Layer Naming and Labelling

The following list defines the required layer names included in the provided template. Each layer represents a specific type of space or element, and the corresponding geometries must be assigned to the correct layer. This consistent labelling is essential for enabling the app to analyse building spaces and apply the machine learning models for predicting satisfaction. To ensure correct recognition, always use the template and keep the layer names exactly as specified.

Layer Name	Description	Geometry Type
COMMERC	Commercial or office space	Closed Brep / Closed Polysurface
RESID_1, RESID_2, RESID_3 *	Residential units with 1, 2, 3+ bedrooms	Closed Brep / Closed Polysurface
CORE	Circulation spaces (e.g., stairs, lifts, corridors)	Closed Brep / Closed Polysurface
SOCIAL_L1, SOCIAL_L2, SOCIAL_L3, SOCIAL_L4_RESID, SOCIAL_L4_COMMERC **	Indoor social spaces by level of accessibility	Closed Brep / Closed Polysurface
SOCIAL_OUTDOOR_ALL, SOCIAL_OUTDOOR_COMMERC, SOCIAL_OUTDOOR_RESID	Outdoor social areas that are either shared by residents and workers or restricted to only one group	Surface
WINDOWS	Window glazing	Surface
BALCONIES	Private outdoor balconies	Surface
CONTEXT	Surrounding buildings and the site's ground surface	Any
STREET_BUSY, STREET_LOCAL	Busy/ high-traffic or local/low-traffic streets	Line
GREEN	External green or water bodies that are not part of the building	Surface

* The number following RESID_ indicates the number of bedrooms in the apartment assigned to that layer. For example:

- RESID_1 → 1-bedroom unit
- RESID_2 → 2-bedroom unit
- RESID_3 → 3-bedroom unit

If the apartment has more than three bedrooms, create a new layer using the same naming convention. For instance, a 4-bedroom unit should be assigned to a layer named RESID_4.

** These spaces are categorised into different levels of accessibility according to the research framework. See detailed descriptions below:

- SOCIAL L1 – Publicly Accessible with Services. Open to the public and activated by commercial amenities such as cafés or retail (e.g., atriums with cafés, podium terraces).

- SOCIAL L2 – Publicly Accessible without Services. Publicly accessible spaces without amenities, often quieter and used for informal gathering (e.g., library reading areas, public terraces).

- SOCIAL L3 – Semi-Public (Building Occupants Only). Accessible only to residents, office workers, or tenants. Shared spaces for internal interaction (e.g., communal lounges, shared breakout areas).

- SOCIAL L4 – Semi-Public (Designated Group of Occupants). Restricted to a specific group of occupants, often specialised spaces (e.g., gyms, private lounges, exclusive resident facilities)

- The 3D model must follow EnergyPlus conventions.

- The app does not currently support curved surfaces. Any curved geometry must be approximated as flat faces before uploading the model for analysis.

- Each thermal zone should be modelled as a separate closed volume.

- Windows should be drawn as individual surfaces adjacent to exterior walls with correct offsets.

Initiating Studies
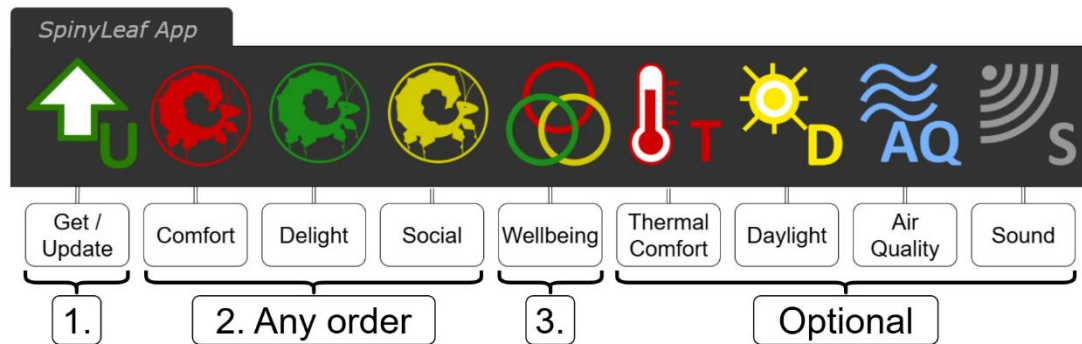
1. Get / Update Model

- **Icon**: Green and white upward arrow.
- **Function**: Uploads the 3D model geometry into the app.
- Click again anytime after editing the geometry to refresh the model.

2. Dimensions (any order)

- These buttons open the setup and simulation interfaces for each wellbeing dimension.
    - **Comfort** (Red icon)
    - **Delight** (Green icon)
    - **Social** (Yellow icon)
- **Function**: Define parameters and run analyses for each dimension.
- **Requirement**: All three must be completed before running the overall wellbeing study.

3. Wellbeing Fostered by Design

- **Icon**: Three interlocking coloured circles.
- **Function**: Combines Comfort, Delight, and Social results into a single wellbeing assessment.
- **Requirement**: Only available after all three dimensions are completed.

4. Optional Comfort Sub-Studies: Helpful for quick testing and adjustments.

- These buttons allow focused simulations related to the Comfort dimension.
    - **Thermal Comfort** (Thermometer icon)
    - **Daylight** (Sun icon)
    - **Air Quality** (Waves icon)
    - **Sound** (Radar icon)
- **Function**: Run specific environmental studies without processing the full Comfort workflow.

Comfort Dimension Tab

1. **Select Climate Data**
   - Choose from the preloaded climate datasets, or
   - Upload a custom ZIP file containing EPW, DDY, and STAT files.

2. **Choose Glazing Type**
   - Select one of the predefined glazing options (single, double, or triple glazing with different U-values and SHGC).

3. **Select External Construction**
   - **AAC_Insul_Plasterboard** (AAC + insulation + plasterboard), or
   - **Metal_Insul_AAC** (metal + insulation + AAC).
   - Adjust insulation values for walls, roof, and ground using sliders.

4. **Set Acoustic Parameters**
   - **Floor finish**: Wood tiles (low absorption) or Carpet (high absorption).
   - **Ceiling finish**: Plasterboard or Acoustic tiles.

5. **Additional Settings**
   - Define window operability for commercial spaces.
   - Enter estimated number of occupants.

6. **Generate Model**

  o Click **Get/Update Model** to create the HBJSON model.

  o A table of room attributes (name, floor, area, bedrooms, balcony, occupants) will appear.

  o A summary of the chosen materials and settings will be listed.

7. **Run Simulations**

  o When ready, click **Run Comfort Dimension Study**.

  o The tool will run thermal, daylight, air quality, and acoustic analyses. This may take several minutes to complete.

  o Results will be displayed in the app.

Delight Dimension Tab
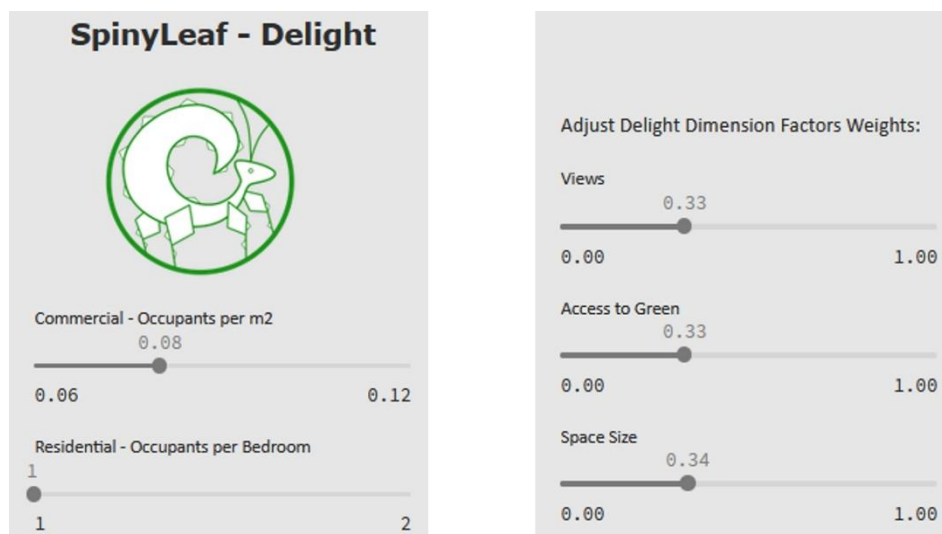
1. **Open Delight Dimension**

  • Click the **green button** (Delight icon) in the toolbar.

2. **Enter Required Inputs**

  • **Occupancy**: The occupancy data is used to compute occupant density in apartment units, which informs the evaluation of satisfaction with perceived space size

    o For offices → enter occupants per square metre.

- o   For apartments → enter occupants per bedroom.
- **Weighting**:
  - o   Assign a weighting to each factor for the overall Delight score.
  - o   Each factor starts with equal weight (score scale 0–2). You can adjust weights to reflect design priorities or site constraints.
  - o   If one factor's weight is reduced (e.g., limited access to views), the tool automatically redistributes the remaining weight across the other factors so the total stays at 100%. Therefore, the designer must prioritise the remaining factors in the design to help mitigate the lack of the reduced one.
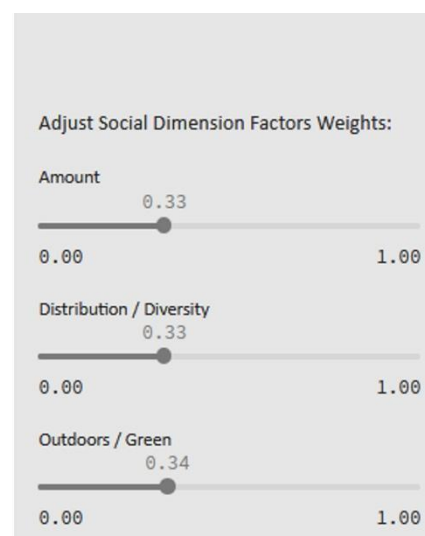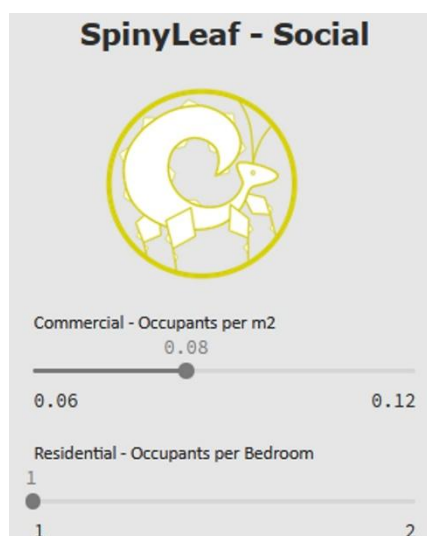
3. **Model Preparation**
   - Click **Get/Update Model** to generate and display the 3D model with current settings.

4. **Run Delight Study**
   - Click **Run Delight Dimension Study** to calculate all Delight-related factors.
   - The tool will automatically extract values for:
     - o   Access to views
     - o   Greenery
     - o   Balconies
     - o   Perceived space size (using occupancy density)

Social Dimension Tab

1. **Open Social Dimension**

   - Click the **yellow button** (Social icon) in the toolbar.

2. **Enter Required Inputs**

   - **Occupancy**: The occupancy input is used to calculate all metrics within the Social dimension, including the availability, distribution, and accessibility of communal and green spaces.

     o For offices → enter occupants per square metre.

     o For apartments → enter occupants per bedroom.

   - **Weighting**:

     o Each factor starts with equal weight (score scale 0–2). You can adjust weights to reflect design priorities or site constraints.

     o If one factor is reduced, the tool redistributes the weight across the others. Designers should prioritise the remaining factors in the design to mitigate the reduced one.
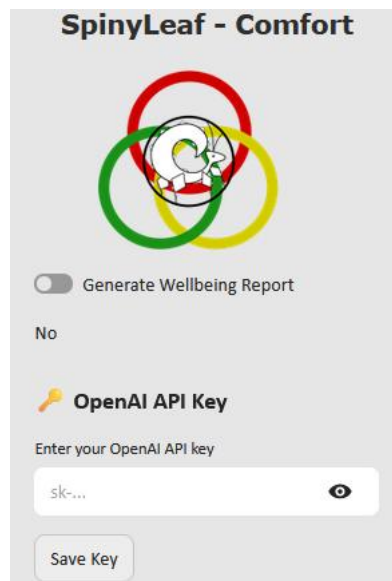
3. **Model Preparation**

   - Click **Get/Update Model** to process the geometry and display the updated 3D model.

4. **Run Social Study**

   - Click **Run Social Dimension Study** to calculate Social metrics, including:

     o Availability of communal and green spaces

     o Distribution/diversity of social spaces (variety of social levels – SL1, SL2, etc)

Wellbeing Fostered by Design (WFD) Tab

1. **Open WFD Study:** This option is only available after completing **Comfort**, **Delight**, and **Social** studies.
    *   Click the **icon with three interconnected circles** in the toolbar.

2. **Choose Report Option**:
    *   In the sidebar, select whether to generate a report at the end of the study:
    *   **Lite Version** → uses GPT-4 via OpenAI's API (requires personal API key).
    *   **Offline Version** → runs locally with LLaMA3 (no key, larger size, slower report generation).

3. **Model Preparation**
    *   Click **Get/Update Model** to prepare the geometry.

4. **Run WFD Study**
    *   Click **Run Wellbeing Fostered by Design Study**.
    *   The tool retrieves and displays the **scores from all three dimensions**.