

# 1. 業務概要

## 1) 業務の目的

平成 30 年 11 月に閣議決定された「気候変動適応計画」では、暑熱による国民生活への影響の評価が重大性、緊急性、確信度のいずれにおいても高く、暑熱に対する適応策（暑さ対策）の推進が求められる。また、環境省では、これまでに熱中症予防情報として暑さ指数（WBGT）を提供してきたが、気候変動適応の観点からも、国民一人一人が暑さ指数（WBGT）を効果的に活用して、暑さ対策を実施していく必要がある。

また、まちなかの暑さ対策は、クールスポットの創出等のハード対策と国民の対策行動を促すようなソフト対策の両面で進めることが重要である。

そこで本業務では、地方公共団体における適応策実施の推進及び、暑さ指数（WBGT）の活用に向けた調査を行った。

## 2) 業務履行期間

令和 2 年 4 月 1 日～令和 3 年 3 月 12 日

## 3) 業務内容

### (1) まちなかの暑熱対策の推進

自治体等が夏季に実施するイベント等において、イベント参加者による施設間等の移動で使う屋外経路を対象に、ハード対策とソフト対策を組み合わせた場合の効果を調査した。

#### ① 温熱環境調査

イベント参加者が実際に利用する屋外経路を対象に、暑さ対策等（日傘の利用等）の比較検証が行えるよう、温熱環境を測定した。測定は定点観測と人の移動に合わせた移動観測を実施することとし、既往の調査研究事例を踏まえた適切な手法で実施した。測定項目は、気温、湿度、黒球温度等とし、暑さ指数（WBGT）等の総合指標として解析可能なデータを取得した。測定は暑熱環境条件のもと、4 日間を対象に実施した。検証に際しては、有識者 2 名に立ち会っていただき助言を得た。

#### ② 被験者を用いた調査

イベント参加者が実際に利用する屋外経路を対象に、暑さ対策等（日傘の利用等）の比較検証が行えるよう、被験者を歩行させ、心拍数等の生理反応、主観申告等を調査した。調査は、暑熱環境条件のもと、1 日 4 時間を 4 日間、各日被験者 4 名で実施した。

#### ③ データ分析

上記①～②の調査を実施し、得られた結果をもとに、各屋外経路の暑さ分析と各暑さ対策行動による熱環境改善等の効果について、適切な手法を検討し、分析した。これらの実施に際しては、有識者 2 名からの助言を得て調査計画を作成した。

### (2) 国民の暑さ指数（WBGT）の活用等に関する意識調査

国民の暑さ指数（WBGT）の認知度等を把握するため、国民を対象とした意識調査を、Web 調査を用いて実施した。24 問の質問票を作成し、地域別、年代別、性別の各属性別に 100 サンプル、計 6,400 サンプルの回答を確保した。質問票の作成にあたっては、「平成 31 年度暑熱環境に対する適

応策調査業務」で実施した意識調査結果を参照し、調査項目の改善を行った。得られた回答について、集計・分析を行い、暑さ指数（WBGT）の今後の活用方法等を考察した。

### （３）暑さ指数（WBGT）の認知度向上

#### ① 各種団体等における説明会

各種団体等の暑さ指数（WBGT）の認知度向上に向け、天王寺動物園の職員を対象とした説明会を行った。説明会資料については、暑さ関連・暑さ指数（WBGT）の内容を反映した説明会テキスト（44頁）を作成した。

#### ② 携帯型暑さ指数（WBGT）計の適正使用推進に向けたマニュアル作成

携帯型暑さ指数（WBGT）計における文献や製品情報を収集し、取扱い方法や計測の際に留意すべき事項を整理した。事項の整理後、暑さ指数（WBGT）計を扱う様々な方にとって理解度を高める目的で、暑さ指数（WBGT）計簡易計測マニュアルを作成した。作成に関しては有識者7名の助言を得た。

### （４）個人における適応策の推進

#### ① 日傘の効果を表現した資料（POP）のデザイン作成、印刷

個人で実施できる適応策のうち、比較的効果が高い日傘等の効果について、わかりやすい表現を用いた国民向けの資料（POP）をデザインし、B5版、計1,000部の印刷を行った。

#### ② 活用マニュアルの作成

資料（POP）活用に当たり、より効果的に日傘の効果が訴求できるよう、同資料（POP）を活用する2頁の説明員用のマニュアルを作成した。

#### ③ 資料（POP）の配布

資料（POP）の活用を希望する全国の百貨店、日傘取扱店等の各店舗に対する配布を実施した。

#### ④ 効果検証、ヒアリング

店舗等での掲示後に、資料（POP）掲示等による日傘等の普及効果について2店舗にメールでのヒアリングを実施した。また、資料（POP）を配布した全国の百貨店に活用状況アンケートを実施した。

### （５）有識者検討会の開催

業務の実施に当たっては、学識者、地方公共団体、開発事業者らで構成する検討会を1回開催し、意見を伺いつつ遂行した。なお、新型コロナウイルス感染症対策による、緊急事態宣言発出中のため、WEBでの参加も可とした。議事要旨を巻末に添付した。

#### 第1回検討会

開催日時：令和3年2月2日（木）15：00～17：00

開催場所：一般社団法人 環境情報科学センター 会議室

出席者：足永委員、後藤委員、中嶋委員、鍋島委員、成田委員、堀越委員、本條委員、三坂委員

## Study on Measures for Adaptation to the Thermal Environment in Fiscal Year 2020

### 1. Abstract

#### 1) Purpose of the study

The Climate Change Adaptation Plan, adopted at a Cabinet meeting in November 2018, contains a request for the promotion of measures for adaptation to summer heat (hereinafter referred to as measures against heat) in recognition of the importance and immediacy of the impact of summer heat on Japanese people's daily lives and their belief in that impact. The Ministry of the Environment has provided a heat stress index (the wet-bulb globe temperature [WBGT]) as an information tool for preventing heat illness. Each Japanese citizen must make effective use of this heat stress index and take measures against heat from the perspective of climate change adaptation. Promoting measures against heat in cities will take the form of structural measures, such as the creation of cool spots, as well as non-structural measures, such as encouraging Japanese people to take active measures against heat. This study investigated the promotion of the enforcement of measures against heat and the use of the heat stress index by local public entities.

#### 2) Period of the study

This study was conducted from April 1, 2020 to March 31, 2021.

#### 3) Contents of the study

##### (1) Promotion of measures against heat in cities

In various events held in the summer season by municipalities and other agencies, we investigated the effects of the combination of structural and non-structural measures in the outdoor paths used by the participants to move between facilities.

##### (a) Investigation of the thermal environment

To compare measures against heat, such as the use of parasols, we measure the thermal environment in the outdoor paths actually used by the event participants. The measurements were performed according to the movement of people and using an appropriate method based on research and studies conducted in the past. The measurement items included air temperature, humidity, and globe temperature. We collected data that could be analyzed using composite indices, including the WBGT. The measurement was performed for four days under the ambient thermal environmental conditions. Advice was obtained from two experts who were present during the verification.

##### (b) Investigation using examinees

To compare the measures taken against heat, such as the use of parasols, we asked the examinees to walk on the outdoor paths actually used by event participants. We then examined the examinees' physiological responses, such as heart rate and subjective declarations. The investigation was performed for four days under the ambient thermal environmental conditions. Each day, four examinees participated in the investigation for four hours.

##### (c) Data analysis

Based on the results obtained in the investigations (a)–(b) above, we explored appropriate methods to analyze the heat of each outdoor path and the effect of each measure taken against heat on the improvement in the thermal

environment. Before performing these investigations, advice was obtained from two experts for creating the investigation plan. These experts were present at every on-site measurement.

(2) Investigation of the awareness of Japanese citizens regarding the use of the heat stress index

We administered a web survey to determine the awareness of Japanese citizens regarding the heat stress index. To do this, we created a questionnaire consisting of 24 questions and obtained 100 samples in each category (a total of 6,400 samples). The categories included region, age, and sex. To create the questionnaire, we referred to the results of the investigation performed in the Study on Measures for Adaptation to the Thermal Environment in Fiscal Year 2019, and we improved the investigation items. The obtained answers were totaled and analyzed to evaluate the methods that will use the heat stress index in the future.

(3) Improvement in awareness about the heat stress index

(a) Briefing sessions in various organizations

To improve the awareness of various organizations and agencies regarding the heat stress index, we held a briefing session for the staff of the Osaka Tennoji Zoo. As materials for the briefing session, we created a heat-related text (44 pages) containing information explaining the heat stress index.

(b) Creation of a manual for promoting the proper use of a portable WBGT meter

We collected literature and information on a portable WBGT meter and examined the method of its handling and notable particulars regarding its use. After this examination, we created a manual with instructions for simple measurement of the heat stress index by the various people who would use the meter, with the aim of providing the user with a more in-depth understanding of the device. Advice on the creation of the instructions was obtained from seven experts.

(4) Promotion of measures against heat by individuals

(a) Design, creation, and printing of point-of-purchase (POP) materials for explaining the effects of parasols

Regarding the measures against heat taken by individuals, we designed and created easy-to-understand materials that explain the effects of parasols for Japanese citizens, and we printed a total of 1,000 copies of the materials on B5-sized paper.

(b) Creation of a manual for using the POP materials

To explain the effects of parasols, we created a manual (2 pages) for using the POP materials so that persons in charge could sufficiently solicit the use of parasols.

(c) Distribution of the POP materials

We distributed the POP materials at various venues, including department stores and parasol dealers throughout Japan, where the use of the POP materials was desired.

(d) Effect verification and interview

After exhibiting the POP materials at the various venues, we conducted interviews with two shops regarding the influence of the exhibited materials on the use of parasols. We also administered a questionnaire survey to investigate the use of the POP materials at department stores throughout Japan where the materials were distributed.

(5) Holding meetings attended by experts

We held one meeting consisting of experts, local public entities, and urban development enterprises before performing this study, and we obtained opinions from these experts regarding measures that can be taken against heat. Because the Japanese government had declared the COVID-19 state of emergency, these experts were able to attend the meeting only via the Internet. The abstract of the meeting is attached to the end of this paper.

First meeting

Date: 15:00–17:00 on February 2 (Thu.), 2021

Place: Conference room of the Center for Environmental Information Science

Attendants: Committee Ashie, Committee Goto, Committee Nakajima, Committee Nabeshima, Committee Narita, Committee Horikoshi, Committee Honjo, and Committee Misaka