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VULNERABILITY ASSESSMENT OF BUILDINGS AROUND GAS STATIONS IN PARTS OF ILORIN

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KEY WORDS:

Vulnerability

Gas stations



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INTRODUCTION

- A gas Station is defined as any land, building or equipment used for the sale or dispensing of petrol or oils for vehicles or incidental thereto and includes the whole of the land, building or equipment whether or not the use as a petrol station is the predominant use or is only a part thereof
- Ilorin south local government area (Ilorin) of Kwara state. Kwara state was created on the 27th of May, 1967 and Ilorin was made the capital city.
- As a result of this Ilorin became a growth pole, in this way attracting people from all walks of life.
- Over time the population have increased,
- The increase in the demand for fuel prompted the building of more gas stations in order to meet the demand of the populace.



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Statement of Problem

There are so many problems lurking around the building of gas stations, being so close to residential quarters, some of which are:

- Fire accident (as a result of spark), which can cause damages which cannot be estimated.
- Air Pollution (as a result of exposure of petroleum products), which is dangerous to human health.
- Traffic hold up (as a result of inadequate parking space for tankers during offloading of petroleum products).



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Aim

- The aim of this work is to assess the vulnerability of buildings around gas stations in Ilorin south local government area of Kwara state, using G.I.S.



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Objectives

1. design and create spatial database for the study area.
2. use the satellite imagery of Ilorin to produce a digital map of Ilorin south LGA, showing the various locations of each gas station in relation to buildings.
3. create a spatial database for parts of Ilorin
4. perform spatial analysis in the study area.
5. generate vulnerability index map for parts of Ilorin.



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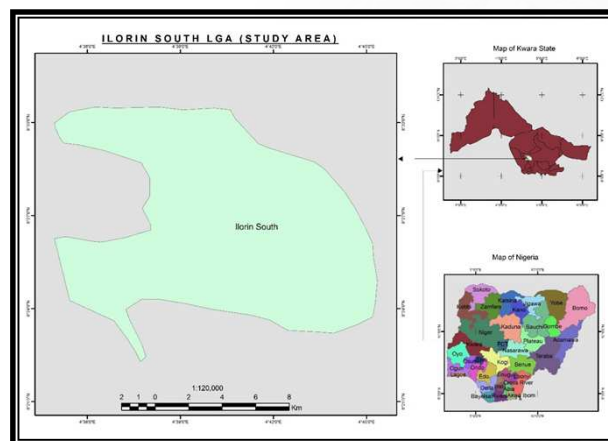


Figure 1.1: The Study Area



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DATABASE DESIGN

- Kufoniyi, (1998) explained GIS data modelling as the processes by which the real world entities and their interrelationship are analysed and modelled in such a way that maximum benefits are derived.
- The view of reality is the mental abstraction of all entities, as they actually exist within the project area
- This view of reality serves as an input in the design phase.
- The design phase which consist of three stages as; **Conceptual design**, **Logical design** and **Physical design**.



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CONCEPTUAL DESIGN

Examples of these entities are reservoirs, pipelines, gas stations, roads, buildings, wards and local government area.

E-R Diagram was drawn as the basis of conceptual model.



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LOGICAL DESIGN

A Relational Database model was used to implement the data base.

This resulted in logical schema for gas stations



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Data ACQUISITION

- The imagery used is Quick-bird (resolution of 0.6m) the year of acquisition is 2010. The imagery did not required geo-referencing before usage
- Positions of dispense pumps were acquired using GPS device



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PHYSICAL DESIGN

Table 3.1: Gas Station Attribute and Data Type

Attribute Name	Data Description	Data type	Data width	Decimal
P_ID	Petrol station identifier	Short integer	3	-
P_LOCATION	Petrol station location	Text	16	-
P_NAME	Petrol station name	Text	12	-
P_E	Petrol station Easting	Double	10	-
P_N	Petrol station Northing	Double	10	-
P_ONR	Petrol station owner	Text	30	-
P_PP	Number of fuel pump	Text	10	-



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DATABASE CREATION AND IMPLEMENTATION

The imagery was used to extract the residential **buildings, roads and the gas station locations** within the study area

The corresponding attribute fields were created in ArcGIS 9.3 geo-database using the ArcCatalog to create respective necessary layers for the purpose of analysis.



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5.0 ANALYSIS

5.1 Buffering



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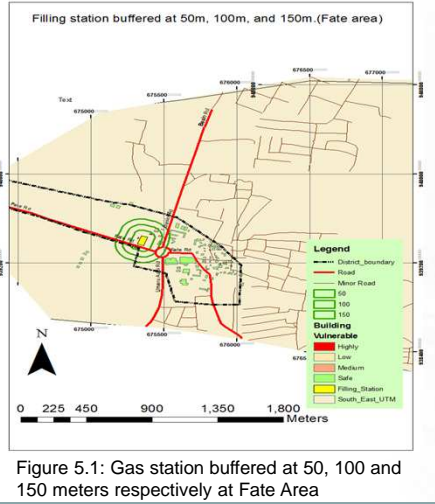


Figure 5.1: Gas station buffered at 50, 100 and 150 meters respectively at Fate Area

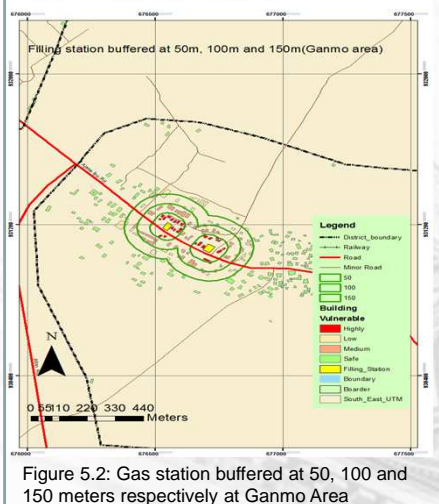


Figure 5.2: Gas station buffered at 50, 100 and 150 meters respectively at Ganmo Area



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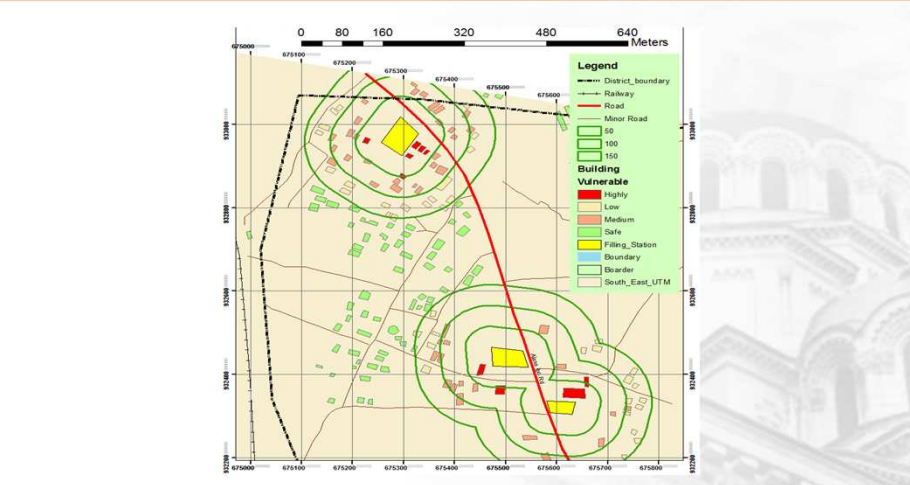


Figure 5.3: Gas Station buffered at 50, 100 and 150 meters respectively at Olunlade Area





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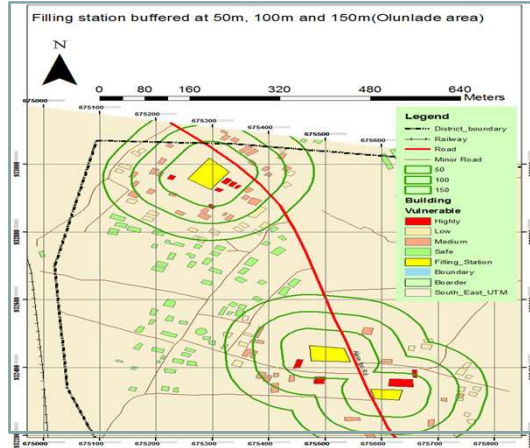


Figure 5.1, Figure 5.2, and Figure 5.3, depict the extent of the buildings at risk if the incident should occur at Fate, Ganmo and Olunlade area of the study area, based on the NNPC-PPMC recommendations.



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5.2 Buildings Vulnerability

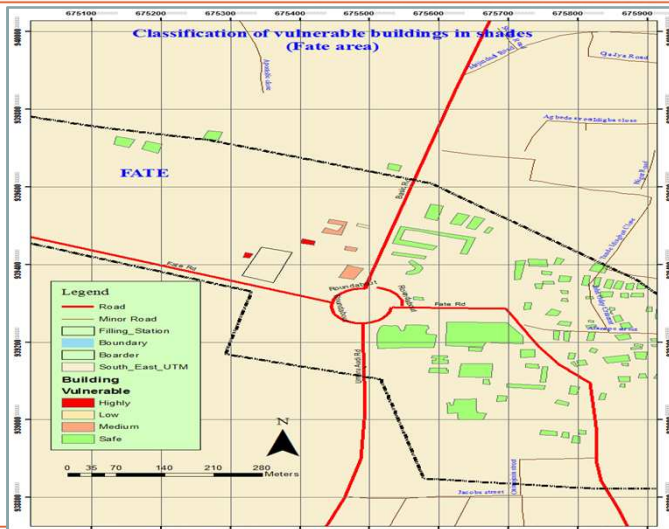


Figure 5.4 Building Vulnerability based on distance from Gas Station at Fate Area



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- Figure 5.4, Figure 5.5, and Figure 5.6, depict the levels of severity at distances of 50,100 and 150 m at Fate, Ganmo and Oluude areas, this implies that the buildings within 50 m from the gas station will be severely affected with the possibility of total damages (75–100 %-Highly vulnerable), while for buildings within 50–100 m are less affected with severity level of medium vulnerability damages of 50–75 %, and severity of low vulnerability implies that the damages is less than 50%, which the distance is between 100 – 150 m and beyond these ranges is the safe zone places. This index is based on the **NNPC-PPMC** recommendations.



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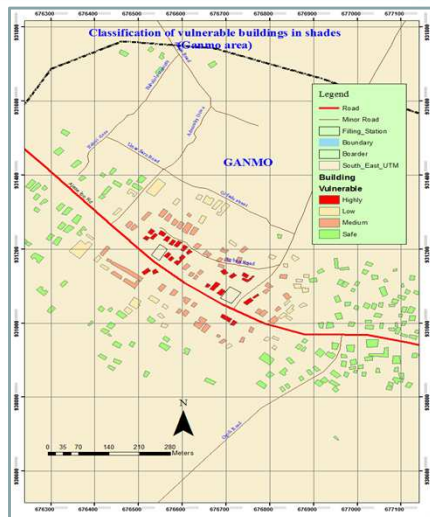


Figure 5.5: Building Vulnerability based on distance from Gas Station at Ganmo Area.

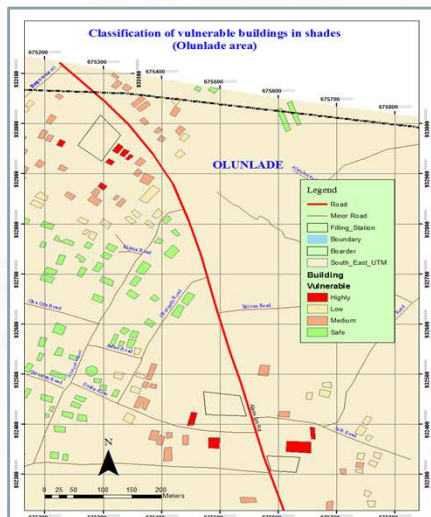


Figure 5.6: Building Vulnerability based on distance from Gas Stations at Oluude Area.





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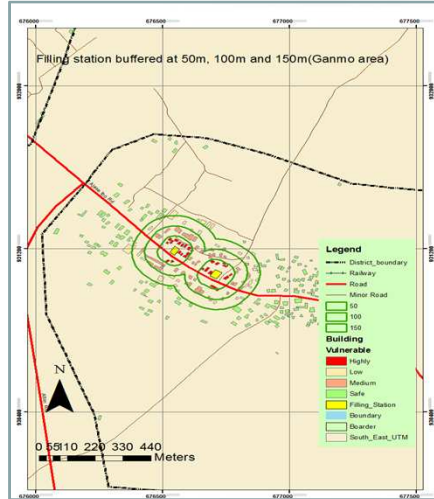


Figure 4.2, filling station buffered at 50, 100 and 150 meters respectively at Ganmo Area.



4.2 Building Vulnerability



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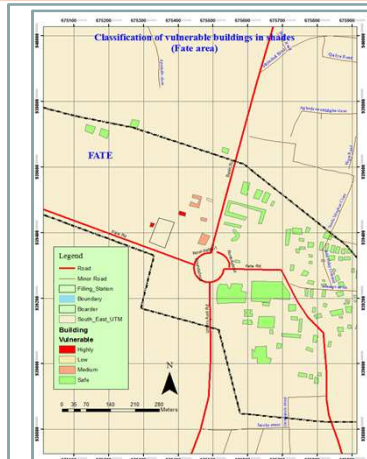


Figure 4.3, Building Vulnerability based on distance from Filling Station at Fate Area.

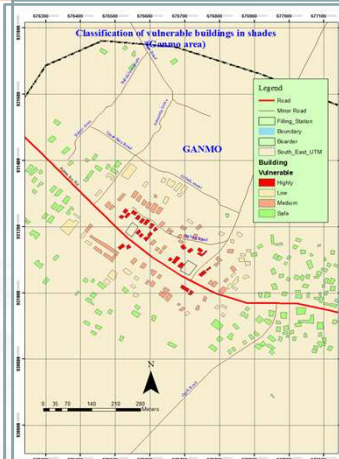


Figure 4.3, Building Vulnerability based on distance from Filling Station at Ganmo Area.





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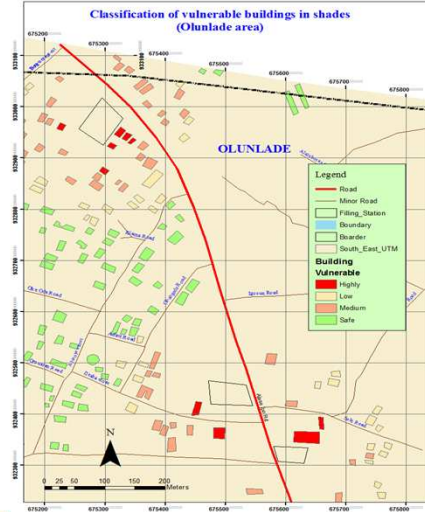


Figure 4.3. Building Vulnerability based on distance from Filling Station at Olunlade Area.



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Affected Buildings at Different Buffer Distance

Vulnerability	Buffer distance	No of affected buildings
Highly	0-50m	37
Medium	50m-100m	95
Low	100m-150m	76





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OBSERVATION

The idea behind classification of vulnerable buildings in shades is to actually distinguish houses in different levels of vulnerability.

For instance buildings **red** shows highly vulnerable areas, **pink** shows medium, while **yellow** shows low vulnerable areas. Those in **green** shows houses in safe zones.

The work also revealed that some gas stations did not adhere to the standard recommended for fuel pumps setback of the Department of Petroleum Resources (DPR).



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CONCLUSION & RECOMMENDATION

This work has been able to generate index levels for members of the public that will like to build in the study area, of risk that they need to lookout for as it relates to their proposed buildings and the gas stations within the study area.

It is recommended that the physical planning authority use this index map at the point of approval either to decline or to grant approval to erect residential structure within the study area.



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