TAHMO AND AERIS:

IoT WEATHER STATIONS FOR IMPROVED FOOD / WATER SECURITY

TAHMO

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Weather touches almost all aspects of farming life, affecting multiple disciplines such as agriculture, hydrological forecasting, and emergency alert systems The ability to forecast weather is critical to agriculture and to ensuring a viable, adequate water supply. Even prior to climate change, millions of farmers worldwide were facing the effects of uncertain weather conditions, with insufficient and irregular rainfall, floods, droughts, and soil degradation all contributing to reduced yields.

"The TAHMO project is ambitious—seeking to work across the African continent, making millions of measurements per day, and feeding them every hour to the entire global community. Aeris provided the platform we needed to be able to reliably and easily manage communication to a complex continental-scale network of sensors. Aeris support has allowed us to react in hours to critical issues, which is fundamental to our users gaining confidence that essential data will be delivered in cases of weather emergencies, and reliably for the long term so that TAHMO data can be woven into their enterprises."

John Selker, Co-Director, TAHMO

Today, Africa, like the rest of the world, is facing the ongoing, monumental upheaval of climate change. How serious a problem is this? In sub-Saharan Africa, agriculture accounts for more than 30% of GDP while employing more than 60% of its working population. The effects of changing environments will need to be addressed if the continent is to up its food production to meet its own needs. Central to that goal is the expanded acquisition of weather data to help farmers plant the best crops at the correct time so as to optimize production.

Reliable, cost-effective weather stations, strategically placed, can help farmers decide when and what to plant; when to apply fertilizers or pesticides; when to harvest; and how to manage livestock. Basically, farmers can plan food production growth with advanced knowledge of weather conditions. For example, automated weather forecasts make it possible to manage crops in real time, providing early warnings, helping farmers adjust irrigation, improving soil management, and providing the optimal time to harvest. This expanded understanding of regional environmental conditions helps create a knowledge-based farming community that can improve productivity through highly focused weather insights.

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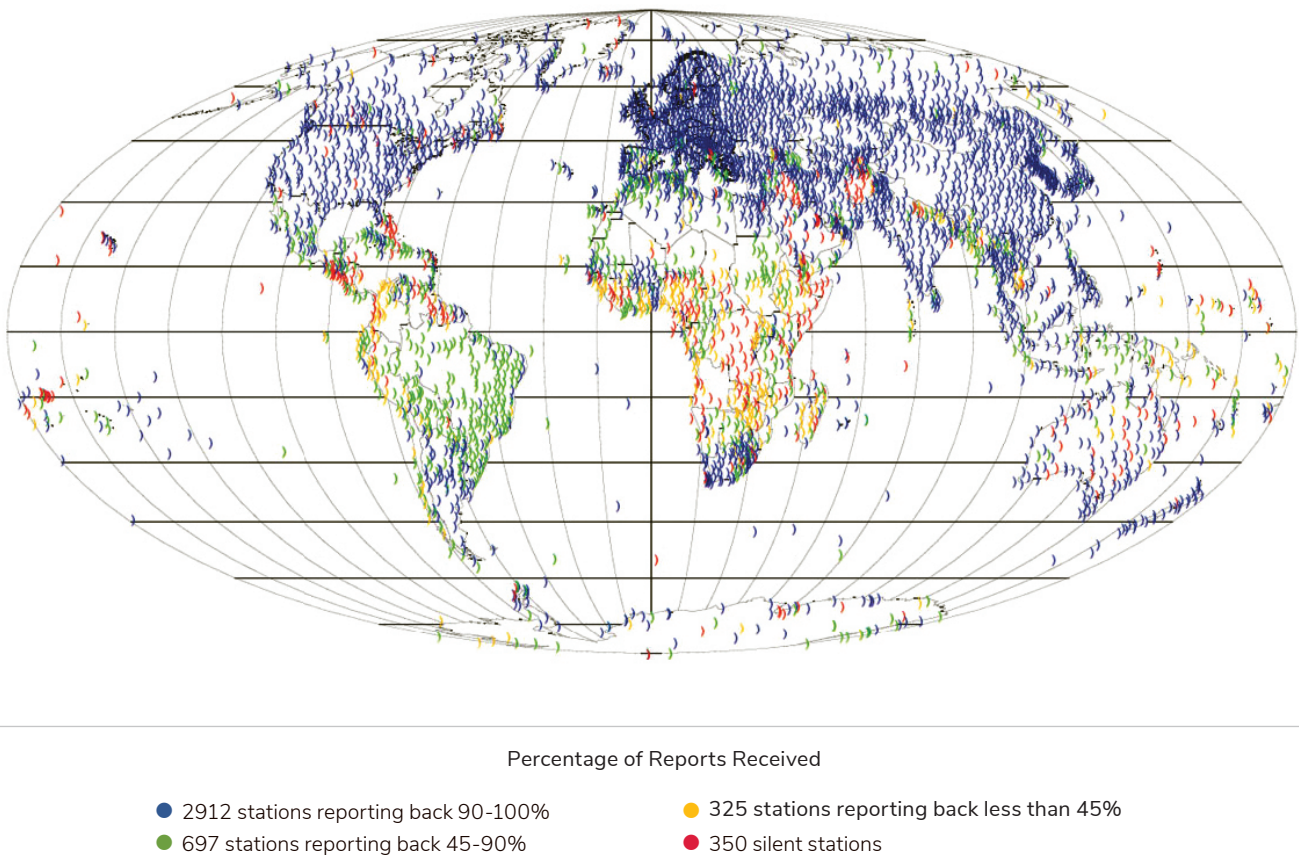# Pain Points: Stations and Data Distribution

Monitoring weather across sub-Saharan Africa is easier stated than implemented. There are several thousand weather monitoring stations in both the U.S and in Europe. Africa, with a much larger land mass, has far fewer, but the need is just as great. For African countries, such as Mozambique, a weather monitoring solution must include more cost-effective weather stations; the ability to get collected data to end users, the farmers; and, as most of the farms are rural and remote, access to connectivity.

Current connectivity solutions in Africa have problems of cost and of high energy demands due to the remoteness of compatible towers. But assuming connectivity can be acquired, the problem shifts again. Is the weather monitoring solution reliable? Is it affordable? Is it sustainable? Repeatable? And can the solution be dispersed widely enough to impact a maximum number of farms? Then add to all that the fact that to make the entire system work, partnerships with relevant government and non-government agencies will be needed in order to collect, and put to use, all the data acquired from these weather stations.

In Mozambique, real-time technology integration is a high bar to cross. Weather stations, and the sharing of data with entire communities, is a vital first step.

Weather Stations Reporting through World Meteorological Organization (WMO)*

Percentage of Reports Received

- 2912 stations reporting back 90-100%
- 697 stations reporting back 45-90%
- 325 stations reporting back less than 45%
- 350 silent stations

*Global distribution of weather stations reporting through WMO's Global Telecommunications System

Case in Point: TAHMO Responds to African Needs

To address the growing need for up-to-date weather information, the Trans-African Hydro-Meteorological Observatory (TAHMO) initiative seeks to install and operate up to 20,000 weather stations in sub-Saharan Africa.

The first TAHMO weather station was installed in 2012. To date, TAHMO has installed more than 500 weather stations in Benin, Burkina Faso, Cameroon, Chad, Democratic Republic of Congo, Ethiopia, Ghana, Kenya, Lesotho, Madagascar, Mali, Malawi, Mozambique, Nigeria, Rwanda, Senegal, South Africa, Tanzania, Togo, Uganda, Zambia, and Zimbabwe.

The Weather Station

In collaboration with the Meter Group, TAHMO has developed a small, reliable, automatic weather station with no moving parts. All the sensors are in a one-piece sensor unit, which employs bi-directional communication for remote firmware updates and data transmission. The weather station itself is solar powered, and the cost for the station is quite low when compared to other varieties with similar functionalities. The station is built using current Internet of Things (IoT) developments in sensor technology and that helps makes the cost much lower.

The TAHMO weather stations records data at a five-minute interval, which then is transmitted remotely over the GPRS network hourly (or at a higher temporal scale). This high-resolution data can be aggregated into daily, weekly, or monthly data sets according to the needs of the user. A multitude of weather attributes are available, such as temperature; rainfall, barometric and vapor pressure; relative humidity; solar radiation; wind direction and speed; lightning strikes; and a library of historical data.

Making Data Available

Data only is useful when it actually is used. To that end, TAHMO, which is a non-profit organization, makes its weather station monitoring data available to national meteorological agencies, government entities, or scientific research users for free. Basically, any researcher seeking to develop peer-reviewed articles for publication can obtain any and all data once they have signed a no-charge agreement clarifying end usage of said data. Fees are incurred only for non-research use of the data. The fees then are used to maintain and grow the observation network.

The majority of weather stations are being installed at local schools (primary, secondary, and at universities), where teachers are using the data from their 'hosted' station in their classroom lessons. Weather stations in schools serve multiple purposes. The concept is to make science, geography, and math education a natural part of students' lives by seeing how weather data translates into quantitative information. This process builds and conveys weather and climate knowledge to the next generation of people on the front lines of climate change in Africa. And, by having the station within school boundaries, theft becomes much less of a problem than if the stations were widely dispersed in fields.

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Benefits of an Aeris Solution

Today, TAHMO is active in 21 countries in West Africa, Southern Africa, and East Africa. Its weather monitoring stations currently ship with Aeris SIMs installed, thereby shortening the deployment process and lowering the cost across the entire supply chain. After experiencing the level of support from Aeris, TAHMO decided to use the Aeris SIM cards globally on its network.

TAHMO is committed to serving the public by advancing the free and open exchange of hydro-meteorological data collected with its monitoring stations. By allowing the free download of all its raw data for scientific research and governmental applications, TAHMO supports and adheres to World Meteorological Organization (WMO) Resolution 40 and Resolution 25 (policies and practices for the exchange of meteorological and related data).

For TAHMO, the partnership with Aeris is producing better coverage at a reduced cost. The heightened support service from Aeris is enhancing the wide application of the weather station solution in most parts of Africa. Improved farm productivity now has an IoT weather roadmap. And farmers throughout Africa are starting to reap the benefits.

ABOUT TAHMO:

The Trans-African HydroMeteorological Observatory (TAHMO) aims to develop a vast network of weather stations across Africa. Current and historic weather data is important for agricultural, climate monitoring, and many hydro-meteorological applications.

Visit:
https://tahmo.org or follow them on Twitter @ https://twitter.com/tahmo_world to see their progress and get in touch with them.

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ABOUT AERIS:

Aeris is a technology partner with a proven history of helping companies unlock value through IoT. We strive to fundamentally improve businesses by dramatically reducing costs, accelerating time-to-market, and enabling new revenue streams. Built from the ground up for IoT and road tested at scale, the Aeris Intelligent IoT Network is based on the broadest technology stack in the industry, including the Aeris Connectivity Platform (ACP) and the Aeris Mobility Platform (AMP), spanning connectivity up to vertical solutions for things that move. At Aeris, we believe that if you focus on the customer, you gain a competitive edge by delivering an experience that surpasses your competitors and fulfills all customer expectations. We know that implementing an IoT solution can be complex, and we pride ourselves on making it simpler.

Visit www.aeris.com or follow us on Twitter @AerisM2M to learn how we can inspire you to create new business models and to participate in the revolution of the Internet of Things.

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