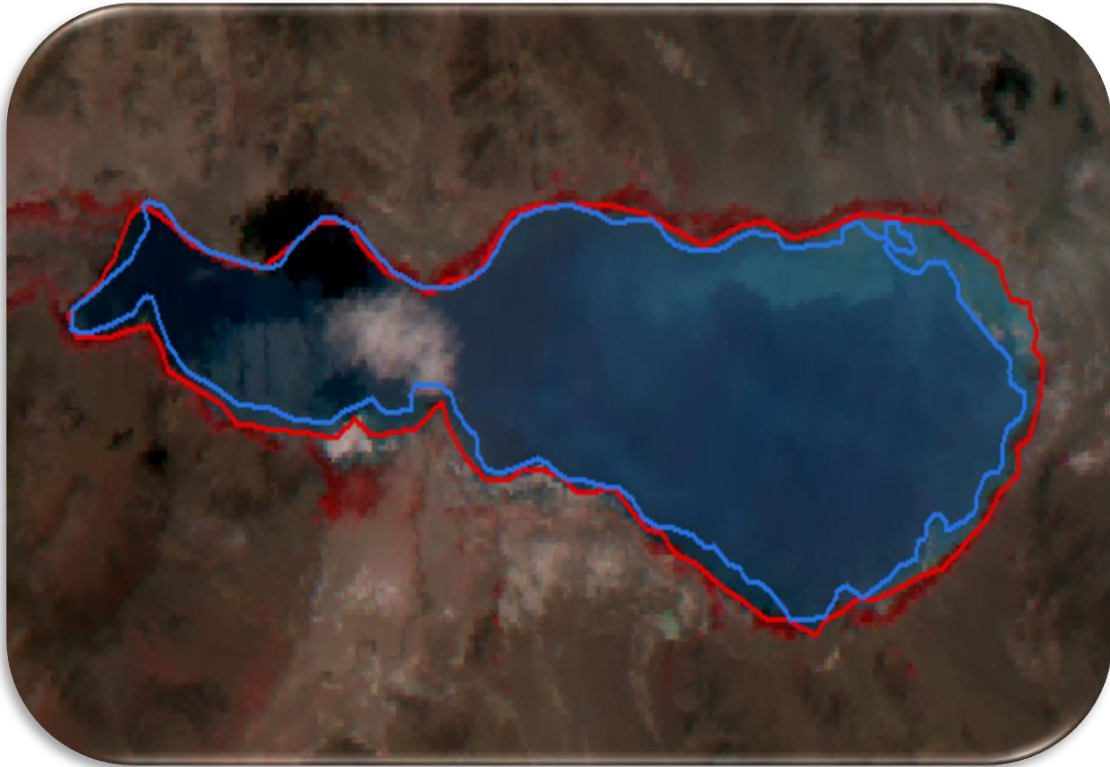




**Monitoring of Glacial Lakes &  
Water Bodies in the Himalayan  
Region of Indian River Basins for  
the Year 2021 (June to October)**



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



# Monitoring of Glacial Lakes & Water Bodies in the Himalayan Region of Indian River Basins for the Year 2021



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

## Document Control Sheet

1.	Security Classification	Restricted			
2.	Distribution	This document is for use by Central Water Commission, Department of Water Resources, River Development & Ganga Rejuvenation, Ministry of Jal Shakti, Govt. of India.			
3.	Report / Document Type	Technical report			
4.	Document Control Number	CWC/M&CC/2021/TR-6			
5.	Title	<b>Monitoring of Glacial Lakes &amp; Water Bodies in the Himalayan Region of Indian River Basins for the Year 2021</b>			
6.	Author(s)	Ajay Kumar, Rekhraj Meena & Manoj Kumar			
7.	Affiliation of authors	Morphology and Climate Change Directorate, CWC, New Delhi			
8.	Project Team	Ajay Kumar, Rekhraj Meena & Manoj Kumar			
9.	Scrutiny mechanism	Compiled by Rekhraj Meena & Manoj Kumar	Reviewed by Ajay Kumar, Director, Morphology & CC Dte	Controlled by Reading Shimray, CE, (P&D Org.)	Approved by R. K. Sinha, Member (RM), CWC
10.	Originating unit	P&D organization, CWC, New Delhi			
11.	Date of Publication	14/12/2021			
12.	Abstract (with Keywords) :	<p>This document presents the details on monitoring of glacial lakes and water bodies in the Indian Himalayan region during the month of October 2021 using satellite remote sensing technique including the data used and methodology followed in this study.</p> <p>Keywords: Glacial Lake, Water Bodies, Himalayas, Remote Sensing, GLOF, AWiFS</p>			

S.NO.	Contents	Page No.
	List of Tables	iv
	List of Figures	v
	Abbreviations	vi
	Executive Summary	vii
1.	Introduction	1
1.1.	Background	1
1.2	Remote Sensing Technology	1
1.3	Objectives	2
2.	Study Area & Materials	3
2.1	Study Area	3
2.2	Materials	3
2.2.1	Satellite Data	3
3.	Methodology	6
3.1	Ortho-rectification of Satellite Data	6
3.2	Monitoring of Glacial Lakes & Water Bodies	6
4.	Results	8
5.	Conclusions	10
6.	References	54

<b>List of Tables</b>			
S.NO.	Table No.	Particulars	Page No.
1.	Table 1	List of satellite data used	3
2.	Table 2	List of Glacial Lakes & Water bodies monitored during the year 2021	9
3.	Table 3(a)	List of GL & WBs that have shown 40% or more increase in water spread area	11
4.	Table 3 (b)	GL/WBs having shown more than or equal to 20% increase in Water Spread Area during 2021 in reference to Base Area (2009) are compared with Water Spread Area of those GL/WBs during last 4 years	13
5.	Table 3 (c)	GL/WBs having shown more than or equal to 20% decrease in Water Spread Area during 2021 in reference to Base Area (2009) are compared with Water Spread Area of those GL/WBs during last 4 years	17
6.	Table 4	List of all GL/WBs with calculation of maximum area during 2021 (max of water spread area during June –October, 2021) and % difference in area in reference to Base area (2009)	18
7.	Table 4 (a)	List of GL & WB that have shown INCREASE in water spread area	18
8.	Table 4 (b)	List of GL & WB that have shown DECREASE in water spread area	30
9.	Table 4 (c)	List of GL & WB that have shown NO CHANGE in water spread area	34
10.	Table 4 (d)	GL & WB that are CLOUD COVERED	39
11.	Table 5 (a)	List of GL & WB that have shown more than or equal to 20% INCREASE in water spread area during 2021 in reference to Base area (2009)	43
12.	Table 5 (b)	List of GL & WB that have shown more than or equal to 20% DECREASE in water spread area during 2021 in reference to Base area (2009)	48

<b>List of Figures</b>			
<b>S.NO.</b>	<b>Table No.</b>	<b>Particulars</b>	<b>Page No.</b>
1.	Figure 1	Index map of study area	5
2.	Figure 2	Glacial Lakes/ Water Bodies Monitored during the year 2021	9
3.	Figure 3 (a)	Glacial Lakes & Water Bodies in Arunachal Pradesh	49
4.	Figure 3 (b)	Glacial Lakes & Water Bodies in Himachal Pradesh	50
5.	Figure 3 (c)	Glacial Lakes & Water Bodies in Jammu & Kashmir including Ladakh	51
6.	Figure 3 (d)	Glacial Lakes & Water Bodies in Sikkim	52
7.	Figure 3 (e)	Glacial Lakes & Water Bodies in Uttarakhand	53

## 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 2021 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 2021.

**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 2021 were computed and compared with inventory area of 2009. The data monitored during June to October 2021 is summarised below in tabular form:-

Month	Monitored	Cloud
Jun-2021	209	268
Jul-2021	169	308
Aug-2021	114	363
Sep-2021	398	79
Oct-2021	367	110



# 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).

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, 2021 to October, 2021
2. Monitoring the spatial extent of few/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 2011-2021. 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, 2021 to October, 2021.

## 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 2021 is given in Table 1.

<b><u>Table 1. List of satellite data used</u></b>			
<b>June-2021 Satellite data</b>			
<b>S. No.</b>	<b>Path</b>	<b>Row</b>	<b>Date</b>
1	115	51	21- June -2021
2	113	49	11- June -2021
3	93	44	07- June -2021
4	97	44	27- June -2021
5	102	50	04- June -2021
6	97	49	27- June -2021
7	93	49	07- June -2021
8	108	52	10- June -2021
9	98	49	08- June -2021

<b>July-2021 Satellite data</b>			
<b>S. No.</b>	<b>Path</b>	<b>Row</b>	<b>Date</b>
1	115	51	19- July -2021
2	105	51	13- July -2021
3	99	49	07- July -2021
4	94	47	06- July -2021
5	91	46	15- July -2021
<b>August-2021 Satellite data</b>			
<b>S. No.</b>	<b>Path</b>	<b>Row</b>	<b>Date</b>
1	93	47	18- August -2021
2	94	47	23- August -2021
3	97	48	14- August -2021
4	102	49	15- August -2021
5	105	51	30- August -2021
6	112	51	17- August -2021
<b>September-2021 Satellite data</b>			
<b>S. No.</b>	<b>Path</b>	<b>Row</b>	<b>Date</b>
1	114	51	20- September -2021
2	109	51	19- September -2021
3	104	51	18- September -2021
4	97	48	07- September -2021
5	92	46	06- September -2021

<b>October-2021 Satellite data</b>			
<b>S. No.</b>	<b>Path</b>	<b>Row</b>	<b>Date</b>
1	112	51	28- October -2021
2	107	52	27- October -2021
3	100	49	16- October -2021
4	95	47	15- October -2021
5	91	46	19- October -2021

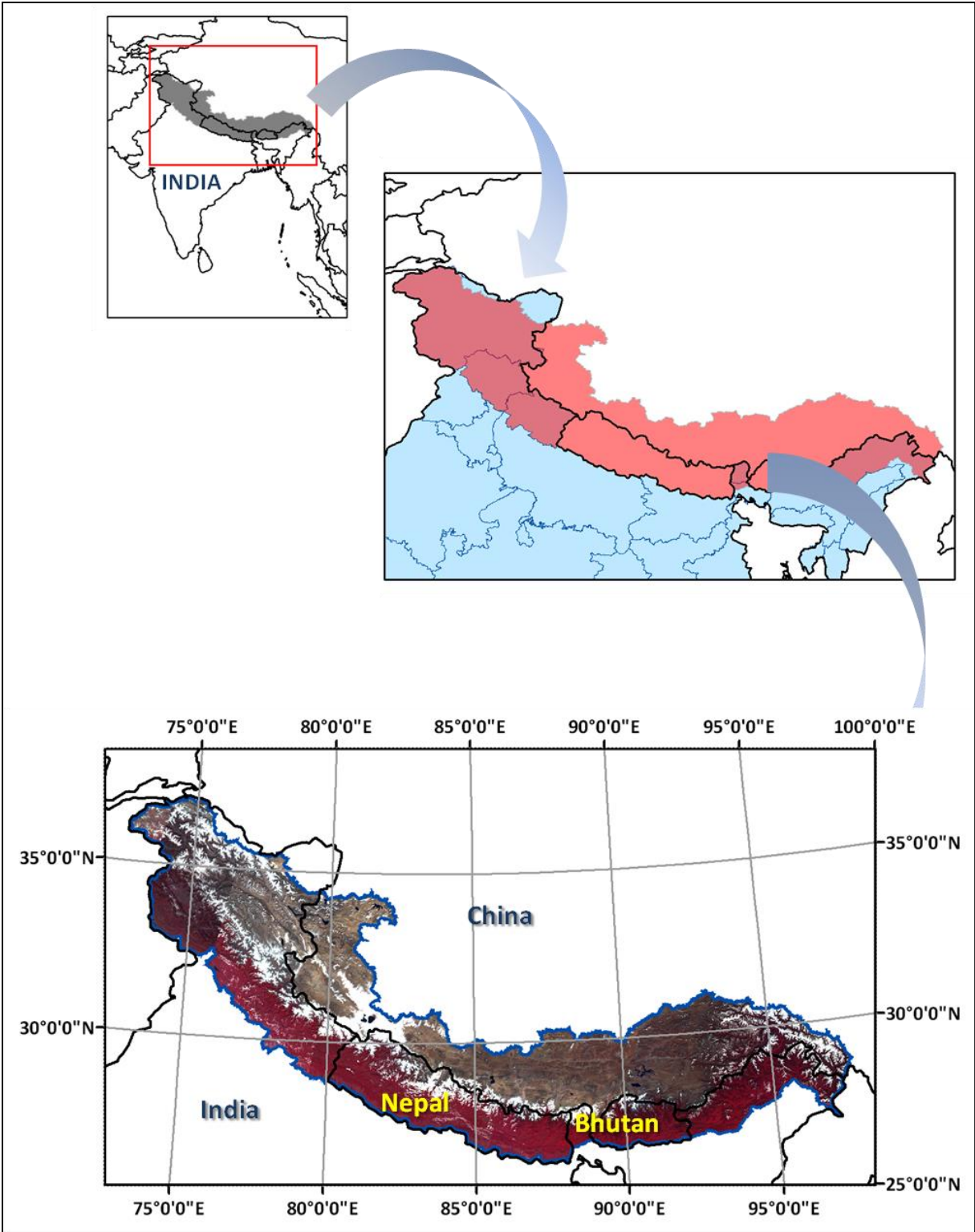


Figure 1. Index map of study area

# 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 Ortho-rectification of Satellite Data

Ortho-rectification 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 Ortho-rectification corrects for many of the anomalies resultant from this conversion. Ortho-rectified imagery is particularly useful in areas of the world with exacerbated terrain features such as mountains, plateaus, etc. The Ortho-rectification 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 Ortho-rectification process depends on the accuracy of the DEM and the correction method.

In this study, Ortho-rectified 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 2021 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.
- For a particular year, the water spread area has been taken as maximum of the area calculated during monitoring from June to October.



# 4. Results

## 4.1 Results

### June 2021

The analysis of water spread area of glacial lakes & water bodies monitored in June 2021 was done for only 209 glacial lakes & water bodies using cloud free satellite data. Based on this, it is found that

- 70 glacial lakes & water bodies have shown decrease in water spread area, 75 have shown increase, 64 have not shown any significant change ( $\pm 5\%$ ).
- 28 out of 70 have decreased by more than 20% and 28 out of 75 have shown increase in area by more than 20%.

### July 2021

The analysis of water spread area of glacial lakes & water bodies monitored in July 2021 was done for only 169 glacial lakes & water bodies using cloud free satellite data. Based on this, it is found that

- 60 glacial lakes & water bodies have shown decrease in water spread area, 59 have shown increase, 50 have not shown any significant change ( $\pm 5\%$ ).
- 24 out of 60 have decreased by more than 20% and 27 out of 59 have shown increase in area by more than 20%.

### August 2021

The analysis of water spread area of glacial lakes & water bodies monitored in August 2021 was done for only 114 glacial lakes & water bodies using cloud free satellite data. Based on this, it is found that

- 60 glacial lakes & water bodies have shown decrease in water spread area, 37 have shown increase, 17 have not shown any significant change ( $\pm 5\%$ ).
- 26 out of 60 have decreased by more than 20% and 11 out of 37 have shown increase in area by more than 20%.

### September 2021

The analysis of water spread area of glacial lakes & water bodies monitored in September 2021 was done for only 398 glacial lakes & water bodies using cloud free satellite data. Based on this, it is found that

- 200 glacial lakes & water bodies have shown decrease in water spread area, 92 have shown increase, 106 have not shown any significant change ( $\pm 5\%$ ).
- 78 out of 200 have decreased by more than 20% and 39 out of 92 have shown increase in area by more than 20%.

## October 2021

The analysis of water spread area of glacial lakes & water bodies monitored in October 2021 was done for only 367 glacial lakes & water bodies using cloud free satellite data. Based on this, it is found that

- 217 glacial lakes & water bodies have shown decrease in water spread area, 79 have shown increase, 71 have not shown any significant change ( $\pm 5\%$ ).
- 99 out of 217 have decreased by more than 20% and 31 out of 79 have shown increase in area by more than 20%.

**Table 2 List of glacial lakes & water bodies monitored during the year 2021**

Month	Monitored	Increased			Decreased			No Change
		> 20%	< 20%	Total	> 20%	< 20%	Total	
Jun-2021	209	28	47	75	28	42	70	64
Jul-2021	169	27	32	59	24	36	60	50
Aug-2021	114	11	26	37	26	34	60	17
Sep-2021	398	39	53	92	78	122	200	106
Oct-2021	367	31	48	79	99	118	217	71

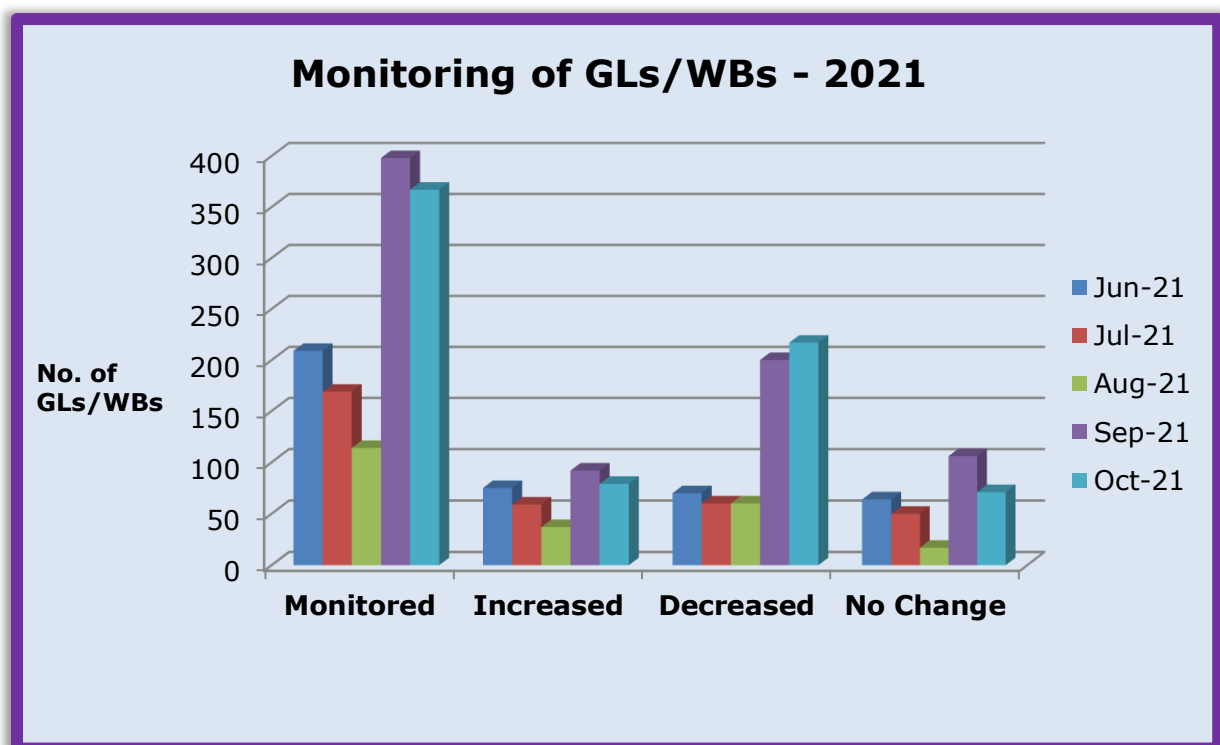


Figure 2: Glacial Lakes/Water Bodies Monitored during the year 2021

# 5. Conclusions

## 5.1 Conclusions

- i. GL & WB having UID's CH\_6, CH\_33, CH\_39, CH\_55, HP\_3, HP\_5 may affect Jammu & Kashmir including Ladakh, HP\_3, HP\_5, may affect Himachal Pradesh, CH\_188, CH\_206, CH\_244, NP\_64 may affect Bihar, SK\_19, SK\_20, SK\_26 may affect Sikkim, AP\_135, AP\_206, CH\_423, CH\_590, CH\_593, CH\_834, CH\_838, CH\_849, CH\_865, CH\_1032, CH\_1175, CH\_1176 may affect Arunachal Pradesh & 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 **requires 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 & WBs that have shown 40% or more increase in water spread area during 2021**

S. No.	UID	Lake_ID	%Diff in Water Spread Area					State	Country	Basin	River	State/UT which may likely to affect
			2021	2020	2019	2018	2017					
1	CH_33	01_61C_005	388.49	273.38	238.13	176.62	-54.98		China	Indus	Indus	J&K/Ladakh
2	HP_5	01_52H_004	219.57	260.87	252.17	243.48	157.88	HP	India	Indus	Chenab	HP, J&K/Ladakh
3	CH_206	02_71P_018	158.82	203.92	74.51	-3.92	-11.25		China	Ganga	Arun Kosi	Bihar
4	CH_1176	03_91H_011	92.00	Cloud	44.00	-21.86	Cloud		China	Brahmaputra	Luhit	AP, Assam
5	CH_423	03_71G_014	91.43	86.43	95.71	78.57	22.21		China	Brahmaputra		AP, Assam
6	CH_55	01_61D_003	82.61	63.04	65.22	63.42	66.97		China	Indus	Indus	J&K/Ladakh
7	CH_849	03_82J_019	68.89	82.22	82.22	80.19	Cloud		China	Brahmaputra		AP, Assam
8	NP_64	02_72I_011	65.00	69.00	92.00	75.00	44.68	Nepal	Nepal	Ganga	Sun Kosi	Bihar
9	HP_3	01_52H_002	64.52	70.97	72.58	74.57	44.58	HP	India	Indus	Chenab	HP, J&K/Ladakh
10	AP_206	03_92E_001	64.44	Cloud	35.56	-8.89	-8.46	AP	India	Brahmaputra	Luhit	AP, Assam
11	SK_20	03_78A_014	63.83	59.57	65.96	65.96	5.20	Sikkim	India	Brahmaputra	Teesta	Sikkim
12	CH_834	03_82J_004	63.23	48.68	57.41	57.58	45.70		China	Brahmaputra		AP, Assam
13	CH_188	02_71L_034	58.70	69.57	89.13	73.91	29.97		China	Ganga	Sun Kosi	Bihar
14	CH_865	03_82K_009	56.03	Cloud	Cloud	1.31	Cloud		China	Brahmaputra		AP, Assam

S. No.	UID	Lake_ID	%Diff in Water Spread Area					State	Country	Basin	River	State/UT which may likely to affect
			2021	2020	2019	2018	2017					
15	CH_1032	03_82O_029	54.41	-14.71	Cloud	Cloud	-18.64		China	Brahmaputra	Dihang	AP, Assam
16	CH_39	01_61C_011	52.94	53.43	45.59	33.33	27.30		China	Indus	Indus	J&K/Ladakh
17	AP_135	03_91D_041	52.17	Cloud	10.43	-1.20	2.38	AP	India	Brahmaputra	Dibang	AP, Assam
18	CH_590	03_77P_019	50.91	50.91	64.09	4.19	4.19		China	Brahmaputra	Dangme Chu	AP, Assam
19	CH_1175	03_91H_010	50.63	Cloud	25.32	-4.53	5.20		China	Brahmaputra	Luhit	AP, Assam
20	CH_244	02_72I_004	49.59	73.55	97.52	75.21	71.92		China	Ganga	Sun Kosi	Bihar
21	CH_838	03_82J_008	45.51	34.62	40.38	40.40	Cloud		China	Brahmaputra		AP, Assam
22	SK_26	03_78A_021	44.64	44.64	37.50	-39.29	-87.99	Sikkim	India	Brahmaputra	Teesta	Sikkim
23	CH_6	01_52O_003	43.92	50.68	71.62	40.54	48.13		China	Indus	Indus	J&K/Ladakh
24	SK_19	03_78A_013	41.27	38.10	66.67	57.07	28.29	Sikkim	India	Brahmaputra	Teesta	Sikkim
25	CH_593	03_77P_023	40.00	82.22	82.22	Cloud	-9.84		China	Brahmaputra	Kuri Chu	AP, Assam

**Table 3 (b) – GL/WBs having shown more than or equal to 20% increase in Water Spread Area during 2021 in reference to Base Area (2009) are compared with Water Spread Area of those GL/WBs during last 4 years**

S. No.	UID	Lake_ID	Water spread area in Ha	%Diff in Water Spread Area				
			2009 (Inventory)	2021	2020	2019	2018	2017
1	CH_33	01_61C_005	139	388.49	273.38	238.13	176.62	-54.98
2	HP_5	01_52H_004	46	219.57	260.87	252.17	243.48	157.88
3	CH_206	02_71P_018	51	158.82	203.92	74.51	-3.92	-11.25
4	CH_1176	03_91H_011	50	92.00	Cloud	44.00	-21.86	Cloud
5	CH_423	03_71G_014	140	91.43	86.43	95.71	78.57	22.21
6	CH_55	01_61D_003	46	82.61	63.04	65.22	63.42	66.97
7	CH_849	03_82J_019	45	68.89	82.22	82.22	80.19	Cloud
8	NP_64	02_72I_011	100	65.00	69.00	92.00	75.00	44.68
9	HP_3	01_52H_002	62	64.52	70.97	72.58	74.57	44.58
10	AP_206	03_92E_001	45	64.44	Cloud	35.56	-8.89	-8.46
11	SK_20	03_78A_014	94	63.83	59.57	65.96	65.96	5.20
12	CH_834	03_82J_004	378	63.23	48.68	57.41	57.58	45.70
13	CH_188	02_71L_034	46	58.70	69.57	89.13	73.91	29.97
14	CH_865	03_82K_009	116	56.03	Cloud	Cloud	1.31	Cloud

S. No.	UID	Lake_ID	Water spread area in Ha	%Diff in Water Spread Area				
			2009 (Inventory)	2021	2020	2019	2018	2017
15	CH_1032	03_82O_029	68	54.41	-14.71	Cloud	Cloud	-18.64
16	CH_39	01_61C_011	408	52.94	53.43	45.59	33.33	27.30
17	AP_135	03_91D_041	115	52.17	Cloud	10.43	-1.20	2.38
18	CH_590	03_77P_019	220	50.91	50.91	64.09	4.19	4.19
19	CH_1175	03_91H_010	79	50.63	Cloud	25.32	-4.53	5.20
20	CH_244	02_72I_004	121	49.59	73.55	97.52	75.21	71.92
21	CH_838	03_82J_008	156	45.51	34.62	40.38	40.40	Cloud
22	SK_26	03_78A_021	56	44.64	44.64	37.50	-39.29	-87.99
23	CH_6	01_52O_003	148	43.92	50.68	71.62	40.54	48.13
24	SK_19	03_78A_013	63	41.27	38.10	66.67	57.07	28.29
25	CH_593	03_77P_023	45	40.00	82.22	82.22	Cloud	-9.84
26	CH_38	01_61C_010	88	39.77	59.09	61.36	35.23	27.78
27	CH_36	01_61C_008	151	37.75	44.37	44.37	18.54	15.32
28	CH_426	03_71K_003	72	36.11	58.33	72.22	23.61	-6.54
29	CH_101	01_62F_010	45	35.56	68.89	64.44	85.66	49.72

S. No.	UID	Lake_ID	Water spread area in Ha	%Diff in Water Spread Area				
			2009 (Inventory)	2021	2020	2019	2018	2017
30	CH_583	03_77P_012	66	34.85	4.55	19.70	7.58	-10.89
31	CH_975	03_82N_004	92	34.78	Cloud	Cloud	35.10	15.77
32	CH_551	03_77L_042	50	32.00	96.00	104.00	62.00	Cloud
33	AP_95	03_91C_049	57	31.58	Cloud	Cloud	Cloud	Cloud
34	NP_67	02_72I_014	137	31.39	32.12	44.53	21.90	20.37
35	CH_420	03_71G_011	1192	31.12	33.64	37.58	33.05	7.27
36	CH_269	02_78A_003	124	30.65	20.16	37.90	33.87	22.35
37	CH_1079	03_91C_033	153	30.07	47.06	6.54	16.76	-0.52
38	CH_369	03_62O_024	721	29.96	42.16	43.83	19.97	9.45
39	CH_446	03_71O_010	813	29.64	43.67	45.51	7.75	77.54
40	CH_404	03_71C_011	119	29.41	72.27	52.10	18.49	11.33
41	CH_1190	03_91H_025	85	29.41	-11.76	28.24	1.53	-3.83
42	CH_552	03_77L_043	181	29.28	38.12	41.99	37.02	Cloud
43	HP_12	01_53E_001	72	29.17	140.28	98.61	90.54	81.65
44	CH_298	03_62J_026	103	28.16	33.98	37.86	36.89	24.70



S. No.	UID	Lake_ID	Water spread area in Ha	%Diff in Water Spread Area				
			2009 (Inventory)	2021	2020	2019	2018	2017
45	CH_132	02_71H_012	89	28.09	59.55	56.18	56.18	42.15
46	CH_183	02_71L_028	77	27.27	36.36	64.94	18.18	25.26
47	NP_78	02_72I_025	106	26.42	19.81	40.57	35.85	17.07
48	CH_422	03_71G_013	244	25.41	31.15	47.54	37.30	19.99
49	CH_835	03_82J_005	67	25.37	7.46	Cloud	31.34	4.90
50	JK_5	01_42H_005	52	25.00	23.08	32.69	23.08	25.11
51	NP_45	02_71D_004	74	24.32	51.35	45.95	45.95	39.29
52	CH_432	03_71K_009	170	24.12	32.94	90.00	46.47	35.30
53	CH_1076	03_91C_025	97	23.71	45.36	54.64	32.99	7.47
54	CH_303	03_62J_031	166	23.49	33.13	50.00	46.99	36.51
55	CH_632	03_82B_006	124	23.39	-0.81	13.71	3.42	-10.61
56	CH_159	02_71L_004	86	23.26	40.70	54.65	35.26	38.86
57	CH_30	01_61C_002	685	22.77	25.40	25.84	21.84	18.52
58	CH_592	03_77P_021	53	22.64	3.77	32.08	15.09	Cloud
59	CH_1170	03_91H_005	58	22.41	Cloud	43.10	Cloud	249.67

S. No.	UID	Lake_ID	Water spread area in Ha	%Diff in Water Spread Area				
			2009 (Inventory)	2021	2020	2019	2018	2017
60	CH_1075	03_91C_024	239	22.18	30.13	32.22	40.68	31.50
61	CH_313	03_62K_009	250	22.00	31.20	34.40	29.20	22.25
62	CH_448	03_71P_001	112	20.54	26.79	36.61	19.73	26.10
63	JK_159	01_43N_032	49	20.41	65.31	34.69	34.69	30.08
64	SK_5	03_77D_005	79	20.25	40.51	49.37	41.77	-23.83
65	AP_100	03_91C_064	89	20.22	Cloud	7.87	-1.14	-20.20
66	AP_84	03_91C_034	134	20.15	Cloud	Cloud	-1.62	Cloud
67	JK_187	01_52C_003	45	20.00	48.89	73.33	73.33	27.36
68	CH_626	03_82A_007	85	20.00	12.94	20.00	20.72	-7.05

**Table 3 (c) – GL/WBs having shown more than or equal to 20% decrease in Water Spread Area during 2021 in reference to Base Area (2009) are compared with Water Spread Area of those GL/WBs during last 4 years**

S. No.	UID	Lake_ID	Water spread area in Ha	%Diff in Water Spread Area				
			2009 (Inventory)	2021	2020	2019	2018	2017
1	CH_809	03_82G_048	55	-20.00	-23.64	-3.64	-4.38	-27.64
2	CH_517	03_77K_015	108	-20.37	13.89	20.37	21.21	-0.13
3	CH_646	03_82B_020	49	-20.41	2.04	26.53	2.98	-17.72
4	AP_77	03_83A_012	63	-20.63	4.76	39.68	Cloud	Cloud
5	NP_12	02_62F_019	58	-20.69	13.79	46.55	24.14	-6.45
6	CH_612	03_78E_023	58	-20.69	-6.90	8.62	-5.17	-18.41
7	CH_418	03_71G_009	178	-20.79	-4.49	3.93	-1.12	-12.32
8	CH_106	02_62B_001	47	-21.28	-4.26	25.53	25.53	0.51
9	CH_709	03_82D_003	50	-22.00	-12.00	-6.00	2.79	-16.69
10	CH_959	03_82K_103	50	-22.00	Cloud	Cloud	Cloud	-31.14
11	UK_2	02_53K_002	1597	-22.17	-20.66	-3.82	-8.27	-16.62
12	JK_198	01_52J_002	67	-22.39	8.96	4.48	4.72	-13.97
13	CH_1089	03_91C_059	98	-22.45	Cloud	18.37	0.14	-9.25

S. No.	UID	Lake_ID	Water spread area in Ha	%Diff in Water Spread Area				
			2009 (Inventory)	2021	2020	2019	2018	2017
14	CH_207	02_71P_019	48	-22.92	-12.50	164.58	32.50	-29.88
15	CH_372	03_62O_027	47	-23.40	-19.15	4.26	4.26	-18.17
16	CH_576	03_77P_005	110	-23.64	-21.82	9.09	7.55	-4.78
17	CH_483	03_77H_012	76	-23.68	18.42	18.42	18.42	19.19
18	NP_58	02_72I_002	67	-23.88	-5.97	8.96	5.97	-11.23
19	BH_188	03_78M_010	50	-24.00	-8.00	2.00	-3.04	Cloud
20	SK_11	03_78A_003	58	-24.14	8.62	55.17	220.69	Cloud
21	JK_111	01_43K_010	66	-24.24	10.61	22.73	6.72	4.13
22	CH_892	03_82K_036	69	-24.64	Cloud	2.90	2.90	Cloud
23	CH_613	03_78E_026	60	-25.00	Cloud	3.33	-1.67	-10.18
24	CH_770	03_82G_009	51	-25.49	-21.57	13.73	6.89	-9.80
25	CH_896	03_82K_040	66	-25.76	Cloud	Cloud	0.65	Cloud
26	JK_99	01_43J_021	1238	-26.41	-11.79	-11.15	-11.15	-11.51

S. No.	UID	Lake_ID	Water spread area in Ha	%Diff in Water Spread Area				
			2009 (Inventory)	2021	2020	2019	2018	2017
27	CH_388	03_62O_043	86	-26.74	6.98	18.60	8.14	-5.38
28	JK_157	01_43N_030	86	-29.07	-3.49	3.49	2.17	-7.31
29	CH_259	02_77D_004	1273	-29.54	-63.00	-38.10	-1.96	-41.75
30	CH_611	03_78E_019	60	-30.00	0.00	10.00	12.18	31.11
31	CH_816	03_82G_055	62	-30.65	Cloud	Cloud	5.71	-22.69
32	CH_609	03_78E_017	65	-30.77	-23.08	Cloud	-4.62	-14.63
33	NP_41	02_63M_002	153	-31.37	-65.36	-1.31	-0.12	-33.76
34	CH_64	01_61G_003	63	-31.75	-4.76	46.03	14.29	0.85
35	CH_530	03_77L_014	48	-33.33	10.42	16.67	12.50	Cloud
36	CH_338	03_62N_021	197	-33.50	7.11	14.72	8.12	5.45
37	JK_191	01_52G_003	1502	-33.56	-1.86	6.46	6.47	-7.27
38	AP_49	03_82O_042	44	-34.09	-6.82	25.00	1.54	15.97
39	CH_636	03_82B_010	52	-34.62	-7.69	28.85	-3.85	-18.72
40	SK_8	03_77D_008	46	-34.78	-2.17	10.87	12.21	37.00

S. No.	UID	Lake_ID	Water spread area in Ha	%Diff in Water Spread Area				
			2009 (Inventory)	2021	2020	2019	2018	2017
41	CH_5	01_52O_002	135	-34.81	7.41	12.59	2.22	-11.07
42	JK_205	01_52J_009	57	-35.09	24.56	42.11	25.32	-6.53
43	CH_524	03_77L_008	85	-35.29	40.00	22.35	1.18	-9.89
44	CH_479	03_77H_004	201	-35.32	-35.82	0.00	7.75	-3.57
45	CH_256	02_77D_001	5831	-36.17	-36.32	-18.28	-18.28	-38.10
46	HP_10	01_53A_002	13679	-36.27	-13.26	7.29	-1.29	-2.89
47	CH_1085	03_91C_052	64	-39.06	Cloud	-21.88	-31.00	-29.00
48	CH_73	01_62B_001	440	-40.45	-27.73	-2.73	-2.60	-26.14
49	CH_716	03_82D_010	76	-40.79	-22.37	-7.89	0.35	-77.53
50	UK_11	02_53P_003	1078	-40.91	-12.24	3.71	2.38	-31.82
51	CH_598	03_78A_018	67	-46.27	Cloud	-17.91	Cloud	Cloud
52	CH_320	03_62N_003	57	-47.37	-7.02	12.28	12.28	-5.64
53	CH_419	03_71G_010	304	-50.00	-33.55	18.75	16.52	2.74
54	CH_522	03_77L_006	44	-50.00	6.82	18.18	9.09	-80.74

S. No.	UID	Lake_ID	Water spread area in Ha	%Diff in Water Spread Area				
			2009 (Inventory)	2021	2020	2019	2018	2017
55	UK_10	02_53P_002	734	-60.63	-50.68	-39.10	-38.56	-40.59
56	CH_62	01_61G_001	85	-61.18	14.12	24.71	13.40	11.51
57	CH_373	03_62O_028	932	-71.78	-2.68	8.91	8.91	0.19
58	CH_403	03_71C_010	49	-75.51	2.04	18.37	18.37	121.38

**Table 4 – List of all GL/WBs with calculation of maximum area during 2021 (max of water spread area during June – October, 2021) and % difference in area in reference to Base 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-21	Jul-21	Aug-21	Sep-21	Oct-21		Area (Max) 2021
1	CH_33	01_61C_005			China	Indus	Indus	139	679	575	493	502	537	679	388.49
2	HP_5	01_52H_004	HP	Lahul and Spiti	India	Indus	Chenab	46	139	Cloud	139	147	137	147	219.57
3	CH_206	02_71P_018			China	Ganga	Arun Kosi	51	Cloud	Cloud	Cloud	132	128	132	158.82
4	CH_1176	03_91H_011			China	Brahmaputra	Luhit	50	Cloud	Cloud	Cloud	53	96	96	92.00
5	CH_423	03_71G_014			China	Brahmaputra	0	140	Cloud	255	Cloud	268	221	268	91.43
6	CH_55	01_61D_003			China	Indus	Indus	46	38	38	84	Cloud	30	84	82.61
7	CH_849	03_82J_019			China	Brahmaputra	0	45	Cloud	Cloud	Cloud	76	Cloud	76	68.89
8	NP_64	02_72I_011	Nepal		Nepal	Ganga	Sun Kosi	100	165	150	Cloud	152	141	165	65.00
9	HP_3	01_52H_002	HP	Lahul and Spiti	India	Indus	Chenab	62	101	102	91	90	83	102	64.52



S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha						% diff	
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21		Area (Max) 2021
10	AP_206	03_92E_001	AP	Lohit	India	Brahmaputra	Luhit	45	Cloud	Cloud	Cloud	Cloud	74	74	64.44
11	SK_20	03_78A_014	Sikkim	North Sikkim	India	Brahmaputra	Teesta	94	Cloud	Cloud	145	154	146	154	63.83
12	CH_834	03_82J_004			China	Brahmaputra	0	378	533	617	Cloud	592	Cloud	617	63.23
13	CH_188	02_71L_034			China	Ganga	Sun Kosi	46	65	Cloud	Cloud	73	20	73	58.70
14	CH_865	03_82K_009			China	Brahmaputra	0	116	Cloud	Cloud	Cloud	181	Cloud	181	56.03
15	CH_1032	03_82O_029			China	Brahmaputra	Dihang	68	Cloud	Cloud	Cloud	105	Cloud	105	54.41
16	CH_39	01_61C_011			China	Indus	Indus	408	624	595	509	536	581	624	52.94
17	AP_135	03_91D_041	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	115	Cloud	Cloud	Cloud	175	137	175	52.17
18	CH_590	03_77P_019			China	Brahmaputra	Dangme Chu	220	Cloud	332	Cloud	304	311	332	50.91
19	CH_1175	03_91H_010			China	Brahmaputra	Luhit	79	Cloud	Cloud	Cloud	95	119	119	50.63
20	CH_244	02_72I_004			China	Ganga	Sun Kosi	121	Cloud	170	Cloud	170	181	181	49.59
21	CH_838	03_82J_008			China	Brahmaputra		156	Cloud	227	Cloud	215	Cloud	227	45.51
22	SK_26	03_78A_021	Sikkim	North Sikkim	India	Brahmaputra	Teesta	56	Cloud	Cloud	Cloud	81	66	81	44.64

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Area (Max) 2021	
23	CH_6	01_52O_003			China	Indus	Indus	148	210	213	177	152	194	213	43.92
24	SK_19	03_78A_013	Sikkim	North Sikkim	India	Brahmaputra	Teesta	63	Cloud	Cloud	79	89	60	89	41.27
25	CH_593	03_77P_023			China	Brahmaputra	Kuri Chu	45	Cloud	Cloud	Cloud	63	53	63	40.00
26	CH_38	01_61C_010			China	Indus	Indus	88	123	118	120	102	115	123	39.77
27	CH_36	01_61C_008			China	Indus	Indus	151	208	199	171	176	178	208	37.75
28	CH_426	03_71K_003			China	Brahmaputra		72	98	Cloud	Cloud	98	87	98	36.11
29	CH_101	01_62F_010			China	Indus	Satluj	45	Cloud	57	Cloud	Cloud	61	61	35.56
30	CH_583	03_77P_012			China	Brahmaputra		66	Cloud	Cloud	89	55	59	89	34.85
31	CH_975	03_82N_004			China	Brahmaputra		92	120	124	Cloud	121	Cloud	124	34.78
32	CH_551	03_77L_042			China	Brahmaputra	Kuri Chu	50	Cloud	Cloud	58	62	66	66	32.00
33	AP_95	03_91C_049	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	57	Cloud	Cloud	Cloud	75	Cloud	75	31.58
34	NP_67	02_72I_014	Nepal		Nepal	Ganga	Sun Kosi	137	180	180	Cloud	176	175	180	31.39
35	CH_420	03_71G_011			China	Brahmaputra		1192	Cloud	Cloud	Cloud	1563	1540	1563	31.12
36	CH_269	02_78A_003			China	Ganga	Arun Kosi	124	153	Cloud	Cloud	162	156	162	30.65

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha						% diff	
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21		Area (Max) 2021
37	CH_1079	03_91C_033			China	Brahmaputra		153	Cloud	Cloud	Cloud	199	Cloud	199	30.07
38	CH_369	03_62O_024			China	Brahmaputra		721	937	915	Cloud	883	906	937	29.96
39	CH_446	03_71O_010			China	Brahmaputra		813	1034	Cloud	Cloud	1054	1031	1054	29.64
40	CH_404	03_71C_011			China	Brahmaputra		119	Cloud	Cloud	Cloud	154	145	154	29.41
41	CH_1190	03_91H_025			China	Brahmaputra	Luhit	85	Cloud	Cloud	Cloud	Cloud	110	110	29.41
42	CH_552	03_77L_043			China	Brahmaputra	Kuri Chu	181	Cloud	228	Cloud	230	234	234	29.28
43	HP_12	01_53E_001	HP	Mandi	India	Indus	Beas	72	85	93	92	74	78	93	29.17
44	CH_298	03_62J_026			China	Brahmaputra		103	Cloud	132	121	Cloud	123	132	28.16
45	CH_132	02_71H_012			China	Ganga	Arun Kosi	89	Cloud	Cloud	Cloud	Cloud	114	114	28.09
46	CH_183	02_71L_028			China	Ganga	Sun Kosi	98	Cloud	Cloud	94	86	98	27.27	98
47	NP_78	02_72I_025	Nepal		Nepal	Ganga	Sun Kosi	106	Cloud	134	Cloud	Cloud	Cloud	134	26.42
48	CH_422	03_71G_013			China	Brahmaputra		244	Cloud	Cloud	Cloud	306	137	306	25.41
49	CH_835	03_82J_005			China	Brahmaputra		67	71	84	Cloud	67	Cloud	84	25.37
50	JK_5	01_42H_005	J&K/ Ladakh		India	Indus	Gilgit	52	65	63	Cloud	59	Cloud	65	25.00
51	NP_45	02_71D_004	Nepal		Nepal	Ganga	Trisuli	74	92	Cloud	Cloud	87	84	92	24.32

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Area (Max) 2021	
52	CH_432	03_71K_009			China	Brahmaputra		170	Cloud	Cloud	Cloud	211	151	211	24.12
53	CH_1076	03_91C_025			China	Brahmaputra		97	111	111	120	102	106	120	23.71
54	CH_303	03_62J_031			China	Brahmaputra		166	191	205	Cloud	Cloud	205	205	23.49
55	CH_632	03_82B_006			China	Brahmaputra		124	153	121	Cloud	114	Cloud	153	23.39
56	CH_159	02_71L_004			China	Ganga	Arun Kosi	86	106	Cloud	Cloud	88	104	106	23.26
57	CH_30	01_61C_002			China	Indus	Indus	685	836	841	821	815	818	841	22.77
58	CH_592	03_77P_021			China	Brahmaputra	Dangme Chu	53	65	Cloud	Cloud	45	45	65	22.64
59	CH_1170	03_91H_005			China	Brahmaputra	Luhit	58	Cloud	Cloud	Cloud	63	71	71	22.41
60	CH_1075	03_91C_024			China	Brahmaputra		239	290	290	Cloud	292	269	292	22.18
61	CH_313	03_62K_009			China	Brahmaputra		250	305	304	Cloud		Cloud	305	22.00
62	CH_448	03_71P_001			China	Brahmaputra		112	135	Cloud	Cloud	95	96	135	20.54
63	JK_159	01_43N_032	J&K/ Ladakh	Anantnag (Kashmir South)	India	Indus	Jhelum	49	56	59	57	50	52	59	20.41
64	SK_5	03_77D_005	Sikkim	North Sikkim	India	Brahmaputra	Teesta	79	Cloud	Cloud	Cloud	92	95	95	20.25

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha						% diff	
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21		Area (Max) 2021
65	AP_100	03_91C_064	AP		India	Brahmaputra	Dibang	89	Cloud	Cloud	Cloud	107	Cloud	107	20.22
66	AP_84	03_91C_034	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	134	Cloud	Cloud	Cloud	161	Cloud	161	20.15
67	JK_187	01_52C_003	J&K/ Ladakh	Kargil	India	Indus	Indus	45	54	Cloud	51	53	51	54	20.00
68	CH_626	03_82A_007			China	Brahmaputra		85	102	Cloud	Cloud	91	72	102	20.00
69	CH_46	01_61C_018			China	Indus	Indus	1779	2133	2115	2014	1893	1892	2133	19.90
70	NP_92	02_72M_016	Nepal		Nepal	Ganga	Arun Kosi	161	Cloud	Cloud	Cloud	193	Cloud	193	19.88
71	CH_550	03_77L_041			China	Brahmaputra	Kuri Chu	56	Cloud	Cloud	57	67	44	67	19.64
72	CH_543	03_77L_027			China	Brahmaputra	Kuri Chu	163	Cloud	194	Cloud	188	170	194	19.02
73	JK_100	01_43J_022	J&K/ Ladakh	Baramul a (Kashmir North)	India	Indus	Jhelum	WB	60	64	71	67	56	51	71
74	CH_547	03_77L_032			China	Brahmaputra	Kuri Chu	GL	88	Cloud	Cloud	Cloud	103	104	104
75	AP_57	03_82O_064	AP		India	Brahmaputra	Dihang	WB	44	52	Cloud	Cloud	45	Cloud	52
76	CH_52	01_61C_024			China	Indus	Indus	WB	4486	5219	5279	5187	5245	5245	5279

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Area (Max) 2021	
77	BH_45	03_77L_077			Bhutan	Brahmaputra	Puna Tsang Chu	WB	51	Cloud	Cloud	Cloud	60	44	60
78	CH_204	02_71P_016			China	Ganga	Arun Kosi	WB	137	161	98	Cloud	68	88	161
79	CH_63	01_61G_002			China	Indus	Indus	WB	1134	1313	1322	1326	Cloud	1314	1326
80	CH_122	02_71H_002			China	Ganga	Arun Kosi	WB	2152	2513	Cloud	Cloud	2513	2511	2513
81	CH_430	03_71K_007			China	Brahmaputra		WB	80	93	Cloud	Cloud	85	65	93
82	CH_40	01_61C_012			China	Indus	Indus	WB	290	336	337	288	278	287	337
83	CH_288	03_62J_016			China	Brahmaputra		44	Cloud	51	Cloud	Cloud	50	51	15.91
84	CH_621	03_82A_002			China	Brahmaputra		319	369	360	Cloud	349	348	369	15.67
85	CH_564	03_77O_001			China	Brahmaputra		154	96	62	Cloud	178	167	178	15.58
86	CH_630	03_82B_004			China	Brahmaputra		97	112	Cloud	Cloud	95	Cloud	112	15.46
87	SK_9	03_78A_001	Sikkim	North Sikkim	India	Brahmaputra	Teesta	156	Cloud	Cloud	Cloud	180	149	180	15.38
88	CH_478	03_77H_003			China	Brahmaputra		208	Cloud	Cloud	Cloud	240	Cloud	240	15.38
89	CH_217	02_71P_029			China	Ganga	Arun Kosi	80	Cloud	Cloud	Cloud	Cloud	92	92	15.00
90	JK_120	01_43M_003	J&K/ Ladakh		India	Indus	Shigar (Indus)	208	174	224	237	233	217	237	13.94

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha						% diff	
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21		Area (Max) 2021
91	CH_43	01_61C_015			China	Indus	Indus	742	845	833	829	763	754	845	13.88
92	CH_631	03_82B_005			China	Brahmaputra		195	222	Cloud	Cloud	199	Cloud	222	13.85
93	CH_316	03_62K_012			China	Brahmaputra		73	Cloud	Cloud	Cloud	78	83	83	13.70
94	CH_231	02_71P_043			China	Ganga	Arun Kosi	66	Cloud	Cloud	Cloud	75	73	75	13.64
95	CH_635	03_82B_009			China	Brahmaputra		156	175	Cloud	Cloud	158	Cloud	175	12.18
96	CH_844	03_82J_014			China	Brahmaputra		183	Cloud	Cloud	Cloud	205	Cloud	205	12.02
97	BH_13	03_77L_033			Bhutan	Brahmaputra		177	Cloud	Cloud	Cloud	198	194	198	11.86
98	JK_115	01_43K_014	J&K/ Ladakh	Anantnag (Kashmir South)	India	Indus	Jhelum	112	Cloud	125	125	Cloud	121	125	11.61
99	CH_442	03_71O_006			China	Brahmaputra		104	113	116	77	101	91	116	11.54
100	CH_235	02_71P_047			China	Ganga	Arun Kosi	71	Cloud	75	Cloud	79	Cloud	79	11.27
101	CH_385	03_62O_040			China	Brahmaputra		107	119	90	Cloud	70	82	119	11.21
102	HP_1	01_52D_001	HP	Chamba	India	Indus	Ravi	688	734	736	761	765	753	765	11.19
103	CH_306	03_62K_002			China	Brahmaputra		45	49	50	Cloud	45	45	50	11.11
104	CH_628	03_82B_002			China	Brahmaputra		405	450	Cloud	Cloud	438	414	450	11.11

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha						% diff	
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21		Area (Max) 2021
105	BH_34	03_77L_066			Bhutan	Brahmaputra	Manas Chu & Mangde Chu	148	Cloud	Cloud	Cloud	164	162	164	10.81
106	CH_50	01_61C_022			China	Indus	Indus	1501	1659	1661	1640	1634	1622	1661	10.66
107	CH_396	03_71C_003			China	Brahmaputra		47	Cloud	52	Cloud	40	46	52	10.64
108	CH_1001	03_82N_030			China	Brahmaputra		132	Cloud	146	Cloud	128	Cloud	146	10.61
109	CH_141	02_71H_021			China	Ganga	Trisuli	48	53	Cloud	Cloud	38	42	53	10.42
110	SK_4	03_77D_004	Sikkim	North Sikkim	India	Brahmaputra	Teesta	106	Cloud	Cloud	Cloud	117	117	117	10.38
111	CH_375	03_62O_030			China	Brahmaputra		97	107	Cloud	Cloud	74	78	107	10.31
112	CH_149	02_71H_029			China	Ganga	Sun Kosi	474	Cloud	Cloud	Cloud	521	501	521	9.92
113	JK_23	01_43A_002	J&K/ Ladakh		India	Indus	Gilgit	91	96	Cloud	Cloud	92	100	100	9.89
114	BH_22	03_77L_051			Bhutan	Brahmaputra	Puna Tsang Chu	143	Cloud	Cloud	Cloud	157	155	157	9.79
115	CH_525	03_77L_009			China	Brahmaputra		522	Cloud	561	Cloud	573	549	573	9.77
116	CH_49	01_61C_021			China	Indus	Indus	1155	1204	1221	1266	1174	1019	1266	9.61
117	JK_3	01_42H_003	J&K/ Ladakh		India	Indus	Gilgit	97	106	Cloud	Cloud	103	Cloud	106	9.28
118	NP_36	02_62P_003	Nepal		Nepal	Ganga	Trisuli	315	Cloud	Cloud	Cloud	344	342	344	9.21



S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha						% diff	
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21		Area (Max) 2021
119	CH_42	01_61C_014			China	Indus	Indus	286	312	302	311	281	271	312	9.09
120	CH_304	03_62J_032			China	Brahmaputra		77	75	75	Cloud	71	84	84	9.09
121	CH_78	01_62E_003			China	Indus	Indus	136	140	141	148	Cloud	134	148	8.82
122	CH_61	01_61F_004			China	Indus	Indus	3639 2	39574	39363	39575	39575	39600	39600	8.82
123	CH_529	03_77L_013			China	Brahmaputra		318	Cloud	Cloud	Cloud	346	340	346	8.81
124	CH_387	03_62O_042			China	Brahmaputra		57	62	62	Cloud	40	41	62	8.77
125	CH_128	02_71H_008			China	Ganga	Arun Kosi	94	101	102	64	100	88	102	8.51
126	CH_722	03_82E_004			China	Brahmaputra		47	51	Cloud	Cloud	44	Cloud	51	8.51
127	CH_181	02_71L_026			China	Ganga	Sun Kosi	59	64	Cloud	Cloud	Cloud	53	64	8.47
128	CH_44	01_61C_016			China	Indus	Indus	344	373	373	355	307	314	373	8.43
129	JK_85	01_43J_007	J&K/ Ladakh		India	Indus	Jhelum	95	Cloud	Cloud	Cloud	103	76	103	8.42
130	CH_438	03_71O_002			China	Brahmaputra		48	52	49	50	35	40	52	8.33
131	CH_270	02_78A_004			China	Ganga	Arun Kosi	84	88	Cloud	Cloud	91	90	91	8.33
132	CH_1136	03_91D_081			China	Brahmaputra	Luhit	304	Cloud	313	Cloud	Cloud	328	328	7.89

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha						% diff	
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21		Area (Max) 2021
133	BH_15	03_77L_037			Bhutan	Brahmaputra		542	Cloud	Cloud	Cloud	584	582	584	7.75
134	JK_82	01_43J_004	J&K/ Ladakh		India	Indus	Jhelum	65	Cloud	59	Cloud	70	56	70	7.69
135	BH_40	03_77L_072			Bhutan	Brahmaputra	Manas Chu & Mangde Chu	91	98	98	82	88	82	98	7.69
136	CH_261	02_77D_006			China	Ganga	Arun Kosi	80	Cloud	Cloud	86	73	71	86	7.50
137	CH_488	03_77H_018			China	Brahmaputra		80	Cloud	Cloud	49	85	86	86	7.50
138	CH_59	01_61F_002			China	Indus	Indus	55	59	49	55	Cloud	50	59	7.27
139	CH_383	03_62O_038			China	Brahmaputra		124	117	Cloud	Cloud	133	98	133	7.26
140	AP_185	03_91H_067	AP	Lohit	India	Brahmaputra	Luhit	56	Cloud	46	Cloud	Cloud	60	60	7.14
141	CH_3	01_52N_001			China	Indus	Indus	11564	12308	12258	Cloud	12328	12354	12354	6.83
142	CH_147	02_71H_027			China	Ganga	Sun Kosi	434	Cloud	Cloud	Cloud	463	412	463	6.68
143	CH_285	03_62J_013			China	Brahmaputra		854	889	883	911	Cloud	892	911	6.67
144	CH_157	02_71L_002			China	Ganga	Arun Kosi	76	81	80	67	67	52	81	6.58
145	CH_29	01_61C_001			China	Indus	Indus	11154	11624	11869	11866	11866	11866	11869	6.41
146	CH_165	02_71L_010			China	Ganga	Sun Kosi	47	50	Cloud	47	49	42	50	6.38

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Area (Max) 2021	
147	BH_72	03_78E_028			Bhutan	Brahmaputra	Puna Tsang Chu	47	25	Cloud	Cloud	43	50	50	6.38
148	CH_102	01_62J_001			China	Indus	Satluj	5571	Cloud	5923	5850	Cloud	5825	5923	6.32
149	CH_203	02_71P_015			China	Ganga	Arun Kosi	1012	1074	1046	1070	972	982	1074	6.13
150	CH_377	03_62O_032			China	Brahmaputra		49	52	Cloud	Cloud	32	28	52	6.12
151	CH_326	03_62N_009			China	Brahmaputra		288	Cloud	305	Cloud	274	272	305	5.90
152	CH_1205	03_91H_040			China	Brahmaputra	Luhit	51	Cloud	Cloud	Cloud	53	54	54	5.88
153	CH_445	03_71O_009			China	Brahmaputra		2123	2241	Cloud	Cloud	Cloud	2229	2241	5.56
154	CH_262	02_77D_007			China	Ganga	Arun Kosi	54	57	Cloud	Cloud	49	46	57	5.56
155	SK_16	03_78A_009	Sikkim	North Sikkim	India	Brahmaputra	Teesta	54	Cloud	Cloud	Cloud	57	Cloud	57	5.56
156	CH_785	03_82G_024			China	Brahmaputra		95	Cloud	Cloud	Cloud	Cloud	100	100	5.26
157	BH_14	03_77L_035			Bhutan	Brahmaputra		58	61	Cloud	54	48	46	61	5.17
158	CH_56	01_61D_004			China	Indus	Indus	550	531	531	578	459	466	578	5.09

**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-21	Jul-21	Aug-21	Sep-21	Oct-21	Area (Max) 2021	
1	CH_148	02_71H_028			China	Ganga	Sun Kosi	200	Cloud	Cloud	Cloud	190	162	190	-5.00
2	CH_93	01_62F_002			China	Indus	Satluj	333	314	316	300	Cloud	284	316	-5.11
3	CH_916	03_82K_060			China	Brahmaputra		93	Cloud	Cloud	Cloud	88	Cloud	88	-5.38
4	CH_499	03_77J_003			China	Brahmaputra		89	84	71	84	75	76	84	-5.62
5	CH_1004	03_82N_033			China	Brahmaputra		89	Cloud	Cloud	Cloud	84	Cloud	84	-5.62
6	CH_252	02_72M_006			China	Ganga	Arun Kosi	71	67	Cloud	57	51	57	67	-5.63
7	CH_862	03_82K_006			China	Brahmaputra		52	Cloud	Cloud	Cloud	49	Cloud	49	-5.77
8	BH_104	03_78I_023			Bhutan	Brahmaputra	Manas Chu & Mangde Chu	51	Cloud	48	Cloud	38	28	48	-5.88
9	CH_784	03_82G_023			China	Brahmaputra		84	Cloud	Cloud	Cloud	79	79	79	-5.95
10	CH_495	03_77H_030			China	Brahmaputra		66	62	Cloud	Cloud	49	49	62	-6.06
11	CH_453	03_77B_002			China	Brahmaputra		227	213	Cloud	Cloud	190	185	213	-6.17
12	JK_154	01_43N_027	J&K/ Ladakh	Srinagar	India	Indus	Jhelum	48	Cloud	44	45	45	34	45	-6.25
13	CH_654	03_82B_028			China	Brahmaputra		48	Cloud	Cloud	Cloud	44	45	45	-6.25

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Area (Max) 2021	
14	NP_86	02_72M_009	Nepal		Nepal	Ganga	Tamur Kosi	64	Cloud	Cloud	Cloud	60	54	60	-6.25
15	AP_108	03_91D_009	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	47	Cloud	Cloud	Cloud	44	Cloud	44	-6.38
16	CH_526	03_77L_010			China	Brahmaputra		47	40	44	Cloud	30	21	44	-6.38
17	CH_710	03_82D_004			China	Brahmaputra		390	Cloud	Cloud	Cloud	365	365	365	-6.41
18	JK_219	01_52K_011	J&K/ Ladakh	Ladakh (Leh)	India	Indus	Shyok	186	174	Cloud	160	157	160	174	-6.45
19	NP_48	02_71D_007	Nepal		Nepal	Ganga	Trisuli	300	280	Cloud	Cloud	277	275	280	-6.67
20	CH_28	01_61B_003			China	Indus	Indus	224	209	186	Cloud	Cloud	168	209	-6.70
21	AP_91	03_91C_045	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	113	Cloud	Cloud	Cloud	105	Cloud	105	-7.08
22	CH_607	03_78E_012			China	Brahmaputra		279	259	Cloud	Cloud	253	250	259	-7.17
23	CH_665	03_82C_010			China	Brahmaputra		153	Cloud	Cloud	Cloud	141	142	142	-7.19
24	CH_283	03_62J_011			China	Brahmaputra		401	Cloud	372	346	Cloud	333	372	-7.23
25	CH_523	03_77L_007			China	Brahmaputra		1478	Cloud	1370	Cloud	1342	1329	1370	-7.31
26	JK_217	01_52K_009	J&K/ Ladakh	Ladakh (Leh)	India	Indus	Shyok	204	189	189	175	129	169	189	-7.35

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha						% diff	
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21		Area (Max) 2021
27	AP_101	03_91C_069	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	78	Cloud	Cloud	Cloud	72	Cloud	72	-7.69
28	CH_452	03_77B_001			China	Brahmaputra		52	48	Cloud	Cloud	35	26	48	-7.69
29	CH_873	03_82K_017			China	Brahmaputra		179	Cloud	Cloud	Cloud	165	Cloud	165	-7.82
30	CH_1065	03_91C_014			China	Brahmaputra		51	Cloud	Cloud	Cloud	47	44	47	-7.84
31	CH_563	03_77N_004			China	Brahmaputra		1296	1194	784	Cloud	1029	1053	1194	-7.87
32	CH_127	02_71H_007			China	Ganga	Arun Kosi	125	115	115	108	95	105	115	-8.00
33	CH_77	01_62E_002			China	Indus	Indus	161	148	129	121	109	104	148	-8.07
34	NP_19	02_62J_003	Nepal		Nepal	Ganga	Karnal	49	Cloud	Cloud	Cloud	Cloud	45	45	-8.16
35	NP_49	02_71D_008	Nepal		Nepal	Ganga	Trisuli	98	90	Cloud	Cloud	84	82	90	-8.16
36	JK_197	01_52J_001	J&K/ Ladakh	Ladakh (Leh)	India	Indus	Shyok	97	Cloud	Cloud	Cloud	88	89	89	-8.25
37	CH_1106	03_91C_078			China	Brahmaputra	Dibang	48	Cloud	Cloud	Cloud	44	Cloud	44	-8.33
38	JK_226	01_52L_002	J&K/ Ladakh	Ladakh (Leh)	India	Indus	Indus	442	387	377	405	405	403	405	-8.37
39	CH_284	03_62J_012			China	Brahmaputra		165	151	144	142	Cloud	138	151	-8.48
40	AP_87	03_91C_040	AP		India	Brahmaputra	Luhit	94	Cloud	Cloud	Cloud	86	Cloud	86	-8.51

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha						% diff	
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21		Area (Max) 2021
41	SK_2	03_77D_002	Sikkim	North Sikkim	India	Brahmaputra	Teesta	105	Cloud	Cloud	Cloud	96	87	96	-8.57
42	BH_166	03_78I_085			Bhutan	Brahmaputra	Puna Tsang Chu	70	Cloud	Cloud	Cloud	59	64	64	-8.57
43	CH_95	01_62F_004			China	Indus	Satluj	196	Cloud	Cloud	179	Cloud	179	179	-8.67
44	UK_4	02_53O_001	Uthrakhand	Naini Tal	India	Ganga	Ramganga	46	Cloud	42	Cloud	Cloud	41	42	-8.70
45	CH_930	03_82K_074			China	Brahmaputra		88	Cloud	Cloud	Cloud	80	Cloud	80	-9.09
46	CH_671	03_82C_016			China	Brahmaputra		54	Cloud	49	30	45	31	49	-9.26
47	CH_416	03_71G_007			China	Brahmaputra		191	Cloud	Cloud	Cloud	173	151	173	-9.42
48	UK_1	02_53K_001	Uthrakhand	Pauri Garhwal	India	Ganga	Ramganga	6790	4529	4476	Cloud	Cloud	6143	6143	-9.53
49	AP_55	03_82O_062	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	52	Cloud	Cloud	Cloud	47	Cloud	47	-9.62
50	UK_8	02_53O_005	Uthrakhand	Udham Singh Nagar	India	Ganga	Ramganga	1510	624	600	Cloud	1363	1126	1363	-9.74
51	JK_218	01_52K_010	J&K/Ladakh	Ladakh (Leh)	India	Indus	Shyok	152	135	Cloud	Cloud	98	137	137	-9.87

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Area (Max) 2021	
52	CH_575	03_77P_004			China	Brahmaputra		211	Cloud	Cloud	Cloud	186	190	190	-9.95
53	CH_53	01_61D_001			China	Indus	Indus	70	63	62	Cloud	Cloud	33	63	-10.00
54	CH_417	03_71G_008			China	Brahmaputra		60	54	Cloud	Cloud	50	27	54	-10.00
55	CH_210	02_71P_022			China	Ganga	Arun Kosi	80	Cloud	69	Cloud	72	70	72	-10.00
56	CH_848	03_82J_018			China	Brahmaputra		99	Cloud	Cloud	Cloud	89	Cloud	89	-10.10
57	CH_511	03_77K_009			China	Brahmaputra		69	62	58	Cloud	56	58	62	-10.14
58	CH_123	02_71H_003			China	Ganga	Arun Kosi	216	Cloud	Cloud	Cloud	Cloud	194	194	-10.19
59	CH_155	02_71H_035			China	Ganga	Sun Kosi	45	Cloud	Cloud	Cloud	40	31	40	-11.11
60	NP_59	02_72I_003	Nepal		Nepal	Ganga	Sun Kosi	45	40	Cloud	Cloud	37	27	40	-11.11
61	BH_73	03_78E_029			Bhutan	Brahmaputra	Puna Tsang Chu	45	Cloud	Cloud	Cloud	38	40	40	-11.11
62	CH_223	02_71P_035			China	Ganga	Arun Kosi	107	Cloud	Cloud	Cloud	95	Cloud	95	-11.21
63	CH_778	03_82G_017			China	Brahmaputra		53	Cloud	Cloud	Cloud	47	46	47	-11.32
64	SK_3	03_77D_003	Sikkim	North Sikkim	India	Brahmaputra	Teesta	96	Cloud	Cloud	Cloud	85	69	85	-11.46
65	BH_129	03_78I_048			Bhutan	Brahmaputra	Manas Chu & Mangde Chu	52	Cloud	Cloud	Cloud	44	46	46	-11.54



S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha						% diff	
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21		Area (Max) 2021
66	CH_855	03_82J_025			China	Brahmaputra		59	Cloud	Cloud	Cloud	52	Cloud	52	-11.86
67	CH_780	03_82G_019			China	Brahmaputra		59	Cloud	Cloud	Cloud	52	Cloud	52	-11.86
68	CH_565	03_77O_002			China	Brahmaputra		100	Cloud	46	22	22	88	88	-12.00
69	CH_905	03_82K_049			China	Brahmaputra		50	Cloud	Cloud	Cloud	44	Cloud	44	-12.00
70	CH_481	03_77H_007			China	Brahmaputra		924	Cloud	Cloud	Cloud	813	790	813	-12.01
71	CH_264	02_77D_009			China	Ganga	Arun Kosi	58	Cloud	Cloud	Cloud	51	51	51	-12.07
72	CH_812	03_82G_051			China	Brahmaputra		49	Cloud	Cloud	Cloud	43	Cloud	43	-12.24
73	CH_398	03_71C_005			China	Brahmaputra		57	50	Cloud	Cloud	47	41	50	-12.28
74	CH_895	03_82K_039			China	Brahmaputra		224	Cloud	Cloud	Cloud	196	Cloud	196	-12.50
75	CH_168	02_71L_013			China	Ganga	Sun Kosi	64	Cloud	56	Cloud	51	38	56	-12.50
76	CH_725	03_82E_007			China	Brahmaputra		71	Cloud	Cloud	Cloud	62	39	62	-12.68
77	CH_640	03_82B_014			China	Brahmaputra		157	137	Cloud	Cloud	127	123	137	-12.74
78	CH_858	03_82K_002			China	Brahmaputra		75	Cloud	Cloud	Cloud	65	Cloud	65	-13.33

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Area (Max) 2021	
79	CH_476	03_77H_001			China	Brahmaputra		442	Cloud	Cloud	Cloud	383	380	383	-13.35
80	JK_67	01_43G_001	J&K/ Ladakh		India	Indus	Jhelum	22154	9690	14410	14410	19190	18802	19190	-13.38
81	CH_924	03_82K_068			China	Brahmaputra		52	Cloud	Cloud	Cloud	45	Cloud	45	-13.46
82	CH_821	03_82G_060			China	Brahmaputra		59	Cloud	Cloud	Cloud	51	Cloud	51	-13.56
83	AP_118	03_91D_022	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	44	Cloud	Cloud	Cloud	38	Cloud	38	-13.64
84	UK_9	02_53P_001	Uthrakha nd	Udham Singh Nagar	India	Ganga	Ganga	2054	642	701	Cloud	1765	1770	1770	-13.83
85	CH_898	03_82K_042			China	Brahmaputra		205	Cloud	Cloud	Cloud	176	Cloud	176	-14.15
86	CH_591	03_77P_020			China	Brahmaputra	Kuri Chu	63	Cloud	Cloud	Cloud	54	47	54	-14.29
87	CH_901	03_82K_045			China	Brahmaputra		49	Cloud	Cloud	Cloud	42	Cloud	42	-14.29
88	AP_204	03_92A_006	AP	Lohit	India	Brahmaputra	Luhit	83	Cloud	Cloud	Cloud	Cloud	71	71	-14.46

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha						% diff	
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21		Area (Max) 2021
89	JK_202	01_52J_006	J&K/ Ladakh	Ladakh (Leh)	India	Indus	Shyok	110	Cloud	Cloud	Cloud	89	94	94	-14.55
90	BH_194	03_78M_019			Bhutan	Brahmaputra	Dangme Chu	55	Cloud	Cloud	Cloud	47	40	47	-14.55
91	CH_187	02_71L_032			China	Ganga	Sun Kosi	55	Cloud	Cloud	Cloud	47	35	47	-14.55
92	NP_80	02_72I_027	Nepal		Nepal	Ganga	Sun Kosi	82	Cloud	Cloud	Cloud	Cloud	70	70	-14.63
93	AP_92	03_91C_046	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	61	Cloud	Cloud	Cloud	52	Cloud	52	-14.75
94	CH_258	02_77D_003			China	Ganga	Arun Kosi	88	Cloud	Cloud	Cloud	75	47	75	-14.77
95	CH_251	02_72M_005			China	Ganga	Arun Kosi	74	Cloud	Cloud	60	60	63	63	-14.86
96	HP_9	01_53A_001	HP	Kangra	India	Indus	Beas	21867	9216	9216	16976	Cloud	18610	18610	-14.89
97	CH_1182	03_91H_017			China	Brahmaputra	Luhit	46	Cloud	Cloud	Cloud	33	39	39	-15.22
98	CH_1046	03_82O_054			China	Brahmaputra	Dibang	51	Cloud	Cloud	Cloud	43	Cloud	43	-15.69
99	AP_85	03_91C_038	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	113	Cloud	Cloud	Cloud	95	Cloud	95	-15.93

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha						% diff	
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21		Area (Max) 2021
100	AP_67	03_82P_010	AP	Lower Dibang Valley	India	Brahmaputra	Dibang	99	Cloud	Cloud	Cloud	Cloud	83	83	-16.16
101	CH_721	03_82E_003			China	Brahmaputra		98	Cloud	Cloud	Cloud	82	Cloud	82	-16.33
102	CH_893	03_82K_037			China	Brahmaputra		55	Cloud	Cloud	Cloud	46	Cloud	46	-16.36
103	CH_1023	03_82O_016			China	Brahmaputra	Dihang	91	Cloud	Cloud	Cloud	76	Cloud	76	-16.48
104	CH_484	03_77H_013			China	Brahmaputra		48	Cloud	Cloud	Cloud	39	40	40	-16.67
105	CH_584	03_77P_013			China	Brahmaputra		53	Cloud	Cloud	35	42	44	44	-16.98
106	BH_57	03_78E_002			Bhutan	Brahmaputra	Puna Tsang Chu	58	Cloud	Cloud	Cloud	45	48	48	-17.24
107	JK_189	01_52G_001	J&K/ Ladakh	Ladakh (Leh)	India	Indus	Shyok	45	37	Cloud	Cloud	32	36	37	-17.78
108	CH_811	03_82G_050			China	Brahmaputra		44	Cloud	Cloud	Cloud	36	Cloud	36	-18.18
109	CH_606	03_78E_010			China	Brahmaputra		49	40	Cloud	Cloud	29	29	40	-18.37
110	CH_166	02_71L_011			China	Ganga	Sun Kosi	58	47	39	Cloud	47	41	47	-18.97
111	CH_1102	03_91C_074			China	Brahmaputra	Dibang	47	Cloud	Cloud	Cloud	38	Cloud	38	-19.15
112	CH_492	03_77H_023			China	Brahmaputra		47	Cloud	Cloud	Cloud	38	35	38	-19.15

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha						% diff	
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21		Area (Max) 2021
113	JK_227	01_52L_003	J&K/ Ladakh	Ladakh (Leh)	India	Indus	Indus	648	523	517	509	507	492	523	-19.29
114	CH_589	03_77P_018			China	Brahmaputra	Dangme Chu	154	118	124	Cloud	103	91	124	-19.48
115	CH_587	03_77P_016			China	Brahmaputra	Dangme Chu	251	179	Cloud	168	202	165	202	-19.52
116	CH_460	03_77C_006			China	Brahmaputra		102	82	Cloud	Cloud	74	74	82	-19.61
117	BH_60	03_78E_007			Bhutan	Brahmaputra	Puna Tsang Chu	61	Cloud	Cloud	Cloud	49	48	49	-19.67
118	CH_809	03_82G_048			China	Brahmaputra		55	Cloud	Cloud	Cloud	Cloud	44	44	-20.00
119	CH_517	03_77K_015			China	Brahmaputra		108	Cloud	Cloud	Cloud	71	86	86	-20.37
120	CH_646	03_82B_020			China	Brahmaputra		49	Cloud	Cloud	Cloud	39	29	39	-20.41
121	AP_77	03_83A_012	AP	Tawang	India	Brahmaputra	Dangme Chu	63	Cloud	Cloud	Cloud	50	50	50	-20.63
122	NP_12	02_62F_019	Nepal		Nepal	Ganga	Karnal	58	Cloud	Cloud	Cloud	Cloud	46	46	-20.69
123	CH_612	03_78E_023			China	Brahmaputra		58	Cloud	Cloud	Cloud	46	42	46	-20.69
124	CH_418	03_71G_009			China	Brahmaputra		178	141	Cloud	121	Cloud	95	141	-20.79
125	CH_106	02_62B_001			China	Ganga	Karnal	47	37	31	22	Cloud	17	37	-21.28

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha						% diff	
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21		Area (Max) 2021
126	CH_709	03_82D_003			China	Brahmaputra		50	Cloud	Cloud	Cloud	39	38	39	-22.00
127	CH_959	03_82K_103			China	Brahmaputra		50	Cloud	Cloud	Cloud	39	Cloud	39	-22.00
128	UK_2	02_53K_002	Uthrakhand	Udham Singh Nagar	India	Ganga	Ramganga	1597	425	393	758	Cloud	1243	1243	-22.17
129	JK_198	01_52J_002	J&K/ Ladakh	Ladakh (Leh)	India	Indus	Shyok	67	Cloud	Cloud	Cloud	46	52	52	-22.39
130	CH_1089	03_91C_059			China	Brahmaputra	Dibang	98	Cloud	Cloud	Cloud	76	Cloud	76	-22.45
131	CH_207	02_71P_019			China	Ganga	Arun Kosi	48	Cloud	Cloud	Cloud	37	20	37	-22.92
132	CH_372	03_62O_027			China	Brahmaputra		47	Cloud	Cloud	Cloud	36	35	36	-23.40
133	CH_576	03_77P_005			China	Brahmaputra		110	Cloud	Cloud	84	59	31	84	-23.64
134	CH_483	03_77H_012			China	Brahmaputra		76	Cloud	Cloud	Cloud	58	56	58	-23.68
135	NP_58	02_72I_002	Nepal		Nepal	Ganga	Sun Kosi	67	48	Cloud	Cloud	Cloud	51	51	-23.88
136	BH_188	03_78M_010			Bhutan	Brahmaputra	Dangme Chu	50	Cloud	Cloud	Cloud	38	34	38	-24.00
137	SK_11	03_78A_003	Sikkim	North Sikkim	India	Brahmaputra	Teesta	58	Cloud	Cloud	Cloud	44	Cloud	44	-24.14

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha						% diff	
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21		Area (Max) 2021
138	JK_111	01_43K_010	J&K/ Ladakh	Rajauri	India	Indus	Jhelum	66	Cloud	Cloud	Cloud	Cloud	50	50	-24.24
139	CH_892	03_82K_036			China	Brahmaputra		69	Cloud	Cloud	Cloud	52	Cloud	52	-24.64
140	CH_613	03_78E_026			China	Brahmaputra	Amo Chu	60	Cloud	Cloud	Cloud	45	39	45	-25.00
141	CH_770	03_82G_009			China	Brahmaputra		51	Cloud	Cloud	Cloud	38	Cloud	38	-25.49
142	CH_896	03_82K_040			China	Brahmaputra		66	Cloud	Cloud	Cloud	49	Cloud	49	-25.76
143	JK_99	01_43J_021	J&K/ Ladakh	Bagdam	India	Indus	Jhelum	1238	886	888	Cloud	829	911	911	-26.41
144	CH_388	03_62O_043			China	Brahmaputra		86	63	Cloud	Cloud	48	54	63	-26.74
145	JK_157	01_43N_030	J&K/ Ladakh	Srinagar	India	Indus	Jhelum	86	Cloud	Cloud	Cloud	Cloud	61	61	-29.07
146	CH_259	02_77D_004			China	Ganga	Arun Kosi	1273	Cloud	Cloud	Cloud	894	897	897	-29.54
147	CH_611	03_78E_019			China	Brahmaputra		60	Cloud	Cloud	Cloud	42	41	42	-30.00
148	CH_816	03_82G_055			China	Brahmaputra		62	Cloud	Cloud	Cloud	43	Cloud	43	-30.65
149	CH_609	03_78E_017			China	Brahmaputra		65	Cloud	Cloud	Cloud	45	29	45	-30.77

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Area (Max) 2021	
150	NP_41	02_63M_002	Nepal		Nepal	Ganga	Rapti	153	90	105	Cloud	Cloud	51	105	-31.37
151	CH_64	01_61G_003			China	Indus	Indus	63	35	Cloud	38	33	43	43	-31.75
152	CH_530	03_77L_014			China	Brahmaputra		48	Cloud	Cloud	Cloud	32	31	32	-33.33
153	CH_338	03_62N_021			China	Brahmaputra		197	131	Cloud	Cloud	122	119	131	-33.50
154	JK_191	01_52G_003	J&K/ Ladakh	Ladakh (Leh)	India	Indus	Indus	1502	998	Cloud	755	584	566	998	-33.56
155	AP_49	03_82O_042	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	44	Cloud	Cloud	Cloud	29	Cloud	29	-34.09
156	CH_636	03_82B_010			China	Brahmaputra		52	Cloud	Cloud	Cloud	34	Cloud	34	-34.62
157	SK_8	03_77D_008	Sikkim	North Sikkim	India	Brahmaputra	Teesta	46	Cloud	Cloud	Cloud	30	23	30	-34.78
158	CH_5	01_52O_002			China	Indus	Indus	135	88	67	Cloud	Cloud	52	88	-34.81
159	JK_205	01_52J_009	J&K/ Ladakh	Ladakh (Leh)	India	Indus	Shyok	57	Cloud	Cloud	Cloud	31	37	37	-35.09
160	CH_524	03_77L_008			China	Brahmaputra		85	Cloud	Cloud	Cloud	55	39	55	-35.29
161	CH_479	03_77H_004			China	Brahmaputra		201	Cloud	Cloud	130	97	110	130	-35.32



S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha						% diff	
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21		Area (Max) 2021
162	CH_256	02_77D_001			China	Ganga	Arun Kosi	5831	3135	Cloud	Cloud	3340	3722	3722	-36.17
163	HP_10	01_53A_002	HP	Bilaspur	India	Indus	Satluj	13679	5195	5399	7751	Cloud	8717	8717	-36.27
164	CH_1085	03_91C_052		0	China	Brahmaputra	Luhit	64	Cloud	Cloud	Cloud	39	23	39	-39.06
165	CH_73	01_62B_001			China	Indus	Satluj	440	262	243	199	Cloud	136	262	-40.45
166	CH_716	03_82D_010			China	Brahmaputra	Dangme Chu	76	Cloud	Cloud	Cloud	45	33	45	-40.79
167	UK_11	02_53P_003	Uthrakhand	Udham Singh Nagar	India	Ganga	Ramganga	1078	587	600	Cloud	637	591	637	-40.91
168	CH_598	03_78A_018			China	Brahmaputra	Amo Chu	67	Cloud	Cloud	Cloud	36	29	36	-46.27
169	CH_320	03_62N_003			China	Brahmaputra		57	30	Cloud	Cloud	23	16	30	-47.37
170	CH_419	03_71G_010			China	Brahmaputra		304	Cloud	Cloud	Cloud	Cloud	152	152	-50.00
171	CH_522	03_77L_006			China	Brahmaputra		44	Cloud	22	20	17	20	22	-50.00
172	UK_10	02_53P_002	Uthrakhand	Udham Singh Nagar	India	Ganga	Ramganga	734	Cloud	93	Cloud	Cloud	289	289	-60.63
173	CH_62	01_61G_001			China	Indus	Indus	85	Cloud	Cloud	Cloud	Cloud	33	33	-61.18

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha						% diff	
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21		Area (Max) 2021
174	CH_373	03_62O_028			China	Brahmaputra		932	263	Cloud	Cloud	211	149	263	-71.78
175	CH_403	03_71C_010			China	Brahmaputra		49	Cloud	Cloud	Cloud	Cloud	12	12	-75.51

**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-21	Jul-21	Aug-21	Sep-21	Oct-21	Area (Max) 2021	
1	CH_321	03_62N_004			China	Brahmaputra		878	920	921	Cloud	862	816	921	4.90
2	CH_305	03_62K_001			China	Brahmaputra		370	382	388	Cloud	383	373	388	4.86
3	BH_132	03_78I_051			Bhutan	Brahmaputra	Manas Chu & Mangde Chu	103	103	103	Cloud	102	108	108	4.85
4	CH_318	03_62N_001			China	Brahmaputra		14300	14962	14985	Cloud	14985	14985	14985	4.79
5	BH_99	03_78I_018			Bhutan	Brahmaputra	Puna Tsang Chu	63	Cloud	Cloud	Cloud	66	62	66	4.76
6	CH_135	02_71H_015			China	Ganga	Arun Kosi	506	Cloud	530	512	477	499	530	4.74
7	CH_158	02_71L_003			China	Ganga	Arun Kosi	258	270	Cloud	238	240	236	270	4.65
8	CH_623	03_82A_004			China	Brahmaputra		46	Cloud	48	Cloud	30	Cloud	48	4.35
9	CH_178	02_71L_023			China	Ganga	Arun Kosi	116	120	94	Cloud	121	114	121	4.31
10	CH_527	03_77L_011			China	Brahmaputra		1209	Cloud	1118	Cloud	1261	1227	1261	4.30
11	JK_95	01_43J_017	J&K/ Ladakh	Baramula (Kashmir North)	India	Indus	Jhelum	164	154	171	Cloud	155	135	171	4.27

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha						% diff	
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21		Area (Max) 2021
12	NP_57	02_72E_001	Nepal		Nepal	Ganga	Baghmati	142	Cloud	Cloud	Cloud	143	148	148	4.23
13	CH_745	03_82F_020			China	Brahmaputra		71	74	Cloud	Cloud	73	Cloud	74	4.23
14	CH_4	01_52O_001			China	Indus	Shyok	65825	68574	68574	Cloud	68574	68574	68574	4.18
15	CH_1	01_52L_008			China	Indus	Satluj	50	Cloud	Cloud	Cloud	Cloud	52	52	4.00
16	BH_137	03_78I_056			Bhutan	Brahmaputra	Manas Chu & Mangde Chu	76	Cloud	Cloud	63	73	79	79	3.95
17	JK_22	01_43A_001	J&K/ Ladakh		India	Indus	Gilgit	203	211	Cloud	Cloud	197	199	211	3.94
18	JK_195	01_52I_003	J&K/ Ladakh		India	Indus	Shyok	180	187	Cloud	Cloud	174	182	187	3.89
19	CH_410	03_71G_001			China	Brahmaputra		720	Cloud	Cloud	748	731	724	748	3.89
20	JK_167	01_43P_002	J&K/ Ladakh	Jammu	India	Indus	Ravi	52	Cloud	54	Cloud	Cloud	45	54	3.85
21	CH_137	02_71H_017			China	Ganga	Arun Kosi	472	Cloud	488	490	480	460	490	3.81
22	CH_971	03_82L_009			China	Brahmaputra		54	Cloud	Cloud	Cloud	56	Cloud	56	3.70
23	NP_76	02_72I_023	Nepal		Nepal	Ganga	Sun Kosi	81	Cloud	Cloud	Cloud	Cloud	84	84	3.70
24	CH_228	02_71P_040			China	Ganga	Arun Kosi	135	140	140	Cloud	114	112	140	3.70

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha						% diff	
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21		Area (Max) 2021
25	CH_88	01_62E_013			China	Indus	Indus	166	172	169	149	Cloud	131	172	3.61
26	CH_156	02_71L_001			China	Ganga	Arun Kosi	85	84	88	77	77	68	88	3.53
27	CH_580	03_77P_009			China	Brahmaputra		94	Cloud	92	85	97	95	97	3.19
28	JK_220	01_52K_012	J&K/ Ladakh	Ladakh (Leh)	India	Indus	Indus	166	171	144	142	139	139	171	3.01
29	BH_35	03_77L_067			Bhutan	Brahmaputra	Manas Chu & Mangde Chu	78	80	80	Cloud	77	69	80	2.56
30	JK_224	01_52K_016	J&K/ Ladakh	Ladakh (Leh)	India	Indus	Satluj	507	520	483	501	497	497	520	2.56
31	NP_30	02_62K_012	Nepal		Nepal	Ganga	Bheri	469	473	463	Cloud	468	481	481	2.56
32	CH_931	03_82K_075			China	Brahmaputra		118	119	Cloud	Cloud	121	Cloud	121	2.54
33	CH_796	03_82G_035			China	Brahmaputra		81	Cloud	Cloud	Cloud	Cloud	83	83	2.47
34	CH_617	03_78M_016			China	Brahmaputra	Dangme Chu	142	Cloud	Cloud	Cloud	138	145	145	2.11
35	CH_528	03_77L_012			China	Brahmaputra		28771	29371	Cloud	Cloud	29377	29377	29377	2.11
36	CH_647	03_82B_021			China	Brahmaputra		48	Cloud	Cloud	Cloud	49	36	49	2.08

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha						% diff	
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21		Area (Max) 2021
37	CH_741	03_82F_016			China	Brahmaputra		49	50	Cloud	Cloud	36	Cloud	50	2.04
38	AP_89	03_91C_042	AP		India	Brahmaputra	Dibang	50	Cloud	Cloud	Cloud	51	Cloud	51	2.00
39	CH_1194	03_91H_029			China	Brahmaputra	Luhit	50	Cloud	Cloud	Cloud	51	Cloud	51	2.00
40	CH_747	03_82F_022			China	Brahmaputra		103	Cloud	Cloud	Cloud	105	Cloud	105	1.94
41	CH_614	03_78M_003			China	Brahmaputra	Dangme Chu	207	Cloud	Cloud	114	209	211	211	1.93
42	CH_94	01_62F_003			China	Indus	Satluj	40552	41260	41260	41260	41260	41239	41260	1.75
43	CH_732	03_82F_007			China	Brahmaputra		115	117	Cloud	Cloud	108	108	117	1.74
44	CH_213	02_71P_025			China	Ganga	Arun Kosi	123	Cloud	Cloud	Cloud	123	125	125	1.63
45	CH_60	01_61F_003			China	Indus	Indus	558	565	567	Cloud	Cloud	557	567	1.61
46	JK_147	01_43N_020	J&K/ Ladakh		India	Indus	Jhelum	63	Cloud	64	Cloud	Cloud	37	64	1.59
47	BH_195	03_78M_020		0	Bhutan	Brahmaputra	Dangme Chu	65	Cloud	66	Cloud	61	64	66	1.54
48	AP_163	03_91D_107	AP	Lohit	India	Brahmaputra	Luhit	67	Cloud	Cloud	Cloud	68	Cloud	68	1.49
49	CH_720	03_82E_002			China	Brahmaputra		659	668	Cloud	Cloud	631	Cloud	668	1.37

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Area (Max) 2021	
50	CH_79	01_62E_004			China	Indus	Indus	233	236	223	212	Cloud	206	236	1.29
51	BH_12	03_77L_030			Bhutan	Brahmaputra		79	80	Cloud	Cloud	77	78	80	1.27
52	CH_733	03_82F_008			China	Brahmaputra		83	Cloud	Cloud	Cloud	84	84	84	1.20
53	JK_212	01_52K_004	J&K/ Ladakh		India	Indus	Shyok	5741	5769	5755	Cloud	5809	5809	5809	1.18
54	CH_634	03_82B_008			China	Brahmaputra		254	Cloud	257	Cloud	256	Cloud	257	1.18
55	CH_271	02_78A_005			China	Ganga	Arun Kosi	89	Cloud	Cloud	Cloud	90	78	90	1.12
56	CH_121	02_71H_001			China	Ganga	Arun Kosi	26825	27069	Cloud	Cloud	27111	27085	27111	1.07
57	CH_51	01_61C_023			China	Indus	Indus	633	630	639	623	614	596	639	0.95
58	CH_490	03_77H_020			China	Brahmaputra		4972	2883	Cloud	3994	5004	5017	5017	0.91
59	CH_161	02_71L_006			China	Ganga	Arun Kosi	379	Cloud	Cloud	Cloud	382	335	382	0.79
60	CH_520	03_77L_001			China	Brahmaputra		55435	Cloud	Cloud	Cloud	55687	55687	55687	0.45
61	CH_755	03_82F_030			China	Brahmaputra		2675	2623	2406	Cloud	2686	Cloud	2686	0.41
62	CH_415	03_71G_006			China	Brahmaputra		956	Cloud	Cloud	Cloud	953	958	958	0.21
63	CH_729	03_82F_004			China	Brahmaputra		692	693	Cloud	Cloud	689	Cloud	693	0.14
64	JK_201	01_52J_005	J&K	Ladakh (Leh)	India	Indus	Shyok	44	Cloud	Cloud	Cloud	44	33	44	0.00

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha						% diff	
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21		Area (Max) 2021
65	JK_30	01_43E_006	J&K/ Ladakh		India	Indus	Gilgit	71	71	62	Cloud	58	40	71	0.00
66	CH_384	03_62O_039			China	Brahmaputra		306	291	277	Cloud	268	306	306	0.00
67	CH_545	03_77L_029			China	Brahmaputra	Kuri Chu	45	Cloud	Cloud	Cloud	40	45	45	0.00
68	CH_641	03_82B_015			China	Brahmaputra		75	Cloud	Cloud	Cloud	64	75	75	0.00
69	CH_853	03_82J_023			China	Brahmaputra		105	Cloud	Cloud	Cloud	105	Cloud	105	0.00
70	CH_876	03_82K_020			China	Brahmaputra		77	Cloud	Cloud	Cloud	77	Cloud	77	0.00
71	AP_90	03_91C_044	AP	Upper Dibang Valley	India	Brahmaputra	Luhit	63	Cloud	Cloud	Cloud	63	Cloud	63	0.00
72	CH_826	03_82G_065			China	Brahmaputra		59	Cloud	Cloud	Cloud	59	Cloud	59	0.00
73	CH_1078	03_91C_029			China	Brahmaputra		211	211	211	Cloud	200	Cloud	211	0.00
74	BH_19	03_77L_044			Bhutan	Brahmaputra	Puna Tsang Chu	123	Cloud	Cloud	Cloud	122	123	123	0.00
75	CH_215	02_71P_027			China	Ganga	Arun Kosi	49	Cloud	Cloud	Cloud	42	49	49	0.00
76	CH_8	01_52O_005			China	Indus	Indus	780	777	761	759	753	747	777	-0.38
77	CH_874	03_82K_018			China	Brahmaputra		165	Cloud	Cloud	Cloud	164	Cloud	164	-0.61



S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Area (Max) 2021	
78	CH_392	03_71B_002			China	Brahmaputra		8185	8125	8121	Cloud	8115	8115	8125	-0.73
79	NP_28	02_62K_010	Nepal		Nepal	Ganga	Karnal	1051	1040	Cloud	Cloud	Cloud	1043	1043	-0.76
80	JK_225	01_52L_001	J&K/ Ladakh	Ladakh (Leh)	India	Indus	Satluj	14110	13964	13985	13985	13985	13985	13985	-0.89
81	CH_92	01_62F_001			China	Indus	Satluj	25486	25227	25235	25235	Cloud	25235	25235	-0.98
82	CH_933	03_82K_077			China	Brahmaputra		100	Cloud	Cloud	Cloud	99	Cloud	99	-1.00
83	CH_622	03_82A_003			China	Brahmaputra		99	89	98	Cloud	85	75	98	-1.01
84	CH_66	01_61H_001			China	Indus	Indus	282	223	203	265	279	271	279	-1.06
85	CH_253	02_72M_007			China	Ganga	Arun Kosi	90	Cloud	Cloud	Cloud	89	82	89	-1.11
86	CH_850	03_82J_020			China	Brahmaputra		439	Cloud	Cloud	Cloud	434	Cloud	434	-1.14
87	CH_425	03_71K_002			China	Brahmaputra		2248	2210	Cloud	Cloud	2219	2219	2219	-1.29
88	CH_533	03_77L_017			China	Brahmaputra		74	67	Cloud	Cloud	73	69	73	-1.35
89	JK_149	01_43N_022	J&K/ Ladakh		India	Indus	Jhelum	72	Cloud	71	Cloud	66	48	71	-1.39
90	BH_4	03_77H_011			Bhutan	Brahmaputra		143	Cloud	Cloud	141	139	132	141	-1.40
91	CH_806	03_82G_045			China	Brahmaputra		70	Cloud	Cloud	Cloud	69	Cloud	69	-1.43

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha						% diff	
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21		Area (Max) 2021
92	CH_386	03_62O_041			China	Brahmaputra		206	203	133	Cloud	172	178	203	-1.46
93	CH_604	03_78E_006			China	Brahmaputra		67	66	Cloud	Cloud	57	46	66	-1.49
94	CH_633	03_82B_007			China	Brahmaputra		199	Cloud	Cloud	Cloud	196	Cloud	196	-1.51
95	CH_339	03_62N_022			China	Brahmaputra		198	194	195	Cloud	Cloud	166	195	-1.52
96	CH_521	03_77L_003			China	Brahmaputra		4065	Cloud	3977	Cloud	3999	3984	3999	-1.62
97	CH_605	03_78E_009			China	Brahmaputra		175	172	Cloud	Cloud	160	154	172	-1.71
98	NP_37	02_62P_004	Nepal		Nepal	Ganga	Trisuli	406	399	Cloud	Cloud	377	373	399	-1.72
99	CH_823	03_82G_062			China	Brahmaputra		58	Cloud	57	Cloud	55	55	57	-1.72
100	CH_216	02_71P_028			China	Ganga	Arun Kosi	54	Cloud	Cloud	46	53	45	53	-1.85
101	CH_347	03_62O_002			China	Brahmaputra		52	51	Cloud	Cloud	Cloud	9	51	-1.92
102	CH_90	01_62E_015			China	Indus	Satluj	51	50	45	39	38	25	50	-1.96
103	CH_739	03_82F_014			China	Brahmaputra		49	48	Cloud	Cloud	36	Cloud	48	-2.04
104	CH_519	03_77K_017			China	Brahmaputra		3853	Cloud	3732	Cloud	3770	3767	3770	-2.15
105	AP_109	03_91D_010	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	46	Cloud	Cloud	Cloud	45	Cloud	45	-2.17

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Area (Max) 2021	
106	HP_6	01_52H_005	HP	Lahul and Spiti	India	Indus	Chenab	45	44	41	36	32	33	44	-2.22
107	CH_1135	03_91D_080			China	Brahmaputra	Luhit	45	Cloud	Cloud	Cloud	Cloud	44	44	-2.22
108	CH_263	02_77D_008			China	Ganga	Arun Kosi	44	Cloud	Cloud	Cloud	43	42	43	-2.27
109	CH_287	03_62J_015			China	Brahmaputra		82	Cloud	80	71	Cloud	68	80	-2.44
110	CH_847	03_82J_017			China	Brahmaputra		282	Cloud	Cloud	Cloud	275	Cloud	275	-2.48
111	CH_482	03_77H_008			China	Brahmaputra		1256	1145	Cloud	Cloud	1204	1224	1224	-2.55
112	CH_80	01_62E_005			China	Indus	Indus	189	184	184	171	Cloud	168	184	-2.65
113	CH_429	03_71K_006			China	Brahmaputra		2096	Cloud	Cloud	1982	2040	2040	2040	-2.67
114	JK_98	01_43J_020	J&K/ Ladakh	Baramula (Kashmir North)	India	Indus	Jhelum	191	183	185	167	145	143	185	-3.14
115	CH_85	01_62E_010			China	Indus	Indus	156	151	141	122	Cloud	99	151	-3.21
116	BH_36	03_77L_068			Bhutan	Brahmaputra	Kuri Chu	86	Cloud	Cloud	Cloud	65	83	83	-3.49
117	NP_62	02_72I_007	Nepal		Nepal	Ganga	Sun Kosi	56	Cloud	Cloud	Cloud	54	49	54	-3.57
118	JK_1	01_42H_001	J&K/ Ladakh		India	Indus	Gilgit	276	266	Cloud	258	248	Cloud	266	-3.62

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Area (Max) 2021	
								119	CH_990	03_82N_019			China	Brahmaputra	
120	JK_47	01_43E_023	J&K/ Ladakh		India	Indus	Gilgit	82	72	Cloud	79	75	Cloud	79	-3.66
121	JK_222	01_52K_014	J&K/ Ladakh	Ladakh (Leh)	India	Indus	Indus	405	356	326	383	390	369	390	-3.70
122	AP_54	03_82O_061	AP	Upper Dibang Valley	India	Brahmaputra	Dibang	54	Cloud	Cloud	Cloud	52	Cloud	52	-3.70
123	CH_81	01_62E_006			China	Indus	Indus	524	504	497	496	Cloud	499	504	-3.82
124	CH_334	03_62N_017			China	Brahmaputra		77	74	Cloud	Cloud	60	62	74	-3.90
125	JK_128	01_43N_001	J&K/ Ladakh		India	Indus	Shingo (Indus)	127	120	122	Cloud	111	95	122	-3.94
126	JK_128	01_43N_001	J&K/ Ladakh		India	Indus	Shingo (Indus)	127	120	122	Cloud	111	95	122	-3.94
127	CH_273	03_62J_001			China	Brahmaputra		147	141	138	Cloud	117	114	141	-4.08
128	CH_936	03_82K_080			China	Brahmaputra		47	Cloud	Cloud	Cloud	45	Cloud	45	-4.26
129	CH_54	01_61D_002			China	Indus	Indus	1560	1466	1492	1478	1485	1490	1492	-4.36

S. No.	UID	Lake_ID	State	District	Country	Basin	River	Water spread area in Ha							% diff
								2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Area (Max) 2021	
130	BH_197	03_78M_022			Bhutan	Brahmaputra	Dangme Chu	67	Cloud	Cloud	Cloud	64	53	64	-4.48
131	CH_854	03_82J_024			China	Brahmaputra		67	Cloud	Cloud	Cloud	64	Cloud	64	-4.48
132	CH_588	03_77P_017			China	Brahmaputra	Dangme Chu	2345	2239	Cloud	Cloud	2232	2232	2239	-4.52
133	CH_863	03_82K_007			China	Brahmaputra		130	Cloud	Cloud	Cloud	124	Cloud	124	-4.62
134	CH_434	03_71K_011			China	Brahmaputra		387	Cloud	Cloud	Cloud	368	355	368	-4.91
135	CH_69	01_62A_003			China	Indus	Indus	1355	1283	1288	1284	Cloud	1280	1288	-4.94

**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-21	Jul-21	Aug-21	Sep-21	Oct-21	Area (Max) 2021	
1	JK_188	01_52E_001	J&K/ Ladakh		India	Indus	Shyok	51	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
2	JK_196	01_52I_004	J&K/ Ladakh		India	Indus	Shyok	124	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
3	CH_735	03_82F_010			China	Brahmaputra		44	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
4	CH_1037	03_82O_044			China	Brahmaputra	Dihang	92	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
5	CH_1039	03_82O_047			China	Brahmaputra	Dihang	44	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
6	CH_1098	03_91C_070			China	Brahmaputra	Dibang	57	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
7	CH_242	02_71P_054			China	Ganga	Arun Kosi	102	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
8	AP_203	03_92A_005	AP	Lohit	India	Brahmaputra	Luhit	50	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
9	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 more than or equal to 20% INCREASE in water spread area during 2021 in reference to Base area (2009)**

S. No.	UID	Lake_ID	Water spread area in Ha							% diff
			2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Area (Max) 2021	
1	CH_33	01_61C_005	139	679	575	493	502	537	679	388.49
2	HP_5	01_52H_004	46	139	Cloud	139	147	137	147	219.57
3	CH_206	02_71P_018	51	Cloud	Cloud	Cloud	132	128	132	158.82
5	CH_1176	03_91H_011	50	Cloud	Cloud	Cloud	53	96	96	92.00
6	CH_423	03_71G_014	140	Cloud	255	Cloud	268	221	268	91.43
7	CH_55	01_61D_003	46	38	38	84	Cloud	30	84	82.61
8	CH_849	03_82J_019	45	Cloud	Cloud	Cloud	76	Cloud	76	68.89
9	NP_64	02_72I_011	100	165	150	Cloud	152	141	165	65.00
10	HP_3	01_52H_002	62	101	102	91	90	83	102	64.52
11	AP_206	03_92E_001	45	Cloud	Cloud	Cloud	Cloud	74	74	64.44
12	SK_20	03_78A_014	94	Cloud	Cloud	145	154	146	154	63.83

S. No.	UID	Lake_ID	Water spread area in Ha							% diff
			2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Area (Max) 2021	
13	CH_188	02_71L_034	46	65	Cloud	Cloud	73	20	73	58.70
14	CH_865	03_82K_009	116	Cloud	Cloud	Cloud	181	Cloud	181	56.03
15	CH_1032	03_82O_029	68	Cloud	Cloud	Cloud	105	Cloud	105	54.41
16	CH_39	01_61C_011	408	624	595	509	536	581	624	52.94
17	AP_135	03_91D_041	115	Cloud	Cloud	Cloud	175	137	175	52.17
18	CH_590	03_77P_019	220	Cloud	332	Cloud	304	311	332	50.91
19	CH_1175	03_91H_010	79	Cloud	Cloud	Cloud	95	119	119	50.63
20	CH_244	02_72I_004	121	Cloud	170	Cloud	170	181	181	49.59
21	CH_838	03_82J_008	156	Cloud	227	Cloud	215	Cloud	227	45.51
22	SK_26	03_78A_021	56	Cloud	Cloud	Cloud	81	66	81	44.64
23	CH_6	01_52O_003	148	210	213	177	152	194	213	43.92
24	SK_19	03_78A_013	63	Cloud	Cloud	79	89	60	89	41.27
25	CH_593	03_77P_023	45	Cloud	Cloud	Cloud	63	53	63	40.00
26	CH_38	01_61C_010	88	123	118	120	102	115	123	39.77
27	CH_36	01_61C_008	151	208	199	171	176	178	208	37.75



S. No.	UID	Lake_ID	Water spread area in Ha							% diff
			2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Area (Max) 2021	
28	CH_426	03_71K_003	72	98	Cloud	Cloud	98	87	98	36.11
29	CH_101	01_62F_010	45	Cloud	57	Cloud	Cloud	61	61	35.56
30	CH_583	03_77P_012	66	Cloud	Cloud	89	55	59	89	34.85
31	CH_975	03_82N_004	92	120	124	Cloud	121	Cloud	124	34.78
32	CH_551	03_77L_042	50	Cloud	Cloud	58	62	66	66	32.00
33	AP_95	03_91C_049	57	Cloud	Cloud	Cloud	75	Cloud	75	31.58
34	NP_67	02_72I_014	137	180	180	Cloud	176	175	180	31.39
35	CH_420	03_71G_011	1192	Cloud	Cloud	Cloud	1563	1540	1563	31.12
36	CH_269	02_78A_003	124	153	Cloud	Cloud	162	156	162	30.65
37	CH_1079	03_91C_033	153	Cloud	Cloud	Cloud	199	Cloud	199	30.07
38	CH_369	03_62O_024	721	937	915	Cloud	883	906	937	29.96
39	CH_446	03_71O_010	813	1034	Cloud	Cloud	1054	1031	1054	29.64
40	CH_404	03_71C_011	119	Cloud	Cloud	Cloud	154	145	154	29.41
41	CH_1190	03_91H_025	85	Cloud	Cloud	Cloud	Cloud	110	110	29.41

S. No.	UID	Lake_ID	Water spread area in Ha							% diff
			2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Area (Max) 2021	
42	CH_552	03_77L_043	181	Cloud	228	Cloud	230	234	234	29.28
43	HP_12	01_53E_001	72	85	93	92	74	78	93	29.17
44	CH_298	03_62J_026	103	Cloud	132	121	Cloud	123	132	28.16
45	CH_132	02_71H_012	89	Cloud	Cloud	Cloud	Cloud	114	114	28.09
46	CH_183	02_71L_028	77	98	Cloud	Cloud	94	86	98	27.27
47	NP_78	02_72I_025	106	Cloud	134	Cloud	Cloud	Cloud	134	26.42
48	CH_422	03_71G_013	244	Cloud	Cloud	Cloud	306	137	306	25.41
49	CH_835	03_82J_005	67	71	84	Cloud	67	Cloud	84	25.37
50	JK_5	01_42H_005	52	65	63	Cloud	59	Cloud	65	25.00
51	NP_45	02_71D_004	74	92	Cloud	Cloud	87	84	92	24.32
52	CH_432	03_71K_009	170	Cloud	Cloud	Cloud	211	151	211	24.12
53	CH_1076	03_91C_025	97	111	111	120	102	106	120	23.71
54	CH_303	03_62J_031	166	191	205	Cloud	Cloud	205	205	23.49
55	CH_632	03_82B_006	124	153	121	Cloud	114	Cloud	153	23.39
56	CH_159	02_71L_004	86	106	Cloud	Cloud	88	104	106	23.26

S. No.	UID	Lake_ID	Water spread area in Ha							% diff
			2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Area (Max) 2021	
57	CH_30	01_61C_002	685	836	841	821	815	818	841	22.77
58	CH_592	03_77P_021	53	65	Cloud	Cloud	45	45	65	22.64
59	CH_1170	03_91H_005	58	Cloud	Cloud	Cloud	63	71	71	22.41
60	CH_1075	03_91C_024	239	290	290	Cloud	292	269	292	22.18
61	CH_313	03_62K_009	250	305	304	Cloud		Cloud	305	22.00
62	CH_448	03_71P_001	112	135	Cloud	Cloud	95	96	135	20.54
63	JK_159	01_43N_032	49	56	59	57	50	52	59	20.41
64	SK_5	03_77D_005	79	Cloud	Cloud	Cloud	92	95	95	20.25
65	AP_100	03_91C_064	89	Cloud	Cloud	Cloud	107	Cloud	107	20.22
66	AP_84	03_91C_034	134	Cloud	Cloud	Cloud	161	Cloud	161	20.15
67	JK_187	01_52C_003	45	54	Cloud	51	53	51	54	20.00
68	CH_626	03_82A_007	85	102	Cloud	Cloud	91	72	102	20.00

**Table 5(b) - List of GL & WB that have shown more than or equal to 20% DECREASE in water spread area during 2021 in reference to Base area (2009)**

S. No.	UID	Lake_ID	Water spread area in Ha							% diff
			2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Area (Max) 2021	
1	CH_809	03_82G_048	55	Cloud	Cloud	Cloud	Cloud	44	44	-20.00
2	CH_517	03_77K_015	108	Cloud	Cloud	Cloud	71	86	86	-20.37
3	CH_646	03_82B_020	49	Cloud	Cloud	Cloud	39	29	39	-20.41
4	AP_77	03_83A_012	63	Cloud	Cloud	Cloud	50	50	50	-20.63
5	NP_12	02_62F_019	58	Cloud	Cloud	Cloud	Cloud	46	46	-20.69
6	CH_612	03_78E_023	58	Cloud	Cloud	Cloud	46	42	46	-20.69
7	CH_418	03_71G_009	178	141	Cloud	121	Cloud	95	141	-20.79
8	CH_106	02_62B_001	47	37	31	22	Cloud	17	37	-21.28
9	CH_709	03_82D_003	50	Cloud	Cloud	Cloud	39	38	39	-22.00
10	CH_959	03_82K_103	50	Cloud	Cloud	Cloud	39	Cloud	39	-22.00
11	UK_2	02_53K_002	1597	425	393	758	Cloud	1243	1243	-22.17
12	JK_198	01_52J_002	67	Cloud	Cloud	Cloud	46	52	52	-22.39
13	CH_1089	03_91C_059	98	Cloud	Cloud	Cloud	76	Cloud	76	-22.45
14	CH_207	02_71P_019	48	Cloud	Cloud	Cloud	37	20	37	-22.92
15	CH_372	03_62O_027	47	Cloud	Cloud	Cloud	36	35	36	-23.40

S. No.	UID	Lake_ID	Water spread area in Ha							% diff
			2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Area (Max) 2021	
16	CH_576	03_77P_005	110	Cloud	Cloud	84	59	31	84	-23.64
17	CH_483	03_77H_012	76	Cloud	Cloud	Cloud	58	56	58	-23.68
18	NP_58	02_72I_002	67	48	Cloud	Cloud	Cloud	51	51	-23.88
19	BH_188	03_78M_010	50	Cloud	Cloud	Cloud	38	34	38	-24.00
20	SK_11	03_78A_003	58	Cloud	Cloud	Cloud	44	Cloud	44	-24.14
21	JK_111	01_43K_010	66	Cloud	Cloud	Cloud	Cloud	50	50	-24.24
22	CH_892	03_82K_036	69	Cloud	Cloud	Cloud	52	Cloud	52	-24.64
23	CH_613	03_78E_026	60	Cloud	Cloud	Cloud	45	39	45	-25.00
24	CH_770	03_82G_009	51	Cloud	Cloud	Cloud	38	Cloud	38	-25.49
25	CH_896	03_82K_040	66	Cloud	Cloud	Cloud	49	Cloud	49	-25.76
26	JK_99	01_43J_021	1238	886	888	Cloud	829	911	911	-26.41
27	CH_388	03_62O_043	86	63	Cloud	Cloud	48	54	63	-26.74
28	JK_157	01_43N_030	86	Cloud	Cloud	Cloud	Cloud	61	61	-29.07
29	CH_259	02_77D_004	1273	Cloud	Cloud	Cloud	894	897	897	-29.54
30	CH_611	03_78E_019	60	Cloud	Cloud	Cloud	42	41	42	-30.00

S. No.	UID	Lake_ID	Water spread area in Ha							% diff
			2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Area (Max) 2021	
31	CH_816	03_82G_055	62	Cloud	Cloud	Cloud	43	Cloud	43	-30.65
32	CH_609	03_78E_017	65	Cloud	Cloud	Cloud	45	29	45	-30.77
33	NP_41	02_63M_002	153	90	105	Cloud	Cloud	51	105	-31.37
34	CH_64	01_61G_003	63	35	Cloud	38	33	43	43	-31.75
35	CH_530	03_77L_014	48	Cloud	Cloud	Cloud	32	31	32	-33.33
36	CH_338	03_62N_021	197	131	Cloud	Cloud	122	119	131	-33.50
37	JK_191	01_52G_003	1502	998	Cloud	755	584	566	998	-33.56
38	AP_49	03_82O_042	44	Cloud	Cloud	Cloud	29	Cloud	29	-34.09
39	CH_636	03_82B_010	52	Cloud	Cloud	Cloud	34	Cloud	34	-34.62
40	SK_8	03_77D_008	46	Cloud	Cloud	Cloud	30	23	30	-34.78
41	CH_5	01_52O_002	135	88	67	Cloud	Cloud	52	88	-34.81
42	JK_205	01_52J_009	57	Cloud	Cloud	Cloud	31	37	37	-35.09
43	CH_524	03_77L_008	85	Cloud	Cloud	Cloud	55	39	55	-35.29
44	CH_479	03_77H_004	201	Cloud	Cloud	130	97	110	130	-35.32
45	CH_256	02_77D_001	5831	3135	Cloud	Cloud	3340	3722	3722	-36.17

S. No.	UID	Lake_ID	Water spread area in Ha							% diff
			2009 (Inventory)	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Area (Max) 2021	
46	HP_10	01_53A_002	13679	5195	5399	7751	Cloud	8717	8717	-36.27
47	CH_1085	03_91C_052	64	Cloud	Cloud	Cloud	39	23	39	-39.06
48	CH_73	01_62B_001	440	262	243	199	Cloud	136	262	-40.45
49	CH_716	03_82D_010	76	Cloud	Cloud	Cloud	45	33	45	-40.79
50	UK_11	02_53P_003	1078	587	600	Cloud	637	591	637	-40.91
51	CH_598	03_78A_018	67	Cloud	Cloud	Cloud	36	29	36	-46.27
52	CH_320	03_62N_003	57	30	Cloud	Cloud	23	16	30	-47.37
53	CH_419	03_71G_010	304	Cloud	Cloud	Cloud	Cloud	152	152	-50.00
54	CH_522	03_77L_006	44	Cloud	22	20	17	20	22	-50.00
55	UK_10	02_53P_002	734	Cloud	93	Cloud	Cloud	289	289	-60.63
56	CH_62	01_61G_001	85	Cloud	Cloud	Cloud	Cloud	33	33	-61.18
57	CH_373	03_62O_028	932	263	Cloud	Cloud	211	149	263	-71.78
58	CH_403	03_71C_010	49	Cloud	Cloud	Cloud	Cloud	12	12	-75.51

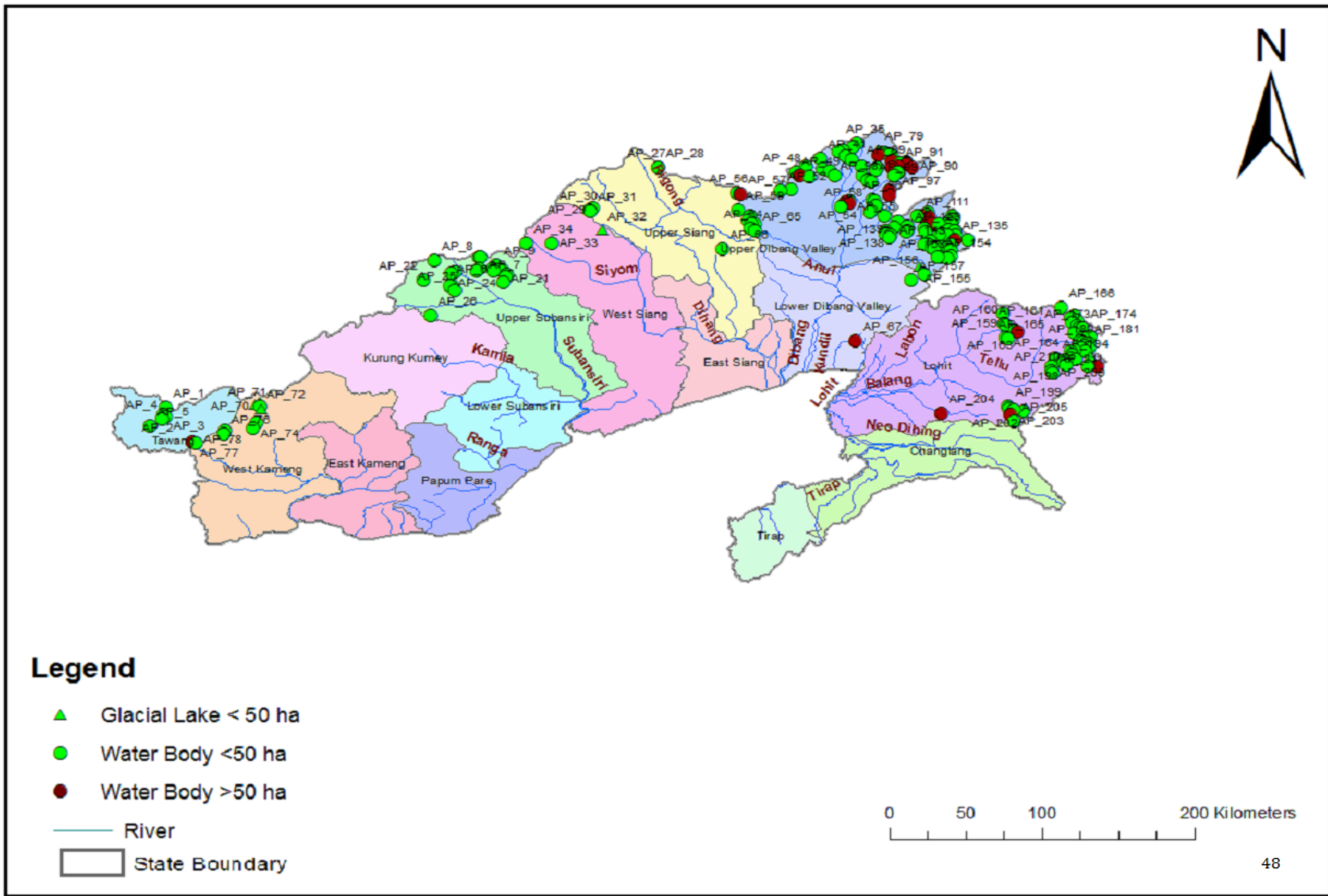
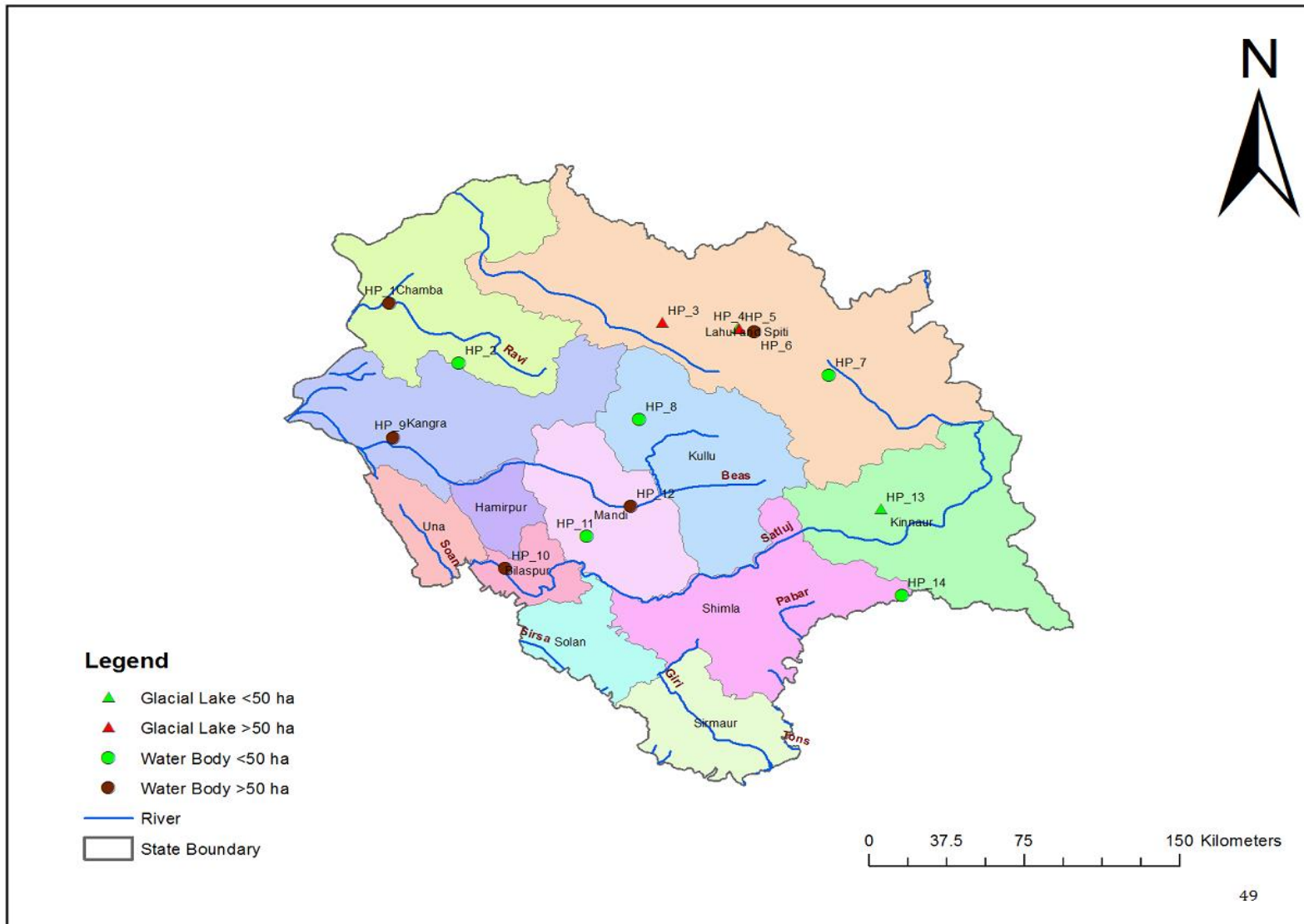
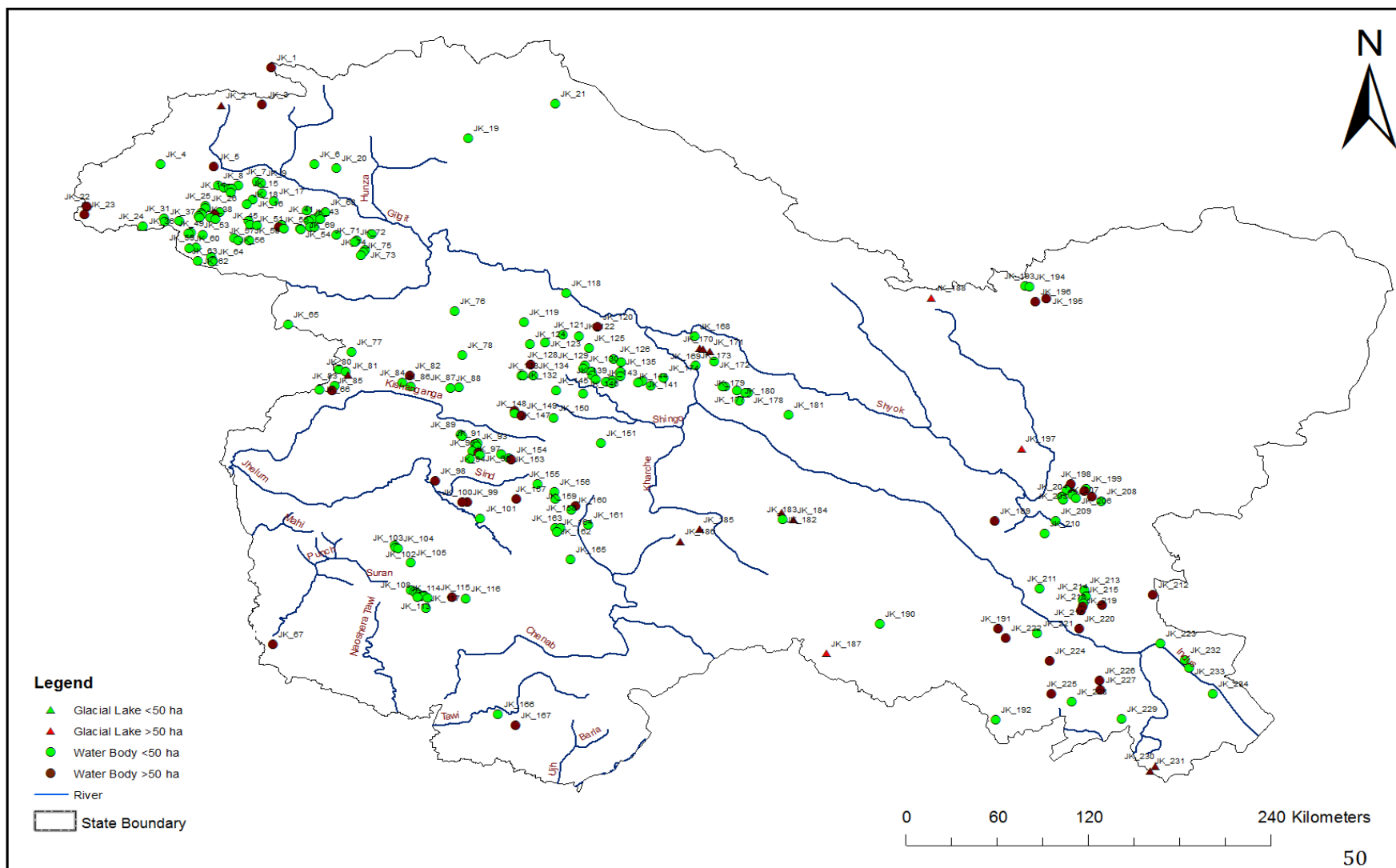


Figure 3 (a): Glacial Lakes & Water Bodies in Arunachal Pradesh

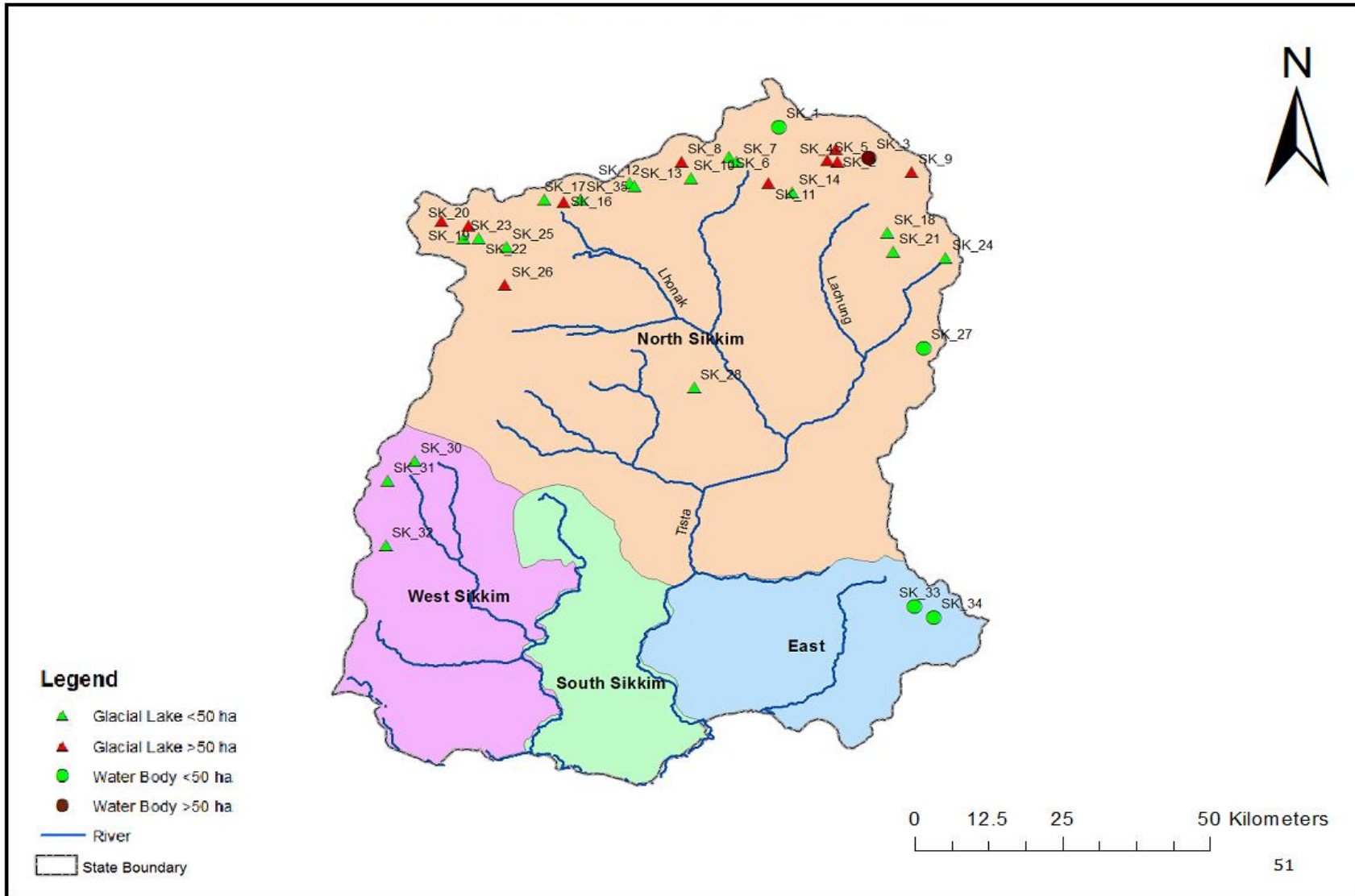




**Figure 3 (b): Glacial Lakes & Water Bodies in Himachal Pradesh**



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



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

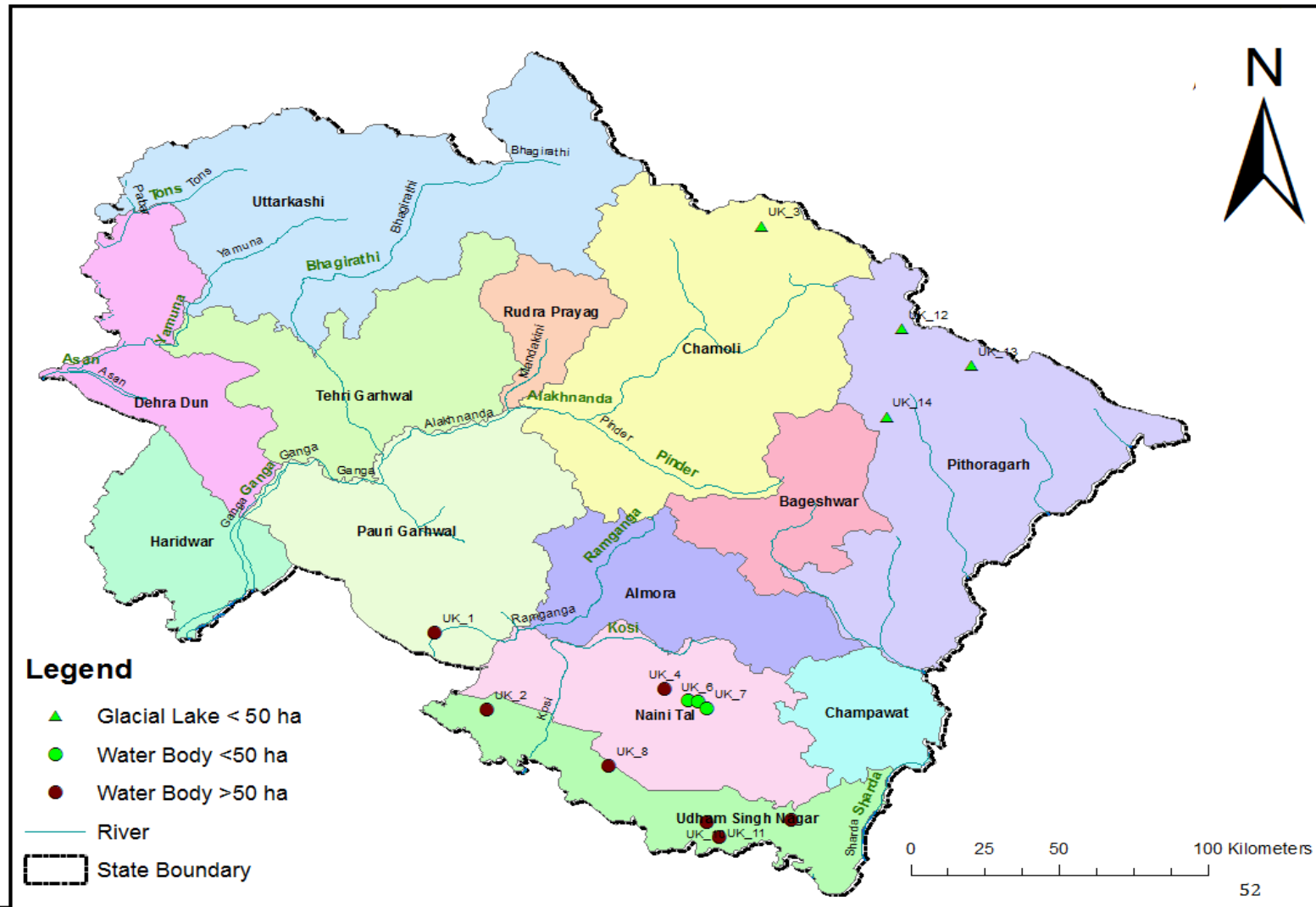


Figure 3 (e): Glacial Lakes & Water Bodies in Uttarakhand

## **References:**

CWC, February 2018. *Report on "Monitoring of Glacial Lakes/Water Bodies in the Himalayan Region of Indian River Basins for 2017"*, Technical Report Published by Morphology & Climate Change Directorate, CWC, New Delhi.

CWC, January 2019. *Report on "Monitoring of Glacial Lakes/Water Bodies in the Himalayan Region of Indian River Basins for 2018"*, Technical Report Published by Morphology & Climate Change Directorate, CWC, New Delhi.

CWC, February 2020. *Report on "Monitoring of Glacial Lakes/Water Bodies in the Himalayan Region of Indian River Basins for 2019"*, Technical Report Published by Morphology & Climate Change Directorate, CWC, New Delhi.

CWC, December 2020. *Report on "Monitoring of Glacial Lakes/Water Bodies in the Himalayan Region of Indian River Basins for 2020"*, Technical Report Published by Morphology & Climate Change Directorate, CWC, New Delhi.

CWC, August, 2021. *Report on "Monitoring of Glacial Lakes/Water Bodies in the Himalayan Region of Indian River Basins for June 2021"*, Technical Report Published by Morphology & Climate Change Directorate, CWC, New Delhi.

CWC, September, 2021. *Report on "Monitoring of Glacial Lakes/Water Bodies in the Himalayan Region of Indian River Basins for July 2021"*, Technical Report Published by Morphology & Climate Change Directorate, CWC, New Delhi.

CWC, September, 2021. *Report on "Monitoring of Glacial Lakes/Water Bodies in the Himalayan Region of Indian River Basins for August 2021"*, Technical Report Published by Morphology & Climate Change Directorate, CWC, New Delhi.

CWC, October, 2021. *Report on "Monitoring of Glacial Lakes/Water Bodies in the Himalayan Region of Indian River Basins for September 2021"*, Technical Report Published by Morphology & Climate Change Directorate, CWC, New Delhi.

CWC, November, 2021. *Report on "Monitoring of Glacial Lakes/Water Bodies in the Himalayan Region of Indian River Basins for October 2021"*, Technical Report Published by Morphology & Climate Change Directorate, CWC, New Delhi.