

Research Report

COMMITTEE : World Meteorological Organization

ISSUE : *Weather data collection : why and how can we involve citizens ?*

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Weather data collection : why and how can we involve citizens ?

INTRODUCTION

Dear delegates,

My name is Léane Cremmer and I am in Terminale at Institut Fénélon in Grasse. This is the third MUN conference I'm attending, but it's my first time as a chair! I'm very excited, but also a bit nervous. In my free time, I read, I play volleyball, and I watch scientific documentaries. Everything that involves science interests me, especially physics. During this conference we will discuss a truly fascinating topic: the weather, and more specifically, the involvement of citizens in weather data collection. How is weather data collected? What are the associated issues? Why and how can we involve citizens? I hope this report interests you and gives you a good overview of the issue. I'll be delighted to hear your ideas!



KEY WORDS

Weather : describes short term natural events - such as fog, rain, snow, blizzards, wind and thunderstorms, tropical cyclones, etc. - in a specific place and time.

Weather data : includes any facts or numbers about the state of the atmosphere, including temperature, wind speed, rain or snow, humidity, and pressure.

Weather forecasting : refers to the process in which science and technology are applied to predict the conditions of the atmosphere for a given location and time.

World Meteorological Organization : a specialized agency of the United Nations (UN) with 193 Member States and Territories. It is the UN system's authoritative voice on the state and behaviour of the Earth's atmosphere, its interaction with the land and oceans, the weather and climate it produces and the resulting distribution of water resources.

Numerical Weather Prediction (NWP) : refers to the practice of predicting the future

state of the atmosphere from the present state, using computer-encoded versions of the predictive equations of atmospheric behavior. The present state is calculated from a comprehensive set of observational data from the entire global domain.

Citizen science : involves the participation of individuals or groups in generating new scientific knowledge. The term was coined to distinguish science conducted by or with amateur scientists from investigations conducted purely by professional scientists.

OVERVIEW

The weather is an important part of our everyday lives. It influences the way we dress, the means of transportation we use, and the activities we do. For centuries, humans have lived not reliably knowing what the weather would look like on the next day. However, with the help of technology, we are now able to predict the weather, and the weather forecasts are becoming increasingly accurate.



Source: WMO

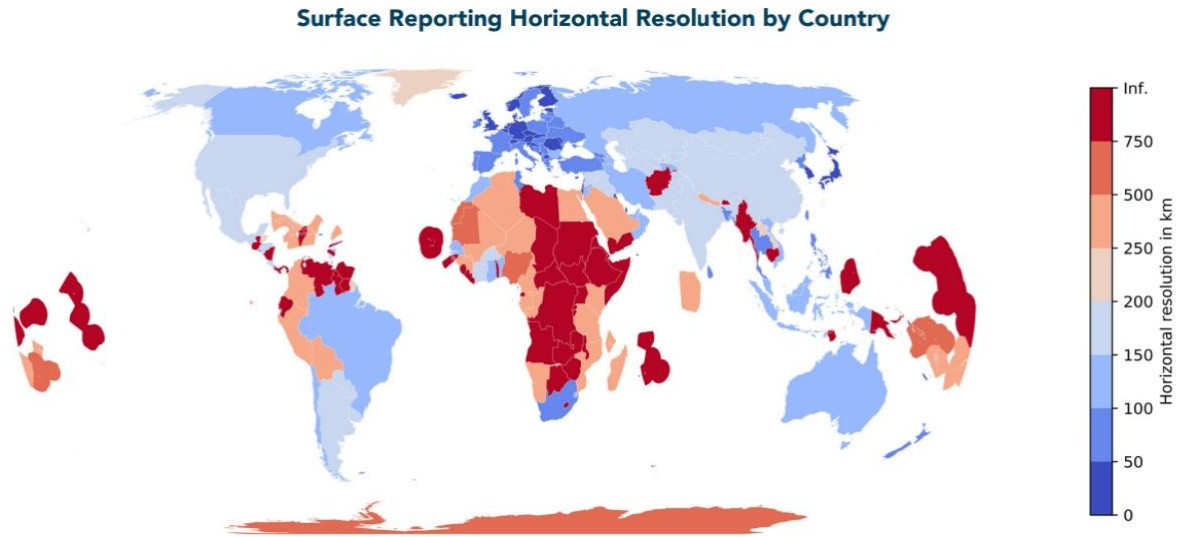
Special instruments dedicated to collecting weather data are located all over the world: according to WMO, there are “10 000 manned and automatic surface weather stations, 1 000 upper-air stations, 7 000 ships, 100 moored and 1 000 drifting buoys, hundreds of weather radars and 3 000 specially equipped commercial aircrafts” as well as “30 meteorological and 200 research satellites” to take measurements.

After being sent to the weather service, this data is then plugged into Numerical Weather Prediction (NWP) supercomputers which make complex calculations to produce weather models. Weather data is the base of weather prediction: without it, forecasts would not be possible.

1) Weather data: an essential tool that isn't available everywhere

Being able to predict the weather thanks to weather data has numerous benefits. In relation to agriculture, it allows farmers to better plan their week and manage their water resources: if it is going to rain, it isn't necessary to water the fields the day before. Similarly, knowing what the weather will look like in the next few days allows them to sow and harvest in optimal weather conditions, thus increasing production. Tourism is also greatly affected by the weather. On a sunny day, tourists prefer doing outdoor activities, while on a rainy day, they go to museums or cinemas. Secure and reliable transportation can also be guaranteed thanks to weather prediction: knowing in advance that it will snow, maintenance teams can cover roads with salt to avoid car accidents. Trains and flights can be cancelled due to dangerous weather conditions on the way or at the destination. Weather forecasts, and therefore weather data collection, have become essential for human activities, and citizens benefit from it on a daily basis.

In order to produce accurate weather forecasts, NWP centres need large quantities of surface weather data. However, the data needed isn't always available. In some countries, mostly Low Income Countries (LICs) and Small Island Developing States (SIDS), the lack of infrastructure results in wide gaps in surface weather measurements. On the map below, the countries in shades of red are those that do not meet the requirements of WMO in terms of surface reporting resolution.



This map shows the horizontal resolution of surface observations in different countries based on stations actively reporting in January 2020. Source: WMO Secretariat.

The lack of data impacts the accuracy of weather forecasts in those regions, but also in neighbouring countries and, to a lesser extent, worldwide.

2) Citizen science and awareness raising: an adequate solution?

According to WMO and WWRP (World Weather Research Programme), “Citizen science projects can offer alternative solutions to fill in these data gaps.” For example, in Ghana, the project “Let’s Talk Weather” allows citizens to send observational data, pictures, and comments to the Ghana Meteorological Agency (GMet) via WhatsApp. This initiative was created in 2020 and aims to explore the “Impact of Users’ Feedback on Weather Forecast Evaluation in Ghana”. The project is also supported by the Global Challenge and Research Fund African Science for Weather Information and Forecasting Technique (GCRF African-SWIFT), in which universities and national meteorological services in Ghana, Kenya, Nigeria, Senegal and the UK collaborate. The contributions from citizens are very helpful, as they allow GMet to improve the accuracy of its forecasts.

In meteorology, citizen science was already used in the nineteenth century by George Symons, who encouraged citizens to contribute to the collection of rain data published in the *British Rainfall*. Today, there are many weather-related citizen science projects around the globe (some of which are listed in the bibliography). Citizen science is less costly than traditional, professional scientist-led projects because it is based on volunteering. It takes less time to collect data, and such projects can be carried out on larger scales. It also has social benefits: according to WMO and WWRP, “Citizen science can generate understanding, communicate risks, and move communities to take action.” However, not all projects can be carried out using citizen science. Upper air weather data, for example, cannot be collected by citizens, and there are also wide gaps concerning this kind of data.

Citizen involvement in weather data collection can also simply take the form of awareness of the importance of this process. Indeed, information and knowledge can empower citizens, knowing what is at stake allows them to better understand new policies and to participate in the decision-making process. Awareness campaigns can also encourage citizens to change their behaviour, share their knowledge with other people, and participate in citizen science projects, providing much needed data to meteorologists and researchers.

In order to fill the gaps in surface weather data collection and improve weather forecasts worldwide, it is essential that citizens and governments collaborate and find solutions together.

RELEVANT UN TREATIES AND EVENTS

2015

Creation of the High Impact Weather project (HIWeather) by WMO and WWRP (World Weather Research Programme). One of its flagship projects is the HIWeather Citizen Science Project, which enables citizens to share information from successful citizen science projects. For example, Let's Talk Weather is one of the projects held within HIWeather.

23/03/1950

Coming into force of the Convention establishing the World Meteorological Organization. Since this date, World Meteorological Day is celebrated on 23 March every year.

POSSIBLE SOLUTIONS

Raising awareness about the importance of weather data collection:

- Educating children from an early age about the weather and the importance of weather data, by organizing weather-related activities and encounters with meteorologists.
- Organizing visits of weather stations that researchers use to explain the role they play in weather prediction.
- Funding the creation of documentaries about weather data
- Conducting awareness campaigns about weather data through social media, TV, newspapers...

Involving citizens in the process of collecting weather data:

- Governments can put in place citizen science projects to collect weather data, or they can encourage citizens themselves to do so (leveraging the use of mobile phones in geographical zones where weather forecast systems are not available and using Big Data solutions).
- Building partnerships with citizen science associations, such as the [Citizen Science Association](#) or the [European Citizen Science Association](#), to create projects on a large scale

Guiding questions:

- Does your country already have citizen science initiatives regarding the weather? If so, how could they be improved and supported?
- Should there be a worldwide citizen science program for weather data collection or should individual projects remain local?
- How can data quality be ensured if it is collected by citizens?
- To whom does the collected data belong?
- Should citizens be rewarded for their contributions? If so, how?
- By whom should awareness campaigns be funded?

- Could your country lead an awareness campaign or a citizen science project in cooperation with another country? With an association?

BIBLIOGRAPHY

Examples of weather citizen science projects:

- Citizen Weather Observer Program (USA): <https://www.weather.gov/cle/CWOP>
- Cooperative Observer Program (USA): <https://www.weather.gov/coop/Overview>
- Weather Observations Website (Australia & UK):
<http://www.bom.gov.au/wow-support/>
- Let's Talk Weather (Ghana): <http://hiweather.net/article/132/162.html>
- Hailstone Hunting (China): <http://hiweather.net/article/132/151.html>
- WeatheX app (Australia): <http://hiweather.net/article/132/152.html>
- Waterproofing Data Project (Brazil):
<https://www.preventionweb.net/news/data-driven-citizen-science-changes-way-communities-deal-flooding>
- Community Collaborative Rain, Hail & Snow Network (USA & Canada):
<https://cocorahs.org/>

Articles to better understand meteorology:

- <https://courses.lumenlearning.com/suny-geophysical/chapter/collecting-weather-data/>
- <https://education.nationalgeographic.org/resource/science-art-meteorology>
- <https://meteofrance.fr/missions/la-collecte-et-la-mise-disposition-des-donnees-meteorologiques>
- <https://nationalcareers.service.gov.uk/job-profiles/meteorologist>
- <https://www.bls.gov/ooh/life-physical-and-social-science/atmospheric-scientists-including-meteorologists.htm>
- <https://www.ncei.noaa.gov/products/weather-climate-models/numerical-weather-prediction>
- <https://study.com/academy/lesson/weather-data-collection-methods.html>

Articles about the impacts of weather forecasting:

- <https://blog.previmeteo.com/impact-de-la-meteo-differents-secteurs/>
- <https://www.pourleco.com/environnement/prevoir-la-meteo-combien-ca-coute-combien-ca-rapporte>
- <https://public.wmo.int/en/media/news/new-study-shows-socio-economic-benefits-of-weather-observations>
- <https://goweatherforecast.com/news/importance-of-weather-forecasting-235>
- <https://www.reuters.com/business/cop/climate-change-extremes-spur-un-plan-fund-weather-forecasting-2021-11-03/>

HIWeather Citizen Science project:

- <https://community.wmo.int/news/hiweatherhigh-impact-weather-citizen-science-guidance-note-weather-climate-and-water-projects>

WMO website:

- <https://public.wmo.int/en/our-mandate/what-we-do/observations>
- <https://public.wmo.int/en/our-mandate/weather>
- <https://public.wmo.int/en/resources/world-meteorological-day>
- <https://public.wmo.int/en/about-us/who-we-are>

Articles explaining citizen science:

- <https://education.nationalgeographic.org/resource/citizen-science>
- <https://scistarter.org/citizen-science>