The State of Arizona
Department of Emergency and Military Affairs

Heatwave Disaster Plan

Group 2

Nancy Daneau *NYU School of Global Public Health, Global Health Conc., New York University, New York N.Y., USA*

Tiffany Ragkaswar *NYU School of Global Public Health, Global Health Conc., New York University, New York N.Y., USA*

Vincent Aina *NYU School of Global Public Health, Environmental Sci. Conc, New York University, New York N.Y., USA*

Public Health Emergency Preparedness and Response
Spring 2023

NYU SCHOOL OF GLOBAL PUBLIC HEALTH

Table of Contents

Preface

This annex is a supporting document for the Emergency Operation Plan supporting the Department of Emergency and Military Affairs. The Division of Emergency Management coordinates the State of Arizona's emergency preparedness, response, and recovery efforts in order to reduce the impact of emergencies and disaster on people and property in the entire state. This emergency operation plan (EOP) provides the framework facilitating an effective statewide response to a catastrophic heatwave event in the state of Arizona. State and local agencies are advised to develop plans and draft agreements for support in the event of an emergency situation.

Heatwaves are dramatically increasing in the United States and worldwide; earth's average temperature has increased 0.14°F per decade since 1880 (pre-industrial age), which is about 2 degrees in total. (Lindsey et al., 2023). This is having a devastating impact on regional and seasonal temperature extremes. The public health impact of these extremes Is becoming clearer every year and is of grave concern because heat waves usually result in the highest annual mortality among other climatological /environmental hazards. **Heatwave is defined as a period of extremely high heat above 90°F over a period of 48 hours or more**.

Arizona, in particular, is one of the US states experiencing extremely high temperatures. Both day and nighttime temperatures are sharply rising due to climate change *combined* with unchecked building development. Green spaces have been built over and replaced by tarred roads, pavement, and concrete – all of which conserve heat for a longer period and release it slowly during the night hours, thus causing higher temperatures at nighttime. This process is known as the "Urban heat island effect."

A record-breaking heat wave was experienced in Phoenix Arizona for a 31-day period ranging from June 30 to July 30 with an average of 110°F breaking a record of 18 days set in 1974. Daytime temperatures soared to a high of 119°F (Schaudt & Davis-Young, 2023) Heat- related illnesses strike when people spend a lot of time in the heat or when they overexert themselves during excessive heat conditions. The elderly, young children, pregnant people, and those who are immunocompromised, sick, obese or have preexisting health conditions are highly susceptible to heat related illnesses.

Response to extreme heat in Arizona cities and counties, such as Maricopa County, include the increased availability of refuge from the heat as shown below in Figure 1.

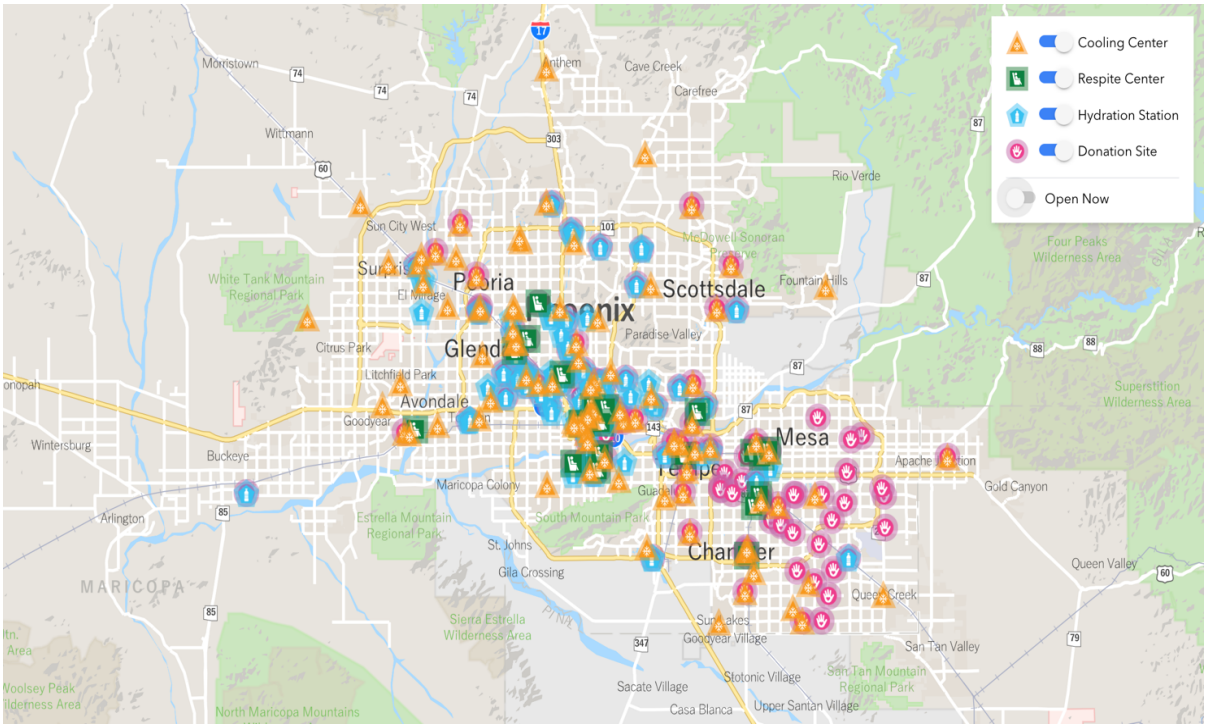


Fig. 1: Map of Maricopa County cooling centers, respite centers, hydration stations, and donation sites open to the general public.

The impact on the public's health is shown in Figure 2 below, with dramatically increased emergency department visits in Arizona over the past decade or so.

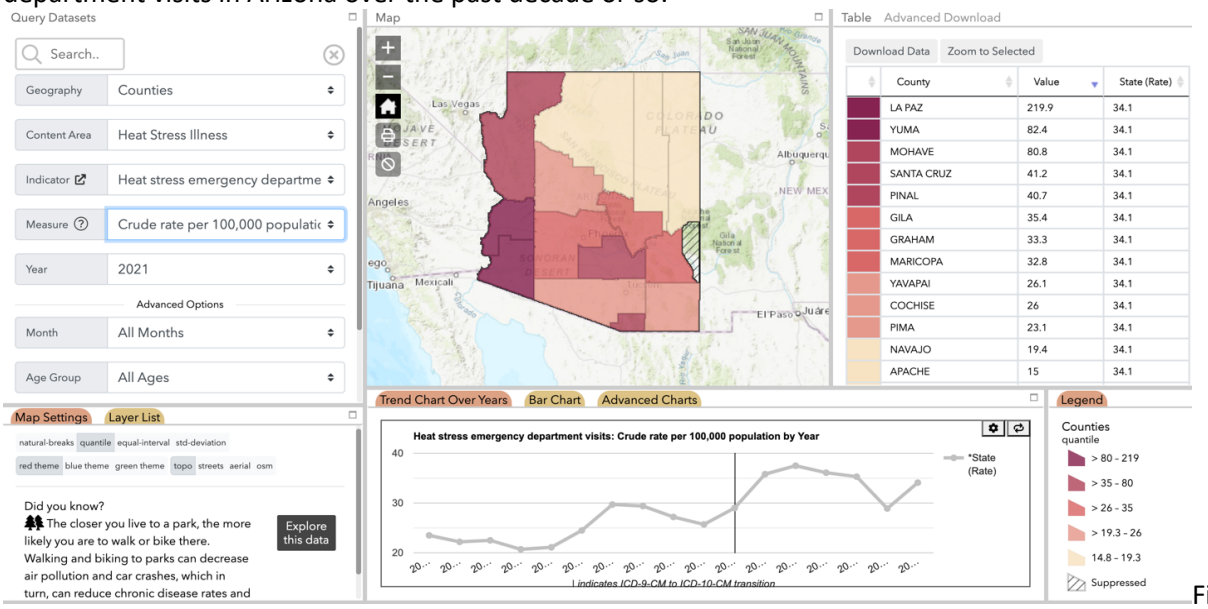


Fig. 2: Arizona ED Heat Stress Data.

Signature Page

THE UNDERSIGNED STAFF CONCUR WITH THE JURISDICTIONAL AND DEPARTMENTAL FEATURES OF THE FOLLOWING EARTHQUAKE DISASTER PLAN GUIDE.

_____ _____

Robert Rowley CEM, MEP Date
Director
Maricopa County Department of Emergency Management

_____ _____

Gabe Lavine Date
Director, Division of Emergency Preparedness
Arizona Department of Emergency and Military Affairs

_____ _____

Kerry L. Muehlenbeck Date
Director - Adjutant General.
Arizona Department of Emergency and Military Affairs

MISSION STATEMENT

The Arizona Department of Emergency and Military Affairs (DEMA) coordinates emergency services and efforts of governmental agencies to reduce the impact of disasters on persons and properties in Arizona. They are also committed to strengthening relationships with the tribes in Arizona through effective collaboration and communication.

STATEMENT OF PURPOSE

The purpose of this plan is to ensure a seamless and coordinated response in the event of extreme heat waves. This plan details the Arizona DEMA recommendation to promote efficiency, which will ultimately save lives and property.

AUTHORITIES

The Arizona Department of Emergency and Military Affairs (DEMA) consists of the Arizona National Guard (Air, Army, Joint Task Force), the Division of Emergency Management and the Division of Administrative Services. DEMA is under the command of the Governor of Arizona, followed by the Adjutant General of Arizona, who concurrently serves as the Director of the Arizona Department of Emergency and Military Affairs. The Director of emergency Management manages the state's emergency preparedness, response, recovery, and mitigation efforts.

The Arizona Constitution (Article 16) provides for a militia of able-bodied citizens of the state, between 18 – 45 years of age. "The Organized militia shall be designated 'The National Guard of Arizona', 'and shall consist of such organized military bodies as now exist under the laws of the territory of Arizona or as may hereafter be authorized by law". A.R.S. § 26-101 et seq. outlines state law regarding both military affairs as well as emergency management.

Administrative rules are found in the Arizona Administrative Code, Title 8, Chapters 2 through 4. Laws 1972 Chapter 192 established the current organization of the department. Except for authority expressly reserved for the Governor, the Adjutant General is responsible for emergency management and all emergency activities are subject to the approval of the adjutant general. (A.R.S. §26-102).

In times of emergency, the Director serves as the Governor's authorized representative and administers funds allocated from emergency declarations. The Director also serves as a non-voting member of the Military Affairs Commission (A.R.S.§ 26-261) and as a member of the State Emergency Council (A.R.S.§ 26-304).

DEFINITIONS

HEAT WAVES: A prolonged period of excessively hot weather, which may be accompanied by high humidity. Heat waves are characterized by significantly above-average temperatures for a particular region during a specific period, often extending for several days or even weeks. The exact threshold for what constitutes a heat wave can vary depending on the climate and typical weather patterns of the area in question. Heat waves can have various health, environmental, and societal impacts. They can lead to heat-related illnesses, and strain on energy resources (such as increased demand for air conditioning), and can be particularly dangerous for vulnerable populations, including the elderly, children, and those with preexisting health conditions. Heat waves can also contribute to drought conditions, wildfires, and other environmental concerns.

Local meteorological agencies and organizations often issue heat advisories and warnings to inform the public about the risks associated with heat waves and to provide guidance on how to stay safe during extreme heat events.

HAZARD ANALYSIS SUMMARY: It is a concise document or report that provides an overview of the findings and conclusions from a hazard analysis process. Hazard analysis is a systematic approach used in various fields, including safety engineering, risk management, and quality assurance, to identify potential hazards, assess their risks, and develop strategies to mitigate or manage those risks. A hazard analysis summary is a valuable tool for organizations to communicate the results of their hazard analysis efforts to stakeholders, make informed decisions, and prioritize safety and risk management initiatives. It serves as a reference document for ensuring that appropriate measures are in place to protect people, assets, and the environment from potential hazards.

AT-RISK INDIVIDUALS: These are individuals who have a higher likelihood of experiencing negative outcomes or harm in specific situations or circumstances due to various factors. These factors may include their health status, age, socioeconomic background, or other vulnerabilities.

EMERGENCY PREPAREDNESS: Refers to the process of planning, organizing, and implementing measures to mitigate the impact of emergencies or disasters. These emergencies can range from natural disasters like hurricanes, earthquakes, floods, and wildfires to human-made incidents such as industrial accidents, terrorist attacks, or public health crises like pandemics. The goal of emergency preparedness is to enhance the ability of individuals, communities, organizations, and governments to effectively respond to and recover from such events.

RESOURCE ALLOCATION: Ensuring that necessary resources, such as personnel, equipment, supplies, and facilities, are available and accessible during emergencies. This may involve stockpiling essential items and coordinating with local, regional, and national agencies.

DISASTER: An event that overwhelms our local resources beyond those needed to respond to emergency situations.

EMERGENCY*:* Can be defined to be an immediate threat to health, life, property, or the environment.

COMMUNICATIONS PLAN

Establishing effective communication systems and protocols for sharing information before, during, and after an emergency is of critical importance. Timely and accurate communication is crucial for coordinating response efforts and keeping the public informed. Communication methods may include, but are not limited to the following:

- Phones
- Traditional media (TV, Radio etc.)
- Social media
- Press Releases
- Internal Email
- 800 MHz Secure Radio
- WebEOC
- EMResource

MUTUAL AID AGREEMENT

The Arizona Department of Emergency Management and Military Affairs will receive mutual aid from:

1. **Local Emergency Response Agencies**: Local fire departments, law enforcement agencies, emergency medical services (EMS), and other local government entities within Arizona often collaborate to provide mutual aid when needed.

2. **Neighboring States**: Arizona may have mutual aid agreements with neighboring states, such as California, Nevada, New Mexico, and Utah, to share resources and personnel during large-scale emergencies or disasters that require cross-border assistance.

3. **Federal Agencies**: Depending on the severity of the situation, federal agencies like Federal Emergency Management Agency (FEMA) and the National Guard may provide support to Arizona through mutual aid agreements or federal disaster declarations.

4. **Non-Governmental Organizations (NGOs):** Various non-profit organizations, such as the American Red Cross and volunteer groups like Community Emergency Response Teams (CERT) can also be activated to support during emergencies.

5. **Private Sector Partners**: Private companies and utilities may provide resources and support in cases where their expertise or infrastructure is needed to address emergency situations.

Concept of Operations (CONOPS)

Concept of Operations: Due to the increased incidence of extreme heatwave parameters, as noted by world leaders at the 2023 U.N. Climate Change Conference in Dubai, with projections that the planet's average global temperature could breach a key planetary warming benchmark: 1.5 degrees Celsius (2.7 degrees Fahrenheit) above preindustrial levels, effective and efficient action is needed to assess the needs, available resources, and evaluate the effectiveness of heatwave disaster response by the Arizona Departments of Health.

1. The organizational structure for coordinating response to heatwave or heat emergency includes the Arizona state department of emergency and military affairs (DEMA). Other key roles in the command structure include the director of the division of emergency management, the safety officer and the public information officer comprise the command structure. directors of the division of administrative services, and the district of health office liaison consisting of the chief of the Arizona department of health.
2. The approach to organization and coordination through planning to ensure response to existing public health emergencies consists of the planning department's responsibilities overseen by the planning chief. The department is then divided into six subgroups consisting of the resource unit, documentation unit, situation unit, technical specialist-data analysis unit, technical specialist-special needs unit, and demobilization unit.
3. The operational activities in regard to the agency's roles and responsibilities consists of the Operations Chief responsibilities divided into three subgroups consisting of the environmental response branch, clinical service branch, and the epidemiologic and surveillance branch director. The environmental response branch responsibilities are facilitated by the hazard evaluation and response unit. The clinical services branch responsibilities are segmented across the ambulatory services unit, hospital services unit, air operations unit, and psychological services unit. The epidemiologic and surveillance branch director's responsibilities are segmented across the surveillance unit and the investigation unit.
4. The deployment of specific activities and procedures consists of identifying/the assessment of needs in order to determine the prevention, protection, mitigation, response, and recovery framework on the national and federal levels. Thus, determining the operational, reginal, state/tribal/territorial, and local emergency strategic plan.
5. Surge capacity to avoid overwhelming local, state, federal and private facility resources during extreme heatwaves in Arizona relies on community preparation to build resilience in regard to the creation of medical needs shelters, alternative care sites, and extended treatment areas. This is necessary in building sustainable systems to ensure populations determinants of health are met on the local, state, federal, and private levels.

Identification of the Local Public Health Agency (LPHA) response roles and associated response functions for:

i. **Command and Control:** Local, state, federal, and private sectors working in conjunction with one another to control and mitigate the hazards associated with extreme heatwaves in Arizona. This can be achieved through the conduction of Hazard Vulnerability Analysis (HVA) can be used to

promote health awareness and education for vulnerable populations regarding extreme heatwave protocols.

ii. **Communication:** Consists of the development of interdepartmental, media relations, public information, joint information centers, and partner notification to ensure effective and efficient methods are being employed to combat extreme heatwave disasters through sending, receiving, and interacting communication proceedings.

iii. **Early Recognition and Surveillance:** Consists of the interconnected operation sources to improve coordination centers, information sharing support, domestic and international communication, and surveillance sources to ensure early recognition is implemented to mitigate the disruption of extreme heatwave disasters in Arizona.

iv. **Investigation:** Meeting with local elected officials and skilled public health professionals consists of the investigation and advancement of emergency preparedness of hospital response resources through the development of hospital planning, training, and exercises regarding extreme heatwave disaster management.

v. **Epidemiology:** The incidence, distribution, and control of health factors to mitigate the onset of extreme heatwaves through evidence-based approach and practices.

vi. **Sample Testing**

   a. Packaging and shipment of regulatory medical equipment (e.g. supplies such as food, water, etc.) is necessary to ensure resources are being distributed in an effective and efficient manner to avoid disastrous hazards due to the emergence of extreme heatwaves in Arizona.

   b. The capability to transport specimens/samples through proper transportation parameters to ensure precautions are implemented regardless of the limitation of utilities such as not being able to access lab cultures/results due to calendar/time constraints.

vii. **Evidence Management:** Organized and accessible approaches to epidemiologic reports and patient medical records are necessary to ensure protocol management is being implemented to mitigate extreme heatwave severity.

viii. **Mass Prophylaxis and Immunization:** Are necessary to ensure proper health-related treatment-based services are being implemented to ensure populations are provided with the medical equipment and resources.

ix. **Mass Patient Care:** Proper strategies to avoid overcapacity concerns within emergency facilities should be implemented to ensure the highest quality of care in regard to extreme heatwave hazards.

x. **Mass Fatality Management:** Proper strategy plans should be implemented through data transparency and health education of federal, state, local and regional levels to ensure populations are provided with timely information regarding extreme heatwave preparedness strategies to decrease morbidity and mortality.

xi. **Environmental Surety:** Ensures the compliance of service providers with federal, state, local and regional regulations regarding environmental policies to prevent the onset of extreme heatwave hazards in Arizona.

xii. **Mental Health of Public Health Emergency Response Personnel:** Providing populations with treatment-based care and equipment to mental clarity/empowerment and mental health services to ensure communities mental health is being taken care of prior/during the onset of extreme heatwave disasters.

References

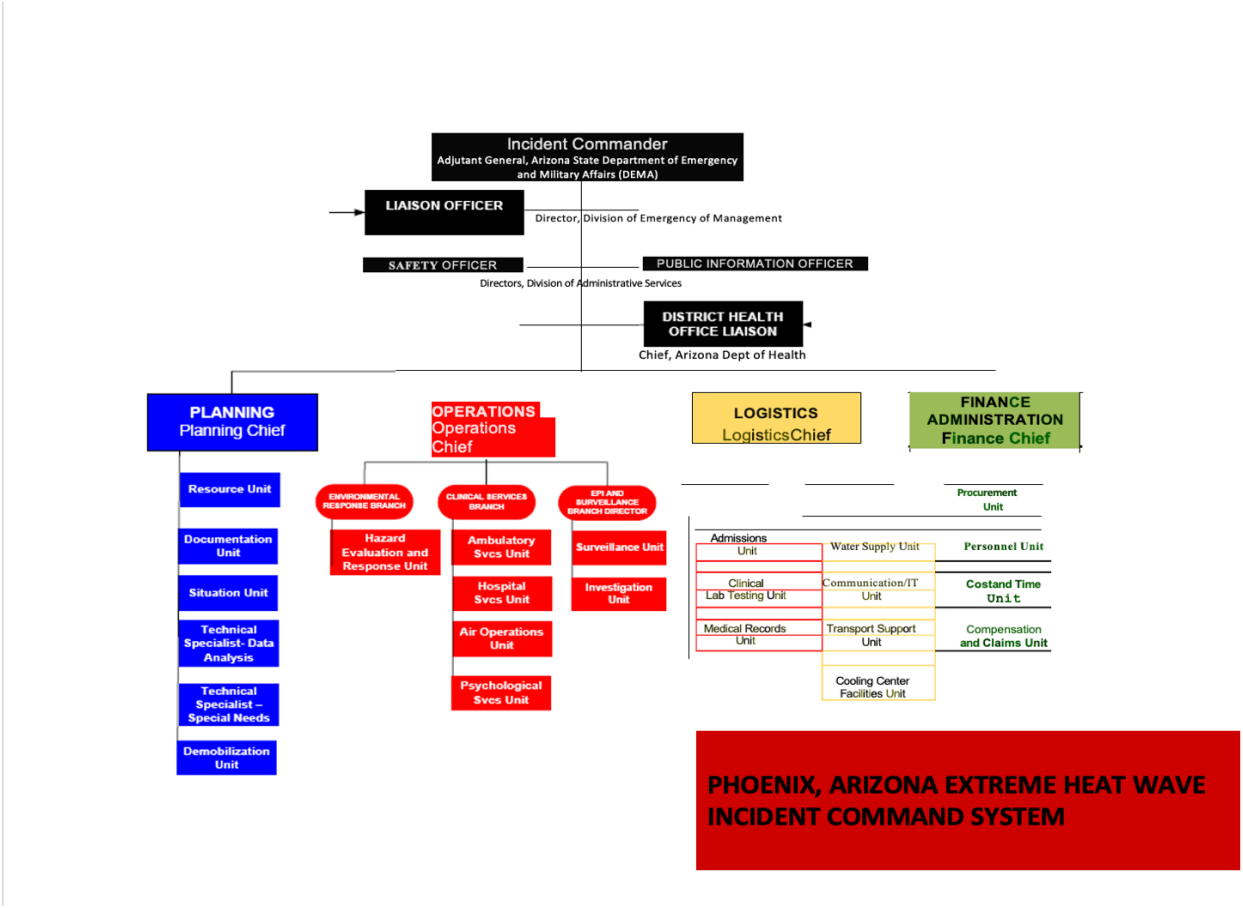
- *Emergency management*. Emergency Management | Department of Emergency and Military Affairs. (n.d.). https://dema.az.gov/emergency-management
- Arizona Department of Emergency & Military Affairs Division of ... (n.d.). https://dema.az.gov/sites/default/files/2023-02/FY23_Border_Fencing_and_Technology_ProgramFinal.pdf
- *Handson Greater Phoenix: Partner: Arizona Department of Emergency and Military Affairs (DEMA)*. HandsOn Greater Phoenix | Partner. (n.d.). https://www.handsonphoenix.org/organization/001A000000ltgUoIAI
- Extreme heat incident annex - arizona department of health services. (n.d.-b). https://www.azdhs.gov/documents/preparedness/emergency-preparedness/response plans/extreme-heat-incident-annex.pdf
- Schaudt, S., & Davis-Young, K. (2023, August 2). *Here's how hot it was in Phoenix every day in July*. KJZZ. https://kjzz.org/content/1853724/heres-how-hot-it-was-phoenix-every-day-july
- Lindsey, R., & Dahlman, L. (2023, January 18). *Climate change: Global temperature*. NOAA Climate.gov. http://www.climate.gov/news-features/understanding-climate/climate-change-global-temperature
- Public Health Surge Capacity and Community Resilience. Accessed October 30, 2023. https://www.ncbi.nlm.nih.gov/books/NBK311257/.
- Biological incident annex to the response and recovery federal ... Accessed October 30, 2023. https://www.fema.gov/sites/default/files/documents/fema_npb_biological_incident annex__20230630.pdf.
- *AZDHS: Epidemiology & Disease Control - Heat Safety*. Arizona Department of Health Services. (n.d.). https://www.azdhs.gov/preparedness/epidemiology-disease-control/extremeweather/heat-safety/index.php#heat-home
- COP28 climate summit begins in Dubai: Live updates and agenda - the ... (n.d.). https://www.washingtonpost.com/climate-environment/2023/11/30/cop28-climate-summit-dubai-begins/

Annex 1 - Threat and Hazard Identification and Risk Assessment (THIRA)

Natural	Technological	Human caused
Flash Flooding: In Arizona, flash floods occur any time in the year. The probability of flash flood is very high whenever it rains, and more caution should be taken especially between July and September when there is rapid development of thunderstorm. On Labor Day of 1970, Tropical Storm Norma. Which is believed to be the deadliest storm in the history of Arizona struck. There were 23 confirmed deaths in Central Arizona which included 14 flash floods on Tonto Creek in the Kohl's Ranch vicinity. A total of 11.92 inches of rainfall was recorded at Workman Creek, with 11.40 inches falling over a 24-hour period. **Droughts:** Majority of the state of Arizona has remained dry, two main counties that have experience below average precipitation in the month of August 2023 are Maricopa and Gila counties. Acute (D2) drought returned to the state (18% total), majorly in the central and southeastern counties. **Wildfires:** The state of Arizona has the largest ponderosa pine forest globally and due to this northern Arizona is very prone to wildfires. A new study by The Nature Conservancy in Arizona and Oregon, The University of Montana and the USDA Forest Service shows Arizona also has some of the largest carbon emissions when fires spark and lingering effects on the climate. Trees not only produce oxygen, but they also capture carbon. So, when a wildfire hits an unmanaged forest, more trees burn, few regrow, and more carbon is released into the atmosphere over time. **Heat related illnesses**: This is rampant mainly during the extremely hot summer season. The populations at risk from heat-related illnesses are vast with varied ages, preexisting health conditions, socio-	**Industrial Spillage:** Over the past four decades, a troubling pattern has emerged concerning industrial safety in and around Phoenix, Arizona. A thorough examination reveals a staggering total of 242 incidents involving storage tank accidents. An in-depth analysis of these incidents illuminates the root causes, with a significant 74% of these accidents directly linked to petroleum refineries, oil terminals, or storage facilities. Alarmingly, a staggering 85% of these accidents were marked by fire and explosions, intensifying the need for heightened safety measures and increased vigilance in these critical industrial sectors. It is essential to recognize that these fire incidents can significantly contribute to the extreme heatwaves regularly experienced in Phoenix, Arizona, making the imperative for safety even more pressing. **Pipeline Explosions:** On August 21, 2021, the Coolidge Police Department received a distress call concerning a ruptured natural gas pipeline. Upon arrival, officers were confronted with a harrowing sight, towering flames shooting over 250 feet into the Arizona sky forming a distinctive "V" shape. These ferocious flames engulfed a farmhouse and left the nearby surroundings charred and devastated. It is crucial to recognize that incidents of this magnitude have a profound impact on exacerbating the intensity of heatwaves in the region. **Chemical Spillages**: In Feb 2023, a significant incident unfolded on an interstate highway near Tucson, Arizona, serving as a stark reminder of the potential hazards posed by transportation accidents involving toxic and flammable chemicals. In this alarming event, a tanker carrying nitric acid	**Urbanization**: Change in land use such as conversion of natural vegetation into urban areas can create what is known as Urban heat island; this basically means urban areas with extensive asphalts and concrete areas can absorb and later emit heat which is a major contributory reason why urban areas are significantly hotter than rural or less developed areas. **Deforestation**: Between 2001 to 2022, Arizona lost about 254kha of tree cover which is equivalent to 14% reduction in tree cover since 2000 and approximately 57.3Mt of carbon dioxide emission which has led to the region's significant lack of vegetation and natural ground cover, coupled with its stony landscape, has given rise to a concerning phenomenon related to the urban heat island effect. During the day, the landscape absorbs and retains heat, failing to cool down significantly at night. This persistence of high temperatures compels residents to rely on their air conditioning systems even after sundown in an attempt to alleviate the relentless grip of the ongoing heatwave. It is crucial to note that records and reports, such as those published by the Arizona Republic newspaper, consistently emphasize that the most vulnerable individuals in these challenging conditions are the unhoused population. **Burning of Fossil Fuel:** Three out of the hundred most polluting power plant in the U.S are located in Arizona. The total emission of Arizona's top ten power plants are thirty million metric tons (the equivalence of 6.5 million cars annual emission) These ten facilities are fossil fuel powered, 3 primarily coal-fired plants and 7 primarily methane gas-fired plants. When fossil fuels are burned for production of electricity, greenhouse gases are released into the atmosphere, including carbon dioxide,

economic factors, religious beliefs, and locations. Heat stroke is fast setting and has a high mortality rate. Early identification and prevention are essential in prevention.	overturned, leading to a perilous leak of its highly toxic and volatile cargo. The ensuing wreckage resulted in a major road closure that disrupted normal traffic flow for several hours. Fortunately, swift action by first responders proved instrumental in containing the spill and averting a more catastrophic outcome. This incident occurred just eleven days after another transportation mishap, this time involving the Norfolk South freight train in eastern Ohio. The train derailment ignited a fierce fire, releasing a plume of toxic fumes and smoke that blanketed the town of East Palestine. The severity of the situation prompted the evacuation of thousands of residents. It is crucial to recognize that such transportation accidents, especially when combined with toxic chemical releases and fires, can significantly compound the challenges posed by heatwaves, further negatively impacting the well-being of the people in Phoenix, Arizona.	methane, and nitrous oxide, which are the major driving force of global warming.

Annex 2 – Incident Command System (ICS) Chart



Annex 3 - Community Training Focused on a Mitigation Strategy

Extreme Heatwave Identification and Protection Strategies Training	
Objectives of your Community Training (What mitigation strategy are you advocating?)	Provide community groups and individuals/households with risk mitigation strategies to prevent and combat the effects of extreme heatwave; knowledge about symptoms to look for, and basic lifesaving response interventions
Estimate Length of Training	1 – 1.5 hours

Target Audience and Max Size of Audience	• 2 groups comprised of:
	  ○ EMS and/or health service providers
	  ○ Community members*
	• Ideal max size is no larger than 50 people
	
	*Those most at risk: children under the age of 5; adults 65 and older; the elderly who live alone; and individuals/families whose income is below the poverty line[1]. Also need to focus on including outside worker and tribal communities

Who Would Be a Good Candidate (e.g., structural engineer, health dept. official, first responder?) as Facilitator of this Session? Why?	A panel/joint effort would be best and should be comprised of: • Department of Health Services Representative • Member of local Fire/EMS department • Hospital Clinical Coordinator/Health Care Provider • Two Community Advisory Board Member Representatives; one aged 65 or older • One child and one teacher from a local elementary, middle, and high school
What Do You Want Community Members to Do as a Result of Their Attending this Session?	1. Sign up for Department of Health emergency alerts 2. Know when to stay inside because of heat index concerns 3. Access the heat index dashboard for Phoenix, AZ, and surrounding areas 4. Be able to recognize heat illness signs and symptoms (heat exhaustion, heat stroke, hyperthermia) 5. Know where the closest cooling center and clinic/hospitals are located 6. Be resourced with water to intake and/or provide fluids 7. Be able to act utilizing basic life support skills for treating heat emergencies[2]; be prepared to implement strategies to cool the body and minimize shock 8. Be aware of local fire and emergency services providers and how to access those services 9. Prepare emergency call list 10. Prepare emergency tool kits (specific to and for the elderly, for outdoor workers, and for schools)

Strategies to Increase Community Uptake of Your Mitigation	1. Put all information on the Phoenix, AZ Dept of Health website as well as the link to AZ's heat index alert system 2. Launch a public service announcement campaign via television and local newspaper ads to help participants sign up for alerts and increase awareness of where urban centers at greatest risk and cooling centers are located on a map—make it accessible via QR code 3. Distribute in schools, churches, supermarkets, and community-based organizations information pamphlets and items such as magnets with QR code, URL to the Dept of Health website, and bilingual brochures titled "It's Hot Outside" 4. Include case studies, tabletop exercises and drills in training to reinforce information 5. Display sample kits and distribute emergency kit checklists and toolkits; provide coupons for items 6. Distribute emergency call list template