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Earthen Domes as an Economical and Sustainable Alternative to the Refugees' Camps in the Northern Region of Syria

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Abstract

As a result of the years-long conflict in Syria, many Syrians have been forced to move to safer areas near the Syrian-Turkish border in the north. As a result of the deteriorating economic conditions, the displaced people are forced to live in tents in camps that lack the basic needs of human beings. In addition, these camps did not protect the residents from the severe weather conditions in summer and winter. This paper proposes a sustainable economic solution by building special earthen domes that provide independence and social interactions between the residents of the camp. The solution presents different architectural models that are adapted to the needs of the displaced and provide thermal insulation and consider the economic and social aspects by relying on earth in providing the building materials. The displaced may participate in building their own houses in a way that secures decent life.

Keywords: Earthen Domes; Adobe; Camp; Refugee Shelters; Sustainability; Heritage; Comfort.

1. Introduction

As a result of the years-long conflict in Syria, hundreds of thousands of Syrians have been forced to move to safer areas inside Syria, where more than 13 million Syrians have been forced to leave their homes, whether inside or outside Syria, including more than 6 million internally displaced people. Thousands of them have lived in camps that lack the basic needs for shelter due to the poor economic conditions and poverty, and the north of Syria is considered the most areas that contain camps and refugees, as the area near the Turkish border is considered safer and more stable. With every winter that passes, a number of displaced people lose their lives, as a result of the bitter cold, severe storms and snow in the winter, and the victims are always children, newborns or the elderly, or as a result of the fires that occur throughout the year, as misuse of the cooking stove leads to the occurrence of fires almost daily. Despite the many difficulties and problems facing the displaced, the housing and shelter sector in general remains the biggest problem for all Syrian refugee camps, because it is considered the most important sector for the continuity of life.

2. Material and Methods

According to the statistics of civil society organizations operating in northern Syria, there are 458 camps distributed within 24 administrative regions, and it includes those camps 78,304 tents, 32,250 concrete rooms, 8,871 caravans, where tents constitute 66% of the total places of housing for the displaced in the camps, while concrete rooms constitute 27%, and caravans or prefabricated rooms constitute 7%. According to December 2020 statistics, the number of displaced people in the northern Syrian camps reached 646,341 displaced persons, and they constitute 117,120 families, where females constitute 53% of the displaced, while males constitute 47%. The results of the study showed that 36% of the camps faced a problem in the drainage of rainwater and sewage water last winter. The displaced people in 156 camps suffered from the formation of torrents during the rainstorms, which led to the closure of roads and the sinking of the tents and in some cases their erosion (Figure 1).



Figure 1. One Of the Random Camps in Northern Syria After a Rainstorm (Source: <https://www.syria.tv/>)

2.1. Housing That Needs Repair or Replacement

Through the study carried out by civil society organizations operating in the region, it was found that 1% of the total caravans included in the study need to provide rain insulators, as their roofs have become damaged and water leakage and need to be covered with rain insulators urgently or maintenance work. Also, 41% of the rooms covered by the study need rain insulators, as most of these rooms have no ceilings and are covered with rain insulators, but their insulations have worn out as a result of weather conditions, and 3% of the total rooms within the camps covered by the study need maintenance work. It was found through the study that 25% of the tents covered by the study need floor insulation, 38% of the tents need rain insulators, 8% of the tents need maintenance work, and 7% of the tents are damaged and need replacement. The results of the study showed the presence of public bathrooms for hygiene purposes within only 35% of the camps included in the study, and some of these camps contain private bathrooms for each displaced family. Near the place of residence, and some of them do not have bathrooms at all, and residents bathe within their tents.

2.2. Earthen Domes as Alternative Solutions for Tents

The damage caused by the war in Syria was not limited to the destruction of some ancient cities and archaeological sites, but also damaged some ancient traditional architectural styles, including the traditional style dating back thousands of years, which was embodied in the construction of the domed mud houses, those houses that were distinguished with its sustainable pattern, which spread to large areas of Syria during the nineteenth and twentieth centuries. I propose through my research paper a sustainable economic solution through the reuse of earthen domes that provide independence and social interaction among the camp residents. The solution provides an architectural model that adapts to the needs of the displaced, provides thermal insulation, and takes into account economic and social aspects, relying on the land to provide building materials, The analytical approach was used to monitor the current situation of the ground architecture in Syria and the possibility of re-applying it in the northern Syrian camps.

2.3. The Architectural Morphology of Corbelled Dome Houses

The mission of the research is to develop and provide housing solutions for the millions of displaced people who have lost their homes due to the conflict, in an attempt to improve their living conditions and find shelter that provides part of their privacy and protects them from the bad weather factors. the proposed solution is replacing the tents with earthen domes where the proposed model includes four vaulted spaces, two rooms for living and sleeping, in addition to the kitchen, bathroom and entrance space within a single block with an area of 36 square meters, which is a good area, capable of accommodating 4 to 5 people the floor of the domed block rises to 25 cm to prevent water leakage and rain. It is better for the building to be according to the north-south direction, with the main opening towards the south, in order to take full advantage of the solar radiation, and protect a house from the east and northeast winds (Figure 2-3-4).



Figure 2. Section in an earthen dome (Source: Earthen Domes et Habitats)

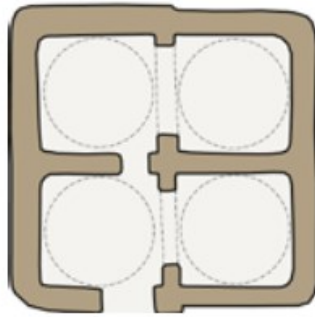


Figure 3. Earthen dome Layout (Source: Earthen Domes et Habitats)



Figure 4. Front facade of an earthen dome (Source: Earthen Domes et Habitats)

2.4. Suggested Construction Technique of Earthen Domes

The proposed construction technique is clay bricks mixed with straw that are made and dried on the construction site for ease of transport and use (Figure 5).

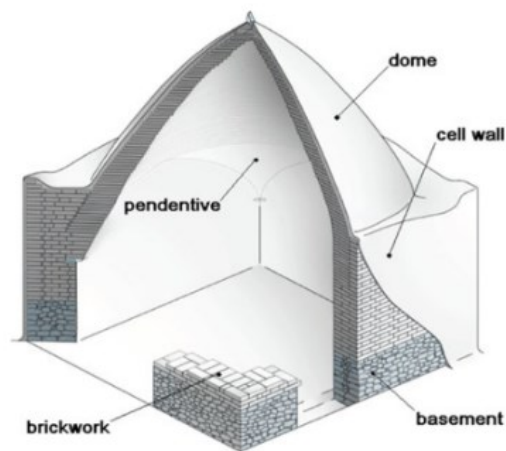


Figure 5. Axonometric View of The Section of An Earthen Dome

2.5 Achieving Sustainability in Earthen Domes

The earthen architecture of the northern villages in Syria is a sustainable architecture that relies on local materials as a building material, where domes can meet thermal comfort in the dry climate regions of Syria. Earthen walls have a naturally high thermal inertness and can regulate indoor humidity. It also has a high indoor air quality because the domes have open vents during hot and warm seasons, which leads to a greater rate of air change.

3. Results

According to the United Nations High Commissioner for Refugees (UNCHR) for the year 2020, the world is experiencing the highest levels of displacement registration. More than 70 million people around the world have been displaced. 25.9 million of them are refugees and 41.3 million are internally displaced. The proposed solution could play an important role in finding solutions to global housing problems not only in developing countries but also in first world countries.

4. Discussions

Building with clay is a common culture and building technique between East and West that has produced wonderful habitats from an aesthetic and anthropological point of view, and there are thousands of examples in the Mediterranean region. With the new concern for the environment, we can return to the land, and produce large numbers of habitats in the short term, able to encourage local development and handicrafts and reduce the share of imported goods related to construction activities, as building with mud is a powerful tool in combating the global housing crisis, it is currently used in All over the world, in ways that have helped rebuild societies facing a housing crisis. There is a definite need to promote local cultures and earthen architecture. The techniques used in traditional architecture are often the best solution in terms of economy and sustainability.

5. Conclusions

With the difficulty of predicting future events, it is likely that the refugees will be returned to their villages in very harsh conditions, when they will have to secure any shelter to stay, and in fact they will not be able to use industrial construction materials that are very expensive, and therefore they have no choice but to submit to the available local materials, Thus, the need for earthen domes emerges as a necessity.

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Conflict of Interests

The Authors declare no conflict of interest.

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