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RESEARCH ARTICLE

COMPARATIVE STUDY OF HOUSING AND POPULATION DENSITY: A CASE STUDY OF MINNA, NIGER STATE

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ABSTRACT

The study brought into focus the effect of population growth on Housing in Minna metropolis. Questionnaires were used for data collection in the six (6) randomly selected areas - Bosso, Maitumbi, and Tunga (High population density areas) G.R.A, Bosso Estate and Tunga Low-cost (Low population density areas). The statistical method employed in analyzing the data was linear regression analysis. The study revealed that increasing population growth, inconsistency and slow speed of implementation of government housing policies, tight and inadequate mortgage facilities and high cost of building materials are responsible for shortage or inadequate housing in Minna. The result of analysis shows that there is significant relationship between number of occupants and total habitable area, number of occupants and total number of rooms; in both low and high density zones. And it also shows that there is no significant relationship between population density and total habitable area, population density and total number of rooms. It was recommended that population should be controlled and directed by the government through the development of hinterlands and rural areas; government should encourage private sector's participation in the provision of housing through the provision of incentives and enabling environment for investment; and also the professionals in the building environment should ensure continuous planning and must be proactive in reacting to events.

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INTRODUCTION

The central role which housing occupies in the lives of human beings is signified by the attention given to it by the United Nations and its Organizations, the Federal government and other various relevant agencies. Housing is recognized as a basic right by the United Nations in Article 25 (1) of the universal declaration of Human Right. It is a product that must be provided for all. Webster's dictionary as one of the explanation for the concept of "housing" gives the following: housing means dwellings provided for people. Business Dictionary defines housing as building or building structure complying with requirements of laws and regulations and where the individuals with their families may live. Similar definition for the concept "housing" is provided in Macmillan Dictionary where the housing is defined as buildings for people to live in (Henilane, 2016). Housing plays an important role in the development of any nation. It had been ascertaining as the basic need of a man (Makinde, 2013; Akinyode and Tareef, 2014).Housing is a basic need of every human being just as food and clothing. It is very fundamental to the welfare, survival and health of man (Fadamiro *et al.*, 2004).

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Hence, housing is one of the best indicators of a person's standard of living and his place in the society. In developing countries, poor housing delivery has been attributed to inadequate mechanisms and systems for land allocation, funding, mortgage institutions and infrastructure (Encarta, 2007). Shelter is central to the existence of men (Kehinde, 2010); He also stated that housing involves access to land, shelter and the necessary amenities to make the shelter functional, convenient, aesthetically pleasing, safe and hygienic. According to him, unsanitary, unhygienic, unsafe and inadequate housing can affect the security, physical health and privacy of man. Oka for (2016) asserted that housing all over the world has remained an interdependent phenomenon that faces mankind and it represents one of the most basic human needs which no doubt has a profound impact on the health, welfare and productivity of every individual irrespective of social-economic status, colour or creed. In urban areas, the major housing problems are severe shortages of housing, overcrowding and the spread of slums and shantytowns (Uwejeya, 2012).According to the United Nations Habitat (2010), 30percent of the world's urban population lives in slums, deplorable conditions where people suffer from one or more of the following basic deficiencies in their housing: lack of access to improved water; lack of access to improved sewage facilities (not even an outhouse); living in overcrowded

conditions; or living in buildings that are structurally unsound; living in a situation with no security of tenure (that is, without legal rights to be where they are, as renters or as owners). The same report said that 35percent of the world's rural population lives in unacceptable conditions. Overall more than two billion people are in desperate need of better housing (Enoghase *et al.*, 2015). It is evident that the current cost of building materials, coupled with high cost of procuring, financing, prohibits supply of housing. Furthermore, the lack of interest of the government in pursuing housing programmes aids the shortage in housing supply. From population of 59,988 in 1963 (Uyanga, 1982), Minna's population increased to 265,626 in 2000(NPC, 2000). Today Minna has a population of 345,312 (NPC, 2006). With about 12 persons occupying a single room in some areas (Maitumbi, Chanchaga). Minna have within the past years being witnessing an unprecedented rate of growth in population leading to shortage and inadequate housing with its associated squalid environmental conditions, which is why this study seeks to assess the relationship between housing and population density.

The Study Area: The origin of Minna as a settlement is traceable to colonialism in Nigeria, which it grew from a satellite town of Bosso to an independent settlement (Kolo, 2002). Today, Minna has not only grown to big urban centre, it has over grown Bosso. Bosso is at present a neighbourhood of Minna. Minna's prominence as an urban centre came through a number of fundamental occurrences. The first came with the extension of railway lines to the town in 1905 (Fabiyi, 1984). This incident changed the nature of the town from as essentially Gbagyi settlement of local importance to an important transport settlement which population included non - Gbagyi migrants, railway workers. That incident also attracted non - railway workers who serviced the emerging economy of Minna. The railway station has also meant increasing administrative importance. Minna s administrative role got a boost in 1976 when it became a state capital. That incident more than any other factor is responsible for the modem urban nature attained by the town. From a population of 59,988 in 1963 (Uyanga, 1982), Minna's population has increased to 345,312 (NPC, 2006). Today Minna has grown to cover the neighbouring towns and villages of Bosso, Tudun Fulani and Maikunkele to the north, Chanchaga to the south, Kpakungu to the southeast and Maitumbi to the northeast All these demographic and spatial changes have implications for housing demand and for creating a housing market that may not be currently rivalled to any other city in Niger State.

Minna have within the past years being witnessing an unprecedented rate of growth in population leading to shortage and inadequate housing with its associated squalid environmental conditions. Therefore, this study seeks to examine the effect of population on housing.

Hypothesis

HO_1. There is no significant relationship between number of occupants and total habitable area.

HO_2: There is no significant relationship between population density and total habitable area.

HO_3: There is no significant relationship between number of occupants and number of rooms.

HO_4: There is no significance relationship between population density and numberof rooms.

Review of Related Literature

Types of Residential Property Development: One of the first activities of the primitive man was to provide shelter for himself and his family. The need for housing was born purely out of the intention to get sheltered from the harsh weather and dangerous environment conditions. Therefore, Jiboye (2014) defined residential properties as those type of properties that are developed for use specifically as dwelling place, otherwise known as housing. It provides shelter to its occupants and is often used for single or multi – family housing in urban, suburban or rural areas (Abdul-Aziz and John Kassim, 2011). Following the above definitions, residential housing developments vary in their classifications by types and characteristics. Hence, Jinadu (2007) and Olatubara (2007) classified dwelling units in different ways as enumerated below:

Housing types by structural design: in this case, the design of the house is used to describe its characteristics such as:

- Housing Estates;
- Bungalow;
- Block of flats;
- Duplex;
- Maisonettes;
- Condominiums;
- Tenements (Face – me – i – face – you).

Housing type by density: This is described according to the number of housing units per plot of particular size, site coverage and the ratio of room occupancy. They comprise:

- Low Density;
- Medium Density and;
- High Density.

Housing type by Specialty: This is described by the special use the residence unit is put to, such as:

- Transient Housing;
- Special Home (Orphanage, Aged and Disabled);
- Mass Housing;
- Student Housing (Hostels and Dormitories);
- Special Quarters (Legislative quarters, Presidential/ Governors Lodge or quarters);
- Barracks;
- Prisons and;
- Other Quarters (Company Staff Quarters)

Housing type by Ownership:This is described by the ownership status, which can be classified as:

- Private (Individual and Organized) and;
- Public.

Housing type by building materials: This is described by the dorminant material used for the wall, such as:

- Mud House;
- Brick House;

- Sandcrete House
- Wooden House;
- Metal ('Portakabin') House;
- Stone House and;
- Bamboo House.

Housing type by Tenure: A house can be described using the status of its tenure such as:

- Owner Occupier;
- Rental;
- Family house and;
- Official Quarters.

Housing type by Quality: This includes a description given to a house as result of its structural characteristics and environmental facilities, such as:

- Low Quality;
- Medium Quality and;
- High Quality.

Below is a detailed description of the residential development types as relevant to the study:

Housing estate: This is a residential development type that contains a group of houses managed in one holding. This development type is common within the study area.

Bungalow: This can be described as a building on one floor. They could be either fully detached or semidetached. Fully detached bungalows usually have just one or a singular section while the semidetached bungalow comes in two sections. They are typically identical and are often described each unit being a mirror image of the other.

Duplexes: This is a residential development with a similar design as bungalows but on two floors. They come in forms of fully and semidetached houses.

Town houses: Town houses have similar building structure with duplex but it is designed as a semidetached duplex without partition wall. They are only different in the sense that each floor is occupied by different inhabitants and thus has its own separate access to the outside.

Maisonettes: They also have two floors in each home unit. They generally have identical designs. One home unit is exactly the same with another home unit. A typical example under this residential development type is the 1004 flats in Lagos.

Apartment houses: They are commonly referred to as block of flats or flat buildings. Flats can be described as one home unit with all its spaces on the same floor level. This means that its kitchen, rooms, toilet, bathroom and all other appurtenances are all on the same level.

Condominiums: This type is a multi – tenanted building designed in a way that owning one of the units gives one an easy access to the facilities surrounding the house.

Tenements: This can be described as roomy apartments commonly found in a poor section of large cities. Tenements have many units attached together under one roof; they are divided by walls to give each occupant his or her space or privacy. Typically, they contain multiple – room facilities that offer single rooms for rent with shared facilities such as kitchen, bathroom and toilet.

Residential developments according to density include:

- **Low density:** This refers to residential developments for population accommodated in more spacious set out, possibly with green space surrounding the building in order to encourage higher quality design. They usually comprise single storey detached dwellings on large allotments with large setbacks on the sides. In Nigeria for example, most Government Residential Areas (GRAs) comprise low density developments.
- **Medium Density:** These are residential developments that are at higher density than standard low density, but not so high to be regarded as high density housing. They usually consist of detached, semi – detached and multi – units housing.
- **High Density:** This includes residential accommodations with a higher population density than average which is typically block of flats, condominiums and tower blocks. This implies more homes on a property.

Finally, residential housing developments according to ownership include

- **Private Housing:** They include houses individually acquired and managed by persons. These are usually categorized by inconsistency in structural design and the additional services made available both in and out of the building according to the preference, taste and economic buoyancy possessed by the owner. In most economies, Private houses dominate the housing supply due to their profit driven nature.
- **Public Housing:**These types of houses are developed and owned by the public sector like government and its agencies. They are characterized by uniformity in terms of design and auxiliary services. Typical instances include government housing estates with official quarters located in various towns and cities.

Include government housing estates with official quarters located in various towns and cities.

RESEARCH METHODOLOGY

The study is based on both primary and secondary data. Primary data was collected through questionnaires administration to households in Minna. Minna was divided into two (2) zones; high populated density and low populated density zones, with three (3) areas chosen at random and ten (10) households also selected at random from each of the three (3) areas from each zone. The records and data of housing supply and population estimates were collected from government agencies; Federal Ministry of Works and Housing, Niger State Housing Corporation and the National Population Commission. The data from the primary source was analysed by the use of computer-based software, statistical programme (SPSS). The statistical method employed in analysing the data is regression analysis that depicts the relationship among variables for the purpose of understanding how the variables relate and for the purpose of prediction, frequency classification to display data were used in the form of bar charts.

RESULTS AND DISCUSSION

The following relationships were analysed in both low and high density areas:

- The relationship between number of occupants and total habitable area.
- The relationship between population density total habitable areas
- The relationship between number of occupants and total number of rooms
- The relationship between population density and total number of rooms.

The average number of occupants in a household for the two locations indicates higher number (26) in the high density areas with (12) for low density areas (Table 1 & Figure 1). The same pattern is exhibited where the total habitable area and total number of rooms with high density areas having higher number than low density areas. The only exception was in population density in which the low density area had a larger number than the high density area. However, the range was much higher in the high density area with 0.35 compared with 0.23for low density areas. Average number of rooms in the study area was 11 and 7 respectively. Figure 1 shows an average number of 12 occupants and total habitable area of 120 sq.m in high density areas. While in low density areas, number of occupants are 9 and total habitable area 87 sq.m. and 11 number of occupantsto 103 sq.m. total habitable area for overall. Findings also shows an average population density of 0.11 to total habitable area of 110 sq.m for high density areas and for low density areas, it shows 0 12 population density to 120 sq.m total habitable area. While it shows 0.12 population density to 118 sq.m total habitable area for overall.

Figure 1 further shows an average number of occupants of 11 to 7 number of rooms for high density areas. And number of occupants of 10 to 7 number of rooms in low density areas. While of overall, it shows number of occupants of 11 to 7 number of rooms. It also shows that average population density is 0.11 to number of rooms of 8 for high density areas. And 0.12 population density to 8 number of rooms for low density areas. While for overall it shows 0.12 population density to 7 number of rooms.

Analysis of Relationships between Variables in Low Density Areas: In carrying out the analysis, the relationships between the following variables were carried out as experiments (Table 2).

Experiment Number 1: Number of occupants vs. Total habitable area.

Experiment Number 2: Population density vs. Total habitable area.

Experiment Number 3: Number of occupants vs. Total number of rooms.

Experiment Number 4: Population density vs. Total number of rooms.

In experiment 1 the Table 2, shows the relationship between number of occupants and total habitable area as positive. This implies that houses in the study area with relatively large habitable area tend to have equally large number of occupants. The coefficient of determinant (R2) value i.e. 35% shows weak relationship and at 5% level of significance, the relationship is statistically significant given that the probability level is less than 0.05.

Experiment 2: The relationship between population density and total habitable area.The relationship is negative, implying that houses in the study area with relatively small habitable area tend to have high population density. The coefficient of determinant (R) value i.e. 11% shows a very weak relationship and at 5% level of significance, the relationship is not statistically significant given that probability level (p-level) is greater than 0.05.

Experiment 3: The relationship between number of occupants and total number ofrooms.The experiment indicates positive relationship, implying that houses in the study area with large number of rooms tend to have large number of occupants. The coefficient of determinant (R) value i.e. 60% shows a strong relationship at 5% level of significance, the relationship is statistically significant given the probability level (P- level) as less than 0.05.

Experiment 4: the relationship between population density and total number of rooms.The relationship indicates positive, implying that houses with large number of rooms tend to equally have high population density. The coefficient of determinant (R2) value i.e. 0% indicates a very weak relationship and at 5% level of significance, the relationship is not statistically significant given that probability level (P-level) is greater than 0.05.

Analysis of Relationships between Variables in High Density Areas: The experiments carried out in high density areas are shown in table 3 below:

From Table 3, Experiment 1: the relationship between number of occupants and total habitable area. The relationship between the variables is positive which implies that houses in the study area with relatively large habitable area tend to have equally large number of occupants. The coefficient of determinant (R2) value of 35% signifies a weak relationship and at 5% level of significance, the relationship is statistically significant given that probability level (P-value) is less than 0.05

Experiment 2: The relationship between population density and total habitable area. The experiment contrasts the first, it shows a negative relationship, implying that houses in the study area with relatively small habitable area tend to have high population density. The coefficient of determinant (R2) value i.e. 7% shows a very weak relationship and at 50% level of significance, the relationship is not statistically significant given that the probability (P-value) is greater than 0.05.

Experiment 3: The relationship between number of occupant and total number of rooms. The experiment indicates positive relationship between the variables implying that houses with large number of rooms tend to have larger number of occupants. The R2 value of 60% signifies a strong relationship and at 5% level of significance, the relationship is statistically significant given that the probability level (P-value) is less than 0.05.

Table 1. Data Presentation

Variables	Low density			High density			Overall
	Mean	Highest	Lowest	Mean	Highest	Lowest	Mean
Number of occupants	9.43	21	2	12.13	50	2	10.78
Total habitable area	87.02	323	39	119.03	312	25	103.02
Population density	0.12	0.23	0.03	0.11	0.35	0.03	0.12
Total number of rooms	5.43	11	3	7.90	27	2	6.67

Source: Researcher's field survey, 2019

Table 2. Analysis of Relationships between Variables in Low Density Areas

Experiment number	Experiment conducted	Relationship between variables	Regression equation	R-sq %	P-value	F-cal	Strength of relationship	Remark
1	Linear regression	NOCCUP VS THAREA	NOCCUP=4.93 + 0.05 THAREA	25	0.0006	14.99	W	SS
2	Linear regression	PDENS VS THAREA	PDENS=0.14 – 0.0THAREA	11	0.0727	3.48	VW	NS
3	Linear regression	NOCCUP VS TNRMS	NOCCUPN=0.28 + 1.69 TNRMS	60	0.0000	42.58	S	SS
4	Linear regression	PDENS VS TNRMS	PDENS = 0.12 + 0.00 TNRMS	0	0.9290	0.01	VW	NS

Source: Researcher's field work, 2019 Key:SS: Significant; NS: Non- Significant W: Weak VW: Very weak S: Strong

Table 3. Analysis of Relationships between Variables in Low Density Areas

Experiment number	Experiment conducted	Relationship between variables	Regression equation	R-sq %	P-value	F-cal	Strength of relationship	Remark
1	Linear regression	NOCCUP VS THAREA	NOCCUP=2.38 + 0.08 THAREA	35	0.0005	15.39	W	SS
2	Linear regression	PDENS VS THAREA	PDENS=0.15 – 0.0THAREA	07	0.1304	2.43	VW	NS
3	Linear regression	NOCCUP VS TNRMS	NOCCUPN=0.32 + 1.49 TNRMS	64	0.0000	42.49	S	SS
4	Linear regression	PDENS VS TNRMS	PDENS = 0.13 + 0.00 TNRMS	0	0.9360	0.01	VW	NS

Source: Researcher's field work, 2019 Key:SS: Significant; NS: Non- Significant W: Weak VW: Very weak S: Strong

Table 4. Analysis of Relationships between Variables for Overall

Experiment number	Experiment conducted	Relationship between variables	Regression equation	R-sq %	P-value	F-cal	Strength of relationship	Remark
1	Linear regression	NOCCUP VS THAREA	NOCCUP=3.78 + 0.07 THAREA	36	0.0000	32.83	W	SS
2	Linear regression	PDENS VS THAREA	PDENS = 138.49 – 304.27 THAREA	08	0.0205	5.67	VW	SS
3	Linear regression	NOCCUP VS TNRMS	NOCCUPN=0.85 + 1.49 TNRMS	64	0.0000	101.29	VS	SS
4	Linear regression	PDENS VS TNRMS	PDENS = 0.12 + 0.00 TNRMS	0	0.8790	0.02	VW	NS

Source: Researcher's field work, 2019; Key:SS: Significant; NS: Non- Significant W: Weak VW: Very weak VS: Very Strong

Table 5. Comparison between Low and High Density Areas

Experiment number	Relationship between variables	Low density			High density		
		Strength of relationship	Remark	Decision rule	Strength of relationship	Remark	Decision rule
1	NOCCUP VS THAREA	W	SS	Reject H_0	W	SS	Reject H_0
2	PDENS VS THAREA	VW	NS	Accept H_0	VW	NS	Accept H_0
3	NOCCUP VS TNRMS	S	SS	Reject H_0	VS	SS	Reject H_0
4	PDENS VS TNRMS	VW	NS	Accept H_0	VW	NS	Accept H_0

Source: Researcher's field work, 2019; Key:SS: Significant; NS: Non- Significant W: Weak VW: Very weak VS: Very Strong H_0: Null hypothesis.

Experiment 4: the relationship between population density and total number of rooms.The experiment indicates a negative relationship which implies that houses with relatively small number of rooms tend to have high population density. The coefficient of determinant (R2) value of 0% shows a very weak relationship and at 5% level of significance, the relationship is non - significant given that probability level (P-value) is greater than 0.05.

Analysis of Relationships between Variables for Overall

The table below shows the analysis of the relationships between the variables for overall. From the analysis in Table 4; Experiment 1: the relationship between number of occupants and total habitable area. The experiment indicates positive relationship which implies that houses in the study area with relatively large habitable area tend to have equally large number of occupants. The coefficient of determinants (R2) value of 36% shows weak relationship.

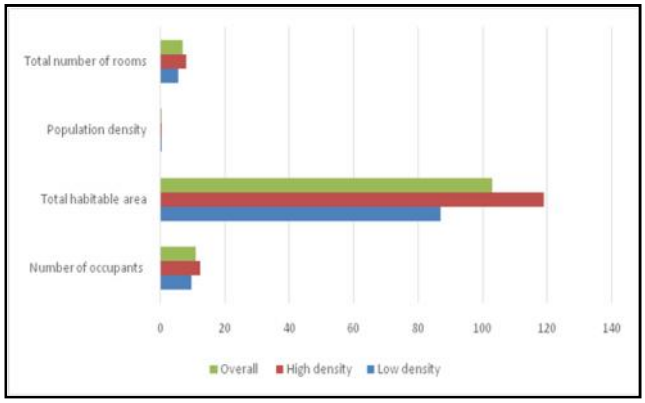

Figure 1. Summary of Data Collected in High and Low Density Areas

At 50% level of significance, the relationship is statistically significant given that probability level (P-value) is less than 0.05.

Experiment 2: The relationship between population density and total habitable area. The negative relationship implies that houses in the study area with relatively small habitable area tend to have high population density. The coefficient of determinants (R2) of 8% shows a very weak relationship. At 5% level of significance, the relationship is statistically significant given the probability level (P-value) as less than 0.05.

Experiment 3: The relationship between number of occupants and total number of rooms. The positive relationship as in experiment 1 implies that houses with large number of rooms tend to have larger number of occupant. The coefficient of determinants (R2) value of 64% shows a very strong relationship. At 5% level of significance, the relationship is statistically significant given probability level (P-value) as less than 0.05.

Experiment 4: The relationship between population density and number of rooms. The negative relationship implies that houses in the study area with relatively small number of rooms tend to have high population density. The coefficient of determinants (R) value of 0% shows a very weak relationship. At 5% level of significance, the relationship is non-significant given the probability level (P-value) as greater than 0.05.

Comparison between Low and High Density Areas

Summary of Findings

From table 5, the following are the findings:

- There is significant relationship between number of occupants and total habitable area in both low and high density areas in Minna and environs. The positive relationship implies that houses with large total habitable area tend to have equally large number of occupants. It also indicates a weak relationship between the variables.
- There is non-significant relationship between population density and total habitable area in both low and high density areas in Minna. The relationships are negative, implying that houses with relatively small habitable area tend to have high population density. It indicates a very weak relationship in both areas.
- There is significant relationship between number of occupants and total number of rooms in both low and high density areas in Minna. The relationships are positive implying that houses with large number of rooms tend to have equally large number of occupants. In low density areas, the relationship is strong and in high density areas, the relationship very strong.
- There is non-significant relationship between population density and total number of rooms in both low and high density areas in Minna. The relationships in low density area are positive implying that houses with large number of rooms tend to have equally large population density. And the relationships in high density areas are negative implying that houses with small number of rooms tend to have large population density and the relationships are both very weak.

Conclusion and Recommendation

Based on the study, inadequate housing or rather, shortage of housing in Minna is becoming a menace as a result of the increasing growth in population. It also discovered that factors such as: high cost of building materials, Land Use Act, tight mortgage facilities among others contribute the problem. The study focused on determining the nature, strength and significance of the relationships between number of occupants and total habitable area; population density and total habitable area; number of occupants and total number of rooms; population density and total number of rooms. The result shows a negative relationship with regards relationship between population density and total habitable area, population density and total number of rooms. However, it did provide significant relationship between number of occupants and total habitable area, number of occupants and total number of rooms with the relationship between the variables being positive. Findings from the study revealed that Minna has an average room occupancy of 10.78 which is contrary to the United Nations standard stipulation of 2.20, the World Health Organization (WHO) standard of 1.8. To this end, the following conclusions were made: the increasing population growth has effect on housing; housing is in short supply and therefore, a comprehensive review of the housing needs is imperative; Overcrowding is a visible feature in Minna; and there is an increasing shortage of social amenities and infrastructure.

Recommendations

- Considering the weak relationship in number of occupants and total habitable area in the relationships explored, it is recommended that other parameters which may have stronger effect such as the cost of building materials, availability and cost of land etc. should be explored.
- The intervention of the public sector in the provision of low-cost houses is desirable and should be pursued with vigour. The housing programmes should be based on genuine participation in order to ensure sustainability.
- Given the rate of population growth and the limitations of existing infrastructural facilities, there is a great need for government to review and establish effective and sustainable housing and urban development policies

which will initiate radical increase in the scope of owner-occupier housing at affordable cost.

- The government should encourage private sector's participation in the provision of housing through the provision of incentives and enabling environment for investment.
- Population should be controlled and directed by the government through the development of hinterlands and rural areas.
- The professionals in the building environment should ensure continuous planning and must be proactive in reacting to events

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