

**PROMOTING WATER AND CLIMATE EDUCATION THROUGH THE TRANS-
AFRICAN HYDRO-METEOROLOGICAL OBSERVATORY**

FRANK OHENE ANNOR

*Faculty of Civil Engineering and Geosciences, Water Resources Section, Delft University of
Technology, Netherlands,
Civil Engineering Department, Kwame Nkrumah University of Science and Technology, Kumasi,
Ghana, annorfrank@yahoo.co.uk*

ALI ABBASI*

*Faculty of Civil Engineering and Geosciences, Water Resources Section,
Delft University of Technology, Netherlands, a.abbasi@tudelft.nl*

NICK VAN DE GIESEN

*Faculty of Civil Engineering and Geosciences, Water Resources Section,
Delft University of Technology, Netherlands, n.c.vandegiesen@tudelft.nl*

JOHN SELKER

*Biological & Ecological Engineering, Oregon State University,
Corvallis, OR 97331, USA, John.Selker@OregonState.edu*

ELIZABETH JACHENS

*Biological & Ecological Engineering, Oregon State University,
Corvallis, OR 97331, USA, jachense@oregonstate.edu*

ELLEN VAN ANDEL

*The Valorisation Centre, Delft University of Technology,
Netherlands, e.vanandel@tudelft.nl*

FRISO VOS DE WAELE

*The Valorisation Centre, Delft University of Technology,
Delft University of Technology, Netherlands, f.a.r.o.vosdewael@tudelft.nl*

MOJTABA SHAFIEI

*Hydroinformatics Department, East Water and Environmental Research Institute (EWERI),
Mashhad, Iran, moj.shafiei@gmail.com*

ABSTRACT

The Trans-African Hydro-Meteorological Observatory (TAHMO) is a Non-Governmental Organisation and together with National Meteorological Agencies aim at installing 20,000 Automatic Weather

* Paper presenter

Stations (AWS) across Sub-Saharan Africa. This is to support the Meteorological Agencies improve climate and weather services in these countries. TAHMO is an initiative with three main components: i) Designing robust and cost effective automatic weather stations; ii) Educating students in high schools, polytechnics and universities; and iii) Developing business plans to sustain the operations and maintenance of the stations. This paper presents the component on water and climate education across Sub-Saharan Africa and lessons that could be drawn to promote this in other parts of the world.

1 INTRODUCTION

Monitoring the world's environment is an important challenge if its natural resources are to be used in an optimal and sustainable manner. Food production and harvest predictions profit from improved understanding of water availability over space and time. Presently, African observation networks are very limited, and national governments and regional planners do not have readily access to weather and climate data to make informed decisions regarding investments in water resources infrastructure.

At the same time people all over the world especially in rural Africa are bearing the full brunt of the impact of climate change on their livelihoods which rely heavily on the climate. All these points to importance of climate and weather services for food production to feed the growing world.

In 2014, the Trans-African Hydro-Meteorological Observatory (TAHMO) was established as a foundation (Non-Governmental Organisation) in the Netherlands with the main aim to support Meteorological Agencies in Sub-Saharan Africa to meet the demands for localised and relevant climate and weather services.

TAHMO is an initiative that was set up with three components. The first component looks at the design of automatic weather stations. From the TAHMO's team several years of experience in Africa it was realised that maintenance of infrastructure was an enormous challenge on the African continent. This challenge motivated the TAHMO team to design a station that required very little maintenance, had no moving part, no cavity; extremely robust and cost effective (see Plate 1). The stations were built with the support of Decagon Devices, a company based in the USA who have been designing, building, manufacturing and marketing scientific equipment and instruments for the past 33 years.



Plate 1: Staff from the Ghana Meteorological Agency installing a TAHMO Generation 2 Weather station in Ghana

The second component is about water and climate education where the stations are installed in schools because they provide a safe and conducive environment for the protection and maintenance of the stations. Environmental clubs with the support of science and geography teachers in schools can easily

dust the solar panel of the station and do minor maintenance while the Meteorological Agencies and TAHMO Engineers do major maintenance and recalibration of the stations when needed. Again the placing of the station in schools encourages the use of the data from the stations and the station itself for their studies in geography and science.

Lastly since the stations are fitted with telemetry to allow for real-time transmission of data every hour to the servers of the meteorological agencies, might need recalibration after sometime, and a functional database to store and process the data collected there is a need to put in measures that will ensure the financial sustainability of operating the stations. In view of this, TAHMO looks at establishing Public Private Partnerships (PPP) with the meteorological agencies to develop climate and weather products to sustain these operations. These calls for the development of business plans and market surveys to determine the needs of the populace especially companies that might pay for the services. Data is made free of charge to government agencies, research and teaching institutions. The last part is therefore the business component.

2 APPROACH

2.1 Installation of stations in schools

The Ministries of Education in the various countries are approached by TAHMO and the national meteorological agency to discuss the possibility of installing the weather stations in schools and using the data in their curriculum. With this approval granted, a school is selected as a possible location for a TAHMO deployed station based on socio-economic and biophysical factors which include whether the school is fenced, the socio-economic activities of people living within 30 km radius from where the school is located and cell phone coverage over the area. The second step prior to installation is to have a letter of agreement with the school concerning their obligation to protect the station and where possible provide a fence around the station. This creates a sense of ownership and responsibility for the school. TAHMO's obligation is to install the station and make data and educational materials available to the school. When all these have been agreed on, the stations are then installed at the school together (See Plate 2) with the Meteorological Agency.



Plate 2: Staff of TAHMO with teachers and students of a school in Africa

2.2 Development of teaching materials and Competitions

Study materials on Sensor design, weather and climate and entrepreneurship are developed together with teachers, the Ministries of Education to reflect local context. Teachers are motivated to enter into small competitions to draft lesson plans based on the materials developed that could be used by other schools within the country and beyond. These materials are put on the TAHMO website (www.tahmo.org) for general public use. These activities carried out in close collaboration with the Global Learning and Observations to Benefit the Environment (GLOBE) Program (www.globe.gov) in some countries.

2.3 Accessing data from the TAHMO Platform

TAHMO has developed a school-to-school portal (www.school2school.net) where data is shared with schools. Students can access the data via the platform (See Figure 1) and follow simple exercises given under the tutelage of their teachers.

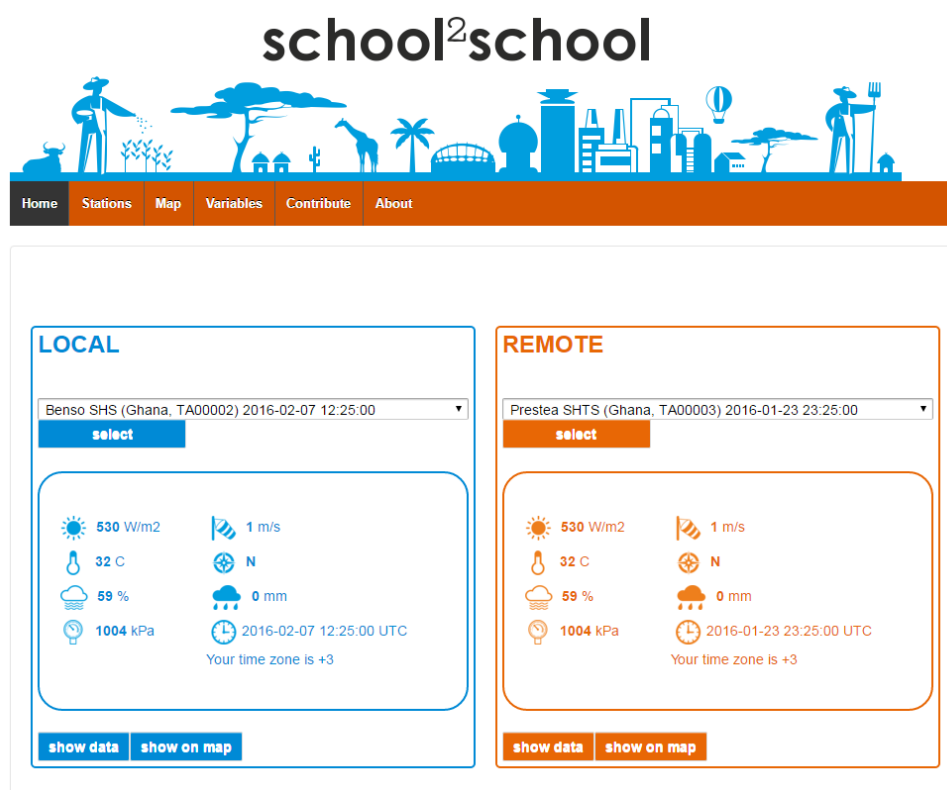


Figure 1: TAHMO School2School Portal

2.4 Exchange Program between schools online

The platform in Figure 1 is used for communication between schools to promote cross-learning between students from all TAHMO Countries including those in the USA and the Netherlands. Each school has a relationship with another school with the pair called sister-schools. Due to the fact that the use of mobile phones at high schools are not allowed in some African countries, the sister-schools have to communicate via letters, which are scanned and emailed to their colleagues through their teachers. Due to the possible abuse of chat windows this part of the platform is still under construction with extensive consultations with schools, students and parents on how best to go about it. This conference could be a platform to discuss these issues further.

3 CONCLUSIONS

TAHMO's School2School program currently offers a platform for students from over 100 schools across Sub-Saharan Africa to learn more about water and climate change as well as share their knowledge about these with their peers in other countries who might have completely different climates in a more practical way. To the students this all looks very exciting and promising, however there is a lot of work to be done to maintain the enthusiasm of the students and teachers as well as maintain the platform.

The main challenge for the School2School program is the ban on the use of mobile phones and tablets in schools. This makes communication a bit difficult for schools without internet access and computer laboratories. For these schools, teachers are heavily relied on to keep the communication going. TAHMO welcomes any innovation in this regard.

REFERENCES

The Trans-African Hydro-Meteorological Observatory. www.tahmo.org [Accessed on 15/08/2016]