Systematic Observations Financing Facility

Weather and climate data for resilience

INVESTING IN IMPACT

THE SCIENTIFIC CASE TO FUND BASIC WEATHER AND CLIMATE DATA AS A GLOBAL PUBLIC GOOD

SYSTEMATIC OBSERVATIONS FINANCING FACILITY

SOFF SECRETARIAT, JULY 2025

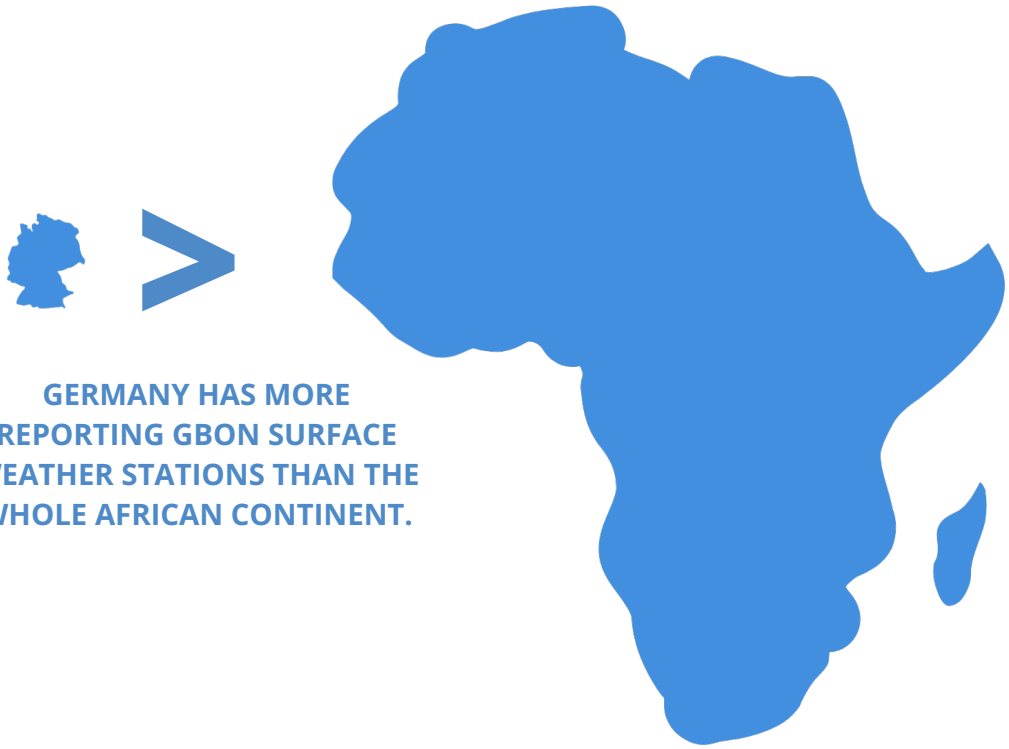
1 SOFF INVESTS IN FOUNDATIONAL WEATHER AND CLIMATE DATA

SOFF is a specialized United Nations fund. SOFF was created at the request of 193 members of the World Meteorological Congress by the United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP), and the World Meteorological Organization (WMO). Its single purpose is to support developing countries in closing today's major basic weather and climate data gaps and to achieve compliance with the Global Basic Observing System (GBON). GBON is an international agreement that clearly defines the basic weather and climate data all countries must generate and internationally exchange.

Closing today's severe data gaps. While GBON compliance has been mandatory for all countries since 2023, huge data gaps exist. For example, Small Island Developing States (SIDS) and Least Developed Countries (LDCs) generate and internationally exchange less than 10% of the required data. Germany has more reporting surface weather stations than the whole African continent.

LESS THAN 10%

OF THE REQUIRED AND MANDATORY SURFACE DATA FROM SIDS AND LDCs ARE ACTUALLY DELIVERED.

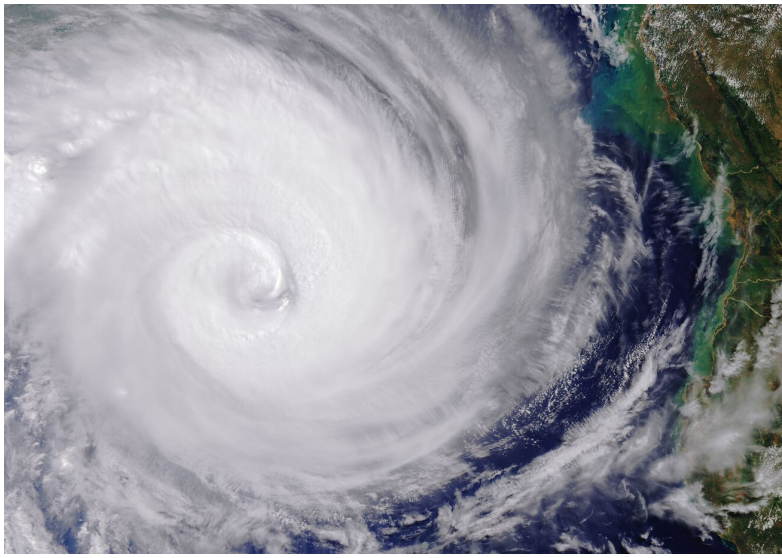


GERMANY HAS MORE REPORTING GBON SURFACE WEATHER STATIONS THAN THE WHOLE AFRICAN CONTINENT.

Simplified illustration. This map do not imply the expression of any opinion whatsoever on the part of the SOFF Secretariat concerning the legal status of any country, territory, or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

2 NO DATA, NO FORECASTS

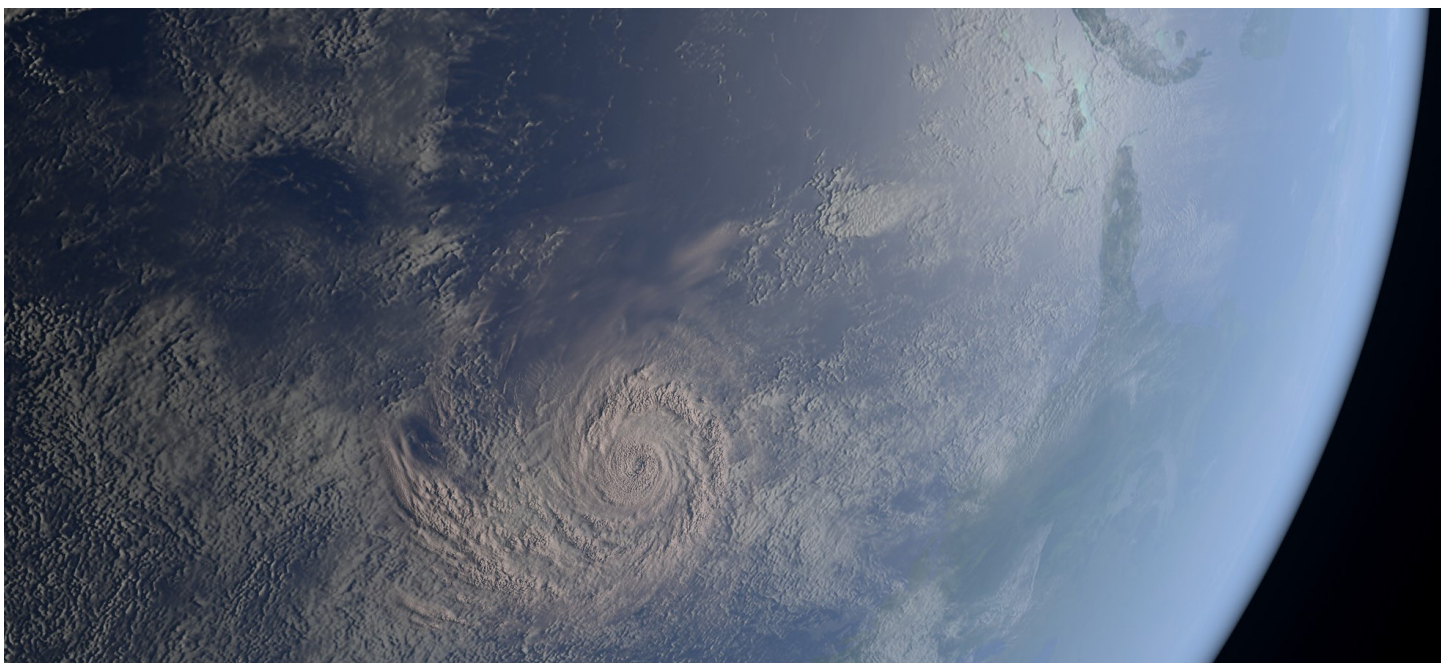
Every forecast relies on observational data. The World Economic Forum Global Risks Report 2025 features the risks of extreme weather events as being top ranked in the 10-year risk list for the second year running. Every weather forecast – from the daily outlook available on our smart phones to life-saving hurricane warnings – relies on real-time weather data generated across the globe. Without robust observational data, forecast reliability is limited.



What happens when we lack data? The case of Hurricane Otis. In October 2023, within 24 hours Hurricane Otis turned from a modest tropical storm to a Category 5 hurricane. It devastated Acapulco, Mexico and the surrounding area. Forecast models failed to predict this rapid intensification due to limited data availability in the Eastern Pacific. According to forecast experts it was "one of the biggest and most consequential forecast-model misses of recent years". Without an accurate forecast, Otis struck almost without warning, causing an estimated damage of US$ 12 billion and at least 52 fatalities.

US$ 12 BILLION

OF DAMAGE CAUSED BY HURRICANE OTIS LACKING AN ACCURATE EARLY FORECAST.



3 WEATHER DATA IS ECONOMIC DATA

The economic importance of weather data. A joint World Bank and WMO report estimated that high quality and timely weather forecasts could generate US$ 160 billion per year in benefits across weather-sensitive sectors. This is a conservative estimate omitting non-financial benefits such as potential lives saved and improvements to well-being, so underestimates the full benefits, particularly for developing countries.

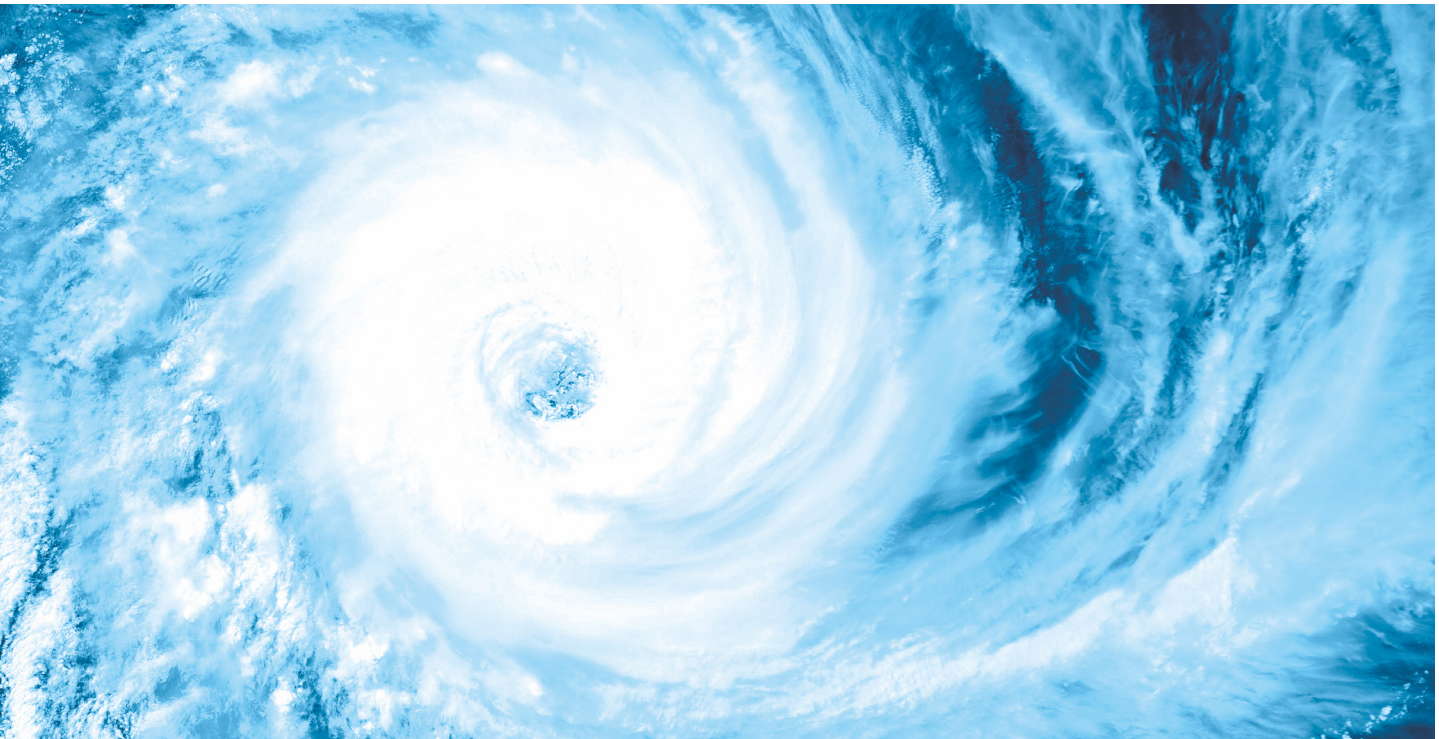
US$ 160 BILLION

OF BENEFITS COULD BE GENERATED THROUGH HIGH QUALITY AND TIMELY WEATHER FORECASTS.

"IN THE NEW CLIMATE ECONOMY WEATHER DATA IS ECONOMIC DATA"

Kristalina Georgieva,
Managing Director,
International Monetary Fund

The foundational importance of surface observations. While satellite technology plays an increasingly important role, surface-based observations remain foundational. They often are the only direct source of atmospheric data, and are critical for calibrating and validating satellite data. As stated by Lord Nicholas Stern, Professor of-Economics at London School of Economics and Political Science, improving collection and exchange of GBON surface observations would yield at least US$ 5 billion annually in socio-economic benefits.



4 SOFF INVESTS WHERE IT MATTERS MOST

Closing today's blind data spots dramatically improves forecast accuracy. WMO and the World Bank warn that severe observing gaps in regions like Africa, parts of Latin America, and the Pacific undermine forecast reliability, both locally and worldwide. The "butterfly effect" in weather means a significant data blind spot anywhere, is a risk everywhere.
A landmark study by the European Centre for Medium-Range Weather Forecasts (ECMWF) in 2025 provides the strongest scientific evidence to date that SOFF investments in data blind spots in the global observing system dramatically improve forecast accuracy, both locally and globally.

Investing in developing countries brings the greatest reductions in global forecast uncertainty. That ECMWF impact study shows that investing in developing countries delivers the greatest reductions in global forecast uncertainty. Observations from SIDS and LDCs are especially critical as data from remote, data-sparse locations have substantial impact on the quality of forecasts.
A single weather-balloon sounding launched over the sparsely observed Pacific has far greater impact on global forecast skill than one released over data-rich Europe. Filling observation gaps in underserved regions yields huge returns in forecast accuracy for all, even in countries far away.

"REPORTING FROM STATIONS IN REMOTE AREAS OF THE GLOBE CONTRIBUTE TO GLOBAL FORECAST QUALITY UP TO 20 TIMES MORE THAN ANY SINGLE STATION IN CONTINENTAL EUROPE.

THIS IS WHY SOFF'S VISION IS SO FORWARD-LOOKING AND INNOVATIVE."

Florence Rabier,
Director-General, European Centre for Medium-Range Weather Forecasts (ECMWF)

5 SOFF INVESTMENTS CREATE LOCAL AND GLOBAL IMPACT

Developing countries hit hard by extreme weather events. According to the World Bank, eight of the ten countries most affected by extreme weather in the last decade were low- or middle-income economies.

Greatest short-term forecast benefits in Africa. Evidence shows that Africa benefits most from improved short-term weather forecasts as a result of better observations. The 2025 ECMWF study finds that forecast uncertainty would be reduced by over 30% for Africa as a result. This is achieved under a scenario of SOFF Investments which includes investments in surface land and upper air stations in all Official Development Assistance eligible countries and SIDS. With such significant reduction in forecast uncertainty, users can more reliably make decisions based on weather forecasts, extreme events can be more accurately predicted, and communities can trust the forecasts they receive. Improved weather forecasts have the potential to unlock up to US$ 350 million annually in socio-economic benefits in the region. In other words, SOFF investments create a significant impact on the reliability of forecasts on a continent where climate and weather-related disasters cause annual losses of up to 5% of the Gross Domestic Product (GDP).

-30%

OF FORECAST UNCERTAINTY FOR AFRICA IF OBSERVATION GAPS ARE FILLED.

Investments in the Pacific SIDS are critical. In the Pacific region, the ECWMF study estimates that an increase in surface observations would result in a reduction in forecast uncertainty by up to 20%. The region is highly exposed to tropical cyclones and rising sea levels, coupled with limited capacity to manage the resulting risks. Annual losses from disasters that result from natural hazards represent around 2-3% of the GDP for Pacific countries. Investing in improved weather observations would yield annual benefits of over US$ 300 million for the region, helping to reduce disaster-related losses and support more effective decision-making and investments.

-20%

OF FORECAST UNCERTAINTY FOR PACIFIC REGION IF OBSERVATION GAPS ARE FILLED.

Global benefits from local investments. Weather is inherently global. Therefore, the benefits of improved observations do not stop at national borders – they ripple globally and across sectors. The ECMWF impact study represents the strongest scientific evidence to date that global forecast accuracy improves in direct proportion to new observations – the more data from developing countries, the larger the impact.

6 SOFF INVESTMENTS DELIVER BENEFITS ACROSS THE ECONOMY

Improved forecasts are critical to minimize losses. According to the MunichRe global loss database natural catastrophes in 2023 caused overall losses of US$ 250 billion worldwide, of which the majority are related to severe weather events. Minimizing losses through better early warnings based on better observation data is therefore paramount. For example, in India enhancing monsoon forecasts is estimated to deliver over US$ 3 billion in avoided losses over five years.

Farmers across the globe depend on reliable forecasts. For agriculture, a sector valued at more than US$ 4 trillion globally, improved forecasts unlock enormous value. There is evidence that farmers adapt farming practices and investment decisions in response to weather information. Investments in improved farmer-centered forecasts deliver benefit-cost ratios as high as 100:1, transforming resilience, productivity, and global food security. This is particularly important for Africa where 50% of the population depends on agriculture. In Senegal, climate model simulations suggest that better dry season forecasts could raise farmer incomes by up to 13.8%. In Peru, improved frost warnings create annual benefits of up to US$ 100 million annually, amounting to US$ 30–50 per household.

100:1

BENEFIT-COST RATIO DELIVERED BY INVESTMENTS IN IMPROVED FARMER-CENTERED FORECASTS, TRANSFORMING RESILIENCE, PRODUCTIVITY, AND GLOBAL FOOD SECURITY.

Better forecasts underpin transition to Net Zero. At the 28th UN Climate Change Conference (COP28), more than 100 countries pledged to triple the world's renewable energy capacity by 2030. Renewable energies are inherently weather-dependent, from the amount of sunlight hitting solar panels, the speed of wind driving turbines, or the rainfall feeding hydroelectric dams. Reliable forecasts are essential for effective investments and efficient operations. For a US energy utility a modest 3.7% reduction in forecast error led to a 38% improvement in wind farm performance, proving that even small gains in accuracy deliver major benefits.

Improved weather forecasts for solar energy production can optimize operational production-consumption balance, enabling a more cost-effective path to net zero. Forecasting is critical to allow renewable energy companies to optimize operations by adjusting equipment positioning, planning maintenance schedules, and managing energy storage to maintain consistent production during varying weather conditions. Energy forecasting based on weather data could become the future of supply and demand prediction.

7 SCALING UP SOFF INVESTMENTS – CREATING A BROAD COALITION

Basic weather and climate data represent a global public good. Already a decade ago, the World Development Report recognized that the largest global problems – from climate change to financial crises – are features of interconnected environmental, economic, and social systems. Addressing them requires coordinated global actions. Setting priorities and targeting actions requires global information. That information, including weather and climate data, is a global public good, but the generation and international exchange of this data is hampered by national financial and capacity constraints.

SOFF is guided by the principles of just transition, equity and sustainability. It is neither equitable nor sustainable to expect developing countries to bear the costs of delivering a global public good that creates huge global value. For example, Switzerland, a small country with high GDP, has 3 million times more economic means to cover the costs of generating and internationally exchanging the mandatory GBON basic weather and climate data compared to Kiribati, a country with a large surface area to be observed and relatively low GDP.

SOFF values the global public good nature of basic weather and climate data. Therefore SOFF provides long-term, results-based, grant-only financial and peer-to-peer technical support. SOFF opened its doors for business in July 2022, and thanks to the support of 12 pioneer funders with contributions amounting to more than US$ 100 million, is already providing initial support to 61 countries.

Following proof of concept, the foundation is set for SOFF to go to scale. With a proven business model and countries' commitment to deliver their share to the global data network. SOFF now needs to further accelerate implementation, with urgency. 101 countries have requested support. To continue operating at speed, scale, and low cost, SOFF short-term funding needs correspond to US$ 200 million to close the most important blind spots.

Creating a broad coalition of committed organizations. In the '*Mutirao*' spirit of the Brazilian COP30 Presidency, SOFF aims at creating a broad coalition of committed public and private partners, from sovereigns to philanthropies, from multilateral development and climate funds to voluntary contributions from the private sector benefitting from better weather data.
To complement its regular fundraising, SOFF is developing a SOFF Impact Bond to front-load resources and create further impact by increasing the amount of data shared by beneficiary countries by five times.

SOFF aims to announce the coalition of partners and the SOFF Impact Bond at COP30 as an innovative and concrete contribution to the COP30 Action Agenda. Please consider joining the coalition for the delivery of a global public good.

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