Geo-spatial Mapping and Multi-criteria Analysis of the Downstream Flood Risk Settlements of Usman Dam Abuja-Nigeria

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Presentation Outline

- Introduction
- Study Area
- Methodology
- Results
- Conclusions

Introduction

- Flooding is one of the most common and widespread of all weather-related natural disasters in the world.

- Flooding is caused by heavy rains, ocean waves coming onshore, fast melting snow, the breaking of dams or levees amongst others.

- In Nigeria, most floods occur because of excessive rainfall leading to dams opening their spillway and dam failures which lead to vast hectares of land rendered useless.

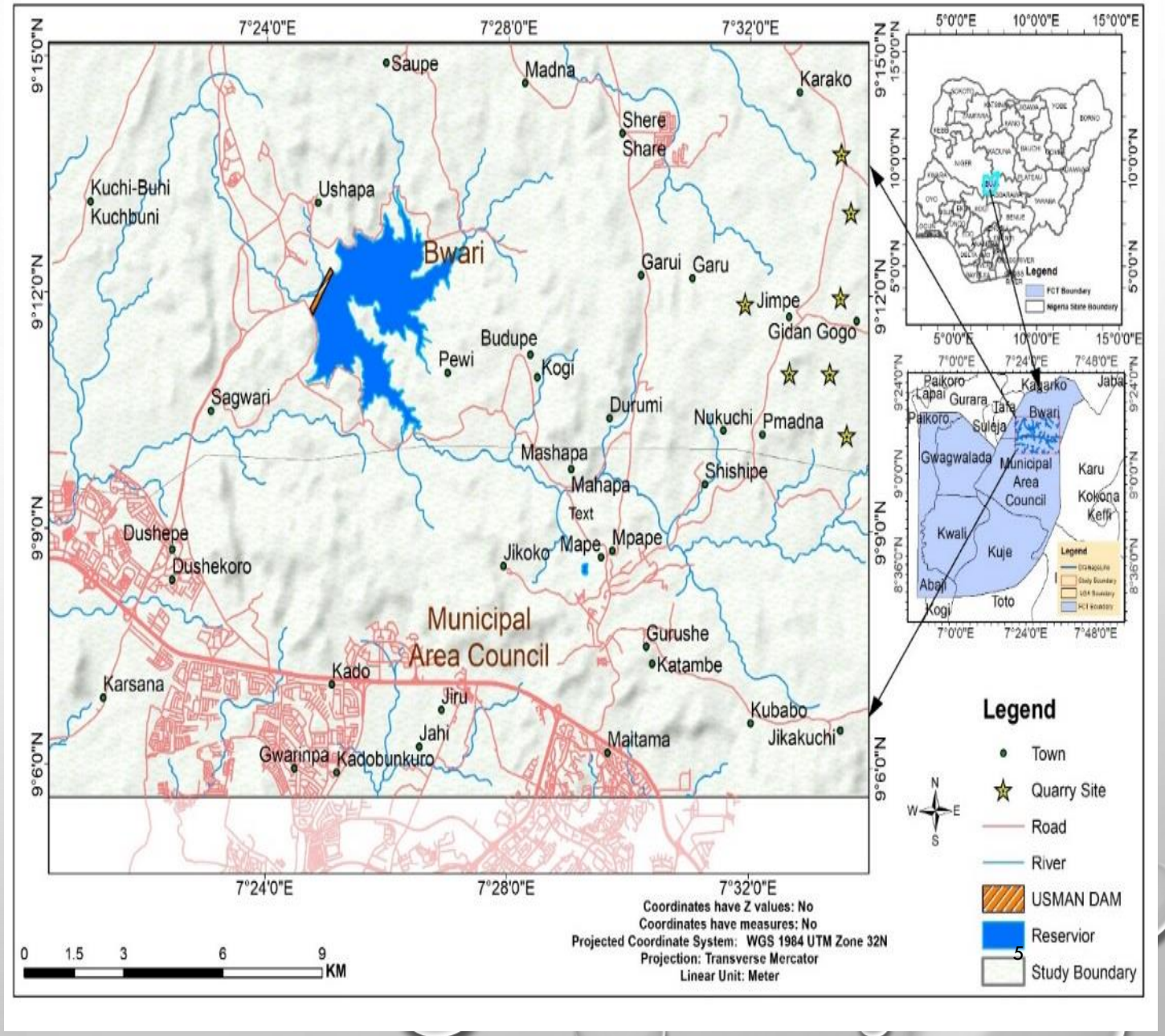
Introduction contd.

- Some research efforts have been carried out in the recent past on Flood incidences with a view to understanding their factors and effects on the immediate environment (Khalequzzaman, 2011; Jansen *et al.*, 2013; Ojigi *et al.*, 2013; Azua *et al.*, 2019).

- However, with no current way of fully compensating for the factors of Flooding, it is imperative that periodic investigations are conducted to reduce their effects on the environment

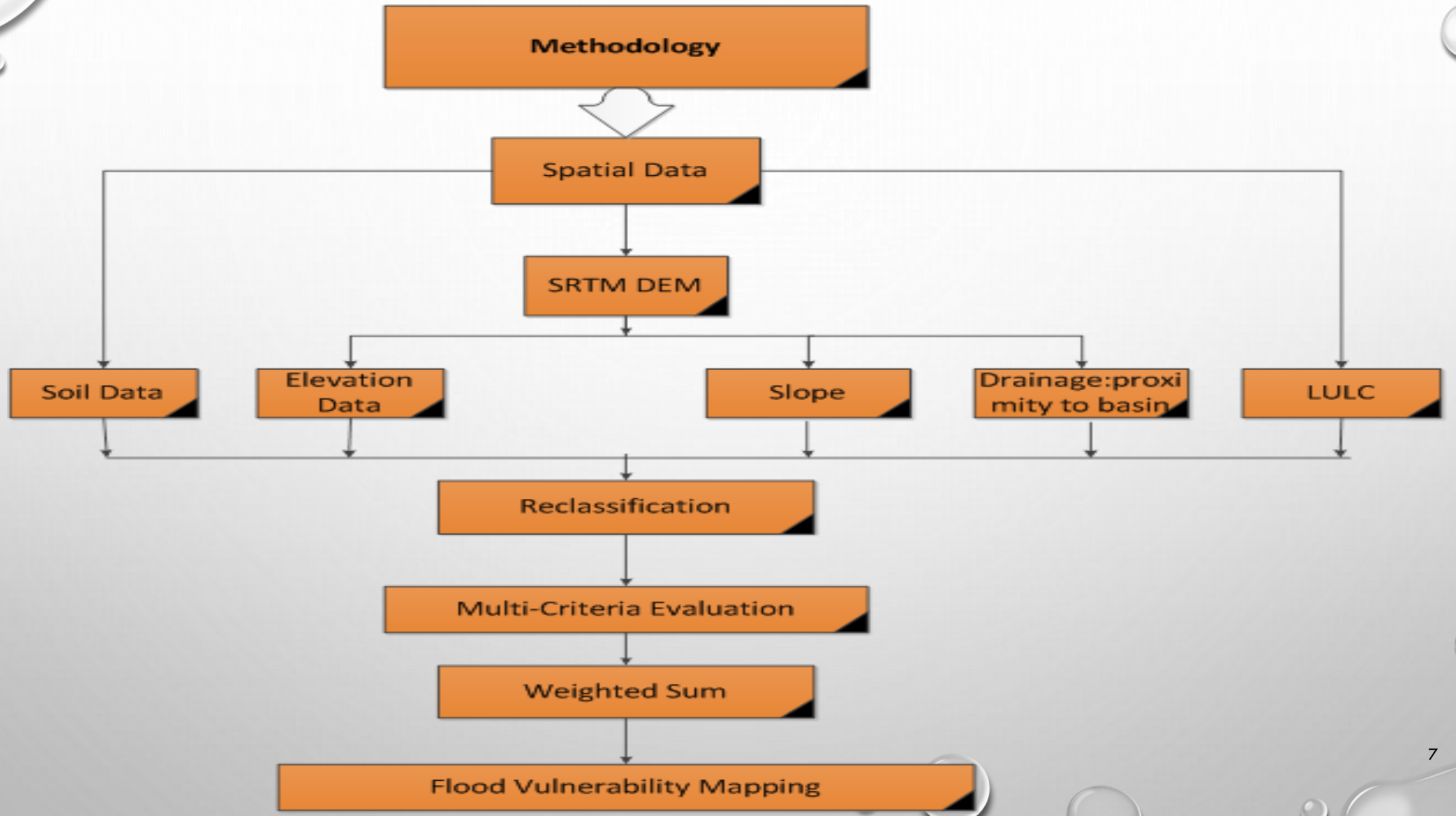
Study Area

- It covers the communities downstream of Usman dam near Ushapa of Bwari Area Council of the Federal Capital Territory, Nigeria.
- Longitudes 7°24'29.596" and 7°29'3.259" East and Latitudes 9°13'35.928" and 9°8'7.435" North.



Usman Dam & Downstream Settlement

Methodology – Workflow Diagram



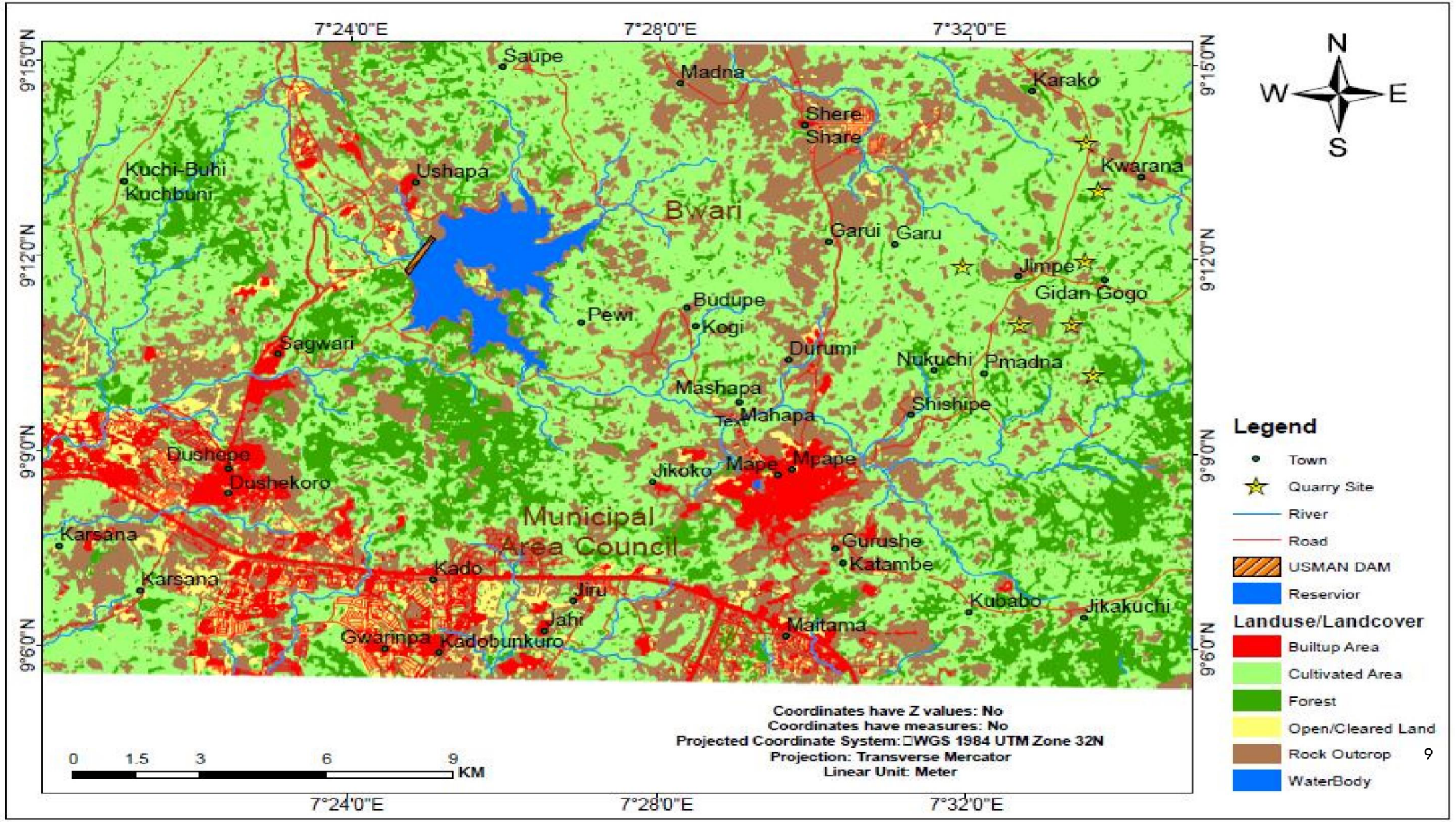
Results

- LULC Identified/Classified – built-up (6.32%), farmland (6.97%), forest (31.96%), grassland (37.16%), rock outcrop (8.80%) and water body (8.79%).

- Overall accuracy was 99.19% while the Kappa Coefficient was 98.74%.

- Classes were ranked between “very small contributor” to “extreme high contributor” to Flood between the ‘<0.1 and 1’ index values.

LULC Map

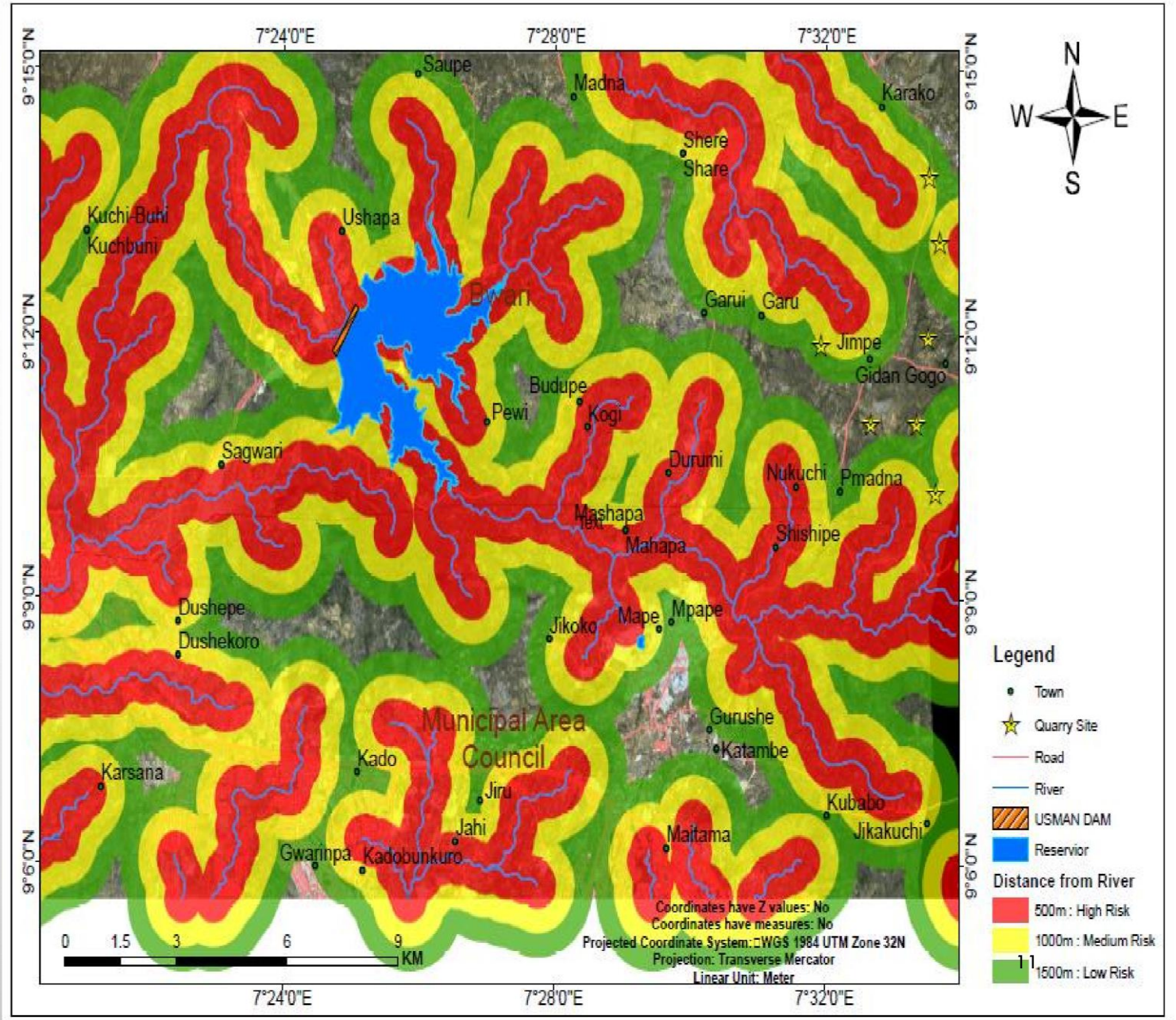

7°24'0"E
7°28'0"E
7°32'0"E
9°15'0"N
9°12'0"N
9°9'0"N
9°6'0"N
N
W
E
S
Saupe
Madna
Karako
Shere
Share
Kwarana
Kuchi-Buhi
Kuchbuni
Ushapa
Bwari
Garui
Garu
Jimpe
Gidan Gogo
Budupe
Pewi
Kogi
Sagwari
Durumi
Nukuchi
Pmadna
Mashapa
Mahapa
Shishipe
Dushepe
Dushekoro
Jikoko
Mape
Mpape
Municipal
Area Council
Karsana
Gurushe
Katambe
Karsana
Kado
Jiru
Jahi
Kubabo
Jikakuchi
Maitama
Gwarinpa
Kadobunkuro
Legend
Town
Quarry Site
River
Road
USMAN DAM
Reservior
Landuse/Landcover
Builtup Area
Cultivated Area
Forest
Open/Cleared Land
Rock Outcrop
WaterBody
Coordinates have Z values: No
Coordinates have measures: No
Projected Coordinate System: WGS 1984 UTM Zone 32N
Projection: Transverse Mercator
Linear Unit: Meter
0
1.5
3
6
9
KM

Results contd.

- Soil – ranked as Gleysol (Small Contributor) and Lixisol (High Contributor) to Flood based on their Index Values ”0.2-0.4” & ”0.6-0.8”.
- Elevation – ranked as High (Small Contributor) and Low (High Contributor) to Flood based on their Index Values ”0.2-0.4” & ”0.6-0.8”.
- Slope – ranked between flat (Very Small Contributor) and Extreme (Very High Contributor) to Flood based on their Index Values ”<0.2 and 1”.

Drainage Proximity Map

- Settlements from reservoir & river channel were identified to be at Low (1500m), Moderate (1000m) and High (500m) Risks of being Flooded.



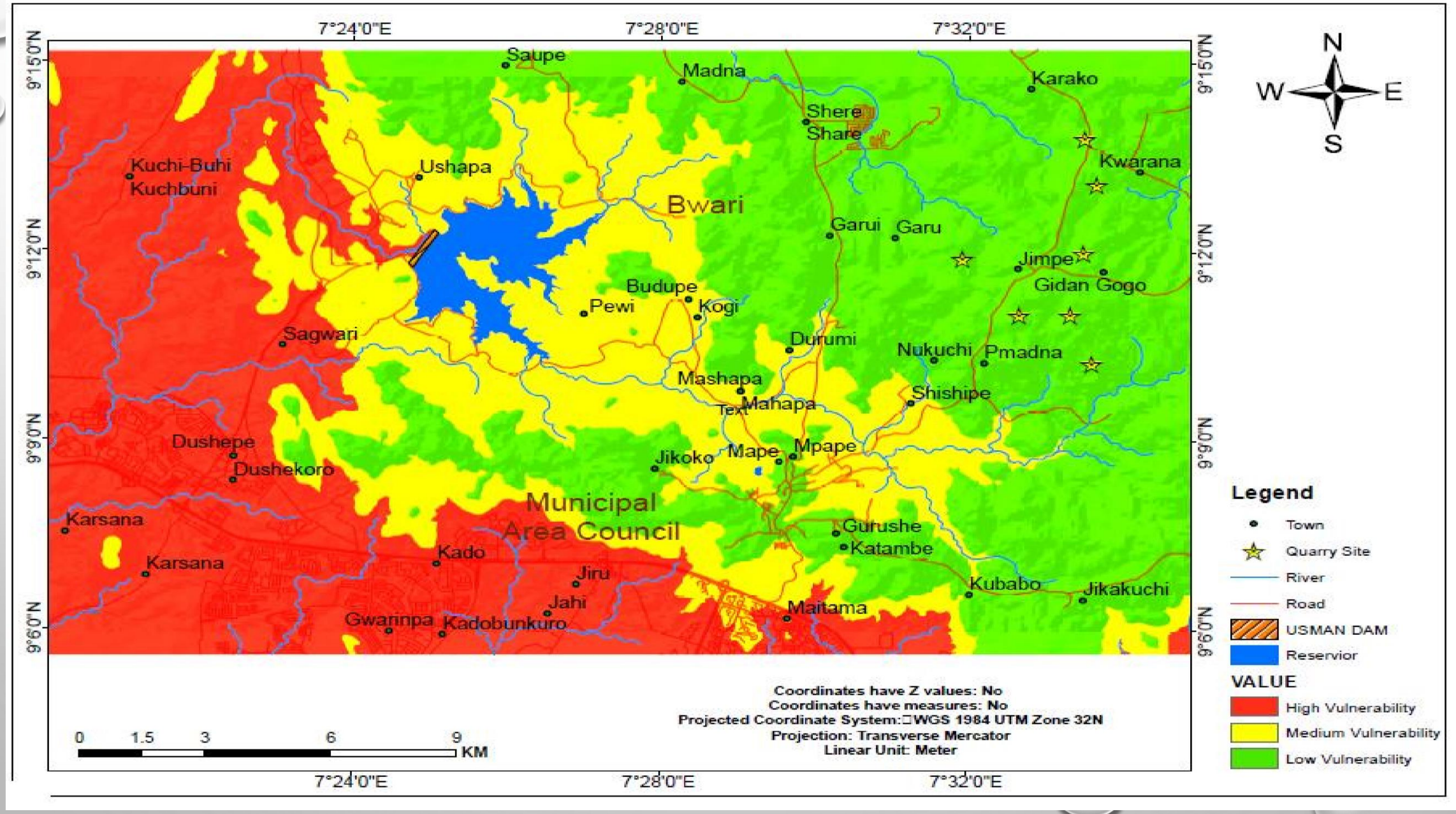
Results contd.

- MCA – ranked Slope (0.24) and Elevation (0.24) as the most contributing factors to Flood followed by proximity to drainage (0.16), LULC (0.12) and Soil (0.08) respectively.

- Consistency Ratio (CR) = 0.011533 (that is,1%) indicating the rankings were consistent where CR < 0.1.

- Flood Vulnerability classes identified for the study area were Low (29.57%), Moderate (64.02%) and High (6.41%) from the Flood Vulnerability Map.

Flood Vulnerability Map



Conclusions

- The Flood risk settlements surrounding the Usman dam in Abuja, Nigeria have been assessed using the MCA.
- Slope and Elevation were the most contributing factors to Flooding followed by proximity to drainage, LULC and Soil.
- Settlements in the eastern part were the least vulnerable to Flood while that close to the river course and dam reservoir in the central and western parts were more vulnerable to Flood incidences.
- It is possible to relocate settlements to the eastern part of the study area to forestall future Flood hazard.

Thanks for Listening