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**Headline: Commentary: Singapore's historical weather records can help us prepare for climate change**

## **Commentary: Singapore's historical weather records can help us prepare for climate change**

Despite Singapore having some of the oldest weather records in Southeast Asia, learning about its past climate requires some sleuthing, say SMU's Fiona Williamson and Praveen Teleti.



**SINGAPORE:** A recent report published by the World Meteorological Organization (WMO) paints a grim picture of climate change.

It highlights inadequate progress on greenhouse gas emissions reductions to keep global warming within 1.5 degrees Celsius of pre-industrial temperatures. The past nine years, from 2015 to 2023, were the nine hottest years on record, and 2024 is on track to breaking that record once more.

Our ability to measure climate change comes from our confidence about the past. Historical climate data helps scientists establish baselines, for example, the pre-industrial baseline for global temperature which is between 1850 and 1900.

Reliable baselines help us understand how far our climate has changed from a period when human influence on the climate system is thought to be minimal.

But have you wondered how we know what these baselines are? How do we know that this is the hottest year on record?

### **HISTORICAL RECORDS, MODERN SCIENCE**

Humanity has been gathering weather data for centuries. In fact, some of the oldest records, found in places like China, Japan and Korea, date back thousands of years, documenting rainfall, snow patterns and the timing of flowers blossoming or ice melting.

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Rain and snow gauges are relatively simple devices. Precision instruments such as thermometers and barometers only came about after the 1600s, but even then, they did not follow modern scales of measurement.

The biggest technological shift was in the 1800s. Weather records became far more reliable and standardised thanks to the rise of modern measuring instruments and international agreements enforcing the adoption of recognised scales.

Whenever scientists make declarations about the hottest year on record, they use weather records that date to the 1880s, when measuring instruments and scales are considered more compatible with modern quality control and calibration methods.

However, historical weather records are not always easy for scientists to access. Scattered across archives, institutions and private collections around the world, these datasets are hidden gems waiting to be uncovered.

## CLIMATE DETECTIVES HELP SCIENTISTS UNDERSTAND WEATHER PATTERNS

Singapore, despite having some of the longest weather records in Southeast Asia, is a prime example of where sleuthing is needed to learn about its past climate.

Much of the country's weather records were made by the English East India Company or the British Colonial Government, but these records were logged in an assortment of diverse institutions, from hospitals and botanic gardens to prisons and ships. A good number of the data are not even in Singapore, but in private collections across the globe.

Pulling these disparate sources together and making sense of them requires not just a scientist, but a historian - a climate detective - who can track down these valuable fragments of the past and piece together a fuller picture of our climate history. The quality of climate reconstructions dramatically improves with the number of historical observations available.

## A MODERN SOLUTION TO EXTRACTING HISTORICAL WEATHER DATA

There is just one challenge. How do we turn these centuries-old records into data that scientists can use? Many of these are handwritten on fragile paper or hold huge quantities of numerical data, and manpower is needed to extract this data from old documents and images.

Our team is applying a modern solution: Crowdsourcing. By inviting the public to help, we intend to extract large amounts of valuable data from historical records.

We created a site called Monsoon Voyages to enable volunteers to transcribe weather information from 19th and 20th-century ship logbooks. These detail weather conditions ships encountered as they sailed through the Malay Archipelago, including rainfall patterns and extreme weather events. Understanding such historical data allows us to better understand long-term climatic patterns and variability in the region.

Many fields of climate research today integrate rescued historical observations with modern datasets. Past weather records help scientists estimate pre-industrial baseline from which current climate is compared, and provide boundary conditions for variables when running global climate models.

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Data-rescue enables researchers to reconstruct and reanalyse the Earth's climate system with greater certainty. It is through such efforts that we can better prepare for the future.

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