Monitoring of Glacial Lakes & Water Bodies in the Himalayan Region of Indian River Basins for 2018 (June to October)

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New Delhi

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12.	Abstract (with Keywords) : This document presents the details on monitoring of glacial lakes and water bodies in the Indian Himalayan region during the month from June to October 2018 using satellite remote sensing technique including the data used and methodology followed in this study. Keywords: Glacial Lake, Water Bodies, Himalayas, Remote Sensing, GLOF, AWiFS			

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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	Uttrakhand
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 2018 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 2018.

***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 2018 were computed and compared with inventory area of 2009. The data monitored during June to October 2018 is summarised below in tabular form:-*

Month	Monitored	Cloud
Jun-18	380	97
Jul-18	294	183
Aug-18	208	269
Sep-18	285	192
Oct-18	320	157

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 catchment 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 to October, 2018
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 2011-2018. 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 to October, 2018.

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 2018 is given in Table 1.

Table 1. List of satellite data used

June Satellite data			
S No	**Path**	**Row**	**Date**
1	113	51	22- June -18
2	110	51	07- June -18
3	105	51	06- June -18
4	99	49	24- June -18
5	95	47	04-June-18
6	91	46	08–June-18
July Satellite data			
S No	**Path**	**Row**	**Date**
1	113	51	16 - July -18
2	111	51	06- July -18
3	106	51	05 - July -18
4	102	49	09 - July -18
5	97	48	08 -July-18

6	92	46	07 –July-18
August Satellite data			
S No	**Path**	**Row**	**Date**
1	113	51	09 - August -18
2	110	51	18 - August -18
3	109	51	13 - August -18
4	102	48	02 - August -18
5	95	47	15 -August-18
6	91	46	19 –August-18
September Satellite data			
S No	**Path**	**Row**	**Date**
1	112	51	21 - September -18
2	111	51	16 - September -18
3	109	51	30 - September -18
4	104	51	29 - September -18
5	97	48	18 -September-18
6	91	46	12 –September-18
October Satellite data			
S No	**Path**	**Row**	**Date**
1	113	51	20 - October -18
2	111	51	10 - October -18
3	108	51	19 - October -18
4	104	51	23 - October -18
5	97	48	12 -October-18
6	91	46	06 –October-18

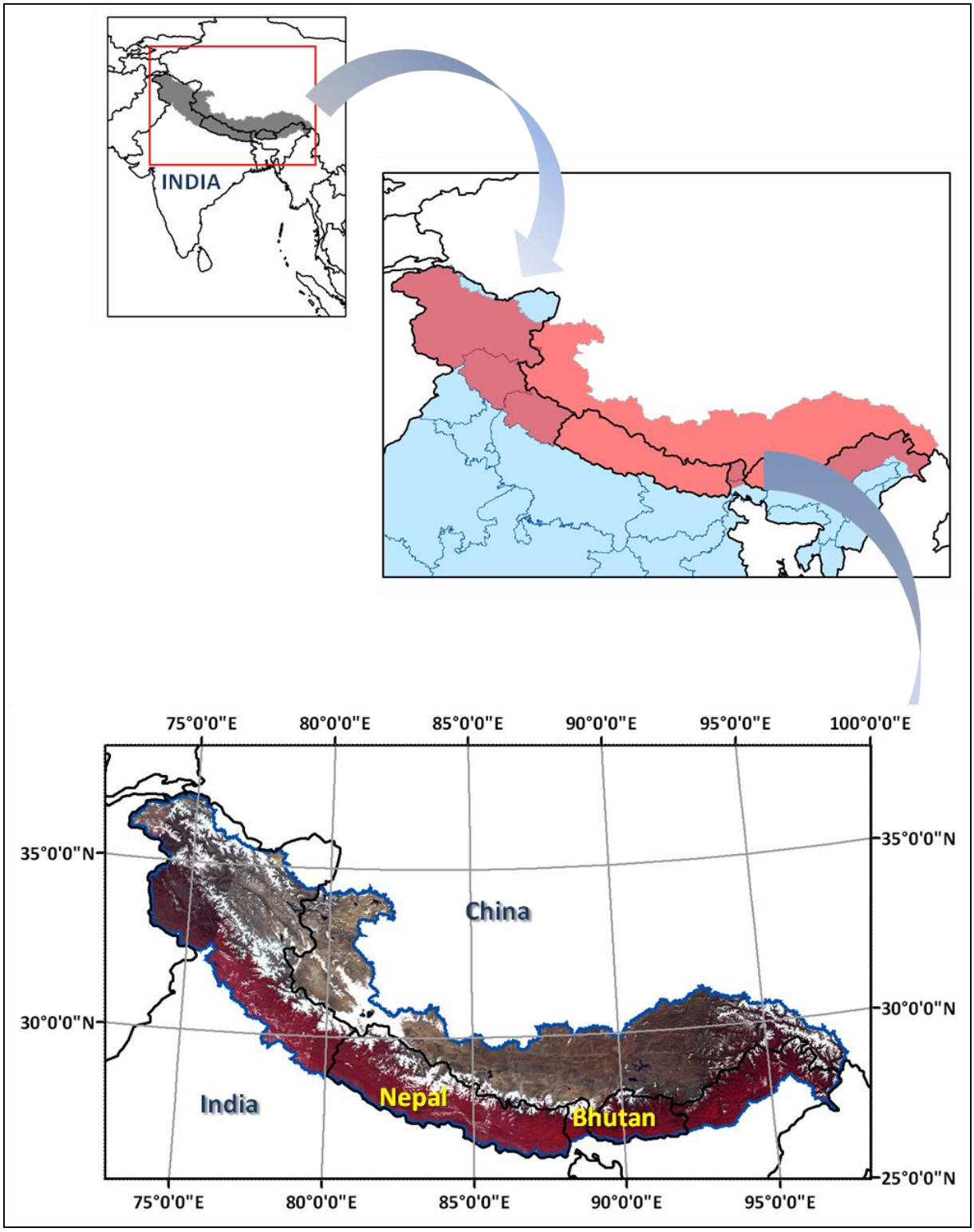

Figure 1. Index map of study area

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 planimetrically 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 2018 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 2018

The analysis of water spread area of glacial lakes & water bodies monitored in June 2018 was done for only 380 glacial lakes & water bodies using cloud free satellite data. Based on this, it is found that

- 29 glacial lakes & water bodies have shown decrease in water spread area, 156 have shown increase, 195 have not shown any significant change (± 5%), while 1 water bodies (Lake ID: 01_52E_001) have dried up.
- 04 out of 29 have decreased by more than 20% and 62 out of 156 water bodies have shown increase in area by more than 20%.

July 2018

The analysis of water spread area of glacial lakes & water bodies monitored in July 2018 was done for only 294 glacial lakes & water bodies using cloud free satellite data. Based on this, it is found that

- 32 glacial lakes & water bodies have shown decrease in water spread area, 129 have shown increase, 133 have not shown any significant change (± 5%), while 1 water bodies (Lake ID: 01_52E_001) have dried up.
- 06 out of 32 have decreased by more than 20% and 50 out of 129 water bodies have shown increase in area by more than 20%.

August 2018

The analysis of water spread area of glacial lakes & water bodies monitored in August 2018 was done for only 208 glacial lakes & water bodies using cloud free satellite data. Based on this, it is found that

- 13 glacial lakes & water bodies have shown decrease in water spread area, 117 have shown increase, 78 have not shown any significant change (± 5%), while 1 water bodies (Lake ID: 01_52E_001) have dried up.
- 01 out of 13 have decreased by more than 20% and 54 out of 117 water bodies have shown increase in area by more than 20%.

September 2018

The analysis of water spread area of glacial lakes & water bodies monitored in September 2018 was done for only 285 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, 175 have shown increase, 95 have not shown any significant change (± 5%), while 1 water bodies (Lake ID: 01_52E_001) have dried up.

- 02 out of 15 have decreased by more than 20% and 80 out of 175 water bodies have shown increase in area by more than 20%.

October 2018

The analysis of water spread area of glacial lakes & water bodies monitored in October 2018 was done for only 320 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, 192 have shown increase, 103 have not shown any significant change (± 5%), while 1 water bodies (Lake ID: 01_52E_001) have dried up.
- 06 out of 25 have decreased by more than 20% and 83 out of 192 water bodies have shown increase in area by more than 20%.

Table 2 List of glacial lakes & water bodies monitored during the year 2018

Month	Monitored	Increased			Decreased			No Change
		> 20%	< 20%	Total	> 20%	< 20%	Total	
Jun-18	380	62	94	156	4	25	29	195
Jul-18	294	50	79	129	6	26	32	133
Aug-18	208	54	63	117	1	12	13	78
Sep-18	285	80	95	175	2	13	15	95
Oct-18	320	83	109	192	6	19	25	103

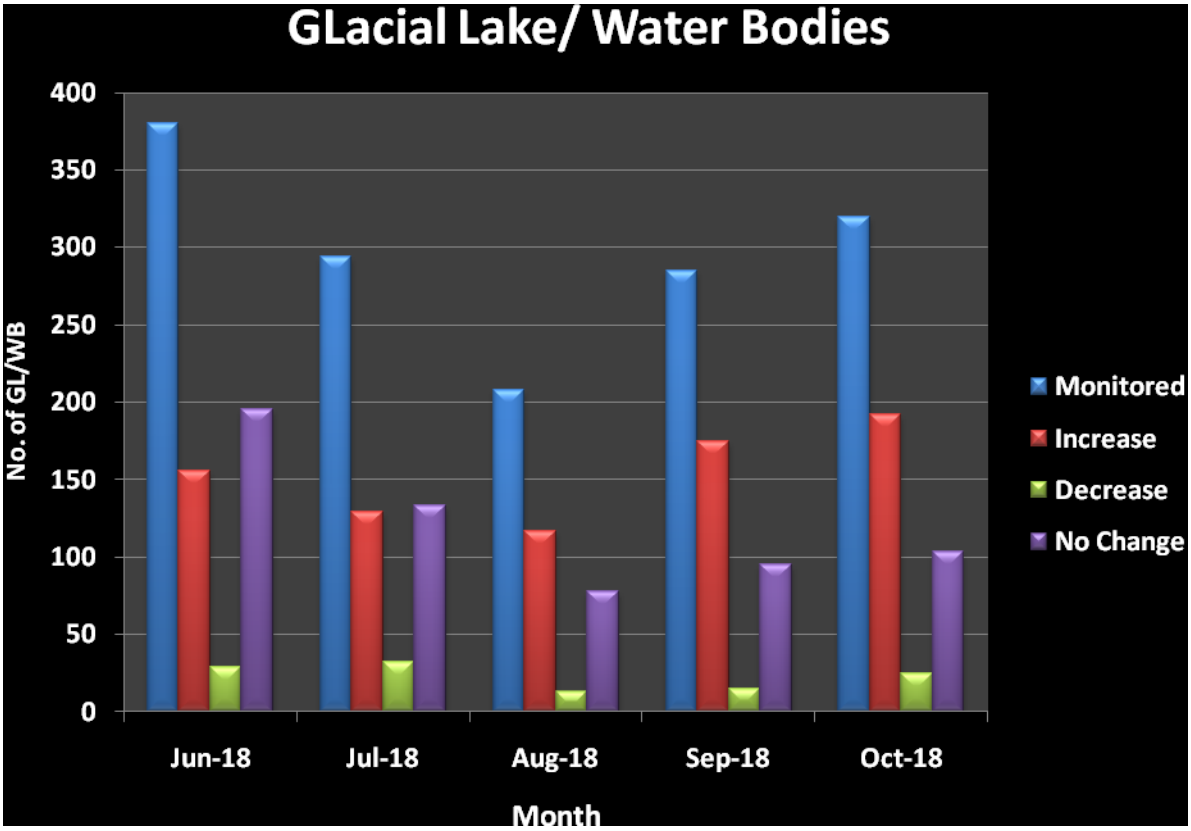

Figure 2: Glacial Lakes/ Water Bodies Monitored during the year 2018

5. Conclusions

5.1 Conclusions

i. 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.**

ii. 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. **These Glacial lakes & water bodies requires continuous monitoring in order to avoid any future disaster.**

iii. GL & WB in **Jammu & Kashmir** (*Lake Id: 01_52H_004, 01_61C_005, 01_52H_002, 01_52C_003, 01_61D_003, 01_43K_014, 01_52O_003);* **Himachal Pradesh** (*Lake Id: 01_52H_004, 01_52L_008, 01_53E_001, 01_62F_010, 01_52H_002, 01_52C_003, 01_61D_003, 01_43K_014, 01_52O_003*); **Punjab** (*Lake Id: 01_52L_008, 01_53E_001, 01_62F_010*); **Arunachal Pradesh & Assam** (*Lake Id: 03_82J_019, 03_71H_014, 03_77L_042, 03_82J_004, 03_62J_031, 03_71K_009, 03_62J_016, 03_91C_024, 03_62J_032, 03_82J_008*); **Bihar** (*Lake Id: 02_72I_004, 02_72I_011, 02_71L_034, 02_78A_004, 02_71H_012, 02_71D_004, 02_72E_001*) and **Sikkim & Assam** (*Lake Id: 03_78A_003, 03_78A_014, 03_78A_013, 03_77D_005, 03_78A_001*) have shown Increase in water spread area (>40%), thereby requiring regular monitoring as shown in Table 3(a).

Table 3 (a): List of GL & WB that have shown INCREASE in water spread area (> 40%) (1/2)

S. No.	UID	Lake_ID	% Diff in Water Spread Area					State	Country	Basin	River	Affected State
			2018	2017	2016	2015	2014					
1	HP_5	01_52H_004	243.48	157.88	158.76	178.26	173.91	HP	India	Indus	Chenab	HP & j&k
2	SK_11	03_78A_003	220.69	Cloud	cloud	-5.17	-27.59	Sikkim	India	Brahmaputra	Teesta	Sikkim & Assam
3	CH_33	01_61C_005	176.62	-54.98	cloud	76.26	33.81		China	Indus	Indus	Jammu & Kashmir
4	CH_1	01_52L_008	147.54	85.84	cloud	-8.00	18.00		China	Indus	Satluj	HP & Punjab
5	HP_12	01_53E_001	90.54	81.65	14.11	15.28	20.83	HP	India	Indus	Beas	Punjab & HP
6	CH_101	01_62F_010	85.66	49.72	cloud	13.33	8.89		China	Indus	Satluj	HP & Punjab

Table 3 (a): List of GL & WB that have shown INCREASE in water spread area (> 40%) (2/2)

S. No.	UID	Lake_ID	% Diff in Water Spread Area					State	Country	Basin	River	Affected State
			2018	2017	2016	2015	2014					
7	CH_849	03_82J_019	80.19	Cloud	cloud	33.33	-8.89		China	Brahmaputra		Arunachal Pradesh & Assam
8	CH_423	03_71G_014	78.57	22.21	-18.73	16.43	20.71		China	Brahmaputra		Arunachal Pradesh & Assam
9	CH_244	02_72I_004	75.21	71.92	cloud	26.45	15.70		China	Ganga	Sun Kosi	Bihar
10	NP_64	02_72I_011	75.00	44.68	cloud	23.00	14.00	Nepal	Nepal	Ganga	Sun Kosi	Bihar
11	HP_3	01_52H_002	74.57	44.58	16.46	25.81	20.97	HP	India	Indus	Chenab	HP & j&k
12	CH_188	02_71L_034	73.91	29.97	cloud	21.74	8.70		China	Ganga	Sun Kosi	Bihar
13	JK_187	01_52C_003	73.33	27.36	14.49	24.44	8.89	J&K	India	Indus	Indus	HP & J&K
14	SK_20	03_78A_014	65.96	5.20	cloud	40.43	36.17	Sikkim	India	Brahmaputra	Teesta	Sikkim & Assam
15	CH_55	01_61D_003	63.42	66.97	cloud	-4.35	0.00		China	Indus	Indus	J&K & HP
16	CH_551	03_77L_042	62.00	Cloud	cloud	28.00	26.00		China	Brahmaputra	Kuri Chu	Arunachal Pradesh & Assam
17	CH_834	03_82J_004	57.58	45.70	cloud	34.13	11.64		China	Brahmaputra		Arunachal Pradesh & Assam
18	CH_270	02_78A_004	57.14	24.71	cloud	10.71	8.33		China	Ganga	Arun Kosi	Bihar
19	SK_19	03_78A_013	57.07	28.29	cloud	28.57	14.29	Sikkim	India	Brahmaputra	Teesta	Sikkim & Assam
20	CH_132	02_71H_012	56.18	42.15	cloud	41.57	34.83		China	Ganga	Arun Kosi	Bihar
21	CH_303	03_62J_031	46.99	36.51	7.52	15.66	2.41		China	Brahmaputra		Arunachal Pradesh & Assam
22	CH_432	03_71K_009	46.47	35.30	-15.53	0.00	11.76		China	Brahmaputra		Arunachal Pradesh & Assam
23	NP_45	02_71D_004	45.95	39.29	cloud	20.27	14.86	Nepal	Nepal	Ganga	Trisuli	Bihar
24	CH_288	03_62J_016	43.18	9.75	cloud	9.09	-2.27		China	Brahmaputra		Arunachal Pradesh & Assam
25	SK_5	03_77D_005	41.77	-23.83	cloud	10.13	7.59	Sikkim	India	Brahmaputra	Teesta	Sikkim & Assam
26	NP_57	02_72E_001	41.55	20.90	cloud	2.82	5.63	Nepal	Nepal	Ganga	Baghmati	Bihar
27	JK_115	01_43K_014	41.07	23.25	14.65	16.07	13.39	J&K	India	Indus	Jhelum	J&K & HP
28	SK_9	03_78A_001	40.78	Cloud	cloud	5.13	0.64	Sikkim	India	Brahmaputra	Teesta	Sikkim & Assam
29	CH_1075	03_91C_024	40.68	31.50	cloud	16.74	8.37		China	Brahmaputra		Arunachal Pradesh & Assam
30	CH_304	03_62J_032	40.59	21.32	-10.57	3.90	0.00		China	Brahmaputra		Arunachal Pradesh & Assam
31	CH_6	01_52O_003	40.54	48.13	cloud	22.30	42.57		China	Indus	Indus	J&K & HP
32	CH_838	03_82J_008	40.40	Cloud	cloud	14.74	12.82		China	Brahmaputra		Arunachal Pradesh & Assam

Table 3 (b) – Comparison of Water Spread Area for lakes showing INCREASE in water spread area (>20%) from 2014 – 2018 with inventory area (1/4)

S.No.	UID	Lake_ID	Water spread area in Ha	% Diff in Water Spread Area				
			2009 (Inventory)	2018	2017	2016	2015	2014
1	HP_5	01_52H_004	46	243.48	157.88	158.76	178.26	173.91
2	JK_3	01_42H_003	97	21.65	4.94	cloud	-2.06	-6.19
3	SK_11	03_78A_003	58	220.69	Cloud	cloud	-5.17	-27.59
4	CH_385	03_62O_040	107	21.25	22.96	cloud	25.23	-4.67
5	CH_33	01_61C_005	139	176.62	-54.98	cloud	76.26	33.81
6	CH_517	03_77K_015	108	21.21	-0.13	cloud	0.00	-0.93
7	CH_1	01_52L_008	50	147.54	85.84	cloud	-8.00	18.00
8	CH_80	01_62E_005	189	21.17	4.74	cloud	-2.65	-5.29
9	HP_12	01_53E_001	72	90.54	81.65	14.11	15.28	20.83
10	BH_19	03_77L_044	123	21.14	-14.07	cloud	0.00	-6.50
11	CH_101	01_62F_010	45	85.66	49.72	cloud	13.33	8.89
12	JK_67	01_43G_001	22154	20.80	21.20	-9.75	23.35	18.98
13	CH_849	03_82J_019	45	80.19	Cloud	cloud	33.33	-8.89
14	CH_893	03_82K_037	55	20.75	Cloud	cloud	-7.27	-16.36
15	CH_423	03_71G_014	140	78.57	22.21	-18.73	16.43	20.71
16	CH_626	03_82A_007	85	20.72	-7.05	cloud	1.18	4.71
17	CH_244	02_72I_004	121	75.21	71.92	cloud	26.45	15.70
18	BH_14	03_77L_035	58	20.69	Cloud	cloud	1.72	8.62
19	NP_64	02_72I_011	100	75.00	44.68	cloud	23.00	14.00
20	CH_377	03_62O_032	49	20.41	31.10	-12.96	0.00	8.16
21	HP_3	01_52H_002	62	74.57	44.58	16.46	25.81	20.97
22	SK_3	03_77D_003	96	20.40	7.90	cloud	1.04	11.46
23	CH_188	02_71L_034	46	73.91	29.97	cloud	21.74	8.70
24	CH_262	02_77D_007	54	20.37	1.26	cloud	-1.85	0.00
25	JK_187	01_52C_003	45	73.33	27.36	14.49	24.44	8.89
26	SK_20	03_78A_014	94	65.96	5.20	cloud	40.43	36.17
27	CH_55	01_61D_003	46	63.42	66.97	cloud	-4.35	0.00
28	CH_551	03_77L_042	50	62.00	Cloud	cloud	28.00	26.00
29	CH_834	03_82J_004	378	57.58	45.70	cloud	34.13	11.64
30	CH_270	02_78A_004	84	57.14	24.71	cloud	10.71	8.33
31	SK_19	03_78A_013	63	57.07	28.29	cloud	28.57	14.29
32	CH_132	02_71H_012	89	56.18	42.15	cloud	41.57	34.83
33	CH_303	03_62J_031	166	46.99	36.51	7.52	15.66	2.41
34	CH_432	03_71K_009	170	46.47	35.30	-15.53	0.00	11.76
35	NP_45	02_71D_004	74	45.95	39.29	cloud	20.27	14.86
36	CH_288	03_62J_016	44	43.18	9.75	cloud	9.09	-2.27

Note: Glacial Lake & Water Bodies are not showing continuous increase in water spread area

Table 3 (b) – Comparison of Water Spread Area for lakes showing INCREASE in water spread area (>20%) from 2014 – 2018 with inventory area (2/4)

S.No.	UID	Lake_ID	Water spread area in Ha	% Diff in Water Spread Area				
			2009 (Inventory)	2018	2017	2016	2015	2014
37	SK_5	03_77D_005	79	41.77	-23.83	cloud	10.13	7.59
38	NP_57	02_72E_001	142	41.55	20.90	cloud	2.82	5.63
39	JK_115	01_43K_014	112	41.07	23.25	14.65	16.07	13.39
40	SK_9	03_78A_001	156	40.78	Cloud	cloud	5.13	0.64
41	CH_1075	03_91C_024	239	40.68	31.50	cloud	16.74	8.37
42	CH_304	03_62J_032	77	40.59	21.32	-10.57	3.90	0.00
43	CH_6	01_52O_003	148	40.54	48.13	cloud	22.30	42.57
44	CH_838	03_82J_008	156	40.40	Cloud	cloud	14.74	12.82
45	CH_271	02_78A_005	89	39.14	29.66	cloud	15.73	25.84
46	CH_165	02_71L_010	47	38.30	9.92	cloud	10.64	34.04
47	CH_422	03_71G_013	244	37.30	19.99	cloud	1.23	25.41
48	CH_552	03_77L_043	181	37.02	Cloud	cloud	23.76	8.84
49	CH_298	03_62J_026	103	36.89	24.70	6.96	10.68	9.71
50	NP_78	02_72I_025	106	35.85	17.07	cloud	6.60	2.83
51	CH_66	01_61H_001	282	35.60	13.30	-2.60	21.28	-15.25
52	CH_159	02_71L_004	86	35.26	38.86	cloud	12.79	9.30
53	CH_38	01_61C_010	88	35.23	27.78	cloud	9.09	4.55
54	CH_235	02_71P_047	71	35.21	20.64	cloud	16.90	5.63
55	CH_975	03_82N_004	92	35.10	15.77	cloud	10.87	0.00
56	JK_159	01_43N_032	49	34.69	30.08	13.26	12.24	8.16
57	NP_19	02_62J_003	49	34.69	Cloud	cloud	24.49	0.00
58	CH_251	02_72M_005	74	33.97	6.80	cloud	1.35	-1.35
59	CH_269	02_78A_003	124	33.87	22.35	cloud	14.52	6.45
60	CH_488	03_77H_018	80	33.75	-20.68	cloud	18.75	-1.25
61	CH_39	01_61C_011	408	33.33	27.30	cloud	12.50	0.49
62	CH_420	03_71G_011	1192	33.05	7.27	cloud	3.10	3.78
63	CH_1076	03_91C_025	97	32.99	7.47	cloud	3.09	4.12
64	CH_207	02_71P_019	48	32.50	-29.88	cloud	27.08	37.50
65	HP_1	01_52D_001	688	32.25	29.05	-4.60	8.58	9.45
66	CH_128	02_71H_008	94	31.91	14.98	cloud	18.09	6.38
67	CH_584	03_77P_013	53	31.90	-7.21	-4.64	3.77	-5.66
68	CH_231	02_71P_043	66	31.82	11.15	cloud	3.03	-9.09
69	BH_99	03_78I_018	63	31.75	-18.51	cloud	11.11	1.59
70	CH_835	03_82J_005	67	31.34	4.90	cloud	14.93	-11.94
71	SK_4	03_77D_004	106	31.13	22.23	cloud	11.32	7.55
72	CH_306	03_62K_002	45	31.11	7.27	0.18	2.22	8.89

Note: Glacial Lake & Water Bodies are not showing continuous increase in water spread area

Table 3 (b) – Comparison of Water Spread Area for lakes showing INCREASE in water spread area (>20%) from 2014 – 2018 with inventory area (3/4)

S.No.	UID	Lake_ID	Water spread area in Ha	% Diff in Water Spread Area				
			2009 (Inventory)	2018	2017	2016	2015	2014
73	BH_12	03_77L_030	79	30.22	-89.67	cloud	5.06	0.00
74	CH_53	01_61D_001	70	30.14	28.93	cloud	8.57	7.14
75	JK_195	01_52I_003	180	29.44	24.12	23.42	17.22	Cloud
76	CH_178	02_71L_023	116	29.31	6.09	-5.41	8.62	-3.45
77	CH_313	03_62K_009	250	29.20	22.25	20.02	17.60	14.40
78	CH_181	02_71L_026	59	28.81	10.84	cloud	1.69	5.08
79	CH_484	03_77H_013	48	27.93	22.19	cloud	0.00	6.25
80	CH_396	03_71C_003	47	27.66	6.96	cloud	8.51	-4.26
81	NP_92	02_72M_016	161	27.33	14.94	cloud	-0.62	-2.48
82	CH_564	03_77O_001	154	27.13	18.96	16.72	13.64	17.53
83	SK_16	03_78A_009	54	26.74	-62.56	cloud	3.70	12.96
84	CH_155	02_71H_035	45	26.67	11.06	cloud	13.33	15.56
85	CH_492	03_77H_023	47	26.59	36.52	cloud	-2.13	-2.13
86	JK_23	01_43A_002	91	26.37	9.56	-1.57	0.00	-5.49
87	UK_8	02_53O_005	1510	26.09	21.17	cloud	2.19	-1.13
88	JK_167	01_43P_002	52	25.67	19.69	cloud	5.77	5.77
89	CH_106	02_62B_001	47	25.53	0.51	cloud	10.64	8.51
90	JK_205	01_52J_009	57	25.32	-6.53	cloud	1.75	-1.75
91	NP_86	02_72M_009	64	25.00	-8.32	cloud	-4.69	-4.69
92	CH_316	03_62K_012	73	24.66	12.35	cloud	2.74	-1.37
93	JK_82	01_43J_004	65	24.62	4.48	16.03	3.08	-4.62
94	CH_623	03_82A_004	46	24.48	1.88	cloud	0.00	2.17
95	BH_22	03_77L_051	143	24.48	-5.12	cloud	11.89	-7.69
96	CH_545	03_77L_029	45	24.44	45.50	cloud	-4.44	-15.56
97	NP_12	02_62F_019	58	24.14	-6.45	cloud	1.72	-13.79
98	CH_375	03_62O_030	97	23.71	27.54	cloud	8.25	3.09
99	CH_426	03_71K_003	72	23.61	-6.54	cloud	-4.17	-4.17
100	BH_13	03_77L_033	177	23.16	-9.93	cloud	2.82	3.95
101	CH_40	01_61C_012	290	23.13	13.89	cloud	8.28	6.21
102	JK_5	01_42H_005	52	23.08	25.11	cloud	-3.85	-7.69
103	CH_575	03_77P_004	211	22.85	3.99	-0.64	-8.53	-7.58
104	CH_78	01_62E_003	136	22.79	14.17	-2.71	20.59	8.09
105	CH_213	02_71P_025	123	22.76	15.61	cloud	0.00	-8.94
106	CH_826	03_82G_065	59	22.57	7.94	cloud	-6.78	-16.95
107	CH_215	02_71P_027	49	22.45	20.58	cloud	0.00	-2.04
108	CH_580	03_77P_009	94	22.33	18.50	-7.79	3.19	0.00

Note: Glacial Lake & Water Bodies are not showing continuous increase in water spread area

Table 3 (b) – Comparison of Water Spread Area for lakes showing INCREASE in water spread area (>20%) from 2014 – 2018 with inventory area (4/4)

S.No.	UID	Lake_ID	Water spread area in Ha	% Diff in Water Spread Area				
			2009 (Inventory)	2018	2017	2016	2015	2014
109	CH_253	02_72M_007	90	22.22	-6.50	cloud	6.67	-5.56
110	CH_621	03_82A_002	319	21.94	8.37	cloud	10.97	6.90
111	NP_67	02_72I_014	137	21.90	20.37	cloud	15.33	10.95
112	CH_30	01_61C_002	685	21.84	18.52	cloud	12.55	11.82

Note: Glacial Lake & Water Bodies are not showing continuous increase in water spread area

Table 3 (c) – Comparison of Water Spread Area for lakes showing DECREASE in water spread area (>20%) from 2014 – 2018 with inventory area

S.No.	UID	Lake_ID	Water spread area in Ha	% Diff in Water Spread Area				
			2009 (Inventory)	2018	2017	2016	2015	2014
1	SK_26	03_78A_021	56	-39.29	-87.99	cloud	14.29	-10.71
2	UK_10	02_53P_002	734	-38.56	-40.59	cloud	21.25	-41.96
3	CH_1085	03_91C_052	64	-31.00	-29.00	cloud	-20.31	Cloud
4	CH_1176	03_91H_011	50	-21.86	Cloud	cloud	-10.00	Cloud

Table 4 - Comparison of all GL & WB with change in water spread area during 2018 with Inventory area 2009

Table 4(a) – List of GL & WB that have shown INCREASE in Water Spread Area (1/11)

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
1	JK_3	01_42H_003	J&K		India	Indus	Gilgit	97	97.26	97.26	108.17	118.00	Cloud	118.00	21.65
2	JK_5	01_42H_005	J&K		India	Indus	Gilgit	52	54.44	54.44	60.86	64.00	Cloud	64.00	23.08
3	JK_22	01_43A_001	J&K		India	Indus	Gilgit	203	192.12	192.12	212.51	223.00	223.00	223.00	9.85
4	JK_23	01_43A_002	J&K		India	Indus	Gilgit	91	100.67	Cloud	111.70	115.00	115.00	115.00	26.37
5	JK_47	01_43E_023	J&K		India	Indus	Gilgit	82	81.96	Cloud	83.99	87.00	87.00	87.00	6.10
6	JK_82	01_43J_004	J&K		India	Indus	Jhelum	65	Cloud	67.91	79.18	81.00	Cloud	81.00	24.62
7	JK_120	01_43M_003	J&K		India	Indus	Shigar (Indus)	208	212.81	212.81	227.30	224.00	Cloud	227.30	9.28
8	JK_159	01_43N_032	J&K	Anantnag (Kashmir South)	India	Indus	Jhelum	49	61.96	Cloud	65.97	66.00	66.00	66.00	34.69
9	JK_111	01_43K_010	J&K	Rajauri	India	Indus	Jhelum	66	67.84	67.84	70.43	68.00	Cloud	70.43	6.72
10	JK_115	01_43K_014	J&K	Anantnag (Kashmir South)	India	Indus	Jhelum	112	138.04	138.04	151.35	158.00	158.00	158.00	41.07
11	JK_67	01_43G_001	J&K		India	Indus	Jhelum	22154	26761.00	26761.00	26761.00	Cloud	Cloud	26761.00	20.80
12	JK_167	01_43P_002	J&K	Jammu	India	Indus	Ravi	52	61.20	61.20	65.35	64.00	64.00	65.35	25.67
13	HP_1	01_52D_001	HP	Chamba	India	Indus	Ravi	688	891.67	891.67	909.90	909.00	909.00	909.90	32.25
14	HP_12	01_53E_001	HP	Mandi	India	Indus	Beas	72	118.91	118.91	137.19	131.00	131.00	137.19	90.54
15	JK_187	01_52C_003	J&K	Kargil	India	Indus	Indus	45	57.53	57.53	75.85	78.00	Cloud	78.00	73.33
16	HP_3	01_52H_002	HP	Lahul and Spiti	India	Indus	Chenab	62	92.15	92.15	108.24	107.00	107.00	108.24	74.57
17	HP_5	01_52H_004	HP	Lahul and Spiti	India	Indus	Chenab	46	145.17	145.17	153.42	158.00	Cloud	158.00	243.48
18	HP_6	01_52H_005	HP	Lahul and Spiti	India	Indus	Chenab	45	46.26	46.26	48.06	49.00	49.00	49.00	8.89
19	JK_191	01_52G_003	J&K	Ladakh (Leh)	India	Indus	Indus	1502	1517.07	1517.07	1599.13	cloud	1599.00	1599.13	6.47

Table 4(a) – List of GL & WB that have shown INCREASE in Water Spread Area (2/11)

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
20	JK_222	01_52K_014	J&K	Ladakh (Leh)	India	Indus	Indus	405	436.09	436.09	457.66	452.00	452.00	457.66	13.00
21	JK_224	01_52K_016	J&K	Ladakh (Leh)	India	Indus	Satluj	507	522.20	522.20	548.42	545.00	545.00	548.42	8.17
22	JK_218	01_52K_010	J&K	Ladakh (Leh)	India	Indus	Shyok	152	153.68	153.68	160.69	cloud	161.00	161.00	5.92
23	JK_189	01_52G_001	J&K	Ladakh (Leh)	India	Indus	Shyok	45	49.06	49.06	Cloud	50.00	50.00	50.00	11.11
24	CH_1	01_52L_008			China	Indus	Satluj	50	Cloud	Cloud	123.77	122.00	113.00	123.77	147.54
25	JK_202	01_52J_006	J&K	Ladakh (Leh)	India	Indus	Shyok	110	119.49	119.49	Cloud	113.00	113.00	119.49	8.62
26	JK_201	01_52J_005	J&K	Ladakh (Leh)	India	Indus	Shyok	44	47.13	47.13	Cloud	47.00	Cloud	47.13	7.11
27	JK_205	01_52J_009	J&K	Ladakh (Leh)	India	Indus	Shyok	57	71.43	71.43	Cloud	68.00	Cloud	71.43	25.32
28	CH_3	01_52N_001			China	Indus	Indus	11564	12311.80	12311.80	12311.80	12312.00	12312.00	12312.00	6.47
29	JK_195	01_52I_003	J&K		India	Indus	Shyok	180	228.39	228.39	Cloud	233.00	Cloud	233.00	29.44
30	CH_28	01_61B_003			China	Indus	Indus	224	234.33	234.33	237.96	235.00	235.00	237.96	6.23
31	CH_61	01_61F_004			China	Indus	Indus	36392	38261.20	38261.20	39458.20	Cloud	39390.00	39458.20	8.43
32	CH_63	01_61G_002			China	Indus	Indus	1134	1272.05	1272.05	1320.16	Cloud	1328.00	1328.00	17.11
33	CH_64	01_61G_003			China	Indus	Indus	63	63.54	63.54	69.25	72.00	72.00	72.00	14.29
34	CH_62	01_61G_001			China	Indus	Indus	85	96.39	96.39	96.06	Cloud	96.00	96.39	13.40
35	CH_30	01_61C_002			China	Indus	Indus	685	816.01	816.01	834.59	828.00	830.00	834.59	21.84
36	CH_33	01_61C_005			China	Indus	Indus	139	384.51	384.51	Cloud	344.00	344.00	384.51	176.62
37	CH_36	01_61C_008			China	Indus	Indus	151	178.30	178.30	Cloud	179.00	179.00	179.00	18.54
38	CH_38	01_61C_010			China	Indus	Indus	88	118.53	118.53	Cloud	119.00	119.00	119.00	35.23
39	CH_39	01_61C_011			China	Indus	Indus	408	523.51	523.51	Cloud	544.00	544.00	544.00	33.33
40	CH_40	01_61C_012			China	Indus	Indus	290	345.15	345.15	357.07	350.00	350.00	357.07	23.13
41	CH_43	01_61C_015			China	Indus	Indus	742	815.32	815.32	852.90	870.00	870.00	870.00	17.25

Table 4(a) – List of GL & WB that have shown INCREASE in Water Spread Area (3/11)

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
42	CH_42	01_61C_014			China	Indus	Indus	286	302.06	302.06	327.13	327.00	327.00	327.13	14.38
43	CH_44	01_61C_016			China	Indus	Indus	344	386.93	386.93	379.95	386.00	386.00	386.93	12.48
44	CH_46	01_61C_018			China	Indus	Indus	1779	2035.62	2035.62	2011.48	2047.00	2047.00	2047.00	15.06
45	CH_50	01_61C_022			China	Indus	Indus	1501	1547.22	1547.22	1575.14	Cloud	1595.00	1595.00	6.26
46	CH_49	01_61C_021			China	Indus	Indus	1155	1163.55	1163.55	1226.99	Cloud	1221.00	1226.99	6.23
47	CH_52	01_61C_024			China	Indus	Indus	4486	4999.61	4999.61	4961.64	5019.00	5019.00	5019.00	11.88
48	CH_53	01_61D_001			China	Indus	Indus	70	91.10	91.10	Cloud	Cloud	Cloud	91.10	30.14
49	CH_54	01_61D_002			China	Indus	Indus	1560	1537.30	1537.30	1530.24	1769.00	1769.00	1769.00	13.40
50	CH_66	01_61H_001			China	Indus	Indus	282	325.80	325.80	382.38	Cloud	368.00	382.38	35.60
51	CH_55	01_61D_003			China	Indus	Indus	46	70.48	70.48	75.17	75.00	75.00	75.17	63.42
52	CH_56	01_61D_004			China	Indus	Indus	550	526.70	526.70	626.14	572.00	572.00	626.14	13.84
53	CH_78	01_62E_003			China	Indus	Indus	136	160.08	160.08	166.91	167.00	167.00	167.00	22.79
54	CH_79	01_62E_004			China	Indus	Indus	233	256.21	256.21	256.38	263.00	263.00	263.00	12.88
55	CH_90	01_62E_015			China	Indus	Satluj	51	54.06	54.06	55.57	55.00	Cloud	55.57	8.95
56	CH_80	01_62E_005			China	Indus	Indus	189	203.22	203.22	229.01	213.00	206.00	229.01	21.17
57	CH_85	01_62E_010			China	Indus	Indus	156	156.61	156.61	Cloud	166.00	166.00	166.00	6.41
58	CH_88	01_62E_013			China	Indus	Indus	166	181.14	181.14	Cloud	178.00	178.00	181.14	9.12
59	CH_106	02_62B_001			China	Ganga	Karnal	47	58.32	58.32	Cloud	Cloud	59.00	59.00	25.53
60	CH_101	01_62F_010			China	Indus	Satluj	45	74.72	74.72	83.55	83.00	83.00	83.55	85.66
61	CH_288	03_62J_016			China	Brahmaputra		44	56.33	56.33	62.25	63.00	63.00	63.00	43.18
62	CH_287	03_62J_015			China	Brahmaputra		82	89.82	89.82	93.06	92.00	92.00	93.06	13.48
63	CH_285	03_62J_013			China	Brahmaputra		854	945.55	945.55	Cloud	964.00	964.00	964.00	12.88
64	CH_284	03_62J_012			China	Brahmaputra		165	172.82	172.82	183.58	186.00	186.00	186.00	12.73
65	CH_298	03_62J_026			China	Brahmaputra		103	133.86	133.86	Cloud	141.00	141.00	141.00	36.89
66	CH_303	03_62J_031			China	Brahmaputra		166	240.40	240.40	241.78	244.00	244.00	244.00	46.99

Table 4(a) – List of GL & WB that have shown INCREASE in Water Spread Area (4/11)

S. No	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
67	CH_304	03_62J_032			China	Brahmaputra		77	100.15	100.15	108.26	108.00	108.00	108.26	40.59
68	NP_19	02_62J_003	Nepal		Nepal	Ganga	Karnal	49	61.08	61.08	Cloud	66.00	66.00	66.00	34.69
69	NP_12	02_62F_019	Nepal		Nepal	Ganga	Karnal	58	68.37	68.37	Cloud	72.00	72.00	72.00	24.14
70	NP_30	02_62K_012	Nepal		Nepal	Ganga	Bheri	469	547.40	Cloud	Cloud	Cloud	Cloud	547.40	16.72
71	CH_386	03_62O_041			China	Brahmaputra		206	230.27	Cloud	Cloud	231.00	231.00	231.00	12.14
72	CH_383	03_62O_038			China	Brahmaputra		124	138.67	Cloud	Cloud	141.00	141.00	141.00	13.71
73	CH_385	03_62O_040			China	Brahmaputra		107	129.74	Cloud	Cloud	129.00	129.00	129.74	21.25
74	CH_377	03_62O_032			China	Brahmaputra		49	58.39	Cloud	Cloud	57.00	59.00	59.00	20.41
75	CH_375	03_62O_030			China	Brahmaputra		97	113.29	Cloud	Cloud	120.00	120.00	120.00	23.71
76	CH_316	03_62K_012			China	Brahmaputra		73	87.40	87.40	Cloud	91.00	91.00	91.00	24.66
77	CH_313	03_62K_009			China	Brahmaputra		250	317.21	317.21	322.77	323.00	323.00	323.00	29.20
78	CH_306	03_62K_002			China	Brahmaputra		45	52.05	52.05	58.69	59.00	59.00	59.00	31.11
79	CH_305	03_62K_001			China	Brahmaputra		370	397.05	397.05	416.80	419.00	419.00	419.00	13.24
80	CH_273	03_62J_001			China	Brahmaputra		147	152.05	152.05	153.69	158.00	158.00	158.00	7.48
81	CH_326	03_62N_009			China	Brahmaputra		288	303.56	303.56	309.45	320.00	320.00	320.00	11.11
82	CH_320	03_62N_003			China	Brahmaputra		57	53.23	53.23	55.24	60.00	64.00	64.00	12.28
83	CH_338	03_62N_021			China	Brahmaputra		197	211.52	211.52	211.08	213.00	213.00	213.00	8.12
84	CH_334	03_62N_017			China	Brahmaputra		77	86.90	Cloud	Cloud	88.00	88.00	88.00	14.29
85	CH_347	03_62O_002			China	Brahmaputra		52	49.60	Cloud	Cloud	54.00	55.00	55.00	5.77
86	CH_369	03_62O_024			China	Brahmaputra		721	842.36	842.36	852.49	865.00	865.00	865.00	19.97
87	CH_373	03_62O_028			China	Brahmaputra		932	933.77	Cloud	1005.79	1006.00	1015.00	1015.00	8.91
88	CH_388	03_62O_043			China	Brahmaputra		86	82.43	Cloud	Cloud	93.00	93.00	93.00	8.14
89	CH_396	03_71C_003			China	Brahmaputra		47	57.57	57.57	59.19	60.00	60.00	60.00	27.66

Table 4(a) – List of GL & WB that have shown INCREASE in Water Spread Area (5/11)

S. No	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
90	CH_398	03_71C_005			China	Brahmaputra		57	62.52	62.52	Cloud	63.00	63.00	63.00	10.53
91	CH_410	03_71G_001			China	Brahmaputra		720	758.80	758.80	Cloud	762.00	762.00	762.00	5.83
92	CH_403	03_71C_010			China	Brahmaputra		49	52.32	52.32	Cloud	58.00	58.00	58.00	18.37
93	CH_404	03_71C_011			China	Brahmaputra		119	137.51	137.51	Cloud	141.00	141.00	141.00	18.49
94	CH_419	03_71G_010			China	Brahmaputra		304	313.01	313.01	354.21	353.00	353.00	354.21	16.52
95	CH_423	03_71G_014			China	Brahmaputra		140	172.33	172.33	185.41	250.00	250.00	250.00	78.57
96	CH_420	03_71G_011			China	Brahmaputra		1192	1240.05	1240.05	1277.19	1586.00	1586.00	1586.00	33.05
97	CH_422	03_71G_013			China	Brahmaputra		244	308.58	308.58	327.27	335.00	335.00	335.00	37.30
98	CH_416	03_71G_007			China	Brahmaputra		191	193.87	193.87	Cloud	204.00	204.00	204.00	6.81
99	CH_432	03_71K_009			China	Brahmaputra		170	232.91	232.91	Cloud	249.00	249.00	249.00	46.47
100	CH_434	03_71K_011			China	Brahmaputra		387	390.47	390.47	Cloud	447.00	447.00	447.00	15.50
101	CH_158	02_71L_003			China	Ganga	Arun Kosi	258	278.11	278.11	Cloud	Cloud	281.00	281.00	8.91
102	CH_122	02_71H_002			China	Ganga	Arun Kosi	2152	2353.83	2353.83	2368.73	2458.00	2458.00	2458.00	14.22
103	CH_128	02_71H_008			China	Ganga	Arun Kosi	94	108.08	108.08	Cloud	124.00	124.00	124.00	31.91
104	CH_127	02_71H_007			China	Ganga	Arun Kosi	125	118.19	118.19	Cloud	134.00	134.00	134.00	7.20
105	CH_137	02_71H_017			China	Ganga	Arun Kosi	472	477.65	477.65	Cloud	501.00	501.00	501.00	6.14
106	CH_141	02_71H_021			China	Ganga	Trisuli	48	Cloud	47.65	Cloud	54.00	54.00	54.00	12.50
107	CH_135	02_71H_015			China	Ganga	Arun Kosi	506	530.25	530.25	Cloud	546.00	546.00	546.00	7.91
108	CH_132	02_71H_012			China	Ganga	Arun Kosi	89	130.59	130.59	Cloud	139.00	139.00	139.00	56.18
109	NP_45	02_71D_004	Nepal		Nepal	Ganga	Trisuli	74	Cloud	88.34	Cloud	108.00	Cloud	108.00	45.95
110	NP_36	02_62P_003	Nepal		Nepal	Ganga	Trisuli	315	331.91	Cloud	331.91	337.00	Cloud	337.00	6.98
111	NP_49	02_71D_008	Nepal		Nepal	Ganga	Trisuli	98	103.54	Cloud	Cloud	110.00	Cloud	110.00	12.24
112	NP_57	02_72E_001	Nepal		Nepal	Ganga	Baghmati	142	176.10	Cloud	Cloud	201.00	201.00	201.00	41.55

Table 4(a) – List of GL & WB that have shown INCREASE in Water Spread Area (6/11)

S. No	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
113	UK_8	02_53O_005	Uthrakhand	Udham Singh Nagar	India	Ganga	Ramganga	1510	Cloud	1829.72	1829.72	1904.00	1904.00	1904.00	26.09
114	CH_621	03_82A_002			China	Brahmaputra		319	383.76	383.76	389.00	367.00	367.00	389.00	21.94
115	CH_623	03_82A_004			China	Brahmaputra		46	57.26	57.26	Cloud	54.00	54.00	57.26	24.48
116	CH_626	03_82A_007			China	Brahmaputra		85	101.67	101.67	102.61	Cloud	98.00	102.61	20.72
117	CH_635	03_82B_009			China	Brahmaputra		156	176.24	Cloud	177.79	Cloud	178.00	178.00	14.10
118	CH_631	03_82B_005			China	Brahmaputra		195	214.12	214.12	216.11	Cloud	212.00	216.11	10.82
119	CH_630	03_82B_004			China	Brahmaputra		97	Cloud	95.49	101.71	Cloud	102.00	102.00	5.15
120	CH_628	03_82B_002			China	Brahmaputra		405	Cloud	Cloud	428.89	433.00	433.00	433.00	6.91
121	CH_722	03_82E_004			China	Brahmaputra		47	Cloud	50.45	Cloud	Cloud	53.00	53.00	12.77
122	CH_725	03_82E_007			China	Brahmaputra		71	72.48	72.48	Cloud	76.00	Cloud	76.00	7.04
123	CH_720	03_82E_002			China	Brahmaputra		659	659.34	659.34	708.27	Cloud	728.00	728.00	10.47
124	CH_564	03_77O_001			China	Brahmaputra		154	Cloud	183.20	195.78	194.00	194.00	195.78	27.13
125	CH_576	03_77P_005			China	Brahmaputra		110	118.30	118.30	110.15	109.00	109.00	118.30	7.55
126	CH_580	03_77P_009			China	Brahmaputra		94	Cloud	114.34	114.99	Cloud	103.00	114.99	22.33
127	CH_584	03_77P_013			China	Brahmaputra		53	69.90	Cloud	Cloud	Cloud	55.00	69.90	31.90
128	CH_583	03_77P_012			China	Brahmaputra		66	58.50	58.50	Cloud	Cloud	71.00	71.00	7.58
129	CH_614	03_78M_003			China	Brahmaputra	Dangme Chu	207	200.91	200.91	Cloud	222.00	222.00	222.00	7.25
130	CH_592	03_77P_021			China	Brahmaputra	Dangme Chu	53	53.43	53.43	Cloud	61.00	61.00	61.00	15.09
131	CH_552	03_77L_043			China	Brahmaputra	Kuri Chu	181	187.36	187.36	Cloud	248.00	248.00	248.00	37.02
132	CH_551	03_77L_042			China	Brahmaputra	Kuri Chu	50	Cloud	58.02	Cloud	81.00	81.00	81.00	62.00
133	CH_545	03_77L_029			China	Brahmaputra	Kuri Chu	45	49.28	Cloud	Cloud	56.00	56.00	56.00	24.44

Table 4(a) – List of GL & WB that have shown INCREASE in Water Spread Area (7/11)

S. No	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
134	CH_640	03_82B_014			China	Brahmaputra		157	167.13	167.13	165.54	Cloud	Cloud	167.13	6.45
135	CH_647	03_82B_021			China	Brahmaputra		48	55.88	55.88	55.01	Cloud	Cloud	55.88	16.42
136	CH_499	03_77J_003			China	Brahmaputra		89	88.83	88.83	Cloud	Cloud	94.00	94.00	5.62
137	CH_733	03_82F_008			China	Brahmaputra		83	89.90	Cloud	98.54	98.00	Cloud	98.54	18.73
138	CH_732	03_82F_007			China	Brahmaputra		115	134.80	134.80	128.63	127.00	Cloud	134.80	17.21
139	CH_739	03_82F_014			China	Brahmaputra		49	47.59	Cloud	Cloud	52.00	Cloud	52.00	6.12
140	CH_741	03_82F_016			China	Brahmaputra		49	54.41	Cloud	Cloud	Cloud	Cloud	54.41	11.04
141	CH_747	03_82F_022			China	Brahmaputra		103	105.88	105.88	118.68	Cloud	Cloud	118.68	15.22
142	CH_848	03_82J_018			China	Brahmaputra		99	98.16	Cloud	104.79	Cloud	Cloud	104.79	5.85
143	CH_849	03_82J_019			China	Brahmaputra		45	Cloud	Cloud	81.09	Cloud	Cloud	81.09	80.19
144	CH_770	03_82G_009			China	Brahmaputra		51	49.26	49.26	54.51	Cloud	Cloud	54.51	6.89
145	CH_893	03_82K_037			China	Brahmaputra		55	54.63	Cloud	66.41	Cloud	Cloud	66.41	20.75
146	AP_87	03_91C_040	AP		India	Brahmaputra	Luhit	94	100.17	Cloud	Cloud	Cloud	Cloud	100.17	6.57
147	CH_796	03_82G_035			China	Brahmaputra		81	89.15	Cloud	Cloud	Cloud	Cloud	89.15	10.06
148	CH_816	03_82G_055			China	Brahmaputra		62	65.54	Cloud	Cloud	Cloud	Cloud	65.54	5.71
149	CH_826	03_82G_065			China	Brahmaputra		59	72.31	Cloud	Cloud	Cloud	70.00	72.31	22.57
150	CH_835	03_82J_005			China	Brahmaputra		67	78.32	78.32	84.37	88.00	Cloud	88.00	31.34
151	CH_834	03_82J_004			China	Brahmaputra		378	579.69	579.69	595.64	587.00	Cloud	595.64	57.58
152	CH_838	03_82J_008			China	Brahmaputra		156	Cloud	175.31	219.02	Cloud	Cloud	219.02	40.40
153	CH_975	03_82N_004			China	Brahmaputra		92	Cloud	Cloud	124.29	Cloud	Cloud	124.29	35.10
154	CH_1075	03_91C_024			China	Brahmaputra		239	305.19	305.19	336.23	332.00	332.00	336.23	40.68
155	CH_1076	03_91C_025			China	Brahmaputra		97	116.09	116.09	128.60	Cloud	129.00	129.00	32.99

Table 4(a) – List of GL & WB that have shown INCREASE in Water Spread Area (8/11)

S. No	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
156	CH_1079	03_91C_033			China	Brahmaputra		153	156.29	156.29	178.64	Cloud	Cloud	178.64	16.76
157	CH_1078	03_91C_029			China	Brahmaputra		211	217.53	217.53	237.16	Cloud	Cloud	237.16	12.40
158	BH_35	03_77L_067			Bhutan	Brahmaputra	Manas Chu & Mangde Chu	78	80.98	80.98	Cloud	Cloud	85.00	85.00	8.97
159	BH_40	03_77L_072			Bhutan	Brahmaputra	Manas Chu & Mangde Chu	91	87.87	87.87	Cloud	97.00	97.00	97.00	6.59
160	BH_99	03_78I_018			Bhutan	Brahmaputra	Puna Tsang Chu	63	72.99	72.99	Cloud	80.00	83.00	83.00	31.75
161	BH_19	03_77L_044			Bhutan	Brahmaputra	Puna Tsang Chu	123	129.49	129.49	Cloud	Cloud	149.00	149.00	21.14
162	BH_22	03_77L_051			Bhutan	Brahmaputra	Puna Tsang Chu	143	153.88	153.88	Cloud	Cloud	178.00	178.00	24.48
163	BH_13	03_77L_033			Bhutan	Brahmaputra		177	212.83	212.83	215.64	218.00	218.00	218.00	23.16
164	BH_15	03_77L_037			Bhutan	Brahmaputra		542	571.93	571.93	597.71	589.00	589.00	597.71	10.28
165	BH_14	03_77L_035			Bhutan	Brahmaputra		58	Cloud	Cloud	60.38	70.00	70.00	70.00	20.69
166	BH_12	03_77L_030			Bhutan	Brahmaputra		79	Cloud	93.39	102.87	99.00	99.00	102.87	30.22
167	CH_533	03_77L_017			China	Brahmaputra		74	87.83	87.83	77.77	78.00	78.00	87.83	18.68
168	CH_530	03_77L_014			China	Brahmaputra		48	47.99	47.99	Cloud	54.00	54.00	54.00	12.50
169	CH_529	03_77L_013			China	Brahmaputra		318	Cloud	357.68	Cloud	Cloud	350.00	357.68	12.48
170	CH_525	03_77L_009			China	Brahmaputra		522	585.32	585.32	601.53	585.00	585.00	601.53	15.23
171	CH_522	03_77L_006			China	Brahmaputra		44	Cloud	Cloud	46.59	43.00	48.00	48.00	9.09
172	CH_517	03_77K_015			China	Brahmaputra		108	123.99	123.99	130.91	119.00	119.00	130.91	21.21
173	CH_426	03_71K_003			China	Brahmaputra		72	Cloud	67.29	Cloud	89.00	89.00	89.00	23.61
174	CH_438	03_71O_002			China	Brahmaputra		48	34.72	34.72	Cloud	56.00	56.00	56.00	16.67
175	CH_442	03_71O_006			China	Brahmaputra		104	120.97	120.97	Cloud	116.00	112.00	120.97	16.32
176	CH_460	03_77C_006			China	Brahmaputra		102	108.97	108.97	Cloud	113.00	113.00	113.00	10.78
177	CH_511	03_77K_009			China	Brahmaputra		69	69.57	69.57	74.56	71.00	71.00	74.56	8.06
178	CH_147	02_71H_027			China	Ganga	Sun Kosi	434	457.23	457.23	Cloud	Cloud	Cloud	457.23	5.35

Table 4(a) – List of GL & WB that have shown INCREASE in Water Spread Area (9/11)

S. No	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
179	CH_155	02_71H_035			China	Ganga	Sun Kosi	45	Cloud	Cloud	Cloud	57.00	57.00	57.00	26.67
180	CH_165	02_71L_010			China	Ganga	Sun Kosi	47	61.72	61.72	Cloud	65.00	65.00	65.00	38.30
181	CH_445	03_71O_009			China	Brahmaputra		2123	2111.41	2111.41	Cloud	2234.00	2234.00	2234.00	5.23
182	CH_446	03_71O_010			China	Brahmaputra		813	856.57	856.57	Cloud	876.00	876.00	876.00	7.75
183	CH_448	03_71P_001			China	Brahmaputra		112	Cloud	124.19	134.10	133.00	133.00	134.10	19.73
184	CH_183	02_71L_028			China	Ganga	Sun Kosi	77	79.36	Cloud	Cloud	91.00	91.00	91.00	18.18
185	CH_178	02_71L_023			China	Ganga	Arun Kosi	116	145.92	Cloud	Cloud	150.00	146.00	150.00	29.31
186	CH_181	02_71L_026			China	Ganga	Sun Kosi	59	Cloud	Cloud	Cloud	76.00	76.00	76.00	28.81
187	CH_188	02_71L_034			China	Ganga	Sun Kosi	46	Cloud	59.79	78.83	80.00	79.00	80.00	73.91
188	NP_58	02_72I_002	Nepal		Nepal	Ganga	Sun Kosi	67	Cloud	Cloud	Cloud	71.00	71.00	71.00	5.97
189	NP_62	02_72I_007	Nepal		Nepal	Ganga	Sun Kosi	56	57.51	Cloud	Cloud	64.00	64.00	64.00	14.29
190	NP_67	02_72I_014	Nepal		Nepal	Ganga	Sun Kosi	137	166.26	Cloud	Cloud	167.00	167.00	167.00	21.90
191	CH_244	02_72I_004			China	Ganga	Sun Kosi	121	202.17	202.17	206.39	212.00	212.00	212.00	75.21
192	NP_78	02_72I_025	Nepal		Nepal	Ganga	Sun Kosi	106	138.09	Cloud	Cloud	144.00	144.00	144.00	35.85
193	NP_64	02_72I_011	Nepal		Nepal	Ganga	Sun Kosi	100	159.05	159.05	159.05	175.00	175.00	175.00	75.00
194	NP_92	02_72M_016	Nepal		Nepal	Ganga	Arun Kosi	161	199.99	Cloud	Cloud	204.00	205.00	205.00	27.33
195	CH_216	02_71P_028			China	Ganga	Arun Kosi	54	60.45	Cloud	Cloud	Cloud	60.00	60.45	11.94
196	CH_235	02_71P_047			China	Ganga	Arun Kosi	71	90.76	Cloud	Cloud	96.00	96.00	96.00	35.21
197	CH_210	02_71P_022			China	Ganga	Arun Kosi	80	88.99	88.99	Cloud	82.00	82.00	88.99	11.24
198	CH_213	02_71P_025			China	Ganga	Arun Kosi	123	149.79	Cloud	Cloud	151.00	151.00	151.00	22.76
199	CH_217	02_71P_029			China	Ganga	Arun Kosi	80	92.94	Cloud	Cloud	Cloud	93.00	93.00	16.25
200	CH_231	02_71P_043			China	Ganga	Arun Kosi	66	83.98	83.98	Cloud	Cloud	87.00	87.00	31.82
201	CH_228	02_71P_040			China	Ganga	Arun Kosi	135	148.67	Cloud	Cloud	Cloud	149.00	149.00	10.37

Table 4(a) – List of GL & WB that have shown INCREASE in Water Spread Area (10/11)

S. No	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
202	CH_215	02_71P_027			China	Ganga	Arun Kosi	49	59.74	Cloud	Cloud	Cloud	60.00	60.00	22.45
203	CH_204	02_71P_016			China	Ganga	Arun Kosi	137	157.73	157.73	Cloud	156.00	156.00	157.73	15.13
204	CH_203	02_71P_015			China	Ganga	Arun Kosi	1012	1040.44	1040.44	1084.80	1120.00	1120.00	1120.00	10.67
205	CH_258	02_77D_003			China	Ganga	Arun Kosi	88	Cloud	Cloud	Cloud	95.00	95.00	95.00	7.95
206	CH_207	02_71P_019			China	Ganga	Arun Kosi	48	Cloud	63.60	Cloud	Cloud	Cloud	63.60	32.50
207	CH_264	02_77D_009			China	Ganga	Arun Kosi	58	Cloud	Cloud	Cloud	61.00	61.00	61.00	5.17
208	CH_263	02_77D_008			China	Ganga	Arun Kosi	44	49.16	Cloud	Cloud	Cloud	49.00	49.16	11.72
209	CH_262	02_77D_007			China	Ganga	Arun Kosi	54	63.12	63.12	Cloud	Cloud	65.00	65.00	20.37
210	CH_251	02_72M_005			China	Ganga	Arun Kosi	74	99.14	99.14	97.23	86.00	86.00	99.14	33.97
211	CH_252	02_72M_006			China	Ganga	Arun Kosi	71	74.26	74.26	76.61	77.00	77.00	77.00	8.45
212	CH_271	02_78A_005			China	Ganga	Arun Kosi	89	111.47	111.47	123.84	114.00	114.00	123.84	39.14
213	CH_253	02_72M_007			China	Ganga	Arun Kosi	90	104.18	Cloud	Cloud	110.00	110.00	110.00	22.22
214	NP_86	02_72M_009	Nepal		Nepal	Ganga	Tamur Kosi	64	63.30	Cloud	Cloud	80.00	80.00	80.00	25.00
215	SK_20	03_78A_014	Sikkim	North Sikkim	India	Brahmaputra	Teesta	94	137.93	137.93	Cloud	156.00	156.00	156.00	65.96
216	SK_19	03_78A_013	Sikkim	North Sikkim	India	Brahmaputra	Teesta	63	98.96	Cloud	Cloud	93.00	93.00	98.96	57.07
217	CH_269	02_78A_003			China	Ganga	Arun Kosi	124	160.18	Cloud	165.03	166.00	166.00	166.00	33.87
218	CH_270	02_78A_004			China	Ganga	Arun Kosi	84	104.76	Cloud	122.80	132.00	127.00	132.00	57.14
219	SK_16	03_78A_009	Sikkim	North Sikkim	India	Brahmaputra	Teesta	54	65.84	Cloud	68.44	67.00	67.00	68.44	26.74
220	SK_3	03_77D_003	Sikkim	North Sikkim	India	Brahmaputra	Teesta	96	115.58	115.58	Cloud	105.00	105.00	115.58	20.40
221	SK_2	03_77D_002	Sikkim	North Sikkim	India	Brahmaputra	Teesta	105	115.44	115.44	Cloud	110.00	110.00	115.44	9.94
222	SK_4	03_77D_004	Sikkim	North Sikkim	India	Brahmaputra	Teesta	106	132.66	132.66	136.04	139.00	139.00	139.00	31.13

Table 4(a) – List of GL & WB that have shown INCREASE in Water Spread Area (11/11)

S. No	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
223	SK_5	03_77D_005	Sikkim	North Sikkim	India	Brahmaputra	Teesta	79	102.11	102.11	111.36	112.00	102.00	112.00	41.77
224	SK_9	03_78A_001	Sikkim	North Sikkim	India	Brahmaputra	Teesta	156	219.62	Cloud	Cloud	192.00	192.00	219.62	40.78
225	SK_11	03_78A_003	Sikkim	North Sikkim	India	Brahmaputra	Teesta	58	Cloud	Cloud	Cloud	Cloud	186.00	186.00	220.69
226	SK_8	03_77D_008	Sikkim	North Sikkim	India	Brahmaputra	Teesta	46	51.62	Cloud	Cloud	51.00	51.00	51.62	12.21
227	CH_261	02_77D_006			China	Ganga	Arun Kosi	80	95.00	95.00	89.78	85.00	85.00	95.00	18.75
228	CH_611	03_78E_019			China	Brahmaputra		60	67.31	Cloud	Cloud	64.00	64.00	67.31	12.18
229	CH_607	03_78E_012			China	Brahmaputra		279	310.84	310.84	295.03	293.00	293.00	310.84	11.41
230	CH_605	03_78E_009			China	Brahmaputra		175	197.00	197.00	189.51	185.00	185.00	197.00	12.57
231	CH_604	03_78E_006			China	Brahmaputra		67	67.30	67.30	71.11	70.00	70.00	71.11	6.14
232	CH_606	03_78E_010			China	Brahmaputra		49	54.85	54.85	48.07	48.00	45.00	54.85	11.95
233	CH_483	03_77H_012			China	Brahmaputra		76	89.38	89.38	87.94	90.00	86.00	90.00	18.42
234	CH_484	03_77H_013			China	Brahmaputra		48	61.41	61.41	Cloud	57.00	57.00	61.41	27.93
235	CH_479	03_77H_004			China	Brahmaputra		201	216.57	216.57	Cloud	Cloud	Cloud	216.57	7.75
236	CH_488	03_77H_018			China	Brahmaputra		80	103.34	103.34	Cloud	107.00	105.00	107.00	33.75
237	CH_492	03_77H_023			China	Brahmaputra		47	59.50	59.50	58.32	Cloud	58.00	59.50	26.59
238	BH_4	03_77H_011			Bhutan	Brahmaputra		143	169.54	169.54	Cloud	160.00	160.00	169.54	18.56
239	BH_72	03_78E_028			Bhutan	Brahmaputra	Puna Tsang Chu	47	Cloud	Cloud	55.80	Cloud	Cloud	55.80	18.73
240	CH_159	02_71L_004			China	Ganga	Arun Kosi	86	116.32	116.32	Cloud	116.00	113.00	116.32	35.26
241	CH_161	02_71L_006			China	Ganga	Arun Kosi	379	408.93	408.93	Cloud	405.00	405.00	408.93	7.90
242	AP_204	03_92A_006	AP	Lohit	India	Brahmaputra	Luhit	83	Cloud	85.38	Cloud	91.00	87.00	91.00	9.64
243	AP_67	03_82P_010	AP	Lower Dibang Valley	India	Brahmaputra	Dibang	99	Cloud	Cloud	Cloud	Cloud	105.00	105.00	6.06
244	CH_575	03_77P_004			China	Brahmaputra		211	Cloud	229.17	259.21	250.00	252.00	259.21	22.85
245	CH_6	01_52O_003			China	Indus	Indus	148	144.26	153.78	Cloud	187.00	208.00	208.00	40.54

Table 4(b) – List of GL & WB that have shown DECREASE in Water Spread Area (1/2)

S. No	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
246	JK_98	01_43J_020	J&K	Baramula (Kashmir North)	India	Indus	Jhelum	191	164.25	164.25	166.27	164.00	Cloud	166.27	-12.95
247	JK_99	01_43J_021	J&K	Bagdam	India	Indus	Jhelum	1238	1083.35	1083.35	1092.91	1100.00	Cloud	1100.00	-11.15
248	JK_196	01_52I_004	J&K		India	Indus	Shyok	124	115.55	115.55	Cloud	105.00	105.00	115.55	-6.82
249	CH_59	01_61F_002			China	Indus	Indus	55	51.87	51.87	Cloud	Cloud	41.00	51.87	-5.70
250	UK_1	02_53K_001	Uthrakhand	Pauri Garhwal	India	Ganga	Ramganga	6790	5545.52	Cloud	5545.52	5721.00	5721.00	5721.00	-15.74
251	UK_2	02_53K_002	Uthrakhand	Udham Singh Nagar	India	Ganga	Ramganga	1597	1331.59	1331.59	1381.04	1465.00	1465.00	1465.00	-8.27
252	UK_10	02_53P_002	Uthrakhand	Udham Singh Nagar	India	Ganga	Ramganga	734	436.09	436.09	436.09	451.00	451.00	451.00	-38.56
253	UK_4	02_53O_001	Uthrakhand	Naini Tal	India	Ganga	Ramganga	46	Cloud	Cloud	Cloud	40.00	Cloud	40.00	-13.04
254	CH_591	03_77P_020			China	Brahmaputra	Kuri Chu	63	Cloud	Cloud	Cloud	Cloud	52.00	52.00	-17.46
255	CH_547	03_77L_032			China	Brahmaputra	Kuri Chu	88	Cloud	71.58	Cloud	Cloud	Cloud	71.58	-18.66
256	CH_850	03_82J_020			China	Brahmaputra		439	409.60	Cloud	Cloud	Cloud	Cloud	409.60	-6.70
257	CH_863	03_82K_007			China	Brahmaputra		130	121.69	Cloud	Cloud	Cloud	Cloud	121.69	-6.39
258	CH_854	03_82J_024			China	Brahmaputra		67	61.71	Cloud	Cloud	Cloud	Cloud	61.71	-7.89
259	CH_862	03_82K_006			China	Brahmaputra		52	Cloud	Cloud	Cloud	47.00	Cloud	47.00	-9.62
260	CH_780	03_82G_019			China	Brahmaputra		59	50.04	Cloud	Cloud	Cloud	Cloud	50.04	-15.19
261	CH_905	03_82K_049			China	Brahmaputra		50	Cloud	Cloud	45.94	45.00	Cloud	45.94	-8.13
262	AP_91	03_91C_045	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	113	106.10	106.10	Cloud	Cloud	Cloud	106.10	-6.11
263	CH_811	03_82G_050			China	Brahmaputra		44	40.19	40.19	Cloud	Cloud	Cloud	40.19	-8.65
264	CH_1085	03_91C_052			China	Brahmaputra	Luhit	64	44.16	Cloud	Cloud	Cloud	Cloud	44.16	-31.00
265	CH_1176	03_91H_011			China	Brahmaputra	Luhit	50	Cloud	39.07	Cloud	Cloud	Cloud	39.07	-21.86

Table 4(b) – List of GL & WB that have shown DECREASE in Water Spread Area (2/2)

S. No	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
266	BH_104	03_78I_023			Bhutan	Brahmaputra	Manas Chu & Mangde Chu	51	Cloud	Cloud	Cloud	Cloud	42.00	42.00	-17.65
267	CH_523	03_77L_007			China	Brahmaputra		1478	1364.10	1364.10	1370.67	1371.00	1371.00	1371.00	-7.24
268	CH_223	02_71P_035			China	Ganga	Arun Kosi	107	Cloud	Cloud	Cloud	Cloud	90.00	90.00	-15.89
269	CH_256	02_77D_001			China	Ganga	Arun Kosi	5831	3313.74	3313.74	Cloud	4765.00	4765.00	4765.00	-18.28
270	SK_26	03_78A_021	Sikkim	North Sikkim	India	Brahmaputra	Teesta	56	Cloud	Cloud	Cloud	Cloud	34.00	34.00	-39.29
271	CH_612	03_78E_023			China	Brahmaputra		58	Cloud	Cloud	Cloud	55.00	55.00	55.00	-5.17
272	CH_478	03_77H_003			China	Brahmaputra		208	Cloud	Cloud	Cloud	194.00	184.00	194.00	-6.73
273	CH_490	03_77H_020			China	Brahmaputra		4972	4589.81	4589.81	4679.47	4679.00	4679.00	4679.47	-5.88
274	BH_60	03_78E_007			Bhutan	Brahmaputra	Puna Tsang Chu	61	Cloud	Cloud	Cloud	Cloud	54.00	54.00	-11.48
275	AP_203	03_92A_005	AP	Lohit	India	Brahmaputra	Luhit	50	Cloud	40.58	Cloud	Cloud	Cloud	40.58	-18.85
276	AP_185	03_91H_067	AP	Lohit	India	Brahmaputra	Luhit	56	51.81	Cloud	Cloud	Cloud	Cloud	51.81	-7.49
277	AP_206	03_92E_001	AP	Lohit	India	Brahmaputra	Luhit	45	Cloud	Cloud	Cloud	Cloud	41.00	41.00	-8.89

Table 4(c) – List of GL & WB that have shown NO CHANGE in Water Spread Area (1/8)

S. No	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
278	CH_417	03_71G_008			China	Brahmaputra		60	62.86	Cloud	Cloud	62.00	62.00	62.86	4.76
279	JK_198	01_52J_002	J&K	Ladakh (Leh)	India	Indus	Shyok	67	70.16	70.16	Cloud	67.00	67.00	70.16	4.72
280	CH_168	02_71L_013			China	Ganga	Sun Kosi	64	62.16	62.16	Cloud	Cloud	67.00	67.00	4.69
281	CH_321	03_62N_004			China	Brahmaputra		878	894.21	894.21	906.82	919.00	919.00	919.00	4.67
282	CH_95	01_62F_004			China	Indus	Satluj	196	193.17	193.17	Cloud	205.00	205.00	205.00	4.59
283	JK_217	01_52K_009	J&K	Ladakh (Leh)	India	Indus	Shyok	204	213.28	213.28	Cloud	211.00	202.00	213.28	4.55
284	CH_339	03_62N_022			China	Brahmaputra		198	206.88	206.88	201.27	203.00	203.00	206.88	4.49
285	CH_527	03_77L_011			China	Brahmaputra		1209	Cloud	1201.40	1240.40	1263.00	1263.00	1263.00	4.47
286	CH_641	03_82B_015			China	Brahmaputra		75	78.24	Cloud	Cloud	Cloud	77.00	78.24	4.32
287	CH_563	03_77N_004			China	Brahmaputra		1296	1334.65	1334.65	1351.89	Cloud	1308.00	1351.89	4.31
288	CH_372	03_62O_027			China	Brahmaputra		47	44.87	44.87	45.41	49.00	49.00	49.00	4.26
289	CH_526	03_77L_010			China	Brahmaputra		47	Cloud	29.11	48.72	49.00	49.00	49.00	4.26
290	CH_590	03_77P_019			China	Brahmaputra	Dangme Chu	220	Cloud	229.21	Cloud	229.00	229.00	229.21	4.19
291	CH_778	03_82G_017			China	Brahmaputra		53	55.20	Cloud	Cloud	Cloud	Cloud	55.20	4.15
292	CH_495	03_77H_030			China	Brahmaputra		66	68.64	68.64	Cloud	68.00	63.00	68.64	3.99
293	CH_81	01_62E_006			China	Indus	Indus	524	512.24	512.24	544.80	540.00	540.00	544.80	3.97
294	CH_806	03_82G_045			China	Brahmaputra		70	72.75	Cloud	Cloud	Cloud	Cloud	72.75	3.93
295	CH_318	03_62N_001			China	Brahmaputra		14300	14412.40	14412.40	14768.90	14857.00	14857.00	14857.00	3.90
296	CH_8	01_52O_005			China	Indus	Indus	780	810.18	810.18	803.73	810.00	810.00	810.18	3.87
297	CH_847	03_82J_017			China	Brahmaputra		282	292.70	Cloud	Cloud	Cloud	Cloud	292.70	3.79
298	CH_123	02_71H_003			China	Ganga	Arun Kosi	216	216.58	216.58	222.61	224.00	224.00	224.00	3.70
299	CH_543	03_77L_027			China	Brahmaputra	Kuri Chu	163	168.98	Cloud	Cloud	Cloud	Cloud	168.98	3.67

Table 4(c) – List of GL & WB that have shown NO CHANGE in Water Spread Area (2/8)

S. No	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
300	CH_187	02_71L_032			China	Ganga	Sun Kosi	55	56.94	56.94	Cloud	Cloud	57.00	57.00	3.64
301	CH_387	03_62O_042			China	Brahmaputra		57	58.72	Cloud	Cloud	59.00	59.00	59.00	3.51
302	CH_930	03_82K_074			China	Brahmaputra		88	91.09	91.09	Cloud	Cloud	89.00	91.09	3.51
303	CH_632	03_82B_006			China	Brahmaputra		124	126.95	126.95	128.24	Cloud	Cloud	128.24	3.42
304	JK_100	01_43J_022	J&K	Baramula (Kashmir North)	India	Indus	Jhelum	60	61.29	61.29	61.75	62.00	Cloud	62.00	3.33
305	CH_729	03_82F_004			China	Brahmaputra		692	714.88	714.88	Cloud	Cloud	Cloud	714.88	3.31
306	CH_102	01_62J_001			China	Indus	Satluj	5571	5658.08	5658.08	5685.22	5752.00	5752.00	5752.00	3.25
307	CH_812	03_82G_051			China	Brahmaputra		49	50.57	Cloud	Cloud	Cloud	Cloud	50.57	3.21
308	CH_587	03_77P_016			China	Brahmaputra	Dangme Chu	251	249.88	249.88	252.12	259.00	259.00	259.00	3.19
309	CH_633	03_82B_007			China	Brahmaputra		199	205.32	Cloud	205.32	199.00	199.00	205.32	3.17
310	CH_844	03_82J_014			China	Brahmaputra		183	174.90	Cloud	188.74	Cloud	Cloud	188.74	3.13
311	CH_721	03_82E_003			China	Brahmaputra		98	Cloud	Cloud	95.04	101.00	Cloud	101.00	3.06
312	CH_755	03_82F_030			China	Brahmaputra		2675	2750.85	2750.85	2756.42	Cloud	Cloud	2756.42	3.04
313	CH_646	03_82B_020			China	Brahmaputra		49	49.43	Cloud	50.46	Cloud	50.00	50.46	2.98
314	CH_892	03_82K_036			China	Brahmaputra		69	66.70	Cloud	Cloud	71.00	Cloud	71.00	2.90
315	CH_895	03_82K_039			China	Brahmaputra		224	218.06	Cloud	230.44	Cloud	Cloud	230.44	2.87
316	CH_29	01_61C_001			China	Indus	Indus	11154	11473.20	11473.20	Cloud	11473.00	11473.00	11473.20	2.86
317	JK_212	01_52K_004	J&K		India	Indus	Shyok	5741	5904.55	5904.55	5795.00	5801.00	5801.00	5904.55	2.85
318	CH_821	03_82G_060			China	Brahmaputra		59	60.66	Cloud	Cloud	Cloud	Cloud	60.66	2.82
319	CH_709	03_82D_003			China	Brahmaputra		50	51.15	Cloud	51.40	50.00	50.00	51.40	2.79
320	CH_577	03_77P_006			China	Brahmaputra		5683	5841.66	5841.66	5840.69	5829.00	5829.00	5841.66	2.79
321	CH_429	03_71K_006			China	Brahmaputra		2096	2152.73	2152.73	Cloud	2153.00	2153.00	2153.00	2.72

Table 4(c) – List of GL & WB that have shown NO CHANGE in Water Spread Area (3/8)

S. No	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
322	JK_226	01_52L_002	J&K	Ladakh (Leh)	India	Indus	Indus	442	435.89	435.89	438.08	454.00	454.00	454.00	2.71
323	CH_481	03_77H_007			China	Brahmaputra		924	948.79	948.79	948.79	949.00	605.00	949.00	2.71
324	CH_157	02_71L_002			China	Ganga	Arun Kosi	76	77.56	77.56	Cloud	78.00	78.00	78.00	2.63
325	CH_931	03_82K_075			China	Brahmaputra		118	121.07	Cloud	Cloud	Cloud	Cloud	121.07	2.60
326	CH_1135	03_91D_080			China	Brahmaputra	Luhit	45	46.12	Cloud	Cloud	Cloud	Cloud	46.12	2.49
327	CH_77	01_62E_002			China	Indus	Indus	161	163.40	163.40	161.12	165.00	165.00	165.00	2.48
328	NP_28	02_62K_010	Nepal		Nepal	Ganga	Karnal	1051	1050.84	1050.84	Cloud	Cloud	1077.00	1077.00	2.47
329	UK_11	02_53P_003	Uthrakhand	Udham Singh Nagar	India	Ganga	Ramganga	1078	1103.61	1103.61	1103.61	1049.00	1049.00	1103.61	2.38
330	CH_156	02_71L_001			China	Ganga	Arun Kosi	85	85.71	85.71	Cloud	87.00	87.00	87.00	2.35
331	CH_384	03_62O_039			China	Brahmaputra		306	301.21	Cloud	306.48	313.00	Cloud	313.00	2.29
332	HP_9	01_53A_001	HP	Kangra	India	Indus	Beas	21867	22366.50	22366.50	22016.50	22306.00	22306.00	22366.50	2.28
333	CH_5	01_52O_002			China	Indus	Indus	135	135.66	135.66	137.37	138.00	122.00	138.00	2.22
334	CH_971	03_82L_009			China	Brahmaputra		54	Cloud	55.19	Cloud	Cloud	Cloud	55.19	2.20
335	JK_157	01_43N_030	J&K	Srinagar	India	Indus	Jhelum	86	87.87	Cloud	Cloud	87.00	Cloud	87.87	2.17
336	CH_482	03_77H_008			China	Brahmaputra		1256	1263.97	1263.97	1272.57	1283.00	1283.00	1283.00	2.15
337	CH_425	03_71K_002			China	Brahmaputra		2248	2218.73	2218.73	Cloud	2296.00	2296.00	2296.00	2.14
338	CH_785	03_82G_024			China	Brahmaputra		95	94.38	Cloud	Cloud	97.00	86.00	97.00	2.11
339	CH_710	03_82D_004			China	Brahmaputra		390	385.98	Cloud	387.98	398.00	398.00	398.00	2.05
340	CH_634	03_82B_008			China	Brahmaputra		254	259.18	259.18	Cloud	254.00	254.00	259.18	2.04
341	JK_197	01_52J_001	J&K	Ladakh (Leh)	India	Indus	Shyok	97	98.98	98.98	Cloud	98.00	Cloud	98.98	2.04

Table 4(c) – List of GL & WB that have shown NO CHANGE in Water Spread Area (4/8)

S. No	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
342	CH_4	01_52O_001			China	Indus	Shyok	65825	66457.70	66457.70	67121.90	67122.00	67122.00	67122.00	1.97
343	JK_225	01_52L_001	J&K	Ladakh (Leh)	India	Indus	Satluj	14110	14135.70	14135.70	14385.80	14386.00	14386.00	14386.00	1.96
344	CH_873	03_82K_017			China	Brahmaputra		179	180.57	Cloud	182.46	Cloud	Cloud	182.46	1.93
345	CH_69	01_62A_003			China	Indus	Indus	1355	1339.57	1339.57	1350.57	1380.00	1380.00	1380.00	1.85
346	CH_51	01_61C_023			China	Indus	Indus	633	638.25	638.25	644.23	Cloud	644.00	644.23	1.77
347	CH_166	02_71L_011			China	Ganga	Sun Kosi	58	56.98	56.98	Cloud	59.00	59.00	59.00	1.72
348	AP_90	03_91C_044	AP	Upper Dibang Valley	India	Brahmaputra	Luhit	63	64.07	Cloud	Cloud	Cloud	Cloud	64.07	1.71
349	CH_823	03_82G_062			China	Brahmaputra		58	58.96	Cloud	Cloud	Cloud	58.00	58.96	1.65
350	JK_95	01_43J_017	J&K	Baramula (Kashmir North)	India	Indus	Jhelum	164	155.85	155.85	166.65	163.00	Cloud	166.65	1.62
351	CH_60	01_61F_003			China	Indus	Indus	558	560.56	560.56	Cloud	567.00	Cloud	567.00	1.61
352	CH_936	03_82K_080			China	Brahmaputra		47	47.73	Cloud	Cloud	Cloud	Cloud	47.73	1.55
353	AP_49	03_82O_042	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	44	44.68	Cloud	Cloud	Cloud	Cloud	44.68	1.54
354	CH_1190	03_91H_025			China	Brahmaputra	Luhit	85	86.30	Cloud	Cloud	Cloud	Cloud	86.30	1.53
355	CH_148	02_71H_028			China	Ganga	Sun Kosi	200	195.75	Cloud	Cloud	203.00	203.00	203.00	1.50
356	BH_195	03_78M_020			Bhutan	Brahmaputra	Dangme Chu	65	65.86	65.86	Cloud	Cloud	Cloud	65.86	1.32
357	CH_865	03_82K_009			China	Brahmaputra		116	117.52	Cloud	Cloud	Cloud	Cloud	117.52	1.31
358	CH_94	01_62F_003			China	Indus	Satluj	40552	40986.80	40986.80	41083.70	41084.00	41084.00	41084.00	1.31
359	CH_901	03_82K_045			China	Brahmaputra		49	49.64	Cloud	Cloud	Cloud	Cloud	49.64	1.30
360	CH_524	03_77L_008			China	Brahmaputra		85	84.99	84.99	86.00	81.00	81.00	86.00	1.18
361	JK_85	01_43J_007	J&K		India	Indus	Jhelum	95	Cloud	95.33	Cloud	96.00	Cloud	96.00	1.05
362	AP_85	03_91C_038	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	113	114.16	Cloud	Cloud	Cloud	Cloud	114.16	1.03

Table 4(c) – List of GL & WB that have shown NO CHANGE in Water Spread Area (5/8)

S. No	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
363	JK_128	01_43N_001	J&K		India	Indus	Shingo (Indus)	127	127.35	127.35	128.27	127.00	Cloud	128.27	1.00
364	CH_1194	03_91H_029			China	Brahmaputra	Luhit	50	50.46	Cloud	Cloud	Cloud	Cloud	50.46	0.92
365	CH_528	03_77L_012			China	Brahmaputra		28771	29029.50	29029.50	29029.50	Cloud	28341.00	29029.50	0.90
366	CH_565	03_77O_002			China	Brahmaputra		100	99.30	99.30	100.88	Cloud	100.00	100.88	0.88
367	UK_9	02_53P_001	Uthrakh and	Udham Singh Nagar	India	Ganga	Ganga	2054	2040.00	2040.00	2040.00	2072.00	Cloud	2072.00	0.88
368	CH_589	03_77P_018			China	Brahmaputra	Dangme Chu	154	155.34	155.34	127.22	115.00	115.00	155.34	0.87
369	NP_37	02_62P_004	Nepal		Nepal	Ganga	Trisuli	406	397.53	Cloud	Cloud	409.00	Cloud	409.00	0.74
370	CH_933	03_82K_077			China	Brahmaputra		100	100.71	Cloud	Cloud	Cloud	Cloud	100.71	0.71
371	CH_896	03_82K_040			China	Brahmaputra		66	66.43	Cloud	63.78	Cloud	Cloud	66.43	0.65
372	CH_671	03_82C_016			China	Brahmaputra		54	54.35	Cloud	Cloud	Cloud	54.00	54.35	0.65
373	CH_855	03_82J_025			China	Brahmaputra		59	54.08	Cloud	59.36	Cloud	Cloud	59.36	0.61
374	JK_220	01_52K_012	J&K	Ladakh (Leh)	India	Indus	Indus	166	156.00	156.00	166.72	cloud	163.00	166.72	0.43
375	BH_36	03_77L_068			Bhutan	Brahmaputra	Kuri Chu	86	86.36	86.36	Cloud	Cloud	Cloud	86.36	0.42
376	JK_149	01_43N_022	J&K		India	Indus	Jhelum	72	71.81	71.81	72.29	70.00	70.00	72.29	0.40
377	CH_876	03_82K_020			China	Brahmaputra		77	77.28	Cloud	Cloud	Cloud	77.00	77.28	0.36
378	CH_716	03_82D_010			China	Brahmaputra	Dangme Chu	76	76.27	76.27	Cloud	Cloud	Cloud	76.27	0.35
379	JK_154	01_43N_027	J&K	Srinagar	India	Indus	Jhelum	48	48.15	48.15	44.91	46.00	Cloud	48.15	0.32
380	CH_924	03_82K_068			China	Brahmaputra		52	52.13	52.13	Cloud	Cloud	52.00	52.13	0.24
381	CH_745	03_82F_020			China	Brahmaputra		71	71.17	Cloud	Cloud	Cloud	Cloud	71.17	0.24
382	AP_109	03_91D_010	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	46	46.10	Cloud	Cloud	Cloud	Cloud	46.10	0.22
383	NP_59	02_72I_003	Nepal		Nepal	Ganga	Sun Kosi	45	45.10	Cloud	Cloud	Cloud	45.00	45.10	0.21

Table 4(c) – List of GL & WB that have shown NO CHANGE in Water Spread Area (6/8)

S. No	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
384	BH_197	03_78M_022			Bhutan	Brahmaputra	Dangme Chu	67	67.12	67.12	Cloud	Cloud	Cloud	67.12	0.18
385	CH_1089	03_91C_059			China	Brahmaputra	Dibang	98	98.14	Cloud	Cloud	Cloud	Cloud	98.14	0.14
386	CH_550	03_77L_041			China	Brahmaputra	Kuri Chu	56	56.06	56.06	Cloud	56.00	56.00	56.06	0.12
387	AP_57	03_82O_064	AP		India	Brahmaputra	Dihang	44	44.00	44.00	Cloud	Cloud	Cloud	44.00	0.01
388	CH_654	03_82B_028			China	Brahmaputra		48	47.84	Cloud	47.84	Cloud	48.00	48.00	0.00
389	NP_80	02_72I_027	Nepal		Nepal	Ganga	Sun Kosi	82	Cloud	Cloud	Cloud	Cloud	82.00	82.00	0.00
390	BH_57	03_78E_002			Bhutan	Brahmaputra	Puna Tsang Chu	58	Cloud	Cloud	Cloud	Cloud	58.00	58.00	0.00
391	BH_73	03_78E_029			Bhutan	Brahmaputra	Puna Tsang Chu	45	Cloud	16.14	Cloud	Cloud	45.00	45.00	0.00
392	CH_1065	03_91C_014			China	Brahmaputra		51	50.98	Cloud	Cloud	Cloud	Cloud	50.98	-0.04
393	CH_121	02_71H_001			China	Ganga	Arun Kosi	26825	26804.20	26804.20	26804.20	26804.00	26804.00	26804.20	-0.08
394	NP_41	02_63M_002	Nepal		Nepal	Ganga	Rapti	153	152.82	Cloud	Cloud	Cloud	Cloud	152.82	-0.12
395	CH_1205	03_91H_040			China	Brahmaputra	Luhit	51	Cloud	50.91	Cloud	Cloud	Cloud	50.91	-0.18
396	CH_93	01_62F_002			China	Indus	Satluj	333	320.91	320.91	332.34	331.00	331.00	332.34	-0.20
397	CH_588	03_77P_017			China	Brahmaputra	Dangme Chu	2345	2318.76	2318.76	2336.88	2339.00	2339.00	2339.00	-0.26
398	CH_415	03_71G_006			China	Brahmaputra		956	929.63	929.63	Cloud	953.00	953.00	953.00	-0.31
399	JK_219	01_52K_011	J&K	Ladakh (Leh)	India	Indus	Shyok	186	172.06	172.06	185.36	cloud	185.00	185.36	-0.35
400	CH_392	03_71B_002			China	Brahmaputra		8185	8156.63	8156.63	8156.63	8118.00	8118.00	8156.63	-0.35
401	CH_430	03_71K_007			China	Brahmaputra		80	79.62	79.62	Cloud	79.00	79.00	79.62	-0.47
402	CH_521	03_77L_003			China	Brahmaputra		4065	4003.73	4003.73	4029.82	Cloud	4038.00	4038.00	-0.66
403	AP_108	03_91D_009	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	47	46.57	Cloud	Cloud	Cloud	Cloud	46.57	-0.92

Table 4(c) – List of GL & WB that have shown NO CHANGE in Water Spread Area (7/8)

S. No	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
404	AP_118	03_91D_022	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	44	43.54	Cloud	Cloud	Cloud	Cloud	43.54	-1.05
405	CH_1136	03_91D_081			China	Brahmaputra	Luhit	304	300.72	Cloud	Cloud	Cloud	Cloud	300.72	-1.08
406	JK_1	01_42H_001	J&K		India	Indus	Gilgit	276	266.99	266.99	268.31	273.00	Cloud	273.00	-1.09
407	CH_418	03_71G_009			China	Brahmaputra		178	160.60	160.60	Cloud	176.00	176.00	176.00	-1.12
408	AP_100	03_91C_064	AP		India	Brahmaputra	Dibang	89	87.99	Cloud	Cloud	Cloud	Cloud	87.99	-1.14
409	AP_135	03_91D_041	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	115	113.62	Cloud	Cloud	Cloud	Cloud	113.62	-1.20
410	JK_147	01_43N_020	J&K		India	Indus	Jhelum	63	62.23	62.23	62.05	62.00	62.00	62.23	-1.22
411	HP_10	01_53A_002	HP	Bilaspur	India	Indus	Satluj	13679	13283.40	13283.40	13502.90	13503.00	13503.00	13503.00	-1.29
412	CH_92	01_62F_001			China	Indus	Satluj	25486	25079.50	25079.50	25079.50	25079.00	25079.00	25079.50	-1.59
413	AP_84	03_91C_034	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	134	131.83	Cloud	Cloud	Cloud	Cloud	131.83	-1.62
414	CH_1102	03_91C_074			China	Brahmaputra	Dibang	47	46.22	Cloud	Cloud	Cloud	Cloud	46.22	-1.66
415	JK_30	01_43E_006	J&K		India	Indus	Gilgit	71	69.82	Cloud	Cloud	68.00	Cloud	69.82	-1.66
416	CH_613	03_78E_026			China	Brahmaputra	Amo Chu	60	Cloud	55.86	Cloud	Cloud	59.00	59.00	-1.67
417	CH_1106	03_91C_078			China	Brahmaputra	Dibang	48	47.19	Cloud	Cloud	Cloud	Cloud	47.19	-1.69
418	CH_853	03_82J_023			China	Brahmaputra		105	102.86	Cloud	102.86	Cloud	103.00	103.00	-1.90
419	CH_259	02_77D_004			China	Ganga	Arun Kosi	1273	1118.27	1118.27	Cloud	1240.00	1248.00	1248.00	-1.96
420	NP_48	02_71D_007	Nepal		Nepal	Ganga	Trisuli	300	287.06	287.06	Cloud	294.00	294.00	294.00	-2.00
421	CH_622	03_82A_003			China	Brahmaputra		99	Cloud	Cloud	97.02	Cloud	96.00	97.02	-2.00
422	CH_1001	03_82N_030			China	Brahmaputra		132	129.29	Cloud	Cloud	Cloud	Cloud	129.29	-2.05
423	CH_1004	03_82N_033			China	Brahmaputra		89	87.09	Cloud	Cloud	Cloud	Cloud	87.09	-2.15
424	CH_519	03_77K_017			China	Brahmaputra		3853	3760.79	3760.79	3764.12	3764.00	3764.00	3764.12	-2.31
425	NP_76	02_72I_023	Nepal		Nepal	Ganga	Sun Kosi	81	78.66	Cloud	Cloud	79.00	75.00	79.00	-2.47

Table 4(c) – List of GL & WB that have shown NO CHANGE in Water Spread Area (8/8)

S. No	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
426	CH_73	01_62B_001			China	Indus	Satluj	440	423.73	423.73	428.55	428.00	428.00	428.55	-2.60
427	CH_617	03_78M_016			China	Brahmaputra	Dangme Chu	142	Cloud	131.85	Cloud	Cloud	138.00	138.00	-2.82
428	CH_520	03_77L_001			China	Brahmaputra		55435	53542.00	53542.00	53542.00	53542.00	53761.00	53761.00	-3.02
429	BH_188	03_78M_010			Bhutan	Brahmaputra	Dangme Chu	50	48.48	48.48	Cloud	Cloud	Cloud	48.48	-3.04
430	CH_453	03_77B_002			China	Brahmaputra		227	Cloud	207.81	220.08	Cloud	220.00	220.08	-3.05
431	AP_54	03_82O_061	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	54	Cloud	Cloud	52.35	Cloud	Cloud	52.35	-3.06
432	CH_990	03_82N_019			China	Brahmaputra		55	53.22	Cloud	Cloud	Cloud	Cloud	53.22	-3.24
433	CH_283	03_62J_011			China	Brahmaputra		401	381.45	381.45	383.65	388.00	388.00	388.00	-3.24
434	CH_665	03_82C_010			China	Brahmaputra		153	147.75	Cloud	Cloud	Cloud	148.00	148.00	-3.27
435	BH_34	03_77L_066			Bhutan	Brahmaputra	Manas Chu & Mangde Chu	148	143.08	Cloud	Cloud	Cloud	143.00	143.08	-3.33
436	CH_242	02_71P_054			China	Ganga	Arun Kosi	102	98.49	Cloud	Cloud	Cloud	98.00	98.49	-3.44
437	CH_636	03_82B_010			China	Brahmaputra		52	49.79	49.79	48.47	50.00	50.00	50.00	-3.85
438	CH_206	02_71P_018			China	Ganga	Arun Kosi	51	Cloud	45.26	Cloud	49.00	49.00	49.00	-3.92
439	CH_784	03_82G_023			China	Brahmaputra		84	80.54	80.54	Cloud	Cloud	Cloud	80.54	-4.12
440	CH_809	03_82G_048			China	Brahmaputra		55	52.59	52.59	51.39	Cloud	50.00	52.59	-4.38
441	CH_1175	03_91H_010			China	Brahmaputra	Luhit	79	75.42	Cloud	Cloud	Cloud	Cloud	75.42	-4.53
442	CH_609	03_78E_017			China	Brahmaputra		65	Cloud	Cloud	Cloud	62.00	47.00	62.00	-4.62
443	CH_476	03_77H_001			China	Brahmaputra		442	Cloud	420.59	Cloud	421.00	421.00	421.00	-4.75
444	JK_227	01_52L_003	J&K	Ladakh (Leh)	India	Indus	Indus	648	601.39	601.39	614.73	617.00	617.00	617.00	-4.78
445	BH_132	03_78I_051			Bhutan	Brahmaputra	Manas Chu & Mangde Chu	103	Cloud	Cloud	Cloud	Cloud	98.00	98.00	-4.85
446	CH_452	03_77B_001			China	Brahmaputra		52	Cloud	44.50	49.47	Cloud	49.00	49.47	-4.87

Table 4(d) - GL & WB that are CLOUD COVERED (1/2)

S. No	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
447	BH_194	03_78M_019			Bhutan	Brahmaputra	Dangme Chu	55	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
448	CH_593	03_77P_023			China	Brahmaputra	Kuri Chu	45	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
449	CH_735	03_82F_010			China	Brahmaputra		44	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
450	CH_858	03_82K_002			China	Brahmaputra		75	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
451	CH_874	03_82K_018			China	Brahmaputra		165	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
452	AP_77	03_83A_012	AP	Tawang	India	Brahmaputra	Dangme Chu	63	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
453	CH_898	03_82K_042			China	Brahmaputra		205	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
454	CH_916	03_82K_060			China	Brahmaputra		93	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
455	CH_1032	03_82O_029			China	Brahmaputra	Dihang	68	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
456	CH_1023	03_82O_016			China	Brahmaputra	Dihang	91	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
457	CH_1037	03_82O_044			China	Brahmaputra	Dihang	92	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
458	CH_1039	03_82O_047			China	Brahmaputra	Dihang	44	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
459	CH_1046	03_82O_054			China	Brahmaputra	Dibang	51	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
460	AP_55	03_82O_062	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	52	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
461	AP_92	03_91C_046	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	61	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
462	AP_95	03_91C_049	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	57	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
463	AP_89	03_91C_042	AP		India	Brahmaputra	Dibang	50	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
464	CH_959	03_82K_103			China	Brahmaputra		50	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
465	AP_101	03_91C_069	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	78	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
466	CH_1098	03_91C_070			China	Brahmaputra	Dibang	57	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
467	CH_1170	03_91H_005			China	Brahmaputra	Luhit	58	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud

Table 4(d) - GL & WB that are CLOUD COVERED (2/2)

S. No	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
468	CH_1182	03_91H_017			China	Brahmaputra	Luhit	46	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
469	BH_129	03_78I_048			Bhutan	Brahmaputra	Manas Chu & Mangde Chu	52	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
470	BH_137	03_78I_056			Bhutan	Brahmaputra	Manas Chu & Mangde Chu	76	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
471	BH_45	03_77L_077			Bhutan	Brahmaputra	Puna Tsang Chu	51	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
472	CH_149	02_71H_029			China	Ganga	Sun Kosi	474	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
473	CH_598	03_78A_018			China	Brahmaputra	Amo Chu	67	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
474	BH_166	03_78I_085			Bhutan	Brahmaputra	Puna Tsang Chu	70	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
475	AP_163	03_91D_107	AP	Lohit	India	Brahmaputra	Luhit	67	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
476	CH_1056	03_91C_005			China	Brahmaputra		86	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud

Table 4(e) - GL & WB that have become DRY

S. No	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
477	JK_188	01_52E_001	J&K	Ladakh (Leh)	India	Indus	Shyok	51	Dry	Dry	Dry	Dry	Dry	Dry	Dry

Table 5(a) - List of GL & WB that have shown INCREASE in water spread area during 2018 with Inventory area 2009 (>20%) (1/5)

S.No.	UID	Lake_ID	Water spread area in Ha							% diff
			2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
1	HP_5	01_52H_004	46	145.17	145.17	153.42	158.00	Cloud	158.00	243.48
2	JK_3	01_42H_003	97	97.26	97.26	108.17	118.00	Cloud	118.00	21.65
3	SK_11	03_78A_003	58	Cloud	Cloud	Cloud	Cloud	186.00	186.00	220.69
4	CH_385	03_62O_040	107	129.74	Cloud	Cloud	129.00	129.00	129.74	21.25
5	CH_33	01_61C_005	139	384.51	384.51	Cloud	344.00	344.00	384.51	176.62
6	CH_517	03_77K_015	108	123.99	123.99	130.91	119.00	119.00	130.91	21.21
7	CH_1	01_52L_008	50	Cloud	Cloud	123.77	122.00	113.00	123.77	147.54
8	CH_80	01_62E_005	189	203.22	203.22	229.01	213.00	206.00	229.01	21.17
9	HP_12	01_53E_001	72	118.91	118.91	137.19	131.00	131.00	137.19	90.54
10	BH_19	03_77L_044	123	129.49	129.49	Cloud	Cloud	149.00	149.00	21.14
11	CH_101	01_62F_010	45	74.72	74.72	83.55	83.00	83.00	83.55	85.66
12	JK_67	01_43G_001	22154	26761.00	26761.00	26761.00	Cloud	Cloud	26761.00	20.80
13	CH_849	03_82J_019	45	Cloud	Cloud	81.09	Cloud	Cloud	81.09	80.19
14	CH_893	03_82K_037	55	54.63	Cloud	66.41	Cloud	Cloud	66.41	20.75
15	CH_423	03_71G_014	140	172.33	172.33	185.41	250.00	250.00	250.00	78.57
16	CH_626	03_82A_007	85	101.67	101.67	102.61	Cloud	98.00	102.61	20.72
17	CH_244	02_72I_004	121	202.17	202.17	206.39	212.00	212.00	212.00	75.21
18	BH_14	03_77L_035	58	Cloud	Cloud	60.38	70.00	70.00	70.00	20.69
19	NP_64	02_72I_011	100	159.05	159.05	159.05	175.00	175.00	175.00	75.00
20	CH_377	03_62O_032	49	58.39	Cloud	Cloud	57.00	59.00	59.00	20.41
21	HP_3	01_52H_002	62	92.15	92.15	108.24	107.00	107.00	108.24	74.57
22	SK_3	03_77D_003	96	115.58	115.58	Cloud	105.00	105.00	115.58	20.40
23	CH_188	02_71L_034	46	Cloud	59.79	78.83	80.00	79.00	80.00	73.91
24	CH_262	02_77D_007	54	63.12	63.12	Cloud	Cloud	65.00	65.00	20.37
25	JK_187	01_52C_003	45	57.53	57.53	75.85	78.00	Cloud	78.00	73.33

Table 5(a) - List of GL & WB that have shown INCREASE in water spread area during 2018 with Inventory area 2009 (>20%) (2/5)

S.No.	UID	Lake_ID	Water spread area in Ha							% diff
			2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
26	SK_20	03_78A_014	94	137.93	137.93	Cloud	156.00	156.00	156.00	65.96
27	CH_55	01_61D_003	46	70.48	70.48	75.17	75.00	75.00	75.17	63.42
28	CH_551	03_77L_042	50	Cloud	58.02	Cloud	81.00	81.00	81.00	62.00
29	CH_834	03_82J_004	378	579.69	579.69	595.64	587.00	Cloud	595.64	57.58
30	CH_270	02_78A_004	84	104.76	Cloud	122.80	132.00	127.00	132.00	57.14
31	SK_19	03_78A_013	63	98.96	Cloud	Cloud	93.00	93.00	98.96	57.07
32	CH_132	02_71H_012	89	130.59	130.59	Cloud	139.00	139.00	139.00	56.18
33	CH_303	03_62J_031	166	240.40	240.40	241.78	244.00	244.00	244.00	46.99
34	CH_432	03_71K_009	170	232.91	232.91	Cloud	249.00	249.00	249.00	46.47
35	NP_45	02_71D_004	74	Cloud	88.34	Cloud	108.00	Cloud	108.00	45.95
36	CH_288	03_62J_016	44	56.33	56.33	62.25	63.00	63.00	63.00	43.18
37	SK_5	03_77D_005	79	102.11	102.11	111.36	112.00	102.00	112.00	41.77
38	NP_57	02_72E_001	142	176.10	Cloud	Cloud	201.00	201.00	201.00	41.55
39	JK_115	01_43K_014	112	138.04	138.04	151.35	158.00	158.00	158.00	41.07
40	SK_9	03_78A_001	156	219.62	Cloud	Cloud	192.00	192.00	219.62	40.78
41	CH_1075	03_91C_024	239	305.19	305.19	336.23	332.00	332.00	336.23	40.68
42	CH_304	03_62J_032	77	100.15	100.15	108.26	108.00	108.00	108.26	40.59
43	CH_6	01_52O_003	148	144.26	153.78	Cloud	187.00	208.00	208.00	40.54
44	CH_838	03_82J_008	156	Cloud	175.31	219.02	Cloud	Cloud	219.02	40.40
45	CH_271	02_78A_005	89	111.47	111.47	123.84	114.00	114.00	123.84	39.14
46	CH_165	02_71L_010	47	61.72	61.72	Cloud	65.00	65.00	65.00	38.30
47	CH_422	03_71G_013	244	308.58	308.58	327.27	335.00	335.00	335.00	37.30
48	CH_552	03_77L_043	181	187.36	187.36	Cloud	248.00	248.00	248.00	37.02
49	CH_298	03_62J_026	103	133.86	133.86	Cloud	141.00	141.00	141.00	36.89
50	NP_78	02_72I_025	106	138.09	Cloud	Cloud	144.00	144.00	144.00	35.85

Table 5(a) - List of GL & WB that have shown INCREASE in water spread area during 2018 with Inventory area 2009 (>20%) (3/5)

S.No.	UID	Lake_ID	Water spread area in Ha							% diff
			2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
51	CH_66	01_61H_001	282	325.80	325.80	382.38	Cloud	368.00	382.38	35.60
52	CH_159	02_71L_004	86	116.32	116.32	Cloud	116.00	113.00	116.32	35.26
53	CH_38	01_61C_010	88	118.53	118.53	Cloud	119.00	119.00	119.00	35.23
54	CH_235	02_71P_047	71	90.76	Cloud	Cloud	96.00	96.00	96.00	35.21
55	CH_975	03_82N_004	92	Cloud	Cloud	124.29	Cloud	Cloud	124.29	35.10
56	JK_159	01_43N_032	49	61.96	Cloud	65.97	66.00	66.00	66.00	34.69
57	NP_19	02_62J_003	49	61.08	61.08	Cloud	66.00	66.00	66.00	34.69
58	CH_251	02_72M_005	74	99.14	99.14	97.23	86.00	86.00	99.14	33.97
59	CH_269	02_78A_003	124	160.18	Cloud	165.03	166.00	166.00	166.00	33.87
60	CH_488	03_77H_018	80	103.34	103.34	Cloud	107.00	105.00	107.00	33.75
61	CH_39	01_61C_011	408	523.51	523.51	Cloud	544.00	544.00	544.00	33.33
62	CH_420	03_71G_011	1192	1240.05	1240.05	1277.19	1586.00	1586.00	1586.00	33.05
63	CH_1076	03_91C_025	97	116.09	116.09	128.60	Cloud	129.00	129.00	32.99
64	CH_207	02_71P_019	48	Cloud	63.60	Cloud	Cloud	Cloud	63.60	32.50
65	HP_1	01_52D_001	688	891.67	891.67	909.90	909.00	909.00	909.90	32.25
66	CH_128	02_71H_008	94	108.08	108.08	Cloud	124.00	124.00	124.00	31.91
67	CH_584	03_77P_013	53	69.90	Cloud	Cloud	Cloud	55.00	69.90	31.90
68	CH_231	02_71P_043	66	83.98	83.98	Cloud	Cloud	87.00	87.00	31.82
69	BH_99	03_78I_018	63	72.99	72.99	Cloud	80.00	83.00	83.00	31.75
70	CH_835	03_82J_005	67	78.32	78.32	84.37	88.00	Cloud	88.00	31.34
71	SK_4	03_77D_004	106	132.66	132.66	136.04	139.00	139.00	139.00	31.13
72	CH_306	03_62K_002	45	52.05	52.05	58.69	59.00	59.00	59.00	31.11
73	BH_12	03_77L_030	79	Cloud	93.39	102.87	99.00	99.00	102.87	30.22
74	CH_53	01_61D_001	70	91.10	91.10	Cloud	Cloud	Cloud	91.10	30.14

Table 5(a) - List of GL & WB that have shown INCREASE in water spread area during 2018 with Inventory area 2009 (>20%) (4/5)

S.No.	UID	Lake_ID	Water spread area in Ha							% diff
			2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
75	JK_195	01_52I_003	180	228.39	228.39	Cloud	233.00	Cloud	233.00	29.44
76	CH_178	02_71L_023	116	145.92	Cloud	Cloud	150.00	146.00	150.00	29.31
77	CH_313	03_62K_009	250	317.21	317.21	322.77	323.00	323.00	323.00	29.20
78	CH_181	02_71L_026	59	Cloud	Cloud	Cloud	76.00	76.00	76.00	28.81
79	CH_484	03_77H_013	48	61.41	61.41	Cloud	57.00	57.00	61.41	27.93
80	CH_396	03_71C_003	47	57.57	57.57	59.19	60.00	60.00	60.00	27.66
81	NP_92	02_72M_016	161	199.99	Cloud	Cloud	204.00	205.00	205.00	27.33
82	CH_564	03_77O_001	154	Cloud	183.20	195.78	194.00	194.00	195.78	27.13
83	SK_16	03_78A_009	54	65.84	Cloud	68.44	67.00	67.00	68.44	26.74
84	CH_155	02_71H_035	45	Cloud	Cloud	Cloud	57.00	57.00	57.00	26.67
85	CH_492	03_77H_023	47	59.50	59.50	58.32	Cloud	58.00	59.50	26.59
86	JK_23	01_43A_002	91	100.67	Cloud	111.70	115.00	115.00	115.00	26.37
87	UK_8	02_53O_005	1510	Cloud	1829.72	1829.72	1904.00	1904.00	1904.00	26.09
88	JK_167	01_43P_002	52	61.20	61.20	65.35	64.00	64.00	65.35	25.67
89	CH_106	02_62B_001	47	58.32	58.32	Cloud	Cloud	59.00	59.00	25.53
90	JK_205	01_52J_009	57	71.43	71.43	Cloud	68.00	Cloud	71.43	25.32
91	NP_86	02_72M_009	64	63.30	Cloud	Cloud	80.00	80.00	80.00	25.00
92	CH_316	03_62K_012	73	87.40	87.40	Cloud	91.00	91.00	91.00	24.66
93	JK_82	01_43J_004	65	Cloud	67.91	79.18	81.00	Cloud	81.00	24.62
94	CH_623	03_82A_004	46	57.26	57.26	Cloud	54.00	54.00	57.26	24.48
95	BH_22	03_77L_051	143	153.88	153.88	Cloud	Cloud	178.00	178.00	24.48
96	CH_545	03_77L_029	45	49.28	Cloud	Cloud	56.00	56.00	56.00	24.44
97	NP_12	02_62F_019	58	68.37	68.37	Cloud	72.00	72.00	72.00	24.14
98	CH_375	03_62O_030	97	113.29	Cloud	Cloud	120.00	120.00	120.00	23.71

Table 5(a) - List of GL & WB that have shown INCREASE in water spread area during 2018 with Inventory area 2009 (>20%) (5/5)

S.No.	UID	Lake_ID	Water spread area in Ha							% diff
			2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
99	CH_426	03_71K_003	72	Cloud	67.29	Cloud	89.00	89.00	89.00	23.61
100	BH_13	03_77L_033	177	212.83	212.83	215.64	218.00	218.00	218.00	23.16
101	CH_40	01_61C_012	290	345.15	345.15	357.07	350.00	350.00	357.07	23.13
102	JK_5	01_42H_005	52	54.44	54.44	60.86	64.00	Cloud	64.00	23.08
103	CH_575	03_77P_004	211	Cloud	229.17	259.21	250.00	252.00	259.21	22.85
104	CH_78	01_62E_003	136	160.08	160.08	166.91	167.00	167.00	167.00	22.79
105	CH_213	02_71P_025	123	149.79	Cloud	Cloud	151.00	151.00	151.00	22.76
106	CH_826	03_82G_065	59	72.31	Cloud	Cloud	Cloud	70.00	72.31	22.57
107	CH_215	02_71P_027	49	59.74	Cloud	Cloud	Cloud	60.00	60.00	22.45
108	CH_580	03_77P_009	94	Cloud	114.34	114.99	Cloud	103.00	114.99	22.33
109	CH_253	02_72M_007	90	104.18	Cloud	Cloud	110.00	110.00	110.00	22.22
110	CH_621	03_82A_002	319	383.76	383.76	389.00	367.00	367.00	389.00	21.94
111	NP_67	02_72I_014	137	166.26	Cloud	Cloud	167.00	167.00	167.00	21.90
112	CH_30	01_61C_002	685	816.01	816.01	834.59	828.00	830.00	834.59	21.84

Table 5(b) - List of GL & WB that have shown DECREASE in water spread area during 2018 with Inventory area 2009 (>20%)

S.No.	UID	Lake_ID	Water spread area in Ha							% diff
			2009 (Inventory)	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Area (Max) 2018	
1	SK_26	03_78A_021	56	Cloud	Cloud	Cloud	Cloud	34.00	34.00	-39.29
2	UK_10	02_53P_002	734	436.09	436.09	436.09	451.00	451.00	451.00	-38.56
3	CH_1085	03_91C_052	64	44.16	Cloud	Cloud	Cloud	Cloud	44.16	-31.00
4	CH_1176	03_91H_011	50	Cloud	39.07	Cloud	Cloud	Cloud	39.07	-21.86

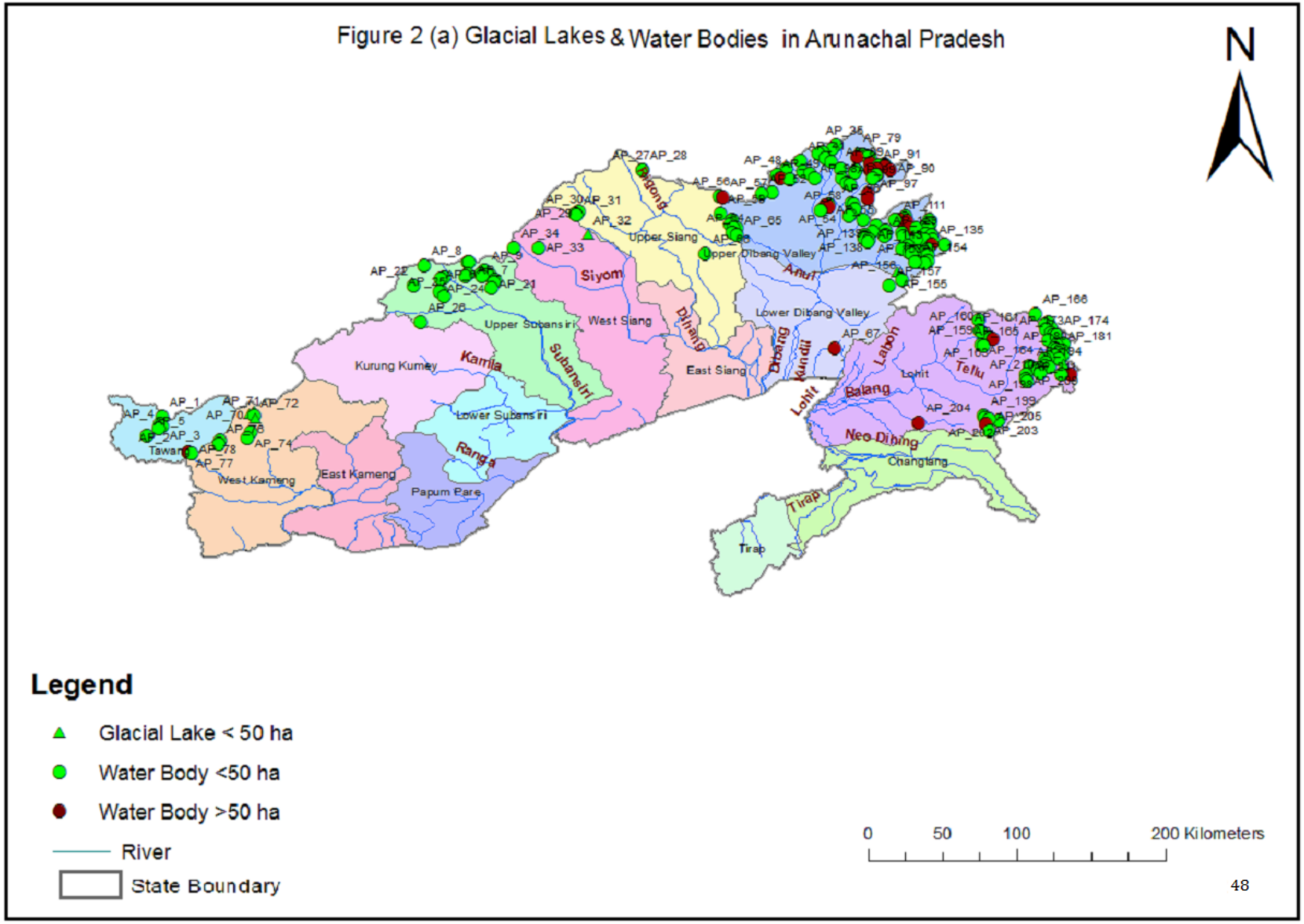

Figure 3 (a): Glacial Lakes & Water Bodies in Arunachal Pradesh

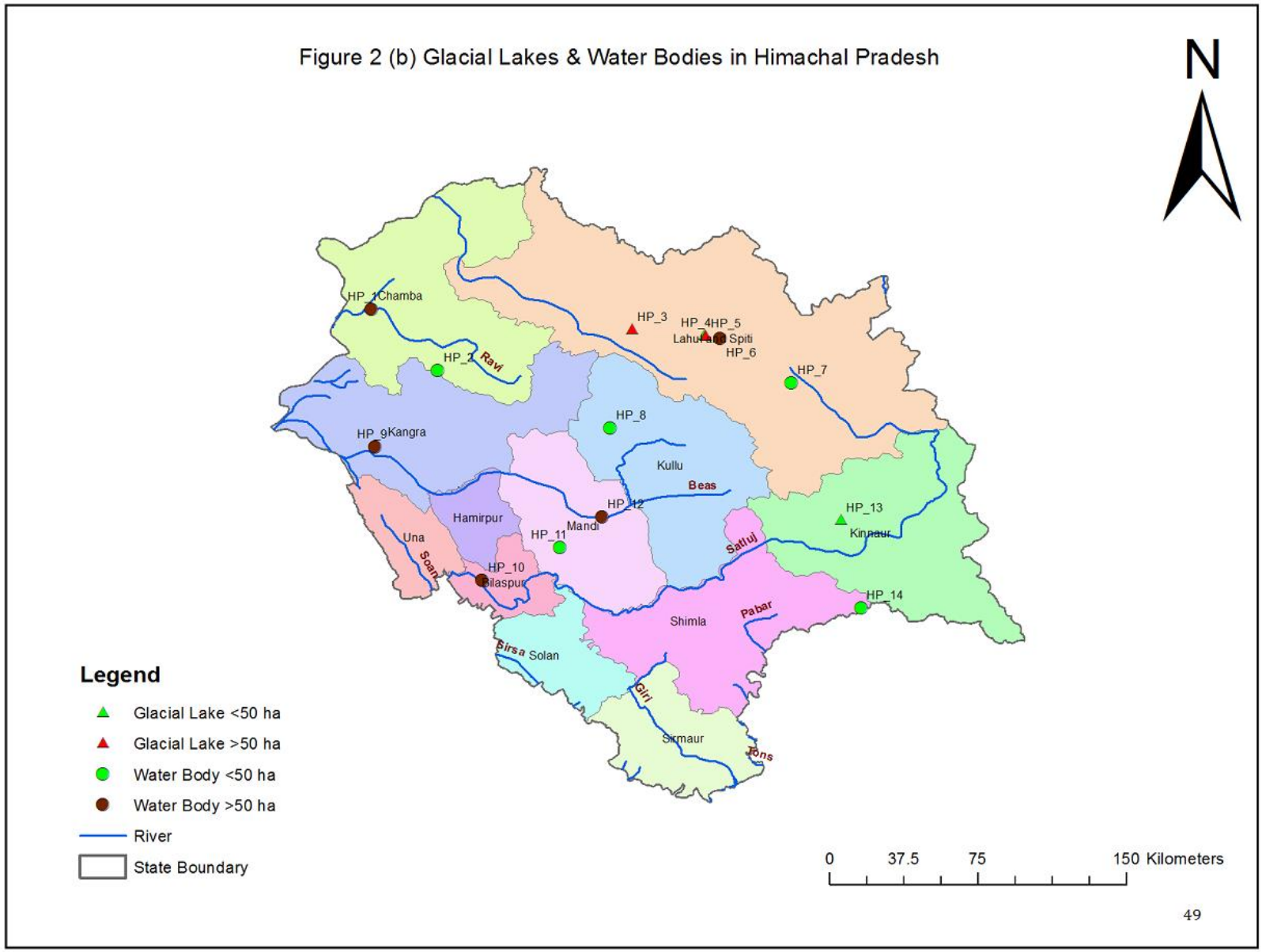

Figure 3 (b): Glacial Lakes & Water Bodies in Himachal Pradesh

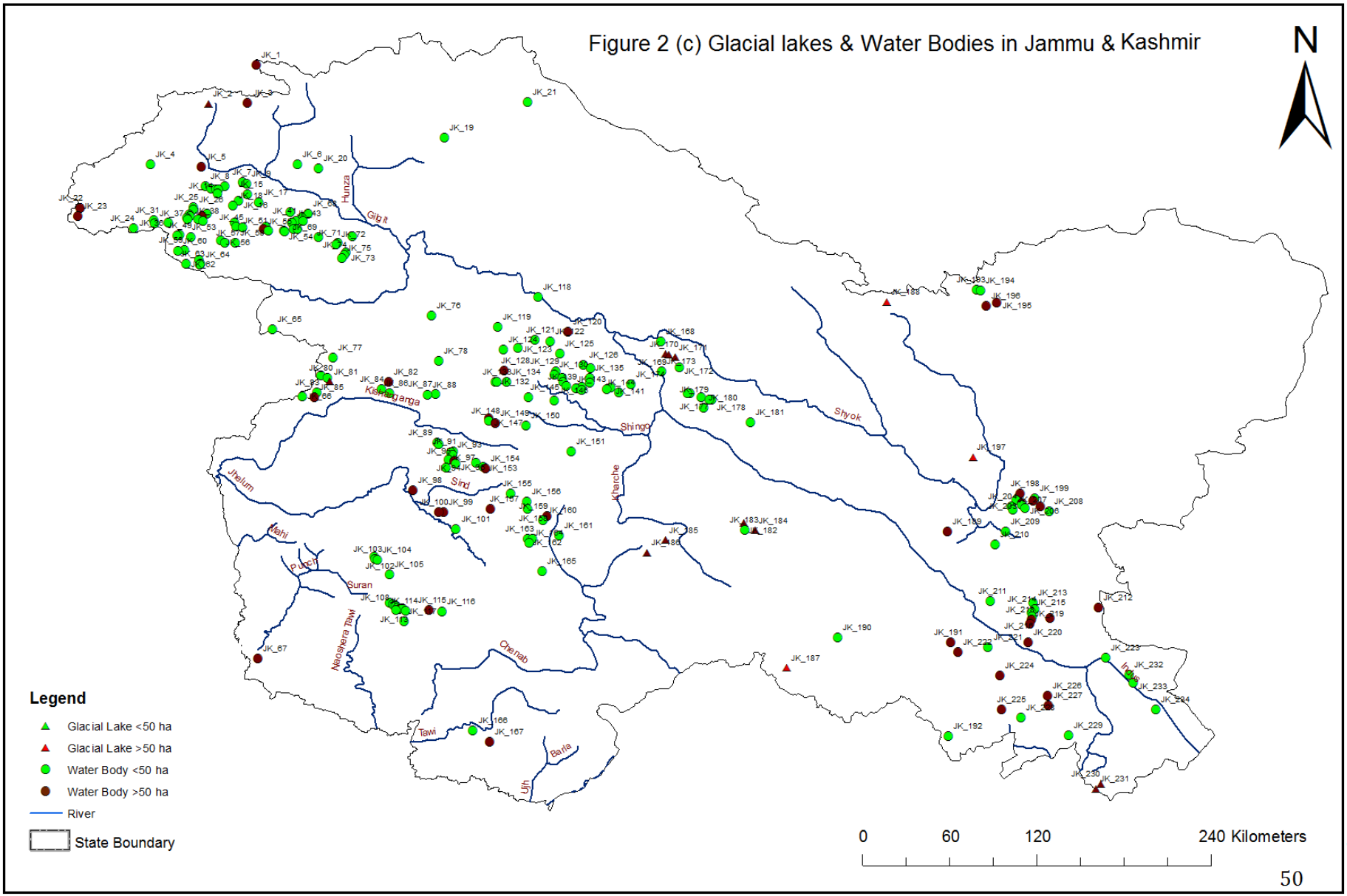

Figure 3 (c): Glacial Lakes & Water Bodies in Jammu & Kashmir

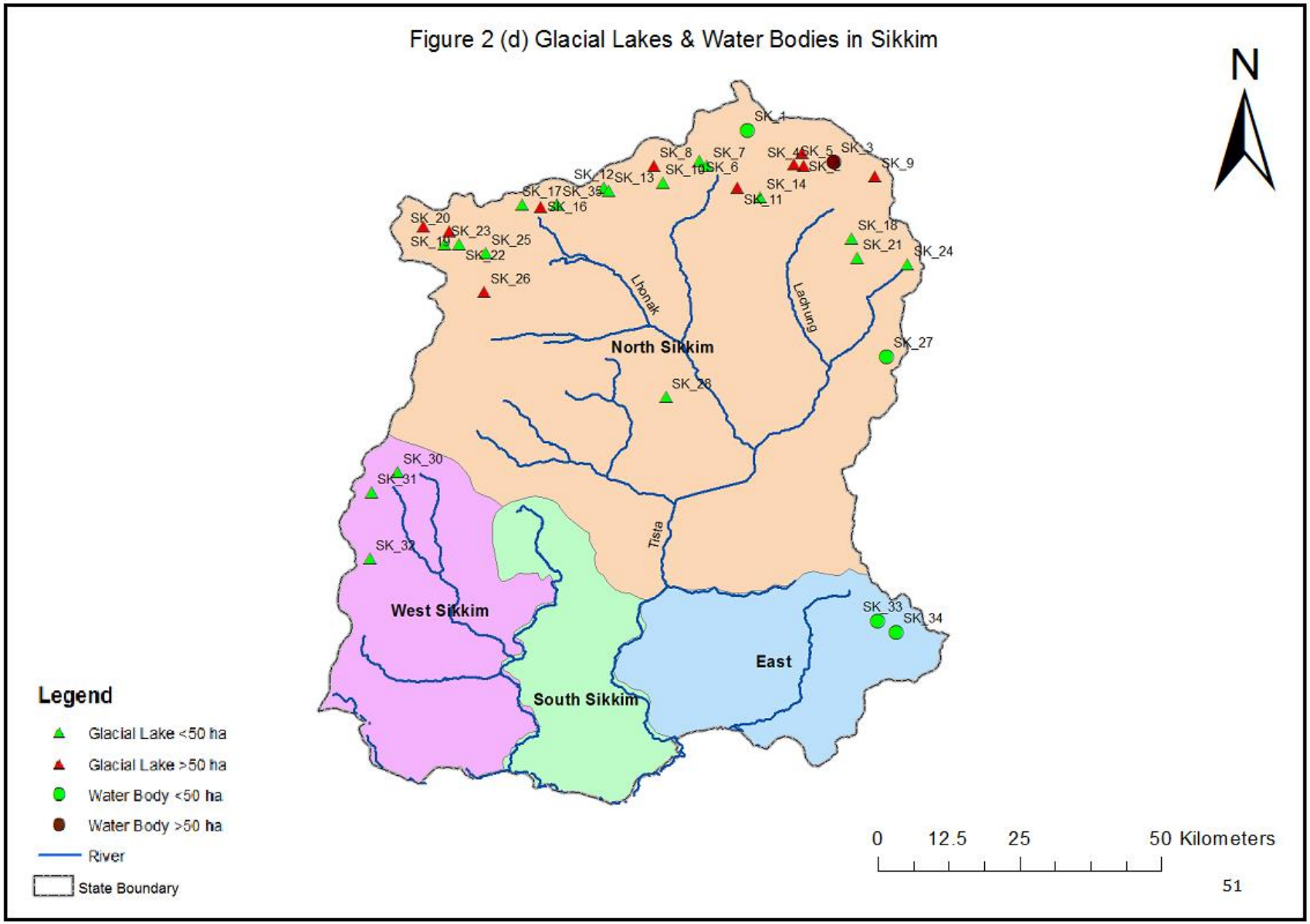

Figure 3 (d): Glacial Lakes & Water Bodies in Sikkim

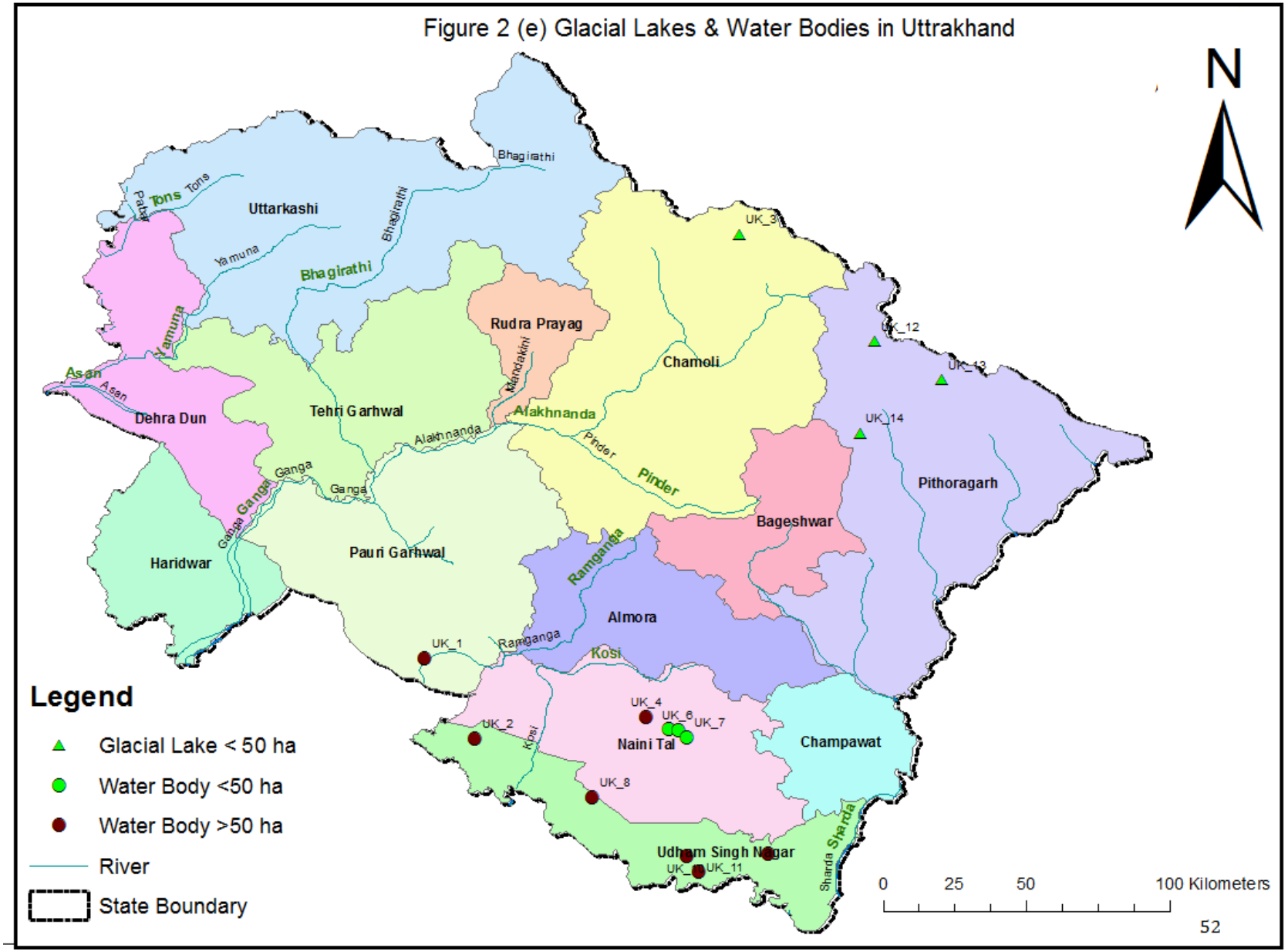

Figure 8 (e): Glacial Lakes & Water Bodies in Uttrakhand

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