TEPO MOS

GIS/PLANNING PORTFOLIO

2022-2025

LAND USE ANALYSIS

GIS analysis promotes informed use of land by identifying geohazards, optimizing land allocation, and ensuring sustainable, regulation-compliant development.

PROBLEM STATEMENT

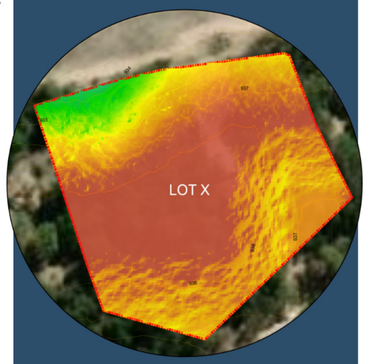
Effective land-use planning requires a detailed assessment of site conditions, environmental constraints, and potential geohazards. Key challenges include flood risk, slope stability, and optimizing land allocation while ensuring regulatory compliance. The site's proximity to a riverside and existing developments adds complexity, requiring careful spatial analysis to balance development potential with environmental sustainability.

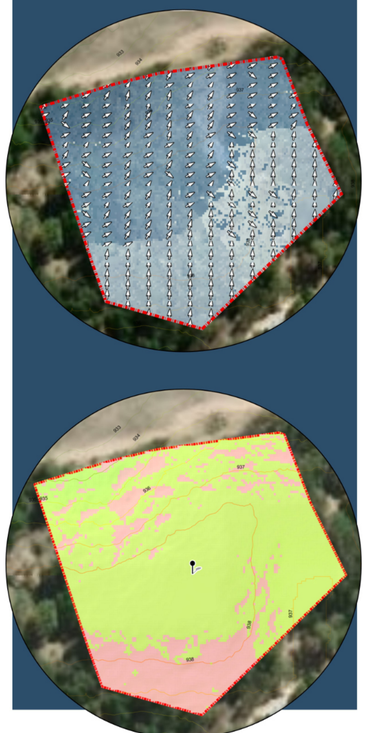
METHODOLOGY

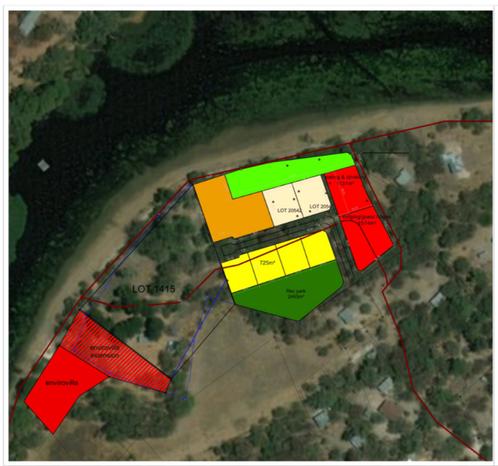
A GIS-driven analysis assesses terrain, hydrology, and land suitability. Elevation models and slope analysis inform geohazard assessments, while hydrological modeling identifies flood-prone areas. Land classification techniques delineate optimal zones for different uses, ensuring a balance between development and environmental constraints. Spatial overlays refine the subdivision strategy, integrating site conditions with regulatory and infrastructural requirements.

RESULTS & IMPACT

Proactive identification of geohazards supports data-driven decision-making, reducing risks and enhancing planning efficiency. The final land-use framework optimizes spatial allocation, ensures regulatory compliance, and creates a sustainable development strategy that accounts for environmental and infrastructural factors.







X-draft Layout

Legend

Proposed
- Residential
- Proposed multi-residential
- Exisiting Plots Aligned
- Open Space
- Commercial
- Agro tourism
- Access Road (15m)

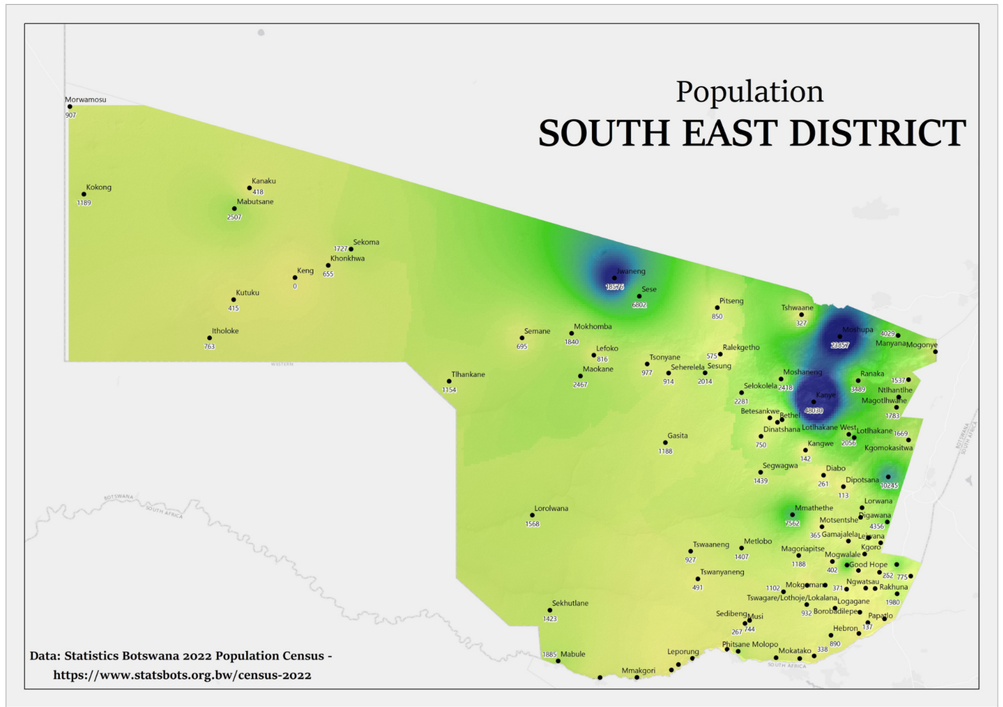
Existing
- Existing Plots Original Placement
- Existing Commercial
- Envirovilla Extension
- Existing roads (dotted through Banana farm)

Land Budget

LAND USE	NO. OF PLOTS	PLOT SIZE (m2)	TOTAL AREA (m2)	%
HIGH INCOME	4	700	2 800	16
MULTI FAMILY RES	1	2 495	2 495	14
COMMERCIAL	2	1352	2705	16
OPEN SPACE	2	2 465	4 930	29
ROADS & PATHWAYS	n/a	n/a	2 807	16
EXISTING PLOTS	2	800	1 600	9
TOTAL	11	7 012	17 337	100

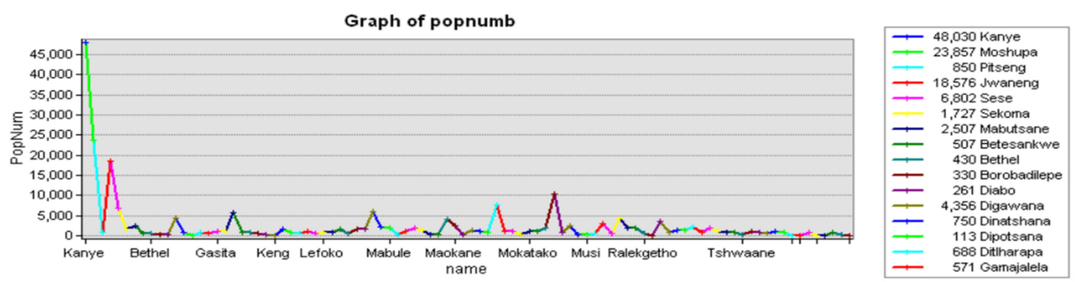
POPULATION DISTRIBUTION & DEMOGRAPHIC ANALYSIS

Mapping population density to support regional planning and resource allocation



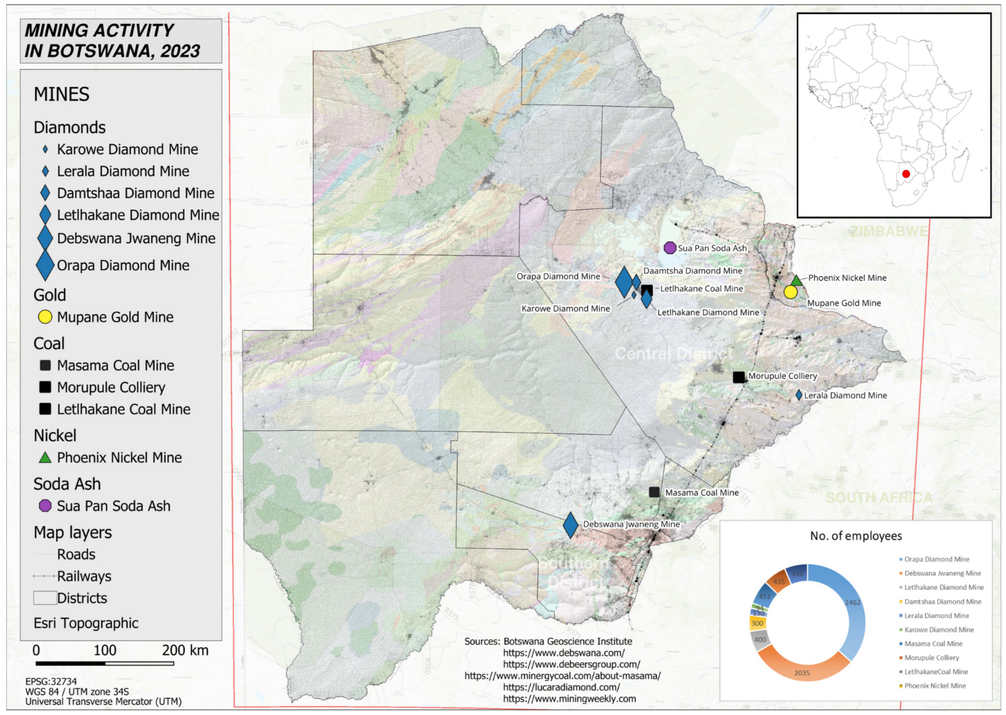
CONTEXT

This map illustrates population distribution across the South East District of Botswana, providing insights into settlement patterns and demographic trends. The challenge is to represent population density effectively for urban planning, infrastructure development, and service delivery. GIS-based analysis processes census data, visualizing population clusters to inform decision-making on resource allocation, transportation planning, and future development strategies. Below is an excerpt in graphical form, presenting the same data represented on the map.



CARTOGRAPHY & ANALYSIS

Mapping diamond mining activity to visualize workforce distribution, economic impact, and spatial trends



CONTEXT

This map represents active diamond mines in Botswana, with symbol sizes reflecting workforce density. The challenge is to effectively communicate the spatial distribution of mining operations and their economic influence. Using GIS, data is processed, symbolized, and analyzed to create a clear representation of employment patterns within the sector. Cartographic techniques enhance readability, while spatial analysis supports informed decision-making in resource management, economic planning, and infrastructure development.

AT A GLANCE:

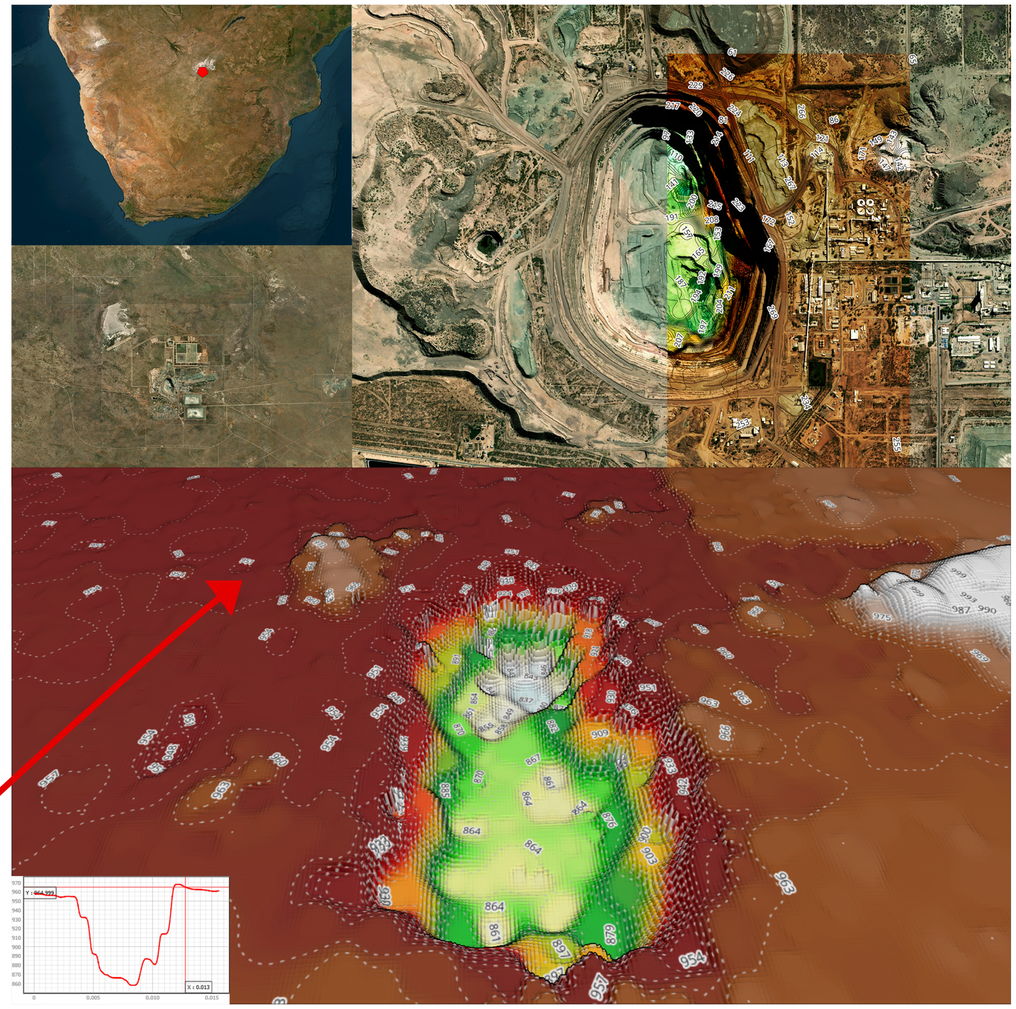
Total Workforce: There's around 6,740 employees across all active mines *

Mining Sector Distribution: 79% of the workforce is employed in diamond mining

Average Workforce Size: 749 employees per mine (average)

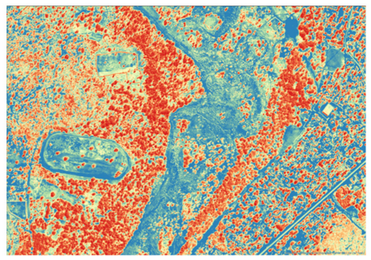
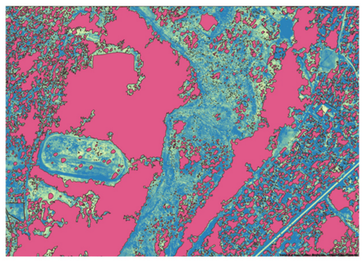
Production Impact: Orapa Diamond Mine produced 9.02 million carats in 2023

Multi-Scale satellite analysis - Debswana Orapa Diamond Pit



OBJECT CLASSIFICATION

The presence of natural vegetation, built-up areas, and open land needed to be quanti fied to guide the subdivision process. Additionally, identifying tree-covered areas was es sential for preserving green spaces and ensuring environmental sustainability.

CONTEXT

Accurate land cover assessment was essential for informed decision-making in land management and development. Traditional site inspections were time-consuming and lacked spatial precision. The challenge was to efficiently differentiate between vegetation, built-up areas, and open land, ensuring that tree coverage was identified and preserved within the planning process.

WORKFLOW

True-Color Satellite Image

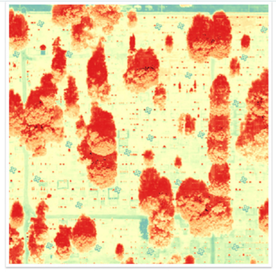
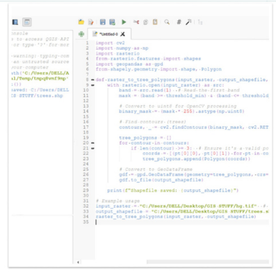
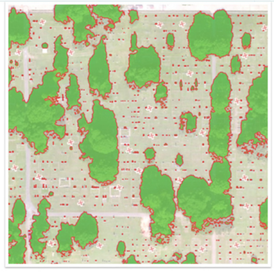
A high-resolution satellite image provided a natural color representation of the site.

Classified Land Cover Map

Advanced image classification techniques were applied to categorize the landscape into distinct land cover types.

Targeted Vegetation Extraction

A refined analysis was conducted to isolate tree-covered areas, .

AT A GLANCE:

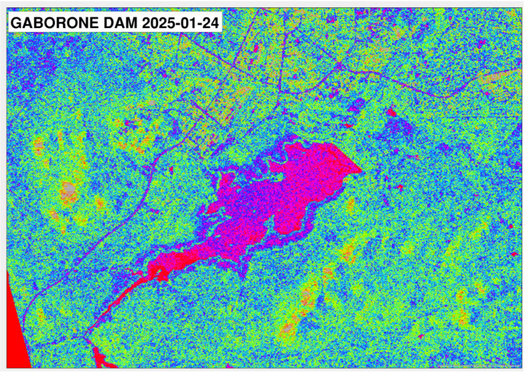
- A high-resolution true-color image serves as the foundation for analysis.
- A custom Python script applies a pseudo color ramp, improving contrast between land cover types.
- Land Cover Interpretation: The filtered image helps distinguish natural vegetation, built-up areas, and open land.
- Tree Mapping: Outlined and filled polygons highlight tree-covered areas, supporting environmental planning and green space preservation.

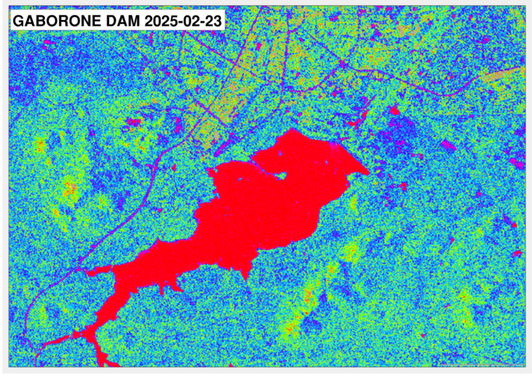
SATELLITE IMAGERY & CHANGE DETECTION

Using remote sensing to monitor development and environmental changes

BRIEF STATEMENT

Satellite imagery provides a powerful tool for analyzing land transformation and environmental dy- namics. The first set of images captures site conditions before and after mall construction, highlighting urban expansion. The second set focuses on a dam, comparing normal water levels to post-rainfall conditions, showcasing hydrological impact. By leveraging satellite data, changes are documented, trends are analyzed, and informed decisions are made for sustainable development and resource management.





APPLICATION ANALYSIS

Location: Kgatleng District, BW

Area: 7,960km ^{2}

Tools Used: ArcGIS, Google Earth

Background

The office received & registered applications received by the physical planning office in Kgatleng District & this allowed me to compile the data below. After compiling the data and noticing the trend I embarked on a research to find out why there is a prevalence of subdivisions in the area.

KGATLENG DISTRICT COUNCIL

PRIVATE BAG 0011, MOCHUDI

TEL: 5777411 FAX: 5777216

General info
Area: 7,960 km^2
Population: 91,660 (as of 2011 census
June 2'nd to June 11

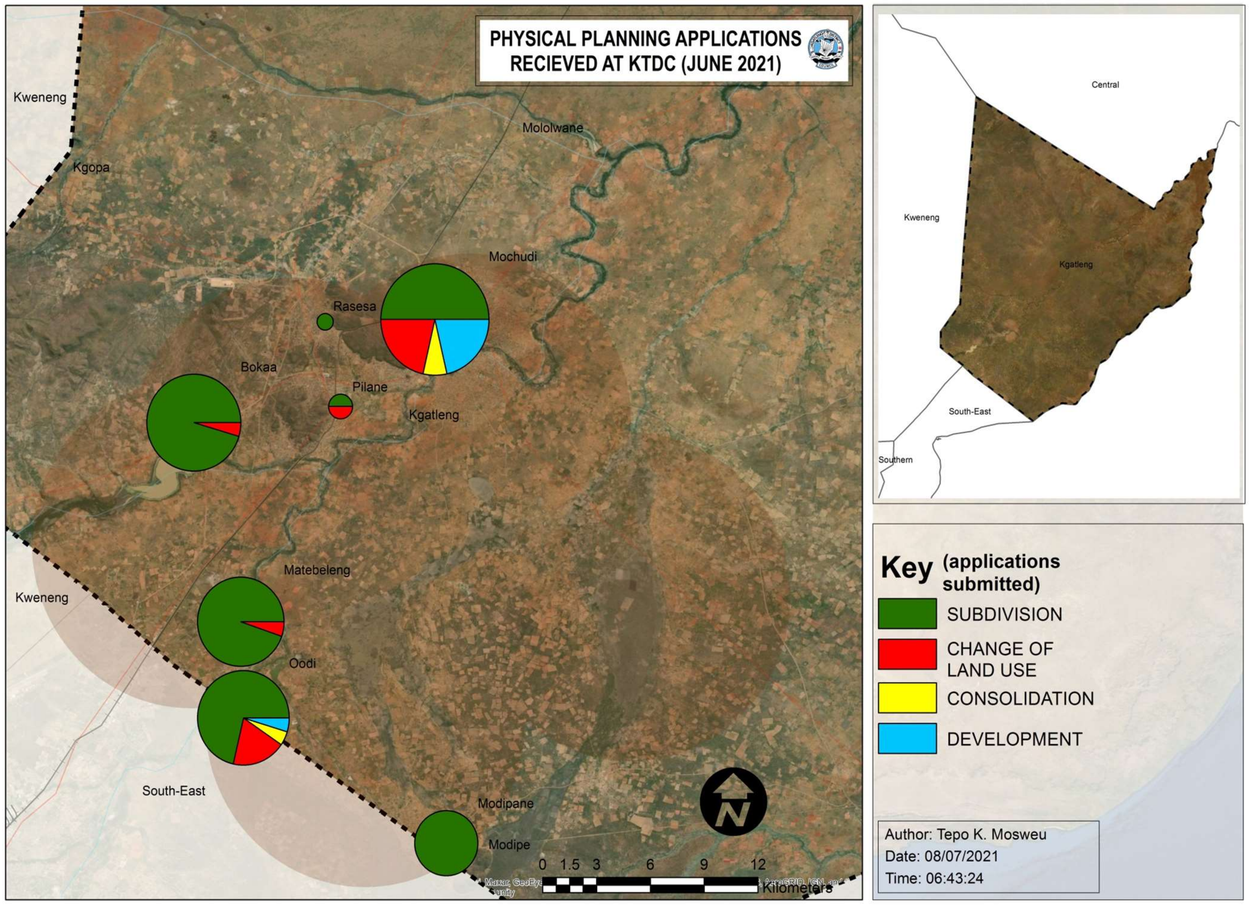
Figure 3.0

Land Use Applications Summary Table:

SETTLEMENTS	SUBDIVISIONS	CHANGE OF LAND USE	CONSOLIDATIONS	DEVELOPMENTS
Mochudi	14	6	2	6
Pilane	1	1		
Rasesa	1			
Bokaa	21			
Morwa				
Matebele	18	1		
Oodi	15	4	1	1
Modipane	11			
Mabalane				
Sikwane				
Mmathubudukwane				
Ramanaka				
Malolwane				
Oliphants Drift				
Artesia				
Malotwana Siding				
Leshibitse				
Ramotlabaki				
Kgomodiatshaba				
Dikgonnye	1			
Other localities				
TOTAL= 104	81	12	3	7

Figure 2.0

2002 aerial image



Through a time-lapse of three aerial images, the evolving landscape of the district becomes evident. Initially featuring two individual plots, the successive images showcase a distinctive trend—subdivision applications transforming these plots into four distinct parcels. This visual narrative, discovered while tracking planning applications, sheds light on a prevalent trend of land subdivision within the district.

Figure 2.1

2002 aerial image

Figure 2.2

2014 aerial image

Figure 2.3

2021 aerial image

Notwane East Neighbourhood Design

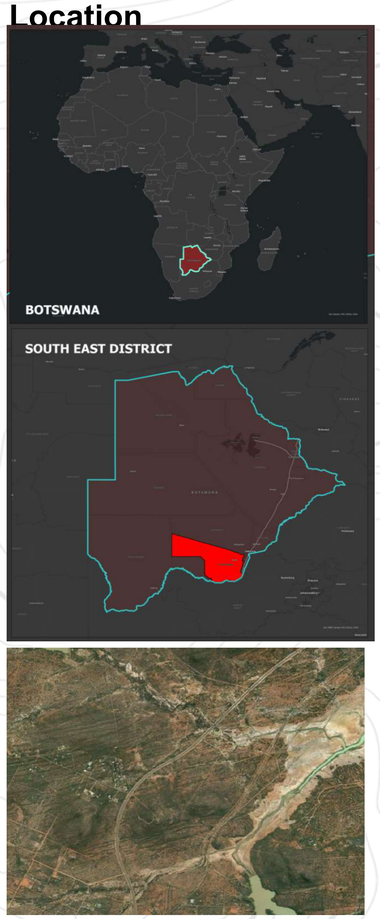
Type: Academic work

Location: Notwane East, South East District, BW

Area: 2.39km^2

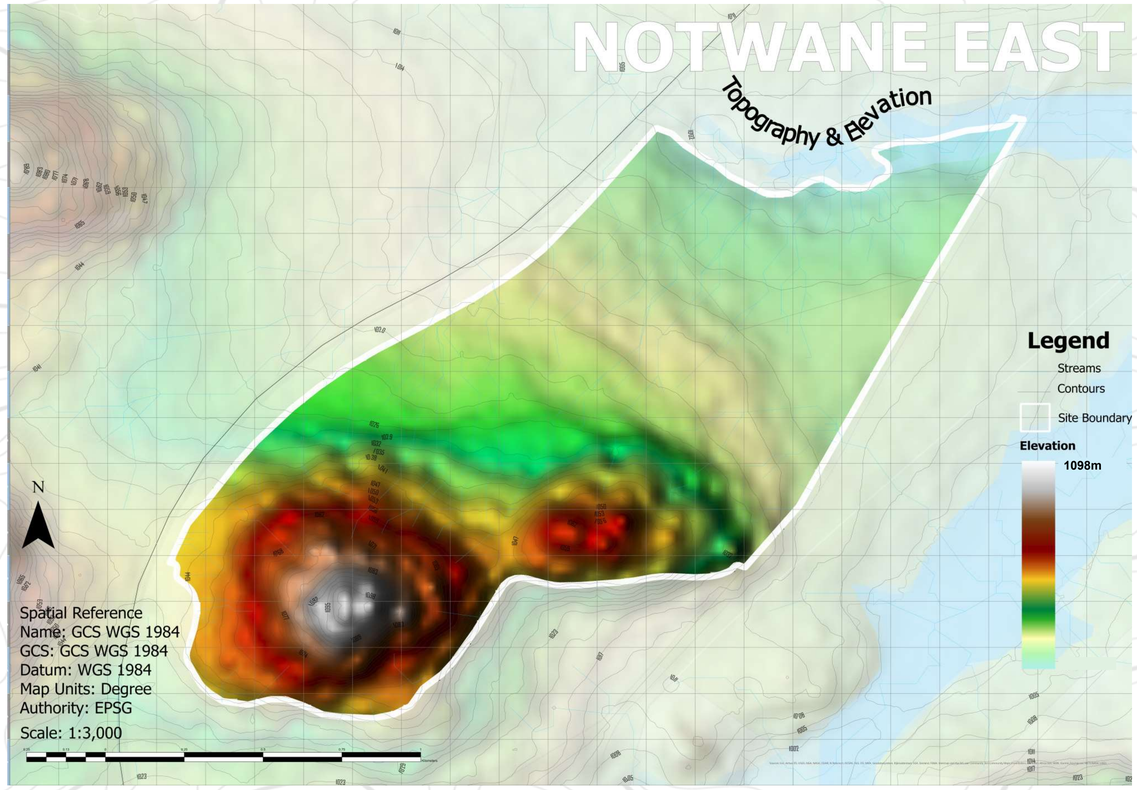
Tools Used: AutoCAD, ArcGIS, Sketchup, MS Publisher

1.1 Site Location



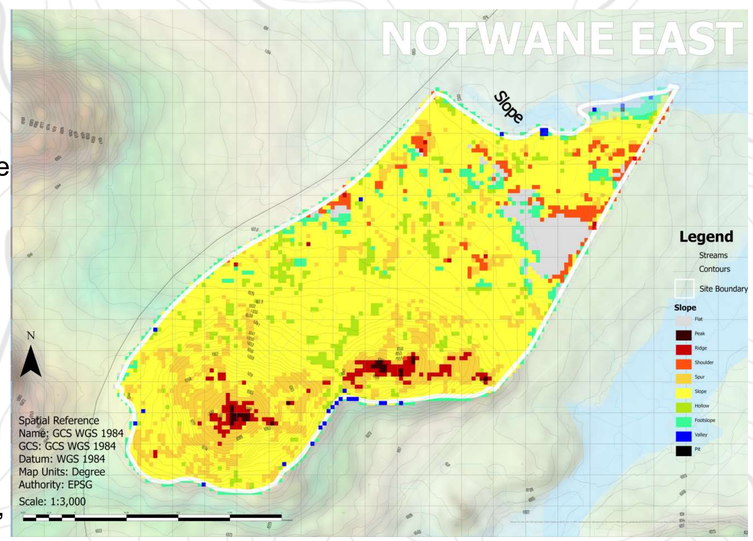
The site is located in the South East District and is approximately 12km south of Gaborone. It measures 239ha and is bounded by the A1 road (W), The Tloaneng River (N) and a railway track (E) which runs parallel to the Metsimaswaana river which feeds the Gaborone Dam located (NE) of the site

1.2 Site Analysis



The site is craggy and has 2 hills with steep elevations. The highest point is the hill on the west at 1297m and the lowest point is north towards Gaborone Dam at a 1000m. Parts of the site are not suitable for building due to the steep elevations and water features.

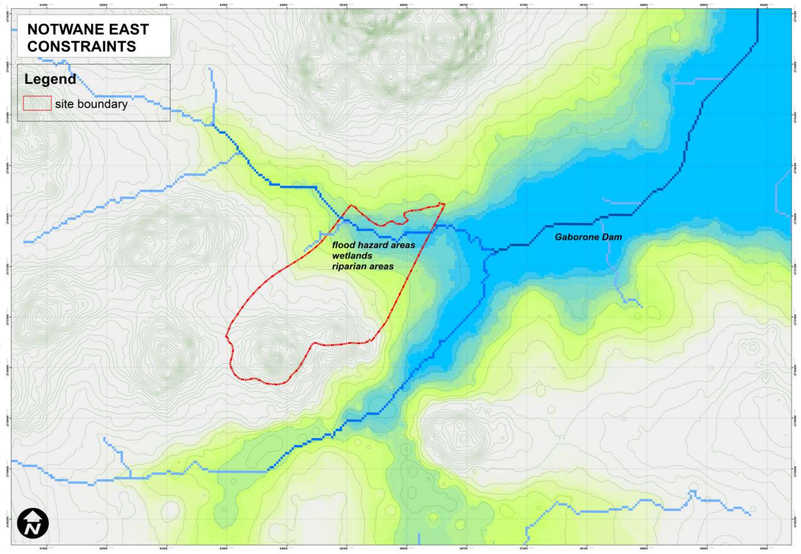
The steep elevations and slopes
on the site have significant implications for any potential development; Site Stability, drainage, vegetation, access etc. This demands thorough planning.



Background

The task was to design a fully functional and sustainable

Neighborhood in Notwane East .



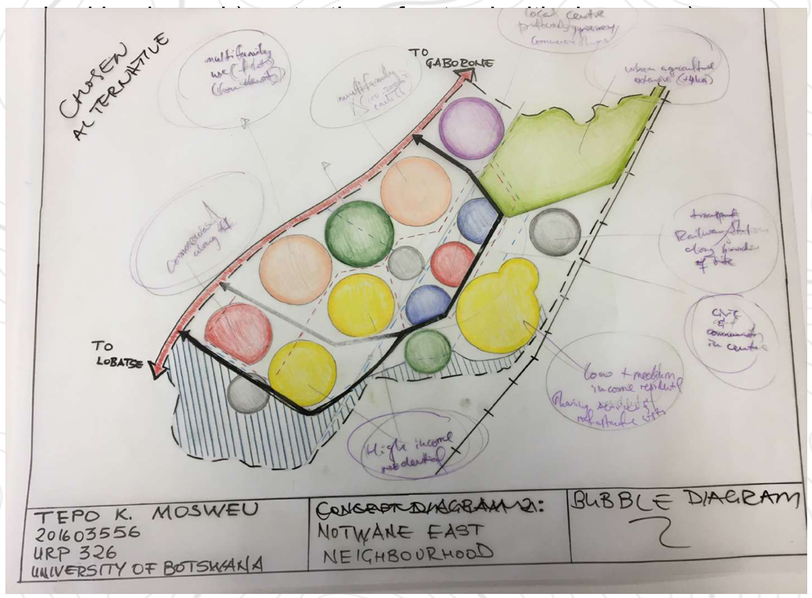
Vision Statement

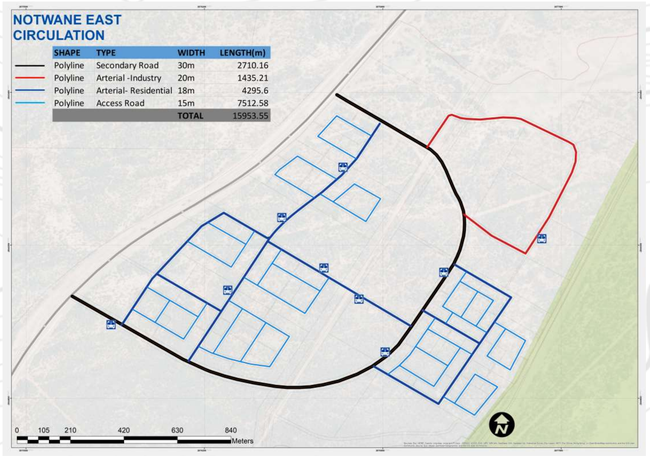
The overarching vision is to cultivate a cohesive neighborhood characterized by its compact design, preserving the ecological es-

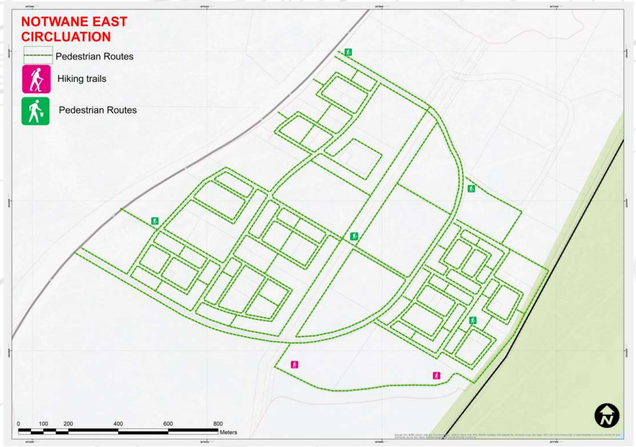
sence of the site, and nurturing sustainable urban development.

I adopted the smart growth concept in the conceptual stage to ad-

dress the natural environment with focus on the following: a)







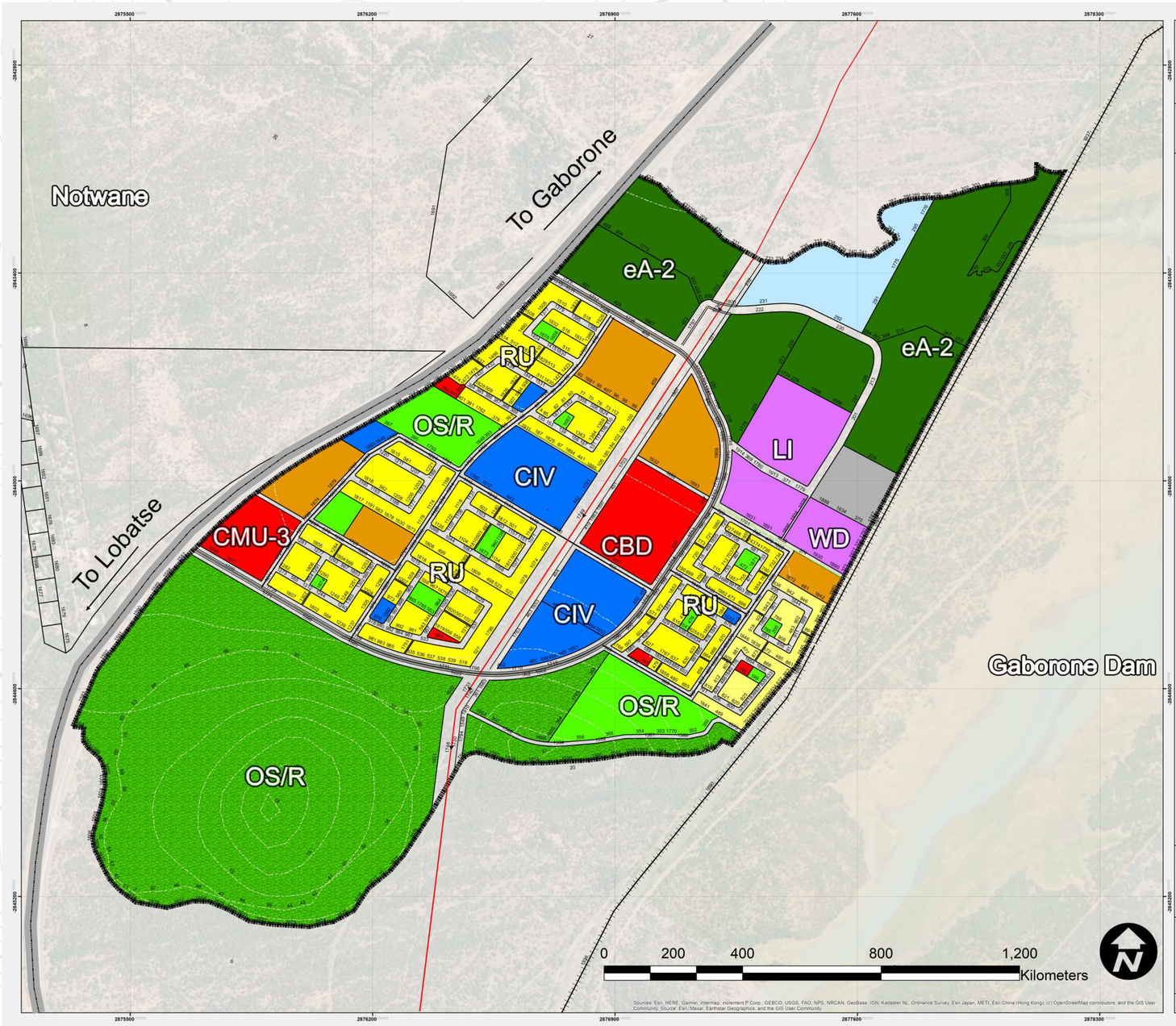
Emphasis on public transport

The site prioritizes public transport accessibility to reduce reliance on private cars. Integration with local transit services ensures convenient and sustainable transportation options for residents and visitors.

Well-designed footpaths and cycle routes traverse the site, promoting pedestrian and cyclist-friendly environments. These pathways connect key areas, fostering a walkable community and encouraging eco-friendly modes of transportation.

Quality Public Transport Routes:

Leveraging the existing railway line on the site's edge, plans include the establishment of a railway station. This initiative not only capitalizes on existing infrastructure but also enhances connectivity, offering a sustainable alternative for long-distance travel.



NOTWANE EAST GENERAL PLAN

Proposed Land Use Plan

Residential
- Low Density Res
- High Density Res
- Multi-Res

Public/Institutional
- Open Spaces
- Agro Land
- Forest Preservation
- Civic & Community
- Stormwater Retention Pond

Employment
- Commercial
- Industrial

Traffic and Transportation
- Train Station
- Existing Railway Track
- Roads

Site Boundary

Job: URP 322 Coursework	
Drawn by: Tepo Mosweu	Dated: 15/08/2021
Scale: 1 centimeter = 50,000 meters @ A1	

Design Guidelines

Conserve and integrate the natural environment with focus on the 2 hills , the 60m wide utility corridor and Gaborone Dam

Use of already existing utility corridor to add another utility function; storm water drainage to allow water to continually flow to the lower side of the site: North towards the proposed urban agricultural fields

Provide a mix of land uses for integrated activities that will foster a sense of community

Provide open spaces for leisure and community building and fosters good health in the urban community

Land uses and zones	Area Coverage (Ha)	Percentage
High income residential	47	19.67%
Middle and low income residential	12	5%
Mixed use residential	23	9.6%
Commercial	13.5	5.6%
Civic and community	16.1	6.7%
Parks and recreation	10.9	4.56%
Agriculture	34	14%
Industrial	10	4%
Transport	9.3	3.9%
Woodland preservation	59	24%
Roads, Buffers, hill coverage	13.5	2.97%
TOTAL	239	100%

Village regeneration - 3D Visualization

Type: Academic work

Location: Village, South East District, BW

Area: 0.0923km ^{2}

Tools Used: AutoCAD, ArcGIS, Sketchup, Photoshop, MS Publisher

Background

Situated in one of the earliest towns in the South East district of Botswana, this neighborhood has experienced a decline in its value over time. The regeneration project aims to revitalize and promote existing activities, breathing new life into the community. My role in this initiative involved producing 3D visuals of both existing conditions and proposed designs to enhance the site. The primary objectives include identifying underutilized spaces ("brown spaces") for additional activities, facilitating alternative modes of mobility, and showcasing the site's heritage, notably the old hangman's post. Integration with existing key features like the art center and commercial areas further contributes to the comprehensive rejuvenation of this historic neighborhood

Figure 3.0
Existing conditions

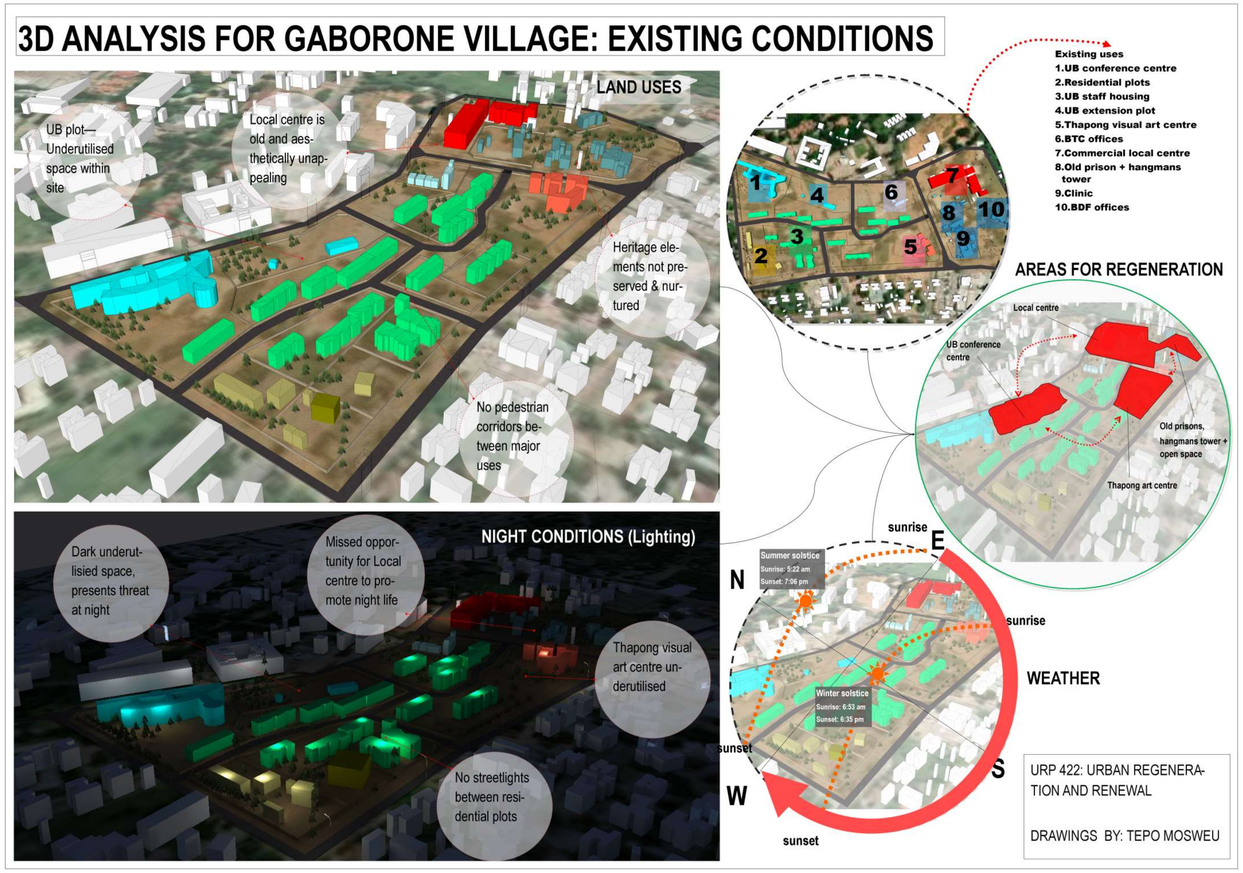
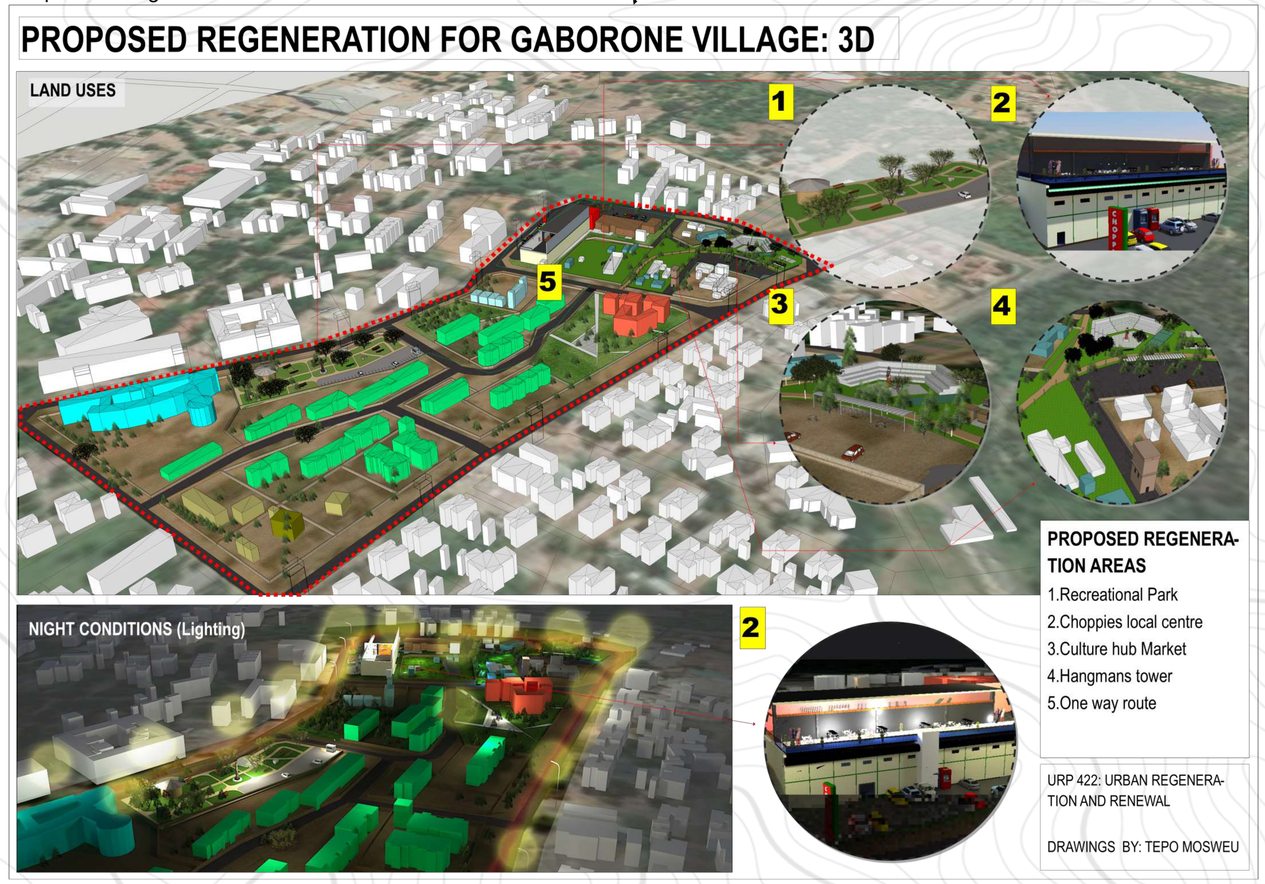


Figure 3.1
Proposed design



Utility mapping & site design

Type: Professional work

Location: Pilane, Kgatleng District, BW

Area: 2397m ^{2}

Tools used: AutoCAD, ArcGIS, Sketchup

Project Background

Mapping underground features (electricity lines, water pipes, septic tanks, and drainage) in a residential site is crucial for strategic project planning. Figure 4 aids in efficient contingency planning, reducing risks, and ensuring safety during development. In the absence of survey data, my firsthand observations inform this mapping, emphasizing a practical and experience-driven approach.

Figure 4.0
Utility Map

LOCATION MAPS NTS

SITE ELEVATION

Plot 3453
Utility map

SYMBOL LEGEND

- Contours
- Plot Boundary
- Powercable
- Waterpipe
- Sewage Pipe
- Sewage manholes
- Existing buildings

ABBREVIATIONS LEGEND

DOP	Depth of Cover
OHE	Overhead Powerline
UGE	Powercable
WL	Waterline

GENERAL NOTES:

This is not a survey document and should not be used as such. A detailed survey must be undertaken before any developments take place on this site

Client: [redacted]

Drawn by: Tepo Mosweu

Title: [redacted] Utility Map

Project No: 003

Date of issue: 20/02/2022

Coordinate System: WGS 1984 Complex UTM Zone 29N
Projection: Transverse Mercator Complex
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -9.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

DOMESTIC UTILITY SCHEDULE	F2	F3	F4	F5	F6
NAME	DEPTH	LENGTH	DIAMETER	MATERIAL	
Electricity	0.5m	253m	0.020m	Aluminium	
Water	1.0m	106m	0.1016m	Polyvinyl Chloride	
Sewage	0.8m	96m	0.1016m	Polyvinyl Chloride	PRIVATE

By providing a baseline understanding of the underground features such as electricity lines, water pipes, septic tanks, and drainage, the map offers key insights for the surveyors. This proactive approach becomes especially valuable as the building goes through further developments like the ones drafted in figure 4.1

Figure 4.1
Proposed extension

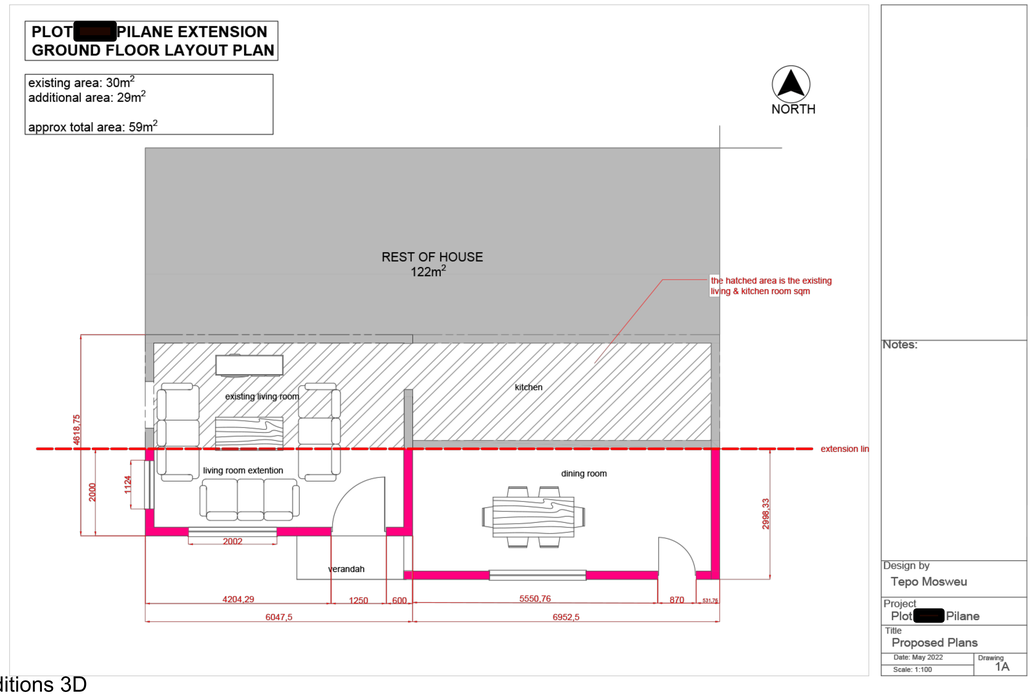


Figure 4.2
Existing conditions 3D

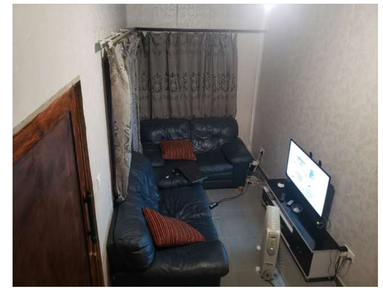


Figure 4.3
Image of existing conditions

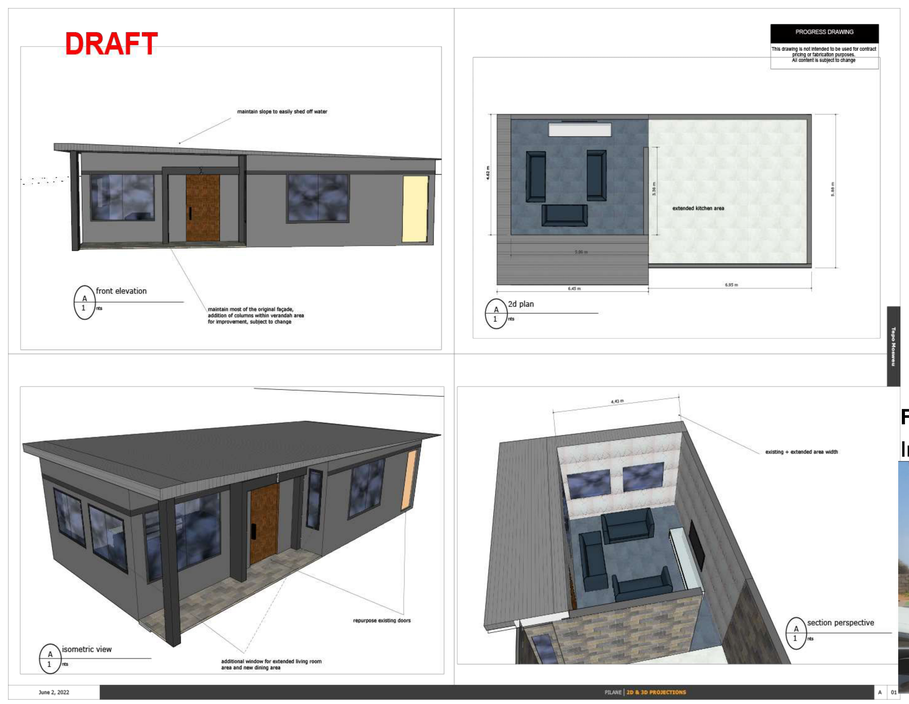


Figure 4.4
Proposed renders

Figure 4.5
Image after construction

New Development

Type: Professional work

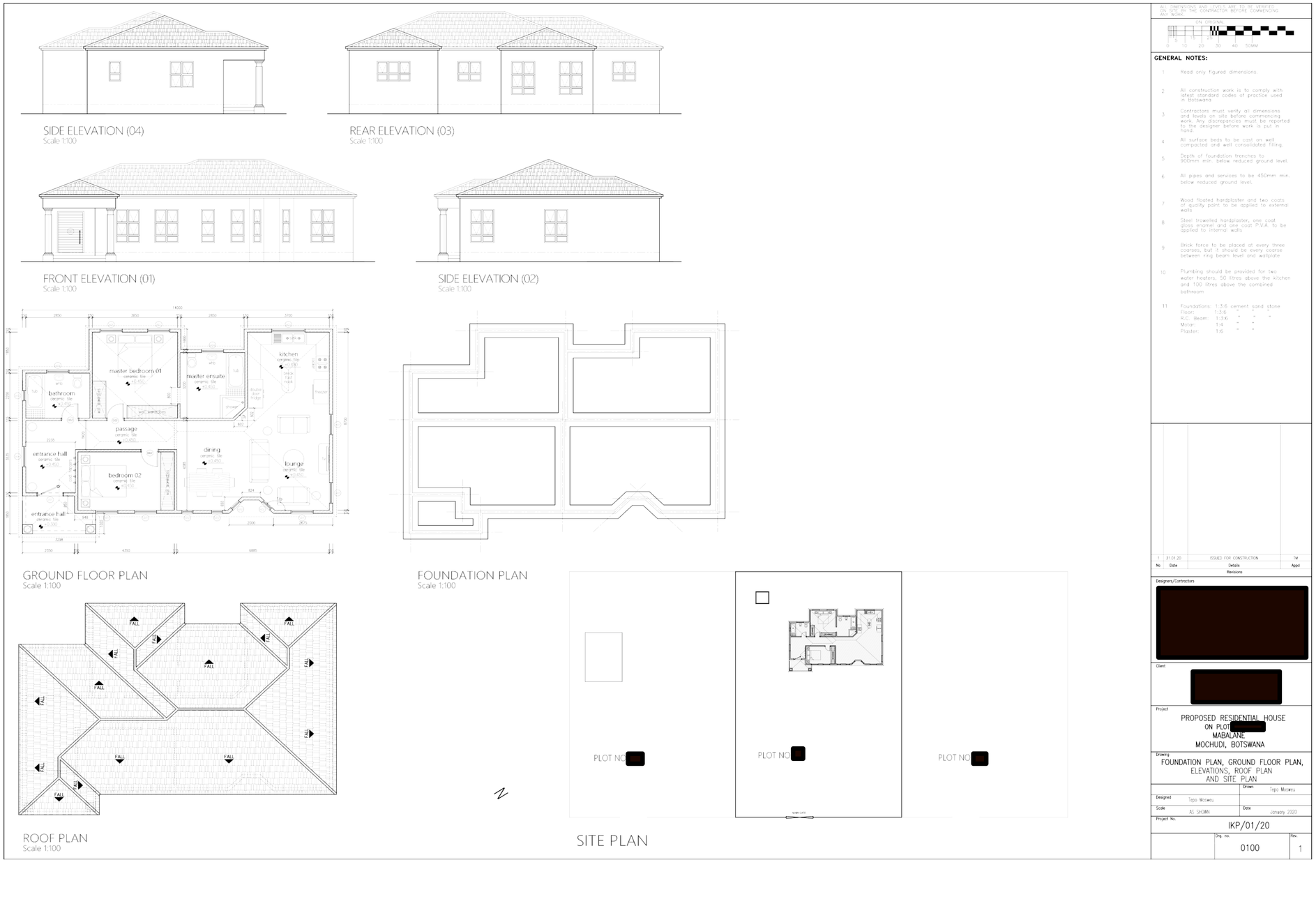
Location: Mabalane, Kgatleng District, BW

Area: 1000m^2

Tools used: AutoCAD, ArcGIS, Sketchup

Project Background

Provided technical drawings for a green site in Mabalane



Field Work

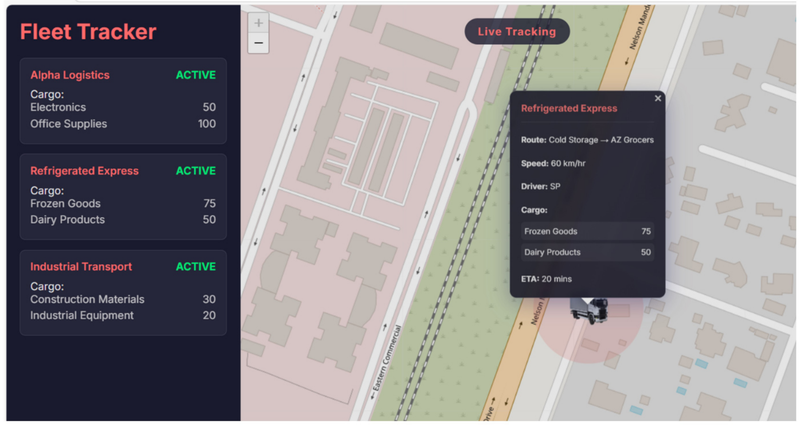
2022-2023

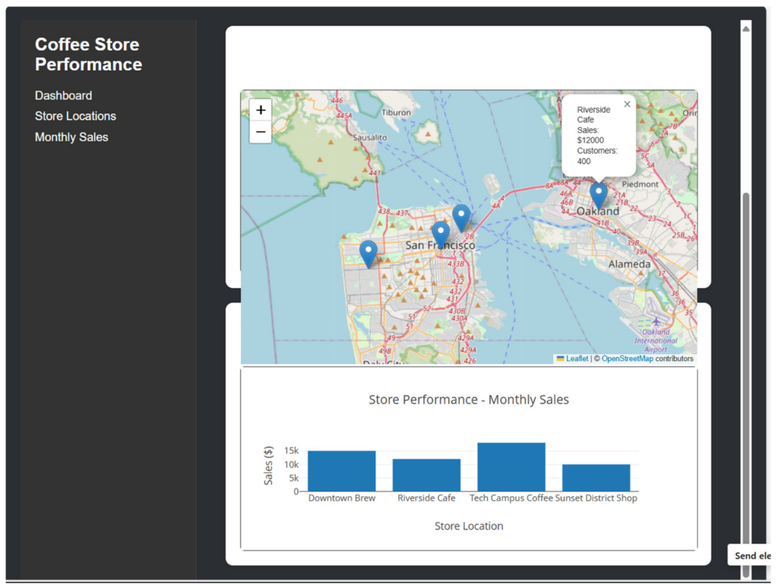
WEBMAPPING

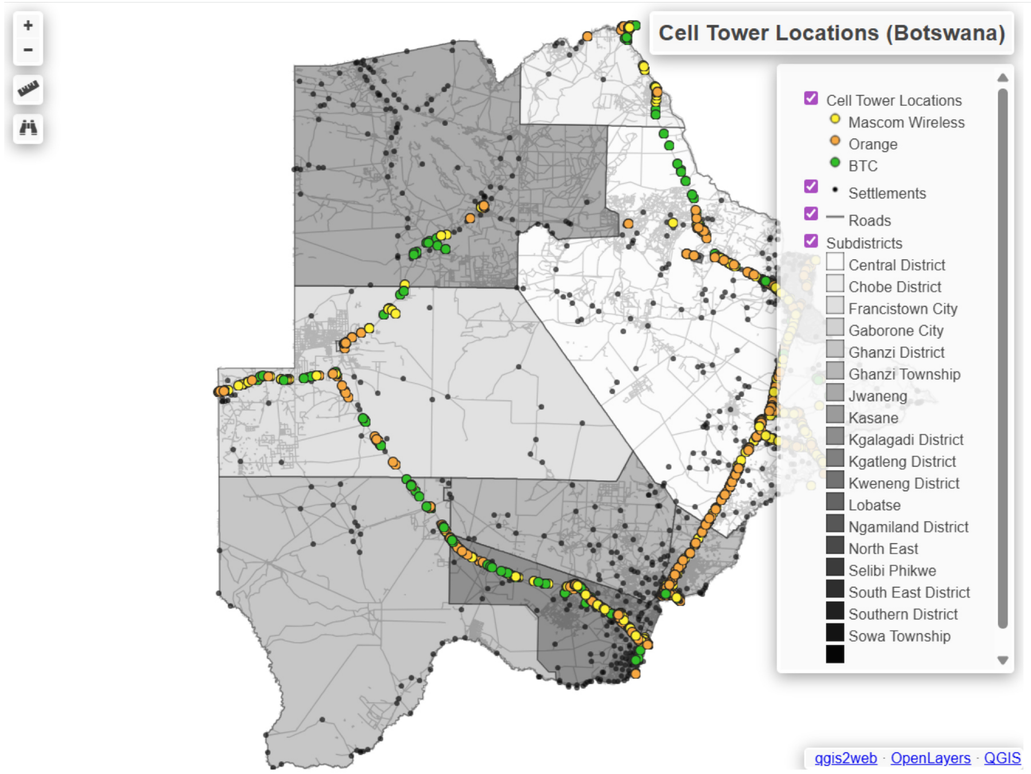
Harnessing the potential of interactive, real-time mapping tools to visualize complex data, uncover spatial trends, and provide actionable insights for informed, data-driven decision-making across industries.

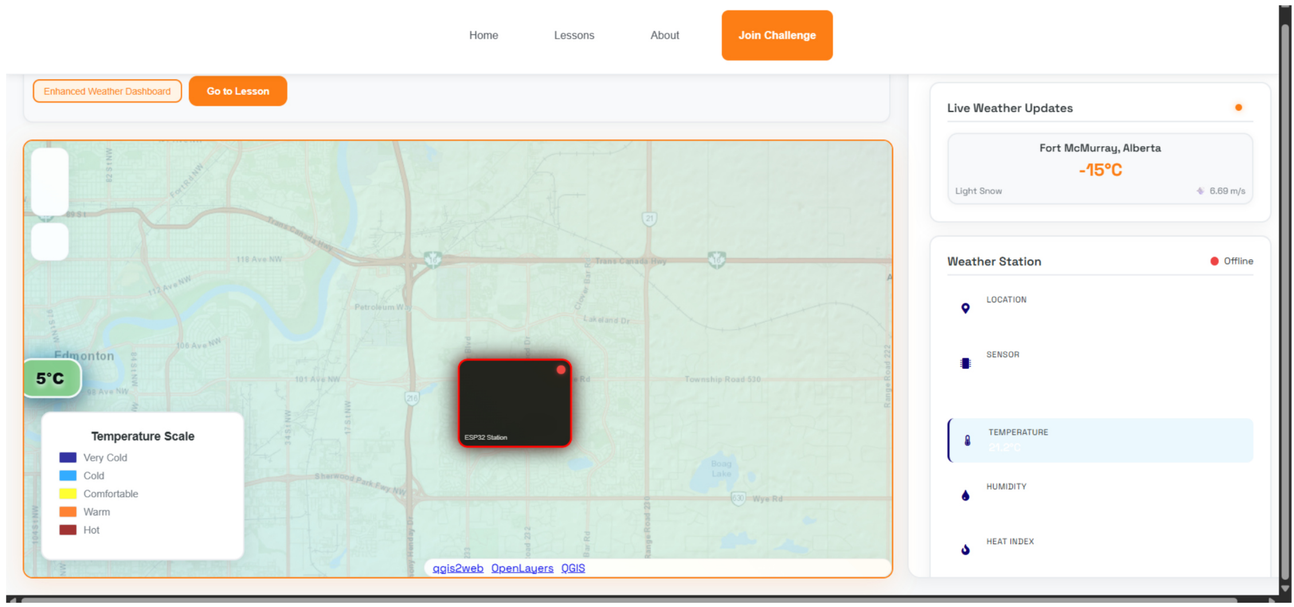
BRIEF STATEMENT

Web mapping transforms geographic data into interactive visualizations that enable real-time analysis and informed decision-making. By integrating GIS with online platforms, web maps like the live fleet tracking tool provide real-time monitoring of truck locations, while the franchise store dashboard visualizes performance across multiple sites. Both maps leverage geo-data for better trend forecasting, operational efficiency, and strategic planning, enhancing user experience and collaboration.









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