

www.sambusgeospatial.com
info@sambusgeospatial.com



NEWSLETTER

8th EDITION | 2023

THE PREMIUM GEOSPATIAL BULLETIN



FORWARD

Dear Esteemed Readers,

Welcome to the eagerly awaited 8th Edition of the Sambus Geospatial Newsletter. This edition marks a celebration of our journey, filled with remarkable achievements that have shaped Sambus Geospatial. We pay tribute to our visionary founder, whose spark ignited our passion for geospatial technology, and we eagerly explore the endless possibilities that lie ahead in this dynamic field.

Within these pages, you'll discover stories illustrating the real-world impact of geospatial solutions. From transforming businesses to empowering communities, each success story showcases the power of location intelligence to drive positive change.

We also honor the 10th memorial anniversary of our founder, a guiding light inspiring us to innovate and lead in geospatial technology.

In our commitment to knowledge sharing and growth, we've curated captivating maps reflecting the diversity of our work. These maps narrate tales of malaria susceptibility hazard, intelligent street light monitoring, and more, testifying to the depth of our geospatial insights. As we reflect on our past achievements, we look forward with anticipation. This 8th Edition invites us to explore new horizons, embrace evolving technologies, and collaborate for a more sustainable and resilient world.

We extend heartfelt gratitude to our team, partners, clients, and readers for contributing to our journey's vibrancy. Your support propels us, encouraging us to redefine possibilities.

Dive into the stories, insights, and innovations in this edition. Together, let's continue harnessing geospatial technology's power to create a brighter, more connected future.

Thank you for being part of the Sambus Geospatial community. Your curiosity, dedication, and passion inspire us daily.

Best Regards,



Managing Director
Sambus Geospatial Limited

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ABOUT SAMBUS GEOSPATIAL

Sambus Geospatial is a technology integration firm that provides a range of geospatial solutions to different industries. With over 33 years of operational experience, our corporate alliance with geospatial giants; Esri, Trimble, NV5 Geospatial, and Wingtra Drones, has given us the edge in the implementation of location intelligence solutions to support and empower seamless workflow and informed decision making in every organization.

Sambus Geospatial operates in Ghana, Nigeria, Liberia, Gambia, Gabon, with operational offices in Ghana and Nigeria. We are also supported by resellers and partners across our operational regions. Operating with a compelling urge to empower the needs of Africa using State-of-the art geographical standard technology, Sambus Geospatial remains the most preferred mapping and geospatial solution provider in West Africa. The organization has qualified staff who develop and deploy tailor-made solutions for all our clients to gain optimum benefit and satisfaction.

Vision statement

To be the preferred geospatial innovator in West Africa.

Mission statement

To become a distinguished organization in the application and advancement of geospatial knowledge and technology for effective planning, operations and enhanced decision making in West Africa.

Core Values

Trust (T): Every business transaction is implicitly a relationship of trust as parties to any transaction have the assurance that they will receive value from the engagement. Trust is the starting point for Sambus with confidence in our staff to deliver value to our stakeholders as we trust that our stakeholders will do the same.

Service (S): Sambus does not just sell, we serve. We serve our clients and stakeholders and support them in reaching their objectives. There is an intrinsic reward in being of service to another, and we live by that at Sambus. We want all our stakeholders, from staff to business partners and clients to remain loyal to the Sambus brand, and it is through quality service that we achieve that.

Integrity (I): Integrity and honesty go side by side, and as a company that embraces openness, we uphold integrity and being morally upright in all our operations and business transactions.

Respect (R): Organizations are made of people, and every person is unique and special regardless of their rank and status in life. Respect for people is an integral part of the Sambus culture and it is our hope that this is reciprocated by all our stakeholders.

Honesty (H): Honesty and transparency in dealings and transactions are what we stand by and expect from all stakeholders.

Commitment (C): An unwavering commitment to delivering added value to our stakeholders and being innovative about the provision of solutions to clients. All our stakeholders are expected to reciprocate the same commitment offered to them.

SAMBUS GEO - USER CONFERENCE 2023

WATCH THE RECORDED SESSIONS

Watch inspiring presentations and demos showcasing best practices in West Africa from our recently concluded Geo-User Conference.

Watch from our Youtube Channel here: <https://bit.ly/48dwTk3>



SAMBUS FOUNDER 10TH MEMORIAL ANNIVERSARY & CELEBRATION



Honouring a Visionary: Reflecting on the 10-Year Commemorative Anniversary of our Founder, the Late Mr Samuel Kenneth Aboah

From the 26th to the 28th of April 2023, we celebrated and paid tribute to the extraordinary life and enduring legacy of our beloved founder, Mr Samuel Kenneth Aboah, on the poignant occasion of the 10-year anniversary since his passing. Through a three-day event filled with heartfelt remembrance and gratitude, we commemorated his visionary spirit, indelible contributions, and the profound impact he had on our company, community, and beyond.

Inauguration of the Sam Aboah Recreational Quadrangle, University of Ghana

The commemorative event commenced with a deeply meaningful gesture; the renaming of the University of Ghana Recreational Quadrangle, in honour of our esteemed founder. With his gener-

ous leadership, he played various roles with the University of Ghana, enabling them to reach a level of excellence. In recognition of his contributions, the University of Ghana renamed the Recreational Quadrangle in his honour to the “Samuel Kenneth Aboah Recreational Quadrangle”.

As the new name was unveiled, we ensured that his enduring presence would forever be etched in the annals of our company’s and the university’s history. The ceremony served as a solemn reminder of his visionary leadership and the guiding principles he instilled in our community.

Kindly see below the link to the



UG post: www.ug.edu.gh/news/ug-names-recreational-quadrangle-after-former-ug-council-member-late-samuel-kenneth-aboah.

Distribution of books to Methodist Primary & Junior High School, Adukrom Akuapem

Continuing the tribute, the next event involved a series of activities that embodied the philanthropic spirit and commitment to education that defined Mr Aboah. We embarked on a journey to the Primary, Junior High, and Senior High Schools where he spent his formative years. Additionally, we made generous donations to these schools, ensuring that his passion for education lives on in the lives of students who follow in his footsteps.



Symposium at Nifa Senior High School, Adukrom Akuapem

Through a symposium and an exhibition exercise held at Nifa Senior High School, the alma mater of Mr Aboah, we celebrated his love for knowledge, innovation, and the pursuit of excellence.

Speakers from Sambus staff and members of Mr Aboahs family presented to and challenged the students to take charge of their studies and learn about the world around them even beyond the confines of their classroom.

During the Q&A session, students thanked the speakers and organisers of the symposium for their presentation and were curious to know more about topics discussed. At the end of the symposium, students visited the Sambus exhibition stand where geospatial gadgets and reading materials had been set up. They showed interest and were curious about how far their interests could carry them in the geospatial field.

Memorial and Thanksgiving Service at Mt Zion Methodist Church Sakumono, Accra

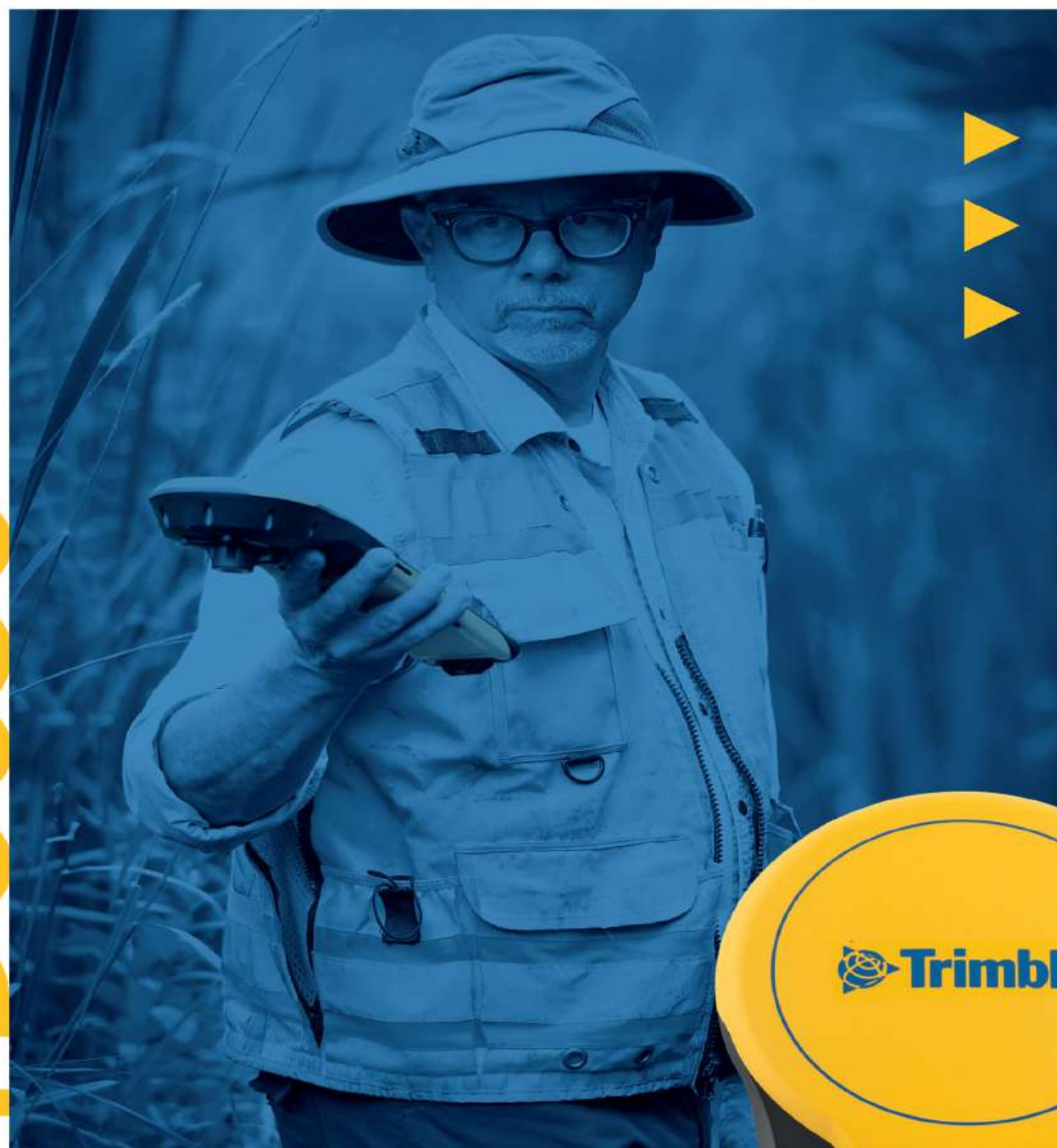
The culmination of the commemorative event was a poignant memorial and thanksgiving service held at the church where our founder worshiped during his lifetime. It brought together family, staff, and members of the community where Mr Aboah resided. The service allowed us to



express our deep gratitude for his enduring legacy and the values he ingrained within our organization. With the conclusion of this momentous occasion, we are filled with a renewed sense of purpose and a commitment to carry forward the torch of Mr Aboah’s vision. We will continue to honour his memory by upholding the principles and values he cherished, driving our company’s growth, and positively impacting the communities we serve. The 10-year anniversary of his passing serves as a poignant reminder that his spirit lives on, inspiring us each day to strive for excellence, innovation, and unwavering dedication. Sambus Geospatial remains forever grateful for the invaluable contributions of our founder, whose impact will continue to guide us as we forge ahead into a bright and promising future.

GNSS HANDHELD

TDC650



Trimble Precision in Your Hands

The **Trimble® TDC650** is the ultimate high-performance GNSS solution for GIS professionals, integrating precise positioning into a convenient handheld for efficient and reliable data collection.

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Accelerate your career with ArcGIS for Personal Use



Get access to the full range of ArcGIS capabilities to create rich, dynamic maps and apps. ArcGIS for personal use is ideal for exciting ArcGIS users who want the same powerful software licensed at home for non-commercial, personal use as well as recent graduates who want to build a personal GIS portfolio.

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ArcGIS Desktop Advanced
ArcGIS 3D Analyst
ArcGIS Data Interoperability
ArcGIS Data Reviewer
ArcGIS Geospatial Analyst
ArcGIS Image Analyst

ArcGIS LocateXT
ArcGIS Network Analyst
ArcGIS Publisher
ArcGIS Spatial Analyst
ArcGIS Workflow Manager
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Act on Your Mission with Esri Non-Profit Package

Expand positive impacts with a geographic approach



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Nonprofit Program features

- Software Subscriptions
- Data and maps
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Fast and accurate survey data every time



Your exceptional choice for professionals in the mapping, surveying, and aerial data collection industries. Revolutionizing their workflows and delivering unparalleled results.

Harnessing Geospatial Technology to Support Early Flood Warning in Nigeria

The Geohazard Risk Mapping Initiative (GRMI) is a youth-led nonprofit organization aimed at mitigating the impacts of climate change in Nigeria through geospatial technology. Nigeria, the most populous country in Africa, is at the front line of climate change consequences, with its communities frequently facing destructive geohazards. Despite the Nigerian governments commendable efforts to minimize these risks, a significant gap exists in disseminating early warning information and access to a real-time flood reporting tool. This gap precipitates a higher vulnerability to the escalating effects of climate change, particularly flooding. To address this challenge, GRMI has developed a strategic approach utilizing geospatial technology.

Climate change-induced environmental conditions pose significant threats to human lives and properties across African countries, particularly Nigeria. The country grapples with recurrent flooding, spurred by changes in rainfall patterns attributed to climate change and other human factors. According to the Centre for Research on the Epidemiology of Disasters (CRED), floods accounted for 43.5 per cent of all deaths

from disasters in 2019, marking an increase in events compared to previous years. Furthermore, floods disrupt human activities and the economy, significantly affecting the most vulnerable populations. The lack of a flood reporting tool and an effective system for communicating early warning hazard information exacerbates these challenges, leaving communities unprepared and vulnerable to flooding.

GRMI & Africa Geoportal Challenge

GRMI wanted to help support Nigerian communities in better understanding, preparing for, and responding to recurring flooding events spurred by changes in rainfall patterns attributed to climate change.

Solution

Using Africa Geoportal, Esri's open GIS community data and mapping platform, GRMI created a real-time flood reporting tool, interactive flood maps, web applications, and a comprehensive flood event database.

Result

Communities and response organizations can now use the data, maps, and applications to better prepare for climate-related challenges like flooding.

Africa Geoportal

In alignment with Sustainable Development Goal 13 (Climate Action) and the Sendai Framework for Disaster Risk Reduction, GRMI was launched to address these issues. The initiative capitalizes on geographic information and satellite imagery analysis to provide vulnerability and emergency mapping of natural, biological, and technological hazards affecting African countries due to climate change.

Since its inception in September 2020, GRMI has assembled a team of 20 youth GIS volunteers skilled in hazard mapping. online webform (Survey123) to report flood events as they occur in/around you.

Using the form functionality of ArcGIS Survey123 on Africa Geoportal, the team created a user-friendly web flood reporting tool to report flooding events in real-time. This information is relayed to the national emergency agency, facilitating flood response in affected locations and contributing to a flood event database that can be used to mitigate future risks.

The team proceeded to produce high-precision static maps and digital interactive flood susceptibility maps using the data, analysis, and mapping tools available on Africa Geoportal.

Due to Africa Geoportals da-

ta-sharing capability and ability to amplify open data, these maps and applications could be shared easily with government institutions and local disaster management agencies and disseminated through various media platforms. Communities can interact with these maps and applications through a browser, which enables them to understand their level of susceptibility to flooding and make appropriate preparations.

Supporting Communities to Be Better Prepared

Since its launch, GRMI has mapped 25 communities across different states in Nigeria, significantly impacting disaster preparedness.

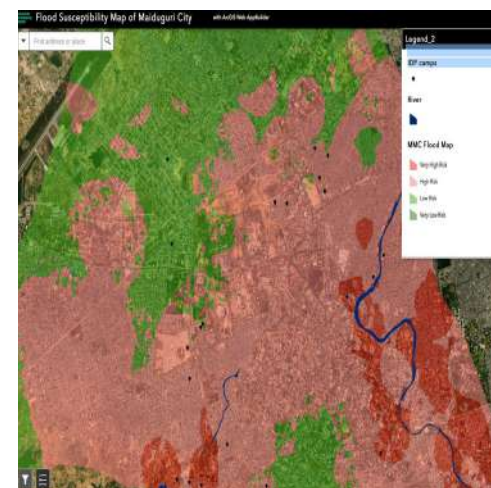
The initiatives efforts are making a tangible difference in underrepresented communities. For instance, GRMI's flood maps for Maiduguri Local Government Area revealed various internally displaced camps at risk of future flooding.

The Geohazard Risk Mapping Initiative is making significant strides in mitigating the impact of floods in Nigeria, and the benefits are plentiful. The flood maps produced by the initiative have offered insightful data that governments, communities, and individuals can use to better prepare for flood events. For instance, the maps reveal the level of flood susceptibility of various locations, including farmlands, schools, and marketplaces. This information is crucial in initiating preventive measures and reducing the damage caused by flood events.

Farmers, for instance, can use this

information to plan their farming activities accordingly, thereby preventing food insecurity caused by unexpected flood events. Similarly, educational institutions can now use these maps to improve their emergency preparedness strategies, ensuring the safety of learners. Moreover, the susceptibility maps also guide the government and local planning agencies in making informed decisions about infrastructure development and land-use planning.

GRMI's user-friendly web app has significantly improved the flood reporting process in Nigeria, enabling real-time data sharing with national emergency agencies.

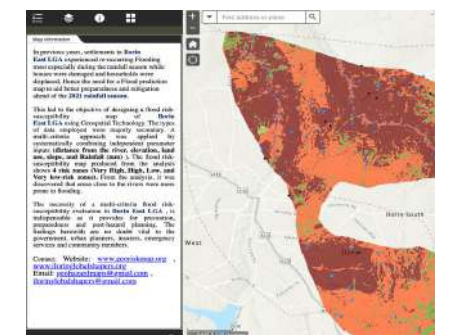


Call to Action and Next Steps

The Geohazard Risk Mapping Initiative has already made great strides, but there is still much to be done. The initiative aims to convert its web app into a mobile app to enhance accessibility and ease of use. However, this project requires additional funding. As such, the call to action is for stakeholders, including governmental and non-governmental organizations, to provide the necessary support to realize this goal.

Moreover, the initiative is continually looking for more volunteers who have skills in geospatial analysis and environmental management to expand its reach to more communities. It is a great opportunity for young professionals to gain practical experience and contribute to a project with significant societal impact. Lastly, community members are encouraged to utilize the flood reporting web app and share it with others. Every report contributes to the comprehensive flood event database and helps provide crucial data that can save lives and properties.

The Geohazards Risk Mapping Initiative is a testament to the power of geospatial technology in addressing climate change-related challenges. Through this initiative, Nigerian communities are better prepared to handle flooding, thereby reducing loss of life, property, and livelihoods. With additional support and resources, the initiative can continue to make an even more significant impact.



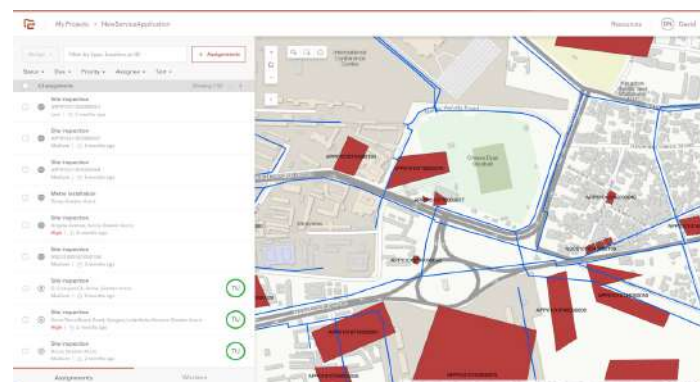


Modernizing Water Service Applications: A Successful Collaboration with ArcGIS Technology

In a significant collaborative effort, Ghana Water Company Limited (GWCL), in partnership with Tensing, undertook an ambitious project to revolutionize its water service application processes. Empowered by ESRI's ArcGIS technology, this transformative endeavor streamlined operations, enhanced customer experiences, and set a new benchmark for efficiency within the water utility sector in Ghana.

Project Overview

GWCL's New Service Application Work Order Application Project aimed to digitize and modernize the intricate processes involved in applying for water service connections. By eliminating manual bottlenecks and inefficiencies, the project sought to provide customers with a convenient, efficient, and transparent application experience.



Challenges Addressed

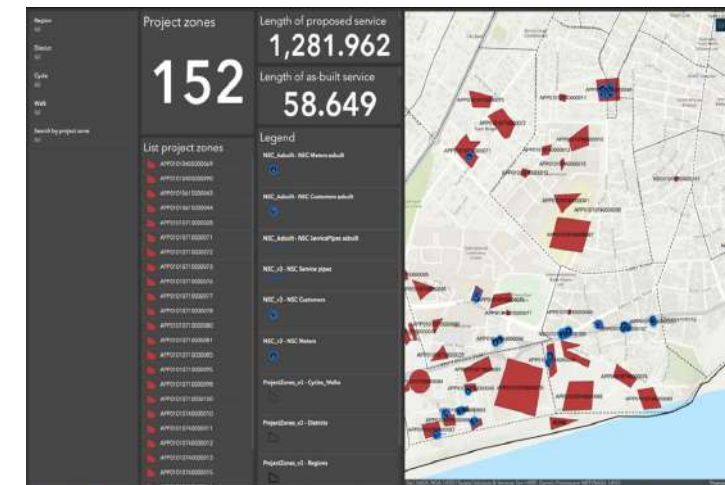
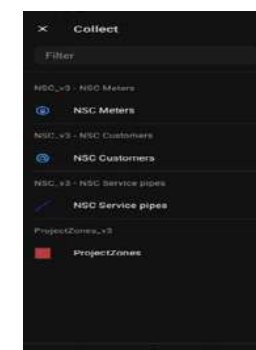
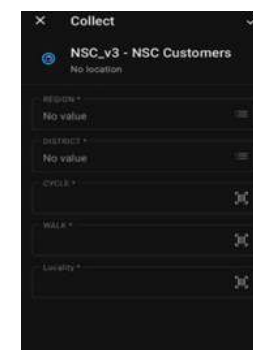
1. Cumbersome manual application procedures.
2. Duplicated customer numbers within billing routes.
3. Limited customer location tracking.
4. Insufficient transparency and data sharing.

Solution with ArcGIS Technology

In collaboration with Sambus Geospatial Limited and Tensing, GWCL harnessed the power of ArcGIS technology to reshape its service application processes. Employing ArcGIS Pro, ArcGIS Workforce, ArcGIS Enterprise, Survey123, and ArcGIS Field Maps, the utility company created an integrated platform to enhance data-driven decision-making, improve communication, and elevate customer service.

Key Benefits Achieved

1. Streamlined Efficiency: The digitized application process significantly shortened the previously cumbersome chain of manual steps, offering customers a streamlined approach to requesting water connections.
2. Enhanced Transparency: Departments gained access to a shared platform, fostering transparency, efficient data sharing, and quicker responses to customer needs.
3. Reduced In-Person Interactions: The implementation of web-based spatial applications decreased face-to-face interactions, minimizing potential corruption risks, and promoting efficient data management.
4. Enhanced Location Management: The robust location-based management system facilitated easy tracking of customer applications, reducing unauthorized connections, and improving overall accountability.
5. Elimination of Number Duplication: The project effectively resolved customer number duplication issues, ensuring accurate billing and simplified customer management.



A Collaborative Endeavor

The successful execution of the New Service Application Work Order Application Project was the result of a joint effort by GWCL staff and Tensing's skilled team. Sambus Geospatial Limited contributed by providing essential ArcGIS technology, supporting the project's success.

Future Innovations

The project's success reflects GWCL's commitment to leveraging technology to transform its operations and enhance customer experiences. As Sambus Geospatial Limited continues to empower businesses with ArcGIS solutions, we're excited to witness more innovative transformations in various sectors. Stay connected with us for more stories of success and innovation powered by geospatial technology. To learn more about our solutions and services, visit our website or contact our dedicated team.

Technology Implemented

Technology Implemented
ArcGIS Pro, ArcGIS Workforce, ArcGIS Enterprise, ArcGIS Field Maps, ArcGIS Survey123

Development Team

Ghana Water Company Limited: David N.O. Nunoo, Michael Nyoagbe, Jeff Opoku-Gyambibi, Felix Amon-teba Petio, Francisca Ameley Gyimah
Tensing: Vera Karas, Jan Creupelandt, Jelmer Akkerman



FEATURE IN OUR NEXT NEWSLETTER

Stay informed about our future newsletters.

If you'd like to highlight your projects and articles, please reach out to us at events@sambusgeospatial.com

UPCOMING GEOSPATIAL EVENTS

Q4 Industry Webinar

The Sambus Industry Webinars offer valuable learning opportunities to enhance awareness of geospatial tools and capabilities for both Sambus clients and the public.

GIS Day 2023

GIS Day is an annual celebration that serves as a platform to showcase remarkable achievements in Geographic Information Systems (GIS): explore real-world GIS applications, honour GIS professionals, and inspire a new generation.

Trimble Dimensions

Dive into the collaborative power of Dimensions and unlock the potential of Trimble products within your toolkit through expert-led sessions, live demonstrations, and hands-on workshops tailored to expand your skills and address industry-specific challenges.

Register here: <https://bit.ly/3Pi4mmc>

2023 Esri European Developer Summit

This event offers developers an exceptional opportunity to connect with industry professionals and stay updated on the latest advancements in ArcGIS developer technology. Location: Berlin, Germany.

Register here: <https://bit.ly/3YBzM9R>

GALLERY OF EVENTS



Training Conducted for Ministry of Power by Nigerian Team



Training Conducted for Ghana CocoBod by Ghanaian Team at Bunso Cocoa College



Sambus Represented Esri at GMES & Africa



Trimble Days in West Africa





MAP GALLERY

SEE THE BEST MAPS DEVELOPS BY PROFESSIONALS



Overview of the solution

In the last decade, street light monitoring has become an important measure to assist in maintaining high-quality public lighting in urban areas especially in places like Nigeria where insecurity seems to be on the high rise. Streetlights have been proven to reduce crime and improve traffic safety while reducing light pollution. However, streetlights are expensive to install and maintain. Cities have struggled with balancing the need for efficiency and cost-efficiency with the need for public safety. Whether it's in a residential or commercial area, streetlights are an important safety measure that can help prevent accidents and fatalities.

However, streetlights are expensive to install and maintain. Cities have struggled with balancing the need for efficiency and cost-efficiency with the need for public safety. When a light goes out, it can be hard for the city or town to find out which street it's on. ArcGIS Online offers a way to monitor streetlights and track when one goes out.

With this solution, agencies in charge of street lights can manage daily tasks related to planning, monitoring, and maintaining the street lights under their control more effectively. This will enable GIS-based visualization and information on street lights at their fingertips. All the information linked to street lights, and the conditions of the facilities are accessible to officials in one place, which will eventually aid in planning the installation of new street lights.

A Field application was configured for the Inspection officer to report the status and condition of the light-bulbs, poles and other necessary information.

Another FieldMaps application was configured using

the existing feature layer from the inspection map for updating of the existing streetlight asset that has been mapped.

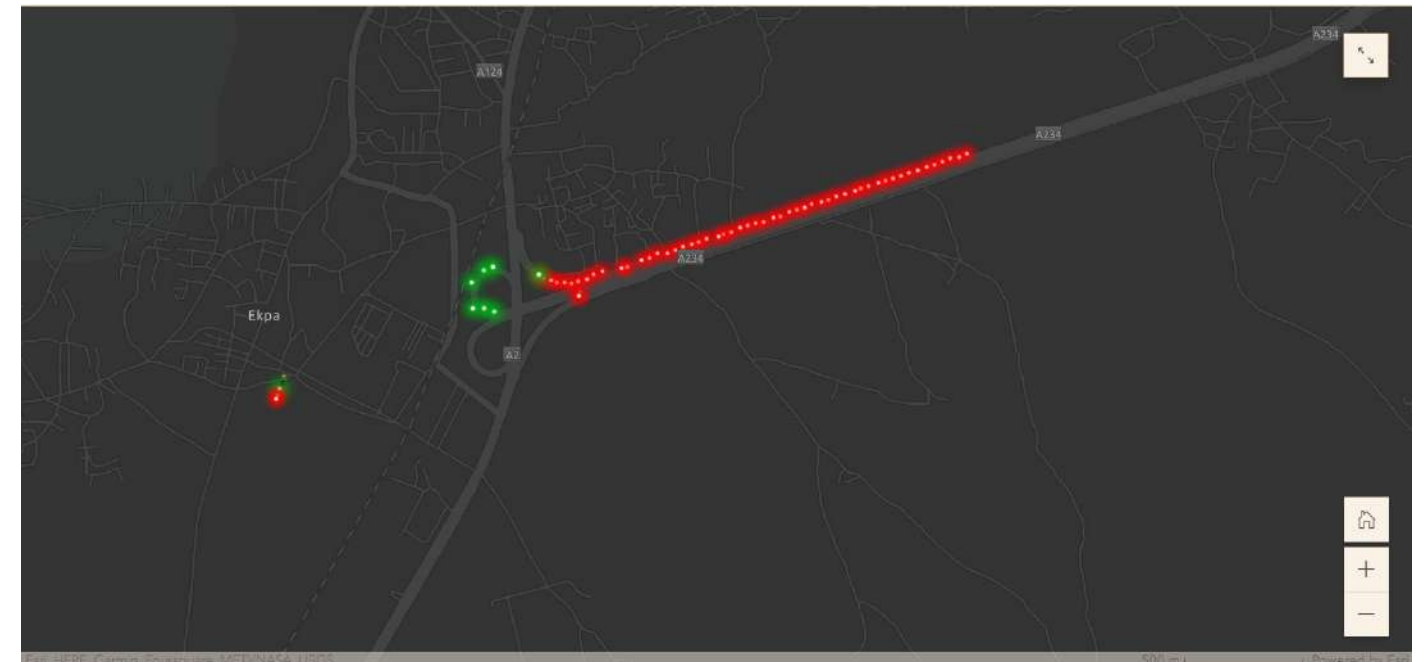
The ArcGIS system has made it very easy to build Geo-customed enabled applications seamlessly because of the integration with the Field Apps and the Essential Apps. The City is seeking for upcoming applications after having a nice experience with the Arc Collector app during the LED conversion. When it comes to locating underground conduits, electrical maintenance staff has expressed interest in utilizing the app to track repairs to beacons and signals. The team members that worked on the conversion process with a solid foundation of GIS resources are directly responsible for its success so far. The labor and resource savings from employing a digital database for such a massive migration are immeasurable. It is no longer necessary to sift through thousands of data entries scattered across piles of paper by streamlining the monthly conversion reports for utility billing through a single spreadsheet pulled from the GIS conversion layer.

How to Setup and Use with ArcGIS Online

If you're looking for a way to monitor street lights, ArcGIS Online can help. With this software, you can track the status of streetlights, identify outages, and see when repairs are made. Here's how to set up and use ArcGIS Online for street light monitoring:

1. Create an account - You'll need a free ArcGIS Online account to get started. Sign up at <https://www.arcgis.com/home/signin.html>.

2. Find the streetlight data layer - Once you're logged in, search for "streetlight" in the basemap gallery. Select the "Streetlight Outages" layer from Esri (it should be the first result).



Inspection_Intelligent Street Lighting Map

3. Add the data layer to your map - Click "Add" to add the layer to your map.

4. Customize the data layer - By default, the data layer will show all streetlights in the United States. You can use the filters to narrow down the results by state, county, or city.

5. Monitor street light outages - The data layer will show you where streetlights are out and when they were reported. This information can help you identify areas where there are frequent outages.

Conclusion

ArcGIS Online is a powerful tool that can help you with street light monitoring. With its mapping capabilities, you can easily track and monitor street lights in your area. Additionally, the data collected by ArcGIS Online can be used to improve street lighting conditions in your community. If you are looking for a way to make your community safer and more efficient, consider using ArcGIS Online.

Software Used

ArcGIS FieldMaps
ArcGIS Dashboard



Intelligent Street Lighting Dashboard

Watch Video of projects created for the data collection here:

Inspection officer Video - <https://bit.ly/3PWTOb4>

Repair Team Video - <https://bit.ly/3RYXzss>

Verification Video - <https://bit.ly/3FpSOYi>

Contact:
Iyinoluwa Ojumu
oiyinoluwa@sambusgeospatial.com

MALARIA SUSCEPTIBILITY HAZZARD MAPPING IN AKURE USING GIS

The use of GIS-based Multicriteria Decision is crucial to the malaria susceptibility management process since malaria is an environmental sickness and spatial phenomenon. A malaria susceptibility map is a useful tool for controlling the spread of the disease. This study's objective was to use GIS-based methodology to evaluate the how susceptible people are to malaria in Akure (Akure North LG and Akure South LG) using criterias like Land Surface Temperature, distance to river, Elevation, Landuse/LandCover, NDVI and slope. Analytical Hierarchical Process methodology was employed for the Multi criteria decision making and the generated Eigen vector used as a coefficient to combine the relevant factor or criteria.

INTRODUCTION

According to USAID Presidents Malaria Initiative FY 2020 Nigeria Malaria Operational Plan, Nigeria is a country where malaria is spread widely; and 76% of the population lives in areas with high transmission rates, compared to 24% in areas with low transmission rates. Plasmodium falciparum is the most common species of malaria parasite (>95%) and is the cause of most severe illness manifestations. The country's five ecological strata, which run from south to north and include mangrove swamps, rain forests, guinea savannahs, Sudan savannahs, and Sahel savannahs, differ in terms of malaria transmission intensity, length, and seasonality. For example, In the south, the transmission season might run all year long; in the north, it lasts for no more than three months.

Geographical information system offers the best platforms for the fusion of data on individual diseases and their assessments in relation to populated areas, local social and health services, and the natural environment. They are excellent for studying epidemiological data, revealing patterns and connections that would be harder to find in tabular format (Bhatt and Joshi, 2012).

THE STUDY AREA

Ondo State's capital, Akure, is located between latitudes 7 12'N and 7 19'N and longitudes 5 08'E and 5 18'E. It is situated in the derived savannah Zone of southwest Nigeria and due to its location, it is easily reachable from any area of the state. The study area has a humid tropical environment with high temperatures throughout the year with no discernible seasonal variations. 27oC is the average annual temperature and its mean annual relative humidity is about 77.1%. The area's mean annual rainfall is 1220 mm. The population of the city increased from 71,006 in 1963 to 239,124 in 1999 due to its quick expansion, making it one of the fastest growing metropolitan regions in South-Western Nigeria by 2006. The Akure Metropolis (Akure North and Soth LG) has experienced rapid development in its infrastructure, including the emergence of new enterprises and the expansion of established ones, as well as the development of housing and estates, surface and groundwater resources, etc.

METHODOLOGY

The Analytic Hierarchy Process (AHP), a method for making multi-criteria decisions, was created by Prof. Thomas L. Saaty in its original form. It is, in essence, a technique for obtaining ratio scales from paired comparisons. The method is used to rank a set of alternatives or to choose the best option from a set of alternatives. Rankings and selections are made considering a broad objective that is divided into a few factors.

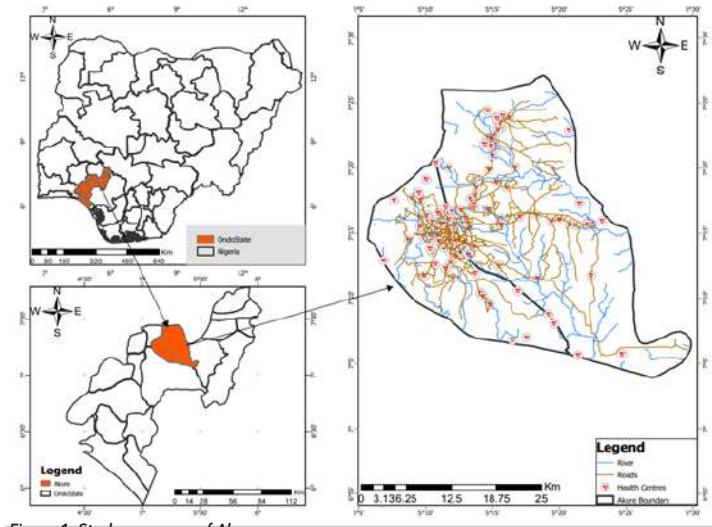


Figure 1: Study area map of Akure.

The methodology is applied by determining the importance weights to be assigned to the criteria in defining the ultimate objective. The criteria are compared pairwise to achieve this. Actual data can be used as the input/parameters or criterion. AHP permits some minor discrepancies in judgment because people are not always reliable. The scales for ratios come from the consistency index is obtained from the principal Eigen vectors and Value of Eigen.

The table below shows the Saaty's pair wise comparison table with 9 degrees.

Note: 2 4 6 8 are all intermediate values

The following steps were used to determine the weights of each factors used:

1. For each of the input parameters, create a pair-wise comparison matrix.
2. Each input parameter's respective weights were assigned.

Intensity of Importance	Definition of Explanation
1	Equal importance Two factors contribute equally to the objective
3	Somewhat more important
5	Much more important
7	Very much more important
9	Absolutely more important

Six data layers were used for deriving the susceptibility map. These parameters are as follows: Distance to river, Land Surface Temperature, Slope, Elevation, Land-use/Land-Cover and NDVI.

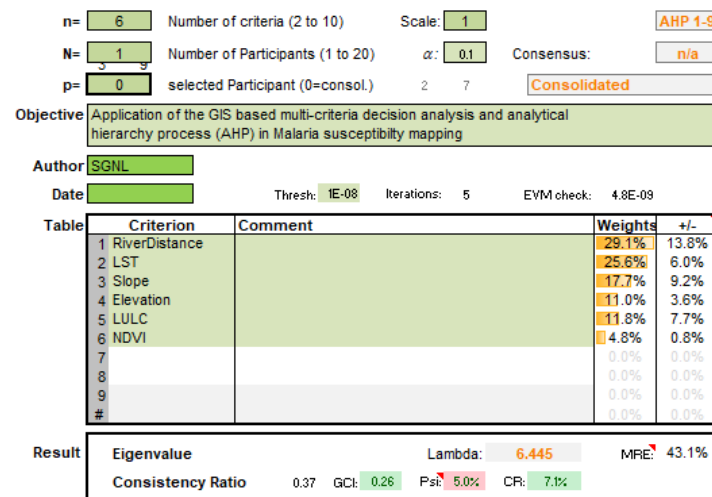


Figure 2: AHP Calculator showing the criterias and eigen values.

Distance to river: One of the reasons why this criterion is used is that it is common that the existence of mosquitoes in a particular location might be impacted by the development corridor's drainage status. As the amount of moisture in the land increases, so does its ability to hold water, which creates a breeding ground for mosquitoes and increases the risk of malaria. The distance to the river layer was generated from the DEM of Akure. The processes involved in generating this layer from DEM involves DEM → Fill → Flow direction → Flow Accumulation Stream → Stream Link → Stream order → Stream to Feature

Land surface Temperature: Temperature is an important indicator of mosquito abundance. Numerous aspects of a mosquito's life cycle have been linked to temperature, including egg viability, larval development, blood-feeding behavior, female fecundity, adult longevity, interactions with parasites and arboviruses, wing size, and population numbers. Mosquitoes become active whenever the temperature rises above 10 degrees on a regular basis, but their activity spikes at 26 degrees and higher which means that the higher the temperature, the higher the rate at which mosquitoes can breed.

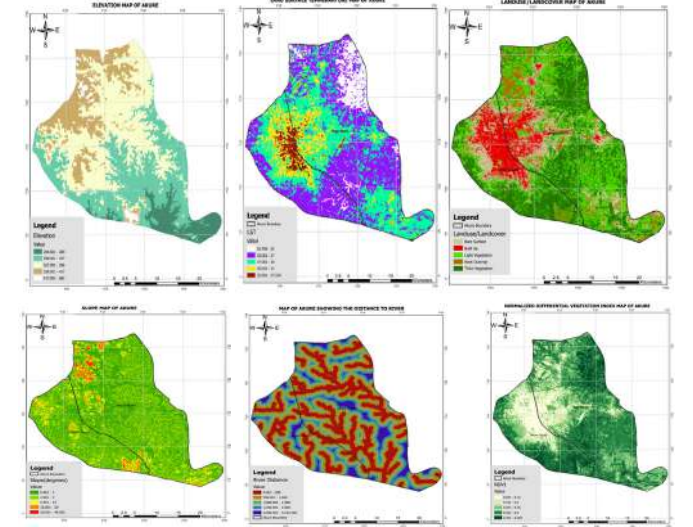
Slope: Another topographic factor that may be related to the development of mosquito larval habitat is slope. Extreme temperatures that disrupt the insect and parasite life cycles prevent malaria transmission at some elevations. DEM is prepared to determine the relationship between topography and terrain features and the accessibility and stability. The DEM (90m resolution) was processed to create the slope map using ArcGIS Pro software's Spatial Analysis Tool (Slope). The slope raster layer was classed using common classification techniques into five subgroups. Further categorized into five subgroups. The subgroups of the reclassified slope raster layer were graded in accordance with how well the area was suited for malaria occurrence. The greater slope values are specifically connected to.

Elevation: Because height greatly influences temperature, this in turn affects mosquito reproduction as well as the length of the immature stage in the life cycle. The length of the cycle of the parasite within the mosquito host is also impacted by high temperatures (that is, shortening it when temperatures rise) (minister of health, 1999; Ahmed, 2014). High temperatures cause the egg, larval, and pupal stages to shorten to increase turnover. The DEM data was processed to create the elevation map in meters and was classed into five subgroups.

Landuse/Land cover: LULC is one of the main anthropogenic environmental change types. Land use refers to the human alteration and control of land regions while land cover refers to the physical and biological cover of terrestrial surfaces. LULC have significant effects on ecological systems, changing the distribution of people, disease-carrying animals, and insect vectors that spread illnesses. The global transmission and geographic distribution of malaria and other vector-borne diseases have changed because of these modifications, with the risk of malaria changing based on a variety of environmental, biological, and social factors. The Near infrared red and green band of Landsat 8 was combined together to make a false color composite layer and further classified using the Supervised Classification approach to classify into the Thich vegetation, Light vegetation, Bare surface, Built up and Rock outcrop.

NDVI: Rainfall can accurately be predicted using Normalized Differential Vegetation Index. NDVI can be employed as a malaria early warning signal (Haque, 2007). The most well-known and often used vegetation index is probably the NDVI. The NDVI is a straightforward but efficient method for measuring green vegetation.

The AHP was utilized to determine the significance of the chosen factors. Experts will allocate and agree upon the weight of each element in the AHP by evaluating its significance in relation to that of other factors.



RESULTS

THEMATIC MAP LATER	ATTRIBUTE	SCORE	WEIGHTS (%)
Distance to River (m)	0.001-500	4	29
	500-1000	3	
	1000-1500	2	
	1500-2000	5	
	Above 2000	1	
Land Surface Temperature	22.788-25	1	25
	25-27	2	
	27-30	3	
	30-32	4	
	Above 32	5	
Slope (degrees)	0.001-2	1	18
	2-5	2	
	5-10	3	
	10-20	4	
	Above 20	5	
Elevation (m)	204-289	1	11
	289-327	2	
	327-358	3	
	358-417	4	
	417-662	5	
Land Use/ Land Cover	Bareland	4	12
	Light Vegetation	3	
	Thick Vegetation	2	
	Built up	5	
	Rock	1	
NDVI	0.041-0.15	5	5
	0.15-0.2	4	
	0.2-0.25	2	
	0.25-0.3	1	
	0.3-0.394	4	

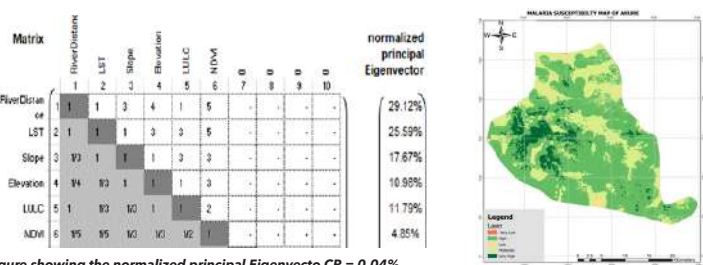


Figure showing the normalized principal Eigenvecto CR = 0.04%

CONCLUSION

In general, mosquitoes preferred the high-humidity regions because they provided the best circumstances for mosquito breeding. Faster mosquito reproduction will increase the likelihood of human interaction, increasing the danger of malaria disease transmission. Padang The Cermin Subdistrict has a significant concentration of greenery. The presence of vegetation can have an impact on the life of mosquitoes since it provides places for spawning, shelter, foraging, and adult mosquitoes to rest. The increased plant density level will improve the convenience level of mosquito growth in locations with the best conditions for mosquito breeding. High mangrove vegetation density exhibits this trait. There are certain coastal places that do not have a high level of vulnerability; not all coastal areas have a high level of susceptibility. This is because other ecological factors have an impact and actually lower the likelihood of malaria susceptibility.

Contact:
Benedict Mberede
bmbere@sambugeospatial.com

Acknowledgments

David Nii Okai Nunoo

GIS & Hydraulic Modelling Manager - GWCL

Samuel Eli Zoe

Business Development Lead - SG Ghana

Sunabiji Waziri Edmond

Business Development Lead - SG, Abuja Nigeria

Josephine Ntow

Research & Development Officer - SG Ghana

Olumide Ogungbemi

Research & Development Officer - SG, Abuja Nigeria

Iyinoluwa Ojumu

Training Officer - SG, Abuja Nigeria

Benedict Mberede

Ag. Technical Support & Professional Services Lead - SG, Lagos Nigeria

Clement Bamidele Oke

Technical Support & Professional Services Lead - SG, Abuja Nigeria

Prosper Mawuli Auayigah

Graphics Design & Website Management Officer - SG Ghana

ESRI Blogs





Get In Touch

Ghana

F702/1 Salem Street, Kuku Hill, Osu
P.O.Box, AN 16701, Accra North, Ghana
Telephone +233 (0) 302 777 127

Abuja Office:

No. 19 Ebitu Ukiwe Street, Jabi,
Abuja, Nigeria
Telephone: +234 (0) 9 292 2821

Lagos Office:

Plot 1601 Adeola Hopewell Street,
Victoria Island, Lagos, Nigeria
Telephone: +234 (0)90 8271 5613

Email: info@sambusgeospatial.com

Visit: www.sambusgeospatial.com

Follow us on Social Media

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