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The interface between the evolving urban land use and the planning of Solwezi urban in Zambia

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Abstract
This study, which is part of the author's M.Sc. dissertation, was designed to examine the interface that existed between the evolving urban land use and the planning of Solwezi urban in Zambia. This perceived interface seemed to have resulted from the problem of urban land use fragmentation and a growing number of suburban and informal housing areas, which appeared to have impacted negatively on Solwezi urban morphology and service delivery. Therefore, the study sought to explain the various functions of the town and their existing patterns and how these related to the overall planning of the town in terms of land use management and service provision. A wide section of literature relating to urban land use and planning and the provision of urban services was reviewed. The study used both structured interviews and semi-structured questionnaires to obtain primary information from residents and municipal council officials respectively. The study used a stratified random sampling technique to select respondents using a list of households obtained from the Central Statistics Office (CSO) as a basis for determining both the total sample of 90 residents and the proportional sample sizes for each residential category. Field data sets were analysed quantitatively using t-test, Chi-square and factor analysis statistical techniques of version 16 of the SPSS software then. Part of the study findings revealed that land use had changed significantly over time in Solwezi urban and that there was some degree of misuse of land as indicated by some overlaps in land use and a considerable mismatch between the use of urban land and the spatial distribution of infrastructure and services. The study recommended that land use in Solwezi Urban would require a thorough review of both the prevailing conditions during the transformation period and the planning authorities responsible for effecting these changes.

Keywords: interface, evolving urban land use, urban planning, land use zoning, service delivery, urban settlements, and urbanization

Introduction

Background to the study

Studies show that urbanization as a process developed when communities stopped depending entirely on the land for their livelihood and therefore the development of activities other than agriculture encouraged the dominance of urban areas. Scholars further argue that systems of transport and trade led to the concentration of large numbers of traders and others at transport nodes and this probably brought about the growth of specialized centres for the exchange of goods and services (Lean and Goodall, 1983) [21]. Literature also reviews that pre-colonial Zambia was characterized by a pattern of traditional agriculture, small villages and chiefs' palaces (Rakodi, 1981) [27] and that almost all towns and cities in Zambia are of colonial origin. The colonial policy of master-to-servant relationship can best be observed by looking at Zambia's pattern of housing in towns and cities during the horrid days of colonialism. Despite the physical zoning into sectors with various social groupings, colonial towns or settlements exhibited the segregated low, medium and high-density areas (Turok, 1979) [31].

Literature reveals that sanitation in terms of water supply and sewerage in Zambia was extremely poor as Africans were made to draw water from nearby streams or wells while pit latrines or the surrounding bushes were used to answer the 'call' of nature. Toilet facilities available were communal, squalid, humiliating and overcrowded (Turok, 1979) [31]. Urban areas were established to service the colonial enterprise for the purpose of providing a workforce for the mining industry, services to the European population and a base for administration (Rakodi, 1981) [21]. It is for this reason that Solwezi urban was established in 1901, barely to service and support the mining function at Kansanshi (Maimbolwa, 1980) [22]. Therefore, the first buildings on the Solwezi Boma site were the administrative offices with associated high-cost (low-density) houses for the European administrators. Later, areas were set aside within the centre's boundary for the development of African housing, mainly for the Boma messengers and others employed in the settlement as part of the administrative system. On the other hand, the first services to be established in the built up settlements were basic in character, small in scale and in number, consisting of generally a primary school, a clinic, a social club and later on an airstrip which provided the quickest means of communication between the settlement and the other Zambian towns (Maimbolwa, 1980) [22].

The purpose of this study therefore was to explain the various land uses of Solwezi urban and their emerging patterns in order to see how these related to the planning and spatial distribution of infrastructure and services in the area. This is because the problem of fragmentation in land use together with a significant growth in the number of suburban and informal housing areas seemed to have impacted negatively on the morphology of Solwezi urban and on the access and provision of infrastructure and

services in the area. Functionally and morphologically the town presented a character that was different from many of the Zambian towns along the line of rail. For instance, a common person could not easily discern the central business district (CBD) of the town. The research felt that Solwezi urban's poor road network and its location outside the rail line's sphere of influence could make an ideal place for the study of the interface that existed between the evolving urban land use and the planning of the town in terms of infrastructural development and service delivery. In this way, various types of land use resulting from an area being in such a situation could also be unveiled. It was hoped that a clear interface between the use of urban land and the planning of Solwezi urban could be brought out in order to militate against such vices as misuse and overuse of land.

Theoretical framework

This study is premised on the three main theories of urban development namely; Burgess's concentric zone model (1925), Hoyt's radial sector model (1939) and Harris and Ullman's multiple nuclei model (1945), which were developed in the United States of America and have since been found to be useful in understanding all towns and cities. These models represent a means of classifying different city growth patterns: a CBD, older inner industrial area and newer suburbs with expanding shopping and office sub-centres. They present a basis on which further analysis can be undertaken rather than being a rigid way of looking at every city. With regard to residential disparity, each of the three theories explains the same basic principle, whether emphasis is placed upon concentric zones, sectors or nuclei and so they must be regarded as being complementary to one another rather than exclusive. However, Harvey (1992) argues that although these theories suggest how cities grow, they fail to explain why they grow. Similarly, Balbo's (1993) argument with respect to the growth patterns of Third World cities hinges upon the lack of unity within the diversity of urban functions.

The study is also built on the concept of the central place theory, which was developed by Walter Christaller in 1933 from a study in Southern Germany and has since been applied in most continents to explain the spatial distribution, the number and size of a specific kind of urban services within a large area. It is important to note that much of Van den Berg's (1983) [32] work on central place theory was rather rural based and does not bear a very direct relation to land use and planning in areas such as Solwezi urban. However, in his application of the central place theory to the distribution of social services in Southern province, Van den berg (1983) [32], identified three kinds of centrality: service centrality, employment centrality and population. Van argued that of the three types of centrality, service centrality appeared to have been the basic criterion used for the designation of tertiary, secondary and primary service centres and service sub-centres while the other criteria offering only slight adjustments.

The study is also based on the fat that residential disparity in urban areas can be measured using Factor Analysis to derive the major dimensions of disparity. The idea is to use the factor that expresses most of the dimensionality in the data to compute an index value that relates each respondent's access to infrastructure and services on a common scale. The methods combine social, economic, demographic and housing characteristics with the object of establishing what common patterns exist in the data (Knox, 1995; Roberts, 1999) [20, 28]. According to Abu-lughod (1969) [1], most studies of residential disparity using the above stated technique identify one major dimension, which discriminates among the sub areas within the city. This is the factor which rates to the socio-economic rank of residents and relates occupation, education, rent, income, housing quality and density of dwelling units' occupancy. Abu-lughod further says that the socio-economic factor frequently accounts for the largest proportion of the variance in the correlation matrix.

Significance of the study

This study is significant because it is a well-known fact that as towns continue to grow at an enormous rate, the lives of the majority of the people in the country are affected by the decisions of the planners, developers, public authorities and private builders. So, research reports relating to urban studies provide important information to aid decision makers as well as urban planners. For instance, a need may exist to review the planning strategies that have been employed in the past in order to seek out relevant approaches for the future. By analysing the study's findings, the consequences of the actions taken in the past can be seen, the forces that work to shape the town can be discovered and the probable consequences of the actions taken now can be forecasted. This means that after the study's findings are known, it may be easy to see the mistakes committed in the past and those that are being committed now so that corrective measures can be taken to redress the situation and avoid future recurrence of similar problems. The study is also significant because its findings might be used as a precondition for further comparative studies of urban growth in Zambia in which different towns can be compared to see how they have evolved and grown as urban areas. Towns away from the influence of the rail line can be compared with those along the rail line to see how they differ functionally and morphologically from each other.

Scope and limitations of the study

The scope of this study is limited to and primarily concerned with urban land use and planning only although it also takes into account some development planning. Growth and settlement patterns have been dealt with as parallel studies to support the purpose of the research subject. It is always not easy to delimit functional zones under review as they merge into each other indistinctively. The classification of residential zones into high, low and medium density is just a convenient way of dividing up the study area. However, there are usually difficulties of mapping accessibility to infrastructure and services due to unclear residential developments. Maps for Solwezi urban have not been easy to find due to poor record keeping and informal handovers from one department to another. It may suffice to say that it is usually difficult to get information from people in a multilingual society like Solwezi urban where the message has to be translated into a language that can easily be understood by the local people.

Materials and Methods

Primary and secondary data

This study used semi-structured interview schedules and structured questionnaires as primary data collection

techniques. The semi-structured interview schedule covered issues of land use while the structured questionnaire covered issues of planning with a view to obtaining information on access to infrastructure and services from the Solwezi residents. Semi-structured interviews were particularly administered to the Solwezi Municipal Council officers and town planners. Secondary data were obtained through document reviews from various sources such as the University of Zambia Library, the Central Statistics Offices of Lusaka and Solwezi, the Survey Department, Lusaka, the Town and Country Planning Department of Solwezi, the Solwezi Municipal Council and the Solwezi Library.

Sampling procedures

A list of households with population figures was obtained from the Lusaka Central Statistics Office. This provided the sampling frame on which the sample survey was based. The population data obtained from CSO provided the basis for deciding the proportional sample sizes for each residential category. Study communities were chosen from the list using random numbers. The study area was divided or stratified into high-cost, medium-cost, low-cost and squatter according to the CSO and local authorities' classification of residential areas. The stratification was based on plot sizes that were categorized as follows: high-cost (30m by 45m), medium-cost (18m by 30m) and low-cost (12m by 27m). Using this stratification as a guide, residential areas were allocated to these categories and study communities were chosen from these lists using random numbers.

The selection of respondents was achieved by assigning random numbers to each household. In this way every household had an equal chance of being included into the sample for interviews. In the event that some respondents were not willing to participate, another was chosen at random using the list of random numbers. A similar method was used in the squatter townships where housing units were rarely arranged in order. Occasionally, respondents were picked randomly at the market for interviews and this worked quite well for squatter townships. In most cases questions were read out in the local language and then responses were translated and recorded in English by the assistant researcher.

Methods of data analysis

This study employed three types of quantitative techniques which were carefully chosen on the basis of the available data in order to help explain the validity and direction of the research questions and hypotheses. These were factor analysis, Chi-square/Fisher's exact test and t-test.

Factor analysis

This report employed factor analysis to establish the level of access to infrastructure and services for each residential category in Solwezi urban based on the major dimension in the data. The method does this by identifying groups of variables with similar patterns of variation, reduces them in number and then expresses them in terms of new variables called factors. Each factor reflects a group of variables that are strongly correlated. The relative contribution of each variable to the overall component is shown by a loading, which is based on the statistical correlations between the variables. It is the variables with high loadings in either direction, which are significant, or usually most of the total variance in the data will be accounted for by the first two or three factors. Twenty-six variables were entered into the SPSS factor analysis for statistical computation.

Chi-square/Fisher's exact test

The report also employed Chi-square/Fisher's exact test technique basically for the purpose of establishing whether or not there was any significant difference in access to infrastructure and services among the Solwezi residents. The technique does this by comparing the obtained set of *observed* frequencies in given categories with a set of *theoretical* or expected frequencies within them. Fisher's exact test automatically replaces Chi-square in the computation when any cell in a given category has expected frequency less than five. The same variables that were entered for SPSS factor analysis were also entered in SPSS Chi-square/Fisher's exact test for statistical computation. The Chi-square technique was preferred because it is possibly the most suitable test when data are in nominal or frequency form for individuals in mutually exclusive categories such as in high-cost, medium-cost, low-cost and squatter areas, which involve the counting of a number of persons as they occur under them.

T-test

Lastly, the same study used the t-test (critical ratio) technique basically for the purpose of establishing whether there was any significant difference in the use of land in Solwezi urban between the years 1974 and 2004. The technique does this by comparing two sets of scores (i.e. 1974 and 2004 scores) to establish whether or not an observed difference is of such a magnitude that it can explain change in land use.

Data analysis on land use using t-test

The analysis of data involved a critical examination of the information obtained from both interview schedules and personal observations to try and establish causes for the evolving urban land use patterns and the nature of accessibility to facilities in Solwezi urban. Table 1, which shows the 1974 and 2004 land use scores obtained from the council, was made to help determine whether there was any significant change in land use over time. The data set for the original land use coverage was obtained from the council while the current 2004 land use scores were calculated from the existing cadastral maps that were used in the distribution of plots. Other frequency tables on accessibility to facilities only established estimated distances from the central business district (CBD). This was to enable the researcher to establish whether or not land and facilities were evenly distributed. The data set in Table 1 was subjected to the t-test to determine whether there was any significant difference between the 1974 and the 2004 urban land uses. This enabled the researcher to determine whether or not to accept the hypothesis. The technique was preferred because it establishes whether or not the two sets of scores have a mean difference so significant as to suggest change in land use.

Table 1: Calculation of t-value

Land use	Land Use Scores				
	1974 [Km²]	2004 [Km²]	1974-2004 Difference [D]	d-d (X)	X^2
Residential	2.50	15.50	13.00	9.19	83.54
Squatter	0.80	0.90	0.10	-3.71	13.76
Commercial	0.05	0.30	0.20	-3.61	13.03
Institutional	0.05	0.50	0.40	-3.41	11.63
Industrial	0.03	0.50	0.50	-3.31	11.00
Small holding	0.50	13.00	12.50	8.69	75.52
Recreational	0.03	0.50	0.50	-3.31	11.00
Open space	0.03	0.30	0.30	-3.56	12.67
Special use	4.50	11.50	7.00	3.19	10.18
Σ	8.50	42.80	34.50		242.33

Interpretation of t-test results

The hypothesis to be tested was *whether there was any significant difference in land use over time in Solwezi urban* by making a comparison of the 1974 and 2004 land use scores so as to establish whether the area in the respective categories, as given in Table 1, had changed significantly over time. The conclusion from the t-calculated indicated that there was a significant change in the area in different categories under observation. The combined table-and-graph charts were then made for each facility according to residential categories. These were carefully drawn using Microsoft Excel. The summarized data sets were then entered according to the SPSS programme for statistical analysis of accessibility in each residential category. The Chi-square test was performed on the appropriate data sets entered.

This study also used factor analysis to establish the level of access for each residential category under study so that the maximum number of factors expected to be produced from the analysis and corresponding to the number of these residential categories, was four. The level of accessibility was computed based on the major dimension in the data. The factor analysis values computed in this manner gave scores (loadings) for each residential category as a measure of their level of accessibility to facilities. The values are products of the factor score coefficients. The data display is in the form of frequency tables and graphs. The frequency distribution graphs, each with a frequency table attached below, have bars each showing the frequency of occurrence of each residential category on each of the variables measured.

Factor analysis on access to infrastructure and services

From the research responses 26 variables were entered in the data matrix in SPSS factor analysis for each of the 90 respondents. These related either directly or indirectly to the issue of accessibility to infrastructure and services. From these data, the SPSS programme computed a 4 by 4 correlation matrix. This was followed by the computation of a set of initial statistics showing the variable communalities; factor Eigen values, percentage and cumulative percentage of variance and an initial matrix (i.e., a 4 by 2 matrix). The sizes of the Eigen values give an idea of the explanatory 'power' of each factor. The larger the Eigen value, the greater is the explanatory power of the associated factor. The Eigen values are therefore used to determine which factors are important for the analysis. Normally factors with Eigen values of greater than one (1) are regarded as important. The 'break of slope' technique is also used to decide which of the factors are important. In this case the Eigen values from the initial statistics have been plotted against each of the factors. The resulting graph takes an elbow shape. The elbow bend signifies the least important factor (see Figure 1).

Table 2: Factor matrix with two factors extracted

	Factor	
	1	2
VAR001	.931	-.124
VAR002	.916	-.241
VAR003	.880	.272
VAR004	.195	.496

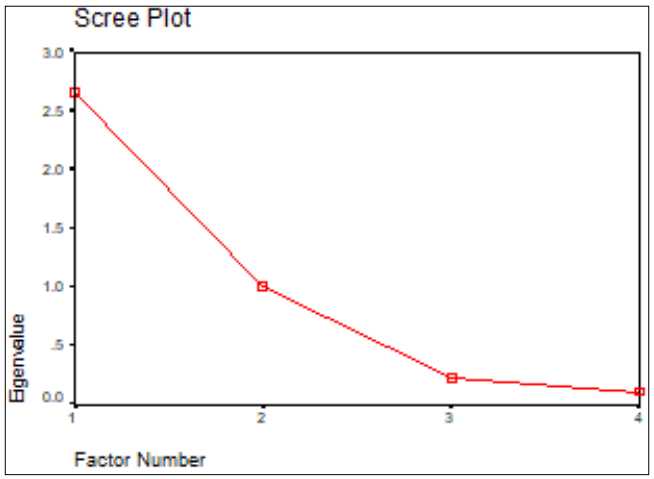

Fig 1: Scree showing "Break of Slope" for factor selection

The two factors extracted in this analysis in Figure 1 have high loadings as shown in Table 2 as well. Factor 1 relates to the high-income groups and may be called primary economic status (wealth) factor where most of the households had the ability and economic means to get access to better services. Factor 2 relates to the medium class and may be called secondary economic status factor where a good number of households had relative ability and economic potential to get better services.

From Figure 1 therefore, factors 1 and 2 are important factors and these have been extracted from this analysis. Factors 1 and 2 are strongly associated with the presence of most of the household facilities such as electricity, good sanitation, proximity to facilities and good walling and roofing materials. Such facilities as walling and roofing materials, bedroom type and size, tenancy status, to mention but a few, are in this report, indirectly treated as accessibility factors because certain classes of people may or may not have access to such facilities due to their

economic status. The factor analysis values computed above indicate that though the residential areas showed a mixture of functions in which houses of various cost and size intermingled, places designated as high-cost areas still had the highest level of accessibility (66.350% variance) followed by the medium-cost areas (25.041% variance), the low-cost areas (5.769% variance) and the squatter areas having the least accessibility level (2.840% variance). This is shown in Table 2 where Eigen values indicate the amount of variance accounted for by the factor. Both the percentage and cumulative percentage of variance indicate the relative importance of the factors while the communalities indicate the total variance in any variable, which is accounted for by the factors.

Hypothesis testing for land use and access to infrastructure and services

The *Chi-square* and the t-test were performed on the appropriate data sets to determine whether to accept or reject the hypotheses at hand. The first hypothesis was to test whether there was any significant difference in the use of urban land in Solwezi urban for the period ranging from 1974 to 2004. The idea was to find out whether or not the change in land use that seemed to have taken place over time was so significant as to create a considerable impact on the development and planning of the town. The t-value obtained, together with its interpretation, is shown in the analysis above.

The second hypothesis was to determine whether there was any significant difference in access to infrastructure and services among the Solwezi urban residents. The null hypothesis tested for land use postulated that there was a significant difference in land use over the period under study (sig. level, 0.10; t_{obs}. 2.093; t_{crit}. 1.860 with df equal to 8). This shows that more than 85 percent of the urban land in Solwezi was currently underutilisation. The change, which was also visible by visual inspection of the study area, had been intra-sectoral, that is, confined within the limits of the town's functional zones, with residential, small holding and special use zones recording the greatest change. The second hypothesis also indicates that there was a significant difference in access to household facilities under consideration between the sampled high and low-cost areas (χ^2=71.005, df=18 and p=0.000); medium and low-cost areas (χ^2=62.524, df=25, and p=0.000) and between the low-cost and squatter areas (χ^2=56.543, df=32 and p=0.005). The Chi-square test was chosen because it is restricted to nominal data that are frequencies of individuals' occurrence in mutually exclusive categories. The results needed to determine the significance of difference in access to facilities are the Chi-square and Fisher's exact probability results.

Findings and Analysis

Land-use pattern and service organisation in Solwezi urban

The study revealed that land use and zoning in Solwezi urban reflected, to a large extent, the influence of colonialism which segregated African settlements from European areas and provided better facilities in the latter and only the barest minimum in the former. The post-independence era saw the growth of informal settlements such as Chawama and Zambia townships in Solwezi urban. Of recent and substantial development was the emergence of major shopping centres like Shoprite, Pep stores, banking institutions like Stanbic and Finance banks, high-cost housing units down the stadium, a nursing school and the Kansanshi mine. Despite this substantial change in development, the question of who built where (location) in Solwezi urban had always remained a secondary issue that had not been taken seriously as most of the new structures were located in areas where they were a misuse. Most striking was the mixed character of residential development which showed that though the town was divided into high, medium and low-cost areas, it was quite hard to distinguish such residential stratification because housing units tended to mingle and merge into each other's boundary unsystematically and unattractively. There was also uncontrolled mushrooming of guesthouses, business houses, and lodges that did not seem to meet the required planning and architectural standards in residential and institutional areas.

Table 3: Solwezi urban land use

Category	Land use (In Sq. km)		Percentage change		Percent increase In 2004		Percent unused land	
	1974	2004	1974	2004	%	times	1974	2004
Residential	2.50	15.45	5.00	30.90	518.0	5.18	30.40	4.60
Squatter	0.80	0.90	1.60	1.80	12.5	0.13	-	-
Commercial	0.05	0.25	0.10	0.50	400.0	4.00	0.50	0.10
Institutional	0.05	0.45	0.10	0.90	800.0	8.00	0.90	0.10
Industrial	0.03	0.48 13.00	0.06	0.96	1500.0	15.00	0.94	0.06
Small holding	0.50	0.48	1.00	26.00	2500.0	25.00	26.00	1.00
Recreational	0.03	0.28	0.06	0.96	1500.0	15.00	0.94	0.06
Open space	0.03	11.50	0.06	0.56	833.3	8.33	0.54	0.06
Special use	4.50		9.00	23.00	155.6	1.55	22.80	8.44
Land used	8.49	42.79	16.98	85.58			83.02	14.42
Land unused	41.51	7.21	83.02	14.42				
Total land	50.00	50.00	100.00	100.00				

The data in Table 3 shows the overall utilization of urban land in Solwezi urban in the period ranging from 1974 and 2004.

Based on the data presented in Table 3, the study revealed that only 17 percent of the total urban land in Solwezi urban was underutilization in 1974 while about 83 percent of it was lying unused. This is possibly due to the fact that during this period, much of Solwezi was rural and that the population of the area was still small. Such a situation could also be partly attributed to the existence of a kind of land tenure system in the area which regarded part of the urban land as traditional and was to be held in trust by the chiefs.

A comparison with the 2004 set of data reveals that there has been a substantial change in land use over time with 85 percent of the total urban land being currently covered with various types of infrastructure. The study also showed that all the land use categories under review showed some increased change in utilization with the greatest percent change recorded in land for residential, small-holding and special-use respectively. Thus, land for residential use changed from 5 percent of the land used in 1974 to 30.9 percent in 2004, that is, 5.18 times greater than that of 1974. Land for small-holding use changed from 1 percent of the land used in 1974 to 26 percent in 2004, that is, 25 times greater than that of 1974. Furthermore, land for special use changed from 9 percent of the land used in 1974 to 23 percent in 2004, that is, 1.55 times greater than that of 1974.

The observed changes in the land use categories in Table 3 could be partly attributed to the increase in the urban population which later could have led to the increase in demand for residential and smallholding land while the change in land for special-use could be associated with the recent rise in death rates caused by the HIV/AIDS pandemic which, most likely, might have accelerated the growth of graveyards and cemetery areas. The study further showed that land for industrial use changed from 0.06 percent of the land used in 1974 to 0.96 percent in 2004, that is, 15 times greater than that of 1974; land for recreational use changed from 0.06 percent of the land used in 1974 to 0.96 percent in 2004, that is, 15 times greater than that of 1974; land for institutional use changed from 0.1 percent of the land used in 1974 to 0.9 percent in 2004, that is, 8 times greater than that of 1974; land for open-space use changed from 0.06 percent of the land used in 1974 to 0.56 percent in 2004, that is, 8.33 times greater than that of 1974; while land for commercial use changed from 0.1 percent of the land used in 1974 to 0.5 percent in 2004, that is, 4 times greater than that of 1974. The change observed in the land for commercial and recreational use above could be attributed to the recent opening of the Kansanshi mine which might have, most likely, led to the increase in inter/intra district business and a considerable demand for commercial and recreational land in the area.

Causes of the land-use pattern in Solwezi urban

The study revealed that land in Solwezi urban had undergone a considerable change and it is likely that several other factors besides the ones identified by this study were at play to shape its urban morphology and land use pattern. It is evident that despite a considerable percent increase that had occurred within the confines of each land use category, the portions of land allocated for such uses as commercial, recreational, industrial and institutional are too small to cope with the current urban transformation and only contributed very little to the overall change in the total urban land use. Such inadequacies in land allocation could have been most likely the cause for the presence of some land overlaps where some commercial activities were spreading into the institutional land while some construction of guest houses encroaching the residential land which was also taking up most of the open space. The survey further revealed that unnecessary wrangles over land were reported among the Solwezi urban residents due to the general lack of adequate control over the use and distribution of urban land where, occasionally, one piece of land could be allocated to more than one developer.

Access in response to planning and spatial dimension in Solwezi urban

It is generally argued that urban areas can neither exist nor survive with mere reference to the ideals and objectives that are created to go with them. There must be a minimum and preferably an optimum of certain mechanics, supplies and services in urban areas to make them most productive and pleasing places to live in (Hiraskar, 1993) [17]. Reference here is made, in particular, to facilities and services that needed to be planned in a manner that fostered a balanced interface and optimum gratification. The results of the study revealed that there were major shortcomings in the capacity of Solwezi urban to cope with the pressing service demands. The situation seemed to be magnified by unfortunate errors in the provision of basic facilities to the lower income groups. Most critical in Solwezi was the housing situation that showed a distinctive division in the condition of housing units between the lower and higher income groups. The survey shows that the quality of the housing stock, existing in the squatter areas of Solwezi urban, was generally poor, and internal crowding within dwelling units was common. One of the most striking features was that the majority of them could not afford even the cheapest permanently completed housing units that were either built by the government or private enterprise. It appeared that planning of housing units in the past, and to a lesser extent at present, had been directed towards costly constructed units, which did not take into account the needs of the urban poor.

The study revealed that most of the Solwezi urban residents had access to water supply though much of it, particularly in the lower income group, was unclean and unsafe for drinking. Wells, as sources of drinking water in the squatter townships, were located too close to pit latrines, with the result that when there was too much water in the rainy season, the refuse from the latrines backed up into the wells that supplied drinking water leading, sometimes, to outbreaks of cholera and dysentery. This critical situation, coupled with the difficulties that resulted from these illnesses connected with it, was compounded by the fact that from the beginning, the planning of Solwezi urban did not foresee and anticipate a widespread creation of squatter townships. A noticeable improvement in the water sub-sector in Solwezi urban could be directly attributed to efforts to commercialize the water and sanitation services through the establishment of the North-western Water and Sewerage Company (NWSC) in the area. Nevertheless, while water service provision appeared to have improved in some areas where water utility campaigns had been launched, the level of service in supplied areas of Solwezi urban had continued to deteriorate. This had mainly been due to the company's inheritance of old and dilapidated infrastructure from the council, low water tariff collection from poorly paid Solwezi residents, inadequate funds for operation and maintenance and inadequate qualified personnel in water management. Furthermore, the town still found it difficult to keep pace with urban growth in trying to develop adequate supply as well as in building and maintaining the pipe distribution system as most of the pipes were old and almost finished. A good example was the Solwezi Technical School area where most of the pipes were leaking.

The journey to work, shopping, health and educational

services for the majority of Solwezi urban residents who lived at a distance from the town centre where most of the facilities were found, took increasingly more time as most of them had to move on foot. There were few or no shopping centres in most residential areas of Solwezi urban let alone the substandard central market points found in the squatter townships where simple commodities like salt, kapenta, soap, candles and vegetables were sold and bought. The absence of residential shopping centres could be explained by the fact that it would not be viable for anyone to set up shopping services in small residential areas where the people's purchasing power is low and where not enough people would use this service to make it a worthwhile, profitable venture. This is perhaps why relatively more expensive and less frequently required goods and services such as cloths, radios, television sets, shoes, tailoring services, electrical fittings, and so on, were made available in the town centre where the resident population provided a market demand which was further reinforced by people coming from various other smaller residential areas.

The current level of education, health and related social services was not commensurate with the increasing demand from the growing population of Solwezi urban. For instance, it was quite evident that health problems were particularly acute in the areas inhabited by lower income groups but health facilities serving these areas were the most inadequate and often located far away from the areas. Solwezi urban, for instance, had only two government health centres that served the Solwezi community while the other existing private health facilities were not reachable by most of the people. The pattern of transport in Solwezi urban reflected the disparities of interest between the high-income groups and the poor masses. Many of those in the lower income groups walked to get to many places that offered basic facilities and a few of those who happened to be fortunate enough used bicycles as transport. It is evident from the foregoing that a number of things and planning strategies needed to be applied in order to fully realize a balance between provision and spatial distribution of services. The results of the survey also show that employment levels were comparatively higher in the high-income groups and lower in the low-income groups particularly among the squatters. Such high levels of employment in the high-income group could be associated with a correspondingly high level of education in those areas, as every employer would want to employ skilled labour.

Overview of proposed land use zonation for Solwezi urban

It is imperative to mention that any success in master-planning would be assessed by the town's functional qualities: that is to say, whether the existing space is adequate to the people's needs, whether housing units produce maximum utility, convenience and safety, whether the shopping facilities are adequate, whether the schools and health centres are properly distributed, whether the roads are providing safety and conveying traffic speedily and cheaply and whether the journey of people from their places of residence to the places of work is convenient, safe and economic. This means that building a new town for Solwezi would mean providing houses and all the related developments, shops, clinics, roads, parks, factories, offices and services essential for the development of a town.

It is worth noting that the most important part of a master plan, which the researcher is very sure might have been ignored when designing the plan for Solwezi urban, was the reservation of land for road system, open spaces, and public amenities, which could not be provided for at a later date. If such precautions had been seriously taken into account, surely the current problem of increasing traffic in Solwezi urban, which called for the expansion of the main central road, would have been avoided. Furthermore, as regards to the zoning structure which was currently posing a big challenge to Solwezi urban, the researcher was proposing the scheme in Table 4 for the major functional zones of the town based on the originally designated coverage and the current demand forces from the increasing population and business.

Table 4: Proposed land use zonation for Solwezi urban

Land use	Designated coverage		Proposed coverage	
	Sq. Km	Percent	Sq. Km	Percent
Residential	17.7	35.4	20	40
Commercial	0.3	0.6	5	10
Communication/Road	0	0	2	4
Recreational	0.8	1.6	5	10
Institutional	0.5	1	4	8
Industrial	0.5	1	4	8
Special-use/Smallholding	30.2	60.4	10	20
Total Land-use	50.0	100.0	50.0	100.0

Source: Field observations, 2005

Table 4 shows a deliberate attempt to increase all land uses except for special use/smallholding whose part of the land has been redistributed to categories that were either not planned for at all or which were given inadequate land but are currently on high demand from the growing population. Such areas include commercial, recreational/open space and communication/road. The special use category that is reserved for anticipated growth of informal areas such as graveyards and other special areas has been reduced to allow for a proportional distribution of land in all categories based on demand. It was quite likely from the researcher's prediction that such a situation as indicated in Table 4 would require pulling down some buildings in bad or dilapidated condition to make way for more open space and public buildings. In addition, certain sections of the Solwezi urban community such as those that had built in the dambo west of the town and east of the Solwezi Teachers' Training College (now Solwezi College of Education) would have to be relocated to higher areas possibly east of the town. Squatter areas would need to be upgraded to a level where they would bring sanity.

As road widening would be impossible in a situation like that of Solwezi urban where buildings were already too close to the main road and where demolition of such buildings would not be the best alternative, the only plausible solution would be to create a new CBD in the drier east in the area extending to Kansanshi where the terrain was fairly levelled, drainage good and where there was enough space to plan ahead for the future of the town. The researcher envisaged a grid network of roads where all the roads or pathways in the inner part of Solwezi urban were nicely tarred in order to bring to the barest minimum the dust that created irritating looks of ugliness on buildings. The researcher's dream was a town like Siavonga, in the

Southern province of Zambia, which is equally away from the rail line but where almost every pathway in the inner town is tarred. Perhaps this new CBD could offer possibilities of coming to reality the dream of a first-class trading area overlooking the Solwezi River and the surrounding countryside. However, this would require moving Mushitala village to the fringe as it fell within the radius of the new CBD. Other costs to consider would include the tarring and expansion of the existing roads and the construction of the entire dual carriageway from the junction to the end of the bridge and the beginning of the road that joins the Solwezi-Mwinilunga Road at Magrade compound (see Figure 2 in Annex 1: Proposed land use zonation for Solwezi urban). With increasing mining activity in the area, the role of mining in the future town plan for Solwezi urban would therefore be to improve the living conditions of the Solwezi urban residents by offering them with employment opportunities in the mines and in other mining related sectors; to add sanity and beauty to the town by constructing more modern infrastructure and upgrading the existing ones; to partner with government and the local authority in bringing about improved health and educational conditions in the area and to take commerce and industry to greater heights as this is the backbone of every stable and well established town. The researcher's aim was not to design a plan for Solwezi urban but was simply trying to contribute towards the betterment and aesthetic beauty of the town by offering what he thought could help solve some of the problems the area was facing. How the area would be developed in future and what type of activities may be carried out remained in the able hands of the local authorities and the government as a whole to implement such plans so that both the government as a policymaker and the planners could begin to see the practical results of their efforts. Much emphasis therefore must be placed on social enquiry to discover the right aims for plans and planners, and on the local residents in the control of their living and working environments.

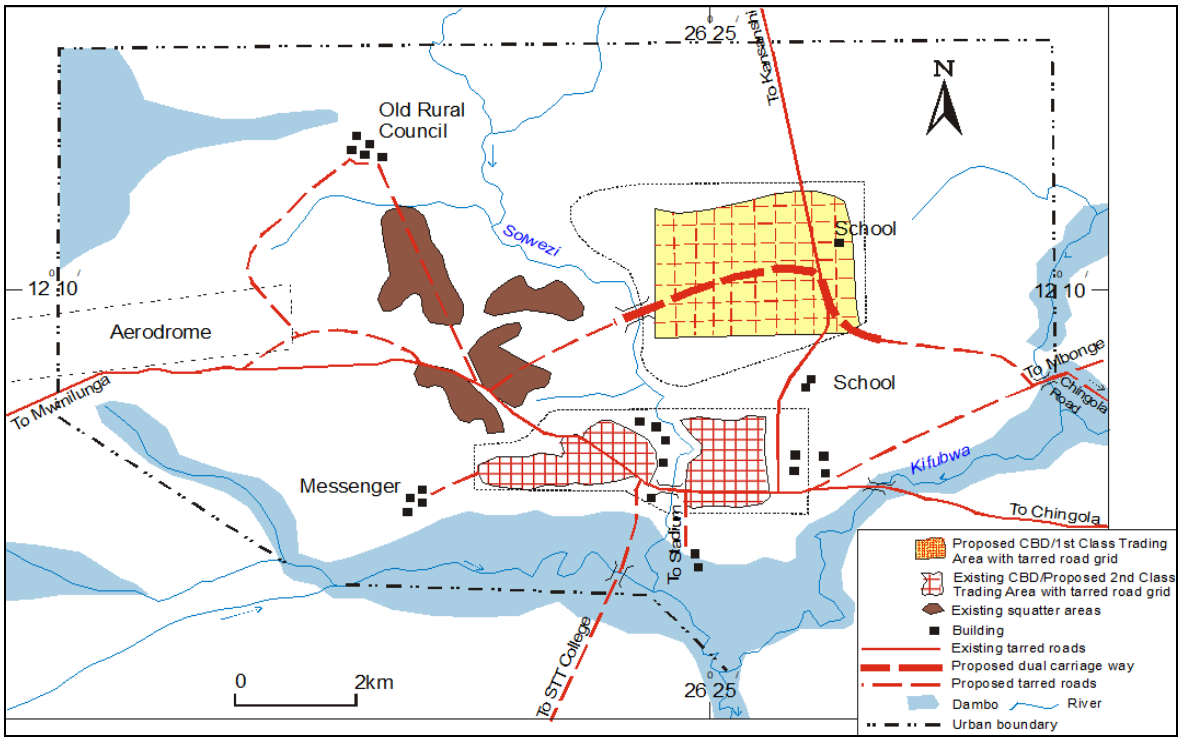

Fig 2: Proposed land use zonation for Solwezi urban

Conclusion and Recommendations

Conclusions

The study concluded that the process of urban transformation continued to operate in Solwezi urban and in many cases one would find scenes of the old and the new juxtaposed, with recently cleared areas interspersed. A complex mix of town functions and land use characterized this transformation that was taking place within the townscape of Solwezi urban. Although the town had recorded a substantial change in the use of urban land during the period under review (i.e. 1974-2004) as indicated by the t-test, much of this change was only confined within residential, smallholding and commercial zones, with a clearly noticeable negligence on industrial and recreational land development. A clear unfavourable interface between land use and service provision unveiled where most residential areas, particularly those of the lower-income group, offered very little to the people in terms of civic amenities. Factors cited as having championed this cause included, inter alia, the scramble for the little space in the fringe of the town centre and along the central road where a few basic shopping facilities were available and where the day-time population provided a market demand for people's businesses; lack of coordinated planning and adherence to zoning and building standards and regulations; irrational and inhumane colonial policies that might be responsible for the present levels of economic and social class and a rapid population growth that had resulted into a relative increase in the informal settlements.

Despite the "substandard" quality of the many dwelling units in the lower income groups, it is worth noting that these units represented a massive unaided self-help effort on the part of the lower income households and that many of these areas had considerable socio-economic viabilities. As noticed from the foregoing, squatter areas represented a substantial though not a major share of residential

construction (about 0.9 sq. km of urban land). It is interesting to note that within many of these living environments, lower income people showed a remarkable ability for improvisation and coping with town life. The survey shows a mixed character of functions in which boundaries were rarely respected and where there was a great imbalance in the spatial distribution and provision of services between the haves and the have-nots. Very few questions, if any at all, had been posed by the people concerned as to how and why certain structures in Solwezi still found their way in areas where they were a misuse and where they tended to disfigure the morphology of the town and yet such questions were at the core of many of the planning considerations.

Recommendations

The study recommended that the noticeable change of development that was taking place in Solwezi required a thorough review of the prevailing conditions during that period of transformation and also for a review of the planning authorities or agencies, which were responsible for effecting those changes. For instance, there was a need for the Zambian government to plan properly on waste disposal and on the creation of space for further urban expansion. There was need to expand the existing major trunk road to accommodate more traffic in Solwezi urban and this would only be possible if another Outlying Business District (OBD) was established possibly on the land stretching from the north eastern fringe of the Solwezi town and the Kansanshi mining area, which was also fairly well drained, undulating and large enough to allow for further road expansion and the construction of the long awaited dual carriage way.

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