Climate Change and Occupational Safety and Health
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Photo courtesy of USGS
Program

• NIOSH Overview
• Climate Change and Workers
• Occupational Health and Safety Response
• NIOSH Climate Change Initiative
• Discussion

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NIOSH Mission

• To generate new knowledge in the field of occupational safety and health

• To transfer that knowledge into practice
NIOSH Activities - Research

- Surveillance/Epidemiology
- Field Studies
- Laboratory Studies
- Exposure Measurement
- Control Technology
- Protective Equipment
- Emergency Response
- Training
- Information Dissemination

Photo by Aaron Sussell
NIOSH

Approximately 1,100 staff members

Locations
Anchorage
Atlanta
Cincinnati
Denver
Morgantown
Pittsburgh
Spokane
Washington, DC
Climate Change and Workers

- Temperature Extremes
- Air Pollution
- UV Radiation
- Extreme Weather
- Wild-land Fire
- Vector-borne and other Infectious Disease
- Changes in Built Environments
- Industrial transitions
Increased Ambient Temperature

- Heat exhaustion
- Stress/stroke
- Decreased chemical tolerance
- Fatigue, Impaired Judgment
- Increased risk of Injury
- Other

Rate of Global Warming

Image courtesy of the National Academy of Science and was created with data from the Goddard Institute for Space Studies.
Air Pollution

- Elevated temperature can increase levels of air pollution
  - e.g., ground level ozone, particulate matter
- Impact on both outdoor and indoor workers
- Aeroallergens and asthma
- Expanded geographic range
Ultraviolet Radiation

- Direct effect of climate change
  - Depletion of stratospheric ozone
- Sunburn
- Skin Cancer
- Eye Damage
- Enhanced photo-toxicity
  - Combined exposures to UV and PAHs
- Number of outdoor workers at risk will increase
Extreme Weather Events

- More frequent
- Heavy precipitation, storms, floods
- Droughts
- Emergency response and clean-up workers
  - New and unanticipated hazards
  - More frequent and longer in duration
- Disruption of infrastructure
- Worker risks include traumatic injury, stress, fatigue, exposure to chemical, physical, and biological agents
Wildland Fire

- Climate change will result in increased numbers and expansion of wildland fires
  - Hot, dry and windy conditions persist are factors conducive to fires
    - Increased numbers of fire fighters will be required
  - Extended fire season
    - Increased work duration
- Climate change influences fire and fire activity can influence climate.
- Occupational risks include: Heat stress, fatigue, smoke exposure, burns, injury
Satellite Image of California Wildland Fires
Vector-Borne and other Disease Hazards

- Climatic variables influence pathogen and disease patterns
- New and expanded vector ranges
  - Longer periods of vector activity
- Lyme disease, Hantavirus, West Nile Virus, Malaria, Dengue, Chikungunya
- Outdoor work increases vulnerability
- Wide variety of disciplines potentially affected
- Increased pesticide use
- Valley Fever (Coccidioidomycosis)
  - Associated with dust storms, dry condition

Vector-Borne and other Disease Hazards

*Culex tarsalis*: Vector for West Nile Virus
Lyme Disease

Confirmed Cases in 2001 = 17,029

Confirmed Cases in 2011 = 24,364

Valley Fever

A Shortcut Across The Top of the World

The Northeast Passage, across the Arctic Ocean, provides a shorter alternative for cargo vessels travelling between Europe and Asia than using the Suez Canal. It is shorter than the Panama Canal route for some voyages between the North American west coast and Europe.

LENGTH OF A VOYAGE TO ROTTERDAM FROM:

YOKOHAMA, JAPAN
12,894 miles via Suez Canal,
8,452 miles via Northeast Passage

SHANGHAI, CHINA
12,107 miles via Suez Canal,
9,297 miles via Northeast Passage

VANCOUVER, CANADA
10,262 miles via Panama Canal,
8,038 miles via Northeast Passage

Source: The Russian Ministry of Transport

September 11, 2009
Developments in Arctic Region

• Oil & Gas Exploration
• Mining
• Shipping
• Commercial Fishing
• Tourism
• Support services – (associated)
• Emergency Response
Industrial Transitions and Emerging Industries

- Shift in industrial investments
  - New capacities and skills will be needed
- Geographical shifts
  - Agriculture
- Recycling

Emerging industries
- Biodiesel
- Nuclear
- Solar
- Wind
- Carbon Capture and Sequestration
Wind Towers with In-Situ Recovery
Uranium wells - Wyoming
From Wyoming wind farm to Los Angeles homes

To help meet California's energy demand, four companies have jointly proposed to execute a multibillion-dollar plan for storing wind-generated energy in underground salt caverns. The energy later would be reconverted to electricity and delivered to customers in the Los Angeles area.

1. A huge wind farm in Wyoming would generate enough electricity to power 1.2 million homes.

2. A 525-mile electric transmission line would transport wind farm electricity to a massive energy storage facility in Utah.

3. The electricity would power compressors, creating high-pressure air that would be pumped into underground salt caverns for storage.

4. When electricity is needed in California, the stored air would drive turbines and generators, producing electricity for transport over an existing transmission line.

How do we eliminate hazards and minimize risks in emerging industries and technologies?
How do we transfer existing successful practices to these new jobs?

- Fall protection
- Crane safety
- Control of hazardous energy
- Permit-required confined space
Changes in the Built Environment – Indoor Air Quality

- Tight buildings
  - Radon
  - Mold
- Unconditioned Factories
  - Heat
- Unanticipated impacts of new building designs

ThyssenKrupp Steel USA factory in Calvert, Alabama. Photo courtesy of Reuters
Possible Solutions:

- Integrate sustainable construction safety and health within green design and construction practices

- Incorporate worker safety and health into LEED or alternate rating system
  - Construction, maintenance and use

- Involve energy and environmental professionals and students in design and planning (Prevention by Design; chapters in engineering books)

Ensure current, emerging, and anticipated worker safety and health issues associated with climate change are appropriately identified and prioritized, and to determine the most important actions that are appropriate to address.
FIGURE 1. Conceptual framework of the relationship between climate change and occupational safety and health

Schulte & Chun [2009]
NIOSH Activities

- Climate change designated as a NIOSH Emphasis area
- Formation of NIOSH Climate Change Occupational Safety and Health (CCOSH) Work Group
  - Interdisciplinary
  - Determine occupational safety and health issues
  - Identify gaps in worker protection
- Develop a research agenda
NIOSH Activities, cont.

- Other CCOSH work group goals:
  - Make recommendations for worker safety and health improvements
  - Topic Page and Blog
  - Establish and maintain a reference database
  - Develop and disseminate communication products
  - Participate on interagency initiatives to ensure occupational safety and health is included as a core component of public health
Elements of a Research Agenda

• Determine the links between climate change and occupational hazards
  • Identify, evaluate, and characterize these links
• Identify the number of workers and subpopulations affected by the direct and indirect effects of climate change
• Identify, evaluate and categorize control methods and adaptive responses to reduce or eliminate the impact of climate change on worker safety and health
  • Develop recommendations and guidance
• Develop new and risk assessment methods
Elements of a Research Agenda, cont.

- Develop and assess risk communication mechanisms and strategies
- Develop leading indicators of climate-potentiated health effects
  - Sentinel event/early warning systems
- Determine mechanisms for establishing a surveillance system
  - identify climate change safety and health injuries and illness,
  - track workers,
  - maintain records of exposure/impacts related to climate change
Identifying Workers and Facilities Likely to be Impacted by Severe Weather Events Stemming from Climate Change: a Geospatial Approach
Key Domestic Partners

• National Center for Environmental Health
• National Institute of Environmental Health Sciences
• National Oceanic and Atmospheric Administration
• Environmental Protection Agency
OSH inclusion in the Interagency Climate Change and Human Health Report
There is strong evidence that climate change is and will present OSH hazards
- Amplification of existing hazards (prevalence, distribution, and severity)
- Unanticipated hazards
- Interactions of known hazards and new conditions leading to new hazards and risks

Research is needed to better characterize and understand how OSH may be associated with climate change events
- Specific hazards, populations at risk, surveillance, sentinel events, risk assessment and management, indicators and preventive actions and options, communication

There is much we can do using established tools and strategies

Integrating climate change and OSH into a comprehensive adaptation planning process will yield the largest health improvements and savings
Some Questions to Consider

• What are the most important climate change and worker safety and health research questions?
• How do we ensure that climate change and worker safety and health is included as a core component of a National and State climate change action plan?
• How do we train and prepare workers to anticipate, recognize, and respond to climate change related hazards?
Discussion
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