

Earth architecture cycles in Hadramaut, Yemen



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ABSTRACT

Even traditional earth building is, in general, a technique in defence under contemporary conditions, the city of Shibam in the Hadramaut valley in Yemen is the outstanding example of an area where earth architecture adopted to the hot arid climate still dominates the picture. Shibam as a World Heritage Site and the wider valley have as only few landscapes the chance of preserving sustainable building practice in large level, yet modern procedures favour techniques that require less maintenance. Technical innovation can fill this gap only partially.

Stabilizing the sustainable practice of traditional earth architecture in such an area requires a bundle of approaches including community-based support of local initiatives and coordinated strategies with the related authorities. The traditional building system can only sustain as a cycle adapted to local life conditions and adaptive to modern expectations alike, a building industry that attracts young men and ensures the continuing handover of skills to next generations, based on a permanent use of structures and a high identification with this “way of life”.

A community-based approach as the best response to the challenges requires reliable local partners and the inclusion of social and communal concerns. In the case of Hadramaut, the World Heritage Site of Shibam proved to be a good base for a successful revitalization of the earth building practice.

Local cycles can contribute to sustainable economy if local demand accept it, but it needs also new comprehensive and holistic approaches by experts and active stakeholders.

Keywords: EARTH ARCHITECTURE – COMMUNITY_BASED APPROACH -
TRADITIONAL BUILDING CYCLE

1 THE MODEL CASE OF SHIBAM - INTRODUCTION

Wadi Hadramaut belongs to the few remaining landscapes where earth architecture still dominates the scenery. It is a large desert valley system in eastern Yemen, with its historic former capital city of Shibam listed as a World Heritage Site built completely in earth brick. Yet the challenges of the modern conditions and expectations bring earth architecture in the Wadi in defense, too, and rivalling building techniques, mainly based on cement block or concrete, are on the rise.

Still, the vast majority of existing and even new houses are built in earth architecture, but in declining numbers, and the coherence of the settlements is declining continuously. This not only affects preservation expectations and the beauty of a unique cultural landscape, but threads the sustainability of earth building as part of local life cycles. This technology is adapted to the

particular climatic and life conditions, it saves energy, resources and avoids emissions, i.e. it achieves to a high degree what other societies and economies want to develop. Therefore, it would be highly desirable to preserve and stabilize the sustainable building industry in response of the contemporary challenges and changes.

Technical innovation and international support can have a share in this support, yet intentions and processes within the involved communities are in the centre of the cycle, and successful recovery has to go hand in hand with them. A community as a “soft factor” is a complex structure and in constant change, and dealing with it combines architectural and technical aspects with social, economic, environmental and political components. There is no real blueprint to this complexity; yet the example of Hadramaut provides valuable experiences.

2 EARTH ARCHITECTURE IN HADRAMAUT - BACKGROUND

Think globally, act locally – this fashionable slogan reflects an essential paradigm of sustainability concerns. New approaches to deal with vernacular building technologies should apply generally and internationally, but any successful approach must be based on the particular regional context with all its geographic, historic, cultural, economic, social and individual components.

The region of Hadramaut covers the largest part of Yemen’s east at the southern tip of the Arabian Peninsula. While most of Yemen’s population lives on the highland around Sana’a, Hadramaut is situated within the large deserts of the peninsula, defined by an extreme hot and arid climate, influenced by the tropical monsoon system of the Indian Ocean. Most of the region is uninhabitable or sparsely inhabited by beduins, with the exception of the coastal strip along the Arabian Sea (with the capital of Hadramaut, al-Mukalla) and the unique valley system of Hadramaut, home of the historic and vernacular earth architecture we will discuss here.



Figure 1. Adaptive Architecture: Al-Khuraiba in upper Wadi Do'an

2.1 THE CITY OF SHIBAM

The most famous site in the architectural and tourist sense is Shibam, listed as Yemen’s first World Heritage Site and known as an iconic view by a wide public internationally. Indeed, as the only city worldwide built entirely by five- or six-floor tower houses made of earth brick and as a walled-in city, surrounded by palm yards in a rare authentic appearance, the value of Shibam is widely accepted and ensures the city good prospects of being preserved as national authorities and international donors concentrate their preservation efforts on Shibam. This prominence could support similar engagements within the wider surrounding of the wadi.

On the other hand, old Shibam as a small urban structure of approx. 350 by 250 m, inhabited by 3000 people, is today rather a small country town even in comparison of other towns in the valley, and the concentration on rehabilitation activities in Shibam could widen the gap between the conservation of a historic (and potentially touristic) site and the wider region in which preservation has only low relevance. In terms of sustainability, it would be essential to stabilize the practice of earth building in the whole wadi region as well.

2.1.1 History

Shibam has been the urban centre of the Wadi in the early Middle Ages, following the destruction of the old capital Shabwa around 240 AD. This event marked the end of the kingdom of Hadramaut, the wealthy keeper of a royal monopoly of incense trade, one of the four kingdoms of South Arabian civilization. None of these kingdoms survived, but Hadramaut alone kept its name and ethnic identity. For more than 2500 years the canyon-like valley was an island of sedentary and urban life within the infinite seas of desert – unknown to the West until ca. 1890. This isolation explains much of the way Hadrami people see themselves – as *hadhari* people, which means “sedentary” in a funny coincidence with the valley’s name in a rather nomad region. And the isolation is definitely the reason for the extreme conservatism of the local architecture. Shibam as an urban fabric as much as its tower house type is deeply rooted in South-Arabian antiquity, as scientists concluded soon after Shibam’s discovery (1) – a very old but still lively heritage.

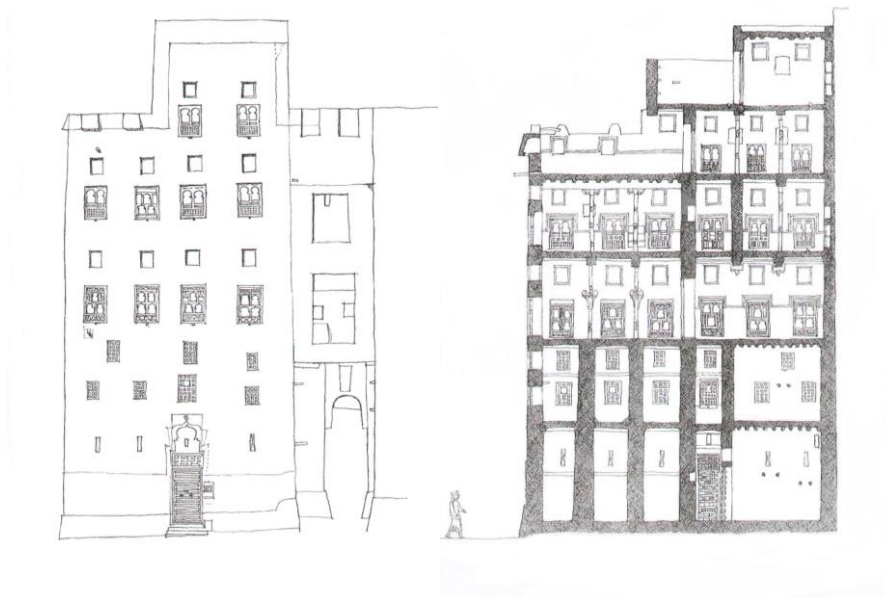


Figure 2. The art of the Tower House: Section and elevation of house B 37, Shibam

2.1.2 The Art of Tower Houses

The tower house of Shibam is the local adaption of the South Arabian tower house known from Sana’a and the old towns and villages of the Yemeni highland. The tower house was not a singular phenomenon in the Ancient Orient – in Egypt and Syria archeological findings show similar types. But while in most Middle East countries the courtyard house dominates vernacular building, the tower house tradition in Yemen reflects the autonomy of Yemen’s culture at this Southern tip of the Arabian world. And more than in the highlands, tower houses in Shibam still preserve much of their appearance developed more than 2000 years ago, due to its continuous isolation.

The walled city of Shibam is built on a mount within the seasonal flood zone of the valley, an island during floods that still can occur once or several times per year which supported the extreme urban density. And as a dense fabric requires adaption to the whole (e.g. by access, light or sewage rights), the density of an urban fabric is a sustainability factor, too.

The type of the six-floor tower house is an elaborate construction system with many particularities that have their logic but contradict conventional modern building in many respect. For instance, walls are not vertical but rather conical, for the wall thickness diminishes from more than a meter at ground floors to a handspan (*shibr*) at sixth floor. In general, this architecture is defined by sensitive hands rather than on plans and numbers. Special solutions characterize stairs, light wells, natural air ventilation, chimney outlets and waste water removal. The typology also requires special solutions for climatic and cultural demands, as in pre-modern times roof terraces were essential to spend hot summer nights as living and sleeping space but in the same time, they have to be protected against viewing women by outsiders. And, an essential aspect, earth constructions have to be protected against water by a number of typical elements such as plastered surfaces exposed to rainwater or internal water use, special water runoffs and a complex traditional system of dry shaft toilets (2). The technology of maintenance and building is inherited from generation to generation by the master builder system that is still more or less intact.

2.1.3 Carpentry

The construction of tower houses in the ancient orient was based on two technical achievements: 1. the making of plaster out of the local limestone by traditional high-temperature kilns, and 2. the complex use of carpentry to stabilize high-rise structures and support their earthquake resilience. According archeological evidence, wooden reinforcements were the standard construction in wide parts of the ancient orient. In most regions, deforestation forced to reduction of wooden elements. In the desert valley of Hadramaut beams are mainly used for ceilings and columns, completed by diagonal anchors below the ceiling corners called *a'ud balalik*.

Apart from these constructive elements, doors and windows in Shibam are made out of *'ilb*, the local hardwood (*spinus christi*). Both are elaborate elements, displaying rich decorative carving of a century old tradition in a large variety and creativity. And the glassless grid windows allow ventilation and lighting while protecting interiors from being viewed and rain or dust, if needed. The columns and wall cupboards in the thickness of the walls, richly carved as well, are other details of this highly adapted architecture (3).

2.2 THE ARCHITECTURE CONTEXT IN THE WADI

The Wadi Hadramaut with its several tributary wadis, all of them cut in the uninhabitable desert plateau (*Jol*) by rocky cliffs. Only the valley floors allow vegetation and human life, but in the same time serve as flood drainage for seasonal torrential floods. As a result, most villages and cities (except Shibam and very few villages) stretch along the cliff foot, often on steep foothills – like the earth architecture, depending on water and protecting from it alike. Oasis cultivation and earth architecture both are sensible systems, highly adapted to local conditions.

Each section of the long winding desert valley has its own local character and its particularities in vernacular architecture. To name some, Seyun in the eastern central Wadi is the historic capital of the Kathiri sultanate and today the capital of the semi-governorate of Hadramaut, Wadi and desert. The old palace, today a museum, is described by some as the world's largest earth building. An architectural style of rich ornamentation is home around Seyun and the small town of al-Ghurfa. Between al-Ghurfa and Shibam exists a remarkable group of large country tower mansions. The eastern town of Tarim is especially known for religious institutes, many historic mosques and more than 25 palaces in a Indian-Neoclassical style, and long ties to countries around the Indian Ocean. At narrow Wadi Masila, Qabr Hud is the unique example of an uninhabited earth-built city around the grave of the pre-Islamic prophet Hud that comes to life only for the annual pilgrimage.

Further west, three large tributary valleys lead further south: Wadi 'Amd, Wadi 'Amd and the left and right Wadi Do'an. The latter is home to a very elaborate and dense tower house architecture in an amazing symbiosis to a dramatic landscape. Al-Hajjarein, central town of the lower Do'an valley, is built above a spectacular cliff setting. Both are listed as tentative World Heritage Sites.



Figure 3. Water and Earth: Sewage works in Shibam; mudbrick making in front of Shibam

2.3 RECENT REHABILITATION APPROACHES

From 2002 until 2011, a joint Yemeni-German urban project led by German GIZ with SFD, Sanaa and local authorities, started rehabilitation in Shibam, awarded in 2006 by the Aga Khan Award for its community-based approach (4). Later, an infrastructure project installed new sanitation and electricity networks and paving in old Shibam. Since 2016 the author undertook further rehabilitation measures, in particular at the suqs and on behalf of the German Foreign Office, and since 2020 UNESCO Doha with SFD support rehabilitation mainly of private houses in Shibam. The Buqshan Foundation Doha supports rehabilitation projects mainly in the Wadi Do'an area. As a result of all these activities, a professional network supporting earth architecture in the wadi is in the rise, yet activities are still rather punctual.

3 TRANSFORMATIONS AND CHALLENGES

Earth architecture in Hadramaut is highly adapted to the extreme conditions and eco-friendly, and it is part of a certain way of life. Earth houses need frequent maintenance providing regular income for male youth but a financial burden for inhabitants. Houses need to be inhabited by people who care for it, i.e. are present in times of rain and have an eye on the structures. This technology is therefore intertwined to many aspects of life that have to be included in all considerations and attempts to support it.

3.1 DEFICITS AND THREADS

Today, earth building practice is confronted with modern construction methods for several reasons, among them: limited acceptance of a traditional and “primitive” technology and the influence of the Gulf “way of life”, the high demand of maintenance, the way architects and other stakeholders are trained and calculate, the official procedures of a centralized administration and the growing investment of businesses and apartment building types unfavourable to earth building.

3.1.1 Suburban sprawl, town planning and infrastructure

Yemen is one of the countries with the highest birth rates, and suburban sprawl transformed the valley in recent decades radically. Pressure to the vulnerable landscape, growing dependence of individual car traffic, decline of palm yards and dramatic drop of groundwater levels are obvious.

The risk of extreme floods like the last disastrous flood of 2008 is rising, and resilient building zoning is not realistic. Townplanning is mainly concentrated on infrastructure projects and division of land by estates, following conventional models of wealthier countries. More flexible alternatives and ecological considerations are unknown. Uncontrolled sprawl threads resources, reduces fertile land and damages the integrity of fabrics and building practice.

3.1.3 The victory of cement blocks

Like in all emerging countries, cement blocks are widely seen as a low-cost construction that does not require much maintenance. This affects all settlements except Shibam where preservation expectations are high. The wealthy elite often introduces imported models (e.g. fancy villas) and influence the building of practice of the wider public. Especially mosque buildings, often oversized and based on the destruction of historic assets, are often prestigious donations with low sensitivity to surroundings, a significant thread to the integrity of settlements. As another challenge, government or public buildings are generally concrete buildings as planning is organized by the capital without considerations of local concerns, and administrative procedures contradict the involvement of traditional building industries.

3.1.3 Plastering and painting

Arab countries are known to have the highest per capita use of cement worldwide. This tendency also affects the earth buildings themselves. Cement plaster or oil cover (in bright colors) are believed to protect earth structures from rain and make further maintenance unnecessary. The result is not only a violation to the appearance of settlements defined so far by the organic colors and surfaces of earth. More worrying, this practice often supports the rise and growing of salty humidity inside the structures that cannot evaporate and eventually destroys structures – an effect that in turn again undermines the reputation of earth architecture.

3.1.4 Proportions and details

The influence of modern techniques, imported examples and media also affects the way motives and proportions are treated. This affects not “only” esthetic and preservationist concerns, but also the quality of architecture in the social and urban sense and the way space as resource is used - and it diminishes its role for identity in the fragile context of the Middle East.

3.1.5 Imported materials

Especially metal elements have been introduced to the contemporary building in Hadramaut. Steel rails are the usual method of ceiling construction even in earth-built houses, and smaller rails are used as lintel for window and door openings. Aluminium elements are used for windows and other elements. Besides, new products of the home building market such as ceramics, pseudo-stone or gypsum ready-made details become fashionable. While a certain influence of fashions is a normal side-effect of a lively building practice, it would be important to support sustainable local materials and limit the need of energy-intensive imported goods.

3.2 CRISIS RESPONSES

Since 6 years, Yemen is shaken by a war that is interwoven in complex regional constellations and driven by internal instability. The isolation of Wadi Hadramaut has kept the region outside direct conflict involvement but the situation adds economic pressure and lack of perspectives and normal development to a country already confronted by shortages and challenges. Under these circumstances, authorities and strategies have only low chances to achieve improvements. This even increases the central role of approaches based on community and local initiative.

3.3 MODERNISATION NEEDS

Following rapid changes in life conditions in the wadi, modernization needs, expectations and potentials result in inevitable transformations of housing and building in the wadi. Unfortunately, in a region where people wait for modernity and at least some wealth, concerns of sustainable dealing with resources and ecological impact find only low attention. On the other hand, especially as the

region is poor and most people can not afford the lifestyle of wealthier Gulf countries, efficient use of resources would be urgently needed. But while sustainable approaches have already reached the attention of these Gulf countries, it does not reach the wider Yemeni public where such structures are still much more intact. The challenge is to combine helpful modernization with traditional techniques in a way that solves main challenges and finds local acceptance alike.

3.4 ENVIRONMENTAL IMPACTS

The vulnerable and extreme life conditions of the desert valley currently become more fragile. Air-conditioned concrete villas and car traffic are options that ignore natural conditions, while sustainable solutions like earth architecture rather try to adapt to them.

3.3.1 Climate Change

The desert valley of Hadramaut is an extreme environment for human life even without current climate changes. The summer temperature of around 47 degrees is already extreme, and there seems to be an increase of torrential rains and flashfloods, that affect the safety of settlements and the stability of earth-built houses in general. Air-conditioning and concrete are seen as a protection, but they add to emissions and thus increase the pressure.

3.3.2 Water Cycles

The traditional water cycle within the houses (supply by wells, low water use, dry shaft toilets, protection of earth surfaces) was very efficient while modern water supply and sewage not only multiplied water use but also brought the plague of the *has* flies that make staying at night on the roof terraces almost impossible – the traditional method for spending summer nights that required no energy at all. Social expectations make some modernization inevitable, but traditional knowledge is a resource of techniques that would be helpful to integrate. Ecological sewage treatment is a valuable technology in a desert climate but requires external finance sources.

3.3.3 Oasis cycle

The oasis around Shibam (and similar traditional oasis sections of the Wadi) is another cycle and indeed the base that made sedentary life in this desert possible 3000 years ago. Canals and dams led seasonal floodwater to gardens to feed crops and protect the settlements from flooding – still the only life-insurance this earth-built city has. Yet this cycle is under pressure, too: groundwater levels drop, palms die, farming is not profitable, the invasive *sesabana* bush replaces the diverse vegetation, pumping stations depend on Diesel and contradict the flooding model. The building cycle and the oasis cycle are interconnected and show that a holistic analysis of the wider context is necessary, even interventions to support earth building can only be limited in their effects.

4 RESULT

As a general rule in supporting earth architecture, functioning elements should be strengthened while critical or dysfunctional elements should be improved. In the background of the many deficits and challenges in the Yemen conditions, informal factors and effects are an essential component of any efficient approach and their careful study is the first step.

Given the special conditions in the Yemen context, the community level is the main working ground. Authorities and NGOS can be main partners, even they do not reflect the whole community and cooperation should be kept as open and flexible as possible. A decentral network of architects and activists can be a backbone of engagements, while visible pilot projects, preferably decentral, should serve as a catalysator for broader awareness and initiative.



Figure 4. The future of earthen architecture is in the hands of youth and community: Eid celebration in Shibam

That requires the consideration of many contradictions, like

- Having a clear strategy in an environment of low respect for legal and administrative authority

- Accumulation of deep knowledge in an environment where academic capacity is either low or even counterproductive (as it helps to replace traditional earth building by “modern” practices)

- Working with authorities and NGOs knowing individual and informal relationships are often more essential and efficient

- Supporting processes with external finance while the primary success factor is community engagement and ownership

- Introducing international standards and professional methods in full knowledge they have to adapt to the traditional structures rather than the other way round

Sensible management can bridge the gap between preservation demands, modernization needs and (very individual) community perceptions. There can be no blueprint – potentials and risks are too complex. Yet straight commitment with a toolkit of several parallel approaches flexible enough to adapt to local developments will help. Visible improvements in the urban space are the most effective measures to convince public and authorities and donors. The involvement of many groups is an essential success factor: master builders and their staff, house owners and tenants, local business, architects and authorities including all parts of the communities and last not least, motivated and educated youth. Assistance by external players can have a supporting role.

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