Tishk International University (TIU) Vernacular Architecture

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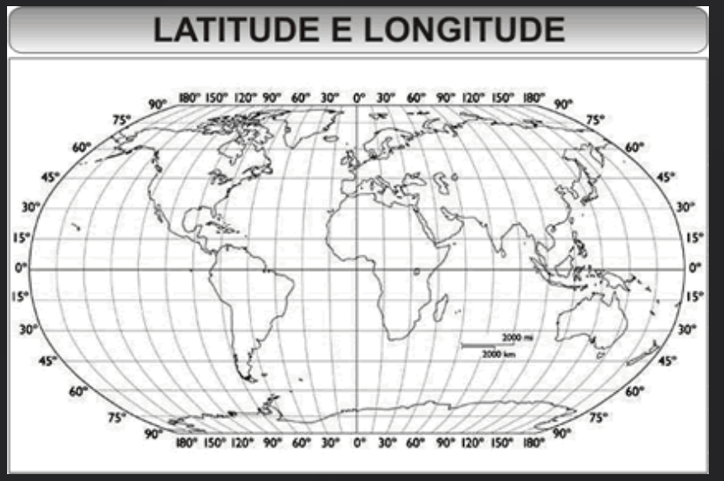
Lecture 4: Vernacular Architecture Across the Globe

Outlines

- Vernacular architecture in hot and arid climatic zone
- Vernacular Architecture of Mediterranean House
- Vernacular Architecture of Underground House
- Vernacular Architecture of Courtyard Houses
- Conclusion

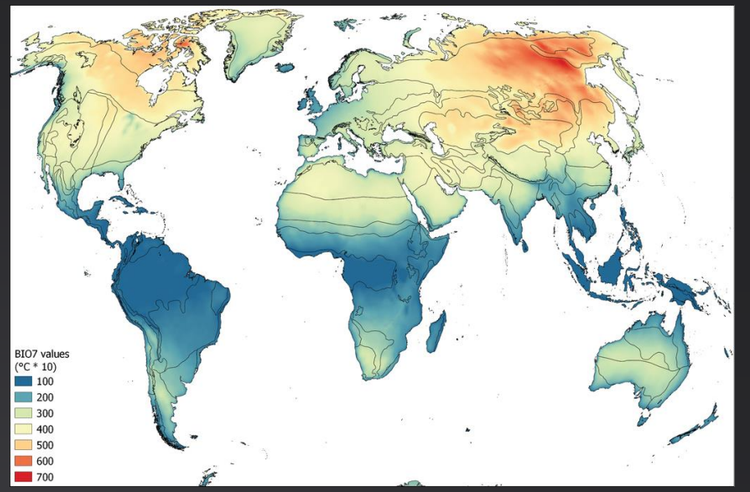
Vernacular Architecture according to Hot and dry climatic zones.

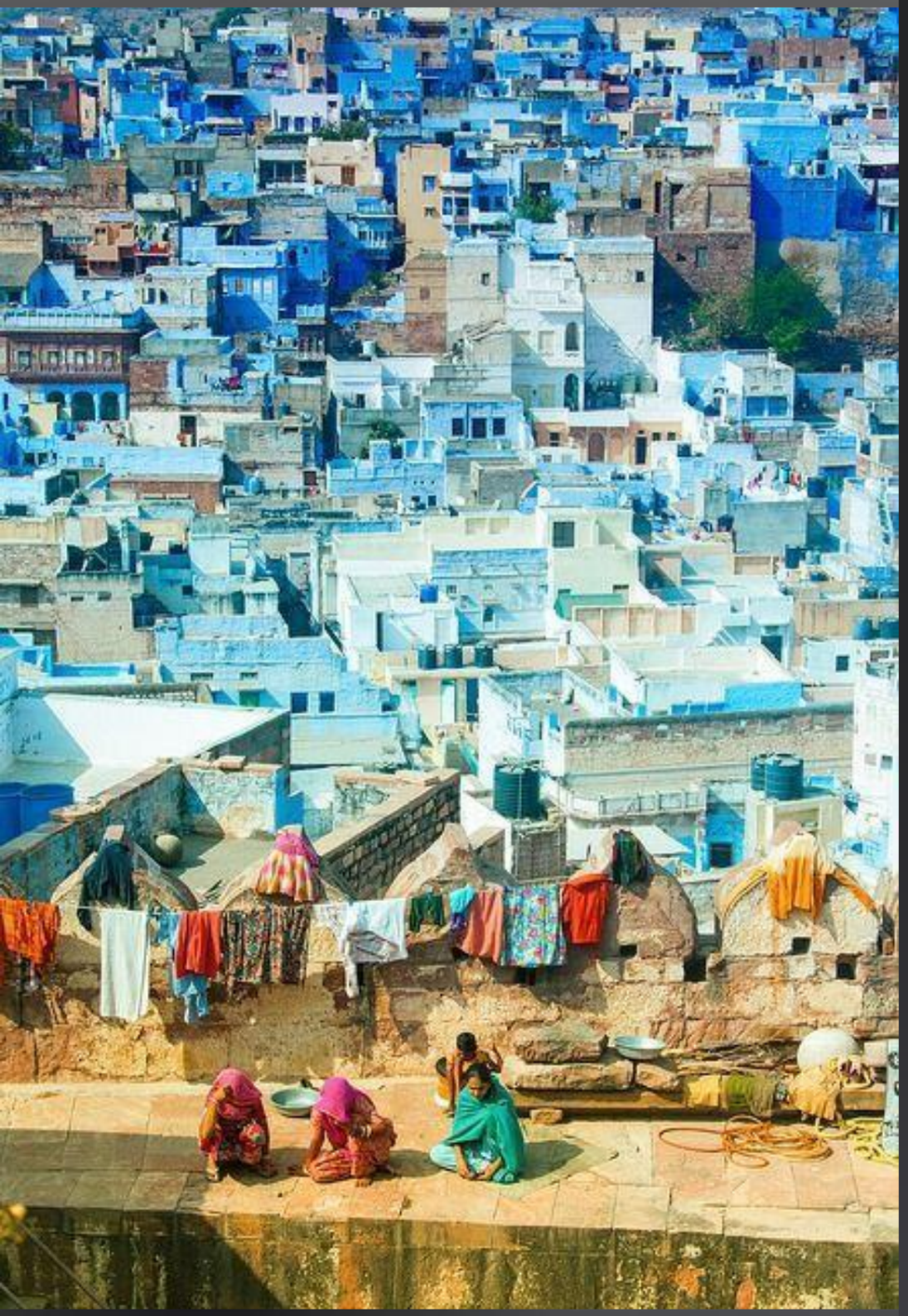
In order to understand all the **design features of the vernacular architecture** in this climate zone, we must know the climatic features of that region.



Hot and dry climatic zones generally occur at a **latitude between 15 degrees to 30 degrees** on both the hemispheres, The general characteristics of this climate are as follows:

- Hot dry weather in summer and cold in winter, High temperature difference between night and day, Very little rainfall,
- Very low humidity, Sandy or rocky ground with very low vegetation cover, Hot winds & frequent dust storms
- High summer daytime temperatures, High solar radiation
- Clear sky most of the year





Elements of Vernacular Architecture

- **Main Objective:** The main objective of the building climate zone is **to *protect the structure*** from weather with an aim **to provide comfortable living conditions.**

- 1. **Mediterranean House:** The Mediterranean house is the the typical building found all around **the Mediterr**anean sea, like **Mediterr**anean sea, like in **Greece, South Italy, Spain, and South and South France.**

The climate in this region **is so hot and** dry, and the **vegetation vegetation consists of little shrubs**, so **wood is** not a good material good material to build.

One of the most prominent Mediterranean cities that have distinguished vernacular architecture is

Santorini island in Greece

The main approach for the Santorini building designs came from the **ancient Greek philosophers** "the very essence of nature are four key elements in various configurations & interactions" :

- **Fire** (e.g. the sunlight or volcanoes)
- **Earth** (e.g. the soil and most materials)
- **Air** (e.g. the wind or oxygen)
- **Water (**e.g. the sea or rain)
- The **philosophical aspects** of these **four elements** were utilized as a **systematic tool** to look at architecture **in relation to nature**.

The buildings of Santorini resample those in the rest of Cycladic islands

- Solid volumes,
- Thick masonry walls with small openings,
- Made in raw(unfired) earth bricks,
- **Burnt brick,**
- Stone or Rock,
- The **whitewashed plaster** skin covering almost everything with an **integrative power.**
- **50 cm - 100 cm thick walls** accordingly to the construction materials.

how urban and building forms have naturally developed?

Over time in **response** to specific **climatic conditions** and the **use of local resources,** while also **reflecting the social changes** in the region.

This evolution has **resulted in unique architectural styles** that blend **function and aesthetics,** addressing the **climatic challenges of hot and dry zones.** The architecture stands as a symbol of the creativity and resilience of the communities living in these areas.

Specifications for Doors, Windows, and Roof Design

- **The doors and windows: windows, stairs, and spaces is focused on using** as little material and space as possible. So, you might see **doors that are shorter than usual**, stairs that are **narrow and steep**, and rooms that are small, **both inside and outside.** This approach is all about saving materials and **space minimalism.**

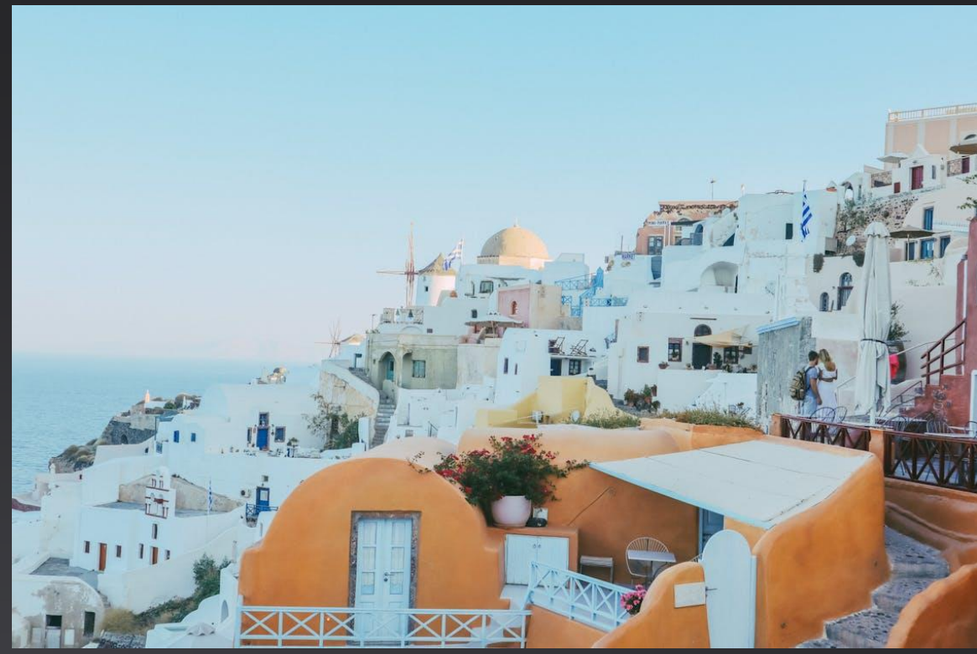
- **The roof shape and design:** Roof characterized by **light wood structure,** more often in **bricks and lime**. There isn't roof projection, but often there are **stairs outside to reach the flat terraced roof.**

Nature's Influence on Architectural Design

Nature as the Main Designer

In this architectural style, **nature played the leading role** in shaping how homes were built. The local people—who were often the builders of their own dwellings—had to adapt to **nature's demands**.

Factors like **climate**, **earthquakes**, **limited building materials**, and **challenging terrain** were the main design influences, and they were **carefully respected** throughout the building process.



Tradition, shaped by generations of experience, guided everything from the **layout** of the homes to their **decoration**, ensuring that the buildings were both practical and culturally meaningful.

Mediterranean house: Trulli, south Italy

These structures, dating from as **early as the mid-14th century,** characteristically feature **pyramidal, domed** or **conical roofs** built up of **corbelled limestone slabs**.

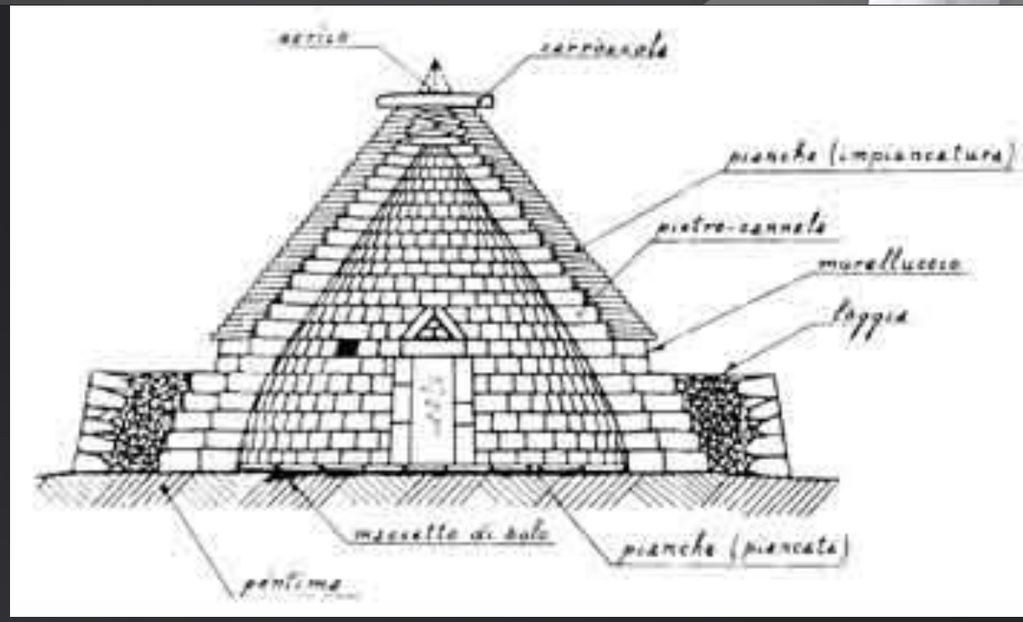
Trulli were generally constructed as **temporary field shelters** and **storehouses** or as **permanent dwellings** by **small-scale landowners** or agricultural **laborers**(worker)

After a while the Trulli **became permanent residential** buildings and **recently** they are built **using new technologies as bricks and concrete.**

“Walls”

- The **whitewashed walls** of the Trulli are built directly onto **limestone** using a **dry-stone wall technique** (that is, without use of mortar or cement).

- The walls comprise a **double skin** with a **rubble** core(irregular stones, broken bricks).

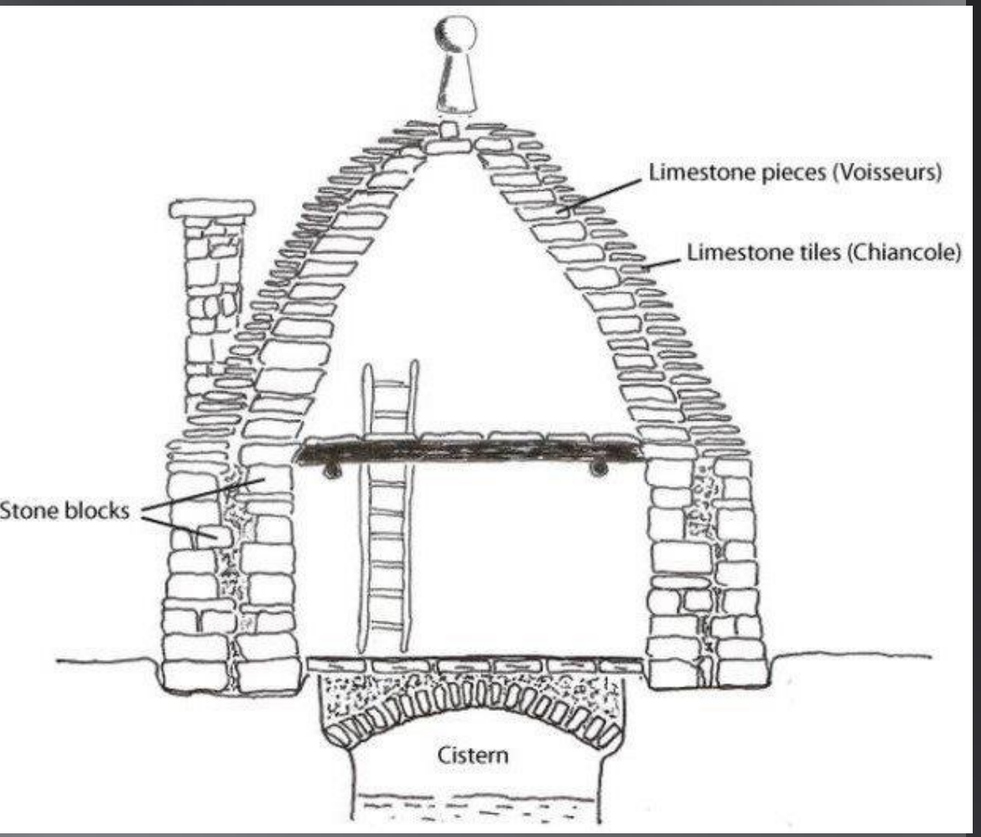


“Roof”

The roof can be referred to as a **false-dome**, characterized by its **lightness** and a **thickness** that **decreases** from the **base** to the **top**, usually ending in a **sphere**.

The roofs have two **layers:** an **inner dome** of wedge-shaped **stones topped with a capstone,** and an **outer waterproof** cone of **overlapping limestone** slabs called **chianche (Kyan-keh).**

Additionally, the roofs of buildings often have **symbols** related to **myths** or **religion** drawn with white **ash** and end **with a special decorative point.** This design is meant to **protect** the building from **bad influences or luck.**

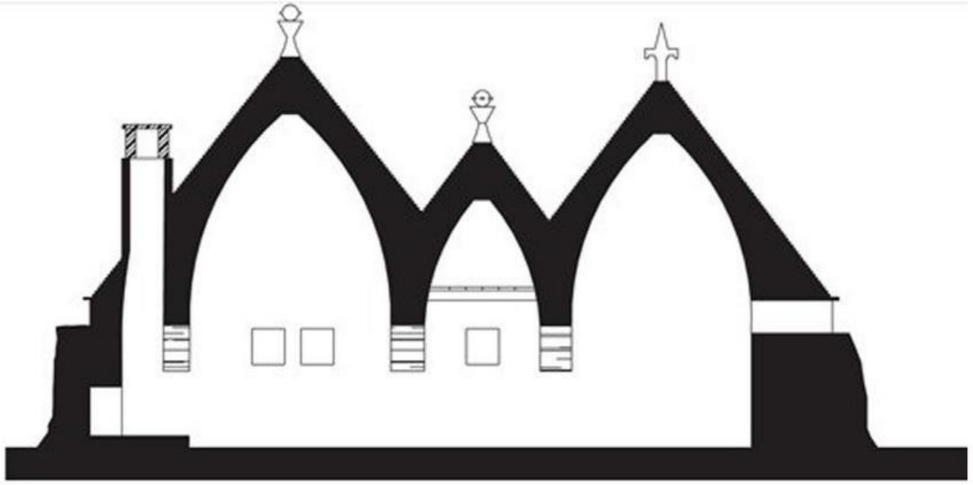


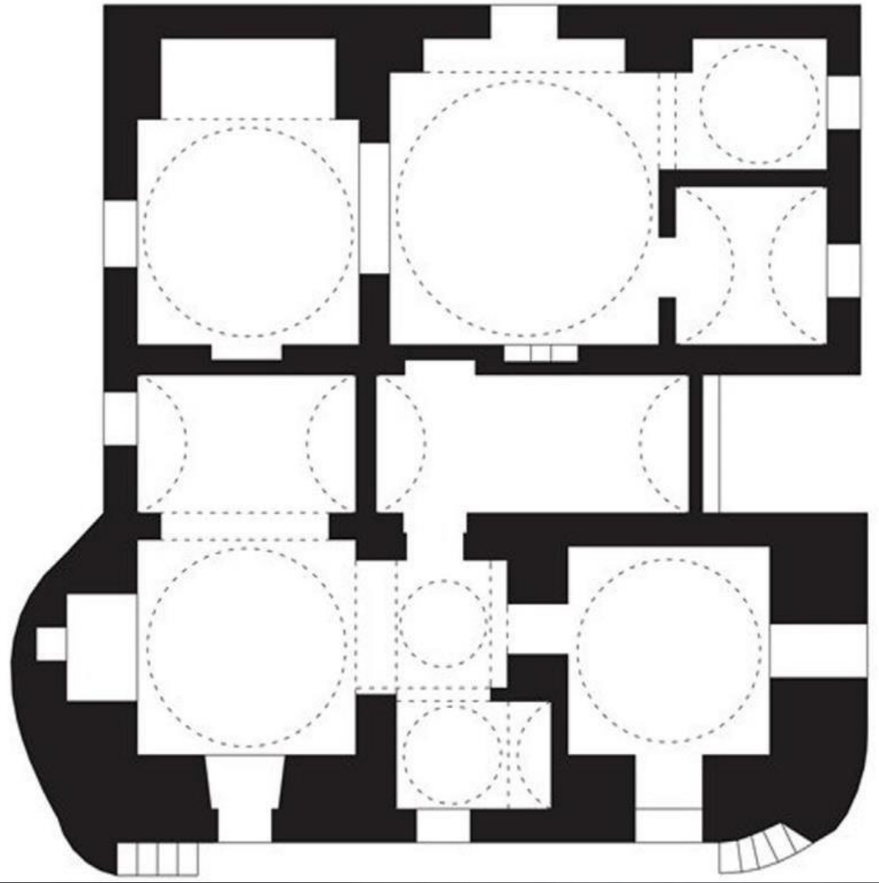
“Cistern”(sɪs.tɜrn)

Water is gathered by the extended edges of the roof, which direct the water into a special pathway on the slab leading to a storage tank under the house.

"Doorways and windows"

The walls have a door and a few small windows. Inside, there's a fireplace and built-in shelves in the thick walls.





Trulli Shape Design

The plan is compact and almost **square-shaped**, while the **roofs are cone-shaped.**

The entire shape of the TRULLI is a **mix between a cube and a cone.** The **roof is domed**, and usually, there is a **sphere**.

The central space is the **living room**, and the **service** spaces are **placed around it in smaller room**s. The interior is **really dark** because the **only opening is the entrance door**. An internal **fireplace** and **alcoves** are recessed into the thick walls.

Trulli Shape Design

Trulli houses have a special design that combines shapes to look unique and attractive.

They **have a neat(tidy), square layout and pointy roofs that make them stand out.**

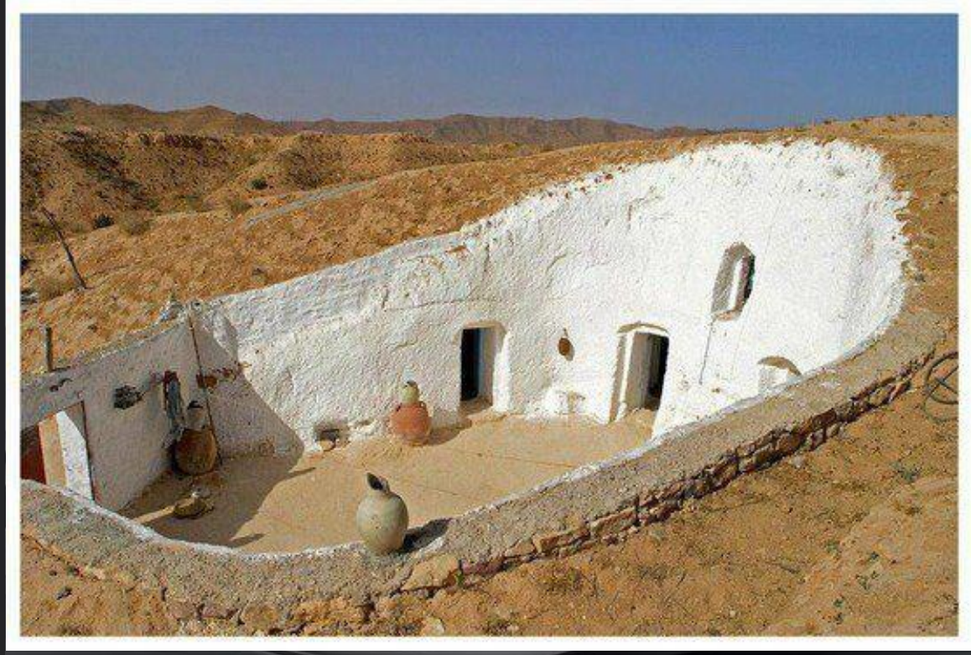
Inside, there's a **main room** with **smaller rooms** around it, making it feel **comfortable and private.**

The inside is a bit **dark because** there's only one **door for light**, which makes these houses intriguing.

They also have a **fireplace and built-in shelves i**n the **thick walls,** showing how smart and useful their design is.

Underground architecture

- The underground constructions are **typical of the dry hot climate** and they use the **soil constant temperature to have a better indoor comfort.**
- The most famous underground settlements in the Mediterranean area are: Cappadocia and Hassankevi in Turkey, **Matmata in Tunisia,** and the typical Italian and Spanish underground settlements.
- This architecture was **born not only to answer climate features,** but **also for social reasons and defense necessities.**



Underground architecture: Matmata in Tunisia

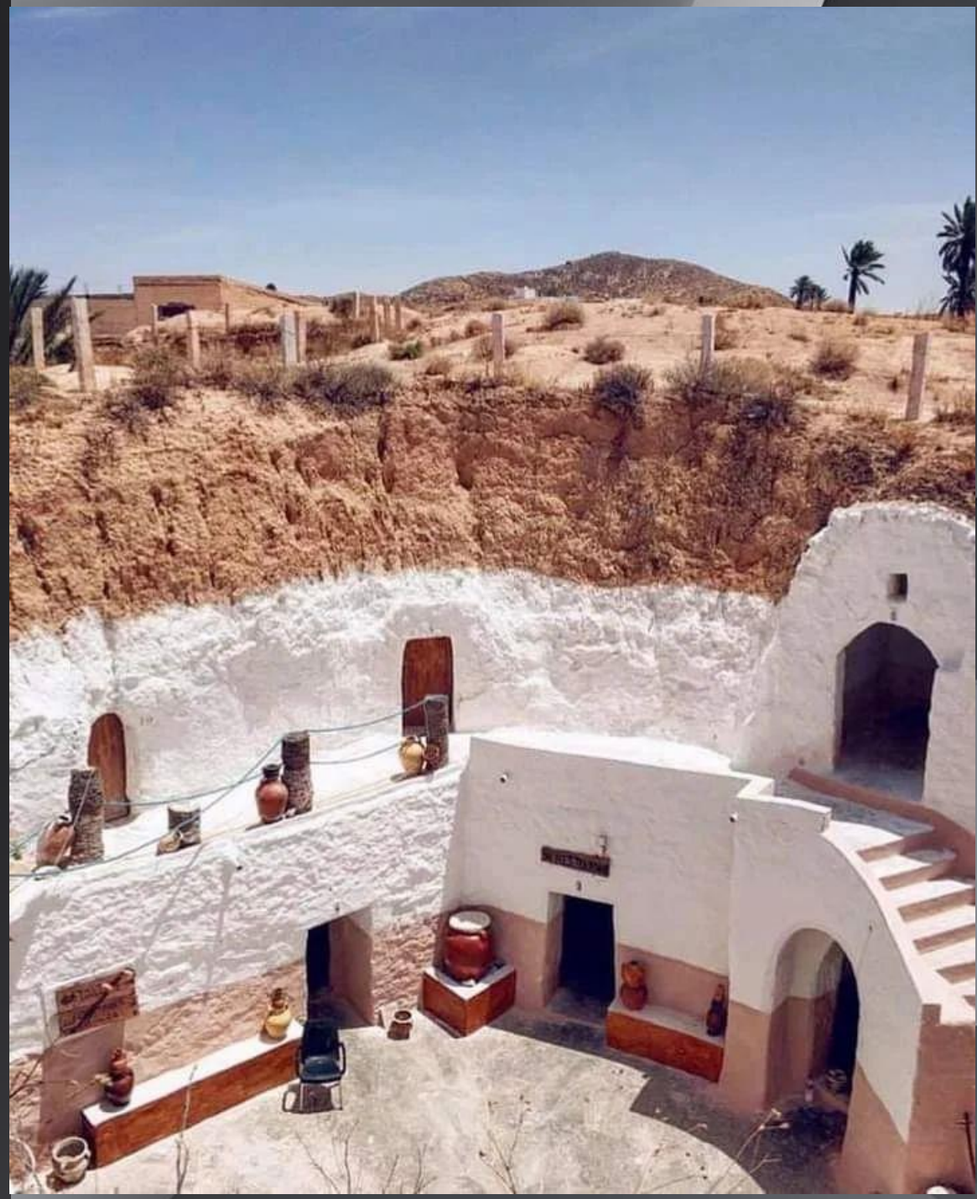
As Matmata is an **arid region** with harsh **climatic conditions**, and temperatures regularly exceed 50 degrees in **summer**. It is also distinguished by the **dusty and sandy desert winds.**

Matmata's terrain is **hilly and a small valleys** between the **limestone mountains contain** deposits of loess (the accumulation of wind-blown silt), almost **20 meters deep.**

Underground architecture: Matmata in Tunisia

Matmata Troglodytes are unique underground **homes designed** to **reduce extreme climates,** benefiting from the **soil's natural insulating** properties.

These dwellings maintain consistent temperatures year-round, **reflecting their builders' socio-cultural and economic backgrounds and environmental factors**. They exemplify innovative underground architecture for **comfortable living in harsh climates**.



Underground architecture: Matmata in Tunisia

The Matmata Dwellings — Why Cave Houses (Troglodytes)?

Why were they built?

The **Matmata troglodyte dwellings** are one of the most common types of underground homes. These cave houses were created by the local people as a way to **escape the harsh climate**. Their widespread use is largely due to the **favorable soil conditions**, which made digging and shaping these homes easier.

Thermal performance

These cave homes have **isothermal properties**, meaning they maintain a relatively **constant indoor temperature year-round**. They stay **warm in winter and cool in summer**, thanks to the natural insulating properties of the earth. The soil absorbs and moderates temperature fluctuations, protecting the interior from both daily and seasonal extremes.

Shape and size

Although the **shape, size, and design details** of sunken courtyard homes may differ between regions—and even from one household to another—due to differences in **cultural background**, **financial situation**, and **environmental conditions** like soil type, climate, and water systems, the **basic layout remains consistent**.

Underground architecture: Matmata in Tunisia

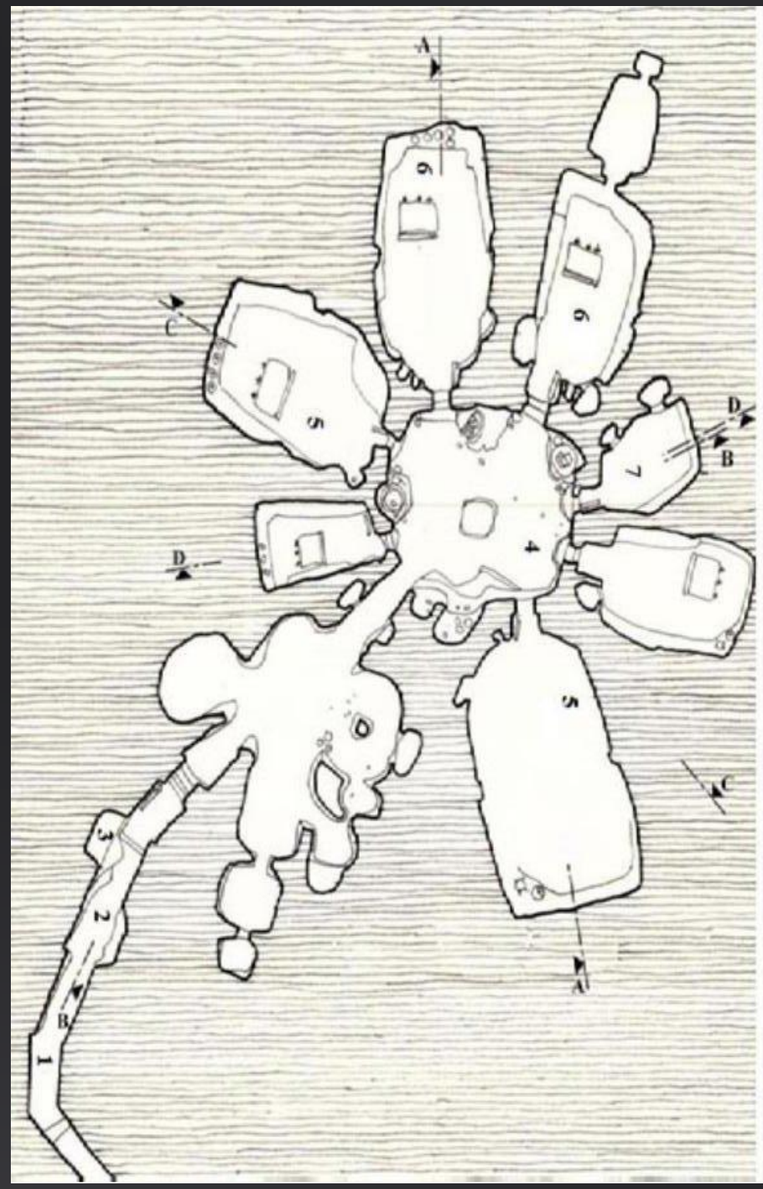
Building **materials such as stone and gypsum** are available from the ambien binding agent, **composed of clay with enough gypsum was used.**

These types of materials also were used **for the finishing coats of the internal walls and some of the fixed furniture** (beds and storage cabinets). While **olive trees,** which are widely planted in Matmata, are used for **doors and some simple furniture.** It is also used for **supporting the roof of rooms** and subterranean **entrance tunnel.**

The Dwellings Layout

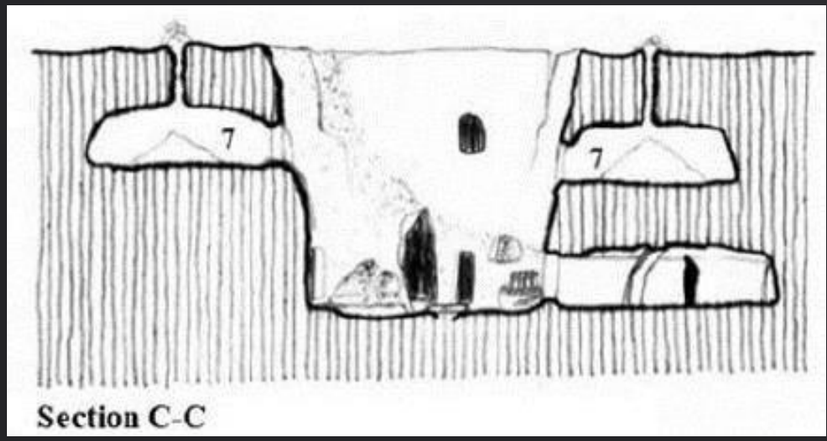
Any house in Matmata has a **number of rooms around the courtyard** that varies **depending on the size of the family and its way of living**, which may dictate a **certain number of storage and utility rooms.**

There are also **granary rooms(storehouse), which are high rooms excavated at a height of 2.5 to 4 meters** from the ground of the courtyard.



Room design

In the context of architectural design, room layout and design play a significant role in determining **the flow of movement, natural light penetration,** and overall user experience within a built environment.



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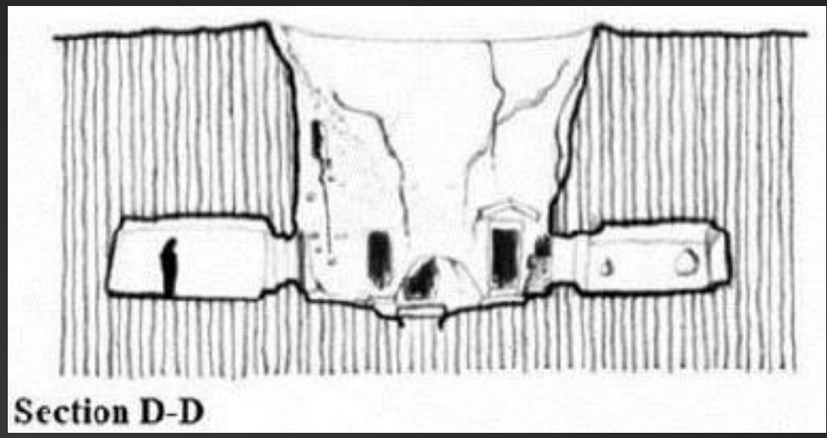
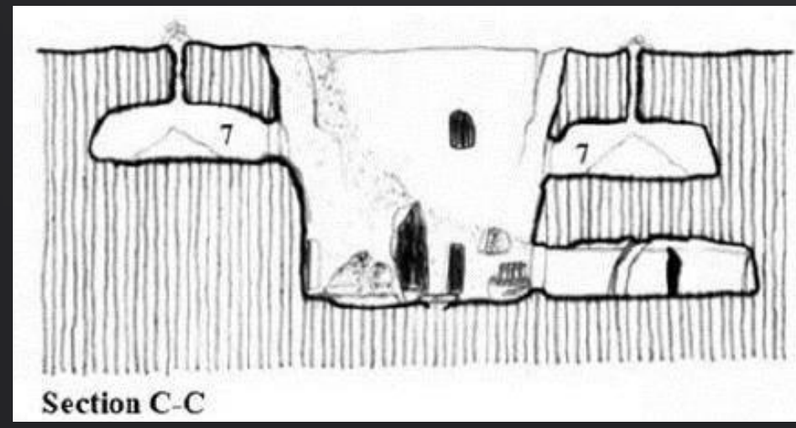

Section D-D

Room design

Considering Architects and designers **prioritize occupant needs and preferences, merging comfort, functionality, and aesthetics in room design.**

This approach ensures spaces **meet unique demands, enhancing life quality and well-being.**

Room design **combines** artistry, **ergonomics(Comfort design), and practicality for attracting interiors.**



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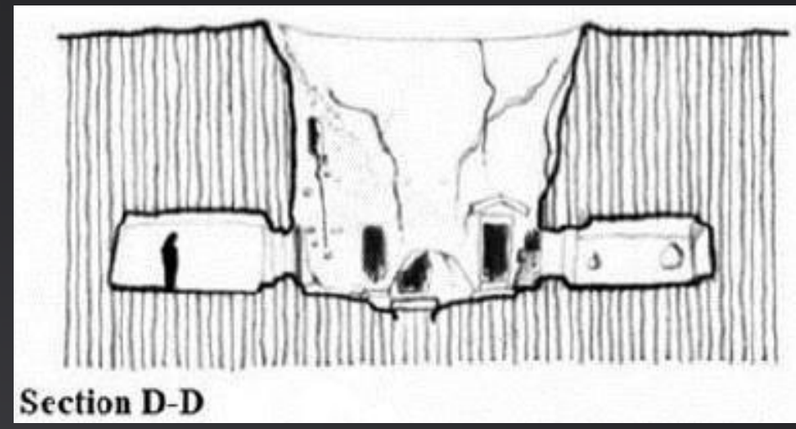
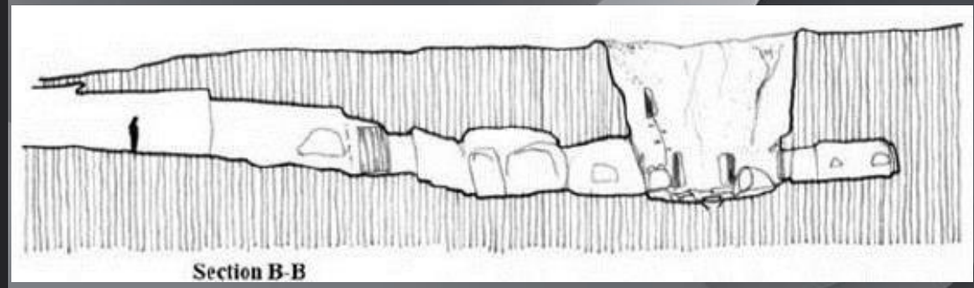
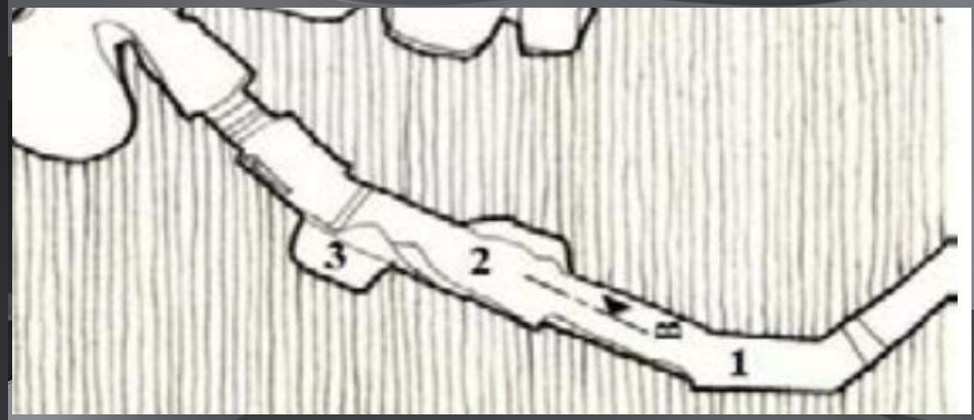

Section D-D

The entrance of the dwelling

After this **curved entrance,** there is a **storage room for storing agricultural instruments** and sometimes for **sheltering sheep and goats.**

The entrance to the **dwelling leads to a storage area where agricultural tools are kept,** and it also serves as a **shelter for sheep and goats at times.**

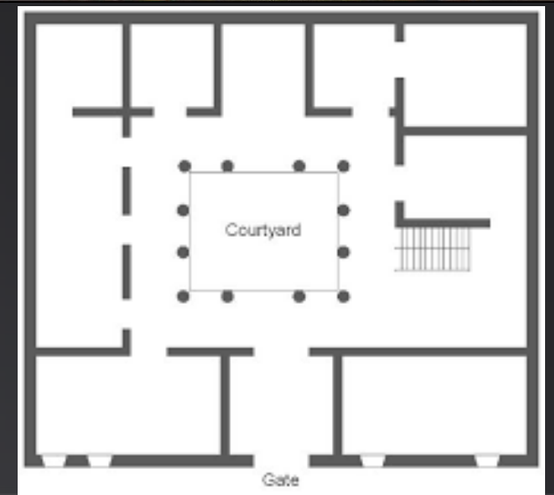




3- Courtyard vernacular houses

In most courtyard countries located in the **hot dry region**, the so **dry, the temperature range is so high**, there's a **strong solar** and the **winds** can transport huge amount of **dust and sand.**

Therefore, all the characteristics of this vernacular house **was** following t**radition**, **culture**, **religion**, **climate answers**. As well as the **principles of thermal control** through the proper use of materials, therefore, the vernacular techniques employed in these buildings are **rarely costly in terms of materials or energy.**

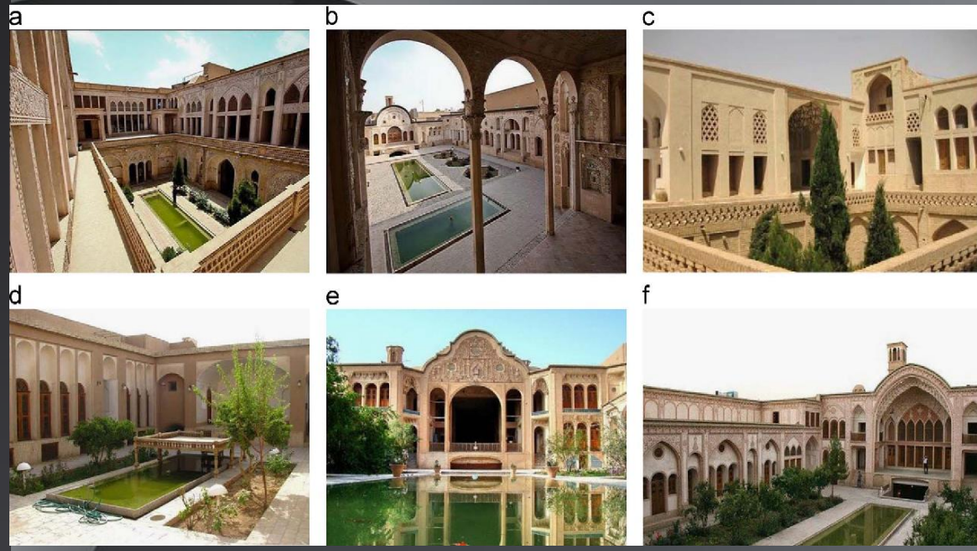


In regions with very hot climates, it's essential that the design of buildings and their materials are chosen to suit the surrounding environment.

This adaptation is important to make sure buildings can handle the **problems** caused by the **hot, dry weather**, like **very high** temperatures and **lack of moisture.**

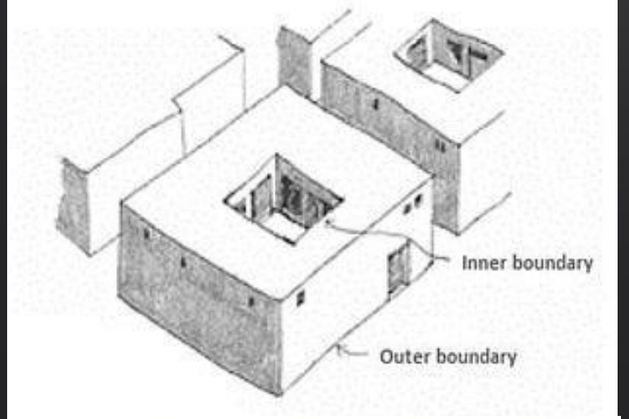
It's very important to carefully design the **structure and shape** of houses so they **fit well** with the **surrounding environment,** especially in places with **hot weather.** This means **thinking about how** to deal with the **challenges that come from being in a hot climate.**

These adaptations **are essential** for **creating living spaces** that are **comfortable** and **sustainable** in the face of the severe **climate conditions.**

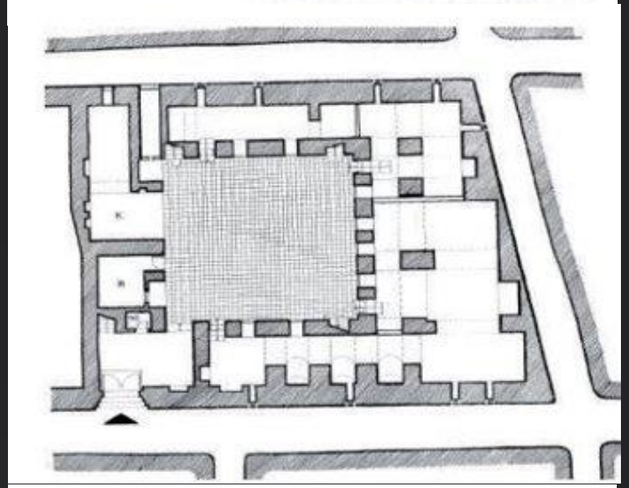


The courtyard houses layout

- The whole design is focused around the **central square-courtyard**: an empty space where all the **rooms face to**.



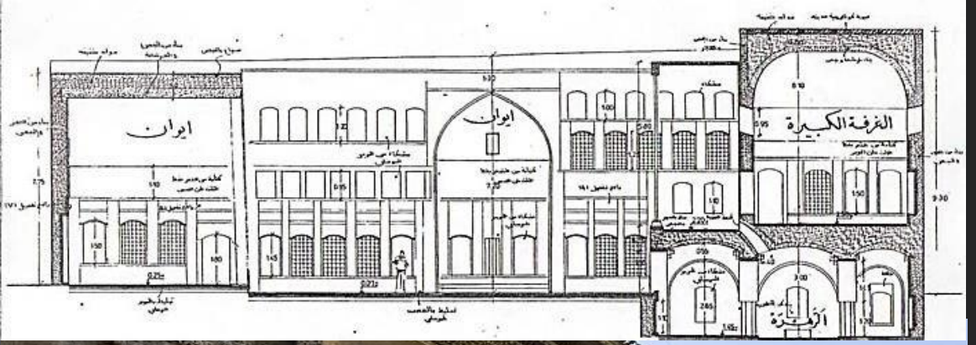
- Around the courtyard often there are **porches** on one or more **sides** and one or **more store.**



- Then **passageways** and r**ooms** were to be arranged around the courtyard.

- The **irregular parts** and **undesirable angles** were modified by changing the **walls depth** that may be used as **shafts, service areas, cabinets**, or **fixed furniture**.

- Usually, there is a **special space** on one side of the courtyard called the **Iwan**, usually **vaulted,** walled on **three** sides, with **one end entirely** open.



Philosophy of the Courtyard House

- Courtyard vernacular house philosophy is **based on achieving** two aims:
  - **Privacy and**
  - **Protection**
- These **two aims influenced** the **house layout**, **spatial relations ,** and **architectural details.**
- A central **interior courtyard onto** which all the rooms **opened** was **restricted (limited)to family use.**
- Courtyard **provided an adequate climatic** and **social solution**; it provided **shading** and **privacy** in an open space.
- Most of **daily facilities** were **located** at the **courtyard.**

Building Envelope

- The building **envelope (shell)** of a courtyard **house forms** an **effective barrier** against the **worst extremes** of the **external climate.** It provides a **filtering** which modifies the climate **sufficiently conditions** to be more **acceptable.**
- The main function of the house envelope is to **resist the transference of heat**, **reflecting sun rays** as much **as possible**, and **minimize** the **heat** and **solar gain** to create **cool conditions inside** the house.

OVERVIEW OF DESIGN PRINCIPLES

- Courtyard or Patio
- White Colored walls (“cool” **colours reduce heat reflection**)
- Arrangement of the houses in is **very closely packed** to each other.
- Vegetation (reduces the **temperature**, filters the **dust** in and **around the house**, elevates the **humidity** level)
- Small **openings**
- **Double roof** or white single roof
- **Thick walls**
- **Big basin** to collect rainwater
- **Louvered** windows

Conclusion

- **Religious** and **social** considerations: Factors that influenced the **shape and layout** of buildings in **hot and dry regions.**
- Taking **advantage of local materials** and **resources:** Utilizing available resources like **limestone** in Trulli houses.
- Providing a **vital connection** between **humans** and the **environment**: Designing buildings to **harmonize** with the **natural surroundings.**
- Designed specially to be **compatible** with **hot** and **dry region conditions**: Architectural designs **tailored**(fitted) to suit the climate.
- **Thick walls** with **small openings**: **Construction features adapted** to the **climate**.
- Reducing the **exterior surface** area exposed to **direct solar radiation**: Using **compact urban fabric** or **underground houses** to **minimize solar** exposure.

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