

## Earthen architecture as an enabler for regenerating the identity of Bam after the earthquake

Early civilizations, as the first architects of simple dwellings, also created the largest castles, palaces and citadels. They can also be considered as the first designers of urban centers and cultural landscapes.

The existing example in Iran is named as the largest adobe building in the world. The building, which was destroyed in the 2003 earthquake, is being rebuilt today with the cooperation and assistance of international organizations, experts, and local masters. It is the world's largest adobe structure.

Bam's ancient city garden has a cultural heritage and economic production system that its cultural and natural landscape can become the most prominent model of sustainable and environmentally friendly architecture (Figure 1).

With the agro-tourism model of sustainable tourism, it can create a change in the regional planning system by using the priority of subsistence farming. This capacity could be used for recent global research in the international development environment.

### Review of related literature

Evidence of human habitation in this region dates back to 7000 BC. The city is surrounded by historical and archaeological sites, and historical records of Bam Citadel (Arg-e Bam) go back 2000 years. It is a famous symbol of the city, and a very important example of Iranian earthen architecture (Ahmadi Roini, 2000, p. 163).

On Friday 26 December 2003, an unforgettable catastrophe destroyed Bam just in few minutes. An es-

01 Landscape of Bam city to the view of Arg-e-Bam (Bam Citadel) as the largest adobe building in the world. The locals' houses are surrounded by these date palms and citrus trees that were grown between them. This picture was captured from a hill, made by ruins after the earthquake happened in 2003. ©Sonia Beygi





02 The rich traditional heritage was destroyed but part of the arches left in the earthquake ©Sonia Beygi

estimated 30,000 to 40,000 people were killed, and a similar number were injured. Massive damage hit both the city and citadel. More than 85% of buildings were destroyed and some 95% of Arg-e-Bam, was almost completely destroyed. So this rated as a catastrophic event from both a humanitarian and a cultural perspective (Figure 2).

Following this devastating earthquake, reconstruction operations began without considering the collective memory of the citizens and the restoration of Bam's lost identity. Inattention to Physical characteristics, as well as its memories and inclusion meanings, caused the residents to lose the sense of belonging to their environment. Reconstruction has an identity if it provides a platform for the formation of collective

memories (Figure 3). It means that identity must have three areas that include body, activity, and imagination for the formation of collective events and the remembrance of memories for the citizens of Bam. Earthen architecture is important in this regard because it can help the community restore the sense of place by creating memorable spaces and designing mental processes through the human-space connection. Sense of this space will make people calm and peaceful. To achieve this vision, two conceptual models are employed in the project ahead (Figure 4).

In fact in this model, symbols in the collective memory are represented through regenerating body and holding a public event there. In this project, earthen architecture is considered as a symbol of the city's

03 + 04 Collective Memory Parameters

- Collective Memory Parameters
- TIME
  - PLACE
- Imaginability
    - landmarks
    - memorable social activities
    - using memorable names and signs
  - Continuity
    - body continuity
    - activity continuity
  - Flexibility
    - body flexibility
    - activity flexibility
  - Nodes
    - center of districts
    - edges of districts
  - Integrity
    - integration of body elements
    - integration of activities and functions
  - Mergeability
    - mergeability of forms
    - core activities
  - Accessibility
    - accessibility for minorities
    - accessibility for variety of groups
    - lack of any barrier to see memorable things
    - decent access to memorable places
    - conserving memorable places





05 Women are packing dates ©Spring Persian Website



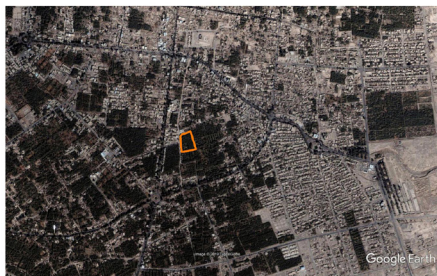
07 View to the site, it represents Bam gardens' vibe ©Sonia Beygi

past identity and date packaging as a public event (Figure 5).

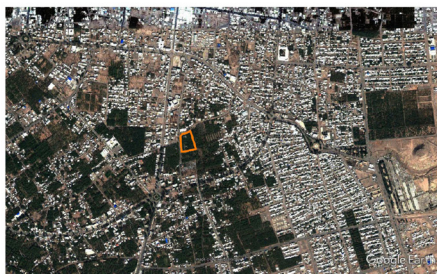
Inspired by the region's rich culture, the following design principles have been considered:

- Safety and stability of buildings against earthquake by utilizing the contemporary earthen architecture knowledge
- Employing the local masters' experience in oral heritage conservation and transferring their knowledge to the next generation
- A multipurpose space with the priority of date packaging as a traditional collaborative activity

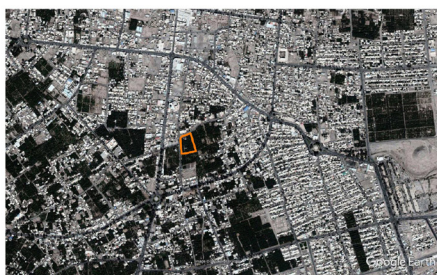
06 Development of the city and the destruction of gardens ©Google Earth



the site location and its vicinity - 2004



the site location and its vicinity - 2011



the site location and its vicinity - 2019

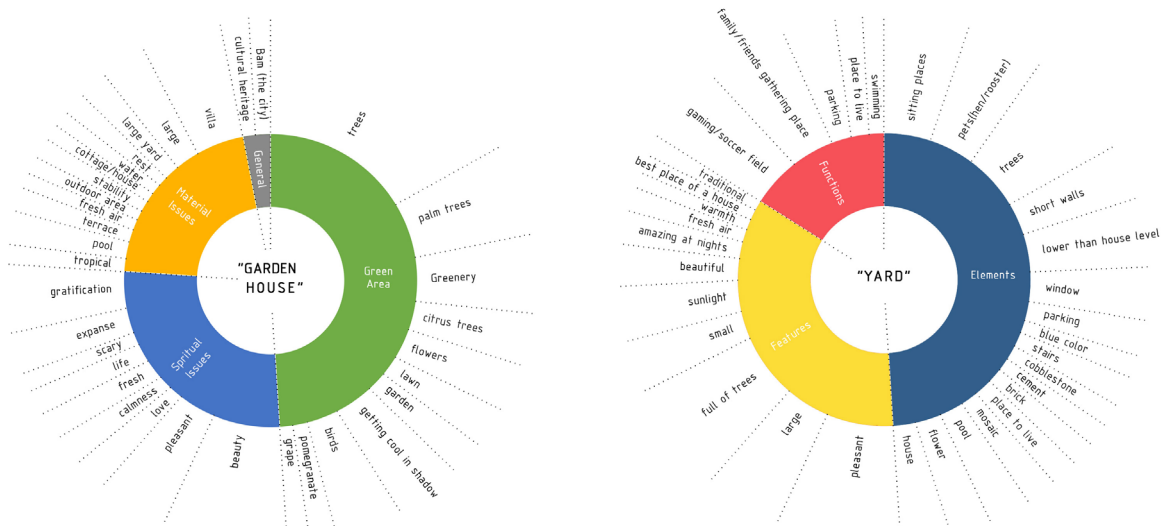
### The productive economy of the gardens

The gardens of Bam have the potential to improve the quality of life of its citizens by developing agriculture and tourism (agro-tourism). This approach comes from looking at the gardens as spaces for cultural and economic development of the city (Figure 6).

On the one hand the Bam's groves along with Arg-e-Bam are two key cultural and landscape factors for the local authorities. On the other hand, restrictions on the vertical development of the city due to the preservation of gardens and the obstacles to the horizontal urbanization due to its geographical location and Arg have led local authorities to provide financial resources to address these challenges. But the existence of gardens, urban agriculture, citadel and desert from two perspectives can act as an opportunity instead of a threat (Figure 7).

- Developing an economy based on agriculture and tourism
- Empowering the local community

A survey on the importance of the gardens shows that income generation, tourism boom, employment,



08 What comes to the local's mind, when they hear about "GARDEN HOUSE" & "YARD" divided by percentage of words/phrases repetition © Data:Golpayegani Abdolreza and Einifar Alireza, 2007/Graphic: Sonia Beygi

tranquility, Security, comfort, freshness, preservation of traditions, originality, memories, habit, greenery, environmental protection, companionship With nature and beauty are the main concerns for the citizens (Figure 8).

**Methods – The speciation of prototype of earthen architecture**

In S.P.R.IN.G. project<sup>1</sup> a need was identified for a multipurpose space for women who do date packaging during the harvesting season. SPASDI<sup>2</sup> (the project partner) owns a garden in the city of Bam which we took advantage of as a platform for creating the desired space. In collaboration with the project we were able to go through the following design process:

1. Deep observation of the project's context, neighborhoods and villages around Bam to discover the heritage of pre-earthquake earthen architecture

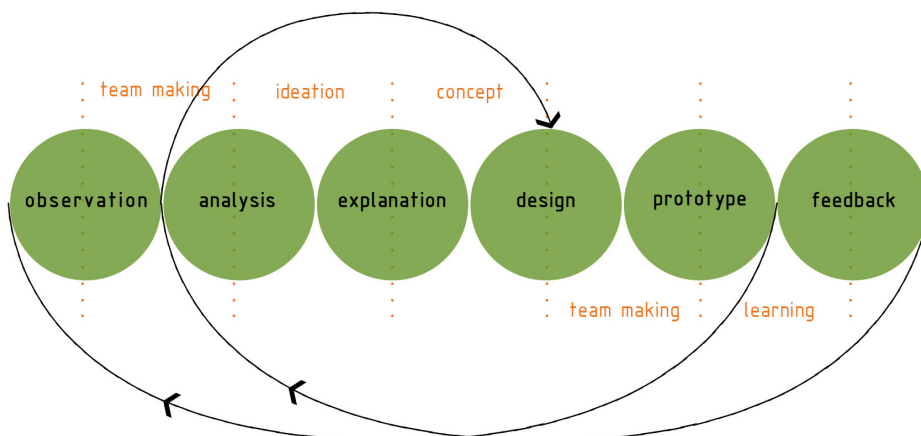
2. Talking and listening to people who are interested and influential, experts in the field of architecture and reconstruction, and old masters.
3. Visiting the old part of Bam and Arg with experts and masters to vulnerability assessment of the remaining of the arches and vaults after the earthquake.

Site analysis, climate studies, human studies, and Bam's architectural typology have been considered in the selection of concepts and design strategies (Figures 8, 10, 11).

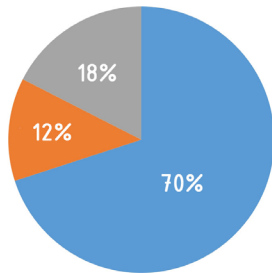
In addition to our field studies we have also done the following lab studies:

- Orientation of the building
- Mass and density
- Privacy and nobility
- Lighting spaces

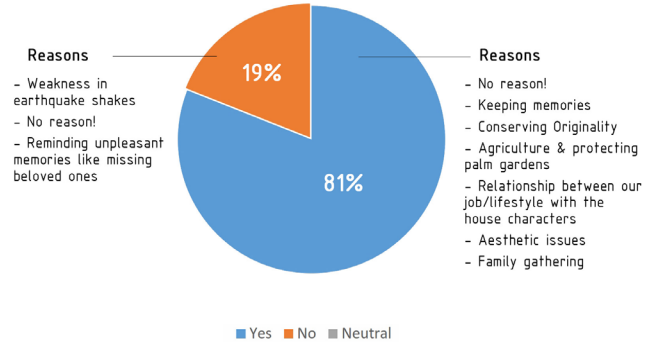
09 Design process



▼ Local Answers about "Bam Regeneration Inspired by Traditional Character"



▼ Local Answers about "Renovation of Houses with Traditional Techniques"

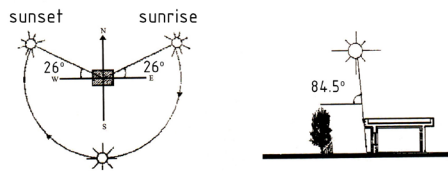


11 Social Studies Analysis © Golpayegani Abdolreza and Einifar Alireza, 2007

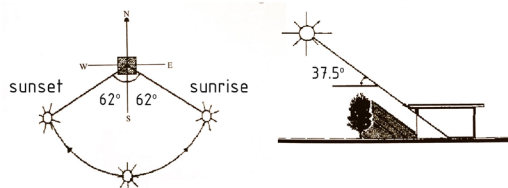
- Flexibility
- Security
- Outdoor, semi-open, closed
- General geometry of the building
- The exterior of the building

- Materials and manufacturing technology
- Internal and external communication (building-yard-garden) (Figure 12)

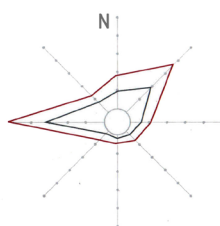
10 Climate Studies © Kasmai Morteza, Ahmadinejad Mohammad (eds.), 2008, p 159



How the sun moves and radiates in Bam in summer (July 1st)



How the sun moves and radiates in Bam in winter (January 1st)



Wind Direction Average in a year

Collaboration has been the main approach through all the phases of this project. We tried to understand the local community's concerns beyond all the studies and analysis (Figure 8, 11). We chose earth as a natural material to build our model and tried to stay open to its character and behavior during the modeling process (Figure 13).

Studying the survived forms after the earthquake was also very helpful. With an open and critical mind through a lot of trial and error and learning we came up with the final design that met our requirements (Figure 14).

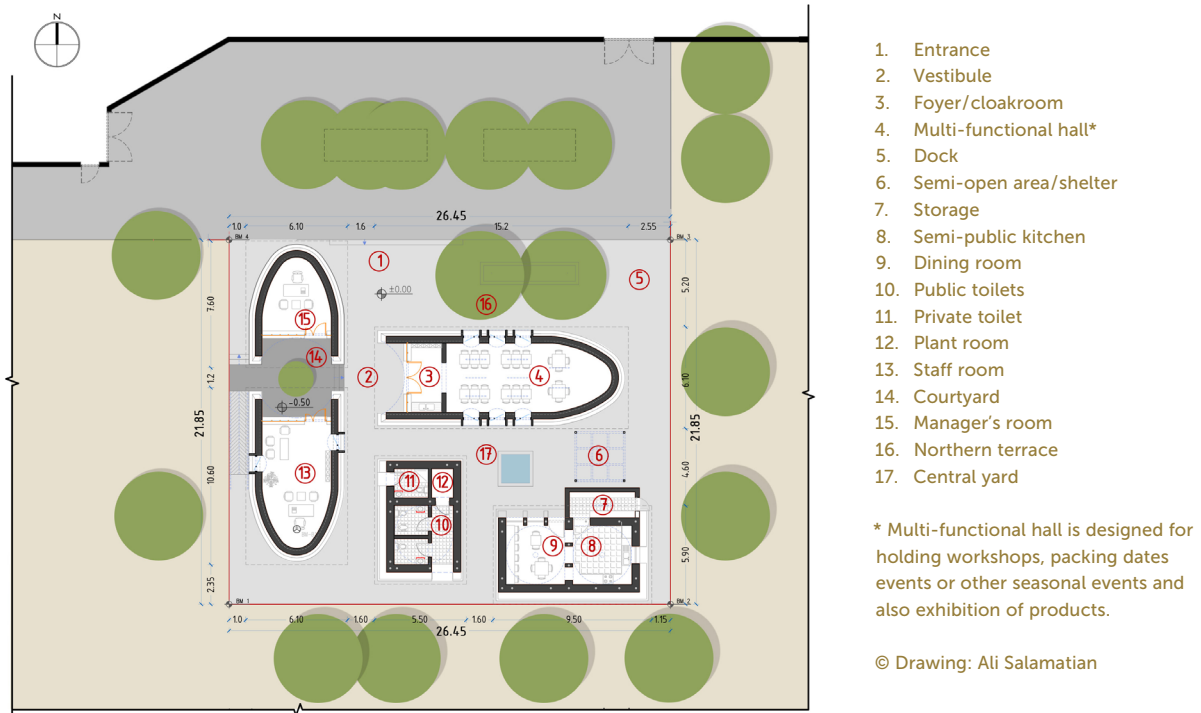
Unfortunately due to some external forces the project was stopped right before the implementation phase but we strongly believe that this model and the lessons learned could be of great value for our country and its people.

**Social participation**

The human factor being the main leverage of innovation gives the earthen architecture the role of a social inclusion tool, thanks to its inherent meanings that overstep the material and technical dimension.

Implementations were focused on constructing community centers as examples for the society, looking for sources of inspiration, learning from the past for sustainable technological innovation, and lo-

EARTHEN ARCHITECTURE AS AN ENABLER FOR REGENERATING THE IDENTITY OF BAM



12 Site plan was designed based on studies' result and Bam's local houses parameters (building – yard – garden)

13 The model made by clay ©Sonia Beygi

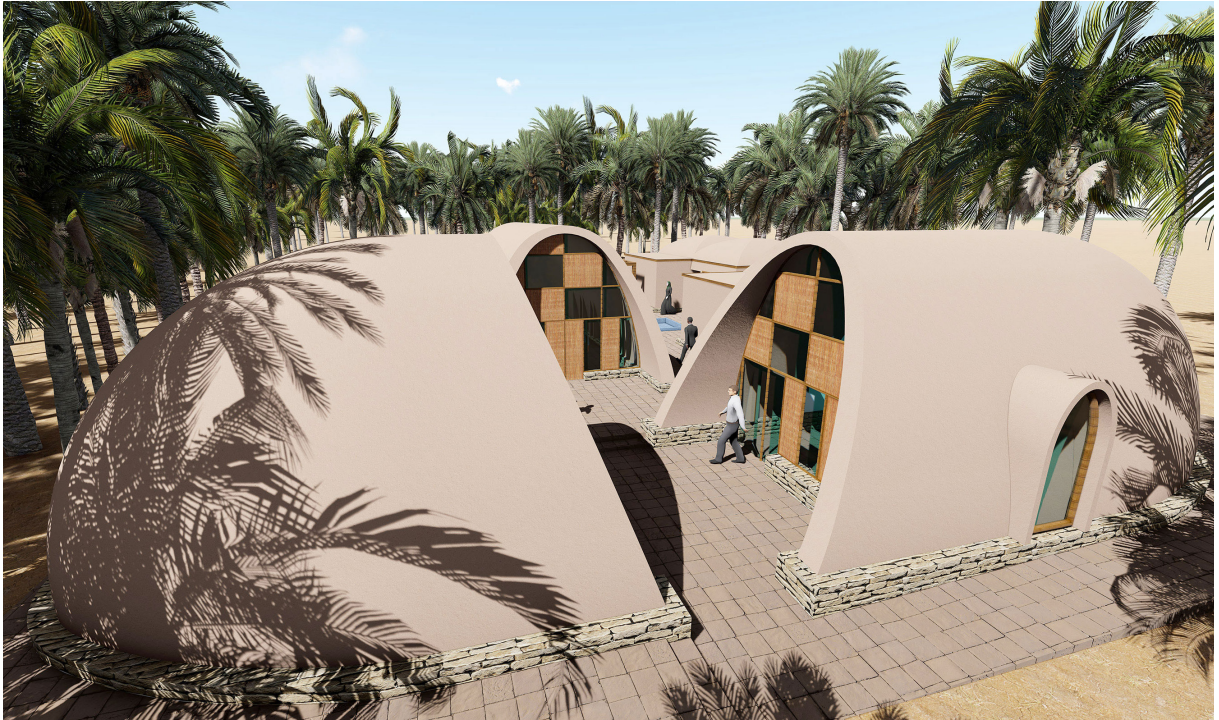


14 The very famous survived vault after the earthquake with the span of 12 meters ©Sonia Beygi



15 We made a prototype of the structure in different site, in order to analyze it and become more familiar with its challenges. ©Sonia Beygi





16 Computational model of the project ©Ali Salamatian

cations of high thermal excursion. The public participation was considered as one of the focal points in these projects.

The functional design of a house in Bam garden city was not limited to the finding of physical space to shelter families; it had an integrated system of social activities that extended to the external garden as a collective social space. The house form also accompanied by regarding the culture of the conservative community, and the awareness toward the environmental needs.

#### Footnotes

- 1 SPRING: "Strengthening CSO's Participation for a Responsible and INclusive agriculture Growth" through the development of rural cooperatives is a project, launched in 2018 by the SPASDI NGO in Bam. To explain the project further, it is part of the European Union's Development Cooperation Program aiming empowering the participation of civil society organizations in the local governance of the states.
- 2 SPASDI: "The Society for the protection and Assistance of Socially Disadvantaged Individuals" is a non-profit, non-governmental public charitable organization that was established in 1999. Since 1999, SPASDI has received special consultative status from United Nations' Economic and Social Council (ECOSOC). <http://spasdi.ir/index.php/en/home-en>

#### Conclusion

To achieve the project's goal, integrating three layers of human capital, built and natural environments guided our design process. In the human layer, to empower and increase the sense of belonging, we took advantage of collaboration with the locals. In the built environment layer, earthen architecture as a collaborative activity is used to regenerate the garden and restore the old identity of Bam's architecture. In the environmental layer, building with low impact, local and natural material and energy efficiency of the building are taken into consideration.

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