

Passive Design

Pakistan

Pakistan



- Pakistan's total housing stock ; 39% of mud houses, 40% of semi-brick houses, and 21% of brick houses
- The average household size ; 6.6 persons
- The occupancy per room is 3.3 persons

Urban and rural housing in most cities of Pakistan is scattered, unplanned clustered based on small town and village.

In urban cities of Pakistan, various development authorities exist for the preparation and regularization of the residential building bylaws.

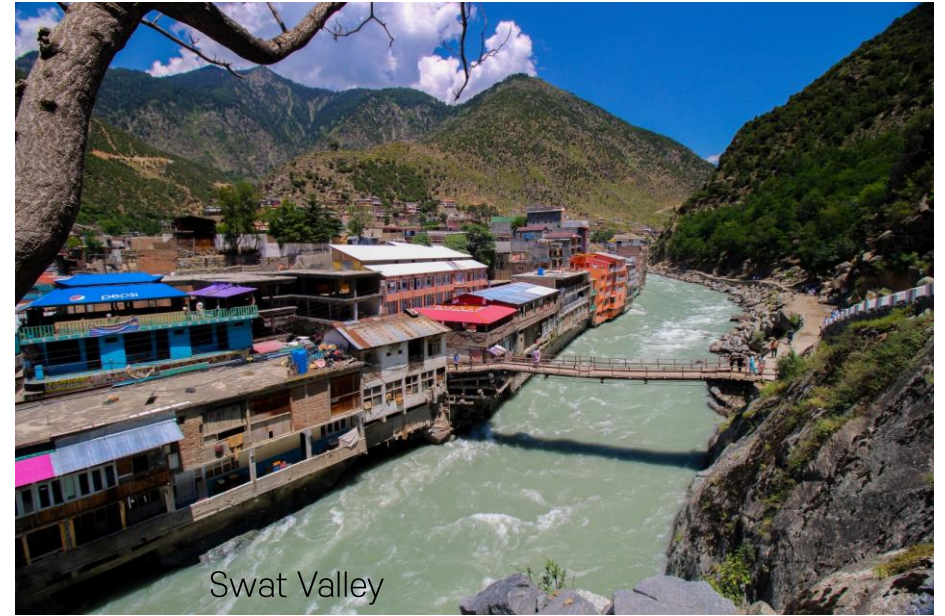
- The capital city "Islamabad" is administered by the Capital Development Authority (CDA)
- "Lahore" by the Lahore Development Authority (LDA)
- "Multan" by Multan Development Authority (MDA)

For almost every city, there exists a controlling authority to regularize the construction.

Vernacular Houses



Highland Roof



Swat Valley

Pakistan is blessed with vast natural resources, diverse climate and geographic conditions of plains, deserts, forests, hills, and plateau.

Highland climate and domestic architecture

Region ; Gilgit, Chitral, Sakardu, Swat, Peshawar, Kohat, Waziristan, Quetta, Sibi and Kalat etc.

The climate of highland zone is characterized by prolonged cool to cold winters, with relatively short mild to warm summer.

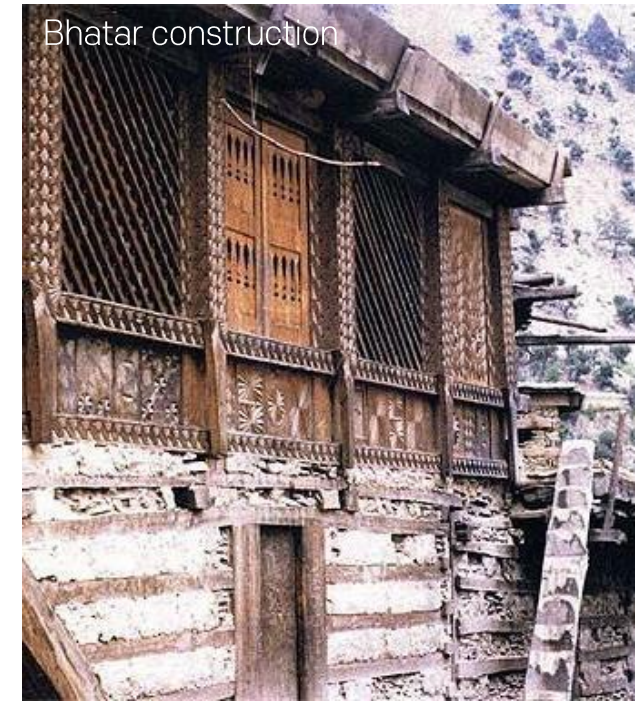
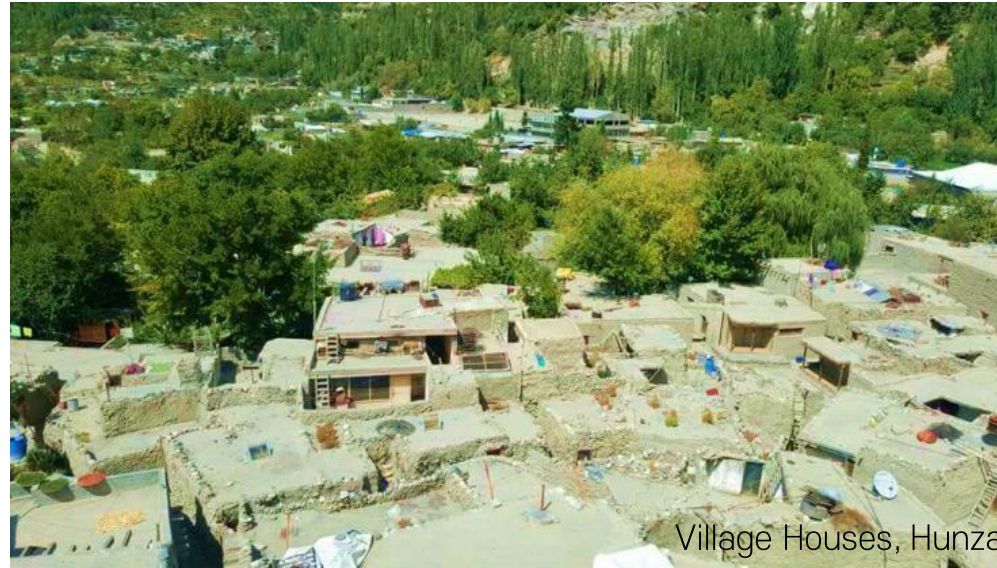
The northern region experiences rainfall throughout the year, while the western part receives less rainfall.

Dense pine forest encourages the use of timber as construction material in many houses of swat valley.

Similar type of locally available traditional materials like stone, timber, mud bricks, clay and soil mortar are used in Gilgit-Baltistan houses.

These houses are the perfect blend of stone craftsmanship; each stone was chiselled to shape, meticulously graded for the required size.

Vernacular Houses



The roof is flat, projected porches serve to fulfil the purpose of sun spaces.

The distinctive feature of local domestic architecture, is interior passages with low doorways.

Hunza valley traditional houses uses Bhatar (a Pashto word) cross wooden beams structure as vernacular construction techniques.

Domestic rural houses are made of large pieces of stones, with rubble masonry, stone chips and mixture of lime mortar with egg yolk.

It has been proven that the use of egg albumen increases the strength of mortar.

Village houses in the highland zone are closely packed and interconnected in a way that their roof become approachable and villagers can walk across on the top.

In some cases, the flat roof construction well shaded through sun spaces helps to minimize the harsh effect of cold weather especially in winters.

The low roof leads to stepped terraces providing landscape opportunities.

Vernacular Houses



Shaded Verandah



Stone Rubble Masonry



Outdoor Sleeping

The use of palm trees in southern region of domestic structure is prevalent, that form the pitch of roof as structural elements with earthen layer. The spacious courtyard with covered verandas are the traditional feature of these houses, increase the air flow within the house.

Mud houses, with traditional Balochi design are also found in warmer regions. These houses have low height wooden openings.

There is a large open space at front of houses used for outdoor sleeping in summer and social gathering in winters.

Vernacular Houses

Thatched Roof



The dry plateau of Balouch region is reflection of Gidan to Baluch and Kodal to Pattan culture.

The domestic architecture of rural houses in mountainous region have the thatched roofs with elongated dome.

The earth sheltered houses found in the foothill and valleys of mountain near Peshawar are blended with nature as urban planning follows the topographic hills.

Vernacular Houses

Lowland climate and domestic architecture

Region ; Islamabad, Lahore, Faisalabad, Multan, Jacobabad, Shikarpur, etc.

The low land climate has hot summers, with monsoon rainfall and cool winters. The land is mostly arid in southern upper and lower Indus Plain. The thunder storms are also common in northern region of Indus.

In rural houses, the use of earthen materials like moulded mud or clay blocks, pise, sun dried and burnt bricks, kankar, white lime mortar and plaster, terracotta tiles, sheesham and neem wood are the available construction materials in rural houses of northern and southern upper Indus plain.

It is the plastic quality of mud and clay that rural people make different pattern on interior and exterior of walls.

The provision of shelves, niches and cupboard facilitates the display and storage.



Mud Brick Construction

Vernacular Houses

Mud and clay is also carved in detailed traditional and cultural patterns.

The screens just above the door lintel level and below the roof will help to draft natural flow of air.

People profoundly design these traditional patterns to show their neighbours, fulfilling the psychological and aesthetical needs of occupants.

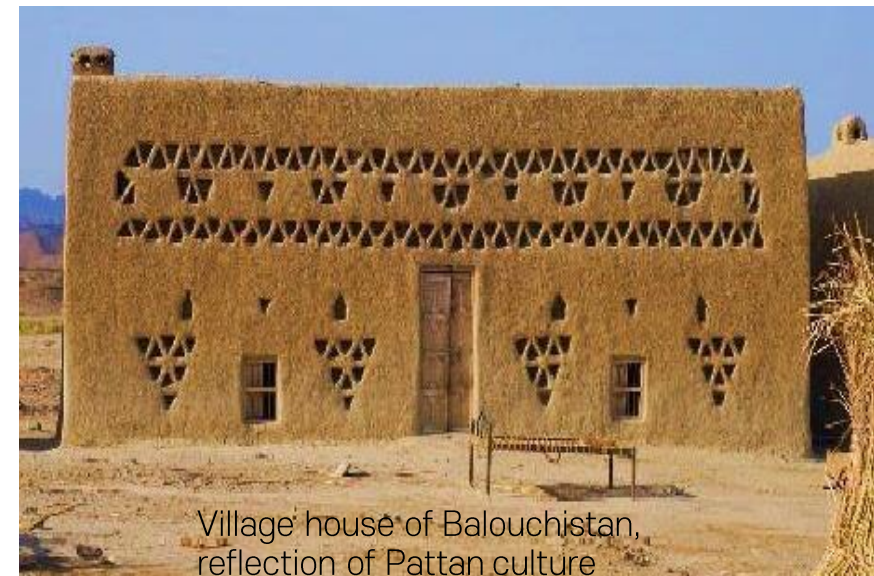
The wooden openings and thick mud plastered walls increase the time lag of walls to the inside space.

The floor of houses made of composite material, using earth mixed with water and straw or dung.

The presence of organic material acts as binder and its thermal conductivity also increases.

The old fashioned Punjabi houses have wooden windows with iron bars in checkers form.

The windows are outlines with paint for aesthetic reason.



Village house of Balouchistan,
reflection of Pattan culture

Vernacular Houses



The roofs of Pakka houses in urban and rural settlements of Punjab have column beam structure.

The roof of walled city houses in Punjab is tied using wood griders placed at regular distance and reinforced with brick tiles.

In some houses, reinforced concrete construction is prevalent, constructed using timber shuttering with a layer of 6-9 inch thick layer of a mixture of lime, cement and sand plaster is spread over the roof.

Over this layer, mud-straw mixture is applied, making the roof almost one foot thick.

Walls and roof are painted with white washed and acts as reflective material for summer heat.

Vernacular Houses

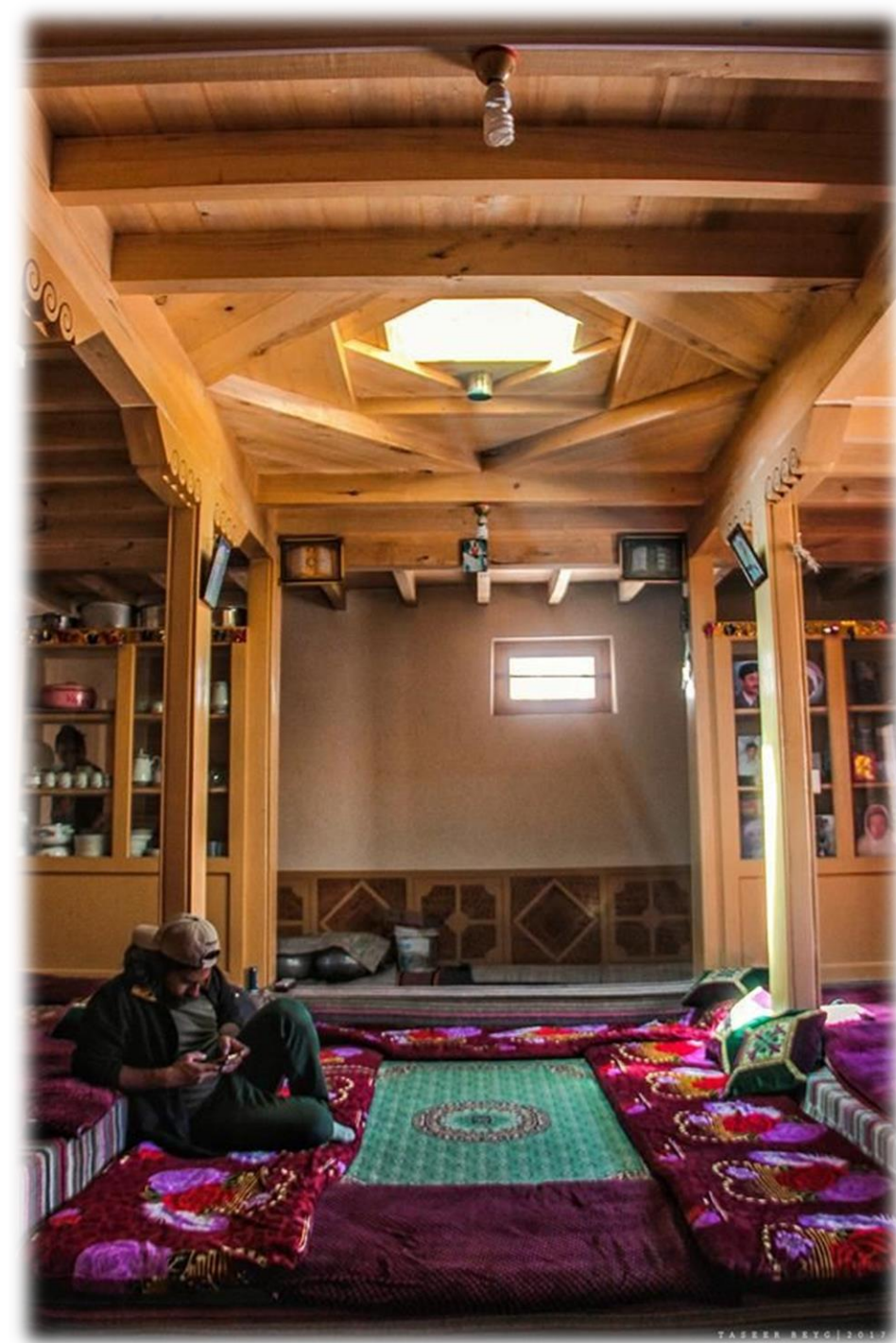


Another traditional material is the use of an internal finish red, lime plaster called surkhi and pukka kalli, to keep the internal surface cool.

The craftsmanship is mastered by some old masons, with wide variety of intricate wall design.

The Bathak in the rural houses are peripheral enclosure that serves the same purpose of guest sitting, commonly observed in the old houses of walled city.

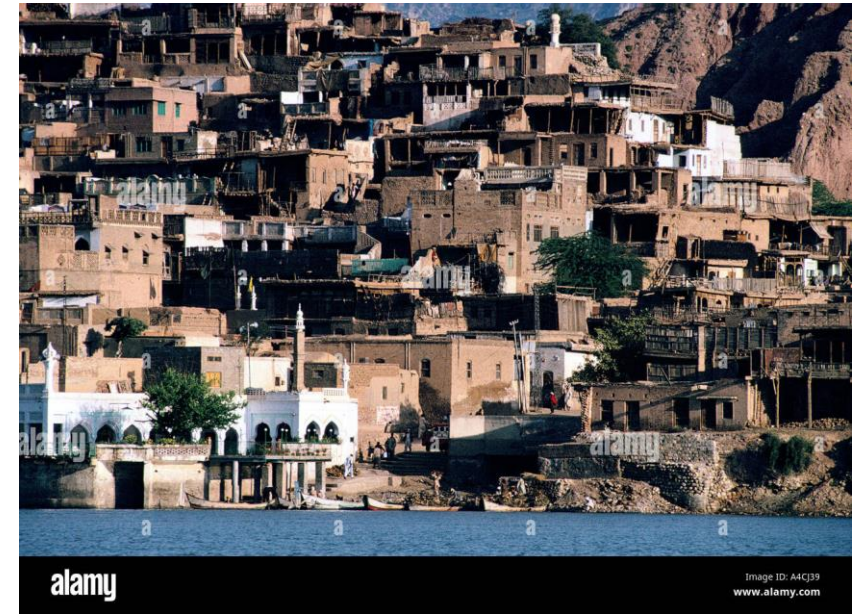
The concept was further adopted in modern houses for porches as extended shading of roof.



Vernacular Houses

Coastal climate and housing architecture

Region ; Indus delta, Karachi, and Makran coast



The coastal climate is characterized by moderate temperature in summer and winters.

The land near the sea heats up and cools down quickly, whereas sea water heats up and cools down slowly results in high humidity conditions.

The old architecture in the region ideally deals with high humidity and warmer summer temperature.

The vernacular houses are characterized by high ceiling design for increased air current.

In most rural areas, domestic structures of lower Indus delta have roofs with central ridge, and double slope.

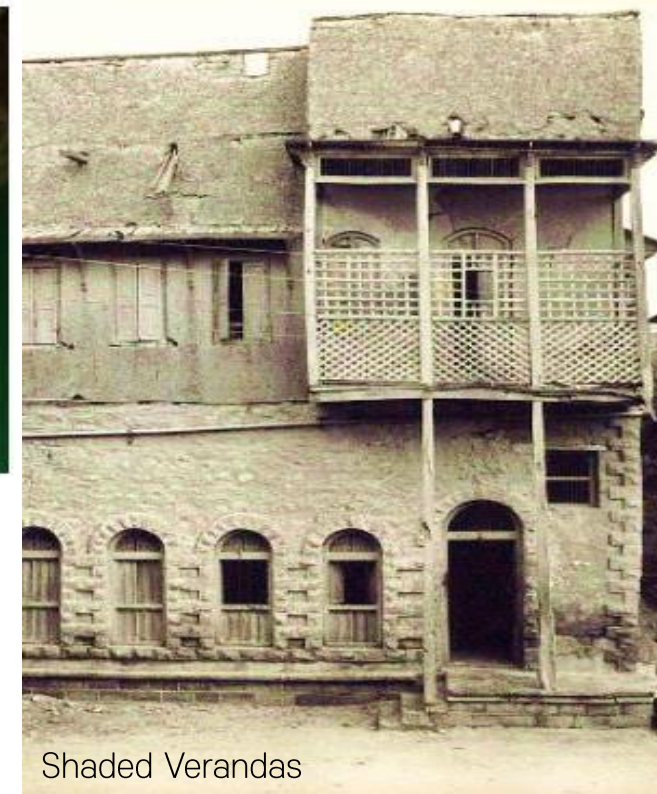
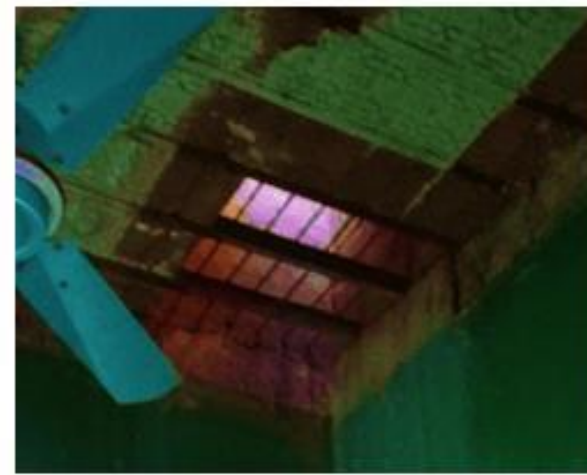
These thatched roof forms the hedge like construction of closely packed juniper stems.

Mud and cement sand block are used as construction and finishing material for wall, roof and floors.

Vernacular Houses



Wind Chimney for cross ventilation



Shaded Verandas

In many village houses of coastal region, dwellings are constructed with Acacia and Sheesham timber frames to form structural support and is plastered with straw and earth, collected from Indus delta. This vernacular traditions help in keeping the envelope cool and enhances the natural cross ventilation through large openings.

In traditional houses, projected balconies provide protection from solar radiations and casting long shadows. Wooden, concrete and terracotta lattices increase the indoor comfort when air pass through the narrow holes of screens, improving the air quality and reduces air temperature.

The chimney is kept open to take advantage of night time breezes in summer and daytime hot air in winter vice versa. Unfortunately, this vernacular cooling technique has been largely replaced by air conditioning and other mechanical means in modern times.

Vernacular Houses

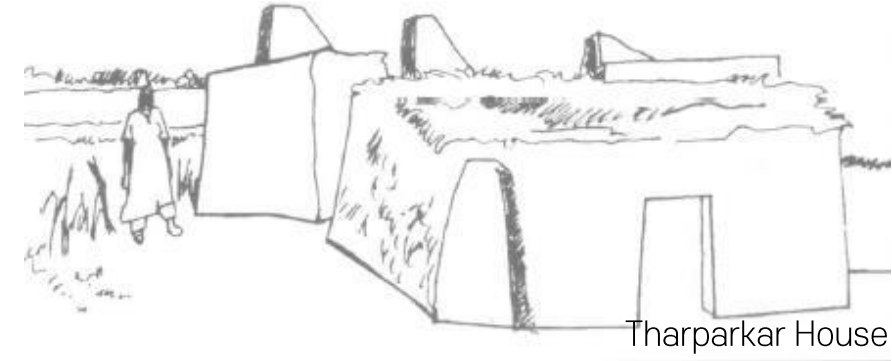


Conical shaped Chaunras

Arid Climate and housing architecture

Tharparkar is an arid region in the south-eastern province of Sindh, Pakistan.

Tharparkar area has desert and barren region of the sand dunes covered with thorny bushes.



Tharparkar House

The material availability in close vicinity of Nagarparkar hills contains Granite rocks and crystalline rocks of the Arravelli range.

The vernacular houses of region have hut style room with thatched roofs of thick straw or reed supported by beams.

The walls are also made of sun dried bricks also plastered with mud finish.

The conical shaped thatched roof is known as Chaunras that extends on huts openings for rain protection.

In flat roof construction, windowless interior increases the air flow from roof top.

The presence of roof with fixed ventilators attracts south-west breeze in internal space.

Thank You

References

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- Pirani, K. K. (1989). *In search of appropriate architecture: a jamat khana in Hunza, Pakistan* (Doctoral dissertation, Massachusetts Institute of Technology).