

LANDSLIDE HAZARDS AND POLICY-RESPONSE IN PAKISTAN: A CASE STUDY OF MURREE

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ABSTRACT

Like most parts of the world, Pakistan has been frequently subjected to a variety of natural hazards. Apart from the vast alluvial Indus plains, where people are mostly vulnerable to devastating floods and waterlogging, a major part of the country is mountainous and geomorphologically very active. It is here that people and their property are most vulnerable to various natural hazards, like earthquakes, landslides, flash floods and several others. Amongst these, the landslides and related failure processes are the most damaging because they are an ever-present and frequent danger for the people and their property. The main objective of this paper is to examine the impact of landslide hazard-reduction policies and their shortfall in Pakistan, with special reference to the important hill station of Murree, which is the worst slide-affected of the country.

INTRODUCTION

Murree, lovingly called "the Queen of the hills", lies in north latitude 33° 54' 30" and east longitude 73° 26' 30". It is the most easily accessible hill-station and sanatorium in Pakistan and is connected by a fine metalled road to Rawalpindi and Islamabad, at a distance of 61 and 51 Km respectively (Fig. 1). It is not only an administrative headquarter and commercial centre, but also the unofficial summer capital of the country.

Murree receives the highest amount of rainfall in Pakistan, averaging 66", with mean annual number of rainy days of 85 (Rabbani, 1986). It is located on a lateral spur of the sub-Himalayan mountains, with an elevation of 5,000-7,500 ft above seal level. This spur stretches at right angles to the plains, with general direction from north-east to south-west, and flanked on either side by parallel lines of hills. The Murree spur is composed of relatively young and geomorphologically fragile rocks, with hard grey-to-redish sandstone, predominantly interbedded with the

soft and purple red calcareous shales. These rocks have the highest tendency towards landslides and related phenomena, specially in the presence of high, precipitation (Khan, 1992a, b; 1994).

This paper assesses and explains the current situation of the extent and causes of the increasing adverse effects of landslides in the area. After identifying major policies adopted by the government, the paper goes on to evaluate their impact towards the reduction of adverse effects of landslides.

DATA COLLECTION AND ANALYSIS

A variety of research techniques were used to collect the necessary data. Prior to the field work, a detailed reconnaissance survey was carried out to review the reports and available record at concerned organizations. Informal interviews and discussions were held with government officials of the relevant departments and influential personnel in the area, in order to get information about the government policies in this context. However, some of the data needed could only be collected from a household survey. Therefore, a sample household questionnaire-survey was undertaken with household heads, so as to elicit the required information for the evaluation of the policies adopted by the government for the reduction of landslide hazards (Khan, 1992a; 1994). For this purpose the city was divided into three areas, based on environmental characteristics, i.e. urbanization, location and people's occupation, etc. These areas were named as (i) Inner City (ii) Urban Fringe and (iii) Rural Fringe. The inner city is the main centre and commercial heart of the town, where people are mainly involved in retail activities. It includes the Station Area, Lower Bazaar, Shiwala, Agency area, Sunny Bank, Kuldana, Pindi Point and Kashmir Point (Fig. 2). The urban fringe includes Chitta More, Kashmiri Mohallah near Bansra Gali, Dhobi Ghat, Kashmiri Mohallah, Abbasi Mohallah (Gharan), and Dhok Jabar Topa, where people are mainly involved in retail, contracting and some farming activities. The rural fringe is semi-urbanized, and has influences of the rural environment. It includes Hill Dholu, Dhok

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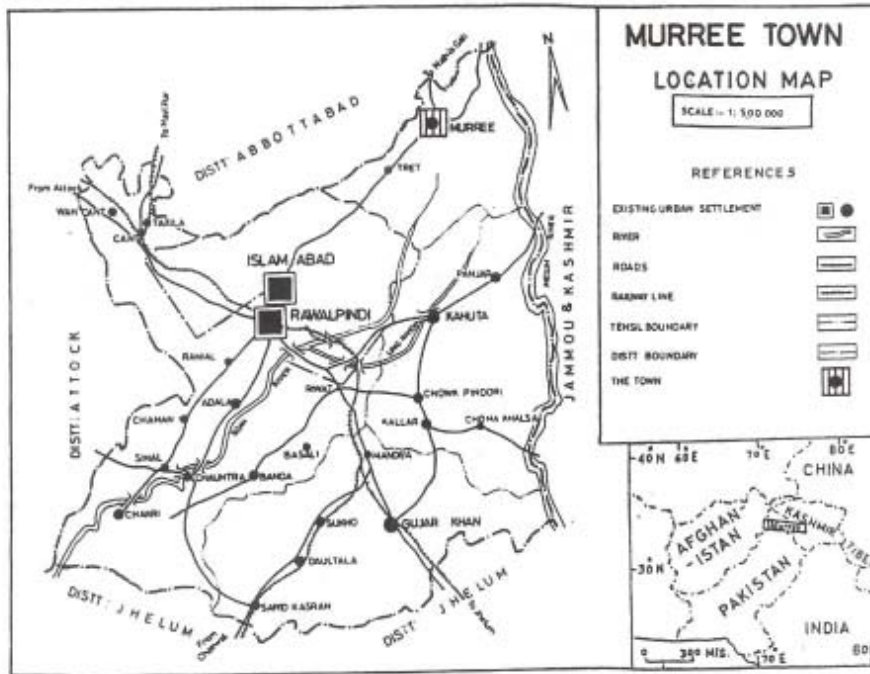


Figure 1

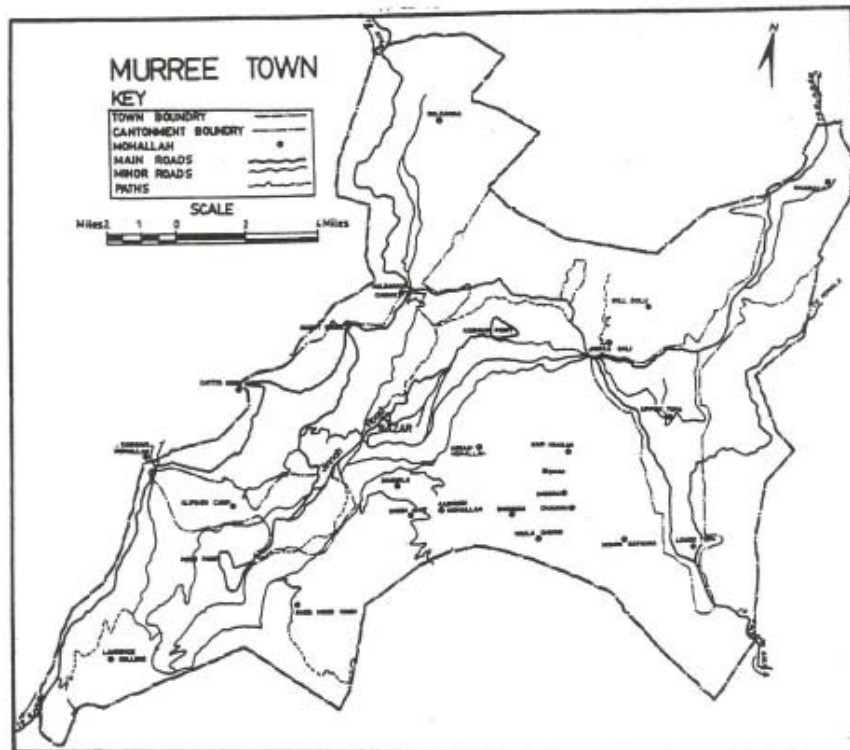


Figure 2

Jabar, Dhak, Bari Nakhar, Bhangon, Choor, Chawana, Mohra Batnara, Maula Dhongi, Ihata Noor Khan, and Murree Brewery (Fig. 2).

Separate "systematic probability samples with random start" were taken from each area by selecting every 10th person from the electoral list. In this way, a total of 245 households among the permanent population of Murree were selected and interviewed. The households were distributed among the three environmental areas as follows: i) Inter city 95; (ii) Urban fringe 48; iii) Rural fringe 102.

These techniques enabled qualitative and quantitative data to be obtained. Data gathered through these techniques were then coded, processed and analyzed with the SPSSX-3 computer-package available at the Cripps Computing Centre, University of Nottingham, U.K. Statistical analyses were carried out by using descriptive statistics, such as frequencies, percentages, means and contingency tables. The Chi-Square test of independence was used for categorical data, as the hypothesis that two variables are independent of each other was often of interest in this study. The null hypothesis in all these cases was that the probability of a response/variable in a given column of the contingency table was the same for each cell in the column. A level of significance of 0.05 was generally required to reject the null hypothesis. To measure the strength of relationship between the variables, Cramers's V and Gamma measures of correlation were used, as relevant in some cases (Blalock, 1979; Bailey, 1987).

EXTENT AND CAUSES OF THE LAND-SLIDE HAZARDS IN MURREE

Extent of Landslide Hazards

Throughout the mountainous part of Pakistan, Murree is considered to be the worst slide-affected areas (Pearce, 1987). The landslide hazard in Murree, therefore, has been a cause of great concern for the safety of life and property since the earliest times. However, during the last three decades, the extent and severity of the adverse effects of landslides have increased tremendously. This has seriously endangered people and their property in the area.

As the incidents and damage from landslides have

not been reported regularly, and different departments dealing with the landslide problems do not keep separate regular records of their activities, detailed data on the damage and cost incurred through landslide hazards is not available. However, through the limited available records and primary sources, like discussions with the officials and interviews with the households, it is possible to show that landslide hazard in different forms has seriously disrupted man and his activities. Considerable damage has occurred to housing, roads, communication lines, electricity and water supply, as well as the retaining structures, in the recent years. Field studies revealed that more than 70% of households in the area have been directly or indirectly affected by landslide hazards (Khan, 1992a and 1994). It was also found that the households spend a considerable part of their earning on repairing the landslide damage to their house. The yearly cost of landslide damage has been shown to be in millions of Rupees over the last few years. This cost, besides property damage, includes the day to day expenditures designed to curtail landslides.

Poorly regulated development has resulted in increased public expenditures on remedial protections. Also, additional funds have been spent for various public utilities and public services on the slide-prone slopes. The Progress Report of Murree Kahuta Development Authority (MKDA) from 1986 to 89 shows that expenses on landslides have reached Rs. 54,95,000 which is more than 5% of its total budget. This money has been spent on the landslide problems, excluding afforestation and other related measures adopted by the authority (MKDA, 1989). Likewise, other concerned departments are also spending at the same rate on landslides. Apart from the normal budget, Murree has frequently received huge special grants, over the last 15 years, from provincial government, especially from the Chief Minister and governor of Punjab, for the landslide-problems (Shiwalvi, 1985, 1987b, 1990b). These trends indicate that the landslide-problem accounts for an increasing proportion of the nation's loss from natural hazards in the whole of Murree hills, in general, and in the city of Murree, in particular.

Causes of Increasing Landslide Hazards

The available literature and data, together with the field observations, show that many factors known to

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cause landslides are present in Murree. These include: young and immature geology, with, highly erodible soils and rocks, steep and irregular slopes, abundant and seasonally intense monsoon rainfall, active freeze and thaw, evidence of the older landslides, and above all extensive human activities, including deforestation, quarrying, building and road construction (Niederer & Schaffner, 1988; Niederer, et. al., 1989; Duldulao, 1989; Khan, 1992a, 1994). The data also revealed that the natural causative factors, like geology, topography and climatic conditions, were there since earliest times. Therefore, the problem of landslides has also been persistent; however, not to the extent that it is at present. In the last 20 to 30 years there has been a sharp increase in destruction caused by landslides. The increasing trends in destruction caused by landslides in the recent decades have persisted, in spite of the fact that neither the climate, nor geologic conditions, appear to have changed significantly (Niederer, et. al., 1989). There is no evidence to show that natural factors have contributed to accelerate landslides. The major reason for this increase is the ecological and environmental imbalance caused by man. It has been suggested that it is man's careless and unwise exploitation of land, forests, rocks and other resources that has led to an increase in the losses from landslides (Moughtin, 1986; GOP, 1987). Not only has the population and occupancy of the slide-prone area been expanded, but also Man's ability to change hill-slopes rapidly has produced an anthropogenic landscape (GOP, 1987; Shiwilvi, 1985, 1990a).

In former times, people living in the area were using resources in a traditional and very careful manner, allowing nature and man to co-exist with the slowly transforming processes of change, without frequent and major upheavals (Moughtin, 1986; Niederer, et al. 1989). It has been observed that, at the time when this area was chosen for the development of a hill-station, it was covered by dense forest, dotted with human settlements (Hunter, 1886; Dar, 1986; Rabbani, 1986). Murree is comparatively more readily accessible to, and influenced by, the population-explosion, modern pressures, and urban growth than the remoter high mountain areas. Therefore, over the last few decades, residential development has begun to grow in number and size. Today, residential growth and day to day concentration of social and economic activities continues unabated on the unstable slopes.

Besides a growing permanent population, Murree has experienced accelerated pressure from the construction of second homes, tourist accommodation and development of recreation-industry almost round the year. The influx of newcomers from outside the area (from 1947 until today) and from nearby villages (within the Murree Tehsil) to settle here, as well as an increasing number of tourists, has caused a steady expansion in the demand for housing and public services. This demand has been met by new construction and extensive development in the existing town and the surrounding area. As development spread, the ruthless felling of ground-holding trees, massive quarrying, construction of more and more roads and heavy multi-storey buildings, with improper drainage and septic sewerage systems, have disrupted the basic equilibrium of the slopes and have seriously endangered the stability of this beautiful hill-station (President of Pakistan, 1986). Where once the scenery was of evergreen-clad mountains dotted by settlements with light traditional scattered buildings, now it is a juxtaposition of building facades honeycombed with population and intermittently accented by trees. Within the context of increasing density of commercial and urban centres, infrastructure, and increasing propensity for constructing residential housings in the slide-prone areas at such an unabated speed, the severity of the landslide-hazards has increased tremendously. This array of costly and unprecedented problems of landslides have harassed the households and public officials alike. Indeed the drastic effects of man's action, and the severity of the consequences of putting a progressively high premium on a hazardous slide-prone area, can nowhere be better illustrated than in Murree.

POLICY-RESPONSE TO LANDSLIDE HAZARDS

Background of the Policy Response

As the problems of steep slopes and fragile geomorphology have existed in the area since the time when the hill-station of Murree was established in 1849, the government has been trying to tackle the landslide problem in some form since the very beginning. Rules and regulations intended to maintain a balance between nature and human activities, were adopted as early as 1851 when "Murree Sanatorium Committee" was constituted (Master-Plan Murree

Town, 1988). In 1867 the Punjab Local Government Act No. XXVI of 1850 was extended to Murree and, consequently, the Muree Sanatorium Committee was converted into "Municipal Committee Murree" (MCM, 1967). Since then it has taken care of the development and planning of the civilian area of Murree city. For the administration of military areas, a separate body called "Cantonment Board Murree" (CBM) was made responsible. The MCM and CBM have subsequently adopted land-use measures and bye-laws, in their respective areas of jurisdiction, to control development in the slide-prone areas and preserve the beauty of the hill-station. The pre-independence population of the town, was very limited. The town was exclusively used by the European population, as well as high military and civilian officials. There were also a number of other hill-stations throughout India (Clarke, 1858); therefore, there was no great pressure on Murree. Hence, the problem of landslides was not so severe.

After independence, the growth, expansion and development of Murree started with increasing human activities. The environment of Murree hill-station and its surroundings became visibly upset. The necessity of creating a balance between nature and human activities was realized in the early years of independence. Therefore, the provincial government in September 1952 appointed a Murree Hills High-Powered Commission (MHHP) to look into this matter. The commission was given the responsibility to go into the details from all points of view and suggest methods for reducing the adverse effects of landslides and other related phenomena. The commission recommended a number of corrective steps, including control on overpopulation. However, the only thing that came out of the commission's work was a request to the Board of Revenue to provide 620,550 acres of land in the plain areas, to move about 49,665 families. No attempts have yet been made to implement any of its recommendation (MHHP, 1958; Hunting, 1961).

Despite the failure to implement land-use regulations and recommendations of the High Powered Commission, the escalating landslide problems in the area have successfully attracted the attention of government since the 1970s. Early attempts to control landslides by the government amounted to little more than the retaining walls, particularly on the roadsides.

Frequent, severe landslides and increasing development in the area, over the last twenty years, have justified sustained efforts by the government to contain landslides. Therefore, various nation-building departments, such as the Forest, Public Health Engineering, Highway, Building, Soil conservation, Revenue, and Civil administration as well as Municipal Committee Murree, Cantonment Board Murree, Murree Kahuta Development Authority, and Murree Improvement Trust, began to make efforts towards the reduction of the adverse effects of landslides (Niederer, et. al., 1989; Shiwalvi, 1987a, 1990a,b). These governmental agencies have spent, and are still spending, a considerable part of their scarce resources on engineering protective measures to reduce the adverse effects of landslides. However, according to the government's own sources, the problem is being tackled on a day-to-day, rather than on a long-term basis. These organizations have overlapping powers and have no coordination for the allotment of roles and responsibilities among each other, according to their resources and capabilities (Fig. 3).

In 1986 the government had also managed to approach the Swiss government and acquired the services of experts from the Swiss Development Corporation (SDC) for the reduction of landslides. They conducted an extensive survey and submitted their report (Niederer and Schaffner, 1988; Niederer, et. al. 1989). Nevertheless, the prospects are rather bleak, as their report declared the area to be beyond repair due to the multi-dimensional nature of the problem, the socio-economic environment as well as technological and financial constraints of the partner organizations.

Major Policies Adopted for Reduction of Landslide Hazards

To reduce the adverse effects of landslides on housing and services, three major policies have been adopted by the government. They are; i) engineering protection policy, ii) compensation policy, and iii) regulatory policy.

i) Engineering Protection Policy:

The engineering protection policy includes various engineering measures to contain landslides and divert

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the flow of a sliding mass away from housing and other infrastructures. This policy is widely adopted by all the governmental agencies and public organizations involved in the landslide problems. It is normally adopted as a curative tool, after the release of landslides. The most dominant measures, so far adopted, are the construction of check dams, retaining walls and buttresses, gabion structures, as well as surface and sub-surface drainage. Almost all these measures are site-specific and are meant to contain landslides, or steer debris flow away from housing, roads, and other property. These measures range from small-scale engineering works to huge structures throughout the study area.

ii) Public Relief or Compensation Policy:

The second option adopted by the authorities is the compensation policy. The compensation is given to those low-income households whose houses have been seriously damaged by landslides and who are not able to replace the damage on their own. It is also given in the cases of injuries and deaths through the landslide incidence. It should also be mentioned here that compensation is very frequently not distributed in each and every case of landslide hazard. It is given mainly in those cases where a large number of people and properties are involved in the incident.

The MCM and other organizations normally involved in the problem have not enough funds to deal with this policy. The main source for compensation, therefore, is special grants from the provincial government and, in some special cases, even from federal authorities. There are emergency relief cells at the federal and provincial level. At a lower level, the relief commissioner is normally the district administrator who, in the case of Murree, is the Deputy Commissioner Rawalpindi. The Relief Commissioner, according to the National Calamities Prevention and Relief Act 33 of 1958, is responsible for the coordination of all the relief activities (GOP, 1958). The concerned households normally have to make a claim for landslide-damage to their relief commissioner, with local revenue administration acting as an agent, passing the claims on. The applicants are required to provide proof that the damage to their household was caused by landslide.

The testification by the area's National or Provincial

Assembly member, or at least an influential Municipal Member, is usually considered as proof in such cases.

iii) Land Use and Regulatory Policy:

In Murree, various regulatory measures have been adopted to control development, and reduce the adverse effects of landslides. These measures range from the preservation of slopes, through the maintenance of dense vegetative cover and a total ban on quarrying, to land-use and building bye-laws (MCB, 1929). It was discovered that some bye-laws and regulations to control development of the town were already in existence in the early 1850's (MCM, 1967). At present, there are two sets of bye-laws operated by MCM and CBM in their respective areas of jurisdiction. The major purpose of these bye-laws is to prohibit unplanned development and statically indeterminate structures, such as multi-storey heavy-weight concrete buildings, which place a huge pressure on the land that the fragile topography of Murree simply cannot afford. The underlying idea in adopting this approach was to curb the increasing trends of construction caused by inflation of population, and discourage the urge to build prestigious houses that put a high premium on this slide-prone area.

EFFECTIVENESS OF THE POLICY-RESPONSE

This section will look at the performance of the policies adopted for the reduction of the adverse effects of landslides. The major yardstick used here, to gauge the performance and effectiveness of the policies, is their ability to reduce the adverse effects of landslide on housing and other infrastructure.

Engineering Protection-Policy and Reduction of Slide-Hazard

Among the three major policies adopted by the government, the engineering protection-policy was found to be the most frequently used for the reduction of adverse effects of landslides. These measures can be easily observed, at first glance, in Murree and surrounding areas, as one enters this region. The engineering protections are politically visible and easy to adopt, and are, therefore, preferred by the public representatives as well as government organizations. An overwhelming majority of households (71.8%)

Table 1: Types of Policies adopted by the LHRP

Responses	Frequency	
	Number	%
Engineering Protection Policy	253	73.3
Compensation Policy	79	22.9
Regulatory Policy	13	3.8
Total	345	100.0

Source: Field Survey, 1990

Table 2: Engouragement with Engineering Protective Measures as a Reason for Settling Down in Murree by Migration Pattern

Reason for Settling Down in Murree	Migration Pattern				Total	
	Migrated		Local		No.	%
	No.	%	No.	%	No.	%
Encouraged by the scale of engineering measures	93	66.9	12	11.3	105	42.9
Other reasons for settling	46	33.1	94	88.7	140	57.1
Total	139	100.0	106	100.0	245	100.0

Chi-Square=6.267
Significance=0.0123
D.F.=1
Cells with E.F. < 5=None
Source: Field Survey, 1990

Phi Coefficient=0.168
Significance=0.0041

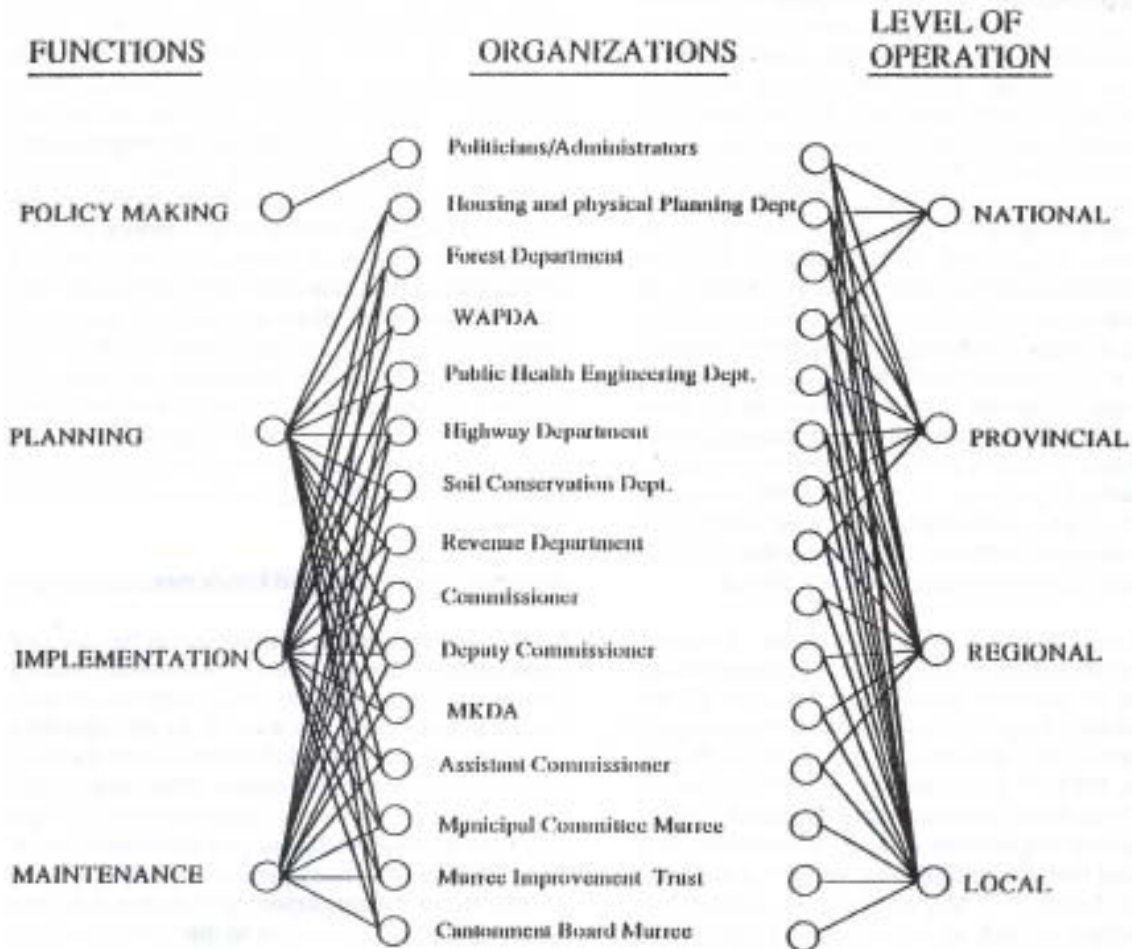


Fig.3 Existing Organization, Their Functions and level of Operation in Murree.
Note the Overlapping of the Organizations in Development Planning Function in the Town.

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were found to be appreciative of the government efforts in this regard. While explaining the type of policies adopted by the government, these 71.8% (176) households in their multiple-response answers (upto two) gave a total of 345 responses. Among these, the dominant majority (73.3%) were about the various engineering protective measures like construction of retaining walls, gabion structures, check dams, surface and subsurface drainage, etc; 22.9% of responses were about compensation; and only 3.8% were related to bye-laws and regulatory measures (Table 1).

The high level of response about the engineering protections, therefore, appears to be an indication of the over-emphasis of the authorities on curative measures. This increasing reliance on the curative measures by the authorities began over the last two decades, especially since 1980, as lots of special grants were made available by the provincial government during this period (Shiwalvi, 1985, 1987b). However, during the same period, the adverse effects of landslides have rapidly escalated. Data on the extent of landslide hazards, analysed elsewhere (Khan, 1994), disclosed that 70.3% of the suffering households were adversely affected by landslides in only the last ten years (1980 to 1990); 23.1% have been affected since the 1970s; whereas only 6.6% households were affected more than twenty years ago, i.e. before 1970. As many as 94.5% of the affected households also confirmed that engineering protective measures are not a complete answer to the landslide problem. They were of the view that, though public expenditures on slide control and protection work proliferated, yet the landslide damage has continued to escalate during this period.

Field studies have revealed that the increasing reliance on engineering measures has created a false sense of security among the majority of the households. This factor was found to have played a big part in their decision to settle down in Murree (Khan, 1994). It was found that a two-third majority (66.9%) of those households who migrated to Murree considered engineering protective measures as a deciding factor in encouraging them to settle down there (Table 2). They hoped that engineering protections on such an unprecedented scale would be sufficient to keep the landslide hazards away from them. Analysis with the Chi-Square test of

independence revealed a significant association between a household's encouragement by engineering protective measures as a reason for settling down in Murree and the migration pattern. The test also indicates that engineering protections, when given as a reason for encouragement to settle down in Murree, have a positive correlation of 0.20 ($\Phi=0.16836$) with the migration pattern.

This evidence, therefore, indicates that, there is a need to bring about changes in basic policy-approach to reduce the adverse effects of landslides in the area. The strong association between engineering protections as a reason for settling down in Murree and the migration-pattern may provide a key to potential-policy changes. The authorities probably need to adopt a comprehensive approach, which could suitably combine slide-control curative methods with appropriate long-term measures. These measures include land-use planning, zoning and subdivision, regulations for hill-slide development and some special developmental policies. It seems necessary, because policies for reducing the adverse effects of landslides aim not only to reduce the risk, but at the same time, to control man-induced aggravation of landslide risk. These two benefits can often be achieved when engineering protective measures are used *in conjunction with* strictly implemented regulatory measures and land-use planning. Needless to say, such a combination is also more likely to reduce the burden on public-resources, and enhance the active participation of the local population in future slide-hazards reduction programmes.

Compensation Policy and Entitlement Conditions

It has been a common observation in the relevant literature that, although all the households are equally prone to landslide hazards, those with low-income, insecure jobs, and a low level of, or no, education are highly vulnerable and suffer serious slide-damage. Therefore, there is a need to look at the impact of the compensation-policy of the government to see how far it is helpful for the low-income households. It will try to identify how many people can fulfil the basic conditions for the entitlement of compensation, and who they are, with reference to the socio-economic profile of the households in the area.

In the compensation policy, there are various conditions to be fulfilled by the applicants in order to qualify for compensation. Apart from the proof of ownership of the property concerned, the basic condition for the entitlement of compensation is the testification by the area's National/Provincial Assembly members that damage to the house of the applicant was really caused by landslide. It was, however, found that a dominant majority of the households are not able to fulfil this condition, as they have no way of approaching any testifying authority. The analysis revealed that, among the 182 affected households, more than three-quarters applied for compensation; among them a dominant majority (71.9%) was found to be unsuccessful in getting compensation. It was found that out of these 71.9% (one hundred) households, three-quarters (72%) had no way of approaching any testifying authority.

Thus it was necessary to see whether or not the lack of approach of households to testifying authorities has any relationship with their socio-economic status. The reasons for not being able to receive compensation were examined with the important socio-economic factors, like educational level and occupation of the households heads, and income-level of the households (Table 3). It was found that the percentage of those who were not successful in getting compensation, because of having no way of approaching any testifying authority to present proof of slide damage along with their applications, was 40% among the illiterate and 35.1% among less-educated (Primary/Middle) households heads. These percentages were quite high as compared to 15.9% and 12% of the household heads with Inter/Matric and Degree-level education, respectively. Similarly, 53.7% people in the informal sector, and 41.5% in the low-salaried formal sector, were not able to fulfil the basic condition for the entitlement of compensation, whereas this figure was only 17% for businessmen. It was also found that those who have no access to compensation, because of not having approach to any public representative, were mainly among the lower-income (63.2%) and lower-middle income (25.8%) groups. On the contrary, no one among the upper and upper-middle income groups was found to have any problem with providing proof of slide-damage to get compensation.

The Chi-Square test revealed a significant association

between the lack of approach to testifying before authorities and socio-economic indicators of the house-holds, including educational attainment, occupation and level of income, at significance levels of less than 1%. A significant correlation between the two variables was also noticed (Table 4).

The study also considers it necessary to examine the extent to which the important socio-economic factors are related to success in getting compensation. It was found that more than two-thirds (66.7%) of those having degree-level education and 75% of the upper-income group were successful in getting compensation, whereas among those with no formal education only one quarter (25%) and 7% of the lower-income group were in the successful category. It was also found that virtually all the households having access to compensation had secure jobs, with the majority (28 out of 39) in profitable business (Table 5).

Hence, to summarize, the study unfolds that those who have access to compensation belong to high socio-economic groups, with a higher educational attainment, better occupation and upper income level. On the contrary, households with lower socio-economic status, who are particularly affected and vulnerable, have no access to it.

Regulatory Policies and Implementation

During the field study, it was found that the authorities have not been successful in implementing these regulatory measures, due to the absence of a proper institutional framework and organizational set-up. The lack of implementation of these regulatory measures is obvious from the response of 176 households, who expressed awareness about government policies on landslide hazard-reduction. As shown earlier (Table 1), only 7.4% respondents, who appreciated government policies, were aware of the regulatory policies. This, however, does not mean that households have a low level of awareness about regulatory measures, because their full awareness about these measures is indicated by many of their responses during the interviews. However, as these regulatory measures have not been implemented and also not emphasized as much by the authorities as the engineering control, the majority of the respondents avoided this in their responses.

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Table 3

HAVING NO APPROACH TO ANY TESTIFYING AUTHORITY AS A REASON FOR NO ACCESS TO COMPENSATION, BY SOCIO-ECONOMIC FACTORS

(A) Education Level										
Reason for no access to compensation	Household Heads Education Level*								Total	
	I		II		III		IV		No.	%
	No.	%	No.	%	No.	%	No.	%	No.	%
No Approach	32	40.0	27	35.1	10	15.9	3	12	72	29.4
Other Reasons	48	60.0	50	64.9	53	84.1	22	88	173	70.6
Total	80	100	77	100	63	100	25	100	245	100

*I = Illiterate, II = Primary/Middle, III = Matric/Inter, and IV = Degree Level

(B) Major Occupation										
Reason for no access to compensation	Occupation of the Household Heads**								Total	
	I		II		III		IV		No.	%
	No.	%	No.	%	No.	%	No.	%	No.	%
No Approach	29	53.7	17	41.5	3	20.0	23	17	72	29.4
Other Reasons	25	46.3	24	58.5	12	80.0	112	83	173	70.6
Total	54	100	41	100	15	100	135	100	245	100

**I = Informal Sector including farming and casual labourer
 II = Formal Sector including teaching, clerical jobs, and non-clerical services
 III = Retired Servants, IV = Businessmen including contractors, hoteliers, and small and large scale retail or wholesale traders.

(C) Income Level										
Reason for no access to compensation	Households, Income Level***								Total	
	I		II		III		IV		No.	%
	No.	%	No.	%	No.	%	No.	%	No.	%
No Approach	48	63.2	24	25.8	--	--	--	--	72	29.4
Other Reasons	28	36.8	69	74.2	65	100.0	11	100	173	70.6
Total	76	100	93	100	65	100	11	100	245	100

***I = Lower Income Group, II = Lower-Middle Income Group, III = Upper-Middle Income Group, and IV = Upper Income Group

Table 4

Summary of Relationship of Lack of Approach to any testifying authority as a reason for no access to relief with socio-economic indicators

Households Socio-Economic Characteristics	Chi-Square	D.F.	Significance	Correlation Coefficients*
Education Level	14.726	3	0.0021	0.245
Major Occupation	28.828	3	0.0000	0.343
Income Level	73.972	3	0.0000	0.549

* Cramer's V Correlation Coefficient was used in all these cases. all these correlation coefficient were significant at less than one percent level (Significant = 0.0001).
 Source: Field Survey 1990

Table 5

ACCESSIBILITY TO COMPENSATION BY SOCEO-ECONOMIC FACOTRS

(A) Education Level										
Accessibility to Compensation	Household Head's Education Level*									
	I		II		III		IV		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Access	13	25.0	9	20.0	9	30.0	8	66.7	39	28.1
No Access	39	75.0	36	80.0	21	70.0	4	33.3	100	71.9
Total	52	100	45	100	30	100	12	100	139	100
*I = Illiterate, II = Primary/Middle, III = Matric/Inter, and IV = Degree Level										
(B) Major Occupation										
Accessibility to Compensation	Household Head's Occupation**									
	I		II		III		IV		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Access	6	15.4	4	15.4	1	20.0	28	40.6	39	28.1
No Access	33	84.6	22	84.6	4	80.0	41	59.4	100	71.9
Total	39	100	26	100	5	100	69	100	139	100
**I = Informal Sector including farming and casual labourer II = Formal Sector including teaching, clerical jobs, and non-clerical services III = Retired Servants, IV = Businessmen including contractors, hoteliers, and small and large scale retail or wholesale traders.										
(C) Income Level										
Accessibility to Compensation	Households Income Level***									
	I		II		III		IV		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Access	4	7.0	19	35.8	13	52.0	3	75.0	39	28.1
No Access	53	93.0	34	64.2	12	48.0	1	25.0	100	71.9
Total	57	100	53	100	25	100	4	100	139	100
***I = Lower Income Group, II = Lower-Middle Income Group, III = Upper-Middle Income Group, and IV = Upper Income Group										

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The lack of implementation of these regulatory measures, according to the households, has been considered as one of the main reasons for the increasing frequency and size of landslides in the area. The respondents emphasized that bye-laws regarding construction had not been abided by during the last few decades. Lack of implementation of regulatory measures concerning faulty construction, and drainage and sewerage system, conservation of steep slopes (including deforestation and quarrying), growth of the city, rapid urbanization, and the natural causative factor of climatic changes were some other major factors, according to the respondents.

It was pointed out by the households as well as the officials that the organizational weakness is perhaps the single most important factor responsible for the lack of implementation of bye-laws and regulatory measures. There is no organization with sole responsibility to implement the regulatory measures. To control and regulate new development a Building-Plan Committee has been constituted. It is working under the chairmanship of Deputy Commissioner Rawalpindi with the heads of various nation-building departments as its members. Discussion with members of the committee revealed that there are difficulties in holding regular meetings because of the multi-departmental nature of the committee. The members also observed that the committee has seldom approved building plans as most of them were not in accord with the bye-laws. All the plans, for instance, involving more than two storeys in a building are rejected outright. The basic idea, they said, is to discourage the increasing construction activities because such activities accelerate the process of landslides, and lead to the accumulation of a progressively high premium on the slide-prone locations. That is why, in the five years between 1984 and 1988, among the total of 870 applications, only three building plans were approved by the committee, while in 1989-90 the committee received a total of 360 applications, out of which sixty were approved, owing to severe political pressures. However again, according to the committee's sources, all the unapproved buildings have also been erected, in clear-cut violation of the bye-laws. Most of the unauthorised structures are commercial buildings, particularly hotels, which belong to the local and external political elite and influential wealthy notables. In a situation like this, the function of the building-

plan committee has been paralysed.

Field survey revealed that these developments have created a slipshod perception and a degree of uneasiness about the curbs, within the building regulations and the slide hazard-reduction programme, among the common citizens. As many as 90% of the households complained about the infractions discrimination and lack of implementation capabilities of the existing institutional framework. They thought that it was the existing organizational set-up, and the ineffective way it uses the curbs in the building regulations, which were responsible for all the unauthorized construction, mushroom growth, and encroachments that have cropped up during the last few decades, without any regard to the regulations and the natural environment. According to these households, all the irregularities were going on with the connivance of the authorities concerned, as they have forced the people to clandestinely construct their apartments illegally by greasing the palms of the officials. Though they do not object to the need for regulatory measures to reduce the losses, they are of the view that the curbs, through such a multi-departmental body, are being used to open new avenues of corruption and discrimination.

The survey further revealed that there is no follow up, coordination and consultation at any level, neither between the authorities and the local people, nor even among the authorities of different organizations involved in the programme. The authorities have not been able to probe into the unauthorized construction, and unearth the hands responsible for the malpractice. It can, therefore, be concluded that the present organizational set-up has probably aggravated the problem of landslides. Hence, to effectively reduce the adverse effects of landslides, it is necessary to have a single cohesive and powerful organization with sole responsibility for tackling the policies of the landslide hazard reduction programme.

SUMMARY AND CONCLUSION

This study found that the dominant policy adopted by the authorities was based on engineering protective measures. An overwhelming majority (71.8%) of households were found to be appreciative of the efforts of government in this connection. It was established that the over-emphasis on the engineering

protective measures began in the last two decades, i.e. since 1970. However, during this period, the adverse effects of landslides on housing and other properties were also found to have escalated. The study has, therefore confirmed that the strategy of relying solely on engineering protection has not been able to reduce the adverse effects of landslides in the area. On the contrary, it was found that this strategy has proved to be self-defeating, as it has created a false sense of security among a majority of the households, which played an important part in their decision to settle down in Murree. Majority of those households who migrated to Murree over the last few decades were impressed and encouraged by the scale of the engineering protections adopted by the authorities. Therefore, they settled in Murree with a hope that these measures on such a large scale would be sufficient enough to keep the slide-damage away from them. It can be concluded that engineering measures on their own, being not really effective in solving the problem, should not, therefore, be applied as a single and dominant policy-instrument. It is more likely to reduce the adverse effects when used in conjunction with the strictly implemented land-use and regulatory measures.

The analysis also revealed that, although the compensation policy was meant to compensate slide-related damage of the low-income households, it had largely failed in this regard. In contrast, it has assisted those who have a higher socio-economic status, with higher educational attainment, a secure and better job, and an upper income level. This situation was found to be the product of the basic requirements and conditions set down for the entitlement to compensation. The analysis further revealed that inaccessibility to the testifying authority, when given as a reason for not receiving compensation, had a significant relationship to the important socio-economic factors. It can, therefore, be concluded that the conditions of providing proof of slide-damage has been practised in a manner that has excluded the majority of the households with lower socio-economic status from the benefit of compensation.

As far as regulatory policy and its implementation is concerned, it was observed that various regulatory measures have been adopted from the very beginning to control development, and thus, reduce adverse

effects of landslides. It was, however, found that there was no organization solely responsible for implementing these regulations. Other non-specific authorities lack implementation-capability, and were found totally unable to control infractions, successfully. It has been pointed out that, as a result of the lack of implementation capabilities, activities like faulty construction, deforestation, and quarrying were going on without any regard for regulations and the natural environment. These infractions were found to accelerate the speed and extent of the adverse effects of landslides.

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