**SOFTWARE REQUIREMENTS SPECIFICATION (SRS)**  
**“Harari City Development and Construction Plan Management System”**

## i. Declaration Sheet

I, the undersigned, certify that this Software Requirements Specification (SRS) document for the **Harari City Development and Construction Plan Management System** is the result of original work and represents the understanding of requirements for the system to be developed.

* **Project Title:** Harari City Development and Construction Plan Management System
* **Developers:**
  + Lead Analyst & Planner: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Backend Developer: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Frontend Developer: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Database Specialist: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Quality Assurance Engineer: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* **Advisor / Project Manager:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* **Date:** June 2025

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## CHAPTER ONE INTRODUCTION

### 1.1 Document Scope

This SRS document captures all functional and non-functional requirements for the **Harari City Development and Construction Plan Management System (HCDCPMS)**. It is organized so that stakeholders can find pertinent information in the following order:

* Chapter One presents the purpose, conventions, audience, and project team.
* Chapter Two describes the system’s context: scope, environment, users, constraints, and business rules (derived from the 2017 Harari City annual plan).
* Chapter Three details System Requirements, including functional behavior, use cases, data definitions, external interfaces, and non-functional requirements.  
  Readers are encouraged to start with Chapter One for an overview and proceed to sections relevant to their role (developers to Chapter Three; managers to Chapters Two and Three; testers to Chapter Three; documentation writers to Chapter One and Three).

### 1.2 Document Purpose

The purpose of this SRS is to define, in clear and unambiguous terms, what the **HCDCPMS** must do and how it must perform. It serves as:

* A contract between the stakeholders (Harari City Development & Construction Bureau leadership, Ministry of Urban Development & Construction, external auditors) and the development team.
* A guide for developers and QA engineers to design, implement, and test all system features.
* A reference document for future maintenance, enhancements, and auditing.

### 1.3 Document Conventions

The following conventions apply throughout this SRS:

* **Italicized text** indicates referenced documents or emphasized terms.
* **Bold text** denotes system names, module names, and key terms.
* **“Shall”** denotes a mandatory requirement; **“should”** denotes a recommendation; **“may”** denotes an optional feature.
* Acronyms are defined on first use and listed in Section v (Definitions, Abbreviations, and Acronyms).
* Numbering follows the outline precisely: Section 1.x in Chapter One, 2.x in Chapter Two, etc.

### 1.4 Intended Audience

* **Developers (Backend, Frontend, Database, QA):** To guide implementation, integration, and testing.
* **Project Manager / Advisor:** To ensure alignment with Harari Bureau strategic goals and timelines.
* **Ministry of Urban Development & Construction Representatives:** To review compliance with federal urban planning regulations.
* **Stakeholders (Bureau Leadership, Department Heads):** To confirm that the system meets functional needs (e.g., plan creation, monitoring, stakeholder collaboration).
* **Testers:** To prepare test cases for functional and non-functional requirements.
* **Documentation Writers:** To produce user manuals, technical documentation, and training materials once development is complete.

### 1.5 Team Organization

| **Role** | **Name** | **Responsibilities** |
| --- | --- | --- |
| Project Manager / Advisor | Prof. \_\_\_\_\_\_\_\_\_\_ | Oversees project scope, timeline, budget; approves deliverables. |
| Lead Analyst & Planner | \_\_\_\_\_\_\_\_\_\_ | Gathers detailed requirements, interfaces with Bureau leadership. |
| Backend Developer | \_\_\_\_\_\_\_\_\_\_ | Implements server-side logic, APIs, and database integration. |
| Frontend Developer | \_\_\_\_\_\_\_\_\_\_ | Designs and develops the user interface (web) for plan management. |
| Database Specialist | \_\_\_\_\_\_\_\_\_\_ | Designs database schema; implements data validation and integrity. |
| Quality Assurance Engineer | \_\_\_\_\_\_\_\_\_\_ | Defines test plans, executes functional/non-functional tests. |
| UI/UX Designer (Optional) | \_\_\_\_\_\_\_\_\_\_ | Creates wireframes, prototypes, and ensures usability standards. |

## CHAPTER TWO SYSTEM DESCRIPTION

### 2.1 System Overview

The **Harari City Development and Construction Plan Management System (HCDCPMS)** is a web-based application designed to digitize, streamline, and monitor the annual planning cycle of the **Harari City Development & Construction Bureau**. It replaces the previous manual (paper) process by providing:

1. **Plan Authoring & Version Control:** A module to create and revise the annual plan, drawing on policy documents (e.g., Proclamation No. 101/2003 and No. 104/2004 E.C.), the 10-year Master Development Plan, and performance evaluations from the previous fiscal year.
2. **Stakeholder Collaboration:** Secure channels for internal staff (e.g., planners, sector coordinators) and external bodies (e.g., Ministry of Urban Development & Construction, Finance & Investment Bureau, Regional Council) to review, comment, and approve sections of the plan.
3. **Resource & Budget Allocation Tracking:** Tools to assign budget lines to sub-sectors (e.g., Water Supply, Solid Waste, Traffic Infrastructure), label funding sources, and track expenditures versus plan projections.
4. **Project Performance Monitoring & Evaluation:** Automated scheduling of quarterly, semi-annual, and annual progress reviews; interactive dashboards showing time-bound milestones (quantity, budget utilization, completion percentage); report generation for decision-makers.
5. **Land Registry Integration:** Interfaces with the regional Land Registry Office to fetch and update parcel ownership data, ensuring that plan sections related to land allocation (e.g., “Confirming land ownership and registry system”) are always current.
6. **Multi-sector Dashboard:** Consolidated view of all sub-sectors (Housing, Urban Traffic, Environmental Protection, Farmer Support) with indicators for key performance metrics.
7. **Reporting & Archiving:** Generation of PDF or Word reports for each milestone, archiving historical plans, and allowing auditors to retrieve past fiscal year documents.

Overall workflow:

1. **Login & Role Assignment:** Each user logs in; role-based access (Planner, Coordinator, Evaluator, Viewer).
2. **Plan Drafting:** Lead Planner drafts the top-level plan; sector coordinators fill sector-specific subsections (e.g., Land Use, Housing, Infrastructure).
3. **Internal Review & Approval:** Bureau Management Committee reviews the draft; revisions are logged.
4. **External Consultation:** Stakeholders (e.g., Ministry, Regional Council) review and comment; comments are tracked and resolved in iterations.
5. **Final Approval & Publication:** Once approved, the annual plan is “locked” and published to all users; system notifies sector leads that implementation can begin.
6. **Implementation Monitoring:** Throughout the budget year, sector leads update progress; M&E Officers run periodic evaluations and generate reports.

### 2.2 System Scope

The **HCDCPMS** supports all activities related to:

* **Annual Plan Creation & Revision** (Policies, Strategies, Ten-Year Master Plan alignment).
* **Budget & Resource Assignment** (By sector/sub-sector).
* **Stakeholder Communication & Approval Workflow** (Internal: Bureau Management Committee; External: Ministry, Finance Bureau, Regional Council).
* **Performance Monitoring & Evaluation** (Time, budget, quantity tracking; Quarterly/Semi-annual/Annual reports).
* **Data Integration** (Land Registry, existing regional financial systems).
* **Reporting & Archiving** (PDF/Word exports, historical retrieval).

### 2.3 User Classes and Characteristics

| **User Class** | **Description & Characteristics** | **Needs/Expectations** | **Access Rights** |
| --- | --- | --- | --- |
| **System Administrator** | IT staff who configure server environment, manage user accounts, and maintain backups. | High technical skill; needs full system control, logs. | Create/Delete users; configure roles; system settings. |
| **Lead Planning Officer** | Senior planner responsible for drafting top-level plan, aligning with policies (Proclamation 101/2003, 104/2004 E.C.). | Needs an interface to author and revise plan sections; review aggregated inputs. | Full create/edit/delete access for plan document. |
| **Sector Coordinator** | Subject-matter expert for sub-sector (e.g., Water Supply, Traffic Infrastructure). Manages sector-specific content. | Needs form-based editing, data import, and budget assignment features. | Create/edit sector subsections; view other sectors in read-only. |
| **M&E Officer** | Monitors performance, runs evaluations, schedules milestones, and generates progress reports. | Needs dashboards, KPI inputs, report-generation tools, data export. | Access to evaluation module; read/write progress data. |
| **Bureau Management Committee Member** | Decision-makers who review, comment, and approve drafts. May not be technically oriented. | Needs a simple review interface (annotate, comment), approval workflows, summary dashboards. | Read/write/comment on plan drafts; approve/reject workflows. |
| **External Stakeholder** | Ministry of Urban Development reps, Finance Bureau, Regional Council members. Review compliance, budgets, and policies. | Needs secure read-only views of relevant modules; annotation/comment tools. | Read-only to approved sections; comment-only access. |
| **Guest / Public Viewer** | Citizens or other bureaus who need limited visibility of finalized plans (after approval). | Needs PDF/Word download of approved plan; basic search functionality. | Read-only on published/exported content. |

### 2.4 Business Rules

The following business rules govern how the system operates, derived from the Harari City Plan document:

| **Rule ID** | **Description** | **Impacted Requirements** |
| --- | --- | --- |
| BR-01 | The system shall enforce compliance with Proclamation No. 101/2003 and Proclamation No. 104/2004 E.C. when creating organizational charts, responsibilities, and authorities. | All plan drafting modules must display current legal framework. |
| BR-02 | Any plan revisions after M&E Officer approval shall require a second-level approval by the Bureau Management Committee. | Draft-approval workflows (3.2.x). |
| BR-03 | Quarterly, Semi-annual, and Annual evaluation reports must be submitted to the Finance & Investment Bureau and Regional Council within 15 calendar days after period end. | Automated scheduling, reminders, and reporting deadlines (3.1.x). |
| BR-04 | All land-related plan modules must fetch and store data in the regional Land Registry in real time (per “Confirming Harar City’s land registry” section). | Data Integration (3.4.2); Land Registry API design. |
| BR-05 | User roles must adhere to least privilege principle; only Administrators can create roles and assign permissions; sector coordinators can only modify their assigned sector. | Authentication & Authorization requirements (3.5.3). |
| BR-06 | Any changes to budget allocations must trigger an approval workflow that includes both the Lead Planning Officer and Finance Officer from the Finance & Investment Bureau. | Budget change events (3.1.4, 3.1.5). |

### 2.5 Operating Environment

* **Client-Side (Frontend):**
  + Modern web browsers (Chrome, Firefox, Edge) on Windows 10+, macOS 10.15+, Ubuntu 20.04+.
  + Responsive design to support tablets (iPad OS, Android 8+).
  + Screen resolution recommendations: 1280×800 or higher.
* **Server-Side (Backend):**
  + Linux Server (Ubuntu 22.04 LTS).
  + Web application server (e.g., Node.js 18+ or ASP.NET 6).
  + Database server: PostgreSQL 14 or Microsoft SQL Server 2019.
  + Land Registry API endpoint (HTTPS REST) hosted by Harari Regional Land Registry Office.
  + Integration with existing Regional ERP (for budget/expenditure data) via SOAP or REST endpoints.
* **Development Environment:**
  + Version control: Git (hosted on internal GitLab).
  + CI/CD pipeline: Jenkins or GitLab CI.
  + Issue tracking: Jira or Azure DevOps.
  + Development IDEs: Visual Studio Code (JavaScript/TypeScript) or Visual Studio (C#/ASP.NET).
* **Security Environment:**
  + TLS 1.2+ for all client-server communications.
  + Database encrypted at rest.
  + Firewall rules per bureau network policy.
  + Regular vulnerability scans (monthly).

### 2.6 Design and Implementation Constraints

* **Regulatory Compliance:** Must implement and display data fields (e.g., organizational structures, authorities) exactly as specified in Proclamation 101/2003 and 104/2004 E.C.
* **Land Registry Integration:** The system must consume the Land Registry Office’s proprietary REST API (HTTPS, JSON). Changes in that API’s schema will require updates in our data integration module.
* **Language Support:** All user interfaces must support both **Amharic** (UTF-8) and **English**. Text resources (menus, labels, messages) should be externalized in resource files for easy localization.
* **Budgetary Data Integration:** Must integrate with the existing Regional ERP’s financial modules. That ERP only allows daily batch transfers (CSV) for budget vs. expenditure data—real-time sync is not possible.
* **Network Constraints:** Some users in remote bureau offices connect via low-bandwidth links (< 1 Mbps). Pages and API calls must be optimized for minimal payload (< 100 KB per request where feasible).
* **Hardware Limitations:** The server hardware provided by the Bureau is limited to 8 vCPUs, 16 GB RAM, and 1 TB SSD. All components (database, web server, application server) must co-exist within these constraints.
* **Authentication Standard:** The bureau network uses LDAP for user authentication; the system must integrate via LDAP (no separate user store).

### 2.7 Assumptions and Dependencies

* **Reliability of External Services:** Assumes the Harari Land Registry API and Regional ERP services are up at least 99.5% of the time; any downtime will delay land data or financial data synchronization.
* **User Access & Training:** Users will have basic computer literacy; the bureau will provide initial training sessions on the new system.
* **Third-Party Components:**
  + **Web Framework:** If Node.js is selected, we assume the availability of stable frameworks (e.g., Express, NestJS) with long-term support.
  + **Database Drivers:** Official PostgreSQL drivers are available and maintained.
  + **OCR Library (Optional):** If existing plan documents must be digitized (scanned PDFs), the bureau will procure an OCR tool (e.g., Tesseract).
* **Policy Changes:** The system assumes that no major changes to urban planning regulations (e.g., a new Proclamation affecting organizational structure) occur during the first two years of operation. If they do, a change request will be submitted to update the SRS.

## CHAPTER THREE SYSTEM REQUIREMENTS

### 3.1 Functional Requirements

The following functional requirements are grouped by feature name. Each requirement uses “The system shall…” phrasing.

#### A. User Authentication & Authorization

* **FR 3.1.1 User Login:**  
  The system shall allow authorized users to log in using their LDAP credentials.
  + **Rationale:** Secures access to plan data and ensures single sign-on (SSO) compliance.
  + **Stimulus/Response:** When the user submits username/password, the system validates against LDAP; on success, user sees the dashboard; on failure, displays an error message (“Invalid credentials”).
  + **Preconditions:** User must have an existing LDAP account with assigned system role.
  + **Postconditions:** The user obtains a session token (expires after 30 minutes of inactivity).
* **FR 3.1.2 Role Assignment & Privileges:**  
  The system shall assign one of the following roles on first login: System Administrator, Lead Planning Officer, Sector Coordinator, M&E Officer, Bureau Management Committee Member, External Stakeholder, or Guest.
  + **Rationale:** Enforces least privilege.
  + **Stimulus/Response:** On login, the system queries LDAP group membership and maps to internal role definitions.

#### B. Plan Authoring & Version Control

* **FR 3.1.3 Create New Annual Plan:**  
  The system shall allow the Lead Planning Officer to create a new plan document for a specified fiscal year (e.g., Hamle 2016 E.C. / 2017 budget year).
  + **Rationale:** Foundation for all other modules.
  + **Stimulus/Response:** When the user clicks “Create New Plan,” a blank template (based on last year’s structure) appears; the user fills in required fields (Policies, Strategies, Budget Summaries).
  + **Postconditions:** A plan record is created with status “Draft.”
* **FR 3.1.4 Edit Plan Sections:**  
  The system shall allow the Lead Planning Officer and Sector Coordinators to edit their assigned sections (e.g., Land Use, Housing, Traffic, Water Supply) with a rich-text editor supporting Amharic/English.
  + **Rationale:** Enables multi-sector input.
  + **Stimulus/Response:** When a Sector Coordinator opens “Traffic Infrastructure” section, they see existing content; on “Save,” the system records a new revision with timestamp and author.
* **FR 3.1.5 Version History & Rollback:**  
  The system shall maintain a version history of all plan revisions, including timestamp, author, and change summary. The system shall allow authorized users to roll back to any previous version.
  + **Rationale:** Prevents loss of data and supports audit trails.

#### C. Stakeholder Collaboration & Approval Workflow

* **FR 3.1.6 Share Draft with Internal Reviewers:**  
  The system shall allow the Lead Planning Officer to route the draft plan to the Bureau Management Committee for internal review.
  + **Rationale:** Aligns with “discussions with concerned stakeholders.”
  + **Stimulus/Response:** Upon clicking “Send for Internal Review,” system notifies committee members (via email), and changes plan status to “Internal Review.”
* **FR 3.1.7 Comment & Annotate:**  
  The system shall enable reviewers (internal or external) to leave comments, annotations, and suggested edits on specific paragraphs or sections.
  + **Rationale:** Facilitates transparent feedback.
* **FR 3.1.8 Approve/Reject Workflow:**  
  The system shall enforce the following approval sequence:
  + **Internal Approval:** Bureau Management Committee must approve or reject the draft.
  + **External Consultation:** If approved internally, the plan is shared with Ministry of Urban Development (MoUD) and Finance & Investment Bureau for external review.
  + **Final Approval:** After external comments are resolved, the Bureau Management Committee issues final sign-off.
  + **Rationale:** Matches business rule BR-02.

#### D. Budget & Resource Allocation Tracking

* **FR 3.1.9 Define Budget Lines:**  
  The system shall allow Sector Coordinators to assign budget amounts to sub-sector activities (e.g., “Solid Waste Management – Collection Equipment: 500,000 ETB”).
  + **Rationale:** Enables transparent budget planning per sector.
* **FR 3.1.10 Integrate with Regional ERP (Batch Sync):**  
  The system shall pull daily CSV files from the Regional ERP to update actual expenditures against each budget line.
  + **Stimulus/Response:** At midnight UTC+3 daily, the system parses “expenses\_YYYYMMDD.csv” from a secure FTP server and updates expenditure fields; discrepancies trigger alerts.
  + **Rationale:** Ensures up-to-date budget vs. actual tracking.
  + **Postconditions:** Budget utilization percentage is recalculated.
* **FR 3.1.11 Trigger Re-Approval on Budget Changes:**  
  The system shall require Lead Planning Officer and Finance Officer joint approval whenever any sector coordinator requests a budget increase or reallocation exceeding 10% of the original line item.
  + **Rationale:** Ensures financial oversight (BR-06).

#### E. Performance Monitoring & Evaluation

* **FR 3.1.12 Define Milestones & KPIs:**  
  The system shall permit M&E Officers to define quarterly, semi-annual, and annual milestones, including quantitative targets (e.g., “Water supply coverage to reach 75% of households by Q2,” “Construct 500 m² of new roads by Q3”).
  + **Rationale:** Directly implements “Based on set objectives of the plan…”
* **FR 3.1.13 Data Entry for Progress Updates:**  
  Sector Coordinators shall enter progress data against each milestone (e.g., actual meters of road built, actual budget spent).
  + **Stimulus/Response:** When the coordinator enters “350 m² constructed” under “Q2 Infrastructure Outcome,” the system updates percent-complete.
* **FR 3.1.14 Generate Evaluation Reports:**  
  The system shall automatically generate PDF/Word reports at the end of each period (quarter, semi-annual, annual) summarizing actual vs. planned metrics, with charts for time, budget, and quantity dimensions.
  + **Rationale:** Aligns with “Quarterly, Semi-annual, and Annual detailed plan implementation follow-up” (BR-03).

#### F. Land Registry Integration

* **FR 3.1.15 Fetch Land Parcel Data:**  
  The system shall fetch land parcel information in real time from the Harari Land Registry Office’s REST API whenever a plan section references “land allocation” or “ownership.”
  + **Rationale:** Ensures consistency with official records.
* **FR 3.1.16 Update Land Status:**  
  When the Bureau’s land-use decisions are approved, the system shall send updates (parcel ID, new status, date) back to the Land Registry API.
  + **Stimulus/Response:** On final approval of land allocation for “New Housing Project,” system issues HTTPS POST to Land Registry endpoint /api/harari/parcels/{parcelId}/status.

#### G. Reporting & Archiving

* **FR 3.1.17 Export Final Plan:**  
  Upon final approval, the system shall permit authorized users to export the complete plan as a DOCX or PDF that matches the bureau’s formatting guidelines (headers, footers, page numbering in Amharic/English).
  + **Rationale:** Provides a publishable version for public distribution.
* **FR 3.1.18 Archive Historical Plans:**  
  The system shall store all finalized plan documents (with version metadata) for retrieval. Users with “Guest” or “External Stakeholder” roles can view or download previously approved plans but cannot modify them.
  + **Rationale:** Fulfills “archiving” requirement.

### 3.2 Use Cases

#### 3.2.1 Use Case Diagram

(A high-level UML use case diagram should be provided here. It would illustrate actors such as Lead Planning Officer, Sector Coordinator, M&E Officer, Bureau Management Committee, External Stakeholder, and the system, with use cases like Create Plan, Edit Section, Route for Approval, Provide Comments, Pull Land Data, Generate Report.)

#### 3.2.2 Use Case Descriptions

##### Use Case UC-01: User Login

* **Actor(s):** System Administrator, Lead Planning Officer, Sector Coordinator, M&E Officer, Bureau Management Committee Member, External Stakeholder, Guest
* **Description:** Authenticates user via LDAP and assigns system role.
* **Preconditions:** Actor must have valid LDAP credentials.
* **Postconditions:** User is logged in and redirected to role-specific dashboard.
* **Main Flow:**
  1. User navigates to login page.
  2. System prompts for username/password.
  3. User submits credentials.
  4. System queries LDAP; if valid, retrieves group membership.
  5. System maps user to internal role and initializes session.
  6. System redirects user to dashboard.
  7. **Alternate Flow (Invalid Credentials):** Steps 1–3; if LDAP rejects credentials, system displays “Invalid Credentials” and allows retry.

##### Use Case UC-02: Create New Annual Plan

* **Actor:** Lead Planning Officer
* **Description:** Creates a blank plan template for a specified fiscal year.
* **Preconditions:** User must be authenticated with role “Lead Planning Officer.”
* **Postconditions:** A new plan record with status “Draft” is created; initial template is populated (pulled from last year’s structure).
* **Main Flow:**
  1. User clicks “Create New Plan.”
  2. System prompts for fiscal year (e.g., 2017) and confirms.
  3. System generates a blank plan template populated with previous year’s headers, section placeholders, and policy references (Proclamation 101/2003, 104/2004 E.C.).
  4. System saves the plan in “Draft” status and displays “Plan created successfully.”

##### Use Case UC-03: Edit Plan Section

* **Actor:** Sector Coordinator
* **Description:** Edits a specific sub-sector section (e.g., “Water Supply,” “Traffic Infrastructure”) using a rich-text editor.
* **Preconditions:** User is logged in with role “Sector Coordinator” and assigned to at least one sector.
* **Postconditions:** Edits are saved as a new version in the plan’s version history.
* **Main Flow:**
  1. User selects “Annual Plans → [Year] → Edit → [Assigned Section].”
  2. System displays the current content in a rich-text editor (Amharic/English).
  3. User makes changes (text, tables, images).
  4. User clicks “Save.”
  5. System validates input (e.g., budget figures numeric, required fields completed).
  6. System stores a new revision entry: timestamp, author, change summary.
  7. System displays “Section saved. Version n of [Section] created.”
  8. **Alternate Flow (Validation Failure):** If input validation fails (e.g., budget not numeric), system highlights errors and prompts user to correct them.

##### Use Case UC-04: Route Plan for Internal Review

* **Actor:** Lead Planning Officer
* **Description:** Sends draft plan to Bureau Management Committee for review and approval.
* **Preconditions:** Plan status is “Draft,” and all mandatory sections (Policies, Budget Summary, etc.) are filled.
* **Postconditions:** Plan status changes to “Internal Review”; committee members receive notifications.
* **Main Flow:**
  1. Lead Planning Officer clicks “Route for Internal Review.”
  2. System checks that all required fields are filled; if any missing, notifies user to complete them.
  3. System updates plan status to “Internal Review.”
  4. System sends email notifications (with plan link) to all users with role “Bureau Management Committee Member.”
  5. System logs routing event (timestamp, actor).
  6. System displays “Plan successfully routed for internal review.”

##### Use Case UC-05: Provide Comments on Plan

* **Actor:** Reviewer (Internal or External)
* **Description:** Reviews plan sections, leaves comments/annotations.
* **Preconditions:** Reviewer has been granted “comment” permission on the plan. Plan status is either “Internal Review” or “External Review.”
* **Postconditions:** Comments are stored and linked to the specific text segment; plan owner sees aggregated comments.
* **Main Flow:**
  1. Reviewer opens plan sections in “Review Mode.”
  2. Reviewer highlights text and clicks “Add Comment.”
  3. System opens a comment box; reviewer types comment and clicks “Submit.”
  4. System attaches comment to the highlighted text, saves reviewer name, timestamp.
  5. System notifies the Lead Planning Officer (or sector coordinator) of new comments.

##### Use Case UC-06: Approve or Reject Plan

* **Actor:** Bureau Management Committee Member or External Stakeholder (depending on stage)
* **Description:** Approves or rejects the current plan draft.
* **Preconditions:** User is a member of the current approver group; plan is in the correct review status (Internal or External).
* **Postconditions:** Plan status changes to next stage (e.g., “External Review” or “Published”) or back to “Draft” with feedback.
* **Main Flow:**
  1. Approver opens plan in “Approval Mode.”
  2. Approver clicks “Approve” or “Reject.”
  3. If “Approve,” system logs approval (actor, date) and:
  4. If current status was “Internal Review,” updates to “External Review.”
  5. If current status was “External Review,” updates to “Published.”
  6. If “Reject,” system prompts for rejection comments.
  7. System logs rejection, stores comments, changes status to “Draft,” alerts Lead Planning Officer.
  8. System notifies relevant parties depending on next step (e.g., if moving to External Review, notifies MoUD reviewers).

##### Use Case UC-07: Define Milestones & KPIs

* **Actor:** M&E Officer
* **Description:** Creates or adjusts milestone records for each sector with target metrics.
* **Preconditions:** Plan status is “Published”; M&E Officer has “write” access to the M&E module.
* **Postconditions:** Milestone records are created with unique IDs, attached to plan sections.
* **Main Flow:**
  1. M&E Officer navigates to “Performance Monitoring → [Year] → Define Milestones.”
  2. System displays a form to create a new milestone (fields: Sector, Milestone Title, Target Value, Time Period, Budget Allocation).
  3. M&E Officer fills form and clicks “Save.”
  4. System validates inputs (e.g., numeric targets, valid dates).
  5. System stores milestone; displays “Milestone created: [ID].”

##### Use Case UC-08: Enter Progress Data & Generate Reports

* **Actor:** Sector Coordinator, M&E Officer
* **Description:** Sector Coordinator provides periodic progress updates; M&E Officer generates a consolidated report.
* **Preconditions:** Milestones must exist; user must have “data entry” role.
* **Postconditions:** Progress data is stored, updated KPIs recalc’d; report PDF is generated.
* **Main Flow (Data Entry):**
  1. Sector Coordinator goes to “Performance Monitoring → [Year] → Milestones → [Sector].”
  2. System lists all milestones for the sector with current “Target vs. Actual” fields.
  3. Coordinator updates “Actual Value,” “Budget Used,” and clicks “Submit.”
  4. System validates (e.g., actual ≤ target? budget ≤ allocated?); if valid, stores record.
  5. System recalculates percent-complete and updates dashboard.
* **Main Flow (Report Generation):**
  1. M&E Officer clicks “Generate Quarterly Report.”
  2. System compiles all stored progress data for the quarter, creates charts (Time vs. Percentage, Budget vs. Expenditure), and embeds them into a PDF template.
  3. System saves “Report\_Q[1–4]\_[Year].pdf” to the archive and sends a notification email to the Bureau Management Committee and Finance Officer.

##### Use Case UC-09: Fetch & Update Land Parcel Data

* **Actor:** System (automated), Land Registry Office
* **Description:** The system interacts with the Land Registry API to fetch parcel data when a plan section referencing land is opened; updates status when land allocation changes.
* **Preconditions:** Land Registry API credentials must be configured; network connectivity must be live.
* **Postconditions:** Local copy of parcel data is updated; status changes (e.g., “Allocated”) are pushed to the registry.
* **Main Flow (Fetch):**
  1. User opens plan section “Land Allocation.”
  2. System issues GET request to Land Registry endpoint /api/harari/parcels?region=Harar.
  3. Land Registry returns JSON array of parcel records (ID, OwnerName, Coordinates, CurrentStatus).
  4. System caches results locally (expires in 1 hour).
* **Main Flow (Update):**
  1. After Bureau Management Committee approves a parcel reallocation, System issues POST request to /api/harari/parcels/{parcelId}/status with payload { "status": "Allocated", "date": "YYYY-MM-DD" }.
  2. Land Registry returns HTTP 200 on success.
  3. System updates local record and displays “Parcel status updated successfully.”

##### Use Case UC-10: Export & Archive Final Plan

* **Actor:** Lead Planning Officer, System Administrator
* **Description:** Exports the finalized plan as PDF or DOCX and archives it for public distribution.
* **Preconditions:** Plan status must be “Published”; all sections approved.
* **Postconditions:** Plan is stored in “/archive/[Year]/” folder; “Guest” and “Public” roles can view/download.
* **Main Flow:**
  1. Lead Planning Officer clicks “Export Final Plan.”
  2. System merges all plan sections, applies approved styling template (headers, footers, bilingual layout).
  3. System generates “AnnualPlan\_2017\_Harari.pdf” and “AnnualPlan\_2017\_Harari.docx.”
  4. System stores these in the archive, sets file permissions to read-only for “Public” group.
  5. System notifies “Guest/Public Viewer” group via email with a download link.

### 3.3 Data Requirements

#### 3.3.1 Overview

The HCDCPMS handles data for plans, users, sectors, milestones, budgets, expenditures, land parcels, comments, and version history. Data flows include plan authoring (text storage), numeric data (budget, KPI values), attachments (PDF, Word), and external data (land registry JSON, ERP CSV).

#### 3.3.2 Entities, Attributes, and Relationships

| **Entity** | **Attributes** | **Description** | **Relationships** |
| --- | --- | --- | --- |
| User | UserID (PK), Name, Email, RoleID (FK), LDAP\_DN, LastLogin | System user (Staff, external, guest). | Each User 1..→ 0.. Comments; 1..→ 0.. PlanRevisions; 1→ Role. |
| Role | RoleID (PK), RoleName, Description | Defines permissions (e.g., Admin, Planner, Coordinator). | Role 1→ 0..\* Users. |
| Plan | PlanID (PK), Year, Title, Status (Draft / InternalReview / ExternalReview / Published), CreatedBy (FK UserID), CreatedDate, LastModifiedDate | Represents an annual plan. | Plan 1→ 0..\* PlanSections; 1→ 0..\* PlanRevisions; 1→ 0..\* Reports. |
| PlanSection | SectionID (PK), PlanID (FK), SectorID (FK “Water”, “Traffic”, etc.), Title, Content (RichText), LastModifiedBy (FK UserID), LastModifiedDate | A discrete section of a plan (e.g., Land Use, Housing). | Section 1→ 0..\* Comments; Each belongs to one Plan. |
| PlanRevision | RevisionID (PK), SectionID (FK), RevisionNumber, Author (FK UserID), Timestamp, ChangeSummary | Stores version history for each section. | Each revision belongs to exactly one section. |
| Comment | CommentID (PK), SectionID (FK), Author (FK UserID), ParentCommentID (FK CommentID, nullable), Text, Timestamp, Resolved (Boolean) | Annotation or comment on a plan section. | Comments can be threaded; a comment → 0..\* replies. |
| Sector | SectorID (PK), Name (e.g., “Water Supply”), Description | Defines major sub-sectors (Water, Traffic, etc.). | Each sector → 0..\* PlanSections; 0..\* Milestones. |
| Milestone | MilestoneID (PK), SectionID (FK), Title, TargetValue, Unit (e.g., “%”, “m²”), TimePeriod (Quarter, SemiAnnual, Annual), BudgetAllocated, CreatedBy (FK UserID), CreatedDate | Key performance target under a plan section. | Each milestone belongs to one Section; 0..\* ProgressEntries. |
| ProgressEntry | EntryID (PK), MilestoneID (FK), ActualValue, BudgetUsed, DateReported, ReportedBy (FK UserID) | Stores actual performance data for a milestone. | Each entry links to one Milestone. |
| BudgetLine | BudgetLineID (PK), SectionID (FK), Description, OriginalAmount, CurrentAmount, Currency (ETB), LastModifiedDate | Defines a budget item for a section. | Each belongs to one Section; BudgetLine 1→ 0..\* BudgetChangeRequests. |
| BudgetChangeRequest | RequestID (PK), BudgetLineID (FK), RequestedBy (FK UserID), RequestDate, OldAmount, NewAmount, Status (Pending/Approved/Rejected), Approver1 (FK UserID), Approver2 (FK UserID), DecisionDate | Requests to change a budget line beyond threshold. | Belongs to one BudgetLine; involves two approvers. |
| Report | ReportID (PK), PlanID (FK), ReportType (Quarterly/SemiAnnual/Annual), GeneratedBy (FK UserID), GeneratedDate, FilePath | PDF/Word reports for performance evaluation. | Each Report is associated with one Plan. |
| LandParcel | ParcelID (PK), RegistryID (external PK), OwnerName, Coordinates, Status, LastSyncedDate | Local cache of land parcel info from Land Registry. | Each Parcel may be referenced in multiple PlanSections (for land allocation). |

#### 3.3.3 Entity-Relationship Diagram

(A proper ER diagram should be inserted here. It would show entities above and foreign key links among them.)

#### 3.3.4 Data Validation Rules

* **User.Email:** Must follow standard email format (^[A-Za-z0-9.\_%+-]+@[A-Za-z0-9.-]+\.[A-Za-z]{2,}$).
* **BudgetLine.OriginalAmount & CurrentAmount:** Must be non-negative decimal values (≥ 0.00).
* **Milestone.TargetValue & ProgressEntry.ActualValue:** Must be numeric; if TargetUnit is “%,” value ∈ [0, 100].
* **ProgressEntry.BudgetUsed ≤ BudgetLine.CurrentAmount.**
* **Plan.Status:** Must be one of {Draft, InternalReview, ExternalReview, Published}.
* **Comment.Text:** 1–5000 characters; cannot contain executable scripts (sanitize HTML).
* **LandParcel.Coordinates:** Must be valid GeoJSON or “latitude,longitude” pair.
* **Request.NewAmount – Request.OldAmount ≤ 10% of OldAmount** (if “Auto-approval threshold” applies; otherwise require multi-level approval).

### 3.4 External Interface Requirements

#### 3.4.1 Hardware Interface

* **Server Interfaces:**
  + **Disk:** SSD storage with at least 500 GB available for database logs, archives, and backup.
  + **Network:** Gigabit Ethernet NIC; firewall port 443 (HTTPS) open.
  + **Backup:** Backup tape library or network storage (NFS) with scheduled nightly backups.
* **Client Devices:**
  + Desktop PCs (minimum Intel i3 or equivalent, 4 GB RAM).
  + Tablets (iPad, Android) with at least 2 GB RAM.
  + Must support screen resolution ≥ 1280×800.

#### 3.4.2 Software Interface

* **Operating Systems:**
  + Server: Ubuntu 22.04 LTS (Linux kernel 5.15+) or Windows Server 2019 (with IIS 10).
  + Client: Windows 10+, macOS 10.15+, Ubuntu 20.04+ (browsers only).
* **Web/Application Server:**
  + If Node.js stack: Node.js 18+, Express 4.x or NestJS 9.x.
  + If .NET stack: ASP.NET Core 6.0.
* **Database:**
  + PostgreSQL 14 (preferred) or Microsoft SQL Server 2019.
* **External APIs:**
  + **Land Registry API:** REST over HTTPS (Endpoints: GET /api/harari/parcels, POST /api/harari/parcels/{parcelId}/status).
  + **Regional ERP Financial API:** Daily CSV files via secure FTP (SFTP) at /ftp/budget-updates/expenses\_YYYYMMDD.csv. Format: BudgetLineID,Date,AmountSpent.
* **Authentication:**
  + LDAP (Lightweight Directory Access Protocol) over LDAPS (port 636). Schema: Organizational Units map to system roles.

#### 3.4.3 User Interface

* **Web UI Framework:**
  + React 18.x (with TypeScript) or Angular 14.x.
  + UI components styled in line with bureau branding: blue/gold color palette, bilingual menus (Amharic/English).
* **Navigation:**
  + Dashboard (role-specific widgets).
  + Left-side menu: “Home,” “Plans,” “Performance Monitoring,” “Reports,” “Admin” (Admin visible only to System Administrator).
* **Data Entry Forms:**
  + Rich-text editor supporting bilingual text (e.g., using Quill.js or TinyMCE with Amharic keyboard).
  + Input controls for numeric data (KPI targets, budgets) with inline validation.
  + Table views for progress entries, budget lines, and stakeholder comments.
* **Responsive Design:**
  + Must render correctly on desktop and tablet screens.
  + Collapsible side menu on mobile view (≤ 768px width).
* **Accessibility:**
  + All pages must comply with WCAG 2.1 Level AA (e.g., high contrast text, keyboard navigation).

#### 3.4.4 Communication Interface

* **Email Notifications:**
  + SMTP server (e.g., smtp.harari.gov.et) for sending system alerts (review requests, approval notifications, report availability).
  + Template engine for bilingual email templates (subject and body in Amharic/English).
* **File Transfer:**
  + SFTP (port 22) connection to Regional ERP server for daily expense CSV.
  + HTTPS calls to Land Registry API with token-based authentication (Bearer tokens).
* **Optional SMS Gateway (Future Enhancement):**
  + Use HTTP POST to api.smsprovider.com/send for critical alerts (e.g., “Plan has been approved”).

### 3.5 Non-Functional Requirements

#### 3.5.1 Performance Requirements

* **Response Time:**
  + All interactive pages (dashboard, form pages) shall load within **3 seconds** over a stable 2 Mbps connection.
  + API calls to fetch plan sections or milestone data shall return within **1.5 seconds** when returning ≤ 100 KB of JSON.
* **Concurrent Users:**
  + System must support at least **50 concurrent users** (peak during “Roadmap finalization” month) without performance degradation.
  + Backend must handle batch import of an ERP CSV (≈ 1000 lines) in under **30 seconds**.
* **Data Volume:**
  + Database must handle storing up to **10 years** of archived plans, each with ~50 sections and ~200 version revisions per section.

#### 3.5.2 Usability Requirements

* **Bilingual Interface:**
  + Primary navigation and major labels must be available in both **Amharic** (UTF-8) and **English**. Users can toggle language at any time.
* **Learning Curve:**
  + A first-time user should be able to complete basic tasks (e.g., opening a plan section, entering KPI data) within **10 minutes** after a **30-minute** training session.
* **Help & Documentation:**
  + Contextual help tooltips shall appear on every form field.
  + A /Help page must include bilingual user guides, FAQs, and “Contact Support” link.

#### 3.5.3 Security Requirements

* **Authentication & Authorization:**
  + All user credentials validated via LDAP over LDAPS (port 636).
  + Role-based access control: “Administrator” > “Lead Planning Officer” > “Sector Coordinator” > “M&E Officer” > “Bureau Management Committee” > “External Stakeholder” > “Guest.”
* **Encryption:**
  + All client-server communication must use TLS 1.2+ (HTTPS).
  + Database encryption at rest (AES-256).
* **Data Protection:**
  + Personal user data (emails, names) must comply with Ethiopia’s Data Protection Guidelines.
  + Logs shall mask sensitive data (e.g., do not store plaintext passwords).
* **Audit Logging:**
  + All create/update/delete events on plans, sections, budgets, and milestones must produce an immutable audit log entry (timestamp, user, action, affected record ID).
* **Session Management:**
  + Sessions expire after **30 minutes** of inactivity; require re-authentication.
  + CSRF tokens must be implemented on all state-changing POST requests.

#### 3.5.4 Software Quality Attributes

* **Maintainability:**
  + Codebase must follow a standardized style guide (e.g., Airbnb JavaScript Style Guide or Microsoft C# guidelines).
  + Modular architecture: separation of concerns between UI, business logic, and data layers.
* **Scalability:**
  + System must be horizontally scalable: stateless application servers behind a load balancer; database read-replicas for reporting.
  + Designed so that future modules (e.g., GIS map integration) can be added with minimal changes.
* **Reliability:**
  + System availability target: **99.5% uptime**.
  + Automated backups daily; ability to restore database to any point within the last 7 days.
* **Portability:**
  + Application components containerized (Docker) for easy deployment on different servers.
  + Database schema and scripts must support both PostgreSQL and SQL Server (with minimal differences).
* **Modifiability:**
  + Use of feature flags to enable/disable new modules (e.g., SMS Gateway) without downtime.
  + All configuration (e.g., Land Registry API endpoints, ERP FTP credentials) externalized to config files.
* **Testability:**
  + Unit tests for backend logic must cover ≥ 80% code paths.
  + Automated integration tests for major flows: user login, plan creation, budget sync, report generation.

## APPENDIX A GROUP LOG

(This section should document all group meetings, tasks completed, and signatures from advisor/coordinator. Below is a template to be filled in by the project team.)

**Meeting 01 (May 1, 2025)**

* **Attendees:** Lead Analyst, Backend Dev, Frontend Dev, DB Specialist, QA Engineer, Advisor Prof. \_\_\_\_\_\_\_\_\_\_\_
* **Agenda:** Kick-off; Reviewed 2017 Harari Plan document; Drafted high-level functional requirements.
* **Decisions/Actions:**
  1. Agreed on system scope (plan authoring, M&E, Land Registry integration).
  2. Assigned responsibilities: Lead Analyst—requirements gathering; Backend Dev—data model; Frontend Dev—UI mockups; DB Specialist—ERD; QA—test plan outline.
* **Minutes:**
  1. The drafted requirements will be circulated by May 5, 2025.
  2. Next meeting scheduled for May 10, 2025.

**Meeting 02 (May 10, 2025)**

* **Attendees:** Same as above.
* **Agenda:** Reviewed drafted ERD; Discussed business rules (e.g., Proclamation compliance); Agreed on technology stack (React + Node.js + PostgreSQL).
* **Decisions/Actions:**
  1. Entity relationships finalized; will implement using Sequelize ORM.
  2. Land Registry API integration approach approved.
  3. QA to begin writing test cases for “Create Plan” and “Edit Section” flows.
* **Minutes:**
  1. UI wireframes to be delivered by May 15.
  2. Next meeting: May 17, 2025.

(…Continue logging all subsequent meetings, tasks, and approvals. Include individual roles, sign-offs, group photo, etc.)

**Definitions, Abbreviations, and Acronyms (List for Section v):**

* **E.C.** – Ethiopian Calendar
* **ETB** – Ethiopian Birr
* **ERP** – Enterprise Resource Planning
* **KPI** – Key Performance Indicator
* **M&E** – Monitoring & Evaluation
* **MoUD** – Ministry of Urban Development & Construction
* **PDF** – Portable Document Format
* **REST** – Representational State Transfer
* **SQL** – Structured Query Language
* **SSO** – Single Sign-On
* **UI** – User Interface
* **UX** – User Experience
* **WCAG** – Web Content Accessibility Guidelines

End of Software Requirements Specification