PAPER #8.04

THE ROLE OF VERNACULAR ARCHITECTURE IN THE FUTURE CITIES

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How to cite
Rosaleny-Gamón, Marcel·lí. "The role of vernacular architecture in the future cities." In *Proceedings of 3rd Valencia International Biennial of Research in Architecture. Changing priorities*. Valencia. 2022. https://doi.org/10.4995/VIBRArch2022.2022.15181

ABSTRACT

The increase in the world population and Climate Change already represent two of the most important challenges that humanity has faced throughout its history. In this sense, the human settlements of the future must find a way to solve the problems derived from these challenges while guaranteeing the development of the communities and the well-being of their inhabitants. Given the global awareness of the need to propose new forms of development, architecture and urbanism have worked on different models of change that can respond to the needs of humanity on a planet of finite resources. Vernacular architecture and its settlements have become a source of knowledge and a lesson in sustainability when facing the challenges of the future. Its ways of life and its principles emerge as teachings to incorporate into contemporary architecture in relation to the four axes of sustainability: environmental, economic, social and cultural sustainability.

KEYWORDS

Vernacular Settlements; vernacular architecture; sustainability; urban planning.

1. INTRODUCTION

In 2007, for the first time in history, the population settled in urban areas surpassed the rural population. According to the United Nations, currently 55% of the population lives in urban areas, and it is expected that this percentage will increase to 68% by 2050 (United Nations Department of Economic and Social Affairs 2018).

This urban population growth will be also reinforced by the forecasted demographic increase for the following decades. Up to 90% of this population growing will lie on the African and Asian continents, being only three countries (India, China and Nigeria) hosting the 35% of this growing (United Nations Department of Economic and Social Affairs 2018).

This circumstance poses a challenge for architecture and urbanism as the expected demographic pressure that cities will suffer forced functional and structural changes looking for a sustainable development. At present, the lack of planning is turning the informal city into the growth model for many of these cities obtaining as a result the predominance of habitats that do not guarantee the basic rights for their occupants. Faced with this option, a new vernacular architecture has emerged as an alternative model in construction against the model started in the Industrial Revolution and expanded along the 20th century, a model that creates an architecture alien of the

environment in which it is built. The new trend focuses on the values of traditional vernacular architecture as a source of forgotten knowledge and it represents an example on the three axes of sustainability: environmental, socio-cultural and socio-economic.
Here, the possibilities that vernacular architecture versus the informal city in terms of resilience and sustainability are presented. This architecture, based on accumulated experience and a sustainable exploitation of the territory and its resources could be a tool in creating a safe future. Throughout this paper, the possibilities of this architecture will be considered as an effective response to the demographic challenge and the pressing climate change.

2. THE PROBLEM WITH THE INFORMAL CITY

As seen in the introduction, the growing demographic pressure in certain countries will become one of the main problems to be solved by urban planning in the coming years. This demographic growth is also accompanied by a rural exodus to the big cities that began around the middle of the 20th century in search of a job in industry or civil construction (Tardin 2006).
One of the countries in which the greatest population growth is expected is Ethiopia, where some cities have already begun to suffer from this pressure, which is beginning to cause urban problems of different nature. The city of Addis Ababa is one of these cities, where demographic pressure has generated the proliferation of spontaneous precarious settlements that are often built without basic services.
Added to these problems of basic habitability are others of a political and administrative nature, such as the need to expropriate land and evict people to replace traditional vernacular neighborhoods with high-rise towers that make the most of construction land (Rancati 2020).It is the spontaneous settlements, however, that generate the greatest problems in cities. These settlements, which, unlike the formal city, are built outside urban and legal legislation, are characterized by self-construction and the poverty of its inhabitants.
Within the concept of *informal city*, among many others, the *villas miseria* of Buenos Aires, the *quebradas* of Caracas, the *barreadas* of Lima, the *alagados* of Salvador or the *favelas* of Brazil are collected. All these settlements share some of the characteristics defined above in addition to those detailed below in relation to urban parameters.

Illegal occupation of land

The economic availability of land that is marketed irregularly or the existence of land without defined use allows the appearance of informal settlements on the outskirts of cities. This land occupation outside urban planning legality is reinforced in many cases by the lack of public policies in urban planning that regulate the growth of these cities (Rancati 2020).

Lack of urban planning

The informal city is morphologically characterized by presenting a discontinuity with the pre-existing fabric of the urban settlement. In this way, the layouts of these settlements are distinguished from each other in the same way that they are distinguished from their surroundings by not presenting a continuity with it.
In the case of the *favelas,* for example, they present an irregular occupation that arises from some specific constructions and progressively widens in the territory. In this process, improvisation stands out both in the construction of buildings and in the planning of urban space. In this sense, public spaces are scarce and valueless, since the possibility of building more houses is prioritized economically.

Lack of infrastructures

In general, informal city settlements are also characterized by the lack of basic infrastructure. This condition not only affects the hygiene and habitability of homes, but also contributes to a biophysical degradation of the environment.

Thus, the lack of sanitation networks, for example, contributes to the contamination of the surrounding soil and water, in addition to increasing the erosion of the slopes. On the other hand, the occupation of the banks of rivers or lakes, wetlands and, sometimes, the riverbeds themselves, are the most frequent cause of floods. In these settlements, which do not have the infrastructure to deal with these disasters, these floods often cause irreparable damage (Tardin 2006).

The lack of drinking water and electricity is another of the most frequent deficiencies in this type of settlement, which greatly compromises the habitability of the dwellings. This lack of drinking water, together with the lack of public sanitation, also means the frequent appearance of diseases linked to lack of hygiene.

3. SUSTAINABILITY AS A NECESSITY IN THE FACE OF THE CHALLENGES OF A PLANET WITH FINITE RESOURCES

To this demographic crisis referenced and which is already generating some of the problems derived from the informal city, another crisis has been added for decades now, which, moreover, is the origin in part of the crises migratory and the rural exodus that do nothing but aggravate this demographic crisis. This is the ecological crisis.

The ecological crisis has become one of the main concerns and challenges of our generation and those to come. Our current model of development is assuming a depletion of the resources and natural reserves of our planet (Peiró 2010). For this reason, in 1987, the United Nations Brundtland Report firmly supported a sustainable development, defining it as that model that satisfies the needs of present generations without compromising the resources of future generations.

This concern for the environment must start from a change in mentality that reconsiders the idea of nature as a mere instrument from which to extract the necessary resources to cover our needs, that is, from the idea of nature as a mere instrument, since, as Peiró states, "... the uncontrolled exploitation of ecosystems supposes the annihilation of our source of life." (Peiró 2010, p. 14).

Given these crises that have arisen, it seems necessary to reflect on the urgency of proposing a more sustainable growth model that encompasses both economic development in global terms and the development of the cities that are the subject of this work.

At this point, it seems necessary to clarify the concept "sustainable", considering that this term is not limited to architecture but to any field of knowledge related to the development of our society. In this sense, the term "sustainable" is usually defined as "that which can be maintained for a long time without depleting resources or causing serious damage to the environment"

This meaning of the term sustainable is closely linked to the concept developed in the aforementioned Brundtland Report and the fact that it links it to two fields of knowledge such as ecology and economics is particularly important. Later, we will see how these two concepts constitute two of the dimensions to be analyzed in relation to sustainability.

Returning to the concept of sustainable development defined in the Brundtland Report, we should continue to define the concept of development, to understand how it is linked to the concept of sustainability. This concept began to be used in the field of biology in the 16th century to indicate the evolution of young individuals towards the

adult phase. However, it is from the World War II when it begins to be used in the field of economics to indicate the economic growth model of industrialized countries. In this sense, the term development is linked to countries, defining developed countries as those with a higher degree of industrialization, while less industrialized countries are classified as developing countries (Bermejo 2014).

It is precisely after the World War II when the greatest economic growth in the history of capitalism takes place based on two basic ideas. First, it is understood that peace constitutes an opportunity to achieve prolonged growth that would allow developing countries to reach the level of industrialization of developed countries. Second, the idea that the planet's resources are unlimited is advocated, thus allowing endless growth.

Already in the 1960s, the environmental problems derived from this economic growth began to be evident. It also became evident that these environmental problems had a planetary scale and resulted in Climate Change, pollution of the atmosphere and oceans, the erosion of the ozone layer and the reduction of forest mass, among many others (Bermejo 2014).

As a result of this incipient concern, the United Nations General Assembly approved the World Earth Charter in 1982, creating the World Commission on Environment and Development a year later. It was this commission that, after years of work and numerous meetings in different countries around the world, presented in 1987 the Report "Our Common Future", better known as the Brundtland Report.

The Report states that developing countries cannot copy the model of developed countries due to the scarcity of natural resources, which is especially evident in terms of energy, materials and water. For this reason, the Brundtland Report raises the need to transform the economic model because "We are unanimous in our conviction that the security, well-being, and very survival of the planet depend on such changes, now" that must occur "in the old approaches to development and environmental protection" (WCED 1987, p. 108).

As stated previously, the Brundtland Report defines sustainable development as "... development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." This definition, as Bermejo states, has a three-dimensional interpretation, since it brings together the economic and social dimensions in the concept of development, the third being sustainability (Bermejo 2014).

Given that buildings consume 25% of the energy produced, it is of vital importance that these ideas, initiated in this Report, finds its way into the world of architecture. The search for sustainability in architecture has become a fundamental pillar of the future of our profession in recent years. This search is not only in the will of the architect to commit to a more sustainable future for construction or in a personal commitment to a planet that has progressively depleted its resources, but has been reflected in recent times in increasingly more demanding. This regulation will lead us, in the very near future, to the construction of buildings with almost zero energy consumption and, therefore, our profession must face as soon as possible this great challenge from which we will not be able to escape.

4. TRADITIONAL VERNACULAR ARCHUTECTURE AS A SUSTAINBLE RESPONSE

Over the last decades, the idea that our way of inhabiting and occupying the territory is not sustainable has been spreading. The industrialization process that has accompanied the advances in construction with the Modern Movement, has entailed

unsustainable environmental costs. The extraction, production and transport of construction materials is one of the main sources of greenhouse gas emissions directly related to the construction process based on the antagonism with the environment that surrounds us (Peiró 2010). As has been seen, numerous political and social movements have achieved a change in mentality that is key in changing the development model. Nature, in this new current, is not understood as a mere instrument with which to satisfy the needs of uncontrolled growth.

Looking to the architecture and urbanism of the past to talk about sustainability no longer represents a revolution, and, in fact, it has become a broad field of study in recent decades. During the last twenty years, a large number of publications have emerged that delve into the knowledge of vernacular architecture with the aim of extracting knowledge focused on the search for sustainability. The growing number of works related to the topic has become an important contribution focusing on the understanding of sustainability in vernacular architecture (Vellinga 2015).

The interest in sustainability in vernacular architecture arose during the first years of the eighties, coinciding with the creation of the World Commission on Environment and Development of the United Nations General Assembly and the entire consequent social awareness movement. In these early years a small number of studies focused on the environmental behavior of vernacular architecture emerged, presented at PLEA (Passive and Low Energy Architecture), a conference that took place in Bermuda in 1982.

However, this current, which coincides with the beginnings of awareness of sustainable development, was not introduced in the academic field until the last years of the 1990s, when sustainability emerged as a central theme in the politics and interest of the general public. Until then, most works focused on the relationship between vernacular architecture and the environment in general terms.

An example of this type of work is the one developed by Paul Oliver, *Encyclopedia of Vernacular Architecture of the World* (Oliver 1999), which, although part of his work focuses on how the natural environment is the starting point of vernacular architecture, it does not delve into the study of its sustainability. This trend is reversed in the early years of the 21st century where works such as those developed by Frey (2010), Weber and Yannas (2013) or Correira, Carlos and Rocha (2013) already appear. These studies delve into the sustainable capacity of vernacular architecture and study, for example, how climatic and geographical conditions lead to a particular type of housing. These are much stricter studies, in which the environment of a home is monitored in order to study the thermal behavior, humidity, solar radiation, or lighting, among others.

At this point it is necessary to establish a definition of *vernacular*, as well as to clarify the differences between this term and other related terms such as *traditional* or *popular*.

Starting from the origin of the word, it comes from Latin and means indigenous, domestic, while *verna* refers to "the slave born in the house" (Frey 2010, p. 74). This first approach already places special emphasis on the place of origin of this architecture: housing. That is, it is not something that has been produced by other people, but something that has been produced by the user himself. This idea is widely developed in the book *Architecture without architects*, by Bernard Rudofsky (1964).

This term can be closely related to what is known as traditional architecture, which, despite having aspects in common, also retains different nuances. Although vernacular architecture, which we have already talked about, stands out for its domestic character, traditional architecture also includes other types of popular

constructions, as long as it can be included within local construction traditions (Cortés 2013). The popular adjective, in relation to architecture, implies that it belongs to the people or that it is characteristic of it. This definition coincides with that of Carlos Flores who affirms that popular architecture is "the art and technique of designing, building and transforming the living environment of this social group that we have called the people, all being carried out... by individuals of the group itself" (Flores in Cortés 2013, p. 187).

In the paper "Rethinking traditional architecture for current living", Elías Ángel Peiró combines the terms *vernacular*, *traditional* and *popular* in the same definition, as he affirms that, although there are small nuances between the three terms, in the case of the architecture could be treated as synonyms. The author considers that "vernacular architecture is one that has been carried out by non-professional builders, using materials from the immediate environment and framed in the wake of a series of skills transmitted since time immemorial." (Peiró 2010, p. 15).

These definitions have the self-construction of this architecture in common, assuming this to be the main differential quality of what is known as cultured architecture, that carried out by professionals. In the aforementioned article by Juan Cortés, he considers that four main components are derived from popular architecture that condition or define this type of architecture:

1) There is a great dependence on the physical environment, derived from the poor development of pre-industrial society.
2) The use of construction techniques and traditional solutions that guarantee the effectiveness (through experience) and the durability of the response.
3) The repetition of timeless models. Architectural types.
4) The functional adaptation to the vital and productive needs of the inhabitants.

The paper goes on to link these four components to the four basic principles of sustainability. On the one hand, the total dependence on the physical environment inevitably results in an attitude of respect towards the environment. The limited technological development of traditional construction techniques is linked to the scarcity of economic resources, the repetition of models and the appearance of types leads to a cultural identity and the adapted urban model necessarily responds to a functional organization of society. The four principles of sustainability are thus established: the environmental perspective, the economic perspective, the cultural and the social (Cortes 2013).

According to Cortés' approaches, these four approaches, which constitute the main strengths of vernacular architecture in the face of the creation of a new architectural model, could be defined as follows:

- Environmental perspective: This approach, which frequently becomes the central axis of the so-called sustainable architecture, considers the adaptation of buildings to the environmental conditions of the surroundings, since it is directly related to the natural resources available to traditional architecture (extraction materials, water, biomass, ...). Given the difficulty of transporting these resources, the builders saw the need to exploit these resources to the maximum even without compromising their availability over time.
- Economic perspective: This perspective is based on the idea that the construction, structural and energy techniques used in popular architecture derive from the experience accumulated by successive generations that have led to solutions that lead to optimal habitability levels with the lowest possible economic cost.
- Cultural Perspective: This approach considers that popular architecture, along with *terrazgo*, constitutes the most significant element of the cultural

landscape, in addition, it is part of a valuable ethnographic heritage that also builds the identity of a territory.
- The social perspective: Building inevitably constitutes occupying the territory and the popular architecture with its occupation model that achieves great social cohesion, since it generates public spaces such as streets and squares, essential elements for the common life of the different societies.

A concept closely related to vernacular architecture and popular architecture is *resilience*. According to the definition elaborated by The Resilience Alliance (2002), resilience is the "ability of an ecosystem to tolerate disturbances without collapsing into a qualitatively different state, controlled by a different set of processes".

The Resilience Alliance is an interdisciplinary network of scientists and practitioners looking at the integrated dynamics of people and nature from a socio-ecological point of view. It has its origins in 1999 and includes a large number of member institutions such as universities, government agencies, NGOs, etc. This alliance periodically publishes the journal Ecology and Society which, over the years, has been dedicated not only to defining this term, but also to addressing numerous issues related to it. In the paper "The characteristics of resilience" published in 2002, a series of parameters that can be analyzed around the resilient capacity of a system are studied:

- The number of changes the system can undergo while retaining the same controls in the function,
- The degree to which the system is capable of self-organization,
- The ability to build and increase the capacity to learn and adapt. (The Resilience Alliance, 2002)

If we apply this term to our field of study, we observe that it becomes a strategic requirement for human settlements in the face of challenges such as Climate Change, socio-cultural change, natural disasters and economic crises that have occurred throughout history. Vernacular architecture and the vernacular settlements, demonstrate a great capacity to evolve and adapt to changing external conditions as a result of multiple cycles of global change (Ozel, B., Dipasquale, L., & Mecca, S. 2014).

In recent years, the term resilience has been used especially in the field of urban planning, understanding that this is a necessary capacity to reduce the negative impact of the changes to which cities are continually forced, as well as to generate safer cities. Resilient settlements need a dynamic architecture that can adapt to the conditions of the environment in a constant process of transformation (Ozel, B., Dipasquale, L., & Mecca, S. 2015).

5. LEARNING FROM VERNACULAR SETTLEMENTS. STRAGETIES OF SUSTAINABILITY

Throughout this paper, some of the pillars of sustainability and resilience have been established on which vernacular architecture is built and which can be a tool when building cities that reduce the negative impact on the environment of demographic pressure expected for the coming years.

Among these characteristics, we could highlight the strategies in the use of the land, the adaptation to the environment in which it is built or the ability to use renewable energy sources. These parameters are thus added to the reduction of waste and pollution to reduce the ecological footprint of settlements (Ozel, B., Dipasquale, L., & Mecca, S. 2015).

Design strategies in vernacular architecture derive from both the climate and the resources available in the environment. In this way, for example, the roofs of traditional buildings are sloped in territories with abundant rainfall, while in other drier territories flat roofs allow this water to be collected for domestic use.

Climate also affects the urban fabric of the settlements, since it changes depending on the temperatures and humidity conditions

of the construction environment. In warm climates such as the Mediterranean, compact cities are built with narrow streets that largely avoid the direct incidence of sunlight while these same streets form ventilation tunnels that generate a passive cooling system (Ozel, B., Dipasquale, L., & Mecca, S. 2015).

It is also worth highlighting the choice of the place where to establish a settlement as another strategy in the creation of sustainable settlements. In this way, the orientation of cities can play a decisive role in their sunlight and, therefore, in the need to allocate resources to heating buildings. Thus, historical settlements are often located on the southern slopes of the mountains, allowing the buildings to get sunlight throughout the day.

To understand the importance of the place and how it partly determines the urban fabric, we will use El Cabanyal, a neighborhood in València as an example. In this neighborhood on the coast of the city of València, the urban fabric is characterized by the regularity of its blocks, which run longitudinally along the coastline (Pastor, 2012). The subdivision, in this case, is the result of the parallel repetition of *barraques*, a building with a rectangular floor plan with facades on the short sides that face the public road and the interior patios.

Although the layout of these buildings was not planned, it was not random either. In its implantation there are a series of conditioning factors that rationally explain the result of this agglomeration and therefore, of the resulting tissue.

The most determining factor is the coastline that is traced in a north-south direction to the east of the neighborhood. The grouping of these *barraques* with this orientation allows these buildings to have their main facades to the east and west, allowing cross ventilation that takes advantage of the prevailing easterly winds in this area. On the other hand, in order to achieve this cross ventilation, the blocks of the urban fabric cannot be more than two plots wide, thus the length of the urban block prevails over its width, which is conditioned by the length of two plots.

In this way, the main streets of the neighborhood maintain a north-south orientation, while smaller roads open up perpendicularly, which, while facilitating communication between roads, also allow the fabric of the neighborhood to take advantage of the prevailing winds. In this case, then, the repetition of the cell and the conditioning factors of the place determine the urban fabric, creating spaces that take advantage of these initial conditions for the benefit of its inhabitants.

Mixed-use spaces and the flexibility of uses in spaces are another of the characteristics of vernacular settlements that are essential to improve their resilience and with it the sustainability of cities. Maximizing activities in spaces and land, as well as combining the uses of urban spaces, contributes to improving the functionality of economic, social and cultural activities with low energy consumption compared to single-use spaces (Ozel, B., Dipasquale, L., & Mecca, S. 2015). These concepts, on the other hand, are closely related to the implementation of collective housing and shared urban facilities to the extent that these spaces for coexistence also contribute to improving the social relations of the communities.

Returning again to El Cabanyal, it is worth noting how the use of the public thoroughfare in this neighborhood allows it to be interpreted as an extension of the dwelling in such a way that the public space is resignified, housing public uses and private uses in such a way that life itself of its inhabitants allows to guarantee the care of the streets, as well as the safety of the people who transit them. In these streets it is not difficult to find groups of neighbors eating in front of their houses at improvised tables or doing domestic chores while the public space also becomes a stage for processions or celebrations.

The use of suitable materials is another of the characteristics that are framed within

different pillars of sustainability, both environmental and economic, since the use of little transformed materials and the use of little machinery to obtain them considerably reduces the environmental pollution derived from the building. This same precept is linked to the use of local materials as a basis for the construction of vernacular buildings in such a way that it contributes to their resilience by having the materials necessary for the repairs that these buildings may require nearby (Rosaleny-Gamón, M., 2021).

The ability to promote the economy and local crafts is Also noteworthy in relation with the promotion of sustainability in vernacular architecture. This facilitates the maintenance of buildings during the useful life of the buildings, while contributing, on the one hand, to the transmission of constructive cultures, and on the other, to the creation of a unique cultural landscape for each territory.

In relation to the resilience of vernacular settlements, it is also worth noting the capacity of traditional architecture to promote autonomy and self-sufficiency through mechanisms such as the integration of housing and production spaces, coexistence with private gardens to supply food and domestic livestock and the use in the home of spaces for the storage and preservation of food.

As a whole, the way of life of the vernacular settlements, together with the intrinsic pillars of sustainability in their way of understanding and exploiting the territory, constitute a case study to improve the understanding and appreciation of the principles of sustainability that can be applied to the construction of new settlements, as well as the growth model of existing cities (Ozel, B., Dipasquale, L., & Mecca, S. 2015).

6. CONCLUSIONS

In the introduction of this work, a problem has been presented that already affects numerous countries, mainly in Africa, Asia and South America. The demographic pressure currently suffered by some countries such as Ethiopia will increase in the coming decades due to the population growth in some of these territories. Architects and urban planners of the 21st century will have to face the problems caused by this demographic challenge. This forces us to rethink the consumption models of contemporary societies, as well as to rethink construction and urban planning systems to guarantee that large urban areas can satisfy the basic needs of its inhabitants.

As has been seen, it was in the 1980s when the social pressure derived from the already evident environmental problems of growth based on a deficient economic system forced United Nations to create the World Commission on the Environment and Development. The aforementioned "Brundtland Report" emerged from this commission, which highlighted the need to change the growth model of the so-called developing countries.

While buildings consume up to 25% of the energy generated worldwide, many architects already considered in that decade the need to renew the trends in construction and urban planning that were still inherited from the Modern Movement and the Industrial Revolution. A model that ignored the environment in which it is built, understanding nature as a mere store of resources.

Some of these architects found in traditional vernacular architecture a source of knowledge about sustainability to apply in contemporary architecture. This model made it possible to establish a system that, far from breaking with the knowledge accumulated over generations and generations, was nourished by it and allowed a return to growth based on a sustainable way of exploiting the territory and its resources.

Throughout the paper, the strength of vernacular architecture has been highlighted as a solution to the need for growth in a world of finite resources. It is therefore an architecture that guarantees sustainable growth, which contemplates the four pillars of sustainability, the environmental perspective,

the economic perspective, the cultural perspective and the social perspective.

In this way, traditional vernacular architecture constitutes an example of sustainable construction, based on the analysis of the territory in which it is built and the resources available. These lessons offered by vernacular settlements become essential when facing the demographic and urban challenges foreseen for the coming decades and which may represent an alternative to informal settlements incapable of guaranteeing a decent life for the citizens who occupy them.

This work does not suppose more than an approximation to a field of study that is gaining strength in recent decades, however, the current bibliography focuses fundamentally on the capacity of vernacular architecture as a cell of the city. The challenges of the future, however, force us to become aware of the importance of urban planning, that is, of the urban scale. This is the field in which professionals in this sector should focus their efforts. The case of El Cabanyal, which has been used to exemplify some of the benefits of vernacular settlements, may serve in the future for the urban planning of the city of Valencia, analyzing the reason underlying each decision of the urban fabric with the objective of achieving more sustainable cities that respond to the demographic, climatic and energy challenges of the next generations.

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