Institute for Social and Environmental Transition – International
POLICY BRIEF

Da Nang, Vietnam:
Heat Stress and Climate Change

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Key Findings:

Da Nang is a thriving and rapidly growing port city on Vietnam's central coast. Construction, fishing, trade, tourism and several universities make it an important intellectual and commercial hub on the coast. A number of climate hazards, including extreme heat and high humidity present risks to Da Nang's people, businesses and infrastructure. Low-income and migrant workers are particularly vulnerable to suffering harm during heat waves, including heat stress, lost labor productivity and exacerbation of existing health conditions.

- By 2050, the heat index during the day begins to continually average above 40°C during May through September and extending the hot season from March through October by 2050. This is two to three months longer than in the past.
- Nighttime heat index temperatures during the hottest months (June to August) are not likely to drop below an average of 29.4°C, reducing recovery capacity at night while sleeping and exacerbating pre-existing health conditions like diabetes or high blood pressure.
- Outdoor and indoor workers are at risk of heat stress with the heat index during the day not likely to fall below 35.1°C by 2050. The Vietnam Ministry of Health urges caution for outdoor workers at 30°C.
- When factoring urban heat island effects, future heat stress in Da Nang will be significant and impact laborers' health and productivity.

Summary

In Central Vietnam, Da Nang has a tropical climate dominated by a dry season that lasts through April to August and wet season from September to March. The city lies between the ocean and mountains and is facing rapid urbanization, which translates into a larger urban footprint of commercial and residential buildings. Natural and climatic hazards are common in the region and Da Nang is not only prone to typhoons, but also flooding, which tend to be the most damaging. Yet, the implications of heat stress, caused by high temperatures and humidity has not been given much attention by the public health or business communities. Employee and employer awareness about the dangers of heat remains low (Dao et al. 2013).

Heat Index
An approximate measurement of how hot a person feels given weather conditions, physical activity, health status and clothing.

Heat stress has entered the global dialogue (Smith et al., 2014) as climate change discussions ensue and investigation into the impacts of heat stress have begun to raise alarms. Health research indicates that health impacts emerge through a broad range of air temperature and humidity conditions, especially if the individual is engaged in physical activity (Parsons 2006). A number of heat indices have been created to approximate health risks due to heat and humidity. At temperatures of 27°C and a relative humidity of 40%, acclimated, healthy individuals may begin to experience increasing fatigue and irritability. A healthy person engaged in medium-hard physical labor, such as a construction worker or farmer may begin experiencing heat stress at heat indices of 26°C (Kjellstrom et al. 2009; Parsons 2006).

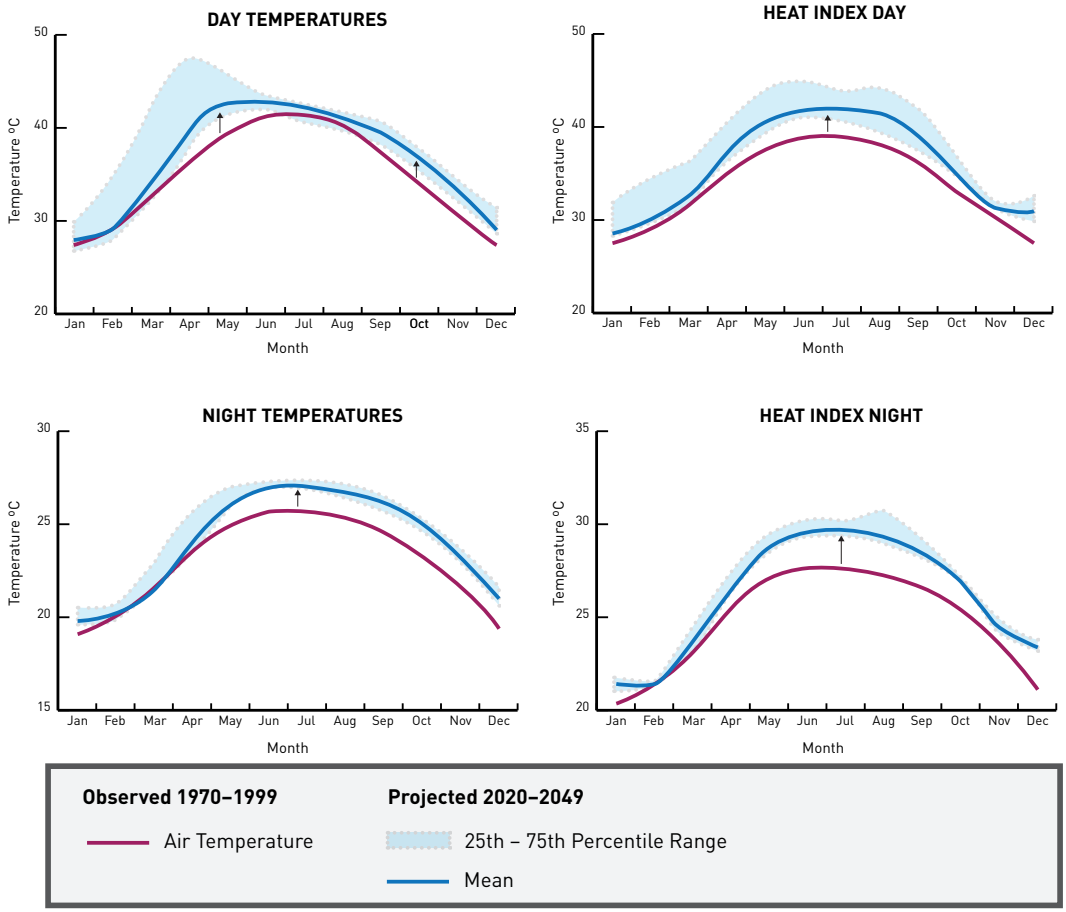
The Vietnam Ministry of Health (MOH) has set work temperature recommendations urging special precautions for when **ambient temperature** (what a standard meteorological thermometer measures) and humidity reach particular thresholds. For outdoor workers, such as construction workers, street vendors, farmers or fisherfolk, the MOH (2002) urges caution when air temperature is 30°C or warmer and humidity measures up to 80%. Indoor workers engaged in light labor, e.g. desk-based work, are theoretically able to handle temperatures of up to 34°C and humidity up to 80% (MOH 2002). Given research and labor experiences around the world, it might be advisable for MOH to consider issuing cautionary heat warnings when the heat index reaches 26°C to protect a broader range of workers, especially those with underlying health conditions and to reduce incidence of decreased labor productivity.

Work rate (based on Metobolic rate)	**Heat Index Value (°C)**
Resting/ light desk work	33
Light activity	30
Medium activity	28
Medium-hard activity	25
Heavy activity	23

ISO 7243: Heat Index reference values to protect workers (Parsons 2006).

Climate Change and Implications for Heat Stress

Projections of future day and night ambient temperatures and heat index values under nearly all climate change scenarios show continued warming through 2050 (Opitz-Stapleton, 2014). Warming is most pronounced in the months leading up to (April and May) and just after (September through November) the hot season, though the hot season will also get warmer. Because of these increases in ambient temperature, the heat index during the day begins to continually average above 40°C during May through September, creating dangerous working conditions for both outdoor and indoor workers. The median heat index during the day is not likely to fall below 35.1°C during any season by 2050, putting both outdoor and indoor workers at risk of heat stress unless a variety of coping mechanisms are adopted.



The number of days (nights) in which the heat index exceeds 34°C (28°C) is also expected to increase dramatically under all climate change scenarios. *If the daytime heat index threshold of 30°C is used (relevant to outdoor workers), it is exceeded almost continuously by 2050.* The types of change in ambient temperature are consistent with previous projections by MONRE (MONRE, 2011).

The length of the hot season is now likely to extend from March through October by 2050, two to three months longer than in the past. Nighttime heat index temperatures during the hottest months (June to August) are not likely to drop below an average of 29.4°C, reducing recovery capacity at night while sleeping, and exacerbating pre-existing health conditions like diabetes or high blood pressure.

What to do?

A previous study by COHED revealed that awareness of precautions for dealing with heat stress remains low. Certain populations, such as women-headed households or the self-employed, are at particular risk of suffering from heat stress and lost labor (Dao et al., 2013). Construction workers, agricultural laborers, street vendors and fishermen (all outdoor workers), and indoor workers engaged in manufacturing or sewing, or those in poorly ventilated and constructed buildings will be particularly hard hit. As both day and night temperatures continue to climb due to climate change, as well as an increase in the area influenced by the city's urban heat island effect due to development and landuse change, passive cooling measures like opening windows or hanging wet sheets for evaporative cooling will become less effective. People will need air conditioning, at least at night, in order to recover from the impacts of heat stress they

suffered while working during the day. Poorer populations that currently rely on passive measures will be hit particularly hard by the projected increases in ambient and heat index temperatures. Outdoor workers in the urban will be at significant risk of heat stroke and, possibly, death in the hot season if their localized heat index approaches 45 to 55°C due to the urban heat island effect and their employers do not allow them to rest and take protective measures.

To ensure resilience to heat stress, we recommend that:

- The Vietnam Ministry of Health adopt a broader range of heat risk thresholds to protect more workers, similar to practices in other countries, and provide recommendations to employers about protective measures over the range.
- There be development of heat warning system that can inform companies, workers and residents of Da Nang of when temperatures exceed safe thresholds.
- Cooling stations or areas are set up near vulnerable population groups identified by COHED to ensure adequate cooling facilities and protection of vulnerable workers.

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