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REPORT OF SPATIAL ANALYSIS OF MAPPED SCHOOLS IN EISS FOCAL STATES

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Background

The Expand, Integrate and Strengthen Systems (EISS) to Build Teachers' Capacity and Resilience (2024–2028) programme represents the second phase of the European Union's Education and Youth Empowerment Programme in Nigeria. Funded by the European Union and implemented with technical support from UNESCO, the programme seeks to strengthen education systems to improve teacher preparation, recruitment, deployment, and professional resilience. A core focus of EISS is Outcome 3, which aims to establish Teacher Learning Teams (TLTs) within geographically defined school clusters. These clusters are intended to foster structured teacher collaboration, peer learning, continuous professional development, and stronger linkages between schools, students, and surrounding communities.

To support the establishment of TLTs, two foundational activities are being implemented across Adamawa, Bayelsa, Enugu, Katsina, Oyo, and Plateau States**,** School Mapping, conducted in collaboration with State Universal Basic Education Boards (SUBEBs) and Local Government Education Authorities (LGEAs), to generate accurate geospatial and administrative data on schools, teachers, and facilities. Stakeholder Sensitization, targeting teachers, head teachers, School-Based Management Committees (SBMCs), Civil Society Organizations (CSOs), and education officials to build understanding, ownership, and commitment to the TLT model. The establishment of effective TLTs requires reliable information on school locations, inter-school distances, teacher deployment, and infrastructure availability. School mapping provides this baseline using GPS-enabled data collection tools, while data harmonization through the Federal Ministry of Education's Teacher Management Information System (TMIS) ensures consistency and usability for planning and decision-making.

Given the need to define school clusters based on real geographic accessibility rather than administrative boundaries, a spatial clustering methodology is required. This exercise therefore applies the Density-Based Spatial Clustering of Applications with Noise (DBSCAN) algorithm to identify schools located within a 5 km radius of one another. The resulting clusters form the spatial foundation for organizing Teacher Learning Teams and planning teacher learning interventions.

2. Objectives

In line with the EISS programme framework and Outcome 3, the objectives of this exercise are to:

1. Generate comprehensive, GPS-based school and teacher data to support evidence-driven clustering and formation of Teacher Learning Teams (TLTs).
2. Identify and delineate school clusters within a 5 km radius using DBSCAN spatial clustering to enable feasible and sustainable teacher learning arrangements.
3. Build the capacity of State and LGA EMIS and Quality Assurance Officers in:
    - GPS-enabled school mapping tools
    - Spatial data management and analysis
    - Interpretation of clustering outputs for planning purposes

4. Strengthen stakeholder understanding and ownership of the TLT concept through structured sensitization of teachers, school leaders, SBMC members, and CSOs.
5. Support effective teacher collaboration, peer learning, and professional development by providing a spatially grounded framework for TLT implementation.
6. Establish a harmonized and standardized school mapping dataset aligned with TMIS and national education data standards.
7. Lay a strong operational foundation for the rollout, monitoring, and sustainability of Teacher Learning Teams across the six (6) EISS focal states.

3. Methodology

3.1 Data Preparation

Prior to analysis, all school records underwent a rigorous data cleaning and transformation. Geographic coordinates were verified and duplicate entries were removed. School attributes relevant to teacher learning and clustering were standardized, and all spatial data transformed into a consistent reference system suitable for distance-based analysis.

3.2 DBSCAN Clustering

DBSCAN is a density-based clustering algorithm that groups spatial points based on proximity. This makes it particularly suitable for real-world geographic applications where settlement patterns vary widely. For this analysis, Haversine distance was used to calculate the proximity.

Under this approach:

1. Schools within a defined distance are classified as core points.
2. Schools connected to core points through spatial proximity are included in clusters.
3. Schools that do not meet minimum density requirements of 5km are classified as noise or outliers.

3.3 Parameter Definition for This Exercise

To align with the objective of capturing schools within a 5 km radius, the DBSCAN parameters were defined as follows:

- **Radius(ε)**: A 5 km threshold representing the maximum distance within which schools are considered neighbours.
- **Minimum cluster size**: Ensures that only schools within the 5km radius threshold are considered valid within the clusters.
- **Outliners**: Isolated schools are added to the closest core clusters.

3.4 Implementation

- Sensitization of Stakeholders
- Field Work (Data Collection)
- Data Cleaning
- Data Analysis
- Reporting

4. Descriptive Analysis of Mapped Schools

This section presents a descriptive overview of the number of schools mapped across the six (6) EISS focal states. A total of 4,385 schools were successfully mapped during the exercise, reflecting variations in school distribution across states.

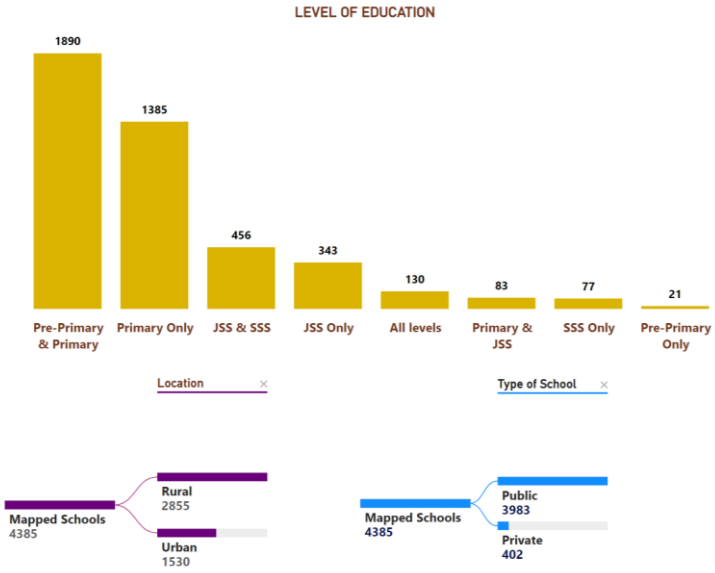

Figure 1.0: Number of schools mapped by State

Oyo State recorded the highest number of mapped schools (992), indicating a relatively dense school network and a large operational base for clustering and Teacher Learning Team (TLT) formation. Adamawa State followed closely with 965 mapped schools, also reflecting extensive school coverage across the state. Plateau State accounted for 900 mapped schools, showing a substantial presence of schools suitable for spatial clustering. Katsina State recorded 744 schools, representing a moderate level of school density compared to the leading states. In contrast, Enugu State (452 schools) and Bayelsa State (332 schools) recorded comparatively lower numbers of mapped schools. These differences are likely influenced by variations in population size.

4.1. Adamawa State

Schools

The Adamawa State school mapping exercise surveyed a total of 965 schools. Mayo Belwa (189), Hong (118), and Lamurde (94) LGAs recorded the highest concentration of schools, while Toungo LGA had the lowest with 15 schools. Most schools offer Primary only education (582), followed by JSS only schools (117), with Pre-primary only schools being the least (5). The majority of schools are located in rural areas (774), compared to 191 in urban areas. Public schools dominate the system with 925 schools, while only 40 schools are private.

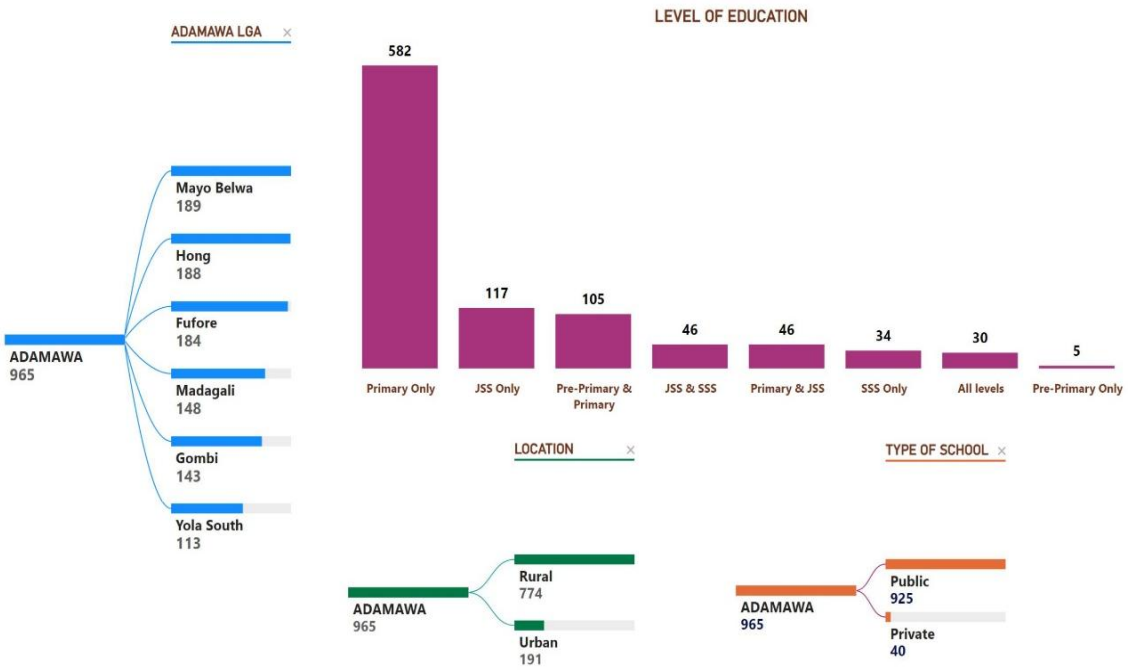

Figure 2: School Distribution by Education Level.

Enrolment

Enrolment data indicate a near gender parity across all education levels. At the pre-primary level, enrolment is almost equal, with 5,925 male and 5,918 female. A similar pattern is observed in primary schools (118,546 male and 113,053 female),

Junior Secondary Schools (24,667 male and 25,916 female), and Senior Secondary Schools (14,160 male and 14,075 female) with the widest gender gap observed at the primary level.

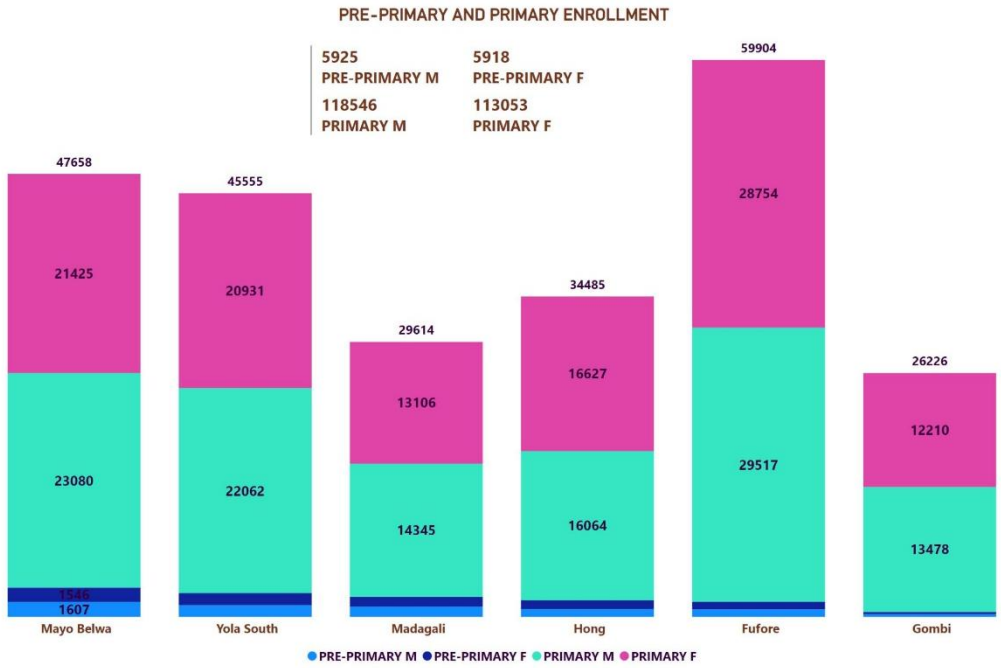

Figure 3: Student Enrolment Distribution by LGA

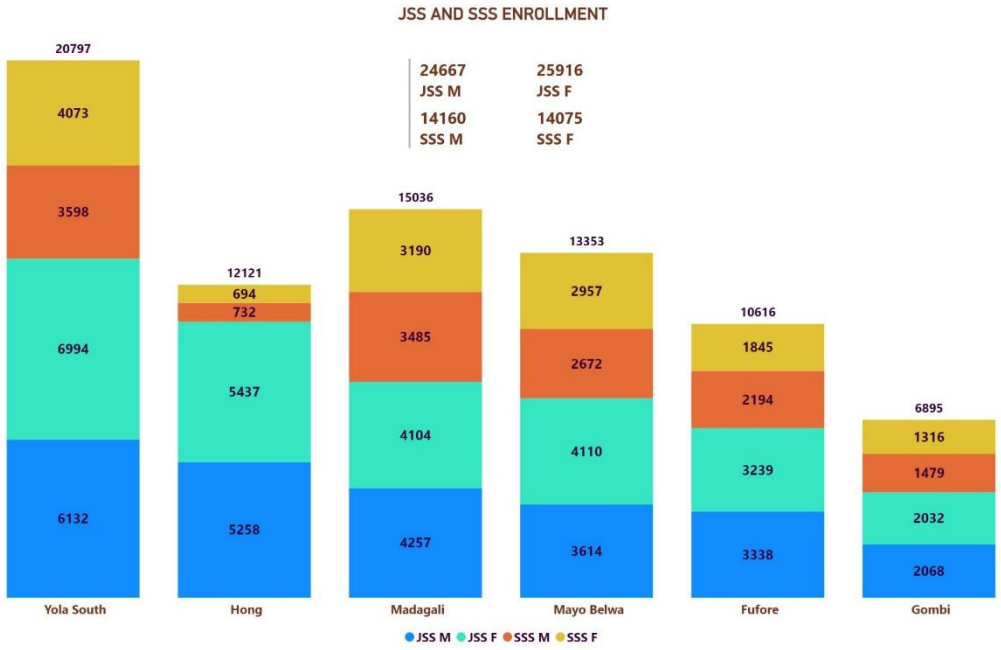

Figure 4: Student Enrolment Distribution by Level

Teachers

Teacher deployment shows notable gender disparities across education levels. Female teachers dominate at the pre-primary level (346 female and 134 male). In contrast, male teachers are more prevalent at the primary (3,844 male and 3,228 female), JSS (1,731 male and 1,143 female), and SSS (1,090 male and 397 female) levels, with the widest gender gap observed at the senior secondary level. Across all levels, teachers with disabilities comprise 58 male and 19 female.

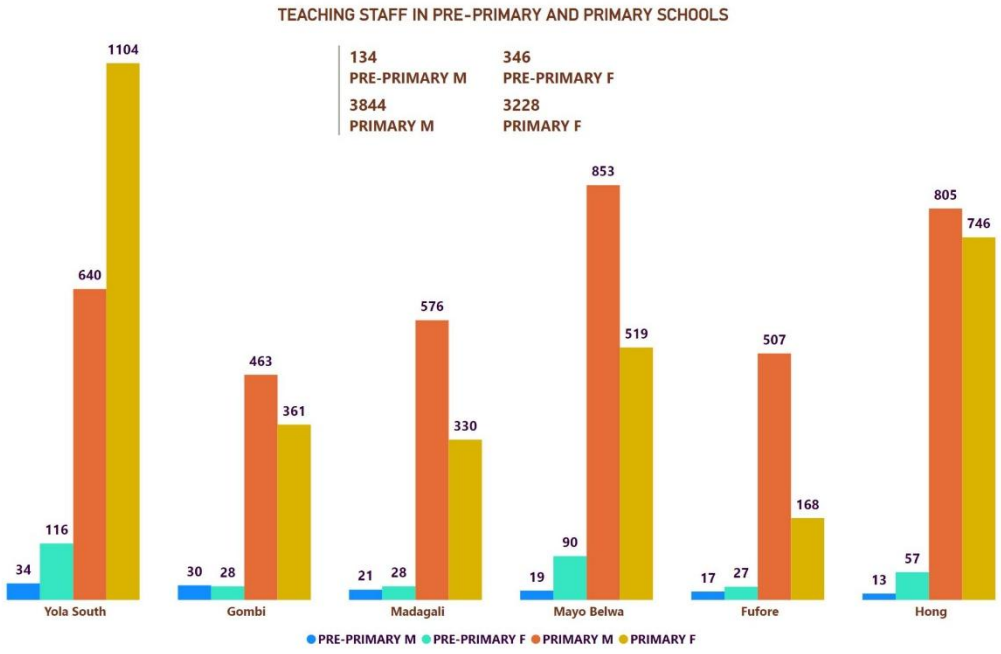

Figure 5: Staffing in Pre-Primary and Primary School by LGA

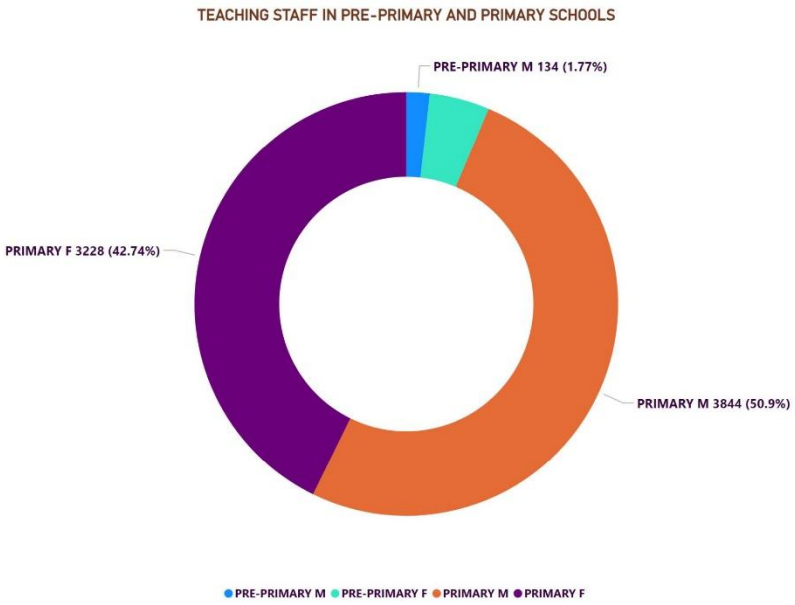

Figure 6: Staffing in Pre-Primary and Primary School by Education Level

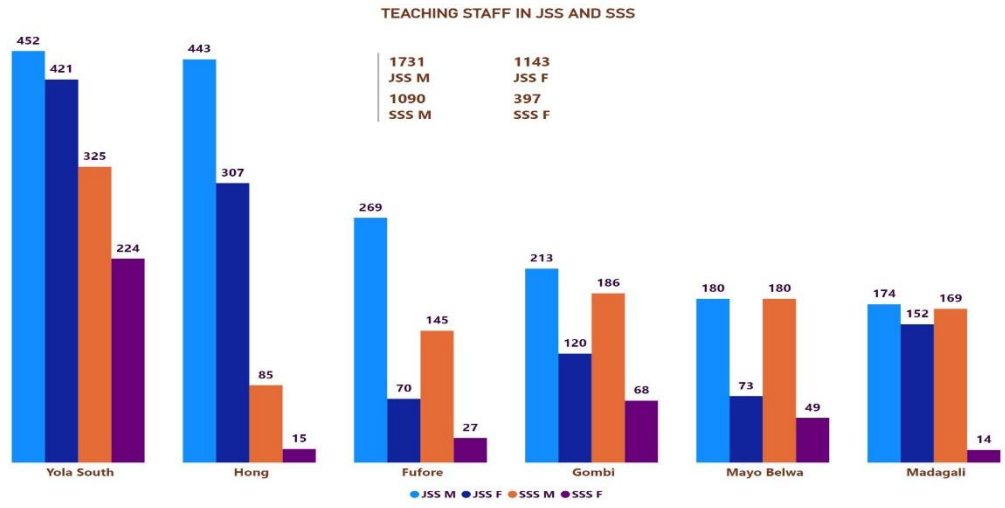

Figure 7: Teaching Staff in JSS and SSS

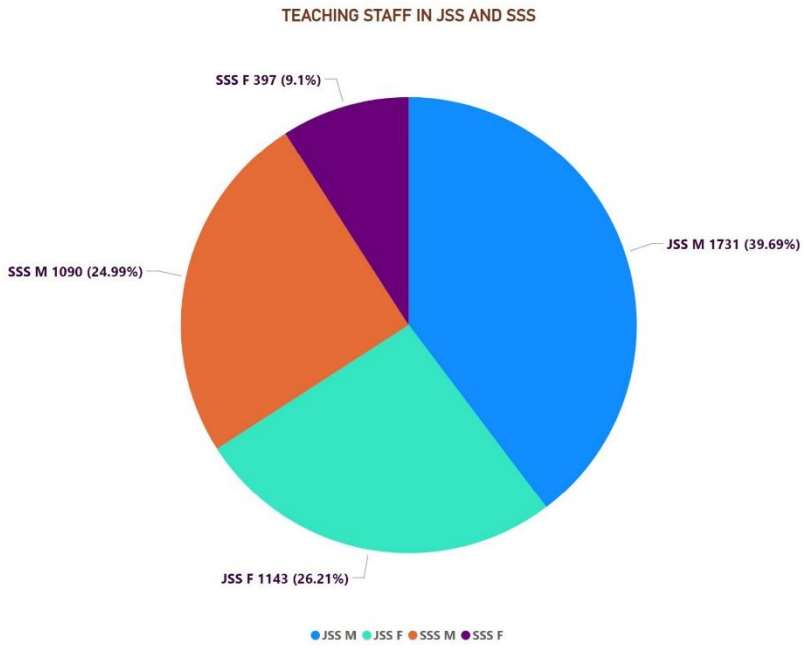

Figure 8: Percentage of Teaching Staff in JSS and SSS

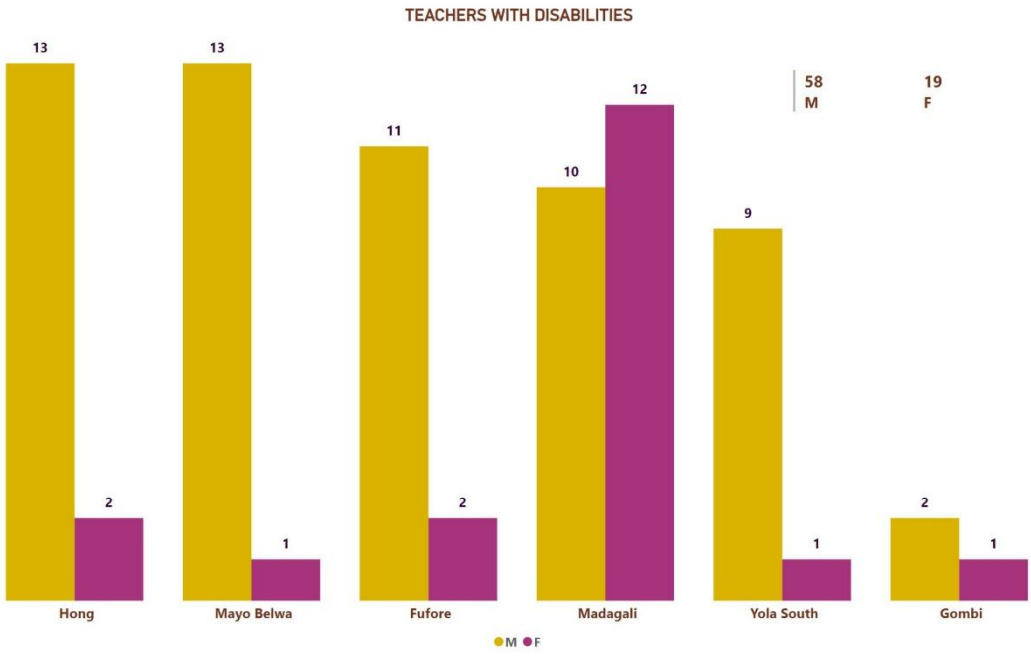

Figure 9: Teaching Staff with Disabilities in JSS and SSS

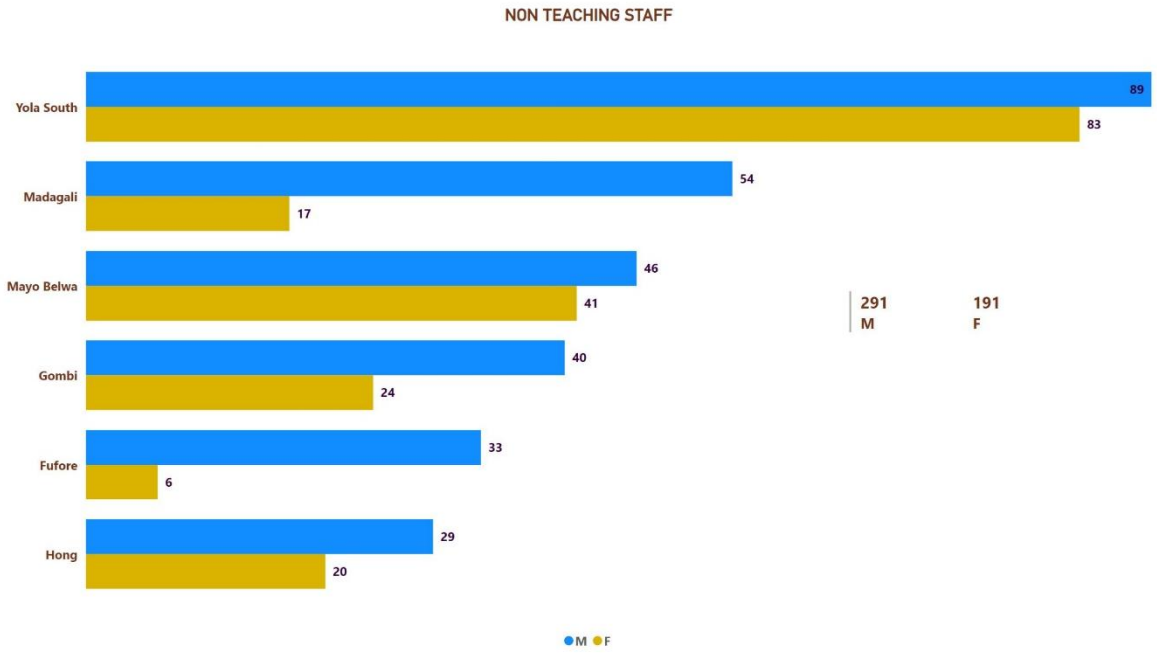

Figure 10: Non-Teaching Staff by LGA

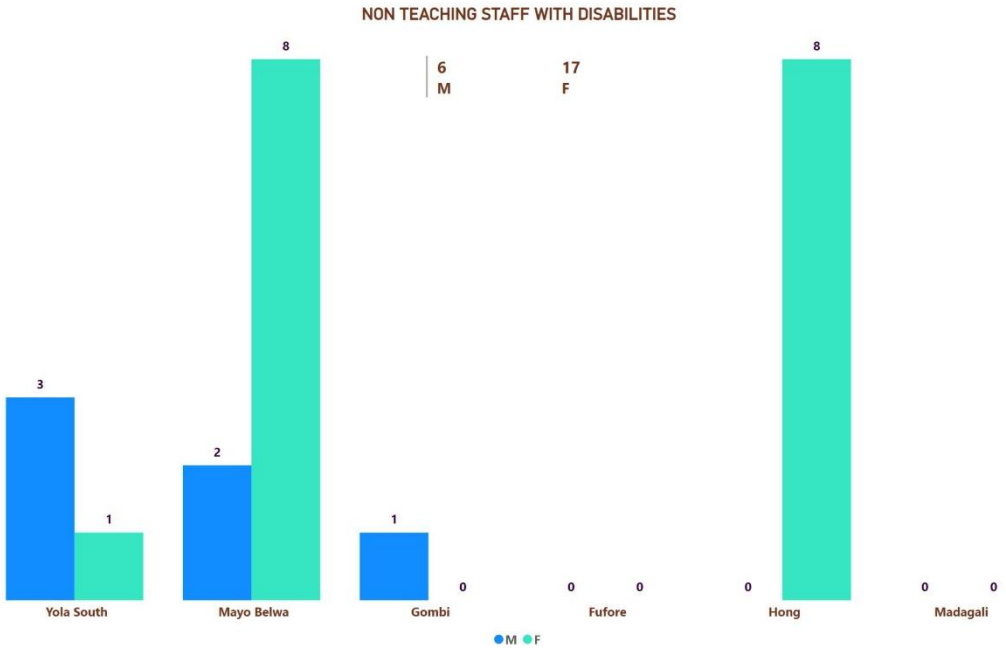

Figure 11: Non-Teaching Staff with Disabilities in JSS and SSS

Facilities

School facilities include 5,197 usable classrooms, 847 computers, 82 libraries, and 785 sports fields. Yola South records the highest availability of classrooms (1,069), computers (235), and libraries (24). Sports fields are most concentrated in Hong (164) and Mayo Belwa (163). Gombi consistently records the lowest availability across most facility types.

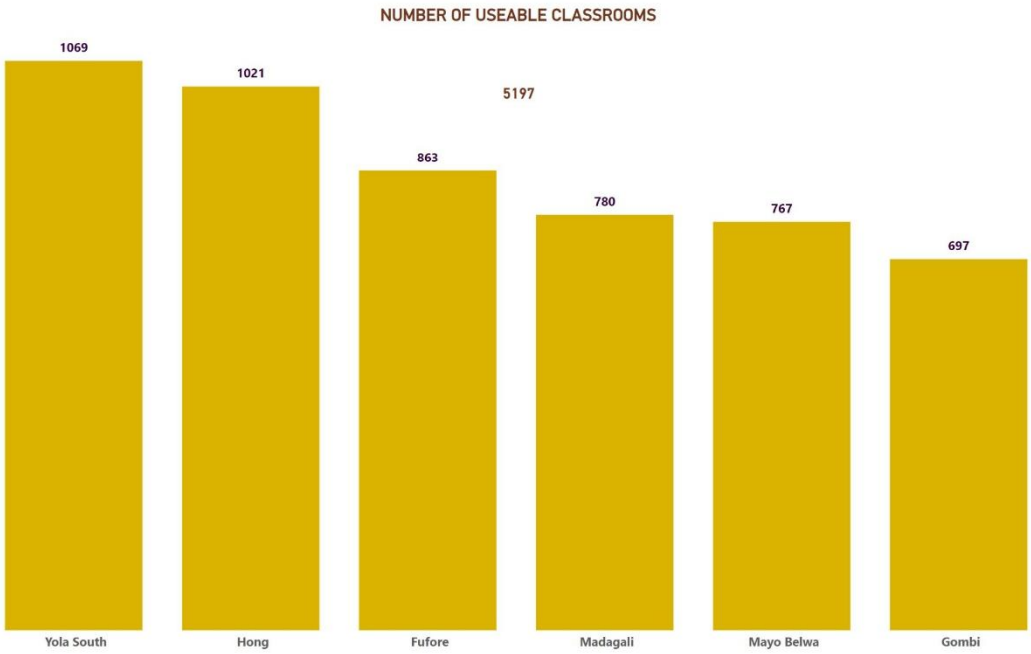

Figure 12: Number of Useable Classrooms by LGA

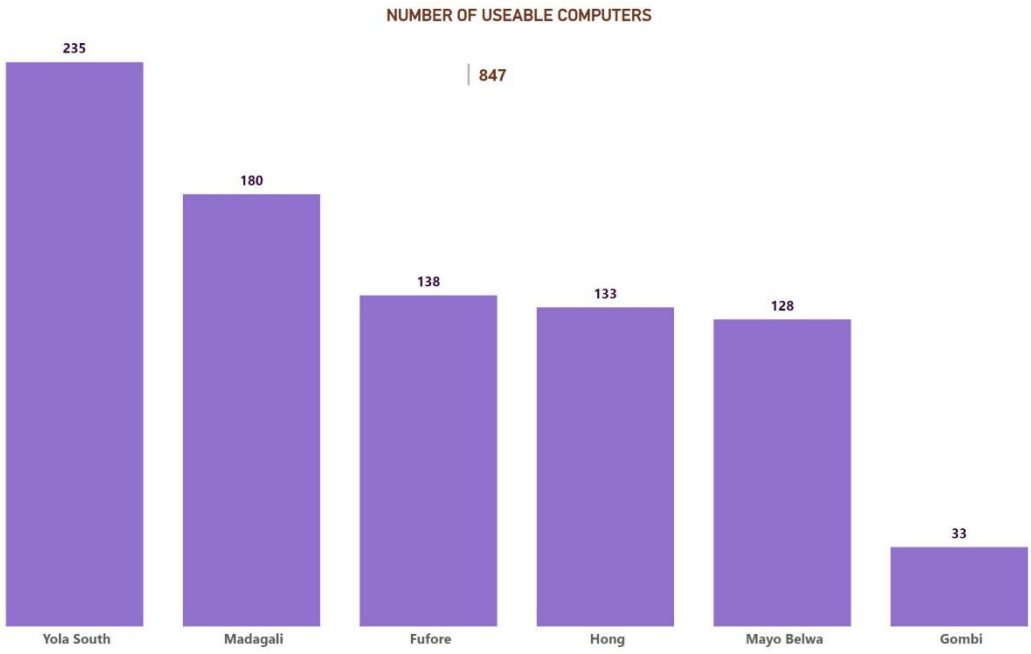

Figure 13: Number of Useable Computers by LGA

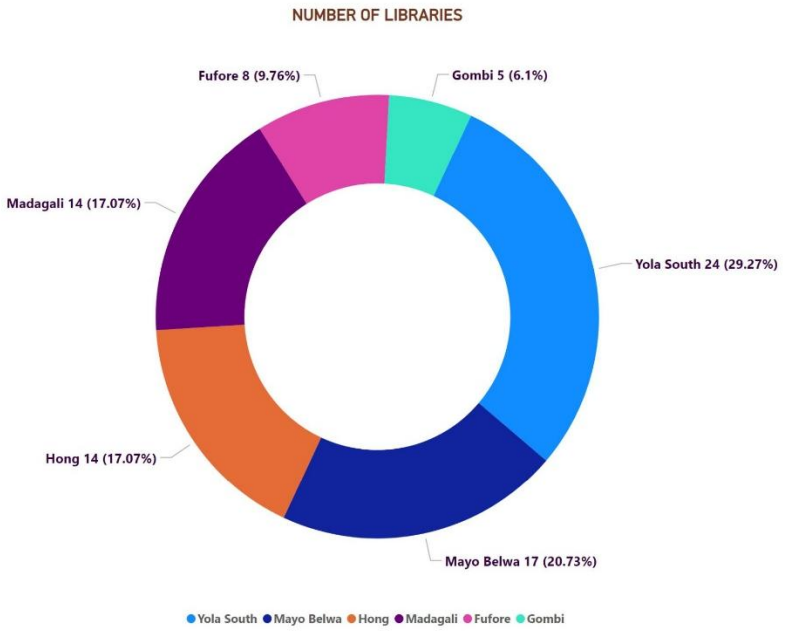

Figure 14: Number of Useable Libraries by LGA

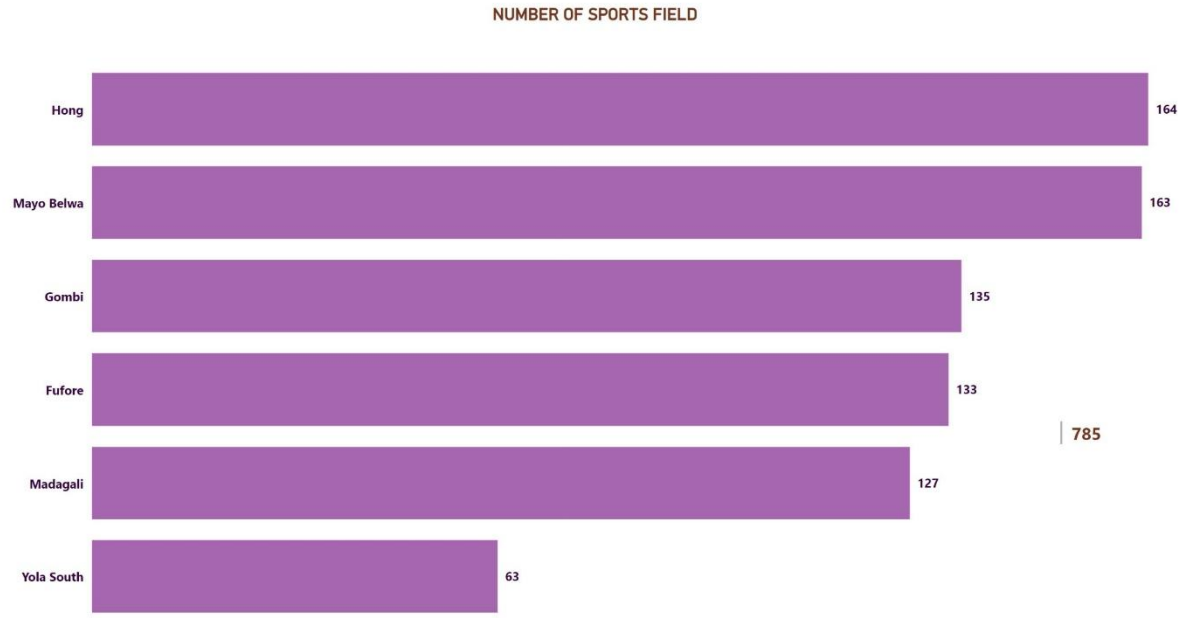

Figure 15: Number of Useable Sports fields by LGA

4.2. Bayelsa State

Schools

The Bayelsa State school mapping exercise surveyed a total of 332 schools. Yenagoa (146), Sagbama (81), and Brass (72) LGAs recorded the highest concentration of schools, while Kolokuma/Opokuma LGA had the lowest with 33 schools. Most schools offer Pre-Primary & Primary schools (105), followed by Primary only schools (77), with SSS only schools being the least (1). The majority of schools are located in urban areas (180), but a notable proportion, 152 are in rural areas. Public schools dominate the system with 205 schools, while 127 schools are private.

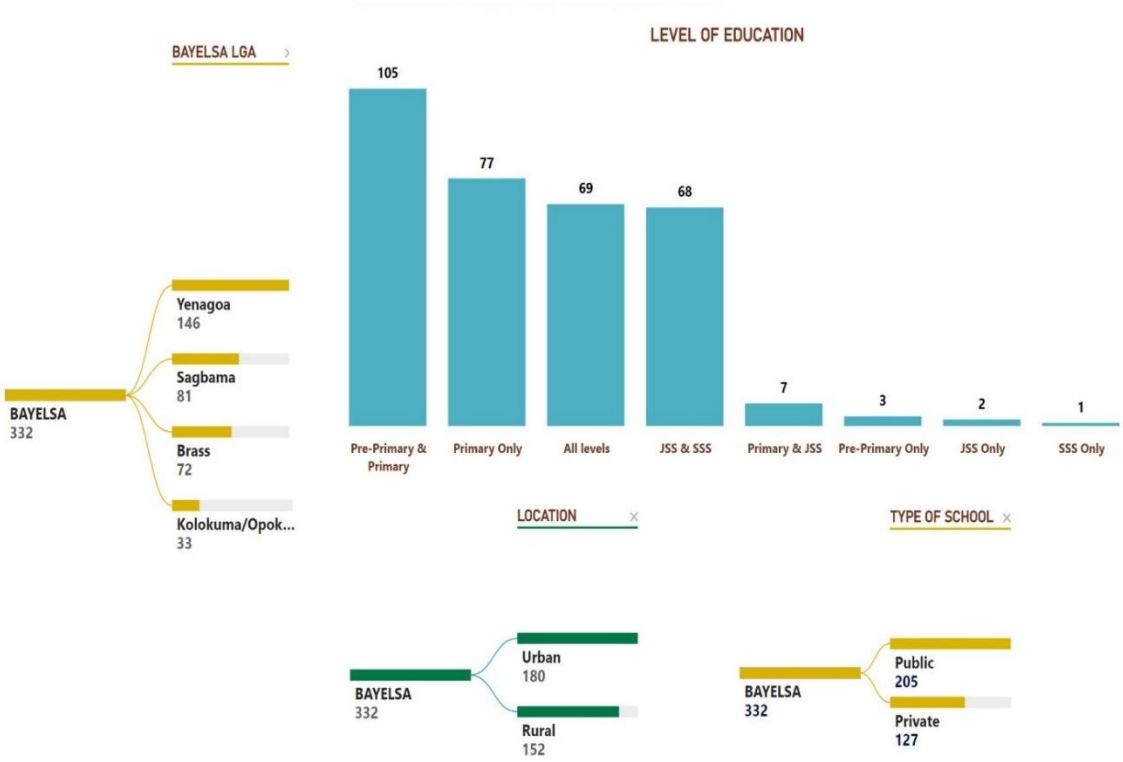

Figure 16: School Distribution by Education Level.

Enrolment

Enrolment data indicate a near gender parity across all education levels. At the Pre-primary level, enrolment is almost equal, with 5,028 male and 4,969 female. A similar pattern is observed in Primary schools (18,497 male and 18,226 female), Junior Secondary Schools (12,225 male and 12,832 female), and Senior Secondary Schools (11,590 male and 12,558 female) with a relatively wider gender gap observed

at the senior secondary level.

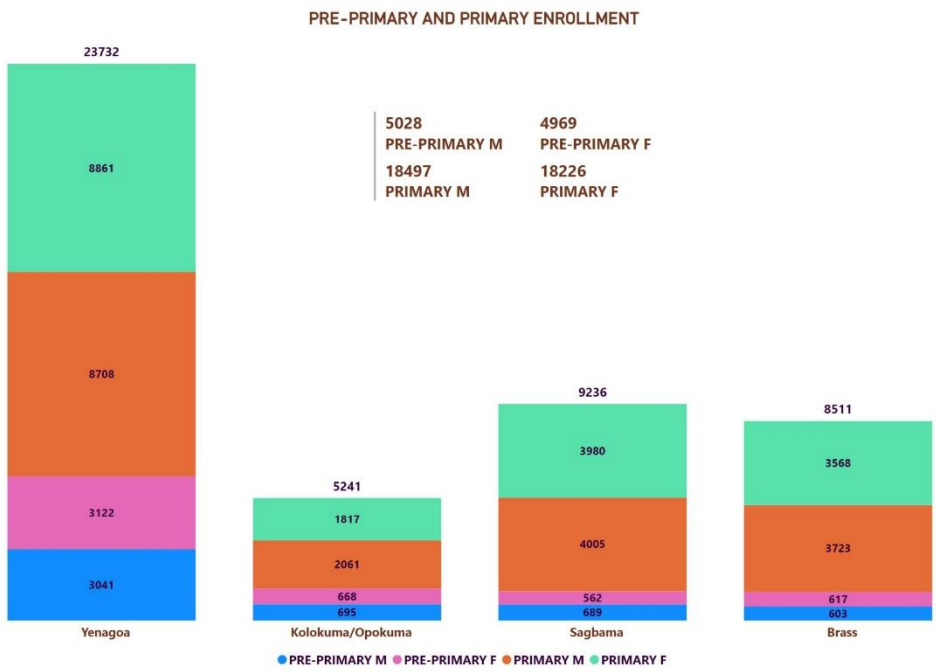

Figure 17: Student Enrolment Distribution by LGA

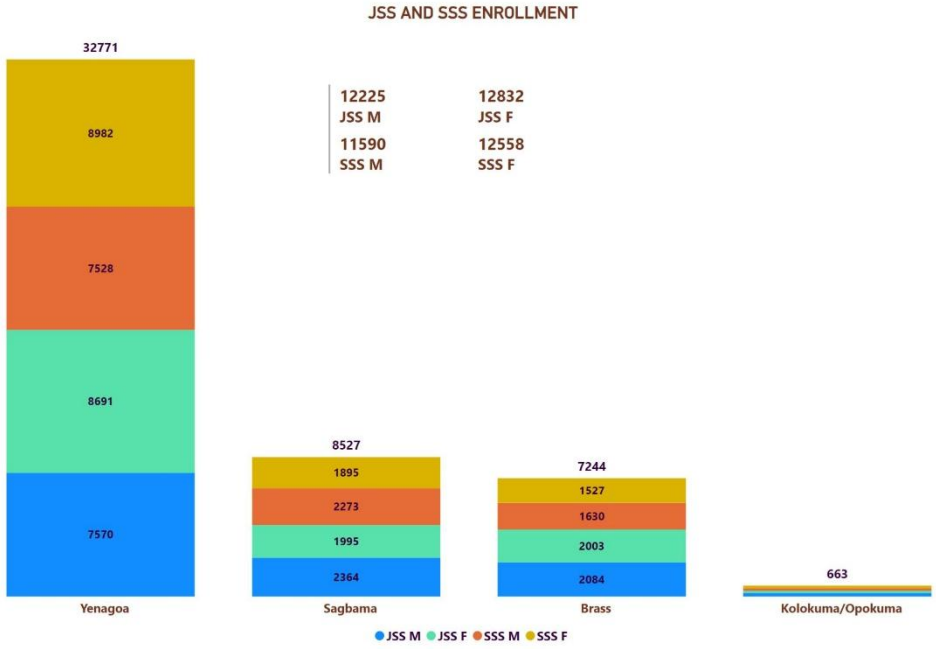

Figure 18: Student Enrolment Distribution by Level

Teachers

Teacher deployment shows notable gender disparities across education levels. Female teachers dominate at the Pre-primary (622 female and 52 male), Primary (1,423 female and 665 male), JSS (809 female and 673 male) and SSS (831 female and 821 male) levels with the widest gender gap observed at the junior secondary level. Across all levels, teachers with disabilities comprise 19 male and 9 female.

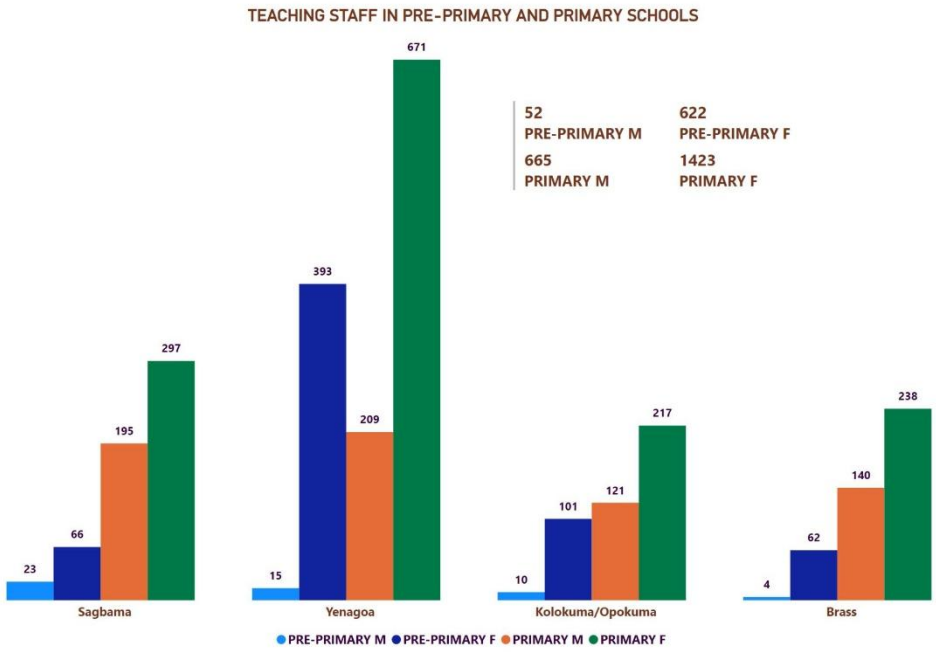

Figure 19: Staffing in Pre-Primary and Primary School by LGA

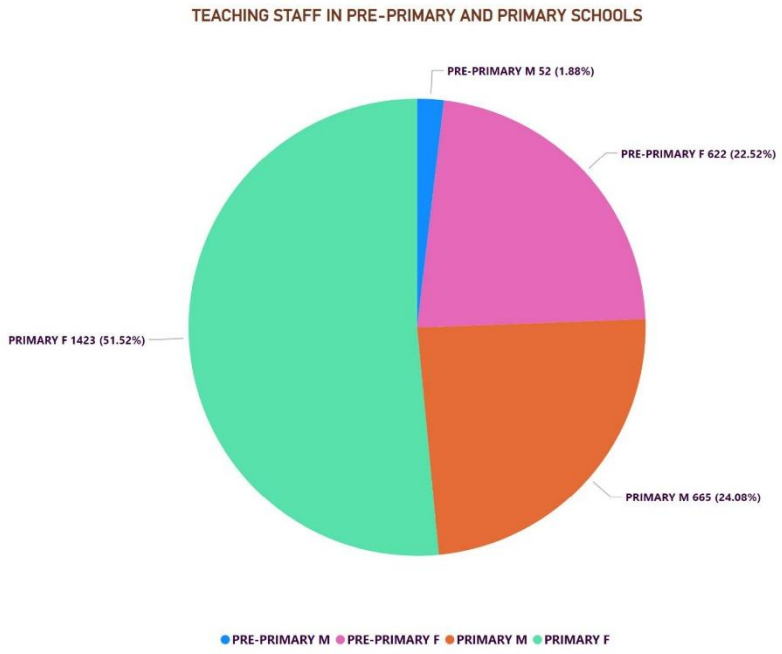

Figure 20: Staffing in Pre-Primary and Primary School by Education Level

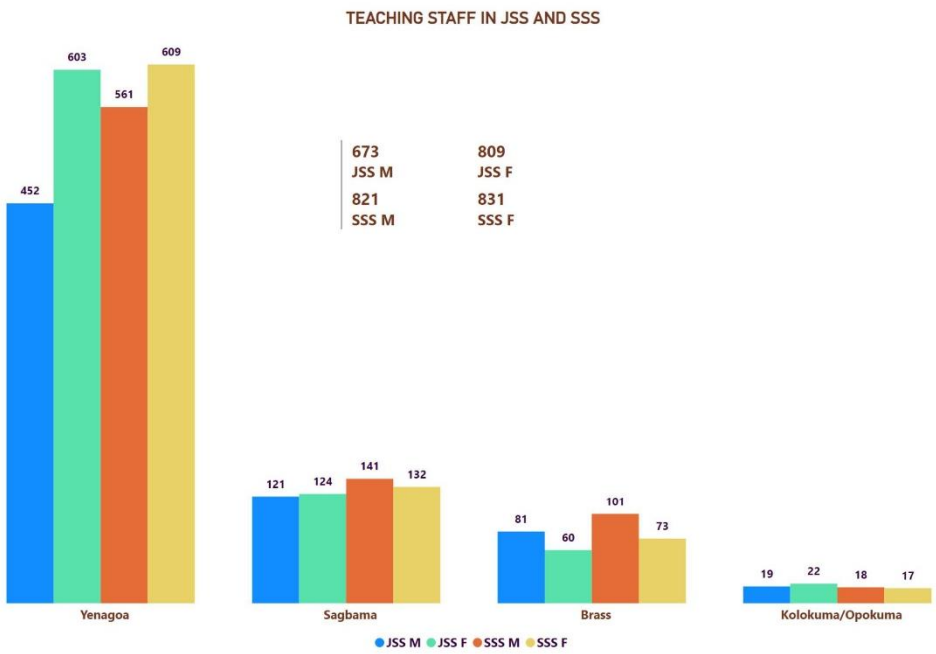

Figure 21: Teaching Staff in JSS and SSS

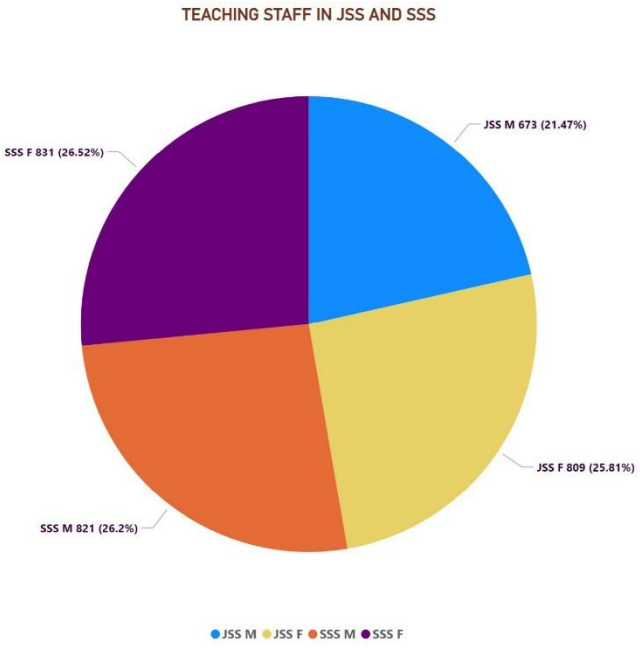

Figure 22: Percentage of Teaching Staff in JSS and SSS

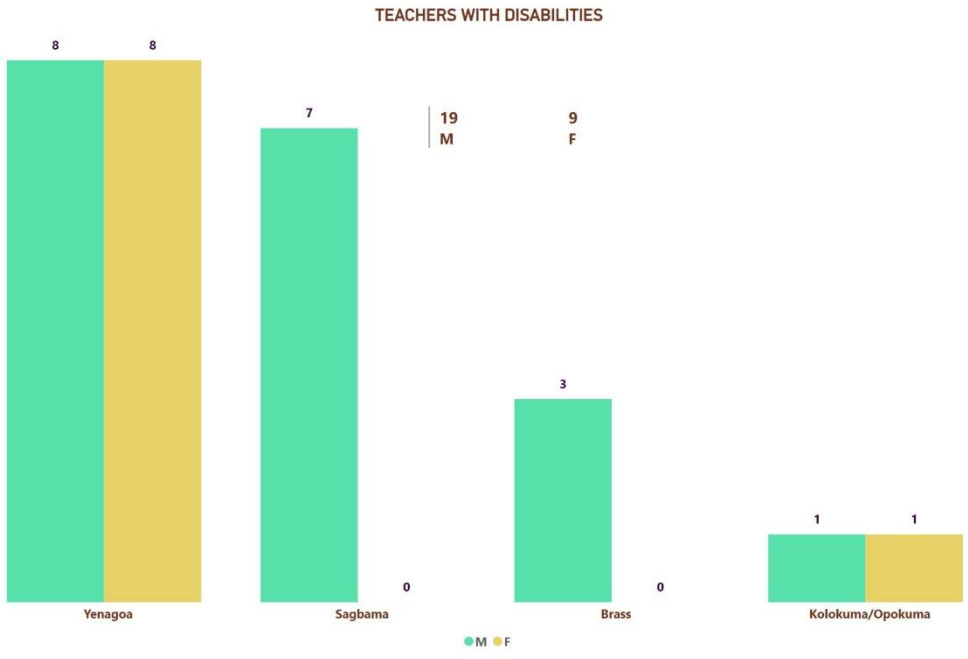

Figure 23: Teaching Staff with Disabilities in JSS and SSS

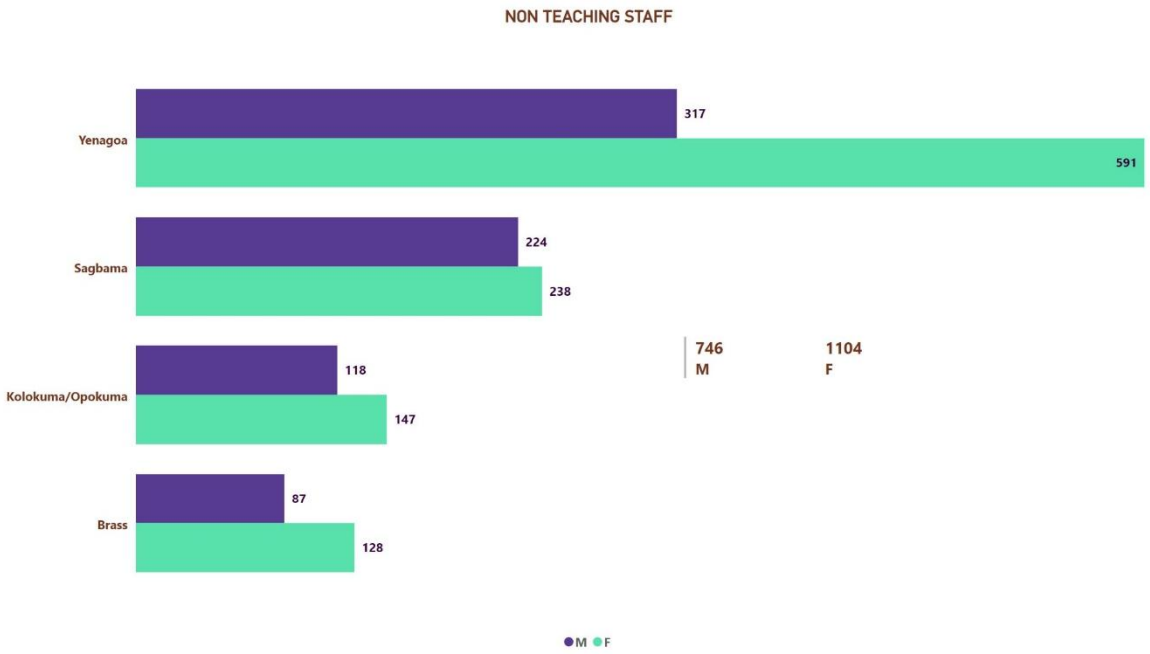

Figure 24: Non-Teaching Staff by LGA

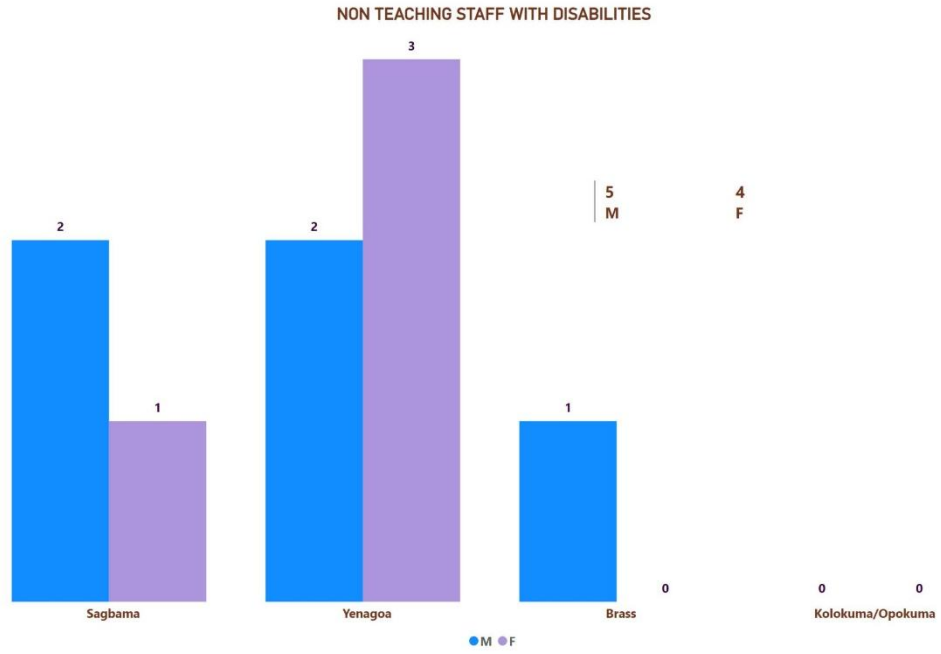

Figure 25: Non-Teaching Staff with Disabilities in JSS and SSS

Facilities

School usable facilities include 3,165 classrooms, 1,405 computers, 100 libraries, and 173 sports fields. Yenagoa records the highest availability of classrooms (1,880), computers (1,249), libraries (80) and sporting field (71). Kolokuma/Opokuma consistently records the lowest availability across most facility types.

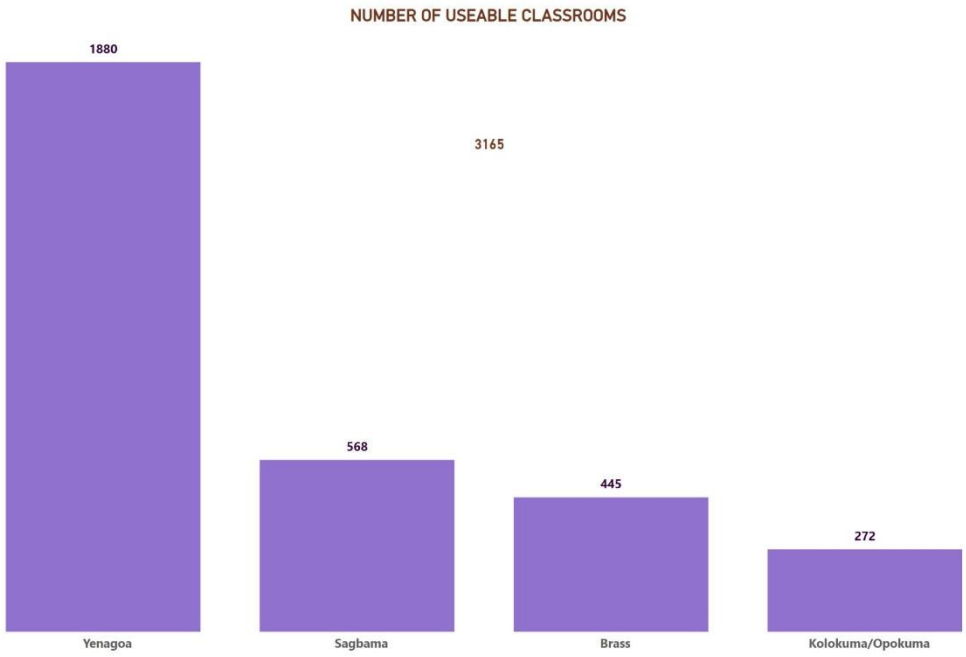

Figure 26: Number of Useable Classrooms by LGA

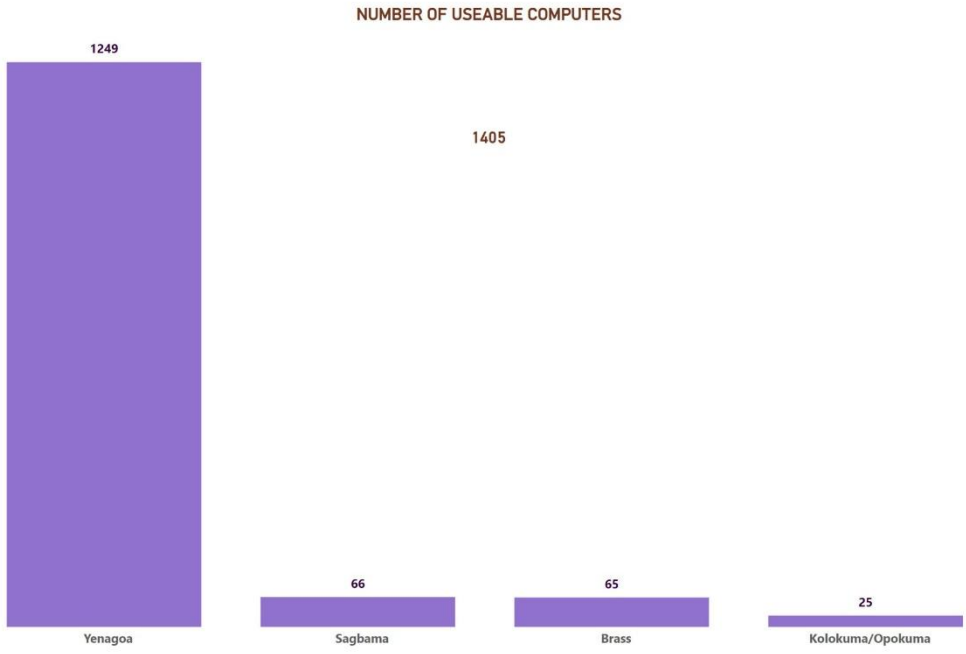

Figure 27: Number of Useable Computers by LGA

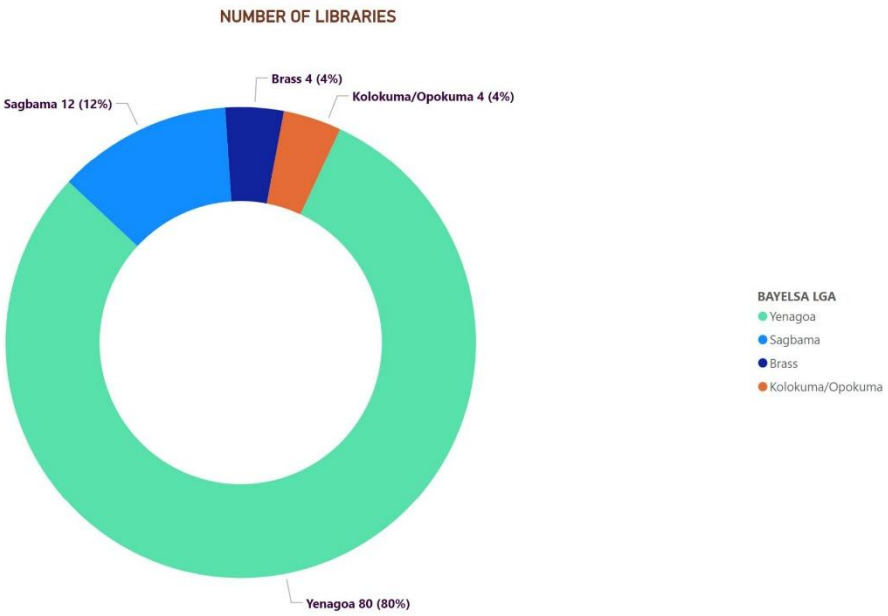

Figure 28: Number of Useable Libraries by LGA

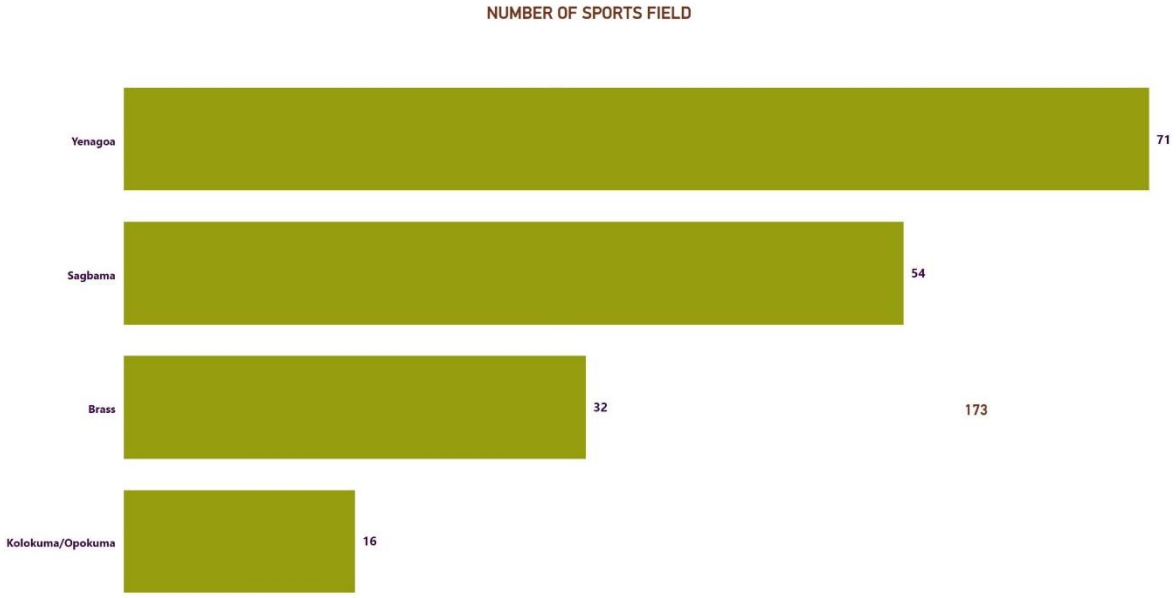

Figure 29: Number of Useable Sports fields by LGA

4.3. Enugu State

Schools

The Enugu State school mapping exercise surveyed a total of 452 schools. Udi (98), Igbo-Etiti (78), Nkanu-East (78), and Enugu-East (75) LGAs recorded the highest concentration of schools, while Oji-River LGA had the lowest with 58 schools. Most schools offer Pre-Primary & Primary schools (350), followed by JSS & SSS schools (77), with Primary & JSS schools being the least (1). The majority of schools are located in rural areas (382), compared to 70 in urban areas. Public schools dominate the system with 434 schools, while 18 schools are private.

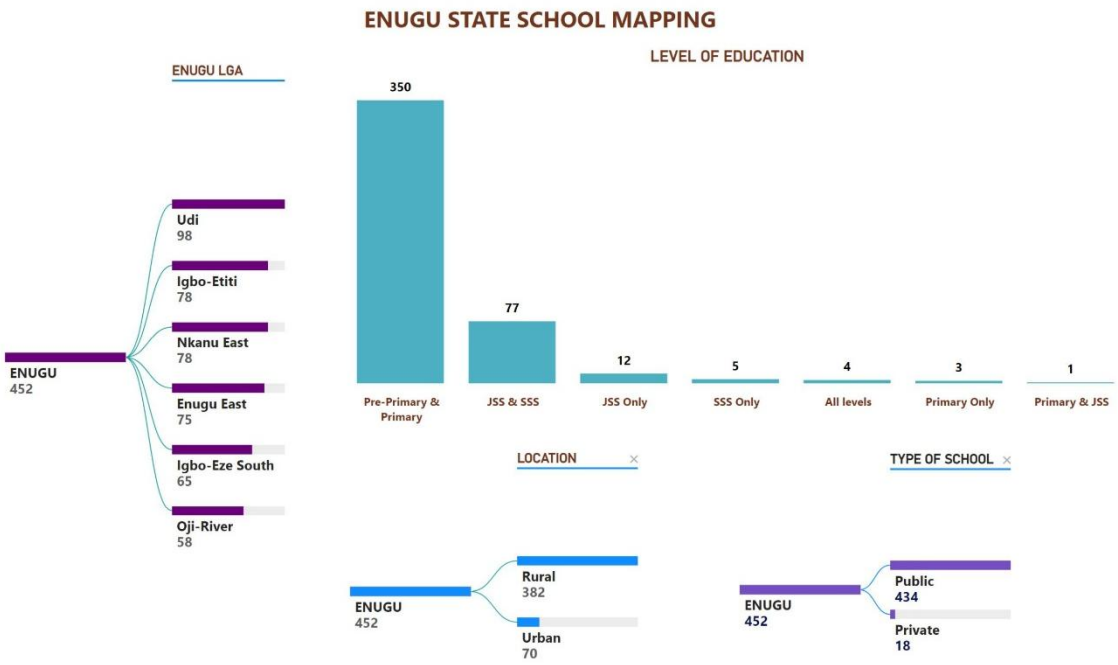

Figure 30: School Distribution by Education Level.

Enrolment

Enrolment data indicate a near gender parity across all education levels. At the Pre-Primary Schools, enrolment is equal, with 8,037 for male and female respectively. At the Primary Schools, enrolment is almost with (23,040 male and 23,458 female), a similar pattern is noticed across Junior Secondary Schools (9,926 male and 10,874 female), and Senior Secondary Schools (7,462 male and 9,159 female) with the widest gender gap observed at the senior secondary level.

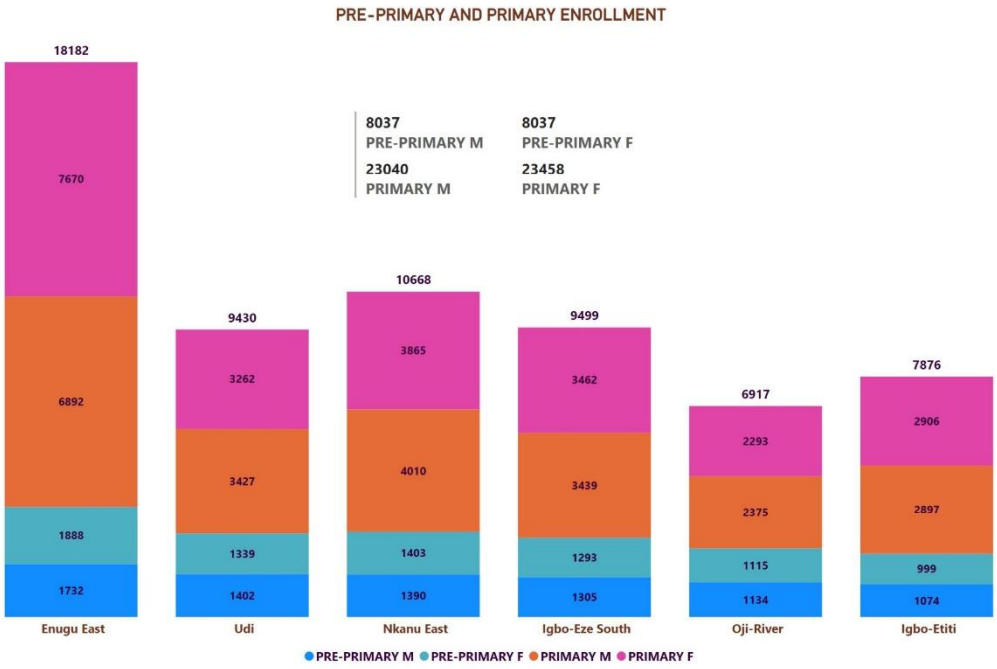

Figure 31: Student Enrolment Distribution by LGA

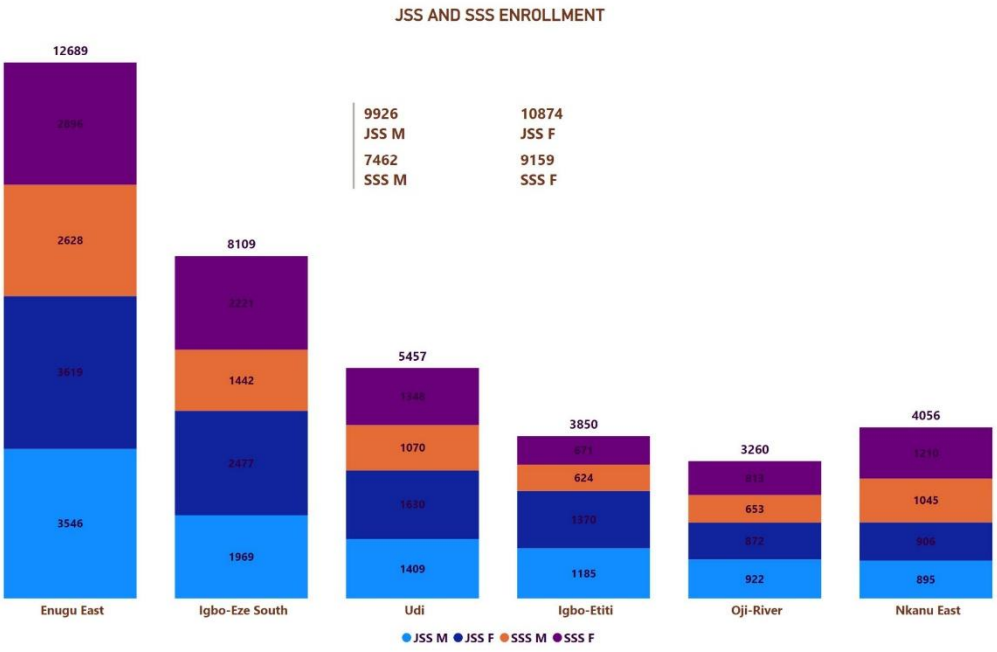

Figure 32: Student Enrolment Distribution by Level

Teachers

Teacher deployment shows notable gender disparities across education levels. Female teachers dominate at the Pre-primary (756 female and 64 male), Primary (2,482 female and 264 male), JSS (1,030 female and 225 male) and SSS (1,170 female and 335 male) levels with the widest gender gap observed at the Primary level. Across all levels, teachers with disabilities comprise 15 male and 29 female.

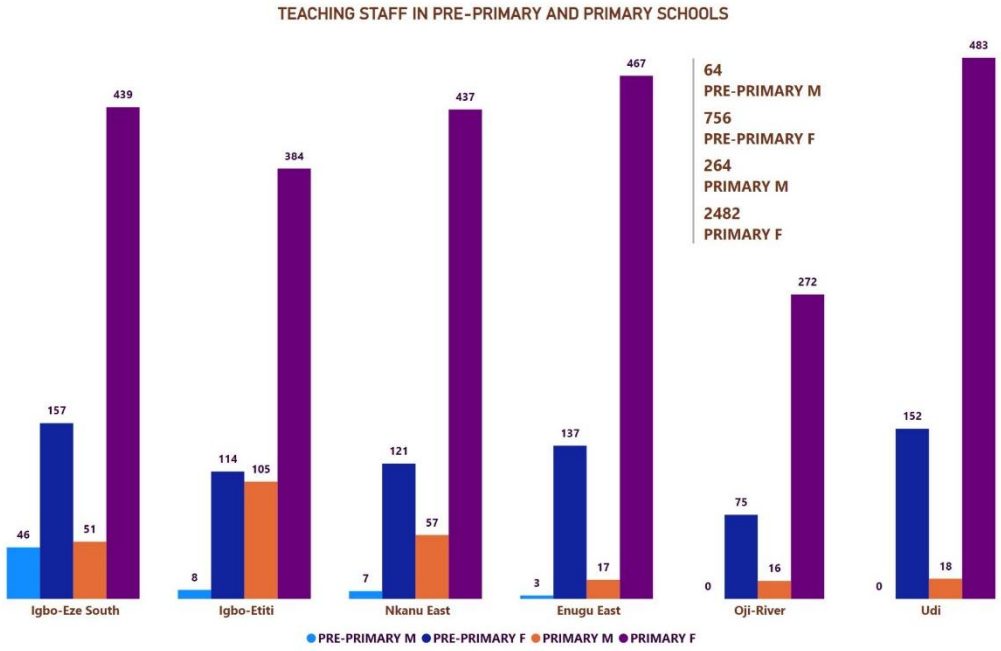

Figure 33: Staffing in Pre-Primary and Primary School by LGA

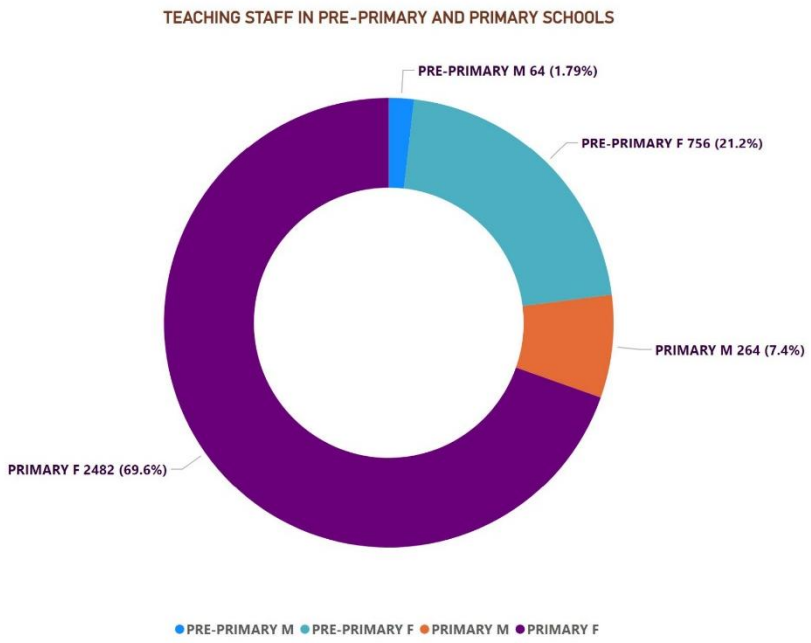

Figure 34: Staffing in Pre-Primary and Primary School by Education Level

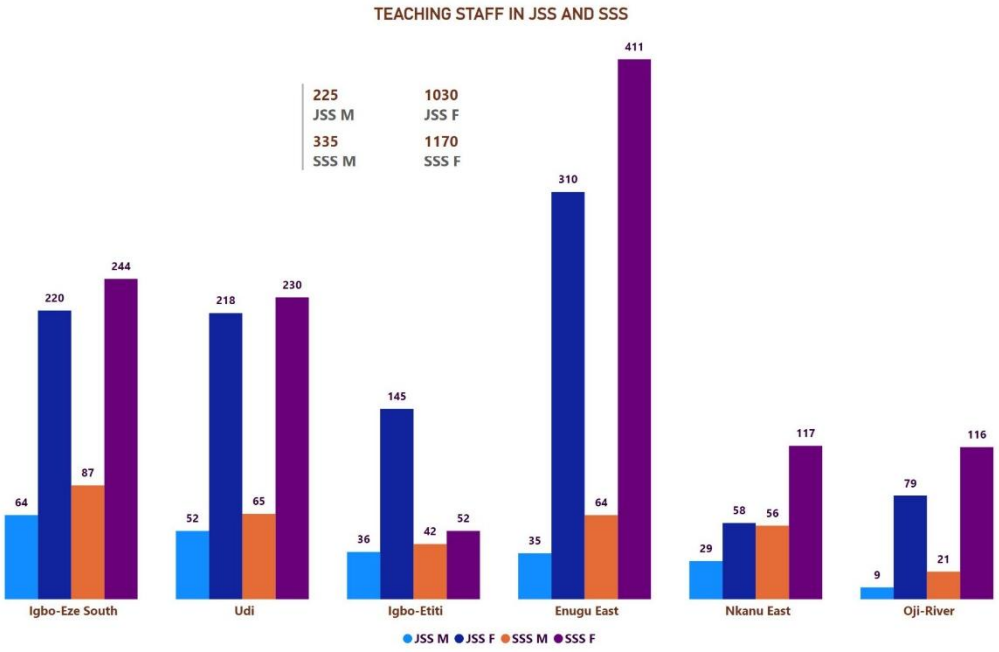

Figure 35: Teaching Staff in JSS and SSS

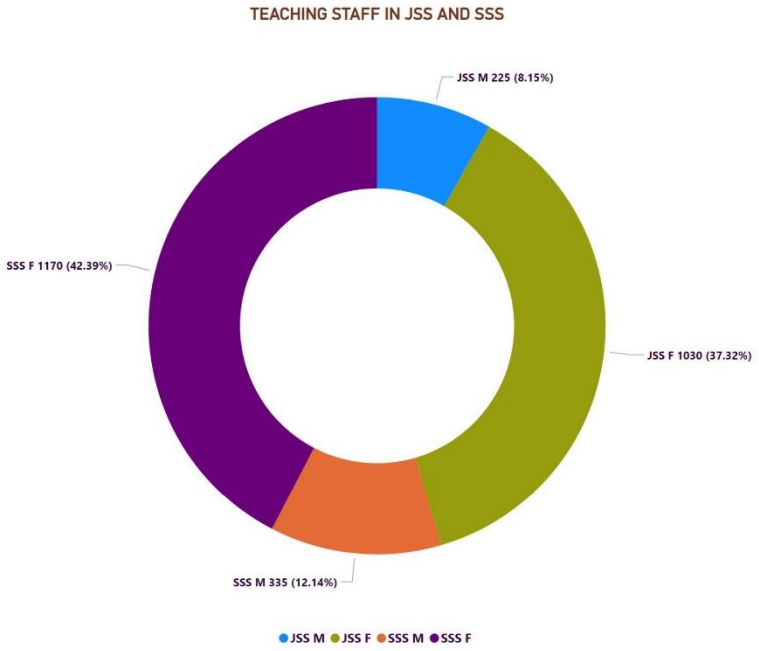

Figure 36: Percentage of Teaching Staff in JSS and SSS

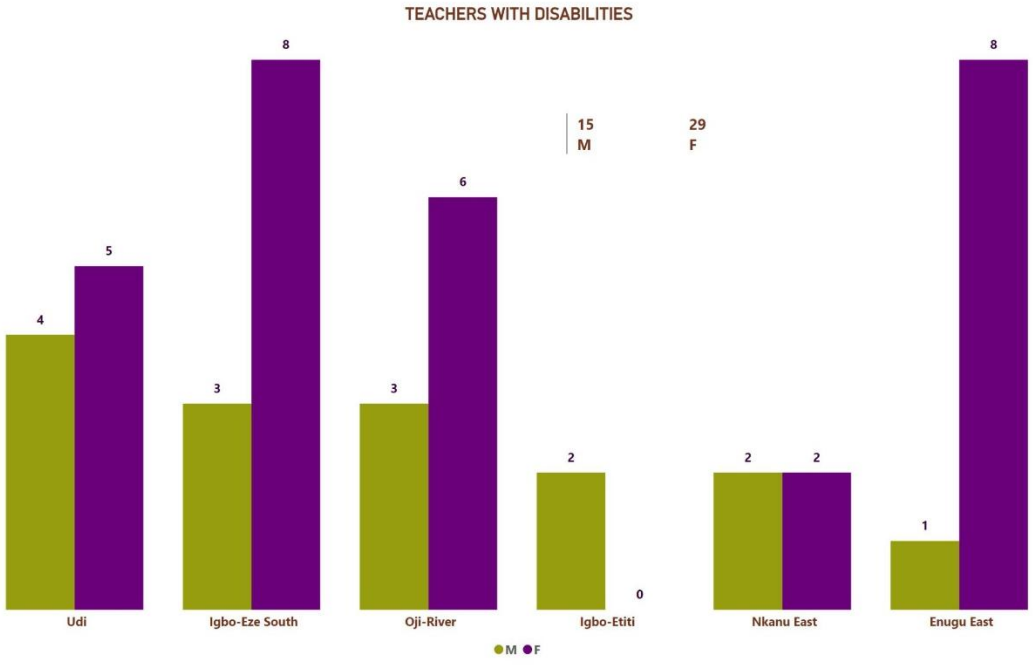

Figure 37: Teaching Staff with Disabilities in JSS and SSS

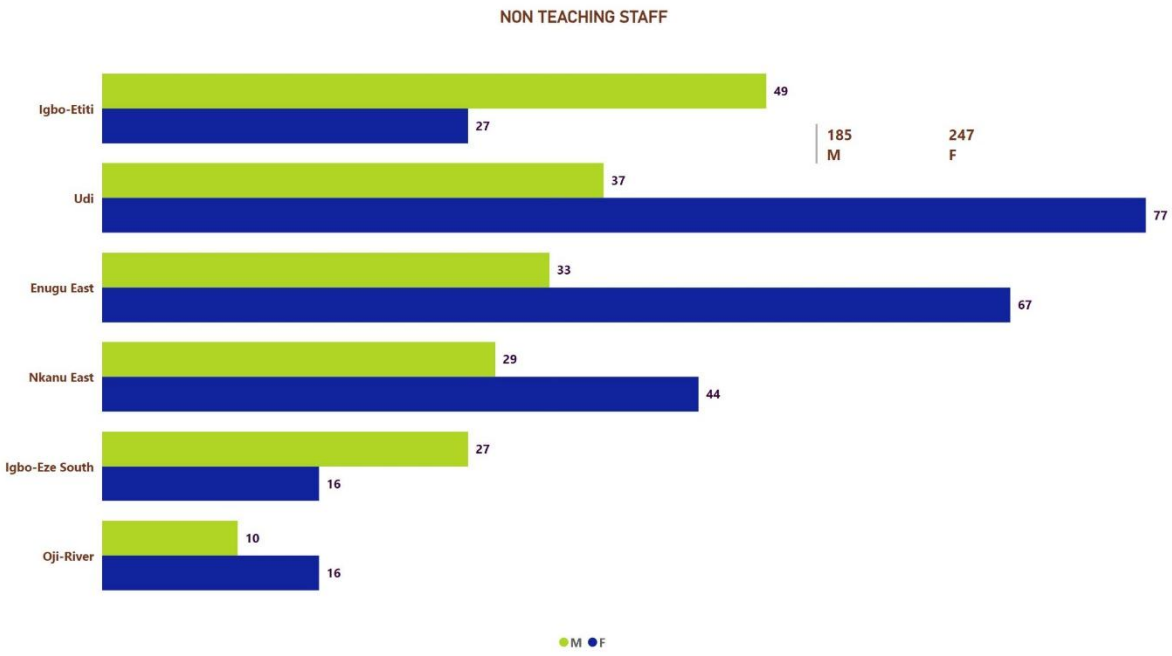

Figure 38: Non-Teaching Staff by LGA

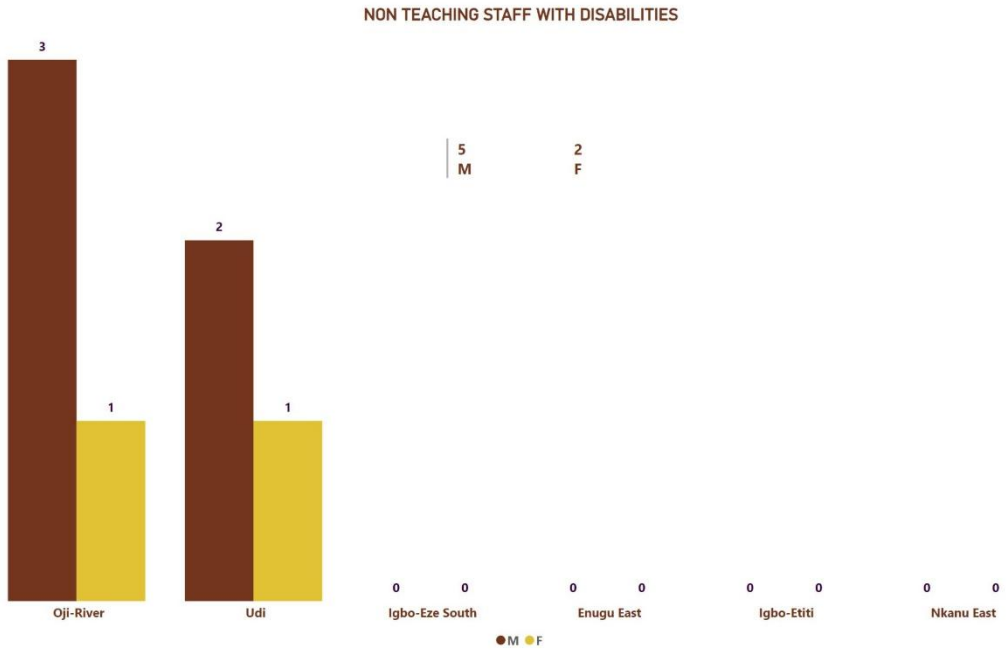

Figure 39: Non-Teaching Staff with Disabilities in JSS and SSS

Facilities

School usable facilities include 3,597 classrooms, 2,176 computers, 166 libraries, and 375 sports fields. Udi records the highest availability of classrooms (766), libraries

(40) and sporting field (83) while Nkanu-East has the highest computers (1,359). Oji-River records the lowest in classrooms (417) and computers (120) but Igbo-Etiti has the lowest in libraries (18) while Enugu-East record the lowest in sports fields (46).

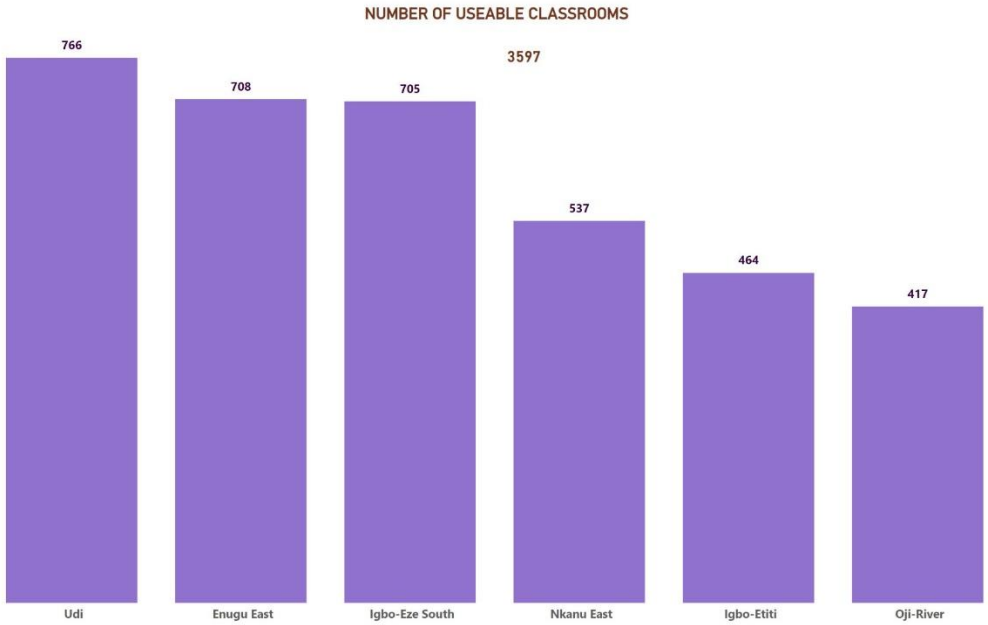

Figure 40: Number of Useable Classrooms by LGA

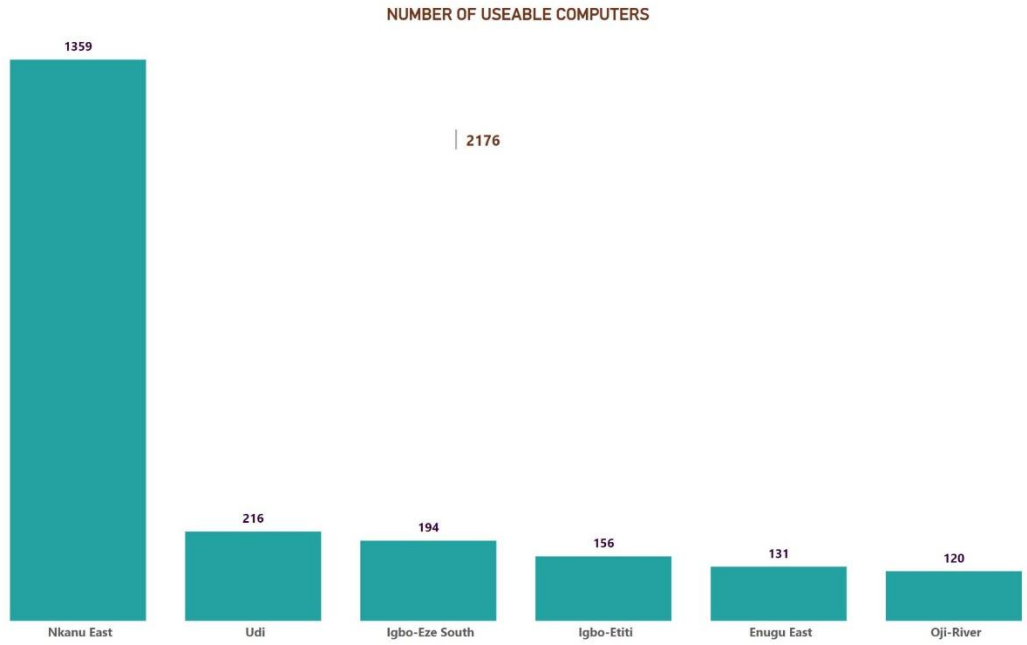

Figure 41: Number of Useable Computers by LGA

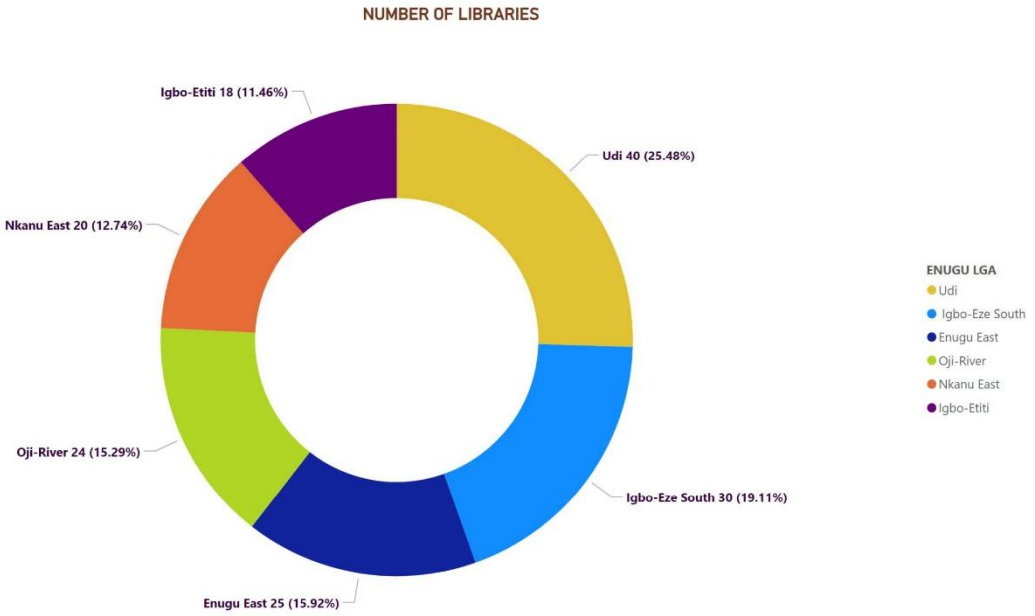

Figure 42: Number of Useable Libraries by LGA

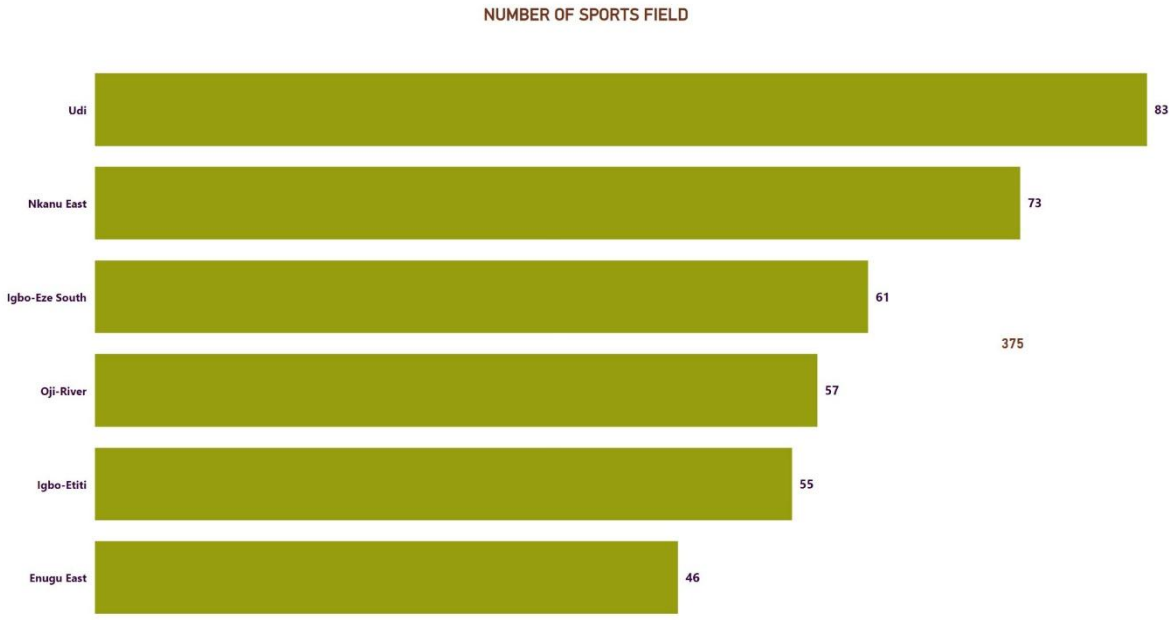

Figure 43: Number of Useable Sports fields by LGA

4.4. KATSINA STATE

Schools

The Katsina State school mapping exercise surveyed a total of 744 schools. Malumfashi (140), Funtua (130), and Katsina (95) LGAs recorded the highest concentration of schools, while Daura LGA had the lowest with 68 schools. Most schools offer Pre-Primary & Primary schools (364), followed by Primary ony schools (232), with Pre-Primary only and Primary & JSS schools being the least (5). The majority of schools are located in rural areas (528), compared to 216 in urban areas. Public schools dominate the system with 689 schools, while 55 schools are private.

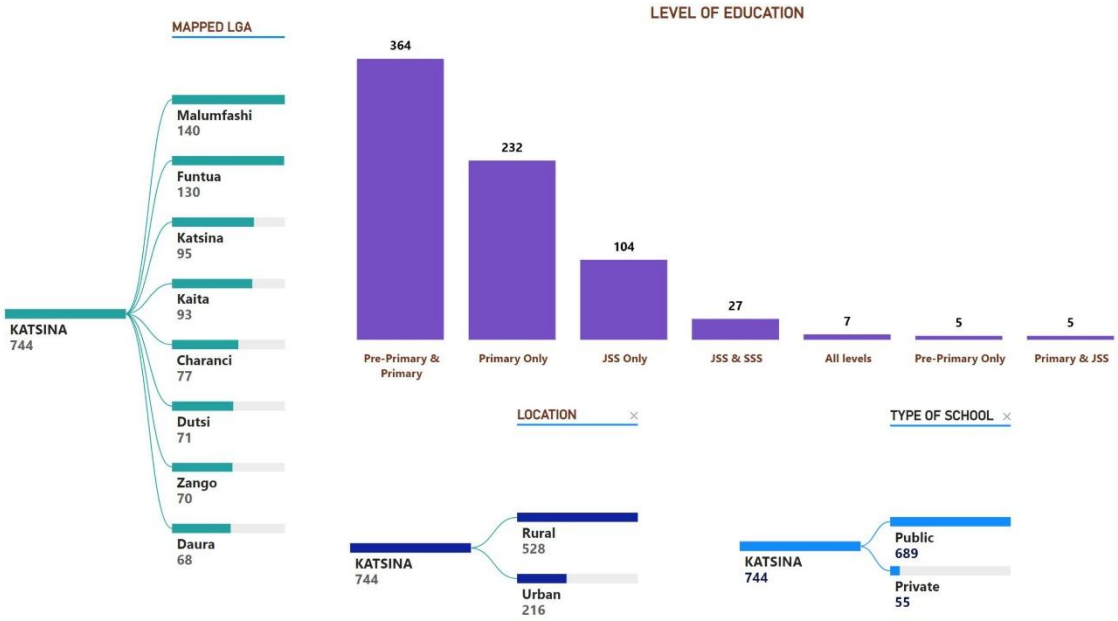

Figure 44: School Distribution by Education Level.

Enrolment

Enrolment data indicate a near gender parity across all education levels. At the Pre-Primary Schools, enrolment is almost equal, with 28,691 male and 29,507 female. A similar pattern is observed in primary schools (264,862 male and 278,853 female), Junior Secondary Schools (76,413 male and 80,651 female), and Senior Secondary Schools (8,649 male and 11,301 female) with the widest gender gap observed at the senior secondary level.

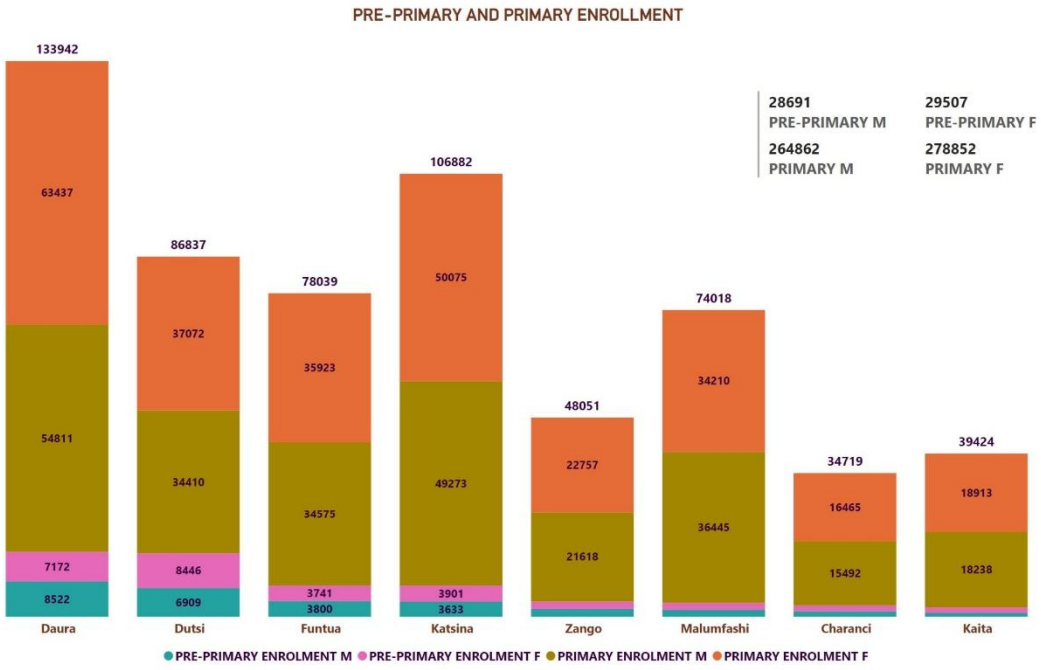

Figure 45: Student Enrolment Distribution by LGA

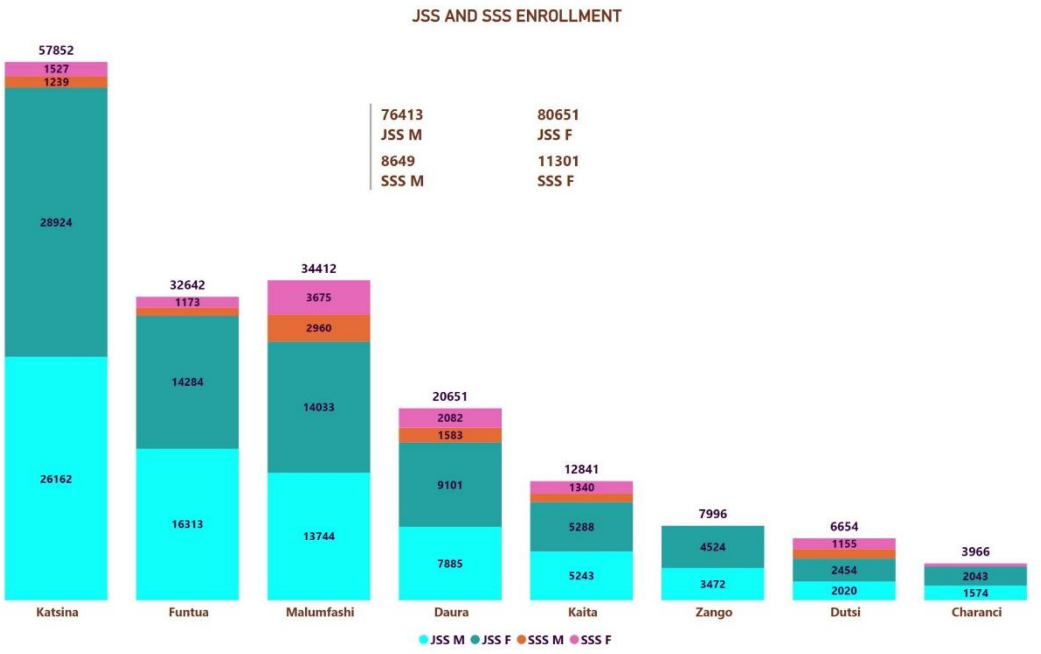

Figure 46: Student Enrolment Distribution by Level

Teachers

Teacher deployment shows notable gender disparities across education levels. Female teachers slightly outnumber male at the pre-primary level (1,303 female compared to 1,013 male). However, male teachers are more prevalent at the primary (3,667 male; 3,311 female), JSS (2,062 male; 1,045 female), and SSS (314 male; 100 female) levels, with the widest gender gap observed at the JSS level. Across all levels, teachers with disabilities comprise 70 male and 42 female.

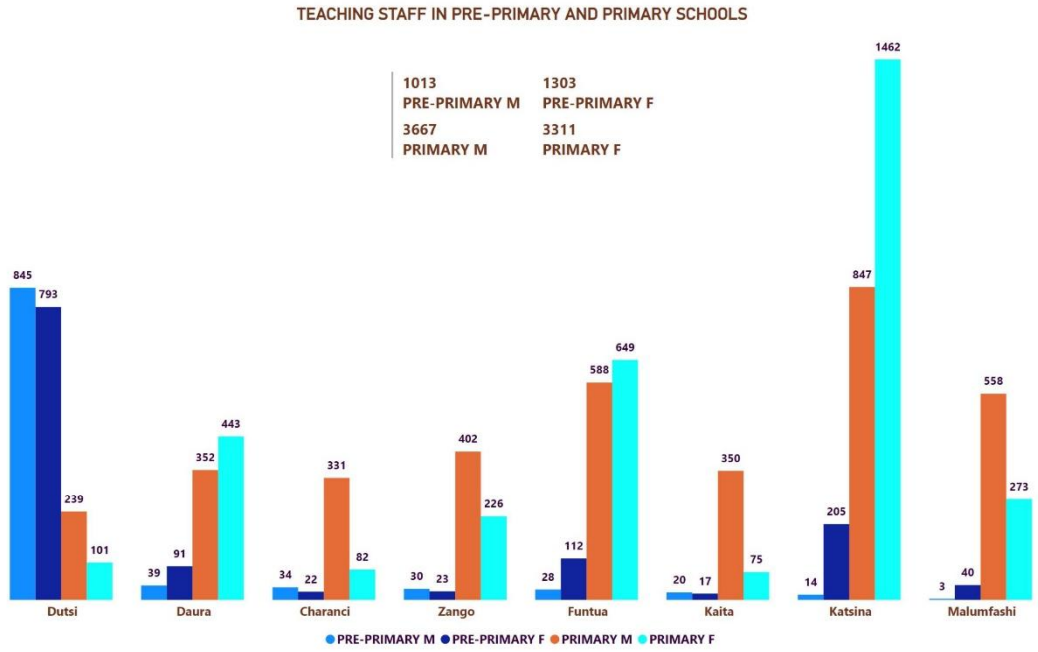

Figure 47: Staffing in Pre-Primary and Primary School by LGA

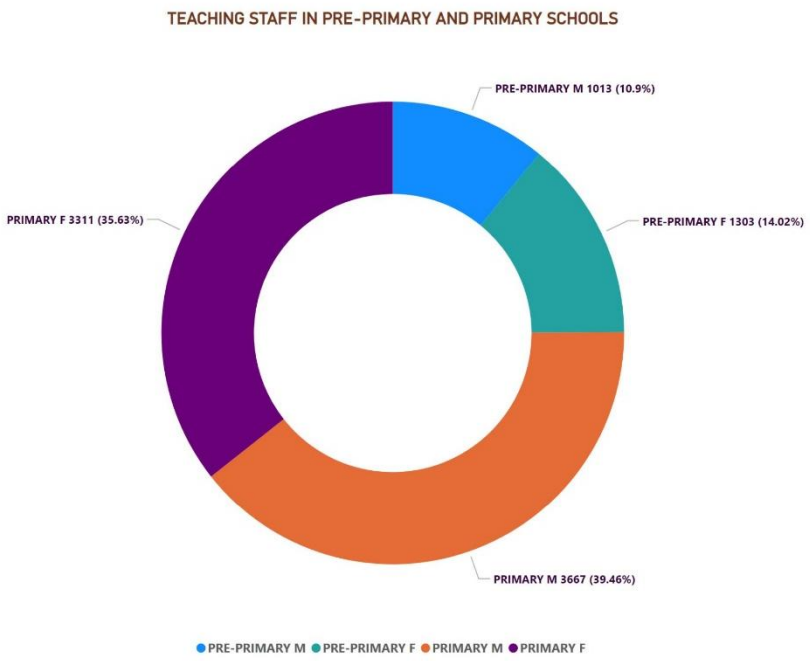

Figure 48: Staffing in Pre-Primary and Primary School by Education Level

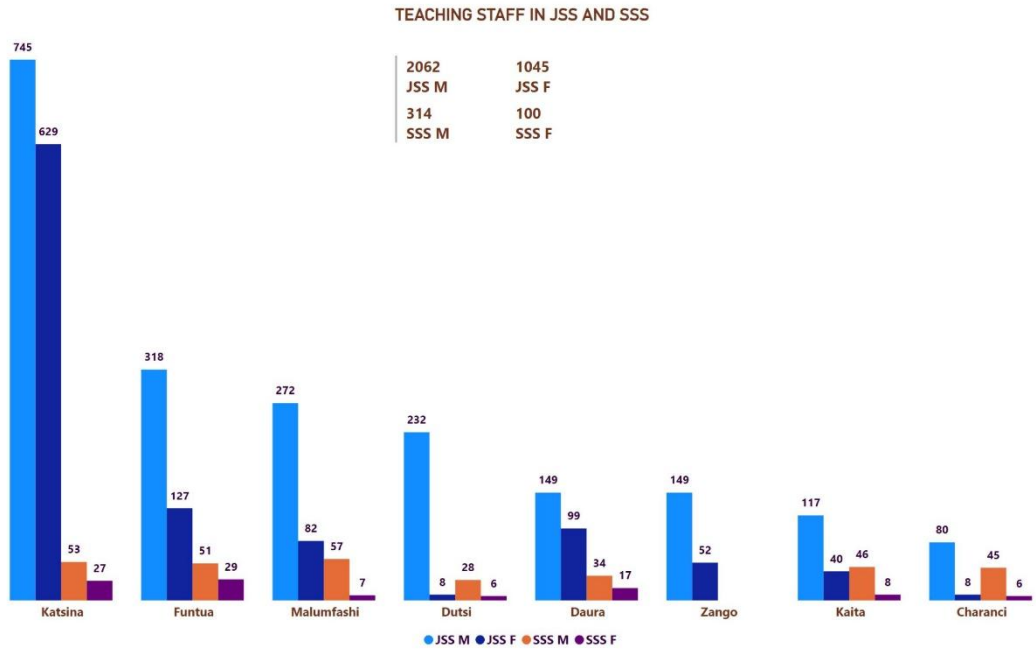

Figure 49: Teaching Staff in JSS and SSS

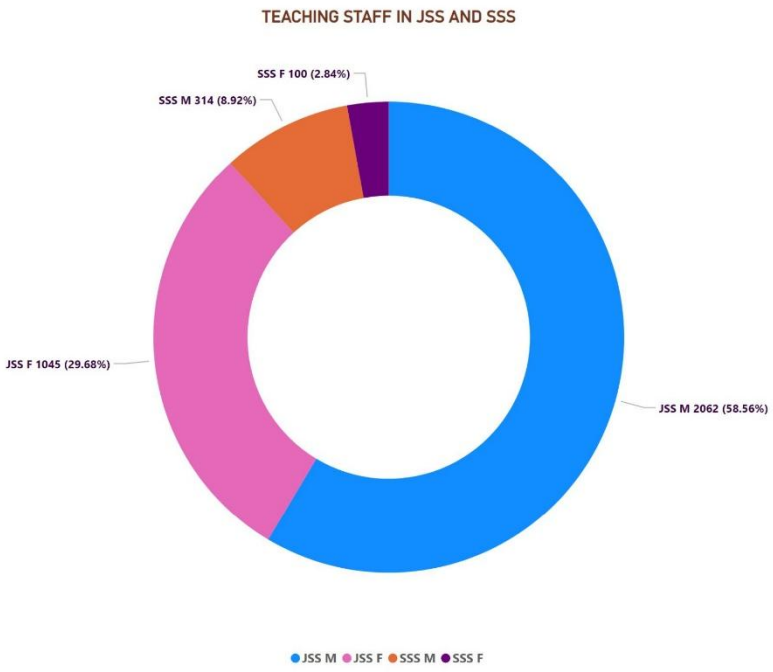

Figure 50: Percentage of Teaching Staff in JSS and SSS

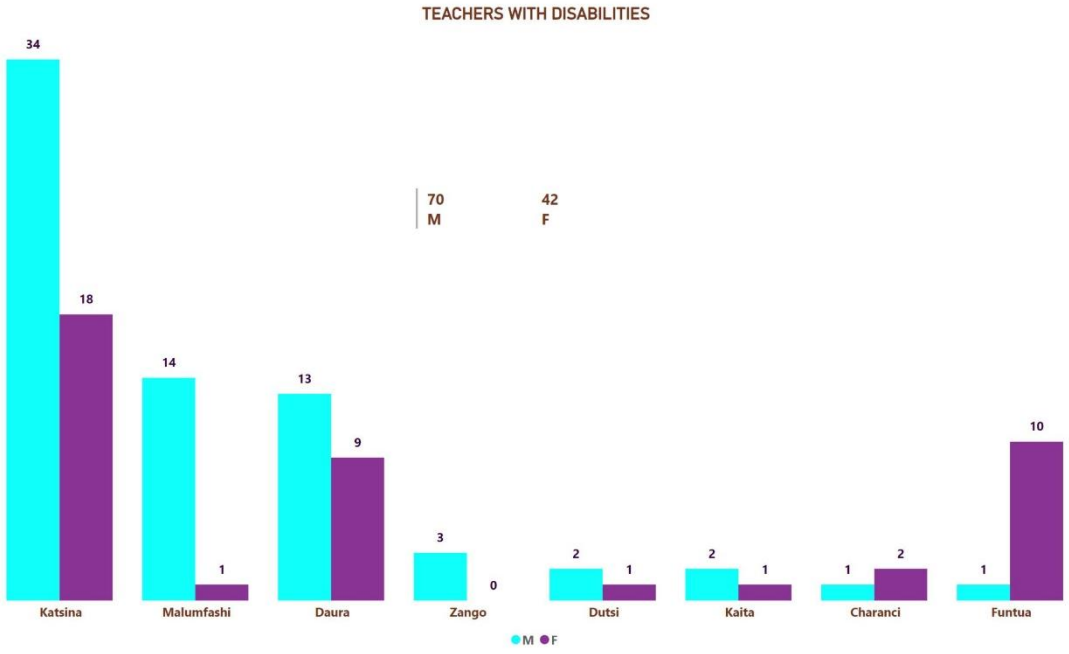

Figure 51: Teaching Staff with Disabilities in JSS and SSS

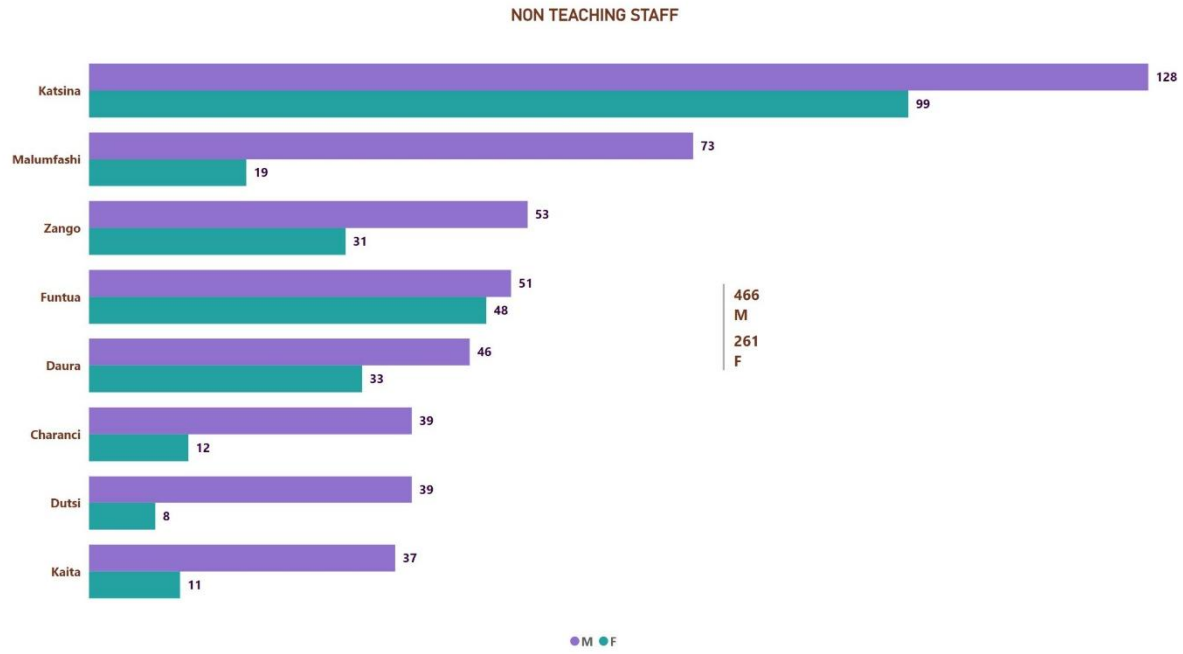

Figure 52: Non-Teaching Staff by LGA

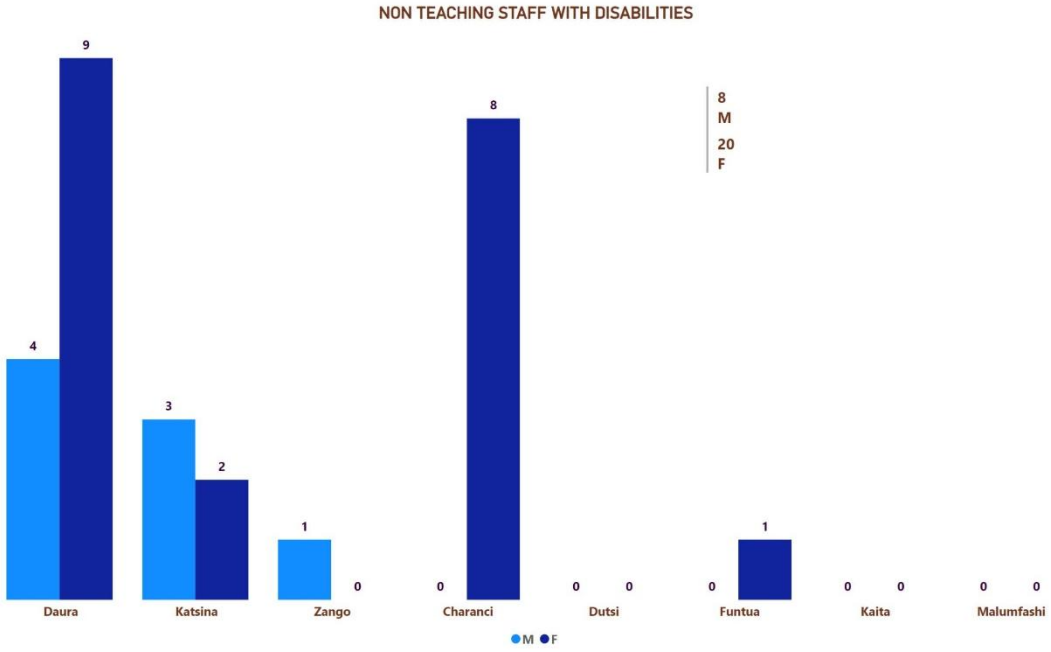

Figure 53: Non-Teaching Staff with Disabilities in JSS and SSS

Facilities

School usable facilities include 6,095 classrooms, 1,268 computers, 156 libraries, and 517 sports fields. Malumfashi records the highest availability of libraries (40) and sporting field (106) while Katsina has the highest classrooms (1,530) and Daura having the highest computers (314). Dutsi records the lowest in sporting field (39) and computers (15) but Kaita records the lowest in classroom (478) while Charanci has the lowest in libraries (9).

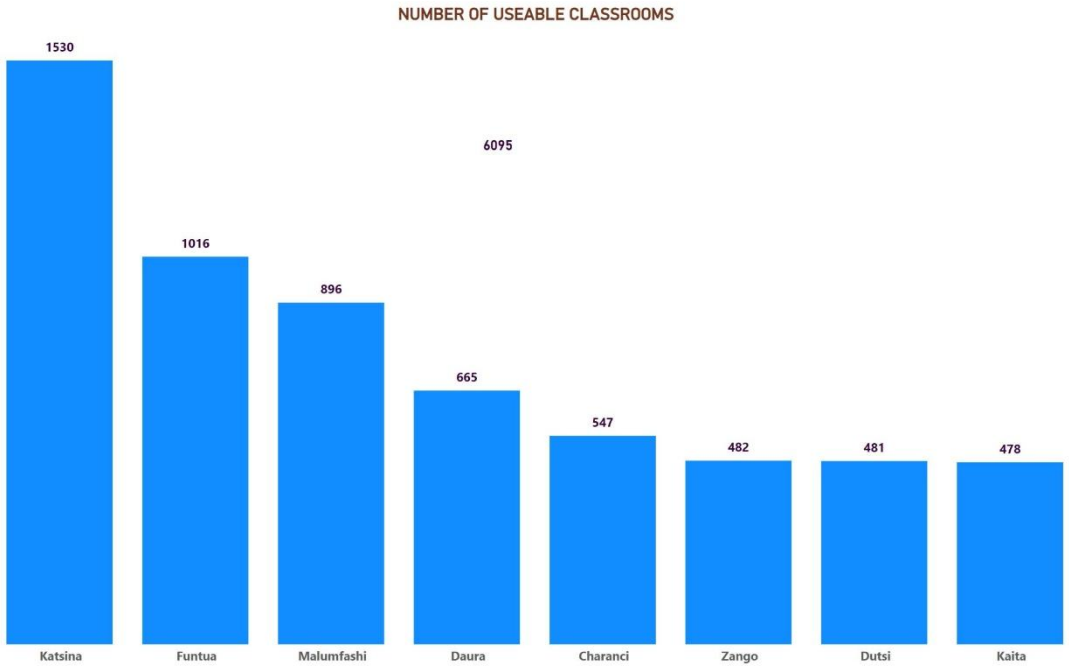

Figure 54: Number of Useable Classrooms by LGA

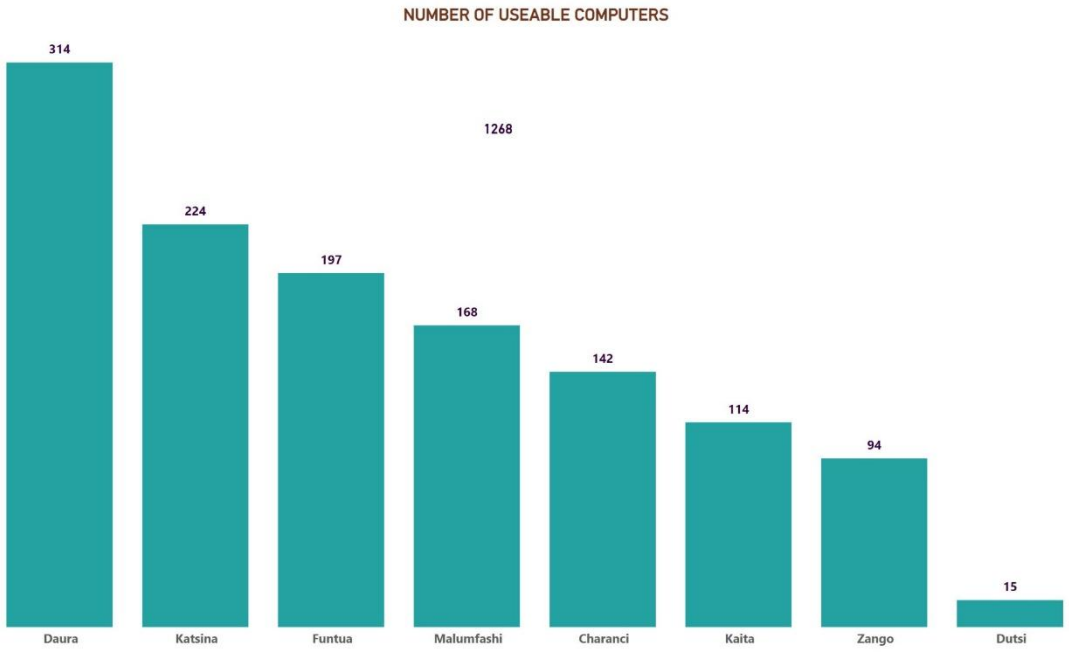

Figure 55: Number of Useable Computers by LGA

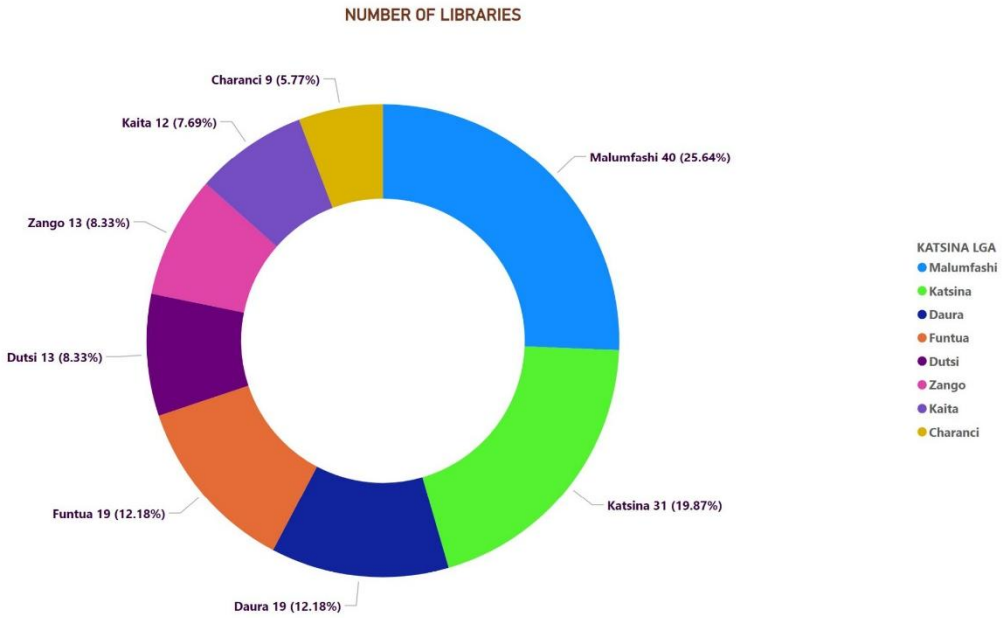

Figure 56: Number of Useable Libraries by LGA

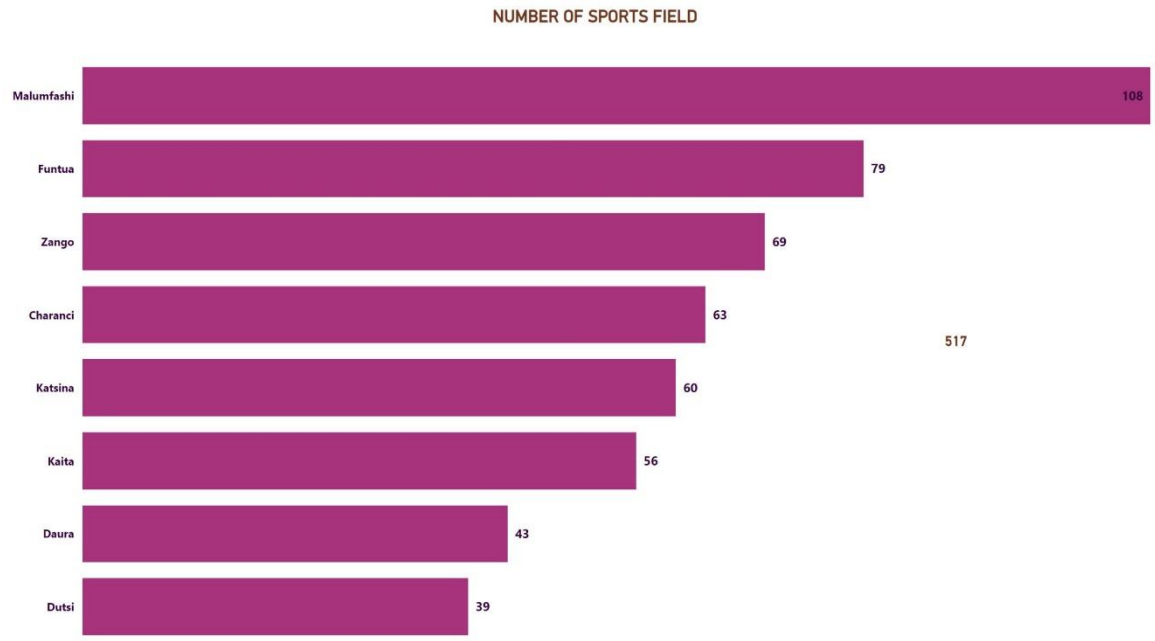

Figure 57: Number of Useable Sports fields by LGA

4.5. Oyo State

Schools

The Oyo State school mapping exercise surveyed a total of 992 schools. Ibadan South West (143), Ibadan North West (124), and Ibadan North (123) LGAs recorded the highest concentration of schools, while Ogbomosho South LGA had the lowest with 59 schools. Most schools offer Pre-Primary & Primary schools (697), followed by JSS & SSS schools (182), with Pre-Primary only schools being the least (1). The majority of schools are located in urban areas (730), compared to 262 in rurals areas. Public schools dominate the system with 887 schools, while 105 schools are private.

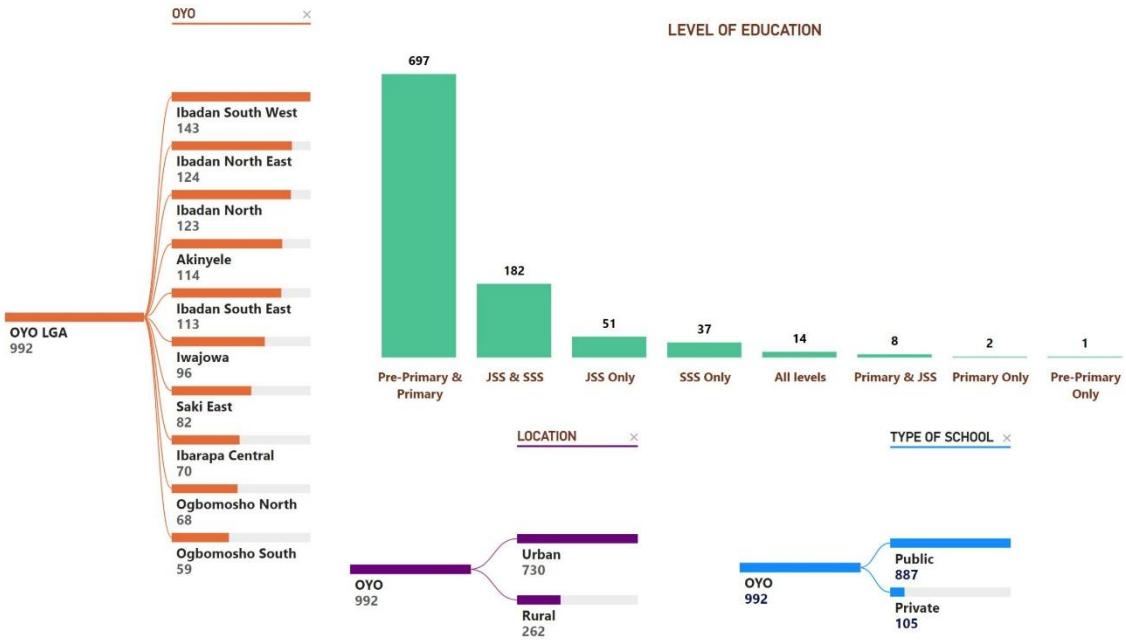

Figure 58: School Distribution by Education Level.

Enrolment

Enrolment data indicate a generally balanced gender distribution across all education levels, with modest variations between male and female. Although enrolment differences exist, most notably at the primary level but the gaps remain relatively small in proportion to total enrolment and do not indicate significant gender imbalance. Pre-Primary Schools (46,982 male and 53,992 female), Primary

Schools (234,413 male and 242,993 female), Junior Secondary Schools (41,137 male and 42,871 female), and Senior Secondary Schools (40,907 male and 37,036 female).

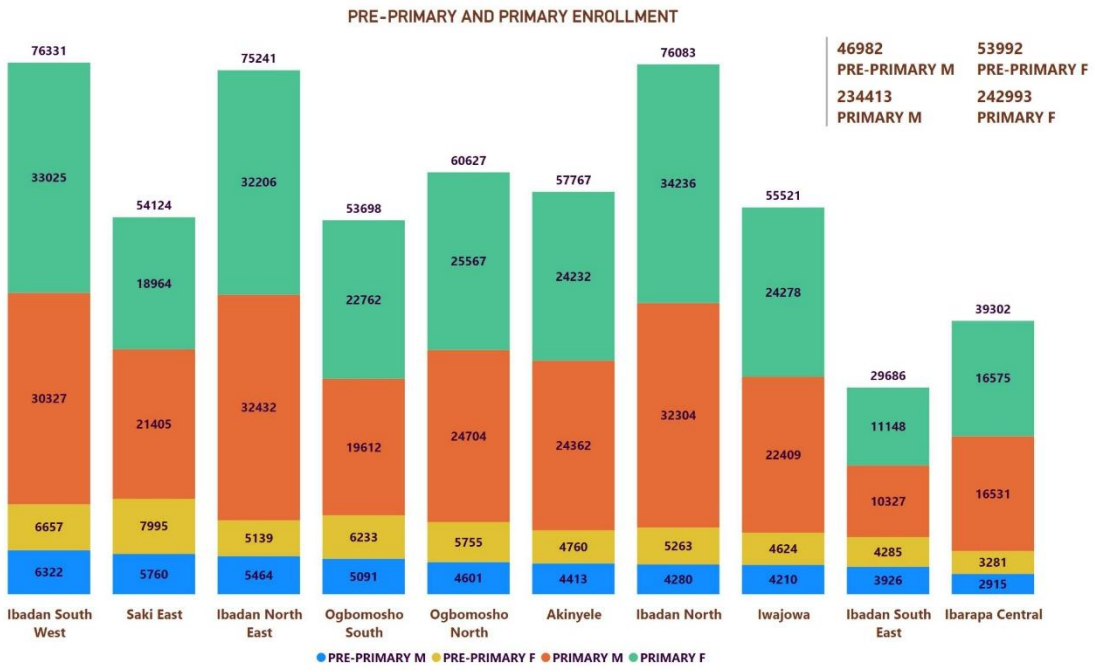

Figure 59: Student Enrolment Distribution by LGA

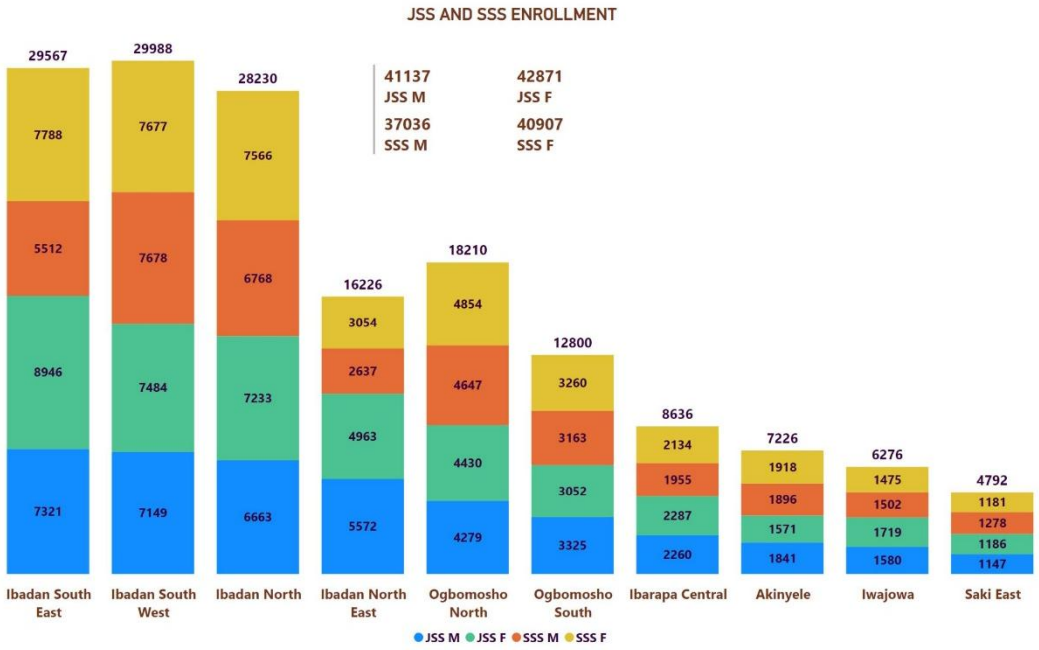

Figure 60: Student Enrolment Distribution by Level

Teachers

Teacher deployment shows notable gender disparities across education levels. Female teachers dominate at the Pre-primary (974 female and 71 male), Primary (3,660 female and 1,379 male), JSS (2,799 female and 1,938 male) and SSS (2,473 female and 2,034 male) levels with the widest gender gap observed at the Primary level. Across all levels, teachers with disabilities comprise 118 male and 144 female.

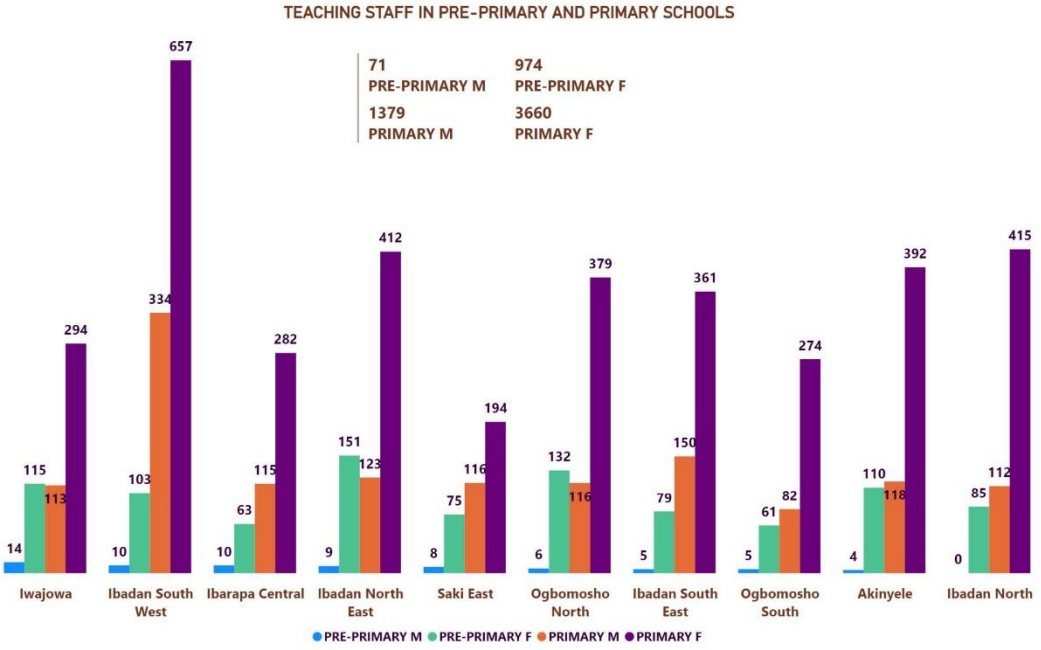

Figure 61: Staffing in Pre-Primary and Primary School by LGA

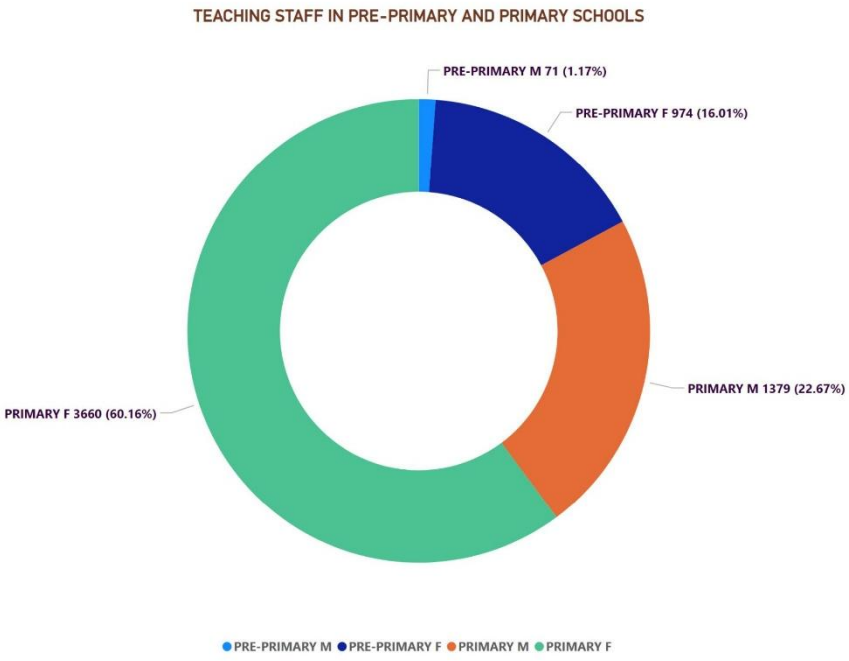

Figure 62: Staffing in Pre-Primary and Primary School by Education Level

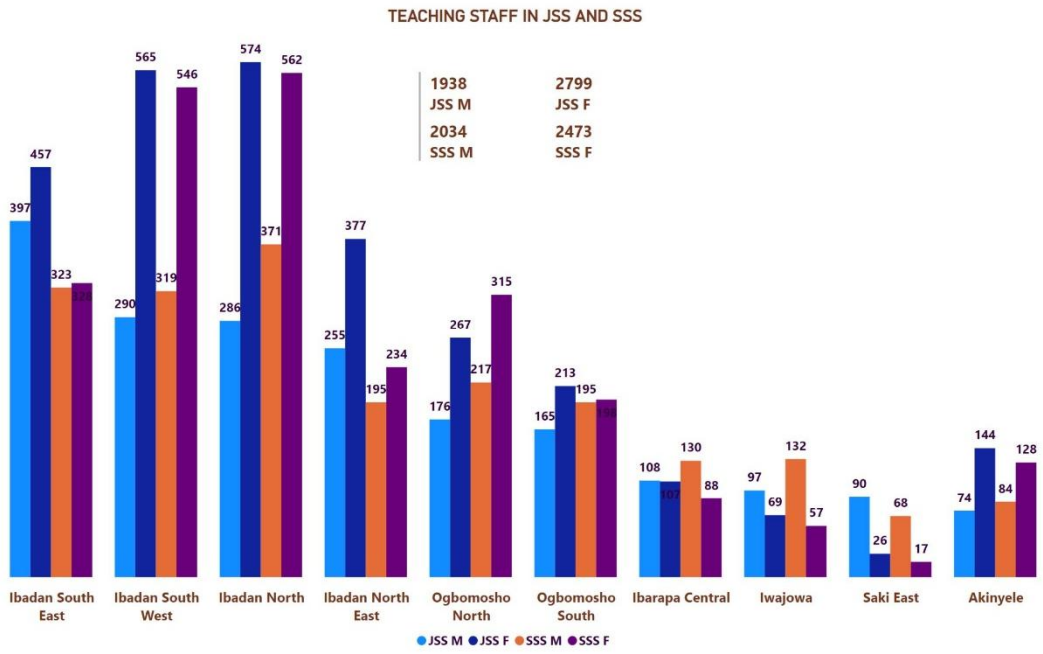

Figure 63: Teaching Staff in JSS and SSS

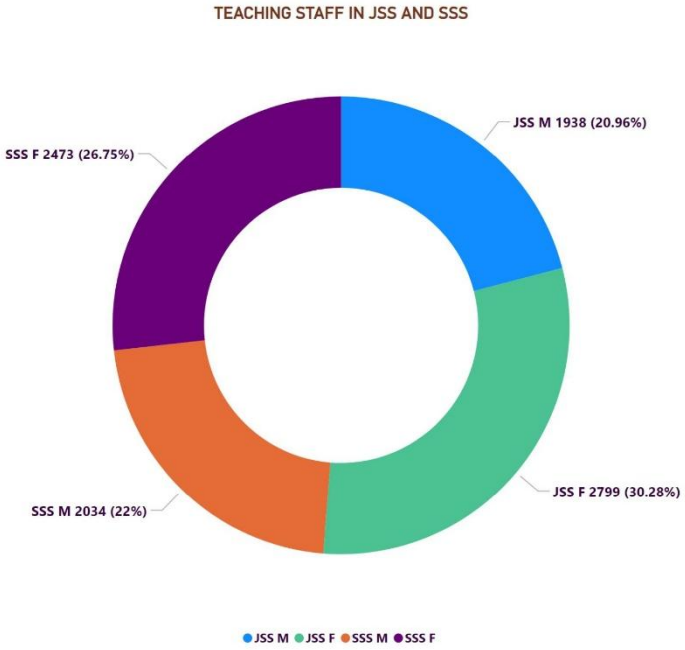

Figure 64: Percentage of Teaching Staff in JSS and SSS

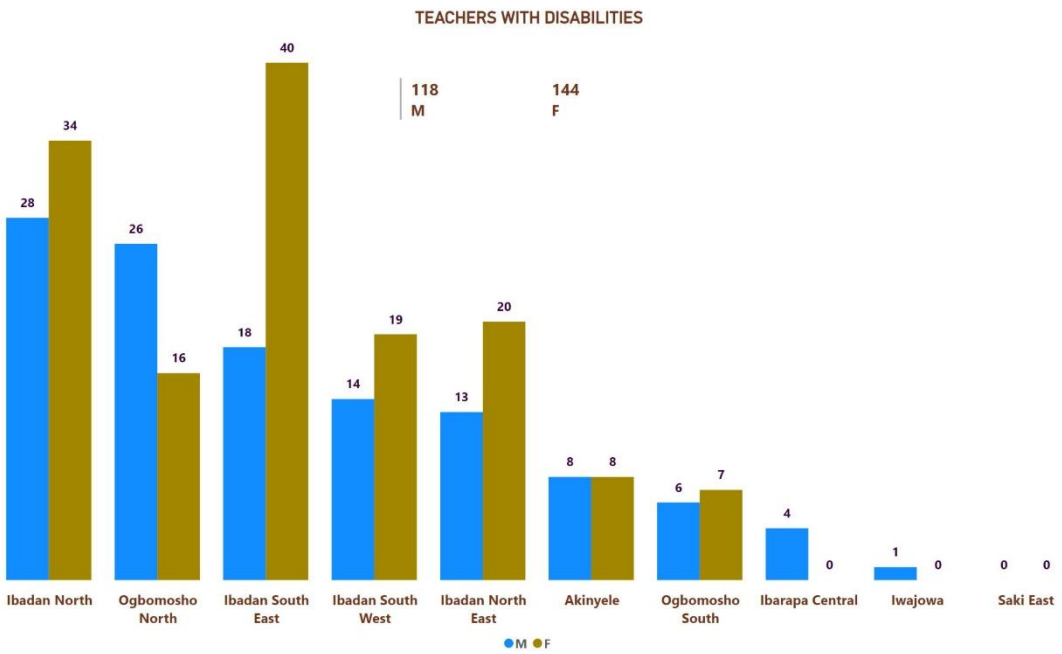

Figure 65: Teaching Staff with Disabilities in JSS and SSS

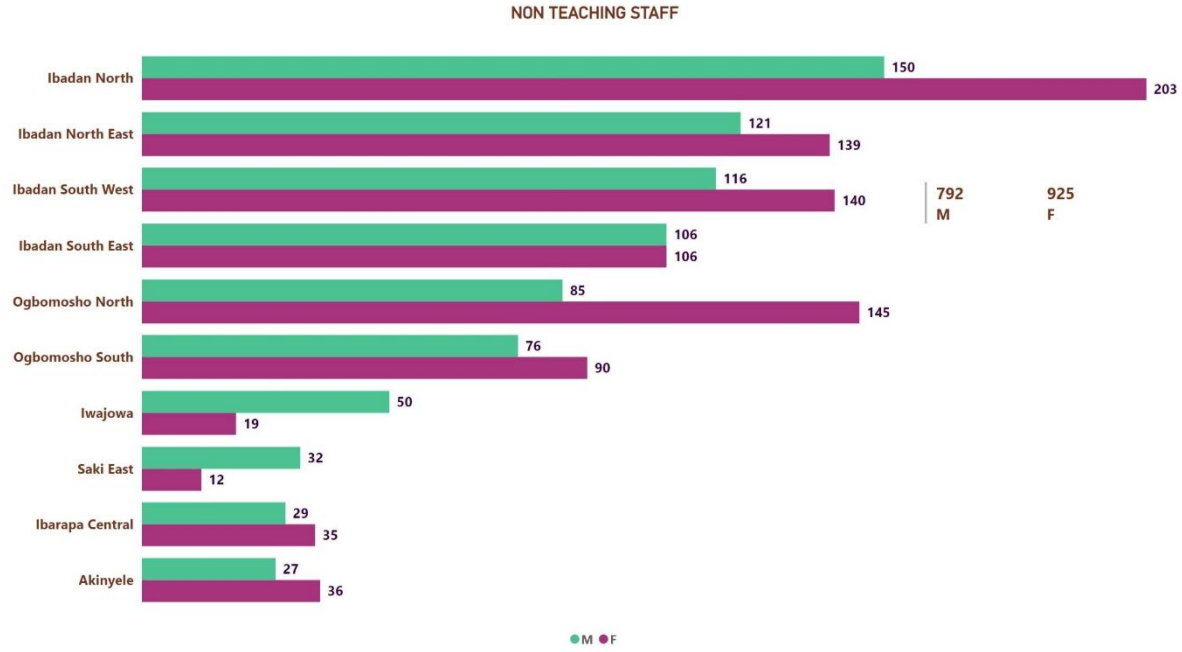

Figure 66: Non-Teaching Staff by LGA

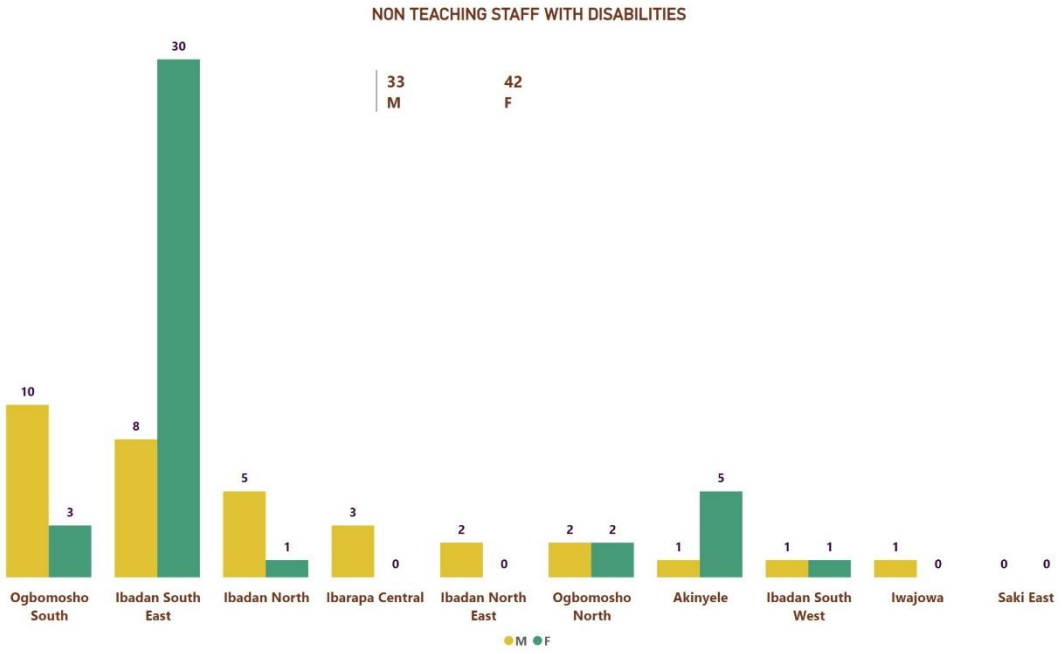

Figure 67: Non-Teaching Staff with Disabilities in JSS and SSS

Facilities

School useable facilities include 7,231 classrooms, 1,857 computers, 248 libraries, and 622 sports fields. Ibadan South West records the highest availability of classrooms (1,176), computers (489), libraries (50), a distribution shared with Ibadan North, which records the same figures and sports fields (95). At the lower end, Saki East records the lowest number of classrooms (331) and libraries (3). Akinyele and Ogbomosho South record the lowest availability of computers (37) and sports fields (24), respectively.

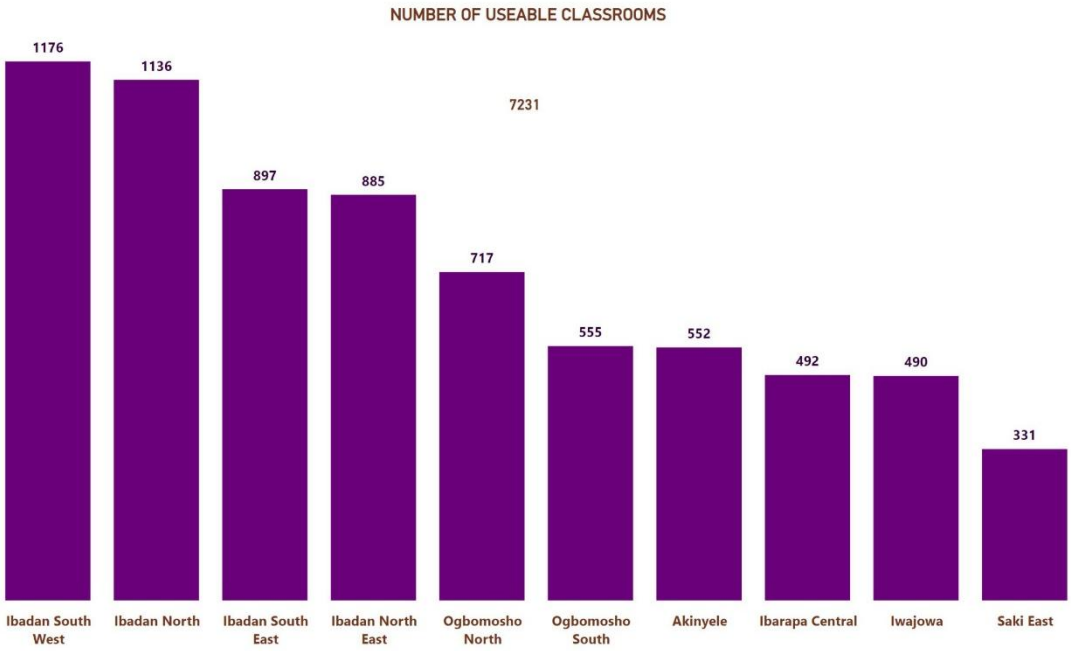

Figure 68: Number of Useable Classrooms by LGA

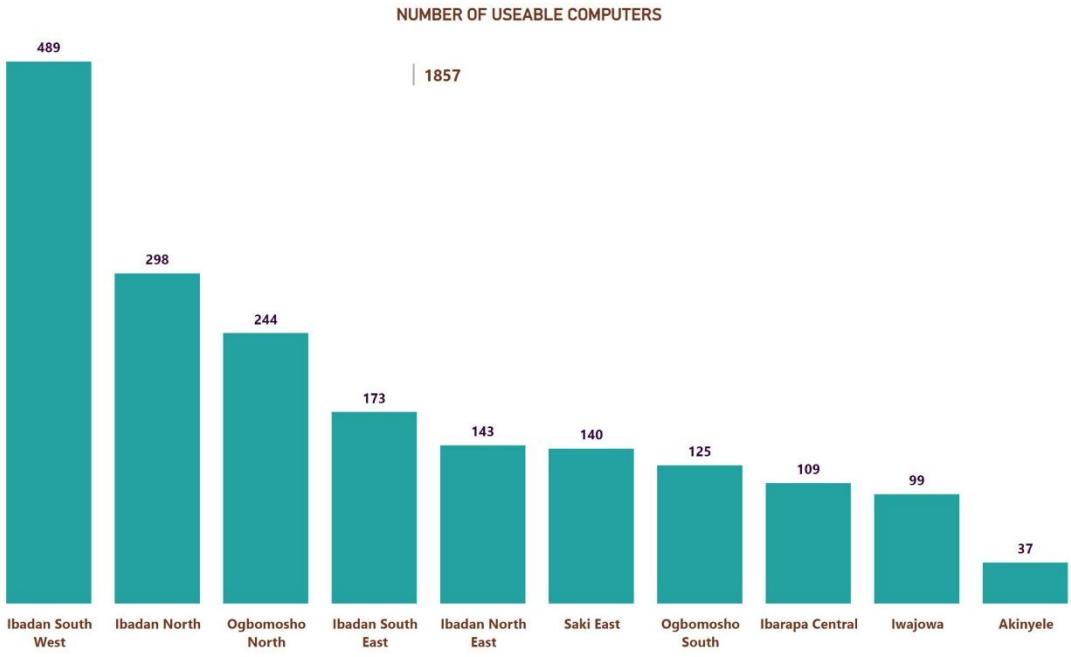

Figure 69: Number of Useable Computers by LGA

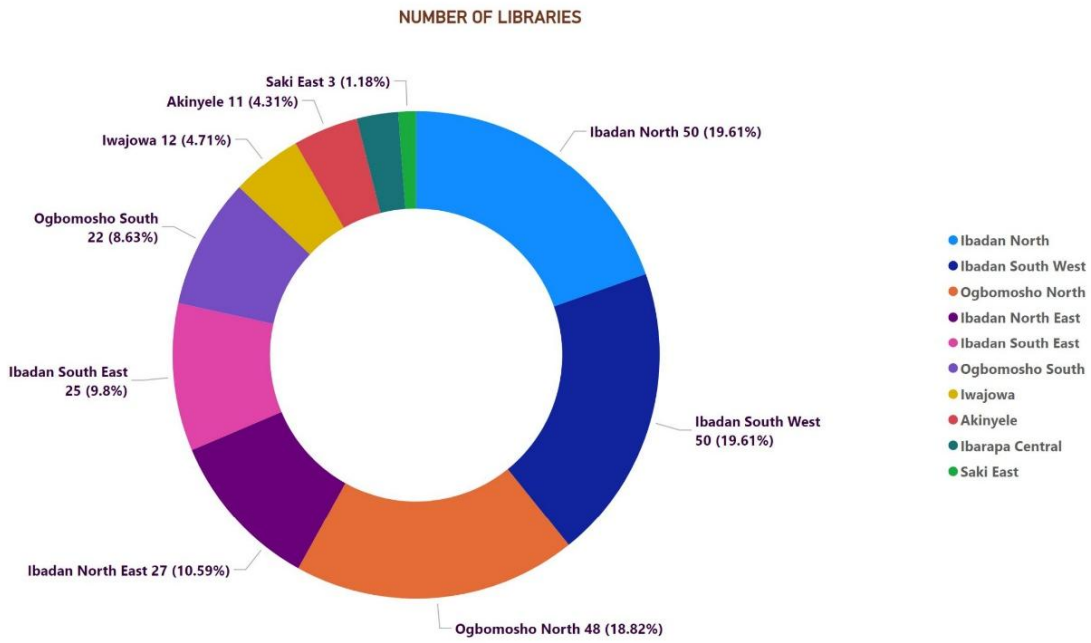

Figure 70: Number of Useable Libraries by LGA

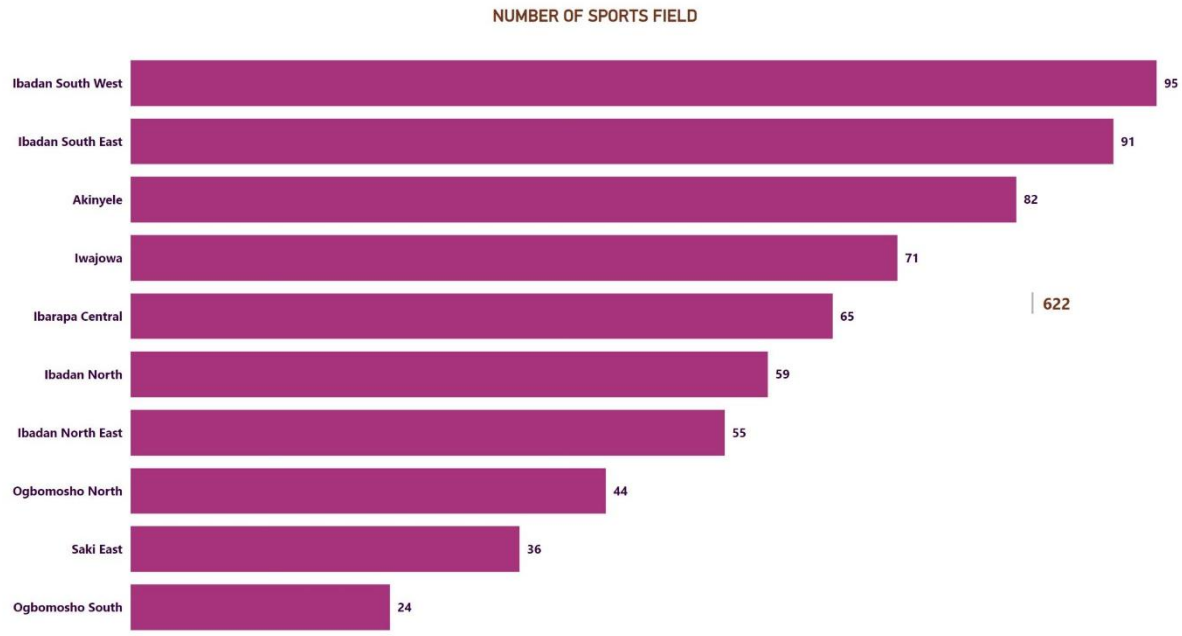

Figure 71: Number of Useable Sports fields by LGA

4.6 Plateau State

Schools

The Plateau State school mapping exercise surveyed a total of 900 schools. Kanam (204), Kanke (171), and Mikang (132) LGAs recorded the highest concentration of schools, while Barkin Ladi, Mangu and Shendam LGA had the lowest with 1 school each. Most schools offer Primary only schools (489), followed by Pre-Primary & Primary schools (269), and schools with all levels being the least (6). The majority of schools are located in rural areas (757), compared to 143 in urban areas. Public schools dominate the system with 843 schools, while 57 schools are private.

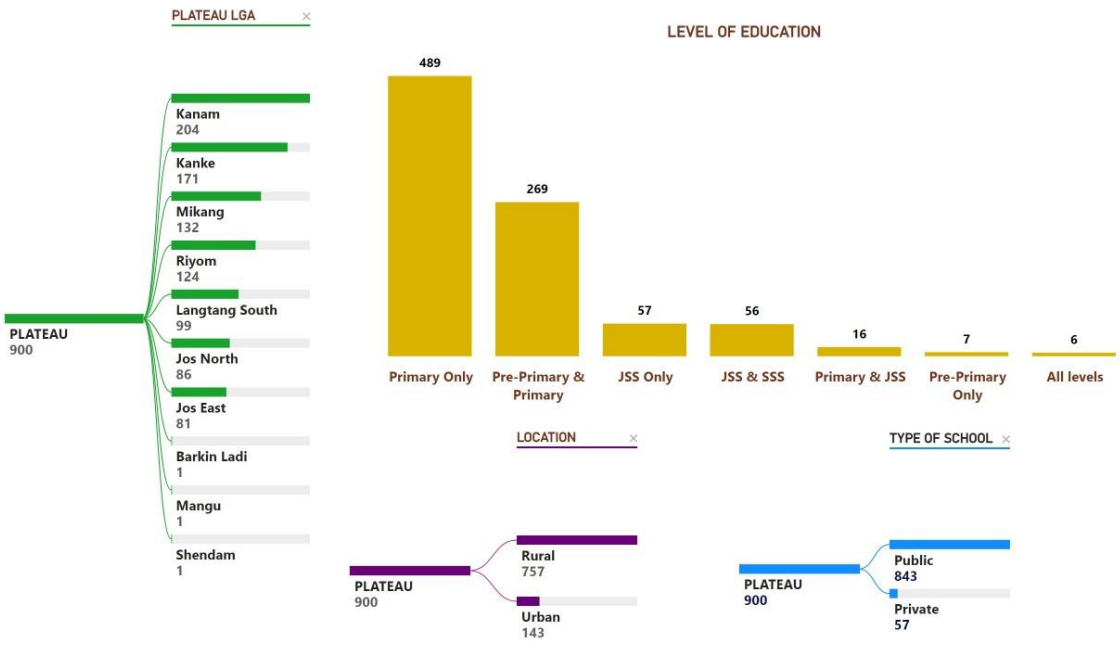

Figure 72: School Distribution by Education Level.

Enrolment

Enrolment data indicate a near gender parity across all education levels. At the pre-primary level, enrolment is almost equal, with 9083 male and 9354 female. A similar pattern is observed in primary schools (76,782 male and 77,727 female), Junior Secondary Schools (10,803 male and 11,544 female), and Senior Secondary Schools (4,560 male and 4,592 female) with the widest gender gap observed at the primary level.

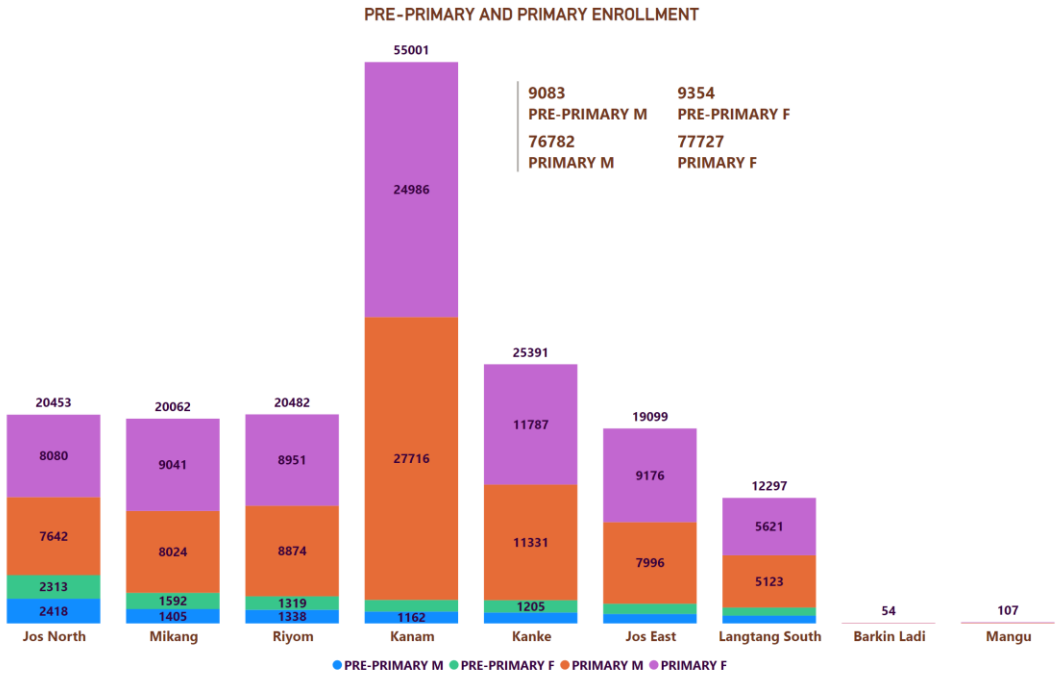

Figure 73: Student Enrolment Distribution by LGA

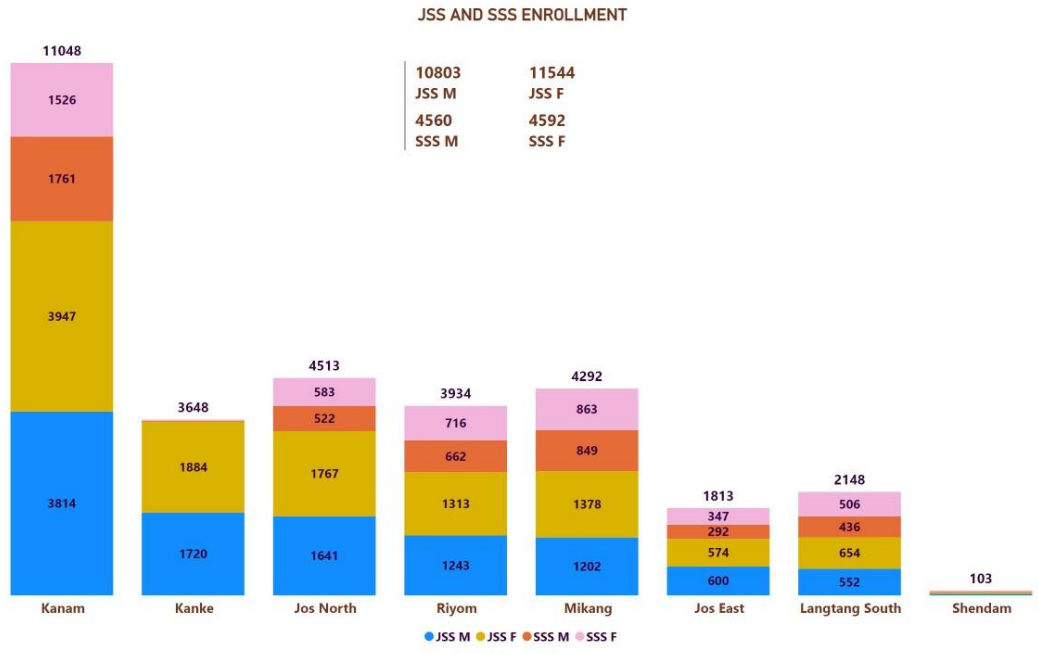

Figure 74: Student Enrolment Distribution by Level

Teachers

Teacher deployment shows notable gender disparities across all education levels. Female teachers slightly outnumber male at the pre-primary level (686 female compared to 224 male). However, male teachers are more prevalent at the primary (2,340 male; 2,222 female), JSS (583 male; 455 female), and SSS (304 male; 139 female) levels. Across all levels, teachers with disabilities comprise 31 male and 57 female.

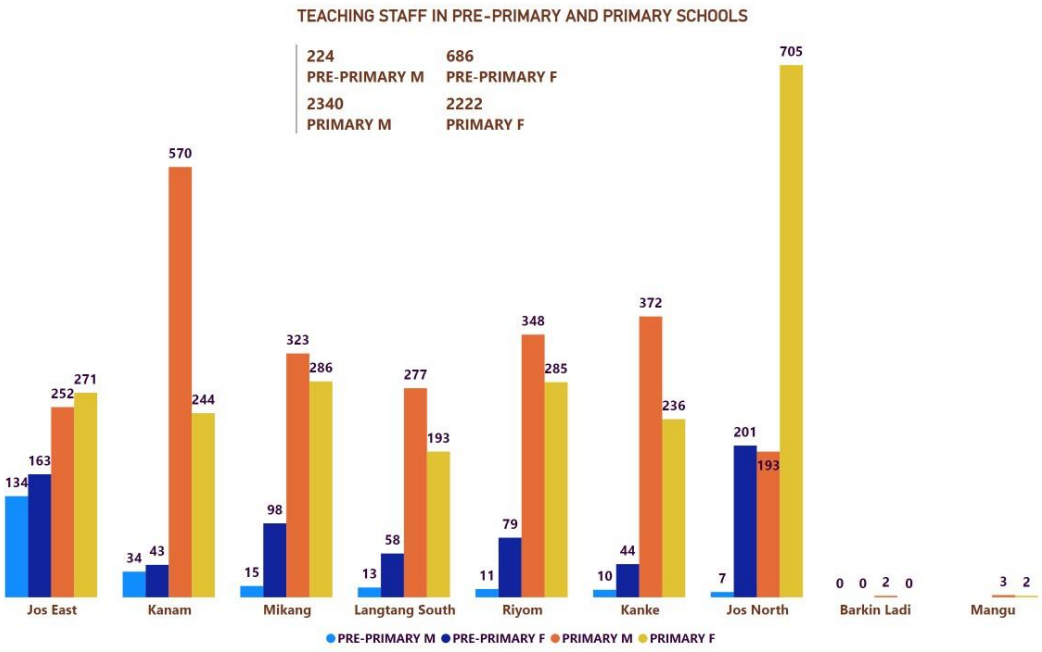

Figure 75: Staffing in Pre-Primary and Primary School by LGA

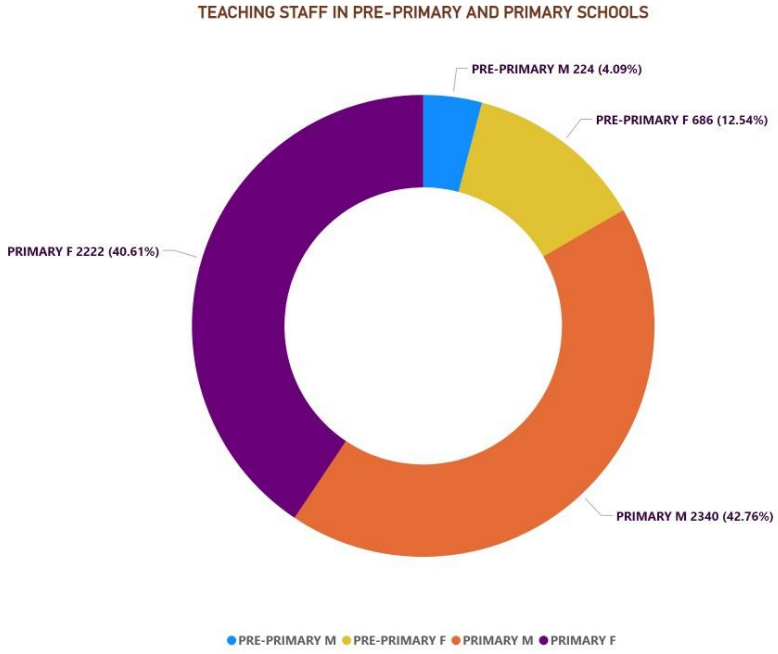

Figure 76: Staffing in Pre-Primary and Primary School by Education Level

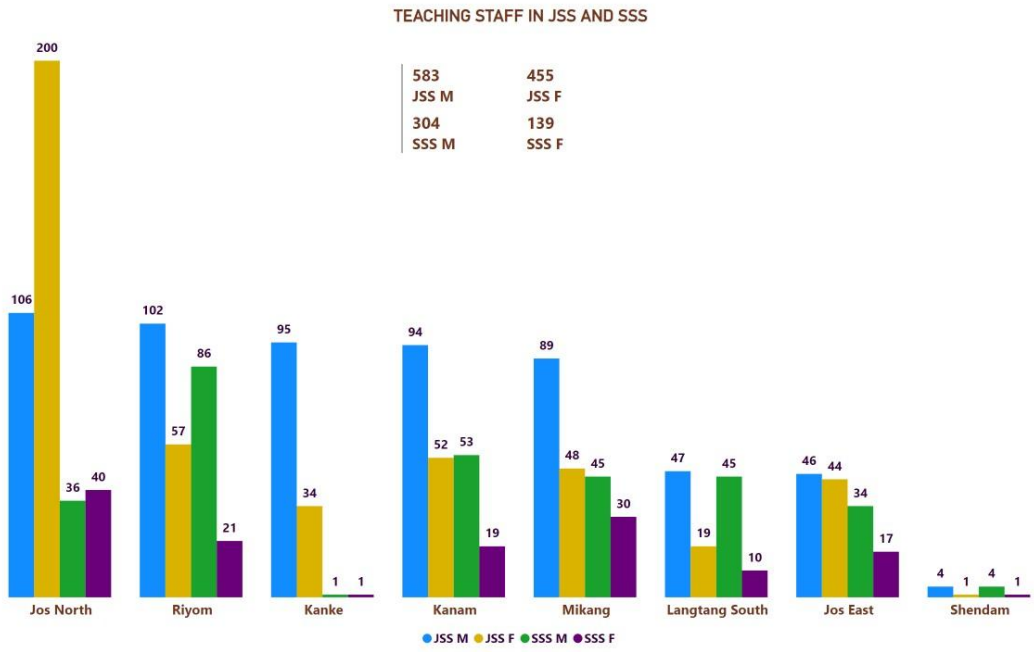

Figure 77: Teaching Staff in JSS and SSS

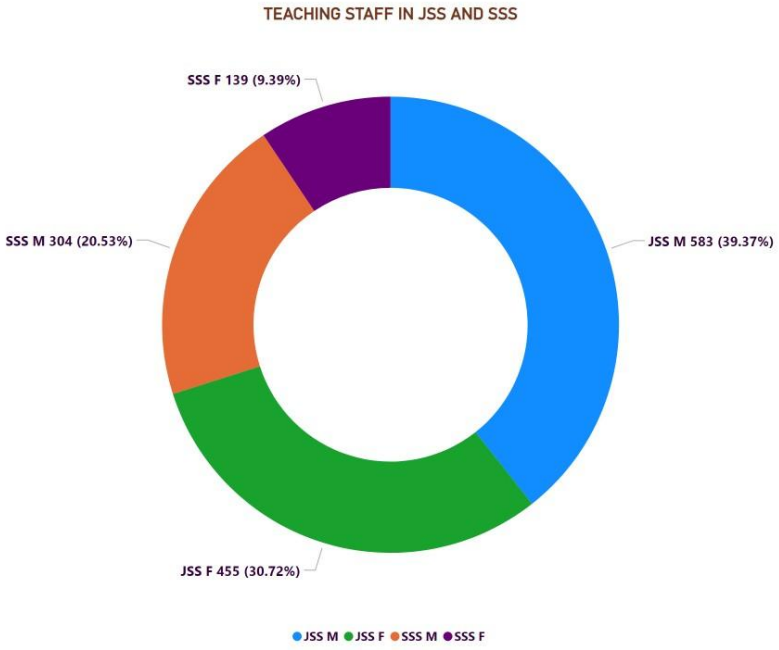

Figure 78: Percentage of Teaching Staff in JSS and SSS

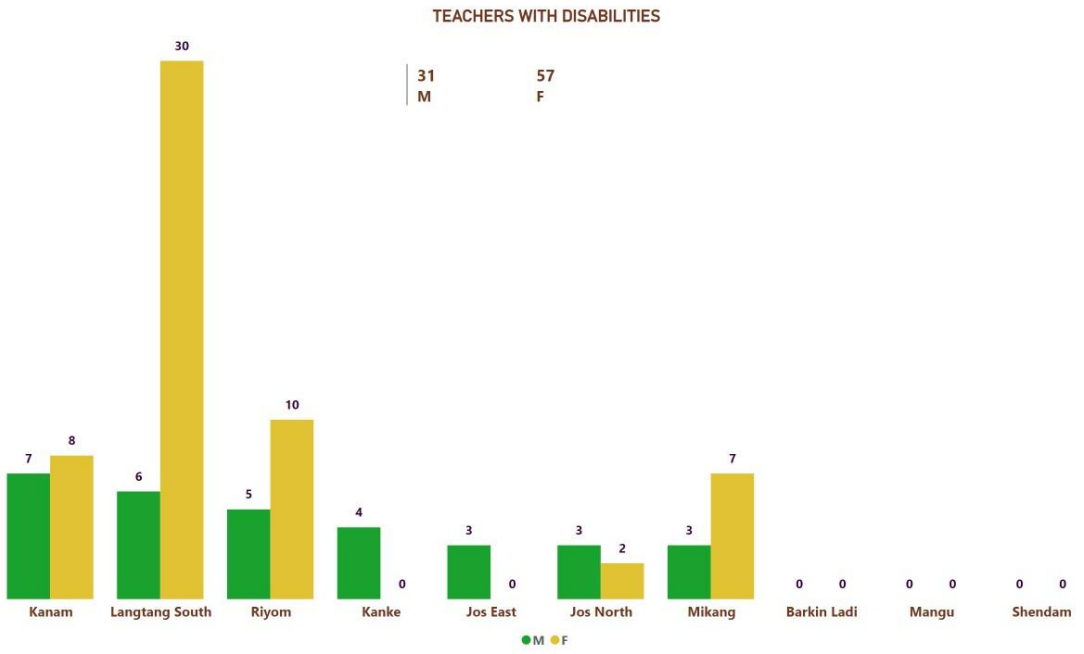

Figure 79: Teaching Staff with Disabilities in JSS and SSS

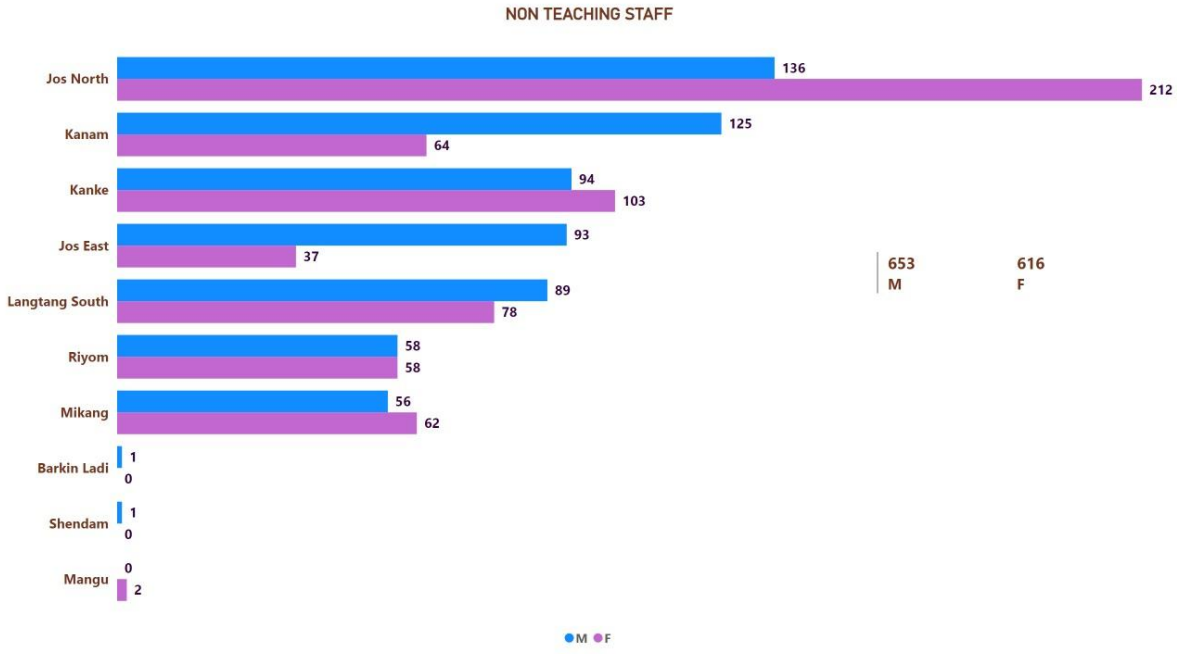

Figure 80: Non-Teaching Staff by LGA

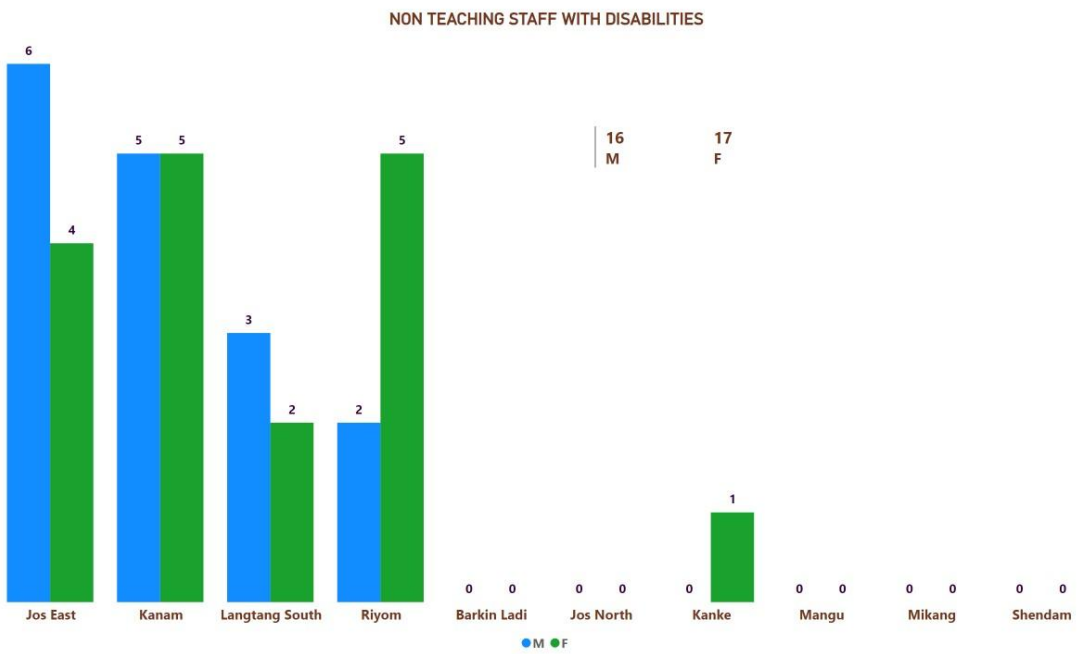

Figure 81: Non-Teaching Staff with Disabilities in JSS and SSS

Facilities

School usable facilities include 4,645 classrooms, 939 computers, 185 libraries, and 742 sports fields. Kanam records the highest availability of classrooms (850) and sports fields (187), while Jos North and Mikang record the highest numbers of computers (270) and libraries (49), respectively. At the lower end, Barkin Ladi and Mangu record the lowest availability of classrooms (2 each), computers (0), and sports fields (1 each). Shendam also records the lowest number of sports fields (1), while Langtang South has the lowest availability of libraries (9).

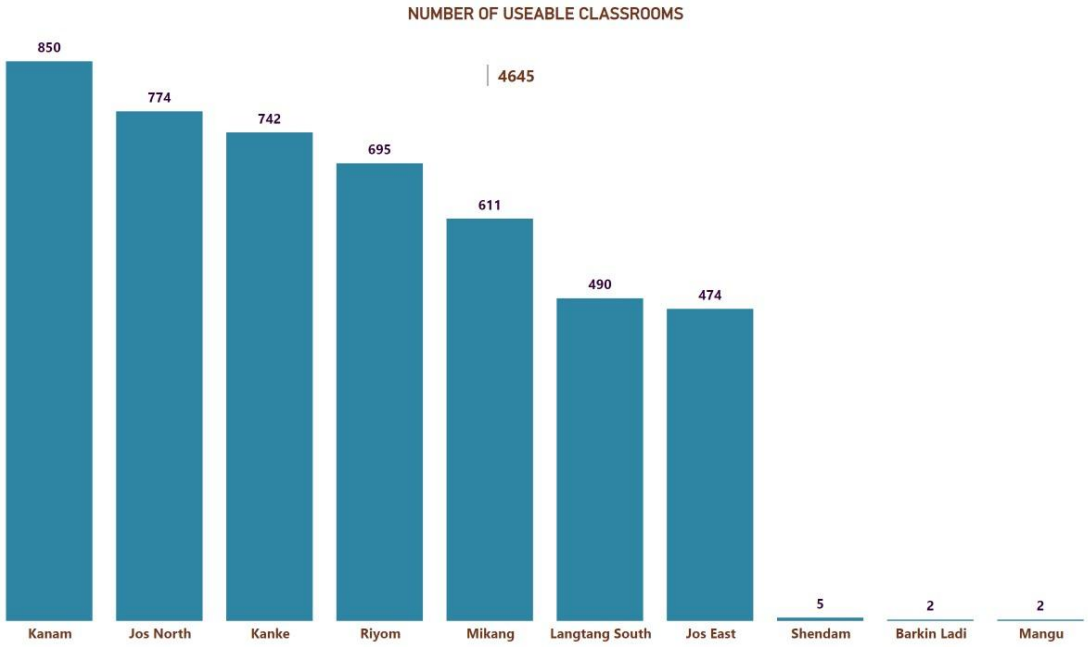

Figure 82: Number of Useable Classrooms by LGA

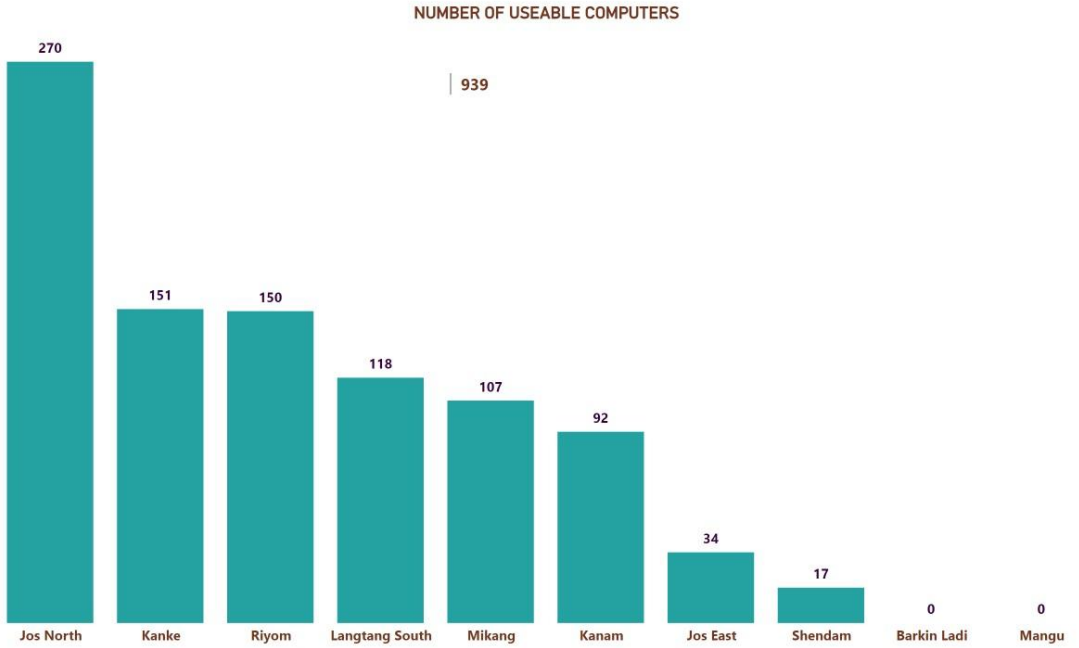

Figure 83: Number of Useable Computers by LGA

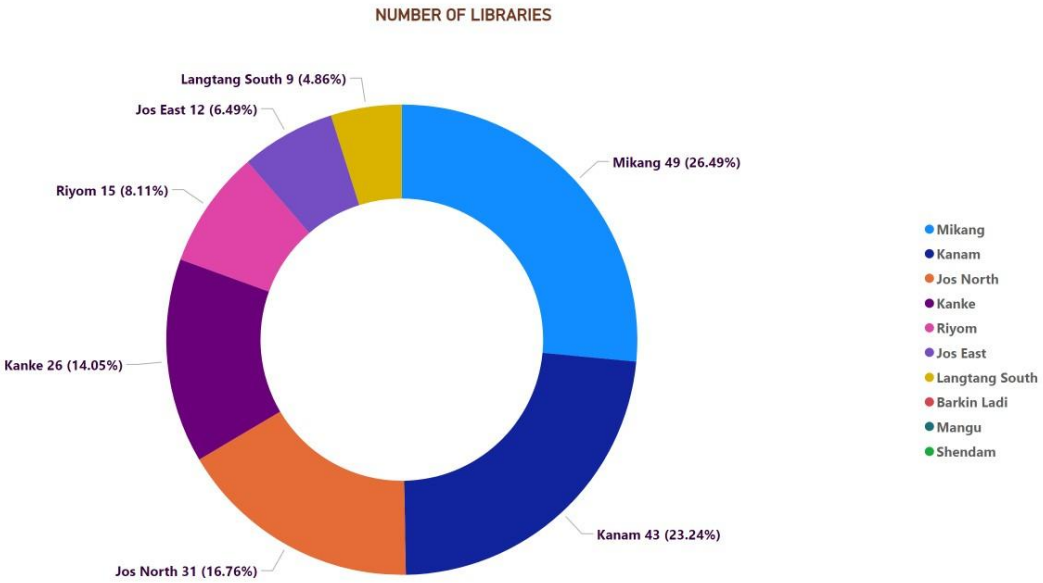

Figure 84: Number of Useable Libraries by LGA

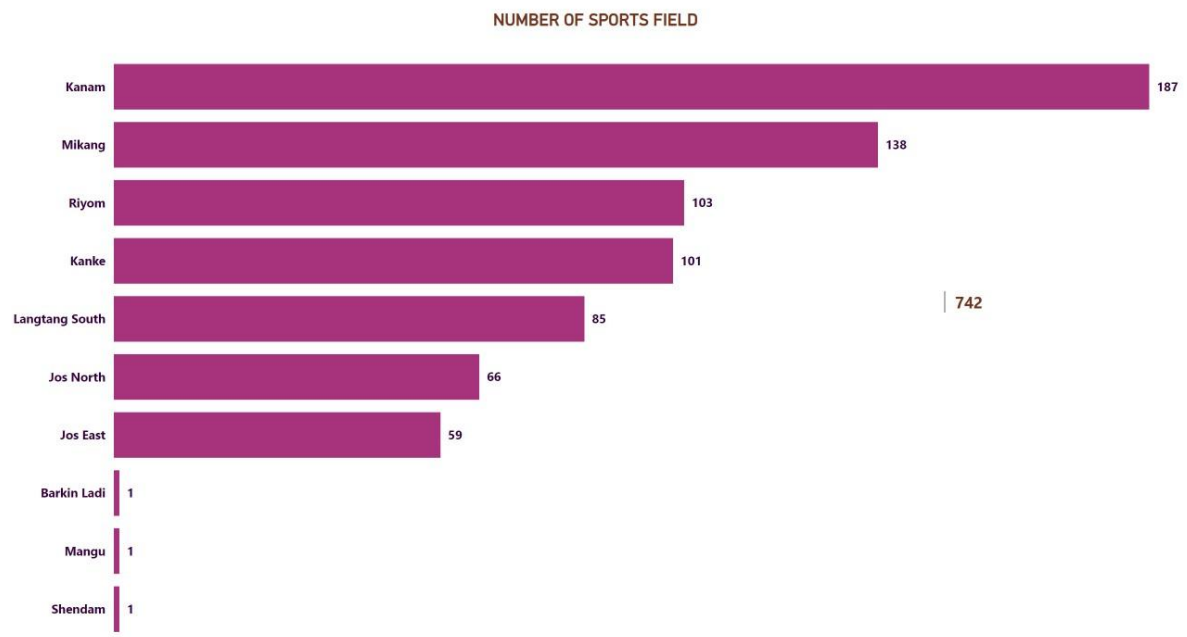

Figure 85: Number of Useable Sports fields by LGA

4.2 Spatial Clustering Results

The spatial clustering analysis examined the geographic distribution of 4,385 mapped schools across six (6) EISS focal states using a DBSCAN approach with a 5 km radius proximity threshold, revealing clear contrasts in settlement patterns and school density across states.

Overall, the analysis shows that school distribution is predominantly rural, with 2,593 schools (59%) located in rural areas and 1,792 schools (41%) in urban areas, though this balance varies sharply by state. Adamawa (965 schools) and Plateau (900 schools) are characterized by extensive rural dispersion, with over three-quarters of their schools located in rural communities, reflecting wide geographic spread and lower settlement density. Similarly, Enugu (452 schools) and Katsina (744 schools) display strong rural dominance, indicating that many schools are spatially isolated or form small, scattered clusters.

In contrast, Oyo State (992 schools) exhibits a predominantly urban pattern, with nearly three-quarters of schools located in urban areas, resulting in larger and denser clusters. Bayelsa State (332 schools) presents a more balanced distribution between urban and rural locations, though its riverine geography contributes to linear and fragmented clustering patterns rather than compact groupings.

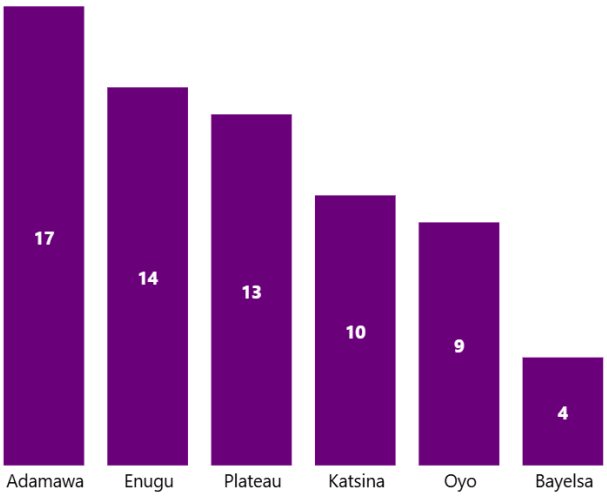

Figure 86: Number of Cluster of Schools by States

4.2.1. Adamawa State

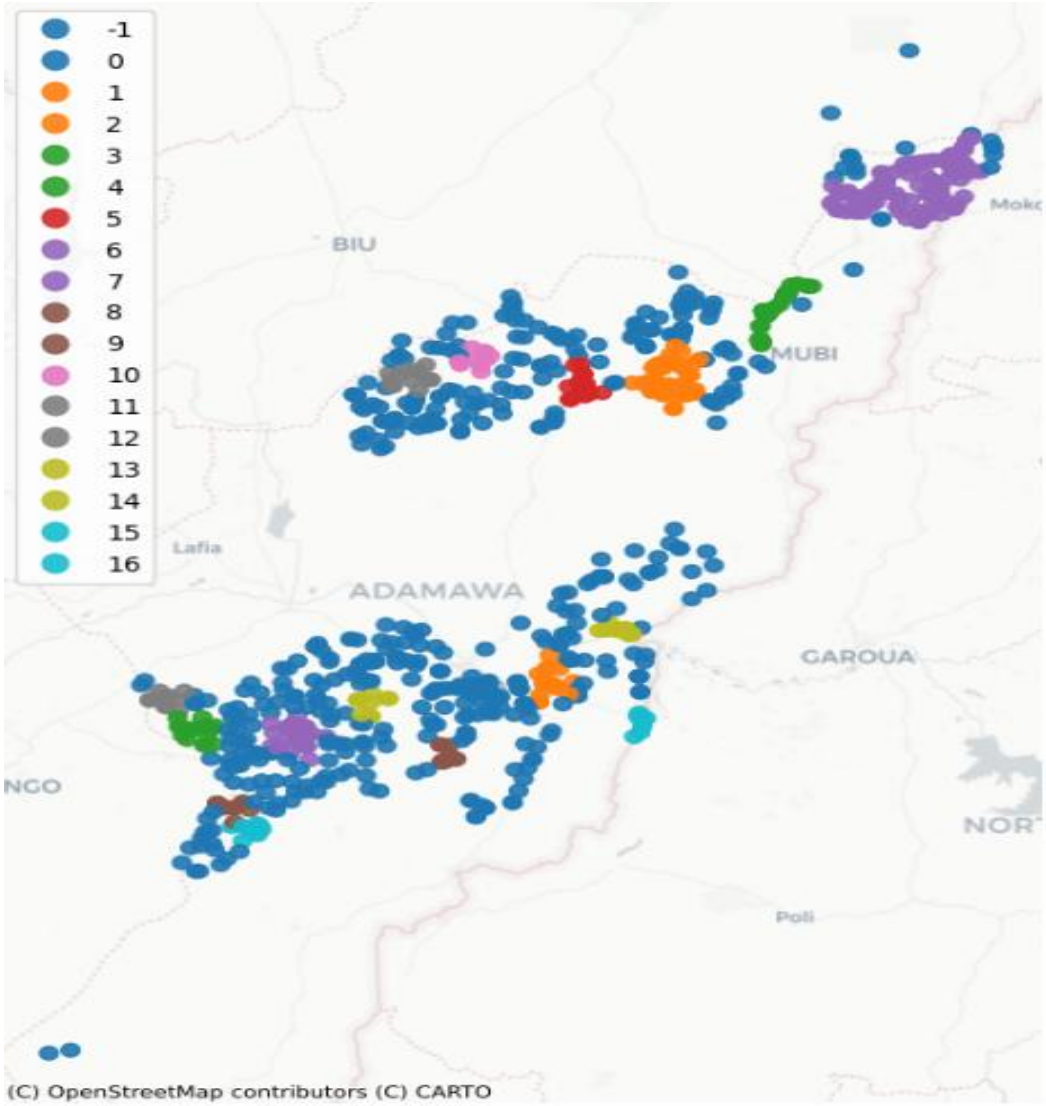

Figure 87: Spatial Distribution and Clustering of Schools in Adamawa

4.2.2. BAYELSA STATE

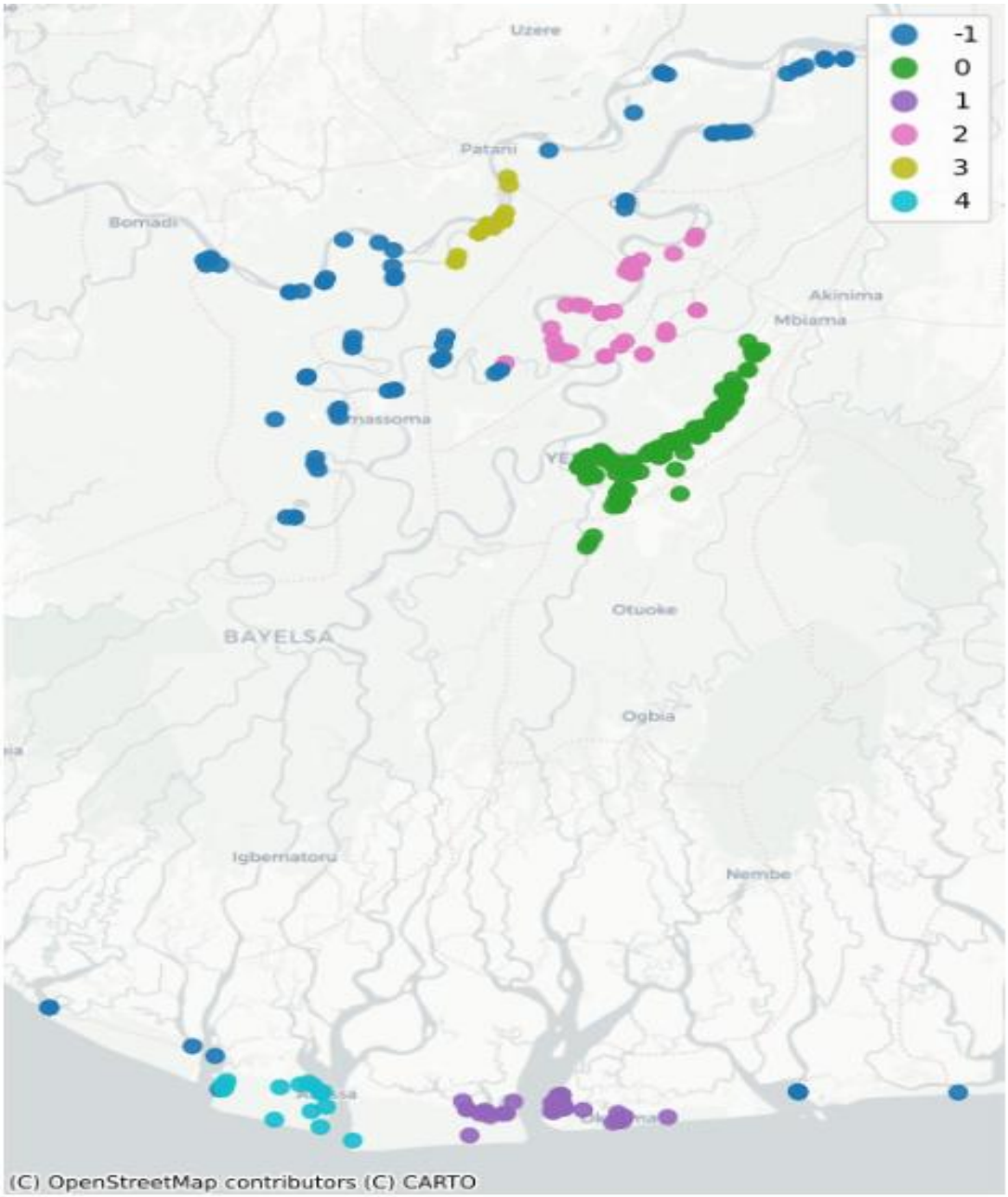

Figure 88: Spatial Distribution and Clustering of Schools in Bayelsa

4.2.3. Enugu State

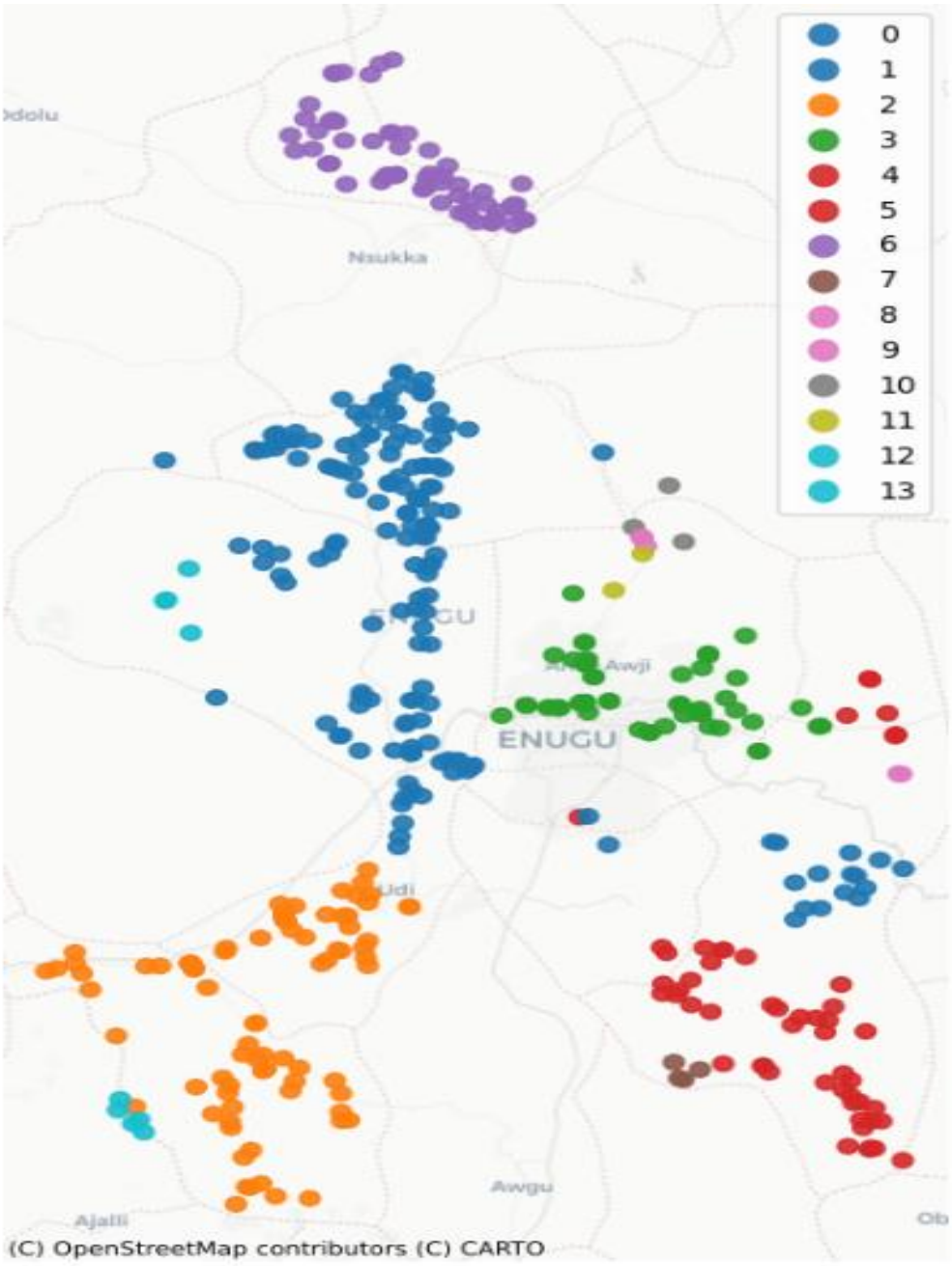

Figure 89: Spatial Distribution and Clustering of Schools in Enugu

4.2.4. Katsina State

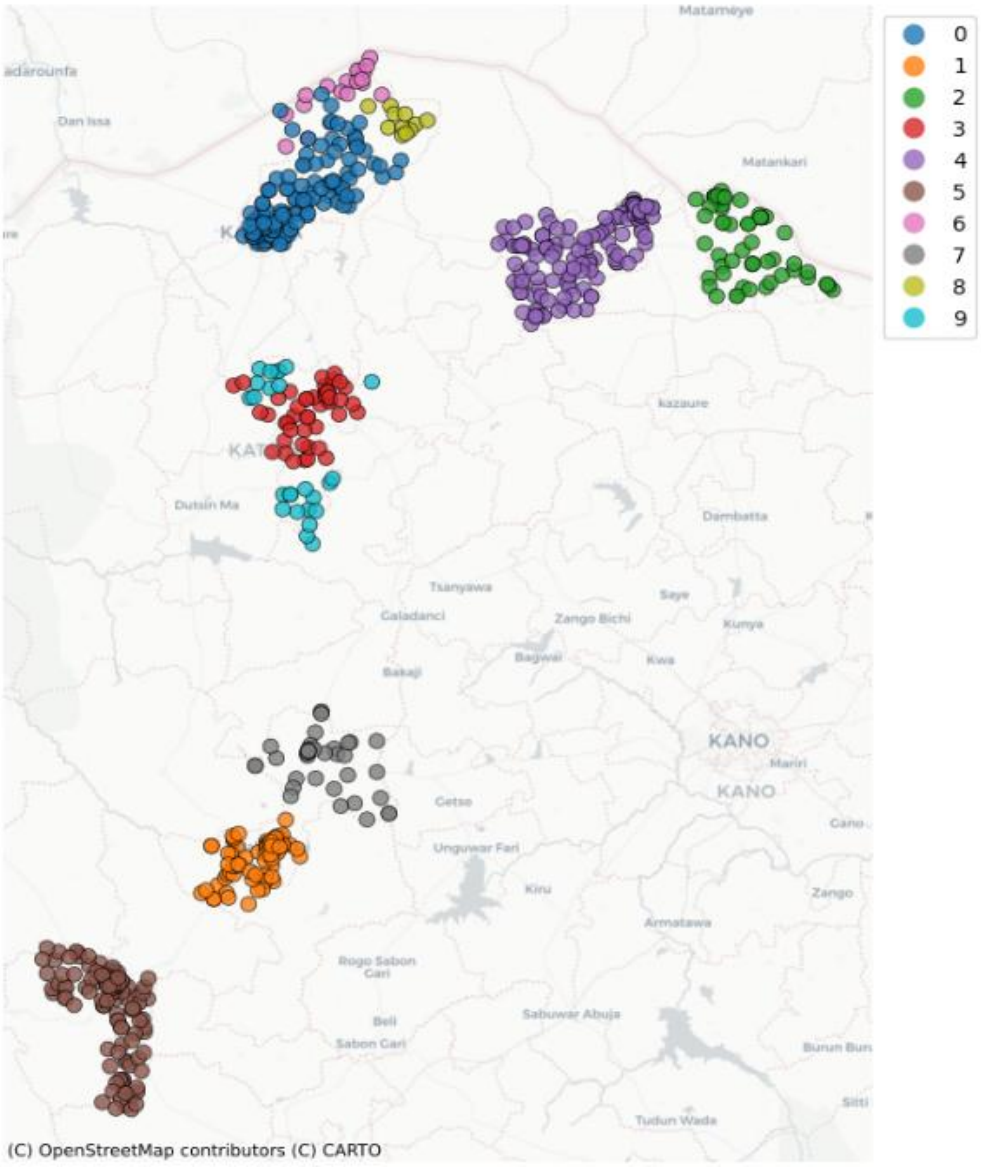

Figure 90: Spatial Distribution and Clustering of Schools in Katsina

4.2.5. Oyo State

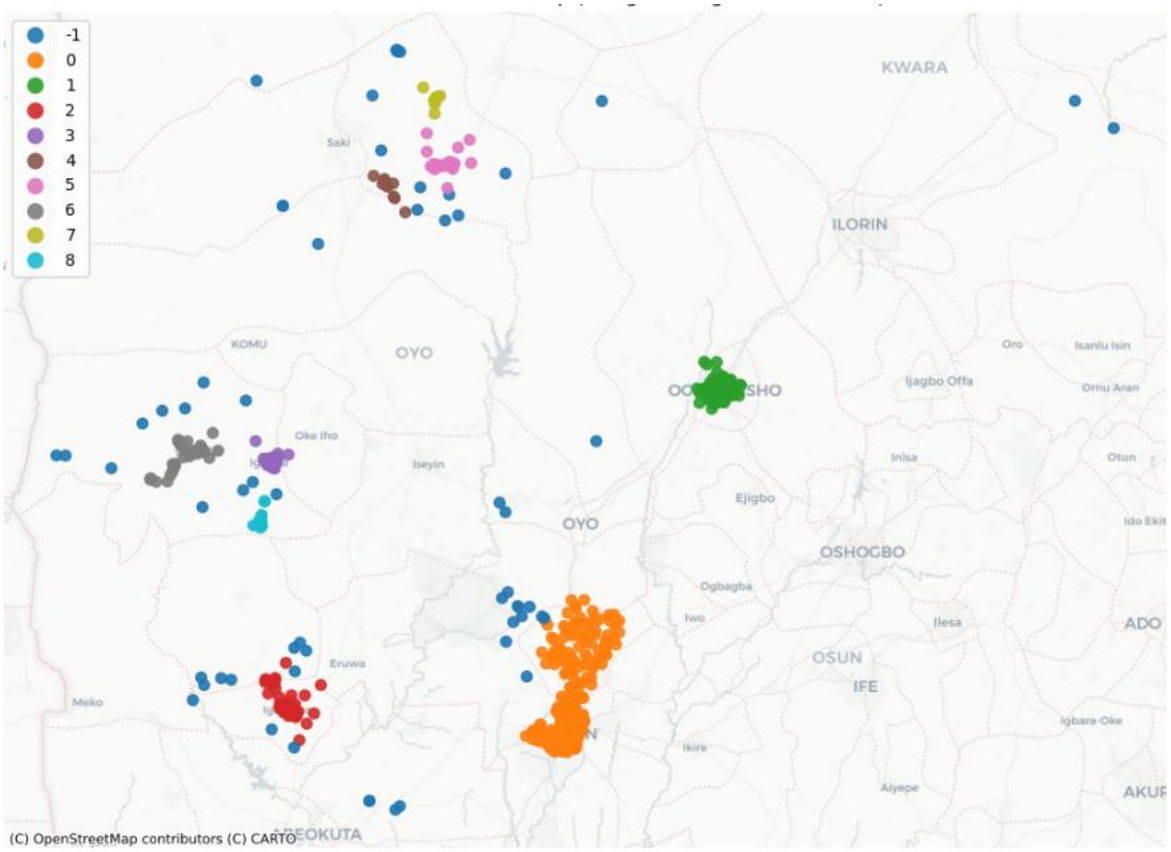

Figure 91: Spatial Distribution and Clustering of Schools in Oyo

4.2.6. Plateau State

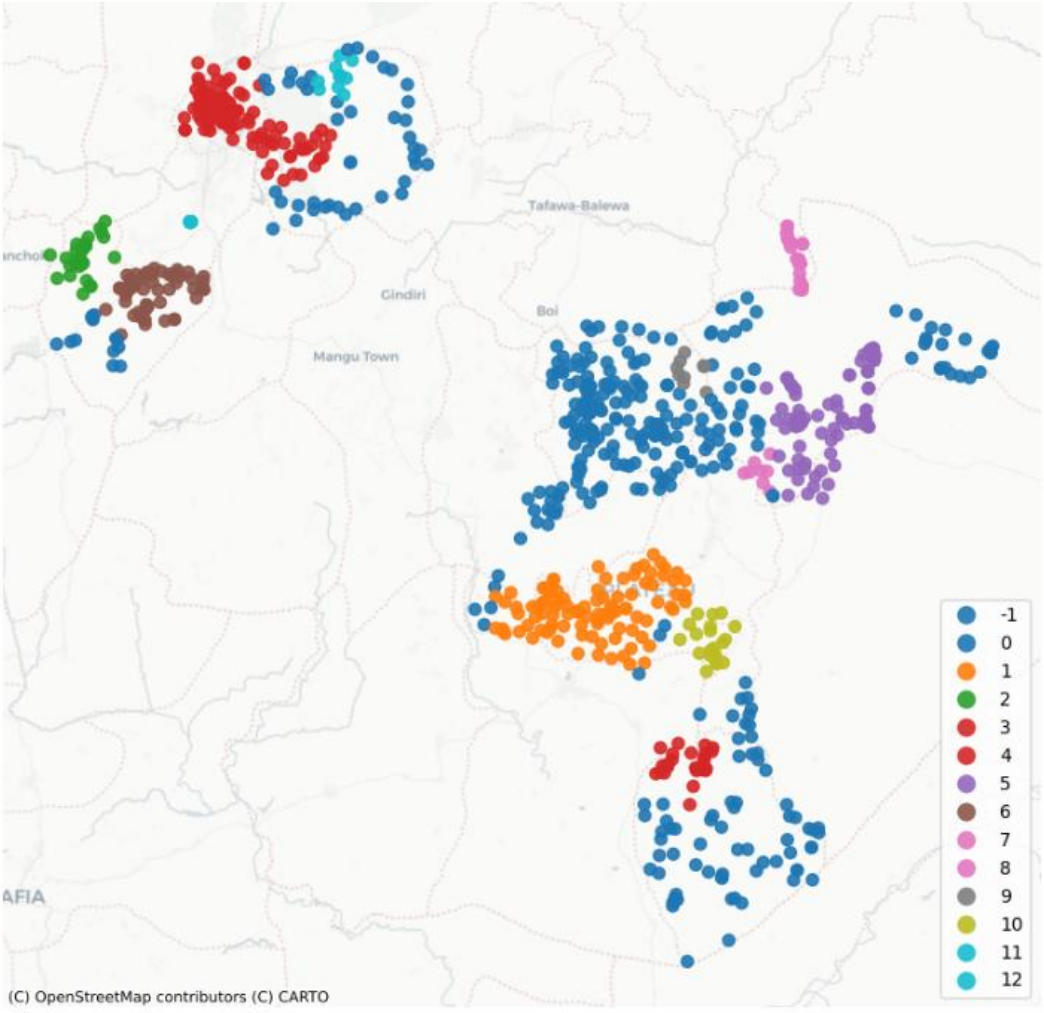

Figure 92: Spatial Distribution and Clustering of Schools in Plateau

5. Interpretation of Results

The spatial clustering analysis provides clear, actionable insights for planning and implementing teacher learning activities across the six (6) EISS focal states:

- **Viable teacher learning clusters**: Schools within the same DBSCAN cluster can be grouped for joint training, peer mentoring, and professional learning communities.
- **Efficient resource deployment**: Training centers and facilitators can be optimally assigned to cluster hubs, reducing travel time and cost.
- **Targeted interventions for isolated schools**: Schools outside clusters may require mobile training teams, digital learning solutions, or special logistical support.
- **Evidence based planning**: The analysis moves planning away from administrative assumptions toward spatial reality.
- **Re-clustering:** The clustering results allow states the flexibility to re-cluster specific areas were operational realities demand adjustment, such as security constraints, seasonal access challenges, or emerging school networks. This adaptability strengthens the long-term viability of Teacher Learning Teams.

Overall, the 5 km radius clustering threshold provides a practical and context sensitive basis for organizing teacher learning activities.

5.1 Key System-Level Constraints Identified

Beyond spatial proximity, the analysis reveals critical infrastructure and equity constraints that must be addressed alongside TLT implementation:

- **Infrastructure gaps:** A total of 241 schools were identified with no classrooms, indicating severe infrastructure deficits that directly affect teaching quality, learning conditions, and the feasibility of hosting cluster-based activities.
- Inclusive education considerations: The presence of 611 teachers with disabilities underscores the importance of ensuring that TLT design, training venues, and support mechanisms are inclusive and accessible, particularly in physically challenging or remote locations.
- **Limited access to libraries:** Only 932 usable libraries were recorded across all mapped schools, meaning that the majority of schools lack functional library facilities. This limits access to reference materials, self-directed learning resources, and structured reading spaces, reinforcing the need for shared resources within clusters or alternative digital and mobile solutions.

Together, these findings highlight that while spatial clustering provides a strong framework for organizing teacher learning, infrastructure deficits and equity considerations must be integrated into implementation planning to ensure effectiveness, inclusiveness, and sustainability.

6. Next Steps

6.1. Integrate Spatial Analysis into the Digital Nigeria Education Management Information System (DNEMIS) Platform

- Embed geospatial analytics within DNEMIS to map school access, teacher distribution, and TLT participation.
- Enable dashboard visualization for real-time insights: school clusters, teacher coverage, infrastructure gaps.
- Track TLT participation spatially to monitor engagement and identify underserved areas.

6.2. Use Cluster Evidence to Prioritize Pilot TLT Rollout

- Select pilot clusters in each state using clear, data-driven criteria:
  - One large urban cluster
  - One moderate semi-urban cluster
  - One cluster with high numbers of isolated or dispersed schools
- Adopt a phased rollout to test differentiated TLT models and generate comparative evidence for future scale-up.

6.3. Develop Special Intervention Packages for Sparse/Noise Schools

- Deploy mobile teacher learning teams to reach isolated schools.
- Introduce blended and digital learning solutions to overcome distance and accessibility barriers.
- Provide transport and logistics support for teachers and facilitators.
- Priority states: Adamawa, Plateau, Bayelsa given high spatial dispersion to ensure equity is addressed.

6.4. Align Infrastructure and Inclusion Gaps with Cluster Planning

- Target clusters with critical infrastructure gaps**:**
  - 241 schools lacking classrooms: prioritize for construction or renovation.
  - 611 teachers with disabilities: ensure TLT venues are accessible.
  - 932 usable libraries: consider shared or mobile library solutions in clusters with low access.
- Ensure complementary investments align with cluster-level TLT implementation.

6.5. Assess Infrastructure in Selected Clusters

- Evaluate conduciveness of classrooms, libraries, and TLT venues.
- Verify availability and usability of equipment for both learning and training activities.

This demonstrates how spatial statistics can guide multi-sectoral planning, not just training logistics.

7. Conclusion

This exercise demonstrates the effectiveness of using DBSCAN spatial clustering to identify schools located within a 5 km radius threshold for the purpose of teacher learning and professional development planning. By focusing on spatial proximity rather than administrative boundaries, the approach enables more realistic, cost effective, and inclusive intervention design particularly for structuring Teacher Learning Teams (TLTs) in ways that reflect real-world accessibility and geographic constraints.

The results support informed decision making on teacher training clusters, highlight gaps in accessibility, and provide a scalable framework that can be replicated across states and education levels. DBSCAN therefore serves as a robust analytical tool for strengthening teacher learning systems through spatially grounded evidence.