
**REDUCTION OF DISASTER VULNERABILITY
THROUGH INDIGENOUS KNOWLEDGE
IN COASTAL AREA OF SINDH PAKISTAN**

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ABSTRACT

Linking indigenous knowledge of the community with modern techniques to measure, analyze and reduce disaster vulnerability is one of way engaging and mobilizing community capacity. This paper discusses the use of the local knowledge in disaster management. It suggests a way to mobilize available human resources in order to strengthen a good partnership between local communities and local and national institutions. The study conducted through field work in two districts Thatta and Badin of coastal area of Sindh Province of Pakistan. Multistage cluster sampling technique was used to select the sample size of 360 respondents from the area. Data was collected through well-structured questionnaire. Data revealed that proper utilization of local wisdom, knowledge along with modern tools and techniques can assist in effective manners in disastrous situation and can reduce the risk. To measure the local knowledge and wisdom of the community statistical model was developed through primary data. In the model, local knowledge is a dependent variable, whereas Age, Experience, and Living status are independent variables. The impact of these independent variables on dependent variable was measured through multiple regressions.

INTRODUCTION

The communities in the coastal area of Sindh are facing natural hazards form years but the major disasters among these are cyclone and floods. These always cause famine, food insecurity and poverty in the area. However, over the years, the communities have used local knowledge to get technologies, expertise, experiences, and beliefs that support them not only in predicting the natural disasters but also in devising techniques and coping mechanisms to deal with the disasters. The communities focus on

disaster prevention and preparedness. Thus, they take measures such as growing flood-drought-resistant and early-maturing indigenous varieties, gathering, wild fruits and vegetables, wetland cultivation, livestock diversifying and splitting, preserving, and storing food for use in times of scarcity. All these measures enable the indigenous communities to live. Forecasting through weather patterns include turning depressingly dark of the sky, because of dark clouds, in their opinion, weather unusually becomes hot and humid and this hotness trances by rain. Wind direction forecasting includes the self-assessment of winds blowing from the south and north and their cohesion. Strong winds start blowing and wind blowing becomes strong at full moon. Forecasting through animal behavior is one of the most old local way and difficult to support scientific phenomena. There is a strong need to analyze them scientifically because this way of forecasting makes the people able to forecast any event in advance. This group of local knowledge includes cattle felt depressed by owners, they stop eating food and could not sleep well at night. Dogs wailing continuously along with cattle and other animals in the area also make sad sounds continuously. People get afraid of such sounds because, they feel that animals behave like this, mostly before the occurrence of disasters. Local people make such observations about 10 to 14 days before. During these days, if local people observe other patterns of animal behavior also then they start to get ready for any disaster. These other patterns include climbing of ants on trees with eggs, bees, displacement in cluster, birds roam in the sky, fish in the sea also become restless, crows fly and cool at night and foxes bark during the day. Considering the vulnerability of the local population of the area and absence of solid organizational support, the present study analysis the trends of local knowledge in the area. Various developing countries are using this knowledge in their Disaster Management systems.

According to Khan (2008), the coastal areas of Sindh are most vulnerable and exposed to cyclones. The entire length of the coastline was subjected to tropical cyclone. In particular, in the year 1999 cyclone ravaged large tracts of coastal districts of Thatta and Badin causing widespread loss to life and property. These coastal areas are also inundated by torrential rains. Although not a

frequent phenomenon, cyclones can cause large-scale damage to the coastal areas of Sindh and Baluchistan (Khan & Khan, 2008).

This study explores ways and means through which the extent of damages caused by disaster such as flood and cyclone could be minimized. It envisages the effective role of local knowledge in predicting the scale and extent of future disasters. It is argued that at policy levels, the role of local knowledge has never been adopted to prepare and forecast the disasters that occur from time to time. This research article conceptualizes the terminology of local knowledge through historic perspective and reviews methodological details for identifying appropriate analytical tools and results.

CONCEPTUAL FRAMEWORK

Local knowledge is the sum of facts that ARE learnt from experiences acquired from observations in the revival of various climatic, agricultural, political, environmental and disastrous events. Local knowledge became the identity of particular communities, although many of these are now extinct. Historically such knowledge named as 'traditional knowledge', 'local wisdom', 'indigenous knowledge' or 'cultural knowledge'. Each segment of society has different norms, values, traditions and environment, that is why such knowledge varies from area to area, region to region, environment to environment, society to society and culture. These differences in societies differentiate the wisdom of the people according to their surroundings. Most important and interesting point is to learn about the relationship of these individuals with their environment and to know about the strength of their relationship with the environment.

This relationship of local people is directly proportional to changes occurred in their environment. This relationship interlined with coping strategies of individuals, which they adopt after any change from his surrounding adds to their knowledge or wisdom. If these people adopt some strategy and technique against the changes which occurred in their environment, such coping strategy learnt from their elders is termed as local knowledge for disaster management (Thrupp, 1989; Emery, 1996; IIRR, 1996; Grenier, 1998; Antweiler, *et.al.*, 1998; Langill, 1999; and Berkes, 1999).

RESEARCH METHODOLOGY

This Study is undertaken with a development objective aimed at identifying key issues essential for formulating long term planning and mitigation measures for reducing disaster vulnerability of coastal community in Pakistan. It analyses the impact of previous disasters and role of public and private sectors on it.

Given section highlights study selection procedure, which is based upon multistage sample procedure in which at first stage taluka of coastal region is selected, and at second stage union councils are selected followed by selection of villages and study respondents. The data was based upon probability methods.

The study hypotheses categorized into qualitative and quantitative variables, such as local knowledge; assessing preparedness and mitigating tools; qualification of flood damages, demography, income etc. The formal method i.e. questionnaire was pre-tested in a pilot study before administering at large scale data collection. Extensive visits held with representatives of national and international non-governmental organizations, district management units for disaster handling in the study area and elsewhere in Karachi and Islamabad. The sample selection with the provision of sampling errors by specified formula, estimates sample respondent with provision of 95% confidence interval. A total sample of 360 households was selected from two districts. The sample size is appropriate at $\pm 5\%$ error rate, 95% level of confidence with the response distribution of population 2.3 million.

RESULTS

Estimating Local Knowledge

As local knowledge is a knowledge is developed by long revives experiences of communities living in a certain geological and meteorological surroundings, but with the passage of time and modernization many of such knowledge became extinct. Based on previous literature and ground realities here for conceptualizing local knowledge measured by quantitatively. The graphical presentation below shows that local knowledge is prediction of damages caused by disasters. In the local community, losses from disasters can reduce by using local wisdom. The local knowledge

is directly related to age of people, living in the same area from long time, experience in the term, and number of disasters a person has faced in his/ her life. Hence, age, living status, and experience are independent variables that affect the dependent variable *Local Knowledge*. These independent variables have a positive direct impact on dependent variables. The existence of local knowledge in any community could be determined using this model. The graphical representation of this model showed the figure below which also linked disaster damages with local knowledge. This model could be test by multi-linear regression model. The equation for multi-linear regression model of local knowledge is:

$$\text{Local Knowledge} = \alpha + \beta_1 \text{age} + \beta_2 \text{living status} + \beta_3 \text{experience} \text{----- eq1}$$

Where

β_1 age = Respondent age

β_2 living status=How long you have been living here

β_3 experience=How many disaster you have faced

In the present study, these variables assessed through determinant-choice questions that provide various alternative answers to choose only one. For each variable, there was only one question with four alternatives. Age as also asked using alternatives because most of old aged people could not figure out their age exactly. Besides this for the homogeneity of the data, all questions kept of the same type. By applying the statistics of this model to the present study, following table shows the results.

TABLE-1
MODEL SUMMARY OF LOCAL KNOWLEDGE

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.806 ^a	.650	.647	1.893

Predictors: (Constant), Experience, Living Status, Age

TABLE-2
NOVA

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	2366.004	3	788.668	220.038	.000 ^a
Residual	1275.985	356	3.584		
Total	3641.989	359			

a. **Predictors:** (Constant), Experience, Living Status, Age

b. **Dependent Variable:** Traditional Knowledge

TABLE-3
COEFFICIENTS OF MODEL

Model	Un standardized coefficients		Standardized Coefficients	T	Sig.
	B	Std.Error	Beta		
(Constant)	9.626	.229		42.110	.000
Respondent Age	.413	.164	.197	2.525	.012
Living Status	.736	.132	.406	5.566	.000
Experience	.506	.169	.235	2.994	.003

Dependent Variable: Traditional Knowledge

In the above regression model statistics the model summarized in Table-1 shows that there is 65% variance in dependent and independent variables as R^2 is equal to 0.65. In Table-2, the whole regression model has shown as significant as the significance value is “.000”. In Table-3 coefficients of all four variables i.e. age; experience; and living status; are significant as the significance value in last table is less than 0.05. However, the model as a whole is significant based on ANOVA. Hence by using the model shown in equation 1

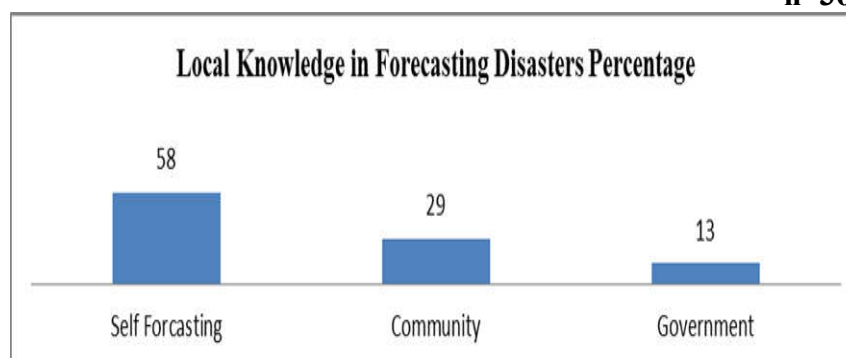
$$\text{Local Knowledge} = 9.626 + 0.413\text{age} + 0.736\text{ living status} + 0.506\text{ experiences}$$

In this model, the education of people is not considered although lot of literature suggests that less educated people prefer to use local knowledge. The advent of local knowledge in this era of modernization rejected this phenomenon. Because, if local knowledge is now adopted by educated as well and most of scientists, the local knowledge in different fields will yield cost and environmental benefits.

Use of Local Knowledge and Different Stages of Disaster Management

Local communities are living in the area for years and they are much more familiar than anyone else with the surroundings. Moreover, the strategies developed in the head offices of public and private organizations are far away from the area and most of those prevalent in local knowledge. Local communities use their wisdom and indigenous knowledge in all stages of disaster management to prevent their selves from maximum destruction.

FIGURE-1
USE OF LOCAL KNOWLEDGE IN FORECASTING DISASTERS
n=360



Source: Survey Data 2010.

Figure-1 show that most of the people prefer self-forecasting 58 percent of the total respondents from the study area rely on their own forecasting for any disaster by using their own knowledge about the environment of their surroundings. Second leading source for future events is community. In addition, this is not because of the fact that they cannot understand or could not hear because of living in a distant place, but most people also do not rely on government's radio announcements because of their poor studies about expected disaster. Sometimes, there are chances that cyclone may turn its direction before its onset, but the government announcements do not support this fact and do not announce accordingly. Moreover, sometimes, government does not tell clearly about the severity of the cyclones and hence the communities disturbed from their normal routine. Hence, most of the community depends on their own self-forecasting. Using self-forecasting there are three major methods to forecast: weather pattern forecasting, wind direction forecasting, and forecasting using animal behaviour.

Results from above Table-4 show that most of the people use weather patterns to predict or forecast any disaster in the area. Table-4 shows that animal behaviours is the least used method in weather forecasting, because most of the people consider them as old fashioned and do apparently not believe.

TABLE-4
PERCENTAGE USE OF EACH LOCAL KNOWLEDGE
METHOD USED BY TARGET POPULATION

DISASTER PREDICTION			
Parameters	Frequency	Percent	Cumulative %
Sea Patterns	22	6.1	6.1
Weather Patterns	188	52.2	58.3
Wind Direction	91	25.3	83.6
Change in Animal Behavior	42	11.7	95.3
Moon pattern	17	4.7	100.0
Total	360	100.0	
Std. Deviation = .942 Mean = 2.57 n = 360			
Scale: Less than 25% = Poor, 26% - 50% = Good, 51% - 100% = Excellent			

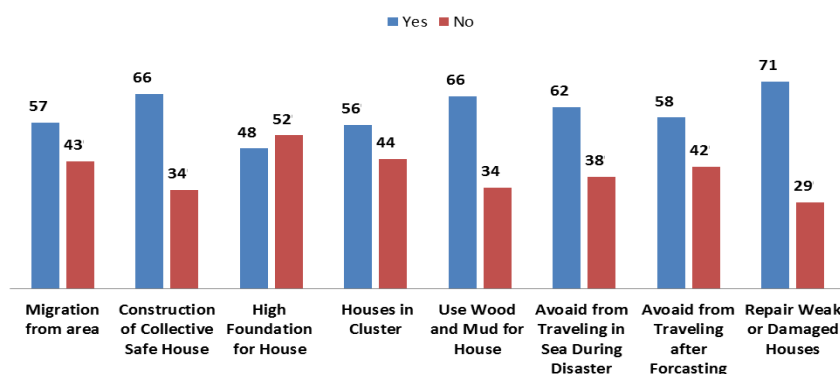
Source: Study Survey 2010

TABLE-5
FACTORS FORCING PEOPLE TO IGNORE FORECASTS

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Poverty	102	28.3	28.3	28.3
Lack of Resources	154	42.8	42.8	71.1
Social Barriers	104	28.9	28.9	100.0
Total	360	100.0	100.0	

The results in the Table-5 show that other than poverty and social barriers, lack of resources is the major factor that compels them to ignore their self-forecasting. Lack of resources refers to have no boats or shelters and enough food stocks that they could move. Because of extreme poverty, they thought that if they move then they may lose their few assets and if they do not displace then they may be able to save their assets. They want to displace along-with their cattle and other livelihood assets because their poverty do not capacitate them to recover after a disaster and neither the government and NGOs help in this regard. Figure-2 shows that local people keep special concern on mitigation measures for disaster in advance.

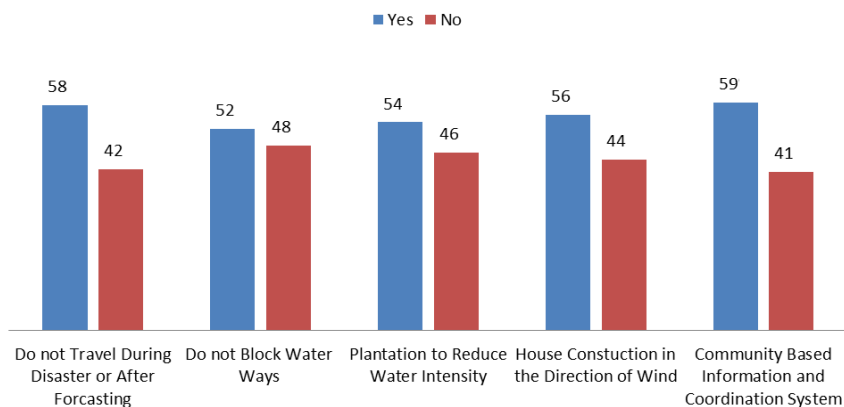
FIGURE-2
PARENTAGES LESSON FOR DISASTER MITIGATION - %
n= 360



Source: Survey Study 2010.

Both Figures-2 and 3 shows that indigenous people was not focusing on only post disaster activities but they gave special consideration to predisaster situation also. Following are the points which were inhabited by the Portuguese and shifted in new generation by local wisdom and knowledge and both Figures-2 and 3 show the percentages of the people of the study area using this knowledge or adopting.

FIGURE-3
TRADITIONAL ACTIVITIES PERFORMED BY
COMMUNITY FOR DISASTER MITIGATION - %
n= 360



Source: Survey study 2010.

Local Knowledge in Reducing Disaster Vulnerability

Local people identified priority-basis factors based on their wisdom to reduce the disaster vulnerability. Four factors given in Table-6 are needed to reduce disaster vulnerability of the people in the area. Table-6 shows 42.8 percent of 360 indicated that through providing employment opportunities vulnerability can be reduced and they handled any disaster situation easily. 28.3 Percent focused on mode of communication. However, health and education 15.8 percent and 13.1 percent respectively, were on least priority.

TABLE-6 FACTORS ON THE BASIS OF PRIORITY TO REDUCE DISASTER VULNERABILITY		
Priority Factor	Frequency	Percent
Employment Opportunity	154	42.8
Mode of Communication	102	28.3
Education	47	13.1
Health Facility	57	15.8
Total	360	100

Source: Study Survey 2010.

Implementing Local Knowledge

In disaster management, the main purpose is to reduce the risk of any disaster. In the recent years, indigenous knowledge keeps very important position in this regard. Without incorporating knowledge of the local communities, it is impossible to reduce the risks in rural communities of developing countries, because local communities feel themselves enriched in their knowledge and do not trust government announcement. Moreover, various villages are very far away and cannot hear the announcements. Hence, the involvement of the local communities will be beneficial and cost effective to deal with any situation of disaster like vulnerability, risk, pre or post disaster situation. Proper utilization of local wisdom, knowledge along with modern tools and techniques can get rid of the worst disaster situation and can reduce risk.

As discussed earlier disasters and their destruction is not new for any local community, the relation between these indigenous people and nature is from the very beginning, they or their

forefathers are old victims of these natural disasters. Obviously, these local people used to tackle these situations through their knowledge, skills and wisdom. The model given in this paper proposes that by including local knowledge in every stage of disaster management one could have effective disaster management and planning system. This model supports participatory approach. The local people should be involved in disaster management. This will ultimately reduce vulnerability of the people and their risk of disaster.

CONCLUSION

The available literature on local knowledge shows that now it is of greater importance in the developmental work. There is a need to understand and involve local knowledge in the development process to attain locals' trust and for effective implementation of projects. Besides, this local knowledge have certain features which are valuable for sustainable development. Likewise, due to its cost effectiveness, it is good for developing countries to empower their aloof communities. Despite advances in knowledge and technology, the vulnerability and risk is increasing year by year throughout the globe. Therefore, it is necessary to involve the local communities in disaster management and trust on their wisdom is mandatory.

RECOMMENDATIONS

- Local people should be taking on trust to use their local knowledge to forecast disaster and adopt preventive measures to have least losses.
- There should be disaster management units within the villages of local people that force people to save themselves and to adopt long term indigenous preventive measures that they know from their parentages.
- Local knowledge practices should be used because of their cost effectiveness and to build local trust that ultimately could help in motivating local communities
- Sustainable measures could be developed to predict disasters using their ability to identify and interpret early warning signals of cyclone based on environmental

indicators, weather interpretations/ predictions, smells, sounds, direction and types of wind, unusual appearance and movements of wildlife, etc.

- Ability of local population to interpret the landscape and indicators of past cyclones such as the location of past cyclones by looking at the shape, direction, and nature of the wind, sea waves, geology, morphology, etc. can be helpful in forecasting disasters.

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