BLOSH

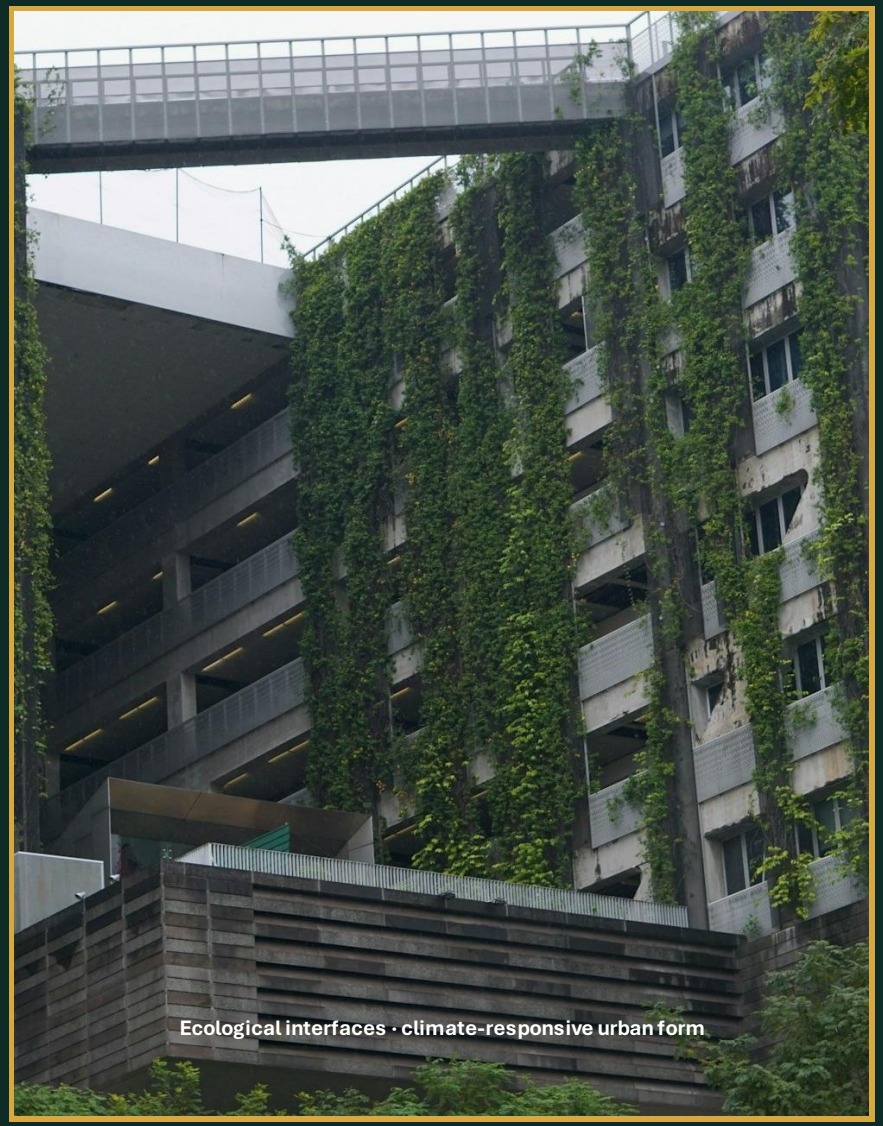
Ecological + Salutogenic Urban Renewal

From interdisciplinary theory to an empirical and transferable design program

B L O S H

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Central South University of Forestry and Technology

World Congress on Design & Health 2026 · Kuching, Malaysia



Ecological interfaces · climate-responsive urban form

KEY POINT · Introduce BLOSH as one connected pathway.

IMAGE SOURCE · Unsplash / Alena Yzhanina (inhe4AiE1Zk)

Urban renewal has changed

From demolition-led redevelopment toward low-carbon, health-promoting, inclusive regeneration of existing districts.



CLIMATE

Heat + extreme rainfall

AGEING

Supportive everyday environments

DENSITY

Limited land + retrofit freedom

INFRASTRUCTURE

Ageing systems + intensive use

KEY POINT · The pressures accumulate in the same places.

IMAGE SOURCE · Unsplash / Willian Justen de Vasconcellos; Aldward Castillo; Joey Huang

The existing city is the real laboratory

Urban renewal asks a more difficult question than new construction.



ageing infrastructure · limited land · heat + rainfall · fragmented ownership · limited budgets

Urban renewal asks:

WHAT can change?

HOW much?

FOR whom?

UNDER what operational conditions?

KEY POINT · Renewal is constrained by what already exists.

IMAGE SOURCE · Unsplash / WillianJusten de Vasconcellos; Christer Lassman

The central question

Can ecological design become a measurable health-supportive resource in everyday urban renewal?



Sustainability + health should be treated as co-performance—not parallel scorecards.

Ecological performance · human experience · operational feasibility · health-related outcomes



KEY POINT · Do not copy forms; understand principles and mechanisms.

IMAGE SOURCE · Unsplash / Marek Lumi (urban public-space use)

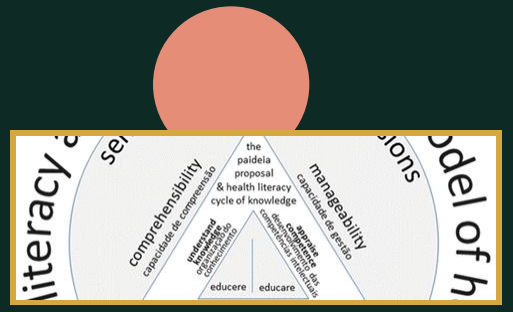
Four knowledge streams

The literature already contains the pieces—but they are fragmented across disciplinary traditions.

Ecological design	Built-environment health	Salutogenesis	Operation
What is changed?	What outcomes occur?	How is it experienced?	Will it work over time?
B + L	EXPOSURE + H	S	O









KEY POINT · Four streams explain different parts of the same system.

IMAGE SOURCE · Unsplash / i-p; InsungYoon; Handbook of Salutogenesis / NCBI; Pexels / Diego Abello Rico

From objects to systems

Buildings as extensions of ecological systems—green, blue, grey, and human infrastructures.



MENARA MESINIAGA · ecological systems as architecture



BIO-INTEGRATION

The deeper principle is not "adding green." It is linking ecological systems, circular flows, climate responsiveness, biodiversity and human use.

Yeang (1999, 2006) · BLOSH manuscript synthesis

KEY POINT · Bio-integration is the foundation—not a decorative style.

IMAGE SOURCE · Wikimedia Commons / Cmglee — Mesiniaga Tower

Principles we can decompose and study

Not a style to reproduce—but mechanisms that can be tested and adapted.

CLIMATE RESPONSIVENESS

orientation · shading · ventilation · daylight

ECOLOGICAL INTERFACES

vertical greenery · sky courts · habitats

CIRCULAR FLOWS

water · energy · material flows

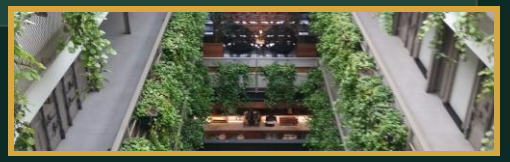
MULTI-SCALE CONNECTIVITY

building ↔ site ↔ landscape ↔ city









KEY POINT · Principle first; form second.

IMAGE SOURCE · Menara Mesiniaga project archive; Unsplash / Eran Design; Declan Sun; Fajar Putra

Seven ecological strategy families

A practical vocabulary for comparison—not a fixed recipe.

1 Vertical greening

2 Sky / roof gardens

3 Ecological corridors

4 Natural / hybrid ventilation

5 Adaptive shading + daylight

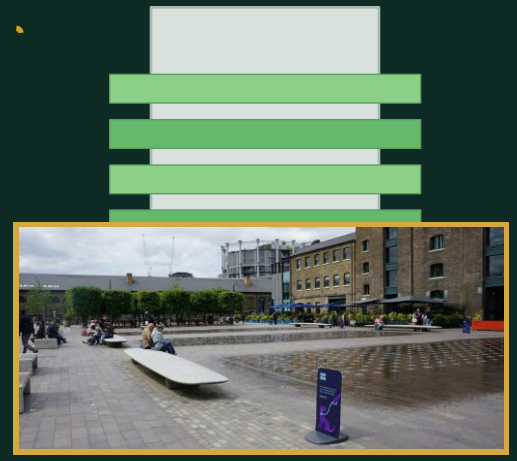
6 Rainwater–vegetation coupling

7 Blue–green accessibility









KEY POINT · Use these families to ask what each intervention actually changes.

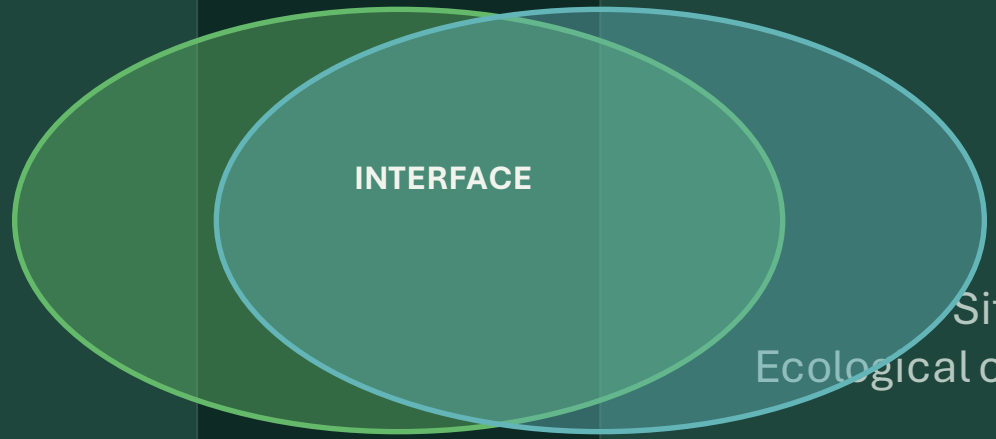
IMAGE SOURCE · Unsplash / José Jovéna; DeclanSun; Alena Yzhanina; Marek Lumi

Why separate Building and Landscape?

Different variables and scales—yet continuous interfaces.

B · BUILDING

Envelope + shading
Ventilation + daylight
Indoor environmental quality
Semi-open architectural spaces



L · LANDSCAPE

Greenness + visibility
Blue-green access
Site / street / neighborhood
Ecological continuity + microclimate

facade greening · courtyards · roof / sky gardens · transitional spaces





KEY POINT · The interface is a research opportunity, not a classification problem.

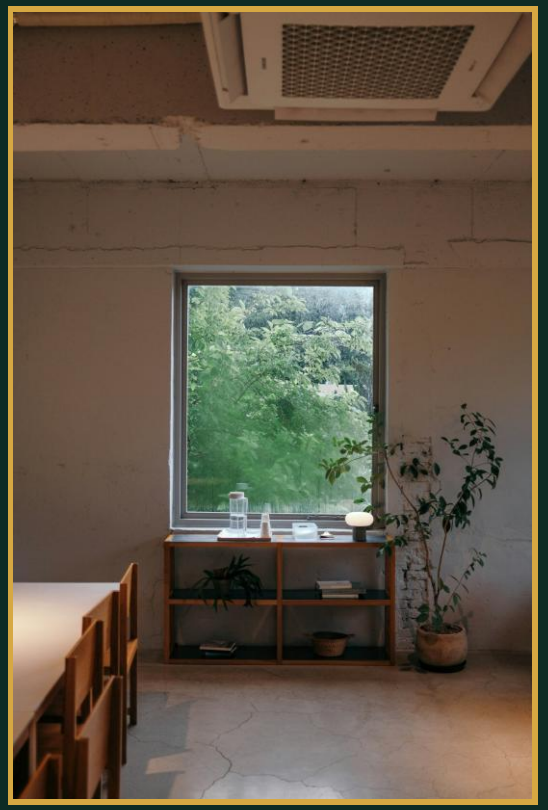
IMAGE SOURCE · Unsplash / Eran Design (interior green wall); Fajar Putra (courtyard interface)

From environmental conditions to health-supportive resources

Evidence spans indoor quality, nature exposure, activity, restoration, and social well-being.

DAYLIGHT	mood · cognition
THERMAL / AIR	comfort · symptoms
GREEN / BLUE	restoration · stress
WALKABILITY	activity · healthy ageing
SOCIAL SPACE	interaction · belonging





Exposure ≠ experience

KEY POINT · Environmental conditions matter—but users do not experience them identically.

IMAGE SOURCE · Design-health workplace image (user archive); Unsplash / Insung Yoon

A classic evidence line: nature through the window

Environmental exposure can become a health-supportive resource through perception and stress recovery.



Ulrich, 1984

Patients with a nature view had shorter postoperative stays, fewer negative nurse comments, and used fewer potent analgesics than matched patients facing a brick wall.

The key point for BLOSH: objective exposure matters, but the restorative mechanism is mediated through human perception and experience.

Source: Ulrich RS. Science. 1984;224:420–421.

KEY POINT · A window view illustrates exposure → experience → health.

IMAGE SOURCE · Unsplash / Insung Yoon; evidence cited: Ulrich RS, Science (1984)

Patient care: daylight, window views, privacy, and coping

Evidence-based design shows how environmental details affect stress, hope, communication, and care experience.



Positive window views	lower stress + greater hope
Daylight access	stress perception + coping behavior
Infusion space choice	privacy + quiet + social interaction
Patient–nurse access	care quality + reassurance

Wang & Pukszta, 2017 · Wang & Peng, 2026

KEY POINT · Health-supportive design is measurable in real care environments.

IMAGE SOURCE · Unsplash / Hush Naidoo Jade Photography; Wang & Pukszta (2017); Wang & Peng (2026)

Green-blue access and healthy ageing

Accessibility, visibility, walkability, comfort, and social support shape whether nature becomes usable health infrastructure.





- ACCESSIBILITY
- GREEN VISIBILITY
- THERMAL COMFORT
- SAFETY
- SOCIAL CONTACT
- PHYSICAL ACTIVITY

Nature only becomes a health resource when people can see it, reach it, feel safe using it, and engage with it.

KEY POINT · Green space is not enough; usable access and experience matter.

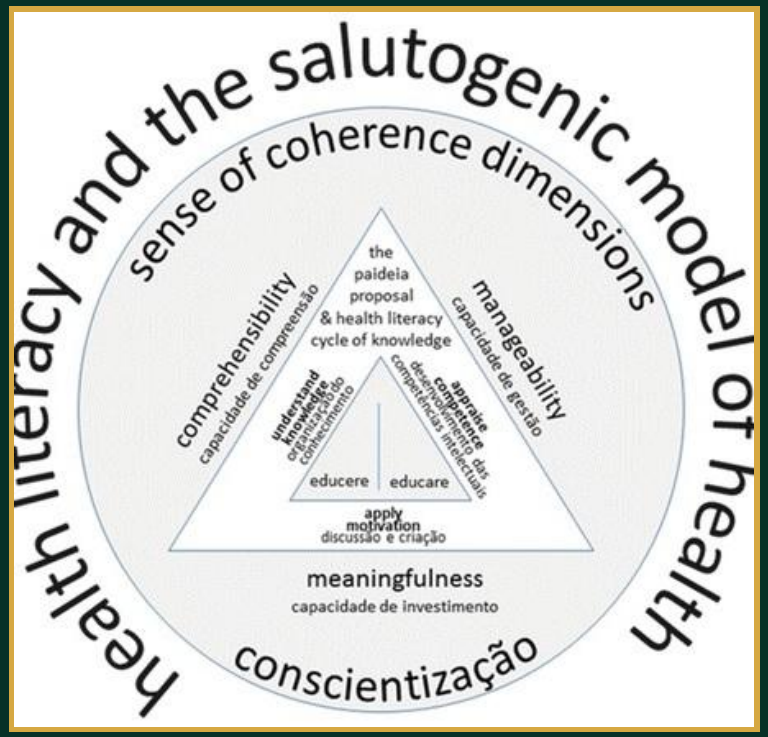
IMAGE SOURCE · Unsplash / Joey Huang; Felix Ngo

Sense of Coherence as a mechanism lens

Salutogenesis asks what supports the generation and maintenance of health.

COMPREHENSIBILITY
Can I understand it?
legibility · clarity · predictability

MANAGEABILITY
Can I use and cope with it?
access · control · comfort · safety



Sense of Coherence links environmental resources to health-generation processes.

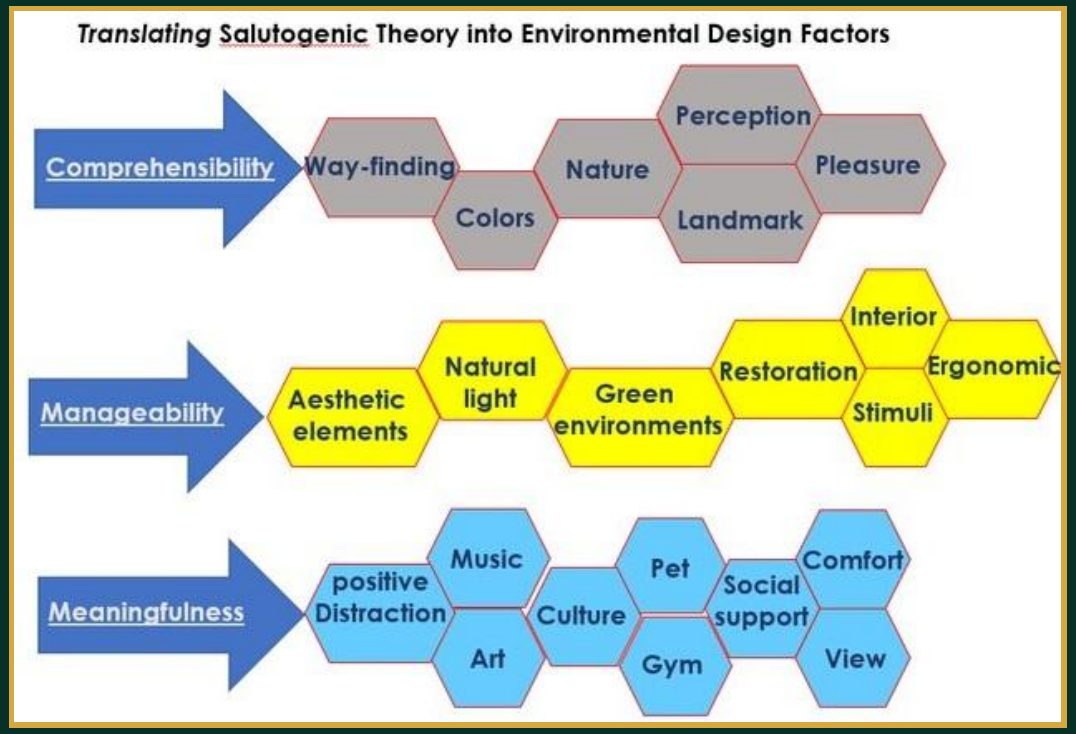
MEANINGFULNESS
Is it worth engaging with?
belonging · purpose · connection

KEY POINT · SOC explains how environmental resources are understood, managed, and valued.

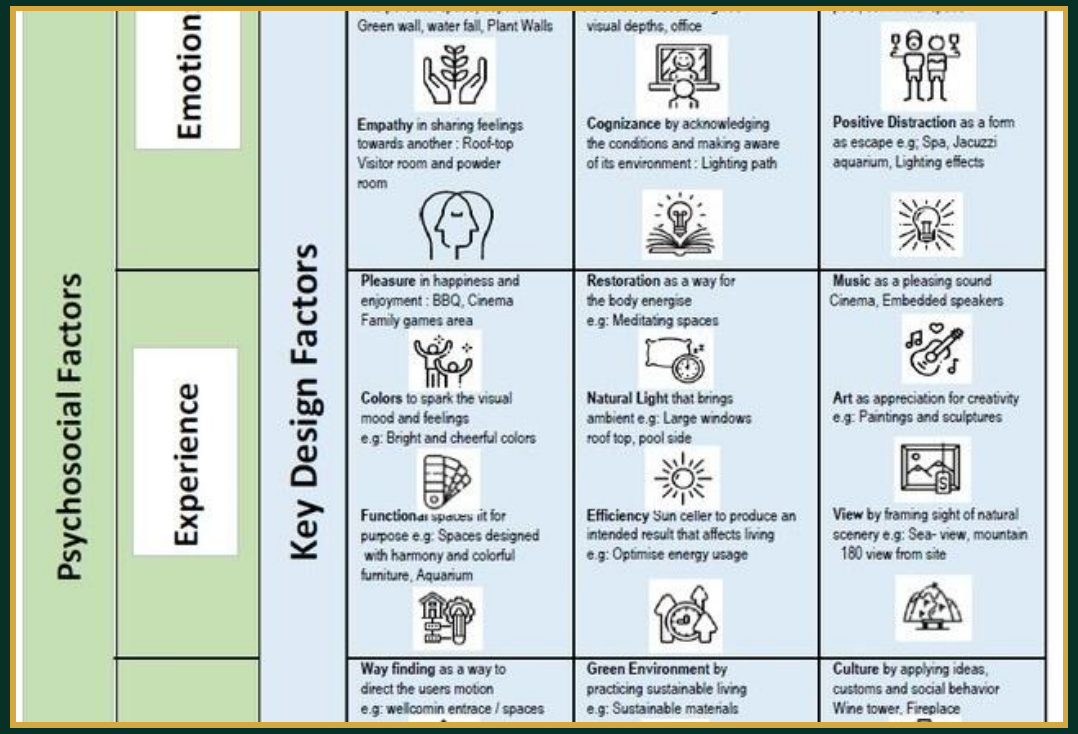
IMAGE SOURCE · Handbook of Salutogenesis / NCBI Bookshelf — SOC model figure

Design & Health Matrix as a bridge

Translate abstract Salutogenic concepts into concrete design factors and measurable experience.



SOC → ENVIRONMENTAL DESIGN FACTORS



DESIGN & HEALTH MATRIX

KEY POINT · The matrix makes the Salutogenic pathway design-relevant and measurable.

IMAGE SOURCE · Alan Dilani (2008) SOC design factors; Yeang & Dilani Design & Health Matrix (user-provided figures)

Ecological performance does not end at handover

Operation is part of the causal context and a boundary condition for real-world performance.

SAFETY	MAINTENANCE	SEASONALITY	GOVERNANCE	LIFECYCLE
fire · fall · hygiene	access · labor · irrigation	heat · rain · winter	responsibility · budget	durability · feedback

A design can be ecologically ambitious and still fail as a renewal strategy if it cannot be operated.



mainte



KEY POINT · Operation determines whether environmental gains persist.

IMAGE SOURCE · Pexels / Diego AbelloRico; Unsplash / Christer Lassman

Four streams, four starting points

These are different parts of the same problem—but they are not always connected in one platform.

ECOLOGICAL DESIGN

What is changed?



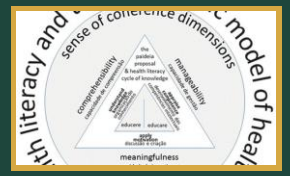
HEALTH RESEARCH

What outcomes occur?



SALUTOGENESIS

How is it experienced?



OPERATION

Will it work over time?



The missing link is not another list of variables. It is a coherent pathway.

KEY POINT · The challenge is integration, not lack of knowledge.

IMAGE SOURCE · Unsplash; Handbook of Salutogenesis / NCBI; Pexels — four evidence-stream anchors

Gap 1 · Design ≠ exposure

The intervention is not the same thing as the environmental condition it produces.

CONFIGURATION → EXPOSURE → ?

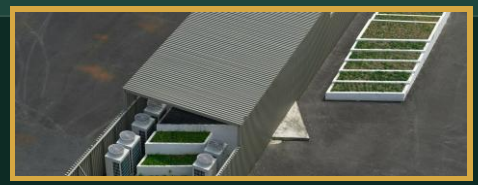
Example · shading device

Design intervention → reduced solar gain · altered daylight · changed thermal conditions

Example · green facade

Configuration → green visibility · shade · humidity · thermal change · habitat effects





KEY POINT · Measure what the design actually changes.

IMAGE SOURCE · Unsplash / Alena Yzhanina; Declan Sun

Gap 2 · Exposure ≠ experience

Objective or semi-objective conditions do not automatically tell us what a place means to users.

OBJECTIVE / SEMI-OBJECTIVE

- temperature
- daylight
- green-view index
- walking distance
- noise



≠

PERCEIVED / EXPERIENCED

- safe
- restorative
- controllable
- legible
- meaningful



KEY POINT · Two people can receive the same exposure and experience it differently.

IMAGE SOURCE · Unsplash / Marek Lumi; Insung Yoon

Gap 3 · Experience → behavior / psychophysiology → health

Avoid assuming that ecological design directly promotes health.

APPRAISAL	RESPONSE	OUTCOME
SOC-linked	behavior + psychophysiology	health-related
perceived control · safety · restoration · meaning	walking · staying · social interaction · stress response	well-being · activity · cognition · social health







KEY POINT · Trace intermediate mechanisms instead of making direct causal leaps.

IMAGE SOURCE · Unsplash / Felix Ngo; Marek Lumi; Insung Yoon

Gap 4 · Implementation

Design intention and real performance can diverge substantially.

DESIGN INTENT × **OPERATION** = **REAL PERFORMANCE**

maintenance | governance | safety | seasonality | user behavior

Operation is not a final-stage checklist. It is a moderating condition



KEY POINT · Implementation is part of the theoretical pathway.

IMAGE SOURCE · Pexels / Diego AbelloRico — rooftop landscape maintenance

Gap 5 + 6 · Scale and transferability

The pathway crosses spatial scales, and successful reference cases cannot be treated as universal templates.

ROOM → BUILDING → SITE → STREET → NEIGHBORHOOD

REFERENCE CASE ≠ COPY LOCAL CONTEXT · climate · retrofit · culture · governance





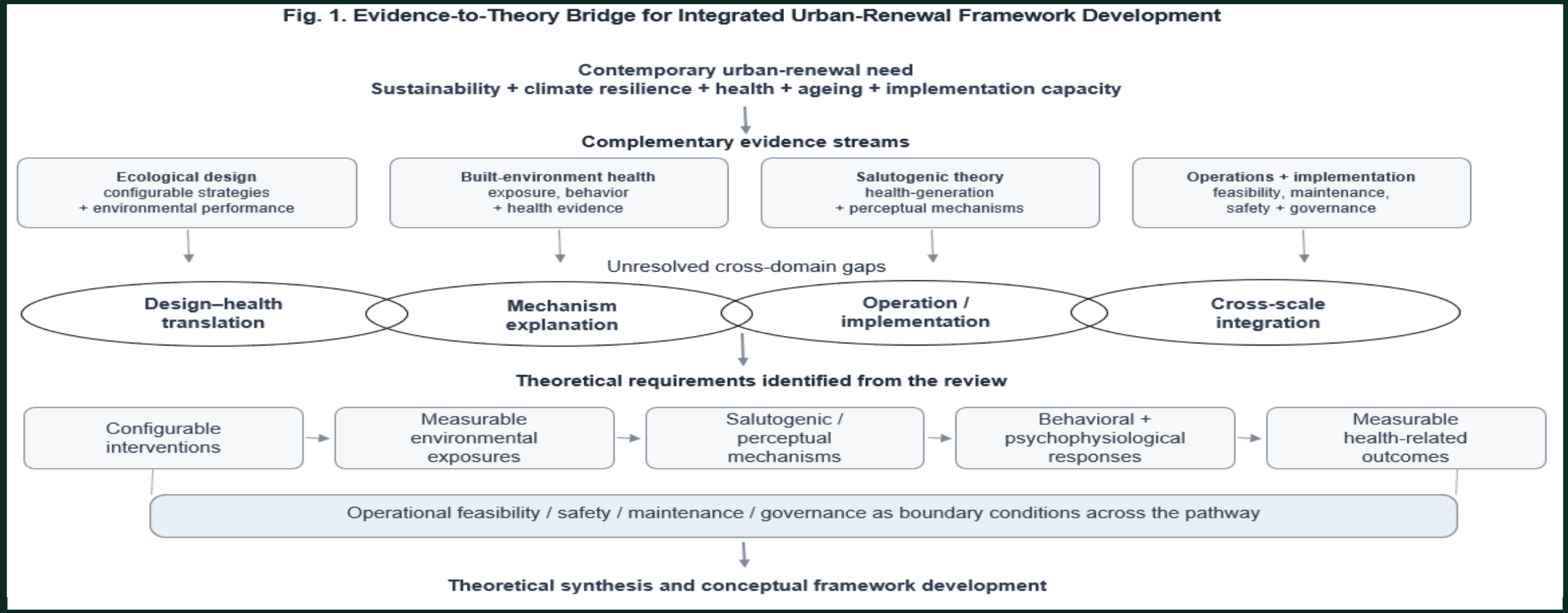


KEY POINT · The principle may travel; the parameter may not.

IMAGE SOURCE · Wikimedia Commons / Cmglee; Unsplash / Runda Choo; Flickr / Nur Ismail Photography (Suasana PjH)

From evidence to framework

The evidence-to-theory bridge identifies what an integrative framework must connect.

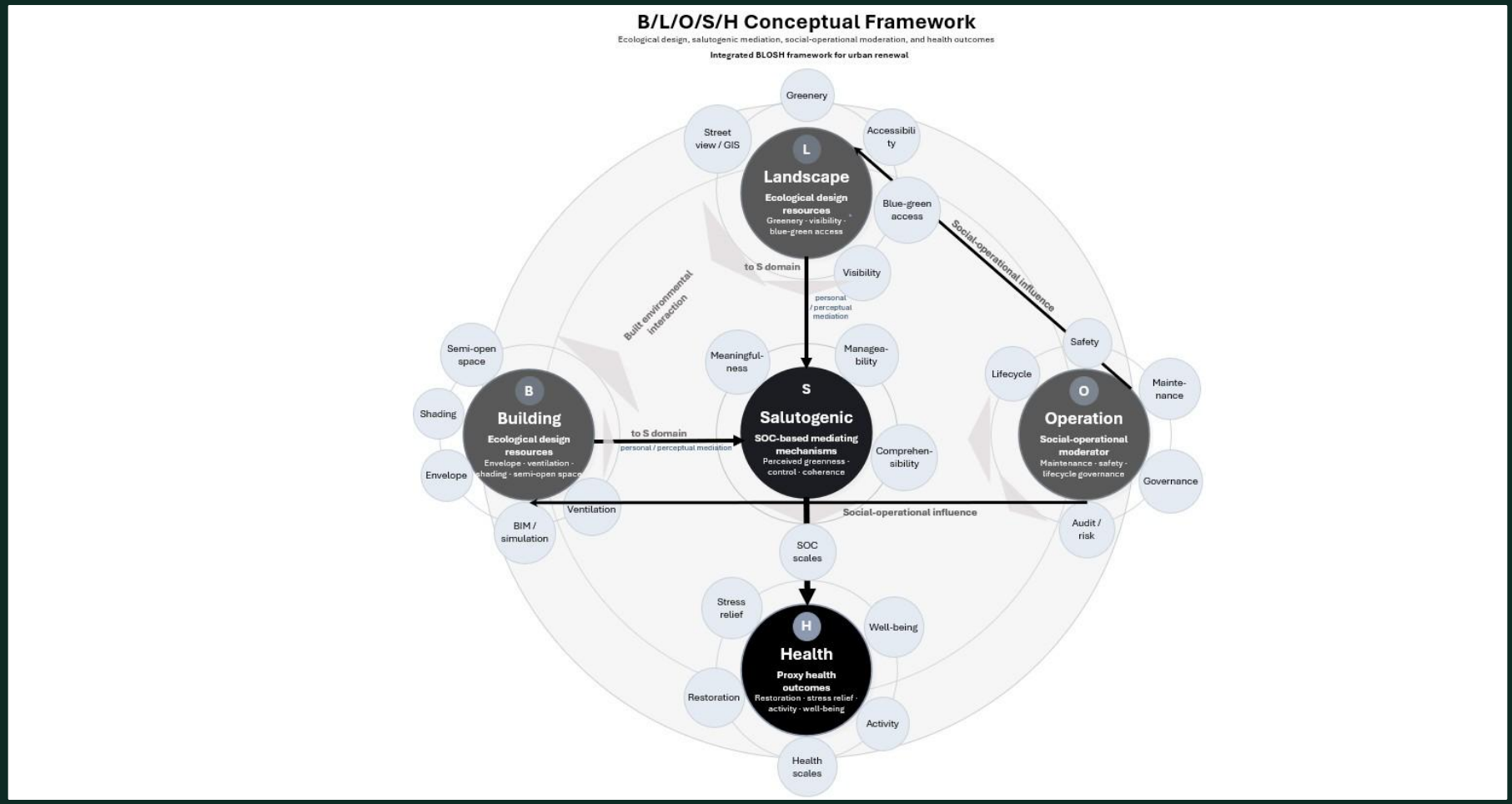


KEY POINT · Configurable interventions → measurable exposures → mechanisms → responses → outcomes, with operation across the pathway.

IMAGE SOURCE · BLOSH manuscript Fig. 1 — evidence-to-theory bridge

B/L/O/S/H

A relational architecture for ecological + Salutogenic urban renewal.



KEY POINT · Five domains with differentiated analytical roles.

IMAGE SOURCE · BLOSH manuscript Fig. 2 — B/L/O/S/H conceptual framework

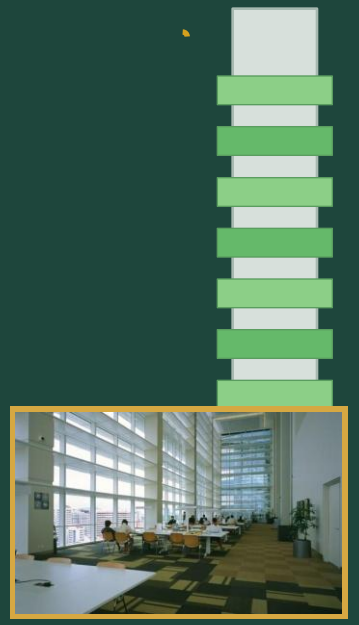
B + L · Intervention and exposure domains

Building and Landscape contain both what is configured and what users are actually exposed to.

B · BUILDING

Envelope · shading
Ventilation · daylight
Semi-open spaces
Indoor environmental quality

ANALYTICAL ROLE
INTERVENTION + EXPOSURE

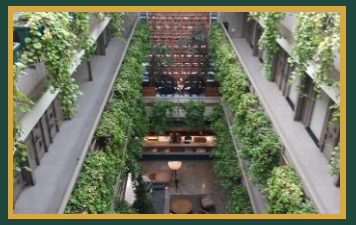


L · LANDSCAPE



Greenness / GVI
Blue-green access
Ecological continuity
Microclimate / visibility

ANALYTICAL ROLE
INTERVENTION + EXPOSURE



KEY POINT · Within B and L, separate configuration from performance.

IMAGE SOURCE · National Library Singapore project image (user archive); Unsplash / Fajar Putra

O + S + H · Boundary condition, mediator, outcome

Operation shapes persistence; Salutogenic mechanisms explain appraisal; Health captures the endpoints.



OPERATION

feasibility · safety · maintenance · governance

MODERATOR / CONSTRAINT



SALUTOGENIC

comprehensibility · manageability · meaningfulness

MEDIATOR / APPRAISAL



HEALTH

psychological · behavioral · physiological · social

OUTCOME

KEY POINT · BLOSH differentiates analytical roles rather than treating all variables alike.

IMAGE SOURCE · Pexels / Diego AbelloRico; Handbook of Salutogenesis / NCBI; Unsplash / Felix Ngo

A mechanism-based sequence

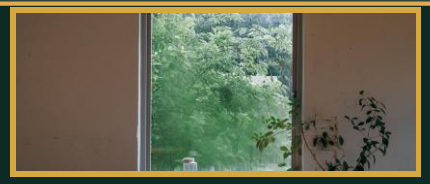
What was designed → what changed → how it was perceived and used → what responses occurred → what outcomes were observed.

CONFIGURATION → EXPOSURE → SALUTOGENIC APPRAISAL → BEHAVIOR / RESPONSE → HEALTH OUTCOME

OPERATION across the entire pathway

feasibility · safety · maintenance · seasonal adaptability · governance · lifecycle







KEY POINT · We are asking a sequence of questions, not claiming direct causality.

IMAGE SOURCE · Unsplash — ecological configuration, exposure, experience, behavior, health visual sequence

From domains to measurable variables

The framework is a map of possibilities—measurement is selected pathway by pathway.

B	shading geometry · daylight · ventilation · IEQ	simulation · sensors
L	GVI · canopy · access · continuity · microclimate	GIS · street view · audit
O	maintenance · risk · governance · seasonal performance	records · interviews · audits
S	control · safety · accessibility · restoration · SOC	POE · surveys · scales
H	stress · well-being · activity · cognition · social interaction	validated scales · behavior · physiology

KEY POINT · Operationalize only the variables needed to test a focused pathway.

IMAGE SOURCE · BLOSH presentation synthesis based on manuscript operationalization table

Begin with a small number of ecological strategies

Trace the chain rather than trying to measure everything at once.



GREENERY / ECOLOGICAL INTERFACES

facade / sky garden → green visibility + shade + microclimate → nature connection + restoration → staying / social interaction → stress relief / well-being



SHADING / DAYLIGHT / VENTILATION

envelope configuration → thermal + light + air conditions → comfort + clarity + control → use / attention → well-being / cognition



BLUE-GREEN ACCESS

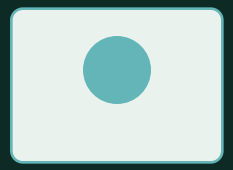
visibility + distance + thermal comfort → safety + accessibility + meaningfulness → walking / staying / social contact → activity + restoration

KEY POINT · Start with two or three pathways and build a coherent evidence chain.

IMAGE SOURCE · Unsplash / Alena Yzhanina; Insung Yoon; Marek Lumi

multi-method measurement

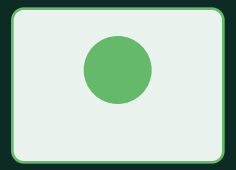
Sensors and simulation characterize performance; people, behavior, and operations complete the evidence chain.



EN

ENVIRONMENT

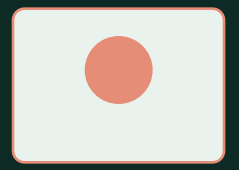
sensors · simulation



SP

SPACE

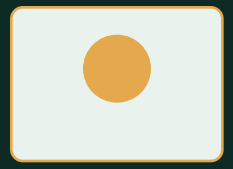
GIS · street view · design audit



EX

EXPERIENCE

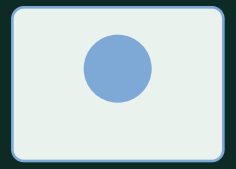
POE · perception survey · SOC scales



BE

BEHAVIOR

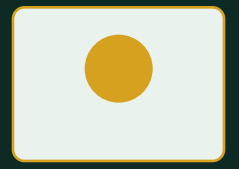
mapping · activity tracking



HE

HEALTH

validated scales · physiology



OP

OPERATION

FM records · interviews · risk audits



Goal: one coherent evidence chain—not six disconnected datasets.



KEY POINT · Combine objective, experiential, behavioral, health, and operational evidence.

IMAGE SOURCE · Unsplash / Insung Yoon; Felix Ngo; measurement framework from BLOSH manuscript

Urban renewal requires feedback

Monitor during operation, adapt, and re-measure.





KEY POINT · Operation becomes an iterative feedback loop rather than a final stage.

IMAGE SOURCE · Pexels / Diego AbelloRico; iterative feedback cycle from BLOSH research plan

Malaysia + Singapore as reference laboratories

Study long-operating ecological projects as cases for scientific decomposition—not templates to copy.



MENARA MESINIAGA

bioclimatic tower · 1992



SUASANA PJH

double-skin + public realm · 2017



NATIONAL LIBRARY SINGAPORE

daylight + shading + sky gardens · 2005

KEY POINT · Reference cases help identify principles, mechanisms, and boundary conditions.

IMAGE SOURCE · Wikimedia Commons / Cmglee; Putrajaya Holdings / Suasana PjH; Wikimedia Commons / National Library Singapore

Menara Mesiniaga · what should we study?

Move beyond an architectural visit toward measurable ecological and operational evidence.







- solar orientation + shading
- vertical planting + sky courts
- semi-open transitional spaces
- climate-responsive envelope
- long-term operation + maintenance

Need: drawings · design intent · environmental performance · maintenance/lifecycle data · user experience + behavior

KEY POINT · The case is valuable only if it can support rigorous empirical investigation.

IMAGE SOURCE · Menara Mesiniaga project images — user-provided archive (ArchDaily / Aga Khan project sources)

Universal principle vs. context-dependent parameter

International learning becomes a scientific problem: what transfers, what changes, and why?

PRINCIPLE

reduce excessive solar gain
increase contact with nature
retain + slow stormwater
support ecological continuity

PARAMETER

shading geometry
plant species + substrate depth
ventilation opening area
drainage capacity
maintenance frequency







The principle may travel; the parameter may not.

KEY POINT · Translation is not copying; it is testing what must be adapted.

IMAGE SOURCE · Wikimedia Commons / Cmglee; Unsplash / Willian Justen de Vasconcellos; Putrajaya Holdings / Suasana PjH

From framework to evidence—and from evidence to transferable guidance

BLOSH is the starting point for a comparative, empirical, and collaborative research program.

1 REFERENCE CASE CALIBRATION → **2** FOCUSED EMPIRICAL PROTOCOL → **3** CHINA COMPARATIVE TESTING → **4** GUIDANCE + DECISION SUPPORT







We are looking for

- ecological projects with meaningful operational history
- access to drawings + performance / maintenance information
- collaborators interested in Salutogenic measurement + user studies
- comparative sites across climates and urban-renewal conditions

BLOSH

Building · Landscape · Operation · Salutogenic mechanisms · Health

Thank you · Questions · Collaboration

zwangpublication@gmail.com

KEY POINT · Close with the invitation: turn the framework into evidence.

IMAGE SOURCE · Wikimedia Commons / Cmglee; Flickr / Nur Ismail Photography; Wikimedia Commons / National Library Singapore