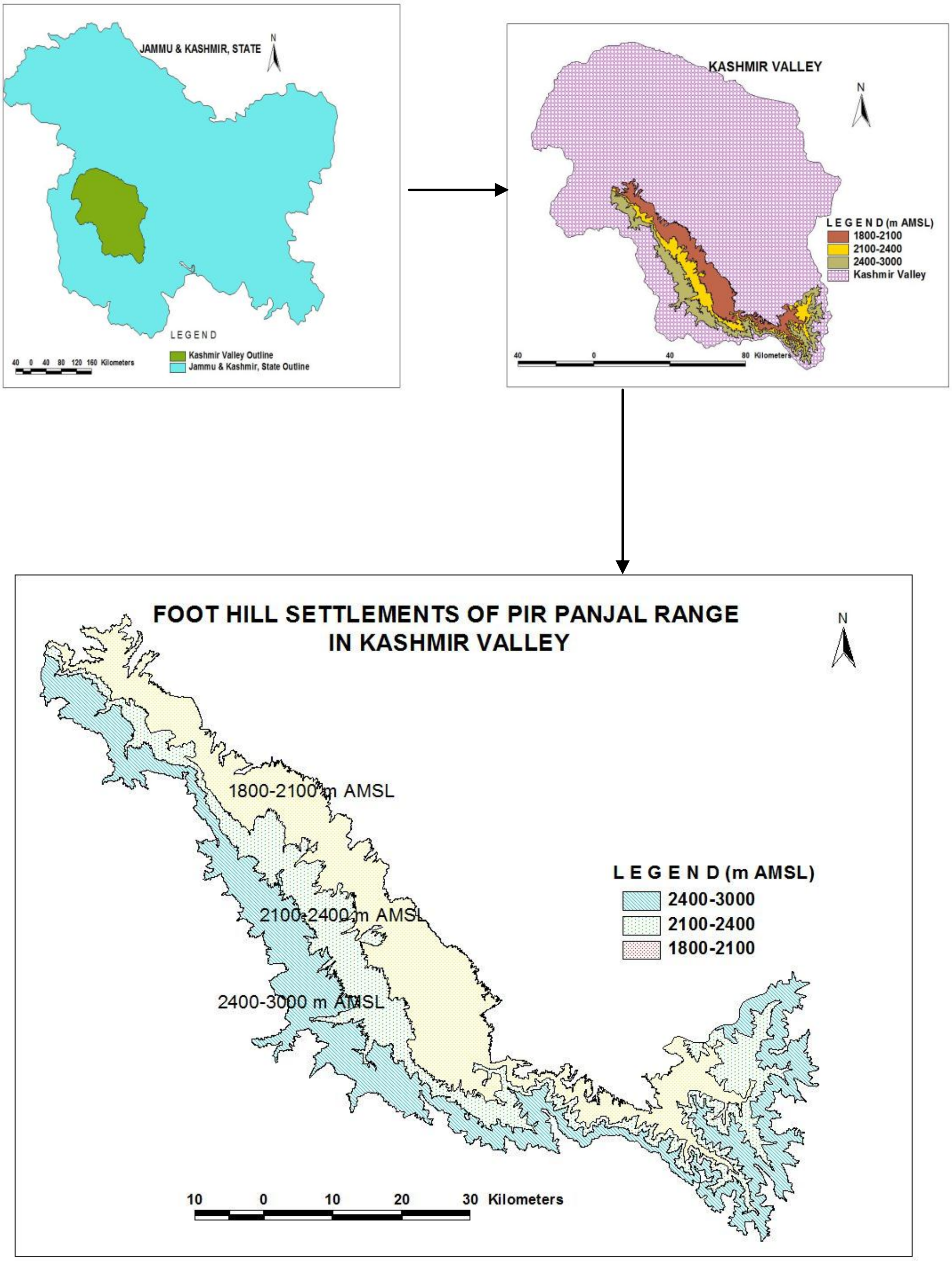
2.1. PHYSICAL SETTING

2.1.1. Location

The study area lies spatially between the geo-coordinates of $33^o23'$ 04.62″ to $34^o12'$ 27.18″ N latitude and $74^o15'$ 43.32″- 75^0 29′ 01.32″ E longitude with a total area of 2, 255.36 sq. km. comprising 18.24 percent area of the total Kashmir valley (Map 2.1). Foot hills of Pir Panjal range (westernmost mountain range of middle Himalayas separating Kashmir division from the Jammu division) in Kashmir are defined as the gently sloping Karewas, with a slope of 10^o-30^o, facing the Kashmir valley, forming an important sub-physiographic division of the region. The area is just an arc shaped longitudinal section of the Pir Panjal range in Kashmir, juxtaposed between the plain area and the mountainous area averagely at an elevation of 1,800-3,000 meters above the mean sea level. The foothills, the transitional, gentler, fertile and resource rich tracts, are studded with numerous springs which serve as primary water resource for the people living in these areas. Most of the springs of Kashmir Valley are concentrated in the foot hill zone of the Pir Panjal range (Raza, *et al*., 1978). The famous springs and tourist resorts of Kokernag, Verinag, Gulmarg, and the like are situated in the area. The area spans over six districts of the Kashmir valley covering major portions of Anantnag, Budgam and Shopian, followed by Baramulla, Kulgam, and Pulwama. The foot hills occupy 547.07 sq. km. (24.25%) area in Anantnag, 496.47 sq. km. (22.02%) in Budgam, 462.92 sq. km. (20.52%) in Shopian, 388.17 sq. km. (17.21%) in Kulgam, 298.84 sq. km. (13.25%) in Baramullah and 61.89 sq. km. (2.74%) in Pulwama districts.

2.1.2. Geomorphology

Foot hills are the intervening tracts between the plains and the mountains. The foot hills of Pir Panjal range in Kashmir are Karewa-studded, gently sloping features with a slope ranging from 10^0-30^0 interspersed by protrusions of small hills of an average altitude of 2,500 meters above mean sea level. Covering the valley of Kashmir on its south-western side from Anantnag up to Baramulla, foot hills are located at an average altitude of 1,800-3,000 meters above mean sea level. Being an inherent component of the Pir Panjal range, the foot hills have undergone the intertwined impacts of the Pleistocene and Sub-Recent uplift and recent glaciation, and followed by the gradational work of the streams which have added to their distinctive characteristics. The foot hills or the sloping Karewas have been continually raised up, tilted and folded along with the upheaving range.



Source: Generated from SOI toposheets, 1971

Map 2.1

There are some hills which rise above the 3,000 m elevation. The highest peak in the foot hills is located in Zugu Kharyan Forest on north-west of Sukhnag in the Upper foot hills in Budgam district.

The sloping Karewas are the gradational features formed due to the collective work of glaciers and streams descending down from the Pir Panjal range and the Lake itself. So, they are formed of fluviatile, glacial and lacustrine deposits, and represent a relief feature of immense geographic and socio-economic significance. The sloping Karewas are the dominant type of Karewas in Kashmir and are longitudinal in form in against the flat-topped Karewas. Their gently sloping surfaces have been cut into deep ravines, ranging from 50 to 150 meters in depth by ongoing rigorous fluvial action. The streams like Bring, Sandran, Vishav, Romoshi, Rambiara, Doodhganga, Sukhnag, and Ferozpur and their tributaries rising from the upper reaches of the Range are active in reshaping and grading the foot hills through different gradational actions. Along the edge of the hills of Pir Panjal, the sloping Karewas have been dissected into a multitude of steep-sided ravines, giving the landscape a typical look of immaturity.

The Karewa deposits in the Kashmir valley have been conventionally divided into two stages, lower and upper, representing argillaceous and arenaceous facies respectively. The upper Karewas are less fossiliferrous than the lower Karewas, and are separated by an unconformity representing an erosional interval as a result of which about 600 m of the lower Karewas was eroded from the crust of the anticlinal fold, as observed in Hirpur of Shopian tehsil along Rembiara River. The thickest of the succession of Karewas is exposed in Pakharpur and therefore, referred to as Pakharpur Formation; here the Karewas rest over the Panjal volcanics with an angular unconformity. The entire belt of the lower Karewas has been exposed by the rivers starting from the south such as Veshav, Rembiara, Romushu, Dodhganaga, Shaliganga, Boknag nar and Ningli, thus exposing lower Karewa sections at Aharbal, Anantnag, Arigam, Baramulla, Ichguz, Aglar, Wapzan, Hirpur, Naugam, Nichihom, Pakharpur, Shupian and Yusmarg (Parray, 2011).

2.1.3. Geological Formations

The foot hills of Pir Panjal range in Kashmir valley located roughly between the elevations of 1800-3000 meters above mean sea level exhibit a varied geomorphology, stratigraphy and lithology almost like any other piece of landscape on the earth's surface. So far the stratigraphic and geological evolution of the foot hills is concerned; they show almost a complete succession of systems/series of respective periods/epochs with their unique formations/beds running from Paleozoic Era onwards (Raza, *et al*., 1978) (Map 2.2). The chrono-stratigraphic and lithological setup of the foot hills are briefly discussed below:

Cambrian System

The Cambrian system occupies a very small area of the study area and is represented by the fossiliferrous rocks which include the soft quartzites, clays and colitic limestone containing trilobites.

Ordo-Silurio-Devonian System

Ordovician, Silurian and Devonian systems lie conformably above the Cambrian system in a successional style. The Silurian deposits are hidden under recent alluvium of Arpat stream and its tributaries. The rock formations of Ordovician system formed in Ordovician period consist of arenaceous and ferruginous shales, quartzose greywackes and limestones. The thick quartzites, unfossiliferrous, beds lying conformably on the Silurian strata are assigned a Devonian origin.

Carboniferous System

It comprises of four sub-series as given under:

Syringothyris Limestone (Lower Carboniferous) Series

Next in the order of superposition is a series of limestone strata lying conformably over the Devonian quartzites.

Fenestella Shales

Overlying the upper beds of the Syringothyris limestone there comes some thickness of unfossiliferrous quartzites and shales before the first beds of the characteristic Fenestella bearing strata begin.

The Panjal Volcanic Series

Rocks of this series are divisible into two broad sections : the lower—a thick series of pyroclastic slates, conglomerates and agglomeratic products, some thousand feet in thickness, and called by Middlemiss the " Panjal agglomeratic slates " ; and the upper—the " Panjal traps," an equally thick series of bedded andesitic traps generally overlying the agglomerates (Wadia, 1981).

Gangamopteris Beds

The Panjal traps are directly and conformably overlain in several parts of Kashmir by a series of beds of siliceous and carbonaceous shales called as gangamopteris beds containing the ferns Gangamopteris and Glossopteris.

Permian System

The Zewan Series

The Permo-Carboniferous series of deposits, the local representative of the Productus limestone of the Salt-Range and of the Productus shales of Spiti, have been known since an early date as the Zewan beds, from their exposure at the village of Zewan in the Vihi area.

Triassic System

In the present study area, the formations of the Triassic period spread over a long stretch and are exposed in the Pir Panjal precipices facing the Jhelum valley and many other places outside the study area (Raza, *et al*., 1978).

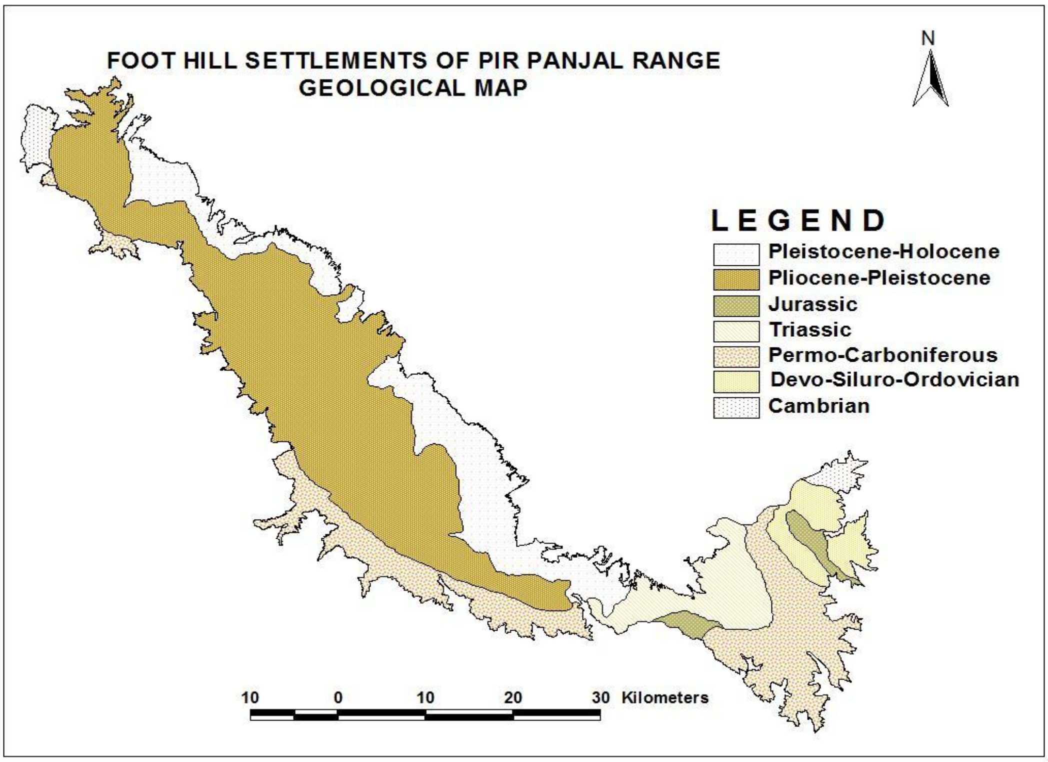
Jurassic System

The Jurassic horizon is believed to be fairly extensive, perhaps stretching up to Gulmarg from Kokernag under glacial and Karewa deposits of the Pliocene-Pleistocene periods.

Pleistocene-Holocene (Recent)

Pleistocene or post-Pliocene deposits, of the nature of fluviatile, lacustrine or glacial, have spread over many parts of Pir Panjal and occupy a large superficial extent hiding the preceding geological set-up of the area. These superficial deposits include Karewas, fluviatile and lacustrine deposits of older alluvium embedded with terminal moraines and the glacial clays, younger alluvium of the low-lying tracts and the glacial and para-glacial materials of the river terraces in the upper valleys of streams.

In the foot hills of the Pir Panjal range of Kashmir valley, the Holocene system is represented by the recent alluvium deposited by rivers often annually during flooding at elevations from 1,800-3,000 meters above mean sea level. It is formed of sediments deposited by the streams coming down from the upper reaches of Pir Panjal.



Source: Generated from SOI Geological Map of J & K State, 1969

Map 2.2

2.1.4. Soils

The soils of the concerned area vary in origin from alluvial to lacustrine and glacial (Raza, *et al*., 1978). Their present day status is mainly attributed to the climatic processes than the geological controls. They have experienced the different phases of fluvial and glacial cycles. Presently, different gradational processes such as frost action, chemical decomposition, thermal expansion, mass wasting, fluvial and aeolian erosion and deposition are responsible for shaping them. Man as a geomorphic agent is playing tremendous role in changing the character of the soils.

Since, foot hills of Pir Panjal range in Kashmir Valley are sloping Karewas, they have broadly a variable mantle of Karewa soils mainly in the Lower Foot Hills and Highland soils in the Upper Foot Hills. The Karewa soils are mostly composed of silts and are poorer. By and large, these soils are devoid of vegetal cover and lack in organic matter. The moisture retaining capacity of the soil is poor as the upper layer has a high sand content.

The highland soils are deficient in bases and become more and more acidic as altitude and vegetal cover increases. They have many differences on account of site, nature of slope and altitude. They are generally thin and immature soils, but the valleys and flat lands, even at high altitudes, may have a deep soil layer with good humus content. These soils have a higher tendency to leach.

So far the local classification of soils of this area is concerned; the Kashmiri peasant recognizes three main types of soils, namely, gurti, bahil and sekil. The gurti literally meaning silt is a fertile soil with high content of clay and silt and high water retaining capacity. It is found in some areas of LFHs-1 and along the stream valleys.

The bahil soils, next in importance to gurti are excellent loams, though proportion of silt, clay and sand varies from place to place. The proportion of silt and clay decreases with increasing distance from the gurti soil zone.

The sekil soils are coarse in texture. These are rich in humus since most part of it lies under the forests and give promising results when put to cultivation under assured water supply.

The present study is based on the soil classification given by Indian Council of Agricultural Research (ICAR), Nagpur in 2010. The ICAR have divided soils of Jammu and Kashmir state in 2010 into 140 classes plus one i.e., Glaciers, Water bodies, etc. on the basis of climatic conditions and physical character of the soils. In the present work, the soil map produced by ICAR, 2010 was a bit modified and eight soil types were identified (Table 2.1 and Map 2.3). These are briefly explained as given below:

Table 2.1: Soil types with Codes and Characteristics

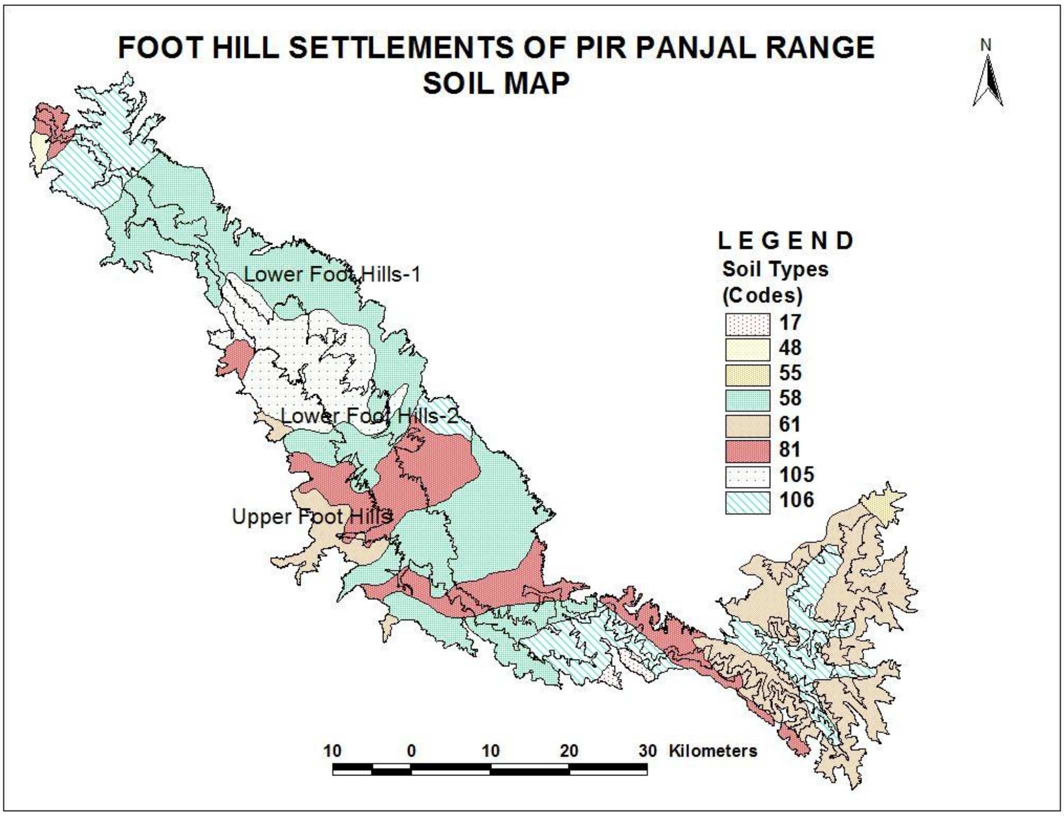
Code	Description	Soil Type
17	Dominantly rock outcrops; associated with shallow, loamy, calcareous soils on steep to very steep slopes with loamy surface, strong stoniness and severe erosion	Lithic Cryorthents
48	Medium deep, moderately well drained, mesic, fine loamy soils on steep slopes with loamy surface and severe erosion; associated with deep, somewhat excessively drained, fine soils on steep slopes with loamy surface, severe erosion and slight stoniness	Fluventic Eutrochrepts/ Dystric Eutrochrepts
55	Deep, well drained coarse-loamy soils on gentle slopes with loamy surface, moderate erosion and slight gravelliness; associated with deep, well drained, coarse loamy, calcareous soils with loamy surface, moderate erosion and slight gravelliness.	Typic Cryofluvents
58	Deep, well drained, calcareous, fine-loamy soils on nearly level slopes with loamy surface and very slight erosion; associated with deep, moderately well drained, calcareous, coarse-loamy soils with loamy surface and moderately shallow ground water.	Typic Eutrochrepts/ Fluventic Eutrochrepts
61	Medium deep, well drained, loamy-skeletal soils on moderate slopes with loamy surface, severe erosion and strong stoniness; associated with medium deep, well drained, fine-loamy soils with loamy surface, moderate erosion and moderate stonniness.	Typic Udorthents/ Dystric Eutrochrepts
81	Deep, moderately well drained, fine soils on very gentle slopes with loamy surface; associated with deep, well drained, fine-loamy soils with loamy surface.	Typic Hapludalfs/ Dystric Eutrochrepts
105	Medium deep, excessively drained, coarse loamy soils, on steep slopes with loamy surface, severe erosion and moderate stonniness; associated with deep, well drained, fine-loamy, calcareous soils with loamy surface and moderate erosion.	Typic Udorthents/ Typic Eutrochrepts
106	Medium deep, well drained, fine loamy soils on moderate slopes with loamy surface and moderate erosion; associated with shallow, excessively drained, loamy soils with loamy surface, moderate erosion and strong stonniness.	Dystric Eutrochrepts/ Lithic Udorthents

Source: Modified from Soil Map of J&K State by ICAR, Nagpur-2010

Since, the above captioned soil types are of different characteristics they exercise different influences on the behavior of trace elements in them. Theoretically, the trace element holding or retaining capacity of the soils keeping in view their totality of characteristics is highlighted as:

58 > 81 > 106 > 105 > 61

The soil types coded with 17, 48 and 55 have been omitted in the above equation for they occupy only a small uninhabited portion of the study area. The above mentioned relationship may be punctuated and interrupted due to other soil parameters such as organic matter in the soils, pH and other chemicals. The local topography and moisture content also play an important role.



Source: Modified from Soil Map of J & K State, ICAR, Nagpur-2010

Map 2.3

2.1.5. Natural Vegetation

The differentiation of physical configuration, altitude, aspect, soil and climatic variables give rise to different assemblages and complexes of natural vegetation of varying form, size and type in the foot hills both horizontally and vertically. The broad-leaved tropical forests which were once a dominant climax community in the foot hills have been taken over by the temperate conifers due the uplift of the Pir Panjal bringing a change in climate from subtropical to temperate (Puri, 1960 cited in Raza, *et al.*, 1978). Man himself being the most potent agent of change has tremendously intervened in changing the picture of natural fauna in the foot hills. The human beings have modified the natural vegetation in the foot hills for timber, grazing, settlement expansion, fuel wood, horticulture and the like uses. The natural vegetation of foot hills comprises of two broad types of forests and grasslands. There are three main factors which explain the altitudinal zoning of vegetation: (i) locational factors, such as terrain, slope and soils; (ii) altitude; and (iii) aspect.

2.1.6. Surface Water Resources (Streams)

The major stream that drains the Kashmir valley is the River Jhelum. Its tributaries drain the foot hills. Certain first and second order streams join together around 3,000 m AMSL in Waniar Reserved Forest and at around 1,850 m AMSL near Manzmuh Village of Anantnag District in Lower Foot Hills flow as a single stream known as Veth or Jhelum. It first runs in north-easterly direction till it reaches the NH-1A on its left and then flows in north-westerly direction on left side (west) of NH-1A. The following tributary streams drain the foot hills of Pir Panjal range (Raza, *et al*., 1978).

The Bring: The headstreams of the Bring receive the snow-melt from a vast area in the Pir Panjal around 3,500 m AMSL. After the confluence of the Ahlan and the Razparyin near the village of Vailu, the river is called the Bring.

The Sandran: Having its birth below the Kaukut peak in the Pir Panjal, the river passes through a deep carved channel, studded with big boulders from its source to a point close to Verinag. Below Verinag, its bed is aligned parallel to that of the Jhelum. It flows only for about twenty two kilometers in the study area.

The Vishaw: The Vishaw has its source from the Konsar Nag at an altitude of 3,840 m AMSL. It flows for about nineteen kilometers within the foot hills.

The Rembiara: The source of Rembiara lies in the Rupri ridge which is the culmination of the Pir Panjal towards west, its main feeders originating from Rupri peak and the Bhag Sar Lake on the one hand, and the Pir Panjal and the Nabba Pir pass on the other. The Rembiara traverses a course of thirty three kilometers before leaving the foot hills at Sheikh Pora.

Romushi: The snowy peak of Kharmarg (4,603 m) near Nabba Pir pass in the Pir Panjal is the source region of the primary feeders of Romushi. The main Romushi stream runs only for five kilometers in the foot hills.

The Dudhganga: Originating below the lofty mountain peak of Tatakuti in the Pir Panjal range, the Dudhganga flows as Dudhganga Nala for about twenty two kilometers in the foot hills and runs in the north-north-east direction.

The Shaliganga: The Shaliganga has its origin close to the Dudhganga. It flows for about twenty one kilometers and leaves the foot hills near Kashi Pora.

The Sukhnag: Draining the slopes of Pir Panjal, various mountain torrents unite themselves into the Sukhnag. It leaves the foot hills at Kawgund after flowing for about twenty kilometers. It drains main portion of the Toshmaidan area.

The Firozepura: The Firozepura Nala drains Tangmarg area. It passes through a sandy bed and flows for about twenty kilometers. It bifurcates in the Lower foot hills near Kulhama.

The Ningal: The Ningal is the last major tributary of Jhelum originating from the Pir Panjal range. Its feeders rise below the Khan Pathri (3,809 m) and Apharwat (4,141 m) peaks of the Pir Panjal above Khelanmarg. It flows for about thirteen kilometers in the study area and leaves at Kalantra Bala.

The Mundri: The Naubal Nala and Sultanpura Kol are last two significant streams that rise in the Upper foot hills and drain the northern most part of the foot hills of Pir Panjal range in Kashmir valley. They join together and once they leave the foot hills, they flow as Mundri Nala.

The surface water resources in the foot hills are very enormous. The total run-off that moves down the rivers or accumulates in large number of marshes and lakes is a powerful indicator of this plentiful supply. The above mentioned river systems are fed either by springs/rain or snow or both. The flow is poor during winter as most of the precipitation comes in the form of snow. These water sources move over different geological/pedological strata and attain the respective character in their composition. Since, these water sources are used for different domestic purposes especially drinking, cooking and bathing, they may have a control on human health of the respective areas. About 30% of the people in sample villages depended on these water sources.

The map 2.4 gives the general overview of the behavior of the main streams in the foot hills of the Pir Panjal range in Kashmir valley.

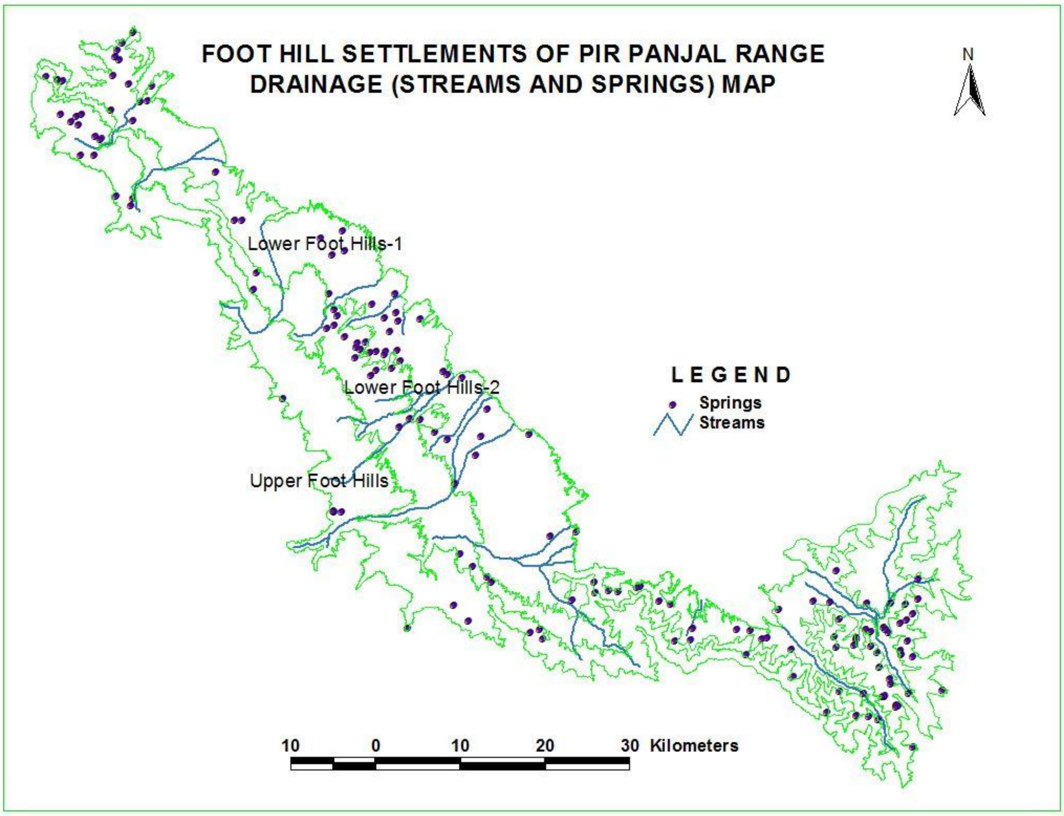
2.1.7. Groundwater Resources/Springs

Springs are assumed to be stable ecosystems and once ground water flows as a spring it loses the natural protection provided by the overlying rock layers and is more vulnerable to contamination threats from surface and atmospheric conditions (Vanderkamp, 1995). Sub-surface water (spring water) though believed to be of better quality is now losing quality at the selfish interests of man.

The foot hills have a promising abundance of groundwater resources (Map 2.4). Four types of springs exist in the area: karst, alluvial, karewa and warm springs. It has been revealed that rock joints and fractures, obviously, provide the most significant structural control for the very existence of the springs in the area. These planes establish a hydrological continuity between the recharge zones at higher altitudes and the discharge sites at the lower altitudes and valley floor (Jeelani, 2010).

People in the foot hill settlements are also dependent on the groundwater for their sustenance either completely or partially. About sixty five to seventy percent (65-70%) of the people in sample villages depended on the spring water. The groundwater gets chemically changed through both natural and human sources. The groundwater comes through variable geological strata and dissolves the minerals in contact. This chemical process changes its chemical status and people take this water mostly without any prior treatment. Also, the intervention through different human activities, the spring water gets polluted. Different types of chemicals/elements are required by human body in required amounts and once the healthy character of water gets impaired, human health deteriorates.

The maximum numbers of springs were identified in the LFHs-1 with decreasing number in the higher altitudinal zones. The surface water seeps in the permeable beds of the mountain and karewa geological formations and moves down the underground slope oozing and gushing out in the low lying tracts. The map 2.4 gives the spatial distribution of natural springs in different altitudinal zones of the foot hills of Pir Panjal range in Kashmir valley.



Source: Generated from SOI Toposheets, 1971

Map 2.4

The demand for underground water is increasing in the area since the surface water sources are becoming impure and the population is increasing in number. Although the springs have served as traditional water sources for the inhabitants for centuries, but little attention is given for their cleaning and development. As the springs are mostly in remote areas, due to the lack of awareness of water quality the families living nearby use the springs for drinking, cooking, bathing, washing and other domestic purposes and the government hardly bothers.

The water quality of the springs in the foot hills of Pir Panjal range is deteriorating day by day. It has been found by Rather et al. (2014) that the water quality of some of the springs has been deteriorating because of human impact. The bio-chemical characteristics of the spring waters are changing. The springs especially which are located at lower altitude than the surrounding human settlements are experiencing threat of eutrophication and increase in the coliform count. It has been noted that the incidence of water borne diseases is very high.

The spring waters of the area are deficient in essential trace elements. Hajam et al. (2015) found that the spring waters in the foot hills of Pir Panjal range in Anantnag district are deficient in essential trace elements and there is a potential threat to the health of the human population of the area. It was revealed that the average concentrations of zinc, copper and iodine (Zn: 0.0006 mg L^{-1}; Cu: 0.002 mg L^{-1}; I: 1.6-4.2 µg L^{-1}) are less than the required and acceptable limits (BIS: Zn: 5 mg L^{-1}; Cu: 0.05 mg L^{-1}; ICMR: I: 150 µg d^{-1}) for human beings.

2.1.8. Climate

The general climate of the foot hills is like the climate of the Kashmir valley as a whole. But, there are certain variations in the total monthly and annual precipitation and temperature. Like other parts of the Kashmir valley, the climate of the foot hills is characterized by a mild summer, not too much vigorous winter and absence of regular rainy season with exception of a few small valleys like Waltengo and Gulmarg. The locational and physiographic setting of the valley has a tremendous control on its climate including the foot hills. The Pir Panjal range acts as an effective barrier to the summer monsoons and the foot hills experience a rain shadow-effect. But, it guides the Western disturbances and makes them to precipitate over a long and wide area along the Pir Panjal. The climate of the foot hills is sub-Mediterranean in nature on account of its rainfall distribution.

2.2. SOCIO-ECONOMIC SETTING

2.2.1. Population Distribution and Density

In the area under study, population distribution and density are uneven. There are about 8, 44,543 people occupying an area of 2, 255.36 sq. km. The population density is 374.46 persons per sq. km. About 99% of the population is distributed in Lower foot hills (1, 800-2, 400 m AMSL) of the area and only less than 1% live in the Upper foot hills (2, 400-3, 000 m AMSL) with a population density of 580.30 persons km^{-2} and 6.07 persons km^{-2} respectively (Table 2.2). Within the LFHs, about 73% population of the total population of the area lives only in LFHs-1 (1, 800-2, 100 m AMSL). The possible factors responsible for the concentration of population in LFHs especially LFHs-1 are availability of land area for cultivation, horticulture, construction of settlements and roads, frequent services of transport, health care, information, education, market and banking, availability of daily jobs, and the like.

The sample villages under study support a population of 29, 949 persons on an area of 2740.3 km^{-2} and so the density is 10.93 persons km^{-2}. Out of the total population in the sample villages, more than 95% population lives in LFHs and less than 5% in the UFHs with population density of 10.81 persons km^{-2} and 14.23 persons km^{-2} respectively (Table 2.3). Likewise household distribution was found uneven with maximum concentration in LFHs than UFHs (Table 2.2).

Table 2.2: Demographic and Socio-Economic Profile

Macro Regions	Micro Regions	Total Population (%)	Population Density	Sex Ratio	Literacy Rate	Working Population (%)	Non-Workers (%)
LFHs	LFHs-1	6, 12, 732(72.55)	711.30	924.81	46.78	30.99	69.01
	LFHs-2	1, 26, 904(26.87)	387.56	917.11	36.45	31.07	68.93
Total		8, 39, 636(99.42)	580.30	923.16	45.04	31.01	68.99
UFHs	UFHs	4, 907(0.58)	6.07	935.35	43.03	59.67	40.33
Grand Total		8, 44, 543(100)	374.46	918.69	45.02	31.18	68.82

Source: Computed from Census of India, 2011

Table 2.3: Population Distribution, Density and Sex Composition in the Sample Villages

Macro Regions	Micro Regions	Sample Sites	Total Population (%)	Area (sq. km.)	Density (persons/sq. km.)	Male Population	Female Population	Sex Ratio
LFHs	LFHs-1	SS1-ANG	516(1.72)	75.3	6.85	272	244	897.06
		SS2-ANG	3004(10.03)	169.6	17.71	1576	1428	906.09
		SS3-KUL	803(2.68)	126.7	6.34	432	371	856.79
		SS4-KUL	490(1.64)	50.6	9.68	238	252	1058.82
		SS5-SHO	289(0.96)	36.4	7.94	142	147	1035.21
		SS6-SHO	1348(4.50)	265.9	5.07	677	671	991.14
		SS7-PUL	907(3.03)	32.0	28.34	451	456	1011.08
		SS8-BUD	2575(8.60)	175.2	14.70	1328	1247	939.00
		SS9-BUD	539(1.80)	88.2	6.11	286	253	884.61
		SS10-BAR	162(0.54)	22.7	7.14	79	83	1050.63
		SS11-BAR	442(1.48)	51.8	8.53	222	220	990.99
	Total		11075(36.97)	1094.4	10.12	5703	5372	941.96
	LFHs-2	SS12-ANG	1578(5.27)	73.6	21.44	812	766	943.35
		SS13-ANG	1412(4.71)	90.6	15.58	732	680	928.96
		SS14-KUL	538(1.80)	26.7	20.15	279	259	928.31
		SS15-KUL	1479(4.94)	93.1	15.89	757	722	953.76
		SS16-SHO	3819(12.75)	413.2	9.24	1926	1893	982.86
		SS17-SHO	1714(5.72)	159.0	10.78	884	830	938.91
		SS18-BUD	4191(13.99)	373.5	11.22	2220	1971	887.84
		SS19-BUD	465(1.55)	134.8	3.45	247	218	882.59
		SS20-BAR	1945(6.49)	146.1	13.31	978	967	988.75
		SS21-BAR	326(1.09)	36.4	8.96	171	155	906.43
	Total		17467(58.32)	1547	11.29	9006	8461	939.48
Total			28542(95.30)	2641.4	10.81	14709	13833	940.45
UFHs	UFHs	SS22-ANG	1109(3.70)	76.9	14.42	571	538	942.21
		SS30-BAR	298(1.00)	22.0	13.55	156	142	910.25
	Total		1407(4.70)	98.9	14.23	727	680	935.35
Total			**29,949(100)**	**2,740.3**	**10.93**	**15436**	**14513**	**940.20**

Source: Computed from Census of India, 2011

2.2.2. Sex Composition

Sex composition is numerically expressed as sex ratio. In India, it is the number of females per thousand males. The sex ratio of the area was 918.69. The sex ratio in the UFHs was more favorable (935.35) as compared in the LFHs (923.16).

At the sample village level, sex ratio of the area (940.20) was comparable to the sex ratio of India (940). There was a little variation in the sex ratio of the LFHs (940.20) and the UFHs (935.35). In the foot hills at sample village level, sex ratio varied from 856.79 to 1058.82. The sample villages in which the sex ratio is below the normal may be ascribed to the low care of and negligence of women at the hands of ill-thought men at different stages of life and hence high female mortality than the males. The socio-economic background may also be counted as a potent factor in skewing the sex ratio of the area.

2.2.3. Literacy Composition

Since the area under study is rural in character with low standard of living, lack of urbanization and technological development, it revealed low literacy rate of 45.02%. The literacy rate of LFHs (45.04%) was relatively higher than the UFHs (43.03%) (Table 2.2). It can be attributed to disparity in the standard of living, availability of transportation and education services and exposure of the people.

At sample village level, the area revealed a literacy rate of 39.27% with relatively high percentage of literates in LFHs (42.31%) than the UFHs (34.54%) (Table 2.4). In the sample villages, percentage of literate population to total population varied from 29.74% to 67.13%. The variations in literacy with respect to gender were also found with lesser number of literates among women.

Table 2.4: Household Distribution and Density and Literacy Composition and Rate

Macro Regions	Micro Regions	Sample Sites	Number of Households	Density (Households /sq. km.)	Total Literate Population	Male Literate Population	Female Literate Population	Literacy Rate
LFHs	LFHs-1	SS1-ANG	77	1.02	228	136	92	44.19
		SS2-ANG	519	3.06	1656	970	686	55.13
		SS3-KUL	136	1.07	370	257	113	46.08
		SS4-KUL	82	1.62	234	137	97	47.76
		SS5-SHO	47	1.29	194	104	90	67.13
		SS6-SHO	226	0.85	785	449	336	58.23
		SS7-PUL	142	4.44	485	276	209	53.47
		SS8-BUD	329	1.88	825	524	301	32.04
		SS9-BUD	93	1.05	171	107	64	31.73
		SS10-BAR	27	1.19	89	53	36	54.94
		SS11-BAR	80	1.54	247	145	102	55.88
	Total		1758	1.61	5284	3158	2126	47.71
	LFHs-2	SS12-ANG	292	3.97	515	313	202	32.64
		SS13-ANG	252	2.78	676	391	285	47.88
		SS14-KUL	84	3.15	160	103	57	29.74
		SS15-KUL	274	2.94	614	351	263	41.51
		SS16-SHO	609	1.47	1542	900	642	40.38
		SS17-SHO	297	1.87	579	363	216	33.78
		SS18-BUD	524	1.40	1322	815	507	31.54
		SS19-BUD	60	0.45	160	118	42	34.41
		SS20-BAR	314	2.15	1040	609	431	53.47
		SS21-BAR	51	1.40	183	114	69	56.13
	Total		2757	1.78	6791	4077	2714	38.87
Total			4515	1.71	12075	7235	4840	42.31
UFHs	UFHs	SS22-ANG	143	1.86	332	187	145	29.93
		SS30-BAR	43	1.95	154	96	58	51.68
	Total		186		486	283	203	34.54
Total			4701	1.72	11761	7118	4643	39.27

Source: Computed from Census of India, 2011

2.2.4. Economic Composition

The economic composition of the population unfolds a gateway for understanding the socio-economic development of the area. It includes both economically active population (working population) and economically non-active population (non-working population). The size of the working force is mainly determined by the total population base but the age structure and demographic regime are also important. There were only one-third (31.18%) of the total population involved in different economic activities (Table 2.2). About 68.82% population constituted the non-working population.

At the sample village level, 30.22% population constituted the total working population in the area with 30.34% in LFHs and 27.57% in UFHs. The working force varied from 18.18-55.31% in SS18-BUD and SS13-ANG respectively (Table 2.5). Among the working population, there was greater percentage of marginal workers than the main workers. The non-workers constituted about more than double the working population. The gender variations were observed quite prevalent.

Table 2.5: Economic Population Composition

Macro Regions	Micro Regions	Sample Sites	Total Working Population (%)	Main Workers	Marginal Workers	Non-Workers
LFHs	LFHs-1	SS1-ANG	159(30.81)	33	126	357
		SS2-ANG	1079(35.92)	510	569	1925
		SS3-KUL	368(45.83)	69	299	435
		SS4-KUL	207(42.24)	68	139	283
		SS5-SHO	58(20.07)	56	2	231
		SS6-SHO	389(28.86)	343	46	959
		SS7-PUL	266(29.33)	190	76	641
		SS8-BUD	664(25.79)	278	386	1911
		SS9-BUD	163(30.24)	136	27	376
		SS10-BAR	45(27.78)	36	9	117
		SS11-BAR	109(24.66)	109	0	333
	Total		3507(31.66)	1828	1679	7568
	LFHs-2	SS12-ANG	351(22.24)	332	19	1227
		SS13-ANG	781(55.31)	220	561	631
		SS14-KUL	225(41.82)	47	178	313
		SS15-KUL	677(45.77)	114	563	802
		SS16-SHO	1201(31.45)	622	579	2618
		SS17-SHO	380(22.17)	269	111	1334
		SS18-BUD	762(18.18)	276	486	3429
		SS19-BUD	142(30.54)	86	56	323
		SS20-BAR	555(28.53)	300	255	1390
		SS21-BAR	80(24.54)	69	11	246
	Total		5154(29.51)	2335	2819	12313
Total			8661(30.34)	4163	4498	19881
UFHs	UFHs	SS22-ANG	306(27.59)	158	148	803
		SS30-BAR	82(27.52)	81	1	216
	Total		388(27.57)	239	149	1019
Total			9049(30.22)	4402	4647	20900

Source: Computed from Census of India, 2011