability to cool residents.

Resilient cooling strategies, like high-energy efficiency cooling systems, demand/response systems, and passive cooling interventions, need policy actions to rapidly scale for a warming world. For example, cool roofs, walls, and surfaces can keep buildings cool and less reliant on mechanical cooling, but are often not considered a part of weatherization audits and upgrades. District cooling, such as through networked geothermal, can keep entire neighborhoods cool while relying on little electricity, but is still in the demonstration project phase in the United States. Heat pumps are also still out of reach for many Americans, making it essential to design technologies that work for different housing types (i.e. affordable housing construction). Initiatives like the Department of Energy’s (DOE) Affordable Home Energy Shot can bring these technologies into reach for millions of Americans, but only if it is given sufficient financial resources. DOE’s Office of Clean Energy Demonstrations and State and Community Energy Programs FY25 budget request to strengthen heat resilience in disadvantaged communities through energy solutions could be a step towards realizing innovative heat technologies. Further, the Environmental Protection Agency’s Energy Star program can further incentivize low-power and resilient cooling technologies — if rebates are designed that take advantage of these technologies.

Thermal resilience of buildings must also be considered, for both day-to-day operations and emergency blackout scenarios. DOE can work with stakeholders to create “cool” building standards and metrics with human health and safety in mind, and integrate them into building codes like ASHREI 189.1 and 90 series. These codes are “win-wins” for building designers, creating buildings that consume far less electricity while keeping inhabitants safe from

the heat. DOE can assist in conducting more demonstration projects for building strategies that ensure indoor survivability in everyday and extreme conditions.

Intervention efficacy and applicability are still evolving for extreme heat resilience interventions at the community scale, such as cool pavements, urban greening, shading, ventilation corridors, and development regulations (i.e. solar orientation). Individual interventions and their interactions need more evidence of their costs and benefits, potential tradeoffs and maladaptations. The National Institutes of Standards and Technology works on building and urban planning standards for other natural hazards, such as their [National Windstorm Impact Reduction Program \(NWIRP\)](#) and their [Community Resilience](#) program, and could serve as a “technology test-bed” for heat resilience practices and advance our understanding of their effectiveness as well as how to measure and account for benefits and costs. This could be done in partnership with the National Science Foundation, which has been dedicating funding for use-inspired research and technology development for climate resilience.

Finally, the U.S. government is the largest landlord in the nation. As the General Services Administration is rapidly decarbonizing its buildings, it can also be a test site for new technologies, building designs, planning, and resilience metrics development and analysis.

Adapt Transportation to the Heat

Public transportation is a site of high exposure to extreme heat. While the Department of Transportation’s Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation (PROTECT) grants are for “surface transportation resilience,” multiple of our local and regional government interviewees expressed difficulty successfully applying to these grants for “cooling” infrastructure, like water fountains, shade, and air-conditioned bus shelters. DOT should make extreme heat resilience explicit in its eligibility requirements as well as review the benefit-cost analysis (BCA) formula and how it might disadvantage cool infrastructure.

Asphalt and concrete roadways contribute to the urban heat island effect and hotter weather makes asphalt in particular more vulnerable to cracking. DOT should leverage its research and development (R&D) capabilities to develop and deploy reflective and cool materials as a part of transportation infrastructure improvements. Finally, DOT should also consider the levers available to incentivize cool surfaces and cool materials as a part of transportation construction.

Create More Heat-Resilient Schools for Sustained Learning

Higher temperatures combined with minimal to no air conditioning in older school buildings have led to an [increase in the number of “heat days”](#), or school closures due to dangerous temperatures. Pulling children out of the classroom not only negatively impacts them, but also puts increasing strain on families that rely on schools as childcare. Even when school is in session, many students are attempting to learn in classrooms exceeding 80°F, a temperature threshold [where studies have repeatedly shown](#) that students struggle to learn and fall short of true academic performance. This is because heat reduces cognitive function and ability to concentrate – both essential to learning. Learning loss from rising heat will only compound the learning losses from the COVID-19 pandemic. The [Environmental Protection Agency](#) predicts that the total lost future income attributable to heat-related learning losses may reach \$6.9 billion at 2°C (a threshold we are well on the way to meeting) and \$13.4 billion at 4°C. Schools need guidance on how to deal with the heat crisis currently at hand, while being supported as they plan necessary climate adaptations needed for a hotter world.

At a minimum, schools can be encouraged to formalize plans for school heat preparedness to protect both the health of students and safeguard their learning. No federal heat safety recommendations yet exist and thus will need to be created by the Department of Education (Ed), EPA, FEMA, the National Oceanic and Atmospheric Administration (NOAA), and others. Title I Grants, in alignment with Justice40, could then assist schools in adapting to climate change that includes researched guidance on ways to cool students indoors, outdoors, and

through behavioral management. Further, school system leaders need a better system to track how schools are currently experiencing extreme heat and what strategies could be employed to respond to heat exposure (closing schools, informed behavioral interventions to manage heat exposure, green infrastructure to build resilience, etc). Federal involvement is essential for creating this tool. Finally, to address the root causes of excessive classroom heat, schools will need to transform their infrastructure through HVAC investments and improvements, greening, playground material changes and shading. HVAC costs alone are expected to be \$40 billion for all U.S. schools that need infrastructure improvements. While Inflation Reduction Act (IRA) tax credits are available for updating HVAC systems, many low-wealth schools will not be able to finance the gap between the credit coverage and the true cost and will need additional financial assistance.

Make Housing and Eviction Policy More Climate-Aware and Resilient

Most of the U.S. lacks minimum cooling requirements for buildings and existence of a cooling device within the property. Adoption of the latest building energy codes, despite their previously described limitations, can still be a cost-saving and life-saving advancement according to research by the DOE. For new properties, the Federal Housing Finance Agency could require that they adhere to the latest energy codes to receive a mortgage from Government Sponsored Enterprises, which is already under consideration by Housing and Urban Development (HUD) and the U.S. Department of Agriculture (USDA) for their mortgage products. For older construction, there could be requirements for adequate cooling to exist in the property at the point of sale.

For all property types, weatherization audits, through the Weatherization Assistance Program (WAP) and Low-Income Home Energy Assistance Program (LIHEAP), can be expanded to consider heat resilience and cooling efficiency of the property and then identify upgrades such as more efficient HVAC, building envelope improvements, cool roofs, cool walls, shade, and other infrastructure. If cooling the entire property is unfeasible or costly, homeowners could benefit from creating “Climate Safe Rooms” which are guaranteed to be safe during a heat wave. DOE and HUD could collaborate to demonstrate climate safe rooms in affordable housing, where many residents lack access to consistent cooling.

Some housing types are more risky than others. People living in manufactured homes in Arizona were 6 to 8 times more likely to die indoors due to extreme heat. This is because of poorly functioning or completely defunct cooling systems and/or inability to pay electric bills. Manufactured home park landlords can also set a variety of rules for homeowners, including banning cooling devices like window ACs and shade systems. While states like Arizona have now passed laws making these bans illegal, there is a need for a nationwide policy for secure access to cooling. HUD does not regulate manufactured homes parks, but does finance the parks through Section 207 mortgages and could stipulate park owners must guarantee resident safety. Finally, HUD could also update the Manufactured Home Construction and Safety Standards to allow for HVAC and other cooling regulations in local building codes to apply to manufactured homes, as they do for other forms of housing, as well as require homes perform to a certain level of cooling under high heat conditions.

Renter’s are another highly vulnerable population. Most states do not require landlords to provide cooling devices to tenants or keep housing below risky temperatures. HUD for example does not require cooling devices in public housing, although regulations exist for heating. HUD could implement similar guarantees of a “right to cool”. Evictions in the summer months are also on the rise, due to rising rents compounded with rising energy costs, putting people out in the deadly heat. Keeping people in housing should be of the utmost importance, yet implementation remains fractured across the nation. Eviction moratoriums at a national level have been challenged by the Supreme Court, which overturned the CDC’s COVID-19 moratorium.

Address Communities’ Needs for Long-Term Infrastructure Funding Support

Heat vulnerability mapping has advanced significantly in the past few years. Federal programs like the NIHHS’s Urban Heat Island Mapping Campaigns have mapped +60 communities in the United States that have guided city

policy. The Census' new product, Community Resilience Estimates (CRE) for Heat, assesses vulnerability at the level of individuals and households. Finally, researchers and non-profit organizations have been developing tools that can assess risk and also aid in individual or local decision-making, such as the Climate Health and Risk Tool and Heat Factor.

Advancements in our understanding of heat's impacts and potential interventions have not translated to sustained resources to support transformative infrastructure development. As one interviewee put it "communities that have mapped their urban heat islands are still waiting on funding opportunities to build relevant infrastructure projects". Federal grants for mitigation and resilience may or may not consider heat resilience projects "cost-effective" and aligned with grant-making objectives, leading to rejection.

FEMA's Hazard Mitigation Grants (HMGP), made available only after a federally-declared disaster, can only be used for extreme heat in specific circumstances and recommends that cost-effective heat mitigation projects will also "reduce risks of other hazards". Another example, FEMA's BRIC grant has rejected cooling centers, HVAC upgrades, and weatherization activities, all strategies with some benefit to preventing morbidity and mortality. Green infrastructure projects, with co-benefits such as flood mitigation, have been more successful, often because the BCA is based on the property-damaging hazard, flooding. Only one FEMA BRIC project has been funded with heat as the main hazard, an urban greening project in Portland, Oregon. This unknown regarding grant success can lead to communities not applying with a heat-focused project, when time could be better spent securing grants for other community priorities. FEMA's announcement that it will fund net-zero projects, including passive heating and cooling, through its HMGP and BRIC programs and Public Assistance could shift the paradigm, yet communities will likely need more guidance and technical assistance to execute these projects.

To invest in resilience to the growing risk of heat, policymakers will need to create a dedicated and reliable funding resource. Federal stakeholders can look to the states for models. California's Integrated Climate Adaptation and Resiliency Program's Extreme Heat and Community Resilience grants are currently slated to allocate \$118 million to 20-40 communities for planning and implementation grants over three rounds. To start, FEMA could replicate this program, similar to its specific programs for wildfires, providing \$50,000 to \$5 million to a wide range of heat resilience projects, and make it eligible for joint funding through BRIC. DOE's \$105 million FY25 budget request for a program for planning, development, and demonstration of community-scale solutions to mitigate extreme heat in low-income communities is a step in the right direction. If funded, the program would benefit from coordinating with FEMA's BRIC program on high-impact solutions.



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WORKFORCE SAFETY AND DEVELOPMENT

Set Indoor and Outdoor Temperature Standards and Workplace Protections to Protect Human Health

Our understanding of *when* heat becomes risky to human health and impacts daily governance is still in development. Our interviewees shared that there is not yet consensus or agreement on the lower threshold for 1) when outdoor and indoor temperatures risks begin and 2) at what level of continued exposure should there be cause for action, such as implementing breaks for workers or deploying rapid emergency cooling to residents. For workplaces, guidelines will come soon: the Occupational Health and Safety Administration (OSHA) is set to release their heat standard for indoor and outdoor workers by the end of 2024, which will advance heat safety for workers across the country. For all other settings (such as residential settings and schools), the jury is still out on a valid threshold and a regulatory mechanism to establish it.

Enforcement of standards is necessary for realizing their full potential. In preparation for a workplace heat standard, interviewees recommended the Department of Labor create an advanced Hazard Alert System for Heat ([using an evolved data standard discussed in a later section](#)) in order to better pinpoint regulatory enforcement. Small businesses will also need help to be prepared for compliance with the new standard. DOL and the Small Businesses Administration should consider setting up a navigator program for resourcing energy-efficient, worker-centric cooling strategies, leveraging IRA funds where applicable.

Build the Extreme Heat Resilience Workforce

Extreme heat is not just a challenge to worker health, it's also a challenge to workforce ability and capacity. As heat becomes a threat to the entire nation, many fields are needing to rapidly adapt to entirely new knowledge bases. For example, much of the health workforce, doctors, nurses, public health workers, receive little to no education on climate change and climate's health impacts. Programs are beginning to crop up, such as [Harvard's C-Change Program](#), yet will need support to scale. With the federal government [being the nation's largest single source funder of graduate medical education](#), there are many levers at their disposal to develop, incentivize, and even require climate and health education. The [U.S. Public Health Commissioned Corps](#) is another program that could mobilize a climate-aware health workforce, placing professionals with a deep awareness of climate change's impact on health in local communities.

The weatherization and decarbonization workforce must also be made aware and ready for heat's growing impacts and emerging strategies to build building and community-scale resilience. While promising strategies exist for heat mitigation, such as cool walls and roofs, these interventions are largely not considered during weatherization audits and energy efficiency audits. Tax credits that have been created by the IRA/BIL *could* be used for interventions for passive or low-energy cooling, yet a lack of clarity prevents their uptake and implementation. For example, [EPA's EnergyStar program](#) used to certify roofing products before the program sunsetted in 2022. Stakeholders at DOE and EPA should consider their role in workforce readiness for extreme heat, collaborating with third party entities to build awareness about these promising strategies.

Navigating all of the benefits of the IRA and BIL is challenging for resource-strapped communities and households. [Program navigators for weatherization assistance and resilience](#) could be an incredible asset to low-resource communities, and leverage IRA resources for technical assistance as well as the newly created American Climate Corps.

Finally, the federal government workforce is being stretched thin by the sheer number of new mandates in IRA and BIL. To meet the moment, agencies have used flexible hiring mechanisms like the Intergovernmental Personnel Act (IPAs) and for some offices its BIL and IRA connected Direct Hire Authority to make those critical talent decisions and staff their agencies. DOE, for example, has exceeded its goals – hiring over 1000 new employees to date. But not all agencies and offices have access to the Direct Hire Authority – and it's set to expire anywhere between

2025 (for IRA) and 2027 (for BIL). Congress should be encouraged to expand this authority, extend it beyond 2025 and 2027 respectively, and remove the limit on the number of staff allowed. Further, agencies should be encouraged to use other flexible hiring mechanisms like IPAs and other termed positions. The federal government should have the talent needed to meet its current mandates and be prepared to solve problems like extreme heat.

PUBLIC HEALTH, PREPAREDNESS, AND HEALTH SECURITY

Build Healthcare System Preparedness

Years of underinvestment in preparedness have impacted U.S. health infrastructure's surveillance, data collection, and workforce capacity to respond to emerging climate threats like extreme heat. The Administration for Strategic Planning and Response's Hospital Preparedness Program, which prepares healthcare systems for emergencies, has had its budget reduced by 67% from FY 2002-FY2022, considering inflation. Further, the Center for Disease Control and Prevention (CDC) has seen a 20% budget reduction from FY 2002-2022. The CDC's Climate Ready States and Cities Initiative can only support nine states, one city, and one county, despite 40 jurisdictions having applied. The Trust for America's Health (TFAH) found increasing funding from \$10 million to \$110 million is required to support all states, and improve climate surveillance. The TFAH also found that an additional \$75 million is needed to extend the CDC's National Environmental Public Health Tracking Program, a program that tracks threats and plans interventions, to every state. Finally, the Office of Climate Change and Health Equity, the sole office within Health and Human Services solely dedicated to the intersection of climate and health, has yet to receive direct appropriations to support its work.

Centers for Medicare and Medicaid (CMS) and the Healthcare Resources and Services Administration (HRSA) provide critical investments to healthcare facilities, operations, care provision, and the medical workforce, yet have no publicly available programs dedicated to building climate resilience in the face of rising temperatures. The Veterans Health Administration (VHA), the largest integrated healthcare system in the U.S., includes responding to heat wave exposure in its agency Climate Action Plan and has made commitments to developing biosurveillance systems that incorporate external data on air quality, temperature, heat index, and weather as well as upgrading medical center infrastructure. This is critical as 62% of VHA medical centers are exposed to extreme heat and the VHA sees a rise in heat-related illness in the Veteran population. Given its sheer size, systems changes like this made by the VHA can drive real change in healthcare practice.

To build resilience to extreme heat within healthcare systems, our interviews and literature review highlighted that these three actions are most critical: 1) increasing surveillance and tracking of heat-related illness through improvements to medical diagnosis and coding practices and technological systems (i.e. EHRs); 2) leveraging healthcare financing for preventative treatments (i.e. cooling devices), incentives for climate-change preparedness, accurate coding and treatment, and quality care delivery (CQIs), and requirements for accreditation and reimbursements; and 3) fostering capacity-building through grants, technical assistance, planning support and guidance, and emergency preparedness.

Design Activation Thresholds for Public Health, Medical, and Emergency Responses

Despite the fact that extreme heat events have overwhelmed local capacity and triggered local disaster declarations, heat is not explicitly required in healthcare preparedness efforts authorized under the Pandemics and All Hazards Preparedness Act (PAHPA), insufficiently included or not included at all in local and state hazard mitigation plans required by FEMA, and there has yet to be a federal disaster declaration for heat. This all inhibits the deployment of federal resources to mitigation, planning, and response that states and local jurisdictions rely on for other hazards. Our interviewees recommended that there needs to be better "activation thresholds" for heat i.e. markers that the hazard has reached a level of impact that needs additional capacity and resources. Most thresholds set right now just rely on high-temperatures, not the risk factors that exacerbate the impacts of heat.

Data inputs into these locally-relevant thresholds can include wet-bulb globe temperature (which accounts for humidity), heat stress risk, level of acclimatization, nighttime temperatures, building conditions and cooling device uptake, work situations, other compounding health risks like wildfire smoke, and other factors. These activation thresholds should also be designed around the most heat-vulnerable populations, such as children, the elderly, pregnant people, and those with comorbidities.

Increased transmission of viral pathogens and pathogen spread is also a growing risk of overall hotter average temperatures that needs more attention. Increased pathogen surveillance and correlation with existing climate conditions would greatly enable U.S. pandemic and endemic disease surveillance. Finally, no program to date at the Biomedical Advanced Development and Research Authority has focused on creating climate-aware medical countermeasures and the 2022-2026 strategic plan includes no mention of climate change.

Reduce Energy Burdens, Utility Insecurity, and Grid Insecurity

As temperatures rise, so do energy bills. Americans are facing an ever-growing burden of energy debt. 16% (20.9 million people) of U.S. households find themselves behind on their energy bills, increasing the risk of utility shut-offs due to non-payment. The Low Income Home Energy Assistance Program (LIHEAP) exists to relieve energy burdens, yet was designed primarily for heating assistance. Thus, the LIHEAP formulas advantage states with historically frigid climates. Further, most states use their LIHEAP budgets for heating first, leaving what remains for cooling assistance (or just don't offer cooling assistance at all). As a result, nationally from 2001-2019, only 5% of energy assistance went to cooling. Finally, the LIHEAP program is massively oversubscribed, and can only service a portion of needy families. To adapt to a hotter world, LIHEAP's budgets must increase and allocation formulas will need to be made more "cooling"-aware and equitable for hot-weather states. The FY25 presidential budget keeps LIHEAP's funding levels at \$4.1 billion, while also proposing expanding eligible activities that will draw on available resources. The National Energy Assistance Directors Association recent analysis found that this funding level could cut ~1.5 million families from the program and cut program benefits like cooling.

Another key issue is that 31 states have no policy preventing energy shut-offs during excessive heat events and even the states that have policies vary widely in their cut-off points. These cut-off policies are all set at the state level, and there is still an ongoing need to identify best practices that save lives. While the Public Utility Regulatory Policies Act of 1978 (PURPA) prohibits electric utilities from shutting off home electricity for overdue bills when doing so would be dangerous for someone's health, it does not have explicit protections for extreme weather (hot/cold). Reforms to PURPA could be considered that require utilities to have moratoriums on energy shut-offs during extreme heat seasons.

Finally, grid resilience will become even more essential in a hotter climate. Power outages and blackouts during extreme heat events are deadly. If a blackout were to occur in Phoenix, Arizona during the summer, nearly 900,000 people would need immediate medical attention. Rising use of AC itself is a risk factor for blackouts due to increases in energy demand. The North American Electric Reliability Corporation (NERC), a regulatory organization that works to reduce risks to power grid infrastructure, issued a dire warning that two-thirds of the U.S. are facing reliability challenges because of heatwaves. Ensuring grids are ready for the climate to come should be top priority for DOE, the Federal Emergency Management Agency (FEMA), and the Federal Energy Regulatory Commission (FERC). Given the risks to human health, the Centers for Disease Control and Prevention (CDC) should work with public health organizations to prepare for blackouts and grid failure events.

Address Critical Needs of Confined Populations Facing Heat

Confined populations, whether because of their medical status or legal status, are vulnerable to extreme heat indoors. Long-term care facilities are required by law to keep properties within 71-81°F. Yet, long-term care facilities are reporting challenges actually meeting resident's needs in a disaster, such as a power outage, calling for a need for more coordination with CMS.

Incarcerated populations on the other hand are not guaranteed any cooling, even as summers become more brutal. This directly leads to an increase in deaths, 45% of U.S. detention facilities saw spikes in deaths on hazardous heat days from 1982 to 2020. Despite this lack of sufficient cooling being “cruel and unusual” punishment, there has been no public activity to date from the Department of Justice to secure cooling infrastructure for federal prisons or work with state prisons to expand cooling infrastructure. The National Institute of Corrections does recommend ASHRAE 55 Thermal Environmental Conditions for Human Occupancy to corrections institutions, though this metric needs to be updated for our evolving understanding of extreme heat’s risks to human health.

FOOD SECURITY AND MULTI HAZARD RESILIENCE

Anticipate and Prevent Supply Chain Disruptions

Hotter temperatures are changing the landscape of American and global food production. 70% of global agriculture is expected to be affected by heat stress by 2045. Recent heat waves have already killed crops and livestock en masse, leading to lower yields and even shortages for certain products - like olive oil, potatoes, coffee, rice, and fruits. Rising heat is also poised to reshape local and state economies that rely on their changing climatic capabilities to produce certain crops. Oranges, a \$5 billion dollar industry for Florida, are struggling in the heat which stresses the trees and provides fertile ground for pathogens. As a result, Florida is facing its worst citrus yield since the Great Depression. A decrease in winter chill is another growing risk, as many perennial crops have adapted to certain amounts of accumulated winter chill to develop and bloom. Winter-time heat is shaking up plants’ biological clocks, decreasing quality and yield. Overall, extreme heat is impacting American household bottom lines in the short-term and long-term through heat-exacerbated earning losses and spiking food prices.

Ensuring ongoing access to critical commodity and specialty agricultural products in a future of higher temperatures is a national security priority. Resilience of products to extreme heat could be included as a future requirement in the Federal Supplier Climate Risks and Resilience Rule that governs Federal Acquisition Regulations. Further, FAS’ work scoping the federal landscape has shown there are few federal research and development programs, financial assistance opportunities, and incentives for heat resilience, and our interviewees concurred with that assessment. The U.S. Department of Agriculture (USDA) can prepare farmers for future climate risks and hotter temperatures, ensuring consistent food production and reducing the losses and needed economic pay-outs from the USDA through crop insurance and disaster assistance. The USDA can accelerate advances in biotechnology and genetic engineering to improve heat resilience of agricultural products while also encouraging practices like shade, effective water management, and soil regeneration that build system-wide resilience. As Congress continues to consider reauthorizations and appropriations for the Farm Bill, they should consider fully funding the Agriculture Advanced Research and Development Authority to advance resilient agriculture R&D while also increasing funding to the USDA Climate Hubs to support roll-out of heat resilient practices.

Connect Drought Resilience and Heat Resilience Strategies

Hotter winters have literal downstream consequences. Warming is shrinking the snowpack that feeds rivers, leading to further groundwater reliance, straining aquifers to the brink of complete collapse. Warmer temperatures also leads to more surface water evaporating, thus leaving less to seep through the ground to replenish overstressed aquifers. Rising temperatures also mean that plants need more water, as they evapotranspire at greater rates to keep their internal temperatures in-check. All of these factors compound the growing risk of drought facing American communities. Drought, now made worse by high heat conditions, accounts for a significant portion of annual agricultural losses. 80% of 2023 emergency disaster designations declared by the United States Department of Agriculture (USDA) were for drought and/or excessive heat. Secure access to water is an escalating catastrophe, and to address it requires a national strategy that accounts for future hotter temperatures and how they will put strain on water accounts necessary to sustain agricultural production and human habitation.

Heat and dry weather/drought also combine to make prime conditions for megawildfires. The smoke then generated by these fires compounds the health impacts of extreme heat, with research showing that concurrent effects of heat and smoke drive up the number of hospitalizations and deaths. More funding from Congress is needed to improve wildfire forecasting and threat intelligence in the era of compounding hazards.

PLANNING AND RESPONSE

Reform the Benefit-Costs Analysis

Benefit cost analysis (BCA) is a critical tool for guiding infrastructure investments, and yet is not set up to account for the benefits of heat mitigation investments. When the focus of the BCA is mitigating property damage and loss of life, it will discount impacts that go beyond those damages such as economic losses, learning losses, wage losses, and healthcare costs. Research will likely be needed to generate the pre-calculated benefits of heat mitigation infrastructure, such as avoiding heat illness, death, and wage losses and preventing widespread power failures (a growing risk). Further, strategies that enhance an equitable response, articulated in the recent update to the Office of Management and Budget's Circular A-4, need to be quantified. This could include response efforts that protect the most vulnerable populations to extreme heat, such as checking in on heat sensitive households identified by the CRE for Heat. Developing these metrics will take time, and should be done in partnership with agencies like the DOE, EPA, and CDC. Finally, FEMA's BCA is often based on a single hazard, the one with the highest BCA ratio, making it more challenging to work on multi-hazard resilience. FEMA should develop BCA methods that allow for accounting of an infrastructure investment for community resilience to many hazards (like resilience hubs).

Create the "Plan" for How the Federal Emergency Management Agency and Others Should Respond to an Extreme Heat Disaster

Extreme heat's extended duration, from a few days to several months, poses a significant challenge to existing disaster policy's focus on acute events that damage property. An acute focus on infrastructure damages by FEMA has been an insurmountable barrier to all past attempts to declare extreme heat as a disaster and receive federal disaster assistance. Because in theory, FEMA can reimburse state and local governments for any disaster response effort that exceeds local resources, including heat waves. Our interviewees acknowledged that federal recognition that heat waves are disasters will only come with extending the definition of *what* a disaster is.

New governance models will need to be created for climate and health hazards like extreme heat, focusing on an adaptation forward, people-centered disaster response approach given the outsized impact of heat hazards on human health and economic productivity. Such a shift will challenge the federal government's existing authorities authorized under national disaster law, the Stafford Act, which at this current moment does not consider "human damages" beyond loss of life. Thus, we do not see how existing infrastructure *fails* to provide critical function during these heat hazard events, such as secure learning, secure workplaces, secure municipal operations, secure healthcare delivery, and resultantly strains or exceeds local resources to respond. By quantifying more of these damages, there will then be an existing incentive to design responses that address current impacts and plan for and mitigate future impacts.

Finally, there are highly-risky heat disasters that we need to be executing planning scenarios for, specifically an extended power outage in a city under high-heat conditions. A power outage during the summer in Phoenix would send 800,000 people to the emergency room, which would very likely overwhelm local resources and those of all surrounding jurisdictions. There is a need for a power outage during an extended heat wave to be an included planning scenario for emergency management exercises lead by state and local governments. FEMA should produce a comprehensive list of everything a city needs to be prepared for a catastrophic power outage.

Spur Insurance and Financing Innovation

While insurance is the countries' largest industry, few insurance products and services exist in the U.S. to cover the losses from extreme heat. The U.S. Department of the Treasury recently acknowledged this lack of comprehensive insurance for extreme heat's impacts in its comprehensive report on how climate change worsens household finances. Heat insurance for individuals could manifest in a variety of ways: security from utility cost spikes during extreme weather events, real-estate assessment and scoring for future heat-risk, "worker safety" coverage to protect wages during extremely hot days where it might be unsafe to work, protections for household items/resources lost due an extended blackout or power outage, and full coverage for healthcare expenses caused by or exacerbated by heat waves. California is currently leading the country on thinking through the role of the insurance industry in mitigating extreme heat's impacts, and should be a model to watch by federal stakeholders to see what can be scaled and replicated across the nation.

Further, it is important that investments made today are resilient for the climate conditions of tomorrow. The Office of Management and Budget's November 2023 memo on climate-smart infrastructure, currently being implemented, provides technical guidance on how federal financial assistance programs can and should be invested in climate resilience. A yet unexplored financial lever for climate resilience identified in our interviews is federally-backed municipal bonds. Climate change is undermining this once stable investment, as cities and local governments struggle to pay back interest due to the rising costs of addressing hazards. The municipal bond market could price climate risk when deciding on interest payments, and give beneficial rates to jurisdictions that have done a full analysis of their risks and made steps towards resilience.

Finally, there is a need to update assessments of heat risk that are used to make insurance and financial decisions. Recent research by the DOE has found that the FEMA NRI property damage data appear to be deficient and underestimate damages when compared to published values for recent U.S. extreme temperature events. To start, FEMA should consider including metrics in its NRI that characterize the building stock (i.e. by adherence to certain building codes) and its thermal comfort levels (even with cooling devices) as well as thermal resilience.

Incorporate Future Climate Projections into Planning at All Levels

Recent research has shown that cities and counties are barreling toward temperature thresholds at which it would be dangerous to operate municipal services, affecting the operations of daily life. Yet little of this future risk is accounted for in the various planning activities (for public health, emergency preparedness, grid security, transportation, urban design, etc) done by local and state governments. Our interviewees expressed that because many plans are based on historical and current risk data, there is little anticipation of the future impacts of hotter temperatures when making current planning choices.

One example stood out around nature-based solutions (NBS): while NBS has received over a billion dollars in federal funding and is argued as an approach to mitigate extreme heat's impacts - planners are not always considering whether the trees planted today will survive effectively in 20-30 years of warming. Reporting has shown that Southern Nevada is at risk of losing many of its shade trees due to inadequate species selection, as the trees that once thrived in this climate exceed their zones of heat tolerance.

Changes are being made to some federally-required planning processes to require assessment of future risk. FEMA's National Mitigation Planning Program now requires state and local governments to plan for future risks caused by climate change, land use, and population change to receive emergency disaster funds and mitigation funding. While extreme heat is a noteworthy future risk, it is not explicitly required in the new guidelines. As of April 2023, only half of U.S. states had a section dedicated to extreme heat in their Hazard Mitigation Plans.

Climate.gov, operated by NOAA, was a recommended starting place for a library of future climate files that can be brought into planning processes and resilience analysis. Technical assistance and decision-making tools that support planners in making predictive analyses based on future extreme temperature conditions can help inform

the effective design of resilient transportation systems, infrastructure investments, public health activities, and grids, and ensure accurate estimations of investment cost effectiveness over the measure lifetime.

DATA AND INDICES

Set Standards for Data Collection and Analysis

While official CDC-reported deaths from heat, approximately 1670 in 2022, exceed those from any other natural hazard, experts widely agree this number is an undercount. True mortality is likely at a rate of 10,000 deaths a year from extreme heat *under current climate conditions*. Many factors compound this systematic undercount: hospitals often do not consider extreme heat in their hazard preparedness plans, there's a lack of awareness around ICD-10 coding for heat illness, death attribution exacerbated/caused by heat is often attributed to other causes. Retraining the healthcare workforce and modernizing death counting for climate change will take time, our interviewees acknowledged. Thus, decision makers need better data and surveillance systems now to address this growing public health crisis. Excess deaths analysis could provide a proxy data point for the true number of heat deaths, and has already been employed by California to assess the impact of past heat waves. The CDC has utilized excess death methods in tracking the COVID-19 pandemic, and could apply this analysis to "climate killers" like extreme heat to inform healthcare system planning ahead of Summer 2024 (such as forecasting tools like HeatRisk). It will be critical to set a standard methodology in order to compare heat's impacts in different communities across the United States. True mortality is also essential to enhancing the benefit-cost analysis for heat mitigation and resilience.

Our conversations also highlighted the data gaps that exist around counting worker injuries and deaths due to extreme heat. For work-related heat-health impacts, injuries or deaths are often only counted if there's a hospital admission that is a required report, heat-exacerbated injuries (i.e. falls) aren't often counted as heat-related, and harms off the job (i.e. long-term kidney impacts) go unnoticed. Studies estimate that California alone saw 20,000 heat injuries a year, while The U.S. Department of Labor (DOL) reports only 3400 injuries a year nationally. DOL could track how overall workplace injuries correlate with temperature to develop a methodology that would yield much more accurate numbers around true heat impacts.

Finally, anticipating the full risks of heat due to factors like existing infrastructure, social vulnerability, and levels of community resilience, remains a work in progress. For example, FEMA's National Risk Index (which informs environmental justice tools like the Climate and Economic Justice Screening Tool and the Community Disaster Resilience Zones program) has notable limitations due to its reliance on previous weather data and narrow focus on mortality reduction, leading to underestimates of damages when compared to published values for recent U.S. extreme temperature events. There is a big opportunity to develop a standard data set for extreme heat risks and vulnerabilities in current and future anticipated climate conditions. This data set can then produce high-quality and relevant tools for community decision making (like FEMA's Flood Maps) and inform federal screening tools and funding decisions.

Create Regulatory Oversight Infrastructure for Extreme Heat

There are only a few regulatory levers currently in place or in the regulatory pipeline to protect Americans from the growing heat and build more heat resilient communities. These include the temperature standards for senior living facilities set by CMS and OSHA's upcoming heat standard. There are many more common settings: homes, schools and childcare facilities, transit, correctional facilities, and outdoor public spaces where regulations are needed. There will also need to be expanded *enforcement* of the regulations, including better monitoring of temperatures outdoors and indoors. HUD, EPA, and NOAA should work to identify expansion opportunities to indoor and outdoor air temperature monitoring, seeking additional funding from Congress where needed

Future regulations for mitigating extreme heat exposure can be conceptualized in the following three ways: technology standards, the required presence of a cooling and/or thermal-regulating technology, behavioral guidelines and expectations, required actions to avert overexposure, and performance standards, requirements that heat exposure cannot cross a certain threshold. These potential regulations will need to be conceptualized, reviewed, and implemented by several federal agencies, as authority for different aspects of heat exposure is fragmented across the federal government. Some examples of regulatory levers identified through our interviews (and introduced in previous sections) include:

- HUD could have standards for building performance that includes thermal comfort and safety, for its properties, backed-mortgages, and public housing it supports, as well as requirements for reducing building waste heat.
- DOE could expand its performance assessment and certification of energy efficiency products to those that also enhance thermal comfort and resilience.
- FEMA could require individuals, local governments, and state governments to do mitigation planning for extreme heat, and make resources then available to build community-scale thermal resilience.
- DOT could implement requirements for infrastructure projects to not increase urban areas UHI effects.
- EPA could further its analysis of the compounding effects of hot air and air pollution, and consider hotter air temperatures (such as those in UHIs) a risk to guaranteeing clean air.
- The Administration for Strategic Planning and Response (ASPR) could require hospital planning for surges in heat illness during heat waves to receive Hospital Preparedness Program funding.

Conclusion

Extreme heat, both acute and chronic, is a growing threat to American livelihoods, affecting household incomes, students' learning, worker safety, food security, and health and wellbeing. While the policy landscape for addressing heat is nascent, this report offers recommendations for near and long term solutions that policymakers can consider. Complimentary to FAS' [Extreme Heat Policy Sprint](#), we hope this report can be a toolkit for potential realistic actions.

Appendix

Featured Policy Recommendations

To Facilitate Government-Wide Coordination

- Through a presidential directive, the WHCPO should appoint a Deputy Director for Heat to lead the National Moonshot on Extreme Heat. The National Moonshot should establish an advisory committee to connect stakeholders with federal resilience programs, develop a comprehensive heat action plan, establish annual progress tracking, establish a centralized portal for local heat action planning, and implement the comprehensive plan across all relevant government agencies and departments.

To Accelerate Resilient Cooling Technologies, Building Codes, and Urban Infrastructure

- The federal government should employ policy actions for resilient cooling strategies, like high-energy efficiency cooling systems, demand/response systems, and passive cooling interventions. This can involve using Initiatives like the Department of Energy's (DOE) Affordable Home Energy Shot and the Environmental Protection Agency's Energy Star to bring low-power and resilient cooling technologies into reach for millions of Americans
- DOE can assist in conducting more demonstration projects for building strategies that ensure indoor survivability in everyday and extreme conditions.
- The GSA could amend its Facilities Standards for the Public Building Service (P100) to incorporate heat resilience. This could be accomplished by requiring compliance with existing green codes (e.g., ASHRAE 189.1/IgCC) that incorporate the energy and health benefits of thermal comfort.
- FEMA, DOT, EPA, and DOE should require that all projects include green and cool infrastructure investments in addition to any gray infrastructure deemed absolutely necessary to meet project goals. These agencies should require teams to submit a justification for funding of any dark and impervious surfaces proposed for project funding.

To Adapt Transportation to the Heat

- The Department of Transportation (DOT) should make extreme heat resilience explicit in its grant eligibility requirements as well as review the benefit-cost analysis (BCA) formula for these grants and how it might disadvantage cool infrastructure.
- DOT should leverage its research and development (R&D) capabilities to develop, demonstrate, and deploy highly reflective and cool materials.
- The Federal Highway Administration (FHA) should include standards that promote cool and green infrastructure within their specifications.

To Create More Heat-Resilient Schools for Sustained Learning

- Federal heat safety recommendations need to be created by the Department of Education (Ed), EPA, FEMA, the National Oceanic and Atmospheric Administration (NOAA), and others. Title I Grants, in alignment with Justice40, could then assist schools in adapting to climate change that includes researched guidance on ways to cool students indoors, outdoors, and through behavioral management.
- Ed should leverage its data-gathering capacities to understand how schools are currently experiencing extreme heat and what strategies are being employed to respond to heat exposure (closing schools, informed behavioral interventions to manage heat exposure, green infrastructure to build resilience, etc)

- Existing projects focused on school infrastructure upgrades should integrate consideration of heat mitigation into their programs.

To Make Housing and Eviction Policy More Climate-Aware and Resilient

- For new properties, the Federal Housing Finance Agency could require that they adhere to the latest energy codes to receive a mortgage from government-sponsored enterprises, which is already under consideration by Housing and Urban Development (HUD) and the U.S. Department of Agriculture (USDA) for their mortgage products. For older construction, there could be requirements for adequate cooling to exist in the property at the point of sale.
- For all property types, weatherization audits, through the Weatherization Assistance Program (WAP) and Low-Income Home Energy Assistance Program (LIHEAP), can be expanded to consider heat resilience and cooling efficiency of the property.
- HUD could update the Manufactured Home Construction and Safety Standards to require homes to perform to a certain level of cooling under high heat conditions.
- The Health and Human Services (HHS) Office of Community Services should request the addition of a question about access to working air conditioning at the census tract level to the American Community Survey (ACS). After a successful legal review, the OMB, Census Bureau, Subcommittee on Interagency Council on Statistical Policy, and subject matter experts should identify ways to ask the question in the ACS.

To Address Communities' Needs for Long-Term Infrastructure Funding Support

- FEMA could create a dedicated grant program for community heat resilience, modeling it off of California's \$200 million Extreme Heat and Community Resilience Program.
- The eligible actions of FEMA's Hazard Mitigation Assistance (HMA) should be expanded to include installation/upgrade of heating, ventilation, and cooling (HVAC) systems and nature-based solutions (NBS) like green space installation
- FEMA should create smaller disaster-assistance grants for extreme weather disasters –HMAG, CMAG, and SMAG (Heat, Cold, and Smoke Management Assistance Grants).

To Set Indoor and Outdoor Temperature Standards and Protections

- OSHA can create an advanced risk-monitoring system for heat in order to better pinpoint regulatory enforcement. DOL could support by tracking how overall workplace injuries correlate with temperature to develop a methodology that would yield much more accurate numbers around true heat impacts.
- A multi-agency working group convened by OMB should develop a plan to enhance coordination with public and private partners in the development and evaluation of evidence-based worker-centric cooling infrastructure technologies and building designs, establish a consensus definition of energy-efficient worker-centric cooling, and outline existing pathways to support an energy-efficient workplace cooling transformation.
- DOL and the Small Businesses Administration should establish a navigator program for resourcing energy-efficient, worker-centric cooling strategies, leveraging IRA funds.
- OSHA, universities, and nonprofit organizations should establish a cooperative agreement to create a program that promotes the enforcement of evidence-based heat protection strategies (e.g., education, hydration, heat acclimatization, environmental monitoring, and physiological monitoring) at the organizational level.

To Build the Extreme Heat Resilience Workforce:

- Encourage education on climate change and climate's health impacts for the healthcare workforce through federal programs that fund graduate medical education.
- DOE and EPA should collaborate on educational programs around strategies for building and community-scale resilience to extreme heat for weatherization and energy-efficiency contractors
- American Climate Corps and other TA programs could be leveraged to create heat resilience "community navigators" for IRA and BIL

To Build Healthcare System Preparedness

- CMS should collaborate with accrediting bodies to include climate change preparedness criteria in healthcare facility accreditation standards and integrate modules on extreme heat-related health impacts and accurate ICD-10 coding into medical education curricula. Make compliance with these standards a requirement for participation in Medicare and Medicaid programs, ensuring a consistent baseline of preparedness across the healthcare system.
- Allocate dedicated funds within HHS to establish Climate-Resilient Health System Grants. CMS and HRSA can administer these grants to healthcare organizations, enabling infrastructure upgrades, workforce training, and research focused on climate-related health challenges.
- ASPR should require HPP recipients to integrate extreme heat in the required coalition-led hazard and vulnerability assessments.

To Design Activation Thresholds for Public Health, Medical, and Emergency Responses

- CDC and ASPR could work to design "activation thresholds", markers that the hazard has reached a level of impact that needs additional capacity and resources, considering the most at-risk populations in the design process
- ASPR should collaborate closely with CDC and NWS to support the expansion of the HeatRisk prototype to include Healthcare and Public Health sector risk analysis (using ASPR-controlled healthcare data) integrated into SLTT heat response plans.
- ASPR should update NDMS response plans to align with forecast-based response triggers (labeled by HeatRisk). Integrate these plans into ongoing regional exercises that include HPP recipients. Identify specific NDMS forecast thresholds to trigger support for SLTTs, such as pre-positioning of personnel, resources, and provision of technical assistance.
- ASPR should develop heat-specific response guidance like heat-sensitive pharmaceutical guidance, heat-associated mass casualty triage, and resources for heat-related patient surges.
- Pathogen surveillance should be increased in correlation with existing climate conditions, which would greatly enable U.S. pandemic and endemic disease surveillance.

To Reduce Energy Burdens, Utility Insecurity, and Grid Insecurity

- LIHEAP's budgets must increase and allocation formulas will need to be made more "cooling"-aware and equitable for hot-weather states.
- DOE, the Federal Emergency Management Agency (FEMA), and the Federal Energy Regulatory Commission (FERC) should ensure grids are ready for extreme heat by identifying critical infrastructure vulnerabilities and prioritizing mitigation and response measures. To address health risks, the Centers for Disease Control and Prevention (CDC) should work with FEMA, FERC, DOE, and public health organizations to prepare for blackouts and grid failure events.

- HHS should allocate a greater share of non-formula, emergency LIHEAP funds for cooling needs, report back to state LIHEAP administrators through an annual dashboard of how a state compares to its proximal peers in cooling allocations and expand outreach and education to state LIHEAP administrators and subgrantees

To Address Critical Needs of Confined Populations Facing Heat

- CMS should increase its coordination capacity for assisting long-term care facilities' needs during times of disasters, such as a power outage
- The Department of Justice should source data on AC coverage in federal and state prisons, secure or require cooling infrastructure for federal prisons, and work with state prisons to expand cooling infrastructure.

To Anticipate and Prevent Supply Chain Disruptions

- The resilience of products to extreme heat could be included as a requirement in the *Federal Supplier Climate Risks and Resilience Rule* that governs Federal Acquisition Regulations.
- The U.S. Department of Agriculture (USDA) can accelerate advances in biotechnology and genetic engineering to improve heat resilience of agricultural products, encouraging practices like shade, effective water management, and soil regeneration that build system-wide resilience.

To Connect Drought Resilience and Heat Resilience Strategies

- A national strategy that accounts for future hotter temperatures and how they will put strain on water accounts should be established to sustain agricultural production and human habitation.
- The USDA should prioritize investments in lining irrigation canals, advancing water-saving irrigation, testing solar water management solutions, integrating renewable energy with agriculture, and fostering crops adapted to arid conditions and climate challenges.

To Reform the Benefit-Costs Analysis (BCA)

- BCAs for infrastructure grants should account for the benefits of heat mitigation investments.
- FEMA should develop BCA methods that allow for accounting of an infrastructure investment for community resilience to many hazards (like resilience hubs).
- FEMA should modify its BCA process to include mitigation of health and life-safety hazards, to better account for multi-hazard mitigation, and to address equity considerations introduced in OMB's recent BCA proposal.
- OMB and FEMA should support research to quantify the benefits of heat mitigation infrastructure, such as avoiding heat illness, death, and wage losses and preventing widespread power failures

To Create the “Plan” for How the Federal Emergency Management Agency and Others Should Respond to an Extreme Heat Disaster

- New governance models should be created for climate hazards that pose public health threats like extreme heat, creating an adaptation forward, people-centered disaster response approach
- Power outages during an extended heat wave should be included in the planning scenarios for emergency management required by the federal government and led by state and locals
- FEMA should produce a comprehensive list of everything a city needs to be prepared for a catastrophic power outage.
- DHS should enhance coordination between federal, state, tribal, and local emergency management agencies to integrate extreme heat considerations into disaster response and recovery planning. DHS

needs to develop heat-specific training programs for emergency responders, develop best practices for deploying cooling centers in high-risk areas, and implement public outreach campaigns to raise awareness about heat-related risks.

To Spur Insurance and Financing Innovation

- Treasury could consider the full range of potential insurance options for heat: security from utility cost spikes during extreme weather events, real-estate assessment and scoring for future heat-risk, “worker wage” coverage for days where it is unsafe to work, protections for household resources lost during an extended blackout or power outage, and coverage for healthcare expenses caused by or exacerbated by heat waves.
- SEC could price climate risk when deciding on interest payments for municipal bonds, and give beneficial rates to jurisdictions that have done a full analysis of their risks and made steps towards resilience.
- FEMA should consider including metrics in its National Risk Index that characterize the building stock (i.e. by adherence to certain building codes) and its thermal comfort levels (even with cooling devices) as well as thermal resilience.

To Incorporate Future Climate Projections into Planning at All Levels

- CEQ and OMB should consider future risks to nature-based solutions (i.e. extreme heat) as a part of government-wide efforts to scale nature-based solutions
- The White House should consider its role in coordinating nationwide climate-risk planning, through auditing plans required by CDC, ASPR, FERC, DOT, FEMA, and other agencies for their readiness for future climate conditions (i.e. extreme heat)
- FEMA should incorporate future projections of disasters into the National Risk Index (NRI), as the NRI currently only uses historical data on losses.

To Set Standards for Data Collection and Analysis

- CDC should set a standard methodology for excess deaths analysis for extreme heat to generate a more accurate estimate of total deaths. This should include modernizing data included in the National Syndromic Surveillance Program (NSSP) by tracking more conditions tied to modern health concerns, as well as school and work impacts.
- CDC should develop guidelines and funding for cities and states to expand their individual syndromic surveillance capabilities.
- FEMA can develop a standard data set for extreme heat risks and vulnerabilities in current and future anticipated climate conditions to produce high-quality tools for community decision-making (i.e. FloodMaps)
- EPA and NOAA should launch an interagency heat monitoring network. This would involve EPA including air temperature monitoring in their monitoring deployments and expanding their Heat Island Reduction program to include monitoring urban heat. EPA and NOAA should both help determine vulnerable communities, utilizing EPA’s Environmental Justice Screening and Mapping (EJScreen) Tool and the Heat Vulnerability Mapping Tool created by NIHHS. As part of the network, NOAA should develop additional air temperature sensors and build data infrastructure capable of supporting real-time monitoring.

To Create Regulatory Oversight Infrastructure for Extreme Heat

- OMB should identify more potential regulatory pathways to build extreme heat resilience, considering technology standards, behavioral guidelines and expectations, and performance standards (examples are listed in the report)

- HUD, EPA, and NOAA should identify expansion opportunities to indoor and outdoor air temperature monitoring, seeking additional funding from Congress where needed

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List of Acronyms

ACF	ADMINISTRATION FOR CHILDREN AND FAMILIES (WITHIN HEALTH AND HUMAN SERVICES)
ASPR	ADMINISTRATION FOR STRATEGIC PLANNING AND RESPONSE
CEQ	COUNCIL FOR ENVIRONMENTAL QUALITY
CDC	CENTERS FOR DISEASE CONTROL AND PREVENTION
CMS	CENTERS FOR MEDICARE AND MEDICAID
ED	DEPARTMENT OF EDUCATION
EOP	EXECUTIVE OFFICE OF THE PRESIDENT
EPA	ENVIRONMENTAL PROTECTION AGENCY
DHS	DEPARTMENT OF HOMELAND SECURITY
DOE	DEPARTMENT OF ENERGY
DOI	DEPARTMENT OF THE INTERIOR
DOJ	DEPARTMENT OF JUSTICE
DOL	DEPARTMENT OF LABOR
DOT	DEPARTMENT OF TRANSPORTATION
FEMA	FEDERAL EMERGENCY MANAGEMENT AGENCY
FERC	FEDERAL ELECTRICITY REGULATORY COMMISSION
GSA	GENERAL SERVICES ADMINISTRATION
HHS	HEALTH AND HUMAN SERVICES
HHS OASH	HEALTH AND HUMAN SERVICES OFFICE OF THE ASSISTANT SECRETARY FOR HEALTH
HRSA	HEALTHCARE RESOURCES AND SERVICES ADMINISTRATION
HUD	HOUSING AND URBAN DEVELOPMENT
IWG-EH	INTERAGENCY WORKING GROUP ON EXTREME HEAT
NOAA	NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NSF	NATIONAL SCIENCE FOUNDATION
NWS	NATIONAL WEATHER SERVICE
OMB	OFFICE OF MANAGEMENT AND BUDGET
ONCIT	OFFICE OF THE NATIONAL COORDINATOR FOR HEALTH IT
OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
SAMHSA	SUBSTANCE ABUSE AND MENTAL HEALTH ADMINISTRATION
SBA	SMALL BUSINESS ADMINISTRATION
SEC	U.S. SECURITIES AND EXCHANGE COMMISSION
USACE	U.S. ARMY CORPS OF ENGINEERS
USDA	U.S. DEPARTMENT OF AGRICULTURE
USGS	U.S. GEOLOGICAL SURVEY
WH CPO	WHITE HOUSE CLIMATE POLICY OFFICE

