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ON THE TROPICAL HOUSE

O DOMU TROPIKALNYM

Abstract

The elementary function of a house is to simply provide a human with a shelter from intruders, from excessive sun as well as from inhospitable weather conditions. Such primary meaning of a house remains nowadays most legible when we look at primitive huts built by jungle tribes or at provisional homes of refugees, who sometimes choose to settle in hard-to-reach places for security reasons. Being a simple response to the local climate conditions, the traditional houses of the world's different regions did often become the first seeds to create and develop a unique building and decorative art, intriguing by means of its aesthetics and allowing harmonious settlements and towns to be formed. Resulting from a pragmatic approach to the design, the features of vernacular building styles did sometimes infiltrate into contemporary architecture, supplying such important trends as modernism or critical regionalism and remaining a source of inspiration for their representatives.

Keywords: house, local conditions, climate, tropical architecture

Streszczenie

Podstawową funkcją domu jest zapewnienie człowiekowi schronienia przed intruzami, przed słońcem czy też przed nieprzyjawnymi warunkami atmosferycznymi. To pierwotne znaczenie domu pozostaje dzisiaj najbardziej czytelne patrząc na prymitywne schronienia ludzi dżungli czy prowizoryczne domostwa banitów, dla bezpieczeństwa osiedlających się w miejscach trudno dostępnych. Stanowiące prostą odpowiedź na warunki lokalnego klimatu, tradycyjne domy różnych miejsc świata stają się nierzadko pierwszym ogniwem do stworzenia i rozwinięcia unikalnej sztuki budowlanej i zdobniczej, intrygującej swoją estetyką i tworzącej harmonijne osady i miasta. Wynikające z pragmatycznych założeń cechy architektury wernakularnej zostały niejednokrotnie na stałe przejęte do języka architektury współczesnej, zasilając niektóre jej nurty, w tym także modernizm czy regionalizm krytyczny, i stanowiąc jednocześnie źródło inspiracji dla reprezentujących je architektów.

Słowa kluczowe: dom, uwarunkowania lokalne, klimat, architektura tropiku

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1. RESIDENTIAL HOUSE

Defined as a building adapted for living purposes in terms of construction and functionality¹, a residential house is at the same time an answer to the broadly understood local conditions. Key among these factors are the terrain's geographical features, its topography, vegetation as well as the fact of belonging to a particular climate zone. Closely related to these elements is the local culture, which remains unique to a particular region and influences its building style, especially with regard to aesthetic values. As a basic unit of spatial organization, the residential house expresses in a most distinctive way the influence that the local factors exert on architectural solutions, starting from its situation on the plot and ending in ornamentation. Nowadays, however, the models of residential houses are routinely uprooted and displaced to another, sometimes very remote place. Such practice is most likely to occur under the guise of the term "inspiration". In consequence, the houses whose architectural form is directly resulting from their location's characteristics have become a rare sight and are often seen as archaic relics, having no *raison d'être* outside a museum. More and more frequent, transferring architectural types from one place to another has found its most extreme manifestation in great tropical cities fraught with glass skyscrapers, which couldn't be built in that location if the expensive air-conditioning was not available. At the same time, however, the same climatic zone provides many interesting examples which are a living image of architecture's dependence on its environment, till nowadays a distinguishing feature of equatorial housep.

2. EQUATORIAL SHELTER

Being the simplest form of making reference to the environment's conditions, the rough shelters of tribal peoples living in the jungle share certain features in common, although being produced by different communities that are distant from each other and rather do not maintain any relationship with the outside world. For example, the foundation on piles is one of the most important among these common features and its role is to protect houses from water, humidity and rot, which are naturally related to the soil of equatorial rainforest. A similar way of protecting houses from changing water level is used by fishermen whose villages are located literally above the lake's surface. Such a choice of location for a house was often made with regard to its inhabitants' status of a hardly tolerated ethnic minority or because of the taxes being applied to them and resulted in many different manners of providing access. While some villages are accessible only by boat (ill. 1), some other had their access causeways built just beneath the water level, or were even constructed as floating islands. In some cases, the foundation on tree trunks, reaching the crown level, is intended as protection not only from water, but also from intruders (ill. 2). Such is the case of some nowadays vanishing tribes where kidnapping and cannibalism were practised, like for example on the New Guinea island. Besides the foundation on piles, another important common feature of equatorial houses is their breathability. Unsealed walls and even

¹ Encyclopedia of PWN (Polish Scientific Publishers).

floor are seemingly an image of poverty, but they do facilitate the airflow, which remains incomparably useful within this climate zone. At the same time, the multi-layered roofing protects the interior from rain.

3. THE STYLE'S PRAGMATIC BEGINNINGS

These simple, primitive shelters shall not be disregarded as they have more than once constituted the basis for the development of a sublime building and decorative art, as has happened in many places in Southeast Asia. From its heritage, apparently the most popular in the Western world is the trend of Balinese houses, wide and low, generously opening onto the surroundings and plastically blended into it. Shallowed to become neutral hotel architecture and widely identified with colonial furniture, the Balinese style has partly lost the legibility of its own roots. Four thousand kilometres to the north, however, we can find another example of equatorial native architecture which remains coherent and original. In Bangkok, modest homes built on piles right above the banks of canals, which cut through the old town, do still constitute a pronounced form of settlement, being reflected in the architecture of one among the city's most renowned museums. Jim Thompson House (ill. 3), nowadays squeezed into Bangkok's urban fabrics, was until recently located within a jungle extending right to its doorstep and it was composed as a group of traditional Thai houses, which were purchased and displaced from their original locations to Thailand's capital. They are characterized by the emphasized roof pitch and by its wide eaves, supported by one storey high brackets and offering appropriate protection from heavy rains and sun. The space between the ground floor piles is usually used for miscellaneous functions that remain less vital for the house's proper functioning. This feature is a pragmatic response to the building site's regular flooding by the rainfall or by the river's changing level. Therefore, the Thai house's main level is its first floor, where the most important spaces are located and from where a direct access to a private river harbour is usually provided. Studying the region's traditional architecture it is also worth taking a look at the building materials, among which teak, naturally non absorbing water, prevails. Moreover, the elements made of teak are traditionally assembled without the use of any metal nails that could potentially corrode. Finally, an inherent feature of tropical houses is their accompanying greenery, including many tropical fruit trees. These and other distinguishing features of tropical houses became the foundation of various regional styles of the tropical architecture, forming harmonious and uniform settlements that remain pragmatically related to the local living conditionp.

4. THE TROPICAL HOUSE OF THE TWENTIETH CENTURY

The architectural heritage of the tropics, with its pragmatic principles of adjustment to the local climate conditions in particular, has been a source to derive from for those contemporary architects of the west who had a chance to design a building located within an area characterized by a tropical or subtropical climate. A great example of such an inspiring interaction of two culturally distinct experiences was the famous Tropical house, designed by Jean Prouvé in the 1940's (ill. 4). In this project, the architect has combined his previous experience in design of prefabricated and demountable houses with the observations of the



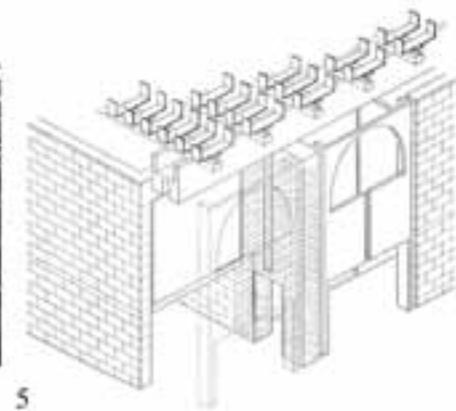
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Ill. 1. Fishermen houses above the lake Tonle Sap, Cambodia Ill. 2. A house of the Korowai, Irian Jaya, Indonesia Ill. 3. Jim Thompson House, Bangkok, Thailand Ill. 4. Jean Prouvé, Tropical House, 1949 [1, p. 63] Ill. 5. Louis I. Kahn, US consulate in Luanda, Angola [5, fig. USC 9] Ill. 6. Louis I. Kahn, master plan for the Indian Institute of Management in Ahmedabad, India

indigenous tropical architecture. In effect, the colonial houses proposed by the atelier of Jean Prouvé consisted of modular metal units, which were industrially fabricated and could be multiplied so as to form varied volumes. Their construction is light (50kg/sqm)² and durable, consisting of three essential types of structural elements. The first of these is the building's bottom framing, which defines the outer contour of the floor plan and contains the lower beams. Their number is equal to the number of structural frames, which constitute another essential element of the house's portable structure. Finally, its third key component is the ridge beam with the two gable beams located on its opposite sides. The building's facade pattern can be individually formulated with the use of prefabricated panels, half a metre or one metre wide, that can be either plain or contain windows, doors or glazing. The plain panels are covered with aluminium sheets and filled with insulating material. Moreover, the Tropical house by Jean Prouvé is characterized by extended eaves so as to shade the veranda surrounding the building on all its sides. It is also equipped with brise-soleil devices that help to reduce sunlight thanks to the regulated position of their elements. Finally, the void provided between the house's roofing and its ceiling, as well as the ventilation duct that runs along the roof's ridge, are intended to cool the building by means of air circulation. Designed in such a way, simple and unusually modern at that time, the tropical shelter by Jean Prouvé was supposed to become an inexpensive and practical alternative to the usual houses of French colonies. Contrary to expectations, however, the project had very few implementations which remain, in principle, its prototypes. The mass production of Tropical houses has never been launched³.

5. SUN AND HEAT

Invited in 1959 to design the US consulate in Luanda, Angola's capital, the architect Louis I. Kahn noticed on his first visit that the equatorial sunlight was dazzling enough to discourage him from looking outside. He also observed that many popular solutions, like for example wooden lattices, were not satisfactory as they limited the view, leaving at the same time plenty of little openings through which the sun still hurt one's eyes. The will to resolve this problem became the architect's motivation. He set himself the goal of elaborating an architectural method of controlling the amount of sunlight falling into the building and therefore protecting it from overheating. Proposed as a solution, the idea of a double wall constitutes a development of the notion of exterior wall. "Starting from a simple partition that a wall constitutes between interior and exterior, Kahn proceeds to a higher degree of differentiation, wherein he defines three separate layers: the inner, the outer and the space between the two."⁴ The double wall's outer layer is also an adaptation of Louis I. Kahn's theory of ruin, which consisted of wrapping a building, or its part, with a secondary exterior wall provided with large openings so as not to embarrass the view. Depending on the angle of the sun as well as on the distance that divides the building's facade from its secondary exte-

² Jean Prouvé, *La Maison tropicale*, Centre Pompidou, Paris 2009, p. 419.

³ *Idem*.

⁴ J. Lucan, *De la décomposition de la fenêtre à la pièce de lumière*, [in:] Louis I.Kahn. *Silence and Light. Actualité d'une pensée*, Cahiers de théorie2/3 [red. Patrick Mestelan], Presses polytechniques et universitaires romandes, Lausanne 2000, p. 103.

rior wall, the shade thrown on the building's windows is supposed to reduce the heat as well as eliminate the glare. At the same time, the view from the windows to the outside remains free from encumbrances. The method of the double wall, developed by the architect while working on the unbuilt project of the US consulate in Angola, was frequently used in his later practice. It particularly influenced the architecture of those among Louis I. Kahn's projects that are located at low latitudes.

The project of the US consulate in Luanda, which can be compared with housing architecture both by its scale and its spatial characteristics, brought even more solutions when it comes to the building's adjustment to the reality of its location. During his stay in Angola, Louis I. Kahn became interested in the architecture of local houses, which had a double roof to protect their interiors from overheating. Having rethought the functioning of this indigenous method, Kahn decided to adopt and improve it in his own work. In effect, he proposed a double-layered roof (ill. 5), with one layer for the sun and the other for the rain, as the architect said himself. The upper layer of roofing, which is addressed to the sun, is lightweight and its role is to reflect sunlight, while the lower roof is intended to collect rainwater. Between these two layers a void space of six feet height (1.8 m) has been provided in order to ensure proper ventilation and to facilitate the maintenance of proper technical condition of the two roofs. As in the case of indigenous architecture, the airflow throughout this space helps to reduce the heat. Interested by the double roof's functioning, Kahn also rethought the use of airflow to cool the spaces inside the building.

6. THE IMPORTANCE OF WATER AND AIR

However, the significance of airflow in cooling a building was not an individual interest of Louis I. Kahn at that time, but rather a frequent consideration of architects designing buildings in hot climates. Despite the fact that air conditioning was generally available in the 1950's, efforts were made to provide such building designs that would not make their comfort of use entirely dependent on mechanical cooling. Among various methods of making a building comply with the conditions of the local climate, the two most popular rely on ensuring airflow through the roof, just like in the case of the US consulate in Luanda, as well as on using varied brise-soleil solutions. A distinguished example of architecture protected by such means from scorching sun is the famous Chandigarh Capitol Complex, designed by Le Corbusier. In the High Court, for example, the form of a giant canopy shades the building below and provides cooling ventilation above its roof. In the Assembly Hall, in turn, the facades are provided with brise-soleil in the form of angled, advanced concrete walls which protect the windows from sun rays falling within a certain range of angle, precisely calculated accordingly to the latitude. At the same time, the proposed solution does not interrupt the view to the outside, which remains nonetheless framed. Moreover, the curved roof which crowns the building's main facade, remaining its most recognizable and distinctive attribute, constitutes the designer's response to the local climate's other important feature. Being able to surprise a European architect, the amount of rainfall during the monsoon season requires particular attention in terms of water evacuation as well as the roof's waterproofing. Considerations on this subject seem to be symbolically represented by the immense water duct form, towering over the entrance to the Assembly Hall and equipped with two outsized sprinklers, located on its opposite sides and emptying into a pool in the building's front. Similar design principles

to those formulated for the Chandigarh Capitol Complex influenced Le Corbusier's project for the Mill Owners' Association Building in Ahmedabad, India, elaborated during the same period of time. The building's structure has been subordinated to the direction of prevailing winds, while its east and west facades are provided with advanced concrete walls which act as brise-soleil. Both their angle and dimensions were accurately adjusted to the location's latitude. Besides the use of brise-soleil features, the building's volume is dominated by massive water ducts and sprinklers, draining the water from the roof, similarly as in the Chandigarh Assembly Hall. Moreover, the heat gain within the building was reduced thanks to two gardens and a pool situated on the rooftop.

These and other searches in contemporary architecture, aiming at its adaptation to the often complicated climate conditions of the region, resulted in the establishment of a tendency that consolidated both the aesthetics and principles of the modern movement with the pragmatism of the simplest local solutions. This combination has become an important distinguishing feature of one among the trends belonging to critical regionalism.

7. GRAND SCALE

The trend of postmodern architecture that implies its adjustment to the climate conditions of the region is also reflected in the urban planning. In his unrealized project for the city of Gandhinagar in India, Louis I. Kahn attributed almost utopian dimensions to this relationship. Taking into account the fact that the region of location suffers from seasonal droughts, the architect approached the project by delineating aqueducts which would direct the water accumulated in reservoirs during the monsoon season towards the new city. The network of water channels then became the basic principle of urban design for Gandhinagar. Moreover, its main streets were laid out with regard to the prevailing winds' direction so as to support the city's breathability and reduce the heat. Finally, the architect avoided having to cut any mango trees down, as they are sacred in Hinduism, and gave them an important role as landmarks. Never realized, the project of Gandhinagar is nonetheless reflected by the basic principles of the master plan drafted for the Indian Institute of Management in Ahmedabad (ill. 6).

8. TODAY AND TOMORROW

By the end of the twentieth century, the popularization of air conditioning caused a retreat from considerations about neutral protection measures addressed to reduce heat gain. Even the equator could not resist the vogue for shiny glass skyscrapers, which are completely alien to this latitude and would remain unsuitable for use if deprived of mechanical cooling. Realizing how fatal may it be to rely heavily on the availability of electrical energy, some contemporary architects undertook research aimed at identifying such design methods that would ensure the buildings' adjustment to the hot and wet climate, allowing at the same time contemporary architectural language to be used. Among these works it is worth mentioning the recent projects by the American architect Erik L'Heureux, who has dedicated recent years to research for such types of building envelopes that would allow both an adequate protection from the sun as well as a proper breathability. The architect has

named them “hot and wet envelopes” and used them in many of his designs, among others in the awarded Simple Factory Building in Singapore. The building’s volume is characterized by a free ground floor plan and is divided into two parts by an inner courtyard, which is meant to facilitate the airflow under the building as well as upwards throughout its open patio. Composed of brise-soleil features forming the interlace pattern, the building’s skin deflects a significant part of solar radiation, protecting it from overheating. In his lecture entitled “Hot & Wet”, Erik L’Heureux presents a typical section of the regional house founded on piles right next to the section of his factory building in Singapore, giving evidence that the architecture of tropical houses can be a source of inspiration nowadays too. In an age when the need for sustainable architecture becomes more and more evident, their pragmatic relationship with their region can also deliver serious reflections on our distant ground. Namely, the conclusion to be derived from observations of the old and the new architecture of the equator is that the most revealing and reasonable way to refer to vernacular architecture is to rethink its functional principles, rather than just repeat its hackneyed forms and ornamentation.

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