Exploring unbalanced urban spatial expansion in sprawling cities. Case study of Kimara Matangini, Kibululu and Dovya settlements in Dar es Salaam City, Tanzania

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Abstract: Unbalanced urban expansion characterize urban growth in rapidly urbanizing cities in the global south. This pattern of growth has resulted into difficulties in provision of services which leads to challenges of livability within settlements. Services such as education, health, water supply and road network are not easily accessible because of unbalanced growth. Balanced urban growth is concerned with three key themes: place, people and planning. The aim of this study is to help policy makers, local governments, developers, planners and service providers to analyze and visualize different options and scenarios to achieve balanced urban expansion. The overall goal of balanced urban spatial expansion is to achieve livable, sustainable, resilient and affordable cities. This paper adopted both qualitative and quantitative approaches of data collection and subsequent analysis and captured empirical evidence from primary and secondary data sources. The key methods included; literature review, interviews and observations. The research was conducted in three settlements with a sub-ward status namely; Kimara Matangini, Kibululu and Dovya. Findings indicate that the drivers of urban spatial growth are related to economic and social factors, people's choice and satisfaction of residential areas, modalities in land acquisition, provision or non-provision of services, mobility, proximity to services and proximity to the city centre. Yet the emerging development pattern pose some challenges to residents settling in these areas because of unavailability or longer distances to basic services. This pattern of growth has culminated into unbalanced urban growth. This study recommends that the government in collaboration with key stakeholders should strengthen development control even in unplanned settlements so as to monitor development and potential service requirements, acquire parcels of land for future service provision, strengthen regularization activities to provide for land reserves for infrastructure and conduct a city wide analysis on the unbalance pattern, especially in rapidly urbanizing peri-urban areas.

Key words: unbalanced spatial growth, service availability, accessibility, livability, density

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1. INTRODUCTION

Urban spatial change is the process of growth and decline of the spatial extent of land use agglomerations. The spatial pattern of cities and their evolution, has been found to be a result of economic and social change factors. Similarly, the size and pattern of urban forms results from the patterns of urbanization and at times influenced by planning interventions [1]. Urban growth exhibits many patterns that reshape the urban spatial structure, which also contribute to changes on housing density and transportation systems. Urban areas are in their nature dynamic, complex and are continuously changing. These changes are catalyzed by many drivers and underlying factors. Among these, transport is

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considered one of the main factors of urban growth. Advances in the transport system have reduced the cost of commuting within urban areas and encouraged urban scattering. Equally, transport infrastructure expansion has stimulated urban growth and land use changes.

Urban spatial growth has been strongly influenced by population growth that catalyze land use change as a source of livelihood. However, in most of the cities in the global south, unplanned urban growth has culminated into informality of both housing and livelihood activities. Where informality has emerged in some difficult or hazardous lands, it has led to the occurrence of disasters in the context of climate change. Consolidation and expansion of informally developed settlements have aggravated the unbalanced nature of urban expansion especially the issue of access to basic services. Infrastructure services and community facilities are problematic to the extent that services provided are not sufficient, due to fact that unplanned settlement agglomerations do not provide room for the provision of these services [2].

Dar es Salaam is a rapidly growing city that has been experiencing substantial changes in its spatial pattern and land development. These spatial changes have been driven by a number of factors which include; transport and communication, internal migration, high natural growth rates of population, public policies and agglomeration economies. Urban expansion has taken the form of 'peripherization' that is characterized by large sections of peri-urban areas with the informal pattern of land use developments. Most of these settlements are deficient in terms of infrastructure services, public facilities and often accompanied by inadequate provision of access roads and public transport. Spatial forms that emerge are largely driven by individual efforts to secure land to construct a shelter that is affordable by respective households [3]. The unplanned spatial expansion of Dar es Salaam leads to unbalanced or difficulties in services provision as per urban planning guidelines. The consequences of this pattern of growth has been manifested in increased inaccessibility to services such as schools and health facilities within and outside the vicinity of the neighbourhoods when densities reach the highest levels. This paper seeks to explore the drivers that contribute to urban spatial growth in Dar es Salaam City and examine accessibility thresholds resulting from this pattern of settlement growth. The main purpose being to contribute to the existing body of knowledge on unbalanced urban expansion and its effects on livability. This paper is expected to find readership among policy makers, practicing planners as well as academicians.

2. CONCEPTUALIZING BALANCED URBAN EXPANSION

Many authors have discussed the concept of balanced urban expansion pointing out that it relates to broader concepts of sustainable development and livable cities [4]. They argue that while the concept symbolizes the big visionary ideas for urban planning and balanced development its implementation can encounter a host of conflicts due to a range of interests and stakeholders involved [4].
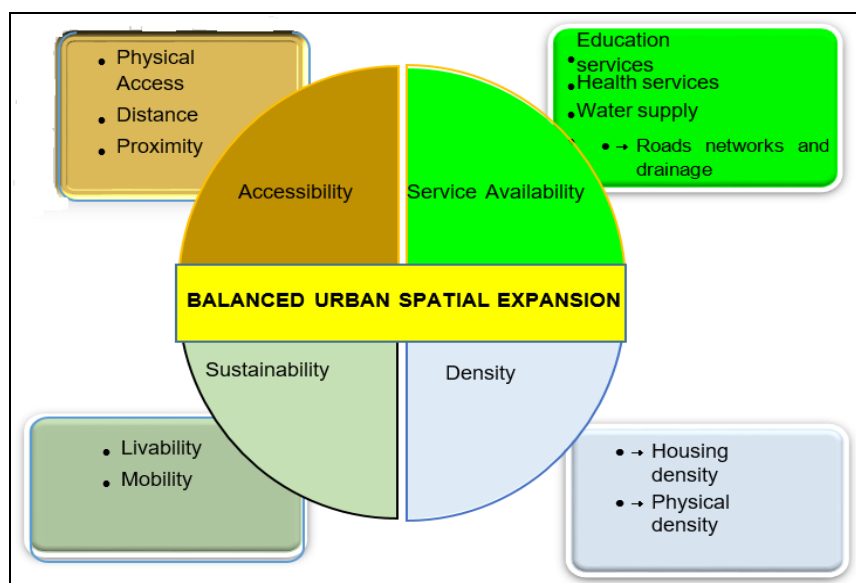

Figure 1. Conceptual framework.
Source; own construct.

In this paper, four key variables have been considered to characterize balanced urban expansion namely; accessibility, service availability, sustainability and density (Figure 1). While the aim of balanced urban expansion or development is to help urban stakeholders to develop various planning tools and models that help to analyze and visualize different options and scenarios, the overall goal of balanced urban expansion is to deliver livable, sustainable, affordable and accessible cities. Accessibility refers to the ability and easiness by which people can reach the desired activities, places or areas. It refers to the potential of opportunities for interaction [5]. An accessible area or environment is an area which allows the freedom of movement and use in total safety, regardless of age and gender [6]. Related to balanced spatial expansion, the concept of accessibility is important because it helps to show how city expansion should accommodate the services needed. Many urban dwellers face accessibility challenges, they are unable to access services because of distance and congestion when urban areas expand without following urban guidelines. Therefore, the concept of accessibility is an important component in urban spatial expansion analysis because it helps to show how urban expansion should be designed to accommodate facilities needed by all users. In this paper a focus is paid on physical accessibility, distance and proximity analysis in analyzing access to facilities by users.

While sustainable development as a concept has been widely discussed from various perspectives namely spatial, environmental, economic, social, cultural and political [7], in this paper, this concept is being viewed from livability and mobility points of view. Livability as a conceptual variable depict changing interpretation due to a range of factors in time and space. What is livable now and in one specific area may not be so in future and in another locality [4]. This points out to discussing livability in context based on locality data or information. The same authors [4] argue that it will be important to regularly collect data that will assess livability, community health, well-being and a range of factors that contribute to a better quality of life in a given urban area or context. Other authors argue that the common goal of livability is to ensure that we direct our actions, planning and designs that will make a place enjoyable to live in [8,9]. The idea of a livable city is to bring the community together for healthy living, enhanced their interaction among themselves and the surrounding environment and promote their productivity and wellbeing in a sustainable way. Livability is often related to the values and preferences of local community places for amenity, wellbeing aspect and sense of place or belonging.

Another perspective on livability as a concept is the social infrastructure and community interactions and their impact on access to quality services. These may include; health, educational, social, cultural, business and recreational facilities in the area and how these facilities promote social interactions, a sense of community place and belonging. The future livable cities must also have climate change adaptation and risk management strategies, particularly taking care of natural disasters, such as flooding and wildfire in their agenda.

Mobility in this discussion refers to the easiness of movement from one destination to another with the help of a transport network and services available within the two destinations. Mobility between original and destination is measured as the distance travelled by people in person miles travelled [10]. In the same vein, accessibility is discussed with the view to the extent to which goods, services, places and information are accessible with minimum time and efforts [5]. It is classified as access to other people, access to human activities, access to services, access to material resources, access to the natural environment and access to information [5]. Accessibility in this paper has been viewed in the context of physical accessibly, distance and proximity.

While distance has been viewed as a key geographical concept especially as part of the theoretical and quantitative revolution, its perceived advantage of distance over other key geographical concepts was that distance connotes an objective physical property [11]. It could easily be measured, quantified, and deployed in comparative work. Impliedly, urban growth or expansion can be determined by the relationship between the service available and the extent of distance perceived in a settlement. This sub variable is closely related to proximity. Proximity is associated with member value. Some authors argue that proximity helps consumer co-operatives understand and serve their members' needs through their closeness to the members' daily social activities (locale) [12]. The sustainable consumption literature highlights the role of proximity as a contextual factor which constrains and shapes consumer preferences [13]. Therefore spatial proximity, is a widely used dimension to analyze geographical closeness of two agents or localities [14]. In this paper, the operational measure of spatial distance is the actor's perception of the geographical distance.

Service availability makes reference to the physical presence of services. In this paper, service availability did not include more complex dimensions such as geographical barriers, travel time and user behaviour, which require more complex input data. Service availability is simply described by the presence of services as responded by respondents. In this context, two major items were put into focus namely; education (schools) and health facilities (dispensaries and health centres).

Density is a concept also draws in varied meanings and interpretations. While physical density (sometimes referred to as objective density) has been examined as land use ratios, from a housing perspective, density has been measured in terms of floor area ratios, plot coverage and dwelling units per specified area [15,16]. Floor Area Ratio (FAR) refers to floor space in relation to plot or land area, plot coverage refers to the proportion of built-up areas to that of plot area expressed in percentage. Floor Area Ratio largely expresses the verticality of buildings while coverage expresses the horizontal coverage of built spaces [15, 16]. In common practice, density has often been referred to as a degree or intensity of development or of occupancy. The focus of this paper is on a number of houses in a given geographical space that is primarily aimed at tracking variations across settlements and as a dimension of balanced urban expansion.

3. METHODOLOGY

Dar es Salaam city was selected as a case study primarily because it is a primate city with a rapid urbanization rate. The unguided nature of city expansion has rendered many of the peri-urban settlements to develop informally. The rate and spatial character of these settlements depict a varied situation in terms of service availability and accessibility, physical accessibility and physical densities. Therefore, having listed five settlements that could be selected, and elimination method was used based on four established criteria to select a few cases for detailed interviews. The selected settlements were Kimara Matangini and Kibululu in Ubungo Municipality, and Dovya (Bunju) in Kinondoni Municipality (Table 1).

Table1. Case selection criteria.

S/N	Settlement	Service availability	Sustainability of the area	Accessibility	Population density	Total score
1	Kimara Matangini	X	X	X	⊕	3
2	Kibamba	⊕	X	⊕	⊕	1
3	Kisarawe	⊕	X	⊕	⊕	1
4	Kibululu	X	X	X	⊕	3
5	Dovya	⊕	X	X	⊕	2

NB: X stands for not well served and ⊕ for a well-served area

The sample size for household interviews was established based on sub-ward population statistics for each settlement. Using a statistical model [17], the sample sizes for household interviews was 68 households for Kimara Matangini, 64 households for Kibululu and 60 households for Dovya. Mapping was used to analyze spatial data especially on the emerging city spatial pattern and location of services. The same methods was employed to analyze proximity and accessibility to services within case study settlements. Quantitative data was analyzed using tables and spatial data (proximity analysis) was analyzed using Geographical Information System Software (GIS).

4. RESULTS

4.1. Urban spatial expansion of Dar es Salaam

Dar es Salaam is the largest city and commercial capital of Tanzania. With a total population of 4.4 million in 2012, it is one of the rapidly growing cities in sub-Saharan Africa [18]. Dar es Salaam's population grew at an average annual rate of 5.6 percent between 2002 and 2012. Despite the rapid

population growth, population densities remain quite low in most parts of the city [19]. The city has a jurisdictional area of 147,557 hectares and its built up area is estimated to be 115,372 hectares. The built up area is equivalent to 71 percent of the jurisdictional area [20]. By 1892, the spatial extent of Dar es Salaam was limited to only 2 kilometre radius from the city centre. This coverage increased to 6 kilometres in 1963, 17 kilometres in 2002 and 30 Kilometres in 2012. The spatial expansion of Dar es Salaam in the 1970s and 1980s followed a star-shaped pattern along major roads of Bagamoyo, Morogoro, Pugu and Kilwa [20]. Presently, the city has grown up to 30 kilometres northwards along Bagamoyo Road, 28 kilometres westwards along Morogoro Road, some 32 kilometres southward westwards and south eastwards along Pugu and Somanga Roads (Figures 2 and 3).
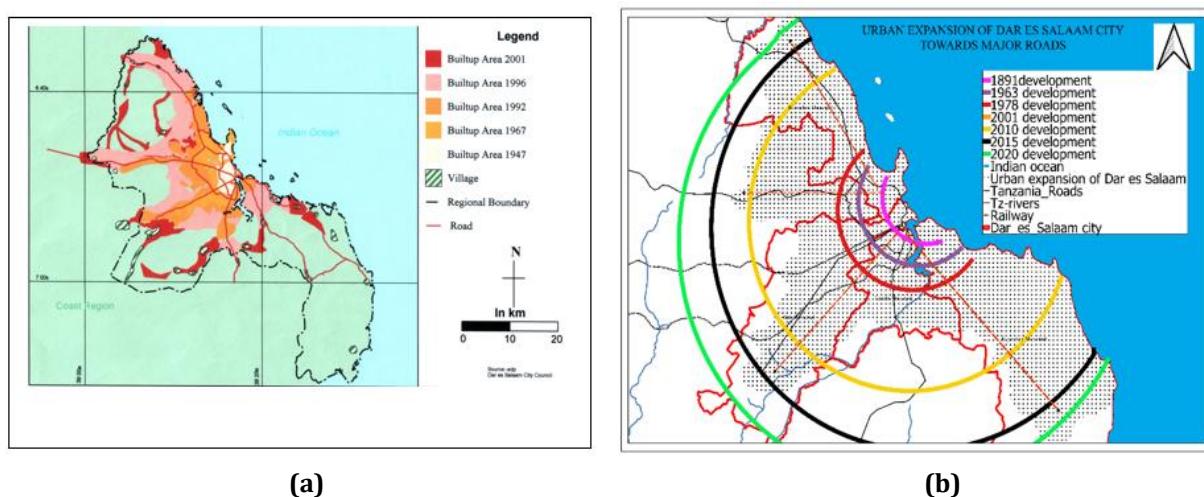

(a)   **(b)**

Figure 2. (a) Dar es Salaam city spatial expansion (1947-2001); **(b)** Dar es Salaam city spatial extent (2020).
Source: [15, 22, 23, 24]

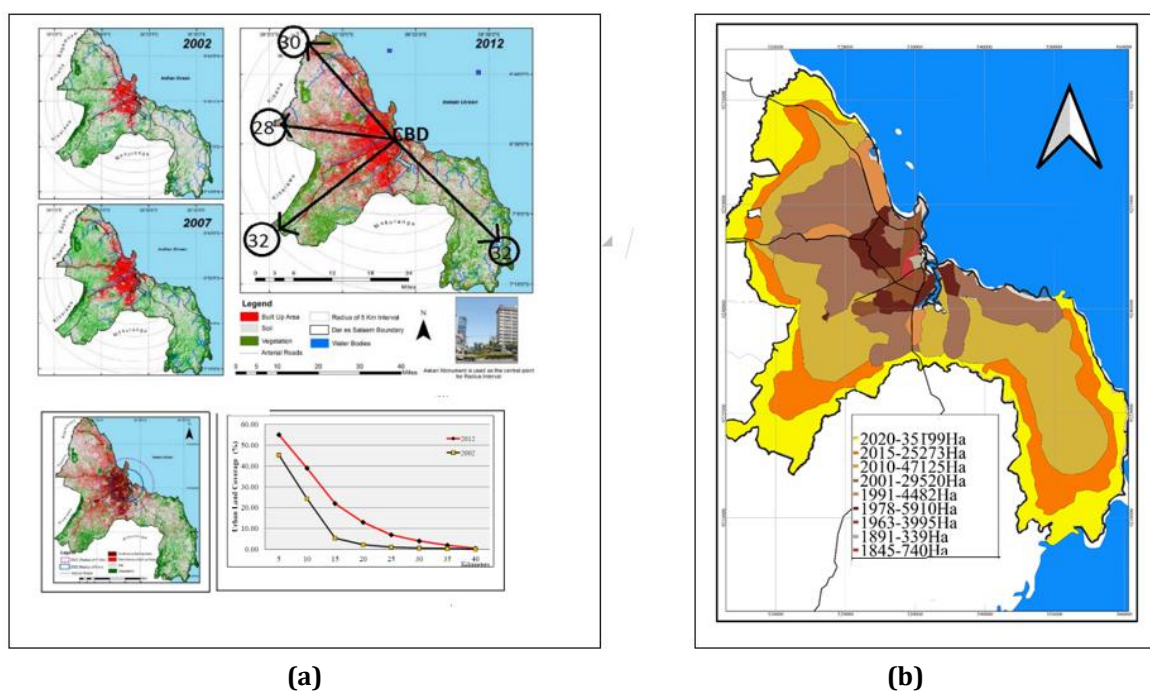**(a)**   **(b)**

Figure 3. Spatial growth trends and extent of Dar es Salaam City. **(a)** City spatial growth trends and extent (2002-2012) and density gradient with distance from the city centre; **(b).** City development extent and built up areas in hectares (1845-2020).
Source; [19, 20, 22, 23]

Provision of infrastructure services has not kept pace with the demographic and spatial growth of the city. Road density for Dar es Salaam has been diminishing over time. For example, while urban growth for Dar es Salaam stood at 13 square kilometres in 1947, the road length by then was 107 kilometres. This resulted into a road density of 8.3 kilometres per square kilometre. In 1967, when urban growth had

reached 51 square kilometres and a corresponding road length of 190 kilometres, road density diminished to 3.7 kilometres. In the year 2012, road length had increased to 941 kilometres within a spatial growth extent of 927 kilometres resulting into road density of 1.0 kilometre per square kilometre [25]. The diminishing road density has been taking place amidst a rapid increase (estimated at 5.6 percent per annum) of Dar es Salaam population. While in 1948 Dar es Salaam population stood at 50,765, this figure increased to 93,363 people in 1957, then to 272,821 in 1967, further increased to 843,090 in 1978 and in 1988 the population for Dar es Salaam had reached 1,377,201. The population census of 2002 recorded a population of Dar es Salaam to be 2,487,288 and the latest census that was conducted in 2012 recorded a population of 4,364,541 [25]. While 85 percent of the population in Dar es Salaam can access potable water supply, only 10 percent have access to sewerage connection services. Informal settlements have also grown in terms of size, population, spatial extent and density. The reasons for informal growth are largely attributed to the limited capacities of urban local government authorities to timely acquire, plan and make serviced land available to developers, increasing land acquisition costs, ineffective urban development control and rapid population increase resulting from in-migration and natural growth.

The city spatial expansion has continued undeterred despite escalating problems in the mobility system of the city. Dar es Salaam has a mono-centric structure, where most of the functions and employment centres are located in the central business district. Mobility system is characterized by highly inadequate road networks, insufficient public transport and severe congestion problems [26]. The ongoing transformations of the central areas into high-rise commercial buildings along with increasing rates of car ownership has further increased pressure on the urban mobility system [27]. Urban expansion is happening largely informally and unguided by the city planning authorities. In total, an estimated 80 percent of Dar es Salaam's territory is informal [28].

4.2. Description of case study areas

The three case study areas are Kimara Matangini, Kibululu and Dovya (Figure 4).
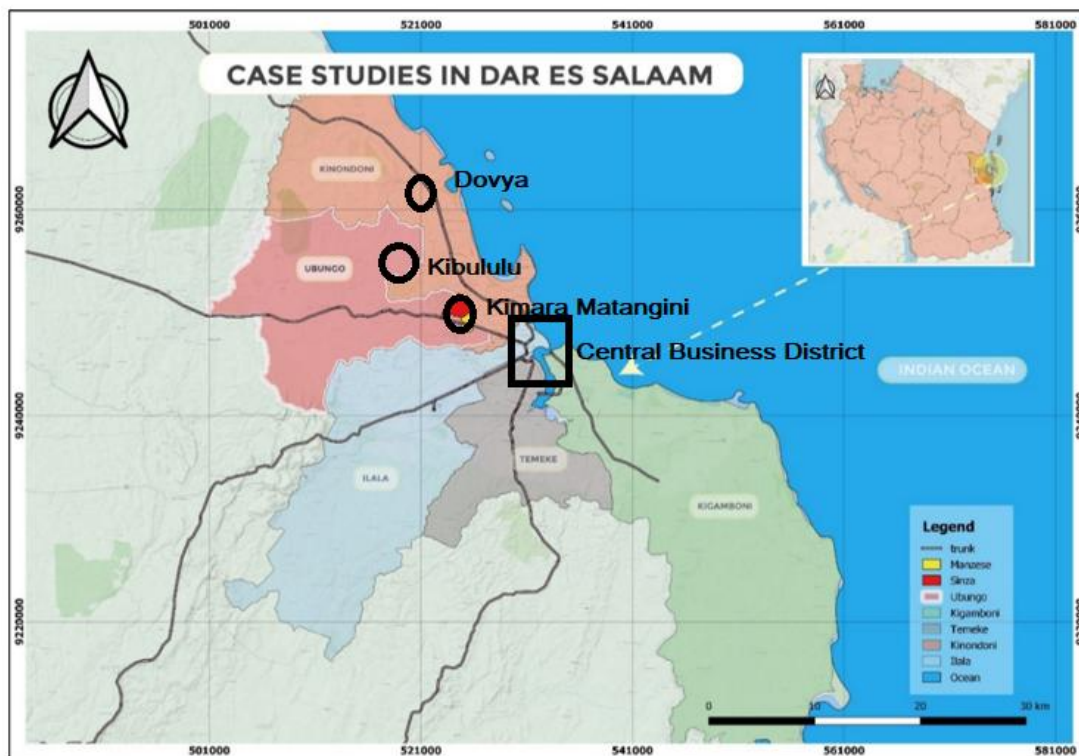

Figure 4. Location of case study areas.
Source: [23] modified by author

Kimara Matangini is a sub-ward in Kimara ward in Ubungo Municipality. It occupies a total area of 277 hectares. It has a total population of 11,000 people and an average population density of 40 persons per hectare. It is located along Morogoro Road. It has developed informally with limited or planned services to serve the entire population and the consolidating settlement. Kibululu sub-ward is located in Goba award in Kinondoni Municipality. Kibululu covers a total area of 592 hectares with a total population of 15,940 people. It has a gross population density of 27 persons per hectare. This is a settlement where informal housing construction is going on. Dovya is a sub-ward located in Bunju ward in Kinondoni Municipality. It covers a total area of 944 hectares and an estimated population of 13,000 people. These two variables give an average population density of 14 persons per hectare. It is a settlement where informal housing development is also on-going (Figures 4, 5, 6 and 7).
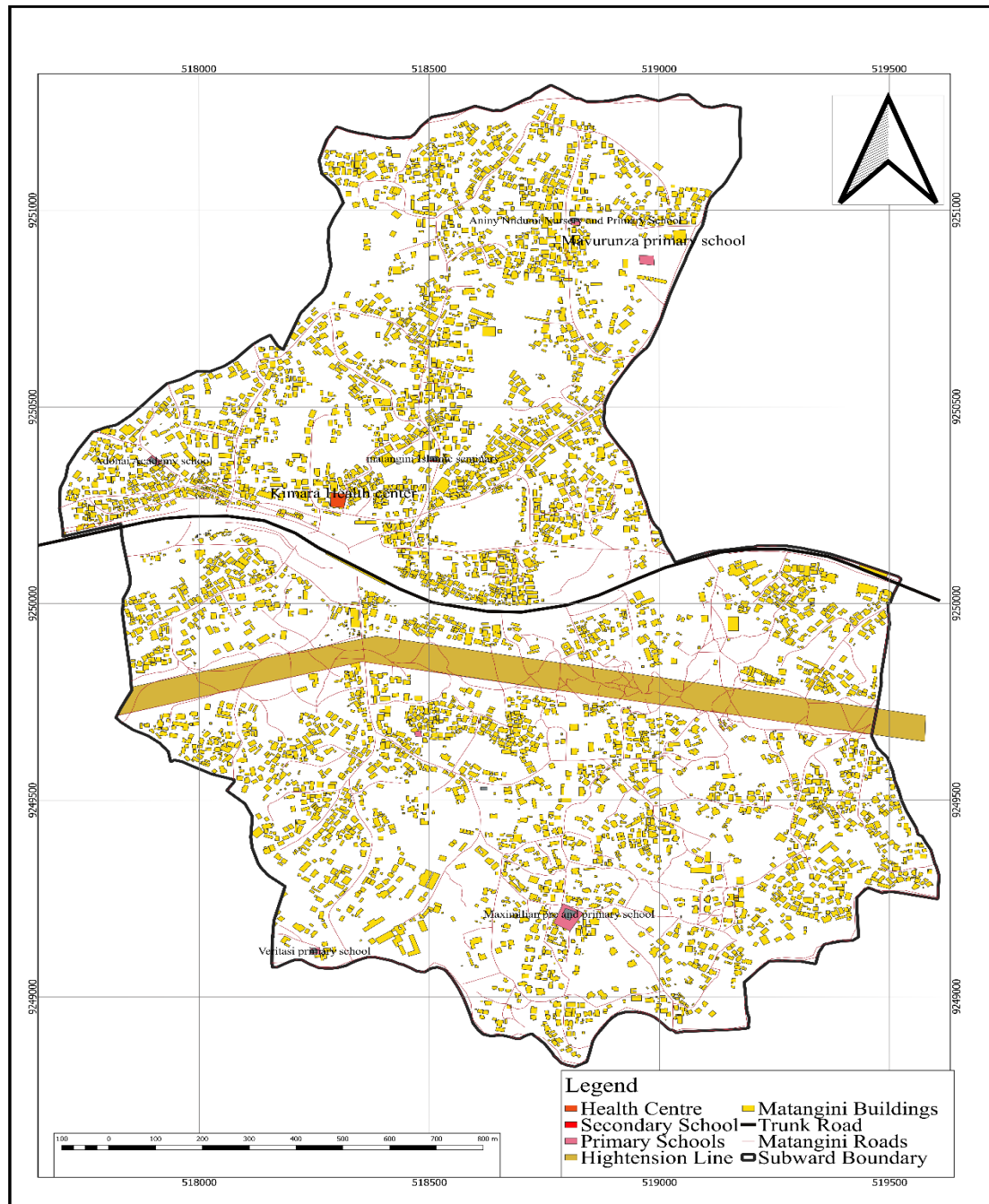

Figure 5. Locational characteristics of Kimara Matangini settlement.
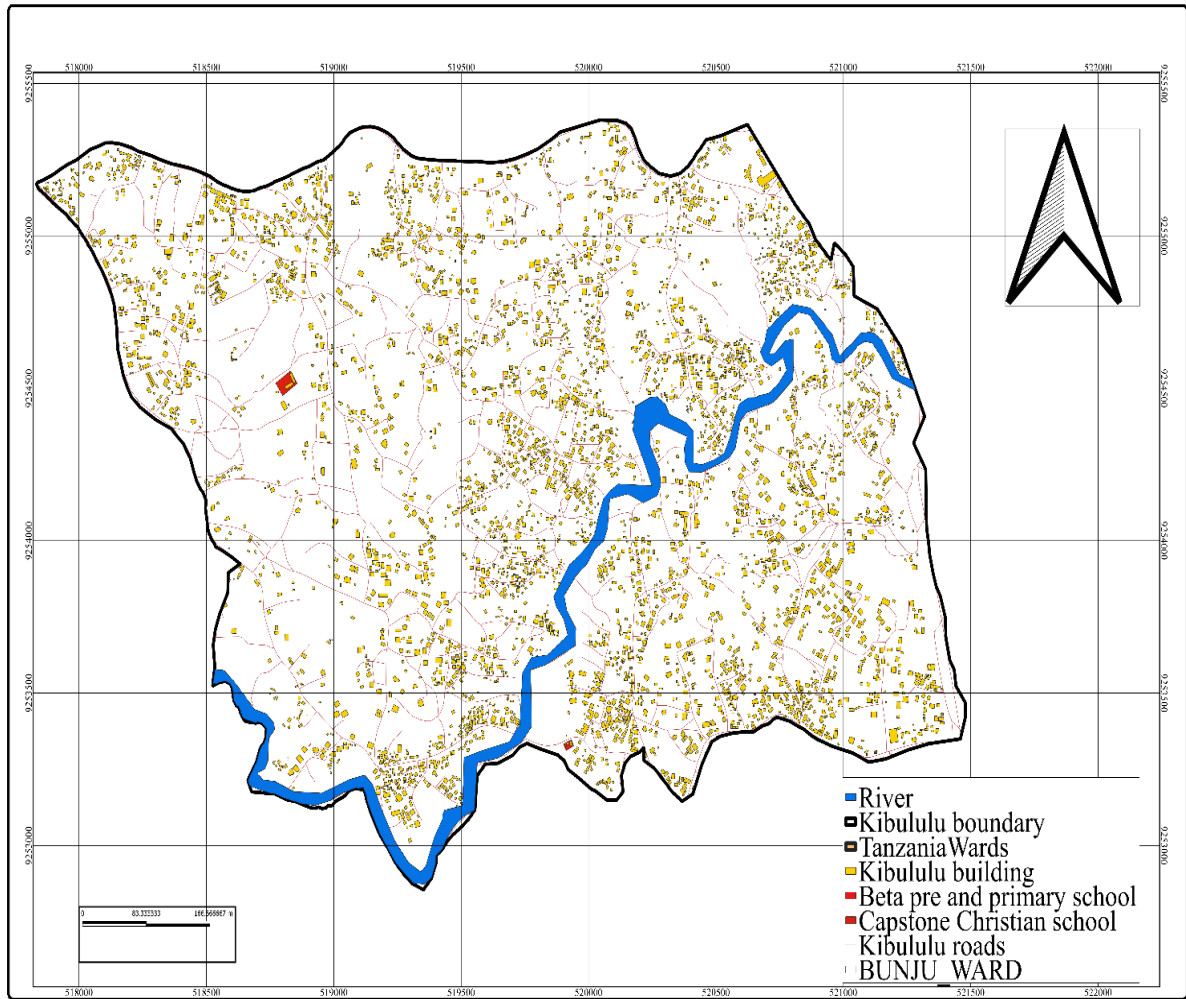Source: [29]

Figure 6. Locational characteristics of Kibululu settlement.
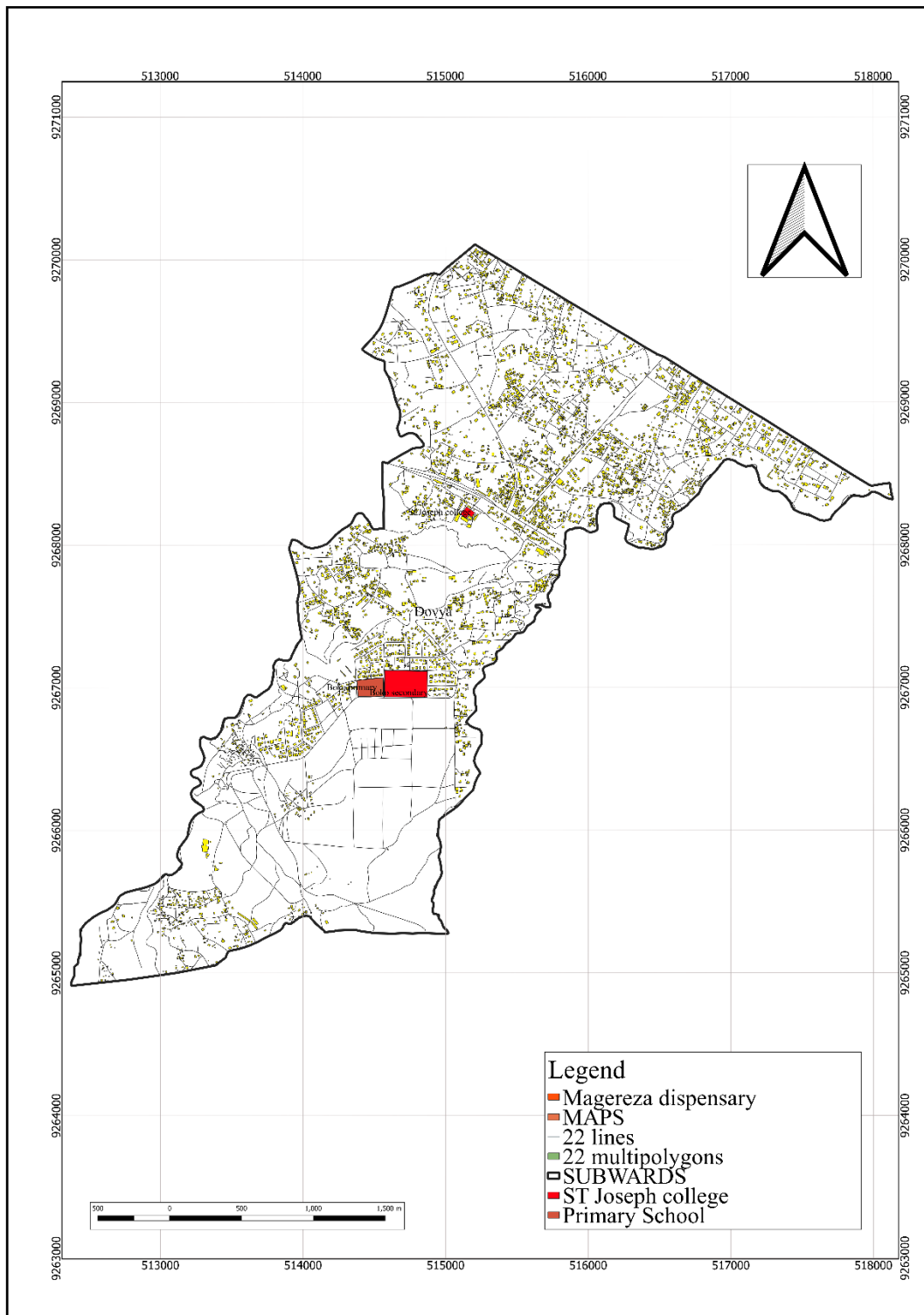
Source: [29]

Figure 7. Locational characteristics of Dovya settlement.
Source: [29]

4.2.1. Household characteristics

From the three case study areas there was variation in number of household members who lived in one house. While in Kimara Matangini the highest number of household members living in one house was 4, the same was for Kibululu where the established figure was 4 household members. In Dovya settlement, the highest values were recorded for 3, 4 and 5 household members per house (Table 2). This size

corresponds to the Tanzania average of 4.6 as reported by the National Household Budget Survey Report of 2020 [30].

Table 2. Household characteristics.

Total number of household members	Settlement		
	Kimara Matangini	Kibululu	Dovya
1	3	2	2
2	7	3	4
3	5	7	13
4	14	15	13
5	12	13	13
6	10	13	8
7	3	6	3
8	1	1	2
9	0	0	0
10	0	0	0
Total	68	64	60

Source: Household interviews, June, 2021

Employment status

Employment status determines the pattern of movement of people from one location to another. About 50 percent of the respondents said that they were employed in the government, private sector and self-employed. Employed respondents in Kimara accounted for 68 percent, 89 percent in Kibululu and 63 percent in Dovya (Table 3).

Table 3. Employment status.

	Kimara Matangini	Percent	Kibululu	Percent	Dovya	Percent
Yes	46	68	57	89	38	63
No	22	32	7	11	22	37
Total	68	100	64	100	60	100

Source: Household interview June, 2021

These data are not far from the national average of 78 percent employment as per Integrated Labour Force Survey of 2014 [31]. They also indicate that the majority of the people from these settlements earn their livelihood based on employment. In terms of employment by sector, the collected data indicate a high percentage of respondents from all three case study settlements to work as self-employed, followed by government and private sector. In Kimara, for example, 44 percent were self-employed, 43 percent were employed in the government sectors and 13 percent were employed in the private sector. In Kibululu settlement 60 percent were self-employed, 30 percent employed in the government sectors and 10 percent were self-employed. In Dovya settlement, 63 percent were self-employed, 32 percent were employed in the government sectors and has and 5 percent were employed in the private sector. These data implies that the majority of the people are currently self-employed in various economic activities (Table 4).

Table 4. Employment by category of respondents.

	Kimara Matangini	Percent	Kibululu	Percent	Dovya	Percent
Government	29	43	21	30	19	32
Private sector	9	13	7	10	3	5
Self employed	30	44	36	60	38	63
Total	68	100	64	100	60	100

Source: Household interview June, 2021

Modality of land acquisition

One of the factors contributing to city sprawl is the modality of land acquisition. Free entry to land acquisition without controls from urban authorities promotes informal land transactions and subsequent development. From the case study settlements, there were two main modalities of acquiring land which included purchase and inheritance or gift. There were neither cases of granted right of occupancy not customary land ownership. In Kimara Matangini purchase of land accounted for 44 percent, 61 percent for Kibululu and 43 percent for Dovya. There were more cases of inheritance and gift in Dovya (57 percent) followed by Kimara (56 percent and Kibululu (39 percent) (Table 5).

Table 5. Modalities of acquiring land.

Modality	Kimara Matangini	Percent	Kibululu	Percent	Dovya	Percent
Purchase	30	44	39	61	26	43
Inheritance and gift	38	56	25	39	34	57
Total	68	100	64	100	60	100

Source: household interview June, 2021

This pattern of land acquisition indicates that increasingly, people who purchase land are more or less equal to those who inherited land. This implies that people purchasing land are usually outsiders from the original settlers of these areas and contribute to sprawling city and further consolidation of houses in these settlements.

Plot sizes

According to the Urban Planning Space Standards, high density plots have the area range of (301-600) square metres, medium density (601-800) square metres and low density (801-1,200) square metres [32]. Observation studies in the three settlements recorded that most of the plots constituted high density and only a few were in the category of low density (Table 6).

Table 6. Plot sizes in the case study areas.

Plot category	Plot size (M²)	Kimara Matangini	Percent	Kibululu	Percent	Dovya	Percent
High density	301-600	62	91	59	92	52	87
Medium density	601-800	5	8	5	8	8	13
Low density	801-1,200	1	1	0	0	0	0
Total		68	100	64	100	60	100

Source: Household interviews and observation studies, June, 2021

Further observations from these areas revealed that some of the plots were below the prescribed standards. This was attributed to the fact that plot owners were free to subdivide and sell plots without any town planning consideration or intervention from the planning authorities. Plot owners were also changing the use of their plots from residential to commercial uses without permission from planning authorities contributing to increased density and the changing form of the settlements in terms of land use.

Factors for choice of the residential area

The factors which influenced people to settle in one settlement varied across the three case study settlements. In Kimara Matangini and Dovya settlements for example, availability of community services was reported to be the leading factor for respondents to settle in that area. This factor accounted for 24 and 18 responses of the sample population respectively. In Kibululu settlement, affordable house rent was a leading factor which accounted for 22 responses of the sampled population. Other factors that influenced people's choice of settling in a specific settlement included; family decided to settle in the settlement, social security, closeness to work place, acquisition of house to suffice household needs, availability of cheap land and proximity to city centre (Figure 8).
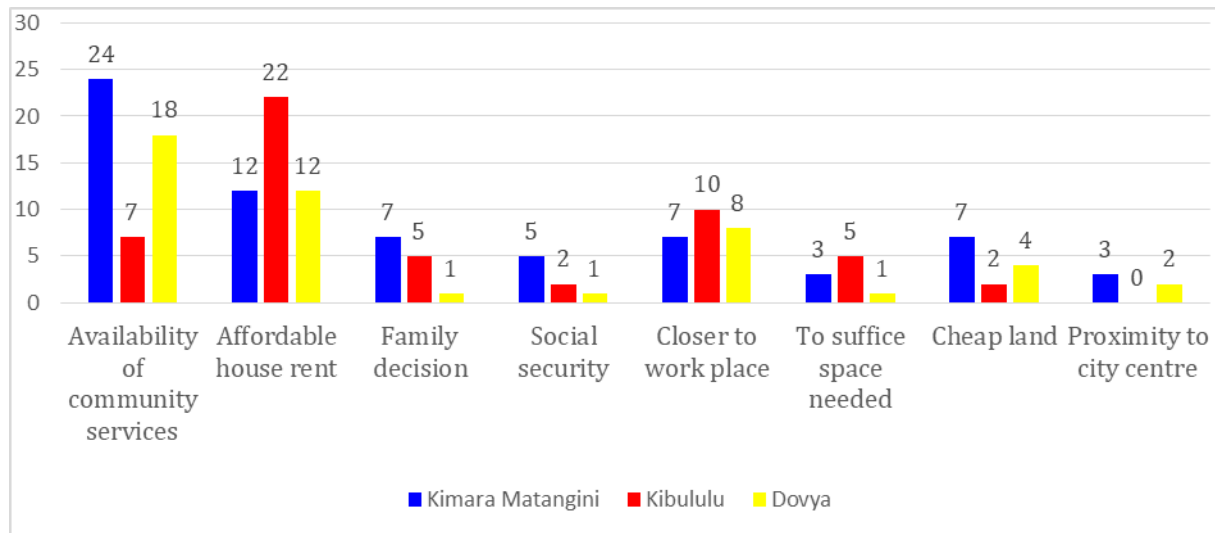
Figure 8. Factors for choice of residential areas.
Source: Household interviews and observation studies, June, 2021

The location and ease of transport accessibility to the workplace has also been highlighted as important element in the selection of a residential area. This is also related to a person's position in the life-cycle. Some researchers have modelled residential mobility at the micro level and clarified the link between place of residence and place of work on the assumption that household residential relocation is strongly embedded in housing market conditions at the local and national levels. This factor has an impact on residential choices to residents due to the reason that people look for an easy way of optimizing their living condition as well as their economic status [9].

Availability of affordable land influence residents to choose certain settlements to live and this factor vary from one settlement to another. This is probably one of the main factors contributing to city sprawl because people strive to buy and develop houses for both owner occupation and renting in peri-urban areas.

Satisfaction of residential choice

Residents' satisfaction of their choice to live in respective settlements was also assessed. Reasons for satisfaction to the residential area again varied from one settlement to another. While comfortability was highly responded in Kimara Matangini, availability of community services was reported by the majority of respondents from Kibululu and Dovya. Other responses included; proximity to the city centre, closeness to workplaces and affordability of house rent (Figure 9).
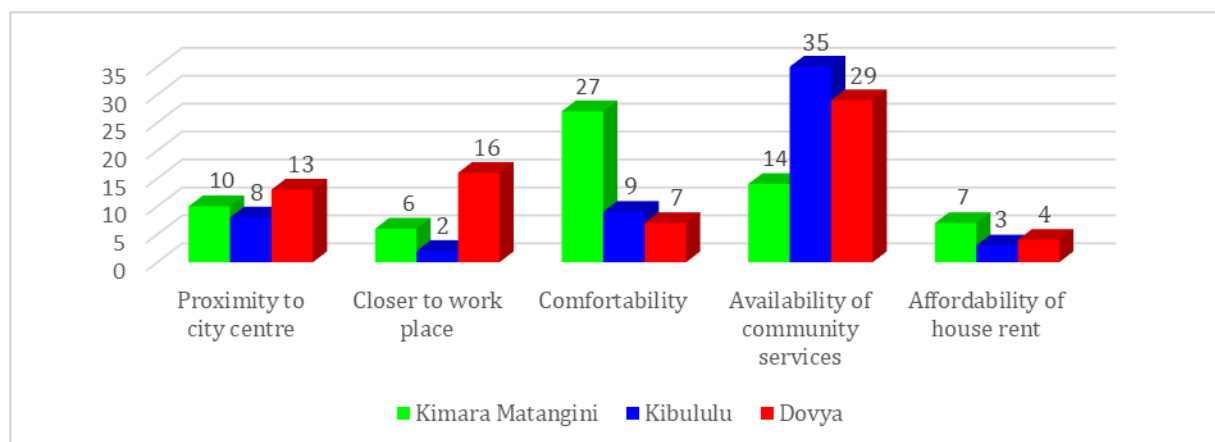

Figure 9. Satisfaction of residential choice.
Source: Household interviews June, 2021

Livability, mobility and proximity to basic facilities in case study areas

From people's perspectives, livability was examined from resident's perception to and actual availability of services for their daily life. Specific focus was paid to education and health facilities namely; nursery and primary schools and dispensaries and health centres because these are basic services provided at local level such as ward or sub-ward areas.

Kimara Matangini had five primary schools, one secondary school and one health centre. Kibululu had two primary schools and one secondary school. Dovya had two primary schools and two secondary schools. Mobility and proximity were analyzed based on optimal distances people had to travel to these services. From household interviews and threshold map analysis (Figures 10, 11, 12, 13, 14, 15 and 16), majority of the residents could reach basic services within a threshold distance of a half to one kilometre. For example, 31 percent of the respondents in Kibululu settlement could reach a primary school within half a kilometre, 30 percent could reach a secondary school within the same distance and the same pattern applies for nursery schools, dispensary and health centre. If one Kilometre is considered the optimal distance to basic services, then all the three settlements had these services within optimal walking distance (Table 7).

Table 7. Mobility and proximity to basic services.

Settlement	Facility		Distance to reach the facility							
			½ km	%	1 km	%	1km +	%	Total	
Kimara Matangini	Education	Primary	28	42	22	32	18	26	68	100
		Secondary	31	46	26	38	11	16	68	100
	Health	Health centre	27	40	31	46	10	14	68	100
Kibululu	Education	Nursery	18	28	32	50	14	22	64	100
		Primary	20	31	34	53	10	16	64	100
		Secondary	19	30	32	50	13	20	64	100
Dovya	Education	Nursery	11	18	28	47	21	35	60	100
		Primary	16	27	23	38	21	35	60	100
		Secondary	16	27	23	38	21	35	60	100
	Health	Dispensary	23	38	19	32	18	30	60	100

Source: Household interviews, June 2021

Figure 10. Proximity analysis for primary schools in Kimara Matangini.
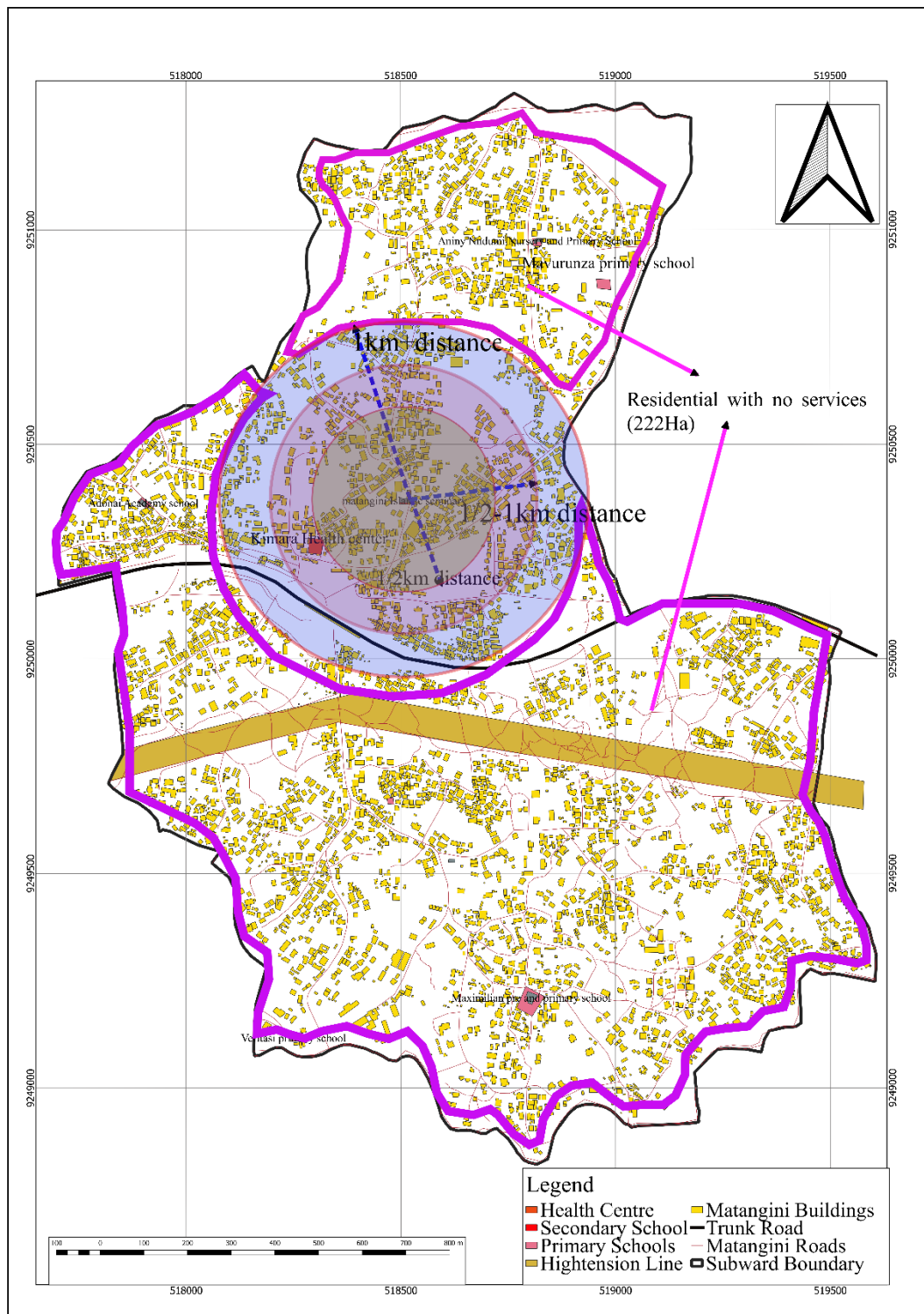Source: Base map of Kimara Matangini, June, 2021

Figure 11. Proximity analysis for Secondary Schools in Kimara Matangini.
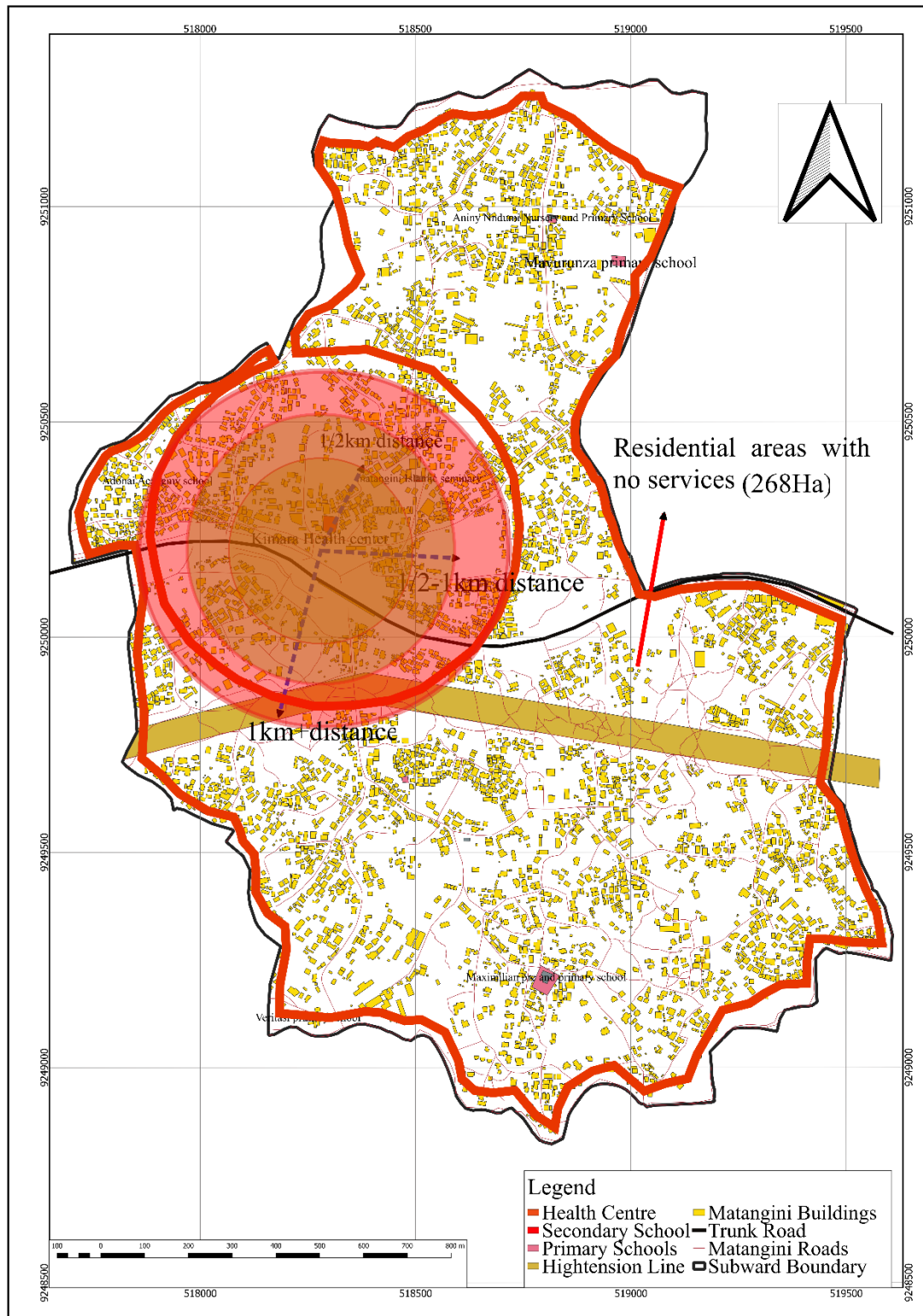Source: Base map of Kimara Matangini, June, 2021

Figure 12. Proximity analysis for a health centre in Kimara Matangini.
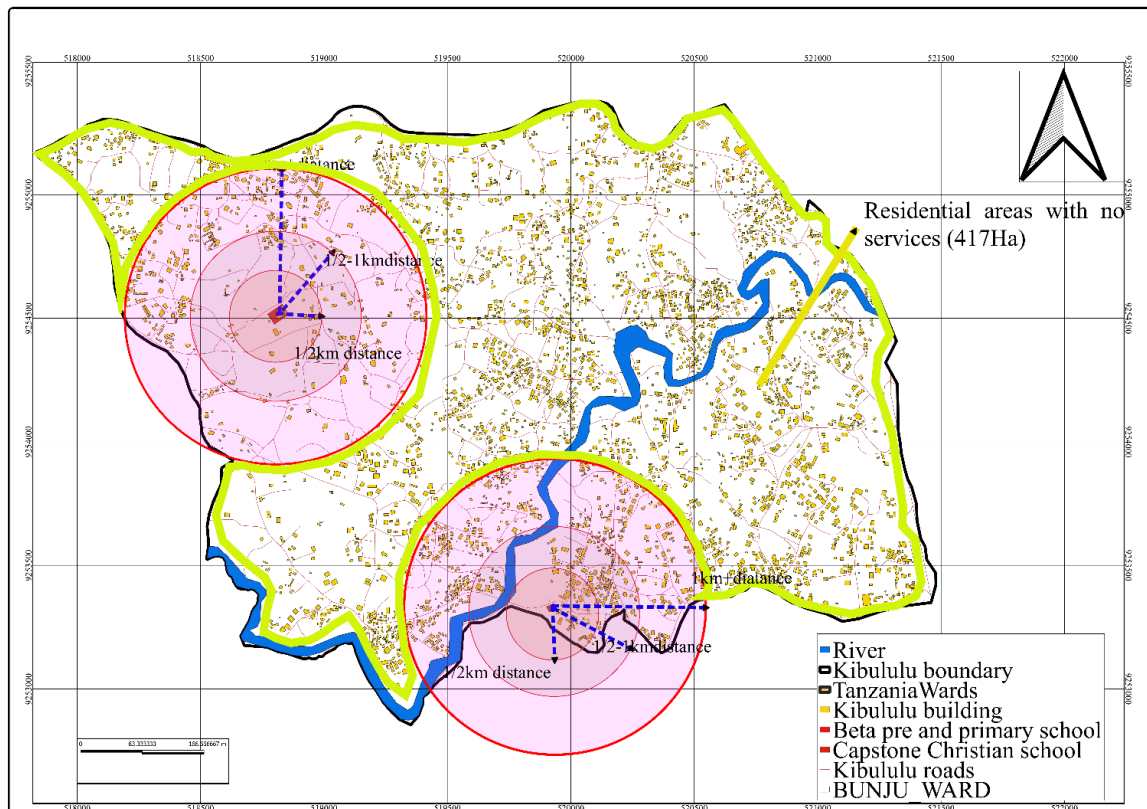Source: Base map of Kimara Matangini, June, 2021

Figure 13. Proximity analysis for Primary Schools in Kibululu sttlement
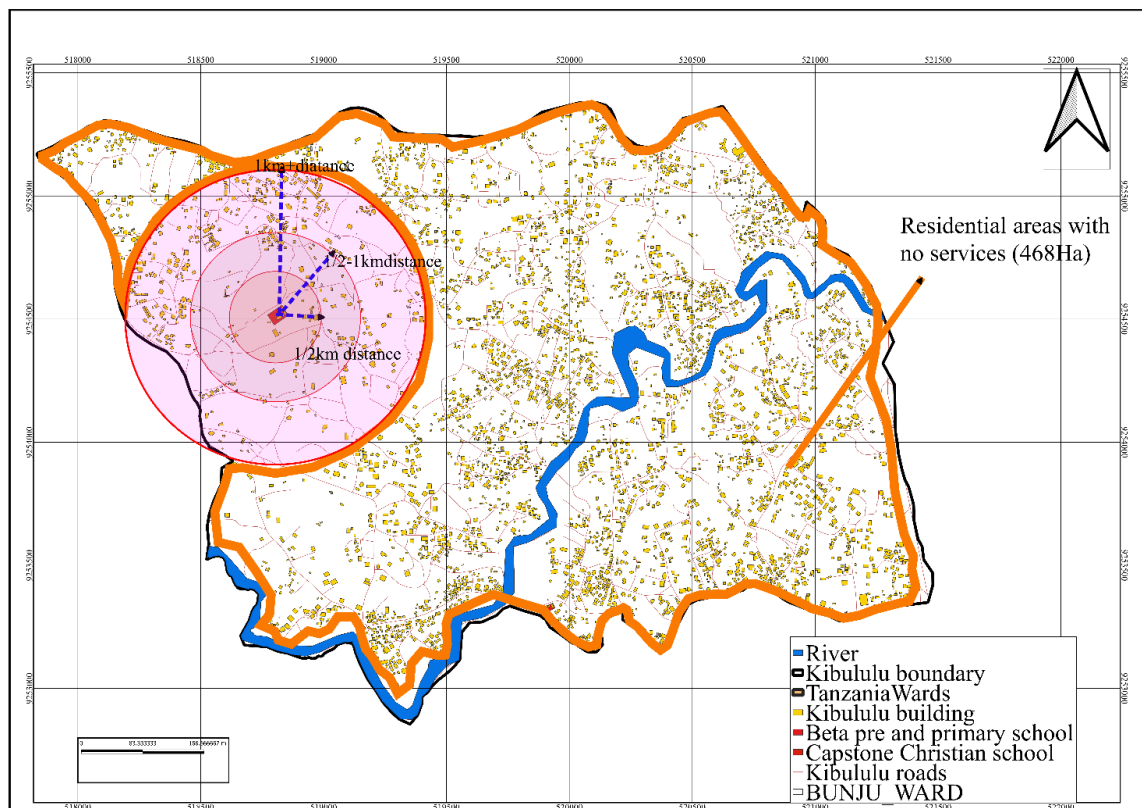Source: Base map of Kibululu June, 2021

Figure 14. Proximity analysis for Secondary School in Kibululu sttlement.
Source: Base map of Kibululu June, 2021

In this analysis, the location of a facility largely defined locational accessibility and whether there was a balanced service location and accessibility. For example, while Kimara Matangini had five primary schools, these schools were located at the peripheries of the settlement leaving the larger central part without primary schools (Figure 10). Applying the principle of one kilometre as the optimal threshold distance for walking to reach primary schools, most of the central parts of the settlement covering 157 hectares 591 hectares representing 57 percent of the total area had longer distances to primary schools. In Dovya settlement, 591 hectares representing 62 percent had longer distances to schools and 417 hectares for Kibululu represented 70 percent. The same pattern was observed for secondary schools where in Kimara 80 percent were outside the threshold of one kilometre, 63 percent for Dovya and 79 percent for Kibululu (Figures 10, 13, 15 and Table 8). The fact that a health centre was located in Kimara settlement, its locational accessibility was more or less similar to secondary schools and about 97 percent of the area was located outside the threshold of one kilometre.

Table 8. Area coverage and accessibility to schools.

Settlement	Total area (Ha)	Accessibility to primary schools (Ha)	Percent	Accessibility to secondary schools (Ha)	Percent
Kimara Matangini	277	157	57	222	80
Dovya	944	591	63	593	63
Kibululu	592	417	70	468	79

Source: Threshold analysis from respective settlements, June 2021
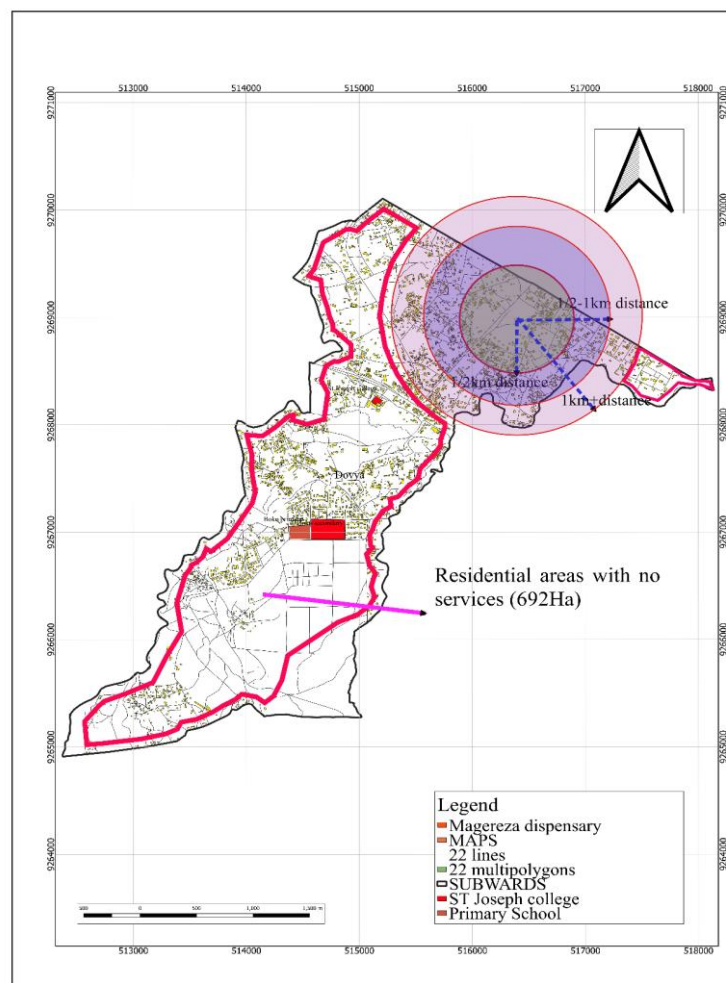

Figure 15. Proximity analysis for Primary School in Dovya settlement.
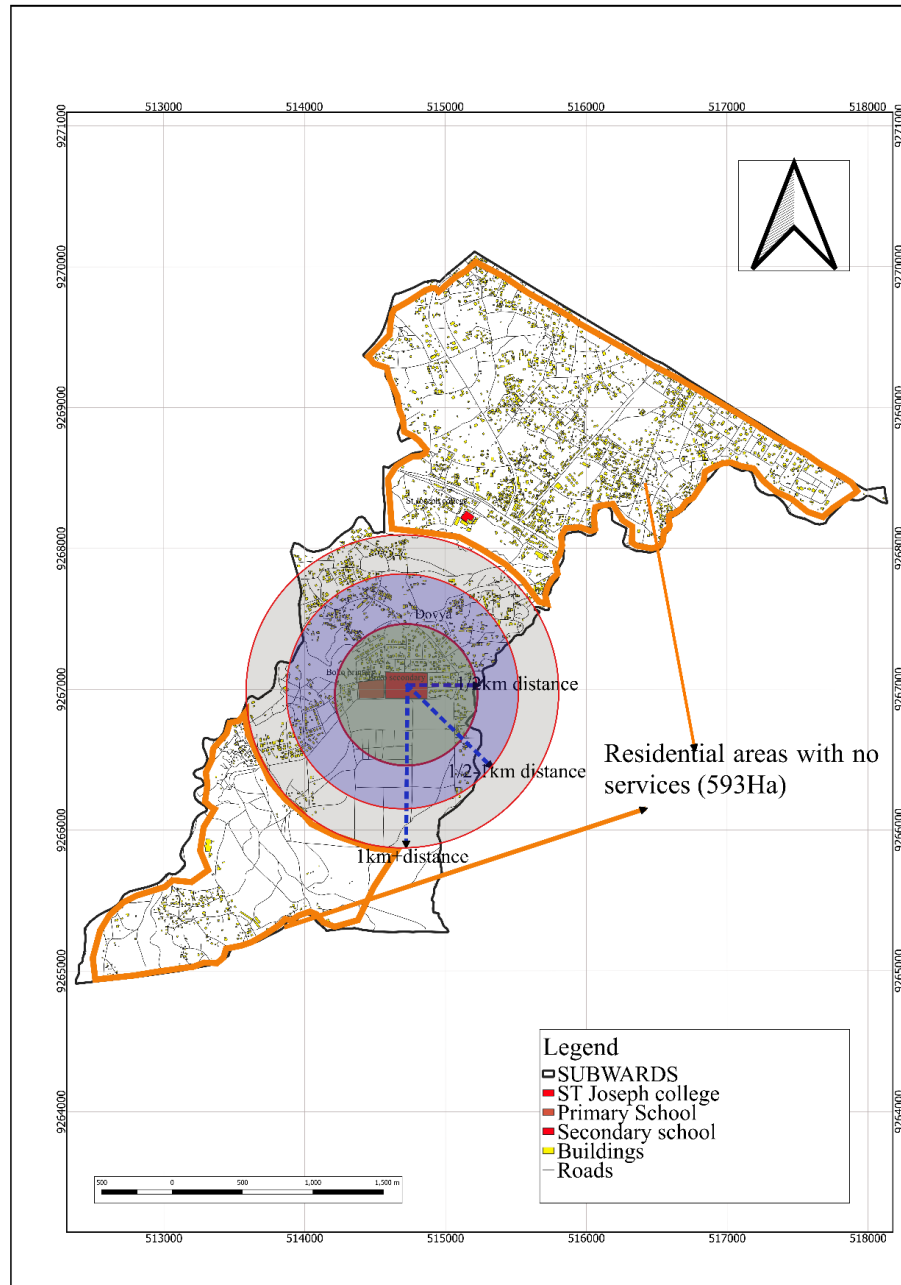Source: Base map of Dovya, June, 2021

Figure 16. Proximity analysis for Secondary School in Dovya settlement.
Source: Base map of Dovya, June, 2021

The spatial analysis of locational accessibility to services was complemented with household interviews to gather responses from residents of the three settlements. Residents from these settlements responded to the type of facility available in their settlement and whether it was easily accessible or not. Results show that where these facilities were located within a half and one kilometre distance, many respondents indicated that the services were easily accessible. Within half and one kilometre the responses were accessible and beyond one kilometre the responses indicated that it was difficult to access such services (Tables 9, 10 and 11).

Table 9. Accessibility to education facilities in Kimara Matangini

Settlement	Education facilities	Name	Location	Distance			Accessibility
				½ km	½-1km	1+km	
Kimara Matangini	Primary	Mavurunza	Within	34	26	8	Easily accessible
		Maximilian		27	20	21	Easily accessible

			30	27	11	Accessible
	Aniny		30	27	11	Accessible
	Adonai		38	21	9	Accessible
	Veritasi		12	37	19	Accessible
Secondary	Matangini Islamic seminary	Within	42	12	14	Easily accessible

Source: Household interview, June, 2021

Table 10. Accessibility to education facilities in Kibululu

	Education facilities	Name	Location	Distance			Accessibility
				½ km	½-1 km	>1km	
Kibululu	Nursery	Beta	Within	34	22	8	Accessible
		Capstone		12	37	15	Difficult
	Primary	Beta		34	22	8	Accessible
		Capstone		12	37	15	Difficult
	Secondary	Capstone		12	37	15	Difficult

Source: Household interview, June, 2021

Table 11. Accessibility to education facilities in Dovya

	Education facilities	Name	Location	Distance			Accessibility
				½ km	½-1km	>1km	
Dovya	Nursery	St. Salome	Within	9	17	34	Difficult
	Primary	Boko		5	14	41	Difficult
	Secondary	Boko		8	14	38	Difficult
	College	St. Joseph college	Within	13	33	14	Easily accessible

Source: Household interview, June, 2021

5. DISCUSSION

The Sustainable Development Goal (SDG) number 11 urges nations to turn cities and human settlements more inclusive, safe, resilient and sustainable. Target 11.1 of this goal focuses on ensuring access for all to adequate, safe and affordable housing, basic services and upgrading of slums. However, one of the challenges in addressing this goal and its targets has been the unavailability of data to facilitate monitoring locally and internationally [32]. This paper has attempted to analyze service accessibility for people living in peri urban settlements of Dar es Salaam even though not in a strict sense as stipulated in the targets of the SDGs. On the other hand, the National Human Settlements Development Policy (2000) of Tanzania envisages to have well organized, efficient, healthy, safe and secured, and aesthetic sustainable human settlements. The same policy emphasizes that control over physical growth of urban areas is necessary in order to reduce urban sprawl and facilitate balanced urban expansion in terms of economy in the use of land and in the provision of infrastructure services and community facilities. The underpinning variables of balanced urban expansion as highlighted in Figure 1 included accessibility, service availability, sustainability and density.

Empirical evidence indicates that Dar es Salaam has overgrown its provided services and sprawled to the limits of its jurisdictional boundaries notwithstanding that its development has been largely influenced by informal settlements. This pattern of growth has not been accompanied by the provision of basic services such as schools and health centres that are located within the recommended thresholds (that is within walking distance). Some authors have argued from compact development point of view or jaggedness and observed that the city compactness was still too low to guarantee city spatial sustainability in terms of effective utilization of land and infrastructure [20]. In other words, the city had sprawled horizontally with larger parts characterized by low-rise buildings that are contiguous in terms of land coverage. Based on similar observations the authors argued that if the number of stories in the low-rise house type areas could be doubled, the extent of the built up area for the city could be reduced from

57,211 hectares to only 11,331 hectares. Similarly the horizontal expansion of the city could be reduced from 30 kilometres to 14 kilometres radii [20].

The city of Dar es Salaam is experiencing rapid population growth, spatial pattern expansion, and land cover changes. The spatial pattern of the city is largely influenced by individually driven efforts of low-income households to secure land that is affordable and in a reasonable location, often in peri-urban areas. Actual land development has been also influenced by informal land markets through the sale and buying unplanned and un-serviced land with limited control from central and local governments. This pattern of city development has rendered majority parts of these settlements developed without basic services especially schools and health facilities. This has led to un-balanced urban expansion manifest externality effects and partly revealed by long distances to reach these services.

The Urban Planning [Space] Standards (2018) recommends for the location of public physical facilities near residents facilitating walk ability and safety [32]. In preparing detailed planning schemes, the same guidelines provide for primary schools be located within one kilometre diameter or impliedly a half a kilometre radius. Empirical evidence presented in this paper reveal that residents from the majority of parts of these settlements had difficulties in accessing these basic facilities including the longer distances beyond the recommended thresholds.

Researchers have discussed the concepts of sustainability and livability from values and preferences local community places for amenity, wellbeing aspect and sense of place or belonging [8]. Even though the latter was not explored deeply in this paper, many respondents expressed this variable on the varied opinions of satisfaction. This was expressed in terms of comfortable living in the settlements, availability of community facilities, closeness to work places and proximity to the city centre. The self-assessment of the satisfaction of the settlements could as well be related to the relative assessment of the respondents when comparing their settlements with other unplanned settlements in Dar es Salaam City. Yet this does not mean these settlements were adequately provided with all necessary services frequently discussed under sustainability and livability perspectives.

6. CONCLUSIONS AND RECOMMENDATIONS

This paper has attempted to illustrate that informal urbanization that drives city spatial development is the major factor that leads to unbalanced city expansion in Dar es Salaam. The underlying causes of urban informality has been linked to poverty, limited capacity of city governments to provide serviced and affordable land for housing, stringent and unaffordable development conditions (serviced land) especially to economically weaker groups. These limitations have contributed significantly to unbalance city spatial development patterns.

The effects of unbalanced urban expansion has been manifest in a number of ways including limited service availability in informal settlements, locational inaccessibility where these services were provided and relatively longer walking distances as compared to recommended guidelines and walking thresholds. The overgrown city that has largely developed with limited planning intervention especially in the peri-urban areas render service provision more difficult and attempts to regularize these settlements to be difficult if the pattern and processes of land markets and development are not regulated timely. Field findings and analysis indicate that limited and inaccessible public services characterize informal settlements that are developing in peri-urban areas of Dar es Salaam. This implies that as consolidation continues unabated in these settlements, the future sustainability of these settlements will be at risk and retrofitting service provision is likely to be costly and more challenging as it will entail compensation of developed properties to pave way for public services. In view of these looming challenges it is recommended that the government in collaboration with key stakeholders at grass root levels should strengthen development control in peri-urban areas so as to monitor development and potential service requirements. The government should also acquire some parcels of land that would in the future be developed for services, strengthen the previous twenty thousand plots project focusing in peri-urban areas as well as the on-going regularization activities to provide for way leaves for infrastructure provision. There is also a need of conducting a city wide analysis on the unbalanced pattern of informal settlements especially in rapidly urbanizing peri-urban areas.

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