Monsoon Flood 2010 Pakistan

Rapid Technical Assessment of Damage and Needs for Reconstruction in Housing Sector

October 2010

UN HABITAT
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National Disaster Management Authority (NDMA)

Prepared by:
UN-HABITAT Pakistan Assessment Team
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All photos:
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FOREWORD

The devastating floods brought about by this summer's monsoon rains resulted in a disaster that was unprecedented in Pakistan. The flood affected 20% of the country, rendering almost 20 million people homeless, with around 2000 dead. Unlike the earthquake of 2005 which was limited to the Northern areas, this was a disaster that rolled across the country, starting from the mountains of AJK, GB and KPK and swept down across the Punjab and over Sindh - a process that took two months, from the end of July to the end of September 2010.

The nature of the floods and their impact varied: from the fast and furious flash floods that destroyed houses built of stones and brick, to the riverine floods that swept away houses when the protective dykes and bunds could no longer contain the swollen rivers, whose waters then engulfed the mud houses which dissolved into the silt.

As soon as the disaster started, efforts were initiated to estimate the damage and assess the needs to provide relief and assist in the early recovery, and even as the flooding continued, the first country-wide technical assessment of the type of damage in the housing sector was undertaken to provide the basis for eventual reconstruction.

NDMA is grateful to UNHABITAT for undertaking this technical assessment under the One UN Joint Programme for Disaster Risk Management, to evaluate the type of damage caused to the houses. The study was done in a quick manner to establish the base line and it requires a detailed analysis but the document does provide a good start towards the end of a comprehensive technical assessment of damage. The Team used participant observation, community interviews and detailed analysis of individual houses to provide an overview of the damage, and, more importantly, an initial estimate of the capacity of households and communities to participate in the reconstruction.

This rapid assessment will provide the Government of Pakistan the baseline of information on which to develop its programmes and meet its commitment to help the people and communities to rebuild their lives and their houses. We are confident that it will also assist the work of other agencies, institutions, NGOs and communities to plan better, safer and more secure housing.

Lt Gen Nadeem Ahmed (R)
Chairman NDMA

Executive Summary

UN-HABITAT assessed the damage caused by the floods in Pakistan, focusing mainly on the housing sector. From 20 August to 04 September, joint teams of Engineers and community social mobilizers assessed the housing situation in 64 villages and 17 urban areas in all of the 33 districts affected by the floods, in all of the 5 provinces and AJK.

The extent and type of damage and the priorities of needs were assessed through two surveys, at house and at the community and settlement level.

On one hand the teams assessed the physical situation of individual structures by detail investigation of two houses per village and by observing and collecting photographic evidence of as many houses as possible.

On the other hand, information was gathered at the settlement level on the basis of structured interviews conducted with the affected community of the village and more in-depth interviews with groups of people with technical skills, e.g. masons.

The study concludes that the wide range of damage suffered was due to a variety of factors:

- The different types of flooding (riverine, flash floods, etc.)
- The variety of materials used in the construction of the houses, e.g. stone house, mud house etc.
- Location and encroachment (*Katcha, Pucca* and river banks and beds)

This report gives an oversight of the typology of the houses in the flood affected areas, and records typical floor plans and the main features and the varieties of each type of house. Through a close examination and analysis of the damage (to foundations, walls, trusses, etc.) the causes of failure and options for improvement are analysed.

The report also provides information regarding many of the factors that are likely to influence the design of any reconstruction response, such as:

- The size and structure of the households;
- The proportion of house-owners to tenants;
- Issues regarding land titles etc.
- The local availability of material, incl. grasses, timber and bricks, and the skills of the labor force in the area; and
- Typical periods suitable and unsuitable for construction in the different Provinces

Glossary

Adobe	Clay or mud bricks unburned (sundried)
Attic	It is the storey or floor above the main principal storey.
Bazgar/hari/ mazara	This term is used for tenants of various kinds.
Bhoosa	Wheat husk.
Bund	Embankment or levee
Buttress	Vertical mass of masonry, built against or projecting from a wall to strengthen the wall and resist the outward pressure.
Capillary action	A phenomenon in which water raises upward through small pours in soil.
Chak	*Chak* are the settlement planed by the British along the canal and usually they are on raised platform. *Thal* areas are also called as *Chak*
Chappar	Hut type structure,
Charpai	Cot
Cladding	Any material used to face a building or structure, and does not contribute in transmitting load.
Cornice	Upper part of building which is often projected and one complete course of stone or brick is laid on roof.
Course	A complete layer of a masonry laid in one go.
Coursed rubble	Stone masonry having uniform height in one course. Different courses could have different heights.
Dyke	Earthen embankment built on each side of river some distance away from its bank to control flood.
Efflorescence	Appearance of white, brown or greenish color powder or crystals on the surface of a wall due to the presence of salts in mortar or masonry units and occurs in presence of moisture.
Erosion	Gradual removal of the matter from an object due to external factor like wind and water.
Gable	Triangular shaped section of an end wall of a building enclosed on two sides by roof from the eave to apex.
Goth	Village is called *Goth* in Sindh and *Baloch* belt of Balochistan.
Jah-e-Namaz	Place for prayer
Joist	Horizontal timber or metal support for floor and flat roofs.
Katchi abadies	Temporary settlements (unauthorized by the revenue department)
Katcha Area	Katcha area is the low lying area alongside the river banks prone to floods and therefore restricted for any developments, e.g. settlement or agriculture.
***Katcha* House**	This term is widely used in Pakistan and India for the structures ie road and buildings which are built in local material for example mud, wood, etc. *Katcha* house is made of dry stone walls, mud walls, and earth is used in floor and roofs, which is compacted dry or mud plaster is provided on the roof surface. Linguistically *Katcha* means less strong but there are certain types of buildings which are strong enough and built in local material. Therefore this term has been redefined in this report.

Khareef	Crops which are sowed in summer and harvested in autumn (wheat, pulses, mustard, tobacco etc.)
Killi	Name of village in Pashtoon areas of Balochistan.
Loop bund	It is the subsidiary bund constructed apart and behind the main bund where main bund is threatened or vulnerable.
Moulded mud	A wall constructed with mud. Mud lumps are thrown rigorously on wall section without forms or framework. Cob is another term used for similar walls but in cob straws are used in larger amount.
Mortar	Plastic mix of cement, lime, *Surkhi* with sand/lime or mud, for joining and bedding bricks, stones or blocks.
Moza	Moza are the villages which are mostly in low lying areas of Punjab.
Nallah	Stream perennial or inundation
Parda	Veil, curtain
***Parda* wall**	Wall for privacy
Pattal, kana	Reeds
Protection Bund	This is the bund constructed alongside the river banks. Bund divides the flood plains and agricultural land, so that crop able land could be protected by flooding. By constructing bund canal irrigated areas is separated from the area which is irrigated or cropped by flood water. Areas which are enclosed by bund are called *Katcha* areas and are prone to regular flooding while the area outside the bund is called *Pucca* areas.
***Pucca* House**	Pronounced as *pakka*; any house built with using modern material like cement, steel etc.
Rabi	Crops which are sowed in autumn and harvested in summer. (Rice, Sugarcane, maize, cotton)
Random rubble	Stone masonry with different sizes and shapes of stone in one course.
Scouring	Removal of soils or rock by flowing water underneath foundations.
Silos	Containers used to store the grains.
Slanting roof	A sloping roof.
Sleep	This term is use in preparation of mud. Mud is soaked and left for few days so that water could ingress in all pours to improve the cohesion between particles.
Spur	These are river training structures build perpendicular in direction of flow from banks towards the river, to guide the river.
Tandoor	Oven built of clay.
Tehsil/Taluka	*Tehsil* is the subdivision of district; in Sindh it is called *Taluka*.
Thermal mass	Heat storing capacity of materials
Timber bracing	Diagonal timber used to strengthen the main frame.
Torrents	The river, streams/nallah passing through a mountainous stage is called torrents. These are very specific in some part of the country, where rain falls on hills and affect foot of the hill. Streams/nallah inundate and spill the downhill areas and affect badly within a short time and seldom give escape time.
Utak, hujra, baitak, dera	A detached room built for the guests and other social events. It has different names in different areas. Generally it consists of a hall, a toilet, a veranda and lawn (with or without boundary wall).

Vernacular buildings	Buildings which are constructed with local material and techniques evolved through long experiences of the specific community and suitable to the local climate. In Pakistan Northern and Southern part including Kashmir has variety of vernacular architecture.
Whythes	Layers

Abbreviations

AJK	Azad Jammu & Kashmir
C/S	Cement Sand
CBOs	Community Based Organizations
CGI	Corrugated Galvanized Iron
GB	Gilgit Baltistan.
KP	Khyber Pukhtoonkhawa
LSOs	Local Support Organizations
RCC	Reinforced Cement Concrete
VDOs	Village Development Organizations
WC	Water Closet

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Annexes

1. Introduction

UN-HABITAT teams, comprising engineers and social scientists, conducted this qualitative technical assessment of housing and settlements in the flood affected areas of Pakistan. The objective of the qualitative assessment was to find:

- Housing and construction typologies
- Impact of flood and subsequent damages
- Capacity of the local construction sector in terms of material and skills
- Settlement issues

Different aspects of construction were focused during the assessment, for instance, building performance, existing practices in construction, material and local knowledge for protection of building and settlement. The information on different kinds of damage was also collected.

For this assessment, 47 *Tehsils* of the most-affected districts were selected from all the provinces to collect sample data. In each visited *Tehsil* two rural areas and one semi urban/urban area were covered. Houses from each visited areas were inspected by the engineers and the social scientists held focused group discussions with community and masons separately.

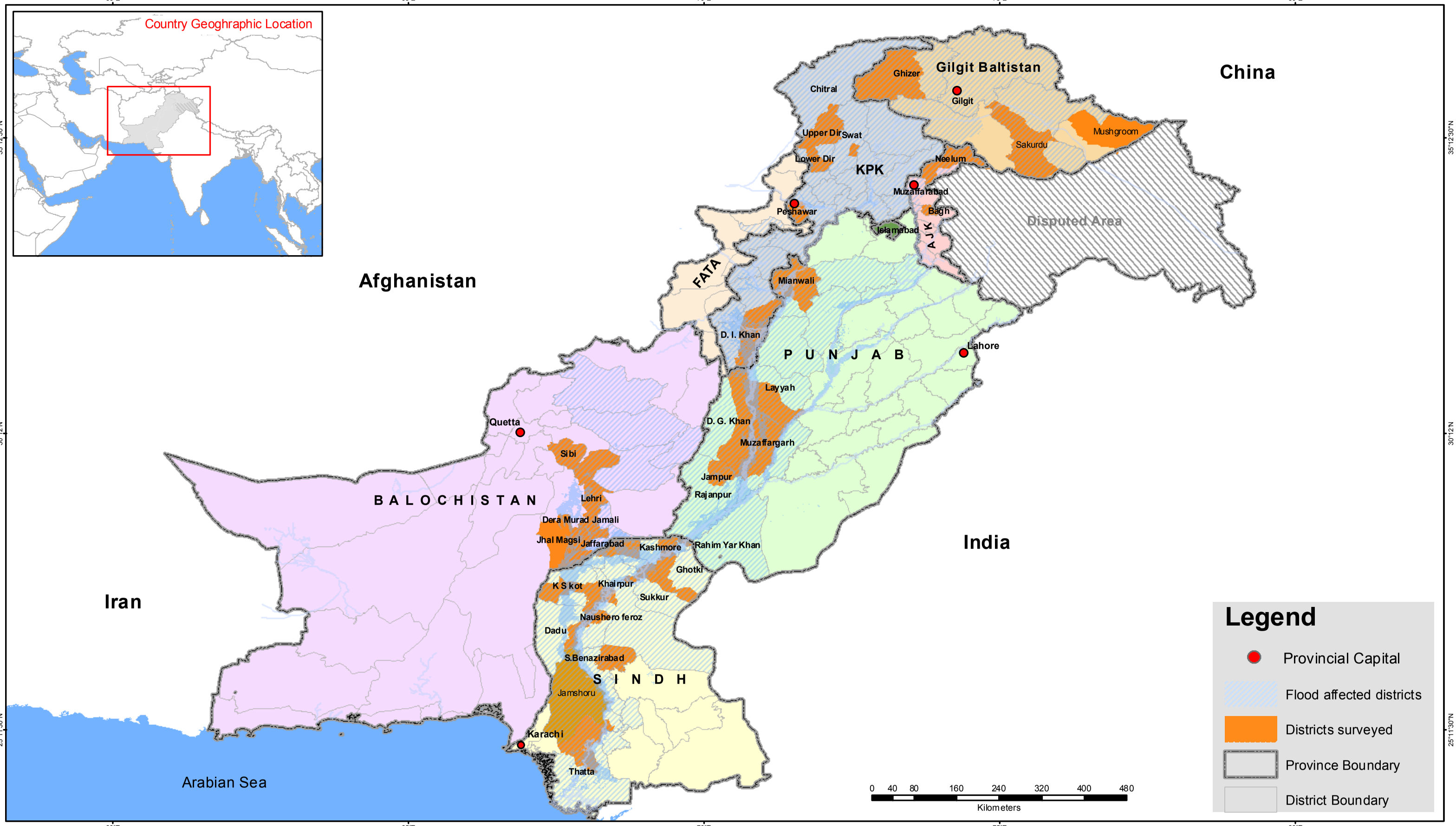
Following table shows detail of areas visited for this assessment:

Province	No. of Districts	No. of Tehsils	No. of Villages	No. of Teams
AJK	1	2	4	1
Balochistan	4	7	9	1
Gilgit Baltistan	3	3	4	2
KP	6	7	16	2
Punjab	6	8	20	3
Sindh	13	20	28	3
Total	33	47	81	12

2010 FLOOD AFFECTED & UN-HABITAT ASSESSMENT AREA

SURVEYED DISTRICTs OF PAKISTAN

20th August to 4th September, 2010



Disclaimer:
The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

Key Note:
This map is showing floodaffected area of pakistan & UNHABITAT team visited districts, this data carried out by assessment team and other sources.

Source: *UNOSAT,OCHA Sitrep, NDMA,UNH Assessment*

Map#: *UNH_Pak_fld_PLN_2010_A3_20102010*

Creation Date: *October 20, 2010*

Datum/Projection: *WGS 84/Geoghraphic*

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2. Housing Typology

2.1 Houses

2.1.1 Rural Houses

In Neelum District of Azad Kashmir, rural houses are generally two-storey. Ground floor is of stone masonry and upper storey is of timber frame either with timber bracing or with timber cladding. The upper floor is used for living which usually has four rooms with kitchen while ground floor is used for cattle, storage and to protect the family from harsh weather and snow affect. In old houses washrooms are not in the house but constructed separately. In some new houses, washroom is constructed within the house. Ground floor is like basement and back wall is usually attached with the ground as houses are built on slope by cutting or filling. These houses do not have boundary walls.

Houses in the Baltistan region are unique in their construction pattern because they build two storey buildings: first floor with Ground/ Basement. Basement is normally used as cattle shed, grain, fodder and fuel (wood or K-oil) storage, and first floor is for living of family during winters and summers as well. The basement also act as insulation against heat losses from floor and is used for washing and drying of cloths of family when there is rains or falling of snow during harsh winters. These houses do not have boundary walls as similar to AJK houses.

In north of KP, houses are constructed on slopes usually these are also double storey. The construction type is called *Bhattar*. The ground storey is used for storage and cattle. These houses also do not have boundary walls as houses are located on the slope.

Typical houses in plain areas of KP, Punjab and Balochistan consist of one or more than one room for living, animal shed, a storage place, silos for grain storage, latrine, a bath room, a *tandoor* (oven) and many stoves in the compound. All these structures are enclosed in boundary wall. Boundary wall is constructed for *parda* and security. Latrine and washing area is mostly roofless with four to five feet high walls.

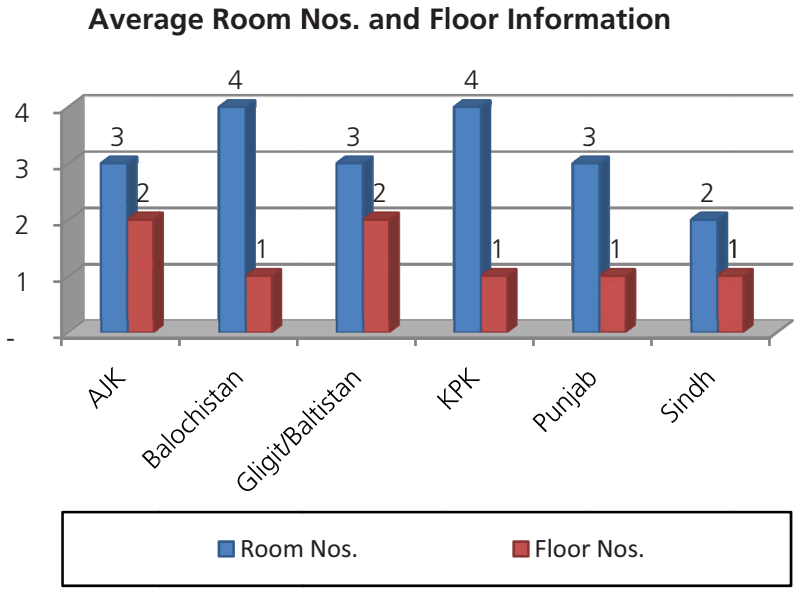
People who own the land and tenants to whom land is granted make boundary wall. These people make big rooms and large houses. People who do not own the land make small rooms with low roof without boundary wall. The rich people like to make high roof rooms to beat very hot weather.

2.1.2 Urban Houses

Mostly houses are of two storeys with multiple families living in the house. These houses have kitchen and washroom in the house but generally washrooms are separately built. Urban houses are mostly fired brick houses in the plain areas while in north or in mountainous areas house are constructed with blocks or stones. Almost all the houses in Urban area including areas in North have boundary walls.

Number of rooms in the houses situated in AJK, GB and Punjab are three on the average while there are normally four rooms in a house in Balochistan. At an average, two rooms are common in the flood affected areas of Sindh.

Some of the typical layout plans of the houses from different parts are given at the end of this section.



2.2 Type of Houses

Houses are broadly classified into Katcha and *Pucca* categories. Selection of particular type from Katcha and *Pucca* category depends on economy, land status, climate, local material and available skills.

2.2.1 Katcha

Katcha areas (areas more prone to regular flooding) usually consist of Katcha houses which are further sub-divided in following categories;

- K1 - *Manna* (Grass Cottage)
- K2 – *Jumpari* (Light frame)
- K3 - Mud Houses (walls constructed in mud)
- K4 - Adobe (walls constructed with unfired adobe bricks)
- K5 - Fired brick walls (walls constructed with fired bricks and mud mortar)
- K6 – Stone masonry (walls constructed in stone masonry)

K1 - *Manna* (Grass cottage)

This type of houses are very light in weight and their walls are made up of local bushes or braches of trees. These types of houses are very easy to build in a short interval. Timber poles (3"-5" thick) are used at the spacing of 6-8 feet. Height of poles vary from 7 to 9 feet. Two timber poles at the centre of shorter walls have more height than side poles. These types of houses have slanting roofs with two sloping sides and two gable ends.

Timber poles are put in one feet deep trench (average 9" thick) and trench is filled with mud again and compacted with timber/brick etc. These are found in Katcha area or in the flood plains. This type of houses can be constructed in two weeks and the construction does not involve much expertise.

K2 –*Jumpari* (Light frame)

This is evolved from gross cottage and built with twigs, which are woven around vertical posts and finally mud plaster is provided. Mostly *Kera* is used as woven material for walling. Timber poles (3"-5" thick) are

used at the spacing of 6-8feet. Height of pole is generally 9 feet. This type of houses have slanting roofs with two sloping sides and two gable ends.

Timber poles are put in one feet deep trench (average 9" diameter) and trench is filled with mud again and compacted with timber/brick etc.

K3 - Mud Houses (walls constructed in mud)

These houses are made with moulded soil and lumps are made and stacked to make the wall. Soil is not compacted and when wall has been built, it is trimmed to give better finishing to the wall. Environmental performance of these buildings is very good due to their thermal mass but they are very vulnerable to floods, rains and earthquakes.

The walls often do not have foundations but are built after removal of the topsoil. In some cases a foundation of stone or burnt bricks may be laid. The depth and width of foundation depends on the financial resources of the family. The depth varies from six inches to three feet (three feet is for mosques, for house it is mostly 2 feet) and width varies from two feet to two and half feet.

Mud Walls are tapered and their height varies from 8 to 12 feet, again depending on the economy. As per local perception, if people had money, they would prefer 12 feet ceiling height. The wall at ground level is 2-2.5 feet and one to one and half at top. The construction is done in steps, one foot in a day. A mason informed us that "the bottom of the eroded wall can be repaired by putting more soil on the bottom", this is called *Peerah*. For making the walls, earth soil is excavated and broken into grains. Then wheat straw is mixed in with water. This soil is kept wet for one day. Next day this mud is used for making walls. Plastering of wall is done only after the rains and its not necessarily done every year.

1.5 feet high mud wall is constructed in a day and this newly constructed section is left to dry for one full day before starting upward construction. A typical two rooms mud house can be built with the help of 2 skilled and 6 unskilled labours but often takes up to 2 months. After the completion of walls construction, dressing of the walls is done to make it even and at the final stage, the wall is plastered with mud.

K4 - Adobe (walls constructed with unfired adobe bricks)

This type of house can be constructed with mud blocks or bricks. Adobe house made with mud blocks is similar to cement concrete block masonry, but blocks are made with mud, dried in sun and used with mud mortar. Wall thickness is generally one foot. Adobe house made with mud bricks is similar to burnt brick masonry but bricks are not burnt and dried in sun and used with mud mortar. Generally, the wall thickness is kept 13.5 inches.

Depth of foundation of these types of houses varies from 1.5 to 3 feet while its width is 18 inches on the average. Mostly, fired bricks are used in the foundation with mortar and the height of wall varies from 10 to 12 feet.

K5 - Fired brick walls (walls constructed with fired bricks and mud mortar)

This is a very common type of construction and is very quick to build. It is constructed with fired bricks in mud mortar. Thickness of wall varies from 9 inches to 13.5 inches. Height of wall varies from 10 to 12 feet. Depth of foundation varies from 1.5 feet to three feet while foundation is 18 inches-wide. Foundation is made with brick or stone. These are found in Sindh and Balochistan.

K6 – Stone masonry (walls constructed in stone masonry)

Its the type of construction made with stones either in mud mortar or no mortar. Width of the wall varies from 15 inches to 18 inches. It can be coursed rubble masonry or random rubble masonry. This type of construction is found in Neelum, Swat, Kohistan etc. In Swat, round stones are used with mud mortar. Height of these buildings is 10 feet.

2.2.2 *Pucca*

It includes the following types

- P1 – *Pucca* Stone Masonry (Unreinforced Stone Masonry C/S Mortar)
- P2 – *Pucca* Brick Masonry (Unreinforced Brick Masonry C/S Mortar)
- P3 – *Pucca* Block Masonry (Unreinforced Block Masonry C/S Mortar)
- P4 - RC Confined Brick Masonry
- P5 - RC Confined Block Masonry
- P6 – *Bhattar* (Timber Reinforced Stone Masonry)
- P7 - *Neelum* House
- P8 - *Dhajji* House

P1 - *Pucca* Stone Masonry (Unreinforced Stone Masonry C/S Mortar)

This type is constructed in stones masonry with cement sand mortar. Stone masonry is done in two whythes but mostly these two whythes are not interlocked with through stones. Dressed stones are used in the front side of stone masonry. Masonry is coursed and each course is 4 to 6 inches high. Width of wall is 15 inches and height is 10 feet maximum. Foundation of these types of houses is 1.5 feet to 2.5 feet but generally made with dry stone masonry. Width of foundation is two to two and half feet.

P2 - *Pucca* Brick Masonry (Unreinforced Brick Masonry C/S Mortar)

These types of houses are constructed with brick by using cement sand mortar. Width of wall generally varies from 9 inches to 13.5 inches but in KP 4.5 thick brick masonry walls are also observed. Height of these walls varies from 10 to 12 feet. Foundation of these types of houses is 1.5 to 2.5 feet. Width of foundation is two to two and half feet. Size of the brick is 9" x 4.5" x 3"

P3 - *Pucca* Block Masonry (Unreinforced Block Masonry C/S Mortar)

These types of houses are constructed with concrete blocks. Width of the wall varies from 6 to 8 inches and height of the wall is generally 10 feet. Concrete blocks are made with the ratios varying from 1:4:8 to 1:6:12., size varies from 16 x 8 x 6 inches, 12 x 6 x 6 inches, 12 x 8 x 6 inches and 12 x 8 x 4 inches.

P4 & P5 - Reinforced/ Confined Masonry (Block/ Brick)

Reinforced masonry houses are those houses which have beams and columns or only bands/beams in the walls. These can be made with blocks or bricks using cement sand mortar.

P6 - *Bhattar* (Timber Reinforced Stone Masonry)

This reinforced stone masonry construction. Reinforcement is in the shape of horizontal timber bands with cross ties provided at 2 feet interval in ladder shape. These ladders are provided at 1.5 to 2 feet equal intervals. This type of construction is mostly found in mountainous areas of KP. Width of wall varies from 18 inches to 2 feet. Depth of foundation ranges from 2 to 3 feet and width of foundations is 2.5 feet.

P7 - Neelum House

This is the traditional construction in Neelum and Leepa valley. It is mostly two storey .Ground storey is made of stone masonry while upper part is timber frame with timber bracing or timber cladding. Some people prefer to have attic floor for storage purpose.

P8 - *Dhajji* House

It is also a traditional construction and it is present in high altitude areas of AJK. It is a timber frame construction with timber bracing with mud and stone as infill. Thickness of wall is minimum 4 inches. It has a timber base plate and wall plate.

2.3 Building Performance

2.3.1 *Katcha* Houses

Manna (Grass Cottage)

Generally, this type of house is comparatively better as water pressure cannot be built and water passes through bushes. As the wall is not plastered, cross ventilation through bushes helps in improving the internal atmosphere. However, as the roof is not plastered so the room retains heat from sun and makes it slightly uncomfortable during daytime.

Jumpari (Light frame)

These are also very weak buildings against the flood. Their environmental performance is better than Manna as these are plastered with mud both from inside and outside. Low windows at the level of charpai (cot) help the family in getting fresh and relative less warm air. Roof of their houses is also plastered which helps in reducing the suffocation.

Mud Houses (walls constructed in mud)

In the flood affected areas, majority of the construction is of *Katcha* construction. Although, the type and size depends on security-related matters and the financial capacity of the family but Katcha is constructed by both poor and rich people. Mud construction is equally accepted due to its good performance against climatic variations and does not have the negative status in rural areas that *Katcha* houses do in urban areas.

Mud houses generally have thick walls (1.5 to 2 feet thick) and small and low windows. Thickness provides thermal mass and low openings help ventilation for the comfort of people during sleeping or sitting on the *charpais* inside and windows still has correlation in most of the hot areas. Small windows at low level provide ventilation at the level of occupants, high vents in combination with low windows ensures air flow. High wall in mud houses help in room cooling.

Over the years these houses have provided comfort to the residents and skills are also developed accordingly. Community prone to regular flooding have introduced some measure for resistant of these houses against flooding like;

- Raised platform
- Use of burnt bricks in bottom part of house

These houses are affected by dampness in the ground and their bottom part is eroded. Bottom of mud walls is also damaged due to rain splashing. Maintenance of roof is required after every rainy season almost once in a year. Plastering / repairing the roof is very easy in mud and women can also do these things. Silos for the storage of grains can be easily made with mud and people are storing grains for many years in these mud silos.

Fired brick walls (walls constructed with fired bricks and mud mortar)

This type of building did not perform well as the mud mortar was dissolved in the flood water. Mortar dissolves in water with passage of time and finally walls lost stability and strength. Water collection has made these types of buildings very vulnerable as no bonding material is available and brick masonry cannot maintain its stability. Another problem with brick masonry is the capillary action of water. Places where

water level is low, water can come up through pores to the walls. It can result in efflorescence. Water in some cases is also saline. Constant/ continuous stay of water in the wall weakens the bricks and the masonry decreasing the life of building. In Sindh, there are unique types of bricks, which are 12 inches long, 6 inches wide and 4 inches high.

Stone masonry (walls constructed in stone masonry)

Dry stone masonry construction is very good against weathering and thickness of wall and mud plaster helps to cope with harsh winter. Its resistant against earthquake is very low. Construction done with river stone in mud mortar is very weak against floods and earthquake both.

2.3.2 *Pucca* Houses

Some *Pucca* buildings were damaged by flash flood, standing water or land sliding. Flash flooding caused major damage to the buildings and also resulted in erosion of the foundation of these buildings. Debris flow in the river or stream was very detrimental to these buildings. Standing water caused settlement of the foundations. This damage was more pronounced in case of shallow foundation

Dhajji House

It is a traditional type of construction. Its performance against earthquakes is very good. Its performance was tested on the shaketable and also through numerical analysis. This type of construction did not suffer much damage in Kashmir 2005 Earthquake.

Bhattar (Timber Reinforced Stone Masonry)

Its traditional timber reinforced stone masonry construction. It performed well during the 2005 Earthquake and its performance was also tested on the shaketable. Walls are very thick and this type of construction is very good in cold areas. It prevents the inhabitants from cold weather.

Neelum House

It is vernacular construction, mostly found in Leepa valley and Neelum and its performance against earthquake and harsh winter is very good. Ground storey is especially made for protection against snow in long winter season.

2.4 Roof and its performance

Flat roofs are used in plain areas of KP, Balochistan and Punjab. While in North when it snows, there are mostly CGI roofs. In Sindh, flat roofs and Slanting roofs are found. Flat roofs are further classified as Katcha built up, RC roof, reinforced and brick roof while slanting roofs are Katcha roof and CGI roofs. According to shape roof can be categorized in to two types, flat roofs and slanting roofs.

In flood affected areas the roof is generally made up of wooden beams, bamboos, mat/ leaves, and mud. Many household have used girders instead of wooden beams where timber is not available and T-irons and bricks instead of bamboos and mat/leaves. 2 – 3 inches thick mud layer is common for all types of roofs except the CGI roofs.

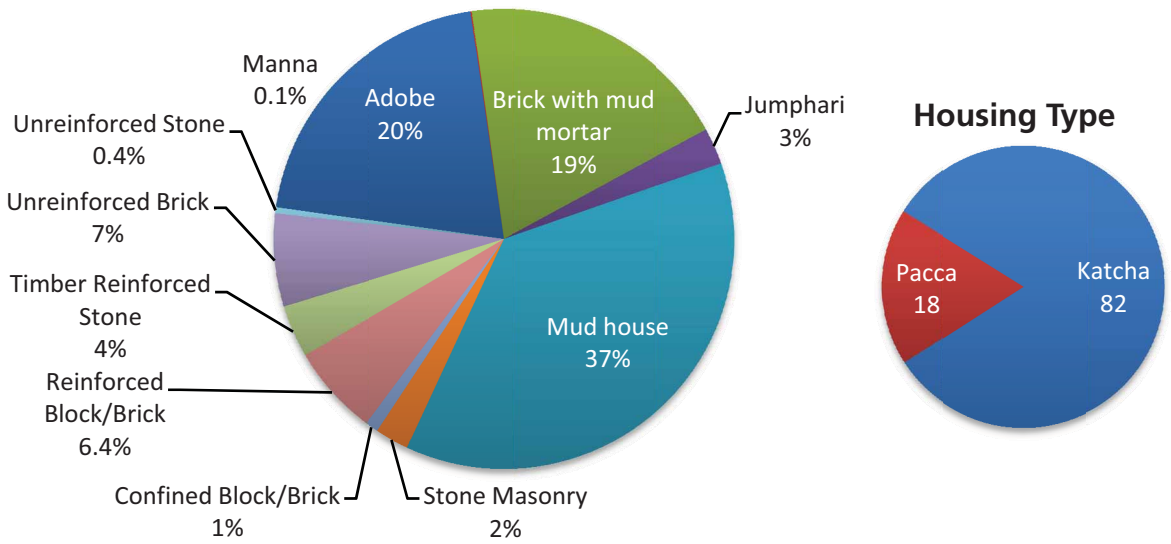
Roofs generally do not have projection. Small pipes are kept at the edge of roofs at regular interval for roof drainage. In some cases, a path with cement mortar is made for roof drainage. A cornice was also observed in a few places to prevent walls from direct rain. Roofing for very poor people and tenants consists of timber logs, *pattal* and mud. Some people use girders, bamboo, *pattal* and mud. Following can be the types of roofs with combination of different materials:

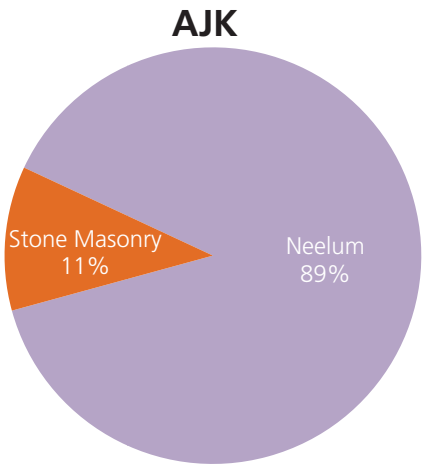
1. Timber and Kana / bushes
2. Timber, *Kera* and Mud

3. Timber, bamboo, *chatai/ kana* and mud
4. Timber, *chatai/kana* and Mud
5. Steel girder bamboo, *chatai/ kana* and mud
6. Steel girder, T-iron, brick and mud
7. Reinforced brick roof
8. Concrete girder, T iron, and precast concrete slab
9. CGI roof (CGI + timber)
10. RC roof
11. Reinforced brick roof

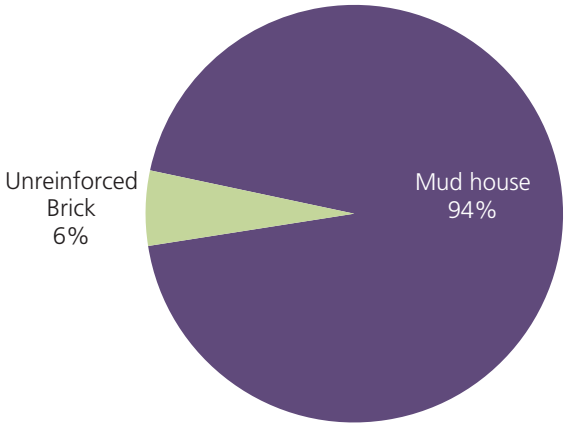
Generally, flat roofs are not water resistant, though plastic sheets are now being used at most places. Water penetrated through the roof in some cases to the wall and eroded mud or mud mortar from joints and damaged the walls and roofs both. Some of the roofs caved in due to heavy rains as water stayed on the roof in shape of pond resulting damage of roof.

Housing Types in the Flood Affected Areas of Pakistan

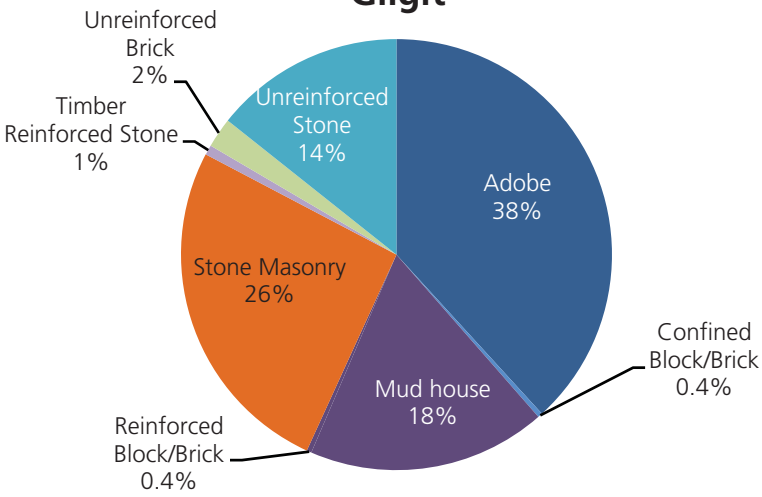




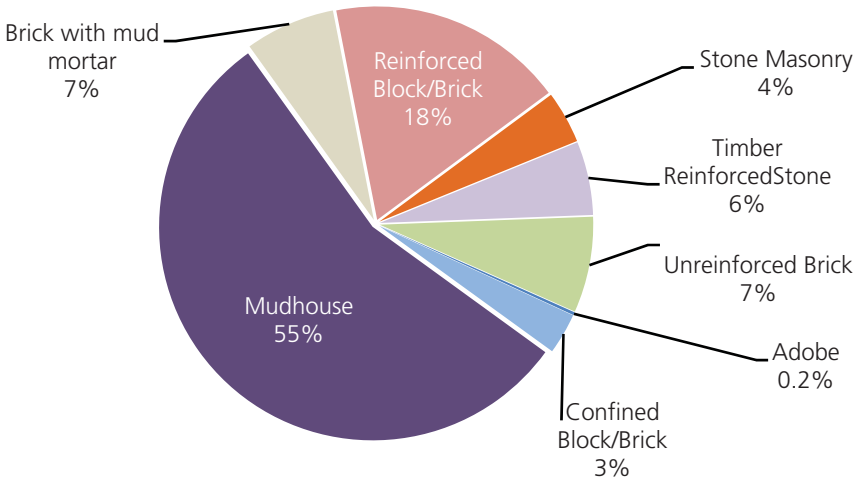
Balochistan

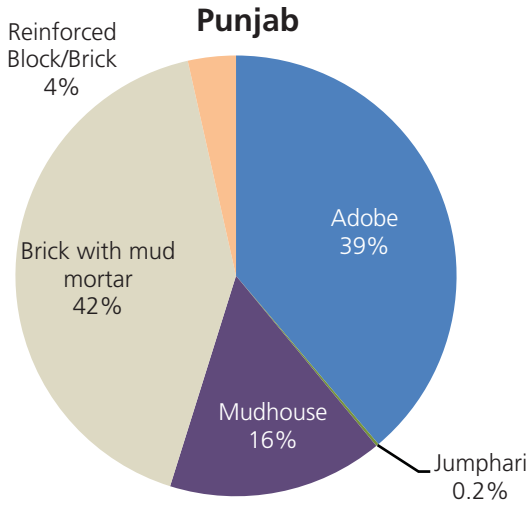


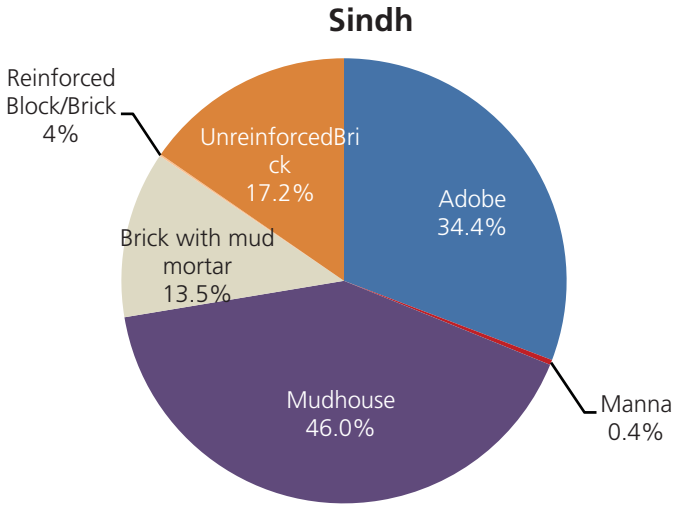
Gilgit



KP




Punjab
Reinforced Block/Brick 4%
Adobe 39%
Brick with mud mortar 42%
Mudhouse 16%
Jumphari 0.2%


Sindh
Reinforced Block/Brick 4%
UnreinforcedBrick 17.2%
Adobe 34.4%
Brick with mud mortar 13.5%
Mudhouse 46.0%
Manna 0.4%

Housing patterns

Sindh
Typical mud house with rooms in a row and grain silos.

Sindh
A settlement in Northern Sindh.

Sindh
Typical mud house having larger compound area.

Sindh
In rural areas of Sindh there are locally made fans that run by donkey.

Punjab
Brick masonry house with tree in the centre of courtyard to provide shade in summers.

Punjab
Typical house with cattle shed on one side.
Increased number of rooms due to growing family size.

Housing patterns: *Typical house in Pakistan consists of one or more than one room for living, animal shed, a storage place, silos for grain storage, latrine, a bath room, a tandoor (oven) and many stoves in the center of compound. All these structures are enclosed in boundary wall.*

Latrine and washing area is mostly open room with four to five feet walls.

People who own the land and tenants to whom land is granted make boundary wall. These people make big rooms and large houses. People who do not own the land make small rooms with low roof without boundary wall. Economically better people like to make high roof rooms to beat very hot weather.

Katcha Houses

K1 Grass Cottage (manna)
Size 1 Room (18X14 ft)
Cost=PKR 20,000

K2 Light Frame (Jumphari)
Size 1 Room (18X14 ft)
Cost=PKR 40,000

K3 Mud House
Size 1 Room (18X14 ft)
Cost=PKR 80,000

K4 Adobe Unfired Brick
Size 1 Room (18X14 ft)
Cost=PKR 90,000

K5 Fired brick with mud mortar
Size 1 Room (18X14 ft)
Cost=PKR 130,000

K6 Dry Stone Masonry
Size 1 Room (15X15 ft)
Cost=PKR 90,000

Pucca Houses

P1 Unreinforced stone masonry C/S mortar
Size 1 Room (15X15 ft)
Cost=PKR 120,000

P2 Unreinforced brick masonry C/S mortar
Size 1 Room (15X15 ft)
Cost=PKR 160,000

P3 Unreinforced block masonry C/S Mortar
Size 1 Room (15X15 ft)
Cost=PKR 160,000

P4 RC Confined brick masonry
Size 1 Room (15X15 ft)
Cost=PKR 200,000

P5 RC Confined block masonry
Size 1 Room (15X15 ft)
Cost=PKR 200,000

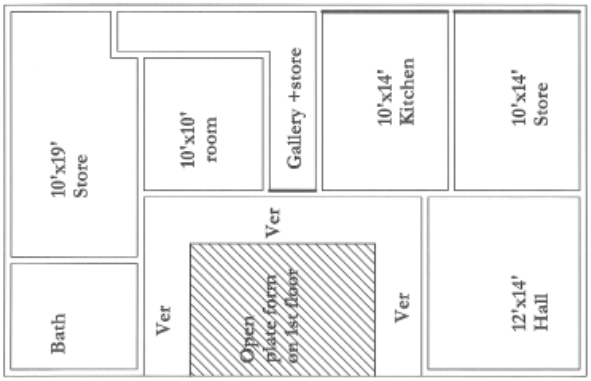
P6 Bhatar/Timber reinforced masonry
Size 1 Room (15X15 ft)
Cost=PKR 140,000

P7 Neelum
Size 1 Room (15X15 ft)
Cost=PKR 185,000

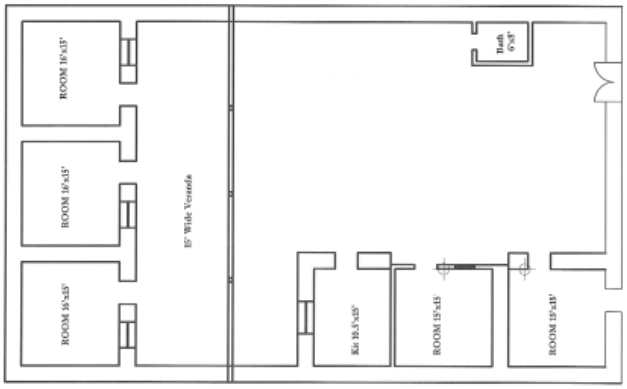
P8 Dhajji
Size 1 Room (15X15 ft)
Cost=PKR 120,000

UN HABITAT

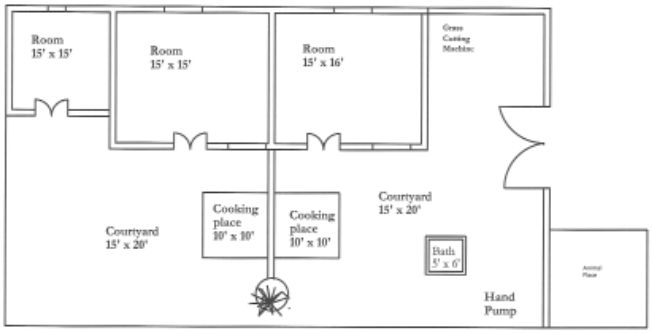
Typical layout plans



Gigit Baltistan
House of Musa Ali, Machulu, Skardu

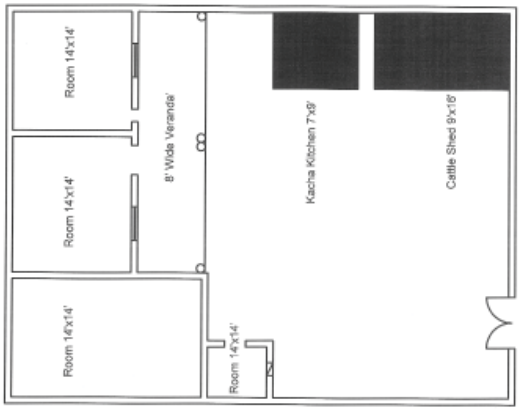


KP
House of Muhammad, Koza Khela Swat

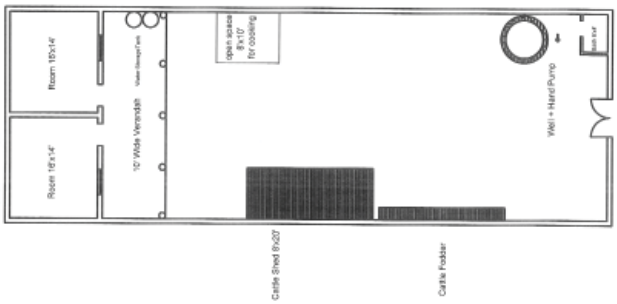


Punjab
House of Mubeen Ahmed, Kotla Dewan, Rajanpur

Punjab
House of Khadim Hussain,Basti Jumawali,Muzaffargarh



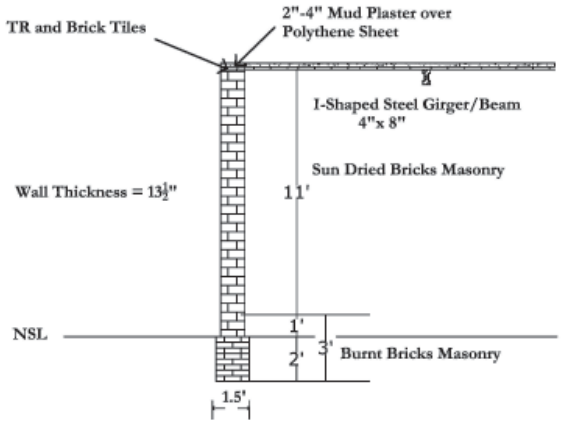
Balochistan
House of Niamat Baksh, Goth Metazai, Jhalmagsi



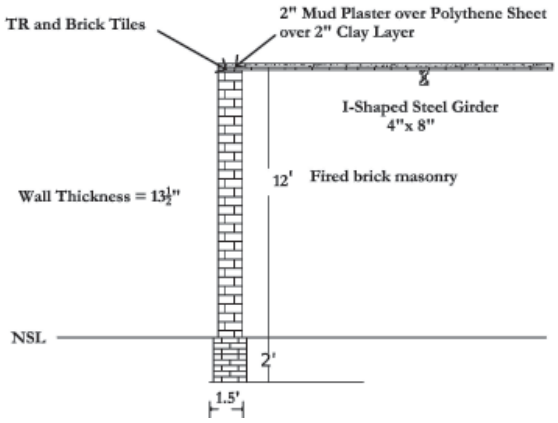
Sindh
House of Ali Murad, Nawa Ismailabad,Nawabshah

Typical layout plans:
Typical layout plan of houses from different parts of flood effected areas.

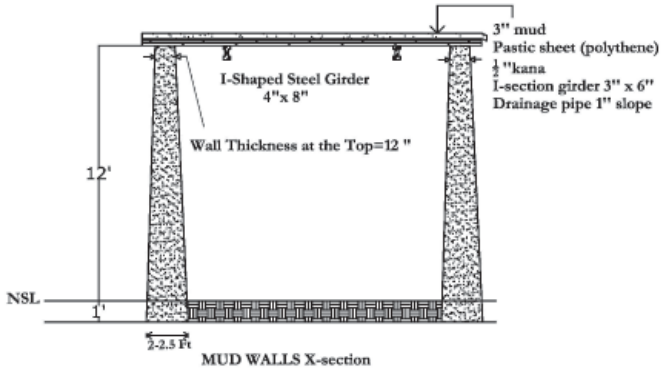
Cross Section



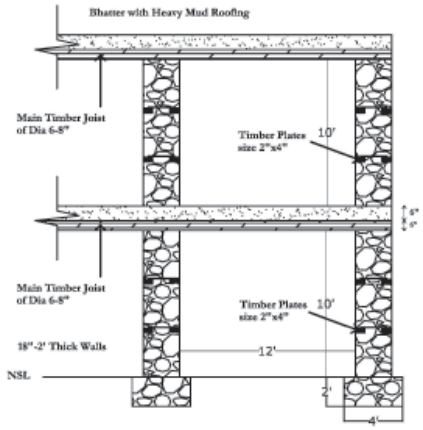
Adobe brick masonry walls with mud mortar



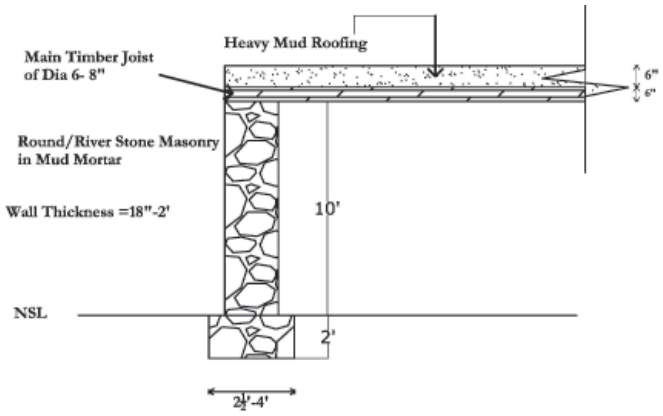
Typical fired brick masonry walls with mud mortar



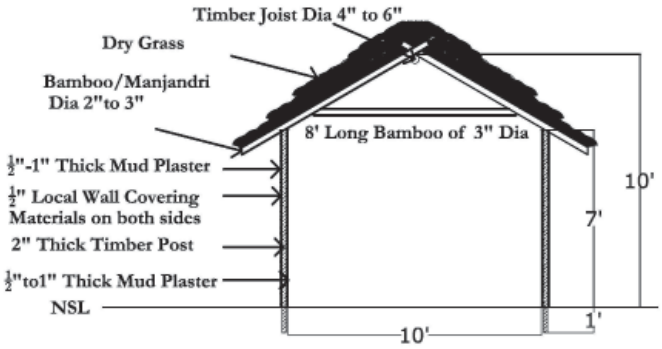
Typical mud wall construction



Bhattar type construction with heavy mud roof



Stone masonry with mud mortar



Manna

Cross Section:

Typical cross section of walls from different flood effected areas.

Roofing

Sind
Sloping Katcha roof, with bamboo and pun.

Sind
Flat mud roof with timber, patar and mud.

AJK
Corrugated galvanized iron sheet with timber.

Punjab
Roof made with girders, bamboo and kana.

Punjab
Steel girder and T-iron with brick tile roof.

Punjab
Roof with wooden beams, wooden joists and mush.

Roofing:

Use of plastering sheeting under the mud is common in flat mud roofs.

Performance of local type (Loh-Kaat) buildings

Sindh
Flooded settlement.

Sindh
Same houses after 26 days.

Sindh
Loh-Kaat house in flood.

Sindh
Same house after 26 days.

Sindh
Foundation have been scoured but building is intact.

Sindh
Loh-Kaat house with flat mud roof.

Loh-Kaat:
These type of buildings are found in southern Sindh like Thata, Badin and other coastal areas and locally known as "Loh-Kaat" which mean iron and wood. Performance of these buildings was very good. Locally available wood of "Babbur" is used mainly in this construction. Twigs and Sawn wood both are used in frame and bracing. Post are lowered 2-3 feet deep in ground and erected. Posts are tied together with Twigs or any available wood and than plastered in most of the cases. Fired brick foundation has also been observed under few buildings. These buildings performed very well, and occupied immediately after recession of water.

3. Flood Damage

3.1 Type and Impact of Flood

There are four main reasons of damage in the affected area.

- Flash flood
- Stagnant water
- Rain water
- Land slides

Seepage due to low water table and due to flood water has also affected the base of buildings especially the brick masonry and mud masonry. Water rises to the walls from ground due to capillary action. Presence of water in the wall for long time can damage the wall base.

3.1.1 Flash Flood

Flash flood is generally in or near to the mountainous areas. It is due to high velocity of flowing water. The extent of damage is a function of depth and speed of water. Normally, flash flood lasts for a short duration ranging from few minutes to one day. There are two types of flash flood;

- Riverine flood
- Hill torrents

Riverine flood is caused by the high water in the river /stream due to heavy rains, splitting of glaciers due to lightening. Riverine flood can damage bridges, the buildings on the banks or even it can erode the banks and can also change the course resulting in wiping out the whole settlement in its way.

Hill Torrent is caused by torrential rains or cloud burst. It starts from the mountainous area and can wipe out the buildings in its way in a very short span of time. This type of situation does not allow for immediate evacuation. Surely, it is dangerous, as torrents occur in small areas for the short time and down area has no information of rain. Flash flood can cause erosion and may trigger land sliding as well.

Common damages include:

- Undermining of foundations
- Scouring/erosion at the base of the walls
- Scouring/erosion at the corners of structures
- Structures wiped out.
- Deposition of debris in house.
- Damage due to debris flow

These damages often lead to dislocation and separation of walls, with consequent overturning and collapse of the roof. There is very limited scope for repairing houses which have been damaged by flash flood due to severity of destruction. Any undermining of foundations/walls, or deterioration at the base of walls, significantly reduces the structural integrity of the house and it is technically and practically unfeasible to repair such houses.

3.1.2 Standing Water Damage

Stagnant water damage occurs when a structure is fully or partially submerged in water for an extended period (one day or more). The water is usually slow moving or still. The most common damage is

weakening of the submerged portion of the wall, which often leads to overturning of the wall panel or disintegration of the wall with the appearance of 'melting'. Water-logged foundations and ground are subject to settlement, resulting in cracking and collapse of walls. For Katcha buildings the impact of stagnant water is extreme and irreversible.

There is limited scope for repairing houses with walls made up of soil which have been partially submerged by stagnant water, as the lack of stability of the walls significantly compromises the structural integrity of the house. This is particularly acute for mud (cob-type) walls, which are hand moulded without solid compaction or compression, result in low density walls and highly susceptible to water damage.

Stagnant water also affected the *Pucca* building mostly due to the settlement of foundation. Damage is severe to the buildings which have shallow foundation (up to 6 to 9 inches). Bricks absorbed a lot of water resulting in de-lamination or deterioration of the bricks in contact with water for long time.

3.1.3 Direct Rain Impact

Direct rain impact occurs when the walls of a structure are exposed to direct rain. In some regions, this impact is repeated periodically during the monsoon season, whereas in other regions annual rainfall is commonly very low and houses are not built with provisions to protect from heavy and sustained rain impact. Katcha houses have little resistance to erosion, which results in deterioration of the walls especially the lower section. In the longer span of time, this may collapse the walls. Splashing due to rain affects the bottom of mud and adobe walls.

Prolonged and extensive rainfall often leads to water-logging of the roof, especially when a flat, soil roof has been built. The combination of this additional mass in the roof, weakening of the timber elements and connections, and weakening of the tops of the walls, may lead to the collapse of the roof and can result in collapsing the walls as well. Few houses use drainage and guttering to divert rainwater away from the face of the walls, or use copings to protect the tops of the walls, even in areas of regular monsoon rains. It is possible that houses which have been exposed to intensive direct rain impact only may be repaired. This will depend on the degree of damage, especially at the base of the walls.

3.1.4 Land Slides

This type of damage was caused due to heavy rain in mountainous areas. It includes houses buried by mud flow, direct hit by the debris or rock fall, land slide under or near to the houses, and land prone to slow sliding or sinking. The houses affected by land slide have heavy structural damage, significant differential settlement, and repairing is not feasible.

3.2 Damage to the Type of Houses

There can be following categories related to any kind of damage.

- Completely destroyed
- Major damage
- Minor damage
- No damage

3.2.1 Completely Destroyed

It includes following type of damages

- Wiped away
- Fully collapsed
- Foundation failure

- Mud mortar dissolved in water
- Bottom of the walls are eroded
- More than 50% rooms are inhabitable
- Or any other damage which is not financially viable to repair

3.2.2 Major Damage

This category includes any visible damage to the structure of building which is not affecting the stability of building significantly or which does not require dismantling of building and is financially viable to be repaired. Following are the guidelines for "Major Damage" category.

- Only roof is damaged
- Less than 50% rooms are habitable
- Repairable damage to wall

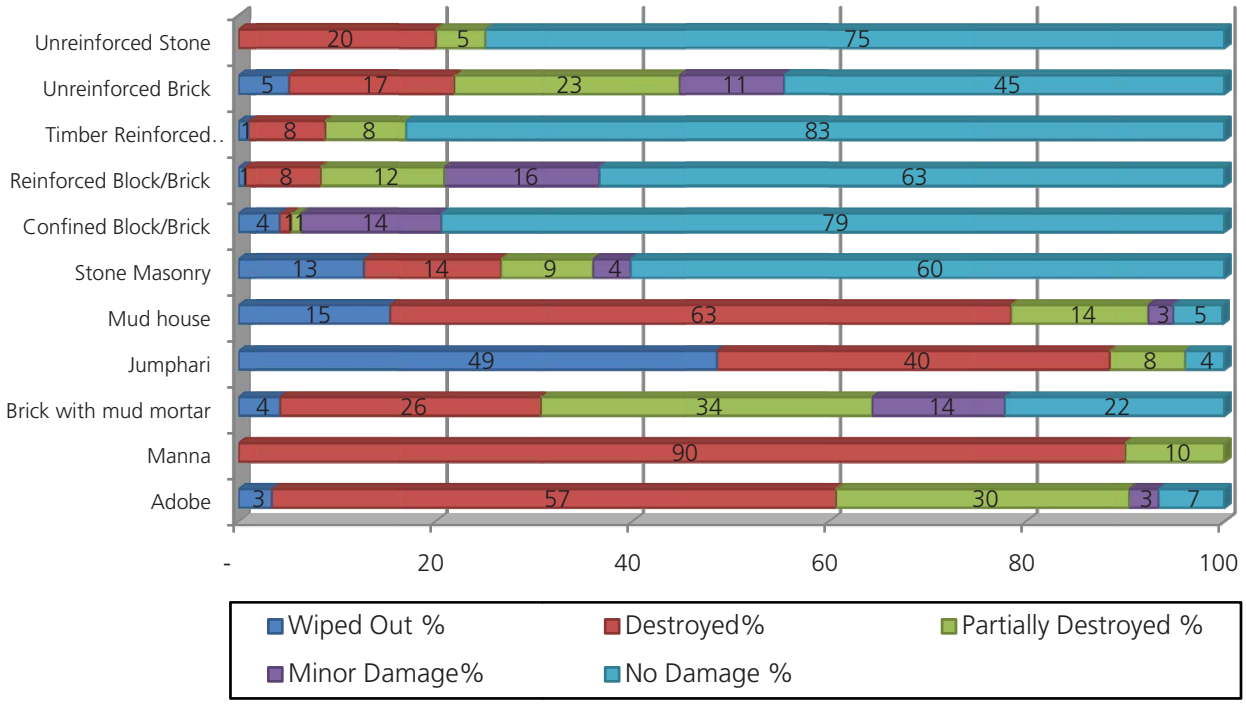
3.2.3 Minor Damage

It is a non-structural damage. It includes the damage to the boundary wall, damage to finishing of the buildings. If house is filled with debris, it can also be considered as minor damage.

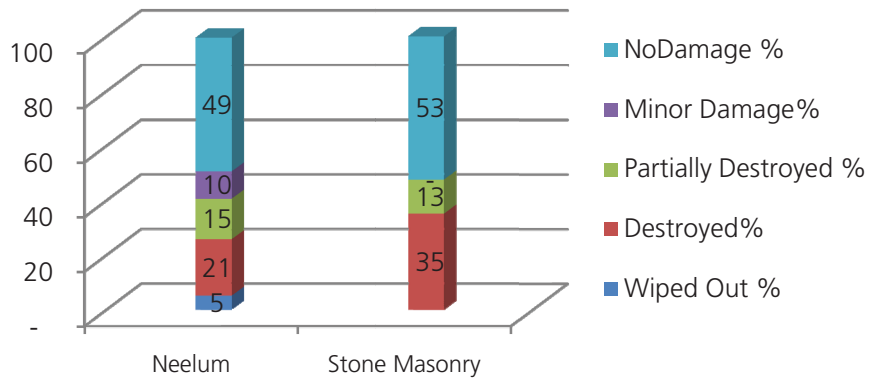
3.2.4 No Damage

Houses which did not receive any of the above damage are in this category.

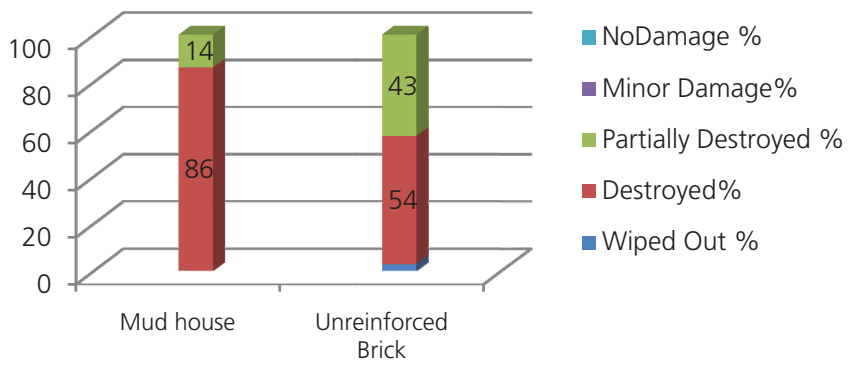
3.3 Damage to different types of buildings



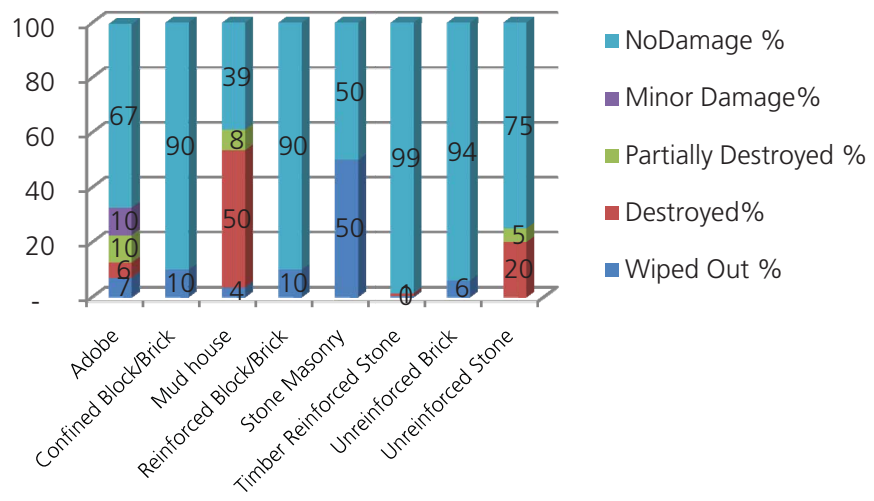
AJK



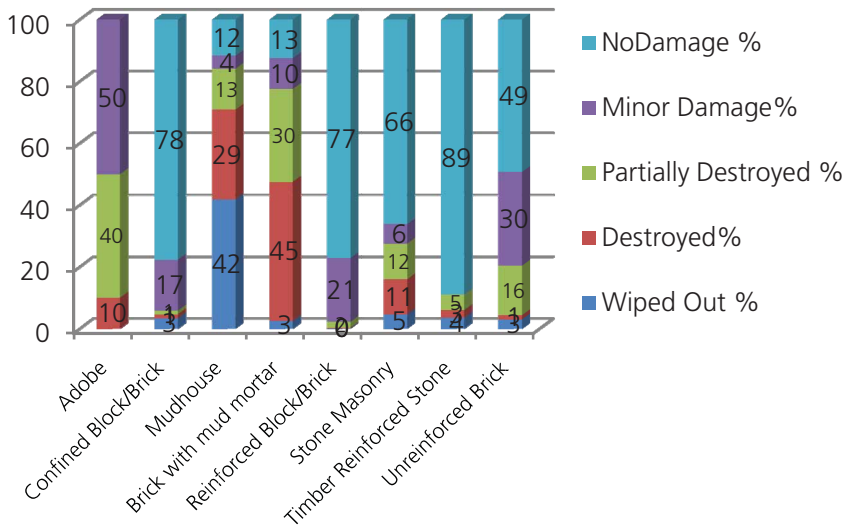
Balochistan



Gilgit



KP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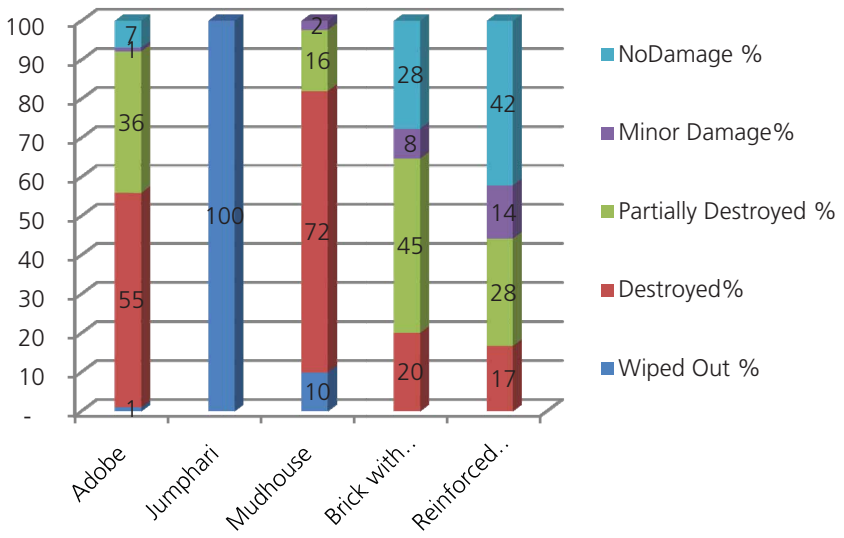
Adobe
Confined Block/Brick
Mudhouse
Brick with mud mortar
Reinforced Block/Brick
Stone Masonry
Timber Reinforced Stone
Unreinforced Brick
NoDamage %
Minor Damage%
Partially Destroyed %
Destroyed%
Wiped Out %

Punjab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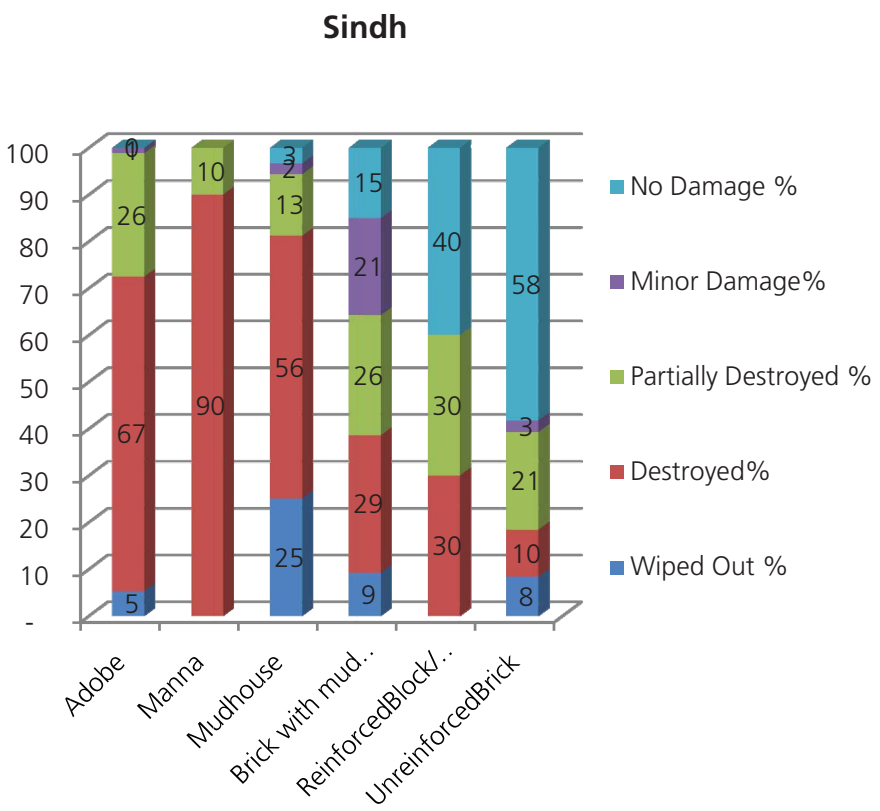
Sindh
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8
Adobe
Manna
Mudhouse
Brick with mud..
ReinforcedBlock/..
UnreinforcedBrick
No Damage %
Minor Damage%
Partially Destroyed %
Destroyed%
Wiped Out %

Damage due to flash flood

Muzaffarabad, AJK
Inundation and rapid water flow causes erosion and washed away of settlements near river bank.

Muzaffarabad, AJK
Impact on corner of a house after a 6 ft high rapid water flow of the flood water.

Swat, KP
Landslide triggered by the rapid flow of flood water.

Swat, KP
Damage due to debris flowing in the flood water.

Swat, KP
Half of the structure is swept away due to the rapid flood water flow.

Muzaffarabad, AJK
Erosion of foundation due to flash flood and under mining of the foundation.

Flash flood: *A flash flood is a rapid flooding of geomorphic low-lying areas - washes, rivers, dry lakes and basins. It may be caused by heavy rain associated with a storm, hurricane, or tropical storm or meltwater from ice or snow flowing over ice sheets or snowfields. Flash floods can also occur after the collapse of a natural ice or debris dam, or a human structure such as a man-made dam. Flash floods are distinguished from a regular flood by a time scale less than six hours.*

Flash flood can cause erosion and may trigger land sliding also, common damages include:

- ☐ *Undermining of foundations*
- ☐ *Scouring/erosion at the base of the walls*
- ☐ *Erosion at the corners of structure*
- ☐ *Structures wiped out.*
- ☐ *Deposition of debris in house.*

Standing water effect on brick masonry

Muzaffargarh, Punjab
Mud mortar dissolved by standing water causing damage to structure.

Muzaffargarh, Punjab
Failure of foundation due to settlement of soil underneath.

Jatoi, Punjab
Poor anchorage causing separation of corners.

Mianwali, Punjab
Mud mortar washed away causing displacement of bricks.

Muzaffargarh, Punjab
Overturning of wall due to settlement causing roof collapse.

Layyah, Punjab
Poor anchorage causing separation of corners.

Standing water effect on brick masonry: *Standing water damage occurs when a structure is fully or partially submerged in water for an extended period (one day or more). The water is generally slow moving or still. The most common damage is weakening of the submerged portion of the wall, which often leads to overturning of the wall panel or disintegration of the wall.*

Pucca buildings are also affected due to settlement of the foundation or sinking of the structure. Pucca buildings with shallow foundations are more vulnerable to standing water.

Standing water effect on mud masonry

Sindh
Corner failure due to settlement of foundation.

Sindh
Major crack due to settlement of foundation.

Balochistan
Collapse of walls due to rain splashes.

Punjab
Erosion of base of wall.

Sindh
Foundation soil got moist due to standing water around it causing settlement of foundation.

Sindh
Collapse of walls due to standing water.

Standing water effect on mud masonry: *Standing water damage occurs when a structure is fully or partially submerged in water for an extended period (one day or more). The water is generally slow moving or still. The most common damage is weakening of the submerged portion of the wall, which often leads to overturning of the wall panel or disintegration of the wall . Damped foundations and ground are subjected to settlement, resulting in cracking and collapse of walls. For Katcha buildings the impact of standing water is extreme and irreversible.*

There is limited scope for repairing houses with earth walls which have been partially submerged by standing water, as the lack of stability of the walls significantly compromises the structural integrity of the house. This is particularly acute for cob-type walls, which are hand moulded without solid compaction, result in low density walls and highly susceptible to water damage.

Damage due to rain

Balochistan
Rainwater made a pond of water on the roof and caused roof to cave in.

Balochistan
Rainwater eroded the mud brick wall.

Balochistan
Rain splashes caused damage to the base of the wall.

Punjab
The roof is not well water proofed.

KP
All roof water drained from one point.

Punjab
Rainwater eroded the Adobe bricks.

Damage due to rain: *Some houses are plastered with mud from out side, due to torrential rain mud is washed away, even it also damaged the sun dried brick, which weaken the structure.*

Houses after normal rains require to be plastered.

Site selection

Kohistan, KP
Houses on river banks and steep slopes.

Pattan, KP
Houses on river banks and steep slopes.

Shangla, KP
Houses on potential landslide hazardous areas.

Swat, KP
Buildings in the river bed.

Madian, KP
Buildings in the river bed and banks.

Swat, KP
Buildings in the river bed.

Site selection: *Poor site selection is very common in northern part of Pakistan (KP, GB and AJK), people have less plain land, they usually construct their houses/ hotels on slopes or on near river banks. Some time they also encroach. Due to this, they are not only vulnerable to flood. The damage is due to the flash flood, debris flow along nallah and also due to land sliding.*

Bridges are commercially important locations. Debris in water are very destructive.

Riverine Flood

AJK
Portion of the home washed away and foundation is eroded.

KP
Due to flooding in the Nallah,building received considerable damage.

KP
Building wiped out by river flood leaving behind debris and timber logs.

AJK
Very high flood water passing through river Neelum.

AJK
Fast moving riverine flood.

AJK
Debris brought by high flood in Nallah.

Riverine flood:

Riverine flooding is another way to say river floods. When a river reaches its floodstage, water can rise and spill over the banks of the river. The amount of flooding is usually a function of the amount of precipitation in an area, the amount of time it takes for rainfall to accumulate, previous saturation of local soils, and the terrain around the river system. For instance, a river located in a broad, flat floodplain will often overflow to create shallow and persistent flood waters in an area that do not recede for extended periods of time. The most widely recognized type of riverine flood is the overbank flood.

Housing Losses

Cattle lying dead.

Flood water damaged furniture in the house.

Kotaddu, Punjab
Farmers lost husk and wheat stock.

Beds are floating in water.

Family have taken out their household items due to early working.

Family has retrieved kitchen utensils from damaged.

Housing Losses:

Families have lost many household items especially in area of flash flooding but in other area people could not save much due to their reluctance to vacate the home in time after flood warning.

Some families have lost dowry of their daughters, costing more than PKR 30,000.

Debris

About one feet mud in the house and lawn.

More then 3 inch sand in lawn and veranda.

Charsada, KP
Family are clearing the debris from house.

Charsada, KP
Family is removing debris.

Sibi, Balochistan
Ground level has become higher than floor level.

Community members are removing more than 3 feet debris from mosque.

Debris:

Households have to spend PKR 10,000 to 25,000 for removal of debris from their houses.

Rainwater damage to roofs

Collapse of wall causing RC roof to collapse.

Complete collapse of roof due to heavy rain.

Damage to the roof made with precast concrete slab caused by extra load.

Roof failure due to heavy and prolonged rain.

Sagging of roof caused by prolonged rains, as mud gets saturated and load increases.

Timber beams broken due to increase load.

Rainwater damage to roofs:

2 to 4 inch mud is used on the roof top. Due to heavy intensive rains, mud on roof absorbs water and it become heavier. Weaker walls and roofing materials could not sustain surplus load causing roof to collapse. At some places roof failure resulted in collapse of walls and ultimately caused collapse of whole structure.

4. Protective Measures

Having history of persistent floods in the region, various communities which are prone to regular flooding have developed some protective measures against. In Jhalmagsi, Balochistan after the 2007 flood, people have raised their compound up to six feet for protection against the floods. In *Jatoi* village, Muzaffargarh, Punjab after 1992 flood, some communities have raised their plinths for protection.

Community have tried following measures to improve the performance of Mud buildings against flooding.

- In some Katcha area of Sindh, people made platforms on the roof to take refuge in flood.
- Brick masonry up to 2-3 feet and mud walls above
- Stone masonry up to 2-3 feet and mud walls above
- Brick masonry up to 2-3 feet with the addition of plastic sheeting at the plinth level
- Use of fired bricks inner and outer face and core of mud in it

For protection of adobe buildings, fired bricks are generally used in the foundation. A few households have tried to put fired bricks in the front face in 13.5 feet thick walls with interlocking at every two to three feet vertically. Sometimes cement mortar pointing is used on 3 feet fired brick masonry portion.

Community seems to know vulnerability of buildings made with fired bricks in mud mortar against the flood. They have used different types of improvements. These are

- Use of lime mortar as pointing of the brick masonry
- Use of cement mortar as pointing of brick masonry
- Cement-Sand plastering of the walls
- Fired brick masonry in mud mortar with the addition of plastic sheeting at different levels
- Cladding of fired brick on sun dried bricks.

Some communities in Balochistan and Sindh have protected their land by making protection bund (*Bacha* bund) around the villages. Spurs dykes and bunds are used to divert the water away from agricultural land as well as residential areas.

Good practices in local construction

Balochistan
Cement plaster pointing on brick masonry with mud mortar.

Sindh
Raised platform for protection against shallow flooding.

Sindh
Reinforced concrete/brick band provided continuously at plinth and lintel levels.

Sindh
Plastic sheeting at plinth level to prevent rising of moisture from foundation to the walls.

Sindh
Plastering of the walls up to 3 feet used to avoid damage in low level floods.

Sindh
Brick masonry under mud wall is used as protective measure against floods.

Good practices in local construction:
Different kinds of good practices in the local construction were also observed during the assessment to avoid damage against floods. Some of these include, Cement plaster/pointing on brick masonry, Raised platform, Reinforced concrete/brick band, plastic sheeting, plastering of walls, and brick masonry under mud wall.

Good practices in local construction

Brick cladding outside mud wall,

Cement mortar pointing on brick masonry in mud mortar on lower part of mud wall.

Bachao Bund for protection of village.

Use of buttressing in boundary wall.

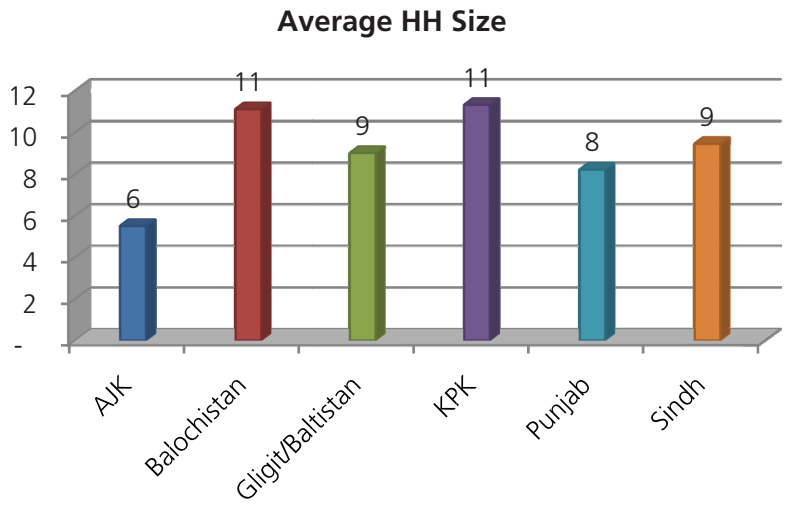
Use of fired brick on front side of wall, brick are interlocked after 5th layer.

Balochistan
Raised compound,called tibba in Balochistan.

Good practices in local construction:
Different kinds of good practices in the local construction were also observed during the assessment to avoid damage against floods. Some of these include, Cement plaster pointing on brick masonry, Raised platform, Reinforced concrete/brick band, plastic sheeting, plastering of walls, and brick masonry under mud wall.

5. Settlement Issues

5.1 Population Characteristics



In Sindh, on the average 9 persons live in two-room houses. The number of persons in the house ranges from 7 to as high as 15.

In Balochistan, on the average 11 persons live in four-rooms house. The number of persons in the house ranges from 9 to as high as 15.

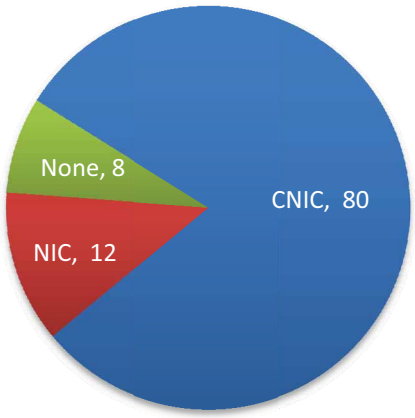
In GB, on the average 9 persons live in three-room- houses.

In KP, on the average 11 persons live in four-room houses. The number of persons in the house ranges from 5 to as high as 15.

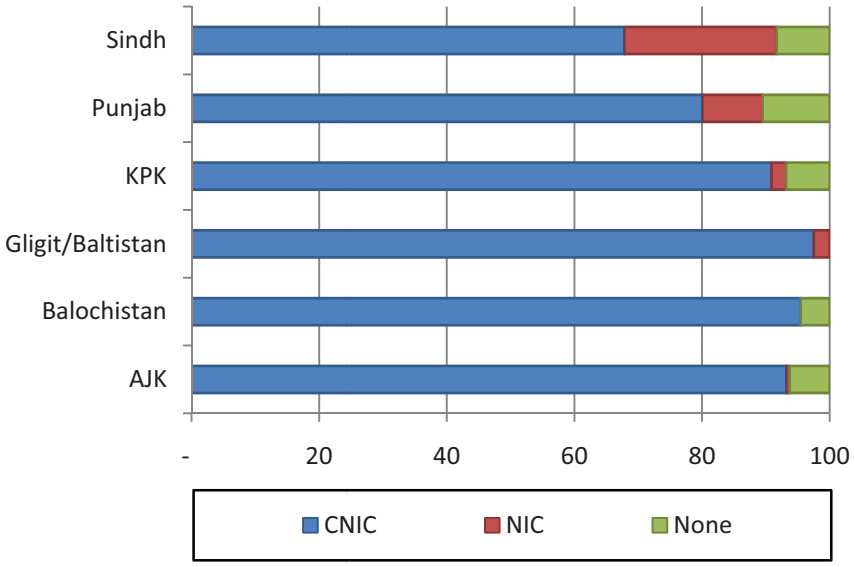
In Punjab, on the average 9 persons live in three-room house. The number of persons in the house ranges from 6 to 12

In AJK, on the average 8 persons live in a three-room house ranging from 7 to 8.

5.1.1 Availability of National Identity Cards

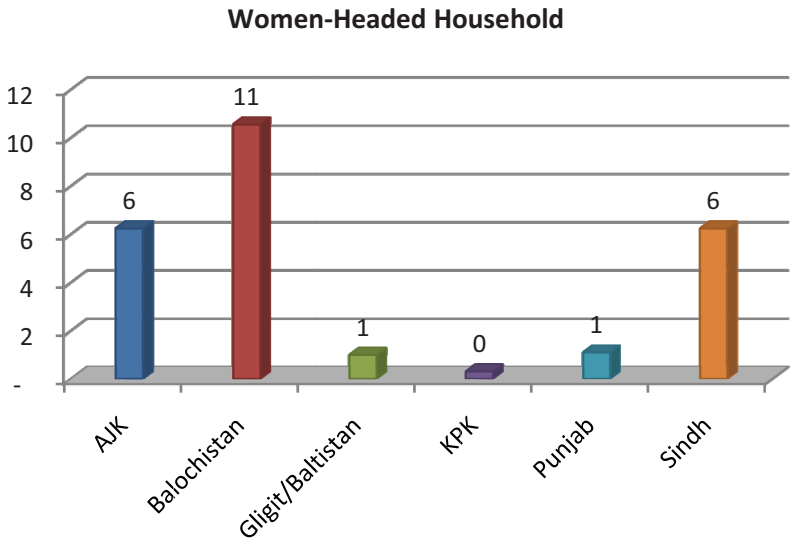


Almost each and every intervention by the authorities and civil society organizations require identity cards for verification of particulars of beneficiaries. For this purpose, the availability of identity cards is very important. In the visited areas (see Map) 80% of the household have the Computerised National Identity Cards (CNIC) while 12% have old National Identity Cards (NIC) and 8% simply do not have identity cards.



Above graph shows the availability of ID province wise in the flood affected visited area only. Majority in AJK, Balochistan and GB have identity cards. More than 25% do not have CNICs in Sindh.

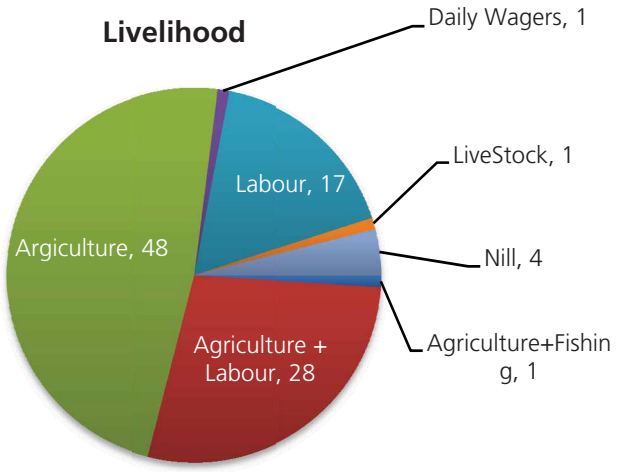
5.1.2 Socio-Economic Situation



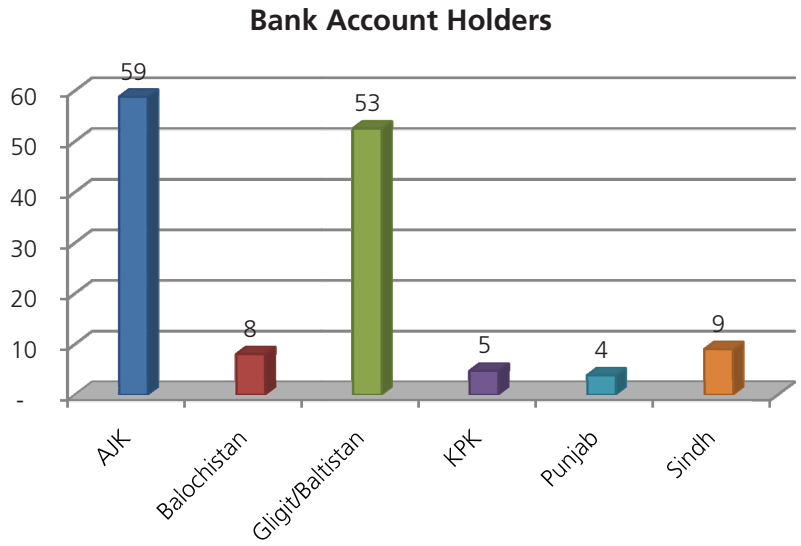
In the flood-affected visited areas of Balochistan about 11 % are women-headed household while in KP no women-headed household were found in the surveyed area. In AJK and Sindh women-headed household are 6%. In GB and Punjab, there were 1% women-headed households.

5.1.3 Occupation

A major portion of the sampled population relies on agriculture for their livelihood.



About 48 percent people rely only on agriculture for livelihood while 28% have to do labour work and 1% fishing, apart from doing agriculture only, to feed their families. 18% are doing daily labour work only, as construction worker, drivers, shoe maker etc.



In AJK and GB, more than 50% households have access to the bank accounts while in all other provinces less than 10 % have bank accounts

5.2 Social Organization

5.2.1 Community organization:

In Sindh: Only 8 village communities out of the 28 villages surveyed are organized. Literacy rate in the affected area is low. Mosques are the major source of information. Most of the heads of households have mobile phones.

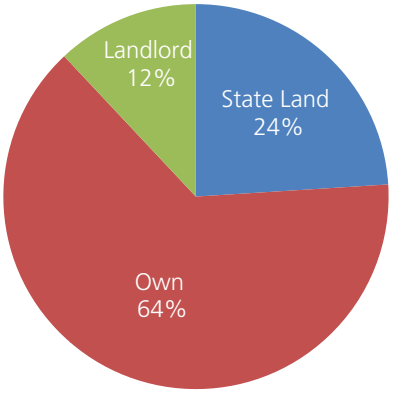
In Balochistan; No proper community organisation was found in the flood affected visited areas. Literacy rate is very low and security situation is volatile. Most of the household heads have mobile phones.

KP: Seven villages out of 16 visited villages have the community organisation. Most of them have access to the TV and Radio. Literacy rate is better than the flood affected areas of Sindh, Punjab and Balochistan. Most of the heads of households have mobile phones.

In Punjab: Community is not organised in the flood affected areas of Punjab. Literacy rate is also very low. In some semi urban area there are some community organizations/CBOs etc but they are not well functional. In rural area of Punjab committees are formed to look after the mosques or mosque related matters only. Moreover the people are poor and busy in their fields whole the day. Most of the heads of households have mobile phones.

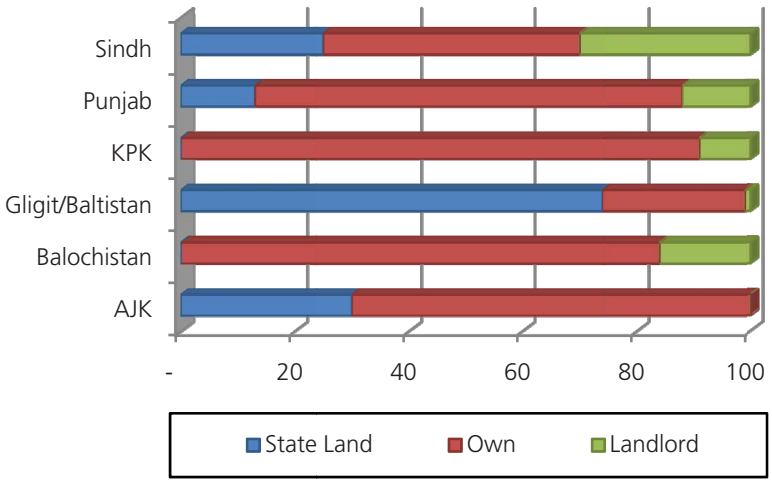
AJK & Gilgit Baltistan: Community is better organized. There are LSO's, CBO's, VDO's and clusters. Most of the community have access to the TV and Radio. Most of the heads of household have mobile phones.

Land Ownership

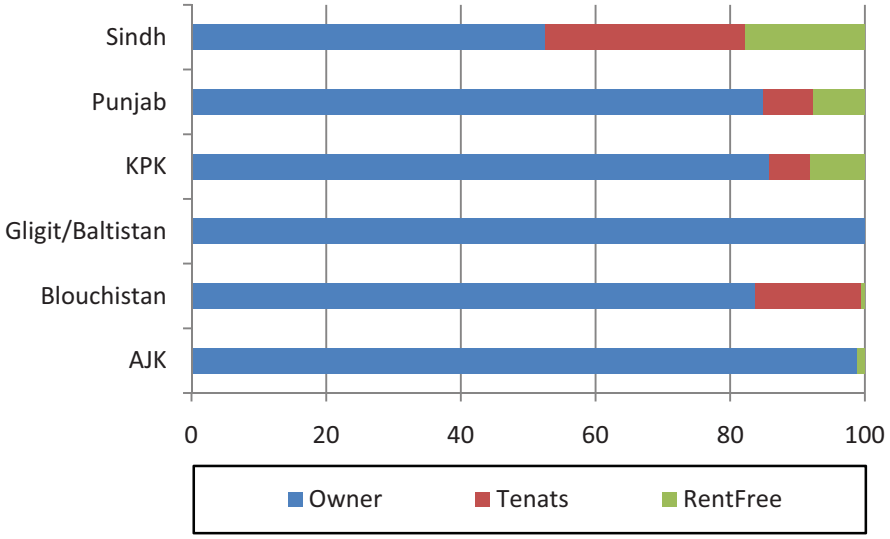


65% of the household own the land for their houses only while 18 % are living on private land as Hari etc. and 17% live on state land mostly in Katcha area (Shamilat).

Province wise Land Ownership



Land ownership problem is severe in Sindh followed by Gilgit Baltistan.



In AJK and GB, all the people in the areas visited by assessment team own the houses. In Sindh, about 50% houses are owned by the people.

5.2.2 Rural Settlement

In northern part of Pakistan like KP, GB and Kashmir, settlements are along the river side, Nallah. People lived in those areas in clustered as well as in scattered settlements. In Punjab, Sindh and Balochistan, majority of people lives in two types of settlements i.e. River Plain (Katcha) and Upper areas (*Pucca*). Areas can also be divided in two types with respect to type of irrigation. Canal irrigated area and is irrigated inclkuding rain-fed or tubewell. Land in Canal irrigated areas in more expensive than other areas. Settlement patterns are governed by the means of livelihood and ownership of land.

Most of the people live in clusters, based on their social and cultural setup. In Balochistan, few districts of Punjab like Dera Ghazi Khan, Rajan Pur, people live in scattered form in order to control their holdings. They believe that *"crops agriculture and politics should be protected round the clock".*

During this flood not only Katcha settlements were effected but *Pucca* settlements e.g. Muzaffargarh which are from river Indus was also badly affected. Settlements in Katcha/riverine area face regular floods and hence their houses are predominantly mud and adobe houses.

Some *Pucca*/ upper areas also face regular floods but mostly floods in *Pucca* area are due to breach of bund/ canal, *zameendara* bund, and restriction to water flow by bridges. Around 65% of the households claimed having ownership of land and rest either on rent or on govt land.

2 to 5 families' lives jointly but every family has its own house and kitchen which is usually built outside. Each house has 2 to 3 rooms (One for family (15'x16', 15'x18'), room for silo/ fertilizer, cattle shed and joint open space serve as a courtyard bounded by mud mortar/ adobe boundary wall, in courtyard oven is also placed which serves 2 to 5 families.

Chak are the settlement planed by the British along the canal and usually they are on raised platform. THAL areas are also called as *Chak*. *Moza* are the villages which are mostly in low lying areas of Punjab. Village is called *Goth* in Sindh and Baloch belt of Balochistan. *Killi* is the name of village in Pashtoon areas of Balochistan.

Public Spaces: The settlement grew organically, the lanes are soil compacted and brick paved. Each village has more than one mosque. People pay special attention on Mosque's construction which is usually built on a raised platform. In South Punjab Baithak/ drawing room built by the rich, is in the centre of the village, used as a Punchayat, and guests are also entertained in that place.

Sindh

Rural settlement

There are two regions in Sindh: Northern and Southern or Upper and Lower Sindh.

There is the following subdivision of the revenue. District, Taluka, UC. Deh and village (Goth). Village/ Goth is the smallest unit of the revenue further it is divided as *Para*, (mohalla). Mohallah is the smallest unit and is comprised of members of one caste in most of the cases. In many villages there are settlements which have the same caste. If caste is different in the same village than it has more *Para*. One *Para* has it territory and may have a boundary. If there is one caste they don't have separate boundary but have some sort of demarcation. That demarcation is made of bushes or boundary wall, which is locally called Lora. Often there is only hedge around the *Para*, and no other boundary wall. In very few cases there may be single houses with a boundary wall of hatch or masonry with a single family. In *Para*, hand-pump and laundry may shared by all, bath rooms are individual and latrines, if exists, is only shared by house-hold.

Utak: This is one similar to *Hujra* in KP or *Baithak* in Punjab, it is made separately for the guests in rural or semi urban areas. If someone could not afford the *Utak*, his guest is slept on village *Utak*. In past there was only one village's *Utak*, which was generally built by elder of the family and if any guest to come; responsibility of dining and serving was of that elder person, but now system has been changed and each one is responsible for his own guest. The poor family like Hindu family which is called *Bahgri* in local terminology (former, daily wager) do not have any *Utak* therefore; they accommodate their guests in their houses.

Single houses: There is scattered population as well. If someone in village has no common understanding in the village he builds his house away from village or if there is no land available for further expansion, elder son has to build his house on other land. In Southern part of the country, people are more liberal as compared to the northern part. This has effect on their boundary walls because in southern part, boundary wall is only a demarcation of land whereas the boundary wall is an essential component of *Parda* in north.

Construction pattern is also different, because in Southern part, wooden frame is prevalent, while in Northern part brick either Katcha or *Pucca* or mud is prevalent. Cooking, heating and water, these facilities are not provided by any agency, owners install hand pump or dig wells for water. Gas is not available to be used as fuel however, the electricity is available to meet electrical amenities in most areas. At some places, people are using latrines whereas the practice of open defecation is also visible.

KP

In rural areas people lived in clusters in joint/extended family system. *Killi* and Banda is the local name of the village. In *Killi*, people live in clusters and in Banda they live in scattered form in order to expand their presence over their land holdings.

5.2.3 Urban Settlements

Punjab

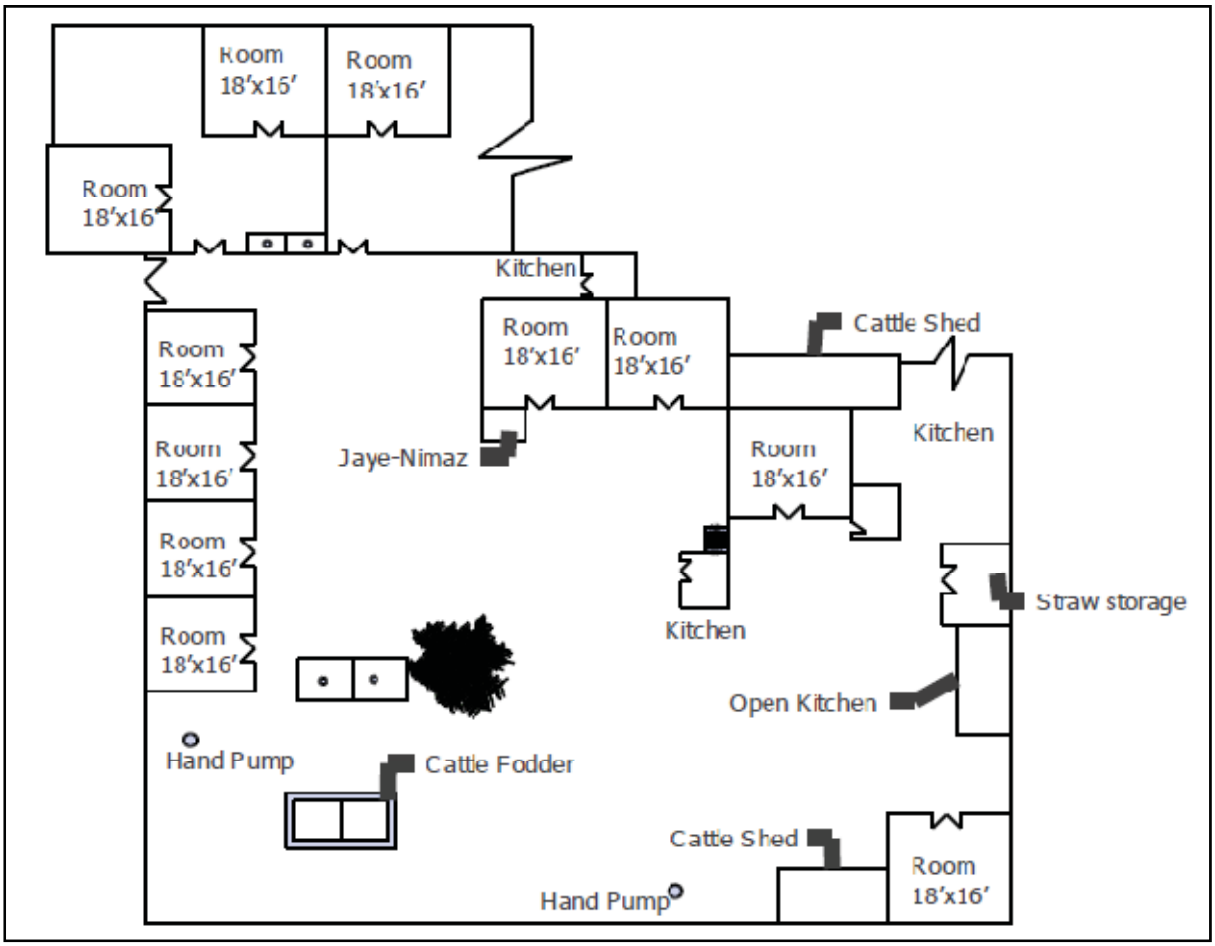
It is a common feature that houses are consisting of two rooms per family, mostly people live in clusters, (parents and brothers), they further sub-divide their plot into different sizes as the family grows. Each house provides toothing at corner for the possible future extension. In semi Urban and Urban areas, there are open surface drains. Some houses have a single joint septic tank, sewage comes to these drains from houses after passing through septic tanks. Some of these tanks have two to three portions.

Although streets are brick paved, there is no proper drainage system and around 2 to 4' water is still standing in the streets. Narrow drains are blocked due to mud. Each house has its own hand pump and courtyard which is shaded by a tree and is used for washing and bathing. Every house has separate wash

room and toilet usually at one corner of the house. Height of latrines and washroom walls is not more than 7 feet.

Generally the construction in urban and semi-urban is burnt brick with cement and mud mortar (depends upon the economic condition). Houses have boundary wall for privacy. Height of wall is around 7′-0′′ and is of burnt brick masonry. Old towns like Kalabagh are very congested, multi story consisting both Katcha and *Pucca* houses. Families live in small plots as small as 1.25 *marla*. Sometimes, several families live in one small house. Flood water caused the deposition of silts in streets as well as in the houses and water is still stagnant in the low areas.

Typical Settlement Layout in Muzaffargarh, Punjab



Sindh

In semi-urban areas there is mixed trend of settlements, but this is not limited to cost and clans, in some cases they have shared boundary walls made up of brick masonry or mud walls with one gate. In one compound, only close relatives live in extended family system. In this kind of settlement, people may have to share kitchen and toilet along with other facilities. There is very little fuel or water supply facility in the semi-urban areas. Hand pumps are found in most of the houses inside the compounds.

Urban areas have organized construction with proper water facility at some cities. Sewerage and well-constructed streets and proper size of the houses are the other noteworthy characteristics in these settlements. All houses are *Pucca* houses with organized streets, parks, community centre, etc.

In urban areas the problem of increasing population manifests under unstoppable growth of squatter settlements known as *katchi abadis* and encroachment of state and private land. It is estimated that 50% of urban population is living in *katchi abadis* / slums. As part of universal similarity, the situation of facilities in *katchi abadis* is very poor with regards to water supply, sewerage and construction of house. Multiple type of houses exist all round including mud and *Pucca* houses with no planned plot size and proper alignment. There are many private housing schemes. It has been observed that people have constructed houses on the river and canal embankments.

KP

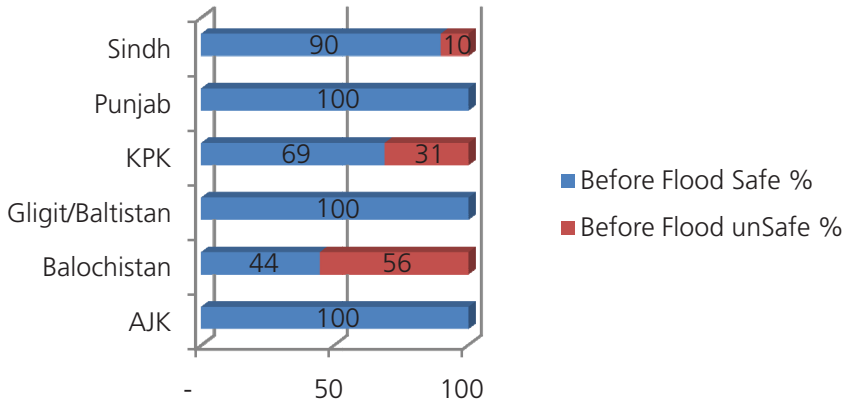
In urban and semi urban areas, where people live in joint family system, the construction is comprised of burnt brick with cement and mud mortar (depends upon the financial resources of family). Houses have boundary walls for parda. Height of wall is around 7 feet.

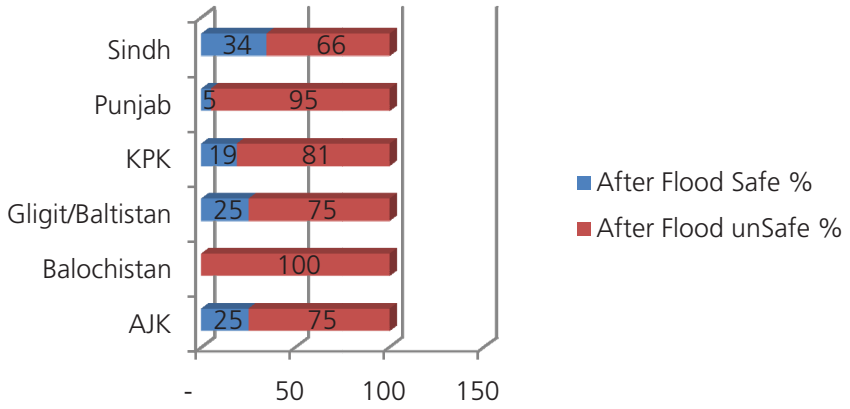
5.3 Services

Most villages had electricity which is damaged at some places due to the flood, usually they use hand pump or dug well for the drinking water. A large majority has mobile phones along with access to mass media and public announcement for news and warnings.

5.3.1 Water supply

In North of Pakistan, GB, AJK and north of KP the sources of water supply are rivers, streams and springs While in south in the plain areas water sources are dug wells and hand pumps.

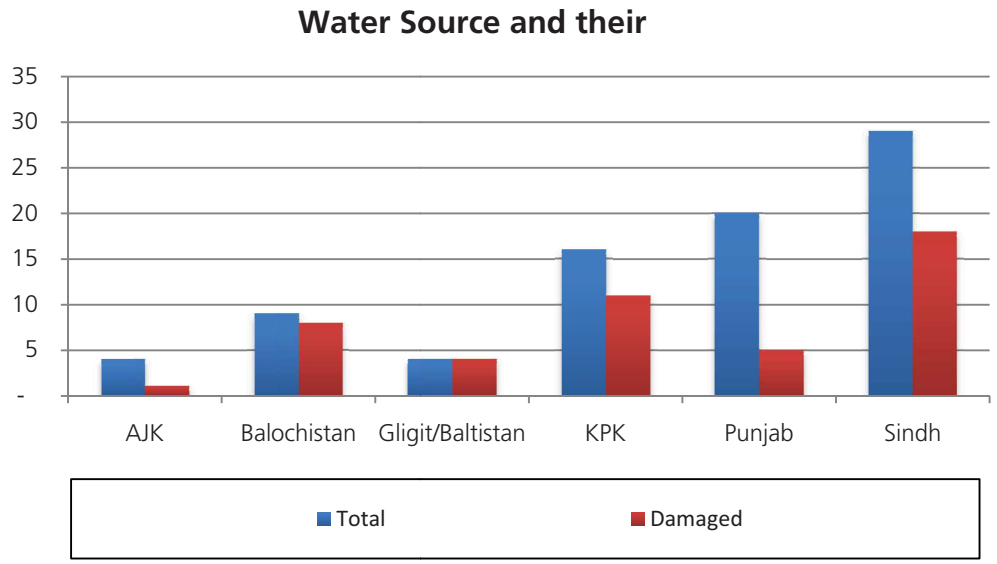




The pre-flood situation in Balochistan depicts that 60% of the population did not have access to safe drinking water whereas the access was far better in Punjab, GB and AJK. And in post-flood scenario, the water has been contaminated either on surface or below ground.

Damage to water supply

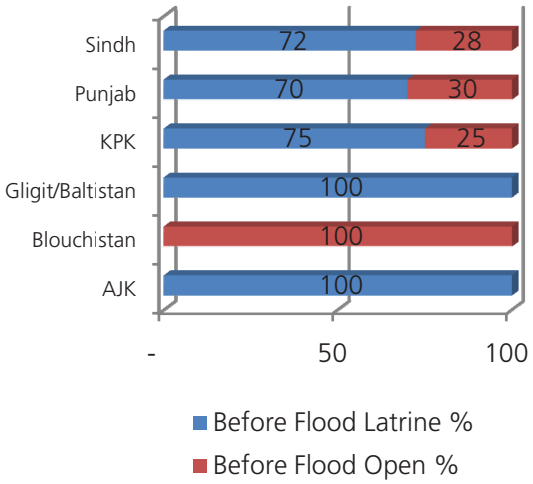
Water sources were also affected by the flood. Following graphs show the damage to the water supply in the flood affected visited areas.

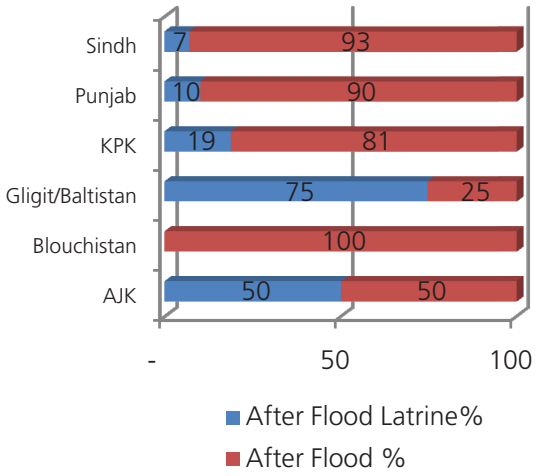


In AJK source of one community out of four is damaged due to flooding while in Sindh sources of water supply for 18 out of 29 communities were damaged.

Sanitation

In Balochistan, all the visited communities are practicing open defecation in house or in the fields. In AJK and GB a majority of communities was using latrines before flood. In KP, Sindh and Punjab more than 60% were using toilets in the affected visited areas although out of these, half of the latrines are unhygienic because these are without WC and floor. Moreover, the excreta are being thrown out by females.





The flood has significantly damaged the latrines. Soakage pits and septic tanks were filled with debris and sewage disposal pipes were choked or damaged.

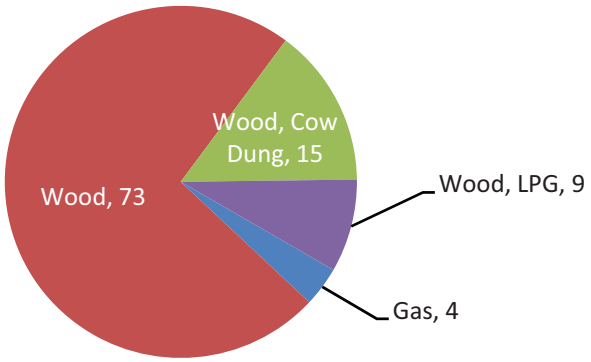
5.4 Type of Sanitation

See the page on sanitation at the end of this section.

5.5 Cooking Stoves

Most of the communities in the affected areas were using mud stoves with timber as fuel.

Cooking Fuel Before Flood %



73% of the household use only timber as cooking fuel. Only four percent have access to the natural gas.

Water supply

Sindh
Open well having 30 feet depth, bucket tide with rope to get water.

KP
River water without filtration is being supplied through pipes in urban areas.

Sindh
Hand pump, an extensively used source to get water. Usually depth of bore hole for a hand pump is kept 60 feet.

Sindh
Hand pump available next to a toilet for washing and cleaning purposes.

Punjab
Quality of water through hand pump is good. It costs PKR 5,000 to install a typical hand pump.

Rajanpur, Punjab
Groundwater extracted through hand pumps for washing, bathing as well as cooking and drinking purposes.

Water resources: *Hand pumps are the major source of water supply in Punjab, Sindh and in low lying areas of KPK and Balochistan because of low cost of installation and good quality of water. There are few areas in sindh where ground water is salin.*

Hand pumps are installed in compounds. Depth of ground water table from the surface in Punjab and Sindh varies from 25 to 35 ft but depth for hand pump is kept up to 60 ft to get maximum discharge during dry spell.

In upper areas of KP spring water is being supplied through pipe lines. Supply of water is intermittent (not continuous) and it requires frequent maintenance. Generally spring water is considered good for drinking purposes.

Cooking stoves

Sindh
Typical kitchen with two feet boundary walls to protect cooking stove from winds.

DG Khan, Punjab
Open air kitchen, burning is effected due to winds.

Sindh
Typical kitchen with two feet boundary walls having holes for ventilation.

Sindh
Kitchen with space for putting utensils. Normally utensils are kept in side rooms.

Rajanpur, Punjab
Kitchen with oven. This small oven is available for 5 to 6 families to make bread (Roti).

Punjab
Kitchen with cracked boundary wall due to flood. Bushes used as fuel for cooking.

Kitchen stoves: *Traditionally people use open air kitchens. Each family has his own separate kitchen and despite two or more families are living together in one house.*

A typical kitchen in these areas is surrounded by two to three feet high wall.

There is a small oven also part of some kitchens that is shared by two to three families.

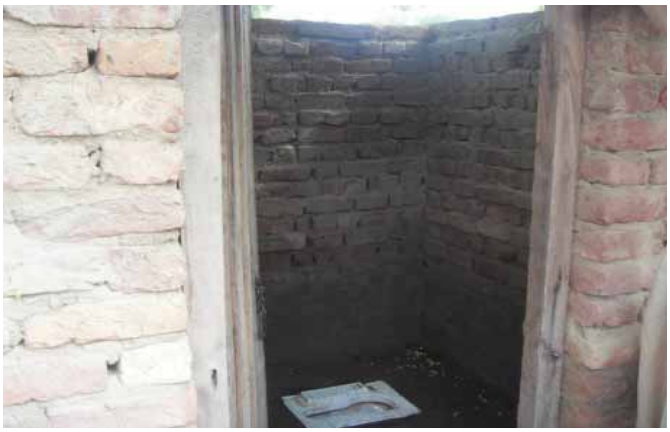
Some houses have ovens locally called Tandoor, these are used to bake bread for large family.

Sanitation

Sindh
Locally available grass is used to cover the sides of open toilet for female and children.

Sindh
A five feet high walls with no roof above, being used by the family.

Sindh
Sewage is drained out either open or in soakage pits.



Sindh
Toilets in semi urban areas.

Punjab
Place for bathing with five feet high walls without roof.

Punjab
Typical toilet in rural areas.

Sanitation: *Usually a place of size (4 x 5 ft) surrounded by mud walls or Kana (local available grass) walls up to 5 ft height having no roof is made within the compound and being used by females for open defecation while men go out in the field for open defecation.*

In some urban and semi urban areas flush latrines (4 x 5 ft size) with 5 ft high walls and no roof above are used. Waste water is disposed in soakage pit, directly in open area/nalla or in septic tank.

Drainage

Drains are blocked by debris causing stagnation of water in streets.

Water from washrooms and kitchens flows into streets due to the blockage of drains.

Punjab
Partially covered septic tank outside home. Waste water enters into drains from septic tank.

Punjab
Typical drains in urban areas, grey water flows in open drains.

Sindh
Waste water from in house septic tank and kitchen disposed off in open drains.

Sindh
Open drains in the city area.

Drainage:

In Urban and semi urban areas, waste water from kitchen and septic tanks is disposed in open drains. Septic tanks can be in the house or outside the house.

Community infrastructure

Destroyed access road cause by the land slide.

Temporary access bridge using salvage material.

Community initiative solution for access.

Community based road damage assessment.

Existing access road with high water table.

No access for motor vehicles.

Community Infrastructure:

The flood has destroyed community infrastructure such as road, bridge, water facilities, market and other important facilities. Immediate restoration of these important facilities are important in creating full factor for the community to return to their previous settlement.

Settlement issues

KP
Unfunctional market due to debris.

KP
Existing household debris removal practice.

KP
Difficult access caused by standing water.

KP
Blocked street and drain.

KP
Significant debris in the urban area.

KP
Day to day life after flood.

Settlement issues:

The rubble and debris removal from the streets of urban area are priority for affected community. Some streets and open areas are low lying areas where water is still standing causing health hazards and hampering normal activities in day to day life.

6. Land Issues

6.1 Land

6.1.1 Temporary use of land (immediate)

The most urgent issue is to move people to safe lands. If that land is owned by the private owners, they may either not allow constructing shelter on that land due to fear of becoming permanent or charge rent for space/plot. This situation becomes worse for Afghan refugees, if they are displaced by the flood, landowner may not allow afghan refugee to construct shelter on that land again

6.1.2 Services for temporary shelter

Land owners may not allow the provision of services (water / sanitation) to be provided to temporary shelters installed at safer places due to the same fear of becoming permanent settlements.

6.1.3 Demarcation of land for household

Marking of the land for particular owner/farmer is vanished due to flooding. There will be potential conflict among neighbour for demarcation of their land for housing and farming both.

6.1.4 Demarcation of land for settlement

In some cases the whole settlement has been flattened by the flood. There may not be any sign for defining the settlement and household plots and farming areas.

6.1.5 Demarcation in Urban Areas

Land demarcation is difficult particularly in urban areas as it is very valuable.

6.1.6 Land Lost due to Changing of River way / Erosion/ Land sliding

In very few cases, river has completely changed its previous way and now it is flowing on a new way which was owned by farmers previously. In some cases land is lost due to erosion on the banks of the river or Canal. In Skardu, Neelum and Muzaffarabad, land lost due to land sliding. Land was also lost closer to the breaches in Sindh.

6.1.7 Hazardous area

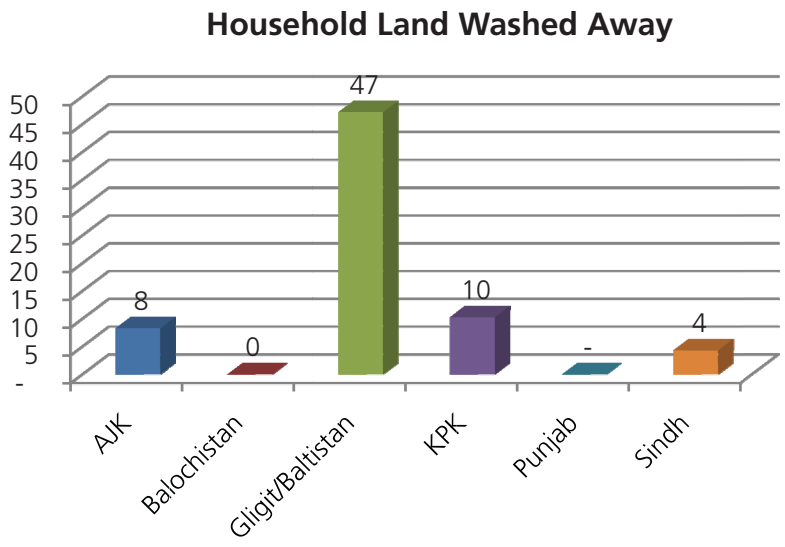
Some plain area will be under the threat of constant flooding after regular intervals.

6.1.8 *Katchi Abadi*/ Slums

In some cities *Katchi abadis* are affected, Landowners (Govt. /private) may not allow those living in slums to rebuild their house

6.1.9 Rubble removal/ site clearance (especially in cities)

In some cities like Nowshera, Charsada, Muzaffargarh etc houses are damaged or filled with sand or silt. Site need to be cleared to put up shelter or silt/sand need to be taken out of house to make it functional. Usually families do not move to tents and want to put up shelters near their house to protect their belonging



In AJK, GB, KP several structures wiped out due to flash flooding resulting 47% in GB, 10% in KP and 8% in AJK lost land.

6.2 Tenancy

6.2.1 Tenancy: *Hari/ Bazgar/ Mazara*'s Agreement

In the pre-flood situation in Balochistan tenants used to pay 50% of their crop to landowner as part of rent of land. In case of violation of this silent agreement, the landlords were authorized by this cruel system to deprive the tenants of their roofing materials. The aggressive behaviour of landlords and the existing system stops tenants to build permanent houses there because insecurity does not allow them to do so.

In Sindh: They divide crops in four parts and one part is given to land lord for expanses of seed, fertilizer etc. and other three are divided in to two halves. One half is given to the landlord and rest of the crop is being used by the tenant for his family.

In Mianwali Punjab, farmers have to give 40 kg out of 200 kg of wheat per *Kanal* per year to the land owner. Crop on *Mongi* is bonus for the farmer and no share is given from this crop to the landlord.

In southern Punjab, farmers pay PKR 12000 - 15000 per Acre annually to the landlord and all crop belongs to the farmers.

In other type of agreement if land lord gives seeds, fertilizer and pesticide, land lord will take six parts out of seven while farmer will get 1/7 part as remuneration of his labour.

7. Urban

7.1 Influx to the Urban Areas

A significant number of the flood affectees got refuge in the urban, semi urban areas in camp schools or on the roads that were related to the agriculture occupation before flood. 30 to 60% are *Haris/ Mazaras*. This portion of the society has lost their houses and means of livelihood who were already living in vulnerable condition and most of them were living below poverty line. After passage of flood, men have started working as unskilled labour and earning some money for their survival. The important aspect of their new life is the reduction of work force because all the members of the tenant families were working on fields before flood and now the families are only depending over the incomes of heads of households.

Despite reduction of work force, the income earned by the head of household is more than the overall income earlier generated by the all family members. The young sons are also putting their share to support their parents and the daily wages are paying them better. For this very reason, the tenants will prefer to live in the cities which will certainly increase pressure on urban settlements. This natural disaster has turned the lifestyle of the various affected families and PUSH factor of their migration has been converted to PULL one now. The independence from tenancy is a new and pleasant feeling for these migrants.

Another reason people may like to settle in urban areas would be future protection from flood calamities. Some political parties are forcing communities to move to urban areas to change the demography of the areas which will support them at the time of general or local bodies elections and on the contrary, others are stopping them to get settled in cities.

8. Construction Material and Quality

8.1 Construction Materials

Bricks

Different types of bricks are available at local level which are classified into categories, sun dried and burnt bricks/ fired bricks. Size of brick is generally 9"x4.5"x3". Fired bricks have three types of bricks: under burnt, well burnt and over burnt. Underburnt brick can be easily recognized by the yellow colour of the brick. Well burnt bricks have red colour. Over burnt brick does not have uniform colour and shape.

Timber and husk or coal is used as fuel for brick burning. Commonly timber and husk is used. Quality depends on the availability of good soil as well. At some places, the quality of the bricks in the affected areas is not good. Bricks have already absorbed a lot of water. In Sindh, most of the bricks are not usable because the bricks remained in water for more than one month. Even before flood bricks were affected by the seepage due to efflorescence. In areas with Saline water, this phenomenon is more pronounced and flood water added deterioration of brick masonry.

Quality of bricks obtained from Kiln is better than obtained from open burning. To compare the strength of bricks obtained from open kiln and sun dried bricks, these were dropped from a height of only two feet and it was observed that both of these bricks were broken.

Bricks absorbed too much water and broken:

Bricks deteriorated due to seepage

Delimitation of bricks

Weather effects due to rain and seepage

Brick production

There are different types of brick production in Pakistan.

Kiln

Wood and bushes are used as fuel for burning of bricks in the kiln. 40000 to 60000 bricks are produced from one kiln in two months. A big Kiln can produce 300,000 to 700,000 bricks in one cycle of brick making. (Cycle include mud preparation, sleeping, moulding, sun drying and then burning)

Due to flooding, kiln stopped producing the bricks as silt brought by the flood covered the good soil and husk used as fuel in kiln was also destroyed. Flood water entered into some of the kiln causing damage to the inside of kiln as those structures inside to support burning were made up of mud

To restart the production again silt layer has to be removed which can take two weeks after the drying up to soil. If water entered into the Kiln then kiln required repairing which is at least two months' work. The kilns whose chimney fell down will require 4 months starting rick production.

Open Kiln

Bhoosa, Rice or wheat Husk is used for burning of bricks. Sun dried bricks are stacked at one place and fired brick are put all around this stack of sun dried bricks. *Bhoosa* (wheat or rice husk is put over the stack and in between along with timber.

Sun dried bricks

These are brick made with mould by using soil with addition of small 10 to 15% of sand. These bricks are dried in Sun for at least three days on dry mud plat form. One person can make 2000 bricks in two days. The labourer prepares the mud and leaves it to sleep for whole night then next day he gives it shape and hence the brick gets ready.

Bamboo

Different qualities of bamboo are available in market depending on the cost of bamboo. Life of bamboo depends on its exposure to the moisture. Depending on quality and exposure to the weather its life varied from 12 to 70 years. If exposed, it can be damaged in three years. Treated bamboos are also available in market. Bamboo is mostly found in Punjab.

Kera

These are bushes which grow in one year time .These are local available material and found in abundance in Katcha areas. Life of *Kera* is 10 to 30 years. Life is affected by their exposure to moisture.

Kana/Cannes/*Patar* (Reed)

These are local available materials and found in abundance in Katcha areas. Kana is type of grass it is used mostly in roofs and for making chiks. It grows in one year and its life is extended up to 20 years. Life is affected by its exposure to moisture. This is found throughout the country and known by different names.

Mazri

Its type of grass and is used for flooring and for roofing. It is found in Punjab, Balochistan and Sindh.

Lokha (KP), Sir and Pun (Sindh)

It is type of grass and used in roofing. It is found on river banks and being used for temporary boundary walls or making temporary partition walls.

Timber

Following are different types of timber used in housing construction;

- Deodar
- Kail
- Chir
- Partal
- Bairy
- Kikar
- Sheesham
- Shareinh
- Sufaida
- Babul
- Palm tree

Deodar, Kail, Chir and Partal are type of pines and are mostly found in North of Pakistan. It is soft wood but expensive. Partal is also available in southern Punjab. These are used in joinery works, for roofing and also for furniture.

Bairy (ziziphus)

It is used in roofing material as beams and joist in Punjab, Sindh and Balochistan. It is hard wood with a life from 20 to 30 years. However, if treated properly, its life can be increased.

Kikar (Acacia)

It is hard wood and used in roofing and for furniture. It's also used as fuel wood. It is available in KP, AJK and Punjab.

Sheesham

It is also hard and known as the royal tree of Punjab. It is used in housing construction and for making furniture. It is available in two major types of quality. One is white in colour and other is black. Black type is of good quality and expensive.

Shareinh

This hard wood is available in Punjab. It is used in housing construction and for making furniture. Its life is 20 to 30 years

Sufaida (Poplar)

It has soft wood and is used in roofs and to make sports goods with a life from 10 to 20 years. Quality of Sufaida is very good in Gilgit Abbottabad and Poonch.

Babul

This is hard wood used in housing construction in Sindh. It is a type of Kikar.

Khaji (Palm tree)

It is used in making thatch roof, baskets, mat, wall covering construction in Sindh and Balochistan. It is hard and durable wood.

Bhan

It is the type of timber in Sindh. It is used to make twigs wall, wall covering, baskets and for fuel. It grows in three years. It is much stronger than *Manjandri* but grows slowly and has not straight stems.

Manjandri

It is very fast growing wood used in housing construction in Sindh. It grows in two years .It is cropped in fields and similar to sugarcane crop. A year old plant is of 3 inches diameter and 18 feet long stem. It is abundantly used in roofs and posts but it is not very strong.

Table below provides cost of different types of timber.

Type of timber	Cost per cubic foot
Deodar	1000-1800
Kail	800-1200
Chir	300-600
Partal	250-400
Bairy	600-800
Kikar	200-300
Sheesham	600 -900
Shareinh	500-700
Sufaida	400-500
Babul	
Palm	

Due to its quality of fast growing and long length of stem it is used for roof and posts. This has very low strength. Grass/bushes present in the flood plains and used in the construction of houses are damaged by the flooding. People may face shortage of these local construction materials. Timber was not affected by the flooding but it was already available in the limited supply in the affected area.

Steel Girder

Girders are available in the market and these are becoming very popular material for roofing due to shortage of wood/timber. Room sizes are determined by the available length of girders. Length of girders varies from 14 feet to 18 feet. Weight of these girders can be reduced by introducing girders with holes and hence its price may be reduced. Girders are required to be painted or coated before use to avoid rusting or corrosion.

Girder's thickness ranges from 1 ¼ to 2 ½ and weight 1.4 kg to 5 kg respectively.

Size = 5"x3",8"x4" etc

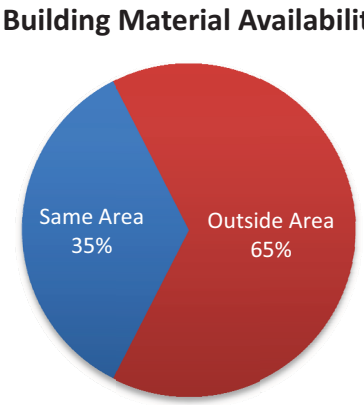
Cost of the girder is Rs 240/kg to 300/kg

Rusting of steel girders

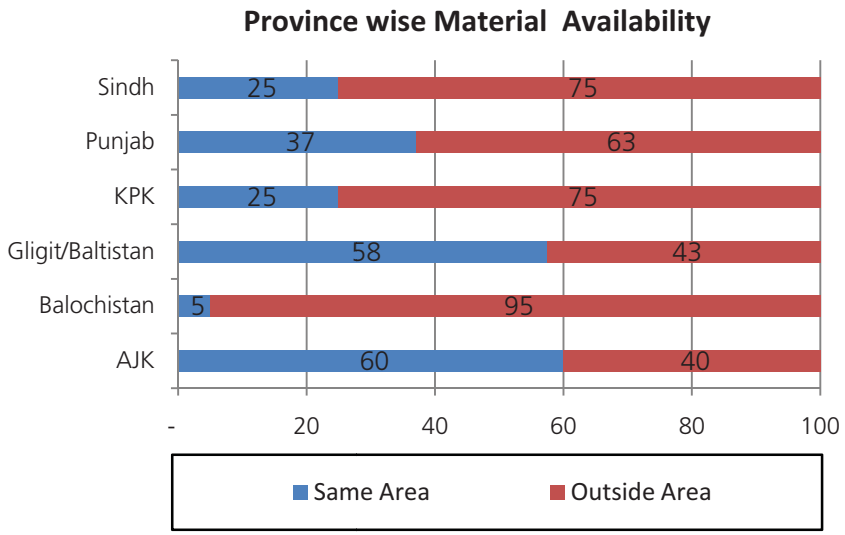
Painted girders r not rusted

T-Irons

These are the roofing material used over the girders to hold the brick roofing tiles.2"x2"x1" is the most common size of T-Iron.



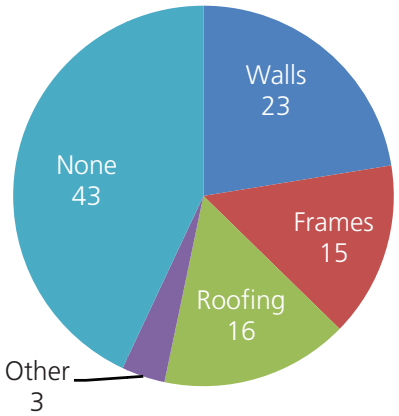
35% of the material for house construction is available in the same village while other material is brought from the market.



In AJK, more than 60% material is available in the same village as they use timber which is found there abundantly and similar situation exists in GB.

8.2 Salvage Material

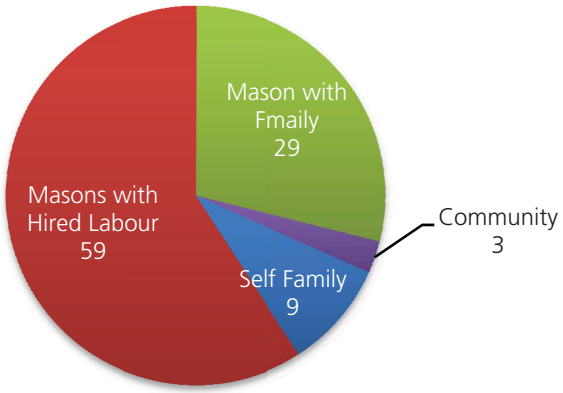
Shelter Material (salvage) is presently Available



43% of the affected households do not have any salvage material. While 23% have wall material which can be reused in shape of bricks/ stones/ blocks.

8.3 Construction skills

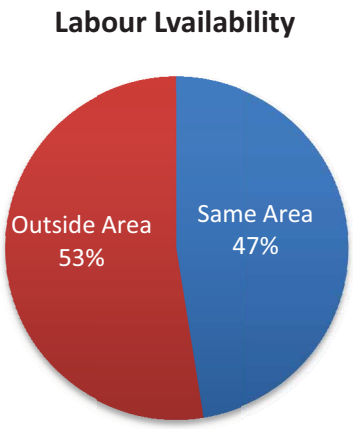
House Build by



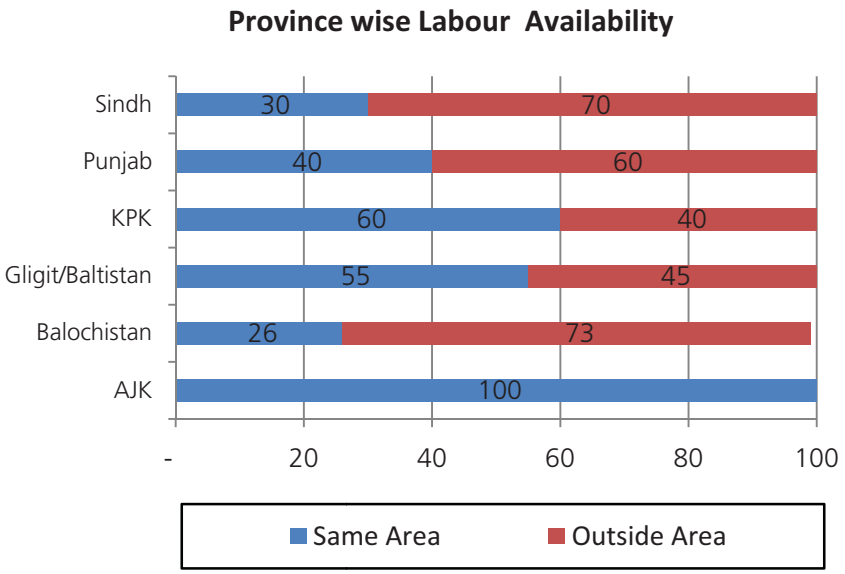
Masons/ skilled persons are involved in about 90 % of the housing construction. Mostly these masons are working on Katcha houses (82%). That means most do not know the use of cement/ concrete. Only less than 15% of *Pucca* houses involve use of cement mortar and concrete.

Majority of the masons in Balochistan (above 90%) do not know the brick masonry. Good brick masons are available in Punjab. Very less masons for brick and block masonry are available in Sindh.

If construction of the houses goes at the normal pace (6-10 houses per year per village) then the enough labour is in the market.



52% skilled labour were available for the construction of the houses in the villages at the normal rate (6 to 10 houses per year) but still they have to contact some mason community called Oad/ Raaj.



4 persons (one skilled) are required to build two room Katcha house in about one month (construction of wall upto the height of 1.5 feet (one hand) is constructed in one day ,then mud layer is left for drying for two days)

6 persons (two skilled, four labours) are required to build a two room house with brick masonry in cement mortar. Chappar (type of mud house with slanting roofs), Manna and Jumpari require less skill and can be done by the owners themselves while in some areas community members help each other in construction of the houses especially in construction of roofs.

Construction Season

Construction in north of Pakistan is affected by monsoon (July-August) and winter due to snow. While in south of Pakistan, being a plain area, construction can continue the whole year except the monsoon season but sowing and harvesting affect the construction in the rural flood affected plain areas.

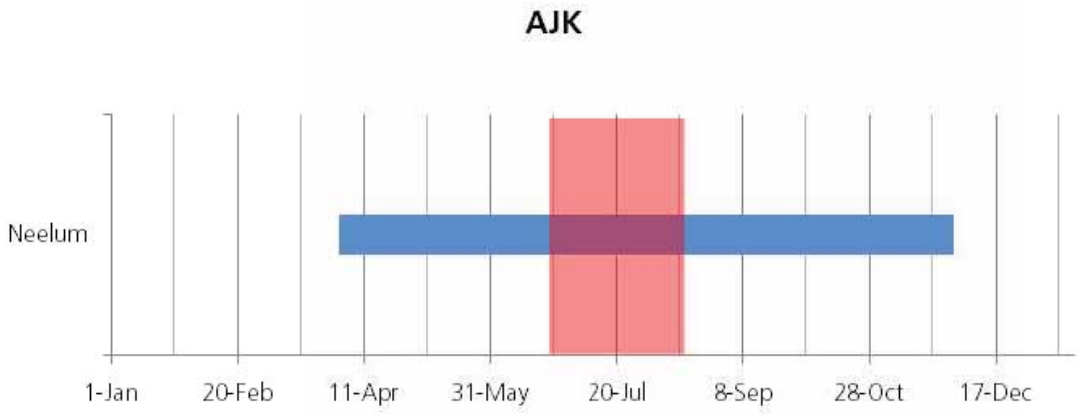
Below is the table showing the time of sowing and harvesting different types of crops.

Seasons	Crops	Sowing	Harvesting
Rabi	Mustard	September and October	January-February
	Wheat	November/ December	15th April to 1st may
	Tobacco	15th December to 15th January	May and June
	Onion	December and January	May
	Red pulse		
Kharif	Sugarcane	September and February	January, February and march
	Cotton	15 May to 25 June	August till 15th December
	Bajra	July to 15th august	November
	Jawar	1st June to 30 august	October
	Rice	15th May to 30th June	August, October/ November

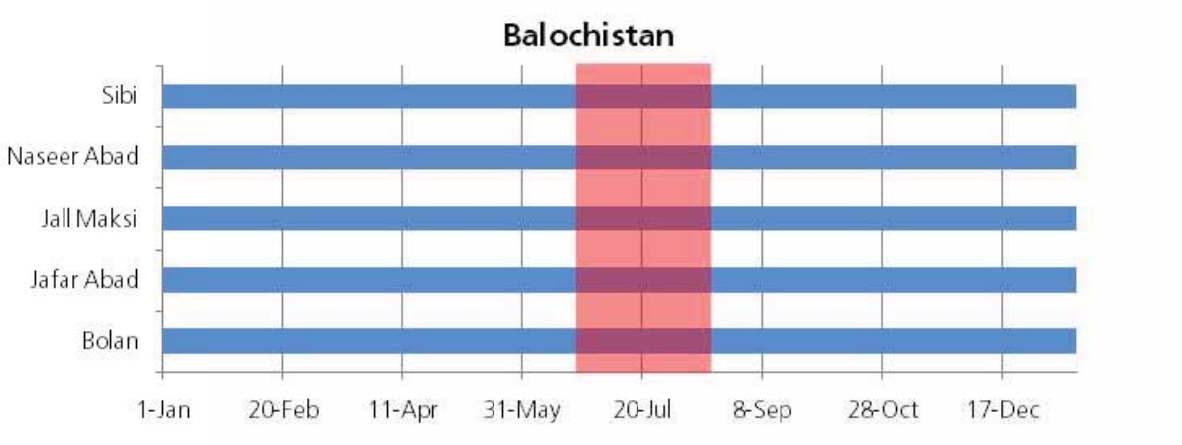
After harvesting of each season, people usually organize and celebrate social events. During that time they have access to loans and they have their incomes in hand. This is the more appropriate time when most of the people, belonging to rural and low profile urban areas, focus on construction or maintenance of their houses. For low income or marginalized groups, they undertake repair and maintenance activities before the onset of monsoon season. They also mostly start at the end of April/May.

Below are some of the graphs showing people's perception about the construction season. It shows when people think that they can do the construction work.

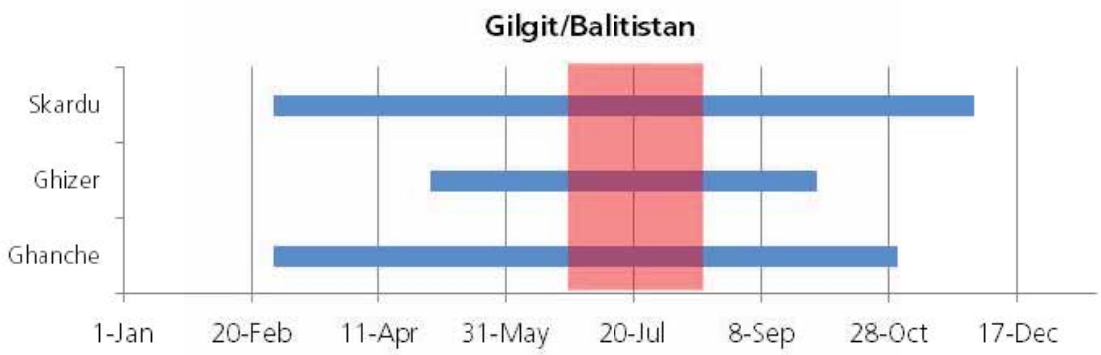
Construction season in flood affected visited district of Pakistan



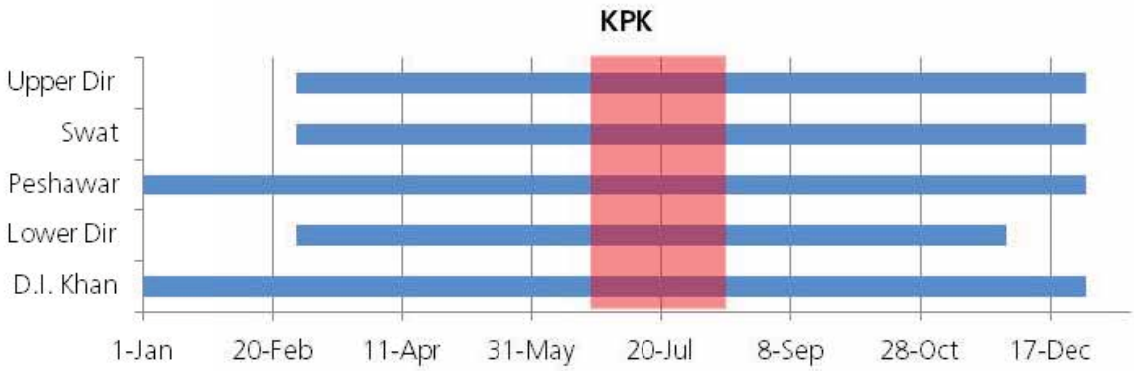
Monsoon period



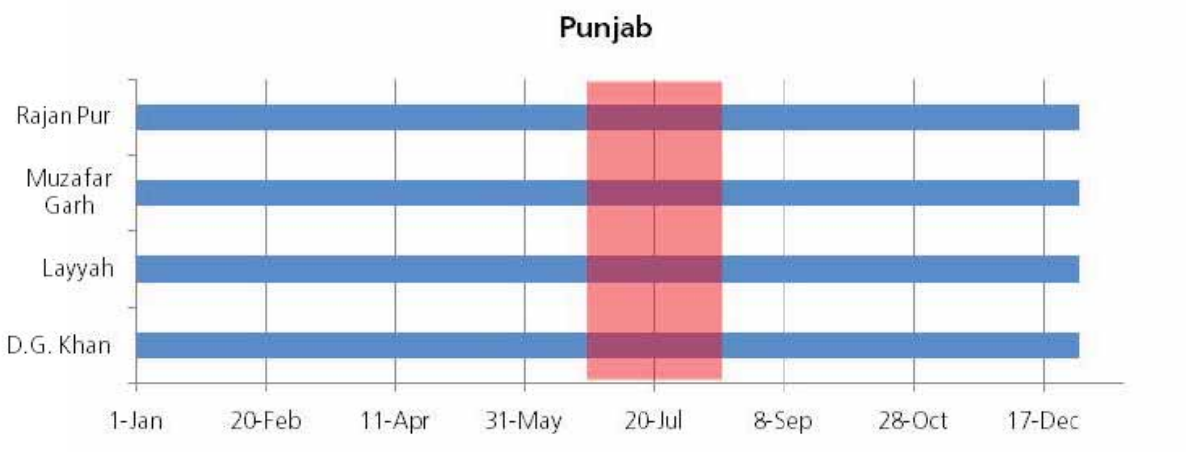
Monsoon period



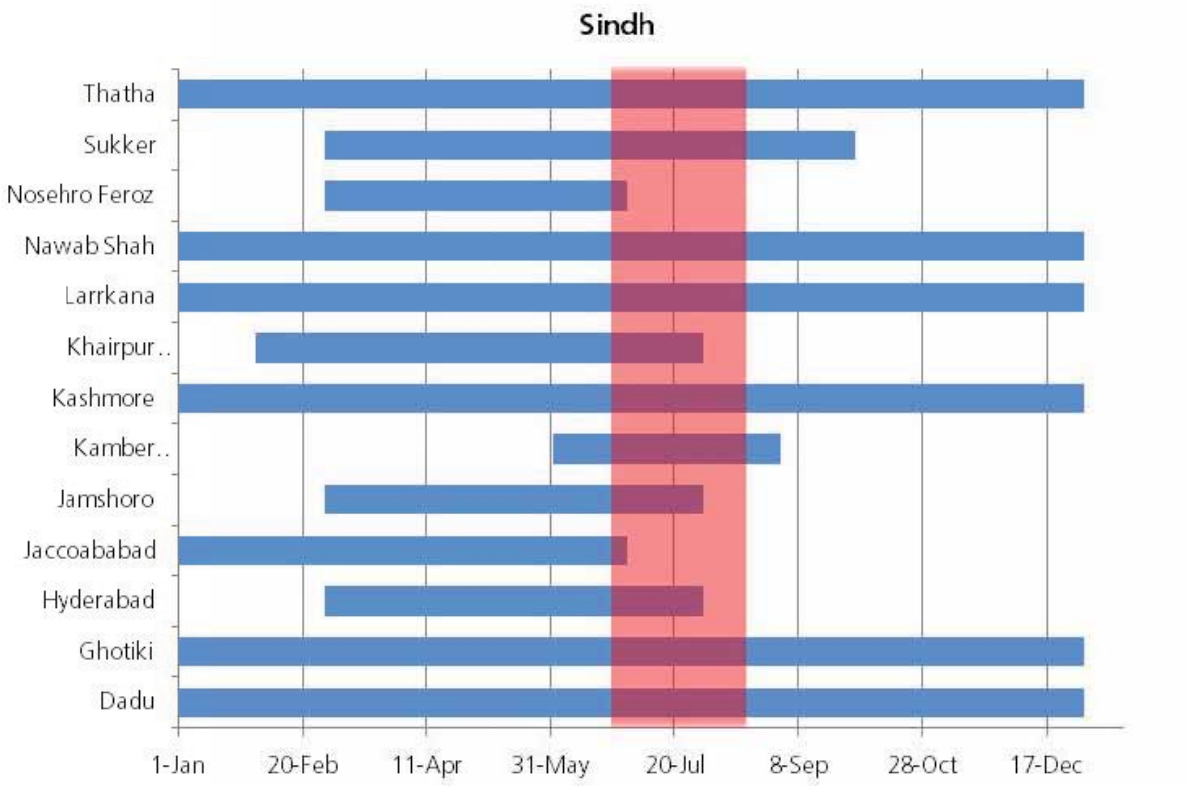
Monsoon period



Monsoon period



Monsoon period



Monsoon period

Below is the list of activities done by the community in two different areas of Sindh during the year

Rural Parts of Thatta (Southern part)												
Activities	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fishing (Shrimp) Ban by Sindh Govt.												
Repairing of Boats, Houses, Social Festivities												
Seeding (Paddy/Cotton/Banana,)												
MONSOON ONSET												
Harvesting (Paddy/Cotton/Banana)												
Fishing (Shrimp)												
Seeding (wheat)												
Harvesting (wheat)												
Social Events												
building season												
This is the major part of Thatta which is coastal area including Badin.												
Rural Parts of Kambar-Shahdad Kot (Northern part)												
Land preparation												
Seeding (Paddy)												
Livestocking												
Harvesting (Paddy)												
MONSOON ONSET SUMMAR												
WINTER RAINS												
Land preparation												
Seeding (wheat)												
Harvesting (wheat)												
Social Events												
Building season												

Construction Material - Bricks

Dadu, Sindh

Mud preparation to get it ready to sleep for one night before moulding.

Dadu, Sindh

Bricks are placed to be sun dried.

Dadu, Sindh

A sun dried and an open kiln brick, both got broken after having dropped at a 3 feet height.

Dadu, Sindh

Bricks are made in open kiln.

Dadu, Sindh

Husk and timber is used as fuel in open kiln.

Punjab

Out of production kiln due to flooding. Standing water and damaged structure.

Kiln: *Wood, bushes are used as fuel for burning of bricks in the kiln. In two months time some 40,000 to 60,000 bricks are produced in a kiln. Large Kiln can produce 300,000 to 700,000 bricks in one cycle. The cycle includes mud preparation, sleeping, moulding , sun drying and then burning.*

Due to flooding, kiln stopped producing the bricks as silt brought by the flood covered the good soil and husk used as fuel in kiln is also destroyed .

Open kiln: *Bhosa, Rice or wheat Husk is used for burning of bricks. Sun dried bricks are stacked at one place and fired brick are put all around this stack of sun dried bricks.*

Sun dried brick: *These are made with mould by using soil with small 10 to 15% of sand. These bricks are dried in sun for three days on dry mud platform. One person can make 2,000 bricks in two days. One day to prepare the mud and then lets it sleep for one night next day he makes the brick.*

Material

Brick tile/ Choka
Roof material.

Kai
Roof material.

Lokha
Roof and wall material.

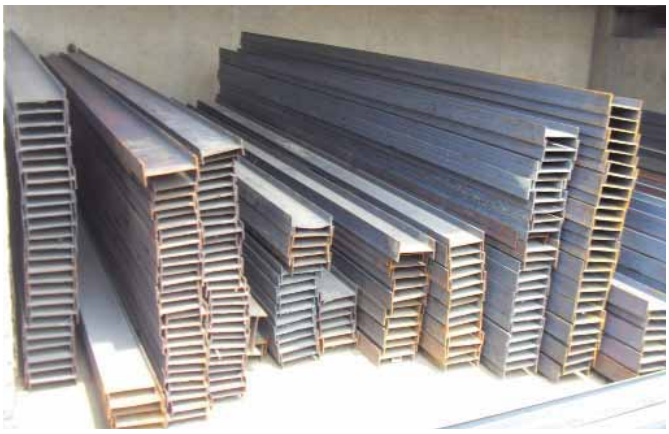
Kana
Roof and wall material.

Layee
Roof and wall material.

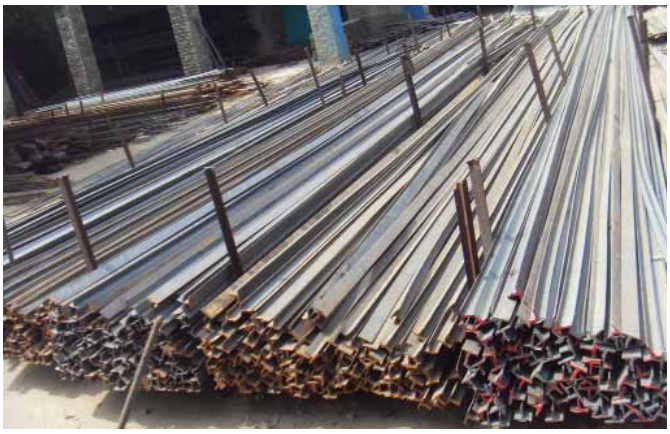
Pun
Roof and wall material.

Material:
This is the roof and wall material which is abundantly used for the roof and wall in most of the flood effected areas.

Material



Girder
Roof material.



T Iron
Roof material.

Bamboo
Roof material.

Manjadri
Roof and wall material.

Patar / Chiq
Roof and wall material.

Patar / Chiq
Roof and wall material.

Material:

This is the roof and wall material which is abundantly used for the roof and wall in most of the flood effected areas.

Salvage material

Jampur, Punjab
Brick salvage

Sindh
Roofing material that can be reused.

Balochistan
Bricks are stacked for reconstruction.

Neelum, AJK
Timber and joist salvage for roofing.

Punjab
Joist can be used for roof.

Punjab
Bricks, girder, doors and windows available to be reused.

Salvage material: *Not all salvage material is reusable. If bricks are in water for more than 30 days they cannot be reuse because they absorb too much water. If girders are bent or twisted it becomes difficult to straighten them. A lot of bamboo and timber broken due to collapse of roof. Roof thatch which submerged in water is not usable. Flash flooded areas people lost all the material.*

Quality of construction

KP
River stones are being used to make stone masonry in mud mortar.

KP
4.5 inch thick wall of brick masonry in mud mortar.

KP
Practice of connecting cross wall.

KP
Poor corner brick masonry.

KP
No connection between cross wall and long wall.

KP
Delamination in brick masonry.

Quality of construction:

Many construction mistakes were observed in field but these can be improved without incurring additional cost.

Quality of construction

KP
Delamination in bricks.

KP
No reinforcement to connect arch and column.

KP
Delamination in mud.

KP
Column and girders do not have anchorage.

KP
Girder are placed directly on wall and not anchored.

Balochistan

Mud lumps shape of balls are stacked to make mud wall.

Quality of construction:

Many construction mistakes were observed in field but these can be improved without incurring additional cost.

Quality of construction

More than one inch wide joint filled with mud mortar.

Bricks are placed vertically in alternate courses.

Spalling off concrete from plinth beam.

Poor interlocking between two walls.

Brick reinforced beam with poor reinforcement detect.

Rebar Hooks, ends are not bent inside.

Quality of construction:

Many construction mistakes were observed in field but these can be improved without incurring additional cost.

Plinth Construction

Water enters into the foundation and weaken the structure.

Settlement of room floor.

Loose fill fell down with the collapse of front plinth wall.

Natural ground level and finish floor level are same.

Settlement of room floor.

Stone masonry front wall fell down.

Plinth construction:

Plinth of the houses are not constructed properly. Floor bedding is not compacted generally. In hilly areas plinths are made on cut and fill.

Construction of mud houses

Balochistan
Excavation of foundation for typical mud wall construction depth varies from 1 to 3 feet.

Punjab
Salvage mud is being used for reconstruction.

Punjab
Trimming of wall is being done to give it finished shape.

Lumps are stacked to construct mud wall, no compaction.

1.5 feet high wall is constructed in one day.

Width of wall of 1.5 feet, construction underway.

Construction of mud houses:
Above pictures shows construction of mud houses after flood.

Historical buildings

Sharda Neelum, AJK
Sharda University: It was construed in 24-27 AD. (1983 Years old)

Sharda Neelum, AJK
Claimed to be the biggest university of central Asia at that time.

Sharda Neelum, AJK
Claimed to be the first formal teaching institute for Bhudist.

Bhag, Balochistan
A shrine

Sibi, Balochistan
Chakar fort of Baloch Sardar Rind. It was constructed in 1500 AD.

Sibi, Balochistan
Chakar fort, constructed with mud brick.

Historical buildings:

Al-Bairuni in his book Kitab-ul-Hind mentioned the importance of Sharda University.

Trees\Grass

Pun

Manjandri

Angrazi babur (Sindhi name)

Banyan (Bargad in Urdu)

Narial (Coconut)

Date

Trees:

Information regarding trees and grass given here, are the trees which are mostly found in those areas and are used either in construction, furniture, shading or for fuel purpose. This does not covers all the type of trees in respective area.

Trees\Grass

Eucalyptus

Sindhi Babur

Sheesham (Tali)

Sir (Sindhi name)

Eucalyptus (locally known as Safaida)

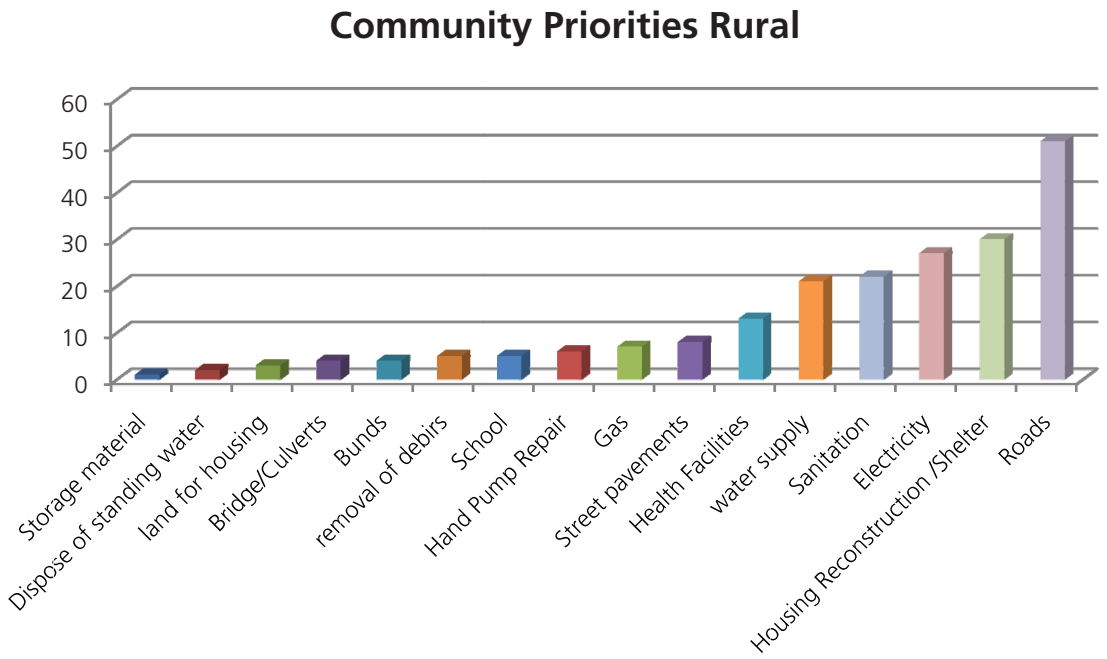
Neem

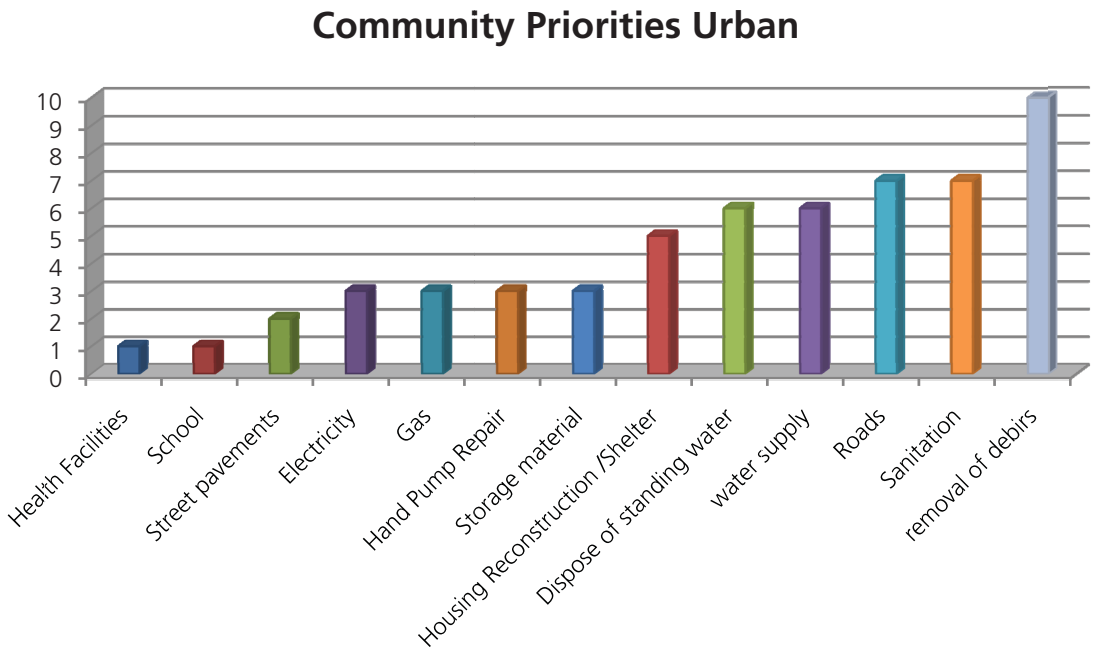
Trees:

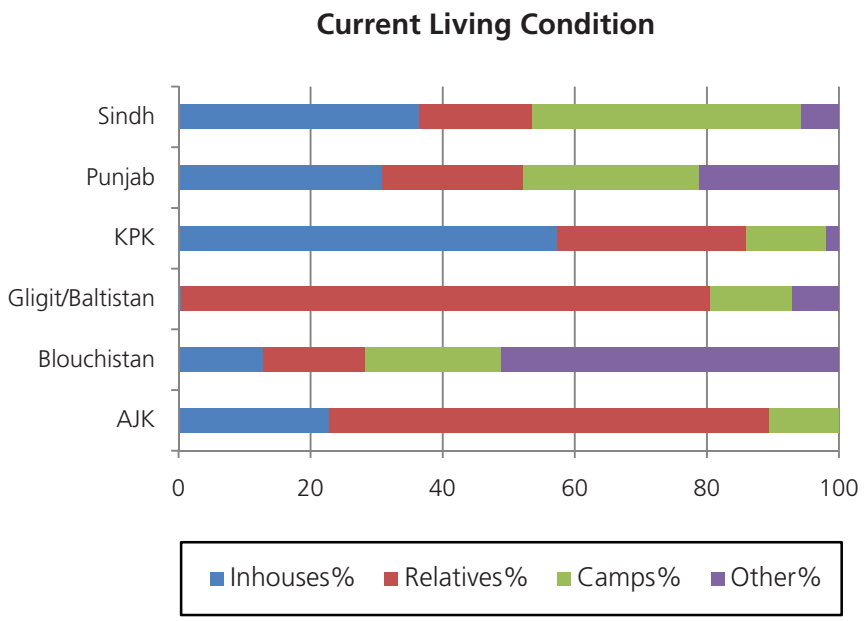
Information regarding trees and grass given here, are the trees which are mostly found in those areas and are used either in construction, furniture, shading or for fuel purpose. This does not covers all the type of trees in respective area.

Annex I - Graphs

Community priorities in early recovery.







In GB and AJK, majority of affected population live with their relatives. About 60% of the families were living on their plots/ in their house in KP. About 40 % of the affectees were living in camps in Sindh

Annex II - Case Studies

Case study:

House of Mr. Kaloo Khan resident of village Bella wala, Union council Sehar Sultan, tehsil Jatoi, District Muzaffargarh. (45 Km from Jatoi)

This house is located in village Bella wala which is on the right bank of the BUND along river Chinab and luckily was not affected by the recent flood. Usually this area was flooded by the river Chinab.
Mr. Kaloo Khan 52 along with his 5 sons, 3 daughter and mother living in this village since his forefather time. His son Ghulam Akbar also living with them along with his family.
Mr. Kaloo along with his family is a farmer, doing the farming on his own land as well as he get the land on contract from the land lord.
Although this house was not damaged in the recent flood, but due to the torrential rain only the boundary wall has been damaged at some places especially at corners.
They have been facing flood every 3 to 4 years. The worst flood they have faced in 1992 in which his house was damaged along with other villagers. They had received the compensation from govt as 10,000 for CD houses and 5,000 for PD houses.

Features of the house:
Layout:

Its almost one kanal plot surrounded by the boundary wall, having 2 units along with 2 storage rooms for silo and fertilizer, each unit is attached to each other having separate open kitchen. Like the traditional houses, this house also has a big courtyard having one big tree, hand pump and one Tandoor. (tandoor is also shaded by the tree)
House owner don't have latrin, open defecation is the normal practice. Hand pump is surrounded three sides having height 3 to 3'-6". House owners also uses this area for washing as well as bathing surrounded by Charpai or curtain.
Rooms size is 18'-0"x14'-0", normally rooms size depends upon the size of girder.
Previously he has one room house along with storage rooms (Hatian), as per tradition when son got married; they need another house/ room. One can easily notice the extension along the left end of the house.

Walls:
As this area is prone to flood, the house owner constructed the house with 13 ½" brick masonry with mud mortar. For the back wall (which is directly facing the flood or rain) they have used 9" thick burnt brick as exterior skin while on the interior they have used 4 ½" thick sundried brick. For the side and front wall they have used 4 ½" burnt brick for outer skin and 9" for interior skin.
Also to avoid dampness owner have used plastic sheet after every two courses on the back wall and at plinth and lintel on the sides and front wall.
Due to the extreme hot weather of the area, height of the walls is 12'-0", having small windows (2'-0") on the front wall and ventilators the both sides of the walls. (Front and back).

Foundation:
As this area is prone to flood, the house owner considers the local practices while constructing the house. He elevated the plinth around 7feet. They called its THALLA. He has compacted the platform manually by using hand compactor (DURMUT).

The normal foundation of this house, they dig the foundation more 3 feet down from actual ground level, having width around 24". They have used the 4" to 6" brick ballast as the lean. After the lean, they had constructed the 18" thick burnt brick wall (using plastic sheet after every 2 courses till plinth level. Plinth is also raised 15" from the back side and the side walls of the house, while on the front side it is leveled to floor while the threshold is only 3" above the floor level.

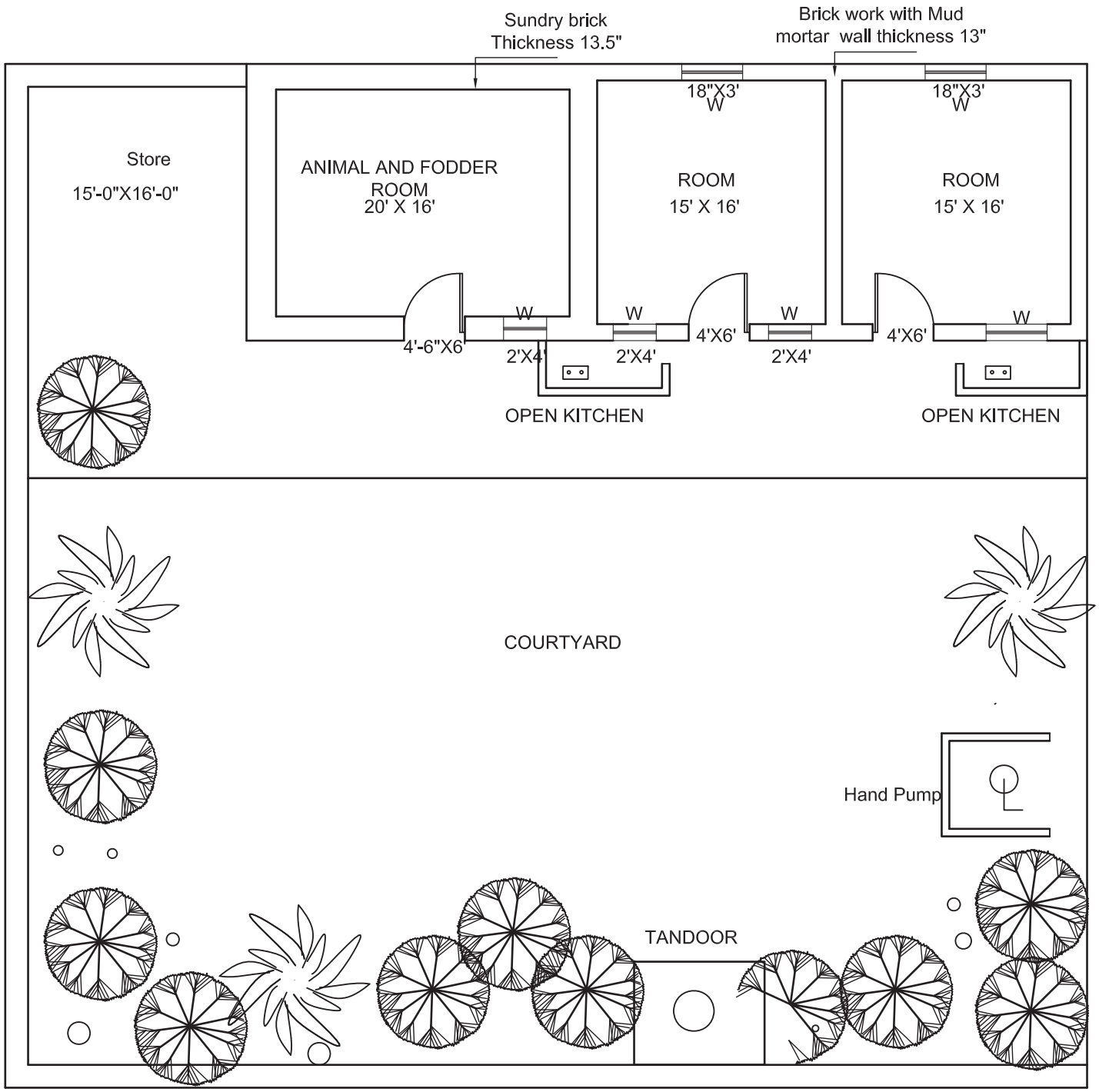
Roof:
Roof is made with girders, house (room) of Kaloo khan used wooden joist along with T-iron at the 9" c/c. while his son used T-iron above the metal girder. They have used the brick tiles 12"x6"x 1 ¼", above tiles they have used the plastic sheet which is covered by 2 inches dry mud which is plastered by 2inches of stabilized mud (mixed with straw).
To ensure the effective drainage of rain water from the roof, he has provided the slope in the roof along with water spout and 3inches parapet surrounding the roof top.

Interiors:
There are 9 inches wide shelves in the three sides of both the room for putting utensils. Mr. Kaloo's rooms is plaster with mud from inside while his son's rooms is cement plasters and color painted. In both rooms niches are also provided while metal trunk boxes are at the one corner of the room. Each room having the capacity of accommodating the 5 to 6 charpais.
Floor is mud plastered. Kitchen is on the both corners of the house, surrounded by 2'-6" mud wall.
This house as like other houses in the village have fair face finish from the exterior while plaster (mud or cement) from inside.

Maintenances:
The normal maintenance is the flooring by lapping it with mud sullery (mixed with wheat husk). For the roofing they maintain on yearly basis depends upon the rainfall. House owner is capable to do the normal maintenance of his house i.e. mud plaster.
Walls having mud plasters is maintained by the mud sullery, for this purpose they use special mud having white particles.

Construction:
Mr. Kaloo shared us when he was planning to re construct another room for his son, it took him almost a year to arrange the resources (material), after arranging the material than he hired the masons and labor for construction.
Now a days the normal daily wages of the masons are 400 to 500 per day while for labor its 250 to 300 per day.
The 90% constructions were done by hired mason and labor while 10% houses owners were supporting the mason in re construction. Masons are from the adjacent union councils. One mason along with 3 labors can easily construct one room in 8 to 10 days.
Before flood the burnt brick cost them around 3.50 PKR and sun dried brick was 0.83 on site. While for the mud they were using the nearby field. It charges those around 12 rupees per cft. Normally they are using donkey carriage.

Photographs showing different features of the house of Mr Kaloo Khan



House plan of Mr.Kaloo khan and Ghulam Akbar

CASE STUDY: VILLAGE TALLI, SIBI

Introduction

Village Talli in Sibi district of Balochistan is divided into two settlements – Talli and Sultan Kot. It is a little more than 25 km east of Sibi city. The village is one and half km in length running west to east and one km in width (north-south). Streams emerging in the northern hilly areas flash flooded Talli during the monsoon rains damaging housing, roads, and infrastructure and services including water supply and waste disposal systems. Balchistan has recently restored the Deputy Commissioner as the executive and in charge of revenue collection. The Provincial parliament is set to restore magisterial powers to the DC as well.

Community and Settlement Pattern

The combined population in both the settlement is reported as about 1800 households with an average household size of 12 persons. Of the total women headed households are 15-20%. The social make up is tribal comprising of Bagrani, Salmanzai and Qutub zai tribes. Majority speaks Sindhi and some speak Seraiki as well. The large majority are gainfully employed as small farmers and farm labor. 2-3 families live together in joint families sharing kitchen and open spaces. The large majority has national identity cards and about 10 -15% have bank accounts. Eighty to eighty five percent households rely on mass media and public announcement for news and warnings. There is one community organization in the village called Youth Union.

Services

The village has electricity and 'piped' water supply. The settlement grew organically. The lanes are of compacted earth. Open spaces are interspersed between houses in different sizes. The settlement has a boys' high school, a girls' middle school and 4-5 primary schools. The village also has a mosque and a police outpost. Talli has a mobile coverage and there is a Ufone tower in the village. Drainage and sewerage system is missing and women use enclosures as dry latrines and for baths and men go out into open fields for defecation. People do not value good hygienic practices.

Land and Construction

Eighty percent of the households claimed having ownership of land and the rest were on rent. Renters are mostly share croppers (50-50) and live on land lords' land providing labor. Majority of the households build their own houses with the help of masons. At an average there are 5 rooms per housing unit overlooking a courtyard bounded by low walls. Thatch shelter is used as a kitchen, where dried timber is used as fuel for cooking.

The houses are mostly (80%) built of rammed mud walls, where clayey soils are mixed with straw and laid in two feet high and one foot thick layers. The roofing is mainly of timber (local wood) frames supporting Palal (type of dried palm leaves) covered with a mud layer. The thicker dimension timber rafters are supported on mud walls and they in turn support smaller dimension (2" dia) runners upon which Palal are laid. Clayey soil and timber is locally available. Households purchase Palal and straw. Some people use timber and tier-

girders from Sibi for roofing and also burnt bricks for masonry (20%). Local masons help households in construction.

Cost and Finance

An average mud house costs about Rs.50,000. The costs are mainly for straw, Palal, doors and windows, construction equipment rental, transport and labor. Households build incrementally and fund construction from seasonal earnings, savings (conversion of family assets like livestock and jewellery). Few of the households borrow from informal money lenders. The usual rate is 5% monthly till the loan is paid off.

Average cost of farmland is reported as Rs.50,000 to 250,000 per acre and land in village for housing as Rs.400,000 per acre.

Infrastructure and services are provided mainly by Government.

Flooding

Flash flood hit the village and people sought shelter in high grounds. Four feet high flood came from the northern side and inundated the village and the force of the running water damaged housing and washed away livestock and household goods including savings in the form of beddings, clothing and jewelry. 6 persons were injured. One woman has been seriously injured and is hospitalized. The flood water receded after 15 days but has left behind stagnant pools in low lying areas, damaged crops, seeds and polluted ground water.

Damage to Housing

In majority of the cases, flash flood has damaged walls and caused them to collapse and fall down. Falling walls have caused roofing to collapse. Standing water in some cases have eroded the foundation and walls have sunk in causing roofing to and windows and doors to collapse. In majority of the cases damaged walls need to be pulled down and rebuilt.

Damage to infrastructure and services

The metal road from Sibi to Talli has been damaged at number of places. In most cases, the earth has given way by the road sides and the culverts and small bridges have broken down. The road ends at Talli village. Where the road survives the metal top is intact and in good condition. Most part of the road is intact and in good condition.

Overhead water tank in the village is in working condition but the underground water source has been damaged. Military tankers provide water to the tank which is then pumped to the overhead water tank. The water flows to houses by gravity. Majority of the households were seen using rubber pipes, and the water was constantly flowing into stagnant pools. Quality of water is poor and storage and distribution is unhygienic.

Mosque, schools, police outposts and other public buildings are made of burnt bricks with concrete roofing. They have been partially damaged and require repairs and rehabilitation.

Flood water is stagnating in low lying areas, especially adjacent to the link road. This is because the water is trapped by the road and cannot flow into the low lying fields on the other side of the roads

Early Recovery

Large numbers (80%) of households continue to stay in the village despite damage to their houses. Of these 40% are staying with their relatives and in tents/ or makeshift shelters. About 15% of the households have shifted their women folk and families to rented accommodation in Sibi city or they are staying in Sibi city with relatives. UNHCR, Government and civil society organizations have provided food, medical relief and temporary shelter to the people.

About 15-20% of the households have started rebuilding their houses. Majority of them are slavaging wood and reusing the mud for reconstruction. The villagers are constructing mud walls, brick masonry and repairing roofs and doors and windows with the help of construction equipment provided to them. About one third of the villagers, especially those living in rented housing are planning to emigrate.

Villagers have also started to prepare for winter sowing and have recovered stored grains, utensils and farm implements.

Annex III - Survey Forms

Mason Group Discussion

District…….. Numbers ……
Tehsil…… Skilled ……
Location …… Semi Skilled……
Date:_____/ _____/2010 Carpenter……Mason……SF…… s
Tehsil……UC…….... 1……
R Village……..S Village…… 2……
No of Participants: …… Date:_____/ _____/2010

1. Type of construction in group focused area ……..
2. Who involves in:

Description	Mason	Carpenter	Steel fixer	Owner	Skilled	S Skilled	Un Skilled
Foundation							
Plinth							
Walls							
Roof							
Mud							
Plaster							
Flooring							
Joinery Works							

3. How long does it usually take to build a two room house?

Pucca	1 month □	2 months □	3 months □	4 months □	More than 4 months □

Kacha	1 month □	2 months □	3 months □	4 months □	More than 4 months □

4. How people are typically working to build a two room house?

1 □	2 □	2-4 □	4-6 □	More than 6 □

5. What kind of skilled persons are in the village?

Rammed earth mason	Adobe brick maker	Fired brick maker	Brick layer / mason	Roofer

Notes:

Materials:

6. What was the usual quantity and cost of materials for 2 rooms?

1 Sand……..
2 Stone…….
3 Crush……..
4 Brick…….
5 Steel……..
6 Wood…….
7……
8……
9……
10……
11…….

7. What was the usual quantity and cost of materials for boundary walls, latrines and other works?

8. Where did the materials come from?

	Stone	Earth	Bricks	Timber	Bamboo / small poles	Matting	Girders	Windows / Doors
Own								
Village								
Market								
Cost/Unit								

Notes on Materials: previous availability, transport etc.

9. Can building be made safer against flood? If yes then how?

.....
.....
.....
.....

10. Can mud walls be made stronger? If yes then how?

.....
.....

……
……

11. Observation of any building which stood in flood? What reasons cause it so?

……
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……
……

12. What is the general construction process?

……
……
……
……

13. How artisans are formed?

……
……
……
……

14. Daily wages

	Skilled	Semi Skilled	Labour
Mason			
Carpenter			
Steel Fixer			

Conclusions from the field visit and mason group discussion

1. How for artisans are involved in construction?

   ……
   ……

2. What is the skill level (good ,average, poor)?

   ……
   ……

3. Which type of skill is better than other type?

   ……
   ……

4. Which type of skill is poorer than other type?

   ……
   ……

5. What type of training they require?

a. Improvement in basic skill
b. Hazard focused training

6. **How is their role in community? i-e Influential, not influential**

   .....

   .....

7. **How construction is carried out? i-e contract or on wages**

   .....

   .....

8. **Are they whole time artisans or part time?**

   .....

   .....

9. **How far house owner is involved in construction?**

   .....

   .....

   Note if any:

   .....

   .....

   .....

Assessment August 2010 flood affected area

Technical Assessment of buildings

Province.....District.....

Tehsil.....UC.....

R Village.....S Village.....

Name of the owner .....

Male .....

Female .....

Name of Interviewers

1.....

2.....

Date:_____/ _____/2010

Coordinates

N..... E.....

Elevation .....

Local Knowledge, perceptions and practice

1. How buildings could be made safer against flood (what do you do)?

Pucca masonry (brick block, stone with cement mortar)

.....

.....

.....

Kacha masonry (brick, adobe, mud and dry masonry)

.....

.....

.....

2. Usually What measures you take to prevent damage from flood (what do you know)?

House

.....

.....

.....

5. Any practice/ Knowledge of water resisting mud plaster and its performance?

.....

.....

5. What type of soil is better for mud wall construction and why they think it is?

Walls.....

Roof.....

Plaster.....

6. Is the soil they think good is available in village? Yes ☐ NO ☐

If No from where they bring

.....

7. What will be constraints in the reconstruction of the houses?

Material.....

Skills……..
Land……
Other……..

8. What, when and where are you planning to build?

……
……

9. What material you have and will re use?

Mud	☐	Door	☐	Windows	☐	Bricks	☐
Steel girder	☐	Bamboo	☐	Wood	☐		

How to Document

Existing Buildings (Note): Document at least two existing building showing the maximum possible features. If all the buildings have been wiped out in the village draw a sketch with the help of house owner and write the details of the material and technique. Layout plan of typical compound and buildings, including: Living accommodation, kitchen, latrine, bathing, washing, storage of fuel, food, trees, water, other.

What kind of construction is this building ?
Kacha
Semi kacha
Semi pakka
Pakka

How many floor?

Is this building damaged?

Building 1

Draw Layout Plan (1:100)of the site showing all the structure in compound with dimensions.

1.Draw the House Plan (1:50) with all dimensions.
2. Draw the Cross-section (1:20)of the building (from Foundation to top) 3.Photograph the damage pattern (Condition of foundation, Walls and Corner, Roof ,Sequence of collapse) 4. Construction techniques (Highlight good and bad practices on back of the paper).

Guiding Notes for Surveyor

1. Confirm, explore and document any local practice for prevention of village and house?
2. Document and explore the reasons for intact house and villages.
3. Compare two villages with same flooding conditions if they have difference in extent of damage.
4. Find the damage pattern of the building of each type in condition of Flowing water and standing water.
5. Check the people perception and intention for future possibility of mud construction.
6. How buildings are damaged by

a. Moving water

.....

.....

.....

b. Standing water

.....

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.....

7. Any local practice of?

Improved walls	☐	Raised building platform	☐	Plantation/hedge	☐
Drainage trenches	☐	circumferential bund	☐	Intercepting drains	☐
Other than above	☐				

Give Detail of above if any exists

.....

.....

.....

Any practice of rammed earth walls

.....

.....

Conclusion of Technical Assessment

1. What are the major deficiencies in construction techniques and building typology?

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2. What feasible improvements are suggested in prevalent construction type?

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3. What are the feasible options for improved settlements with respect to the flood?

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UN-HABITAT
FOR A BETTER URBAN FUTURE

Shelter Rapid Assessment

Community Group Discussion Form

Form# _____

Date _____

Team# _____

District		Tehsil	
Union Council		Village	
□ Rural	□ Urban		□Semi Urban
GPS Coordinates	X:	Y:	Elevation:

1.Community related information

a. Total population				Nos.	
b. How many households?				Nos.	
c. Women headed households?				Nos.	%
d. What is the average household size?				Nos.	
e. Persons with NIC/CNIC					
CNIC		***NIC***		***None***	
Nos.	%	Nos.	%	Nos.	%
f. No. of persons dead in flood	Nos.	Injured			Nos.
g. Head household with bank account (On-line bank)				Nos.	%
h. Head household persons rely on public and community communications (e.g; TV, Radio , Community leader etc)				Nos.	%
i. What is the major language spoken?					
j. Which is the major social group here?					%
k. Which are the other social groups here?					%
					%
					%
l. What is the major source of livelihood?					%
m. Is there a community organization? If yes, then mention the name of organization and contact person name	Organization:				
	Person Name:				
n. Where are people living presently?					
i) In their houses/ in their plot					%
ii) With relatives and friends or in camps in the same village/community					%
iii) In camps or outside the community					%
iv) Others (Specify)					%
o. Head house hold have migrated or planning to migrate				Nos.	%

2. Housing trends before flood					
a. How many households are					
Owners		Tenants		Live rent free	
Nos.	%	Nos.	%	Nos.	%
b. What is the average no. of rooms per house?					Nos.
c. Average number of floor					Nos.
d. Give different types of construction and their average costs					
Kacha			***Pacca***		
Banna/Grass cottage	%	Rs.	Unreinforced brick/block masonry	%	Rs.
Jumphari(light frame)			Unreinforced stone masonry		
Mud house			Reinforced block/brick masonry		
Adobe			Confined /RC with block or brick masonry as infill		
Stone masonry			Timber reinforced stone masonry (bhatar)		
Other:			Other:		
e. Who builds the house?					
i) Self family					%
ii) Masons and hired labor					%
iii) Masons with family					%
iv) Others (specify)					%
f. Building season starts from which months and ends when				Starts:	
				Ends:	

3. Housing trends after flood					
a. How many houses have been destroyed completely?					
Type	***Wiped out%***	***Destroyed%***	***Partially destroyed%***	***Filled with debris%***	***No damage%***
Kacha					
Banna/Grass cottage					
Jumphari(light frame)					
Mud house					
Adobe					
Stone masonry					
Brick/block masonry					
Pacca					
Unreinforced brick/block masonry					
Unreinforced stone masonry					
Reinforced block/brick masonry					
Confined /RC with block or brick masonry as infill					
Timber reinforced stone masonry (bhatar)					
Other:					

b. What shelter material (salvage) is presently available to people?				
Walls	***Frames***	***Roofing***	***Others***	
%	%	%		%

c. Where will masons and labor come from for reconstruction?			
□ From same area			%
□ From out side	Location:	Distance: Km	%

d. Where can people get the building material from?			
□ From same area			%
□ From out side	Location:	Distance: Km	%

4. Services and Infrastructure

a. What is the condition of water supply?

Type	***Before flood***	***After flood***
i) Source		
ii) Collection and storage		
iii) Quality of water		

b. What is the means of toilet and washing?

Type	***Before flood***	***After flood***
i) For men		
ii) For women		

c. Is there any damage to the water supply and sewers, if any?

d. What is the condition of transportation and roads before and after flood?

Before	
After	

e. What fuel do you use for cooking before and after flood?

Before	
After	

f. What is the community's priority about repair of infrastructure?

i)	ii)
iii)	iv)

g. What is the difference in the electricity situation before and after flood?

Before	
After	

5. Land settlement					
a. How many persons live on?					
State Land		***Own***		***Landlord***	
Nos.	%	Nos.	%	Nos.	%
b. How may HH land have been washed away?					Nos.
c. What is the tenancy agreement between the landlord and tenant farmer (in recovery)?					
d. What is the tenancy agreement between the state and the occupants?					
e. Explain and kind of land dispute that would affect re construction?					
f. What is the cost per unit of land?					
Agriculture		***Residential***		***Others***	
Rs.		Rs.			Rs.
g. Is the settlement subject to flooding?					
i) Seasonal, what is the damage and how do people respond to it?					
ii) Occasional, what is the damage and how do people respond to it?					
iii) This flood, what is the damage and how did the people responds to it?					
h. What the water level?		was:		is:	
i. What was the duration of flood water?		days:		hours:	
j. When water will recede?					
k. Is the settlement subject to other hazards? If yes explain(e.g. earthquake , landslide ,etc)					
l. What is people's perception about rebuilding? (Location of settlement, construction of bunds/dams, drainage, etc.)					

m. How do people want to reconstruct (Community plan) ?
In the next six month
For long term

Team member #1 _____

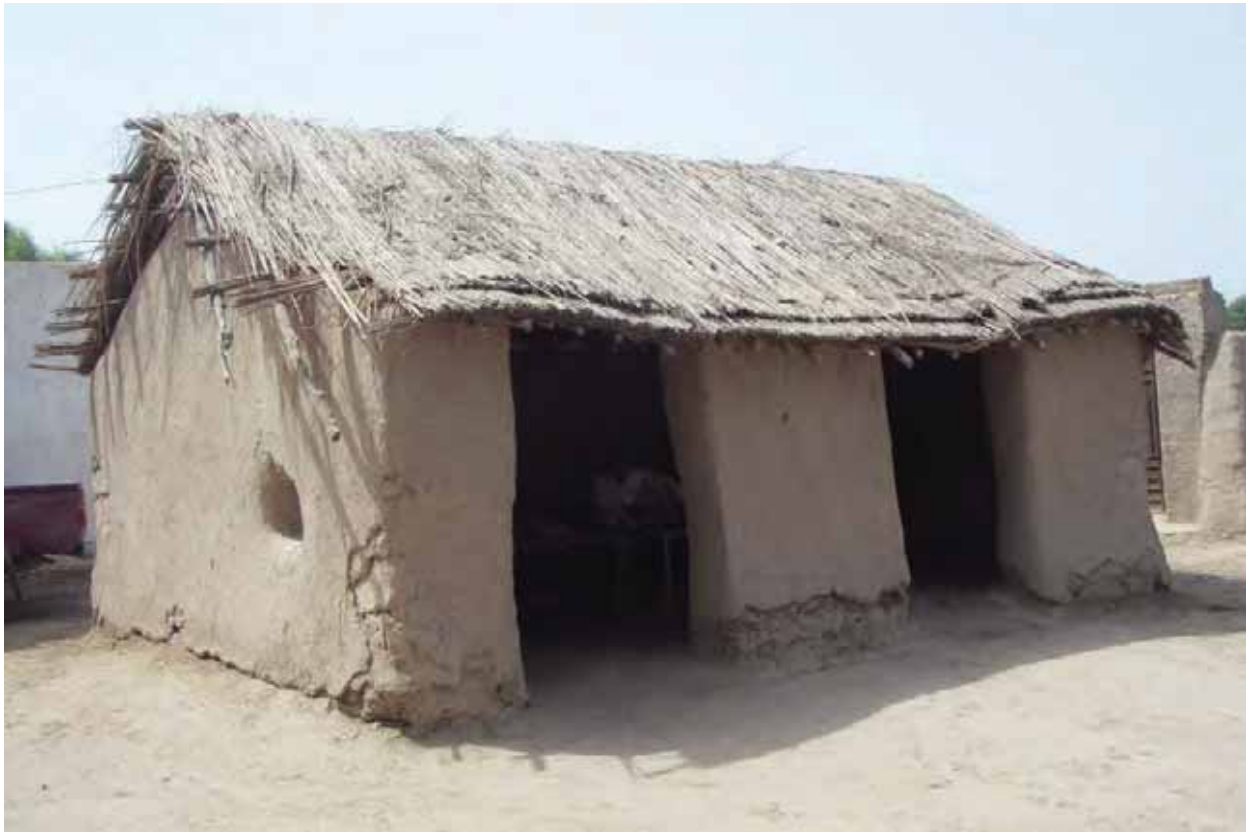
Team member #2 _____

Team member #3 _____

Reviewed and checked by _____

Annex IV - Useful Information

Grass house Sindh. Local grasses and reeds affected by flooding. May be improved by fixing to ground and bracing for cyclones. Household needs sanitation solutions.



Mud house pitched grass roof Sindh. Local grasses and reeds affected by flooding. May use plastic sheeting as temporary roofing. Walls can be built in short time.

Mud construction can be improved by better compaction and other cheap improvements, but better by settlement protection measures. Mud is not easy to salvage or reuse, mud is not available or free everywhere. It performs very well in heat and has less environmental impact than fired materials. Bottom pics new shelter constructed in Punjab last week august.

Sindh mud house with pitched grass roof. Using a steel girder. Priority purchase for many households. Can be more economical. Natural materials in roof good for climate, durability issues can be improved.




Steel girders are used with bamboo, reeds, t- iron, cement tiles etc and will be a key investment for families, they can be better quality to avoid twisting, including lighter and more economical open girders (bottom right).

All roofs can improve water proofing and thermal performance saving bills.

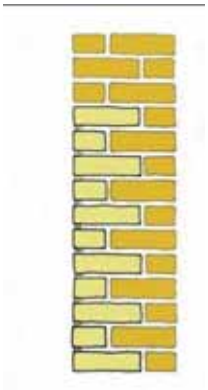
Poorly waterproofed or constructed roofs will fail in heavy rain and can pull down the walls. Better design and construction can increase the lifespan of the roof.




Local materials supply will be affected by flooding, markets need to be regenerated, replanting needed, livelihood opportunities, mitigate inflation. Investment goes into local economy. Local materials best for climate.




Roof tiles will increase in use as roofing, with mud or screed. Top shows energy efficient tiles made in Pakistan which can make a large difference to inside temperature. Other cheaper measures can also be used. Bottom pics from Punjab shows family investing in new tiles end august so shelter materials are reusable.



Unfired brick and mud mortar walls can be improved for flood resistance and durability by using fired brick in the exposed face of the building. Fired brick in mud mortar is also vulnerable to washing out and can be improved with sand cement mortar pointing in the joints. Bottom left pic shows fired brick facing on mud brick and pointing on outer face.

After the flood 2007, many families invested in metal containers to replace the earth pots previously used for grain storage. Building improvements should include storage, water sanitation, fuel efficient cooking and other priorities not only the dwelling house.

For communities at frequent risk of flooding with katcha housing, any surplus financial assistance over and above the house replacement cost, can be used collectively to carry out rudimentary settlement mitigation works by the community and other infrastructure works including safe water and sanitation which should be considered basic housing needs.

Annex V - Assessment Team Members

Province	Team	Members
KP	KP1	Fahad Ali (Team leader)
		Imran Ullah
		Naveed ur Rehman
	KP2	Ghulam Jilani (Team leader)
		Abdul Saboor
		Faraz Ahmed
Punjab	PN1	Sana Ullah (Team leader)
		Daood Hussain
		Irfan Ullah
	PN2	Maqsood Akram (Team leader)
		Abid Tariq
		Muhammad Shafait
		Ihtisham Gul
	PN3	Sheikh Ahsan (Team leader)
		Zubair Hashmi
		Imran Ahmed
Sindh	SN1	Hamid Mumtaz (Team leader)
		Saeed UR Rehman
		Nisar Ahmed
	SN2	Parvez Ahmed (Team leader)
		Safdar Mehmood
		Munir Bukhari
	SN3	Aitizaz Ahsan (Team leader)
		Sajid Rasheed
		Majid Rashid
Balochistan	BN1	Muhammad Imran (Team leader)
		Arshad Ali
Gilgit Baltistan	GB1	Shabbir Hussain
Azad Kashmir	AK1	Sabar Awan
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UN-HABITAT IN PAKISTAN

UN-HABITAT has been operating in humanitarian and crisis situations and for development supporting federal and provincial governments, local authorities and civil society to strengthen capacity to manage and recover from man-made and natural disasters and mitigate future calamities. The cornerstone of UN-HABITAT's strategy is sustainable relief and recovery leveraging investments in the emergency and recovery phases into the longer-term development of human settlements. Through participation at the earliest stages, UN-HABITAT ensures that human settlements interventions, either immediate emergency or transition recovery, are linked to longer-term development strategies for affected areas. UN-HABITAT is applying integrated approach in all interventions. Shelter, WASH and community infrastructure development projects have been merged as a single package in overall disaster response as a matter of policy so that all the basic amenities can be addressed while facilitating communities. The same approach is being introduced for flood response.

- **Sustainable Urbanization**

  UN-HABITAT leads the Sustainable Urbanization component under the Joint One UN Programme on Environment (JP-4). UN HABITAT is in process to launch the Sustainable Urbanization component in a meaningful manner. The objective of the component is to "create a better understanding of critical urban issues affecting slum dwellers and urban poor, including issues related to climate change (as a contribution to achieving MDG-7)". The objectives are to establish baseline data and mapping on critical urban issues, to create multi stakeholder based mechanisms for participatory urban planning and management and to improve indicators of informal settlement dwellers through demonstration projects.

- **Disaster Risk Management**

  The projects in the One UN Joint Programme for Disaster Risk Management are developed in collaboration with government. UN-HABITAT supported NDMA following June 2007's flood by conducting damage assessments, formulating reconstruction policies, and assisting in mapping and information services. Furthermore, UN-HABITAT has formulated, designed and disseminated several technical information tools and guidelines for safer reconstruction in disaster hit areas.

- **Technical Support to Pakistan Census Organization**

  UN-HABITAT Pakistan is helping build the capacity of Pakistan Census Organization through provision of technical expertise and equipments for upgradation of GIS laboratories for improved and more accurate results. The support includes provision of modern GIS equipment, preparation of guidelines for procurement of GIS hardware, installation of advanced GIS softwares, development of GIS training manuals, trainings on use of GIS and advanced spatial analysis techniques, integration of census data into geodatabase for thematic mapping, creation of catalogue for Census Data and dissemination of maps.

- **Environment**

  Under the One UN initiative, UN-HABITAT is executing 'Water and Sanitation Improvement in Informal Settlements through Gender Mainstreaming and Empowerment of Local Authorities' project in selected cities of Pakistan. Project is being implemented as a part of One UN's Joint Programme 'Environment' Component 1 and 2. The project aims at facilitating access to water and sanitation for urban women, thereby improving their quality of life and freeing more time for women to engage themselves in other socio-economic activities.

- **Land and Housing**

  Through Housing Reconstruction Programme in collaboration with ERRA, UN-HABITAT supported the owner-driven reconstruction approach by providing technical assistance to affected families after earthquake of 2005. To create sense of ownership in communities and to ensure sustainable results, UN-HABITAT involved local communities through social mobilization to take part in rehabilitation and reconstruction process.

  UN-HABITAT Pakistan implemented ERRA Rural Landless Project to support the families in the earthquake affected areas of KPK and AJK who had lost their land due to the earthquake or those who were living on highly hazardous areas. During the course of this project, affected families were provided a safer piece of land through transparent mechanism of one-window operation.

- **Shelters**

  UN-HABITAT provided culturally and environment-friendly emergency winterized shelters to the affected populations in AJK, KPK and Baluchistan along with training of skilled labour during earthquake 2005 in AJK and KPK, Balochistan earthquake 2008, internal displacement in KPK 2008-09 and recent floods in all over the country. The assistance includes provision of tents, temporary shelters, hygiene kits and house repair kits. It is extended to the construction of latrines, parda walls, school repairs and installation of water hand pumps.

This report gives an oversight of the typology of the houses in the flood affected areas, and records typical floor plans and the main features and the varieties of each type of house. Through a close examination and analysis of the damage (to foundations, walls, trusses, etc.) the causes of failure and options for improvement are analyzed.

The report also provides information regarding many of the factors that are likely to influence the design of any reconstruction response, such as:

- The size and structure of the households;
- The proportion of house-owners to tenants;
- Issues regarding land titles etc.
- The local availability of material, incl. grasses, timber and bricks, and the skills of the labor force in the area; and
- Typical periods suitable and unsuitable for construction in the different Provinces.

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