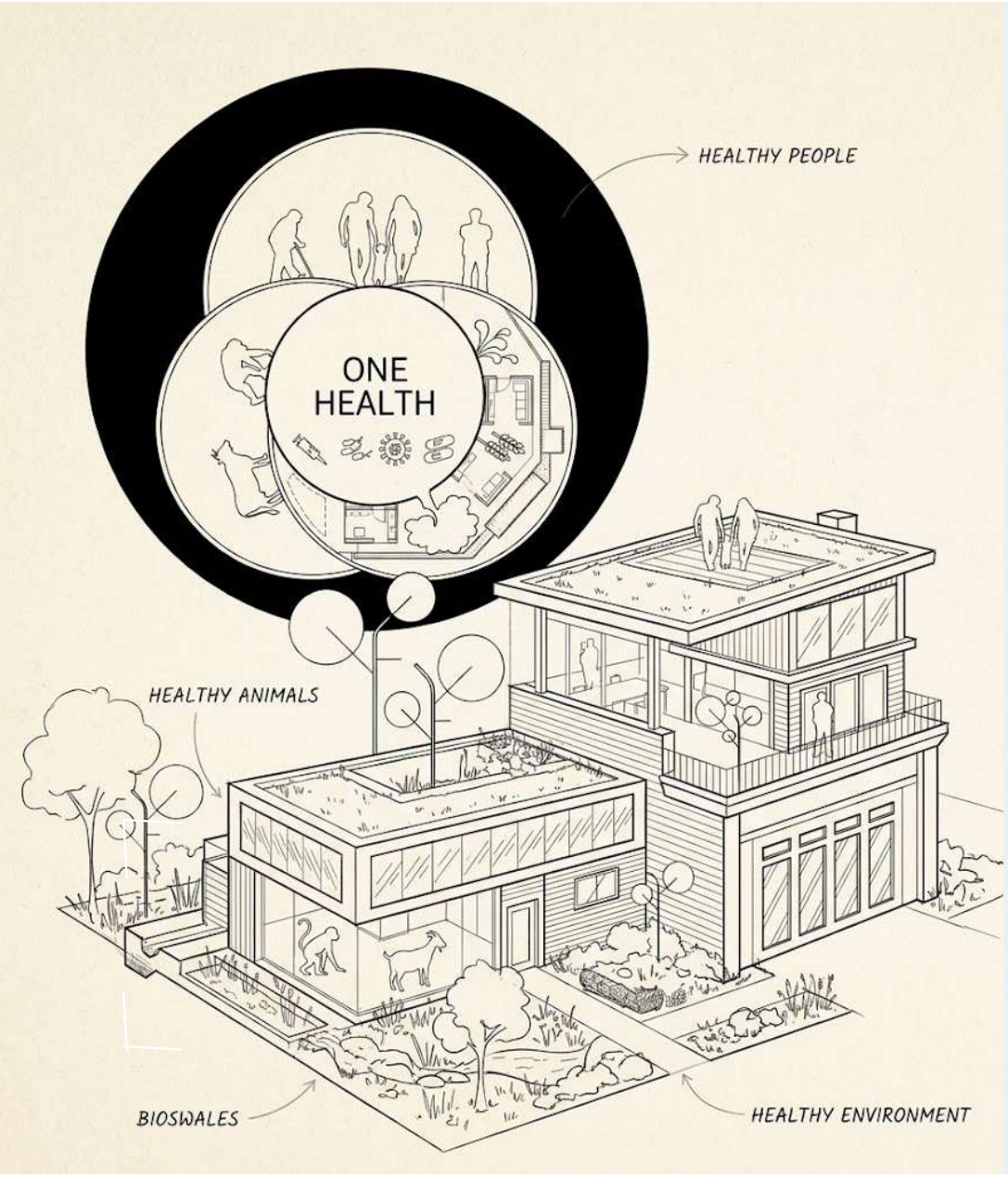


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MAPPING THE ONE HEALTH–ARCHITECTURE INTERFACE

A systematic review and bibliometric analysis of health resilience in tropical LMICs — from 29 health-resilience variables to five new One Health variables.

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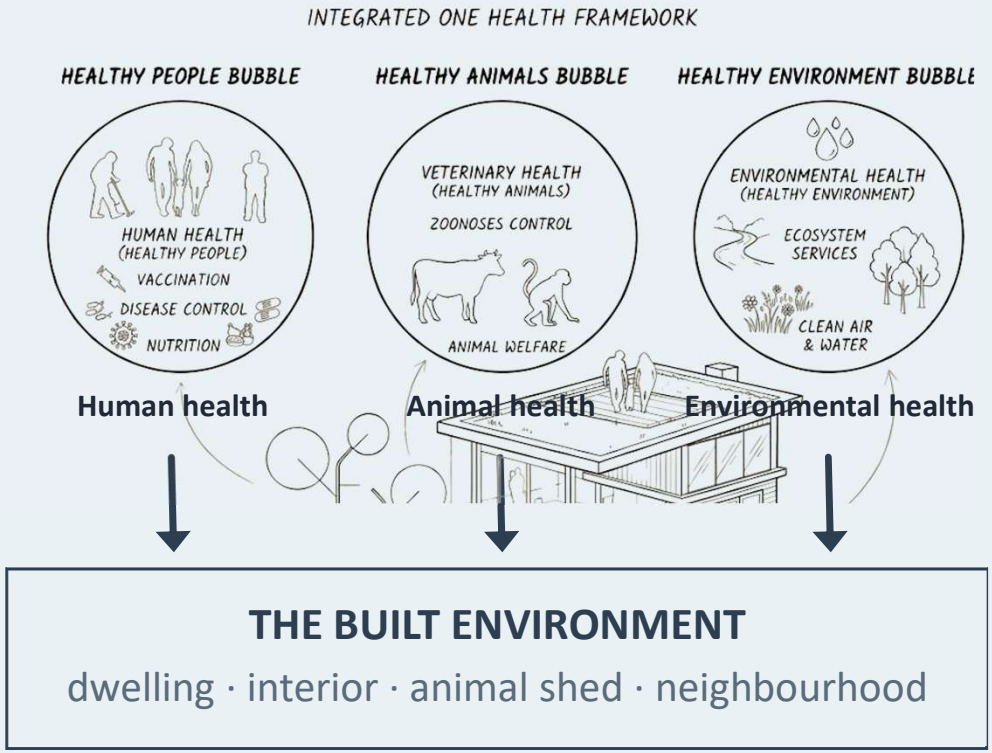
CONCEPTUAL BACKGROUND

The Promise of One Health

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One Health holds that the health of people, animals and ecosystems is interdependent — and it has moved from zoonotic control toward cities, buildings and the places where exposure happens.

Urban One Health extends the approach to planning — but the dwelling, the interior and the immediate neighbourhood are rarely treated as One Health variables.



Faijue et al., 2024 · Adnyana et al., 2026 · Morano et al., 2026 · Ellwanger et al., 2022

THE PROBLEM

A Global North Default

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Techno-centric default

- AI-enabled surveillance, IoT monitoring, big-data analytics
- Reactive data collection over passive design
- Presupposes digital infrastructure and financing

Tropical LMIC reality

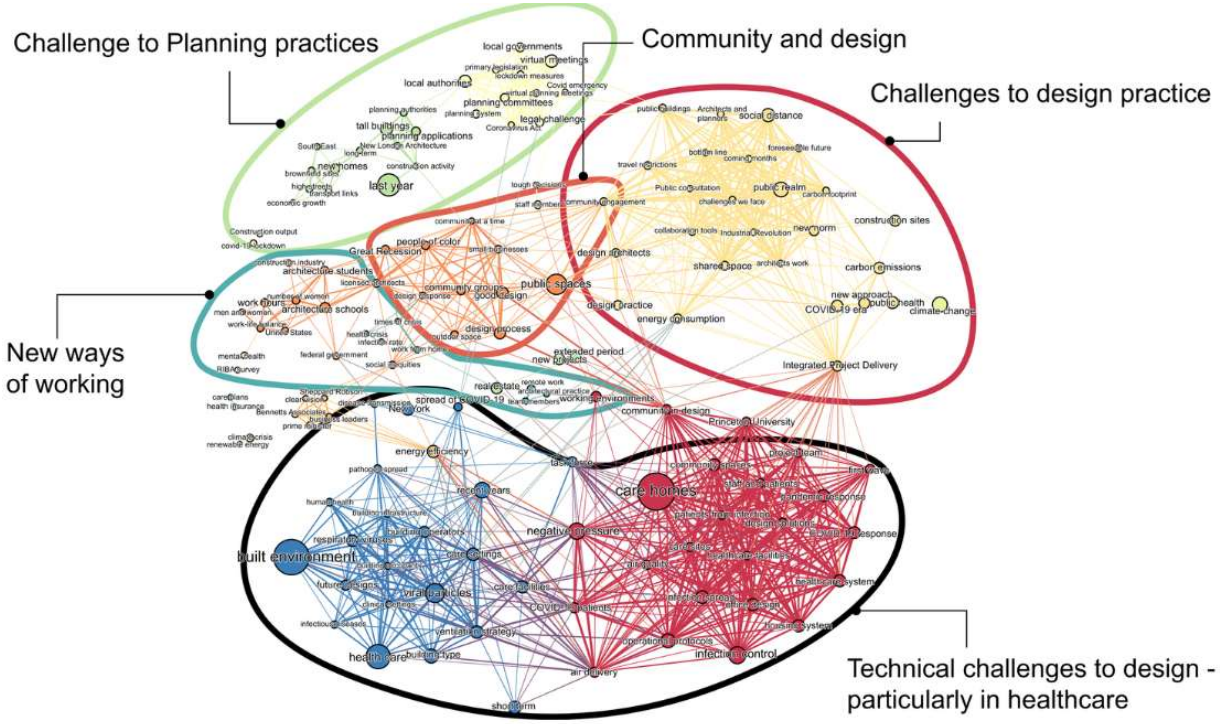
- Fragile infrastructure; unreliable power and connectivity
- Resilience rooted in passive, climate-adaptive traditions
- Vernacular knowledge effective, yet absent from indexed research

Health resilience in the tropics is not only data to be monitored; it is built form to be designed.

Benis et al., 2021 · Yopa et al., 2023 · Pesliak & Killin, 2025

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The Pandemic Debate in Architecture Was About People



Semantic map of the architectural debate, 255 articles in architecture journals, Mar 2020 – Sep 2021 (Yaneva, 2023, Fig. I.1 © the author and Ben Blackwell)

Five clusters

- Challenges to planning practice
- Community and design
- Challenges to design practice
- New ways of working
- Technical challenges — particularly healthcare

Key takeaway

Health was framed around occupants, care homes and infection control. Animals and ecosystems do not appear.

WHERE WE COME FROM · 2

Our Research Trajectory: Macro-to-Micro

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Salama, 2020

Urban scale

Urban dynamics, distancing, living–working patterns under COVID-19

de Yong et al., 2024

Security-Pandemic theory

23 variables · 3 aspects: dynamics, distancing, hybrid living–working · SLR of 109 articles

de Yong et al., 2026

Health resilience, tropical LMICs

29 interior-architecture variables · physical, environmental, socio-spatial

This study, 2026

One Health

29 variables + 5 new One Health variables · 531 studies

from the city to the interior · from pandemic security to health resilience to One Health

The Interscalar Gap: From City to Interior

URBAN Level → **ARCHITECTURE** Level



Cities are groupings of structures and landscapes of varying sizes and complexities, generally clustered together to define a community for economic, social, cultural, and/or environmental reasons.



Exterior areas and/or settings for planned groupings of spaces and structures. Landscapes generally combine both natural and built environments.



Structures are planned groupings of spaces defined by and constructed of products; generally, related activities are combined into composite structures. Generally, structures have both an internal space and an external form.



Interior spaces are defined by an arranged grouping of products and generally enclosed within a structure. They are generally created to enhance activities and mediate external factors

(McClure, 2007)

Salama, 2020 · de Yong, Rachmawati & Defiana, 2024 (Building and Environment 258) · de Yong et al., JAABE (in press)

RESEARCH QUESTIONS

Three Questions

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RQ1

Which interior-architecture variables does the One Health-related literature document, and at what scale?

29 health-resilience variables + 5 new One Health variables → 531 studies

RQ2

How are these variables connected to the One Health pillars — human, animal and environmental health?

Triangle Pillar coding · ATLAS.ti AI codes · VOSviewer map and Claude AI codes

RQ3

To what extent does this evidence address tropical LMICs, and which variables should a building-scale One Health framework prioritize?

Tropical-LMIC evidence → Tropical Architecture

METHODS

One Corpus, Three Lenses

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1,932 records pooled from 4 Scopus exports (AI list 136 · semantic 100 · keyword 657 · keyword 1,039)

1,898 unique records after de-duplication — *– 34 duplicates*

784 pass A: ≥1 of the 29 health-resilience variables in a built-setting context — *– 1,114 not flagged*

531 included: 519 via the 29 variables + 12 via 5 new One Health variables (pass B) — *– 300 incidental*

152 building / interior · 379 urban / neighbourhood

Deductive SLR

29 health-resilience variables as starting codebook + 5 new variables; scale, role, pillars, setting

ATLAS.ti AI coding

3,687 labelled codes mapped onto the variables; misfits reveal 5 new variables

VOSviewer map

Keyword co-occurrence, 657-record export: 246 keywords, 5 clusters

METHODS · CODING FRAMEWORK

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Starting Codebook: 29 Health-Resilience Variables

Terms from our review of health resilience in tropical LMICs (Previous Research). Health resilience ≠ One Health, so new variables could emerge.

Physical

9 variables

Management
Spatial Connectivity
Building Typology
Intelligent-Smart-Automated Building Features
Water
Energy and Carbon Emissions
Blue and Green Structure
Integrated Resilient Cooling and Ventilation Systems
Material and Circularity

Environmental

8 variables

Indoor Air Quality
Connectedness To Nature
Resilient To Natural Hazards
Thermal Comfort
Daylight
Acoustic Comfort
Lighting and Visual Comfort
Design Appeal based on Human Needs

Socio-spatial

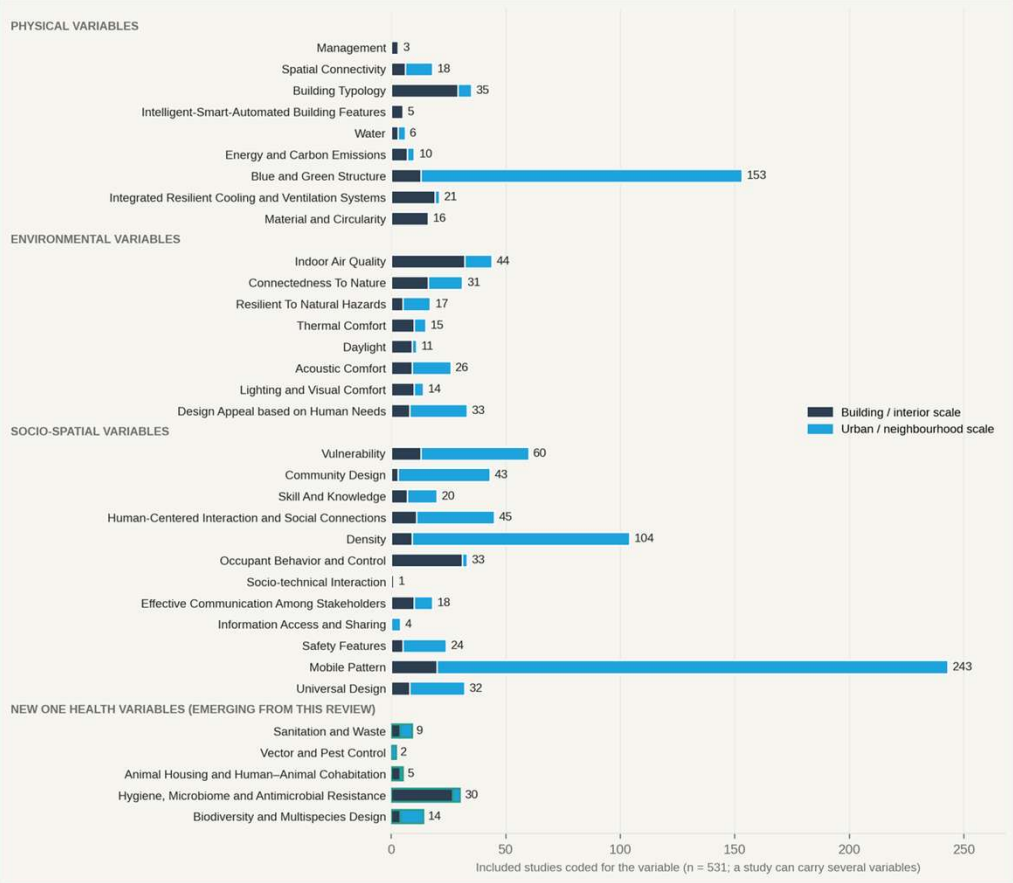
12 variables

Vulnerability
Community Design
Skill And Knowledge
Human-Centered Interaction and Social Connections
Density
Occupant Behavior and Control
Socio-technical Interaction
Effective Communication Among Stakeholders
Information Access and Sharing
Safety Features
Mobile Pattern
Universal Design

RESULTS · RQ1

Evidence Lives at Neighbourhood Scale

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n = 531 included studies; a study can carry several variables · teal outline = new One Health variables

243 · 153 · 104

Mobile Pattern, Blue and Green Structure and Density — the three largest variables, almost all urban

379 of 531

studies at urban / neighbourhood scale; 152 at building / interior scale

1 – 11 studies

Socio-technical Interaction, Management, Information Access, Smart Building Features, Water, Energy, Daylight

RESULTS · RQ1–RQ2

Green Space Is the Strongest Bridge

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167

studies on Blue and Green Structure or Connectedness To Nature (31.5%)

Urban green & blue space

Parks and blue space and mental health in Guangzhou; eye-level street greenness and cycling in Hong Kong; biodiversity in the 15-minute city.

Liu et al., 2021 · Lu et al., 2019 · Kabisch et al., 2025

46

propose or test a design — a third of all 143 design studies

Biophilic building design

Frameworks and neuropsychological evidence for restorative biophilic interiors; biophilic rules in building regulations in Australia and India.

Sedghikhanshir & Montelli, 2026 · Youn et al., 2025 · Amirtham & Bavya, 2025

3 of 6

studies engaging all three One Health pillars are about green space

Green space as One Health

Restorative capacity and biodiversity of urban green space through an adapted One Health lens; biophilic cities as infrastructure for other species.

Castañeda et al., 2024 · Panlasigui et al., 2021

144 of the 167 are urban — the building-scale, multispecies version is what is missing

RESULTS · RQ2

Connected to People, Rarely to Animals

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Human

95.3%

506 studies

Environment

13.2%

70 studies

Animal

3.6%

19 studies

All three

1.1%

6 studies

The six tripartite studies

- Restorative capacity & biodiversity of urban green space
- The regenerative city
- Water-sensitive urban design
- Urban ecosystem services in Edmonton
- Informal settlements in Makassar, Indonesia
- Ammonia in a fattening-pig room — the only building-scale one

6 of 6

All six tripartite studies carry at least one of the five new One Health variables. Across all 531 studies: risk factor 58.9% · measured 14.1% · designed 26.9%.

Castañeda et al., 2024 · Schurig & Turan, 2022 · Schulze et al., 2024 · Zazula & Birchall, 2024 · French et al., 2021 · Xie et al., 2017

RESULTS · RQ2

The One Health × Architecture Matrix

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	Human	Animal	Environment	All three pillars	Risk factor	Measured	Designed object	Tropical setting	LMIC setting
Management (n=3)	3	·	1	·	1	2	·	·	·
Spatial Connectivity (n=18)	17	·	2	·	10	2	6	3	7
Building Typology (n=35)	33	1	4	·	14	3	18	1	2
Intelligent-Smart-Automated Building Features (n=5)	5	·	1	·	·	1	4	·	·
Water (n=6)	6	·	·	·	1	2	3	1	2
Energy and Carbon Emissions (n=10)	8	1	4	·	2	·	8	1	1
Blue and Green Structure (n=153)	144	6	28	2	101	14	38	14	39
Integrated Resilient Cooling and Ventilation Systems (n=21)	21	2	4	1	5	6	10	1	5
Material and Circularity (n=16)	15	2	1	·	2	5	9	1	1
Indoor Air Quality (n=44)	44	3	16	1	14	17	13	3	9
Connectedness To Nature (n=31)	31	3	4	2	10	2	19	3	5
Resilient To Natural Hazards (n=17)	14	2	15	2	8	3	6	4	7
Thermal Comfort (n=15)	15	·	5	·	5	3	7	2	3
Daylight (n=11)	11	·	1	·	1	2	8	2	2
Acoustic Comfort (n=26)	25	·	11	·	13	6	7	1	2
Lighting and Visual Comfort (n=14)	12	·	·	·	6	3	5	1	2
Design Appeal based on Human Needs (n=33)	32	2	3	·	19	7	7	2	7
Vulnerability (n=60)	57	3	13	2	39	3	18	8	13
Community Design (n=43)	41	2	8	1	29	2	12	1	5
Skill And Knowledge (n=20)	20	1	2	1	10	1	9	2	4
Human-Centered Interaction and Social Connections (n=45)	43	2	4	·	30	3	12	2	8
Density (n=104)	97	1	9	1	82	14	8	14	28
Occupant Behavior and Control (n=33)	33	2	4	·	6	14	13	2	3
Socio-technical Interaction (n=1)	1	·	·	·	·	1	·	·	·
Effective Communication Among Stakeholders (n=18)	18	3	1	1	6	·	12	1	2
Information Access and Sharing (n=4)	4	·	1	·	3	1	·	·	1
Safety Features (n=24)	23	·	1	·	11	6	7	3	7
Mobile Pattern (n=243)	226	4	30	2	170	35	38	13	44
Universal Design (n=32)	31	1	2	·	13	4	15	·	3
[new] Sanitation and Waste (n=9)	9	1	3	1	4	3	2	8	8
[new] Vector and Pest Control (n=2)	2	2	1	1	1	1	·	1	1
[new] Animal Housing and Human–Animal Cohabitation (n=5)	5	4	2	2	2	2	1	1	2
[new] Hygiene, Microbiome and Antimicrobial Resistance (n=30)	30	4	7	1	5	20	5	5	6
[new] Biodiversity and Multispecies Design (n=14)	13	13	5	4	3	1	10	1	1

Environment pillar

Proportionally concentrated in Resilient To Natural Hazards (15 of 17), Indoor Air Quality (16 of 44) and Acoustic Comfort (11 of 26).

Animal pillar

Among the 29: at most 6 studies per variable. The 5 new variables hold 17 of the 19 animal-pillar studies.

Designed object

Most frequent in Blue and Green Structure and Mobile Pattern (38 each), then Connectedness To Nature (19), Building Typology and Vulnerability (18 each).

RESULTS · WHAT IS NEW

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Five New One Health Variables

Not in the health-resilience review; they emerged from ATLAS.ti codes and were applied in a second screening pass.

30

Hygiene, Microbiome & Antimicrobial Resistance

hospital surface succession · microbes on materials · probiotic cleaning · school handwashing stations

94 codes

14

Biodiversity & Multispecies Design

biodiversity-informed envelopes · supplemental nests · biodiverse residential development

79 codes

9

Sanitation & Waste

communal septic tanks, Surabaya · WASH in Rohingya camps · waste siting

11 codes

5

Animal Housing & Human–Animal Cohabitation

fattening-pig room · dog housing · pets indoors

16 codes

2

Vector & Pest Control

urban disease ecology · mosquitoes and rats in Makassar settlements

7 codes

49 studies carry a new variable (9.2%); 12 only via pass B

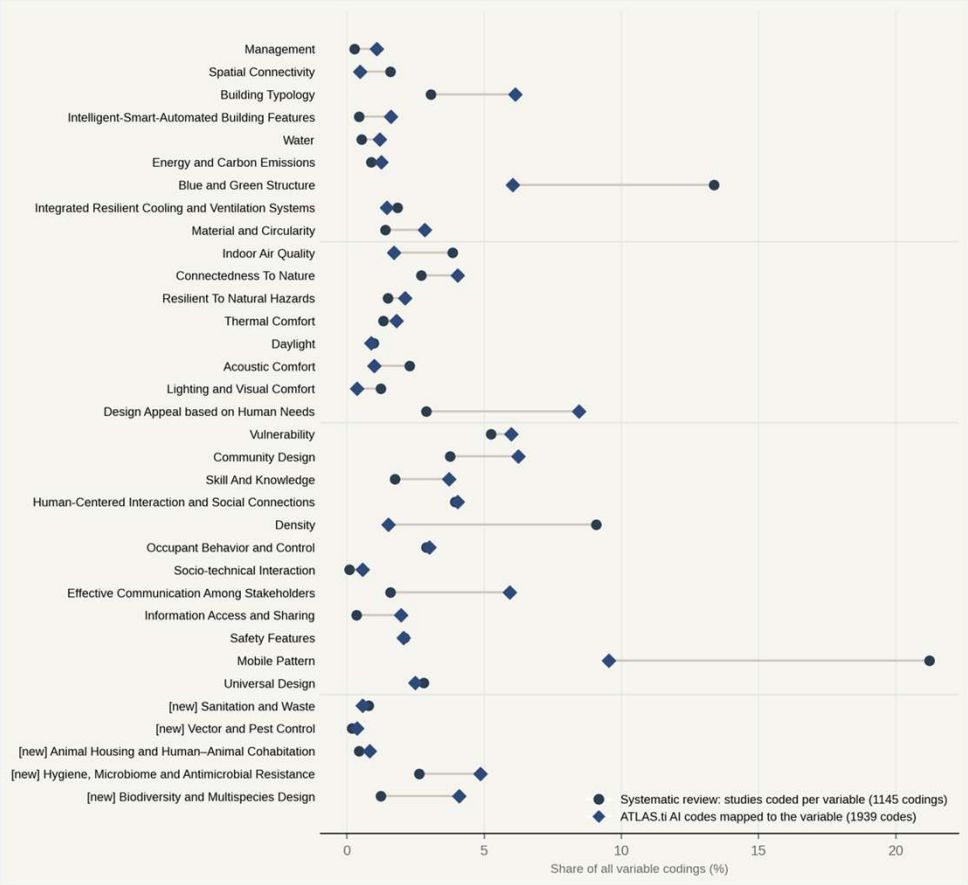
33 of 49 at building scale — vs 152 of 531 overall

17 of 19 animal-pillar studies; all 6 tripartite studies

22.4% in the tropics — vs 6.4% for the rest

RESULTS · ATLAS.TI TRIANGULATION

AI Coding Confirms the Core



ρ = 0.66

Spearman correlation between studies per variable (review) and ATLAS.ti codes per variable, 29 variables ($p < 0.001$)

1,732 of 3,687

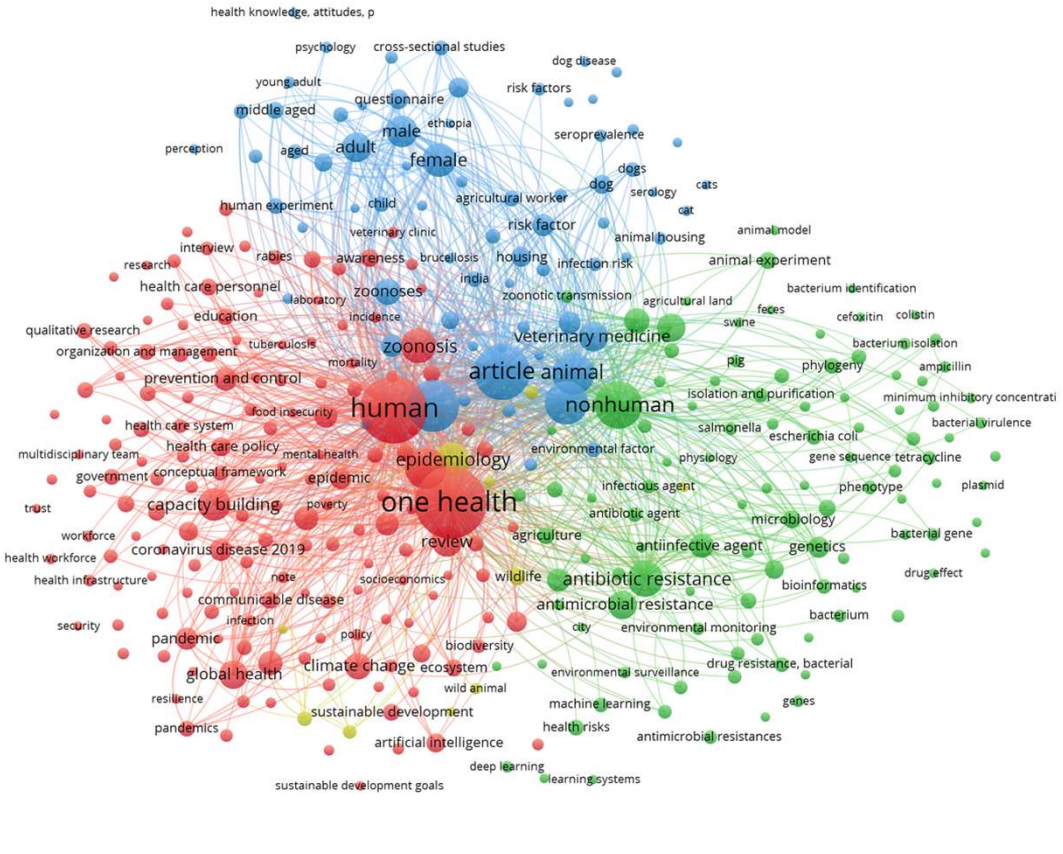
labelled codes (47.0%) map onto the 29 variables; 207 (5.6%) onto the 5 new ones

Where they differ

The review counts what is measured (Density, Mobile Pattern); ATLAS.ti captures design concepts — Design Appeal, Building Typology, biodiversity.

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The Field's Vocabulary Has No Animals



Authors' VOSviewer map of export (iii), 657 records · author + index keywords · min. occurrence 10 · 5 clusters

Key takeaway

Neither "one health" nor any animal, zoonotic or vector term reaches 10 occurrences among 246 keywords.

RESULTS · RQ3

The Tropics Are Barely Represented

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42

studies in the tropics (7.9%); 105 in LMICs (19.8%)

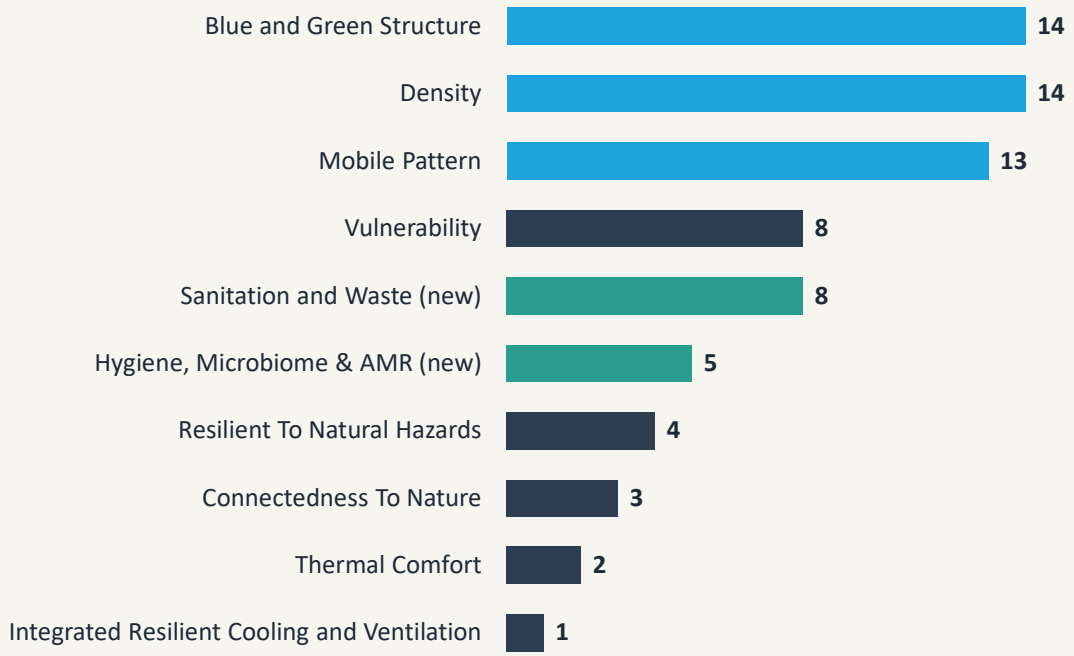
3

studies from Indonesia (Makassar, Surabaya, East Java)

0

propose or test a passive envelope, floor or section design for a dwelling

Variables in the 42 tropical studies



Dwelling-scale tropical evidence: Accra housing · flooded homes in Puerto Rico · traditional vs modern houses in Ecuador

French et al., 2021 · Purwanto et al., 2023 · Fitriani et al., 2019 · Udofia et al., 2014 · Kroeger, 1980

DISCUSSION

Tropical Architecture for One Health

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A design ethic that treats envelope permeability, floor elevation, shading, green structure and material choice as measurable health interventions — not vernacular aesthetics.

1. Passive over Powered

Envelope permeability, cross-ventilation and shading perform without unreliable grids.

2. Local over Homogenized

Rooted in the socio-spatial realities and knowledge systems of the tropical Global South.

3. Shared over Single-species

Designs the dwelling compound for people, animals and ecosystems together.

DISCUSSION · RQ3

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Six Priority Variables for the Tropical Dwelling

HEALTH-RESILIENCE VARIABLE

Integrated Resilient Cooling and Ventilation Systems · Thermal Comfort

21 and 15 studies; 1 and 2 in the tropics — passive cross-ventilation, humidity control

HEALTH-RESILIENCE VARIABLE

Building Typology

35 studies, 1 tropical — raised floors (panggung), steep-pitched roofs

HEALTH-RESILIENCE VARIABLE

Blue and Green Structure · Connectedness To Nature at building scale

13 and 16 building-scale studies — shaded green courtyards, semi-outdoor living

NEW ONE HEALTH VARIABLE

Vector and Pest Control

2 studies — screening, drainage, pest-proof construction

NEW ONE HEALTH VARIABLE

Sanitation and Waste

9 studies, 8 in the tropics — toilets, septic tanks, drainage

NEW ONE HEALTH VARIABLE

Animal Housing and Human–Animal Cohabitation

5 studies — shared compounds, pens, pets indoors

Next step: measure humidity, airflow, vectors, sanitation and wellbeing across contrasting envelopes, floors and green courtyards

SYNTHESIS

Two Paradigms Compared

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	Global North techno-centric	Tropical Architecture + One Health
Core reliance	AI, big data, IoT surveillance	Passive design, envelope, section and compound
Energy profile	Energy-intensive, grid-dependent	Energy-independent, self-sustaining
Health orientation	Pathogenic — tracks existing outbreaks	Salutogenic — supports wellbeing
Species scope	Human occupants	People, animals and ecosystems in one dwelling
Resilience under stress	Vulnerable to infrastructure and funding failure	Resilient to grid failure and resource scarcity

CONCLUSION

Answering the Research Questions

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RQ1 Variables & scale

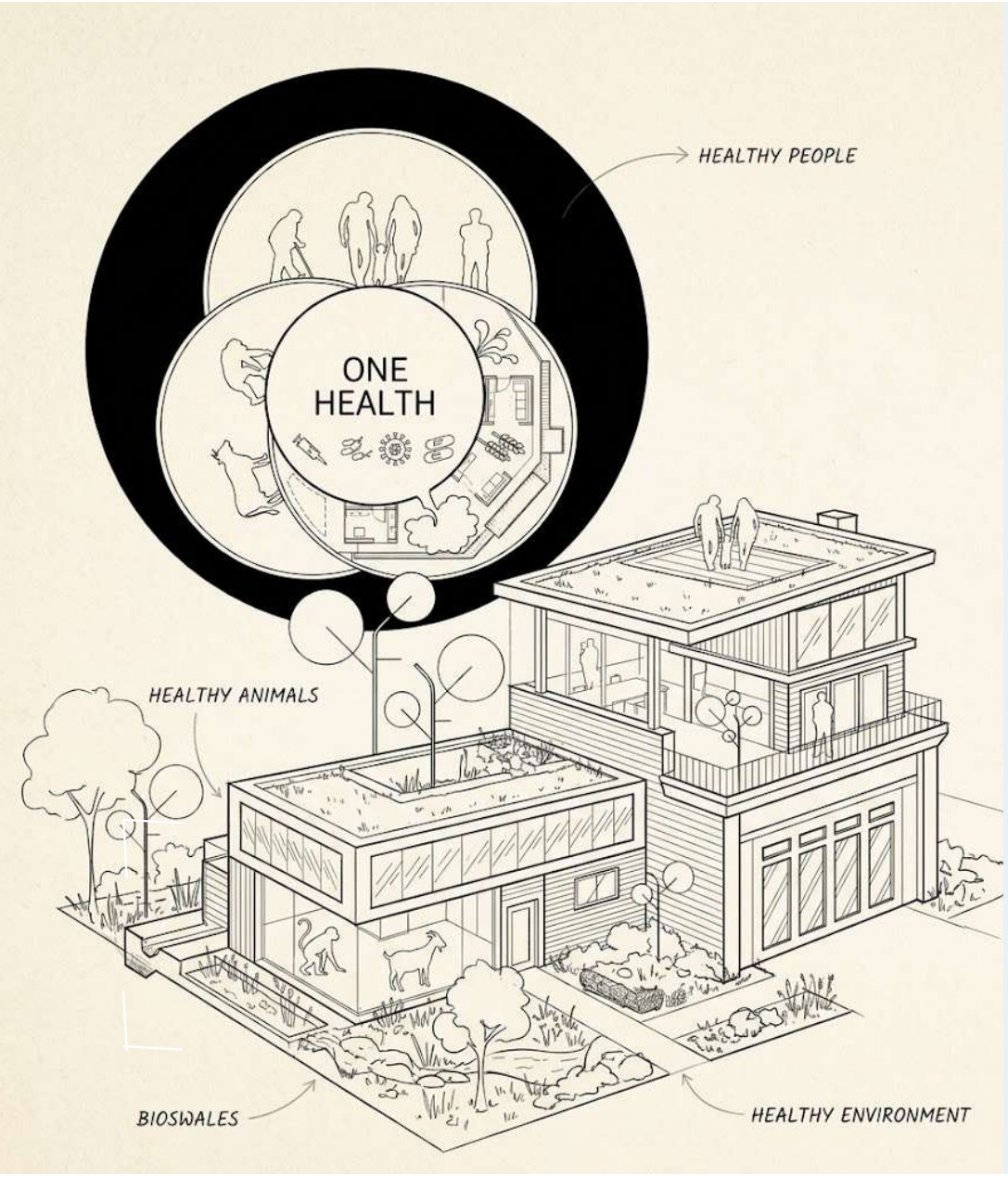
- All 29 health-resilience variables documented; 379 of 531 studies at urban scale
- Mobile Pattern 243 · Blue and Green Structure 153 · Density 104; green space + nature 167
- 5 new One Health variables: hygiene & AMR 30 · biodiversity 14 · sanitation 9 · animal housing 5 · vectors 2

RQ2 Connection to the pillars

- Human 95.3% · environment 13.2% · animal 3.6% · all three 1.1%
- The new variables carry 17 of 19 animal-pillar and all 6 tripartite studies
- ATLAS.ti agrees (ρ = 0.66); VOSviewer: no One Health or animal term reaches the threshold

RQ3 Tropical LMICs

- 42 tropical studies (7.9%), 3 in Indonesia; none tests a passive envelope, floor or section design
- New variables are 3.5× as frequent in the tropics
- Tropical Regionalism + six priority variables (three of them new)



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THANK YOU

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