# Transposing the discourse of industrialised construction in housing between Lisbon and Luanda during the 1970s

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**Abstract.** This paper focuses on the prefabrication process and typification applied in building mass housing neighbourhoods on the outskirts of Lisbon, Portugal, and Luanda, Angola. It explores the transfer of these systems and know-how from Europe to Africa, mapping housing neighbourhoods built at the end of Portuguese colonialism and the transition from dictatorship in Portugal (25 April 1974) to the independence of Angola (1975). The push for widespread housing led to developing large estates on peripheral land, utilising industrialised materials and processes to meet production demands. Large construction firms spearheaded innovation, with prefabrication vital in ensuring economic feasibility and rapid construction times. Portugal initiated its first prefabricated projects during the 1960s. At the same time, the Portuguese state invested in Angola, elevating the importance of housing development in both regions. This article proposes a comparative analysis of housing estates, focusing on the role of large construction companies and the influence of specific prefabricated systems on constructing residential estates in Lisbon and Luanda. It seeks to answer how the introduction of prefabricated design elements led to functional and aesthetic innovations and whether they benefited from foreign expertise. It also investigates the transfer and utilisation of these systems in the Global South, emphasising their profound impact on architectural design and urban planning during the colonial transition. These neighbourhoods drew inspiration from various international models, including Swedish, French, and Soviet systems, and influences from Non-Aligned Movement countries like Yugoslavia and Cuba. Following Angola's independence, additional prefabricated technologies were introduced, facilitating the transition from colonial to postcolonial structures and addressing housing demand while adapting to tropical climates. The comparative analysis underscores how prefabrication influenced architectural design and urban planning during the colonial transition, with construction companies playing a pivotal role in shaping urban landscapes and promoting modern living standards.

**Keywords:** Modern Housing, Prefabricated systems, Construction narratives, Lisbon, Luanda

## 1. INTRODUCTION[1]

In recent decades, scholarly focus on the architectural heritage of late colonial and early post-independence periods in sub-Saharan Africa has grown significantly[2]. Within former Portuguese territories, diverse approaches have emerged, investigating the distinctiveness of particular buildings[3], collective housing endeavours[4], or the influence of the Public Works Department's rational design principles[5]. A recent shift in perspective emphasizes the global exchange of expertise, materials, and processes, moving away from singular narratives[6]. However, a gap exists in understanding the prevalence and impact of prefabricated techniques in mass housing construction. This paper addresses this gap by examining archival records from specific neighbourhoods and their construction contractors in Portugal and Angola. It aims to elucidate the transnational exchange of expertise and materials, going beyond technical aspects to

analyse how prefabricated systems have shaped housing development. Furthermore, it offers critical insights into globalisation's political and economic dimensions.

During the late 1960s and 1970s, Portuguese colonial cities experienced significant transformations in their urban peripheries, primarily driven by housing shortages. To address this, industrialised construction processes were deemed necessary to meet the demand quickly and affordably. The expansion into peripheral areas aimed not only to alleviate housing shortages but also to attract a burgeoning middle class seeking suburban comforts. Adopting prefabrication techniques was instrumental in providing solutions for environmental comfort and sustainability, influenced by geopolitical realities in Portugal and Angola. Through examining housing estates in Lisbon and Luanda, this paper underscores the pivotal role of large construction companies and their adoption of innovative prefabrication methods.

In Portugal, collaborations with foreign companies, such as the manufacture of French "Fiorio" prefabricated panels by the Portuguese factory ICESA and applied by Reaes Pinto or by the Luso-Swedish partnership with MERCATOR-S.A.R.L., led to the introduction of functional and aesthetic innovations in prefabricated developed by Fernando Silva, setting architectural standards for future developments in different locations of Lisbon's outskirts. In Luanda, projects like Prenda and Rangel neighbourhoods, undertaken by Predial Económica SARL (PRECOL) with government backing, exemplified pre-stressed concrete and Le Corbusier's Modulor system, reflecting international design influences. Concrete played a central role in both projects, evident in the beam-pillar system's structural module, the balconies' panels, and the prefabricated elements of the brise-soleils adorning the facades. These architectural choices were both aesthetic and functional, as they facilitated cross-ventilation, optimised form and orientation according to climatic conditions, and minimised exposure to harsh sunlight angles, enhancing interior comfort[7].

Following Angola's independence in 1975, urban development opened to international collaborations, introducing prefabricated systems from countries like Yugoslavia via NAM countries[8]. The widespread adoption of these systems, known locally as "Blocos dos Cubanos" (Cuban Blocks), represents a vital housing development for housed foreign helpers and "internationalists" mainly from the COMECON countries, as well as Portugal, Brazil, Sweden, and Italy. It will undoubtedly be interesting to explore the transfer of prefabricated systems developed and popularised in the former Yugoslavia during the 1960s, known as "IMS Žeželj," highlighting the strong influence of tropical architecture launched in the experimental construction site of the "Lixeira-Luanda"[9].

Through archival research, case studies of housing estates, and analysis of urban planning policies, this study offers insights into the complex intersections of architecture, colonialism, and postcolonial urbanism. Contextualising the adoption of prefabrication within broader historical and geopolitical dynamics aims to contribute to a deeper understanding of the legacies of colonial and post-colonial architecture and the ongoing challenges of housing provision in former Portuguese colonial contexts.

## 2. The transfer of the module, the panel, and the prefabricated elements in housing construction in Portugal and their transposition in Angola

Prefabrication in Portugal started with Ruy José Gomes publishing the first

text on the subject in 1952 at the National Civil Engineering Laboratory (LNEC)[10], emphasizing design flexibility and efficient construction processes. Despite early experiences in Alvalade, industrial constructions did not initially gain popularity. In 1954, ICESA - *Indústria de Construção e Empreendimentos Turísticos*, partnered with a French company "Société Entreprises de Licence des procédés Fiorio", to establish a factory for prefabricated elements in Póvoa de Santa Iria. This led to rigorous testing and the adoption of prefabrication techniques, as seen in reports from LNEC, including a 1969 report on the ICESA facilities"[11], presenting the various phases of the Fiorio system.

**Figure 1.** A succession of photographs of the manufacture of "Fiorio" panels at the ICESA factory. Reinforced resistant exterior walls, resistant interior panels and storage areas © Credits LNEC, Lisbon, July 1969 [Archive: 4487].

The French Fiorio system was successfully applied by architect Alberto Reaes Pinto in housing developments such as Santo António dos Cavaleiros (1966-1969) and Quinta do Morgado (1969-1970). These developments featured slab blocks and towers constructed using reinforced concrete elements, with Fiorio panels for exterior walls. The integration of prefabricated elements facilitated rapid construction and ensured consistent quality, with tailored finishes in interior spaces.
The construction strategies not only aimed to address social housing shortages but also targeted the upper-middle class by focusing on architectural excellence and improved living conditions. Architect Fernando Silva played a key role in introducing innovative prefabrication techniques in urban developments such as Alto da Barra urbanisation (1962-1975), collaborating with Luso-Swedish companies to enhance housing projects aesthetically and functionally. Silva, as an architect and founding partner of MERCATOR SARL, maintained high control over the construction process, introducing novel prefabrication systems like the "tunnel-forming" construction system. The establishment of the Portuguese-Swedish construction firm LUSECA facilitated meticulous construction processes, including replacing traditional beam-pillar plate systems with reinforced concrete load-bearing walls, aligning with international construction standards[12]. Despite limitations in internal space flexibility[13], Silva set a benchmark architectural standard by defining construction elements that provided exceptional comfort in residential complexes. Weekly design meetings from October 1969 enabled knowledge transfer, particularly from Sweden, leading to significant advancements in construction techniques and quality.
The transfer of prefabricated systems and techniques extended beyond Portugal to its African colonies, including Angola. The Portuguese government promoted industrialised construction methods to address housing shortages in colonial cities like Luanda, which were driven by rapid urbanisation and economic growth. Collaboration with Portuguese and foreign companies, and the adoption of advanced prefabrication systems facilitated the construction of large-scale housing projects, providing modern amenities and improved living conditions for residents.
Simões de Carvalho, after his stay in Paris where he specialised in urban planning at the prestigious *Institute of Urban Planning* (University of Paris) and collaborated with André Wogenscky and Le Corbusier (1956-1959), returned to Luanda became head of the Luanda Planning Office[14]. He was crucial in promoting prefabrication in the type-projects for housing, such as

the concrete constructions for *rural houses in Quilunda*, encouraged by the *Junta Provisional de Povovamento de Angola* (JPPA), showing architectural elements close to the *Maison du Péon* (Chandigarh, 1952)[15], as the detail of the concrete's gargoyles; also with the *Quinta Palatino neighbourhood*, designed by Weiner, Sert and Schulz in Havana, Cuba [16].
The Unit Neighbourhood nº1 in *Prenda Musseque*, designed by Simões de Carvalho, Augusto Pereira, and Pinto da Cunha and Rangel neighbourhood, designed by Simões de Carvalho with Lopo Carvalho (1968-1974), were developed with the support of the government and private contractors notably *Predial Económica Ultramarina* (PRECOL), utilised pre-stressed concrete and modular systems to create efficient, aesthetically pleasing housing. Le Corbusier's Modulor system, integrated into these projects, demonstrated the influence of international design principles in shaping the city's modern architecture. Prefabricated elements, such as brise-soleils, balconies, and panels, enhanced the functionality and appearance of the buildings, optimising them for the tropical climate.

**Figure 2.** Fernão Simões de Carvalho et al., Neighbourhood Unit nº1, Luanda, Angola, 1963-1968. Variety of prefabricated elements on the façade of Block D2, Luanda, Angola. © Inês Lima Rodrigues, 2010.

## 3. Portuguese and Angolan Housing Stock in Democratic and Independence times

On April 25, 1974, the Carnation Revolution in Portugal led to the overthrow of the Estado Novo regime, significantly impacting housing policy. Interestingly, one of the critical moments of the fall of Fascimo took place in the Quinta do Morgado neighbourhood on 11 March 1975. Post-revolution, the SAAL (*Serviço de Apoio Ambulatório Local*) program was initiated in Portugal to provide housing for marginalized populations through collaboration among various parties. However, the program ended prematurely in 1976, halting housing development progress.
Following Angola's independence in 1975, international cooperation cooperations, particularly from Yugoslavia, Cuba, and Sweden, significantly influenced post-colonial Angola's housing development. Yugoslavia's prefabrication technology, the IMS Žeželj system, was adopted by Angola, leading to the development of sustainable housing complexes in Luanda, such as the *Urbanisation of Lixeira*, designed by Ivan Petrović leveraging existing prefabrication IMS Žeželj factories in Luanda[17]. This project featured European-style prefabricated buildings with climate-adaptive elements like loggias and balconies, contrasting sharply with the surrounding areas and showcasing the success of international cooperation in post-colonial Angola.
Cuba's international cooperation also heavily influenced Angola's housing development, creating "Cuban Blocks" in Luanda to address housing needs for civil servants. Drawing from the "Great Soviet Panel" factory experience in Cuba, the "Sandino" System emerged in Luanda like the construction systems in Havana, such as in the *Camilo Cienfuegos* and *Alamar neighbourhoods*, implemented with the same constructive system and similar architectural approaches (four-storey buildings, the modular network, panels with the centred or raised window and the use of panels with box-shaped cantilevered elements). The transfer of the "tropical panel"

spread in Cuba, as identified by Alonso and Palmarola[18], was adopted in Luanda to achieve more sustainable façades, quickly becoming a model solution to housing problems throughout the country. The first attempt was made to use lightweight, prefabricated construction elements to apply a system previously adopted by Cuba, which, when applied in Luanda without any modifications, initially resulted in a fiasco. The extremely simple modular system, of the "Sandino" type, which could be assembled without special equipment, consisting of un-insulated prefabricated concrete slabs inserted into the vertical grooves of equally pre-fabricated concrete posts spaced 1.04 meters apart, did not take into account the special socio-cultural patterns of the Angolan people[19],This system was neither designed nor adapted to cultural or climatic requirements, but simply technically adjusted, and failed to gain acceptance in Angola. However, the introduction of technological approaches in terms of partial prefabrication became a reality with the aim of simplifying housing construction and developing production methods for heavy prefabricated parts.
By the late 1970s, Angola had adapted these prefabricated technologies to its socio-cultural and climatic context through public high-rise constructions of Cuban 5-storey buildings made of light, partially prefabricated elements. From this model, called E-14, and its successor E-15, several housing complexes, known as “Cuban Blocks”, were constructed with Cuban assistance in cities like Luanda, Sumbe, and Benguela, particularly in peripheral zones. The " Cuban Blocks" in Luanda's Caputo neighbourhood consisted of 96 blocks of flats arranged in an orthogonal grid pattern. In the *Cazenda neighbourhood*, two smaller blocks stand adjacent to the airport, where the “Cuban Blocks” prominently feature in the urban landscape, contrasting with the only three modern blocks constructed according to Simões de Carvalho’s Housing Unit No. 3. This juxtaposition highlights the shift from Luso-Angolan prefabrication at the end of colonialism to the systematisation of the Soviet System in the late 1970s and onwards.

**Figure 3.** View from Luanda over the “Cuban Blocks” in the Cazenda neighbourhood (in the background, the three buildings constructed as part of the unfinished urban plan for Neighbourhood Unit No.3). © Credits Inês Lima Rodrigues, 2010.

The buildings followed the Soviet models, featured two symmetrical dwellings per floor with standard amenities like living rooms, bedrooms, bathrooms, and utility rooms. The construction of these *Cuban blocks* showcased a shift from Luso-Angolan to Soviet-inspired prefabrication methods, marking a new era of urban transformation in Angola post-colonialism. These projects aimed to address the housing challenges in Angola and led to the standardisation of construction practices and innovative urban forms in the country. Various architectural styles were implemented, but all shared the common goal of providing adequate housing solutions in Angola's evolving urban landscape.

## 4. CONCLUSIONS

The research conducted in this paper sheds light on the significant role of prefabrication in shaping housing development in Portugal and Angola during critical periods of colonial transition and post-independence. Through a comparative analysis of housing estates in Lisbon and Luanda, we've explored how the introduction of prefabricated design elements has led to functional and aesthetic innovations. In both contexts, prefabrication emerged as a response to pressing housing shortages and the imperative to provide affordable housing quickly. Large construction companies were pivotal in driving innovation, collaborating with foreign partners to introduce advanced prefabrication methods. In Portugal, partnerships with French and Swedish companies led to the adoption of innovative techniques, while in Angola, collaboration with Yugoslavia and Cuba brought in prefabricated systems tailored to local climatic conditions.

Transferring knowledge and know-how from foreign sources was crucial in these developments. Portuguese architects and engineers collaborated closely with their international counterparts, adapting prefabrication techniques to suit local contexts. This transfer of expertise facilitated the adoption of functional and aesthetic innovations and promoted cross-cultural exchange and collaboration. Furthermore, the utilization of prefabricated systems in the Global South, particularly in Angola, highlights the adaptability of these techniques to diverse socio-political and climatic conditions. From the introduction of the Fiorio system in Portugal to the widespread adoption of Cuban and Yugoslavian prefabrication methods in Angola through the variation of the “Sandino” system. These systems have transformed architectural design and urban planning, contributing to the modernization of housing stock in both regions.

The developments in Lisbon and Luanda showcased the versatility and adaptability of prefabricated systems in diverse urban contexts, undergoing numerous adaptations and upgrades to meet site-specific demands. Through partnerships between local and foreign companies, technical expertise was leveraged to shape new lifestyles amidst chaotic urban contexts. These innovations exemplify the transposition of technology during the colonial transition period, reflecting a broader trend of international exchange and innovation in architectural practices.

In conclusion, the study underscores the enduring legacy of prefabrication in shaping architectural narratives and urban landscapes during periods of colonial transition and post-independence. By exploring the interplay between prefabrication, foreign expertise, and local adaptation, this research offers critical insights into the dynamics of architectural innovation and globalization in mass housing construction.

While this study sheds light on prefabrication's role in housing development in Portugal and Angola, future research could explore its long-term impacts on housing quality, durability, and sustainability. Longitudinal studies tracking prefabricated buildings' performance over time could provide valuable insights into their effectiveness and areas for improvement. Additionally, investigating the social and cultural dimensions of prefabricated housing could uncover how these systems influence community formation, social cohesion, and cultural identity. Comparative studies across other regions of the Global South could offer insights into prefabrication's transferability across different contexts and climates.

Overall, by building on the findings of this study and addressing these research gaps, scholars can continue to advance our understanding of the role of prefabrication in shaping the built environment and addressing the challenges of housing provision in diverse socio-cultural contexts.

## 5. BIOGRAPHY

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[2] On the subject can be emphasised Udo Kultermann's exemplary work from the pioneering on Africa *Neues Bauen in Afrika* (1963); *New Directions in African Architecture* (1969) to a *Critical Mosaic 1900-200*0, Vol. 6 (2000).

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Figure 1.

Figure 2

Figure 3