

**NANYANG  
TECHNOLOGICAL  
UNIVERSITY**  
**SINGAPORE**

**SC2006 – Software Engineering**  
**Lab 2 Deliverables**

<b>Lab Group</b>	<b>SCS6</b>
<b>Team</b>	<b>5</b>
<b>Members</b>	<b>Nguyen Le Tam (U2420673E)</b>
	<b>Mehul Modi (U2423434H)</b>
	<b>Nguyen Tran Chien (U2420243A)</b>
	<b>Anthea Toh (U2423691F)</b>
	<b>Chan Tzen Loong Max (U2422224B)</b>

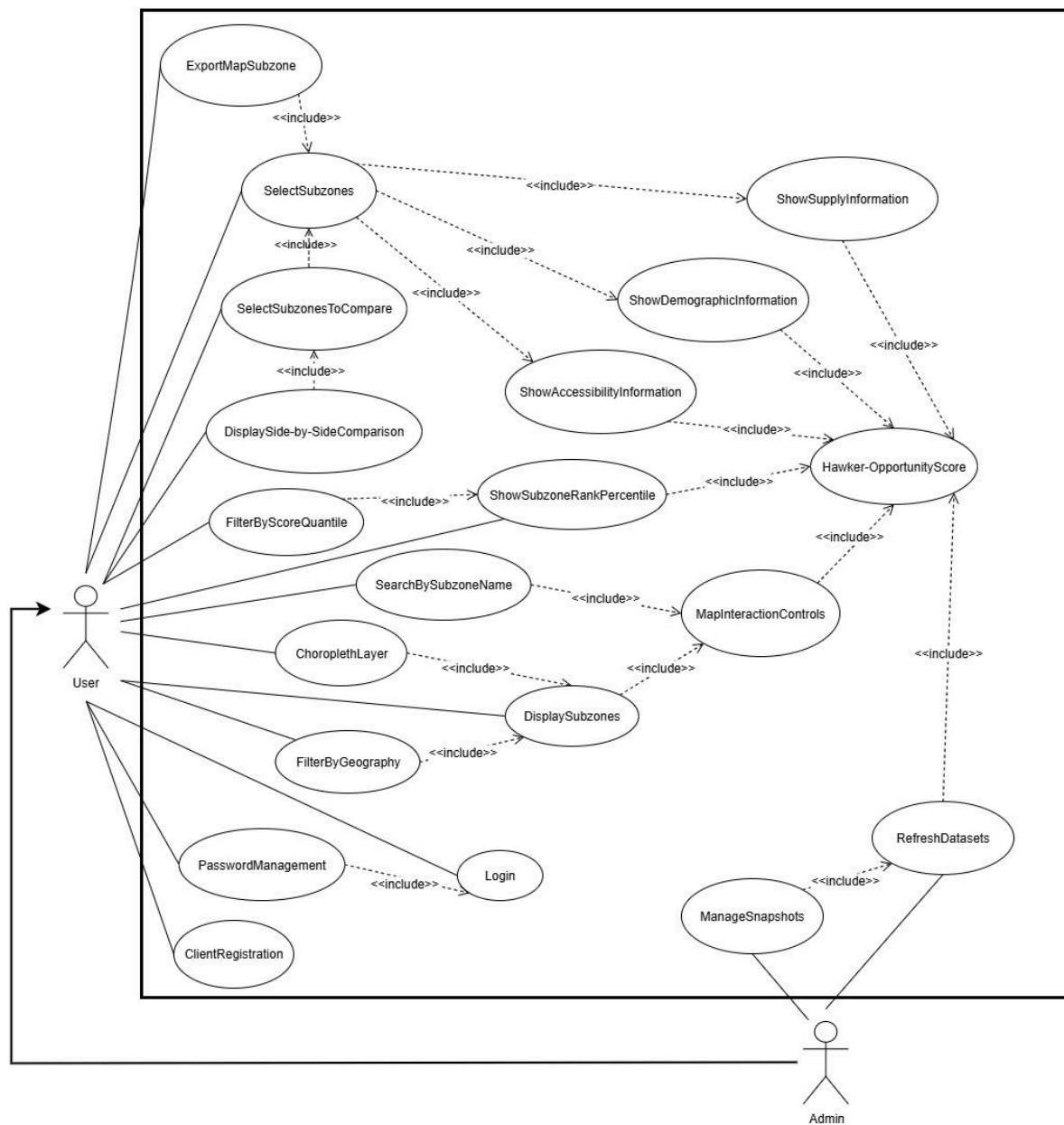
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# 1. Use Case diagram and Use Case description

## A. Use Case Diagram



## B. Use Case Descriptions

### 1. For Functional Requirement #1

#### 1.1. DisplaySubzones

Use Case ID:	1.1		
Use Case Name:	DisplaySubzones		
Created By:	Nguyen Le Tam	Last Updated By:	Nguyen Le Tam
Date Created:	6th September 2025	Date Last Updated:	6th September 2025

Actor:	User
Description:	User views the Singapore map segmented by subzones. Each subzone appears as a polygon boundary on the map.
Preconditions:	The system has loaded URA subzone boundary datasets.
Postconditions:	Subzones are displayed on the map as polygons that can be clicked or hovered.
Priority:	High
Frequency of Use:	Every time a user accesses the system.
Flow of Events:	<ol style="list-style-type: none"><li>1. The user opens the application home screen.</li><li>2. System loads map base layer.</li><li>3. The system overlays polygons of subzones</li><li>4. The user sees the polygons drawn on the map.</li></ol>
Alternative Flows:	If the dataset is unavailable, the system shows "Unable to load subzones" and provides retry.
Exceptions:	Map rendering fails due to API or browser issues.
Includes:	Use case 1.3 and 1.2
Special Requirements:	The map must be zoomable and responsive.
Assumptions:	URA datasets are complete and up-to-date.s
Notes and Issues:	Polygons may overlap if datasets are misaligned.

## 1.2. ChoroplethLayer

Use Case ID:	1.2		
Use Case Name:	ChoroplethLayer		
Created By:	Nguyen Le Tam	Last Updated By:	Nguyen Le Tam
Date Created:	6th September 2025	Date Last Updated:	6th September 2025

Actor:	User
Description:	Users view each subzone shaded according to its Hawker-Opportunity Score (normalized value).
Preconditions:	Score computation has been completed and stored in the system.
Postconditions:	Subzones are displayed with a colour representing their score.
Priority:	High
Frequency of Use:	Each session when the user interacts with the map.
Flow of Events:	<ol style="list-style-type: none"><li>1. The user accesses the home map.</li><li>2. The system retrieves scores for each subzone.</li><li>3. The system normalizes scores and maps them to a colour gradient.</li><li>4. The system applies shading to each polygon. A legend is displayed to explain colour ranges.</li></ol>
Alternative Flows:	If dataset is unavailable, system shows error "Unable to load boundaries" and provides retry
Exceptions:	Rendering fails due to browser or API error.
Includes:	Use case 2.1 Hawker-OpportunityScore
Special Requirements:	Must support zooming and responsiveness.
Assumptions:	The latest snapshot of scores is available.
Notes and Issues:	Polygons may overlap if datasets are misaligned.

### 1.3. MapInteractionControls

Use Case ID:	1.3		
Use Case Name:	MapInteractionControls		
Created By:	Nguyen Le Tam	Last Updated By:	Nguyen Le Tam
Date Created:	6th September 2025	Date Last Updated:	6th September 2025

Actor:	User
Description:	The user interacts with the Singapore map of subzones.
Preconditions:	The system has loaded subzone polygons and computed scores.
Postconditions:	Subzones can be zoomed, panned, hovered, or selected.
Priority:	High
Frequency of Use:	Every time a user explores the map.
Flow of Events:	<ol style="list-style-type: none"><li>1. User zooms in/out to adjust map scale.</li><li>2. User pans map to move to another area.</li><li>3. User hovers over a polygon.</li></ol>
Alternative Flows:	If map API fails, the user is restricted to default zoom level.
Exceptions:	None
Includes:	None
Special Requirements:	Must support mouse gestures.
Assumptions:	Browser/device supports modern mapping libraries.
Notes and Issues:	Performance may lag if too many polygons are displayed at once.

## 2. For Functional Requirement #2

### 2.1. Hawker-OpportunityScore

Use Case ID:	2.1		
Use Case Name:	Hawker-OpportunityScore		
Created By:	Nguyen Le Tam	Last Updated By:	Nguyen Le Tam
Date Created:	6th September 2025	Date Last Updated:	6th September 2025

Actor:	System (triggered indirectly by Admin refresh or initial load).
Description:	The system calculates the Hawker-Opportunity Score ( $H_i$ ) for each subzone using kernel-smoothed demand, competing-adjusted supply, and transport accessibility.
Preconditions:	Population, hawker centres, MRT stations, and bus stop datasets are loaded and validated.
Postconditions:	Each subzone has stored values for $Dem_i$ , $Sup_i$ , $Acc_i$ , and the final $H_i$ score.
Priority:	High
Frequency of Use:	Whenever datasets are refreshed or recomputed.
Flow of Events:	<ol style="list-style-type: none"> <li>1. The system retrieves resident counts and their centroid locations.</li> <li>2. System computes smoothed demand (<math>Dem_i</math>) by convolving population with kernel <math>K\lambda_D</math>.</li> <li>3. System computes supply (<math>Sup_i</math>) by convolving hawker centres with kernel <math>K\lambda_S</math>, adjusting each centre's contribution by the demand it already serves.</li> <li>4. System computes accessibility (<math>Acc_i</math>) by convolving MRT and bus stops with their respective kernels <math>K\lambda_M</math> and <math>K\lambda_B</math>, weighted by <math>\beta_{MRT}</math> and <math>\beta_{BUS}</math>.</li> <li>5. System standardizes each component using robust z-scores.</li> <li>6. System computes the final:  <math display="block">H_i = w_D \cdot Z(Dem_i) - w_S \cdot Z(Sup_i) + w_A \cdot Z(Acc_i)</math> </li> <li>7. Scores are stored in the snapshot with metadata.</li> </ol>
Alternative Flows:	<p>A1: If capacity (<math>C_{\square}</math>) for a hawker centre is missing, system assumes <math>C_{\square} = 1</math></p> <p>A2: If transport weights are not provided, system assumes <math>\beta_{MRT} = \beta_{BUS} = 1</math></p>
Exceptions:	Failure to load one dataset aborts computation; system logs error and retains previous snapshot.
Includes:	None
Special Requirements:	Kernel bandwidth ( $\lambda$ ) must be configurable.
Assumptions:	Census and NEA datasets are up-to-date.
Notes and Issues:	Admin may adjust weights ( $w_D, w_S, w_A$ ) before recomputation.



## 2.2. ShowSubzoneRankPercentile

Use Case ID:	2.3		
Use Case Name:	ShowSubzoneRankPercentile		
Created By:	Nguyen Le Tam	Last Updated By:	Nguyen Le Tam
Date Created:	6th September 2025	Date Last Updated:	6th September 2025

Actor:	User
Description:	User views how a selected subzone ranks relative to all other subzones in terms of Hawker-Opportunity Score.
Preconditions:	Scores for all subzones have been computed.
Postconditions:	Percentile rank is displayed in the tooltip and subzone details panel.
Priority:	Medium
Frequency of Use:	Occasionally, when comparing subzones or selecting one.
Flow of Events:	<ol style="list-style-type: none"><li>1. The user hovers or clicks on a subzone.</li><li>2. The system retrieves the percentile rank of the subzone.</li><li>3. The system displays "Top X%" or equivalent in the tooltip and details panel.</li></ol>
Alternative Flows:	If percentile cannot be computed (incomplete data), the system hides percentile and shows message "Rank not available".
Exceptions:	Error in ranking algorithm leads to incorrect percentile displayed.
Includes:	Use case 2.1. Hawker-OpportunityScore
Special Requirements:	Percentiles should be recomputed automatically whenever dataset refresh occurs.
Assumptions:	Ranking is based on the latest snapshot of scores.
Notes and Issues:	Percentile presentation must be clear (e.g., Top 10%, Bottom 50%).

### 3. For Functional Requirement #3

#### 3.1.FilterByGeography

Use Case ID:	3.1		
Use Case Name:	FilterByGeography		
Created By:	Nguyen Le Tam	Last Updated By:	Nguyen Le Tam
Date Created:	6th September 2025	Date Last Updated:	6th September 2025

Actor:	User
Description:	User filters the map to show only specific subzones within a region.
Preconditions:	The system has loaded all subzone polygons and computed scores.
Postconditions:	Only polygons matching the regions remain visible on the map.
Priority:	Medium
Frequency of Use:	Occasionally, when focusing on a specific region.
Flow of Events:	<ol style="list-style-type: none"><li>1. The user opens the filter panel.</li><li>2. The user selects a region from the dropdown list. The system highlights and displays only subzones within that region.</li><li>3. Optionally, the user selects a subzone for more fine-grained filtering.</li><li>4. System updates map view accordingly.</li></ol>
Alternative Flows:	If no region is selected, the system shows all subzones.
Exceptions:	Dropdown fails to load due to missing dataset.
Includes:	Use case 1.1. DisplaySubzones
Special Requirements:	Filter must be applied instantly without requiring page reload.
Assumptions:	Subzones list matches URA official dataset
Notes and Issues:	Must handle user deselection gracefully (restore all subzones).

### 3.2.FilterByScoreQuantile

Use Case ID:	3.2		
Use Case Name:	FilterByScoreQuantile		
Created By:	Nguyen Le Tam	Last Updated By:	Nguyen Le Tam
Date Created:	6th September 2025	Date Last Updated:	6th September 2025

Actor:	User
Description:	User filters the map to show only subzones that fall within a selected score percentile range (e.g., Top 10%, Top 25%).
Preconditions:	Scores and percentile ranks have been computed for all subzones.
Postconditions:	The map updates to display only subzones within the chosen percentile threshold.
Priority:	Medium
Frequency of Use:	Often, when identifying high-potential areas.
Flow of Events:	<ol style="list-style-type: none"><li>1. The user opens the filter panel.</li><li>2. The user selects a quantile option (Top 10%, Top 25%, Top 50%).</li><li>3. The system retrieves a list of subzones that meet the criterion.</li><li>4. System updates map to show only those subzones.</li><li>5. Legend updates to reflect visible score range.</li></ol>
Alternative Flows:	If the percentile option "All" is chosen, the system restores the full map view.
Exceptions:	If percentile cannot be calculated (missing scores), the system shows the message "Filter unavailable".
Includes:	Use case 2.3. ShowSubzoneRankPercentile
Special Requirements:	Updates should be dynamic (<1 second delay).
Assumptions:	All scores normalized before applying percentile thresholds.
Notes and Issues:	Must be consistent with percentile values shown in tooltips.

### 3.3. SearchBySubzoneName

Use Case ID:	3.3		
Use Case Name:	SearchBySubzoneName		
Created By:	Nguyen Le Tam	Last Updated By:	Nguyen Le Tam
Date Created:	6th September 2025	Date Last Updated:	6th September 2025

Actor:	User
Description:	The user searches for a subzone by entering its name in a search bar.
Preconditions:	The list of subzone names is available in the system.
Postconditions:	The map zooms to and highlights the selected subzone.
Priority:	High
Frequency of Use:	Frequently, when users know exactly which subzone they want to view.
Flow of Events:	<ol style="list-style-type: none"><li>1. The user types a subzone name into the search bar.</li><li>2. The system provides autocomplete suggestions as user types.</li><li>3. The user selects a suggested subzone from the dropdown.</li><li>4. The system zooms into and highlights the selected subzone polygon.</li><li>5. Tooltip appears with subzone name, score, and percentile rank.</li></ol>
Alternative Flows:	If no matches are found, the system displays "No subzone found".
Exceptions:	Autocomplete fails due to missing dataset or system error.
Includes:	Use case 1.1. DisplaySubzones
Special Requirements:	Autocomplete must handle both full names (e.g., "Tampines") and partial input (e.g., "Tam").
Assumptions:	Subzone names are stored exactly as defined in URA datasets.
Notes and Issues:	Should handle both subzone and Subzone search in one field.

## 4. For Functional Requirement #4

### 4.1.ShowDemographicInformation

Use Case ID:	4.1		
Use Case Name:	ShowDemographicInformation		
Created By:	Nguyen Le Tam	Last Updated By:	Nguyen Le Tam
Date Created:	6th September 2025	Date Last Updated:	6th September 2025

Actor:	User
Description:	When a subzone is selected, the system displays its total population and age group breakdown (0–14, 15–64, 65+).
Preconditions:	Demographic dataset is available and linked to subzone IDs.
Postconditions:	Demographic statistics appear in the subzone details panel.
Priority:	High
Frequency of Use:	Often, whenever users want to evaluate demand.
Flow of Events:	<ol style="list-style-type: none"><li>1. The user selects a subzone polygon on the map.</li><li>2. The system retrieves population data for that subzone.</li><li>3. The system displays total residents and population in age groups.</li><li>4. The system displays values as both raw counts and percentages.</li><li>5. The system generates a bar chart visualizing the distribution.</li></ol>
Alternative Flows:	If demographic data for a subzone is missing, the system shows “Demographics unavailable”.
Exceptions:	Chart rendering fails due to client browser limitations.
Includes:	Use case 2.1 - Hawker-Opportunity Score.
Special Requirements:	The chart must update instantly when a new subzone is selected.
Assumptions:	Census data is the latest available from SingStat.
Notes and Issues:	Large population subzones must be scaled properly to avoid misleading charts.

## 4.2.ShowSupplyInformation

Use Case ID:	4.2		
Use Case Name:	ShowSupplyInformation		
Created By:	Nguyen Le Tam	Last Updated By:	Nguyen Le Tam
Date Created:	6th September 2025	Date Last Updated:	6th September 2025

Actor:	User
Description:	When a subzone is selected, the system displays the number of hawker centres within a fixed radius from the subzone centroid.
Preconditions:	NEA hawker centres dataset is available and geocoded.
Postconditions:	Hawker counts and a list of nearby centres appear in the subzone details panel.
Priority:	High
Frequency of Use:	Frequently, when assessing competition.
Flow of Events:	<ol style="list-style-type: none"><li>1. The user selects a subzone polygon.</li><li>2. The system computes the number of hawker centres within the default radius of the subzone centroid.</li><li>3. The system displays counts for each radius.</li><li>4. The system lists each hawker centre with its name and distance.</li></ol>
Alternative Flows:	If the hawker dataset is outdated, the system shows “Data not refreshed – counts may be inaccurate”.
Exceptions:	A hawker centre has missing coordinates; the system skips it and logs errors.
Includes:	Use Case 2.1 Hawker-Opportunity Score.
Special Requirements:	Distances must be computed accurately using geospatial functions.
Assumptions:	The Hawker centre list from NEA is authoritative.
Notes and Issues:	Duplicate centres must be de-duplicated by ID.

4.3.ShowAccessibilityInformation

Use Case ID:	4.3		
Use Case Name:	ShowAccessibilityInformation		
Created By:	Nguyen Le Tam	Last Updated By:	Nguyen Le Tam
Date Created:	6th September 2025	Date Last Updated:	6th September 2025

Actor:	User
Description:	When a subzone is selected, the system displays accessibility metrics based on MRT stations and bus stops within fixed radii from the subzone centroid.
Preconditions:	MRT and bus stop datasets are available.
Postconditions:	Accessibility metrics appear in the subzone details panel.
Priority:	Medium
Frequency of Use:	Occasionally, when considering location convenience.
Flow of Events:	<ol style="list-style-type: none"><li>1. The user selects a subzone polygon.</li><li>2. The system counts the number of MRT stations within a default radius of the centroid.</li><li>3. The system displays counts by radius.</li><li>4. The system lists MRT stations and bus stops found, with names/codes and distances from centroid.</li></ol>
Alternative Flows:	<ul style="list-style-type: none"><li>• If MRT data is missing → system shows “MRT data unavailable”.</li><li>• If bus stop data is missing → system shows “Bus stop data unavailable”.</li></ul>
Exceptions:	Geospatial query fails due to corrupted coordinates.
Includes:	Use Case 2.1 Hawker-Opportunity Score.
Special Requirements:	Distances must be calculated in meters using GIS libraries.
Assumptions:	Distance is computed as a straight-line, not walking path.
Notes and Issues:	Walking path integration could be a future enhancement.

## 5. For Functional Requirement #5

### 5.1.SelectSubzonesToCompare

Use Case ID:	5.1		
Use Case Name:	SelectSubzonesToCompare		
Created By:	Nguyen Le Tam	Last Updated By:	Nguyen Le Tam
Date Created:	6th September 2025	Date Last Updated:	6th September 2025

Actor:	User
Description:	User selects 2 subzones to add into the comparison tray for side-by-side evaluation.
Preconditions:	Both subzones must have scores and details computed.
Postconditions:	Subzones are added into a comparison tray, ready for comparison.
Priority:	High
Frequency of Use:	Occasionally, when evaluating multiple candidate subzones.
Flow of Events:	<ol style="list-style-type: none"><li>1. The user views the map and clicks a subzone.</li><li>2. The system shows a "+ Add to Compare" button in the subzone details panel.</li><li>3. The user clicks the button.</li><li>4. The system adds a subzone into the comparison tray.</li><li>5. The user repeats for other subzone.</li><li>6. Tray confirms the 2 selected subzones.</li></ol>
Alternative Flows:	<ul style="list-style-type: none"><li>• If the same subzone is selected twice, the system prevents duplicate entry.</li><li>• If the user tries to add more than two subzones → system shows "Maximum two subzones allowed".</li></ul>
Exceptions:	If one subzone has incomplete data, the system prevents it from being added and shows an error message.
Includes:	Use Case 5.2 SelectSubzone
Special Requirements:	Trays must remain visible and persistent during navigation.
Assumptions:	Users understand the limit of two subzones.
Notes and Issues:	Consider allowing more than two subzones in future versions.



## 5.2.SelectSubzone

Use Case ID:	5.2		
Use Case Name:	SelectSubzone		
Created By:	Nguyen Le Tam	Last Updated By:	Nguyen Le Tam
Date Created:	15th September 2025	Date Last Updated:	15th September 2025

Actor:	User
Description:	User selects a specific subzone to focus
Preconditions:	Subzone polygons and scores are loaded.
Postconditions:	The chosen subzone is highlighted; its details panel is open and populated
Priority:	High
Frequency of Use:	Frequent
Flow of Events:	<ol style="list-style-type: none"><li>1. User clicks a subzone polygon or chooses one via search.</li><li>2. System centers and zooms to the subzone and highlights its polygon.</li><li>3. System opens the details panel and displays information of that subzone</li><li>4. System shows actions: Add to Compare, Export, Clear Selection.</li></ol>
Alternative Flows:	<ul style="list-style-type: none"><li>• If data is incomplete, show “Data unavailable” for the missing metric.</li><li>• Clicking outside polygons clears selection.</li></ul>
Exceptions:	Geometry or lookup failure.
Includes:	Use Case 4.1 – 4.3
Special Requirements:	Populate the panel in $\leq 1$ . Maintain selection in URL for deep-linking. Ensure keyboard focus moves to the panel.
Assumptions:	None
Notes and Issues:	None

### 5.3. DisplaySide-by-SideComparison

Use Case ID:	5.3		
Use Case Name:	DisplaySide-by-SideComparison		
Created By:	Nguyen Le Tam	Last Updated By:	Nguyen Le Tam
Date Created:	6th September 2025	Date Last Updated:	6th September 2025

Actor:	User
Description:	User views demand, supply, accessibility, and scores for two selected subzones displayed side-by-side.
Preconditions:	Subzones have been selected for comparison.
Postconditions:	A comparison screen with both subzones' metrics is displayed.
Priority:	High
Frequency of Use:	Occasionally, during evaluation of candidate sites.
Flow of Events:	<ol style="list-style-type: none"><li>1. User clicks "Compare" in the tray with two subzones selected.</li><li>2. The system opens the comparison view.</li><li>3. The system retrieves demographic data, hawker supply counts, accessibility, and scores for both subzones.</li><li>4. The system displays both subzones in two parallel columns.</li><li>5. The system renders a radar chart showing differences in demand, supply, access, and final score.</li></ol>
Alternative Flows:	If one dataset is missing, the system displays "Data not available" for that metric.
Exceptions:	If rendering fails, the system falls back to a tabular-only comparison.
Includes:	Use Case 5.1 – SelectSubzonesToCompare.
Special Requirements:	Charts must be responsive and exportable.
Assumptions:	Percentile ranks are recomputed at the same time as scores.
Notes and Issues:	UI must clearly indicate which subzone is which (labels, colors).

## 6. For Functional Requirement #6

### 6.1. RefreshDatasets (Admin)

Use Case ID:	6.1		
Use Case Name:	RefreshDatasets		
Created By:	Nguyen Le Tam	Last Updated By:	Nguyen Le Tam
Date Created:	6th September 2025	Date Last Updated:	6th September 2025

Actor:	Admin
Description:	Admin triggers a refresh of official datasets (population, hawker centres, MRT/bus stops) and recomputes scores.
Preconditions:	Admin is logged in and authorized.
Postconditions:	A new dataset is loaded, scores are recomputed, and a snapshot is stored.
Priority:	High
Frequency of Use:	Occasionally, when datasets are updated (e.g., monthly or quarterly).
Flow of Events:	<ol style="list-style-type: none"><li>1. Admin logs into the system.</li><li>2. Admin navigates to the Admin Console.</li><li>3. Admin clicks "Refresh Data".</li><li>4. The system fetches the latest official datasets.</li><li>5. The system recomputes scores for all subzones.</li><li>6. The system creates and saves a new snapshot with version notes and timestamp.</li></ol>
Alternative Flows:	A1: If a dataset cannot be retrieved, the system keeps the last valid version and logs an error. A2: If recomputation partially fails, system shows "Partial refresh completed – some scores unavailable".
Exceptions:	Internet or API failure prevents fetching datasets.
Includes:	Use case 2.1. Hawker-OpportunityScore
Special Requirements:	Only Admin accounts may execute this function.
Assumptions:	Official datasets are accessible at data.gov.sg.
Notes and Issues:	Admin must verify refresh success via system logs.

## 6.2. ManageSnapshots (Admin)

Use Case ID:	6.2		
Use Case Name:	ManageSnapshots		
Created By:	Nguyen Le Tam	Last Updated By:	Nguyen Le Tam
Date Created:	6th September 2025	Date Last Updated:	6th September 2025

Actor:	Admin
Description:	Admin manages snapshots of score calculations, including viewing versions, rolling back, and verifying dataset notes.
Preconditions:	At least one snapshot has been created previously.
Postconditions:	Admin can view or restore specific snapshots.
Priority:	Medium
Frequency of Use:	Occasionally, when auditing or verifying calculations.
Flow of Events:	<ol style="list-style-type: none"><li>1. Admin logs into Admin Console.</li><li>2. Admin opens the "Snapshots" section.</li><li>3. The system displays a list of snapshots with timestamp, dataset versions, and notes.</li><li>4. Admin selects a snapshot to view or restore.</li><li>5. If restored, the system reverts scores to that snapshot's values.</li></ol>
Alternative Flows:	If no snapshots are available, the system displays "No snapshots found".
Exceptions:	Rollback fails due to a corrupted snapshot file.
Includes:	Use Case 6.1 RefreshDatasets
Special Requirements:	Snapshots must be archived for at least 30 days.
Assumptions:	Dataset versions are recorded correctly in metadata.
Notes and Issues:	Consider long-term archival beyond 30 days for traceability.

### 6.3. ExportMapSubzone

Use Case ID:	6.3		
Use Case Name:	ExportMapSubzone		
Created By:	Nguyen Le Tam	Last Updated By:	Nguyen Le Tam
Date Created:	6th September 2025	Date Last Updated:	6th September 2025

Actor:	User
Description:	User exports the current subzone details as a PDF or PNG file with dataset version and timestamp included.
Preconditions:	A subzone or map view has been loaded successfully.
Postconditions:	File is generated and downloaded to the user's device.
Priority:	Medium
Frequency of Use:	Occasionally, for reporting or presentations.
Flow of Events:	<ol style="list-style-type: none"><li>1. The user clicks the "Export" button on the subzone details page.</li><li>2. The system collects current subzone state, filters applied, and visible details.</li><li>3. The system generates export content with subzone, legend, and sidebar details.</li><li>4. System appends metadata (timestamp, dataset version, project name).</li><li>5. The system generates files in chosen format (PDF/PNG).</li><li>6. The file is downloaded to the user's device.</li></ol>
Alternative Flows:	If export fails, the system displays "Export unsuccessful – please try again."
Exceptions:	Browser blocks file download; system prompts user to allow it.
Includes:	Use Case 5.2 SelectSubzone
Special Requirements:	Export must preserve readability (legends, labels, scale).
Assumptions:	The user device supports file downloads.
Notes and Issues:	Consider CSV export in future to allow raw data download.

## 7. For Functional Requirement #7

### 7.1. ClientRegistration

Use Case ID:	7.1		
Use Case Name:	ClientRegistration		
Created By:	Nguyen Le Tam	Last Updated By:	Nguyen Le Tam
Date Created:	6th September 2025	Date Last Updated:	6th September 2025

Actor:	Client
Description:	Client registers for an account with the system to access standard features
Preconditions:	The client does not already have an account registered with the same email.
Postconditions:	A new client account is created with the "Client" role.
Priority:	High
Frequency of Use:	Once per client (account creation).
Flow of Events:	<ol style="list-style-type: none"><li>1. The client navigates to the registration page.</li><li>2. User enters name, email address, contact number, and password.</li><li>3. The system verifies that the email is not already registered.</li><li>4. The system hashes the password securely.</li><li>5. System creates the Client account with role = "Client".</li><li>6. The system confirms registration success.</li></ol>
Alternative Flows:	If an email already exists, the system displays "Email already registered."
Exceptions:	Database error prevents account creation.
Includes:	None
Special Requirements:	Passwords must meet policy requirements (length, character diversity).
Assumptions:	The user provides valid contact details.
Notes and Issues:	The option to add a profile picture may be added later.

## 7.2. UserLogin

Use Case ID:	7.2		
Use Case Name:	Login		
Created By:	Nguyen Le Tam	Last Updated By:	Nguyen Le Tam
Date Created:	6th September 2025	Date Last Updated:	6th September 2025

Actor:	User
Description:	User logs into the system using email and password.
Preconditions:	A valid account exists.
Postconditions:	User is authenticated and redirected to the home map view.
Priority:	High
Frequency of Use:	Frequently, each time a session begins.
Flow of Events:	<ol style="list-style-type: none"><li>1. The user navigates to the login page.</li><li>2. The user enters an email and password.</li><li>3. The system masks password input with dots (option to unmask).</li><li>4. The system validates credentials against stored account data.</li><li>5. If valid, the system logs the user in and redirects to the home screen.</li></ol>
Alternative Flows:	If credentials are invalid, the system shows "Email and password do not match."
Exceptions:	Authentication server is unavailable.
Includes:	None
Special Requirements:	The session must expire after 30 minutes of idle time.
Assumptions:	The user provides correct credentials.
Notes and Issues:	Consider adding 2FA for Admin accounts in future.

### 7.3. PasswordManagement

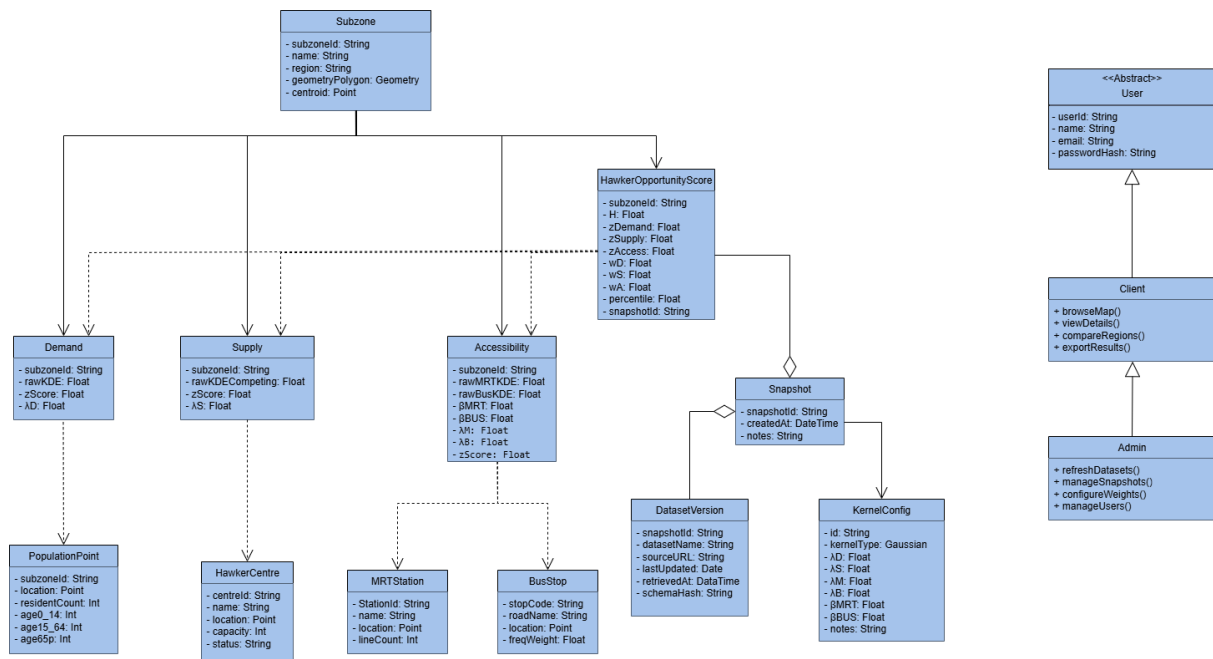
Use Case ID:	7.3		
Use Case Name:	PasswordManagement		
Created By:	Nguyen Le Tam	Last Updated By:	Nguyen Le Tam
Date Created:	6th September 2025	Date Last Updated:	6th September 2025

Actor:	User
Description:	Change an existing password while signed in.
Preconditions:	Valid authenticated session.
Postconditions:	Password is updated
Priority:	Medium
Frequency of Use:	Occasionally, when password reset is needed.
Flow of Events:	<ol style="list-style-type: none"><li>1. User opens Settings → "Change Password".</li><li>2. User enters current password and new password.</li><li>3. System verifies current password.</li><li>4. System validates new password against policy.</li><li>5. System updates password and invalidates other sessions</li></ol>
Alternative Flows:	Wrong current password → "Incorrect current password." New password fails policy
Exceptions:	Identity service unavailable.
Includes:	Use Case 7.3. Login
Special Requirements:	Passwords must be hashed securely before storage.
Assumptions:	Stable network and session storage.
Notes and Issues:	Consider notifying users by email after change.



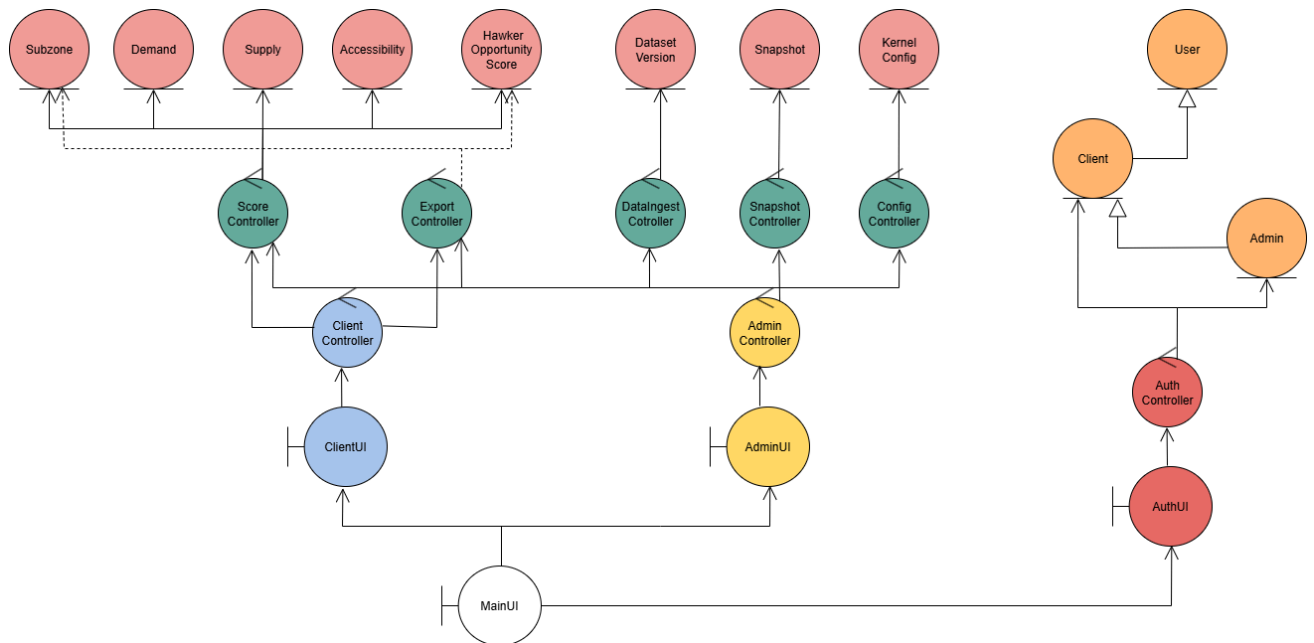
## 2. Class Diagram of Entity Classes

If the image is unclear, please refer to the pdf file that is uploaded together with this document.



### 3. Key Boundary Classes and Control Classes

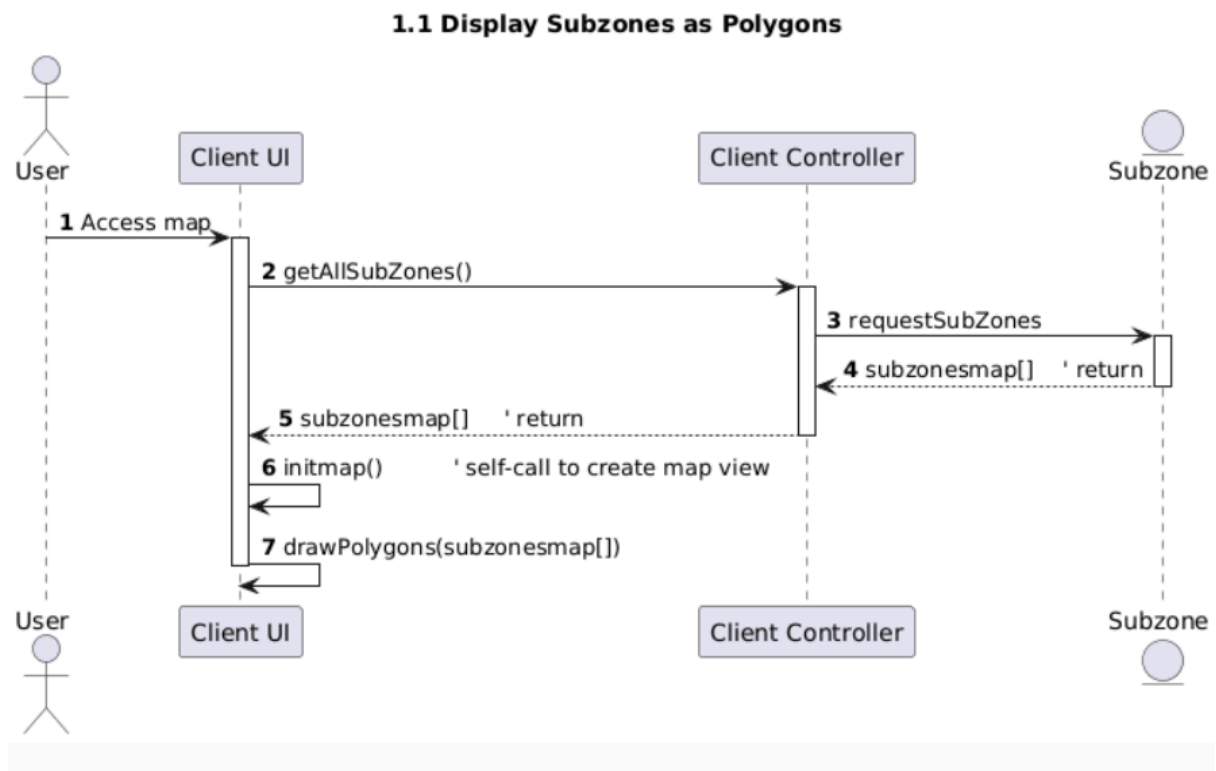
*If the image is unclear, please refer to the pdf file that is uploaded together with this document.*



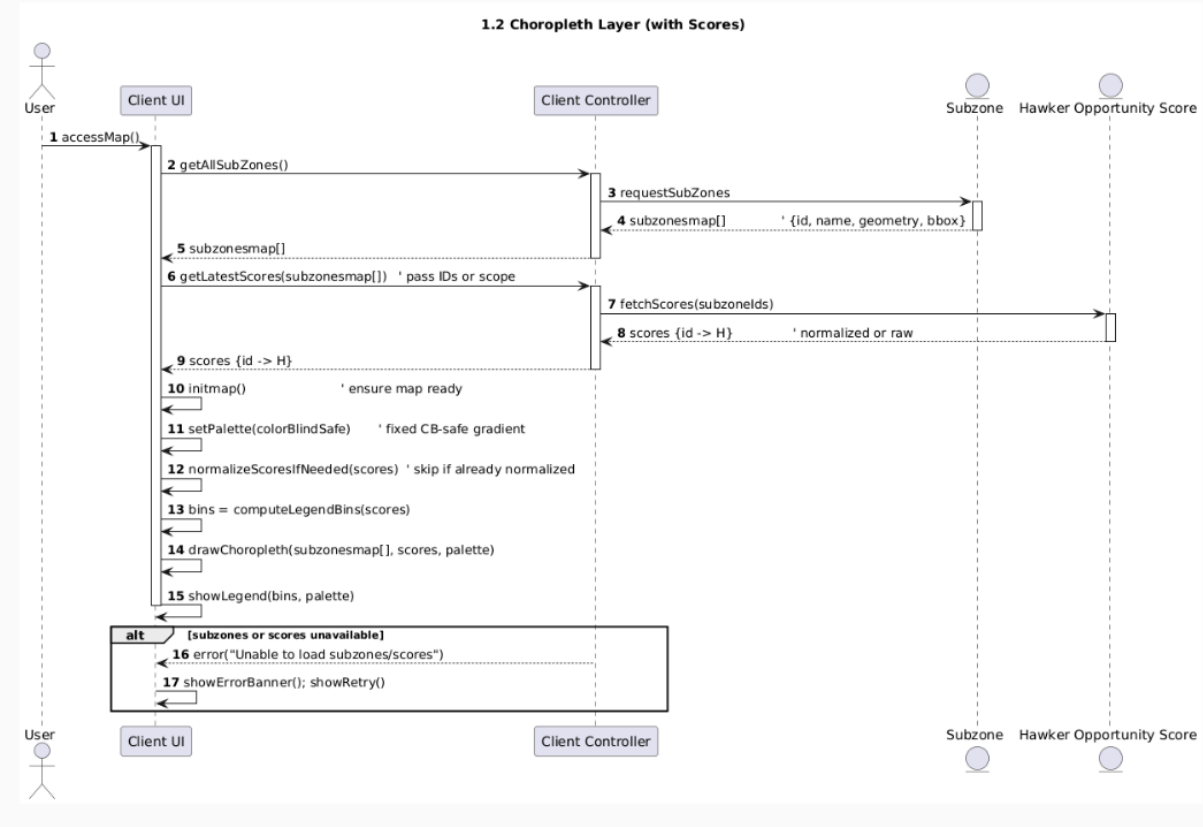
## 4. Sequence Diagrams of Use Cases

### I. For Use Cases Under 1. ( Display map )

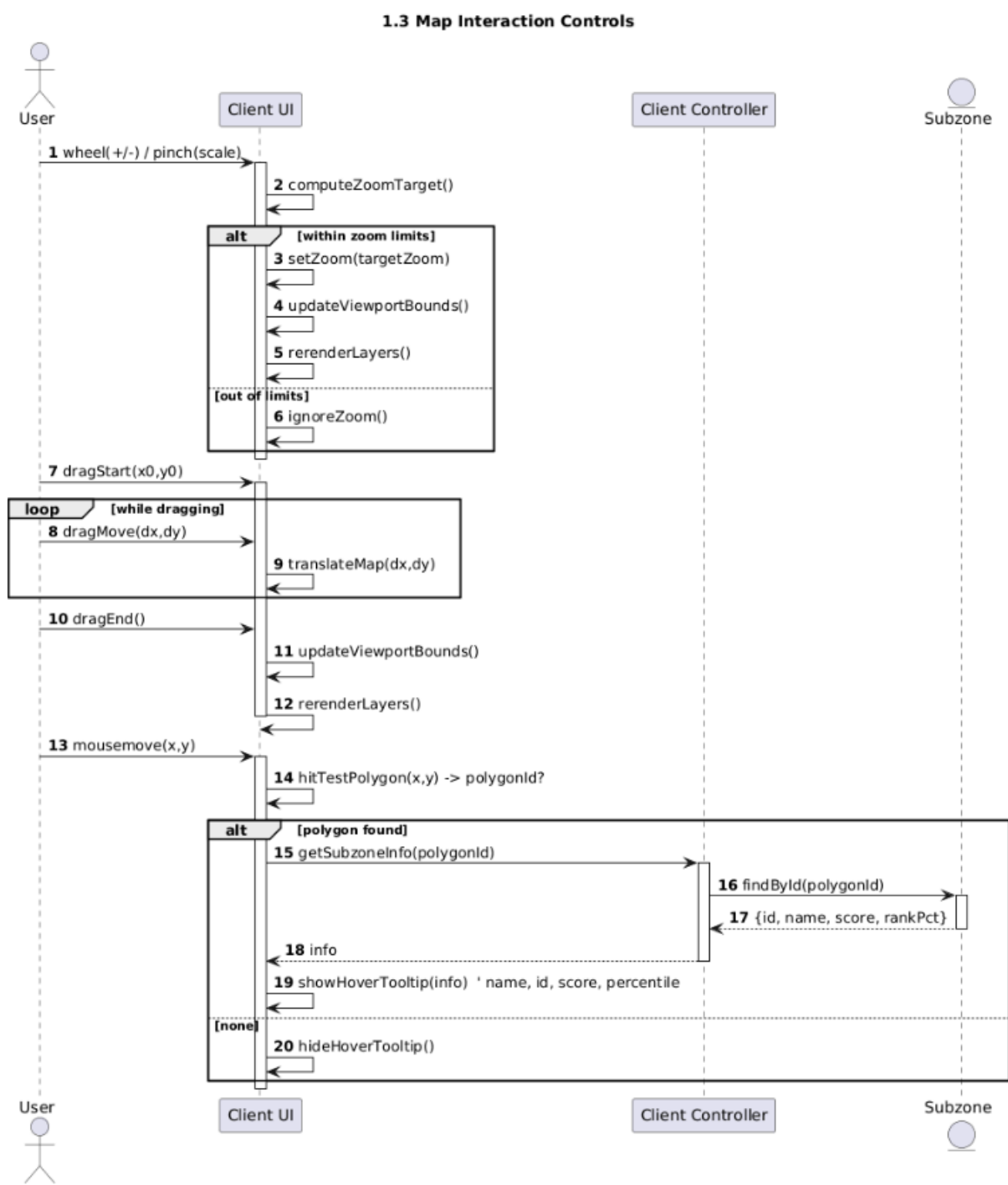
#### 1.1 DisplaySubzones



## 1.2 Choropleth layer

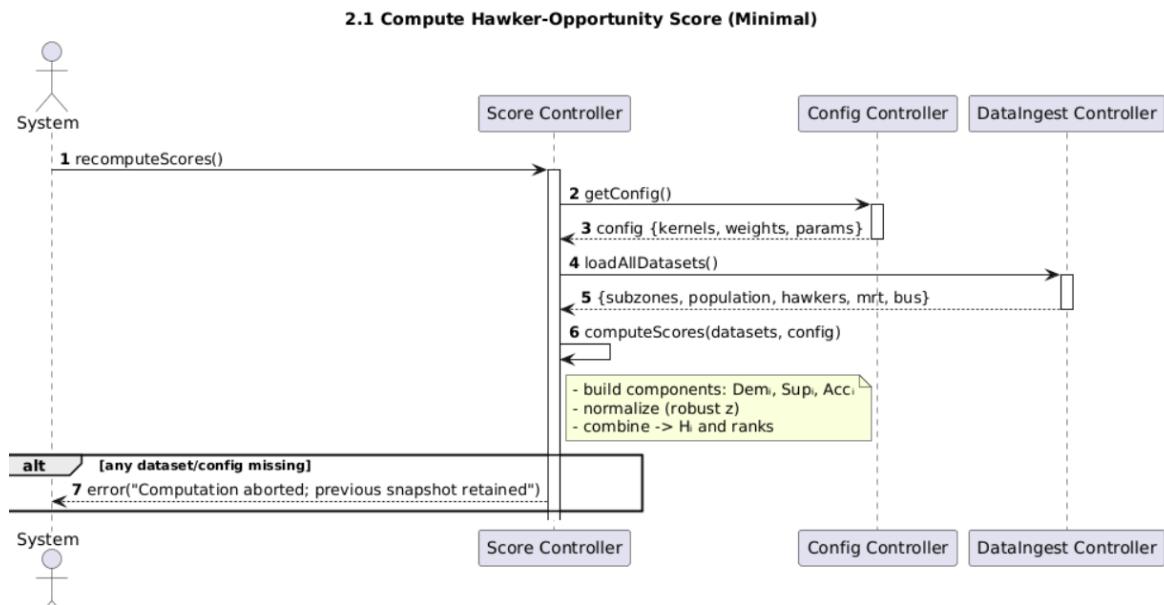


## 1.3 MapInteractionControls

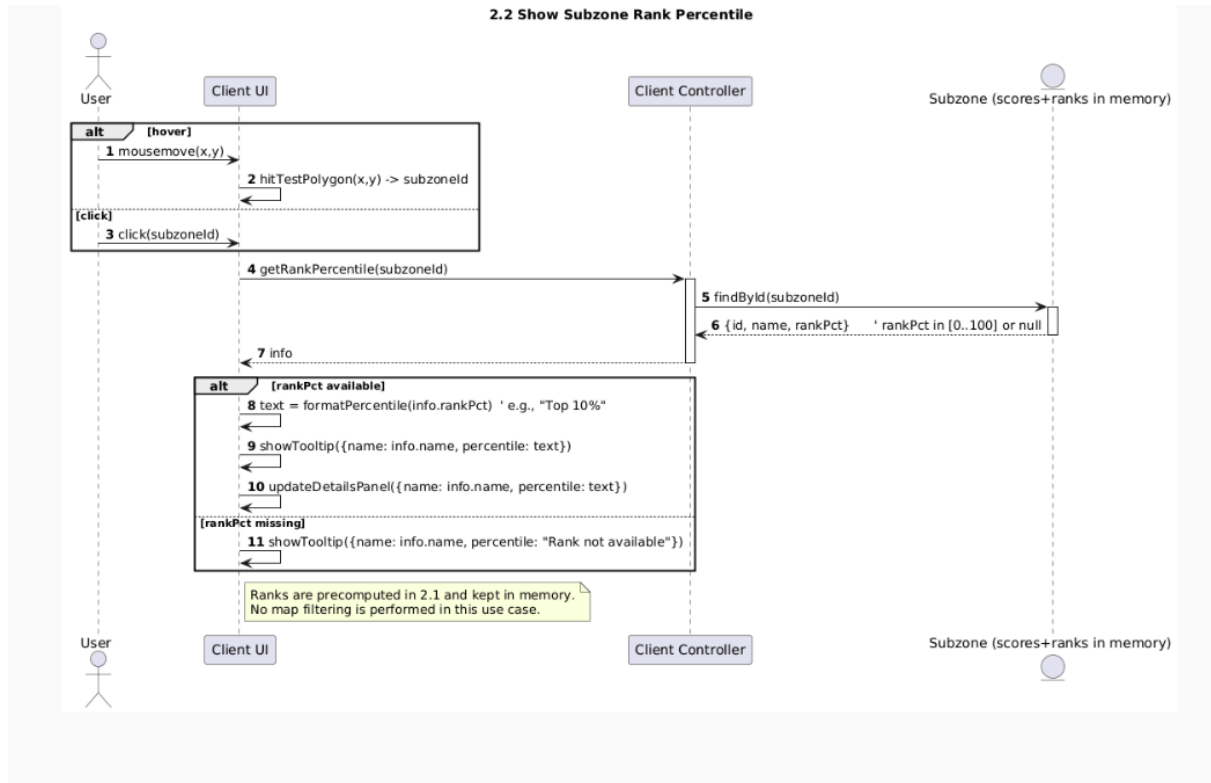


## II. For Use Cases Under 2. ( Display score and percentile )

### 2.1 Hawker-Opportunity Score



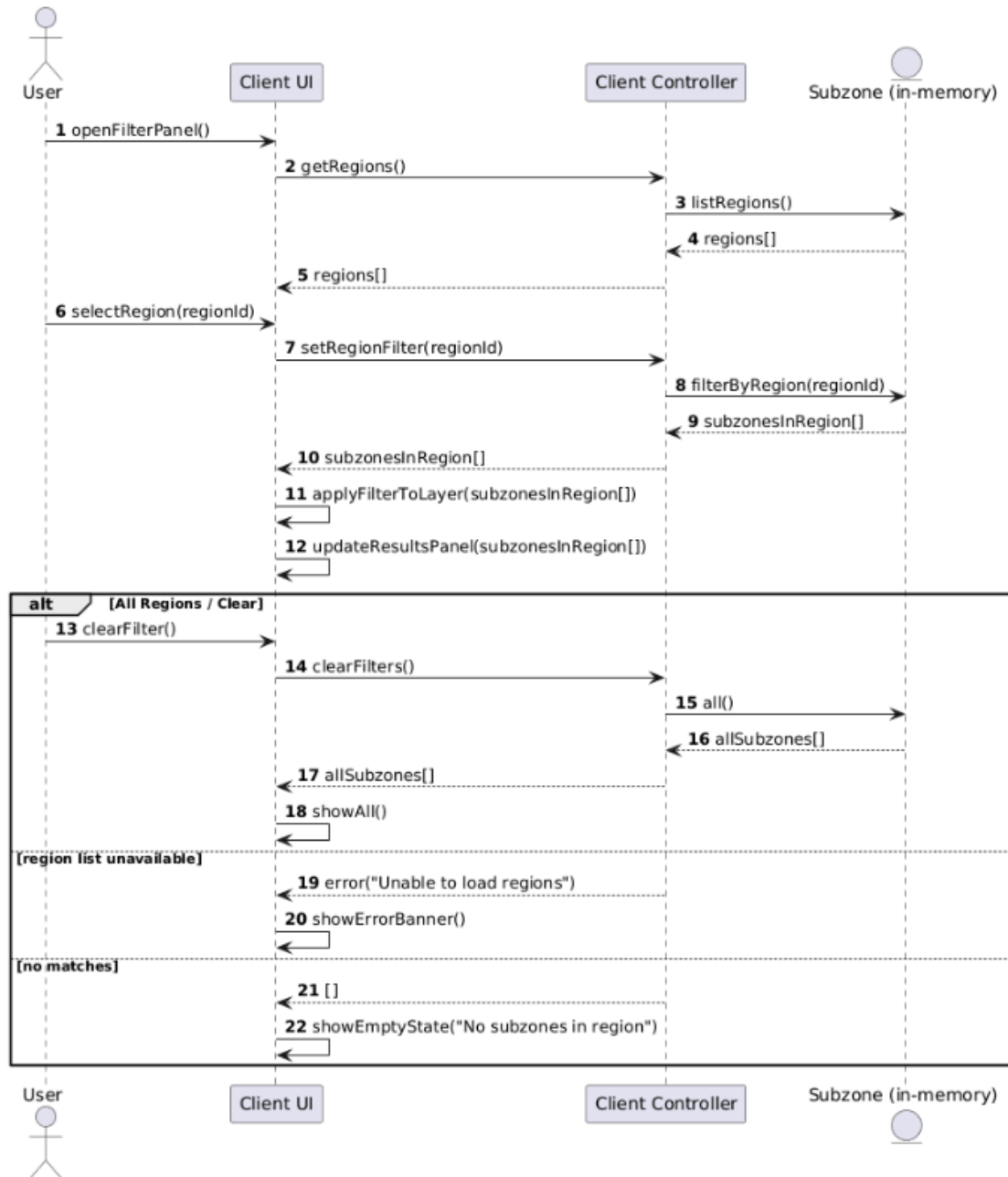
## 2.2 ShowSubzoneRankPercentile



### III. For Use Cases Under 3. ( Filtering and search)

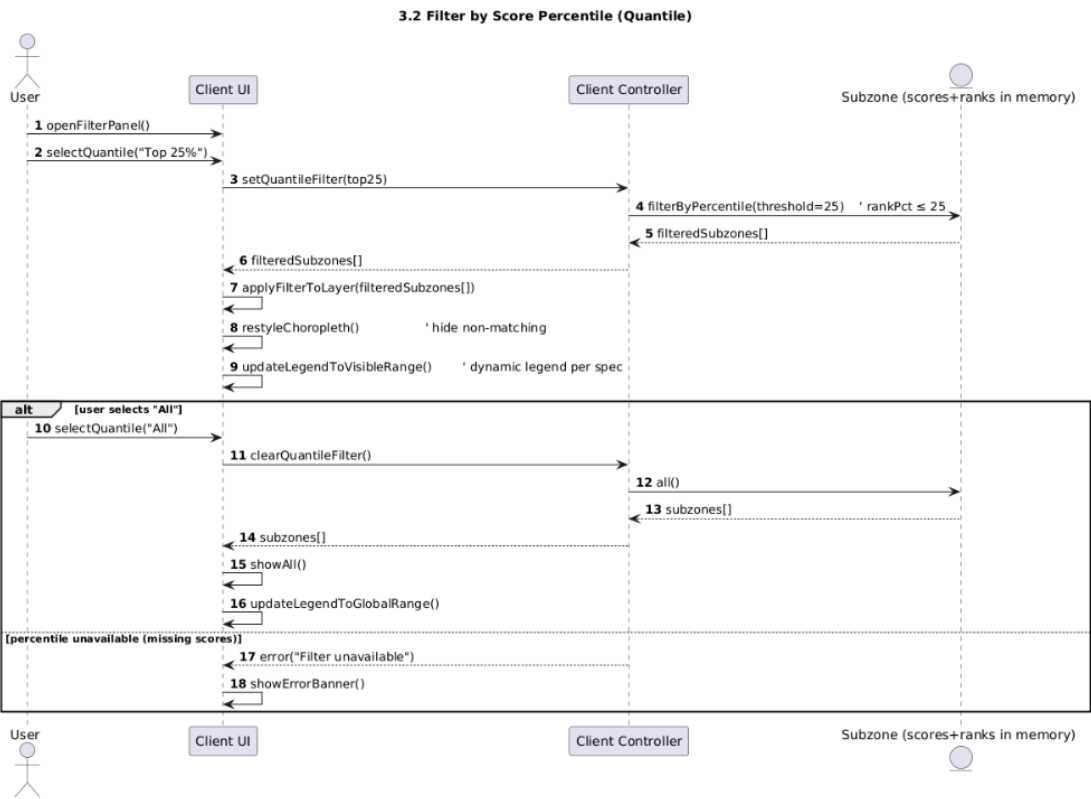
#### 3.1 FilterByGeography

3.1 Filter by Region (dropdown)



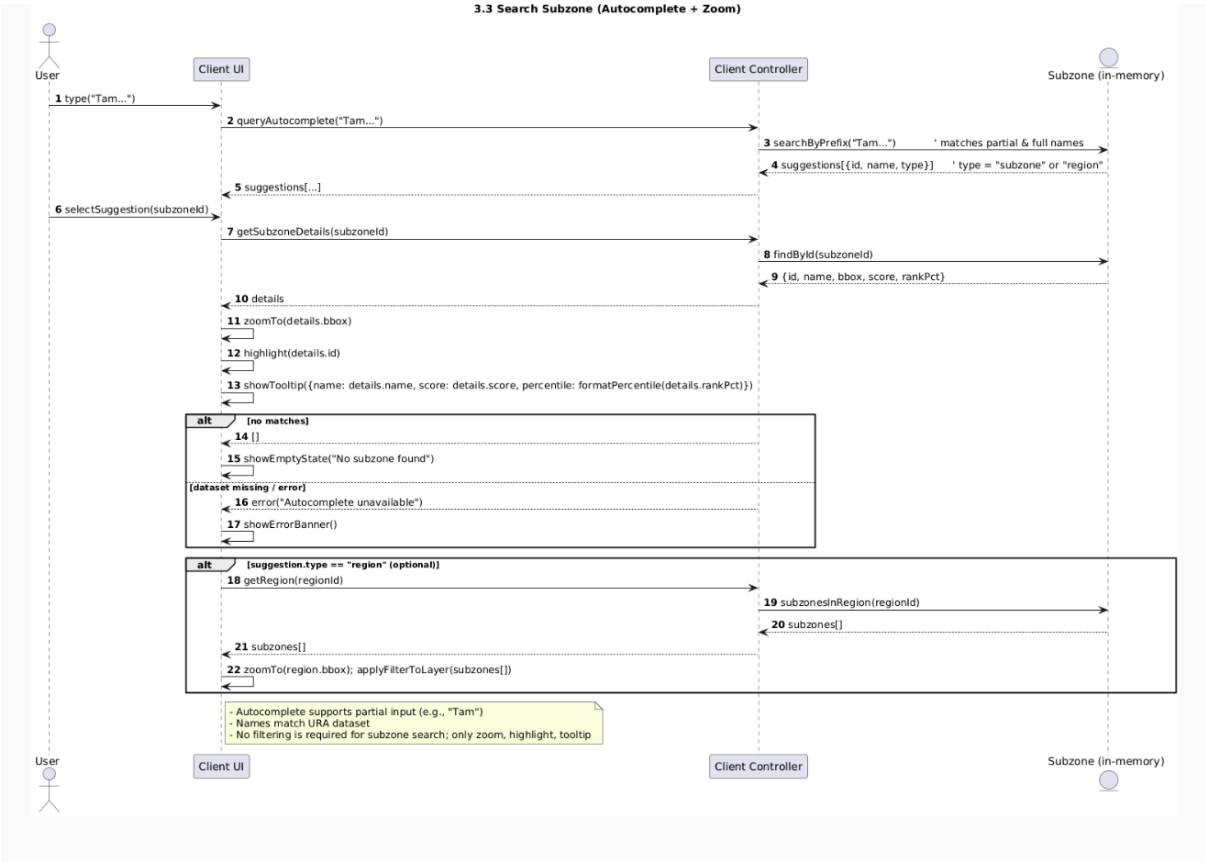


### 3.2 FilterByScoreQuantile



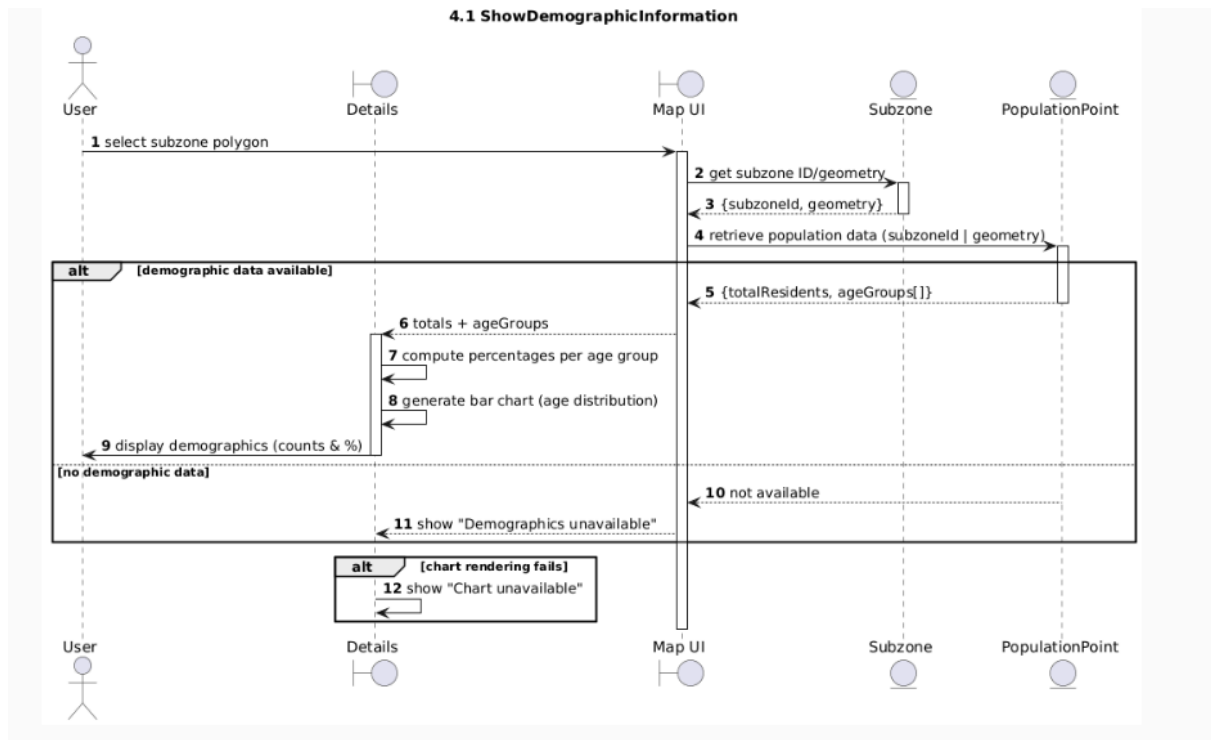
### 3.3 SearchBySubzoneName

#### 3.3 Search Subzone (Autocomplete + Zoom)

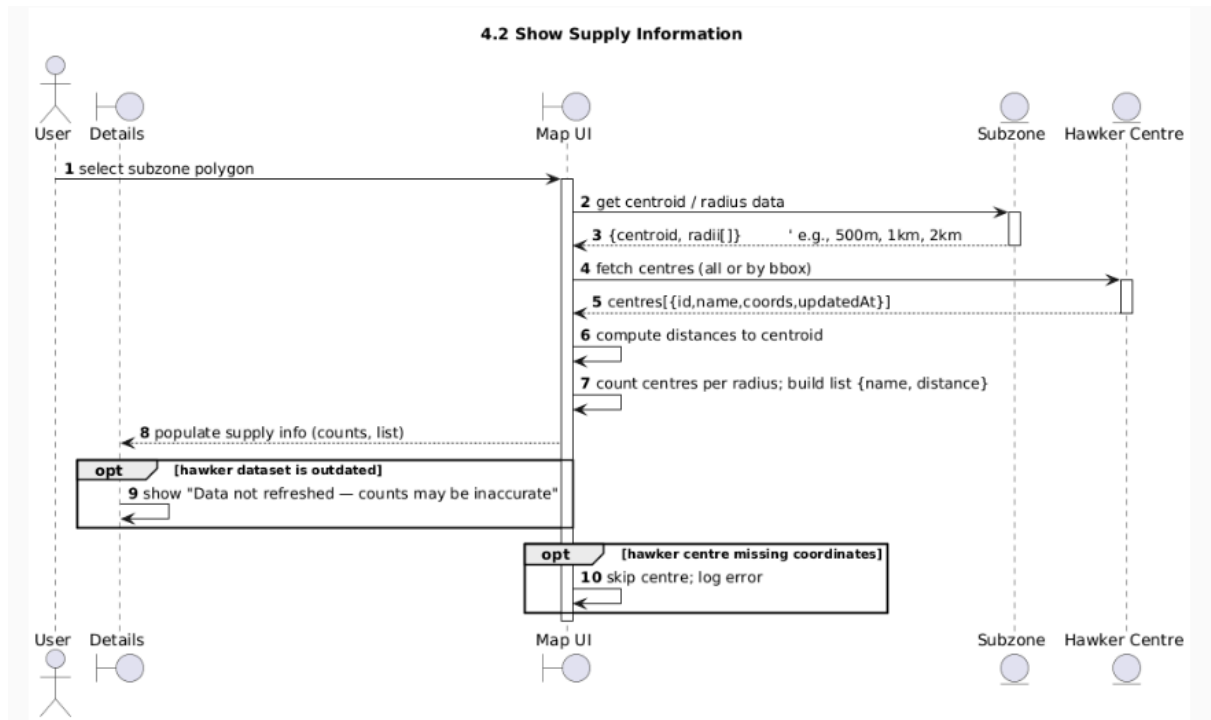


## IV. For Functional Requirement #4.

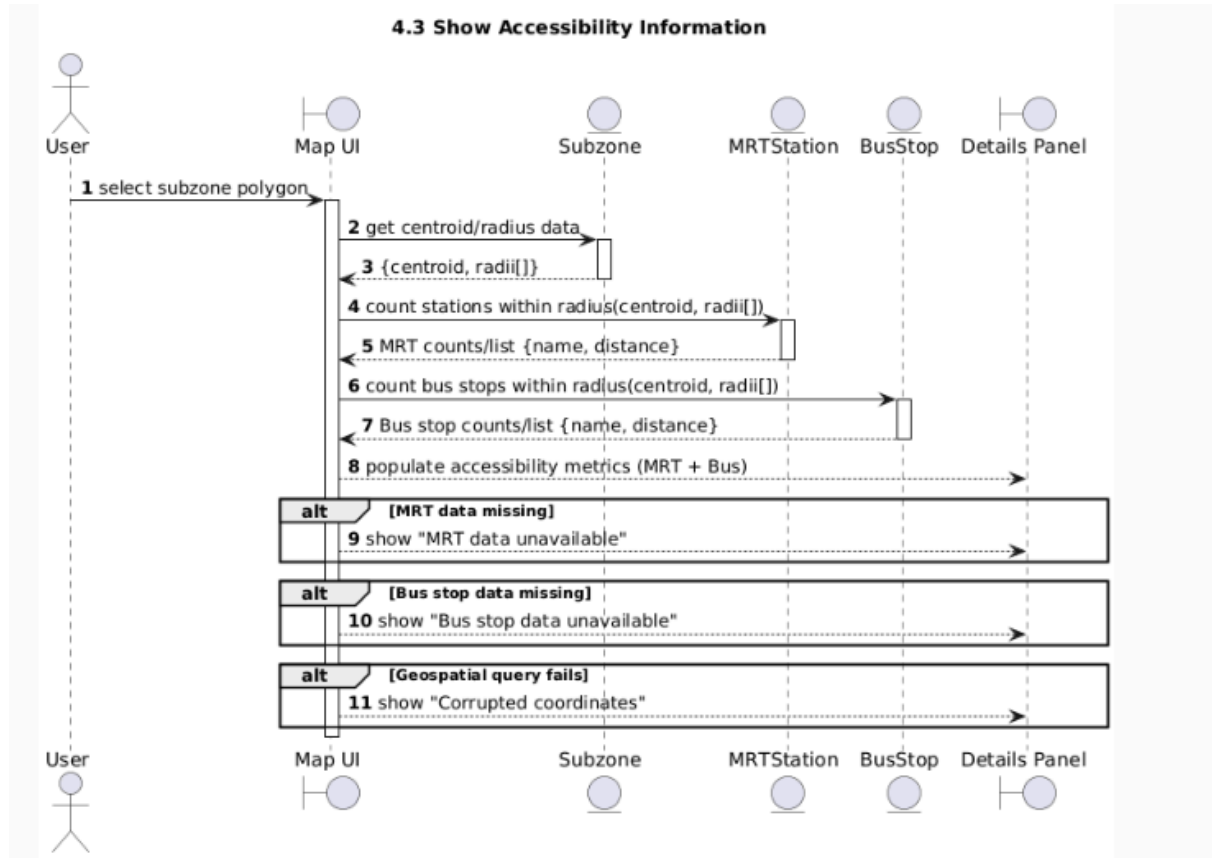
### 4.1 Show Demographic Information



## 4.2 ShowSupplyInformation

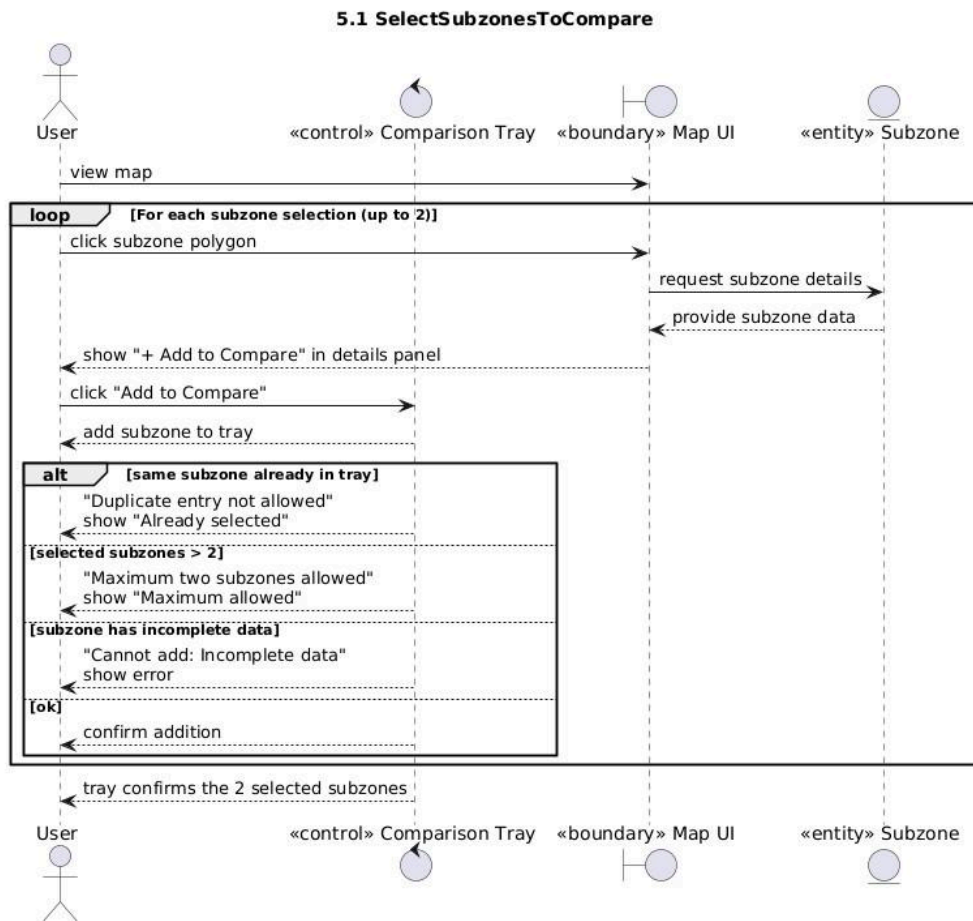


### 4.3 ShowAccessibilityInformation

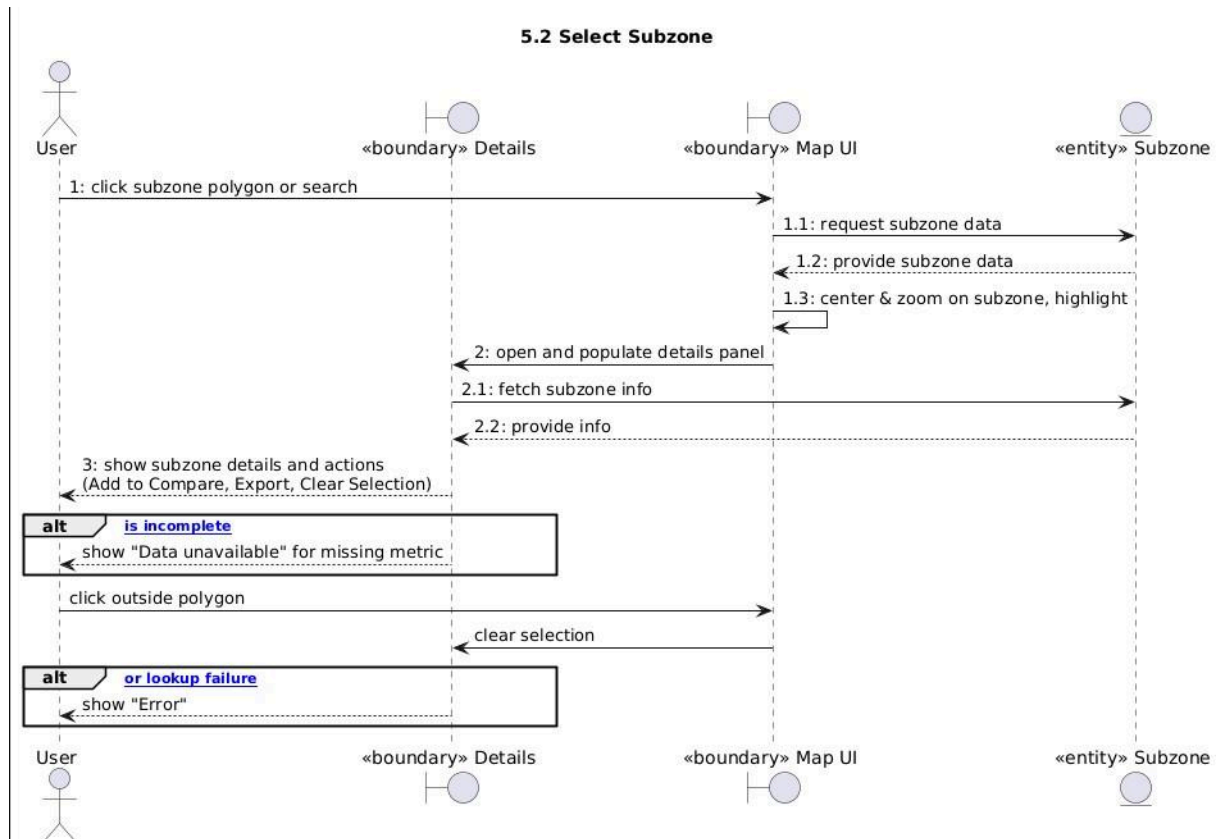


## V. For Functional Requirement #5

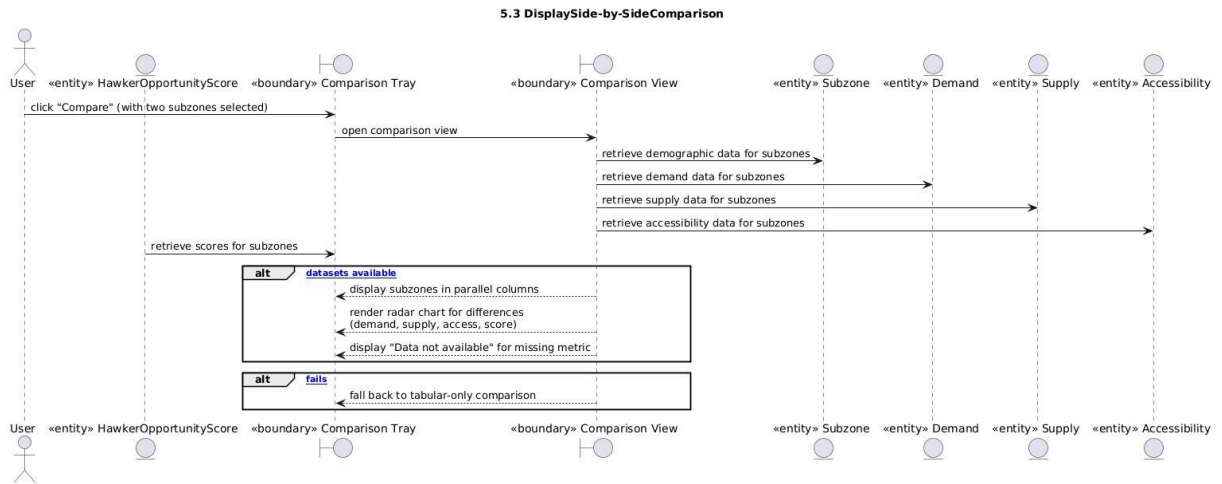
### 5.1 SelectSubzonesToCompare



## 5.2 SelectSubzone



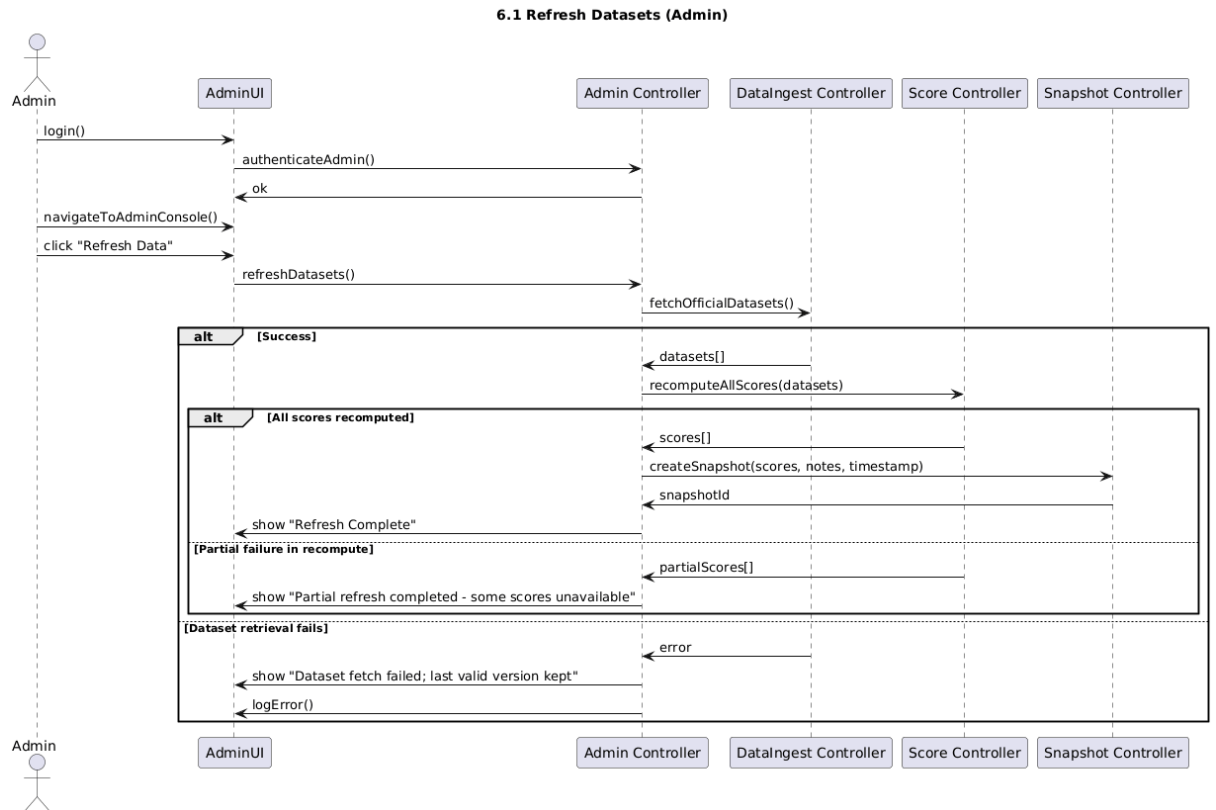
## 5.3 Display Side-by-Side Comparison





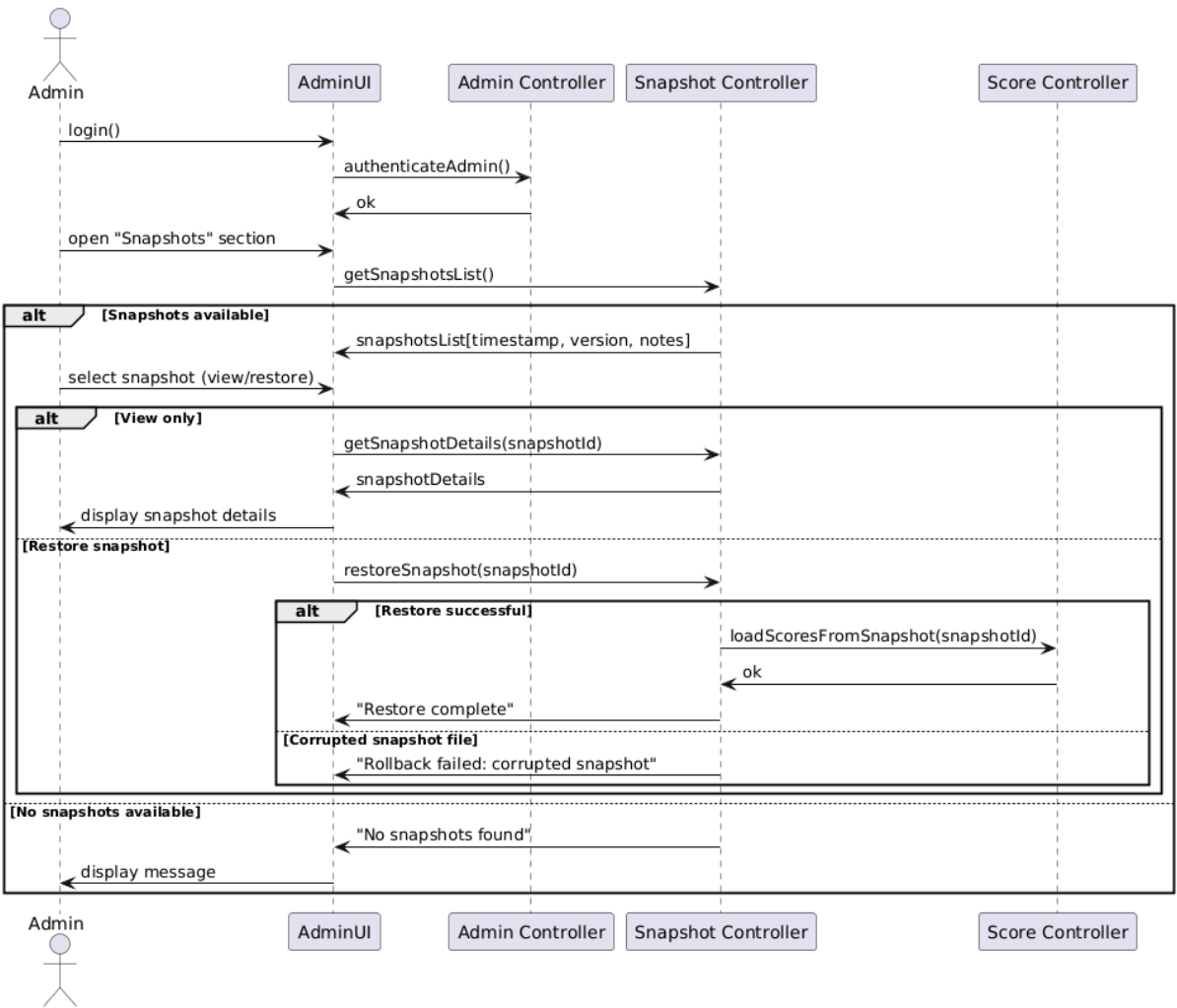
## VI. For Functional Requirement #6

### 6.1 RefreshDatasets (Admin)



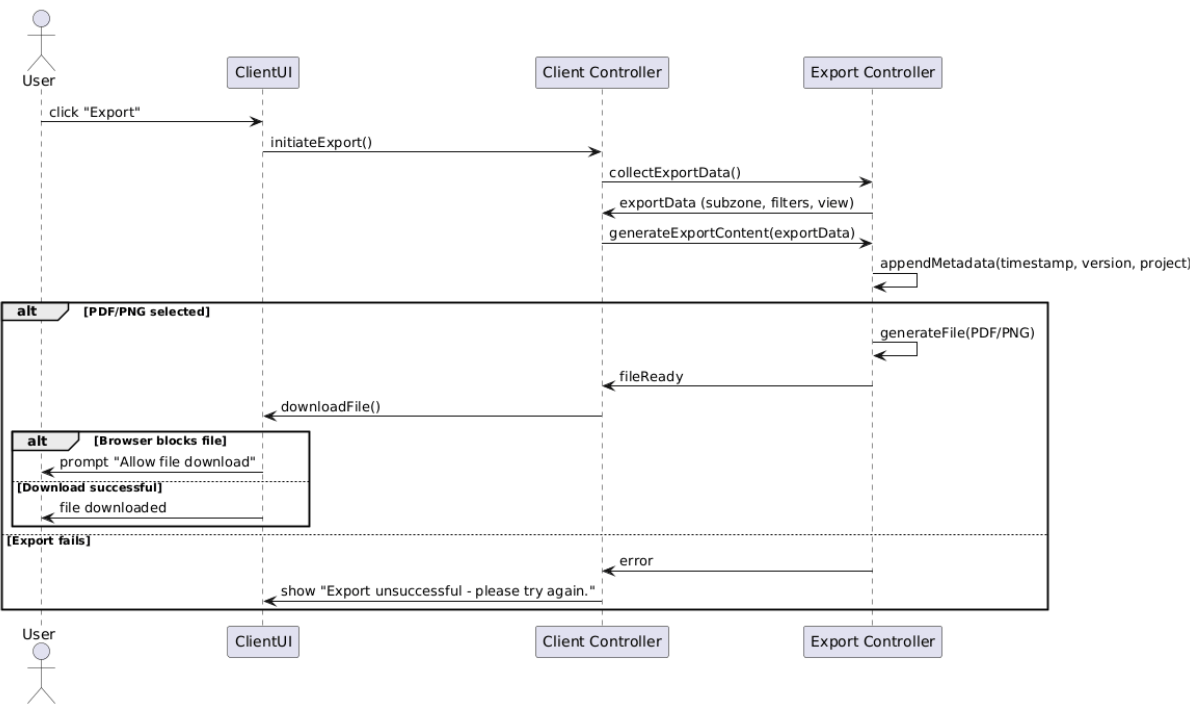
## 6.2 ManageSnapshots (Admin)

6.2 Manage Snapshots (Admin)



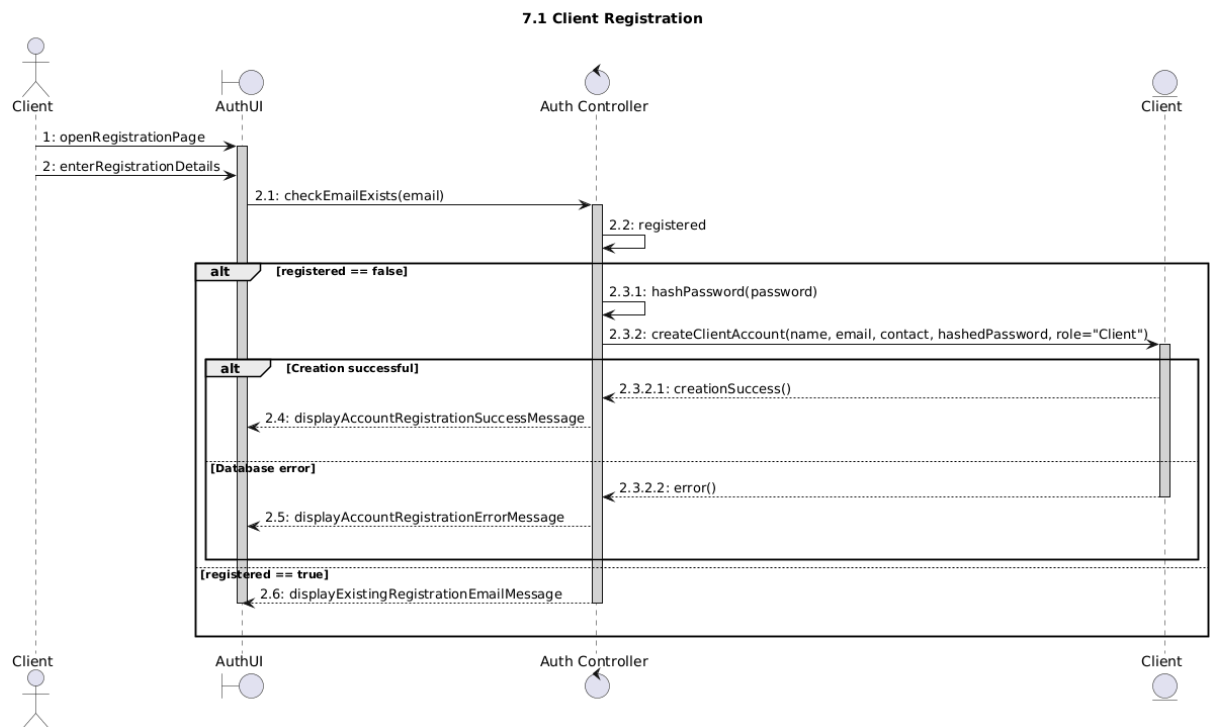
### 6.3 ExportMapSubzone

6.3 Export Map Subzone



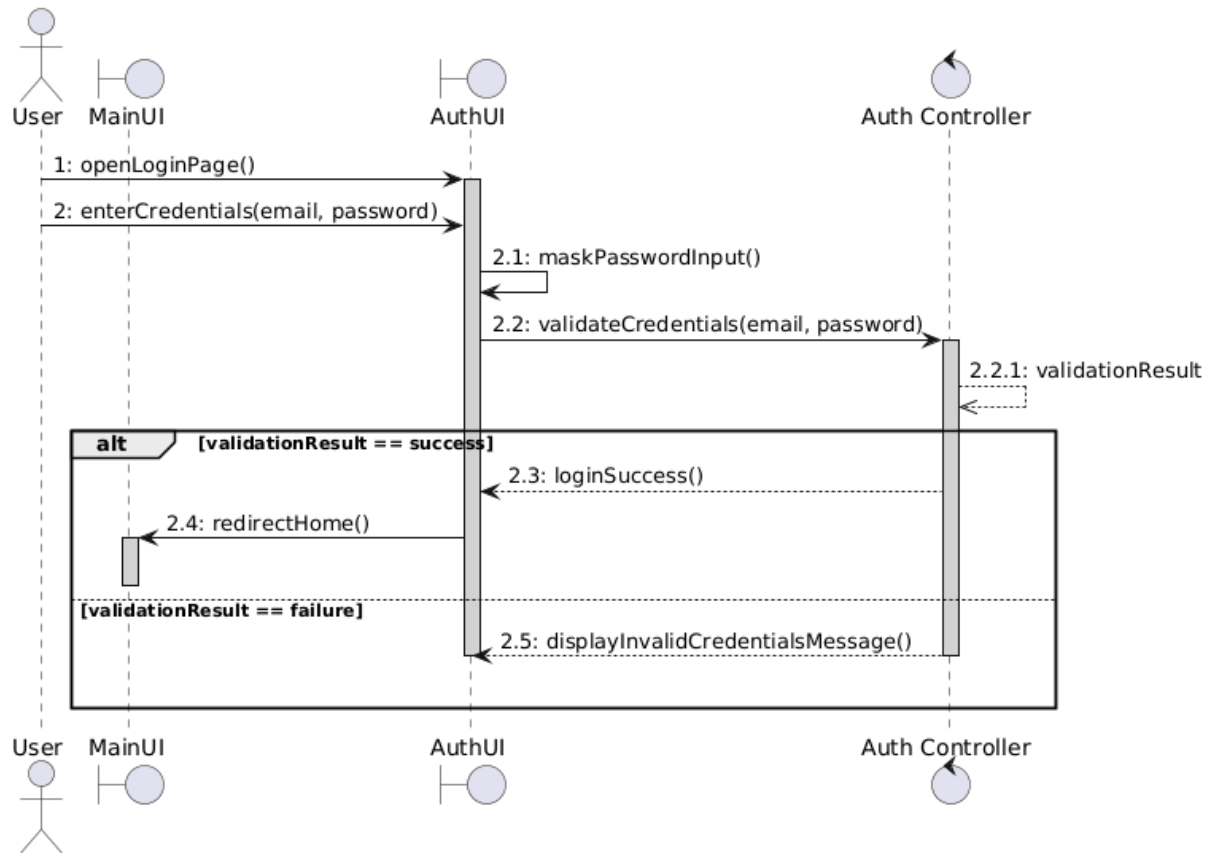
## VII. For Functional Requirement #7

### 7.1 ClientRegistration



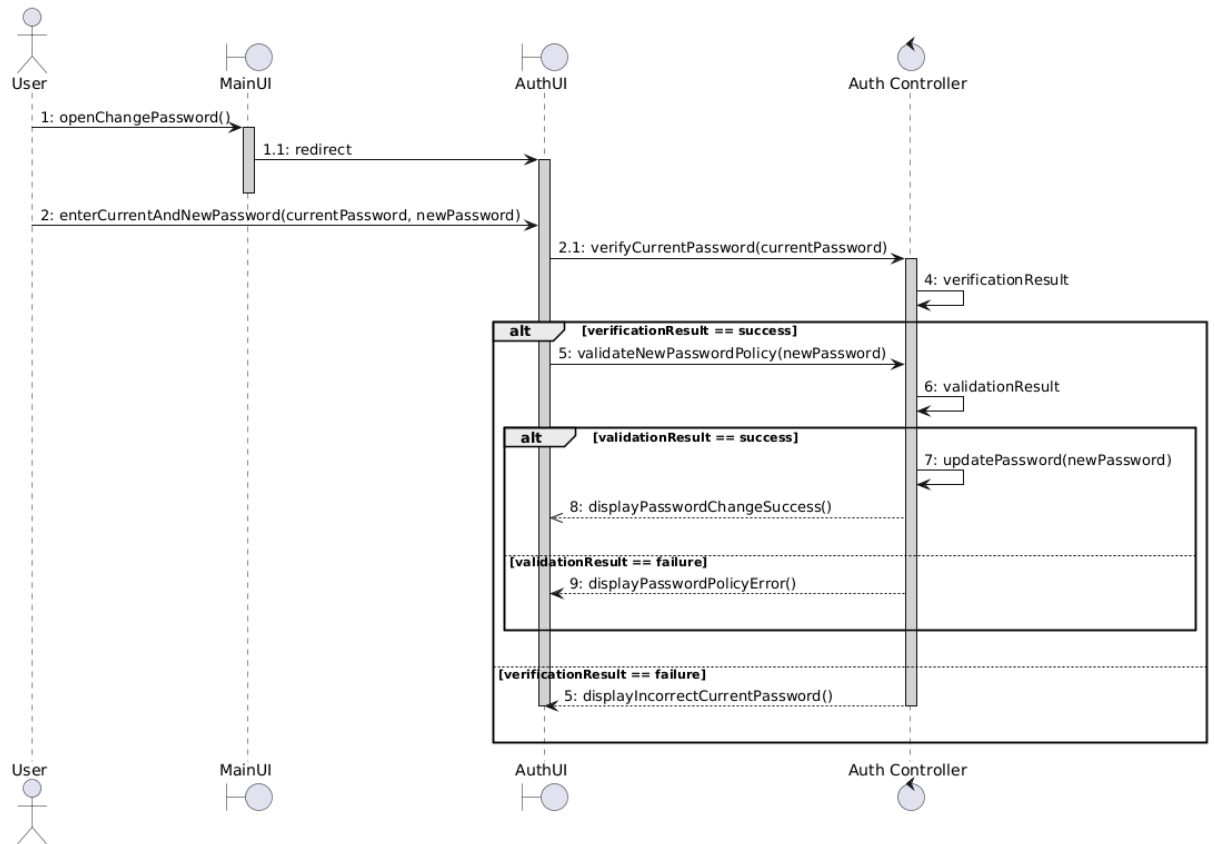
## 7.2 UserLogin

### 7.2 User Login



## 7.3 PasswordManagement

### 7.3 Password Management



## 5. Initial Dialog Map

If the image is unclear, please refer to the png file that is uploaded together with this document.

