

**GROUND WATER YEAR BOOK**  
**JAMMU & KASHMIR**  
**2014-15**

### INTRODUCTION

Jammu and Kashmir is a northern most and 6<sup>th</sup> largest state of India. It lies within latitudes of 32°17' and 36° 58' N and longitudes of 73° 26' and 80° 30' E. It has a total geographical area of 2,22,236 km<sup>2</sup> which includes an area of 78,114 km<sup>2</sup> under occupation of Pakistan and 5180 km<sup>2</sup> which has been illegally handed over by Pakistan to China. It also includes 37,555 km<sup>2</sup> area which is under illegal occupation of China. Total 30 Survey of India Degree Sheets cover entire J&K State. The state has international border with China and Afghanistan in the north, Tibet in east and Pakistan in the west. The states of Punjab and Himachal Pradesh lie in the south. Major parts of Jammu and Kashmir State represent high rugged mountainous terrain. The Jammu and Kashmir State is divided into two administrative divisions viz. Kashmir Division comprising Kashmir and Ladakh Regions and Jammu division comprising of Jammu Region. There are total twenty-two districts in J&K state. The administrative map of the state is shown in figure 1.

The Central Ground Water Board started monitoring of ground water regime through All India network of hydrograph stations from 1969 onwards. The density of observation wells was increased year after year. Earlier ground water monitoring was carried out through a network of open wells, generally dug wells for drinking purpose tapping shallow aquifers. Keeping in view the importance of future ground water development, the network was subsequently strengthened by construction of purpose built piezometers. Presently, in Jammu and Kashmir a total of 246 dug wells and 11 piezometers are being monitored for this purpose. The Central Ground Water Board, North Western Himalayan Region is monitoring water levels in observation wells in Jammu and Kashmir State four times a year viz. May (between 20<sup>th</sup> and 31<sup>st</sup>), August (between 20<sup>th</sup> and 31<sup>st</sup>), November (1<sup>st</sup> and 10<sup>th</sup>) and January (1<sup>st</sup> and 10<sup>th</sup>). Water samples from observation wells are collected once in a year during May for quality testing. The water level and chemical analysis data thus collected is analyzed and interpreted by GEMS and Map Info software and Ground Water Year Book is issued annually with interpreted data and thematic maps depicting ground water scenario of J&K state.

During the period May 2014 – January 2015, an effort was made to strengthen existing monitoring network. The total number of active ground water monitoring wells are 257 (as on January 2015) which are located in alluvial areas of Jammu, Kathua, Reasi, Samba, Rajouri, Udhampur, Srinagar, Baramulla, Sopore, Anantnag, Ganderbal, Kupwara and Pulwama Districts. Most of monitoring stations falling in valley areas of these districts.

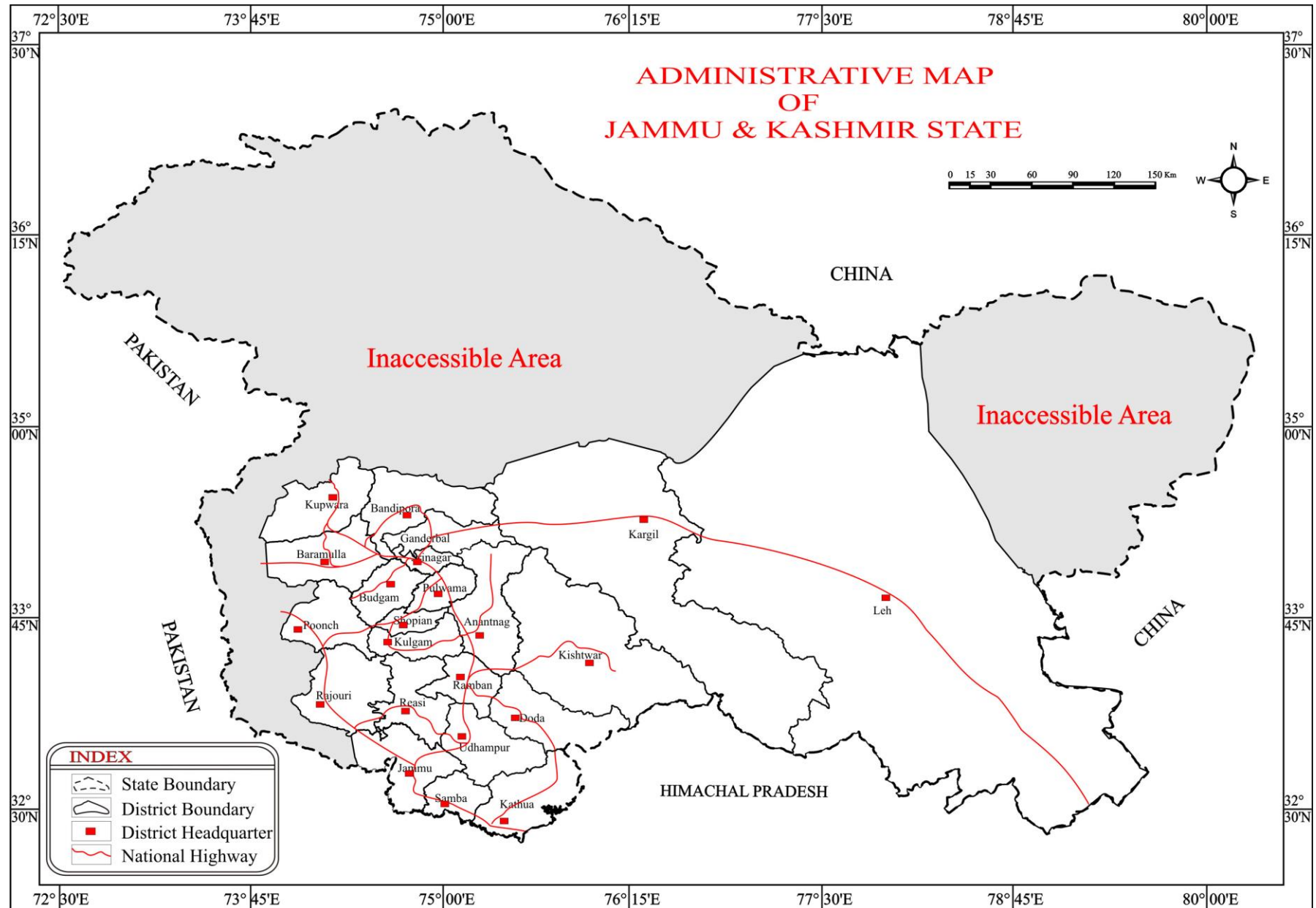
The present report discusses regional behavior of water levels in phreatic aquifers for the period May, August, November 2014 and January 2015 which will enable user agencies to plan

development strategies. The results of chemical analysis of water samples collected in May 2013 from observation wells established by Central Ground Water Board, North Western Himalayan Region are also discussed.

The main objectives of ground water regime monitoring in Jammu and Kashmir may be summarised as follows:

1. To study fluctuation of water levels both spatially and temporally in response to ground water recharge and/or discharge.
2. To evaluate changes in ground water level with respect to preceding year for the same period.
3. To evaluate changes in ground water levels with respect to a long term average water level such as decadal mean.
4. To study fluctuation of water level during different seasons of 2014-15.
5. To study hydro-chemical behaviour of phreatic aquifers.

Figure 1



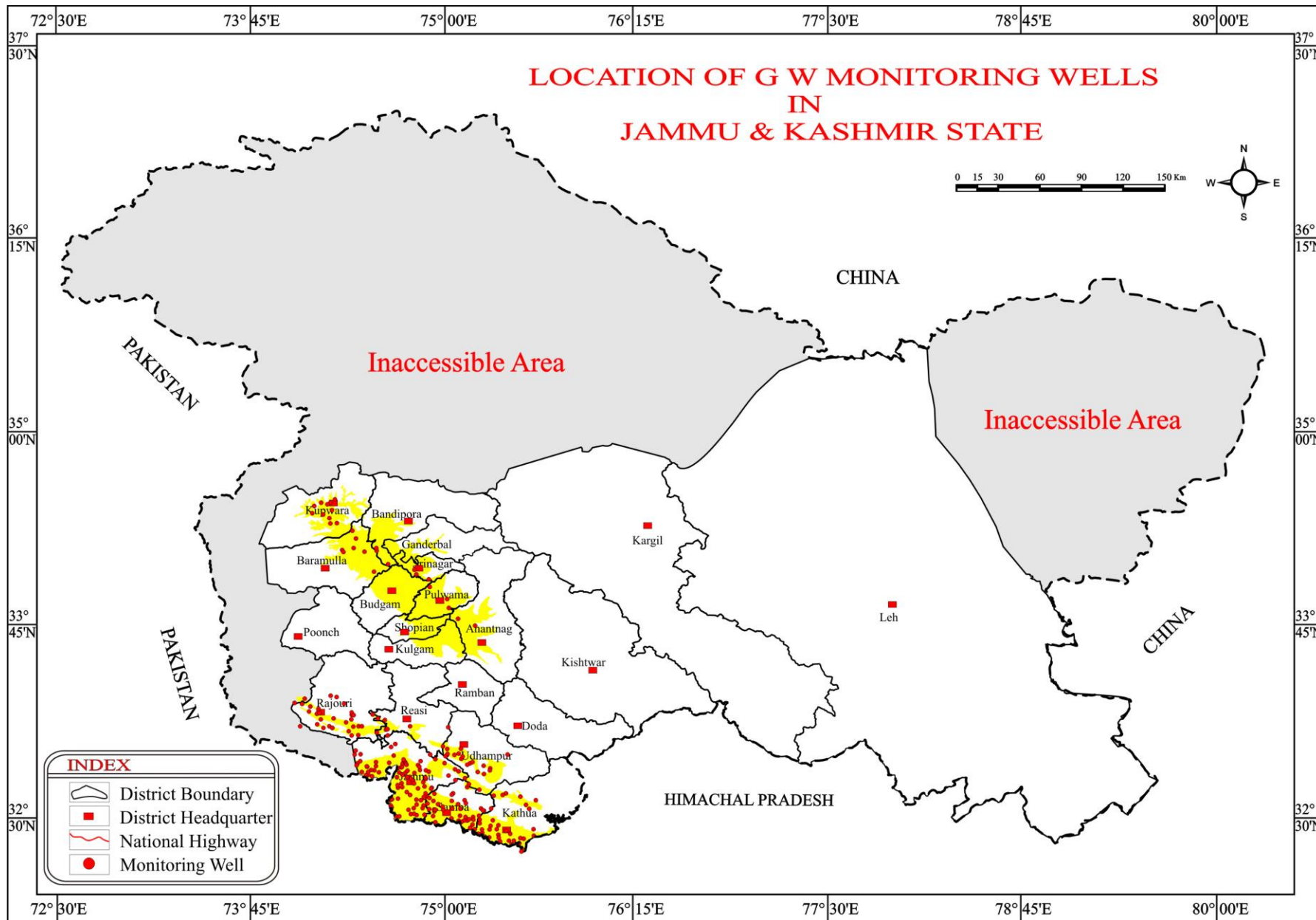
## 1.1 Status of Hydrograph Network Stations

In Jammu & Kashmir, at present there are 246 Hydrograph Network Stations besides 11 numbers of piezometers which are being monitored every year during pre-monsoon and post-monsoon periods. 226 NHS exist in Jammu Region and 31 stations in Kashmir Region. Till date no monitoring stations have been established in Ladakh Region. There are at present 11 piezometers which are being monitored. District-wise number of hydrograph network stations as on 31.03.2015 is given in table-1 and their locations are shown in Figure 2.

**Table: 1 District-wise break-up of active Ground Water Monitoring Wells in J&K State (as on January 2015)**

Sl. No.	Region	District	Total no of Monitoring wells	Number of Active Ground Water Monitoring Wells			
				May 2014	Aug 2014	Nov 2014	Jan 2015
1.	<b>Jammu Region</b>	Jammu	112	110	112	104	105
2.		Kathua	54	50	57	46	47
3.		Udhampur	31	29	30	28	29
4.		Rajouri	31	30	30	29	30
<b>Total</b>			<b>228</b>	<b>218</b>	<b>229</b>	<b>207</b>	<b>211</b>
1.	<b>Kashmir Region</b>	Anantnag	01	01	01	01	-
2.		Baramulla	12	11	11	11	-
3.		Kupwara	11	11	11	11	-
4.		Pulwama	04	04	04	03	-
5.		Srinagar	03	02	02	02	-
<b>Total</b>			<b>31</b>	<b>29</b>	<b>29</b>	<b>28</b>	<b>-</b>
<b>TOTAL IN J&amp;K STATE</b>			<b>259</b>	<b>247</b>	<b>258</b>	<b>235</b>	<b>211</b>

Figure 2



**PHYSIOGRAPHY**

Physiography of the Jammu & Kashmir State is very varying with highest mountain ranges of the world, extensive plateau, enormous valleys, deep gorges and large canyons in Middle and Trans-Himalayan Regions. The individual ranges have characteristic steep slopes towards south and much gentle slope towards north. The northern slopes are covered with thick and dense growth of vegetation. While the southern slopes are mostly bare, with thin sparse forest cover. The Zaskar range separates Ladakh Region with Kashmir Valley while Pir Panjal range divides Jammu Region and Kashmir Valley (Figure 3). The state can be divided into six distinct physiographic units as discussed below.

- ***Sirowal Belt***

The Sirowal belt covers an area of about 1000 km<sup>2</sup> and has an average topographic gradient of 1:250 to 1:300 in southwest direction. The land elevation of Sirowal belt above mean sea level is normally within 320 m. Southern parts of Jammu and Kathua Districts fall in this belt.

- ***Kandi Belt***

The elevation of Kandi belt ranges between 320 m and 400 m above mean sea level (m amsl). The average topographic gradient varies between 1:60 and 1:100. Kandi belt covers an area of about 1500 km<sup>2</sup> and occupies parts of Jammu and Kathua Districts imperceptibly north of Sirowal belt. Kandi belt in Jammu & Kashmir state runs in northwest - southeast direction as a narrow strip between rivers Munnawar Tawi in the west and Ravi in the east. The belt is occupied by reworked Siwalik debris, which has master slope towards south-west.

- ***Siwalik Region***

Land elevation of Siwalik region ranges between 400 m and 750 m above mean sea level. Ridges and small independent valleys are the prominent features of Siwalik region which covers parts of Kathua, Jammu, Udhampur and Rajouri Districts.

- ***Kashmir Valley***

The elevation of valley floor above mean sea level ranges between 1500 m and 2000 m. Kashmir valley covers an area of 5600 km and comprises parts of Budgam, Pulwama, Srinagar, Anantnag, Baramulla and Kupwara Districts.

- ***Hilly Mountains***

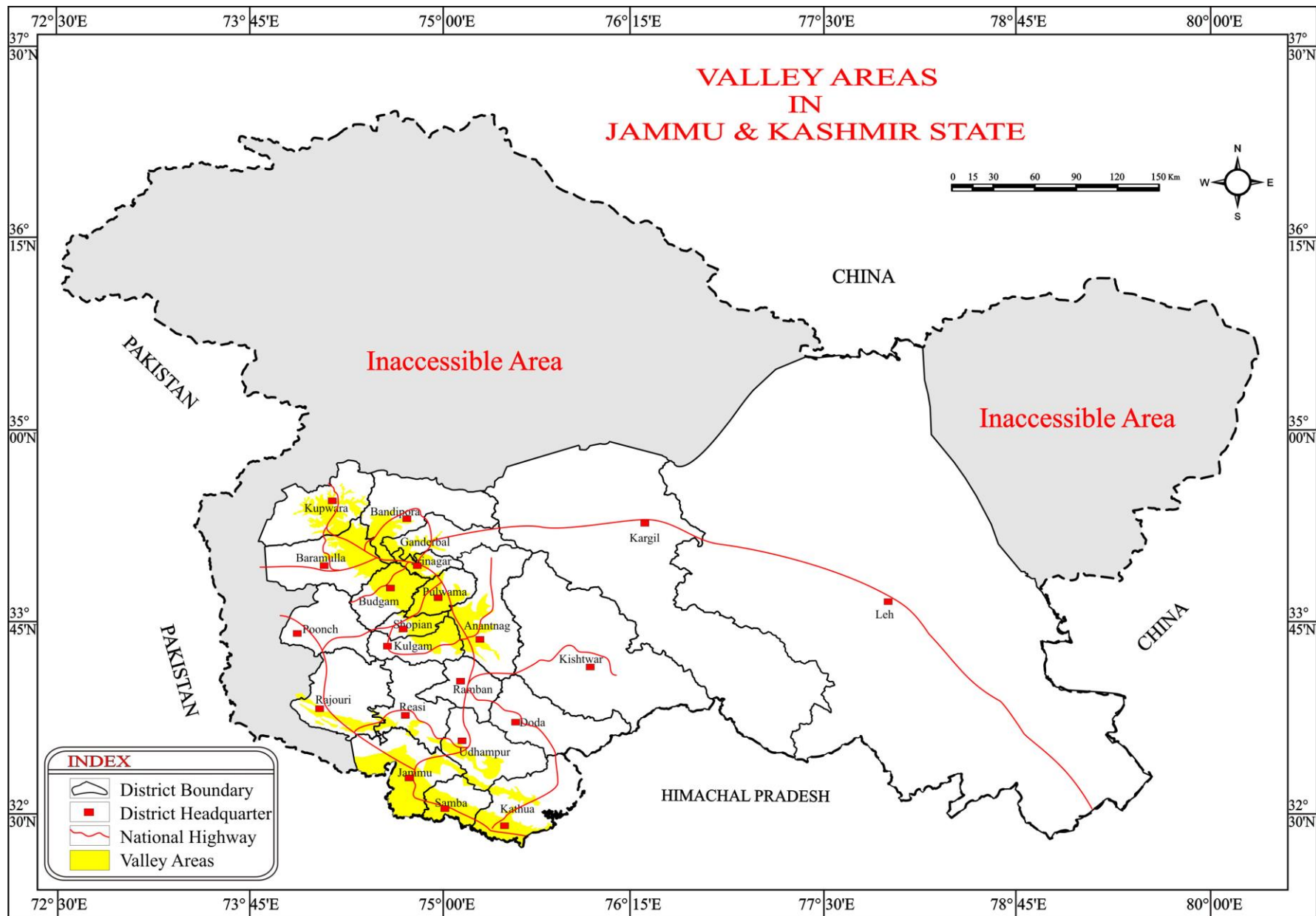
The high mountain ranges have the elevation between 2000 m and 5000 m above mean sea level and form parts of Udhampur, Anantnag, Baramulla, Srinagar and Kupwara Districts.

- ***Trans-Himalayan Zone***

The trans-Himalayan zone constitutes the inaccessible mountainous terrain of Kargil and Leh districts in Ladakh Region. The elevation of this zone varies between 5000 m and 8000 m above mean sea level. However, along the lower reaches of Indus and Shyok rivers the elevation is less than 5000 m.



Figure 3





**GEOLOGY**

Geological formations ranging in age from Pre-Cambrian to Recent are found in the State. These formations can broadly be classified into three categories. Hard or consolidated- rocks comprising granites, slates, quartzite, Panjal traps and limestone etc. Semi-consolidated rocks comprising of clay stone, siltstone and sandstone etc. Unconsolidated formations from Quaternary to Recent age comprising of Clay, Silt, Sand, Gravel and Boulder etc. The brief geological setting of the state is given in Table-2.

**Table 2 Geological Setting in J&K State**

<b>Age</b>	<b>Formation</b>
Recent to Sub-recent	Alluvium
Pleistocene	Karewas
Middle Pliocene to Pleistocene	Siwaliks
Miocene	Murees
<b>Unconformity</b>	
Eocene	Subathu Formations
Cretaceous/ Eocene	Volcanics/ Basic Intrusives
Cretaceous	Flysch Beds
Jurassic	Punch-Mandi Formations
Triassic	Mandi & Infra-Triassic Formations
Palaeozoic	Panjal Traps/ Tanwal
Carboniferous / Permian	Agglomeratic Slates Fenestella Shales Gondwana Formations Zewan Beds
Silurian-Devonian	Muth Quartzites
Upper Pre-Cambrian to Lower Cambrian	Dogra Slates
Lower Pre-Cambrian	Salkhala Series
Pre-Cambrian	Granite & Basic Intrusives

**DRAINAGE**

Entire state of Jammu and Kashmir falls in the rivers of Indus River System and the only exception is the small area in the extreme north-east which is part of Quraquash River Basin.

- ***Indus Basin***

The total drainage area of Indus Basin is 11,78,440 km<sup>2</sup> out of which an area of 453,250 km<sup>2</sup> falls in high Himalayan mountains and the remaining 725,190 km<sup>2</sup> falls in the plains of the drainage area in plains. A total of 321,290 km<sup>2</sup> area of Indus basin falls in India whereas only 131,960 km<sup>2</sup> area falls in Pakistan.

The Indus River (Sanskrit-Sindhu, Greek-Sinthos, Latin-Sindhus) originates from lofty mountains near Mansarovar Lake at an elevation of 5182 m and traverses for several hundred kms through Tibet and India before reaching Suleiman mountains in Pakistan. A part of the Indus Basin is above the permanent snow line, which varies in altitude from 4268 m in the eastern parts to 5792 m on the western parts. In Ladakh Region, the snow line is at 5488 m above mean sea level, which recedes during summer.

The hydrographic system of the Indus Basin is very extensive. The river initially runs along the strike of the mountains and then suddenly makes an acute bend to the south and flows directly across the mountain. The Gilgit River joins the Indus at its great bend to the south. The Indus flows initially under the name of Singee Khabab until it is joined by Ghar River at about 257 kms from its source. After short distance downstream it enters Kashmir at an elevation of 4206 m and flows over a long flat plain in Tibet plateau. It skirts Leh at 3200 m and is joined by Zaskar River while still flowing north but more westerly. The Indus passes near Skardu and reaches Haramosh Mountain (7407 m). Here it takes a turn southwards at an acute angle and passing near Hattu Pir, enters Kohistan. After flowing through wilds of Kohistan and at about 1450 km from its source, the Indus is joined by Kabul and Swat Rivers from Afghanistan. At this point the elevation of the Indus falls to about 610 m. After leaving Attock in Pakistan the river flows southwards, parallel to the Suleiman Range. At about 805 km. from the Arabian Sea and at an elevation of 79 m. The Indus receives waters from all of its five major tributaries viz. Jhelum, Chenab, Ravi, Beas and Satluj and here, it is known as Panjnad (five rivers). The river finally joins the Arabian Sea through its mouth, which form a big delta covering 7770 km<sup>2</sup> and a vast coastline of about 201 kms.

Major sub-basin of Indus System in Jammu & Kashmir State is the Jhelum Sub-basin, the Chenab Sub-basin and the Ravi Sub-basin. A brief account of these three sub-basins is given as under:-

- ***Jhelum Sub-Basin***

The Jhelum is known in Kashmir as the Veth River. Most parts of Kashmir valley are drained by Jhelum River, which flows in northwesterly direction. The Jhelum River (Sanskrit-Vitasta, Greek-

Hydaspes, Latin-Bipaspes) originates from Verinag Spring. The River has various tributaries in the valley several of which come from the everlasting snows of the Liddar valley. Near Srinagar it received by the Sind River, and then forms the Wular Lake. The Wular Lake in Baramulla District which, in fact, a delta of Jhelum River. Below Baramulla, the river leaves the fertile banks of the valley and rushes headlong down a deep gorge at Khadnayar and joins the Chenab River at Trimmu in Pakistan.

- ***Chenab Sub-Basin***

The Chenab River or Asikin, as it was known in Vedic times, is formed by two important tributaries, the Chandra and the Bhaga, which join near Keylong in Himachal Pradesh to form Chandra-Bhaga or the Chenab River in Himachal Pradesh.

The River then flows through the Kashmir Himalayas to emerge into the plains at Akhnoor in Jammu District, at about 250 kms from its source. Ranbir canal takes off from its left bank in Akhnoor tehsil.

- ***Ravi Sub-Basin***

Very small parts of the state, mainly the extreme south-eastern parts, fall in the Ravi Sub-basin. The Ravi River rises from the northern face of Rohtang Pass in Himachal Pradesh at an elevation of 4116 m. After passing through Dhauladhar hill ranges, the river emerges from the foothills near Madhopur where the headworks of the Upper Bari Doab Canal exist. It has the smallest catchment area among the rivers of the Indus System. An important tributary of Ravi River, the Ujh River Which originates from the Basohli hills of Kathua District joins the mainstream to its right at Lassian.

**HYDROMETEOROLOGY**

The State of Jammu and Kashmir has great diversity in its temperature and precipitation. Excepting the plain, south of the Siwaliks of the Jammu Division, the climate over the greater parts of the state resembles to the mountainous and continental parts of the temperate latitudes.

**5.1. Climate of Jammu Division**

Climate of Jammu division is sub-humid to sub-tropical. It is divisible in to two parts namely (i) the plain region, lying to the south of the Siwaliks and (ii) the mountainous region, stretching over the Middle and the Greater Himalayas in the district of Doda, Rajouri, Poonch and Udhampur. The climate of the plain region and Middle Himalayans including the Pir Panjal is characterized by a rhythm of seasons which is caused by the reversal of winds in the form of south-west and north-east monsoons. The reversal of pressure takes place regularly twice a year. This region has sub-tropical climate with hot and dry climate in summer and cold climate in winter. It lies in the northern hemisphere above the tropic of Cancer. The Minimum and Maximum temperature of the district varies between 4<sup>0</sup>C to 47<sup>0</sup>C and the monsoon starts from the beginning of July to the first week of September. The climate of this region is characterized by a rhythm of seasons which is caused by the reversal of winds in the form of the south-west and north-east monsoon. From October to June the precipitation and temperature patterns resembles closely the valley temperature zones. However, the summer rainfall and temperature resembles the precipitation pattern in the sub-tropical zone. The region receives an average annual precipitation of 1070 mm mainly in the form of rainfall. Snowfall occurs in high mountainous parts of Jammu region due to south-west monsoon from July to September and contributes about 80% of the total rainfall. The temperature in plain areas of Jammu regions goes up to 45°C during summer and drops to as low as 3° C during winter season. Average number of Annual rainy days in Jammu region is 59 days.

**5.2. Climate of Kashmir Division**

The weather and climate of Kashmir Division are intrinsically linked with the weather mechanism of the subcontinent in general. The location of the Kashmir Valley at a high altitude (about 1600m) in the north –western corner of the subcontinent, surrounded by high mountains on all sides, give it a unique geographical character with distinctive climatic characteristics. It experiences Temperate-cum-Mediterranean type of climate. The average annual precipitation is 660 mm. In winters, rainfall occurs from the western disturbances (temperate cyclones). These disturbances have their origin in the Mediterranean Sea. The rainfall generated by these cyclones is fairly widespread locally known as *Alamgir*. (About 65% of the precipitation occurs in the form of snow during winter season, i.e. December to February. March and April are the months of rainfalls. May to September is

relatively dry months. The mercury drops between  $-8^{\circ}\text{C}$  and  $12^{\circ}\text{C}$  during winter and attains a moderate temperature of around  $35^{\circ}\text{C}$  during summer.

### **5.3. Climate of Ladakh Division**

Ladakh Division, lying mainly to the north of the Greater Himalayas, has unique geographical feature. It is characterized with parallel mountain ranges, numerous snow-covered peak, gigantic glaciers, narrow fertile valleys, alluvial fans, river terraces and seasonal lush green pastures. For most of the part Ladakh has bare crats, barren rock and granite tablelands, devoid of natural vegetation. All these factors have closely influenced the climate of Ladakh. Moreover, the influence of local relief is most pronounced in respect of the effectiveness of isolation on slopes having different exposures and with the modification of wind direction and speed. Every variation in slope with respect to the sun rays produces a different micro-climate. In general the climate of Ladakh division is very cold, arid and dry resembling to that of a cold desert. It is a Cold Continental arid type and occupies of Leh and Kargil districts and receives an average annual precipitation of 150 mm. Leh, located at the edge of the Tibetan plateau receive an annual precipitation of only 83 mm in the form of rain. In addition, it receive moderate to high snow fall. Kargil gets about 150 mm of rain and snowfall. The temperature falls down to  $-5^{\circ}\text{C}$  to  $35^{\circ}\text{C}$  during winter. Drass, the second coldest inhabited place in the world falls in this region.

**SOILS**

Various types of soils are formed in different regions of the state owing to marked physiographic and climatological variations.

Alluvial soils occur in parts of Jammu and Kathua Districts where the land elevation is less than 300 m above mean sea level (m amsl). These soils are homogeneous and very fertile.

Brown hilly soils are formed at land elevations between 300 and 1500 m amsl in the areas of moderately undulating topography. Spodosols are developed in areas with land elevation between 1500 and 3000 m amsl experiencing relatively colder winters and higher mean annual rainfall. These soils occur in Poonch and Doda districts.

Ochraquolls soils are yellowish brown in colour and have moderately low permeability. These are developed at an elevation of about 1600 m amsl in mid upland areas of Kashmir Valley. Hapludalfs soils are yellowish brown to dark brown in colour, very deep and well drained.

Skeletal soils are developed in parts of Leh and Kargil districts of Ladakh Region, which vary in altitude between 2400 m and 7200 m amsl and experience severely cold and dry winters.

**HYDROGEOLOGY**

The hydrogeological set up in the state is very complicated owing to varied geological settings and ground water conditions. All the three regions of Jammu & Kashmir state represent entirely different ground water regimes. Based on geology and aquifer characteristics, the area of the state can be divided into two broad hydrogeological units. These are Porous and Fissured formations.

**7.1. Porous Formation**

Porous formations are best suitable for the exploration and development. Potential zones are encountered in these formations. These formations are: -

**7.1.1. Jammu Region**

In Outer Plains of Jammu Region, extending between River Ravi in the east to Munnawar Tawi in the west, the ground water occurs in piedmont deposits belonging to upper Pleistocene to Recent age. The deposits comprise unconsolidated sediments in the form of terraces and coalescent alluvial fans developed by the streams debauching out of Siwalik Hills. The sediments consist of coarse clastics ranging in size from boulders to gravel in the loose clay matrix and occasionally alternating bands of clay of varying thickness. Kankar is also intercalated with these sediments at different intervals and in variable quantity.

These deposits are graded into finer sediments from north to south in that order. Down south it comprises alternate bands of sands of all grades and clay with subordinate peck of gravels and pebbles.

**➤ Kandi Formation**

Kandi formation comprises very coarse material with little clay but in the Outer Plain of Jammu & Kashmir State the typical Kandi formations are not seen. Instead, they comprise boulder, gravel, pebble and coarse sand with substantial amount of clay sometimes hard and sticky of varying thickness. The clay proportion increases towards southwest. Occurrence of perched water bodies is a common phenomenon in the Kandi belt of Jammu & Kashmir state. The ground water generally occurs under unconfined conditions in Kandi formation.

**➤ Sirowal Formation**

The Kandi formations coalesce into Sirowal formations in the south, which are finer outwash of Siwalik debris, brought by streams. Ground water occurs under both the confined as well as unconfined conditions in Sirowal formation. A spring line demarcates the contact between Kandi and Sirowal formations because the ground water oozes out along this line causing marshy conditions. The spring line has undergone deformation due to decline of water level resulting from development of ground water in Sirowal area. However, the base flow could be seen in streams south of this line,



which also in the Sirowal formation is the existence of auto-flow conditions in the deeper aquifer system.

The Dun Belt separates the Siwalik hills in the middle Himalayas and runs as a series of river terraces between Basohli (32°30', 76°49'30") in the east to Riasi (33°05', 74°50') and beyond in the west. The sediments are in the form of isolated sub-recent to recent valley fill deposits ranging in thickness between a few metres to a few tens of metres. These deposits are often dissected as a result of the present day drainage pattern. The deposits comprise of coarse clastics such as boulders, cobbles and pebbles etc. inter bedded with lenticular clays.

#### ➤ *Isolated Valley Fills in Middle Himalayas*

There exist a number of isolated valleys in middle Himalayas where ground water occurs in valley fill deposits comprising of lacustrine to fluvio-glacial sediments. A few meter thick layer of loess overlies these deposits, which is windblown.

Ground water in such valleys generally occurs under confined conditions. One of the prominent isolated valleys in middle Himalayas is Kishtwar valley in Kishtwar district of Jammu Region.

#### **7.1.2. Kashmir Region**

Kashmir valley covers an area of 5600 km and is occupied by Karewas that consist of a huge pile of alternating bands of sand, silt and clay interspersed by glacial boulder beds. The sands are mostly fine to very fine grained and it is very rare that they are medium to coarse grained. There is considerable lateral facies variation in the nature of sediments. The aggregate thickness of these sediments is of the order of 2500-3000 m. Ground water in the Karewas of Kashmir valley occurs under both the confined as well as unconfined conditions.

#### **7.1.3. Ladakh Region**

In Leh plain of Ladakh Region the sediments consist of moranic and fluvio-glacial boulders, cobbles underlain by lacustrine deposits consisting of clay and silt. The Leh plain covers an area of about 100 km<sup>2</sup> between Phayang Nala in the west to Sabu Nala in the east. Ground water generally occurs under unconfined conditions.

#### **7.2. Fissured Formation**

About 15000 sq. km. Area in Jammu Region is occupied by hilly terrain. It comprises rocks ranging in age from the Precambrian (Salkhala series) to Miocene or even Pliocene (Murees and upper-middle Siwaliks). The rock types range from soft or friable sandstones, Clays, Shales, Conglomerates to hard traps and metamorphic such as quartzite and crystalline limestone. In the Siwalik terrain where groundwater is tapped comes mainly either from the weathers mantle or from the joints or cracks of these rocks. Friable Siwalik sandstone does possess primary but are not very potential aquifers.

### 7.3. BEHAVIOUR OF WATER LEVELS

#### 7.3.1. Depth to Water Level

The water levels in Ground Water Monitoring Wells of Jammu and Kashmir State were measured four times during the period 2014 – 2015 (May 2014, August 2014, November 2014 and January 2015). The water levels observed are shown in Table 3. The ground water levels in different seasons were analysed to evaluate the temporal behaviour of water level. The behaviour of water levels during the period May 2014 to January 2015 has been compared with the previous water levels as well as with the average water level for the last decade (decadal behaviour) to ascertain the changes in the ground water regime. All the data has been put in the GIS format and the data has been analysed. After analysis the contours of the water levels below the ground surface have been created. The areas with same water levels have joined and the areas have been demarcated with uniform contour intervals. The contouring has been done by Natural Neighbourhood Interpolation method.

**Table 3. Depth to Water Level Data for all Seasons (KASHMIR REGION)**

SI No.	Location	Type of structure	Longitude	Latitude	May-14	Aug-14	Nov-14
<b>ANANTNAG DISTRICT</b>							
1	Rambarpora	Dug Well	74.10	33.79	14.25	12.50	12.70
<b>BARAMULLA DISTRICT</b>							
2	Aripanthan	Dug Well	74.58	34.23	1.82	3.54	2.55
3	Binner	Dug Well	74.36	34.23	2.00	3.54	2.42
4	Bomai	Dug Well	74.42	34.36	1.07	2.80	2.29
5	Mirgund Silk Centre	Dug Well	74.65	34.14	1.30	2.16	1.55
6	Sangrama	Dug Well	74.43	34.24	1.08	2.08	2.71
7	Sopore Model Town	Dug Well	74.44	34.31	0.27	1.58	0.49
8	Waripora	Dug Well	74.56	34.09	0.50	4.13	6.20
9	Handipora (Zambodzpora)	Dug Well	74.36	43.22	1.22	5.82	2.38
10	Gandhasi bhat	Dug Well	75.04	33.86	0.79	0.70	1.80
11	Badran	Dug Well	74.58	34.24	4.10	3.68	4.25
12	Ranji	Dug Well	74.50	32.22	1.93	3.27	2.20
13	Dusilpora	Dug Well	34.17	74.61			
<b>KUPWARA DISTRICT</b>							
14	Gulgam	Dug Well	74.22	34.54	3.71	6.14	3.86
15	Dolipora	Dug Well	74.16	34.47	2.08	7.23	4.38
16	Drugmulla	Dug Well	74.29	34.49	3.60	6.53	5.10
17	Guse	Dug Well	74.28	34.54	12.56	12.89	13.33
18	Handwara Almustafa Colony	Dug Well	74.28	34.40	2.04	2.89	2.64
19	Khanpora	Dug Well	74.27	34.44	1.73	3.67	2.22
20	Kupwara Main Chowk	Dug Well	74.26	34.53	1.93	5.19	1.90
21	Langate	Dug Well	74.31	34.38	1.40	4.24	3.66

SI No.	Location	Type of structure	Longitude	Latitude	May-14	Aug-14	Nov-14
22	Magam	Dug Well	74.23	34.46	1.34	5.13	3.40
23	Trehgam	Dug Well	74.18	34.52	2.66	6.78	5.64
<b>PULWAMA DISTRICT</b>							
24	Pampora	Dug Well	74.92	33.99	3.21	5.19	
25	Tral	Dug Well	75.03	33.91	14.79	14.69	15.24
26	Sambura-Ko kapura	Dug Well	75.22	33.74	3.11	5.10	5.58
27	Zewan	Dug Well	74.92	34.04	2.60	4.26	3.20
<b>SRINAGAR DISTRICT</b>							
28	Skuast shuhama	Piezometer	74.83	34.20			8.05
29	Rainawari	Dug Well	74.82	33.10	9.47	9.85	
30	Regal Chowk,Srinagar	Dug Well	74.83	34.07	3.16	2.74	2.44

**Table. 4 Depth to Water Level Data for all the four Seasons (JAMMU REGION)**

SI No.	Location	Type of Structure	Longitude	Latitude	May-14	Aug-14	Nov-14	Jan-15
<b>JAMMU DISTRICT</b>								
1	Agre Chak	Dug Well	74.72	32.62	3.64	1.46	2.14	2.60
2	Akhnoor (Batera)	Dug Well	74.75	32.86	6.09	0.00	12.12	13.58
3	Alla	Dug Well	74.84	32.52	3.67	2.55	2.53	3.05
4	Arnia	Dug Well	74.80	32.52		7.62	8.52	9.22
5	Badsoo	Dug Well	75.02	32.85	1.30	0.10	0.78	
6	Bakore	Dug Well	74.56	32.81	4.93	2.43	3.32	3.96
7	Baradow	Dug Well	74.44	32.91	5.80	3.53	3.22	4.53
8	Bassi Kalan	Dug Well	74.90	32.64	3.50	2.46	3.17	3.28
9	Batera	Dug Well	74.75	32.85	10.58	6.80	6.78	8.16
10	Bega	Dug Well	74.67	32.61	3.00	2.00	2.18	2.76
11	Bengular	Dug Well	75.06	32.49		6.91	0.00	9.15
12	Bera	Dug Well	74.68	32.62	3.24	1.96	2.08	2.79
13	Bhagwanachak	Dug Well	74.58	32.86	27.89	26.51	23.33	24.69
14	Birpur	Dug Well	74.95	32.54		11.64	10.71	23.40
15	Bishnah	Dug Well	74.86	32.61	2.66	1.83	2.12	2.14
16	Channi	Dug Well	74.92	32.63	7.64	7.26	6.44	12.00
17	Chatta	Dug Well	74.93	32.69	4.20	3.42	3.98	5.23
18	Chowki chowra	Dug Well	74.65	33.03	2.03	5.61	1.13	2.10
19	Daboh	Dug Well	75.11	32.59	4.34	3.21	2.81	3.51
20	Devipur	Dug Well	74.66	32.86	7.11	4.17	5.79	7.29
21	Dhanpur	Dug Well	74.54	32.81	6.41	4.30	3.53	4.53
22	Dharam Khu	Dug Well	74.76	32.86	25.09	20.99	24.97	23.53

Sl No.	Location	Type of Structure	Longitude	Latitude	May-14	Aug-14	Nov-14	Jan-15
23	Dhora	Dug Well	75.14	32.61	2.95	0.00		
24	Didyal	Dug Well	74.96	32.47	2.27	1.37	1.68	1.97
25	Garhi (Jammu)	Dug Well	74.77	32.79	8.20	0.00	7.08	
26	Gajansoo	Dug Well	74.71	32.76	3.34	1.67	2.78	3.12
27	Gho-Manhasan	Dug Well	74.74	32.72	2.37	1.26	2.03	1.76
28	Gho-Rakwalan	Dug Well	74.95	32.55	3.82	2.91	2.35	3.07
29	Gho-Brahamna	Dug Well	74.96	32.55	6.49	6.43	7.35	5.45
30	Gigrial	Dug Well	74.48	32.80	3.20	2.72	3.33	3.58
31	Greater Kailash	Dug Well	74.93	32.69	6.22	7.53	5.47	6.22
32	Gudwal	Dug Well	74.01	32.55	2.65	2.08	1.87	2.13
33	Gura	Dug Well	74.96	32.55	13.54	10.47	10.03	11.40
34	Hamirpur Kohna	Dug Well	74.55	32.77	3.90	2.29	2.83	3.28
35	Hamirpur Sidhar	Dug Well	74.53	32.78	3.96	2.62	2.42	3.14
36	Hazuribag	Dug Well	74.81	32.74	8.46	6.10	6.07	6.57
37	Jagati	Dug Well	74.90	32.81	0.47	0.07	1.60	1.50
38	Jaswan	Dug Well	74.73	32.79	4.75	3.95	4.45	4.58
39	Jhiri	Dug Well	74.74	32.83	5.63	2.77	5.70	4.71
40	Jindrah	Dug Well	75.09	32.81	1.75	10.95		11.49
41	Jogwan	Dug Well	74.44	32.93	3.02	5.00	3.72	4.84
42	Jourian	Dug Well	74.58	32.83	5.37	2.33	2.33	3.53
43	Kachrial	Dug Well	74.47	32.87	3.93	1.40	0.67	1.41
44	Kainthpur	Dug Well	74.98	32.59	4.11	3.59	3.45	3.55
45	Kalah	Dug Well	74.47	32.91	0.85	2.09	2.05	2.58
46	Kaluchak	Dug Well	74.89	32.66	4.99	4.34	3.81	4.45
47	Kamila	Dug Well	75.07	32.61	4.89	0.00		
48	Kana Chak	Dug Well	74.72	32.82	4.45	2.03	3.20	3.50
49	Kangar	Dug Well	74.85	32.84	10.16	5.86	4.38	8.24
50	Karnaile Chak	Dug Well	74.82	32.79	7.65	5.84	6.32	6.51
51	Katcha-Pind Dansal	Dug Well	74.86	32.87	2.60	2.20	2.54	2.56
52	Khairi (Bishnah)	Dug Well	74.91	32.59	3.05	2.01	1.83	4.34
53	Khairi (Raipur)	Dug Well	74.86	32.81	6.36	4.60	2.18	4.52
54	Khour	Dug Well	74.52	32.83	4.48	1.67	2.75	4.91
55	Kot Kaswal	Dug Well	75.11	32.80	1.33	0.38	1.01	3.05
56	Kothey Saini	Dug Well	74.88	32.58	3.90	4.29	3.90	3.93
57	Kotli Charkan	Dug Well	74.83	32.62	3.62	1.74	2.50	2.77
58	Kunihala	Dug Well	75.03	32.90	1.67	1.52	1.68	1.76
59	Lalyal	Dug Well	74.77	32.66	3.69	3.31	3.05	3.43
60	Lam	Dug Well	74.51	32.83	2.13	3.66	2.32	1.67
61	Laswara	Dug Well	74.84	32.59	2.15	0.59	1.58	1.76
62	Leherian	Dug Well	74.69	32.90	9.83	5.29	8.11	8.88

Sl No.	Location	Type of Structure	Longitude	Latitude	May-14	Aug-14	Nov-14	Jan-15
63	Lower Barnai	Dug Well	74.79	32.76	5.45	3.07	4.40	4.94
64	Mahal Shah Kalandrian	Dug Well	74.94	32.51	4.02	3.90	2.88	4.15
65	Maheen Charkan	Dug Well	74.95	32.66	9.90	7.20	7.50	7.63
66	Majua Laxmi	Dug Well	74.92	32.56	2.57	2.08	5.87	2.35
67	Makwal	Dug Well	74.72	32.69	3.85	2.65		3.62
68	Marh	Dug Well	74.75	32.78	2.39	1.79	2.18	2.11
69	Marjholi	Dug Well	74.77	32.85	30.00	25.77	24.62	26.14
70	Mothlian Kalan	Dug Well	75.07	32.66	6.40	0.00		
71	Miran Sahib	Piezometer	74.79	32.65	7.51	7.45	6.53	6.64
72	Muthi	Dug Well	74.80	32.75	1.80	0.95	1.70	1.73
73	Nagrota (Sittlei)	Dug Well	75.07	32.62	3.65	2.35		3.38
74	Nandpur	Dug Well	74.89	32.52	3.87	2.94	2.30	2.74
75	Nikowal	Dug Well	74.71	32.51	5.08	4.67	4.61	4.95
76	Nud	Dug Well	75.15	32.61	2.95	2.18	2.22	2.70
77	Painthi	Dug Well	75.16	32.59	6.16			
78	Pallanwala	Dug Well	74.45	32.85	1.85	0.86	1.52	1.89
79	Palatan	Dug Well	74.45	32.84	2.16	0.61	1.91	1.96
80	Palli	Dug Well	74.89	32.63		1.75	1.91	1.82
81	Pangli Colony	Dug Well	74.52	32.79	3.29	1.04	1.93	2.92
82	Pata Khu	Dug Well	74.77	32.84	22.26	20.15	18.30	20.15
83	Patli	Dug Well	74.95	32.61	7.70	7.97	6.82	6.97
84	Patyale Chak	Dug Well	74.78	32.76	4.35	3.02	3.44	3.69
85	Purkhoo	Dug Well	74.78	32.80	18.26	16.51	15.68	16.58
86	Poal	Dug Well	74.82	32.53	3.63	1.93	2.10	2.62
87	Raiyan	Dug Well	75.12	32.51	21.00	20.44	16.28	17.90
88	Rangoora	Dug Well	74.90	32.75	1.60	1.05	0.46	0.76
89	Rehal	Dug Well	74.88	32.56	5.31	4.30	4.15	4.76
90	Sajwal	Dug Well	74.59	32.79	2.71	1.38	2.65	2.92
91	Salehar	Dug Well	74.82	32.56	3.82	2.42	2.58	3.27
92	Samba	Dug Well	75.12	32.56	15.85	16.60	14.50	15.00
93	Sandhwan	Dug Well	74.71	32.71	3.52	2.63	3.12	3.14
94	Satwari	Dug Well	74.85	32.69	11.01	9.51	9.11	9.67
95	Sei Khurd	Dug Well	74.72	32.51	4.20	3.66	3.55	3.93
96	Senth	Dug Well	74.51	32.77	2.94	1.95	2.24	2.66
97	Shame Chak	Dug Well	74.74	32.83	6.51	3.63	4.17	3.79
98	Sidhra	Dug Well	74.89	32.76	3.90	2.50	2.40	3.66
99	Sobka	Dug Well	74.75	32.88	23.14	20.27	19.28	20.88
100	Sohanjana	Dug Well	74.74	32.70	4.00	3.00	3.18	3.43
101	Suchetgarh	Piezometer	74.67	32.58	2.64	1.71	1.61	2.61
102	Suchetgarh-II	Piezometer	74.68	32.57	3.23	1.59	2.24	1.49

Sl No.	Location	Type of Structure	Longitude	Latitude	May-14	Aug-14	Nov-14	Jan-15
103	Sugetar	Dug Well	74.96	32.88	1.27	0.30	0.75	0.95
104	Sumah	Dug Well	74.67	32.96	3.00	2.88	3.12	3.37
105	Supwal	Dug Well	74.07	32.56	6.43	2.99	3.33	5.17
106	Swankha More	Dug Well	74.01	32.57	18.71	19.11	17.16	17.74
107	Tanda Sheoda	Dug Well	74.70	32.98	3.94	2.88	3.70	3.81
108	Taryai	Dug Well	74.61	32.87	34.27		32.10	32.80
109	Trikuta Nagar	Dug Well	74.89	32.70	3.70	2.44	2.53	2.89
110	Upperla kanhal	Dug Well	74.88	32.63	3.43	1.48	2.40	1.85
111	Uttarbani	Dug Well	75.06	32.65	1.75			
	<b>KATHUA DISTRICT</b>							
112	Barni	Dug Well	75.59	32.42	7.16	3.36	6.00	6.40
113	Bhagwal	Dug Well	75.37	32.45	23.92	7.46	11.44	17.94
114	Billawar	Dug Well	75.61	32.61	0.48	1.20	1.29	1.45
115	Chak hariya	Dug Well	75.37	32.39	2.68	1.74	1.60	2.13
116	Chann Khatrian	Dug Well	75.25	32.49	5.92	4.27	3.20	6.21
117	Chan ranga	Dug Well	75.33	32.48	10.78	5.69	4.25	8.21
118	Chapki Kalan	Dug Well	75.31	32.45	17.56	8.46	5.68	10.78
119	Challan	Dug Well	0.00	0.00		4.08		
120	Dulme Chak	Dug Well	75.18	32.43	3.85	3.50	3.13	3.46
121	Feru chak	Dug Well	75.28	32.38	5.73	3.22	1.29	4.94
122	Gadyal-II	Dug Well	75.30	32.42	3.55			
123	Gond	Dug Well	75.50	32.33	5.80	0.00		5.00
124	Gangu chak	Dug Well	75.26	32.40	2.73	2.32	2.22	2.15
125	Jandi	Dug Well	75.25	32.46	4.86	5.35	4.22	4.82
126	Jasath	Dug Well	75.20	32.50	11.86	9.72	5.85	8.25
127	Karol Krishna	Dug Well	75.24	32.40	7.65	8.94	7.08	7.99
128	Kathua	Dug Well	75.53	32.36	1.77	0.92	0.72	1.11
129	Kerian Gandyal-II	Dug Well	75.52	32.30	3.13	2.46	2.50	3.23
130	Kerian Ramnagar	Dug Well	75.51	32.28	2.65	2.53	2.76	2.90
131	Khanpur	Dug Well	75.36	32.43	2.46	1.49	1.48	1.67
132	Khukhial	Dug Well	75.47	32.35	1.69	1.15	1.46	1.47
133	Konthal	Dug Well	75.26	32.42	11.95	4.63	4.25	11.17
134	Kootah	Dug Well	75.24	32.51	25.47	23.95	23.61	23.79
135	Kote punnu	Dug Well	75.38	32.35	2.22	1.61	1.74	1.85
136	Kothian	Dug Well	75.51	32.37	2.46	0.11	0.22	1.05
137	Lakhnot	Dug Well	75.45	32.33	1.88	0.00		
138	Lakhanpur	Dug Well	75.59	32.38	6.73	2.62	3.64	3.74
139	Lakri	Dug Well	75.42	32.66	2.77	2.64	2.50	2.76
140	Lale Chak	Dug Well	75.20	32.45	3.13	2.09	1.62	1.98

Sl No.	Location	Type of Structure	Longitude	Latitude	May-14	Aug-14	Nov-14	Jan-15
141	Lokli	Dug Well	75.27	32.54	3.95	2.73	2.98	4.08
142	Londi	Dug Well	75.21	32.43	5.37	5.44	4.65	5.15
143	Madun	Dug Well	75.16	32.48	2.43	0.00	1.76	2.26
144	Mahi Chak	Dug Well	75.42	32.42	22.65	18.45	18.15	23.64
145	Mandli	Dug Well	75.51	32.64	1.90	2.00	2.00	2.11
146	Mukandpur	Dug Well	75.37	32.37	4.08	3.72	3.91	3.97
147	Nagri	Dug Well	75.43	32.35	1.83	1.34	2.43	2.53
148	Nagrota-Gujaroo	Dug Well	75.39	32.65	6.48	4.53	6.03	6.82
149	Naran	Dug Well	75.15	32.50	6.65	5.46	4.41	5.32
150	Nauni	Dug Well	75.30	32.56	2.14	1.88	1.33	2.48
151	Nilcha	Dug Well	75.25	32.56	10.67	9.70	8.35	9.53
152	Pallan	Dug Well	75.57	32.56	1.10	0.50	1.13	1.37
153	Pangdour	Dug Well	75.11	32.48	3.36	3.50	3.30	3.25
154	Pansar	Dug Well	75.31	32.37	6.11	5.90	5.68	6.08
155	Patyari	Dug Well	75.27	32.55	3.21	0.00		
156	Patitari	Dug Well	75.44	32.40	9.17	3.67	2.25	2.05
157	Phalora	Dug Well	75.14	32.48	2.39	2.14	1.90	2.08
158	Phinter	Dug Well	75.54	32.58	5.50	3.90	4.82	6.73
159	Raghu chak	Dug Well	75.20	32.49	2.94	1.74	1.43	2.03
160	Ramkot	Dug Well	75.34	32.64	6.00	5.30	5.81	6.34
161	Sadoh	Dug Well	75.13	32.47	6.54	8.60	7.21	6.82
162	Sanoora	Dug Well	75.18	32.49	0.91	0.87	0.90	0.90
	<b>RAJOURI DISTRICT</b>							
163	Bagnoti	Dug Well	74.30	33.14	4.59	3.12	4.45	4.86
164	Bakhar	Dug Well	74.43	33.09	1.66	1.43		1.69
165	Banpari	Dug Well	74.46	33.03	3.33	1.80	2.25	2.71
166	Bareri	Dug Well	74.19	33.10	2.56	1.46	2.63	4.43
167	Bhatta Mohra	Dug Well	74.20	33.20	1.60	1.74	1.56	1.90
168	Channi Parat	Dug Well	74.46	33.09	6.10	9.22	4.87	7.95
169	Chittiar	Dug Well	74.28	33.29	2.08	1.57	1.47	3.14
170	Chowki Handa	Dug Well	74.19	33.17	2.03	2.22	1.37	2.00
171	Darhal Quila	Dug Well	74.15	33.22	2.70	3.04	2.48	5.85
172	Dharamsal	Dug Well	74.41	33.13	3.47	1.63	2.25	3.83
173	Dhok Baniar	Dug Well	74.42	33.03	2.53	3.06	2.88	2.85
174	Dyala	Dug Well	74.37	33.24	1.95	2.00	2.60	3.06
175	Gagrote	Dug Well	74.27	33.09	2.60	2.96	0.71	2.65
176	Jhangar	Dug Well	74.05	33.24	4.80	4.62	4.74	5.00
177	Kalal	Dug Well	74.23	33.08	4.75	4.62	1.80	4.20
178	Kalsian	Dug Well	74.14	33.19	1.03	2.02	0.08	1.28



Sl No.	Location	Type of Structure	Longitude	Latitude	May-14	Aug-14	Nov-14	Jan-15
179	Kangri (Grid Station)	Dug Well	74.40	33.06	3.00	2.43	2.77	4.80
180	Laroka	Dug Well	74.10	33.24	1.43	1.30	1.17	1.55
181	Lower Kharak	Dug Well	74.42	33.17	0.67	0.42	0.62	1.83
182	Marchola	Dug Well	74.48	33.09	3.62	1.84	1.00	3.15
183	Naunihal	Dug Well	74.21	33.18	1.85	3.19	0.85	3.02
184	Panja	Dug Well	74.42	33.18	1.60	1.24	1.38	1.58
185	Pukharni	Dug Well	74.11	33.27	1.24	1.29	1.07	1.26
186	Potha	Dug Well	74.32	33.28	1.65	1.53	2.30	2.49
187	Rumli Dara	Dug Well	74.22	33.14	2.81	3.93	1.69	3.25
188	Seri	Dug Well	74.29	33.08	2.74	2.42	2.43	2.81
189	Sial	Dug Well	74.32	33.07	1.28	0.98	0.77	1.04
190	Siot	Dug Well	74.38	33.12	2.27	1.60	1.63	1.46
191	Solki	Dug Well	74.43	33.16	1.88	1.03	1.29	2.85
192	Thangrot	Dug Well	74.59	33.14	1.75	0.57	0.93	2.71
	<b>UDHAMPUR DISTRICT</b>							
193	Aliyah	Dug Well	74.55	33.17	1.99	0.91	1.66	1.97
194	Badola	Dug Well	75.03	32.94	3.00	1.40	2.15	2.32
195	Battal Ballian	Dug Well	75.13	32.88	3.90	9.98	4.82	5.90
196	Bhamla	Dug Well	74.58	33.05	3.88	3.68	2.14	3.67
197	Birmah	Dug Well	75.11	32.91	2.40	2.70	1.92	2.46
198	Channi Mansar	Dug Well	75.16	32.70	2.47	1.55	1.46	2.25
199	Dadua	Dug Well	74.64	33.07	2.03	1.69	1.77	1.93
200	Dalsar	Dug Well	75.31	32.82	0.55	0.30	0.42	1.25
201	Dehari	Dug Well	75.27	32.78	0.45	0.10	1.55	4.43
202	Eastern Mand	Dug Well	74.02	32.90	2.90	0.60	1.92	4.80
203	Garan Jagir	Dug Well	74.65	33.07	2.72	2.11	2.55	3.11
204	Garhi (Udh)	Dug Well	75.08	32.91	0.85	0.70		0.45
205	Jallow	Dug Well	75.23	32.80	0.90	0.80	1.22	1.93
206	Jhakkar	Dug Well	75.12	32.95	4.00	0.65	4.10	5.01
207	Katra	Dug Well	74.93	32.91	2.90	0.00	2.14	2.69
208	Kotli Pain Megaini	Dug Well	75.42	32.91	1.05	0.75	0.79	2.75
209	Kuperlah	Dug Well	75.18	32.85	1.63	0.74	2.14	3.40
210	Manwall	Dug Well	75.15	32.76	7.05	8.00	4.53	7.58
211	Nagrota Panjarain	Dug Well	75.27	32.84	1.50	1.65	1.50	1.82
212	Nanora	Dug Well	74.63	33.13	2.22	1.97	3.48	3.88
213	Phangyal	Dug Well	75.14	32.90	2.72	3.35	1.45	2.15
214	Ramnagar	Dug Well	75.31	32.81	5.00	4.10	5.05	5.16
215	Riasi	Dug Well	74.08	33.09	25.10	25.10	25.11	25.35
216	Ritti	Dug Well	75.16	32.84	0.92	0.40	0.23	0.92

Sl No.	Location	Type of Structure	Longitude	Latitude	May-14	Aug-14	Nov-14	Jan-15
217	Salabra	Dug Well	75.18	32.72	1.45	1.75	1.55	1.78
218	Seen Thakaran	Dug Well	75.04	32.91	1.98	1.08	2.89	3.05
219	Sunal	Dug Well	75.24	32.68	1.53	0.90	2.05	3.35
220	Talpad	Dug Well	75.20	32.86	1.05	0.60	0.85	1.63
221	Talwara	Dug Well	74.79	33.09	4.85	4.05	4.40	4.82
222	Kahpotha	Dug Well	75.04	32.83		1.09		
223	Sagoon	Dug Well	75.09	32.74		2.50		
224	Surinsar	Dug Well	75.04	32.77		0.40		
225	Upper Ban	Dug Well				0.75		
226	Dhanu Kanal	Dug Well				0.32		

### 7.3.2. Depth to Water Level -May 2014

In **Jammu Region** the water level data in respect of 218 out of 247 National Hydrograph Network Stations for the month of May 2014 were analyzed. The depth to water levels ranges from 0.45 m bgl (Dehari in Udhampur district) to 34.27 m bgl (Taryai in Jammu district).

The water level is recorded less than 2 meters below ground level (m bgl) in 45 (20.54%) wells. 108 wells (49.31% of the total wells analyzed), have shown depth to water level in the range 2 to 5 m bgl, whereas 42 wells (19.26%) have shown water levels in the range of 5 to 10 m bgl. 12 (5.47%) wells are showing deeper water level i.e. in the range of 10 to 20 m bgl. 11 (5.02%) wells are showing very deep water level of more than 20 m bgl. None of the wells have shown water levels more than 40 m bgl.

The perusal of the map indicates that the valley areas of Rajouri and Udhampur Districts mostly show water levels between 2 to 5 m bgl except for some places in Dun Belt where water level is between 5 to 10 m bgl. In the outer plains of Jammu and Kathua districts, most of the area is having water levels between 2 to 5 m bgl. Some parts of Jammu and Kathua Districts show water levels between 5 to 10 m bgl and 10 to 20 m bgl especially in Kandi belt. In this belt the water levels are as deep as 20 m bgl which are observed at the transition boundary of Siwalik Hills and Kandi belt. Water levels deeper than 20m bgl were observed in the extreme north in the valley portion of Kathua district, and in the north-western portion of Jammu district mostly in Kandi belt. (Figure 4)

**In Kashmir Region** The water level data in respect of all the 29 out of 30 National Hydrograph Network Stations for the month of May 2014 were analyzed. The depth to water levels ranges from 0.27 (in Sopere Model Town Baramulla district) to 14.79 m bgl (in Tral Pulwama district).

The water level is recorded less than 2.0 m below ground level in 14 (46.66%) wells, 11 (36.66%) of the total wells analyzed, have shown depth to water level in the range 2-5 m bgl, whereas 01 well have shown water levels in the range of 5-10 m bgl (3.33% of total wells), 03 (10%)

wells are showing the deeper water level i.e. 10-15 m bgl, where as none of the wells have shown water level more than 15.0 m bgl.

The valley of Baramulla district has maximum of its part under 0 – 2 m bgl and a very small patch of Pulwama, Kupwara and major part in Budgam districts are having water levels between 0 -2 m bgl. Rest of the parts of Kupwara, Baramulla and Badgam, Pulwama and Anantnag districts are having water levels between 2 – 5 m bgl. The water levels between 5 and 10 m bgl is observed in few portions of Bandipora, Baramulla, Ganderbal, Srinagar, Pulwama, Shopian, Kulgam and Anantnag district. Entire Kulgam district falls in the range of 5-10 mbgl. The water level between 10 – 15 m bgl is observed in some parts of Pulwama and Anantnag districts. (Figure 5)

### **7.3.3. Depth to Water Level -August 2014**

**In Jammu Region,** The water level data in respect of 229 out of 250 National Hydrograph Network Stations for the month of August 2014 were analyzed. The depth to water levels ranges from 0.00 m bgl (in Akhnoor (Batera), Dhora, Garhi (Jammu), Kamila, Mothlian Kalan, Nandini ,Nagrota (Uttarbani), Painthi, Peer Kho, Quadarpur & Salehar areas of Jammu district and Uttarbani, Gadyal, Gond, Lakhnot, Madun, Patyari-II of Kathua District and Katra of Udhampur district) to a maximum of 26.51 m bgl (Bhagwanachak in Jammu district).

The water level is recorded less than 2 meters below ground level (m bgl) in 95 (41.48%) wells. 88 wells (38.42% of the total wells analyzed), have shown depth to water level in the range 2 to 5 m bgl, whereas 31 wells (13.53%) have shown water levels in the range of 5 to 10 m bgl. 07 (3.05%) wells are showing deeper water level i.e. in the range of 10 to 20 m bgl. 08 (3.49%) wells are showing very deep water level of more than 20 m bgl. None of the wells have shown water levels more than 40 m bgl.

The valley areas of Rajouri District have water levels generally between 0 to 5 m bgl. The valley area of Udhampur District shows water levels between 0 – 2 m bgl except for few patches in eastern and southern part where water levels are between 2 and 5 m bgl. In Dun Belt water level is between 0 and 5 m bgl except in central part where water levels up to 10 m bgl are observed. In Sirowal formation of Jammu water levels varies between 2 to 5 and 5-10 m bgl. The transition part of Sirowal belt and Kandi belt of both Jammu and Kathua Districts shows water levels between 5 to 10 m bgl and 10 to 20 m bgl. Water levels deeper than 20m bgl were observed in the extreme north-western portion of Jammu district in Kandi belt (Figure 6)

**In Kashmir Region** The water level data in respect of all the 29 out of 30 National Hydrograph Network Stations for the month of August 2014 were analyzed. The depth to water levels ranges from 0.70 (in Ganshahi Bhat Baramulla district) to 14.69 m bgl (in Tral Pulwama district).

The water level is recorded less than 2.0 m below ground level in 02 (6.89%) wells, 14 (48.27%) of the total wells analyzed, have shown depth to water level in the range 2-5 m bgl, whereas 10

(34.48%) of the wells have shown water levels in the range of 5-10 m bgl, 03 (10.34%) wells are showing the deeper water level i.e., 10-15 m bgl, none of the wells have shown water level more than 15.0 m bgl.

A few portion in the interior of Baramulla and south western patch of Pulwama district has water level 0 – 2 m bgl where as the valley portions of entire Budgam, Bandipora and major portions of Baramulla, Kupwara Pulwama and Shopian districts are having water levels between 2 – 5 m bgl. The water levels between 5 – 10 m bgl is observed in north-western parts of Kupwara, south-western parts of Baramulla, entire Kulgam and major parts of Anantnag, Shopian, Srinagar and Ganderbal districts. The water level between 10 – 15 m bgl is observed in two very small patches of Anantnag and Pulwama districts. (Figure 7)

#### **7.3.4. Depth to Water Level -November 2014**

In **Jammu Region**, the water level data in respect of 207 out of 250 National Hydrograph Network Stations for the month of November 2014 were analyzed. The depth to water levels ranges from - 0.00 m bgl (Bengulur in Jammu District) to 32.10 m bgl (Taryai in Jammu district)

Majority of the wells that is 65 numbers of wells (31.40%) have recorded the water level less than 2.0 m bgl. 99 wells (47.82%) of the total wells analyzed have shown depth to water level in the range 2-5 m bgl. Whereas 26 wells (12.56%) of the total wells analyzed have shown water levels in the range of 5-10 m bgl. 11 (5.31%) wells are showing the deeper water levels, i.e. 10-20 m bgl. 06 wells (2.89%) of the total wells analyzed have shown water levels in the range of 20-40 m bgl. None of the wells are showing water levels more than 40.0 m bgl.

Valley areas of Udhampur and Rajauri districts and Dun belt show water level between 0-2 and 2-5 m bgl except for two patches in Dun Belt that shows water levels between 5 and 10 m bgl. In Sirowal area of Outer Plain most of the water levels recorded between 2 and 5 m bgl except for few small patches that shows water levels from 0 to 2 m bgl. In Kandi Belt the water levels are deeper. In Kandi belt water levels ranges between 2 and 10 m bgl and few patches of the Kandi belt has water levels more than 10 m bgl. In the Taryai area of Jammu District, the water levels are deeper than 20 m bgl. (Figure 8)

In **Kashmir Valley**, the water level data in respect of 28 out of all the 31 National Hydrograph Network Stations for the month of November 2014 were analyzed. The depth to water levels ranges from 0.49 mbgl (Sopore Model Town in Baramulla District) to 15.24 m bgl (Tral in Pulwama District).

The water level is recorded less than 2.0 m below ground level in 4 (14.28%) wells, 16 (57.14%) of the total wells analyzed, have shown depth to water level in the range 2-5 m bgl, whereas 05 wells (17.85%) have shown water levels in the range of 5-10 m bgl, 03 (10.71%) wells

are showing the deeper water levels i.e., 10-20 m bgl, none of the wells have shown water level more than 20.0 m bgl.

A few portion in the interior of Baramulla and southern extreme patch of Bandipora district has water level 0 – 2 m bgl, all major parts of Kashmir Valley viz. Kupwara, Baramulla, Budgam, Pulwama, Srinagar and Shopian districts have water levels between 2 to 5 m bgl. Water levels between 5 and 10 m bgl are observed in small parts of Kupwara, Baramulla, Budgam, Srinagar, Bandipora, Anantnag and entire Kulgam and Ganderbal districts where as in north eastern edge of Pulwama and western parts of Anantnag districts the water levels further tumble down to > 10 m bgl. Only a single well at Tral in Pulwama District where the water level above 15 m bgl was observed (Figure 9)

### **7.3.5. Depth to Water Level -January 2015**

**In Jammu Region**, the water level data in respect of 211 out of 228 National hydrograph Network Stations for the month of January 2015 were analyzed. The depth to water levels ranges from 0.45 in Garhi (Udh) Udhampur District to 32.80 m bgl in Taryai Jammu District.

About 42 (19.90%) have recorded the water level less than 2.0 m bgl. 111 wells (52.60%) of the total wells analyzed, have shown depth to water level in the range 2-5 m bgl, whereas 37 wells (17.53%) of the total wells analyzed, have shown water levels in the range of 5-10 m bgl, 11 (5.21%) wells are showing the deeper water levels i.e., 10-20 m bgl, 10 (4.73%) wells are showing deepest water level that is more than 20.0 m bgl. None of the wells had shown water levels deeper than 40 m bgl.

All of the areas of valley in Udhampur and Rajouri District show water level between 0-2 and 2-5 m bgl except for very small portions which shows water levels between 5 and 10 m bgl. In Dun Belt, water levels are in the range of 2 to 5 m bgl and 5 to 10 m bgl except for only two small patches on the extreme north eastern and north western ends where water levels are from 0 to 2 m bgl. In the Sirowal area of Jammu District most of the water levels recorded between 2 and 5 m bgl with 2 small patches of 0-2 m and one small patch of 5-10 m bgl. In Kathua district water levels in this belt varies between 2 to 5 in the western and eastern parts whereas the central part is having water levels between 5 and 10 m bgl. The Kandi belt in both Jammu and Kathua Districts is having deeper water levels between 5 to 10 and 10 to 20 m bgl. In Kandi Belt of both the districts, the water levels are deeper especially in Taryai Bhagwanchak and Marjoli areas of Jammu District and Nilcha area of Kathua districts more than 20 m bgl water levels are observed. (Figure 10)

**In Kashmir Region** due to heavy snowfall Monitoring of NHS stations is not being done for the month of January.

**Table 5. CATEGORIZATION OF DEPTH TO WATER LEVEL- MAY 2014**

District	No. Of wells Analyzed	Depth to Water Level (mbgl)		Number of Wells Showing Depth to Water Level (mbgl) in the Range of						Percentage of Wells Showing Depth to Water Level (mbgl) in the Range of					
		Min	Max	0 – 2	2 – 5	5 – 10	10 – 20	20 – 40	>40	0 – 2	2 - 5	5 – 10	10 – 20	20 – 40	>40
ANANTNAG	1			0	0	0	1	0	0	0.00	0.00	0.00	100.00	0.00	0.00
BARAMULLA	11	0.27	4.10	9	2	0	0	0	0	81.82	18.18	0.00	0.00	0.00	0.00
JAMMU	109	0.47	34.27	11	59	25	7	7	0	10.09	54.13	22.94	6.42	6.42	0.00
KATHUA	50	0.48	25.47	8	20	14	5	3	0	16.00	40.00	28.00	10.00	6.00	0.00
KUPWARA	11	1.00	12.56	5	5	0	1	0	0	45.45	45.45	0.00	9.09	0.00	0.00
PULWAMA	4	2.60	14.79	0	3	0	1	0	0.00	0.00	75.00	0.00	25.00	0.00	0.00
RAJAUARI	30	0.67	6.10	13	16	1	0	0	0	43.33	53.33	3.33	0.00	0.00	0.00
SRINAGAR	2	3.16	9.47	0	1	1	0	0	0	0.00	50.00	50.00	0.00	0.00	0.00
UDHAMPUR	29	0.45	25.10	13	13	2	0	1	0	44.83	44.83	6.90	0.00	3.45	0.00
<b>TOTAL</b>	<b>247</b>	<b>0.27</b>	<b>34.27</b>	<b>59</b>	<b>119</b>	<b>43</b>	<b>15</b>	<b>11</b>	<b>0</b>	<b>23.89</b>	<b>48.18</b>	<b>17.41</b>	<b>6.07</b>	<b>4.45</b>	<b>0.00</b>

**Table 6. CATEGORIZATION OF DEPTH TO WATER LEVEL- AUGUST 2014**

District	No. Of wells Analyzed	Depth to Water Level (mbgl)		Number of Wells Showing Depth to Water Level (mbgl) in the Range of						Percentage of Wells Showing Depth to Water Level (mbgl) in the Range of					
		Min	Max	0 – 2	2 – 5	5 – 10	10 – 20	20 – 40	>40	0 – 2	2 - 5	5 – 10	10 – 20	20 – 40	>40
ANANTNAG	1			0	0	0	1	0	0	0.00	0.00	0.00	100.00	0.00	0.00
BARAMULLA	11	0.70	5.82	2	8	1	0	0	0	18.18	72.73	9.09	0.00	0.00	0.00
JAMMU	112	0.00	26.51	36	48	16	6	6	0	32.14	42.86	14.29	5.36	5.36	0.00
KATHUA	51	0.00	23.95	17	20	12	1	1	0	33.33	39.22	23.53	1.96	1.96	0.00
KUPWARA	11	2.89	12.89	0	4	6	1	0	0	0.00	36.36	54.55	9.09	0.00	0.00
PULWAMA	4	4.26	15.24	0	1	2	1	0	0	0.00	25.00	50.00	25.00	0.00	0.00
RAJAURI	30	0.42	9.22	16	13	1	0	0	0	53.33	43.33	3.33	0.00	0.00	0.00
SRINAGAR	2	2.74	9.85	0	1	1	0	0	0	0.00	50.00	50.00	0.00	0.00	0.00
UDHAMPUR	36	0.00	25.10	26	7	2	0	1	0	72.22	19.44	5.56	0.00	2.78	0.00
<b>TOTAL</b>	<b>258</b>	<b>0.00</b>	<b>26.51</b>	<b>97</b>	<b>102</b>	<b>41</b>	<b>10</b>	<b>8</b>	<b>0</b>	<b>37.60</b>	<b>39.53</b>	<b>15.89</b>	<b>3.88</b>	<b>3.10</b>	<b>0.00</b>



**Table 7. CATEGORIZATION OF DEPTH TO WATER LEVEL- NOVEMBER 2014**

District	No. Of wells Analyzed	Depth to Water Level (mbgl)		Number of Wells Showing Depth to Water Level (mbgl) in the Range of						Percentage of Wells Showing Depth to Water Level (mbgl) in the Range of					
		Min	Max	0 – 2	2 – 5	5 – 10	10 – 20	20 – 40	>40	0 – 2	2 - 5	5 – 10	10 – 20	20 – 40	>40
ANANTNAG	1			0	0	0	1	0	0	0.00	0.00	0.00	100.00	0.00	0.00
BARAMULLA	11	0.49	6.20	3	7	1	0	0	0	27.27	63.64	9.09	0.00	0.00	0.00
JAMMU	104	0.00	32.10	19	56	16	9	4	0	18.27	53.85	15.38	8.65	3.85	0.00
KATHUA	46	0.22	23.61	15	19	9	2	1	0	32.61	41.30	19.57	4.35	2.17	0.00
KUPWARA	11	1.90	13.33	1	7	2	1	0	0	9.09	63.64	18.18	9.09	0.00	0.00
PULWAMA	3	3.20	14.79	0	1	1	0	1	0	0.00	33.33	33.33	0.00	33.33	0.00
RAJAURI	29	0.08	4.87	17	12	0	0	0	0	58.62	41.38	0.00	0.00	0.00	0.00
SRINAGAR	2	2.44	8.05	0	1	1	0	0	0	0.00	50.00	50.00	0.00	0.00	0.00
UDHAMPUR	28	0.23	25.11	14	13	0	0	1	0	50.00	46.43	0.00	0.00	3.57	0.00
<b>TOTAL</b>	<b>235</b>	<b>0.00</b>	<b>32.10</b>	<b>69</b>	<b>116</b>	<b>30</b>	<b>13</b>	<b>7</b>	<b>0</b>	<b>29.36</b>	<b>49.36</b>	<b>12.77</b>	<b>5.53</b>	<b>2.98</b>	<b>0.00</b>

**Table 8. CATEGORIZATION OF DEPTH TO WATER LEVEL- JANUARY 2015**

District	No. Of wells Analyzed	Depth to Water Level (mbgl)		Number of Wells Showing Depth to Water Level (mbgl) in the Range of						Percentage of Wells Showing Depth to Water Level (mbgl) in the Range of					
		Min	Max	0 – 2	2 – 5	5 – 10	10 – 20	20 – 40	>40	0 – 2	2 - 5	5 – 10	10 – 20	20 – 40	>40
ANANTNAG															
BARAMULLA															
JAMMU	105	0.76	32.80	15	59	16	8	7	0.00	14.29	56.19	15.24	7.62	6.67	0.00
KATHUA	47	0.90	23.79	9	19	14	3	2	0.00	19.15	40.43	29.79	6.38	4.26	0.00
KUPWARA															
PULWAMA															
RAJOURI	30	1.04	7.95	9	18	3	0	0	0.00	30.00	60.00	10.00	0.00	0.00	0.00
SRINAGAR															
UDHAMPUR	29	0.45	25.35	9	15	4	0	1	0.00	31.03	51.72	13.79	0.00	3.45	0.00
<b>TOTAL</b>	<b>211</b>	<b>0.45</b>	<b>32.80</b>	<b>42</b>	<b>111</b>	<b>37</b>	<b>11</b>	<b>10</b>	<b>0.00</b>	<b>19.91</b>	<b>52.61</b>	<b>17.54</b>	<b>5.21</b>	<b>4.74</b>	<b>0.00</b>

**Figure 4**

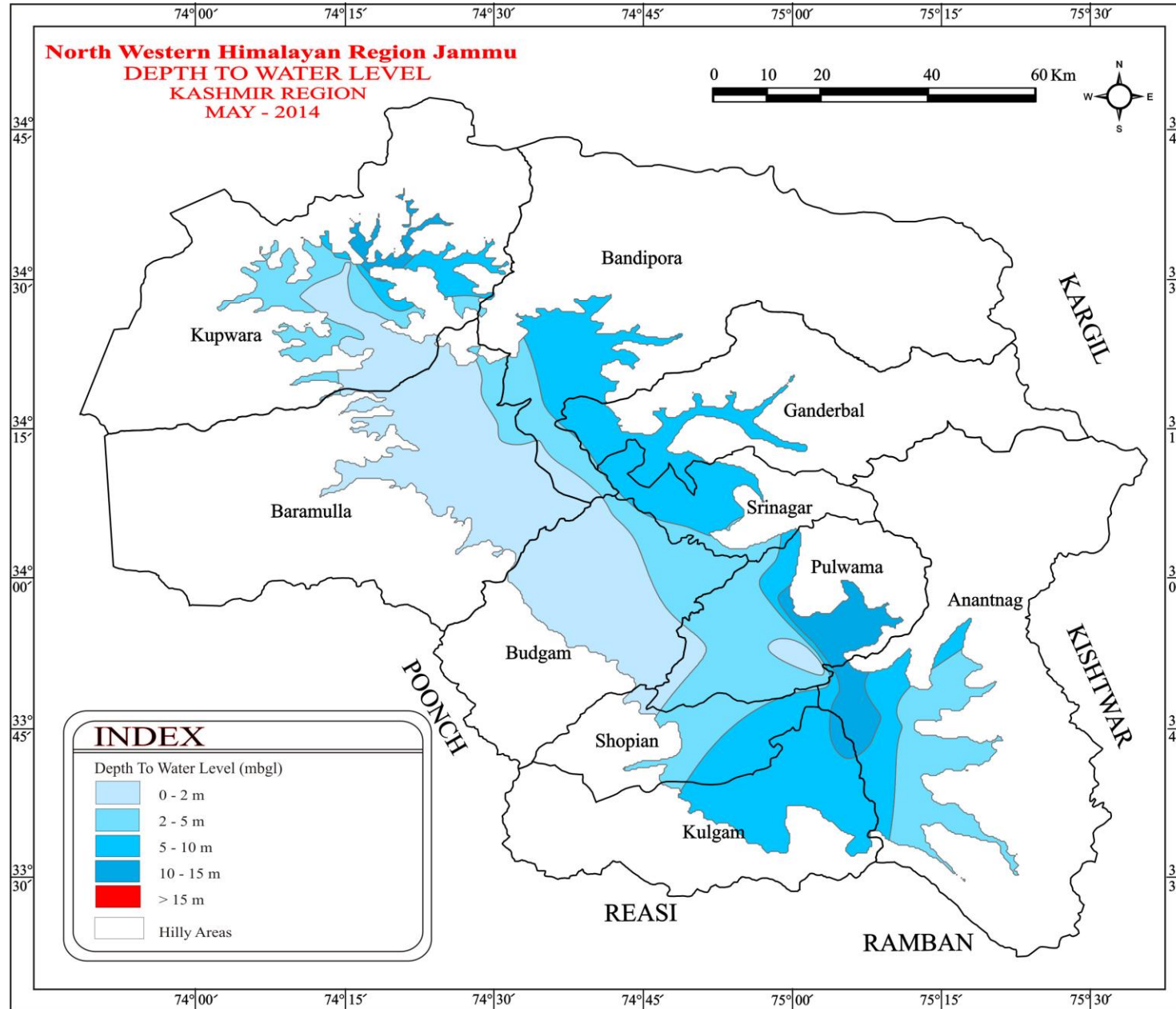


Figure 5

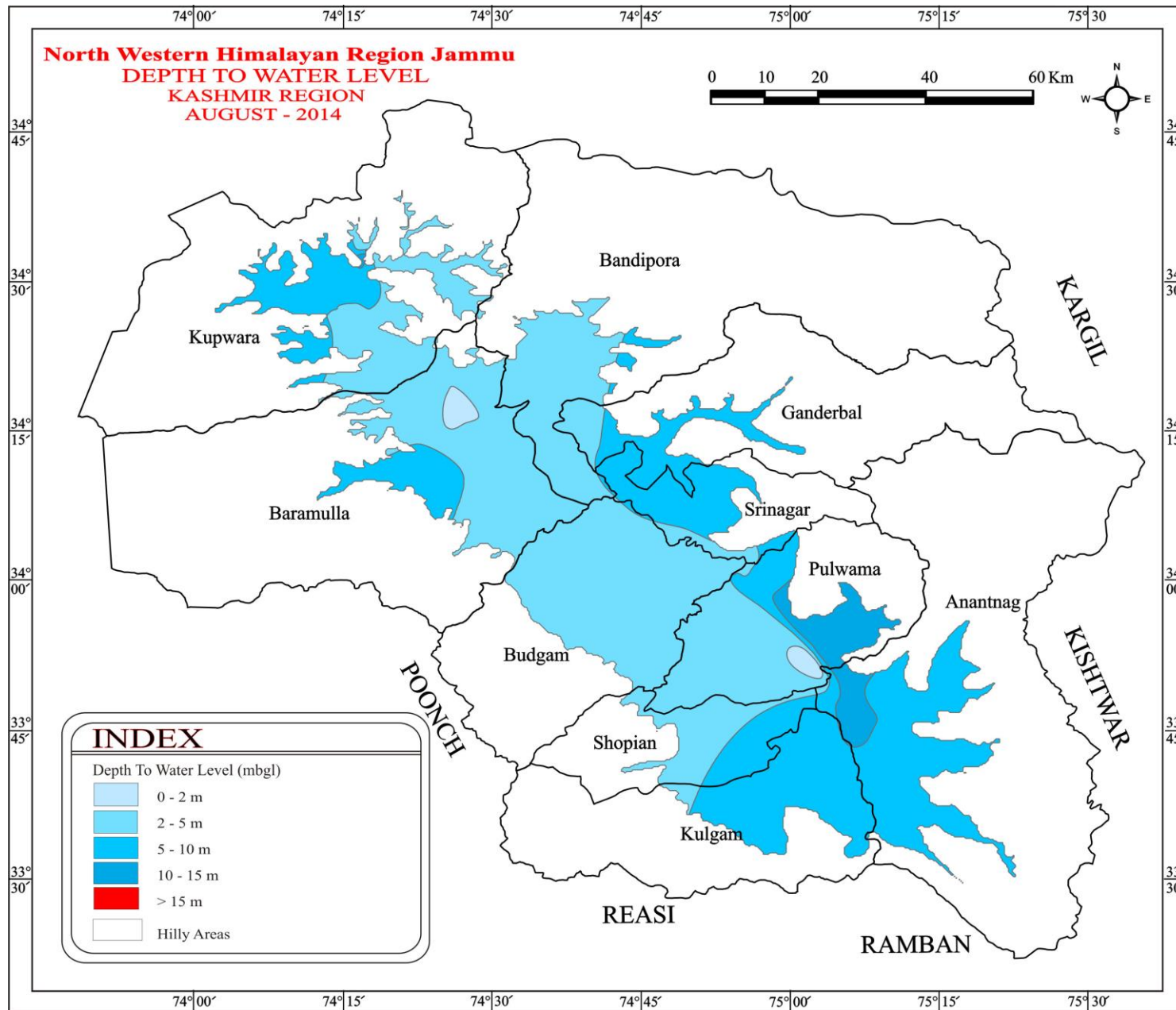


Figure 6

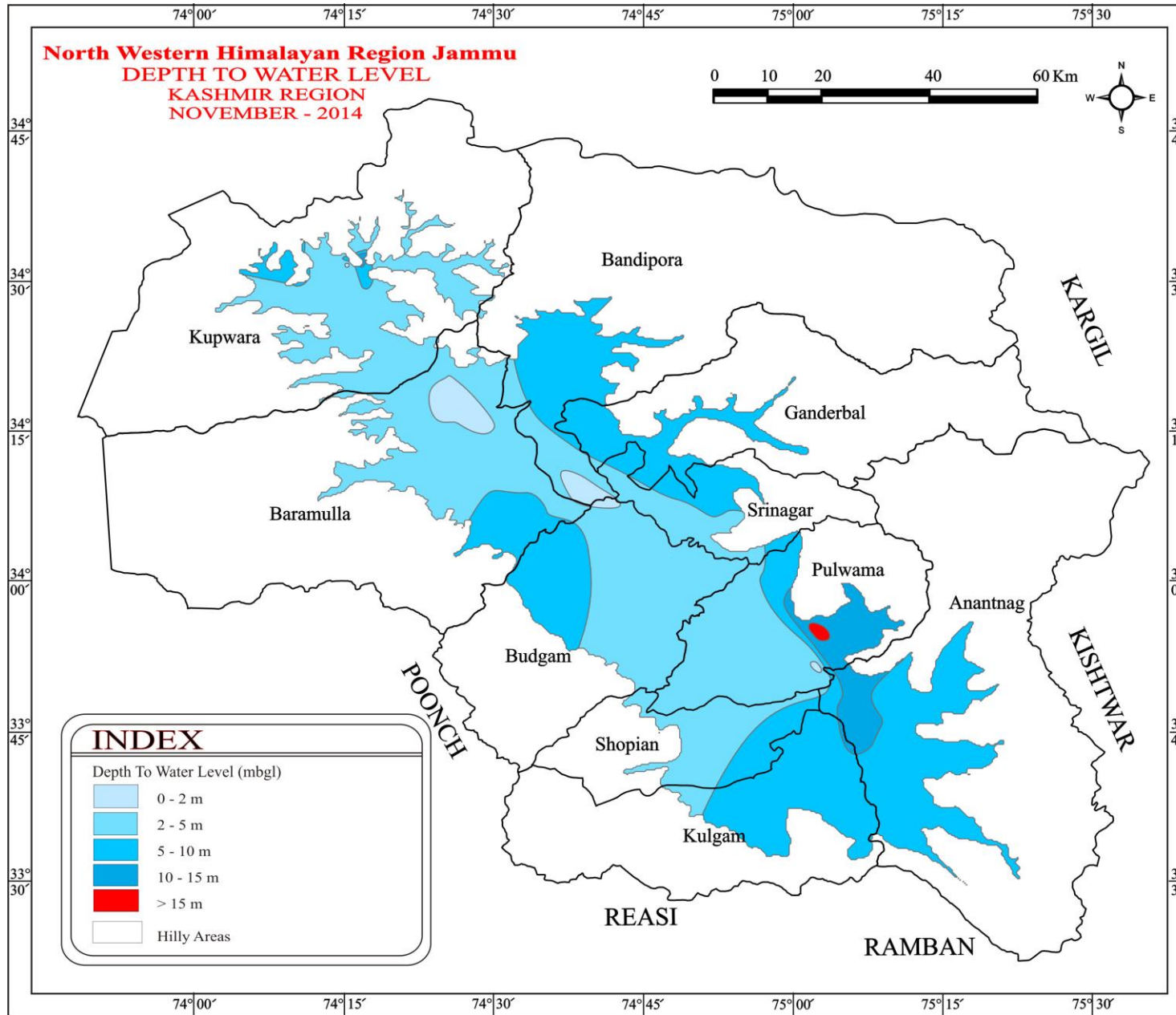




Figure 7

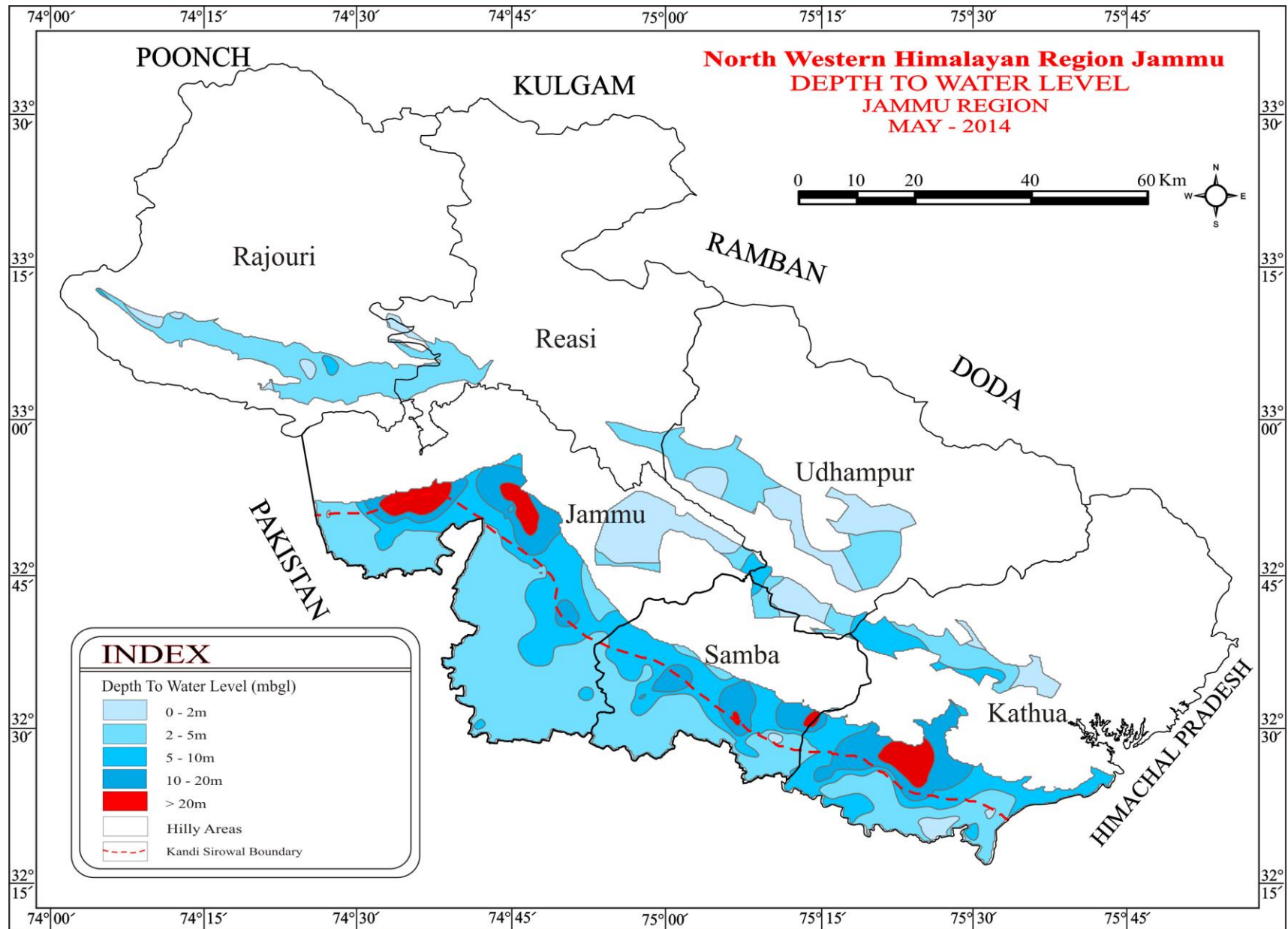


Figure 8

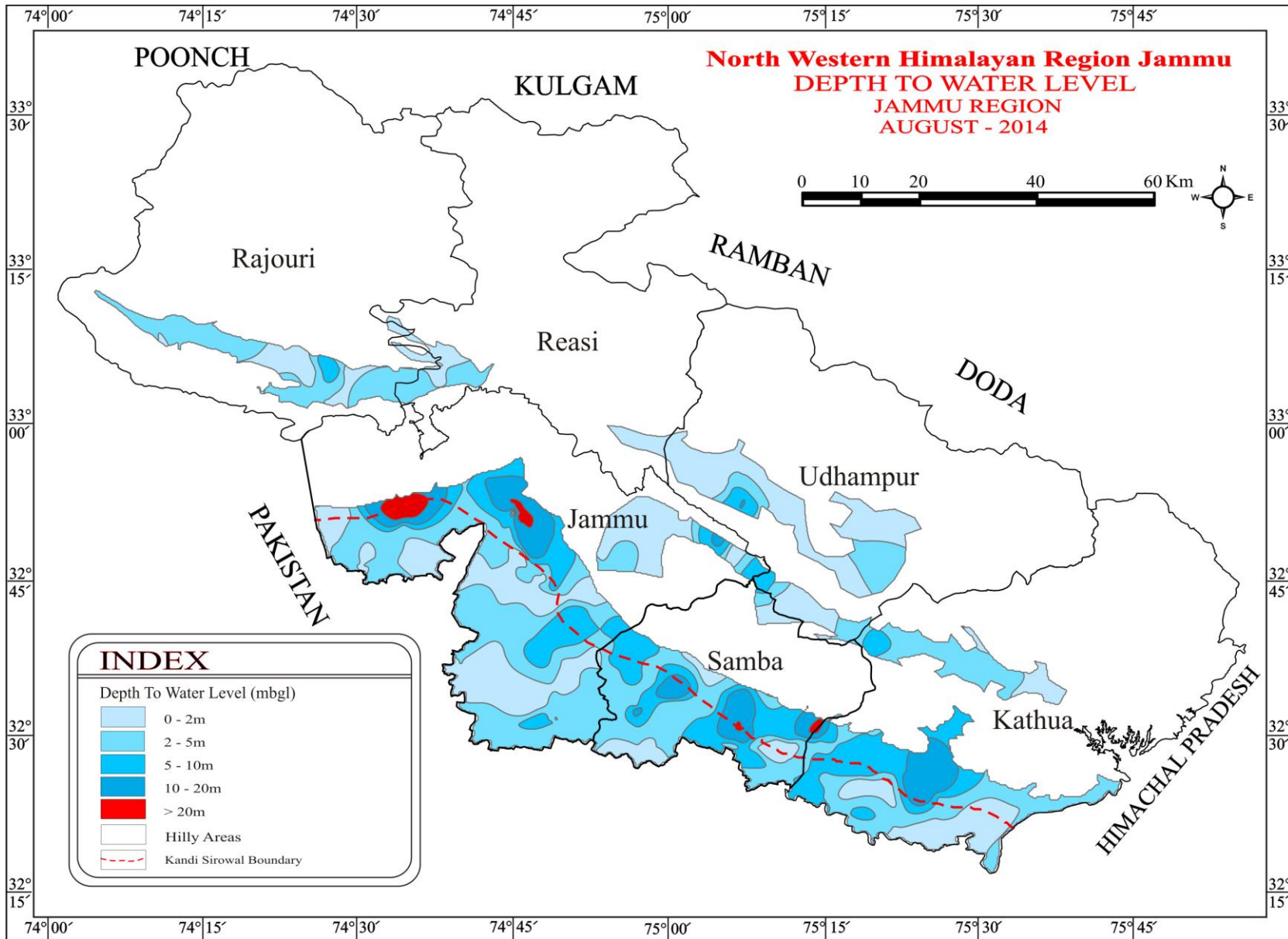


Figure 9

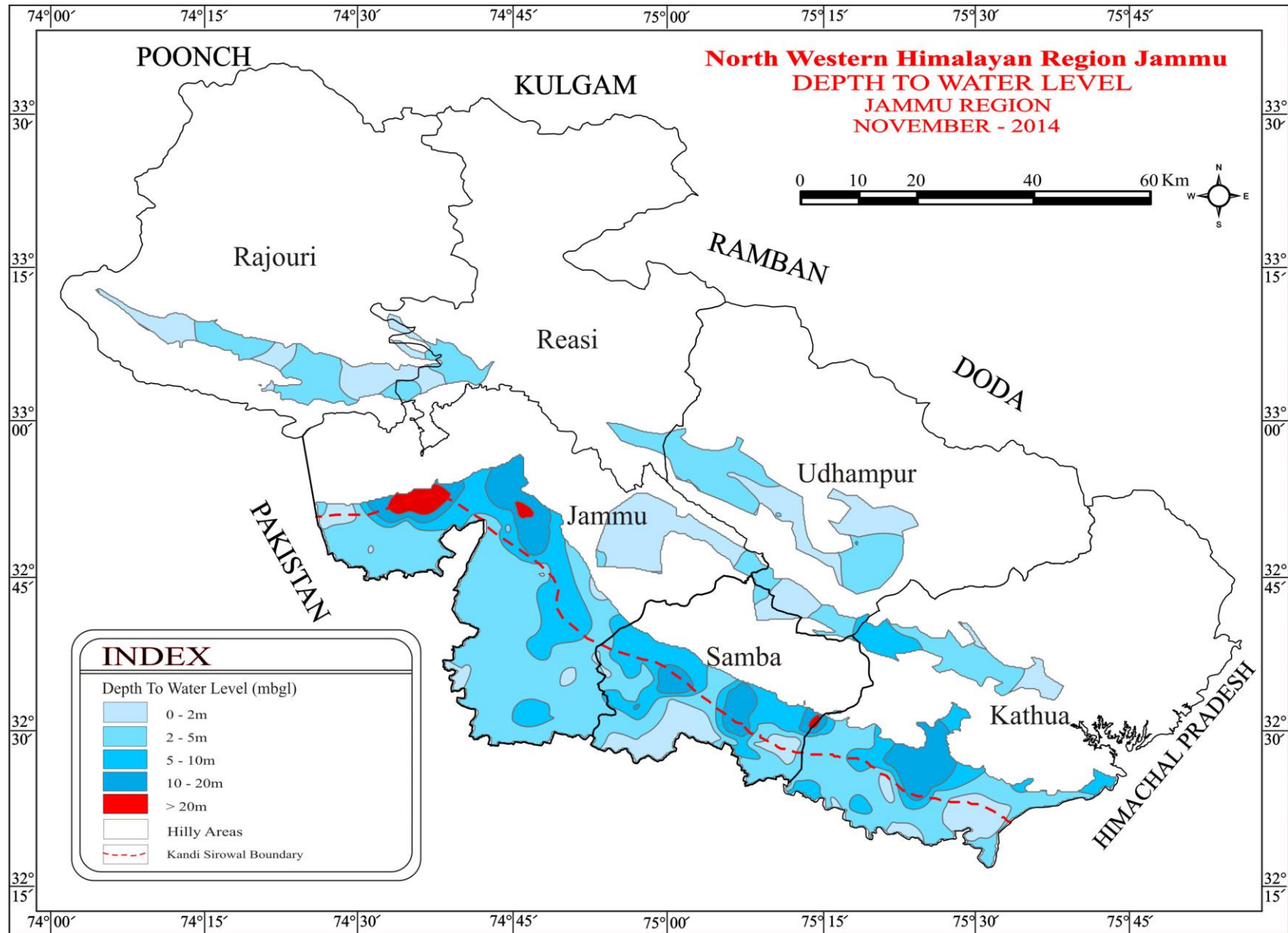
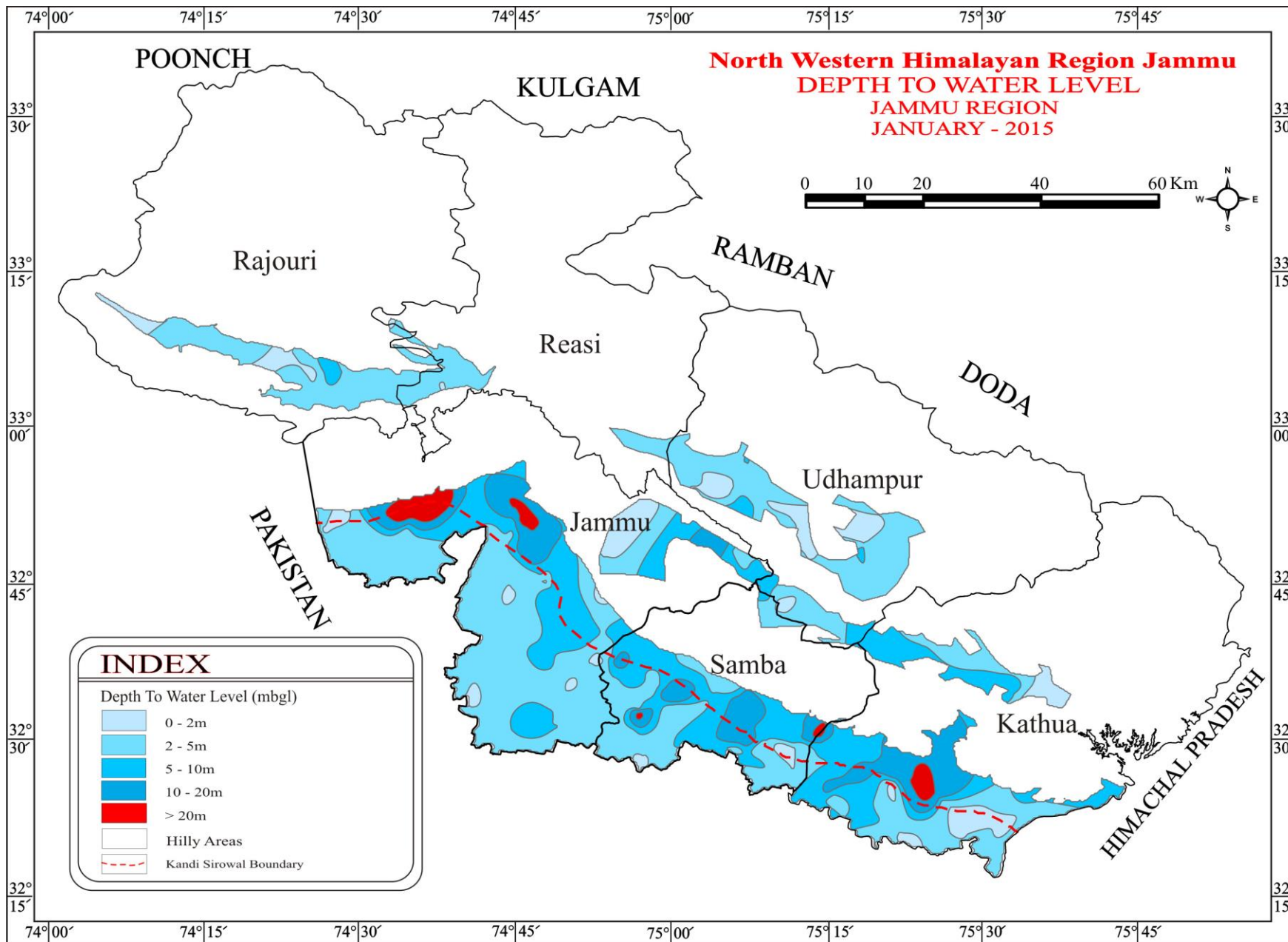




Figure 10



## **7.4. SEASONAL FLUCTUATION OF WATER LEVEL**

### **7.4.1 November 2014 with respect to May 2014 in Jammu Region**

The seasonal water level fluctuation between November 2014 & May 2014 in respect of 203 National Hydrograph Stations are analyzed. It is observed that 171 stations (84.24%) have been shown rise in water level where as only 32 stations (15.76%) have shown fall in water levels in the range of 0-2 m, 2-4 m and >4 m..

Out of 203 stations showing rise in water levels, 136 wells (66.99%) have shown rise less than 2 m. 22 wells (10.83%) and 13 wells (6.40%) have shown rise in the range of 2-4 m and >4 m respectively. 30 (14.77%) have shown decline between 0-2 m and 1 well (0.49%) has shown fall between 2-4 and 1 well (0.49%) has shown decline >4 m.

Effect of rainfall is directly reflected in all parts of the area monitored during November 2014. Almost all the four valley areas are showing rise in the water levels except for small patches. On the southern and eastern parts of Rajouri valley in southern parts of Udhampur and western and middle portions of Dun belt, and in few in locations of Jammu, Samba and Kathua Districts which shows fall of water level within 2 m bgl. (Figure 11)

### **7.4.2 May 2014 with respect to November 2013 in Kashmir Region**

**In Kashmir Valley**, seasonal water level fluctuation between May 2014 & November 2013 in respect of 28 National Hydrograph Stations are analyzed. It is observed that 23 stations (85%) have been shown rise in water level where as only 4 stations (15%) have shown fall in water levels in the range of 0-2 m, 2-4 m and >4 m.

Out of 28 stations showing rise in water levels, 18 wells (64.28%) have shown rise less than 2 m. 8 wells (28.57%) and 2 wells (7.14%) have shown rise in the range of 2-4 m and >4 m respectively. None of the wells have shown fall between of water levels.

Almost entire Bandipora, Ganderbal and Srinagar, Kulgam and major portions of Kupwara, Baramulla, Pulwama and Shopian districts shows rise below 2 m. Major parts of the valley have shown rise in water level less than 2 m followed by 2-4 and >4 m. On the eastern and southern parts of Anantnag district, western parts of Kupwara and few portions of Baramulla, Budgam and Shopian districts where rise in water level is between 2 to 4 m. Northern Kupwara, eastern Baramulla and western- southern parts of Budgam districts shows fall in >4 m (Figure 12)

<b>Table 9. CATEGORIZATION OF CHANGES IN WATER LEVEL BETWEEN MAY 2014-NOVEMBER 14 - JAMMU DIVISION</b>																			
District	No. Of wells Analyzed	Range of Fluctuation (m)				No. of Wells Showing Fluctuation (m)						Percentage of wells Showing Fluctuation						Total No. Of Wells	
		Rise		Fall		Rise			Fall			Rise			Fall			Rise	Fall
		Min	Max	Min	Max	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4		
JAMMU	100.00	0.06	5.78	0.01	6.03	70	14	5	9	1	1	70.00	14.00	5.00	9.00	1.00	1.00	89.00	11.00
KATHUA	46.00	0.01	12.48	0.03	0.81	27	5	8	6	0	0	58.70	10.87	17.39	13.04	0.00	0.00	40.00	6.00
RAJAURI	29.00	0.04	2.95	0.07	0.65	23	2	0	4	0	0	79.31	6.90	0.00	13.79	0.00	0.00	25.00	4.00
UDHAMPUR	28.00	0.13	2.52	0.01	1.26	16	1	0	11	0	0	57.14	3.57	0.00	39.29	0.00	0.00	17.00	11.00
<b>TOTAL</b>	<b>203.00</b>	<b>0.01</b>	<b>12.48</b>	<b>0.01</b>	<b>6.03</b>	<b>136</b>	<b>22</b>	<b>13</b>	<b>30</b>	<b>1</b>	<b>1</b>	<b>67.00</b>	<b>10.84</b>	<b>6.40</b>	<b>14.78</b>	<b>0.49</b>	<b>0.49</b>	<b>171.00</b>	<b>32.00</b>

<b>Table 10. CATEGORIZATION OF CHANGES IN WATER LEVEL BETWEEN NOVEMBER 13 AND MAY 14 - KASHMIR DIVISION</b>																			
District	No. Of wells Analyzed	Range of Fluctuation (m)				No. of Wells Showing Fluctuation (m)						Percentage of wells Showing Fluctuation						Total No. Of Wells	
		Rise		Fall		Rise			Fall			Rise			Fall			Rise	Fall
		Min	Max	Min	Max	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4		
ANANTNAG	1.00	0.77	0.77	0.00	0.00	1	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
BARAMULLA	11.00	0.42	7.74	0.00	0.00	8	2	1	0	0	0	72.72	18.18	9.09	0.00	0.00	0.00	11.00	0.00
KUPWARA	10.00	0.25	6.73	0.00	0.00	5	4	1	0	0	0	50.00	40.00	10.00	0.00	0.00	0.00	10.00	0.00
PULWAMA	4.00	0.49	3.13	0.00	0.00	3	1	0	0	0	0	75.00	25.00	0.00	0.00	0.00	0.00	4.00	0.00
SRINAGAR	2.00	0.67	2.22	0.00	0.00	1	1	0	0	0	0	50.00	50.00	0.00	0.00	0.00	0.00	2.00	0.00
<b>TOTAL</b>	<b>28.00</b>	<b>0.25</b>	<b>7.74</b>	<b>0.00</b>	<b>0.00</b>	<b>18</b>	<b>8</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>64.29</b>	<b>28.57</b>	<b>7.14</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>28.00</b>	<b>0.00</b>

**Figure 11**

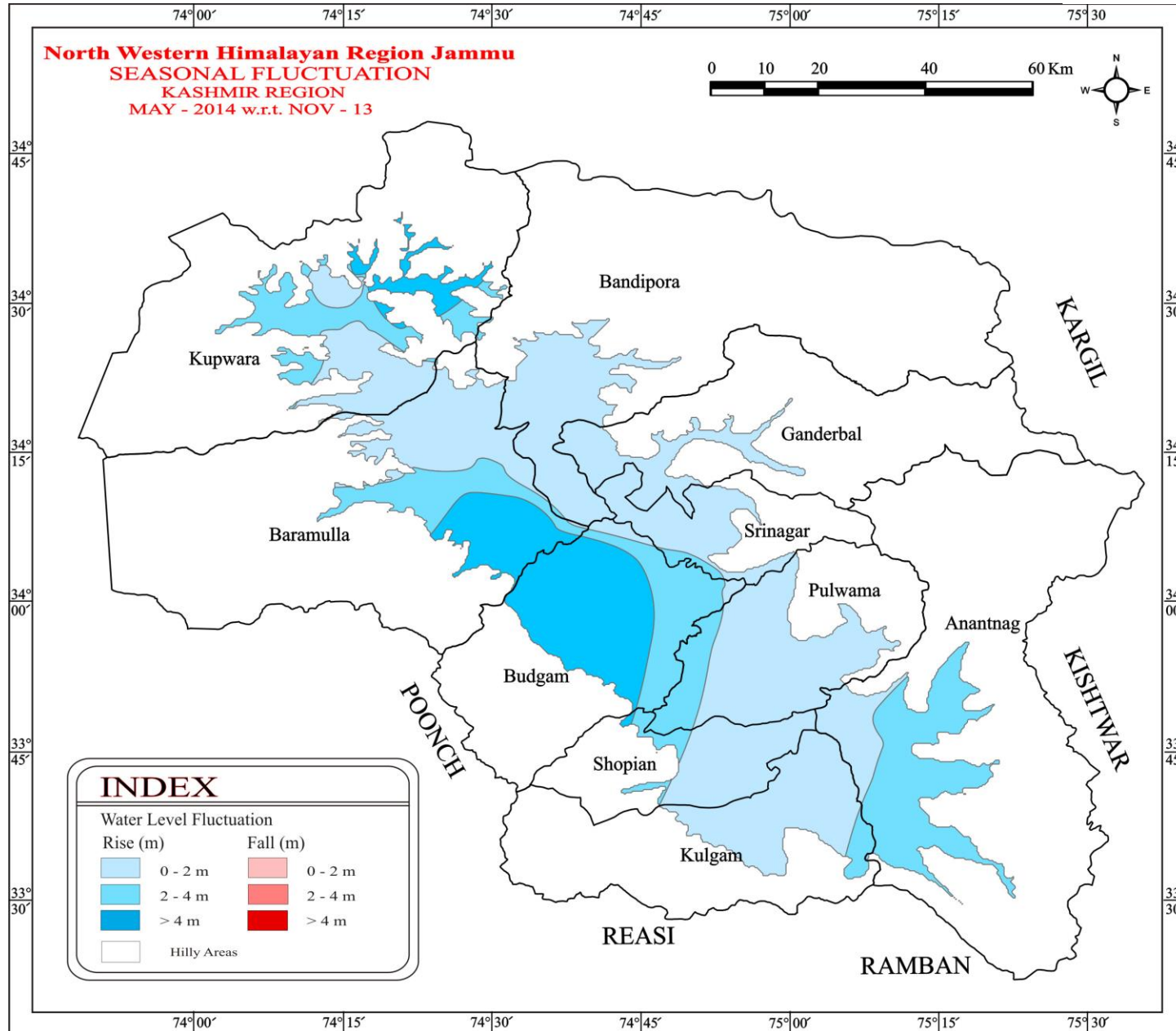
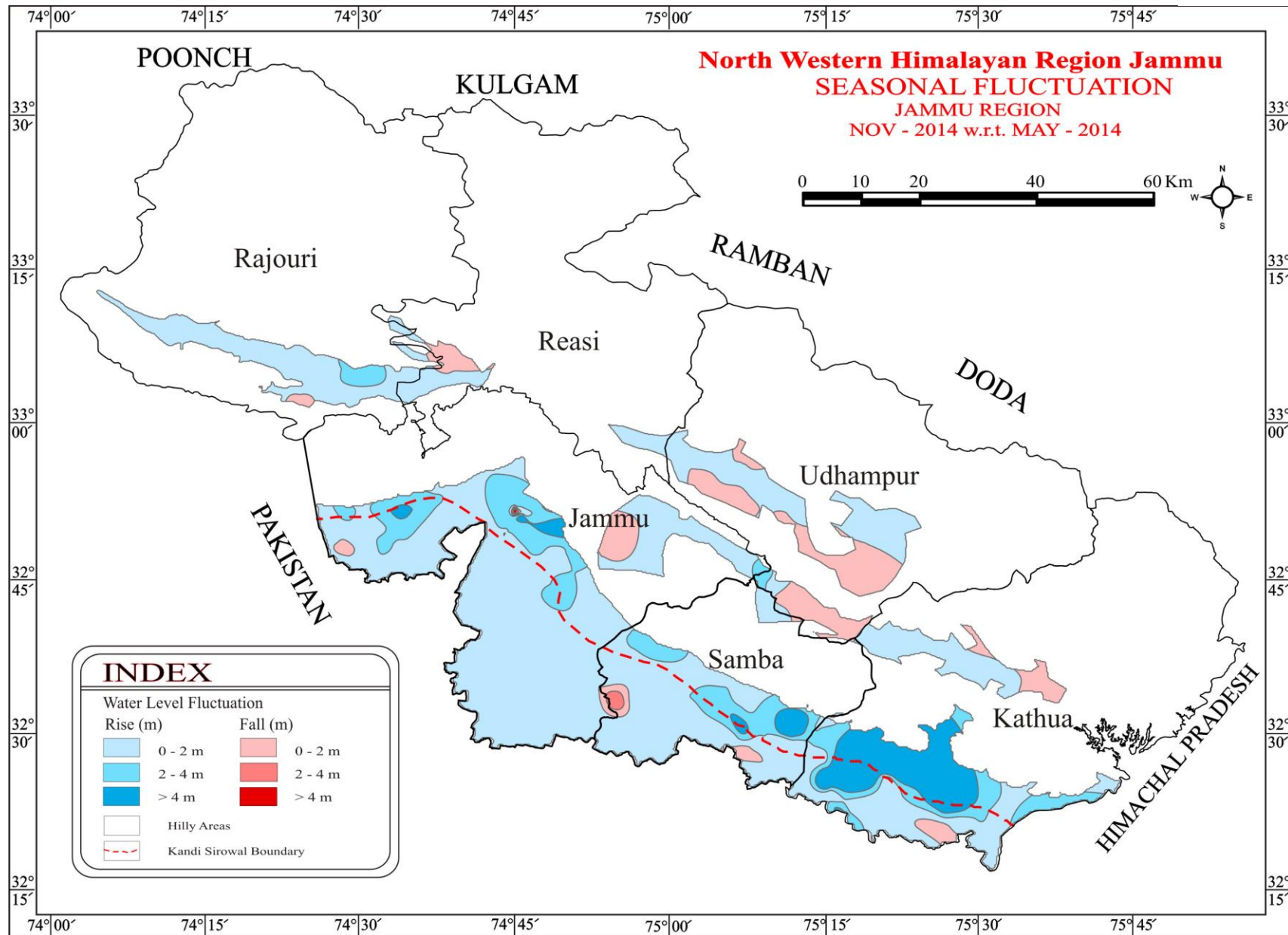


Figure 12





## **7.5. Annual Fluctuation**

### **7.5.1. May 2014 with respect to May 2013**

**In Jammu Region**, for analyzing the annual fluctuation, the water level data in respect of 201 National Hydrograph Network Stations for the month of May 2014 were analyzed and compared with their water levels monitored during May 2013.

A total of 145 wells (72.14%) have shown rise and 56 wells (27.86%) have shown fall in water levels, in the range of 0-2 m, 2-4 m and >4 m. Rise is shown by 121 wells (60.20%) in the range of 0-2 m, 12 wells (5.97%) are showing rise from 2-4 m bgl and 12 wells (5.97%) of the wells analyzed are showing rise >4 m. Among 56 wells showing fall, 44 wells (21.89%) that have shown fall in water level are in the range of 0-2 m, 7 well (3.48%) has shown fall between 2-4 m. 5 (2.48%) wells have shown fall >4 m.

Major parts of Jammu, Kathua, Samba, Rajouri and Udhampur Districts shows rise in water levels when compared with annual fluctuation, especially in parts of Jammu, Samba, Kathua and Udhampur Districts, which have shown rise in the range of 0-2. Rise between 0 – 2 m is observed in western parts of Rajouri District and major portion of Udhampur and Jammu, Kathua and Samba Districts. Only some of places in Rajauri, Udhampur, Samba and Kathua District have shown the decline in water level from 0 -2 and 2-4 m. Fall is mainly observed in the western and southern parts of Jammu District. (Figure 13)

**In Kashmir Valley** the water level data in respect of 28 National Hydrograph Stations for the month of May 2014 were analyzed. It was compared with those of monitored during May 2013. Of 28 wells, a total of 14 wells (50.00%) have shown rise in the range of 0-2 m and >4m and 14 wells (50.00%) have shown fall in water level are in the range of 0-2 m.

Rise is shown by 13 wells (46.42%) in the range of 0-2 m, and only 1 well (3.57%) of the wells analyzed are showing rise >4 m. Among 28 wells all 14 wells (50.00%) have shown fall in water level are in the range of 0-2 m, no any well has shown decline >2m.

The rise in water level is observed in Anantnag, Kulgam, Shopian, Pulwama, Srinagar and major parts of Budgam, Ganderbal and Kupwara district where as rest of the Kashmir valley was showing decline in water levels in the range of 2 – 5 m. (Figure 14)

### **7.5.2. August 2014 with respect to August 2013**

**In Jammu Region**, For analyzing the annual fluctuation, the water level data in respect of 208 National Hydrograph Network Stations for the month of August 2014 were analyzed and compared with their water levels monitored during August 2013 (For analyzing the annual fluctuation the newly fixed and added dug wells were not considered as they were included in the monitoring network from May-2013 itself.

A total of 177 wells (85.09%) have shown rise and 31 wells (14.90%) have shown fall in water levels, in the range of 0-2 m, 2-4 m and >4 m. Rise is shown by 22 wells (10.57%) in the range of 0-2 m, 03 wells (1.44%) are showing rise from 2-4 m bgl and 06 wells (2.88%) of the wells analyzed are showing rise >4 m. Among 208 wells showing fall, 133 wells (63.94%) that have shown fall in water level are in the range of 0-2 m, 32 well (15.38%) has shown fall between 2-4 m. 12 (5.77%) wells have shown fall >4 m.

The entire Jammu Region is showing decline in water levels except few portions in Udhampur and Kandi and Dun belts. The decline in the range of 0 – 2 m is observed in almost whole of the Outer Plains except for the few patches in Kandi belt where fluctuations are showing fall in water levels > 2 m. Few portions of Udhampur and some northern parts of Jammu, Samba and Kathua districts especially falling in Kandi shows rise in water levels. (Figure 15)

**In Kashmir Valley**, the water level data in respect of 28 National Hydrograph Stations for the month of August 2014 were analyzed. It was compared with those of monitored during August 2013. Of 28 wells, a total of 21 wells (92.30%) have shown fall in the range of 0-2 m and 2-4m and 07 wells (7.69%) have shown rise in water levels in the range of 0-2 m. Rise is shown by all 7 wells (25%) in the range of 0-2 m, no any well analyzed are showing rise >2 m. Among 28 wells showing fall, 15 wells (53.57%) that have shown fall in water level are in the range of 0-2 m, whereas only 06 well (21.43%) has shown fall between 2-4 m. no any well have shown fall >4 m.

The rise in water level 0 – 2 m is observed in few parts of Kashmir valley in Anantnag, Kulgam and Srinagar and small portions of Ganderbal and Baramulla district where as rest of the Kashmir valley was showing decline in water levels in the range of 0 – 2 m except western parts of Kupwara and Budgam and southern parts of Baramulla districts which shows fall between 2 – 5m. (Figure 16)

### **7.5.3. November 2014 with respect to November 2013**

In **Jammu Region**, the water level data, in respect of 198 National Hydrograph Stations for the month of November 2014 was analyzed. It was compared with those of monitored during November 2013. Majority of the wells have shown decline in water levels. A total of 75 wells have shown rise and 123 wells have shown fall in water levels, in the range of 0-2 m, 2-4 m and >4 m.

Rise is shown by 71 wells (35.86%) in the range of 0-2 m. 02 wells (1.01%) are showing rise from 2-4 m bgl and 02 wells (1.01%) of the wells analyzed are showing rise >4 m. Among 123 wells showing fall, 116 wells (58.58%) that have shown fall in water level are in the range of 0-2 m. 04 wells (2.02%) have shown fall between 2-4 m and 03 (1.51%) wells has shown fall >4 m.

Major parts of all the districts, i.e., Jammu, Kathua, Samba, Rajouri and Udhampur have shown equally rise and decline in water level in the range of 0-2 m and some pockets have shown

rise in water level >2 m. Fall of water levels in the range of 0-2 m is observed in very major portions in all the districts. (Figure 17)

**In Kashmir Valley**, the water level data in respect of 26 National Hydrograph Stations for the month of November 2014 were analyzed. It was compared with those of monitored during November 2013.

Of 26 wells, a total of 22 wells (84.61%) have shown rise in the range of 0-2 m 2-4m and >4m and 04 wells (15.38%) have shown rise in water levels in the range of 0-2 m. Rise is shown by 18 wells (69.23%) in the range of 0-2 m, 3 wells (11.54%) in the range of 2-4m and 1 well (3.85%) in showing rise >4 m. Among 26 wells, all 4 wells (15.38%) that have shown fall in water level in the range of 0-2 m, whereas no any well have shown fall >2 m.

Almost entire valley portion in Kashmir has shown rise in the water levels except few patches in Pulwama, Kupwara and Baramulla districts. The rise in the water levels in the range 0 – 2 m was observed almost all the districts except few portions Kupwara, Budgam, Srinagar and Anantnag districts. Whereas rise in the water levels in the range 2 – 4 m was observed in northern and southern parts of Budgam and Srinagar districts respectively and few small patches in Anantnag and Kupwara districts. The rise in the water levels >4 m was observed in only northern parts of Kupwara district. Rest few patches in Pulwama, Kupwara and Baramulla districts, where fall in the water levels below 2 m was observed. (Figure 18)

#### **7.5.4. January 2015 with respect to January 2014**

The water level data in respect of 202 National Hydrograph Stations for the month of January 2015 were analyzed. It was compared with those of monitored during January 2014.

Majority of the wells have shown fall in water levels. A total of 147 wells (72.77%) have shown decline and 55 wells (27.22%) have shown rise in water levels, in the range of 0-2 m, 2-4 m and >4 m. Rise is shown by 52 wells (25.74%) in the range of 0-2 m, 02 wells (0.99%) are showing rise from 2-4 m and 01 (0.49%) wells analyzed has shown rise >4 m. Among 147 wells showing fall, 134 wells (66.34%) that have shown fall in water level in the range of 0-2 m, 7 wells (3.46%) have shown fall between 2 to 4 m and 06 wells (2.97%) analyzed has shown fall >4 m.

The decline in water levels is observed in major parts of all the districts. The Outer Plains are reflecting the same scenario of decline except for few patches where there is rise in water levels mostly in the range of 0 – 2 m. In few patches in Samba, Kathua, Udhampur and Dun Belt the water levels shows decline above 2 and 4m. In Rajouri valley the decline up to 2m is found in general. (Figure 19)



**Table 11. CATEGORIZATION OF CHANGES IN WATER LEVEL BETWEEN MAY 2013 AND MAY 14**

District	No. Of wells Analyzed	Range of Fluctuation (m)				No. of Wells Showing Fluctuation (m)						Percentage of wells Showing Fluctuation						Total No. Of Wells	
		Rise		Fall		Rise			Fall			Rise			Fall			Rise	Fall
		Min	Max	Min	Max	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4		
ANANTNAG	1.00					0.00	1.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	1.00	0.00
BARAMULLA	11.00	0.30	2.04	0.28	0.54	7.00	1.00	0.00	3.00	0.00	0.00	63.63	9.09	0.00	27.27	0.00	0.00	8.00	3.00
JAMMU	101.00	0.01	11.68	0.03	6.09	57.00	6.00	3.00	27.00	5.00	3.00	56.44	5.94	2.97	26.73	4.95	2.97	66.00	35.00
KATHUA	48.00	0.05	10.48	0.01	11.95	28.00	3.00	7.00	7.00	1.00	2.00	58.33	6.25	14.58	14.58	2.08	4.17	38.00	10.00
KUPWARA	9.00	0.10	4.47	0.10	0.10	7.00	0.00	1.00	1.00	0.00	0.00	77.78	0.00	11.11	11.11	0.00	0.00	8.00	1.00
PULWAMA	4.00	0.04	1.25	0.00	0.00	4.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00
RAJAURI	30.00	0.02	7.40	0.02	1.88	21.00	2.00	1.00	6.00	0.00	0.00	70.00	6.67	3.33	20.00	0.00	0.00	24.00	6.00
SRINAGAR	1.00	2.94	2.94	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	1.00	0.00
UDHAMPUR	22.00	0.03	5.86	0.02	2.23	15.00	1.00	1.00	4.00	1.00	0.00	68.18	4.55	4.55	18.18	4.55	0.00	17.00	5.00
<b>TOTAL</b>	<b>227.00</b>	<b>0.01</b>	<b>11.68</b>	<b>0.00</b>	<b>11.95</b>	<b>139.00</b>	<b>15.00</b>	<b>13.00</b>	<b>48.00</b>	<b>7.00</b>	<b>5.00</b>	<b>61.23</b>	<b>6.61</b>	<b>5.73</b>	<b>21.15</b>	<b>3.08</b>	<b>2.20</b>	<b>167.00</b>	<b>60.00</b>

**Table 12. CATEGORIZATION OF CHANGES IN WATER LEVEL BETWEEN AUGUST 2013 AND AUGUST 14**

District	No. Of wells Analyzed	Range of Fluctuation (m)				No. of Wells Showing Fluctuation (m)						Percentage of wells Showing Fluctuation						Total No. Of Wells	
		Rise		Fall		Rise			Fall			Rise			Fall			Rise	Fall
		Min	Max	Min	Max	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4		
ANANTNAG	1.00					1.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
BARAMULLA	11.00	0.29	0.29	0.25	2.62	2.00	0.00	0.00	7.00	2.00	0.00	18.18	0.00	0.00	63.64	18.18	0.00	2.00	9.00
JAMMU	107.00	0.14	11.77	0.07	5.33	11.00	1.00	3.00	69.00	19.00	4.00	10.28	0.93	2.80	64.49	17.76	3.74	15.00	92.00
KATHUA	49.00	0.25	10.46	0.01	5.60	4.00	2.00	3.00	29.00	7.00	4.00	8.16	4.08	6.12	59.18	14.29	8.16	9.00	40.00
KUPWARA	10.00	0.53	0.53	0.02	3.52	1.00	0.00	0.00	6.00	3.00	0.00	10.00	0.00	0.00	60.00	30.00	0.00	1.00	9.00
PULWAMA	4.00	0.14	0.14	0.06	0.99	1.00	0.00	0.00	3.00	0.00	0.00	25.00	0.00	0.00	75.00	0.00	0.00	1.00	3.00
RAJAURI	30.00	0.12	0.12	0.05	8.99	1.00	0.00	0.00	24.00	3.00	2.00	3.33	0.00	0.00	80.00	10.00	6.67	1.00	29.00
SRINAGAR	2.00	0.57	1.43	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00
UDHAMPUR	22.00	0.10	1.40	0.06	7.90	6.00	0.00	0.00	11.00	3.00	2.00	27.27	0.00	0.00	50.00	13.64	9.09	6.00	16.00
<b>TOTAL</b>	<b>236.00</b>	<b>0.10</b>	<b>11.77</b>	<b>0.00</b>	<b>8.99</b>	<b>29.00</b>	<b>3.00</b>	<b>6.00</b>	<b>149.00</b>	<b>37.00</b>	<b>12.00</b>	<b>12.29</b>	<b>1.27</b>	<b>2.54</b>	<b>63.14</b>	<b>15.68</b>	<b>5.08</b>	<b>38.00</b>	<b>198.00</b>

**Table 13. CATEGORIZATION OF CHANGES IN WATER LEVEL BETWEEN NOVEMBER 2013 AND NOVEMBER 14**

District	No. Of wells Analyzed	Range of Fluctuation (m)				No. of Wells Showing Fluctuation (m)						Percentage of wells Showing Fluctuation						Total No. Of Wells	
		Rise		Fall		Rise			Fall			Rise			Fall			Rise	Fall
		Min	Max	Min	Max	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4		
ANANTNAG	1.00					0.00	1.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	1.00	0.00
BARAMULLA	11.00	0.30	2.04	0.28	0.54	7.00	1.00	0.00	3.00	0.00	0.00	63.64	9.09	0.00	27.27	0.00	0.00	8.00	3.00
JAMMU	102.00	0.02	5.59	0.02	12.12	43.00	0.00	1.00	52.00	3.00	3.00	42.16	0.00	0.98	50.98	2.94	2.94	44.00	58.00
KATHUA	46.00	0.04	4.44	0.01	2.36	16.00	1.00	1.00	27.00	1.00	0.00	34.78	2.17	2.17	58.70	2.17	0.00	18.00	28.00
KUPWARA	9.00	0.10	4.47	0.10	0.10	7.00	0.00	1.00	1.00	0.00	0.00	77.78	0.00	11.11	11.11	0.00	0.00	8.00	1.00
PULWAMA	4.00	0.04	1.25	0.00	0.00	4.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00
RAJAURI	29.00	0.02	2.54	0.03	1.91	7.00	1.00	0.00	21.00	0.00	0.00	24.14	3.45	0.00	72.41	0.00	0.00	8.00	21.00
SRINAGAR	1.00	2.94	2.94	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	1.00	0.00
UDHAMPUR	21.00	0.17	1.57	0.05	1.32	5.00	0.00	0.00	16.00	0.00	0.00	23.81	0.00	0.00	76.19	0.00	0.00	5.00	16.00
<b>TOTAL</b>	<b>224.00</b>	<b>0.02</b>	<b>5.59</b>	<b>0.00</b>	<b>12.12</b>	<b>89.00</b>	<b>5.00</b>	<b>3.00</b>	<b>120.00</b>	<b>4.00</b>	<b>3.00</b>	<b>39.73</b>	<b>2.23</b>	<b>1.34</b>	<b>53.57</b>	<b>1.79</b>	<b>1.34</b>	<b>97.00</b>	<b>127.00</b>

**Table 14. CATEGORIZATION OF CHANGES IN WATER LEVEL BETWEEN JANUARY 2014 AND JANUARY 15**

District	No. Of wells Analyzed	Range of Fluctuation (m)				No. of Wells Showing Fluctuation (m)						Percentage of wells Showing Fluctuation						Total No. Of Wells	
		Rise		Fall		Rise			Fall			Rise			Fall			Rise	Fall
		Min	Max	Min	Max	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4		
ANANTNAG																			
BARAMULLA																			
JAMMU	103.00	0.02	1.49	0.03	11.94	36.00	0.00	0.00	61.00	3.00	3.00	34.95	0.00	0.00	59.22	2.91	2.91	36.00	67.00
KATHUA	47.00	0.08	4.36	0.06	6.49	6.00	2.00	1.00	35.00	1.00	2.00	12.77	4.26	2.13	74.47	2.13	4.26	9.00	38.00
KUPWARA																			
PULWAMA																			
RAJOURI	30.00	0.20	0.44	0.02	2.65	4.00	0.00	0.00	24.00	2.00	0.00	13.33	0.00	0.00	80.00	6.67	0.00	4.00	26.00
SRINAGAR																			
UDHAMPUR	22.00	0.01	0.79	0.07	4.18	6.00	0.00	0.00	14.00	1.00	1.00	27.27	0.00	0.00	63.64	4.55	4.55	6.00	16.00
<b>TOTAL</b>	<b>202.00</b>	<b>0.01</b>	<b>4.36</b>	<b>0.02</b>	<b>11.94</b>	<b>52.00</b>	<b>2.00</b>	<b>1.00</b>	<b>134.00</b>	<b>7.00</b>	<b>6.00</b>	<b>25.74</b>	<b>0.99</b>	<b>0.50</b>	<b>66.34</b>	<b>3.47</b>	<b>2.97</b>	<b>55.00</b>	<b>147.00</b>

Figure 13

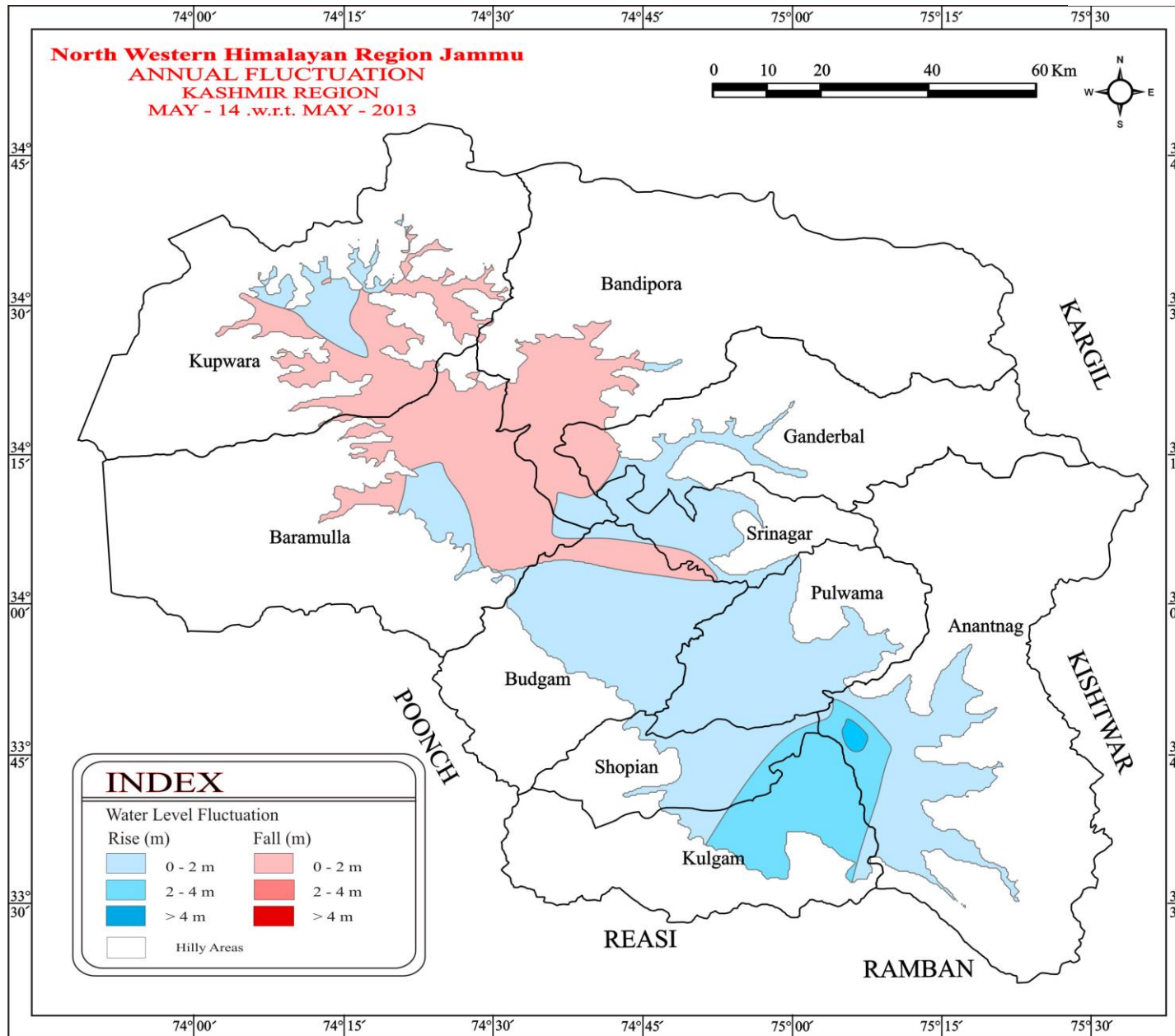


Figure 14

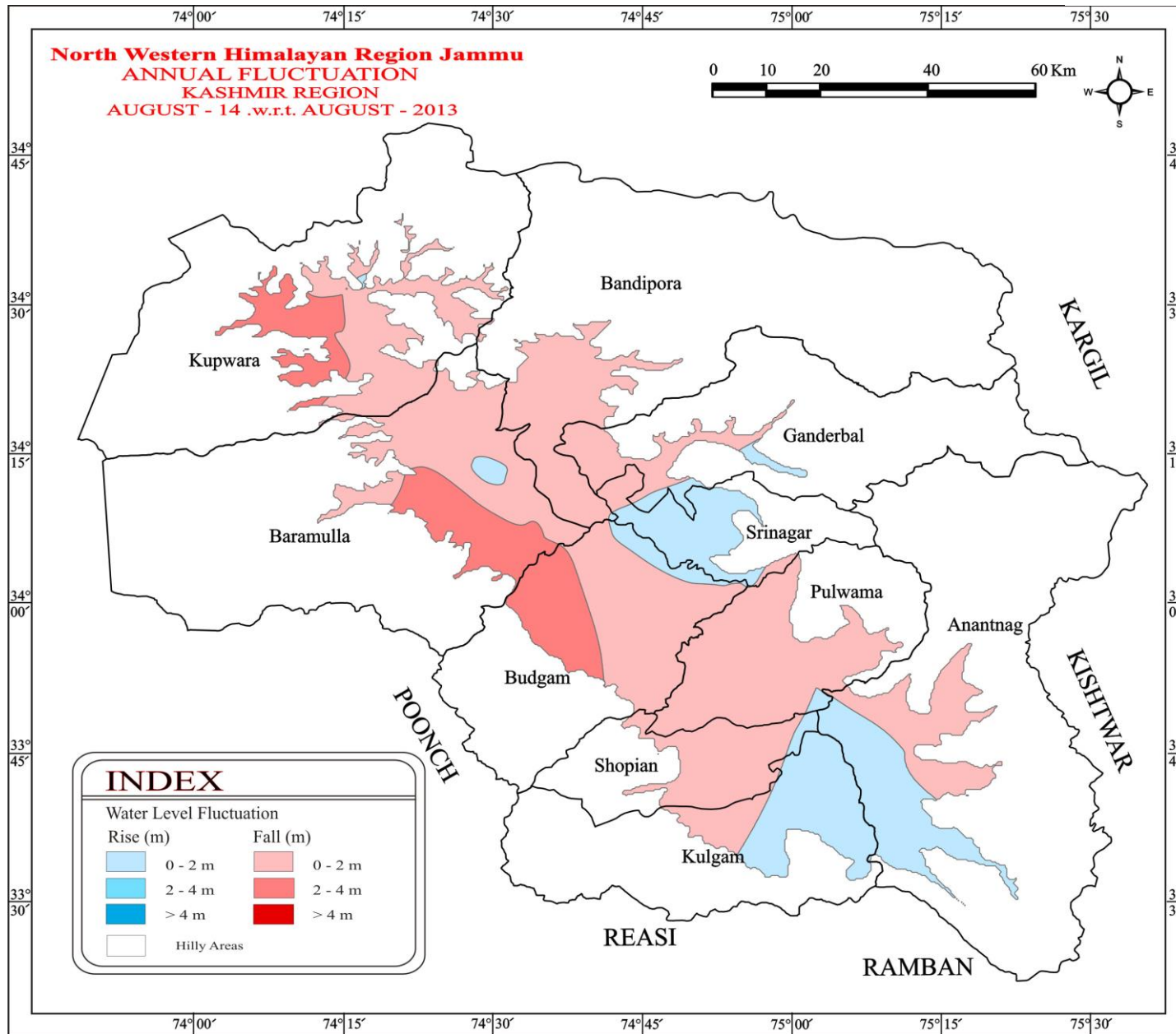


Figure 15

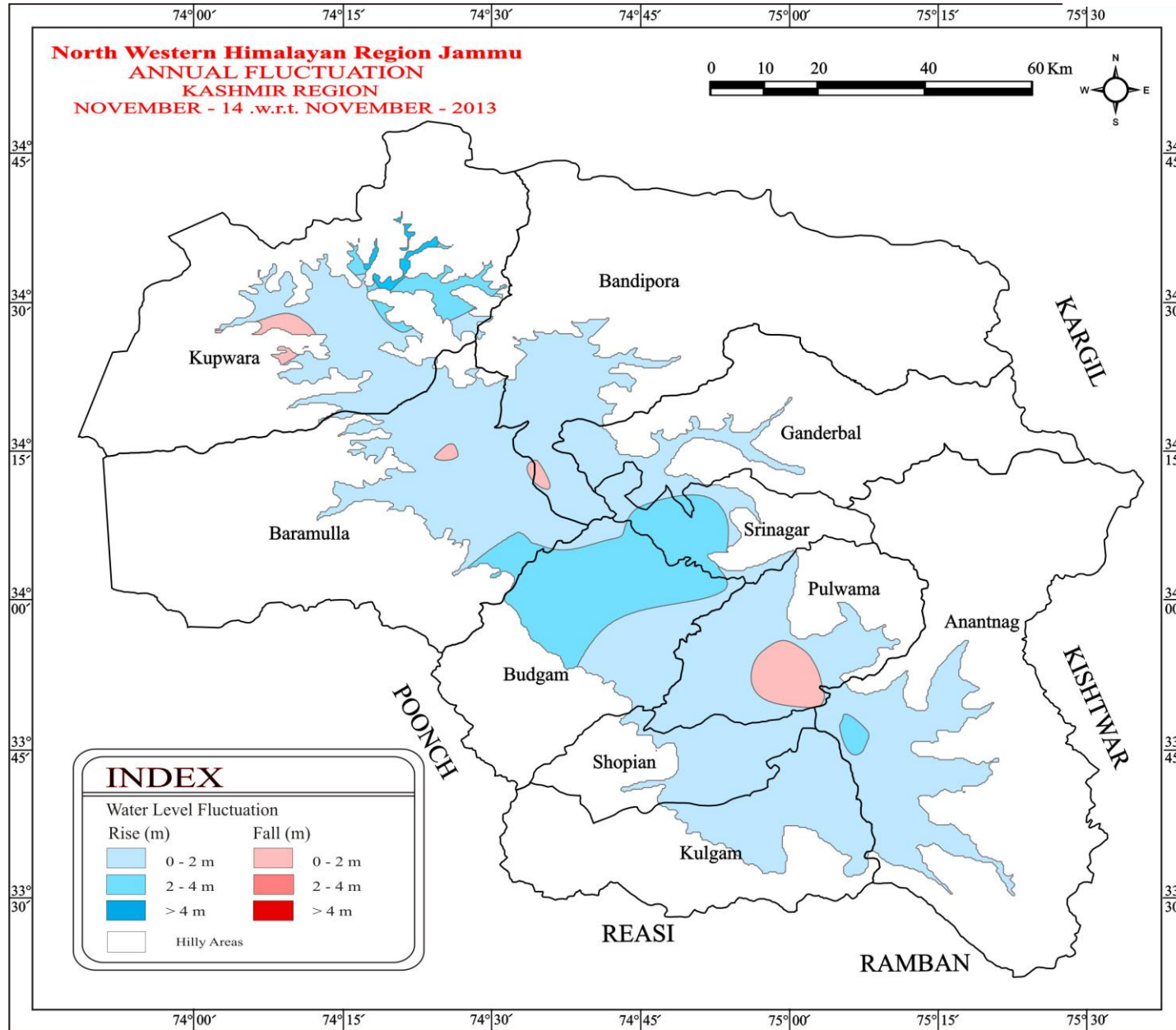




Figure 16

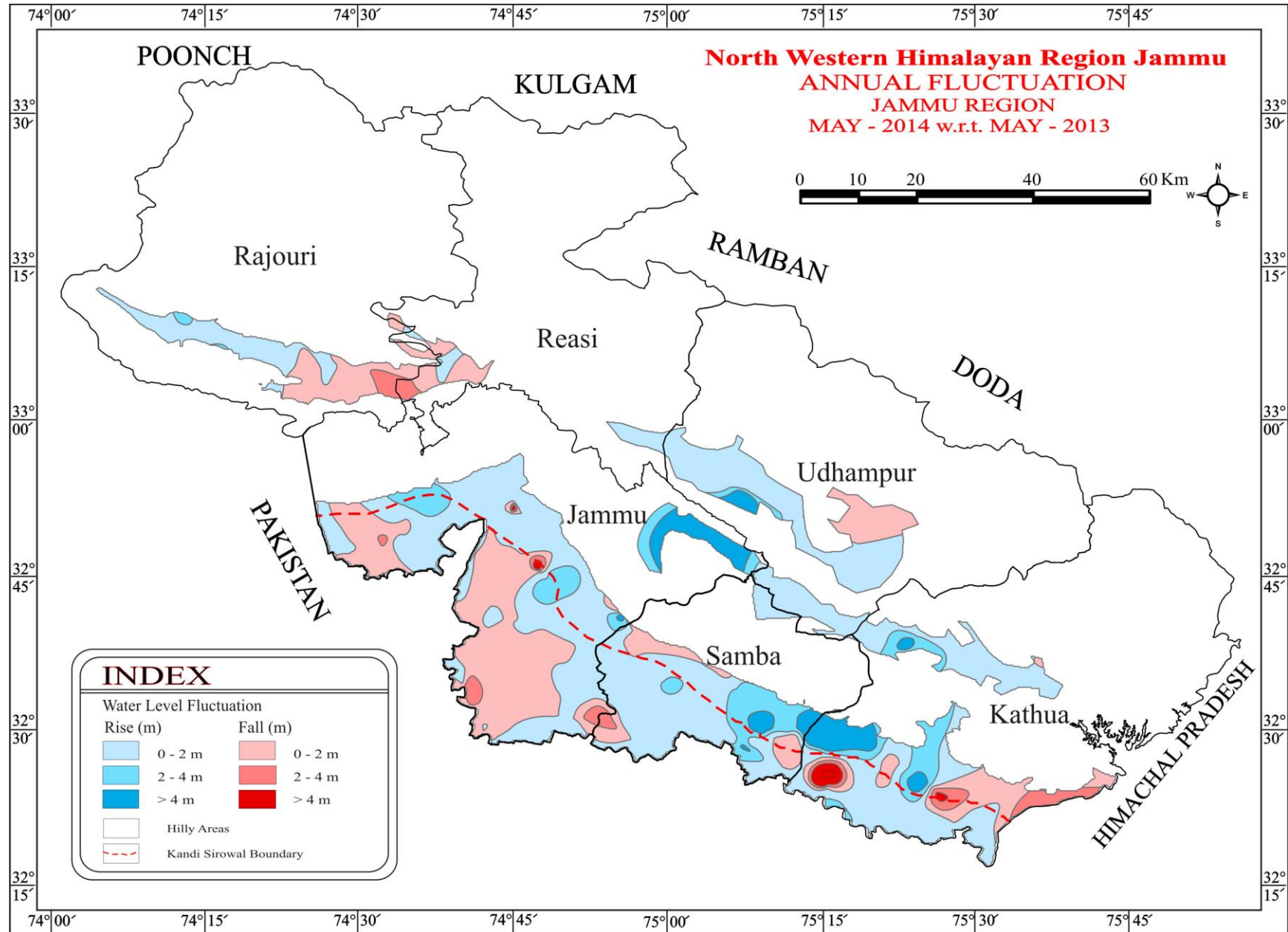




Figure 17

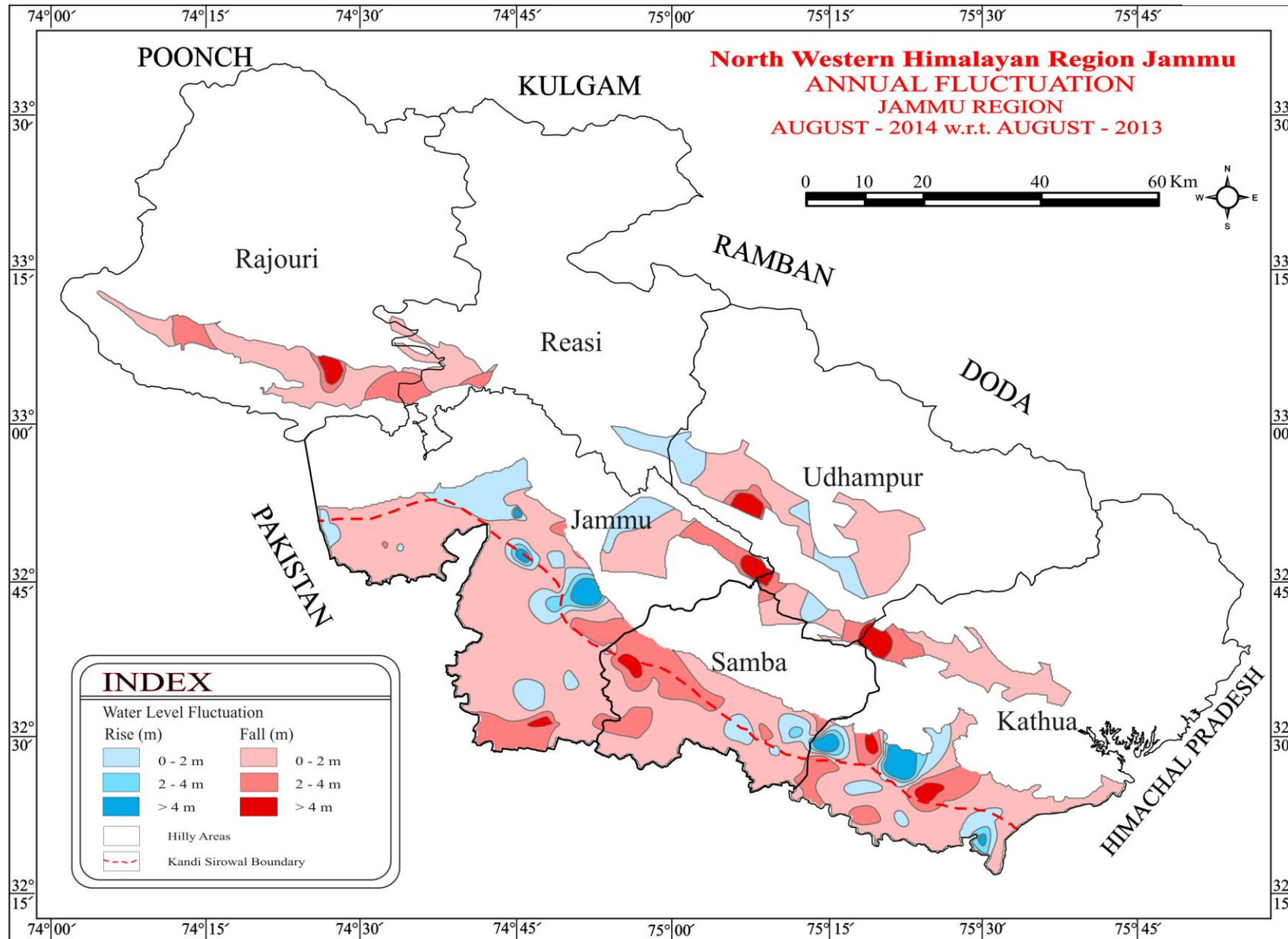


Figure 18

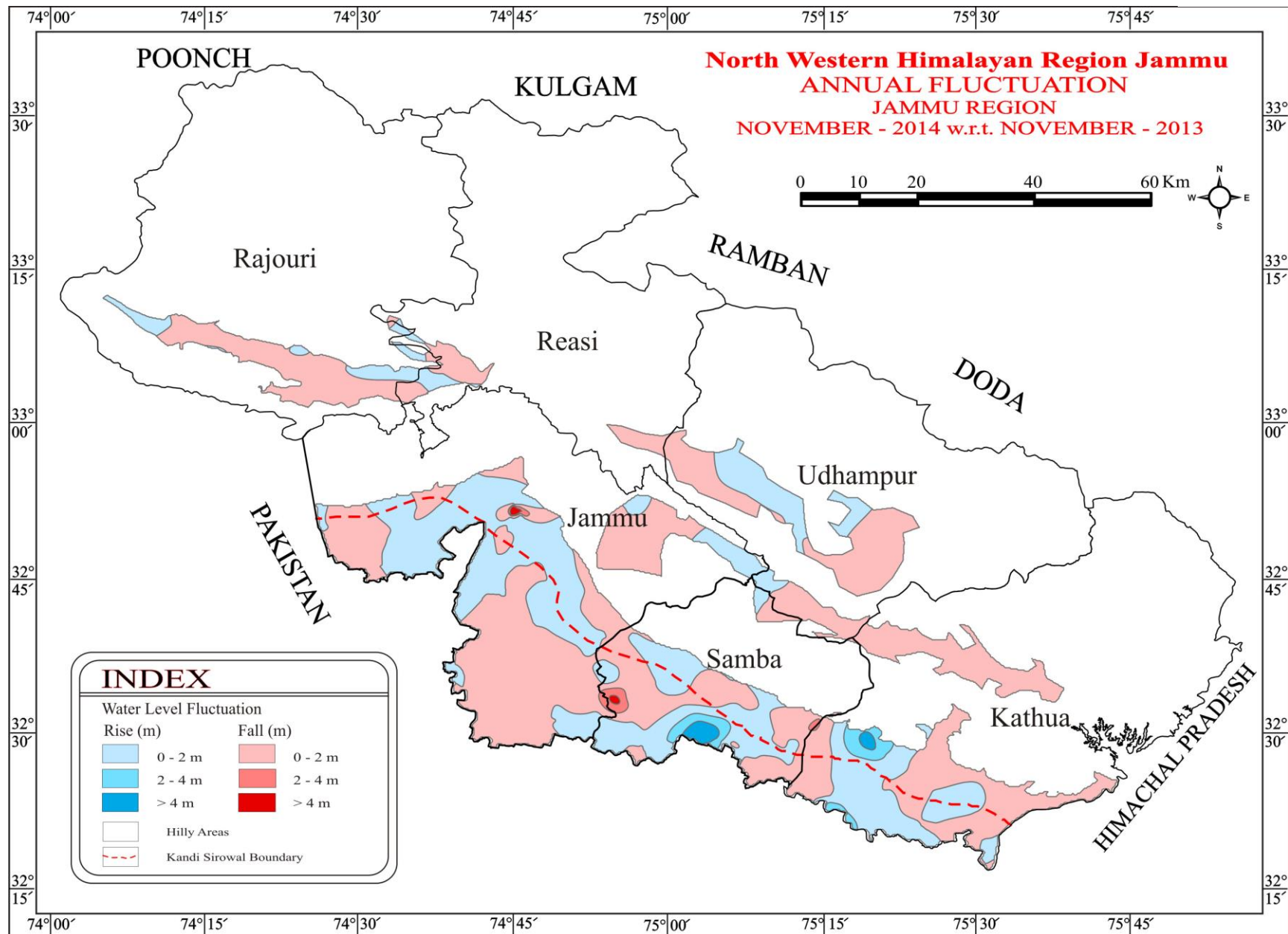
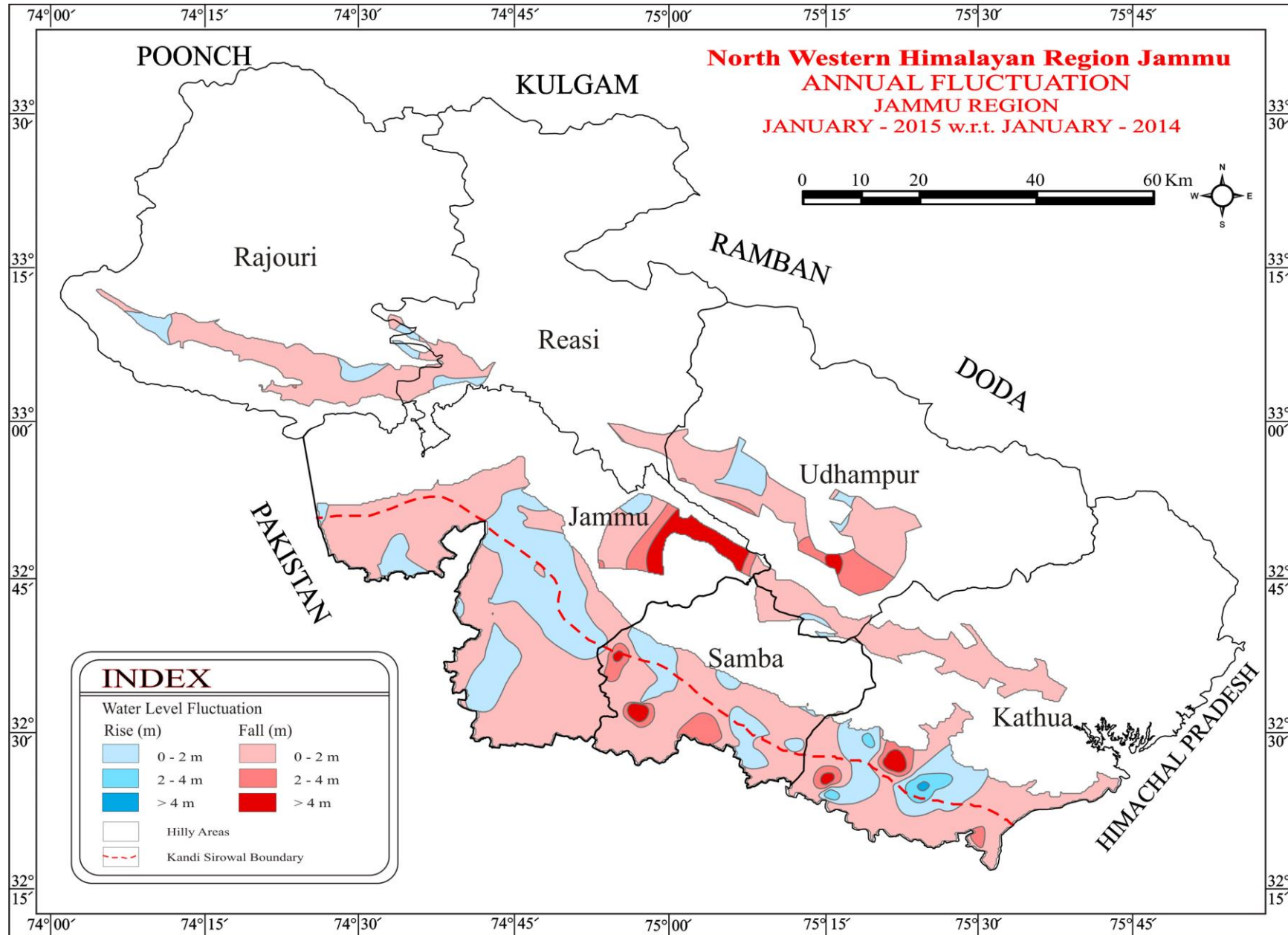


Figure 19



## **7.6. Decadal Fluctuation**

### **7.6.1. May 2014 with respect to mean of May 2004 – May 2013**

The water level fluctuation for the month of May 2014 Vs. Mean of May 2004 – May 2013 has been worked out in respect of 127 observation wells. It is observed that a total of 98 wells (77.16%) have shown rise and 29 wells (22.83%) have shown decline in water level (especially in Kandi areas of Outer plains).

Out of 98 (77.16%) number of wells showing rise, 77 wells (60.63%) wells are showing rise less than 2 m, 14 wells (11.02%) have shown rise from 2-4 m and 07 (5.51%) well has shown rise more than 4 m. Out of 29 wells (22.83%) which are showing fall, 27 wells (21.26%) that have shown fall in water levels are in the range of 0-2 m, and 2 wells (1.57%) >4 m bgl.

The major part of the Jammu Region is showing rise in the water levels except some portions of Jammu and Kathua and small patches of Samba and Rajouri Valley. The rise in the range of 0 – 2 m is shown in all the districts and the rise between 2 – 4 m is shown in Samba and Udhampur and in small patches of Jammu, Kathua and Dun belt. Decline and in separate clusters of Samba, Kathua and small patches of Rajouri valley. The decline above 4 m was observed in the north-eastern and south western parts of Kathua district only. (Figure 20)

### **7.6.2. August 2014 with respect to mean of August 2004 – August 2013**

The water level fluctuation for the month of August 2013 Vs. (Mean of August 2004 – August 2013 has been worked out in respect of 131 observation wells. It is observed that a total of 36 wells (27.48%) have shown rise and 95 wells (72.51%) have shown decline in water level (especially in Kandi areas of Outer plains)

Out of 36 number of wells showing rise, 31 wells (23.66%) wells are showing rise less than 2 m, 03 wells (2.29%) have shown rise from 2-4 m and 2 (1.53%) wells has shown rise more than 4 m. Out of 95 wells, which are showing fall, 83 wells (63.36%) that have shown fall in water level are in the range of 0-2 m, 09 (6.87%) of the wells has shown fall between 2-4 m and 3 wells (2.29%) >4 m bgl.

All of the areas monitored have shown decline in water levels in all ranges for major portions in Jammu Region. Few areas are showing rise in the water levels in all ranges in all the districts. The rise in the range 0 – 2 m is shown every district and rise above 2m is observed Kandi belt of Samba and Kathua, in southern and north-western parts of Jammu and western parts of Dun belt. Rise above 4 m is shown in only few patches of northern areas of Jammu and south-eastern patch of Kathua district. Fall in the range 0 – 2 m is observed in the major parts of all Districts and the decline in the range of 2 – 4 m is observed in southern parts of Jammu and few areas in Samba and Kathua districts as well as in some parts of Udhampur and Dun belt. Decline above 4m is shown at only small patches of Udhampur and Rajouri valley. (Figure 21)



### **7.6.3. November 2014 with respect to mean of November 2004 – November 2013**

The water level fluctuation for the month of November 2014 w.r.t. (mean of November 2004 to November 2013) has been worked out in respect of 125 observation wells. It is observed that a total of 95 wells (76.00%) have shown rise and 30 wells (24.00%) have shown decline in water levels.

Out of 95 number of wells showing rise, 85 wells (90.54%) wells are showing rise less than 2 m. 07 wells (6.75%) has shown rise from 2-4 m and 03 wells (2.70%) has shown rise more than 4 m. Out of 30 wells, which are showing fall, 28 wells (22.40%) that have shown fall in water levels are in the range of 0-2 m. Two wells (1.60%) has shown fall between 2-4 m and none of the wells have shown fall >4 m.

Rise in water levels is observed in major portions of all districts of Jammu Region. Few isolated areas have shown decline in the water levels. The rise in the range 0 – 2 m is shown in every district and entire of Dun belt whereas and rise above 2 m is observed small portions of Samba, Jammu and Kathua districts. Rise above 4 m is shown in only few patches of small portions of Samba and Kathua districts. Fall in the range 0 – 2 m is observed in all Districts and the decline in the range of 2 – 4 m is observed in small patches in southern and western parts of Jammu and Kathua district respectively. No any area has shown decline above 4m (Figure 22).

### **7.6.4. January 2015 with respect to mean of January 2005 – January 2014**

The water level fluctuation for the month of January 2015 w.r.t. mean of (January 2005 to January 2014) has been worked out in respect of 127 observation wells. It is observed that a total of 73 wells (57.48%) have shown rise and 54 wells (42.52%) have shown decline in water levels.

Out of 73 number of wells showing rise, 66 wells (51.97%) wells are showing rise less than 2 m. 07 wells (5.51%) has shown rise from 2-4 m and no any well (0.00%) has shown rise more than 4 m. Out of 54 wells, which are showing fall, 48 wells (37.79%) that have shown fall in water levels are in the range of 0-2 m. 04 wells (3.15%) has shown fall between 2-4 m and 02 (1.57%) of the wells have shown fall >4 m.

Rise in water levels is observed in major portions of all districts of Jammu Region whereas decline has also been shown in all the districts especially in the Sirowal belt. The rise in the range 0 – 2 m is shown in every district whereas and rise above 2 m is observed small portions of Jammu, Samba and Kathua districts. No any portion shows rise above 4 m. Fall in the range 0 – 2 m is observed in southern and middle portions of all the districts and the decline in the range of 2 – 4 m is observed in small patches in Jammu, Samba, Udampur and Kathua district. Only small patch in Kathua district shown decline above 4m (Figure 23)

<b>Table 15. CATEGORISATION OF CHANGES IN WATER LEVEL BETWEEN MAY 2014 TO DECADAL MEAN (MAY 2004-MAY 2013)</b>																			
District	No. Of wells Analyzed	Range of Fluctuation (m)				No. of Wells Showing Fluctuation						Percentage of wells Showing Fluctuation						Total No. Of Wells	
		Rise		Fall		Rise			Fall			Rise			Fall			Rise	Fall
		Min	Max	Min	Max	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4		
JAMMU	51.00	0.04	12.43	0.01	1.14	28.00	5.00	2.00	16.00	0.00	0.00	54.90	9.80	3.92	31.37	0.00	0.00	35.00	16.00
KATHUA	37.00	0.19	6.26	0.06	7.12	21.00	4.00	4.00	6.00	2.00	0.00	56.76	10.81	10.81	16.22	5.41	0.00	29.00	8.00
RAJAURI	24.00	0.17	4.33	0.19	1.86	17.00	3.00	1.00	3.00	0.00	0.00	70.83	12.50	4.17	12.50	0.00	0.00	21.00	3.00
UDHAMPUR	15.00	0.03	3.21	0.13	0.30	11.00	2.00	0.00	2.00	0.00	0.00	73.33	13.33	0.00	13.33	0.00	0.00	13.00	2.00
<b>TOTAL</b>	<b>127.00</b>	<b>0.03</b>	<b>12.43</b>	<b>0.01</b>	<b>7.12</b>	<b>77.00</b>	<b>14.00</b>	<b>7.00</b>	<b>27.00</b>	<b>2.00</b>	<b>0.00</b>	<b>60.63</b>	<b>11.02</b>	<b>5.51</b>	<b>21.26</b>	<b>1.57</b>	<b>0.00</b>	<b>98.00</b>	<b>29.00</b>

<b>Table 16. CATEGORISATION OF CHANGES IN WATER LEVEL BETWEEN AUGUST 2014 TO DECADAL MEAN (AUGUST 2004-AUGUST 2013)</b>																			
District	No. Of wells Analyzed	Range of Fluctuation (m)				No. of Wells Showing Fluctuation						Percentage of wells Showing Fluctuation						Total No. Of Wells	
		Rise		Fall		Rise			Fall			Rise			Fall			Rise	Fall
		Min	Max	Min	Max	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4		
JAMMU	54.00	0.04	12.42	0.04	4.57	15.00	1.00	1.00	33.00	3.00	1.00	27.78	1.85	1.85	61.11	5.56	1.85	17.00	37.00
KATHUA	38.00	0.02	4.56	0.01	2.46	10.00	2.00	1.00	23.00	2.00	0.00	26.32	5.26	2.63	60.53	5.26	0.00	13.00	25.00
RAJAURI	24.00	0.15	0.69	0.03	7.21	2.00	0.00	0.00	19.00	2.00	1.00	8.33	0.00	0.00	79.17	8.33	4.17	2.00	22.00
UDHAMPUR	15.00	0.07	1.50	0.06	7.15	4.00	0.00	0.00	8.00	2.00	1.00	26.67	0.00	0.00	53.33	13.33	6.67	4.00	11.00
<b>TOTAL</b>	<b>131.00</b>	<b>0.02</b>	<b>12.42</b>	<b>0.01</b>	<b>7.21</b>	<b>31.00</b>	<b>3.00</b>	<b>2.00</b>	<b>83.00</b>	<b>9.00</b>	<b>3.00</b>	<b>23.66</b>	<b>2.29</b>	<b>1.53</b>	<b>63.36</b>	<b>6.87</b>	<b>2.29</b>	<b>36.00</b>	<b>95.00</b>

**Table 17. CATEGORISATION OF CHANGES IN WATER LEVEL BETWEEN NOVEMBER 2014 TO DECADAL MEAN (NOVEMBER 2004-NOVEMBER 2013)**

District	No. Of wells Analyzed	Range of Fluctuation (m)				No. of Wells Showing Fluctuation						Percentage of wells Showing Fluctuation						Total No. Of Wells	
		Rise		Fall		Rise			Fall			Rise			Fall			Rise	Fall
		Min	Max	Min	Max	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4		
JAMMU	52.00	0.01	7.62	0.06	3.19	32.00	3.00	2.00	13.00	2.00	0.00	61.54	5.77	3.85	25.00	3.85	0.00	37.00	15.00
KATHUA	35.00	0.02	5.27	0.08	1.83	28.00	3.00	1.00	3.00	0.00	0.00	80.00	8.57	2.86	8.57	0.00	0.00	32.00	3.00
RAJOURI	24.00	0.06	2.53	0.07	0.47	16.00	1.00	0.00	7.00	0.00	0.00	66.67	4.17	0.00	29.17	0.00	0.00	17.00	7.00
UDHAMPUR	14.00	0.10	1.88	0.03	1.29	9.00	0.00	0.00	5.00	0.00	0.00	64.29	0.00	0.00	35.71	0.00	0.00	9.00	5.00
<b>TOTAL</b>	<b>125.00</b>	<b>0.01</b>	<b>7.62</b>	<b>0.03</b>	<b>3.19</b>	<b>85.00</b>	<b>7.00</b>	<b>3.00</b>	<b>28.00</b>	<b>2.00</b>	<b>0.00</b>	<b>68.00</b>	<b>5.60</b>	<b>2.40</b>	<b>22.40</b>	<b>1.60</b>	<b>0.00</b>	<b>95.00</b>	<b>30.00</b>

**Table 18. CATEGORISATION OF CHANGES IN WATER LEVEL BETWEEN JANUARY 2015 TO DECADAL MEAN (JANUARY 2005-JANUARY 2014)**

District	No. Of wells Analyzed	Range of Fluctuation (m)				No. of Wells Showing Fluctuation						Percentage of wells Showing Fluctuation						Total No. Of Wells	
		Rise		Fall		Rise			Fall			Rise			Fall			Rise	Fall
		Min	Max	Min	Max	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4		
JAMMU	54.00	0.03	2.65	0.05	4.29	30.00	4.00	0.00	16.00	3.00	1.00	55.56	7.41	0.00	29.63	5.56	1.85	34.00	20.00
KATHUA	34.00	0.02	3.66	0.01	6.11	21.00	2.00	0.00	10.00	0.00	1.00	61.76	5.88	0.00	29.41	0.00	2.94	23.00	11.00
RAJOURI	24.00	0.01	3.25	0.01	1.57	9.00	1.00	0.00	14.00	0.00	0.00	37.50	4.17	0.00	58.33	0.00	0.00	10.00	14.00
UDHAMPUR	15.00	0.04	1.05	0.10	2.61	6.00	0.00	0.00	8.00	1.00	0.00	40.00	0.00	0.00	53.33	6.67	0.00	6.00	9.00
<b>TOTAL</b>	<b>127.00</b>	<b>0.01</b>	<b>3.66</b>	<b>0.01</b>	<b>6.11</b>	<b>66.00</b>	<b>7.00</b>	<b>0.00</b>	<b>48.00</b>	<b>4.00</b>	<b>2.00</b>	<b>51.97</b>	<b>5.51</b>	<b>0.00</b>	<b>37.80</b>	<b>3.15</b>	<b>1.57</b>	<b>73.00</b>	<b>54.00</b>

Figure 20

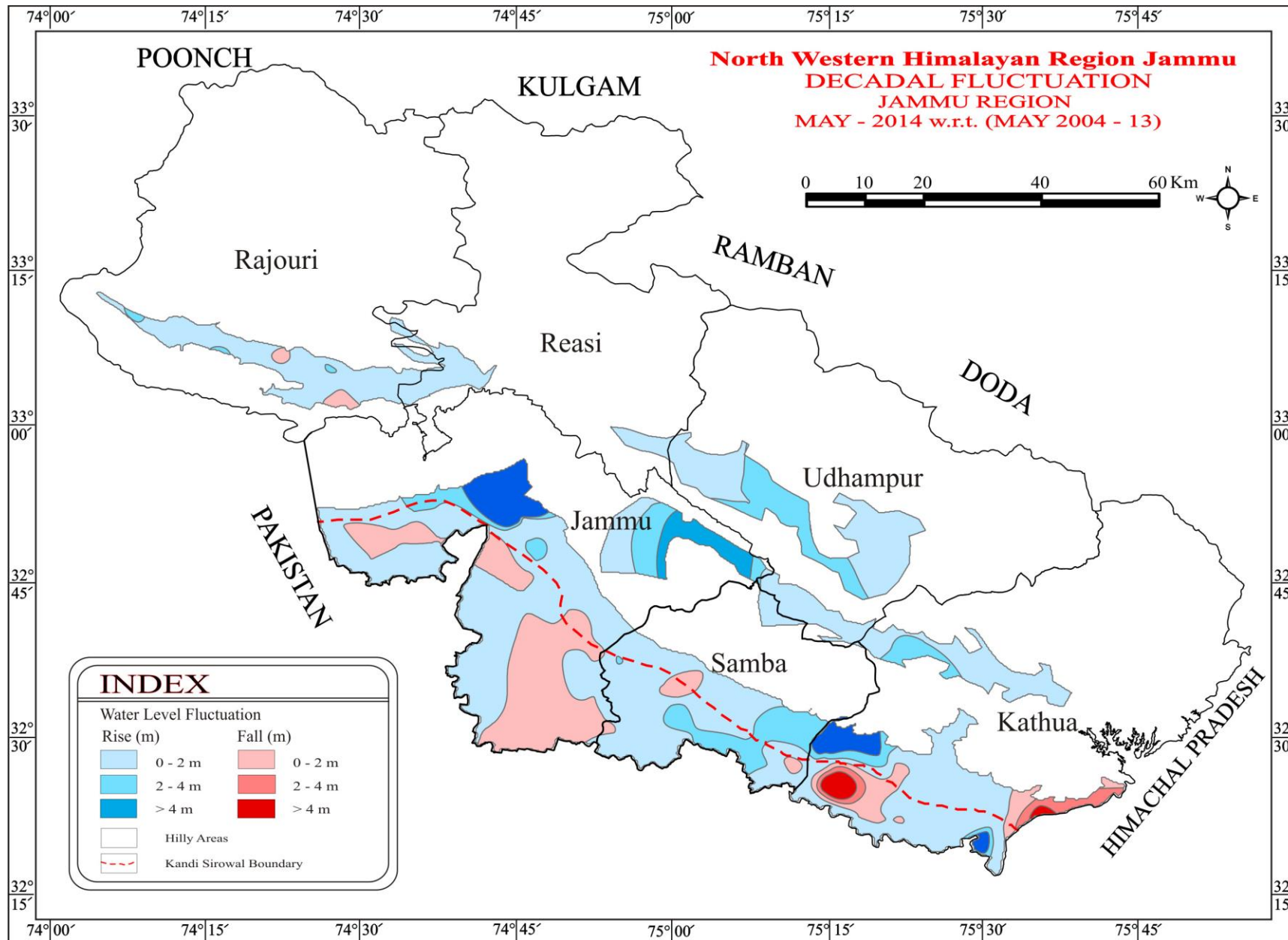




Figure 21

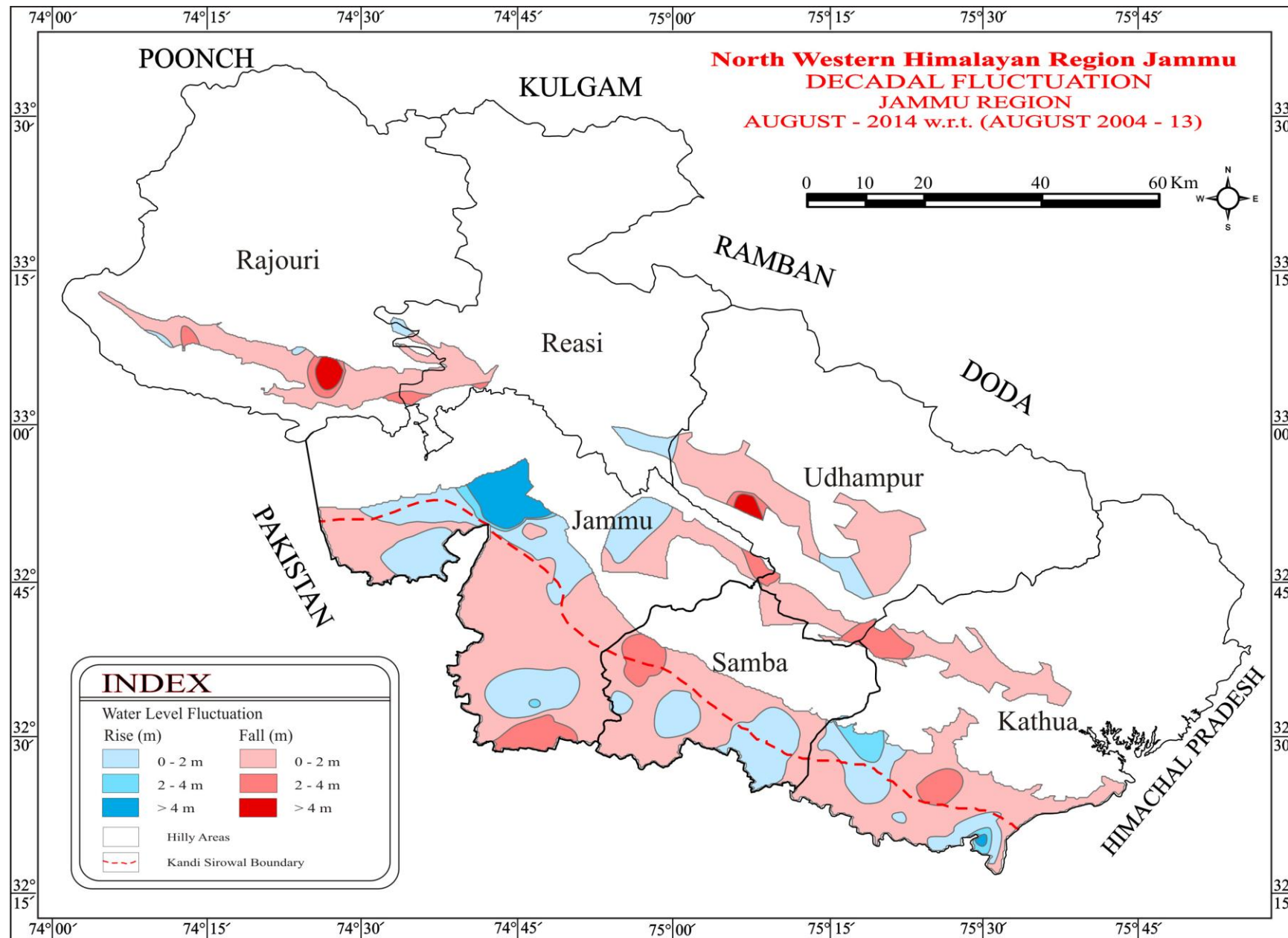


Figure 22

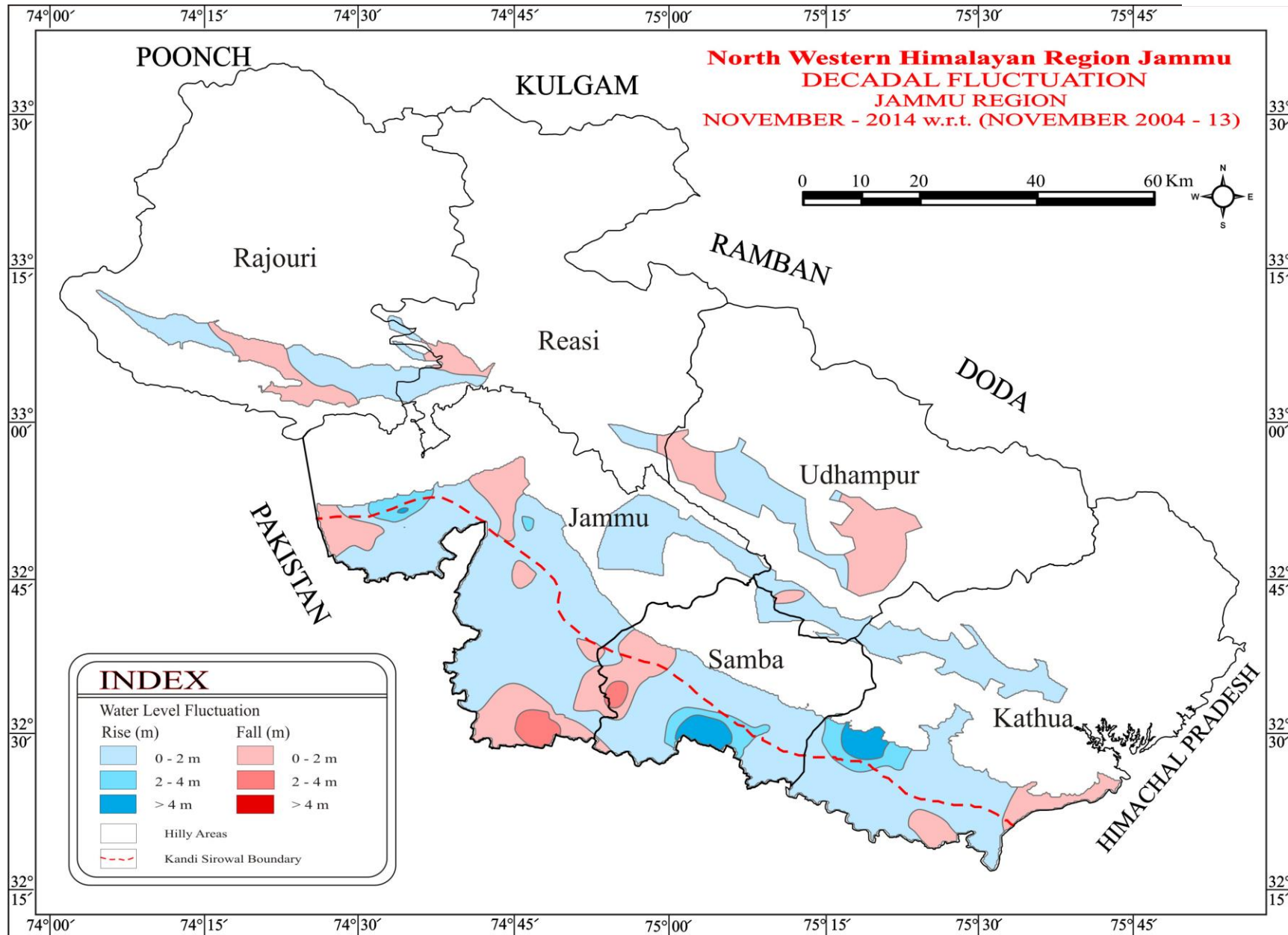
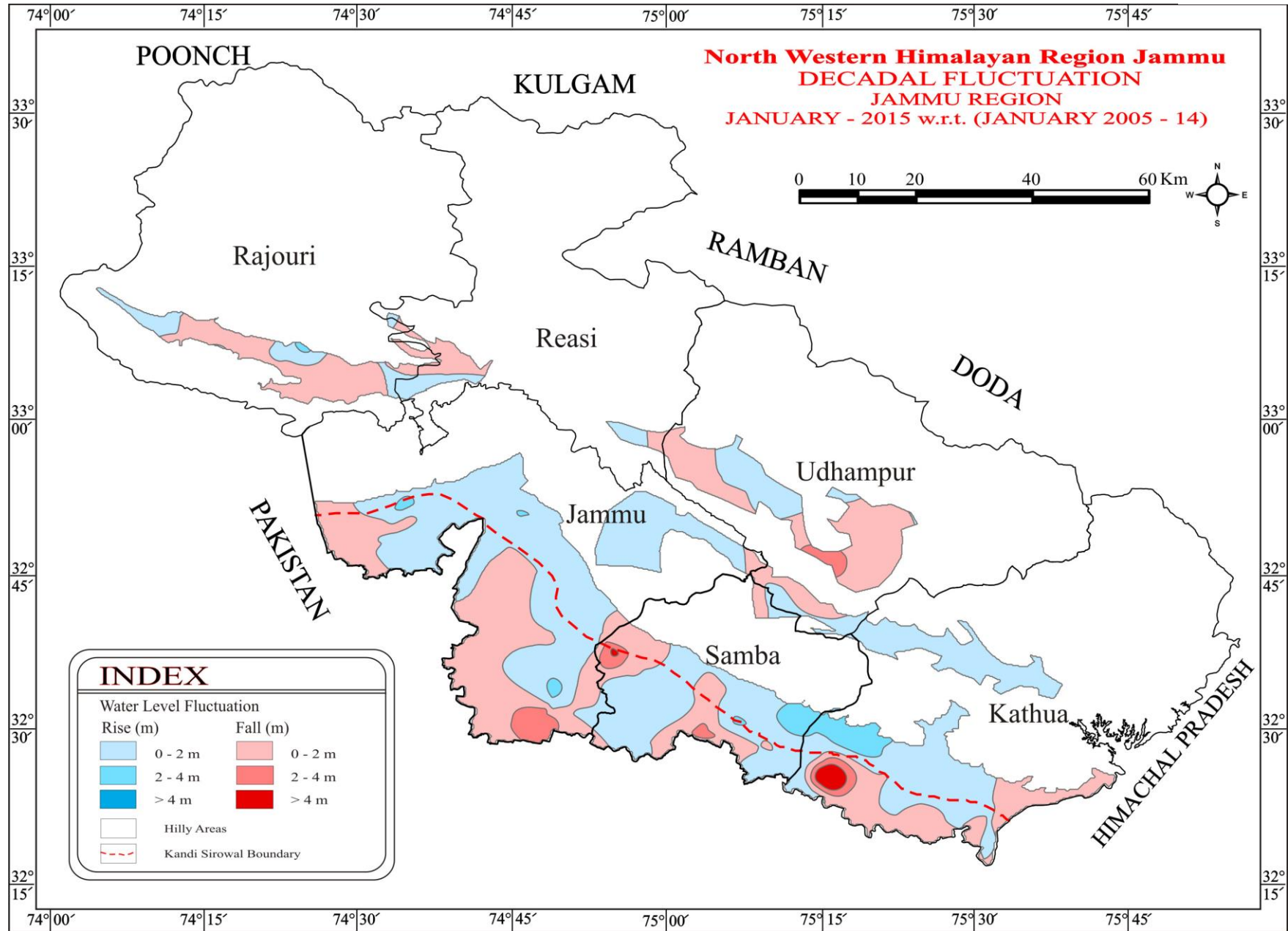


Figure 23



**HYDROCHEMISTRY**

The quality of shallow ground water in the state of Jammu & Kashmir has been evaluated on the basis of 228 no's of water samples collected from shallow aquifers during pre-monsoon season. All the collected samples were analysed by adopting standard methods of analysis (APHA). Chemical analysis data of samples are given in table 26 and 27. The summarized results of ground water samples are given in table given below.

**Table 19 Ground Water Quality of Hydrograph Stations during May 2013**

S.No.	Parameters	Permissible limit	Ranges	No. of Samples	Percentage %
1	Sp. Conductance µs/cm at 25°C	--	<750	185	81.14
			751-2250	41	17.98
			2251-3000	01	0.43
			>3000	01	0.43
2	Chloride (mg/l)	250-1000	<250	227	99.56
			251-1000	01	0.44
			>1000	00	0.0
3	Fluoride (mg/l)	1.50 mg/l	<1.00	225	98.68
			1.01-1.50	01	0.44
			>1.50	02	0.88
4	Nitrate (mg/l)	45 mg/l	<45	198	86.84
			46-100	22	9.85
			>100	08	3.51
5	Iron (mg/l)	1.00 mg/l	<1.00	202	89.91
			1.01-1.50	09	3.95
			>1.50	14	6.14

**8.1. Analytical Results and Discussions****pH**

In Jammu Region, pH values ranging between 7.05 (Rehal) to 8.7 (Battal Ballian) and in Kashmir Region pH values ranging between 7.44 (Aripathan) to 8.03 (Regal Chowk). The pH values more than 8.30 shows presence of carbonate ions reported in these samples. Whereas rest of the samples have only bicarbonate ions. Point values for pH of all the NHNS of all Regions and Kashmir region are appended in the in table 26 and 27.

**Specific Conductance**

Majority of samples (81.14%) are found to have specific conductance less than 750 µS/cm at 25°C hence the ground water is fresh and potable. About 17.98% and 0.43% of the samples have values between 751- 2250 µS/cm and 2251-3000 µS/cm respectively. In Jammu Region, specific conductance varies between 180 and 4820 µS/cm at 25°C. More than 3000 µS/cm is observed only

in one sample from Suchetgarh of Jammu District (Specific conductance 3300  $\mu\text{S}/\text{cm}$  at 25°C) an abandoned well samples collected from nearby this well is potable.

In Kashmir Region specific conductance varies between 190-1210  $\mu\text{S}/\text{cm}$  at 25°C. Major part of the valley areas showing EC values <1000  $\mu\text{S}/\text{cm}$  except some locations i.e. Aripanthan and Kupwara.

### Chloride Concentration

The concentration of Chloride in majority of the samples (99.56%) is less than 250 mg/l. Rest of 0.44% of samples Chloride concentration ranges from 251-1000 mg/l (Londi 312 mg/l from Kathua District).

In Jammu Region, the Chloride concentration less than 200 mg/l except for Londi and Bareri. In Kashmir Region all the valley areas have Chloride concentration less than 200 mg/l. The Chloride concentration in all the samples is within the maximum permissible limit of BIS for drinking water purpose.

### Fluoride Concentration

Fluoride is an important parameter for evaluating ground water quality. The concentration of fluoride in majority of the samples (99.12 %) is less than 1.00 mg/l, except one place where high Fluoride is determined Sunal of Udhampur District 3.05 mg/l.

### Nitrate Concentration

Nitrate is also an important parameter for evaluating ground water quality. In majority of samples 86.84%, concentration of nitrate is less than 45 mg/l, while 9.85 % (22 nos) of samples are associated with nitrate concentration more than 45 mg/l, but less than 100 mg/l. Rest of 3.51% (8 nos) of samples are reported to have nitrate concentration more than 100 mg/l. The details of samples, which are associated with Nitrate concentration more than maximum permissible limit of BIS (>45mg/L) are summarized in the table 20 given below.

**Table 20. Samples associated Nitrate concentration more than 45 mg/l as per BIS.**

S. No.	District	Location	Nitrate > 45 (mg/l)
1	Jammu	Dhanpur	115.0
2		Hamirpur Sidhar	216.0
3		Jaswan	134.0
4		Bega	115.0
5		Jourian	48.0
6		Marh	54.0
7		Arnia-I	60.0
8		Channi	48.0
9		Khairi	47.0
10		Kothey-sani	46.0



S. No.	District	Location	Nitrate > 45 (mg/l)
11		Miranshaib	48.0
12		Satwari	46.0
13		Supwal	51.0
14		Tirkutanagar	61.0
15		Greaterkailash	46.0
16	Kathua	Ganu Chowk	178.00
17		Jandi	106.00
18		Londi	121.00
19		Challan	74.00
20		Karol Krishna	53.00
21		Kerian Gandyal	50.00
22		Samba	94.00
23	Kupwara	Dolipura	57
24		Magam	64
25	Udhampur	Nagrota	60.0
26		Parnala	86.0
27		Sirdhara	63.0
28	Kashmir Valley	Rambarpora	70
29		Binner	54
30		Aripanthan	188

### Iron Concentration

In majority of samples, 89.91% (205) have Iron concentration less than 1.00 mg/l. Iron concentrations in these samples are within the norms setup by BIS for drinking water purpose. About 3.95 % (09 nos) of samples, concentration of Iron ranges from 1.01 mg/l to 1.50 mg/l. In rest of samples 6.14 % (14 nos) Iron concentration is more than 1.50 mg/l. In Jammu Region, iron concentration ranging between 0-8.05 mg/l.

In Kashmir Region, Iron concentration is too high and this iron is basically geogenic. Iron concentration ranges between traces to 14.0 mg/l. Samples, which are associated with concentration more than maximum permissible limit 1.0 mg/l are summarised in the table 21 given below.

**Table 21. Samples associated Iron concentration more than 1.00 mg/l of BIS**

S.No	District	Location	Iron >1.00 (mg/l)
1	Jammu	Bakore	4.55
2		Bhagwanchak	1.83
3		Gajansoo	4.98
4		Senth	2.13
5		Arnia-I	8.05
6		Chamlia	1.73
7		Didyal	2.02
8		kaluchak	2.58
9		Laswara	2.04



S.No	District	Location	Iron >1.00 (mg/l)
10		Kana Chak	1.11
11		Purkhoo	1.49
12		Taryai	1.20
13		Nandpur	1.08
14		Supwal	1.09
15		Greaterkailash	1.03
16	Kathua	Chakhariya	1.21
17		Dharamsal	3
18	Rajouri	Kalal	2
19		Banpari	1
20	Udhampur	Jindhara	1.34
21		Gandhasi Bhat	2.22
22	Kashmir Valley	Pampore Silk Centre	14.00
23		Zeewan	12.00

### Total Hardness

Hardness of the water is the capacity of water to neutralise soap. Hardness is mainly caused by Carbonate & Bicarbonate ions of Calcium and Magnesium.

### Classification of Hardness

This classification is based on the value of total Hardness. Ground water may be classified in to four type's soft, moderate hard, hard and very hard.

**Table 22. Ground water samples summarised as per classification of Hardness**

S.No	District	Nos of Samples	Soft (0-60) mg/l	Mod. Hard (61-120) mg/l	Hard (121-180) mg/l	Very Hard more than 180 mg/l
1	Jammu	93	00	09 (9.6%)	50(53.8%)	34 (36.6%)
2	Kathua	42	00	02 (4.8%)	15 (35.7%)	25 (59.5%)
3	Rajauri	32	00	00 (0.0%)	19(61.3%)	12 (38.7%)
4	Udhampur	34	00	02 (6.5%)	09 (29.0%)	20 (64.5%)
5	Kashmir Valley	27	00	02 (7.4%)	01 (3.7%)	24 (89.0%)
	Total	228*	00	15	94	115
	Percentage	100%		6.6%	41.2%	50.4%

\*Four samples are not included in this analysis due to leakage.

As per the classification, Ground water is hard and very hard. About 41.2% and 50.4% of samples belong to hard and Very hard categories respectively. None of the samples in the study area belong to Soft category.

### Range of Hardness:

The ranges of Total hardness of samples are calculated district wise and summarized in the table given below.

**Table 23. District Wise Range of Hardness of NHS 2012**

S.No	District	Range of Total Hardness (as CaCO <sub>3</sub> ) mg/l
1	Jammu	100-310
2	Kathua	80-770
3	Rajauri	125-315
4	Udhampur	105-525
5	Kashmir Valley	92-420

From the table, it is very clear that in samples collected from Jammu District, value of Total Hardness varies from 100-310 mg/l. Similarly for Kathua, Rajauri & Udhampur Districts TH values vary from 80-770mg/l, 125-315 mg/l and 105-525 mg/l respectively.

In Kashmir Region, TH value varies from 92-420 mg/l .(As per the BIS norms 300 and 600 mg/l is the limit for desirable and maximum permissible limit respectively for drinking water purposes. All samples are within the maximum permissible limit (600 mg/l) except at one location (Londi –Kathua district) where high value of Total Hardness (770mg/L) is observed.

## **8.2. Pollution Study**

Pollution studies have been carried out at Mansar in Udhampur district and Jhelum River at Kashmir valley.

### **Mansar Lake**

Mansar Lake is situated 62 km from Jammu, Mansar (32.6961° N, 75.1468° E) is a beautiful lake fringed by forest-covered hills, over a mile in length by half-a-mile in width. Mansar Lake is also picking up its fame among the tourists with all its flora & fauna. The lake has cemented path all around with required illumination with projected view decks to enjoy flickering of seasonal birds, tortoise and fishes of different species. There is a wild life Sanctuary housing jungle life like Spotted Deer, Neelgai etc. besides other water birds such as Cranes, Ducks etc. One can also witness the traditional and typical distinct life style of Gujjar and Backarwals wearing ethnic costume, living in open Kullhas around on the hills of Mansar Lake.

Study has been carried out in monsoon season the sample has collected by boat with 10 m matrix. pH of the sample vary from 7.95 to 8.3. Conductivity ranges from 170-280 µS/cm.

**Table 24. River Water Quality of Mansar Lake 2013**

S.No.	Parameters	Permissible limit	Ranges
1	Sp. Conductance µs/cm at 25°C	-	170-280
2	Chloride (mg/l)	250-1000	7-11
3	Fluoride (mg/l)	1.50 mg/l	0.15-0.33
4	Nitrate (mg/l)	45 mg/l	0.6-7.6

The ranges of important parameters are appended in the table above all parameters are within the range and have no pollution problem at present.

### **Jhelum River**

The River Jhelum rises from Verinag Spring situated at the foot of the Pir Panjal in the south-eastern part of the valley of Kashmir in India. It flows through Srinagar and the Wular Lake before entering Pakistan through a deep narrow gorge.

**Table 25. River Water Quality of Jhelum River 2013**

S. No.	Parameters	Permissible limit	Ranges
1	Sp. Conductance µs/cm at 25°C	-	250-320
2	Chloride (mg/l)	250-1000	4-14
3	Fluoride (mg/l)	1.50 mg/l	0-0.2
4	Nitrate (mg/l)	45 mg/l	1.81-6.49

Study has been carried out in post monsoon season the sample have been collected from Varinag 33.39 15° N, 75.1327° E to 34.12 15° N, 74.2217° E 100 km (Baramulla ) along the path by boat with 10 km matrix. pH of the sample vary from 8.2 to 8.43. Conductivity ranges from 250-320 µS/cm.

The ranges of important parameters are appended in the tables given above all parameters are within the range. It is observed that concentration of all the parameters increases along the flow of the river but no pollution problem at present.

**RECOMMENDATIONS**

1. Ground water in Jammu and Kashmir state is fresh and potable in most of the areas. Water supply in this state is mainly dependant on ground water whether it is spring source, shallow ground water or deep ground water. Ground water is the main source for surface water bodies in the form of base flow in lean periods. Proper protection measures need to be taken to avoid contamination of ground water.
2. Even though salinity is not a major concern in the state, there are problems of ground water contamination like iron (Fe) (in Tertiary belt and in Kashmir valley) marshy gases (in shallow and deep aquifers of Kashmir valley), Fluoride in localized areas like in parts of Doda dist. Nitrate contamination, Bacteriological contaminations, ground water pollution is due to pesticides/ fertilizers in agriculture and horticulture. The quality surveillance needs to be increased by State Government Organisations. Ground water quality shall be monitored once in a year for all major elements, trace metals and bacteriological contaminations.
3. Most of the ground water is hard to very hard category causing gastro-intestinal problems. This type of water may be treated properly before supplying the water for drinking purposes.
4. Deeper aquifers in both Jammu region and Kashmir valley can be developed for mitigating the water supply requirements. Micro-level planning is required to develop these aquifers based on the available data of aquifer geometry, parameters and water resources. Groundwater from deeper aquifers in Kashmir valley consists of iron and marshy gasses which need to be treated properly before supplying the water. It is better to identify the iron free aquifers through scientific ground water exploration techniques couples with modern techniques of geophysics so that iron problem can be mitigated. Tube wells shall be constructed by tapping only iron free aquifers and avoiding iron rich aquifers through cement sealing and putting gravel pack only around the iron free aquifers.
5. The reality of climate change is the most significant long term threat to water resources. In hilly region water supply is still based on springs, where discharges of springs are drastically being reduced. Systematic enumeration/inventory of springs including its quality, snow water harvesting techniques and other available techniques is required to develop ground water resources on sustainable basis need to be adopted.
6. Fast developing urban & industrial areas need special attention/quality surveillance by the State government authorities. Proper monitoring for trace elements in industrial areas like Bari-Brahmana, Gangyal and other industrial areas located in Kashmir valley shall be taken up.

Monitoring network stations shall be established all along the nalas and drains carrying industrial effluents.

7. As the water supplies in Jammu city and parts of areas in Srinagar city are ground water based, proper well head protection measures need to be taken to avoid bacteriological contamination like coliform bacteria and E-coli.
8. There is lack of proper sewage and sanitation in all over the state resulting into ground water and surface water contaminations. This issue need to be addressed immediately by the authorities. Village sewages shall be disposed off properly after proper treatment. In water logging areas, where ground water is being contaminated by polluted surface water, proper drainage shall be created for avoiding the water logging conditions.
9. Ground water contamination by improper disposal of domestic and industrial solid wastes is of another concern. Special efforts shall be made to address this problem.
10. There is an urgent need to take-up comprehensive studies on ground water quality of both shallow and deep ground waters analyzing major elements, heavy metals, pesticides, microbial contamination is the need of the hour. Areas identified in this report where higher concentrations of heavy metals, nitrates and fluorides need to be given special attentions.
12. The existing data base on quality with different organizations like CGWB, PHED, State pollution control board, academic institutions like Jammu university and Kashmir university need to be integrated and a comprehensive data base need to be established.
13. Scientific research projects on ground water contamination especially geo-genic contamination like Iron, gasses and fluoride need to be taken up immediately
14. Proper management strategies need to be drawn up to combat the problems of geo-genic contamination. Cost effective community level treatment plants need to be established. The treatment plants as recommended in this report shall be constructed with trained manpower as in charges so that these treatment plants may work efficiently for longer periods.
15. As the ground water is hard to very hard type and consists of iron, proper treatment shall be followed before using this water for irrigation through modern irrigation methods like sprinkler irrigations and drip irrigations. This type of water may choke the sprinklers and drips.

**Table 26. Result of Chemical Analysis of water samples of National Hydrograph Stations collected during May 2013 JAMMU REGION**

<b>JAMMU DISTRICT</b>																				
S. No.	Location	Type of Source	Date of collection	Temp °C	pH	Sp Cond ms/cm 25°C	CO <sub>3</sub>	HCO <sub>3</sub>	Alkalinity	Cl	SO <sub>4</sub>	NO <sub>3</sub>	F	Ca	Mg	Na	K	TH	TDS	Fe
1	AKHNOOR	T/W	24/5/13	21	7.93	530	0	293	240	18.0	24	14.0	0.13	64	29	5.7	6.5	280	281	0.30
2	BAKORE	H.P	24/5/13	20	7.72	610	0	214	175	46.0	53	43.0	0.11	50	34	28.0	3.7	265	323	4.55
3	BARADOW	D.W	24/5/13	19	7.83	360	0	189	155	14.0	2	17.0	0.06	46	15	6.8	0.43	175	191	0.14
4	BARERA	D.W	24/5/13	21	7.96	470	0	235	193	25.0	2	7.1	0.09	56	21	3.7	1.2	225	249	0.31
5	BHAGWANCHAK	D.W	24/5/13	21	8.28	420	0	171	140	14.0	45	40.0	0.10	30	16	45.0	1.3	140	223	1.83
6	DEVIPUR	D.W	24/5/13	20	7.91	360	0	189	155	18.0	3	9.7	0.08	52	13	1.9	1.3	185	191	0.06
7	DHANPUR	H.P	24/5/13	22	7.63	630	0	232	190	28.0	2	115.0	0.03	80	21	18.0	1	285	334	0.14
8	DHARAM KHOO	D.W	24/5/13	21	8.24	280	0	134	110	18.0	20	9.5	0.13	28	20	5.1	2.3	150	148	0.05
9	GAJANSOO	H.P	24/5/13	19	8.01	580	0	220	180	64.0	43	0.9	0.14	38	28	45.0	5.9	210	307	4.98
10	GARHI	D.W	24/5/13	20	8.66	470	18	134	140	35.0	56	13.0	0.16	14	34	33.0	9.3	175	249	0.21
11	GHO MANHAS	D.W	24/5/13	21	8.01	680	0	323	265	32.0	16	5.8	0.26	20	54	27.0	2	270	360	0.23
12	GIGRIAL	D.W	24/5/13	20	8.27	320	0	183	150	18.0	2	5.4	0.19	34	15	16.0	1.6	145	170	0.01
13	GURA	D.W	24/5/13	20	8.35	420	12	159	150	25.0	35	34.0	0.16	24	37	17.0	1.3	210	223	1.00
14	HAZURIBAG	H.P	24/5/13	21	8.07	280	0.00	73	60	14.0	75	4.5	0.13	34	10	4.1	22.1	125	148	0.43
15	HAMIRPUR KONA	D.W	24/5/13	21	8.49	270	6	128	115	7.0	18	2.0	0.11	34	13	2.5	0.72	140	143	0.13
16	HAMIRPUR SIDHAR	D.W	24/5/13	21	7.67	1190	0	152	125	113.0	145	216.0	0.25	50	34	116.0	73	265	631	0.13
17	JASWAN	D.W	24/5/13	22	7.8	450	0	82	67	50.0	0	134.0	0.16	18	26	16.0	48	150	239	0.20
18	JHRI	D.W	24/5/13	19	8.45	310	12	104	105	14.0	32	11.0	0.10	24	22	5.9	3.4	150	164	0.04
19	JOIRIAN	D.W	24/5/13	19	8.26	580	0	177	145	53.0	47	48.0	0.08	48	17	46.0	14	190	307	0.26
20	JOGWAN	D.W	24/5/13	19	8.05	420	0	189	155	25.0	2	40.0	0.16	58	12	13.0	1.34	195	223	0.01
21	KACHRIAL	D.W	24/5/13	21	7.78	690	0	232	190	25.0	57	16.0	0.11	70	18	10.0	20	250	366	0.20
22	KALAH	D.W	30/5/13	19	7.95	510	0	213	175	28.0	3	38.0	0.10	80	0	14.0	14.2	200	270	0.02
23	KANA CHAK	D.W	30/5/13	21	7.89	480	0	183	150	25.0	23	13.0	0.05	40	22	9.0	8.2	190	254	1.11
24	KANGAR	D.W	30/5/13	19	8.24	260	0	128	105	18.0	3	9.7	0.14	24	16	6.4	1.7	125	138	0.23
25	KHAIRI	D.W	30/5/13	20	8.27	220	0	98	80	14.0	0	18.0	0.11	30	6	6.2	1.6	100	117	0.09



S. No.	Location	Type of Source	Date of collection	Temp °C	pH	Sp Cond ms/cm 25°C	CO <sub>3</sub>	HCO <sub>3</sub>	Alkalinity	Cl	SO <sub>4</sub>	NO <sub>3</sub>	F	Ca	Mg	Na	K	TH	TDS	Fe
26	KHOUR	H.P	30/5/13	19	7.71	490	0	177	145	18.0	25	16.0	0.10	46	15	15.0	1.43	175	260	0.13
27	LAM	D.W	30/5/13	19	8.13	520	0	214	175	21.0	2	4.1	0.00	54	9	11.0	13	170	276	0.13
28	LEHHERIAN	D.W	30/5/13	19	8.44	330	12	134	130	18.0	27	12.0	0.14	22	24	16.0	2.4	155	175	0.40
29	MARH	H.P	30/5/13	19	8.07	640	0	207	170	36.0	73	54.0	0.19	38	46	24.0	1.8	285	339	0.37
30	MARJHOLI	D.W	30/5/13	21	8.15	350	0	159	130	14.0	9	6.3	0.05	18	17	5.3	2.5	150	186	0.00
31	MUTHI	D.W	30/5/13	21	8.25	500	0	195	160	36.0	64	4.0	0.26	32	34	26.0	3.00	220	265	0.09
32	NAGBANI	D.W	30/5/13	19	8.19	380	0	189	155	11.0	25	0.0	0.38	26	23	16.0	1.30	160	201	0.40
33	NANDNI	D.W	30/5/13	18	8.37	310	6	146	130	18.0	2	0.0	0.02	30	15	8.9	2.6	135	164	0.10
34	PALLANWALA	D.W	30/5/13	21	8.28	300	0	128	105	14.0	16	7.0	0.10	20	18	10.0	0.70	125	159	0.97
35	PALTAN	D.W	30/5/13	19	8.31	320	6	98	90	28.0	33	14.0	0.08	28	18	14.0	0.90	145	170	0.08
36	PANGLI COLONY	D.W	30/5/13	18	8.11	340	0	128	105	18.0	47	7.4	0.11	30	18	14.0	3.90	150	180	0.04
37	PATA KHU	D.W	30/5/13	20	7.91	360	0	189	155	11.0	5	7.0	0.05	34	20	6.0	2.50	165	191	0.01
38	PATYALE CHAK	D.W	30/5/13	19	8.1	380	0	177	145	14.0	49	4.2	0.20	22	28	22.0	1.50	170	201	0.01
39	PURKHOO	H.P	30/5/13	19	8.42	370	6	159	140	25.0	26	29.0	0.10	20	30	22.0	2.06	175	196	1.49
40	SANDHWAN	H.P	31/5/13	20	8.07	620	0	232	190	43.0	88	14.0	0.13	24	46	41.0	11.00	250	329	0.33
41	SAJWAL	D.W	31/5/13	19	8.01	390	0	165	135	14.0	11	6.2	0.07	38	16	4.0	2.40	160	207	0.25
42	SENTH	D.W	31/5/13	19	7.99	560	0	275	225	18.0	21	17.0	0.26	58	22	18.0	9.00	235	297	2.13
43	TARYAI	D.W	31/5/13	21	8.15	300	0	122	100	14.0	20	5.0	0.13	34	12	3.0	2.60	135	159	1.20
44	SHAMECHAK	D.W	31/5/13	20	8.38	380	12	137	132	18.0	37	22.0	0.08	46	12	17.0	1.20	165	201	0.05
45	BARNAI	H.P	31/5/13	19	8.17	450	0	189	155	21.0	19	14.0	0.03	32	24	12.0	8.00	180	239	0.94
46	KALOO CHAK	H.P	31/5/13	20	8.06	570	0	305	250	21.0	4	0.0	0.06	60	22	14.0	11.00	240	302	0.08
47	ARNIA-I	DW	24-5-13	19	8.07	720	0	220	180	46.0	45	60.0	0.14	20	22	65	46	140	382	8.05
48	ARNIA-II	DW	24-5-13	21	7.6	1180	0	494	405	78.0	9	42.0	1.00	56	40	63.0	91	305	625	0.57
49	ALLA	DW	25-5-13	20	8.2	250	0	79	65	11.0	1	5.8	0.36	26	13	3.6	0.6	120	133	0.57
50	ARGE CHAK	DW	25-5-13	21	7.94	490	0	183	150	14.0	0	11.0	0.27	45	21	8.7	0.7	160	260	0.23
51	BERA	DW	25-5-13	19	7.95	500	0	238	195	14.0	3	2.6	0.32	20	26	29.0	2.01	155	265	0.06
52	BEGA	DW	25-5-13	21	8.2	1510	0	519	425	113.0	124	115.0	0.56	8	61	65.0	310	270	800	0.16

S. No.	Location	Type of Source	Date of collection	Temp °C	pH	Sp Cond ms/cm 25°C	CO <sub>3</sub>	HCO <sub>3</sub>	Alkalinity	Cl	SO <sub>4</sub>	NO <sub>3</sub>	F	Ca	Mg	Na	K	TH	TDS	Fe
53	BISHNA	DW	28-5-13	18	8.28	630	0	287	235	50.0	11	6.6	0.10	18	30	52.0	30	170	334	0.20
54	BASSI KALAN	DW	28-5-13	19	8.36	380	6	159	140	21.0	5	18.0	0.23	20	24	15.0	1.6	150	201	0.08
55	BIRPUR	TW	28-5-13	19	8.28	220	0	98	80	14.0	4	17.0	0.05	30	18	7.6	1.03	100	117	0.07
56	CHANNI	DW	28-5-13	20	7.9	640	0	171	140	36.0	5	48.0	0.01	40	20	24.0	1.4	180	339	0.00
57	CHAMLIA	DW	29-5-13	21	7.99	590	0	293	240	36.0	15	2.9	0.28	12	22	85.0	2.9	120	313	1.73
58	DIDYAL	DW	29-5-13	20	7.91	460	0	226	185	21.0	2	20.0	0.11	24	24	32.0	3.3	160	244	2.02
59	GHO-BRAHMANA	DW	29-5-13	20	7.87	580	0	219	180	43.0	3	27.0	0.03	26	21	52.0	1.9	150	307	0.59
60	GUDWAL	DW	29-5-13	19	8.15	230	0.00	110	90	28.0	5	12.0	0.06	34	11	8.4	1.2	125	122	0.02
61	GHO-RAKHWALA	DW	29-5-13	20	8.02	740	0	311	255	71.0	2	17.0	0.17	26	39	67.0	0.5	225	392	0.08
62	KAINTHPUR	DW	30-5-13	21	8.07	270	0	128	105	21.0	0	6.2	0.19	20	17	8.8	1.4	120	143	0.46
63	KALUCHAK	DW	30-5-13	21	8.16	400	0	153	125	29.0	39	10.0	0.01	18	29	21.0	3	165	212	2.58
64	KHAIRI	DW	30-5-13	19	8.33	670	36	171	200	60.0	57	47.0	0.17	16	46	63.0	12	230	355	0.47
65	KOTHEY-SANI	DW	30-5-13	20	8.28	530	0	171	140	29.0	28	46.0	0.25	32	23	32.0	1.2	175	281	0.15
66	KOTLI-CHARKAN	DW	31-5-13	18	8.31	350	12	153	145	11.0	19	15.0	0.53	36	20	7.7	0.62	170	186	0.00
67	KARNAILE CHAK	DW	31-5-13	19	8.17	350	0	159	130	18.0	4	18.0	0.00	36	16	7.5	2.6	155	186	0.01
68	LALYAL	DW	31-5-13	19	8.09	320	0	177	145	21.0	1	2.3	1.00	30	14	19.0	5.1	130	170	0.43
69	LASWARA	DW	31-5-13	19	7.88	740	0	140	115	71.0	68	36.0	0.30	58	27	27.0	0.8	255	392	2.04
70	MAKWAL	DW	31-5-13	20	8.21	260	0	134	110	14.0	3	0.3	0.02	24	14	7.2	2	115	138	0.07
71	MAJUHA LAXMI	DW	31-5-13	21	8.35	380	12	183	170	21.0	3	16.0	0.18	16	27	29.0	2.3	150	201	0.16
72	MAHAL KALANDARIAN	DW	1/6/2013	19	7.85	540	0	293	240	21.0	24	12.0	0.82	18	23	75.0	1.1	140	286	0.27
73	MEEN-CHARKAN	DW	1/6/2013	19	8.38	480	18	226	215	18.0	2	39.0	0.21	56	21	15.0	1.08	225	254	0.05
74	MIRANSHAIB	DW	31-5-13	21	7.44	700	0	171	140	96.0	120	48.0	0.14	14	39	75.0	0.6	245	371	0.07
75	NNDPUR	HP	31-5-13	20	8.23	450	0	183	150	53.0	2	1.7	0.37	18	16	34.0	35	110	239	1.08
76	NIKOWAL	DW	29-5-13	19	8.25	510	0	330	270	18.0	13	0.0	0.57	20	38	46.0	2.5	205	270	0.37
77	PATLI	DW	29-5-13	21	8.47	510	6	214	185	43.0	33	11.0	0.88	20	35	42.0	1.90	195	270	0.26
78	PALLI	DW	29-5-13	20	8.05	750	0	360	295	43.0	24	12.0	0.98	18	32	98.0	1.80	175	398	0.14
79	POAL	DW	29-5-13	20	8.18	480	0	207	170	25.0	18	13.0	0.31	40	26	13.0	0.7	205	254	0.07

S. No.	Location	Type of Source	Date of collection	Temp °C	pH	Sp Cond ms/cm 25°C	CO <sub>3</sub>	HCO <sub>3</sub>	Alkalinity	Cl	SO <sub>4</sub>	NO <sub>3</sub>	F	Ca	Mg	Na	K	TH	TDS	Fe
80	QUDARPUR	HP	31-5-13	21	7.91	860	0	177	145	60.0	158	22.0	0.21	44	37	69.0	1.60	260	456	0.03
81	REHAL	DW	31-5-13	19	8.7	530	0	262	215	36.0	4	1.7	0.25	14	32	45.0	1.60	170	281	0.22
82	SALEAHAR	DW	31-5-13	19	8.22	1580	0	720	590	71.0	133	4.5	0.31	42	50	90.0	255.00	310	837	0.36
83	SATWARI	DW	28-5-132	18	8.6	430	12	116	115	36.0	27	46.0	0.01	20	30	27.0	1.80	175	228	0.03
84	SEI KHURD	DW	28-5-132	18	8.52	480	6	262	225	11.0	23	0.1	0.28	18	27	49.0	2.10	155	254	0.83
85	SOHANJAN	DW	28-5-132	19	8.44	720	12	195	180	53.0	104	23.0	0.38	20	38	43.0	61.00	205	382	0.07
86	SUCHETGARH	DW	31-5-13	21	8.61	4820	6	232	200	18.0	36	0.2	0.07	16	33	39.0	2.50	175	2555	0.98
87	SUPWAL	DW	31-5-13	20	8.17	510	0	153	125	50.0	4	51.0	0.33	30	26	28.0	0.20	180	270	1.09
88	SWANKHA	DW	31-5-13	19	7.94	460	0	189	155	25.0	3	45.0	0.12	32	11	47.0	1.17	125	244	0.95
89	UPRALAKANHA	DW	31-5-13	19	8.69	570	6	275	235	1.9	2	7.9	0.21	12	27	91.0	0.70	140	302	0.22
90	TIRKUTANAGAR	DW	31-5-13	18	8.35	460	6	159	140	39.0	4	61.0	0.18	56	9	26.0	1.30	225	244	0.07
91	CHATA	HP	31-5-13	20	8.27	400	0	183	150	18.0	16	15.0	0.03	44	17	10.0	1.60	180	212	0.61
92	GREATERKAILASH	DW	31-5-13	19	8.25	390	0	146	120	28.0	40	46.0	0.21	30	27	24.0	1.20	185	207	1.03
93	RS PURA	DW	31-5-13	18	8.39	400	6	140	125	11.0	21	8.7	42.00	42	11	8.7	0.50	150	212	0.24

### DISTRICT KATHUA

S. No.	Location	Type of Source	Date of collection	Temp °C	pH	Sp Cond mS/cm 25°C	CO <sub>3</sub>	HCO <sub>3</sub>	Alkalinity	Cl	SO <sub>4</sub>	NO <sub>3</sub>	F	Ca	Mg	Na	K	TH	TDS	Fe
1	BANGLAR	DW	28.5.13	27.5	7.3	1680	BD	353.8	290	170	228	4.2	0.45	72	18	202.5	59.0	255	874	0.16
2	BARNI	DW	30.5.13	24.5	7.92	320	BD	183	150	14	4	23.50	0.48	46	13	10.0	0.8	170	166	0.40
3	BHAGWAL	DW	30.5.13	24	7.95	390	BD	201.3	165	18	12	17.00	0.33	52	13	13.4	2.0	185	203	0.43
4	CHAK HARIYA	DW	30.5.13	26	7.65	530	BD	311.1	255	11	30	5.30	0.33	70	17	22.1	9.5	245	276	1.21
5	CHALLAN	DW	30.5.13	24	8.1	790	BD	158.6	130	92	95	74.00	0.39	48	33	69.7	9.7	255	411	0.67
6	CHANRANGA	DW	30.5.13	26	8.3	340	BD	128.1	105	14	49	15.00	0.33	36	13	15.5	7.0	145	177	ND
7	CHAPKI KALAN	DW	30.5.13	24	8.02	350	BD	195.2	160	11	16	9.60	0.33	44	15	12.1	2.5	170	182	0.16
8	DABOH	DW	29.5.13	22	7.95	410	BD	170.8	140	32	47	7.70	0.39	40	15	34.6	3.9	160	213	0.12
9	DULME CHAK	DW	30.5.13	23	8.1	1200	BD	500.2	410	78	155	40.00	0.39	44	43	100.0	165.0	285	624	0.15

S. No.	Location	Type of Source	Date of collection	Temp °C	pH	Sp Cond ms/cm 25°C	CO <sub>3</sub>	HCO <sub>3</sub>	Alkalinity	Cl	SO <sub>4</sub>	NO <sub>3</sub>	F	Ca	Mg	Na	K	TH	TDS	Fe
10	FERUCHAK	DW	30.5.13	26	7.99	360	BD	189.1	155	11	31	11.00	0.36	32	21	20.5	1.0	165	187	0.36
11	GANGU CHAK	DW	30.5.13	26	7.92	1030	BD	170.8	140	107	165	178.00	0.23	74	40	87.4	51.4	350	536	0.23
12	JANDI	DW	30.5.13	26	7.96	1220	BD	549	450	78	164	106.00	0.68	88	71	74.8	112.0	510	634	0.34
13	JASATH	DW	30.5.13	23.5	8.02	570	BD	280.6	230	28	31	15.00	0.54	54	26	32.5	3.3	240	296	0.21
14	KAROL KRISHNA	DW	28.5.13	24	8.36	920	6.00	353.8	300	71	129	53.00	0.48	32	53	114.0	24.6	298	478	ND
15	KATHUA	DW	30.5.13	26.5	8.05	870	BD	183	150	128	138	22.00	0.45	74	28	80.0	13.6	300	452	0.16
16	KERIAN GANDYAL	DW	30.5.13	24	7.31	690	BD	237.9	195	107	-1	50.00	0.07	84	26	22.6	15.4	315	359	0.07
17	KERIAN RAMNAGAR	DW	30.5.13	24	7.69	520	BD	268.4	220	7	61	3.90	0.48	76	19	9.1	5.0	270	270	0.27
18	KHANPUR	DW	30.5.13	27	8.1	350	BD	207.4	170	7	19	6.90	0.39	70	0	13.1	1.3	175	182	
19	KHUKHIAL	DW	30.5.13	24	8.04	870	BD	323.3	265	46	38	2.20	0.39	46	12	54.8	68.3	165	452	
20	KONTHAL	DW	28.5.13	23.5	8.13	460	BD	262.3	215	18	27	10.00	0.48	66	9	32.4	4.3	200	239	
21	KOTE PANU	DW	30.5.13	24	7.97	420	BD	237.9	195	11	35	1.80	0.39	52	12	26.0	8.5	180	218	
22	KOTHIAN	DW	30.5.13	26	7.96	340	BD	183	150	18	5	9.40	0.39	32	16	17.5	3.5	145	177	
23	LAKHANPUR	DW	30.5.13	25	8.15	180	BD	91.5	75	7	9	5.60	0.33	32	0	7.7	1.5	80	94	
24	LALECHAK	DW	28.5.13	27.5	8.1	650	BD	250.1	205	53	102	7.10	0.48	52	24	60.7	23.3	230	338	
25	LOKLI	DW	29.5.13	21.5	8.2	270	BD	146.4	120	7	4	9.90	0.33	44	5	4.4	1.8	130	140	
26	LONDI	DW	28.5.13	25	7.98	2400	BD	536.8	440	312	542	121.00	1.25	100	126	335.0	34.0	770	1248	
27	MADUN	DW	28.5.13	25	8.24	7.2	BD	420.9	345	28	35	18.00	0.39	96	27	36.3	5.8	350	4	
28	MUKANDPUR	DW	30.5.13	24	7.87	690	BD	353.8	290	28	54	5.40	0.39	82	23	27.3	24.1	300	359	
29	NAGRI	DW	30.5.13	25	8.2	360	BD	183	150	14	32	0.90	0.57	22	23	22.5	4.0	150	187	
30	NARAN	DW	30.5.13	22	8.23	820	BD	384.3	315	46	2	2.90	0.39	32	12	107.0	16.9	130	426	
31	NILCHA	DW	29.5.13	24	7.34	270	BD	170.8	140	4	23	4.00	0.29	42	12	6.7	1.8	155	140	
32	NOUNI	DW	29.5.13	23.2	7.41	400	BD	207.4	170	21	19	5.80	0.33	42	21	14.8	2.0	190	208	
33	NUD	DW	29.5.13	23	7.54	600	BD	213.5	175	46	84	23.00	0.39	74	18	35.5	7.0	260	312	
34	PANGDOUR	DW	29.5.13	35	8.1	490	BD	250.1	205	14	13	36.00	0.58	76	13	9.8	1.3	245	255	
35	PANSAR	DW	30.5.13	23	8.12	570	BD	384.3	315	7	43	1.00	0.12	28	38	64.9	3.5	225	296	

S. No.	Location	Type of Source	Date of collection	Temp °C	pH	Sp Cond ms/cm 25°C	CO <sub>3</sub>	HCO <sub>3</sub>	Alkalinity	Cl	SO <sub>4</sub>	NO <sub>3</sub>	F	Ca	Mg	Na	K	TH	TDS	Fe
36	PATIARI	DW	29.5.13	21.5	Leak															
37	PHALORA	DW	30.5.13	23	8.21	940	BD	225.7	185	36	324	25.00	0.39	22	18	211.5	2.5	130	489	
38	RAGHU CHAK	DW	30.5.13	24	7.91	390	BD	219.6	180	11	15	0.50	0.22	52	11	15.1	2.4	175	203	
39	RAIYAN	DW	28.5.13	24.5	7.95	560	BD	317.2	260	21	27	4.30	0.07	86	10	29.5	1.9	255	291	
40	SADOH	DW	28.5.13	24.5	7.98	710	BD	427	350	18	8	30.00	0.35	134	0	32.6	1.4	335	369	
41	SAMBA	DW	28.5.13	22	8	810	BD	201.3	165	71	66	94.00	0.12	66	13	81.9	9.4	220	421	
42	SNOORA	DW	29.5.13	22	8.36	230	12	103.7	105	3.55	11.8	2.10	0.07	26	9.7	8.2	0.9	105	120	

### DISTRICT UDHAMPUR

S. No.	Location	Type of Source	Date of collection	Temp °C	pH	Sp Cond ms/cm 25°C	CO <sub>3</sub>	HCO <sub>3</sub>	Alkalinity	Cl	SO <sub>4</sub>	NO <sub>3</sub>	F	Ca	Mg	Na	K	TH	TDS	Fe
1	BATTAL BALLIAN	DW	1/6/2013	24	7.05	940	0	153		152.0	97.0	28.0	0.21	48	50	63	1.9	325	508	0.51
2	BILLAWAR	DW	1/6/2013	24	7.45	890	0	402		57.0	1.0	12.0	0.19	56	29	64.0	17	260	481	0.15
3	CHANNI MANESAR	DW	1/6/2013	23	7.87	340	0	189		21.0	22.0	3.7	0.18	32	21	21.0	0.7	165	184	0
4	DEHARI	DW	1/6/2013	24	7.87	980	0	183	0	188.0	36.0	1.1	0.30	78	29	85.0	3.5	315	529	0.1
5	DHANSI	DW	1/6/2013	24	7.66	610	0	244	0	57.0	29.0	15.0	0.12	52	26	39.0	2.4	235	329	0.03
6	GARHI	DW	1/6/2013	21	7.7	520	0	207		36.0	29.0	21.0	0.17	52	16	33.0	1	195	281	0.01
7	JINDHARA	DW	1/6/2013	23	7.72	600	0	287	0	39.0	33.0	11.0	0.15	50	23	37.0	26	220	324	1.34
8	KATRA	DW	1/6/2013	25	7.82	590	0	323	0	25.0	0.0	3.5	0.03	50	38	10.0	1.5	280	319	0.56
9	KAIL	DW	1/6/2013	25	7.79	380	0	195	0	18.0	25.0	3.2	0.15	40	23	6.5	0.5	195	205	0
10	SUNAL	DW	1/6/2013	25	7.98	300	0	159	0	18.0	18.0	18.0	3.05	44	9	14.0	0.5	145	162	0
11	LAKRI	DW	1/6/2013	22	8.02	490	0	256	0	36.0	1.4	1	0.07	48	17	31.0	4	190	265	0
12	MANDLI	DW	1/6/2013	24	7.85	650	0	336	0	36.0	1	1.7	0.15	42	23	54.0	8.2	200	351	0.14
13	MANWAL	DW	1/6/2013	23	8.06	500	0	159	0	43.0	1.4	22.0	0.17	48	11	20.0	0.8	165	270	0.23
14	NAGROTA	DW	1/6/2013	23	8.13	920	0.00	293	0	85.0	0	60.0	0.17	48	45	74.0	30	305	497	0.09
15	PARNALA	DW	1/6/2013	25	7.06	960	0	208	0	131.0	9	86.0	0.12	60	24	81.0	5.9	250	518	0.11
16	PALLAN	DW	1/6/2013	24	7.3	330	0	146	0	32.0	1	1.6	0.17	40	7	17.0	1	130	178	0.22

S. No.	Location	Type of Source	Date of collection	Temp °C	pH	Sp Cond ms/cm 25°C	CO <sub>3</sub>	HCO <sub>3</sub>	Alkalinity	Cl	SO <sub>4</sub>	NO <sub>3</sub>	F	Ca	Mg	Na	K	TH	TDS	Fe
17	PHANGYAL	DW	1/6/2013	21	7.57	260	0	120	0	28.0	20	11.0	0.03	28	9	28.0	1.5	105	140	0
18	PHINTER	DW	1/6/2013	20	7.68	400	0	177	0	36.0	21	12.0	0.11	46	13	22.0	7	170	216	0.24
19	RAMCOT	DW	1/6/2013	23	7.61	570	0	305	0	36.0	22	5.2	0.15	52	29	31.0	8	250	308	0.26
20	RAMNAGAR	DW	1/6/2013	Data not available																0.15
21	RIASI	DW	1/6/2013	22	8.16	1080	0	610	0	71.0	1	2.4	0.00	84	76	23.0	22	525	583	0.66
22	SALABARA	DW	1/6/2013	25	8.44	320	6	128	0	21.0	0	44.0	0.07	34	24	11.0	0.31	155	173	0.01
23	SUYGETAR	DW	1/6/2013	23	8.04	860	0	403	0	74.0	1	2.3	0.25	42	30	93.0	4.6	230	464	0.01
24	TALWARA	DW	1/6/2013	24	8.02	560	0	298	0	25.0	5	8.8	0.11	62	29	6.5	1.7	275	302	0.04
25	JAGTI	DW	1/6/2013	24	8.22	350	0	177	0	21.0	1	20.0	0.07	44	16	6.7	1.8	175	189	0.06
26	BADOLA	DW	1/6/2013	Data not available																0.13
27	SEEN THAKRAN	DW	1/6/2013	20	7.97	490	0	226	0	39.0	2	3.1	0.31	48	17	25.0	0.5	190	265	0.1
28	NAGORAT PANJGRA	DW	1/6/2013	22	8.37	290	6	140	0	21.0	9	7.9	0.17	28	15	18.0	1.5	130	157	0.13
29	KUPERLAH	DW	1/6/2013	Data not available																0.09
30	EASTREN MAND	DW	1/6/2013	23	8.25	480	0	256	0	25.0	2	18.0	0.09	44	29	13.0	3	230	259	0.1
31	TALPAD	DW	1/6/2013	25	8.45	260	6	134	0	21.0	0	1.2	0.15	28	12	13.0	1.20	120	140	0.16
32	PHIKROO	DW	1/6/2013	23	8.47	310	6	159	0	18.0	13	4.1	0.04	36	11	21.0	1.60	135	167	0.07
33	SIRDHARA	DW	1/6/2013	24	8.21	610	0	201	0	32.0	5	63.0	0.21	34	39	8.2	2.1	245	329	0
34	RANGURA	DW	1/6/2013	22	8.09	1180	0	194	0	43.0	0	28.0	0.09	28	38	7.2	1.05	225	637	0

### DISTRICT RAJOURI

No.	Location	Type of Source	Date of collection	Temp °C	pH	Sp Cond ms/cm 25°C	CO <sub>3</sub>	HCO <sub>3</sub>	Alkalinity	Cl	SO <sub>4</sub>	NO <sub>3</sub>	F	Ca	Mg	Na	K	TH	TDS	Fe
1	ALIAH	DW	25.5.13	18	7.27	570	0	220	180	28	6	8	0.25	44	12	33.0	0.7	160	353	ND
2	BAGNOTI	DW	21.5.13	19	7.53	480	0	140	115	57	20	10	0.25	32	17	33.0	1.7	150	298	0
3	BANPARI	DW	24.5.13	17	7.15	650	0	208	170	57	32	11	0.23	44	23	39.0	2.2	205	403	1
4	BARERI	DW	22.5.13	18	7.31	1150	0	244	200	227	37	6	0.35	44	43	125.0	5.4	285	713	0
5	BHAMLA	DW	21.5.13	21	7.65	450	0	220	180	18	14	3	0.14	24	22	32.0	1.9	150	279	1



No.	Location	Type of Source	Date of collection	Temp °C	pH	Sp Cond ms/cm 25°C	CO <sub>3</sub>	HCO <sub>3</sub>	Alkalinity	Cl	SO <sub>4</sub>	NO <sub>3</sub>	F	Ca	Mg	Na	K	TH	TDS	Fe
6	BHATTA MORH	DW	22.5.13	17	7.65	510	0	191	157	21	0	5	0.24	24	17	26.0	2.9	130	316	0
7	CHANNI PARAT	DW	28.5.13	18	7.53	510	0	189	155	18	21	10	0.39	24	22	26.0	2.8	150	316	ND
8	CHITTIAR	DW	22.5.13	19	7.60	380	0	189	155	11	12	2	0.12	32	13	22.0	1.5	135	236	0
9	CHOWKI HANDA	DW	22.5.13	18	7.29	540	0	232	190	38	14	3	0.35	24	21	46.0	1.3	145	335	0
10	DADUA	DW	28.5.13	18	7.20	560	0	232	190	21	7	5	0.23	16	24	42.0	0.6	140	347	0
11	DHARAL QUILLA	DW	22.5.13	19	7.65	370	0	143	117	14	0	8	0.10	20	18	7.6	1.3	125	229	0
12	DHARAMSAL	DW	28.5.13	20	7.69	810	0	395	324	46	0	10	0.22	24	51	55.0	5.9	270	502	3
13	DHOK BANJAR	DW	23.5.13	18	8.01	410	0	165	135	25	4	8	0.12	18	20	25.0	0.5	125	254	0
14	JHANGAR	DW	22.5.13	21	8.27	810	0	177	145	85	76	25	0.39	26	46	49.0	2	255	502	0
15	KALAL	DW	23.5.13	18	7.81	560	0	232	190	25	6	12	0.24	30	27	24.0	3	185	347	2
16	KALSIAN	DW	22.5.13	18	8.28	330	0	183	150	11	11	3	0.22	50	8.5	5.8	4.8	160	205	1
17	KANGRI	DW	24.5.13	20	8.21	440	0	165	135	18	18	12	0.34	34	12	24.0	0.4	135	273	1
18	LAROKA	DW	22.5.13	19	7.74	720	0	287	235	43	17	3.0	0.00	50	22	45.0	1.9	215	446	0
19	MARCHOLA	DW	23.5.13	18	7.62	620	0	250	205	21	17	5	0.30	40	21	32.0	1.7	185	384	0
20	NANORA	DW	28.5.13	18	8.26	390	0	256	210	11	1	5	0.08	48	24	4.4	0.5	220	242	0
21	RUMLI DHARA	DW	23.5.13	21	8.14	350	0	195	160	11	1	5.0	0.08	42	8.5	19.0	0.5	140	217	0
22	SERI	DW	23.5.13	20	7.86	910	0	159	130	131	90	32	0.10	64	38	54.0	1.6	315	564	0
23	SIAL	DW	23.5.13	19	8.06	410	0	179	147	21	0	10.0	0.10	48	2.4	25.0	1	130	254	0
24	SIOT	DW	21.5.13	18	8.04	420	0	171	140	21	7	11	0.24	52	4	18.0	3	145	260	0
25	SOLKI	DW	29.5.13	20	7.3	440	0	188	154	14	1	10.0	0.10	48	9.7	9.8	1.6	160	273	ND
26	THANGROT	DW	23.5.13	18	7.88	760	0	330	270	21	15	15.0	0.10	48	30	36.0	3.8	245	471	0
27	POTHA	DW	23.5.13	21	7.2	430	0	195	160	25	2	6.0	0.24	46	9.7	19.1	4	155	267	0
28	PANJA	DW	29.5.13	19	7.31	720	0	305	250	32	10	22.0	0.14	78	7.3	44.0	1.3	225	446	0
29	PHUKARNI	DW	22.5.13	19	7.24	400	0	194	159	18	1	5.0	0.00	48	8.5	15.0	1.1	155	248	0
30	LOWER KHARAK	DW	29.5.13	19	7.35	460	0	233	191	14	1	10	0.14	50	16	13.0	1.5	190	285	ND
31	BARKHAR	DW	24.5.13	18	7.31	330	0	183	150	14	4	5.0	0.24	52	7.3	6.3	3.8	160	205	ND

**Table 27. Result of Chemical Analysis of water samples of National Hydrograph Stations collected during May 2013 KASHMIR REGION**

S. No.	Location	Type of Source	Date of collection	Temp °C	pH	S Cond ms/cm 25°C	CO <sub>3</sub>	HCO <sub>3</sub>	Alkalinity	Cl	SO <sub>4</sub>	NO <sub>3</sub>	F	Ca	Mg	Na	K	TH	TDS	Fe
<b>ANANTNAG</b>																				
1	Rambarpora	dugwell	27-5-13	18	7.88	820	0	366	300	36	84	70	0.12	104	27	40.0	29.0	370	426	0.14
<b>BUDGAM</b>																				
2	Aripanthan	dugwell	27-5-13	16.8	7.44	1210	0	305	250	99	96	188	0.38	116	32	80.0	37.0	420	629	0.38
3	Bardan	dugwell	27-5-13	17.1	7.74	280	0	109.8	90	11	14	9.6	0	30	9	6.4	2.6	110	146	0.00
<b>BARAMULLA</b>																				
4	Mirgund Silk Centre	dugwell	28-5-13	16.2	7.73	780	0	445.3	365	25	56	4.6	0.39	56	21	102.5	11.0	225	406	0.02
5	Sangrama	dugwell	28-5-13	17.3	7.73	570	0	286.7	235	21	33	22	0.33	88	12	17.5	6.7	270	296	0.17
6	Sopore Model Town	dugwell	29-5-13	16.2	7.74	510	0	219.6	180	36	37	14	0.33	64	11	30.0	7.3	205	265	0.30
7	Waripora	dugwell	27-5-13	19.9	7.69	190	0	103.7	85	7	1	8.3	0.23	26	6	5.4	1.1	90	99	0.25
8	Zanbadpura (Hadipora)	dugwell	28-5-13	18	7.56	800	0	396.5	325	43	51	5.5	0.45	102	24	39.5	1.3	355	416	0.15
<b>KUPWARA</b>																				
9	Binner	dugwell	28-5-13	19.4	7.56	460	0	195.2	160	14	17	54	0.23	72	9	9.3	4.6	215	239	0.23
10	Bomai	dugwell	29-5-13	19.2	7.67	860	0	390.4	320	64	64	22	0.23	104	27	55.0	4.0	370	447	0.26
11	Chowgal	dugwell	29-5-13	20.2	7.94	460	0	231.8	190	7	38	14	0.23	64	12	18.0	1.7	210	239	0.05
12	Dolipura	dugwell	28-5-13	17.8	7.94	530	0	134.2	110	57	13	57	0.33	56	19	12.5	1.7	220	276	0.04
13	Drugmullah	dugwell	29-5-13	18.8	7.82	370	0	189.1	155	11	9	6.5	0.19	50	9	10.1	2.3	160	192	
14	Gulgam	dugwell	28-5-13	16.1	7.71	790	0	317.2	260	64	65	33	0.23	82	26	56.5	9.0	310	411	0.23
15	Guse	dugwell	28-5-13	19.4	7.96	410	0	219.6	180	18	33	27	0.23	52	23	15.0	2.5	225	213	0.00
16	Khanpoora	dugwell	28-5-13	18.7	7.53	490	0	237.9	195	25	39	13	0.29	68	15	17.5	9.9	230	255	0.05
17	Kupwara	dugwell	28-5-13	14.9	7.67	1160	0	378.2	310	149	93	29	0.23	114	24	110.0	13.0	385	603	0.20
18	Langate	dugwell	28-5-13	19.2	7.82	460	0	189.1	155	21	30	15	0.29	62	10	14.6	1.1	195	239	0.03
19	Magam	dugwell	28-5-13	18.1	7.51	850	0	305	250	71	32	64	0.23	114	22	27.5	0.0	375	442	0.00
20	Trehgam	dugwell	28-5-13	16.4	7.95	870	0	335.5	275	71	50	26	0.29	110	22	35.0	5.5	365	452	0.06
<b>PULWAMA</b>																				
21	Gandhasi Bhat	dugwell	27-5-13	20.5	7.88	500	0	305	250	7	6	17	0.3	82	15	5.5	2.0	265	260	2.22

S. No.	Location	Type of Source	Date of collection	Temp °C	pH	S Cond ms/cm 25°C	CO <sub>3</sub>	HCO <sub>3</sub>	Alkalinity	Cl	SO <sub>4</sub>	NO <sub>3</sub>	F	Ca	Mg	Na	K	TH	TDS	Fe
22	Pampore Silk Centre	dugwell	27-5-13	19	7.83	870	0	542.9	445	25	84	18	0.63	76	50	65.0	36.0	395	452	14.00
23	Sambura	dugwell	31-5-13	18.5	7.94	410	0	213.5	175	14	10	4.9	0.23	72	4	6.7	0.0	195	213	0.00
24	Tral	dugwell	27-5-13	20	7.65	640	0	353.8	290	18	24	21	0.23	102	19	8.7	2.4	335	333	0.12
25	Zeewan	dugwell	27-5-13	17	7.5	730	0	347.7	285	46	0	43	0.33	126	7	16.2	3.6	345	380	12.00
26	<b>SRINAGAR</b>																			
27	Rainawari	dugwell	24-5-13	19	7.83	780	0	347.7	285	32	71	23	0.33	92	24	36.0	11.5	330	406	0.06
28	Regal Chowk	dugwell	24-5-13	20	8.03	950	0	524.6	430	50	112	4.3	0.29	92	46	65.0	46.0	420	494	0.00

Figure 24

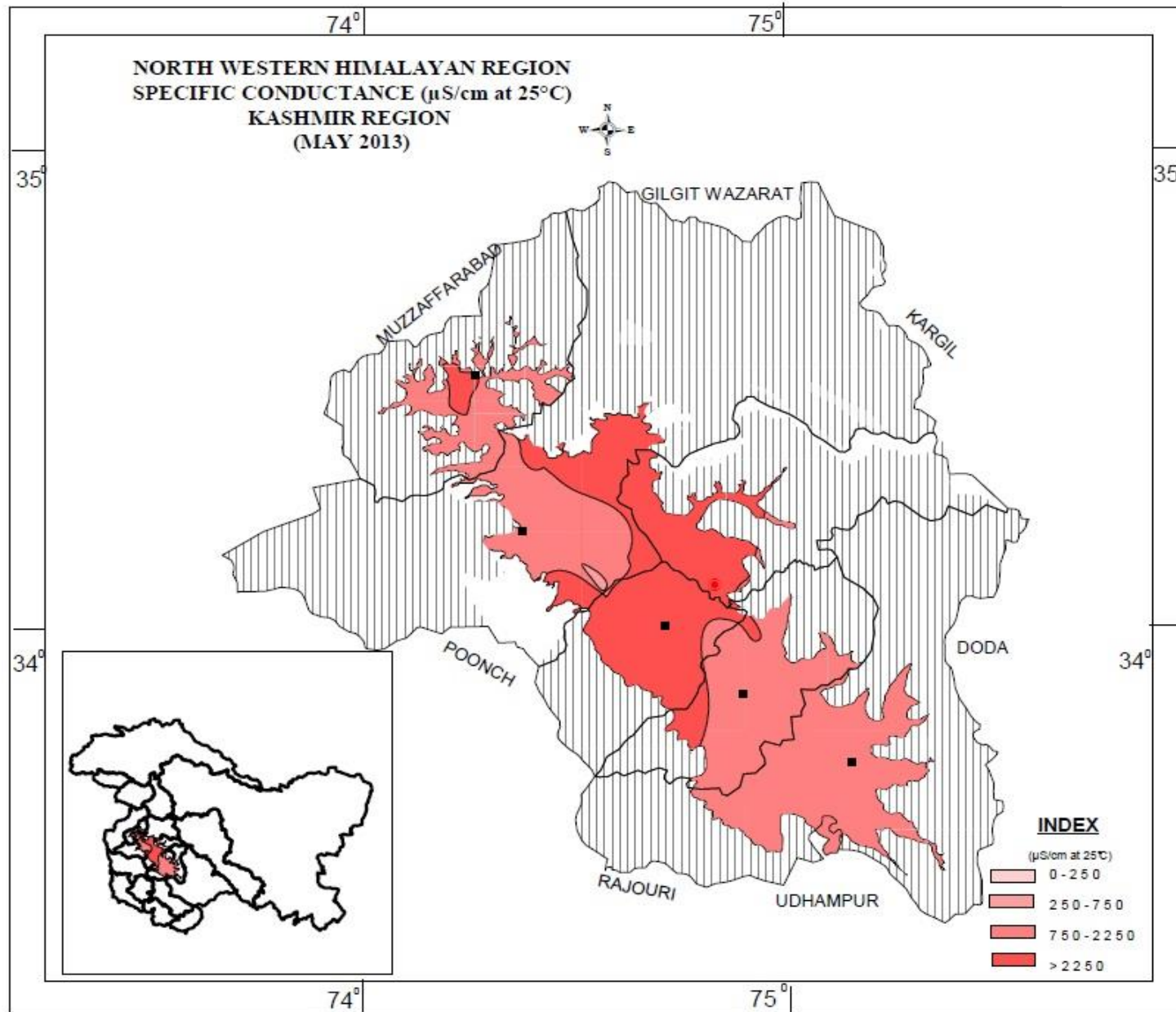


Figure 25

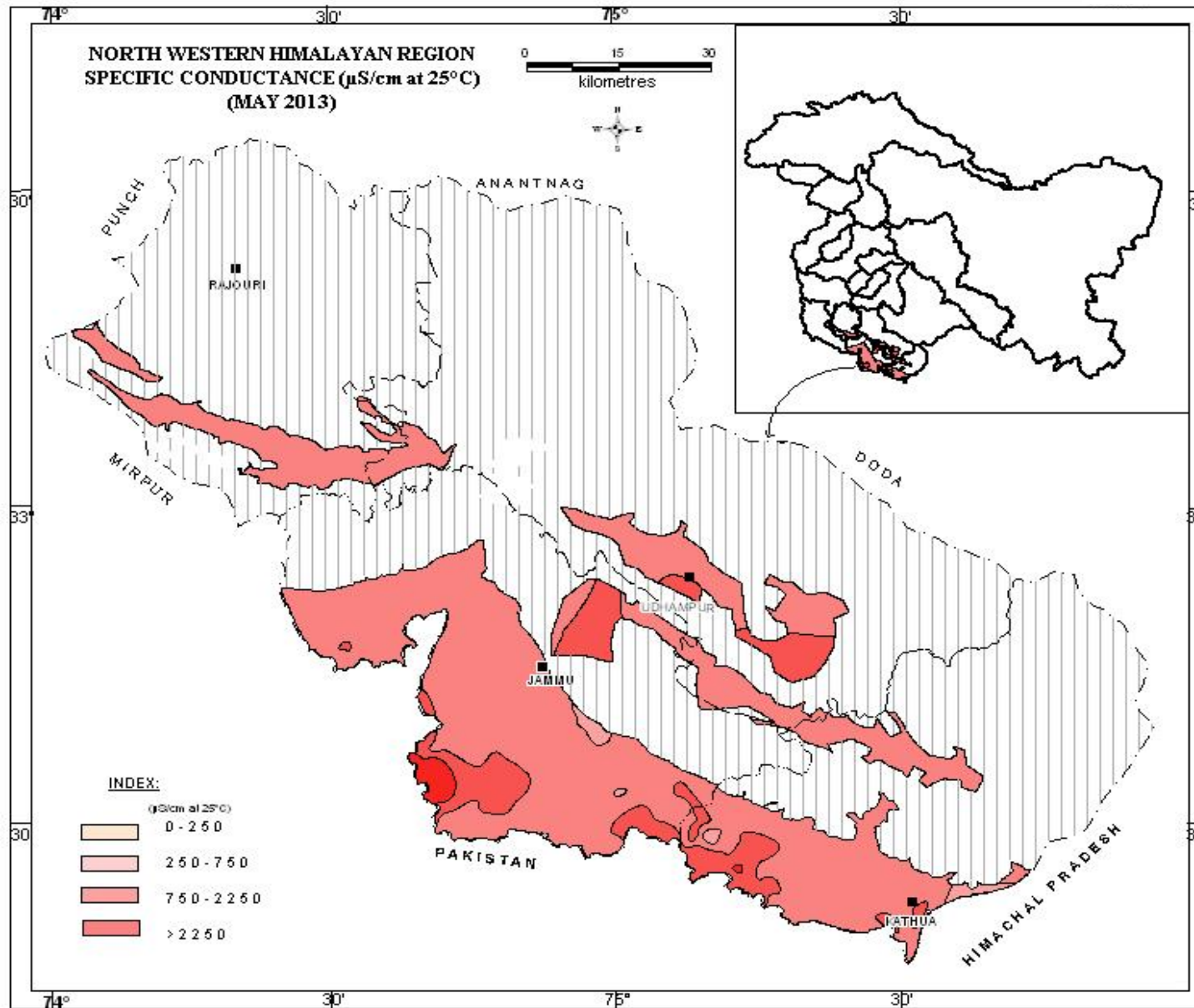


Figure 26

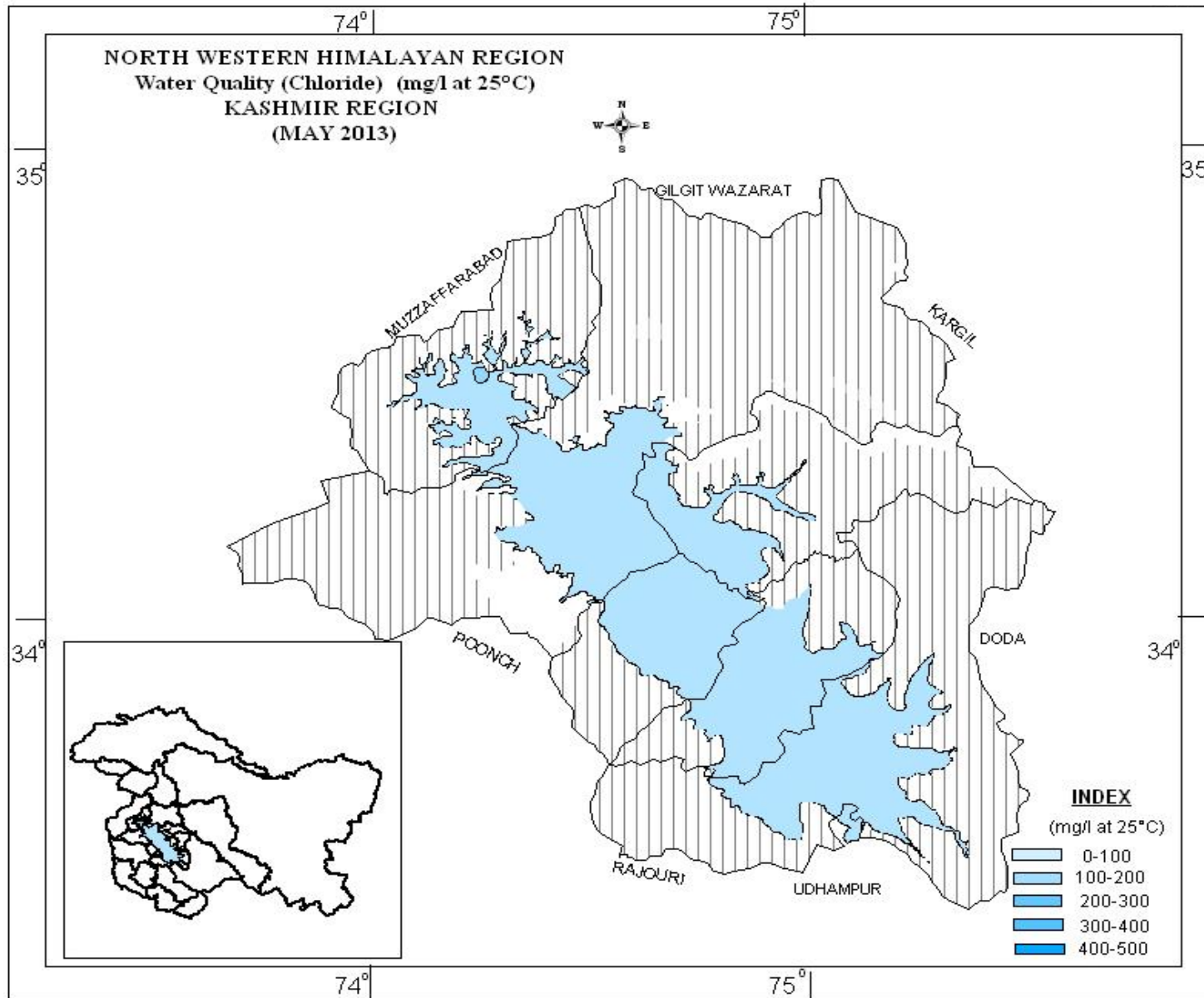




Figure 27

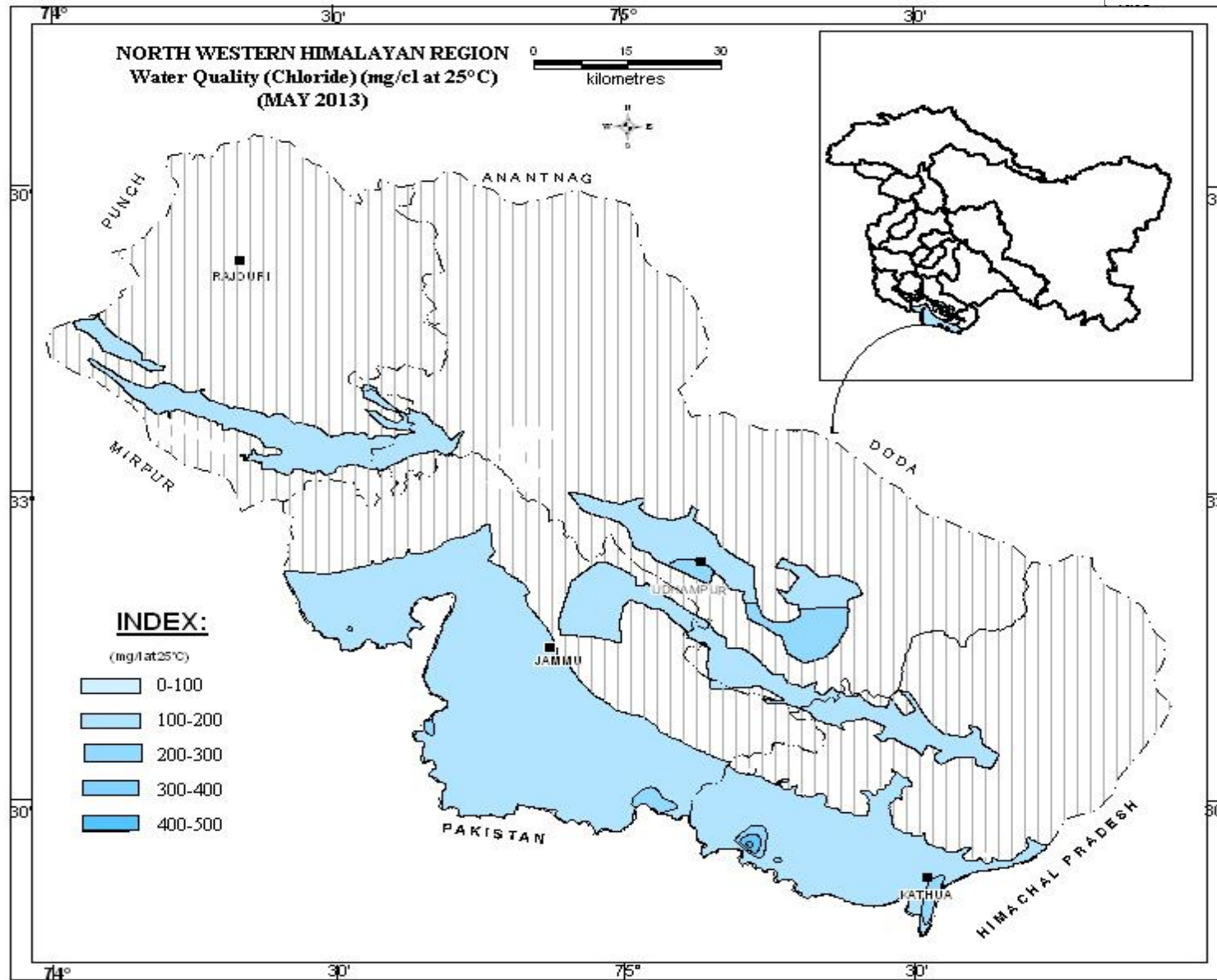


Figure 28

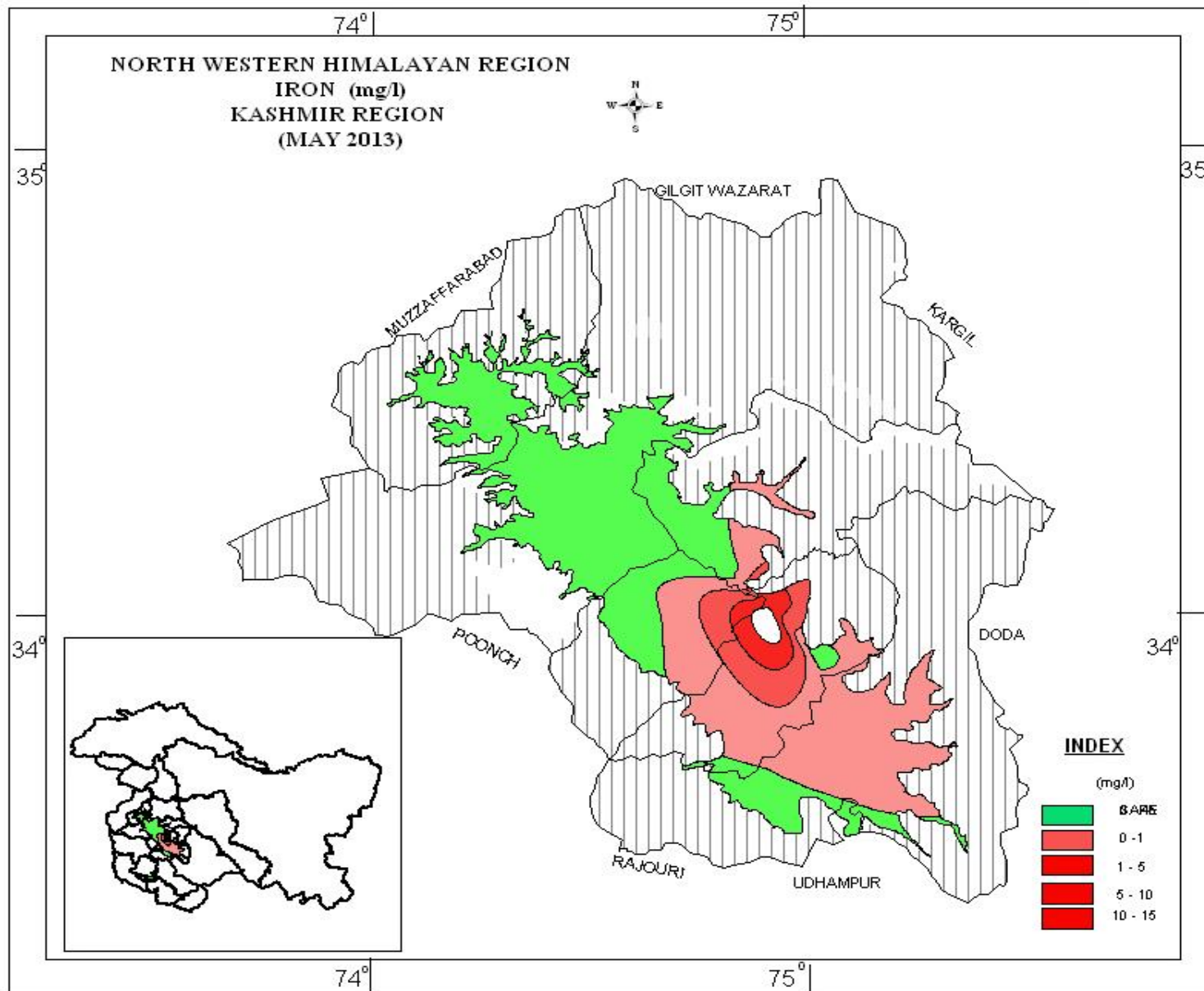


Figure 29

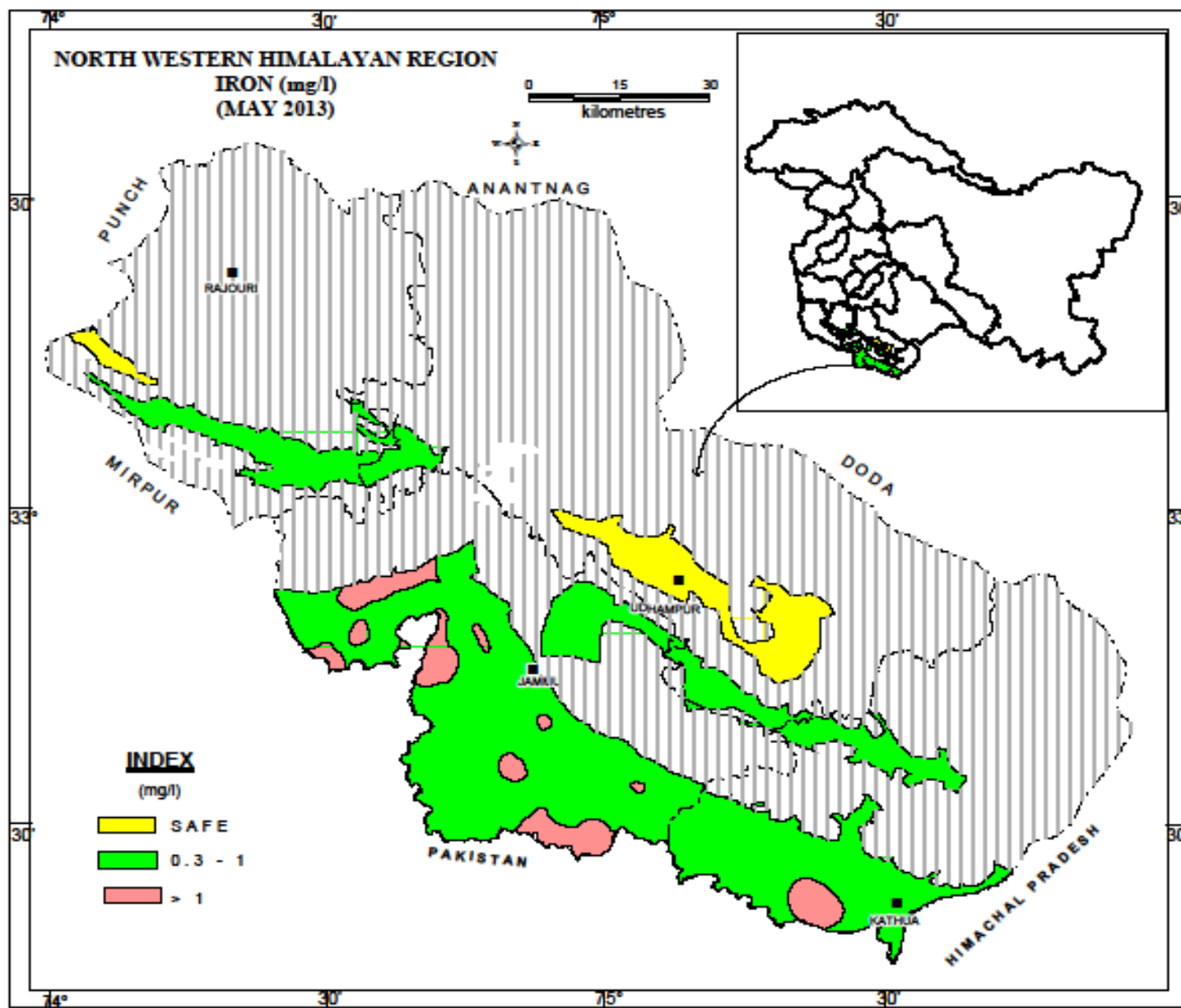


Figure 30

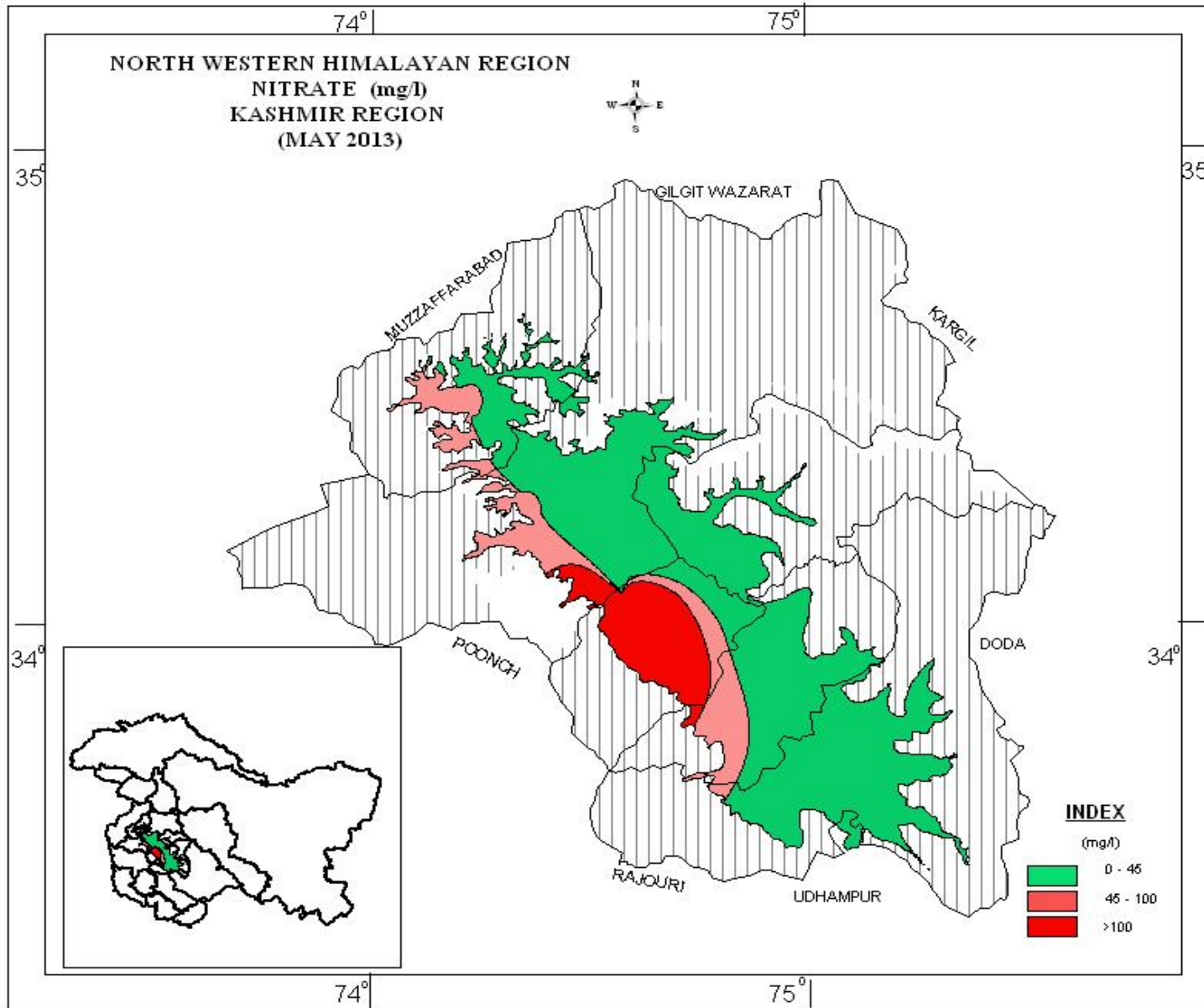


Figure 31

