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## **TYOLOGY OF MICRO APARTMENTS BASED ON THE STRUCTURE OF LIVING SPACE**

*Dorđe Alfirević<sup>143</sup>; Sanja Simonović Alfirević<sup>144</sup>*

### **Abstract**

A micro apartment is a concept of organizing living space that typically provides the basic necessities for long-term residence for one or two occupants. In general, it refers to a residential unit with a floor area ranging from 15 to 30 square meters. Micro apartments are considered to be one of the prevalent forms of sustainable housing in the future, as the concept is based on smaller living spaces and reduced consumption of energy and resources. The research is based on a deductive method and begins with the analysis of current micro apartment typologies, along with the formulation of different theoretical models. Subsequently, an analysis and comparison of characteristic examples of micro apartments are conducted to establish a clear typology. Finally, based on the typology, an evaluation is carried out, and proposals for different approaches to micro apartment design are formulated. The aim of the research is to comprehensively systematize the typological forms of micro apartments recognized in architectural practice and examine their characteristics and potential applications in urban environments. Additionally, the research aims to identify distinctive structural differences among various typological forms of micro apartments. The ultimate goal of the research is to contribute to the development of sustainable housing solutions in urban areas, with a particular emphasis on the concept of micro apartments.

**Key words:** *Architecture, sustainable housing, micro-apartment, typology, design.*

### **Introduction**

Micro housing involves "living in substandard conditions, in residential units that are very small in size. Such apartments typically have only the most basic amenities, such as a sleeping area, kitchen, and bathroom, and may not fulfil all aspects of functionality." [1] The term "micro-apartment" commonly refers to residential units that are smaller than 30 square meters. It is believed that this is usually sufficient space for basic living needs, including a bed, kitchen, bathroom, and a living area. Micro-apartments are a concept that is increasingly being utilized in urban environments

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where space is limited, and real estate prices are high. These apartments are based on the idea of reducing and utilizing living space for essential needs, aiming to reduce energy consumption, resource usage, and construction costs. In functional terms, micro-apartments can be independent units, or they can be organized as multiple units sharing common areas such as a kitchen and bathroom. The theoretical foundations of the micro-apartment concept can be traced back to the German concept of "Wohnung für das Existenzminimum" (Apartment for Existential Minimum), which was developed in the 1920s. This concept aimed to create spatially efficient typologies of affordable apartments based on minimal quality standards [2], [3]. The question of minimum-sized housing units was a central topic at the Second Congress of the International Congress of Modern Architecture held in Frankfurt in 1929. The congress debated the minimum size of apartments and the possibilities for formalizing design ideas based on rationality and economy. In the early 21st century, social initiatives such as the "Tiny House Movement" in the United States and the inclusion of the category of small houses in international housing standards have spurred the development of micro-apartments in the Western world [4]. While the Western approach often tends to be market-oriented and characterized by limited flexibility, in the East, particularly in Japan, micro-apartments emphasize achieving maximum spaciousness, utilizing natural light and the external environment within the interior, as well as offering flexibility in space and furniture [5], [6].<sup>145</sup>

### **About the typology of micro-apartments**

Although the concept of micro-apartments is relatively new<sup>146</sup>, there has been a considerable number of research conducted in the field, with similar or overlapping approaches in analyzing this housing model. Many studies have examined the characteristics of micro-apartments to devise better and more sustainable ways of living in smaller spaces.<sup>147</sup> Elements of thinking about specific typologies of micro-apartments can be observed in Jessica Adorno's research, where she explores micro-apartments as residential spaces for young professionals and analyzes micro-

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<sup>145</sup> In Japan, micro-apartments are designed with careful consideration for optimizing space utilization and creating an open and airy atmosphere. The focus is on maximizing natural light through large windows, utilizing clever storage solutions, and incorporating multipurpose furniture that can be easily reconfigured to adapt to different needs. The goal is to create a sense of openness and flexibility within the limited square footage. Additionally, Japanese micro-apartments often pay attention to the integration of indoor and outdoor spaces, such as incorporating balconies or terraces that extend the living area and provide a connection to the surrounding environment. This approach aims to enhance the overall living experience and mitigate the limitations of small living spaces. Overall, the emphasis in Eastern micro-apartments is on creating a harmonious and functional living environment despite the compact size, promoting a sense of spaciousness, flexibility, and a connection to the natural surroundings.

<sup>146</sup> The origin of micro apartments in history is difficult to precisely determine as the concept of very small residential units appears in different cultures and time periods. However, it is widely accepted that one of the earliest realized examples of micro housing in the modern era is the Nakagin Capsule Tower in Tokyo (Kisho Kurokawa, 1972).

<sup>147</sup> See: [1], [10], [11], [4], [12], [13], [14], [5], [15], [16], etc.



communities, co-housing communities, tiny houses, micro-units, and more [4]. In the research conducted by the British Property Federation titled "Definition of Micro-Apartments," a typology emerged that relates to small residential spaces and includes compact living, co-living, and shared living. Although this typology is based on different surface areas of housing units and the presence of certain capacities and additional amenities within the apartment, it is still not sufficiently clear as it does not provide information about the structures of the analyzed spaces [7].

In a general sense, typologies of micro-apartments can be established based on various parameters depending on the aspect being considered. Some characteristic parameters for classifying micro-apartments are:

- a) *Surface area* - micro-apartments are characterized by their small size, typically ranging from 15 to 30 square meters. Based on this parameter, categories of micro-apartments can be identified with surface areas of 15, 20, 25, and 30 square meters;
- b) *Structure* - micro-apartments can have different room layouts, such as studios, bachelor apartments, or one-bedroom apartments;
- c) *Functionality* - micro-apartments can cater to various functional needs of the users, and based on this aspect, they can be categorized as single-space, segregated, or flexible units.

In addition to the mentioned parameters, there are other factors that can be used to classify micro-apartments and establish their typologies, such as design, sustainability, location, price, etc. The motivations behind creating classifications of micro-apartments can vary and typically include: a) *facilitating choice* - this allows potential residents to more easily select the best micro-apartment for themselves based on their needs and preferences; b) *improving quality* - this enables designers to develop new and innovative housing models while providing a high-quality living space for residents; c) *standardization* - this simplifies the evaluation and comparison of different apartment models for both experts and residents; d) *cost-effectiveness* - this allows designers and developers to create more efficient housing models that are simultaneously more affordable for potential residents.

When considering the structure of rooms, the following terms are commonly associated with micro-apartments in the literature [8], [9]:

- a) "Studio apartment" - An apartment with a single multipurpose room that combines living, dining, kitchen, and sleeping areas, typically with a separate bathroom within the same unit<sup>148</sup>;
- b) "Efficiency apartment" - An apartment that typically consists of a single room, where kitchen and bathroom facilities are not fully developed or separate;
- c) "One-bedroom apartment" - An apartment with a separate bedroom combined with an entry area, living room, kitchen, and bathroom<sup>149</sup>;

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<sup>148</sup> Other terms such as "studio", "studio flat", "bachelor flat", "bachelor apartment" and others are also used.

<sup>149</sup> The term "one-bedroom apartment" is interpreted differently in practice and can refer to an apartment with an entry area, a kitchen for food preparation, a multipurpose room with a dining area, and a bathroom. Therefore, the main difference in interpretations lies in whether the term "room" implies a separate space for sleeping [8].



- d) "Maisonette" - An apartment with its own external entrance (or two opposite entrances);
- e) "Duplex" - An apartment with rooms on two different levels that are interconnected by an internal staircase<sup>150</sup>;
- f) "Loft" - An apartment located in a converted industrial space, characterized by an open layout without internal walls and doors, often with high ceilings or in an attic space;
- g) "Co-living apartment" - An apartment shared with other residents, typically consisting of individual accommodation units (rooms) and shared spaces such as a kitchen, living room, and bathroom;
- h) "Pod apartment" - An apartment in the form of an individual capsule that serves as a private sleeping and living space.

It is evident from the presented terminology that different characteristics (structural, functional, etc.) are often combined to label micro apartments, and some terms have similar characteristics, leading to confusion and ambiguity. Through the analysis of numerous examples in the literature, it can be observed that due to their small size, micro apartments are often equipped with only basic amenities such as a kitchen and bathroom, while in some cases, they may lack a kitchen and/or bathroom. This is precisely one of the reasons why a definitive typology of micro apartments has not yet been established.

### **Typology of micro apartments according to the structure of the rooms**

Based on the aforementioned, in this research, we will propose a typology of micro apartments based on a hypothesis set forth in a study titled "Micro Apartments - Achieving Spatial Comfort in Substandard Living Conditions," where the authors concluded that for minimal spatial comfort in a micro apartment, it is "necessary to have a resting space (bed) with the possibility of using shared space for food preparation and personal hygiene" [1]. Starting from this assumption, a basic model of a micro apartment, labelled as Type 1, was conceived, and by gradually adding space to meet the basic physiological needs of the users (kitchen, bathroom, etc.), the remaining types were formed in the systematization. (Fig. 1)

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<sup>150</sup> It can also refer (in the USA) to a house consisting of two units (known as a "duplex").



**Figure 8:** Typology of micro apartments according to the structure of the rooms: 1) Type 1 - [LR] + K + B, 2) Type 2 - [LR + B] + K, 3) Type 3 - [LR + K] + B, 4) Type 4 - [LR + B + K], 5) Type 5 - [LR + B + K + BR]<sup>151</sup> (Source: author's drawing)

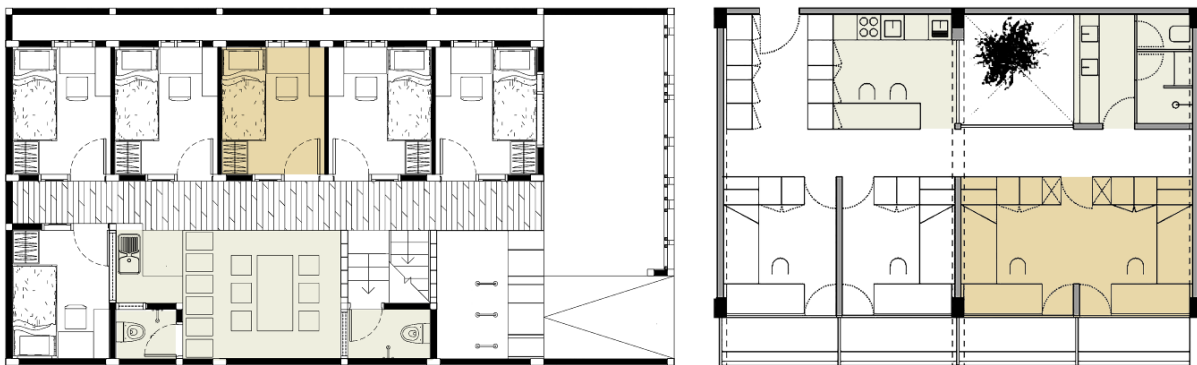
### Type 1 - [LR] + K + B

Micro apartments of this type consist of a single multipurpose room where basic living functions such as daily activities and sleeping are organized. The needs for meal preparation, personal hygiene, or using the restroom are met by using shared facilities such as a communal kitchen and bathroom, which are located outside the basic accommodation unit. This spatial organization is primarily characteristic of co-living concepts and student housing, where users consciously choose to share certain amenities. The co-living concept promotes social interaction among residents and allows for cost reduction in living spaces while still providing privacy in the basic accommodation unit. This type of micro apartment is often part of a larger residential complex or building dedicated to co-living. The accommodation unit in this type of living arrangement can take the form of a "capsule" and is usually located adjacent to the shared space containing the communal kitchen, bathroom, and relaxation areas. Co-living apartments have a specific concept focused on sharing certain rooms and resources, so a single-person room is typically considered part of a broader residential arrangement. However, the individual room within a co-living apartment is primarily

<sup>151</sup> Explanation of abbreviations: LR - living room, K - kitchen, B - bathroom, BR - bedroom.



the private and functional space of the tenant, which can be regarded as a very small micro apartment. (Fig. 2) This type of spatial organization, with shared kitchens and bathrooms, may particularly attract certain social categories of the population. For example, young people searching for affordable housing in urban areas, as well as those who value social interaction and a sense of community, may be drawn to this type of living. Additionally, individuals with flexible schedules and frequent travel may appreciate the simplicity and practicality of living in a micro apartment with shared facilities. However, individuals who prefer a higher degree of privacy, have specific hygiene requirements, or have specific needs regarding food storage space may feel uncomfortable or consider this concept less suitable for themselves.



**Figure 2:** Type 1 - Micro apartment with a living room (and shared kitchen and bathroom outside the housing unit): 1) Bioclimatic and Biophilic Boarding House, Surabaya, Andyrahman Architect, 2016; 2) Unifesp São José dos Campos Student Housing, São José dos Campos, Atelier Rua & Rede Arquitetos, 2014.

(Source: author's archive)

### Type 2 - [LR + K] + B

Micro apartments of this type have an open-plan concept where the living area and kitchen are combined in the same room. Due to the living area and kitchen being in one space, flexible and multifunctional furniture pieces are typically used. For example, a table can serve both as a workspace and a dining element. The bathroom in this type of micro apartment is located outside the main living unit, which means that the tenant has to use a shared bathroom somewhere in the building, usually on the same floor, and share it with neighbours. These 'external' bathrooms are usually equipped with basic sanitary elements such as a shower cabin, toilet, and sink, but for multiple users. Micro apartments of this type can be a viable housing option in urban areas, primarily for individuals. Since the bathroom is shared with others, it is necessary to have flexibility in terms of scheduling and time allocation for showering, personal hygiene, and using the facilities. Adequate storage spaces for personal hygiene items are essential to facilitate the use of shared spaces. (Fig. 3) This type of micro apartment is relatively rare in practice, which can be attributed to several reasons:



a) Having a bathroom outside the apartment can be impractical and inconvenient for residents. They would have to leave the apartment to access the bathroom, which can be uncomfortable, especially at night or in inclement weather;

b) Having a bathroom outside the apartment can pose an additional challenge in maintaining hygiene. Residents would need to regularly use a shared bathroom that would require cleaning and maintenance for multiple users;

c) Using a shared bathroom can limit the privacy and intimacy of the residents, especially in situations when they want to use the shower or toilet.

Sharing a bathroom among users may not be acceptable for all social categories, but it may be less of a concern for categories such as: a) students, b) young professionals who are just starting their careers and adapting to new living conditions and a limited budget, c) individuals with lower incomes as this concept provides access to more affordable housing, and d) individuals who prefer social interactions.



**Figure 3:** Type 2 - Micro apartment with a combined living room and kitchen (and a shared bathroom outside the housing unit): 1) Doorm Student Housing, Lisbon (Luís Rebelo de Andrade, 2015) (Source: [www.archdaily.com](http://www.archdaily.com)), 2) The Woods Housing, Wright State University, Dayton, 1980 (Source: author's archive)

### **Type 3 - [LR + B] + K**

In this type of micro apartment, the kitchen is located outside the accommodation unit and is shared with other tenants, occupants of the same building or residential complex. This concept allows for efficient use of space and resources, as the kitchen is used collectively instead of each unit having a separate kitchen. It can cater to different categories of residents such as singles, young professionals, students, travellers, or individuals who prefer the conveniences of communal living. This type of micro apartment typically has lower operating costs compared to larger apartments or units with their own kitchen and bathroom, making them financially accessible, especially for individuals with limited budgets or those looking to reduce housing expenses. A shared kitchen promotes social interaction among residents and can serve as a place for socializing, sharing meals, and exchanging ideas. On the other hand, sharing a

kitchen can reduce privacy and intimacy, as residents may be exposed to noise, smells, or unwanted encounters with other kitchen users. An evident problem associated with this type of micro apartment is that residents do not have complete control over the kitchen space, which can limit their ability to customize the space according to their needs and potentially create issues regarding kitchen usage schedules, cleanliness, maintenance, and sharing of kitchen appliances and utensils. Sharing a kitchen can be challenging for introverted users, as they may feel uncomfortable due to the presence of other people in the shared space. They may prefer their own private kitchen where they can have complete control and peace. For extroverted individuals, this type of micro apartment can be an opportunity to meet new people and form social connections. (Fig. 4) They can enjoy the possibility of socializing and conversing with other kitchen users.

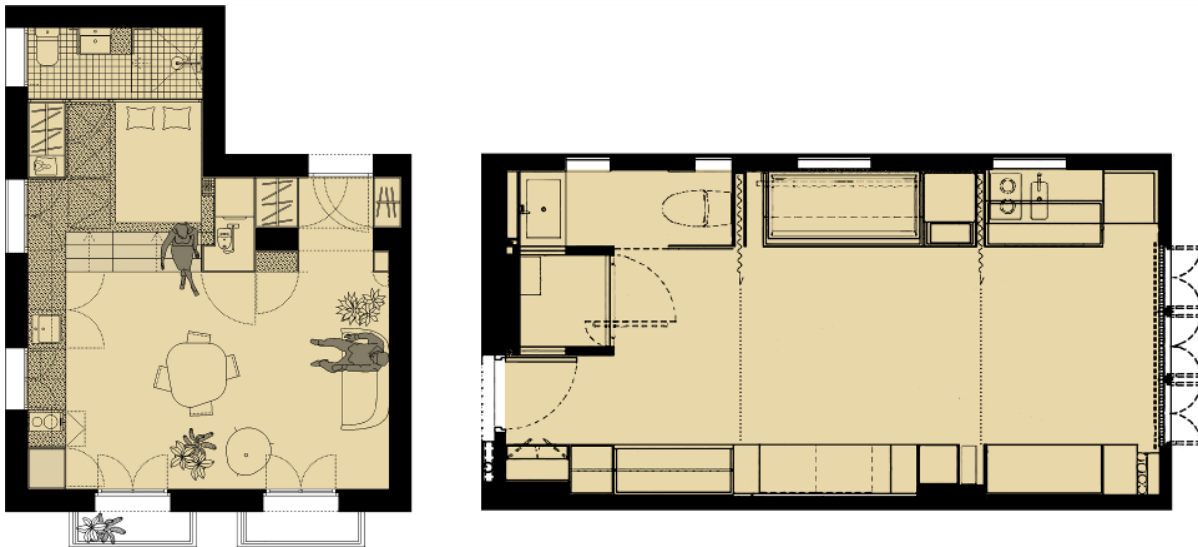


**Figure 4:** Type 3 - Micro apartment with a combined living room and bathroom (and a shared kitchen outside the housing unit): 1) Co-Kitchen, Stockholm, KTH Royal Institute of Technology, 2021; 2) The International House, Munich, Geier-Maass Architekten, 2014.  
(Source: author's archive)

### **Type 4 - [LR + B + K]**

Micro apartments with a combined living area, kitchen, and bathroom in the same space are typically based on the concept of an open floor plan, which creates a sense of spaciousness in a small area and maximizes the use of available space. Furniture and interior elements are often designed to be multifunctional, foldable, or built-in to make the most of the space. The use of flexible tables, chairs, beds, or sophisticated transformation systems allows the space to adapt to different needs and usage patterns throughout the day. The kitchen in this type of micro apartment has a compact design with basic elements such as a sink, stove, refrigerator, and storage space, as the goal is to provide basic meal preparation capabilities in a limited area. In this type of micro apartment, the bathroom can be physically separated from the rest of the space or only partially separated, for example, with a partition or curtain, and

usually has basic sanitary elements such as a shower cabin, toilet, and sink. In certain cases, the sanitary elements are divided into a separate shower cabin and a toilet with a sink, which increases the efficiency of space usage, as two people can use different facilities simultaneously. Compared to the previously mentioned types of micro apartments, this type provides basic conditions for comfortable living for the occupants. (Fig. 5) However, like other types, it also has certain drawbacks that become apparent during use. The lack of separate rooms can impact the sense of privacy for residents. Micro apartments are typically intended for one person or perhaps a couple, making them inadequate for larger families or multiple occupants. Some individuals may feel cramped or claustrophobic in a smaller space, especially if they are accustomed to larger living areas. The need for storage of personal belongings can often be a challenge, leading to creative solutions such as storing items within furniture elements, under the bed, in closets and shelves above doors, in drawers within staircases, and so on.

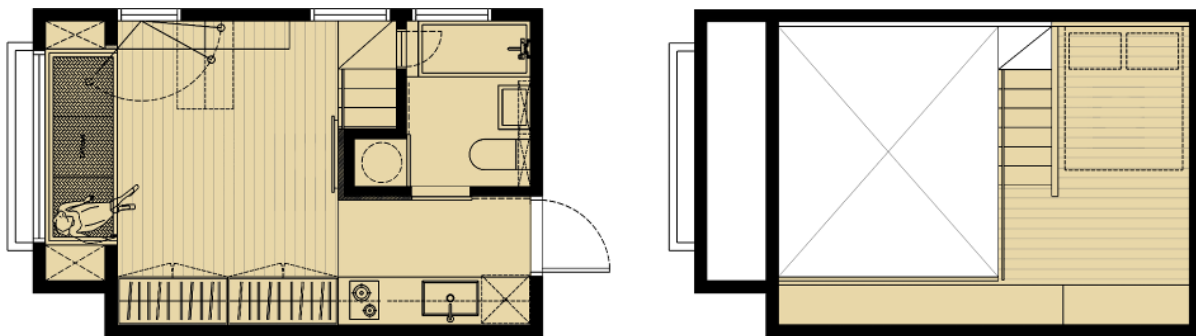


**Figure 5:** Type 4 - micro apartment with a combined living room, bathroom and kitchen: 1) Yojigen Poketto, Madrid, Elii, 2017; 2) Domestic Transformer Apartment, Hong Kong, Gary Chang, 2007.  
(Source: [www.archdaily.com](http://www.archdaily.com))

### **Type 5 - [LR + B + K + BR]**

The specificity of this type is the presence of a separate bedroom. The bedroom provides privacy and a separate sleeping area, which can be important for users who want to separate sleep from other activities in the apartment. In comparison to other rooms, the bedroom can be located on a mezzanine or formed within a spatial niche, if the height and configuration of the space allow it. This room can have a standard bed, wardrobes for clothing storage, and other elements typical of a bedroom. However, the bedroom can also be formed on a platform (mezzanine) above the area used for daily activities such as a workspace or seating area, or storage space or even

additional functions (kitchen or bathroom) can be organized below the platform. The sleeping area can be created by pulling out a bed from the floor platform or the bed can be unfolded from a closet or a part of the wall, known as a "Murphy bed".<sup>152</sup> These beds are usually folded during the day to free up space for other activities and are easily unfolded for sleeping at night. The bedroom can also be formed within a spatial niche, providing additional separation and intimacy. In this situation, the sleeping area is separated by a curtain or movable partition or simply partitioned by a screen. (Fig. 6) Micro apartments with a separate bedroom can be suitable for individuals, couples, and even small families who want a separate sleeping area but are still interested in efficient use of space and living in a smaller home.



**Figure 6:** Type 5 - micro apartment with a combined living room, bathroom, kitchen, and bedroom: 22sqm Apartment in Taiwan, Taipei, A Little Design, 2015. (left: floor plan of the lower level, right: floor plan of the gallery)

(Source: [www.archdaily.com](http://www.archdaily.com))

## Conclusion

The Micro apartments represent an innovative solution for housing needs in urban environments where space is limited and there is high demand for affordable housing. The types of micro apartments analyzed within this typology offer various possibilities and configurations of space that are tailored to the needs of the users. The research has presented types of micro apartments with their characteristic structural features, advantages, and disadvantages:

1. Micro apartments with a living room (and shared kitchen and bathroom facilities outside the accommodation unit) are compact spaces that enable efficient use of space, cost reduction in housing, and promotion of social interaction among residents. They provide the lowest level of privacy compared to other types.
2. Micro apartments with a combined living room and kitchen (and a shared bathroom outside the accommodation unit) also offer efficient use of space but provide a lower level of privacy within the primary living unit for residents.

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<sup>152</sup> The Murphy bed" is named after its inventor William L. Murphy, who patented the first folding bed model around 1911.



3. Micro apartments with a combined living room and bathroom (and a shared kitchen outside the accommodation unit) allow users to have a private space for sleeping and personal hygiene maintenance, while other living functions are carried out in shared areas.
4. Micro apartments with a combined living room, bathroom, and kitchen provide a more comprehensive accommodation unit where users have the ability to independently prepare meals and maintain personal hygiene, thereby offering the basic amenities for a comfortable stay.
5. Micro apartments with a combined living room, bathroom, kitchen, and separate bedroom provide the highest level of privacy and spatial separation for sleeping, allowing users to have a dedicated sleeping area within a compact living space.

All these types of micro apartments share the common characteristic of maximizing the use of available space, incorporating multifunctional furniture and interior design elements, and adapting to different user needs. Their compact size allows for efficient use of space and cost reduction while still providing essential functionalities for comfortable living. On the other hand, it's important to consider some potential drawbacks, such as limited storage space, challenges in organizing sleeping areas, and the need to adapt one's lifestyle to a compact space. Overall, the presented types of micro apartments offer diverse options for comfortable, efficient, and affordable living in urban environments, tailored to individual needs and preferences.

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## INVITATION LETTER

Dear Assis. Prof. Dr. Alfirić,

Scientific Committee is inviting you and co-author Sanja Simonović Alfirić to be the **invited lecturers** with the manuscript titled "TYPOLOGY OF MICRO APARTMENTS BASED ON THE STRUCTURE OF LIVING SPACE" at the Fifth International Scientific Conference "Science, Education, Technology and Innovation – SETI V 2023" for the thematic field: "D. Sustainable territorial development".

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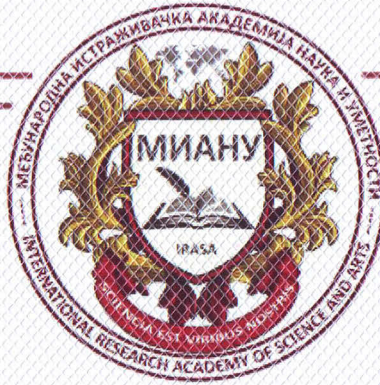
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