

Using Vernacular Architecture Practices as a Strategy for Sustainable Rural Contemporary Architecture in North -West Syria

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ABSTRACT

Our planet is currently facing increasing challenges with climate change, global warming, and urbanization. Studies indicate that half of the Earth's population lives in urban areas, a percentage that might rise to 66% by the middle of this century. Thus, the importance of rural areas with its vernacular architecture emerges as potential field capable of relieving the burden on the planet, as vernacular architecture is a product of thought, lifestyle, and human-made experiences to create a product suitable for its environmental, cultural, economic, and social needs. The paper highlights vernacular architecture as a potential source of sustainable practices in contemporary architecture by studying vernacular rural architecture in northwest Syria, an area faced armed conflict and a natural disaster recently. Moreover, analysing its architecture based on the sustainability framework produced by the VERSUS project, which discusses three basic aspects of sustainability in vernacular architecture (environmental principles - socio-cultural principles - socio-economic principles). It was found through the research that the environmental standards are the most applied ones with some gaps, a strategy was proposed to develop a model derived from the vernacular architecture for a resilient sustainable architecture that fulfil the contemporary requirements and needs of the region.

Keywords – Vernacular architecture, Rural, Masonry houses, Traditional building techniques, Environmental Policies, Economic-cultural policies, Socio-cultural policies, Sustainability.

1. INTRODUCTION

Vernacular architecture is the product of a process of centuries of trial /error and learning using available local building materials and is thus a cumulative knowledge based on experience(Mileto et al., 2022). Also, on one hand, it is a product of evolutionary adaptations between man and the natural environment. These adaptations resulted in unique building solutions. vernacular architecture is a reservoir of technical, social, and cultural knowledge of the society that produced it and passed it on from one generation to another (Dipasquale et al., 2022).On the other hand, technology beating tradition is a reality nowadays (Daghfal & Professor, 2019).

Many believe that the concept of sustainability is new to use at the architectural and environmental level today, but this is not absolutely true due to the adoption of many sustainable design principles in vernacular architecture. When looking for a sustainable environment, it is best to refer to vernacular architecture, which seems to have many of these features up to the present day(Salgin et al., 2017). The vernacular architecture was shaped by a

conceptual framework, which developed an understanding of perceived responses to environmental, urban, and cultural conditions. Thus, sustainable architecture is the most authentic expression in a specific environment and conditions. For this reason, vernacular architecture has many lessons we should learn to create a sustainable architectural environment (Salgın et al., 2017). Vernacular architecture holds more value than its cultural value. It represents the development of a community's identity and a measure of global changes (Hardiilla & Nugroho, 2020).

Syria extends over multiple geographical regions and diverse natural resources, so the rural environments and forms of living in Syria differ widely. For example, Syria has agricultural lands in the north and west, plain lands in the central regions suitable for grazing and agricultural activities, and deserts in the south and east of the country. On the other hand, the diversity of Syria's geology led to the diversity of building materials (limestone, sand, basalt stones, and earth), and this in turn was one of the most important factors in the diversity of architectural styles in the Syrian countryside and provided a fertile environment for exchanging knowledge and experiences within the country. Moreover, Syrian rural society has a workforce and a cohesive social structure represented by the family (Al Asali & Shahin, 2016).

The decline in population growth rates in the Syrian countryside and migration to cities led to an increase in the urban population to more than half of the total population of Syria, at the expense of the share of the Syrian rural population, which led to the neglect of this vast geography. In addition to the previous suffering of the Syrian countryside from the lack of development plans to confront the problems that escalated due to urbanization rates resulting from natural growth and internal migration (Al Asali & Shahin, 2016), and finally the Syrian war in 2011, which exacerbated the crisis in rural areas and caused massive demographic changes over the entire area of the country and the movement of the population in their search for safe areas to live, especially in northwest Syria (the Syrian revolution areas) after the forced displacement that occurred from all Syrian governorates and the huge wave of displacement that occurred in late 2019 and the beginning of 2020, which reduced the geographical area of northwest Syria and put pressure on all residential settlements, including rural areas (Altah & Haj Ismail, 2022).

1.1 Objectives of the Research

In general, the research aims to draw attention to the importance of rural areas in Syria as a geographical space capable of accommodating population growth and as a source for mitigating the phenomenon of global warming due to the sustainable strategies carried by rural vernacular architecture, and identifying the problems that it suffers from.

In particular, highlighting the vernacular rural architecture in northwestern Syria, which has been exposed to successive crises - the Syrian war since 2011

and the earthquake of February 6, 2023 - as alternative areas for housing, and an important resource for sustainability in contemporary rural areas in which the rural vernacular architecture has begun to fade and lose its cultural, environmental, social and economic identity as a result of globalization impact.

2. MATERIALS AND METHODS

- literature Review regarding the research topic in the world and in Syria to benefit from the most important experiences and positives and avoid negatives.
- Analysis of a case study from the northwestern region of Syria, using the sustainability framework developed in (VerSus) for the Vernacular Architecture Project, which consists of three pillars. Each pillar is divided into five principles, and under each principle there are several practices.
- The practices applied in the case study will be compared with the practices identified in each principle, and will be evaluated by the value of one of the four categories as shown in Figure. 1. a.
- Finally, the principles most applied in the case study will be identified, in order to study the possibility of their application in contemporary rural architecture.



Figure 1: (a) The Assessment and Evaluation Method (developed by author), (b) VerSus Framework (Correia & Dipasquale, n.d.)

2.1. VerSus Framework

VerSus is a European project developed under the Culture Program 2007-2013, funded by the European Commission from 2012 to 2014. Its main objective is to gain knowledge of the basic principles of sustainability learned from vernacular heritage, and to explore new ways of applying these

principles in modern sustainable architecture. By establishing basic principles, which define a large number of strategies that must be considered and integrated into sustainable contemporary architecture (Correia & Dipasquale, n.d.). Figure .1. b. shows the three main pillars of sustainability, with the principles as stated in Versus project.

Table .1 explains the framework of the Versus project, which are the basic pillars of sustainability in vernacular architecture, the principles it contains for their application, and the practices each principle contains, which will be used in analyzing the case study.

Table 1: Pillars and practice of Vernacular architecture Sustainability According VERSUS project (Correia & Dipasquale, n.d.)

VERSUS Project		
Pillars of sustainability	Principles	Practices
<i>Environmental Sustainability</i>	To respect nature	<ul style="list-style-type: none"> • Assuring an appropriate choice of site • Minimizing the impact of interventions • Ensuring conditions for site's regeneration • Integrating with the environmental morphology • Understanding the features of the site
	To benefit from natural and climate resources	<ul style="list-style-type: none"> • Choosing appropriate building orientation • Considering the hydrography of the place and managing the water resources • Location buildings to take advantage of the natural landform • Incorporating solar energy into the overall design • Taking advantage of soil thermal inertia
	To reduce pollution and waste materials	<ul style="list-style-type: none"> • Consuming local available materials • Using recyclable and recycled materials • Reducing loss of thermal energy • Using available energy resources • Planning maintenance and extending the durability of the buildings
	To contribute to health quality	<ul style="list-style-type: none"> • Enhancing indoor temperature and humidity levels within acceptable values • Ensuring adequate natural ventilation • Guaranteeing adequate natural lighting and sun radiation • Improving natural and passive heating • Avoiding toxic materials

	To reduce natural hazards effects	<ul style="list-style-type: none"> • Providing practical guidance to anticipate and mitigate risks • Developing strong and flexible construction systems • Considering the specific characteristics of local risks • Integrating technical and behavioral measures for reducing vulnerability • Incorporating strategies for post disaster recovery
Socio-cultural Sustainability	To protect the cultural landscape	<ul style="list-style-type: none"> • Understanding the value of the place and its dynamics • Enhancing techniques of land use that guarantee and sustain biological diversity • Articulating spatial organization with productive needs • Optimising soil features and microclimates through sustainable crop planting and land management • Regulating productive activities by environmental features, as well as by seasonal and economic cycles
	To transfer construction culture	<ul style="list-style-type: none"> • Allowing practical constructive experiences to facilitate empirical know-how • Recognizing the value of mastery and constructive memory • Involving younger generations in constructive processes • Acknowledging the value of roles in traditional activities and knowledge • Facilitating the participation of local communities in decision-making processes
	To enhance innovative and creative solutions	<ul style="list-style-type: none"> • Developing collective intelligence • Encouraging diversity in building system solutions • Integrating influences from other building cultures • Allowing in experimentation in building techniques and processes • Evolving building techniques from experience, through processes of trial and error
	To recognize intangible value	<ul style="list-style-type: none"> • Transmitting cultural values and history • Incorporating social rituals • Building community character and sense of place • Recognising local symbolical expressions • Enhancing of building and productive processes as cultural values
	To encourage social cohesion	<ul style="list-style-type: none"> • Promoting intergenerational relations • Ascribing value to the development of collective welfare • Enhancing community engagement and participation • Encouraging places for community meetings • Building common infrastructures and market places

<i>Economic-cultural Sustainability</i>	To support autonomy	<ul style="list-style-type: none"> • Sharing resources • Using local and accessible materials and resources • Promoting indigenous workmanship • Encouraging local production • Enhancing community empowerment
	To promote local activities	<ul style="list-style-type: none"> • Reinforcing urban farming and local production of food • Enhancing short circuits and local trades • Promoting collective use of spaces • Including spaces for productive activities at urban and architectural scale • Developing handicraft products made with local materials
	To optimize construction efforts	<ul style="list-style-type: none"> • Optimizing the use of materials • Assuring appropriate scale of the building • Enhancing technical simplicity in building processes • Reducing transportation efforts • Encouraging the use of low-transformed materials
	To extend the building's lifetime	<ul style="list-style-type: none"> • Predicting regular substitution of building components • Preventing erosion of building elements • Planning maintenance of the building • Designing flexible buildings for possible changes and extensions • Building strong and durable structures
	To save resources	<ul style="list-style-type: none"> • Using recyclable materials • Promoting building densification and compactness • Assuring supply of renewable energy • Developing construction systems adequate to local conditions • Enhancing natural ventilation, heating and lighting systems

3. LITERATURE REVIEW

3.1. Rural Vernacular architecture In Syria

In their article "Rural Habitation in Syria: The Culture of Traditional Architecture and its Role in The Reconstruction Process", the researchers explained that the reconstruction phase gives, as indicated by most references and studies, priority to human development. And that the study of traditional architecture indicates that reconstruction plans must be based on human experience and living conditions by learning from the cultural and social heritage, represented by vernacular architecture, and preserving this identity as part of development. Ensuring the continuity of urban development as one of the most important aspects of development that can be achieved through the use of natural and local materials and focusing on the organic aspect of

urban growth. Also, they discussed the importance of the family in the Syrian countryside as a social institution that constitutes an important aspect of rural urbanization, in addition to the diversity of building materials, which are represented in vernacular building patterns, which provide an alternative to imported patterns. Additionally, the architectural forms of rural housing and settlement patterns in villages depend on geographical features and changes in the concept of ownership and the relationship between the place of work and the place of residence. In this particular context, traditional architecture, exemplified by the use of local materials and knowledge of the space industry, provides an opportunity for a self-developing process of reconstruction. (Al Asali & Shahin, 2016)

In their article "Earth Architecture in Syria between Past Heritage and Contemporary Experiences", the researchers discussed that traditional architecture has been neglected in Syrian cities and even in rural buildings for several factors. During the research, he stressed the importance of land as a source of building materials, which reflects the culture of integration with the environment according to economic, social and environmental other aspects. The research recommended relying on soil-based construction in rural architecture in Syria, according to traditional techniques and experiences. (Kandakji, 2017)

3.2. Rural vernacular architecture in the World

In their article "Assessment of Vernacular Impact and World Heritage: A Case Study of Patmos", the researchers discussed that interest in the value of vernacular heritage appeared in conjunction with the Venice Charter and the expansion of the concept of a monument from individual architectural work to the urban and rural environment in which reside and refer to a specific civilization, major development, or important historical event. They explained that the vernacular heritage lacks a plan to ensure its protection (the researcher used the methodology of a case study and relied on the H I A tool that was used to assess the site's interventions in the world heritage sites and that can facilitate the selection and implementation of mitigation and management strategies for vernacular architecture) He pointed out that vernacular architecture is the most vulnerable to risks, including natural disasters, climate change and human causes, and that the most important factors of vulnerability that increase risks are: loss of tacit knowledge, lack of scientific and technological knowledge. Improper maintenance and management. Inadequate or temporary buffering of the ecosystem that may cause risks and may eventually turn into disasters. (Dipasquale et al., 2022)

In their article " Traditional earthquake resistant techniques for vernacular architecture and local seismic cultures: A literature review" The researchers pointed out the large number of papers have been published recently regarding both sustainability and sustainable architecture, but a real discussion is

missing about vernacular architecture and local seismic cultures. This is because examples of vernacular architecture have diverse environmental lessons that have huge potential for application in architecture today. On many occasions, contemporary architecture is believed to be moving towards sustainability, which means that the new paradigm is believed to have set a new path for architecture that has lost its way, marked by the stigma of creativity as opposed to nature. However, the history of architecture tells us that architecture has been sustainable since its birth and that since its inception, it has fulfilled many needs that are no longer met today, due to other priorities of the global world, as a result, we turn to technology in an effort to provide a balance. On the other hand, the most important traditional earthquake-resistant techniques were concluded according to several criteria, including terms of preventing damage and applicability in the future, and we can identify the most important traditional techniques that we can use during the rehabilitation of existing buildings for vernacular architecture and the traditional techniques that we can use during new construction (contemporary rural architecture) and partial reconstruction. (Ortega et al., 2017)

4. NORTH-WEST SYRIA CASE PRESENTATION AND ANALYSIS

4.1. Location of study

Jabal Al-Zawiya is the name of a mountain range located in Idlib in Syria, located in the northern part of the mountains of the limestone mass in northwest Syria. The study area is located in northwest Syria and is bordered to the west by the Al-Ghab and Al-Ruj plains, and in its approximately southwestern part lies the city of Apamea, and to the east is the Aleppo-Damascus Road, and its most important points are the Maarat al-Numan Citadel and the plains of Qinnasrin and Hama, and to the north is the plains of Maarat Misrin, and to the south. Shaizar Castle. Jabal Al-Zawiya located between longitudes $25^{\circ} 36'$ and $35^{\circ} 36'$ and latitudes $40^{\circ} 35'$ and $50^{\circ} 35'$ (Basic Science Series, 2022) show figure 2. a

The highest peaks in the region are Kafr Aweid Peak (1200 m), Prophet Ayoub Peak (939 m), and Arbaeen Mountain (877 m), and the latter is considered one of the most important areas for recreation and tourism for the people of northwestern Syria.

4.2. The Context of Villages in Study Location

The elements influencing the creation of human settlements in Syria are those agreed upon by the rural geography literature, and they fall into three broad categories: natural causes, human factors, and social factors. These elements influence the circumstances for the establishment of a village, and so, with the exception of settlements designed in advance, there are three major types of villages (Merging form: Compact form, separate from fields and farmland -

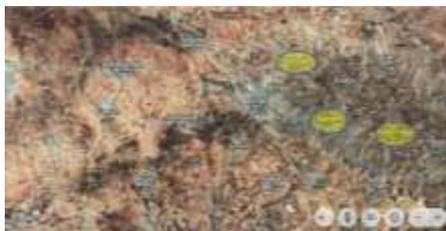
Scattered form: Trace a river or road - Linear form: Houses are spread across the land without a regular pattern, highlighting the interdependence between housing and farmland, shown in figure (2,b) (Al Asali & Shahin, 2016)
 The study area is a combination of the three types, according to the size of the village (farm - village - town) and the topographical location (steep slope - slight slope). shown in figure (2,c)



a . Location of Jabal Al- Zawiya (Wikipedia., 2011), the red border of location study based on the World Atlas, developed by the author (Mohamed., 2010)



b. (Models and distribution of villages in Syria)(Al Asali & Shahin, 2016)



c. (Location Study, Villages, Google Earth)



d. (Kafr Haya Village, Google Earth)



e. (Nahleh Village, Google Earth)



f. (Kafr Lata Village, Google Earth)

Figure 2: case study location and villages

Kafr Haya Village

It is a Syrian village located in Ihsim region in Ariha District, Idlib governorate. According to the Syria Central Bureau of Statistics, Kafr Haya had a population of 916 in the 2004 census. It belongs to scattered villages types, shown in figure (2,d).

Nahleh Village

It is a Syrian village located in Ariha region in Ariha District, Idlib. According to the Syria Central Bureau of Statistics, Nahleh had a population of 1189 in the 2004 census. It belongs to merging villages types. Shown in figure (2,e).

Kafr Lata Village

Kafr Lata is a village in the Ariha region in Ariha district in Idlib Governorate in Syria. It is located in Jabal Al-Arbaeen and contains an ancient mosque that is five centuries old. Its population reached 4,231 according to the Census Office in 2004. It belongs to linear villages types, shown in figure (2,f).

4.3. Analysis of Vernacular architecture according to VerSus

Environmental principles

To respect nature

Integration: In building materials, the population relied on the available natural resources, which are the limestone and the dirt that the Jabal Al-Zawiya region is rich in, and thus the houses appeared as if they were an extension of the nature of the region. Shown in figure (3.a)

Understanding the place, Harmony, and Minimal intervention: The dwellings were spread parallel to the slope lines and followed the best orientation for the dwelling in the area, which is towards the south. Shown in figure (3.a, b, c)

Unchanged morphology and Geology: Most of the dwellings were located near caves of buildings and previous civilizations and carved within the rock and were used for housing and animal husbandry and other purposes. Shown in figure (3.c)

Minimal Impact: Align with the slope.

Principle status: Good

To benefit from natural and climate resources

Orientation: The dwellings were directed towards the south, which is the preferred side to benefit from the winter sun, where there is a yard or a front yard used for sitting on sunny winter days, where the entrance and one or more windows on the southern facade. Making the eastern and western facades closed to protect them from the summer sun, and openings on the northern side, where the winds are desirable in summer. Shown in figure (3. d)

Topography: The hierarchy of the dwellings according to the contour lines and the long side of most of the dwellings was parallel to the south side to benefit from the winter sun and protection from the summer sun.

Adaptation to climate: The flat surface was used for the purpose of collecting rainwater, either in existing reservoirs from previous civilizations, or new

reservoirs were dug due to the lack of surface water resources. Shown in figure (3. e)

Soil thermal inertia: The use of protected basements in some dwellings and caves in other dwellings. Shown in figure (3. f)

Principle status: Average

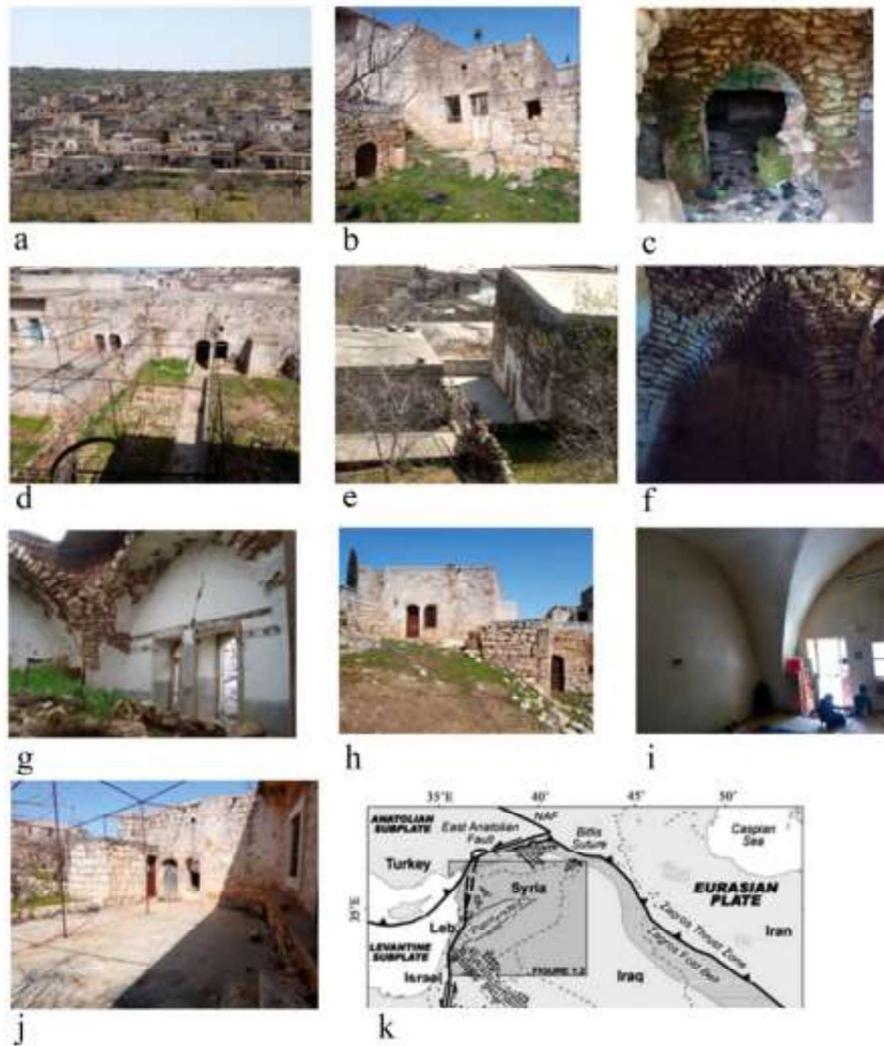


Figure 3: All photos except (k) explain the practices of environmental principles in the case study by the author, (k) The main tectonic trends of Syria, after Cornell University, USA 2001 (el Ssayed et al., 2012)

To reduce pollution and waste materials

Local material: Using the materials of stones and soil available on the site and the surrounding area.

Recycling: Sustainable materials that can be reused

slightly transformed materials: The process of producing and assembling these materials does not result in any negative effects that harm the environment.

Less machinery used: The process of forming building materials is completely manual and no machine that has negative emissions on the environment is not relied upon.

Reduction of transport: Building materials are produced from the same site and therefore do not need to be transported by machines.

Shown in figure (3.c, f, g, h)

Principle status: Good

To contribute to health quality

Thermal insulation: The construction materials themselves are heat-insulating, in addition to making the walls and the outer ceiling of such a high thickness that it consists of three layers: an outer and inner stone layer between them is a layer of soil. A second treatment is to reduce the external openings and direct them to the south and north. Shown in figure (3.b, c, d, g)

Natural ventilation: The desired wind in summer blows from the northwest, so windows have been set up on the northern facade, facing the window and the door on the southern facade, thus forming an air stream that secures comfortable ventilation inside. One of the treatments to ensure natural ventilation in the winter season is to create an opening at the top of the south facade wall in order to let the air loaded with carbon dioxide gas escape and allow the internal air exchange process. Shown in figure (3.b, d, j)

Natural lighting: Placing the openings in the southern and northern facades provides unobtrusive natural lighting to suit the movement of the sun and its tendencies in summer and winter. So that it prevents the harmful glare from the vision, which usually comes from the east or west side. Shown in figure (3. d, e, i, j)

Natural shading: Establishing a pergola in the front space that advances the south facade to provide shade in the summer so that the residents can use the front space of the house comfortably in the summer. Shown in figure (3.d, j)

Principle status: Good

To reduce natural hazards effects

Jabal Al-Zawiya is located to the east of the Dead Sea Fault, so earthquakes pose the greatest danger to the built environment in this location look figure (3. k). No measures have been taken to mitigate the seismic risks to the vernacular architecture in this area.

The construction was made using two stone walls with an insulating material between them, which is the red soil found in the area, with the aim of providing

sufficient resistance to the loads to prevent horizontal pushing, and the other to provide thermal insulation. According to the field survey, the thickness of the walls was not intended to resist earthquakes because it was not at the expense of the local community.

Principle status: Not applicable

Socio-cultural principles

To protect the cultural landscape

Terraced cultivation: tendencies were dealt with by the creation of so-called terraces and were used to grow seasonal vegetables. Shown in figure (4. a)

Cultivated valleys: The valley plains were exploited for seasonal crops such as wheat and barley. Shown in figure (4. b)

Protection channels: Establishing some channels to water crops in the summer, which depends on collecting them from surface water. The slanted nature of the earth has been taken advantage of for the water flow process. Shown in figure (4. c)

Principle status: Average

To transfer construction culture

Identity: It reflects the culture and identity of the community that extends from the surrounding environment.

Adaptation to Local resources: building materials, collecting rainwater.

Evolution: Dealing with new materials and technologies according to the culture of society. Shown in figure. (4. e)

Principle status: Poor

To enhance innovative and creative solutions

Collective intelligence: through the reflection of the culture of the community on the internal details of the dwelling, such as the presence of the threshold, which constitutes an introductory space for the dwelling that contains several functions. On its side is a bench to put a cupboard for drinking water, as well as put a heater on the other end of the threshold. Which facilitates the placement of heating materials such as firewood and others. The heating process can release smoke inside the house, this has been addressed by creating a hatch under the roof on the south side and the possibility to renew the air of the house periodically making the housing environment healthier. Shown in figure (4. f)

Testing: The process of constructing cross vaults passed through multiple stages, some of which failed, until the local community reached certain dimensions and measures for the dimensions of the structural elements in order to give a safe and stable building. Show figure (4. g)

Dexterity: The environment in which this community lives dictates thinking of solutions to achieve social and cultural requirements. One element (Al-Koor: A group of interconnected cubic cells with an upper circular opening

with a diameter of more than 30 cm and a small front opening, raised from the ground by more than 25 cm, built with lime soil mixed with straw and water). It has been used for two purposes, the first is food security, especially in the winter season. And the second is a place to put furniture to provide the requirements of day and nightlife in one space. Shown in figure (4. h)

Beauty: The use of wood material with different designs for windows and interior wall storage, in addition to shelves, to place some ornaments and traditional antiques on them. Shown in figure (4. i)

Principle status: Average



Figure 4. examples explain the practices of Socio-cultural principles in the case study by the author.

To recognize intangible values

Link to The Place: the nature, life style, Grandparents' place. Show figure (4. d)

Sacredness: the place of worship (the mosque). Show figure (4. j)

Places For Community: in the house , front space or the way to get the water. Shown in figure (4. k)

Peace and Well-being: The community cooperation on important occasions despite differences between them, such as construction, weddings, and funerals.

Principle status: Average

To encourage social cohesion

Shared Facilities: like water well. Shown in figure (4. c, l)

Pedestrian zones: the way to get the water. Shown in figure (4. k)

Mutual aid: in farming activities like harvest or construction building.

Principle status: Poor

Socio-economic principles

To support autonomy

Self-building: When any family wants to start building its house, all families gather each other for help, every one according to his ability and awareness (under the management of skilled labors)

Gathering the soil and rocks in the site and helping to build the Coverage under the main arches and ceiling. (To minimize the cost)

Gardens for self-production: Every house contains a small garden in front space for winter and summer vegetables like (Parsley - mint - radish –chard-tomato-cucumber and others). Shown in figure (5. a)

In the vast lands, they cultivated annual crops such as wheat and barley and raised fruit trees such as vines, almonds, and figs (The high cost of obtaining these products and the time required for that, as the travel needs to be more than 13 km)

Collection and storage: Each house contained (Al-Koor) adjacent cells built of mud and straw. Each cell contains a circular top opening to fill the cell with a specific type of food and a bottom side opening to take materials from it when needed and for cooking. It was raised from the ground by 30 cm in order to stay away from moisture. Shown in figure (5. b, c).

Each house has an opening in its roof located at the meeting point of the intersecting arches of the vaults, to drop grains and food products after they have dried from the roof into the house in preparation for placing them in the Koor, it is called (Bab Al-Hanj). Shown in figure (5. d).

livestock breeding: Almost people worked in livestock breeding like sheep, goats, and cows for providing what they need from animal food products like (meat, milk, cheese, ghee, etc.) and industrial products (leather and hair). Also,

Mules, donkeys, and horses for transportation, movement, and plowing. Show figure (5. e).

Processing systems: Every house or a group of houses had an oven (it's called Al-Tanoor) for making bread (a daily need that saves the cost of traveling to the close city, it will need animals and long time). Shown in figure (5. f)

Access to water: In addition to the fact that every house has a groundwater tank, there were some wells to support water security during the drought years (for watering their plants and animals, thus their income and revival).

Principle status: Good

To promote local activities

Local construction and Skilled labor : Reliance on local workers and craftsmen who have gained skill through practice in the process of cutting stones and preparing them for construction.

The owners of the local building craft learned to build stones and take the appropriate dimensions for the structural elements that ensure the safety of the building by taking advantage of the existing architecture from previous civilizations and experience. Show figure (5. g) (External labor is costly, and thus the cost of construction is reduced through available materials and local labor).

Local possessing:

production of bread: it was going through several stages and operations.

First, the wheat and barley are harvested manually.

Secondly, isolating the seeds from the straw, and it was done through two stages. The first was grinding the straw to remove the grain of wheat from its spike. This was done by a machine in the form of a wheel shaped more than 1 meter wide, made of wood, and surrounded by a metal frame in a spiral shape. There is a place for her to sit and she is connected with the animal in order to drag her over the pile of spikes. The second is the process of completely isolating the love from the straw, and it is done by making use of the wind energy, where this mixture is dropped from a high place so that the wheat grains descend directly while the wind scatters the straw away. This process is called locally (Al-Tadria or Al-Tansif)

Third, grinding wheat by milling when needed. The mill is two cylinders of hard flint. The first is the base and a wooden axis protrudes from it towards the top to be an axis for the rotation of the upper stone. The second is the rotary chamber, which is perforated from the axis with a hole that matches the wooden axis and is slightly wider in order to put the wheat through it to complete the grinding process. It has a side wooden handle for rotation.

Farming the land: Plowing the land by the animals they keep, thus reducing the cost of production. Show figure (5. e) to see the old plow from the metal (it is called Al-Samd), It was also made of wood.

Adapted transportation

As for the transportation process, it was carried out by animals such as donkeys and mules, and the appropriate roads were settled for them, Delivering their crops to the nearest exchange market, and thus production continuity. Show figure (5. h).

Principle status: Average

To optimize construction efforts

optimized use: Creating some improvements to the house to respond to the needs of users without financial costs, such as shelves for placing pots and other things from locally available plaster. Shown in figure (5. i).

Shared uses: Using the main space for several purposes, such as sitting during the day and sleeping at night, to shorten the costs of constructing the building. Shown in figure (5. j).

Planning in phases: Because of the high cost if the house is fully implemented at one time.

Principle status: Poor

To extend the building's lifetime

Maintenance: Stairs to climb on the roof to isolate it annually. Shown in figure (5. k).

Stabilization: Making the main pillars bearing the roof in large dimensions in order to ensure the stability of the building and using stone arches to transfer the load using pressure.

Resistant materials: Stone and earth are environmental materials and are therefore sustainable and reduce building maintenance costs. Shown in figure. (5. g, j, l)

Principle status: Poor

To save resources

Shared infrastructures: Water resources such as wells, because of the cost of drilling a well, reduce the cost to a minimum for the family.

Energy loss reduction: Several practices, such as reducing the area of the external openings, using environmental materials, and proper direction, reduce energy losses and thus lower operating costs. shown in figure (5. a, k, l)

passive systems: Deficient energy consumption due to sustainable materials, the thickness of the outer cover of the house, and the reduction of heat exchange to a minimum due to the small size of the external openings. Shown in figure (5. a, j, k).

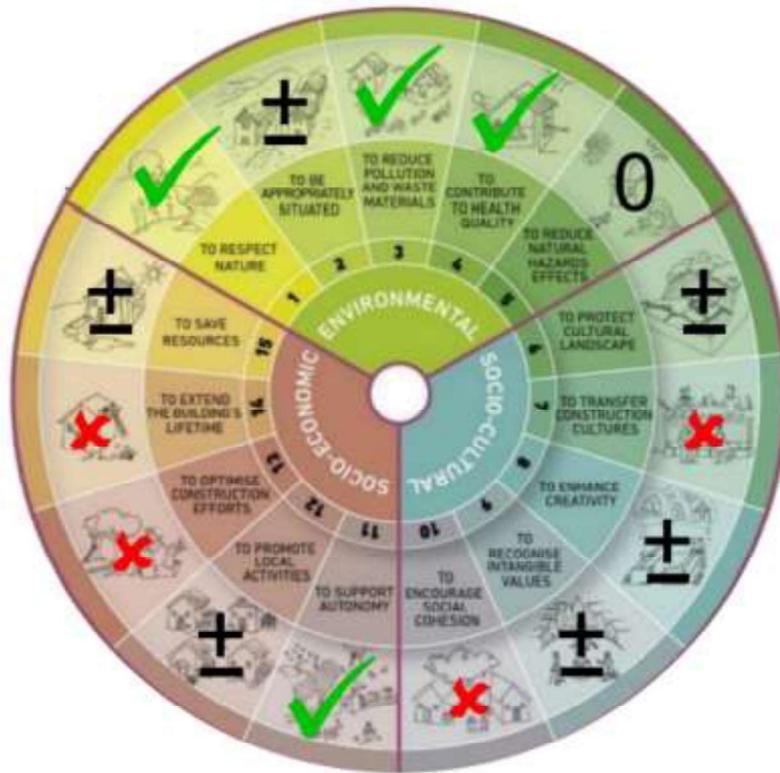
Principle status: Average



Figure 5: All photos explain the practices of Socio-economic principles in the case study by the author.

4.3. *The Analysis*

The evaluation of vernacular architecture in the case study according to the sustainability principles form shows that the environmental principle is the most applied, then the socio-economic principle, and finally the socio-cultural principle. Shown in figure 6



Good ✓ Average ± Poor ✗ Not Applicable 0

Figure 6: Analysis of the case study by sustainability framework, developed by the author.

5. RESULTS AND Discussion

Rural areas are considered a large and essential geographic component in the world that can be a supportive point in the field of sustainability and mitigation of global warming. The rural areas in Syria play great importance in absorbing population flows due to the population change that occurred in search of safer places since 2011 war. Regarding the case study, a massive displacement and large population flows occurred in northwestern Syria after the 2011 war, especially after the wave of displacement in 2019-2020 and the recent earthquake, which makes it important to think about contemporary architectural solutions based on traditional local architecture that has lasted

for decades. In contributing to the sustainability of human settlements and reducing the burden on cities and large urban agglomerations.

A field survey was conducted for the study area, which is Jabal al-Zawiya, and three villages with different models were chosen for the possibility of generalizing the study. The researcher made field visits to the local rural architecture in the study area. The methodology for collecting information included observation, personal interviews, and focused dialogue sessions, and Some articles and references that discussed topics about the study area or were part of it.

The local architecture in the study area was evaluated based on the Versus project to determine the proportion of sustainability pillars that were applied in the study case, which concluded as follows:

A large portion of local architecture is still in use today, and this is an indication of the importance of studying this architecture for the local community and the importance of preserving the rural system in line with development.

Local rural architecture was damaged by several factors:

Neglect: The influence of weather factors due to time without restoration due to migration to cities or the desire for modern construction and keeping pace with technical development.

War: A large part of it was subjected to bombing, resulting in total or partial destruction, which requires a strategy to deal with it.

Laws and legislation: A large part of it was affected by the absence of laws and regulations that guarantee the protection of this type of building, and it was replaced by modern housing.

Contemporary rural architecture is completely separated from its environment, and we can say that the model of modern architecture in cities is the system followed in rural areas.

A large number of villages began to turn into towns and cities randomly due to the absence of laws and urban regulations that respect the nature of the region, and the rural system began to disappear little by little.

Preserving traditional vernacular rural architecture through restoration and rehabilitation and considering it as a cultural heritage that carries within it a system of life that should continue.

Regarding the above mentioned results, we can debate that vernacular architecture is the product of thoughts, lifestyle and cumulative experiences. The case study was evaluated according to the sustainability framework of vernacular architecture. It was found that the environmental pillar is the most compatible, followed by the socio-economic pillar, and finally the socio-cultural pillar. According to these results, a strategy was proposed to apply the positive aspects of the environmental principle in contemporary rural vernacular architecture, and to search for a mechanism to develop appropriate traditional technique to mitigate natural hazards such as earthquakes: The strategy is built on different levels, and suggesting an action plan as follows:

5.1. On Environmental level

1-Focus on the aspects that have been applied extensively in the environmental pillar which are:

- Respect for nature, which includes several strategies within this principle: (integration with nature and minimal impact on the environment, using the materials available in the area and understanding the place, directing the buildings towards the southern side and following the buildings along the contour lines, and this reduces the change in geology and morphology Region)
- Taking advantage of natural resources and climate, and several strategies fall under this principle: (optimal guidance to reduce the impact of construction on the environment and choosing the most appropriate sites for construction, collecting rainwater through the roofs of buildings and creating a ground water tank in each residence, thermal insulation of buildings by doubling the external wall Place an insulating material between them and insulate the surfaces.
- Reducing pollution and reducing waste resulting from the construction process: (using building materials available in the study area, which are stones and soil. These materials are considered environmentally friendly and recyclable, and relying on skilled craftsmen in producing building stones from the same area)
- A built environment that contributes to health quality: (natural ventilation and natural lighting, by placing windows on the southern and northern sides, reducing the openings on the eastern and western facades to a minimum, and creating an upper opening at the highest level of the roof of the house to ensure air exchange and the exit of bad air. Placing the yard on the southern side of the house, as it is the preferred side in the region, to benefit from the insolation in the winter and to contain a number of plants such as vines and others, which contribute to shading and thermal comfort in the summer, and thermal insulation by using double the external surfaces or using thermal insulation materials).

2- The appropriate strategies for the region related to mitigating the natural risks to which vernacular architecture is exposed, especially with regard to earthquake risks.

Table 2 summarizes the traditional earthquake resistant techniques classified according to the typologies defined and highlighting: a. type of damage avoided: and b. applicability or ease of use as a strengthening technique, "difficult" indicates that the technique should be better implemented at the time of the construction or during partial reconstruction, and "practical" indicates that the technique can be and have been successfully applied for strengthening. (Ortega et al., 2017), Each one has been given a color so that it can be displayed with the appropriate technique.

Table 2: Summary of traditional earthquake resistant techniques

Technique	Damage prevention			Applicability as strengthening technique		
	Separation	Out-of-plane	Delamination	In-plane	Difficult	Practical
1. techniques improving the connection between structural elements						
Ring beam	yes	yes	yes	yes	yes	
Corner braces	yes					yes
Quoins	yes				yes	
Reinforced floor-to-wall and roof-to-wall connections		yes				yes
Ties	yes	yes				yes
2. techniques stabilizing structural elements and buildings						
Timber elements within the masonry	yes	yes	yes	yes	yes	
Wall subdivision		yes	yes	yes	yes	
Through-stones	yes	yes	yes	yes		yes
Mended cracks		yes		yes		yes
Reinforcing openings		yes		yes	yes	
Stiffening floors and roofs		yes		yes		yes
Wall structural timber frame	yes	yes	yes	yes	yes	
3. techniques allowing partial collapse of structural elements						
Redundancy of structural elements					yes	
4. Techniques counteracting horizontal loads						
Buttresses	yes	yes				yes
Walls thickening		yes		yes		yes
Urban reinforcing arches		yes				yes

Based on the table, we find:

The techniques are divided into four types in terms of (improving the connection between structural elements, stabilizing the structural elements and the building, allowing partial collapse of the structural elements, and resisting horizontal loads).

- a- It becomes clear to us how effective of each of the traditional techniques to mitigate or resist the damage that occurs as a result of earthquakes, which are divided into four categories of damage, which are: (separation, out-of-plane, delamination, in-plane).
- b- It becomes clear to us that the best techniques resist the damage of the four categories are (ring beam, timber elements within the masonry, through stones (diatons), wall structural timber frame), we see that these techniques are applied in partial reconstruction or new construction.
- c- Techniques used in strengthening resist fewer damage from the four categories.
- d- The techniques used for strengthening are more than the techniques used for partial reconstruction or new construction.

5.2. Action Plan

1. Awareness of the importance of the environment and communication with the relevant institutions, to integrate these strategies into the comprehensive plan for rural architecture in case study location
2. Advantage of the expert local craftsmen in dealing with local building materials and techniques.
3. Holding Materials technical training courses on the use of local building materials, stone-cutting workers (Kleen).
4. Establishing a specialized team to conduct research on the best earthquake-resistant technologies that are appropriate for the study area.

6. Conclusion

The research discussed the importance of rural geography with its traditional vernacular architecture in reducing the impact of challenges facing the planet Earth. A literature review in Syria showed weak interest in studying this environment and a lack of research in this field, in addition to its scarcity in considering that Syrian vernacular rural architecture as a sustainable environmental source for contemporary Syrian rural architecture, in addition to the loss of rural architecture in Syria of its identity due to globalization.

The research was based on taking a case study from the rural geography in northwestern Syria, which is the rural geography of Jabal al-Zawiya, and it was analyzed according to the VERSUS Project for Rural Sustainability. The research concluded that the environmental pillar witnessed many practices

(with gaps) that constitute a basis for reliance on in contemporary rural architecture.

The research presented a strategy that can be applied as follows:

- Producing a sustainable urban and rural architectural environment that supports reducing climate change, which is one of the most important challenges facing life on Earth.
- The geography of which is similar to the case study is an experience that can be generalized to all Syrian countrysides.
- Reducing the burden on urban areas in northwestern Syria, which witnessed significant population overcrowding after the 2011 war.
- Drawing the attention of concerned parties and decision-makers to the importance of this geography in providing appropriate housing solutions in light of the crisis resulting from demographic change due to the war.
- Drawing the attention of all stakeholders to the importance of preserving and rehabilitating traditional rural vernacular architecture as it carries a lifestyle that must be preserved and continued.
- Human development by providing many job opportunities and reviving traditional crafts in producing building materials in the study area.
- A starting point in developing a female construction officer in rural areas in the future.
- Opening the door to more research on the importance of vernacular rural architecture in providing solutions for contemporary rural architecture on the pillars of sustainability.
- Access to the best traditional earthquake-resistant technologies that are compatible with the study area in terms of construction method and building materials, especially after the region was exposed to the earthquake of February 6, 2023.

6.1. Recommendations:

- Rural geography constitutes an important environmental resource and large areas to which we should direct our attention and work to form an institution specialized in rural development.
- Working to establish an urban system that ensures the continuation and preservation of the rural lifestyle.
- Inclusion of the earthquake-resistant study of contemporary rural architecture.
- Classifying vernacular rural buildings according to the degree of damage, restoring and rehabilitating them to protect them from destruction and extinction.
- Applying traditional earthquake-resistant techniques (reinforcement - partial or total reconstruction) in the process of restoring and rehabilitating vernacular rural buildings.

In the future, we can discuss the mechanisms of development at the economic and cultural levels by proposing appropriate strategies for the context based on the framework of the principles of sustainability for local architecture. Such

as autonomy in agricultural production and the use of lands and adjacent spaces. And the establishment of social spaces that enable rural communities to establish stronger relationships and bonds, in addition to spaces for children's play and entertainment.

REFERENCE

- Al Asali, M. W., and Shahin, I. (2016). Rural habitation in Syria: The culture of traditional architecture and its role in the reconstruction process. *Metu Journal of the Faculty of Architecture*, 33(2), 101–119.
- Altah, H., and Hajismail, S. (2022). Architectural Heritage in Medium and Small Syrian Cities: Management Advanced Strategies for Postwar Recovery. *International Journal of Architecture and Design*, 8(1), 51–65.
- Correia, M., Dipasquale, L., Mecca, S. *VERSUS: Heritage for Tomorrow Vernacular Knowledge for Sustainable Architecture*. Florence, Italy. Florence University Press. 2014.
- Daghfal, G. P., and Professor, C. A. (2019). Vernacular Architecture: Changes in The Tradition Folkloric Forms and Narrations in Old Lebanese Houses. In *IJASOS-International E-Journal of Advances in Social Sciences* (Vol. 13).
- Dipasquale, L., Montoni, L., Montacchini, A., and Mecca, S. (2022). Vernacular and World Heritage Impact Assessment: the case study of Patmos. *Journal of Cultural Heritage Management and Sustainable Development*, 12(2), 150–170.
- El Ssayed, H. M., Zaineh, H. E., Dojcinovski, D., and Mihailov, V. (2012). Re-Evaluations of Seismic Hazard of Syria. *International Journal of Geosciences*,
- Hardiilla, D., and Nugroho, A. C. (2020). Resilience Capacity Planning: A Strategy Requirement for Vernacular Architecture Existences as a part of Sustainable Development in Lampung. *IOP Conference Series: Earth and Environmental Science*, 409(1).
- Kandakji, N. (2017). *Earth Architecture in Syria between the Past Heritage and The Contemporary Experiences*.
- Mileto, C., Vegas López-Manzanares, F., Lidón de Miguel, M., & Hueto Escobar, A. (2022). Guest editorial: Vernacular architecture: sustainability and risks. In *Journal of Cultural Heritage Management and Sustainable Development* (Vol. 12, Issue 2, pp. 89–91). Emerald Group Holdings Ltd.
- Ortega, J., Vasconcelos, G., Rodrigues, H., Correia, M., & Lourenço, P. B. (2017). Traditional earthquake resistant techniques for vernacular architecture and local seismic cultures: A literature review. In *Journal of Cultural Heritage* (Vol. 27, pp. 181–196). Elsevier Masson SAS.
- Salgın, B., Bayram, Ö., Akgün, A., & Agyekum, K. (2017). Sustainable Features of Vernacular Architecture: Housing of Eastern Black Sea Region as a Case Study. *Arts*, 6(4), 11.
- Mohamed, N, Nicola, Z, Mustafa, H, Daoud, S, Shafiq, J, and Anwar, R. *World Atlas "أطلس العالم"*, Accessed June 4, 2010, Pdf copy. Beirut- Lebanon Library. Available from: Noor Library.
- Wikipedia, The Free Encyclopedia. *Jabal Zawiya*, 27 December 2023, https://en.wikipedia.org/wiki/Jabal_Zawiya. October 2011.