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Multifunctional Homes: A Sustainable Answer to the Challenges of the Future

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Abstract: The reason for our research is to seek a valid solution, intended for urban development, among those already materialized or in the form of a concept, which corresponds to the pressing needs of the present and of a future dictated by the realities of such a present. We are aware of societal dictating forces as well as of the validity of certain solutions that, if applied on a large scale, could at least partially remedy the deficient functioning of a society adapting to the economic crisis, the crisis of natural resources, and the political and demographic crises, as it attempts to adjust. In the field of urban development, within such a context, as old as it is new, the solution was offered to us in the form of a concept aiming at restructuring and compartmentalizing interior space, with applicability in both the private and public sector. This concept, simple and predictable, has as its goal the reduction of interior space while significantly increasing its functionality through the mediation of mobile structures. It bases its success on reductionism, multifunctionality and versatility, giving up those constitutive parts with null usability or which, by activating the concept, become null, their function being fulfilled by substitution. A reduction applied to the built environment results in a chance given to urban green space, while by restricting the built environment we gain space for nature.

Keywords: sustainable urban development; multifunctional homes; concepts of living; urban nature

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1. Introduction

Due to legislation restricting land appropriation, urbanity within its finite space reacts to limitations imposed on expansion and development with a proactive attitude intended to reverse environmental degradation. As a result, new working tendencies and perspectives begin to infuse mainstream architecture and design to cope with ecological restrictions, limited space and booming demographics. The stresses imposed on human society as consequence of an ailing environment demand structural changes permeating architecture and design. Human alienation from nature and a perceived apathy toward the built environment is at the core of degrading living conditions. Cutting ties with the natural environment gives way to exploitative attitudes leading to galloping environmental degradation, and consequential impacts on the social environment [1]. We talk about a pervading concrete ambient and the reign of built structures, gaining dominium over the natural environment. Design in the Anthropocene era should be about remembering ancestral knowledge referring to human–nature cohabitation and social interconnection, counterbalancing an era marked by detachment and ignorance, which have given way to exploitative relationships to the detriment of harmonious cohabitation [2]. Striving to cope with such a pervading and disquieting attitude, laws and regulations are implemented to restrict uncontrolled human intervention on the natural environment, measures that perturb traditional ways of conducting urban development. Underestimating the vital value of nature due to preponderant human urbanization, in which context nature is scarce and comes in the form of overdesigned green spaces, has as a consequence the decline of both physical and social environments. The loss of natural habitats and ever-increasing environmental pollution due to human actions impacts human well-being [3].

Human alienation from the natural environment becomes perceivable in social behavior leading to widespread social breakdown [4]. In order to revive the broken relationship with nature, a change in values and human behavior enforced by legislation must occur, limiting urban expansion, mediating a change of direction, balancing preponderances from the natural environment toward urban centers, and rewilding urban nature [5]. Limiting the built environment and reducing its footprint translates into gained space for nature and spaces for social interaction, resulting in increased community cohesion. Urban nature proliferation affects the way in which people engage with both natural and social environments, triggering a sense of connection, purpose and belonging. In an alienating environment, be it natural or social, people are less inclined to chaperone and salvage liaisons of harmonious interconnection and symbiosis [6]. One solution for urban nature accommodation comes in the form of reducing the footprint, impeding comfort, privacy and the volatile aspect of social status. To overcome the mentioned limitations, an interior design concept of reduction while adding value was developed (RoomInnovation).

1.1. Conversion of Concepts

New tendencies and outcomes arrive as the conversion of concepts and habits in mainstream architecture and, in urban development, the overall questioning of the establishment, laws, regulations and restrictions. It is in the spirit of embracing sustainability and finding directions that innovative concepts must be advanced and materialized, so that they can reach the masses. Apartment buildings comprise the majority of built infrastructure within the urban context. It is here that change must happen in order to gain sizable beneficial consequences. Discussing living space within the limits of an apartment building, where space and built-in affordances are already generated and forwarded in a finite form, the user must adjust to the pre-established realities and capabilities of a given environment with but minor availability for change. New concepts must be advanced and implemented where build-ups are imperative, advocating for a minimization of space and an augmentation of its functional capacity, in a quest to make the transition toward using functionality to decrease reliance on matter. It is necessary to acknowledge the fact that other than the aesthetic and tactile stimuli pertaining to an objective presence, the object in itself becomes obsolete. Given the adverse effects of human behavior on the natural environment, its pauperization accentuated by ever-increasing consumption, the remaining alternative is to act according to sagacious principles on which to construct human appreciation and behavior. Instead of objects (the result of converting matter), the option should be abstract and versatile structures behaving in accordance with shifting human needs. Instead of a static and unidirectional built environment, one should opt for an interactive and mobile one.

Where build-ups are imperative, it is necessary to minimize space and augment its functional capacity, an example of which is RoomInnovation [7], a concept developed by the Maurer Group, a Romanian-based development company which came up with a solution for the finite buildable space as well as other societal, economic and environmental stringent issues. The concept is intended as a solution to the following contemporary malaises: the energy problem, the demographic problem and the problem of urban development in this new era, which is an urban-centered era.

The city mirage phase is in its chronic state and is accentuating toward converting populations primarily into city dwellers or suburbanites. This transformation is having a massive demographic impact on cities and consequentially on the real estate sector [8]. RoomInnovation crystallizes around a tendency to downsize surfaces and insist on the maximization of space functionality through appropriate compartmentalization, being empowered by the need to change social values and human behavior within the contemporary context, which is primarily an urban and suburban context.

1.2. The Issue of City Overcrowding

Societies are making a massive transition toward a predominantly urban future, and this trend is accelerating [9]. This transformation has a massive impact on cities, which are expanding into megacities [10]. This transition demands sustainable megatrends. As urban areas continue to grow exponentially, the impact on people, urban experiences and the patterns of living are in a transitioning state [11]. Within these brackets (the transitioning phase), one could place a design and architectural concept of downsizing built structures, reinstating urban nature, and maximizing functionality and efficiency. This concept is expected to ease change in the way humans relate to the urban environment (exterior) and living space (interior).

While the drive behind urban overcrowding (limitless) becomes dramatic in impact (environmental, social, economic) and a presence on an ever-larger scale, there is an increasing demand for space/land (limited). In order to salvage nature on city outskirts (under the pressure of cities' expansion), concepts must be implemented for efficient organization of both public and private space within existing urban precincts. To go forward with needed conceptual attributes, the following are required:

- Reversing concrete expansion;
- Allowing the inflow of nature within the city.

We acknowledge the parsimonious spaces allocated to urban nature (green space) and we conclude that more are needed. We do not approve of overdesigned green spaces demanding increased attention and unfulfilling for the urban dweller's need for nature. However, it is not only for the value added to urban aesthetics (opting for raw and untrimmed), or for human psychological benefits, but also for the right of integrated biodiversity. The subtle but continuous seizure of adjacent land through urban expansion demanded by overpopulation is forcing nature to recede. We advocate for accommodating nature within the urban environment, considering a decrease in the size of built structures a valid alternative. It is not a matter of benevolence but one of indispensability: urban nature generates and supports a broad array of regulating, provisioning and cultural ecosystem services [12], promotes physical and mental health [13], and maintains people's connection to nature [14]. Urbanization resides at the base of environmental change, conditioning biodiversity in urban centers and adjacent zones [15].

1.3. Change as a Point of View

Change is indeed a common struggle intermingling articulating ideas (philosophers, theoreticians), gaining a shape (designers, architects, artists), being built (engineers), materializing (developers), being purchased (customers), and being experienced (users). Change (idea) must be grasped by a clear thought. Change (objectified) is something to be designed. Change was placed under discussion by Withers and Kallipoliti [16] in relation to scarcity and ways to overcome its implications. It is through them that change and vernacular came to be in the same sentence, for their concept of the recycling of vernacular ecological knowledge as a trigger of change in design, architecture and urban development alike in times of increasing scarcity [16].

This is a comeback of the old ways as alternatives for solving the problems of today. Designers search for inspiration in the knowledge of the past—stretching back for moving forward. This tendency is not to be interpreted as nostalgic or retrogressive, but accepted as a contemporaneous tendency with the potential for innovation through experimentation.

This paper aims at creating a discussion around the need for change (in building urban environments) and ways to fulfill it. The agenda of sustainability is open to new entries in and perspectives on its multifaceted definition and fulfillment. It has to do with an engagement with life and the well-being of all (at a societal, environmental and economic level), with the utilization of specific materials (recyclable, biodegradable, rapidly renewable), and with knowing from where and how. The change is possible and in fact happening (RoomInnovation), providing examples to initiate fellowship. We must encourage an increase in demand for environmentally conscious products and services

that will persuade other agents of change (real estate developers) that sustainability sells. Pilot projects that tackle the sustainability agenda are testing the market. Sustainable urban development depends on the result. Sustainable urban development needs the support of the masses (consumers/users). They have to embrace environmentally aware choices in order for these choices to become mainstream. They are feasible but need support from governmental agencies, real estate developers, architecture and design firms and from the consumer, whose choices, driven by desire, trigger change: change isn't necessarily enabled by common sense or the presence of imagination, but by desire [16].

Effecting change is affected by bureaucracy and the technical difficulties embedded in systems of production and communication [16] and by economic forces, which impact decision-making. But change must be fulfilled through imagination and a will to strive toward alternative futures which do not rely on the extractive exploitation of our resources and the perpetuation of environmental inequalities [16].

Innovative solutions approached via experimentation tend to gain new relevance in the framework of the current crises (social, environmental and economic). These results of a quest for fulfilling a sustainable future must be taken outside their niche and become ubiquitous. What is different now is the possibility of taking these projects out of the *elite* space and the sole reach of the few and adapting them for the mainstream [16]. RoomInnovation is just such an example, building innovation for the common buyer, intuiting that change relies in the prerogative of the masses.

2. Materials and Concepts

2.1. The Concept

RoomInnovation is an interior compartmentalization concept that is both simple and complex: it is a literal follow-up of the marketed line "use only what you need". It is a shift in perceptions about what an apartment has to offer in terms of affordances. Within the habitual organization of an apartment, there are units designed for specific purposes such as a dining room or bedroom. The concept juggles with these elementary notions of interior structuring on a material and ideational level. In this shift of objectified metaphors, overlapping, intercalating, it redefines intentionality through the means of materialization: the object-bed affords repose (practical) but it also stands as a ceiling compositional element and surface for aesthetic interventions (idealistic). By extension, the bedroom = a room intended for sleep and in use preponderantly during nighttime, becomes, through activating embedded qualities, a sitting room, whose utility becomes relevant during daytime. The two complement each other while overlapping affordances.

The concept transforms apartments from a static/passive space into a mobile and versatile one. The apartment relies on a dynamic interior structure with retractable walls (at the press of a button) to achieve several configurations better adjusting to the needs of the inhabitant. Within a precinct, the inhabitant is given the choice of open space or the intimacy of closed/enclosing walls. Concerning intimacy, the concept takes the inhabitant a step further in offering the studio as a bargain, with the hall, the bedroom, the bathroom and the balcony independently built due to the intelligent compartmentalization of (bed)rooms (losing their limiting specificity, they gain versatile attributes).

The concept is in accordance with the three pillars of sustainability (social, environmental and economic), for it is a gain in terms of using space and saving energy resources, as well as a means of passive income (renting) or supporting professional practices (office, studio, salon). Building less, via downsizing, translates into less consumption of materials, less energy usage, less conversion of natural space into built space. For the image of the urban environment, it should mean less build-ups and more nature. Gaining space for urban nature is the reason a decrease in footprint is intended. A plethora of benefits for the sake of society and the individual alike, as well as for the natural environment, set this as a vital and aesthetic framework. It is a shift in human behavior, and it balances built space with natural space, opening up a dialog with nature and with the other through

retractable walls (symbol) and open space (nature). It calls for a commitment to combat social alienation and the alienation from nature within the concrete urban framework.

The concept brings an affordable (in term of pecuniary means of acquisition) change in architecture and interior design, offering multiple interior compositions and triggering further exploration into the direction of perpetual mobility and adjustability, implying a built structure that affords creativity and change (mobile partitions, embedded and retractable platforms). Nature, in its intrinsic capacity to afford movements and usage of its structures and compositions, surfaces, textures and forms, is used as a model. We observe, appreciate and make use of the purposeful character of a given space/structure in nature. The concept, intended for the interior space, is trying to mimic nature's affordance principle, exhibiting shifting functionality (adaptability). This concept is a trigger of change, aligning itself with the purpose, identity, and strategy of sustainable development. It generates authentic values and a change in consumer behavior, setting a durable foundation for growth in the process.

The continuous changeability of the urban environment reverberates on the natural environment with its landscape and human impact burden. The concept is intended as a means of change by slowing urban monopolization of space and contributing to the urban image and composition [17]. Proposing reduced dimensions of build-ups, the concept aims at leveling friction between city coverage and the coverage of nature, striving for balance and equity between the two [18] by proposing a built structure with a minimal footprint but augmented living space—intelligent compartmentalization, with retractable walls proving maximum efficiency.

It is adding value, by subtracting size, to the strategy of achieving a sustainable urban environment by advocating for building less and downsizing built structures (sparse) and accommodating nature (abundant).

The proposed concept juggles dual characteristics within the living space: on the one hand, a reduction of the blueprint surface, on the other an increase in its permissiveness and versatility. The reduction in the dimensions is intended for financial advantage but also for accommodating a greater percentage of nature (green space) and shared social space. A reduced footprint means a space gained for nature. RoomInnovation is one commitment to sustainable urban development, to urban dwellers, envisioning nature (green spaces) and nature engulfing built structures (green walls, roof gardens, suspended gardens) as a framework. It demonstrates an active involvement in this demanding transition toward a sustainable urban future both locally and internationally.

The implementation of the RoomInnovation concept can generate:

- Positive economic, environmental and social impact;
- A positive influence on the customer's experiences;
- A new environmental and social model.

If we are to grasp the image of the future in the overcrowded urban context, we could find this building concept valid and even predictive with its commitment to lessening and downsizing built space and augmenting natural space.

Returning to the living space compartmentalization, one could envision a mobile interior space, with an in-built capacity for changing frames and offering a surplus of freedom and creativity according to the intentions and needs of the user, and against the boredom and incapacity inculcated by an unchangeable environment within the user. Offering options gives the user a sense of creative fulfillment not only in placing objects in space and recomposing this space through multiple compartmentalization models, available through the possibility of canceling the walls, but precisely because of the change of space, the user is also offered the possibility of carrying out activities otherwise prohibited in the space delimited by the immovable walls.

Through a process of abstraction and conceptualization of the interior space, the objects become mobile structures (whose shape remains to be predetermined to adapt to the particularities of a given space). Through conceptualization, an increase in the efficiency and functionality of a contextual space is expected. In addition, the notions of a

(bed)room and a (living) room become obsolete by lifting the limitations imposed by the formal features of the objects denominating the space. For example: the bed object, which through the functionality offered occupies a determined space centered around itself, a space thus limited to a single functionality, cancels multiple other space functionalities. By substituting the bed object with a mobile structure inoculated with the functionality of a bed object but also with the capacity for another functionality, for example, that of a false ceiling, or a frame for the lighting system, this situation being made possible by a technical system for raising the structure in question to the level of the ceiling, a space open to other uses is effectively obtained.

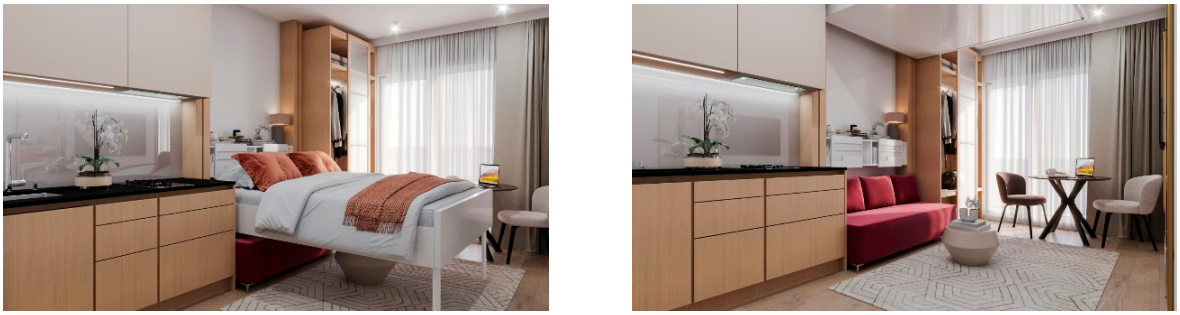
The basic idea is that mobility and adaptation, the ability of structures to substitute for static and formally predefined objects, and the mobility and versatility of the interior space can be achieved by including at the structural level the possibility of canceling the dividing walls and recomposing spaces for the changing needs of the user, all at a price intended for the common buyer. The major points of comparison are:

Bed => one room, one functionality—bedroom (Figure 1a);

Mobile structure (functioning as bed in its active state, elevated at the ceiling level in its passive state) => one room, multiple functionalities—bedroom/living room/office/studio etc. (Figure 1b);

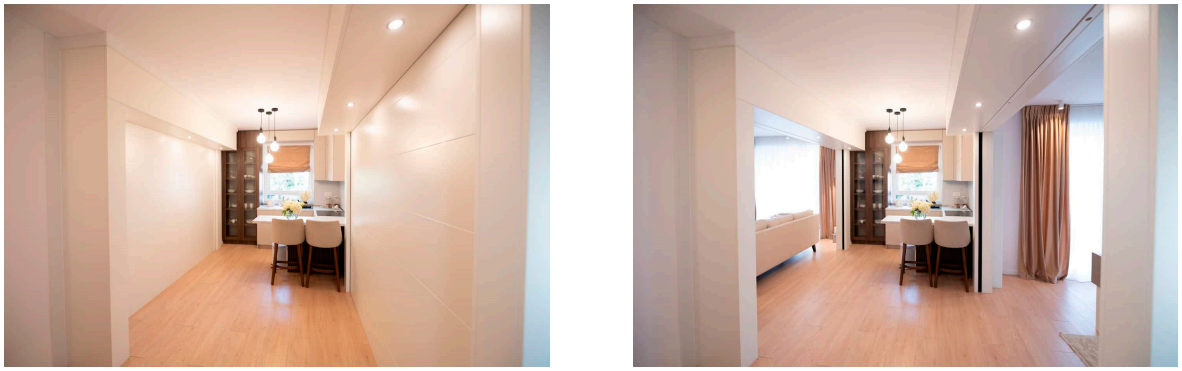
Built walls => predefined space (Figure 2a);

Mobile structures => open to defining (Figure 2b).



(**a**) (**b**)

Figure 1. The Elevating Bed is shown in both its functional states: (**a**) active—exercising its main function, that of a regular bed, giving the room the functionality of a bedroom; (**b**) passive—exercising its second function, that of fake ceiling and framing for lighting or sound system, giving the room new functionalities [7].



(**a**) (**b**)

Figure 2. The site of the Retractable Wall in both its functional states: (**a**) active—summing up the formal characteristics of a partition wall. In its active state, the wall creates intimate, closed, regularized spaces. Moving to a passive state (**b**) of the wall means withdrawing the rolling panel vertically, opening the space, canceling partition [7].

2.1.1. Human Needs Demand Fulfillment

Due to recent pandemic, which has highlighted the weaknesses of crowded urban living, new needs emerged and demand fulfillment. The concept offers a solution in the form of a Studio (Figure 3, zone 1A), an independent unit within the proposed compartmentalization of the main apartment, comprising a kitchenette, bathroom and balcony, proper for isolation. The concept (relying on downsizing, versatility and mobility) responds to this need for extra space allocated to isolation as much as space intended for intellectual, recreational and professional activities.

Figure 3. The "Studio" concept [7].

With the constant aging of societies, the proposed concept offers a solution through the mediation of the adjacent room behaving like a studio—the possibility of fulfilling subsidiary duties and offers, thanks to the same dual characteristics, the possibility of family intimacy and the necessary assistance as well as the independence desired by both parties.

The aim is the defining and materializing of a concept with a human face, one calibrated to a human dimension, aligned to the directives of Schumacher [19]. While cities and suburban areas will evolve into increasingly important centers of activity and culture [10], the concept has the potential for imposing a positive urban transformation, in terms of economic advantages, human comfort and general well-being, by creating a more favorable personal and social environment all while reducing the impact on the environment within a global context under the threat of the effects of climate, economic and social changes.

The concept is expected to transform the way in which we interact with and experience interior space by optimizing the usage of space, material resources, human interconnectivity and by creating innovative products (mobile structures) and services. As future predictions show, resource management will become increasingly important within the urban context, as resource needs and consumption increase in existing and emerging megacities. One of the key challenges for urban planners and city leaders is how to ensure an urban life that reinstates meaning and reverses the negative impact on the environment.

The interior space created through this conceptual implementation will offer new ways of organizing space to accommodate multiple models of social and familial interaction. A greater interconnection between generations is desired, and the concept also offers the possibility of independence given by private space, made possible by an effective system intended to accommodate a scenario in which overpopulated cities will continue to expand their footprints.

RoomInnovation is an anticipatory concept that outlines a living scenario with a sustainable focus, which will shape human behavior within the urban environment.

2.1.2. Activating Interior Space

The active space comprising the conceptual apartment (RoomInnovation) intended for the common buyer is self-justifying. This concept has the potential to be a game changer in what concerns the common housing space, with human, economic and environmentally beneficial implications. The proposed apartment is responsible for and intended to facilitate cohabitation between generations. With two or more independent units, this apartment emphasizes aesthetic and functional versatility, energy efficiency and the maximization of usable space. The concept was born as a response to current local and global challenges aggravated by to the environmental, social and economic crises.

We need to answer the following question and set it as an emerging point of focus: How can the real estate field create a positive impact on future generations? The answer—RoomInnovation—is an innovative concept easing the transition toward a responsible production method that generates responsible consumption and influences responsible behavior, both involved in order to materialize a sustainable urban development. Through this concept, the agent of change proves responsibility toward people and the environment, while creating a favorable context for user empowerment through:

- Improving the efficiency of the living space;
- Optimizing the method of compartmentalizing the apartment;
- Resource reuse;
- Generating income;
- Saving energy and material resources;
- Reducing the degree of pollution.

2.2. Gaining Space for Urban Nature

The motive behind the conceptual initiation and implementation is related to leaving a positive legacy:

- Leaving a positive mark on society;
- Improving the quality of life and comfort in residential spaces;
- Gaining space for urban nature;
- Limiting the impact upon the environment.

It is human habit to curb nature's proliferation inside the urban context, as well as outside its boundaries, as being troublesome and invading. It has to be amended through overdesigned green spaces. Green spaces are a poor substitution for nature. They tend to be designed constraints of shapes and nuances, unfit for biodiversity and natural development. We are inclined to recognize that biodiversity (found in the natural environment) has inherent values that are absent in human-made green spaces. There is perceived evidence of the added value of biodiverse, over simply "green", areas in cities [15]. Building less and gaining space for nature is intended as an appeal in favor of the proliferation of green spaces and the accommodation of nature in the urban environment. For the concretization of the sustainable city, the quality as well as the quantity of urban nature matters [15].

It is not only a matter of preference; it is a global call for action, accredited in The New Urban Agenda, released during the United Nations Habitat conference on human settlements, one of the objectives being that of finding ways to grant universal access to green space [20]. The still-to-materialize sustainable city of the future will have to address critical needs of the inhabitants as well as conserving nature, restoring biodiversity and maintaining and enhancing ecosystem services [21,22].

The city planner (architect, designer, urban developer) brings to view the reality of the urban space inserting itself into nature, not vice versa, and constantly gaining dominion, even though it is to human disadvantage. As humans stand before nature found in its untrimmed state, they feel the need to shrink it to their own understanding and to resize it

to their own laws. Nature is perceived by way of a permanent opposition and therefore forced into submission. Nature tends to submit passively and to permit assimilation within its limits. Within the laws of the urban expansionistic trend, nature is taken into possession by means of consuming (destruction and manipulation) its riches and making use of what it affords.

The question that must be asked with regard to urban development is whether the human conscience and perception will embrace the task of obliterating urban alienation and dehumanization. One way to reconnect to human community and nature is to initiate a more complete connection to humanity and reinstall nature (as a vital context) within the human conscience.

Ideas, recycled or new, innovative or traditional, must be acted upon, materialized, as in the case of the conversion of existing buildings, vernacular architecture and design, and ideas built into architectural structures (RoomInnovation—building less and gaining space for nature).

2.3. Use Only What Is Needed

"Use only what is needed" can pass as a reasonable chant in the context of a frail contemporaneity keeping a precarious balance, aiming at changing behavior, pleading for conscious consumption. Within this benevolent frame of diminishing consumption, we intend to raise awareness of this undervalued need for urban nature, as much as gaining space for living. It can be a habit to take getaways from concrete, steel and glass, and composed reflections, and immerse ourselves in nature for the sake of losing ourselves and remembering. Nature is the component found in insufficient quantity for fulfilling the needs of the sustainable city. Space needs to be gained for nature within the urban environment, and new frameworks must be designed for implementing this urgent need—urban nature. This translates into changing how(s) and highlighting the need for sustainability in answer to the why(s). Nature is resilient and highly adaptable; therefore, making room for nature in architecture and design should be a must and not a variable. Think nature (fit and follow) in design and architecture and forward green alternatives pleading for urban nature with built structures as frameworks. Built structures should accommodate nature (green walls, suspended gardens, roof gardens, green spaces). Whatever is taken from nature (natural space becoming built infrastructure) by dislocation should be restored by relocation—built structures becoming a framework for urban nature (green spaces, green roofs, green walls, etc.) in a designing process of accommodating nature within the urban environment.

When considering a visual representation of the appeal following the directive "use only what is needed", with materiality and size as well as quantity reduced to what is strictly necessary, we might imply that built structures should follow the same ethical pattern. The consequence of reducing the footprint of architectural projects, tending toward verticality, could incidentally be that of gaining space for nature, inasmuch as it is gaining space for living.

The reductionist concept approaches sustainability by way of accommodating nature, by minimizing consumption (reducing building materials and energy) and air and noise pollution, while magnifying savings (in space, money, materials, energy, etc.). This could be placed within the brackets of environmental issues, but by embedding the concept in architecture, social and urban development issues are tackled as well. The concept, advancing the precepts of reduction, efficiency and mobility and promoting a downsized but dynamic interior space, is justified as a possible answer to stringent environmental and societal issues.

2.4. The Real Needs of Humans

Societal development (technology) should tend to the real needs of people, this also implying adjusting to the actual size of humans: they are small, and, therefore, small is beautiful [19]. Schumacher, in his call for action, talks about an imperative need for changing the technological narrative, pointing toward an intermediate one that can em-

power and not subdue the user. For the technological, alienating magnitude, he substitutes human-scale, decentralized, appropriate technologies [19].

The agents of change must actively seek a better way ahead, targeting sustainable development via alternative ethical solutions. These solutions must solve specific and real challenges, and the ideas that form their base must be directed at reality while deepening their consequences at the level of human consciousness—"awakening the heart" [23]. Schumacher's work was "for the people, and it was the people [...] who would ultimately turn the tide to sanity" [23].

To mediate change at the level of human behavior, the message delivered by the agents of change must reach ideational levels by redefining wealth, knowledge, work, economics, development and progress—nothing less than a metaphysical reconstruction [23].

The message of change, which theorizes the transition to sustainable development and sustainable behavior, must reach the masses and reshape mainstream agendas that dictate the use of resources (land, energy, etc.), technologies and industries, national and international institutions and policies, and scale (defining human activities and lifestyles) [23]. It is a question of the means of propagation and infiltration into human consciousness through the following:

- Media (passing the message into the mainstream and creating a trend which was proved an efficient medium of reaching a target);
- Architecture and design (durability, aesthetics, ergonomics, ecology, status);
- Consumerism (transition toward an ethical, transparent and educated consumption);
- Economics (minimizing resource depletion, pollution (environmental, visual, noise));
- Psychology (purchasing for continuity, health, beauty and ethics);
- Sociology (designing for social integration and against alienation, mediating human–nature interaction as means to sanity and ancestral wisdom).

Robertson [24] talks about an evolution of consciousness, surfacing in contemporary ideas, and the challenge of reaching a new age of ecology and spiritual awareness, which has to do with societal behavioral patterns. The economic aspect should be largely perceived as a generator of behavioral change (pecuniary amends, taxes and fees) for easing the transition toward sustainable behavior.

The new concept (the dynamic interior: retractable walls, lift-beds, mobile surfaces, the studio) is intended to help in coping with the challenges generated by the worldwide recession, the oil and gas crisis and the price escalation of commodity goods (results of the pandemic and political and environmental crises). The sustainable urban development agenda is prescriptive to the worldwide depression, pointing to intuitively obvious solutions [25].

The concept of "less is more" and the guiding consumer's principle "use only what you need", and going further to rethinking needs, are all at the core of behavioral change. This translates into the fact that more (goods) will not bring palliation to an ailing society, that large-scale (technology) is dehumanizing and ever-bigger (mega-) is morally wrong and in contrast to human dimensions [19]. There is an optimal human scale, relationship development, a human-attuned structure of life. There are strict thresholds in the scale of human activity and development that, when surpassed, produce disastrous effects that impose on the quality of all life [25].

Ecological concepts that are building blocks for sustainable development such as less is more [26]; human scale [27]; small is beautiful [19]; biomimicry [28]; natural capital (natural resources: renewable and non-renewable) [29]; what is enough [30]; social entrepreneurship [31]; and reverential ecology [32] transform human thought and behavior, contributing to changing institutions that rule, harm, and overwhelm human existence and human relationships to the environment. They are working concepts approaching ecology by addressing such issues as: environmental justice, ecological literacy, public policy, conservation, population, renewable energy, climate change, ethical investment, ecological tax reform, etc. There is the utilitarian ecological approach (environmental protection is vital for human existence) and the reverential one (protecting the environment

out of a deep reverence for it) [32]. Reverential ecology is about knowing and respecting natural boundaries. In this manner natural and human-made systems could cope with regeneration and recycling. It has to do with knowing when enough is enough [30,32].

2.5. Human Imperatives

As worldwide conditions continue to change and worsen socially, environmentally, and politically, the need for sustainable development increases. The contemporary human feels estranged from nature, positioning themself in a constant opposition to it. There is an erroneous perception that it has been given to them for use and they base its thriving upon its affordances, legitimated by religious beliefs. Because of the ever-increasing numbers in human population, the illusion of human dominion over nature is being shaken. There is a loud call for a transition to a sustainable development, one in harmony with the natural systems that support human existence [19]:

- Creating new structures, patterns, and institutions that are human in scale and nature;
- Creating conventions and frameworks for civilization that are in accord with human scale and nature;
- Awakening citizens (actively participating in shaping society);
- Reorienting human-made systems toward nature;
- Changing current methods of production (dehumanizing);
- Minimizing currents rates of using natural capital;
- Treating natural nonrenewable resources (natural capital) as capital items and not income items, placing them under strict conservational laws;
- Initiating production methods and patterns of living which do not depend on nonrenewable natural resources;
- Evolving a new lifestyle with new methods of production and new patterns of consumption (designed for permanence, health and beauty);
- Perfecting production methods which are biologically sound;
- Evolving small-scale, nonviolent technology (technology with a human face);
- Initiating perfect systems that don't rely on human virtues, but on scientific rationality and technical competence.

There is a plethora of solutions for the privileged, personalized and adapted to fit in with status and an appetite for unicity amassment. We oriented our research toward the common user with thought for functionality and affordability. The proposed concept bases its concretization on methods, systems and products which are:

- Cheap enough so that they are generally affordable;
- Suitable for small-scale application, and which are less likely to be harmful to the natural environment [27,33];
- Compatible with the human need for creativity [33,34].

2.6. The Proper Use of Land

Land is, according to Schumacher's words, "the greatest of material resources". Its usage could conclude a society's future [33]. In the way humans position themselves in relation with nature, the delusion of mastership must cease—humans are "children and not masters of nature". Humans must conform their actions to the natural laws if they are to maintain dominance over the environment. The elusion of the laws of nature perturbs the balance maintained by the natural environment. A deterioration of the environment => the decline of civilization [35].

Civilized humans have marched across the face of the earth and left a desert in their footprints [35]. Civilized people have despoiled the lands on which they have lived for so long. The continuation of such a predatory attitude toward the environment has its base in the history of progressive civilizations, ever searching for rich lands to deplete in order to prosper. Depletion of natural resources has been the chief cause for the decline of civilizations; the dominant factor in determining all trends of history [33,35].

Due to its reduced footprint and value added to interior space through concept implementation, an enhanced human accommodation is expected, favoring the user while lowering the impact on the environment.

The "ecological problem" is not new. Yet there are two decisive differences:

1. The earth is now much more densely populated that it was in earlier times and there are no new lands to move to;
2. The rate of change and destruction has consequentially accelerated [33,35].

Land is seen as a priceless asset. It is people's task and happiness "to dress and to keep." The management of the land must be primarily oriented toward three goals: health, beauty and permanence. The fourth, productivity, will be attained almost as a by-product [33,35]. Land and its priceless value should be taken into consideration at an inception level in developing an architectural project and used parsimoniously. The implementation of the RoomInnovation concept mediates a turn into such a reductionist direction in what concerns size while an augmentative dimension is added to interior space with regard to usability and comfort through activating an interactive and integrated system facilitating multiple configurations through the mediation of mobile structures (The Wall and The Bed).

2.7. The Contemporary Urban Dweller

In the vast modern towns, the urban dweller is more isolated than his ancestors were in the countryside. The city man in a modern metropolis has reached a degree of anonymity, social atomization and spiritual isolation that is virtually unprecedented in human history [36].

Mediating human–nature interconnection has become an imperative, and this cannot be done halfway by suggesting a combination between leisure time and outdoor activities, but by guerrilla techniques of bringing nature into cities. Changing the structure of urban development and embracing the concept of urban nature together with limiting cities' expansion will give nature a break time and will put an imprint on the city dweller that is equal to losing a sense of detachment from the natural environment and providing a sense of appurtenance to nature acknowledged as a vital human context.

"Break time" for nature means embracing the task of keeping back, working with nature to find ways to restore and improve soil fertility, as well as value and protect the genetic variety of plants and animals. At the opposite pole there is habitual behavior oriented toward a ravaging dominion of urban expansion conducted as a form of violence. A nonviolent approach to nature and a human–nature collaboration is what forms the base for sustainable development [33,37]. Given the real possibility of chaperoning nature on the part of any society but seeing otherwise, one could only conclude that is not a question of "can" and know-how but of conscious choice and malignancy. Therefore, "it is not a question of what we can afford but of what we choose" [33].

Continuing in the direction of nonsustainable development, concerning natural resources, the threat is not only in slowing the process of regeneration in the case of renewables, but most dramatic is the status of nonrenewables (fossil fuels or heavy metals). The main threat is that the productivity of our renewable resource base could atrophy through climate change, acid rain, toxic metals, etc [38].

2.8. Technology with a Human Face

Technology, which is at the base of contemporary development, is perceived as inhuman; therefore, there is a quest to advance a technology with a human face. Technology (the product of people), tends to evolve by its own laws and principles, which differ from those of human nature or of living nature in general, as it is shown in Figure 4. An example is the limit of growth:

- Nature knows where and when to stop. Greater than the mystery of natural growth is the mystery of the natural cessation of growth. There is a measure in all natural things

(size, speed, violence). As a result, the system of nature, of which humans are a part, tends to be self-balancing, self-adjusting, and self-cleansing;

- Technology recognizes no self-limiting principle in terms of size, speed, or violence. It therefore does not possess the virtues of being self-balancing, self-adjusting, and self-cleansing. In the subtle system of nature, technology acts like a foreign body, and there are now numerous signs of rejection [33].

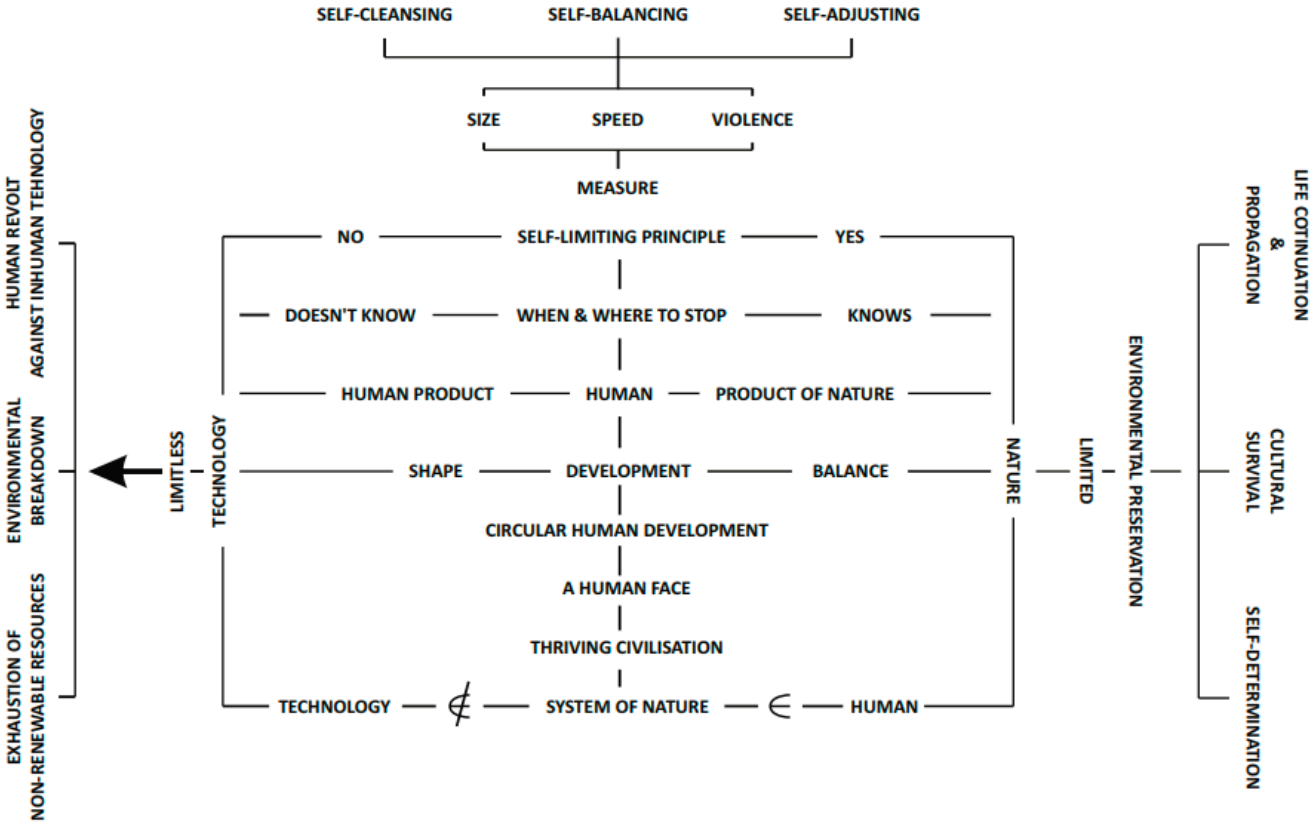


Figure 4. Technology vs. nature in human development.

The modern world (shaped by modern technology), faces three crises simultaneously:

1. Human nature revolts against inhuman technological, organizational and political patterns, which it experiencing as suffocating and debilitating;
2. The living environment which supports human life gives signs of partial breakdown;
3. The consumption rate of the world's nonrenewable resources (fossil fuels) is such that serious bottlenecks and virtual exhaustion looms ahead [33].

What is quite clear is that a way of life that bases itself on materialism, on permanent, limitless expansionism in a finite environment, cannot last long, and that its life expectation is all the shorter the more successfully it pursues its expansionist objectives [33].

Universal common goals such as environmental preservation (indispensable for human survival and the survival of its culture) and growth and progress (essential features of life) must be subjected to a shift in perception toward a qualitative determination and permanence [39].

Technology, at the core of human development, continues to pursue ever-greater size, ever-higher speeds, and ever-increased violence, in defiance of the laws of nature (harmony)—the opposite of progress (permanence). Technological development must be redirected toward sustainable development and lifestyles. Technology, in accordance to the laws of sustainability, must not only bring financial benefits but also do good for people, the environment and the resource base [33,37].

At a national and international level, this is an opportune time to address the need for technologies and solutions that directly benefit people and are nonviolent toward the environment. The importance of changing behaviors and the attitudes of the masses is not to be neglected. The hope for change rests on the masses, who are often able to take a wider and more "humanistic" view than the experts, being also the ones experiencing it firsthand.

"The power of ordinary people [...] does not lie in starting new lines of action, but in placing their sympathy and support with minority groups which have already started" [33]. The expectations of advancing change rely on initiating a systematic study of how to help people to help themselves. The intermediate technology proposed by Schumacher, one with a human face, is attainable. Its welcomed and viable attributes include the following:

- Reintegrating human skills and creativity into the production process;
- Serving production by the masses instead of mass production;
- Leading back to real human needs;
- Resizing things to human size.

2.9. The Priority of Relationships

Designing on contextual realities (societal, economic, environmental, political), and entering the limiting specificity of interior/living space, the focus must follow a shift from material things to their multifunctionality and priority of relationships. The effect is one of abstraction—returning to the basics of the archetypal dwelling, with a sleeping place and an eating place [40].

Under such an abstracting circumstance, the place gains a variable character—space counting as a limited number of objects/mobile structures, each retaining a form recognizable as a table, chairs or a bed, the original function of things being addressed and resulting in shiftable forms giving way to movement and adaptability. These conceptual objects/mobile structures move away from previous formal expressions toward a radical translation of primitive activities into material form.

Within the context of approaching multifunctionality, the objects/mobile structures with their working attributes and assigned functionality adhere to the ordinariness of everyday objects—minimality and multifunctionality residing in the daily domestic surroundings. Or rather, they pursue a sense of place and form most adaptable to a human dimension.

The abstracted/minimized commonplace can be seen in the following qualities:

- Indispensable to the atmosphere of the urban trend—minimalism and multifunctionality;
- Neither too abstract nor too close to accustomed style, this is the "home" with a multifunctional edge and signaling of spatial affordances;
- As a contemporary home prototype, comprising well-controlled spaces.

The style and method—minimalism and multifunctionality—pares the designs down to carefully controlled details, mobility, and adaptability, limiting options to a few materials and surface treatments. An interest is maintained in the relationship between the objects/mobile structures and the space and setting them up so as to complement each other. Relationships (objects/space; human/objects; human/space) are prioritized, as well as the setting of objects/mobile structures in space.

Gaining utile space while reducing surface becomes a premise in compacting built structures to free premises for nature. Looking at objects and their composition in terms of usefulness and efficiency, the elements of interior space appear in a purer, more easily understood form (objects afforded the functions of bed, table, chair without submitting to habitual conformations). When these conditions are taken as a premise, the concept of space becomes highly abstract (surpassing the form/function boundary). This incipient abstraction frees us to compose the interior space. Consideration of composition in an interior space and the skillful use of space, objects and their relationships will present a more effective stage.

2.10. Exploring Problems of Structural Space

The RoomInnovation spatial and organizational concept also develops its relationship between living space and human experience within the space. The concept relies on abstracting form and the utility it comprises and affords.

The working concept and the conceptual objects/mobile structures (Bed and Wall), in sharing a common abstraction, instead of being appreciated for some independent significance (domestic utility) create the space and framework for a living performance. We can derive different meanings for a bed or a wall. It has location within the space, and a size and shape relative to that of the space, or we could consider its existence as an object with a significance, independent of space. When we consider these two different meanings, the former may be called "the priority of relations". Here, the consideration is given to the relation of the object to the space. Its form or texture, its "object-ness", is the variable, not the issue. In the latter "priority of object", in whatever situation the object exists, its "object-ness" cannot be changed or denied. In this case, the identity of the object is the theme.

Conceptual objects/mobile structures (Bed and Wall) take on meaning according to their position/state (active or passive), and according to this they define a certain domestic atmosphere (bedroom/active; living room/passive). In addition to "object-ness" and "relation-ness," considering their interaction, their "complementarity," is also necessary, but what we have been concerned with here is whether the object or the relations take priority in the interior space.

In implementing the concept, a clear priority of relations is apparent, meaning forming relationships between, for example, objects or structures, and space. The theme of "Lift Bed" is the relationship of the placement of the object in a bare space. The theme of "The Wall" was also one of relationship priority, in this case, the relationship between bare space and an object—a screen. Despite the unarguable existence and importance of the objective qualities of each object, small changes in those qualities would not greatly alter the complementarity between objects and their relationship to the space, and therefore would not greatly alter the overall effect of the space; because by far the most important elements are the relations between the space and the various objects (structure).

The RoomInnovation concept was created with the priority of relationships. The human situation in its primitive form may have started from the floor. In order to keep an open floor, the ceiling becomes an active structural element.

One/two retractable walls make entirely varied spatial compositions possible. In passive/active placement, the walls divide the space to create two to four different spaces on either side.

Optional interior compositions are therefore created, to set up a framework for a domestic performance.

2.11. The Spatial Composition

A spatial composition can cause a specific psychological reaction, referring to a particular psychological boundary (bedroom becoming living room). For example, the clearly distinct space and spatial composition created by the central placement of, for example, a bed (active state) or its counter-position—ceiling configuration and camouflage (fake ceiling: lights and multiple textured, colored and finished surfaces)—and by the active or passive configuration of a retractable wall take on a great number of different aspects and lead one across different boundaries.

Other elements of psychological importance include the height of the ceiling, the placement of objects, and the material and performance qualities of the conceptual objects (Bed and Wall).

Even more than the distances between the walls (measurable dimension), it is the character and efficiency of usable space that most clearly defines the perceptual dimension (unmeasurable dimension) of the space. The impact that the materiality (quality and presence/absence) of the objects (Wall and Bed) make on the overall impression of a room

shows just how psychologically important the materiality of objects and their placement is in creating space. In sectioning off an area from nature to build human space, one has to create, with simplicity, the most expressive element of interior design.

Built space is defining human territory in nature.

Psychological expression may occur through the composition of different structures (domestic objects), their repartition within space and their surfaces. Variations in their (Bed and Wall) intrinsic state (active/passive) delimit space and imply function. In comparison with dividers of space (Wall) and creators of functionality (Bed) which physically partition space and render its functionality, the implication of territories through different materials permits relationships between spaces. Interior design gains this entire dimension when, rather than perceiving space as a psychologically static entity, we use its multifaceted affordance in creating adapted functionalities (bedroom becoming living room).

2.12. The Role of Objects/Mobile Structures

When entering or moving through a space, one will be exposed to physical stimuli that will trigger psychological and sensorial experiences. Architecture and interior design use a variety of techniques to create psychological effects, or functions. There are many ways to divide space, but architecture divides primarily with structure. Through RoomInnovation, we accede to dynamic structures, and through them to dynamic spaces and behaviors.

The working attributes of the concept are as follows:

- Using the bare minimum of objects as devices;
- Retractable walls create a sense of endless space;
- Retractable walls and lift beds allow a sense of expansion and the discovery of space's hidden potentiality;
- Windows are sized to provide natural lighting and give the smaller room an open feeling;
- A complete environment for the domestic performance is created within less space;
- The action that takes place in a given space indicates the way space should be organized—the action defines the space, and the space frames and sustains the action;
- Through minimal and functional design, a smaller apartment becomes an unlimited space of great dignity;
- In creating space, its features must be thoroughly grasped for effective functionality, expression and display.

The discussed concept could become a premise from which to start a series of new materialized interpretations, setting a mark on interior design and architecture by encompassing the following attributes and capacities:

- Emphasizing space by empowering the conceptual object/mobile structures (Wall and Bed) and allowing space and objects/mobile structures to coexist. By focusing on objects/mobile structures, a complementarity with space will develop;
- Considering the division of space to be of pivotal importance;
- Defining space through a minimum of objects/mobile structures;
- Stretching the boundaries of the floor by activating the Wall and Bed and creating the illusion of open space;
- Expanding space—the primary purpose of subtracting the materiality of objects while easing access to their functionality;
- Putting emphasis on the floor, the element having a radical effect on human perception regarding interior space; it supports an invisible space above it and that which it affords.

With the intention of finding proper alternatives to ease the burden of cities found under a silent aggression of human migration toward urban epicenters, we focused our attention upon two alternatives that could be interlinked:

1. Limiting and constraining new constructions while reiterating reusing, refurbishing, adapting and updating old ones.
2. Reducing the footprint of new constructions and gaining space for nature and community space.

In accordance with the reductionist attitude, the concept of versatile interior compartmentalization via retractable walls and mobile structures is justified by the need to inflict changes on attitudes regarding building and maintaining social status and human behavior in what concerns space/land appropriation, material possessions and their ever-increasing size and quantity, and trigger vectors of change in minimizing consumption (of space, materials, energy and money). The concept, through its material representations (e.g., RoomInnovation), still to mature, brings its share to the image of an affordable city of endurance. The efficiency of its applicability has to be followed and proved, but for a starter it is a bold endeavor, and represents a financial risk for the developer guided by such a drive of acquiring green markers for the benefit of all.

Within the framework of such a question as "How will the future look in the overcrowded urban context?" the concept juggles with dual characteristics: minimizing the footprint of the architectural project on one hand, and increasing affordances and versatility of living space on the other. A reduction approach applied to the surface (that of the apartment and building as a whole) brings financial and environmental advantages while increasing the surface allocated to nature and community space. A reduced footprint could be translated into space gained for nature, an aspect to be speculated about in the future.

As urban areas continue to grow worldwide, questions arise and demand attention, regarding their impact on people and on the natural and urban environment, or how this tendency is going to influence human behavior or the pattern of living. The answer, at an ideational level, inclines toward shifting behavior in the direction of reductionism, with ways of thinking and living that have a solid justification. This functional concept could change the way we relate to urban space, and implicitly to interior space—reduced in dimensions but not in availabilities, and in strong connection with nature and community space.

Finally, the question that must be asked, in the context of urban development, is that regarding a common goal: Will we let the environment of urban centers dehumanize, or will we induce a more complete connection with our humanity, setting nature as a vital context? One alternative is to implement reasonable solutions driven by the ideas such as using only what is needed, or the one around which this research revolves: building less while gaining space for nature.

The sustainable city must be an amalgamation of socio-ecological systems, formed and functioning according to human values, attitudes and generated behaviors [41,42]. At the crossroad of human/nature cohabitation resides the success of fulfilling the sustainable city with its archaic pattern of shared habitat [15].

Our intention with this paper is to highlight and open to discussion alternatives to the problems faced by our society today, a multifaceted and common motivation for researchers. Here we present but a few, and hope to give agents of change a chance to affirm their actions and encourage others to follow in this common striving to bring the change that is so much needed and hoped for, the change toward the so much predicted future, which is the sustainable future.

What will be the future of urban living? The growth of the population is dramatic in impact and present on a large scale. Cities and their inhabitants are influential factors shaping the future. Even global pandemics are unlikely to significantly alter this macro trend toward urbanization. The urban future is a subject to be imagined. Trends are needed that aim to fulfill the sustainable urban future. The scenarios must be developed knowing that they will shape our lives and the environment and will shape the future for the generations that succeed us. And such intentions are assumed through the implementation (under development) of RoomInnovation, a project intended for generations.

Versatile compartmentalization offers the possibility for different generations to live "together but separately". The recent pandemic has highlighted the weaknesses of crowded urban living, and the need for a living space with certain attributes was highly perceived (e.g., the Studio). RoomInnovation responds to such necessities (space for isolation) as well as for intellectual and recreational activities. With the constant aging of societies, it offers the solution for fulfilling subsidiary duties and offers, thanks to the same dual characteristics, the possibility of family intimacy and the availability of necessary assistance as well as the independence desired by both parties (Figure 5). RoomInnovation is a concept with a human face—a concept calibrated to a human scale.

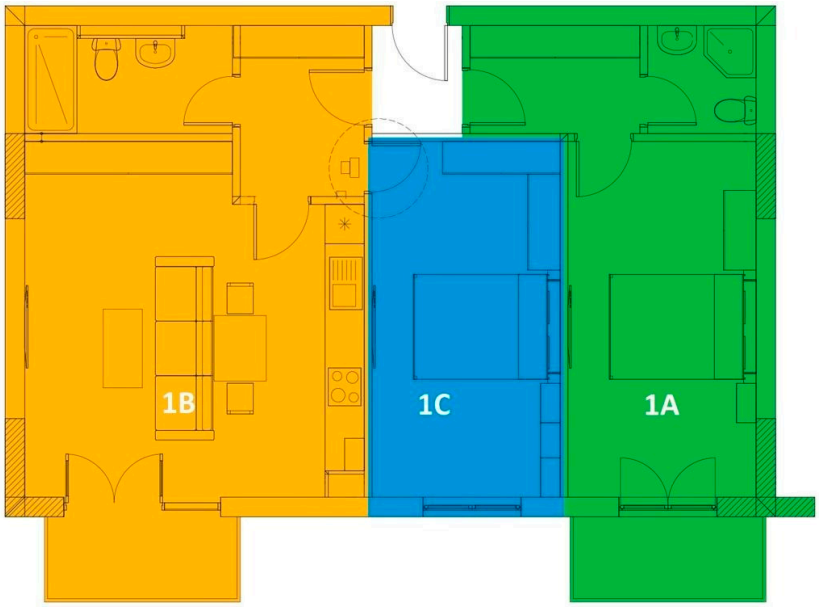


Figure 5. Responsible apartments for generations: two or more completely independent units with the help of enclosing walls [7].

The concept brings the potential of a positive urban transformation, especially in terms of improving the economic deficit, the ergonomics of living space, the ecology of the urban environment, and the general well-being of inhabitants by creating more favorable environmental and social circumstances in an urban context generally under the effects of climate, economic and social changes. It aims at transforming human behavior by optimizing space usage, resource consumption and human interconnectivity, and by creating innovative products (mobile structures) and services.

2.13. An Anticipatory Concept That Changes Human Behavior

It is our intention to propose a methodology for changing human behavior in relation to reversing an increased appetite for gigantism and ever more. Within the context of living space, values should change in the direction of decreased surface and consumption. Issues related to trends and societal status are an impediment to passing on this tendency of using only what is necessary, or in using less; or even more, in needing less. There is propaganda for acquiring and possessing ever more and ever bigger, which is supposed to fulfill our troubled sense of purpose and meaning. Building status through the appropriation of material possessions is a trend of the unconscious past, and the future relies on turning the page to acknowledgment and sustainable behavior.

RoomInnovation is an anticipatory concept that outlines a sustainable scenario focusing on the future and shaping living and behavior patterns within the context of the urban environment. This concept is intended as a revolution in what comprises the commoner housing space, with human, economic and environmental implications. The proposed apartment is responsible and intended for generations. With two or more independent

units, this apartment emphasizes aesthetic and functional versatility, energy efficiency and the maximization of usable space. The concept was born as a response to current local and global challenges, and to the environmental, social and economic crises.

The real estate field can create a positive impact on urban development through sustainability-oriented solutions. With this concept, the transition to a responsible production method that generates responsible consumption and influences responsible behavior is plausible. It is a path to materializing a sustainable urban development—building less while gaining space for nature.

With the concept of the dynamic interior mediated by mobile structures (Wall and Bed), we intend to:

- Leave a positive mark on society;
- Improve the quality of life and comfort in residential spaces;
- Minimize pollution (environmental, visual and noise);
- Gain space for nature within the urban environment.

With this research paper, we adhere to the general quest to define sustainability within the urban framework, acknowledging its imperative and defining and approving the existence of more than one direction toward fulfillment, for sustainability does not require universal solutions but regional ones due to its specificity. There is a common goal in what concerns urban development, and it has to do with embracing the sustainability agenda and finding ways of reaching sustainable goals such as the following:

- Make amends for the dehumanization of urban environment;
- Initiate a more complete connection to humanity and nature;
- Set nature as a vital context;
- Implement sustainable solutions;
- Change consumer behavior.

Agents of change rise in the fields of architecture, interior design and urban planning, searching for appropriate ways to place development on sustainable tracks, offering a wished-for circularity. This has to do with human behavior dictated by principles and values, and has to do with human interaction with an enclosing nature. There is a perceived inclination toward reconnecting with a dispraised and undermined natural environment that is reacknowledged and reinstated as a vital context for human functioning toward a perpetual existence and development.

The example came in the form of an interior design concept, through which a decrease in size is not perceived as a downfall, if perceived at all, given the in-built capacity of interior structure to juggle with versatile demarcated spaces while accommodating shifting human needs. It is a version of an interactive space, in which old notions of enclosing walls (confinement) become obsolete, as do notions of bedroom and living room.

Through the implementation of the concept, the interior gains the attribute of versatility and adaptability to meet the user's needs and ease the burden of consumption of the user's experience.

A reduction in size, after the box constraints are erased by canceling walls when and where the need arises, leaves the user with the benefits of a manageable space, summing up the advantages of having to deal with less space to maintain and garnish, all adding to less investment, consumption and expenditure.

Regarding the built and the objective environment, it is obvious that it costs humanity more to produce the habitual, the ugly and that which fails than to search continuously for working alternatives. If is not the inner drive, it is the force of circumstances that will ultimately conduct us toward better, saner and more energy-saving tools and devices [43]. Things will be made in a more decentralized and participatory way within the human-made environment, as we expect more and better for our minds, bodies and tasks [43].

The concept of using only what is needed should be highlighted where consumer behavior must be subjected to change. Many material possessions that are expensive to purchase and maintain are underused [43]. We search for alternative solutions such as

buying less and buying smaller, for redesigns and rebuilding of products and building structures that can be shared and used to full capacity, embracing the total capacity of interior space while rejoicing in the conversion of exterior space into green space.

With this in mind, we move the discussion from Papanek's and Hennessey's incentive to get involved with the built and objective environment to the individual task of designing interior compositions, using the in-built versatility of mobile structures. The goal is making the interior an inclusive space of added possibilities and affordances, and guiding the user to experience and to get creative in using space to the fullness of its increased capacity.

Through our discourse, we intend to enable the user to determine whether the purchase of a bigger apartment is necessary or needed.

Within the context of Papanek's and Hennessey's frustration with regard to the fact that most of us are still not very straight about the things we need to own and the things we only need to use, we open to discussion the ownership concept, the pattern of thinking that more and bigger is not only wanted but needed for various reasons. We intend to discuss the trend of cutting whatever forms the clutter and uselessness in consumer choices regarding the investment in and acquisition of material goods. The same goes with resizing to better fit the human size and actual needs, which are the needs of transitory humans, with increasingly active lives and who are predisposed to mobility within the larger context of internationalization and cosmopolitanism.

There is also the aspect of aesthetics. In tackling the problem of attaining sustainability, one has to include the "beauty" element. More often than not, sustainability was a subject of interest for engineers, scientists and economists, but not for many aestheticians or artists, for whom "beauty," of which they are the creators, supporters and researchers, is in itself sustainable. When we consider sustainability with applicability in design or architecture, one should consider adding aesthetics as equally valuable as the triad (ecology, economy and the social factor) for fulfilling sustainability.

The concept under scrutiny has begun to fully embrace the aesthetic purpose, offering colors, materials, finishes and forms that are aesthetically pleasing, adaptable to the user's tastes and adding value to compositional harmonies while becoming compositional structural elements.

Being able to design your own living interior is surely as satisfying as it is customary, but being able to also recompose the usually built structure of your apartment is gratifying and new for the common user. The participatory way of defining space provides much greater satisfaction. By modifying the interior structure by activating the retractable walls, you have the possibility of interfering in a creative way and at an aesthetic and functional level. Finally, one can transcend a predefined space and develop entirely new constructs.

The recent economic recession has also made valid the concept of buying and using less, with many willing to try new ways of reducing their expenditures, which frequently run high because of initial exorbitant investment, finishes and furniture, utility bills and maintenance costs.

Papanek and Hennessey [43] mentioned a set of criteria by which to judge the quality of a product, including: materials; workmanship; reliability; safety; durability and lifespan; ease of maintenance and repair; accessibility and availability of parts; finishes; and associational and aesthetic values. These are guidelines helping in examining a product that already exist, but its existence should also be questioned: "Should it exist, and if so, why and for whom?".

Pollster Louis Harris (in [43], p. 76) makes a prognosis: "What is important for people is no longer going to be material acquisitions", whereas Patrick H. Caddell (in [43], p. 76) shares his conclusions: "Upper-income buyers who are better educated are most inclined to buy smaller cars." He concludes: "If such changes continue, we may well find some alternatives to the importance of status assigned to large material goods and, in the end, important and significant changes in consumer spending habits".

3. Research Method and Results

Based on theoretical research, observations and conclusions drawn during experimenting contemporaneously, we forwarded a questionnaire to the targeted public aiming at collecting information regarding the validity of the interior space concept when placed under scrutiny. There were more than 200 persons who completed the questionnaire, covering all age groups, education levels and employment statuses (Figure 6).

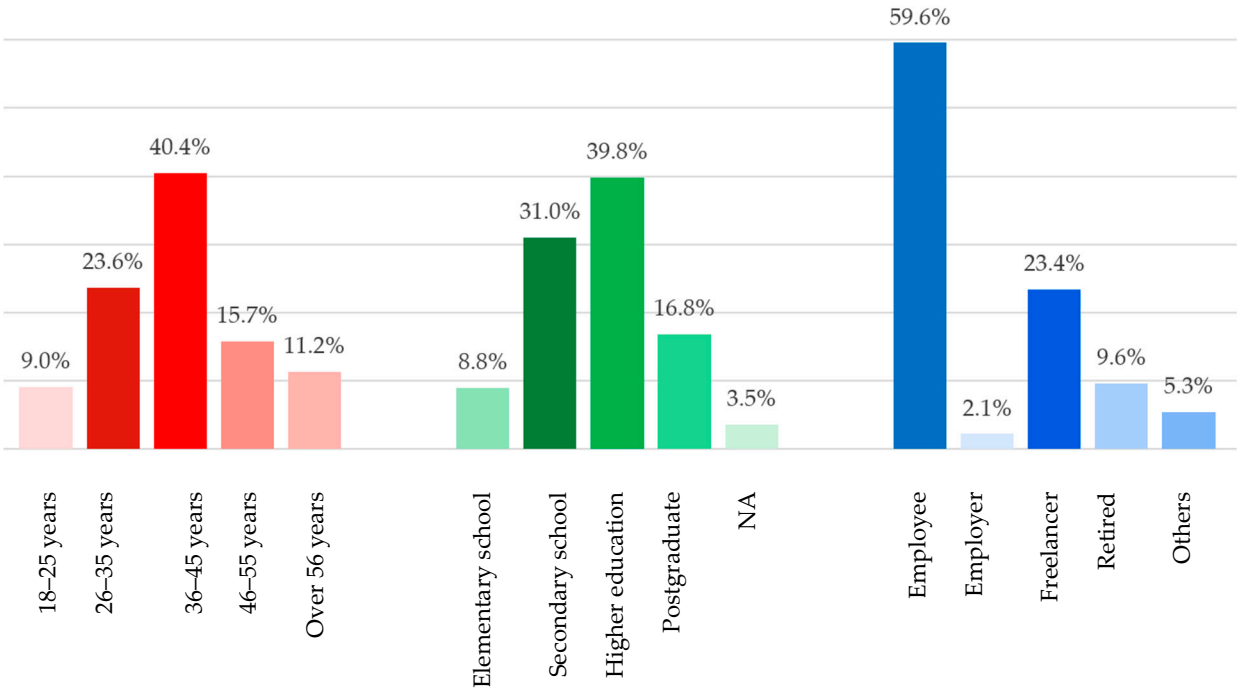
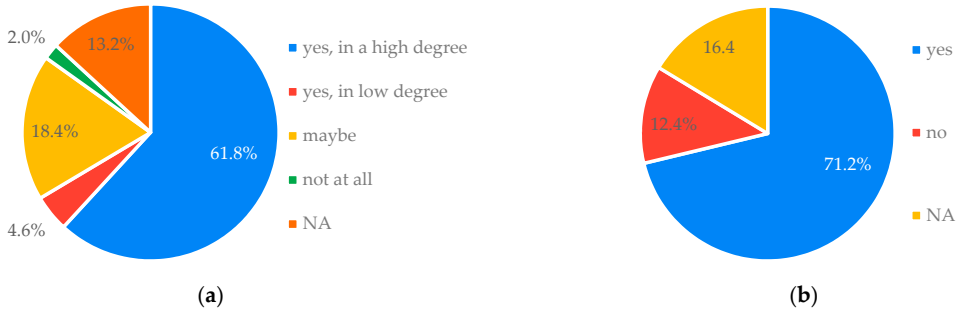


Figure 6. Age groups, education level and employment status of the respondents.

According to the results obtained after organizing the answers, the concept is most well received by people in the age category of 36–45 (40.5%), followed by participants in the age category of 26–35 (25%). In terms of the employment status of the participants and their level of education, the vast majority of those showing a positive attitude toward the concept are employees (75%), followed by freelancers (13.1%), both with a higher education level (57.8%).

The questionnaire provided the participants with sites for visualization and familiarization with the concept in question, giving them the opportunity to compose a conscious attitude. Of the respondents, 61.8% considered this concept to be a sustainable one, with 18.4% considering it partially sustainable, followed by 13.2% answering that they don't know (Figure 7a). It should be mentioned that the materials and processes through which the concept is to be materialized are not discussed here, although it goes without saying that, the orientation being a solidly sustainable one, they will be in accordance with the precepts of sustainability. Here, the concept of reducing interior living space and increasing the chances for exterior green spaces is under discussion. The problem may be one regarding the familiarity of the respondents with the concept of sustainability. We started from the premise that the participants have knowledge of what a sustainable concept means. Among participants, 68% intuited properties of the concept that can, given implementation on a large scale, add value to the attempted sustainable urban development. For 65.3% of the participants, the energy efficiency of the apartment is a very important factor, deciding the choice and purchase, with 25.3% ticking the important option. Regarding the concept of RoomInnovation, the focus is on reducing the surface area and, as a consequence, reducing energy consumption, and 86% of the participants considered the option valid in order to reduce utility costs.



(**a**) (**b**)

Figure 7. Sustainability of the concept (**a**) and reducing the building footprint can increase the surrounding green space (**b**). Note: NA means "don't know"/"don't answer".

The need for green spaces composing the vicinity is a stringent one; it has deep implications for the health and psyche of the inhabitants, it is a trigger for decision-making, and it is an imperative in designing a built environment with a human face. Among those surveyed, 71.2% considered a reduction in the footprint of the residential building justifiable in order to increase or accommodate surrounding green spaces (Figure 7b).

A percentage of 56.7 of those who completed the questionnaire declare themselves willing to give up an additional room, rendered useless by the application of the RoomInnovation concept (system and product). Almost 70% recognize the capacity of the elevated bed to increase the efficiency of the interior space to which it is allocated, and to change its functionality, proving, by activating the related function, the uselessness of a room strictly limited to a single functionality (Figure 8a). A percentage of 62.1 opted for an apartment with retractable walls and that is predisposed to multiple configurations (Figure 8b). In terms of the participants' perception on the static character of the dividing walls and their obtainable retractability and therefore transformative quality, 70% declare that they felt at certain points the need to remove walls in order to carry out certain activities, with 66% finding them constraining and opting, if given the chance, for an interior space with an optional closed/open surface.

(**a**) (**b**)

Figure 8. The efficiency of the elevated bed (**a**) and of retractable walls (**b**). Note: NA means "don't know"/"don't answer".

According to the results recorded after completing the questionnaire, 80% of the respondents prefer a mobile partition, the change of configuration being at the discretion of the user. Of the respondents, 87.7% showed their preference for an interior with introduced capacities of offering both intimacies, composed by closed walls, and open space, obtained by activating walls into dematerializing. Of the respondents, 78.7% were in favor of the proposal to divide the apartment into two independent units, the master unit and the studio, opening a new range of possibilities for using space and allowing it to be used. This compartmentalization, comprising a main unit and studio, was aimed at facilitating the development of family, social and professional activities (depending on: office, cabinet, living room, studio, rental space, guest room, isolation space). Of the respondents, 80.7% consider that this additional function of the apartment is valid and desirable, with only 13.3% ticking the option "don't know". A percentage of 82.7 consider the included studio

with independent entrance a desirable space, bringing economic, social and family benefits: 89.3% among the self-employed respondents consider the studio with independent entrance an added value, due to the fact that it can be used as an office, workshop, cabinet, living room, etc.; 78.7% as a parent consider the studio an added value, due to the fact that it facilitates the closeness of the son/daughter while also ensuring the necessary and desired independence; 78.7% as a son/daughter consider the studio an added value, due to the fact that it will allow bringing the elderly parents closer, facilitating the closeness of the family but also the necessary and desired independence; 73.3% responded that as a student, they consider the studio an added value, due to the fact that it ensures family approbation and support, while at the same time ensuring the necessary and desired independence.

Strengths–Weaknesses–Opportunities–Threats (SWOT) Analysis

A SWOT analysis based on the four major aspects—environmental, social, economic and technical—was made in order to assess the feasibility of integrating the RoomInnovation concept into the notion of sustainability (Table 1).

Table 1. SWOT analysis.

Strengths	Weaknesses
S1. Environmental strengths: ➢ Gain space for nature within the urban environment ➢ Reduce the degree of pollution (environmental, visual and noise) ➢ Decrease water, air and land use ➢ Save energy sources ➢ Resource reuse ➢ Increased efficiency and decreased materials and energy use due to a qualitative manufacturing process	**W1. Environmental weaknesses:** ➢ Use of energy for operation throughout the entire service life of the product ➢ Increased energy embedded due to the need for transportation on long distances from the production unit to different locations around the world ➢ Low recycling or reuse possibilities due to composite materials used in production
S2. Social strengths: ➢ Can be considered a fulfilled personal social responsibility ➢ Leaves a positive mark on society ➢ Improves the quality of life and comfort in residential spaces ➢ Sets nature as a vital context ➢ Gains space for living within an overpopulated urban environment ➢ Accommodates different generations under the same roof by adding the Studio to the main module	**W2. Social weaknesses:** ➢ The concept is applicable for targeted categories of users, not yet adapted for elderly and people with special needs ➢ People need to be convinced of the usefulness of the concept ➢ The concept could be wrongly perceived as a compromising solution targeting those with low income
S3. Economic strengths: ➢ Decreased costs for energy used for heating and cooling, in time ➢ Similar or lower price compared to products in the same category ➢ Improving the efficiency of the living space ➢ Offers the possibility of a passive income (the Studio) ➢ Retractable walls and studio do not represent an added price to the purchase	**W3. Economic weaknesses:** ➢ Higher price compared to low cost of nontechnological solutions existing on the market (Murphy bed) ➢ The necessity of replacement after 5000 cycles (approximately 13 years; shorter lifespan than classic solutions) ➢ Additional costs for authorization and regular maintenance visits, similar to other lifting equipment ➢ Additional costs for marketing and promotional materials ➢ Additional costs for organizing and maintaining showrooms and service personnel by the promoter / real estate company or investors
S4. Technical strengths: ➢ Very good quality of execution, TÜV certified ➢ Good materials ➢ Good example of technical progress ➢ A method of optimization of the apartment ➢ Multiple functionalities ➢ Easy to operate ➢ Patented technology	**W4. Technical weaknesses** ➢ Impossible to operate during electric blackouts ➢ The need for a 24/7-open maintenance service unit with qualified personnel ➢ The need certification and operating authorization from certified institutions ➢ Higher maintenance costs ➢ Limited range of dimensions and materials used in production ➢ Poor soundproofing for enclosing walls ➢ No local producers

Table 1. *Cont.*

Opportunities	Threats
O1. Environmental opportunities: ➢ Initiate a more complete connection between humanity and nature ➢ Make amends for the dehumanization of the urban environment ➢ The perspective of implementing new policies and technologies of recycling and reuse ➢ Reduce the C&D waste like concrete and mortars, bricks, and finishing and painting materials used for classic walls ➢ Diminish human/nature as well as human/built environment alienation through increased interactivity ➢ Decrease consumption	**T1. Environmental threats:** ➢ The gained space can be used for other buildings instead of nature ➢ Low recycling and reuse possibilities in the future as in the present days
O2. Social opportunities: ➢ Changing consumer mentality and behavior ➢ Gaining space for parks, green areas and recreational spaces ➢ Raising the level of socialization and helping to strengthen intrafamily relationships ➢ Increasing chances for ownership (personal residence) ➢ Creating attachment and thus prolonging the lifespan of products by mediating human/object interconnection ➢ Creating and maintaining an interactive channel with the users	**T2. Social threats:** ➢ Possible obsolete solution over decades ➢ Risk of injuries in case of malfunctioning ➢ Lack of specialized labor force for production and maintenance
O3. Economic opportunities: ➢ Increased cooperation between construction and machinery sectors ➢ Creation of new markets for dwellings and for such equipment ➢ Creation of a new value chain in the constructions sector ➢ Finding ways for local production and distribution ➢ Creation of new jobs, new business opportunities, new added values at all levels ➢ Increased competitiveness between involved companies ➢ Sustainable development of companies in the future ➢ Increasing purchasing power due to a reduction in size (purchasing price being calculated per square meter) ➢ Increasing the range of products (mobile structures) and offers in materials, finishes, color palette, over time	**T3. Economic threats:** ➢ Increased maintenance costs in time due to increased labor and spare parts costs and / or due to increased costs for recertification or operation reauthorization (periodically) ➢ Repair and replacement of faulty parts only by specialized personnel ➢ The existence of other similar solutions, better in performance or lower in costs
O4. Technical opportunities: ➢ Implementing sustainable solutions ➢ Adjustments made following the impressions collected from users in order to improve the system and products and increase user satisfaction ➢ Attempting to modularize and standardize the component parts	**T4. Technical threats:** ➢ It may create a monopoly on the production and maintenance of equipment, which would lead to an unjustified increase in maintenance costs ➢ The equipment can be banned by the authorities based on new future technical regulations ➢ Maintenance staff may not work during weekends and legal holidays, which may lead to increased intervention time in case of failure ➢ Failure in the middle of operation, case in which both advantages (gained space and usefulness) vanish ➢ Lack of spare parts ➢ Equipment not working for long periods of time exposes it to malfunctioning

4. Discussions

Our research was directed toward highlighting valid solutions to future predictions. Because resource management will become increasingly important within condensed urban environments, as total resource needs and consumption are expected to increase

consequentially with the rising of demographics, changing social values will underpin the creation of a fairer, more inclusive and gentler urban future. Lawmakers and their implementing agencies must take into account all these changes and act accordingly and in tandem with them. The ascending number in urban populations, globalization, climate change and changes in human values are causes that shape cities. Urban societies will evolve based on the absorption of these trends. One of the key challenges for urban planners and city leaders is how to ensure an urban environment that not only meets human needs and expectations but also reverses the negative impact on the environment.

The implementation of the RoomInnovation concept could offer new ways of organizing living space to accommodate multiple models of social interaction. Its construction will require an innovative architectural structure. A greater interconnection between generations is desired, offering the possibility of both independence and privacy as well as social interaction made possible by a clean, safe and efficient system, necessary to accommodate a scenario in which overpopulated cities will continue to expand their footprints.

We chose to conduct our study around an existing concept that is on the verge of implementation on a substantial scale. It is mandatory for sustainability-oriented solutions to reach the masses so that the results become visible. In order for agents of change to take the plunge in investing in such solutions, they have to be convinced of their validity and profitability as well as their capacity to add value to their reputation. It is our intention to encourage more agents of change to step in and bring their contribution to the general well-being of city dwellers in a context of increasing population density, a damaged environment and harshening living conditions.

By evaluating the principles on which this concept is based, we conclude that an interior concept that promotes a decreased surface while increasing functionality, by which an added value of interactivity between user and interior environment is made possible through mobile structures, is a sustainability-oriented concept that is valuable to the changes intended within the urban context in the general quest of reaching a sustainable urban environment.

Besides the reality of reducing consumption on different levels (used matter, space, investment, expenditure), there is a level of creativity and individualism in managing living space, in being capable of multiple compositions mediated by the in-built mobile structures with their related capabilities (retractable walls, elevating bed). It is a starting point to embracing the idea that a smaller space does not in any way reduce comfort or become an impediment in conducting activities. On the contrary, through a versatile compartmentalization and the installment of such mobile structures, acting like interior items, the user gains space and can enjoy the advantage of spaces open to change and reorganization.

It is a common practice to cancel green spaces in favor of built structures. It is a troublesome endeavor to restrict construction in order to give way to nature. Building less and gaining space for nature is a topic to be further discussed and imagined. Against the difficulty of implementation, it is a concept to be embraced. It is a subject that must be further explored for the benefit of the urban dweller in need of a shift in priorities, opting for an urban environment in which nature occupies a substantial part in its composition and not a random one. The urban environment is spreading incessantly, therefore there is a perceived need of letting nature in. Nature must be allowed to enter urban space and bring a feeling of naturalness to the mostly alienating environment.

Through our discourse, we intended to enable the user to determine whether the purchase of a bigger space is necessary or needed, shifting the focus from owning bigger interior spaces to being exposed to/making use of larger outside green spaces. Through shifting compositions, this questioned space is somehow absolved of obsolescence and continuous experience fatigue, and it also encourages the user's participation in the making of new interior spaces, accommodating human living and the proliferation of exterior spaces accommodating urban nature.

We scrutinized the possibility of people interacting with the built environment on an experimental and creative level, given the opportunity of proper and affording conditions. We considered the social, economic and ecologic implications of embracing such a changing concept on a large scale, over a long-range period. We also took into account a user's better understanding of products they themselves function and define, therefore feeling less alienated from them. With this in mind, we conducted our research as an incentive to get the user to creatively interact with the built and objective environment toward the individual task of designing interior compositions, using the in-built versatility of mobile structures. We sought to make the interior an inclusive space of added possibilities and affordances, and to guide the user to experience and to get creative in using space to the fullness of its increased capacity.

It is for the first time at a national level that an agent of change intends to apply a concept with such a changing potential on a large scale. We are talking about whole neighborhoods; thus the change is sizable and well-perceived. It is a recipe on the verge of approval and testing, and if the results are beneficial, it is one that could and should be followed as valid methodology for developing sustainably.

This research paper was intended not only for changing the consumer's behavior and choices, but also for changing the consumer's attitude relating to building social status. It was directed toward the developer, intending to convince such agents of change of the benefits of embracing sustainable solutions for profit, reputation and legacy, and also to the responsible state bodies that impose and regulate laws and legislation regarding urban constructions, in order to make them aware of the need to support and encourage sustainable efforts.

5. Conclusions

This concept, through an applied reduction of the interior space, is intended to significantly increase functionality (mobile structures), affordability and efficiency, targeting human well-being as well as the environment benefits through savings in materials, processes and space—a reduced footprint of built structures translates into space won for urban nature. The concept is justified by the need for managing resources being of increasing importance within condensed urban environments and under environmental stresses. The concept is expected to change social values, which will also underpin the creation of a fairer, more inclusive and gentler urban future.

The concept, relying on downsizing footprint size while augmenting space efficiency, is relevant in cases of limited building space within restricted urban frames. It addresses not only consumers but also lawmakers and their implementing agencies that must apply solutions to societal and environmental challenges.

Enhancing user interaction with alternative interior space through the operation of mobile structures and activating a shifting system based on increasing space affordances, the concept, through its mobile structures (the Wall and Bed) represents a creative alternative that targets a humane built environment that meets human needs while striving to reverse negative impacts on the environment and society.

The implementation of the RoomInnovation concept could offer versatile modes of organizing living space to accommodate multiple models of social interaction. Its implementation will require an innovative architectural structure embedding mobility and facilitating variations in spatial composition, absolving living space of obsolescence and continuous experience fatigue, accommodating human living and adding green value to surrounding exterior space (reduced footprint = urban nature).

Through this research we intended to approach the alternative of reduced living space without the impediments and stresses imposed by such scenarios through proposing a concept acting on reduction while adding value (RoomInnovation).

A mark was placed on the importance of encouraging different fractions of society to become aware of the environmentally oriented alternatives and empowering the consumer to mediate change. Also, we intended to emphasize the need for solutions that are adjusted

to genuine human needs and resized to a human dimension. These solutions must exhibit a green tag and an increased sensibility in intercepting the consequences of their implementation on humans and nature alike. Such solutions must reach mainstream propagation and popularity to make the change visible and sound. They must reach the masses, convincing them to take a stance in the direction of using less while experiencing more, guiding choices away from the appropriation of material goods toward the experience they ought to offer, just as there should be the alternative of opting for the service to the detriment of the product. Our attention was held by the reality of affordable solutions for the common buyer, proposing structures rather than objects, mobility rather than fixity, sufficiency rather than redundancy, less (as in less consumption, pollution, expansion, expense) rather than more (as in more on the negative side), proposing the possibility of building less and gaining space for nature.

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