Project title: Land valuation in Abuja

Short description: Land valuation in Abuja is a solid starting point. It's high-value, in-demand, and plagued with pricing inconsistency and opacity, which means there’s clear value in solving it.

Aim: to start with digitizing land valuation in Abuja for an accurate, reliable and secure land valuation in Abuja and then proceed to asset valuation in Nigeria online

- Problems the app will be solving:

 No standardized pricing system for land.

 Buyers and financial institutions struggle to verify fair market value.

 Manual valuations are slow, inconsistent, and prone to manipulation.

 Lenders, investors, insurers, and buyers all want credible, fast appraisals.

**🎯 Target Market**

* Individuals buying or selling land.
* Real estate agents.
* Mortgage or microfinance banks.
* Government bodies (eventually).

🧩 Core MVP Features

| **Module** | **Key Features** |
| --- | --- |
| **User Account** | Basic auth (admin, evaluator, user) |
| **Land Entry Form** | Location, size, use (residential/commercial), coordinates, title status, nearby infrastructure, images |
| **Valuation Engine** | Rule-based first (price per sqm by location + adjustments), regression next |
| **PDF Report Generator** | Valuation summary with maps, metadata, timestamp, etc. |
| **Admin Panel** | Manage entries, override values, track submissions |
| **Data API (later)** | Access for banks or partners |

- Data Requirements

| **Data Type** | **Description** | **Source** |
| --- | --- | --- |
| **Land Prices** | Historical sale/asking prices | Agents, sites like PropertyPro.ng, Jiji, LandWey, etc. |
| **Location Data** | Coordinates, districts, amenities nearby | OpenStreetMap, Google Places API |
| **Title/Document Status** | C of O, R of O, Customary | Manual entry initially |
| **Zoning/Land Use** | Residential, Commercial, etc. | Abuja Geographic Information Systems (AGIS) |
| **Infrastructure** | Roads, schools, water, etc. | Map APIs, satellite imagery (Google, Mapbox) |

**🏗️ Phase 4: Suggested Tech Stack**

**Backend:**

* Django or FastAPI (Django is more plug-and-play for admin & auth)
* PostgreSQL + PostGIS (for geospatial data)
* Pandas/scikit-learn for modeling

**Frontend:**

* Jinja2 templates (simple MVP), or React if interactive UI is preferred
* Bootstrap/Tailwind for quick styling

**Other:**

* Report Generator: WeasyPrint / xhtml2pdf
* Mapping: Leaflet.js + OpenStreetMap (or Google Maps)

Goals and justifications for the use of ML in the system:

**1. Price Prediction (Core ML Use Case)**

**When**: After you have enough labeled data (actual sales or verified prices).

**How**:  
Train a regression model (e.g., Linear Regression, XGBoost, Random Forest) that predicts price based on:

* 📍 Location (geo-coordinates or district)
* 📐 Size (sqm)
* 🏛️ Title type (C of O, R of O, etc.)
* 🛣️ Access to infrastructure
* 🗺️ Land use/zoning (residential, commercial)
* 🌍 Proximity to landmarks (e.g., central business district, roads)

**Goal**: Automatically provide more accurate and data-driven valuations instead of fixed rules or heuristics.

**2. Anomaly Detection (Fraud/Abuse Prevention)**

**When**: Once users can submit or edit asset entries.

**How**:  
Use unsupervised ML (e.g., Isolation Forest, One-Class SVM) to detect suspicious entries like:

* Unusually high/low valuations for a region
* Data inconsistencies (area vs price vs title)

**Goal**: Flag entries that might be errors or fraud attempts.

**3. Image-Based Intelligence (Optional, Advanced)**

**When**: If you start supporting photo uploads for plots or land documents.

**How**:

* Use **OCR** to extract text from scanned titles.
* Use **image classification** to assess land type (undeveloped, fenced, built-up).

**Goal**: Automate metadata extraction or detect fake docs.

**4. Recommendation Engine (Add-on)**

**When**: If you grow into a platform with many listings.

**How**:

* Suggest areas or plots based on user interest or budget using collaborative filtering or content-based models.

**Goal**: Enhance UX, retain users longer.

**5. Natural Language Understanding (Search + Chat)**

**When**: If you add natural language search or a chatbot.

**How**:

* Use NLP (e.g., transformers or embedding models) to parse user queries like:

“What’s the average price for fenced land in Gwarinpa with CofO?”

**Goal**: Friendly, intelligent interface that understands context.