

Transitional housing. Adaptive and Sustainable Design Strategies for Gaza Strip Reconstruction

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Abstract

This paper presents the experience of Università Iuav di Venezia as a consultant to UNDP/PAPP in developing design strategies for a transitional community neighborhood in the Gaza Strip. Recognising the complexity of the humanitarian crisis and the challenges posed by protracted and evolving conflict, the paper proposes an adaptive and replicable design framework. The strategy shifts from a rigid conventional top-down model to an adaptive, bottom-up methodology, introducing design processes guided by a cohesive urban vision. The strategy proposed involves an integrated and incremental set of phased interventions, implemented through a community-based and area-based approach. The outcome is a transitional community neighborhood designed to meet immediate recovery needs while facilitating long-term reconstruction efforts. The proposed transitional housing system provides a medium-to long-term solution, with the potential to evolve into permanent housing or public services according to contextual needs. Flexibility remains a core design principle, enabling site-specific urban configurations tailored to the distinctive characteristics of different locations within the Gaza Strip.

keywords: transitional housing; early recovery; community-based approach; sustainable reconstruction;

Introduction

The paper presents a transitional community neighborhood design developed by a joint team from the Università Iuav di Venezia¹ as part of a collaboration with the United Nations Development Programme / Programme of Assistance to the Palestinian People (UNDP/PAPP) – the UN Office established through the UN General Assembly Resolution 33/147 of 20 December 1978, which called upon UNDP to «improve the economic and social conditions of the Palestinian people [...]»².

Within this framework, Università Iuav di Venezia conducts research on planning and design strategies aimed at supporting UNDP through in-depth knowledge and on-the-ground experience in urban and territorial transformation processes, with a particular focus on post-conflict reconstruction. The results of this research, carried out by a team of researchers and expert consultants, were recently published in the book *Proactive Reconstruction* (2025), presented at the 2025 Venice Biennale of Architecture.

A recent follow-up phase of the research focuses on the development of a transitional³ community neighborhood, conceived as a pilot project to test and verify design hypotheses related to technological solutions that enable high levels of flexibility, adaptability, and incremental development. The pilot project will act as a testing ground for fully constructed building elements, with subsequent possible large-scale applications.

The approach is intentionally tentative and empirical. The project remains open to plural design expressions, strongly shaped by the changing and evolving needs of different population groups. Thus, flexibility and adaptability are precisely the qualities that enable the project to integrate insights proposed by local communities, local authorities, and international non-governmental organizations. Implementing a pilot project is crucial, as it permits the testing of key assumptions and the rectification of any potential shortcomings.

The research aims to provide an alternative design to the prevailing standard of transitional sheltering response in emergency contexts. Currently, sheltering solutions are built within a short time frame and then rebuilt or upgraded multiple times on the same site due to the protracted nature of displacement situations and the delay in implementing formal reconstruction (Picker and Pasquetti, 2015; Agier, 2002). In contrast, our research introduces an alternative approach that starts with the construction of a structure capable of evolving over time: initially addressing urgent, short-term emergencies and progressively adapting to meet long-term necessities. The temporal dimension is inherent in the project's process-driven character.

This processual approach starts from the recognition of the impossibility of outlining a fixed design solution and rather embraces the role of the designer as a definer of spatial principles (Gregotti, 1966) and of urban metamorphosis (Albrecht and Benevolo, 1990; Benevolo 1996) within a range of infinite variations.

Given the geopolitical uncertainties in the Middle East and the ongoing devastation affecting not only the Gaza Strip but also parts of the West Bank – particularly within the Palestinian territories – identifying suitable locations for the placement of the designed units remains challenging. However, mathematical models, applied through

1 Namely, the Urbicide Task Force and C.SCARPA research centers (www.urbicide.taskforce.iuav.it; www.iuav.it/it/strutture-e-reti-di-ricerca/centro-superiore-c.scarpa).

2 The UNDP Programme of Assistance to the Palestinian People, established under UN General Assembly Resolution 33/147 (1978), aims to improve the socio-economic conditions of Palestinians and support the establishment of a viable state capable of ensuring development and resilience. Key interventions focus on governance, enhancing justice, cohesion, and institutional reform; economic empowerment through sustainable, self-reliant poverty reduction; environmental improvements in water, services, and climate adaptation; and infrastructure development in energy, transport, housing, education, and healthcare for marginalized areas.

3 “Transitional housing or transitional community neighbourhood” generally refers to an intermediate housing or neighbourhood solution for displaced people between emergency shelter and long-term accommodation for displaced people, considering three different types of solutions at different times. In this paper, however, “transitional” is understood as a gradual process of stabilization—on the same structure from temporary shelter to increasingly stable—and as a potential transformation of these spaces into public areas and services following reconstruction.

automated and parametric approaches, can provide valuable support in planning reconstruction processes in advance, while anticipating issues related to urbanization dynamics.

Design choices are inherently influenced by the characteristics of the territory in which a project is located. These factors include topographical conditions, location, climate, economic factors, and larger socio-political dynamics. For example, to design interventions in the Gaza Strip today means responding to a complex web of regulatory, logistical, and material limitations, including above all the policies enforced by the Coordinator of Government Activities in the Territories (COGAT). Among its many roles, COGAT controls the flow of goods into Gaza, including construction materials labeled as “dual-use”: items that could have both civilian and military applications, and are therefore subject to strict restrictions. This regulatory context became a key element of the transitional community neighbourhood. Materials have been selected not only for their capacity to be sourced and manufactured locally, as well as strengthening the local labor economy, but also because they comply with the restrictions imposed by COGAT. Therefore, constraints were reframed as an opportunity to introduce innovative, context-sensitive features into the transitional housing model. The design process must therefore remain context-specific, taking into account local conditions striving, as much as possible, for an adaptive design strategy.

Reconstruct in Uncertainty / A revised/An evolving approach to reconstruction

The research on the transitional community neighborhood is based on broader investigations conducted at Iuav since 2016, which has focused on methods and forms of urban and housing reconstruction following natural disasters or conflicts (Galli, 2024).

The comparative analysis of reconstruction processes, in both quantitative and qualitative terms, has provided valuable benchmarks for refining future reconstruction patterns. However, the unprecedented scale of current destructive phenomena calls for innovative solutions capable of putting past lessons into practice.

In fact, we are witnessing a substantial change in the form of conflict, or of perpetual instability (non-peace), which sees a progressive increase in the involvement of civilians, both victims and targets, compared to the past. The consequence is that cities have become the preferred battlefields, and their destruction, via ground or air, has become a primary strategic goal for military and political purposes.

This condition leads to the reemergence of the term “urbicide” in urban discourse, defined as the deliberate violence against cities, their destruction, and the intentional elimination of physical space, collective memory (Caro, 1974; Bogdanovic, 1993; Ribarevic-Nikolic and Juric, 1992; Graham, 2005), as well as the displacement, fragmentation, or erasure of the communities that inhabit them.

When comparing these past events with the current situation, it is important to note that historical urban reconstructions, particularly those following World War II, typically occurred once a period of pacification had been achieved. While the planning for reconstruction often began and even progressed during wartime, with a prime example being the drafting of the London Plan developed while London was experiencing significant bombing from the Blitz, the actual rebuilding largely commenced after hostilities ceased.

Unlike past eras, the persistent and ever-changing nature of contemporary conflicts means that planning for reconstruction solely after peace is secured is no longer a viable approach.

Gaza, sadly exemplifies this reality. If the conflict is viewed not solely through the lens of the most recent war between Israel and Hamas, but rather as an escalation within the broader Israel-Gaza conflict, or even as a phase of the ongoing Israeli-Palestinian conflict, its implications become more evident. As a result of this protracted violence, eight United Nations Relief and Works Agency (UNRWA) refugee camps were established in the Gaza Strip, most of them between 1948 and 1952, following the 1948 Arab-Israeli War.

In the face of this protracted conflict (Azar *et al.*, 1978), the fundamental assumptions for both an emergency-type response and traditional reconstruction efforts no longer hold true. Protracted displacement and extended stays in refugee camps have marked the failure of emergency-oriented responses, leading to various forms of waste from social, environmental, economic, and urban perspectives.

At the same time, traditional top-down reconstruction efforts do not meet the circumstances needed for success, due to both the geopolitical uncertainty required to ensure the viability of such operations and the exceptional scale of destruction of the urban fabric.

We therefore advocate an alternative reconstruction approach - one that does not forgo a long-term perspective - while enabling rapid interventions, based on updated data, guided by parametric calculations, and that is capable of adapting to unforeseen changes.

Data-driven Approaches to Urban Recovery in Conditions of Prolonged Uncertainty

In response to these complex challenges of post-conflict reconstruction under conditions of prolonged uncertainty, a new methodology has been evolving — one that advances the integration of parametric design logic within spatial data infrastructures to support real-time, evidence-based urban recovery. This approach reflects a broader trend in urban planning toward computationally enhanced decision-making, in which geospatial technologies and algorithmic models are employed to simulate, evaluate, and iteratively refine planning strategies in dynamic, data-intensive environments (Batty, 2013). These tools provide a rapid and objective means of supporting complex decision-making processes. While they cannot substitute for on-the-ground surveys, they offer valuable insights during the earliest stages of response. These systems are increasingly able to synthesise heterogeneous datasets, from satellite imagery and cadastral maps to demographic surveys and on-the-ground observations (when available), into coherent and actionable spatial intelligence. Within this context, two computational modules were designed and tested to support recovery planning through a structured, data-driven methodology. Specifically in the Gaza Strip — one of the most severely impacted and densely populated crisis regions — these tools provide a valuable framework for planning amidst extreme infrastructural devastation and persistent geopolitical volatility.

The first — the Land Selection Module — is a powerful analytical tool designed to identify appropriate sites for transitional shelter and the relocation of displaced communities. It is grounded in physical and social recognition processes, implemented through a complex, multi-level evaluation process. At the physical level, the module operates at the urban scale to assess damage severity using high-resolution satellite imagery and orthophotos. This analysis is based on a standardised classification system applied to a 250-meter grid, resulting in a damage-density matrix that ranks areas according to the extent of destruction and the concentration of affected populations. The results are then cross-referenced with land ownership information—specifically prioritising public or semi-public lands, such as government or *waqf*⁴ parcels, to identify legally and procedurally viable sites for immediate intervention. From a social perspective, the module incorporates principles of community attachment by prioritising areas that allow displaced populations to return as close as possible to their original homes. The main objective is to preserve existing social relationships and support the stability of cultural and communal life. The result is an interactive heatmap that highlights and ranks potential intervention areas according to socio-spatial relevance toward a recovery-oriented planning strategy.

The first simulation was performed using only two space layers: damage assessment and land ownership. Although these serve as a solid starting point, a more accurate and better-adapted application would require

4 According to Muslim law, *waqf* refers to the act of relinquishing the benefits or income derived from an owned asset, so that it can be used for a good cause or public benefit. The person who makes the *waqf* retains legal ownership of the asset, but its use is permanently dedicated to a charitable purpose. The asset, often land or property, cannot be sold or inherited once it becomes *waqf*, even though it still legally belongs to the person who made the donation. David Santillana, *Istituzioni di diritto musulmano malechita*, Roma, Istituto per l'Oriente, 1938, II, pp. 412–451.

additional spatial variables. To name just a few: proximity to functioning or partially damaged infrastructure, access to public services, or buffer zones from the Israeli-controlled border could drastically improve the accuracy of the outcome. A key feature of the module is its capability to apply different weights to the chosen parameters and sub-criteria, enabling decision-makers and planners to adjust the influence of individual parameters according to shifting operational conditions or specific planning agendas. This flexibility preserves the entire tool's applicability despite political and humanitarian uncertainty while maintaining a data-driven approach and strategic consistency.

Based on these outputs, the second module – the Neighbourhood Simulation Module – enables the investigation of context-driven sheltering solutions. Instead of forcing a single solution on all, it provides an opportunity to test a variety of spatial typologies: modular units, tents, prefabs, caravans, etc, despite the constraints and possibilities of a given site. This module supports quick and easy comparative analysis of planning scenarios based on a multi-criteria assessment, in order to identify the most sustainable and operationally feasible spatial configuration.

The two modules provide a flexible yet methodologically rigorous technological infrastructure that can easily adjust to shifting conditions and still remain consistent with long-term strategic goals. More than technical instruments, the Land Selection and Neighbourhood Simulation modules are “knowledge systems”—translating uncertainty into an organised, transparent, and public urban reconstruction procedure.

In addition to simulating initial emergency responses, it would be beneficial to implement the platform for the reconstruction and development phase, too. By adjusting data and criteria, it can serve as a valuable tool for coordinating all actors involved in reconstruction. It can function as an open online space accessible to a variety of users and be user-friendly, including the local population with whom programmatic decisions can be shared, donors to ensure transparency of funds, as well as technicians and researchers.

A Bottom-up Strategy

The coordination of reconstruction efforts becomes a crucial dimension of the process. While parametric tools can significantly support such coordination, what can truly shift the paradigm is, above all, an approach grounded in small, self-contained units, whose aggregation will ultimately lead to comprehensive reconstruction. For this reason, the luav design strategy—an alternative to standard emergency strategies—advocates for a bottom-up approach composed of small-scale interventions applied at both the architectural and urban scale.

At the architectural scale, transitional community neighborhoods are conceived as pieces of urban fabric designed to host small communities. These neighborhoods are initially composed of housing units, each hosting around 12 people and arranged along a main street. Gradually, an increasing number of housing units expand around the existing structures, extending onto contiguous plots of land.

At the following stage, some rooms of the housing unit can be reconverted into public facilities such as markets, taking advantage from the facing on the street frontage. Gradually, other houses can be converted at the ground floor into public facilities such as schools or small clinics, while inhabitants relocate to upper levels. The ground floor of the building can thus evolve over time, scaling its equipment and facilities to the community's needs.

Different communities may inhabit different transitional community neighborhoods, constructed in parallel. The overall process resembles, in fact, the development of multiple pilot projects; rather than the execution of a single, unified plan, resulting in a potentially heterogeneous outcome.

The strategy adopts a bottom-up approach, conceptualized and implemented directly with and by the local community. It emphasizes the self-organization of a local workforce, positioning community members as active agents in the reconstruction process through participatory design mechanisms (Lozano, 1990). This method

seeks to respond to the needs and aspirations of local populations by fostering inclusive and context-sensitive planning.

The incremental and evolutionary structure is not designed for unlimited growth. There is, in fact, an optimal dimension, an urban and human scale, that limits the growth of the neighborhood. The optimal dimension has been researched over time by architects and planners, and almost all agree that the neighborhood should extend at a maximum of 500 meters in radius, conferring on the neighborhood, or cell, a walkable scale (Piacenti, 2024).

At the urban scale, the strategy envisions a cellular pattern made of neighborhood or urban cells, a constellation of small or micro cities, defined and polycentric multifunctional units, interspersed within green and productive zones, with a certain degree of autonomy and capable of mutual interaction. This configuration can be reached through an area-based approach that focuses on a specific, defined geographic area as the primary unit for planning, implementation, and coordination, rather than focusing solely on specific sectors (such as health, education, or transportation). It is a decentralization strategy of financial resources and infrastructure that enables simultaneous interventions across multiple areas, thereby optimizing the use of time and fostering more rapid recovery and reconstruction.

The bottom-up approach attempts to go beyond the standard and common reconstruction process, which operates by layers and delegates or assigns to specialized offices the planning of a specific area of expertise (e.g., health or education, or roads).

In the complex society of our contemporary era, it is necessary to work on approximation and uncertainty, making it preferable and safer to experiment on a small scale rather than to reason on the understanding of increasingly unpredictable global phenomena. The approach functions as a dynamic design system, intended to manage urban transformation through the deployment of specific components that catalyze positive environmental change. It acknowledges the necessity for ongoing adaptation and refinement in response to external pressures and evolving conditions.

Permanent Temporariness: Transitional Housing

Within this broader framework of dynamic urban transformation, transitional housing emerges as a key field for experimentation and innovation. It marks a significant paradigm shift from the conventional emergency shelters typically used in post-conflict contexts⁵. First, the structure is designed to maximize flexibility to accommodate different unit sizes, housing options, and functional uses (Figure 1).

Units can consist of one or two floors (in accordance with adopted technological solutions) and adjusted to meet the needs of single or multi-generational families. A comparative analysis between transitional housing solutions and traditional shelters reveals that, at an early stage (t), the accommodation capacity of both types can be equivalent. However, considering an evolutionary time frame (t), while conventional structures tend to maintain an unchanged number of inhabitants, the modules proposed by our research demonstrate greater flexibility and adaptability. These allow for a potential increase in the accommodated population, responding dynamically to any new or different needs of the settled population. The housing module is conceived according to a principle of incrementality, so as to allow progressive adaptation to the housing needs of the families welcomed in the emergency phase, foreseeing the possibility of elevation to accommodate new members and support the natural evolution of the family unit.

According to the most recent data (2024) from the Palestinian Central Bureau of Statistics (PCBS) on household composition, the average size in the Gaza Strip was 5.3 people. The predominant type of housing across the five governorates (Gaza, North Gaza, Khan Yunis, Deir al-Balah, and Rafah) revealed that the apartments were the most common, accounting for 77.8% of all households. This was followed by independent houses (21%), villas (0.2%), and other types, such as independent rooms, tents, caravans, or barracks, which together accounted for

5 see: Corsellis, T., & Vitale, A. (2005). *Transitional Settlement: Displaced Populations*. Oxfam GB.

around 1% (based on 2020 data). In 2022, the PCBS recorded an average of 3.5 rooms per housing unit and an average occupancy of 1.7 people per room; however, a significant proportion—ranging from 36% to 40%—lived in dwellings with more than two people per room. The most severe overcrowding was observed in independent rooms and unconventional housing, where over 60-70% of families lived with more than three people per room.

In the 2024 annual report published by PCBS, most households in Gaza are identified as nuclear families, typically consisting of parents and children, but a significant portion are extended families, often including grandparents, uncles, and aunts, due to social traditions and economic necessity. A growing number of female-headed households has been recorded, particularly following the 2023–2024 escalation and the loss of male breadwinners. Displaced households have become increasingly common, often consisting of merged or recombined family units living in temporary shelters or host families' homes (PCBS, 2025).

As previously mentioned, the project is based on the principle of incremental flexibility. This applies not only to the speed with which it responds to the housing emergency but also to its ability to adapt over time to the community's future needs as well as the entire population. For example, structures designed with a modular system from the outset can be converted into public spaces to serve the community. Thanks to their modularity and reversibility, the housing modules can be repurposed for different functional configurations, even for public use, such as clinics, classrooms, market spaces, and other urban services.

A further key element characterizing the project proposal regards the courtyards (both private and public) that increase the quality of life for the inhabitants and provide outdoor spaces for meeting and conviviality that are usually lacking in standard housing solutions. Courtyard buildings, in fact, ensure high-quality space and climatic performance. Roofs are also a potential advantage: initially configured as mere roofs, they can be imagined as terraces providing each unit with a private outdoor space.

The mentioned adaptability and incremental nature of the project concern not only the capacity to respond to changing housing needs or to allow for future reconfigurations, but also the construction process of the housing modules. The building structure is conceived according to a multiscalar and incremental ratio, and takes the form of a frame structure enclosed with lightweight walls, such as fabric or tarpaulin walls, that, in an emergency phase, can immediately provide displaced persons with safety and protection from the elements.

In later stages, the progressive integration of more stable building components, such as prefabricated panels instead of tarpaulin walls, allows the structure to evolve, challenging the notion of the city as a stable and permanent entity. The phases of emergency and reconstruction follow one another seamlessly.

Future reconfigurations are permitted and guaranteed by the adoption of off-grid technologies such as waterless WCs, solar and photovoltaic panels, and rainwater harvesting.

The adoption of these off-grid systems eliminates the need for extensive underground infrastructure and, more importantly, significantly increases the flexibility and reconfigurability of spaces for various functions beyond just housing. This is because it removes the constraints imposed by traditional plumbing stacks, drainage columns, and other fixed utility connections.

Currently, some of these systems are expensive, especially their more advanced versions. However, it's also true that substantial investments from various actors are typically available during the initial construction phases of refugee camps. Furthermore, the larger the scale of intervention, the more accessible these new technologies become. Therefore, new refugee camps could be transformed into experimental laboratories for innovative and low-energy impact technologies.

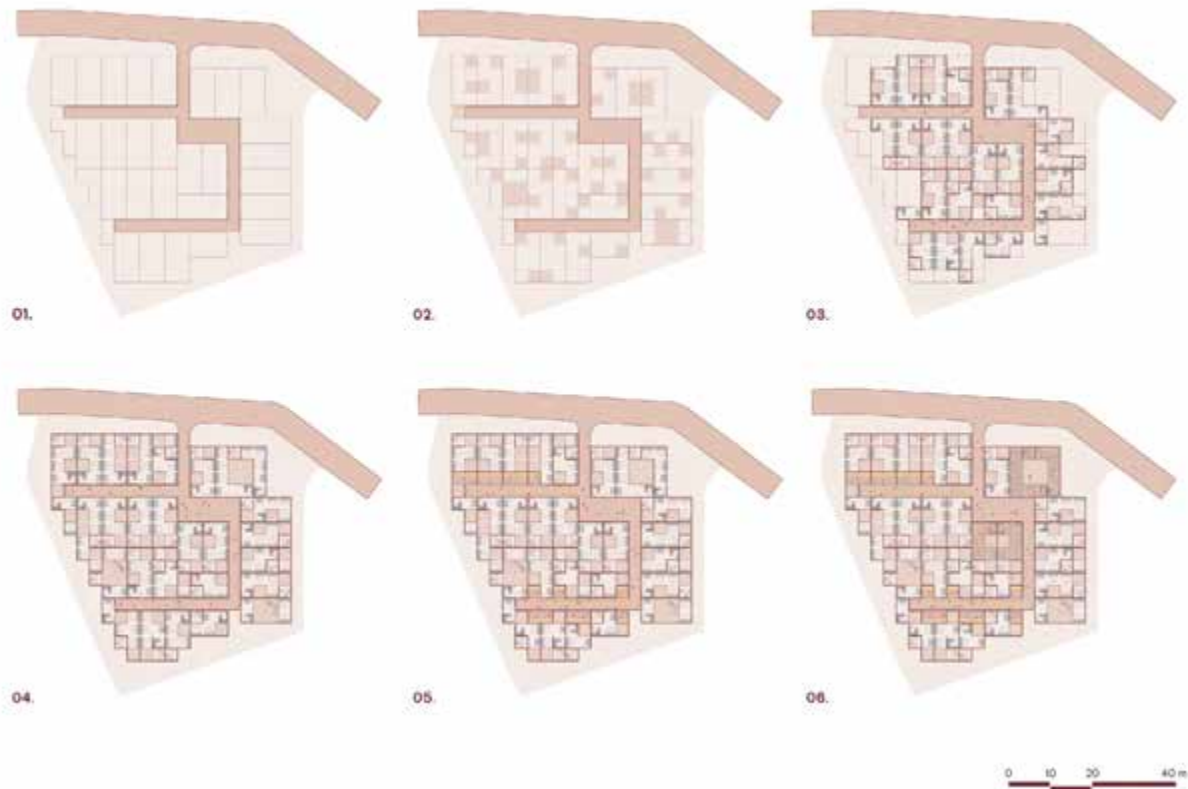


Figure 1: Transitional community neighborhood implementation process: 1) Plot definition; 2) Open space definition; 3) First housing units; 4) Housing unit development; 5) Markets; 6) Facilities.

Transitional Housing as an Alternative to Refugee Camps

The transitional housing approach offers several advantages compared to the current model of standard refugee camps. Originally conceived as temporary solutions for accommodating displaced people during emergencies, refugee camps tend, as a matter of fact, to assume a long-term character and frequently evolve into stable communities that increasingly reflect urban contexts, far exceeding their intended function (Picker and Pasquetti, 2015). Over time, these refugee camps have transitioned from tents or emergency shelters to more permanent structures, often built with concrete and steel. Examples include Dadaab in Kenya, Cox's Bazar in Bangladesh, and several Palestinian Refugee Camps established in Lebanon, Jordan, Syria, the Gaza Strip, and the West Bank in response to the 1948 exodus (*Nakba*). This physical and spatial consolidation reveals the inefficiency of prefabricated shelters—which are designed for short-term use but have been inhabited for decades—and the gradual deterioration of the living conditions of refugees. Moreover, camp growth and development usually occur spontaneously. Camps are therefore disorganised and fragmented in terms of services and infrastructure as demonstrated by the case of the Zaatari refugee camp, which has expanded over a period of thirteen years to become a complex community with its own social, economic, and urban characteristics, but also with important management problems (wastewater, electric grid, etc.). These examples demonstrate the importance of accepting indeterminacy and adopting principles of flexibility in designing resilient communities. Michel Agier's notion of "city-camps" (Agier, 2002) aptly captures this transformation, emphasizing the convergence between camps and cities. Nevertheless, refugee camps continue to be conceived primarily as provisional spaces for humanitarian intervention by international organisations, failing to adequately engage with their long-term urbanising dynamics. According to the 2005 UNHCR *Handbook for Planning and Implementing Development Assistance for Refugees Programmes*, planning is categorized into three distinct phases: "short-term humanitarian

and transitional planning,” “multi-year development planning,” and “macro-policy and global development.” However, these phases are often treated as separate frameworks with discrete objectives, whereas, in practice, the processes of emergency response, recovery, and long-term development tend to overlap and evolve fluidly over time (Duffield, 2013). In this context, time emerges as the critical factor shaping the consolidation and normalization of what were initially intended to be temporary emergency camps.

In contrast, the transitional housing approach avoids land waste, allowing for integration with the existing urban fabric and helping to prevent sprawl and uncontrolled expansion.

It also offers advantages from a social point of view, involving refugees as active participants in the reconstruction process by building their own homes or working for construction companies and material production factories; after an initial phase of assistance, they can become productive members of society. At the same time, it creates jobs and employment opportunities for local people, contributing to the revitalization of the local economy. Additionally, transitional housing is a more economically competitive alternative to refugee camps because the short lifespan of prefabricated shelters contrasts with the prolonged duration of many camps. This discrepancy can lead to significant savings in resources and costs.

Given that refugee camps tend to last for several decades, and given the possibility that their structures may be transformed to meet new needs, one of the fundamental aspects concerns land ownership issues. If the neighborhood cannot be established on public land, it is necessary to adopt a system that ensures the protection of pre-existing property rights both during the transitional phase and in the subsequent phase of consolidation. In addition to official documentation regarding land ownership, local practices and any forms of collective or communal land use must also be taken into account in order to ensure fair treatment of the rights of both refugees and landowners.

Incremental Housing Prototype

In post-conflict reconstruction, the selection of appropriate technologies addresses complex challenges involving social, economic, technological, and logistical aspects. Resource scarcity—especially the limited access to construction materials, energy, and water—hampers rebuilding efforts. In the context of Gaza, these issues are intensified by COGAT’s policy regulation of the entrance of all goods into the Gaza Strip, including items designated as “dual-use.” The list includes items that are broad categories, further constraining reconstruction. Therefore, the search for alternatives strongly depends on specific constraints, in addition to a relief analysis of the area, a market analysis, and a review of administrative and organizational factors that affect the accurate choice of technology.

Emerging research highlights the potential of lightweight, modular materials that are easy to transport and assemble. These alternatives offer a flexible, cost-effective response suited to unstable environments and limited industrial capacity, providing a promising pathway for sustainable reconstruction in constrained and ever-changing settings (Johnson, 2007; Caron and Kelly, 2008).

The layout of the transitional community neighborhood is based on a regular structural bay of 3 meters (Figure 2). The modular, point-based structure allows for the expansion of units in both directions.

The standard residential unit measures 6 x 12 metres and comprises six 3 x 3 meters rooms and 18 square meters of open space, distributed in one or two courtyards. The structural frame is designed to accommodate up to two levels, hosting up to 12 people.

Given the regular structural frame, it is possible to divide or combine multiple housing units to meet diverse needs. This flexibility addresses situations like overcoming an emergency, which requires an increase in per capita living space, or accommodating growth in family size.

The structure is able to expand and transform in response to territorial specificities and social dynamics, acting

as a generative matrix of a new urban model. Designed according to an incremental and multi-scalar logic, the structure is configured in the early stages of recovery as a light device and then evolves into a more stable and permanent structure in the subsequent phases.

This standard layout enables high residential density, required by the densely populated environment, recognizing an increased value for open space. Moreover, it shapes an introverted urban form, which is not new in the context of the Arab city. Historically, organic growth and gradual transformation have characterized cities in this region. As happened 1.000 years ago, we imagine that this process of growth can gradually reshape the geometric urban fabric of the new city to the point of totally camouflaging the new structure on the historical built environment. The simple structure can morph into a city, temporally articulating the space.

There is quite a bit more to these processes than simply a change in physical form and urban morphology. Unimagined uses and patterns can arise in dense urban conditions.

Urban design can be adapted to the specific characteristics of each site and replicated across various areas in the Gaza Strip or other territories, generating site-specific urban configurations, a city that builds and regenerates itself.

At both scales of intervention, the strategy is incremental. This means that the risks of incorrect development forecasts are minimized, ensuring the functioning of the urban cell or a small residential neighborhood at every stage of its evolution.



Figure 2: Plan of incremental housing aggregation example.

Fiberglass Technology

To support this incremental approach, the choice of construction technology plays a pivotal role. The structure proposed is based on the use of lightweight fiberglass, which fulfills two key functions: it enables rapid construction within a timeframe comparable to early recovery interventions, while providing housing units with the lifecycle of a permanent building and dignified living conditions (Figure 3).

We can compare the current proposal with two different alternatives: prefabs (including C-boxes, readapted containers, modular housing units, etc.) and recovery using traditional technologies (concrete structures with brickwork). Prefabs can be bought on the market and installed easily and quickly on-site following approval. They have an estimated cost of around 2450-400 dollars per square meter, but come with a limited lifecycle (from 5 to 15 years of expected life). At this stage, plans for their disposal and replacement with more permanent solutions cannot be made. Prefabs also do not provide high-quality space, either in terms of private living space or public space. These solutions are not particularly suitable for the climate (corrosion, heat, etc.), and sometimes require shared facilities such as kitchen and bathroom services. Traditional technologies have limited feasibility of implementation in the short term due to materials shortages (concrete, iron, etc.), restricted site access, and unclear property definitions. In the longer term, the use of traditional technologies will face further limits due to the necessity of heavy machinery (cranes, mixers, etc.) and the high water consumption.

The advantages of fibreglass can be grouped into seven principal categories: flexibility, effortless construction, efficiency, durability, feasibility, collective engagement, and convenience.

The fiberglass structural design is inherently modular and scalable, enabling it to accommodate a wide range of unit sizes, residential typologies, functional programs, and user modifications. Both public and private spaces are conceived as multifunctional and temporally adaptable, allowing customization based on evolving needs and available financial resources, including materials, finishes, and technological solutions.

The construction methodology prioritizes simplicity and speed. Fiberglass structures can be assembled rapidly without the use of cranes or heavy machinery and, in many cases, without the need for preliminary site leveling. Selected components can be preassembled to further accelerate on-site construction, making the process more accessible and feasible even under resource-constrained conditions. The system is designed for deployment using unskilled or semi-skilled labor, fostering inclusivity and enabling community-based implementation. Moreover, the use of lightweight materials facilitates easy disassembly, relocation, and reassembly, thereby extending the functional utility of each structural unit.

In terms of efficiency, the project could offer housing with superior acoustic and thermal insulation, anti-seismic structures, and sustainable features like rainwater collection and renewable energy supply. Its layout ensures security, privacy, and comfort, while courtyard buildings enhance spatial quality and climate performance.

The use of fiberglass components — characterized by a lifecycle of 25 to 30 years — elevates the typology from temporary shelter to semi-permanent housing. This shift redefines the concept of transitional housing by embedding longevity and sustainability into its core. Involving local people in designing and building temporary housing not only aligns with local needs and preferences but also fosters a sense of ownership and place. Furthermore, components are reusable, recyclable, and integrated into new life cycles, reducing material waste and environmental impact over successive housing cycles.

The project complies with the regulatory framework of COGAT and leverages construction materials that are readily available on local and international markets. This ensures ease of implementation within existing legal and logistical constraints. The structural materials are readily available on the market and could be produced locally in a second phase. The potential for local production in later phases further enhances economic sustainability. While fiberglass is the preferred material for the pilot phase, alternative materials such as steel, concrete, and recycled rubble may be employed to suit contextual and economic variations, thus increasing the adaptability

and scalability of the project.

The construction of temporary housing generates new skills through training and employment opportunities for local people. Community participation is central to both the design and implementation processes, ensuring that the final built environment reflects the lived experiences, cultural practices, and aspirations of its users.

From an economic perspective, the long lifespan of fiberglass structures makes them a cost-effective solution within a long-term planning framework. Although the pilot phase exhibits a higher cost per square meter due to limited-scale production, this figure is expected to decrease significantly in full-scale deployment scenarios, where economies of scale can be leveraged. Indeed, considering the entire life cycle, the proposed solution offers clear advantages in terms of cost. The prefab modules most commonly used for the construction of refugee camps have a service life of approximately fifteen years, according to technical documentation provided by the manufacturers. However, as early as the third to fifth year after installation, these prefab units require significant maintenance interventions, primarily due to water damage. The most frequent repair works concern roofs, which are damaged by rain, as well as the flooring and walls, which deteriorate due to heavy use and rising damp. The proposed solution involves the use of materials with significantly greater durability. Although this requires a higher initial investment, it ensures a lower overall cost when the full life cycle of the shelter is considered.

Moreover, the holistic inclusion of both private and public covered spaces in cost assessments underscores the project's value as a complete urban system rather than a collection of discrete housing units.

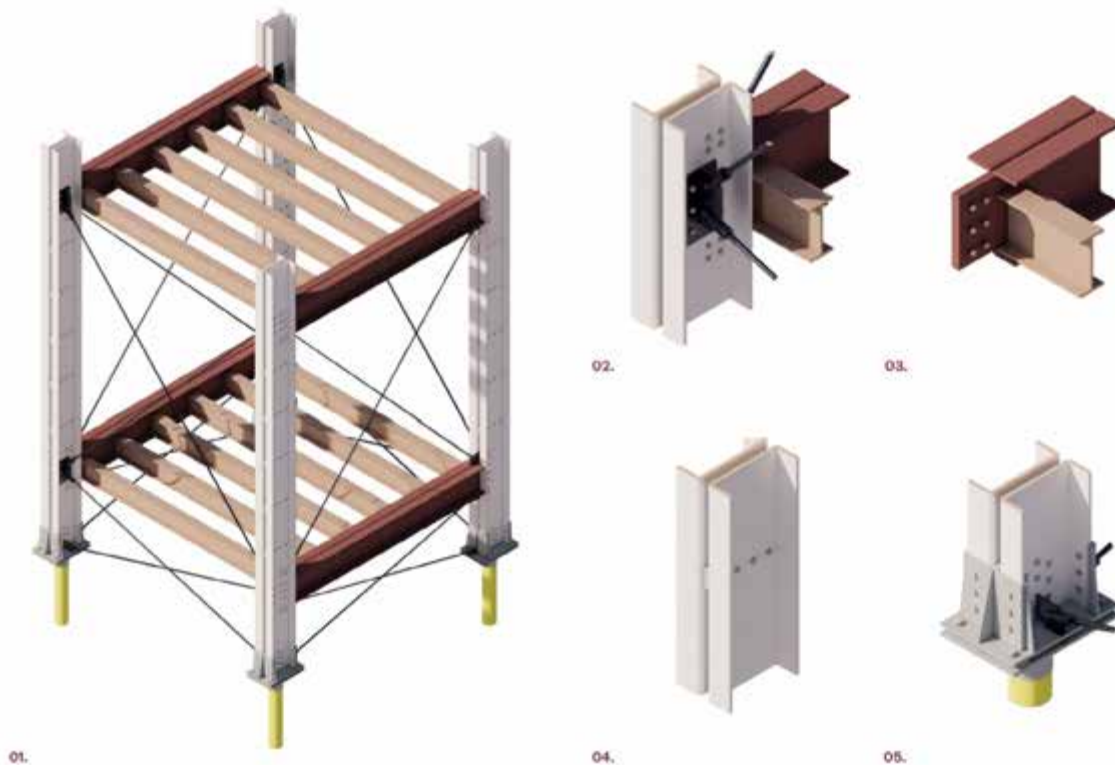


Figure 3: Transitional housing structure and details: 1) Pultruse Structure; 2) Main beam and column connection; 3) Secondary beam connection; 4) Spacer plate between columns profiles; 5) Column base plate;

Designing for Transition in an Age of Instability

While awaiting reconstruction for the Palestinian population, the reasoning developed for the specific case of the Gaza Strip can be projected to many other contexts and situations. The possibility of replication appears evident in all other contexts of post-conflict reconstruction, as low-level, low-intensity, persistent conflicts are increasingly envisioned to be the pattern of the future (Kaldor, 1999).

Currently, 56 armed conflicts are underway in the world: the Myanmar conflict, the insurgency in the Sahel, the Sudanese conflict, the Russo-Ukrainian War, and the Ethiopian civil conflict, to mention the major ones. Overall, the ongoing conflicts involve 92 countries – almost half of all countries worldwide – and have displaced over 100 million people.

Increasingly, violence is directed against civilians, and the scale of forced population displacement per conflict is increasing.

Beyond refugees, there are many other categories of people involved in displacement dynamics and unstable contexts. This includes migrants, as well as residents of areas facing pressures such as climate change, social issues, extreme urban and demographic growth, inequalities, criminality, and inadequate urban planning (Albrecht and Galli 2023).

All these pressures challenge permanence as a default condition for cities. This open-ended time of modes of living needs a design. It is thus imperative to think about inhabiting as a fact of transition and subject to change, and to plan the process and forms of its implementation.

The combined impacts of conflict, disaster, climate change, and social and economic pressures paint a difficult scenario for “our common future”⁶ and call for a transition to new models capable of transforming this overwhelming sum of pressures into design factors. Urban areas are at the center stage of such a transition, being at the same time the areas most responsible for the current risks (70 percent of global emissions, 50 million urban inhabitants involved in war, a projected 216 million climate migrants), those benefiting from the current paradigm (50 percent of the global GDP comes from 380 cities, 83 percent of scientific products and patents), those more involved by future modifications (sea level rise alone will threaten 800 million people by 2050), and are, quite possibly, a significant part of the solution.

In conclusion, these arguments move beyond business-as-usual intervention protocols and offer an updated approach to early recovery and reconstruction. This approach emphasizes temporariness as a core design factor, without abandoning design practice and the pursuit for an urban form, even amid the uncertainties of habitation duration.

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The ongoing collaboration between PAPP and luav facilitates an iterative refinement of the strategy through continuous engagement with a broad range of stakeholders. This process ensures contextual relevance by incorporating feedback from institutional partners and external experts. Developed jointly with UNDP/PAPP, key national institutions, and specialized consultants, the project embodies a dynamic and participatory approach, characterized by ongoing consultation and stakeholder involvement.

6 Gro Harlem Brundtland, “Our Common Future: Report of the World Commission on Environment and Development” (United Nations, 1987).

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