

Architecture as a Way of Life: A Practice-Based Study on Adaptive Compact Housing under Conditions of Spatial Scarcity

Mahasti Tafahomi

Abstract

This paper presents the results of a three-year practice-based research study on compact housing, conducted through the design, construction, occupation, and iterative evaluation of the MiniVilla housing concept in the Netherlands. The research investigates spatial configuration, material use, and functional zoning under conditions of land scarcity, changing household patterns, and contemporary technical standards. Particular attention is given to kitchens, washing facilities, and sleeping arrangements, which were identified as critical domains requiring flexible spatial solutions due to evolving technologies and lifestyles. The study demonstrates that compact housing can only remain viable when treated as an adaptive system, in which spatial and material parameters are adjusted per location and use case. The paper concludes with design propositions derived directly from empirical findings and outlines directions for further experimental implementation.

Keywords

Compact housing; adaptive design; practice-based research; spatial scarcity; residential architecture; flexible units; material performance; user experience; prefabricated

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I. Methodology

This research is based on a longitudinal, practice-based methodology carried out over a three-year period. The MiniVilla concept functioned simultaneously as a dwelling, prototype, and research instrument. The study combined:

- continuous occupation and observation;
- qualitative user feedback;
- spatial use analysis;
- evaluation of façade and interior material performance;
- iterative design adjustments informed by empirical findings.

Rather than testing a fixed typology, the research adopted an **adaptive design approach**, allowing modifications to spatial layout and material application in response to observed performance and user needs.

II. Results

2.1 Spatial Configuration and Compact Living

The results indicate that conventional fixed layouts are insufficient for compact dwellings. Spatial efficiency alone does not guarantee long-term usability. Instead, adaptability proved essential in responding to:

- changing household compositions;
- hybrid living and working patterns;
- psychological needs such as orientation, privacy, and daylight access.

Compact housing benefits from spatial systems that allow reconfiguration rather than rigid zoning.

2.2 Material Performance: Façade and Interior

Material choices were evaluated both technically and experientially. While insulation values, durability, and acoustic performance remain essential, the study shows that perceived quality, tactility, and aging behavior significantly influence user satisfaction in small spaces.

The findings confirm that standardized material packages underperform when detached from site-specific conditions such as climate exposure, urban density, and regulatory constraints.

2.3 Kitchens, Washing Facilities, and Sleeping Units

A focused sub-study was conducted on kitchens and washing facilities, as these spaces are undergoing rapid transformation due to:

- diversification of appliances;
- reduced household sizes;
- changing habits related to food preparation, laundry, and clothing care.

The research indicates that traditional fixed kitchen and laundry layouts are increasingly incompatible with contemporary use. Similarly, sleeping spaces are no longer limited to static bedroom typologies but interact with work, rest, and storage functions.

These findings point toward the necessity of **flexible, modular units** for cooking, washing, and sleeping, capable of adapting to different appliance configurations and lifestyle patterns.

III. Discussion

3.1 Architecture as an Integrated System

The results support a view of architecture as an integrated system in which technical performance, spatial quality, and human experience are inseparable. Historical architectural movements are referenced analytically to illustrate how built form consistently reflects prevailing societal conditions.

In the current context of ecological pressure and land scarcity, compact housing must respond not only through minimization, but through intelligent adaptation.

3.2 Design Implications

Based on the empirical findings, the study proposes the following design implications:

1. Compact housing should be designed as an **adaptive system**, not a fixed typology.
2. Spatial quality depends on proportional clarity, daylight distribution, and material coherence.
3. Kitchens, washing facilities, and sleeping areas require **flexible unit-based design** rather than static room definitions.
4. Material and spatial parameters must be adjusted per location and context.
5. User experience should be evaluated through long-term occupation, not assumed at the design stage.

IV. Future Research and Implementation

The research concludes that flexible kitchen, washing, and sleeping units represent a critical next step in compact housing design. These units will be implemented in subsequent MiniVilla iterations and tested through continued real-world use. Future studies will evaluate:

- adaptability to different appliance technologies;
- user interaction over time;
- technical integration with building systems;
- spatial impact on overall dwelling performance.

V. Conclusion

This three-year practice-based study demonstrates that compact housing cannot be reduced to efficiency metrics alone. Under conditions of land scarcity and social change, architecture must operate as a technically rigorous, context-responsive, and human-centered discipline. The MiniVilla research shows that adaptability—particularly in kitchens, washing facilities, and sleeping arrangements—is essential for future residential models. The findings presented here contribute empirical evidence to the ongoing development of adaptive compact housing systems.