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MINIMUM LIVING SPACE: KÖRPER, LEIB AND CAPSULE UTOPIAS

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ABSTRACT

This study argues that the quality of minimal space transcends its capacity to be measured based on quantitative standards, or what we philosophically call the "object body" (Körper), ignoring the complex phenomenological experience of the "lived body" (Leib), which enriches spatial perception. The objective is to define such space as an integral condition, combining normative parameters with contributions from utopian architecture (Archigram, Metabolistas), the phenomenology of space, and Neri Oxman's Material Ecology. The methodology is qualitative with quantitative support, utilizing documentary and theoretical analysis of architectural and phenomenological proposals, a review of regulations, and case studies. It is concluded that minimal habitable space constitutes an integral condition that articulates quantity, perceptual quality, and the adaptive capacity of the built environment. True quality is measured by the richness of bodily experience, considering the type of user (Homo Movens vs. Homo Ludens) that these utopias sought to accommodate.

KEYWORDS: Minimal Space; Body-Object (Körper); Lived-Body (Leib); Capsule Dwelling.

1. INTRODUCTION

Accelerated urban development, the housing crisis and the transformations in lifestyles in the post-pandemic era, determine the need for an imperative to reconsider the concept of minimum habitable space. In light of this, we must not forget that after the ravages of the Second World War in both England and Japan (where a large part of the houses were destroyed), they promoted the search for quick, cheap and serial solutions.

This panorama, impregnated with the progress of Fordism and industrialization, as well as the cult of the space race and pop culture, leads to the imagining of housing in capsules as an Oedipal surveillance of the shortage of housing or novel ways of living (Souto Rubio, 2021). This idea has traditionally been considered from a mainly quantitative point of view – institutions such as UN-Habitat, 2015 – where acceptable conditions range from 12 to 20 m²/per capita and serious overcrowding under conditions of less than 5 m²/person.

Although they serve as important reference thresholds to ensure basic consistency, they are not sufficient on their own to capture the true complexity of living. This deficiency raises the following research questions: What is the minimum range of m², and m³ to ensure decent habitability without falling into overcrowding? And more profoundly: what is the phenomenological experience of living in a similar small space like?

To answer these questions, the general objective of this document is to study and describe the minimum amount of habitable space, involving normative, utopian, phenomenological and technological reflections; which is materialized through the development of five specific objectives:

1. Investigate regulatory and ergonomic criteria for minimum space.
2. Review utopian references from Archigram, Metabolists, Cedric Price, Superstudio, as well as useful contributions made by architectural utopias to the microhabitat project.
3. Incorporate the phenomenological vision of Careri (2002) when conceiving "minimal-housing".
4. To examine Neri Oxman's Material Ecology (Oxman, 2016) as a reference to evaluate the role of technological-material advancement in improving habitable microspaces.
5. Propose a conceptual framework of minimum living space that can be used as an interdisciplinary synthesis.

Thus, this paper suggests that minimum living space should be considered as an integrated defining

concept that goes beyond merely representing quantifiable dimensions of the objective body (Körper), meaning the measurable and quantifiable physical body, towards the adhesion of a rich subjective experience derived from the lived body (Leib); (Merleau-Ponty, 1945; Waldenfels, 1994), central to today's ongoing discussion of the space experience (Seamon, 2016). In other words, architecture's task of establishing that "a bed, table, and chair are in their proper place" must be overcome to ask not only that "a bed, table, or chair is where it belongs," but rather how it feels or will feel to inhabit when these objects are there. (Waldenfels, 1994).

2. METHODOLOGY

The method adopted in this research is qualitative and quantitative. The qualitative part is a documentary and theoretical reflection on architectural propositions, utopias and phenomenological readings. This quantitative part of support, however, is limited to the systematic review and comparison of guidelines/standards developed by international bodies for minimum habitable dimensions in normative parameters.

Three methods of data collection are used:

1. First, a comprehensive literature review of international standards (e.g., UN-Habitat, 2015) and relevant scientific papers was conducted.
2. Second, the discussion of paradigmatic architectural examples such as Kisho Kurokawa's Nakagin Capsule Tower, Archigram's Plug-in City, and Cedric Price's Fun Palace; rather than discussing less stereotypical case studies that could benefit from cyber thinking.
3. Thirdly, the phenomenological reading of spatial experiences and, to this end, based on the work of Francesco Careri (2002) on walking as an aesthetic practice.

For this, three analysis techniques are used:

1. Comparative analysis between normative standards and utopian proposals to identify tensions and complements between them.
2. Content analysis in theoretical texts and manifestos of the avant-garde movements studied.
3. Interpretative synthesis to contemplate the results obtained so far in a coherent way, thus aiming to build a broad conceptual map on minimum living spaces.

The proposed model will eventually be tested by its application in the case study, with special emphasis on the comparison between Archigram and

the Metabolists, to see how, despite their different cultural backgrounds, both coincided in similar formal solutions for the housing capsule that shaped each other through a shared spirit of time (Souto Rubio, 2021).

Theoretical Framework: Definitions of Body, Space and Technology of the Inhabitable.

The discourse of minimum living space encompasses the territory between quantitative prescription and experience, so that quantity must emerge as form. This theoretical framework describes three complementary perspectives to establish the theme: the Körper-based critique (body as object) of norms, the integration of the Leib (body as subject) as a central category of inhabiting, and the contributions of architectural utopias and Material Ecology as a radical counterpoint to today's extreme social reality.






2.1. The Problem of the Body-Object (Körper) In Urban Legislation and Social Practice

International standards (let's say... UN-Habitat, 2015) define minimum quantitative thresholds of habitability (between 12 and 20 m² and between 30-

35 m³ per person) using biometric logic as a basic notion of dignity. These policy-based indices are based on an understanding of the body (Körper) as a measurable object, static and dead at the same time (Waldenfels, 1994). In classical ergonomics, this view provides a means of assessing 'whether' the body is in a space, not 'how'. It converts spatial experience into generated empirical data – there is space for a bed, there is ventilation – but ignores its sensory, emotional and singular narrative dimension of inhabiting. The criticism here is not of the norm itself, but of its insufficiency as the only measure.

This quantitative approach often conflicts with attitudes towards the condition of housing today, where economic pressure and urgency effectively deprive solutions that still respond positively at a physical level only with minimal form of housing; forming a space alien to the true uses: many people living under one roof; people who are restricted from moving around the territory, isolated from the social fabric for similar reasons (such as unemployment); teleworkers who through work are intertwined in their flats; they need to do everything there. It is then that the distance between abstraction and practical reality becomes clear.

Infographic 1: contrasting the concepts of "Körper (Objective Body)" and "Leib (Lived Body)", two fundamental paradigms in phenomenology and philosophy to understand the duality of bodily experience. (García, 2025).

Körper (Objective Body) vs. Leib (Lived Body)	
Körper (Objective Body)	Leib (Lived Body)
Definition:	Definition:
The body as a physical object, measurable and observable from an external perspective. It is the body you <i>have</i> .	The body as a subject of experience, perception and action. It is the body that <i>one is</i> and experiences from within.
Representative Icons:	Representative Icons:
 Tape Measure: Symbolizes the measurability, dimensions, and proportions of the body as an object of study.	Sensory Perception: It represents the subjective experience of the world through the senses (sight, hearing, touch, taste, smell).
 Floor Plans: Refers to the anatomical structure, arrangement of organs, and body systems as an objective map.	 Movement Flows: Illustrates body dynamics, gestures, and the way the body moves and interacts with its environment.
 ISO Standards: Represents the standardization, classification, and normalization of the body according to scientific and medical parameters.	 Emotional Responses: Symbolizes the intrinsic connection between the body and emotions, where feelings are physically manifested.
Key Features:	Key Features:
* Objectivity: It can be analyzed and described in an impartial way.	* Subjectivity: It is the first-person experience, unique to each individual.
* Materiality: It focuses on the physical, biological, and chemical aspects of the body.	* Intentionality: The body is always oriented and in relation to the world.
* Third Person: It is the body seen by others or by oneself as an object.	* Incarnated Consciousness: The mind and body are inseparable in lived experience.

* Fragmentation: It can be broken down into its constituent parts (organs, tissues, cells).	* Holism: It is experienced as a unified and coherent whole.
Areas of Study:	Areas of Study:
Anatomy, physiology, biomechanics, traditional medicine.	Phenomenology, psychology, dance, somatic arts, psychotherapy.
Example:	Example:
A doctor examining an X-ray to diagnose a bone fracture is analyzing the Körper .	Feeling the warmth of the sun on your skin, the joy of a hug or the tiredness after running are Leib experiences.

2.2. The Lived Body (Leib) as the Phenomenological Basis of Space.

The phenomenology of Merleau-Ponty (1945) and Waldenfels (1994) makes the body-object secondary in relation to the body-subject (Leib). Leib is not in space as an object, but rather the infrastructure through which the world manifests itself. From this point of view, three aspects are suggested to redefine what is habitable:

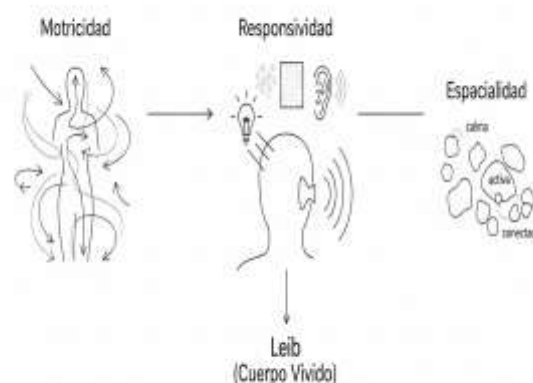
- Motor Intentionality: The body extends into space before any consciousness. The way to imagine a well-designed space is to "know" these movements – turning, reaching, reclining – and find them frictionless at the level of consciousness.
- Answer: Space "speaks" to the body: a low threshold encourages bending; the texture of

your floor, to the touch. Architecture can shape these "callings" to help people feel good or – by default, through carelessness – cause them stress.

- Lived spatiality: "Distance" and "proximity" are not given in meters, they are the effective and functional meaning. The kitchen may be "far away" if your access is inconvenient, or it may be just three steps away.

These maxims indicate that spatial intensity is less a product of the absolute scale, plus a drive between materiality, light, and configuration in such a way that they activate the inhabited situation. This is particularly relevant for social housing, when perceived spatial stress may be greater due to the inability to control the living environment or make environmental changes.

Infographic 2: (García, 2025).



3. TECHNOLOGICAL UTOPIAS VS. SOCIAL REALITIES: THE CONCEPTUAL GAP

The solutions to the problem of minimum housing have ranged from industrial standardization to biological accommodation, although generally from

an idealized image of those to whom such a solution was applied.

1. Archigram and the Metabolists: The capsule for Homo Ludens/Movens as a living machine. Both post-war movements shared an interest in technology, mobility, and planned obsolescence (Souto Rubio 2021). They

changed the discussion of square meters to the system: fixed megastructures + replaceable capsules.

- Archigram (Living Pod, 1966) dreamed of Homo Ludens: a nomadic, playful user, consumer of technology, global and free citizen (Cook, 1972).
- The Metabolists (Nakagin Tower, 1972) saw Homo Movens: the subject in permanent movement, the executive or worker on the way who would be temporarily anchored in a capsule (Kurokawa, 1969).

2. The Real Occupant of Social Housing: Homo Survivens?

This is a dichotomous fictional premise that there is a fundamental chasm between the fictional user of utopia and the demographic reality seen within contemporary social housing. In the context of Homo Ludens/Movens - a young, itinerant, economically independent, technologically dependent animal - the figure of Homo Survivens emerges: for whom housing is not a consumer gadget or place of passage, but a fragile refuge from precarious job prospects; an environment in which care will be given and received; often their only reliable asset. For him, mobility is not a matter of worry-free choice, but the compulsion of the labour market or uprooting; technology is nothing, but also an impediment to access, it serves instead as a potential barrier to entry; And the "planned obsolescence" of your place of residence is not something that will happen in the future, but a threat in terms of physical security today.

This difference is key: the utopias of the capsules dreamed of by a cosmopolitan individual at home, while social habitats must respond to groups (families, the elderly, singles) in vulnerable situations. The point is not whether the capsule can be technically achievable, but for whom and under what social circumstances it is legitimate and possible.

3. Material Ecology: Technology, the rich or the poor?

Oxman (2016) expresses the paradigm shift: "Not to build more parts, rather analogous to natural systems that grow materials with variable properties." Instances such as 'Aguahoja' show this: 3D printed structures with gradients in rigidity, transparency, or biodegradability that respond to humidity, temperature, and use (Guinda Millán, 2023). This is not simply 'effectiveness'; it is to give space a material response that converses with the Leib.

But the crucial question remains: is this

technological modernity, with its promise of genuinely adaptive and sensual places, serving Homo Survivens, or will it be a luxury only available to the elites? It seems that Material Ecology could reproduce the abyss of past utopias if it is not approached with a heart for inclusivity and true scalability; where it could be radical by democratizing the spatial response, expanding the material benefits of adaptation to the places most in need.

Infographic 3: (García, 2025).

Dimension	Körper Approach (Normative)	Leib Approach (Phenomenological)	Material Ecology Approach (Technological)
User Concept	Standard human (anthropometric data)	Vivid, situated, sensitive body (Leib)	User in symbiosis with a bio-digital environment
Objective of the Space	Contain basic functions (sleeping, eating)	Enable a rich and seamless experience	Dynamically adapt to changing needs
Flexibility	Fixed (defined by the plane)	Perceptual and motor	Intrinsic and material (matter changes)
Risk	Dehumanization, experiential insufficiency	Subjectivism, difficult to measure	Elitism, technological gap, complexity
Potential for Social Housing	Essential but insufficient base	Guide to Qualitative Design	To be defined: Luxury or right?

4. Application to architectural cases:

In the context of the tension between the body as an object (Körper) and as an experience (Leib), the need arises to conceptualize a habitable environment in the post-pandemic era. The evolution of contemporary architectural thought is related to how humans interact with space. This heterotopia (Machado, 2018) has been intensified by the paradigm shift of the COVID-19 pandemic, which has accelerated the need to create efficient, healthy, flexible, and resilient spaces.

Historically, architecture has been able to adapt to health and social crises. Examples include Leonardo Da Vinci's "Ideal City," which introduced hygiene features after the Black Death, and Haussmann's Plan of Paris, which prioritized wide streets after the cholera outbreak in 1830.

Previous pandemics, such as tuberculosis, also led to transformations in housing and school design, promoting large windows and terraces to improve health and cleanliness. This background highlights

the connection between architectural design and public health, an aspect that the current pandemic has made evident.

To clarify the analysis of specific architectural works, it is indicated how these two concepts, the Körper and the Leib, and the tension between them, are manifested in the design of the minimum space:

- Steven Holl - Fukuoka Apartment Building (1991).
- Körper: This building is structured by a rigid grid made up of concrete cubes. Residential units are presented as pure, modular volumes, which can be interpreted as objects (Körper) inserted within a larger skeleton (Waldenfels, 1994).
- Leib: Holl achieves a critical synthesis by converting the voids generated by the removal of cubes into terraces, gardens, and gazebos, thus creating a "phenomenological section." The experience of inhabiting extends beyond the private space, allowing the body to interact with these communal spaces and enjoy light, air, and strategically channeled views, enriching sensory perception (Waldenfels, 1994). The minimal space within the dwelling is counteracted by the expansion of the living space.
- Nakagin Capsule Tower / Kisho Kurokawa (1972).
- Körper: This building exemplifies the concept of the Körper. Capsules are prefabricated, standardized, and meticulously stacked units in a tower (Souto Rubio, 2021). Each capsule is designed as an industrial object adapted to the basic ergonomic needs of the "average man", conceptualizing the architecture as an efficient machine to house predefined functions (Waldenfels, 1994).
- Leib: Despite the philosophical intentions behind Kurokawa's project, it did not manage to fully materialize in phenomenological terms (Souto Rubio, 2021). The extremely limited space hindered motor intentionality, forcing constant reflections and planning to perform elementary movements. The low responsiveness of the environment only favored activities such as sleeping or working in isolation, thus restricting the resident's "can" (I can) (Waldenfels, 1994). In this way, the rigidity of the object hindered the spatial appropriation essential to living the Leib, resulting in discomfort and claustrophobia despite its iconic conceptual value.
- Gasket Homes / Archigram (1965).
- Körper: Designed as "personalised objects" and "individual products", the Gasket Homes capsules have larger dimensions (50 m²) than those of Nakagin but are characterised by plastic profiles and standard furniture (Souto Rubio, 2021).
- Leib: This project aimed to give the inhabitant freedom to "model their reality" and choose a tailor-made object" (Souto Rubio, 2021). Archigram sought to associate a "being able to do" (I can) with the leisure and mobility inherent in Homo Ludens (Huizinga cited in Souto Rubio, 2021; Waldenfels, 1994). However, the consumerist nature of the capsules and the lack of a social environment beyond the object itself raise doubts about the true longitudinal richness of the Leib experience despite its flexible intent.
- Apartment Buildings in Hong Kong (Cage Houses, Microapartments).
- oKörper: These examples illustrate an extreme and intense application of Körper logic driven by rigorous economic optimization. The human body is considered a variable to maximize profits per square meter through subdivisions until minimum units are reached (Waldenfels, 1994).
- Leib: These spaces constitute a continuous attack on the experience lived bodily. They drastically limit any existing potentiality (I can), restricting "being able to do" to the most elementary (Waldenfels, 1994). The total absence of positive response together with deficiencies in natural light and ventilation negatively affect sensory perception; This generates claustrophobia and despair. The inability to control or customize the environment nullifies any ability to create a "home," trapping the body in a prison where the outside world remains out of reach.

This comparative analysis illustrates a spectrum where Hong Kong symbolizes the negation of the Leib; while Nakagin Tower represents a Körper ideal that fails to adequately integrate Leib. On the other hand, Steven Holl together with the flexible aspirations proposed by Archigram offer a critical synthesis by piercing or redefining the limitations imposed by the Körper to facilitate an expanded experience for the Leib. However, none of these initial utopias has yet achieved the intrinsic material flexibility or environmental adaptability suggested by Material Ecology proposed by Oxman; which opens up new possibilities for future solutions.

Finally, it should be noted that the decline of the

capsule-type housing model as a generalized urban solution was the result of multiple factors: from energy crises to difficulties inherent in complex projects and ambivalences regarding the professional role of the architect (Souto Rubio, 2021). The critique of these dwellings – describing them as "extraordinarily expensive machinery but located in extremely narrow conditions" – clearly highlights this persistent tension between technological idealization (Körper) and real experience (Leib) (Nietshke, 1966, cited in Frampton, 1980; Souto Rubio, 2021).

Material Ecology de Neri Oxman:

Towards an Intrinsic Material Flexibility of the Lived Body

Material Ecology by Neri Oxman proposes a change in the way we understand design, moving away from the modular solutions of the twentieth century and considering the material as something dynamic. This philosophy redefines the relationship between design, manufacturing and the environment, promoting an approach that prioritises adaptability and sustainability.

Oxman criticizes traditional design that puts form before material, creating disposable objects. In 2008, he introduced the concept of Material Ecology, advocating for a design inspired by nature, where objects "grow" and adapt to their environment. Examples such as "Aguahoja" illustrate their approach, using biocomposites that alter their properties depending on the conditions.

Material Ecology's designs integrate biodegradation into their life cycle and focus on behavior, allowing structures to respond to user needs. This creates an intrinsic material flexibility that goes beyond modular reconfiguration.

Innovative Biomaterials:

Mycelium as a Fundamental Pillar for Sustainable Architecture

Mycelium, the structure of fungi, is presented as a sustainable biomaterial with structural and insulating properties. Its ability to be grown with organic waste makes it a renewable and eco-friendly option. Projects such as the "Mycelium Monolith Pavilion" demonstrate its constructive potential. However, mycelium faces challenges, such as resistance to extreme weather conditions. The acceptance of this material among architects is key, as most appreciate its aesthetics, although there is resistance to fully adopting it.

Co-creating with mycelium, inspired by Oxman, allows architects to implement sustainable approaches that foster biodiversity and contribute to sustainability.

Housing Future: The Balance Between Körper-Object and Leib-Lived Body

The search for a balance between the efficiency of the Körper and the expertise of the Leib is a challenge for the architects. Housing models such as capsule housing have proven to be unsatisfactory.

Material Ecology and the use of biomaterials such as mycelium offer new opportunities to bridge this gap, promoting flexible designs that adapt to human needs. This approach seeks to create spaces that are not only functional, but also that can "grow" or "mutate" in response to the environment. Rethinking architectural thinking towards sustainable practices is essential to achieve truly adaptive and resilient environments, integrating environmental and social dimensions into architecture.

5. CONCLUSION AND FUTURE PROSPECTS

In the end, the consideration of a minimum living space goes beyond a mere physical determination. Research indicates that it should be conceived as a general condition in which quantity, quality, and versatility are combined (Medina Yaguno & Zea Zubia, 2021; Souto Rubio, 2021). Motor intentionality, response, and bodily order generate the phenomenological experience of inhabiting, which are crucial for a space not to frustrate or generate feelings of claustrophobia, no matter how small it is (Waldenfels, 1994).

The architectural utopias of the twentieth century, represented by Archigram and the Metabolists, with their lessons on the design of flexible and propulsive microspaces – Homo Ludens and Homo Movens – as an excellent product of these justifications, make explicit the limitations that an approach focused solely on the Körper entails (Souto Rubio, 2021).

The emergence of Oxman's Material Ecology (2016) and the production of biomaterials such as mycelium represent a qualitative evolution that leads to the presentation of a design that allows flexibility from its own character and material behaviour, as opposed to the reconfiguration of prefabricated elements alone (Guinda Millán, 2023). This method of working with heterogeneous, multifunctional, biodegradable materials, which "grow" and are sensitive and shaped by the environment (as modeled in Aguahoja), opens the way towards the creation of spaces that dynamically adapt to the desires of the Leib and bring it into play, fostering the physical response itself while traversing an interpenetrating relationship with all forms that have a certain substance from within the Körper.

The widespread failure of capsule housing in the

past is directly related to the fact that it has not been possible to balance the efficiency of the Körper with the complexity of the Leib, a gap that Material Ecology tries to close with material intelligence and environmental adaptation (Souto Rubio, 2021; Guinda Millán, 2023). In the end, the value of a habitable minimum is the thickness of its bodily experience to offer beyond any formal efficacy (Souto Rubio, 2021).

In the future, it is vital to stimulate research into Material Ecology and microarchitectural prototypes, as well as public policies that incorporate the qualitative dimension of minimum space into the regulatory logic. It is important to take into account the limitations of capsule utopias and the principles of Material Ecology, where flexibility and adaptability coexist with an awareness of human life, thus avoiding "sub-dwellings" and promoting true

solutions that integrate real conditions through the coexistence of the life cycle of the material and harmony with nature (Souto Rubio, 2021; Guinda Millán, 2023).

The post-pandemic emergency, as well as the demands for sustainability, have put housing – and habitability in general – at the centre of the axis of economic recovery and the construction of a more resilient and inclusive society. From this cross-sectional analysis of historical precedents, utopian speculations, and post-pandemic challenges to cutting-edge materials science, we deduce that the future of architecture lies in environments that manage to be not only technologically advanced and ecologically sustainable, but, fundamentally, deeply sensitive to the multifaceted richness, dynamism, and sensory depth of human life.

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