



CHANGING RISK PERCEPTION OF PEOPLE: A KEY FOR ENHANCING BUILDING CODE COMPLIANCE

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Abstract

Understanding Risk Perception of communities is an important aspect for developing risk reduction concepts and programs. This helps authorities, communities and individuals to comprehend the needs, and to plan and undertake actions to manage risks. In a country like Nepal which faces high seismic hazard due to its geologic condition, and where the risk is further aggravated by the large stock of weak buildings, lack of preparedness and awareness among the people and institutions, enhancing the risk perception of the people should be considered as a crucial aspect in creating demand for risk reduction and thus by influencing the risk reduction process. Out of several actions for risk reduction, safer building construction through the building code compliance is taken as a top most factor.

To bring change in the level of risk perception of the people, it is necessary to gauge the residents' current perception of risk, their level of preparedness and the earthquake risk reduction activities they are implementing if any. The earthquake risk perception of population is defined in terms of Knowledge, Attitude and Practice (KAP) on earthquake risk and reduction measures. To understand the influence of change in risk perception to the change in building code compliance, a study was conducted in 23 municipalities of Nepal under Building Code Implementation Program in the municipalities of Nepal (BCIPN) being implemented by NSET. The survey was conducted among 40,000 respondents in the different wards of the municipalities. This paper examines the current level of risk perception by measuring knowledge on earthquake risk, their attitude towards existing risk and their behavior for risk reduction. The study used simple random sampling based on Stratified Systematic Area Sampling procedures. Several questions related to knowledge, attitude and practice were included for the survey on KAP and the questions were grouped accordingly. The questions were assigned certain weightage and scores obtained was calculated.

The KAP assessment of the municipalities reflected that the knowledge level of the residents is fairly good (scored 47 out of 100) in addition their attitude towards earthquake risk reduction is also very positive (scored 73 out of 100) but still there seems to be a gap between transforming these knowledge and attitude into real actions/practice (scored 20 out of 100). Level of risk perception was compared with the level of building code compliance. Intervention such as orientation on earthquake risk reduction, training programs, campaigns were made to enhance the level of risk perception. Later, the level of risk perception together with the level of building code compliance were measured. It has been observed that level of building code compliance increased significantly as the level of risk perception enhanced.

The study also shows that there has been some initiatives and knowledge on earthquake risk reduction including the building code implementation in the municipalities complimented by the positive attitude of the people towards it, the need now is to widen the knowledge coverage and to translate raised awareness into actions of risk reduction.

Keywords: Risk Perception; KAP Analysis; Building Code Compliance



1.Introduction

1.1 Background

As in many developing countries, Nepal is also witnessing rapid urbanization. More and more residential and commercial buildings are constructed in urban and urbanizing centres. The major source of earthquake risk in terms of human casualty is from possible collapse of buildings. More than two-thirds of earthquake risk comes from poorly constructed buildings without earthquake-resistance. To address this huge risk, intervention on safer construction is required. Effective implementation of building code is one of the most important ways to decrease potential risk of casualty from earthquake.

However, a majority of the buildings are constructed without following the stipulations of the national building code and hence are extremely vulnerable to earthquakes. Most municipalities are not capable of exercising effective control over the building permit and building inspection processes due to lack of appropriate mechanisms and lack of capacities for building code implementation. Low level of awareness among the population is another reason for poor enforcement of building code. The Building Code Implementation Program in Municipalities of Nepal (BCIPN) focuses on assisting the municipal governments in Nepal to enhance their capacities to develop and administer the building permits and control system for ensuring improved seismic performance of all new building construction. This entails, in one hand, helping the municipalities to develop an effective mechanism for building code implementation, and on the other hand, enhance earthquake awareness of the residents and technical knowledge of the municipal officials, technical professionals on aspects of earthquake risk management including earthquake-resistant design and construction. This is to be achieved by conducting a series of training courses for technical personnel, including the contractors and masons, and by conducting earthquake orientation and other awareness activities. A total of 24 municipalities was part of the program.

To understand the change in the residents' perception of risk to earthquakes, their level of preparedness and the earthquake risk reduction activities they are implementing and its influence on the change in building code compliance, a study was conducted in the municipalities. A total of 39,874 samples were administered in the different wards across municipalities during the year 2013 -2015. Later in the year 2016, the municipalities were revisited and the change in perception was measured.

Risk Perception Study (RPS): An Overview

Studies on risk perception examine the opinions people express when they are asked in various ways to characterize and evaluate hazardous activities and technologies. Risk perception is the subjective judgement that people make about the characteristics and severity of risk.

Risk Perception Study in the municipalities was done using the KAP Survey approach.

KAP stands for Knowledge, Attitude and Practice. It is used to investigate:

- What the respondents know about it (K)
- How the respondents feel about it (A)
- What the respondents do about it (P)

Research that measures KAP is based on the assumption that a person's knowledge influences their attitude, which in turn influences their behavior. It involved standardized questionnaires that are composed of yes/no questions and multiple-choice questions.



2. Methodology

The study used simple random sampling based on Stratified Systematic Area Sampling procedures. The results can be extrapolated to the whole population with a confidence level of 95% and an accuracy of + or – 5%.

A total of 39,874 surveys were administered by the team in the municipalities (Fig. 1). The sample of 1%-5% of total population of each of the municipalities was selected for conducting the baseline survey. Random sample was selected to represent all the municipal wards proportionately. Also, the random sample is the representative of people from different sectors, professions, ethnic groups, economic status groups etc.

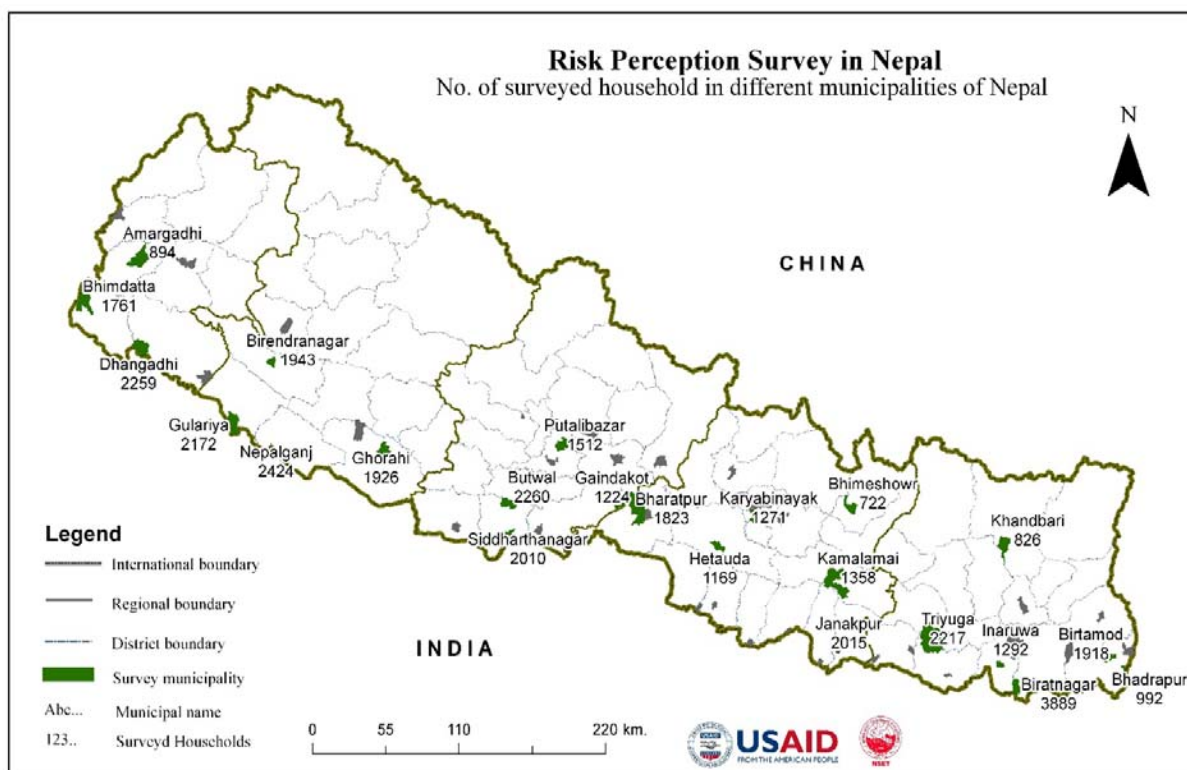


Fig. 1- Distribution of survey in different municipalities (NSET, 2013)

Household Selection

Once the number of households to be surveyed from each sub-area was determined by use of Stratified Systematic Sampling, a plan for selecting households was determined. To get the sampling interval, or the space between each selected household, total number of households was divided by the sample size. For e.g.; for a town of 6,000 households and a sample size of 500, every 12th house was visited.

Enumerators/Surveyors, Data Entry Personnel

Local enumerators (mostly social mobilizers, community volunteers, and health volunteers) were trained to conduct the risk perception survey. The training included sampling techniques, field procedures for the survey, detailed review of the questionnaire, general interviewing techniques, “dos and don'ts”, and test interviews. The enumerators after receiving the training were mobilized in the field for conducting the survey.

Survey Questionnaire

A structured questionnaire was developed comprising of 38 questions, included the participants' demographic characteristics, their knowledge about earthquakes and risk of their community, their attitude toward earthquakes risk reduction and uptake of precautionary measures (practice).



Demographic variables: Twelve questions were asked to assess the demographic characteristics of the participants: age, sex, education, home ownership, community, members in the family, income and occupation etc.

Knowledge about earthquake risk reduction: Six questions were asked to evaluate the participants' knowledge of risk, risk reduction techniques and the safety measures to be followed. Each question asked tested their knowledge on earthquake risk reduction. Participants got different score for each correct answer depending on the answers they gave out of 0-1 score. Each question were then multiplied by the weightage given. The sum of the scores was used as the knowledge score for each participant.

Attitude toward earthquake risk reduction: Five questions were asked to assess the attitude of the participants toward the earthquake. Question like "Who has the primary responsibility of making your house safe from earthquake" was in this section. As in the knowledge testing, Participants got different score for each correct answer depending on the answers they gave out of 0-1 score. Each question were then multiplied by the weightage given. The sum of the scores was assumed as the attitude score for each participant.

Practice (Taking precautionary actions): Five questions were asked to evaluate the measures of precautionary actions, practice for each participant. The questions were about the practices/ actions that can reduce the damages of earthquakes such as "Have you implemented any protection measures for securing non-structural items? Participants got different score for each correct answer depending on the answers they gave out of 0-1 score. Each question were then multiplied by the weightage given. The sum of the scores was assumed as the practice score for each participant.

3. Risk Perception of Residents

3.1 Characteristics of the Respondents

Of the participants highest proportion, 29 % were aged 31-40 years old and the ratio of female was slightly higher than male, 54% of the samples were from female respondent and 46% male respondents. 33% of the respondents were housewife while about 20% of the participants were involved in business. 23% had received secondary education and 15% were illiterate. Furthermore, 54% of the participants had experienced earthquake at least once in the past while only 10% have participated in earthquake awareness programs. 52% of the respondents were the owner of the house.

3.2 Baseline KAP Result

Knowledge about earthquake risk reduction:

More than half of the respondents have some information to be safe from disasters, whereas 30% of the respondents still don't know how to be safe from the most threatening disaster. 53% of the respondents think that their community is at risk and majority of them think that weak infrastructure is the main reason for risk. When asked what they will do if there is an earthquake, 44% of the respondents said that they will run out of the house and 37% will find a safe place, whereas most of them knew that open space was the most safe place when outside during an earthquake. More than half of the respondents didn't have any idea on earthquake safe construction also indicated by the fact that 54% still haven't heard about National Building Code (Fig.2 & 3).



IDEA ON EARTHQUAKE SAFE CONSTRUCTION TECHNOLOGY

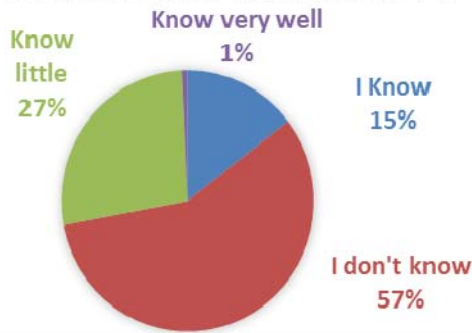


Fig.2- Idea on safer construction (NSET, 2013)

HEARD ABOUT NATIONAL BUILDING CODE

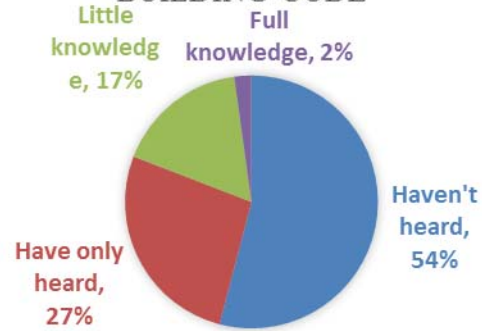


Fig.3- Heard about National Building Code (NSET, 2013)

Attitude towards earthquake risk reduction:

More than half of the respondents, more or less, knew something about earthquake. Further five questions were asked to assess the attitude of the participants toward earthquake risk reduction. It was observed that the residents of the municipalities have somewhat positive attitude towards earthquake risk reduction. Of the respondents surveyed 43% feel that their house is not safe from earthquakes, 25 % was not sure, while 27.5 % thinks that their house is safe and 4.5% of them do not know anything. When asked if they have thought about making their home safe, 33% of the respondent gave a negative answer while 35% need to think about it, only 31% were sure about it. This clearly shows that though people are aware on the risk they are facing still they are reluctant to implement the risk reduction measures. The respondents have a positive attitude towards risk reduction as most of them 72% mentioned that it was their own primary responsibility for making their home earthquake safe (Fig.4 &5).

THOUGHT ABOUT MAKING IT SAFE

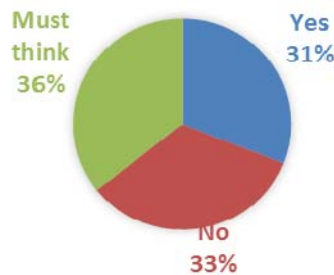


Fig.4- Attitude towards safer construction (NSET, 2013)

PRIMARY RESPONSIBILITY OF MAKING YOUR HOUSE SAFE

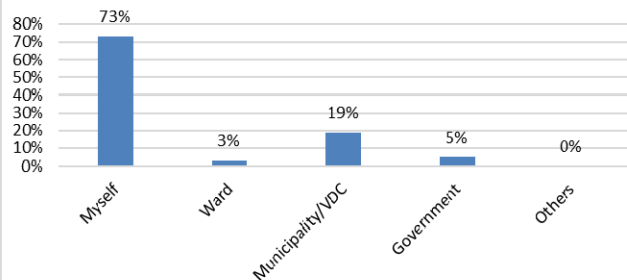


Fig.5- Attitude towards safer construction (NSET, 2013)

Practice (Taking precautionary actions):

It was seen that although the residents of the program municipalities are aware on the earthquake risk and have a positive attitude towards it, still there is a huge gap in turning those learnings into actions. 58 % of the respondents have not yet discussed among family members on how to be safe from earthquakes. 60-70 % of the respondents noted that they have not implemented any protection measures for securing non-structural items that may fall and cause injury or stored basic life saving items.



Baseline KAP Score

The radar graph (Fig.6) shows the integrated KAP for all of the municipalities. The KAP score assessment of all the municipality, as represented in the figure clearly shows that the Knowledge level of the residents is fairly good (scored 47 out of 100) in addition their Attitude towards earthquake risk reduction is also very positive (scored 73 out of 100) but still there seems to be a gap between transforming these knowledge and attitude into real actions/ Practice (scored 20 out of 100).

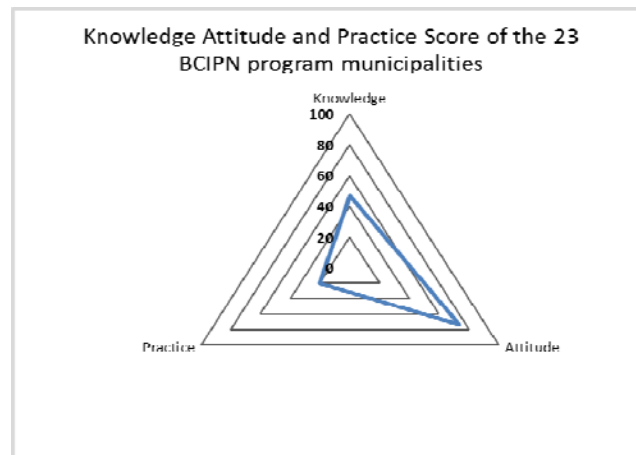


Fig.6- KAP Score of 23 BCIPN Program Municipalities (NSET, 2013)

The figure below (Fig.7) shows the variation of KAP Score in different program municipalities.

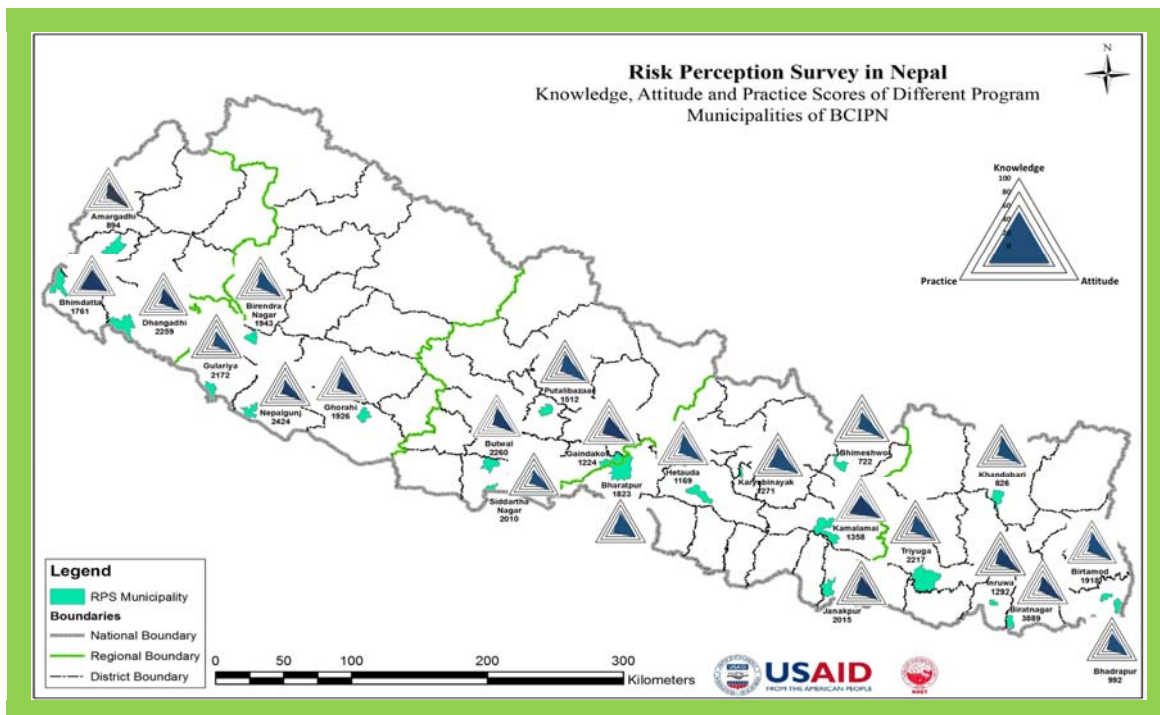


Fig.7- KAP Score in different program municipality (NSET, 2013)



Factors affecting KAP components

KAP Score with Earthquake Experience, Gender, Age Group Level of Education and Occupation

Of the respondents surveyed 79% mentioned that they have experienced earthquake and the respondents who have experienced earthquake have scored slightly higher in KAP (Fig.8). Similarly, male respondents have scored slightly higher (Fig.9). It was observed that lower the age higher was the knowledge and practice score, while attitude seemed to be somewhat consistent throughout (Fig.10). Further, level of education also affected the KAP score: increase in the level of education increased the KAP score (Fig.11). Similarly, the KAP is significantly affected by Occupation types (p-value 0.00). The respondents who work in private organization, government offices and students have the highest KAP score whereas labour workers and housewives have the lowest score.

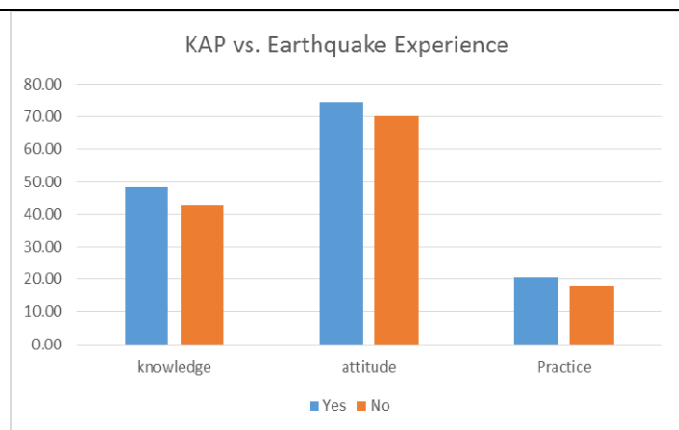


Fig.8- Having experienced earthquake Vs KAP Score (NSET, 2013)

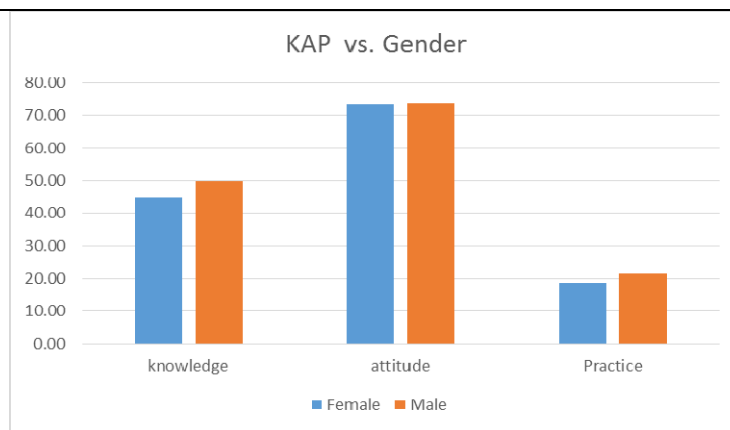


Fig.9- Gender Vs KAP Score (NSET, 2013)

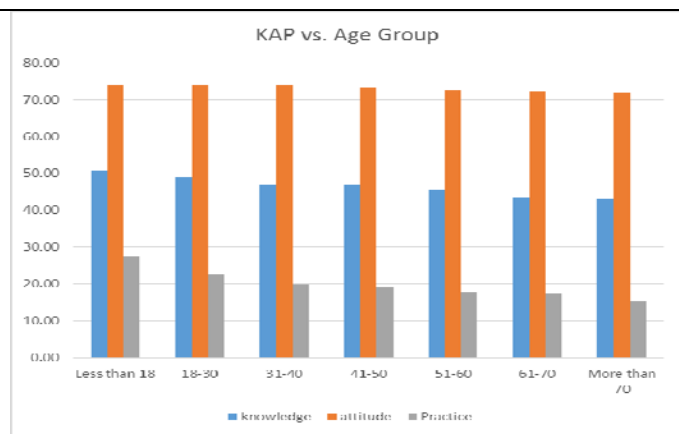


Fig.10- Age Group Vs KAP Score (NSET, 2013)

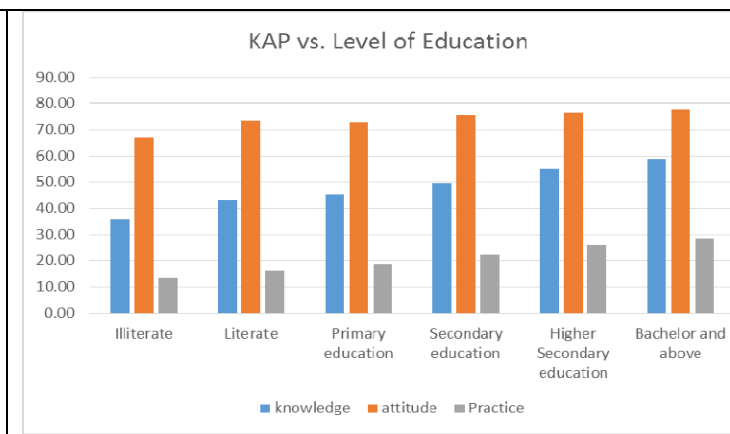


Fig.11- Level of Education Vs KAP Score (NSET, 2013)

KAP Score with Participation in Awareness/Traning Program

A majority (90-95%) of the respondents haven't participated in any orientation or training program, 10% of those who have participated in orientation program and 5% participating in training program were found to be implementing the knowledge gained into practice.

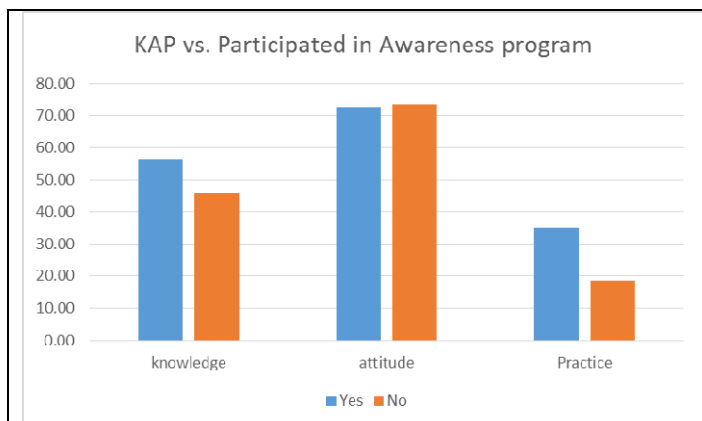


Fig.12- Participation in Awareness Program Vs KAP Score (NSET, 2013)

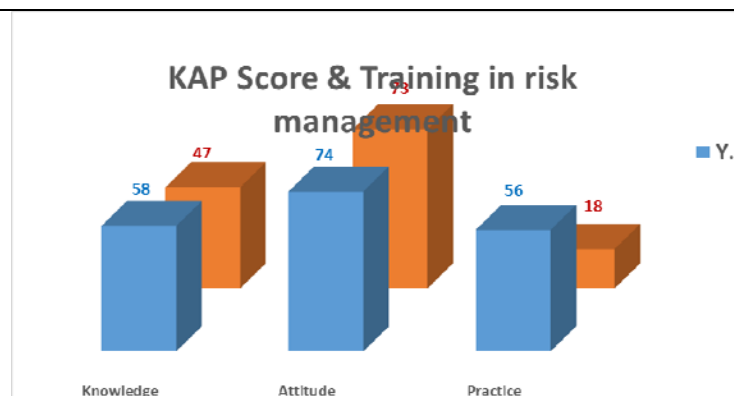


Fig.13- Participation in Training Program Vs KAP Score (NSET, 2013)

4.Change in Risk Perception (A Case of Bharatpur Sub Metropolitan City)

Intervention Measures

Bharatpur Sub Metropolitan City, located in the central region of the country, and is one of the fast growing cities, had initiated building code implementation since 2005, while the official declaration was done only on Jan 15, 2013. There were very little plans, and very few trainings have been conducted for earthquake resistant building construction. There was no strict implementation of building code in the municipality.

Of the total buildings constructed in the municipality per year, around 60-70% of the buildings were constructed with permit, however implementation at field level was very low as a result of lack of awareness among population, lack of trained manpower and lack of implementation and monitoring mechanism.

The program Building Code Implementation Program in Municipalities of Nepal (BCIPN) was implemented in the municipality in the year 2013. In order to enhance the capacity of the municipality to develop and administer the building permits and control system for ensuring improved seismic performance of all new building construction a number of activities were carried out in the municipality. Some of the major activities were as follows:

Capacity enhancement: With the view of developing local champions and enhancing their capacity, various training programs were conducted for different target groups. Different types of training courses such as Mason Training Course, Basic Course for Engineers, Advanced Design Course for Engineers and Training Course for Social Mobilizers for different target groups were conducted in the municipality.

Awareness programs: Likewise for raising awareness of the local people, various awareness raising programs were conducted such as House owners' orientation programs, orientation program for local social mobilizers, community leaders and other community people, free technical consultation sessions, awareness programs through local radios and televisions etc.

During the 3 years of program intervention in the municipality, 76 engineers of the municipality were trained on earthquake resistant housing construction through 3 different engineers training.

More than 264 masons were trained in earthquake resistant building construction through 9 different mason trainings conducted during different time within the 3 years of program intervention. There has been a significant change in the perception of the people, more demand has been created. In the earlier years of program intervention it was difficult to even gather 24 masons to conduct the Mason training program but now the



situation is different, masons themselves are demanding for more trainings and waiting for their turn to participate in the training.

Almost 1000 people were directly trained/oriented through various House Owners trainings, community orientations, mobile clinics and other trainings. The continuous interventions have resulted in significant change in the perception of the people and the institutionalization of Building Code Implementation in the municipality.

The Change

A comparative study for measuring the change in risk perception through the various interventions was conducted in the year 2016 in Bharatpur Sub Metropolitan City. A total of 420 households were surveyed.

The study showed that there has been a significant change in the perception of the people towards earthquake risk reduction. There has been an increased percentage of the community who thinks that their community is at risk of earthquake (Fig.14) and the percentage of people having the knowledge of earthquake safety technique for houses has also increased (Fig.15).

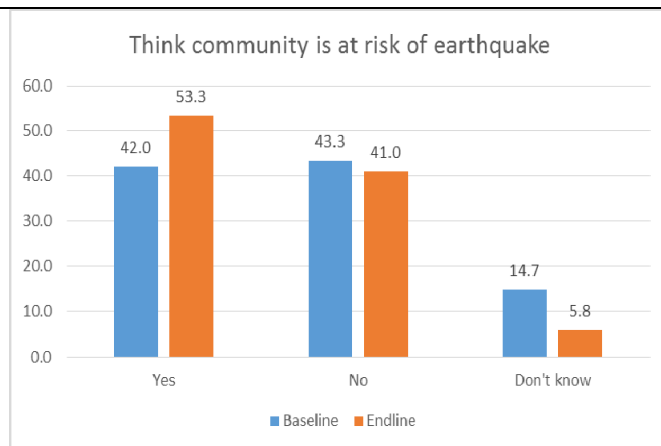


Fig.14- Change in the thought of the community regarding the risk of earthquake (NSET, 2016)

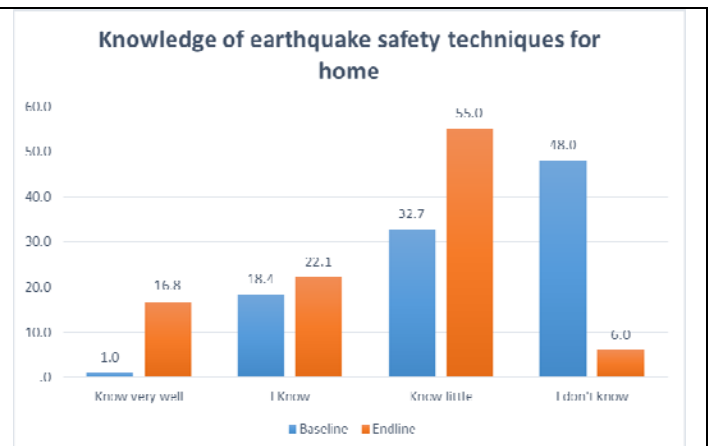


Fig.15- Change in the knowledge level of community on earthquake safety technique(NSET, 2016)

Willingness to pay for Safer Housing

The change in risk perception of the residents has led to their willingness to pay additional amount for making their home earthquake resistant. With regards to the willingness to pay additional amount for earthquake resistant building, 85% of the respondents mentioned that they are willing to pay additional amount for making their house earthquake resistant. When asked how much extra they are willing to pay, 35% mentioned that they are willing to pay 10% more, 16% mentioned that they are willing to pay more than 20% (Fig 16&17).



Willing to pay extra amount for earthquake resistant building

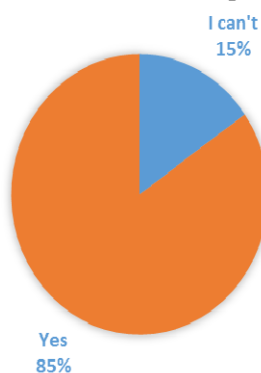


Fig.16- Willingness to pay additional amount for earthquake resistant building (NSET, 2016)

How much extra amount willing to pay in percentage

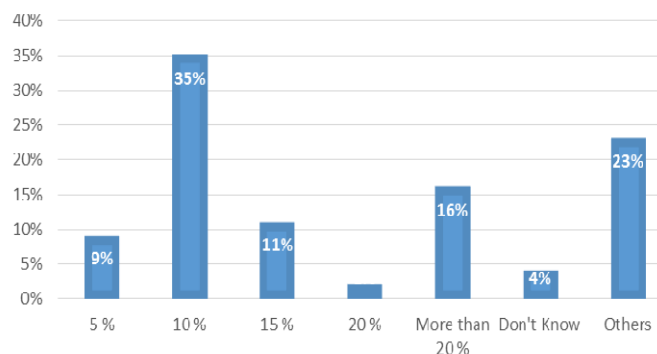


Fig.17- Additional amount willing to pay for safer construction (NSET, 2016)

Change in the KAP Score

The KAP score assessment of Bharatpur Sub Metropolitan City reflected a significant change in the practice score of the participants (Practice score changed from 30 to 53) as indicated in Fig.18. The knowledge gained has been transformed into actions/practice. People have started to implement the earthquake risk reduction measures in their daily life. Their perception of risk has changed and now they are willing to pay additional amount to make their home earthquake resistant.

KAP	2013 (Baseline)	2016 (Endline)
Knowledge	52	55
Attitude	62	67
Practice	30	53

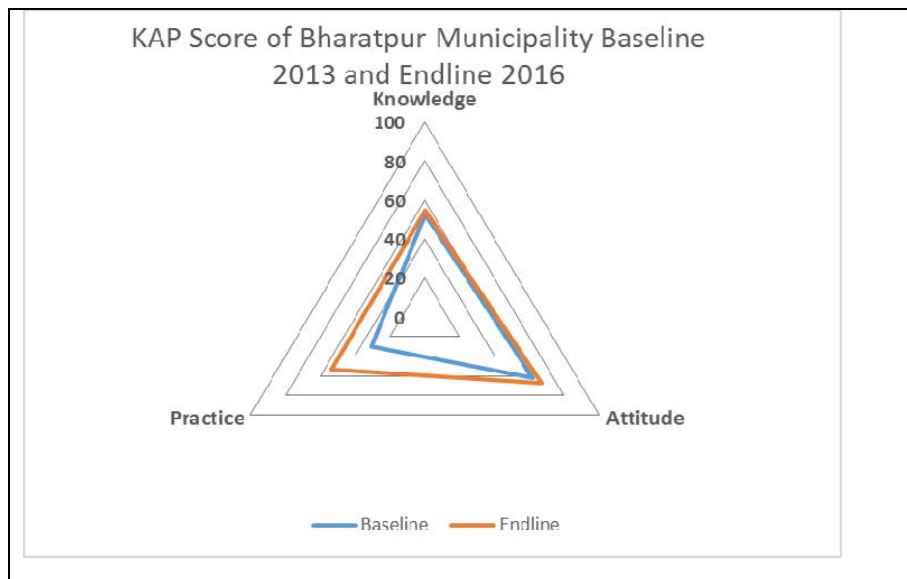


Fig. 18 – Change in the KAP Score of Bharatpur municipality in 2013 and 2016

5. Findings and Conclusion

The study conducted in 2013, revealed that those who participated in awareness and training program were found to be implementing the knowledge gained into practice such as their ratio of discussion with family members was significantly higher than the respondents who haven't participated yet. There was a significant relationship between participation in awareness program and implementing protection measures and storing basic lifesaving items, the chi-square P-value was (0.00) for both relations. The mean of Knowledge and Practice score of the respondents who have participated in awareness/training program was higher than the respondents who haven't participated in any programs yet. This showed that in order to transfer the existing knowledge into practice training programs/orientations are needed (Significantly higher difference in practice score - 56:18).

Significant relation between Age group and Knowledge and Practice score was observed. The lower the age higher the knowledge score, and higher the age lower the knowledge score, respondents with age more than 70 had the lowest practice score. Knowledge and Practice score of male respondents was found to be higher than the female respondents.

Similarly types of occupation of respondents and KAP score was found to be significantly associated. The respondents who work in private organization, government offices, and students have the highest KAP score whereas labour workers and housewives have the lowest. The mean of knowledge score of the respondents who have experienced earthquake was found to be higher than the respondents who haven't experienced. The P-value 0.000 indicates that there is a significant relation between them.

It was also observed that though the people know that weak infrastructures was the main reason of risk in the community still the people were not much aware on earthquake safer construction and more than half of the respondents haven't heard about the building code.

Increasing age, lower education level, previous experience of earthquake, non-participation in awareness/training program were identified as the risk factors on low knowledge towards earthquake. In our study, the attitude toward earthquake was not a significant factor for taking precautionary actions against an earthquake.

Considering the learnings and the need identified by the risk perception study in 2013 and the general experiences on building code implementation in few municipalities, strategy for implementation building code at municipal level for BCIPN program was developed.



The study in 2016, showed that intervention of BCIPN program activities with the existing knowledge on earthquake risk reduction complimented by the positive attitude of the people towards it, has been successful to transfer the knowledge gained into actions to some extent.

Changing Risk Perception of People is indeed a Key for Enhancing Building Code Compliance in the Municipalities. The need now is the scaling up of those activities, successful methods and implementation at a large scale with the institutionalization of the whole process to achieve a resilient community.

4. Acknowledgements

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