I have postgresql database named 'cf_db' the username is postgres and password is admin123

System Overview Designed by a specialist in Web Mapping and Community Forest Management, this system streamlines the digitization and analysis of community forest block data.

The interface should be clean. Now this application will be prepared in English language and Nepali language will be added later. FAST API will be used for the backend.

1. Authentication Module (already prepared everything if you see in "F:\CF_application"

Access: Secure login for registered users.

Onboarding: New users can register via a sign-up form.

Recovery: Automated password reset workflow for lost credentials.

2. Data Ingestion

Metadata: Post-login, the user inputs the **Community Forest Name**, which is stored and indexed for tabular retrieval.

Spatial Upload: The user uploads the forest boundary file (Polygon).

3. Geospatial Processing & Logic

Area Calculation (Backend): To ensure accuracy, area is always calculated using a metric projection.

If input is **SRID 4326 (WGS84)**: The system automatically reprojects the geometry to the appropriate UTM Zone (e.g., SRID 32644 or 32645) before calculating the area.

If input is **UTM (32644/32645)**: Area is calculated directly without reprojection.

Visualization (Frontend): Regardless of input projection, all geometries are transformed to **SRID 4326** for rendering on the web map interface.

System Logic Flow (For Backend Logic)

1. Data Ingestion

Supported Formats: ESRI Shapefile, KML, GeoJSON, GPKG.

Input Geometry: Accepts Point, LineString, or Polygon.

2. Geometric Processing (ETL)

Lines: Executed through a "Feature to Polygon" topology operation to construct closed boundaries.

Points: Utilized strictly for attribute assignment via **Spatial Join** (Point-in-Polygon) to label the underlying geometry.

Polygons: Accepted as-is. Support for both single-feature and multi-feature files.

(see the example in "F:\CF_application")

3. Block Naming Heuristics (Priority Order)

Case A: **Points provided:** Name is derived from the point spatially located within the polygon.

Case B: **Polygon attributes only:**

Primary: Column explicitly named "Name" (case-insensitive).

Secondary: First detected string/text data type column.

Fallback: Feature ID (FID) or Index.

Area Calculation: Vector vs Raster

Vector data is more accurate than raster for area calculation because it uses precise coordinate-based boundaries rather than pixel counting.

Raster pixel counting is less accurate—simply multiplying pixel size by count doesn't account for partial pixels at boundaries, especially on irregularly shaped features.

Best approach: Use the vector polygon's accurate area combined with raster pixel classification. Count pixels from each class within the polygon and calculate their proportions relative to the known vector area.

Error margin: The difference between raster-derived and vector polygon areas indicates accuracy level and whether methodology recalibration is needed.

Raster data calculation

Zonal statistics and calculations are performed using vector geometries against raster data from the ‘rasters’ schema. Results for each analysis are aggregated into a single output column (e.g., min, max, and mean elevation concatenated as "elevation_description"). A comprehensive metadata is available in its table comments for each raster dataset.

Primary Raster Analyses (rasters schema)

1. **dem**: Calculate minimum, maximum, and mean elevation.
2. **aspect**: Compute percentage area by aspect category; identify dominant aspect.
3. **slope**: Compute percentage area by slope class; identify dominant slope class.
4. **agb_2022_nepal**: Calculate above-ground biomass statistics.
5. **annual_mean_temperature**: Identify dominant temperature class.
6. **minimum_temperature**: Populate dominant minimum temperature.
7. **annual_precipitation**: Identify dominant precipitation class.
8. **canopy_height**: Classify into categories (0 m = non-forest; 1-5 m = bush/regenerated; 5-15 m = pole trees; >15 m = high forests); compute area percentages and dominant class.
9. **esa_world_cover**: Calculate area by landcover type; identify dominant class.
10. **forest_loss_fire**: Compute year-wise forest loss area; calculate total forest loss.

11. **forest_type**: Calculate area by forest type; identify dominant type.
12. **nepal_forest_health**: Compute area by health class; identify dominant class.
13. **nepal_gain**: Calculate total forest gain area.
14. **nepal_lossyear**: Compute year-wise forest loss and total loss; derive "other loss" as nepal_lossyear minus forest_loss_fire (attributable to development, disasters, erosion, or encroachment).
15. **hansen2000_classified**: Calculate area by class; identify dominant class.
16. **soilgrids_isric:** Calculate dominant values for all soil properties.

These following data are vector dataset (point, line and polygon) which all are in srid 4326.

Settlement, health facilities, poi, education facilities: These are the point data. These datasets are used to be displayed only within 1000 meters from uploaded polygon. The displaying field are from poi (name, name_en, amenity, addr_stree, addr_city whichever is available first), settlement (vil_name), health_facilities (hf_type, vdc_name1), education_facilities (name, name_en, amenity whichever are available)

district Headquarter: This dataset will be used to estimate for each direction (north, east, south, west) and distance from the uploaded polygon.

Earthquakes, geology: /these data will be used nearest earthquake point distance and direction and dominant geology if available.

Ridge, road, river_line, esa_forest_Boundary: road(name, name_en, highway, name_ne), river_line (river_name, features), esa_forest_Boundary (boundary of) will be used as forest extent N, E, S, W)

landcover_1984: This data will be used to intersect with uploaded polygon and produced categorical landuse of 1984.

vegetation_type: dominant vegetation zone and vegetation type will be calculated for the uploaded polygon

building: count of building within 1000-meter distance from the uploaded polygon.

Ward, municipality, province: These datasets will be used to define the address of polygon. Based on dominant area of the polygon covered in to this layer.

(note: A GPKG layer with forest block and derived data populated data will be available to download)

How will the table be prepared?

The data uploaded and analyzed or any activities by the user will be visible only for that user. The data generated will be able to be edited by the respective users. Super users may read and write the data generated by general users.

Map preparation guidelines:

1. The map size will be A5 and format png. The uploaded polygon will be zoom within the A5 layout.

2. The map layer will be:
    a. A general-purpose map that will show the extent with esa forest boundary,
    b. classified slope
    c. Classified Aspect
    d. Classified Canoy Height
    e. ESA land cover Map
    f. landcover_1984
    g. contour map (To determine the contour interval maximum height – minimum height 25 meter to 50meter i.)
    h. soil pH
    i. **nepal_lossyear, nepal_gain** map