

SAFER Expert Questionnaire

Content Validity and Dimension Prioritization

Survey form

SAFER-EXP-01

Expert code

Date completed

Questionnaire
round

☐ Round 1 ☐ Round 2

Study title

A Multi-Dimensional Resilience Assessment Framework for Indoor Aging-Friendly Environments: LLM-Assisted Indicator Construction Using Google Gemini Pro

Purpose. This questionnaire asks specialists to evaluate the importance of indicators in the SAFER framework and to prioritize its five dimensions: Spatial, Adaptive, Functional, Environmental, and Responsive. Your responses will support aggregate content-validity assessment and AHP dimension weighting.

What you will do

- Complete a short professional-background section.
- Rate each indicator from 1 (not important) to 5 (extremely important).
- Compare the relative importance of the five SAFER dimensions.
- Add comments where wording, measurability, scope, or duplication needs attention.

Confidentiality

Use only the expert code assigned by the research team. Do not write your name, email address, employer, or other identifying information on this form. Responses will be analyzed and reported in aggregate.

Estimated completion time: 25–35 minutes

Return date: _____

Research-team use: form received

☐ Complete ☐ Follow-up needed

Section A. Consent to Participate

Please mark one response for every statement. If you select No for any item, do not continue with the questionnaire.

Consent statement	Yes	No
I have read the study information and understand the purpose of this expert questionnaire.	☐	☐
I understand that participation is voluntary and that I may stop before submission.	☐	☐
I understand that my responses will be anonymized and reported in aggregate form.	☐	☐
I consent to participate in this expert evaluation.	☐	☐

Expert code: _____

Date: _____

Section B. Expert Background

Please select the option that best describes your background. These fields are used only to describe panel composition.

B1. Primary discipline

- ☐ Building engineering
 ☐ Gerontology / geriatric care
 ☐ Occupational therapy
☐ Urban planning / aging-friendly design
 ☐ Environmental psychology
☐ Other: _____

B2. Relevant professional or research experience

- ☐ 0–4 years
 ☐ 5–9 years
 ☐ 10–14 years
 ☐ 15 years or more

B3. Main professional role

- ☐ Academic researcher
 ☐ Practitioner
 ☐ Policy / planning professional
☐ Clinical / care professional
☐ Other: _____

B4. Country or region of professional practice

B5. Experience with aging-friendly housing or indoor-environment assessment

- ☐ None
 ☐ Limited
 ☐ Moderate
 ☐ Extensive

B6. Experience with AHP or multi-criteria decision methods

- ☐ None
 ☐ Limited
 ☐ Moderate
 ☐ Extensive

Section C. Indicator Rating Instructions

Rate how important each indicator is for assessing resilience in an indoor aging-friendly residential environment. Mark one box per row.

Rating	Meaning
1	Not important
2	Slightly important
3	Moderately important
4	Important
5	Extremely important

Please consider: conceptual relevance to aging-friendly resilience; practical importance; measurability in residential settings; overlap with other indicators; and clarity of the operational definition. Use the comment line when you recommend modification or exclusion.

Dimension guide

Spatial	Layout, circulation, access, adjacency, and room-use flexibility.
Adaptive	Retrofit readiness, assistive-device support, fixture adjustment, and future modification.
Functional	Support for daily activities, bathing, toileting, kitchen use, rest, medication, sleep, and communication.
Environmental	Thermal, air, lighting, acoustic, humidity, ventilation, glare, and surface-safety conditions.
Responsive	Monitoring, emergency response, alerts, backup power, and low-effort security systems.

Dimension S: Spatial

9 indicators

ID	Indicator	Operational definition	1	2	3	4	5
S1	Circulation path width	Clear width of primary circulation routes $\geq$ 900 mm	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
S2	Level-change management	Number of unmitigated steps or abrupt level changes	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
S3	Floor surface continuity	Proportion of floor area with slip-resistant, continuous surface	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
S4	Turning radius adequacy	Availability of 1500 mm turning space in key activity zones	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
S5	Room adjacency logic	Proximity of bedroom to bathroom; travel distance $\leq$ 6 m	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
S6	Furniture arrangement flexibility	Proportion of wall area unobstructed for furniture reconfiguration	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
S7	Storage accessibility	Proportion of storage reachable within the 400–1200 mm height band	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
S8	Entry sequence safety	Presence of a covered, level approach with grab support at entry	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
S9	Spatial redundancy	Availability of alternative room-use configurations under functional decline	☐	☐	☐	☐	☐
Comment or suggested wording: _____							

Overall comments on this dimension:

Dimension A: Adaptive

10 indicators

ID	Indicator	Operational definition	1	2	3	4	5
A1	Grab rail provision	Installed or provision-ready grab rails in the bathroom, stairway, and entry	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
A2	Wet room convertibility	Ease of converting the existing bathroom to a wet-room format	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
A3	Assistive device storage	Dedicated, accessible storage space for mobility aids	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
A4	Structural reinforcement readiness	Wall reinforcement for future grab-rail installation	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
A5	Height-adjustable fixture provision	Kitchen-bench and washbasin height adjustability	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
A6	Threshold elimination capacity	Technical feasibility of eliminating existing thresholds	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
A7	Smart control interface	Compatibility with voice- or touch-based environmental control systems	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
A8	Ramp installation feasibility	Structural and spatial feasibility of ramp installation at entry	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
A9	Stairlift provision readiness	Staircase geometry compatible with stairlift installation	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
A10	Adaptive lighting control	Availability of adjustable, scene-programmable lighting systems	☐	☐	☐	☐	☐
Comment or suggested wording: _____							

Overall comments on this dimension:

Dimension F: Functional

9 indicators

ID	Indicator	Operational definition	1	2	3	4	5
F1	Bathing task support	Shower seating, hand-held showerhead, and anti-scald provision	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
F2	Toilet transfer support	Toilet height, bilateral grab-rail clearance, and transfer space	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
F3	Kitchen task accessibility	Appliance reachability, knee clearance, and slip-resistant surface	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
F4	Rest facility adequacy	Availability of intermediate seating in primary circulation routes	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
F5	Emergency egress capacity	Time to exit under a simulated mobility-limitation scenario	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
F6	Medication management support	Designated medication storage with visibility and accessibility	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
F7	Meal preparation continuity	Availability of seating and a task surface at the kitchen workstation	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
F8	Sleep environment quality	Bedroom noise isolation, blackout capacity, and temperature controllability	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
F9	Communication system access	Fixed telephone or intercom reachable from resting positions	☐	☐	☐	☐	☐
Comment or suggested wording: _____							

Overall comments on this dimension:

Dimension E: Environmental

10 indicators

ID	Indicator	Operational definition	1	2	3	4	5
E1	Thermal comfort range	Operative temperature maintained within 20–26°C year-round	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
E2	Thermal resilience under extreme heat	Ability to maintain < 32°C for 72 h without mechanical cooling	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
E3	Indoor air quality	PM _{2.5} and CO ₂ levels within WHO guideline thresholds	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
E4	Daylighting adequacy	Maintained illuminance ≥ 300 lux at task height in primary activity zones	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
E5	Acoustic isolation	Background noise level ≤ 35 dB(A) in bedroom and living areas	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
E6	Humidity control	Relative humidity maintained within 40–60% under normal operation	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
E7	Ventilation adequacy	Air change rate ≥ 0.5 ACH in occupied spaces	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
E8	Natural light access	Proportion of primary rooms with direct external glazing	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
E9	Surface temperature safety	Absence of surface temperatures > 43°C on accessible contact surfaces	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
E10	Glare control	Availability of adjustable shading at primary glazed openings	☐	☐	☐	☐	☐
Comment or suggested wording: _____							

Overall comments on this dimension:

Dimension R: Responsive

9 indicators

ID	Indicator	Operational definition	1	2	3	4	5
R1	Fall detection system	Installed or provision-ready automated fall detection in key rooms	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
R2	Emergency call system	Wired or wireless personal emergency-response system provision	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
R3	Remote health monitoring	Infrastructure support for wearable or ambient health monitoring	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
R4	Smoke and CO detection	Multi-zone smoke and carbon-monoxide detection with audible alerts	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
R5	Flood / leak detection	Water-intrusion detection in bathroom and kitchen areas	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
R6	Caregiver alert infrastructure	Communication pathway connecting the resident to a designated carer	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
R7	Power resilience provision	Battery backup or generator readiness for critical systems	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
R8	Medication reminder system	Automated or smart reminder provision for medication schedules	☐	☐	☐	☐	☐
Comment or suggested wording: _____							
R9	Security system adequacy	Door and window security with low-effort operation for older adults	☐	☐	☐	☐	☐
Comment or suggested wording: _____							

Overall comments on this dimension:

Section D. AHP Pairwise Comparison of SAFER Dimensions

Compare each pair of dimensions according to its relative importance for indoor aging-friendly resilience assessment. Mark exactly one box for each pair.

Value	Interpretation
1	Equal importance
3	Moderate importance
5	Strong importance
7	Very strong importance
9	Extreme importance
2, 4, 6, 8	Intermediate judgments

Spatial		Adaptive
Mark one box only. Values to the left favor Spatial; values to the right favor Adaptive.		
☐ 9	☐ 8	☐ 7
☐ 6	☐ 5	☐ 4
☐ 3	☐ 2	☐ 1
☐ 2	☐ 3	☐ 4
☐ 5	☐ 6	☐ 7
☐ 8	☐ 9	
Optional rationale: _____		

Spatial		Functional
Mark one box only. Values to the left favor Spatial; values to the right favor Functional.		
☐ 9	☐ 8	☐ 7
☐ 6	☐ 5	☐ 4
☐ 3	☐ 2	☐ 1
☐ 2	☐ 3	☐ 4
☐ 5	☐ 6	☐ 7
☐ 8	☐ 9	
Optional rationale: _____		

Spatial		Environmental
Mark one box only. Values to the left favor Spatial; values to the right favor Environmental.		
☐ 9	☐ 8	☐ 7
☐ 6	☐ 5	☐ 4
☐ 3	☐ 2	☐ 1
☐ 2	☐ 3	☐ 4
☐ 5	☐ 6	☐ 7
☐ 8	☐ 9	
Optional rationale: _____		

Spatial		Responsive
Mark one box only. Values to the left favor Spatial; values to the right favor Responsive.		
☐ 9	☐ 8	☐ 7
☐ 6	☐ 5	☐ 4
☐ 3	☐ 2	☐ 1
☐ 2	☐ 3	☐ 4
☐ 5	☐ 6	☐ 7
☐ 8	☐ 9	
Optional rationale: _____		

Adaptive		Functional
Mark one box only. Values to the left favor Adaptive; values to the right favor Functional.		
☐ 9	☐ 8	☐ 7
☐ 6	☐ 5	☐ 4
☐ 3	☐ 2	☐ 1
☐ 2	☐ 3	☐ 4
☐ 5	☐ 6	☐ 7
☐ 8	☐ 9	
Optional rationale: _____		

Adaptive		Environmental
Mark one box only. Values to the left favor Adaptive; values to the right favor Environmental.		
☐ 9	☐ 8	☐ 7
☐ 6	☐ 5	☐ 4
☐ 3	☐ 2	☐ 1
☐ 2	☐ 3	☐ 4
☐ 5	☐ 6	☐ 7
☐ 8	☐ 9	
Optional rationale: _____		

Adaptive		Responsive
Mark one box only. Values to the left favor Adaptive; values to the right favor Responsive.		
☐ 9	☐ 8	☐ 7
☐ 6	☐ 5	☐ 4
☐ 3	☐ 2	☐ 1
☐ 2	☐ 3	☐ 4
☐ 5	☐ 6	☐ 7
☐ 8	☐ 9	
Optional rationale: _____		

Functional

Environmental

Mark one box only. Values to the left favor Functional; values to the right favor Environmental.

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Optional rationale: _____

Functional

Responsive

Mark one box only. Values to the left favor Functional; values to the right favor Responsive.

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Optional rationale: _____

Environmental

Responsive

Mark one box only. Values to the left favor Environmental; values to the right favor Responsive.

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Optional rationale: _____

Consistency check. The research team will calculate the AHP consistency ratio after submission. If $CR > 0.10$, you may be asked to review a small number of comparisons and submit a revised final matrix.

Section E. Second-Round Review Form

Complete this section only when the research team provides revised wording for an indicator after the first review round.

Candidate ID: _____

Dimension: _____

Original wording

Summary of first-round comments

Proposed revised wording

Recommended decision

☐ Retain as revised ☐ Revise again ☐ Exclude

Revised importance rating

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

Additional comment

Duplicate this page for each item requiring a second-round decision.

Section F. Final Review and Submission Check

Please complete the checklist before returning the questionnaire.

Completion check	Done
I completed the consent and background sections.	☐
I marked one importance rating for every indicator.	☐
I completed all ten AHP pairwise comparisons.	☐
I reviewed my responses for accidental omissions.	☐
I did not include identifying personal information in free-text comments.	☐

Expert code: _____

Date completed: _____

Research-team use only	Do not complete
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Form completeness ☐ Complete ☐ Follow-up required

Importance ratings entered by _____

Data-entry verification by _____

AHP consistency ratio CR = _____ ☐ ≤ 0.10 ☐ Revision requested

Final matrix accepted ☐ Yes ☐ Pending

Thank you for your expert contribution.