



GIS PORTFOLIO

Selected Maps, Projects, and Applications of Geospatial Technologies



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Thematic Areas: Public Health · Environmental Risk · Climate Change · Epidemiology
· Infrastructure Planning

About Me

My name is Godwin Etim Akpan, and I am a GIS Specialist based in Raleigh, United States of America, with over a decade of experience applying geospatial technologies to support public health surveillance, disease outbreak response, infrastructure planning, environmental studies, and transportation and road safety mapping. Proficient in tools such as ArcGIS Pro, ArcGIS Online, QGIS, R, SQL, and Python, I specialize in spatial analysis, cartographic design, and data-driven decision support.

My portfolio includes interactive dashboards, site suitability assessments, and thematic maps that have informed national and international initiatives. I have contributed to projects addressing COVID-19 and measles outbreak mapping, road network digitization, traffic accident hotspot analysis, climate and environmental risk modeling, and emergency preparedness, with work featured in peer-reviewed journals and the Esri Virtual Map Gallery.

With a passion for transforming complex geospatial data into clear, actionable insights, I bring a collaborative mindset, technical precision, and a deep commitment to making a measurable impact in the real world.

Portfolio Highlights

- **Peer-Reviewed Publications:** Lead or co-author on multiple GIS-driven studies published in *PLOS ONE* and *IJID Regions*, advancing knowledge in malaria vector modeling, COVID-19 surveillance, and measles outbreak response.
- **International Recognition:** Maps and dashboards featured in the Esri User Conference Virtual Map Gallery (2021, 2023), showcasing innovation in public health and environmental GIS to a global audience.
- **National Impact:** Supported Liberia's Ministry of Health, NPHIL, and AFENET with real-time COVID-19 and measles outbreak mapping, directly informing emergency response, resource allocation, and vaccination campaigns.
- **Transportation & Road Safety GIS:** Digitized and validated national road networks and led spatial analysis of traffic accident hotspots in Liberia, supporting infrastructure initiatives and road safety planning for government agencies.
- **Climate & Environmental Leadership:** Developed 3D climate risk visualizations and land degradation assessments used for SDG monitoring and policy engagement in West Africa and the US.
- **Cross-Border Collaboration:** Produced cross-border surveillance and risk maps for Ebola and Marburg virus threats, facilitating rapid preparedness and joint action between Liberia and Guinea.
- **Technical Breadth:** Demonstrated expertise across ArcGIS Pro, QGIS, remote sensing platforms, Python/R scripting, and mobile data collection (KoboToolbox, Survey123), with applications spanning infrastructure, epidemiology, and environmental management.
- **Stakeholder Engagement:** Created national stakeholder and training coverage maps that improved coordination, transparency, and decision-making for government agencies, NGOs, and international donors.

GIS Portfolio Summary

Project	Country / Region	Tools Used	Impact/Outcome	Year(s)	Publication / Recognition
Airport Site Suitability Mapping – Obafemi Awolowo University	Nigeria	ArcGIS Desktop, Landsat 8, SRTM DEM, Remote Sensing	Identified optimal airstrip location; informed sustainable campus infrastructure planning	2016	
Land Degradation & Productivity Assessment – River Gee County	Liberia	Trends.Earth, ArcGIS, Remote Sensing	Tracked SDG 15.3 progress; informed national policy and collaboration with Conservation Intl.	2019	
Sea Level Rise Projection – Miami	USA (Miami, FL)	ArcGIS Pro, ArcGIS Online, 3D Scene Layers	Developed 3D visualization for scenario planning and climate resilience	2024	
Road Network Digitization & Validation – Liberia	Liberia	ArcGIS Pro, GPS, Satellite Imagery	Digitized and validated national road network; delivered standardized shapefiles to LISGIS for integration into the national GIS database. Final visualization pending.	2023–2024	LISGIS National GIS Database
Traffic Accident Hotspot Mapping – Greater Monrovia	Liberia (Monrovia)	ArcGIS Pro, Spatial Statistics	Designed and supervised hotspot analysis of police-reported crashes; methodology established for ongoing road safety interventions.	2024–Present	Liberia National Police (Ong)
COVID-19 Reinfection Mapping	Liberia	ArcGIS Pro, Spatial Statistics	Detected reinfection clusters; guided MoH/WHO response; published in PLOS ONE	2020–2021	PLOS ONE
Temporal Comparison of COVID-19 Case Statuses in Montserrado	Liberia	ArcGIS Pro	Tracked outbreak progression; informed interventions and resource allocation	2021–2023	
Measles Case Incidence by County and District	Liberia	ArcGIS Pro, R, WHO Epi Week Calendar	Guided immunization targeting; published in IJID Regions	2022	IJID Regions
Spatial Distribution of AFI Patients Positive for SARS-CoV-2	Liberia (Monrovia)	ArcGIS Pro	Identified COVID-19 hotspots in urban communities; supported outbreak planning	2021	AFENET Liberia website

Project	Country / Region	Tools Used	Impact/Outcome	Year(s)	Publication / Recognition
Mapping the FETP Footprint Across Africa	Africa (Continental)	ArcGIS Pro	Visualized FETP implementation; supported donor engagement and regional planning	2023	
AFENET Liberia Project Footprint Map	Liberia	ArcGIS Pro	Centralized visualization of public health interventions; improved coordination	2020–2024	
One Health RCCE Stakeholder Mapping	Liberia	ArcGIS Pro, KoboToolbox	Identified stakeholder gaps; enhanced coordination for epidemic preparedness	2023	
Emergency Preparedness Training Coverage	Liberia	ArcGIS Pro	Mapped training distribution; supported workforce planning	2022	
Cross-Border Surveillance Mapping of Marburg and Ebola Virus Diseases	Liberia / Guinea	ArcGIS Pro	Supported cross-border preparedness and surveillance	2021	
COVID-19 Case Distribution in Sinkor	Liberia (Sinkor)	ArcGIS Pro	Hyperlocal outbreak mapping; featured in Esri Virtual Map Gallery	2021	Esri UC Virtual Map Gallery
COVID-19 Distribution by Status – Liberia	Liberia	ArcGIS Pro	National dashboarding; daily situational awareness; featured in Esri Virtual Map Gallery	2023	Esri UC Virtual Map Gallery

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A. ENVIRONMENTAL & INFRASTRUCTURE PROJECTS

1. Airport Site Suitability Mapping – Obafemi Awolowo University, Nigeria

Institution: Federal University of Technology Akure (FUTA) / ARCSSTE-E

Location: Ile-Ife, Osun State, Nigeria | **Year:** 2016 | **Role:** Project Lead

Tools: ArcGIS Desktop, Landsat 8, SRTM DEM, Fuzzy Overlay, Remote Sensing

Project Overview:

Led a GIS-based multi-criteria analysis to identify the optimal site for a mini-airport on the OAU campus. Integrated topography, hydrology, geology, accessibility, and land cover data using fuzzy logic modeling to support sustainable infrastructure planning.

Objectives:

- Pinpoint airstrip locations minimizing environmental and engineering constraints
- Reduce construction costs by targeting flat, accessible, and stable terrain
- Enable data-driven campus infrastructure decisions

Key Criteria:

- **Accessibility:** Proximity to existing roads
- **Hydrology:** Avoidance of flood-prone areas
- **Slope:** Preference for flat terrain (DEM analysis)
- **Geology:** Stable substrates (granite, gneiss)
- **Land Use:** Minimize disruption to existing structures

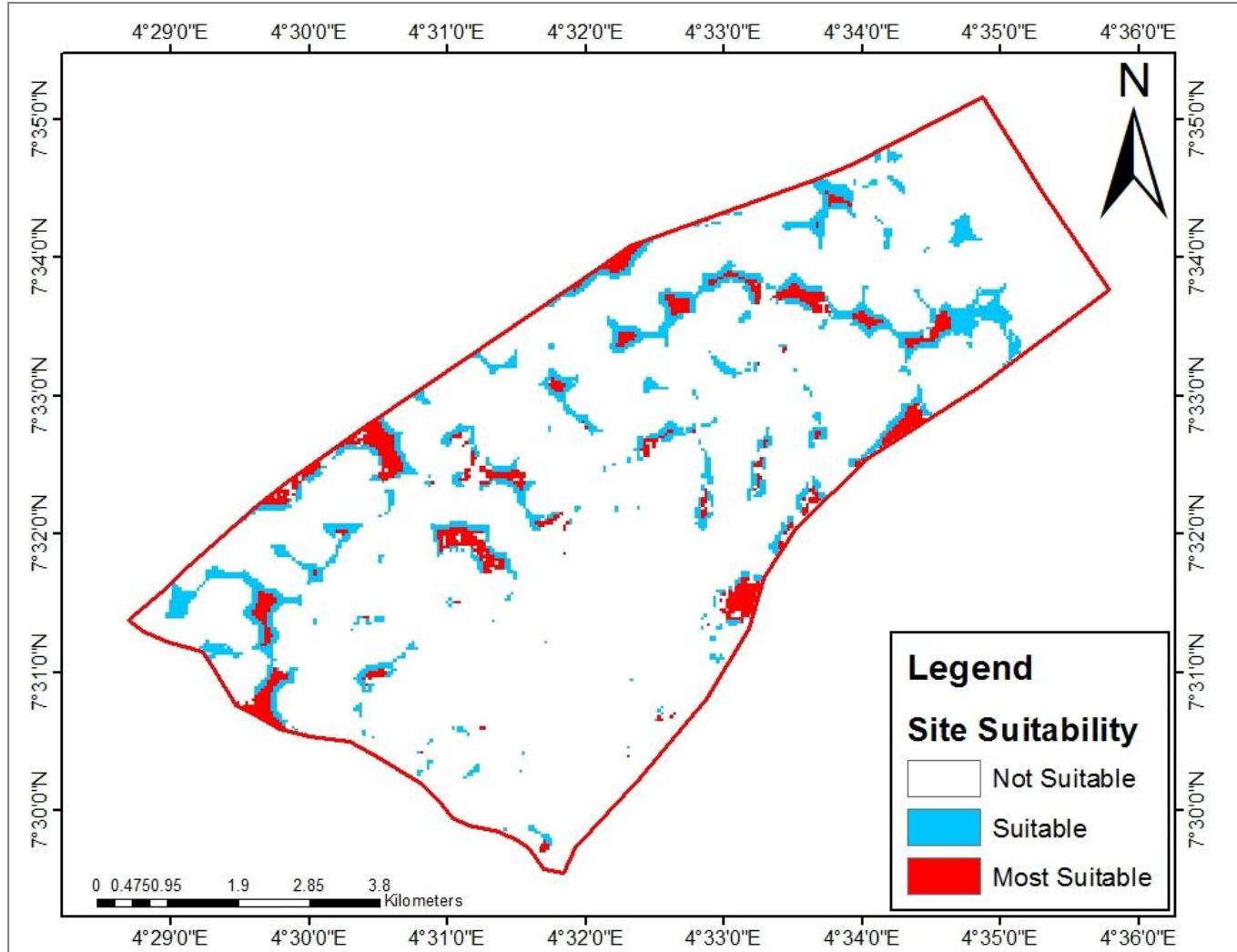
Methodology:

- Acquired and processed satellite and DEM data
- Digitized geology, road, and stream networks
- Conducted supervised land use classification
- Applied fuzzy membership and overlay for spatial integration
- Generated a site suitability map ranking all candidate locations

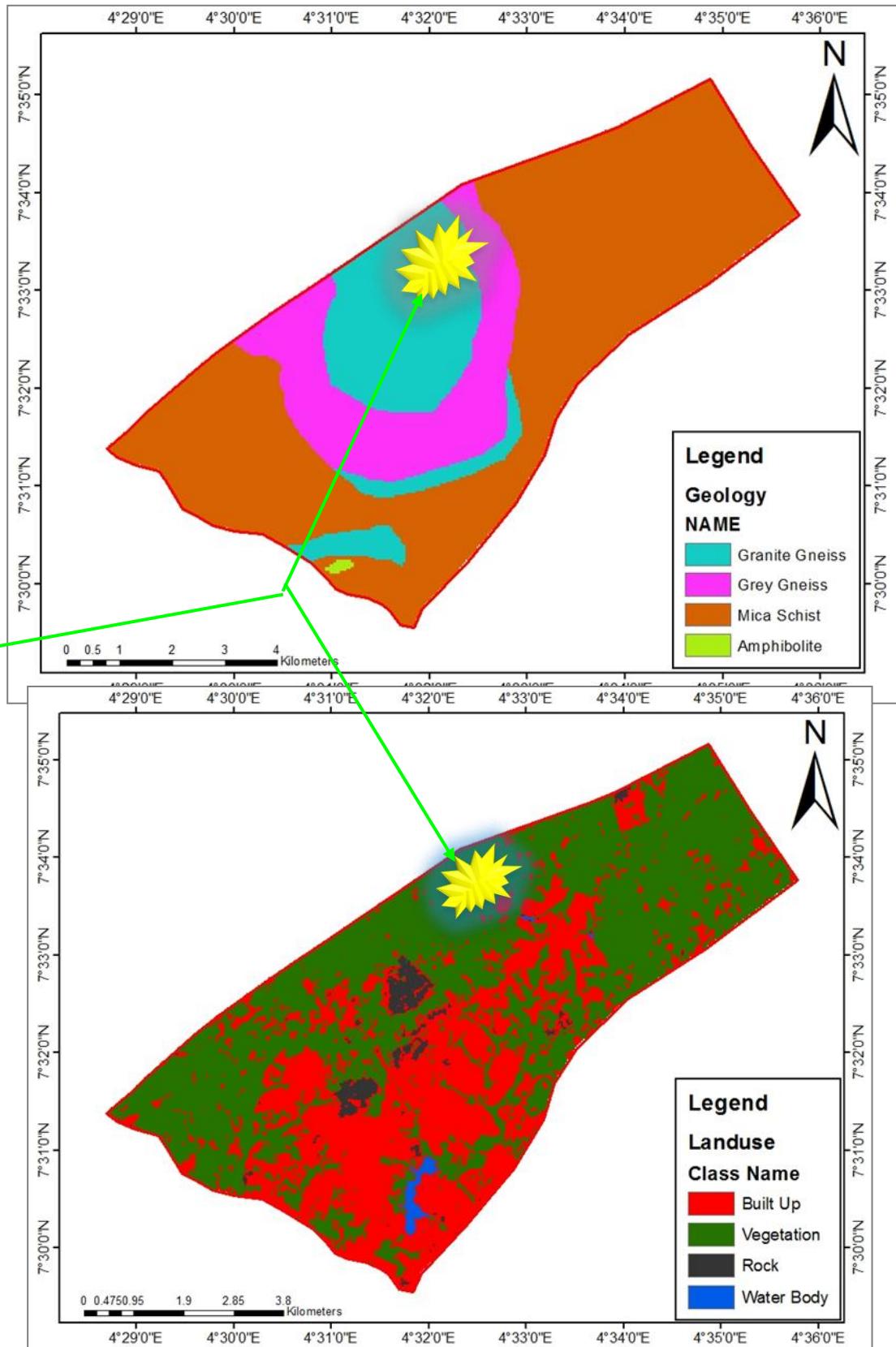
Results & Impact:

- Produced a suitability map categorizing areas as most suitable, suitable, or not suitable
- Identified an optimal site (7.53°N , 4.53°E) balancing terrain, access, and stability
- Informed campus infrastructure planning and set a benchmark for future environmental assessments

Site selection from fuzzy logic



Possible site for an airport in OAU Campus, Nigeria



2. Land Degradation and Productivity Assessment – River Gee County, Liberia (2001–2015)

SDG 15.3 Pilot Project | Independent GIS Research | 2019

Tools: Trends.Earth, ArcGIS, Remote Sensing

Overview:

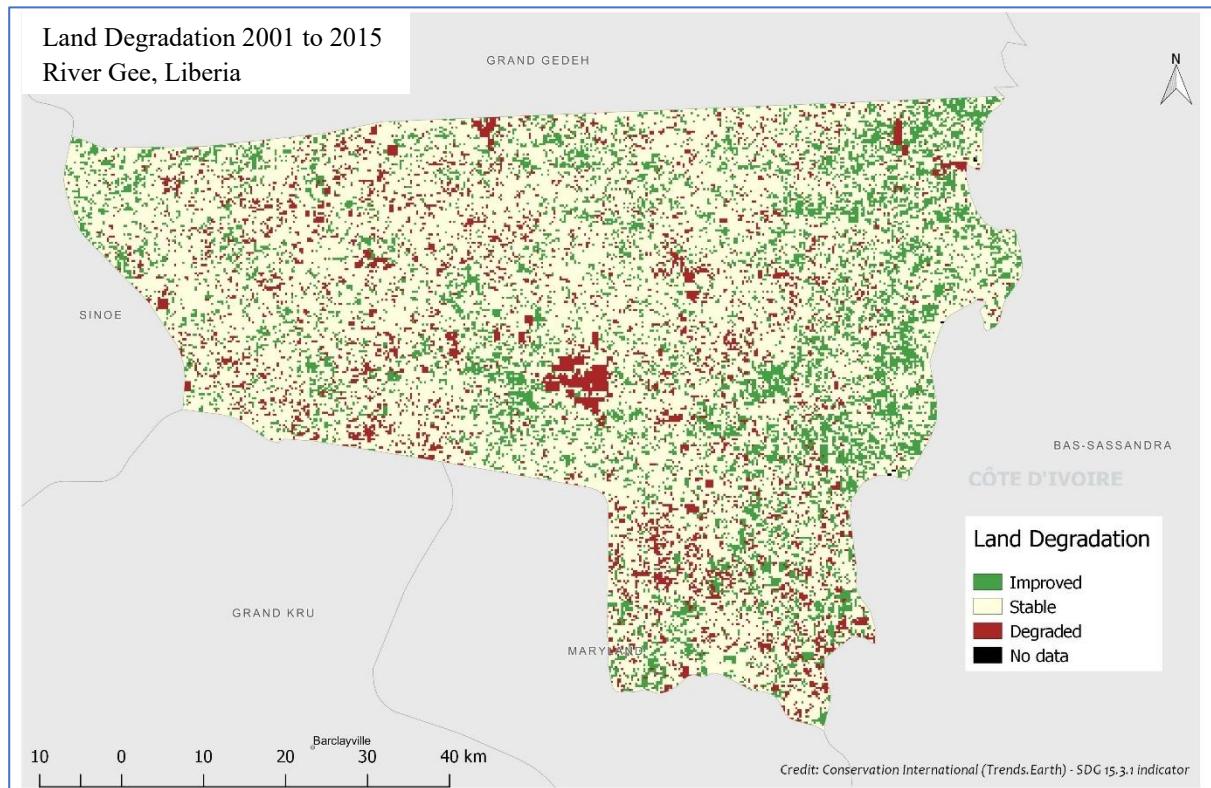
Independently designed and delivered a GIS-based pilot project to assess land degradation and productivity trends in River Gee County, supporting Liberia's SDG 15.3 (Life on Land) implementation. Leveraged Earth observation data and the Trends.Earth platform to map and analyze changes from 2001 to 2015 in one of Liberia's least-studied regions.

Key Contributions:

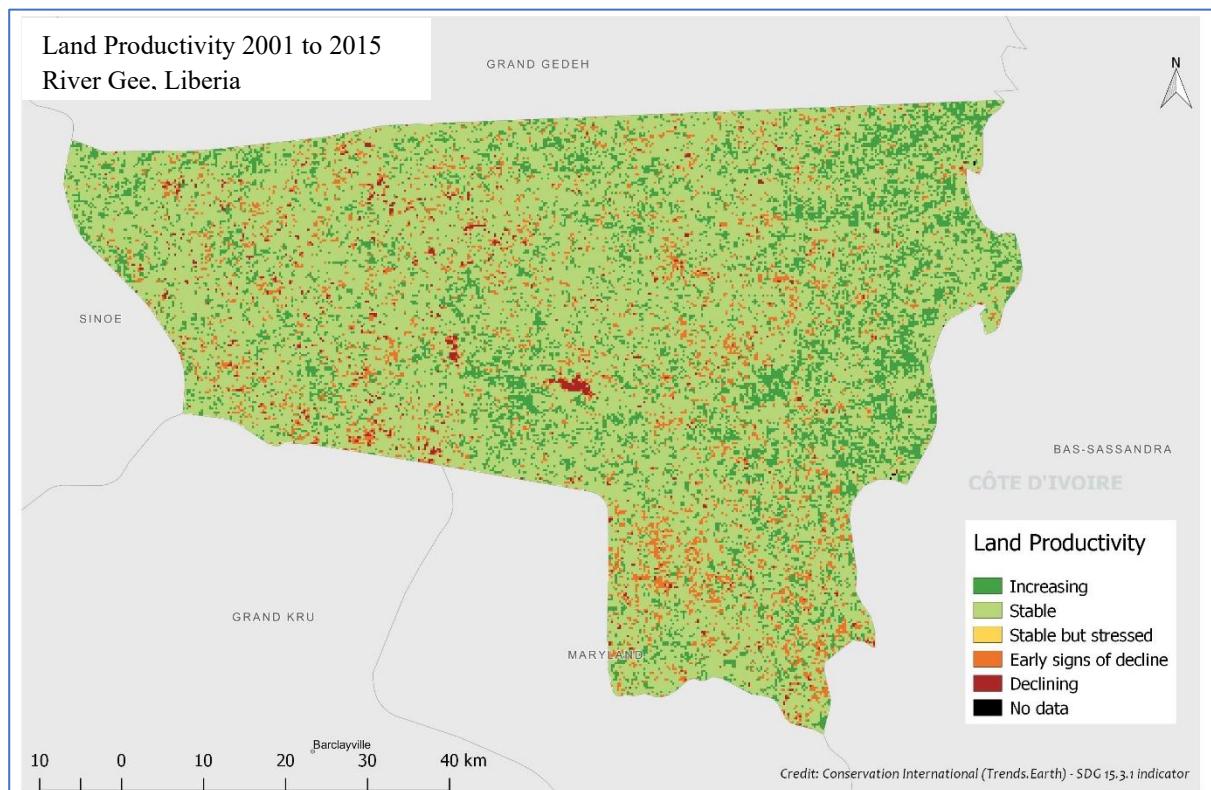
- **Project Leadership:** Conceived and executed the project as a proof-of-concept for national SDG monitoring.
- **Geospatial Analysis:** Processed and interpreted land productivity, land cover, and soil organic carbon data to identify degradation hotspots.
- **Cartography:** Produced high-resolution maps visualizing 14-year trends in land degradation and productivity.
- **Policy Engagement:** Presented findings to local policymakers, including the Senator of River Gee County, to inform sustainable land management and SDG advocacy.
- **Reporting:** Authored a comprehensive analytical report with actionable recommendations.

Impact:

- Demonstrated the value of open-source GIS and remote sensing for tracking land degradation neutrality (LDN) at the sub-national level.
- Informed further collaboration with Conservation International and contributed to national policy discussions on sustainable land use in Liberia.



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3. Sea Level Rise Projection – Miami, Florida

3D Visualization of Climate-Induced Sea Level Rise

Institution: Esri Training – Climate Change Action Program

Location: Miami, FL, USA | **Year:** 2024 | **Role:** GIS Analyst / Climate Visualization Trainee

Tools: ArcGIS Pro, ArcGIS Online, 3D Scene Layers, Time-Based Symbology

Overview:

Developed an interactive 3D model to visualize projected sea level rise impacts in Miami as part of a certified Esri climate action training. Integrated building elevation and scenario data to simulate inundation timelines for 2030, 2050, and 2090.

Objectives:

- Communicate long-term sea level rise risk through intuitive 3D visualization
- Highlight spatial and temporal patterns of urban vulnerability
- Provide a scenario planning tool for climate resilience discussions

Methodology:

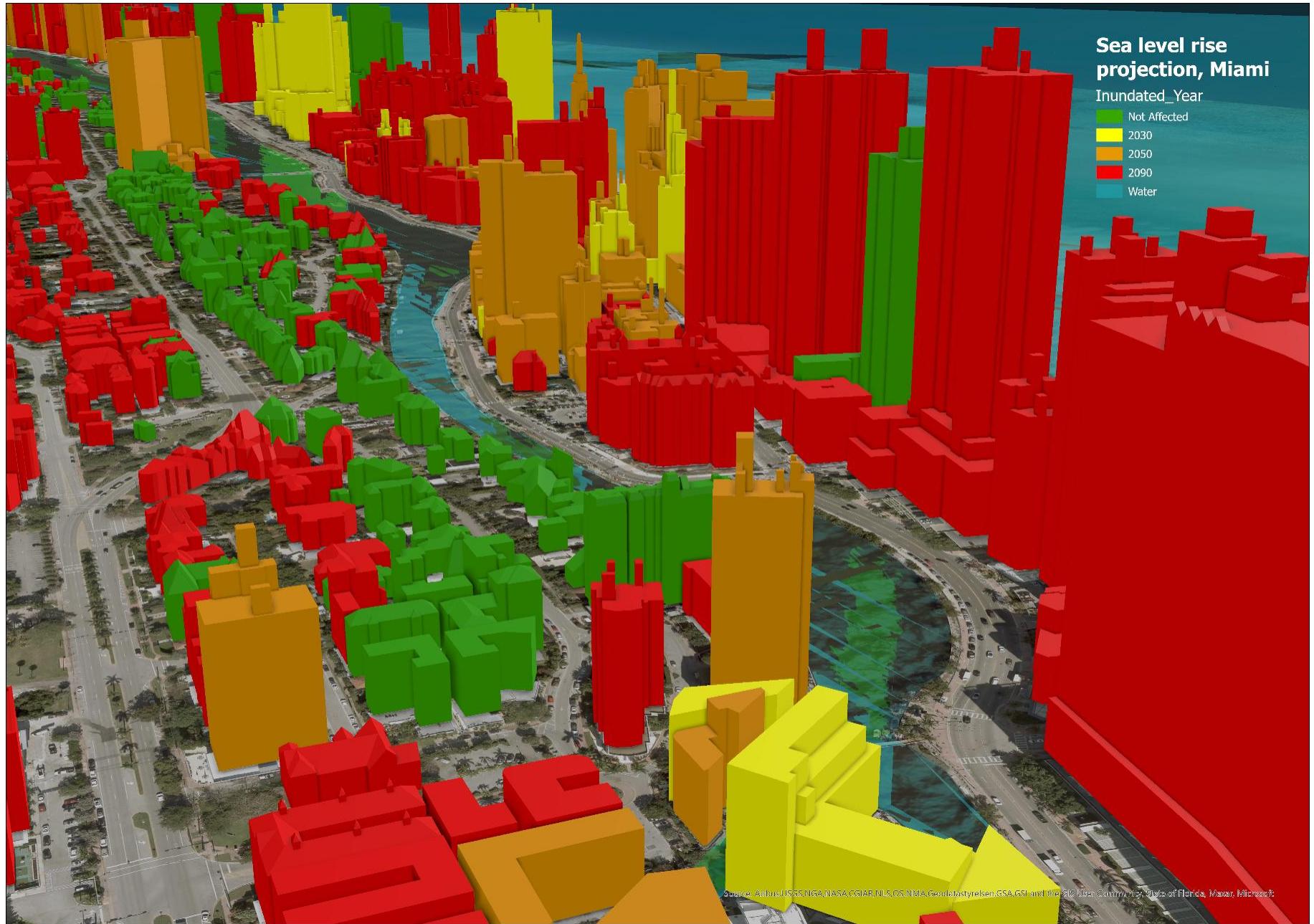
- Acquired elevation and land cover data from Esri Living Atlas and NOAA
- Classified buildings by predicted year of inundation using time-enabled attributes
- Applied color-coded symbology (green: not affected; yellow: 2030; orange: 2050; red: 2090)
- Built a 3D scene in ArcGIS Pro and published via ArcGIS Online for public engagement

Key Features:

- 3D building extrusion for realistic spatial context
- Color-coded inundation years for clear stakeholder communication
- Water overlay to visualize permanent inundation zones
- Identification of early-impact neighborhoods for policy prioritization

Outcome & Impact:

- Demonstrated the power of geospatial analysis for climate adaptation planning
- Gained proficiency in time-enabled 3D mapping for hazard communication
- Supported Esri's initiative to equip professionals with actionable climate resilience tools



B. TRANSPORTATION & ROAD SAFETY MAPPING

Note: These projects focused on digitizing and analyzing existing road networks and safety data, not on reviewing or digitizing transportation plan documents or engineering designs.

4. Road Network Digitization & Validation – Liberia

Partner: Liberia Institute of Statistics and Geo-Information Services (LISGIS)

Status: Personal Contribution Completed | Final Visualization Pending (LISGIS-led)

Summary:

As part of a national infrastructure initiative, I completed the digitization and validation of Liberia's road network using LISGIS systems. My role involved integrating field-collected GPS data and satellite imagery, as well as standardizing road attributes (e.g., class, condition, and accessibility). The cleaned shapefiles were successfully delivered and incorporated into LISGIS's national GIS database. Final map products and visualizations are pending completion and release by LISGIS.

5. Traffic Accident Hotspot Mapping – Greater Monrovia

Partner: Liberia National Police – Traffic Division

Status: Ongoing (Student-Supervised Field Data Collection)

Summary:

Designed and supervised a project to analyze police-reported crash data and identify traffic accident hotspots using ArcGIS Pro. The analytical framework includes point density analysis, kernel heatmap generation, and temporal mapping. While data visualization is in progress, the methodology has been established to support future road safety interventions.

C. CLIMATE CHANGE & VECTOR ECOLOGY

6. Modeling the Potential Distribution of Malaria Vectors Under Climate Change Scenarios – Nigeria

M.Sc. Project / Federal University of Technology Akure (FUTA) & ARCSSTE-E / 2017

Tools: MaxEnt, ArcGIS Desktop, Bioclimatic Modeling

Overview:

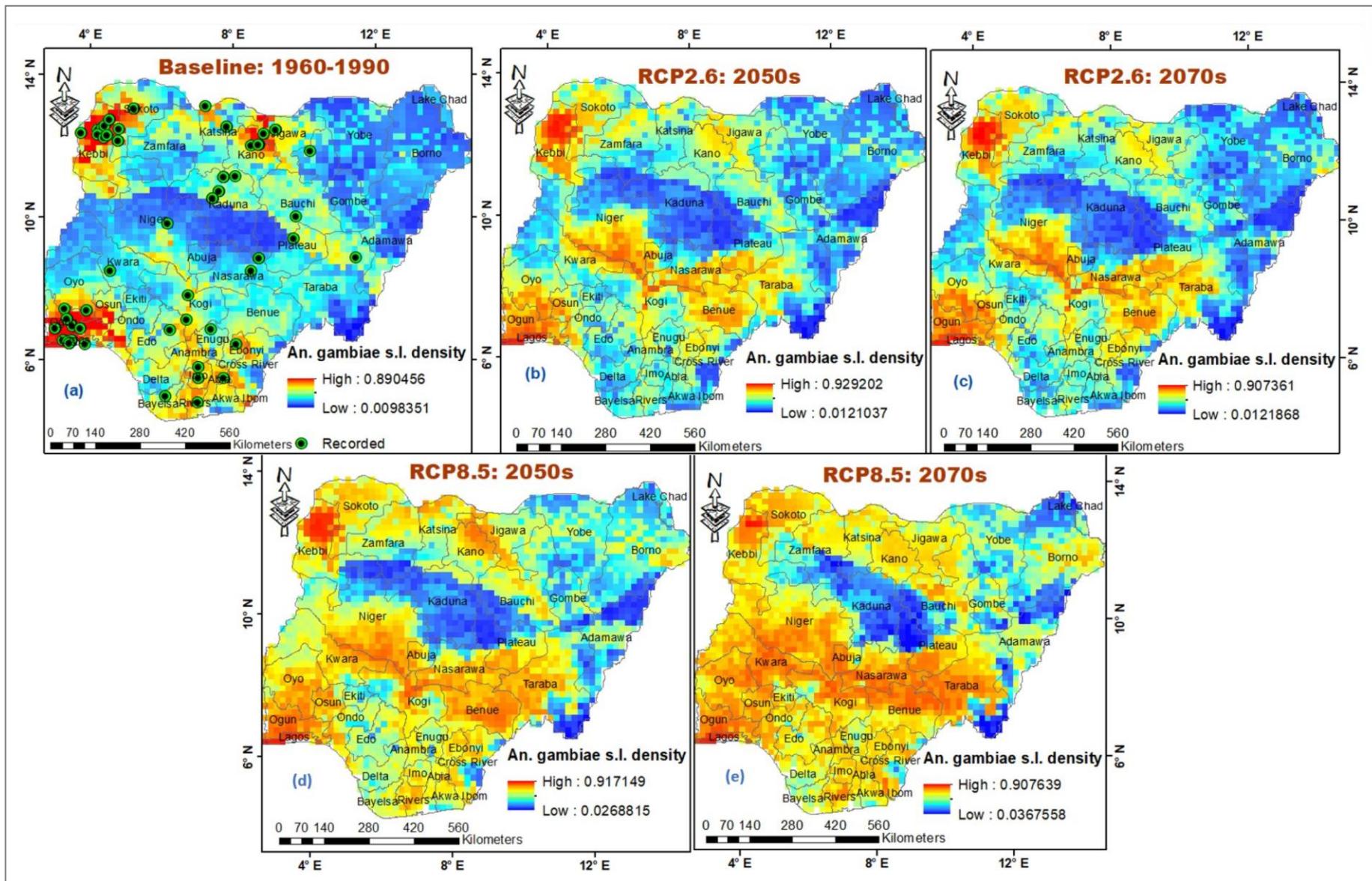
Led a spatial modeling project to assess how climate change may alter the habitat suitability of dominant *Anopheles* mosquito species—malaria vectors—in Nigeria. Integrated bioclimatic, land use, and elevation data with MaxEnt to predict current and future distributions under IPCC RCP2.6 and RCP8.5 scenarios.

Key Contributions:

- Modeled distributions of eight *Anopheles* species for mid- and late-century climate scenarios.
- Combined 19 bioclimatic variables with land use and terrain data for robust habitat predictions.
- Applied zonal statistics, reclassification, and overlay analysis in ArcGIS to identify shifting risk zones.
- Used Jackknife tests to determine environmental drivers of species distribution.
- Shared findings with Nigeria Centre for Disease Control (NCDC) to inform public health planning.
- Lead author of a peer-reviewed [PLOS ONE article](#), providing actionable insights for malaria surveillance and control.

Impact:

- Identified significant projected shifts in *Anopheles gambiae* s.l. density and range under climate change, with higher risk predicted for northern savannas and southern forests in high-emission scenarios.
- Outputs support evidence-based malaria control strategies and climate-adaptive health planning in Nigeria.



D.SPATIAL EPIDEMIOLOGY & SURVEILLANCE

7. COVID-19 Reinfection Mapping – Liberia (2020–2021)

Geospatial Investigation of COVID-19 Reinfection Patterns and Cluster Environments

Client/Partners: Liberia Ministry of Health, AFENET, CDC, WHO

Role: GIS & Data Analyst, COVID-19 Surveillance Mapping Team

Tools: ArcGIS Pro 2.8.2 (Global/Local Moran's I, Hot Spot Analysis)

Publication: [COVID-19 reinfection in Liberia: Implication for improving disease surveillance, PLOS ONE \(2022\)](#)

Project Summary:

Led spatial analysis of COVID-19 reinfection patterns across Liberia during the third wave, supporting national surveillance and response planning.

Key Contributions:

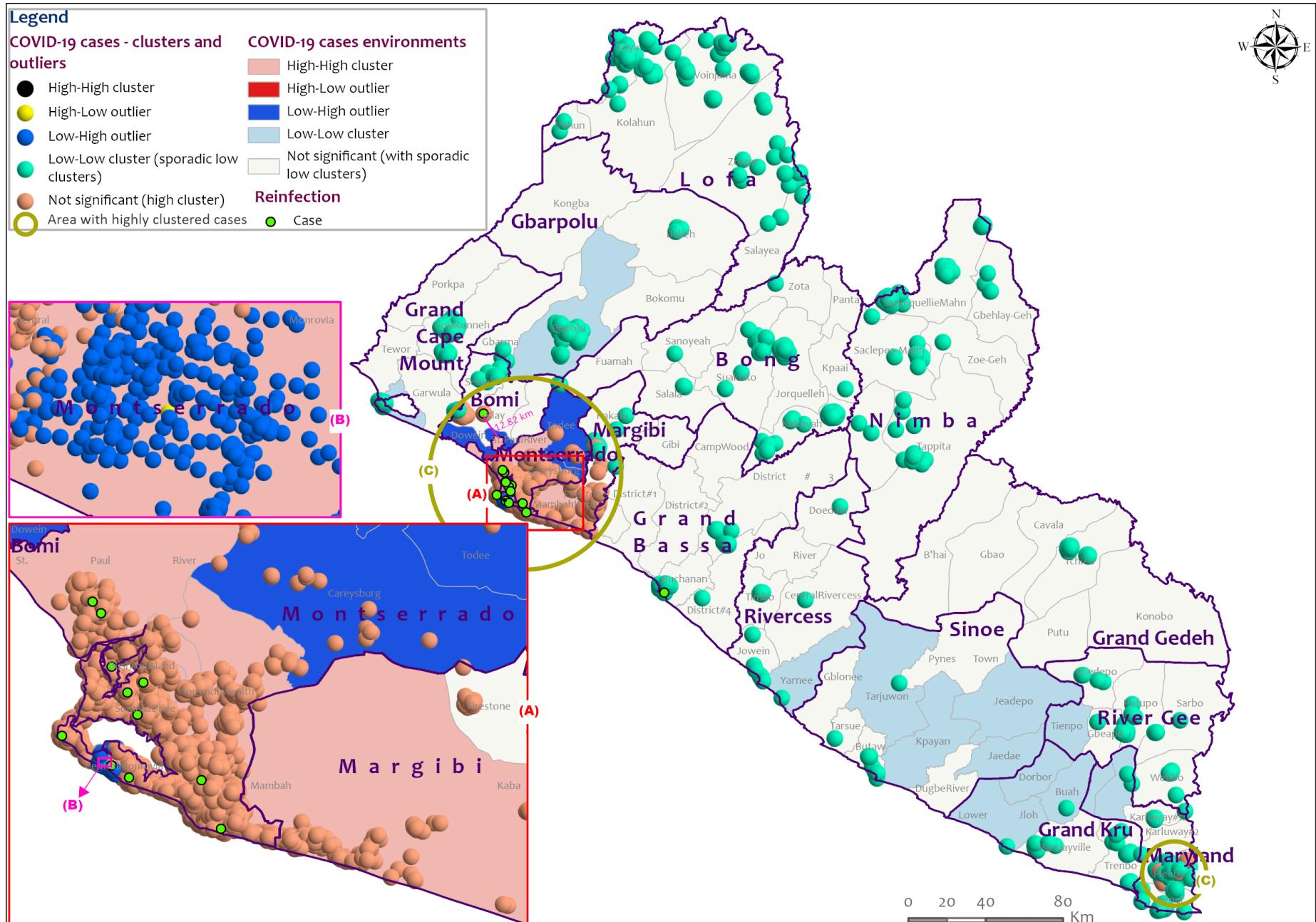
- **Reinfection Mapping:** Developed custom identifiers for case mapping; applied WHO case definitions for reinfection.
- **Cluster & Outlier Detection:** Used Global Moran's I and Anselin Local Moran's I to identify statistically significant clusters and outliers at county, district, and case levels.
- **Spatial Analysis:** Employed inverse distance weighting and 999 permutations for robust spatial autocorrelation testing.
- **Visualization:** Created maps categorizing environments (high-high clusters, low-high outliers); visualized reinfection sites using 3D symbology for magnitude and clarity.

Key Findings:

- 84.6% of reinfection cases occurred in Montserrado; significant clustering detected ($z = 7.33, p < 0.001$).
- High-transmission communities (Logan Town, Clara Town, New Kru Town) were epicenters for reinfection.
- District-level analysis confirmed non-random spatial clustering, informing targeted interventions.

Impact:

- Outputs guided Liberia MoH and NPHIL in resource allocation, contact tracing, and risk communication during the pandemic's third wave.
- Contributed to the first geospatial publication on COVID-19 reinfection in Liberia, supporting ongoing public health surveillance and research.



8. Temporal Comparison of COVID-19 Case Statuses in Montserrado County, Liberia (2021–2023)

Distribution of COVID-19 Cases in Montserrado Communities

Client/Partners: Liberia Ministry of Health, NPHIL, AFENET, CDC, WHO

Role: GIS & Data Specialist, COVID-19 Surveillance Mapping Team

Tools: ArcGIS Pro | Data: National Public Health Institute of Liberia (NPHIL)

Summary:

Developed a three-part GIS map series to visualize the progression of COVID-19 case statuses across Montserrado County communities at three critical timestamps: June 29, 2021; July 27, 2022; and February 19, 2023. The project supported outbreak monitoring, public health communication, and resource allocation during and after the pandemic's third wave.

Objectives:

- Enhance situational awareness for COVID-19 surveillance and response
- Support public health communication with clear, time-series visualizations
- Track spatial disparities and reinfection trends at the community level

Technical Highlights:

- Disaggregated case data by status: New, Active, Recovered, Deaths, Reinfections
- Applied spatial clustering, case density mapping, and zoom panels for urban analysis
- Developed custom symbology for intuitive community-level interpretation

Key Findings:

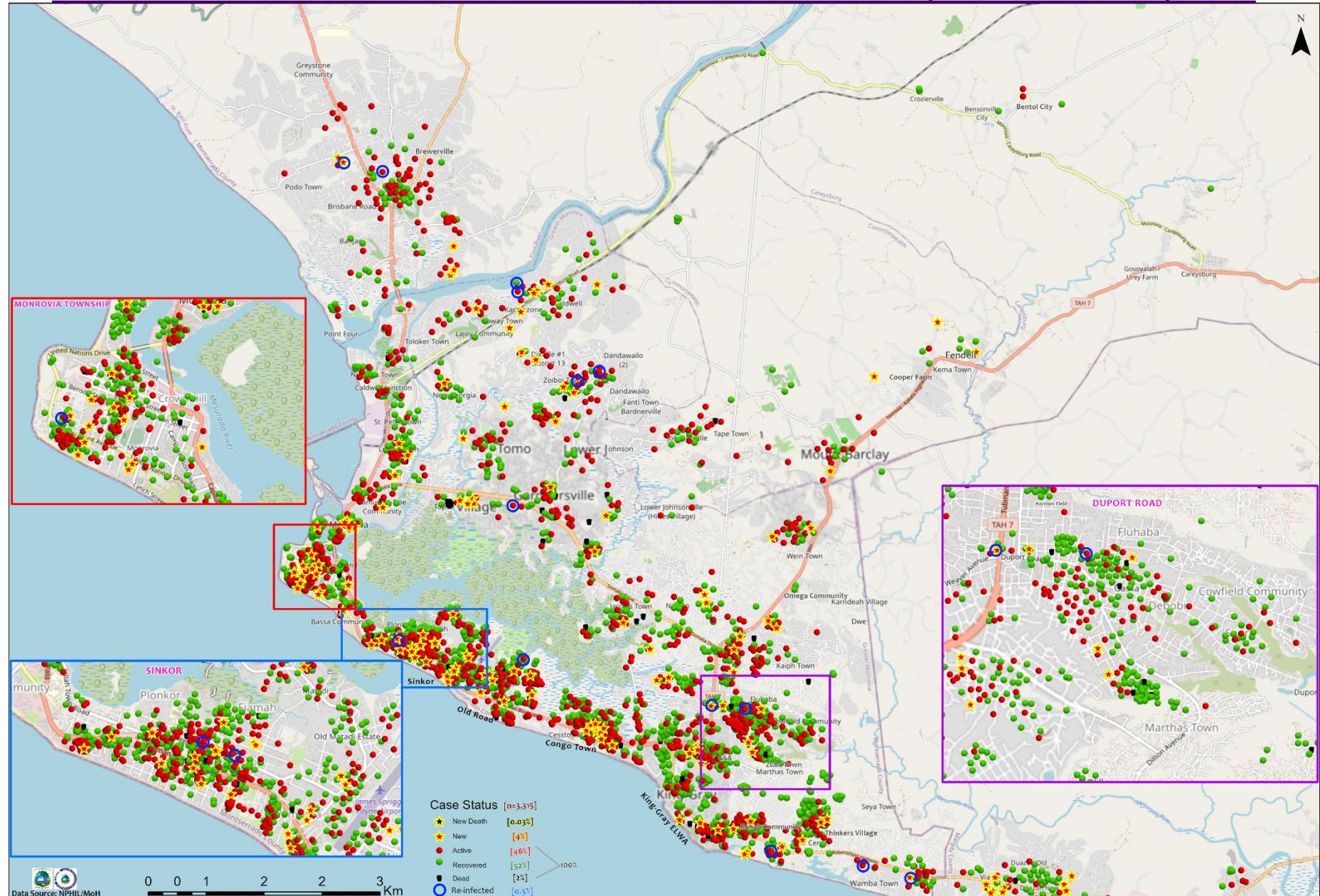
- **June 2021:** Intense outbreak phase with widespread active cases, reinfections, and deaths in densely populated areas (e.g., Sinkor, Paynesville, Monrovia Township).
- **July 2022:** Marked shift toward recovered cases, indicating intervention effectiveness and reduced transmission.
- **February 2023:** Significant decline in new, active, and fatal cases; recovered cases predominate, and cluster density is much reduced.

Impact:

- Maps and analytics were used in national situation reports, guiding targeted interventions and resource deployment.
- Time-series design provided actionable insights for epidemic preparedness and future response planning.

(June 2021)

Distribution of COVID-19 Cases in Montserrado Communities, Liberia June 29, 2021

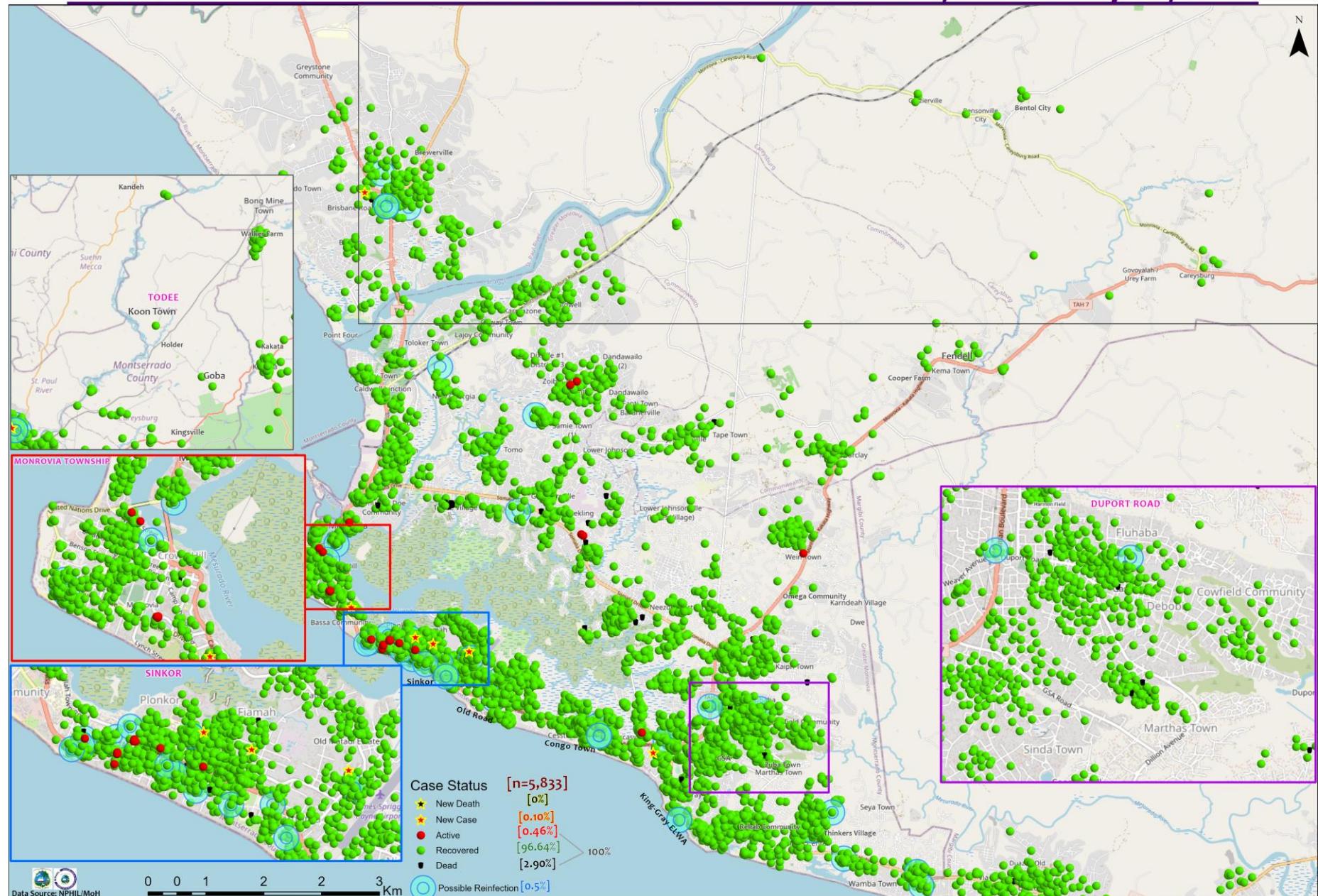


Data Source: NPHL/MoH

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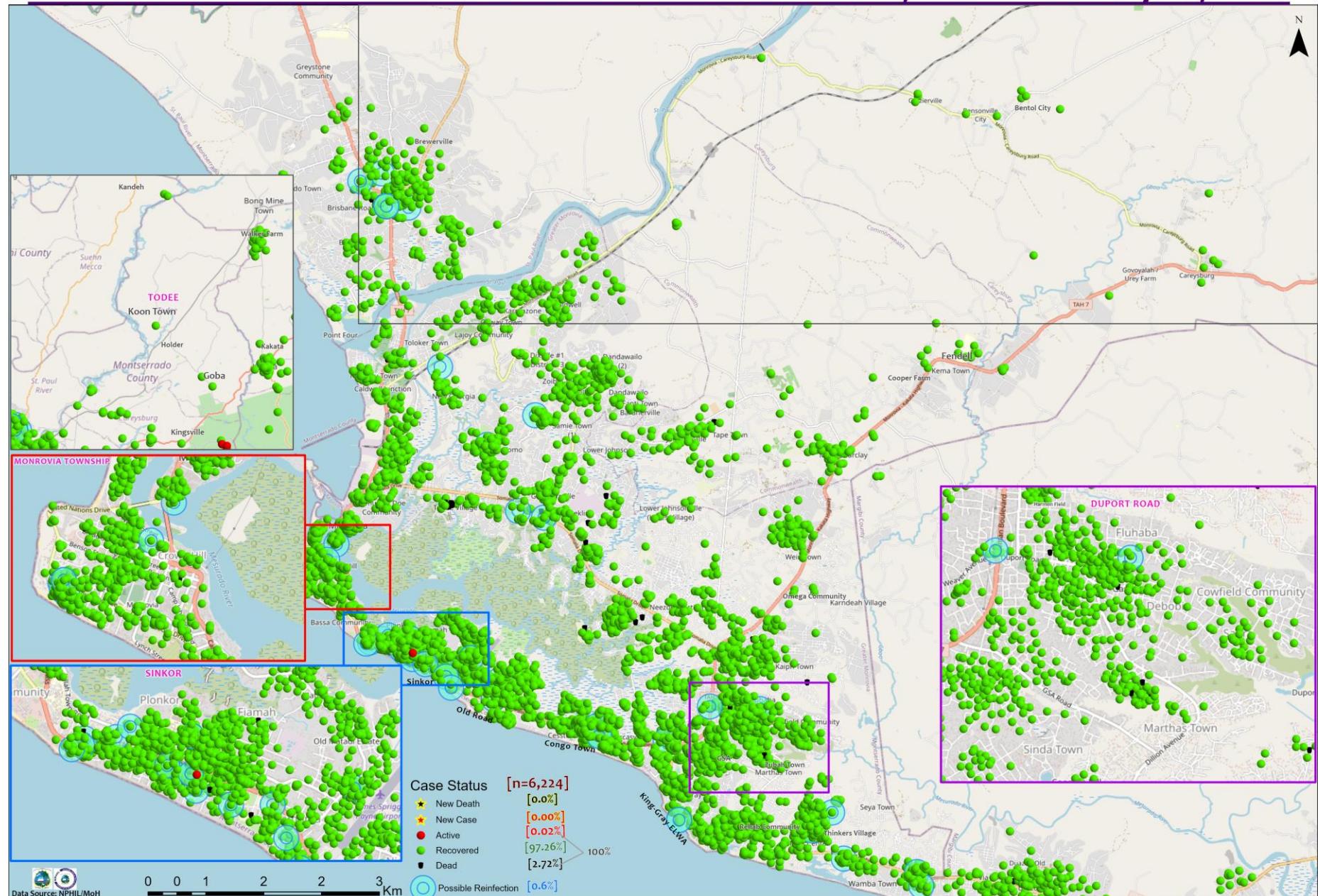
(July 2022)

Distribution of COVID-19 Cases in Montserrado Communities, Liberia July 27, 2022



(February 2023)

Distribution of COVID-19 Cases in Montserrado Communities, Liberia February 19, 2023



9. Measles Case Incidence by County and District – Liberia (2022)

Spatiotemporal Analysis of Measles Cases by District

Client/Partners: Liberia Ministry of Health, NPHIL, AFENET (CDC-funded)

Role: GIS Analyst / Cartographer

Tools: ArcGIS Pro, Microsoft Excel, WHO Epi Week Calendar

Publication: [Descriptive Analysis of Measles Outbreak in Liberia, 2022](#). *International Journal of Infectious Diseases: Regions*

Overview:

Developed a 9-frame time-series map series to visualize weekly measles case progression across Liberia's districts from Epi Week 1 to 51, 2022. The project supported outbreak monitoring, resource targeting, and public health communication during a nationwide epidemic that affected all counties.

Key Contributions:

- Collected and processed weekly surveillance data from national datasets
- Joined tabular case data to district shapefiles for spatial analysis
- Performed choropleth classification to visualize case volume and spread
- Designed multi-panel layouts with inset maps for high-density zones (e.g., Montserrado)
- Applied color gradients and boundary overlays for clear interpretation

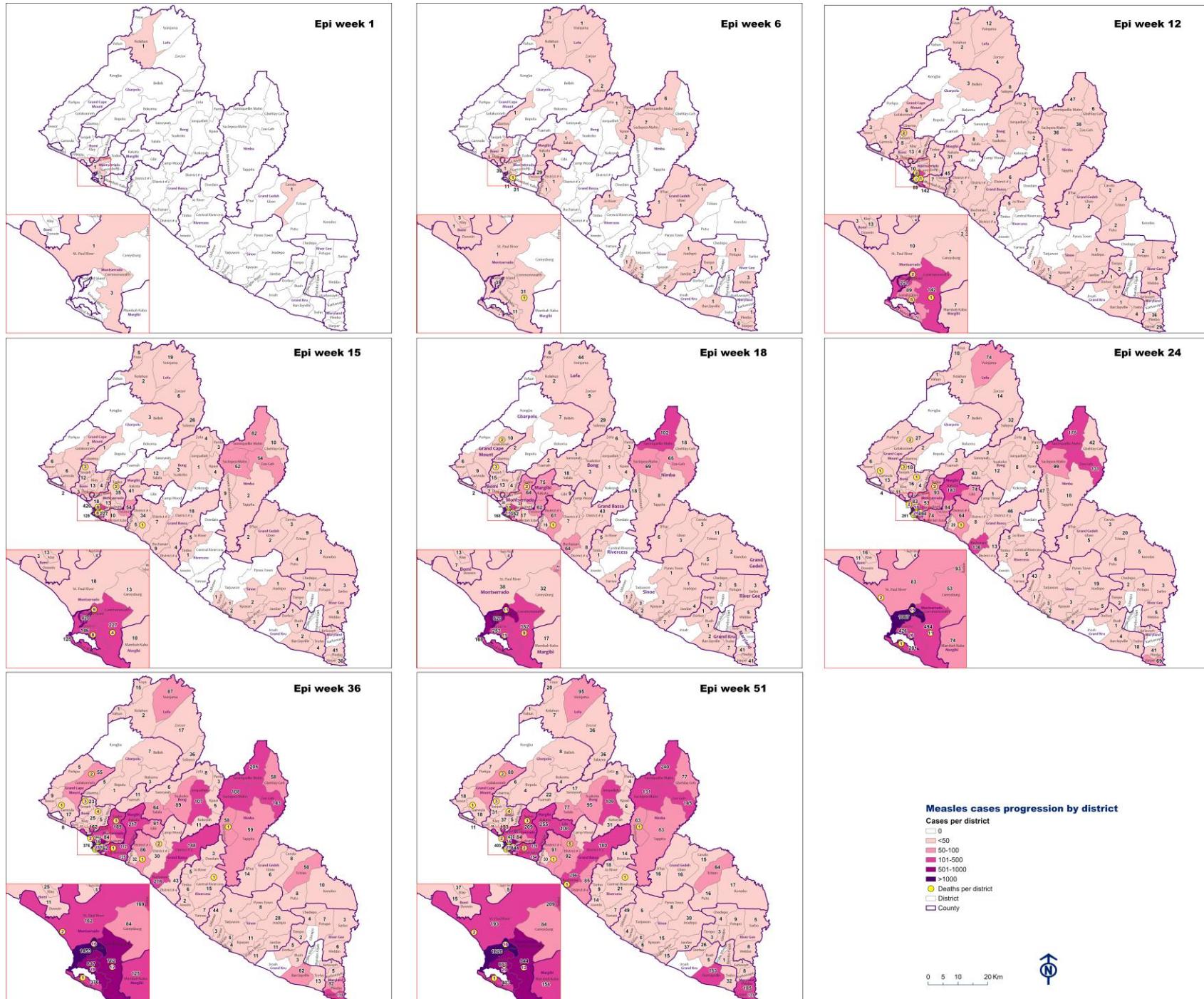
Key Findings:

- Over 8,100 measles cases and 84 deaths reported; all but 3 of 92 districts affected
- Highest burden in children under five; median age 4 years
- Case fatality rate ranged from 0–10.6% across districts
- Outbreak linked to suboptimal vaccination coverage and COVID-19 disruptions
- Maps revealed temporal and spatial hotspots, guiding targeted vaccination and response

Impact:

- Enhanced situational awareness for MoH, WHO, UNICEF, and surveillance teams
- Informed resource deployment, early warning in neighboring districts, and evaluation of intervention timing
- Supported the first comprehensive, district-level geospatial analysis of a national measles outbreak in Liberia

For enhanced usability, the map is also attached separately in the [GIS Portfolio](#) folder, allowing viewers to zoom in for a more detailed examination.



10. Spatial Distribution of AFI Patients Positive for SARS-CoV-2 – Monrovia, Liberia

COVID-19 Surveillance Mapping for Acute Febrile Illness (AFI) Study

Client/Partners: AFENET Liberia, NPHIL, CDC, Ministry of Health

Role: GIS Analyst

Tools: ArcGIS Pro

Date: December 2021

Overview:

Produced a detailed map visualizing the spatial distribution of acute febrile illness (AFI) patients who tested positive for SARS-CoV-2 in Monrovia.

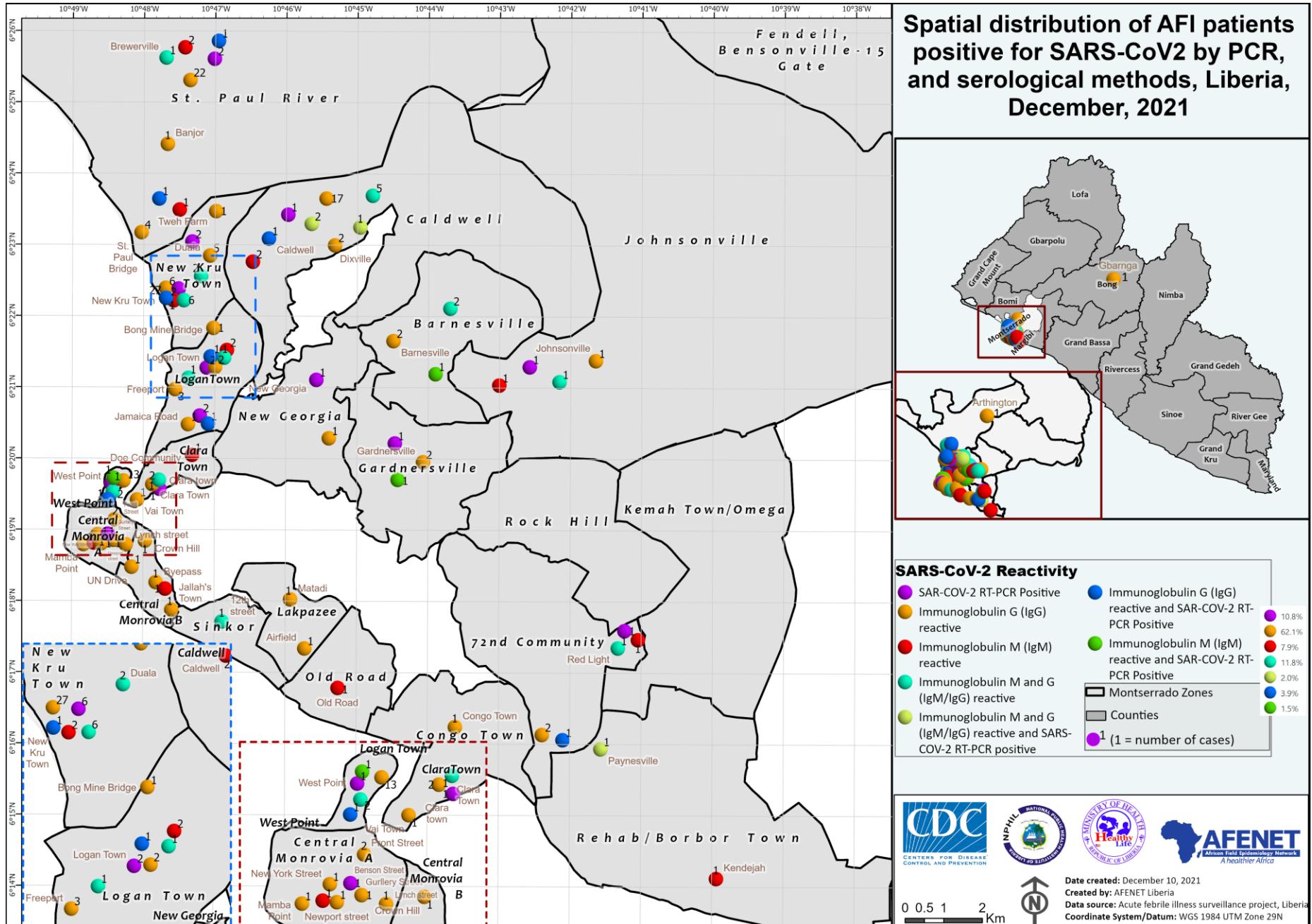
Supported epidemiological understanding of COVID-19 circulation in densely populated urban communities, informing targeted interventions.

Key Features & Methodology:

- **Multi-Class Thematic Symbology:** Visualized seven diagnostic result types using color-coded pie symbols (PCR, IgG, IgM, etc.).
- **Point Density Representation:** Labeled symbols by patient count to highlight clustering in hotspots (e.g., West Point, Clara Town, Logan Town).
- **Inset & Contextual Maps:** Included focused inset of Greater Monrovia with administrative boundaries for spatial context.
- **Legend & Map Elements:** Provided a detailed legend for diagnostic combinations; included compass, scale bar, and overlays for analytical clarity.
- **GIS Tasks:**
 - Processed and validated patient location and test result data
 - Performed spatial joins to associate cases with community zones
 - Designed multi-variable symbology and constructed high-resolution maps for epidemiological reporting

Impact:

- Enabled national and international epidemiologists to identify COVID-19 exposure patterns in high-density urban areas.
- Supported data-driven targeting of surveillance, testing, and health messaging during a critical phase of Liberia's pandemic response.



E. HEALTH SYSTEMS & EMERGENCY PREPAREDNESS

VISUALIZATIONS

11. Mapping the FETP Footprint Across Africa: 2023 Overview

Continental Visualization of Field Epidemiology Training Program (FETP) Implementation

Client/Partner: AFENET Headquarters – Africa Field Epidemiology Network

Role: GIS & Data Visualization Specialist

Tools: ArcGIS Pro

Date: March 2023

Overview:

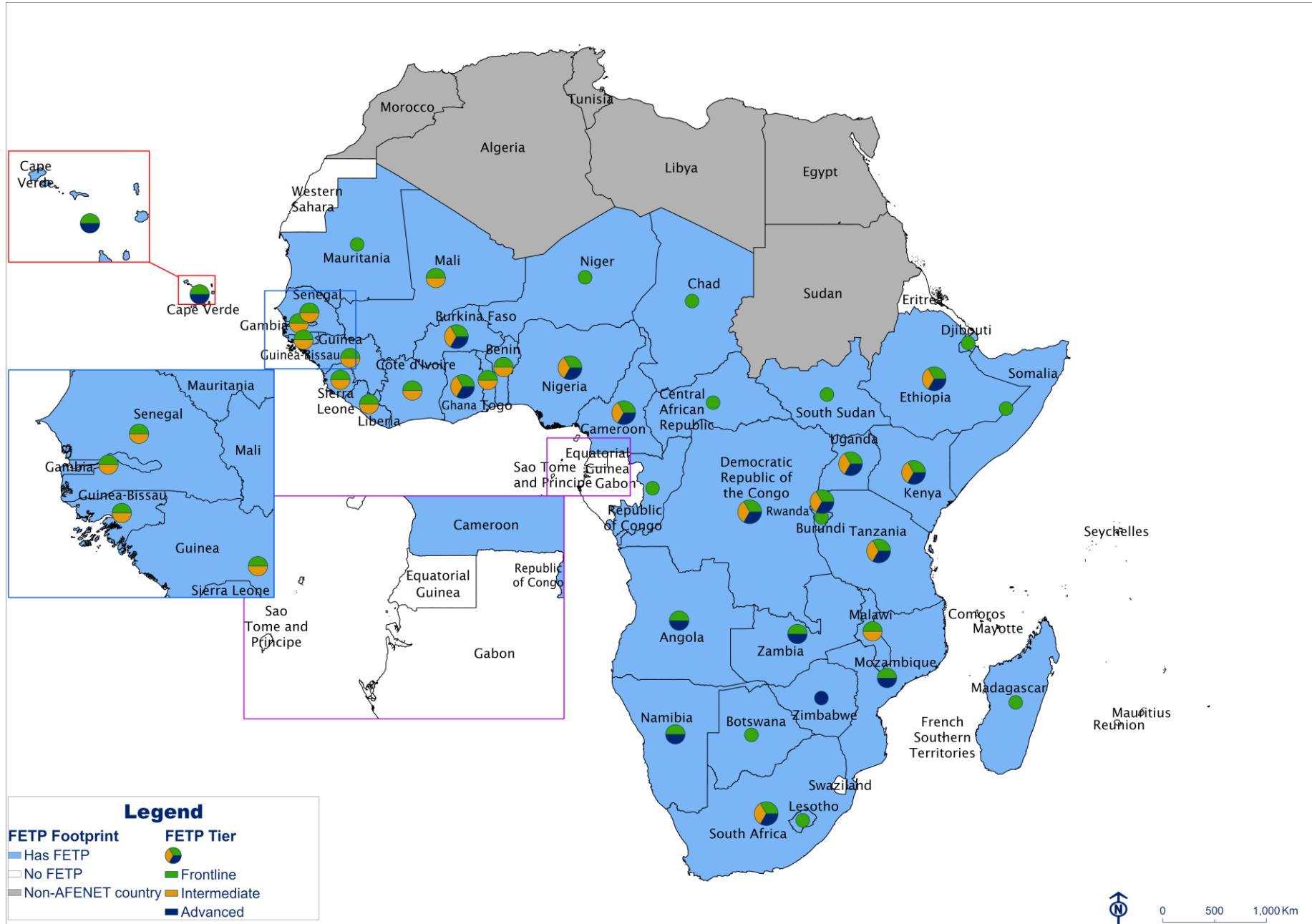
Developed a thematic map providing a continental overview of Field Epidemiology Training Program (FETP) implementation across Africa, distinguishing the presence and tier levels of FETPs in over 40 countries. The visualization supports donor engagement, program planning, and regional capacity assessments for public health workforce development.

Key Features & Methodology:

- **Country Coverage:** Color-coded countries by FETP presence; blue for active programs, grey for no program.
- **Tiered FETP Levels:** Pie chart symbology represents the proportion of Frontline, Intermediate, and Advanced FETP tiers per country.
- **Regional Insets:** Highlighted clusters in West/Central Africa and island nations for detailed visibility.
- **Cartographic Elements:** Included scale bar, north arrow, and clear legend for ease of interpretation.
- **GIS Tasks:**
 - Extracted and cleaned FETP site data across AFENET member countries
 - Joined program data to political boundaries
 - Designed and styled pie chart symbology for tier distribution
 - Configured dynamic insets for small countries/islands
 - Optimized layout for digital reports and international presentations

Impact:

- Served as a key visual tool for AFENET, Africa CDC, WHO, and international partners to showcase the scale and maturity of public health workforce training in Africa
- Used in stakeholder reports, newsletters, and donor meetings to drive further investment in field epidemiology and health security



12. AFENET Liberia Project Footprint Map (2020–2024)

Project Title: National GIS-Based Visualization of Public Health Interventions in Liberia

Client/Partner: African Field Epidemiology Network (AFENET), Liberia Office

Software Used: ArcGIS Pro

Role: GIS & IT Specialist – Created various thematic and operational maps across multiple projects

Date: March 2020 – July 2024

Description:

Spanning all 15 counties, this national thematic map offers a clear visualization of AFENET's expansive role in Liberia's public health landscape. Developed to centralize and communicate the scope of AFENET-supported initiatives, the map highlights the organization's impact in field epidemiology, disease surveillance, and emergency response—particularly during and after the COVID-19 pandemic. By showcasing the breadth of these interventions, the map serves as a vital tool for both strategic planning and public engagement.

Key Map Features:

- **Multi-Project Visualization:** The map displays over a dozen public health initiatives, including Field Epidemiology Training, Ebola/Marburg preparedness, outbreak investigations, vaccine hesitancy studies, AEFI lab testing, and RCCE activities.
- **Custom Symbology:** Unique vector icons were created for each project type, allowing intuitive spatial interpretation and quick differentiation across health sectors.
- **County-Level Coverage:** Projects were mapped at the county level, ensuring clear visualization of spatial coverage and regional activity.
- **Comprehensive Cartographic Elements:** Includes a detailed legend, administrative boundaries, scale bar, compass rose, and standardized formatting for professional use.

GIS Tasks Performed:

- Collected and cleaned location and programmatic data from AFENET's project databases.
- Conducted geospatial validation, geocoding, and administrative boundary alignment.
- Designed and implemented custom symbology for multi-layered project representation.
- Applied spatial joins and attribute queries to associate health programs with counties.
- Exported high-resolution map layouts for internal reporting, stakeholder presentations, and donor engagement.

Impact:

This map significantly improved stakeholder understanding of AFENET's nationwide interventions, enhancing transparency, inter-agency coordination, and donor visibility. It became a cornerstone visual tool during strategic meetings with the Ministry of Health, NPHIL, WHO, US CDC, LISGIS, and other implementing partners, supporting resource allocation, policy planning, and field response coordination.

AFENET Liberia Project Footprint Map (2020–2024)

National GIS-Based Visualization of Public Health Interventions in Liberia

Client/Partner: African Field Epidemiology Network (AFENET), Liberia Office

Role: GIS & IT Specialist

Tools: ArcGIS Pro

Date: March 2020 – July 2024

Overview:

Developed a national thematic map showcasing AFENET's public health interventions across all 15 counties of Liberia. The map centralizes and visualizes the scope of AFENET-supported initiatives—including field epidemiology training, disease surveillance, outbreak response, and vaccine studies—serving as a strategic tool for planning, coordination, and stakeholder engagement during and after the COVID-19 pandemic.

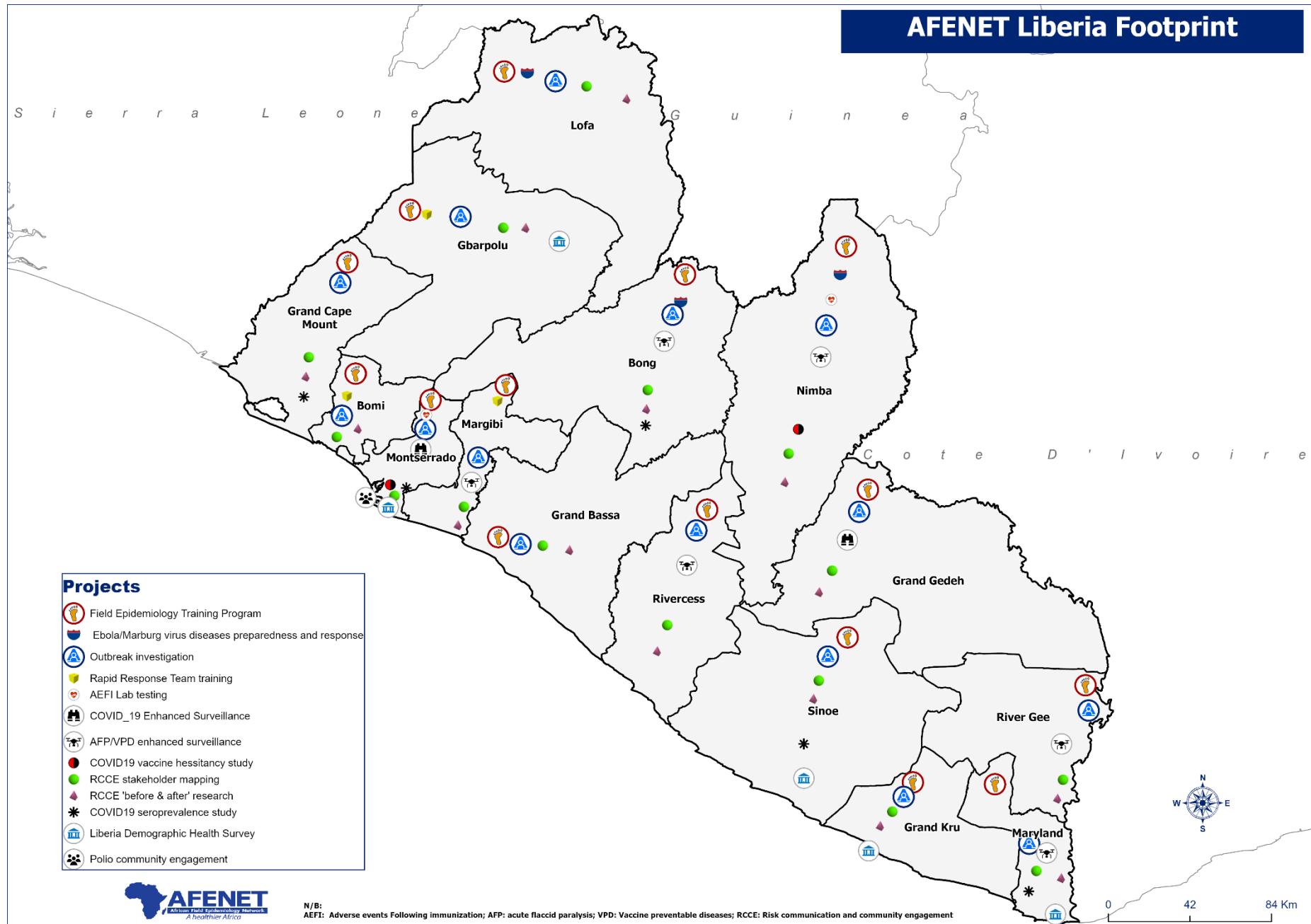
Key Features & Methodology:

- **Multi-Project Visualization:** Mapped over a dozen AFENET-led public health initiatives, including outbreak investigations, vaccine hesitancy studies, AEFI lab testing, and RCCE activities.
- **Custom Symbology:** Designed unique vector icons for each project type, enabling intuitive differentiation and spatial interpretation.
- **County-Level Coverage:** Visualized interventions at the county level for clear assessment of regional activity and reach.
- **Comprehensive Cartography:** Included detailed legend, administrative boundaries, scale bar, compass rose, and standardized formatting for professional presentation.
- **GIS Tasks:**
 - Collected and cleaned project location and program data
 - Performed geospatial validation, geocoding, and administrative alignment
 - Applied spatial joins and attribute queries to link programs with counties
 - Exported high-resolution layouts for internal reports, donor presentations, and public dissemination

Impact:

- Enhanced transparency and coordination among the Ministry of Health, NPHIL, WHO, US CDC, LISGIS, and other partners.
- Supported resource allocation, policy planning, and field response coordination by providing a clear, centralized view of AFENET's nationwide interventions.
- Became a cornerstone visual tool for stakeholder meetings, donor engagement, and strategic public health communications.

AFENET Liberia Footprint



13. One Health RCCE Stakeholder Mapping – Liberia, 2023

National Mapping of One Health Risk Communication and Community Engagement (RCCE) Stakeholders by Implementation Level

Client/Partners: AFENET Liberia, Ministry of Health (MOH), NPHIL, German Cooperation (GIZ)

Role: GIS & Data Manager

Tools: ArcGIS Pro, KoboToolbox

Date: 2023

Overview:

Led the national mapping of One Health RCCE stakeholders across Liberia, categorizing organizations by implementation level (Community, District, County, National). Developed a custom KoboToolbox data collection tool for offline field use and managed data flows remotely, supporting Liberia's multisectoral approach to epidemic preparedness and health system strengthening.

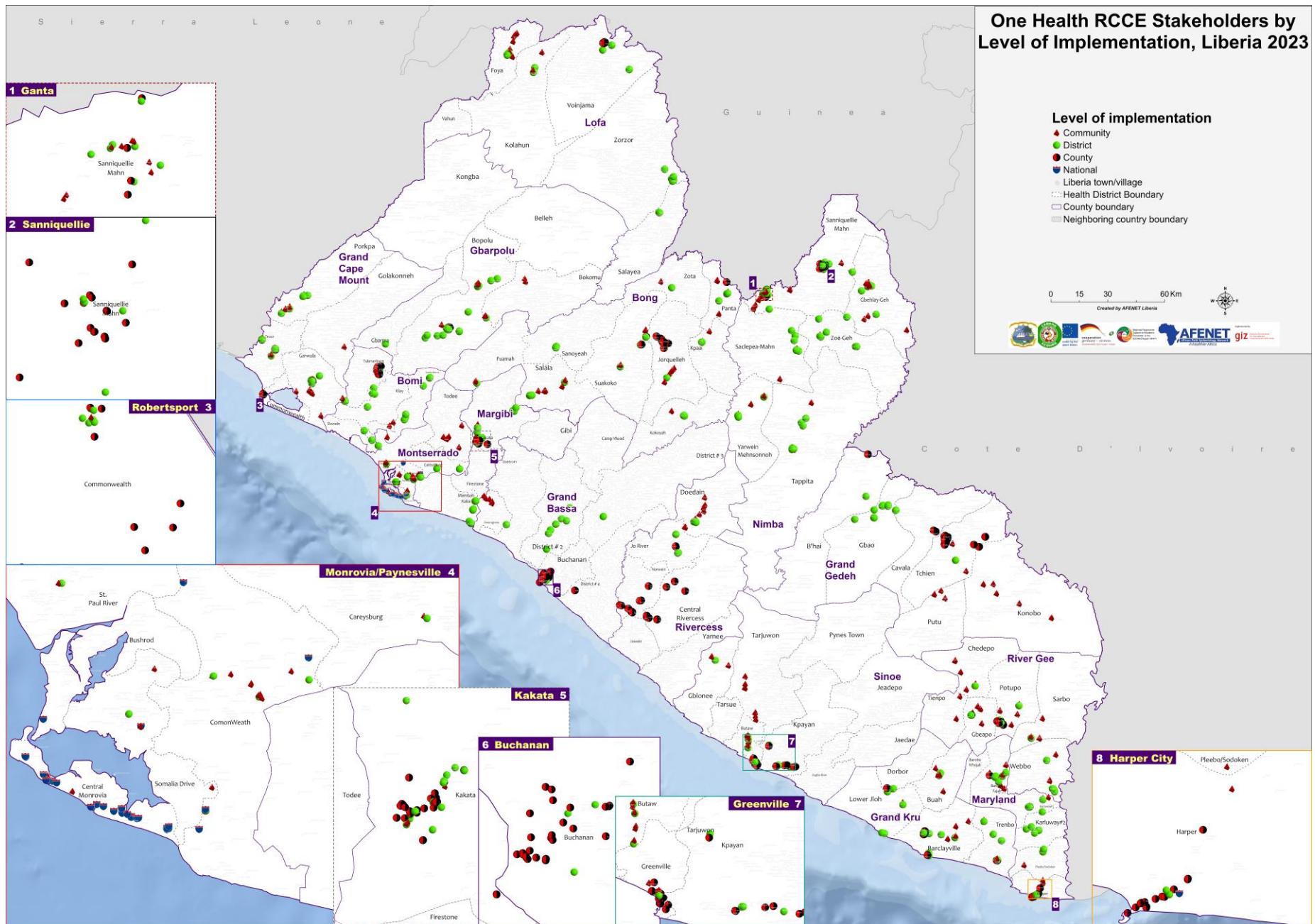
Key Features & Methodology:

- **Stakeholder Visualization:** Mapped RCCE actors using symbol-based categorization (e.g., red diamonds for community, green circles for district, custom icons for county and national levels).
- **Inset Maps:** Highlighted stakeholder density in urban centers (Monrovia, Kakata, Buchanan, etc.).
- **Contextual Layers:** Overlaid administrative and health district boundaries for clarity.
- **GIS Tasks:**
 - Compiled and cleaned stakeholder datasets from field assessments and partner records
 - Geocoded and spatially validated locations
 - Designed custom symbology and created inset maps for hotspot visualization
 - Finalized high-resolution layouts for workshops, coordination meetings, and donor briefings

Impact:

- Provided the RCCE Technical Working Group (TWG) with a strategic decision-support tool for identifying coverage gaps, prioritizing underserved regions, and enhancing coordination during One Health preparedness planning.
- Informed national discussions on capacity building, resource allocation, and multisectoral collaboration at all levels of Liberia's health system.

For enhanced usability, the map is also attached separately in the [GIS Portfolio](#) folder, allowing viewers to zoom in for a more detailed examination.



14. Emergency Preparedness Training Coverage – Liberia (2022)

National Training Coverage Map for Public Health Workforce Development

Client/Partner: National Public Health Institute of Liberia (NPHIL), supported by AFENET Liberia

Role: GIS Specialist / Cartographer

Tools: ArcGIS Pro

Date: January 2022

Overview:

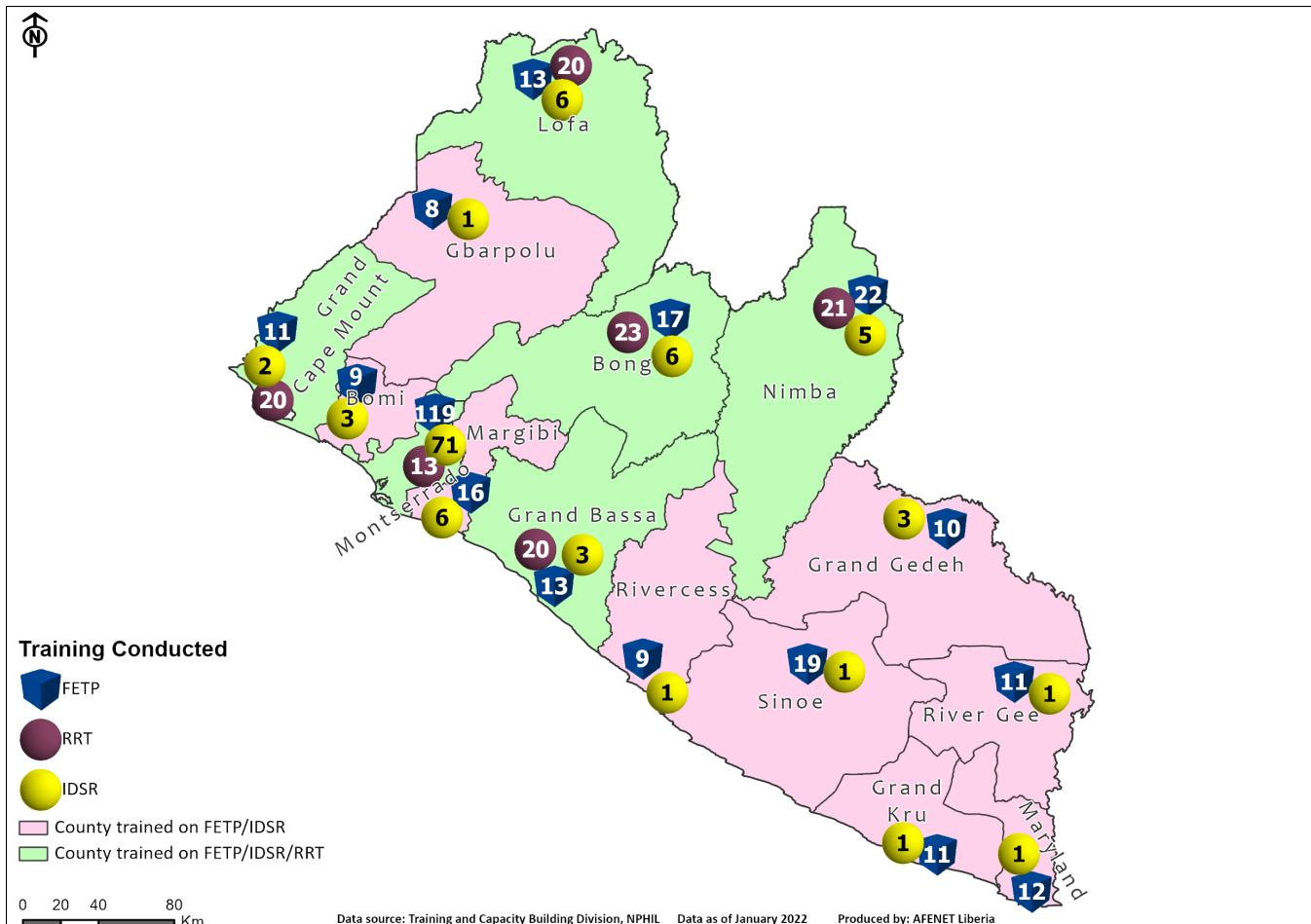
Designed a thematic map visualizing the distribution and frequency of three key public health training programs—Field Epidemiology Training Program (FETP), Integrated Disease Surveillance and Response (IDSR), and Rapid Response Teams (RRT)—across Liberia’s 15 counties. The map illustrates national efforts to strengthen epidemic intelligence, rapid response, and workforce capacity at the sub-national level.

Key Features & Methodology:

- **Bubble Chart Overlay:** Used colored, size-scaled bubbles to represent the number of FETP (blue), RRT (purple), and IDSR (yellow) trainees per county.
- **Color-Coded Counties:** Differentiated counties with full vs. partial training coverage for quick visual assessment.
- **Cartographic Elements:** Included a clear legend, scale bar, north arrow, and accessible symbology for professional use.
- **GIS Tasks:**
 - Merged and cleaned trainee data from multiple Excel sources
 - Joined training counts to county shapefiles using unique identifiers
 - Designed multi-symbol map symbology with proportional bubble scaling
 - Coordinated quality assurance with NPHIL’s training division
 - Exported high-resolution layouts for presentations, planning, and donor reporting

Impact:

- Provided decision-makers and international partners with a quick reference to identify counties with limited or no training coverage.
- Supported progress tracking toward national workforce development goals and informed resource allocation for future training cycles.
- Enhanced transparency and planning for Liberia’s ongoing emergency preparedness and health system strengthening efforts.



15. Cross-Border Surveillance Mapping of Marburg and Ebola Virus Diseases in Liberia

Mapping Spatial Risk of Cross-Border Hemorrhagic Fever Threats (Guinea–Liberia)

Client/Partners: AFENET Liberia, NPHIL, Ministry of Health, US CDC

Role: GIS & IT Specialist

Tools: ArcGIS Pro

Date: February 2021

Overview:

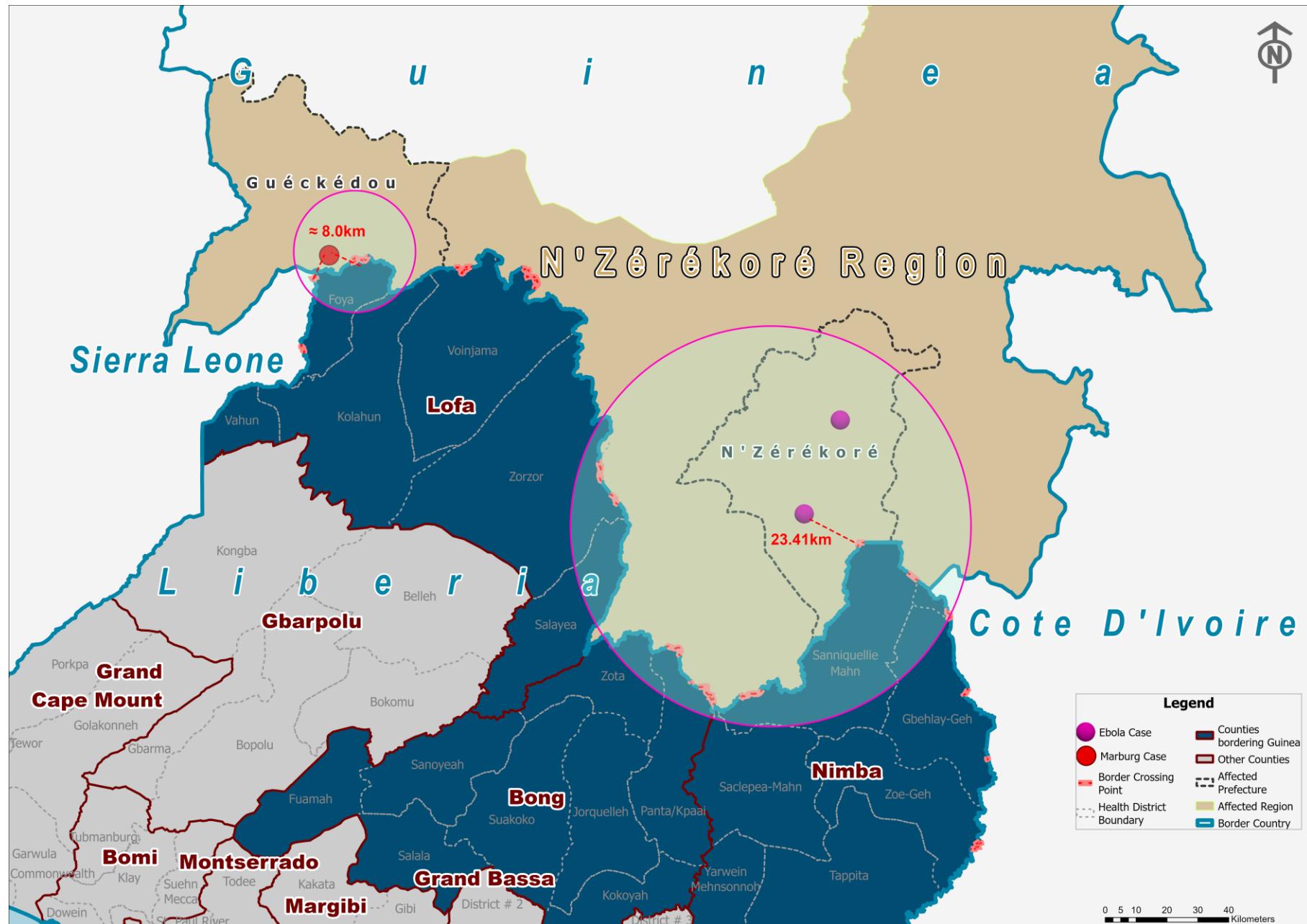
Developed risk visualization maps to support cross-border preparedness and surveillance coordination for Ebola and Marburg virus disease (MVD) threats along the Guinea–Liberia border. The project mapped the proximity of confirmed cases in Guinea to Liberian counties, enabling rapid situational awareness and response planning.

Key Features & Methodology:

- **Incident Mapping:** Marked Ebola and Marburg case sites with distinct symbology; visualized proximity rings (e.g., 8 km, 23.4 km) to illustrate transmission risk to Liberia.
- **Administrative & Health Layers:** Incorporated health district boundaries, county borders, and key crossing points for comprehensive spatial context.
- **Color Coding & Legends:** Differentiated affected regions and high-risk zones for quick interpretation by field teams and policymakers.
- **GIS Tasks:**
 - Mapped case data using coordinates and field reports
 - Applied buffer analysis to calculate distances to the border
 - Integrated multi-layered administrative and health datasets
 - Designed standardized symbology and prepared high-resolution maps for epidemiological briefings

Impact:

- Provided critical situational awareness for public health authorities and border surveillance teams, facilitating rapid deployment of alert systems and event-based surveillance measures.
- Supported coordinated regional preparedness between Guinea and Liberia, strengthening early detection and response to hemorrhagic fever threats.



F. ESRI VIRTUAL MAP GALLERY (FEATURED SUBMISSIONS)

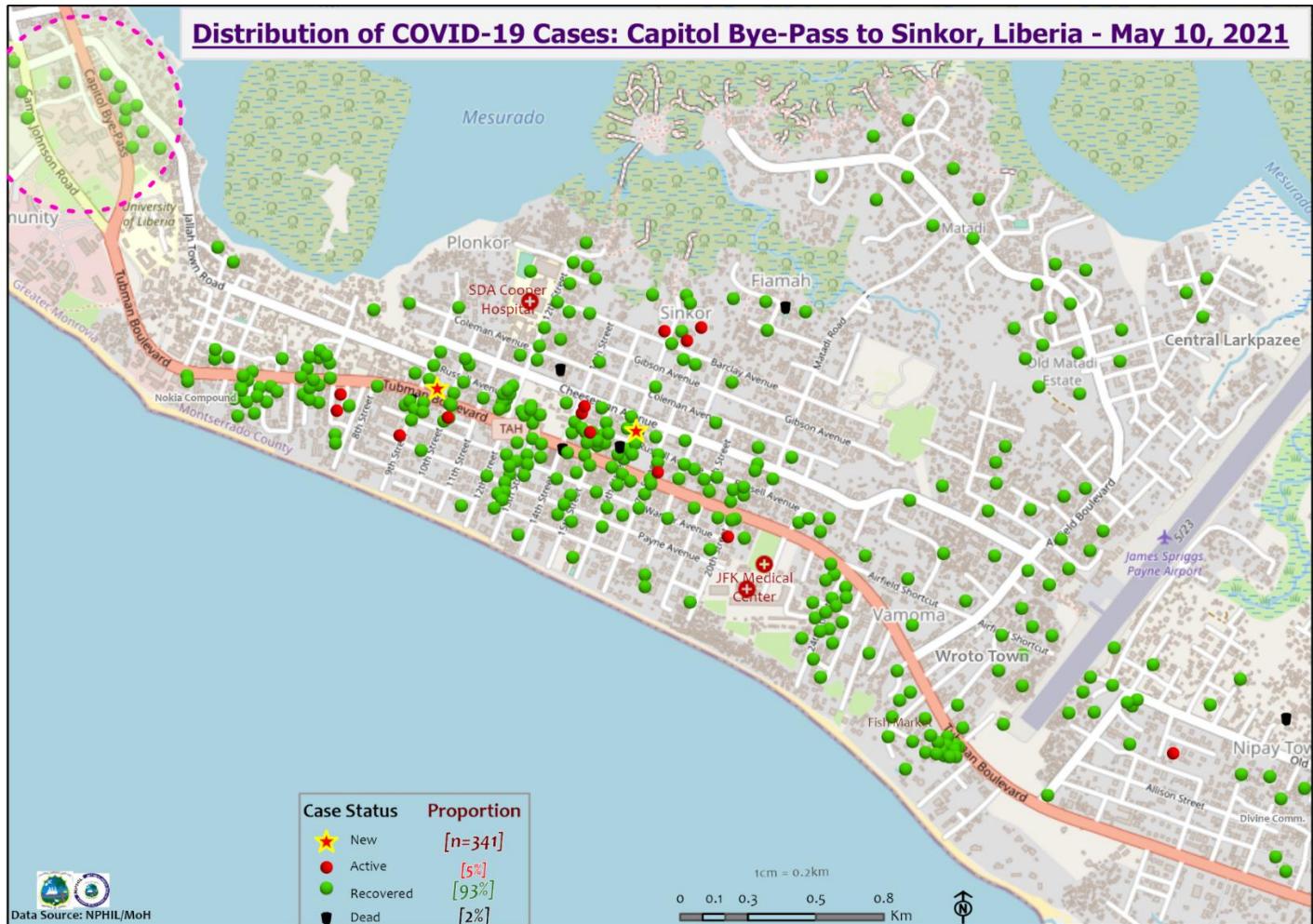
16. COVID-19 Case Distribution in Sinkor, Liberia (May 2021)

Neighborhood-Scale Mapping of Urban Transmission Dynamics

Role: GIS Analyst / Cartographer

Tools: ArcGIS Pro

Data Source: NPHIL / Ministry of Health



Overview:

Produced a high-resolution map visualizing the distribution and status of COVID-19 cases along the Capitol Bye-Pass to Sinkor corridor in Montserrado County, as of May 10, 2021. The map provided a granular view of urban transmission, supporting outbreak monitoring and localized response during Liberia's COVID-19 pandemic.

Key Features & Methodology:

- Case Status Visualization:** Used point symbology and color-coding—green for recovered (93%), red for active (5%), yellow stars for new cases, and black for deaths (2%)—to represent 341 total cases.
- Focus Areas:** Mapped major health facilities (JFK Medical Center, SDA Cooper Hospital) for reference and context.

- **Cartographic Design:** Integrated administrative boundaries, road networks, and facility locations with epidemiological data for clarity and actionable insights.
- **Recognition:** Featured in the 2021 [Esri User Conference Virtual Map Gallery](#) as a model for hyperlocal outbreak monitoring and resource planning.

Impact:

- Supported targeted public health interventions and community-level health messaging in high-density urban neighborhoods.
- Enhanced situational awareness for local health authorities and partners during a critical phase of the pandemic.

17. COVID-19 Distribution by Status - Liberia, 2023

National Mapping and Dashboarding for Pandemic Response

Role: GIS Analyst / Project Supervisor

Tools: ArcGIS Pro

Data Source: National health surveillance data (MoH, NPHIL, WHO)

Overview:

Developed and maintained a high-resolution map illustrating the progression of confirmed, recovered, and active COVID-19 cases across Liberia throughout 2023. The visualization served as an essential decision-support tool for daily national incident management meetings and was featured in the [Esri Virtual Map Gallery](#) during the 2023 Esri User Conference.

Key Features & Methodology:

- **Daily Data Processing:** Received, cleaned, and analyzed daily surveillance submissions for accuracy; manually digitized case locations before system standardization.
- **Status Visualization:** Mapped confirmed, active, and recovered cases using color-coded symbology for clear temporal and spatial tracking.
- **Dashboard Integration:** Supervised the creation and daily update of an [interactive GIS dashboard](#) (managed by WHO, supported by AFENET) for real-time COVID-19 reporting and risk communication.
- **Cartographic Design:** Integrated administrative boundaries, case data, and key health infrastructure for actionable insights.

Impact:

- Provided national authorities and partners with up-to-date situational awareness for public health planning, resource allocation, and risk communication.
- Enhanced Liberia's pandemic response by supporting evidence-based interventions and transparent reporting at both national and county levels.
- Recognized internationally through selection for the Esri Virtual Map Gallery, highlighting the role of GIS in epidemic management.

Percent Distribution of COVID-19 Cases by Status in Liberia - February 19, 2023



Total Cases: 8,090

Affected Counties	Cumulative Cases
Montserrado	6,224
Maryland	362
Nimba	346
Margibi	337
Bong	171
Lofa	165
Grand Bassa	110
River Gee	69
Bomi	65
Grand Gedeh	63
Gbarpolu	62
Grand Cape Mount	61
Grand Kru	26
Rivercess	16
Sinoe	13

Legend

- Case Status**
- Active [<1%]
 - Recovered [96.2%]
 - Dead [3.6%]

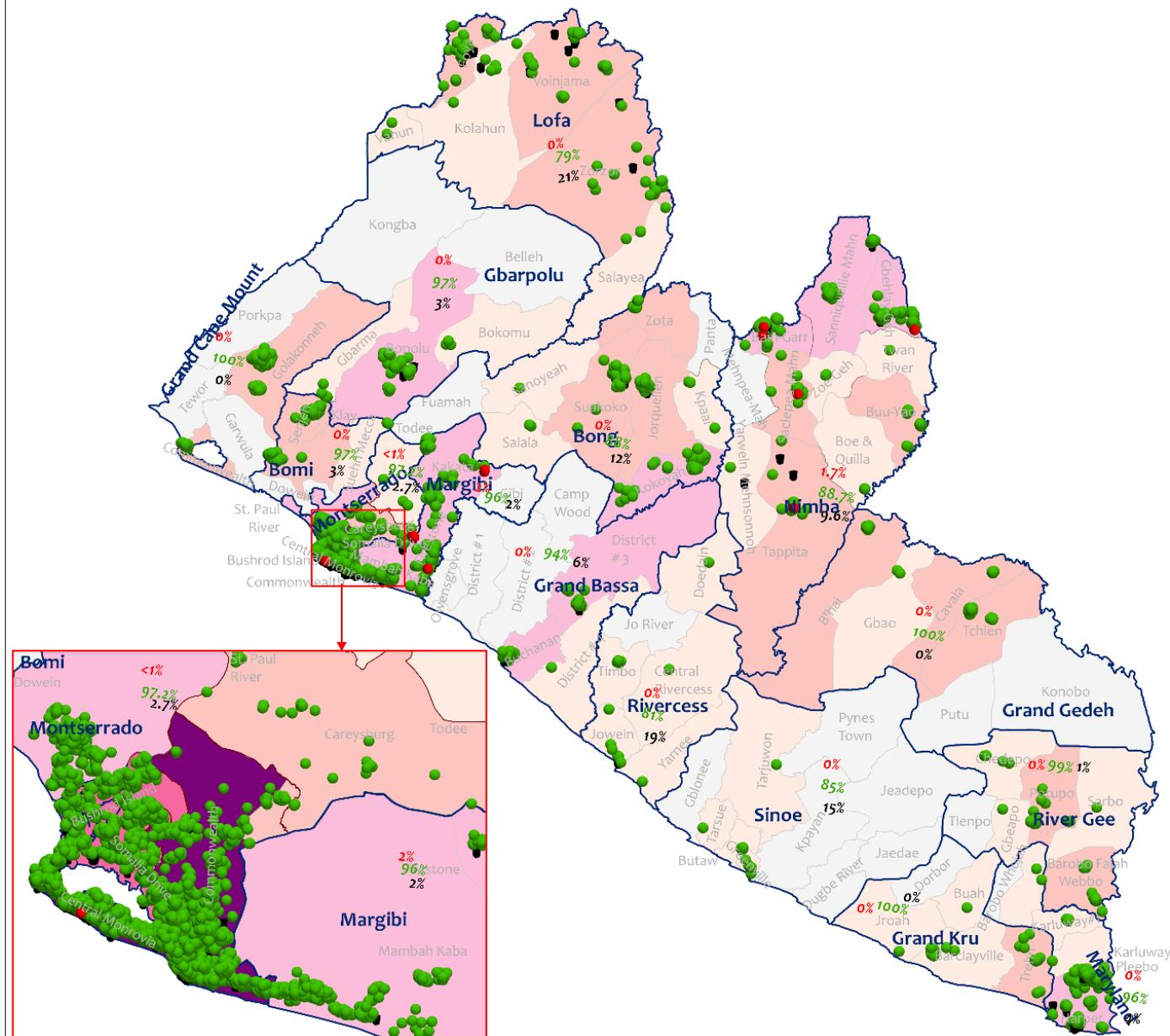
Cases per district

0
1-10
11-50
51-500
501-1000
1001-1500
1501-2500



Data Source: NPHIL/MoH

0 45 90 Km



Key Skills & Tools

GIS & Spatial Analysis

- **Software:** ArcGIS Pro, ArcGIS Online, ArcGIS Desktop, QGIS
- **Expertise:** Cartography, spatial analysis, 3D mapping, geostatistics, terrain modeling, suitability modeling (fuzzy overlay, reclassification, proximity analysis)
- **Applications:** Public health mapping, climate risk analysis, land suitability, infrastructure planning, environmental monitoring

Remote Sensing & Earth Observation

- **Tools:** ENVI, ERDAS Imagine, ArcGIS Image Analyst
- **Data Sources:** Landsat (5/7/8/9), Sentinel-2, MODIS, SRTM, ASTER, Google Earth Engine
- **Techniques:** Supervised/unsupervised classification, NDVI, change detection, band math, mosaicking, atmospheric correction

Programming & Scripting

- **Languages:** Python, R, SQL, Bash, PowerShell
- **Applications:** Geospatial data automation, machine learning (e.g., MaxEnt), web scraping, batch processing, ETL pipelines

Big Data & Spatial Analytics

- **Platforms:** Apache Hive, Hadoop HDFS, PySpark
- **GIS Tools:** ArcGIS GeoAnalytics, large-scale spatial joins, HiveQL for query optimization
- **Use Cases:** Climate change modeling, habitat prediction, intrusion detection analytics

Field Data Collection & Mobile GIS

- **Platforms:** KoboToolbox, ArcGIS Survey123, Field Maps, QuickCapture
- **Skills:** GPS-integrated mapping, geotagged surveys, mobile workflows, data validation and synchronization (offline/online)

Visualization & Reporting

- **Tools:** ArcGIS (static/interactive maps, dashboards), Power BI
- **Expertise:** Thematic mapping, symbol-driven legends, multi-layer integration
- **Communication:** Technical writing, policy briefs, infographics for donor and stakeholder reporting