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From Temporary to Permanent; A Circular Approach for Post-disaster Housing Reconstruction

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Abstract. Housing crisis is an evitable outcome of most of post-disaster scenarios due to the massive destruction they usually produce. Therefore, the reconstruction process and particularly in terms of housing is considered as an evident prerequisite in handling disasters' aftermaths. Temporary accommodation alternatives have been widely assumed in a variety of post-disasters cases as a primary step of the reconstruction process. Yet despite this fact, they have been broadly criticized for being unsustainable and resource-consuming. This matter can negatively affect the recovery process of the disaster-affected communities at different levels. Those effects can be even more serious when hitting developing countries, turning them more vulnerable. Still, there is an insistent need to find a rapid action to accommodate the disaster-affected people following their displacement while reconstructing their permanent homes. This paper proposes an incremental housing strategy which could form a key part of a proactive strategy that has not been offered by conventional methods. It provides time-efficient housing construction approaches while responding to the immediate large-scale interventions. Likewise, it bridges over the two phases of temporary and permanent housing in one integral transformable process that relies on efficiency and adaptability. The paper also discusses the sustainability aspects of executing the incremental strategy and examines its qualitative outcomes that contribute to a circular built environment in disaster-disrupted communities.

Keywords: Temporary accommodation, post-disaster reconstruction, incremental housing strategy, resources efficiency, adaptability.

1. Introduction

Many countries around the world have experienced disasters and wars which have had plenty of material and moral disadvantages over those nations and their inhabitants. The destruction of the urban construction and built environment is one of the most dangerous physical outcomes of wars and disasters due to the serious impacts it creates on the lives of individuals and families, undermining different normalcy aspects of them related to the livelihood, security, privacy and stability[1]. In this context, the



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reconstruction of houses has a high importance among other structures due to its significant role in re-establishing the social environment of the communities and retrieving their functions in order to revive the dynamic environment and development of the urban areas and cities which represent the vital pivots of the countries [2]. As the reconstruction and repair of damaged and demolished houses is usually a long process and may take a considerable time for the properties and homes to become inhabitable once again. It is necessary to provide the disadvantaged groups with temporary accommodation to resume their households' activities and normal life responsibilities during the gap time between the aftermath of a disaster or the end of a war, and the completion of the reconstruction process of the permanent houses [3].

Temporary housing solutions have been widely considered in many of post-disaster and post-war experiences through different forms, and they played significant role in gradually bringing the individuals back to their normal lives and activities while reconstructing their residences. On the other hand, temporary housing is considering as a controversial issue, and has been extremely criticized, due to different problems and factors of sustainability and cultural inadequacy [2].

1.1. Post-disaster reconstruction stages

Post-disaster reconstruction normally starts from the onset of the devastative action until the provision of the permanent housing solutions [4]. The reconstruction process in terms of housing is usually confronted by tackling the prompt need to have short-term action, simultaneously whilst considering the long-term concerns of the community sustainable development [5]. Quarantelli has subdivided the reconstruction process in terms of re-housing following a disaster into four stages[6];

1. Emergency shelters, which represent the immediate relief that receives the displaced families during the peak of emergency directly following the destruction of their properties and often without previous preparations as it occurs within hours following the destructive action.
2. Temporary shelters, which perform the next stage where the families move to within few days following their displacement and often without high previous preparations [7].
3. Temporary housing, which is temporary as well, but it occurs for a longer term than the previous stage, since it is supplied by higher features for relatively higher qualities of life than the ones in the precedent stages, and it is expected to be provided for the affected families within weeks to few months following their displacement, thus, they would have the ability to re-practice their daily routine and resume their responsibilities and activities.
4. Permanent housing which represents the finite rebuilt home, where the affected-families eventually move into and reside permanently by the end of reconstruction process. This stage normally runs simultaneously while the people reside in temporary accommodation alternatives.

The construction process of the permanent housing is considerably long and may take few years, as it is related to several factors and variables taking into consideration the distinct proportions and levels of damage in each affected zone [2].

1.2. Temporariness and transitional living

Emergency architecture and building for the temporariness following crisis scenarios has become a phenomenon in the recent decades, posing the affected people to express the phase of transitional living, which imposes plenty of questions concerning culture, stability, identity, affiliation, sense of home, and other critical issues [2].

Temporary structures that are used in post-disaster and post-war scenarios overwhelmingly end up to be permanent without intention nor preparations. The lack of planning for long-term occupancy makes them deficient by the time. Other destinies that the temporary structures usually experience are demolishing, relocating, selling, etc. as figure1 illustrates.

These actions are often financially unviable and give a sense of interruption of the normalcy that the inhabitants seek, the matter that may deprive them from their psychological needs concerning their stability, affiliation, comfort, and privacy, leaving them vulnerable to the stress of transitional living. Therefore, it is very important for the displaced people to have an adequate first housing experience

after their displacement to regain their stability and comfort in order to get over their trauma and move forward with their normal lives and practices [2].



Figure 1. Temporary housing usual destinies. Figure by: Rand Askar.

Plenty of reconstruction programs have been confronted by a contradiction with the necessities of the inhabitants that had led to their dissatisfaction, which sometimes results in disapproval or even abandonment or being modified by the residents [1]. Therefore, the needs of the target community should not be neglected but considered from the very beginning of program setting. Recently, the issues of speed and scale have become more critical [8] and the rapid growth of the urban areas that could be an outcome of a disaster or a war, normally accompanied by random expansions and informal building which result in slums especially in low-income societies. This issue has been steadily gaining worldwide attention [8], since one third of the world's urban population is now living in slums and informal clusters which particularly form 70 percent of the housing in developing countries. These slums and informality matters need effective actions in order to get controlled or prevented from upgrading arbitrarily. Moreover, the structures and constructions of conventional instant buildings are mostly problematic

considering the economical obstacles that most people face [9], besides the social inadequacy issues that might not meet the actual and immediate capacities of the newly-revived communities[8].

A strategy known as incremental housing could form a key part of the solution, as it may produce a response to the immediate large-scale interventions, complying with a proactive strategy which has not been offered by conventional methods that provide instant housing construction approaches [8].

2. Incremental methodology

The incremental term has been argued by several architects such as John Turner, Bernard Leupen, Alejandro Aravena, and Filipe Balestra among other precedents to formulate a housing strategy in order to find an answer for the displacement and homelessness issues [11], which results from housing destruction following a disaster or a major community event such as wars or conflicts. More importantly, it addresses the instability and protection issues concerning temporary accommodations and transitioning between different types of residences that the disadvantaged people experience while constructing their permanent homes [2].

Incremental strategy relies on the adaptation of each construction step with the local capacities and allows the evolution and expansion simultaneously with the community growth and development [11]. It embodies a moving state of architecture that could replace the static state in time-based and promptly responsive statuses as it is required in post-disaster and post-war cases through the transition phase of recovery and reconstruction. That is to say that incremental architecture could lead to a new visibility of permanency which expresses the flexibility aspects of architecture in a further manner.

The process arises from a starter core which must be built in subjection to specific guidelines, in order to allow safe expansions and appropriate construction approaches in the future. Thus, providing the resident with a finished part of a house to live in while constructing the other parts of this house at the same time [12]. This core generally consists of a living space with a kitchen and a bathroom, with connections to the urban area. The infrastructure is also developing incrementally along with the core units since the starter cores along with their land frame help in defining a neighbourhood and streets and provides a range of options for future expansions [8]. The residents are responsible to adding the next layers of extensions according to their capacities and needs over an unspecified time limit. In that way, they evolve their dwellings flexibly without cost and time constraints to eventually achieve their desired home. Figure 2 illustrates the methodology of incremental strategy.

Similarly, Architect Alejandro Aravena referred to the process he used in his project in “Quinta Monroy” as “infrastructure as housing” where he constructed two-story half houses with a space left between houses for expansions. Each half house formed a core of a home to be completed by the residents and contained all the basic and essential elements and utilities which cannot be built by the residents such as the supporting structure, stairs, bathrooms and kitchens. The rest of elements; partitions, interior finishes, and the remaining enclosure would be left for the families to build. Figure 3 shows a housing unit in “Quinta Monroy” before and after expansion.

2.1. Incremental housing for post-disaster and post-war reconstruction

Incremental housing presents a housing strategy that has been adopted in plenty of frames regarding housing crisis in situations such as; social housing, post-disasters housing, refugees housing, and other situations of emergency architecture [11], since it is capable of forming a rapid answer to the housing crisis and give a significant effect in improving the situation. Incremental strategy has been assumed in various contexts from the very initial stages of post-disaster and post-war reconstructions expressed in advanced types of shelters such as transitional shelters, core shelters, and progressive shelters among others. What makes the incremental strategy potentially functional in post-disaster cases is its capacity and efficiency in dealing with displacement and instability issues that the disrupted community experience following the disasters or conflicts. Considering its coherent relationship with the sustainable urban development, it provides a flexible and affordable solution for housing crisis [11]. It represents a strategy based on time-efficiency that bridges over the two phases of temporary and permanent housing and blends them in one integral process that shortens the borderline which splits them up [11].

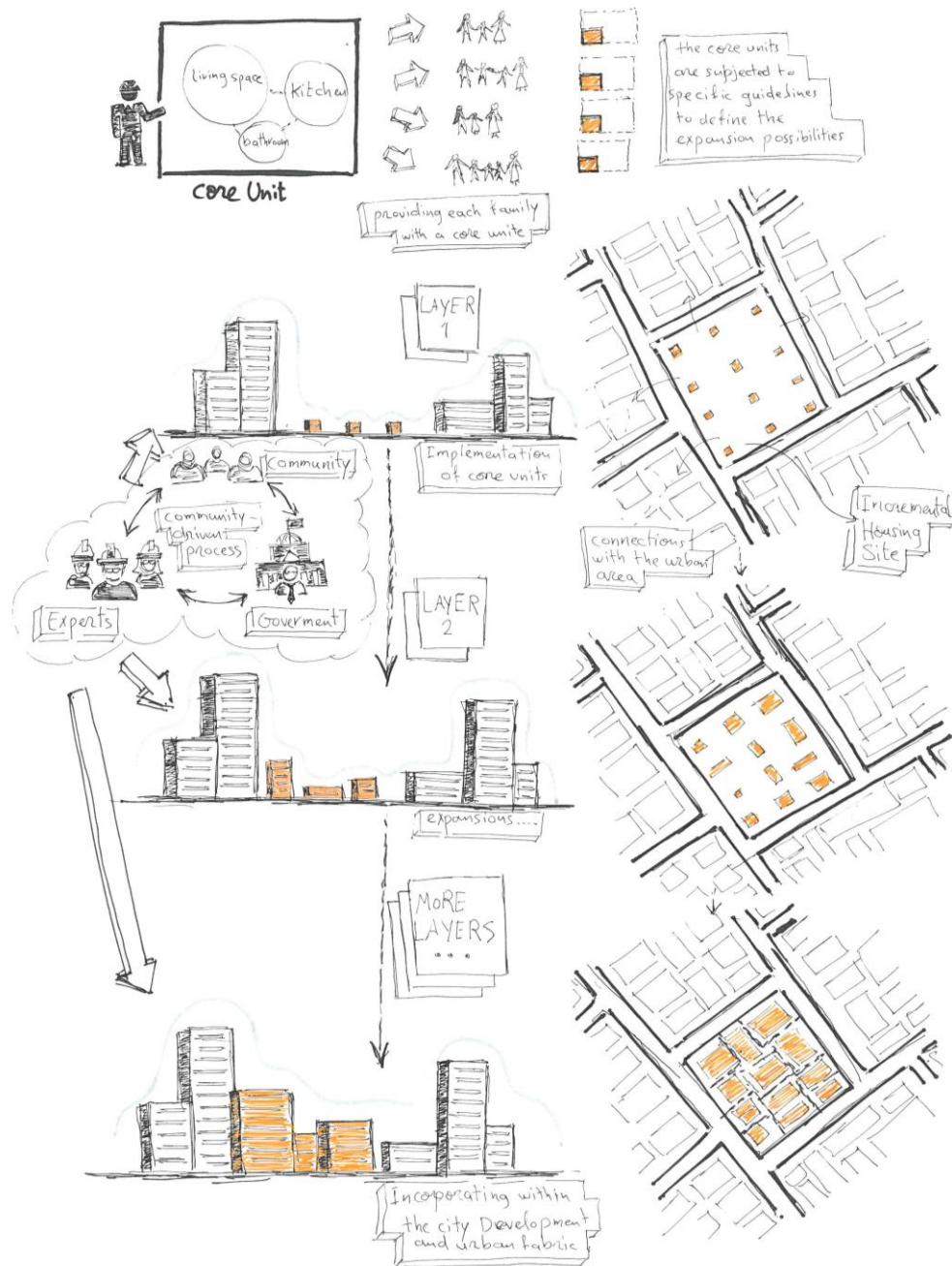


Figure 2. Incremental Methodology. Figure by: Rand Askar.



Figure 3. Quinta Monroy before and after resident's additions. Source: Elemental 2014.

2.2. *When can incremental housing occur?*

For disaster struck or war torn communities, incremental constructions can be built in the sites of governmental reconstructions and places of home reparations. After the disruptive action of a disaster or war, the affected people should directly move to temporary accommodations while the government repairs or rebuilds their properties. Incremental constructions could start then in a certain framework supported by some agencies and other governmental institutions and form an answer for people homelessness by acting as temporary housing in the initial stages then evolve incrementally to be the future permanent housing.

2.3. *A narrative of flexible increments*

Flexibility means the ability of transformation in response to the changing needs and practices. Architecture is an adaptable practice that requires time considerations in terms of construction to respond to the changeable uses, practices, and activities of its users. To that end, the starter core must have simple but considerably sufficient elements and features that satisfy the functional and vital needs of the target families, in other words, it should provide a simple multi-purpose space with accessible facilities [8]. The residents could then control the evolution and extension of their own space based on their capacities and requirements. So mainly, incremental housing offers the minimum and acts as an affordable way to resettle the displaced, homeless, or even low-income families and reconnect them with the urban life and development. This could be achieved from the earlier stages of the construction process depending on the existing infrastructure and the surrounding urban styles. Furthermore, this strategy gives the residents wider options concerning the decisions of forming their homes and promoting the possibilities of flexible expansions and spaces divisions, as each step or increment comes up with adaptability, flexibility and sensitivity potentials [2].

2.4. *Permanency is the new temporality*

Underestimating the time factor through the design and planning considerations results in many architectural failures, which blur and ignore the evolution of the architectural object over time and the influences of the surrounding temporal and fixed circumstances [13]. Contemporary architecture has more demands as it requires a wider consideration of the time factor and maintains adaptability over time. Furthermore, the matters of speediness and scale are becoming more controversial and provoke further challenges nowadays especially in the cases of disasters and wars [8].

Oftentimes, temporary structures turn out to be permanent with time but lacking sufficient features due to poor consideration and planning. On the other hand, the communities are rapidly growing and changing, while the architectural appearance of the urban frame is still adapting slowly. In this quest, Leupen has expressed that it is hard to found a reality for the slow-moving medium as buildings under the quick movement of modernization and the unpredictability inherent in the process [14]. The incremental housing strategy can be a successful key point for such cases, as it transcends the borders between temporary accommodation and permanent housing phases by defining each one as a complementary to the other to form a complete process. Likewise, incremental architecture poses is the permanency that forms a major basic for family stability. Taylor proposed that “a community’s longing for permanence could be the new aesthetics of the temporary” [13].

2.4.1. *Affordability for low-income communities.* Providing affordable houses relies on adopting some subsidization policies that are capable of minimizing costs of housing options, thus, allowing more people to obtain a housing opportunity. These affordable solutions move from having a housing space with primitive and basic services that eventually turn into a complete house through a community-driven process [2]. This differs from owner-driven process which is usually followed in informal clusters or slums, thus, it acts as a feasible way to meet demand at low cost and uses the capacities of the settlers, which in return establishes an identity relationship between the inhabitants and their new homes [8].

Building complete housing units limits the number of families to be housed, since it is accompanied with increasing costs, but they rapidly provide ready units with questionable quality. While conversely,

core units providing minimum absolute needs can receive larger numbers of families with minimum costs. In this quest, Turner observed that when people have freedom to act, they prefer to live in large unfinished houses rather than in small finished ones [15].

2.4.2. *psychological recovery*. In the disrupted war-torn or disaster struck communities, wide impacts are observed not just over the physical appearance of the cities and urban settlement, but also over the people and inhabitants of these communities. As Relocating and transitional living always forms an inconvenience and stress for people, since their sense of home and protection has been interrupted, incremental housing solves the issues of psychological needs like privacy, dignity, comfort that are higher after a trauma [2].

2.4.3. *Guided community participation*. Incremental housing could hold further value than the building process itself, it could establish and support the social networks and offer some small-scaled commercial opportunities [8]. Likewise, it gives the opportunity for the community to participate [11] by involving the people in decision making concerning their own living environment [9], allowing them to contribute to the design process and formation of their own residential spaces and adopt their own way of living. Therefore, this strategy could form a positive answer to the problem of cultural inadequacy that occurs in most of post-disasters and post-war reconstruction scenarios.

2.5. *Organized informality*

High rates of urban growth and unsuccessful approaches of housing and spatial planning policies directly result in high growth of informal settlements [2]. The process of people-driven construction without authorization has been controversial due to the problematic issues it produces [9]. These issues are related to the quality of life within the informal settlements which have negative influences over the city scale to the minimum scale of individuals [9]. These informal housing squatters are characterized by insecurity of tenure alongside low standards of infrastructure and services [2].

Incremental housing strategy has been adopted as a key solution to the unregulated and amorphous conditions existing in informal settlements and slums, as it enables a three-sided collaboration process [9]. Here, the three actors are; individuals, public sector (governments), and private sector (experts), all brought together to act in an organized coherent relationship in a more efficient method represented in re-planning and reorganizing the slums and informal settlements. In addition to upgrading and improving them to have a homogeneous appearance that fits the surrounding city's architectural environment, along with creating a dimension which establishes key roots in the places where people interact with the support of their community.

3. Towards sustainable development and circular economy

Incremental strategy could be affectively employed in many construction practices that contribute to the international planning towards resource efficiency and circular economy in the construction sector which have been recently attracting worldwide attention for sustainable urban development focusing on incorporating economic, environmental and social aspects within a multidisciplinary long-lasting process to address the constantly changing needs and values of urban environments and communities.

The Construction industry is considered the number one consumer of global virgin resources and raw materials, as it consumes 40% of the global energy and resources in addition to the harmful environmental effects represented in the release of one third of the global greenhouse gas emissions which results in the risk of resource scarcity. Thus, there is a huge global interest in designing future buildings on concepts of resource efficiency, adaptability, and circular economy in order to enhance the productivity of global construction industry, save costs, increase building capacity, improve resources proficiency, foster innovation and job creation opportunities, and enhance the sustainable development process [2].

4. Conclusion

Temporary housing has been widely criticized for being unsustainable in terms of cultural inappropriateness and economic viability. Moreover, the units generally last more than intended and thus, they have a tendency to become permanent. This has some future effects over the afflicted urban area's appearance and its urban fabric; therefore, it must be planned from the beginning considering its prospective durability. The sustainability of temporary housing units questions the destiny of these units after their interim use for temporary accommodation, in other words, their latter use after they are no longer considered for temporary accommodation.

In this context, incremental housing strategies have been adopted as an alternative that replaces the stage of temporary housing, as they incorporate both the concept of temporariness of temporary housing phase and the permanency of permanent housing phases within a complementary process that bridges over the two phases, along with its other beneficial aspects of embodying economic, social and environmental sustainability by saving huge resources and materials, incorporating adaptable design and providing affordable solutions which all contribute to the sustainable development and pave the way towards a circular future in the affected countries.

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