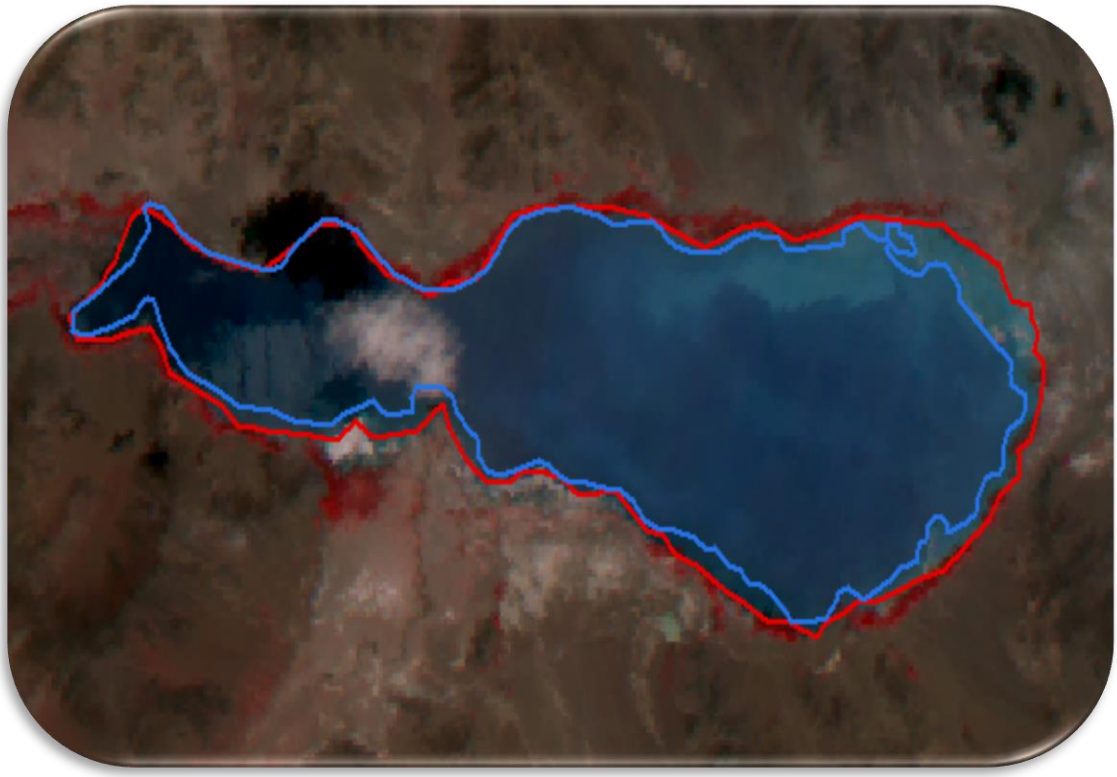
सत्यमेव जयते

Monitoring of Glacial Lakes & Water Bodies in the Himalayan Region of Indian River Basins for the Year 2019 (June to October)



Morphology & Climate Change Directorate
Central Water Commission
Department of Water Resources, River Development & Ganga Rejuvenation
Ministry of jal Shakti, New Delhi

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Document Control Sheet

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ABBREVIATIONS	
AP	Arunachal Pradesh
AWiFS	Advanced Wide Field Sensor
DEM	Digital Elevation Model
DIFF	Difference
FCC	False Color Composite
GL	Glacial Lake
GLOF	Glacial lake Outburst Flood
HA	Hectare
HP	Himachal Pradesh
J&K	Jammu & Kashmir
LAT	Latitude
LONG	Longitude
LU/LC	Land Use /Land Cover
NRSC	National Remote Sensing Centre
SRTM	Shuttle Radar Topography Mission
UID	Unique Identification
UK	Uttarakhand
WB	Water Body

Executive Summary

Glacial lakes are common in the high elevation of glacierised basin. They are formed when glacial ice or moraines impound water. These lakes normally drain their water through seepage in front of the retreating glacier. Flash floods caused by the outburst of glacial lakes, called as Glacial Lake Outburst Flood (GLOF), are well known in Himalayan terrain, where such lakes are formed due to landslides. Satellite remote sensing based mapping and monitoring of the glacial lakes and water bodies, covering Indian Himalayan region, was taken up. The analysis done for June to October 2019 and Water spread areas for glacial lakes & water bodies compared with inventory year of 2009.

Based on the current inventory, 415 glacial lakes & water bodies with a water spread area more than 50 ha are monitored. Apart from this, another 62 glacial lakes & water bodies with water spread area in the range 44 to 50 ha also have been monitored. Accordingly, a total of 477 glacial lakes & water bodies were considered for monitoring during 2019.

Satellite images of AWiFS sensor received from NRSC, Hyderabad were used as input for this report. Water spread areas for glacial lakes & water bodies during June to October 2019 were computed and compared with inventory area of 2009. The data monitored during June to October 2019 is summarised below in tabular form:-

Month	Monitored	Cloud
Jun-19	249	228
Jul-19	259	218
Aug-19	254	223
Sep-19	276	201
Oct-19	314	163

1. Introduction

1.1 Background

Glacial lakes are common in the high elevation of glacierised basin. They are formed when glacial ice or moraines impound water. There are varieties of such lakes, ranging from melt water ponds on the surface of glacier to large lakes in side valleys dammed by a glacier in the main valley. These lakes normally drain their water through seepage in front of the retreating glacier. The moraine creates topographic depression in which the melt water is generally accumulated leading to formation of glacial lake. When this lake is watertight, melt waters will accumulate in the basin until seepage or overflow limits the lake level. Such moraine-dammed lakes appear to be the most common type of glacial lakes. The impoundment of the lake may be unstable, leading to sudden release of large quantities of stored water. Failure of these ice or moraine dams as very destructive events has been documented throughout the world. Flash floods caused by the outburst of glacial lakes, called as Glacial Lake Outburst Flood (GLOF), are well known in Himalaya where such lakes had been formed by landslides.

Satellite remote sensing techniques are used to map, inventory and monitor the glacial lakes & water bodies in Indian Himalayan region, which is formed by joining the catchments of rivers draining in India.

1.2 Remote Sensing Technology

Remote sensing is the science of acquiring information about the Earth's surface without actually being in contact with it. This is done by sensing and recording reflected or emitted energy and processing, analyzing, and applying that information. Satellite remote sensing technology contributed significantly to the acquisition of Earth’s resources and thus helping for better management of these resources. Satellite remote sensing plays a complementary role to other means of spatial data acquisition i.e., through conventional procedures. Satellite remote sensing offers several unique advantages quick data collection, reliability, more accurate, repetitive collection, geometric integrity and digital storage, which makes it an ideal tool for mapping, inventorying and monitoring the natural resources.

Glaciers and glacial lakes are generally located in remote areas, where access is through tough and difficult terrain. The inventory of glacial lakes using conventional methods requires extensive time and resources together with undergoing hardship in the field. Creating inventories and monitoring of the glacial lakes can be done quickly and correctly using satellite images and aerial photographs. Use of these images and photographs for the evaluation of physical conditions of the area provides greater accuracy. The multi-stage approach using remotely sensed data and field investigation increases the ability and accuracy of the work. Visual and digital image analysis techniques integrated with techniques of geographic information systems (GIS) are very useful for the study of glacier, glacial lakes.

1.3 Objectives

The objectives of the study are based on the inventory of glacial lakes & water bodies in the Indian Himalayan region using satellite data of the year 2009 (Ref: NRSC Report No. NRSC-RS&GISAA-WRG-CWC-Lakes-May2011-TR255), with glacial lakes having spatial extent greater than 50 ha (during the inventorying year) -

1. Monitoring the spatial extent of the glacial lakes & water bodies on monthly basis during June, 2019 to October, 2019
2. Monitoring the spatial extent of 2 selected lakes, if required, with high-resolution data on event basis,

The inventory of glacial lakes & water bodies in the Indian Himalayan region using satellite remote sensing has been carried out using base year of 2009 and monitoring has been done for the years 2011-2019. The changes in the current years will be analysed with respect to the year 2009.

This report presents the details on the data used and methodology followed in monitoring of glacial lakes & water bodies in the Indian Himalayan region using satellite data for the month from June, 2019 to October, 2019.

2. Study Area & Materials

2.1 Study Area

The present study is carried out for the area covering Indian Himalayas. The study area extends across different countries namely India, Nepal, Bhutan and China. The index map showing study area is given in Figure 1.

2.2 Materials

Advanced Wide Field Sensor (AWiFS) data from the Indian remote sensing satellite, Resourcesat-2 has been used in the study for monitoring of glacial lakes pertaining to current month.

2.2.1 Satellite Data - For the purpose of monitoring glacial lakes and water bodies from satellite images, it is preferable to have cloud free satellite images during the time of monitoring. Since the monitoring is carried out during monsoon period, probability of availability of cloud free data is less. Hence all the possible satellite data were browsed and checked for their coverage of the study area and cloud cover.

The list of satellite data used for monitoring during June to October 2019 is given in Table 1.

Table 1. List of satellite data used

June-2019 Satellite data			
S. No.	**Path**	**Row**	**Date**
1	113	51	June 22, 2019
2	109	51	June 02, 2019
3	102	50	June 15, 2019
4	96	48	June 09, 2019
5	92	46	June 13, 2019

July-2019 Satellite data			
S. No.	**Path**	**Row**	**Date**
1	111	48	July 06, 2019
2	110	51	July 01, 2019
3	106	51	July 05, 2019
4	101	50	July 04, 2019
5	96	48	July 03, 2019
6	92	46	July 07, 2019
August-2019 Satellite data			
S. No.	**Path**	**Row**	**Date**
1	113	49	August 09, 2019
2	106	51	August 22, 2019
3	102	50	August 26, 2019
4	96	48	August 20, 2019
5	92	46	August 24, 2019
September-2019 Satellite data			
S. No.	**Path**	**Row**	**Date**
1	113	51	September 26, 2019
2	109	51	September 06, 2019
3	103	49	September 24, 2019
4	96	48	September 13, 2019
5	91	46	September 12, 2019
October-2019 Satellite data			
S. No.	**Path**	**Row**	**Date**
1	112	51	October 15, 2019
2	108	52	October 19, 2019
3	102	50	October 13, 2019
4	96	48	October 31, 2019
5	92	46	October 11, 2019

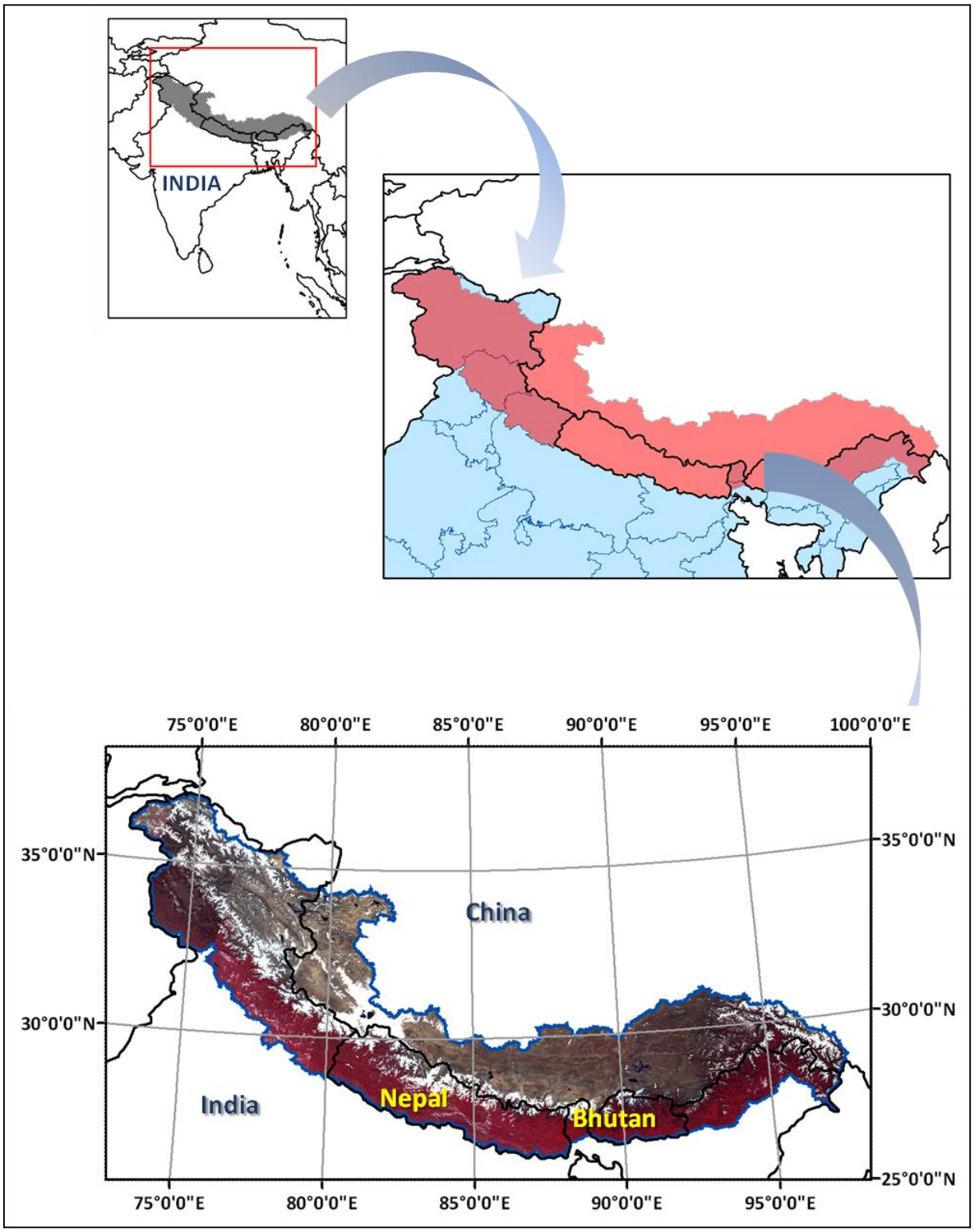

Figure 1. Index map of study area

3. Methodology

The monitoring of glacial lakes and water bodies in the Indian Himalayan region using satellite images involves the following steps.

- Ortho-rectification of satellite data
- Identification & digitization of glacial lakes & water bodies
- Organisation of database

This chapter discusses each of the above steps in detail.

3.1 Orthorectification of Satellite Data

Orthorectification is the process by which the geometric distortions of the image are modelled and accounted for, resulting in a plan metrically correct image. 3D world is imaged by most sensors in 2D and Orthorectification corrects for many of the anomalies resultant from this conversion. Orthorectified imagery is particularly useful in areas of the world with exacerbated terrain features such as mountains, plateaus, etc. The Orthorectification process yields map-accurate images which can be highly useful as base maps and may be easily incorporated into a GIS. The success of the Orthorectification process depends on the accuracy of the DEM and the correction method.

In this study, Orthorectified data generated under AWiFS derived LU/LC project has been used.

3.2 Monitoring of Glacial Lakes & Water Bodies

The glacial lakes & water bodies are delineated based on the visual interpretation of satellite images of Resourcesat2 AWiFS sensor. Identification of features was done through panchromatic mode and/or different colour combinations of the multi-spectral bands namely green, red, near infrared and shortwave infrared.

To identify the glacial lakes & water bodies, different image enhancement techniques are used to improve the visual interpretation. This method is complimented with the knowledge and experience of the Himalayan terrain conditions for inventorying glacial lakes and water bodies. With different spectral band combinations in false colour composite (FCC) and in individual spectral bands, glacial lakes and water bodies can be identified. The knowledge of image interpretation keys: colour, tone, texture, pattern, association, shape, shadow, etc. will also enhance the capability of identifying these features.

The water spread area of the lakes in false colour composite images ranges in appearance from light blue to blue to black. The frozen lakes appear white in colour. Sizes of water bodies are generally small, having circular, semi-circular, or irregular shapes with very fine texture. They are generally associated with glaciers in the case of high lying areas, or rivers in the case of low lying areas.

The present study proposed to monitor all the glacial lakes & water bodies that are larger than 50 ha in area. Even though during inventory, glacial lakes and water bodies having area more than 10 ha were digitised, monitoring was carried out only for the glacial lakes & water bodies that are larger than 50 ha. The boundary of glacial lakes and water bodies are digitized as polygon feature using on-screen digitisation techniques. The polygons are geo-processed and the water spread area of glacial lakes & water bodies were computed digitally. These steps were repeated for each date of satellite data and water spread area was computed. The maximum water spread area for each water body among the different dates of satellite in the month of June to October 2019 has been considered for the final analysis of the change in water spread. The following criteria were followed while monitoring the water bodies.

- A change in water spread area within +/- 5% is considered to be no change.
- Partly or fully cloud covered or frozen water bodies have not been considered in monitoring.
- The spatial extent of water spread area during the current month has been mapped and compared with the spatial extent of water spread area mapped during 2009

4. Results

4.1 Results

June 2019

The analysis of water spread area of glacial lakes & water bodies monitored in June 2019 was done for only 249 glacial lakes & water bodies using cloud free satellite data. Based on this, it is found that

- 15 glacial lakes & water bodies have shown decrease in water spread area, 150 have shown increase, 82 have not shown any significant change (± 5%), while 2 water bodies (Lake ID: 02_53P_002 & 02_63M_002) have dried up.
- 02 out of 15 have decreased by more than 20% and 70 out of 150 water bodies have shown increase in area by more than 20%.

July 2019

The analysis of water spread area of glacial lakes & water bodies monitored in July 2019 was done for only 259 glacial lakes & water bodies using cloud free satellite data. Based on this, it is found that

- 34 glacial lakes & water bodies have shown decrease in water spread area, 161 have shown increase, 62 have not shown any significant change (± 5%), while 2 water bodies (Lake ID: 01_52E_001 & & 02_63M_002) have dried up.
- 09 out of 34 have decreased by more than 20% and 75 out of 161 water bodies have shown increase in area by more than 20%.

August 2019

The analysis of water spread area of glacial lakes & water bodies monitored in August 2019 was done for only 254 glacial lakes & water bodies using cloud free satellite data. Based on this, it is found that

- 23 glacial lakes & water bodies have shown decrease in water spread area, 178 have shown increase, 51 have not shown any significant change (± 5%), while 2 water bodies (Lake ID: 01_52E_001 & 02_77D_003) have dried up.
- 11 out of 23 have decreased by more than 20% and 92 out of 178 water bodies have shown increase in area by more than 20%.

September 2019

The analysis of water spread area of glacial lakes & water bodies monitored in September 2019 was done for only 285 glacial lakes & water bodies using cloud free satellite data. Based on this, it is found that

- 14 glacial lakes & water bodies have shown decrease in water spread area, 203 have shown increase, 58 have not shown any significant change (± 5%), while 1 water bodies (Lake ID: 01_52E_001) have dried up.
- 04 out of 14 have decreased by more than 20% and 99 out of 203 water bodies have shown increase in area by more than 20%.

October 2019

The analysis of water spread area of glacial lakes & water bodies monitored in October 2019 was done for only 314 glacial lakes & water bodies using cloud free satellite data. Based on this, it is found that

- 25 glacial lakes & water bodies have shown decrease in water spread area, 228 have shown increase, 60 have not shown any significant change (± 5%), while 1 water bodies (Lake ID: 01_52E_001) have dried up.
- 08 out of 25 have decreased by more than 20% and 114 out of 228 water bodies have shown increase in area by more than 20%.

Table 2 List of glacial lakes & water bodies monitored during the year 2019

Month	Monitored	Increased			Decreased			No Change
		> 20%	< 20%	Total	> 20%	< 20%	Total	
Jun-19	249	70	80	150	02	13	15	82
Jul-19	259	75	86	161	09	25	34	62
Aug-19	254	92	86	178	11	12	23	51
Sep-19	285	90	113	203	04	10	14	58
Oct-19	314	114	114	228	08	17	25	60

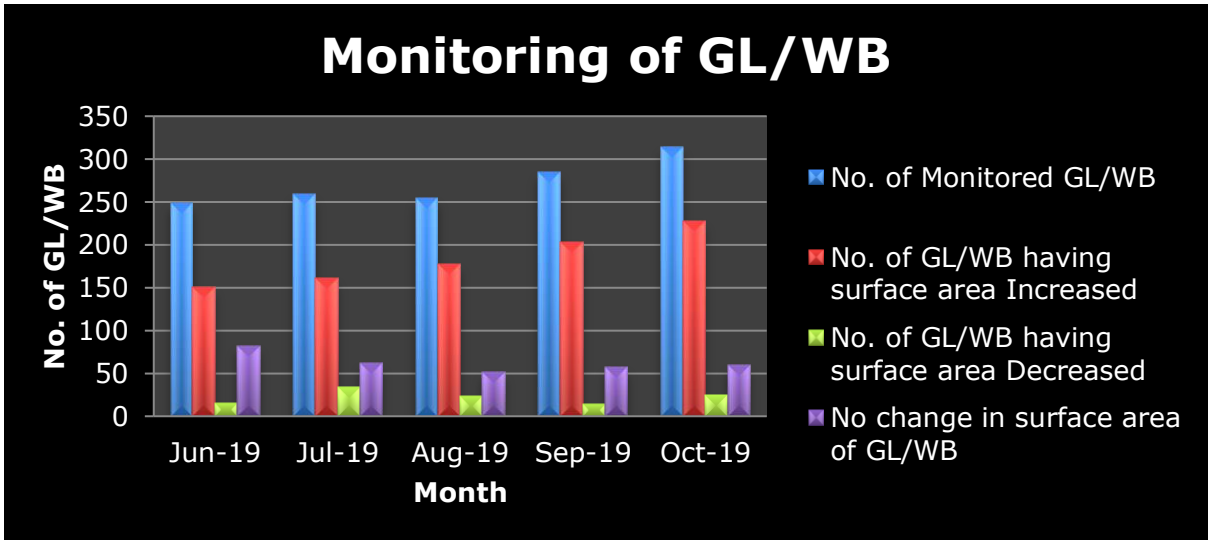

Figure 2: Glacial Lakes/Water Bodies Monitored during the year 2019

5. Conclusions

5.1 Conclusions

i. GL & WB having UID's CH_6, CH_33, CH_36, CH_38, CH_39, CH_55, CH_64, CH_80, CH_85, HP_3, HP_5, JK_115, JK_187, JK_205 may affect Jammu & Kashmir, CH_1, CH_101, HP_3, HP_5, HP_12 may affect Himachal Pradesh, HP_12 may affect Punjab, CH_132, CH_159, CH_183, CH_188, CH_206, CH_207, CH_216, CH_217, CH_235, CH_244, CH_261, CH_270, CH_271 NP_12, NP_19, NP_45, NP_57, NP_64, NP_67, NP_78 may affect Bihar, SK_4, SK_5, SK_11, SK_19, SK_20 may affect Sikkim and West Bengal, AP_118, BH_22, CH_288, CH_ 303, CH_ 369, CH_ 404, CH_ 422, CH_ 423, CH_ 426, CH_ 432, CH_ 438, CH_ 446, CH_ 478, CH_ 545, CH_ 550, CH_ 551, CH_ 552, CH_ 590, CH_ 593, CH_ 621, CH_ 630, CH_ 633, CH_ 725, CH_ 826, CH_ 834, CH_ 838, CH_ 849, CH_ 971, CH_ 1076, CH_ 1170, CH_ 1176, CH_ 1205 may affect Arunachal Pradesh and AP_118, BH_22, CH_288, CH_ 303, CH_ 369, CH_ 404, CH_ 422, CH_ 423, CH_ 426, CH_ 432, CH_ 438, CH_ 446, CH_ 478, CH_ 545, CH_ 550, CH_ 551, CH_ 552, CH_ 590, CH_ 593, CH_ 621, CH_ 630, CH_ 633, CH_ 725, CH_ 826, CH_ 834, CH_ 838, CH_ 849, CH_ 971, CH_ 1076, CH_ 1170, CH_ 1176, CH_ 1205, SK_4, SK_5, SK_11, SK_19, SK_20 may affect Assam respectively as these GLs/WBs have shown increase in water spread area by 40%. These Glacial lakes & water bodies are shown in **Table 3(a**) and **require vigorous monitoring in order to avoid any future disaster.**

ii. Water spread area of glacial lakes & water bodies showing Increase in water spread area (>20%) are shown in **Table 3(b).** Last four year trends of this glacial lakes & water bodies have been also shown for comparison. **These Glacial lakes & water bodies requires continuous monitoring in order to avoid any future disaster.**

iii. Water spread area of glacial lakes & water bodies showing Decrease in water spread area (>20%) are shown in **Table 3(c).** Last four year trends of this glacial lakes & water bodies have been also shown for comparison.

Table 3 (a): List of GL & WB that have shown INCREASE in water spread area (> 40%)

S. No.	UID	Lake_ID	%Diff in Water Spread Area					State	Country	Basin	River	State may affect
			2019	2018	2017	2016	2015					
1.	HP_5	01_52H_004	252.17	243.48	157.89	202.17	178.26	HP	India	Indus	Chenab	HP, J&K
2.	CH_33	01_61C_005	238.13	176.63	-54.99	150.39	125.9		China	Indus	Indus	J&K
3.	CH_207	02_71P_019	164.58	32.5	-29.88	-29.17	27.08		China	Ganga	Arun Kosi	Bihar
4.	CH_1	01_52L_008	140.00	147.54	85.84	99.42	-8		China	Indus	Satluj	HP
5.	CH_551	03_77L_042	104.00	62	Cloud	49.52	18		China	Brahmaputra	Kuri Chu	AP, Assam
6.	HP_12	01_53E_001	98.61	90.54	81.65	79.54	Cloud	HP	India	Indus	Beas	HP, Punjab
7.	CH_244	02_72I_004	97.52	75.21	71.93	86.55	-24.79		China	Ganga	Sun Kosi	Bihar
8.	CH_423	03_71G_014	95.71	78.57	22.21	-18.73	16.43		China	Brahmaputra		AP, Assam
9.	NP_64	02_72I_011	92.00	75	44.68	56.65	Cloud	Nepal	Nepal	Ganga	Sun Kosi	Bihar
10.	CH_217	02_71P_029	91.25	16.25	21.21	Cloud	13.75		China	Ganga	Arun Kosi	Bihar
11.	CH_432	03_71K_009	90.00	46.47	35.3	26.19	-46.47		China	Brahmaputra		AP, Assam
12.	CH_188	02_71L_034	89.13	73.91	29.98	34.22	21.74		China	Ganga	Sun Kosi	Bihar
13.	CH_593	03_77P_023	82.22	Cloud	-9.84	44.18	55.56		China	Brahmaputra	Kuri Chu	AP, Assam
14.	CH_849	03_82J_019	82.22	80.19	Cloud	Cloud	33.33		China	Brahmaputra		AP, Assam
15.	CH_206	02_71P_018	74.51	-3.92	-11.25	-17.49	156.86		China	Ganga	Arun Kosi	Bihar
16.	JK_187	01_52C_003	73.33	73.33	27.36	35.56	24.44	J&K	India	Indus	Indus	J&K
17.	HP_3	01_52H_002	72.58	74.58	44.58	29.27	25.81	HP	India	Indus	Chenab	HP, J&K
18.	CH_426	03_71K_003	72.22	23.61	-6.54	-11.11	16.67		China	Brahmaputra		AP, Assam
19.	CH_6	01_52O_003	71.62	40.54	48.13	54.95	22.3		China	Indus	Indus	J&K
20.	SK_19	03_78A_013	66.67	57.08	28.29	60.32	28.57	Sikkim	India	Brahmaputra	Teesta	Sikkim, West Bengal & Assam
21.	SK_20	03_78A_014	65.96	65.96	5.2	Cloud	40.43	Sikkim	India	Brahmaputra	Teesta	Sikkim, West Bengal & Assam
22.	CH_55	01_61D_003	65.22	63.41	66.98	26.46	-4.35		China	Indus	Indus	J&K
23.	CH_183	02_71L_028	64.94	18.18	25.26	49.44	-32.47		China	Ganga	Sun Kosi	Bihar
24.	CH_621	03_82A_002	64.89	21.94	8.37	14.86	10.97		China	Brahmaputra		AP, Assam

S. No.	UID	Lake_ID	%Diff in Water Spread Area					State	Country	Basin	River	State may affect
			2019	2018	2017	2016	2015					
25.	CH_101	01_62F_010	64.44	85.66	49.72	Cloud	13.33		China	Indus	Satluj	HP
26.	CH_590	03_77P_019	64.09	4.19	4.19	-2.86	-7.27		China	Brahmaputra	Dangme Chu	AP, Assam
27.	CH_85	01_62E_010	61.54	6.41	-0.26	-13.18	-10.9		China	Indus	Indus	J&K
28.	CH_38	01_61C_010	61.36	35.23	27.78	656.22	9.09		China	Indus	Indus	J&K
29.	CH_834	03_82J_004	57.41	48.05	45.7	Cloud	34.13		China	Brahmaputra		AP,Assam
30.	CH_132	02_71H_012	56.18	56.18	42.15	Cloud	41.57		China	Ganga	Arun Kosi	Bihar
31.	SK_11	03_78A_003	55.17	220.69	Cloud	Cloud	-5.17	Sikkim	India	Brahmaputra	Teesta	Sikkim, West Bengal & Assam
32.	CH_159	02_71L_004	54.65	35.26	38.86	Cloud	12.79		China	Ganga	Arun Kosi	Bihar
33.	CH_1076	03_91C_025	54.64	32.99	7.46	7.35	3.09		China	Brahmaputra		AP, Assam
34.	CH_288	03_62J_016	54.55	43.18	9.75	11.91	9.09		China	Brahmaputra		AP, Assam
35.	CH_216	02_71P_028	53.70	11.94	-0.31	137.56	9.26		China	Ganga	Arun Kosi	Bihar
36.	CH_270	02_78A_004	53.57	57.14	24.71	Cloud	10.71		China	Ganga	Arun Kosi	Bihar
37.	CH_235	02_71P_047	53.52	35.21	20.65	Cloud	16.9		China	Ganga	Arun Kosi	Bihar
38.	CH_404	03_71C_011	52.10	18.49	11.33	2.56	-26.05		China	Brahmaputra		AP, Assam
39.	CH_303	03_62J_031	50.00	46.99	36.51	22.75	15.66		China	Brahmaputra		AP, Assam
40.	SK_5	03_77D_005	49.37	41.77	-23.83	Cloud	10.13	Sikkim	India	Brahmaputra	Teesta	Sikkim, West Bengal & Assam
41.	CH_545	03_77L_029	48.89	24.44	45.51	10.84	-4.44		China	Brahmaputra	Kuri Chu	AP, Assam
42.	CH_438	03_71O_002	47.92	16.67	-27.71	119.21	-18.75		China	Brahmaputra		AP, Assam
43.	CH_422	03_71G_013	47.54	37.3	19.99	Cloud	1.23		China	Brahmaputra		AP, Assam
44.	CH_633	03_82B_007	46.73	3.17	-2.97	-5.82	-0.5		China	Brahmaputra		AP, Assam
45.	NP_12	02_62F_019	46.55	24.14	-6.45	Cloud	1.72	Nepal	Nepal	Ganga	Karnal	Bihar
46.	CH_271	02_78A_005	46.07	39.15	29.65	153.7	15.73		China	Ganga	Arun Kosi	Bihar
47.	CH_64	01_61G_003	46.03	14.29	0.86	22.22	152.38		China	Indus	Indus	J&K
48.	NP_45	02_71D_004	45.95	45.95	22.96	Cloud	20.27	Nepal	Nepal	Ganga	Trisuli	Bihar
49.	CH_39	01_61C_011	45.59	33.33	27.3	Cloud	12.5		China	Indus	Indus	J&K

S. No.	UID	Lake_ID	%Diff in Water Spread Area					State	Country	Basin	River	State may affect
			2019	2018	2017	2016	2015					
50.	CH_446	03_71O_010	45.51	7.75	77.54	1.99	4.31		China	Brahmaputra		AP, Assam
51.	AP_118	03_91D_022	45.45	-1.05	-6.32	18.77	0	AP	India	Brahmaputra	Dibang	AP, Assam
52.	CH_725	03_82E_007	45.07	7.04	-21.53	-10.03	0		China	Brahmaputra		AP, Assam
53.	CH_261	02_77D_006	45.00	18.75	19.85	137.86	8.75		China	Ganga	Arun Kosi	Bihar
54.	NP_19	02_62J_003	44.90	34.69	Cloud	24.45	20.41	Nepal	Nepal	Ganga	Karnal	Bihar
55.	NP_67	02_72I_014	44.53	21.9	20.37	Cloud	15.33	Nepal	Nepal	Ganga	Sun Kosi	Bihar
56.	CH_971	03_82L_009	44.44	2.2	2.2	-11.21	-11.1		China	Brahmaputra		AP, Assam
57.	CH_36	01_61C_008	44.37	18.54	15.32	19.38	93.38		China	Indus	Indus	J&K
58.	CH_1176	03_91H_011	44.00	-21.86	Cloud	Cloud	-10		China	Brahmaputra	Luhit	AP, Assam
59.	CH_369	03_62O_024	43.83	19.97	9.45	3.23	3.61		China	Brahmaputra		AP, Assam
60.	SK_4	03_77D_004	43.40	31.13	22.23	Cloud	11.32	Sikkim	India	Brahmaputra	Teesta	Sikkim, West Bengal & Assam
61.	CH_1170	03_91H_005	43.10	Cloud	249.67	-8.9	0		China	Brahmaputra	Luhit	AP, Assam
62.	CH_550	03_77L_041	42.86	0.11	-11.59	26.8	17.86		China	Brahmaputra	Kuri Chu	AP, Assam
63.	BH_22	03_77L_051	42.66	24.48	-5.12	Cloud	11.89		Bhutan	Brahmaputra	Puna Tsang Chu	AP, Assam
64.	CH_826	03_82G_065	42.37	22.57	7.94	Cloud	-6.78		China	Brahmaputra		AP, Assam
65.	JK_205	01_52J_009	42.11	25.32	-6.53	Cloud	1.75	J&K	India	Indus	Shyok	J&K
66.	CH_552	03_77L_043	41.99	37.02	-21.84	Cloud	23.76		China	Brahmaputra	Kuri Chu	AP, Assam
67.	JK_115	01_43K_014	41.96	41.07	23.57	14.65	16.07	J&K	India	Indus	Jhelum	J&K
68.	NP_57	02_72E_001	41.55	41.55	9.9	Cloud	2.82	Nepal	Nepal	Ganga	Baghmati	Bihar
69.	CH_80	01_62E_005	41.27	21.17	4.74	Cloud	-2.65		China	Indus	Indus	J&K
70.	CH_630	03_82B_004	41.24	5.15	-1.56	-3.13	0		China	Brahmaputra		AP, Assam
71.	CH_1205	03_91H_040	41.18	-0.18	-0.18	Cloud	-2		China	Brahmaputra	Luhit	AP, Assam
72.	CH_478	03_77H_003	40.87	-6.73	-85.01	-85.01	-9.13		China	Brahmaputra		AP, Assam
73.	NP_78	02_72I_025	40.57	35.85	17.07	Cloud	6.6	Nepal	Nepal	Ganga	Sun Kosi	Bihar
74.	CH_838	03_82J_008	40.38	40.4	Cloud	Cloud	14.74		China	Brahmaputra		AP, Assam

Table 3 (b) – Comparison of Water Spread Area for lakes showing INCREASE in water spread area (>20%) from 2015 – 2019 with inventory area

S. No.	UID	Lake_ID	Water spread area in Ha	%Diff in Water Spread Area				
			2009 (Inventory)	2019	2018	2017	2016	2015
1.	HP_5	01_52H_004	46	252.17	243.48	157.89	202.17	178.26
2.	CH_33	01_61C_005	139	238.13	176.63	-54.99	150.39	125.9
3.	CH_207	02_71P_019	48	164.58	32.5	-29.88	-29.17	27.08
4.	CH_1	01_52L_008	50	140.00	147.54	85.84	99.42	-8
5.	CH_551	03_77L_042	50	104.00	62	Cloud	49.52	18
6.	HP_12	01_53E_001	72	98.61	90.54	81.65	79.54	Cloud
7.	CH_244	02_72I_004	121	97.52	75.21	71.93	86.55	-24.79
8.	CH_423	03_71G_014	140	95.71	78.57	22.21	-18.73	16.43
9.	NP_64	02_72I_011	100	92.00	75	44.68	56.65	Cloud
10.	CH_217	02_71P_029	80	91.25	16.25	21.21	Cloud	13.75
11.	CH_432	03_71K_009	170	90.00	46.47	35.3	26.19	-46.47
12.	CH_188	02_71L_034	46	89.13	73.91	29.98	34.22	21.74
13.	CH_593	03_77P_023	45	82.22	Cloud	-9.84	44.18	55.56
14.	CH_849	03_82J_019	45	82.22	80.19	Cloud	Cloud	33.33
15.	CH_206	02_71P_018	51	74.51	-3.92	-11.25	-17.49	156.86
16.	JK_187	01_52C_003	45	73.33	73.33	27.36	35.56	24.44
17.	HP_3	01_52H_002	62	72.58	74.58	44.58	29.27	25.81
18.	CH_426	03_71K_003	72	72.22	23.61	-6.54	-11.11	16.67
19.	CH_6	01_52O_003	148	71.62	40.54	48.13	54.95	22.3
20.	SK_19	03_78A_013	63	66.67	57.08	28.29	60.32	28.57
21.	SK_20	03_78A_014	94	65.96	65.96	5.2	Cloud	40.43
22.	CH_55	01_61D_003	46	65.22	63.41	66.98	26.46	-4.35
23.	CH_183	02_71L_028	77	64.94	18.18	25.26	49.44	-32.47
24.	CH_621	03_82A_002	319	64.89	21.94	8.37	14.86	10.97
25.	CH_101	01_62F_010	45	64.44	85.66	49.72	Cloud	13.33

S. No.	UID	Lake_ID	Water spread area in Ha	%Diff in Water Spread Area				
			2009 (Inventory)	2019	2018	2017	2016	2015
26.	CH_590	03_77P_019	220	64.09	4.19	4.19	-2.86	-7.27
27.	CH_85	01_62E_010	156	61.54	6.41	-0.26	-13.18	-10.9
28.	CH_38	01_61C_010	88	61.36	35.23	27.78	656.22	9.09
29.	CH_834	03_82J_004	378	57.41	48.05	45.7	Cloud	34.13
30.	CH_132	02_71H_012	89	56.18	56.18	42.15	Cloud	41.57
31.	SK_11	03_78A_003	58	55.17	220.69	Cloud	Cloud	-5.17
32.	CH_159	02_71L_004	86	54.65	35.26	38.86	Cloud	12.79
33.	CH_1076	03_91C_025	97	54.64	32.99	7.46	7.35	3.09
34.	CH_288	03_62J_016	44	54.55	43.18	9.75	11.91	9.09
35.	CH_216	02_71P_028	54	53.70	11.94	-0.31	137.56	9.26
36.	CH_270	02_78A_004	84	53.57	57.14	24.71	Cloud	10.71
37.	CH_235	02_71P_047	71	53.52	35.21	20.65	Cloud	16.9
38.	CH_404	03_71C_011	119	52.10	18.49	11.33	2.56	-26.05
39.	CH_303	03_62J_031	166	50.00	46.99	36.51	22.75	15.66
40.	SK_5	03_77D_005	79	49.37	41.77	-23.83	Cloud	10.13
41.	CH_545	03_77L_029	45	48.89	24.44	45.51	10.84	-4.44
42.	CH_438	03_71O_002	48	47.92	16.67	-27.71	119.21	-18.75
43.	CH_422	03_71G_013	244	47.54	37.3	19.99	Cloud	1.23
44.	CH_633	03_82B_007	199	46.73	3.17	-2.97	-5.82	-0.5
45.	NP_12	02_62F_019	58	46.55	24.14	-6.45	Cloud	1.72
46.	CH_271	02_78A_005	89	46.07	39.15	29.65	153.7	15.73
47.	CH_64	01_61G_003	63	46.03	14.29	0.86	22.22	152.38
48.	NP_45	02_71D_004	74	45.95	45.95	22.96	Cloud	20.27
49.	CH_39	01_61C_011	408	45.59	33.33	27.3	Cloud	12.5
50.	CH_446	03_71O_010	813	45.51	7.75	77.54	1.99	4.31
51.	AP_118	03_91D_022	44	45.45	-1.05	-6.32	18.77	0
52.	CH_725	03_82E_007	71	45.07	7.04	-21.53	-10.03	0

S. No.	UID	Lake_ID	Water spread area in Ha	%Diff in Water Spread Area				
			2009 (Inventory)	2019	2018	2017	2016	2015
53.	CH_261	02_77D_006	80	45.00	18.75	19.85	137.86	8.75
54.	NP_19	02_62J_003	49	44.90	34.69	Cloud	24.45	20.41
55.	NP_67	02_72I_014	137	44.53	21.9	20.37	Cloud	15.33
56.	CH_971	03_82L_009	54	44.44	2.2	2.2	-11.21	-11.1
57.	CH_36	01_61C_008	151	44.37	18.54	15.32	19.38	93.38
58.	CH_1176	03_91H_011	50	44.00	-21.86	Cloud	Cloud	-10
59.	CH_369	03_62O_024	721	43.83	19.97	9.45	3.23	3.61
60.	SK_4	03_77D_004	106	43.40	31.13	22.23	Cloud	11.32
61.	CH_1170	03_91H_005	58	43.10	Cloud	249.67	-8.9	0
62.	CH_550	03_77L_041	56	42.86	0.11	-11.59	26.8	17.86
63.	BH_22	03_77L_051	143	42.66	24.48	-5.12	Cloud	11.89
64.	CH_826	03_82G_065	59	42.37	22.57	7.94	Cloud	-6.78
65.	JK_205	01_52J_009	57	42.11	25.32	-6.53	Cloud	1.75
66.	CH_552	03_77L_043	181	41.99	37.02	-21.84	Cloud	23.76
67.	JK_115	01_43K_014	112	41.96	41.07	23.57	14.65	16.07
68.	NP_57	02_72E_001	142	41.55	41.55	9.9	Cloud	2.82
69.	CH_80	01_62E_005	189	41.27	21.17	4.74	Cloud	-2.65
70.	CH_630	03_82B_004	97	41.24	5.15	-1.56	-3.13	0
71.	CH_1205	03_91H_040	51	41.18	-0.18	-0.18	Cloud	-2
72.	CH_478	03_77H_003	208	40.87	-6.73	-85.01	-85.01	-9.13
73.	NP_78	02_72I_025	106	40.57	35.85	17.07	Cloud	6.6
74.	CH_838	03_82J_008	156	40.38	40.4	Cloud	Cloud	14.74
75.	AP_77	03_83A_012	63	39.68	Cloud	Cloud	-14.29	-7.9
76.	NP_76	02_72I_023	81	39.51	-2.47	37.12	-12.6	-2.47
77.	JK_85	01_43J_007	95	38.95	1.05	0.35	32.65	-3.16
78.	SK_16	03_78A_009	54	38.89	26.74	-62.56	-28.88	3.7
79.	CH_165	02_71L_010	47	38.30	38.3	9.92	21.89	10.64

S. No.	UID	Lake_ID	Water spread area in Ha	%Diff in Water Spread Area				
			2009 (Inventory)	2019	2018	2017	2016	2015
80.	CH_269	02_78A_003	124	37.90	33.87	22.35	-12.9	14.52
81.	CH_298	03_62J_026	103	37.86	36.89	24.7	22.14	10.68
82.	NP_80	02_72I_027	82	37.80	0	-3.26	2.65	-7.32
83.	CH_420	03_71G_011	1192	37.58	33.05	7.27	-6.14	3.1
84.	SK_26	03_78A_021	56	37.50	-39.29	-87.99	-81.87	14.29
85.	CH_128	02_71H_008	94	37.23	31.91	14.98	4.87	18.09
86.	CH_448	03_71P_001	112	36.61	19.73	26.1	27.05	13.39
87.	AP_206	03_92E_001	45	35.56	-8.89	-8.46	-15.56	-100
88.	CH_262	02_77D_007	54	35.19	20.37	1.26	22.94	-1.85
89.	JK_159	01_43N_032	49	34.69	34.69	30.08	21.71	12.24
90.	CH_215	02_71P_027	49	34.69	22.45	20.58	-100	0
91.	CH_313	03_62K_009	250	34.40	29.2	22.25	26.17	17.6
92.	CH_53	01_61D_001	70	34.29	30.14	28.93	-75.69	8.57
93.	CH_263	02_77D_008	44	34.09	11.72	-59.17	-100	4.55
94.	CH_722	03_82E_004	47	34.04	12.77	-11.54	9.85	-2.13
95.	CH_647	03_82B_021	48	33.33	16.42	Cloud	0.65	-14.58
96.	CH_375	03_62O_030	97	32.99	23.71	27.54	-6.71	8.25
97.	CH_316	03_62K_012	73	32.88	24.66	12.35	18.77	2.74
98.	JK_5	01_42H_005	52	32.69	23.08	25.11	-11.63	-3.85
99.	CH_442	03_71O_006	104	32.69	16.32	19.7	8.65	3.85
100.	SK_9	03_78A_001	156	32.69	40.78	Cloud	15.38	5.13
101.	CH_377	03_62O_032	49	32.65	20.41	31.1	-4.57	0
102.	AP_109	03_91D_010	46	32.61	0.22	6.55	20.91	2.17
103.	CH_210	02_71P_022	80	32.50	11.24	6.2	-100	-6.25
104.	CH_1075	03_91C_024	239	32.22	40.68	31.5	10.31	16.74
105.	CH_181	02_71L_026	59	32.20	28.81	10.84	10.61	1.69
106.	HP_1	01_52D_001	688	32.12	32.25	29.05	26.13	8.58

S. No.	UID	Lake_ID	Water spread area in Ha	%Diff in Water Spread Area				
			2009 (Inventory)	2019	2018	2017	2016	2015
107.	CH_592	03_77P_021	53	32.08	15.09	Cloud	2.57	9.43
108.	BH_35	03_77L_067	78	32.05	8.97	Cloud	-25.64	14.1
109.	CH_547	03_77L_032	88	31.82	-18.66	Cloud	12.77	-3.41
110.	CH_488	03_77H_018	80	31.25	33.75	-20.68	-20.68	18.75
111.	CH_306	03_62K_002	45	31.11	31.11	7.27	19.89	2.22
112.	NP_92	02_72M_016	161	31.06	27.33	14.94	-74.55	-0.62
113.	CH_66	01_61H_001	282	30.50	35.6	13.3	18.59	21.28
114.	CH_231	02_71P_043	66	30.30	31.82	11.15	-100	3.03
115.	SK_3	03_77D_003	96	30.21	20.4	7.9	-21.06	1.04
116.	CH_78	01_62E_003	136	30.15	22.79	14.17	5.47	20.59
117.	JK_195	01_52I_003	180	30.00	29.44	24.12	23.42	17.22
118.	SK_2	03_77D_002	105	29.52	9.94	-7.89	-43.35	-4.76
119.	JK_82	01_43J_004	65	29.23	24.62	4.48	27.31	3.08
120.	CH_636	03_82B_010	52	28.85	-3.85	-18.72	4.44	-5.77
121.	BH_129	03_78I_048	52	28.85	Cloud	Cloud	-7.69	-9.62
122.	CH_430	03_71K_007	80	28.75	-0.47	20.4	35.91	-3.75
123.	CH_304	03_62J_032	77	28.57	40.59	21.32	21.95	3.9
124.	CH_623	03_82A_004	46	28.26	24.48	1.88	2.17	0
125.	BH_13	03_77L_033	177	28.25	23.16	-9.93	15.75	2.82
126.	CH_1190	03_91H_025	85	28.24	1.53	-3.83	-8.23	0
127.	CH_396	03_71C_003	47	27.66	27.66	6.96	6.96	8.51
128.	CH_213	02_71P_025	123	27.64	22.76	15.61	-100	0
129.	CH_40	01_61C_012	290	27.59	23.13	13.89	0.04	8.28
130.	CH_204	02_71P_016	137	27.01	15.13	17.37	-100	10.95
131.	CH_347	03_62O_002	52	26.92	5.77	-22.27	-12.52	-15.38
132.	JK_3	01_42H_003	97	26.80	21.65	4.94	11.17	-2.06
133.	CH_178	02_71L_023	116	26.72	29.31	6.09	17.02	8.62

S. No.	UID	Lake_ID	Water spread area in Ha	%Diff in Water Spread Area				
			2009 (Inventory)	2019	2018	2017	2016	2015
134.	JK_100	01_43J_022	60	26.67	3.33	6.7	0.89	-6.67
135.	CH_631	03_82B_005	195	26.67	10.82	-0.92	12.31	7.69
136.	CH_155	02_71H_035	45	26.67	26.67	11.06	3.14	13.33
137.	CH_253	02_72M_007	90	26.67	22.22	-6.5	-19.28	6.67
138.	CH_646	03_82B_020	49	26.53	2.98	-17.72	20.31	-18.37
139.	JK_23	01_43A_002	91	26.37	26.37	9.56	17.08	0
140.	BH_34	03_77L_066	148	26.35	-3.33	Cloud	-0.71	2.03
141.	UK_8	02_53O_005	1510	26.09	26.09	21.17	-6.21	2.19
142.	CH_564	03_77O_001	154	25.97	27.13	18.96	16.72	13.64
143.	CH_30	01_61C_002	685	25.84	21.84	18.52	30.17	12.55
144.	CH_383	03_62O_038	124	25.81	13.71	19.5	10.85	13.71
145.	CH_106	02_62B_001	47	25.53	25.53	0.51	-10.64	10.64
146.	CH_580	03_77P_009	94	25.53	22.33	18.5	11.2	3.19
147.	BH_104	03_78I_023	51	25.49	-17.65	-18.18	-38.55	5.88
148.	CH_46	01_61C_018	1779	25.41	15.06	13.3	0.97	15.51
149.	CH_641	03_82B_015	75	25.33	4.32	-8.45	6.53	0
150.	CH_1175	03_91H_010	79	25.32	-4.53	5.2	-11.39	-11.39
151.	BH_12	03_77L_030	79	25.32	30.22	-89.67	7.22	5.06
152.	CH_635	03_82B_009	156	25.00	14.1	5.72	1.55	3.21
153.	AP_49	03_82O_042	44	25.00	1.54	15.97	-6.17	-9.09
154.	NP_62	02_72I_007	56	25.00	14.29	207.93	207.93	-7.14
155.	CH_62	01_61G_001	85	24.71	13.4	11.51	-14.05	-17.65
156.	CH_387	03_62O_042	57	24.56	3.51	-5.32	7.04	0
157.	CH_584	03_77P_013	53	24.53	31.9	-7.21	3.49	3.77
158.	CH_228	02_71P_040	135	24.44	10.37	-8.41	-100	0
159.	CH_533	03_77L_017	74	24.32	18.68	17.43	-4.92	1.35
160.	CH_785	03_82G_024	95	24.21	2.11	-6.8	4.26	6.32

S. No.	UID	Lake_ID	Water spread area in Ha	%Diff in Water Spread Area				
			2009 (Inventory)	2019	2018	2017	2016	2015
161.	CH_1194	03_91H_029	50	24.00	0.92	-28.01	3.5	-16
162.	CH_157	02_71L_002	76	23.68	2.63	19.91	2.63	11.84
163.	BH_19	03_77L_044	123	23.58	21.14	-14.07	9	0
164.	JK_120	01_43M_003	208	23.56	9.28	23.92	11.63	21.15
165.	CH_796	03_82G_035	81	23.46	10.06	9.84	-7.41	-2.47
166.	NP_86	02_72M_009	64	23.44	25	-8.32	-100	-4.69
167.	CH_526	03_77L_010	47	23.40	4.26	-38.06	-11.89	-6.38
168.	AP_185	03_91H_067	56	23.21	-7.49	-12.3	1.79	0
169.	CH_511	03_77K_009	69	23.19	8.06	13.49	0.06	-8.7
170.	JK_47	01_43E_023	82	23.17	6.1	-6.19	48.17	0
171.	JK_167	01_43P_002	52	23.08	25.67	19.69	7.96	5.77
172.	CH_251	02_72M_005	74	22.97	33.97	6.8	-73.56	1.35
173.	BH_60	03_78E_007	61	22.95	-11.48	Cloud	-10.76	1.64
174.	JK_111	01_43K_010	66	22.73	6.72	4.13	-0.83	-6.06
175.	CH_778	03_82G_017	53	22.64	4.15	-5.99	-3.25	-11.32
176.	BH_197	03_78M_022	67	22.39	0.18	Cloud	-11.04	-2.99
177.	CH_524	03_77L_008	85	22.35	1.18	-9.89	5.67	14.12
178.	BH_40	03_77L_072	91	21.98	6.59	Cloud	-1.84	3.3
179.	CH_59	01_61F_002	55	21.82	-5.7	8.8	20	-18.2
180.	CH_149	02_71H_029	474	21.73	Cloud	6.32	10.88	10.76
181.	BH_4	03_77H_011	143	21.68	18.56	15.74	-57.94	1.4
182.	CH_258	02_77D_003	88	21.59	7.95	12.52	631.22	15.91
183.	CH_385	03_62O_040	107	21.50	21.25	22.96	29.36	25.23
184.	CH_43	01_61C_015	742	21.29	17.85	5.77	-5.62	-2.02
185.	CH_634	03_82B_008	254	20.87	2.04	-2.24	-3.94	0.39
186.	CH_654	03_82B_028	48	20.83	0	-46.86	0.48	-2.08
187.	JK_67	01_43G_001	22154	20.80	20.8	21.2	-1.34	23.35

S. No.	UID	Lake_ID	Water spread area in Ha	%Diff in Water Spread Area				
			2009 (Inventory)	2019	2018	2017	2016	2015
188.	BH_14	03_77L_035	58	20.69	20.69	Cloud	3.5	1.72
189.	CH_44	01_61C_016	344	20.64	12.48	11.42	11.1	4.94
190.	JK_201	01_52J_005	44	20.45	7.11	-5.18	-14.52	6.82
191.	CH_517	03_77K_015	108	20.37	21.21	-0.13	-2.06	0
192.	CH_168	02_71L_013	64	20.31	4.69	-10.79	-2.88	-10.94
193.	CH_63	01_61G_002	1134	20.19	17.11	11.67	10.85	12.08

Table 3 (c) – Comparison of Water Spread Area for lakes showing DECREASE in water spread area (>20%) from 2015 – 2019 with inventory area

S. No.	UID	Lake_ID	Water spread area in Ha	%Diff in Water Spread Area				
			2009 (Inventory)	2019	2018	2017	2016	2015
1.	CH_1085	03_91C_052	64	-21.88	-31	-29	-26.94	-20.31
2.	JK_196	01_52I_004	124	-29.84	-6.82	-16.63	-25.49	-8.87
3.	CH_481	03_77H_007	924	-37.01	2.71	-4.96	-4.96	-22.29
4.	CH_259	02_77D_004	1273	-38.10	-1.96	-41.75	-41.75	-15.55
5.	UK_10	02_53P_002	734	-39.10	-38.56	-40.59	-36.48	21.25
6.	JK_188	01_52E_001	51	-80.39	Dry	Dry	-11.35	-100

Table 4 - Comparison of all GL & WB with change in water spread area during 2019 with Inventory area 2009

Table 4(a) – List of GL & WB that have shown INCREASE in Water Spread Area

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
1.	HP_5	01_52H_004	HP	Lahul and Spiti	India	Indus	Chenab	46	158	156	162	156	160	162	252.17
2.	CH_33	01_61C_005			China	Indus	Indus	139	344	427	Cloud	466	470	470	238.13
3.	CH_207	02_71P_019			China	Ganga	Arun Kosi	48	Cloud	99	123	127	Cloud	127	164.58
4.	CH_1	01_52L_008			China	Indus	Satluj	50	Cloud	113	120	Cloud	Cloud	120	140.00
5.	CH_551	03_77L_042			China	Brahmaputra	Kuri Chu	50	81	80	102	Cloud	85	102	104.00
6.	HP_12	01_53E_001	HP	Mandi	India	Indus	Beas	72	131	119	113	Cloud	143	143	98.61
7.	CH_244	02_72I_004			China	Ganga	Sun Kosi	121	212	231	239	Cloud	235	239	97.52
8.	CH_423	03_71G_014			China	Brahmaputra		140	Cloud	251	272	262	274	274	95.71
9..	NP_64	02_72I_011	Nepal		Nepal	Ganga	Sun Kosi	100	175	177	192	Cloud	191	192	92.00
10.	CH_217	02_71P_029			China	Ganga	Arun Kosi	80	93	Cloud	119	153	127	153	91.25
11.	CH_432	03_71K_009			China	Brahmaputra		170	249	247	323	Cloud	303	323	90.00
12.	CH_188	02_71L_034			China	Ganga	Sun Kosi	46	79	83	87	Cloud	81	87	89.13
13.	CH_593	03_77P_023			China	Brahmaputra	Kuri Chu	45	Cloud	82	73	Cloud	Cloud	82	82.22
14.	CH_849	03_82J_019			China	Brahmaputra		45	Cloud	Cloud	Cloud	82	Cloud	82	82.22
15.	CH_206	02_71P_018			China	Ganga	Arun Kosi	51	49	59	81	89	Cloud	89	74.51
16.	JK_187	01_52C_003	J&K	Kargil	India	Indus	Indus	45	78	63	65	60	57	78	73.33
17.	HP_3	01_52H_002	HP	Lahul and Spiti	India	Indus	Chenab	62	107	105	Cloud	102	99	107	72.58
18.	CH_426	03_71K_003			China	Brahmaputra		72	89	119	123	Cloud	124	124	72.22
19.	CH_6	01_52O_003			China	Indus	Indus	148	254	Cloud	244	235	229	254	71.62

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
20.	SK_19	03_78A_013	Sikkim	North Sikkim	India	Brahmaputra	Teesta	63	Cloud	84	96	105	89	105	66.67
21.	SK_20	03_78A_014	Sikkim	North Sikkim	India	Brahmaputra	Teesta	94	156	Cloud	Cloud	Cloud	Cloud	156	65.96
22.	CH_55	01_61D_003			China	Indus	Indus	46	75	65	73	76	63	76	65.22
23.	CH_183	02_71L_028			China	Ganga	Sun Kosi	77	91	110	127	Cloud	120	127	64.94
24.	CH_621	03_82A_002			China	Brahmaputra		319	Cloud	Cloud	413	526	Cloud	526	64.89
25.	CH_101	01_62F_010			China	Indus	Satluj	45	Cloud	74	Cloud	72	69	74	64.44
26.	CH_590	03_77P_019			China	Brahmaputra	Dangme Chu	220	Cloud	353	351	351	361	361	64.09
27.	CH_85	01_62E_010			China	Indus	Indus	156	166	154	166	252	175	252	61.54
28.	CH_38	01_61C_010			China	Indus	Indus	88	119	117	Cloud	142	139	142	61.36
29.	CH_834	03_82J_004			China	Brahmaputra		378	587	562	Cloud	595	Cloud	595	57.41
30.	CH_132	02_71H_012			China	Ganga	Arun Kosi	89	139	135	Cloud	Cloud	135	139	56.18
31.	SK_11	03_78A_003	Sikkim	North Sikkim	India	Brahmaputra	Teesta	58	Cloud	63	Cloud	Cloud	90	90	55.17
32.	CH_159	02_71L_004			China	Ganga	Arun Kosi	86	113	Cloud	Cloud	Cloud	133	133	54.65
33.	CH_1076	03_91C_025			China	Brahmaputra		97	129	Cloud	150	150	Cloud	150	54.64
34.	CH_288	03_62J_016			China	Brahmaputra		44	Cloud	61	Cloud	68	58	68	54.55
35.	CH_216	02_71P_028			China	Ganga	Arun Kosi	54	60	Cloud	73	Cloud	83	83	53.70
36.	CH_270	02_78A_004			China	Ganga	Arun Kosi	84	127	Cloud	129	Cloud	126	129	53.57
37.	CH_235	02_71P_047			China	Ganga	Arun Kosi	71	96	100	98	109	97	109	53.52
38.	CH_404	03_71C_011			China	Brahmaputra		119	141	165	173	Cloud	181	181	52.10
39.	CH_303	03_62J_031			China	Brahmaputra		166	244	228	249	225	230	249	50.00
40.	SK_5	03_77D_005	Sikkim	North Sikkim	India	Brahmaputra	Teesta	79	102	106	118	Cloud	Cloud	118	49.37

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
41.	CH_545	03_77L_029			China	Brahmaputra	Kuri Chu	45	Cloud	59	62	65	67	67	48.89
42.	CH_438	03_71O_002			China	Brahmaputra		48	56	66	71	Cloud	69	71	47.92
43.	CH_422	03_71G_013			China	Brahmaputra		244	335	Cloud	317	Cloud	360	360	47.54
44.	CH_633	03_82B_007			China	Brahmaputra		199	199	Cloud	Cloud	231	292	292	46.73
45.	NP_12	02_62F_019	Nepal		Nepal	Ganga	Karnal	58	Cloud	Cloud	Cloud	85	84	85	46.55
46.	CH_271	02_78A_005			China	Ganga	Arun Kosi	89	Cloud	115	128	Cloud	130	130	46.07
47.	CH_64	01_61G_003			China	Indus	Indus	63	Cloud	92	78	61	56	92	46.03
48.	NP_45	02_71D_004	Nepal		Nepal	Ganga	Trisuli	74	108	108	Cloud	Cloud	103	108	45.95
49.	CH_39	01_61C_011			China	Indus	Indus	408	544	516	Cloud	570	594	594	45.59
50.	CH_446	03_71O_010			China	Brahmaputra		813	876	925	1161	Cloud	1183	1183	45.51
51.	AP_118	03_91D_022	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	44	Cloud	Cloud	48	Cloud	64	64	45.45
52.	CH_725	03_82E_007			China	Brahmaputra		71	Cloud	Cloud	Cloud	103	84	103	45.07
53.	CH_261	02_77D_006			China	Ganga	Arun Kosi	80	Cloud	86	116	113	Cloud	116	45.00
54.	NP_19	02_62J_003	Nepal		Nepal	Ganga	Karnal	49	Cloud	63	Cloud	71	69	71	44.90
55.	NP_67	02_72I_014	Nepal		Nepal	Ganga	Sun Kosi	137	167	197	198	Cloud	188	198	44.53
56.	CH_971	03_82L_009			China	Brahmaputra		54	Cloud	Cloud	Cloud	78	Cloud	78	44.44
57.	CH_36	01_61C_008			China	Indus	Indus	151	179	204	Cloud	214	218	218	44.37
58.	CH_1176	03_91H_011			China	Brahmaputra	Luhit	50	Cloud	Cloud	Cloud	Cloud	72	72	44.00
59.	CH_369	03_62O_024			China	Brahmaputra		721	865	905	915	1030	1037	1037	43.83
60.	SK_4	03_77D_004	Sikkim	North Sikkim	India	Brahmaputra	Teesta	106	139	134	145	152	Cloud	152	43.40
61.	CH_1170	03_91H_005			China	Brahmaputra	Luhit	58	Cloud	Cloud	Cloud	70	83	83	43.10

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
62.	CH_550	03_77L_041			China	Brahmaputra	Kuri Chu	56	Cloud	72	74	79	80	80	42.86
63.	BH_22	03_77L_051			Bhutan	Brahmaputra	Puna Tsang Chu	143	178	182	204	Cloud	Cloud	204	42.66
64.	CH_826	03_82G_065			China	Brahmaputra		59	Cloud	Cloud	Cloud	84	Cloud	84	42.37
65.	JK_205	01_52J_009	J&K	Ladakh (Leh)	India	Indus	Shyok	57	Cloud	Cloud	67	81	Cloud	81	42.11
66.	CH_552	03_77L_043			China	Brahmaputra	Kuri Chu	181	248	244	250	Cloud	257	257	41.99
67.	JK_115	01_43K_014	J&K	Anantnag (Kashmir South)	India	Indus	Jhelum	112	158	114	138	159	150	159	41.96
68.	NP_57	02_72E_001	Nepal		Nepal	Ganga	Baghmati	142	201	Cloud	183	Cloud	193	201	41.55
69.	CH_80	01_62E_005			China	Indus	Indus	189	206	210	222	267	198	267	41.27
70.	CH_630	03_82B_004			China	Brahmaputra		97	102	Cloud	Cloud	137	124	137	41.24
71.	CH_1205	03_91H_040			China	Brahmaputra	Luhit	51	Cloud	Cloud	Cloud	63	72	72	41.18
72.	CH_478	03_77H_003			China	Brahmaputra		208	184	230	269	293	Cloud	293	40.87
73.	NP_78	02_72I_025	Nepal		Nepal	Ganga	Sun Kosi	106	144	138	149	Cloud	144	149	40.57
74.	CH_838	03_82J_008			China	Brahmaputra		156	219	Cloud	Cloud	210	Cloud	219	40.38
75.	AP_77	03_83A_012	AP	Tawang	India	Brahmaputra	Dangme Chu	63	Cloud	Cloud	Cloud	68	88	88	39.68
76.	NP_76	02_72I_023	Nepal		Nepal	Ganga	Sun Kosi	81	75	101	103	Cloud	113	113	39.51
77.	JK_85	01_43J_007	J&K		India	Indus	Jhelum	95	Cloud	Cloud	Cloud	132	100	132	38.95
78.	SK_16	03_78A_009	Sikkim	North Sikkim	India	Brahmaputra	Teesta	54	67	Cloud	71	75	69	75	38.89
79.	CH_165	02_71L_010			China	Ganga	Sun Kosi	47	65	65	64	Cloud	65	65	38.30
80.	CH_269	02_78A_003			China	Ganga	Arun Kosi	124	Cloud	Cloud	171	Cloud	Cloud	171	37.90

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
81.	CH_298	03_62J_026			China	Brahmaputra		103	141	131	123	142	140	142	37.86
82.	NP_80	02_72I_027	Nepal		Nepal	Ganga	Sun Kosi	82	Cloud	94	Cloud	Cloud	113	113	37.80
83.	CH_420	03_71G_011			China	Brahmaputra		1192	Cloud	1586	1636	1640	1628	1640	37.58
84.	SK_26	03_78A_021	Sikkim	North Sikkim	India	Brahmaputra	Teesta	56	Cloud	Cloud	Cloud	Cloud	77	77	37.50
85.	CH_128	02_71H_008			China	Ganga	Arun Kosi	94	124	125	129	Cloud	123	129	37.23
86.	CH_448	03_71P_001			China	Brahmaputra		112	133	Cloud	147	Cloud	153	153	36.61
87.	AP_206	03_92E_001	AP	Lohit	India	Brahmaputra	Luhit	45	Cloud	Cloud	Cloud	61	Cloud	61	35.56
88.	CH_262	02_77D_007			China	Ganga	Arun Kosi	54	65	66	72	73	68	73	35.19
89.	JK_159	01_43N_032	J&K	Anantnag (Kashmir South)	India	Indus	Jhelum	49	66	60	66	57	56	66	34.69
90.	CH_215	02_71P_027			China	Ganga	Arun Kosi	49	60	55	66	63	60	66	34.69
91.	CH_313	03_62K_009			China	Brahmaputra		250	323	331	Cloud	333	336	336	34.40
92.	CH_53	01_61D_001			China	Indus	Indus	70	Cloud	Cloud	91	94	Cloud	94	34.29
93.	CH_263	02_77D_008			China	Ganga	Arun Kosi	44	Cloud	57	59	59	Cloud	59	34.09
94.	CH_722	03_82E_004			China	Brahmaputra		47	53	Cloud	Cloud	Cloud	63	63	34.04
95.	CH_647	03_82B_021			China	Brahmaputra		48	Cloud	Cloud	Cloud	64	Cloud	64	33.33
96.	CH_375	03_62O_030			China	Brahmaputra		97	120	117	Cloud	129	121	129	32.99
97.	CH_316	03_62K_012			China	Brahmaputra		73	Cloud	95	Cloud	97	94	97	32.88
98.	JK_5	01_42H_005	J&K		India	Indus	Gilgit	52	64	59	57	63	69	69	32.69
99.	CH_442	03_71O_006			China	Brahmaputra		104	112	134	138	Cloud	117	138	32.69
100.	SK_9	03_78A_001	Sikkim	North Sikkim	India	Brahmaputra	Teesta	156	Cloud	195	191	207	Cloud	207	32.69
101.	CH_377	03_62O_032			China	Brahmaputra		49	59	Cloud	Cloud	62	65	65	32.65

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
102.	AP_109	03_91D_010	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	46	Cloud	Cloud	55	Cloud	61	61	32.61
103.	CH_210	02_71P_022			China	Ganga	Arun Kosi	80	82	97	102	102	106	106	32.50
104.	CH_1075	03_91C_024			China	Brahmaputra		239	Cloud	Cloud	Cloud	316	Cloud	316	32.22
105.	CH_181	02_71L_026			China	Ganga	Sun Kosi	59	76	77	78	Cloud	65	78	32.20
106.	HP_1	01_52D_001	HP	Chamba	India	Indus	Ravi	688	909	730	811	876	907	909	32.12
107.	CH_592	03_77P_021			China	Brahmaputra	Dangme Chu	53	Cloud	55	56	70	61	70	32.08
108.	BH_35	03_77L_067			Bhutan	Brahmaputra	Manas Chu & Mangde Chu	78	Cloud	Cloud	103	Cloud	85	103	32.05
109.	CH_547	03_77L_032			China	Brahmaputra	Kuri Chu	88	Cloud	Cloud	116	Cloud	Cloud	116	31.82
110.	CH_488	03_77H_018			China	Brahmaputra		80	105	75	Cloud	Cloud	Cloud	105	31.25
111.	CH_306	03_62K_002			China	Brahmaputra		45	59	53	Cloud	56	53	59	31.11
112.	NP_92	02_72M_016	Nepal		Nepal	Ganga	Arun Kosi	161	205	195	Cloud	Cloud	211	211	31.06
113.	CH_66	01_61H_001			China	Indus	Indus	282	368	332	341	351	353	368	30.50
114.	CH_231	02_71P_043			China	Ganga	Arun Kosi	66	Cloud	86	86	Cloud	67	86	30.30
115.	SK_3	03_77D_003	Sikkim	North Sikkim	India	Brahmaputra	Teesta	96	Cloud	116	120	125	123	125	30.21
116.	CH_78	01_62E_003			China	Indus	Indus	136	167	Cloud	154	177	172	177	30.15
117.	JK_195	01_52I_003	J&K		India	Indus	Shyok	180	Cloud	232	234	234	214	234	30.00
118.	SK_2	03_77D_002	Sikkim	North Sikkim	India	Brahmaputra	Teesta	105	110	114	119	Cloud	136	136	29.52
119.	JK_82	01_43J_004	J&K		India	Indus	Jhelum	65	Cloud	65	74	84	71	84	29.23
120.	CH_636	03_82B_010			China	Brahmaputra		52	Cloud	53	Cloud	67	61	67	28.85

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
121.	BH_129	03_78I_048			Bhutan	Brahmaputra	Manas Chu & Mangde Chu	52	51	Cloud	52	Cloud	67	67	28.85
122.	CH_430	03_71K_007			China	Brahmaputra		80	79	100	103	Cloud	99	103	28.75
123.	CH_304	03_62J_032			China	Brahmaputra		77	Cloud	97	99	99	99	99	28.57
124.	CH_623	03_82A_004			China	Brahmaputra		46	54	57	Cloud	59	Cloud	59	28.26
125.	BH_13	03_77L_033			Bhutan	Brahmaputra		177	218	212	227	Cloud	Cloud	227	28.25
126.	CH_1190	03_91H_025			China	Brahmaputra	Luhit	85	Cloud	Cloud	Cloud	96	109	109	28.24
127.	CH_396	03_71C_003			China	Brahmaputra		47	60	Cloud	Cloud	54	54	60	27.66
128.	CH_213	02_71P_025			China	Ganga	Arun Kosi	123	151	Cloud	154	157	154	157	27.64
129.	CH_40	01_61C_012			China	Indus	Indus	290	350	354	Cloud	370	365	370	27.59
130.	CH_204	02_71P_016			China	Ganga	Arun Kosi	137	Cloud	156	174	Cloud	171	174	27.01
131.	CH_347	03_62O_002			China	Brahmaputra		52	55	64	Cloud	66	65	66	26.92
132.	JK_3	01_42H_003	J&K		India	Indus	Gilgit	97	118	115	Cloud	Cloud	123	123	26.80
133.	CH_178	02_71L_023			China	Ganga	Arun Kosi	116	146	142	147	Cloud	141	147	26.72
134.	JK_100	01_43J_022	J&K	Baramula (Kashmir North)	India	Indus	Jhelum	60	62	76	74	71	67	76	26.67
135.	CH_631	03_82B_005			China	Brahmaputra		195	212	Cloud	218	242	247	247	26.67
136.	CH_155	02_71H_035			China	Ganga	Sun Kosi	45	57	Cloud	50	Cloud	53	57	26.67
137.	CH_253	02_72M_007			China	Ganga	Arun Kosi	90	Cloud	Cloud	112	Cloud	114	114	26.67
138.	CH_646	03_82B_020			China	Brahmaputra		49	Cloud	Cloud	Cloud	62	Cloud	62	26.53
139.	JK_23	01_43A_002	J&K		India	Indus	Gilgit	91	115	103	Cloud	113	110	115	26.37
140.	BH_34	03_77L_066			Bhutan	Brahmaputra	Manas Chu & Mangde Chu	148	Cloud	Cloud	187	Cloud	182	187	26.35

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
141.	UK_8	02_53O_005	Uthrakhand	Udham Singh Nagar	India	Ganga	Ramganga	1510	1904	Cloud	1026	1128	1125	1904	26.09
142.	CH_564	03_77O_001			China	Brahmaputra		154	194	159	190	188	193	194	25.97
143.	CH_30	01_61C_002			China	Indus	Indus	685	830	862	Cloud	857	853	862	25.84
144.	CH_383	03_62O_038			China	Brahmaputra		124	141	141	156	153	147	156	25.81
145.	CH_106	02_62B_001			China	Ganga	Karnal	47	59	47	51	Cloud	49	59	25.53
146.	CH_580	03_77P_009			China	Brahmaputra		94	103	113	116	117	118	118	25.53
147.	BH_104	03_78I_023			Bhutan	Brahmaputra	Manas Chu & Mangde Chu	51	Cloud	Cloud	Cloud	Cloud	64	64	25.49
148.	CH_46	01_61C_018			China	Indus	Indus	1779	Cloud	2105	2200	2219	2231	2231	25.41
149.	CH_641	03_82B_015			China	Brahmaputra		75	Cloud	Cloud	Cloud	94	Cloud	94	25.33
150.	CH_1175	03_91H_010			China	Brahmaputra	Luhit	79	Cloud	Cloud	Cloud	Cloud	99	99	25.32
151..	BH_12	03_77L_030			Bhutan	Brahmaputra		79	99	96	Cloud	97	91	99	25.32
152.	CH_635	03_82B_009			China	Brahmaputra		156	178	Cloud	Cloud	195	185	195	25.00
153.	AP_49	03_82O_042	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	44	Cloud	Cloud	55	Cloud	Cloud	55	25.00
154.	NP_62	02_72I_007	Nepal		Nepal	Ganga	Sun Kosi	56	64	Cloud	66	Cloud	70	70	25.00
155.	CH_62	01_61G_001			China	Indus	Indus	85	Cloud	76	91	106	100	106	24.71
156.	CH_387	03_62O_042			China	Brahmaputra		57	59	66	Cloud	68	71	71	24.56
157.	CH_584	03_77P_013			China	Brahmaputra		53	55	51	58	66	63	66	24.53
158.	CH_228	02_71P_040			China	Ganga	Arun Kosi	135	149	144	153	168	Cloud	168	24.44
159.	CH_533	03_77L_017			China	Brahmaputra		74	78	82	92	Cloud	85	92	24.32
160.	CH_785	03_82G_024			China	Brahmaputra		95	Cloud	Cloud	Cloud	105	118	118	24.21
161.	CH_1194	03_91H_029			China	Brahmaputra	Luhit	50	Cloud	Cloud	Cloud	60	62	62	24.00

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
162.	CH_157	02_71L_002			China	Ganga	Arun Kosi	76	Cloud	88	Cloud	Cloud	94	94	23.68
163.	BH_19	03_77L_044			Bhutan	Brahmaputra	Puna Tsang Chu	123	149	146	152	Cloud	Cloud	152	23.58
164.	JK_120	01_43M_003	J&K		India	Indus	Shigar (Indus)	208	141	199	Cloud	255	257	257	23.56
165.	CH_796	03_82G_035			China	Brahmaputra		81	Cloud	Cloud	Cloud	100	Cloud	100	23.46
166.	NP_86	02_72M_009	Nepal		Nepal	Ganga	Tamur Kosi	64	Cloud	Cloud	77	Cloud	79	79	23.44
167.	CH_526	03_77L_010			China	Brahmaputra		47	49	58	52	50	54	58	23.40
168.	AP_185	03_91H_067	AP	Lohit	India	Brahmaputra	Luhit	56	Cloud	Cloud	Cloud	66	69	69	23.21
169.	CH_511	03_77K_009			China	Brahmaputra		69	Cloud	71	68	Cloud	85	85	23.19
170.	JK_47	01_43E_023	J&K		India	Indus	Gilgit	82	Cloud	86	Cloud	101	Cloud	101	23.17
171.	JK_167	01_43P_002	J&K	Jammu	India	Indus	Ravi	52	64	59	58	Cloud	60	64	23.08
172.	CH_251	02_72M_005			China	Ganga	Arun Kosi	74	Cloud	Cloud	Cloud	Cloud	91	91	22.97
173.	BH_60	03_78E_007			Bhutan	Brahmaputra	Puna Tsang Chu	61	Cloud	Cloud	75	Cloud	Cloud	75	22.95
174.	JK_111	01_43K_010	J&K	Rajauri	India	Indus	Jhelum	66	Cloud	Cloud	Cloud	81	71	81	22.73
175.	CH_778	03_82G_017			China	Brahmaputra		53	Cloud	Cloud	Cloud	65	Cloud	65	22.64
176.	BH_197	03_78M_022			Bhutan	Brahmaputra	Dangme Chu	67	Cloud	69	Cloud	Cloud	82	82	22.39
177.	CH_524	03_77L_008			China	Brahmaputra		85	81	80	104	95	100	104	22.35
178.	BH_40	03_77L_072			Bhutan	Brahmaputra	Manas Chu & Mangde Chu	91	Cloud	Cloud	Cloud	Cloud	111	111	21.98
179.	CH_59	01_61F_002			China	Indus	Indus	55	Cloud	Cloud	Cloud	67	Cloud	67	21.82
180.	CH_149	02_71H_029			China	Ganga	Sun Kosi	474	492	Cloud	Cloud	Cloud	577	577	21.73
181.	BH_4	03_77H_011			Bhutan	Brahmaputra		143	160	163	174	Cloud	Cloud	174	21.68

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
182.	CH_258	02_77D_003			China	Ganga	Arun Kosi	88	Cloud	Cloud	Dry	107	Cloud	107	21.59
183.	CH_385	03_62O_040			China	Brahmaputra		107	129	126	130	Cloud	129	130	21.50
184.	CH_43	01_61C_015			China	Indus	Indus	742	870	888	892	900	896	900	21.29
185.	CH_634	03_82B_008			China	Brahmaputra		254	254	Cloud	Cloud	299	307	307	20.87
186.	CH_654	03_82B_028			China	Brahmaputra		48	Cloud	50	Cloud	58	Cloud	58	20.83
187.	JK_67	01_43G_001	J&K		India	Indus	Jhelum	22154	26761	16378	25760	25832	25593	26761	20.80
188.	BH_14	03_77L_035			Bhutan	Brahmaputra		58	70	61	65	65	61	70	20.69
189.	CH_44	01_61C_016			China	Indus	Indus	344	Cloud	415	414	411	408	415	20.64
190.	JK_201	01_52J_005	J&K	Ladakh (Leh)	India	Indus	Shyok	44	Cloud	47	52	53	Cloud	53	20.45
191.	CH_517	03_77K_015			China	Brahmaputra		108	119	115	130	Cloud	Cloud	130	20.37
192.	CH_168	02_71L_013			China	Ganga	Sun Kosi	64	67	70	77	Cloud	64	77	20.31
193.	CH_63	01_61G_002			China	Indus	Indus	1134	1328	1277	1357	1363	1353	1363	20.19
194.	HP_6	01_52H_005	HP	Lahul and Spiti	India	Indus	Chenab	45	49	52	49	54	45	54	20.00
195.	CH_626	03_82A_007			China	Brahmaputra		85	Cloud	Cloud	Cloud	102	Cloud	102	20.00
196.	CH_806	03_82G_045			China	Brahmaputra		70	Cloud	Cloud	Cloud	84	79	84	20.00
197.	NP_59	02_72I_003	Nepal		Nepal	Ganga	Sun Kosi	45	45	54	45	Cloud	47	54	20.00
198.	CH_583	03_77P_012			China	Brahmaputra		66	71	57	68	76	79	79	19.70
199.	UK_4	02_53O_001	Uthrakhand	Naini Tal	India	Ganga	Ramganga	46	Cloud	Cloud	Cloud	Cloud	55	55	19.57
200.	CH_575	03_77P_004			China	Brahmaputra		211	252	215	225	229	216	252	19.43
201.	BH_132	03_78I_051			Bhutan	Brahmaputra	Manas Chu & Mangde Chu	103	Cloud	Cloud	123	Cloud	122	123	19.42
202.	CH_733	03_82F_008			China	Brahmaputra		83	98	93	Cloud	99	Cloud	99	19.28

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
203.	CH_720	03_82E_002			China	Brahmaputra		659	Cloud	Cloud	786	Cloud	Cloud	786	19.27
204.	CH_784	03_82G_023			China	Brahmaputra		84	Cloud	Cloud	Cloud	100	Cloud	100	19.05
205.	CH_419	03_71G_010			China	Brahmaputra		304	Cloud	361	361	360	347	361	18.75
206.	CH_141	02_71H_021			China	Ganga	Trisuli	48	54	57	50	Cloud	46	57	18.75
207.	CH_484	03_77H_013			China	Brahmaputra		48	57	55	49	Cloud	Cloud	57	18.75
208.	CH_388	03_62O_043			China	Brahmaputra		86	93	Cloud	Cloud	94	102	102	18.60
209.	CH_844	03_82J_014			China	Brahmaputra		183	195	Cloud	Cloud	217	Cloud	217	18.58
210.	CH_529	03_77L_013			China	Brahmaputra		318	Cloud	364	371	377	375	377	18.55
211.	CH_483	03_77H_012			China	Brahmaputra		76	86	83	90	Cloud	Cloud	90	18.42
212.	CH_403	03_71C_010			China	Brahmaputra		49	58	50	55	Cloud	51	58	18.37
213.	CH_1089	03_91C_059			China	Brahmaputra	Dibang	98	Cloud	Cloud	Cloud	Cloud	116	116	18.37
214.	CH_287	03_62J_015			China	Brahmaputra		82	92	Cloud	Cloud	97	90	97	18.29
215.	AP_57	03_82O_064	AP		India	Brahmaputra	Dihang	44	Cloud	Cloud	Cloud	Cloud	52	52	18.18
216.	CH_522	03_77L_006			China	Brahmaputra		44	Cloud	52	34	40	49	52	18.18
217.	CH_203	02_71P_015			China	Ganga	Arun Kosi	1012	1120	1196	1177	Cloud	1193	1196	18.18
218.	CH_54	01_61D_002			China	Indus	Indus	1560	1769	1565	1650	1836	1840	1840	17.95
219.	CH_122	02_71H_002			China	Ganga	Arun Kosi	2152	Cloud	2515	2534	Cloud	2536	2536	17.84
220.	CH_156	02_71L_001			China	Ganga	Arun Kosi	85	Cloud	96	Cloud	Cloud	100	100	17.65
221.	JK_222	01_52K_014	J&K	Ladakh (Leh)	India	Indus	Indus	405	452	432	476	475	476	476	17.53
222.	CH_747	03_82F_022			China	Brahmaputra		103	Cloud	Cloud	Cloud	121	Cloud	121	17.48
223.	JK_147	01_43N_020	J&K		India	Indus	Jhelum	63	Cloud	66	Cloud	74	68	74	17.46
224.	AP_90	03_91C_044	AP	Upper Dibang Valley	India	Brahmaputra	Luhit	63	Cloud	Cloud	Cloud	Cloud	74	74	17.46

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
225.	CH_525	03_77L_009			China	Brahmaputra		522	585	588	606	Cloud	613	613	17.43
226.	AP_67	03_82P_010	AP	Lower Dibang Valley	India	Brahmaputra	Dibang	99	Cloud	Cloud	Cloud	Cloud	116	116	17.17
227.	CH_434	03_71K_011			China	Brahmaputra		387	447	424	453	Cloud	434	453	17.05
228.	BH_15	03_77L_037			Bhutan	Brahmaputra		542	589	593	619	634	Cloud	634	16.97
229.	CH_530	03_77L_014			China	Brahmaputra		48	Cloud	54	56	56	52	56	16.67
230.	CH_52	01_61C_024			China	Indus	Indus	4486	Cloud	5211	5192	5227	5226	5227	16.52
231.	CH_135	02_71H_015			China	Ganga	Arun Kosi	506	546	558	589	Cloud	589	589	16.40
232.	CH_50	01_61C_022			China	Indus	Indus	1501	Cloud	1646	1747	1743	1733	1747	16.39
233.	CH_187	02_71L_032			China	Ganga	Sun Kosi	55	57	Cloud	64	Cloud	62	64	16.36
234.	BH_99	03_78I_018			Bhutan	Brahmaputra	Puna Tsang Chu	63	Cloud	Cloud	Cloud	Cloud	73	73	15.87
235.	CH_42	01_61C_014			China	Indus	Indus	286	327	321	309	326	331	331	15.73
236.	CH_334	03_62N_017			China	Brahmaputra		77	88	Cloud	Cloud	89	88	89	15.58
237.	CH_264	02_77D_009			China	Ganga	Arun Kosi	58	Cloud	Cloud	67	Cloud	Cloud	67	15.52
238.	CH_745	03_82F_020			China	Brahmaputra		71	Cloud	Cloud	Cloud	82	Cloud	82	15.49
239.	CH_614	03_78M_003			China	Brahmaputra	Dangme Chu	207	222	239	Cloud	230	233	239	15.46
240.	CH_924	03_82K_068			China	Brahmaputra		52	Cloud	Cloud	Cloud	60	Cloud	60	15.38
241.	AP_101	03_91C_069	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	78	Cloud	Cloud	Cloud	90	80	90	15.38
242.	NP_49	02_71D_008	Nepal		Nepal	Ganga	Trisuli	98	110	Cloud	111	Cloud	113	113	15.31
243.	CH_721	03_82E_003			China	Brahmaputra		98	Cloud	Cloud	113	112	106	113	15.31
244.	JK_149	01_43N_022	J&K		India	Indus	Jhelum	72	Cloud	Cloud	70	83	72	83	15.28

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
245.	BH_36	03_77L_068			Bhutan	Brahmaputra	Kuri Chu	86	Cloud	Cloud	Cloud	Cloud	99	99	15.12
246.	CH_79	01_62E_004			China	Indus	Indus	233	263	255	262	268	268	268	15.02
247.	CH_933	03_82K_077			China	Brahmaputra		100	101	Cloud	Cloud	115	Cloud	115	15.00
248.	NP_30	02_62K_012	Nepal		Nepal	Ganga	Bheri	469	537	499	Cloud	531	539	539	14.93
249.	AP_108	03_91D_009	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	47	Cloud	Cloud	54	Cloud	Cloud	54	14.89
250.	CH_338	03_62N_021			China	Brahmaputra		197	213	190	Cloud	216	226	226	14.72
251.	CH_812	03_82G_051			China	Brahmaputra		49	51	Cloud	Cloud	56	Cloud	56	14.29
252.	CH_386	03_62O_041			China	Brahmaputra		206	231	224	Cloud	235	233	235	14.08
253.	CH_51	01_61C_023			China	Indus	Indus	633	Cloud	646	706	698	722	722	14.06
254.	CH_49	01_61C_021			China	Indus	Indus	1155	Cloud	1255	1305	1314	1317	1317	14.03
255.	CH_640	03_82B_014			China	Brahmaputra		157	Cloud	Cloud	Cloud	179	Cloud	179	14.01
256.	CH_326	03_62N_009			China	Brahmaputra		288	320	310	Cloud	328	310	328	13.89
257.	BH_195	03_78M_020			Bhutan	Brahmaputra	Dangme Chu	65	Cloud	72	Cloud	74	72	74	13.85
258.	CH_770	03_82G_009			China	Brahmaputra		51	Cloud	Cloud	Cloud	51	58	58	13.73
259.	CH_632	03_82B_006			China	Brahmaputra		124	130	Cloud	Cloud	141	139	141	13.71
260.	CH_543	03_77L_027			China	Brahmaputra	Kuri Chu	163	169	Cloud	185	Cloud	Cloud	185	13.50
261.	CH_1078	03_91C_029			China	Brahmaputra		211	239	Cloud	Cloud	231	Cloud	239	13.27
262.	CH_305	03_62K_001			China	Brahmaputra		370	Cloud	401	409	417	419	419	13.24
263.	CH_285	03_62J_013			China	Brahmaputra		854	964	954	Cloud	960	930	964	12.88
264.	CH_158	02_71L_003			China	Ganga	Arun Kosi	258	281	279	Cloud	Cloud	291	291	12.79
265.	CH_242	02_71P_054			China	Ganga	Arun Kosi	102	98	Cloud	Cloud	Cloud	115	115	12.75
266.	CH_284	03_62J_012			China	Brahmaputra		165	186	171	Cloud	180	180	186	12.73

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
267.	BH_194	03_78M_019			Bhutan	Brahmaputra	Dangme Chu	55	Cloud	Cloud	Cloud	Cloud	62	62	12.73
268.	CH_5	01_52O_002			China	Indus	Indus	135	122	Cloud	152	150	Cloud	152	12.59
269.	CH_147	02_71H_027			China	Ganga	Sun Kosi	434	473	488	488	Cloud	488	488	12.44
270.	CH_77	01_62E_002			China	Indus	Indus	161	165	Cloud	175	181	170	181	12.42
271.	CH_665	03_82C_010			China	Brahmaputra		153	148	Cloud	161	172	Cloud	172	12.42
272.	CH_853	03_82J_023			China	Brahmaputra		105	103	Cloud	Cloud	118	Cloud	118	12.38
273.	CH_320	03_62N_003			China	Brahmaputra		57	64	Cloud	Cloud	60	57	64	12.28
274.	CH_732	03_82F_007			China	Brahmaputra		115	121	Cloud	Cloud	129	Cloud	129	12.17
275.	CH_823	03_82G_062			China	Brahmaputra		58	Cloud	Cloud	Cloud	65	Cloud	65	12.07
276.	CH_617	03_78M_016			China	Brahmaputra	Dangme Chu	142	Cloud	Cloud	Cloud	159	159	159	11.97
277.	CH_931	03_82K_075			China	Brahmaputra		118	Cloud	Cloud	Cloud	132	Cloud	132	11.86
278.	CH_410	03_71G_001			China	Brahmaputra		720	762	Cloud	773	805	804	805	11.81
279.	CH_417	03_71G_008			China	Brahmaputra		60	62	Cloud	Cloud	Cloud	67	67	11.67
280.	CH_123	02_71H_003			China	Ganga	Arun Kosi	216	Cloud	229	234	Cloud	241	241	11.57
281.	CH_137	02_71H_017			China	Ganga	Arun Kosi	472	501	516	519	Cloud	526	526	11.44
282.	JK_189	01_52G_001	J&K	Ladakh (Leh)	India	Indus	Shyok	45	Cloud	Cloud	50	47	47	50	11.11
283.	CH_848	03_82J_018			China	Brahmaputra		99	Cloud	Cloud	Cloud	110	Cloud	110	11.11
284.	BH_73	03_78E_029			Bhutan	Brahmaputra	Puna Tsang Chu	45	Cloud	Cloud	50	Cloud	Cloud	50	11.11
285.	CH_416	03_71G_007			China	Brahmaputra		191	204	211	209	209	212	212	10.99
286.	SK_8	03_77D_008	Sikkim	North Sikkim	India	Brahmaputra	Teesta	46	Cloud	51	47	47	48	51	10.87
287.	CH_460	03_77C_006			China	Brahmaputra		102	113	86	97	Cloud	Cloud	113	10.78

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
288.	CH_858	03_82K_002			China	Brahmaputra		75	66	Cloud	Cloud	83	Cloud	83	10.67
289.	CH_398	03_71C_005			China	Brahmaputra		57	63	Cloud	Cloud	57	59	63	10.53
290.	CH_1098	03_91C_070			China	Brahmaputra	Dibang	57	Cloud	Cloud	Cloud	61	63	63	10.53
291.	AP_135	03_91D_041	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	115	Cloud	Cloud	Cloud	Cloud	127	127	10.43
292.	CH_321	03_62N_004			China	Brahmaputra		878	919	928	Cloud	960	969	969	10.36
293.	JK_197	01_52J_001	J&K	Ladakh (Leh)	India	Indus	Shyok	97	Cloud	103	103	107	97	107	10.31
294.	CH_161	02_71L_006			China	Ganga	Arun Kosi	379	405	409	408	Cloud	418	418	10.29
295.	JK_128	01_43N_001	J&K		India	Indus	Shingo (Indus)	127	127	140	Cloud	133	134	140	10.24
296.	CH_425	03_71K_002			China	Brahmaputra		2248	2296	2443	2461	2473	2461	2473	10.01
297.	CH_8	01_52O_005			China	Indus	Indus	780	810	759	847	858	849	858	10.00
298.	CH_611	03_78E_019			China	Brahmaputra		60	Cloud	60	Cloud	Cloud	66	66	10.00
299.	JK_22	01_43A_001	J&K		India	Indus	Gilgit	203	223	179	Cloud	218	223	223	9.85
300.	NP_36	02_62P_003	Nepal		Nepal	Ganga	Trisuli	315	334	318	Cloud	Cloud	346	346	9.84
301.	CH_56	01_61D_004			China	Indus	Indus	550	Cloud	564	604	585	566	604	9.82
302.	CH_628	03_82B_002			China	Brahmaputra		405	433	Cloud	Cloud	444	Cloud	444	9.63
303.	CH_415	03_71G_006			China	Brahmaputra		956	953	976	1000	1043	1019	1043	9.10
304.	CH_576	03_77P_005			China	Brahmaputra		110	109	120	117	105	116	120	9.09
305.	CH_811	03_82G_050			China	Brahmaputra		44	45	Cloud	Cloud	48	Cloud	48	9.09
306.	NP_58	02_72I_002	Nepal		Nepal	Ganga	Sun Kosi	67	71	72	73	Cloud	63	73	8.96
307.	CH_373	03_62O_028			China	Brahmaputra		932	1015	782	911	924	906	1015	8.91
308.	CH_612	03_78E_023			China	Brahmaputra		58	Cloud	63	Cloud	Cloud	Cloud	63	8.62
309.	CH_61	01_61F_004			China	Indus	Indus	36392	39390	39043	39293	39431	39452	39452	8.41

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
310.	CH_445	03_71O_009			China	Brahmaputra		2123	2234	2279	2300	Cloud	2295	2300	8.34
311.	JK_224	01_52K_016	J&K	Ladakh (Leh)	India	Indus	Satluj	507	545	533	532	544	549	549	8.28
312.	HP_9	01_53A_001	HP	Kangra	India	Indus	Beas	21867	22306	17316	22718	23385	23653	23653	8.17
313.	CH_339	03_62N_022			China	Brahmaputra		198	203	214	Cloud	213	213	214	8.08
314.	CH_527	03_77L_011			China	Brahmaputra		1209	Cloud	1198	1210	1291	1306	1306	8.02
315.	NP_48	02_71D_007	Nepal		Nepal	Ganga	Trisuli	300	294	Cloud	324	Cloud	312	324	8.00
316.	CH_930	03_82K_074			China	Brahmaputra		88	Cloud	Cloud	Cloud	95	Cloud	95	7.95
317.	AP_100	03_91C_064	AP		India	Brahmaputra	Dibang	89	Cloud	Cloud	96	Cloud	Cloud	96	7.87
318.	CH_88	01_62E_013			China	Indus	Indus	166	Cloud	179	Cloud	164	173	179	7.83
319.	CH_1001	03_82N_030			China	Brahmaputra		132	Cloud	Cloud	Cloud	142	Cloud	142	7.58
320.	CH_148	02_71H_028			China	Ganga	Sun Kosi	200	203	214	213	Cloud	215	215	7.50
321.	CH_273	03_62J_001			China	Brahmaputra		147	158	Cloud	Cloud	149	154	158	7.48
322.	CH_671	03_82C_016			China	Brahmaputra		54	Cloud	58	Cloud	58	51	58	7.41
323.	AP_54	03_82O_061	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	54	Cloud	Cloud	Cloud	58	Cloud	58	7.41
324.	HP_10	01_53A_002	HP	Bilaspur	India	Indus	Satluj	13679	13503	12039	14676	14673	14605	14676	7.29
325.	CH_1136	03_91D_081			China	Brahmaputra	Luhit	304	Cloud	Cloud	Cloud	326	Cloud	326	7.24
326.	CH_127	02_71H_007			China	Ganga	Arun Kosi	125	134	127	133	Cloud	128	134	7.20
327.	CH_95	01_62F_004			China	Indus	Satluj	196	Cloud	185	196	210	205	210	7.14
328.	NP_37	02_62P_004	Nepal		Nepal	Ganga	Trisuli	406	409	413	435	Cloud	426	435	7.14
329.	CH_166	02_71L_011			China	Ganga	Sun Kosi	58	59	60	62	Cloud	55	62	6.90
330.	CH_3	01_52N_001			China	Indus	Indus	11564	Cloud	12270	12346	12321	12290	12346	6.76
331.	CH_1079	03_91C_033			China	Brahmaputra		153	Cloud	Cloud	Cloud	163	Cloud	163	6.54

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
332.	CH_102	01_62J_001			China	Indus	Satluj	5571	5752	5730	Cloud	5923	5934	5934	6.52
333.	JK_191	01_52G_003	J&K	Ladakh (Leh)	India	Indus	Indus	1502	1599	1378	1530	1528	1535	1599	6.46
334.	CH_93	01_62F_002			China	Indus	Satluj	333	331	334	354	331	328	354	6.31
335.	CH_729	03_82F_004			China	Brahmaputra		692	697	734	Cloud	Cloud	Cloud	734	6.07
336.	AP_204	03_92A_006	AP	Lohit	India	Brahmaputra	Luhit	83	Cloud	Cloud	Cloud	Cloud	88	88	6.02
337.	CH_587	03_77P_016			China	Brahmaputra	Dangme Chu	251	Cloud	245	Cloud	266	239	266	5.98
338.	CH_604	03_78E_006			China	Brahmaputra		67	Cloud	65	71	Cloud	Cloud	71	5.97
339.	CH_90	01_62E_015			China	Indus	Satluj	51	Cloud	Cloud	Cloud	Cloud	54	54	5.88
340.	CH_1065	03_91C_014			China	Brahmaputra		51	Cloud	Cloud	Cloud	54	Cloud	54	5.88
341.	CH_847	03_82J_017			China	Brahmaputra		282	298	Cloud	Cloud	297	Cloud	298	5.67
342.	CH_499	03_77J_003			China	Brahmaputra		89	94	92	Cloud	94	Cloud	94	5.62
343.	CH_384	03_62O_039			China	Brahmaputra		306	313	Cloud	Cloud	Cloud	323	323	5.56
344.	CH_429	03_71K_006			China	Brahmaputra		2096	2153	Cloud	2209	Cloud	2211	2211	5.49
345.	CH_607	03_78E_012			China	Brahmaputra		279	Cloud	294	281	Cloud	Cloud	294	5.38
346.	CH_895	03_82K_039			China	Brahmaputra		224	Cloud	Cloud	Cloud	236	Cloud	236	5.36
347.	BH_137	03_78I_056			Bhutan	Brahmaputra	Manas Chu & Mangde Chu	76	Cloud	Cloud	61	Cloud	80	80	5.26
348.	JK_212	01_52K_004	J&K		India	Indus	Shyok	5741	5801	5830	6036	5811	5811	6036	5.14
349.	CH_318	03_62N_001			China	Brahmaputra		14300	14857	Cloud	Cloud	14998	15031	15031	5.11
350.	CH_482	03_77H_008			China	Brahmaputra		1256	1283	1230	1243	1319	Cloud	1319	5.02

Table 4(b) – List of GL & WB that have shown DECREASE in Water Spread Area

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
1.	CH_523	03_77L_007			China	Brahmaputra		1478	1371	1361	1375	1399	1371	1399	-5.35
2.	CH_916	03_82K_060			China	Brahmaputra		93	Cloud	Cloud	Cloud	Cloud	88	88	-5.38
3.	CH_476	03_77H_001			China	Brahmaputra		442	Cloud	382	418	Cloud	Cloud	418	-5.43
4.	CH_490	03_77H_020			China	Brahmaputra		4972	4679	4498	4315	4340	Cloud	4679	-5.89
5.	CH_709	03_82D_003			China	Brahmaputra		50	Cloud	45	47	47	44	47	-6.00
6.	CH_495	03_77H_030			China	Brahmaputra		66	Cloud	62	Cloud	Cloud	Cloud	62	-6.06
7.	CH_28	01_61B_003			China	Indus	Indus	224	Cloud	Cloud	Cloud	208	Cloud	208	-7.14
8.	CH_716	03_82D_010			China	Brahmaputra	Dangme Chu	76	Cloud	70	Cloud	Cloud	56	70	-7.89
9.	CH_606	03_78E_010			China	Brahmaputra		49	Cloud	45	Cloud	Cloud	Cloud	45	-8.16
10.	JK_99	01_43J_021	J&K	Bagdam	India	Indus	Jhelum	1238	1100	1038	1039	933	915	1100	-11.15
11.	UK_1	02_53K_001	Uthrakhand	Pauri Garhwal	India	Ganga	Ramganga	6790	5721	Cloud	5288	5438	6029	6029	-11.21
12.	CH_589	03_77P_018			China	Brahmaputra	Dangme Chu	154	115	134	Cloud	134	131	134	-12.99
13.	CH_1106	03_91C_078			China	Brahmaputra	Dibang	48	Cloud	Cloud	41	Cloud	Cloud	41	-14.58
14.	CH_780	03_82G_019			China	Brahmaputra		59	50	Cloud	Cloud	Cloud	Cloud	50	-15.25
15.	CH_598	03_78A_018			China	Brahmaputra	Amo Chu	67	Cloud	49	55	Cloud	Cloud	55	-17.91
16.	CH_256	02_77D_001			China	Ganga	Arun Kosi	5831	4765	4686	4422	Cloud	Cloud	4765	-18.28
17.	CH_1085	03_91C_052			China	Brahmaputra	Luhit	64	Cloud	Cloud	Cloud	Cloud	50	50	-21.88
18.	JK_196	01_52I_004	J&K		India	Indus	Shyok	124	Cloud	84	85	87	71	87	-29.84
19.	CH_481	03_77H_007			China	Brahmaputra		924	Cloud	Cloud	582	Cloud	Cloud	582	-37.01
20.	CH_259	02_77D_004			China	Ganga	Arun Kosi	1273	Cloud	Cloud	788	Cloud	Cloud	788	-38.10

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
21.	UK_10	02_53P_002	Uthrakhand	Udham Singh Nagar	India	Ganga	Ramganga	734	Dry	Cloud	447	447	426	447	-39.10
22.	JK_188	01_52E_001	J&K		India	Indus	Shyok	51	Cloud	10	Dry	Dry	Dry	10	-80.39

Table 4(c) – List of GL & WB that have shown NO CHANGE in Water Spread Area

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
1.	CH_565	03_77O_002			China	Brahmaputra		100	100	Cloud	101	103	105	105	5.00
2.	JK_217	01_52K_009	J&K	Ladakh (Leh)	India	Indus	Shyok	204	202	Cloud	201	214	205	214	4.90
3.	JK_95	01_43J_017	J&K	Baramula (Kashmir North)	India	Indus	Jhelum	164	163	Cloud	Cloud	172	164	172	4.88
4.	CH_4	01_52O_001			China	Indus	Shyok	65825	67122	68733	68751	68958	69022	69022	4.86
5.	CH_223	02_71P_035			China	Ganga	Arun Kosi	107	Cloud	Cloud	Cloud	112	101	112	4.67
6.	CH_1004	03_82N_033			China	Brahmaputra		89	Cloud	Cloud	Cloud	93	Cloud	93	4.49
7.	JK_198	01_52J_002	J&K	Ladakh (Leh)	India	Indus	Shyok	67	Cloud	65	69	70	61	70	4.48
8.	CH_755	03_82F_030			China	Brahmaputra		2675	2756	2778	Cloud	2793	2784	2793	4.41
9.	JK_219	01_52K_011	J&K	Ladakh (Leh)	India	Indus	Shyok	186	Cloud	Cloud	180	188	194	194	4.30
10.	CH_372	03_62O_027			China	Brahmaputra		47	49	36	48	48	44	49	4.26
11.	CH_252	02_72M_006			China	Ganga	Arun Kosi	71	Cloud	73	74	Cloud	73	74	4.23
12.	CH_739	03_82F_014			China	Brahmaputra		49	Cloud	Cloud	Cloud	51	Cloud	51	4.08
13.	CH_81	01_62E_006			China	Indus	Indus	524	540	Cloud	545	Cloud	535	545	4.01
14.	CH_605	03_78E_009			China	Brahmaputra		175	Cloud	182	180	Cloud	Cloud	182	4.00
15.	NP_28	02_62K_010	Nepal		Nepal	Ganga	Karnal	1051	1077	1075	1093	Cloud	1079	1093	4.00
16.	CH_418	03_71G_009			China	Brahmaputra		178	176	Cloud	178	185	182	185	3.93
17.	CH_452	03_77B_001			China	Brahmaputra		52	49	Cloud	54	51	Cloud	54	3.85
18.	CH_60	01_61F_003			China	Indus	Indus	558	Cloud	Cloud	Cloud	579	556	579	3.76
19.	UK_11	02_53P_003	Uthrakhand	Udham Singh Nagar	India	Ganga	Ramganga	1078	1049	1118	1002	947	819	1118	3.71
20.	JK_220	01_52K_012	J&K	Ladakh (Leh)	India	Indus	Indus	166	163	Cloud	162	172	167	172	3.61
21.	CH_29	01_61C_001			China	Indus	Indus	11154	11473	11476	11440	11541	11552	11552	3.57

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
22.	JK_157	01_43N_030	J&K	Srinagar	India	Indus	Jhelum	86	Cloud	68	80	89	88	89	3.49
23.	CH_613	03_78E_026			China	Brahmaputra	Amo Chu	60	Cloud	62	Cloud	Cloud	Cloud	62	3.33
24.	JK_226	01_52L_002	J&K	Ladakh (Leh)	India	Indus	Indus	442	454	423	456	456	Cloud	456	3.17
25.	CH_622	03_82A_003			China	Brahmaputra		99	96	Cloud	Cloud	102	Cloud	102	3.03
26.	CH_850	03_82J_020			China	Brahmaputra		439	Cloud	Cloud	Cloud	452	Cloud	452	2.96
27.	CH_892	03_82K_036			China	Brahmaputra		69	71	Cloud	Cloud	Cloud	Cloud	71	2.90
28.	CH_710	03_82D_004			China	Brahmaputra		390	398	383	401	395	393	401	2.82
29.	JK_30	01_43E_006	J&K		India	Indus	Gilgit	71	Cloud	69	73	Cloud	Cloud	73	2.82
30.	JK_218	01_52K_010	J&K	Ladakh (Leh)	India	Indus	Shyok	152	Cloud	Cloud	155	156	143	156	2.63
31.	CH_69	01_62A_003			China	Indus	Indus	1355	1380	Cloud	1376	1390	1378	1390	2.58
32.	CH_577	03_77P_006			China	Brahmaputra		5683	5829	5299	5437	5462	5383	5829	2.57
33.	CH_528	03_77L_012			China	Brahmaputra		28771	28341	29087	29160	29482	Cloud	29482	2.47
34.	CH_94	01_62F_003			China	Indus	Satluj	40552	41084	41345	41457	41491	41373	41491	2.32
35.	CH_283	03_62J_011			China	Brahmaputra		401	388	Cloud	Cloud	410	402	410	2.24
36.	JK_1	01_42H_001	J&K		India	Indus	Gilgit	276	Cloud	282	Cloud	278	276	282	2.17
37.	CH_936	03_82K_080			China	Brahmaputra		47	48	Cloud	Cloud	Cloud	Cloud	48	2.13
38.	CH_901	03_82K_045			China	Brahmaputra		49	Cloud	Cloud	Cloud	50	Cloud	50	2.04
39.	BH_188	03_78M_010			Bhutan	Brahmaputra	Dangme Chu	50	Cloud	Cloud	Cloud	Cloud	51	51	2.00
40.	CH_392	03_71B_002			China	Brahmaputra		8185	8118	8031	Cloud	8173	8346	8346	1.97
41.	JK_225	01_52L_001	J&K	Ladakh (Leh)	India	Indus	Satluj	14110	14386	14323	14349	14289	14332	14386	1.96
42.	CH_862	03_82K_006			China	Brahmaputra		52	Cloud	Cloud	Cloud	53	Cloud	53	1.92
43.	JK_202	01_52J_006	J&K	Ladakh (Leh)	India	Indus	Shyok	110	Cloud	109	112	112	100	112	1.82
44.	CH_873	03_82K_017			China	Brahmaputra		179	182	Cloud	Cloud	Cloud	Cloud	182	1.68

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
45.	CH_521	03_77L_003			China	Brahmaputra		4065	Cloud	3982	3996	4055	4132	4132	1.65
46.	CH_121	02_71H_001			China	Ganga	Arun Kosi	26825	26804	26943	27038	Cloud	27115	27115	1.08
47.	CH_563	03_77N_004			China	Brahmaputra		1296	1308	Cloud	Cloud	Cloud	Cloud	1308	0.93
48.	AP_91	03_91C_045	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	113	Cloud	Cloud	Cloud	114	Cloud	114	0.88
49.	UK_9	02_53P_001	Uthrakhand	Udham Singh Nagar	India	Ganga	Ganga	2054	2072	709	1829	1961	1978	2072	0.88
50.	CH_519	03_77K_017			China	Brahmaputra		3853	3764	3736	3774	3875	Cloud	3875	0.57
51.	CH_453	03_77B_002			China	Brahmaputra		227	220	199	Cloud	228	Cloud	228	0.44
52.	CH_588	03_77P_017			China	Brahmaputra	Dangme Chu	2345	Cloud	2332	Cloud	2348	2353	2353	0.34
53.	CH_591	03_77P_020			China	Brahmaputra	Kuri Chu	63	Cloud	57	62	Cloud	63	63	0.00
54.	CH_479	03_77H_004			China	Brahmaputra		201	201	129	70	Cloud	Cloud	201	0.00
55.	CH_92	01_62F_001			China	Indus	Satluj	25486	25079	25016	25275	Cloud	25471	25471	-0.06
56.	CH_520	03_77L_001			China	Brahmaputra		55435	53761	53962	54096	54577	54906	54906	-0.95
57.	NP_41	02_63M_002	Nepal		Nepal	Ganga	Rapti	153	Dry	Dry	151	Cloud	148	151	-1.31
58.	AP_163	03_91D_107	AP	Lohit	India	Brahmaputra	Luhit	67	Cloud	Cloud	66	Cloud	Cloud	66	-1.49
59.	AP_92	03_91C_046	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	61	Cloud	Cloud	Cloud	60	Cloud	60	-1.64
60.	CH_855	03_82J_025			China	Brahmaputra		59	Cloud	Cloud	Cloud	58	Cloud	58	-1.69
61.	JK_98	01_43J_020	J&K	Baramula (Kashmir North)	India	Indus	Jhelum	191	164	187	187	177	176	187	-2.09
62.	CH_73	01_62B_001			China	Indus	Satluj	440	428	267	318	Cloud	304	428	-2.73
63.	CH_809	03_82G_048			China	Brahmaputra		55	Cloud	Cloud	Cloud	53	Cloud	53	-3.64
64.	UK_2	02_53K_002	Uthrakhand	Udham Singh Nagar	India	Ganga	Ramganga	1597	1465	Cloud	754	Cloud	1536	1536	-3.82

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
65.	JK_154	01_43N_027	J&K	Srinagar	India	Indus	Jhelum	48	46	45	Cloud	46	46	46	-4.17
66.	BH_72	03_78E_028			Bhutan	Brahmaputra	Puna Tsang Chu	47	Cloud	45	Cloud	Cloud	Cloud	45	-4.26
67.	JK_227	01_52L_003	J&K	Ladakh (Leh)	India	Indus	Indus	648	617	583	596	595	596	617	-4.78

Table 4(d) - GL & WB that are CLOUD COVERED

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
1.	CH_735	03_82F_010			China	Brahmaputra		44	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
2.	CH_741	03_82F_016			China	Brahmaputra		49	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
3.	CH_863	03_82K_007			China	Brahmaputra		130	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
4.	CH_865	03_82K_009			China	Brahmaputra		116	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
5.	CH_854	03_82J_024			China	Brahmaputra		67	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
6.	CH_874	03_82K_018			China	Brahmaputra		165	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
7.	CH_876	03_82K_020			China	Brahmaputra		77	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
8.	CH_896	03_82K_040			China	Brahmaputra		66	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
9.	CH_893	03_82K_037			China	Brahmaputra		55	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
10.	CH_898	03_82K_042			China	Brahmaputra		205	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
11.	CH_905	03_82K_049			China	Brahmaputra		50	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
12.	CH_1032	03_82O_029			China	Brahmaputra	Dihang	68	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
13.	CH_1023	03_82O_016			China	Brahmaputra	Dihang	91	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
14.	CH_1037	03_82O_044			China	Brahmaputra	Dihang	92	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
15.	CH_1039	03_82O_047			China	Brahmaputra	Dihang	44	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
16.	CH_1046	03_82O_054			China	Brahmaputra	Dibang	51	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
17.	AP_55	03_82O_062	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	52	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
18.	CH_1135	03_91D_080			China	Brahmaputra	Luhit	45	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
19.	AP_84	03_91C_034	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	134	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
20.	AP_95	03_91C_049	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	57	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
21.	AP_89	03_91C_042	AP		India	Brahmaputra	Dibang	50	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
22.	AP_87	03_91C_040	AP		India	Brahmaputra	Luhit	94	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
23.	AP_85	03_91C_038	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	113	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
24.	CH_816	03_82G_055			China	Brahmaputra		62	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
25.	CH_821	03_82G_060			China	Brahmaputra		59	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
26.	CH_835	03_82J_005			China	Brahmaputra		67	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
27.	CH_975	03_82N_004			China	Brahmaputra		92	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
28..	CH_990	03_82N_019			China	Brahmaputra		55	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
29.	CH_959	03_82K_103			China	Brahmaputra		50	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
30.	CH_1102	03_91C_074			China	Brahmaputra	Dibang	47	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
31.	CH_1182	03_91H_017			China	Brahmaputra	Luhit	46	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
32.	BH_45	03_77L_077			Bhutan	Brahmaputra	Puna Tsang Chu	51	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
33.	CH_609	03_78E_017			China	Brahmaputra		65	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
34.	CH_492	03_77H_023			China	Brahmaputra		47	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
35.	BH_57	03_78E_002			Bhutan	Brahmaputra	Puna Tsang Chu	58	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
36.	BH_166	03_78I_085			Bhutan	Brahmaputra	Puna Tsang Chu	70	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
37.	AP_203	03_92A_005	AP	Lohit	India	Brahmaputra	Luhit	50	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
38.	CH_1056	03_91C_005			China	Brahmaputra		86	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud

Table 5(a) - List of GL & WB that have shown INCREASE in water spread area during 2019 with Inventory area 2009 (>20%)

S. No.	UID	Lake_ID	Water spread area in Ha							% diff
			2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
1	HP_5	01_52H_004	46	158	156	162	156	160	162	252.17
2	CH_33	01_61C_005	139	344	427	Cloud	466	470	470	238.13
3	CH_207	02_71P_019	48	Cloud	99	123	127	Cloud	127	164.58
4	CH_1	01_52L_008	50	Cloud	113	120	Cloud	Cloud	120	140.00
5	CH_551	03_77L_042	50	81	80	102	Cloud	85	102	104.00
6	HP_12	01_53E_001	72	131	119	113	Cloud	143	143	98.61
7	CH_244	02_72I_004	121	212	231	239	Cloud	235	239	97.52
8	CH_423	03_71G_014	140	Cloud	251	272	262	274	274	95.71
9	NP_64	02_72I_011	100	175	177	192	Cloud	191	192	92.00
10	CH_217	02_71P_029	80	93	Cloud	119	153	127	153	91.25
11	CH_432	03_71K_009	170	249	247	323	Cloud	303	323	90.00
12	CH_188	02_71L_034	46	79	83	87	Cloud	81	87	89.13
13	CH_593	03_77P_023	45	Cloud	82	73	Cloud	Cloud	82	82.22
14	CH_849	03_82J_019	45	Cloud	Cloud	Cloud	82	Cloud	82	82.22
15	CH_206	02_71P_018	51	49	59	81	89	Cloud	89	74.51
16	JK_187	01_52C_003	45	78	63	65	60	57	78	73.33
17	HP_3	01_52H_002	62	107	105	Cloud	102	99	107	72.58
18	CH_426	03_71K_003	72	89	119	123	Cloud	124	124	72.22
19	CH_6	01_52O_003	148	254	Cloud	244	235	229	254	71.62
20	SK_19	03_78A_013	63	Cloud	84	96	105	89	105	66.67
21	SK_20	03_78A_014	94	156	Cloud	Cloud	Cloud	Cloud	156	65.96
22	CH_55	01_61D_003	46	75	65	73	76	63	76	65.22
23	CH_183	02_71L_028	77	91	110	127	Cloud	120	127	64.94

S. No.	UID	Lake_ID	Water spread area in Ha							% diff
			2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
24	CH_621	03_82A_002	319	Cloud	Cloud	413	526	Cloud	526	64.89
25	CH_101	01_62F_010	45	Cloud	74	Cloud	72	69	74	64.44
26	CH_590	03_77P_019	220	Cloud	353	351	351	361	361	64.09
27	CH_85	01_62E_010	156	166	154	166	252	175	252	61.54
28	CH_38	01_61C_010	88	119	117	Cloud	142	139	142	61.36
29	CH_834	03_82J_004	378	587	562	Cloud	595	Cloud	595	57.41
30	CH_132	02_71H_012	89	139	135	Cloud	Cloud	135	139	56.18
31	SK_11	03_78A_003	58	Cloud	63	Cloud	Cloud	90	90	55.17
32	CH_159	02_71L_004	86	113	Cloud	Cloud	Cloud	133	133	54.65
33	CH_1076	03_91C_025	97	129	Cloud	150	150	Cloud	150	54.64
34	CH_288	03_62J_016	44	Cloud	61	Cloud	68	58	68	54.55
35	CH_216	02_71P_028	54	60	Cloud	73	Cloud	83	83	53.70
36	CH_270	02_78A_004	84	127	Cloud	129	Cloud	126	129	53.57
37	CH_235	02_71P_047	71	96	100	98	109	97	109	53.52
38	CH_404	03_71C_011	119	141	165	173	Cloud	181	181	52.10
39	CH_303	03_62J_031	166	244	228	249	225	230	249	50.00
40	SK_5	03_77D_005	79	102	106	118	Cloud	Cloud	118	49.37
41	CH_545	03_77L_029	45	Cloud	59	62	65	67	67	48.89
42	CH_438	03_71O_002	48	56	66	71	Cloud	69	71	47.92
43	CH_422	03_71G_013	244	335	Cloud	317	Cloud	360	360	47.54
44	CH_633	03_82B_007	199	199	Cloud	Cloud	231	292	292	46.73
45	NP_12	02_62F_019	58	Cloud	Cloud	Cloud	85	84	85	46.55
46	CH_271	02_78A_005	89	Cloud	115	128	Cloud	130	130	46.07

S. No.	UID	Lake_ID	Water spread area in Ha							% diff
			2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
47	CH_64	01_61G_003	63	Cloud	92	78	61	56	92	46.03
48	NP_45	02_71D_004	74	108	108	Cloud	Cloud	103	108	45.95
49	CH_39	01_61C_011	408	544	516	Cloud	570	594	594	45.59
50	CH_446	03_71O_010	813	876	925	1161	Cloud	1183	1183	45.51
51	AP_118	03_91D_022	44	Cloud	Cloud	48	Cloud	64	64	45.45
52	CH_725	03_82E_007	71	Cloud	Cloud	Cloud	103	84	103	45.07
53	CH_261	02_77D_006	80	Cloud	86	116	113	Cloud	116	45.00
54	NP_19	02_62J_003	49	Cloud	63	Cloud	71	69	71	44.90
55	NP_67	02_72I_014	137	167	197	198	Cloud	188	198	44.53
56	CH_971	03_82L_009	54	Cloud	Cloud	Cloud	78	Cloud	78	44.44
57	CH_36	01_61C_008	151	179	204	Cloud	214	218	218	44.37
58	CH_1176	03_91H_011	50	Cloud	Cloud	Cloud	Cloud	72	72	44.00
59	CH_369	03_62O_024	721	865	905	915	1030	1037	1037	43.83
60	SK_4	03_77D_004	106	139	134	145	152	Cloud	152	43.40
61	CH_1170	03_91H_005	58	Cloud	Cloud	Cloud	70	83	83	43.10
62	CH_550	03_77L_041	56	Cloud	72	74	79	80	80	42.86
63	BH_22	03_77L_051	143	178	182	204	Cloud	Cloud	204	42.66
64	CH_826	03_82G_065	59	Cloud	Cloud	Cloud	84	Cloud	84	42.37
65	JK_205	01_52J_009	57	Cloud	Cloud	67	81	Cloud	81	42.11
66	CH_552	03_77L_043	181	248	244	250	Cloud	257	257	41.99
67	JK_115	01_43K_014	112	158	114	138	159	150	159	41.96
68	NP_57	02_72E_001	142	201	Cloud	183	Cloud	193	201	41.55
69	CH_80	01_62E_005	189	206	210	222	267	198	267	41.27

S. No.	UID	Lake_ID	Water spread area in Ha							% diff
			2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
70	CH_630	03_82B_004	97	102	Cloud	Cloud	137	124	137	41.24
71	CH_1205	03_91H_040	51	Cloud	Cloud	Cloud	63	72	72	41.18
72	CH_478	03_77H_003	208	184	230	269	293	Cloud	293	40.87
73	NP_78	02_72I_025	106	144	138	149	Cloud	144	149	40.57
74	CH_838	03_82J_008	156	219	Cloud	Cloud	210	Cloud	219	40.38
75	AP_77	03_83A_012	63	Cloud	Cloud	Cloud	68	88	88	39.68
76	NP_76	02_72I_023	81	75	101	103	Cloud	113	113	39.51
77	JK_85	01_43J_007	95	Cloud	Cloud	Cloud	132	100	132	38.95
78	SK_16	03_78A_009	54	67	Cloud	71	75	69	75	38.89
79	CH_165	02_71L_010	47	65	65	64	Cloud	65	65	38.30
80	CH_269	02_78A_003	124	Cloud	Cloud	171	Cloud	Cloud	171	37.90
81	CH_298	03_62J_026	103	141	131	123	142	140	142	37.86
82	NP_80	02_72I_027	82	Cloud	94	Cloud	Cloud	113	113	37.80
83	CH_420	03_71G_011	1192	Cloud	1586	1636	1640	1628	1640	37.58
84	SK_26	03_78A_021	56	Cloud	Cloud	Cloud	Cloud	77	77	37.50
85	CH_128	02_71H_008	94	124	125	129	Cloud	123	129	37.23
86	CH_448	03_71P_001	112	133	Cloud	147	Cloud	153	153	36.61
87	AP_206	03_92E_001	45	Cloud	Cloud	Cloud	61	Cloud	61	35.56
88	CH_262	02_77D_007	54	65	66	72	73	68	73	35.19
89	JK_159	01_43N_032	49	66	60	66	57	56	66	34.69
90	CH_215	02_71P_027	49	60	55	66	63	60	66	34.69
91	CH_313	03_62K_009	250	323	331	Cloud	333	336	336	34.40
92	CH_53	01_61D_001	70	Cloud	Cloud	91	94	Cloud	94	34.29

S. No.	UID	Lake_ID	Water spread area in Ha							% diff
			2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
93	CH_263	02_77D_008	44	Cloud	57	59	59	Cloud	59	34.09
94	CH_722	03_82E_004	47	53	Cloud	Cloud	Cloud	63	63	34.04
95	CH_647	03_82B_021	48	Cloud	Cloud	Cloud	64	Cloud	64	33.33
96	CH_375	03_62O_030	97	120	117	Cloud	129	121	129	32.99
97	CH_316	03_62K_012	73	Cloud	95	Cloud	97	94	97	32.88
98	JK_5	01_42H_005	52	64	59	57	63	69	69	32.69
99	CH_442	03_71O_006	104	112	134	138	Cloud	117	138	32.69
100	SK_9	03_78A_001	156	Cloud	195	191	207	Cloud	207	32.69
101	CH_377	03_62O_032	49	59	Cloud	Cloud	62	65	65	32.65
102	AP_109	03_91D_010	46	Cloud	Cloud	55	Cloud	61	61	32.61
103	CH_210	02_71P_022	80	82	97	102	102	106	106	32.50
104	CH_1075	03_91C_024	239	Cloud	Cloud	Cloud	316	Cloud	316	32.22
105	CH_181	02_71L_026	59	76	77	78	Cloud	65	78	32.20
106	HP_1	01_52D_001	688	909	730	811	876	907	909	32.12
107	CH_592	03_77P_021	53	Cloud	55	56	70	61	70	32.08
108	BH_35	03_77L_067	78	Cloud	Cloud	103	Cloud	85	103	32.05
109	CH_547	03_77L_032	88	Cloud	Cloud	116	Cloud	Cloud	116	31.82
110	CH_488	03_77H_018	80	105	75	Cloud	Cloud	Cloud	105	31.25
111	CH_306	03_62K_002	45	59	53	Cloud	56	53	59	31.11
112	NP_92	02_72M_016	161	205	195	Cloud	Cloud	211	211	31.06
113	CH_66	01_61H_001	282	368	332	341	351	353	368	30.50
114	CH_231	02_71P_043	66	Cloud	86	86	Cloud	67	86	30.30
115	SK_3	03_77D_003	96	Cloud	116	120	125	123	125	30.21

S. No.	UID	Lake_ID	Water spread area in Ha							% diff
			2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
116	CH_78	01_62E_003	136	167	Cloud	154	177	172	177	30.15
117	JK_195	01_52I_003	180	Cloud	232	234	234	214	234	30.00
118	SK_2	03_77D_002	105	110	114	119	Cloud	136	136	29.52
119	JK_82	01_43J_004	65	Cloud	65	74	84	71	84	29.23
120	CH_636	03_82B_010	52	Cloud	53	Cloud	67	61	67	28.85
121	BH_129	03_78I_048	52	51	Cloud	52	Cloud	67	67	28.85
122	CH_430	03_71K_007	80	79	100	103	Cloud	99	103	28.75
123	CH_304	03_62J_032	77	Cloud	97	99	99	99	99	28.57
124	CH_623	03_82A_004	46	54	57	Cloud	59	Cloud	59	28.26
125	BH_13	03_77L_033	177	218	212	227	Cloud	Cloud	227	28.25
126	CH_1190	03_91H_025	85	Cloud	Cloud	Cloud	96	109	109	28.24
127	CH_396	03_71C_003	47	60	Cloud	Cloud	54	54	60	27.66
128	CH_213	02_71P_025	123	151	Cloud	154	157	154	157	27.64
129	CH_40	01_61C_012	290	350	354	Cloud	370	365	370	27.59
130	CH_204	02_71P_016	137	Cloud	156	174	Cloud	171	174	27.01
131	CH_347	03_62O_002	52	55	64	Cloud	66	65	66	26.92
132	JK_3	01_42H_003	97	118	115	Cloud	Cloud	123	123	26.80
133	CH_178	02_71L_023	116	146	142	147	Cloud	141	147	26.72
134	JK_100	01_43J_022	60	62	76	74	71	67	76	26.67
135	CH_631	03_82B_005	195	212	Cloud	218	242	247	247	26.67
136	CH_155	02_71H_035	45	57	Cloud	50	Cloud	53	57	26.67
137	CH_253	02_72M_007	90	Cloud	Cloud	112	Cloud	114	114	26.67
138	CH_646	03_82B_020	49	Cloud	Cloud	Cloud	62	Cloud	62	26.53

S. No.	UID	Lake_ID	Water spread area in Ha							% diff
			2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
139	JK_23	01_43A_002	91	115	103	Cloud	113	110	115	26.37
140	BH_34	03_77L_066	148	Cloud	Cloud	187	Cloud	182	187	26.35
141	UK_8	02_53O_005	1510	1904	Cloud	1026	1128	1125	1904	26.09
142	CH_564	03_77O_001	154	194	159	190	188	193	194	25.97
143	CH_30	01_61C_002	685	830	862	Cloud	857	853	862	25.84
144	CH_383	03_62O_038	124	141	141	156	153	147	156	25.81
145	CH_106	02_62B_001	47	59	47	51	Cloud	49	59	25.53
146	CH_580	03_77P_009	94	103	113	116	117	118	118	25.53
147	BH_104	03_78I_023	51	Cloud	Cloud	Cloud	Cloud	64	64	25.49
148	CH_46	01_61C_018	1779	Cloud	2105	2200	2219	2231	2231	25.41
149	CH_641	03_82B_015	75	Cloud	Cloud	Cloud	94	Cloud	94	25.33
150	CH_1175	03_91H_010	79	Cloud	Cloud	Cloud	Cloud	99	99	25.32
151	BH_12	03_77L_030	79	99	96	Cloud	97	91	99	25.32
152	CH_635	03_82B_009	156	178	Cloud	Cloud	195	185	195	25.00
153	AP_49	03_82O_042	44	Cloud	Cloud	55	Cloud	Cloud	55	25.00
154	NP_62	02_72I_007	56	64	Cloud	66	Cloud	70	70	25.00
155	CH_62	01_61G_001	85	Cloud	76	91	106	100	106	24.71
156	CH_387	03_62O_042	57	59	66	Cloud	68	71	71	24.56
157	CH_584	03_77P_013	53	55	51	58	66	63	66	24.53
158	CH_228	02_71P_040	135	149	144	153	168	Cloud	168	24.44
159	CH_533	03_77L_017	74	78	82	92	Cloud	85	92	24.32
160	CH_785	03_82G_024	95	Cloud	Cloud	Cloud	105	118	118	24.21
161	CH_1194	03_91H_029	50	Cloud	Cloud	Cloud	60	62	62	24.00

S. No.	UID	Lake_ID	Water spread area in Ha							% diff
			2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
162	CH_157	02_71L_002	76	Cloud	88	Cloud	Cloud	94	94	23.68
163	BH_19	03_77L_044	123	149	146	152	Cloud	Cloud	152	23.58
164	JK_120	01_43M_003	208	141	199	Cloud	255	257	257	23.56
165	CH_796	03_82G_035	81	Cloud	Cloud	Cloud	100	Cloud	100	23.46
166	NP_86	02_72M_009	64	Cloud	Cloud	77	Cloud	79	79	23.44
167	CH_526	03_77L_010	47	49	58	52	50	54	58	23.40
168	AP_185	03_91H_067	56	Cloud	Cloud	Cloud	66	69	69	23.21
169	CH_511	03_77K_009	69	Cloud	71	68	Cloud	85	85	23.19
170	JK_47	01_43E_023	82	Cloud	86	Cloud	101	Cloud	101	23.17
171	JK_167	01_43P_002	52	64	59	58	Cloud	60	64	23.08
172	CH_251	02_72M_005	74	Cloud	Cloud	Cloud	Cloud	91	91	22.97
173	BH_60	03_78E_007	61	Cloud	Cloud	75	Cloud	Cloud	75	22.95
174	JK_111	01_43K_010	66	Cloud	Cloud	Cloud	81	71	81	22.73
175	CH_778	03_82G_017	53	Cloud	Cloud	Cloud	65	Cloud	65	22.64
176	BH_197	03_78M_022	67	Cloud	69	Cloud	Cloud	82	82	22.39
177	CH_524	03_77L_008	85	81	80	104	95	100	104	22.35
178	BH_40	03_77L_072	91	Cloud	Cloud	Cloud	Cloud	111	111	21.98
179	CH_59	01_61F_002	55	Cloud	Cloud	Cloud	67	Cloud	67	21.82
180	CH_149	02_71H_029	474	492	Cloud	Cloud	Cloud	577	577	21.73
181	BH_4	03_77H_011	143	160	163	174	Cloud	Cloud	174	21.68
182	CH_258	02_77D_003	88	Cloud	Cloud	Dry	107	Cloud	107	21.59
183	CH_385	03_62O_040	107	129	126	130	Cloud	129	130	21.50
184	CH_43	01_61C_015	742	870	888	892	900	896	900	21.29

S. No.	UID	Lake_ID	Water spread area in Ha							% diff
			2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
185	CH_634	03_82B_008	254	254	Cloud	Cloud	299	307	307	20.87
186	CH_654	03_82B_028	48	Cloud	50	Cloud	58	Cloud	58	20.83
187	JK_67	01_43G_001	22154	26761	16378	25760	25832	25593	26761	20.80
188	BH_14	03_77L_035	58	70	61	65	65	61	70	20.69
189	CH_44	01_61C_016	344	Cloud	415	414	411	408	415	20.64
190	JK_201	01_52J_005	44	Cloud	47	52	53	Cloud	53	20.45
191	CH_517	03_77K_015	108	119	115	130	Cloud	Cloud	130	20.37
192	CH_168	02_71L_013	64	67	70	77	Cloud	64	77	20.31
193	CH_63	01_61G_002	1134	1328	1277	1357	1363	1353	1363	20.19

Table 5(b) - List of GL & WB that have shown DECREASE in water spread area during 2019 with Inventory area 2009 (>20%)

S. No.	UID	Lake_ID	Water spread area in Ha							% diff
			2009 (Inventory)	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Area (Max) 2019	
1	CH_523	03_77L_007	1478	1371	1361	1375	1399	1371	1399	-5.35
2	CH_916	03_82K_060	93	Cloud	Cloud	Cloud	Cloud	88	88	-5.38
3	CH_476	03_77H_001	442	Cloud	382	418	Cloud	Cloud	418	-5.43
4	CH_490	03_77H_020	4972	4679	4498	4315	4340	Cloud	4679	-5.89
5	CH_709	03_82D_003	50	Cloud	45	47	47	44	47	-6.00
6	CH_495	03_77H_030	66	Cloud	62	Cloud	Cloud	Cloud	62	-6.06
7	CH_28	01_61B_003	224	Cloud	Cloud	Cloud	208	Cloud	208	-7.14
8	CH_716	03_82D_010	76	Cloud	70	Cloud	Cloud	56	70	-7.89
9	CH_606	03_78E_010	49	Cloud	45	Cloud	Cloud	Cloud	45	-8.16
10	JK_99	01_43J_021	1238	1100	1038	1039	933	915	1100	-11.15
11	UK_1	02_53K_001	6790	5721	Cloud	5288	5438	6029	6029	-11.21
12	CH_589	03_77P_018	154	115	134	Cloud	134	131	134	-12.99
13	CH_1106	03_91C_078	48	Cloud	Cloud	41	Cloud	Cloud	41	-14.58
14	CH_780	03_82G_019	59	50	Cloud	Cloud	Cloud	Cloud	50	-15.25
15	CH_598	03_78A_018	67	Cloud	49	55	Cloud	Cloud	55	-17.91
16	CH_256	02_77D_001	5831	4765	4686	4422	Cloud	Cloud	4765	-18.28
17	CH_1085	03_91C_052	64	Cloud	Cloud	Cloud	Cloud	50	50	-21.88
18	JK_196	01_52I_004	124	Cloud	84	85	87	71	87	-29.84
19	CH_481	03_77H_007	924	Cloud	Cloud	582	Cloud	Cloud	582	-37.01
20	CH_259	02_77D_004	1273	Cloud	Cloud	788	Cloud	Cloud	788	-38.10
21	UK_10	02_53P_002	734	Dry	Cloud	447	447	426	447	-39.10
22	JK_188	01_52E_001	51	Cloud	10	Dry	Dry	Dry	10	-80.39

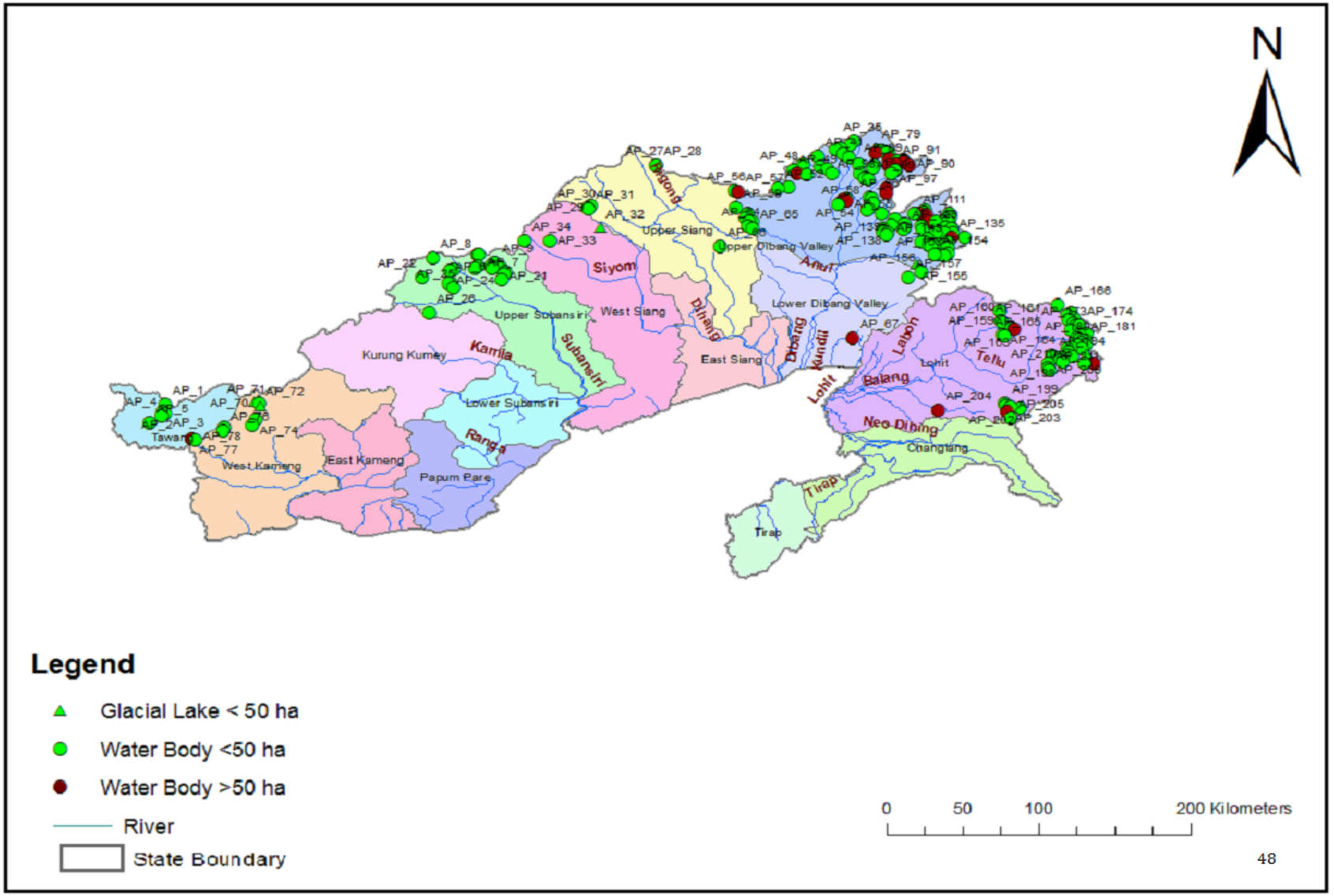

Figure 3 (a): Glacial Lakes & Water Bodies in Arunachal Pradesh

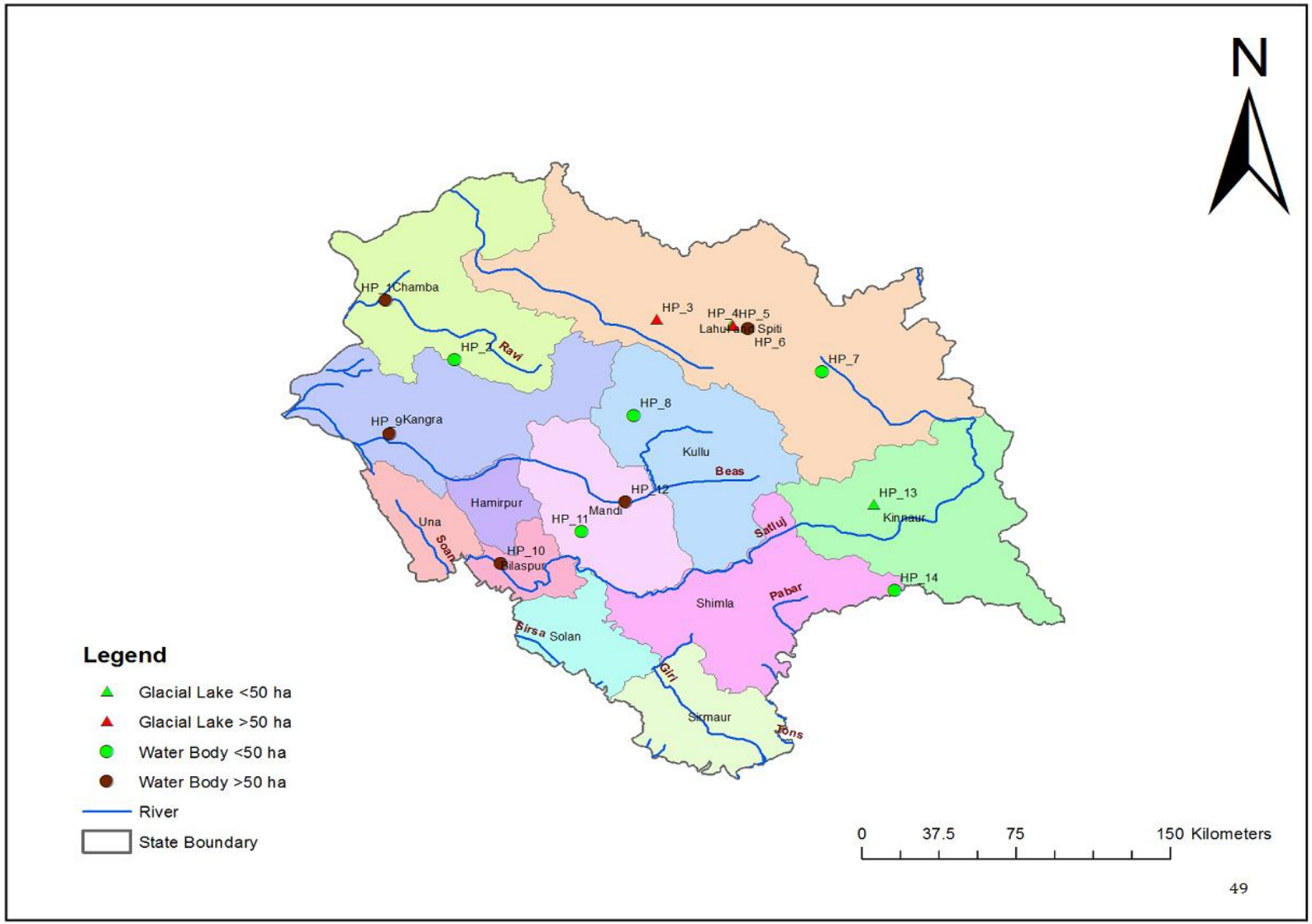

Figure 3 (b): Glacial Lakes & Water Bodies in Himachal Pradesh

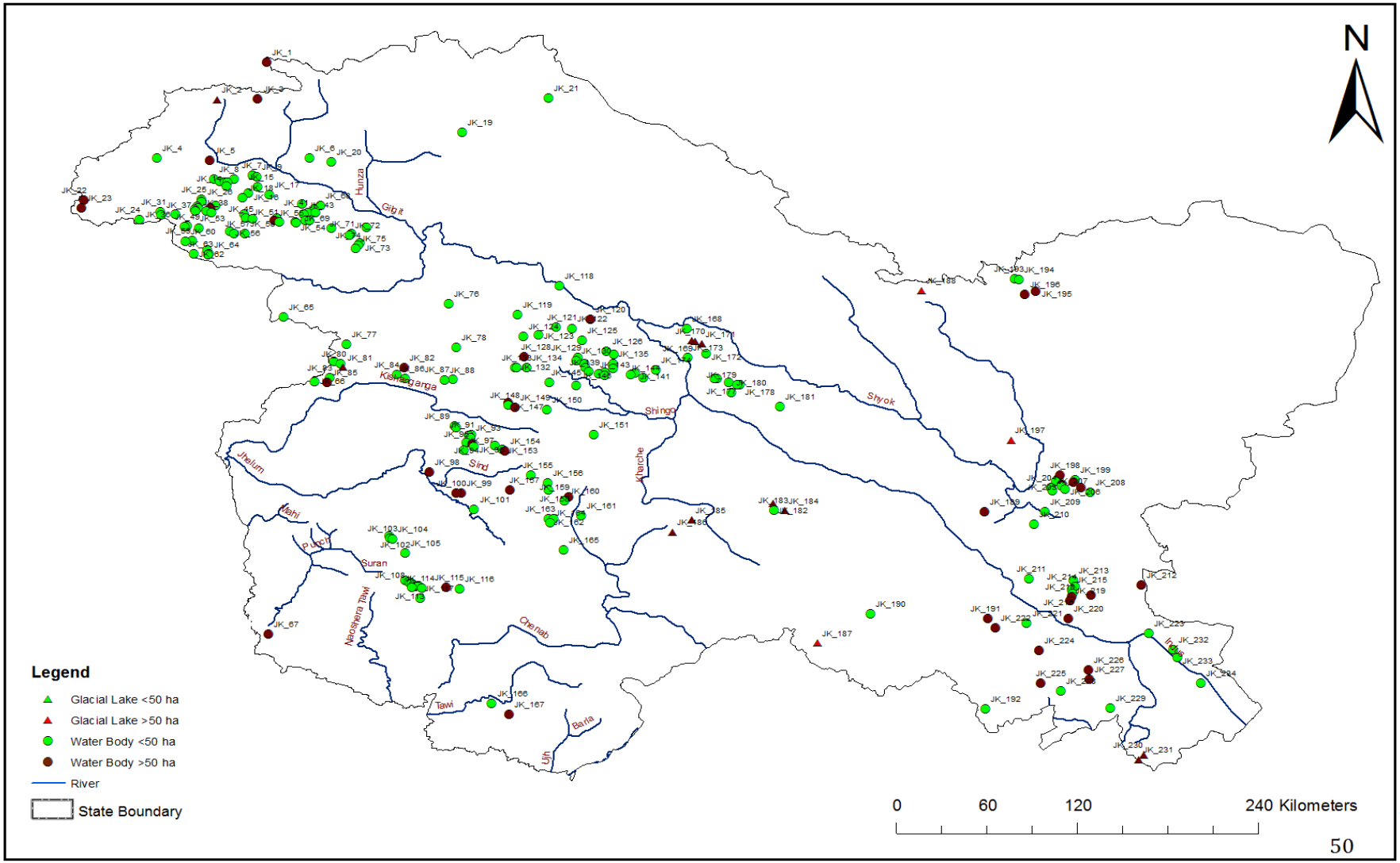

Figure 3 (c): Glacial Lakes & Water Bodies in Jammu & Kashmir

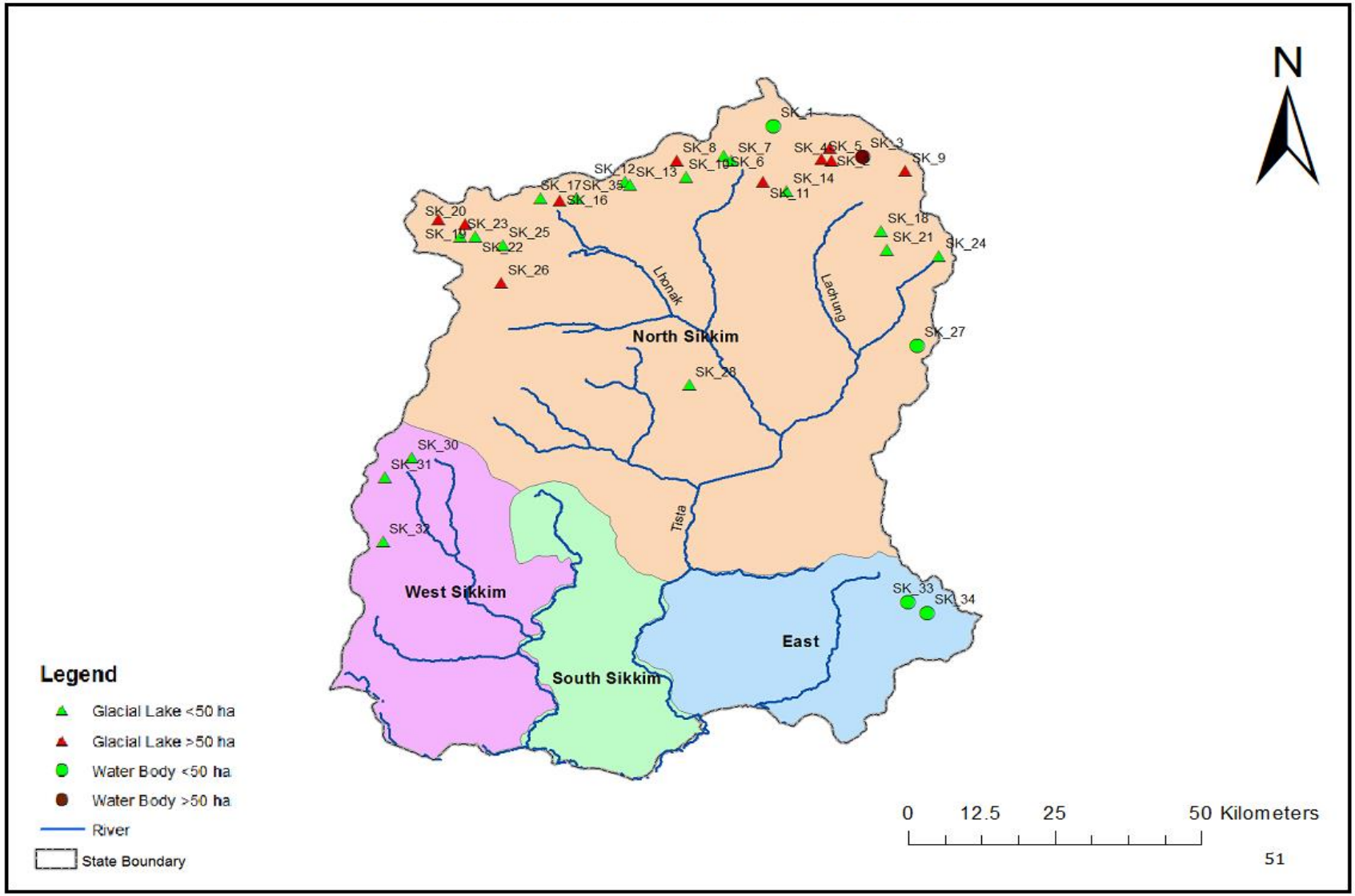

Figure 3 (d): Glacial Lakes & Water Bodies in Sikkim

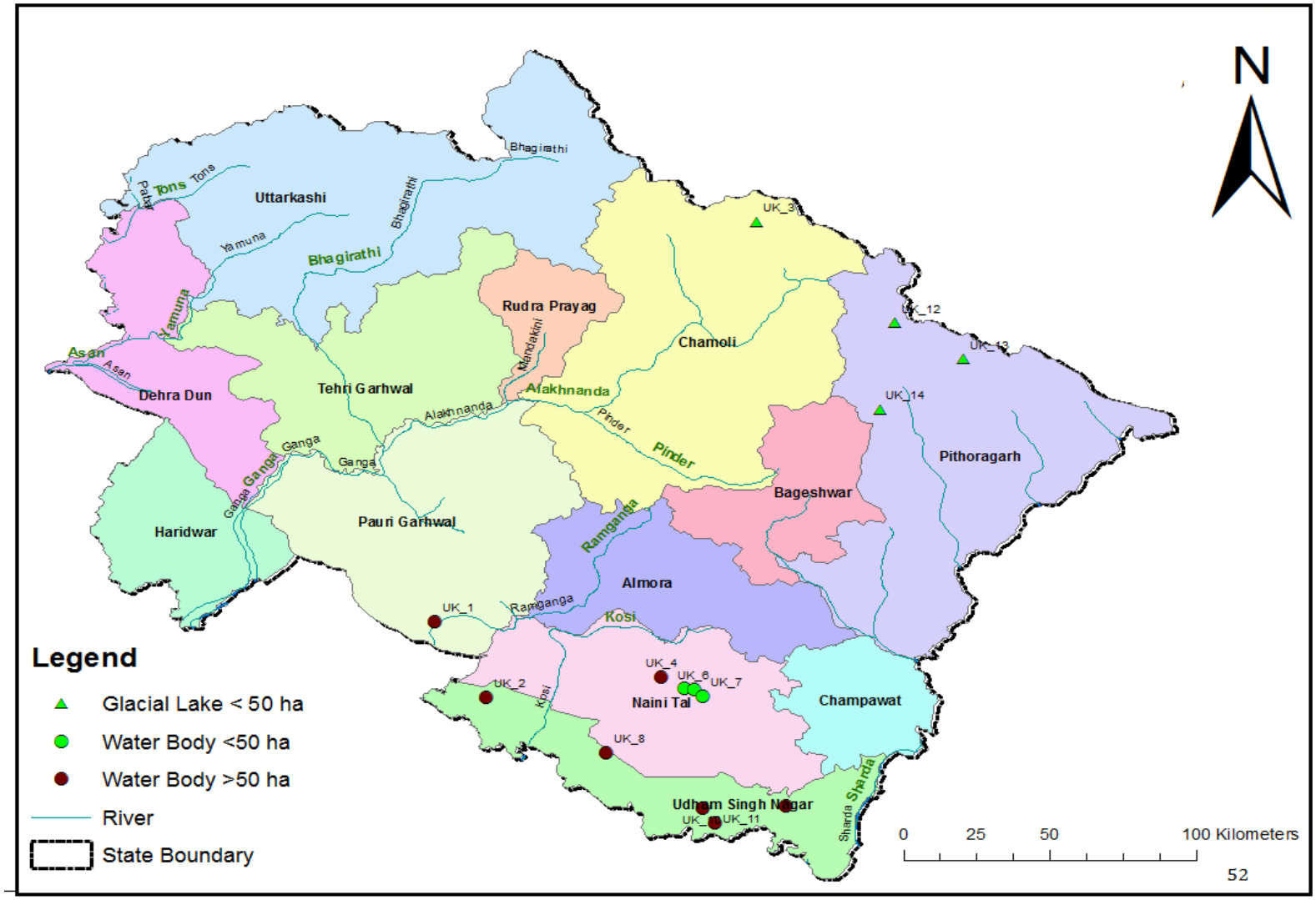

Figure 3 (e): Glacial Lakes & Water Bodies in Uttrakhand

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