National Institute of Environmental Health Sciences

CLIMATE CHANGE VULNERABILITY ASSESSMENT

A Report Assessing How Climate Change Will Impact Worker Health and How To Prepare for These Impacts

The National Clearinghouse for Worker Safety and Health Training

JANUARY 2015

TABLE OF CONTENTS

INTRODUCTION/PURPOSE

Climate change will have a severe impact on human health (*Climate Change Impacts in the United States: The Third National Climate Assessment*, 2014) and can exacerbate already existing vulnerabilities that affect people's daily lives. Outdoor workers, such as those in the construction, energy, public service industries, and some indoor workers, such as manufacturing production industries, are among those who will be more severely impacted by the consequences of climate change, especially since they are more frequently exposed to hazardous materials and/or hazardous environments. Climate change will alter how these workers operate and, consequently, how they are trained for their daily work. In order to best protect workers from climate-related hazards, workers need to be trained to identify climate-related health hazards and how to best mitigate these hazards. While the National Institute of Environmental Health Sciences (NIEHS) Worker Training Program (WTP) has been given the responsibility to help protect workers from hazardous materials, the Program needs to also recognize its own vulnerabilities in order to best accomplish its mission.

The purpose of this report is to assess climate change vulnerabilities that may affect the WTP, its awardees, and its target worker population. It will also explore individual and community resiliency in the face of climate change challenges. It will identify the existing WTP resources, as well as training gaps. The goal of this report is to help WTP and its grantee community better plan for the health impacts and programmatic changes due to predicted changes in the global climate.

METHODOLOGY

This assessment report was compiled through a review of the current available literature on climate change and worker health; a review and assessment of available training and resources on worker health and climate change vulnerability-related modules; and consultation and review by the WTP awardee community.

A matrix was created to demonstrate how industries (associated with the WTP worker population) can be affected by climate change, the occupational health impacts, and individual health impacts. The identified climate change vulnerabilities and health outcomes are based on the "Climate Change and Occupational Safety and Health: Establishing a Preliminary Framework" article (Shulte & Chun, 2009). The matrix can be found in Appendix A of this report. A review of current climate change studies and assessments was also conducted to better understand how climate change will impact the WTP, its trainers, and worker constituents.

Workers need to be trained to identify climate-related health hazards and how to best mitigate these hazards.

To determine what existing training courses and modules are currently available, a general search was conducted on the WTP curricula catalog (Appendix B) and also on the Internet for specific training topics that can be applied to mitigate the risks of climate change vulnerabilities (Appendix C). These topics include, but are not limited to, general climate change information, heat and cold stress, mental health resilience, confined space, and mold.

A draft of this report was presented and discussed by the WTP awardees prior to and during the

October 2014 workshop on Climate Change and Worker Health. Results of the discussion and comments are integrated into the final report.

BACKGROUND

NIEHS WTP

The NIEHS WTP was tasked by the Superfund Amendments and Reauthorization Act of 1986 (SARA) to create a grant program to train and educate workers engaged in activities related to hazardous waste removal, containment, and emergency response. Since its inception in 1987, the Program seeks to prevent work-related harm by assisting in the training of workers on how best to protect themselves, and their communities, from exposure to hazardous materials encountered during their work. It accomplishes its mission and objectives by funding non-profit organizations with a demonstrated track record of delivering a high-quality, peer-reviewed safety and health training to target populations who are, or will be, working in hazardous environments. Awardees of the program are non-profit organizations with demonstrated access to appropriate worker populations and experience in implementing and operating worker health and safety training programs.

profit organizations that are committed to protecting workers and their communities.

Through its successful efforts and support, the WTP has created a strong network of non-profit organizations that are committed to protecting workers and their communities by delivering high-quality, peer-reviewed safety and health training to target worker populations who may be exposed to hazardous materials during hazardous waste operations, hazardous material transportation, environmental restoration of contaminated facilities, or chemical emergency response. The WTP provides assistance to organizations in developing their institutional competency to provide appropriate model training and education programs to hazardous materials and waste workers.

The WTP accomplishes its mission through five main program areas, including one program that is funded by an Interagency Agreement with the Department of Energy (DOE). The four program areas are: the Hazardous Waste Worker Training Program (HWWTP), the Environmental Career Worker Training Program (ECWTP), previously called the Minority Worker Training Program until 2014, the NIEHS/DOE Nuclear Worker Training Program, and the Hazmat Disaster Preparedness Training Program (HDPTP).[1]

The core program for the WTP is the HWWTP, which provides model occupational safety and health training for workers who are involved in activities related to hazardous waste removal, containment, or chemical emergency response, including terrorist attacks. This model program encourages innovation for training worker populations by addressing issues such as literacy, appropriate adult education techniques, training quality improvement, and other areas not addressed directly by the private sector. The ECWTP was established to provide training programs to train individuals, who live near hazardous waste sites or in the community at risk of exposure to contaminated properties, aiming to obtain work in the environmental field. The ECWTP seeks to address the needs of vulnerable and disadvantaged communities by advancing training to promote a sustainable, environmental career path for workers who deal with hazardous materials handling, waste,

1 This paper will not explore how Advanced Training Technologies (ATT) Program will be affected by climate change. The ATT focuses on the development of advanced training technological products for the health and safety training of hazardous materials workers, emergency responders, and skilled support personnel, and is not an actual worker training program.

construction, and other emerging industries.[2] Initiated in 1992, the NIEHS/DOE Nuclear Worker Training Program provides safety and health training for workers who may be engaged in hazardous substance cleanup or emergency response at DOE nuclear weapons facilities. The HDPTP is intended to foster the development of disaster-specific training programs as an extension of the HWWTP for the purpose of preparing a cadre of experienced workers for preparedness and response to future terrorist incidents in a wide variety of facilities and high-risk operations. The purpose of the HDPTP is to complement the Department of Homeland Security's (DHS) various preparedness training programs by enhancing the safety and health training capacity of HAZMAT workers and emergency responders to prevent, deter, or respond to terrorist incidents involving weapons of mass destruction, as well as natural disasters.

WTP Constituency (Worker Population Impacted by Climate Change)

Across the spectrum of events, from acute severe weather disasters to intense heat waves, the consequences of climate change will impact the health of workers directly and indirectly. Some impacts may constitute a heavier burden on certain industries and trades, depending on the location and nature of the work.

The NIEHS WTP awardees for all four training program areas primarily work with those who are or will be engaged in: active and inactive waste treatment, storage and disposal, hazardous waste generation, cleanup and remedial action, and emergency response. Further, awardees may support workers engaged in hazardous materials transportation. Target populations for this training include those covered by requirements of Federal Occupational Health and Safety Administration (Code of Federal Regulations, Title 29, Part 1910) and Environmental Protection Agency (CFR, Title 40, Part 311) standards for Hazardous Waste Operations and Emergency Response, regulations governing the NIEHS HWWTP (CFR, Title 42, Part 65), as well as hazardous materials transportation workers regulated by the US Department of Transportation (49 CFR 171-177). Target worker populations include various trades within the construction industry (e.g., carpenter, heavy equipment operator, iron worker, mason, welder, etc.), hazardous waste cleanup industry, health care industry, public and private waste collection and disposal industry, public works, transportation industry, and others. Trainees also include semi-skilled day laborers who work and get paid on a daily or short-term basis. These workers are often involved in construction or in cleanup after disasters.

The consequences of climate change will impact the health of workers directly and indirectly.

The WTP awardees under the HDPTP also provide training to workers who are, or may be, involved in the response and recovery of disasters, including emergency responders and skilled support personnel (e.g., construction workers, utility workers, hazardous waste cleanup workers, semi-skilled day laborers, and transportation workers). Skilled support personnel can assist in rescuing the injured, demolition of compromised buildings, debris removal, restoring utilities, and rebuilding communities. They are often required to work in locations in which they are exposed to unknown hazards.

While it is important to recognize that all worker populations will be affected by the various climate change impacts, some consequences will be more prominent for certain worker populations. Of particular focus should be vulnerable populations, such as older workers, or workers who may have medical conditions. A second potentially vulnerable

2 http://grants2.nih.gov/grants/guide/rfa-files/RFA-ES-14-008.html

population is workers who were previously employed in other industries and are entering new industries. This may include older workers, day laborers who may not speak English, or workers who have no previous experience working with hazardous materials.

WTP Responds: Past Disaster Experience

WTP has extensive experience in responding to disasters caused by severe weather events.

The NIEHS WTP has extensive experience in responding to disasters caused by severe weather events. As part of the Department of Health and Human Services (HHS), the NIEHS WTP may participate in disaster response and recovery efforts under both the Worker Safety and Health Support Annex of the National Response Framework, and the National Disaster Recovery Framework. Under these frameworks, the Program and its awardees have been actively involved in several natural disasters through the years – from Hurricane Katrina in 2005 to Superstorm Sandy in 2012 – to protect workers who may face various unknown threats and hazards while responding and rebuilding in the aftermath of the destruction.

Through experience and the evaluation of lessons learned, the WTP and its awardees have developed effective mechanisms for getting needed safety and health resources into the field, including teams of trainers and subject matter experts, printed resource materials, on-line electronic learning tools, personal protective equipment and other training supplies, tailored training to reach underserved communities, and podcasts (audio training tips made available through easy download to trainers in the field). The following text boxes provide examples of how WTP and its awardee community have effectively protected workers involved in response and recovery activities.

The need for a more climate resilient community is outlined in Presidential Executive Order Preparing the United States for Climate Change. Training workers to become more knowledgeable about climate change vulnerabilities can prepare workers, and the communities in which they live, for extreme weather events, such as hurricanes, and other climate change related hazards, such as heat waves (Executive Order 13653, 2013).

HURRICANE KATRINA RESPONSE

Following the devastation from Hurricane Katrina in 2005, the WTP deployed resources under the Health and Safety Annex of the National Response Plan to protect workers who were cleaning up the destruction left by the hurricane. The Program created health and safety PowerPoint briefings and accompanying booklets for Katrina Responders, and posted pertinent modules from the Occupational Safety and Health Administration (OSHA) Disaster Site Worker course on the National Clearinghouse for Worker Safety and Health Training website. The Program also coordinated resources and expertise with OSHA, the National Institute of Occupational Safety and Health (NIOSH), and other members of the National Response Team. Training efforts of WTP awardees in the Gulf region were also identified, in anticipation of activating the WTP Emergency Support Activation Plan (ESAP).

SUPERSTORM SANDY RESPONSE

In 2012, Superstorm Sandy caused extensive damage throughout the East Coast as it released torrential rains, ferocious winds, and widespread flooding. In response to the Superstorm, the WTP activated its ESAP. Awardees deployed local trainers to educate cleanup workers and community members about the health hazards found following hurricanes and floods. After the site hazard assessment identified mold as one of the greatest hazards, the WTP and the National Clearinghouse created the NIEHS Mold Remediation Guidance and the Mold Clean Up and Treatment Orientation PowerPoint training and booklet. Approximately 155,000 people were trained under the program and more than 35,900 English booklets, 15,700 Spanish booklets, and 290 Vietnamese booklets were distributed to recovery workers, homeowners, and volunteers (NIEHS Worker Training Program, 2013).

CLIMATE CHANGE VULNERABILITY ASSESSMENT

Extreme weather events caused by climate change, such as heat waves, droughts, and heavy rain, will no doubt become a heavy burden to all workers across the country. Workers will need additional training to learn how to protect themselves from the hazards of climate change, how climate change will affect their work, and how they can minimize climate change-related health impacts. In order to train workers on how to best protect themselves and their communities from climate change-related hazards, the WTP and awardees will have to consider how to incorporate climate change concerns into the existing objectives and activities.

This section provides an overview of the challenges that WTP and its awardees may face as climate change-related impacts become more prominent and frequent over time. The section also identifies the climate change health impacts and related occupational health effects, as well as anticipated training needs associated with the specific impact. It also provides an overview of other considerations that may impact how workers can best mitigate climate change hazards, including employer/work environment-related concerns.

Emerging Climate Change Challenges

Climate change will create a new workforce population as industries are affected by severe weather changes, such as drought. Additionally, the workforce will be impacted as efforts are made to move away from industries that produce high levels of greenhouse gas emissions, such as the oil and coal industries. The WTP and its awardees will need to be prepared to address the indirect consequences of climate change, including emergence of new worker populations and new industries. The awardees will need to have the capacity to provide effective training to these new workers, and the Program will need to have the capacity to assist the awardees with this influx of workers.

Climate change will create a new workforce population as industries are affected by severe weather changes.

As efforts to mitigate the effects of climate change are under consideration, several "climate friendly," low carbon, or green industries are also emerging. As high carbon energy sources and industries are transitioning to a low carbon economy, workers in the high carbon energy industries are at risk of losing their jobs (Costello, 2010). Other workers who might be affected by these changing and emerging

industries include public and private waste collectors and building trades. Nonetheless, these workers may benefit from green jobs training, such as retrofitting and alternative energy infrastructure training (Costello, 2010), or training in new technology and strategies in water management, as well as disaster management and response that can contribute to building resilience to the impacts of climate change (Oxfam America, 2010).

It is important to note that not all "green jobs" are inherently safe. While the goal of some "green" industries is to eliminate/ reduce the use of certain hazardous materials, the use of other hazardous materials may be introduced. For instance, the manufacturing, constructing, and maintenance of solar energy materials present various hazards, such as UV exposure and heat. Biodiesel production exposes workers to caustic, volatile, and flammable chemicals. The wind energy industry also subjects workers to various hazards, including composites, confined spaces, and falls. Workers in the recycling industry can also be exposed to various toxic metals, ergonomic, and biological hazards. The health effects of nanomaterials are still largely unknown. These newer industries will potentially require additional training, or curriculum development.

It is important to note that not all "green jobs" are inherently safe.

Moreover, in response to the increase and severity of acute weather events, the Program and its awardees will need to be able to provide additional training to all workers who will be assisting in the response and cleanup of disasters. This population will include semi-skilled day laborers, who may have little to no training on responding or rebuilding following disasters.

Climate Change Occupational Health Impacts and Anticipated Training Needs

The workers trained under this program are vulnerable to a wide range of climate change impacts due to the nature and location of the majority of their work. However, in addition to the vulnerabilities and impacts described below, other factors, including workplace establishments and individual health factors, also play a role in workers' increased susceptibility to climate change-related threats. These factors are discussed at the end of this section. Climate change training and capacity building must address the health impacts described below.

Extreme Ambient Temperatures

Most hazardous waste cleanup work takes place outdoors, such as that conducted at Superfund or Brownfield sites. Construction work, some utility/ infrastructure work, and waste collection work is also primarily conducted outdoors. Outdoor workers are most susceptible to direct ambient temperature-related impacts, such as heat or cold stress. Indoor workers, who do not have adequate ventilation, air conditioning, and/or heating, can also be exposed to ambient temperature-related stresses.

Over the past 30 years, average temperatures have resulted in an increased rate of warming across the U.S., with temperatures in North and West geographies, as well as Alaska increasing most (U.S. Environmental Protection Agency, 2014). Heat waves, a notorious impact of climate change, have caused severe injury and death in various populations. The Third National Climate Assessment

Report noted that in 2011 and 2013 the number of intense heat waves nearly tripled the long-term average. In a recent study, the Centers for Disease Control and Prevention (CDC) identified 20 cases of work-related heat illness or death reviewed over a two-year period, of which nine deaths occurred in the first three days of working on the job, and four of them occurred on the first day of work. These workplaces either had an inadequate or no heat illness prevention program, and new workers were not acclimatized to the heat.

While heat stress is most often a concern for outdoor workers, such as construction workers and hazardous waste site workers, one should also consider other types of "outdoor" workers, such as truck drivers, who may not have proper air conditioning. Further, indoor workers, such as manufacturing workers engaged in manufacturing processes and intermittent hot work, can be affected if the buildings they work in do not have proper ventilation or air conditioning. Workers exposed to high ambient temperatures in which the total heat burden exceeds the capacity of the body to maintain normal body functions without excessive strain can cause heat stress and stroke, decreased chemical tolerance (as chemicals are more easily absorbed during the body's thermoregulation), and fatigue (National Institute for Occupational Safety and Health (NIOSH), 2013). The loss of labor productivity and increased risk of accidental injuries can be attributed to heat exhaustion (Kjellstrom, Gabrysch, Lemke, & Dear, 2009).

Similarly, extreme cold weather, such as the "polar vortex" in the winter of 2013, can have a tremendous impact on workers. Exposure to extreme cold weather can lead to serious injury, illness, and even death. Thus, outdoor workers are at risk for cold stress. Susceptible workers include those who work in areas that are poorly insulated or have no heat, and those who have no shelter.

Anticipated Training Needs

Current training should ensure that workers are able to recognize heat and cold stress, including related symptoms and signs, and when and how to seek help. Additional training should also help workers identify how climate change will begin to alter the temperatures of their work environment, and how these extreme temperature changes may impact their health in the long term.

The loss of labor productivity and increased risk of accidental injuries can be attributed to heat exhaustion.

Workers may become acclimatized to the heat, while being exposed gradually to the hot environment. However, full acclimatization to the heat may take approximately 14 days (Arbury, 2014). New workers entering a hot environment need to be slowly exposed to the workplace and will need plenty of rest and water. Workers need to be able to recognize the real health hazards associated with heat exposure, and learn strategies to compensate, such as acclimatization, and the proper use of a rest, water, and shade schedule.

Air Pollution

The changing climate can exacerbate the effects of bad air quality on health. Poor air quality days increase as warm, stagnant air increases the formation of ground-level ozone (U.S. Environmental Protection Agency, 2013). High wind events, such as tornados and hurricanes, can also generate dust particles. Outdoor workers, such as transportation workers, utility workers, and construction workers, are also most vulnerable to increased emissions of greenhouse gases and air pollutants, including particulate matter, carbon monoxide, lead, ozone,

nitrogen oxides, and sulfur dioxide. Increases in air pollution will be coupled with increases in naturally occurring pollutants, such as ragweed pollen – which may become more prevalent as the pollen season occurs earlier and lasts longer.

Indoor workers may also be vulnerable to the impacts of air pollution, as indoor air pollution can reach 2-5 times the concentration of pollution in outdoor air (U.S. Environmental Protection Agency, 2012). Indoor air pollution can be caused by outdoor air pollution, central heating and cooling systems, humidification devices, mold, and radon. Increases in air pollutants can affect workers who spend most of their time exposed to these threats. Illnesses that can be exacerbated by air pollutants include respiratory illnesses, such as asthma, allergic disorders, and other chronic lung diseases. Workers exposed long-term to ozone can also develop and/or exacerbate cardiovascular diseases. While air pollution is prominent all across the U.S. in urban areas, workers in the Midwest and Southeast regions of the U.S. may be most vulnerable (U.S. Global Change Research Program, 2014). [3]

Anticipated Training Needs

Workers should be able to recognize how increasing temperatures can interact with air pollutants to affect health. Workers should also be able to recognize the various air pollutants they may be exposed to at work, and the possible short- and long-term health effects these pollutants may cause for them. Further, workers may need to recognize how pollen allergies can affect their productivity at work. Indoor workers should be able to identify whether or not their workplace has appropriate ventilation systems.

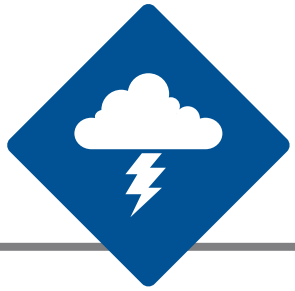
Ozone Depletion

Ozone depletion increases outdoor workers' exposure to harmful ultraviolet (UV) radiation. UV radiation exposure has caused the loss of approximately 1.5 million disability-adjusted life years, and 60,000 premature deaths in the year 2000 (Shulte & Chun, 2009). UV radiation can be directly attributed to increased risk of several eye diseases, including cortical cataract, conjunctival neoplasms, and ocular melanoma; skin cancer; and disturbed immune function (Shulte & Chun, 2009). Ozone depletion will be most prominent in the Southeast, Midwest, Great Plains, and Southwest regions of the U.S. (U.S. Global Change Research Program, 2014).

Anticipated Training Needs

Workers should be trained to protect themselves from UV radiation, such as wearing sunscreen and sunglasses, as well as identify symptoms of UV-related diseases.

3 **Southeast:** The Southeast region includes the states of Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia, as well as Puerto Rico and the U.S. Virgin Islands.
Northeast: The Northeast region includes the states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, West Virginia, and the District of Columbia.
Northwest: Idaho, Oregon, and Washington
Southwest: Arizona, California, Colorado, Nevada, New Mexico, and Utah
Midwest: Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin
Great Plains: Kansas, Montana, Nebraska, North Dakota, Oklahoma, South Dakota, Texas, and Wyoming



Extreme Weather

Extreme weather events are some of the most visible impacts of climate change. From heat waves to heavy downpours to wildfires to intense hurricanes, climate change is recognized to result in more intense and frequent weather-related events that can have catastrophic consequences for workers in a variety of direct and indirect ways.

Across the U.S., there has been an increase in severe weather events over the last 50 years, and these will continue to increase in intensity and frequency (U.S. Global Change Research Program, 2014). Disasters, such as hurricanes and tornadoes, have caused severe damage to infrastructure, such as buildings and roads, creating hazardous debris and unstable work areas. For instance, recent ice storms have increased the vulnerability of various industries, and communities in the Northeast and Southeast. Workers, such as utility workers or emergency response workers, can be asked to work in environments they are not familiar with, such as confined spaces, leading to increases in traumatic injuries. Workers who are assisting with the cleanup, demolition, or rebuilding of buildings and infrastructure, can be exposed to several hazards, including solid waste, mold, oil, sharp debris, chemicals, and other toxins. Exposure to these can cause physical injury, rashes, and various respiratory diseases. Workers are also exposed to ambient temperature stress, including heat stress, vector-borne infectious diseases, poisonous plants, and wildlife. Furthermore, inappropriate use of equipment, such as generators, can lead to carbon monoxide poisoning.

In addition to the chemical and physical dangers resulting from disasters, these events can have a tremendous impact on the mental health of workers. As demonstrated in recent hurricanes and storms, workers who are also residents of the impacted community can also be affected – mentally and physically – when their families, homes, and communities are impacted by a severe weather event. Disasters can disrupt the daily routine for workers and their families by adding new stressors to their lives. Workers worry about the well-being of their own family, in addition to the continuity of their daily work. Some workers, such as utility workers, may be required to work following disasters to restore public utilities. Furthermore, the consequences of climate change tend to cause greater damage in vulnerable and disadvantaged communities, as some are already exposed to environmental hazards. More often than not, these communities are also devastated by disasters at more frequent intervals. For instance, Hurricane Katrina caused widespread damage to the Gulf Coast region, causing distress to the vulnerable communities located in the region. Five years after the hurricane, the region was devastated by the Deepwater Horizon oil spill – while the communities were still recovering from the destruction caused by the Hurricane.

Disasters can disrupt the daily routine for workers and their families by adding new stressors to their lives.

Moreover, workers at disaster sites are often under a lot of pressure due to the intensity of the work, the experience of enduring the disaster, and being away from family and friends. They have reported mental health symptoms related to the event, including depression, post-traumatic stress disorder, and substance abuse. Mental stress can cause depression and post-traumatic stress disorder and can exacerbate cardiovascular and respiratory diseases. Methods to recognize, refer, and mitigate these symptoms are necessary for the well-being of the disaster site worker.

Health care workers, such as nurses and doctors, can face several mental and physical stresses when an extreme weather event occurs. Healthcare settings are usually the first resource for many in the community and can become easily overwhelmed during emergency situations, especially if an evacuation is required. Healthcare workers are often required to work overtime in emergency situations, if the healthcare facility is overwhelmed. The evacuation process can be extremely stressful, as healthcare providers must move weak patients quickly during a short time period and often with limited resources. Additionally, as a result of the severe damage caused by these weather events, the scope of work required to reopen some facilities is extensive, such as the case of Charity Hospital in New Orleans following Hurricane Katrina.

Anticipated Training Needs

Disaster responder and cleanup workers should have disaster site training prior to being deployed to any site. All workers should also receive site-specific training in order to be aware of site-specific hazards and risks. Moreover, workers should be trained on recognizing stress, identifying mental health symptoms, ways to cope, and ways individuals can increase resilience to trauma and stress.

Disaster responder and cleanup workers should have disaster site training prior to being deployed to any site.

While acute weather events will have severe, multifaceted impacts on workers in all regions across the U.S., some regions may face specific types of disasters. For instance, workers in the Northeast coastal region, Southeast, Midwest, and some areas of the Southwest will face more frequent and intense hurricanes, torrential rain, and flooding. Workers who will be responding and working during and following the flooding or hurricane disasters should pay special attention to debris, confined spaces, and mold. Workers in the Great Plains, Northwest, and some Southwest regions will face increasing drought and wild fires. A good resource to follow is the NFPA 1670 Standard on Operations and Training for Technical Search and Rescue Incidents, which provides the foundation for proper handling of events.

Preparing for the impacts of extreme weather can also be considered during training. Workers can be trained on how to identify potential risks that can become a hazard following a weather event.

Vector-borne Diseases and Expanded Habitats

The long-term changing ambient temperatures, humidity, rising sea level, and environment have altered vector, pathogen, and host habitats. Vector-borne infectious diseases (such as malaria, West Nile, and Lyme diseases), poisonous plants, and venomous wildlife have become more prominent and widespread, putting workers at risk for exposure (U.S. Environmental Protection Agency, 2013). If exposed to these threats, workers can contract infectious diseases, dermatitis (from poisonous plants), and other related injuries and illnesses. Again, outdoor workers, such as construction workers, disaster site cleanup workers, and laborers, are most vulnerable to these exposures. Healthcare workers, airline workers, and workers who travel frequently are also at risk of exposure, as they can come into contact with infected individuals.

Anticipated Training Needs

Vector-borne and allergy-related illnesses will greatly affect the Midwest, Southwest, Northwest,

and Southeast regions of the U.S. Workers will need additional knowledge on these vectors and how to best protect themselves against disease-carrying vectors by using safe, effective methods, including safe insecticides, protective clothing, or other preventative measures. Workers may need additional training on identifying symptoms of diseases. Workers may also need to receive further training on the hazard of using pesticides/insecticides.

Work-Related Factors to Consider

The climate change impacts mentioned above can be either mitigated, or exacerbated, by workplace and conditions. For instance, while personal protective equipment (PPE) is extremely important to protect workers from physical hazards, the equipment may cause workers to be subjected to even more heat stress. However, not wearing the equipment properly can lead to hazardous exposures. Employers and workers together can find solutions to address the impacts of climate change by finding work practices that can mitigate hazards. In regards to heat stress and protective equipment, heat stress can be alleviated by providing workers with adequate work/rest cycles and access to water.

Workers will need to be trained to recognize and identify situations in which climate change may have a hazardous impact on their health, and inform employers about these issues and concerns. For instance, in order to adapt to the increasing temperature in certain regions, new technology and tools have been applied to rail tracks in order to mitigate risks of the changes of the track structure due to extreme heat. Employers will have the responsibility to change and adapt work environments and processes for employees.

Individual Health-Related Factors to Consider

Individual health conditions must also be considered when looking at how climate change may impact a person's health. Some individual health factors may increase a person's susceptibility to climate-related occupational hazards, such as age, weight, degree of acclimatization, metabolism, and pre-existing medical conditions, use of alcohol and recreational and medicinal drugs. Other factors include a person's genetic characteristics, which may make them more predisposed to air pollutants, and type of work clothing worn. (Schulte and Chun, 2009)

Individual health conditions must also be considered when looking at how climate change may impact a person's health.

BALANCING INDIVIDUAL AND COMMUNITY RESILIENCY

It is important to recognize that workers are part of the community in which they live. Meanwhile, during times of severe weather disasters, local workers are often called upon to help with recovery and rebuilding efforts. Worker injury and illness can be compounded by the stress of helping rebuild communities, while also ensuring the safety and health of their own family and rebuilding their own homes. Thus, workers should be as prepared as possible for the consequences of climate change. Individually, workers can plan with their families, recognizing vulnerable populations (e.g., elderly, young, and those with pre-existing conditions), and prepare them for any likely event. In order to build community resiliency, trained workers should take their skills and training to prepare and train their communities and respond when there is a local event.

For instance, WTP trained personnel can help develop community and individual resilience by

serving as neighborhood responders before anyone gets activated or deployed. They can apply their skills and training to prepare the community, and respond, if there is an event. As with individual resilience, they need to start by recognizing and preparing vulnerable populations in the community – including the young, the old, and those with pre-existing conditions.

As part of an after-action meeting conducted following the Deep Water Horizon (DWH) oil spill, NIEHS determined that disaster worker training and education required additions to address behavioral health consequences faced by workers who assist with response and recovery activities following disasters. In June 2012, the Worker Training Program, with support from the Substance Abuse and Mental Health Services Administration (SAMHSA), began a Gulf Responder Resilience Training Project (GRRTP), to address behavioral health training and education for disaster workers.

The program consists of three phases and includes participation of Gulf Coast Communities and organizations. The program aims to identify resources, gaps, and needs in mental health and worker training, develop a curriculum module on behavioral health & resilience and pilot the new module in communities. The ultimate goal of the program is to provide a training module that will help create more resilient workers and communities. To date, the worker and supervisor training courses have been developed and pilot tested in the Gulf Coast and New York. Flexibility is needed to revise, adapt, and update the modules to meet any changing needs incurred by climate change.

EXISTING RESOURCES AND NEEDED RESOURCES

As mentioned previously in the report, the NIEHS WTP has been actively involved in the response to various natural disasters. In mobilizing its resources to assist in the disasters, the Program created various training tools in PowerPoint and booklet format. These are awareness-level training tools that provide basic information to workers who are assisting in the response and cleanup of various disasters. To date, the NIEHS National Clearinghouse has developed training tools, and/or booklets for: hurricanes, earthquakes, avian influenza, mold, floods, radiological dispersion devices or dirty bombs, and wildfires. Some of these booklets and training tools are also available in various languages. For more information, please visit the NIEHS Resiliency web page: *http://tools.niehs.nih.gov/wetp/index.cfm?id=2528*.

While direct courses on the impact of climate change on worker health are limited, modules that deal with several vulnerabilities and hazards related to climate change are available, such as cold stress, heat stress, and biological hazards. Topics that may need further development include introduction to climate change, outdoor and indoor air pollution (natural and manmade pollutants), UV radiation, vector-borne diseases, and diseases that can be passed from animal to humans. Nonetheless, workers should be aware of what climate change is, and how it will impact them individually, in the workplace, and impact their communities in the long-term.

A preliminary assessment of available courses and resources by WTP awardees can be found in Appendix B. An assessment of available resources and materials from outside the NIEHS WTP can be found in Appendix C.

NIEHS WTP Program and Awardee Vulnerability Analysis

Program Staff and Resource Capacity

WTP is a multidisciplinary program that considers worker safety awareness, community safety and health, emergency response, economic and social wellbeing of workers, and environmental impacts. The Program has successfully supported the effective training of workers, and raising awareness of emerging worker safety and health issues. As the science behind the health impacts of climate change on workers is evolving and the list of climate-related vulnerabilities expands, WTP will need to reassess its priorities and focus areas, as well its staff and resource capacity to better respond to climate change vulnerabilities, as well as other non-climate change-related worker safety and health concerns. Currently, the WTP consists of five fulltime staff, who are tasked to oversee the four program areas and its grantee networks. As the Program continues to meet its goals and objectives in the face of the overwhelming worker safety and health issues, it will need to consider whether its current staff and resources will allow it to also address climate change concerns.

For instance, to better respond to climate change-related risks, WTP will need the capacity to maintain awareness of how climate change will affect the various components of the program, including who will be impacted by climate change and how, and the health and safety training that workers receive. To best protect workers, WTP will need to anticipate, and not react to, potential health concerns, and relate these in a timely manner to its awardees. In addition, just as new scientific knowledge regarding the risks of climate change on health is emerging, so are new findings on ways to best mitigate or adapt to certain hazards. WTP will need to be aware of the science behind the adaptation and mitigation methods, and be able to communicate these new findings to the awardees in an effective and efficient manner.

The WTP will also need to take into consideration its capacity to provide support (technical and/or financial) to awardees who are responding to acute weather events, providing climate change health impact training or training on emerging green jobs, or other climate change training support. The awardees are an extremely important component of the Program's success, and the Program will need the awardees' expertise to effectively and successfully deliver climate change training to workers.

The Program will need the awardees' expertise to effectively and successfully deliver climate change training to workers.

Awardee Staff and Resource Capacity

The WTP awardees will need to maintain awareness of climate change concerns and issues, and find ways to creatively and effectively integrate climate change-related health information into its training to workers. To accomplish this, the awardees will need the capacity (staff and resources) to be able to keep up with current scientific information and incorporate these findings into their training to best prepare workers for climate change-related health issues.

CONCLUSION AND NEXT STEPS

The consequences of climate change are already having severe impacts on workers.

The consequences of climate change are already having impacts on workers as demonstrated by recent severe weather disasters, and rising ambient temperatures. While some workers have made great strides to prepare for these disasters, other impacts should also be anticipated, and prepared for, especially those which may be more gradual and less obvious. Emerging climate challenges to examine – and proactively address – include the effects of bad air quality, ozone depletion, and vector-borne diseases on worker health.

While seeking to address these consequences, current training programs need to be further enhanced, and developed, to address potential gaps in worker training. Some training priorities include: 1.) instilling a more robust understanding of the impacts of exposure to extreme temperatures, 2.) teaching workers to recognize how increasing temperatures can interact with air pollutants, 3.) enhancing worker knowledge on protection from UV rays, 4.) strengthening training on trauma and stress to improve resilience, and 5.) improving training to recognize disease-carrying vectors.

By addressing existing gaps, as a first step, the NIEHS WTP and its awardees can play a vital role to prepare workers to deal with already present and emerging challenges related to the impacts of climate change.

BIBLIOGRAPHY

Arbury, S. E. (2014). Health illness and death among workers--United States, 2012-2013. *Morbidity and Mortality Weekly Report Centers for Disease Control and Prevention*.

Assocation of State and Territorial Health Officials. (2014). *Extreme Weather and Climate Readiness: Toolkit for State and Territorial Health Departments*. Arlington: ASTHO.

Costello, T. (2010). *Labor and Climate Change: A Briefing Paper for Activists*. Labor Network for Sustainability.

Executive Order 13653. (2013). Preparing the United States for the Impacts of Climate Change.

Kjellstrom, T., Gabrysch, S., Lemke, B., & Dear, K. (2009). The "Hothaps" program for assessing climate change impacts on occupational health and productivity: an invitation to carry out field studies. *Global Health Action*.

National Institute for Occupational Safety and Health (NIOSH). (2013, January). *Heat Stress*. Retrieved September 16, 2014, from NIOSH: Workplace Safety & Health Topics: http://www.cdc.gov/niosh/topics/heatstress/

NIEHS Worker Training Program. (2013). *NIEHS Hurricane Sandy Response Report*. RTP: NIEHS.

Oxfam America. (2010). *A Fresh Look at the Green Economy: Jobs that Build Resilience to Climate Change*. Boston: Oxfam America.

Shulte, P., & Chun, H. (2009). Climate change and occupational safety and health: establishing a preliminary framework. *Journal of Occupational and Environmental Hygiene*, 6 (9), 542-554.

U.S. Environmental Protection Agency. (2012). *Basic Information: Air and Radiation*. Retrieved Septemer 9, 2014, from U.S. EPA: http://epa.gov/air/basic.html

U.S. Environmental Protection Agency. (2014). *Climate Change Indicators in the United States, 2014: Third Edition*. U.S. EPA.

U.S. Environmental Protection Agency. (2013). *Climate Impacts on Human Health*. Retrieved 9 16, 2014, from U.S. EPA: http://www.epa.gov/climatechange/impacts-adaptation/health.html#impactsextremeweather

U.S. Global Change Research Program. (2014). *National Climate Assessment*. Washington, D.C.

[APPENDIX A] CLIMATE VULNERABILITY MATRIX

AIR POLLUTION

Industry	Affected Population	New Hazards/ Vulnerabilities	Occupational Health Effects	Work Related Factors	Individual Factors	Locations Most Affected
Construction	Construction workers (including all construction trades: carpenter, electrician, heavy equipment operator, ironworker, laborer, mason, plasterer, plumber, pipefitter, sheet metal worker, and welder), day-laborers	Increased particulates and pollutants (taking into consideration changing weather and season patterns)	Respiratory illnesses, cardiovascular disease, increased allergens	Work practices, work/rest cycles, protective gear	Age, weight, degree of physical fitness, metabolism, use of alcohol or drugs, medical conditions, clothing worn	Indoor and outdoor; mostly urban
Hazardous Waste Cleanup	Cleanup workers, DOE legacy site cleanup workers, disaster responders and workers, construction workers	Increased particulates and pollutants	Respiratory illnesses, cardiovascular disease, increased allergens	Work practices, work/rest cycles, protective gear	Age, weight, degree of physical fitness, metabolism, use of alcohol or drugs, medical conditions, clothing worn	Indoor and outdoor; mostly urban
Transportation	Truck drivers, public transportation operators, hazardous waste material transport drivers, construction drivers, public transportation systems (e.g., rail workers, mass-transit system workers)	Increased particulates and pollutants (taking into consideration changing weather and season patterns)	Respiratory illnesses, cardiovascular disease, increased allergens	Work practices, PPE, amount of time spent on route, indoor air quality	Age, weight, degree of physical fitness, metabolism, use of alcohol or drugs, medical conditions, clothing worn	
Energy sector	DOE facility workers, renewable energy workers, alternative energy workers, miners, oil refinery workers, electric power workers, nuclear facility workers, pipeline construction and maintenance workers, shale gas/oil extraction workers	Increased particulates and pollutants (taking into consideration changing weather and season patterns)	Respiratory illnesses, cardiovascular disease, increased allergens	Work practices, work/rest cycles, protective gear	Age, weight, degree of physical fitness, metabolism, use of alcohol or drugs, medical conditions, clothing worn	Indoor and outdoor; urban and rural
Health care	Nurses, doctors, workers who work in health care settings	Increased particulates and pollutants caused by newer "greener" cleaning agents, indoor air pollutants	Respiratory illnesses, cardiovascular disease, increased allergens	Work practices, work/rest cycles, protective gear, hazard exposure	Age, weight, degree of physical fitness, metabolism, use of alcohol or drugs, medical conditions, clothing worn	Indoor

Industry	Affected Population	New Hazards/ Vulnerabilities	Occupational Health Effects	Work Related Factors	Individual Factors	Locations Most Affected
Emergency Response	Emergency responders, EMT, firefighters, disaster site workers, skilled support personnel, day laborers	Increased particulates and pollutants	Respiratory illnesses, cardiovascular disease, increased allergens	Work practices, work/rest cycles, protective gear	Age, weight, degree of physical fitness, metabolism, use of alcohol or drugs, medical conditions, clothing worn	Indoor and outdoor; urban and rural
Manufacturing	Manufacturing and industrial trades, chemical manufacturing plant workers, product manufacturing plant workers	Increased indoor particulates and pollutants	Respiratory illnesses, cardiovascular disease, increased allergens	Work practices, work/rest cycles, protective gear, proper ventilation	Age, weight, degree of physical fitness, metabolism, use of alcohol or drugs, medical conditions, clothing worn	Indoor and outdoor; urban and rural
Infrastructure (i.e.. Utility work and Public works)	Workers of electrical generation (nuclear and fossil fuel), electrical transmission and distribution, gas transmission and distribution, water treatment, distribution, and purification, road and building repair, public and private waste collection and disposal, facility and grounds maintenance	Increased particulates and pollutants	Respiratory illnesses, cardiovascular disease, increased allergens	Work practices, work/rest cycles, protective gear	Age, weight, degree of physical fitness, metabolism, use of alcohol or drugs, medical conditions, clothing worn	Indoor and outdoor; urban and rural

EXTREME WEATHER

Industry	Affected Population	New Hazards/ Vulnerabilities	Occupational Health Effects	Work Related Factors	Individual Factors	Locations Most Affected
Construction	Construction workers (including all construction trades: carpenter, electrician, heavy equipment operator, ironworker, laborer, mason, plasterer, plumber, pipefitter, sheet metal worker, and welder), day-laborers	Floods, droughts, and disaster clean-up related hazards (such as hazardous debris, mold, sediments, etc.)	Respiratory illnesses, cardiovascular disease, rashes, allergens, vector-born infections, mental stress, heat stroke, cold stress, traumatic injuries, skin irritations	Work practices, work/rest cycles, access to water, access to shade/ cooling/heating, protective gear	Age, weight, degree of physical fitness, medical conditions, previous experience with disasters, medical conditions, type of clothing worn	Indoor and outdoor; urban and rural
Construction	Construction workers (including all construction trades: carpenter, electrician, heavy equipment operator, ironworker, laborer, mason, plasterer, plumber, pipefitter, sheet metal worker, and welder), day-laborers	Mental stress	Mental stress, cardiovascular disease, headaches, depression, stress,	Work practices, work/rest cycles	Age, medical conditions, previous experience, mental health	Indoor and outdoor; urban and rural
Hazardous Waste Cleanup	Cleanup workers, DOE legacy site cleanup workers, disaster responders and workers, construction workers	Floods, droughts, and disaster clean-up related hazards (such as hazardous debris, mold, sediments, etc.)	Respiratory illnesses, cardiovascular disease, rashes, allergens, vector-born infections, mental stress, heat stroke, cold stress, traumatic injuries, skin irritations	Work practices, work/rest cycles, access to water, access to shade/ cooling/heating, protective gear	Age, weight, degree of physical fitness, medical conditions, previous experience with disasters, medical conditions, type of clothing worn	Indoor and outdoor; urban and rural
Hazardous Waste Cleanup	Cleanup workers, DOE legacy site cleanup workers; disaster responders and workers, construction workers	Mental stress	Mental stress, cardiovascular disease, headaches, depression, stress	Work practices, work/rest cycles	Age, medical conditions, previous experience, mental health	Indoor and outdoor; urban and rural
Transportation	Truck drivers, public transportation operators, hazardous waste material transport drivers, construction drivers, public transportation systems (e.g., rail workers, mass-transit system workers)	Floods, droughts, and disaster clean-up related hazards (such as hazardous debris, mold, sediments, etc.)	Dangers of driving in disaster sites, driving in hazardous conditions	Work practices, route location, road conditions, work/rest cycles	Age, previous experience with disasters, driving experience	

Industry	Affected Population	New Hazards/ Vulnerabilities	Occupational Health Effects	Work Related Factors	Individual Factors	Locations Most Affected
Transportation	Truck drivers, public transportation operators, hazardous waste material transport drivers, construction drivers, public transportation systems (e.g., rail workers, mass-transit system workers)	Mental stress	Mental stress, cardiovascular disease, headaches, depression, stress	Work practices, work/rest cycles, route location, road conditions	Age, medical conditions, previous experience, mental health	
Energy sector	DOE facility workers, renewable energy workers, alternative energy workers, miners, oil refinery workers, electric power workers, nuclear facility workers, pipeline construction and maintenance workers, shale gas/oil extraction workers	Floods, droughts, and disaster clean-up related hazards (such as hazardous debris, mold, sediments, etc.)	Respiratory illnesses, cardiovascular disease, rashes, allergens, vector-born infections, mental stress, heat stroke, cold stress, traumatic injuries, skin irritations	Work practices, work/rest cycles, access to water, access to shade/ cooling/heating, protective gear	Age, weight, degree of physical fitness, medical conditions, previous experience with disasters, medical conditions, type of clothing worn	All
Energy sector	DOE facility workers, renewable energy workers, alternative energy workers, miners, oil refinery workers, electric power workers, nuclear facility workers, pipeline construction and maintenance workers, shale gas/oil extraction workers	Mental stress	Mental stress, cardiovascular disease, headaches, depression, stress	Work practices, work/rest cycles	Age, medical conditions, previous experience, mental health	All
Health care	Nurses, doctors, workers who work in health care settings	Floods, droughts, and disaster clean-up related hazards (such as hazardous debris, mold, sediments, etc.)	Respiratory illnesses, cardiovascular disease, rashes, allergens, vector-born infections, mental stress, traumatic injuries	Work practices, work/rest cycles, access to water, PPE, location and condition of work place	Age, weight, degree of physical fitness, medical conditions, previous experience with disasters, medical conditions, type of clothing worn	All
Health care	Nurses, doctors, workers who work in health care settings	Mental stress	Mental stress, cardiovascular disease, headaches, depression, stress	Work practices, work/rest cycles	Age, medical conditions, previous experience, mental health	All

Industry	Affected Population	New Hazards/ Vulnerabilities	Occupational Health Effects	Work Related Factors	Individual Factors	Locations Most Affected
Emergency Response	Emergency responders, EMT, firefighters, disaster site workers, skilled support personnel, day laborers	Floods, droughts, and disaster clean-up related hazards (such as hazardous debris, mold, sediments, etc.), exposure to chemicals, confine space	Respiratory illnesses, cardiovascular disease, rashes, allergens, vector-born infections, mental stress, heat stroke, cold stress, traumatic injuries, skin irritations	Work practices, work/rest cycles, access to water, access to shade/ cooling/heating, protective gear	Age, weight, degree of physical fitness, medical conditions, previous experience with disasters, medical conditions, type of clothing worn	All
Emergency Response	Emergency responders, EMT, firefighters, disaster site workers, skilled support personnel, day laborers	Mental stress	Mental stress, cardiovascular disease, headaches, depression, stress	Work practices, work/rest cycles	Age, medical conditions, previous experience, mental health	All
Manufacturing	Manufacturing and industrial trades, chemical manufacturing plant workers, product manufacturing plant workers	Mental stress	Mental stress, cardiovascular disease, headaches, depression, stress	Work practices, work/rest cycles	Age, medical conditions, previous experience, mental health	All
Infrastructure (i.e.. Utility work and Public works)	Workers of electrical generation (nuclear and fossil fuel), electrical transmission and distribution, gas transmission and distribution, water treatment, distribution, and purification, road and building repair, public and private waste collection and disposal, facility and grounds maintenance	Floods, droughts, and disaster clean-up related hazards (such as hazardous debris, mold, sediments, etc.) (when responding to restore utilities)	Respiratory illnesses, cardiovascular disease, rashes, allergens, vector-born infections, mental stress, heat stroke, cold stress, traumatic injuries, skin irritations	Work practices, work/rest cycles, access to water, access to shade/ cooling/heating, protective gear	Age, weight, degree of physical fitness, medical conditions, previous experience with disasters, medical conditions, type of clothing worn	All
Infrastructure (i.e.. Utility work and Public works)	Workers of electrical generation (nuclear and fossil fuel), electrical transmission and distribution, gas transmission and distribution, water treatment, distribution, and purification, road and building repair, public and private waste collection and disposal, facility and grounds maintenance	Mental stress	Mental stress, cardiovascular disease, headaches, depression, stress	Work practices, work/rest cycles	Age, medical conditions, previous experience, mental health	All

EXTREME AMBIENT TEMPERATURES

Industry	Affected Population	New Hazards/ Vulnerabilities	Occupational Health Effects	Work Related Factors	Individual Factors	Locations Most Affected
Transportation	Truck drivers, public transportation operators, hazardous waste material transport drivers, construction drivers, public transportation systems (e.g., rail workers, mass-transit system workers)	Heat stress/ stroke, decreased chemical tolerance, cold stress	Heat stress (dehydration, heat rash, heat cramps, heat exhaustion, heat fatigue, heat syncope/ fainting, heat stroke), cardiovascular disease, fatigue, cold stress (frost bite, hypothermia, chilblains)	Work practices, work/rest cycles, access to water, access to AC/ heating in transportation, amount of time spent on route	Age, weight, degree of physical fitness, degree of acclimatization, metabolism, use of alcohol or drugs, medical conditions, prior heat injury, clothing worn	
Energy sector	DOE facility workers, renewable energy workers, alternative energy workers, miners, oil refinery workers, electric power workers, nuclear facility workers, pipeline construction and maintenance workers, shale gas/oil extraction workers	Heat stress/ stroke, decreased chemical tolerance, cold stress	Heat stress (dehydration, heat rash, heat cramps, heat exhaustion, heat fatigue, heat syncope/ fainting, heat stroke), cardiovascular disease, fatigue, cold stress (frost bite, hypothermia, chilblains)	Work practices, work/rest cycles, access to water, access to shade/ cooling/heating, properly worn PPE	Age, weight, degree of physical fitness, degree of acclimatization, metabolism, use of alcohol or drugs, medical conditions, prior heat injury, clothing worn	Indoor and outdoor; urban and rural
Emergency Response	Emergency responders, EMT, firefighters, disaster site workers, skilled support personnel, day laborers	Heat stress/ stroke, decreased chemical tolerance, cold stress	Heat stress (dehydration, heat rash, heat cramps, heat exhaustion, heat fatigue, heat syncope/ fainting, heat stroke), cardiovascular disease, fatigue, cold stress (frost bite, hypothermia, chilblains)	Work practices, work/rest cycles, access to water, access to shade/ cooling/heating, properly worn PPE	Age, weight, degree of physical fitness, degree of acclimatization, metabolism, use of alcohol or drugs, medical conditions, prior heat injury, clothing worn	Mostly outdoor; urban and rural

Industry	Affected Population	New Hazards/ Vulnerabilities	Occupational Health Effects	Work Related Factors	Individual Factors	Locations Most Affected
Manufacturing	Manufacturing and industrial trades, chemical manufacturing plant workers, product manufacturing plant workers	Heat stress/ stroke, decreased chemical tolerance, cold stress	Heat stress (dehydration, heat rash, heat cramps, heat exhaustion, heat fatigue, heat syncope/ fainting, heat stroke), cardiovascular disease, fatigue, cold stress (frost bite, hypothermia, chilblains)	Work practices, work/rest cycles, access to water, access to shade/ cooling/heating, properly worn PPE	Age, weight, degree of physical fitness, degree of acclimatization, metabolism, use of alcohol or drugs, medical conditions, prior heat injury, clothing worn	Mostly outdoor; urban and rural
Infrastructure (i.e.. Utility work and Public works)	Workers of electrical generation (nuclear and fossil fuel), electrical transmission and distribution, gas transmission and distribution, water treatment, distribution, and purification, road and building repair, public and private waste collection and disposal, facility and grounds maintenance	Heat stress/ stroke, decreased chemical tolerance, cold stress	Heat stress (dehydration, heat rash, heat cramps, heat exhaustion, heat fatigue, heat syncope/ fainting, heat stroke), cardiovascular disease, fatigue, cold stress (frost bite, hypothermia, chilblains)	Work practices, work/rest cycles, access to water, access to shade/ cooling/heating, properly worn PPE	Age, weight, degree of physical fitness, degree of acclimatization, metabolism, use of alcohol or drugs, medical conditions, prior heat injury, clothing worn	Mostly outdoor; urban and rural
Construction	Construction workers (including all construction trades: carpenter, electrician, heavy equipment operator, ironworker, laborer, mason, plasterer, plumber, pipefitter, sheet metal worker, and welder), day-laborers	Heat stress/ stroke, decreased chemical tolerance, cold stress	Heat stress (dehydration, heat rash, heat cramps, heat exhaustion, heat fatigue, heat syncope/ fainting, heat stroke), cardiovascular disease, fatigue, Cold stress (frost bite, hypothermia, chilblains)	Work practices, work/rest cycles, access to water, access to shade/ cooling/heating, properly worn PPE	Age, weight, degree of physical fitness, degree of acclimatization, metabolism, use of alcohol or drugs, medical conditions, prior heat injury, clothing worn	Mostly outdoor; urban and rural

Industry	Affected Population	New Hazards/ Vulnerabilities	Occupational Health Effects	Work Related Factors	Individual Factors	Locations Most Affected
Hazardous Waste Cleanup	Cleanup workers, DOE legacy site cleanup workers, disaster responders and workers, construction workers	Heat stress/ stroke, decreased chemical tolerance, cold stress	Heat stress (dehydration, heat rash, heat cramps, heat exhaustion, heat fatigue, heat syncope/ fainting, heat stroke), cardiovascular disease, fatigue, Cold stress (frost bite, hypothermia, chilblains)	Work practices, work/rest cycles, access to water, access to shade/ cooling/heating, properly worn PPE	Age, weight, degree of physical fitness, degree of acclimatization, metabolism, use of alcohol or drugs, medical conditions, prior heat injury, clothing worn	Mostly outdoor; urban and rural

INDUSTRIAL TRANSITIONS AND EMERGING INDUSTRIES

Construction	Construction workers (including all construction trades: carpenter, electrician, heavy equipment operator, ironworker, laborer, mason, plasterer, plumber, pipefitter, sheet metal worker, and welder), day-laborers	Job security/ new hazard scenario	Musculoskeletal disorders, mental stress, cardiovascular disease, unknown disease	Work practices, work/rest cycles, protective gear	Age, medical conditions, degree of physical fitness, socio-economic factors, medical conditions, PPE	Indoor and outdoor; urban and rural
Hazardous Waste Cleanup	Cleanup workers, DOE legacy site cleanup workers; disaster responders and workers, construction workers	Job security/ new hazard scenario	Musculoskeletal disorders, mental stress, cardiovascular disease, unknown disease	Work practices, work/rest cycles, protective gear	Age, medical conditions, degree of physical fitness, socio-economic factors, medical conditions, PPE	Indoor and outdoor; urban and rural
Transportation	Truck drivers, public transportation operators, hazardous waste material transport drivers, construction drivers, public transportation systems (e.g., rail workers, mass-transit system workers)	Job security/ new hazard scenario	Musculoskeletal disorders, mental stress, unknown disease	Work practices, work/rest cycles,	Age, medical conditions, degree of physical fitness, socio-economic factors, medical conditions, PPE	All
Energy sector	DOE facility workers, renewable energy workers, alternative energy workers, miners, oil refinery workers, electric power workers, nuclear facility workers, pipeline construction and maintenance workers, shale gas/oil extraction workers	Job security/ new hazard scenario (renewable, green energy growth)	Musculoskeletal disorders, cardiovascular disease, unknown disease, traumatic injury, biological hazards	Work practices, work/rest cycles, protective gear	Age, medical conditions, degree of physical fitness, socio-economic factors, medical conditions, PPE	All

Industry	Affected Population	New Hazards/ Vulnerabilities	Occupational Health Effects	Work Related Factors	Individual Factors	Locations Most Affected
Energy sector	DOE facility workers, renewable energy workers, alternative energy workers, miners, oil refinery workers, electric power workers, nuclear facility workers, pipeline construction and maintenance workers, shale gas/oil extraction workers	Mental stress from job insecurity and the unknown	Mental stress, cardiovascular disease, musculoskeletal disorder, depression	Work practices, future of industry	Age, medical conditions, mental health, socio-economic status	All
Manufacturing	Manufacturing and industrial trades, chemical manufacturing plant workers, product manufacturing plant workers	Job security/ new hazard scenario	Musculoskeletal disorders, cardiovascular disease, unknown disease, traumatic injury, biological hazards	Work practices, protective gear	Age, medical conditions, degree of physical fitness, socio-economic factors, medical conditions, PPE	All
Manufacturing	Manufacturing and industrial trades, chemical manufacturing plant workers, product manufacturing plant workers	Mental stress from job insecurity and the unknown	Mental stress, cardiovascular disease, musculoskeletal disorder, depression	Work practices, future of industry	Age, medical conditions, mental health, socio-economic status	All
Infrastructure (i.e.. Utility work and Public works)	Workers of electrical generation (nuclear and fossil fuel), electrical transmission and distribution, gas transmission and distribution, water treatment, distribution, and purification, road and building repair, public and private waste collection and disposal, facility and grounds maintenance	Job security/ new hazard scenario	Musculoskeletal disorders, mental stress, cardiovascular disease, unknown disease	Work practices, work/rest cycles, protective gear; type of new chemicals or hazards used in treatments	Age, medical conditions, degree of physical fitness, socio-economic factors, medical conditions, PPE	All

OZONE DEPLETION

Industry	Affected Population	New Hazards/ Vulnerabilities	Occupational Health Effects	Work Related Factors	Individual Factors	Locations Most Affected
Construction	Construction workers (including all construction trades: carpenter, electrician, heavy equipment operator, ironworker, laborer, mason, plasterer, plumber, pipefitter, sheet metal worker, and welder), day-laborers	Increased UV radiation	Skin cancer, eye effects, immune dysfunction	Work practices, work/rest cycles	Age, weight, degree of physical fitness, metabolism, use of alcohol or drugs, medical conditions, clothing worn, sunblock	Mostly outdoor; urban and rural
Hazardous Waste Cleanup	Cleanup workers, DOE legacy site cleanup workers, disaster responders and workers, construction workers	Increased UV radiation	Skin cancer, eye effects, immune dysfunction	Work practices, work/rest cycles	Age, weight, degree of physical fitness, metabolism, use of alcohol or drugs, medical conditions, clothing worn, sunblock	Mostly outdoor; urban and rural
Energy sector	DOE facility workers, renewable energy workers, alternative energy workers, miners, oil refinery workers, electric power workers, nuclear facility workers, pipeline construction and maintenance workers, shale gas/oil extraction workers	Increased UV radiation	Skin cancer, eye effects, immune dysfunction	Work practices, work/rest cycles	Age, weight, degree of physical fitness, metabolism, use of alcohol or drugs, medical conditions, clothing worn, sunblock	Mostly outdoor; urban and rural
Emergency Response	Emergency responders, EMT, firefighters, disaster site workers, skilled support personnel, day laborers	Increased UV radiation	Skin cancer, eye effects, immune dysfunction	Work practices, work/rest cycles	Age, weight, degree of physical fitness, metabolism, use of alcohol or drugs, medical conditions, clothing worn, sunblock	Mostly outdoor; urban and rural
Infrastructure (i.e.. Utility work and Public works)	Workers of electrical generation (nuclear and fossil fuel), electrical transmission and distribution, gas transmission and distribution, water treatment, distribution, and purification, road and building repair, public and private waste collection and disposal, facility and grounds maintenance	Increased UV radiation	Skin cancer, eye effects, immune dysfunction	Work practices, work/rest cycles	Age, weight, degree of physical fitness, metabolism, use of alcohol or drugs, medical conditions, clothing worn, sunblock	Mostly outdoor; urban and rural

VECTOR-BORNE DISEASES AND EXPANDED HABITATS

Industry	Affected Population	New Hazards/ Vulnerabilities	Occupational Health Effects	Work Related Factors	Individual Factors	Locations Most Affected
Construction	Construction workers (including all construction trades: carpenter, electrician, heavy equipment operator, ironworker, laborer, mason, plasterer, plumber, pipefitter, sheet metal worker, and welder), day-laborers	Increase and changed pathogens, increase in plant allergens, increase/ changed insect distribution (taking into consideration changing weather and season pattern, pollen season)	Vector-borne infections caused by insects (e.g., mosquitos and ticks), allergies/ asthma, dermatitis, infectious disease	Work practices	Age, weight, degree of physical fitness, medical conditions, clothing worn, use of insecticides, medication used	Mostly outdoor; mostly rural
Hazardous Waste Cleanup	Cleanup workers, DOE legacy site cleanup workers, disaster responders and workers, construction workers	Increase and changed pathogens, increase in plant allergens, increase/ changed insect distribution	Vector-borne infections caused by insects (e.g., mosquitos and ticks), allergies/ asthma, dermatitis, infectious disease	Work practices, protective equipment	Age, weight, degree of physical fitness, medical conditions, clothing worn, use of insecticides, medication used	Mostly outdoor; mostly rural
Health care	Nurses, doctors, workers who work in health care settings	Increase and changed pathogens, increase in plant allergens, increase/ changed insect distribution (taking into consideration changing weather and season pattern, pollen season), contact with sick patients	Vector-borne infections caused by insects (e.g., mosquitos and ticks), allergies/ asthma, dermatitis, infectious disease, patient-provider infection	Work practices, PPE	Age, weight, degree of physical fitness, medical conditions, medication used, properly worn PPE	In hospitals, health care facilities

Industry	Affected Population	New Hazards/ Vulnerabilities	Occupational Health Effects	Work Related Factors	Individual Factors	Locations Most Affected
Emergency Response	Emergency responders, EMT, firefighters, disaster site workers, skilled support personnel, day laborers	Increase and changed pathogens, increase in plant allergens, increase/ changed insect distribution	Vector-borne infections caused by insects (e.g., mosquitos and ticks), allergies/ asthma, dermatitis, infectious disease	Work practices, protective equipment	Age, weight, degree of physical fitness, medical conditions, clothing worn, use of insecticides, medication used	Mostly outdoor; urban and rural
Infrastructure (i.e.. Utility work and Public works)	Workers of electrical generation (nuclear and fossil fuel), electrical transmission and distribution, gas transmission and distribution, water treatment, distribution, and purification, road and building repair, public and private waste collection and disposal, facility and grounds maintenance	Increase and changed pathogens, increase in plant allergens, increase/ changed insect distribution	Vector-borne infections caused by insects (e.g., mosquitos and ticks), allergies/ asthma, dermatitis, infectious disease	Work practices, protective equipment	Age, weight, degree of physical fitness, medical conditions, clothing worn, use of insecticides, medication used	Mostly outdoor; mostly rural

[APPENDIX B] AVAILABLE WTP TRAINING COURSES/RESOURCES

CONFINED SPACE

Awardee/ Provider	Course Title	Type of Course	Specific Location in Module	*Link (if available)*	Notes
Alabama Fire College	Air Monitoring Basics in Hazmat Response	Emerg. Resp. for Specific Hazards		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=8962*	
Alabama Fire College	Confined Space Rescue Technician	Confined Space		*https://tools.niehs.nih.gov/wetp/public/index.cfm?FuseAction=browser_detail&CCODE=226*	
CPWR - The Center for Construction Research and Training	Confined Space (Instructor) 508 Compliant	Confined Space		*https://tools.niehs.nih.gov/wetp/public/index.cfm?FuseAction=browser_detail&CCODE=2884*	
IAFF	Training for Hazardous Materials Response: Confined Space Operations	Confined Space	Unit 1-6	*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=4634*	
International Chemical Workers Union	Training for Hazardous Materials Response: Confined Space Rescue	Confined Space	Unit 1-8	*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=4653*	
International Chemical Workers Union	HAZWOPER Train-the-Trainer	Emerg. Resp. Train-the-Trainer	Section 12	*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=1501*	
International Chemical Workers Union	Hanford 2007 refresher	Emerg. Resp. Refresher	Pages 1-4	*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=4979*	
International Union Operating Engineers	Confined Space Awareness 16-Hour	Confined Space	Page 1-155	*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=10042*	
International Union Operating Engineers	Confined Space Awareness 8-Hour	Confined Space		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=10045*	
LIUNA Training	Confined Space Awareness	Confined Space		*https://tools.niehs.nih.gov/wetp/public/index.cfm?FuseAction=browser_detail&CCODE=219*	
LIUNA Training	Permit-required Confined Space	Confined Space	Pages 1-260	*https://tools.niehs.nih.gov/wetp/public/index.cfm?FuseAction=browser_detail&CCODE=580*	

Awardee/ Provider	Course Title	Type of Course	Specific Location in Module	*Link (if available)*	Notes
New England Consortium	Confined Space Entry Awareness	Confined Space		*Material not available online*	
NYCOSH	Confined Space	Confined Space		*Material not available online*	
SEIU	Permit Required Confined Space Entry	Confined Space		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=8819*	
Teamsters	Confined Space: Enter by Permit Only	Confined Space		*Material not available online*	
UAW	Confined Space Entry Training	Confined Space	Pages 2-117	*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=150*	
University of Buffalo	Confined Space Initial	Confined Space		*Material not available online*	
University of Buffalo	Confined Space and Permit Required	Confined Space		*Material not available online*	
University of California Los Angeles	Introduction to Confined Space Rescue	Confined Space		*Material not available online*	
University of California Los Angeles	General Site Worker	Basic Superfund Site Worker	Module 12	*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=7273*	Basic 40 hour course
University of Cincinnati	Confined Space Rescue	Confined Space		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=7472*	
University of Washington/ Northwest Center of Occupational Health and Safety	40-Hour HAZWOPER	Emerg. Resp./ HazMat Tech		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=9241*	
PETE (formerly Kirkwood)	Confined Space Awareness	Confined Space		*https://tools.niehs.nih.gov/wetp/public/index.cfm?fuseaction=browser_detail&ccode=178*	
PETE (formerly Kirkwood)	Non-Entry Confined Space Rescue	Confined Space		*https://tools.niehs.nih.gov/wetp/public/index.cfm?fuseaction=browser_detail&ccode=1624*	
PETE (formerly Kirkwood)	Confined Space Rescue	Confined Space		*https://tools.niehs.nih.gov/wetp/public/index.cfm?fuseaction=browser_detail&ccode=124*	

Awardee/ Provider	Course Title	Type of Course	Specific Location in Module	*Link (if available)*	Notes

DISASTER CLEANUP

CPWR - The Center for Construction Research and Training	40 Hour hazardous Waste Worker 508 Compliant	Basic Superfund Site Worker		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=8443*	
International Chemical Workers Union	Disaster Site Worker	16 Hour Disaster Site Worker		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=3775*	
International Chemical Workers Union	Mold awareness	Microbial Remediation: Mold and Mildew		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=3900*	
International Chemical Workers Union	Mold awareness	Microbial Remediation: Mold and Mildew	Slides 1-29	*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=3900*	
International Union Operating Engineers	Mold Awareness	General Hazard Awareness	Page 49	*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=10072*	
International Union Operating Engineers	OSHA 5600 Disaster Site Worker Trainer	Disaster Site Worker Train-the-Trainer		*https://tools.niehs.nih.gov/wetp/public/index.cfm?FuseAction=browser_detail&CCODE=2071*	
International Union Operating Engineers	OSHA 5602 Disaster Site Worker Update	Disaster Site Worker Train-the-Trainer		*https://tools.niehs.nih.gov/wetp/public/index.cfm?FuseAction=browser_detail&CCODE=3504*	
International Union Operating Engineers	OSHA 7600 Disaster Site Worker 15-Hour	16 Hour Disaster Site Worker	Pages 1-409	*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=10074*	
LIUNA Training	Radiation Worker II 16-Hour	Radiation Worker II Training	Page 1-209	*https://tools.niehs.nih.gov/wetp/public/index.cfm?FuseAction=browser_detail&CCODE=3464*	
LIUNA Training	Microbial Remediation	Microbial Remediation		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=2841*	
OAI	EPA Model Lead Abatement Worker and Supervisor	Lead Abatement Worker Basic		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=7724*	
OAI	Lead Renovation, Repair, and Paint	Lead renovation and repair		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=8799*	

Awardee/ Provider	Course Title	Type of Course	Specific Location in Module	*Link (if available)*	Notes
OAI	Mold Awareness 8hr	Microbial Remediation: Mold and Mildew		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=7726*	
United Steelworkers of America	Hazardous Waste Operations and Emergency Response (HAZWOPER) Refresher Edition 20 April 2014	Site Worker Refresher	141-170	*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=9961*	
United Steelworkers of America	Mold Remediation Project, Edition 3 2010	Microbial Remediation; mold and mildew		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=7880*	
United Steelworkers of America	Pre-startup Safety Review Training, Hurricane Edition	Disaster Site Worker Train-the-Trainer		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=7535*	
University of Buffalo	Pre-startup Safety Review Training, Tornado Project	Disaster Site Worker Train-the-Trainer		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=7575*	
University of Cincinnati	Mold Remediation	Microbial Remediation: Mold and Mildew		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=5673*	
University of Texas Health Science Center at Houston Southwest Center for Occupational and Environment	Protecting Yourself During Post-High Wind Storm Cleanup	Emerg. Resp. Awareness		*Material not available online*	Factsheet
	Mold Awareness and Inspection	Environmental Technician		*https://tools.niehs.nih.gov/wetp/public/index.cfm?fuseaction=browser_detail&ccode=236*	

EMERGENCY RESPONSE

Awardee/ Provider	Course Title	Type of Course	Specific Location in Module	*Link (if available)*	Notes
Alabama Fire College	Basic Incident Command System (ICS)	Incident Management Systems Awareness	Material available from FEMA	*https://tools.niehs.nih.gov/wetp/public/index.cfm?FuseAction=browser_detail&CCODE=3928*	
Alabama Fire College	Hazmat First Responder Awareness Level (8 Hrs.)	Emerg. Resp. Awareness		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=9208*	
Alabama Fire College	ICS 300: Intermediate ICS for Expanding Incidents	Incident Management Systems Awareness		*https://tools.niehs.nih.gov/wetp/public/index.cfm?FuseAction=browser_detail&CCODE=3950*	
Alabama Fire College	ICS 400: Advanced ICS Command and General Staff - Complex Incidents	Incident Management Systems Awareness		*Material not available online*	
CPWR - The Center for Construction Research and Training	Mass Casualty Incident Triage Awareness (8 Hrs)	Emerg. Medical Basic/ Advanced		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=9587*	
CPWR - The Center for Construction Research and Training	24-hr Hazardous Waste Worker	Basic Superfund Site Worker	Chapter 6-4, 9-1	*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=4792*	Also includes Confined Space/ Emergency Response
IAFF	Hazardous Material Worker Initial - 40 Hour	Basic Superfund Site Worker		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=4314*	
IAFF	Training for HazMat Response: FRO 2005	Emerg. Resp. Basic Oper.		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=3973*	
IAFF	Training for Hazardous Materials Response: Radiation	Awareness of Radiation Haz. for Emerg. Resp.	Unit 4	*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=4659*	
International Chemical Workers Union	Plume Mapping	CAMEO		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=4112*	
International Chemical Workers Union	Oak ridge 2007	Emerg. Resp. Refresher		*https://tools.niehs.nih.gov/wetp/public/index.cfm?FuseAction=browser_detail&CCODE=1805*	

Awardee/ Provider	Course Title	Type of Course	Specific Location in Module	*Link (if available)*	Notes
International Union Operating Engineers	oak ridge 2007 refresher	Emerg. Resp. Refresher		*https://tools.niehs.nih.gov/wetp/public/index.cfm?FuseAction=browser_detail&CCODE=1804*	
National Labor College	Respiratory Protection	Respiratory Protection	Pages 2-156	*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=2242*	
New England Consortium	Chemical/Emergency Response	Emerg. Resp. Basic Oper.		*https://tools.niehs.nih.gov/wetp/public/index.cfm?FuseAction=browser_detail&CCODE=2684*	
New England Consortium	24 Hour Emergency Responders Basic Health and Safety Course	Emerg. Resp. Basic Oper.		*Material not available online*	
New England Consortium	ER First Responder Operations	Emerg. Resp. Basic Oper.		*Material not available online*	HAZWOPER Emergency Responder Operations Level course covering the requirements for small spills under 29CFR.1910.120(q). Activities can include PPE, respiratory protection, defensive control and procedures relative to decontamination.
New England Consortium	Emergency Response Awareness-Work Zone Safety and HAZMAT Incidents	Emerg. Resp. Awareness		*Material not available online*	
New England Consortium	8- Hour Emergency Responder All Hazards Awareness Training	Emerg. Resp. Awareness		*Material not available online*	For workers responding to CBNRE-Mass Casualty Incidents manual and course to suite the audience.
OAI	8 Hr Hospital First Receivers	Hospital Emerg. Room Oper.		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=7745*	
OAI	HAZMAT Refresher for Emergency Response	Emerg. Resp. Refresher		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=8781*	
OAI	Hazardous Materials and Emergency Response Awareness	Emerg. Resp. Awareness		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=7720*	
Teamsters	16-hour Emergency Response Course - Awareness Level	Emerg. Resp. Awareness	Pages 5, 175	*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=7679*	

Awardee/ Provider	Course Title	Type of Course	Specific Location in Module	*Link (if available)*	Notes
Teamsters	24-hour Radiological Control Worker II Course			*Material not available online*	
Teamsters	40-hour Basic Hazardous Waste Worker Course	Haz. Waste Operations	Chapter 10 page 174	*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=7152*	Also includes information on decontamination
UAW	8-hour Initial Respiratory Protection Course	Respiratory Protection		*https://tools.niehs.nih.gov/wetp/public/index.cfm?FuseAction=browser_detail&CCODE=160*	
UAW	Comites de Salud - Health and Safety Committees - Spanish	Emerg. Resp. Awareness		*https://tools.niehs.nih.gov/wetp/public/index.cfm?FuseAction=browser_detail&CCODE=2444*	
UC Berkeley's Labor Occupational Health Program	Emergency Response	Basic Industrial Emerg. Responder Oper.		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=98* *https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=100; https://tools.niehs.nih.gov/wetp/public/index.cfm?FuseAction=browser_detail&CCODE=114*	
United Steelworkers of America	8-Hour Hazwoper Refresher Course	RCRA TSD Site Refresher		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=1882*	
United Steelworkers of America	Emergency Response Workbook, Edition 1, April 2011	Emerg. Resp. Awareness		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=7881*	
University of Buffalo	8-hr HAZWOPER Operations for Healthcare Workers Initial	Emerg. Medical Basic/ Advanced		*Material not available online*	
University of Buffalo	Emergency Response Operations	Emerg. Resp. Basic Oper.		*Material not available online*	
University of California Los Angeles	Hazardous Materials First Responder Awareness	Emerg. Resp. Awareness		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=7252*	
University of Cincinnati	24-Hour Program for Industrial Emergency Responder-Operations Level 508 Compliant	Industrial Emerg. Responder Tech.	Pages 2-448	*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=6992*	
University of Cincinnati	40-Hour Technician Level for Emergency Responders	Emerg. Resp./ HazMat Tech	Pages 1-561	*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=4952*	

Awardee/ Provider	Course Title	Type of Course	Specific Location in Module	*Link (if available)*	Notes
University of Cincinnati	8-hour hospital based decontamination	WMD Hospital Staff Operations		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=9320*	Prepares hospital workers to deal with the massive influx of patients during a mass casualty incident. Decontamination of patients and appropriate safety measures are covered in-depth.
University of Cincinnati	First-on-the-Scene Awareness Program, Municipal	Emerg. Resp. Awareness		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=6913*	
University of Cincinnati	Assessing Preparedness: Natural and Intended Emergencies in the Community	Environmental Justice		*Material not available online*	Community preparedness
PETE (formerly Kirkwood)	Waste Site Worker Safety (40 hr)	Emergency Response		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=4426*	
PETE (formerly Kirkwood)	Emergency and Disaster Response to Chemical Releases	Emergency Response		*https://tools.niehs.nih.gov/wetp/public/index.cfm?fuseaction=browser_detail&ccode=2344*	

Awardee/ Provider	Course Title	Type of Course	Specific Location in Module	*Link (if available)*	Notes

GREEN JOBS

DILLARD UNIVERSITY	Introduction to Green Weatherization/Awareness & Hands-on Training	Basic Construction Skills	Pages 1-20	*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=8021*	
International Union Operating Engineers	Green Chemistry & Green Awareness	General Hazard Awareness	Pages 1-81	*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=10049*	
LIUNA Training	Environmental Preparatory Worker Course	Environmental Preparation		*https://tools.niehs.nih.gov/wetp/public/index.cfm?FuseAction=browser_detail&CCODE=106*	
NYCOSH	Worker and Environmentalist Green Chemistry Awareness Training Curriculum	Pollution Prevention		*Material not available online*	
OAI	Green Job Safety and Health Training	Basic Construction Skills		*Material not available online*	
University of California Los Angeles	Decoding Green Chemistry for Workers	Toxic Use Reduction		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=8459*	
University of Cincinnati	Good, Green, Safe Jobs	Toxic Use Reduction		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=8619*	
University of Cincinnati	Weatherization	General Industry Safety/ Plant Operation		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=8699*	
PETE (formerly Kirkwood)	Green Building Construction Workers Safety and Health	Green Building Awareness		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=8460*	

Awardee/ Provider	Course Title	Type of Course	Specific Location in Module	*Link (if available)*	Notes

HEAT STRESS

PETE (formerly Kirkwood)	Waste Site Worker Safety (40 hr)	Heat and cold stress	18-19	*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=4410*	

OTHER

New England Consortium	8-Hour Worker Centered Pollution Prevention	Pollution Prevention		*Material not available online*	This training has been developed to assist New England companies and unions in developing more coordinated strategies to prevent both occupational and environmental exposures and to increase worker participation in identifying pollution prevention opportunities.
OAI	Career Development	Life Skills		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=7760*	For those entering construction and environmental remediation industries
United Steelworkers of America	Basic Health and Safety for Devastated Communities, Edition 3 November 2010	Katrina Safety Awareness		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=7879*	Helps educate people in communities devastated by natural disasters on what to know what to do to get back into their homes; includes
United Steelworkers of America	A Just Transition for Jobs and the Environment	Environmental Justice		*https://tools.niehs.nih.gov/wetp/public/Course_download2.cfm?tranid=2569*	Hazards awareness training course for workers and community members
University of Cincinnati	Creating a Climate Kit	Climate change		*Material not available online*	Climate change course: Facilitator and Trainee course

[APPENDIX C] AVAILABLE "EXTERNAL" TRAINING COURSES/RESOURCES

GENERAL CLIMATE CHANGE

Name of Training	Group Sponsoring Training	Description of Training	URL
Climate Change, Its Consequences on Employment and Trade Union Action: A Training Manual for Workers and Trade Unions	United Nations Environment Programme	The purpose of these manuals is to provide workers and trade unions with general information and guidance on how to deal with climate change and chemicals. In particular, it aims to enhance understanding of (i) climate change and related mitigation and adaptation issues and their consequences on employment, and (ii) sound and sustainable management of chemicals and of related risks in the workplace. The manuals target experienced or inexperienced workers and trade unions, both from developing countries and countries with economies in transition from Africa, Asia and the Pacific, Eastern Europe, and Latin America and the Caribbean. It attempts to combine different types and levels of information to suit the needs and interests of all. The Manual is elaborated for women and men, workers, who are in industry, agriculture, government and other public or private sectors.	http://apps.unep.org/publications/pmtdocuments/TOT_ClimateChangeManual_eng.pdf
Advancing Clean Air, Climate, & Health: Opportunities for Nurses	Alliance of Nurses for Healthy Environments	This continuing education offering consists of a workbook and media modules to create a campaign for advocacy that is designed for public and environmental health nurses who are interested in learning about the science of climate change, public health impacts, and how they can effectively advocate for the Clean Air Act and clean energy policies. The first 250 nurses to successfully complete the workbook, videos, and post-test and evaluation will receive 3 nursing continuing education credits for free.	http://envirn.org/pg/pages/view/82102/advancing-clean-air-climate-amp-health-opportunities-for-nurses

Name of Training	Group Sponsoring Training	Description of Training	URL

EXTREME AMBIENT TEMPERATURES

A Guide for Employers to Carry Out Heat Safety Training for Workers	Occupational Safety and Health Administration	The past few summers have shown that the risk of heat illness from high temperatures is one of the most serious challenges to the safety and health of workers. This training guide will help you plan how to prevent heat illness among your crew and provide training to your workers. The training guide includes the following tools: Complete instructions for teaching workers about heat hazards; a daily checklist to make sure all appropriate precautions are in place each workday; OSHA Heat Safety Fact Sheet, in English and Spanish, that reviews some of the key information about heat illness; and easy-to-read OSHA posters, in English and Spanish, for the worksite and the community that you can copy and distribute to workers.	https://www.osha.gov/SLTC/heatillness/osha_heattraining_guide_0411.pdf
Heat Hazards in Agriculture, A Guide for Employers to Carry Out Tailgate Training for Workers, 2008	Commission on Health and Safety and Workers' Compensation (State of California)	Recent California summers have shown that the risk of heat illness is one of the most serious challenges to the safety and health of farmworkers. This training guide helps employers plan how to prevent heat illness among the crew and provide training to workers.	http://www.dir.ca.gov/chswc/HeatHazard_Tailgate.html
Guidance and Resources for Outdoor Workers in the Heat (GROWTH) Toolkit	Arizona Department of Health Services	The toolkit provides outdoor workers and employers with resources to prevent, recognize, and treat heat illness utilizing information developed by the Occupational Safety and Health Association (OSHA).	http://www.azdhs.gov/phs/oeh/extreme/heat/outdoor-worker.php
Keeping workers safe during heatwaves: information for employers, managers and work place health safety officers	Adapting to Climate Change in China (ACCC)	This paper provides information for employers, managers and workplace health and safety managers discussing effective way to reduce the vulnerability of workers exposed to intensive heat such as outdoor workers, kitchen staff and heavy manual laborers affected mostly by heat waves due to their increased exposure and little ability to adapt their environment. ACCC focuses its study on developing an effective plan aiming to protect workplace staff health and decrease heat stress.	http://www.preventionweb.net/english/professional/publications/v.php?id=36379

AIR POLLUTION

Air Pollution Training Institute/ APTI-Learn	U.S. Environmental Protection Agency	The APTI Virtual Classroom gives users the opportunity to take EPA's Air Pollution Training Institute self-instructional courses. EPA established its Air Pollution Training Institute (APTI) over 30 years ago to provide technical air pollution training to environmental professionals in State, tribal, and local governments. Now, this premiere technical air pollution training material is available to all with web access. The page provides a tool to help plan a regimen of training courses geared to one's work specialty.	http://www.apti-learn.net/LMS/EPAHomePage.aspx?m=1&n=0

Name of Training	Group Sponsoring Training	Description of Training	URL

OZONE DEPLETION

Workplace Safety & Health Topics	Centers for Disease Control and Prevention	Provides detailed information for employers and workers on how to avoid exposure to UV radiation.	http://www.cdc.gov/niosh/topics/uvradiation/
Seven Safety Suggestions for Summer Work	Centers for Disease Control and Prevention	Outdoor jobs expose workers to heat stress and ultraviolet (UV) radiation, poisonous plants and creatures, and pest-borne diseases. This list of tips provides appropriate training and adequate protection that can go a long way toward keeping workers safe outside.	http://www.cdc.gov/Features/WorkingOutdoors/
Guidelines for Outdoor Workers	Skin Cancer Foundation	Provides skin cancer prevention guidelines for outdoor workers below to stay safe in the sun.	http://www.skincancer.org/prevention/sun-protection/prevention-guidelines/guidelines-for-outdoor-workers
Protect the Skin that You're In/ Sun Sense Campaign	Laborers' Health and Safety Fund of North America (LHSFNA)	Resources from an all-out effort to alert laborers to the solar danger in outdoor summer work. Sun Sense is the LHSFNA's annual awareness campaign about the danger of skin cancer caused by the sun.	http://www.lhsfna.org/index.cfm/lifelines/may-2013/new-sun-sense-posters-highlight-risks-precautions/
Sun Safety in the Field: A Guide for Farmers	Iowa State University Extension	Sun safety tips for farmers	https://store.extension.iastate.edu/Product/pm1518h-pdf
Ultraviolet (UV) Radiation Dangers	Texas Department of Insurance	Offers resources for employers and employees recommendations to protect against UV damage.	http://www.tdi.texas.gov/wc/safety/2014uvradiation.html

EXTREME WEATHER

Ready Responder Resources from the Department of Homeland Security	Federal Emergency Management Agency; U.S. Department of Homeland Security	The Ready Responder Toolkit is designed to provide emergency response agencies with a series of planning tools to help prepare their personnel and families for emergencies. These tools are flexible and customizable to be used by planners to meet the needs of their agency or department.	http://www.ready.gov/responder

Name of Training	Group Sponsoring Training	Description of Training	URL
Fire Department Preparedness for Extreme Weather Emergencies and Natural Disasters	U.S. Department of Homeland Security	This report examines the impact of extreme weather and natural disasters on the fire service. It also addresses the types of service calls most likely to arise as a result of these disasters and what equipment and planning are needed in order to be prepared. Safety, mutual aid, shift management, resource identification, logistics, and other related issues are discussed, along with examples from case studies of fire departments that have learned from experience what can happen. The report provides information that fire departments can use to enhance their level of preparedness and ensure greater safety the next time disaster strikes.	https://www.usfa.fema.gov/downloads/pdf/publications/tr_162.pdf

VECTOR-BORNE DISEASES AND EXPANDED HABITATS

Workplace Safety & Health Topics: Tick-Borne Diseases	Centers for Disease Control and Prevention (CDC)	Webpage provides background on why workers are especially at risk of exposure to tick-borne diseases; frequently asked questions on the topic; recommendations for employers and workers to protect individuals from tick-borne diseases; and a number of helpful resources.	http://www.cdc.gov/niosh/topics/tick-borne/
West Nile Virus Overview and Resources	The National Institute for Occupational Safety and Health (NIOSH)	Webpage offers background on why West Nile virus (WNV) presents particular risks to outdoor workers and laboratory, field, and clinical workers. Page also provides links to a number of NIOSH and CDC resources on the topic.	http://www.cdc.gov/niosh/topics/westnile/default.html

National Institute of Environmental Health Sciences

This publication was made possible by contract number 273-2010-00083U from the National Institute of Environmental Health Sciences (NIEHS), NIH.