PROPOSAL FOR

AMAZON WEB SERVICES CLOUD CREDIT

FOR CAPACITY BUILDING ON

MONITORING OF SDGs

Executive summary

Spatial data is critical in the monitoring of the United Nations Sustainable Development Goals (SDGs). In order for effective monitoring of SDGs targets, a training programme would be organized by the Ghana Space Science and Technology Institute using open source spatial data available on Amazon Web Service Cloud Credit. This data usage would amount to $1281.69 monthly and the cumulative bill for the three years span of the programme would be $46140.84. At the end of this programme, participants are expected to effectively monitor various targets in their field of endeavour with the use of Earth observation data.

Overview:

The Ghana Space Science and Technology Institute (GSSTI) as a part of its mandate coordinate all space related activities in the country. The Remote Sensing and Climate Centre (RSCC), which is one of the three Centers under the GSSTI has the responsibility of coordinating all remote sensing activities in the country. The Centre engages in research, teaching/training, provision of services in the areas of remote sensing, GIS, climate and other related areas towards the monitoring and achievement of the sustainable development goals.

The team at the RSCC seeks for grant and partnership to organize workshops for a larger group of professionals from all governmental agencies, institutions, and civil society to enable them build their capacity in monitoring the targets for United Nations Sustainable Development Goals (SGDs). These funds from your outfit will be of immense importance to make our vision a reality.

The workshop will be held after the grant has been approved. As part of the workshop, there will be lectures and exercises on the various tools and Earth Observation (EO) data from open source such as Sentinel and Landsat available on the Amazon Web Services. The participants will have the experience of using tools and services that will help them leverage on big Earth observation data and AWS cloud computing environment in an interactive lecture and training series delivered by experts at the RSCC.

The establishment of targets for learning will precede every lecture series. Before each session, participants will be given the opportunity to indicate their goals (aspiration) for participation to ensure that their expectations are met. An evaluation of the selected organizations needs in the area of Remote Sensing, GIS and Cloud computing will be carried out in order to inform the drawing of the training contents. This makes assessment a critical component of the training to ensure that our interventions work before, during, and after the programme.

Title:

Training on Remote sensing and GIS for monitoring Sustainable Development Goals (SDGs)

Key topic it addresses

Creating awareness on the importance of Earth Observation (EO) data such as Landsat and Sentinel imagery on AWS as an enhanced tool for monitoring and assessing the Sustainable Development Goals (SDGs).

Overall focus

The programme intends to train key organizations in the government sector to use Amazon Web Services to build Earth Observation applications in monitoring and evaluating the country's development in the area of agriculture and water resources management towards the achievement of the United Nations Sustainable Development Goals (SDGs). The training programme would highlight the benefits of using the EO application tools on AWS and other useful sources in the respective fields of the participants with the aim of enhancing their skills in monitoring SDG targets with the emphasis on Goals 2 and 6 which corresponds to Agriculture and Water in relation to their respective targets and indicators.

Targets and Indicators of focus

6.6.1, Change in extent of freshwater-related ecosystems

    (including water extend and mangroves mapping)

2.4.1 Agricultural Sustainability (Soil moisture and evapotranspiration)

Key datasets

Water resources: Landsat, Sentinel 2, GPM, Terra, Aqua, SMAP, GRACE

Agriculture: SMAP, Landsat (OLI sensor), Terra & Aqua (MODIS sensor), Sentinel 2 & 3

Methodology

The methodologies employed in the training program were specifically developed for monitoring SDGs targets and indicators as indicated which focuses on Agriculture and Water.

Methodology for agriculture (Goal 2)

The methodology adopted for monitoring Agriculture would be indicators 2.3.1 and 2.4.1 which seeks to monitor Volume of production per labour unit by classes of farming/pastoral/forestry enterprise size and proportion of agricultural area under sustainable productive farming respectively.

Methodology for water (Goal 6)

The methodology adopted for monitoring water would be indicator 6.6.1. which seeks to monitor the changes in the water ecosystem over time in the following areas:

- ❖ Spatial extent of water-related ecosystems and inland open waters
- ❖ Quantity of water in ecosystems
- ❖ Quality of water in ecosystems

This methodology has been accepted by the United Nations Environment

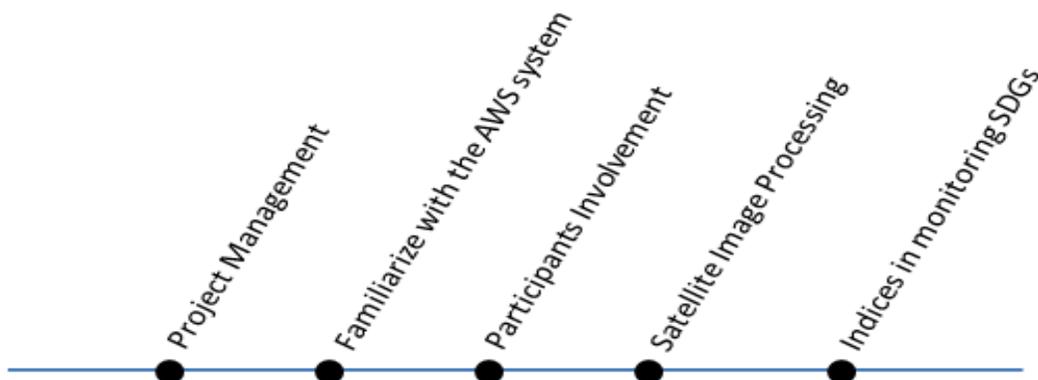**Goals and structure of the Programme**

1. Introduction of Amazon Web Service cloud credit.
2. EO application must address a need in the respective fields of the participant.

3. Participant must be able to process and analyze big Earth Observation data on AWS for sustainable development.

The benefits of the work to AWS

1. Awareness will be created among professionals about the data availability on AWS.
2. The demand for EO data on AWS will increase as more institutions and agencies will find it useful
3. AWS would increase its market share with an increase in demand for EO data.
4. Spreading the skill-set of using the EO data in monitoring and assessing the targets for Sustainable Development Goals (SDGs).

Work packages

Project Management Familiarize with the AWS system Participants Involvement Satellite Image Processing Indices in monitoring SDGs

The intended scientific outcomes

The country would become aware of the need to use big Earth Observation (EO) data to accurately report on the selected Sustainable Development Goals (SDGs) and also for decision makers to have timely and accurate information to base policy on. These models would estimate

land cover under agricultural activities, those prone to deforestation and land degradation and the forest cover estimates over time and identify the driving factors.

Deliverables

These activities will be conducted within six months of each year. These includes all preparatory activities towards the training programme. The activities covers thematic areas which have been factored into the deliverable. They are:

- Evaluation of participant's anticipation for the training
- Training workshops
- Evaluation of the training
- Pilot use case (Validating EO data with ground base)
- Final report

Training outline

No.	TASK	TIMELINE
1	❖ Evaluation of participant's anticipation for the training. ❖ Introduction to Earth Observation Data, Amazon Web Service cloud credit Programme. ❖ Introduction of AWS tools and applications ArcGIS on AWS introduction ❖ Lectures on different Remote Sensing data (Landsat and Sentinel) ❖ Satellite Image Management (Atmospheric correction with free EO data such as Landsat)	Year 1 (First Six Months)

	❖ Assessment of participants feedback ❖ Impact assessment report on the introductory training.	
2	❖ Identification of participants for SDG targets monitoring in Agriculture and evaluation of their anticipation for the training. ❖ Lectures on Earth Observation (EO) for Agriculture ❖ Image Analysis for land Use and Land Cover (LULC) ❖ Satellite Image Management (indices for farmland such as NDVI, EVI) ❖ Soil moisture and Evapotranspiration mapping for sustainable Agricultural productivity using imagery like SMAP, Landsat (OLI sensor), Terra & Aqua (MODIS sensor) and Sentinel 2 and 3. ❖ Satellite image processing in aiding Crop monitoring ❖ Assessment of participants feedback ❖ Impact assessment report on the SDG target monitoring for Agriculture	Year 1 (Second Six Months)
3.	❖ Identification of participants for SDG targets monitoring in water sector and evaluation of their anticipation for the training. ❖ Lectures on Earth Observation (EO) for Water Resources Management ❖ Satellite Image Management (indices for water	Year 2 (First Six Months)

	such as NDWI, MNDWI, WRI)
	❖ Changes in the extent of freshwater and its relations with ecosystems (including water extend and mangroves mapping) using satellite imagery like Landsat, Sentinel 2, GPM, Terra, Aqua, SMAP, GRACE ❖ Water Use Efficiency in an irrigated area ❖ Assessment of participants feedback ❖ Impact assessment report on the selected SDG targets monitoring for Agriculture.	

Target Audience

The program is intended for water resource managers, relevant staff of the Ghana statistical service and the ministry of food and agriculture (MOFA), research scientists, environmentalist, hydrologist, and other professionals who use spatial data in their line of work and individuals who wish to gain comprehensive insight into the application of spatial data in monitoring the SDGs in the area of Agriculture and Water resource management. It will also be beneficial to those who would like to know certain procedures they are not familiar with.

Management structure

The project will be managed by the Principal lead and the Co-Lead. Both the PI and Co-PI will be assisted by two research assistance. The project lead will provide guidance and see to the successful implementation of the project. The Co-PI will assist the PI in the implementation of the project and be the main facilitator of the training components of the project. The research

assistant will assist the Co-PI during the training sections, arranging logistics and reporting for the training programmes.

Team credential

The Remote Sensing and Climate Center (RSCC) have reputable Scientists with experience in remote sensing and its application. Their vast experience in this field covers but not limited to satellite image processing and management, data collection and formatting, manipulation, analysis, visual display, etc. The project team have the ability to make applications to relevant sectors towards the achievement of sustainable development goals (SDG's).

Kofi Asare (PI) has operational and research experience in the field of climate and remote sensing and its application towards sustainable development. Kofi has a postgraduate degree in Geography. Kofi previously worked with the Ghana Meteorological Agency for seven years and then joined the Remote Sensing and Climate Center under the Ghana Space Science and Technology Institute as a Research Scientist. As the Manager of the Remote Sensing and Climate Center (RSCC), he is responsible for directing the administrative, scientific, technical and commercial function of the RSCC. Kofi's main research interest includes climate adaptation, climate modelling, analyzing and transforming climate and earth observation data into useful information for decision making. He has keen interest in making EO and climate data accessible to users. He uses both gauge and remote sensing data in his research.

Kenneth Aidoo (Co-PI) is a Research Scientist at Ghana Space Science and Technology Institute under Ghana Atomic Energy Commission. He studied Geomatic Engineering as a Bachelor degree and proceeded to do Masters in Photogrammetry and Geoinformatics and also Environmental Protection and Agricultural Food Production. He has considerable experience in survey and mapping, as he is able to process aerial imagery to orthophotos for entire project. He

also has expertise in processing hyperspectral images, radar satellite images and landsat for various applications. He would be coordinating for the program.

Patrick Nii Lante Lamptey (Research Assistant) is currently an Assistant Research Scientist with the Remote Sensing and Climate Centre of G.S.S.TI. Patrick had his undergraduate studies in Physics at the University of Cape Coast, Ghana. He holds a master's degree in Remote Sensing and G.I.S. from the Aberystwyth University in the U.K. During his masters he validated SMOS satellite soil moisture estimates over certain ecological zones over Europe using in-situ datasets. Patrick's research interests include the use of satellite estimate of soil moisture data for weather and climate forecasting and geo-spatial analysis of meteorological data which includes data interpolation, gridding etc. Patrick has experience in the merging of in-situ data and satellite products for the production of improved gridded satellite products as rainfall and temperature.

Comfort Gyasiwaa Botchway (Research Assistant) is currently an Assistant Research Scientist with the Remote Sensing and Climate Centre of G.S.S.TI. Comfort holds a postgraduate degree in the field of Environment. She has considerable experience in using remote sensing data for environmental monitoring.

Workshop Budget

The estimated budget for the use of Amazon Web Services is $1281.69 monthly and it accumulates to $ 46140.84 for the three years span the program will be running.

Conclusion

At the end of this program, participants would be able to handle free spatial data, analyzed and interpreted on Amazon Web Service to solve numerous challenges in their fields. This would

enhance monitoring of targets set for the selected United Nations Sustainable Development Goals (SDGs) of which the Government of Ghana is determined to achieve.

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