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Assessment of Quality of Use in Collective Housings, Case Study: Collective Housing of Social Formula, 700 Dwellings, Khenchela City, Algeria

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Abstract

Architectural quality is critical to the overall well-being, health, and comfort of the users. The stakes are even higher when it comes to residential buildings due to their nature since this type of building forges its occupants' life. This paper investigates the architectural quality of use and how it can be evaluated and assessed in order to achieve better well-being of the residents and guarantee their comfort. While affirming the vital importance of implementing said quality. At this stage, two methods were employed, a quantitative approach and a qualitative approach, to assess the quality of use in the collective housing of social formula in question (the dwellings). More so, a questionnaire was formulated and shaped accordingly with quality of use evaluation criteria, to apprehend the satisfaction of the residents. Mainly the findings attested to the fact that the requirements and needs (of cultural and social dimensions) of the residents weren't taken into consideration in the design process, which led to the protest of numerous unregulated modifications made by the residents to accommodate their requirements. The research demonstrated that in order to ensure that no modifications, problems, or discomfort would be present in the collective housing, the quality of use could very much be the prophylactic measure for that.

Key words: Architectural quality, Collective housing, Criteria, Evaluation, Quality of use.

INTRODUCTION

Quality has been the shining subject of studies and researchers for decades, it is almost impossible to note something regarding the architectural design and conception, that doesn't fall under the umbrella of the said quality, all of which can be rated as good or bad, generally speaking. Evidently, in architecture, it comes to pushing and evolving the design to a level where it fulfills the needs and expectations of future users at a highest degree. Management of such an improvement comprises three actions: planning, prevention, and evaluation (Nelson 2006).

According to the International Organization of Standardization (ISO), the usability of a product (the architectural product in our case) attests to the length of operation of the product in a determined setting by distinct operators (residents in our case) to attain stated objectives in a stated situation. It also expresses that usability is restrained by three factors: satisfaction, effectiveness, and efficiency. Henceforth, the evaluation of usability is based on the experience and feedback of the users (residents) regarding the design (architectural design). Therefore, an optimal design is a user-friendly design (S.N.Harun 2011).

The Quality of Use

at an architectural scale, the quality of use can simply and more clearly be defined as the ability of the space in question to satisfy and accommodate the needs, expectations, and drawbacks of the targeted users for that specific space (CETE de l'Est 2013).

On the other hand, simply doesn't mean easy, especially in this case, so in order to make it possible for us to define this quality of use and determine precisely the distinctive characteristics of said quality, we need to evaluate it according to a number of criteria that defines it simultaneously.

Additionally, to determine with precision the distinctive characters of this quality, we were able to distantly name nine (09) criteria, divided into two (02) groups, according to (CETE de l'Est 2013):

* Quality of use allied to the urban scale:

Criterion n°1: Urban integration: this criterion addresses the building's implantation as well as its degree of incorporation within its surroundings. Thereby, the building's ability to contribute to urban life. Thus, it isn't merely an issue of positioning buildings next to each other but rather a much more complex process.

Criterion n°2: Service and ease of access: assembling the troubles of each mobility mode (pedestrian, cyclist, and driver) falls under the mobility domain, during which we ensure service and ease of access to the residential building.

* Quality of use at the building scale:

Criterion n°3: Architectural organization: this criterion in particular responds to the needs established by the functional organization, so it measures the coherence and appropriate dimensions of various spaces. As a result, the internal space must be optimally dimensioned; the uses within the building must be divided; and the needs of people with limited mobility must be considered. This is one of the most important criteria because it allows us to incorporate the issue of cultural and social background into the architectural design, resulting in a residential building that meets the residents' cultural and social needs.

Criterion n°4: Visual quality: when there is insufficient natural light in buildings, the synchronization of biological rhythms (wake-sleep cycle) can be disrupted, resulting in mood disorders. Poor visual quality in residential buildings can also be a source of serious illness.

Criterion n°5: Air quality: given that we spend so much time indoors, the air quality must be optimal at all times, thus, an air circulation system is required to renew the internal air and evacuate the polluted one (bad odors also). Depending on the scope of the building, the system in question could very well be natural, mechanical, or hybrid.

Criterion n°6: Acoustic quality: to provide seclusion from noises generated from other units or coming from outside, a good acoustic isolation is recommended.

Criterion n°7: Hygrothermal comfort: as an important criterion, hygrothermal comfort can have a direct impact on the health and well-being of the residents. However, a person's hygrothermal comfort in any given built environment is related to a feel sensation, we must attend to a set of a well know baselines. Winter comfort and summer comfort are distinguished.

Criterion n°8: Materials: the sensory feeling of the resident's environment is, as important as, his appreciation of the visible materials that surround him in creating ambiances. Furthermore, the quality and color scheme of the visible materials has a direct impact on the psychological stimulation of the residents. A good, solid, and eco-friendly material make a long run towards attaining good well-being.

Criterion n°9: Adaptability to the users' behavior (cross-cutting criterion): now to the most important criterion of the quality of use, because fulfilling this criterion is equivalent to fulfilling a substantial portion of the quality in question. There is no regulatory oversight in this situation, only common-sense guidance. Human behavior must be considered when designing residential buildings. A residential building that accommodates the needs and requirements of its residents (cultural, social, etc.) is a building that articulates a fundamental aspect of their comfort, well-being, and life. Because it is bound to all the other criteria, this explicit criterion is transversal in nature.

In this research we will be addressing the collective social housing as our main goal for assessing the quality of use, considering that this particular type of collective housing is the more current and present in the residential building market and covers one of the largest portions of the habitant population in our society. We can most definitely consider the quality of use as a significant instrument to be implemented in our quest of reaching optimal architectural quality on all fronts.

That being said, collective social housing is one of the most difficult, complex, and challenging types of residential buildings to program, design, and post-occupancy evaluate; due to the complexity of the social, cultural, and economic structure of its different occupants.

MATERIALS AND METHODS

In this research, we will be implementing two approaches to evaluate the quality of use in the dwellings in question:

- The initial one, involves a quantitative approach, to apprehend the satisfaction of the users (in this case the residents) regarding each criterion apprehended in the depiction of the concept of quality of use. Using a questionnaire structured around the criteria used to evaluate the said quality (n°1: Urban integration. n°2: Service and ease of access. n°3: Architectural organization. n°4: Visual quality. n°5: Air quality. n°6: Acoustic quality. n°7: Hygrothermal comfort. n°8: Materials. n°9: Adaptability to the users' behavior).

- The next one is consistent with a qualitative way to analyze said quality.

A questionnaire is really a quantitative approach utilized on a population (sample) that must facilitate statistical deductions. The number of the set's items dictates the validity of the questionnaire and allows the data to be considered as reliable (Vilatte 2007).

Henceforward, a questionnaire was elaborated to apprehend the satisfaction of the targeted residents using the Likert scale method. More so, the social dimension (modifications made by the residents to accommodate the space to their particular distinctive needs) will be evaluated. Hence, figuring out the suitability between the social dimension and the architectural dimension (architectural design). It is to be noted that the two methods will be merged side by side accordingly in every criterion when demonstrating the data in the section Materials and Methods.

Case Study

The following part demonstrates the investigated case study, in which we will be evaluating the quality of use. The 700 dwellings are a housing project located in the center of Khenchela city (Figure 2). The city is located in the high plateaus area, northeast of Algeria (Figure 1).

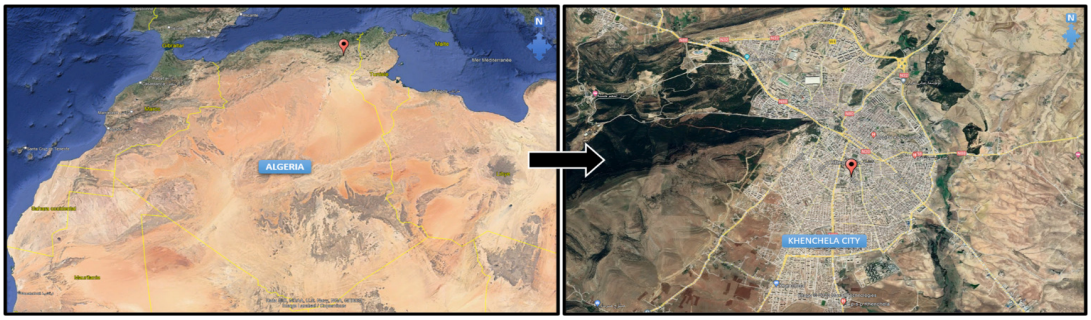

Figure 1. The geographic location of Khenchela city. Source : Google Earth 2022.

The 700 dwellings are located in a high-density area of the city, they are surrounded by residential neighborhoods and other dwellings. The site is well-identified by many landmarks (administrative buildings and schools). This housing project was built in 1978 and inaugurated in 1980. The urban layout was very basic. Apparently, the plan was just to extend and connect the surrounding streets. The placement of the buildings was mainly done in such order to accommodate the construction crane (Figure 3).

Figure 2. The geographic location of the 700 dwellings. Source : Google Earth 2022.

Figure 3. Urban layout of the 700 dwellings. Source : Google Earth 2022.

Figure 4. The 700 dwellings housing project. Source : Author, 2022.

RESULTS AND DISCUSSIONS

Criterion n°1

To start with, the residents, in this case, were asked to express their degree of satisfaction towards the building's positioning in relation to the urban layout. (Figure 5) demonstrates that 83.3% of the residents were rather "satisfied" with that criterion, as for the remaining 16.7%, they were divided between "neutral" responses (12.5%) and "dissatisfied" (4.2%).

This shows that the majority of the residents questioned where contended with this criterion, due to the fact that the urban integration is well accomplished owing to the circumstance that the dwellings are in the center of the city with a high density surrounding, despite that the urban layout was not very well thought of (except for the building shown in (Figure 6)).

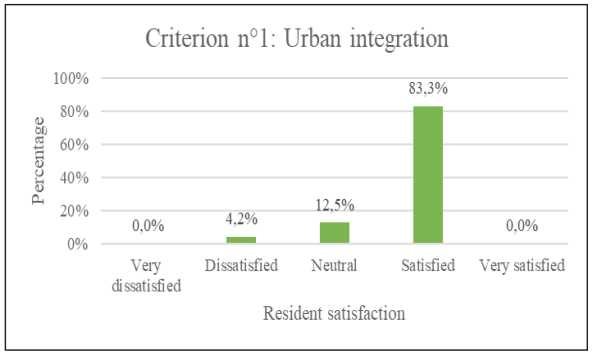

Figure 5. Residents' satisfaction with criterion n°1. Source : Author, 2022.

Figure 6. Urban layout of the 700 dwellings. Source : Google Earth, 2022.

Criterion n°2

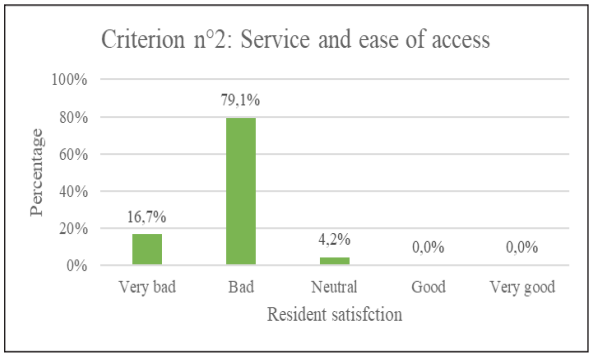

Figure 7. Residents' satisfaction with criterion n°2. Source : Author, 2022.

Figure 8. Main entrance of the building. Source : Author, 2022.

Figure 9. Main entrance's hallway and staircase. Source : Author, 2022.

Additionally, the graph above (Figure 7) reveals the residents' disapproval of the service and ease of access of their building, as it's shown 79.1% of them attested that it's "bad", 16.7% attested that it's "very bad", while none of the responses were neither "good" nor "very good", and only 4.2% were "neutral" responses.

This displays that, even if the urban integration was very well thought of, the entrance of the building remains a vital factor for the residents, and the fact that every single resident that either attested "bad" or "very bad" in the questionnaire, also expressed a major disapproval regarding the dimensions, lighting, hygiene and even safety of the entire entrance (hallway and staircase included), moreover (Figure 9) supports that.

Criterion n°3

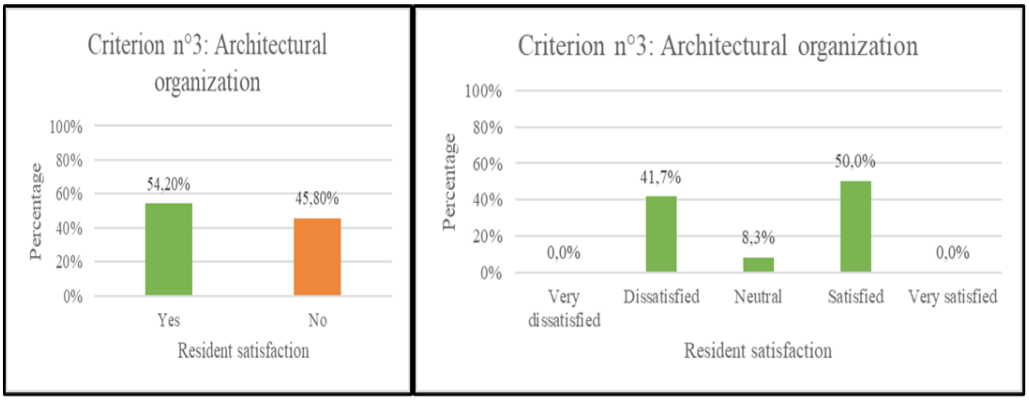

Figure 10. Residents' satisfaction with criterion n°3. Source : Author, 2022.

Figure 11. Modification made by residents: tearing down a wall to widen the living room. Source : Author, 2022.

To continue, concerning the architectural organization criterion, the residents were first asked about the functional disposition of their housing, to which 54.2% answered by "yes" and 45.8% answered by "no" (Figure 10), this shows that half the residents are pleased with the functional layout of their housings. But then again, when they were asked about their satisfaction regarding the dimensions (area) of the different spaces, the half that answered by "yes" previously expressed they were "satisfied", correspondingly the other half that answered by "no" expressed they were "dissatisfied", besides the 8.3% of "neutral" responses. As a matter of fact, the only modification made to the layout was actually to widen a space (the living room), as it's shown in (Figure 11).

This reveals that, the main concern of the residents, with regard to the architectural organization, is limited to the dimensions (areas) of the different spaces (the bigger the better).

Criterion n°4

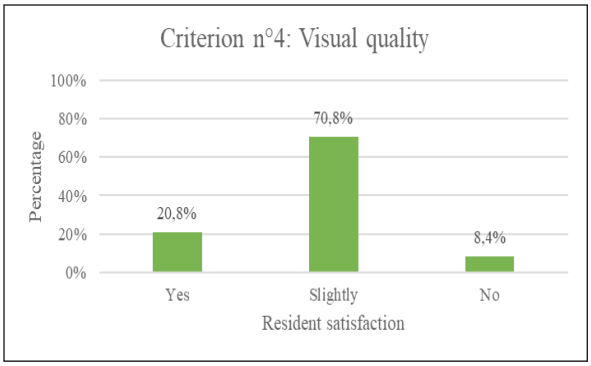

Figure 12. Residents' satisfaction with criterion n°4. Source : Author, 2022.

Figure 13. North facing front shows no direct sun light exposure even in mid-day. Source : Author, 2022.

The graph above (Figure 12) displays that only 20.8% of the residents replied by "yes" concerning the sufficiency of natural light supply indoors, and the majority (by 70.8%) replied by "slightly", whereas 8.4% replied by "no".

This demonstrates that, the majority of the residents are unfulfilled with the natural light supply indoors, especially since the ones that are in fact fulfilled, their housing is oriented to the east and the south. Whereas, the disapproving ones, are oriented north and west; as shown in (Figure 13) this particular front, with several windows, is north facing (the picture was taken in mid-day).

Criterion n°5

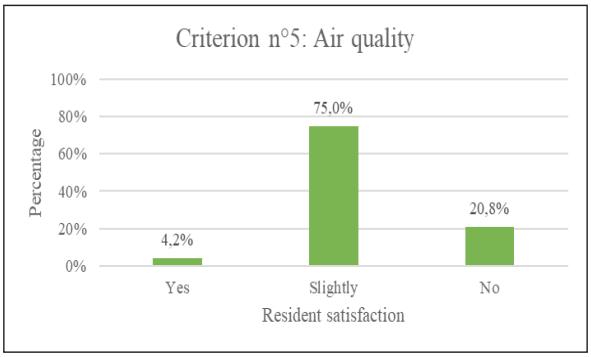

Figure14. Residents' satisfaction with criterion n°5. Source : Author, 2022.

Figure 15. The sewer system exposed and badly maintained. Source : Author, 2022.

Additionally, the graph in (Figure 14) shows that 20.8% of the residents are unhappy with the air quality, also 75% of them revealed that they are only "slightly" satisfied, and merely 4.2% were happy with it.

This only proves that poor air quality is present, considering that the residents affirmed: "bad odors originating from the sewers often blocked". (Figure 15) highlight the precedent statement.

Criterion n°6

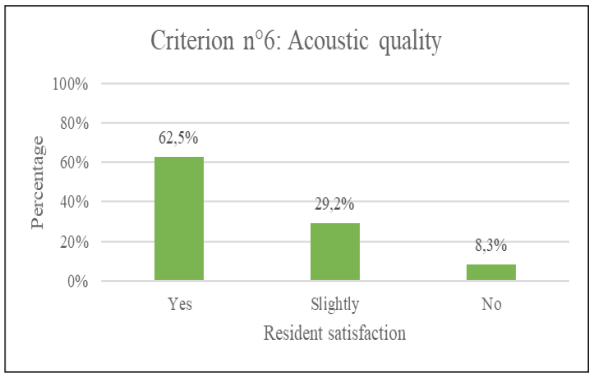

Figure 16. Residents' satisfaction with criterion n°6 (outside noises). Source : Author, 2022.

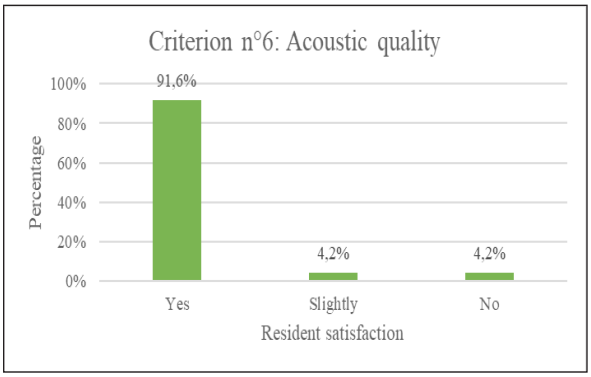

Figure 17. Residents' satisfaction with criterion n°6 (noises within the building). Source : Author, 2022.

When it comes to the acoustic quality criterion, both graphs (Figure 16) and (Figure 17), reveal clearly the dissatisfaction of the residents toward the acoustic quality of their housing. As the first graph demonstrates that, a shocking number of 91.6% of the residents replied by "yes" towards being annoyed and irritated by outside noises (nearby playing grounds), whereas, 4.2% replied by "no" although this small percentage were residents of the last floor. To continue to the second graph, a similarly large majority of the residents were annoyed by noises coming from within the building, and only 8.3% seem to not be affected by this.

The large windows along the front wall, seem to be lacking any form of acoustic isolation as shown in (Figure 18).

This goes to prove that, the low-cost nature of the collective housing of social formula, is affecting a large portion of the residents' life quality and well-being. Because, a simple acoustic isolation could go a long way in improving the said quality.

Figure 18. Large windows along the front wall, with no acoustic isolation. Source : Author, 2022.

Criterion n°7

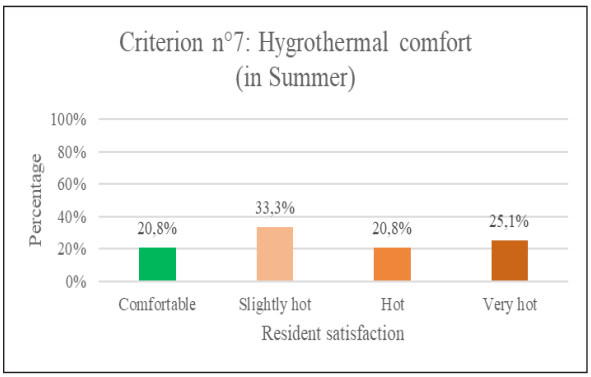

Figure 19. Residents' satisfaction with criterion n°7 (Winter period). Source : Author, 2022.

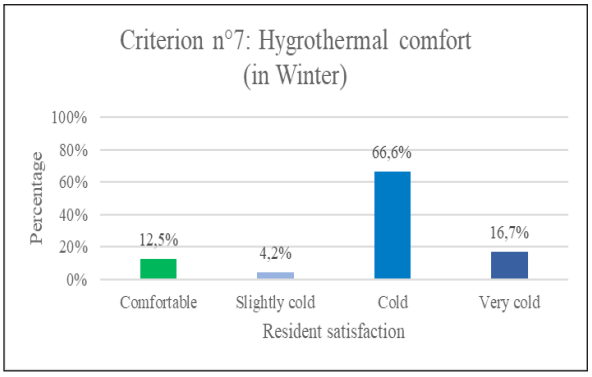

Figure 20. Residents' satisfaction with criterion n°7 (Summer period). Source : Author, 2022.

In terms of hygrothermal comfort, this specific criterion stands for the experienced state by the residents in regards to the thermal ambiance inside their housings. Therefore, the evaluation of satisfaction will be conducted according to two distinctive periods (winter period and summer period):

Winter Period

The graph (Figure 19) reveals that more than two-thirds (2/3) of the residents protested with "cold" and "very cold" in the questionnaire. Precisely, 66.6% attested "cold" while 16.7% attested "very cold". The remaining answers were divided between "slightly cold" (4.2%) and "comfortable" (12.5%).

This goes to prove that, there is a wide-ranging absence of any sort of thermal insulation in these dwellings, which was confirmed by the totality of residents when asked about the cold wall phenomenon, for, 100% expressed that they do in fact experience a cold wall phenomenon. Moreover, a decent number of residents confirmed the fact that there is no thermal insulation in the walls (they were able to see that when they did some rehabilitation work on their housing).

Summer Period

The second graph (Figure 20) on the other hand shows a different reading. During the summer period, the residents are more so equally divided in their answers, the graph demonstrates that 20.8% deemed it "comfortable", where 33.3% deemed it "slightly hot", whereas 20.8% protested it to be "hot" and 25.1% to be "very hot". Consequently, a combined percentage of 45.9% were dissatisfied during this season.

This testifies to, the fact that considerable satisfaction amongst the resident during the summer, is to be noted. However, the sum of 45.9% that protested a dissatisfaction (20.8% "hot", 25.1% "very hot") confirmed the use of an air conditioning system, it is also important to note that this same percentage of residents are fully south-facing and south-west facing, which engenders a huge amount of solar exposition during the long days of summer. Coming back to, the satisfied portion of the residents (20.8%), it is also important to know that they are north facing, which is advantaging during summer (and disadvantaging during winter), more so, they confirmed the absence of an air conditioning system.

Eventually, in regards to the hygrothermal comfort criterion, thermal insulation and optimal orientation for both periods (winter and summer) are vital factors in achieving thermal comfort for the well-being of the residents, whilst, reducing energy consumption (for heating and cooling) (being energy efficient).

Criterion n°8

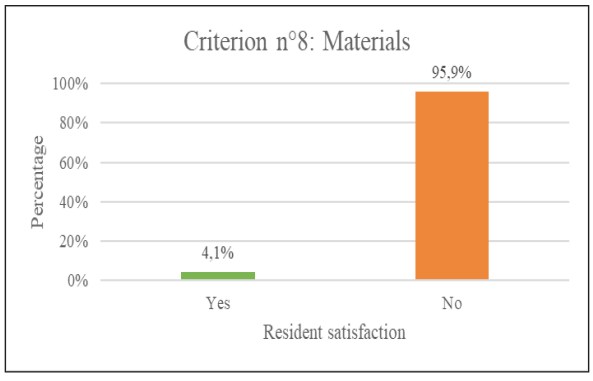

Figure 21. Residents' satisfaction with criterion n°8. Source : Author, 2022.

Figure 22. Materials modifications (replacements) by the residents. Source: Author, 2022.

When it comes to, materials appreciation, the residents plainly expressed their disapproval by a staggering percentage of 95.9%. Moreover, the vast majority of that 95.9% of residents revealed making modifications (replacement) to several materials including floor tiles, wall tiles (bathroom and kitchen), and wood carpentry (Figure 22).

This proves yet another time, that the low-cost approach of the dwellings doesn't quite work in the best interest of the residents and their well-being.

Criterion n°9

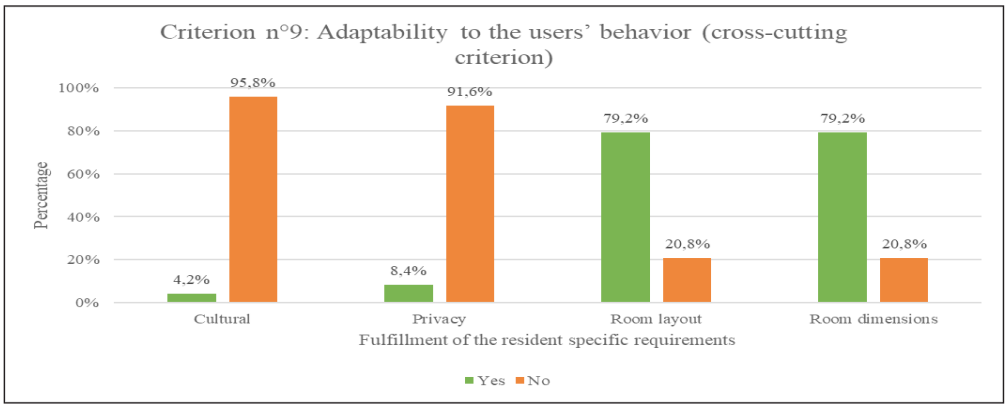

Figure 23. Residents' satisfaction with criterion n°9. Source : Author, 2022.

This specific criterion displays the adaptability of the building to the residents' behavior, as it is a cross-cutting criterion due to the fact that it is linked to all previous criteria on an architectural scale. In addition, the graph (Figure 23) demonstrates the degree of the residents' fulfillment regarding their specific needs and behaviors, being taken into consideration or not. Thus, as the graph shows, an obvious gap is noticed between the cultural dimension (along with the privacy factor) and the space requirements. It can be seen that over 90% of the residents testify that their cultural needs (95.8%) and their privacy requirements (91.6%) aren't met. Whereas, over 70% of them reveal that their space requirements are fulfilled: 79.2% satisfaction with room layout and 79.2% satisfaction with room dimensions.

This proves that essentially the residents of that region incline to be more concerned about the fulfillment and consideration, at the architectural design level, of their cultural needs, traditions, and lifestyle requirements. Moreso, the following part will demonstrate even more the impact of the cultural dimension on the behavior of the residents.

Figure 24. Modifications made by the residents to adapt their housing to their cultural needs. Source : Author, 2022.

Figure 25. Privacy problems that led residents to modifications. Source : Author, 2022.

As exhibited in (Figure 24), the residents made a significant number of modifications to accommodate their needs. And by doing so, they are adapting the architectural design to their behavior and special requirements. As it shows, points 1 and 2 of (Figure 24) display the removal of the wide opening of the balcony. While point 2 was successful in doing so, by narrowing down the wide opening to a normal size window, point 1 only used a curtain to preserve privacy (point 4 shows more details from the inside). As for point 4, a more radical approach was used, the picture shows that the resident eliminated the entire row of wide windows and replaced them with much smaller windows to ensure optimal preservation of privacy. To continue, point 5 reveals a much significant downsizing of the kitchen's window due to the fact that it is a more privacy-demanding space due to its occupants.

Additionally, (Figure 25) offers a clearer view of the situation, it is shown that the residents suffered from a "face to face" problem with the neighboring building, thereby, a privacy problem on a cultural level, which drove the actions of the residents to downsize the several wide windows.

Finally, although the modifications made by the residents were detrimental to the building's façade, and quite probably against architectural laws; we can only blame them to a certain extent since their needs, cultural background, and requirements weren't taken into consideration at all in the design process of the dwellings in question. Therefore, a post-occupancy evaluation process and a feedback approach would be vital to future housing projects.

CONCLUSION

The fact that the quality of use wasn't implemented in the design process (nor the programming process), as proven earlier, triggered a series of issues that varied from comfort aspects to alternating modifications (as was illustrated earlier). In fact, a housing project can't possibly be a response to the sum of expectations and needs of the totality of residents, nor to individual practices that per definition are linked to individuals. Nevertheless, this should not and must not be an argument to exclude the importance of putting the resident's cultural and social needs, expectations, and difficulties in a primary state (from the very beginning and through involving them early on). Mainly by implementing the quality of use as an instrument to achieve the so very much desired architectural quality.

From a different perspective, resolving the crises of housing, no matter how problematic and challenging may it be, should absolutely not be at the expense of the well-being, quality of life, and sociocultural needs of future residents. As may that be the doorway to a whole new wave of problems that could never be recovered from. As it could be the main root of social problems coupled with huge visual pollution and disorder in the residential neighborhoods (the dwellings). Thus, an assessment and implementation of the quality of use are rather essential in ensuring the best quality of life and well-being possible for the residents, while granting optimal architectural quality. The assessment of the quality of use mainly facilitated the apprehending of the criteria to be utilized in future implementations of said quality.

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