README - Lifetime Exposure Data for Japan

Content of the dataset

Contact author : PhD Student Amaury Laridon at Vrije Universiteit Brussel (VUB), Belgium.
Amaury.Laridon@vub.be

This document is intended to provide a clear interpretation of the results delivered to Mr. Sayumi Take, working for *Nikkei Inc*.

The transferred dataset contains estimates of **lifetime exposure** to six different types of climate extremes for an "average" Japanese person born between 1960 and 2020. The data are also provided for an "average" inhabitant of the **East Asia and Pacific region**. By "average", we mean that both the climate data (e.g. the number of extreme events occurring per year over a given spatial area) and demographic data were **averaged at the country level** (for Japan) or **regional level** (for East Asia and the Pacific).

The six climate extremes analysed in this dataset are:

- Heatwaves
- Wildfires
- Droughts
- Crop failures
- River floods
- Tropical cyclones

When results are expressed for the East Asia and Pacific region, the following **26 countries** are included in the regional average, according to the dataset used:

- Australia, Brunei Darussalam, China, Fiji, Hong Kong, Indonesia, Japan, Cambodia, Kiribati, Republic of Korea, Lao PDR, Myanmar, Mongolia, Malaysia, New Caledonia, New Zealand, Philippines, Papua New Guinea, Dem. Rep. Korea, French Polynesia, Solomon Islands, Thailand, Timor-Leste, Vietnam, Vanuatu, Samoa

How to read the results

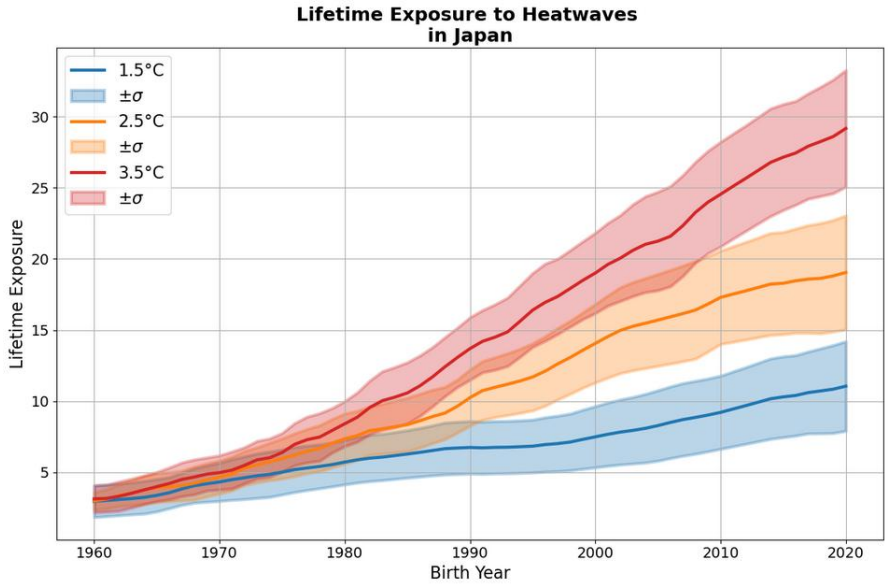

Figure 1: *Under a scenario of 3.5°C global warming by 2100 relative to the pre-industrial period, a child born in 2020 in Japan is projected to experience an average of* ***29 heatwaves*** *over their lifetime. The standard deviation around this average is* ***8.2****, meaning there is a 68% probability that the actual lifetime exposure will fall within the range of* ***29.0 ± 8.2*** *heatwaves.*

Under an alternative emissions scenario that limits global warming to ***1.5°C by 2100****, the projected lifetime exposure for the 2020 Japanese birth cohort decreases to* ***11 ± 6*** *heatwaves.*

In comparison, a person born in ***1960 in Japan*** *is projected to experience* ***2.94 ± 2.22*** *heatwaves under the 1.5°C scenario, and* ***3.11 ± 1.89*** *heatwaves under the 3.5°C scenario. This indicates that the* ***climate future of older generations is largely unaffected by future greenhouse gas emissions****, while that of younger generations is highly sensitive to the emissions pathway.*

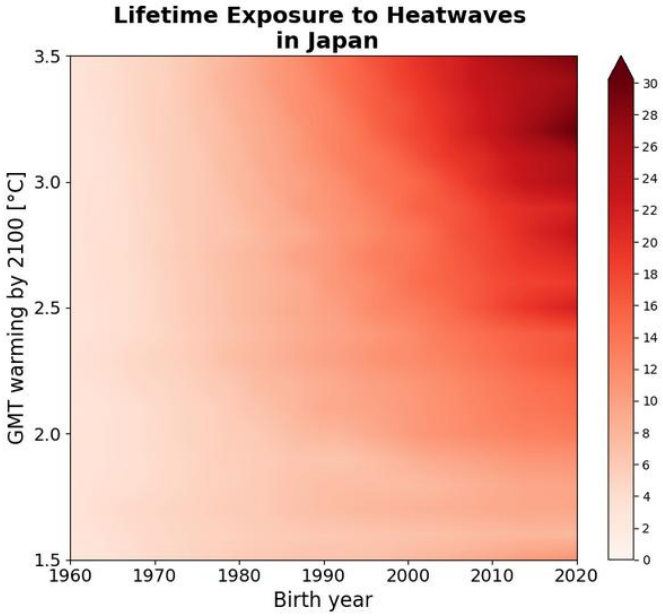

Figure 2: *This figure is a so-called "burning embers" diagram. It presents the estimated* ***total number of heatwaves*** *that a given birth cohort (x-axis) is projected to experience over their lifetime (z-axis), depending on the* ***level of global warming reached by 2100*** *(y-axis).*

Except for heatwaves, for which the results are the most robust among the six climate extremes, we recommend exercising nuance and caution in the interpretation and use of results for the other hazards. Accurately capturing a robust climate signal for these other hazards in climate models is more complex, and in the case of Japan, this challenge is compounded by two conflicting effects.

First, the **uncertainty is significantly higher when these hazards are assessed at the national scale**, due to the relatively small spatial extent of the country compared to the global scale. For this reason, we generally recommend relying on **regional-level results** when analysing other countries.

However, in the case of **Japan**, this approach has important limitations. As shown in the full list of countries included in the East Asia and Pacific region in our model, several of these countries are located at considerable geographic distances from Japan, and therefore are expected to face **very different climate impacts in the future**. Averaging climate responses over such a broad and heterogeneous region may dilute or mix **divergent or even contradictory signals**, reducing the interpretability and policy relevance of the results for a specific country like Japan.

Therefore, for the other hazards than heatwaves, **visualizations of the type used in Figure 1 are generally more appropriate**, as the "burning embers" format used in Figure 2 can produce **unreliable results for certain combinations of birth cohorts and warming levels**.

Figure 1 has the advantage of simultaneously displaying the **mean values and their associated uncertainty**, which is not the case for Figure 2.

References

For technical details regarding the methodology used, the reader is referred to the following articles:

- Thiery W, Lange S, Rogelj J, Schleussner CF, Gudmundsson L, Seneviratne SI, et al. Intergenerational inequities in exposure to climate extremes. Science. 2021 Oct 8;374(6564):158–60.

- Grant L, Vanderkelen I, Gudmundsson L, Fischer E, Seneviratne SI, Thiery W. Global emergence of unprecedented lifetime exposure to climate extremes. Nature. 2025 May;641(8062):374–9.