

Synopsis

***A Resilience Approach
to Durable Solutions for
Rural Housing in India***

submitted by

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December 2016

1. Introduction

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 (Unnati & Knowledge Works, 2012). Housing as a component of the living environment has a profound influence on the health, efficiency, social behavior, satisfaction and general well-being of individuals, families and their communities. Adequate housing contributes to the attainment of physical and moral health of a nation and stimulates social stability, work efficiency and development of the individual (Jiboye, 2011).

Addressing housing shortage has thus been an important strategy for poverty alleviation in India since independence. Especially in rural areas that have traditionally been identified as 'underdeveloped' areas, housing has been a critical area of investment by the government (National Housing Bank, 2012). There has been an effort to devise policies and strategies with a view to actually reaching the most deserving, most visibly through Indira Awaas Yojana (IAY), the flagship scheme of the government of India. However addressing housing shortage has been an important, as yet unachieved target for the government. The Eleventh Five Year Plan of Government of India notes that "at least 18 million rural people do not have a house." (para 4.31, pg. 86). Housing shortage is estimated to have increased at the rate of 0.89 million houses per year during 1991-2002. The shortage of urban houses stood at 18.8 million units in 2012 and it is expected to grow at a compound annual growth rate of 6.6 per cent for 10 years till 2022. In addition estimates that about 10 lakh houses are lost to natural disasters each year (The Hindu Business Line, 2015)

According to the Vulnerability Atlas of India, about 57% of the country is prone to earthquakes, about 12% of these being prone to severe earthquakes. Further, about 12% of the land is prone to floods and 10% land is prone to cyclones (Ministry of Rural Development, 2011). Loss of a house and other assets is one of the most devastating for survivors of a natural calamity. The poor - the primary clients of social housing initiatives are invariably located at the periphery of the villages, along the coast and river banks and have traditionally been more vulnerable to stresses and shocks resulting from such occurrences. **A large part of these losses is preventable and can be minimized with a combination of measures that include environmental management to mitigate the disaster, resilience building of communities including safe construction and, effective early warning.**

This study seeks to explore reasons and solutions for enhancing disaster resilience of housing, especially those that are funded through public money in the form of state sponsored housing. With regard to state supported housing interventions, the study is limited to Indira Awaas Yojana that has been the flagship programme of the Government of India with regard to rural housing. The study postulates that the overall performance of the 'housing ecosystem' is contingent on the quality of relationship between different actors in the ecosystem. One of the main findings of the study from field surveys in five most disaster prone districts in the country: Bahraich in UP, Puri in Orissa, Villupuram

in Tamil Nadu, Uttarkashi in Uttarakhand and Jamnagar in Gujarat has been that the existing relationships are driven by financial transactions. For instance, between, the government and homeowners; between homeowners and building artisans or materials suppliers etc., financials have taken precedence over durability and even disaster resilience. This trend is supported by the prevalent perspective of 'house as a commodity / product' contrary to the traditional approach in India that saw 'housing as a process'. The study argues that the overall approach towards housing needs to change in favour of a more awareness oriented and performance focused culture.

2. Review of Literature

This chapter contains three main sections:

1. Disaster Losses
2. Issues of durability in IAY
3. Policy focus on disaster resilience of Housing

2.1 Disaster Losses

A feature common to almost all the disaster is the structural damage to the houses. According to the Annual Reports of the natural disaster management Division, Ministry of Agriculture, India lost 27.62 million houses to disasters from 1985 to 2001. This gives the annual average of 1.73 million houses.

In a disaster, a house is whiffed, swept, broken, drowned, collapsed or damaged. But what matters is the fact that people became homeless. A house is simply not a four walled structure, but a home, a shelter which imparts a sense of belonging to a family (Kapur, 2010). India has an average household size of 5.4 members. Translating this figure to the average annual loss of 1.7 million houses means that 9 million people lose their homes to disaster each year. Table 1 below provides an estimate of disaster related housing losses in India from 1991 - 2011.

Table 1 Disaster related housing losses in India (1991 - 2001)

Disaster Related Housing Losses in India			
YEAR	EARTHQUAKE	FLOODS	CYCLONES / STORMS
1991	0	400000	0
1993	0	60000	60000
1994	0	2500	0
1995	0	3000	0
1997	30000	0	0
1999	105500	0	700000
2000	0	252000	0
2001	1790000	0	2000
2002	200	0	5000

2003	0	4500	231645
2004	0	105000	0
2005	150000	256500	0
2006	0	4000000	150000
2008	0	2400000	0
2009	0	0	4000
2010	0	400000	507000
2011	75000	0	250000
TOTAL (1991 - 2011)	2150700	7883500	1909645
TOTAL LOSS DUE TO EARTHQUAKES, FLOODS, CYCLONE)			11943845
AVERAGE LOSS PER ANNUM (HOUSING UNITS)			1085804.091

Source: Emdat Database, 2013 compilation by Author

The number of people (beneficiaries) who have been given government assistance through various relief programs doubled in 1966 to 1988 from 142 to 285 respectively. With more and more people on dole from the government, the amount of relief also marked a two-fold rise from Rs 3.17 million to Rs 6.3 million during the same period (Kapur, 2010).

Further confirming the growing impact of disasters is the fact that whereas in 1973 the Sixth Finance commission sanctioned an amount of Rs.507 million for the purpose of relief, ten years later the amount has to increase to Rs.2,408 million (Table 1). By 1994, it had jumped to Rs.47,282 million again nearly doubling in 2000 to a staggering Rs.82,557 million.

Table 2 Fund Allocation for Disaster by Finance Commission (1973 - 2010)(Rs in Million)

FINANCE COMMISSION	YEAR	TITLE	AMOUNT
Sixth	1973	Famine relief	507
Seventh	1978	Margin Money	1,006
Eight	1984	Margin Money	2,408
Ninth	1988	Calamity Relief fund	6,023
Tenth	1994	Calamity Relief fund	47,282
Eleventh	2000	Calamity Relief fund	82,557
Twelfth	2005	Calamity Relief fund	213,333
Thirteenth	2010	Calamity Relief fund	335,809

Source: Finance Commission Report I to XIII

2.2 Issues of durability in IAY

At first impression, rural housing is vulnerable to weaknesses in the delivery system for housing materials and services. It is also observed that the sector is

deeply affected by the infrastructure deficit – roads, electricity supply, drinking water and sanitation.

Based on the mid-term review of IAY during the XI Plan, the Planning Commission notes, “although ‘high user satisfaction’ is reported under IAY, the quality of housing remains a problem. Several examples have been reported of poor quality of construction, sagging foundation, and use of temporary materials for roofing or leaving the construction incomplete because of inadequate finance.” (Planning Commission, 2010 Cited in MoRD, 2012).

Indira Awaas Yojana: Key Highlights

Indira Awaas Yojana is a flagship programme of the Ministry of Rural Development launched on 1st January, 1996 as an independent scheme. The scheme aims to provide financial and technical assistance to BPL households living in dilapidated and kutchha houses with a component for providing house sites to the landless poor as well.

It has various components such as providing assistance for construction of new house (with a minimum built up area of at least 20 sq. mt. excluding the toilet), Up-gradation of kutchha or dilapidated house, providing house sites (hamlets) to landless poor. A special consideration of five percent of IAY allocation is made towards various special projects identified in the guidelines which would be retained at central level as reserve fund.

The funding of the cost of the scheme is designed to be shared on 75:25 basis between Government of India and State Governments while in the case of North Eastern States the ratio is 90:10. In case of Union Territories, the full cost would be provided by Government of India.

For the administration of the scheme, up-to 4% of the funds released can be utilized, of which up-to 0.5% can be retained at the state level and the balance shall be distributed to the districts.

Under this scheme, the house to be constructed should only be constructed by beneficiary himself/herself with support from NGOs/ charitable organisation and no contractor is allowed to be involved in the process of construction. Construction of houses should involve locally available material and building technologies.

Funding is provided to the beneficiary in three instalments based on the progress of construction.

(Source :MoRD, 2013, compilation Author)

One of the reasons for poor quality and limited life of construction has been inadequacy of the unit cost assistance provided for construction. During the mid-term review of IAY during the XI Plan, the Planning Commission also notes that, “a significant number of families are not able to complete the house in all respects, and most houses remain without plastering or flooring...the poor quality of houses constructed is partly due to the low unit cost. State Governments have been asking for enhancement of unit assistance to between Rs. 50,000 and Rs. 70,000. This is in line with the recommendations of HUDCO,

Auroville Earth Institute, BMTPC and CBRI...” This issue has been addressed in April 2013 by enhancing the unit cost under IAY. The Reserve Bank of India has thus included IAY beneficiaries under the Differential Rate of Interest (DRI) scheme for lending upto Rs.20,000/- per housing unit at interest rate of 4%.

The Planning Commission, during the mid-term appraisal of IAY¹ under the XI also notes, “The Union Budget for 2010-11 has raised the unit cost under IAY to Rs.45,000 in plain areas and Rs.48,500 in hilly areas. Additional costs could be provided by widening the ambit of the DRI scheme and increasing the amount of loan permissible to Rs.50,000 at 7 per cent interest pa (as against Rs. 20,000 per unit at 4 per cent rate of interest currently allowed under IAY). The real challenge is to promote the DRI scheme by radically improving its awareness and implementation. Only 10,970 IAY beneficiaries have so far availed of loans under the scheme during 2009-10. It needs to be promoted through women’s SHGs and dovetailed with the National Rural Livelihoods Mission.” (Ministry of Rural Development, Guidelines, Ministry of Rural Development, Government of India, 2014). **It is evident that the issue of durability is not an issue of assistance only but several other factors that need to be examined in detail.**

Moreover, the ability of the states and IAY beneficiaries to influence the durability of houses with the enhanced assistance is a question. There has been limited effort at ensuring the availability of technical knowledge and skills at the local level to construct good quality and durable housing. As evident from the data of Census of India 2011, there is a visible transformation of building stock from biomass-earth segment directly to the pucca RBC/RCC burnt brick segment. While the insistence on “pucca” in terms of structurally stronger houses per se is certainly the need of the hour, interpretation of “pucca” as energy intensive materials may not be well-founded as an argument.

2.3 Policy focus on disaster resilience of housing

2.3.1 Disaster resilience focus of IAY

The focus on disaster performance of IAY houses is summarized in one sentence in the current IAY guidelines (Ministry of Rural Development, Guidelines, Ministry of Rural Development, Government of India, 2014), under Chapter 4, 4.10 i.e., Design and Construction standards stating that in areas prone to natural calamities, disaster resilient features should be built in. Besides this, the scheme is generally silent about disaster risk / resilience.

2.3.2 Advise for housing construction in disaster guidelines

2.3.2.1 Hyogo Framework for Action, 2005

India is a signatory to the Hyogo Framework for Action that pursues “...substantial reduction of disaster losses, in lives and in the social, economic and environmental assets of communities and countries” with houses being assets of the community.

¹http://planningcommission.gov.in/plans/mta/11th_mta/MTA.html

The framework makes each State own the 'primary responsibility for its own sustainable development and for taking effective measures to reduce disaster risk, including the protection of people on its territory, infrastructure and other national assets from the impact of disasters'. It also says that issues of informal or non-permanent housing and the location of housing in high-risk areas should be addressed as priority. **Beyond this, the document is silent on the choice of homestead sites / housing construction.**

1.1.1.1 The Disaster Management Act, 2005

This is the most important and also the first comprehensive law in India with regard to disasters passed on 23rd December 2005. The Act lays down setting up of Disaster Management Authorities and preparation of disaster management plan at national, state and district level. The act talks about the provision of funds for mitigation at National, State and District level in the form of Disaster Mitigation Funds and gives provision for preparation of Disaster Management Plans.

The act also state that the District Authority may order certain functions to be performed at - the district level or at the local level by any department to take the following measures for the prevention or mitigation of disaster:

- Establishment of adequate warning system
- Drawing up mitigation, preparedness and response plans, capacity building, data collection and identification and training of personnel in relation to disaster management.
- Assessing damage from any disaster
- Carrying out rehabilitation and reconstruction activities in the affected area in accordance with the State Plan and District Plan.
- Providing education, rescue, temporary shelter or other immediate relief.

Deeper analysis reveals that it talks about the pre-disaster (mitigation) situations in general terms while the response during disaster and post disaster situations are explained in detail.

1.1.1.2 Disaster Management Guidelines

The National Disaster Management Authority has prepared disaster management guidelines to assist ministries and departments of Government of India and state governments to prepare their Disaster Management Plans. Guidelines have been prepared for management of various disasters both natural and manmade. For the purpose of this research, guidelines for floods, cyclones and landslides have been analyzed to scan out the provisions made for pre disaster risk reduction by using environmental measures for protection of habitats.

a) National Disaster Management Guidelines for Floods

The State governments/SDMAs shall prioritize carrying out of detailed hydrological and morphological studies of existing embankments in their states. The on-going embankment projects will also be reviewed with respect to their location and designs.

The flood plain zoning approach has been continuously impressed upon the states by the CWC. A model draft bill for flood plain zoning legislation was

circulated by the union government in 1975 to all the states but with only few states responded to it. The guideline points out the necessity of the state governments/SDMAs to enact and enforce appropriate laws for implementing flood plain zoning regulations due to lack of flood plain zoning which has resulted in significant increase in encroachment into the flood plain areas sometimes even authorized and duly approved by the town planning authorities. The guidelines also mentions that as a preventive measures, the inhabitation of low-lying areas along the rivers, nallas and drains will be regulated by the state governments/State Disaster Management Authorities (SDMAs)/ District Disaster Management Authorities (DDMAs). Regarding post-disaster mitigation for flood prone areas, an alternative arrangement for housing relief camps will be placed through various mitigation projects.

However, these “guidelines” are not mandatory for compliance by the state.

b) National Disaster Management Guidelines for Cyclones

For the management of cyclones, the national guideline has put out detail action points. Some of the important action points are as follows -

- State-level technical capacities will be enhanced to develop local scale cyclone impact assessment tools for hazard mapping of wind damage and storm surge inundation.
- Customized sector specific multi-lingual cyclone warning for facilitating community based emergency response will be institutionalized on priority.
- A robust system of locating cyclone shelters and cattle mounds will be established based on the vulnerability profile of the regions with the prescribed structural safety standards.
- Local communities will be **encouraged** to follow prescribed cyclone resistant structural design standards for construction of private houses.
- Housing schemes under different central/ state government programme will obtain clearance from competent authorities, who will take into consideration all DM related aspects.
- Maintenance aspects of cyclone shelters and other safe places at the ULB/PRI level will be institutionalized.
- An integrated hazard mitigation framework will be developed for cyclone storm surge, wind hazard, rainfall-runoff and river flood modeling on a GIS platform.
- Institutionalized multi-agency collaboration will be developed with clarity of roles and responsibilities from national to local levels and periodic updating of SOPs at different levels.

As with other guidelines, these provisions are “recommendatory” and not mandatory.

2.3.3 Environment Impact Assessment (EIA) Notification 1994, (Revised 2006)

The act mandates environment clearance for a list of projects including building and construction projects with built up area greater than 20000 sq. m. and less than 1,50,000sq.m.The Act gives directive for the establishment of State

Environment Impact Assessment Authority (SEIAA) for regulating the project approvals and State Expert Appraisal Committees (SEAC) for technical support. The decisions of SEIAA would be based on the recommendations of the SEAC.

The provisions under this act imply that all the townships and housing projects having the specified areas would require an EIA and would be evaluated for risk from disasters. The act also seeks to ensure that development projects do not degrade the environment of the area and prevent any chances of increasing any kind of disaster risk to the nearby habitats.

Nothing is specifically mentioned in relation to homestead plot selection/ provision by Government.

2.3.4 Coastal Regulation Zone Notification, (Revised 2011)

The Central Government has declared the coastal stretches of the country and the water area up to its territorial water limit, excluding the islands of Andaman and Nicobar and Lakshadweep and the marine areas surrounding these islands, as Coastal Regulation Zone (CRZ). This was done with a view to ensure livelihood security to the communities living in the coastal areas, to conserve and protect coastal stretches and to promote development through sustainable manner based on scientific principles. The CRZ notification was initially framed in 1991 but was revised in 2011.

Under the activities prohibited within CRZ, exception is provided for reconstruction, repair works of dwelling units of local communities including fishers [3. i. (e)]. However it has been specified that State Government will have to incorporate the necessary disaster management provision and safeguards from natural disaster for such activities [8. III. A. (ii)] and Annexure I [D. II. 7.]. It has also been stated that the states should prepare detailed plans for long term housing needs of coastal fishermen communities including various factors of disaster preparedness. The CRZ notification identifies the role of mangroves in the coastal ecosystem and disaster risk reduction and their conservation highlighted.

No specific guideline has been provided on site selection for homestead.

2.3.5 The Land Acquisition, Rehabilitation and Resettlement (LARR) Bill, 2011

The bill seeks to repeal and replace India's Land Acquisition Act, 1894. The LARR 2011 has been positioned as the central legislation in India for the rehabilitation and resettlement of families affected by land acquisitions. The bill is confined to rehabilitation and resettlement in cases when the people are displaced due to acquisition of their land.

The bill does not apply to the rehabilitation and resettlement of persons affected by natural calamities and even man-made disasters. It talks about the provision of amenities and infrastructure in the relocated areas but does not talk about the location of the relocated

land per se, if the land provided falls under area prone to disasters (low lying area susceptible to flooding or land with polluted ground water).

3. Research Questions

The following research questions have been formulated in the light of the literature review.

- a) Why do state sponsored houses fare poorly with regard to disaster risk?
- b) What needs to change for state sponsored houses to perform better?
- c) How can this change be achieved so that the resilience of state sponsored houses can be improved?

These research questions will serve as a base to frame the objectives of this study.

4. Objectives

The following objectives are formulated based on the research questions provided above:

1. To identify the key bottlenecks in accessing adequate housing by the poor in rural India.
2. To map the rural housing ecosystem through a case study approach and document the current attributes and inter-relationships between stakeholders
3. To propose an Actionable Framework for enhancing durability and promoting Resilience in Rural Housing.

4. Methodology

The research methodology has been structured into three different phases as follows:

Phase 1: Identifying bottlenecks in accessing adequate housing by the rural poor in India through a survey of 500 households in 5 most disaster prone states in the country and analyzing their relationships through the pivot table.

Phase 2: Mapping the rural housing ecosystem through a case study approach and documenting their current attributes and inter-relationships.

Phase 3: Establishing desired attributes and identifying leverage points in the system using Delphi methodology with different stakeholder groups.

Phase 4: Facilitating the leverage points in the ecosystem at the state level in Sikkim.

4.1 Phase 1 - Identifying bottlenecks in accessing adequate housing by the poor in India through a survey of 500 households in five most disaster prone states in the country.

Besides literature review, 100 houses in each of the following districts were chosen as a random sample of IAY houses constructed after 2009:

- a) Bahraich in UP,
- b) Puri in Orissa,
- c) Villupuram in Tamil Nadu,
- d) Uttarkashi in Uttarakhand and
- e) Jamnagar in Gujarat

This data was collected as part of a collaborative initiative between Unnati and Knowledge works, under the guidance of the author. In addition data of 200 houses in Sikkim was made available through a collaborative project between Government of Sikkim, Sikkim University and IIT Delhi, being carried out under the technical oversight by the author. Questionnaires in both these projects include simple questions that provide an understanding of the extent to which standard practices of safe construction have been followed in these areas. The survey teams were trained by the author in administering the questionnaires in the field and data collection.

Detailed analysis of the filed data threw up the following concerns:

4.1.1 Location of houses and homesteads

In the current demographic composition comprising largely of people below 30 years of age, the demand for housing in the country is immense. Given the need for provision of homestead plots to a large number of poor families in rural India, availability of suitable land itself is a challenge. This is one of the reasons that the homestead scheme of the government has not picked up in a big way.

It was 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. This makes such houses most vulnerable with regard to local disaster risk.

4.1.2 Choice of materials and technologies

It was observed that the materials used for construction of IAY houses are predominantly brick 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' e.g., the foundations, in many states, there is a tendency to use cheaper materials that may not perform as desired. 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.

4.1.3 Integration of standard disaster risk reducing details

Even in states that provide simple details to the 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 as well as limited availability of trained manpower for correct execution.

There were instances in earthquake prone areas of Gujarat where lintel bands are being indicated in plaster and not being cast using steel and concrete. Similarly there are instances of plinth raising in UP but use of mud mortar in foundations maintains the high degree of vulnerability of the house.

4.1.4 Post 'completion' maintenance of houses

There are a substantial number of IAY houses that are left incomplete. 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 is common practice to construct the foundation and walls in one slot 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.

In many cases of older IAY houses that were constructed through contractors before this practice was made illegal, houses are in a state of serious state of disrepair. One of the IAY beneficiaries in Tamil Nadu shared, "these poor quality houses were given by the government; we should now be paid to repair and maintain them... the plaster has fallen off and the RCC slab can collapse and kill me..."

4.1.5 Adequacy of the delivery mechanism at the state level

The field 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 have a system of monitoring to track the pace of construction but systems for monitoring quality of construction and hand holding and even orientation of homeowners to ensure durable construction are lacking in many cases. Wherever there is a dedicated officer / system for monitoring quality such as in Gujarat and Tamil Nadu, the overall quality of houses especially with regard to inclusion of safety features is visibly higher. 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 is seen more commonly. 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 are evident. In many villages skilled construction labor was virtually non-existent. Usually some persons are recognized as able to work in house construction but rarely possess any formal training. Most construction laborers informed that they

had acquired skills while on the job or from their parents and other elders. They also admitted not having received any formal technical training in the varied skills associated with house building. Even in states that provide simple details to the 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 as well as limited availability of trained manpower for correct execution.

4.2 Phase 2 - Mapping the rural housing ecosystem through key informant surveys and case study documentation of their current attributes and inter-relationships.

4.2.1 The Housing System

Housing researchers are faced with a vast and diverse field of studies describing housing systems and the policies that helped shape these systems (Venter, 2010). In addition, housing studies is generally not regarded as discipline on its own, but rather as a field of activity, a part of the larger multifaceted policy and practice discourse (Oxley, 2001:92).

There are three main points followed while studying the housing ecosystem - (i) Components of the housing system, (ii) Relationship and interaction between the components and (iii) Role and responsibilities of each component.

4.2.2 Components of the Housing System and their Relationships

The components of the housing system may be categorised as follows -

- A. People/Homeowners including other local leaders - formal/informal
- B. Artisans
- C. Building Materials Producers & Suppliers
- D. Financing Institute
- E. Technical Agencies
- F. Policy Makers including Local Administration

Key informant surveys were carried out with 5 artisans, 10 building materials producers, staff of 2 finance institutions, 8 technical agencies and 5 policy makers from different parts of the country. In addition, case studies of 06 entrepreneurs providing integrated services : production of building materials, construction contracts as well as training, were documented to develop an overall understanding of strengths and challenges of different stakeholders, and their relationships. This process led to the following insights :

4.2.2.1 People/Homeowners including other leaders - formal/informal:

People or the homeowners are driven by aspirations for modern “pucca” house. As per Census of India, 2001, of the total rural households, 49.7% households were residing in pucca, 21.4% were residing in semi-pucca houses and 18.8% were residing in kutchha houses. This is a direct result of development programmes undertaken by the government. One example is the government

flagship scheme - IAY (Indira Awaas Yojana) which was launched with the aim of providing “pucca” houses to the rural poor.

People became more inclined to the aesthetics of housing thus making it a primary indicator. This focus on aesthetics and economic value of a house has led to substantial haste for achieving the ‘biggest bang for the buck’.

4.2.2.2 Artisans

At the moment most artisans are driven by client demand for aesthetics and more space in the house. Even masons who have been trained in disaster risk reduction features find it difficult to convince home owners to prioritise investment in safety over aesthetics or greater space within the house. Training of artisans is conducted through projects by agencies but there is rarely any follow up. Most skill transfer for new masons happens on the job, often learning imperfect practices from their experienced yet often untrained seniors.

4.2.2.3 Building Materials Producers & Suppliers

Building materials producers & suppliers are strictly market driven; they tend to focus on internal competencies that foster greater responsiveness to their customers and their target market and sometimes by the government too. The drive by the government is usually project/scheme specific e.g., tax exemption from the government if “green” materials are produced or supplied by them. The study found that the bulk of building material entrepreneurs are focused on ‘fly ash blocks and pavers’ only as these are items in demand in government contracts.

4.2.2.4 Financing Institutes

In the Portfolios of the Poor (2010), Collins, Morduch, Rutherford and Ruthven discuss that the poor not only have very low and unpredictable incomes but also have inefficient financial instruments to manage such income flows and this makes their money-management task even tougher. According to Wright (1999), some of the key issues in offering savings products to poor households include the following: 1) balancing between convenience and returns, 2) balancing terms and needs, and 3) compulsory locked-in savings requirement (Mukhopadhyay & Kumar, 2013). Basu (2006) has pointed out three main reasons for poor service to the rural population; uncertainty—about the repayment capacity of poor rural borrowers, with their irregular/volatile income streams and expenditure patterns, high transaction costs and the government’s policies have made things worse from the banks’ perspective, creating a “financial climate” not conducive to lending in general and rural banking in particular.

The main reasons for low penetration of formal housing finance are the limited presence of banks and other lenders in dispersed rural areas and the difficulties in establishing potential borrower creditworthiness because of informal and variable income; some borrowers do not meet the minimum income or collateral requirements. (IAY)

4.2.2.5 Technical Agencies

Technical agencies are mostly project driven. Since current world emphasize on climate change etc., most of the technical agencies are working on green and climate friendly techniques (R&D).

4.2.2.6 Policy makers including Local Administrators

The policy makers are largely interested in quantity (numbers and figures) rather than quality and durability. This is evident several reports and documents of the government. Other important parameters like durability are not emphasized. Targets for the future are in figures and numbers. They are also driven by politico – legal pressures hence the enthusiasm of announce new schemes and not follow them through adequately.

4.2.3 Existing Relationships of the Stakeholders

a. People - other stakeholders

People/Homeowners approach artisans for multiple reasons and assistance - as technical adviser, designer and engineer all rolled into one. Building materials producers & suppliers are approached according to the demand of the “pucca” building materials.

It is well established that the poor households’ ability to save is seriously crippled by lack of available savings instruments which are safe and dependable. Poor households prefer savings products that offer easy accessibility, security, liquidity and assured returns. Describing them as “barefoot hedge-fund managers”, Banerjee and Duflo (2011) further highlight the diverse strategies that the poor deploy in order to access such means of credit (Mukhopadhyay & Kumar, 2013).

According to Basu (2006), small rural borrowers hesitate to get loans from formal banks due to three main reasons. First, rural banks do not provide flexible products and services to meet the income and expenditure patterns of small rural borrowers. Second, the transaction costs of dealing with formal banks are high. Procedures for opening an account or seeking a loan are cumbersome and costly (with high rejection rates), and clients often have to pay hefty bribes (ranging from 10 to 20 percent of the loan amount) to access loans. This makes the ultimate cost to borrowers very high (despite interest “caps”). It takes, on average, thirty-three weeks for a loan to be approved by a commercial bank. Third, banks demand collateral, which poor rural borrower’s lack. Land remains the predominant form of collateral. But, poor households very often do not have clear titles to their land, and in any case, this collateral is seldom executed, so it is just another cost with little benefit in practice (Basu, 2006).

The relationship with the technical agencies is absent in the existing situation. However technical agencies do work with people for small ‘model projects’ etc. Homeowners approach the policy makers mainly for accessing schemes that too if they have enough information about their own scheme entitlements. In recent times, the Right to Information (RTI) act has also added another dimension in this relationship that requires government to be more accountable.

b. Artisans - other stakeholders

At times the homeowners are the artisans themselves which count for 80% of the construction workforces in India being unskilled. In other cases the artisan, no matter how poorly qualified, is the engineer, architect, building materials supplier rolled into one. Building material suppliers sometimes use artisans to clear their inventory of poor quality materials. This becomes a win - win situation for the supplier, the artisan and the homeowner as the former two make profits and the homeowner may also save some money. However, all this is at the expense of the durability and structural performance of the house.

c. Building Materials Producers & Suppliers - other stakeholders

“Green” options preached by the government are expensive and few. It is mostly beyond the reach and affordability of most of the rural population.

There are no major linkages or relationship. The only existing approach is for acquiring loans as SME's, which are usually difficult. The prevalent though often unjustified, belief that small borrowers constitute a higher risk than large ones has encouraged catering to large borrowers (J.Yaron, 1992).

d. Financing Institute - other stakeholders

The linkage and relationship of the financing institution with other stakeholders do not exist in most cases. The main reason for this weak linkage is due to the credit delivery system. Many specialized credit institutions have suffered from deficiencies inherent in their design. The continuous availability of external funds (government) at below-market interest rates has not obliged rural financial institutions to operate under financial viability constraints. Together with the lack of competition and limited accountability, this has led to bad loans, extremely inefficient operations, patronage, and irregularities (J.Yaron, 1992). Yaron (1992) in his paper signify that there is high influence by political leaders where he quoted a report prepared for the World Bank by local experts in India which states that "During the election years there is considerable propaganda from political platforms for postponement of loan recovery or pressure on the credit institutions to grant extensions to avoid or delay the enforcement process of recovery. The willful defaulters are, in general, socially and politically important people whose example others are likely to follow."

e. Technical Agencies - other stakeholders

The Technical Agencies approach the homeowners for Small Projects and Household Survey for need assessment. Technical Agencies are Project biased when it comes to approaching the artisans and engage relationship with them. Another reason for approach is for capacity building occasions which often refers to strengthening the skills, competencies and abilities of people and communities in developing societies so they can overcome the causes of their exclusion and suffering.

f. Policy Makers (Including Local Administrators) - other stakeholders

Policy Makers relationship with other stakeholders is quite vague. The relationship with the people/homeowners is basically data collection and surveys for scheme evaluations such as through NSSO (National Sample Survey

Organisation), Census India and RTI. There are no relationships or major linkages except for committees for Five Year Plans.

The chart below summarises the existing attributes and relationships between actors:

Attributes/ Driven By	Stakeholders	People (Homeowner)	Artisans	Building Materials Producers Suppliers	Financing & Institute	Technical Agencies	Policy Makers
Driven by aspirations for modern "pucca" house. Aesthetics as the primary indicator of housing	People (Homeowner)		Artisan as technical adviser, designer, engineer rolled into one	Demand proven 'pucca' materials	Finance??	No Linkages Major	RTI? Application for Scheme
Driven by market / cost of project...	Artisans	80% of construction workforce in India are unskilled		No Major Linkages	No Linkages Major	No Linkages Major	No Linkages Major
Market driven. "Green" materials primarily promised by Government.	Building Materials Producers & Suppliers	"Green" options expensive and few	No Linkages Major		No Linkages except difficult SME loans at	Major Linkages except difficult loans as SME	No Linkages Major
Biased against potential "NPA". Finance available for middle - high income group	Financing Institute	Data	No Linkages Major	No Major Linkages / Weak Linkages		Workshops? Few projects (difficult terms)	No Linkages Major
Project driven, many working on green and climate friendly techniques (R&D).	Technical Agencies	Small Projects, HH Survey for need assessment	Project based/Capacity Building Occasions	No Major Linkages	No Linkages Major		Reports of Projects
Interested in the quantity (figures), driven by politico-legal pressures.	Policy Makers	NSSO, Census of India, RTI ???	No Linkages. Major Skill Building Schemes	No Linkages. Major Committees for Five Year Plan	Implementation of Schemes, Committees for Five Year Plan	Committees for Five Year Plans	

4.3 Phase 3 - Establishing desired attributes and identifying leverage points in the system using Delphi methodology with different stakeholder groups.

Based on the case studies and discussions with key informants, a list of desired attributes and relationships has been worked out. This is summarized in the chart below:

ATTRIBUTES/ DRIVEN BY	STAKEHOLDER S	People (Homeowner)	Artisans	Building Materials Producers	Financing Institute	Technical Agencies	Policy Makers
Awareness on safety, sustainability issues	People (Homeowner)	Cultural shift in favour of "Adequate" Habitat	Demand for "Quality"	Demand new and Innovative Materials	Access to easy solutions for finance	Support for supervision in Quality	Input on Policy Formulation and Scheme design
Awareness, responsibility and professional commitment to trade	Artisans	Optimal charge for professional services	Collectives for shared capacity enhancement	Collaborative working	Collaboration for funds for construction, pilots...	Collaboration for technology R&D.	Input on Policy Formulation and Scheme design
Larger commitment to safety and sustainability in habitat products and services	Building Materials Producers & Suppliers	Accept innovative material and technology	Collaborative working	Collaborative working	Collaboration for funds for construction, pilots...	Popularise new and innovative solutions	Funding for pilots and market creation
Driven by search for solution to BOP	Financing Institute	Supporting 'green', 'safe,...	Supporting 'green', 'safe, ...	Encouraging new and Innovative solutions	Shared commitment to Quality Construction	Support for new and innovative concepts, pilots....	Develop mainstream financing options for BOP
Proactive and innovative approaches to problem solving	Technical Agencies	Identifying real needs and potential	Collaborative relationship with collectives	Developing supply chains for Green & Safe building	Funding for pilots and market creation	Knowledge exchange and shared learning	Support for new and innovative concepts
sectoral linkages, system thinking translated to policy and practice	Policy Makers	Support for Cultural Shift	Development of new technology especially using traditional methods	Encouraging new and innovative solutions	Collaboration on development of new financial products	Collaboration for development of new schemes	Knowledge exchange and shared learning

4.4 Phase 4: Development and piloting of the framework

Development and piloting of the framework is presented after the Results and Discussions section.

4.4.1 Results and Discussions

RESEARCH QUESTIONS	RESEARCH OBJECTIVES	RESEARCH FINDINGS	IMPLICATIONS
Why do state sponsored houses fare poorly with regard to disaster risk?	To identify the key bottlenecks in accessing resilient housing by the poor in rural India.	<p>'Commodification' trends and minimal owner control / lack of choices result in poor quality and unsafe buildings</p> <p>High quality of individual components such as use of good quality material or deployment of 'experienced' / trained artisans for construction, by themselves, have little impact on the durability of the house and its performance in the face of disasters.</p>	<p>Housing needs to be redefined as a 'process' and not simply the creation / delivery of a product at a given cost.</p> <p>With the homeowner in the centre, upstream and downstream processes – institutional as well as markets, need to work in tandem so that disaster resilient houses can be created</p>
What needs to change for state sponsored houses to perform better?	To map the rural housing ecosystem through a case study approach and document the current attributes and inter-relationships between stakeholders	The process of housing works as a 'system'. The interaction between the parts of the system is a critical factor that influences the quality of the final output of the system. Three most important critical leverage points lie in the interaction between the people and	The homeowner has to be positioned as the prime mover of the housing process. Homeowners need to be empowered to plan, make choices with regard to design and technology options. They need access to markets where tested alternate materials

		<p>artisans, people and policy makers, and between people and technical agencies that develop technologies and facilitate enterprises</p>	<p>and technologies can be sourced from. In addition, they need access to trained manpower who can , indeed build safe® houses using these technologies. In parallel, systematic training of building artisans needs to be undertaken in manner that they are linked to the market / needs of the customers. Likewise technology developers and building material producers need to work closely with homeowners to understand their needs, challenges as well as aspirations.</p>
<p>How can this change be achieved?</p>	<p>To propose an Actionable Framework for enhancing durability and promoting Resilience in Rural Housing.</p>	<p>Currently the homeowner is perceived to be a ‘beneficiary’ of aid. This perception is propagated in various ways and formats in the way different actors deal with the homeowners.</p>	<p>Policy actors need to establish performance standards and benchmarks, beyond the traditional focus on numbers. More importantly, they need to provide facilitate and continuously invest in building capacity of all the actors. This would be a critical step towards</p>

			strengthening the 'process' aspect of housing development.
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4.4.2 Proposed Framework for Resilient Housing Eco-system

The resilient housing eco system focuses on 3 leverage points identified through Delphi methodology with different stakeholders. These are:

4.4.2.1 Knowledge leverage point:

This covers awareness creation amongst homeowners, systematic capacity building of artisans and building materials suppliers and producers as well as orientation of policy makers to resilience issues. In addition, this node also covers the development of tools and methods that can help these stakeholders understand and negotiate disaster performance better with other actors. For instance, IT enabled tools for artisans to make quick cost estimates to show to homeowners the additional fraction of the cost it takes to achieve a substantially better performing building as far as disaster risk is concerned. Similarly, artisans could use tools to simulate the performance of buildings , show case studies etc to orient the homeowner on the need to construct safer and not bigger . IT enabled tools could also help in continuous capacity building of artisans who continue to be the single window repository of knowledge and services especially for rural homeowners.

At a broader level, the knowledge node would facilitate two way flow of information and knowledge between people and policy makers to adapt housing schemes to ground realities as well as emerging changes in the natural environment for example in relation to climate variability. Housing schemes need to adapt rapidly to a scenario of climate triggered disasters as well as depleting natural resources due to the use of high energy materials used in construction.

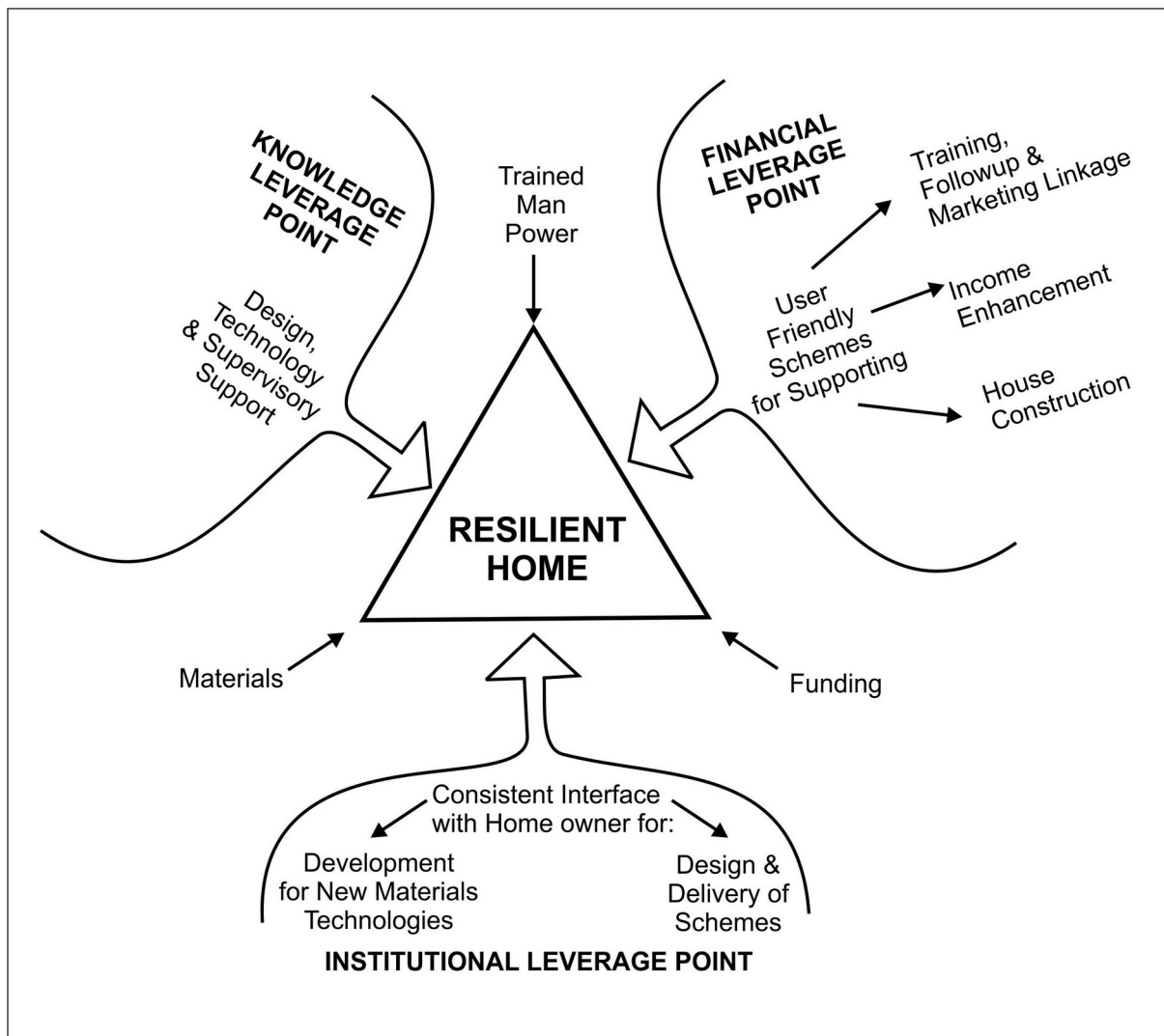
4.4.2.2 Institutional leverage point

This covers institution building and establishing of explicit linkages, for instance between home owners and policy makers for feedback on schemes, design of new schemes etc; between homeowners and bankers for design of new loan products etc. The focus is on getting linkages between different stakeholders 'institutionalized' and obligatory so that resilience is not compromised through the work of any of the stakeholders.

4.4.2.3 Financial leverage point

Finance is a critical enabler not only for construction but it is also required for creating opportunities for income enhancement of BPL families who are often stretched for financial resources for construction. This would reduce dependence on others and also facilitate repayment of small loans if required. Finance needs to be made available for development of capacities and IT enabled tools for building artisans.

The illustration below conceptually captures the framework:



4.4.3 Application of the framework in the state of Sikkim

Through the Rural Housing Knowledge Network project of Ministry of Rural Development vested with IIT Delhi, this thesis had the benefit of testing out elements of the conceptual framework in the state of Sikkim.

4.4.3.1 Concept and Evolution of CMRHM and development of the current design - institutional responsiveness

Over the years, Sikkim government has been giving priority to the housing sector especially in the rural areas, aiming in making Sikkim "kutcha house free state".

Aids like providing G.C.I Sheets, house up-gradation and also re-construction under Central Schemes like MukhyaMantri Awaas Yojna and I.A.Y were acknowledged. However qualitative housing status of rural poor could not be upgraded to the desired level. Considering this CMRHM was devised to integrate schemes like IAY for house up gradation, Electricity from RGGVY, MGNREGA for land development and water connection from NDWRDP, which also included providing land to the landless from Land Revenue and Disaster Management Department under Land Bank Scheme.

The government has further pushed the concept to another level with an attempt to make earthquake resistant houses, learning from the aftermath of the earthquake of September 2011. The improvements in the concept were technological and design changes. Thus, a Model C house has been designed with some changes in the design to make the houses earthquake resistant.

The key features to this concept outline that -

- Houses maybe built with the help of community support.
- If beneficiary is incapable of constructing the house, BRHCC will take up the implementation through a Panchayat nominee as a special case.
- The house should not be constructed by any external agency, and is to be constructed by the beneficiary himself/ herself.
- Special Monitors in the form of 29 senior level officers from other Departments have been designated as Special Monitors to conduct regular, independent inspection.
- A supervision team was created for proper monitoring of the program, supervised by a Block Rural House construction Committee (BRHCC) constituted under the chairmanship of the concerned local area MLA.
- For awareness regarding the scheme and the earthquake proof construction features, regular classes were held for sensitization under State Institute of Capacity Building (S.I.R.D) and various other awareness campaigns and consultative workshops were held for the training of the B.D.O's, the account officials, the field functionaries, Engineers, Rural Development Assistants, Panchayat Inspectors and Masons which helped in the success of the scheme in a lot of levels.

4.4.3.2 Training of masons and building artisans on an IT supported platform

- a. A four day 'hands-on' Masons Knowledge Upgradation Programme was organized in South District, Sikkim from 9-13 January 2014 by Government of Sikkim in MikholaBoomtar in collaboration with RHKN and Jay Pee Cements. The programme included few classroom sessions and several hand on sessions that were video documented for developing training material for further sessions.
- b. Training of Trainers Workshops on Durable Rural Housing in East District, West District, North District and South District was organized by the RMDD on 27 April - 2 May 2014. This programme was organized in partnership with RHKN. Collaborative support in these events was also

received from Jay Pee Cements and Elegant Steels, SPS Group. Under the Knowledge Partnership with RHKN and technical inputs from the two corporate partners, master trainers were familiarized with the Audio Visual modules of correct construction practices using cement and steel were. These **modules were disseminated on micro-SD cards and pen drives** to state engineers and master masons for sharing with the larger community of practitioners and professionals so that durability of rural housing construction in the state can be influenced at large. Covering about 200 masons and 60 engineers, the workshop deliberations also brought out ideas on making rural housing more efficient, cost effective and greener.

4.4.3.3 Pan-state training of engineers and field functionaries for technical supervision to improve durability of construction

A **2-day Engineers' Training Programme in Gangtok** where 120 junior engineers of the Rural Management and Development Department of Government of Sikkim from all the four districts of Sikkim were trained. The training was organized in collaboration with RHKN, Jaypee Cements and Elegant TMT bars. These junior engineers are posted at the Gram Panchayats level and help in supervising the various rural housing programs namely IAY / Chief Minister's Rural Housing Mission (CMRHM) and the Reconstruction of Earthquake Damaged Rural Houses (REDRH) Project. The training comprised of sessions on the principles of earthquake resistant construction, how to use reinforcements, how to use the construction material correctly, how to make concrete, group work to prepare a checklist of common mistakes and how to avoid them. These sessions were video documented for developing training material for further sessions.

These experiences were a good demonstration of the potential of IT based platforms for systematic capacity enhancement of artisans and field engineers.

Development of “pucca Ekra Technology” in response to ground realities and the need to go green

Under the IAY/CMRHM convergence scheme initiated in 2011, presently three models are permissible:

- 1) Model A: GCI Sheet house: Grant in aid of Rs 3.5 lakh
- 2) Mode B: Slab roof house: Grant in aid of Rs 3.5 lakh
- 3) Model C: Slab roof Earthquake Resistant house: Grant in aid of Rs 4.0 lakh
- 4) Model D - Pucca Ekra house has been allowed by the state government in February 2015 with the following design parameters:
 - 605 square feet plinth area
 - RCC foundation with 9 columns up to plinth beam
 - Ekra super structure with GCI sheet roof over the plinth beam

This was in response to several factors. High cost of brick construction since bricks are not made locally and carriage into the hills adds to the cost. Bricks have a large carbon footprint which needs to be reduced. Also, Ministry of Rural

Development vide directive dated 18th March, 2014 made it mandatory to construct labor intensive, durable and good quality buildings using the designs which are in tune with the local culture, and respect the traditional practices of construction. It recommended the use of eco-friendly building material in construction and reducing the use of cement, sand and steel, and recycling of building material is not only feasible but is also essential in the context of the climate change and for environmental improvement.

As a result of all these factors, the existing framed structure typology followed in CMRHM has been combined with Ekra walling. During earthquakes, ekra walling provides a better response as compared to stone masonry load-bearing walls. This system of wall uses large amounts of bamboo and can replace bricks. The burnt clay bricks are well known for negative impacts like land degradation as they are made from top fertile soil and use high amount of energy in manufacturing and transportation with heavy production of greenhouse gases. Hence, the ekra wall houses are economical, eco-friendly, use local construction material and are quickly constructed.

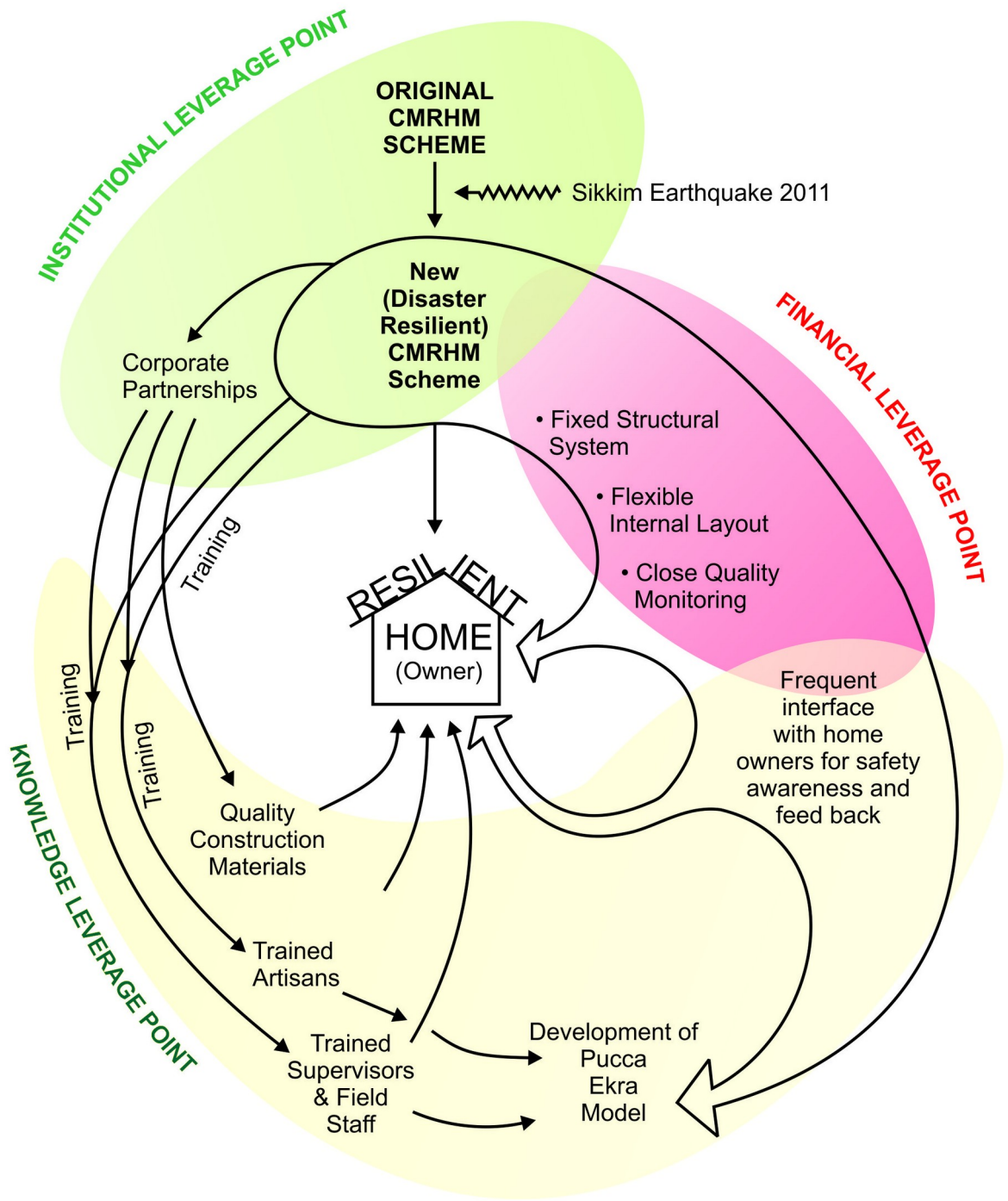
4.4.3.4 Socio-economic and technical assessment of scheme for design of phase II of the scheme

The Government has initiated a multi-disciplinary impact assessment study of CMRHM / IAY scheme covering the social, cultural, economic and technical aspects which will help in a better understanding of the impacts and recommended mid-course corrections in the scheme. The study has two components:

- a. **Social, cultural and economic component:** This component covers the impact of the improved housing on the human wellbeing covering the aspects of education, health, sanitation, livelihoods etc. and intangible benefits like dignity, status in society etc.
- b. **Technical Component :** This component covers aspects related to approach adopted by the home owner in house construction, procurement of stock and non-stock material, provisioning of skilled and unskilled labour, accessing technical and financial support, investment by the owner in cash and kind, beneficiary opinion on the design of the house, use of the living space by the home owner etc.

It is expected that these findings will also feed into the phase II of the scheme.

The detailing of the Resilient Housing ecosystem as experienced in Sikkim is captured in the figure below:



5. Organization of the dissertation

Chapter One contains an introduction to the thesis. Contents of this chapter include need for the study, research objectives, research methodology, and structure of the thesis. Further, there is a section devoted to spelling out the scope of research and research questions of the study.

Chapter Two summarizes the learning from review of literature on relevant themes, including the resilience discourse, the evolution of social housing in India, issues of durability in IAY and systems thinking.

Chapter Three details *Chapter Four* presents the results and discussions and details the desired relationships between actors in the rural housing eco-system. It also highlights the leverage points that are required to take achieve 'resilience' in the eco-system.

Chapter Five consolidates and summarizes the learning from the studies as well as results of testing and validation of the Resilient Housing eco-system framework. The chapter concludes with the summary, conclusions, contribution of work to the research and practice and some limitations of the study.

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