

# System Requirements Specification (SRS)

## Requirements Analysis:

### 1. Introduction

UrbanLedge is a comprehensive web-based property tax management system designed to modernize municipal property tax administration. This document outlines the functional and non-functional requirements for the system, serving as the foundation for development, testing, and deployment.

### 2. Functional Requirements

#### 2.1 User Management and Authentication

**FR-AUTH-001:** The system shall support user registration with email verification and role assignment

- Users can register with username, email, password, and full name
- Email verification required before account activation
- Support for multiple user roles: Admin, Officer, Citizen

**FR-AUTH-002:** The system shall implement secure authentication mechanisms

- Firebase-based authentication with JWT token management
- Password hashing using bcrypt with salt rounds
- Session management with automatic timeout
- Support for password reset via email

**FR-AUTH-003:** The system shall enforce role-based access control (RBAC)

- Granular permissions for different user roles
- Admin: Full system access and user management
- Officer: Property management, assessment, and reporting
- Citizen: Personal property viewing and payment access

#### 2.2 Property Management

**FR-PROP-001:** The system shall enable comprehensive property registration

- Capture property details: address, land area, built area, usage type
- Support for multiple property types (Residential, Commercial, Industrial)

- Ward-based geographical organization
- Owner association with user accounts

**FR-PROP-002:** The system shall support property data management

- CRUD operations for property records
- Bulk import capabilities for existing data
- Property ownership transfer functionality
- Historical property data tracking

**FR-PROP-003:** The system shall provide property search and filtering

- Search by address, owner, ward, property type
- Advanced filtering options
- Pagination for large result sets
- Export functionality for property lists

### 2.3 Tax Assessment and Calculation

**FR-ASSESS-001:** The system shall automate tax assessment processes

- Configurable tax slabs based on property type and area ranges
- Automatic calculation using current tax rates
- Financial year-based assessment cycles
- Support for different assessment periods

**FR-ASSESS-002:** The system shall handle tax exemptions and reductions

- Configurable exemption rules and percentages
- Senior citizen, disability, and other category-based exemptions
- Time-bound exemption validity periods
- Exemption application and approval workflow

**FR-ASSESS-003:** The system shall support penalty calculations

- Automatic penalty application for late payments
- Configurable penalty rates and grace periods
- Penalty waiver capabilities for administrative approval

### 2.4 Payment Processing

**FR-PAY-001:** The system shall support multiple payment methods

- Credit/Debit cards via integrated payment gateways

- Net banking and UPI payments
- Digital wallet integrations (PayPal, Google Pay)
- Cash payment recording for offline transactions

**FR-PAY-002:** The system shall ensure secure payment processing

- PCI DSS compliant payment handling
- Transaction encryption and secure data transmission
- Unique transaction reference generation
- Payment status tracking and confirmation

**FR-PAY-003:** The system shall generate payment receipts

- Automatic receipt generation upon successful payment
- PDF receipt download functionality
- Receipt numbering and archival
- Payment history and transaction logs

## 2.5 Reporting and Analytics

**FR-REPORT-001:** The system shall provide comprehensive reporting

- Revenue collection reports by ward, property type, and time period
- Delinquent property identification and tracking
- Payment status and outstanding amount reports
- Custom date range reporting capabilities

**FR-REPORT-002:** The system shall offer real-time analytics dashboards

- Key performance indicators (KPIs) visualization
- Collection rate monitoring and trends
- Property statistics and growth metrics
- Interactive charts and data visualization

**FR-REPORT-003:** The system shall support data export functionality

- CSV, PDF, and Excel format exports
- Scheduled report generation
- Automated report distribution via email
- Data backup and archival capabilities

## 2.6 Administrative Functions

**FR-ADMIN-001:** The system shall provide system configuration management

- Tax slab and rate configuration
- Exemption rule setup and management
- User role and permission management
- System-wide settings and preferences

**FR-ADMIN-002:** The system shall support audit and compliance

- Comprehensive audit logging for all system activities
- User action tracking with timestamps and IP addresses
- Compliance reporting for regulatory requirements
- Data retention and archival policies

**FR-ADMIN-003:** The system shall enable bulk operations

- Bulk property data import and updates
- Mass assessment generation
- Bulk notification and communication features
- Batch processing for large-scale operations

### 3. Non-Functional Requirements

#### 3.1 Performance Requirements

**NFR-PERF-001:** The system shall handle high concurrent user loads

- Support for 10,000+ concurrent users
- Response time < 2 seconds for 95% of operations
- Scalable architecture for growing municipalities

**NFR-PERF-002:** The system shall maintain optimal database performance

- Query response time < 500ms for standard operations
- Support for 1 million+ property records
- Efficient indexing and query optimization

**NFR-PERF-003:** The system shall ensure high availability

- 99.9% uptime excluding scheduled maintenance
- Automatic failover and recovery mechanisms
- Load balancing for distributed deployments

#### 3.2 Security Requirements

**NFR-SEC-001:** The system shall implement comprehensive data protection

- End-to-end encryption for data transmission (TLS 1.3)
- AES-256 encryption for data at rest
- Secure password policies and complexity requirements

**NFR-SEC-002:** The system shall prevent unauthorized access

- Multi-factor authentication for administrative accounts
- SQL injection and XSS attack prevention
- CSRF protection and secure session management

**NFR-SEC-003:** The system shall comply with regulatory standards

- GDPR compliance for data protection and privacy
- PCI DSS compliance for payment processing
- Audit trail requirements for financial transactions

### 3.3 Usability Requirements

**NFR-USAB-001:** The system shall provide intuitive user interfaces

- Self-service design requiring minimal training
- Consistent navigation and information architecture
- Clear error messages and user guidance

**NFR-USAB-002:** The system shall support accessibility standards

- WCAG 2.1 AA compliance for web accessibility
- Screen reader compatibility and keyboard navigation
- Support for multiple languages and locales

**NFR-USAB-003:** The system shall offer mobile compatibility

- Responsive design for all device sizes
- Progressive Web App (PWA) capabilities
- Touch-friendly interface elements

### 3.4 Reliability Requirements

**NFR-REL-001:** The system shall maintain data integrity

- ACID compliance for financial transactions
- Automatic data backup and recovery procedures
- Data consistency across distributed components

**NFR-REL-002:** The system shall handle error conditions gracefully

- Comprehensive error handling and logging
- User-friendly error messages and recovery options
- Automatic retry mechanisms for transient failures

**NFR-REL-003:** The system shall support disaster recovery

- Point-in-time data recovery capabilities
- Geographic redundancy for critical deployments
- Business continuity planning and procedures

### **3.5 Scalability Requirements**

**NFR-SCALE-001:** The system shall support horizontal scaling

- Microservices architecture for independent scaling
- Database sharding capabilities for large datasets
- Cloud-native deployment options

**NFR-SCALE-002:** The system shall accommodate growth

- Multi-tenant architecture for different municipalities
- Configurable workflows for varying requirements
- API-first design for third-party integrations

### **3.6 Compatibility Requirements**

**NFR-COMPAT-001:** The system shall work across platforms

- Support for modern web browsers (Chrome, Firefox, Safari, Edge)
- Cross-platform compatibility (Windows, macOS, Linux)
- Mobile browser support (iOS Safari, Chrome Mobile)

**NFR-COMPAT-002:** The system shall integrate with external systems

- RESTful API design for third-party integrations
- Standard data formats (JSON, XML, CSV)
- Support for common authentication protocols

### **3.7 Maintainability Requirements**

**NFR-MAINT-001:** The system shall support easy maintenance

- Modular architecture with clear separation of concerns
- Comprehensive documentation and code comments

- Automated testing and quality assurance processes

**NFR-MAINT-002:** The system shall enable continuous deployment

- CI/CD pipeline support for automated updates
- Zero-downtime deployment capabilities
- Rollback mechanisms for failed deployments

## 4. Interface Requirements

### 4.1 User Interfaces

**UI-001:** Web-based responsive interface for all user roles

- Dashboard with role-specific widgets and metrics
- Property management forms with validation
- Assessment and payment interfaces
- Administrative configuration panels

**UI-002:** Mobile-optimized interfaces

- Touch-friendly navigation and controls
- Optimized layouts for small screens
- Offline capability for critical functions

### 4.2 API Interfaces

**API-001:** RESTful API endpoints for all major functions

- Property CRUD operations
- Assessment and payment processing
- Reporting and analytics data access
- Administrative configuration APIs

**API-002:** Third-party integration interfaces

- Payment gateway APIs
- Email and SMS service integrations
- File storage and document management APIs

## 5. Data Requirements

### 5.1 Data Storage

**DR-001:** Relational database for structured data

- PostgreSQL/MySQL support with ACID compliance

- Proper normalization and indexing
- Data retention policies and archival

#### **DR-002:** File storage for documents and receipts

- Secure cloud storage integration
- PDF generation and storage capabilities
- Document versioning and access control

### **5.2 Data Security**

#### **DR-SEC-001:** Sensitive data protection

- Personal identifiable information (PII) encryption
- Financial data security and compliance
- Access logging and monitoring

## **6. Assumptions and Constraints**

### **6.1 Assumptions**

- Municipalities have basic internet connectivity
- Users have access to modern web browsers
- Payment gateways are available in target regions
- Database servers meet minimum performance requirements

### **6.2 Constraints**

- Open-source licensing requirements
- Budget constraints for smaller municipalities
- Regulatory compliance requirements
- Technology stack limitations and compatibility

## **7. Acceptance Criteria**

### **7.1 Functional Acceptance Criteria**

- All CRUD operations working for properties, assessments, and payments
- User authentication and authorization functioning correctly
- Tax calculations accurate within 0.01% tolerance
- Payment processing successful for all supported methods
- Reports generated accurately and on schedule

### **7.2 Non-Functional Acceptance Criteria**

- System handles 1,000 concurrent users with <2s response time
- 99.9% uptime achieved during testing period
- All security scans pass without critical vulnerabilities
- WCAG 2.1 AA compliance verified
- Data integrity maintained across all operations