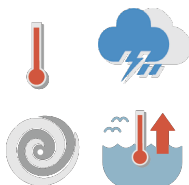


Employees

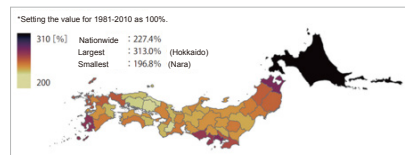
Major Factors of Impacts

Rising average temperatures, increased number of summer days, increased heavy rainfall and large typhoons, rising sea levels and storm surges



Current Situation and Future Projections

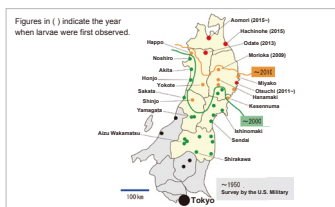
There is a nationwide trend of increase in number of emergency medical transports, etc., due to heat stroke. A study projecting number of people transported due to heat stroke in the future showed that number of people transported would be approximately 1.3 to 2.9 times higher for RCP 2.6 and 3.2 to 13.5 times higher for RCP 8.5, compared to current number for each prefecture.



*Note: The actual number of people transported for heat stroke has more than doubled since 2010 compared to 2008 (the year the Fire and Disaster Management Agency of the Ministry of Internal Affairs and Communications started surveying the number of people transported for heat stroke) - 2009 (Ministry of the Environment 2018, see Figure 1-5)

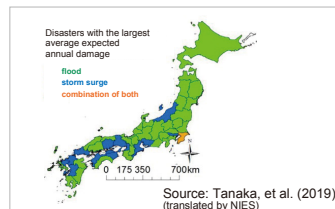
Heat stroke risk map in the future (2031-2050) climate under RCP8.5 scenario (average of 4 GCM) Source: Kusaka (2020) (translated by NIES)

It has been observed that habitat range of *Aedes albopictus*, an infectious disease vector, is expanding and period of time during which they can be active is growing longer. In the future, frequency of infectious disease outbreaks may increase as period of their activity grows longer.



Changes in the northern limit of the *Aedes albopictus* in the Tohoku region (2018) Source: National Institute of Infectious Diseases (edited and translated by NIES)

Heavy rainfall events with potential to cause floodings are projected to increase at the end of the century in major river basins, with 31 prefectures projected to suffer the greatest level of damage from floods alone.



Types of disasters that cause the greatest damage**
**Note that this figure only shows type of disasters that cause the largest amount of damage between flood, storm surge, and combination of both, but other disasters are also projected to occur.

Adaptation

To address health risks, health of employees will be protected from both soft measures (e.g., improvement of work styles) and hard measures (e.g., improvement of facilities). For disaster risks, lives of employees will be protected from disasters by strengthening disaster countermeasures such as BCPs.

Factors

Rising temperatures, increased heavy rainfall / large typhoons

Impacts

Increased health risk

- Increased heat stroke, etc.
- Increased costs for heat stroke prevention
- Decreased labor productivity
- Increased risk of infectious diseases
- Increased costs for infection control



Increased disaster risk

- Increased risk of suffering from disasters
- Increased costs for disaster countermeasures and work-related accidents etc.
- Inhibits commuting and working



Adaptation measures

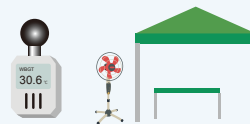
Soft measures Improve work styles / Work management

Health management

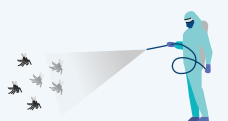


Soft measures / Hard measures Work environment control

Heat control measures for workplaces



Infection control measures



Hard measures Install and improve equipment

Install highly efficient air conditioning



Install alarm systems



Introduce robot technology, ICT, etc.



Soft measures Strengthen disaster countermeasures

Formulate and implement BCP

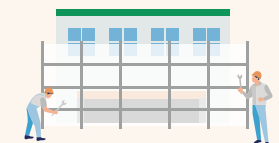


Review hazard maps



Hard measures Improve disaster prevention functions

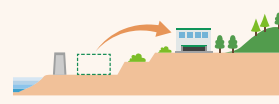
Repair/reconstruct facilities



Raise ground level



Optimal placement of facilities



Climate change impacts and adaptation measures on "employees" common to various industries

Factors Rising temperatures, increased heavy rainfall/large typhoons

Impacts Increased health risk Increased disaster risk

- Increased heat stroke, etc. (Increased excess deaths and number of people transported by ambulance due to heat stress)
- Increased costs for heat stroke prevention costs
- Decreased labor productivity due to heat
- Increased risk of infectious diseases (e.g., mosquito-borne)
- Increased costs for infectious disease control
- Increased job turnover due to worse working environment and difficulty in securing human resources
- Increased risk of suffering from disasters (torrential rains, typhoons, floods, storm surges)
- Increased costs for disaster countermeasures, work-related injuries, etc.
- Interference with commuting and working

Adaptation measures	Soft measures		Hard measures	
	[Improve work styles/work management]	[Work environment management]	[Install and improve equipment]	[Others]
	<ul style="list-style-type: none"> Health management Adopt remote work Raise awareness of heat stroke and infectious disease prevention Prepare health guidance manuals, etc. Adjust or shorten business hours and working hours in summer Promote "Cool Biz", sunshades, hats, etc. 	<ul style="list-style-type: none"> Ensure work intervals and rest time Heat acclimatization Recommend water and salt intake Consider appropriate clothing (introduction of air-conditioned clothing, etc.) Supervisory patrols during work, etc. 	<ul style="list-style-type: none"> 1) Install highly efficient air conditioning 2) Install alarm systems <ul style="list-style-type: none"> Disseminate heat index set by Ministry of the Environment Monitor heat index set by Ministry of the Environment 3) Introduce robot technology, ICT, etc. 4) Improve workplace environment for outdoor workers <ul style="list-style-type: none"> Provide rest areas to avoid exposure to the sun Install early alert systems of environmental sensors Thorough measures against vector-bearing mosquitoes (eliminate infestation conditions such as not creating watering holes where mosquitoes are likely to occur) 5) Introduce technology to reduce labor <ul style="list-style-type: none"> Improve performance of machinery 6) Optimal placement of facilities 7) Introduce highly insulated facilities 	<ul style="list-style-type: none"> Take out accident insurance (accident and medical insurance for employees)
			<ul style="list-style-type: none"> [Strengthen disaster countermeasures] Precautionary measures <ul style="list-style-type: none"> Formulate and implement BCP Review hazard maps Evacuation drills Raise public awareness Remedial measures <ul style="list-style-type: none"> Planned shutdowns [Improve work styles] <ul style="list-style-type: none"> Adopt remote work [Others] <ul style="list-style-type: none"> Take out damage insurance 	<ul style="list-style-type: none"> [Improve disaster prevention functions] Buildings <ol style="list-style-type: none"> Repair and reconstruct facilities Reinforce structures and take countermeasures based on regular inspections of structures Raise ground level Construct outer embankments Optimal placement of facilities Facilities and equipment <ol style="list-style-type: none"> Prepare for loss of power and other lifelines <ul style="list-style-type: none"> Wireless and satellite phone communication networks Uninterruptible power supply (UPS) Secure multiple means of energy including power generation equipment and air conditioning for power outages Install watertight panels and watertight doors

Effect	Low ~ Medium	1) ~ 5)Low ~ Medium 6) ~ 7)High	Low	1) ~ 5)Medium ~ High 6) ~ 7)Low ~ Medium
Cost	Low ~ Medium	1) ~ 5)Low ~ Medium 6) ~ 7)High	Low	1) ~ 5)Medium ~ High 6) ~ 7)Low ~ Medium
Time span	Short ~ Medium	1) ~ 5)Short ~ Medium 6) ~ 7)Long	Short	1) ~ 5)Medium ~ Long 6) ~ 7)Short ~ Medium

How to proceed with adaptation measures

[Current approach] Ensure that each employee has correct knowledge about heat stroke and takes precautions to prevent it, and take appropriate measures when an employee suffers from heat stroke. Enable employees to take action to reduce risk of disasters and to take measures to reduce risk of suffering in the event of an emergency.

[Climate change-aware approach] Heat stroke is one of direct effects of heat, which is strongly correlated with climate change, and as for mortality risk, an increase in excess mortality has been observed due to rising temperatures. Long-term shutdowns and large amounts of damage caused by disasters and other events are major threats to business continuity and reliability of companies, and climate change adaptation needs to be mainstreamed in terms of employee security.

[Preparing and planning for climate change] To address health risks, it is necessary to take measures to protect employees' health from both soft measures (e.g., raise public awareness and improve work environment) and hard measures (e.g., improve facilities). To address disaster risks, it is necessary to protect employees' lives from disasters by strengthening disaster countermeasures including formulation of business continuity plan (BCP).

[References] Ministry of the Environment (2018) "Heat Stroke Environmental Health Manual 2018" https://www.wbgt.env.go.jp/heatillness_manual.php, Ministry of the Environment (2008) Global Warming Impacts and Adaptation Research Committee Report "Smart Adaptation to Climate Change" http://www.env.go.jp/earth/ondanka/rc_eff-adp/index.html, Ministry of the Environment (2022) "Climate Change Adaptation Guide for Private Sector - Preparing for Climate Risk and Surviving-" https://adaptation-platform.nies.go.jp/private_sector/guide/index.html, National Institute of Infectious Diseases "Expansion of the distribution range of Aedes albopictus" (IASR Vol. 41 p92-93: June 2020) <https://www.niid.go.jp/niid/images/idsr/iasr/41/484.pdf>, Tanaka, Yukako et al. (2019) "Assessment on the Risk of Flood and Storm Surge with Flood Control Facilities" https://doi.org/10.2208/jscejhe.75.2_1_109, Kusaka, Hiroyuki (2020) "Future Heat Stroke Risk Assessment (SI-CAT Guidebook Editorial Board, Social Implementation Guidebook for Climate Change Adaptation Technologies)" https://www.mext.go.jp/content/20200325-mxt_kankyoku-1345230_3.pdf, Smith, Michael (2013) "Assessing Climate Change Risks and Opportunities for Investors: Property and Construction Sector - Investor Group on Climate Change and ANU", DOI:10.13140/RG.2.1.3851.4169

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