

“Bridging the Knowledge Gap in Typological Supply: An Integrated Architect- Investor Framework, Enabling Greater Value Co-Creation in the Urban Residential Investment Practice”

by 6143768

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This thesis addresses the knowledge gap between Architects and Real Estate Investors that constrains typological innovation in the residential investment market. Its primary contribution is the development of a Handbook that defines an integrated framework enabling both disciplines to co-create greater value through Research by Design as an iterative process for testing assumptions and aligning spatial and financial decisions. Grounded in Spatial Adequacy and Patient Capital, the framework translates non-monetary spatial qualities into long-term monetary performance and asset stability. The approach is validated through a Swiss urban case study, demonstrating how evolved practice perspectives can support the design of supply-demand-aligned residential typologies in Zurich.

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1. The Introduction (What and Why?)

Market data indicates that Switzerland faces a significant housing shortage in its urban fabric, ranked fourth-worst in Europe (Swissinfo, 2025), driven by sustained population growth, one million new residents from 2012 to 8,9 million in 2025 (Macrotrends, 2025), and what appears to be a structural housing crisis rooted in typological mismatch: single- and two-person households now constitute around 70% of Swiss households (Federal Statistical Office, 2025), yet residential supply remains disproportionately oriented toward larger units (average 99m²) (Housing Standardisation, 2024), which suggests acute pressure onto Supply-Demand alignment, affordability and typological supply.

1.1 The Problem Statement

The misalignment indicates a fundamental failure of spatial adequacy: evidence suggests that housing supply perpetuates outdated household assumptions while actual occupancy patterns have shifted. Single-person households, exceeding 36% and projected to reach 40% by 2055 (Federal Statistical Office, 2025; Swissinfo, 2025), occupying oversized units generate spatial inefficiency, inflating per-capita costs and displacing multi-person households toward affordability challenges (Gorlin & Newhouse, 2024). Regulatory frameworks increasingly mandate densification and sustainability (Federal Department of Foreign Affairs, 2023), while Investors struggle to balance financial feasibility with non-monetary values (MME, 2025).

This convergence suggests a critical knowledge gap: Architects design without awareness of financial feasibility and investment requirements; Investors assess assets without understanding spatial adequacy or the ability to value non-monetary factors. The result shows a narrow design-finance corridor, created by the investors asset strategy, constraining innovation when typological evolution is most urgent (Gorlin & Newhouse, 2024).

Within Swiss urban contexts, residential vacancy rates have declined for five consecutive years to 1.08% (Federal Statistical Office, 2025), in the core of Geneva 0.54% and Zurich 0.07% (Federal Statistical Office, 2025), well below the 1.5% equilibrium threshold established for market stability, while building permits remain depressed and the new supply of typologies, represent the outdated household composition, accelerating the pressure. This convergence amplifies pressure to densify existing urban fabric with new housing typologies that align with Swiss Federal Office for Housing policy objectives and the actual local housing demand.

1.2 Relevance

This research addresses what appears to be a critical knowledge gap within the interdependent relationship between Architects and Real Estate Investors. The market demonstrates that one cannot effectively operate without the other. Yet their collaboration remains constrained by divergent expertise: Architects lack financial feasibility awareness and household market data (Jewell, 2024); Investors lack spatial adequacy understanding and the ability to value not yet monetary values (Rong, 2020), a mutual comprehension conspicuously absent when developing residential typologies. Architects typically demonstrate limited awareness of financial feasibility, focusing predominantly on design considerations and following the investor's brief. Conversely, Investors possess adequate knowledge of traditional market products, where comparables and data are available. But lack the profound asset/ spatial understanding to push beyond and innovate real estate assets because there are no market comparables available when investing in unconventional non-monetary values that will only show monetary impact during the asset's lifecycle.

This gap becomes particularly acute when projects demand unconventional approaches that challenge traditional business cases.

What remains absent is an integrated framework for evolving the two practices' collaboration. Creating a common tool enabling co-creation by creating a profound knowledge base of both practices, so that most do not need to become specialists in both fields, but enhance collaborative work. This framework creates a tool, enabling the alignment of residential typological supply with actual household demand while balancing spatial quality and financial returns. My thesis constitutes a deliberate step toward establishing this integrated methodology within the European, more specifically, the Swiss urban residential contexts, enabling both professions to co-create value and address the housing shortages through real innovation.

The Handbook benefits three primary stakeholders: Real Estate Investors, the architecture practice, the Public/Residents and Society in general. Further elaborated in the Handbook and Research Outcome.

1.3 Objective and Motivation

Motivation:

I have confronted the knowledge gap between Real Estate Investors and Architects throughout my formative years. My grandfather began as an Architect and evolved to simultaneously embody the role of Investor, a dual perspective that shaped my understanding of their interdependence. My entire education and career trajectory have been deliberately constructed to bridge Finance and Architecture, mastering both languages.

I understand intimately how interdependent these domains are, yet they occupy such divergent spectrums that individuals and institutions invariably specialise in one, perpetuating the knowledge gap. Possessing deep knowledge of both sides reveals how profoundly beneficial cross-domain expertise becomes, particularly for Investors who ultimately hold greater decision-making authority. Through numerous investment cycles, I have observed Investors consistently applying identical assumptions to residential assets situated in vastly different contexts and struggling to commit to non-traditional designs, due to difficult valuation. While Architects remain isolated from financial implications and design for the brief or assumed demand. I aim to challenge these established boundaries by creating an integrated framework, focusing on research by design, enabling Investors and Architects to collaborate more precisely through an iterative process, thereby advancing both investment strategies and architectural design. This is particularly critical in the residential sector, where conventional approaches persistently fail to address structural typological mismatch, due to the valuation of not yet monetary values.

Ambition:

My ambition extends beyond this thesis; it represents work developed for years before this programme. This foundation, combined with a disciplined work ethic and continuous growth, positions me to advance this thesis beyond conventional expectations and establish a framework with practical application potential.

Aim:

To establish an integrated Framework for the architect and Investor, defining concrete elements to evolve, one of which is research by design. The Handbook develops a common tool to co-create and innovate the residential investment practice on both sides, the design adequacy and financial attractiveness, to align with the market-specific demand.

Goal:

To create an integrated framework, enabling long-term asset stability and aligning typological supply-demand, to tackle housing shortage and the associated societal costs. Furthermore, applying the handbook to create a design case, pushing traditional boundaries and using the architectural mind as a value enabler.

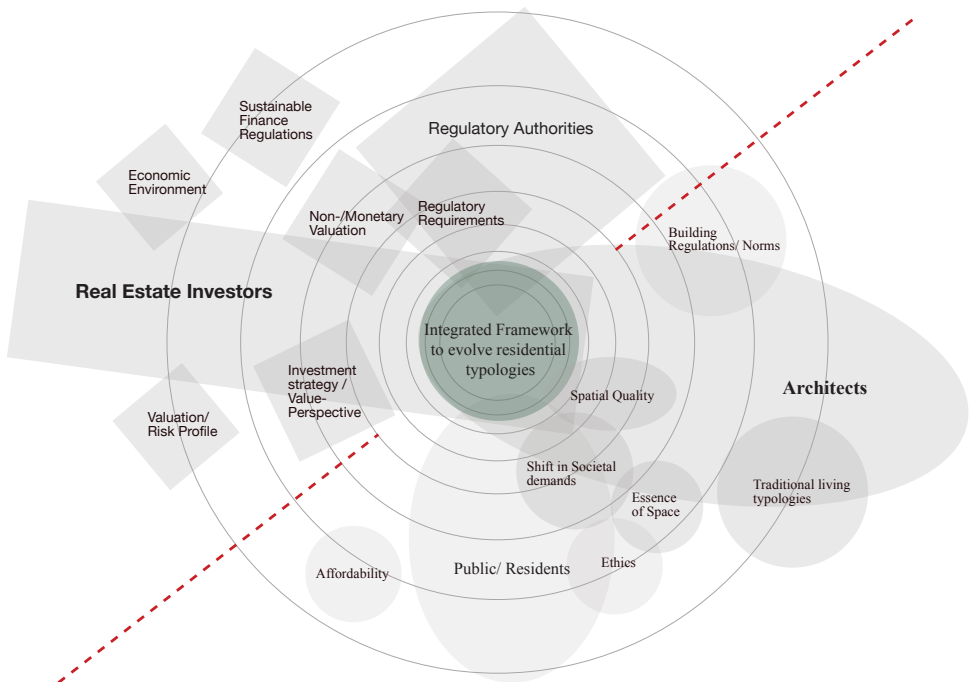
Beyond the Gap: Limitations of Co-Creation:

Even achieving ideal Architect-Investor co-creation, we cannot overcome fundamental market structure constraints: capitalist real estate markets inherently require monetary returns, generating persistent tension between financial revenue and affordable housing provision. This thesis does not claim to resolve capitalism's structural contradictions nor transform entire market sectors. Rather, it acknowledges that individual actors operate within market constraints and proposes that an evolved individual handling and process perspective, specifically, research by design, enables superior outcomes within existing structures. The framework targets achievable behavioural shifts (research by design, patient capital, spatial adequacy) rather than utopian systemic transformation.

1.4 Research Question

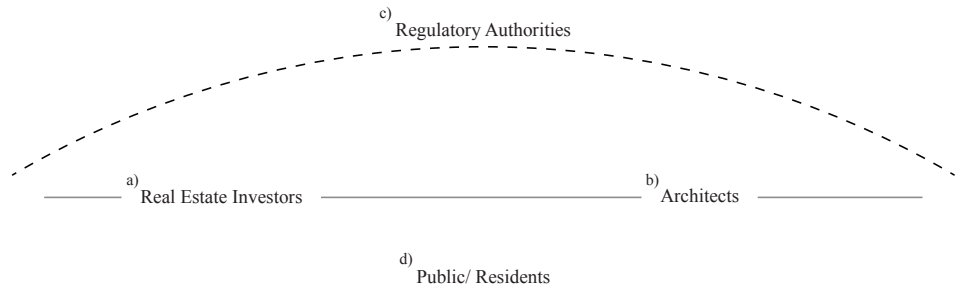
How can an integrated framework enable the development of residential typologies that align supply with actual household demand, while maintaining spatial quality and financial feasibility to ensure long-term asset stability for real estate Investors in Swiss urban contexts?

- a)
How must investors value perspective evolve to assess typological strategies, balancing supply-demand alignment with financial feasibility for long-term asset stability?
- b)
How must Architects design strategy and process evolve to align residential typological supply with shifting household demand while maintaining essential spatial quality?
- c)
How can an integrated framework strengthen Architect-Investor collaboration to co-create monetary and non-monetary value through enhanced mutual understanding?



1.5 Scope

Key Influencers: Roles and Positions



a)

Real Estate Investor: The Investor allocates capital into residential assets, defines the investment case, assesses financial feasibility, and determines whether expected returns justify execution. The Investor commissions the Architect, ensures regulatory compliance, and leases the completed asset to Residents, generating returns on invested capital.

b)

Architects (the role of an Architect): The Architect is commissioned by the Investor to design and deliver a built asset that fulfils financial objectives while meeting regulatory and design standards. The Architect translates investment goals and spatial requirements into built form, coordinating specialists throughout the process.

c)

Regulatory Authorities: Regulatory Authorities establish and enforce the legal, financial, environmental, and ethical standards within which both Architect and Investor operate. They define the boundaries of feasibility and design freedom simultaneously, and their requirements must be satisfied throughout the full project lifecycle.

d)

Public/ Residents: Residents are the end-users of housing, directly affected by design quality and affordability outcomes. Through occupancy, they sustain the building's lifecycle and generate the rental revenue stream that enables Investor returns. Their spatial needs, which are increasingly misaligned with current supply, are the central demand signal this Handbook responds to.

Theoretical Anchor:

The research prioritises identifying essential space demand of Swiss urban households as the primary optimisation, developing typological configurations that resolve supply-demand mismatch as the key intervention. The dual theoretical anchors provide complementary optimisation mechanisms: Spatial Adequacy defines what must be built (right-sized, essential-quality typologies); Patient Capital defines the investors capital strategy (long-term value stability exceeds short-term cost minimisation). Both theories are crucial to co-create, prioritising essential sufficiency over maximal abundance, creating parallel optimisation logic across spatial and financial domains.

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1. Spatial: Theory of Spatial Adequacy

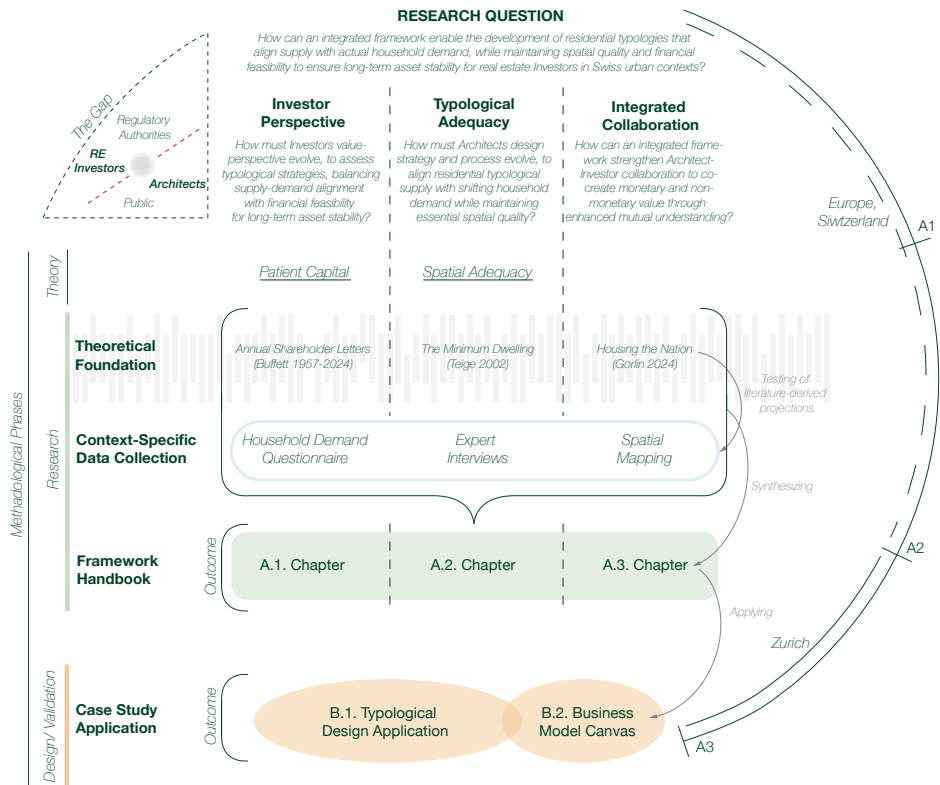
This thesis anchors on Spatial Adequacy Theory (Teige, 2002), the principle that residential typologies must align with actual location-specific household demand rather than perpetuating traditional assumptions. Building on Teige's existenzminimum framework (2002), spatial adequacy states that right-sized configurations, optimised to occupant needs while preserving essential quality, minimise societal costs from spatial inefficiency and displacement pressure. Applied to Switzerland's urban context, this theory reframes the empirical supply-demand mismatch as a solvable design-investment problem. Aligning typological supply with actual household demand simultaneously improves Investor financial feasibility through reduced vacancy risk and societal outcomes through enhanced affordability and spatial efficiency. This dual optimisation positions spatial adequacy as the integrating mechanism between architectural design strategy (sub-question b) and Investor valuation evolution (sub-question a).

2. Financial: Theory of Patient Capital

This thesis anchors financial assessment on the Theory of Patient Capital (Frazzini, 2018; Cunningham, 1997), the principle that extended investment holding periods incentivise quality-focused asset stewardship over short-term yield maximisation. Building on Buffett's empirically validated long-term investment philosophy (Buffett, 1957), patient capital posits that Investors optimizing for sustained asset performance rather than immediate returns align inherently with superior typological quality: they capture long-term benefits (tenant retention, regulatory compliance, stable rents) and avoid costs of obsolescence (vacancy, displacement pressure, regulatory penalties). This thesis defines sustainability as long-term stability, enhanced through patience, extended holding periods, and asset care rather than short-term financial extraction. Applied to Switzerland's housing shortage, this theory reframes Investor-Architect collaboration as alignment, where extended hold periods demand earlier design integration to ensure typologies meet evolving household demand throughout the asset lifecycle.

Research Diagram: Program and Context

This thesis is structured around two tightly linked segments. The first is the Handbook, a scalable tool, as the thesis' primary research output. The second tests the framework through application, combining architectural design and an investment-oriented assessment.



A. The Handbook: The Ultimate Tool (Research Output)

The Handbook defines an integrated framework, positioned at the European urban residential market level to remain scalable across comparable contexts. It is developed through three chapters, each answering one sub-question and together forming an integrated operational approach.

A.1 Investor's Value-Perspective (sub-question a)

Defines how investor decision-making must evolve beyond a purely short-term DCF logic by evolving the investment perspective and process through research by design, patient-capital principles and asset ownership. It establishes an evolved value-perspective and process, allowing innovation within the residential investment practice while focusing on monetary feasibility and creating non-monetary value drivers that influence long-term performance for the asset and its environment.

A.2 Architect's Design Strategy (sub-question b)

Defines how the architect's role within the investment process needs to evolve and design strategies to enable targeted innovation. It defines the research-by-design iterative process and the spatial adequacy design strategy that enable co-creation to design supply-demand-aligned typologies without sacrificing essential spatial quality.

A.3 Integrated Architect-Investor Collaboration (sub-question c)

Operationalises the collaboration gap between architects and investors through research by design. It synthesises A.1 and A.2 into a shared process: when collaboration must occur and how the process should be applied, to iteratively test decisions in both practices.

B. Design: Case Study Application in the Swiss Urban Context

The tool (Handbook) is applied to the Zurich urban case to move beyond theoretical validity and test practical application under household demand.

B.1 Typological Design Application

Applies the Handbook to Zurich. The process and perspective defined in chapters A.1 and A.2 are translated into the asset design, demonstrating how the tool and thinking are reflected in the architectural design of the innovated typologies throughout various levels of scale.

B.2 Business Model Canvas Assessment

Translates the Handbook's perspective into the Business Case for the Asset. Describing how the valuation should occur and with what perspective, both monetary and non-monetary values should be viewed.

Location

Framework scope - European urban residential markets: The Handbook is developed at a European level to remain scalable across comparable urban housing markets. Switzerland is used as the anchoring context to ground the framework in a high-pressure, high-regulation environment, while keeping the framework transferable beyond a single national case.

Design Application scope - Zurich, Switzerland: The framework is applied in Zurich to provide location-specific context and to develop the architectural part of the Handbook.

Limitations

Geographic transferability: The framework remains European because real estate regulation, investment regimes, and housing-market structures differ substantially across continents (e.g., EU sustainability finance instruments versus non-European systems). A global scope would reduce applicability and precision.

Key Challenges:

- Aligning architectural spatial logic with investor feasibility, risk, and valuation logic.
- Converting household-structure change into typology and unit-mix implications.
- Collecting context-specific evidence to test, calibrate, and validate framework assumptions.
- Translating Patient Capital from theory into explicit valuation criteria and decision steps.
- Translating Spatial Adequacy into buildable typologies and measurable performance indicators.

Initial Landscape Assessment (Baseline)

Researcher's perspective on the current Investor-Architect landscape before investigation.

Real Estate Investors Value-Perspective & Valuation:

The majority of institutional Real Estate Investors have maintained the same valuation perspective over recent decades. Focusing on three dimensions: Profitability, Security and Liquidity, assessed through assumptions fed into the Discounted Cash Flow Model, creating the base of the decision-making of the investment. The Timeline is often focused on short-term profitability, and assumptions are made by the financial Analyst via Market knowledge and Statistics. This short-term orientation and lack of seeing value in non-monetary/ comparable values, conflicts with patient capital principles, extended holding periods and asset stewardship, constraining typological innovation requiring up-front investment for long-term stability.

Profitability:

Investors maximize risk-adjusted returns through rental yields and capital appreciation, calculated by an DCF (Discounted Cash Flow Model) and measured by IRR (Internal Rate of Return), CoC (cash-on-cash) returns, and NOI (Net Operating Income) growth.

Security:

Investors protect capital through tenant quality, lease duration, diversification, and conservative leverage to ensure stable cash flows and minimise downside risk.

Liquidity:

Liquidity is maintained through regulatory compliance, particularly energy standards, and debt provider alignment, ensuring assets remain financeable and enabling exit without valuation discounts.

Typological supply vs. household demand:

Market trends indicate that European residential developments tend to perpetuate traditional 2-4 room family-oriented typologies despite single-person households appearing to be the fastest-growing demographic segment. This spatial adequacy challenge suggests scarcity in appropriately sized units, forcing higher-income single households to compete with lower-income multi-person households for identical, oversized typologies. Experimental concepts (co-living, modular, flexible configurations) remain pilot projects rather than mainstream typological evolution.

Societal Cost:

Typological supply-demand mismatch indicates spatial inefficiency (single-person households occupying excess m²), rental price inflation through intensified competition, and systematic displacement of lower-income multi-person households toward homelessness or subsidised housing dependency. This shows the gap that Spatial Adequacy Theory addresses: aligning typological supply with actual household demand reduces both Investor vacancy risk and societal displacement costs.

2. The Approach (How?)

2.1 Methodological Framework

The Thesis is segmented into four crucial phases. Each phase builds upon another to create a coherent and holistic outcome, challenged through iterations and layering.

PHASE 1: Theoretical Foundation & Projection Establishment

Objective: Establish theoretical grounding and current-state benchmarks across Investors and Architects value-perspective, spatial adequacy, and collaboration frameworks while challenging established approaches.

Method: Literature Review

Analysis Method: Comparative benchmarking, critical challenge of conventional frameworks and forming projections.

PHASE 2: Context-Specific Data Collection

Objective: Generate primary data, testing literature-derived projections within the location specific context, Zurich, gathering empirical evidence on actual household demand, typological supply and learning from experts in academia, research and both practices. The Interviews, conducted after the data gathering and literature derived projections, are crucial to challenge them and to learn from the experts pain points and challenges

Method 2.1: Household Demand Questionnaire

Objective: Collection of location specific household demand data as input to develop an innovative, adequate typology.

Target: 65 residents within the Urban Context

Analysis Method: Descriptive statistics, gap analysis, weighted ranking

Method 2.2: Investor Expert Interviews

Objective: To learn from the experts perspective and positioning within the topic.

Target: Institutional Investors, Market Experts, Experts of the gap, Architects, Researchers

Analysis Method: Interviews/ Discussions

Method 2.3: Spatial Mapping & Typological Analysis

Objective: Collection of unified qualities and deficiencies.

Target: 100 residential typologies currently being supplied in Zurich

Analysis Method: Supply-demand gap calculation; efficiency benchmarking; spatial analysis

PHASE 3: Handbook Development - the ultimate tool (generic)

Objective: Synthesise literature (Phase 1) and primary data (Phase 2) into the integrated Handbook, producing Chapters A.1, A.2, A.3. Still being reiterated and discussed with experts, to improve and challenge my own positionings.

Chapter A.1: Investor's Value-Perspective (Research Sub-Question a)
Chapter A.2: Architect's Design Strategy (Research Sub-Question b)
Chapter A.3: Integrated Architect-Investor Collaboration (Research Sub-Question c)

Please refer to the Handbook for further elaboration on the outcome of each chapter.

PHASE 4: Tool Application (specific)

Objective: Apply and validate the ultimate tool, the Handbook, by using the defined strategies in the specific market design context.

B.1: Typological Design Application

Process: Directly applying the strategies and perspectives defined in the Handbook. Using the reiterative process to challenge the architectural design through the investor's needs. Translating quantitative household demand data into spatial adequacy, designed to target the chosen customer segment to sharply address, thus supplying the right typology matching the demand.

B.2: Business Model Canvas

Process: The scope of the investor's validation is limited due to the thesis's architectural focus. However to show the strategy and use-case, the handbook strategies have been applied to define the asset-specific business model canvas, to then further develop the asset-specific financial analysis.

Expected Validation

The thesis defined framework, the handbook, is being validated through the architectural design and business model canvas. Furthermore, has the positioning and strategic definition of the handbook been validated, challenged and reiterated through the expert discussions? The Architectural strategies have been validated through the iterative approach of the design. The key validation is the composition of the outcome, the design and the business model canvas, working closely together, created through research by design.

2.2 Theoretical Framework

The research anchors, Theory of Patient Capital (financial lens) and Theory of Spatial Adequacy (spatial lens), address the knowledge gap between Architects and Real Estate Investors, informing possible strategies. The theoretical framework supports these anchors within the three domains:

- 1) Investor's Value-Perspective,
- 2) Architect's Design Criteria, and
- 3) Integrated Architect-Investor Collaboration.

The three theoretical backbones operate as an integrated system within this thesis. Patient Capital defines the investment perspective required for long-term value creation; Spatial Adequacy defines the design logic that generates non-monetary value; Research by Design establishes the iterative process through which both perspectives are tested and aligned. Together, they form the foundation of the Handbook, enabling Architects and Investors to co-create typologies that are spatially adequate, financially feasible, and aligned with actual household demand.

The three domains are complemented by subsidiary references extending the discussion across interlinked economic, spatial, regulatory and social dimensions.

Theoretical Backbone

1. Investor's Value-Perspective

Theory of Patient Capital:

- Cunningham, L. A. (1997). The Essays of Warren Buffett: Lessons for Corporate America. *Cardozo Law Review*, 19(1).
- Buffett, W. E. (1957-2024). Berkshire Hathaway annual shareholder letters. Berkshire Hathaway Inc.
- Frazzini, A., Kabiller, D., & Pedersen, L. H. (2018). Buffett's alpha. *Financial Analysts Journal*, 74(4).

Buffett's annual shareholder letters provide the direct example of Patient Capital theory, demonstrating that extended holding periods and quality-focused asset selection generate superior risk-adjusted returns within the stock market through partial ownership of companies. The three chosen sources offer complementary perspectives on this philosophy. This thesis applies Buffett's Patient Capital approach to the real estate industry, translating the principles of long-term stewardship and quality orientation into a residential investment strategy.

2. Architect's Design Strategy

Theory of Spatial Adequacy:

- Teige, K. (Ed.). (2002). *The Minimum Dwelling*. MIT Press Graham Foundation for Advanced Studies in the Fine Arts.

Teige establishes the theoretical foundation for distinguishing essential spatial quality from excess, defining Spatial Adequacy as a design principle. However, Teige does not

address the financial implications of spatial excess or adequacy. This thesis develops that connection, translating Spatial Adequacy into financial terms by demonstrating how adequacy over maximisation transforms non-monetary spatial value into monetary performance over the long term.

3. Integrated Architect-Investor Collaboration

Collaboration/ Research by Design:

- Gorlin, A., & Newhouse, V. (Eds). (2024). *Housing the nation: Social equity, architecture, and the future of affordable housing*. Rizzoli International Publications, Inc.
- Lawson, B. (2006). *How designers think: The design process demystified* (4th ed.). Architectural Press.

Gorlin directly relates housing design to affordability, diagnosing the disciplinary knowledge gap where Architects design for societal demand while Investors struggle to make traditional typologies financially viable. Lawson complements this with insight into the design process itself. This thesis develops Gorlin's diagnosis further by establishing Research by Design as the iterative process through which both industries collaborate, testing assumptions and co-creating value beyond what either profession achieves independently.

The key Theoretical Backbone has been supported by many other literature pieces, spanning from the investor's perspective, spatial strategies, via many more subsidiary topics, to Research by design.

- Asset Management Association Switzerland. (2024). *AMAS guidelines on sustainability*. AMAS.
- Conrads, C., Hackelberg, F., & Veith, T. (2022). *ESG and real estate: A practical guide for the entire real estate and investment life cycle*. Haufe Group.
- Baum, A. E., & Hartzell, D. (2020). *Real estate investment: Strategies, structures, decisions* (2nd ed.). John Wiley & Sons, Inc.
- Walker, T., Krosinsky, C., Hasan, L. N., & Kibsey, S. D. (2019). *Sustainable real estate: Multidisciplinary approaches to an evolving system*. Palgrave Macmillan.
- Boudet, D. (Ed.). (2017). *New housing in Zurich: Typologies for a changing society*. Park Books
- Hillier, B. (1996). *Space is the machine: A configurational theory of architecture*. Cambridge University Press.
- Cross, N. (2006). *Designerly ways of knowing*. Springer.
- Jewell, N. (2024). *The missing business education in architecture: Why architects struggle to value their services*. Building Design.
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- Rong, H. H., Yang, J., Kang, M., & Chegut, A. (2020). *The value of design in real estate asset pricing*. *Buildings*, 10(10), Article 178.
- European Commission. (2019). *Regulation (EU) 2019/2088 of the European Parliament and of the Council of 27 November 2019 on sustainability-related disclosures in the financial services sector*. Official Journal of the European Union.
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- European Commission. (2021a). *Commission Delegated Regulation (EU) 2021/2139 of 4 June 2021 supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council by establishing the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to climate change mitigation or climate change adaptation and for determining whether that economic activity causes no significant harm to any of the other environmental objectives*. Official Journal of the European Union.
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- Federal Office for the Environment. (2025). *Switzerland's climate policy*. Swiss Confederation.
- Federal Statistical Office. (2025). *Construction and housing statistics*. Swiss Confederation.
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- Love, P. E. D., Ahiaga-Dagbui, D. D., & Irani, Z. (2016). *Cost overruns in transportation infrastructure projects: Sowing the seeds for a probabilistic theory of causation*. *Transportation Research Part A: Policy and Practice*, 92, 184-194.
- Coulter, R. (2023). *Housing and life course dynamics: Changing lives, places and inequalities*. Policy Press.
- Sevaldson, B. (2010). *Discussions & movements in design research*. FORMakademisk, 3 (1).
- United Nations Environment Programme Finance Initiative. (2016). *Sustainable real estate investment: Implementing the Paris climate agreement: An action framework*. UNEPFI, Ceres, IGCC, IIGCC, PRI, RICS.

2. The Results (What has been achieved?)

A fundamental distinction must be established between the generic and the specific outcome of this thesis:

Generic = the Handbook – applicable and scalable throughout the European urban context.

Specific = the Design & Business Model – specific to the urban context of Zurich

Both outcomes require different research inputs and data sources; however, an iterative loop between the generic and the specific was central to the process. The Handbook was continuously refined and evolved through its application in the design and business model, and vice versa.

3.1 The Handbook of Research

The Handbook is the product of extensive research, as described in the preceding chapters, drawing on a systematic literature review, iterative projection testing, and structured discussions with fifteen experts representing a range of complementary perspectives. The expert selection followed an exploratory approach designed to capture a wide spectrum of perspectives relevant to the residential investment process. Sampling began with practitioners directly engaged in real estate investment management and architectural practice, then broadened to include specialised academics across real estate valuation, real estate innovation, architectural innovation, cooperative housing models, and alternative ownership structures. While not every specific field can be represented, the sampling was conducted to ensure the Handbook does not lean toward one discipline but benefits from diverse expertise. These expert discussions constituted one of the most consequential steps of the research process, ensuring that the outcome functions as a practical and applicable tool for both the architectural and investment professions. The research necessarily operated across a wide scope, making disciplinary focus a continuous challenge. While the scope of the thesis was deliberately maintained, many additional themes emerged during expert discussions that feed further exploration beyond this work. These discussions were essential not only to validate the defined integrated framework but also to challenge and refine it, testing its assumptions against the realities of practice and identifying where further development is warranted. The key takeaways from the expert discussions are documented in the appendix.

3.2 The Design Research

The Handbook constitutes the primary generic research outcome, the ultimate tool for evolving the residential investment process from both the Architect's and the Investor's perspective. As the architectural focus of this thesis, the strategies defined within the Handbook have been applied to generate a concrete architectural outcome: a demonstration of what the Handbook produces when put into practice.

The architectural exploration draws on multiple layers of literature from the theoretical framework and situates design decisions within empirical, real-world conditions. As defined in the Handbook, strategies and design thinking are established at the framework level; however, their application requires location-specific data. Two inputs are therefore essential: the **Typological Supply Analysis** and the **Household Demand Questionnaire**. Together, these datasets enable a precise understanding of the local supply-demand mismatch, identifying the household segment experiencing the greatest misalignment and thereby the highest displacement pressure, cost burden, and associated societal cost. Once the segment is identified, both data packages serve as critical inputs for the architectural design task, enabling the architect to position the design in a fundamentally different relationship to the investor. From this foundation, the research-by-design iterative process can begin, testing conventional assumptions and co-creating value across both practices.

Typological Analysis

The typological analysis aimed to develop a precise and holistic understanding of the current residential supply in Zurich, its spatial qualities, and its deficiencies. To achieve this, both a quantitative and a qualitative analysis were conducted.

Sample Selection: The sample comprised 100 residential floor plans to represent the current typological supply in Zurich. The sample was limited to multi-unit residential complexes, excluding single-family homes and serviced or commercial residential typologies. Data was gathered between February and April 2026 from two sources: Immoscout24, representing typologies currently supplied or recently built, and the City of Zurich permitting records, representing typologies in the approval process expected to be supplied within one to three years. Both sources followed identical selection criteria. The sample was geographically limited to the urban city of Zurich to establish a suitable baseline for the design. The full dataset is documented in the appendix.

Quantitative Analysis: The quantitative component aimed to identify the precise spatial distribution across functions, that is, the proportion of total floor area allocated to each programmatic element. This baseline enables direct comparison against demand data and the subsequently developed design. The key findings from the average of the 100 analysed floor plans are presented below:

Bedroom	31%
Bathroom	9%
Kitchen/ Eating/ Recreation	47%
Circulation/ Entree	11%
Storage	2%
Total	100%

Qualitative Analysis: The qualitative component aimed to identify spatial qualities and deficiencies through layered sketching as an analytical method. A sub-sample of 38 typologies was selected from the 100 to maintain analytical depth and rigour. The act of sketching demanded thorough engagement with each typology; complemented by layered analysis, it enabled the systematic extraction of isolated spatial components and a nuanced understanding of their qualities and shortcomings. The layered qualitative analysis produced the following key inputs for the design:

- **Light:** the distribution of natural light within the typology
- **Movement:** circulation patterns across morning, evening, and night-time use
- **Space distribution:** the spatial allocation between served and serving functions
- **Unified Qualities and Deficiencies:** A holistic synthesis of qualities and deficiencies across the sample set

The full quantitative and qualitative analyses are documented in the appendix.

Household Demand Questionnaire

The household demand data was collected to establish a precise understanding of local market demand in the context in which the design is to be supplied. As this data does not exist in the required form, a three-day field trip to Zurich was undertaken to conduct street-level interviews across the urban fabric.

Sample Selection: A total of 65 households were interviewed throughout Zurich. The aim was to interview households residing in the urban city of Zurich. To achieve a representative sample, interviews were conducted at various locations across the city to capture a mix of household types. Key locations included the University of Zurich, the lakefront, the business district, and the more industrial districts of the city. Individuals were selected randomly on the street without targeting specific profiles, ensuring a non-biased dataset. The sampling approach can be represented and justified in the manner described.

Questionnaire Structure: The questionnaire was structured around four key elements. First, questions identifying the respondent's current living situation. Second, questions capture what they demand or wish for in their housing. Third, questions exploring the trade-offs they would be willing to make to genuinely inform the design with realistic constraints. Fourth, open-ended questions. The full questionnaire structure is documented in the appendix.

This data serves three functions: first, to inform the design; second, to validate the design's supply-demand alignment; and third, to demonstrate the long-term stability of the design to the investor. Key findings are presented below; the full questionnaire is documented in the appendix.

THE HOUSEHOLDS

The households included within the questionnaire

65
Households

20-40
years old of major segment

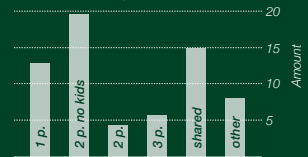
52%
pay > 30% of their
income to rent

Studying
Y. Professional
Professional
Retired

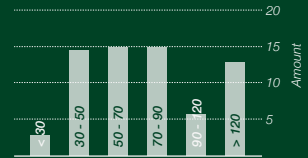
65%
live < 3 year in their
current apartment

19NPS
overall satisfaction score

Household composition



Household total space in m²



THE HOUSEHOLDS WITHIN ZURICH



RANKING OF SPACE

The households included within the questionnaire

Time spent

Sleeping
Recreation

Cooking
Study
Hygiene
Balcony

Quality importance

Recreation
Sleeping

Cooking
Balcony
Hygiene
Study

Primary compromise

Rent too high
Poor spatial quality

Location
Outdated space
Too small
Too large

-27NPS

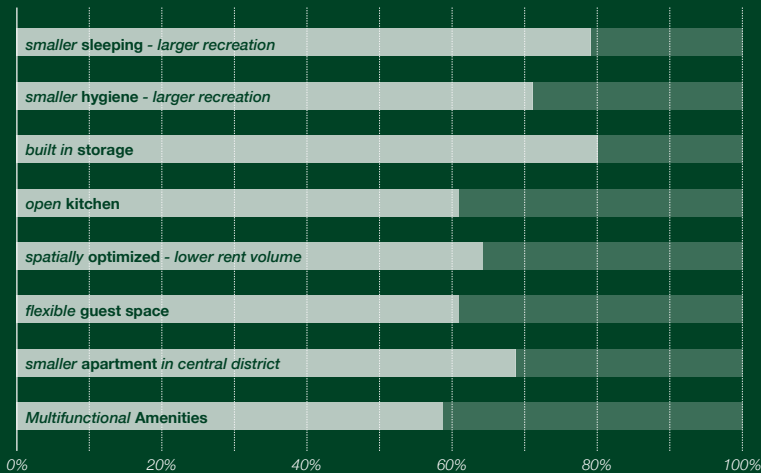
overall adaptability need score

67%

find it difficult to find
suitable housing

THE CHOICE OF DEMAND

The direct choice of an option - defining design inputs.



Design Explorations

Design exploration is a fundamental dimension of typological innovation. Challenging established conventions is inherently difficult; however, the architectural discipline is uniquely equipped to do so when given the creative latitude. The combination of data-driven decision-making with architectural spatial intelligence is, in this thesis, the mechanism through which meaningful and realistic typological evolution becomes possible.

The design exploration was informed by the data gathered above and guided by the architectural precedents found in Zurich, most notably the publication *New Housing in Zurich: Typologies for a Changing Society* by Boudet (2017), which provided a critical reference framework for understanding the city's residential typological tradition and its potential for evolution.

3.3 The Design & Business Model

The specific outcome, the Design and Business Model, emerges once the Handbook is accompanied by location-specific contextual data, as outlined above. It constitutes a highly context-specific typological innovation, positioned to directly address the supply-demand mismatch in Zurich. As established in the Handbook, the design alone cannot generate real impact; it must be financially viable and attractive to the investor. The design and investment strategy were therefore co-developed through the research-by-design process, the iterative mechanism at the core of this thesis.

Key Strategies in the Design

Spatial Awareness - Serving or to be Served: A foundational perspective in the design of residential typologies is the critical categorisation of space into three distinct types:

1. **Functional Space:** Space required for the specific function itself, the area occupied by a sofa, a kitchen unit, or bathroom fixtures.
2. **Space that Serves:** Space that accompanies functional space to make it operable within the apartment, the clearance around a dining table, or the standing area in front of a kitchen.
3. **Space to be Served:** Space provided additionally to connect functions or to create higher spatial quality. This category is frequently misused.

A typology reduced to its essential requirements would consist solely of functional space and serving space. However, these functions must be connected, generating space that is not required for use in itself, but for the coherence of the typology as a whole. This strategy informed the iterative design process, enabling a systematic interrogation of conventional layouts by focusing on movement patterns and the necessity of each spatial element at the moment of use.

Willingness to Pay (Demand-Driven Design): This strategy centres on designing in direct response to what the targeted household segment actually demands, and on critically challenging one's own assumptions in the process. A key question applied throughout the design was: Is it truly necessary to conceal all building systems within the apartment? Doing so increases construction costs, which are ultimately passed on to the tenant through rent. If tenants are willing to accept visible systems in exchange for lower rent, that preference should inform the design. This approach was applied consistently across all layers of the project, guided by the findings of the household demand questionnaire.

Capacity to Adapt: Capacity to adapt is not an option but a necessity. To make a design sustainable, that is, long-term stable, it must incorporate a degree of adaptability. This can take many forms and operate at various scales within a project. Importantly, the capacity to adapt is not synonymous with flexibility. Excessive flexibility increases construction costs substantially and does not always improve the spatial quality that residents actually demand. In this design, essential adaptability has been carefully integrated, with deliberate limitations on the range of configurations available, establishing a precise balance between spatial quality, cost, and long-term stability.

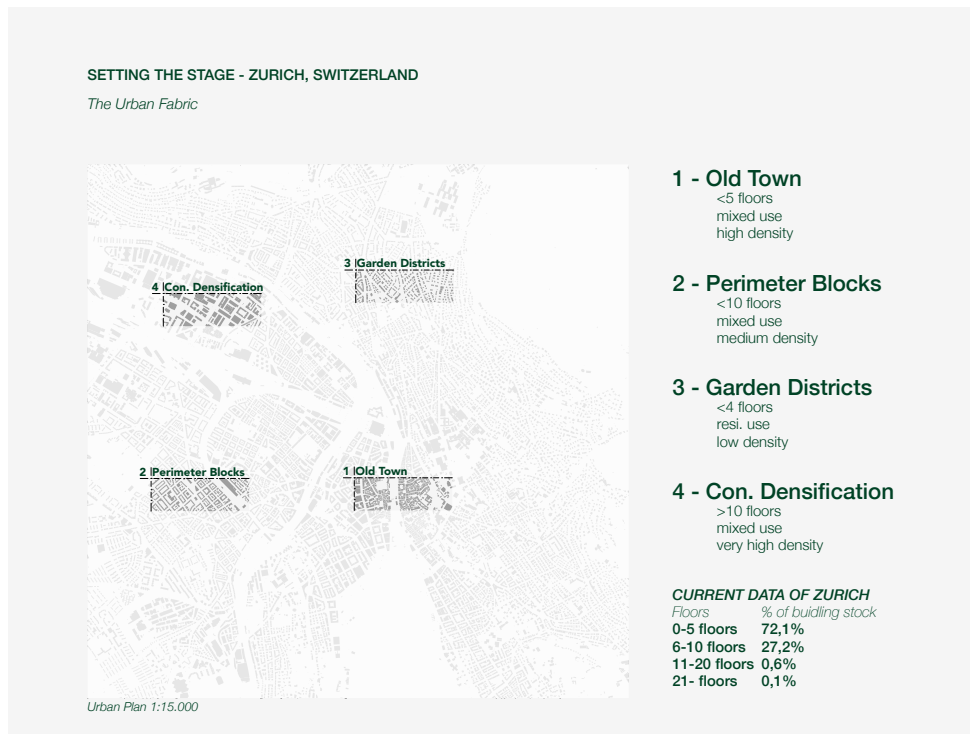
Level of Detail: As spatial dimensions decrease, the necessity for precision in detail increases substantially. Elements must become multifunctional. Each component must be reduced to its essential function and then developed into a multifunctional element. The craftsmanship demanded by this design approach is considerably higher than in conventional residential projects, yet it remains scalable, ensuring cost-effectiveness without compromising the quality of the spatial evolution.

Key Layered Explanation of the Design and Business Model

Urban Fabric:

The aim of the urban fabric analysis is not to root the design in a single site, but to demonstrate the range of possible placements within the Zurich city market. The city is broadly segmented into four urban fabric typologies. The most suitable potential for this design lies within the perimeter block fabric, characterised by five-to-ten-storey mixed-use buildings at medium density. The proposed placement illustrates an example approach an investor could adopt when targeting a redevelopment as an investment strategy in Zurich.

Zurich's built environment is characterised by a traditional typological palette, limited high-rise development, with perimeter blocks dominating the areas immediately surrounding the historic centre. The proposed placement challenges the conventional redevelopment height of five to ten storeys by introducing an eighteen-storey punctual densification, opening a productive discussion about the potential of vertical intensification within established urban districts.



SETTING THE STAGE - ZURICH, SWITZERLAND

Possible position to densify the Perimeter Blocks



Targeted Customer Segment

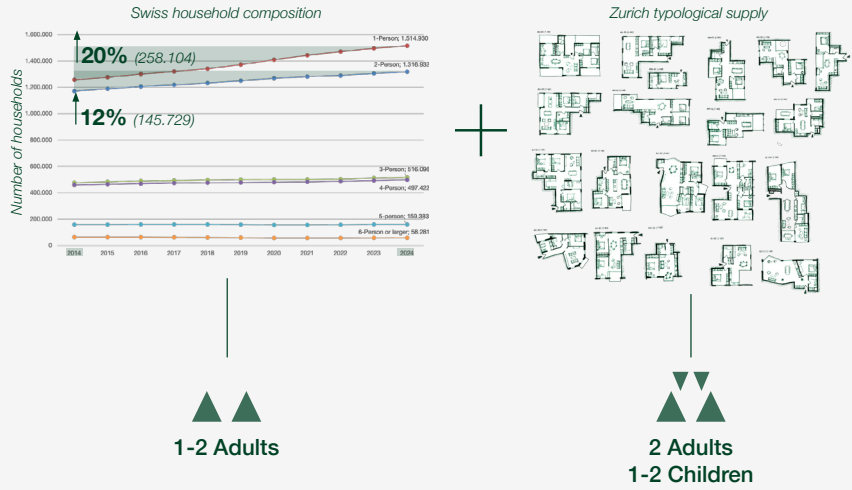
The targeted segment comprises one-to-two adult households, whether single adults or couples. The typology accommodates up to four adults, though a single bathroom is provided, designed with multi-use in mind. This segment was identified through market research and the precise analysis of the typological supply-demand mismatch.

Household composition data reveals that the largest growth over the past decade has occurred in one- and two-person households. Yet the current typological supply continues to be designed for two adults with one or two children. This creates a direct competitive conflict: families, typically with lower purchasing power, are forced to compete with one-to-two adult households, typically with higher purchasing power, for the same typological supply. The result is the systematic displacement of families toward the urban periphery, driven by typological misalignment rather than absolute shortage.

This design directly addresses that mismatch by developing an evolved typology for the one-to-two adult household, calibrated to their spatial demands while remaining adaptable to shifting household compositions. The typology accommodates change up to a defined threshold: once a child born within the household grows to require an independent room, the typology may no longer be suitable, at which point the household can transition to a conventional apartment, freeing the unit for incoming one-to-two adult households.

SWISS/ ZURICH MISALIGNMENT & HOUSEHOLD EVOLUTION

Evolution of

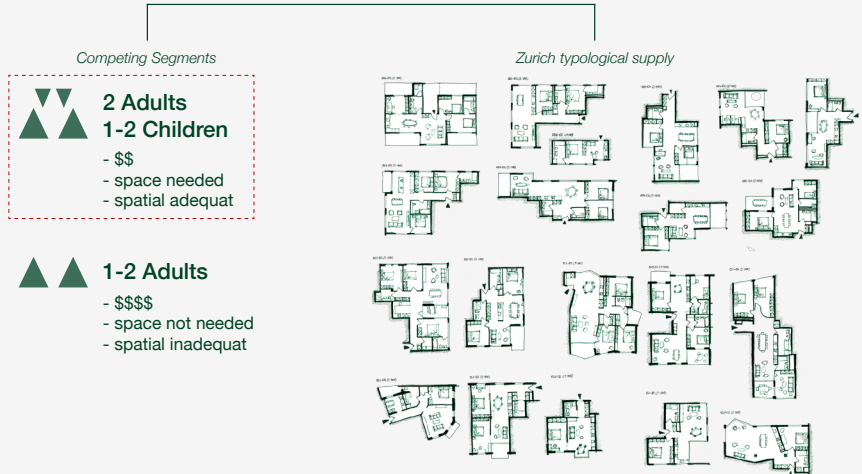


Source: Swiss Federal Stastical Office; Zurich Current Typology Supply to rent & in permitting process

SWISS/ ZURICH MISALIGNMENT & HOUSEHOLD EVOLUTION

Designing for location specific context -
balance between demand & innovation

Typological Mismatch
(Specific)

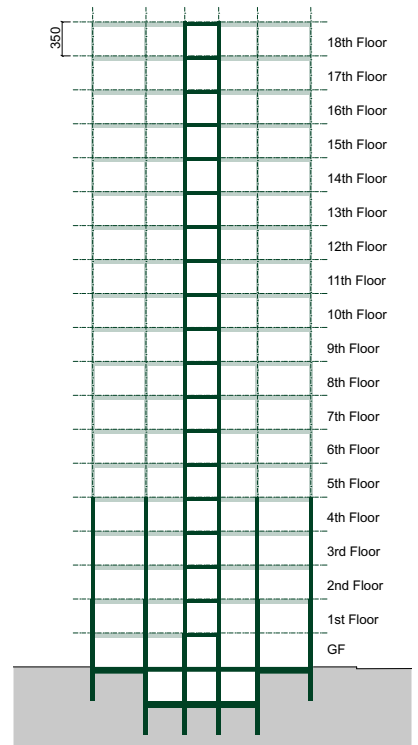
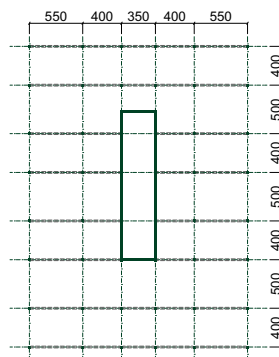


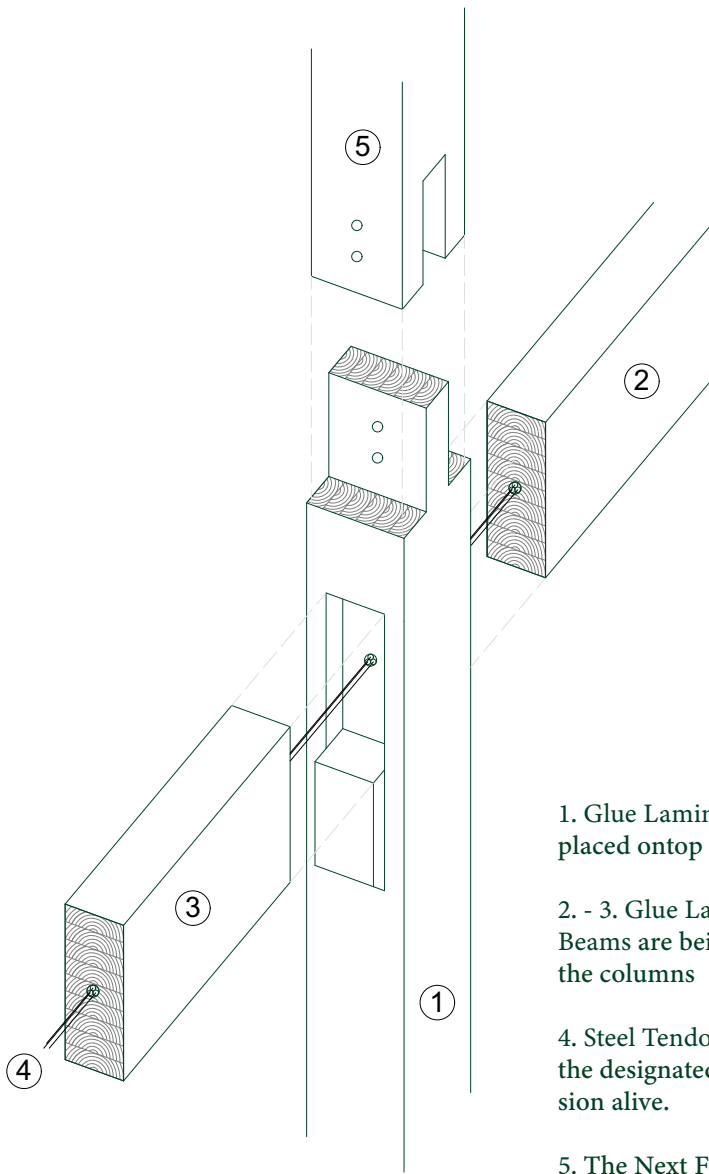
Construction

The construction system has been developed along two parallel objectives: sustainability and scalability, and the honest use of materials according to their structural capabilities. The primary structural system is a **prefabricated glued-laminated timber (GLT)** construction, employed for beams, columns, and floor panels. The core and ground floor are constructed in reinforced concrete to ensure structural stability and provide a fire-rated vertical escape route. Column dimensions are reduced at higher levels of the building, reflecting the actual structural loads and avoiding the waste of material resources.

The beam-column joint was a central design challenge. Various timber joint configurations were explored, each encountering the same constraint: the material resources required to achieve all structural demands within a single connection. The adopted solution draws on ETH Zurich-inspired steel-tendon construction, a hybrid approach that reduces material consumption by exploiting timber's compressive capacity and steel's tensile capacity within a single, efficient joint. The structural grid has been developed in direct response to the functional requirements it must accommodate. Further detail is provided in the appendix. construction grid has been carefully developed for its function, and what it needs to house. Further Details can be found in the appendix.

Material	Floor	Column	GLT-Beam
GLT-Wood	17 - 18	260 × 260 mm	180 x 450 mm
GLT-Wood	13 - 16	280 × 280 mm	180 x 450 mm
GLT-Wood	9 - 12	300 × 300 mm	180 x 450 mm
GLT-Wood	5 - 8	320 × 320 mm	180 x 450 mm
Concret	3 - 4	350 x 350 mm	180 x 450 mm
Concret	1 - 2	400 x 400 mm	180 x 450 mm
Concret	GF	450 x 450 mm	180 x 450 mm



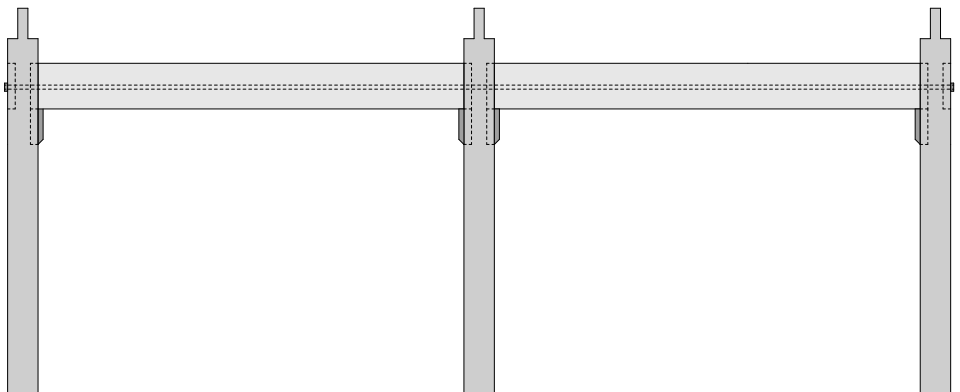


1. Glue Laminated Timber Column placed on top of the previous floor

2. - 3. Glue Laminated Timber Beams are being inserted between the columns

4. Steel Tendons are feed through the designated path, to bring tension alive.

5. The Next Floor can be build up



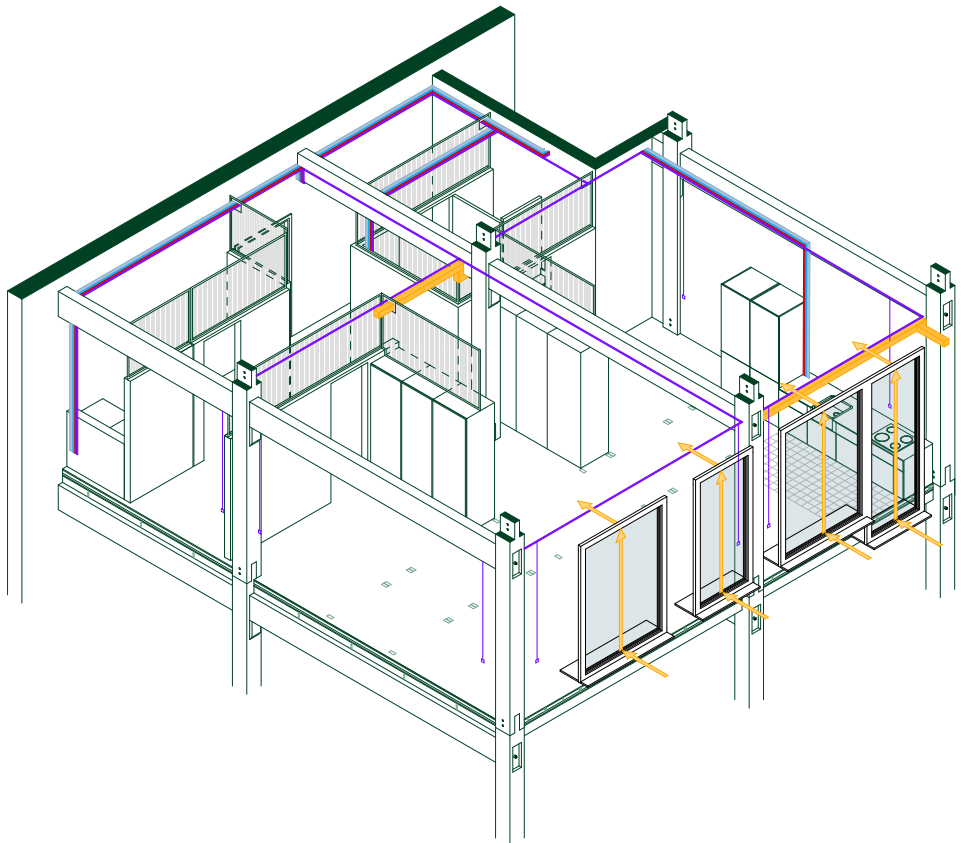
Systems

The building systems have been designed to be sustainable, resource-efficient, and responsive to the actual demands of the typology, carrying not only functional but also spatial quality. All systems are designed for ease of maintenance, as all construction materials are dry-assembled, significantly reducing on-site build time and simplifying future interventions. The placement of water, electrical, and ventilation systems has been carefully considered to enable adaptability by design, without introducing unnecessary flexibility that would consume resources if left unused by the resident. Full visual documentation of the system build-up is provided in the appendix.

Heating: A low-temperature floor heating system is employed. Heating pipes are embedded within dry-screed panels, separated by timber elements that simultaneously provide a stable connection for the internal wall structure.

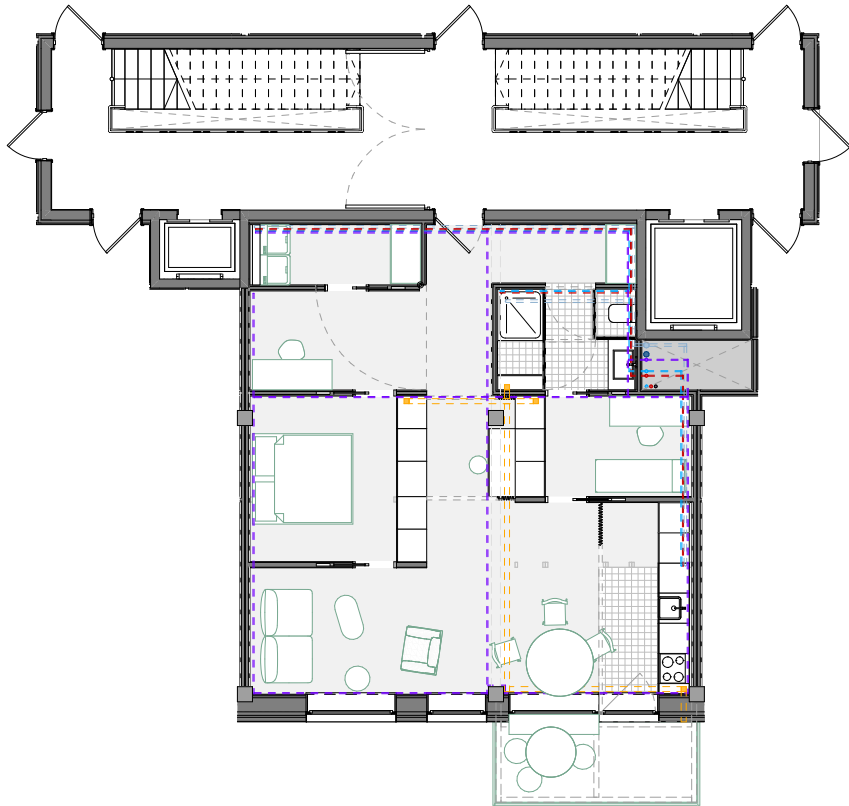
Water: A clearly organised pipe system accommodates grey water for the washing machine, kitchen, and bathroom; a dedicated toilet pipe; and hot and cold water supply to all required connection points.

Electricity: A clear and accessible distribution system, designed to be adapted and extended where required. Given the high dependency of this system on individual occupancy patterns, the capacity to adapt is deliberately legible.



Ventilation: Windows are equipped with integrated natural ventilation systems built into the frame. Mechanical ventilation supplements this, extracting air from the sleeping area, bathroom, and kitchen.

Windows: The windows function not only as ventilation and light elements, but as inhabitable spatial elements in their own right. Their placement and design have been carefully considered to make them part of the building's system and to serve as multifunctional façade components, providing opportunities for recreation and occupation within the window depth itself.

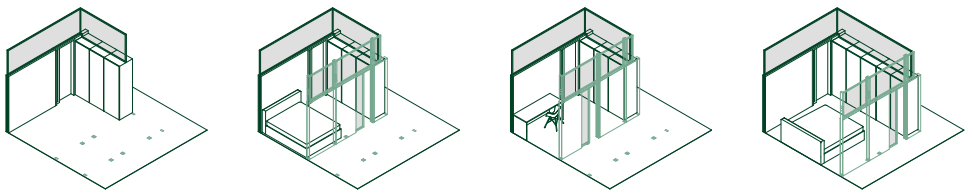


Design of each function

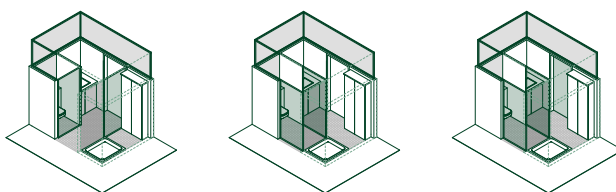
The design of a typology requires each function to be individually analysed and designed in detail. Applying the key strategies outlined above to the findings of the typological supply analysis and the household demand questionnaire, each function has been evolved to meet actual demand. Further analytical detail for each function is provided in the appendix. The following section elaborates on the functions that have undergone the most significant spatial evolution.

Sleeping: The conventional approach to sleeping in residential typologies, particularly in apartments of more than one room, positions the bedroom on the façade with direct access to a window. In studio apartments, it is common for the sleeping area to be located deeper within the plan, as the unit functions as a single, undifferentiated space. Notably, in Stockholm, Sweden, it is common practice to locate the bedroom as a sleeping niche in the middle of the apartment, without direct window access, a response to rapid densification that prioritises the essential qualities of the sleeping space: privacy and intimacy.

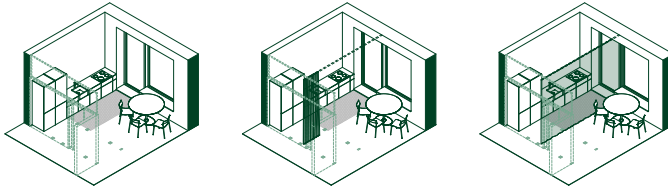
In this design, the sleeping zone is positioned in the centre of the apartment. This decision allows it to function either as an extension of the recreational façade space, when desired, or as a fully enclosed, intimate space with overhead lighting and mechanical ventilation. This spatial decision is the conceptual heart of the typology, simultaneously maximising spatial efficiency and spatial quality.



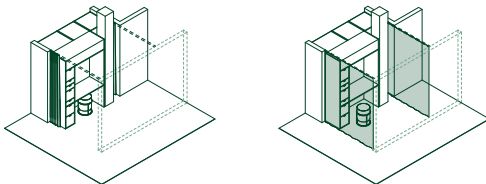
Hygiene: The bathroom is conventionally designed as an enclosed, monofunctional space, with a movement area serving only a single use at any given time. Applying the design strategy of functional disaggregation, identifying what is strictly required for each bathroom function and what can be externalised and made multifunctional, the bathroom in this design simultaneously functions as a corridor to the sleeping zone, enabled through the strategic use of doors. The bathroom can thus be traversed as a circulation route while enclosing all its functions. The toilet and shower can be used independently and simultaneously by different occupants, making the bathroom a critical element for multi-use and densification, without compromising the quality of the space.



Kitchen: The open kitchen has become the dominant configuration in contemporary residential typologies and is broadly preferred because it integrates the kitchen into the recreational space, enabling multi-use. However, its principal disadvantage is the absence of separation, both visual and smell, from the living area. The household demand questionnaire revealed that Zurich residents appreciate the open layout but place significant value on the ability to separate the kitchen from the recreational space, to contain cooking habits and manage sightlines.



Storage: In most typologies, storage is treated as a secondary element, placed at corners or within spatial inefficiencies. When viewed through the lens of the multilayer strategy, the corridor and storage space take on a different character. The design creates a circular movement pattern throughout the typology, enabling multiple routes between points, and thus the opportunity to make circulation space multifunctional when not in active use. The central corridor can be transformed into a working area through the use of a curtain and an intelligently designed storage system, fundamentally rethinking the role of storage within the residential plan.



Recreation: The recreational space was not independently redesigned. Rather, its evolution is the direct consequence of the spatial evolution of all other functions. This is clearly legible in the floor plans through the capacity to adapt.

Typological Design

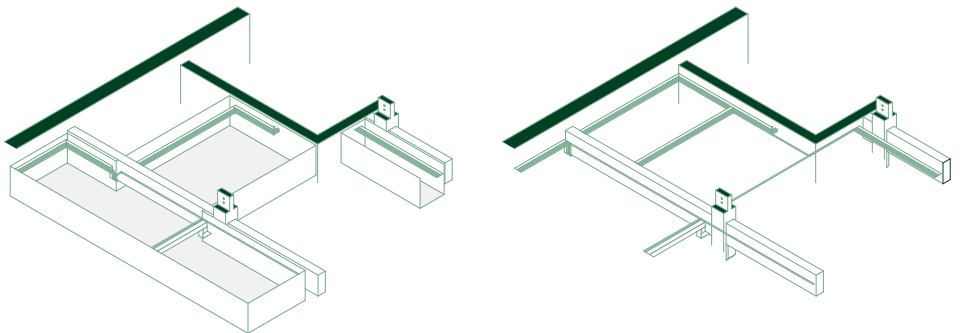
The composition of evolved functions is a complex spatial task. The distribution of light, depth, and movement within the apartment, as well as the placement of the apartment within the building floor plan, must all be considered simultaneously. Research by design, the iterative reworking of each element, is the appropriate instrument for this process.

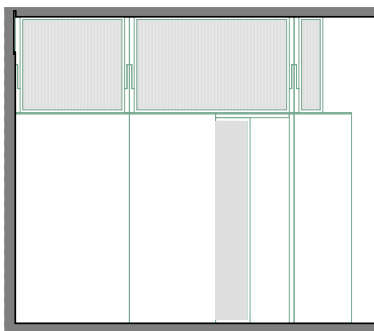
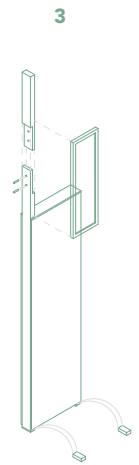
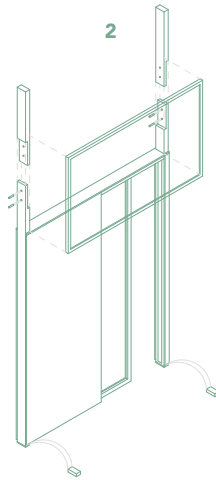
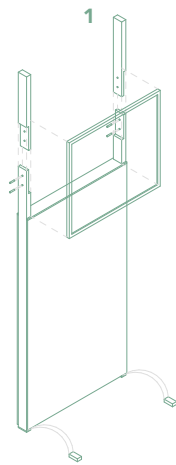
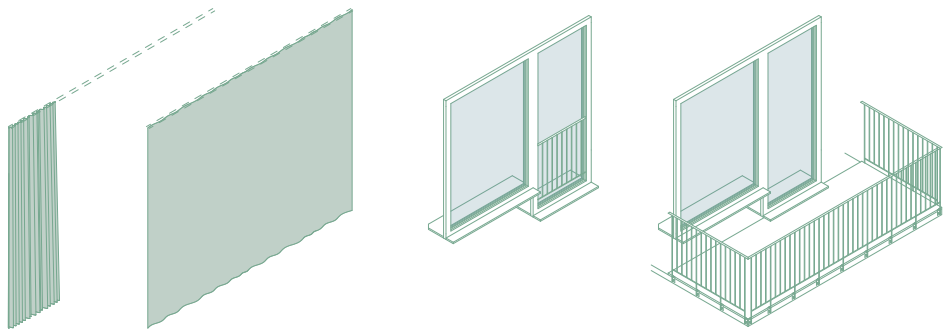
The placement of functions, the multilayered use of space, and the continuous focus on the intended occupant were reiterated extensively throughout research by design. The adaptable wall and overhead lighting system are two additional critical elements of the typological composition.

Overhead Light: The design provides complete visual privacy up to 220 cm from the floor. Above this threshold, translucent polycarbonate elements flood the apartment with indirect light, simultaneously creating a sense of spatial openness. This decision is both functional and qualitative in nature.

The Wall: The wall is the most critical element enabling the capacity to adapt, and thus the long-term stability of the typology for its target segment. The finished floor incorporates timber interlocks that can be removed to receive three wall panels. The panels are prefabricated, stored in the basement when not in use, and transported to the unit via the elevator. Assembly can be completed by the building's caretaker within a few hours, without specialist equipment or skills. The panels consist of three primary components: the panel itself, the overhead element, and the polycarbonate frame. This element is the operational heart of the typology, unlocking its full potential for the resident and providing the investor with a demonstrable future-proofing mechanism.

The Curtain: The cautious use of curtains within the typological design has enabled the flexibility of space, more specifically the multilayered use of space.





Floor Preparation



Option A



Option B

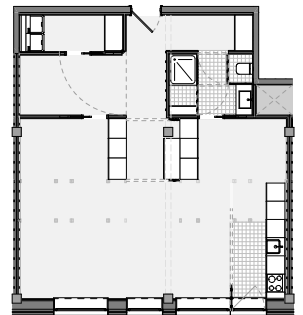
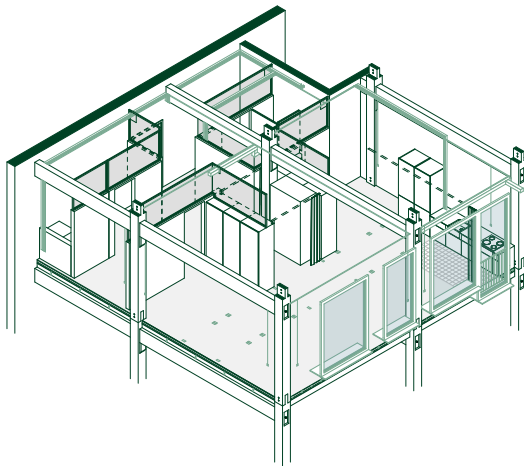


The Ceiling: The typology features an exposed GLT panel ceiling with visible systems. Should a future resident prefer an enclosed ceiling, the design is prepared to accommodate an additional ceiling layer within the corridor and bathroom, directly adjacent to the vertical shaft, creating an entirely different spatial atmosphere.

The Balcony: The typology is designed with two configurations: a French balcony or a full external balcony. Given current household demand for outdoor space, the full balcony is the preferred configuration. However, should future demand shift, the typology is prepared for the French balcony option, with provision for the later attachment of a lightweight metal balcony via the window-cleaning crane mounted on the building's roof.

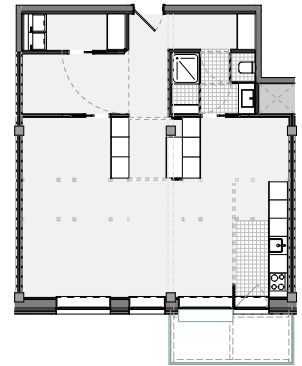
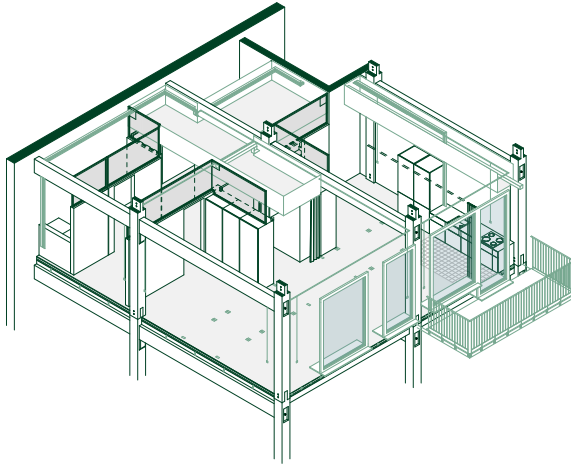
Baseline + Specifications: Variations of use = Capacity to adapt

The design is conceived as an IKEA Configurator model. The baseline product is spatially sufficient and contains all essential elements. Depending on the individual occupant's way of living, the wall, ceiling, and balcony can be configured accordingly, with the wall serving as the primary configurative element. Various use configurations are illustrated below, demonstrating the full capacity to adapt.

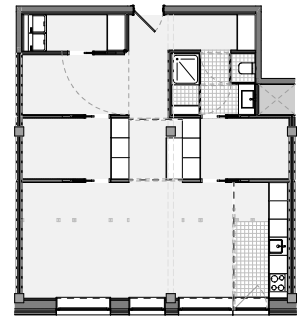
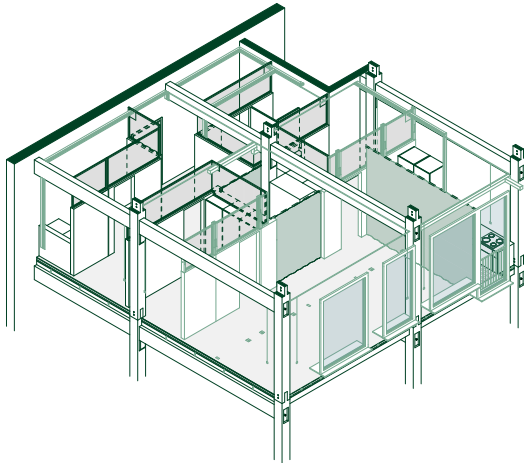


Baseline Configuration

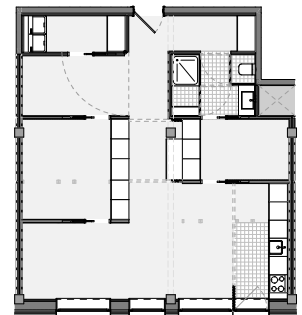
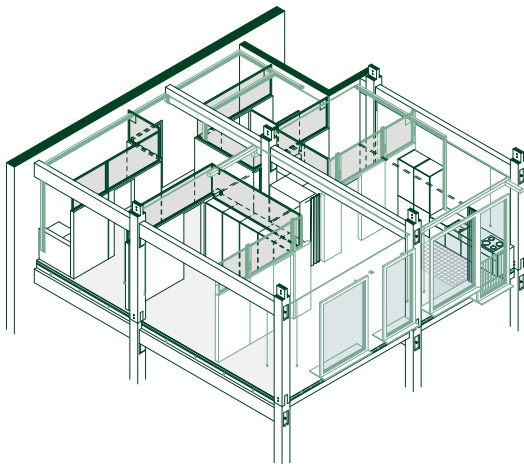
Option A - Second Ceiling Configuration



Option B - Closed Curtains Configuration



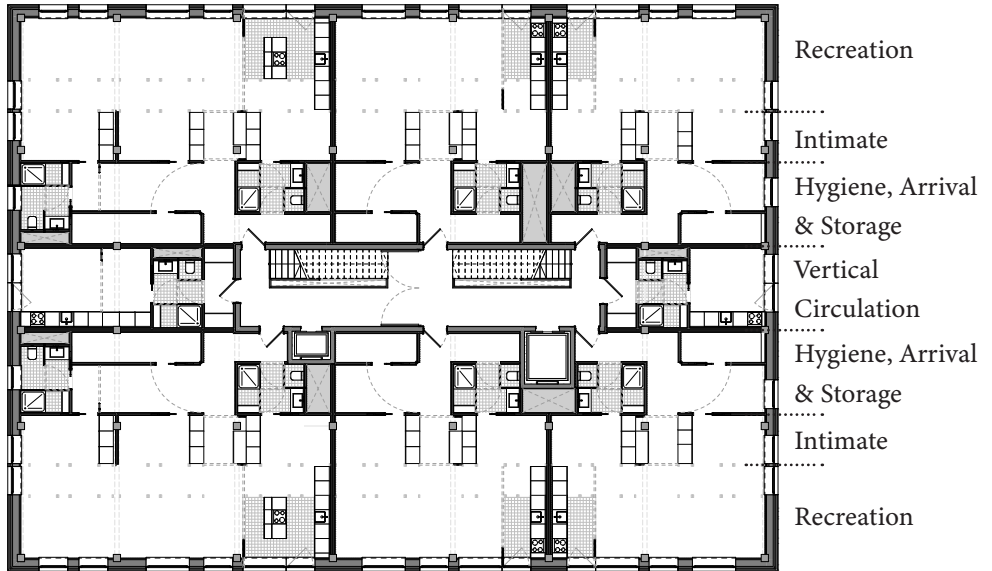
Option C - Large Bedroom Configuration



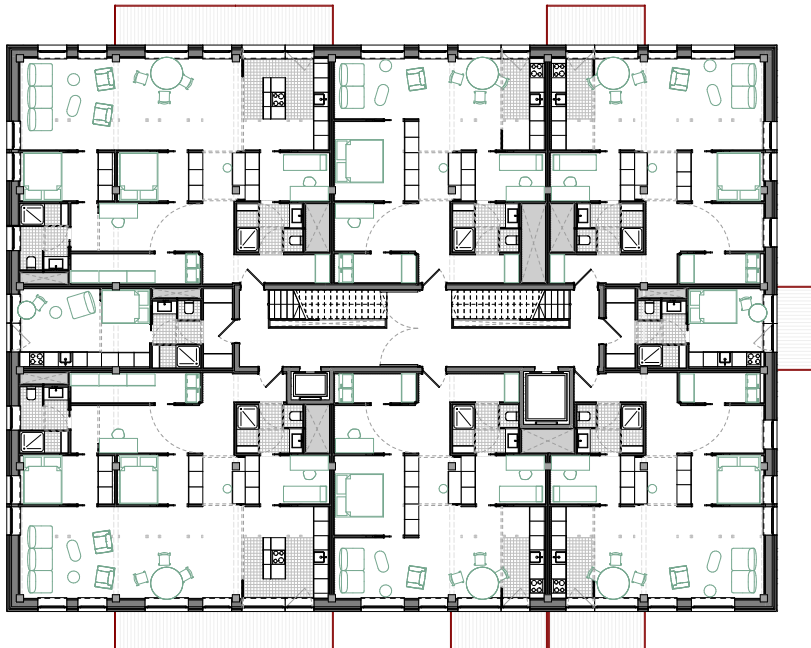


Building Footprint

Vertical Circulation: The placement of the circulation core within the building footprint must be developed in direct relationship to the typologies it serves, both elements exert a significant influence on the other. Multiple core configurations were explored; the central core system was identified as the most appropriate. The design navigates the regulatory requirement for two independent staircases through the provision of fire doors, while maintaining a spatially considered and efficient plan arrangement.

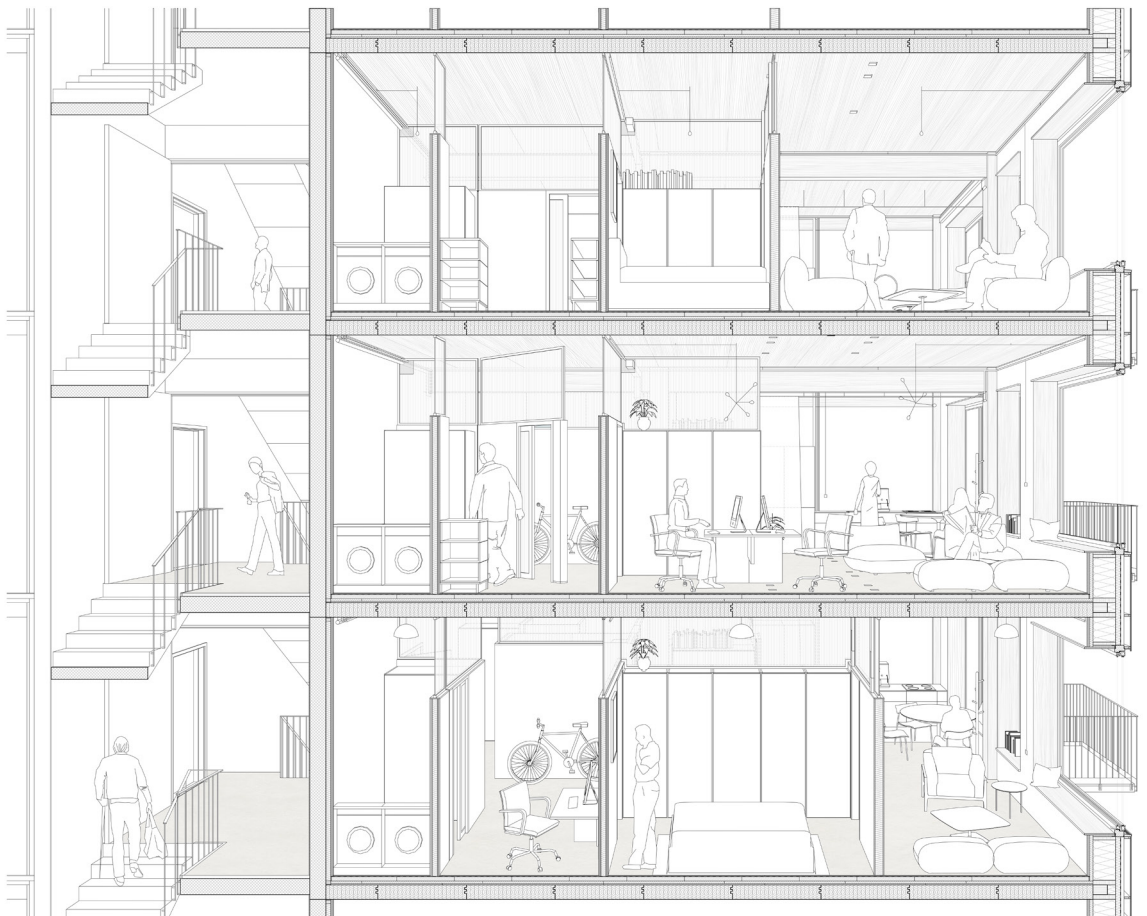


Floor Plan Baseline Configuration with Systematic Zoning



Floor Plan with Additional Configuration

Systematic Arrangement: The systematic organisation of both structural axes is critical for the placement of vertical shafts and the overall building efficiency. A clear structural logic reduces construction costs and enables a coherent design with a legible capacity to adapt.



Filter of Public to Private

While this thesis focuses on the typological design, the design has been embedded within a high-rise building to demonstrate how the various scales of the project relate to one another. Residential typologies are inherently private spaces. Two key spatial filters mediate the transition from private to public: the façade and the ground floor.

Façade: The façade is the threshold between the intimate interior and the public exterior. The design proposes a carefully assembled façade using polycarbonate as its primary material. Polycarbonate was selected for its translucent qualities, filtering light differently at different times of day and generating unique façade patterns that respond to the way the resident inhabits the space. An integrated sliding system enables the material to function as a shading device, giving the resident agency over their own representation of the urban environment.

Ground floor: The ground floor provides the spatial filter between the public and the private realms. The design proposes a double-height entrance hall housing a mix of commercial office space, a café and restaurant, a community centre, and a private residential entrance. The commercial element, positioned to the left of the entrance, spans two floors and provides economic stability and daytime activation. The right side of the plan accommodates a community centre, bookable by residents and neighbours for events and workshops, a space designed to bring together the one-to-two adult household occupants of the building. The street-facing niche is conceived as an ideal location for start-up enterprises to test products in direct contact with the urban public, keeping residents engaged with innovation and supporting local entrepreneurship. The entrance is anchored by a café that simultaneously functions as the building's concierge, receiving packages and serving as the public face of the building for its residents.



Facade Elevation by Night

The spatial organisation of the ground floor plan is critical to the building's urban embedding. The deliberate decision of where to extrude and where to recess the façade fundamentally shapes the quality of interaction between the building and the city. The café and restaurant volume is extruded toward the street, pushing into the urban fabric and drawing in customers. The façade simultaneously creates a welcoming, recessed, and sheltered space directly in front of the entrance and community hall, establishing a clear public-private threshold with intentionally blurred interactions in between, creating mutual benefit for each spatial condition.



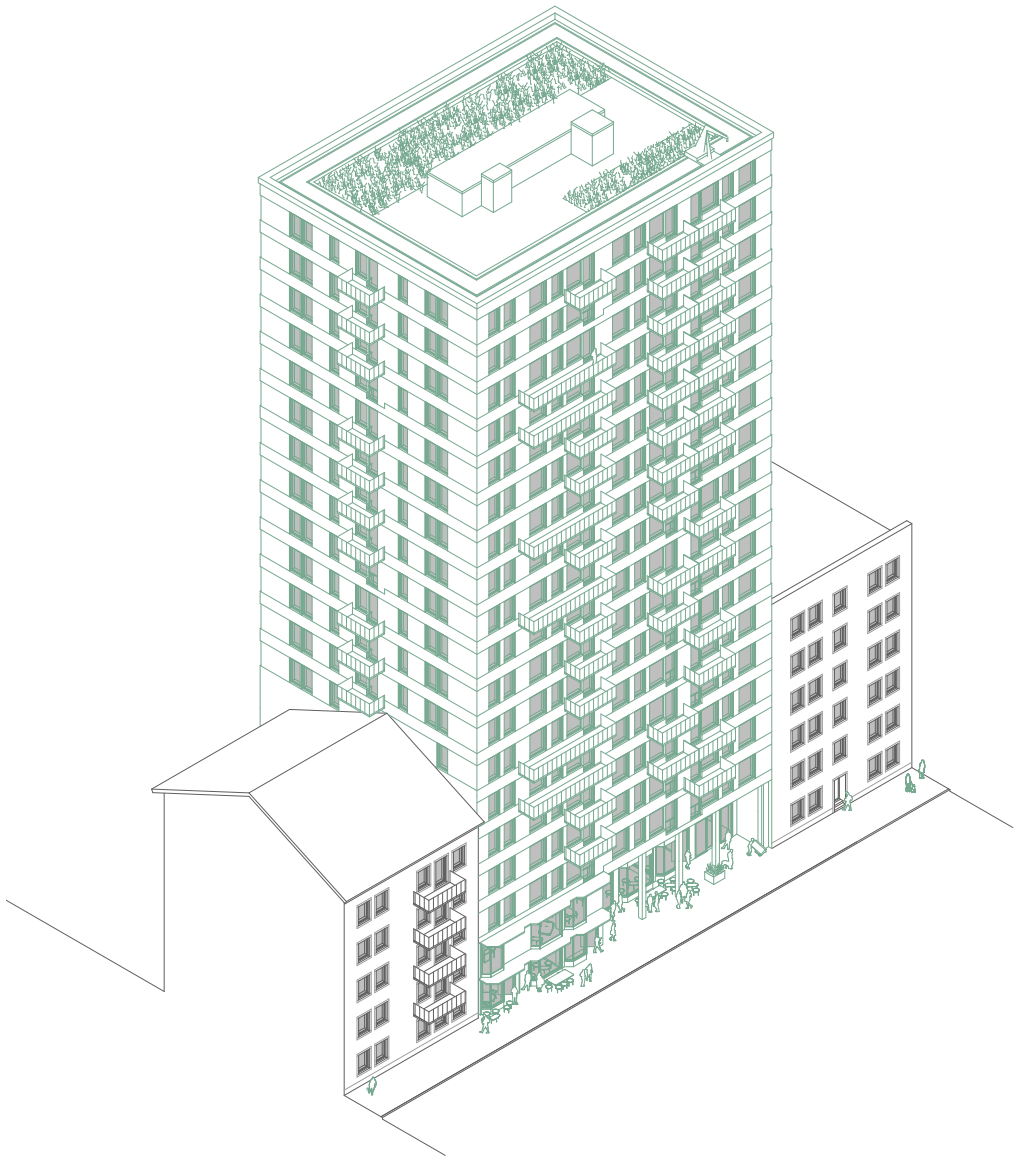
Private



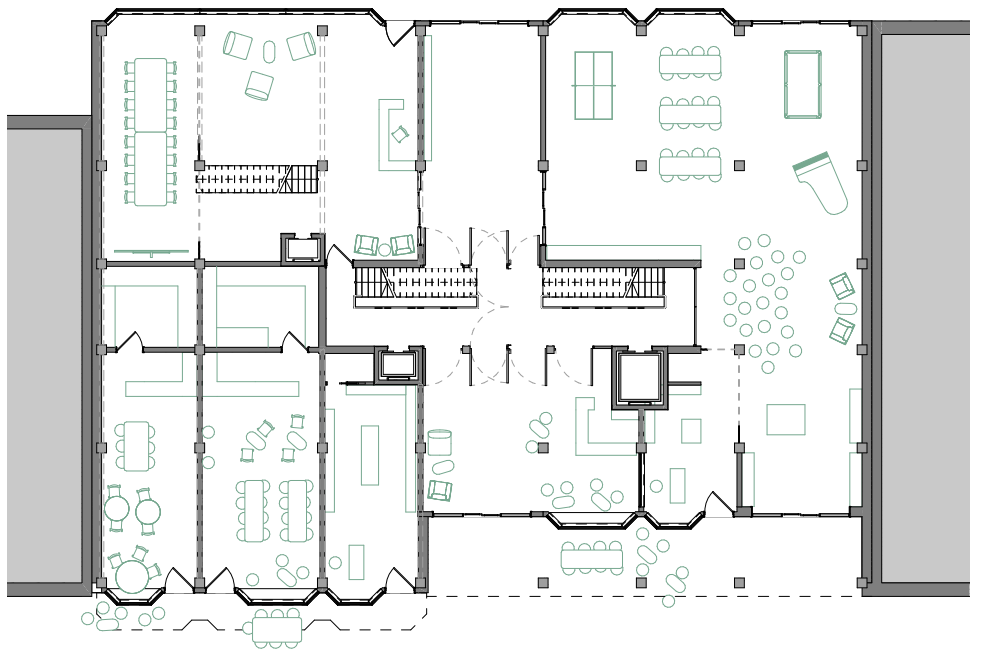
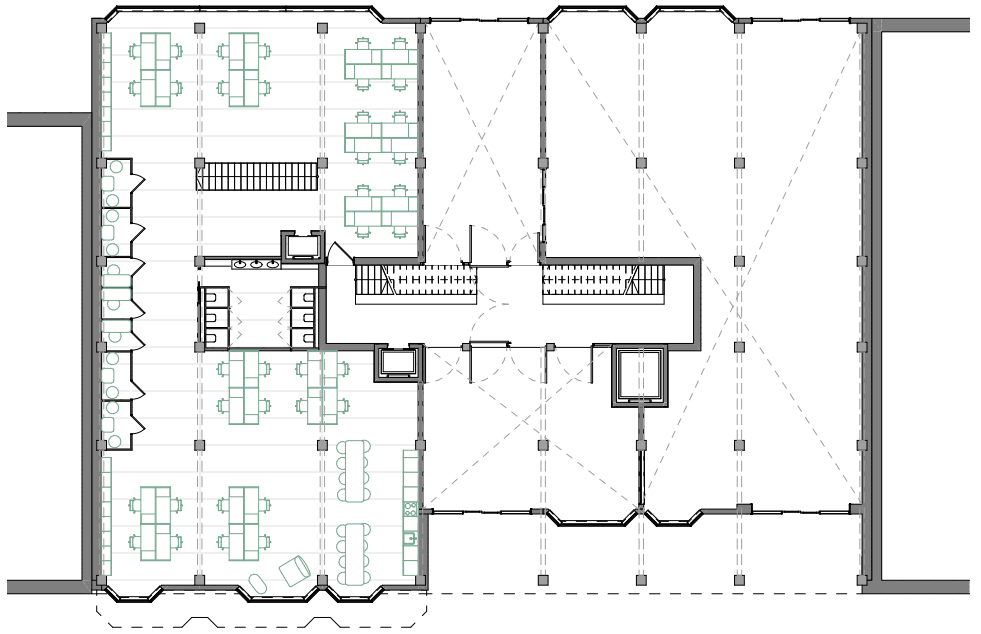
Filter



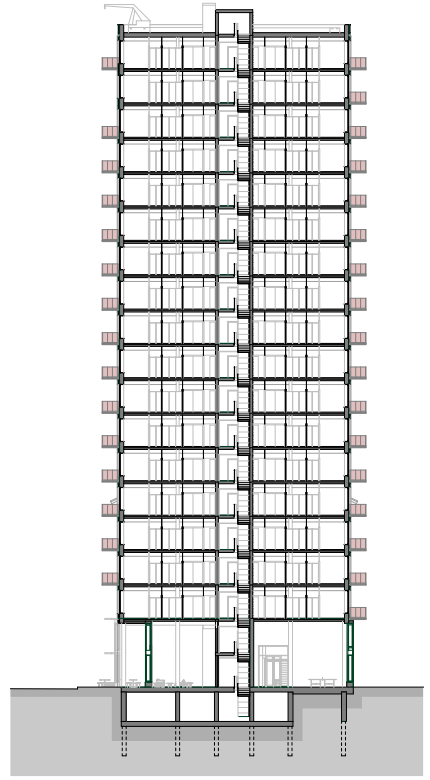
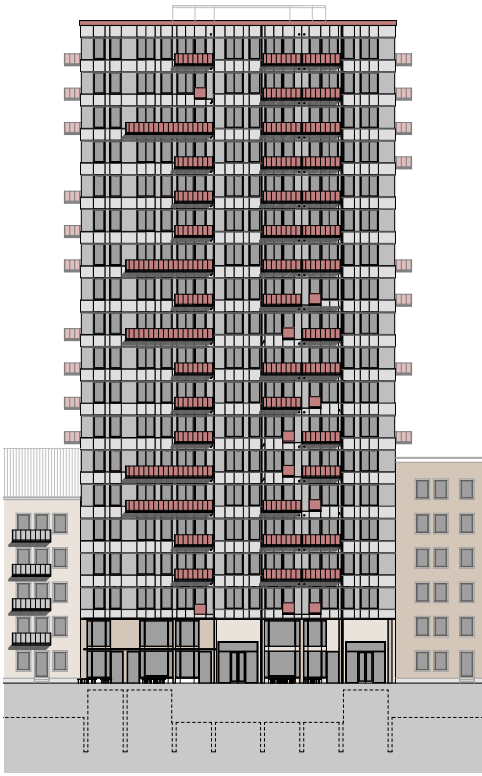
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Urban Axonometry



Ground Floor Plan including Mezzanine Level

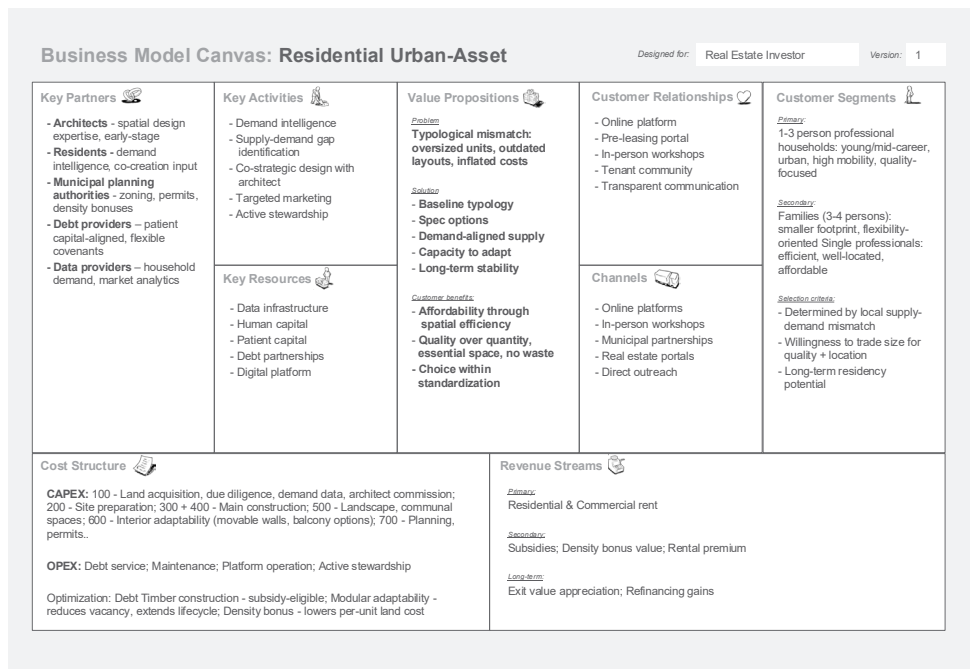


Urban Elevation & Section

Business Model Canvas

The Handbook elaborates in depth on how the investment value perspective and strategy must evolve to enable innovation in the residential market. This section outlines the investment case for the evolved typology. The Business Model Canvas is a widely used tool for structuring a business proposition, and the typology, in essence, constitutes precisely that: a viable business proposition that simultaneously addresses the supply-demand misalignment and reduces associated societal costs. The canvas elements are outlined below.

The central finding is that this evolved typology represents a viable investment strategy: it responds to a clearly identified and verified demand, balances spatial quality with construction cost, and incorporates a capacity to adapt for the future. The research-by-design process, the iterative reworking of the design, was instrumental in achieving this balance, enabling a continuous calibration of the financial implications and the spatial value of each design decision. The resulting typology can be supplied to the Zurich housing market, directly addresses verified demand, and provides the investor with the adaptability required as household compositions continue to shift.



Financial Model Effect (DCF – Discounted Cash Flow)

The financial model is impacted as directly as the design through the integrated framework of the Handbook, crucially through the iterative process of Research by Design. Many elements of the financial model, including debt structure, exit assumptions, and revenue and cost projections, are influenced by the Handbook-defined approach. Two financial models (DCF) have been developed to demonstrate this: one for a typical development case and one for a typical portfolio holding case. Both are uploaded as additional files. These example models represent the key elements to be considered and demonstrate the modelling knowledge required to assess investment cases within this framework.

The following outlines the key elements of the financial model that should be challenged and reiterated once the architect has developed an innovative typology. These are not exhaustive but represent the elements most affected by the integrated approach.

Cost Side

Building Cost: A detailed building cost offer is typically provided by the architect or contractor. Building Cost should not be viewed as something to minimise at first glance, but as directly related to the revenue side and the quality provided. The detailed offer must be reiterated against the current design to exclude any mismatch between cost and the proposed design. On the cost side, no non-monetary value exists; everything can be priced.

Vacancy Risk (Tenant Retention): Vacancy costs in the DCF should be reiterated. Household demand data should be directly matched with the design and analysed for alignment, providing feedback to the architect or, if alignment is strong, reconsidering vacancy assumptions, including rent and broker lease-up costs. The non-monetary value of a suitable typology lies in preventing move-outs; when residents do leave due to household expansion, the building functions as its own broker through word-of-mouth referral based on spatial adequacy and tenant retention quality. Vacancy risk is further lowered by the typology's capacity to adapt to changing ways of living.

Revenue Side

Rent Price and Stability: The aim is not necessarily to price the typology at a higher rate, but to recognise that rental price volatility is significantly lower, indicating a more stable future cash flow. If residents find the typology adequate and aligned with their demand, the incentive to move out is minimal, particularly when non-monetary values such as adequacy, layout innovation, and adaptability have been invested in. This stability must be represented in the rental price assumptions.

Non-Monetary to Monetary at Exit: Once the investor sells the asset after ten to fifteen years, a track record has been established indicating low vacancy risk, high tenant retention, and stable rental income with low volatility.

These elements transform the non-monetary value invested at the outset, the iterative process with the architect, the demand-driven design, and the innovative floor plan into monetary value at exit. The next buyer will be willing to purchase at a higher capitalisation rate/ exit multiple, accepting a lower initial yield in exchange for long-term asset stability. This must be represented in the exit multiple within the financial model.

The aim is not to achieve extreme rents, but to recognise that households are willing to pay for what they demand. If the typology supplies exactly what is demanded and nothing more, and the financial model reflects that on the cost side, then the cost-to-price ratio improves, compared to traditional typologies, increasing the margin for the investor. Crucially, when presenting financial summaries to the next buyer or to investment boards, it is essential not only to present the model and its monetary values, but to present the non-monetary values and the design itself; the decision-maker must understand what the figures represent, because conviction only emerges from that understanding.

Opportunity

Public Image: The investor may gain a beneficial public image, resulting in higher demand for collaboration and improved deal sourcing.

Debt Provision: Debt providers recognising the lower risk profile of the asset may offer more favourable interest rates.

Subsidies: If municipalities recognise the societal value created, subsidies may be granted.

4. Conclusion and discussion (What is the impact?)

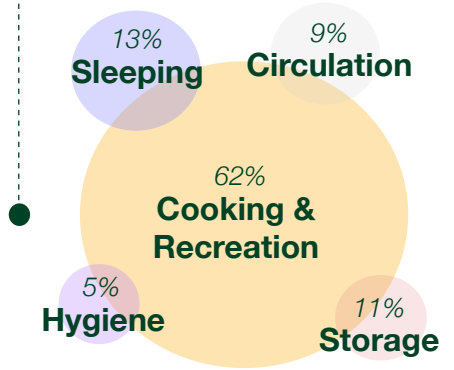
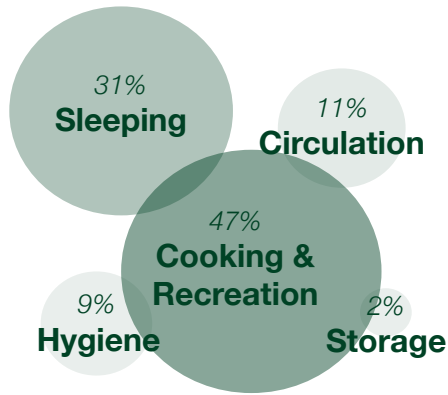
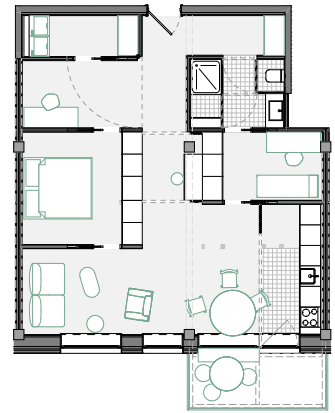
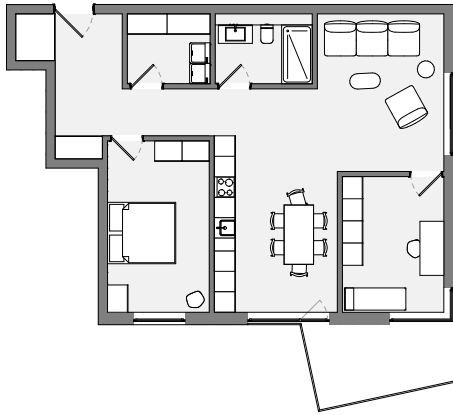
4.1 Conclusion (answer to the research question)

The primary answer to the research question is embedded within the Handbook. The integrated framework constitutes the ultimate shared tool for architects and investors, enabling each profession to evolve its own practice and, more importantly, to co-create greater value through research by design, unlocking innovation that neither discipline could achieve independently.

To verify the supply-demand alignment of the evolved typology, the quantitative spatial distribution of the current typological supply is compared below against the spatial distribution of the designed typology, measured against the demand identified through the household demand questionnaire.

Verification of Supply Demand Alignment and Spatial Distribution.





The design validates the Handbook and demonstrates the effectiveness of its application. Research by design, as defined within the framework, demands considerable self-belief and a genuine willingness to transform one's own process, but the results demonstrate that significant innovation and value can be unlocked through this approach.

The illustration above and design elaboration, shows the real impact of the handbook. How the application can give the architecte the ability to innovate typologies that mitigate risks for the investor.

Supply-Demand Aligned Design *(Specific)*

2,5-3,5 Room Traditional Typology

*competing with families
disproportioned
high social cost
high volume of rent*



Studio Furnished Apartment

*furnished/ detached
disproportioned
short-term
proportionally high rent*

*designed for evolved demand
+ prepared to adapt
adequat size/ rent volume
matched with targeted segment
demand
(4,5 room??)*

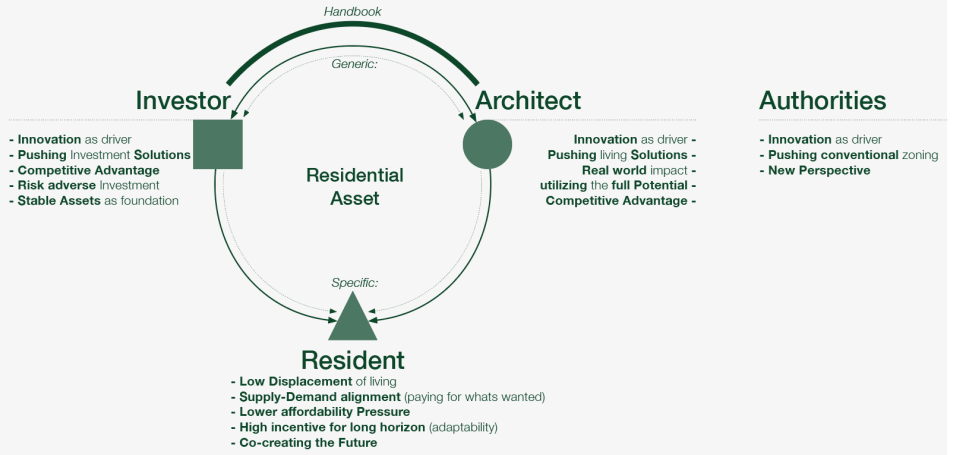
LONG TERM STABLE

Capacity to Adapt *(Long-Term-Stable)*

Adaptable Wall Second Ceiling Curtain Balcony



THE KEY BENEFITS OF THE DESIGN



VALUE TO THE INDUSTRY



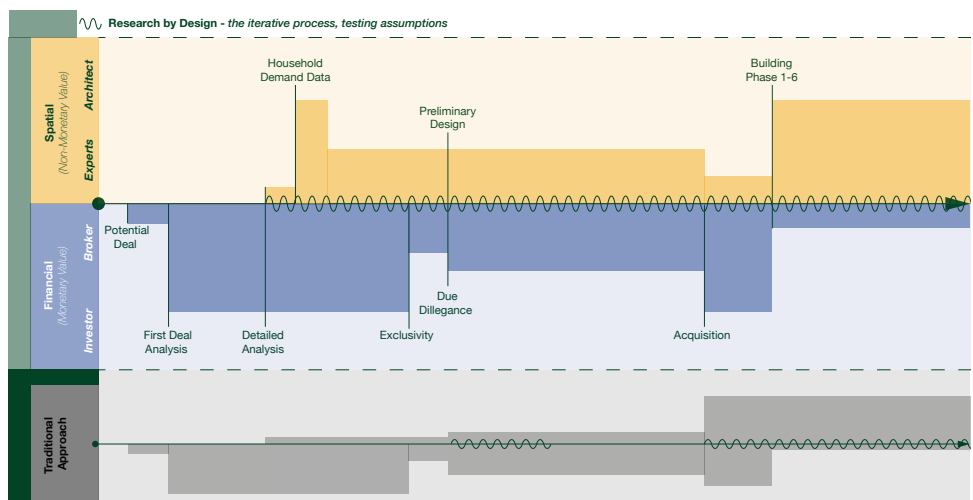
Knowledge Production

The primary contribution of this thesis is the knowledge production, through the Handbook, establishing an integrated framework for transforming non-monetary value into monetary value over the long term. This is achieved through the defined framework in the Handbook, with Research by Design as the central iterative process tool, producing knowledge to test assumptions (Financial & Spatial) and enhances of suitable innovation.

The Main Contribution

The primary contribution of this thesis is the knowledge production, through the Handbook, establishing a framework for transforming non-monetary value into monetary value over the long term. This is achieved through the integrated framework defined in the Handbook, with Research by Design as the central iterative process tool, enabling the testing of assumptions and the facilitation of suitable innovation. The framework further defines an evolved investment perspective and a repositioned role for the Architect within the residential investment process. For Investors, the framework enables the valuation of non-monetary qualities and supports long-term asset stability through innovative, supply-demand-aligned typologies. For Architects, it positions spatial expertise as a value driver within the investment process, expanding influence beyond the design brief. For urban residents, the framework contributes to housing supply that aligns with actual shifted household demand, improving affordability and spatial adequacy. For Regulatory Authorities, the iterative process offers a mechanism to inform and challenge decision-making on building regulations and zoning, grounded in tested design-investment outcomes.

Real Estate Investment Process
(Research by Design - Simplified)



4.2 Implications and/or recommendations

The significance of the thesis outcome for the architectural profession is substantial and is elaborated in detail in the Handbook, specifically in Chapters A.2 and A.3.

4.3 Reflection

This thesis has developed into something that I am genuinely proud of. The scope was deliberately ambitious, and the challenge of producing something both specific and impactful within such a broad topic, the two practices, with the focus on architecture, was difficult. With the sustained support of my three supervisors, I have managed to achieve two things I set out to accomplish: first, to develop a Handbook that translates the knowledge gained through this research into an applicable tool for practice; and second, to apply that tool to an architectural design. In doing so, this thesis fulfils its core ambition, to contribute to the evolution of the architectural profession and to reposition the architect as a meaningful actor within the financial and investment world, bringing the creative and spatial intelligence of architecture into the domain of real impact.

In reflection, the expert discussions and the iterative process of challenging my own projections were the most formative elements of this research. The co-creation across both practices, architecture and investment, made this outcome possible. It is a way of working that I believe every stakeholder in the residential real estate world would benefit from adopting.

No Market Evidence Yet

The strategy and framework developed do not yet have comparable market evidence. The financial impact of the design is based on the author's knowledge and supported by indicating factors within the market, but no direct evidence or proof exists that can be directly related to the proposed approach. Data would need to be collected in the market to develop such evidence and relate it directly back to the framework.

Further Ideas

The thesis has evolved significantly from the initial problem definition. Throughout the research, many ideas for possible solutions to close the gap emerged, particularly in the form of supporting software tools, which can be discussed at the presentation or beyond. The thesis reveals a substantial gap and a misalignment within the real estate industry that could capture value through process improvement as described, and potentially through the development of supporting software.

The Back matter

Reference List

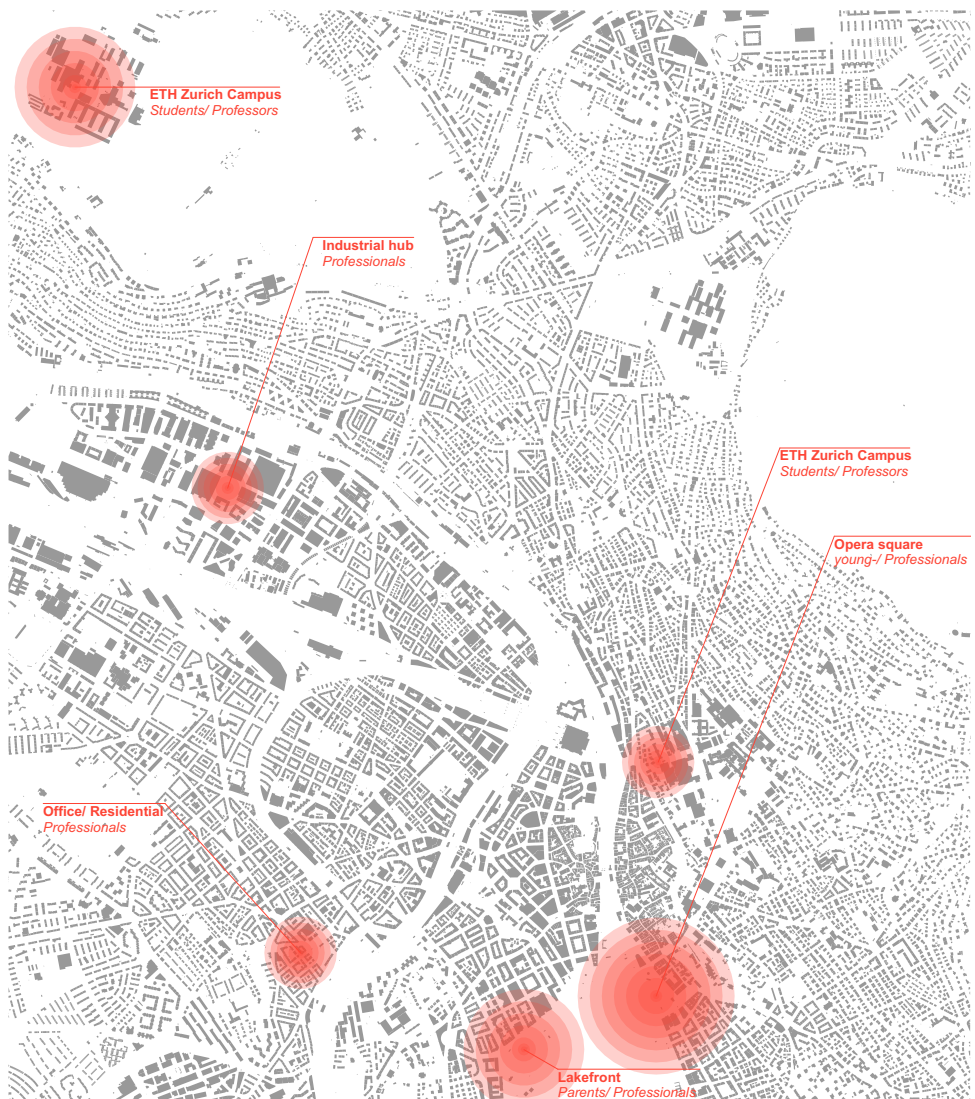
The full list of references is included in the Theoretical Backbone Chapter.

Additional Material

Additional Material, such as the Financial Models and other outcomes of the research, can be provided upon request.


Household Demand Questionnaire

The following document is the exact output from the 3-Day field trip for the household demand questionnaire in Zurich. Excel can be provided if requested.



Übersicht über Antworten Aktiv


Antworten

65 

Durchschnittliche Zeit

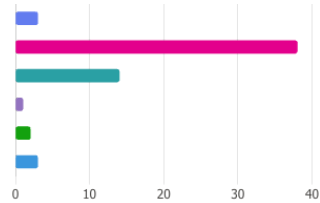
17:32 

Dauer

22 Tage 

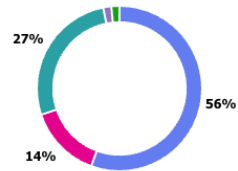
1. What is your current age?

● <20 years old	3
● 20-30 years old	38
● 30-40 years old	14
● 40-50 years old	1
● 50-60 years old	2
● >60 years old	3



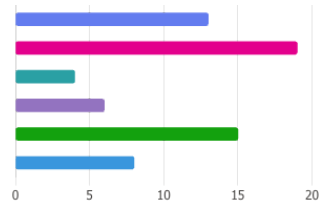
2. What is your current Occupation

● studying/ apprenticeship	35
● young professional	9
● professional	17
● retired professional	1
● Sonstiges	1



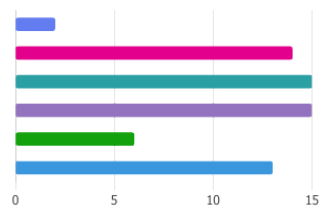
3. What is your current household composition?

● 1 person (single)	13
● 2 persons, no children	19
● 2 persons, with child(ren)	4
● 3 persons	6
● Shared flat (non-family, WG)	15
● Sonstiges	8



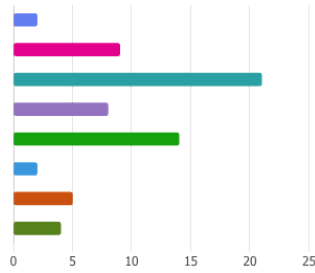
4. What is the approximate total floor area of your current apartment?

● Under 30 m ²	2
● 30-50 m ²	14
● 50-70 m ²	15
● 70-90 m ²	15
● 90-120 m ²	6
● Over 120 m ²	13



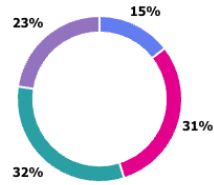
5. How many rooms does your current apartment have?

● Studio (0 separate rooms, open plan)	2
● 1 rooms + living room	9
● 2 rooms + living room	21
● 3 rooms + living room	8
● 4 rooms + living room	14
● 5 rooms + living room	2
● 6 rooms + living room	5
● Sonstiges	4



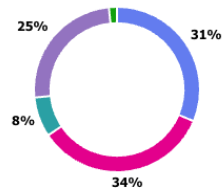
6. What percentage of your monthly household net income goes to rent?

● Less than 20%	9
● 20-30%	19
● 30-40%	20
● Over 40%	14



7. How long have you lived in your current apartment?

● <1 year	20
● 1-3 years	22
● 3-6 years	5
● >6 years	16
● Sonstiges	1



8. In which Zurich district (Kreis) do you live?

● Kreis 1 (Altstadt)	0
● Kreis 2 (Enge/Wollishofen)	3
● Kreis 3 (Wiedikon)	6
● Kreis 4 (Aussersihl)	3
● Kreis 5 (Industriequartier)	1
● Kreis 6 (Unterstrass/Oberstrass)	4
● Kreis 7 (Fluntern/Hottingen)	10
● Kreis 8 (Riesbach)	1
● Kreis 9 (Altstetten/Albisrieden)	5
● Kreis 10 (Höngg/Wipkingen)	6
● Kreis 11 (Oerlikon/Seebach)	5
● Kreis 12 (Schwamendingen)	0
● Outside Zurich city limits	20



9. How satisfied are you with your current apartment overall?

Promotoren	18
Passive	34
Kritiker	7



10. RANK the following spaces by how much time you spend in them daily.

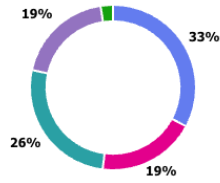


11. RANK the following spaces by how important they are for your quality of life at home.



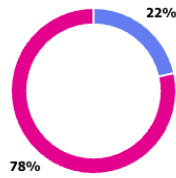
12. How do you currently use your bedroom?

● Exclusively for sleeping	41
● Also for working / studying	24
● Also for relaxing / reading	33
● Also for storage	24
● I do not have a separate bedroom (studio)	3



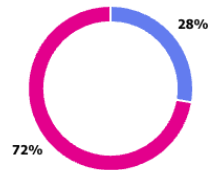
13. If your apartment had a fixed total area, which would you prefer?

● A - Larger bedroom (min. 14 m ²) + smaller open living space	14
● B - Smaller sleeping area / niche (4–10 m ²) + larger open living/working space	51



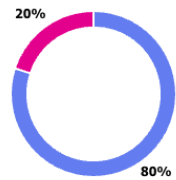
14. Which bathroom would you prefer?

● A - Full bathroom with bathtub (approx. 8–10 m ²) + less living space	18
● B - Compact shower-only bathroom (approx. 4–5 m ²) + more open living space	47



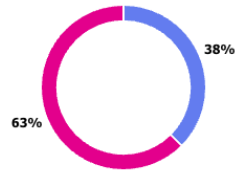
15. Which storage solution would you prefer?

● A - Built-in wardrobes and storage integrated into the apartment	52
● B - Empty space to furnish with your own furniture as you prefer	13



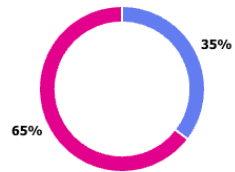
16. Which kitchen setup would you prefer

- A - Separate enclosed kitchen (approx. 8–12 m²) 24
- B - Open kitchen integrated into the living space 40



17. Which would you prefer if it meant paying 15–20% less rent?

- A - Standard apartment (current market size, approx. 70–90 m²) at current rent 23
- B - Spatially optimized apartment (approx. 45–60 m²) with higher spatial quality per m² at lower rent 42



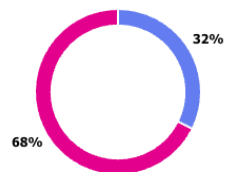
18. Which would you choose for overnight guests?

- A - A dedicated guest bedroom (approx. 10–12 m²), used rarely 25
- B - A flexible living space with a fold-down bed / sofa bed, used daily as living area 40

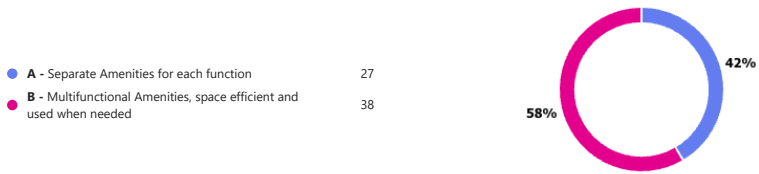


19. Which location-size trade-off would you prefer?

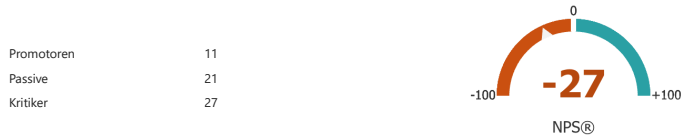
- A - Larger apartment (80–100 m²) in an outer district (Kreis 9–12), 30–40 min to city center 21
- B - Smaller apartment (40–55 m²) in a central district (Kreis 1–8), 5–15 min to city center 44



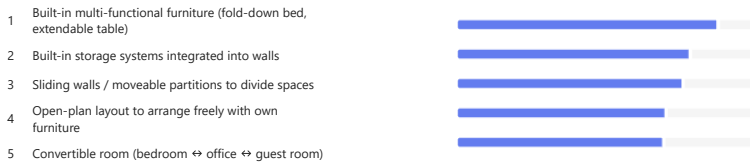
20. Which kind of Amenities would you prefer?



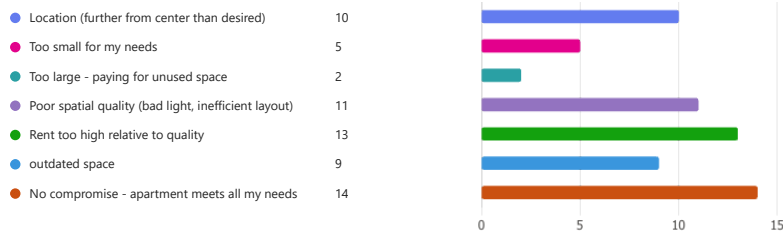
21. How important is it that your apartment can adapt to changing life situations?



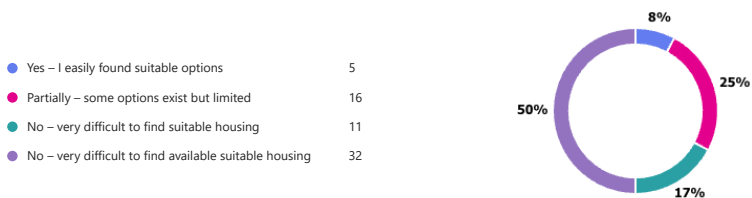
22. RANK the following flexible features by how much you would value them in an apartment.



23. What was your PRIMARY compromise when choosing your current apartment?



24. Do you feel current housing supply in Zurich matches your household needs?



Open Question 25 Answers:

Here are the responses translated exactly as listed:

- Always have a lot of daylight as a priority and access to the outdoors, whilst the layout should feel spacious and lively. No dark, many small rooms
- The apartments are not so open-plan. The option to extend outward.
- Terrace
- Very satisfied. Way too expensive but great. People are being displaced
- Separate kitchen for asian cooking. Shoes storage at the entrance.
- Terrace
- Balcony, terrace, maisonette apartment
- Balcony
- Living room, large kitchen
- Rent
- Change the furniture
- Inside and outside combine for more light and nature, or a city feeling
- Less rent for what you get
- The building will unnecessarily have to make way for a replacement new-build.
- Separate kitchen and living room - so you could use the living room for other needs
- Make it more flexible, design more furniture myself if I had time to do it.
- Sunny outdoor space
- The rent :-) One can hope!
- Built-in wardrobes, cellar storage
- Lower the rent
- I live with 6 people; I would prefer fewer. More sunlight in my room
- Second bed to have a guest
- Better layout
- Kitchen too old, insulation very bad, and many things need to be renewed
- Update kitchens (often very old and small), make housing more affordable
- Fix storage organization and make it a bit more spacious
- I want minimalistic efficiency to optimise my studying and working routine, even at the cost of comfort and social life.
- Bigger garden, larger kitchen
- Smaller. More green around the building, more space, larger, organised building projects instead of building one at a time.
- Lockable rooms, dark facade, dark colours
- Terrace, not only functional, but also a neighbourhood
- Réduit with space
- More outdoor space (balcony), bigger living room
- Elevator
- More open living space
- Needed: bathtub; better heating in winter; better air quality indoors (more natural materials; wood, stone, etc.); minimised lost space (due to poorly used hallways and staircases)
- Washing machine in the apartment
- More/bigger windows

Expert Discussion Key Takeaway

(crucial research element, to challenge research-derived projections in the real world)
Not all Discussions are listed below to keep the scope. These are not direct representations of the experts' words but qualitative takeaways, interpreted and reformulated by the author, considered too relevant to leave out and too peripheral to integrate into the core argument.

Fear of Innovation

Hilde Remøy - Delft University of Technology: identifies a structural constraint on typological evolution: the industry's reluctance to challenge established asset strategies. Real estate is capital-intensive and historically conservative in its risk-return profile, and that conservatism is reinforced by limited data on the long-term performance of innovative typologies. While architectural innovation is abundant, capital remains hesitant to follow, particularly in European markets compared to Asian or American counterparts. The result is a systematic underinvestment in precisely the typological strategies the market most urgently needs in the current phase.

Non-Monetary Value and Financing Conditions

Ivana Borgna Nott - Blanco Architecture and Design raises a consequential question: how do banks integrate non-monetary asset value into their risk assessment, and what effect could that have on financing conditions? If spatial quality and long-term occupancy stability are recognised as risk-reducing characteristics, they should translate into more favourable debt structures, reduced financing costs or preferential loan terms for demonstrably adequate residential assets. Lower vacancy risk and stronger tenant retention directly reduce the probability of debt service failure, which is precisely what lenders price. The constraint is regulatory. FINMA holds overarching supervisory authority over Swiss banking practice, limiting how far banks can act on non-monetary value assessment independently. This represents a structural opportunity: financing instruments that reward spatial adequacy and typological alignment remain an unresolved and productive frontier for both the banking sector and real estate investments to make up for lost returns.

From Non-Monetary to Monetary Value: The Certification Path

Thomas Richter - ZHAW Real Estate Management and Finance: identifies the critical process through which non-monetary values become financially legible. ESG is the clearest precedent: for years treated as subjective and non-quantifiable, until international certification frameworks made it measurable and the market confirmed its impact through rent premiums, financing discounts, and exit premiums. The non-monetary became monetary the moment it became certifiable and market-validated. The same process must now occur for spatial quality and other factors. It requires developing certification frameworks grounded in market demand and demonstrated willingness to pay, transforming currently subjective spatial qualities into quantifiable, investable characteristics. The process is slow and sequential: evidence generation, market validation, certification standardisation, regulatory recognition. But it is the necessary trajectory for real estate valuation to accurately reflect shifting market demand.

Valuation Method is Not the Problem

Thomas Richter - ZHAW Real Estate Management and Finance: the challenge of integrating non-monetary value into real estate valuation is not methodological; the methods exist. What is missing is market consensus on whether a given spatial quality genuinely translates into measurable demand and willingness to pay. Once that consensus exists, the valuation follows. The bottleneck is not only the tool; it is the evidence base.

The Limits of Voluntary Perspective Change

Marja Elsinga - Delft University of Technology raises a structural challenge to the investor evolution argument central to this Handbook. Investors operating in a supply-constrained market have little intrinsic motivation to change; their current strategies work precisely because demand pressure absorbs typological inadequacy. The incentive to adapt disappears the moment market conditions ease, and capital can simply exit.

Elsinga argues that meaningful perspective change will not originate from investors themselves. It must be driven externally, through regulatory pressure, academic evidence, or coordinated industry expertise. This positions the Handbook's argument not as a voluntary evolution, but as one that requires external catalysts to take effect.

The Limits of Monetising Non-Monetary Value

Marja Elsinga - Delft University of Technology offers a critical counterpoint to the monetisation trajectory discussed with Thomas Richter. Where Richter argues that non-monetary values must evolve toward certified, quantifiable monetary terms, Elsinga questions how accurately that translation currently occurs in practice. The Environmental dimension of ESG is measurable and increasingly priced, certified through labels such as LEED, BREEAM, and QNG, with demonstrable market impact. The Social dimension, however, remains largely unmeasured in real estate valuation, despite its relevance. Elsinga does not reject the ambition to monetise social value, but cautions against assuming the process is working when the evidence remains thin. The gap between what is claimed and what is actually captured in valuations is wider than the industry acknowledges.

Capital as the Last Party to the Table

Steve Weikal - Massachusetts Institute of Technology: validates a central tension of this Handbook: in the conventional development chain, capital arrives last, presented with a near-complete proposition rather than embedded in early design thinking. The cost of this sequencing is measurable. Design quality gets value-engineered out as cost pressures mount in later stages, and investors default to proven typologies because they lack the spatial literacy to evaluate unconventional ones. Weikal's observation is direct: investors who genuinely understand the asset class they invest in, as specialist investors in student or senior housing do, make fundamentally better decisions. The knowledge gap is most damaging when generalist capital chases specialised product without the vocabulary to assess it.

Self-Belief and the Monetisation of Non-Monetary Value in Patient Capital

Tia van Beek - Principal Asset Management: Non-monetary values, such as spatial quality, need not always be certified to become monetised. In a build-to-exit strategy, certification is essential to ensure the next buyer recognises and prices the value created. In a build-to-hold strategy, however, the asset's own track record, tenant retention, revenue stability, and maintenance costs validate and monetise non-monetary value over time, without requiring external certification. This demands investor self-belief: the willingness to take the risk, hold the asset, and harvest the value created internally before any exit.

The Root of the Shortage

Christopher de Vries - Delft University of Technology: reinforces a central positioning of this Handbook: the housing shortage is not simply a shortage of dwellings, it is a shortage of the right square metre distribution across segments of society. The households most acutely affected are younger and mid-career professionals, broadly below fifty, who have not accumulated the capital gains of the preceding generation and are now competing for housing in dense urban contexts where space per person is shrinking and purchasing power is under sustained pressure. Meanwhile, the generation between sixty and ninety occupies residential space at significantly higher ratios of square metres per person. This demographic asymmetry is one of the structural accelerators of the current urban housing shortage in Europe. Put simply: if nothing changed, the shortage would partially resolve itself over time as larger units become available through generational transition. But densification cannot mean replicating the same typological assumptions that have defined residential supply for decades, because the demographic profile that generated those assumptions is already shifting. Building more of the same does not solve a mismatch; it deepens it.

The Role of Municipalities in Supply-Demand Alignment

Hilde Remøy - Delft University of Technology: raises the relevance of municipal ownership in typological supply decisions. Zoning plans and building regulations exist, but they are often generalised and do not reflect actual household demand at the neighbourhood level. Remøy argues that municipalities should take a more active advisory role, learning from past typological supply, understanding their residential demography, and providing structured guidance on what should be built. In doing so, they become an active party in supply-demand alignment rather than a passive regulatory body, with direct consequences for the long-term value and social adequacy of the resulting assets.

Understanding What Residents Actually Want

Steve Weikal - Massachusetts Institute of Technology: raises a pointed question: who in the development process actually understands what residents want? His answer aligns with this Handbook's methodology, only the residents themselves. Historically, developers relied on intuition and direct market conversation. Today, the tools exist to get significantly closer to end-user demand: social media data, search behaviour analysis, and structured household questionnaires. Weikal notes that AI-enabled rapid prototyping tools are emerging but remain limited, focused on input costs and profitability, not yet incorporating qualitative variables such as sunlight exposure, spatial configuration, or transit proximity. The industry thinks in terms of cost and price rather than value. Closing that gap begins with getting demand data closer to the resident, precisely what the location-specific household questionnaire methodology applied in Zurich demonstrates.

Typological Supply Adequacy

Dirk van Gameren - Delft University of Technology: New typologies are frequently identified, built at scale, and then rendered obsolete as demand shifts, pointing to a structural failure in supply-mix calibration. The core challenge is determining what tenants genuinely need and are willing to pay for, avoiding oversupply of space or unit elements that occupants do not value. A return to demand fundamentals, understanding under- and over-supply at the typological level, is essential before scaling any new residential product.

Separate Practices, Shared Understanding

Christopher de Vries - Delft University of Technology: raises a relevant boundary condition for the collaboration framework developed in this chapter. Mutual understanding has a limit, and that limit matters. It is not the aim of this Handbook for Architects to build financial models, nor for Investors to dictate spatial programmes. The value of each profession lies in its specialisation. The aim is more targeted: that each profession develops sufficient understanding of the other's value logic to recognise how its own decisions affect it. An Investor does not need to become an Architect; they need enough comprehension to assess how spatial quality translates into occupancy stability and long-term asset performance. An Architect does not need to run a DCF model; they need enough awareness to recognise which design decisions carry financial consequences and which create non-monetary value a patient capital framework can reward. The creativity of the architect should not be limited, but a more understanding will help to turn creative ideas into valuable ideas.

Value of the Location vs. Value Towards the Location

Hilde Remøy - Delft University of Technology: offers a critical reframing of a foundational investment assumption. The principle of "location, location, location" is well established in real estate investment; location determines the risk-return profile, and investors price accordingly. Remøy challenges the directionality of this logic: non-monetary asset qualities not only respond to location, but they can actively shape it. A well-designed, spatially adequate residential asset contributes to the social and physical quality of its immediate context, influencing the very location value investors rely on. The effect of non-monetary value on location is more significant than conventional investment frameworks account for.

The Value of Mutual Literacy

Steve Weikal - Massachusetts Institute of Technology: reinforces the collaboration argument of this Handbook through a critical observation: the value that remains uncaptured between architects and investors is not primarily a process failure; it is a literacy failure. Investors who cannot read spatial quality cannot recognise the value an architect creates. Architects who cannot read financial logic cannot argue for the design decisions that generate it. Weikal points to MIT research demonstrating that design quality, sustainability integration, and spatial differentiation generate measurable rent premiums and exit premiums, but only where the investor understands and commits to those qualities early enough to prevent them from being engineered out. The evidence base exists. What is missing is the shared vocabulary to act on it within the investment process.

Cooperative Housing as a Long-Term Stewardship Model

Dirk van Gameren - Delft University of Technology: Cooperative housing associations operate with a long-term ownership perspective, as residents are active stewards of their own assets. Their returns need only meet self-defined ambitions, enabling a holistic, patient-capital approach that supports creative, demand-specific typologies and extended holding periods. Their willingness to take unconventional risks, driven by strong self-belief in non-monetary value, offers a compelling reference model for institutional investors seeking to balance financial feasibility with spatial and social quality.

Government as the Third, and Dominant, Actor

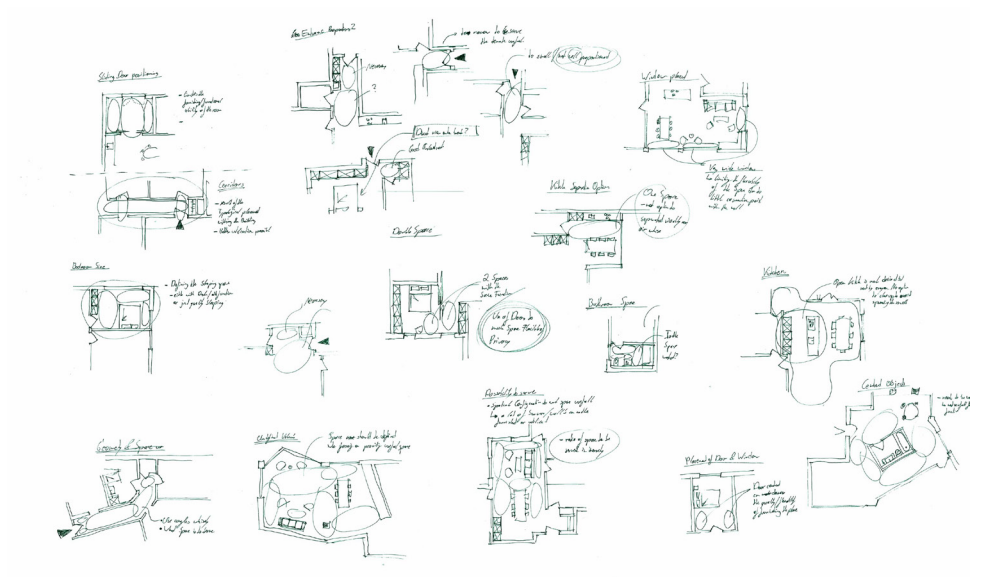
Tia van Beek - Principal Asset Management: Even where Architect and Investor achieve full strategic alignment on typology, spatial quality, and financial feasibility, governmental intervention frequently overrides the outcome. Authorities hold the highest decision-making power across typological mix, quality standards, and amenity requirements, and their increasing involvement regularly renders densification and development potential commercially unviable. This dynamic is acknowledged as critical to the current market, but remains outside the scope of this Handbook, which deliberately focuses on the Architect–Investor corridor due to scope and implementation constraints.

Quantitative Typological Analysis

Below is the export of the Analysis Excel, but quality & proportional deviation of the current supply is provided.

Residential Multifamily Typological Supply Dataset (2016-2026)													Result of the Proportions in %					
There is not existing data so, I am analyzing as much of the supply within the timeframe to make conclusions on the proportions of spatial adequacy. This dataset does not show the quantity of supply, but quality & proportional deviation of the current supply generated.													Bedroom	Bedroom	Kitchen/	Circulation/	Storage	
Link to source	Dataset	Type of Data	Year of con.	Nr. Rooms	Bedrooms m2	Bathroom m2	Kitchen/Eating m2	Recreation m2	Circulation/Entree m2	Storage m2	Outdoor m2	Wh/L m2	Assumed People M2	m	m	Entree m2	Storage	
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	1	4.5	42 m²	9 m²	12 m²	20 m²	9 m²	10 m²	8 m²	102 m²	3.5	41%	9%	31%	9%	10%
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	2	2.5	15 m²	4 m²	12 m²	12 m²	4 m²	3 m²	8 m²	50 m²	1.2	30%	8%	48%	8%	6%
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	3	3.5	28 m²	4 m²	20 m²	14 m²	3 m²	10 m²	69 m²	2.3	41%	6%	49%	4%	0%	
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	4	3.5	30 m²	7 m²	15 m²	15 m²	8 m²	4 m²	8 m²	89 m²	2.4	37%	8%	37%	12%	5%
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	5	4.5	37 m²	11 m²	18 m²	20 m²	10 m²	6 m²	49 m²	3.5	43%	12%	45%	0%	0%	
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	6	3.5	26 m²	10 m²	17 m²	23 m²	13 m²	1 m²	21 m²	99 m²	2.4	29%	11%	44%	14%	1%
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	7	1.5	10 m²	7 m²	6 m²	3 m²	2 m²	20 m²	32 m²	1.2	31%	22%	47%	0%	0%	
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	8	5.5	56 m²	15 m²	15 m²	29 m²	11 m²	2 m²	11 m²	128 m²	4.6	44%	12%	34%	9%	2%
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	9	4.5	39 m²	11 m²	17 m²	24 m²	9 m²	11 m²	99 m²	3.5	37%	12%	42%	9%	0%	
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	10	3.5	24 m²	6 m²	23 m²	21 m²	12 m²	6 m²	49 m²	2.3	31%	6%	65%	3%	0%	
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	11	2.5	15 m²	5 m²	15 m²	21 m²	9 m²	9 m²	64 m²	1.2	23%	7%	56%	13%	0%	
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	12	2.5	18 m²	5 m²	17 m²	16 m²	3 m²	7 m²	59 m²	1.2	30%	8%	57%	6%	0%	
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	13	2.5	15 m²	5 m²	16 m²	21 m²	10 m²	9 m²	66 m²	1.2	22%	7%	56%	15%	0%	
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	14	3.5	33 m²	10 m²	20 m²	16 m²	12 m²	9 m²	119 m²	4.5	44%	9%	31%	10%	0%	
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	15	3.5	39 m²	5 m²	25 m²	11 m²	6 m²	7 m²	79 m²	2.3	40%	6%	47%	7%	0%	
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	16	6.5	72 m²	13 m²	23 m²	21 m²	24 m²	9 m²	12 m²	157 m²	5.7	47%	8%	29%	16%	0%
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	17	1.5	13 m²	5 m²	12 m²	13 m²	10 m²	5 m²	8 m²	57 m²	1.2	23%	8%	44%	17%	8%
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	18	1.5	19 m²	5 m²	12 m²	13 m²	6 m²	5 m²	41 m²	1	24%	11%	55%	9%	0%	
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	19	5.5	38 m²	10 m²	15 m²	16 m²	6 m²	4 m²	11 m²	92 m²	4.5	43%	11%	35%	7%	0%
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	20	3.5	24 m²	5 m²	15 m²	17 m²	3 m²	4 m²	9 m²	68 m²	2.3	36%	8%	47%	4%	0%
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	21	4.5	41 m²	10 m²	10 m²	23 m²	17 m²	12 m²	18 m²	113 m²	3.6	36%	9%	29%	15%	11%
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	22	2.5	19 m²	4 m²	10 m²	20 m²	2 m²	16 m²	63 m²	1.2	31%	7%	58%	4%	0%	
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	23	2.5	19 m²	5 m²	9 m²	23 m²	4 m²	5 m²	60 m²	1.2	24%	8%	52%	8%	0%	
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	24	3.5	27 m²	7 m²	12 m²	21 m²	20 m²	12 m²	18 m²	99 m²	2.4	27%	7%	34%	20%	12%
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	25	1.5	10 m²	5 m²	9 m²	13 m²	4 m²	5 m²	46 m²	1	22%	11%	48%	8%	8%	
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	26	3.5	29 m²	7 m²	10 m²	26 m²	16 m²	8 m²	56 m²	2.4	30%	12%	48%	9%	0%	
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	27	2.5	19 m²	4 m²	11 m²	22 m²	12 m²	15 m²	22 m²	11 m²	21%	21%	11%	52%	0%	
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	28	1.5	10 m²	5 m²	11 m²	13 m²	4 m²	4 m²	43 m²	1	23%	11%	57%	9%	0%	
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	29	3.5	26 m²	8 m²	18 m²	20 m²	13 m²	4 m²	45 m²	88 m²	2.4	29%	9%	43%	14%	4%
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	30	3.5	29 m²	5 m²	19 m²	12 m²	9 m²	6 m²	73 m²	2.4	40%	6%	42%	12%	0%	
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	31	2.5	19 m²	4 m²	16 m²	13 m²	6 m²	13 m²	66 m²	1.2	27%	8%	54%	10%	0%	
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	32	3.5	29 m²	5 m²	20 m²	20 m²	11 m²	5 m²	3 m²	88 m²	2.4	32%	5%	45%	12%	0%
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	33	4.5	46 m²	10 m²	15 m²	25 m²	10 m²	3 m²	55 m²	109 m²	3.5	43%	9%	37%	9%	3%
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	34	4.5	44 m²	13 m²	18 m²	18 m²	20 m²	3 m²	58 m²	113 m²	3.6	39%	12%	32%	18%	0%
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	35	2.5	14 m²	4 m²	15 m²	20 m²	3 m²	3 m²	8 m²	60 m²	1.2	24%	7%	59%	9%	0%
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	36	1.5	10 m²	4 m²	8 m²	14 m²	2 m²	4 m²	29 m²	1	20%	11%	62%	0%	0%	
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	37	2.5	14 m²	4 m²	15 m²	15 m²	3 m²	3 m²	4 m²	59 m²	1.2	26%	8%	55%	5%	6%
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	38	3.5	28 m²	6 m²	15 m²	14 m²	4 m²	2 m²	6 m²	68 m²	2.4	40%	8%	42%	6%	3%
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	39	1.5	10 m²	4 m²	8 m²	8 m²	3 m²	5 m²	33 m²	1	30%	12%	48%	9%	0%	
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	40	2.5	19 m²	5 m²	14 m²	14 m²	3 m²	4 m²	6 m²	105 m²	1.2	26%	10%	51%	9%	7%
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	41	3.5	29 m²	11 m²	18 m²	21 m²	3 m²	5 m²	8 m²	89 m²	2.3	32%	13%	46%	4%	5%
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	42	1.5	10 m²	5 m²	6 m²	7 m²	4 m²	7 m²	34 m²	1	30%	14%	45%	12%	0%	
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	43	1.5	10 m²	7 m²	8 m²	5 m²	3 m²	3 m²	33 m²	1	30%	20%	40%	9%	0%	
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	44	1.5	10 m²	5 m²	10 m²	8 m²	3 m²	3 m²	39 m²	1	28%	13%	50%	9%	0%	
https://doi.org/10.5281/zenodo.1391001	In Permitting	2027	45	1.5	10 m²	5 m²	15 m²	11 m²	3 m²	3 m²	47 m²	1	21%	9%	63%	6%	0%	
https://doi.org/10.5281/zenodo.1391001	Current Offering	2025	46	2.5	14 m²	5 m²	20 m²	21 m²	7 m²	8 m²	68 m²	1.2	21%	8%	61%	10%	0%	
https://doi.org/10.5281/zenodo.1391001	Current Offering	2026	47	1.5	10 m²	5 m²	15 m²	6 m²	5 m²	9 m²	41 m²	1.2	24%	13%	51%	12%	0%	
https://doi.org/10.5281/zenodo.1391001	Current Offering	2025	48	4.5	41 m²	10 m²	29 m²	21 m²	6 m²	17 m²	107 m²	3.5	39%	9%	45%	6%	0%	
https://doi.org/10.5281/zenodo.1391001	Current Offering	2025	49	4.5	41 m²	10 m²	29 m²	20 m²	5 m²	18 m²	105 m²	3.5	39%	9%	47%	6%	0%	
https://doi.org/10.5281/zenodo.1391001	Current Offering	2025	50	1.5	10 m²	5 m²	10 m²	4 m²	4 m²	4 m²	32 m²	1	31%	14%	44%	11%	0%	
https://doi.org/10.5281/zenodo.1391001	Current Offering	2025	51	1.5	10 m²	5 m²	10 m²	4 m²	4 m²	4 m²	38 m²	1	26%	12%	50%	12%	0%	
https://doi.org/10.5281/zenodo.1391001	Current Offering	2025	52	2.5	16 m²	7 m²	15 m²	16 m²	6 m²	6 m²	59 m²	1.2	27%	11%	52%	10%	0%	
https://doi.org/10.5281/zenodo.1391001	Current Offering	2025	53	2.5	14 m²	6 m²	15 m²	19 m²	6 m²	6 m²	69 m²	1.2	24%	9%	47%	10%	0%	
https://doi.org/10.5281/zenodo.1391001	Current Offering	2025	54	2.5	14 m²	5 m²	15 m²	16 m²	6 m²	6 m²	56 m²	1.2	26%	8%	56%	10%	0%	
https://doi.org/10.5281/zenodo.1391001	Current Offering	2025	55	3.5	28 m²	11 m²	18 m²	26 m²	9 m²	9 m²	92 m²	2.4	30%	11%	48%	10%	0%	
https://doi.org/10.5281/zenodo.1391001	Current Offering	2025	56	3.5	28 m²	10 m²	15 m²	23 m²	10 m²	8 m²	88 m²	2.3	32%	11%	44%	12%	0%	
https://doi.org/10.5281/zenodo.1391001	Current Offering	2026	57	2.5	14 m²	5 m²	14 m²	16 m²	5 m²	10 m²	53 m²	1.2	27%	9%	54%	10%	0%	
https://doi.org/10.5281/zenodo.1391001	Current Offering	2026	58	2.5	14 m²	6 m²	15 m²	20 m²	5 m²	12 m²	71 m²	1.2	29%	12%	48%	17%	0%	
https://doi.org/10.5281/zenodo.1391001	Current Offering	2026	59	2.5	18 m²	6 m²	11 m²	28 m²	6 m²	2 m²	22 m²	68 m²	1.2	26%	9%	57%	8%	0%
https://doi.org/10.5281/zenodo.1391001	Current Offering	2026	60	3.5	29 m²	12 m²	20 m²	20 m²	5 m²	10 m²	86 m²	2.4	34%	14%	47%	6%	0%	
https://doi.org/10.5281/zenodo.1391001	Current Offering	2026	61	4.5	40 m²	7 m²	25 m²	30 m²	15 m²	11 m²	117 m²	3.5	34%	6%	47%	13%	0%	
https://doi.org/10.5281/zenodo.1391001	Current Offering	2026	62	4.5	40 m²	6 m²	25 m²	12 m²	8 m²	9 m²	119 m²	3.5	38%	8%	38%	10%	0%	
https://doi.org/10.5281/zenodo.1391001	Current Offering	2026	63	1.5	10 m²	6 m²	9 m²	45 m²	10 m²	6 m²	80 m²	1.2	13%	8%	68%	13%	0%	
https://doi.org/10.5281/zenodo.1391001	Current Offering	2026	64	3.5	29 m²	3 m²	6 m²	57 m²	4 m²	3 m²	57 m²	1.2	44%	5%	45%	7%	0%	
https://doi.org/10.5281/zenodo.1391001	Cooperative Devels	2019	65	2.5	14 m²	6 m²	18 m²	23 m²	9 m²	11 m²	70 m²	1.2	19%	9%	59%	13%	0%	
https://doi.org/10.5281/zenodo.1391001	Cooperative Devels	2019	66	3.5	29 m²	6 m²	14 m²	21 m²	34 m²	13 m²	86 m²	2.4	33%	10%	41%	16%	0%	
https://doi.org/10.5281/zenodo.1391001	Cooperative Devels	2019	67	4.5	39 m²	6 m²	20 m²	28 m²	13 m²	15 m²	108 m²	3.5	36%	8%	44%	12%	0%	
https://doi.org/10.5281/zenodo.1391001	Cooperative Devels	2021	68	4.5	51 m²	12 m²	20 m²	23 m²	11 m²	13 m²	117 m²	3.5	43%	10%	37%	9%	0%	
https://doi.org/10.5281/zenodo.1391001	Cooperative Devels	2021	69	3.5	34 m²	12 m²	20 m²	23 m²	8 m²	13 m²	98 m²	2.4	35%	12%	44%	8%	0%	
https://doi.org/10.5281/zenodo.1391001	Cooperative Devels	2021	70	5.5	74 m²	14 m²	19 m²	25 m²	18 m²	13 m²	150 m²	4.6	49%	9%	30%	12%	0%	
https://doi.org/10.5281/zenodo.1391001	Cooperative Devels	2021	71	4.5	50 m²	11 m²	17 m²	22 m²	17 m²	10 m²	123 m²	3.						

Unified Deficiencies



Data Management checklist

DATA MANAGEMENT CHECKLIST

Instruction

This checklist is relevant for all graduation projects of the Master AUBS. The form is intended to highlight common aspects of graduation projects that require particular attention with regard to planning the research and data management. Relevant information and supplementary sources regarding each question are provided below each question.

With this checklist, the faculty wants to avoid that students unexpectedly find themselves in complex and stressful situations, in which ethical or privacy matters and/or other laws and regulations become an issue. In projects involving humans, certain types of data processing increase the risks to the human participants: planning such projects requires additional evaluations and advice from university staff before ethical approval can be received and the project can begin. In the case of a graduation project, obtaining additional advice or permits may delay the project with an extra education period or semester. To avoid this, it is recommended that students set up a graduation project with a low level of risk. Therefore, all students have to check their risk, by completing this checklist before their A1.

The first section of the checklist (A) should be completed by all students, together with their supervisor, during the planning of the graduation project, before the A1. It does not need to be submitted to anyone for review or approval. Please consider questions 1 to 3 carefully in relation to the intended graduation project, and answer with 'yes' or 'no'.

The second section of the checklist (B) should only be completed if the graduation project involves working with data from human participants. In that case, the student and their supervisor must apply for and receive ethical approval from the [Human Research Ethics Committee](#) (HREC) before the project can begin (see the paragraph 'Explanation and follow-up' after the questions). The student can submit the application to the HREC, but the supervisor is responsible for making sure that the project is compliant with relevant privacy regulations and ethical policies.

Section A. General considerations	yes	no
<p>1. Is the graduation project conducted as part of an internship (at a company), or as part of a research project at TU Delft?</p> <p>If a student's graduation project is conducted at a company or as part of a research project at the university, questions of data ownership and intellectual property rights need to be addressed in a written graduation or internship agreement before the project begins. Students and their supervisor should consult the Intellectual Property Rights of Students webpage. Additional information can also be found in the Extended Personal Research Data Workflow.</p>		✓
<p>2. Does the project involve conducting (part of) the research outside the Netherlands?</p> <p>Students who intend to travel abroad (even to other EU countries) for study, exchange, research, internship, or graduation project purposes need to follow the Travel Safety Protocol. This includes attending a mandatory Travel Safety Training Session: see the Disclaimer.</p>		✓
<p>3. Will the research involve processing data from humans, such as running a survey, conducting interviews or workshops, collecting data through social media or internet forums, or re-using existing datasets about humans provided by a third party? (If 'yes', see follow-up questions 4 to 13 in Checklist B.)</p> <p>Students who work with data from human participants must complete the next section and apply for and receive ethical approval from the Human Research Ethics Committee (HREC) before conducting the research.</p>		✓

Section B. Extended risk factors (only if question 3 has been answered with 'yes'.)	yes	no
<p>4. Will the project involve participants who may be considered vulnerable, such as the elderly, refugees or asylum seekers, ethnic minorities, patients, or people with disabilities?</p> <p>Participants who may suffer very adverse consequences (for instance, due to discrimination) if their personal data became publicly available can be considered vulnerable.</p>		✓
<p>5. Will the project involve participants who cannot themselves give informed consent for taking part in the project, but for whom consent must be obtained from a legal guardian?</p> <p>Participants who cannot give informed consent can include, for instance, children or participants with intellectual disabilities, mental disorders, or dementia. Such participants are also considered vulnerable in the context of the General Data Protection Regulation (GDPR).</p>		✓
<p>6. Will the project involve processing any of the special categories of personal data below?</p> <ul style="list-style-type: none"> - Race - Ethnicity - Criminal offence data - Political opinion - Union membership - Religious or philosophical beliefs - Sex life and/or sexual orientation - Health data (including measurements such as heart rate) - Biometric or genetic data (including fingerprints, iris scanning, facial recognition) <p>The General Data Protection Regulation (GDPR) defines a stricter rules for processing special categories of personal data. If it is necessary to process these data in a project, it is it is important to provide additional safeguards.</p>		✓
<p>7. Will the project involve processing personal data that could be considered sensitive, such as the ones listed below?</p> <ul style="list-style-type: none"> - Information about a person's income, debts, or other payments - Information about a person's (un-)employment status - Information about a person's performance at school or work - Information about relationship problems or (gambling) addiction - Information about poverty, domestic violence, or youth welfare/social work involvement <p>Some types of personal data are considered sensitive, because they can have a high impact on the privacy of the data subject if other persons gain access to these data. Sensitive personal data should only be processed if necessary: in such cases, additional safeguards need to be put in place.</p>		✓
<p>8. Will the project involve processing video-recordings, or photographs of participants?</p> <p>TU Delft considers photographic and video-materials of research participants to be sensitive personal data. If such data need to be processed, additional safeguards must be put in place.</p>		✓

Section B. Extended risk factors (only if question 3 has been answered with 'yes'.)	yes	no
<p>9. Will the project involve sharing or transferring personal data between multiple partners or collaborating organisations involved, such as between TU Delft and an internship company?</p> <p>According to privacy law, sharing personal data between organisations requires a privacy agreement to be in place: setting this up takes time, and requires support from additional university staff. Furthermore, personal data sharing can potentially expose research participants to different types of risks: these risks must be considered in the ethical application.</p>		✓
<p>10. Will the project involve deception, or covert observation of participants?</p> <p>In some types of research, obtaining informed consent for processing participants' personal data is not an option: for instance, if the research involves deception, or the research is covert (conducted without participants knowing about it). In such situations, the steps to mitigate risks to participants are important, and an alternative legal basis for processing the participant's data needs to be established with the help of additional support staff.</p>		✓
<p>11. Will the project involve working with social media data?</p> <p>Social media data are personal data, but since it is usually not possible to ask for informed consent for processing social media data, another legal basis for processing the participant's data needs to be established. Processing of social media data also involves legal considerations related to terms of use of data from third-party platforms: therefore, research with social media data requires expert support on privacy, ethics, and legal matters.</p>		✓
<p>12. Will the project involve using learning algorithms or other AI to analyse, combine, or otherwise process data from participants?</p> <p>The use of AI in research involves many considerations in terms of data protection, ethics, security, and intellectual property: for more information, see TU Delft's Instructions for use of Generative AI.</p>		✓
<p>13. Will the project involve participants who are based in a country or countries outside of the EU?</p> <p>Students affiliated with TU Delft must comply with Dutch and EU regulations of personal data processing (GDPR). Furthermore, the student and their supervisor must make sure that the research complies with local (privacy) legislations of any foreign destinations. Additional support from an external (local) expert may be required.</p>		✓

Explanation and follow-up

If you have answered 'no' to all questions 4 to 13, your project is likely to be considered low or minimal-risk: see the paragraph 'Projects with minimal or low-risk' on the next page.

If you have answered 'yes' to one or more of the questions 4 to 13, your research likely involves extended or high risks to participants, according to the [General Data Protection Regulation](#) (GDPR) and TU Delft's privacy and ethical policies: for information regarding such projects, see the paragraph 'Projects with extended or high-risk' on the next pages.

Projects with minimal or low-risk

If you have answered 'no' to questions 4 to 13, your project is likely to be considered low-risk. This does not mean that the project involves no risks at all, but suggests that these risks can likely be addressed by the student and supervisor in the application to the [Human Research Ethics Committee](#) (HREC) within the timeline for a graduation project and without need for additional support.

Compiling the HREC application:

An application to the HREC generally involves a Data Management Plan (DMP), a risk-identification and mitigation checklist, and informed consent materials. Master's students at ABE who intend to compile a HREC application are advised to make use of the following support documents:

- the [student guide](#)
- the [Example Data Management Plan](#) for MSc projects

The graduation supervisor is [responsible](#) for the student's project and ethical application, and must provide support for compiling the HREC application documents.

Additional support

For low-risk student graduation projects, compiling of the HREC application documents should be done by the student in consultation with the supervisor. The Faculty Data Steward can be contacted for individual questions at datasteward-BK@tudelft.nl: however, the Data Steward does not provide detailed feedback on student DMPs for low-risk HREC applications.

Additional resources

The HREC has guides available for [completing the checklist](#) and for compiling [informed consent materials](#). Additionally, the [Guide to the Extended Personal Research Data Workflow](#) has been created to help researchers and students who work with human participants comply with both GDPR principles and TU Delft's policies on Data Management and Human Research Ethics.

Timeline

Minimal or low-risk HREC applications are generally processed faster than extended or high-risk applications (see the paragraph below). Nevertheless, the initial evaluation by the HREC usually takes approximately 2 weeks, and may take longer during busy periods or holiday: see the [HREC website](#) for up-to-date information. Additionally, the application may require revisions before final approval is granted. If you do not receive an initial response about your ethical application after 4 weeks from the time of submission, you may follow up with the HREC to enquire about an update.

Projects with extended or high-risk

If you have answered 'yes' to one or more of questions 4 to 13, there are potential increased risks related to how data from human participants will be processed in your project. These risks will need to be addressed in consultation with the Data Steward and other relevant support staff before submitting the ethical application to the [Human Research Ethics Committee](#) (HREC).

Compiling the HREC application

An application to the HREC generally involves a Data Management Plan (DMP), a risk-identification and mitigation checklist, and informed consent materials. Master's students at ABE who intend to compile a HREC application are advised to make use of the following support documents:

- the [Ethical Approval & Data Management Planning Student Information](#)
- the [Example Data Management Plan](#) for MSc projects

The graduation supervisor is [responsible](#) for the student's project and ethical application, and must provide support for compiling the HREC application documents.

