JOURNAL OF EDUCATION FOR SUSTAINABLE INNOVATION | ISSN 3025-1052
Vol. 2, No. 2, 2024, 180-194
https://doi.org/10.56916/jesi.v2i2.996

Investigating the factors contributing to an excessive number of students in primary schools using GIS technology: A case study of Zanzibar's Urban West Region

Mzee Kheir Jecha*
Department of Computer Science and Information Technology. The State University of Zanzibar, Tanzania

Haji A. Haji
Department of Computer Science and Information Technology. The State University of Zanzibar, Tanzania

Omar Haji Kombo
Department of Computer Science and Information Technology. The State University of Zanzibar, Tanzania

***Corresponding Author:** mzee.kheir@moez.go.tz

Keywords
School Mapping
Geographical Position Systems
Geography Information Systems

Article History
Received 2024-10-18
Accepted 2024-12-06

Abstract
ICT, or Information and Communication Technology, is a versatile technology that is used in various fields. In this context, the researcher delved into GIS and School Mapping. School mapping is the process of accurately locating schools on a map of a particular area. To achieve this, a GPS receiver is used to capture precise coordinates of each school location, which are then used to create a map. The schools themselves are treated as spatial data, meaning that they are referenced to specific locations on the earth. Spatial data typically includes information about the location and shape of features on a map, while attribute data provides additional details about those features. For example, the location of schools would be spatial data, while attribute data might include the name of the school, the level of education taught, and the school's capacity. This research aims to investigate the factors contributing to an increase in the number of students in schools using GIS technology in the urban west region of Zanzibar. The results of this investigation could help better understand the sources and impact of changes in the student population, as well as provide important information to policymakers and education planners looking forward to improve the education system.

INTRODUCTION

In the past decade, there has been a rapidly increasing number of students in primary schools in Zanzibar. In the history of Zanzibar during the colonial era, the educational system was based on four institutional pillars corresponding to the types of schools, i.e., government, mission, Indian, and Quranic schools. Back then, the students were few, and they balanced with the ratio of schools. After the 1964 Revolution (the 1st of July 1964), the Revolutionary Government of Zanzibar declared that all schools were owned by the Revolutionary Government. Furthermore, on April 23, 1964, the

government officially declared free education for all people, regardless of race, colour, origin, or gender. (Hemed 2019). At that time, the pupils were standard with the ratio of schools, and the total number of schools across the country was 62. The total number of students enrolled in schools was 24,334, with a teacher-to-student ratio of 1:37 and 655 teachers. As time went on, more schools were constructed and opened for operation whenever there was a demand, which allowed any pupil of any age to be enrolled in school. It must be distinguished that the number of students enrolled was quite small; there was a balance between the student ratio, teacher ratio, and school infrastructure. As time passed, the situation changed, and the number of students increased tremendously while the teacher's and school's infrastructure remained the same.

The growing number of students in primary schools is one of the challenges facing the education system in Zanzibar. Among the common problems characterized by the education system in Zanzibar is the increasing number of students, or, in other words, overcrowded classrooms in schools (Likuru et al., 2022). Overcrowded classrooms refer to a situation where there are more students in the classroom than the space can accommodate (Fatima et al., 2019; Mushatq et al., 2019). The Ministry of Education has made efforts to address this issue. For instance, in 2017, the number of primary school pupils was 440,931, and this increased to 552,328 in 2021, for public schools only. The number of public schools also increased, from 447 in 2017 to 950 in 2021. (Education Statistical Act, 2017–2021). Therefore, there were different efforts from the ministry of education has taken to solve the problem, including establishing double shifts morning and afternoon sessions, merging schools, combining students in one class, introducing pre-primary education within the school, and building more new schools (MOEVT & PO – RALG, 2018). Despite these efforts, the challenges of the growing number of schoolchildren and overcrowding in primary and secondary schools still exist. The issue of overcrowded classrooms is a global problem that concerns many countries, including China, India, and Nigeria.

According to the 2022 Census report, the population of Zanzibar has increased by five times since the 1967 survey, from 354,815 people to 1,889,773 people. The main purpose of this report is to provide an aggregated total of the population by sex at the county level to help decision-makers. The 2022 survey found that the Urban West Region has the largest population, with 893,169 people, accounting for 47.3% of the total population in Zanzibar. (RGoZ, 2022). This indicates that the population of people of Zanzibar increased for high speed and also shows the number of students still excessively.

Table 1. Projected population at the end of the development frameworks

YEAR	PROJECTION	DESIGNATION
2025	2.1 million	Zanzibar Development Plan
2030	2.4 million	Sustainable Development Goals 2030.
2050	4.6 million	Zanzibar Development Vision. (2050).

This projection shows how the population of Zanzibar will be during that years, and here what I mean the numbers of students will be more than time three from now. So that authorized organizations and planners' officers should be care in mind on the hand of educations site.

Table 2. The number of the Primary schools in the Urban West Region in the five years

	SCHOOLS			
YEAR	URBAN	WEST A	WEST B	TOTAL
2017	24	46		70
2018	24	24	24	72
2019	24	24	24	72
2020	24	24	25	73
2021	23	23	27	73

This table shows the time series of the availability of schools in the Urban West Region in the five years past and the nest table bellows shows the number of students in that years.

Table 3. The number of the Students for Primary schools in the Urban West Region in the five years

	STUDENTS			
YEAR	URBAN	WEST A	WEST B	TOTAL
2017	26712	68157		49869
2018	27921	37014	35290	100225
2019	28133	40662	38154	106949
2020	28882	44416	40155	113453
2021	29211	46056	43192	118459

This study looks at the educational policy, educational frameworks, and educational regulations thoroughly to determine what is recommended on the student-school ratio, and why the number of pupils in the classrooms is more than recommended according to the Educational Policy of 2016, which expresses the student's ratio per class to be 40 - 45. This is a big issue that encouraged researchers to do this research. This study focuses on 30 primary schools located in the Urban West Region, which comprises three districts: The Urban District, West 'A' District, and West 'B' District. Each district has 10 primary schools, making the total number of primary schools 30. The selection of these schools was based on a non-probability sample method, which involved a non-random collection of schools based on proximity or other criteria for easy data collection.

This paper sets three specific objectives that will contribute to accomplishing the main aim.

1. To analyze how the spatial distribution of schools influences the student-to-class ratio within primary schools in the Urban West Region of Zanzibar.
2. To suggest solutions or effective measures, utilizing GIS technology to overcome the problem of an excessive number of students in Zanzibar Urban West Region's primary schools.

Study area and Data Sources

The study was conducted in the Urban West Region in Unguja Island. The originated area of the Unguja Island is coastal area of the East Africa surrounded in the Indian Ocean. The urban West Region has the geographic coordinates 6°10'00.0"S (-6.1666700°) latitudes (width) and 39°15'00.0"E (39.2500000°) longitude (length). The Island has 85 km long from North to South and 39 km wide East to West with the area of 1660 km. The study area covered in Urban West Region which have three Districts including the Urban District which contain 15.46 km^2 Area, 219,007 population and 14,171/k

m^2 Population Density (Census 2022.). West "A" District has contained 104.8 km^2 Area, 329,645 population and 3,146/k m^2 Population Density (Census 2022.). and the West "B" District has contained 113.0 km^2 Area, 344,517 population and 3,050/k m^2 Population Density (Census 2022.). The researcher in the figure bellow create a map involved the school's locations on the exactly area location according to the school's coordinates.

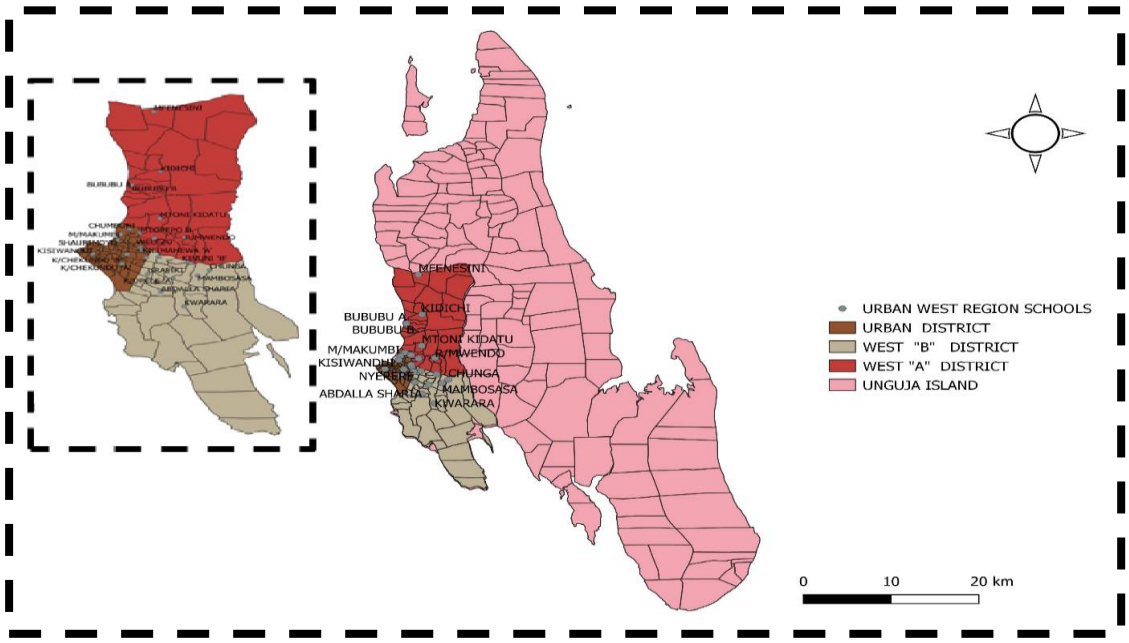

Figure 1. Study Area Urban West Region with schools selected in Unguja Island

METHODS

Both primary and secondary data are used in this study. The information gathered from public primary schools via questionnaires and interviews is considered primary data. Typically, the data gathered from the study's directed group area is what the researcher directly observed. Primary data included responding to the questionnaires, and data was collected from the school member committee for interviews and group discussions, Through GIS technology the primary data was collecting through GPS, it captures the coordinating of the school's location this was as primary data and put in the computer in QGIS application to do various mapping creation and other data analytics. Here primary data are the coordinates of the school's location obtained using Global Positioning System (GPS). The secondary data are the data that were collected from other surviving workings to support my paper. Normally there is second-hand material that contains any existing workings from the libraries (books, magazines, journals, and newspapers), the internet, investigation works, and other places. and the secondary data are the topography maps of Unguja, Urban West Region these obtained through Shapefiles, the names of schools, and other details from Educational Management Information System (EMIS). The researcher, collected secondary data from the Ministry level, the Internet, and other sources found during the field research. Secondary data included maps, various sources comprising books, journals, reports, publications, non–publication materials, files, and statistical data. These sources also were obtained from various institutions and organizations including local, national, and international. The institutions like (National Bureau of Statistics) (NBS), (the Office of Chief Government Statistics) (OCGS), the Ministry of Education and Vocational Training (MoEVT), Zanzibar Public Library, American Corner Unguja, (The State University of Zanzibar) (SUZA), Google

Scholar, and other reliable sources in internet web sites. The secondary data stimulate greater awareness and help to identify further knowledge.

RESULTS AND DISCUSSION

GPS with school mapping.

To acquire data on mapping, the researcher also employed the use of GPS technology as a technique of data collecting. A satellite-based navigation system called the Global Position System (GPS) enables users to pinpoint their precise location and time anywhere on Earth. (Senus et al., 1981). The coordinate system concepts are necessary to locate locations in space and depict them on maps. GPS works with latitudes, longitudes, and ellipsoidal heights by applying mathematical techniques to assign numbers, or coordinates, to each location in space (Mears et al., 2021). GPS is widely used in various applications such as: -Navigation: GPS is used in car navigation systems, smartphones, and other devices to provide turn-by-turn directions and route optimization. Additionally, GPS is used for mapping and surveying; it can be used to make precise maps, survey land, and monitor surface changes over time. (Campos-Sánchez et al., 2020). On the other hand, tracking: GPS is used to track the whereabouts of people, cars, and other assets in real-time. Order but final timing (Jebur et al., 2021). GPS is used as a precise time reference for various applications such as telecommunications, financial transactions, and scientific research (Ayer and Fosu 2008). The researcher adopts Mapping and surveying to get data on geographic mapping creation, the researcher takes the coordinates from the school's sites and uses the shape files of Urban West Region to create various mapping with the help of the application of QGIS in the computer for doing mapping and other analytics.

Experiments GIS technology. For a specific set of uses, GIS technology continues to be a potent collection of tools for gathering, retrieving, transforming, and presenting spatial data from the actual world. (Smith et al., 1987). Lamented that a set of procedures served to respond to queries about spatial entities in the database, with the majority of the data in the GIS database system being spatially indexed (Audet & Ludwing, 2000, p. 6).

GPS tool. The researcher used a GPS tool to ensure his survey of recording coordinates to all school sites. The researchers travel to site one by one, to take the exact school site location for GPS. These coordinates create school mapping and school buffering, the main roads, and the community habitant's location. While coordinating at the survey site, the researcher turns on the GPS and waits for the device to receive satellite signals, indicating that it is "Ready to Navigate." Next, the researcher uses GPS to record the location of the school, selecting "Mark a Waypoint" after entering the location (latitude and longitude) and elevation details on the survey Mert and Dag (2018). Finally, the researcher turns off the GPS after obtaining the coordinates to preserve battery life and moves on to the next primary school to collect data from other schools, the location, and other schools. At the end of each survey in a day. The researcher should save data in a computer. The researcher checks that data after the survey and then the questionnaire as sample data filled in the computer. Within 8 working days for two weeks completing the survey and the researcher has in hand all school coordinates allocated as the Table 4 shows.

Table 4 shows the list of 10 schools named for primary in URBAN DISTRICT with each over roll enrolment students and the number of class uses in that school coupled with the GPS coordinate in longitude and latitudes special for mapping creation and buffering. In this Table, if you take any school with its number of pupils and divide it by the number of classrooms in use can find the real number of students who are suffering from overcrowding in class and are beyond the guideline of the student-class ratio.

Table 4. Urban Districts with school's coordinates (n=10)

Sn	Primary School Name	URBAN DISTRICT Over Roll Total	Class in uses	GPS Longitude	GPS Latitude
1	CHUMBUNI	2042	17	39.2158	-6.14404
2	K/CHEKUNDU 'A'	1654	26	39.2116	-6.17393
3	K/CHEKUNDU 'B'	1265	22	39.2116	-6.17387
4	KILIMAHEWA 'A'	1676	28	39.2228	-6.16234
5	KILIMAHEWA 'B'	2177	31	39.2218	-6.15976
6	KISIWANDUI	2015	16	39.1949	-6.16511
7	M/MAKUMBI	1534	18	39.2106	-6,14844
8	MUUNGANO	1677	12	39.2142	-6.16557
9	NYERERE	2470	15	39.2250	-6.16843
10	SHAURIMOYO	2632	22	39.2091	-6.15333

Table 5. West "A" Districts with school's coordinates (n=10)

Sn	Primary School Name	WEST "A" DISTRICT Over Roll Total	Class in uses	GPS Longitude	GPS Latitude
1	BUBUBU "A"	2549	25	39.253	-6.77741
2	BUBUBU "B"	2152	25	39.217	-6.1058
3	CHUNGA	2070	10	39.2601	-6.17901
4	KIDICHI	2569	13	39.233	-6.09406
5	MFENESINI	2518	15	39.2293	-6.04221
6	MTONI KIDATU	3171	19	39.2326	-6.13481
7	MTOPEPO "A"	3985	26	39.2213	-6.14656
8	MTOPEPO "B"	3970	27	39.2216	-6.14695
9	R/MWENDO	2509	24	39.2465	-6.15098
10	WELEZO	2321	14	39.2296	-6.15163

Table 5 shows the list of 10 schools named for primary in WEST "A" DISTRICT with each over roll enrolment students and the number of class uses in that school coupled with the GPS coordinate in longitude and latitudes special for mapping creation and buffering. However, the researcher does this to show the answer of the student's class ratio in each school and here the increasing number of students are opened in bare eyes.

Table 6 shows the list of 10 schools named for primary in WEST "B" DISTRICT with each over roll enrolment students and the number of class uses in that school coupled with the GPS coordinate in longitude and latitudes special for mapping creation and buffering. However, the researcher does this to show the answer of the student's class ratio in each school and here the increasing number of students are opened in bare eyes.

Table 6. West "B" Districts with school's coordinates (n=10)

Sn	Primary School Name	WEST "A" DISTRICT Over Roll Total	Class in uses	GPS Longitude	GPS Latitude
1	ABDALLASHARIA	2563	21	39.201	-6.15743
2	K/UPELE "A"	2766	26	39.2398	-6.18593
3	K/UPELE "B"	2845	24	39.2399	-6.18593
4	KINUNI "A"	3655	19	39.2483	-6.17235
5	KINUNI "B"	3099	17	39.2480	-6.17212
6	KWARARA	1821	29	39.2459	-6.21008
7	MAGOGONI "A"	1821	15	39.2318	-6.16776
8	MAGOGONI "B"	1534	17	39.232	-6.1678
9	MAMBOSASA	1730	29	39.2536	-6.18365
10	URAFIKI	2048	24	39.2255	-6.18276

The use of QGIS 3.16 Hannover Application.

The open-source desktop GIS program known as QGIS, or Quantum Geographic Information System, is often abbreviated as QGIS. While ArcGIS is limited to the Windows version, QGIS is compatible with multiple operating systems, including Windows, Mac OS X, Linux (Ubuntu), and Unix. What's more, QGIS comes with a ton of plugins that add new features and are free. Meyer, D., & Riechert, M. (2019).

Figure 2. The uses of QGIS Application

The researcher while opening the QGIS Application came like this while loading the application and it took a while depending on the capacity of the computer (Choudhury and Arutchelvan, 2016). Following Figure 3 the application creates the mapping of Urban West Region with colors in each district.

However, because QGIS is mostly developed by volunteers and the community, it lacks a wealth of documentation and can occasionally be difficult to use. Due to its many features and plugins, QGIS only requires a basic level of knowledge and expertise to create maps. QGIS is a cross-platform, collaborative software that is always evolving, and it is an easy-to-use geographic information system (GIS) with common functions and features. The software's functionalities Geographic data is available (Tama and Malinowska 2018). Modify the projection, import and link spreadsheets to geographic data, style maps, add titles and other graphical elements, and export files in various formats with ease. The school mapping is created by the researcher using QGIS.

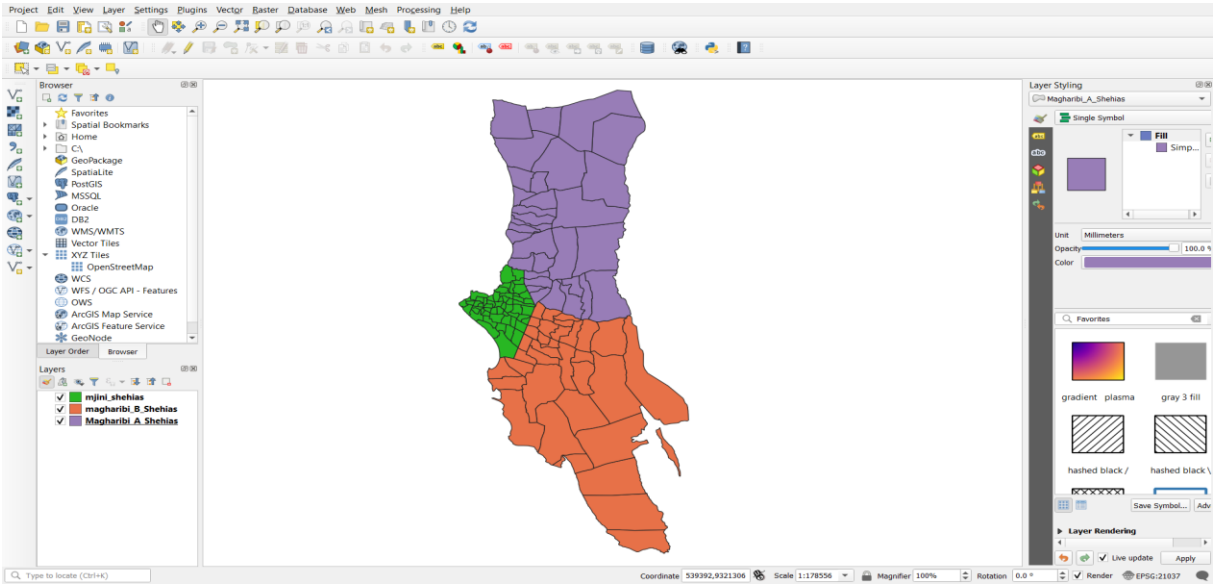

Figure 3. Creating the map in QGIS Application

Results The application of GIS in school mapping.

The term "geographic information system (GIS) in school mapping" has been used in educational planning and refers to a variety of issues related to resource allocation, service delivery efficiency, and increasing learning efficiency. A common tool for displaying the correlations between the distribution of schools and the school-age population they serve in a given area is mapping. In the majority of application domains, GIS is commonly employed as a sophisticated technological instrument though GIS is just regarded as a superior tool. (Hite 2008) argues that the advantages of GIS for microplanning are potentially very important, given the advancements in presentation, preparation, and flexibility. GIS was initially created for scientific land management objectives. Regarding geographic information systems (GIS), the researcher used both primary and secondary data for this study. The primary data consisted of school coordinates that were obtained using the Global Position System (GPS), while the secondary data included topographic maps (Shapefiles) of the Urban West Region and its districts, school details, and additional information from publications, journals, and the internet. To conduct additional interviews and discussions for the research, the researcher went to the Department of Land and Mapping. The department's officers were very helpful in helping with mapping and other coordinated uses of GIS. During the fieldwork, the coordinates of the schools were acquired using a global positioning system (Garmin 76csx GPS model), and QGIS desktop 3.16 Hannover was utilized for the creation of maps and additional analysis. The Urban West Region's school distribution is determined by GIS analysis.

The results of the study's distribution of public primary schools and their locations within Zanzibar's Urban West Region are displayed in Figure 4. The Ministry of Education and Vocational Training provided the addresses of all the local primary schools. Figure 4, which depicts the spatial distribution of primary schools in the area, reveals that the urban district has a concentration of schools, while the rest of the area around West A and B has more schools than the town itself. Figure 6, which depicts the population density and number of students in primary schools, indicates that the area has a higher student population than other urban areas. To create the 3-meter Buffer Zone of schools in the Urban West Region, the researcher in this study identified 30 government primary schools.

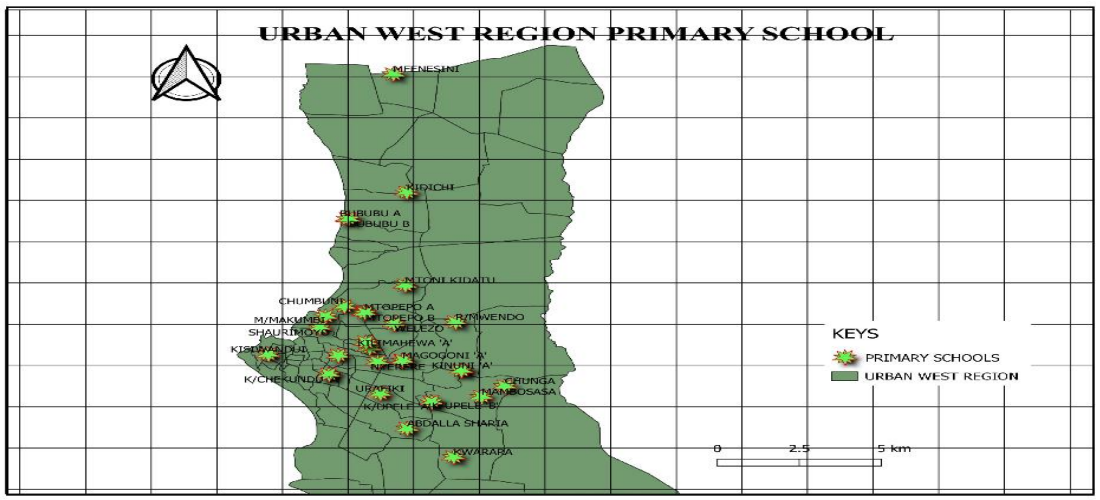

Figure 4. Distribution of schools

To determine the schools' area of influence and anticipated separation from the road, Figure 6 depicts the 300-meter buffer zones surrounding the school. Because it is one of the busiest commercial areas in Urban, the results indicate that there are few schools in the local government area. The fact that there are so many buildings in this area indicates that there is not enough room for schools to be established. However, because of the area's well-maintained roads, West A and B have more schools. The Urban West Region's Population density is depicted in the Figure below along with a 3-eter buffer zone around schools.

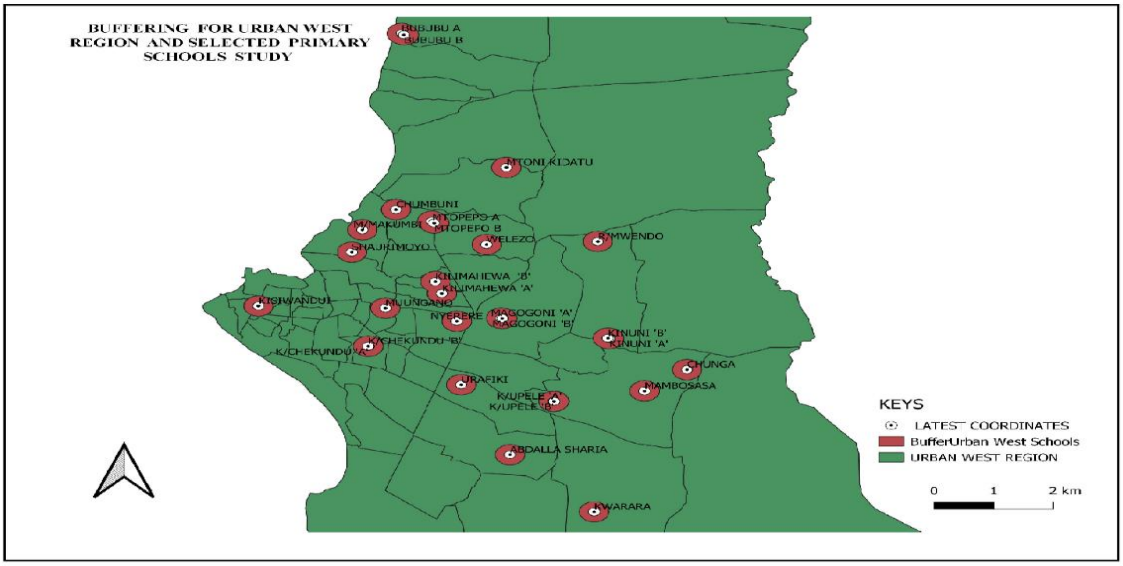

Figure 5. Schools buffering 300-meter

The population density in the Urban West Region is depicted in Figure 6, along with the 300-meter buffer zones surrounding each school to establish the schools' expected distance from other community buildings and their area of influence. The Urban West Region case study indicates that community buildings appear to encircle the schools. However, it also reveals that many schools were inherited from the colonial era after independence in 1964 and that the central government built very few new school buildings in urban areas, which are now among the busiest and most commercial. Using Geographic Information Systems in Education, the Urban West Region's decision support system

condenses the GIS-based EDSS construction process. The study made an effort to demonstrate whether or not GIS would be utilized in the planning procedure and the technology and land use decisions. Decision-making in Zanzibar has become inevitable as a result of the use of GIS technology. By giving planners access to an integrated geographic scenario of school locations, the application of GIS technology in education planning has been demonstrated to be highly significant in the decision-making process. Strong analytical tools like GIS mapping and Education Management Information Systems (EMIS) are better suited for creating well-structured educational policies. Research also demonstrates that database analysis provides a comprehensive solution for educational planning management or DSS.

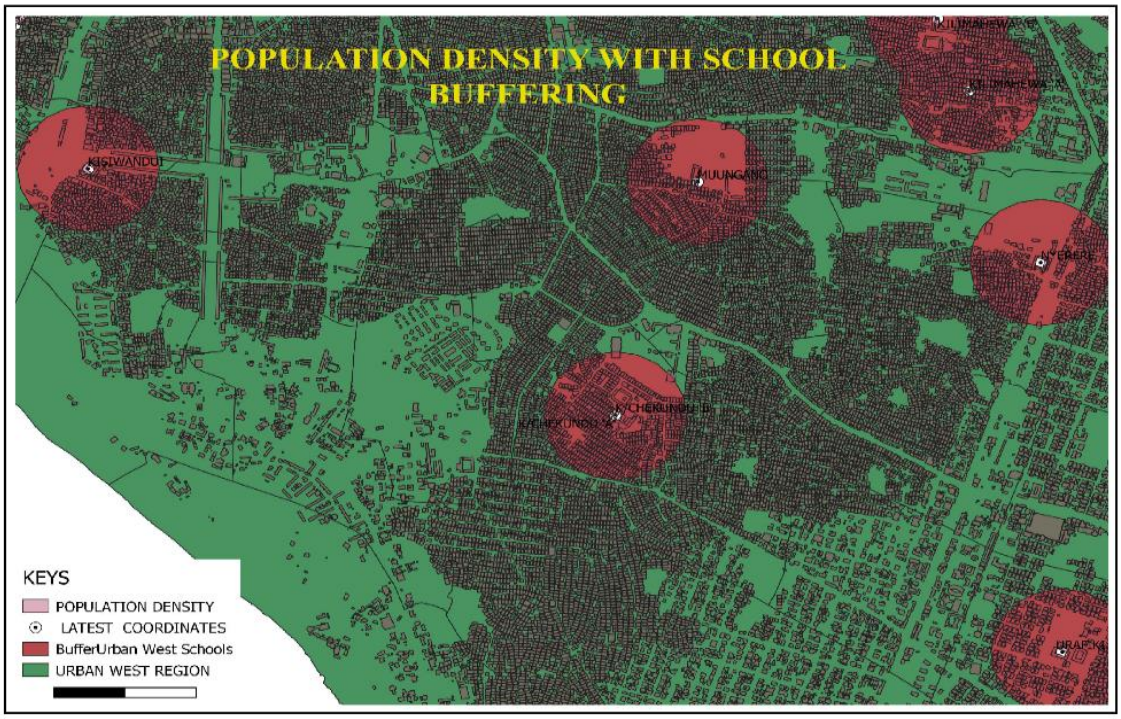

Figure 6. Population Density

Table 7. Pupils in standard III in urban school, with Shehia lives in various districts (n=58)

PUPILS STUDY IN URBAN BUT LIVE OUT URBAN DISTRICT					
S/n	Pupils	Shehia Live	S/n	Pupils	Shehia Live
1	BOY	BUBUBU	30	GIRL	KINUNI
2	GIRL	BUBUBU	31	BOY	KISAUNI
3	BOY	BUBUBU	32	BOY	KISAUNI
4	BOY	CHUKWANI	33	BOY	MASINGINI
5	BOY	DARAJA BOVU	34	BOY	MASINGINI
6	BOY	DARAJA BOVU	35	BOY	MAUNGANI
7	BOY	DOLE	36	GIRL	MAUNGANI
8	BOY	FUONI	37	BOY	MAUNGANI
9	BOY	FUONI	38	BOY	MAUNGANI
10	GIRL	FUONI	39	GIRL	MAUNGANI
11	GIRL	FUONI JITIMAI	40	BOY	MIGOMBANI
12	BOY	FUONI KISIMA MKUYU	41	GIRL	MTONI KWA SEFU
13	BOY	FUONI KWARARA	42	BOY	MWERA

14	BOY	FUONI MALI NNE	43	GIRL	MWERA
15	GIRL	FUONI MELI TANO	44	GIRL	MWERA
16	BOY	FUONI UWANDANI	45	BOY	MWERA
17	GIRL	FUONI UZI	46	BOY	MWERA
18	BOY	JUMBI	47	BOY	MWERA
19	GIRL	JUMBI	48	GIRL	MWERA
20	BOY	JUMBI	49	GIRL	MWERA
21	BOY	KIANGA	50	GIRL	MWERA
22	GIRL	KIANGA	51	BOY	MWERA
23	GIRL	KIANGA	52	BOY	MWERA
24	BOY	KIANGA	53	BOY	NYARUGUSU
25	GIRL	KIANGA	54	GIRL	SHAKANI
26	BOY	KIANGA	55	BOY	TOMONDO
27	GIRL	KIDICHI	56	GIRL	TUNGUU
28	GIRL	KIDICHI	57	BOY	UWANJA WA NDEGE
29	BOY	KINUNI	58	BOY	UWANJA WA NDEGE

Table 7 shows the sample of the exact picture for one school in primary standard three a, b, and c are learning in urban schools but all of them are living out of the urban districts and others found lives outside of the Urban West Region means lives out of this region. This bare witness that factor that increases the number of students in the urban West region in primary schools and others has a reason for coming here. Figure 4.15 below also shows the real picture of the pupils who are live outside of the urban district and learn in the schools in the urban districts this sample for one school of standard three only if the researcher shows all students from nursery 1 and 2 also from standard 1 up standard 7 definitely all pupils from outside the district.

Figure 7 goes together with Table 4 which presents the sample of one school in urban in one class level in standard III only, thus this bare the fact of reason for overcrowded students many of them come from out of urban district and here is not true as their areas have not schools but also the number of students there are too much.

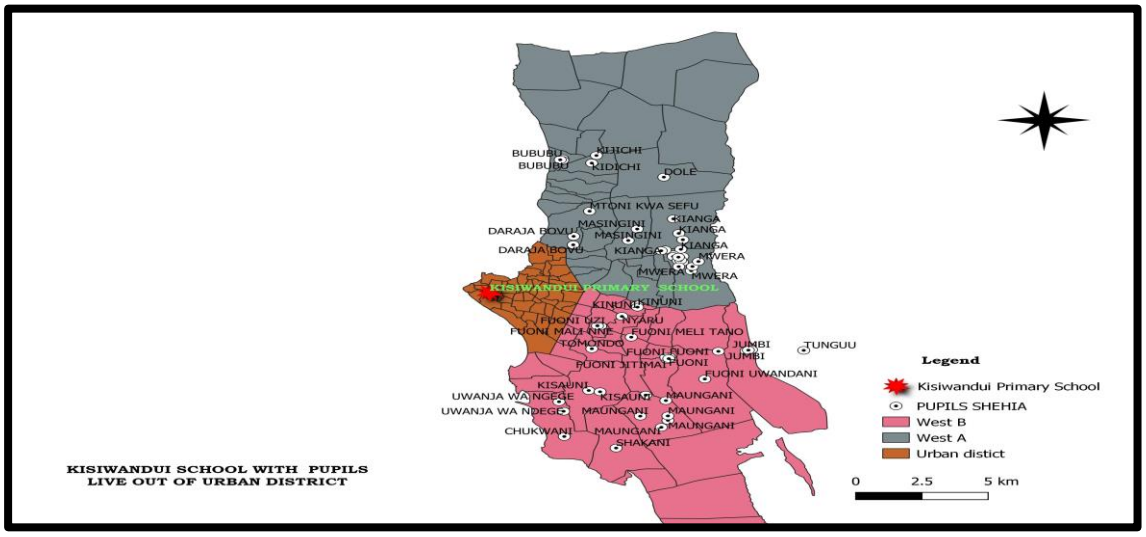

Figure 7. One Urban primary school takes pupils out of Urban

The researcher realized that in these areas pupils who come from other areas, need to create schools, to reduce the distance of pupils from home to school. Also, there needs to be schools in districts come here because in district West A and West B, the population are much higher and the number of schools are not afforded to the population of pupils in those areas. If the government has the aim of eliminating the double shift in our schools should increase the number of schools with the full equipment. Figure 7 below comes with a picture of the areas where no schools exist and other areas where schools are available but were defeated by the population density of those areas. The researcher found areas like Kinuni, Kijito Upele, Bububu, Kijichi, Kianga, Mwera, Regezamwendo, Fuoni, Chukwani etc. These areas found the schools but not afford according to the population density of these areas so the good suggestion is the Ministry should add the new schools nearest to the old schools and build new one flat buildings.

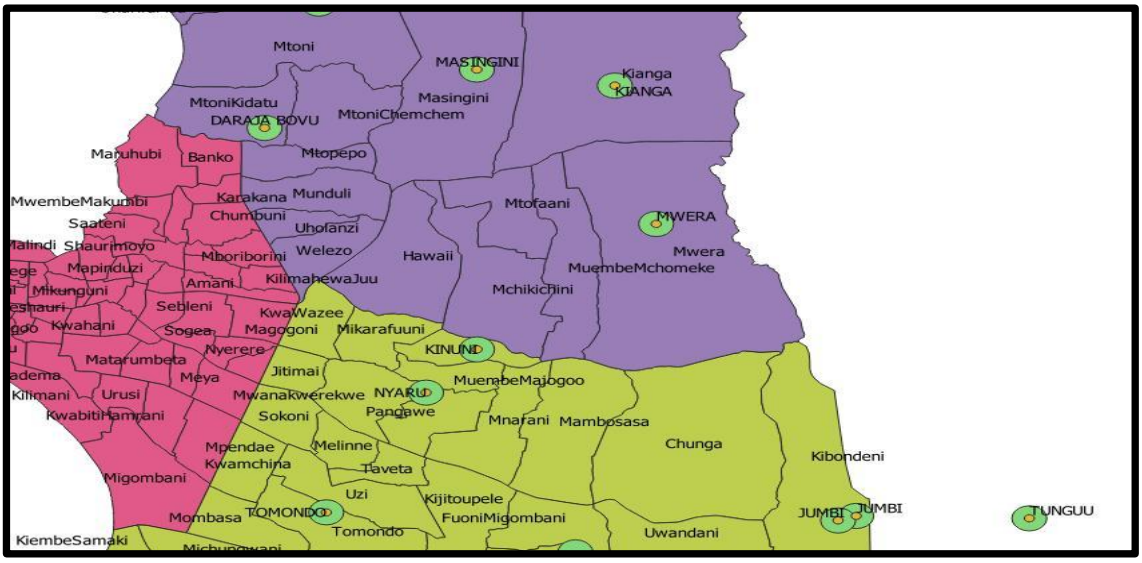

Figure 8. Suggested areas to add more schools

Figure 8 shows a few samples of the suggested areas to add more primary schools because the existing schools are not affordable according to the pupil population of those areas and reduce the distance from home to schools for pupils in those areas.

Discussions

Using GIS technology, this study examines the factors that lead to an excessive student-to-teacher ratio in primary schools located in Zanzibar's Urban West Region using a case study approach. The study's objectives tried to answer the research questions as the following.

CONCLUSION

From the investigation results, the researcher concludes the study with the following thematic conclusion:

Availability of School Infrastructure.

The study concludes that few infrastructures like classrooms, libraries, laboratories, ICT facilities like computer labs printers, photocopies machines, projectors, playgrounds, dormitories, chairs, tables, toilets, sources of power, sources of water, desks, sign art rooms and teacher's house, few number of schools which have all these facilities neither in public primary nor in secondary schools and worst many pupils seat on the floor regardless other facilities so this led to big challenge in public school.

Number of students per classroom.

The study also concludes that in most public schools there was no class ratio with an average of 40 students and in many primary classes students exceeded 100, this led to teachers and pupils suffering during the teaching and learning procedure and it affected the overall program of teacher and students on the learning process.

The challenges faced by teachers during teaching in an overcrowded classroom.

The researcher found challenges teachers faced during the class overcrowded. The impact of the increasing number of students in the classroom, many students are unable to read and write, many students in another school are unable to get good scores, many students are unable to participate in other activities in classrooms, teachers are unable to control the many students, teachers unable to teach in large class and many students get more and first tired (Meier et al., 2020). Less individualized focus, less discipline issues, the danger of illness risk, greater noise and distractions. Having more students in the classroom many classrooms today have over 100 pupils, normally more students there are more noise in the classroom that affect, which leads to a hander for pupils to concentrate, affecting teaching and learning output also teacher has difficulty focusing leading to stress. Less personalized instruction. More pupils may have contributed to a chaotic classroom atmosphere that presents more challenges for the teacher to handle due to disciplinary issues. Due to the increased likelihood of disruptive behavior and conflicts among students—especially when there are insufficient resources to accommodate the additional students—teachers end up spending more time managing behavioral issues and less time teaching. unfavorable environmental conditions. Schools with larger class sizes typically have worse environmental conditions. This could involve inadequate lighting and ventilation, indoor air quality, noise control from acoustics, physical security, and heating and cooling systems.

Ways to overcome the overcrowded classroom.

The government should build more schools and exceed the number of classrooms also where the primary started the government establish the nearest building for secondary school to avoid the distance for secondary schools should increase school buildings in districts and follow the demand in the district's enrollments.

Recommendations for action

This research provides contribution to societies and the government at large, including the following:

1. It is suggested that the government re-examine its other policies and maintain the appropriate policies that are applicable. Any issues that arise should be resolved to prevent the emergence of more deserters. EFA is a good policy, for instance, but even though the government accepted it, but the government was unprepared before implementing it which led to a rapidly excessive number of students in primary schools, particularly in the Urban West Region.
2. It is true that any person needs development, so should maintain a strong foundation in our education because education is the key to life, and should not rely on other people's keys to development. For this reason, the government should have retained capable leaders to have appropriate, effective management resources.
3. Communities and the government should adopt a different perspective on urbanization. No need to move more people from rural to urban areas; instead, should develop locally. The government should also provide the infrastructure and other necessities to stop the migration of people from rural to urban areas.

4. Since GIS has numerous applications in daily lives, the government ought to invest more in this technology as it can lead to many innovations and inversions in the nation.
5. GIS applies to land management. Digital cadastral databases are being created in many countries to integrate the various aspects of land supervision. These databases allow for the reuse of land for appropriate purposes and facilitate the management of utilities.
6. Educational Planners should utilize GIS equipment to research, create, carry out, and track the progress of their plans.
7. The government uses GIS technology for Regional Development. Planning, surveying, and engineering professionals rely on GIS to provide them with the resources they need to plan and map their cities.

REFERENCES

Al-Enazi, M., Mesbah, S., & Anwar, A. (2016). School distribution planning using GIS in Jeddah City. *International Journal of Computer Applications, 138*(1), 33–36.

Almahdi, A. J., Rashed, B. M., & Fattah Dakhil, A. (2019). Technical foundations of GIS for the planning and management of the educational sector in the city of Nasiriyah. *Computer Engineering and Applications Journal, 8*(1), 53–64.

Andries, A., Morse, S., Murphy, R. J., Lynch, J., & Williams, E. R. (2022). Assessing education from space: Using satellite Earth observation to quantify overcrowding in primary schools in rural areas of Nigeria. *Sustainability, 14*(3), 1408.

Bahaire, T., & Elliott-White, M. (1999). The application of geographical information systems (GIS) in sustainable tourism planning: A review. *Journal of Sustainable Tourism, 7*(2), 159–174.

Campos-Sánchez, F. S., Abarca-Álvarez, F. J., Molina-García, J., & Chillón, P. (2020). A GIS-based method for analyzing the association between school-built environment and home-school route measures with active commuting to school in urban children and adolescents. *International Journal of Environmental Research and Public Health, 17*(7), 2295.

Fatima, Z. U. A., Mushatq, M., & Fatima, Q. U. A. (2019). Overcrowded classroom problems faced by school teachers in district Muzaffarabad. *International Journal of Academic Research in Progressive Education and Development, 8*(4), 328–339.

Hashim Hameed, N. (2016). On the use of GIS technique to analyze the distribution of primary schools in Holy Karbala City. *Engineering and Technology Journal, 34*(15), 2816–2827.

Jebur, A. K. (2021). Uses and applications of geographic information systems. *Saudi Journal of Civil Engineering, 5*(2), 18–25.

Kamruzzaman, M., Hine, J., Gunay, B., & Blair, N. (2011). Using GIS to visualize and evaluate student travel behavior. *Journal of Transport Geography, 19*(1), 13–32.

Khobragade, S. P., & Kale, K. V. (2016). School mapping system using GIS for Aurangabad city. *IJIRCCE, 4*(10), 17110–17119.

Likuru, C., & Mwila, P. M. (2022). Overcrowded classrooms: Effect on teaching and learning process in public secondary schools in Ilemela Municipality, Tanzania. *Asian Journal of Education and Social Studies, 30*(2), 75–87.

Makino, Y., & Watanabe, S. (2002, November). The application of GIS to school mapping in Bangkok. In *Asian Association on Remote Sensing (AARS) with collaboration Survey Department, the 23rd Asian Conference on Remote Sensing Proceeding* (pp. 25–29).

Mårtensson, U. (2011). *Introduction to remote sensing and geographical information systems.*

Meier, C., & West, J. (2020). Overcrowded classrooms–The Achilles heel of South African education? *South African Journal of Childhood Education, 10*(1), 1–10.

Mears, M., Brindley, P., Barrows, P., Richardson, M., & Maheswaran, R. (2021). Mapping urban greenspace use from mobile phone GPS data. *PLOS ONE, 16*(7), e0248622.

Murad, A. A., Dalhat, A. I., & Naji, A. A. (2020). Using geographical information system for mapping public school's distribution in Jeddah City. *International Journal of Advanced Computer Science and Applications, 11*(5).

Oloko-Oba, M. O., Ogunyemi, A. S., Alaga, A. T., Olatunji, S. B., Ibrahim, S. I., Isa, I., & Kolawole, M. H. (2015). A geospatial approach to the evaluation of accessibility to government primary schools in Ilorin West Local Government Area, Kwara State, Nigeria. *European International Journal of Science and Technology, 4*(8), 96–107.

Olubadewo, O. O., Abdulkarim, I. A., & Ahmed, M. (2013). The use of GIS as an educational decision support system (EDSS) for primary schools in the Fagge Local Government Area of Kano State, Nigeria. *Academic Research International, 4*(6), 614.

Safari Bazargani, J., Sadeghi-Niaraki, A., & Choi, S. M. (2021). A survey of GIS and IoT integration: Applications and architecture. *Applied Sciences, 11*(21), 10365.

Shah, T. I., Bell, S., & Elahi, M. (2011). School mapping in education micro-planning: A case study of Union Council Chak 84/15L, District Khanewal, Pakistan. *Prairie Perspectives: Geographical Essays, 14*.

Sisman, S., & Aydinoglu, A. C. (2020). Using GIS-based multi-criteria decision analysis techniques in smart cities. *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, 44*, 383–389.

Sudrajat, I. (2021). Overcrowded classrooms in the analysis of teacher-students interaction. *JELA (Journal of English Language Teaching, Literature and Applied Linguistics), 3*(2), 74–88.

Tayeg, A. (2015). Effects of overcrowded classrooms on teacher-student interactions: A case study of EFL students at Biskra University.

Thawaba, S. (2016). The integration of GIS into school mapping: A case of Ramallah City, Palestine.

Van Maarseveen, M., Martinez, J., & Flacke, J. (2019). *GIS in sustainable urban planning and management: A global perspective* (p. 364). Taylor & Francis.

Xu, Y., Song, W., & Liu, C. (2018). Social-spatial accessibility to urban educational resources under the school district system: A case study of public primary schools in Nanjing, China. *Sustainability, 10*(7), 2305.