

— A3 GRADUATION PRESENTATION · MSC BUILDING TECHNOLOGY

Translating resident values into modular façade design

A Value–Indicator Framework for industrialised social-housing refurbishment

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— WHERE IT BEGINS

“Behind every façade is a daily life the façade either makes easier — or doesn't.”

— THE PROBLEM

Two languages, one façade.



THE ENGINEER SPEAKS

Performance

heat loss (U-value) · airtightness · energy use

≠



THE RESIDENT SPEAKS

Lived experience

warmth · what it costs · having a say · still feeling like home

— THE PROBLEM · WHY IT MATTERS

40% of the EU's energy is used by **buildings**.

36% of the EU's **GHG emissions** comes from **buildings**.

85% of today's buildings will **still stand in 2050** · we **renovate, not rebuild**.

Social housing residents are most exposed yet have the least say.



Yet upgrades often underperform · the **performance gap**, a **socio-technical misfit** with how residents actually live.

European Commission (Renovation Wave), 2020 · BPIE, 2022 · Sunikka-Blank & Galvin, 2012.

— THE PROBLEM · THE TRADE-OFF

+ THE PROMISE

- **Speed** · prefab panels, fast install
- **Factory quality control**
- **Less disruption** for residents
- **Customisable** in principle

– THE RISK

- One standard design **repeated everywhere**
- Residents' values **designed out of the result**
- Blocks **lose their own character**





— THE PROBLEM

STEP 1 · ENGAGEMENT SURFACES

What residents value

the missing translation step

STEP 2 · DESIGN DECIDES

What the façade does

The value–design translation gap: residents are asked what they care about, but there's no method to carry it into the façade. So it's heard, then lost.

— THE PROBLEM

Four reasons the gap stays open.

Engagement enters too late

Residents are consulted after the design is already fixed.

Communication asymmetry

Residents and professionals don't share the same terms.

Fragmented governance

Decisions are split across parties; no one owns the translation.

Standardisation logic

Industrialised systems push toward one repeated solution.

Not a failure of technology · a failure of translation.



— THE MAIN RESEARCH QUESTION

How can resident values be systematically integrated into modular façade renovation design in social housing?

Structure of the research and presentation

STEP 1 · SQ1

1

Identify

CROSS-CASE ANALYSIS

STEP 2 · SQ2

2

Translate

THE FRAMEWORK

STEP 3 · SQ3

3

System development

LAYERED LOGIC

STEP 4 · SQ4

4

Application

RESEARCH BY DESIGN

STEP 5 · SQ5

5

Evaluation

KPI SCORING

Design Science Research × Research by Design × Diagrammatic reasoning

Phase 1

Identify

SUB-QUESTION 1

Which resident values recur across European social-housing renovation cases, and what currently prevents them from shaping design decisions?

— PHASE 1 · IDENTIFY · CROSS-CASE ANALYSIS

8 European case studies.



Comfort	*"Operable windows and daylight they can control"*	Reigersbos, Amsterdam
Affordability	*"Clarity on cost and rent before deciding"*	Overvecht-Noord, Utrecht
Fairness	*"The same baseline and transparent decisions for all"*	Bospolder, Rotterdam
Empowerment	*"A genuine vote in the decisions"*	Križevci, Croatia
Sustainability	*"Circular materials they can see and understand"*	Els Mestres, Sabadell
Identity	*"Keeping the building's recognisable character"*	Sutton Estate, London



Reigersbos
Amsterdam (NL)



Dukenburg
Nijmegen (NL)



Overvecht-Noord
Utrecht (NL)



Els Mestres
Sabadell (ES)



Sutton Estate
London (UK)

— PHASE 1 · IDENTIFY

The six recurring values.

Comfort

Daylight and operable, controllable windows.

Affordability

Clear cost and rent impact, upfront.

Fairness

An equal baseline, transparent decisions.

Empowerment

A genuine say in the decisions.

Sustainability

Visible, understandable green measures.

Identity

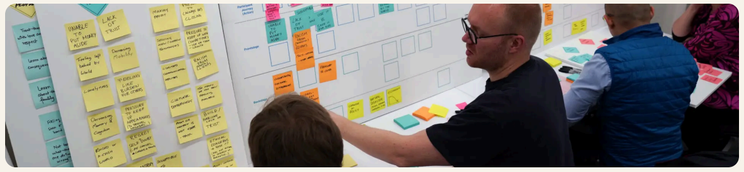
A recognisable building they belong to.



EnergyLab Zuidoost
resident co-design workshop (NL)



HOUSEFUL
residents reviewing plans (ES)



Križevci
concern-mapping session (HR)

Phase 2

Translate

SUB-QUESTION 2

How can these resident values be translated into architectural design indicators for façade renovation?

— PHASE 2 · TRANSLATE

The Value–Indicator Framework.

6
Resident values

→

17
Design indicators

Comfort

RESIDENTS SAY

daylight you can control · *windows you can open* · *shade in summer*

↳ DESIGN INDICATORS

Thermal performance · **Daylight access** · **Solar control**

Identity

RESIDENTS SAY

recognise my own home · *materials with character*

↳ DESIGN INDICATORS

Material expression · **Façade articulation** · **Variation between homes**

Phase 3

System development

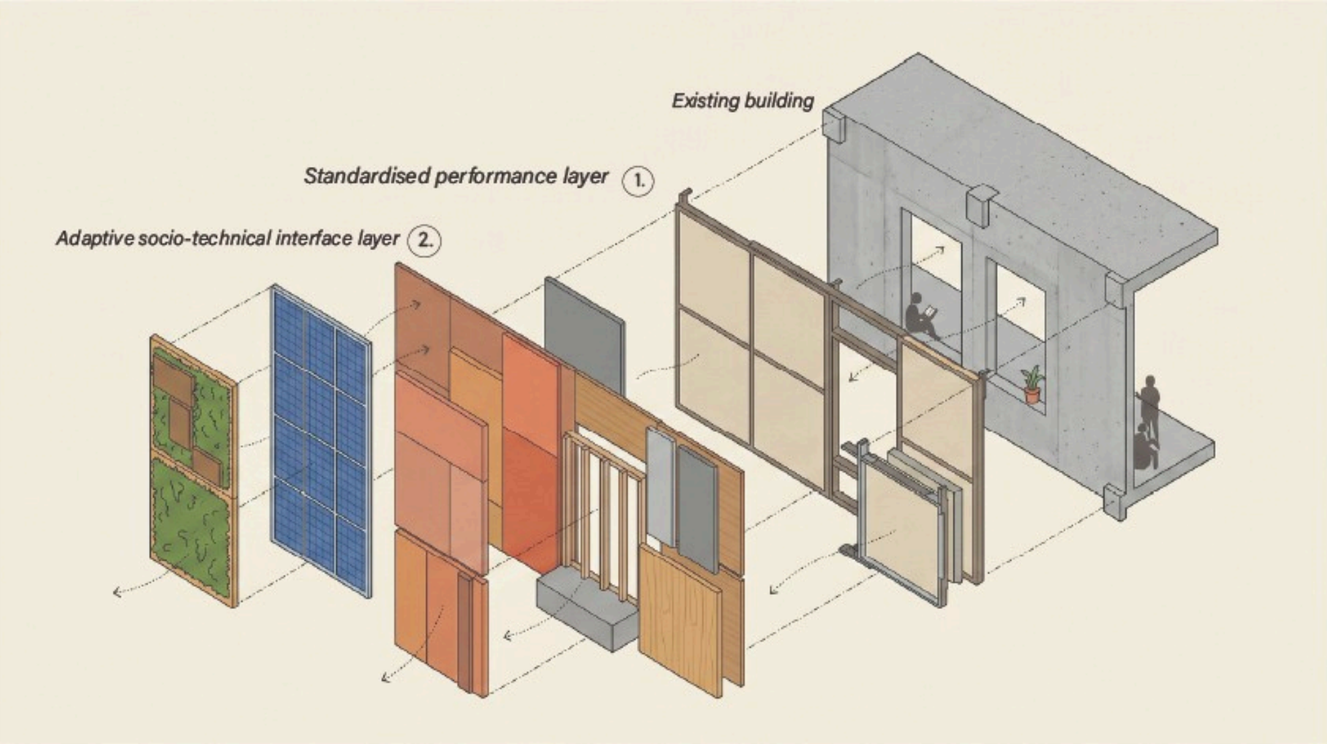
SUB-QUESTION 3

How can these design indicators be operationalised into a modular façade system suitable for industrialised refurbishment?

— PHASE 3 · THE SYSTEM

VIMFS

Value-Integrated Modular Façade System



FIXED · SAME FOR ALL

1 Standardised performance layer

→ secures affordability & fairness

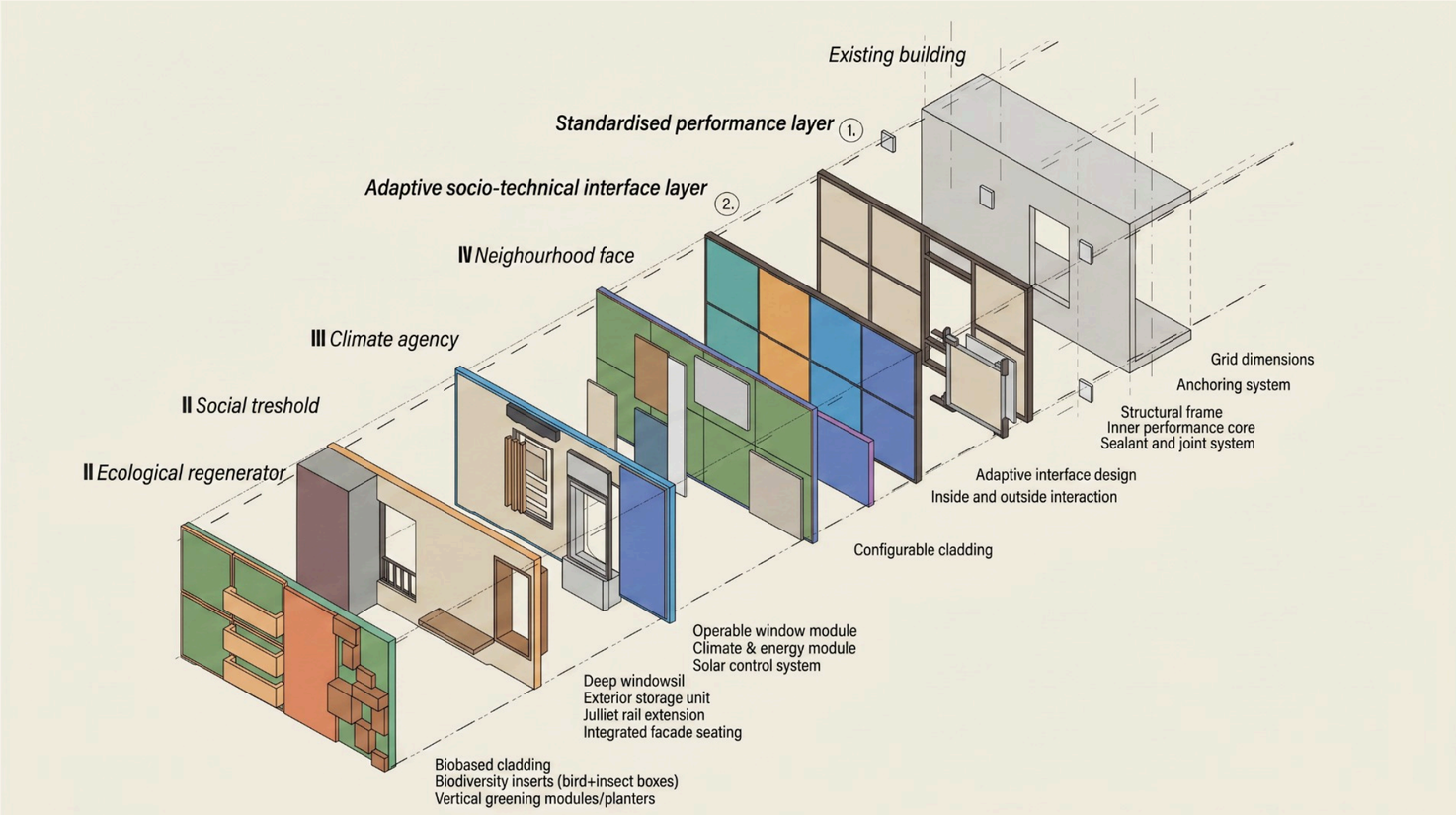
ADAPTABLE · PER DWELLING

2 Adaptive socio-technical interface

→ carries residents' values

— PHASE 3 · SYSTEM

Layer 2 · a bounded catalogue of four value clusters.



I Ecological regenerator (ER)

sustainability · identity

II Social threshold (ST)

comfort · identity · empowerment

III Climate agency (CA)

comfort · empowerment

IV Neighbourhood face (NF)

identity · fairness

Phase 4

Application

SUB-QUESTION 4

How can a configuration logic translate value priorities into traceable design variants within this system?

— PHASE 4 · APPLICATION

The configuration logic.

STEP 01

Listen

Who lives here, and what do they value?

USES
Resident engagement

PRODUCES
Value priorities

→

STEP 02

Translate

What must the façade achieve?

USES
Value–Indicator Framework

PRODUCES
Façade criteria

→

STEP 03

Design

Which façade response delivers it?

USES
Two-layer system + catalogue

PRODUCES
A configured façade

→

STEP 04

Compare

How do the variants differ?

USES
The 17 KPIs

PRODUCES
A compared variant



— PHASE 4 · CASE STUDY APPLICATION

Gijsingstraat, Rotterdam West.

A post-war walk-up in Bospolder-Tussendijken Unit 92–94 A/D.
Single glazing, leaky envelope, no shading, little resident control.
A repetitive layout, suited to modular intervention.

1952	4	C–G	205
post-war walk-up block	storeys + attic, porch access	energy labels across the row	kWh/m²·yr avg. heating demand

STEP 1 · LISTEN

Who lives here, and what do they value?

INPUT

Resident engagement

- Home visits
- Value cards
- Council

→

INSTRUMENT

The project profile

- 1952 walk-up
- Long-term residents
- Climate-aware

→

OUTPUT

Value priorities

- Sustainability
- Identity



STEP 2 · TRANSLATE

What must the façade actually achieve?

INPUT
Value priorities
Sustainability · Identity

→

INSTRUMENT
Value–Indicator–Criteria matrix
Value · Indicator · Criterion

→

OUTPUT
A façade criteria set
Measurable targets

Worked through for V03 · each value ends in a **measurable façade criterion**:

VALUE	INDICATOR	FAÇADE CRITERION
Sustainability	Bio-based material share	A set share of natural, bio-based materials in the façade
Identity	Variation between dwellings	≥ 20% of façade parts differ from home to home

STEP 3 · DESIGN

Which façade response delivers it?

INPUT

Façade criteria

- Visible greening
- Natural materials

→

INSTRUMENT

Two-layer logic + catalogue

- Layer 1 fixed
- Layer 2 · ER + NF

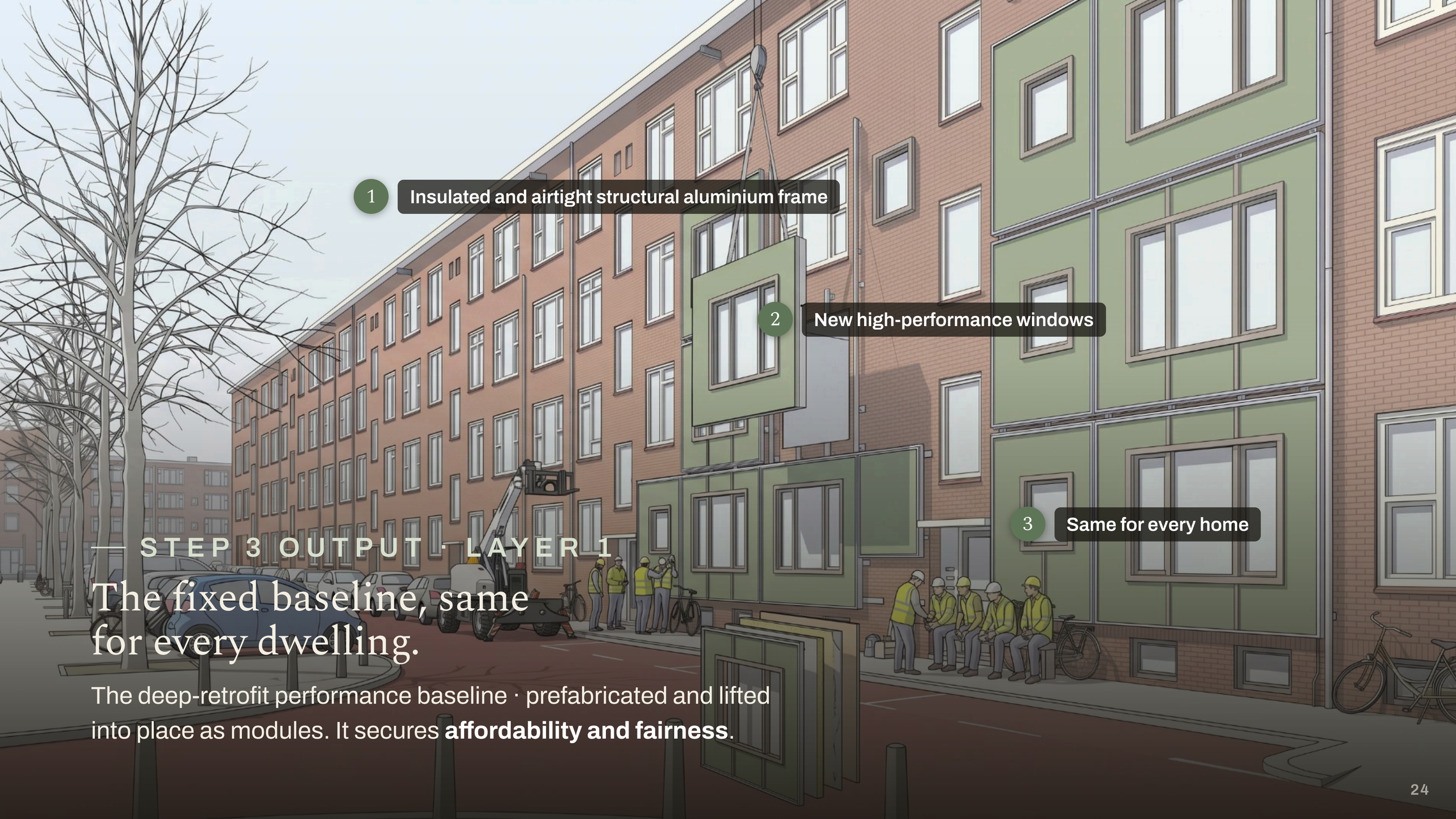
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OUTPUT

A configured V03 façade

- Bio-based cladding
- Vertical greening
- Façade PV

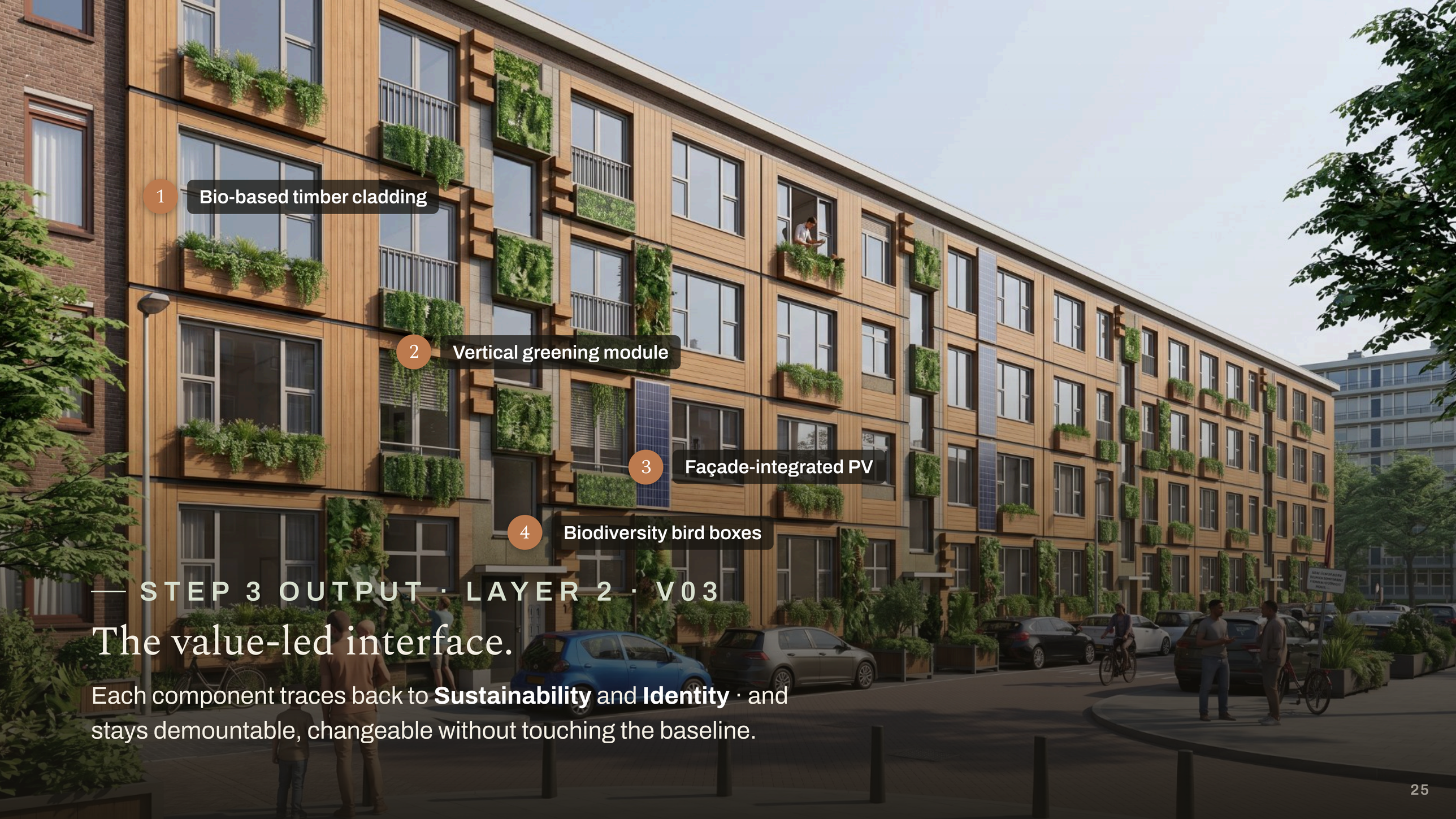




— STEP 3 OUTPUT · LAYER 1

The fixed baseline, same for every dwelling.

The deep-retrofit performance baseline · prefabricated and lifted into place as modules. It secures **affordability and fairness**.



— STEP 3 OUTPUT · LAYER 2 · V03

The value-led interface.

Each component traces back to **Sustainability** and **Identity** · and stays demountable, changeable without touching the baseline.



V01 · Control & Comfort

comfort + empowerment



V02 · Clear & Affordable

affordability + fairness



V03 · Ecological Renewal

sustainability + identity



V04 · Community Threshold

empowerment + comfort + identity



— PHASE 4 · AT STREET LEVEL

One street, recognisably renewed.

The shared Layer 1 keeps the block coherent; Layer 2 lets each dwelling carry its own value profile Difference you can read as neighbourhood character.

Phase 5

Evaluation

SUB-QUESTION 5

To what extent are the resident values visible, measurable, and differentiated across the resulting design variants?

— PHASE 5 · EVALUATION · TURNING INDICATORS INTO KPIS

1 · INDICATOR	2 · MEASURE	3 · TARGET	4 · SCORE
What the façade must address	Measure it on the design	The threshold to beat	Met 1 · part ½ · no 0
Expressed as a measurable façade criterion.	The **KPI** turns the design into one number you can check · a %, a count, or €/m².	Set by one of three sources.	Summed across 17 checks.

Three examples from V03 · one per source:

BUILDING REGS (NL)

1 KPI C4 · Daylight access

2 measured

glazing area ÷ room floor area

2.4 m² ÷ 12 m² = **1/5**

3 target · **≥ 1/7 of floor area**
· Bbl 2024

4 ✓ Met · 1

INDUSTRY REFS

1 KPI A1 · Cost per m²

2 measured

total façade cost ÷ façade area

€384,000 ÷ 700 m² = **€548/m²**

3 target · **≤ €450 / m²**

4 ✕ Not met · 0

V–I FRAMEWORK

1 KPI E1 · Operable elements

2 measured

count operable elements per home

2 windows + 2 vents + 2 shades = **6**

3 target · **≥ 4 per home**
· V–I Framework

4 ✓ Met · 1

Regulation
Building Decree (Bbl 2024) · the legal minimums.
`C2 · C3 · C4 · C5`

Industry
BPIE retrofit-cost data · Dutch EPD carbon database · disassembly-index weighting.
`C1 · A1–A3 · S1–S3`

The framework
Value-side thresholds the V–I Framework sets itself (resident-facing).
`E1–E2 · F1–F2 · I1–I2`

PHASE 5 · EVALUATION · THE COMPARISON AND KPI SCORING

VALUE	V01 · CONTROL & COMFORT	V02 · CLEAR & AFFORDABLE	V03 · ECOLOGICAL RENEWAL	V04 · COMMUNITY THRESHOLD
Comfort C1–C5 · thermal · daylight · ventilation	✓✓✓✓✓	✓✓✓✓◐	✓✓✓✓✓	✓✓✓✓✓
Affordability A1–A3 · cost/m² · component families · baseline repetition	◐✓✓	◐✓✓	✕✓✓	◐✓✓
Fairness F1–F2 · equal baseline · logic	✓✓	✓✓	✓✓	✓✓
Empowerment E1–E2 · operable · controlled area	✓✓	◐◐	✓✓	✓✓
Sustainability S1–S3 · biobased · carbon · reuse	✕◐✓	✕◐✓	✓✓✓ 1	◐◐✓
Identity I1–I2 · expression · variation	✓✓	◐◐	✓✓	✓✓
Total · 17 KPIs evaluated	15	12.5 2	16 3	15.5

Visible
You can point to where each value lives on the façade · sustainability is the greening, comfort is the shading.

Measurable
Each value earns a score against a threshold · not a matter of opinion.

Differentiated
Different priorities give different totals · the four variants score 15 / 12.5 / 16 / 15.5.

✓ Met ◐ Partial ✕ Not met



CONCLUSION · ANSWERING THE QUESTION

How can resident values be systematically integrated into modular façade renovation design in social housing?

“We don't have to choose between standardisation and resident responsiveness.”

- **Values as the starting point** of a traceable design chain · not late-stage consultation.
- **A two-layer system** · a fixed shared baseline, an adaptive layer that carries the value-driven choices.



— CONTRIBUTION · WHAT THIS THESIS PRODUCED

Six products.

1. Resident values
2. Value–Indicator Framework
3. Two-layer system (VIMFS)
4. Component catalogue
5. Configuration logic
6. KPI evaluation

“Every choice on the façade can be traced back to a resident's value.”

`Value` ⇄ `Indicator` ⇄ `Criterion` ⇄ `Component` ⇄ `Design application` ⇄ `KPI evaluation`



— WHAT COMES NEXT

From a design-stage method to a tested process.

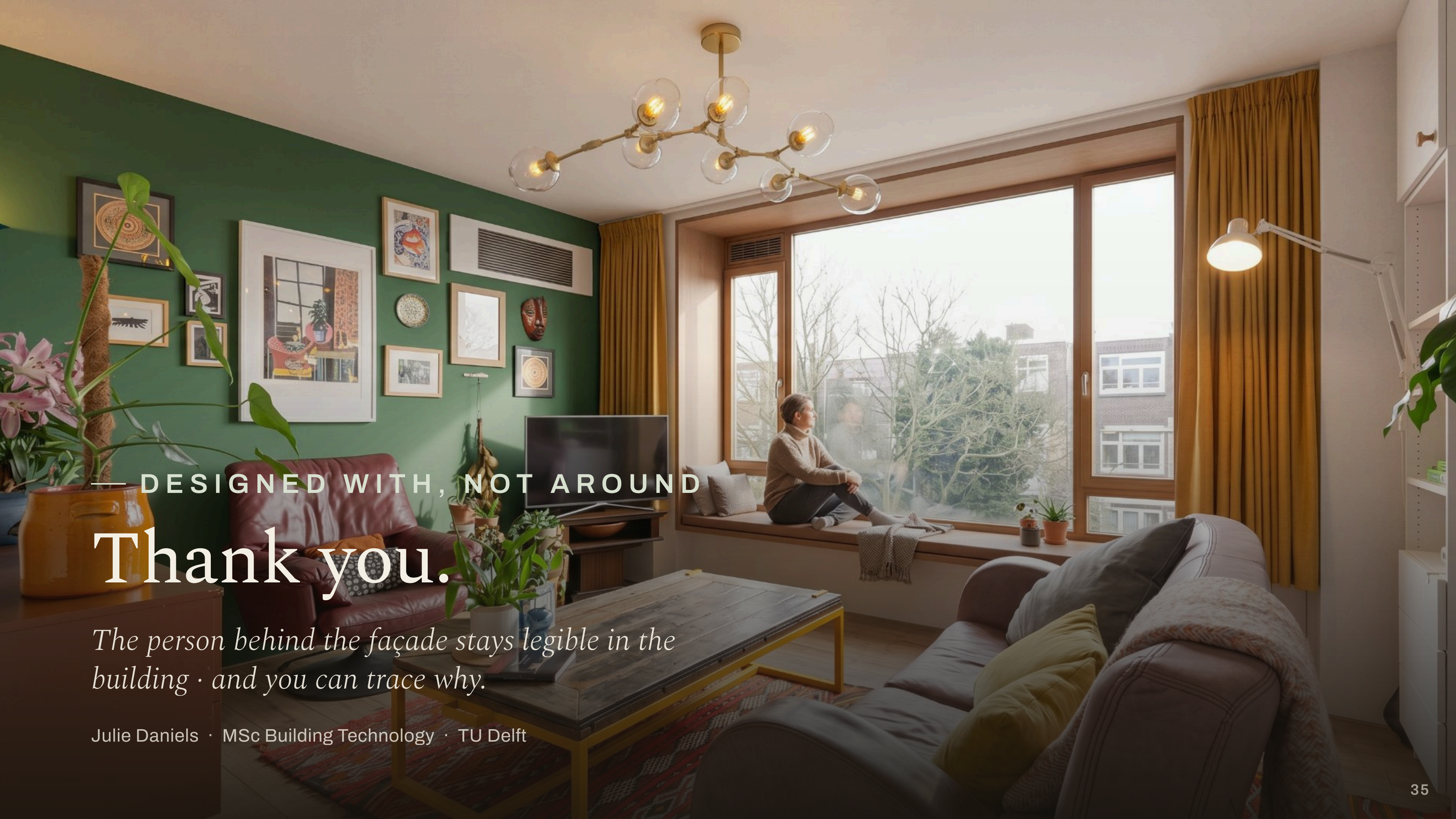
1. Test the engagement protocol in a real renovation.
2. Get a contractor-reviewed cost plan.
3. Run life-cycle, overheating, daylight and acoustic analysis.
4. Detail and prototype the reversible connections.
5. Extend beyond the walk-up to gallery flats, point blocks and larger complexes.



— REFLECTION

Letting technical precision be directed by resident values.

The façade as a meeting point between performance, construction, and everyday life.



— DESIGNED WITH, NOT AROUND

Thank you.

The person behind the façade stays legible in the building · and you can trace why.

Julie Daniels · MSc Building Technology · TU Delft



Questions

Translating resident values into modular façade design.

Julie Daniels · MSc Building Technology, TU Delft



— APPENDIX · FOR DISCUSSION

Reference material for discussion.

— APPENDIX · THE DELIVERABLES

CONCEPTUAL

what residents value, made designable

- **Six resident values**
  from 8 documented European cases
- **Value–Indicator Framework**
  6 values → 17 design indicators

SYSTEM

a buildable, industrialised façade

- **Two-layer system · VIMFS**
  fixed Layer 1 + adaptive Layer 2
- **Component catalogue**
  four value clusters (I–IV)

PROCEDURAL

how a design is made and checked

- **Configuration logic**
  Listen → Translate → Design → Compare
- **KPI evaluation method**
  17 checks, scored 1 / ½ / 0

APPLIED

tested on a real building

- **Gijsingstraat case study**
  post-war walk-up, Rotterdam West
- **Four design variants (V01–V04)**
  + a proposed engagement structure

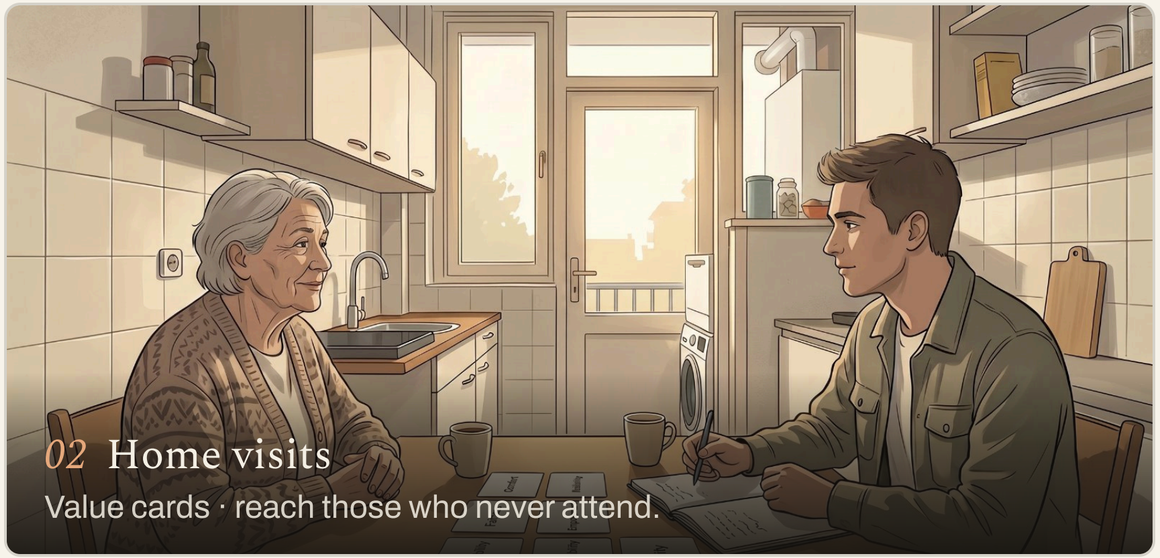
Four kinds of output · one connected method.

— APPENDIX · THE PROPOSED ENGAGEMENT STRUCTURE



01 Plenary evening

What is fixed · what is still open.



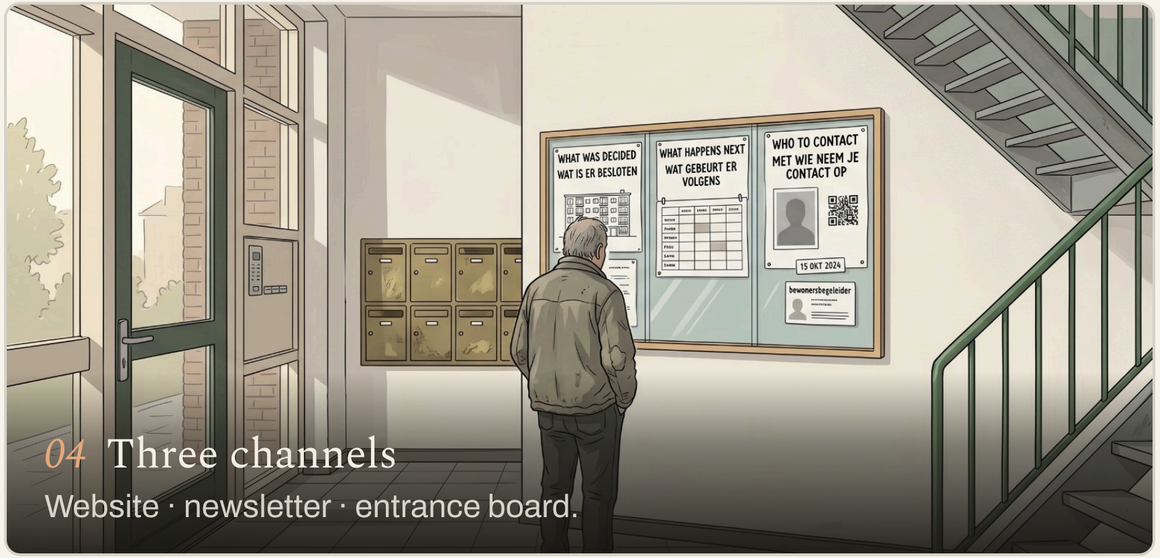
02 Home visits

Value cards · reach those who never attend.



03 Design council

Keeps values recognisable in the design.



04 Three channels

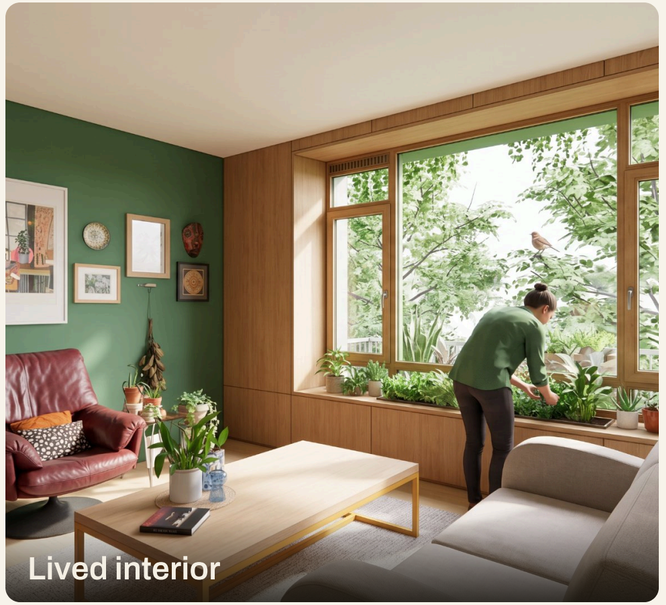
Website · newsletter · entrance board.

Proposed, not yet validated · it directly addresses late entry, communication asymmetry and fragmented governance.


Façade elevation

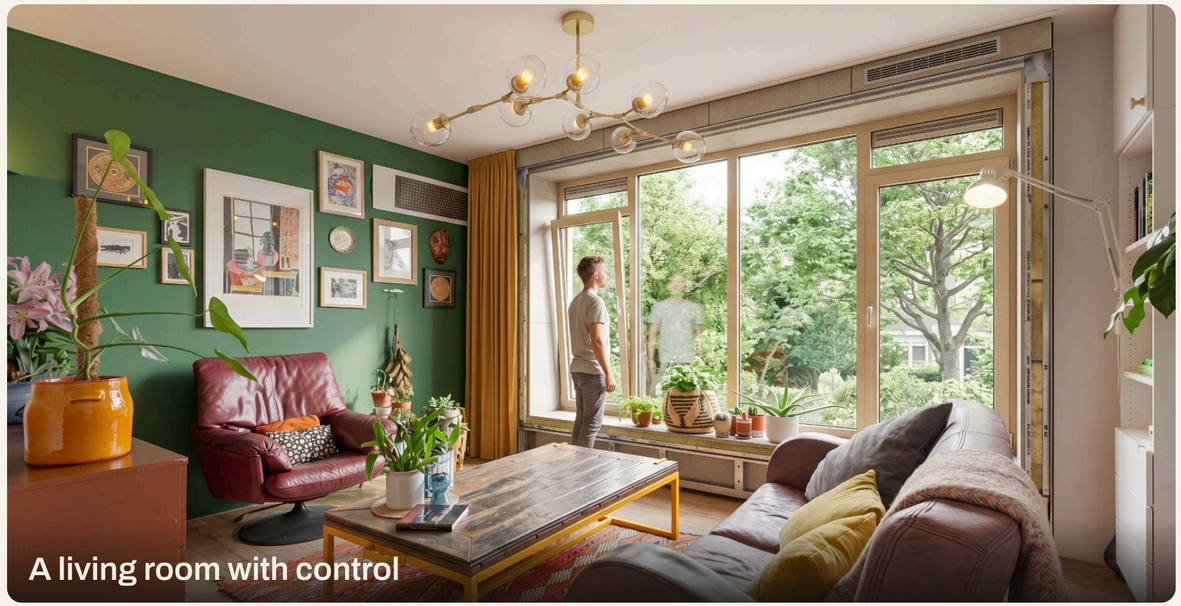

Courtyard threshold


Courtyard garden


Lived interior


At street level

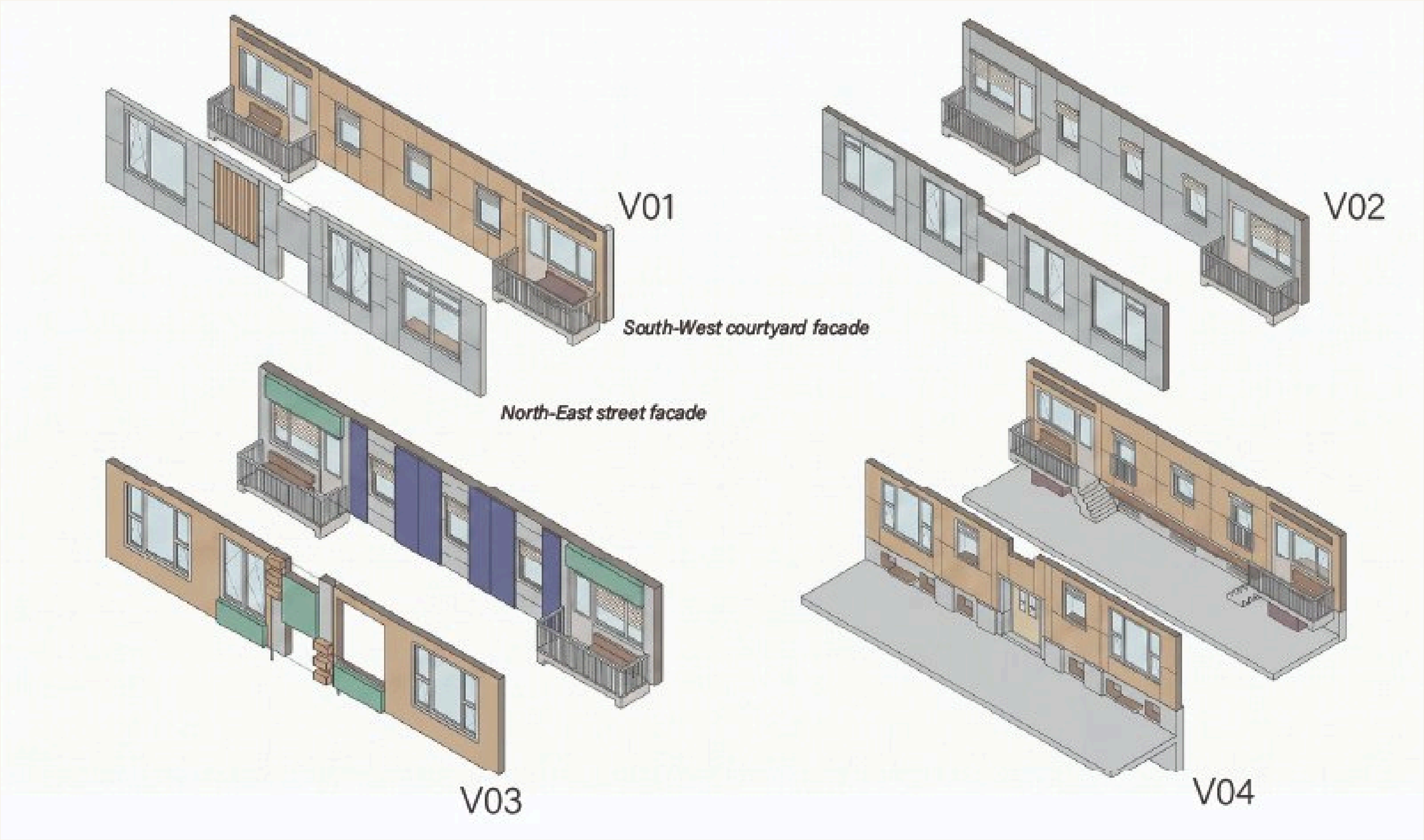

At street level


A living room with control


Kitchen at the threshold


A lasting home

— APPENDIX · THE FOUR VARIANTS, DRAWN



— APPENDIX · THE CONFIGURATION LOGIC, ILLUSTRATED

From values to a design variant.



— APPENDIX · SCOPE

A DESIGN-STAGE METHOD

+ A **traceable chain** from value to a checkable façade output.
+ Every choice **auditable** · back to a value, forward to a KPI.
+ Demonstrated end-to-end on **one real building**.

NOT YET CLAIMED

– Not a finished, **engineered product**.
– Not a **validated participation** process · engagement is proposed.
– No **energy, daylight or life-cycle** simulation results.