I. The Geographical and Demographic Setting

The Geographical Features and Problems of Chitral: A Short Introduction

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The geographical structures, change, and problems of the high mountain area of Chitral `between glaciers and desert' are remarkable. In this context we have to look at the historical background and the physical and human geographical situation of this area together.

Chitral, a former semi-independent territory both in the distant past and also in the British era and early days of Pakistan, is situated on the northwestern border of Pakistan adjacent to Afghanistan (see Figure 1). In the past, the territory of Chitral also was influenced by invasions and immigrations from the north. The roots of the last house of the Chitrali ruler (*mehtar* `ruler, monarch') can be followed back to the family of the Timurids. Since the 1890's, Chitral was indirectly ruled by the British up to 1947 and by Pakistan up to the beginning of the 1970's. At that time, the former power of the local rulers and the former semi-independence of Chitral State were abolished, and since then Chitral has been integrated gradually into the political system of the state of Pakistan, with the status of a district of the Northwest Frontier Province (NWFP).

The rich natural features of Chitral are generally marked by its high mountain character. Chitral is a part of the subtropical zone with dry summers and rainfall-affected winters. The mean temperature at Chitral Town rises from 4°C (January) to 28°C (July). The precipitation (registered only at two valley stations) decreases from southwest to northeast (e.g. the mean yearly amount at Drosh is more than 600 mm and at Chitral Town about 450 mm); but in the high glacier regions the precipitation presumably is about four times as much. Sometimes heavy rainfall also occurs in summer, partly influenced by the superposition of a marginal monsoon influence (in the south) and influences of western disturbances in the heights. There is also a considerable annual rainfall variability from year to year. The valleys are very dry in summer and autumn and are also influenced by local wind systems.

Vegetation steps depending on climate and the height vary because of exposition, too. In the south, vegetation reaches from the semi-desert bottoms of the valleys with *Artemisia* steppe and evergreen oak forests on the lower slopes, to coniferous forests (mainly *Cedrus* and *Pinus*) and, with a timber line at about 3300 m, to the heights of sub-alpine scrubs and alpine meadows. On the other hand in the treeless northwest, north, northeast, and east of Chitral, the semi-desert features reach from the bottom of the valleys up to the heights, where also some localities like alpine meadows with high pastures are found (see below). Near the snow line (south—about 4800 m, north—about 5000–5100 m) grows pioneer vegetation which covers a vast area up to the glaciers.

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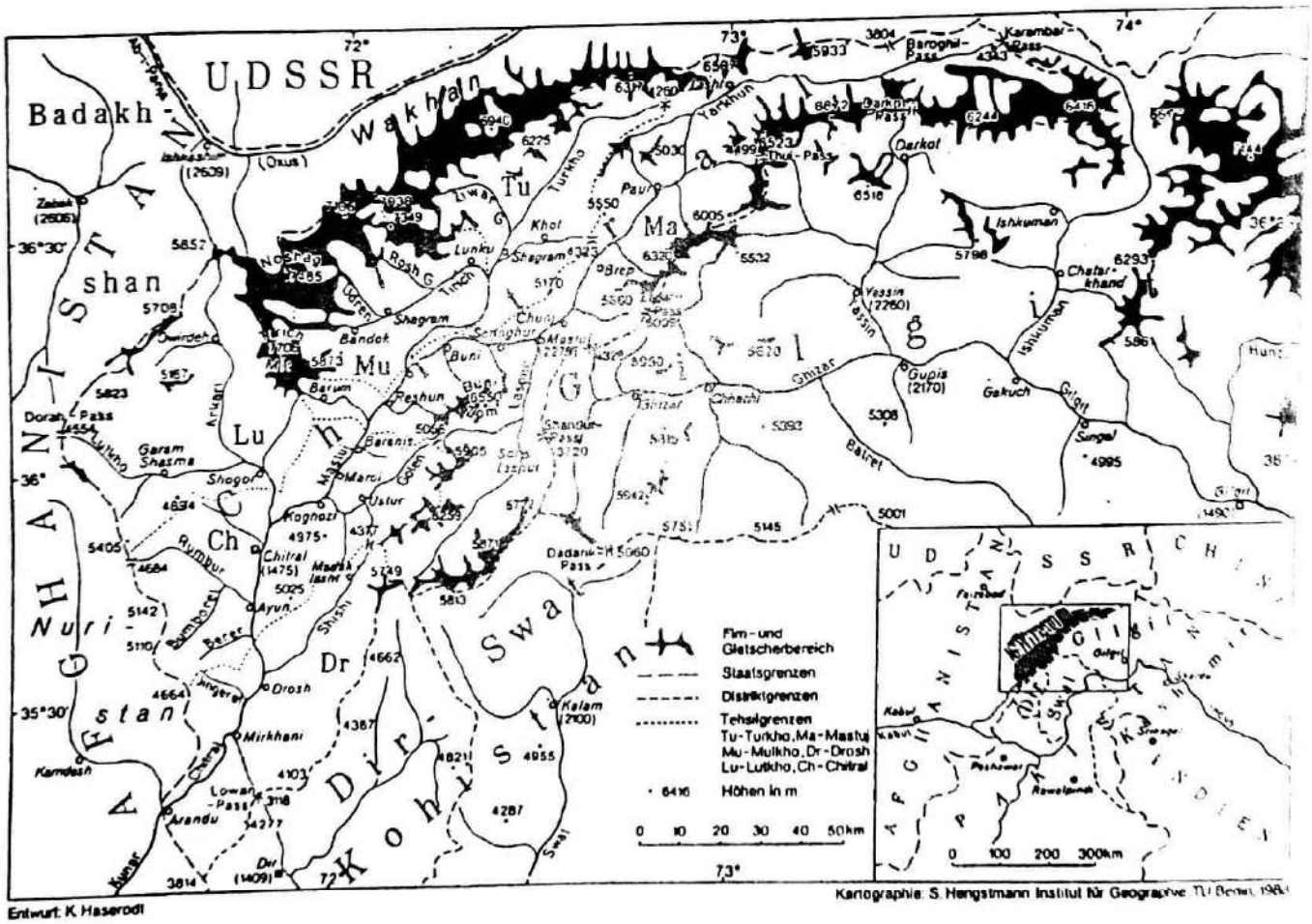

Figure 1 Chitral and neighbouring areas.

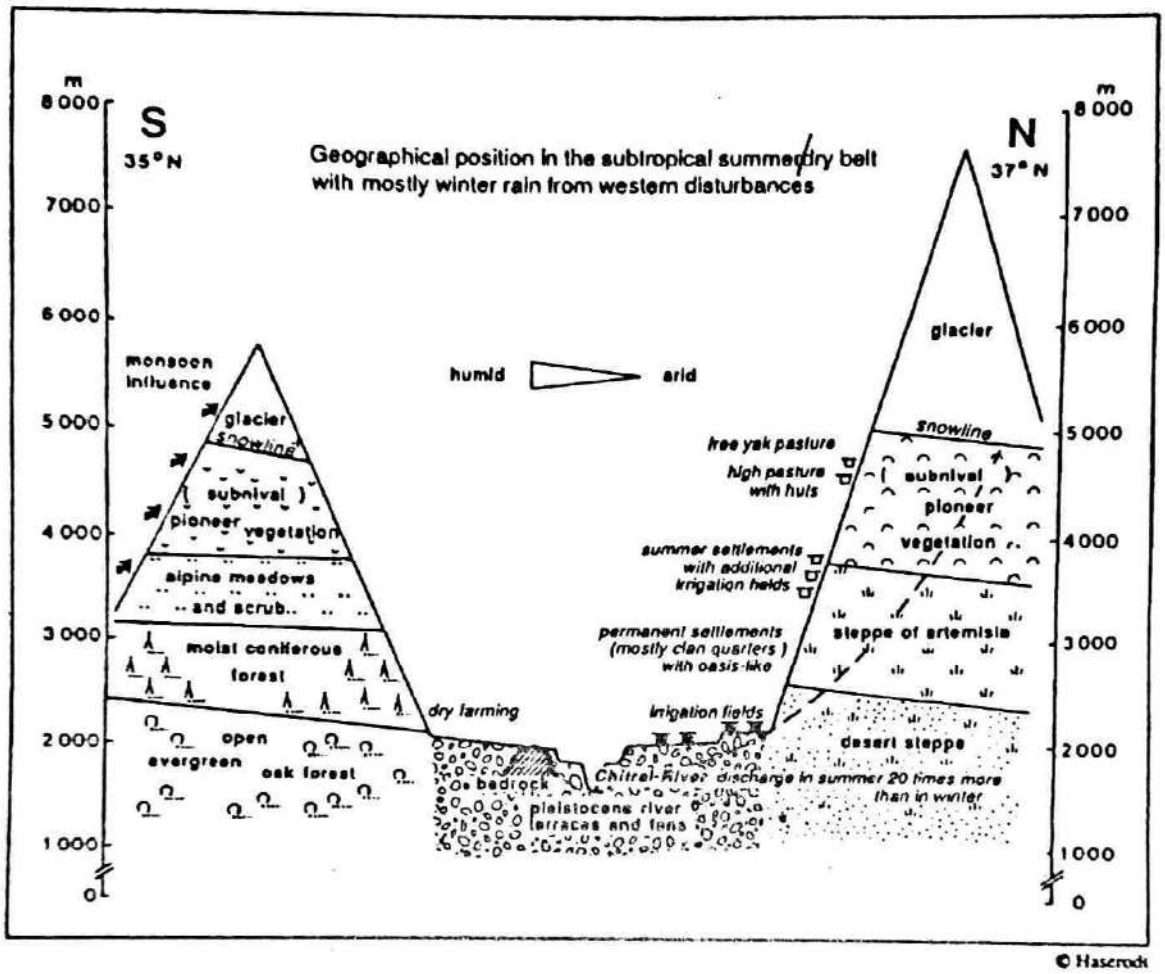

Figure 2 Profile of the geographical structure of Chitral.

About ten per cent of the territory of Chitral presently is glacier covered; the lengths of the longest valley glaciers are about 30 km. Not direct rainfall but meltwater from snow and glaciers mainly controls the hydrological regime, especially of the main rivers. Their maximum discharges occur in summer (twelve times more than in winter).

The glacier-covered high mountains in Upper Chitral, with heights up to 7700 m, are mostly situated in ranges at the Afghan border or nearby (e.g. Tirichmir). Besides the influence by geological structures, the geomorphological facts and features of the landscape are influenced remarkably by the former Pleistocene glaciation. Especially in Upper Chitral in the northwest, north, northeast, and east we can notice a lot of phenomena of former glacial erosion in the valleys and at the slopes (e.g. `U'-shaped valleys, polished rocks) and also moraine deposits. In Middle and Lower Chitral old fluvio-glacial fans and terraces are frequent.

The majority of the traditional settlements are situated at the bottom of the valleys, often on old fluvio-glacial terraces or alluvial fans, and often scattered as separate clan quarters with separate small mosques. The traditional Chitrali houses are well constructed, as one-room houses. In the southern parts of Chitral, as well as in the area of Kafiristan in the southwest, a lot of timber is used for the construction of houses. There the houses are built close together, at some places like fortified villages. A special type of building in some areas of Chitral are the old forts of the former rulers and their relatives.

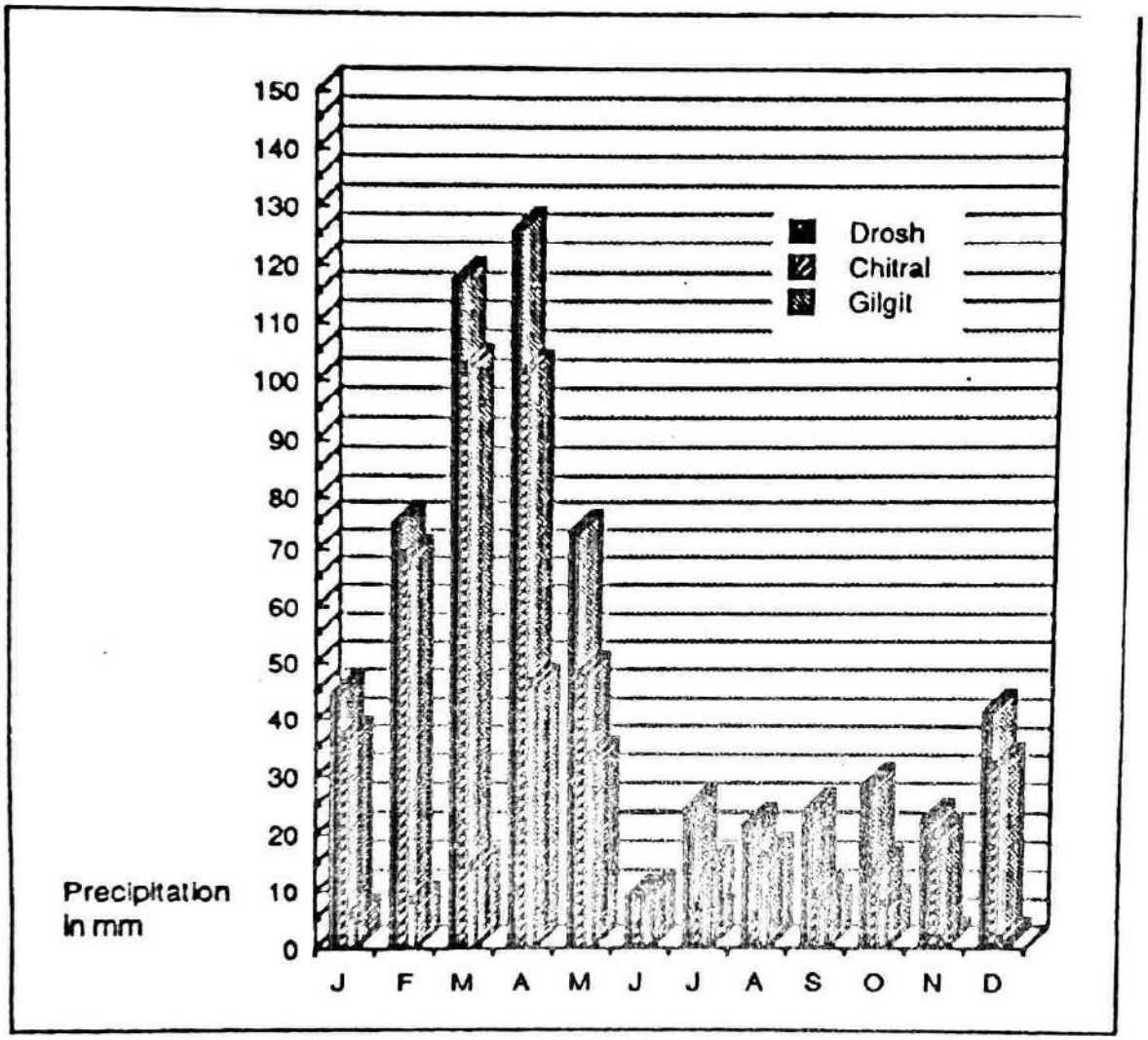

Figure 3 Monthly mean precipitation at Drosh (1465 m), Chitral Town (1480 m), and Gilgit (1460 m) during 1965–1982.

Among the population of Chitral, there is a remarkable ethnic diversity with different traditions and customs because of different influences by migrations from outside in the past and up to the present. Currently still about eighty-five per cent of the population are Kho, the Khowar-speaking majority, with about two-thirds Sunni Muslims and one-third Ismailis. Apart from the Kho there are the Kalash, an old non-Muslim tribe with a currently decreasing small population and with very different customs. To mention one of the other ethnic groups, the transhumant Gujurs in the south of Chitral are well-known shepherds with important livestock. Inside Chitral a total of more than ten languages are spoken.

Another feature of change in Chitral is the fast growth of the population. Between about 1900 and the middle of our century the population of Chitral doubled, and it has doubled again within the twenty years between 1961 and 1981 (3.7 per cent per annum). Consequently, the Chitrali population is a remarkably young population. The population pressure is due as well to the longstanding closed-up condition of the intra-mountainous Chitral. The overall population density in Chitral in 1981 was only fourteen inhabitants per

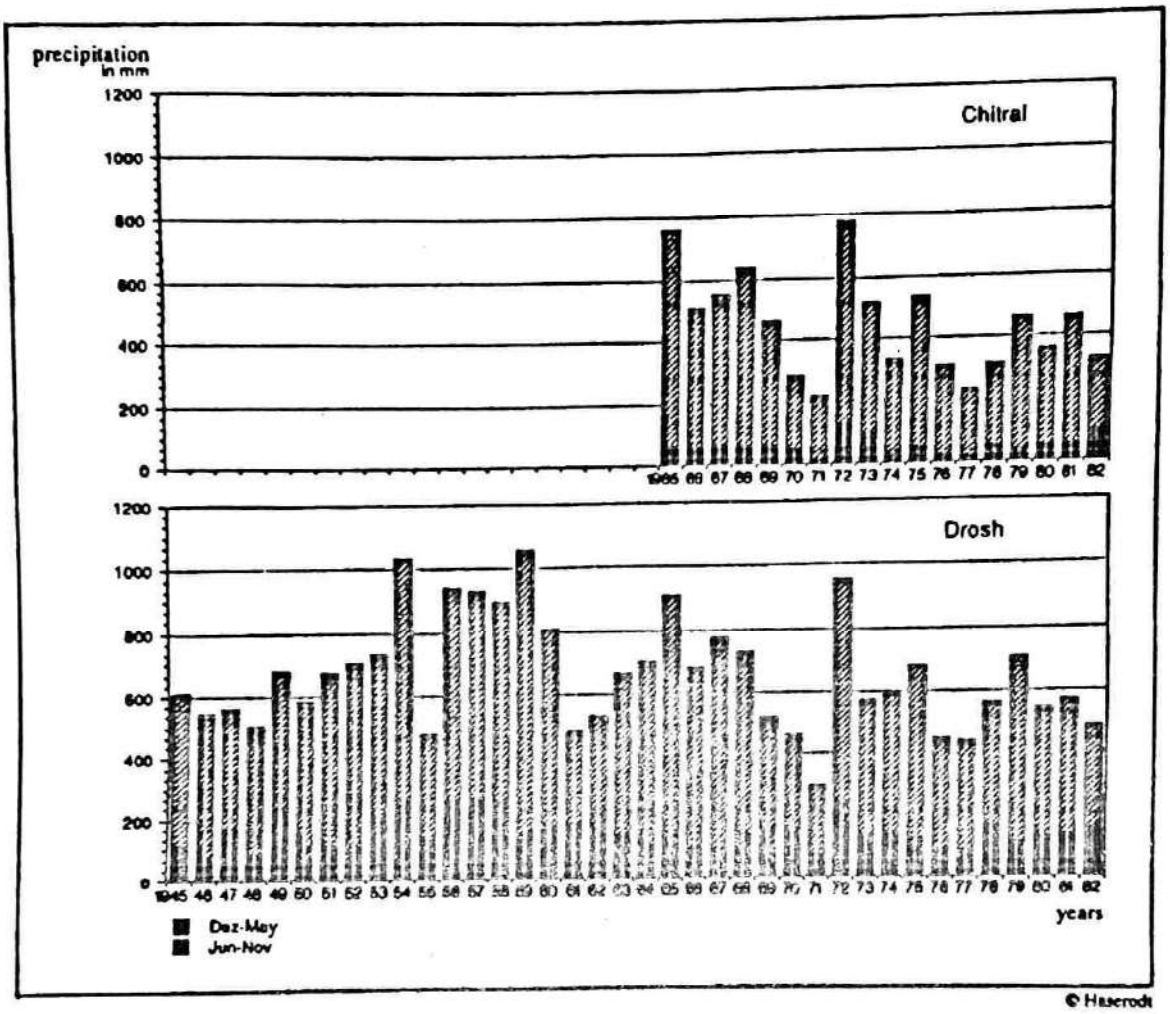

Figure 4 Variation of yearly precipitation at Chitral Town (1965–1982) and at Drosh (1945–1982).

square kilometre, whereas the density in the oasislike cultivated areas rises to more than 350 inhabitants per square kilometre. This population pressure results in the necessity for and intensity of seasonal and also long-term migration because of the few possibilities of work inside Chitral. Especially younger people have migrated since the 1960's to the Pakistani down-country and in the 1970's even abroad, for example to the Gulf states.

The agriculture of Chitral is slowly changing from traditional towards some modernization. Because of natural limitations (see above) only about 1.2 per cent of the total geographical area of Chitral is cultivated and can be used for agricultural production. Depending on the amount of precipitation, only a small percentage of that area is cultivated by dry farming. The great preponderance (95%) depends on irrigation by a network of small channels. But only 40 per cent of the area is cropped more than once a year. Not the main river on the valley floor, with its maximum flow in summer (see above), but its tributaries are the main sources of irrigation. These tributaries frequently suffer from a shortage of water in summer. In addition to the large number of small, traditional, local irrigation channels, extending the irrigation area into the dry land required some new irrigation schemes by the Government, which were constructed on the steep slopes during the 1970's and 1980's.

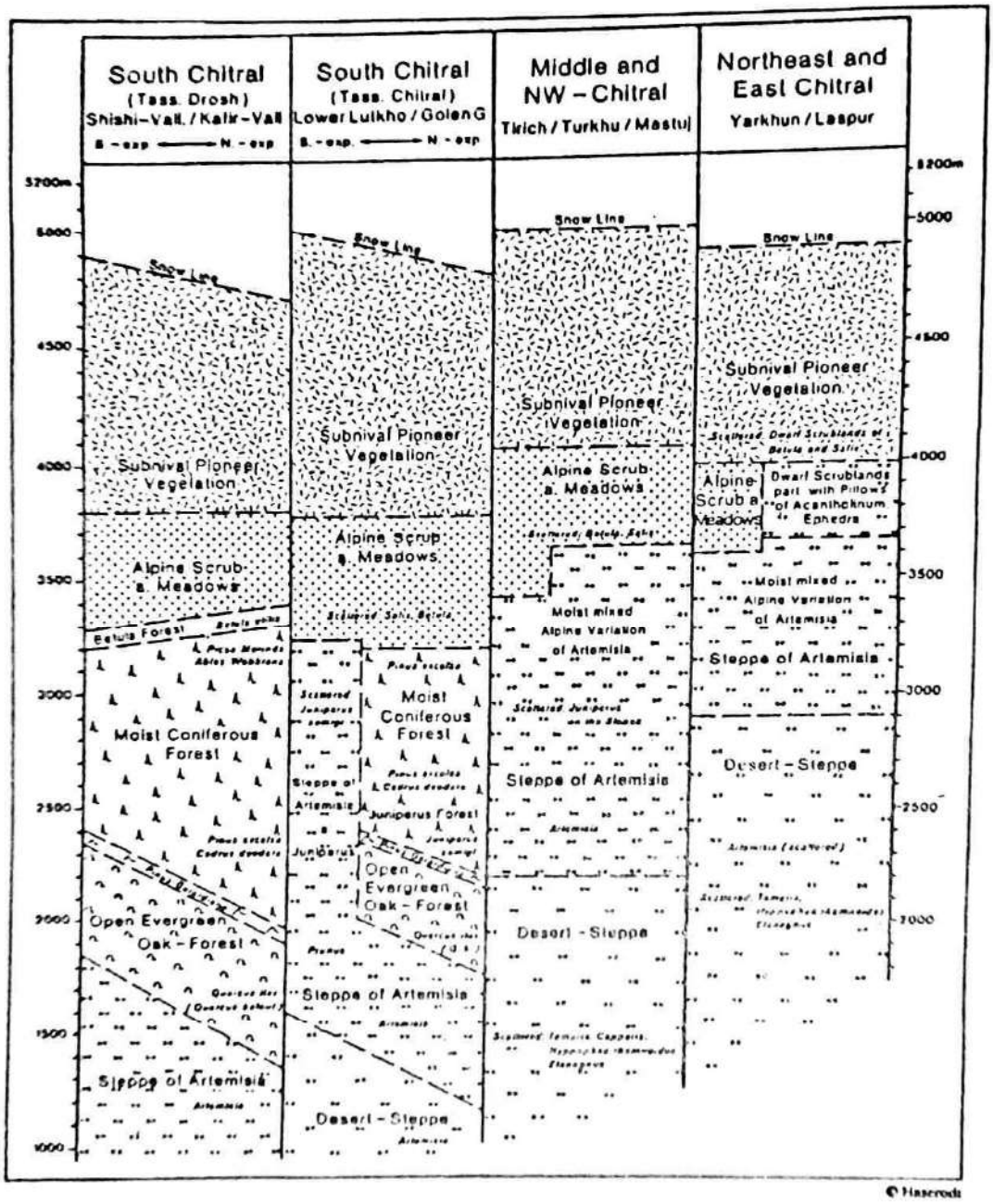

Figure 5 Vertical gradation of vegetation in Chitral.

A noticeable change in crop production has taken place. The cultivation of barley and millet has decreased, while the cultivation of maize and rice has increased. Rice cultivation has been extended into the higher parts of the main valleys up to the height of 2500 m (Yarkhun valley). Today the main cereal crop is still wheat, but now with new and more productive varieties which were introduced in the 1970's together with the use of artificial fertilizer. But for the upper parts of Chitral the transport of fertilizer is too cost-intensive. Generally, local food production does not satisfy the demand of the increasing population. Thus for decades wheat has been transported by lorries during summer into Chitral to be sold at a subsidized price. As a cash crop, dried fruits (mostly apricots) and walnuts from Chitral are sold in the bazaars and as an export crop outside

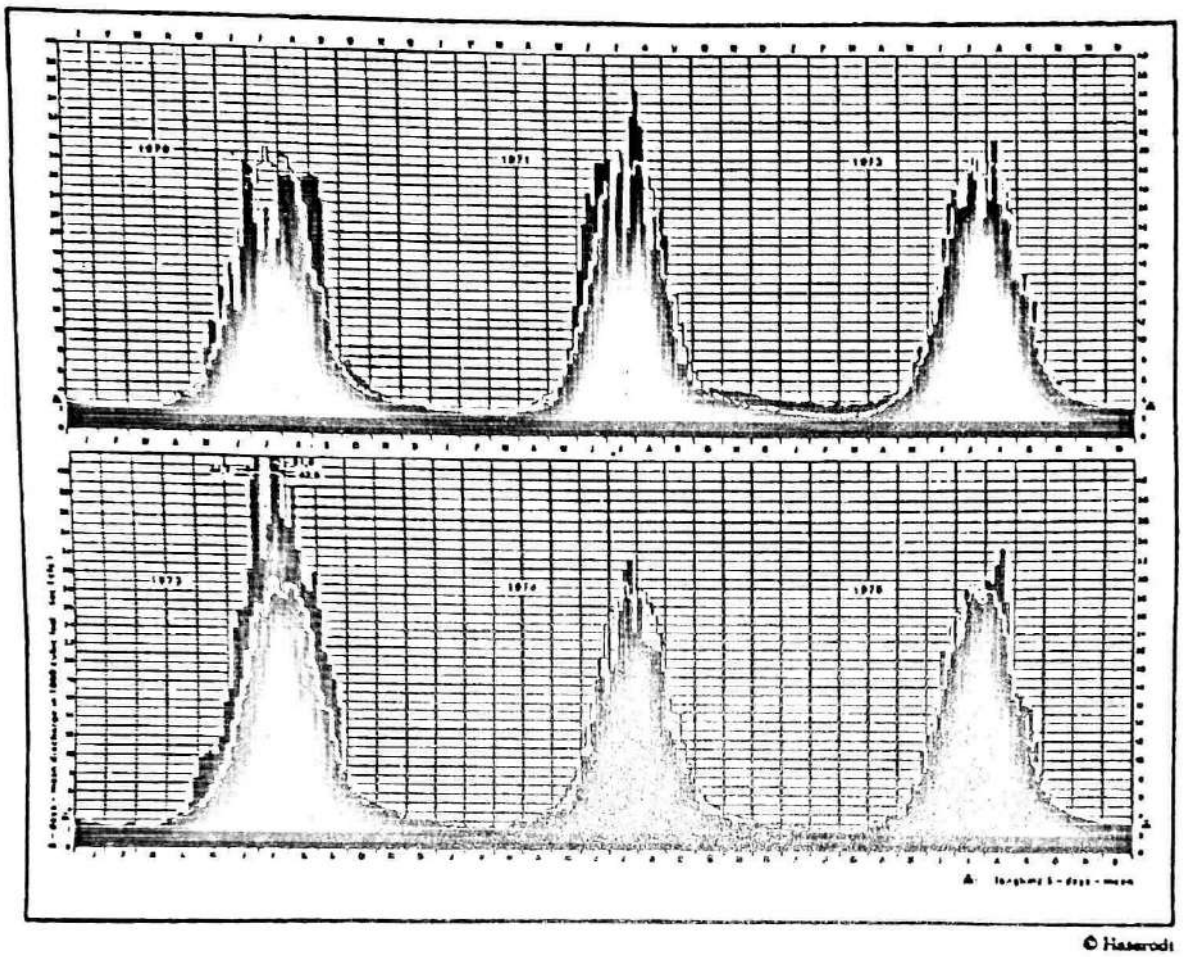

Figure 6 Discharge of Chitral River at Chitral (1480 m).

Chitral in small quantities. The increasing potato production in the higher areas, which is still on a small level is partly a cash crop for the bazaars inside Chitral.

Most Chitralis are still using traditional implements for their agriculture. Only a few tractors and threshers are working in the whole of Chitral. Especially in the north and northeast of Chitral, a high rate of land tenure still exists and partly causes a continuation of the landlord systems. In some parts of Chitral Government-appointed agriculture assistants are working. In the 1980's, the Ismailia supported Aga Khan Rural Support Programme (AKRSP) was established with great success.

Traditionally, livestock is very important for the Chitrali people because of the natural limitation of possibilities of agricultural production. The increasing livestock is integrated into the seasonally differentially used high mountain steps. Also, different kinds of seasonally used settlements, huts, and pastures have been developed due to the ethnic and socio-economic diversity. Especially the transhumant Gujurs in the south and southeast, also the Kho and some minorities in the southeast, northwest, north, and northeast of Chitral, keep large and increasing herds of cattle, goats, and sheep. Seasonally, the herds of grazing animals endanger the ecological balance in the high pastures like alpine meadows, in the area of seasonal passing, and partly as well in the valleys. In addition to the herds watched by shepherds, at higher altitudes free-grazing yaks are found in some places in the north and northeast.

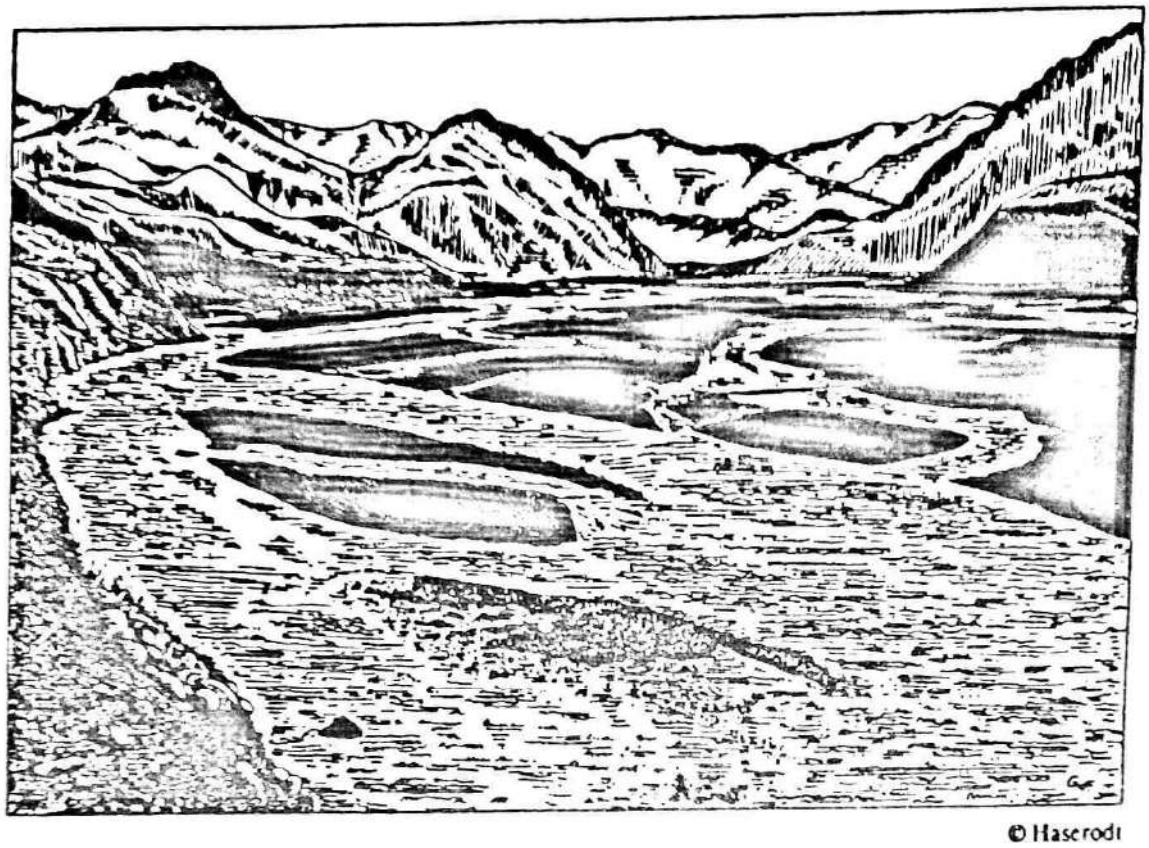

Figure 7 Mastuj River and Pleistocene shaped heights, Karo Lasht near Buni (1940 m).

In the wooded south of Chitral, during the 1960's and the beginning of the 1970's poorly controlled timber exploitation of the coniferous step of forest (mainly *Cedrus deodora* and *Pinus excelsa*) on a commercial level with transportation outward and for sale down-country took place. Mostly Pathans were engaged in this trade. In the 1970's and during the 1980's this exploitation was reduced and was more closely controlled by the Government Forest Department. The royalty system was changed in favour of the people

Figure 8 Chitral valley between Gahiret and Ayun with Pleistocene terraces and fans.

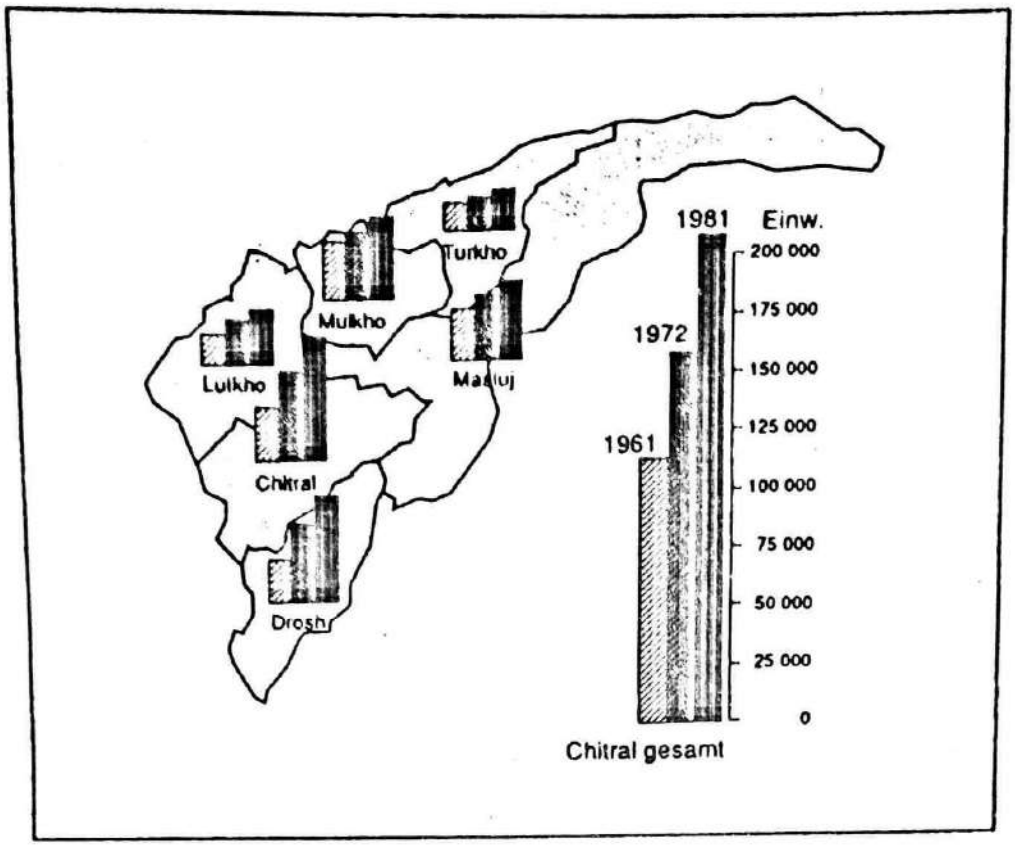

Figure 9 Population of Chitral District 1961, 1972, 1981 (totally and by tehsil).

of Chitral. But until now still no afforestation within the forest area has been realized. Ecological devastation has increased as result of the increasing livestock grazing especially by the Gujurs. There are also generally the traditional customs of grazing, browsing, and lopping for fodder inside the evergreen oak forest. In the past and up to this day a large quantity of timber has been used for house construction and for firewood. Additionally, firewood problems have increased. Especially in the treeless northwest, north, northeast, and east of Chitral there is a very acute shortage of firewood. In these areas besides juniper and planted poplars even *Artemisia* and *Ephedra* are used as fuel. With this the problems of soil erosion have been aggravated as well.

Transport problems inside Chitral, and also in linking the Chitral territory with outside, are severe. Especially in the 1970's and during the 1980's the network of unmetalled roads was extended into the upper parts of the main valleys. Some of these are usable by trucks, some only by jeeps; but in the peripheries and inside some side valleys and to reach most of the passes, the old mule tracks and mountain paths still exist. For twenty-five years it has been planned to construct a tunnel through the Lowari range in the south, in order to by pass the yearly isolation of the Chitral area from the rest of Pakistan, which lasts for more than five months. But there has not been any success up to now. For this reason the subsidized air connections by PIA from Peshawar to Chitral Town have increased rapidly during the last two decades. Sometimes there are up to three flights daily.

Compared with the neighbouring more developed region of Gilgi, in Chitral the non-agrarian sources of income are fewer. Since the 1960's, work as dealers and shopkeepers has recognizably extended and became remarkably more diversified in the bazaars (especially Chitral Town and Drosh); but also inside the villages there are jobs as

Figure 10 Settled areas and fields on Pleistocene river terraces and old fans.

traditional manual workers. In the bazaars, the growing influence of Pathans as dealers and traders can be recognized. On the other hand, the jobs in the service sectors are not only office jobs; there are also road workers and so on. For example, the police and the Chitral Scouts are important sources of jobs. During the 1980's, special problems were created in Chitral because of the influx of thousands of Afghan refugees. Also the main bazaars at Chitral Town and Drosh have changed their faces. More and more goods from down-country have been imported too. The export of manpower as a seasonal and also as a long-term migration of Chitral workers has increased (see above).

In the public sector of education the progress was remarkable during the 1970's. In 1981, Chitral District had overall more than 200 schools with Urdu as the teaching medium and one Government Degree College. But the literacy rate of 13 per cent (male 22 per cent, female only 2 per cent) in the whole of Chitral was two-and-a-half times lower than in Gilgit. Problems exist also in public health. The increased network of dispensaries suffer from shortages in medicine and only three small hospitals and three doctors work for the more than 250,000 inhabitants of Chitral. In 1981, only 2 percent of Chitrali households had drinking water by pipes, the other by open channels, only 4 percent (Gilgit

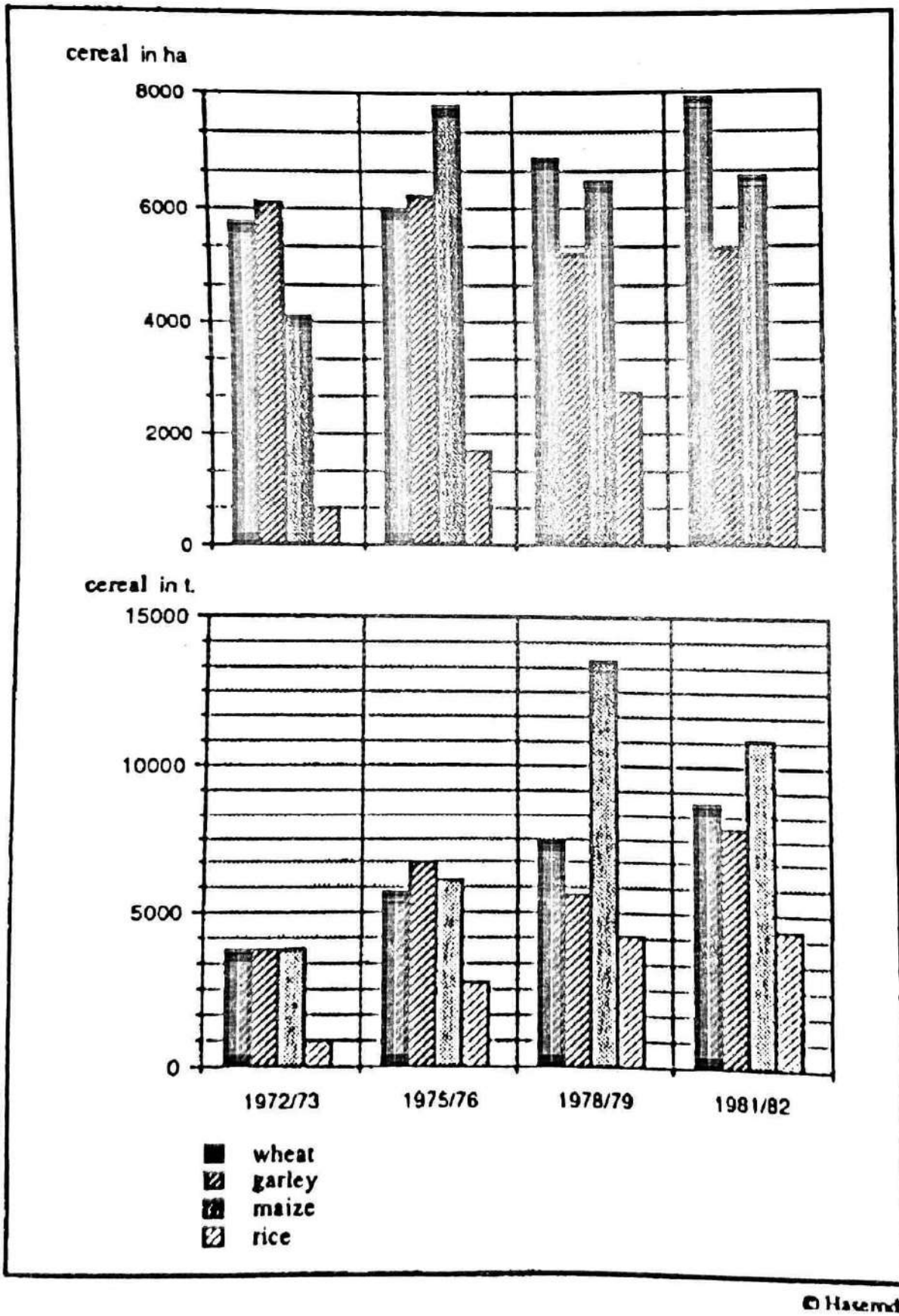

Figure 11 Development of cropped area and cereal production in Chitral District, 1972, 1975, 1978, 1981 (wheat, barley, maize, rice).

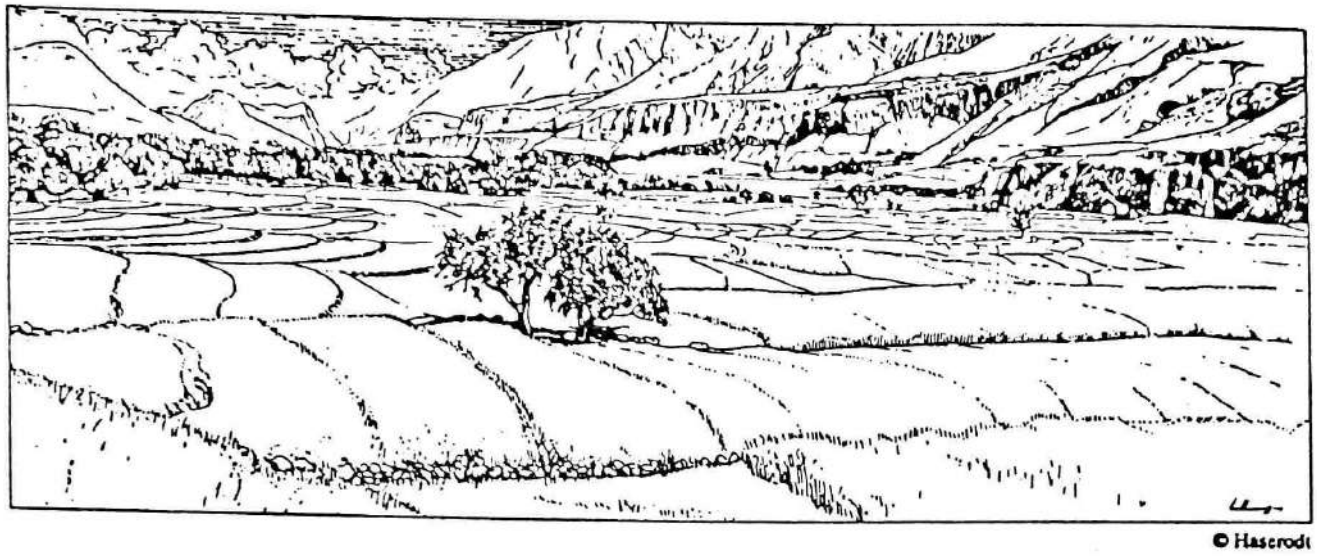

Figure 12 Chitral landscape at Ayun (1420 m) with rice cultivation (in front) and Pleistocene terraces (background).

20 percent) had electricity from small hydroelectric stations. But progress is going on; for example, in the 1980's Chitral got the facilities to receive TV from Peshawar.

Because of its high mountain features, Chitral offers a rich potential for tourism. But compared with Gilgit and Hunza. the real tourism inside Chitral is quite less developed. This fact is also influenced by difficulties in road connections. Domestic and foreign

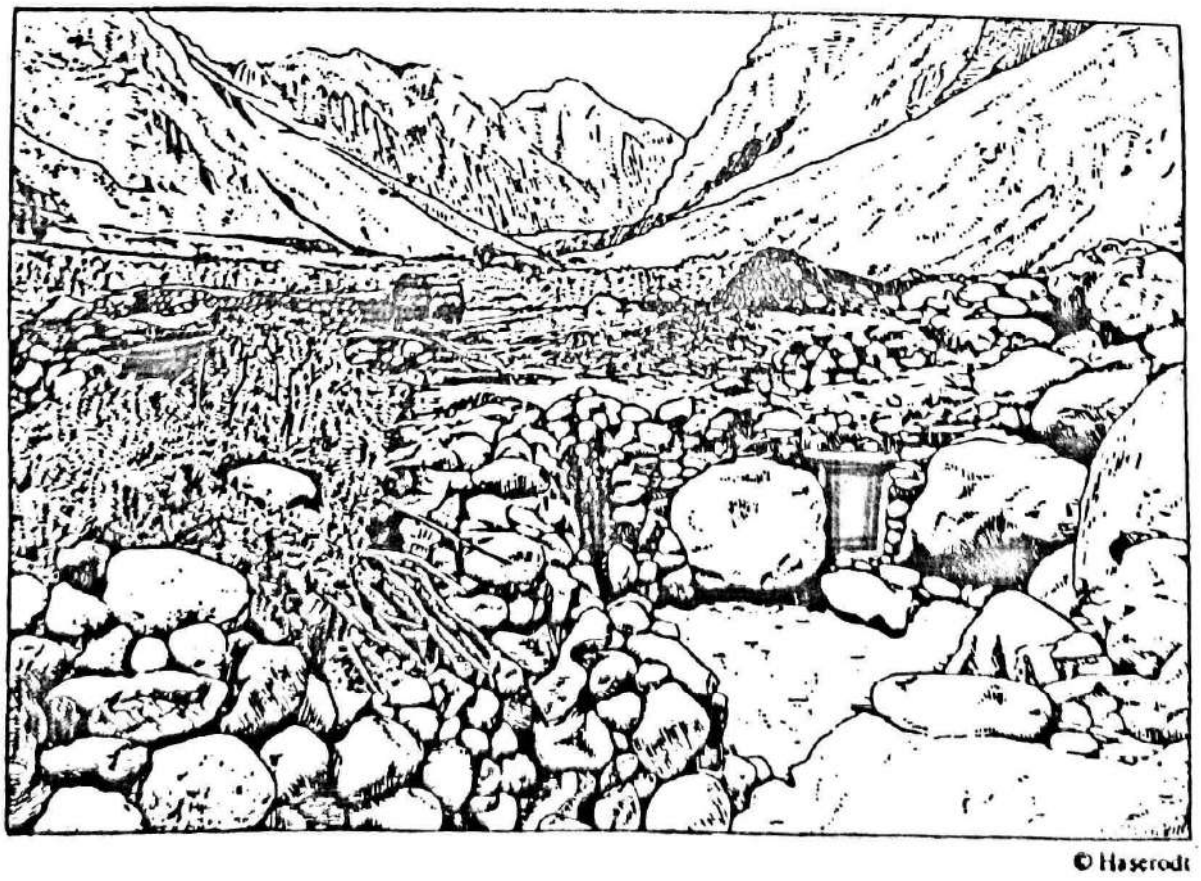

Figure 13 High pasture summer settlement (3250 m) with huts at Bandok (Upper Terich).

tourists mainly come to Chitral by air. But the flights are subject to weather conditions. The majority of the tourists make the popular trip into the ethnologically interesting Kalasha valleys. The tourists also appreciate the special local polo matches; some will book `jeep safaris'; and a few are trekkers. Still, the capacity of the hotels, resthouses, and local inns is limited, especially outside of Chitral Town. The Chitralis themselves have participated in tourism only to a minor degree until now, because of down country' influence on tour organization.

However, change and development of the remote and backward region of Chitral has been significant within the last twenty years. Still the main problems of Chitral are overpopulation, food and firewood shortage, and a generally permanent unemployment. The development of Chitral is also influenced by repercussions of remigrated or temporarily remigrated inhabitants of Chitral itself. Last but not the least factor on the socio-economic and political sector, the integration of Chitral in the mainstream of Pakistan has increased remarkably.

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Irrigation and Society in Chitral District

*Israr-ud-Din**

Introduction

Chitral is the northernmost district of Pakistan, situated amidst the high ranges of the Karakoram and the Hindukush. It is extremely rugged and mountainous with deep, narrow, and tortuous valleys through which run the Chitral River and its numerous tributaries. The district covers an area of about 1500 sq miles, spreading between elevations of 3577 ft to above 25,000 ft above sea level. The population of the district is about 250,000, who live in 500 villages. The villages and cultivated areas are found between 3577 and 10,000 ft above sea level and are mostly confined to the alluvial fans, or to certain river terraces, where soil fertility coincides with easily available water. Villages are also located on the beds of former river courses where similar conditions prevail. Vast tracts of land are still uninhabited because of precarious conditions of water supply and other adverse physical conditions.

Agriculture is the mainstay of the people of the region. The most important aspect of agriculture is irrigation by channels taken out mostly from the side streams or tributaries of the Chitral River. The bed of the main river itself is very deep, making channel construction very difficult; therefore, its use in the region is very insignificant and the people mostly depend on the streams and springs for irrigation. Irrigation is essential to cultivation, and in all but the extreme southwest, no crops are grown without it. The rainfall in most of the valley bottoms is too low to support more than semi-desert scrub, but higher on the mountains, especially in winter, precipitation in the form of snow is heavier and so there is plentiful meltwater. Where this can be diverted from a stream or river and conducted to an area of flat alluvial fan or gently sloping land, it can be used for irrigation.

The irrigation in the whole district is carried but by means of channels which are brought from nearby streams or springs or from the river. These channels are constructed along the hillside with considerable skill and labour and maintained with great difficulty. The channels are mostly (90%) private and are built and kept by the villagers themselves on a communal basis. At present, some channels have been constructed by the Government through the Irrigation Department and the Local Bodies. The AKRSP is also helping the people in the construction of village channels in certain parts of the district.

It can be understood that development and management of irrigation channels are the main concern of the people of the area. A UNESCO Survey shows that out of 117 constituencies of the Union Councils, 102 (87%) made demands for help for irrigation development. According to my own survey in some 71 villages, the conceived priorities

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of the villagers were as shown in Table 1 below. In 1986 out of a total of 76 projects of AKRSP, 43 (57%) included irrigation projects.

Table 1. Priority of irrigation in 71 villages

Priority	Number of villages	Percent
1st	27	37
2nd	21	30
3rd	16	23
4th	7	10

The society in the region can rightly be termed a hydraulic society, because the life of the people of most of the villages revolves around the different aspects of irrigation organization and management. Right from the construction of a channel to the regular conveyance of water to the fields, they have to undergo many painstaking processes of organization and management. This can be appreciated only by undertaking in-depth studies. Unfortunately, very few studies have been carried out on the region. Let alone Chitral, studies on irrigation management are scarce even on other parts of Pakistan. It is only recently that such studies have been initiated by the PCRWR. The present study, titled *Irrigation and Society in Chitral District*, sponsored by the PCRWR, investigates the present system of social organization of irrigation at various selected sites: Khot, Kosht, Singur, and Drosh. It also looks into the social and physical constraints faced by the water users.[1]

Case study I: Khot Valley

Khot is a side valley of the Torkhow River, a tributary of the Chitral River. The length of the Khot valley is about 60 km, stretching between the altitudes of 7000–10,000 ft. The upper reaches of the valley contain many glaciers which feed the Khot stream, maintaining its perennial flow. The settlements and cultivated lands of the valley are found on the different terraces or gently sloping sides.

Climatically the valley belongs to the arid part of the district and obtains less than 250 mm rainfall annually in its lower parts. The upper elevations of the mountains are believed to get up to 350 mm rainfall. Most of these rains occur during the winter and early spring months helping the growth of glacial and snowfields in the high elevations. This makes possible the regular flow of springs and streams throughout the year. As in

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1. I am thankful to the Pakistan Council of Research in Water Resources, Islamabad, for sponsoring this study. My thanks are also due to Dr Peter Reis, Social Scientist, University of Idaho, Professor Dr Bradley Parlin, and Professor Dr Mark Lusk of Utah State University, and Dr Jamshed Tirmizi, Social Scientist, USAID, Lahore, for their guidance and suggestions at different stages of the study. Dr N.M. Awan, Chairman, PCRWR and his staff, especially Mr Zaheer Aslam Malik and Mr Zafar Iqbal extended all cooperation, for which I am much obliged.

other parts of the district, summer rains are very limited, making artificial irrigation indispensable. Also the summer rains cause flash floods which greatly damage the channels and cultivations.

The mean temperature of the hottest month in the area is about 27°C and mean maximum of the hottest month is approximately 30°. The length of the growing season is eight to nine months with a mean temperature sufficient for various crops to mature, though only one cropping season is experienced. The orography of the valley is such that it experiences the longest sunny periods in the whole region both in winter and summer, which helps greatly to prolong the growing season about a month or so in comparison to other areas at the same elevation. For four to five months, however, below freezing temperatures are experienced; therefore, the danger of frost is also common.

Khot valley comprises about 70 villages in which approximately 4500 people live. Its area is about 80 sq km; thus the overall density is about 50 persons per sq km. But if we take only the settled area, then the density rises to 70. Khot is one of the oldest settled valleys of the district. According to traditions, the founders of the two most important clans of the valley, Bayika and Kosht, first settled here some 500 years ago. It was they who constructed the most important Ra channel of the valley and established the irrigation system here. Therefore, these two clans have been enjoying special rights and privileges regarding the use of the channel as well as in the administrative and political affairs of the valley. In later periods families belonging to various other clans of the Kho tribes of the district migrated to the valley to settle. But they have all been labelled as one clan, called Pattane to differentiate them from the original settlers.

The population supports itself by cultivation of grains which include wheat, barley, maize, and grams, beans; and other vegetables like potatoes, etc. This is supplemented by livestock rearing which has been possible because of the existence of rich pastures in the upper parts of the valley. The livestock includes goats, sheep, cows, bullocks, and yaks. There are no cash crops grown in the valley. Potatoes grow very well, but due to the inaccessibility of markets are not produced on a commercial basis. Because of the high altitude, fruit trees including apples, apricots, and walnuts are planted only a limited scale.

Almost all the farmers are owner-cultivators. There are a few absentee landlords who possess more than a hundred acres of land each. The overwhelming majority of the households are headed by small landowners possessing about one acre of land per household. The cropping periods of various crops are as follows.

Crop	Sowing	Harvest
Wheat (Winter)	October	End of August
Wheat (Spring)	March	Beginning of August
Maize	Beginning of May	September
Potatoes	Beginning of May	October

Because there is only one cropping season in the area and land holdings are small, the people live at subsistence level. During the last two decades, many people from the valley have gone out to the Gulf states, or to other big cities of Pakistan, thus supplementing their family incomes considerably. This phenomenon has helped the agricultural sector of the area because of the application of better inputs, e.g. artificial fertilizers and better

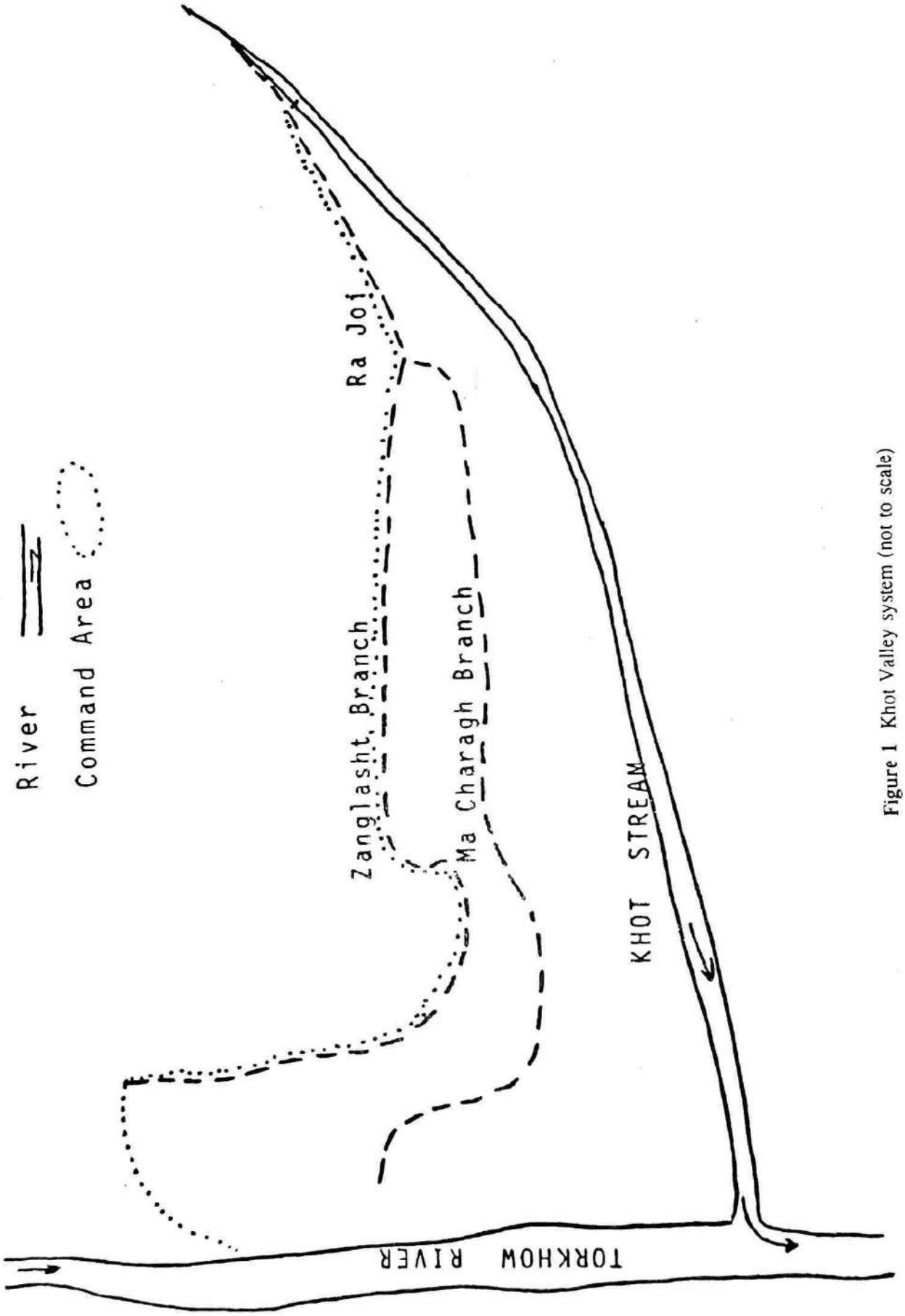

Figure 1 Khot Valley system (not to scale)

seeds in large quantities. As in most other parts of Chitral District, irrigation is a very essential part of agriculture in the Khot Valley. But it is to be noted that due to the difficult physical conditions of the area it needs considerable skill to construct irrigation channels in the region. Khot valley is mostly irrigated by the Ra žoi system which was founded by Bayik and Khosh, founders of the Bayika and Khosha clans, some 500 years back.

The channel has the following parts.

		Name	Length (miles)
1.	Original part Urfi part from (From Headworks to Punchung)	Ra žoi or Urfi part	13
2.	Extended part of Urfi	Zauglasht žoi	8
3.	Ma Charagh Branch (From Bokhan Dur to Ma Charagh)	Ma Charagh žoi	20

The system serves a command area of about 50 sq miles. Approximately 70 villages, comprising 900 families, depend on the system.

In order to ensure that the water rights and privileges of the people of such a large area are safeguarded and the numerous maintenance problems of the channel are looked after properly, the people of the valley have over the centuries evolved an elaborate system of the organization of the channel, the salient features of which are discussed below.

1. *Phi* system. *Phi* literally means 'wooden shovel', but here it refers to a group of people. All the different village communities in the command area have been grouped into sixteen *phi* according to which they are allotted their share of water and the duties they perform in connection with the operation and maintenance of the channel. The distribution of the sixteen *phi* according to the different sections/branches of the channel is as follows.

1.	Urfi Portion	4 *phi*
2.	Zanglasht	6 *phi*
3.	Ma Charagh	6 *phi*

Each *phi* contributes sixteen to thirty persons for the various duties regarding the channel from time to time. Each *phi* has two shares of water from the channel daily to complete the turn in eight days, irrespective of the number of families it may have. The change in the number of families in different groups with the passage of time does not in any way affect their original rights and duties. The duties of the *phi* include annual repair works, emergency repairs, daily night or day duties at headworks, and sluice gates and at areas which are prone to landslides. The schedule of work has been evolved in such a way that full participation of the different *phi* in different turns has been fully ensured. Assignment

of turns within each *phi* is the responsibility of the *phi* concerned, and in case of any defaults the whole *phi* has to pay the penalty.

The *phi* system which was introduced at the very construction of the channel has proved workable until today. The change in population and increase in the number of families has not in any way affected the system.

2. Water allocation. The allocation of water to the irrigators is made in many different ways, but I will refer to only a few of them. I have already mentioned *soroo*γ or per head allocation of water according to the *phi* groups, in which 16 × 2, i.e. 32, shares of water are allocated daily. But the *phi* belonging to the original clans have two more turns of water daily in addition to their *soroo*γ. This additional water is called *sawa*. This privilege is given to the original clans to give them special advantage over the new settlers or the water users of the extended part of the channel. But the interesting point is the way *soroo*γ and *sawa* are rotated between the villages. One important thing regarding the *soroo*γ is that two persons belonging to the same *phi*, but from different villages, having their turn the next day would have to perform night duty at the *madok* or sluice gates. At the same time, two distant villages at the other end are also given water share without any night duty which is called *sawa*. *soroo*γ, also called *basi* (meaning night duty), and *sawa* rotate alternately according to a set timetable from village to village, and at the end of the rotation, which is completed in ten days, the two would recur in the same village to repeat again according to the set pattern.

*chakhtoo*γ is another type of water allocation which is enjoyed by thirty-seven families. These families are given the privilege of having a certain amount of water all the time. The amount of water is fixed according to three different units: water equal to a horseshoe (4-inch diameter), a pony-shoe (1 inch), or an ass-shoe (½ inch). Some of these *chakhtoo*γ are hereditary to the families descending from the founder clans. A number of the *chakhtoo*γ have been granted by the rulers to certain families. Most of these families have to compensate in different ways, for example by feeding the people at the time of repairs, providing wood for sluice gates, or providing labour to work at the channel. These also include a few elites who pay nothing.

3. *Mir žoi.* Regarding the organization of the channel, the pivotal figure is the *mir žoi* (chief of the channel). He is a local authority in charge of all the different affairs regarding the irrigation system. There are two main *mir žoi* at the original portion and two for the extended parts. They also have assistants to help them. One of the Urfi *Mir Žoi*s is the overall in-charge.

The appointment of the Urfi *mir žoi* used to be hereditary. He also used to be the head of the Bayika clan and was political chief in the valley appointed by the rulers. Thus the *mir žoi* used to enjoy executive authority over the people. This position of the *mir žoi* not only helped him to assert his authority in respect of the social organization of the channel but also to establish set traditional patterns over the centuries. The hereditary system continued till 1970 when, on the demand of other clans, it was decided through consensus to appoint the *mir žoi* on a rotation basis among the three different clans.

Conflicts. Not many conflicts occur between the irrigators. Whatever minor conflicts arise are settled by the *mir žoi*. The authority of the *mir žoi* is so strong that many such matters are settled by him.

Conclusions. (1) For the establishment of an organized system, cohesion and homogeneity among the community is the most important prerequisite. (2) The role of

the channel chief is another important factor. Besides belonging to the community, he should also possess some political authority to assert himself for the implementation of the rules and roles of the organization. (3) Valuing water as 'community property' can become the organizing and unifying force for farmers in a given system. The success of the Khot system also lies in the fact that its organization is totally based on community decisions. Management and decisions related to irrigation are based on the premise that water is community property. (4) In effecting outside intervention in the form of new techniques and development in the irrigation channels, the participation of the local communities is very essential. Otherwise such measures will fail either because of lack of understanding of the local problems or because of the indifference of the local people.

Case study II: Kosht

Introduction. Kosht is located about 50 miles north of Chitral Town on the west of the Torkhow River, at its junction with the main Chitral River. It lies on the slope of the Tirich Spur between the heights of 6400 ft to over 8000 ft above the sea level. The gradient of the slope is such that cultivation is possible only through terracing. The area is drained by one stream called Kosht Gol which is fed by snow in the early months of the summer and by springs in the rest of the year. There are eight springs which rise at different points of the Kosht stream. Water in the stream is sufficient during the snow melting period, but for rest of the time the flow of the springs is not sufficient for the entire need of the village.

Climatically, the area is arid, getting less than 10 inches of rainfall, most of which is obtained during winter and spring in the form of snow. Summers are generally dry. The winter and spring snow helps greatly to enhance the water flow in the stream and springs. In years when these rains fail, the water shortage problem is further exacerbated. The population of Kosht is about 5000, comprising 750 families. As the area lies along the side of the hill, it is vertically divided into two parts — Upper Kosht and Lower Kosht. In all, the area includes fourteen villages/hamlets.

Kosht is inhabited by sixteen clans who have settled in the area during the last 400–500 years. Some of these clans, e.g. Raza, Tarqala, and Mohammad Bega, belong to the privileged class. They also possess most of the lands in the area and also enjoy the lion's share in the water rights.

The lands in Kosht are very fertile, and various food grains including wheat, maize, beans, grams, and millet are grown. Rice is grown only in the lower parts. Good quality apricots, mulberries, apples, peaches, grapes, and melons grow in abundance. Different vegetables including tomatoes, potatoes, cabbages, and onions also grow well. In the lower part of the area two cropping seasons prevail, while in the upper parts crops are grown only in one season. Because of the shortage of water, considerable acreage of land has to be left fallow every year.

The area does not possess very rich pastures like those in Khot. However, some scrub lands on top of the nearby hills are used for grazing sheep and goats. Sheep are reared mostly for their wool, from which woollen cloth is made for sale and for local use. Cows and oxen are also kept in almost every house.

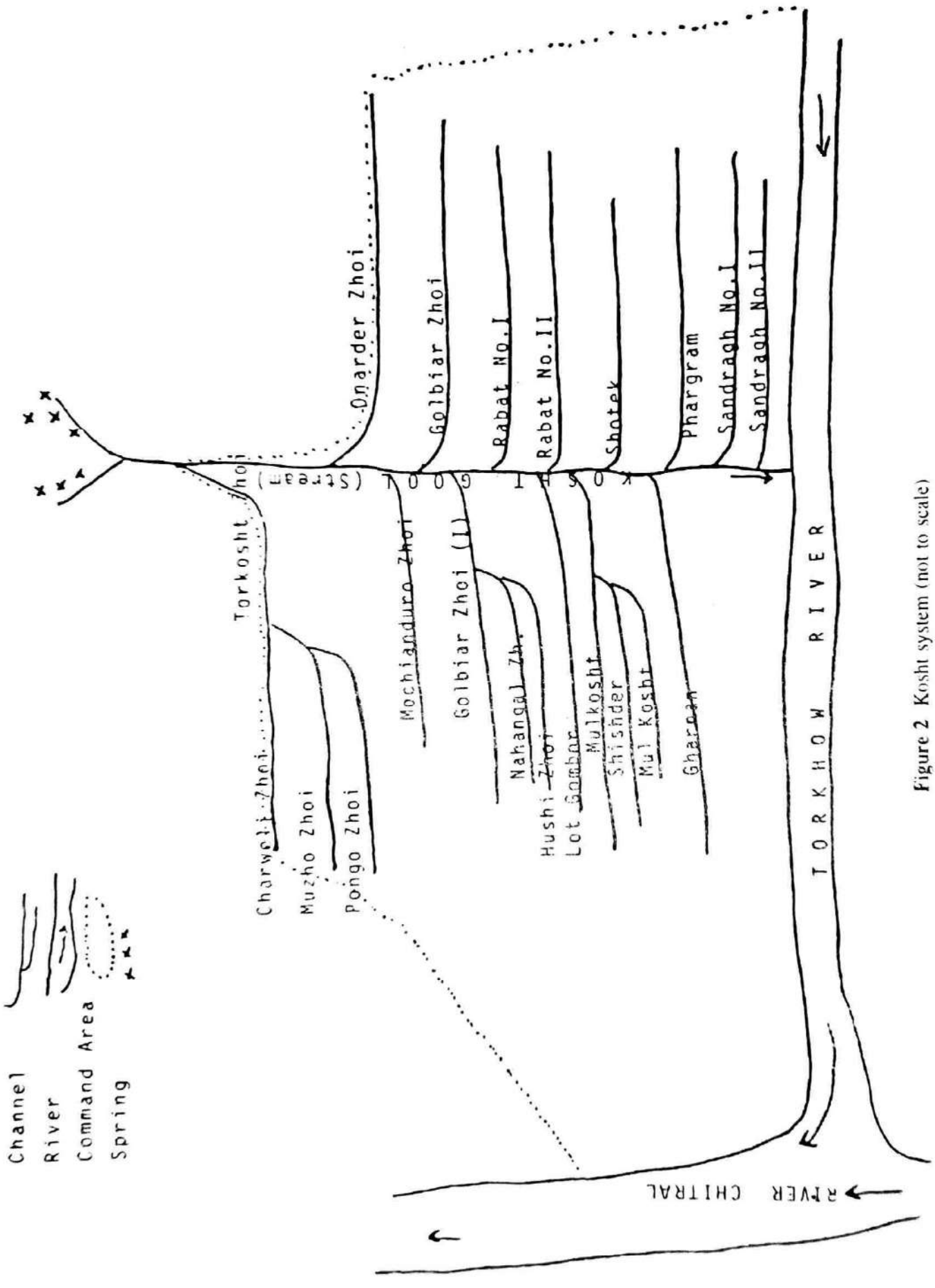

Figure 2 Kosht system (not to scale)

Irrigation. A network of irrigation channels taken out from the Kosht stream (or Kosht Gol) serves the whole area (Fig. 2). A total of fourteen channels of different length, varying from 8 km to less than 1 km long have been constructed by the various clans living in the area during a period of more than 500 years. Originally the Upper Kosht and the Lower Kosht channels were constructed some hundred years back but later with the extension of cultivation to the different parts of the area many new channels were added, thus making the system an enormous network.

It should be kept in mind that the Kosht stream (Kosht Gol) runs in the middle of the Kosht area bisecting it into two parts. There are eight canals serving the right side of the stream, while the remaining eight canals serve the left bank of the stream.

Structure of the canals. The structure of these canals is mostly *kacha*. They have been dug generally through soft morainic or alluvial soil, though, at certain points, they are cut through hard rocks. The *hurdur* (headworks) of all the channels are located in the Kosht Gol one above the other. The Upper Kosht channel, the oldest system, has its headworks at the top. The second oldest is the Lower Kosht channel, which is at the lowest level. The rest of the headworks are located in between. The headworks need annual repairs besides emergency repairs after flash floods. All these channels suffer from the problems of leakage, silting, landslides, and flash floods.

Organization. The various villagers are responsible for looking after their respective channels. There are two chief *mir žois* (channel chiefs) each for the Upper Kosht and Lower Kosht channels. Besides, there are a few petty ones to look after the smaller channels. They are responsible for the smooth running of the channels. The *mir žoi* should be a man of dependable character and know about the rotation of water among the villages and the irrigators. The various *mir žois* jointly also manage the distribution of water between the different channels.

Distribution of water. The most important aspect of the irrigation of Kosht is the distribution of water among different small villages as well as the larger units of the area. The water distribution is made according to a set timetable which is strictly adhered to. The water allocation is done according to the following units.

1. *Soroo*γ: In Kosht, generally speaking, all the water in a channel at a given time is a unit of *soroo*γ which can be used by one or more irrigators. A *soroo*γ can be on a full-day (24-hour) basis or on a half-day (12-hour) basis, depending on the circumstances. A *soroo*γ of water allocation will be appointed between irrigators as well as between various channels. Initially, a *soroo*γ was allocated according to the size of the land holdings of the clans, therefore, the large landowners possessed the largest share in water allocation. These large landowners usually were the clan chiefs who manoeuvered the construction of these channels, finally occupying the largest parts of the irrigated areas for themselves and their clan members. At present some families get water only for three hours every fifteen days while other for ten to twelve hours in the same period. In this way a village gets its turn of *soroo*γ in fifteen days, out of which some people get water after three days and many others only after fifteen days. The people belonging to the different clans and different villages of Kosht know the details of all the *soroo*γ with their timings, and therefore each of them vigilantly guards their rights.

The *soroo*γ allocation between the Upper Kosht and Lower Kosht and the various channels is as follows:

Upper Kosht: round the clock without any closure.

Lower Kosht:

anusooγ or daytime: from dawn to late afternoon (*asar* time)

chuyooγ or nighttime: late afternoon till dawn.

Number of Lower Kosht channels using water in daytime = 5

Number of Lower kosht channels using water at nighttime = 3

Some five channels in Lower Kosht, besides getting *sorooγ* water, also get some permanent water from small springs rising from seepage, leakage, or in other ways. In all, 20 *sorooγ*, including 10 × 24 hours and 10 × 12 hours, are obtained from all the channels in the Kosht area. These *sorooγ* have been further divided into 102 shares to be used among different clans/families/villages. Out of the total, 51 shares are of 24 hours, while the rest are of 24 hours, running during the daytime (called *anusooγ*) or nighttime (*chuyooγ*). Table 2 shows the *sorooγ* turn in days and the number of shares used.

Table 2. *Sorooγ* turns in days and number of shares

Duration	2nd day	3rd day	4th day	5th day	6th day	7th day	8th day	9th day	12th day	14th day	Total
24 hours	0	1	5	1	1	0	1	1	0	0	10
Total shares	0	3	20	5	6	0	8	9	0	0	51
12 hours	1	1	2	1	0	2	1	0	1	1	10
Total shares	2	3	8	5	0	14	8	0	6	5	51

The following points are worth noting from Table 2.

1. The *sorooγ* turns vary from 2–14 days between clans/villages.
2. *sorooγ* of 12 hours duration which rotate in 12 days is divided into 6 shares used by six families, each of whom gets water for two consecutive days.
3. *sorooγ* of 12 hours duration which recur in 14 days is shared by five families as follows:

Mohammad Bega Clan:	7 consecutive days
Shah Noa Clan:	3 consecutive days
Zargara:	1 consecutive days
Maja:	2 consecutive days
Walia:	1 day

4. Clan share in the *sorooγ* is important. The most important clan is Mohammad Bega, which makes up one-third of the total population. It is also the elite class, having tenants amongst the other clans living here. The role of the predecessor of the clan in the construction of the various channels has also been significant; therefore, they have the lion's share in every channel and in every *sorooγ*.
5. Shares in case of individual families/clans are also further distributed among them in case of extended families. Thus in certain cases a family gets water after 20 days or even more.

Golooγ. This literally means water flowing through a small gorge and is a fixed amount of water, one-third of the *sorooγ*. The people also use a stone or piece of wood with a hole big enough to allow five fingers to pass through it or about 3 inches in diameter, as the measurement unit of *golooγ*. Unlike *sorooγ*, which is allocated to different irrigators, *golooγ* is allocated to individual families. Some *golooγ* run permanently round-the-clock while others are on a night or day basis. In all, there are 24 *golooγ*, out of which 7 run round-the-clock, 12 run during the daytime, and 5 flow during the night. These *golooγ* belong to different families belonging to different clans, each of whom share the water among themselves.

Gospanooγ. The third unit of water allocation is called *gospanooγ*, which is one-third of a *golooγ*, and is attached to certain *sorooγ*. In other words, certain *sorooγ*-holders have allocated of their water to a few families having no water in exchange for help in different matters regarding channel repairs, regular flow of water in the channel, etc. In all, there are only five *gospanooγ* attached to the bigger channels, Charvelu Žoi and Phargam Žoi.

Rights and duties. The irrigators are supposed to contribute one 'shovel' (*phi*) per *sorooγ* for repairs and maintenance works. This means four persons with various articles, for example rope, shovel, and axe are to be contributed per 'shovel'. The payment to the *mir žoi* is also made on a per 'shovel' basis which is about 16 kg of wheat.

There are no prescribed 'shovels' for the *golooγ* holders. In this case each family holding *golooγ* will contribute one person each along with the necessary articles to work in the channel. He will also pay about 5 kg of wheat to the *mir žoi*.

Those holding *gospanooγ* will have a one-sixth share of payment to the *mir žoi* and the contribution of articles in repair works. They will also be helping the *sorooγ* holders they are attached to in maintaining the regular flow of that *sorooγ*.

Conflicts. Dispute about water is a common phenomena in Kosht because of (i) great shortage of water and (ii) unequal distribution of water. The disputes occur both between individuals and between groups. In the former case, the problem is not very serious and is very often settled locally. But in the case of group conflicts, the matter are often taken to court.

Measures to solve the water shortage problem. Haunted by acute water shortage, the inhabitants of Kosht have tried one scheme after another to attempt to solve this chronic problem. In 1961, they tried to breed as artificial glacier on the top of the hill over Kosht called Tirich An (or Tirich Spur) which, unfortunately, failed. More recently the people have undertaken another endeavour of 'river capturing' from the other side of the hill, which they call the Hill Top Irrigation Scheme. On top of the other side of the hill behind Kosht there is a glacial lake, the outflow of which is towards another valley. The people have now hit upon a plan of using more of the lake water diverting it towards Kosht Gol for which they have to cut a 14,000 ft long gorge through the ridge to a depth of about 315 ft. Despite their limited resources, the people have launched the project with full determination and mainly on a self-help basis, and to a certain extent with some assistance from government agencies. So far the progress has been as follows:

1. Construction of 17 km road to the top
2. Cutting of ridge: depth 62 ft, length 400 ft, and width 150 ft

Conclusions. (1) The system in Kosht is a good example of using a limited water resource equitably within a vast area and large population. Though certain clans have the

largest share in water, there is no household without a share, no matter how small. (2) This is also an example of harmonious living of many clans and families, which they have developed by living together through many centuries. (3) The system is quite old; therefore, the irrigators thoroughly understand both their system and their organization. This shows that sufficient time is needed both to develop cohesion among the diverse people and also for successful organization of the irrigation management. (4) The people of Kosht also possess qualities of taking new initiatives and are fully determined to remove the water shortage problem in one way or another. For all such moves they are not only well organized but also fully united.

Case study III: Singur

Introduction. Singur is collective name given to a number of villages situated on the right back of the Chitral River at a distance of about three miles from Chitral Town. Lately it has been included in the Chitral Town Committee. The principal villages are Lot Deh, Miran Deh, Shah Miran Deh, and Gushm. The total population is 2608 persons in about 400 households. Important clans living in the area include Katura, Sangala, Moghola, Mirasiya, Busha, Shahbuna, Dashmana, and other tribes. The Moghola and Shah Mira are the original settlers; while the Katura, Sangala, Mirasiya, and Busha are recent settlers, but belong to the privileged class and possess most of the land and water.

The area spreads over three flat terraces on the west bank of the Chitral River which slope gently from west to east. It is drained by two streams called Lot Gol and Koti Gol which are mostly fed by springs in the summer months. Therefore, water flow in these streams is not only low but also unreliable. The water of Lot Gol is used by Lot Deh and Miran Deh. A certain part of the water from the stream has also been taken away to irrigate the land in a distant village, Dolomute, belonging to one of the princes, thus further intensifying the water scarcity problem. Because of shortage of water these two villages have to follow strict rationing of water, to be discussed later.

The Koti Gol stream is shared by Miran Deh and Shah Miran Deh. A part of the water was diverted to Birmoghlasht, the summer cottage of the ex-ruler of Chitral. The remaining water is hardly enough for these two villages. Shah Miran Deh, however, has no problem of water shortage because of a channel some 5 miles long brought from a stream near Chitral Town, called Chitral Stream (Fig. 3). Thus the Shah Miran Deh people use their share of Koti Gol water supplied to the village through steel pipes for drinking. The lower parts of the whole Singur area are served by another channel, called Sin Channel, brought from the river. Gushm village is located near this channel and gets abundant water. Moreover, the cultivated lands of the other villages served by this channel, are mostly given to rice cultivation because of water abundance. Most of the village mills also run on this channel.

In Singur area, crops are grown in two seasons, rabi and hharif. Rabi crops include mostly wheat and some barley. Winter vegetables, e.g. cabbages, spinach, turnips, and radishes also are grown. Alfalfa is grown for fodder. In summer, maize and rice are the main food crops, while tomatoes, onions, and different types of vegetables are also grown. Fruit include apples, apricots, peaches, grapes, walnuts, and melons.

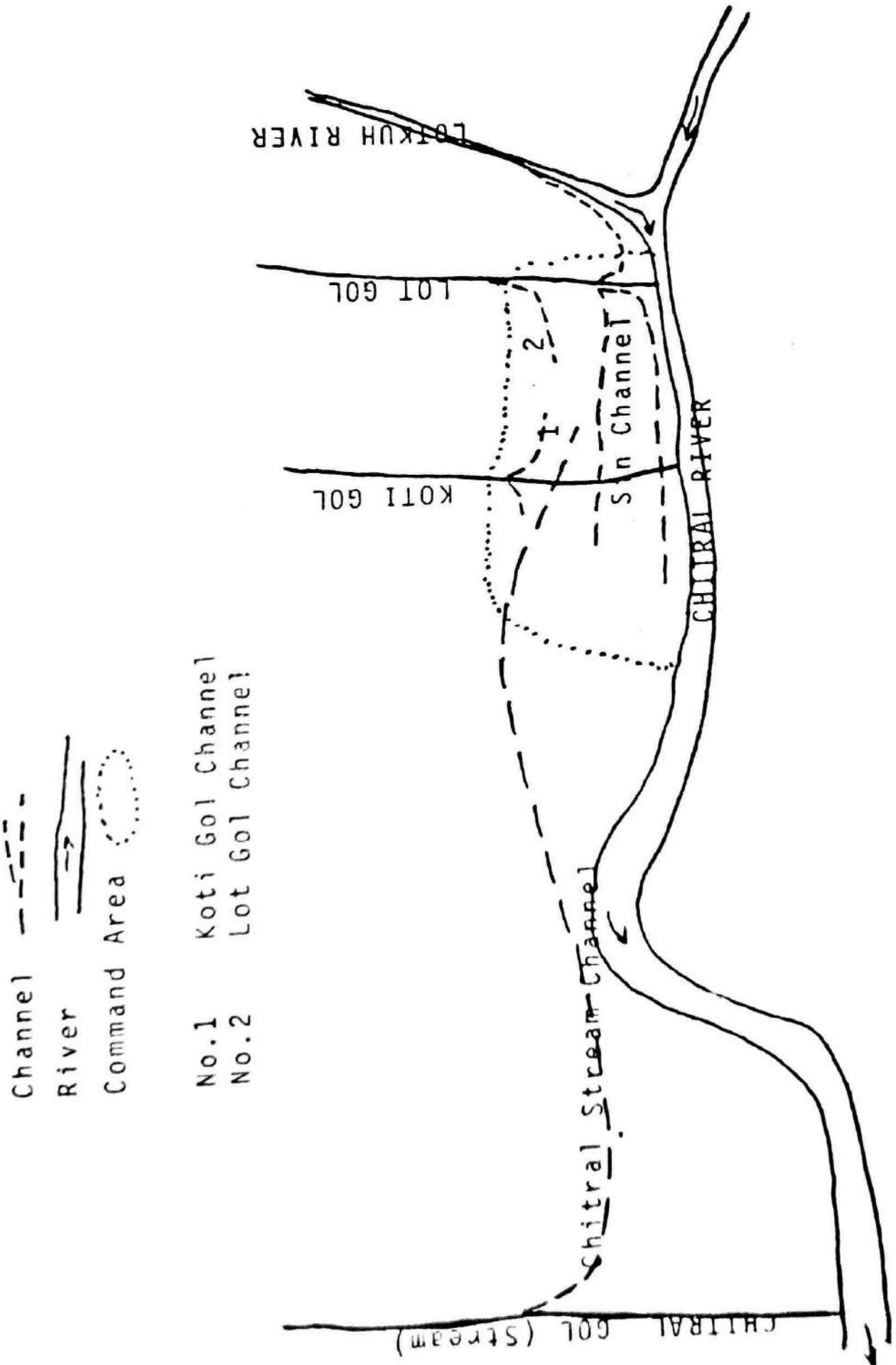

Figure 3 Singur system (not to scale)

Irrigation. As has been mentioned, the area is irrigated by four different systems, as discussed below:

1. Lot Gol (stream) system. Lot Gol gets a perennial flow of water but the amount of water fluctuates from time to time. During the spring, there is a lot of water in the stream due to melting snow, but during the summer the amount of water decreases to hardly one-and-a-half mill water (approximately one cusec), thus creating a problem of water scarcity. One-third of the water has been diverted to a distant village Dolomute, and only two-thirds is left to irrigate the lands in Lot Deh and Miran Deh. There is one channel about a mile long, with a few distributaries, which is taken out from the stream about a furlong away from the village. The channel runs through terrain easy enough for construction and maintenance. Therefore, it does not need any complex maintenance system.

Because of insufficiency of water, the people have devised the distribution of water on a tribal/clan basis. First of all, the available water in the channel is divided into three parts; then two shares — one of one-third and the other of two-thirds of the water — are made. The one-third share is called *takooγ* 'odd unit', and the two-thirds share is called *justooγ* or 'even unit'. On some days, three different clans receive *takooγ* or one-third of the water each for 24 hours, and on other days one tribe/clan would get *justooγ* or two shares and another tribe/clan would get one share. The cycle is completed on the tenth day according to the following schedule (Table 3).

Table 3. Water allocation schedule: Singur

Day of rotation	Share allotted	Recipient
First day	1st *takooγ* (1/3)	One Katura family in Miran Deh Village
	2nd *takooγ* (1/3)	Another Katura family in Miran Deh
	3rd *takooγ* (1/3)	Imam-e-Masjid
Second day	*justooγ* (2/3)	A Katura family in Miran Deh
	takooγ (1/3)	Another Katura family
Third day	*justooγ* (2/3)	Other families in Miran Deh
	takooγ (1/3)	Misc. families in Miran Deh
Fourth day	1st *takooγ* (1/3)	Shalikan (Lot Deh)
	2nd *takooγ* (1/3)	Qureshi family (Lot Deh)
	3rd *takooγ* (1/3)	Moghola (Lot Deh)
Fifth day	1st *takooγ*	Sufi Singur family (Lot Deh)
	2nd *takooγ*	Qazi family (Lot Deh)
	3rd *takooγ*	Sangale tribe (Lot Deh)
Sixth day	1st *takooγ*	Mirasya (Lot Deh)
	2nd *takooγ*	Shah Bone tribe (Lot Deh)
	3rd *takooγ*	Moghole (Lot Deh)
Seventh day	*justooγ*	Mirasiya (Lot Deh)
	takooγ	Imam-e-Masjid (Lot Deh)
Eighth day	1st *takooγ*	Moghole (Lot Deh)
	2nd *takooγ*	Qureshi (Lot Deh)

Day of rotation	Share allotted	Recipient
	3rd *takooγ*	Shalekan (Lot Deh)
Ninth day	*justooγ*	Sufi family
	takooγ	Sangina tribe

The above table shows that in nine days there are four *justooγ* and nineteen *takooγ*. Distribution on a village basis is as follows:

Village	No. of *takooγ*	No. of *justooγ*	Total
Miran Deh	5	2	7
Lot Deh	14	2	16

Lot Deh has more population than Miran Deh, therefore it has been given more water than the latter.

The following points are worth mentioning as regards the distribution of water on a clan/family basis. (1) Katura enjoy the largest share, even though their total number is small. This is because they belonged to the ruling family of the state and are taken to be the privileged class. (2) Moghole, the original inhabitants of village Lot Deh, and forming the bulk of the population, have very little share. (3) Mirasiya also belong to the privileged class, and therefore are comparatively well placed. This family also occupied large holdings in the area. (4) Sufi of Singur family is a respected family of the area for religious reasons, and venerated highly by the rulers and the local people. Though their number is not great, they have been given a sufficient share because of their eminent position. (5) Each of the rest of the families has been given at least a *takooγ* in the distribution of the water. Thus despite the shortages of water in the area, the principle of equitable distribution of water is followed.

It is should also to be pointed out that sometimes the amount of water in the stream is so low that it is not possible to divide it into *takooγ*s or *justooγ*s. In such cases, all the water is considered as one share and used either as *takooγ* or *justooγ*. In the case of *takooγ*, the duration fixed is eight hours to each irrigator/clan or family, and in case of *justooγ* it is sixteen hours.

2. Koti Gol system. Koti Gol stream flows between Miran Deh and Shah Miran Deh. The former is on its left bank and the latter is on the right bank. One small channel has been taken out on each of its two sides to serve the two villages. The stream takes its source mostly from springs whose flow varies from month to month and year to year. A part of the water has been allocated to Birmoghlasht, the summer residence of the former ruler, situated on top of a hill at 8000 feet. The remaining water is very little. In the spring time, due to melting show there is sufficient water in Koti Gol, which is used for Rabi crops, but for summer crops the water is insufficient. The water of the stream is divided into three portions to be used equally by Miran Deh, Sangale clan, and Shah Miran Deh. The first two portions have been pooled together to be used by the Katura and Mirasiya of Miran Deh, and the Sangale clans of Shah Miran Deh, according to the following schedule.

First day Total amount goes to Katura of Miran Deh for 24 hours.

Second day Total amount goes to Sangale of Shah Miran Deh tribe for 24 hours.
Third day Total amount goes to Mirsiya clan for 24 hours.
Fourth day Total amount goes to Sangale for 24 hours.
Fifth day Total amount goes to Katura of Miran Deh.

Thus the cycle is completed in five days. It is evident that the Sangale clan gets water on alternate days, while the others receive it on every third day. The reasons for this is that the Mirasiya and Katura also get some share of water from the Lot Gol, while the Sangale receive water only from the Koti Gol. The share of each clan is further distributed within the clan itself according to the number of users because of extended families.

The third portion, allocated to Shah Miran Deh, is used for drinking purposes only, because the village is self-sufficient in water as a result of the construction of a five-mile-long channel brought from Chitral Stream.

The Chitral stream channel. This channel was constructed in the first decade of the present century as far as a place called Balach by the then ruler, Shah Shuja-ul-Mulk. Later, in 1938, the channel was extended to Shah Miran Deh of Singur by Shah Nasir-ul-Mulk, another ruler of Chitral, mainly because one of his notables was granted lands in the village and settled there. In the beginning, the channel was not big enough to carry sufficient water, but with the passage of time the people of Shah Miran Deh, through self-help and occasionally with government assistance, have been able to widen and improve the channel so that it carries sufficient water for them to use without any rationing.

The *sin* (river) channel. This channel has been taken out from the river four miles upstream from Singur. It was constructed about a hundred years ago to irrigate the lands in many other villages besides Singur. In Singur more than half of the lands located towards the lower side are served by this channel. The channel is big enough to carry sufficient water to irrigate the land in Singur and further down in Balach village. The command area, due to abundance of water, is mostly given to rice cultivation.

Recently the same channel has been further widened, lined, and covered at places to be used for the hydroelectric power station established near Singur. In this way the headworks was much improved and the regular flow of water has been further ensured.

Problems and organization. Flash floods during the summer months which often destroy the headworks are common problems for all the channels. The Chitral Stream channel is especially prone to floods, which creates a lot of problems. Such emirgency works are done by the irrigators collectively on the basis of one individual from each household. Silting is another problem of the Chitral Stream channel and the Sin channel; they have to be cleared at least twice every year by the irrigators collectively.

A *mir žoi* is appointed for the Chitral Stream channel to look after the proper flow of the water in the channel, because the villages coming first on the way, i.e. Balach and Goldur, try to misuse the water. The *mir žoi* is paid by all the irrigators on the basis of ten kg of wheat per irrigator.

Conflict. Different types of conflict have been occurring at different times.

1. Conflict between villages. There has been a chronic conflict between the villages Lot Deh and Miran Deh versus Shah Miran Deh about the extension of the Chitral Stream channel. The former villages want the channel to be extended to their part so that their problem of water shortage can be solved, but the Shah Miran Deh people are not prepared to allow any extension until the following conditions are fulfilled: (i) Before the extension

of the channel to the other side, the whole channel from the source should be widened so that additional water can be provided to the other villages without affecting the present water situation in Shah Miran Deh. (ii) Due to the proposed extension, a number of houses of Shah Miran Deh will have to be pulled down; therefore, sufficient compensation to the owners should be arranged by the villagers. (iii) In case of shortage of water in the source stream, the priority right of Shah Miran Deh should be recognized.

The people of Lot Deh and Miran Deh have not so far been able to fulfill the above conditions, therefore, the extension programme could not be undertaken. They have taken the case to various district authorities but the latter have also found the Shah Miran Deh people to be justified. Lately the Irrigation Department, on the request of the people of the area, has been considering the construction of a new, 13-mile long channel to be brought from the river, which when completed would go a long way toward solving the chronic water shortage problem of not only these villages but also many others.

2. Conflict with the villages around Chitral Town. In certain years, water of the Chitral Stream, which is used by the villagers around it in Chitral Proper, becomes too low to be sufficient for all the users. In such case these people object to the conveyance of the water of their stream to a distant village in Singur. But because the water had been granted to the people by the ruler, it cannot be totally stopped, though some arrangements for equitable distribution are made.

3. Local conflicts. Minor local conflicts in Lot Deh and Miran Deh which are settled by the local elders are also common.

Conclusions. (1) Irrigation in Singur is an example of the problem of water abundance and shortage in the same area. (2) It also shows the power of the rulers of the former state in water allocation and distribution to different people and areas. (3) It is also an example of harmonious living of the different clans and the sharing of the limited water equitably among themselves. (4) In this village, like Kosht, water belongs to the land. Different clans who settled in the area were allocated both the lands and the water specified for those lands.

Case study IV: Drosh

Introduction. Drosh is the collective name given to a number of villages called Azur Dam, Kuru, Khoran Dok, Dar Khan, An Dur, Charvelan Deh, Potnian Deh, Chikidam, Azad Dam, Katur Dam, Dam, Dar Girdini, Gromal, Langa, Shah Nagar, Kaldam, and Alyan. It is situated on the eastern bank of the Chitral River at a distance of 25 miles south of Chitral Town. The total population of the area is 8000, and the total number of households is 1200.

The Drosh area gets 19 inches of rainfall on the average every year, most of which falls in winter and spring. Summers are dry and irrigation is needed for summer crops. The area is drained by one perennial stream, called Drosh Gol, but the amount of water in it decreases in the summer months, when it is used only in a few surrounding villages. Irrigation of the whole area mostly depends on a channel brought from the Shishi River, a tributary of the Chitral River. The channel is big enough to provide sufficient water to most parts of Drosh. The total command area is 4½ sq mi. According to the list of the holdings of the irrigators, the total acreage is 1857 chakorum (1 chak = ½ jareeb).

The area enjoys two cropping seasons: wheat and barley are grown in rabi, and maize, rice, lentils, and beans are grown in kharif. Vegetables of various types are also grown both in rabi and kharif. Peaches, mulberries, apples, grapes, melons, and walnuts also grow well. The climate is also suitable for citrus fruit but it is not grown much.

The area is inhabited by twenty-five different clans, most of whom have settled here during the last fifty to a hundred years. Cohesion and unity is, therefore, lacking among the people. The most important clans are as follows.

Kalash: These are the original inhabitants who used to be Kafir but now have embraced Islam. These people used to occupy this whole territory but now have been deprived of most of the fertile and flat land, which went to the new settlers. These people are now confined to rather unattractive and less fertile areas. They make up the bulk of the population.

Raza: The Raza are related to the royal family of Chitral. Lately this clan has occupied an important position in the area. They possess the largest and best acreages of land in the area. They also have played an important role in the irrigation development of the area.

Katura: This clan belongs to the royal family of Chitral. A prince belonging to the family was governor here; he possesses the bulk of the lands. He also has played an important part in the irrigation development of the area.

Irrigation. Though some irrigation is done from small channels brought from the Drosh Gol, it is confined to small villages around the stream and organizationally is not very significant. The main channel of the area is the Shishi channel brought from the Shishi River along its left side to the Drosh area. The channel originally was constructed about a hundred years ago by a Prince named Sarbaland Khan to irrigate his land in the village Azar Dam. At that time the channel was only a mile long and had dimensions of 2 ft × 2 ft. Later, at the beginning of the present century, an administrator of Drosh, the late Feroz Khan, using his authority mobilized the people of the area and not only widened the channel to 4 ft × 6 ft but also extended it to the Kuru village of Drosh, the present limit. He also changed the headworks to the present site. Previously the headworks was on the left side of the Shishi River, and was frequently washed away because of the fast flow of the river, especially during floods. Therefore, the headworks was shifted to the right bank to an easier site for the diversion of water. Then about 100 feet below it the channel was transferred to the other bank by a long and wide wooden aqueduct. After completion of the channel, not only was the water shortage problem of the many villages of Drosh solved, but also hundreds of acres of new area were brought under irrigation. Moreover, dozens of water mills were installed, to be run by the waters of the channel. After 1930, when Prince Hussam-ul-Mulk became governor of this area, he also took a great deal of interest in the channel and through one of his officials, Mohammad Sharif Khan, he got the channel further widened to the following dimensions:

Head part for about a mile:	8 × 8 ft
Middle part:	4 × 4 ft
Tail part:	2 × 2 ft

Moreover, the different works regarding the channel, such as repairs, maintenance, and water distribution were properly organized. At that time all the water users were mobilized officially, and therefore things went on smoothly and no problem arose regarding repairs and maintenance of the channel. Various structural problems, such as

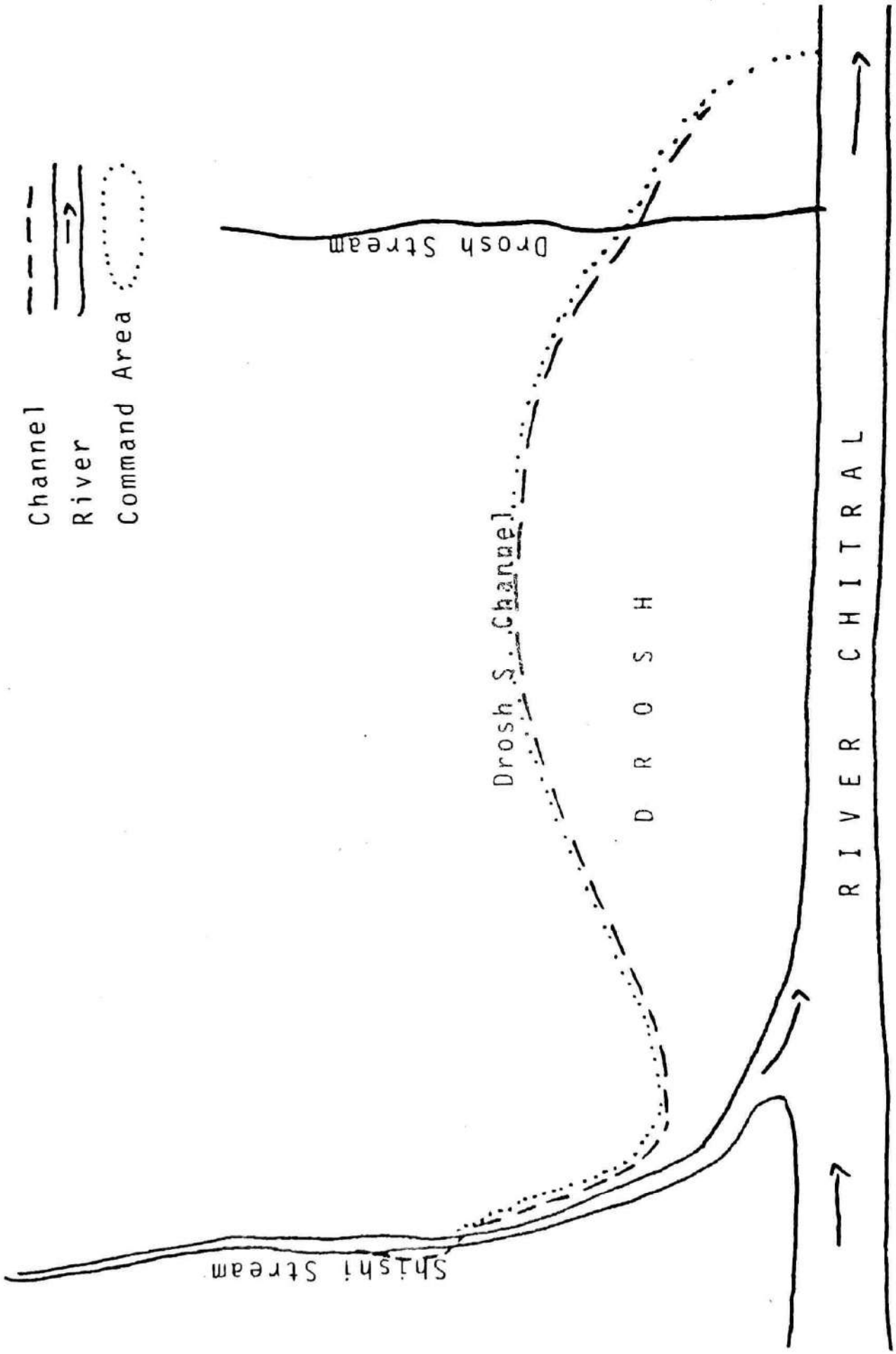

Figure 4 Drosh channel system (not to scale)

breaking of the channel, silting, and washing away of the headworks were dealt with well in time, and thus regular water flow was fully ensured. At that time a hydroelectric power generator was also run on the channel for the use of the Governor's House and other houses of the notables. In the 1950's the old administrative system in the whole former state was abolished and a new setup was introduced. Governors were replaced by tehsildars, who were mostly outsiders. Thus official interest in the channel declined, resulting in the disruption of the organization. This was also the time when the people in the whole former state started to enjoy the blessings of freedom from the local aristocracy which they unfortunately misunderstood to mean getting rid of every responsibility. Thus without official pressure the people were not even ready to perform the day-to-day repair works of their channel. For a few years the local chiefs managed to organize the people somehow or other, but the decay of the system had started. In the 1960's the Basic Democracies system was introduced in the country and Chitral was no exception. The Chairman of the Local Union Council, the late Mohammad Ashraf Khan, tried to revive interest in the affairs of the channel but with the difference that different works were done on cash payment. This was the end of the free labour which the people used to provide on a self-help basis. Since then, for minor or major work the people expect cash payment which has created problems for the maintenance of the channel. After the introduction of the local bodies in 1979, two chairmen of the District Council, namely Mr. Khurshid Ali and Prince Mohiyud Din, both of whom belonged to the Drosh Area, provided more than a million rupees for the improvement and other organizational matters relating to the channel. Though some progress has been made, public participation could not be fully mobilized. This state of affairs has finally led to the setting up of a Supervisory Committee, comprising seven members and headed by the Chairman, District Council. The committee has recommended a charge of Rs. 20 per jareeb per session per irrigator to be used in the channel. A list of all the lands and irrigators has been prepared by the Committee according to which more than a lakh of rupees would be collected. The pay of two *mir žoi* amounting to Rs. 13,000 will be paid by the Chairman, District Council from his own funds. It remains to be seen how far this Committee is going to be successful in managing the affairs of the channel in the future. But one thing is quite clear: the interest in the channel, especially of the irrigators at the tail end, has to be revived.

Physical system and organization. The channel is about six miles long and has been divided into the following parts for organizational purposes:

1. Head to Shumiat Gol: This portion is about 1½ miles long and is the responsibility of all the users. At the head, the channel is approximately 8 × 8 ft. The site selected is such that water is easily diverted through gravity into the channel. But during floods much damage occurs, which needs a lot of labour for repairs in order to maintain the water flow without much loss of time. But, unfortunately, due to lack of cooperation from the water users, especially the people at the tail, a sufficient number of people can not be mobilized in time. This results in delaying the completion of repairs and prolongation of the closure of the channel for many days.

For about a mile the channel runs along a rocky hill; this section faces severe structural problems. This portion is quite fragile, therefore the channel often breaks. Scree fall from the hillside at various places is another common problem which damages the channel considerably. Lately, a new channel has been constructed above the present channel to irrigate villages in the upper parts of Drosh. The channel often breaks because

of engineering faults and also washes away parts of the Shishi channel. At various points the channel is crossed by *barani nalas* (rainfed streams) which do great damage because of flash floods, which are common during the summer monsoon. This happens at a time when the water is direly needed for rice and other kharif crops.

The District Council has so far spent more than a million rupees to improve this portion, but for various reasons the required results could not be achieved. Moreover, according to the people of the area, certain parts, instead of being improved, have deteriorated. One watchman is exclusively appointed to look after this portion round-the-clock to do minor repairs, to close the water in times of emergency, and to inform people whenever any major problem crops up.

2. Azur Dam portion: From Shumiat Gol to a place called Chinar, about a half mile long portion is the responsibility of the people of Azar Dam. Here the channel runs through soft alluvium and does not face many structural problems. The dimensions of the channel are from 6–8 ft wide and 4 ft deep.

3. Shah Nigar portion (about 1½ miles): This portion, 4–6 ft wide and 4 ft deep, runs through soft soil above the Shah Nigar area. The population of the Shah Nigar area are responsible for the maintenance of this portion. This portion is crossed by a few *barani nalas* which create problems during flash floods.

4. Chikidam portion (1½ miles): The villages responsible for this portion include Chikidam, Azad Dam, Potnian Deh, and Charvelan Deh. Here the channel mostly runs through a flat alluvial plain and only has the problem of silting at certain times of the year. In this and the remaining portion water runs from the month of August until the end of October. These villages also use the water of the Drosh Stream up to the end of July. The Shishi Channel is 3 × 3 ft in this portion.

5. Langa to Kuru portion (1½ miles): This is the last portion including the villages of Langa, Dadkhan Duri, Kuru, and Khoran Dok. Here the channel is 3 × 3 ft and runs through flat alluvium. It is crossed by streams prone to flash floods. Maintenance works include clearing of the silt once a year and repair after flash floods.

Problems of social organization. The Shishi channel suffers badly from problems of social organization. The villagers at the tail mostly fail to cooperate in the repair works on the portion between the head and Shamiat Gol which is prone to numerous structural problems. The reasons are as follows: (i) Most of the clans are new settlers in the area and, therefore, have not developed any cohesion among themselves. (ii) The villagers at the tail include a number of large landowners who do not take a personal interest in the affairs of the channel. This attitude also discourages other water users from participating in the repair works. (iii) A number of the people at the tail also are engaged in other occupations, such as trade, employment, or wood selling. Thus, lack of commitment to agricultural pursuits discourages participation of the people in construction and maintenance activities of the channel. (iv) Right from the inception of the channel the organization has been a 'top-down' business. As long as authoritarian rule prevailed in the area, things went smoothly, but with the end of authoritarian rule problems of organization started to come up. Under the new setup, cash payment for repair work was started and such expenditures were borne by government bodies. This, unfortunately, led to further deterioration in the situation, with the result that at present it has become very difficult to mobilize most of these people for repairs and maintenance works.

The establishment of the Supervisory Committee has been, so far, the latest measure to solve the problems of social organization. But one thing which is lacking in the Committee is that it is not a representative body, but body nominated by the Chairman, District Council. One day the people may object even to the authenticity of the committee and refuse to cooperate. However, one can hope that this committee can become a precursor of a water users' association (WUA) in the area. From the conditions prevailing in the area, it can be said with certainty that the time is ripe to establish a WUA for Shishi channel, a step which would be welcomed by the people.

Structural problems and solutions. As is obvious, social organization of the people of Drosh is needed for the management of the various problems associated with the structural constraints of the channel. As far as matters related to water allocation are concerned, no rationing is done anywhere along the channel because the water supply is abundant when the channel is running to full capacity. The most important matter related to the channel is the solution of various structural problems. When these are solved by the Government or other agencies, then the people of the area can relieved of the great bulk of their burdens. Various problems and solutions are discussed here. (1) The head is often washed away by floods. This situation needs to be improved by constructing a RCC weir. (2) At many places along the hillside scree falls do a lot of damage to the channel. The problem can be solved by constructing covers at all such places. (3) The retaining walls along the hillside and at various other places are *kacha* and too weak to hold the burden of the water. Therefore the channel often breaks. These walls should be completely made *pakka* to remove the problem. (4) At nine places the channel is crossed by *nalas* which cause damage during floods. In all such places RCC culverts should be constructed. (5) Improvement of the engineering structure of the Kaldam channel running above Shishi channel is also a must for the safety of the latter. Otherwise all the improvements will be wasted because of the breaking of the former channel.

Conclusions. (1) The Shishi channel carries sufficient water to its command area, but because of structural problems and lack of proper organization on the part of the water users cannot deliver its full potential benefits. (2) Lack of organization is because (i) the 'top-down' organization system functioning since the inception of the channel is now missing; (ii) the recent settled, heterogeneous population lacks cohesion and unity; (iii) preoccupations other than agriculture discourage voluntary participation in the management of the channel. (3) For efficient running of the channel: (i) Structural problems of the channel should be removed. (ii) A water users' association should be organized.

General conclusions

The study of the irrigation and society in the Chitral District, based on the investigations made in the four sites – Khot, Kosht, Singur, and Drosh – lead us to the following general conclusions. (1) The water, land, history, society, and destiny of the people of Chitral District are intricately bound. (2) In Khot, Kosht, and Singur the development of the irrigation systems has been of a 'bottom-up' nature. Therefore, these have been successful while in Drosh the 'top-down' process of the system has been fraught with difficulties and has failed. (3) The successful strategy in the region mostly has been participation of the local people in channel construction activities, and upon project completion, the irrigators

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Settlement Patterns and House Types in Swat Kohistan, Swat Valley, NWFP, Pakistan

*Usman Ali**

Abstract. This study examines the physical, historical, socio-economic, and cultural aspects of human settlements and their house types in the northern mountainous regions of Swat Valley known as Swat Kohistan. The study of mountainous settlements is important since about sixty percent of the nation's land is mountainous. In Swat Valley, more than half of the land is mountainous and is characterized by unique settlement patterns and house types. A traditional type of society characterizes Swat Kohistan. The traditional human settlements and house types in Swat Kohistan are effective adaptations to the local ecological, cultural, and economic environments. The environmental factors of physiography, elevation, and climate are the major determining factors for the settlement patterns and house types of the area. Similarly, the distribution of resources and socio-cultural groups have also had a pronounced influence on the origin, growth, and distribution of human settlements and house types in the study area. The positional functions of Swat Valley and Swat Kohistan, because of its nearness to the main passes, have also contributed a great deal in the establishment of ancient settlements, their functional characteristics, their patterns, and their house types.

Introduction

This paper attempts to describe, interpret, and analyse the varied patterns of human settlements and house types in the northern mountainous part of Swat Valley known as Swat Kohistan. Little research has focussed on the settlement patterns and house types in this area. The present attempt will, therefore, provide an in-depth understanding of the problem. Figure 1 shows the location of Swat Kohistan within Malakand Division, and Figure 2 the administrative divisions within Swat.

The Swat Kohistan area comprises the narrow gorges of the Swat River and its tributaries as well as the hilly and mountainous slopes. These varied geographical areas are inhabited by various groups. The **Torwals** inhabit the narrow gorge of the Swat River from Bahrain to Asrit Khwar (stream); the **Kohistani** clans live in Kalam Tehsil in the valleys of the Utror and Ushu Rivers, which are the two principal tributaries of the Swat River, while the **Gujar** ethnic group resides along the hill and mountain slopes. The

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primary function of this paper is to examine the differences in human settlements and house types in relation to their varied locational, ethnic, and ecological settings.

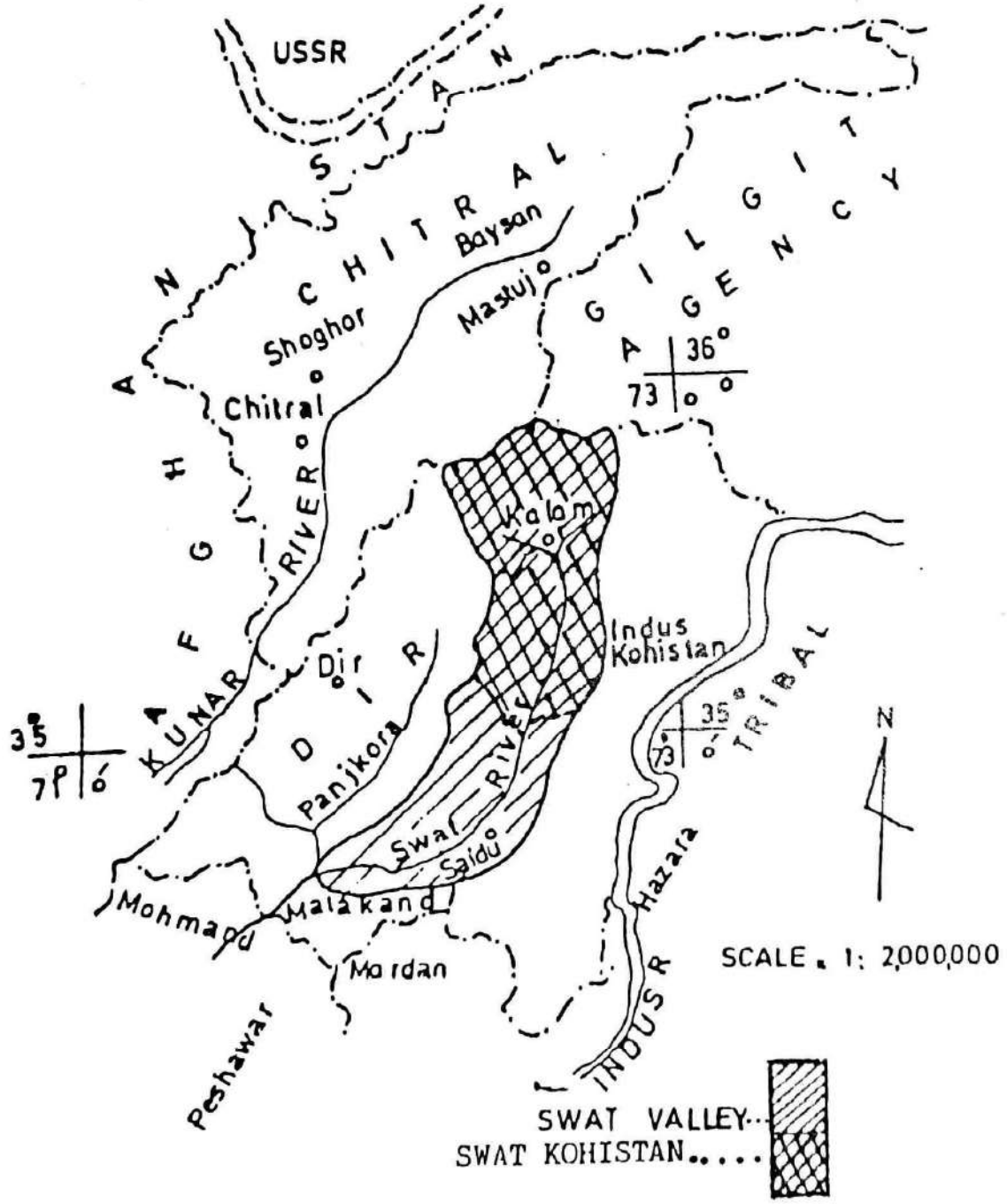


Figure 1 Malakand Division, location of Swat Valley.

Statement of the problem. Human settlements, which are as old as mankind itself, are centres of activities, cultures, and civilization, and are therefore the most important and basic expressions of man's utilization of space. In the era of modern socio-economic developments, it is fully recognized that the spatial aspects of developments should be given due importance. The settlement, which is an important element of spatial organization, plays a very important role in socio-economic developments. In order to understand the socio-economic landscape, it is essential to understand the processes which are

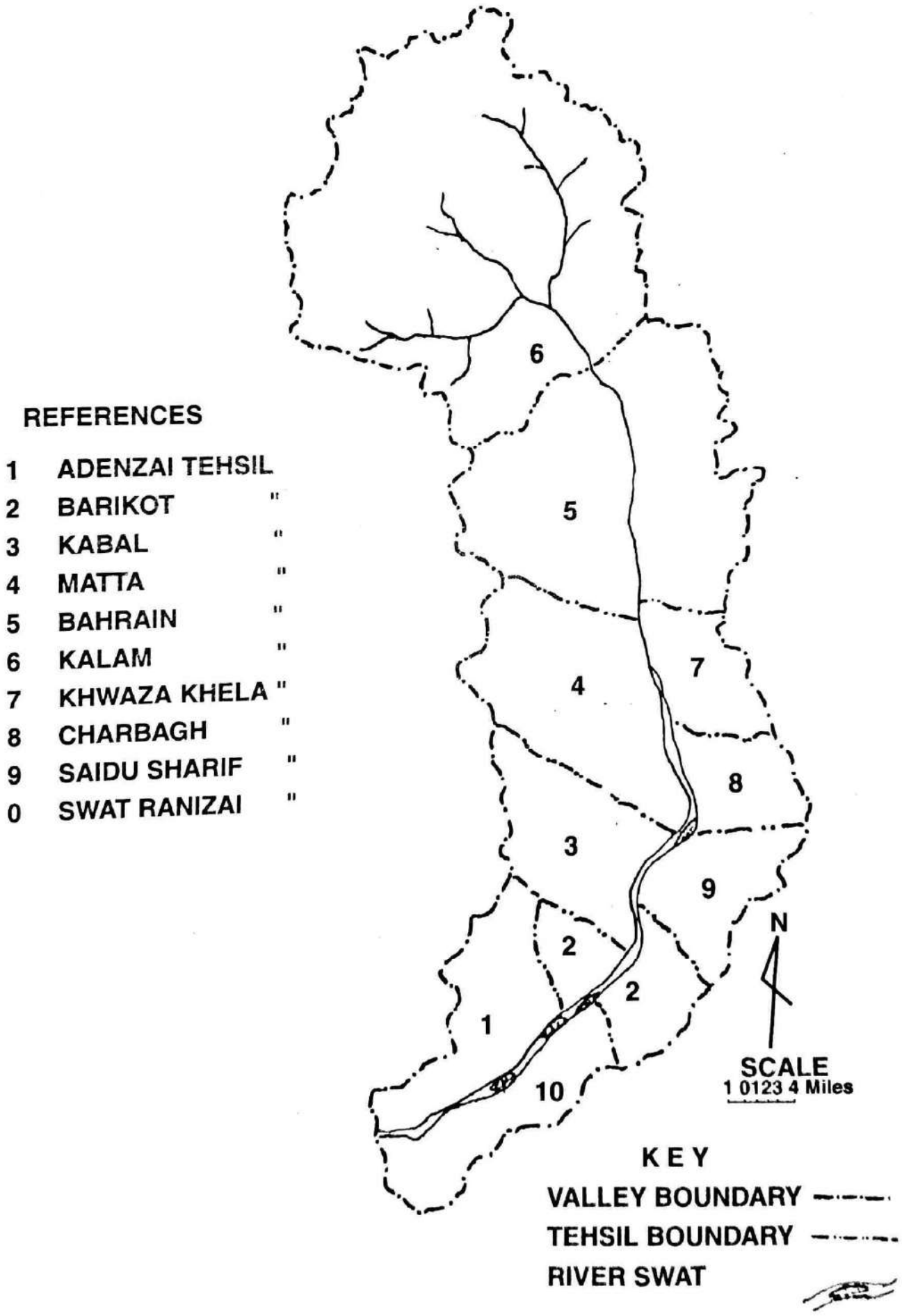


Figure 2 Swat Valley, administrative areas (1985)

responsible for the origin, growth, distribution of, and variation in human settlements and their interrelationships.

This study is an attempt to assess the relationship between geographical phenomena and human settlements in the Swat Kohistan area of Swat Valley, which will be extremely important from the planning point of view.

Literature review. Swat valley has remained an area of major interest for travellers, tourists, and archaeologists, as well as social and physical scientists, particularly geologists. As a result, a number of studies have been carried out generating a considerable number of published materials in the form of travel accounts, books, articles, and government reports. A number of them which have discussed the Swat Kohistan area of Swat Valley are discussed in the following account.

An attempt at the reconstruction of the early proto-history of Swat Kohistan area was made by Stacule (1970) in his work 'An Archaeological Survey near Kalam (Swat Kohistan'. The author suggests that human habitations started in the Utror Valley in proto-historic times as a result of nomadism and seasonal migrations between the Chitral and Swat Valleys. Work on the Buddhist and early historical periods of the area was been carried out by Sir Aurel Stein (1930) in his study *Serindia: An Archaeological tour in Upper Swat and adjacent hill tracts*. Rashid in his article 'Swat and its Archaeological Remains' (1966) reviews a number of previous works and tries to assess the impact of past heritage on the cultural patterns of today. Similar work on the excavations and archaeological findings by Inayat-ur-Rahman (1968) also discusses past excavations and their results. Important works regarding the recent history of the area include those of Yousufi (1961), Hussain (1962), and Khan (1982). The work of Yousufi, *Yousafzai Pathans*, traces the history of the Yousafzai tribe in the Swat Valley. Hussain's book, *The Story of Swat*, discusses the history of the former Swat state as told by its former ruler; while the work of Roshan Khan elucidates the ethnic history of the Pathans.

Many studies have been carried out relating to the anthropology of the area. Among them, the study of Rehman (1969) highlights similarities between the present folk customs and traditions and those of the ancient (Buddhist) inhabitants of Swat Valley. In addition, a series of works on the anthropology of the area has been published by Barth (1956), in which the author has brought out the ecological relationships between the inhabitants of the area.

Among works on the sociology of the area, the most famous are those of Ahmad (1962), Fautz (1963), and Barth (1971). Ahmad has examined the overall social structure of the area, while Fautz has related the social structure of Swat Valley to its agricultural landscape. On the other hand, Barth has discussed the existing social stratification and social structure of the society. The economy and overall resources of the area have been discussed in a government report (Khan 1971) entitled *Integrated Resource Survey and Development Potential of Swat River Watershed*. Other government reports written on the various sectors of the economy of NWFP also include sections on the area. These include, *The Agricultural Economy of NWFP* (1970), and *The Industrial Profile of NWFP* (1982). Economic and demographic statistics on the valley are available from a variety of publications such as *Development Statistics of NWFP* (Govt. of NWFP 1984), *Pakistan Census of Agriculture* (GOP 1980), *Agricultural Statistics of Pakistan* (GOP 1979), and population census publications (GOP 1981).

Some works on geology and mineralogy of the area are those of Sultan (1970) and Tahirkheli (1959). Important studies on the glaciology and hydrology of the area include those of Porter (1970) and WAPDA (1964). The former study discusses the glacial records in Swat Valley in the Pleistocene period while the latter is a reconnaissance report on the area.

In biological sciences the work of Nazir (1969) published as an article *Trout in Swat* analyses the distribution and ecological habitat of trout, while Champian et al. in their study *Forest types of Pakistan* (1965) have discussed the ecological habitats of forests in Swat Kohistan. G. Mountfort (1969) in his work, *The Vanishing Jungle* describes the habitat and wildlife. Work on the irrigation organizations prevalent in Swat Kohistan has been carried out by Ali (1989); this work focusses on the traditional customs and law for the extraction, manipulation, and management of water for irrigation. Two studies have been carried out on the geography of settlements. Israr-ud-Din's (1972) work *Settlement patterns in Peshawar and Malakand Division*, is very generalized; nevertheless, it provides some information on the distribution and location of settlements. Ali's 1985 work, *Settlement Patterns in Swat Valley*, however, provides an in-depth analysis of human settlements in the area, and the present paper is primarily based on its findings.

Units of analysis. The unit of analysis for this study is the Swat Kohistan area of Swat Valley which has been discussed regionally and ecologically in terms of its settlement patterns and house types. The units of analysis which elaborate the impact of the physical conditions on human settlements and their house type include elements of the physical environment such as topography, drainage, lithology, altitude, climate, and seasonality. Moreover, the units of analysis for describing and explaining the origin, distribution, and functioning of the settlements include elements of the society from its various analytical spheres: kinship structure, tribal structure, access to land and water, land tenure system, and social organization from its social sphere; religion, folk customs, and traditions from its cultural sphere; and leadership, power, and status from its political sphere. All these units of analysis have proved to be ideal parameters for describing and analysing the patterns of human settlements and their house types in the study area.

Methodology. This study is exploratory, descriptive, comparative, and analytical in nature. The analytical and descriptive observations presented are based upon field research and survey research methods utilizing key informant interviews, documentary analysis, and direct observation. Before the compiling of this paper, a rapid rural appraisal of the area was carried out for cross-checking and for the latest information.

Study area

Physical background

Physiography. The Swat Kohistan area consists of the northern half of Swat Valley. It covers an area of 1238 sq mi, or more than half of the Swat Valley (2375 sq mi). It consists of rocky, rugged, and complex mountainous land including great heights. In these areas, there is perpetual snow and high glaciated peaks. This area is located north of Madyan, a village situated 70 miles upstream and with an elevation of 4335 feet (1321 metres) above mean sea level. The limit of this region is defined by the two principal

tributaries the Swat River, the Utror and Ushu rivers in the west and east, respectively. These rivers join near the village of Kalam situated 100 miles upstream with an elevation of 6800 feet (2073 metres) above mean sea level, and form the Swat River which flows toward the south. These rivers have made small valleys which separate the mountain summits. These valleys are very narrow with steep slopes and seem almost like gorges. The Swat River also forms a gorge from Kalam to Madyan. In this region, the altitude and relief decrease southward. Two large spurs project toward the south from the main mountains of Swat Kohistan. The western spur forms the boundary between Swat and Dir Districts. This spur possesses glaciers in the north. The western spur is called Mankyal Ghar and forms the watershed between the Swat and Indus River basins. At the north, it starts as a single spur, but towards the south it is reduced to many low ranges.

Climate. Swat Kohistan has warm, dry summers and cold, moist winters. The mean annual temperature is 50°F. Precipitation occurs mainly in the winter and early spring. All the winter precipitation is in the form of snow and the accumulated snow at Kalam may reach from 8 to 14 feet.

Natural vegetation. Vegetation is the product of climate. Climate and topography have produced a marked altitudinal zonation of natural vegetation in the area in the form of a variety of forests. More than half of the area is under forests which are being exploited very ruthlessly.

Sociological background

Ethnic characteristics. Swat Kohistan is predominantly inhabited by the Kohistani and Gujar ethnic groups. These tribes are discussed separately below.

Kohistani tribe. As the name signifies, they are the people living in the mountainous, forested, deep and narrow gorges of the Swat Valley (*koh* means 'mountain' and *Kohistani* means 'people of the mountains'). The Swat Kohistan area comprises two tehsils, namely Bahrain and Kalam. In Bahrain Tehsil, the Kohistanis belong to the Torwal tribe. They speak the Torwali language which is a Dardic, language, while those living in northern Kalam Tehsil speak a Kohistani language. Both of these tribes have fair complexions, with mostly greenish eyes and red hair. These people are believed to be the ancient inhabitants of Swat valley who had been pushed to these areas by various waves of conquering newcomers. So far, these people have continued to maintain their independent existence. They practice a high degree of endogamy. They are Sunni Muslim by faith and are agriculturists by occupation. Due to strong ethnic cohesion and equitable distribution of land, there is little social stratification and polarization in their societies.

Gujar tribe. The Gujar is an important cultural group inhabiting the area. They are of the Jat or Rajput race found elsewhere in the subcontinent and have clans similar to those of the Afghans or Kohistanis. In addition to Pashto, they speak the Gojri language which also includes words from Panjabi, Urdu, and Hindko. They live on the mountainous slopes and are Muslims. These Gujars were originally grazers and nomads and were pushed by powerful invaders to these marginal hilly and mountainous slopes. Their main occupation is the rearing of cattle and grazing of goats and sheep, as well as cultivation of small pieces of land which they lease from the local landlords. In Kalam Tehsil, one of the settlements and its cultivable catchment area has been encroached upon by this tribe, through the settlement of Gabral. Apart from these tribes, a very small number of people

usually belonging to specific religious groups are also found in some settlements, e.g. Jalban and Gahil villages in Kalam Tehsil. These people were brought from the lower Swat Valley in the past for their religious services. They include the Mullakhel. They speak Pashto in addition to Kohistani. Their house type is like those of the Pathans.

Economic and demographic characteristics. The basic economic activity of the Kohistani tribe is agriculture and timbering which is controlled by the relief and climate of the area. The total cultivable area of Swat Kohistan is 9280 acres. Of this, 3961 acres are concentrated between 5000 and 6000 feet above sea level, in Bahrain Tehsil. These lands have steep slopes with narrow, terraced farms. The climate is also unfavourable for the production of crops. The soils are very thin, acidic, gravelly sandy loams. The irrigation system of the area is based on small channels taking water from the tributary streams of the Swat River and the nearby springs. Irrigation is practised on a communal as well as individual basis depending upon the terrain and availability of land and water. Potatoes are grown exclusively as *kharif* crop, while wheat is the indigenous *rabi* crop in Bahrain Tehsil.

Kalam Tehsil comprises 5319 acres of cultivable land which are located above 6000 feet elevation. These lands have extremely steep slopes with highly terraced farms and severe climatic conditions and hence they are less favourable for the production of crops. Here, only one crop of potatoes is grown annually. Above 8000 feet, due to extreme climates and unfavourable terrain, agriculture is absolutely uneconomical. According to 1981 census figures, the area contained 75,187 persons. Of them, 56,611 lived in Bahrain Tehsil, while 18,576 were in Kalam Tehsil.

Settlement pattern

By settlement pattern we mean the patterned manner in which household and community units are arranged spatially over the landscape. It is the order observed by members of the society in the utilization of space. It is the plan according to which houses, shopping centres, graveyards, forts, fields, and shelters are distributed over the landscape. The settlement pattern can be conceived of in three levels.

i. The first or basic level is the individual houses or structures.
ii. The second is the manner is which these houses and structures are arranged within a single community.
iii. The third is manner in which these communities are distributed over the landscape.

Settlements, which are the basic expressions of man in the utilization of space, produce different patterns in different environments and ecological settings. The landscape of Swat Kohistan is characterized by rural settlements. The origin, growth, distribution, size, pattern, and house types of these rural settlements are discussed below.

Origin and diffusion of settlements in Swat Kohistan

The origin of human settlements in Swat Kohistan goes back to proto-historic times. Archaeologists have discovered four settlements of this period along the Kalam-Utror route (Stacule 1970). The evolution of these ancient settlements can be explained on the basis

of the particular position of the area for its nearness to the Chitral valley and its connections with the Hindukush, Pamir, Karakoram, Oxus Valley and the whole of the subcontinent. Due to the abundant supply of pasturage, water, and building materials the region offered, nomadic and semi-nomadic people came and settled in the area along the direct route between Chitral and Swat Kohistan. They constructed their settlements along the raised terraces of the Utror River in somewhat flat and plain terrain. After the passage of time, other proto-historic tribes such as Iranians, Greeks, Scytho-Parthians, Khushanas, and Shahis came to the Swat valley and constructed their settlements along the banks of River Swat and its tributaries. At the end of the Maurya period (324–185 B.C.), Buddhism spread in the whole of the Swat valley, which became a very famous centre of Buddhist religion. In 1023 A.D., Mahmood of Ghazni attacked Swat and crushed the last Buddhist King, Raja Gira, in a battle. The invasion of Mahmood of Ghazni is of special importance because of the introduction of Islam as well as changing the chronology of settlement patterns in the whole of the Swat Valley. The original Buddhist people embraced Islam by force. The dissenters were either killed or sought refuge in the northern Swat Kohistan which provided them with shelter. These people were called the Red-Kafirs. They embraced Islam later on. They are believed to be the present Torwals and Kohistani people inhabiting Swat Kohistan. In 1515, another Pathan dynasty invaded the Swat Valley and conquered it by force. This was the Yousafzai tribe who came from Afghanistan. This tribe captured the most fertile and easily accessible lands of the valley. The Kohistanis on the other hand, due to their locational advantages in the northern hilly and forested regions, at great heights of rough terrain, have been living in the habitat along with their Indus Kohistani brethren, and continue to live here. Unlike the Yousafzai sociological landscape, the Kohistanis live in a homogeneous and less hierarchical society. People of other tribes have not settled on their lands, neither have they been incorporated in the local economy over the ages. All land belongs to the Kohistani clan, which does suffer from the usual phenomena of fragmentation. The mountain slopes, inhabited by the Gujars on the periphery of the River Swat and its tributaries, form the frontier settlement of the valley, beneath the watershed area. These Gujars, who are basically grazers and nomads, practice transhumancy. They live in dispersed and isolated settlements along the hill and mountain slopes.

At present, Swat Kohistan contains a total of 112 settlements. Of them, 35 are located in Kalam Tehsil while the remaining 77 are in Bahrain Tehsil.

Size and distribution of settlements

Study on the size and distribution of settlements in Swat Kohistan has revealed that small settlements with less than 500 people are predominant in the area. They are locally known as *bandas* (dispersed settlements). They account for about 68 per cent of the total settlements. The rest of the settlements are nucleated villages with more than 5000 population. The size of settlements has been affected by physical, social, and economic factors as discussed below.

iii. Ethnic traditions. Due to this factor, the brothers and cousins usually construct their houses away from the original settlements in the form of nuclei, resulting in dispersal of the old settlements. Thus the size of the original settlements is becoming smaller and new small settlements are originating.

iv. Agrarian regime. Because of the permanent distribution of land, the landlords followed by their servants and relatives have constructed houses on their cultivated fields resulting in the small size of settlements.

v. Political conditions. In the past, the area was settled during troubled periods. There were internal and external wars which resulted in the nucleation of larger settlements. Due to the present stable conditions, the settlements are disintegrating and becoming smaller.

Economic factors

i. Availability of agricultural lands. Agricultural land is a scarce resource in the area and is confined to the raised alluvial terraces and fans, found near the mouths of the tributary streams of the Swat river. Thus large nucleated settlements are confined to these areas while the small settlements are located on the mountain and hill slopes.

ii. Availability of forests. Timber cutting is the most important economic activity in the area next to agriculture. Settlements are usually concentrated at the rims of thick forests near the banks of the streams. Here large size settlements are found.

Pattern of settlements

In depth study of the typology of settlements has revealed that all existing settlements in Swat Kohistan are rural in character. These rural settlement are called villages and *bandas*. A village is an aggregation of contiguous houses, while a *banda* consists of detached, semi-detached, and isolated houses. These villages and *bandas*, due to their varied environmental conditions, lack large-scale manufacturing and commercial activities. In these rural settlements, more than seventy-five percent of the population is engaged in agriculture, timbering, and grazing. The patterns of settlements found here are:

i. Nucleated settlements. They have a dense core and are surrounded by a loose sprawl of buildings which have their nuclei in the main settlement.

ii. Compact settlements. In this case, the buildings are grouped together in a compact form with terraced houses separated by streets and roads. The most important factors which have contributed to nucleation and compaction of settlements include the elements of natural or physical, social, and economic environments. Among the elements of physical environment, uniformity of relief and soil fertility have an important role in the nucleation and compaction of settlements. The elements of the social environment contributing to nucleation and compact settlements include conditions of security, clan solidarity, and communal works; while the economic factors leading to nucleation and compaction of settlements include distribution of resources, agricultural cooperation, and fragmented holdings.

iii. Hamleted or fragmented types of settlements. This is a settlement pattern transitional between the nucleated and dispersed patterns. In this case, there is one main

or original settlement along with one or many young settlements on the original village site. They have evolved due to the uneven and broken terrain as well as absence of flat lands, increase in the population of the original settlements, inter-tribal constraints, etc. The nucleated, compact, and hamleted or fragmented settlements are mainly confined to the banks of the tributary streams and the Swat River which is dominantly inhabited by the Kohistani ethnic group.

iv. Dispersed settlements. In this case, the houses are separated from one another and are widely spaced. Such settlements are confined mainly to the hilly and mountainous slopes which are predominantly inhabited by the Gujar ethnic group. Availability and distribution of small lands in patches, grazing grounds, ruggedness of the topography, and pastoral activities of the people are the main causes of dispersed settlements. The nearest-neighbour index of spacing, 'R', worked out for the area is equal to 1.73, which indicates a dispersed or scattered pattern of settlements.

Shape of settlements

Due to the varied environmental conditions, the settlements in Swat Kohistan have assumed various shapes. They include:

i. Rectangular settlements. This shape is found in the nucleated and compact settlements inhabited by the Kohistani clan. In this case, the buildings are compact and are surrounded by agricultural fields or other natural features; as a result, the settlements have assumed the shape of rectangles.

ii. Ribbon or linear settlements. In this case, the buildings are arranged side by side along the roads, river, or stream banks. Such settlements are also found in the area inhabited by Kohistanis.

iii. Double villages. These are twin settlements standing on either side of a river or stream. Nearly all settlements in the area are in the form of double villages because of the high drainage density of the area and location of settlements near these drains.

iv. Shapeless settlements. The dispersed settlements inhabited by the Gujar ethnic group are usually shapeless because of the absence of roads and important physical features.

House types

As stated earlier, the first and most basic level in the study of settlement typology is the individual building structure. These individual buildings or houses are parts of settlements or in other words, settlements are made of houses. Figure 3 shows typical floor plans for Pathan, Gujar, and Kohistani house types.

The immediate physical and socio-economic environment determine the house type in the Swat Kohistan area. The common house type, observed in the area, consists of two or three rooms attached to each other with doorz. In winter, cattle are penned in the third room and the residents live in the second room. In summer, the cattle are penned in the veranda and the residents live in the first room. Above the third room, two small rooms

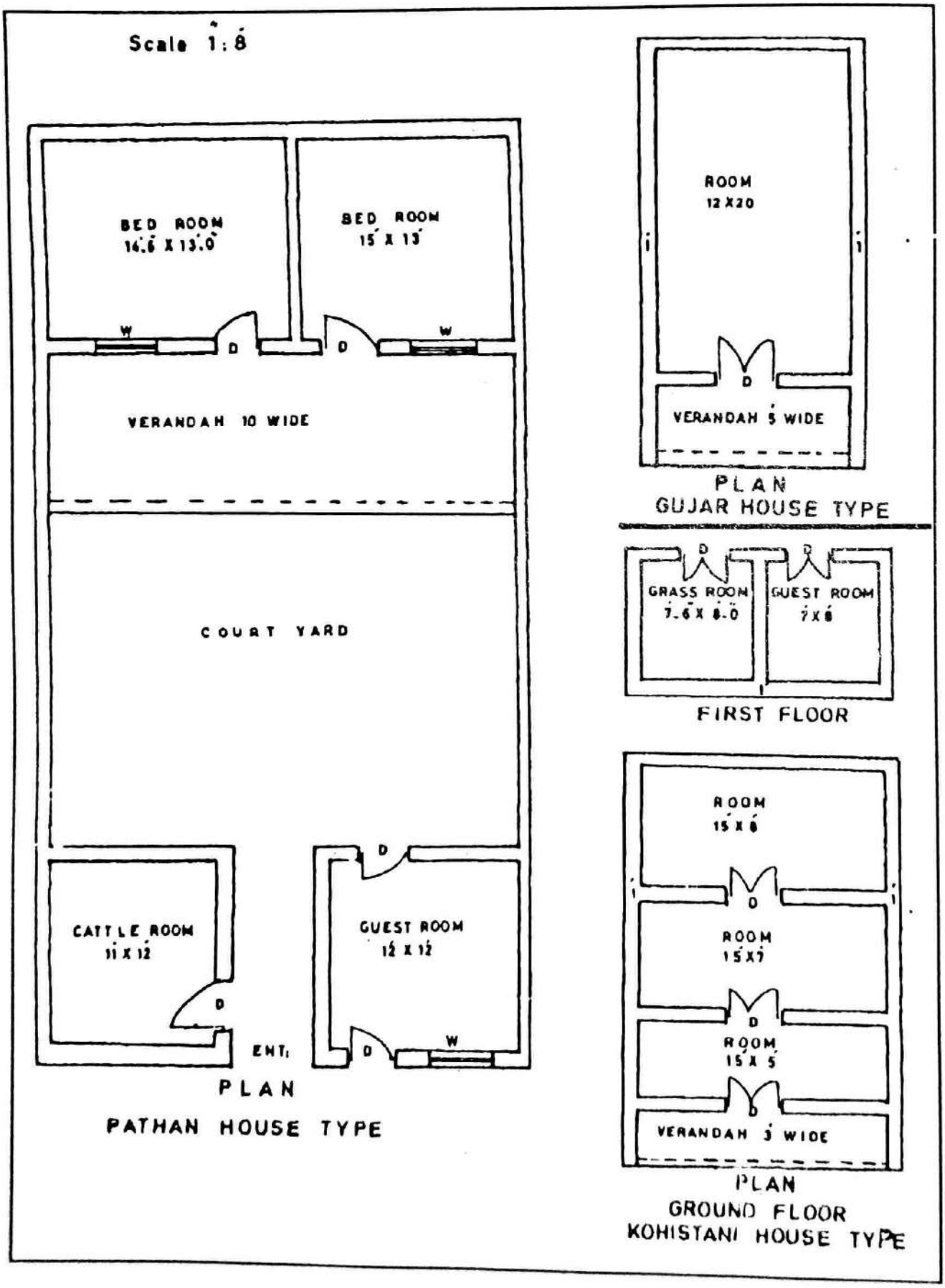


Figure 3 Common house type and plan in Swat Valley

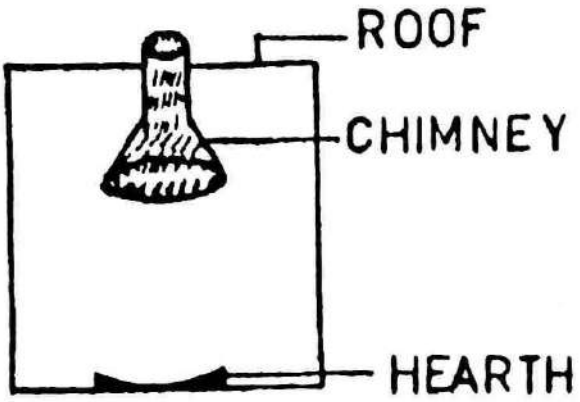
are constructed whose doors open to the back of the house. They are connected with the ground by stone or wooden stairs. One of these rooms serves as the guest room or *baiThak*, while the other is used for storing straw. In the flat roof of the second room, immediately above the hearth, a chimney is constructed which is similar in function to the chimney found in the *Khowar xatán* of Chitral District. The difference is that while constructing a *kumal* (smoke-hole), a bulge is created in the roof while in the Kohistani type only a chimney is put in the hole in the roof of the second room.

The roofs are flat and overhang the walls to protect them from rain and snow. The roofs slope towards one side to drain rainwater and snow. The building materials are wood, mud, and stones. The roofs of houses are made of heavy wooden beams and smaller beams on which mud mixed with straw is laid and pressed by tramping or wooden rollers. The walls are made of stones and wooden beams. These walls are then plastered with mud mixed with straw and cow dung. Nearly all the houses are without enclosed open spaces outside. Figure 4 shows construction details of some Kohistani house types.

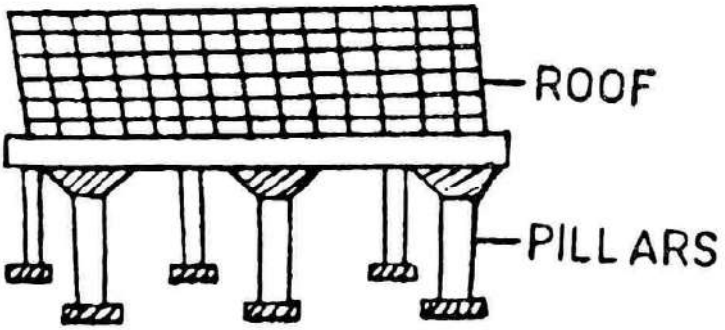
Most of the mosques are made of wood and thus represent the biggest wooden structures visible in the villages. The Kalam Mosque is a notable example. In addition to these *kačča* housing units, some wealthy people have constructed *pakka* or permanent houses in which steel, cement, concrete, and burnt bricks have been used in the roofs as well as walls. The majority have used copper plates in the roofs. The survey has revealed that out of the total housing stock of 12,995 in the Swat Kohistan area, 12,445 are temporary or *kačča* while the rest of 550 are *pakka* housing units. The survey has also revealed that the average number of rooms per house in Bahrain Tehsil is 3.0, while in Kalam Tehsil it is 3.5.

The houses of the Gujars consist of simple houses or huts which are similar to the living spaces of their cattle. They generally consist of two rooms — one for humans and the other for cattle. The are also without lawns and in some cases without doors. Their walls are made of irregular and rough stones without mud plastering. In addition, there are single-room houses or huts concentrated over the pastures. They are used by the transhumants in the summer months. They are temporary structures made of stone, wood, and mud.

The most important pressing problems of human settlement in Swat Kohistan include lack of amenities, transportation, electricity, communication, population pressure, health facilities, water supply schemes, and poverty. Therefore, these problems should be solved immediately, otherwise their magnitude will increase manifold and will become difficult to solve in the future. The Government should develop institutions and various planning boards for the development of the area on modern scientific lines. The area offers great potential for the tourist industry with its beautiful valleys, snow-clad mountains, glaciers, gushing streams and favourable climatic conditions. Therefore, if this area is developed for tourism it will become a paradise and the socio-economic conditions of its inhabitants will develop accordingly.



CHIMNEY IN A KOHISTANI HOUSE



ROOF AND PILLARS OF A "KUTCHA"HOUSE

Figure 4 Construction details of Kohistani houses

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Demographic Characteristics of Chitral

*M. Anwar-ul-Haq and Kishwar Ijaz**

Introduction

Just as effective development in modern socio-political life depends on reliable knowledge of natural and other resources, so effective development planning depends on reliable knowledge of population. In conducting such planning, an important question is: "What is the present and future demand for goods, facilities, and services in both the private and public sectors of the economy?" The answer to this question for any area depends upon its present state of population. How many people are there and what are their characteristics? Are the male and female components balanced or unbalanced? Are the different age groups balanced or unbalanced? Where does the population live within the defined geographic boundaries of the area?

The size, distribution, and composition of the population have an important relation to the standard of living. In some areas, this relation is such that available resources are minimal for each individual. Other areas have a better population–resources balance. The welfare of each individual as well as of the community or society as a whole is dependent on the nature of the population–resources balance. In any country, province, or locality, it becomes important to study the existing demographic conditions.

This paper describes the size, distribution, and characteristics of the population (growth rate, sex ratio, dependency ratio, child-per-woman ratio, doubling time, literacy rate, health facilities, and housing facilities) in Chitral District. Data from the 1972 and 1981 censuses were used for this purpose.

Age and sex composition

The size, growth rate, and age distribution of a region's population have been identified by planners as being some of the most important factors which affect its economic development. These factors, however, operate independently of one another, and each one of them should be considered separately in analysing its effect on the growth of per capita income in a country.

A high rate of population growth necessitates a high rate of capital investment to maintain the existing or to achieve a given per capita rate of economic output. In a region where the supply of capital is short, a high rate of population growth requires a high rate

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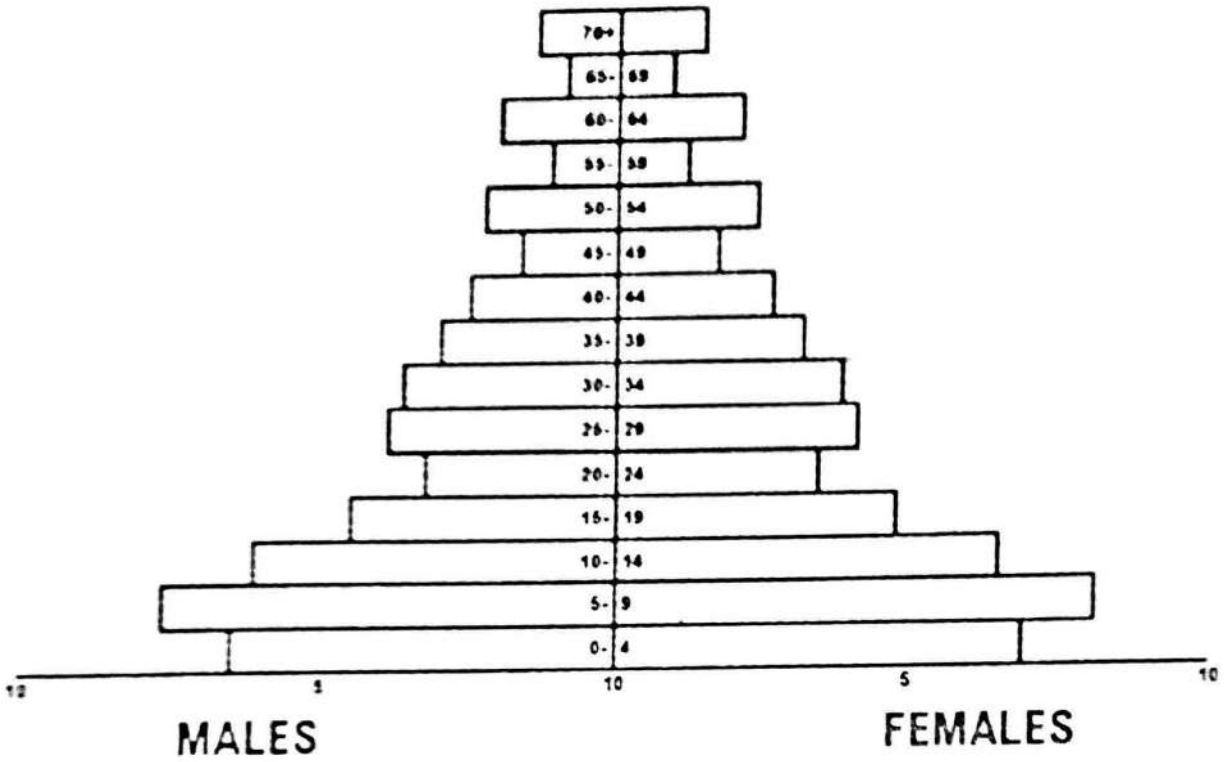

Figure 1 Population pyramid for Chitral, 1972.

of capital investment just to maintain the existing facilities. With a lower rate of population growth, the same amount of capital investment could lead to a higher level of per capita production, and hence a higher level of income.

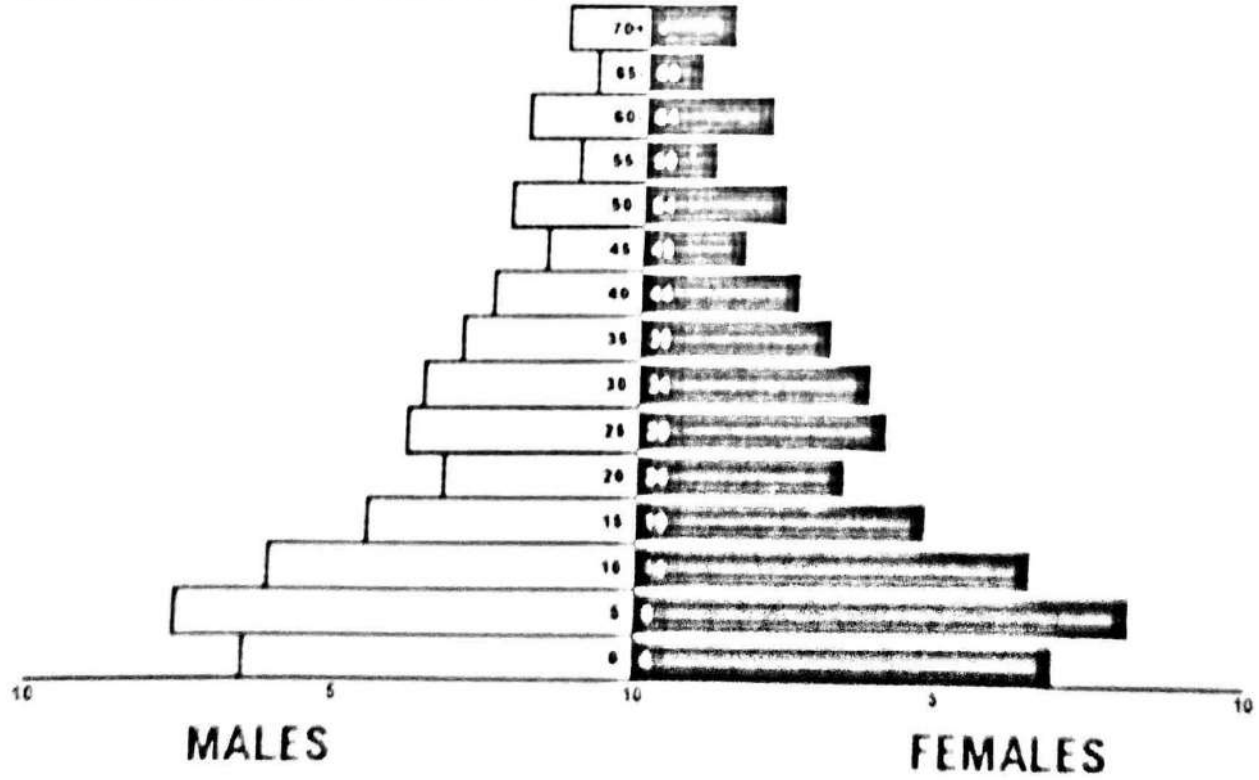

Figure 2 Population pyramid for Chitral, 1981.

The effect of age distribution on economic development can be seen in terms of the relative proportions in a country's population of (1) persons who are dependent for their support on the rest of the population because they are too young or too old to work; and (2) persons who are in the biologically productive stages of their lives. In a population where the effect of migration is negligible, age distribution is determined primarily by the fertility course experienced by the population. In Chitral, where levels of fertility have been persistently high, the age distribution of the population is broad based, the younger age groups forming a relatively higher and the older age groups forming a relatively smaller proportion of the population as a whole. According to the 1981 population census, about 42.0 per cent of the population of Chitral was under 15 years of age, about 45.1 per cent was in the biologically productive category of 15-60 years, while about 6.2 per cent was constituted by older persons of 60 years or above. Figures 1 and 2 show population pyramids for 1972 and 1981.

The relative proportion of children under 15 years of age plus those who are 60 years and over to the biologically productive age group of 15-60 years constitutes the **dependency ratio** of the population. The dependency ratio for Chitral is 93, compared to 87 for Pakistan as a whole.

Table 1. Population by sex, total size, and household size for Chitral District

	Population 1981				
Area	Both sexes	Male	Female	Population 1972	Household size
Chitral District	208,560	107,948	100,612	159,000	6.9
Chitral Subdivision	121,641	64,305	57,336	87,617	6.8
Mastuj Subdivision	86,919	43,643	43,276	71,393	7.0

The data in Table 1 show the population of District Chitral by administrative unit, sex, and household size. The information in Table 1 indicates that, in 1981, 51.8 per cent of the population of Chitral District was male, as compared to 48.2 per cent female. In Chitral Subdivision, there were 52.9 per cent males and 47.1 per cent females, while Mastuj Subdivision had 50.2 per cent males and 49.8 per cent females. At all three levels, males constitute a greater proportion of the population than do females. The data further show that, on the average, the household size in Chitral District and in both the Subdivisions is seven.

The child/woman ratio is a simple measure of period fertility. The usefulness of this ratio arises from the fact that it requires information only on the age and sex structure of the population.

Table 2. Sex, dependency, and child/woman ratios for Chitral District, 1972 and 1981

	Ratios, 1972			Ratios, 1981		
Area	Sex (m/f)	Dependency	Child/ woman	Sex (m/f)	Dependency	Child/ woman
Chitral District	105	92	0.64	107.2	93	0.70
Chitral Subdivision	110	91	0.67	112.1	92	0.71

	Ratios, 1972			Ratios, 1981		
Mastuj Subdivision	99	107	0.61	100.8	95	0.68

The data given in Table 2 show the male/female sex ratio (calculated for 1981 on the basis of the figures in Table 1), dependency ratio, and child/woman ratio for both the 1981 and the 1972 censuses.

The sex ratio shows a higher proportion of males than females in Chitral District. The data on dependency burden show a very high rate of dependent population in Chitral District. Furthermore, the child/woman ratio in the district is also high. The high dependency and child/woman ratios show that Chitral District has a poor economy and high fertility, which is surely affecting the quality of life in the area.

Population growth rate and doubling time

The population growth rate of Pakistan is in the vicinity of 3 percent per annum, which is the highest among the nine most populous countries of the world (Rukanuddin and Farooqi 1988). The data given in Table 3 indicate that the growth rate in Chitral District is higher than the growth rate of the country, which has very bad implications for the resource development of the area.

Table 3. Population growth rate for Chitral District

Area	Inter-census increase, 1961-72 censuses	Inter-census increase, 1972-81 censuses
Chitral District	2.90	3.3
Chitral Subdivision	n.d.	4.0
Mastuj Subdivision	n.d.	2.4

The data presented in Table 4 reveal that the population of Chitral District will double in the 21 years commencing with the 1981 census. Efforts must be made through appropriate policies and programmes to reduce the rate of population growth and prolong the time before the population doubles.

Table 4. Population doubling time for Chitral District for 1981

Area	Population doubling time (years)
Chitral District	21
Chitral Subdivision	18
Mastuj Subdivision	29.5

Level of literacy

It is widely assumed that unless education expands a nation cannot benefit from the blessings of modern technology and science. There is no direct cause-and-effect relationship here; education programmes alone cannot induce economic development. Yet it is equally clear that lack of literacy and education can retard economic development. A certain minimum level of literacy seems to be required in order for a population to break out of the vicious circle of a subsistence economy into full participation in a modern economy based on complex technology and intricate systems of specialization and exchange. It should be kept in mind that it is not only the number of educated people in a society which determines its ability to progress rapidly; the more important factor is the quality of education and quality of manpower, its character, motivation, and sense of rationality, which the educational process should bring into being. It is the type and quality of education which determines whether the society will be able to develop rapidly or will destroy itself through its own mechanism. For these reasons, the educational level of the population is of great interest and concern.

Table 5. Literacy level in Chitral District

	Percent literate, 1972			Percent literate, 1981		
Area	Both sexes	Male	Female	Both sexes	Male	Female
Chitral Division	8.6%	15.1%	1.4%	14.1%	27.7%	2.9%
Chitral Subdivision	n.d.	n.d.	n.d.	14.6%	24.0%	3.3%
Mastuj Subdivision	n.d.	n.d.	n.d.	13.6%	24.9%	2.5%

n.d. - data not available

The data presented in Table 5 indicate a very low literacy rate in Chitral District. Further, the literacy rate among women and girls is much lower than that of men. It can be concluded that the low level of education in Chitral District is an indicator of underdevelopment in the district.

Health facilities

Health planning may be defined as that aspect of overall development planning which includes all the public services for promoting and maintaining the health of all individuals of the society. Increase in the income and standard of living of the population, as well as increase in its absolute size and greater awareness of health needs in any society affect the demand for health services, and consequently the resources which become available for the provision of health services. Health planning includes, among other things, programmes for environmental improvements, personal and social health services, and control of communicable diseases and general services contributing to good standards of nutrition.

Table 6. Health facilities in Chitral District

Census year	Hospitals	Beds	Dispensaries
1972	4	72	38
1981	3	56	35

The data shown in Table 6 indicate that there were 4 hospitals, 72 beds, and 38 dispensaries in Chitral District in 1972; and 3 hospitals, 56 beds, and 35 dispensaries in 1981. It is astonishing to note that the number of hospitals, beds, and dispensaries decreased rather than increased during the ten years between 1972 and 1981. This is a clear indicator of the poor level of health facilities in the district.

Housing conditions

The study of population is focused on the structure, distribution, and components of population growth—namely fertility, mortality, and migration—as well as on their determinants. The unit of observation in these analyses has usually been the individuals themselves, either by sex, or as couples. However, in any society, individuals do not behave in isolation; their general participation in various activities is either in aggregates or groups. The most important human grouping is the family and household. It is through the family that each generation is replaced by another generation. The family thus represents the molecular unit of society, which contributes to the growth of population through the mechanism of its reproduction process, and also fulfills its responsibilities to the young and aged of the society. Since a family or household in most cases is supposed to occupy a housing unit, a study of the household becomes of paramount importance in analyzing housing trends for planning for future needs.

Table 7. Percentage of households using various energy sources in Chitral District, according to 1981 census

	Water		Light			Cooking fuel		
	River/ stream	Other	Kero- sene	Electricity	Other	Wood	Gas	Other
% house- holds	96.6	3.4	92.5	3.9	3.6	98.7	0.1	1.3

The data in Table 7 show that 96.6 per cent of the households in Chitral use river or stream water, while only 3.4 per cent use other sources of water. A vast majority, 92.5 per cent of the households used kerosene oil for lighting, as compared to 3.9 per cent using electricity and 3.6 per cent using other sources. Again, a majority (98.7 per cent) of households used wood as cooking fuel; only 0.07 per cent used gas, and 1.28 per cent other sources. It is clear that the people in Chitral are overwhelmingly using traditional sources of water, light, and cooking fuel; this is an indicator of poor housing conditions in Chitral District.

Conclusion

The three administrative units considered—Chitral District, Chitral Subdivision, and Mastuj Subdivision—have a smaller female than male population. The data cited in this paper further reveal that on the average, the household size in Chitral District and in both subdivisions is seven. In Chitral District, the total male population exceeds the female population. Dependency and child/woman ratios are very high, showing a poor economy and high fertility respectively. The low level of education in Chitral District is an indicator of the underdevelopment of the area. The population growth rate in Chitral District is even higher than the growth rate of the country overall, which has very serious implications for the resource position of the area. There were 4 hospitals, 72 beds, and 398 dispensaries in Chitral District in 1972; whereas in 1981 there were only 3 hospitals, 56 beds, and 35 dispensaries. The number of hospitals, beds, and dispensaries decreased rather than increased in Chitral during the period under consideration, giving a clear indication of the poor health facilities in the district. The overwhelming majority of the people in Chitral use traditional sources of water, light, and cooking fuel, which is an indication of poor housing conditions in the district.

It is therefore strongly suggested that planners keep these indicators in view in planning the development of the area.

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Culture Area Karakoram Project: A New German–Pakistan Interdisciplinary Program

*Eckart Ehlers, Irmtraud Stellrecht, Matthias Winiger**

High mountain research has gained considerable importance and international recognition in recent years. In the Asian context, two areas have been outstanding in that respect: the Hindukush and the Himalayas. The Hindukush has attained considerable scientific attention, especially in the years before 1980. In recent years, different parts of the Himalayas have been the focus of more or less intensive research. (For a recent survey see Ives and Messerli 1989). Without going into details, it is a startling fact that the mountainous regions of northern Pakistan have been more or less omitted from this general interest. With the exception of the International Karakoram Project (Miller 1984), no systematic research has been carried out so far. Such a statement holds true not only for the region as a whole, but also for its different parts like Chitral, Hunza, or Baltistan.

The following paper is not a research paper in the proper sense of the word; it is a paper **about** research. It is on a research project which is under way and which, hopefully, will be under way for quite a time to come. I want to give a report and an introduction on the development, the intentions, and the organization of a project that has been named the **Culture Area Karakoram** (CAK) Project. This project came into existence in 1989, sponsored and financed by the German Research Council (DFG) and designed for a period of altogether six years, divided into three, two-year periods. It is a project that is both **international** and **interdisciplinary**, and which has, at its regional focus, the thus-far missing link between the Hindukush in the west and the Himalayas in the East.

It is international in that it is a Pak–German project, based on scientific cooperation between Pakistani and German scholars. As such, it wants to be seen as a continuation of long-standing German research **in** and **on** Pakistan, studies that after World War II have been closely connected with the name of Professor Karl Jettmar and his team from the South Asia Institute (SAI) of the University of Heidelberg. At the same time, however, both Professor Jettmar and the coordinators and members of the CAK project want to stress that the CAK project is neither a continuation of nor an organizational supplement to the studies of the SAI It is a project of its own in content and approach, in scope and methodology, and in scientific purpose and execution.

It is an **interdisciplinary** project insofar as it attempts to combine different disciplines in regard to the solution of specific research problems. It therefore attempts to combine different disciplines—from geology to physical and cultural geography, and from anthropology to different philologies. The focus of their research is directed and concentrated on one specific research area, i.e. the Karakoram culture area.

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Against this background, the Karakoram area of northern Pakistan has been chosen as a research area for an interdisciplinary approach. The vital question is the relationship between

Environment - Man - Culture

in its physical, historical, and actual context, with special emphasis on the changes brought about by the opening of the Karakoram Highway.

Before going into details of the research project itself, it will be appropriate to delineate the basic assumptions, and the theoretical and practical considerations that are connected with this project. They may be considered under three aspects.

- the general state of the art in regard to high-mountain-area research;
- the Karakoram in its specific function as a research problem; and
- the general theoretical and methodological framework of the CAK project.

It should, however, be noted that all these studies should not only be seen only in the regional context of the Karakoram region proper, but that results and findings are considered to be of a general nature and therefore transferable to other parts of northern Pakistan. The following aspects should therefore be understood as general approaches which are likewise applicable to mountain areas such as the Hindukush or to mountainous environments such as Chitral.

1. The general state of the art in regard to high mountain area research

The relationship between **man**, **environment**, and **culture** has been at the centre of an intense discussion among scientists and professionals from different disciplines (e.g. biology, geography, agrarian sciences, social anthropology, sociology, and economics). The main point of interest has been the relationship between culture and nature. The dimensions, qualities, quantitative proportions, and changes over time of each of these elements are of central interest.

Man finds himself in an environment with all its given factors, such as climate, natural resources, altitude, landscape structure, and all the difficulties and risks that these imply. Man is, however, also able to make use of this environment and to shape it. Culture, with its norms and values, traditions and findings, which are all subject to change, can modify, transform, or even break up any given environment. The relationship between **man**, **environment**, and **culture** must therefore be understood as a dynamic interaction in which all sides play an active part. Today, the transformation of any environment and the utilization of its resources is no longer determined only by its inhabitants and their local experience, but also by external factors.

An increasing awareness of the significance of ecological and human systems in mountainous regions can be observed throughout the world (cf. e.g. the recent publication by Ives-Messerli and the periodical *Mountain Research and Development*). Mountainous regions very often host extremely well adapted and unique cultures, and provide basic natural resources (such as water, hydraulic energy, firewood) not only for the regions

themselves, but also for the adjacent lowlands. In addition, mountain ranges deter traffic, often also cutting off passages that would enable contacts and exchanges with the neighbouring lowlands. As a consequence of rapidly increasing pressure, extremely vulnerable mountainous ecosystems are undergoing dramatic environmental and cultural changes in most parts of the world. Especially the area of the Karakoram is presently undergoing profound ecological and socio-economic changes. This has consequences not only for the region itself, but for the whole country.

Recent research on highland-lowland interaction has been extensive, both on the national and international levels. Noteworthy in regard to the Karakoram region are the studies edited by Miller (1984) on the International Karakoram Project, published as proceedings of international conferences held in Islamabad and London. Similar approaches have been pursued, as mentioned before, in the neighbouring regions of the Himalayas. These undertakings are partly sponsored by or carried out in close cooperation with international institutions such as the MAB program of UNESCO, the United Nations University (UNU), and the International Geographical Union (IGU) (cf. Rathjens et al. 1973 and Troll 1972). In general, they involve a great number of detailed and highly important studies on specific aspects of mountainous environments. But many of these studies lack integrative approaches to research, interpretation, and discussion.

In contrast to these programs, the proposed research project on the **Culture Area Karakoram (CAK)** is based on an interdisciplinary approach and aims at the integration of different academic disciplines in all phases of its implementation and evaluation. **Man-geosphere interactions** are at the center of the research interest. Close cooperation between physical geography, human geography, ethnology, and different disciplines of the humanities (especially languages) is therefore indispensable. A more sophisticated approach to the complex problems in mountain areas aims at broadening and deepening our knowledge of man-environment interactions as well as highland-lowland interactions, and at transforming the results into practical strategies for the improved development of mountainous areas in the future.

2. The Karakoram in its specific function as a research problem

The culture area Karakoram (CAK) is characterized by a number of specific features, some of which are unique among the world's mountain regions.

a. The Karakoram mountains provide an extreme physical environment. Characteristic features include glaciated ranges with some of the highest peaks on earth, extensive glaciation (highest percentage of any mountain system outside the polar regions), and an extreme altitudinal zonation. Variations in the vegetation cover and climate influence the natural resource and land-use patterns, as well as highland-lowland interaction in general. As such, the Karakoram is an ideal test case for questions concerning extreme physical environments and highland-lowland interactions.

b. The Karakoram mountain system is unique in regard to its cultural diversity and history. Due to the fact that this area has always been a kind of barrier between Central Asia in the north and the Indian subcontinent in the south, the Karakoram has functioned as a region of refuge. As a result, this region is characterized by an extreme diversity of

ethnic, religious, linguistic, social, and economic groups. A multitude of different material and spiritual culture patterns can be found here in a confined area.

c. Extreme physical environments like the Karakoram are also characterized by a very low density of road networks, resulting in a low degree of accessibility. The construction of the Karakoram Highway and road links has induced fundamental changes by improving accessibility, communication, infrastructure development, and transmontane exchange.

In view of these unique features and the complexity of research problems, it is surprising that, in contrast to other mountainous regions, the Karakoram has not yet been the focus of interdisciplinary research. Ideally, the whole mountain system of the Karakoram and its foreland should be the focus of research. In reality, however, only small but characteristic parts of the total region and certain segments of its population as well as its material and spiritual culture can be included in the proposed research.

3. The general theoretical and methodological framework

As the research approach is an interdisciplinary one, all academic disciplines have been incorporated into an overall research design. This means that a main hypothesis has been chosen as a guideline for the methodological and theoretical approach of the research. In this context, the basic assumptions are the following.

1. An interrelationship between environment, man, and culture exists in any given spatial frame, especially in mountain areas.
2. This interrelationship is affected by different internal and/or external processes of change.
3. An analysis of the interrelationship of environment, man, and culture must evaluate the present situation in the light of historical processes and current impacts on the region in question.

The main objective of all disciplines participating in the Culture Area Karakoram project is to analyze such interactions and processes.

Ecological, cultural, linguistic, and ethnic differences characterize the Karakoram. The structural aspects of this relationship between environment, man, and culture can be transformed into a chronological working model which encompasses three different phases.

1. Initial Phase: Isolated mountain communities face a high degree of environmental dependence, loose integration into a trans- and intramontane communication network and therefore only sporadic exchange relations (economic autarky, socio-political autonomy, subsistence farming, utilization of ecological resources).
2. Intermediate Phase: Intensification of intra- and transmontane communication (approximately since 1850) due to external political and economic penetration of the Karakoram, reduced isolation, and induced changes in the utilization of the resource potential, with major impacts on the socio-cultural sphere.
3. Recent Phase: The spread of modern communications systems (e.g. the Karakoram Highway), a higher degree of socio-economic and cultural integration, intensified exchange relations, exploitation of natural resources, and increasing migration to

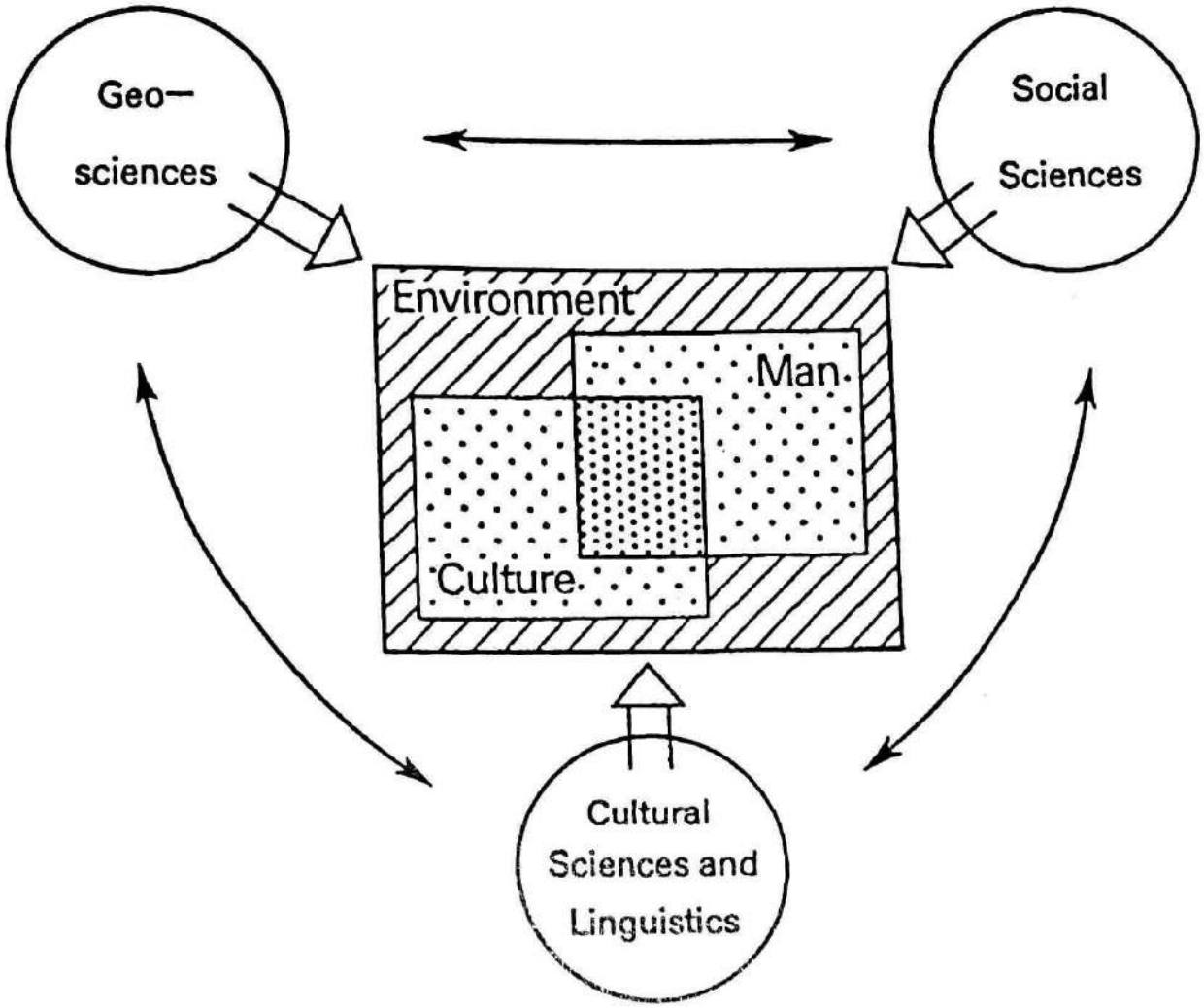

Figure 1 The Interaction of Man-Environment-Culture and its investigation using an interdisciplinary approach.

other areas due to the reduction of economic and cultural obstacles.

It is against the background of these general considerations that research was initiated a year ago. The project is planned for an overall duration of six years, divided into three two-year phases. So far the following projects have been started.

A. Physical geography

In physical geography — center of an interdisciplinary group of geographers, botanists, geologists, and hydrologists — a number of studies have commenced with the aim of investigating the following main aspects.

1. **Vertical and horizontal arrangement of climate**, e.g. precipitation, temperature, wind circulation, etc., within our research area. These studies are based not only on the elaboration and interpretation of existing data, but are to be complemented by data from a set of new weather stations which will be installed in specific areas (mainly Bagrot and Yasin valleys).

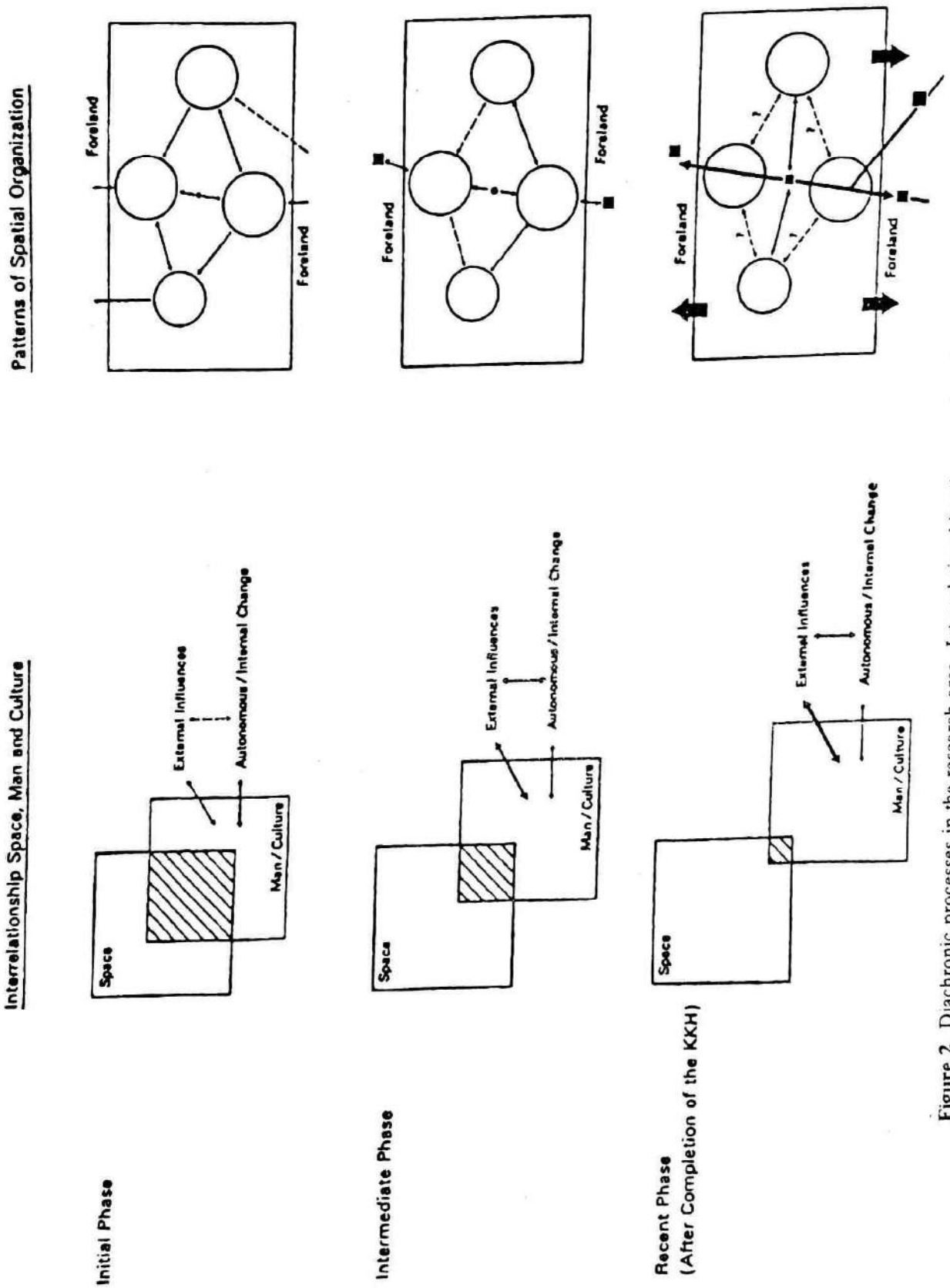

Figure 2 Diachronic processes in the research area. Interrelationship of man and environment: traditional and modern aspects.

2. Vertical and horizontal arrangement of potential vegetation, its regional variations, and its linkage to climatic parameters. In close cooperation between botanists and

geographers, not only recent, but also historical changes of climate and vegetation are to be investigated using modern techniques such as dendrochronology, pollen analysis, and radiocarbon dating.

3. Influence of human activities on the natural vegetation cover and its degradation; and mapping and classification of the surface coverage (land use and vegetation types). Special attention is given to the changing forest cover in different areas, with the Kaghan Valley as an additional case study. It goes without saying that these investigations are of utmost scientific and practical significance. The use of aerial photographs as well as of historical ground photographs is as important as that of satellite images, which are now available.

4. Man-induced environmental hazards such as landslides and erosion due to changes in land use or to road construction. Here again, it is self-evident that research of this kind does not need any justification. The environmental situation, i.e. the environmental degradation of areas like Hunza, Gilgit, Yasin, and Chitral speaks for itself and cries for both scientific investigation and practical remedy.

B. Cultural geography

A number of research activities have been started in the field of cultural geography as a broad umbrella for specific aspects of social and economic development and change, as a general term for investigations on the form, function, and structure of human activities within a given time and space.

1. Studies on the development, form, and change of central-place systems. To the best of our knowledge this study of a well-known and much discussed problem in Western countries will be the first of its kind to analyze the settlement hierarchy and its implications for traditional and modern regional development in any high altitude environment outside Europe or North America.

2. Research on economic systems and social organization in rural areas. The need for analysis of both traditional and changing land-use systems, of marketing mechanisms for agricultural products, of the context of irrigation and society, and the study of the impact of innovations on well established forms of rural production systems are the centre of this study, which has so far been confined to the Yasin valley.

3. Socio-economic participation of ethnic groups in high mountain environments. Research of this kind, taking the Wakhi as an example, has two foci. First, it aims at investigating the adaption process of a minority group which migrated into its present settlement areas only from about 1800 A.D. onwards. Second, it should result in a better understanding of the highly sophisticated system of high mountain agriculture. As such it may also improve our knowledge of agro-technologies in which physically/ecologically marginal resources are used.

It is clear that such a set of research objectives can only be covered completely by including a historical and political dimension. Besides corresponding approaches within each of the aforementioned studies, a fourth project of its own will be devoted to a fourth area.

4. The transformation of spatial structures in the Karakoram under the influence of exogenous forces. Central hypotheses of these studies include the fact that high-

mountain regions are dynamic complementary parts of their respective forelands, and that they reflect the social and economic changes of the lowlands and even those of a global character. The successive integration of the region under study into processes and influences of the world market, and their impacts on spatial and socio-economic development are the main research interests of this specific project.

C. Social/cultural anthropology

The first phase of research in anthropology has been started with two projects: one in medical anthropology in Yasin valley and one on the phenomena of culture change and acculturation in the Bagrot valley. Acculturation is a scientific term subsumed under the heading of cultural change; its meaning and content is that the meeting of two or more cultures sets in motion a process of change different, and operating with different intensity for each cultural field. In this context it means that change in Bagrot Valley is closely interlinked with the social, cultural, political, and economic development of the nearby urban center of Gilgit; and that traditional identities and world views are undergoing dramatic transformations. A fundamental starting point to understand these processes will be a **household analysis**. A household, including for example an extended family, and modelling an integrated network of personal relations, seems to be a good basis to gain insight into changes in all sectors of life, disclosing thus a whole spectrum of world views and identities.

Medical anthropology is a newly opened field of interdisciplinary research. The basic conception behind this approach is an integrative one, seeing disease in the context of culturally transformed environments, social interaction between the individual and a social field, stress factors caused by material situation, and political status. And, of course, there are physical processes, too, which are genetically inherited or the consequence of a specific lifestyle in a specific natural and cultural environment. The medical anthropological approach to disease and its causes is importantly different from the widely accepted approach of modern Western medicine with its tendency to bio-physical reductionism. To achieve this integrative view, social anthropologists and medical doctors cooperate in this project, in close contact with already existing health services in Yasin valley.

D. Indo-Aryan and Central Asian languages and cultures

For the sake of completeness, it should be noted that smaller projects on Shina language and literature, on aspects of the Wakhi language, and on a comparative translation of the Shigar-Nameh, under the supervision of Professors Buddruss (Mainz) and Sagaster (Bonn), have started. These studies, although very special in approach and content, will nevertheless contribute significantly to the study of problems of historical interpretation as well as to understanding of the present, pronounced trends of ethnic, historic, and regional identity.

Final remarks

In order to conclude this survey of the intention and present state of the CAK project, two final remarks should be added. Processes and influences of the world market and their impacts on spatial and socio-economic development are the main research interest of this specific project.

First, it has been mentioned several times that the interdisciplinary character of the CAK project is considered to be of utmost scientific importance, and that it is hoped eventually to achieve this goal better than other groups have been able to. In order to realize this goal, it has been decided to concentrate research in different disciplines in rather closely confined areas. So far, we have concentrated on Yasin and Bagrot valley, as well as on the Hunza core area, thus enforcing intellectual discussion and exchange among all the scientists involved. Although regional concentration of research does not necessarily guarantee interdisciplinarity, close cooperation in many fields and disciplines is already under way.

Second, the project is still in its initial stage. This means that there are still a number of logistic problems, both international and interdisciplinary. At the same time, however, it means that scientific results cannot be presented at the present moment. Nevertheless, it is anticipated that research findings will be made available both in English and German, hopefully also in Urdu, in due time. In order to achieve this, scientific meetings in Germany and Pakistan are planned. Hopefully, the CAK project will be able to present a wide range of results on the occasion of the Third International Conference on the Hindukush!

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