# Disaster Resilience of Indira Awaas Yojana Houses

*– Pilot study in six states*

2012

उन्नति
UNNATI
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Knowledge WORKS

# Contents

## 1.0 RURAL HOUSING : AN IMPORTANT STATE COMMITMENT

Housing is one of the most fundamental essentials of a dignified life. The constitution of India lays down access to housing as one of the primary responsibilities of the State towards the citizens. Towards this end, Government of India has been implementing a large assistance programme for housing for at least 3-4 decades that has evolved into what is now known as Indira Awaas Yojana (IAY).

Rural Housing is one of the six components of Bharat Nirman Programme. Under Bharat Nirman Programme Phase-I, 60 lakh houses were envisaged to be constructed through Indira Awaas Yojana during the four years i.e. from 2005-06 to 2008-2009. Against this target, 71.76 lakh houses were constructed with an expenditure of Rs.21720.39 crore. This figure has now been double to construct 120 lakh houses during 2009-14.

IAY is currently one of the most popular schemes of the government that is implemented across the country. In addition, similar programmes have also been instituted by various state governments specifically for addressing the housing needs of marginalized people in the state such as tribals, as well as specific trade communities such as beedi workers.

**" In the present form, IAY is one of the very popular schemes of the MoRD and has caught the imagination of the rural people. The popularity can be attributed to the fact that the scheme enables beneficiaries to participate and involve themselves in construction of their home. The role of the State Government is confined to mere facilitating use of local, low cost, environment-friendly, and disaster resistant technology and also in encouraging construction of sanitary latrine and smokeless *chulha*… The beneficiaries construct the houses as per their own choice of design, technology, and requirement."**

**(Source : XI Five Year Plan, pg 32)**

## 2.0 ROLE OF IAY IN DELIVERING HOUSING TO THE RURAL POOR

In the last few years there have been important revisions in the IAY provisions with the intention of making IAY accessible by the poorest in rural India. Some of these are :

- In order to introduce transparency in selection of beneficiaries permanent IAY waitlists are to be prepared gram panchayat wise by the States/UTs in order of their poverty status based on the BPL list 2002.

- Financial assistance provided under IAY for construction of a new house has been revised from Rs. 35,000/- per unit to Rs. 45,000/- in plain areas and from Rs. 38,500/- in hilly/difficult areas to Rs. 48,500/- with effect from 01.04.2010. Further, RBI has advised all banks to include IAY houses under the DRI scheme for lending upto Rs.20,000/- per housing unit at 4%.
- Sanitary latrine and smokeless chullah are required to be constructed along with each IAY house. For construction of the sanitary latrine, financial assistance is additionally provided from the Total Sanitation Campaign (TSC) funds.
- Government has approved a scheme as part of IAY for providing homestead sites to those rural BPL households whose names are included in the Permanent IAY Waitlists but do not have a house site1. Rs.10,000/- per homestead site is provided as support shared by the Centre and the States in the ratio of 50:50. States are also incentivized with additional physical targets equal to the number of homestead sites provided through regularization of existing occupied land, allotment of Govt. land or purchase/acquisition of land, as the case may be.
- Houses are invariably allotted in the name of women or jointly along with the husband.

## 3.0 PILOT STUDY ON SAFETY OF IAY HOUSES IN DIFFERENT VULNERABILITY CONTEXTS

**About the Pilot study and its methodology**

A study was undertaken by Unnati and Knowledge Works during June – December 2012 to understand the successes and limitations of Indira Awaas Yojana with regard to vulnerability of these houses to different natural hazards in the country. The following partners collaborated in the study at the state level:

- **Odisha:** Five villages of Satyabadi block of Puri district in collaboration with CENDRET and SWAD to study resilience of IAY houses to cyclones and floods.
- **Uttar Pradesh:** Five villages in Kaisarganj block of Bahrich district facilitated by Sahabhagi Sikshan Kendra (SSK) to understand resilience to floods caused by Ghagra River.

[1] The Planning Commission has set 27 monitorable socioeconomic targets. One of these targets is *'to provide homestead sites to all by 2012 and to step up the pace of house construction for rural poor to cover all the poor by 2016- 17'.* As per Ministry's estimates, there are 7.7. million rural BPL households who do not have a house site in the country.

- **Tamilnadu:** Select villages of Gingee, Kandamangalam, Vanur and Koliyanur blocks of Villupuram district in collaboration with Kalvi Kendra to capture the impact of Tusanami.
- **Uttarakhand:** Five villages of Dunda and Bhatwadi blocks of Uttarkashi district in collaboration with HPSS to look at the possible impacts of landslides.
- **Gujarat:** In collaboration with Swayam Sikshan Proyag, select villages of Jodia taluka of Jamnagar district to understand earthquake safety of IAY houses.

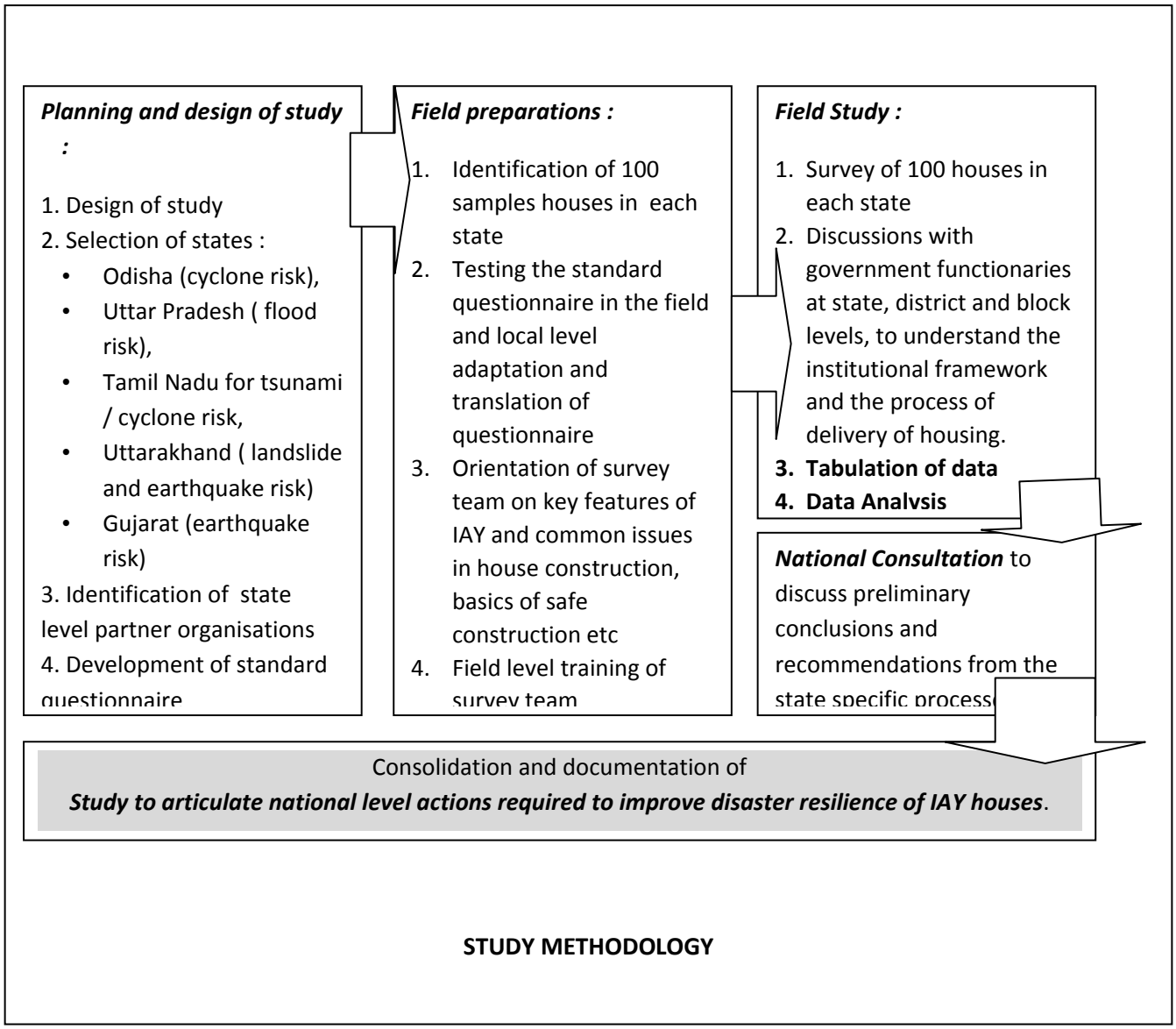
The findings of another independent study by the Centre for Sustainable Development in **Himachal Pradesh** were also integrated in the study. A total of about 600 houses were examined across the six states exposed to five different kinds of natural hazards.


**Location of pilot study districts**

Besides the field level data collection, state specific policy framework for housing delivery was also examined through meetings with concerned government departments. In some of the states, the Disaster Risk Management unit of UNDP provided valuable support to understand the housing safety guidelines and operational framework of IAY housing delivery.

The questionnaire used for collecting data included questions about the location of the house, process and material of construction, cost of construction etc. that Through discussions with government functionaries involved in housing delivery at the state, district and block levels, the study sought to understand the institutional framework and the process of delivery of state sponsored housing. This information served as a base for understanding the key bottlenecks experienced by rural families as well as the government machinery in achieving disaster resilient housing. The preliminary conclusions and recommendations from the state specific processes were discussed at the National Consultation organized in New Delhi on 21 December 2012 in collaboration with **basin**-*South Asia* Platform to advocate for integration of safety issues in IAY.

Learnings from all of these processes have been consolidated in this document which briefly captures state specific findings and articulates national level actions required to improve disaster resilience of IAY houses. Additional information on specific states is available in the state reports accompanying this document.

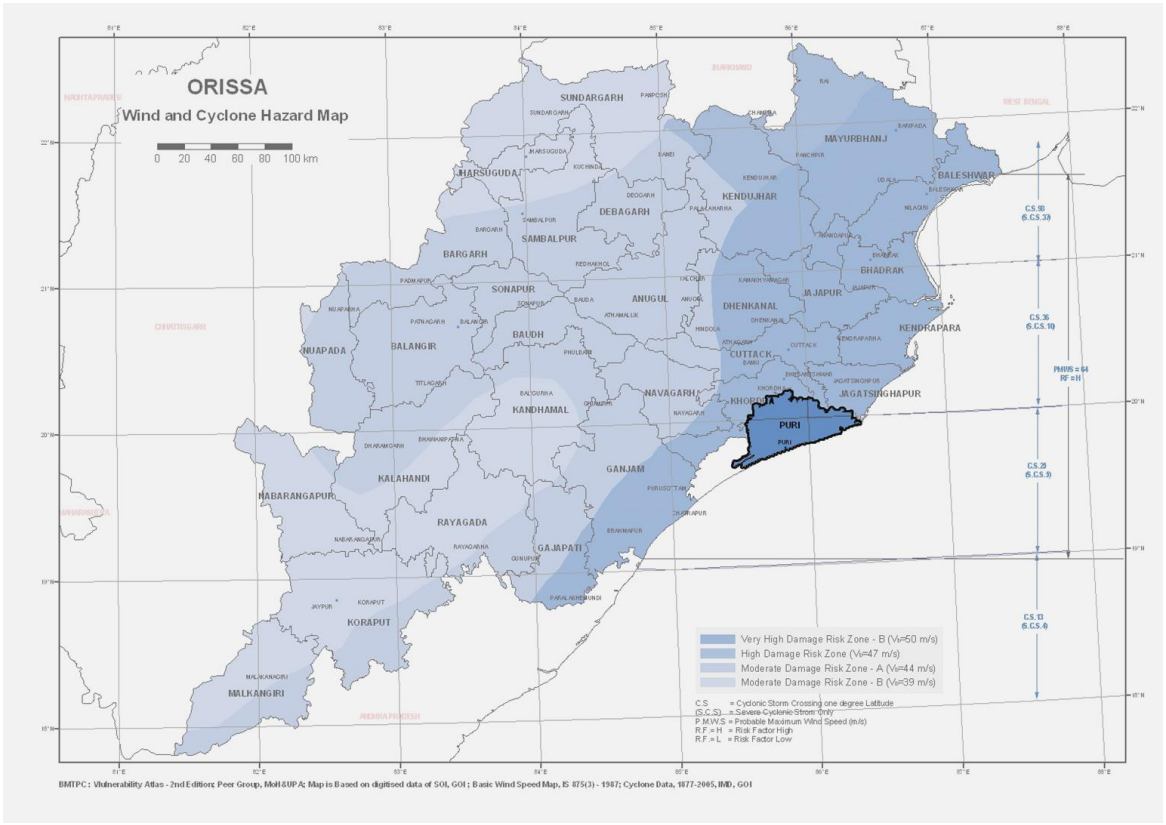



**STUDY METHODOLOGY**

## 3.1 ODISHA

Odisha is one of the most disaster prone states of the country. It is highly vulnerable to cyclones, storm surges, floods and drought. Its densely populated coastal plains are the alluvial deposits of its river systems. Besides these natural hazards, human-induced disasters such as accidents, stampede, fire, etc. vector borne disasters such as epidemics, animal diseases and pest attacks and industrial / chemical disasters add to suffering.

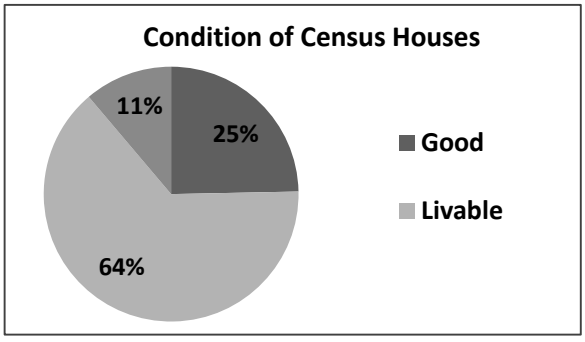
As indicated in the map below, most of the state is prone to high- very high risk of cyclones.




**Wind and Cyclone Hazard Map of Odisha**
(SOURCE: Vulnerability Atlas of India, 2007)

### 3.1.1 Status of housing in Puri District, Odisha (census 2011)

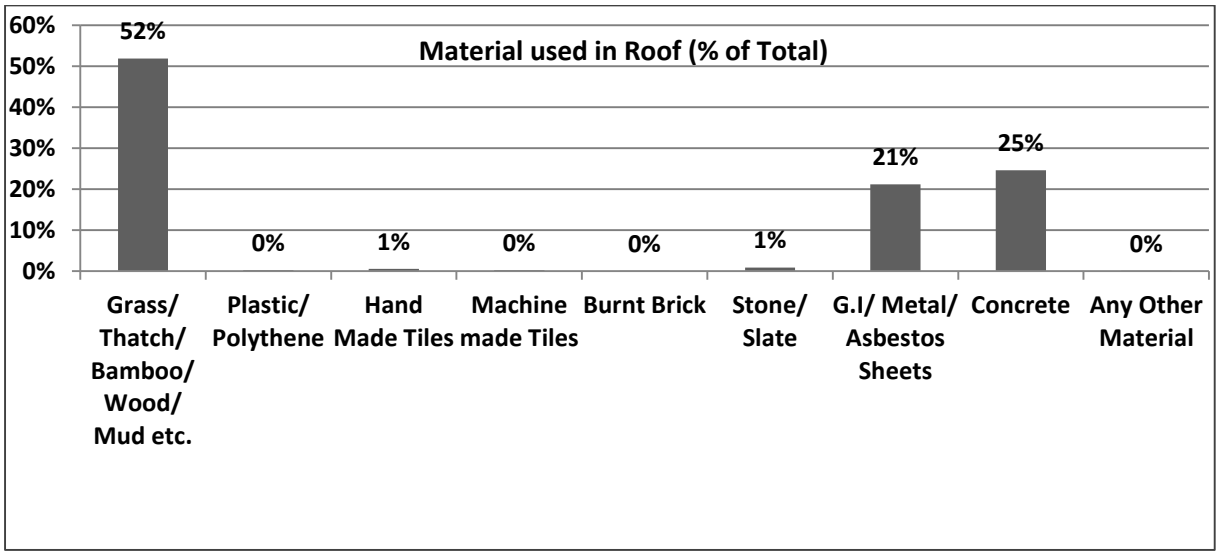
Census 2011 indicates the following trends with regard to Housing:




**Condition of Houses:** Approximately 25% houses are of good quality and 64% are of livable quality while 11% are dilapidated.

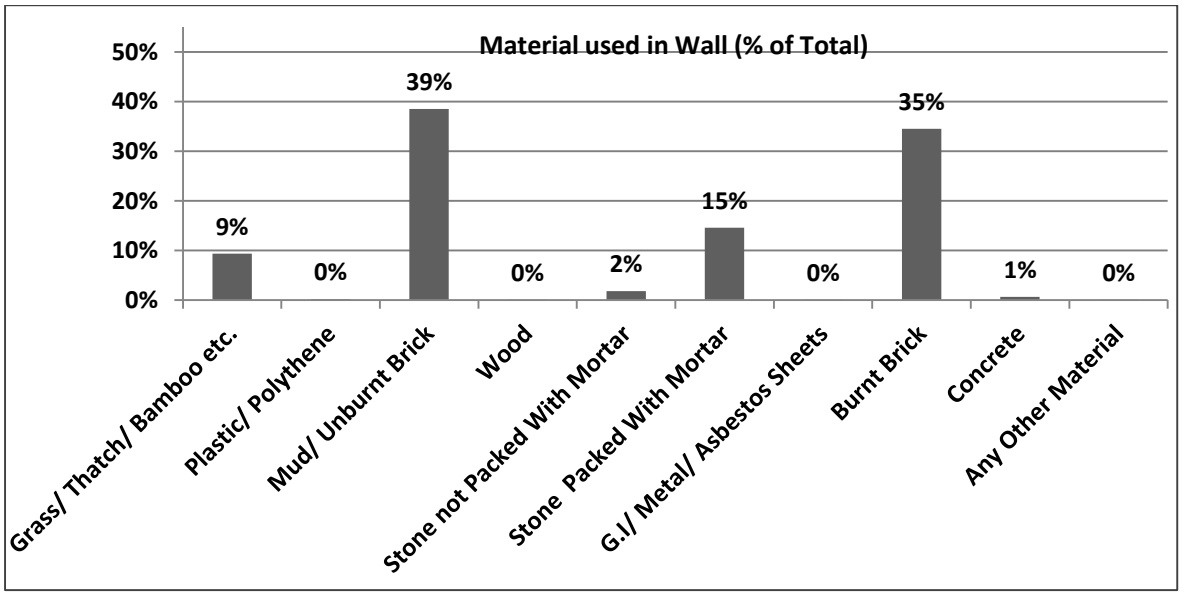
**Material used for Roofing**

The predominant materials used in the construction of roof are grass, thatch, bamboo, wood or mud followed by concrete and then G.I. or Metal or asbestos sheets.




**Material used for walling**

The predominant materials used are mud or unburnt bricks, secondly burnt bricks are used, followed by stone, packed with mortar which was also found to be common.



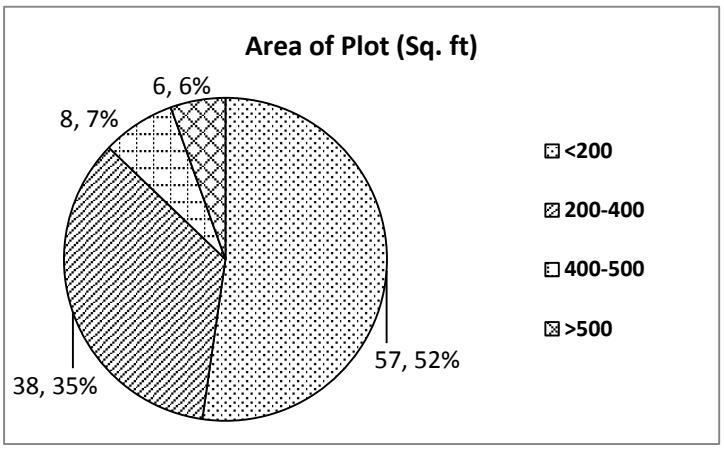
### 3.1.2 Status of IAY housing in Puri District – Findings of the Pilot Study

Key findings of the pilot study in Puri District are:

**a. General Observations**

- **Area of the Plot**

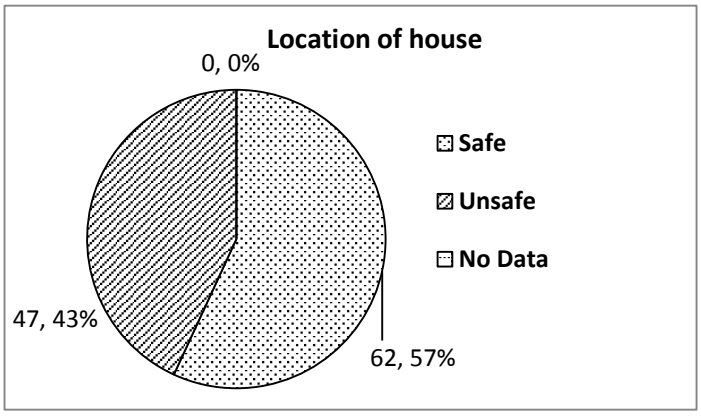
| Area of Plot (Sq. ft.) | <200 | 200-400 | 400-500 | >500 |
|---|---|---|---|---|
| No. of Plot | 57 | 38 | 8 | 6 |




Among the houses surveyed 52% plots were having area less than 200 Sq. ft., while 35% and 7% have an area ranging between 200 – 400 sq. ft. and 400 – 500 sq. ft. Only 6% plots have area greater than 500 sq. ft.

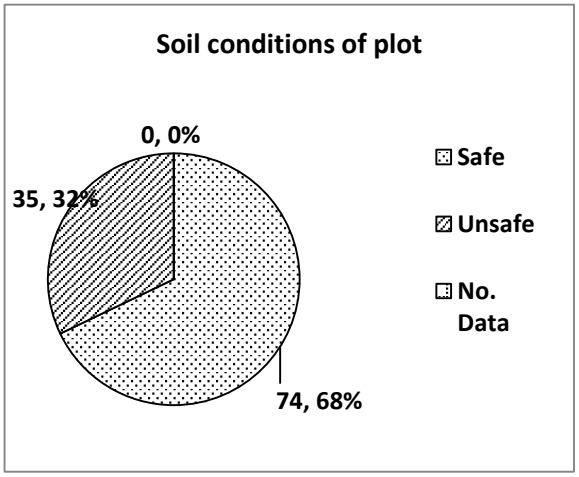
- **Location of the House**

Majority of the houses (62.5 percent) are safely located. However, 47 per cent of the houses are unsafe with regard to cyclones.



- **Soil conditions of the plot**

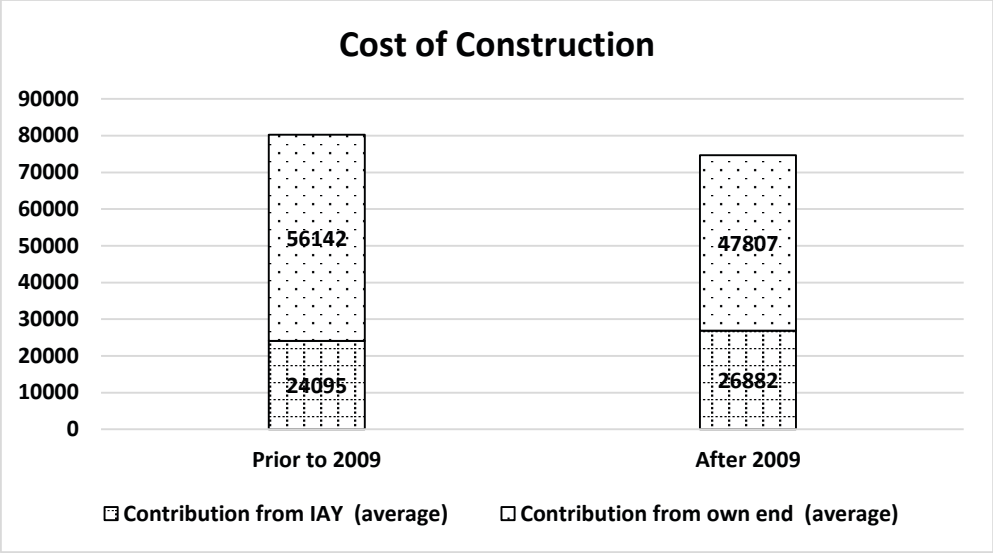
| | Soil conditions of plot |
|---|---|
| Safe | 74 |
| Unsafe | 35 |
| No. Data | 0 |




32% households reported that the soil conditions of their plot were unsafe due the absence of hard rock. These houses were reported to be constructed on loose soil.

- **Cost of construction**

| Cost of Construction | | | |
|---|---|---|---|
| | **Contribution from IAY (average)** | **Contribution from own end (average)** | **Actual Cost of Construction (average)** |
| **Prior to 2009** | 24095 | 56142 | 80237 |
| **After 2009** | 26882 | 47807 | 74689 |

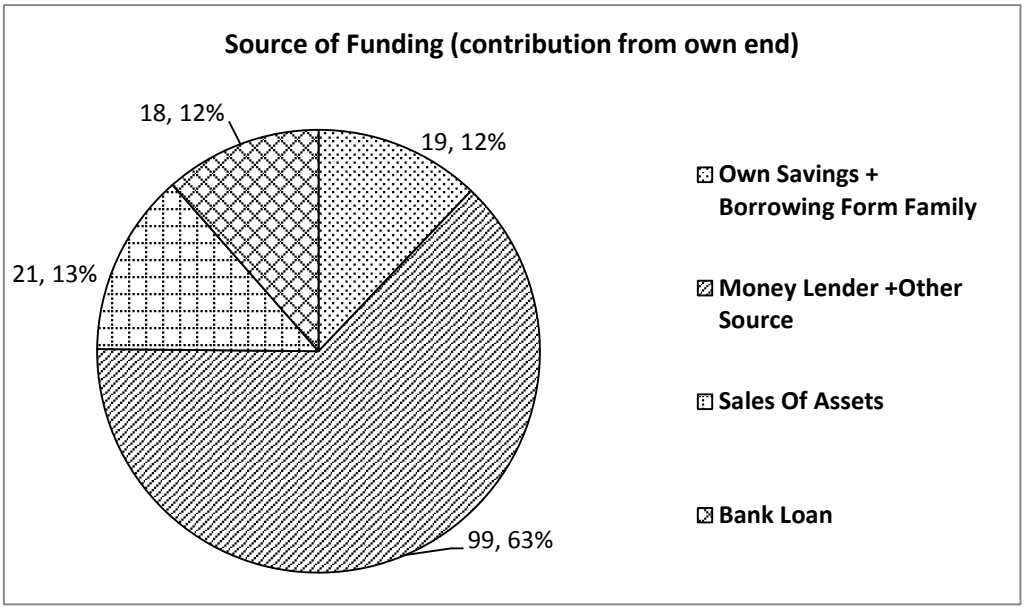



The graph and table indicate the average expense on construction on an IAY house using government assistance received and owner's won contribution. Average expenses incurred on house construction prior to 2009 (when the unit assistance under IAY was Rs 35000 for plain areas) and after 2009 when the unit assistance was revised to the current Rs 45000 have been tabulated. It is evident that in both the cases, people have been spending at least equivalent to the amount received under IAY for constructing their house.

- **Source of Funding**

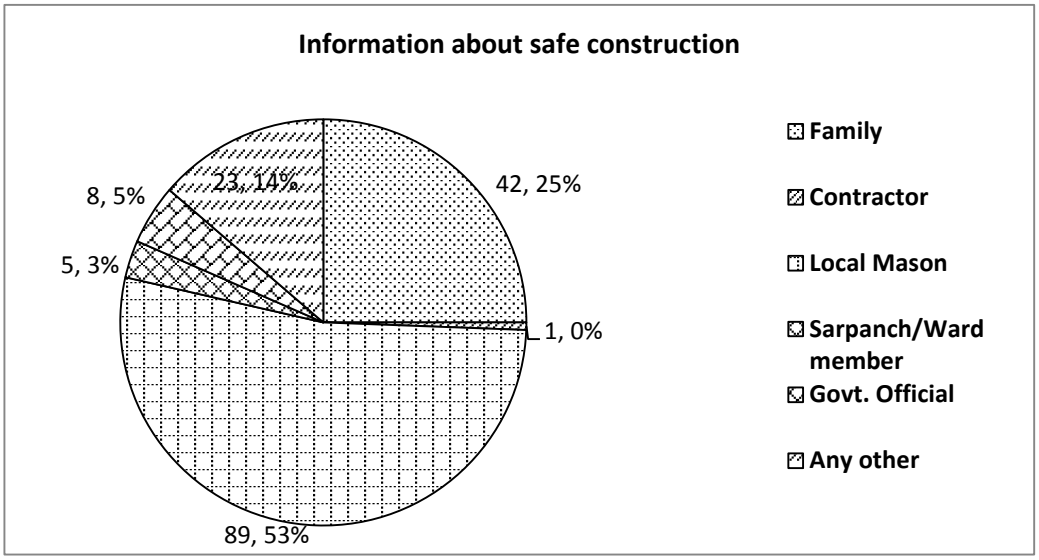
| Source of Funding | | | |
|---|---|---|---|
| Own Savings + Borrowing Form Family | Money Lender + Other Source | Sales Of Assets | Bank Loan |
| 19 | 99 | 21 | 18 |

The most common source of funding for the construction of houses over and above the government assistance under IAY, is borrowing from the money Lender, 63% people had done this while 12% of people reported to have taken bank loan to meet the construction cost of the house.




- **Access to information on safe construction**

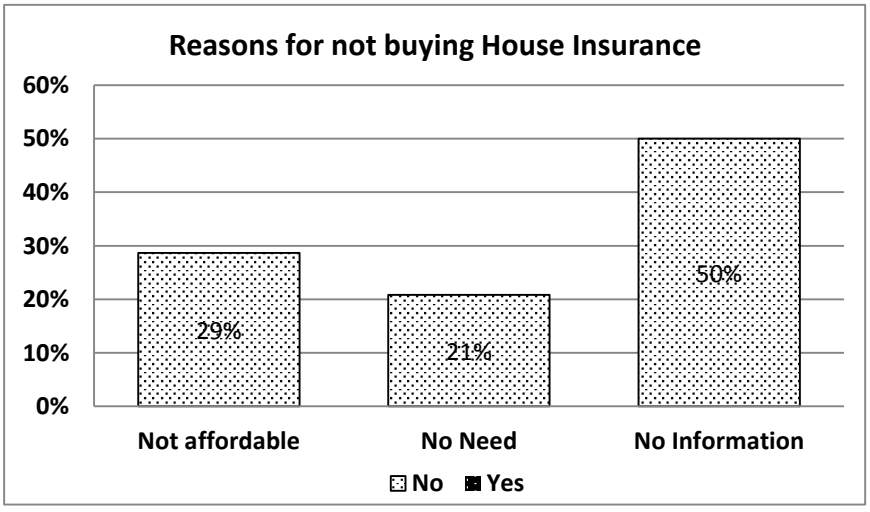
| Information about safe Construction | | | | | | |
|---|---|---|---|---|---|---|
| Family | Contractor | Local Mason | Contractor | Sarpanch/Ward member | Govt. Official | Any other |
| 42 | 1 | 89 | 0 | 5 | 8 | 23 |




Among the 109 families surveyed in the district, about 53% of families said that they were informed by a Local Mason about safe construction while 25% reported guidance from their family. 5% reported to have been guided by govt. official while 3% consulted the Sarpanch of their village for information on Safe construction.

- **Insurance of IAY Houses**

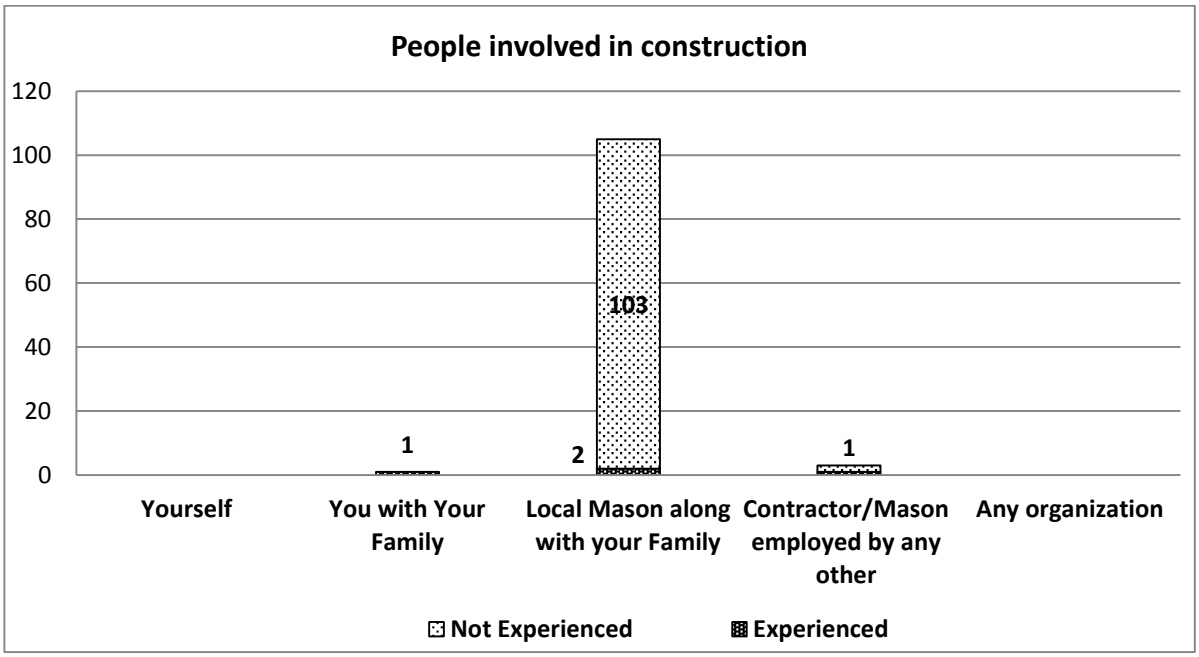
| House Insurance | | | |
|---|---|---|---|
| | Not affordable | No Need | No Information |
| Yes | 0% | 0% | 0% |
| No | 29% | 21% | 50% |



Of the 109 Houses surveyed, no house was reported to be insured. Among the 109 houses, 50% families reported lack of information on house insurance while 21% did not feel any need for house insurance and 29% do not have affordability for insurance cover.

- **People involved in Construction**

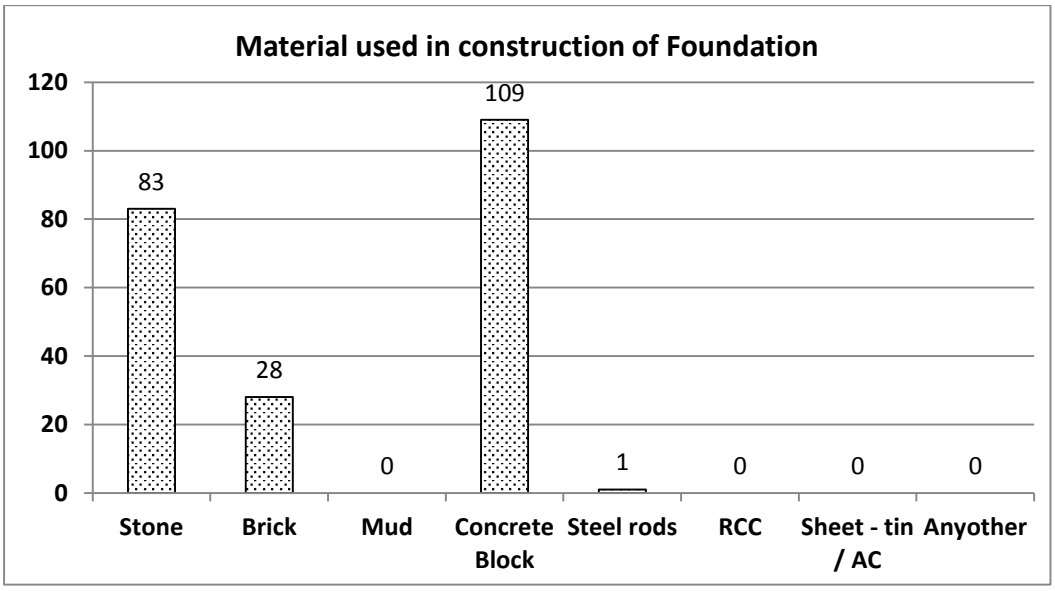
| | Experienced | Not Experienced |
|---|---|---|
| Yourself | 0 | 0 |
| You with Your Family | 1 | 0 |
| Local Mason along with your Family | 2 | 103 |
| Contractor/Mason employed by any other | 1 | 2 |
| Any organization | 0 | 0 |




Among the 109 houses surveyed in Puri, a majority, 103 households worked themselves with a non-experienced local mason for the construction of their house.

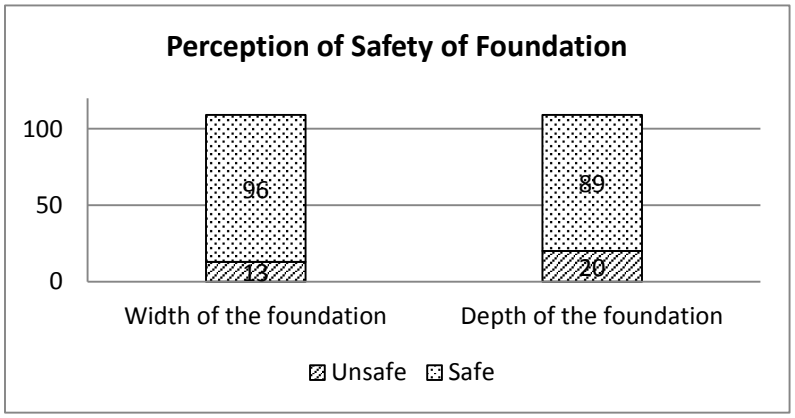
**b. Foundations**

| | Stone | Brick | Mud | Concrete Block | Steel rods | RCC | Sheet - tin / AC | Any Other |
|---|---|---|---|---|---|---|---|---|
| Foundation | 83 | 28 | 0 | 109 | 1 | 0 | 0 | 0 |




The main materials used in foundation were stone, concrete blocks and bricks. The binder used in construction of foundation was reported to be cement.

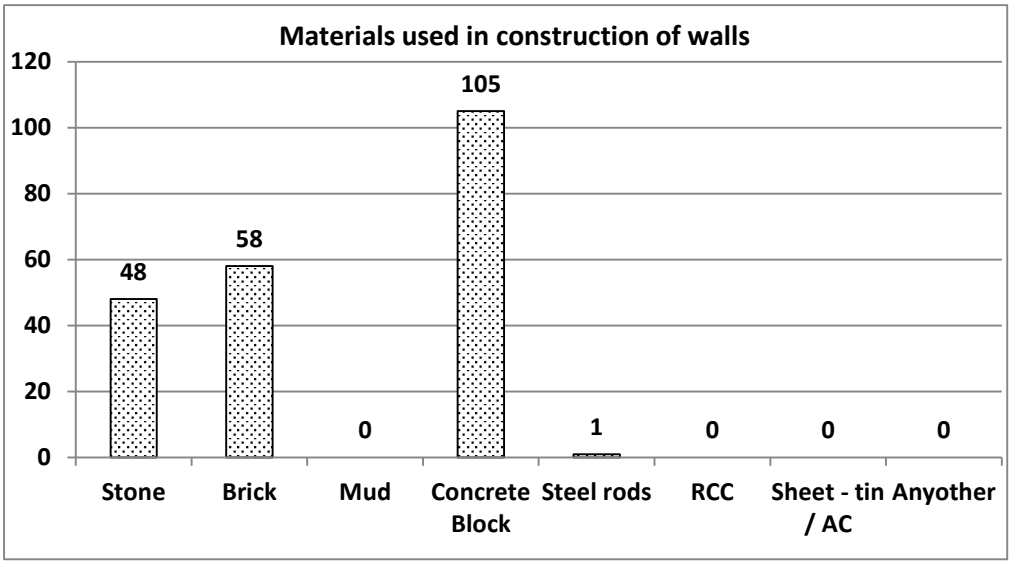
| Perception of Safety of Foundation | | |
|---|---|---|
| | Unsafe | Safe |
| Width of the foundation | 13 | 96 |
| Depth of the foundation | 20 | 89 |




Around 96 people out of total of 109 consider the width of the foundation of their house to be safe, while 89 people consider the depth of the foundation to be safe.

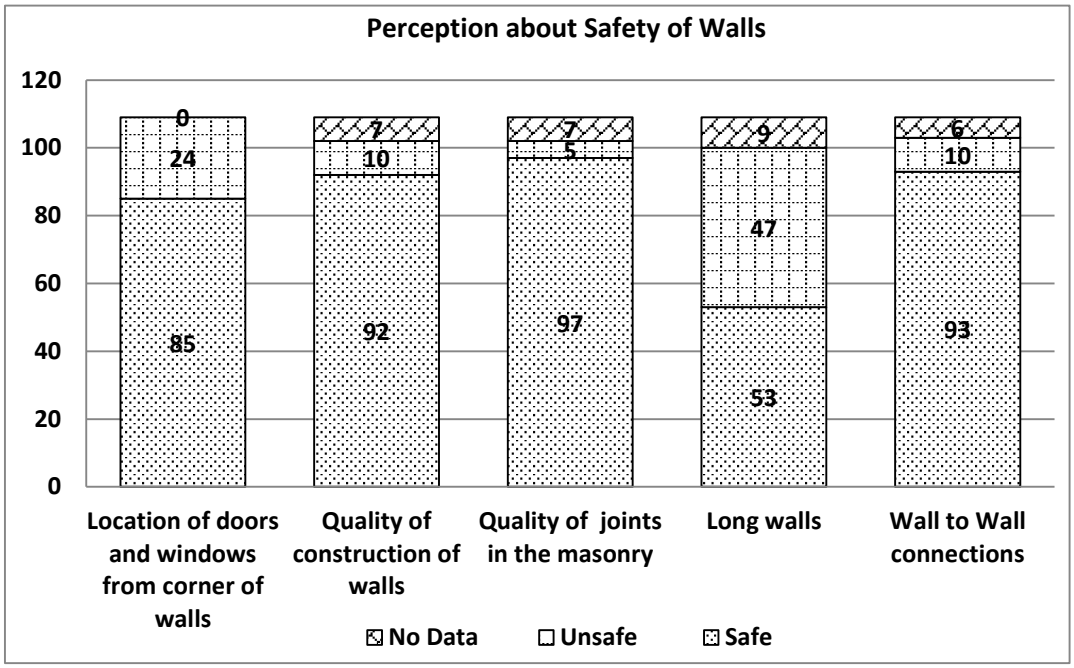
**c. Walling**

| | Stone | Brick | Mud | Concrete Block | Steel rods | RCC | Sheet - tin / AC | Any Other |
|---|---|---|---|---|---|---|---|---|
| Wall | 48 | 58 | 0 | 105 | 1 | 0 | 0 | 0 |



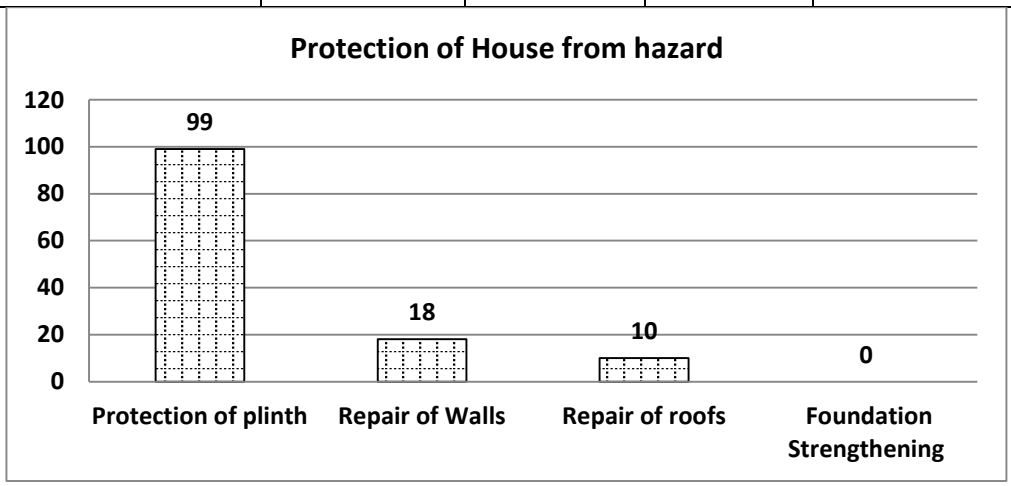

The most commonly used materials the in construction of walls are stone and bricks with concrete block, cement being the binder in most of the cases. There was no case where whole or some parts of the house have been constructed using mud as a binder.

| Perception about safety of Wall | | | |
|---|---|---|---|
| | **Safe** | **Unsafe** | **No Data** |
| **Location of doors and windows from corner of walls** | 85 | 24 | 0 |
| **Quality of construction of walls** | 92 | 10 | 7 |
| **Quality of joints in the masonry** | 97 | 5 | 7 |
| **Long walls** | 53 | 47 | 9 |
| **Wall to Wall connections** | 93 | 10 | 6 |




The quality of construction of the walls, the wall to wall connections, the construction of long walls, the construction quality of the joints in masonry and the location of doors and windows from the corner of the walls were all found to be safe in more than 80% houses.

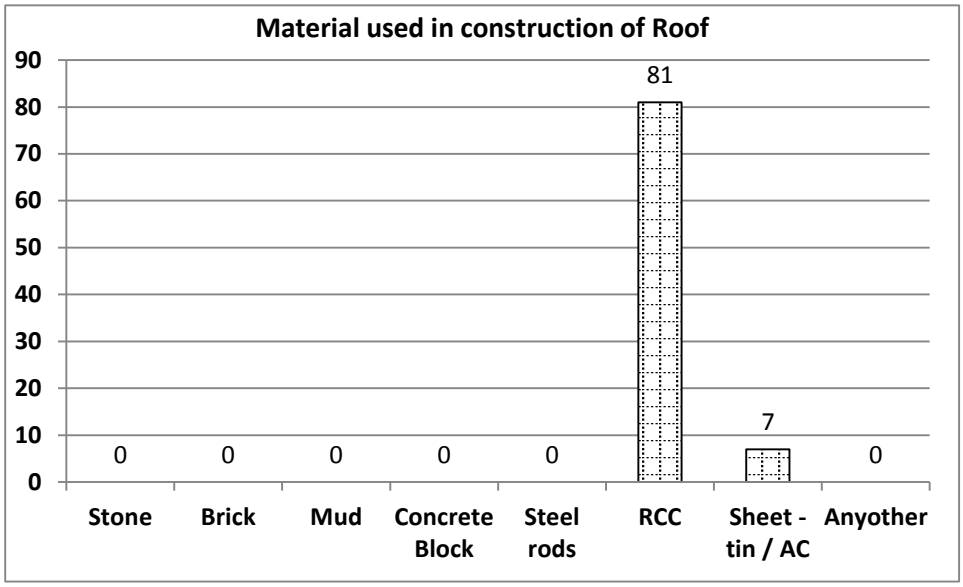
| Protection of House from hazard | | | | |
|---|---|---|---|---|
| | Protection of plinth | Repair of Walls | Repair of roofs | Foundation Strengthening |
| Protection of House from hazard | 99 | 18 | 10 | 0 |




In order to protect their houses from Cyclones, 10 households reported to regularly repair their roof. The main area of repair was reported to be protection of Plinth.

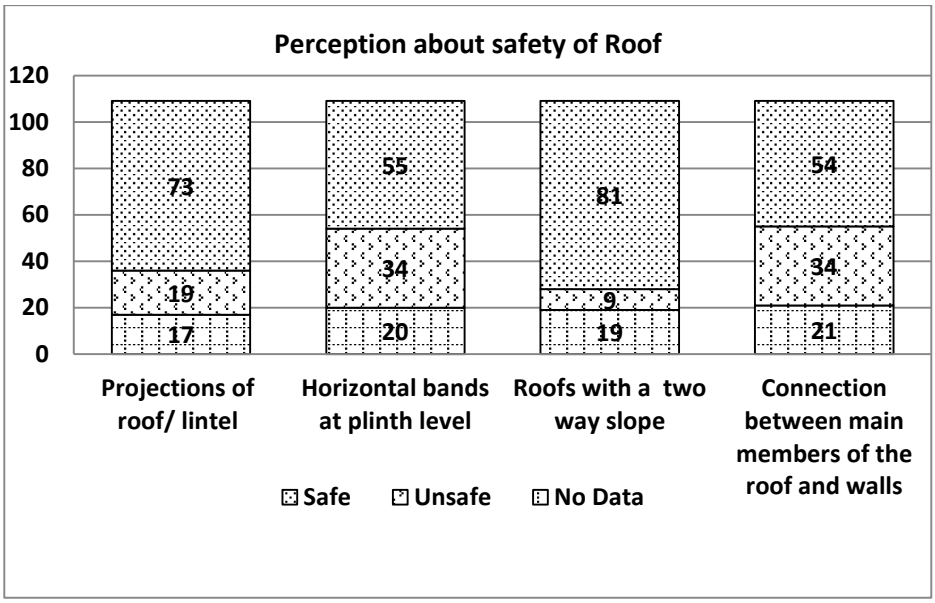
### d. Roofing

| | Stone | Brick | Mud | Concrete Block | Steel rods | RCC | Sheet - tin / AC | Any Other |
|---|---|---|---|---|---|---|---|---|
| Roof | 0 | 0 | 0 | 0 | 0 | 81 | 7 | 0 |




The main material for roofs was RCC used by 81 out of the total 109 households surveyed.

| **Perception about safety of Roof** | No Data | Unsafe | Safe |
|---|---|---|---|
| Projections of roof/ lintel | 17 | 19 | 73 |
| Horizontal bands at plinth level | 20 | 34 | 55 |
| Roofs with a two way slope | 19 | 9 | 81 |
| Connection between main members of the roof and walls | 21 | 34 | 54 |




The surveyors found most of the roof components to be safe as shown in the above graph.

**Overall assessment of damageability:**

A cumulative analysis of different components of IAY houses surveyed in Puri with regard to risk of landslides and seismic activity was compiled considering the specifications for foundations (20% score of total), walls (30% score of total), roofs (40% score of total) and, architectural specifications (10% score of total). The foundations were analysed for the material used, depth and width while the walls were analysed for the materials used, presence of lintel band, quality of masonry joints and quality of wall to wall connections.

Similarly, the roofs were analysed for the materials used and quality of connections between the roof and the walls. This analysis reveals that 22 of the 109 houses surveyed are rather susceptible to serious damage due to cyclones and floods as they scored less than 40%, 42 scored between 40-70 % and were moderately susceptible to damage and 45 were unlikely to suffer serious damage due to earthquake and landslide as they had scored above 70% in the final analysis.

It is interesting to note that the bulk of the houses surveyed in Odisha were medium to low susceptible to damage due to cyclones and floods. The houses that scored less and were therefore considered to be rather susceptible to damage were largely those that were located on unsafe sites along steep slopes. The main reason for this trend was understood to

be the legacy of large scale post-cyclone recovery work that also included capacity building of masons on safe construction.

### 3.1.3 Key Highlights of IAY Delivery mechanism in Odisha

Important highlights of the delivery mechanism of IAY include:

a. Preference is given to eligible houseless MGNREGS workers included in the IAY waitlist

b. Payment is made in four installments at the following stages, i.e.

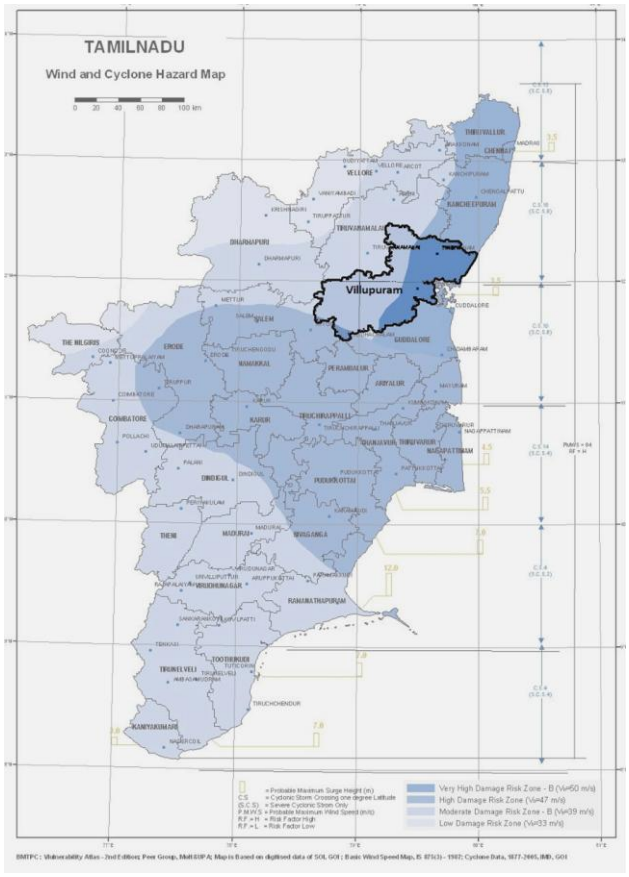
| | |
|---|---|
| Rs.5000/- | on issue of work order |
| Rs.15000/- | at the plinth level |
| Rs.15000/- | at the lintel level |
| Rs.10000/- | roof casting/roof laying |

c. While the state does not have any defined mechanism for ensuring quality construction and providing technical advice though a number of trained personnel on safe construction are available as a result of the reconstruction efforts after the super cyclone.

The state government has also introduced Mo Kudia scheme which is being implemented in order to fulfill the unmet need for shelter of the most vulnerable genuine poor but whose name does not figure in the BPL list. In addition, the state government has Vasundhara scheme that set out to provide homesteads of up to 10 decimals of land to homestead-less families.

## 3.2 TAMIL NADU

The geographical setting of Tamil Nadu escalates the state's vulnerability to natural disasters such as cyclones, flood and earthquake-induced tsunami. Tamil Nadu has the second longest coastline, 1061 Km, of all coastal states in India. Nearly 29 million people (50% of state population) live across 13 coastal districts of Tamil Nadu.




**Wind and Cylone Vulnerability Map of Tamil Nadu**

About 8% of the state is affected by five to six cyclones every year, of which two to three are severe. Cyclonic storms occur during rainy season marked by the onset of the northeast monsoon between mid-September and mid- December.

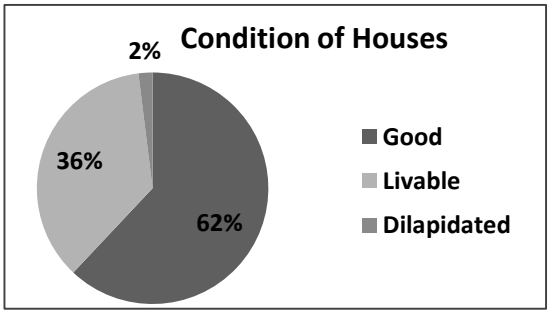
During the 2004 Indian Ocean Tsunami 8,081 deaths were reported, over 150,000 houses were destroyed and damaged, basic infrastructure was destroyed and there was a significant impact on fisheries and agriculture sectors.

### 3.2.1 Status of housing in Viluppuram District, Tamil Nadu (census 2011)

Census 2011 indicates the following trends with regard to Housing:

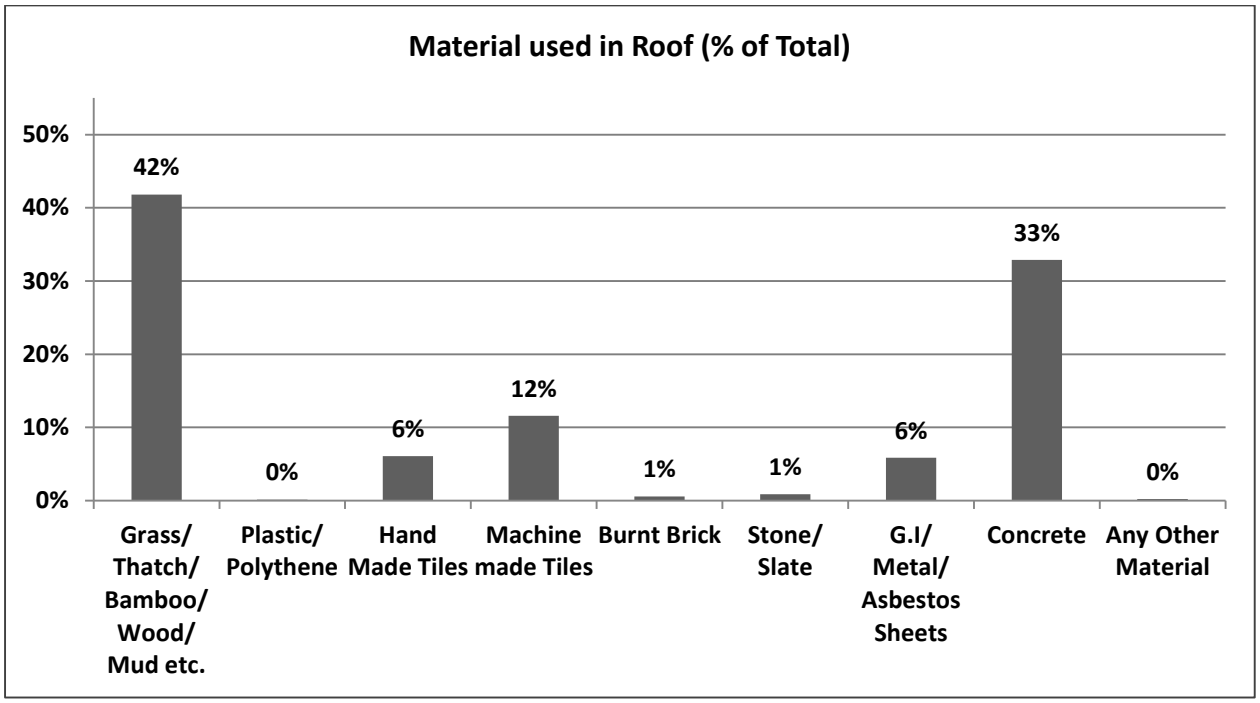
**Condition of Houses**

Approximately 62% houses are of good quality and 36% are of livable quality while 2% are dilapidated.



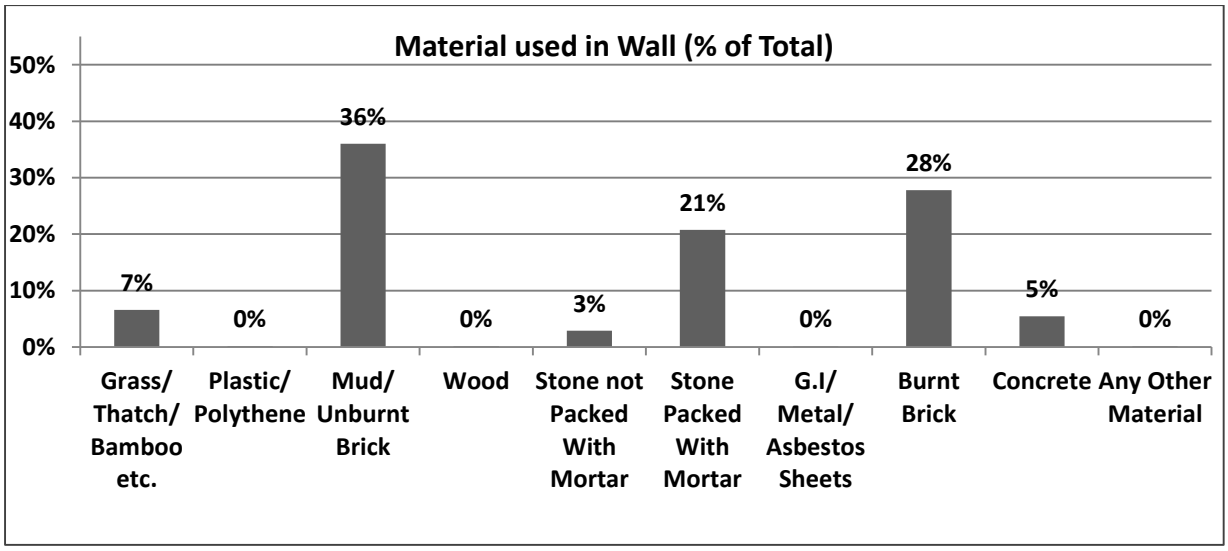
**Material used for Roofing**

The predominant materials used in the construction of roof are grass, thatch, bamboo, wood or mud followed by concrete and then machine made tiles.




**Material used for walling**

The predominant materials used are mud or unburnt bricks, secondly burnt bricks are used and then the use of stone packed with mortar was found to be common.



### 3.1.4 Status of IAY housing in Viluppuram District – Findings of the Pilot Study

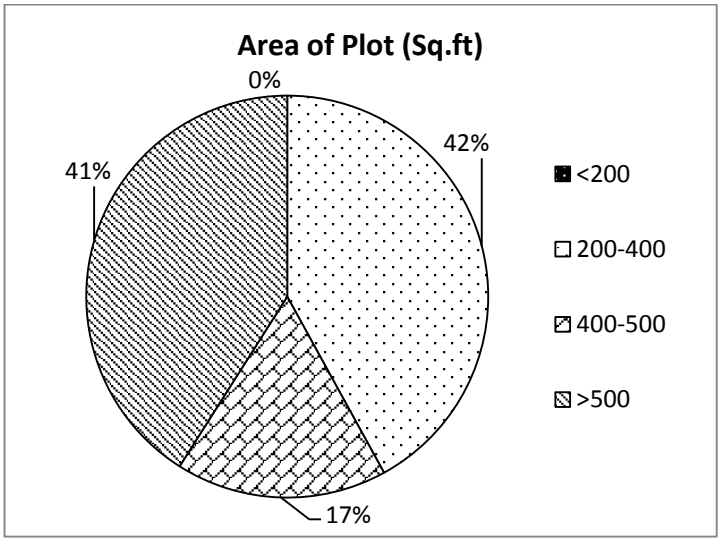
During 2012, the pilot study was conducted in Villupuram district in Tamil Nadu to understand successes and challenges faced by IAY beneficiaries in enhancing the resilience of their houses to local disasters. The survey was carried out using a questionnaire that was tested in the field; the questionnaire aimed at capturing perception of the homeowner / user with regard to the disaster vulnerability of their house as well as, the perception of a surveyor trained at making the necessary assessments in the field.

Key highlights of the findings of the survey are given below:

**a. General Observations**

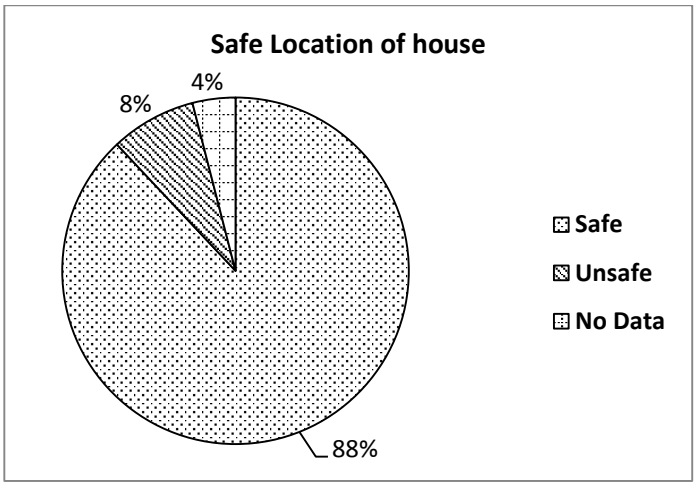
- **Area of the Plot**

| Area of Plot (Sq. ft.) | | | | |
|---|---|---|---|---|
| | **<200** | **200-400** | **400-500** | **>500** |
| Area of Plot (Sq. ft.) | 0 | 42 | 17 | 41 |




About 42% of the houses surveyed had a plot area between 200 - 400 sq. ft., while 17% had a plot area in the range of 400 – 500 sq. ft.; and 41% had an area greater than 500 sq. ft..

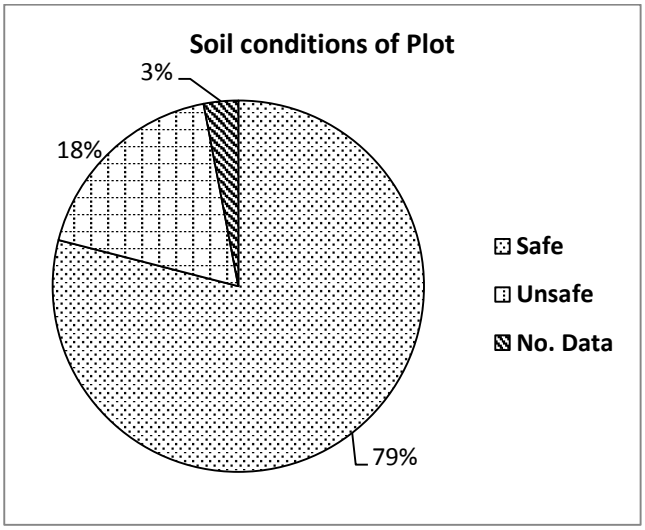
- **Location of House**




Most houses in the sample were located to be on safe location with regard to their exposure to Tsunami, cyclonic winds and floods. However, about 8% houses were reported to be dissatisfied with the location of their house as it was in a vulnerable location.

- **Soil Conditions of the Plot**

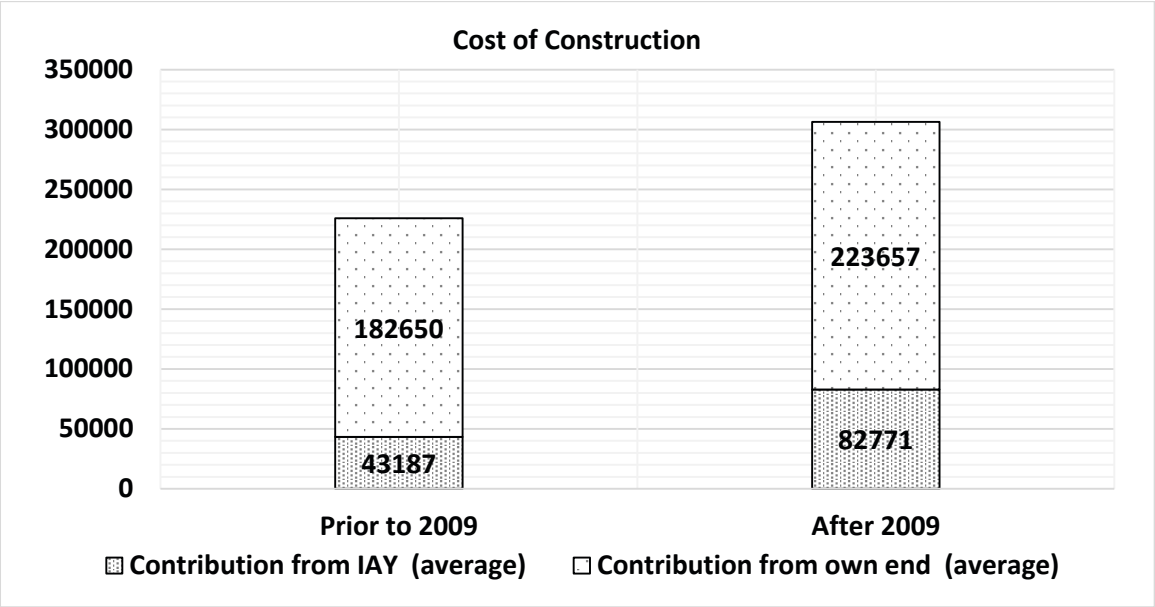
| Soil conditions of plot | |
|---|---|
| Safe | 79 |
| Unsafe | 18 |
| No. Data | 3 |



18% households reported that the soil conditions of their plot were unsafe due the absence of hard rock. These houses were reported to be constructed on loose soil.

- **Cost of Construction**

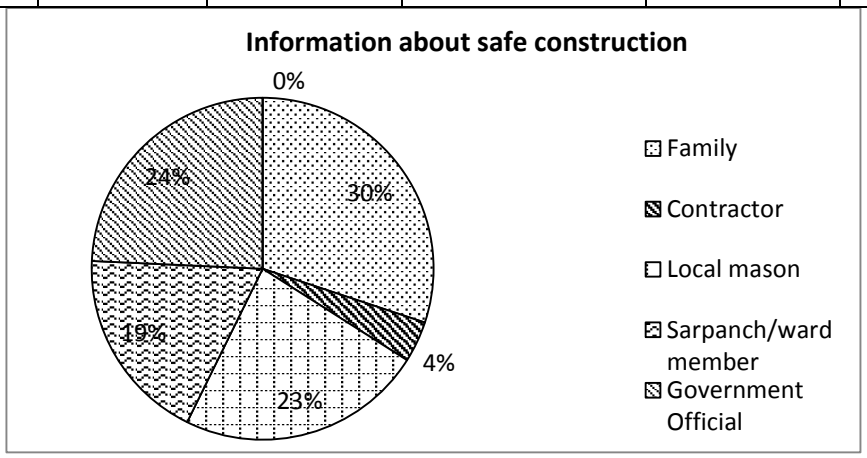
| Cost of Construction | | | |
|---|---|---|---|
| | **Contribution from IAY (average)** | **Contribution from own end (average)** | **Actual Cost of Construction (average)** |
| **Prior 2009** | 43187 | 182650 | 225837 |
| **After 2009** | 82771 | 223657 | 306428 |




The graph and table indicate the average expense on construction on an IAY house using government assistance received and owner's won contribution. Average expenses incurred on house construction prior to 2009 (when the unit assistance under IAY was Rs35000 for plain areas) and after 2009 when the unit assistance was revised to the current Rs45000 have been tabulated. It is evident that in both the cases, people have been spending at least equivalent to the amount received under IAY for constructing their house.

- **Access to information on safe construction**

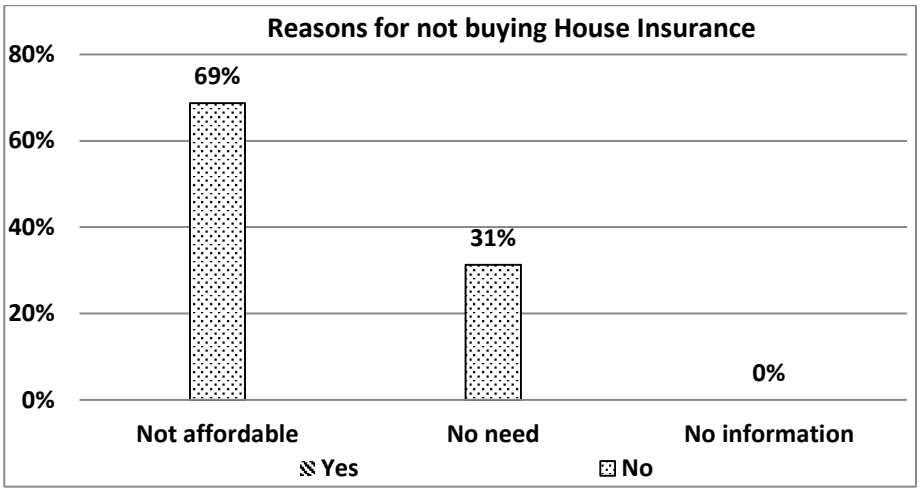
| Information about safe construction | | | | | |
|---|---|---|---|---|---|
| Family | Contractor | Local mason | Sarpanch/ward member | Government Official | **NGO** |
| 31 | 4 | 24 | 17 | 24 | 0 |




In Villupuram among the 100 families surveyed, about 24% of families said that were informed by a Govt. official about safe construction while 19% reported guidance from the Sarpanch. 24% reported to have been guided by Local mason while 31% consulted their family members.

- **Insurance of IAY houses**

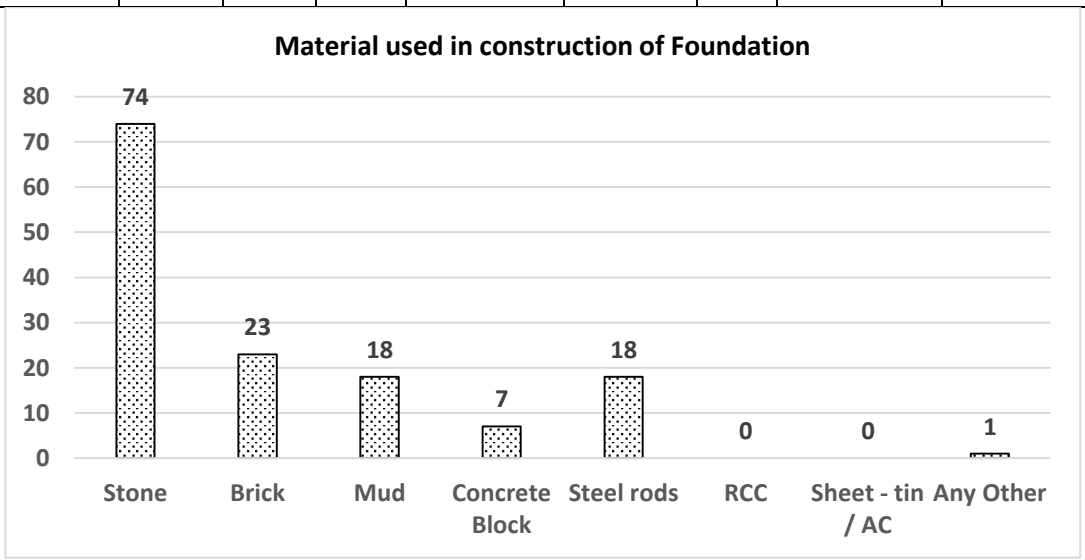
| House Insurance | | | |
|---|---|---|---|
| | Not affordable | No need | No information |
| Yes | 0% | 0% | 0% |
| No | 69% | 31% | 0% |




Among the 100 Houses surveyed, no house was reported to be insured. Among these 100 houses 69% families reported lack affordability on house insurance while 31% did not feel any need of house insurance.

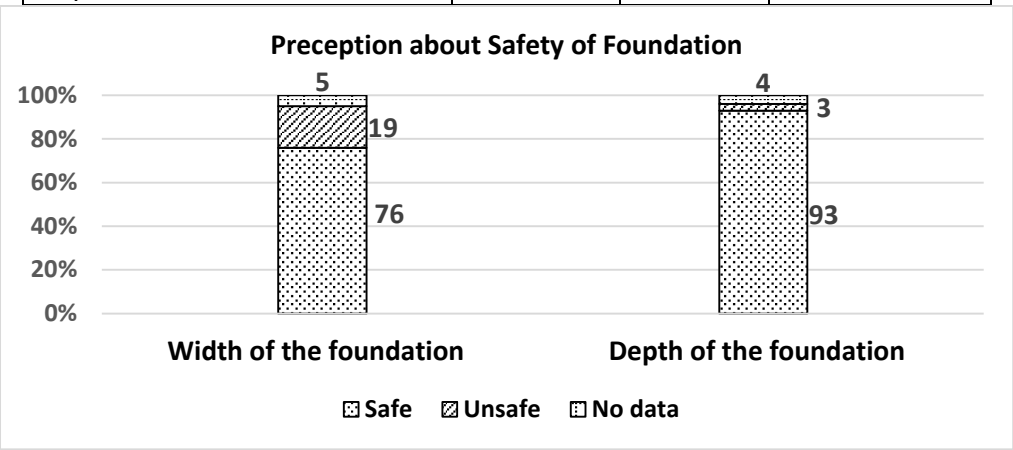
### b. Foundations

| Material used in construction of Foundation | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Stone | Brick | Mud | Concrete Block | Steel rods | RCC | Sheet - tin / AC | Any Other |
| Foundation | 74 | 23 | 18 | 7 | 18 | 0 | 0 | 1 |




The main material used in foundation was reported to be stone (74 houses), Bricks (23 houses) and Steel Rods (18 houses). The binder used in construction of foundation by 18 households was mud and for the rest was reported to be cement.

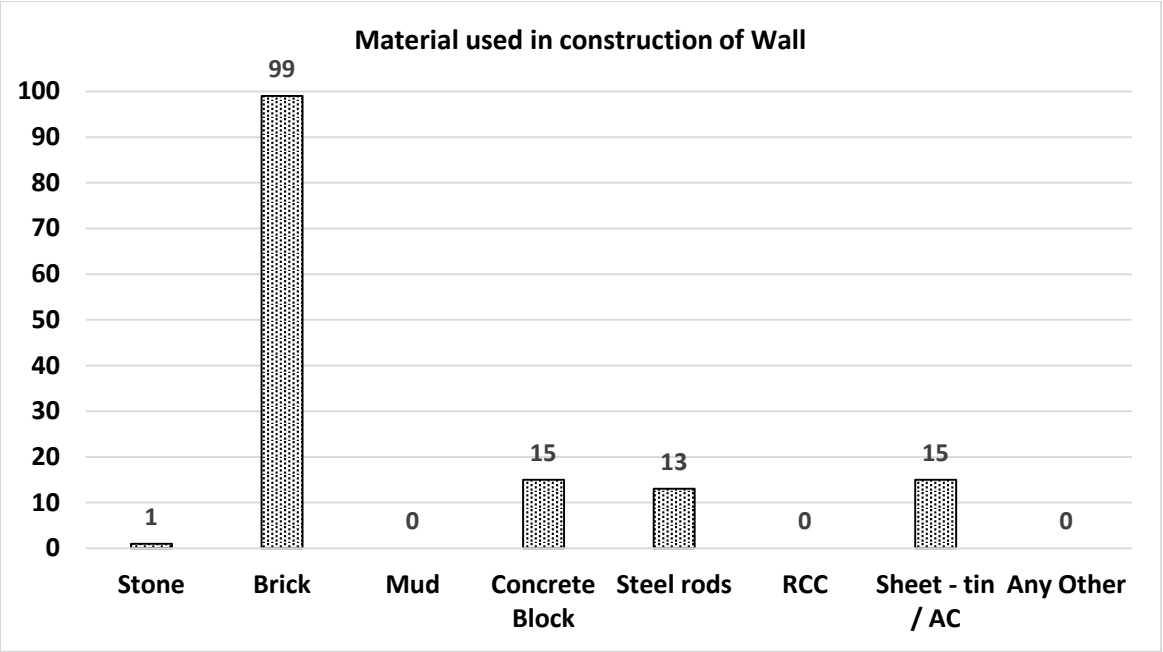
| Perception about Safety of Foundation | | | |
|---|---|---|---|
| | Safe | Unsafe | No data |
| Width of the foundation | 76 | 19 | 5 |
| Depth of the foundation | 93 | 3 | 4 |



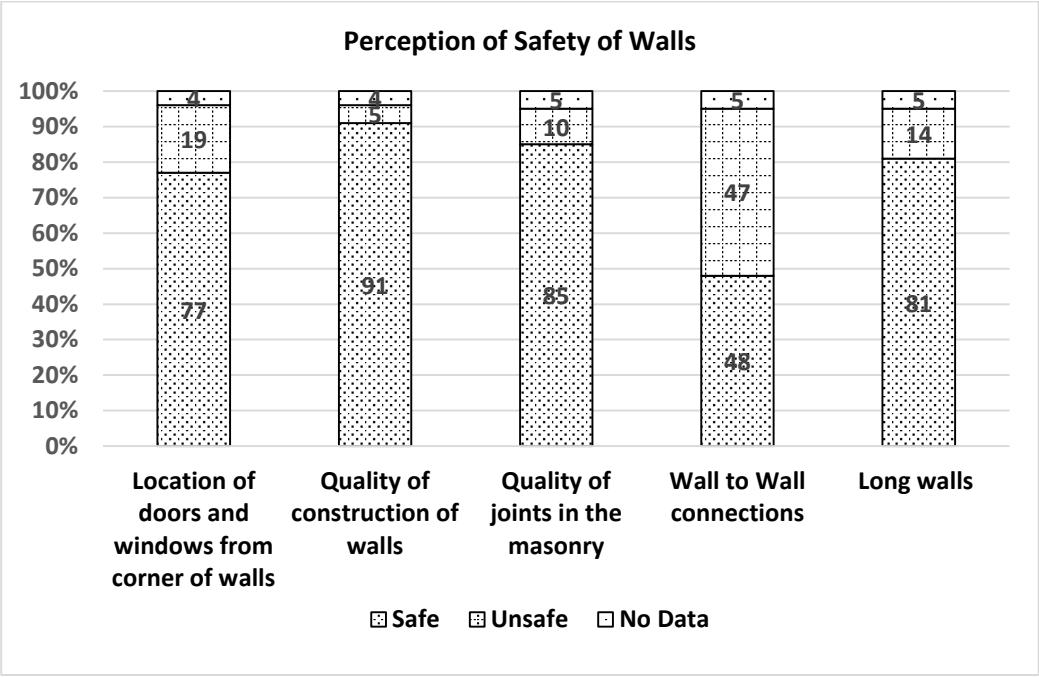

Around 76 people out of total of 100 consider the width of the foundation of their house to be safe, while 93 people consider the depth of the foundation to be safe.

c. **Walling**

| Material used in construction of Wall | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Stone | Brick | Mud | Concrete Block | Steel rods | RCC | Sheet - tin / AC | Any Other |
| Walls | 1 | 99 | 0 | 15 | 13 | 0 | 15 | 0 |

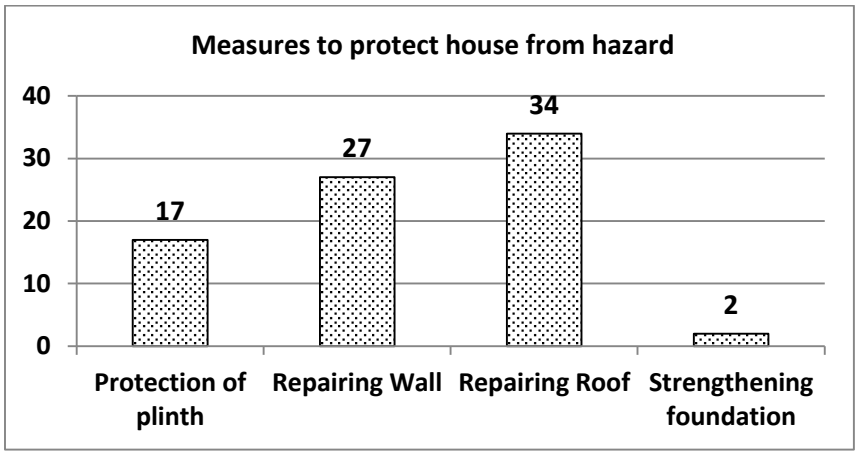



The most commonly used materials in the construction of walls are bricks with steel reinforcement and concrete block, cement being the binder in most of the cases.




The quality of construction of the walls, the construction of long walls, the construction quality of the joints in masonry and the location of doors and windows from the corner of the walls were all found to be safe in more than 70% houses expect wall to wall connections.

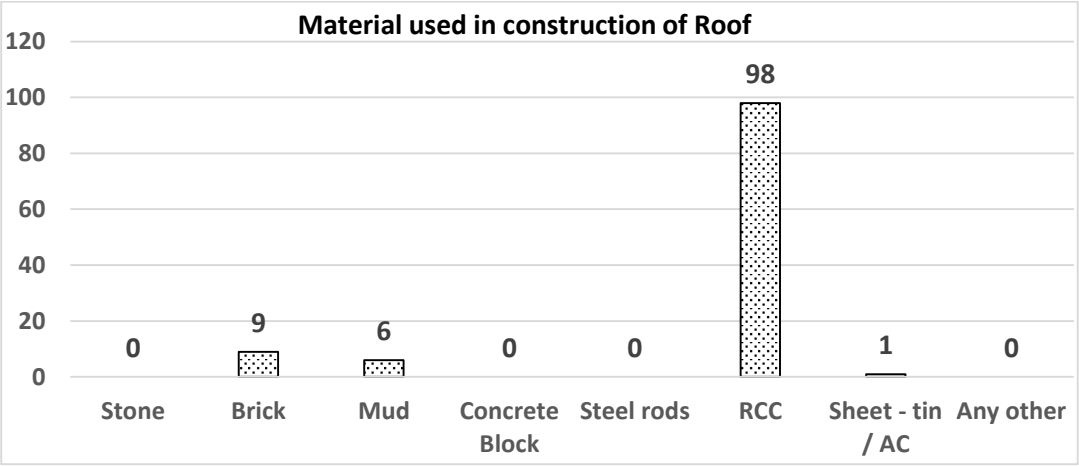
| Measures to protect house from hazard | | | | |
|---|---|---|---|---|
| | Protection of plinth | Repairing Wall | Repairing Roof | Strengthening foundation |
| No of Household | 17 | 27 | 34 | 2 |




In order to protect their houses, 34% households reported to regularly repair their roofs.

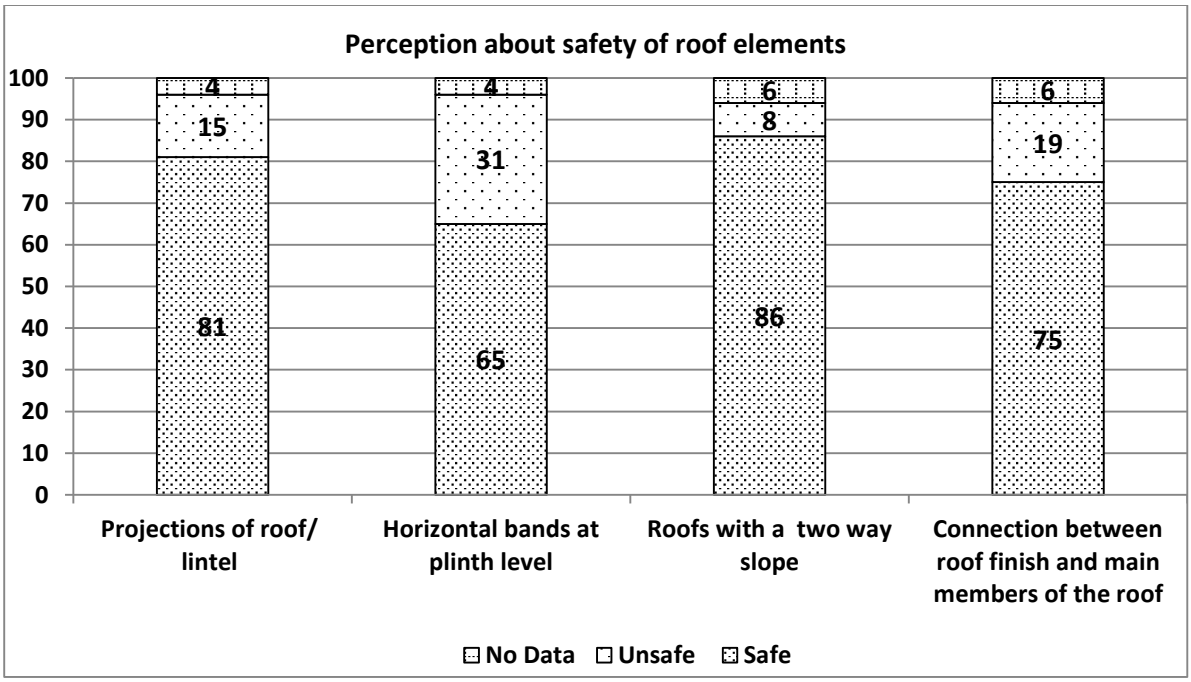
**d. Roofing**

| Material used in construction of Roof | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Stone | Brick | Mud | Concrete Block | Steel rods | RCC | Sheet - tin / AC | Any other |
| Roof | 0 | 9 | 6 | 0 | 0 | 98 | 1 | 0 |




The main material used in majority of roofs was RCC used by 98 out of the total 100 households surveyed.

| Perception about safety of roof elements | | | |
|---|---|---|---|
| | Safe | Unsafe | No Data |
| Projections of roof/ lintel | 81 | 15 | 4 |
| Horizontal bands at plinth level | 65 | 31 | 4 |
| Roofs with a two way slope | 86 | 8 | 6 |
| Connection between roof finish and main members of the roof | 75 | 19 | 6 |




The surveyors found most of the roof components to be safe as shown in the above graph.

**Overall assessment of damageability:** A cumulative analysis of different components of IAY houses surveyed in Villupuram with regard to risk of Tsunamis, cyclone and flooding was compiled considering the specifications for foundations (40% score of total), walls (30% score of total) and, roofs (30% score of total). The foundations were analyzed for the material used, depth and width of foundation as well as height of plinth while the walls were analyzed for the materials used, presence of lintel band, quality of masonry joints and wall to wall connections. Similarly, roofs were analyzed for the materials used and quality of connection between the roof and the walls. This analysis reveals that out of the 100 houses surveyed in Villupuram, 15 were rather susceptible to serious damage as they scored less

than 40%, 16 scored between 40-70 % and were moderately susceptible to damage and 69 were unlikely to suffer serious damage during cyclones / flooding as they had scored above 70% in the final analysis.

The houses that scored less were mainly on account of oversight with regard to critical items such as adequate plinth height and use of plinth bands in the foundation. These households also admitted to use of mud mortar for foundations. In terms of walling, lintel bands were found to be missing in many houses and connections between the between the walls and the roof was missing making the houses prone to damage during cyclones. The large majority of surveyed houses that scored higher were relatively safer and had all the elements necessary for resilience in the tsunami / cyclone and flood prone context of Villupuram. This positive trend could be attributed to the proactive support provided by the state government in terms of technical guidance and supervision. The added funding for house construction has also been critical in supporting the homeowners to prioritize quality.

### 3.1.5 Key Highlights of IAY Delivery mechanism in Tamil Nadu

Indira Awaas Yojana in Tamil Nadu is topped up with additional state assistance for construction of RCC roofs. This is a measure from the state government to mitigate the risk of fire in rural hamlets and a drive to transform Tamil Nadu to a 'hutless' state. The breakup of centre – state share of contribution is given below:

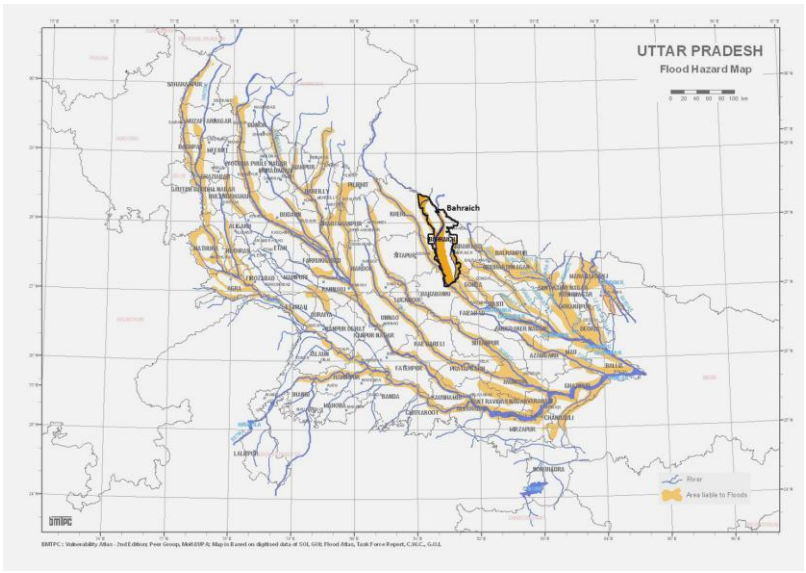
| **UNIT COST FOR IAY HOUSES** | | |
|---|---|---|
| 1 | Central Government Share (75 %) | Rs. 33750 |
| 2 | State Government Share (25 %) | Rs. 11250 |
| Total from IAY | | Rs. 45000 |
| 3 | Roofing Cost State Government Share | Rs. 55000 |
| Grand Total | | Rs. 100000 |

The scheme is implemented through an elaborate system of overseers (at the village level) supervised by JE and AE (distt. Level). Assistance is provided partly in the form of cash and partly material procured at the district level through tendering.

In addition to IAY, the state government has initiated **"**Chief Minister's Solar Powered Green House Scheme (CMSPGHS)" aimed at "providing solar powered green house for the poor living below poverty line in rural areas" at an unit cost of Rs.1,80,000/- per house. Each house will have an area of 300 square feet and will be constructed at an unit cost of Rs.1,80,000/- fully funded by the State Government. Each house will be provided with 5 solar powered lights, one each in bed room, living room, kitchen, toilet and verandah. All the lights will be of Compact Fluorescent Lamp (CFL). Every beneficiary will also have the option of an electric connection powered by TNEB which will be metered. However, only people with pattas for their house sites are eligible under this scheme.

## 3.3 UTTAR PRADESH

Uttar Pradesh is one of the most disaster prone states of the country exposed to various natural disasters; floods being the predominant one. Data from the EM-DAT suggests that the highest damage caused by flood was during the year 2001. The number of people affected has varied from three crore during 1980 floods to about one lakh during the 2006 floods.

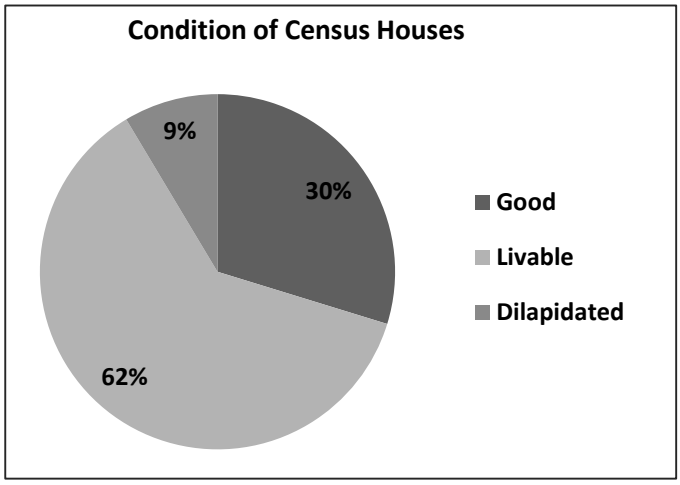



**Flood Hazard Map of UP**

*(Source: Vulnerability Atlas of India, 2007)*

### 3.3.1 Status of housing in Bahraich District, UP (census 2011)

Census 2011 indicates the following trends with regard to Housing:

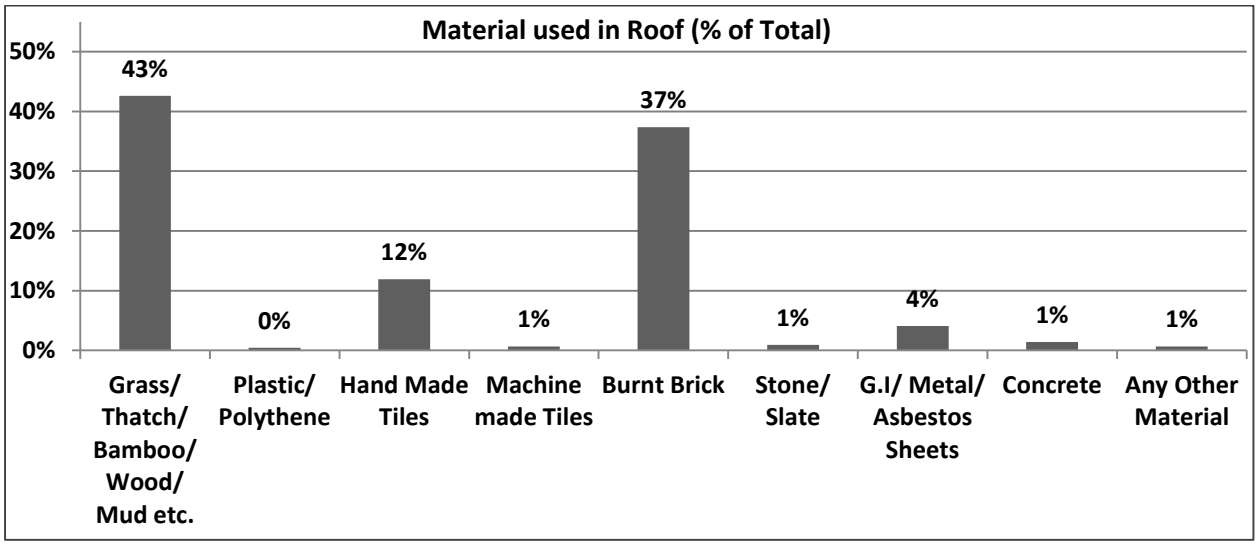



**Condition of Houses**

Approximately 30% houses are of good quality and 62% are of livable quality while 9% are dilapidated.

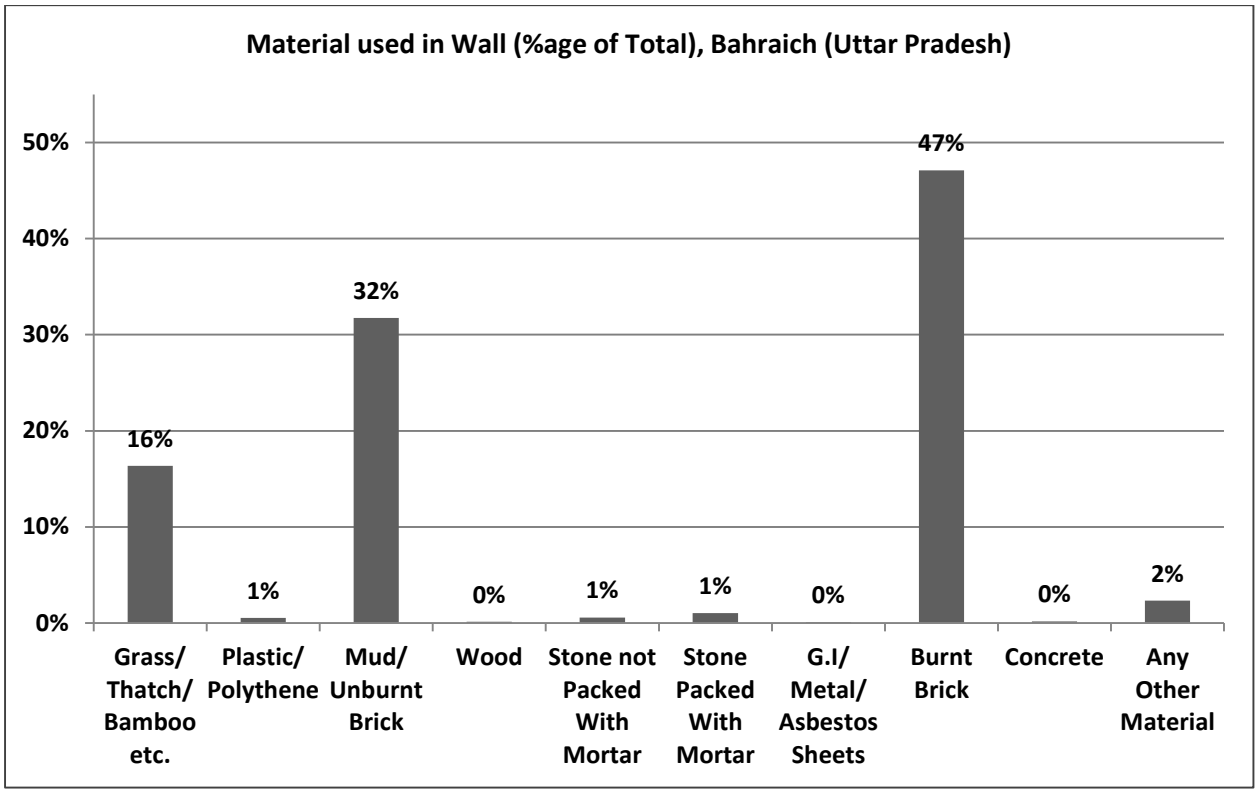
**Material used for Roofing**

The predominant materials used in the construction of roof are grass, thatch, bamboo, wood or mud, followed by burnt brick and handmade tiles.




**Material used for walling**

The predominant material used is burnt bricks, followed by unburnt bricks or mud and grass or bamboo or thatch etc.




### 3.3.2 Status of IAY housing in Bahraich District – Findings of the Pilot Study

Key findings of the pilot study in Bahraich District are:

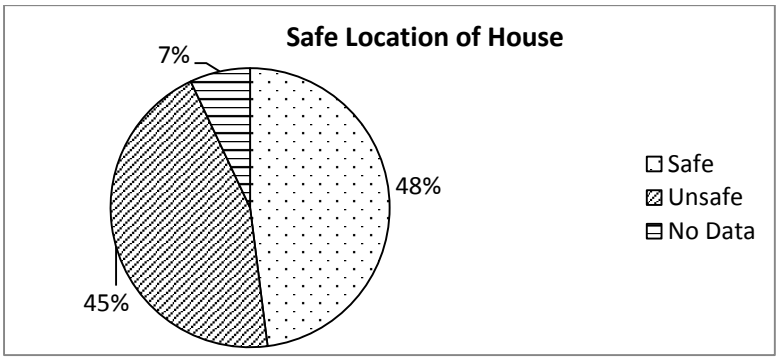
During 2012, the pilot study was conducted in Bahraich district to understand successes and challenges faced by IAY beneficiaries in enhancing the resilience of their houses to local disasters. The survey was carried out using a questionnaire that was tested in the field; the questionnaire aimed at capturing perception of the homeowner / user with regard to the disaster vulnerability of their house as well as, the perception of a surveyor trained at making the necessary assessments in the field.

Key highlights of the findings of the survey are given below:

**a. General Observations**

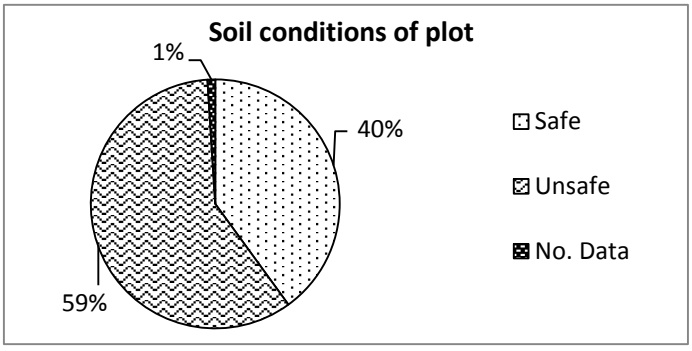
- **Location of House**

Most houses in the sample reported to be located on safe sites with regard to distance from the nearest river, since floods pose the highest risk.




- **Soil Conditions of the Plot**

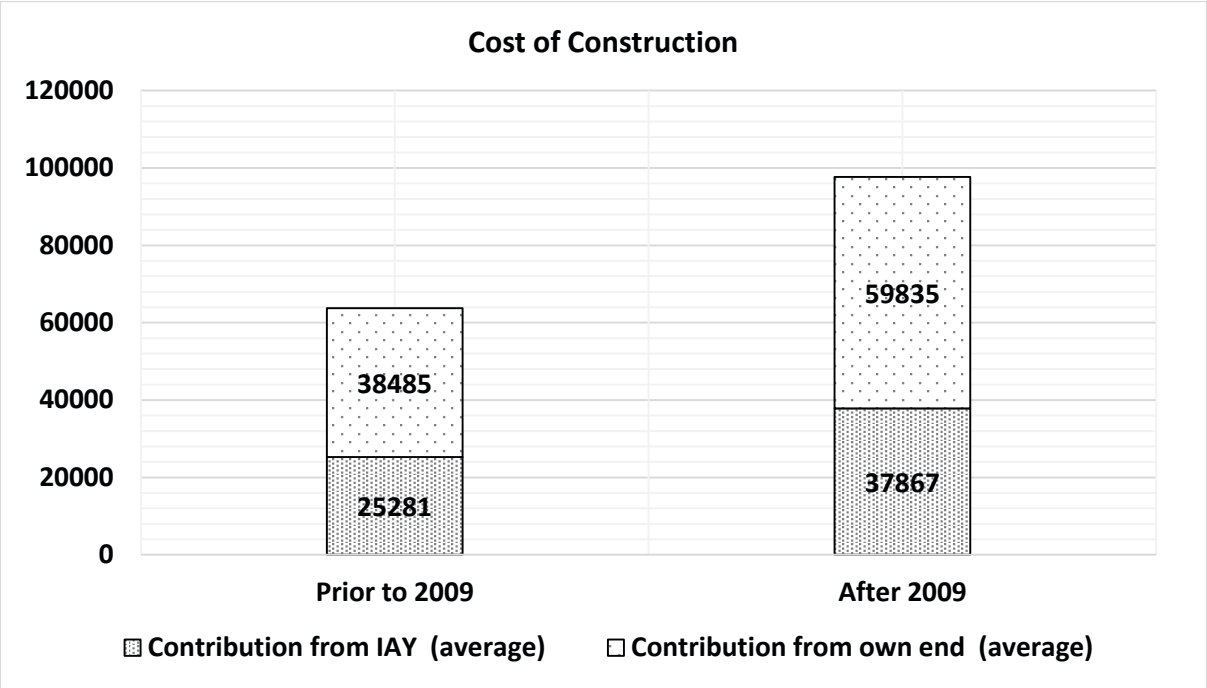
| | Soil conditions of plot |
|---|---|
| Safe | 40 |
| Unsafe | 59 |
| No Data | 1 |




59% households reported that the soil conditions of their plot were unsafe due the absence of hard rock. These houses were reported to be constructed on loose soil.

- **Cost of Construction**

| **Cost of Construction** | | | |
|---|---|---|---|
| | **Contribution from IAY (average)** | **Contribution from own end (average)** | **Actual Cost of Construction (average)** |
| **Prior to 2009** | 25281 | 38485 | 63766 |
| **After 2009** | 37867 | 59835 | 97702 |

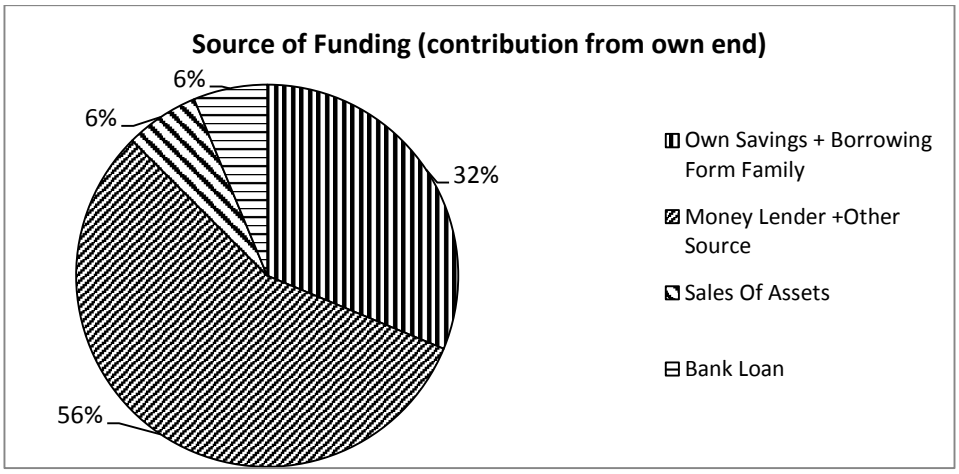



The graph and table indicate the average expense on construction on an IAY house using government assistance received and owner's won contribution. Average expenses incurred on house construction prior to 2009 (when the unit assistance under IAY was Rs.35000 for plain areas) and after 2009 when the unit assistance was revised to the current Rs.45000 have been tabulated. It is evident that in both the cases, people have been spending at least equivalent to the amount received under IAY for constructing their house.

- **Different Sources of funding**

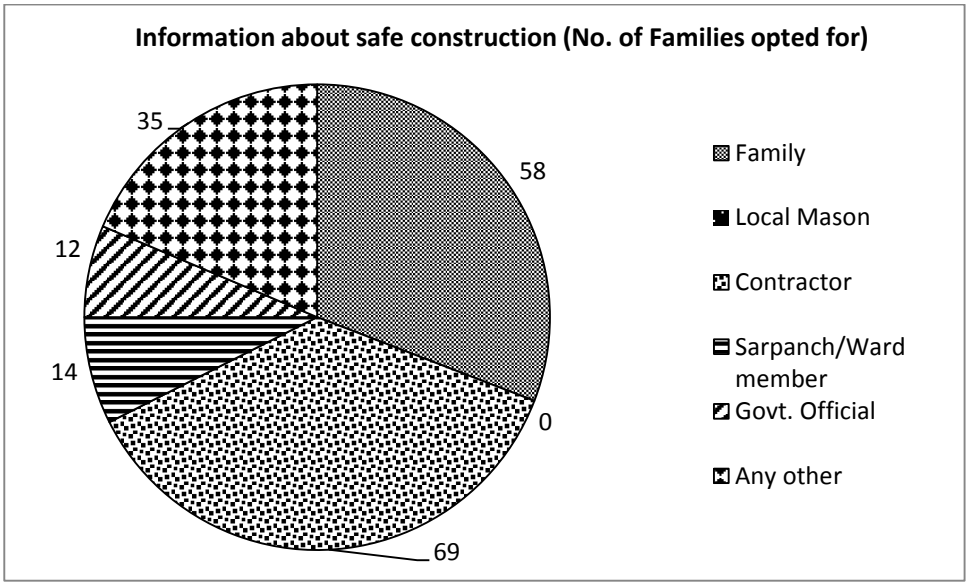
The most common source of funding for the construction of houses in Bharaich, over and above the government assistance under IAY, is borrowing from Money Lenders or other sources, 56% people had done this while 32% of people reported to either use their own savings or borrowing money from Family to meet the construction cost of the house.

| Own Savings + Borrowing from Family | Money Lender +Other Source | Sales of Assets | Bank Loan |
|---|---|---|---|
| 25 | 45 | 5 | 5 |




- **Access to information on safe construction**

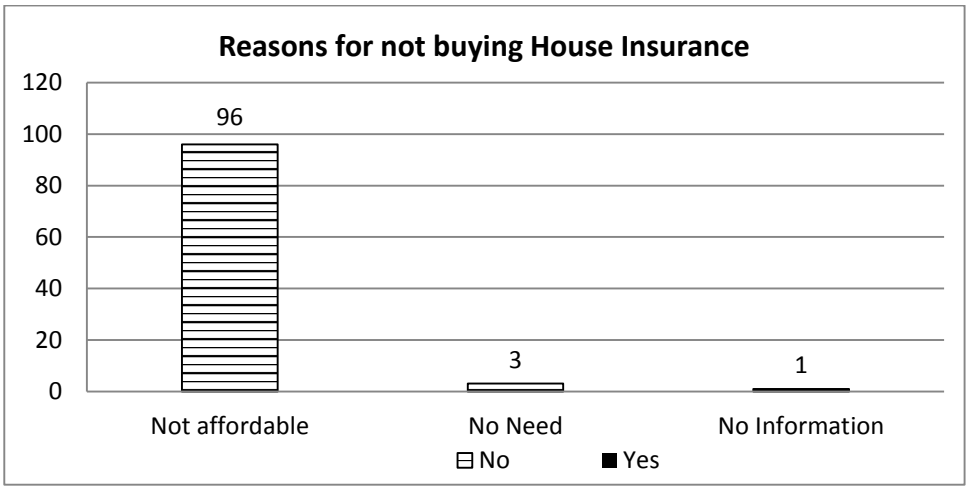
| Information about safe construction | | | | | |
|---|---|---|---|---|---|
| Family | Local Mason | Contractor | Sarpanch/Ward member | Govt. Official | Any other |
| 58 | 0 | 69 | 14 | 12 | 35 |




Awareness plays a major role in construction of a safe house. In Bahraich, among the 100 families surveyed, about 69 families said that they were informed by contractor about safe construction while 58 families reported guidance from their own family members. 14% reported to have been guided by Sarpanch/Ward Member while 35% consulted any other source for information on Safe construction.

- **Insurance of IAY houses**

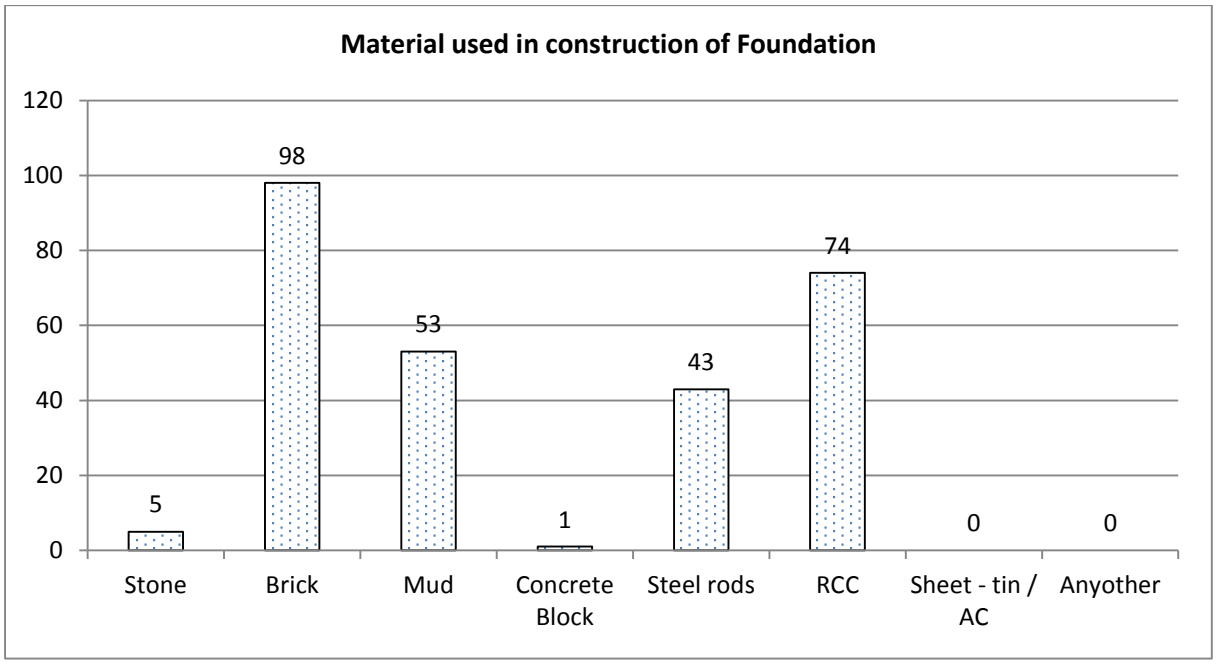
| House Insurance | | | |
|---|---|---|---|
| | Not affordable | No Need | No Information |
| Yes | 0 | 0 | 0 |
| No | 96 | 3 | 1 |




Among the 100 Houses surveyed, no house was reported to be insured. Among these 100 houses 96 families reported lack of affordability for house insurance while 3 families did not feel any need of house insurance.

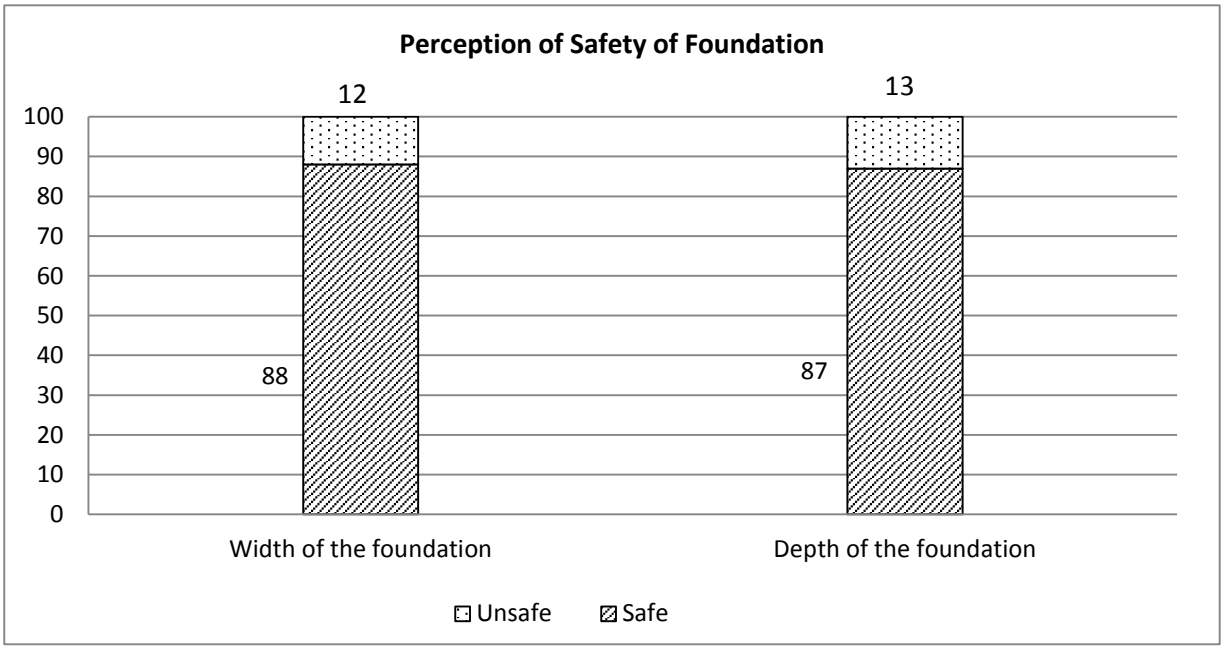
**b. Foundations**

| Material used in construction of Foundation | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Stone | Brick | Mud | Concrete Block | Steel rods | RCC | Sheet - tin / AC | Any Other |
| Foundation | 5 | 98 | 53 | 1 | 43 | 74 | 0 | 0 |




The main material used in foundation was reported to be bricks with RCC, Mud and steel rods. The binder used in construction of foundation by 53 households was mud and for the rest was reported to be cement.

| Perception about safety of foundation | | |
|---|---|---|
| | Safe | Unsafe |
| Width of the foundation | 88 | 12 |
| Depth of the foundation | 87 | 13 |

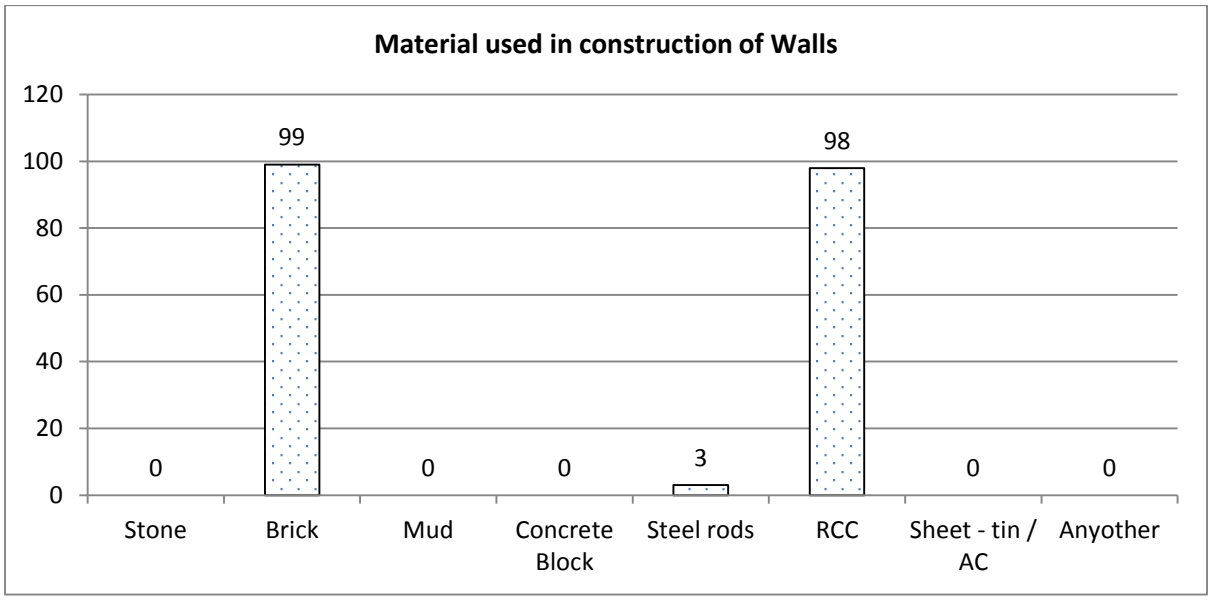


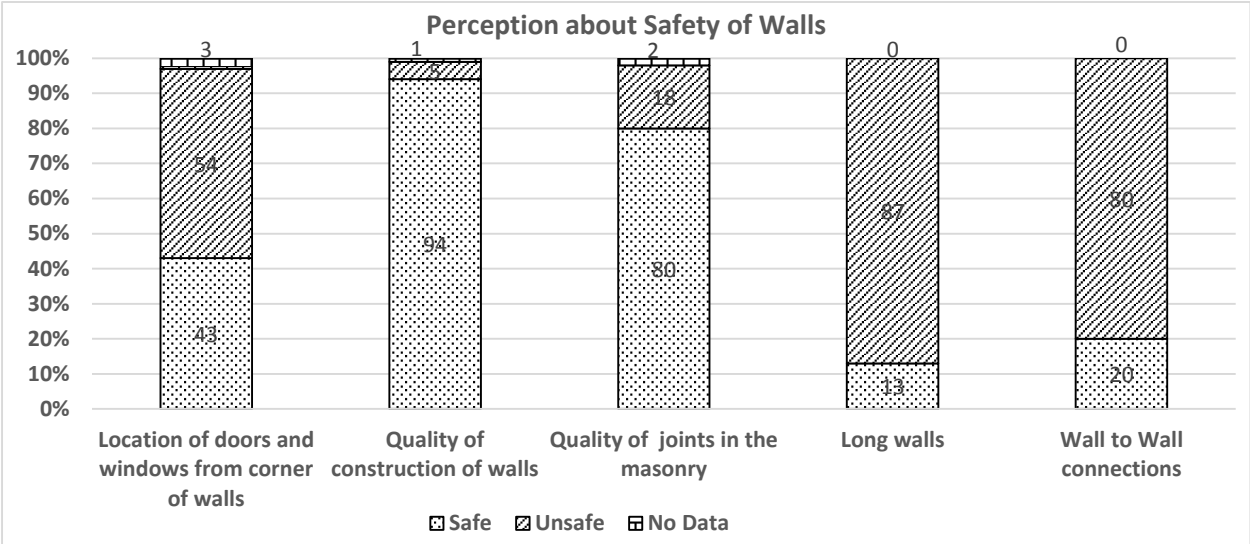

Around 88 people out of total of 100 consider the width of the foundation of their house to be safe, while 87 people consider the depth of the foundation to be safe.

c. **Walling**

The most commonly used materials the in construction of walls are bricks with RCC reinforcement, cement being the binder in most of the cases.

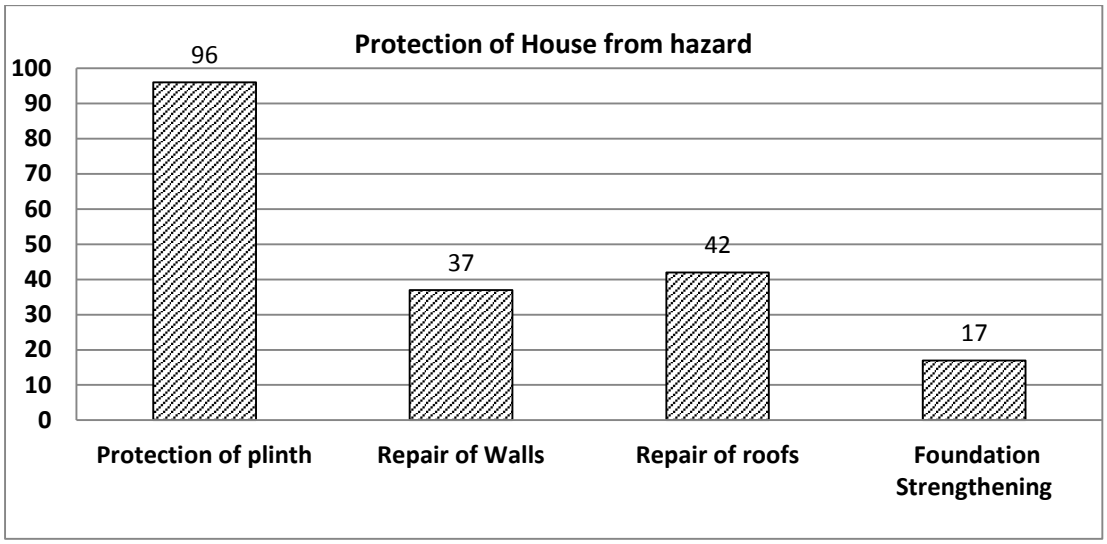
| Materials used in Construction of Wall | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Stone | Brick | Mud | Concrete Block | Steel rods | RCC | Sheet - tin / AC | Any Other |
| Wall | 0 | 99 | 0 | 0 | 3 | 98 | 0 | 0 |




The quality of construction of the walls, the construction quality of the joints in masonry were found to be safe in more than 80% houses. The wall to wall connections, the construction of long walls and the location of doors and windows from the corner of the walls were found to be unsafe in most of the houses

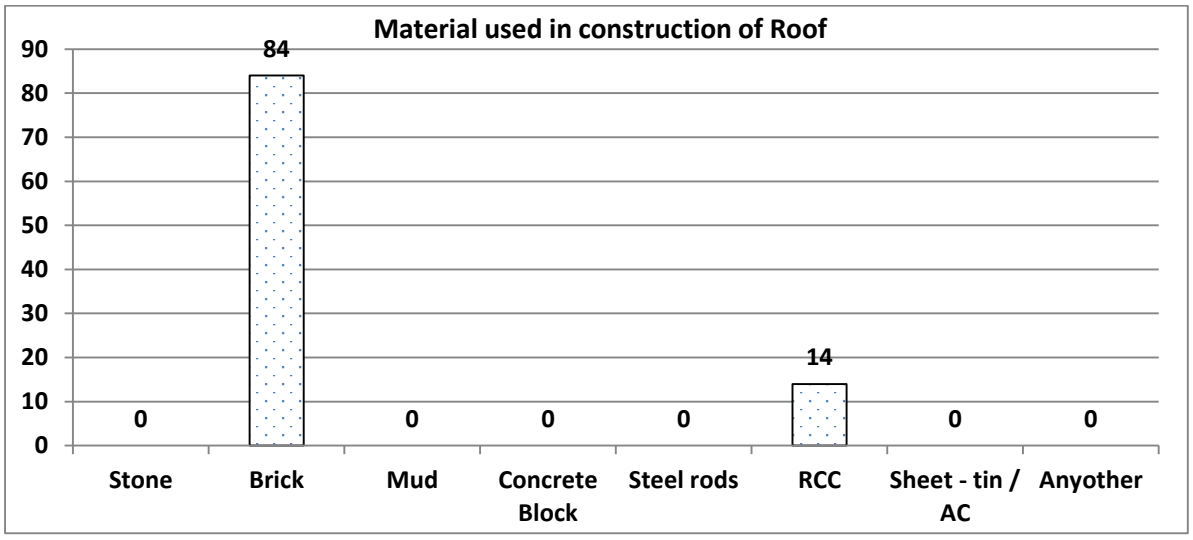
| Protection of House from hazard | | | |
|---|---|---|---|
| Protection of plinth | Repair of Walls | Repair of roofs | Foundation Strengthening |
| 96 | 37 | 42 | 17 |




In order to protect their houses from earthquakes, 96% households reported to regularly repair their Plinth while 37% and 42% reported to repair their walls and roofs respectively.

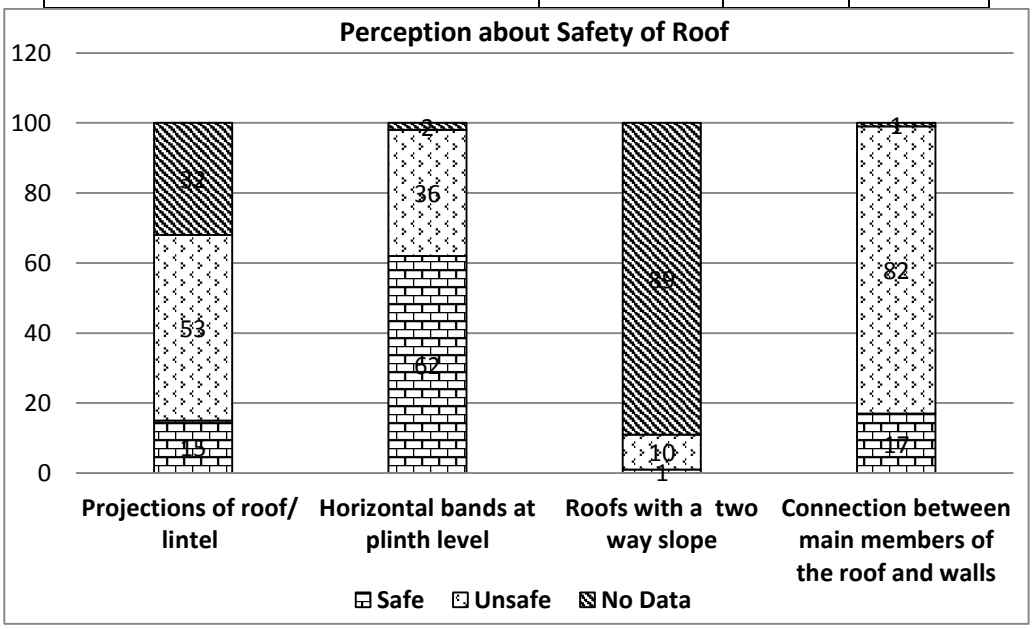
### d. Roofing

| Material used in construction of Roof | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Stone | Brick | Mud | Concrete Block | Steel rods | RCC | Sheet - tin / AC | Any Other |
| Roof | 0 | 84 | 0 | 0 | 0 | 14 | 0 | 0 |




The main material used in majority of roofs was bricks used by 84 out of the total 100 households surveyed along with RCC used in 14 houses.

| Perception about Safety of Roof | | | |
|---|---|---|---|
| | Safe | Unsafe | No Data |
| Projections of roof/ lintel | 15 | 53 | 32 |
| Horizontal bands at plinth level | 62 | 36 | 2 |
| Roofs with a two way slope | 1 | 10 | 89 |
| Connection between main members of the roof and walls | 17 | 82 | 1 |




The surveyors found many of the roof components either to be unsafe or no response was received against them, as shown in the above graph.

**Overall assessment of damageability**

A cumulative analysis of different components of IAY houses surveyed in Bahraich with regard to risk of floods was compiled considering the specifications for foundations (40% score of total), walls (20% score of total), roofs (20% score of total) and, soil conditions of site (20% score of total). The foundations were analysed for the material used, depth and width while the walls were analysed for the materials used, presence of lintel band, quality of masonry joints and quality of wall to wall connections. Similarly, the roofs were analysed for the materials used and quality of connections between the roof and the walls. This analysis reveals that 54 of the 100 houses surveyed are rather susceptible to serious damage due to floods as they scored less than 40%, 41 scored between 40-70 % and were

moderately susceptible to damage and 5 were unlikely to suffer serious damage due to floods as they had scored above 70% in the final analysis.

The houses that scored less and were therefore considered to be rather susceptible to damage were largely those that were located on unsafe sites with loose soil conditions. Foundations with mud mortar and unprotected plinths also contribute to the vulnerability of these houses. A sizeable number of houses were reported to have weak wall to wall and wall to roof connections by the homeowners. These were the main factors that affected the safety perception of the houses.

The primary reason for this trend was understood to be the gap in IAY delivery in terms of technical support and supervision on one hand and low risk perception of homeowners on the other.

### 3.3.3 Key Highlights of IAY Delivery mechanism in UP

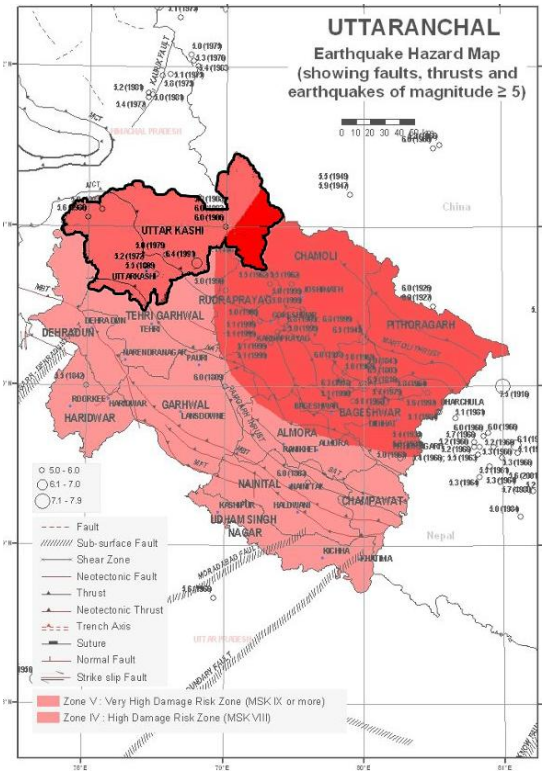
The state does not have an elaborate mechanism for delivery of IAY houses. Assistance is disbursed in two installments: 75% payable upon issue of sanction order and 25% payable at the time of roofing. These installments are paid to the beneficiary upon verification by the Grameen Vikas Adhikari who is an employee of the State Government. Besides this cash support, no other support – material or otherwise is provided to IAY families. Progress of work i.e. completion of house construction is monitored by the Garmeen Vikas Adhikari and reported to the BDO in periodic meetings. Quality monitoring is the responsibility of Junior Engineers (normally two for each block) one each from the Rural Engineering Services and Minor Irrigation.

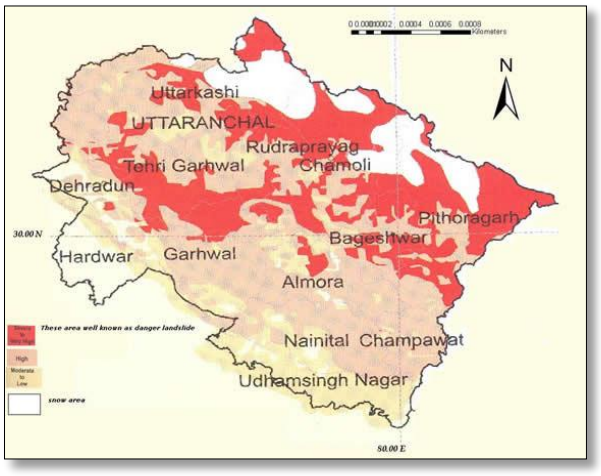
On the lines of IAY, the state was also providing assistance especially to SC families left out of the permanent IAY families through Mahamaya Awas Yojana. The pattern of assistance and supervision was same as that of IAY. The scheme has been discontinued since the change of government in the state in 2012.

## 3.4 UTTARAKHAND

Uttarakhand experienced 17 earthquakes of magnitude 5 or more on the Richter scale, in the 20th century. Floods and landslides are also common risks in Uttarakhand. Intense rainfall over short periods of a few days – often described locally as 'cloudbursts' – tends to destabilize weak or fractured slopes.

During the monsoon of 2010, the state was severely hit by devastating floods and landslides resulting in massive loss of human lives, property, crops and infrastructure took place. More than 20,000 houses were partially damaged and 1500 pucca and 3000 semi-pucca houses were completely damaged. In all 29.24 lakh people were affected and 233 habitations were rendered unfit for human habitation. The state falls in zone 4 and 5 of seismic vulnerability.




**Earthquake Vulnerability Map Uttarakhand** **Landlside zonation Map – Uttrakhand**

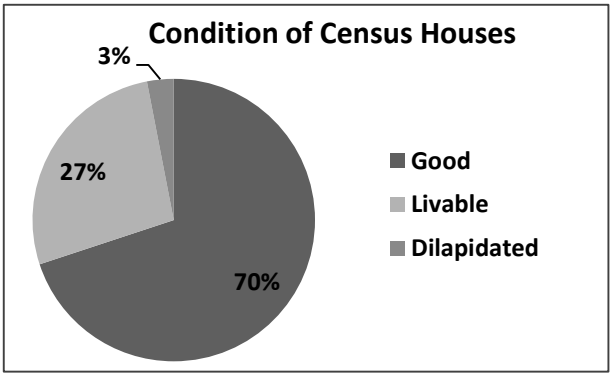
(Source: Vulnerability Atlas of India, 2007)

### 3.4.1 Status of housing in Uttarkashi District, Uttarakhand (census 2011)

Census 2011 indicates the following trends with regard to Housing:

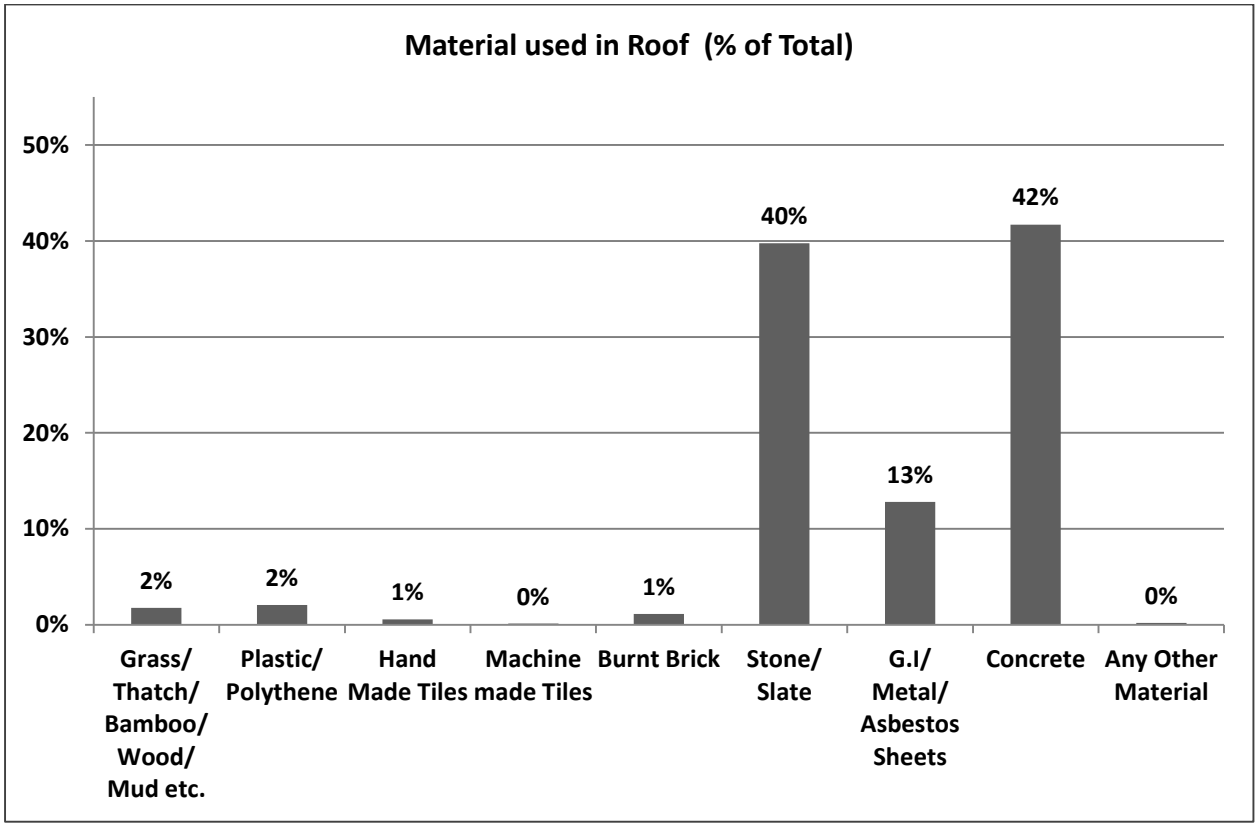
**Condition of Houses**

Approximately 25% houses are of good quality and 64% are of livable quality while 11% are dilapidated.



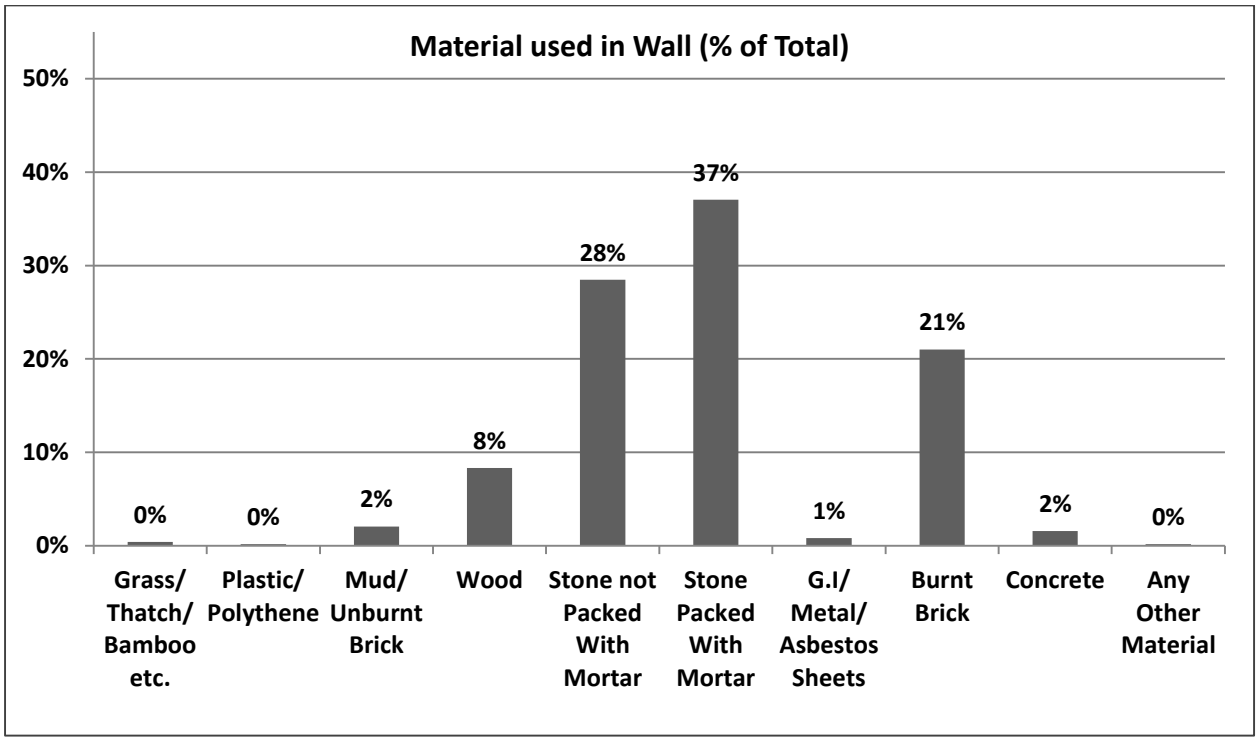

**Material used for Roofing**

The predominant materials used in the construction of roof are RCC followed by stone/slate and then G.I. or Metal or asbestos sheets.



**Material used for walling**

The predominant materials used are mud or unburnt bricks, secondly burnt bricks are used; use of stone packed with mortar was found to be common.




### 3.1.5 Status of IAY housing in Uttarkashi District – Findings of the Pilot Study

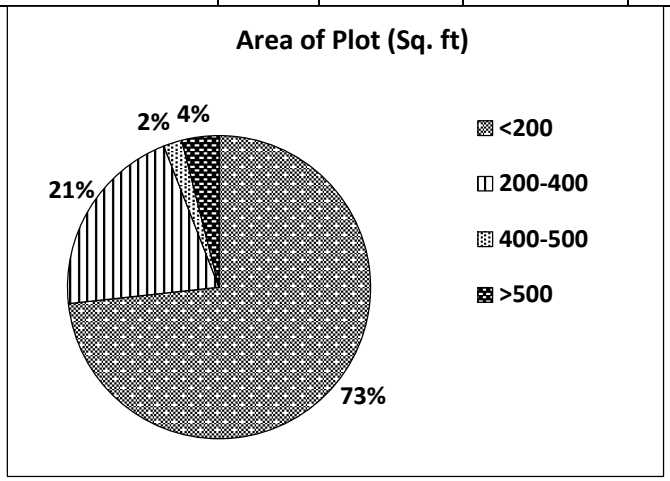
During 2012, the pilot study was conducted in Uttarkashi district to understand successes and challenges faced by IAY beneficiaries in enhancing the resilience of their houses to local disasters. The survey was carried out using a questionnaire that was tested in the field; the questionnaire aimed at capturing perception of the homeowner / user with regard to the disaster vulnerability of their house as well as, the perception of a surveyor trained at making the necessary assessments in the field.

Key highlights of the findings of the survey are given below:

## a. General Observations

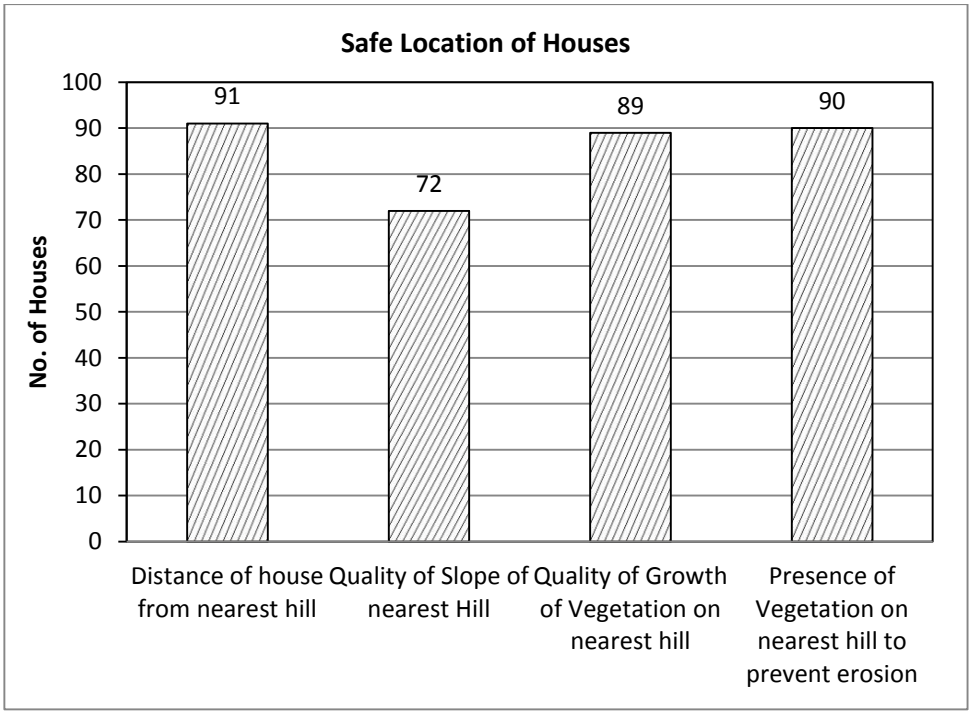
- **Area of the Plot**

| Area of Plot (Sq. ft.) | | | | |
|---|---|---|---|---|
| | <200 | 200-400 | 400-500 | >500 |
| Area of Plot (Sq. ft.) | 74 | 21 | 2 | 4 |




About 73% of the houses which were surveyed had area less than 200 sq. ft., 21% of the houses had area between 200 – 400 sq. ft., while 2% and 4% lies in the range of 400 – 500 sq. ft. and greater than 500 sq. ft. respectively.

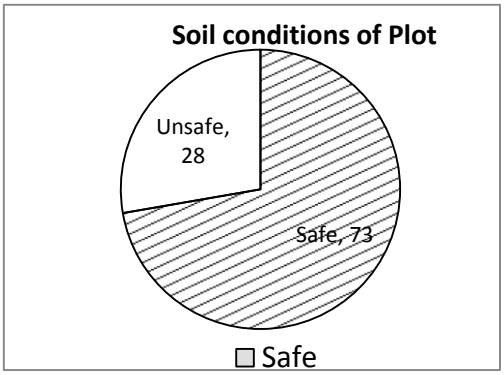
- **Location of House**



- **Soil Conditions of the Plot**

Most houses in the sample reported to be located in safe sites with regard to distance from the nearest hill being greater than the height of the retaining wall, presence of vegetation on the nearest hill and this vegetation growing well vertically indicating stability of slope. However, about 30 houses were reported dissatisfaction with the fact that the slope of the nearest hill was rather steep making their site vulnerable to the impact of any seismic activity / rain related landslide uphill.

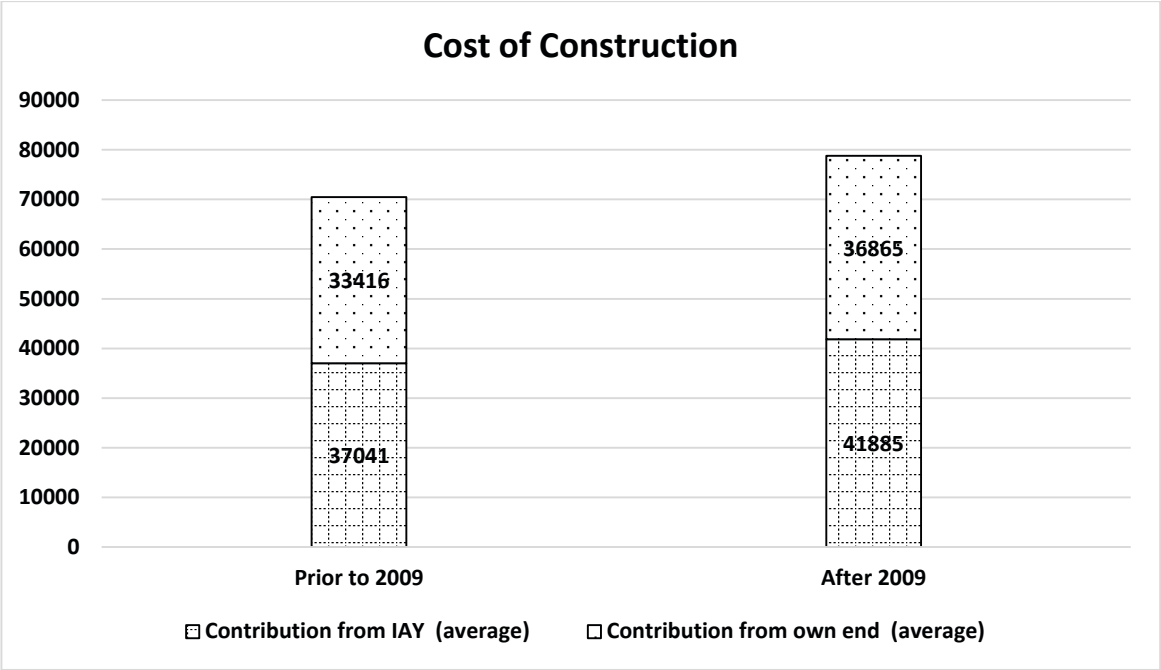
| Soil conditions of plot | |
|---|---|
| Safe | 73 |
| Unsafe | 28 |
| No Data | 0 |



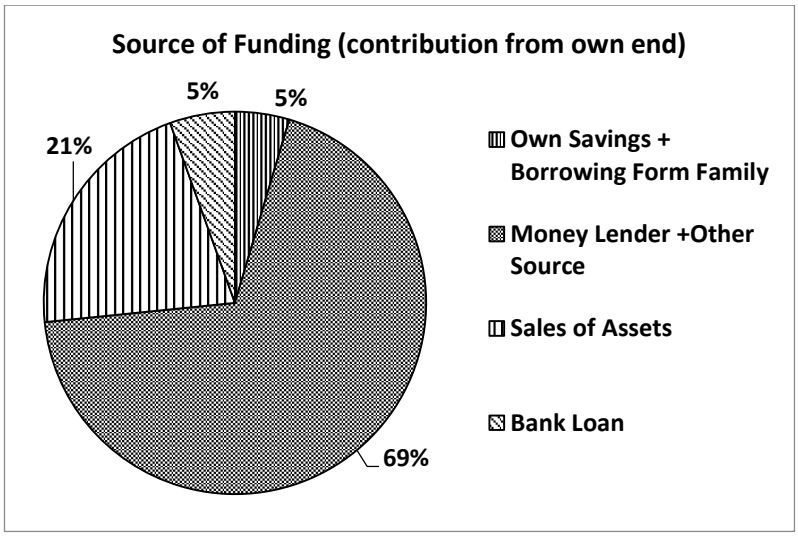

28 percent households reported that the soil conditions of their plot were unsafe due the absence of hard rock. These houses were reported to be constructed on loose soil.

- **Cost of Construction**

| **Cost of Construction** | | | |
|---|---|---|---|
| | **Contribution from IAY (average)** | **Contribution from own end (average)** | **Actual Cost of Construction (average)** |
| **Prior to 2009** | 37041 | 33416 | 70457 |
| **After 2009** | 41885 | 36865 | 78750 |




The graph and table indicate the average expense on construction on an IAY house using government assistance received and owner's won contribution. Average expenses incurred on house construction prior to 2009 (when the unit assistance under IAY was Rs.35000 for plain areas) and after 2009 when the unit assistance was revised to the current Rs.45000 have been tabulated. It is evident that in both the cases, people have been spending at least equivalent to the amount received under IAY for constructing their house.

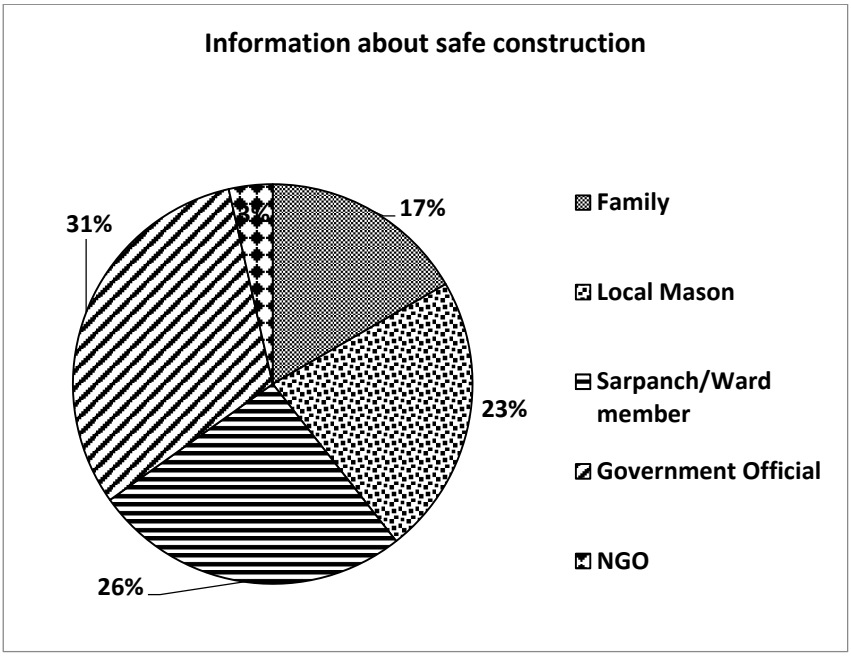



The most common source of funding for the construction of houses in Uttarkashi, over and above the government assistance under IAY, is borrowing from Money Lenders or other

sources, 69% people had done this while 21% of people reported to have sold some of their own assets to meet the construction cost of the house.

- **Access to information on safe construction**

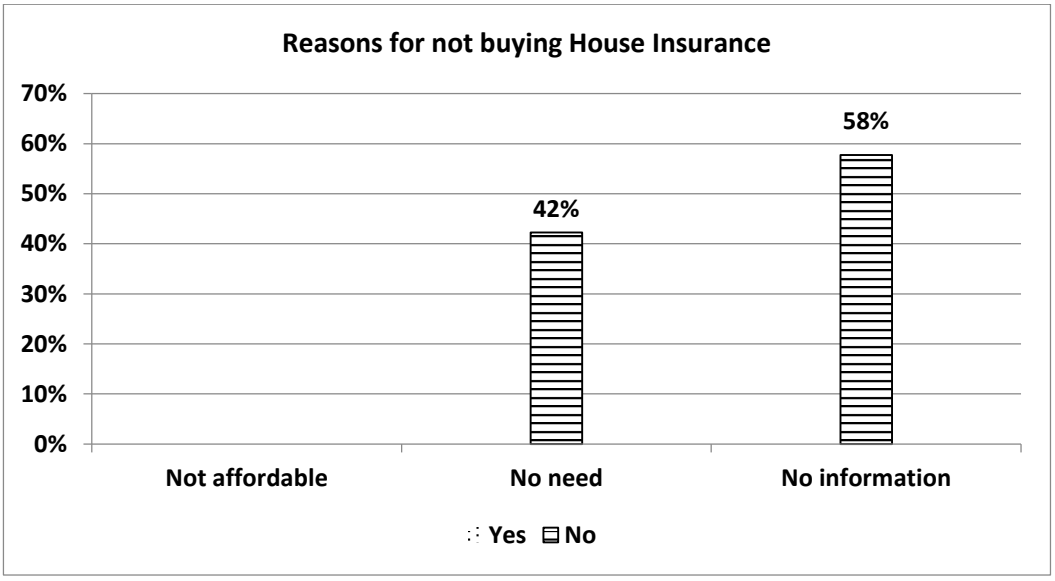
| Information about safe construction | | | | |
|---|---|---|---|---|
| Family | Local mason | Sarpanch/ward member | Government Official | **NGO** |
| 17 | 23 | 26 | 31 | 3 |




In Uttarkashi among the 101 families surveyed, about 31% of families said that they were informed by a Govt. official about safe construction while 26% reported guidance from the Sarpanch. 23% reported to have been guided by Local mason while 33% consulted their family members for information on Safe construction.

- **Insurance of IAY houses**

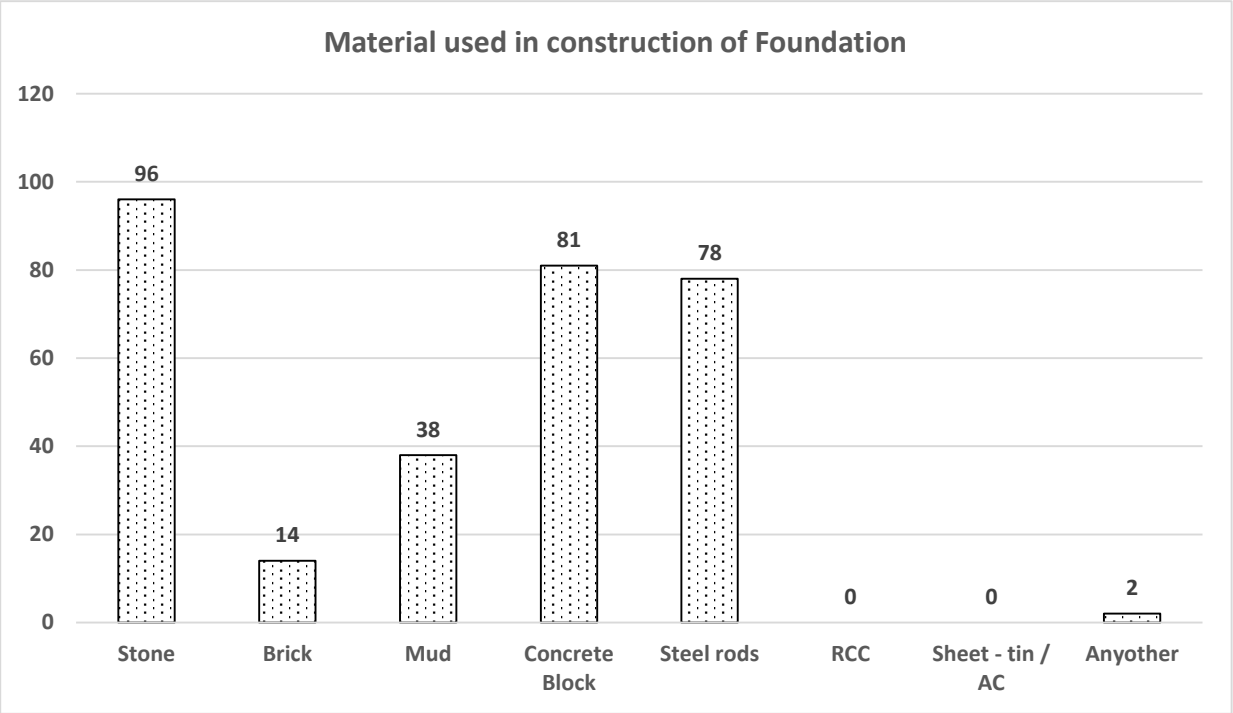
| House Insurance | | | |
|---|---|---|---|
| | Not affordable | No need | No information |
| Yes | 0% | 0% | 0% |
| No | 0% | 42% | 58% |




Among the 101 Houses surveyed, no house was reported to be insured. Among these 101 houses 58% families reported lack of information on house insurance while 42% did not feel any need of house insurance.

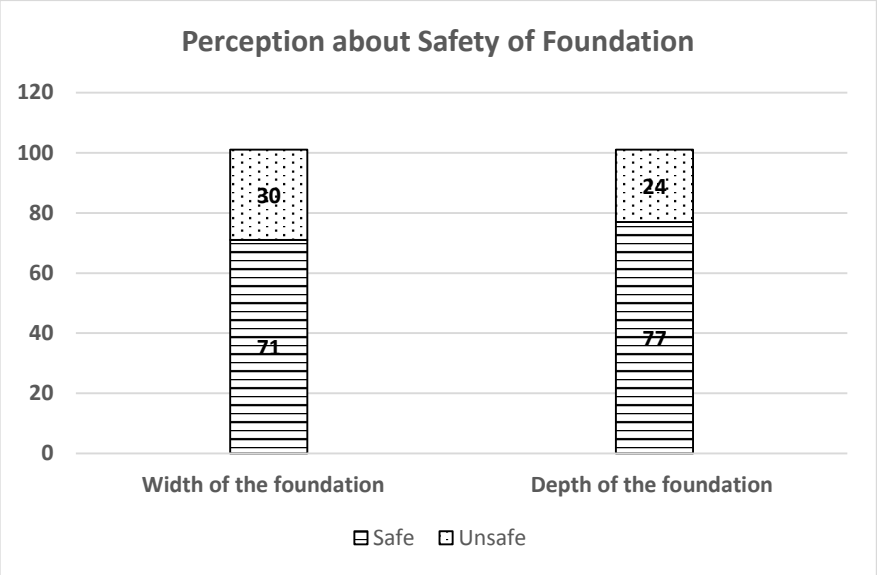
b. **Foundations**

| Material used in construction of Foundation | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Stone | Brick | Mud | Concrete Block | Steel rods | RCC | Sheet - tin / AC | Any Other |
| Foundation | 96 | 14 | 38 | 81 | 78 | 0 | 0 | 2 |




The main material used in foundation was reported to be stone, concrete blocks and steel rods. The binder used in construction of foundation by 14 households was mud and for the rest was reported to be cement.

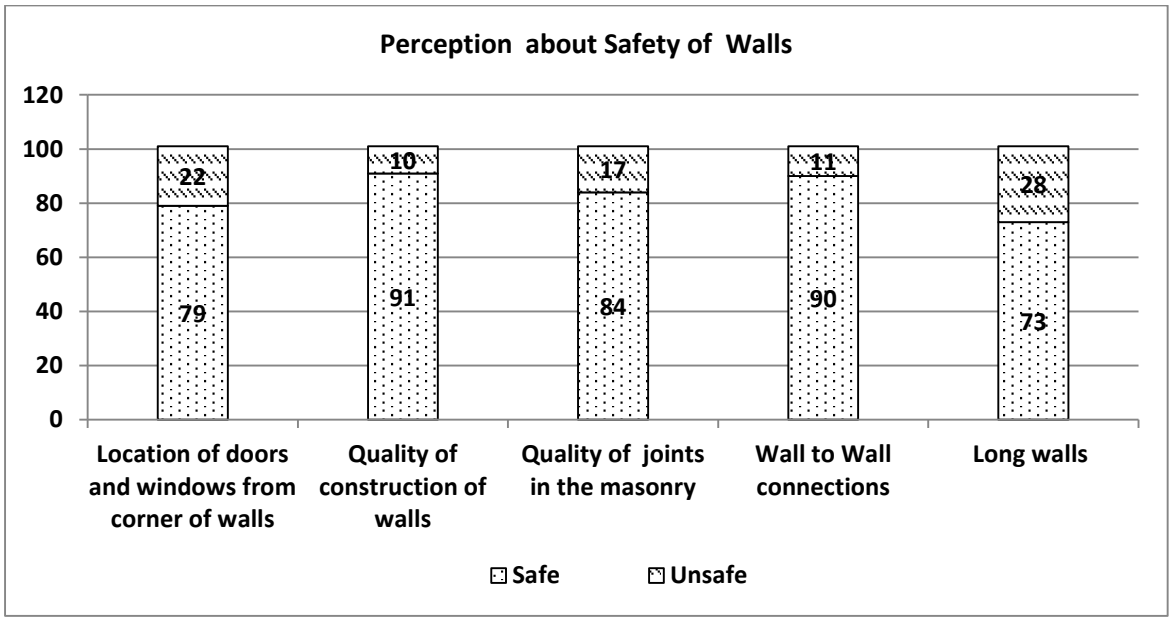
| Perception about Safety of Foundation | | | |
|---|---|---|---|
| | Safe | Unsafe | No data |
| Width of the foundation | 71 | 30 | 0 |
| Depth of the foundation | 77 | 24 | 0 |




Around 72 people out of total of 101 consider the width of the foundation of their house to be safe, while 77 people consider the depth of the foundation to be safe.

c. **Walling**

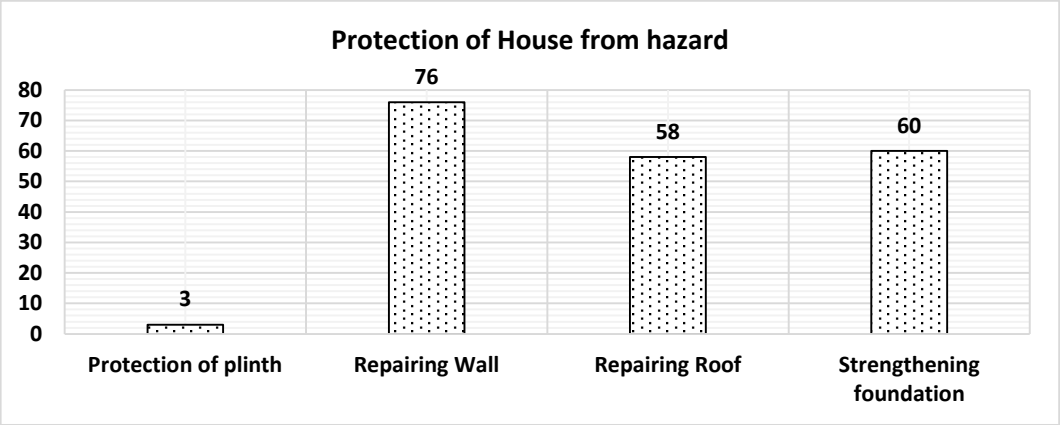
| Material used in construction of Wall | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Stone | Brick | Mud | Bamboo | Cement | Lime | Sheet - tin / AC | Wood | Cement Bricks | Any Other |
| Walls | 86 | 51 | 41 | 1 | 88 | 28 | 69 | 9 | 43 | 1 |



The most commonly used materials the in construction of walls are stone and bricks with steel reinforcement, cement being the binder in most of the cases. There were some cases where whole / some parts of the house have been constructed using mud as a binder also.

The quality of construction of the walls, the wall to wall connections, the construction of long walls, the construction quality of the joints in masonry and the location of doors and windows from the corner of the walls were all found to be safe in more than 73% houses.

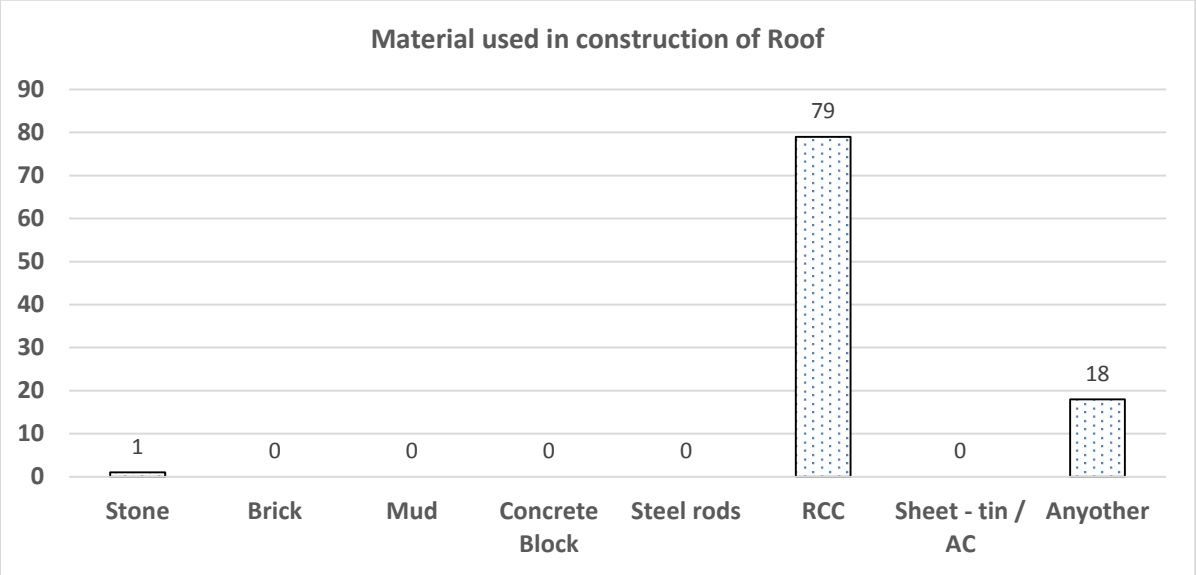
| Measures to protect house from hazard | | | | |
|---|---|---|---|---|
| | Protection of plinth | Repairing Wall | Repairing Roof | Strengthening foundation |
| No of Households | 3 | 76 | 58 | 60 |




In order to protect their houses from earthquakes, 76% households reported to regularly repair their walls. The main area of repair was reported to be the corner / joinery between adjoining walls.

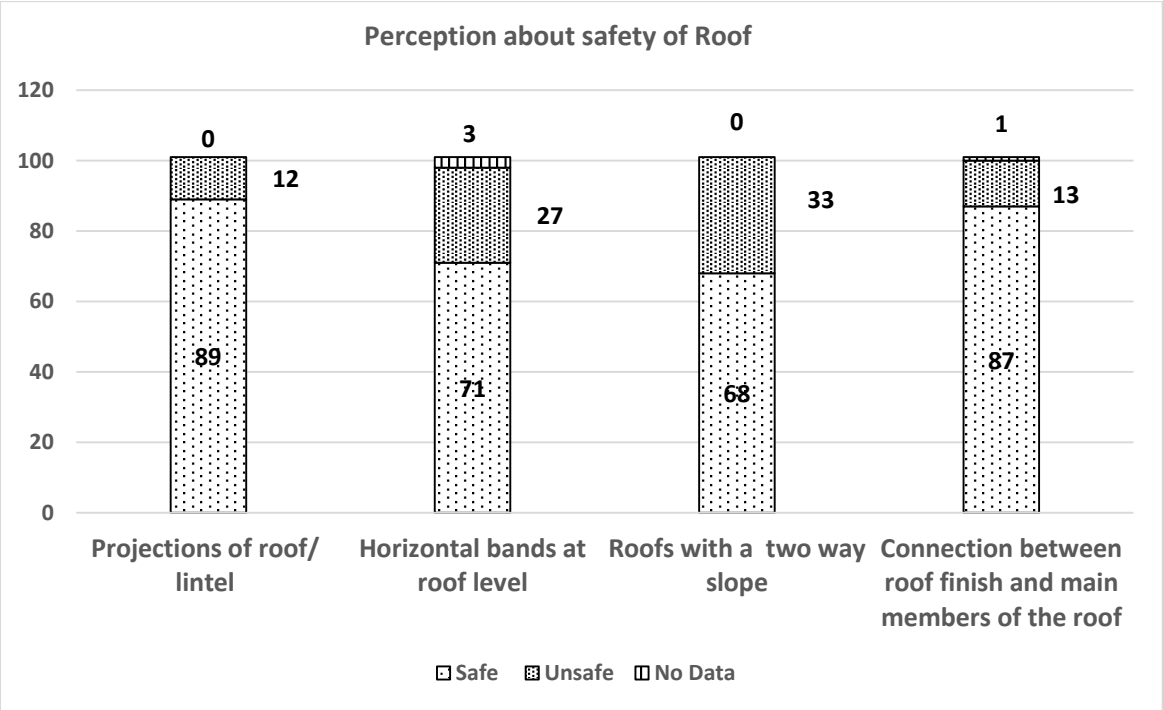
**d. Roofing**

| Material used in construction of Roof | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Stone | Brick | Mud | Concrete Block | Steel rods | RCC | Sheet - tin / AC | Any other |
| Roof | 1 | 0 | 0 | 0 | 0 | 79 | 0 | 18 |




The main material used in majority of roofs was RCC used by 79 out of the total 101 households surveyed.

| Perception about safety of roof elements | | | |
|---|---|---|---|
| | Safe | Unsafe | No Data |
| Projections of roof/ lintel | 89 | 12 | 0 |
| Horizontal bands at plinth level | 71 | 27 | 3 |
| Roofs with a two way slope | 68 | 33 | 0 |
| Connection between roof finish and main members of the roof | 87 | 13 | 0 |




The surveyors found most of the roof components to be safe as shown in the above graph.

**Overall assessment of damageability:** a cumulative analysis of different components of IAY houses surveyed in Uttarkashi with regard to risk of landslides and seismic activity was compiled considering the specifications for foundations (30% score of total), walls (40% score of total), roofs (20% score of total) and, architectural specifications (10% score of total). The foundations were analysed for the material used, depth and width while the walls were analysed for the materials used, presence of lintel band, quality of masonry joints and quality of wall to wall connections. Similarly, the roofs were analysed for the materials used and quality of connections between the roof and the walls. This analysis reveals that out of the 101 houses surveyed in Uttarkashi, 38 were found to be rather susceptible to serious damage due to earthquake and landslide forces as they scored less than 40%, 43 scored between 40-70 % and were moderately susceptible to damage and 20 were unlikely to suffer serious damage due to earthquake and landslide as they had scored above 70% in the final analysis.

The houses that scored less and were therefore considered to be rather susceptible to damage were largely those that were located on unsafe sites evidenced in the constant repair that was needed for the neighboring retaining walls. Many houses did not have lintel bands; and a need to repair the wall junctions regularly was shared by the households

surveyed. Long walls were also found to be common. These were the main factors that affected the safety perception of the houses.

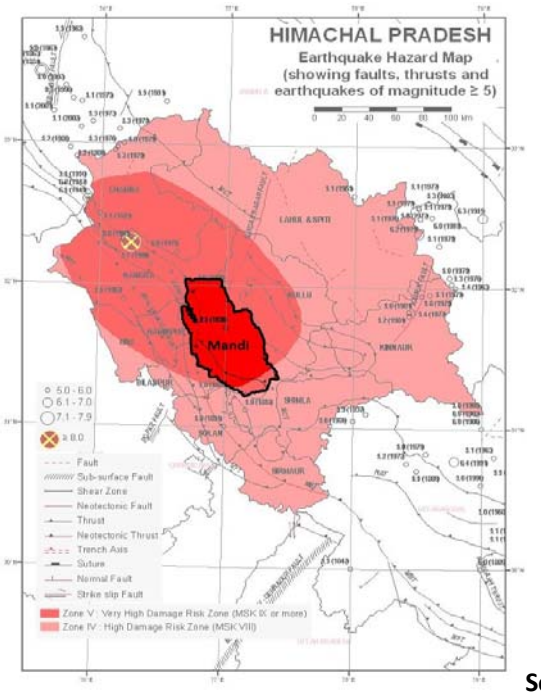
### 3.1.6 Key Highlights of IAY Delivery mechanism in Uttarakhand

IAY is implemented in Uttarakhand as per the national norms. Assistance of Rs 48500 is provided in two installments: 75% payable upon issue of sanction order and 25% payable at the time of roofing. These installments are paid to the beneficiary upon verification by the Grameen Vikas Adhikari who is an employee of the State Government. Besides this cash support, no other support – material or otherwise is provided to IAY families. There is no system of technical supervision although progress of work i.e. completion of house construction is monitored by the Garmeen Vikas Adhikari and reported to the BDO in periodic meetings.

On the lines of IAY, the state is implementing two rural housing schemes: Deen Dayal Uttarakhand Grameen Awas Yojana and Rajya Rin Seh Anudaan Gramin Awas Yojna. Both of these are fully state sponsored. The former provides assistance in one installment and targets general category BPL families left out of the IAY waitlist. Rajya Rin Seh Anudaan Gramin Awas yojna is a credit sum subsidy scheme targeting those BPL and APL families that have an annual income less than Rs 32000 per annum. Such households can avail of a credit of Rs 40,000 from listed banks and a subsidy of Rs 10000 from the state. 77% of the funds of the scheme are reserved for non - SC / ST households.

## 3.5 HIMACHAL PRADESH

Himachal Pradesh has a per capita income of Rs. 10942 and a literacy of 83.78%. 100 percent of the villages is fully electrified in the state. Decadal growth of population is 12.81%. The state is low density with a density of 123 persons per sqkm. The state falls in seismic zone IV and V of earthquake vulnerability.




**Seismic Vulnerability Map of Himachal Pradesh**
(Source : Vulnerability Atlas of India0, 2007)

Considering the high degree of disaster vulnerability of the state towards different kinds of natural hazards, a broad district wise vulnerability status has been devised for the state by evaluating the risk severity. The evaluation also gives weightage to the density of population likely to be affected as well as takes account of hazards likely to be induced by hydel projects, roads industries etc. Mandi district along with Kangra and Hamirpur lie in very high vulnerable category on the basis of the matrix devised. Mandi district also has moderate flood vulnerability.

| DISTRICT | EARTHQUAKE | LANDSLIDE | FLOODS | AVALANCHES | INDUSTRIAL | OVERALL VULNERABILITY |
|---|---|---|---|---|---|---|
| Hamirpur | VERY HIGH | LOW | LOW | ----- | ----- | MEDIUM |
| Mandi | VERY HIGH | MEDIUM | MEDIUM | ----- | ----- | HIGH |
| Kullu | HIGH | HIGH | HIGH | MEDIUM | HIGH | VERY HIGH |
| Bilaspur | MEDIUM | MEDIUM | LOW | ------ | MEDIUM | MEDIUM |

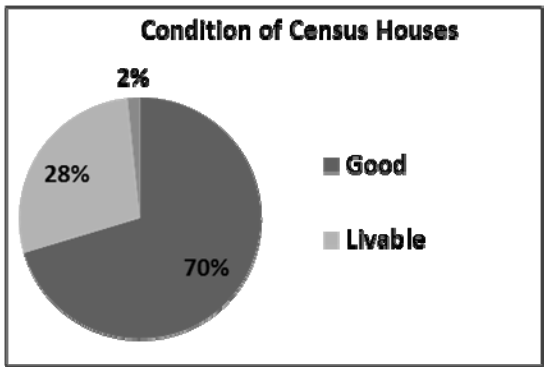
**District Wise Vulnerability Matrix**

*(Source: State Council for Science Technology &Environment Analysis)*

### 3.5.1 Status of housing in Mandi District of Himachal Pradesh

Census 2011 indicates the following trends with regard to Housing:

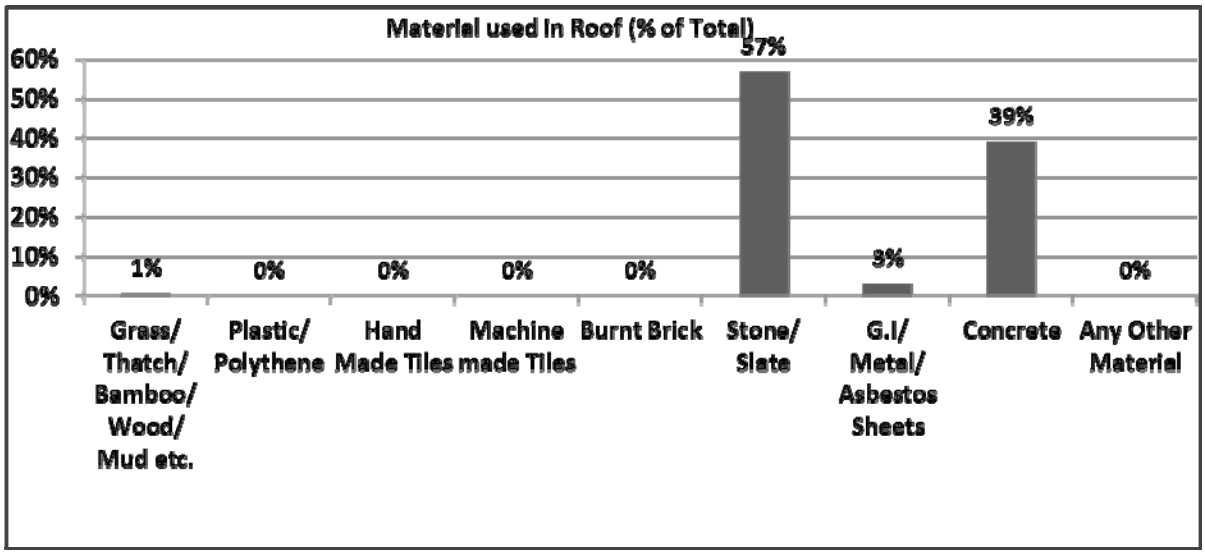
**Condition of Houses**




Approximately 70% houses are of good quality and 28% are of livable quality while 2% are dilapidated.

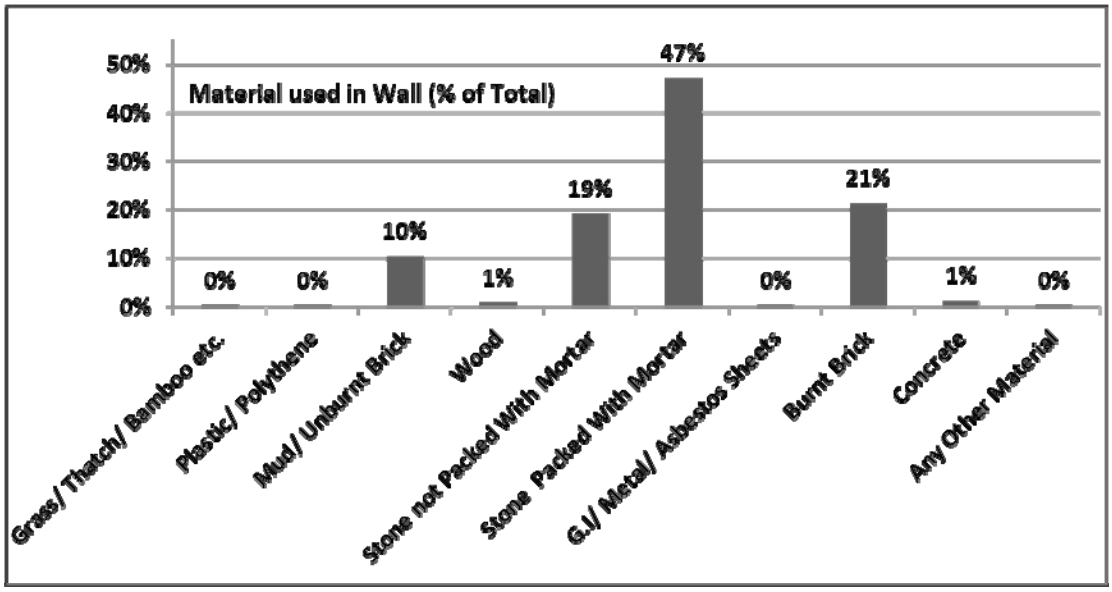
**Material used for Roofing**

The predominant material for roofing in Mandi is Stone/slate used by about 57% households, followed by concrete at 39%. About 3% houses use GI / metal / asbestos.




**Material used for Walling**

The predominant material for making walls in Mandi is stone packed with mortar used by about 47% households, followed by burnt brick at 21%. Stone not packed with mortar is also widely used, 19% of the sample were found using this. A small percentage, 10% of houses also use mud/burnt brick and people rarely use concrete and wood.



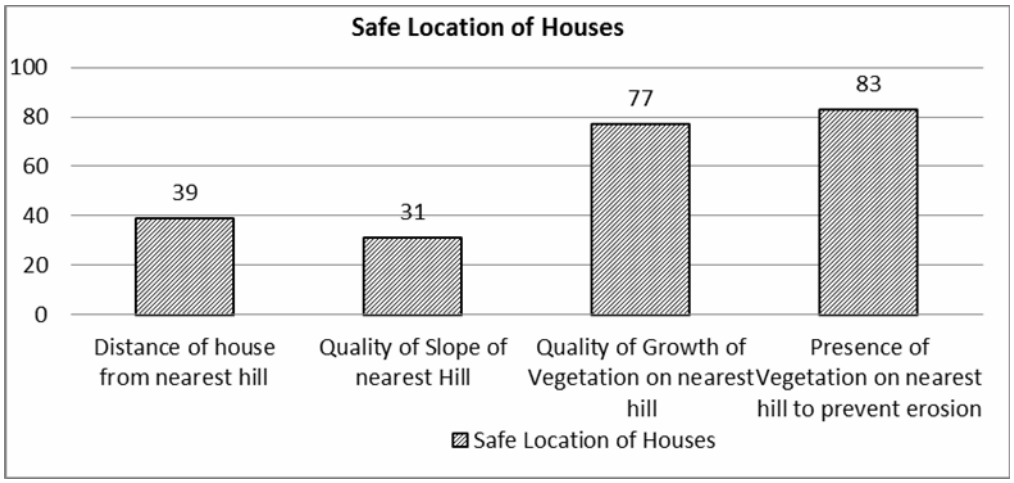

### 3.5.2 Status of IAY housing in Mandi district – Findings of the Pilot Study

During 2012, the pilot study was conducted in Mandi district in Himachal Pradesh to understand successes and challenges faced by IAY beneficiaries in enhancing the resilience of their houses to local disasters. The survey was carried out using a questionnaire that was tested in the field. The questionnaire aimed at capturing perception of the homeowner / user with regard to the disaster vulnerability of their house as well as, the perception of a surveyor trained at making the necessary assessments in the field.

Key highlights of the findings of the survey are given below:

**a. General Observations**

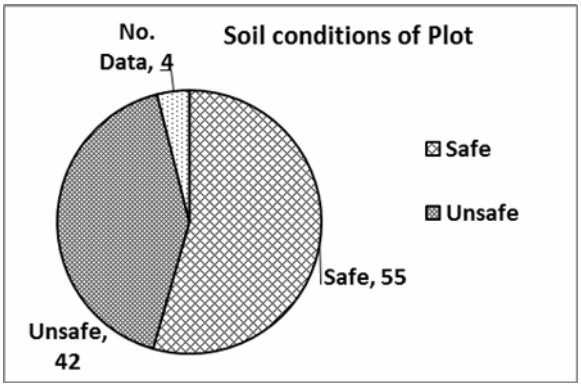
- **Safe Location of Houses**




Most houses in the sample reported to be located in safe sites with regard to distance from the nearest hill being greater than the height of the retaining wall, presence of vegetation on the nearest hill and this vegetation growing well vertically indicating stability of slope. However, about 31 houses reported dissatisfaction with the fact that the slope of the nearest hill was rather steep making their site vulnerable to the impact of any seismic activity / rain related landslide uphill.

- **Soil conditions of plot**

| | Soil conditions of plot |
|---|---|
| Safe | 55 |
| Unsafe | 42 |
| No. Data | 4 |

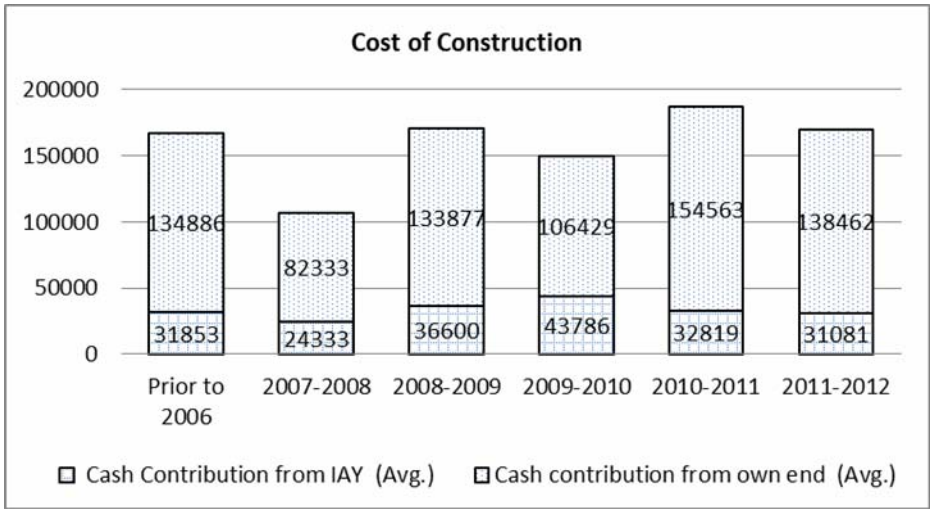


42 households reported that the soil conditions of their plot were unsafe due the absence of hard rock. These houses were reported to be constructed on loose soil.

- **Cost of Construction**

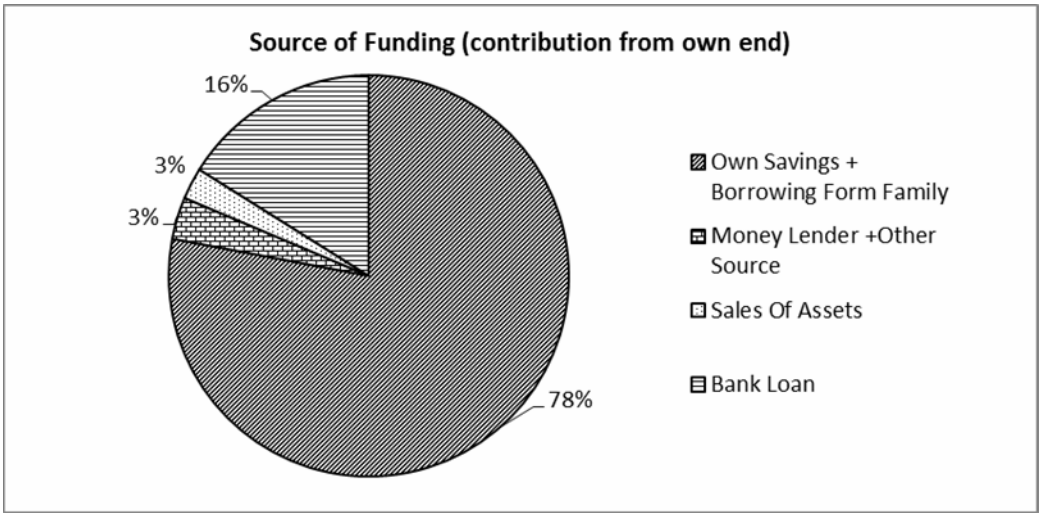
  The graph and table shows the average expense on construction from 2006-2012.

| Cost of Construction ( in Rupees) | | |
|---|---|---|
| | Cash Contribution from IAY (Avg.) | Cash contribution from own end (Avg.) |
| Prior to 2006 | 31853 | 134886 |
| 2007-2008 | 24333 | 82333 |
| 2008-2009 | 36600 | 133877 |
| 2009-2010 | 43786 | 106429 |
| 2010-2011 | 32819 | 154563 |
| 2011-2012 | 31081 | 138462 |



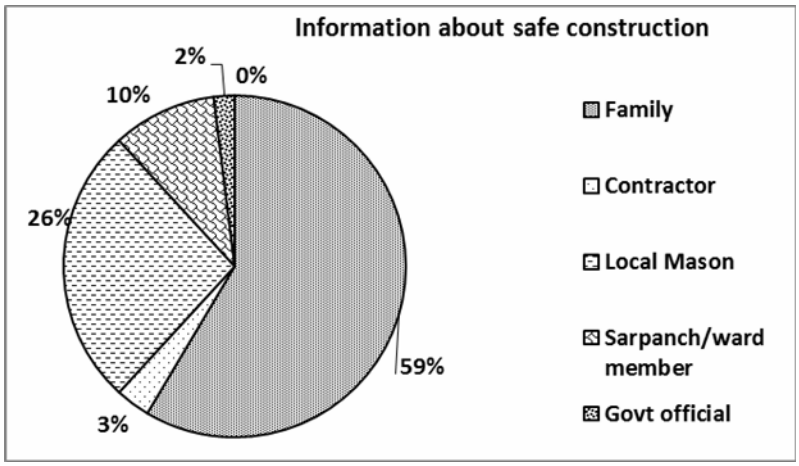

It is evident that people spend at least double the amount received from IAY for constructing their house.

- **Source of Funding**




The most common source of funding for the construction of houses in Mandi, over and above the government assistance under IAY, is borrowing from their family or using their own savings, 78% people had done this while 16% of people reported to have taken bank loan to meet the construction cost of the house.

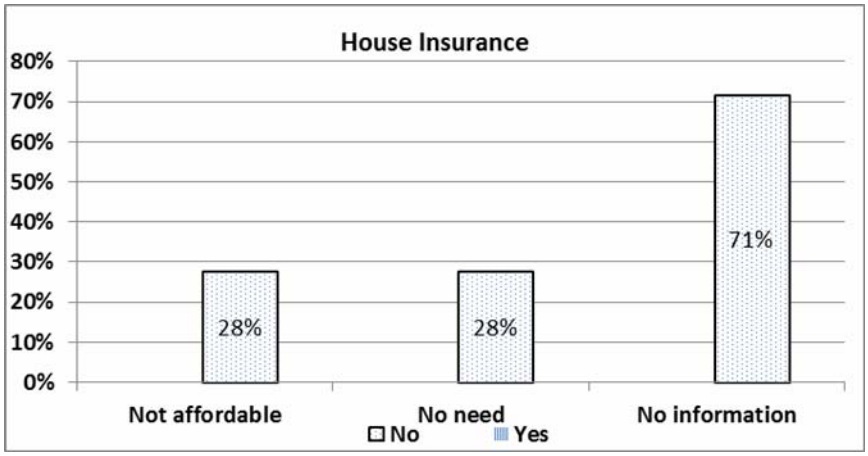
- **Access to information on safe construction**



In Mandi, among the 101 families surveyed, about 59% of families said that they were informed by a government official about safe construction while 26% reported guidance from the Local Mason. 3% reported to have been guided by Contractor while 10% consulted the Sarpanch of their village for information on Safe construction.

- **House Insurance**

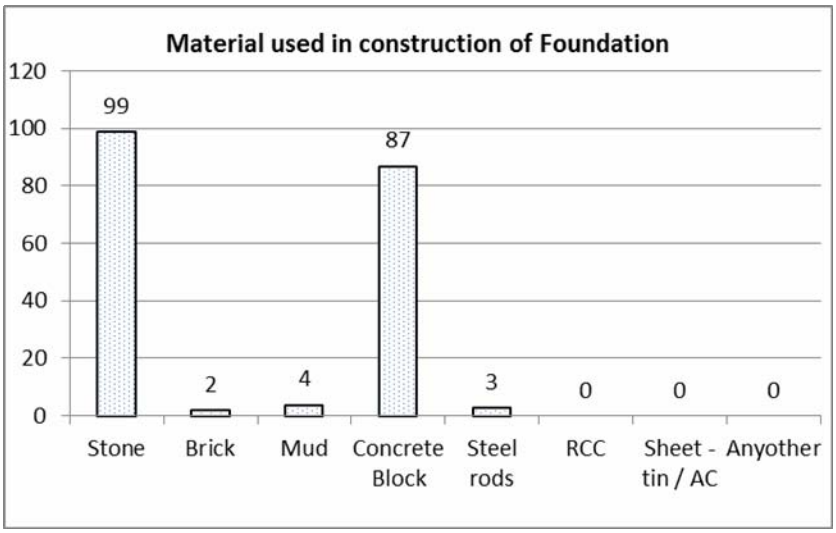
| House Insurance | | | |
|---|---|---|---|
| | Not affordable | No need | No information |
| Yes | 0% | 0% | 0% |
| No | 28% | 28% | 71% |




Among the 101 Houses surveyed, no house was reported to be insured. Among these 101 houses 71% families reported lack of information on house insurance while 28% did not feel any need of house insurance and 28% reported that they cannot afford insurance premium.

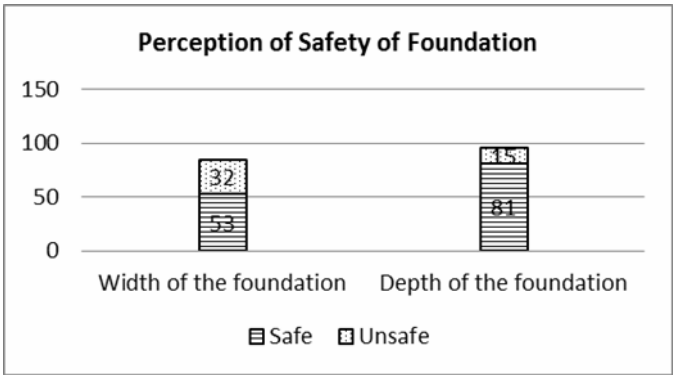
**b. Foundations**

| Material used in construction of Foundation | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Stone | Brick | Mud | Concrete Block | Steel rods | RCC | Sheet - tin / AC | Any other |
| Foundation | 99 | 2 | 4 | 87 | 3 | 0 | 0 | 0 |




The main material used in foundation was reported to be stone and concrete blocks. The binder used in foundation by 14 households was mud and cement by the rest.

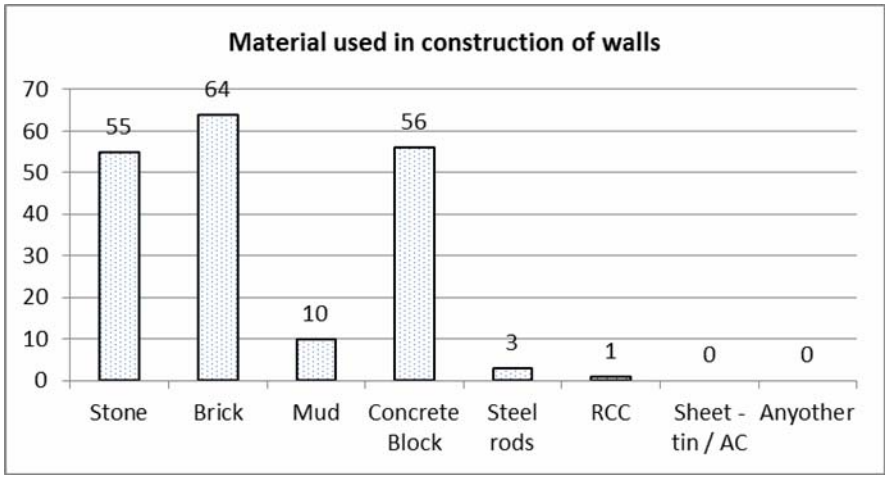
| Perception about Safety of Foundation | | |
|---|---|---|
| | Safe | Unsafe |
| Width of the foundation | 53 | 32 |
| Depth of the foundation | 81 | 15 |



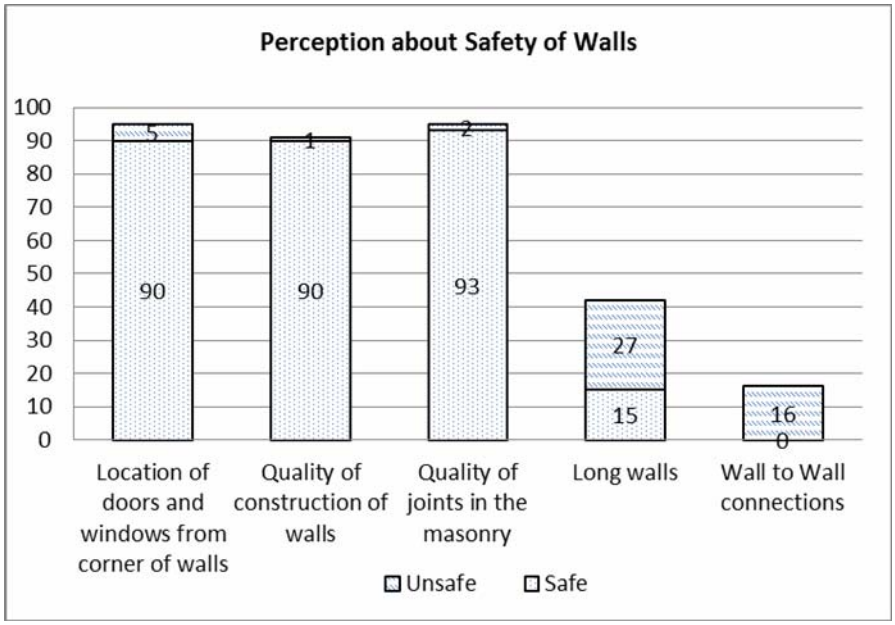

Around 53 people out of total of 101 consider the width of the foundation of their house to be safe, while 81 people consider the depth of the foundation to be safe.

c. **Walling**

| Material used in construction of walls | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Stone | Brick | Mud | Concrete Block | Steel rods | RCC | Sheet - tin / AC | Anyother |
| Wall | 55 | 64 | 10 | 56 | 3 | 1 | 0 | 0 |

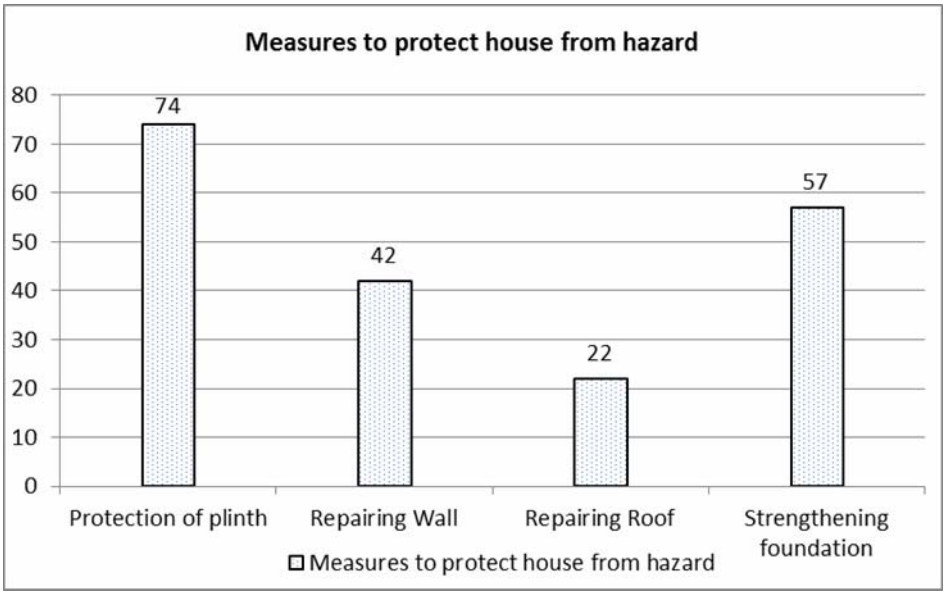



The most commonly used materials the in construction of walls are stone and bricks with steel reinforcement, cement being the binder in most of the cases. There were some cases where whole / some parts of the house have been constructed using mud as a binder also.



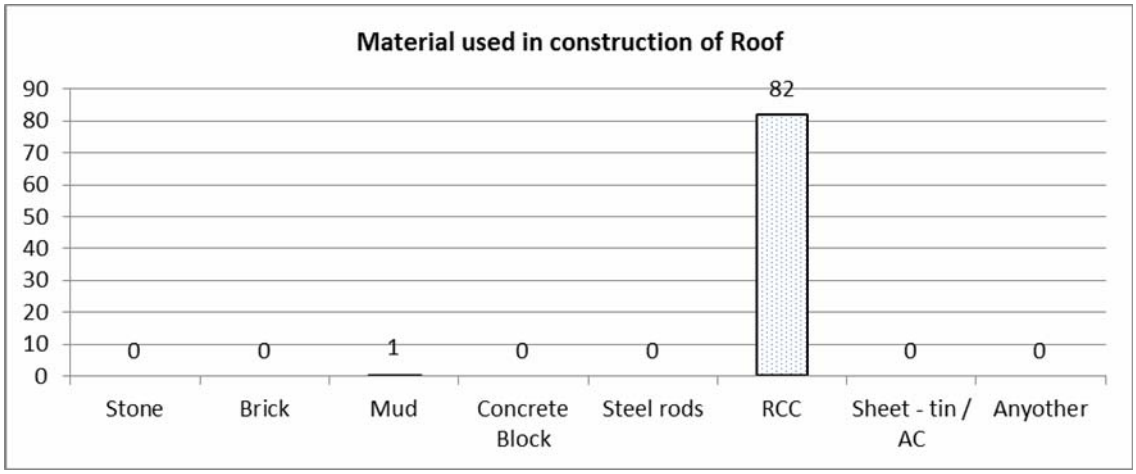
The quality of construction of the walls, wall to wall connections, construction of long walls, construction quality of the joints in masonry and the location of doors and windows from the corner of the walls were all found to be safe in more than 73% houses.

In order to protect their houses from earthquakes, 42% households reported to regularly repair their walls. The main area of repair was reported to be protection of Plinth.



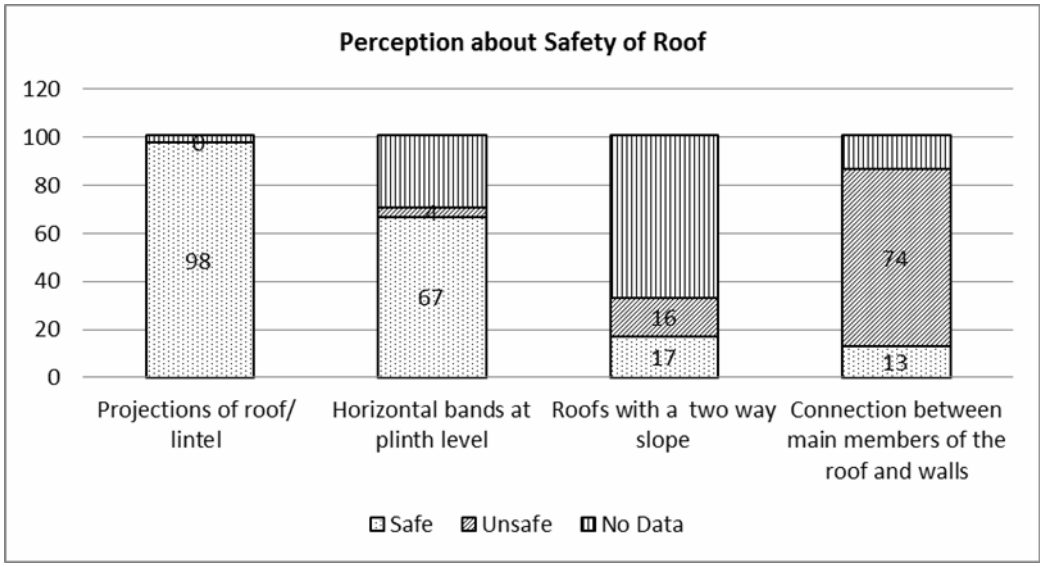
**d. Roofing**

| Material used in construction of Roof | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Stone | Brick | Mud | Concrete Block | Steel rods | RCC | Sheet - tin / AC | Any other |
| Roof | 0 | 0 | 1 | 0 | 0 | 82 | 0 | 0 |




The main material used in majority of roofs was RCC used by 82 out of the total 101 households surveyed.

| Perception about Safety of Roof | | | |
|---|---|---|---|
| | Safe | Unsafe | No Data |
| Projections of roof/ lintel | 98 | 0 | 3 |
| Horizontal bands at plinth level | 67 | 4 | 30 |
| Roofs with a two way slope | 17 | 16 | 68 |
| Connection between main members of the roof and walls | 13 | 74 | 14 |




The surveyors found most of the roof components to be safe as shown in the above graph.

**Overall assessment of damageability:** A cumulative analysis of different components of IAY houses surveyed in Mandi with regard to risk of landslides and seismic activity was compiled considering the specifications for foundations (30% score of total), walls (40% score of total), roofs (20% score of total) and, architectural specifications (10% score of total). The foundations were analysed for the material used, depth and width while the walls were analysed for the materials used, presence of lintel band, quality of masonry joints and quality of wall to wall connections. Similarly, the roofs were analysed for the materials used and quality of connections between the roof and the walls. This analysis reveals that 48 of the 101 houses surveyed are rather susceptible to serious damage due to earthquake and landslide forces as they scored less than 40%, 42 scored between 40-70 % and were moderately susceptible to damage and 11 were unlikely to suffer serious damage due to earthquake and landslide as they had scored above 70% in the final analysis.

The houses that scored less and were therefore considered to be rather susceptible to damage were largely those that were located on unsafe sites along steep slopes. 42 households reported that the soil conditions of their plot were unsafe due the absence of hard rock. These houses were reported to be constructed on loose soil. Many houses also did not have lintel bands; and use of mud mortar in foundations as well as walls was also

found in some cases. A sizeable number of houses were reported to have weak wall to roof connections by the homeowners. These were the main factors that affected the safety perception of the houses.

### 3.5.3 Key highlights of the delivery mechanism in Himachal Pradesh

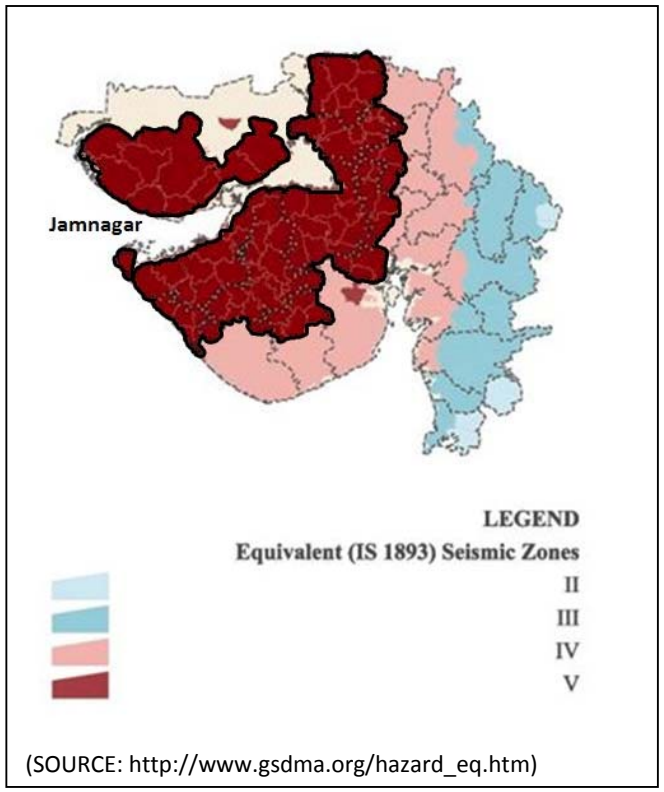
Under IAY in Himachal Pradesh, an assistance of Rs 48500 is provided to the beneficiary family. The state does not have an elaborate mechanism for delivery of IAY houses. Assistance is normally disbursed in three installments: 50% payable upon issue of sanction order, 40% payable upon completion upto lintel level and 10% payable upon completion of house. These installments are paid to the beneficiary through the Panchayat upon verification by the Panchayat Secretary or Panchayat Sahayak who are employees of the State Government. In some districts where there is limited working season due to extreme cold conditions such as, Kinnaur and Lahaul- Spiti, funds are released as one lump sum installment.

Besides this cash support, no other support – material or otherwise is provided to IAY families. Progress of work i.e. completion of house construction is monitored by the Panchayat Sahayak and reported to the BDO in periodic meetings. There is no formal system for monitoring the quality of construction, although Junior Engineers are available at the Block level.

On the lines of IAY, the state also provides assistance to those families that have been left out of the permanent IAY families through Atal Awas Yojana. The pattern of assistance and supervision is same as that of IAY.

## 3.6 GUJARAT

Gujarat is a multi-hazard prone state with a history of droughts as well as floods. The coastal parts also have a history of cyclones. The 2001 earthquake in Bhuj affected over 7,904 villages in 182 talukas of 21 districts of the state. More than 18000 people lost their lives, and about 166000 suffered injuries of various degrees. About 332,188 houses were destroyed while 725,802 houses were damaged to varying degrees.



(SOURCE: http://www.gsdma.org/hazard_eq.htm)

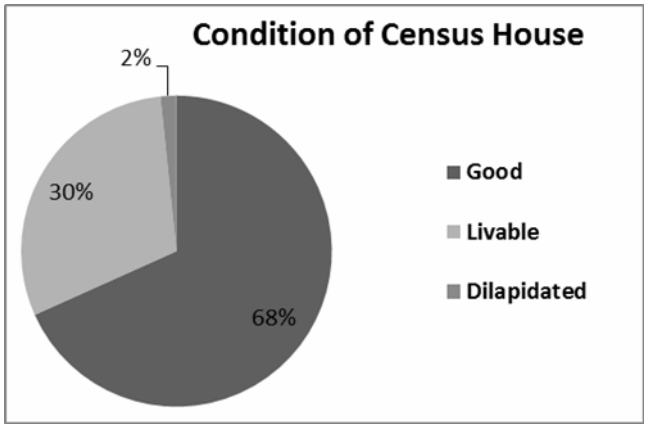
For the purpose of the study, houses were studied in Jamnagar district of Gujarat that has a history of earthquakes and cyclone. As indicated in the map below, the district falls in seismic zone V.

### 3.6.1 Status of housing in Jamnagar District, Gujarat (Census, 2011)

Census 2011 indicates the following trends with regard to Housing:

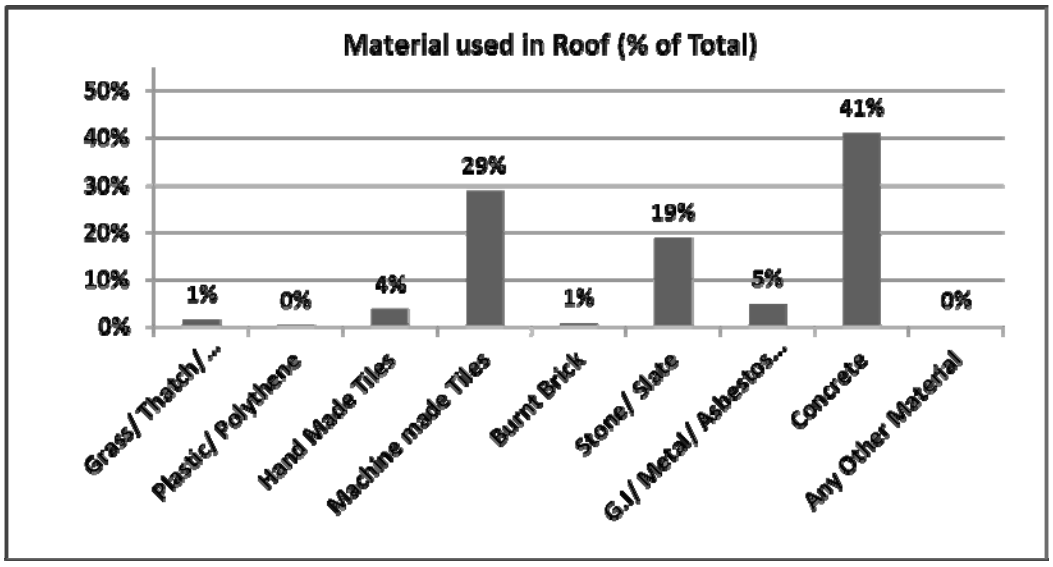
**Condition of Houses**

Approximately 68 % houses are of good quality and 30 % are of liveable quality while 2 % are dilapidated.



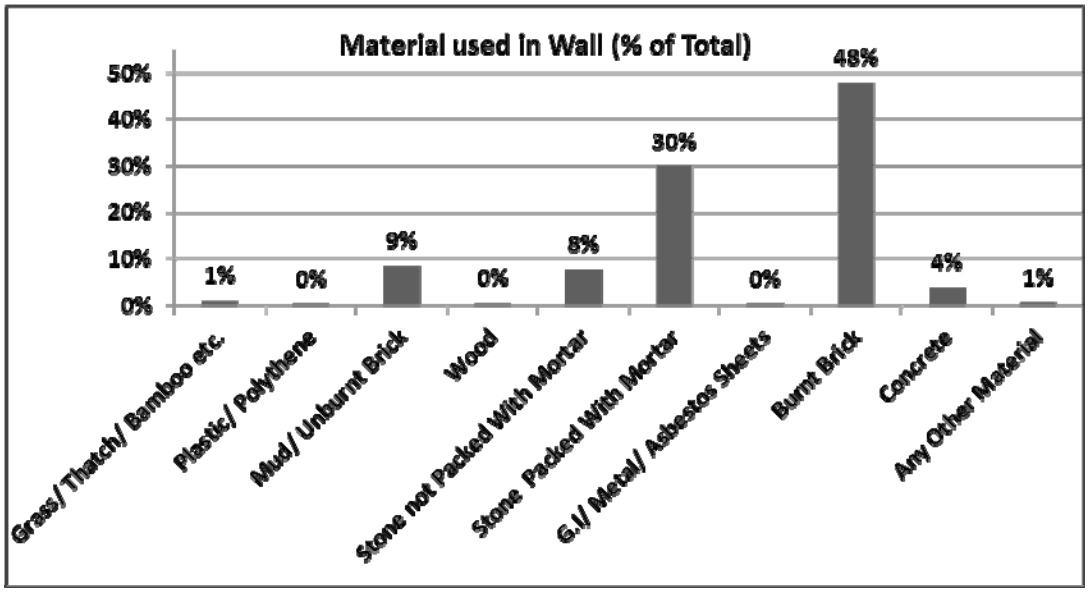
**Material used for Roofing**

The predominant material for roofing in the state is RCC used by about 41% households, followed by machine made tiles at 29%. A smaller percentage, 19% of houses also use GI / metal / asbestos.




**Material used for Walling**

The predominant material for walling in the state is burnt brick used by about 48% households, followed by stone packed with mortar at 30%. A small percentage, 8% of houses are made with dry stone masonry while 9% house are made of mud / unburnt bricks.




### 3.6.2 Status of IAY housing in Jamnagar – Findings of the Pilot Study

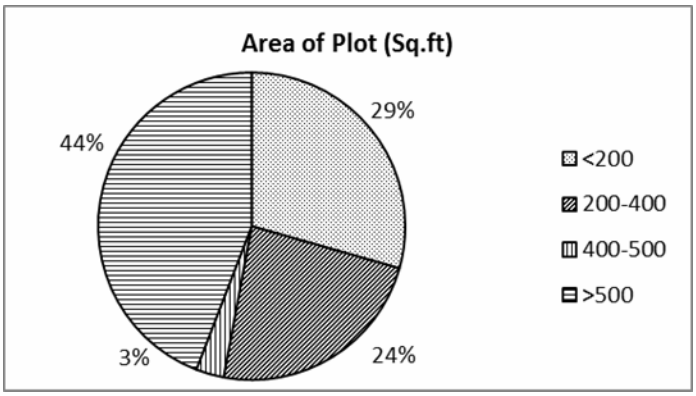
During 2012, the pilot study was conducted in Jamnagar district in Gujarat to understand successes and challenges faced by IAY beneficiaries in enhancing the resilience of their houses to local disasters. The survey was carried out using a questionnaire that was tested in the field; the questionnaire aimed at capturing perception of the homeowner / user with regard to the disaster vulnerability of their house as well as, the perception of a surveyor trained at making the necessary assessments in the field.

Key highlights of the findings of the survey are given below:

**a. General Observations**

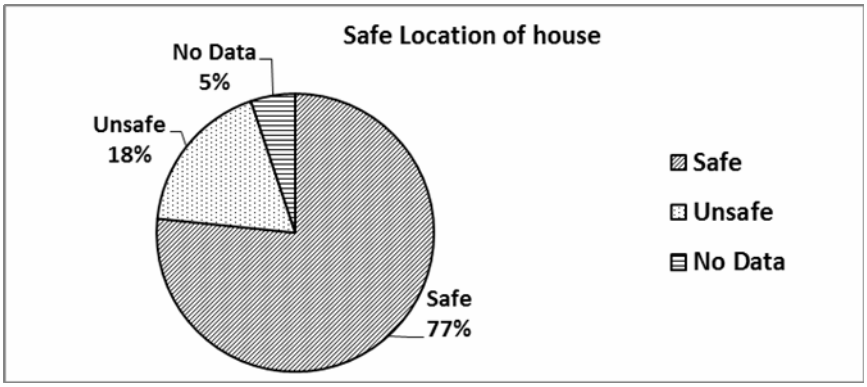
- **Area of the Plot**

| | <200 | 200-400 | 400-500 | >500 |
|---|---|---|---|---|
| Area of Plot (Sq.ft.) | 29.4 | 23.5 | 2.9 | 44.1 |




Among the houses surveyed 29% plots were having area less than 200 Sq. ft., while 24% and 44% have area ranging between 200 – 400 sq. ft. and greater than 500 sq. ft., respectively. Only 3% houses have an area ranging from 400 – 500 sq. ft.

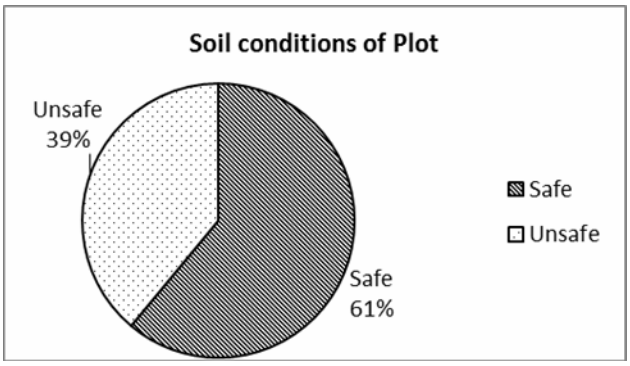
- **Location of House**




Most houses in the sample were reported to be located on safe sites. However, about 18 households reported to be dissatisfied with the location of their homesteads given their exposure to cyclonic winds and localized flooding.

- **Soil Conditions of the Plot**

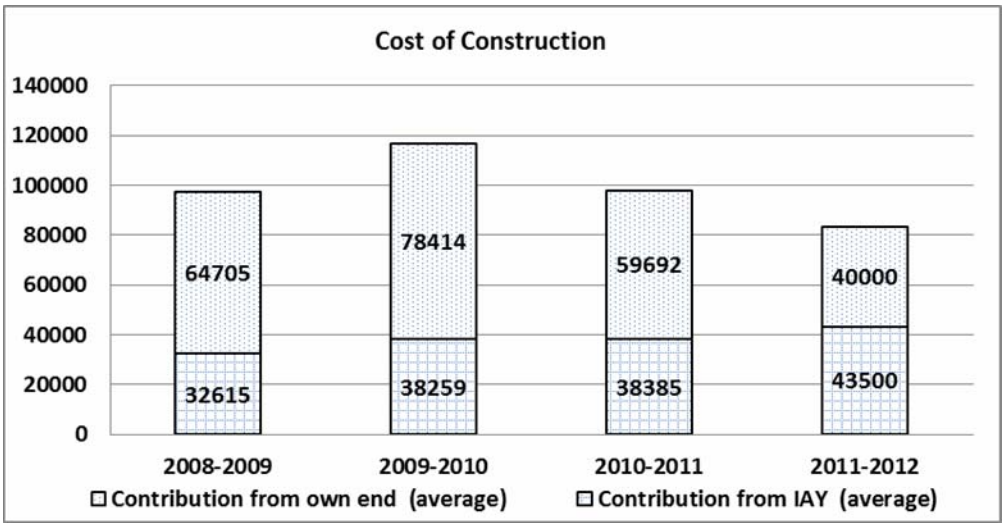
| | Soil conditions of plot |
|---|---|
| Safe | 47 |
| Unsafe | 30 |
| No. Data | 0 |




39 % households reported that the soil conditions of their plot were unsafe due the absence of hard rock. These houses were reported to be constructed on loose soil.

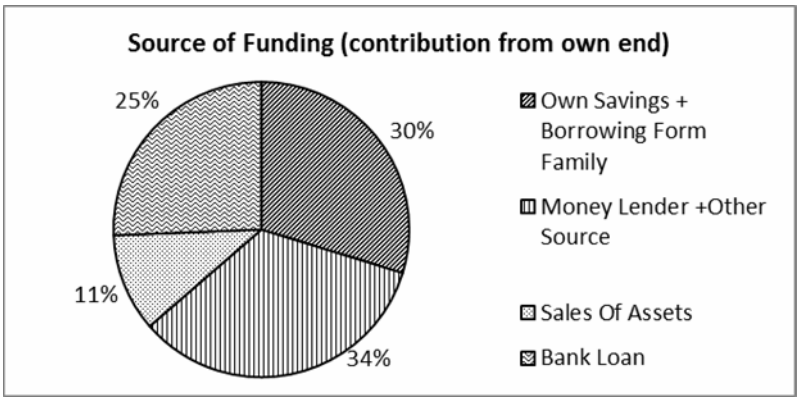
- **Cost of Construction**

| Cost of Construction | | |
|---|---|---|
| | Contribution from IAY (avg.) | Contribution from own end (avg.) |
| 2008-2009 | 32615 | 64705 |
| 2009-2010 | 38259 | 78414 |
| 2010-2011 | 38385 | 59692 |
| 2011-2012 | 43500 | 40000 |




The graph and table shows the average expense on construction from 2008-2012. It is evident that people spend at least doubles or equivalent amount to the amount received from IAY for constructing their house.

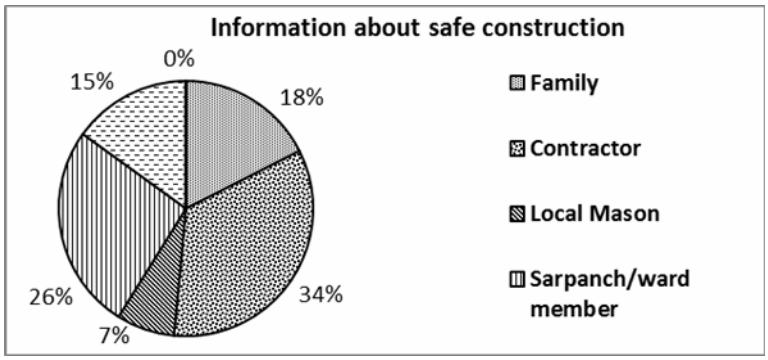
- **Different sources of funding**




The most common source of funding for the construction of houses in Jamnagar, over and above the government assistance under IAY, is borrowing from money lender and their family or using their own savings, 34% and 30% people had done this respectively while 25% of people reported to have taken bank loan to meet the construction cost of the house.

- **Access to information on safe construction**

| Information on Safe Construction | | | | | |
|---|---|---|---|---|---|
| Family | Contractor | Local Mason | Sarpanch/ward member | Govt. official | NGO |
| 18% | 34% | 7% | 26% | 15% | 0% |

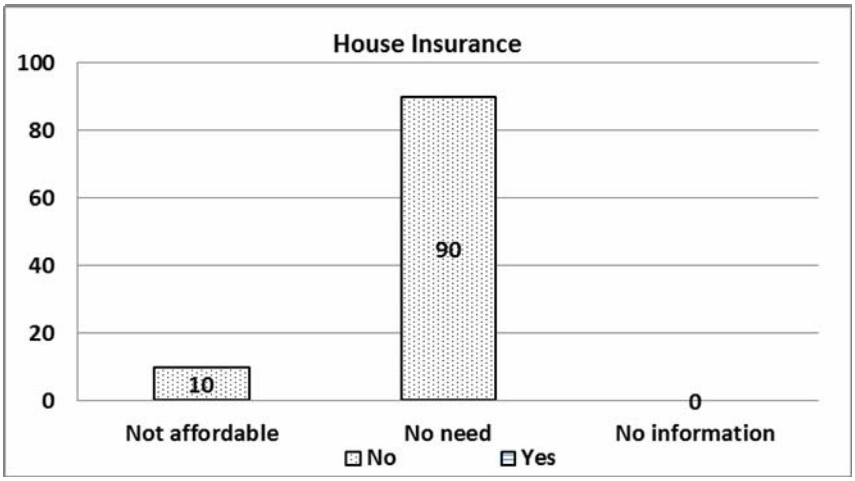



In Jamnagar among the 100 families surveyed, about 15% of families said that they were informed by a Govt. official about safe construction while 7% reported guidance from the Local Mason. 34% reported to have been guided by Contractor while 26% consulted the

Sarpanch of their village for information on Safe construction. No NGOs were involved in Jamnagar to educate the residents about safe construction.

- **Insurance of IAY houses**

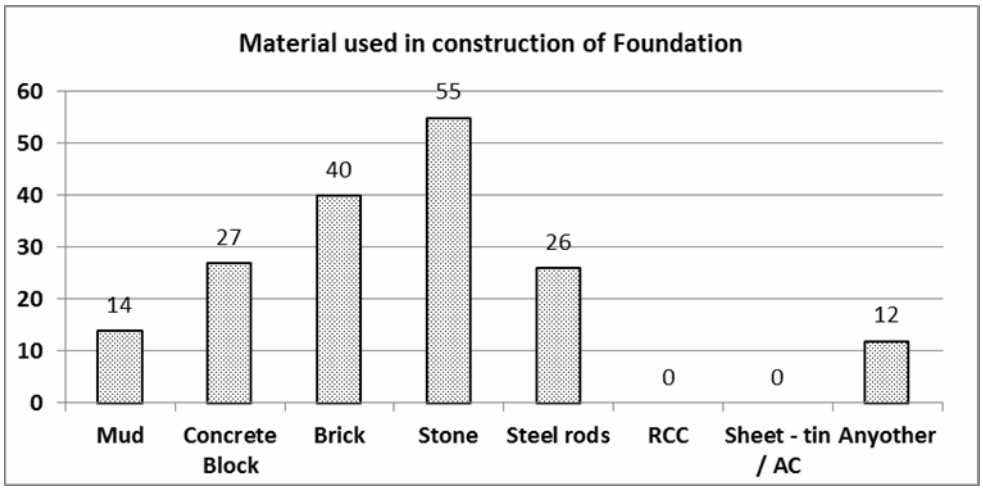
| House Insurance | | | |
|---|---|---|---|
| | Not affordable | No need | No information |
| Yes | 0 | 0 | 0 |
| No | 10 | 90 | 0 |




Among the 100 Houses surveyed, no house was reported to be insured. Among these 100 houses 10% families reported lack affordability for house insurance while 90% did not feel any need of house insurance.

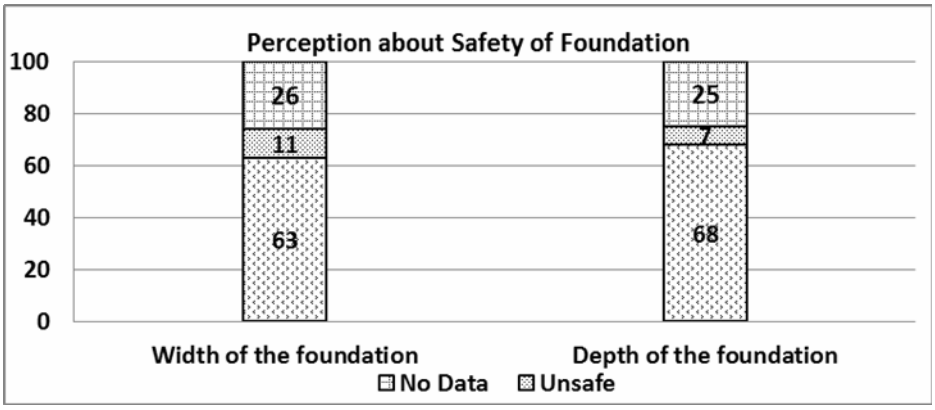
**b. Foundations**

| | Mud | Concrete Block | Brick | Stone | Steel rods | RCC | Sheet - tin / AC | Any Other |
|---|---|---|---|---|---|---|---|---|
| Foundation | 14 | 27 | 40 | 55 | 26 | 0 | 0 | 12 |




The main material used in foundation was reported to be stone, Brick, concrete blocks and steel rods. The binder used in construction of foundation by 14 households was mud and for the rest was reported to be cement.

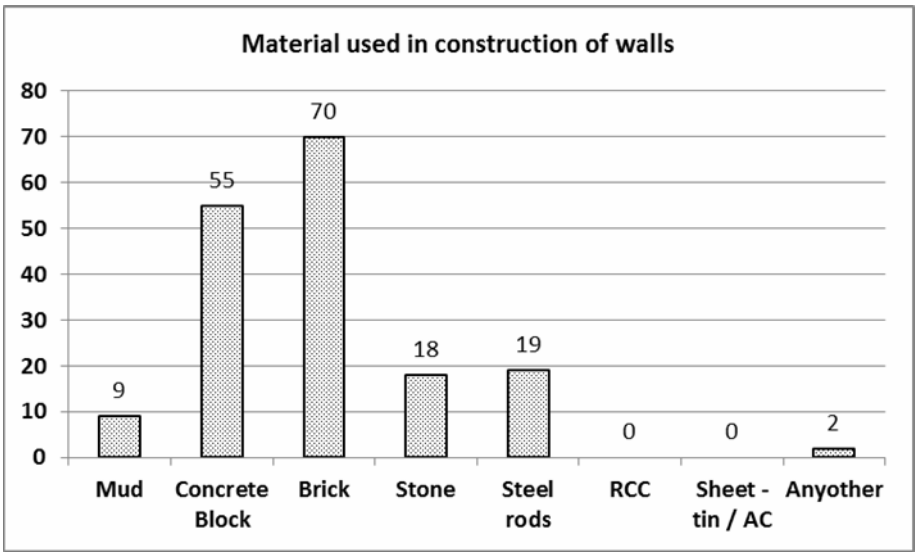
| | Safe | Unsafe | No Data |
|---|---|---|---|
| Width of the foundation | 63 | 11 | 26 |
| Depth of the foundation | 68 | 7 | 25 |



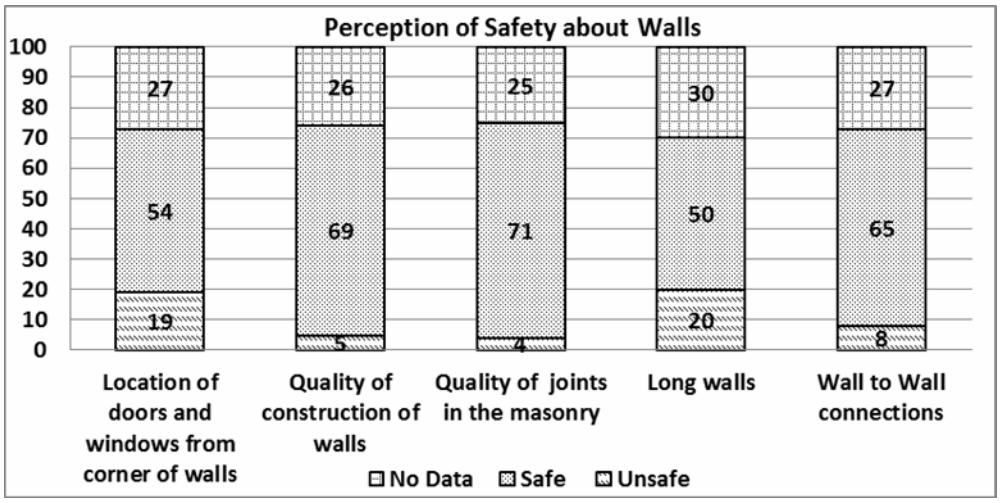

Around 63 people out of total of 100 consider the width of the foundation of their house to be safe, while 68 people consider the depth of the foundation to be safe.

c. **Walling**

| Material used In construction of Wall | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Mud | Concrete Block | Brick | Stone | Steel rods | RCC | Sheet - tin / AC | Any Other |
| Wall | 9 | 55 | 70 | 18 | 19 | 0 | 0 | 2 |

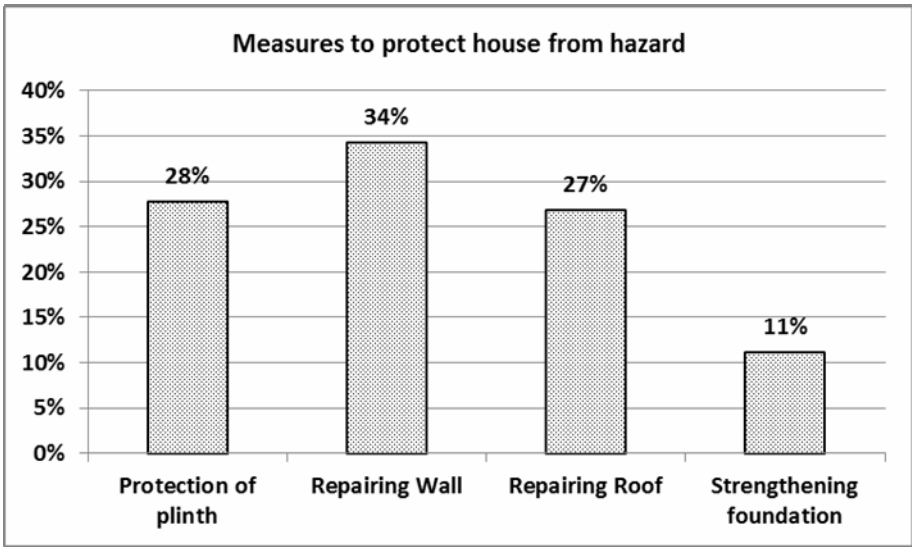



The most commonly used materials the in construction of walls are stone, concrete block and bricks with steel reinforcement, cement being the binder in most of the cases. There were some cases where whole / some parts of the house have been constructed using mud as a binder also.




The quality of construction of the walls, the wall to wall connections, the construction of long walls, the construction quality of the joints in masonry and the location of doors and windows from the corner of the walls were all found to be safe in more than 50% houses.

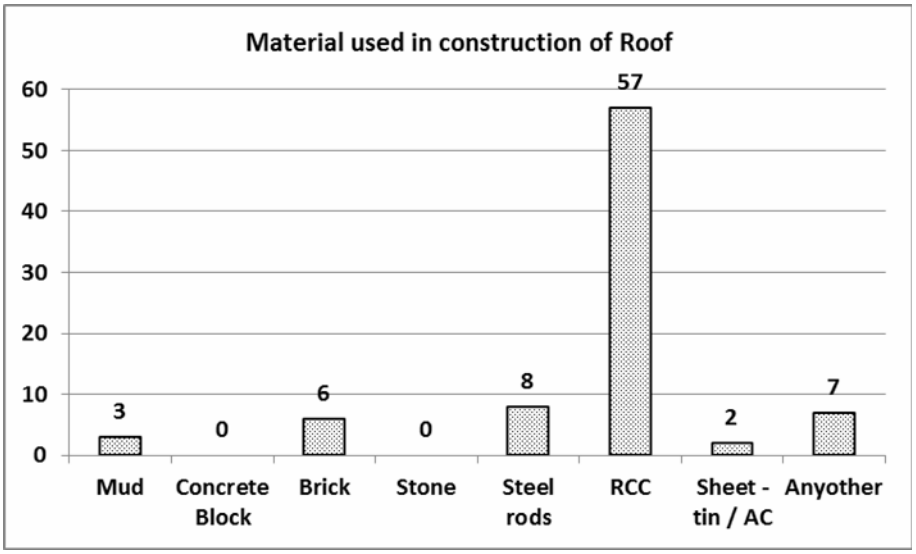
| Measures to protect house from hazard | | | | |
|---|---|---|---|---|
| | Protection of plinth | Repairing Wall | Repairing Roof | Strengthening foundation |
| Measures to protect house from hazard | 28% | 34% | 27% | 11% |



In order to protect their houses from earthquakes, 34% households reported to regularly repair their walls while 28% and 27% reported to protect the plinth of the house and repair the roof of the house respectively.

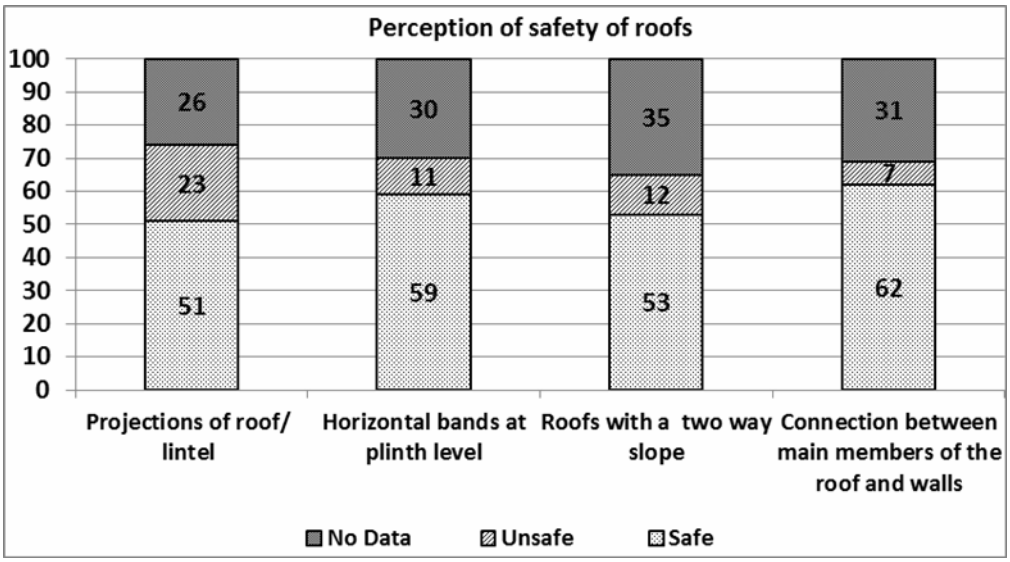
**d. Roofing**

| | Mud | Concrete Block | Brick | Stone | Steel rods | RCC | Sheet - tin / AC | Any Other |
|---|---|---|---|---|---|---|---|---|
| Roof | 3 | 0 | 6 | 0 | 8 | 57 | 2 | 7 |




The main material used in majority of roofs was RCC used by 57 out of the total 100 households surveyed.

| Perception about safety of roofs | | | |
|---|---|---|---|
| | Safe | Unsafe | No Data |
| Projections of roof/ lintel | 51 | 23 | 26 |
| Horizontal bands at plinth level | 59 | 11 | 30 |
| Roofs with a two way slope | 53 | 12 | 35 |
| Connection between main members of the roof and walls | 62 | 7 | 31 |




The surveyors found about 50% of the roof components to be safe as shown in the above graph.

### 3.6.3 Key Highlights of IAY Delivery mechanism in Gujarat

Important steps in the delivery mechanism include:

1. Orientation of all IAY beneficiaries to the scheme, specifications and safe housing technology.
2. A booklet is provided to all the IAY beneficiary which includes among other things, technical specifications of the house: **Plinth area**: minimum 20 sq. Meter, **Foundation**: Minimum 3 ft., Plinth: plinth level concrete band with 10mm steel, **Wall**: 9 inch with 1:6 material ratio, Joints **in the wall**: L shape or T shape w, **Roof:** suggested RCC roof or Mangalore tiles or EI sheets, **Kitchen:** 3.27m X 1.82 m, **Flooring:** IPS.
3. After the Advance installment of Rs. 21,000/- for purchase of material is disbursed, Taluka level engineer/Additional Assistant Engineer (AAE) and Patwari visit the site and report on completion of work up to lintel level. They also check the inclusion of safety bands at plinth and lintel level along with size, quality of construction. If the work is satisfactory, they recommend for release of second installment of Rs. 15,000.

4. Patwari and AAE again jointly visit the site and give the completion report of the house. This report is given by the Patwari which includes a certification of construction of the house according to housing safety norms given in the IAY booklet issued by the state, construction of the smokeless *chulha*, toilet etc. and the release of the third and final installment is recommended.

# 4.0 KEY CONCERNS IN RELATION TO DISASTER SAFETY OF IAY HOUSES–FINDINGS OF THE FIELD SURVEY

The field survey across the six states exposed to different disaster types unraveled some new facts and reinforced some that have been known for some time though not explored and established in a systematic manner as the pilot study.

The key ones are summarized below:

## i. Location of houses and homesteads

Land of appropriate size and adequate quality for housing has been a challenge for many years. This challenge is further getting exacerbated given the overall increase in population and the phenomenon of nucleation of families that is evident even in rural areas. The current demographic composition comprising largely of people below 30 years of age will manifest in the form of further increase in the demand for housing in the near future.

Thus the demand for housing in the country and land for construction of these houses is immense. It has been observed that a significant number of IAY families, being amongst the poorest in the village, construct their houses in most precarious locations such as the flood plains of rivers and steep hill- slopes. This makes such houses most vulnerable with regard to local disaster risk.

## ii. Choice of materials and technologies

It has been observed that the materials used for construction of IAY houses are predominantly brick / stone and RCC. The reasons for this shift can be varied, including aspirations of the homeowner perceiving these to be 'pucca' materials, easy availability of these materials as well as easy availability of artisans working on these materials. Whether this trend is desirable or not is a matter of separate debate.

In portions of the house that are not 'visible' eg the foundations, in many states, a tendency to use cheaper materials that may not perform as desired was observed. For instance use of poor quality brick bats bound by mud mortar is common even in flood prone Bahraich district of UP. Similarly, the use of local stone with mud mortar is common in cyclone prone Puri district of Odisha. Overall the choice of materials and technologies is moving towards

perceived 'pucca' but this alone may not be a sufficient trend to ensure that houses being constructed are risk resilient.

### iii. Integration of standard disaster risk reducing details

Even in states that provide detailed guidance to IAY families on safe construction, it has been observed that such details are not implemented on ground. This is primarily due to inadequacy of funds with the homeowner, limited understanding of the homeowner on issues of risk and vulnerability as well as limited availability of trained manpower for correct execution.

There were instances in earthquake prone areas of Gujarat where lintel bands had been indicated in plaster and not cast actually using steel and concrete. Similarly use of corner reinforcements was found to be missing in many cases even in areas vulnerable to seismic forces. There were instances of plinth raising in UP but absence of plinth protection features made this effort sub-optimal.

### iv. Post 'completion', preventive maintenance of houses

There is a substantial number of IAY houses that are left incomplete. While these may be a result of ambitious undertaking by the families but the fact remains that the quality of construction of such houses deteriorates drastically over time. For larger families, it was found to be a common practice to construct the foundation and walls in one instance and construct the roof separately when additional money is available. This leaves the walls exposed(at least partially) to the elements and degradation sets in.

Similarly absence of weatherproofing course over the roof was observed in many states especially where houses had RCC / RBC roofs.

Although much older IAY houses were not included in the survey, the condition of some of them was found to be in a state of serious state of disrepair.

### v. Adequacy of the delivery mechanism at the state, district and ground level

The pilot study with the small sample of houses has clearly highlighted the critical role of the institutional architecture involved in delivery of social housing. All the states visited had a system formonitoring fund disbursal and even the pace of construction but systems for monitoring quality of construction was found to be either lacking or rather weak in many cases.

It was observed that the presence of a dedicated system for monitoring quality of construction such as in Gujarat and Tamil Nadu, contributed immensely to the overall quality of houses especially with regard to inclusion of safety features.

In terms of on-ground agents of delivery of housing, the role of masons was found to be hugely influential in guiding the choice of material, design of the house, quality of construction etc. Additionally, in places like Gujarat and Odisha where a large number of masons have been trained on safe construction in the aftermath of major disasters, the inclusion of risk resilient features was found to be common through not perfectly implemented. On the contrary, in other states where such support is unavailable and the task of construction is left to the mason who may be experienced and yet not oriented to safety issues, fundamental issues like the use of mud mortar in foundation in flood prone areas, long walls and poor anchorage between walls and roofs were evident.

## 5.0 THE WAY FORWARD

To address the key concerns highlighted by the pilot study, there is a need for fundamental transformation in the way we approach housing in general and social housing in particular, since it is an investment by the government on behalf of the people of India. Although estimates of housing shortage in rural India by different agencies vary hugely, the vulnerability of new and existing housing stock to natural disasters warrants attention of homeowners, masons and contractors, professionals as well as policy makers.

Some of the critical steps that need to be taken to improve the disaster resilience of new houses constructed under IAY are :

### i. Addressing safety of homestead sites

Although land is a highly debated issue, for the purpose of house construction through government assistance, it is important that the quality of land and location are carefully considered. This is especially important when homesteads are being simply being allotted / regularized as part of a social housing scheme since no discretion is required to be exercised in these processes in terms of quality of land.

Additionally, there are no guidelines from the Centre on choice of land for the purpose of homestead sites. Land being a State subject (as is disaster management), criteria for degree of safety and live-ability of homesteads should be decided by the states based on local geo-climatic conditions and disaster risks. In multi-hazard prone areas technical supportat state and district level is necessary for deiciding on habitability of different areas in the state. Use of GIS, Aerial photography and assessment of geo climatic conditions would be helpful in effective delivery of the homestead sites.

Additionally, where new clusters are being developed, it is critical that a larger perspective on planning is adopted so that land can be developed through different programmes to minimize the vulnerability of new clusters.

### ii. Easier Access to Finance for supporting safe construction

The experience of the last two decades, as also noted in the XI Plan Document, inadequacy of cash assistance for construction under the IAY has resulted in poor quality of house, non-fulfillment of requirements of the disaster-prone areas, and debt trap on account of the beneficiaries having to borrow funds to complete the construction of a pucca house. There are several examples of poor quality RCC work, differential settlement of foundations, weak roofs and worse still, incomplete houses. Even after contributing their labour and borrowing from local sources as noted in all the houses surveyed, a significant number of families are

not able to complete the house in all respects, and most houses remain without plastering or flooring.

The Working Group on Rural Housing for XII Five Year Plan has recommended that unit assistance for housing under IAY should be enhanced and all the multi-hazard prone districts identified by NDMA should be classified as difficult areas and provided higher unit assistance.

The measures to bridge the gap of funds could include integrating the schemes such as TSC for all IAY beneficiaries over and above the SC/ST category as is currently done. Also innovative ways to link NREGA with land development for IAY beneficiaries could be explored for alleviating disaster risk to houses.

The revised IAY guidelines of 2008 have made a provision for Differential Rate of Interest (DRI) Scheme for lending upto Rs. 20,000/- per housing unit at interest rate of 4% per annum to help bridge the funding gap. The District Rural Development Agencies (DRDAs) are expected to play an important role in linking the IAY beneficiaries with local banks to apply for loan under DRI with minimum required documentation. However, so far, less than 20,000out of 26.61 lakh IAY beneficiaries across the country have availed loan under DRI Scheme during the current year. For this provision to deliver its promise, it is essential that a link with livelihood and income enhancement programmes is made so that loans are availed of and quality of IAY houses improved.

Additionally the current chasm between the insurance sector and rural housing needs to be plugged. This is an area that needs a lot of ground research and continued engagement with the insurance sector.

### iii. Need for a new menu of materials and technologies for promoting resilience as well as cost optimization

For construction of the large number of houses that the country needs, it is important to look at innovative building technologies that are people based, environment friendly and yet have high performance standards. The choice of innovative building materials and

technologies needs to be based on a fundamental understanding of the fact that rural housing is an incremental process and is closely integrated with peoples aspirations for a better quality of life and social standing.

The pace of R&D on technologies for the masses has seen a major slow down in the last decade or so. There is a need to reinvent alternate technologies that were developed more than two - three decade ago to explore solutions for the challenges we are facing today. Locally applicable designs and construction technologies based on socio-cultural and climatological factors need to be developed and promoted in each state.

Although the Scheme guidelines do not specify any design but the need to use locally available materials, skills, cost effective and environment friendly technologies has been highlighted. This needs to be reinforced in practice.

In parallel, there is a need to strengthen production systems and supply chain of alternate building materials and technologies. This can be done by facilitating small scale entrepreneurs as well as through building centres. The current efforts of the government towards the revival of building centres in the country is a step in the right direction as long as the sustainability strategy of these centres incorporates demand creation and business development and not purely government support.

### iv. **Rediscovering the delivery architecture for creating disaster resilient housing stock in rural India.**

Even before any other actors can influence home owners, it is important that the homeowners are themselves made aware and oriented to the nuances of living in a house that is vulnerable to local disaster risk. There is a need for a large scale intervention to orient homeowners on local disaster risk and how their houses can be made resilient.

The pilot study highlighted the critical role of the mason in influencing different decisions of the homeowner with regard to design, choice of technologies, inclusion of safety features etc. The capacity of the masons as one of the most critical actors in housing delivery needs

to be strengthened so that he / she can inform the homeowner on how to balance cost with structural performance and disaster resilience of the house.

For state supported housing, it is very critical that adequate guidance on quality construction is provided to the homeowner as well as support system is created for supervising construction at the ground level. In states like Tamil Nadu this structure has been created by the state government while in Gujarat, the JEs supervising NREGA are instructed to also supervise IAY construction. At the village level, the prime role in supervision of construction is played by the functionaries at the Panchayat and block level.

Additionally, IAY monitoring should go beyond fund disbursal alone and also include indicators for monitoring the pace and quality of construction including use of disaster resilient features as per the local context.

### v. Information and knowledge

Risk communication has been an area of concern in the country. Even in areas that have suffered disasters, myths about 'preventability' of losses persist. These myths are further reinforced when the poor have to struggle to construct a basic dwelling. There is a need to improve risk perception of the people and support them in preventing losses that are indeed preventable.

## 6.0 CONCLUSION

Rural housing in India is at an interesting cross-roads. While housing activity is continuing at a fast pace, the huge stock of unsafe houses that is accumulating in the process can be a serious liability for the future. As the voice of the 'Disaster Risk Reduction' discourse becomes louder in the national and international political agendas, it needs a diligent follow up at the policy and programme level especially in relation to physical assets such as housing.