सत्यमेव जयते

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


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

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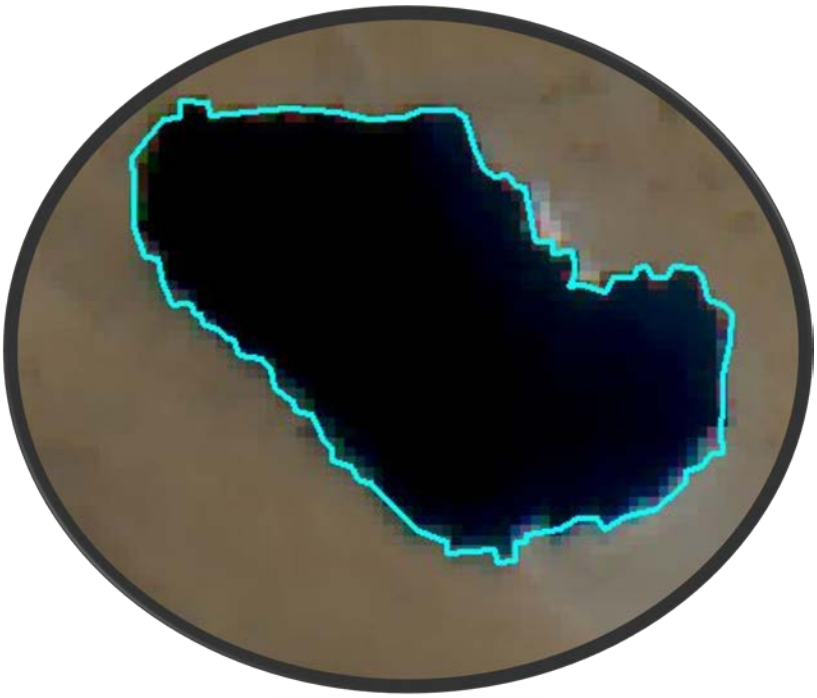


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## Document Control Sheet

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| ABBREVIATIONS | |
|---|---|
| AP | Arunachal Pradesh |
| AWiFS | Advanced Wide Field Sensor |
| DEM | Digital Elevation Model |
| DIFF | Difference |
| FCC | False Colour 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 |
| UT | Union Territory |

# 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 October 2021 and comparison with inventory year of 2009 is presented here.*

*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 October 2021.*

***The inputs for this report are received from NRSC, Hyderabad**. Cloud free satellite data was available for only 367 glacial lakes & water bodies during October 2021. 217 have shown decrease in water spread area, Water spread areas for the same were computed and compared with inventory area. Among them, 79 have shown increase and 71 have not shown any significant change. It is also noted that 99 out of 217 have decreased by more than 20% and 31 out of 79 water bodies have shown increase in area by more than 20%.*

# 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 to October months
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 2011-2020. 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 in the month of 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 October 2021 is given in Table 1.

**Table 1. List of satellite data used**

| S No | Path | Row | Date |
|---|---|---|---|
| 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 |

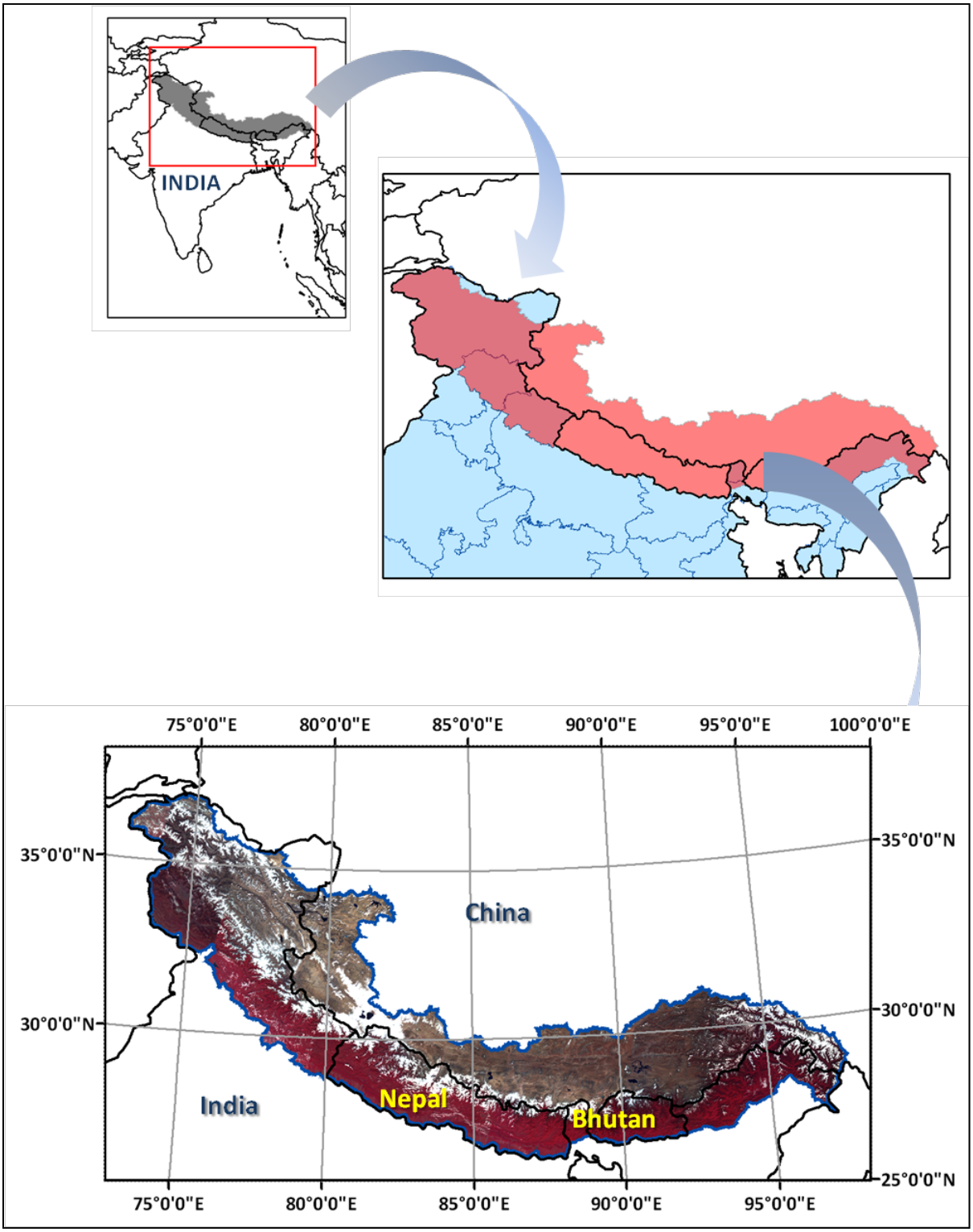



**Figure 1. Index map of study area**

# 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. Orthorectified 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, 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 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.

# 4. Results

## 4.1 Results

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

- 216 glacial lakes & water bodies have shown decrease in water spread area, 80 have shown increase, 71 have not shown any significant change (± 5%).
- 98 out of 216 have decreased by more than 20% and 32 out of 80 water bodies have shown increase in area by more than 20%. The list of such glacial lakes & water bodies is given in Table (4).

**Table (2): List of glacial lakes & water bodies monitored during October, 2021**

| Month | Monitored | Increased | | | Decreased | | | No Change |
|---|---|---|---|---|---|---|---|---|
| October 2021 | 367 | > 20% | < 20% | Total | > 20% | < 20% | Total | 71 |
| | | 31 | 48 | 79 | 99 | 118 | 217 | |

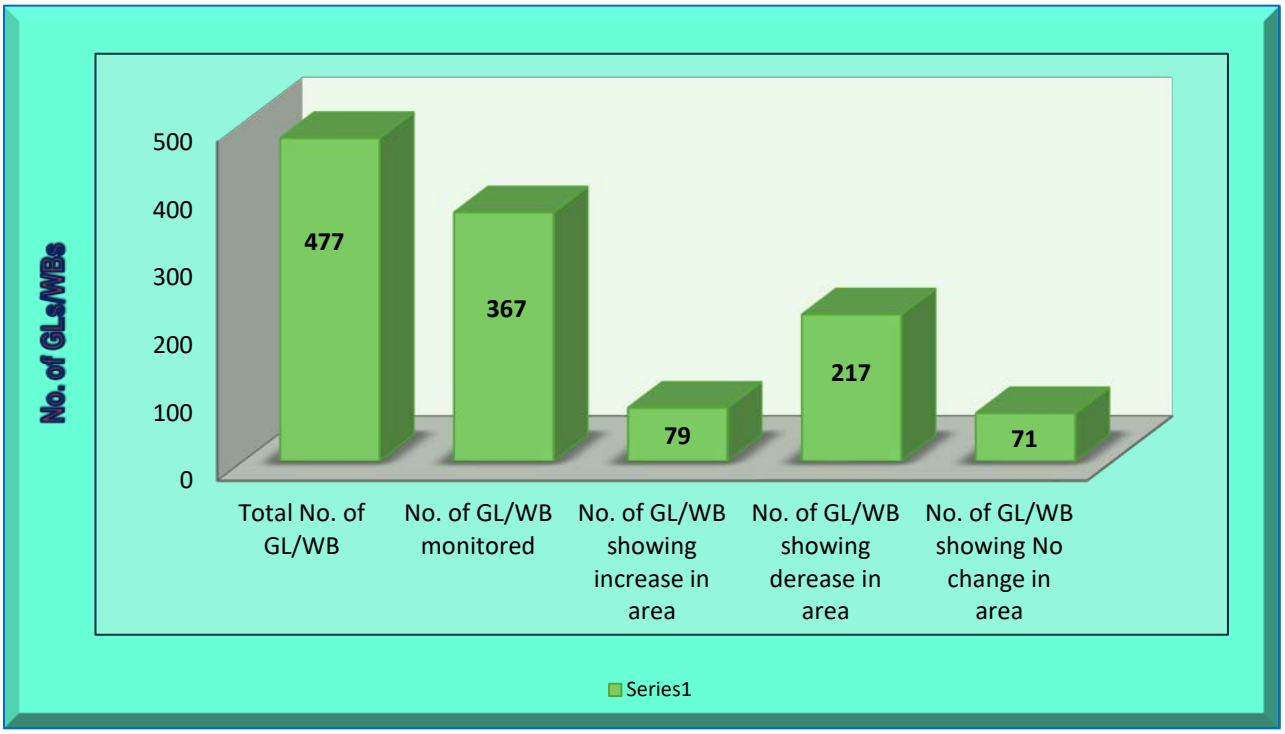



**Figure 2: Glacial Lakes/ Water Bodies Monitored during the month October 2021**

# 5. Conclusions

## 5.1 Conclusions

i. GL & WB having Lake Id's (CH_33, CH_39, HP_5), (*HP_5*), (*CH_206, CH_244, NP_64,*), (SK_20) and (AP_206, CH_423, CH_590, CH_1175, CH_1176) may affect **Jammu & Kashmir/Ladakh, Himachal Pradesh, Bihar, Sikkim, and Arunachal Pradesh & Assam** respectively as shown in Table (3). The area for the above-mentioned GL/WBs has been increased by more than 40%, therefore these GL/WBs required **vigorous monitoring in order to avoid any future disasters**.

ii. Water spread area of glacial lakes & water bodies showing Increase in water spread area (>20%) are shown in **Table 5(a).** Also last five year trends of these glacial lakes & water bodies are shown for comparison in **Table 6(a)**. **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 5(b).** Also last five year trends of this glacial lakes & water bodies are shown for comparison in **Table 6(b)**.

**Table (3): List of GL/WBs showing more than 40% increase in area as compared to Base Year (Required Vigorous monitoring)**

| S. No. | UID | Lake_ID | Water spread area in Ha | | % Diff in Water Spread Area | | | | | | State/ UT | Country | Basin | River | State/UT which may likely to affect |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2009 (Inventory) | Oct 2021 | Oct 2021 | 2020 | 2019 | 2018 | 2017 | 2016 | | | | | |
| 1 | CH_33 | 01_61C_005 | 139 | 537 | 286.33 | 273.38 | 238.13 | 176.62 | -54.98 | 150.39 | | China | Indus | Indus | J&K/Ladakh |
| 2 | HP_5 | 01_52H_004 | 46 | 137 | 197.83 | 260.87 | 252.17 | 243.48 | 157.88 | 202.37 | HP | India | Indus | Chenab | HP, J&K/Ladakh |
| 3 | CH_206 | 02_71P_018 | 51 | 128 | 150.98 | 203.92 | 74.51 | -3.92 | -11.25 | -17.49 | | China | Ganga | Arun Kosi | Bihar |
| 4 | CH_1176 | 03_91H_011 | 50 | 96 | 92.00 | Cloud | 44.00 | -21.86 | Cloud | -13.80 | | China | Brahmaputra | Luhit | AP, Assam |
| 5 | AP_206 | 03_92E_001 | 45 | 74 | 64.44 | Cloud | 35.56 | -8.89 | -8.46 | -15.56 | AP | India | Brahmaputra | Luhit | AP, Assam |
| 6 | CH_423 | 03_71G_014 | 140 | 221 | 57.86 | 86.43 | 95.71 | 78.57 | 22.21 | -18.73 | | China | Brahmaputra | | AP, Assam |
| 7 | SK_20 | 03_78A_014 | 94 | 146 | 55.32 | 59.57 | 65.96 | 65.96 | 5.20 | 5.20 | Sikkim | India | Brahmaputra | Teesta | Sikkim |
| 8 | CH_1175 | 03_91H_010 | 79 | 119 | 50.63 | Cloud | 25.32 | -4.53 | 5.20 | -11.39 | | China | Brahmaputra | Luhit | AP, Assam |
| 9 | CH_244 | 02_72I_004 | 121 | 181 | 49.59 | 73.55 | 97.52 | 75.21 | 71.92 | 86.55 | | China | Ganga | Sun Kosi | Bihar |
| 10 | CH_39 | 01_61C_011 | 408 | 581 | 42.40 | 53.43 | 45.59 | 33.33 | 27.30 | 19.81 | | China | Indus | Indus | J&K/Ladakh |
| 11 | CH_590 | 03_77P_019 | 220 | 311 | 41.36 | 50.91 | 64.09 | 4.19 | 4.19 | -2.86 | | China | Brahmaputra | Dangme Chu | AP, Assam |
| 12 | NP_64 | 02_72I_011 | 100 | 141 | 41.00 | 69.00 | 92.00 | 75.00 | 44.68 | 56.65 | Nepal | Nepal | Ganga | Sun Kosi | Bihar |

## Table 4 – Comparison of water spread area during October 2021 with inventory area

### Table 4(a) - GL & WB that have shown INCREASE in water spread area

| S.No. | UID | Lake_ID | State/ UT | District | Country | Basin | River | LAT | LONG | Elevation | Water spread area in Ha | | % diff | GL/ WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 2009 (Inventory) | Oct 2021 | | |
| 1 | CH_33 | 01_61C_005 | | | China | Indus | Indus | 33.7486 | 80.6416 | 4480 | 139 | 537 | 286.33 | WB |
| 2 | HP_5 | 01_52H_004 | HP | Lahul and Spiti | India | Indus | Chenab | 32.4964 | 77.5516 | 4150 | 46 | 137 | 197.83 | GL |
| 3 | CH_206 | 02_71P_018 | | | China | Ganga | Arun Kosi | 28.3577 | 87.8852 | 4204 | 51 | 128 | 150.98 | WB |
| 4 | CH_1176 | 03_91H_011 | | | China | Brahmaputra | Luhit | 28.9454 | 97.0981 | 4412 | 50 | 96 | 92.00 | WB |
| 5 | AP_206 | 03_92E_001 | AP | Lohit | India | Brahmaputra | Luhit | 27.9898 | 97.3691 | 4185 | 45 | 74 | 64.44 | WB |
| 6 | CH_423 | 03_71G_014 | | | China | Brahmaputra | | 29.0838 | 85.1896 | 4605 | 140 | 221 | 57.86 | WB |
| 7 | SK_20 | 03_78A_014 | Sikkim | North Sikkim | India | Brahmaputra | Teesta | 27.9119 | 88.1986 | 5199 | 94 | 146 | 55.32 | GL |
| 8 | CH_1175 | 03_91H_010 | | | China | Brahmaputra | Luhit | 28.9398 | 97.2614 | 4412 | 79 | 119 | 50.63 | WB |
| 9 | CH_244 | 02_72I_004 | | | China | Ganga | Sun Kosi | 27.9461 | 86.4465 | 5046 | 121 | 181 | 49.59 | GL |
| 10 | CH_39 | 01_61C_011 | | | China | Indus | Indus | 33.7204 | 80.7213 | 4490 | 408 | 581 | 42.40 | WB |
| 11 | CH_590 | 03_77P_019 | | | China | Brahmaputra | Dangme Chu | 28.0588 | 91.9397 | 4631 | 220 | 311 | 41.36 | WB |
| 12 | NP_64 | 02_72I_011 | Nepal | | Nepal | Ganga | Sun Kosi | 27.8995 | 86.9211 | 5003 | 100 | 141 | 41.00 | GL |
| 13 | CH_101 | 01_62F_010 | | | China | Indus | Satluj | 30.3864 | 81.9299 | 5229 | 45 | 61 | 35.56 | GL |
| 14 | HP_3 | 01_52H_002 | HP | Lahul and Spiti | India | Indus | Chenab | 32.5247 | 77.2183 | 4069 | 62 | 83 | 33.87 | GL |
| 15 | CH_551 | 03_77L_042 | | | China | Brahmaputra | Kuri Chu | 28.099 | 90.7398 | 5008 | 50 | 66 | 32.00 | GL |
| 16 | CH_6 | 01_52O_003 | | | China | Indus | Indus | 33.5621 | 79.963 | 4246 | 148 | 194 | 31.08 | WB |
| 17 | CH_38 | 01_61C_010 | | | China | Indus | Indus | 33.7247 | 80.6903 | 4492 | 88 | 115 | 30.68 | WB |
| 18 | CH_1190 | 03_91H_025 | | | China | Brahmaputra | Luhit | 28.783 | 97.1519 | 3712 | 85 | 110 | 29.41 | WB |
| 19 | CH_552 | 03_77L_043 | | | China | Brahmaputra | Kuri Chu | 28.0894 | 90.7885 | 5165 | 181 | 234 | 29.28 | GL |

| S.No. | UID | Lake_ID | State/ UT | District | Country | Basin | River | LAT | LONG | Elevation | Water spread area in Ha | | % diff | GL/ WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 2009 (Inventory) | Oct 2021 | | |
| 20 | CH_420 | 03_71G_011 | | | China | Brahmaputra | | 29.1221 | 85.3985 | 4618 | 1192 | 1540 | 29.19 | WB |
| 21 | CH_132 | 02_71H_012 | | | China | Ganga | Arun Kosi | 28.5638 | 85.6041 | 5366 | 89 | 114 | 28.89 | GL |
| 22 | NP_67 | 02_72I_014 | Nepal | | Nepal | Ganga | Sun Kosi | 27.8614 | 86.4764 | 4550 | 137 | 175 | 27.74 | GL |
| 23 | CH_446 | 03_71O_010 | | | China | Brahmaputra | | 29.204 | 87.3914 | 4291 | 813 | 1031 | 26.81 | WB |
| 24 | CH_269 | 02_78A_003 | | | China | Ganga | Arun Kosi | 27.9463 | 88.0752 | 5488 | 124 | 156 | 25.81 | GL |
| 25 | CH_369 | 03_62O_024 | | | China | Brahmaputra | | 29.8574 | 83.2516 | 4635 | 721 | 906 | 25.66 | WB |
| 26 | CH_303 | 03_62J_031 | | | China | Brahmaputra | | 30.1039 | 82.2696 | 4876 | 166 | 205 | 23.49 | GL |
| 27 | CH_1170 | 03_91H_005 | | | China | Brahmaputra | Luhit | 28.9778 | 97.2141 | 4092 | 58 | 71 | 22.41 | WB |
| 28 | CH_404 | 03_71C_011 | | | China | Brahmaputra | | 29.2312 | 84.37 | 4679 | 119 | 145 | 21.85 | WB |
| 29 | CH_159 | 02_71L_004 | | | China | Ganga | Arun Kosi | 28.3947 | 86.3792 | 5481 | 86 | 104 | 20.93 | GL |
| 30 | CH_426 | 03_71K_003 | | | China | Brahmaputra | | 29.7664 | 86.9226 | 4976 | 72 | 87 | 20.83 | WB |
| 31 | SK_5 | 03_77D_005 | Sikkim | North Sikkim | India | Brahmaputra | Teesta | 28.0091 | 88.6979 | 5209 | 79 | 95 | 20.25 | GL |
| 32 | CH_298 | 03_62J_026 | | | China | Brahmaputra | | 30.256 | 82.2095 | 5057 | 103 | 123 | 19.42 | GL |
| 33 | CH_30 | 01_61C_002 | | | China | Indus | Indus | 33.7511 | 80.5977 | 4492 | 685 | 818 | 19.42 | WB |
| 34 | AP_135 | 03_91D_041 | AP | Upper Dibang Valley | India | Brahmaputra | Dibang | 28.7757 | 96.5315 | 3510 | 115 | 137 | 19.13 | WB |
| 35 | CH_547 | 03_77L_032 | | | China | Brahmaputra | Kuri Chu | 28.2424 | 90.7273 | 4654 | 88 | 104 | 18.18 | GL |
| 36 | CH_36 | 01_61C_008 | | | China | Indus | Indus | 33.7344 | 80.6771 | 4492 | 151 | 178 | 17.88 | WB |
| 37 | SK_26 | 03_78A_021 | Sikkim | North Sikkim | India | Brahmaputra | Teesta | 27.8245 | 88.2492 | 5427 | 56 | 66 | 17.86 | GL |
| 38 | CH_593 | 03_77P_023 | | | China | Brahmaputra | Kuri Chu | 28.0321 | 91.0017 | 4204 | 45 | 53 | 17.78 | WB |
| 39 | CH_52 | 01_61C_024 | | | China | Indus | Indus | 33.0352 | 80.5811 | 4321 | 4486 | 5245 | 16.92 | WB |
| 40 | CH_122 | 02_71H_002 | | | China | Ganga | Arun Kosi | 28.7236 | 85.8796 | 4646 | 2152 | 2511 | 16.68 | WB |
| 41 | CH_63 | 01_61G_002 | | | China | Indus | Indus | 33.6727 | 81.3712 | 4677 | 1134 | 1314 | 15.87 | WB |
| 42 | CH_217 | 02_71P_029 | | | China | Ganga | Arun Kosi | 28.1784 | 87.5615 | 5011 | 80 | 92 | 15.00 | GL |
| 43 | CH_316 | 03_62K_012 | | | China | Brahmaputra | | 29.7355 | 82.9739 | 5337 | 73 | 83 | 13.70 | GL |
| 44 | CH_288 | 03_62J_016 | | | China | Brahmaputra | | 30.3622 | 82.0548 | 5283 | 44 | 50 | 13.64 | GL |

| S.No. | UID | Lake_ID | State/ UT | District | Country | Basin | River | LAT | LONG | Elevation | Water spread area in Ha | | % diff | GL/ WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 2009 (Inventory) | Oct 2021 | | |
| 45 | NP_45 | 02_71D_004 | Nepal | | Nepal | Ganga | Trisuli | 28.4888 | 84.4857 | 4181 | 74 | 84 | 13.51 | GL |
| 46 | JK_187 | 01_52C_003 | J&K/ Ladakh | Kargil | India | Indus | Indus | 33.1573 | 76.9843 | 4479 | 45 | 51 | 13.33 | GL |
| 47 | CH_1075 | 03_91C_024 | | | China | Brahmaputra | | 29.2981 | 96.8164 | 3952 | 239 | 269 | 12.55 | GL |
| 48 | CH_183 | 02_71L_028 | | | China | Ganga | Sun Kosi | 28.1358 | 86.5293 | 4984 | 77 | 86 | 11.69 | GL |
| 49 | CH_231 | 02_71P_043 | | | China | Ganga | Arun Kosi | 28.0935 | 87.6375 | 5178 | 66 | 73 | 10.61 | GL |
| 50 | SK_4 | 03_77D_004 | Sikkim | North Sikkim | India | Brahmaputra | Teesta | 28.0071 | 88.7128 | 5236 | 106 | 117 | 10.38 | GL |
| 51 | JK_23 | 01_43A_002 | J&K/ Ladakh | | India | Indus | Gilgit | 35.9451 | 72.5947 | 3761 | 91 | 100 | 9.89 | WB |
| 52 | BH_13 | 03_77L_033 | | | Bhutan | Brahmaputra | | 28.2658 | 90.0688 | 5149 | 177 | 194 | 9.60 | GL |
| 53 | BH_34 | 03_77L_066 | | | Bhutan | Brahmaputra | Manas Chu & Mangde Chu | 28.0226 | 90.7083 | 4868 | 148 | 162 | 9.46 | GL |
| 54 | HP_1 | 01_52D_001 | HP | Chamba | India | Indus | Ravi | 32.6147 | 76.0316 | 1141 | 688 | 753 | 9.45 | WB |
| 55 | CH_1076 | 03_91C_025 | | | China | Brahmaputra | | 29.2945 | 96.8344 | 4013 | 97 | 106 | 9.28 | GL |
| 56 | CH_304 | 03_62J_032 | | | China | Brahmaputra | | 30.0785 | 82.3423 | 4849 | 77 | 84 | 9.09 | GL |
| 57 | CH_621 | 03_82A_002 | | | China | Brahmaputra | | 31.1201 | 92.8332 | 4902 | 319 | 348 | 9.09 | WB |
| 58 | CH_61 | 01_61F_004 | | | China | Indus | Indus | 34.0222 | 81.6133 | 4812 | 36392 | 39600 | 8.82 | WB |
| 59 | NP_36 | 02_62P_003 | Nepal | | Nepal | Ganga | Trisuli | 28.6922 | 83.8525 | 4910 | 315 | 342 | 8.57 | GL |
| 60 | CH_564 | 03_77O_001 | | | China | Brahmaputra | | 29.9188 | 91.0895 | 3873 | 154 | 167 | 8.44 | WB |
| 61 | BH_22 | 03_77L_051 | | | Bhutan | Brahmaputra | Puna Tsang Chu | 28.092 | 90.3 | 4513 | 143 | 155 | 8.39 | GL |
| 62 | HP_12 | 01_53E_001 | HP | Mandi | India | Indus | Beas | 31.673 | 77.0791 | 898 | 72 | 78 | 8.33 | WB |
| 63 | CH_50 | 01_61C_022 | | | China | Indus | Indus | 33.0976 | 80.3928 | 4337 | 1501 | 1622 | 8.06 | WB |
| 64 | JK_115 | 01_43K_014 | J&K/ Ladakh | Anantnag (Kashmir South) | India | Indus | Jhelum | 33.5131 | 74.7686 | 3486 | 112 | 121 | 8.04 | WB |
| 65 | CH_1136 | 03_91D_081 | | | China | Brahmaputra | Luhit | 28.5162 | 96.6984 | 3330 | 304 | 328 | 7.89 | WB |
| 66 | CH_488 | 03_77H_018 | | | China | Brahmaputra | | 28.1807 | 89.5344 | 4694 | 80 | 86 | 7.50 | WB |

| S.No. | UID | Lake_ID | State/ UT | District | Country | Basin | River | LAT | LONG | Elevation | Water spread area in Ha | | % diff | GL/ WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 2009 (Inventory) | Oct 2021 | | |
| 67 | BH_15 | 03_77L_037 | | | Bhutan | Brahmaputra | | 28.2377 | 90.1043 | 5126 | 542 | 582 | 7.38 | GL |
| 68 | CH_270 | 02_78A_004 | | | China | Ganga | Arun Kosi | 27.9328 | 88.0668 | 5562 | 84 | 90 | 7.14 | GL |
| 69 | AP_185 | 03_91H_067 | AP | Lohit | India | Brahmaputra | Luhit | 28.0957 | 97.289 | 3762 | 56 | 60 | 7.14 | WB |
| 70 | CH_529 | 03_77L_013 | | | China | Brahmaputra | | 28.4489 | 90.2569 | 5188 | 318 | 340 | 6.92 | WB |
| 71 | CH_3 | 01_52N_001 | | | China | Indus | Indus | 34.1589 | 79.7794 | 4961 | 11564 | 12354 | 6.83 | WB |
| 72 | CH_29 | 01_61C_001 | | | China | Indus | Indus | 33.9535 | 80.9036 | 4525 | 11154 | 11866 | 6.38 | WB |
| 73 | BH_72 | 03_78E_028 | | | Bhutan | Brahmaputra | Puna Tsang Chu | 27.6392 | 89.7401 | 2130 | 47 | 50 | 6.38 | WB |
| 74 | CH_46 | 01_61C_018 | | | China | Indus | Indus | 33.367 | 80.5531 | 4289 | 1779 | 1892 | 6.35 | WB |
| 75 | JK_159 | 01_43N_032 | J&K/ Ladakh | Anantnag (Kashmir South) | India | Indus | Jhelum | 34.0937 | 75.4979 | 3575 | 49 | 52 | 6.12 | WB |
| 76 | CH_1205 | 03_91H_040 | | | China | Brahmaputra | Luhit | 28.4123 | 97.4646 | 4300 | 51 | 54 | 5.88 | WB |
| 77 | CH_149 | 02_71H_029 | | | China | Ganga | Sun Kosi | 28.3206 | 85.8392 | 5067 | 474 | 501 | 5.70 | GL |
| 78 | CH_785 | 03_82G_024 | | | China | Brahmaputra | | 29.5405 | 93.345 | 4631 | 95 | 100 | 5.26 | WB |
| 79 | CH_525 | 03_77L_009 | | | China | Brahmaputra | | 28.7892 | 90.8941 | 4511 | 522 | 549 | 5.17 | WB |

## Table 4(b) - GL & WB that have shown DECREASE in water spread area

| S.NO. | UID | Lake_ID | State/ UT | District | Country | Basin | River | LAT | LONG | Elevation | Water spread area in Ha | | % diff | GL/ WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 2009 (Inventory) | Oct 2021 | | |
| 1 | CH_147 | 02_71H_027 | | | China | Ganga | Sun Kosi | 28.3612 | 85.8701 | 5212 | 434 | 412 | -5.07 | GL |
| 2 | CH_823 | 03_82G_062 | | | China | Brahmaputra | | 29.2403 | 93.276 | 4914 | 58 | 55 | -5.17 | WB |
| 3 | CH_42 | 01_61C_014 | | | China | Indus | Indus | 33.4992 | 80.35 | 4277 | 286 | 271 | -5.24 | WB |
| 4 | CH_69 | 01_62A_003 | | | China | Indus | Indus | 31.5778 | 80.9895 | 5140 | 1355 | 1280 | -5.54 | WB |
| 5 | CH_326 | 03_62N_009 | | | China | Brahmaputra | | 30.5908 | 83.5187 | 5227 | 288 | 272 | -5.56 | WB |
| 6 | CH_51 | 01_61C_023 | | | China | Indus | Indus | 33.0993 | 80.1774 | 4346 | 633 | 596 | -5.85 | WB |
| 7 | CH_784 | 03_82G_023 | | | China | Brahmaputra | | 29.5125 | 93.6199 | 4362 | 84 | 79 | -5.95 | WB |
| 8 | CH_732 | 03_82F_007 | | | China | Brahmaputra | | 30.5205 | 93.4448 | 4780 | 115 | 108 | -6.09 | GL |
| 9 | CH_654 | 03_82B_028 | | | China | Brahmaputra | | 30.0495 | 92.4432 | 4993 | 48 | 45 | -6.25 | WB |
| 10 | CH_128 | 02_71H_008 | | | China | Ganga | Arun Kosi | 28.6171 | 85.5265 | 5113 | 94 | 88 | -6.38 | GL |
| 11 | CH_710 | 03_82D_004 | | | China | Brahmaputra | | 28.8819 | 92.1515 | 4476 | 390 | 365 | -6.41 | WB |
| 12 | CH_533 | 03_77L_017 | | | China | Brahmaputra | | 28.3857 | 90.3192 | 5337 | 74 | 69 | -6.76 | WB |
| 13 | CH_321 | 03_62N_004 | | | China | Brahmaputra | | 30.6681 | 83.6252 | 5166 | 878 | 816 | -7.06 | WB |
| 14 | CH_665 | 03_82C_010 | | | China | Brahmaputra | | 29.7789 | 92.3881 | 4916 | 153 | 142 | -7.19 | WB |
| 15 | BH_4 | 03_77H_011 | | | Bhutan | Brahmaputra | | 28.2302 | 89.8875 | 4921 | 143 | 132 | -7.69 | GL |
| 16 | NP_37 | 02_62P_004 | Nepal | | Nepal | Ganga | Trisuli | 28.217 | 83.9455 | 798 | 406 | 373 | -8.13 | WB |
| 17 | NP_19 | 02_62J_003 | Nepal | | Nepal | Ganga | Karnal | 30.0678 | 82.1264 | 4829 | 49 | 45 | -8.16 | WB |
| 18 | JK_197 | 01_52J_001 | J&K/ Ladakh | Ladakh (Leh) | India | Indus | Shyok | 34.4577 | 78.1351 | 5295 | 97 | 89 | -8.25 | GL |
| 19 | CH_434 | 03_71K_011 | | | China | Brahmaputra | | 29.4758 | 86.2308 | 4759 | 387 | 355 | -8.27 | WB |
| 20 | NP_48 | 02_71D_007 | Nepal | | Nepal | Ganga | Trisuli | 28.1755 | 84.0994 | 705 | 300 | 275 | -8.33 | WB |
| 21 | CH_158 | 02_71L_003 | | | China | Ganga | Arun Kosi | 28.8322 | 86.5225 | 5319 | 258 | 236 | -8.53 | WB |
| 22 | BH_166 | 03_78I_085 | | | Bhutan | Brahmaputra | Puna Tsang Chu | 27.7996 | 90.2306 | 4758 | 70 | 64 | -8.57 | WB |
| 23 | CH_95 | 01_62F_004 | | | China | Indus | Satluj | 30.4308 | 81.4329 | 5484 | 196 | 179 | -8.67 | WB |

| S.NO. | UID | Lake_ID | State/ UT | District | Country | Basin | River | LAT | LONG | Elevation | Water spread area in Ha | | % diff | GL/ WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 2009 (Inventory) | Oct 2021 | | |
| 24 | CH_44 | 01_61C_016 | | | China | Indus | Indus | 33.4329 | 80.4666 | 4287 | 344 | 314 | -8.72 | WB |
| 25 | JK_226 | 01_52L_002 | J&K/ Ladakh | Ladakh (Leh) | India | Indus | Indus | 32.9819 | 78.5954 | 4985 | 442 | 403 | -8.82 | WB |
| 26 | JK_222 | 01_52K_014 | J&K/ Ladakh | Ladakh (Leh) | India | Indus | Indus | 33.2519 | 78.0429 | 4532 | 405 | 369 | -8.89 | WB |
| 27 | CH_253 | 02_72M_007 | | | China | Ganga | Arun Kosi | 27.9264 | 87.7699 | 4913 | 90 | 82 | -8.89 | GL |
| 28 | CH_59 | 01_61F_002 | | | China | Indus | Indus | 34.2987 | 81.2015 | 5274 | 55 | 50 | -9.09 | WB |
| 29 | UK_1 | 02_53K_001 | Uthrakh and | Pauri Garhwal | India | Ganga | Ramganga | 29.5695 | 78.763 | 347 | 6790 | 6143 | -9.53 | WB |
| 30 | JK_218 | 01_52K_010 | J&K/ Ladakh | Ladakh (Leh) | India | Indus | Shyok | 33.4549 | 78.4984 | 5308 | 152 | 137 | -9.87 | WB |
| 31 | BH_40 | 03_77L_072 | | | Bhutan | Brahmaputra | Manas Chu & Mangde Chu | 28.0155 | 90.3741 | 5185 | 91 | 82 | -9.89 | GL |
| 32 | CH_575 | 03_77P_004 | | | China | Brahmaputra | | 28.81 | 91.1452 | 4450 | 211 | 190 | -9.95 | WB |
| 33 | CH_523 | 03_77L_007 | | | China | Brahmaputra | | 28.8242 | 90.8334 | 4508 | 1478 | 1329 | -10.08 | WB |
| 34 | CH_181 | 02_71L_026 | | | China | Ganga | Sun Kosi | 28.1857 | 86.5317 | 5025 | 59 | 53 | -10.17 | GL |
| 35 | CH_123 | 02_71H_003 | | | China | Ganga | Arun Kosi | 28.6862 | 85.9542 | 4643 | 216 | 194 | -10.19 | WB |
| 36 | CH_607 | 03_78E_012 | | | China | Brahmaputra | | 27.9424 | 89.3879 | 4584 | 279 | 250 | -10.39 | WB |
| 37 | CH_583 | 03_77P_012 | | | China | Brahmaputra | | 28.5287 | 91.6651 | 4973 | 66 | 59 | -10.61 | WB |
| 38 | CH_165 | 02_71L_010 | | | China | Ganga | Sun Kosi | 28.3486 | 86.225 | 5348 | 47 | 42 | -10.64 | GL |
| 39 | UK_4 | 02_53O_001 | Uthrakh and | Naini Tal | India | Ganga | Ramganga | 29.3859 | 79.4599 | 1942 | 46 | 41 | -10.87 | WB |
| 40 | CH_80 | 01_62E_005 | | | China | Indus | Indus | 31.3133 | 81.5171 | 5174 | 189 | 168 | -11.11 | WB |
| 41 | BH_73 | 03_78E_029 | | | Bhutan | Brahmaputra | Puna Tsang Chu | 27.6438 | 89.4611 | 4220 | 45 | 40 | -11.11 | WB |
| 42 | CH_432 | 03_71K_009 | | | China | Brahmaputra | | 29.5573 | 86.2663 | 4749 | 170 | 151 | -11.18 | WB |
| 43 | CH_261 | 02_77D_006 | | | China | Ganga | Arun Kosi | 28.056 | 88.4265 | 4886 | 80 | 71 | -11.25 | GL |
| 44 | BH_129 | 03_78I_048 | | | Bhutan | Brahmaputra | Manas Chu & Mangde Chu | 27.8669 | 90.8162 | 4135 | 52 | 46 | -11.54 | WB |

| S.NO. | UID | Lake_ID | State/ UT | District | Country | Basin | River | LAT | LONG | Elevation | Water spread area in Ha | | % diff | GL/ WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 2009 (Inventory) | Oct 2021 | | |
| 45 | BH_35 | 03_77L_067 | | | Bhutan | Brahmaputra | Manas Chu & Mangde Chu | 28.0383 | 90.364 | 5216 | 78 | 69 | -11.54 | GL |
| 46 | CH_79 | 01_62E_004 | | | China | Indus | Indus | 31.3568 | 81.1498 | 5157 | 233 | 206 | -11.59 | WB |
| 47 | CH_161 | 02_71L_006 | | | China | Ganga | Arun Kosi | 28.3741 | 86.3046 | 5346 | 379 | 335 | -11.61 | GL |
| 48 | CH_49 | 01_61C_021 | | | China | Indus | Indus | 33.1046 | 80.2862 | 4345 | 1155 | 1019 | -11.77 | WB |
| 49 | CH_565 | 03_77O_002 | | | China | Brahmaputra | | 29.8996 | 91.1667 | 3798 | 100 | 88 | -12.00 | WB |
| 50 | CH_605 | 03_78E_009 | | | China | Brahmaputra | | 27.9603 | 89.3964 | 4576 | 175 | 154 | -12.00 | WB |
| 51 | CH_264 | 02_77D_009 | | | China | Ganga | Arun Kosi | 28.0103 | 88.2582 | 5256 | 58 | 51 | -12.07 | GL |
| 52 | CH_271 | 02_78A_005 | | | China | Ganga | Arun Kosi | 27.9281 | 88.0028 | 5345 | 89 | 78 | -12.36 | GL |
| 53 | CH_141 | 02_71H_021 | | | China | Ganga | Trisuli | 28.4685 | 85.5188 | 4445 | 48 | 42 | -12.50 | GL |
| 54 | CH_442 | 03_71O_006 | | | China | Brahmaputra | | 29.556 | 87.0275 | 4729 | 104 | 91 | -12.50 | WB |
| 55 | NP_62 | 02_72I_007 | Nepal | | Nepal | Ganga | Sun Kosi | 27.9237 | 86.7866 | 4516 | 56 | 49 | -12.50 | GL |
| 56 | CH_210 | 02_71P_022 | | | China | Ganga | Arun Kosi | 28.2294 | 87.591 | 5410 | 80 | 70 | -12.50 | GL |
| 57 | CH_778 | 03_82G_017 | | | China | Brahmaputra | | 29.5423 | 93.8304 | 4419 | 53 | 46 | -13.21 | WB |
| 58 | JK_167 | 01_43P_002 | J&K/ Ladakh | Jammu | India | Indus | Ravi | 32.6969 | 75.1456 | 664 | 52 | 45 | -13.46 | WB |
| 59 | CH_386 | 03_62O_041 | | | China | Brahmaputra | | 29.511 | 83.4443 | 4959 | 206 | 178 | -13.59 | WB |
| 60 | CH_1065 | 03_91C_014 | | | China | Brahmaputra | | 29.599 | 96.1413 | 4073 | 51 | 44 | -13.73 | GL |
| 61 | BH_45 | 03_77L_077 | | | Bhutan | Brahmaputra | Puna Tsang Chu | 28.0151 | 90.2103 | 5127 | 51 | 44 | -13.73 | WB |
| 62 | UK_9 | 02_53P_001 | Uthrakh and | Udham Singh Nagar | India | Ganga | Ganga | 28.9583 | 79.8424 | 210 | 2054 | 1770 | -13.83 | WB |
| 63 | JK_82 | 01_43J_004 | J&K/ Ladakh | | India | Indus | Jhelum | 34.9209 | 74.5208 | 4045 | 65 | 56 | -13.85 | WB |
| 64 | JK_219 | 01_52K_011 | J&K/ Ladakh | Ladakh (Leh) | India | Indus | Shyok | 33.4274 | 78.4879 | 5284 | 186 | 160 | -13.98 | WB |
| 65 | CH_476 | 03_77H_001 | | | China | Brahmaputra | | 28.8297 | 89.8518 | 4248 | 442 | 380 | -14.03 | WB |
| 66 | CH_448 | 03_71P_001 | | | China | Brahmaputra | | 28.8324 | 87.56 | 5296 | 112 | 96 | -14.29 | WB |
| 67 | AP_204 | 03_92A_006 | AP | Lohit | India | Brahmaputra | Luhit | 27.6973 | 96.452 | 1167 | 83 | 71 | -14.46 | WB |

| S.NO. | UID | Lake_ID | State/ UT | District | Country | Basin | River | LAT | LONG | Elevation | Water spread area in Ha | | % diff | GL/ WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 2009 (Inventory) | Oct 2021 | | |
| 68 | CH_481 | 03_77H_007 | | | China | Brahmaputra | | 28.2738 | 89.3457 | 4425 | 924 | 790 | -14.50 | WB |
| 69 | JK_202 | 01_52J_006 | J&K/ Ladakh | Ladakh (Leh) | India | Indus | Shyok | 34.1733 | 78.4378 | 5393 | 110 | 94 | -14.55 | WB |
| 70 | CH_499 | 03_77J_003 | | | China | Brahmaputra | | 30.4793 | 90.9662 | 5035 | 89 | 76 | -14.61 | WB |
| 71 | NP_80 | 02_72I_027 | Nepal | | Nepal | Ganga | Sun Kosi | 27.7548 | 86.958 | 4940 | 82 | 70 | -14.63 | GL |
| 72 | CH_93 | 01_62F_002 | | | China | Indus | Satluj | 30.8018 | 81.5652 | 4591 | 333 | 284 | -14.71 | WB |
| 73 | CH_262 | 02_77D_007 | | | China | Ganga | Arun Kosi | 28.0233 | 88.3545 | 5195 | 54 | 46 | -14.81 | GL |
| 74 | CH_251 | 02_72M_005 | | | China | Ganga | Arun Kosi | 27.9492 | 87.9311 | 5106 | 74 | 63 | -14.86 | GL |
| 75 | HP_9 | 01_53A_001 | HP | Kangra | India | Indus | Beas | 31.9894 | 76.0504 | 407 | 21867 | 18610 | -14.89 | WB |
| 76 | JK_100 | 01_43J_022 | J&K/ Ladakh | Baramula (Kashmir North) | India | Indus | Jhelum | 34.1198 | 74.8307 | 1580 | 60 | 51 | -15.00 | WB |
| 77 | CH_592 | 03_77P_021 | | | China | Brahmaputra | Dangme Chu | 28.0375 | 91.4518 | 4737 | 53 | 45 | -15.09 | GL |
| 78 | JK_67 | 01_43G_001 | J&K/ Ladakh | | India | Indus | Jhelum | 33.2131 | 73.7116 | 335 | 22154 | 18802 | -15.13 | WB |
| 79 | CH_1182 | 03_91H_017 | | | China | Brahmaputra | Luhit | 28.877 | 97.3554 | 4569 | 46 | 39 | -15.22 | WB |
| 80 | CH_56 | 01_61D_004 | | | China | Indus | Indus | 32.1569 | 80.3033 | 4989 | 550 | 466 | -15.27 | WB |
| 81 | CH_626 | 03_82A_007 | | | China | Brahmaputra | | 31.0362 | 92.7869 | 4909 | 85 | 72 | -15.29 | WB |
| 82 | NP_86 | 02_72M_009 | Nepal | | Nepal | Ganga | Tamur Kosi | 27.8703 | 87.8676 | 4910 | 64 | 54 | -15.63 | GL |
| 83 | CH_511 | 03_77K_009 | | | China | Brahmaputra | | 29.467 | 90.1723 | 3933 | 69 | 58 | -15.94 | WB |
| 84 | CH_127 | 02_71H_007 | | | China | Ganga | Arun Kosi | 28.6238 | 85.5094 | 5127 | 125 | 105 | -16.00 | GL |
| 85 | CH_339 | 03_62N_022 | | | China | Brahmaputra | | 30.2042 | 83.2422 | 4598 | 198 | 166 | -16.16 | WB |
| 86 | AP_67 | 03_82P_010 | AP | Lower Dibang Valley | India | Brahmaputra | Dibang | 28.1481 | 95.9433 | 1655 | 99 | 83 | -16.16 | WB |
| 87 | JK_220 | 01_52K_012 | J&K/ Ladakh | Ladakh (Leh) | India | Indus | Indus | 33.313 | 78.4781 | 4684 | 166 | 139 | -16.27 | WB |
| 88 | NP_49 | 02_71D_008 | Nepal | | Nepal | Ganga | Trisuli | 28.1538 | 84.1121 | 624 | 98 | 82 | -16.33 | WB |

| S.NO. | UID | Lake_ID | State/ UT | District | Country | Basin | River | LAT | LONG | Elevation | Water spread area in Ha | | % diff | GL/ WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 2009 (Inventory) | Oct 2021 | | |
| 89 | CH_284 | 03_62J_012 | | | China | Brahmaputra | | 30.4315 | 82.3617 | 4882 | 165 | 138 | -16.36 | WB |
| 90 | CH_438 | 03_71O_002 | | | China | Brahmaputra | | 29.7047 | 87.0169 | 4903 | 48 | 40 | -16.67 | WB |
| 91 | CH_216 | 02_71P_028 | | | China | Ganga | Arun Kosi | 28.206 | 87.0521 | 4980 | 54 | 45 | -16.67 | GL |
| 92 | CH_484 | 03_77H_013 | | | China | Brahmaputra | | 28.2089 | 89.7452 | 4949 | 48 | 40 | -16.67 | GL |
| 93 | CH_283 | 03_62J_011 | | | China | Brahmaputra | | 30.4685 | 82.0592 | 5180 | 401 | 333 | -16.96 | WB |
| 94 | CH_584 | 03_77P_013 | | | China | Brahmaputra | | 28.5301 | 91.5619 | 5153 | 53 | 44 | -16.98 | WB |
| 95 | CH_228 | 02_71P_040 | | | China | Ganga | Arun Kosi | 28.1139 | 87.6553 | 4954 | 135 | 112 | -17.04 | WB |
| 96 | CH_287 | 03_62J_015 | | | China | Brahmaputra | | 30.3978 | 82.1923 | 5203 | 82 | 68 | -17.07 | WB |
| 97 | SK_2 | 03_77D_002 | Sikkim | North Sikkim | India | Brahmaputra | Teesta | 28.0261 | 88.71 | 5148 | 105 | 87 | -17.14 | GL |
| 98 | JK_217 | 01_52K_009 | J&K/ Ladakh | Ladakh (Leh) | India | Indus | Shyok | 33.4643 | 78.6109 | 4914 | 204 | 169 | -17.16 | WB |
| 99 | BH_57 | 03_78E_002 | | | Bhutan | Brahmaputra | Puna Tsang Chu | 27.9725 | 89.9299 | 5076 | 58 | 48 | -17.24 | GL |
| 100 | JK_95 | 01_43J_017 | J&K/ Ladakh | Baramula (Kashmir North) | India | Indus | Jhelum | 34.4321 | 74.9242 | 3571 | 164 | 135 | -17.68 | WB |
| 101 | CH_453 | 03_77B_002 | | | China | Brahmaputra | | 30.1477 | 88.6267 | 5011 | 227 | 185 | -18.50 | WB |
| 102 | CH_430 | 03_71K_007 | | | China | Brahmaputra | | 29.5795 | 86.261 | 4749 | 80 | 65 | -18.75 | WB |
| 103 | CH_563 | 03_77N_004 | | | China | Brahmaputra | | 30.009 | 91.8609 | 3869 | 1296 | 1053 | -18.75 | WB |
| 104 | CH_148 | 02_71H_028 | | | China | Ganga | Sun Kosi | 28.3303 | 85.8687 | 5167 | 200 | 162 | -19.00 | WB |
| 105 | CH_334 | 03_62N_017 | | | China | Brahmaputra | | 30.4654 | 83.9845 | 5450 | 77 | 62 | -19.48 | WB |
| 106 | CH_375 | 03_62O_030 | | | China | Brahmaputra | | 29.7263 | 83.1046 | 5021 | 97 | 78 | -19.59 | WB |
| 107 | CH_252 | 02_72M_006 | | | China | Ganga | Arun Kosi | 27.9506 | 87.9088 | 5165 | 71 | 57 | -19.72 | GL |
| 108 | JK_85 | 01_43J_007 | J&K/ Ladakh | | India | Indus | Jhelum | 34.8292 | 74.0617 | 3680 | 95 | 76 | -20.00 | WB |
| 109 | JK_189 | 01_52G_001 | J&K/ Ladakh | Ladakh (Leh) | India | Indus | Shyok | 33.9992 | 77.9789 | 4991 | 45 | 36 | -20.00 | WB |
| 110 | CH_156 | 02_71L_001 | | | China | Ganga | Arun Kosi | 28.8869 | 86.5145 | 5098 | 85 | 68 | -20.00 | WB |
| 111 | CH_809 | 03_82G_048 | | | China | Brahmaputra | | 29.421 | 93.291 | 4643 | 55 | 44 | -20.00 | WB |
| 112 | CH_517 | 03_77K_015 | | | China | Brahmaputra | | 29.1176 | 90.3359 | 4451 | 108 | 86 | -20.37 | WB |
| 113 | AP_77 | 03_83A_012 | AP | Tawang | India | Brahmaputra | Dangme Chu | 27.5185 | 92.034 | 4273 | 63 | 50 | -20.63 | WB |

| S.NO. | UID | Lake_ID | State/ UT | District | Country | Basin | River | LAT | LONG | Elevation | Water spread area in Ha | | % diff | GL/ WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 2009 (Inventory) | Oct 2021 | | |
| 114 | NP_12 | 02_62F_019 | Nepal | | Nepal | Ganga | Karnal | 30.1296 | 81.7791 | 5015 | 58 | 46 | -20.69 | WB |
| 115 | BH_14 | 03_77L_035 | | | Bhutan | Brahmaputra | | 28.2497 | 90.1871 | 5455 | 58 | 46 | -20.69 | GL |
| 116 | BH_197 | 03_78M_022 | | | Bhutan | Brahmaputra | Dangme Chu | 27.8339 | 91.5536 | 4521 | 67 | 53 | -20.90 | WB |
| 117 | CH_416 | 03_71G_007 | | | China | Brahmaputra | | 29.654 | 85.8088 | 5149 | 191 | 151 | -20.94 | WB |
| 118 | CH_383 | 03_62O_038 | | | China | Brahmaputra | | 29.6047 | 83.3773 | 4889 | 124 | 98 | -20.97 | WB |
| 119 | CH_88 | 01_62E_013 | | | China | Indus | Indus | 31.2415 | 81.6861 | 5341 | 166 | 131 | -21.08 | WB |
| 120 | BH_60 | 03_78E_007 | | | Bhutan | Brahmaputra | Puna Tsang Chu | 27.9414 | 89.93 | 5002 | 61 | 48 | -21.31 | GL |
| 121 | CH_550 | 03_77L_041 | | | China | Brahmaputra | Kuri Chu | 28.1235 | 90.5667 | 5178 | 56 | 44 | -21.43 | GL |
| 122 | CH_640 | 03_82B_014 | | | China | Brahmaputra | | 30.4936 | 92.6433 | 4817 | 157 | 123 | -21.66 | WB |
| 123 | UK_2 | 02_53K_002 | Uthrakhand | Udham Singh Nagar | India | Ganga | Ramganga | 29.3194 | 78.9203 | 265 | 1597 | 1243 | -22.17 | WB |
| 124 | JK_198 | 01_52J_002 | J&K/ Ladakh | Ladakh (Leh) | India | Indus | Shyok | 34.2331 | 78.4262 | 5350 | 67 | 52 | -22.39 | WB |
| 125 | CH_273 | 03_62J_001 | | | China | Brahmaputra | | 30.8805 | 82.8592 | 5446 | 147 | 114 | -22.45 | WB |
| 126 | CH_385 | 03_62O_040 | | | China | Brahmaputra | | 29.5824 | 83.3556 | 4888 | 107 | 82 | -23.36 | WB |
| 127 | NP_58 | 02_72I_002 | Nepal | | Nepal | Ganga | Sun Kosi | 27.9752 | 86.6812 | 4834 | 67 | 51 | -23.88 | GL |
| 128 | CH_709 | 03_82D_003 | | | China | Brahmaputra | | 28.8937 | 92.1287 | 4403 | 50 | 38 | -24.00 | WB |
| 129 | JK_227 | 01_52L_003 | J&K/ Ladakh | Ladakh (Leh) | India | Indus | Indus | 32.9208 | 78.6002 | 4982 | 648 | 492 | -24.07 | WB |
| 130 | JK_111 | 01_43K_010 | J&K/ Ladakh | Rajauri | India | Indus | Jhelum | 33.519 | 74.5837 | 3934 | 66 | 50 | -24.24 | WB |
| 131 | CH_622 | 03_82A_003 | | | China | Brahmaputra | | 31.1092 | 92.952 | 4894 | 99 | 75 | -24.24 | WB |
| 132 | JK_201 | 01_52J_005 | J&K/ Ladakh | Ladakh (Leh) | India | Indus | Shyok | 34.1861 | 78.5078 | 5424 | 44 | 33 | -25.00 | WB |
| 133 | CH_28 | 01_61B_003 | | | China | Indus | Indus | 34.2349 | 80.5058 | 5071 | 224 | 168 | -25.00 | WB |
| 134 | CH_647 | 03_82B_021 | | | China | Brahmaputra | | 30.2128 | 92.5711 | 5037 | 48 | 36 | -25.00 | WB |
| 135 | JK_98 | 01_43J_020 | J&K/ Ladakh | Baramula (Kashmir North) | India | Indus | Jhelum | 34.2499 | 74.6695 | 1579 | 191 | 143 | -25.13 | WB |
| 136 | JK_128 | 01_43N_001 | J&K/ Ladakh | | India | Indus | Shingo (Indus) | 34.9912 | 75.2361 | 4138 | 127 | 95 | -25.20 | WB |

| S.NO. | UID | Lake_ID | State/ UT | District | Country | Basin | River | LAT | LONG | Elevation | Water spread area in Ha | | % diff | GL/ WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 2009 (Inventory) | Oct 2021 | | |
| 137 | CH_591 | 03_77P_020 | | | China | Brahmaputra | Kuri Chu | 28.0879 | 91.2572 | 4630 | 63 | 47 | -25.40 | WB |
| 138 | UK_8 | 02_53O_005 | Uthrakhand | Udham Singh Nagar | India | Ganga | Ramganga | 29.1352 | 79.2888 | 239 | 1510 | 1126 | -25.43 | WB |
| 139 | CH_372 | 03_62O_027 | | | China | Brahmaputra | | 29.8131 | 83.6543 | 4574 | 47 | 35 | -25.53 | WB |
| 140 | CH_492 | 03_77H_023 | | | China | Brahmaputra | | 28.1374 | 89.5348 | 5292 | 47 | 35 | -25.53 | WB |
| 141 | CH_495 | 03_77H_030 | | | China | Brahmaputra | | 28.0256 | 89.4271 | 4791 | 66 | 49 | -25.76 | WB |
| 142 | CH_483 | 03_77H_012 | | | China | Brahmaputra | | 28.2404 | 89.6948 | 4693 | 76 | 56 | -26.32 | GL |
| 143 | JK_99 | 01_43J_021 | J&K/ Ladakh | Bagdam | India | Indus | Jhelum | 34.1184 | 74.861 | 1585 | 1238 | 911 | -26.41 | WB |
| 144 | HP_6 | 01_52H_005 | HP | Lahul and Spiti | India | Indus | Chenab | 32.4816 | 77.6146 | 4276 | 45 | 33 | -26.67 | WB |
| 145 | BH_194 | 03_78M_019 | | | Bhutan | Brahmaputra | Dangme Chu | 27.8472 | 91.5833 | 4656 | 55 | 40 | -27.27 | WB |
| 146 | CH_460 | 03_77C_006 | | | China | Brahmaputra | | 29.5875 | 88.2317 | 4506 | 102 | 74 | -27.45 | WB |
| 147 | CH_612 | 03_78E_023 | | | China | Brahmaputra | | 27.8549 | 89.2666 | 5192 | 58 | 42 | -27.59 | GL |
| 148 | CH_387 | 03_62O_042 | | | China | Brahmaputra | | 29.4989 | 83.4279 | 4959 | 57 | 41 | -28.07 | WB |
| 149 | CH_398 | 03_71C_005 | | | China | Brahmaputra | | 29.8455 | 84.6756 | 5536 | 57 | 41 | -28.07 | GL |
| 150 | SK_3 | 03_77D_003 | Sikkim | North Sikkim | India | Brahmaputra | Teesta | 28.0132 | 88.7558 | 5094 | 96 | 69 | -28.13 | WB |
| 151 | JK_157 | 01_43N_030 | J&K/ Ladakh | Srinagar | India | Indus | Jhelum | 34.1392 | 75.1474 | 3780 | 86 | 61 | -29.07 | WB |
| 152 | JK_154 | 01_43N_027 | J&K/ Ladakh | Srinagar | India | Indus | Jhelum | 34.3881 | 75.1185 | 3663 | 48 | 34 | -29.17 | WB |
| 153 | CH_166 | 02_71L_011 | | | China | Ganga | Sun Kosi | 28.3354 | 86.1917 | 5422 | 58 | 41 | -29.31 | GL |
| 154 | CH_259 | 02_77D_004 | | | China | Ganga | Arun Kosi | 28.2939 | 88.121 | 4383 | 1273 | 897 | -29.54 | WB |
| 155 | CH_155 | 02_71H_035 | | | China | Ganga | Sun Kosi | 28.1825 | 85.9229 | 4355 | 45 | 31 | -31.11 | WB |
| 156 | CH_604 | 03_78E_006 | | | China | Brahmaputra | | 27.9699 | 89.3782 | 4568 | 67 | 46 | -31.34 | WB |
| 157 | CH_157 | 02_71L_002 | | | China | Ganga | Arun Kosi | 28.8581 | 86.5201 | 5254 | 76 | 52 | -31.58 | WB |
| 158 | CH_611 | 03_78E_019 | | | China | Brahmaputra | | 27.8779 | 89.312 | 5001 | 60 | 41 | -31.67 | GL |
| 159 | CH_64 | 01_61G_003 | | | China | Indus | Indus | 33.6333 | 81.3874 | 4872 | 63 | 43 | -31.75 | WB |
| 160 | BH_188 | 03_78M_010 | | | Bhutan | Brahmaputra | Dangme Chu | 27.8772 | 91.6338 | 4480 | 50 | 34 | -32.00 | WB |

| S.NO. | UID | Lake_ID | State/ UT | District | Country | Basin | River | LAT | LONG | Elevation | Water spread area in Ha | | % diff | GL/ WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 2009 (Inventory) | Oct 2021 | | |
| 161 | JK_149 | 01_43N_022 | J&K/ Ladakh | | India | Indus | Jhelum | 34.6665 | 75.1793 | 4234 | 72 | 48 | -33.33 | WB |
| 162 | CH_587 | 03_77P_016 | | | China | Brahmaputra | Dangme Chu | 28.3302 | 91.9633 | 4747 | 251 | 165 | -34.26 | WB |
| 163 | CH_55 | 01_61D_003 | | | China | Indus | Indus | 32.4232 | 80.8653 | 4452 | 46 | 30 | -34.78 | WB |
| 164 | CH_613 | 03_78E_026 | | | China | Brahmaputra | Amo Chu | 27.8087 | 89.227 | 5137 | 60 | 39 | -35.00 | GL |
| 165 | JK_205 | 01_52J_009 | J&K/ Ladakh | Ladakh (Leh) | India | Indus | Shyok | 34.1506 | 78.5532 | 5562 | 57 | 37 | -35.09 | WB |
| 166 | CH_77 | 01_62E_002 | | | China | Indus | Indus | 31.6162 | 81.0168 | 5137 | 161 | 104 | -35.40 | WB |
| 167 | CH_530 | 03_77L_014 | | | China | Brahmaputra | | 28.4387 | 90.1736 | 5283 | 48 | 31 | -35.42 | WB |
| 168 | CH_204 | 02_71P_016 | | | China | Ganga | Arun Kosi | 28.4991 | 87.4522 | 4177 | 137 | 88 | -35.77 | WB |
| 169 | CH_256 | 02_77D_001 | | | China | Ganga | Arun Kosi | 28.4045 | 88.2286 | 4422 | 5831 | 3722 | -36.17 | WB |
| 170 | HP_10 | 01_53A_002 | HP | Bilaspur | India | Indus | Satluj | 31.3855 | 76.535 | 506 | 13679 | 8717 | -36.27 | WB |
| 171 | CH_187 | 02_71L_032 | | | China | Ganga | Sun Kosi | 28.0445 | 86.5137 | 5241 | 55 | 35 | -36.36 | GL |
| 172 | CH_85 | 01_62E_010 | | | China | Indus | Indus | 31.2741 | 81.5949 | 5228 | 156 | 99 | -36.54 | WB |
| 173 | CH_388 | 03_62O_043 | | | China | Brahmaputra | | 29.4704 | 83.7638 | 5281 | 86 | 54 | -37.21 | WB |
| 174 | CH_338 | 03_62N_021 | | | China | Brahmaputra | | 30.4308 | 83.9969 | 5429 | 197 | 119 | -39.59 | WB |
| 175 | NP_59 | 02_72I_003 | Nepal | | Nepal | Ganga | Sun Kosi | 27.951 | 86.6897 | 4726 | 45 | 27 | -40.00 | GL |
| 176 | CH_168 | 02_71L_013 | | | China | Ganga | Sun Kosi | 28.3034 | 86.1576 | 5307 | 64 | 38 | -40.63 | GL |
| 177 | CH_646 | 03_82B_020 | | | China | Brahmaputra | | 30.2164 | 92.5166 | 4981 | 49 | 29 | -40.82 | WB |
| 178 | CH_606 | 03_78E_010 | | | China | Brahmaputra | | 27.9636 | 89.4127 | 4576 | 49 | 29 | -40.82 | WB |
| 179 | CH_589 | 03_77P_018 | | | China | Brahmaputra | Dangme Chu | 28.1016 | 91.9429 | 4705 | 154 | 91 | -40.91 | WB |
| 180 | JK_147 | 01_43N_020 | J&K/ Ladakh | | India | Indus | Jhelum | 34.6973 | 75.1369 | 4103 | 63 | 37 | -41.27 | WB |
| 181 | CH_671 | 03_82C_016 | | | China | Brahmaputra | | 29.6666 | 92.3935 | 4677 | 54 | 31 | -42.59 | WB |
| 182 | CH_377 | 03_62O_032 | | | China | Brahmaputra | | 29.6893 | 83.1901 | 5007 | 49 | 28 | -42.86 | WB |
| 183 | JK_30 | 01_43E_006 | J&K/ Ladakh | | India | Indus | Gilgit | 35.9453 | 73.3646 | 4162 | 71 | 40 | -43.66 | WB |
| 184 | CH_422 | 03_71G_013 | | | China | Brahmaputra | | 29.1021 | 85.0971 | 4541 | 244 | 137 | -43.85 | WB |
| 185 | CH_725 | 03_82E_007 | | | China | Brahmaputra | | 31.004 | 93.0878 | 5040 | 71 | 39 | -45.07 | WB |

| S.NO. | UID | Lake_ID | State/ UT | District | Country | Basin | River | LAT | LONG | Elevation | Water spread area in Ha | | % diff | GL/ WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 2009 (Inventory) | Oct 2021 | | |
| 186 | BH_104 | 03_78I_023 | | | Bhutan | Brahmaputra | Manas Chu & Mangde Chu | 27.9396 | 90.5348 | 5036 | 51 | 28 | -45.10 | GL |
| 187 | UK_11 | 02_53P_003 | Uthrakhand | Udham Singh Nagar | India | Ganga | Ramganga | 28.901 | 79.623 | 207 | 1078 | 591 | -45.18 | WB |
| 188 | CH_479 | 03_77H_004 | | | China | Brahmaputra | | 28.3271 | 89.4288 | 4426 | 201 | 110 | -45.27 | WB |
| 189 | CH_258 | 02_77D_003 | | | China | Ganga | Arun Kosi | 28.3092 | 88.3253 | 4364 | 88 | 47 | -46.59 | WB |
| 190 | CH_418 | 03_71G_009 | | | China | Brahmaputra | | 29.5258 | 85.6437 | 5031 | 178 | 95 | -46.63 | WB |
| 191 | CH_419 | 03_71G_010 | | | China | Brahmaputra | | 29.347 | 85.083 | 4483 | 304 | 152 | -50.00 | WB |
| 192 | CH_452 | 03_77B_001 | | | China | Brahmaputra | | 30.1682 | 88.6197 | 5029 | 52 | 26 | -50.00 | WB |
| 193 | SK_8 | 03_77D_008 | Sikkim | North Sikkim | India | Brahmaputra | Teesta | 28.0073 | 88.4949 | 5023 | 46 | 23 | -50.00 | GL |
| 194 | CH_90 | 01_62E_015 | | | China | Indus | Satluj | 31.1823 | 81.1945 | 5413 | 51 | 25 | -50.98 | WB |
| 195 | CH_53 | 01_61D_001 | | | China | Indus | Indus | 32.8015 | 80.4836 | 5590 | 70 | 33 | -52.86 | WB |
| 196 | CH_524 | 03_77L_008 | | | China | Brahmaputra | | 28.8255 | 90.6864 | 4446 | 85 | 39 | -54.12 | WB |
| 197 | CH_522 | 03_77L_006 | | | China | Brahmaputra | | 28.8945 | 90.4054 | 4529 | 44 | 20 | -54.55 | WB |
| 198 | CH_417 | 03_71G_008 | | | China | Brahmaputra | | 29.5586 | 85.8807 | 5184 | 60 | 27 | -55.00 | WB |
| 199 | CH_526 | 03_77L_010 | | | China | Brahmaputra | | 28.8113 | 90.4929 | 4459 | 47 | 21 | -55.32 | WB |
| 200 | CH_609 | 03_78E_017 | | | China | Brahmaputra | | 27.8766 | 89.2961 | 5236 | 65 | 29 | -55.38 | GL |
| 201 | CH_188 | 02_71L_034 | | | China | Ganga | Sun Kosi | 28.0336 | 86.4962 | 5057 | 46 | 20 | -56.52 | GL |
| 202 | CH_716 | 03_82D_010 | | | China | Brahmaputra | Dangme Chu | 28.1915 | 92.043 | 5036 | 76 | 33 | -56.58 | WB |
| 203 | CH_598 | 03_78A_018 | | | China | Brahmaputra | Amo Chu | 27.8554 | 88.9448 | 4874 | 67 | 29 | -56.72 | WB |
| 204 | CH_207 | 02_71P_019 | | | China | Ganga | Arun Kosi | 28.3524 | 87.8751 | 4199 | 48 | 20 | -58.33 | GL |
| 205 | UK_10 | 02_53P_002 | Uthrakhand | Udham Singh Nagar | India | Ganga | Ramganga | 28.9515 | 79.5869 | 213 | 734 | 289 | -60.63 | WB |
| 206 | CH_62 | 01_61G_001 | | | China | Indus | Indus | 33.8202 | 81.6446 | 4968 | 85 | 33 | -61.18 | WB |
| 207 | CH_5 | 01_52O_002 | | | China | Indus | Indus | 33.9803 | 79.5432 | 5259 | 135 | 52 | -61.48 | WB |
| 208 | JK_191 | 01_52G_003 | J&K/ Ladakh | Ladakh (Leh) | India | Indus | Indus | 33.3107 | 77.997 | 4531 | 1502 | 566 | -62.32 | WB |

| S.NO. | UID | Lake_ID | State/ UT | District | Country | Basin | River | LAT | LONG | Elevation | Water spread area in Ha | | % diff | GL/ WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 2009 (Inventory) | Oct 2021 | | |
| 209 | CH_106 | 02_62B_001 | | | China | Ganga | Karnal | 30.618 | 80.6304 | 5214 | 47 | 17 | -63.83 | WB |
| 210 | CH_1085 | 03_91C_052 | | | China | Brahmaputra | Luhit | 29.1745 | 96.3256 | 4375 | 64 | 23 | -64.06 | WB |
| 211 | NP_41 | 02_63M_002 | Nepal | | Nepal | Ganga | Rapti | 27.6211 | 83.1017 | 110 | 153 | 51 | -66.67 | WB |
| 212 | CH_73 | 01_62B_001 | | | China | Indus | Satluj | 30.823 | 80.743 | 4527 | 440 | 136 | -69.09 | WB |
| 213 | CH_576 | 03_77P_005 | | | China | Brahmaputra | | 28.7653 | 91.675 | 4616 | 110 | 31 | -71.82 | WB |
| 214 | CH_320 | 03_62N_003 | | | China | Brahmaputra | | 30.7106 | 83.6086 | 5210 | 57 | 16 | -71.93 | WB |
| 215 | CH_403 | 03_71C_010 | | | China | Brahmaputra | | 29.311 | 84.4304 | 4558 | 49 | 12 | -75.51 | WB |
| 216 | CH_347 | 03_62O_002 | | | China | Brahmaputra | | 29.9607 | 83.2699 | 4585 | 52 | 9 | -82.69 | WB |
| 217 | CH_373 | 03_62O_028 | | | China | Brahmaputra | | 29.7947 | 83.5558 | 4574 | 932 | 149 | -84.01 | WB |
| 209 | CH_106 | 02_62B_001 | | | China | Ganga | Karnal | 30.618 | 80.6304 | 5214 | 47 | 17 | -63.83 | WB |
| 210 | CH_1085 | 03_91C_052 | | | China | Brahmaputra | Luhit | 29.1745 | 96.3256 | 4375 | 64 | 23 | -64.06 | WB |
| 211 | NP_41 | 02_63M_002 | Nepal | | Nepal | Ganga | Rapti | 27.6211 | 83.1017 | 110 | 153 | 51 | -66.67 | WB |
| 212 | CH_73 | 01_62B_001 | | | China | Indus | Satluj | 30.823 | 80.743 | 4527 | 440 | 136 | -69.09 | WB |
| 213 | CH_576 | 03_77P_005 | | | China | Brahmaputra | | 28.7653 | 91.675 | 4616 | 110 | 31 | -71.82 | WB |
| 214 | CH_320 | 03_62N_003 | | | China | Brahmaputra | | 30.7106 | 83.6086 | 5210 | 57 | 16 | -71.93 | WB |
| 215 | CH_403 | 03_71C_010 | | | China | Brahmaputra | | 29.311 | 84.4304 | 4558 | 49 | 12 | -75.51 | WB |
| 216 | CH_347 | 03_62O_002 | | | China | Brahmaputra | | 29.9607 | 83.2699 | 4585 | 52 | 9 | -82.69 | WB |
| 217 | CH_373 | 03_62O_028 | | | China | Brahmaputra | | 29.7947 | 83.5558 | 4574 | 932 | 149 | -84.01 | WB |

## Table 4(c) - GL & WB that have shown NO CHANGE in water spread area

| S.NO. | UID | Lake_ID | State/ UT | District | Country | Basin | River | LAT | LONG | Elevation | Water spread area in Ha | | % diff | GL/ WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 2009 (Inventory) | Oct 2021 | | |
| 1 | CH_445 | 03_71O_009 | | | China | Brahmaputra | | 29.3088 | 87.1895 | 4298 | 2123 | 2229 | 4.99 | WB |
| 2 | BH_132 | 03_78I_051 | | | Bhutan | Brahmaputra | Manas Chu & Mangde Chu | 27.8906 | 90.2901 | 5059 | 103 | 108 | 4.85 | GL |
| 3 | CH_318 | 03_62N_001 | | | China | Brahmaputra | | 30.8889 | 83.5802 | 5101 | 14300 | 14985 | 4.79 | WB |
| 4 | CH_102 | 01_62J_001 | | | China | Indus | Satluj | 30.6377 | 82.1351 | 4784 | 5571 | 5825 | 4.56 | WB |
| 5 | CH_285 | 03_62J_013 | | | China | Brahmaputra | | 30.4189 | 82.3022 | 4931 | 854 | 892 | 4.45 | WB |
| 6 | JK_120 | 01_43M_003 | J&K/ Ladakh | | India | Indus | Shigar (Indus) | 35.2319 | 75.6304 | 2635 | 208 | 217 | 4.33 | WB |
| 7 | CH_543 | 03_77L_027 | | | China | Brahmaputra | Kuri Chu | 28.2738 | 90.7368 | 4510 | 163 | 170 | 4.29 | WB |
| 8 | NP_57 | 02_72E_001 | Nepal | | Nepal | Ganga | Baghmati | 27.6018 | 85.157 | 1545 | 142 | 148 | 4.23 | WB |
| 9 | CH_4 | 01_52O_001 | | | China | Indus | Shyok | 33.75 | 79.24 | 5064 | 65825 | 68574 | 4.18 | WB |
| 10 | CH_1 | 01_52L_008 | | | China | Indus | Satluj | 32.3264 | 78.7238 | 3861 | 50 | 52 | 4.00 | WB |
| 11 | BH_137 | 03_78I_056 | | | Bhutan | Brahmaputra | Manas Chu & Mangde Chu | 27.8618 | 90.591 | 4770 | 76 | 79 | 3.95 | WB |
| 12 | NP_76 | 02_72I_023 | Nepal | | Nepal | Ganga | Sun Kosi | 27.7831 | 86.9569 | 5204 | 81 | 84 | 3.70 | GL |
| 13 | NP_30 | 02_62K_012 | Nepal | | Nepal | Ganga | Bheri | 29.1966 | 82.9485 | 3692 | 469 | 481 | 2.56 | WB |
| 14 | CH_796 | 03_82G_035 | | | China | Brahmaputra | | 29.4765 | 93.6314 | 4369 | 81 | 83 | 2.47 | WB |
| 15 | CH_628 | 03_82B_002 | | | China | Brahmaputra | | 30.9759 | 92.9413 | 4904 | 405 | 414 | 2.22 | WB |
| 16 | CH_617 | 03_78M_016 | | | China | Brahmaputra | Dangme Chu | 27.8419 | 91.8929 | 4638 | 142 | 145 | 2.11 | WB |
| 17 | CH_528 | 03_77L_012 | | | China | Brahmaputra | | 28.5663 | 90.3964 | 5013 | 28771 | 29377 | 2.11 | WB |
| 18 | CH_614 | 03_78M_003 | | | China | Brahmaputra | Dangme Chu | 27.9011 | 91.8969 | 4452 | 207 | 211 | 1.93 | WB |
| 19 | CH_94 | 01_62F_003 | | | China | Indus | Satluj | 30.6848 | 81.4701 | 4585 | 40552 | 41239 | 1.69 | WB |
| 20 | CH_213 | 02_71P_025 | | | China | Ganga | Arun Kosi | 28.2142 | 87.4683 | 4781 | 123 | 125 | 1.63 | WB |

| S.NO. | UID | Lake_ID | State/ UT | District | Country | Basin | River | LAT | LONG | Elevation | Water spread area in Ha | | % diff | GL/ WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 2009 (Inventory) | Oct 2021 | | |
| 21 | CH_43 | 01_61C_015 | | | China | Indus | Indus | 33.4879 | 80.3162 | 4284 | 742 | 754 | 1.62 | WB |
| 22 | CH_527 | 03_77L_011 | | | China | Brahmaputra | | 28.7597 | 90.847 | 4510 | 1209 | 1227 | 1.49 | WB |
| 23 | CH_733 | 03_82F_008 | | | China | Brahmaputra | | 30.5349 | 93.0581 | 4817 | 83 | 84 | 1.20 | WB |
| 24 | JK_212 | 01_52K_004 | J&K/ Ladakh | | India | Indus | Shyok | 33.5303 | 78.9105 | 4353 | 5741 | 5809 | 1.18 | WB |
| 25 | JK_195 | 01_52I_003 | J&K/ Ladakh | | India | Indus | Shyok | 35.4105 | 78.2844 | 5154 | 180 | 182 | 1.11 | WB |
| 26 | CH_580 | 03_77P_009 | | | China | Brahmaputra | | 28.5463 | 91.5255 | 5083 | 94 | 95 | 1.06 | WB |
| 27 | CH_121 | 02_71H_001 | | | China | Ganga | Arun Kosi | 28.8923 | 85.5857 | 4602 | 26825 | 27085 | 0.97 | WB |
| 28 | CH_490 | 03_77H_020 | | | China | Brahmaputra | | 28.1499 | 89.3497 | 4472 | 4972 | 5017 | 0.91 | WB |
| 29 | CH_305 | 03_62K_001 | | | China | Brahmaputra | | 29.9856 | 82.5346 | 4829 | 370 | 373 | 0.81 | WB |
| 30 | CH_410 | 03_71G_001 | | | China | Brahmaputra | | 29.8928 | 85.2471 | 5162 | 720 | 724 | 0.56 | WB |
| 31 | CH_520 | 03_77L_001 | | | China | Brahmaputra | | 28.9557 | 90.711 | 4442 | 55435 | 55687 | 0.45 | WB |
| 32 | CH_415 | 03_71G_006 | | | China | Brahmaputra | | 29.6532 | 85.7377 | 5063 | 956 | 958 | 0.21 | WB |
| 33 | CH_306 | 03_62K_002 | | | China | Brahmaputra | | 29.9801 | 82.5881 | 4853 | 45 | 45 | 0.00 | WB |
| 34 | CH_384 | 03_62O_039 | | | China | Brahmaputra | | 29.5893 | 83.9888 | 4554 | 306 | 306 | 0.00 | WB |
| 35 | CH_545 | 03_77L_029 | | | China | Brahmaputra | Kuri Chu | 28.273 | 90.5901 | 5419 | 45 | 45 | 0.00 | GL |
| 36 | CH_641 | 03_82B_015 | | | China | Brahmaputra | | 30.349 | 92.7353 | 5112 | 75 | 75 | 0.00 | WB |
| 37 | BH_19 | 03_77L_044 | | | Bhutan | Brahmaputra | Puna Tsang Chu | 28.1058 | 90.2471 | 4369 | 123 | 123 | 0.00 | GL |
| 38 | CH_215 | 02_71P_027 | | | China | Ganga | Arun Kosi | 28.1945 | 87.6407 | 5352 | 49 | 49 | 0.00 | GL |
| 39 | CH_60 | 01_61F_003 | | | China | Indus | Indus | 34.2751 | 81.0521 | 5255 | 558 | 557 | -0.18 | WB |
| 40 | NP_28 | 02_62K_010 | Nepal | | Nepal | Ganga | Karnal | 29.5306 | 82.0914 | 2970 | 1051 | 1043 | -0.76 | WB |
| 41 | CH_392 | 03_71B_002 | | | China | Brahmaputra | | 30.4355 | 84.0592 | 5387 | 8185 | 8115 | -0.86 | WB |
| 42 | JK_225 | 01_52L_001 | J&K/ Ladakh | Ladakh (Leh) | India | Indus | Satluj | 32.8967 | 78.3135 | 4522 | 14110 | 13985 | -0.89 | WB |
| 43 | CH_92 | 01_62F_001 | | | China | Indus | Satluj | 30.6888 | 81.232 | 4570 | 25486 | 25235 | -0.98 | WB |
| 44 | CH_40 | 01_61C_012 | | | China | Indus | Indus | 33.5459 | 80.1506 | 4280 | 290 | 287 | -1.03 | WB |
| 45 | BH_12 | 03_77L_030 | | | Bhutan | Brahmaputra | | 28.2787 | 90.2258 | 5301 | 79 | 78 | -1.27 | GL |
| 46 | CH_425 | 03_71K_002 | | | China | Brahmaputra | | 29.8012 | 86.9456 | 4969 | 2248 | 2219 | -1.29 | WB |
| 47 | CH_135 | 02_71H_015 | | | China | Ganga | Arun Kosi | 28.533 | 85.6086 | 5352 | 506 | 499 | -1.38 | GL |

| S.NO. | UID | Lake_ID | State/ UT | District | Country | Basin | River | LAT | LONG | Elevation | Water spread area in Ha | | % diff | GL/ WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 2009 (Inventory) | Oct 2021 | | |
| 48 | CH_78 | 01_62E_003 | | | China | Indus | Indus | 31.4584 | 81.0907 | 5101 | 136 | 134 | -1.47 | WB |
| 49 | BH_195 | 03_78M_020 | | | Bhutan | Brahmaputra | Dangme Chu | 27.8377 | 91.6051 | 4135 | 65 | 64 | -1.54 | WB |
| 50 | BH_99 | 03_78I_018 | | | Bhutan | Brahmaputra | Puna Tsang Chu | 27.9772 | 90.2323 | 5072 | 63 | 62 | -1.59 | GL |
| 51 | CH_178 | 02_71L_023 | | | China | Ganga | Arun Kosi | 28.1974 | 86.5817 | 5094 | 116 | 114 | -1.72 | GL |
| 52 | JK_22 | 01_43A_001 | J&K/ Ladakh | | India | Indus | Gilgit | 35.995 | 72.6126 | 3622 | 203 | 199 | -1.97 | WB |
| 53 | JK_224 | 01_52K_016 | J&K/ Ladakh | Ladakh (Leh) | India | Indus | Satluj | 33.1062 | 78.3036 | 4671 | 507 | 497 | -1.97 | WB |
| 54 | CH_521 | 03_77L_003 | | | China | Brahmaputra | | 28.9493 | 90.517 | 4442 | 4065 | 3984 | -1.99 | WB |
| 55 | CH_396 | 03_71C_003 | | | China | Brahmaputra | | 29.8666 | 84.624 | 5395 | 47 | 46 | -2.13 | GL |
| 56 | CH_1135 | 03_91D_080 | | | China | Brahmaputra | Luhit | 28.5416 | 96.6176 | 4268 | 45 | 44 | -2.22 | WB |
| 57 | CH_519 | 03_77K_017 | | | China | Brahmaputra | | 29.011 | 90.4473 | 4445 | 3853 | 3767 | -2.23 | WB |
| 58 | CH_137 | 02_71H_017 | | | China | Ganga | Arun Kosi | 28.4954 | 85.6359 | 5278 | 472 | 460 | -2.54 | GL |
| 59 | CH_482 | 03_77H_008 | | | China | Brahmaputra | | 28.2272 | 89.6382 | 4568 | 1256 | 1224 | -2.55 | WB |
| 60 | CH_429 | 03_71K_006 | | | China | Brahmaputra | | 29.6251 | 86.2473 | 4846 | 2096 | 2040 | -2.67 | WB |
| 61 | CH_577 | 03_77P_006 | | | China | Brahmaputra | | 28.6629 | 91.6796 | 4616 | 5683 | 5522 | -2.83 | WB |
| 62 | CH_203 | 02_71P_015 | | | China | Ganga | Arun Kosi | 28.5766 | 87.5441 | 4152 | 1012 | 982 | -2.96 | WB |
| 63 | BH_36 | 03_77L_068 | | | Bhutan | Brahmaputra | Kuri Chu | 28.0035 | 90.9051 | 4754 | 86 | 83 | -3.49 | WB |
| 64 | CH_66 | 01_61H_001 | | | China | Indus | Indus | 32.1188 | 81.2694 | 4612 | 282 | 271 | -3.90 | WB |
| 65 | CH_8 | 01_52O_005 | | | China | Indus | Indus | 33.3903 | 79.367 | 4353 | 780 | 747 | -4.23 | WB |
| 66 | CH_54 | 01_61D_002 | | | China | Indus | Indus | 32.5367 | 80.2286 | 4306 | 1560 | 1490 | -4.49 | WB |
| 67 | SK_9 | 03_78A_001 | Sikkim | North Sikkim | India | Brahmaputra | Teesta | 27.9917 | 88.8155 | 5303 | 156 | 149 | -4.49 | GL |
| 68 | CH_263 | 02_77D_008 | | | China | Ganga | Arun Kosi | 28.0184 | 88.2873 | 5268 | 44 | 42 | -4.55 | GL |
| 69 | SK_19 | 03_78A_013 | Sikkim | North Sikkim | India | Brahmaputra | Teesta | 27.9188 | 88.161 | 5441 | 63 | 60 | -4.76 | GL |
| 70 | CH_81 | 01_62E_006 | | | China | Indus | Indus | 31.292 | 81.2447 | 5050 | 524 | 499 | -4.77 | WB |
| 71 | CH_588 | 03_77P_017 | | | China | Brahmaputra | Dangme Chu | 28.2972 | 91.9457 | 4756 | 2345 | 2232 | -4.82 | WB |

## Table 4(d) - GL & WB that are Covered by Clouds

| S.NO. | UID | Lake_ID | State/ UT | District | Country | Basin | River | LAT | LONG | Elevation | Water spread area in Ha | | % diff | GL/ WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 2009 (Inventory) | Oct 2021 | | |
| 1 | JK_1 | 01_42H_001 | J&K/ Ladakh | | India | Indus | Gilgit | 36.8806 | 73.7013 | 4286 | 276 | Cloud | NA | WB |
| 2 | JK_3 | 01_42H_003 | J&K/ Ladakh | | India | Indus | Gilgit | 36.6465 | 73.6473 | 3925 | 97 | Cloud | NA | WB |
| 3 | JK_5 | 01_42H_005 | J&K/ Ladakh | | India | Indus | Gilgit | 36.2491 | 73.3615 | 2217 | 52 | Cloud | NA | WB |
| 4 | JK_47 | 01_43E_023 | J&K/ Ladakh | | India | Indus | Gilgit | 35.865 | 73.7452 | 4140 | 82 | Cloud | NA | WB |
| 5 | JK_188 | 01_52E_001 | J&K/ Ladakh | | India | Indus | Shyok | 35.418 | 77.6046 | 5098 | 51 | Cloud | NA | GL |
| 6 | JK_196 | 01_52I_004 | J&K/ Ladakh | | India | Indus | Shyok | 35.3911 | 78.2188 | 5140 | 124 | Cloud | NA | WB |
| 7 | CH_313 | 03_62K_009 | | | China | Brahmaputra | | 29.8405 | 82.7835 | 5058 | 250 | Cloud | NA | GL |
| 8 | CH_623 | 03_82A_004 | | | China | Brahmaputra | | 31.1025 | 92.6988 | 5003 | 46 | Cloud | NA | WB |
| 9 | CH_632 | 03_82B_006 | | | China | Brahmaputra | | 30.9338 | 92.7744 | 4835 | 124 | Cloud | NA | WB |
| 10 | CH_635 | 03_82B_009 | | | China | Brahmaputra | | 30.9061 | 92.8171 | 4960 | 156 | Cloud | NA | WB |
| 11 | CH_631 | 03_82B_005 | | | China | Brahmaputra | | 30.9346 | 92.8292 | 4886 | 195 | Cloud | NA | WB |
| 12 | CH_630 | 03_82B_004 | | | China | Brahmaputra | | 30.9489 | 92.8896 | 4892 | 97 | Cloud | NA | WB |
| 13 | CH_721 | 03_82E_003 | | | China | Brahmaputra | | 31.1036 | 93.1435 | 5024 | 98 | Cloud | NA | WB |
| 14 | CH_722 | 03_82E_004 | | | China | Brahmaputra | | 31.0647 | 93.2924 | 5047 | 47 | Cloud | NA | WB |
| 15 | CH_636 | 03_82B_010 | | | China | Brahmaputra | | 30.8784 | 92.8806 | 4982 | 52 | Cloud | NA | WB |
| 16 | CH_634 | 03_82B_008 | | | China | Brahmaputra | | 30.8961 | 92.9098 | 4943 | 254 | Cloud | NA | WB |
| 17 | CH_633 | 03_82B_007 | | | China | Brahmaputra | | 30.8947 | 92.9507 | 4958 | 199 | Cloud | NA | WB |
| 18 | CH_720 | 03_82E_002 | | | China | Brahmaputra | | 31.1315 | 93.1768 | 5007 | 659 | Cloud | NA | WB |
| 19 | CH_729 | 03_82F_004 | | | China | Brahmaputra | | 30.6212 | 93.1805 | 4499 | 692 | Cloud | NA | WB |
| 20 | CH_735 | 03_82F_010 | | | China | Brahmaputra | | 30.4703 | 93.5332 | 5014 | 44 | Cloud | NA | GL |
| 21 | CH_739 | 03_82F_014 | | | China | Brahmaputra | | 30.3478 | 93.5067 | 4537 | 49 | Cloud | NA | GL |
| 22 | CH_741 | 03_82F_016 | | | China | Brahmaputra | | 30.3188 | 93.3424 | 4612 | 49 | Cloud | NA | WB |

| S.NO. | UID | Lake_ID | State/ UT | District | Country | Basin | River | LAT | LONG | Elevation | Water spread area in Ha | | % diff | GL/ WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 2009 (Inventory) | Oct 2021 | | |
| 23 | CH_745 | 03_82F_020 | | | China | Brahmaputra | | 30.2675 | 93.4563 | 4076 | 71 | Cloud | NA | GL |
| 24 | CH_747 | 03_82F_022 | | | China | Brahmaputra | | 30.2418 | 93.6373 | 4181 | 103 | Cloud | NA | GL |
| 25 | CH_755 | 03_82F_030 | | | China | Brahmaputra | | 30.0205 | 93.9681 | 3475 | 2675 | Cloud | NA | WB |
| 26 | CH_847 | 03_82J_017 | | | China | Brahmaputra | | 30.1259 | 94.09 | 3802 | 282 | Cloud | NA | WB |
| 27 | CH_848 | 03_82J_018 | | | China | Brahmaputra | | 30.1152 | 94.1881 | 3905 | 99 | Cloud | NA | GL |
| 28 | CH_849 | 03_82J_019 | | | China | Brahmaputra | | 30.0971 | 94.2697 | 3896 | 45 | Cloud | NA | GL |
| 29 | CH_850 | 03_82J_020 | | | China | Brahmaputra | | 30.0503 | 94.2482 | 3830 | 439 | Cloud | NA | WB |
| 30 | CH_853 | 03_82J_023 | | | China | Brahmaputra | | 30.0461 | 94.1569 | 4294 | 105 | Cloud | NA | WB |
| 31 | CH_863 | 03_82K_007 | | | China | Brahmaputra | | 29.9588 | 94.2918 | 4282 | 130 | Cloud | NA | WB |
| 32 | CH_865 | 03_82K_009 | | | China | Brahmaputra | | 29.9469 | 94.3579 | 4148 | 116 | Cloud | NA | WB |
| 33 | CH_855 | 03_82J_025 | | | China | Brahmaputra | | 30.0049 | 94.3838 | 4020 | 59 | Cloud | NA | WB |
| 34 | CH_858 | 03_82K_002 | | | China | Brahmaputra | | 29.9874 | 94.4354 | 3989 | 75 | Cloud | NA | WB |
| 35 | CH_854 | 03_82J_024 | | | China | Brahmaputra | | 30.0129 | 94.4716 | 4327 | 67 | Cloud | NA | WB |
| 36 | CH_862 | 03_82K_006 | | | China | Brahmaputra | | 29.9405 | 94.5884 | 4509 | 52 | Cloud | NA | WB |
| 37 | CH_874 | 03_82K_018 | | | China | Brahmaputra | | 29.8904 | 94.57 | 4149 | 165 | Cloud | NA | WB |
| 38 | CH_770 | 03_82G_009 | | | China | Brahmaputra | | 29.6295 | 93.5615 | 4563 | 51 | Cloud | NA | WB |
| 39 | CH_780 | 03_82G_019 | | | China | Brahmaputra | | 29.5025 | 93.9367 | 4444 | 59 | Cloud | NA | WB |
| 40 | CH_930 | 03_82K_074 | | | China | Brahmaputra | | 29.5261 | 94.0573 | 4533 | 88 | Cloud | NA | WB |
| 41 | CH_924 | 03_82K_068 | | | China | Brahmaputra | | 29.5447 | 94.0668 | 4299 | 52 | Cloud | NA | WB |
| 42 | CH_931 | 03_82K_075 | | | China | Brahmaputra | | 29.5176 | 94.1208 | 4501 | 118 | Cloud | NA | WB |
| 43 | CH_933 | 03_82K_077 | | | China | Brahmaputra | | 29.5045 | 94.1329 | 4577 | 100 | Cloud | NA | WB |
| 44 | CH_936 | 03_82K_080 | | | China | Brahmaputra | | 29.4727 | 94.2363 | 4509 | 47 | Cloud | NA | WB |
| 45 | CH_901 | 03_82K_045 | | | China | Brahmaputra | | 29.8167 | 94.133 | 4558 | 49 | Cloud | NA | WB |
| 46 | CH_873 | 03_82K_017 | | | China | Brahmaputra | | 29.9168 | 94.2796 | 4385 | 179 | Cloud | NA | WB |
| 47 | CH_876 | 03_82K_020 | | | China | Brahmaputra | | 29.8966 | 94.4615 | 4346 | 77 | Cloud | NA | WB |
| 48 | CH_896 | 03_82K_040 | | | China | Brahmaputra | | 29.8079 | 94.5005 | 4301 | 66 | Cloud | NA | WB |
| 49 | CH_893 | 03_82K_037 | | | China | Brahmaputra | | 29.8278 | 94.462 | 4133 | 55 | Cloud | NA | WB |
| 50 | CH_895 | 03_82K_039 | | | China | Brahmaputra | | 29.8127 | 94.4325 | 4083 | 224 | Cloud | NA | WB |

| S.NO. | UID | Lake_ID | State/ UT | District | Country | Basin | River | LAT | LONG | Elevation | Water spread area in Ha | | % diff | GL/ WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 2009 (Inventory) | Oct 2021 | | |
| 51 | CH_892 | 03_82K_036 | | | China | Brahmaputra | | 29.8296 | 94.632 | 4231 | 69 | Cloud | NA | WB |
| 52 | CH_898 | 03_82K_042 | | | China | Brahmaputra | | 29.7791 | 94.6008 | 4216 | 205 | Cloud | NA | WB |
| 53 | CH_905 | 03_82K_049 | | | China | Brahmaputra | | 29.7755 | 94.5724 | 4161 | 50 | Cloud | NA | WB |
| 54 | CH_916 | 03_82K_060 | | | China | Brahmaputra | | 29.5454 | 94.9649 | 4300 | 93 | Cloud | NA | WB |
| 55 | CH_1032 | 03_82O_029 | | | China | Brahmaputra | Dihang | 29.3049 | 95.639 | 3322 | 68 | Cloud | NA | WB |
| 56 | CH_1023 | 03_82O_016 | | | China | Brahmaputra | Dihang | 29.3721 | 95.8718 | 4344 | 91 | Cloud | NA | WB |
| 57 | CH_1037 | 03_82O_044 | | | China | Brahmaputra | Dihang | 29.1797 | 95.4852 | 3533 | 92 | Cloud | NA | WB |
| 58 | CH_1039 | 03_82O_047 | | | China | Brahmaputra | Dihang | 29.1628 | 95.491 | 3544 | 44 | Cloud | NA | WB |
| 59 | CH_1046 | 03_82O_054 | | | China | Brahmaputra | Dibang | 29.1283 | 95.4383 | 3284 | 51 | Cloud | NA | WB |
| 60 | AP_49 | 03_82O_042 | AP | Upper Dibang Valley | India | Brahmaputra | Dibang | 29.1768 | 95.6156 | 3063 | 44 | Cloud | NA | WB |
| 61 | AP_54 | 03_82O_061 | AP | Upper Dibang Valley | India | Brahmaputra | Dibang | 29.0112 | 95.8849 | 3763 | 54 | Cloud | NA | WB |
| 62 | AP_55 | 03_82O_062 | AP | Upper Dibang Valley | India | Brahmaputra | Dibang | 29.0051 | 95.9054 | 3601 | 52 | Cloud | NA | WB |
| 63 | AP_108 | 03_91D_009 | AP | Upper Dibang Valley | India | Brahmaputra | Dibang | 28.9279 | 96.3388 | 4011 | 47 | Cloud | NA | WB |
| 64 | AP_109 | 03_91D_010 | AP | Upper Dibang Valley | India | Brahmaputra | Dibang | 28.919 | 96.383 | 3302 | 46 | Cloud | NA | WB |
| 65 | AP_118 | 03_91D_022 | AP | Upper Dibang Valley | India | Brahmaputra | Dibang | 28.8761 | 96.3941 | 3119 | 44 | Cloud | NA | WB |
| 66 | AP_57 | 03_82O_064 | AP | | India | Brahmaputra | Dihang | 29.0616 | 95.2625 | 3668 | 44 | Cloud | NA | WB |
| 67 | AP_84 | 03_91C_034 | AP | Upper Dibang Valley | India | Brahmaputra | Dibang | 29.3018 | 96.0822 | 4274 | 134 | Cloud | NA | WB |
| 68 | AP_91 | 03_91C_045 | AP | Upper Dibang Valley | India | Brahmaputra | Dibang | 29.229 | 96.1915 | 3473 | 113 | Cloud | NA | WB |
| 69 | AP_92 | 03_91C_046 | AP | Upper Dibang Valley | India | Brahmaputra | Dibang | 29.2257 | 96.16 | 3313 | 61 | Cloud | NA | WB |

| S.NO. | UID | Lake_ID | State/ UT | District | Country | Basin | River | LAT | LONG | Elevation | Water spread area in Ha | | % diff | GL/ WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 2009 (Inventory) | Oct 2021 | | |
| 70 | AP_95 | 03_91C_049 | AP | Upper Dibang Valley | India | Brahmaputra | Dibang | 29.1962 | 96.2028 | 4246 | 57 | Cloud | NA | WB |
| 71 | AP_90 | 03_91C_044 | AP | Upper Dibang Valley | India | Brahmaputra | Luhit | 29.2231 | 96.2781 | 4207 | 63 | Cloud | NA | WB |
| 72 | AP_89 | 03_91C_042 | AP | | India | Brahmaputra | Dibang | 29.2439 | 96.2442 | 4459 | 50 | Cloud | NA | WB |
| 73 | AP_87 | 03_91C_040 | AP | | India | Brahmaputra | Luhit | 29.2553 | 96.2447 | 4406 | 94 | Cloud | NA | WB |
| 74 | AP_85 | 03_91C_038 | AP | Upper Dibang Valley | India | Brahmaputra | Dibang | 29.269 | 96.1567 | 3991 | 113 | Cloud | NA | WB |
| 75 | CH_806 | 03_82G_045 | | | China | Brahmaputra | | 29.4054 | 93.7079 | 4505 | 70 | Cloud | NA | WB |
| 76 | CH_811 | 03_82G_050 | | | China | Brahmaputra | | 29.3826 | 93.6403 | 4717 | 44 | Cloud | NA | WB |
| 77 | CH_812 | 03_82G_051 | | | China | Brahmaputra | | 29.3697 | 93.6939 | 4725 | 49 | Cloud | NA | WB |
| 78 | CH_816 | 03_82G_055 | | | China | Brahmaputra | | 29.3322 | 93.7214 | 4610 | 62 | Cloud | NA | WB |
| 79 | CH_821 | 03_82G_060 | | | China | Brahmaputra | | 29.2872 | 93.7363 | 4562 | 59 | Cloud | NA | WB |
| 80 | CH_826 | 03_82G_065 | | | China | Brahmaputra | | 29.038 | 93.8357 | 4116 | 59 | Cloud | NA | WB |
| 81 | CH_971 | 03_82L_009 | | | China | Brahmaputra | | 28.8539 | 94.0002 | 3865 | 54 | Cloud | NA | GL |
| 82 | CH_835 | 03_82J_005 | | | China | Brahmaputra | | 30.6263 | 94.445 | 4095 | 67 | Cloud | NA | GL |
| 83 | CH_834 | 03_82J_004 | | | China | Brahmaputra | | 30.6605 | 94.4855 | 3917 | 378 | Cloud | NA | GL |
| 84 | CH_838 | 03_82J_008 | | | China | Brahmaputra | | 30.4502 | 94.6041 | 3998 | 156 | Cloud | NA | GL |
| 85 | CH_975 | 03_82N_004 | | | China | Brahmaputra | | 30.6011 | 95.1831 | 4278 | 92 | Cloud | NA | GL |
| 86 | CH_990 | 03_82N_019 | | | China | Brahmaputra | | 30.4735 | 95.5751 | 4866 | 55 | Cloud | NA | WB |
| 87 | CH_1001 | 03_82N_030 | | | China | Brahmaputra | | 30.2508 | 95.6038 | 4442 | 132 | Cloud | NA | GL |
| 88 | CH_1004 | 03_82N_033 | | | China | Brahmaputra | | 30.2213 | 95.5834 | 4342 | 89 | Cloud | NA | GL |
| 89 | CH_959 | 03_82K_103 | | | China | Brahmaputra | | 29.2951 | 94.2017 | 3931 | 50 | Cloud | NA | WB |
| 90 | AP_101 | 03_91C_069 | AP | Upper Dibang Valley | India | Brahmaputra | Dibang | 29.051 | 96.1445 | 3199 | 78 | Cloud | NA | WB |
| 91 | AP_100 | 03_91C_064 | AP | | India | Brahmaputra | Dibang | 29.0794 | 96.1447 | 3945 | 89 | Cloud | NA | WB |
| 92 | CH_1089 | 03_91C_059 | | | China | Brahmaputra | Dibang | 29.0917 | 96.2109 | 4261 | 98 | Cloud | NA | WB |

| S.NO. | UID | Lake_ID | State/ UT | District | Country | Basin | River | LAT | LONG | Elevation | Water spread area in Ha | | % diff | GL/ WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 2009 (Inventory) | Oct 2021 | | |
| 93 | CH_1102 | 03_91C_074 | | | China | Brahmaputra | Dibang | 29.03 | 96.223 | 4199 | 47 | Cloud | NA | GL |
| 94 | CH_1106 | 03_91C_078 | | | China | Brahmaputra | Dibang | 29.0084 | 96.2179 | 3664 | 48 | Cloud | NA | WB |
| 95 | CH_1098 | 03_91C_070 | | | China | Brahmaputra | Dibang | 29.0437 | 96.1935 | 4178 | 57 | Cloud | NA | WB |
| 96 | CH_1079 | 03_91C_033 | | | China | Brahmaputra | | 29.2297 | 96.8013 | 4263 | 153 | Cloud | NA | GL |
| 97 | CH_1078 | 03_91C_029 | | | China | Brahmaputra | | 29.2377 | 96.8237 | 4214 | 211 | Cloud | NA | WB |
| 98 | CH_1194 | 03_91H_029 | | | China | Brahmaputra | Luhit | 28.7623 | 97.0567 | 3285 | 50 | Cloud | NA | WB |
| 99 | CH_844 | 03_82J_014 | | | China | Brahmaputra | | 30.1735 | 94.3457 | 3654 | 183 | Cloud | NA | WB |
| 100 | NP_78 | 02_72I_025 | Nepal | | Nepal | Ganga | Sun Kosi | 27.779 | 86.6136 | 4831 | 106 | Cloud | NA | GL |
| 101 | NP_92 | 02_72M_016 | Nepal | | Nepal | Ganga | Arun Kosi | 27.7985 | 87.0926 | 4538 | 161 | Cloud | NA | GL |
| 102 | CH_223 | 02_71P_035 | | | China | Ganga | Arun Kosi | 28.152 | 87.1575 | 5141 | 107 | Cloud | NA | WB |
| 103 | CH_242 | 02_71P_054 | | | China | Ganga | Arun Kosi | 28.21 | 87.1 | 4852 | 102 | Cloud | NA | GL |
| 104 | CH_235 | 02_71P_047 | | | China | Ganga | Arun Kosi | 28.0693 | 87.0483 | 5589 | 71 | Cloud | NA | GL |
| 105 | SK_16 | 03_78A_009 | Sikkim | North Sikkim | India | Brahmaputra | Teesta | 27.9477 | 88.3313 | 5034 | 54 | Cloud | NA | GL |
| 106 | SK_11 | 03_78A_003 | Sikkim | North Sikkim | India | Brahmaputra | Teesta | 27.9753 | 88.6164 | 4960 | 58 | Cloud | NA | GL |
| 107 | CH_478 | 03_77H_003 | | | China | Brahmaputra | | 28.4005 | 89.0614 | 4712 | 208 | Cloud | NA | WB |
| 108 | AP_203 | 03_92A_005 | AP | Lohit | India | Brahmaputra | Luhit | 27.6899 | 96.8606 | 3371 | 50 | Cloud | NA | WB |
| 109 | AP_163 | 03_91D_107 | AP | Lohit | India | Brahmaputra | Luhit | 28.2024 | 96.8977 | 3751 | 67 | Cloud | NA | WB |
| 110 | CH_1056 | 03_91C_005 | | | China | Brahmaputra | | 29.8231 | 96.3507 | 4870 | 86 | Cloud | NA | GL |
| 93 | CH_1102 | 03_91C_074 | | | China | Brahmaputra | Dibang | 29.03 | 96.223 | 4199 | 47 | Cloud | NA | GL |
| 94 | CH_1106 | 03_91C_078 | | | China | Brahmaputra | Dibang | 29.0084 | 96.2179 | 3664 | 48 | Cloud | NA | WB |
| 95 | CH_1098 | 03_91C_070 | | | China | Brahmaputra | Dibang | 29.0437 | 96.1935 | 4178 | 57 | Cloud | NA | WB |
| 96 | CH_1079 | 03_91C_033 | | | China | Brahmaputra | | 29.2297 | 96.8013 | 4263 | 153 | Cloud | NA | GL |
| 97 | CH_1078 | 03_91C_029 | | | China | Brahmaputra | | 29.2377 | 96.8237 | 4214 | 211 | Cloud | NA | WB |
| 98 | CH_1194 | 03_91H_029 | | | China | Brahmaputra | Luhit | 28.7623 | 97.0567 | 3285 | 50 | Cloud | NA | WB |
| 99 | CH_844 | 03_82J_014 | | | China | Brahmaputra | | 30.1735 | 94.3457 | 3654 | 183 | Cloud | NA | WB |
| 100 | NP_78 | 02_72I_025 | Nepal | | Nepal | Ganga | Sun Kosi | 27.779 | 86.6136 | 4831 | 106 | Cloud | NA | GL |
| 110 | CH_1056 | 03_91C_005 | | | China | Brahmaputra | | 29.8231 | 96.3507 | 4870 | 86 | Cloud | NA | GL |

## Table 5 – List of GL & WB with extreme change in water spread area

### Table 5(a). List of GL&WB that have shown INCREASE in water spread area (>20%)

| S.NO. | UID | Lake_ID | State/ UT | District | Country | Basin | River | LAT | LONG | Elevation | Water spread area in Ha | | % diff | GL/ WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 2009 (Inventory) | Oct 2021 | | |
| 1 | CH_33 | 01_61C_005 | | | China | Indus | Indus | 33.7486 | 80.6416 | 4480 | 139 | 537 | 286.33 | WB |
| 2 | HP_5 | 01_52H_004 | HP | Lahul and Spiti | India | Indus | Chenab | 32.4964 | 77.5516 | 4150 | 46 | 137 | 197.83 | GL |
| 3 | CH_206 | 02_71P_018 | | | China | Ganga | Arun Kosi | 28.3577 | 87.8852 | 4204 | 51 | 128 | 150.98 | WB |
| 4 | CH_1176 | 03_91H_011 | | | China | Brahmaputra | Luhit | 28.9454 | 97.0981 | 4412 | 50 | 96 | 92.00 | WB |
| 5 | AP_206 | 03_92E_001 | AP | Lohit | India | Brahmaputra | Luhit | 27.9898 | 97.3691 | 4185 | 45 | 74 | 64.44 | WB |
| 6 | CH_423 | 03_71G_014 | | | China | Brahmaputra | | 29.0838 | 85.1896 | 4605 | 140 | 221 | 57.86 | WB |
| 7 | SK_20 | 03_78A_014 | Sikkim | North Sikkim | India | Brahmaputra | Teesta | 27.9119 | 88.1986 | 5199 | 94 | 146 | 55.32 | GL |
| 8 | CH_1175 | 03_91H_010 | | | China | Brahmaputra | Luhit | 28.9398 | 97.2614 | 4412 | 79 | 119 | 50.63 | WB |
| 9 | CH_244 | 02_72I_004 | | | China | Ganga | Sun Kosi | 27.9461 | 86.4465 | 5046 | 121 | 181 | 49.59 | GL |
| 10 | CH_39 | 01_61C_011 | | | China | Indus | Indus | 33.7204 | 80.7213 | 4490 | 408 | 581 | 42.40 | WB |
| 11 | CH_590 | 03_77P_019 | | | China | Brahmaputra | Dangme Chu | 28.0588 | 91.9397 | 4631 | 220 | 311 | 41.36 | WB |
| 12 | NP_64 | 02_72I_011 | Nepal | | Nepal | Ganga | Sun Kosi | 27.8995 | 86.9211 | 5003 | 100 | 141 | 41.00 | GL |
| 13 | CH_101 | 01_62F_010 | | | China | Indus | Satluj | 30.3864 | 81.9299 | 5229 | 45 | 61 | 35.56 | GL |
| 14 | HP_3 | 01_52H_002 | HP | Lahul and Spiti | India | Indus | Chenab | 32.5247 | 77.2183 | 4069 | 62 | 83 | 33.87 | GL |
| 15 | CH_551 | 03_77L_042 | | | China | Brahmaputra | Kuri Chu | 28.099 | 90.7398 | 5008 | 50 | 66 | 32.00 | GL |
| 16 | CH_6 | 01_52O_003 | | | China | Indus | Indus | 33.5621 | 79.963 | 4246 | 148 | 194 | 31.08 | WB |
| 17 | CH_38 | 01_61C_010 | | | China | Indus | Indus | 33.7247 | 80.6903 | 4492 | 88 | 115 | 30.68 | WB |
| 18 | CH_1190 | 03_91H_025 | | | China | Brahmaputra | Luhit | 28.783 | 97.1519 | 3712 | 85 | 110 | 29.41 | WB |

| S.NO. | UID | Lake_ID | State/ UT | District | Country | Basin | River | LAT | LONG | Elevation | Water spread area in Ha | | % diff | GL/ WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 2009 (Inventory) | Oct 2021 | | |
| 19 | CH_552 | 03_77L_043 | | | China | Brahmaputra | Kuri Chu | 28.0894 | 90.7885 | 5165 | 181 | 234 | 29.28 | GL |
| 20 | CH_420 | 03_71G_011 | | | China | Brahmaputra | | 29.1221 | 85.3985 | 4618 | 1192 | 1540 | 29.19 | WB |
| 21 | CH_132 | 02_71H_012 | | | China | Ganga | Arun Kosi | 28.5638 | 85.6041 | 5366 | 89 | 114 | 28.09 | GL |
| 22 | NP_67 | 02_72I_014 | Nepal | | Nepal | Ganga | Sun Kosi | 27.8614 | 86.4764 | 4550 | 137 | 175 | 27.74 | GL |
| 23 | CH_446 | 03_71O_010 | | | China | Brahmaputra | | 29.204 | 87.3914 | 4291 | 813 | 1031 | 26.81 | WB |
| 24 | CH_269 | 02_78A_003 | | | China | Ganga | Arun Kosi | 27.9463 | 88.0752 | 5488 | 124 | 156 | 25.81 | GL |
| 25 | CH_369 | 03_62O_024 | | | China | Brahmaputra | | 29.8574 | 83.2516 | 4635 | 721 | 906 | 25.66 | WB |
| 26 | CH_303 | 03_62J_031 | | | China | Brahmaputra | | 30.1039 | 82.2696 | 4876 | 166 | 205 | 23.49 | GL |
| 27 | CH_1170 | 03_91H_005 | | | China | Brahmaputra | Luhit | 28.9778 | 97.2141 | 4092 | 58 | 71 | 22.41 | WB |
| 28 | CH_404 | 03_71C_011 | | | China | Brahmaputra | | 29.2312 | 84.37 | 4679 | 119 | 145 | 21.85 | WB |
| 29 | CH_159 | 02_71L_004 | | | China | Ganga | Arun Kosi | 28.3947 | 86.3792 | 5481 | 86 | 104 | 20.93 | GL |
| 30 | CH_426 | 03_71K_003 | | | China | Brahmaputra | | 29.7664 | 86.9226 | 4976 | 72 | 87 | 20.83 | WB |
| 31 | SK_5 | 03_77D_005 | Sikkim | North Sikkim | India | Brahmaputra | Teesta | 28.0091 | 88.6979 | 5209 | 79 | 95 | 20.25 | GL |

## Table 5(b). List of GL&WB that have shown DECREASE in water spread area (>20%)

| S.NO. | UID | Lake_ID | State/ UT | District | Country | Basin | River | LAT | LONG | Elevation | Water spread area in Ha | | % diff | GL/ WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 2009 (Inventory) | Oct 2021 | | |
| 1 | CH_88 | 01_62E_013 | | | China | Indus | Indus | 31.2415 | 81.6861 | 5341 | 166 | 131 | -21.08 | WB |
| 2 | BH_60 | 03_78E_007 | | | Bhutan | Brahmaputra | Puna Tsang Chu | 27.9414 | 89.93 | 5002 | 61 | 48 | -21.31 | GL |
| 3 | CH_550 | 03_77L_041 | | | China | Brahmaputra | Kuri Chu | 28.1235 | 90.5667 | 5178 | 56 | 44 | -21.43 | GL |
| 4 | CH_640 | 03_82B_014 | | | China | Brahmaputra | | 30.4936 | 92.6433 | 4817 | 157 | 123 | -21.66 | WB |
| 5 | UK_2 | 02_53K_002 | Uthrakh and | Udham Singh Nagar | India | Ganga | Ramganga | 29.3194 | 78.9203 | 265 | 1597 | 1243 | -22.17 | WB |
| 6 | JK_198 | 01_52J_002 | J&K | Ladakh (Leh) | India | Indus | Shyok | 34.2331 | 78.4262 | 5350 | 67 | 52 | -22.39 | WB |
| 7 | CH_273 | 03_62J_001 | | | China | Brahmaputra | | 30.8805 | 82.8592 | 5446 | 147 | 114 | -22.45 | WB |
| 8 | CH_385 | 03_62O_040 | | | China | Brahmaputra | | 29.5824 | 83.3556 | 4888 | 107 | 82 | -23.36 | WB |
| 9 | NP_58 | 02_72I_002 | Nepal | | Nepal | Ganga | Sun Kosi | 27.9752 | 86.6812 | 4834 | 67 | 51 | -23.88 | GL |
| 10 | CH_709 | 03_82D_003 | | | China | Brahmaputra | | 28.8937 | 92.1287 | 4403 | 50 | 38 | -24.00 | WB |
| 11 | JK_227 | 01_52L_003 | J&K | Ladakh (Leh) | India | Indus | Indus | 32.9208 | 78.6002 | 4982 | 648 | 492 | -24.07 | WB |
| 12 | JK_111 | 01_43K_010 | J&K | Rajauri | India | Indus | Jhelum | 33.519 | 74.5837 | 3934 | 66 | 50 | -24.24 | WB |
| 13 | CH_622 | 03_82A_003 | | | China | Brahmaputra | | 31.1092 | 92.952 | 4894 | 99 | 75 | -24.24 | WB |
| 14 | JK_201 | 01_52J_005 | J&K | Ladakh (Leh) | India | Indus | Shyok | 34.1861 | 78.5078 | 5424 | 44 | 33 | -25.00 | WB |
| 15 | CH_28 | 01_61B_003 | | | China | Indus | Indus | 34.2349 | 80.5058 | 5071 | 224 | 168 | -25.00 | WB |
| 16 | CH_647 | 03_82B_021 | | | China | Brahmaputra | | 30.2128 | 92.5711 | 5037 | 48 | 36 | -25.00 | WB |
| 17 | JK_98 | 01_43J_020 | J&K | Baramula (Kashmir North) | India | Indus | Jhelum | 34.2499 | 74.6695 | 1579 | 191 | 143 | -25.13 | WB |
| 18 | JK_128 | 01_43N_001 | J&K | | India | Indus | Shingo (Indus) | 34.9912 | 75.2361 | 4138 | 127 | 95 | -25.20 | WB |
| 19 | CH_591 | 03_77P_020 | | | China | Brahmaputra | Kuri Chu | 28.0879 | 91.2572 | 4630 | 63 | 47 | -25.40 | WB |

| S.NO. | UID | Lake_ID | State/ UT | District | Country | Basin | River | LAT | LONG | Elevation | Water spread area in Ha | | % diff | GL/ WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 2009 (Inventory) | Sept-2021 | | |
| 20 | UK_8 | 02_53O_005 | Uthrakhand | Udham Singh Nagar | India | Ganga | Ramganga | 29.1352 | 79.2888 | 239 | 1510 | 1126 | -25.43 | WB |
| 21 | CH_372 | 03_62O_027 | | | China | Brahmaputra | | 29.8131 | 83.6543 | 4574 | 47 | 35 | -25.53 | WB |
| 22 | CH_492 | 03_77H_023 | | | China | Brahmaputra | | 28.1374 | 89.5348 | 5292 | 47 | 35 | -25.53 | WB |
| 23 | CH_495 | 03_77H_030 | | | China | Brahmaputra | | 28.0256 | 89.4271 | 4791 | 66 | 49 | -25.76 | WB |
| 24 | CH_483 | 03_77H_012 | | | China | Brahmaputra | | 28.2404 | 89.6948 | 4693 | 76 | 56 | -26.32 | GL |
| 25 | JK_99 | 01_43J_021 | J&K | Bagdam | India | Indus | Jhelum | 34.1184 | 74.861 | 1585 | 1238 | 911 | -26.41 | WB |
| 26 | HP_6 | 01_52H_005 | HP | Lahul and Spiti | India | Indus | Chenab | 32.4816 | 77.6146 | 4276 | 45 | 33 | -26.67 | WB |
| 27 | BH_194 | 03_78M_019 | | | Bhutan | Brahmaputra | Dangme Chu | 27.8472 | 91.5833 | 4656 | 55 | 40 | -27.27 | WB |
| 28 | CH_460 | 03_77C_006 | | | China | Brahmaputra | | 29.5875 | 88.2317 | 4506 | 102 | 74 | -27.45 | WB |
| 29 | CH_612 | 03_78E_023 | | | China | Brahmaputra | | 27.8549 | 89.2666 | 5192 | 58 | 42 | -27.59 | GL |
| 30 | CH_387 | 03_62O_042 | | | China | Brahmaputra | | 29.4989 | 83.4279 | 4959 | 57 | 41 | -28.07 | WB |
| 31 | CH_398 | 03_71C_005 | | | China | Brahmaputra | | 29.8455 | 84.6756 | 5536 | 57 | 41 | -28.07 | GL |
| 32 | SK_3 | 03_77D_003 | Sikkim | North Sikkim | India | Brahmaputra | Teesta | 28.0132 | 88.7558 | 5094 | 96 | 69 | -28.13 | WB |
| 33 | JK_157 | 01_43N_030 | J&K | Srinagar | India | Indus | Jhelum | 34.1392 | 75.1474 | 3780 | 86 | 61 | -29.07 | WB |
| 34 | JK_154 | 01_43N_027 | J&K | Srinagar | India | Indus | Jhelum | 34.3881 | 75.1185 | 3663 | 48 | 34 | -29.17 | WB |
| 35 | CH_166 | 02_71L_011 | | | China | Ganga | Sun Kosi | 28.3354 | 86.1917 | 5422 | 58 | 41 | -29.31 | GL |
| 36 | CH_259 | 02_77D_004 | | | China | Ganga | Arun Kosi | 28.2939 | 88.121 | 4383 | 1273 | 897 | -29.54 | WB |
| 37 | CH_155 | 02_71H_035 | | | China | Ganga | Sun Kosi | 28.1825 | 85.9229 | 4355 | 45 | 31 | -31.11 | WB |
| 38 | CH_604 | 03_78E_006 | | | China | Brahmaputra | | 27.9699 | 89.3782 | 4568 | 67 | 46 | -31.34 | WB |
| 39 | CH_157 | 02_71L_002 | | | China | Ganga | Arun Kosi | 28.8581 | 86.5201 | 5254 | 76 | 52 | -31.58 | WB |
| 40 | CH_611 | 03_78E_019 | | | China | Brahmaputra | | 27.8779 | 89.312 | 5001 | 60 | 41 | -31.67 | GL |
| 41 | CH_64 | 01_61G_003 | | | China | Indus | Indus | 33.6333 | 81.3874 | 4872 | 63 | 43 | -31.75 | WB |
| 42 | BH_188 | 03_78M_010 | | | Bhutan | Brahmaputra | Dangme Chu | 27.8772 | 91.6338 | 4480 | 50 | 34 | -32.00 | WB |
| 43 | JK_149 | 01_43N_022 | J&K | | India | Indus | Jhelum | 34.6665 | 75.1793 | 4234 | 72 | 48 | -33.33 | WB |

| S.NO. | UID | Lake_ID | State/ UT | District | Country | Basin | River | LAT | LONG | Elevation | Water spread area in Ha | | % diff | GL/ WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 2009 (Inventory) | Sept-2021 | | |
| 44 | CH_587 | 03_77P_016 | | | China | Brahmaputra | Dangme Chu | 28.3302 | 91.9633 | 4747 | 251 | 165 | -34.26 | WB |
| 45 | CH_55 | 01_61D_003 | | | China | Indus | Indus | 32.4232 | 80.8653 | 4452 | 46 | 30 | -34.78 | WB |
| 46 | CH_613 | 03_78E_026 | | | China | Brahmaputra | Amo Chu | 27.8087 | 89.227 | 5137 | 60 | 39 | -35.00 | GL |
| 47 | JK_205 | 01_52J_009 | J&K/ Ladakh | Ladakh (Leh) | India | Indus | Shyok | 34.1506 | 78.5532 | 5562 | 57 | 37 | -35.09 | WB |
| 48 | CH_77 | 01_62E_002 | | | China | Indus | Indus | 31.6162 | 81.0168 | 5137 | 161 | 104 | -35.40 | WB |
| 49 | CH_530 | 03_77L_014 | | | China | Brahmaputra | | 28.4387 | 90.1736 | 5283 | 48 | 31 | -35.42 | WB |
| 50 | CH_204 | 02_71P_016 | | | China | Ganga | Arun Kosi | 28.4991 | 87.4522 | 4177 | 137 | 88 | -35.77 | WB |
| 51 | CH_256 | 02_77D_001 | | | China | Ganga | Arun Kosi | 28.4045 | 88.2286 | 4422 | 5831 | 3722 | -36.17 | WB |
| 52 | HP_10 | 01_53A_002 | HP | Bilaspur | India | Indus | Satluj | 31.3855 | 76.535 | 506 | 13679 | 8717 | -36.27 | WB |
| 53 | CH_187 | 02_71L_032 | | | China | Ganga | Sun Kosi | 28.0445 | 86.5137 | 5241 | 55 | 35 | -36.36 | GL |
| 54 | CH_85 | 01_62E_010 | | | China | Indus | Indus | 31.2741 | 81.5949 | 5228 | 156 | 99 | -36.54 | WB |
| 55 | CH_388 | 03_62O_043 | | | China | Brahmaputra | | 29.4704 | 83.7638 | 5281 | 86 | 54 | -37.21 | WB |
| 56 | CH_338 | 03_62N_021 | | | China | Brahmaputra | | 30.4308 | 83.9969 | 5429 | 197 | 119 | -39.59 | WB |
| 57 | NP_59 | 02_72I_003 | Nepal | | Nepal | Ganga | Sun Kosi | 27.951 | 86.6897 | 4726 | 45 | 27 | -40.00 | GL |
| 58 | CH_168 | 02_71L_013 | | | China | Ganga | Sun Kosi | 28.3034 | 86.1576 | 5307 | 64 | 38 | -40.63 | GL |
| 59 | CH_646 | 03_82B_020 | | | China | Brahmaputra | | 30.2164 | 92.5166 | 4981 | 49 | 29 | -40.82 | WB |
| 60 | CH_606 | 03_78E_010 | | | China | Brahmaputra | | 27.9636 | 89.4127 | 4576 | 49 | 29 | -40.82 | WB |
| 61 | CH_589 | 03_77P_018 | | | China | Brahmaputra | Dangme Chu | 28.1016 | 91.9429 | 4705 | 154 | 91 | -40.91 | WB |
| 62 | JK_147 | 01_43N_020 | J&K/ Ladakh | | India | Indus | Jhelum | 34.6973 | 75.1369 | 4103 | 63 | 37 | -41.27 | WB |
| 63 | CH_671 | 03_82C_016 | | | China | Brahmaputra | | 29.6666 | 92.3935 | 4677 | 54 | 31 | -42.59 | WB |
| 64 | CH_377 | 03_62O_032 | | | China | Brahmaputra | | 29.6893 | 83.1901 | 5007 | 49 | 28 | -42.86 | WB |
| 65 | JK_30 | 01_43E_006 | J&K/ Ladakh | | India | Indus | Gilgit | 35.9453 | 73.3646 | 4162 | 71 | 40 | -43.66 | WB |
| 66 | CH_422 | 03_71G_013 | | | China | Brahmaputra | | 29.1021 | 85.0971 | 4541 | 244 | 137 | -43.85 | WB |
| 67 | CH_725 | 03_82E_007 | | | China | Brahmaputra | | 31.004 | 93.0878 | 5040 | 71 | 39 | -45.07 | WB |
| 68 | BH_104 | 03_78I_023 | | | Bhutan | Brahmaputra | Manas Chu & Mangde Chu | 27.9396 | 90.5348 | 5036 | 51 | 28 | -45.10 | GL |

| S.NO. | UID | Lake_ID | State/ UT | District | Country | Basin | River | LAT | LONG | Elevation | Water spread area in Ha | | % diff | GL/ WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 2009 (Inventory) | Sept-2021 | | |
| 69 | UK_11 | 02_53P_003 | Uthrakhand | Udham Singh Nagar | India | Ganga | Ramganga | 28.901 | 79.623 | 207 | 1078 | 591 | -45.18 | WB |
| 70 | CH_479 | 03_77H_004 | | | China | Brahmaputra | | 28.3271 | 89.4288 | 4426 | 201 | 110 | -45.27 | WB |
| 71 | CH_258 | 02_77D_003 | | | China | Ganga | Arun Kosi | 28.3092 | 88.3253 | 4364 | 88 | 47 | -46.59 | WB |
| 72 | CH_418 | 03_71G_009 | | | China | Brahmaputra | | 29.5258 | 85.6437 | 5031 | 178 | 95 | -46.63 | WB |
| 73 | CH_419 | 03_71G_010 | | | China | Brahmaputra | | 29.347 | 85.083 | 4483 | 304 | 152 | -50.00 | WB |
| 74 | CH_452 | 03_77B_001 | | | China | Brahmaputra | | 30.1682 | 88.6197 | 5029 | 52 | 26 | -50.00 | WB |
| 75 | SK_8 | 03_77D_008 | Sikkim | North Sikkim | India | Brahmaputra | Teesta | 28.0073 | 88.4949 | 5023 | 46 | 23 | -50.00 | GL |
| 76 | CH_90 | 01_62E_015 | | | China | Indus | Satluj | 31.1823 | 81.1945 | 5413 | 51 | 25 | -50.98 | WB |
| 77 | CH_53 | 01_61D_001 | | | China | Indus | Indus | 32.8015 | 80.4836 | 5590 | 70 | 33 | -52.86 | WB |
| 78 | CH_524 | 03_77L_008 | | | China | Brahmaputra | | 28.8255 | 90.6864 | 4446 | 85 | 39 | -54.12 | WB |
| 79 | CH_522 | 03_77L_006 | | | China | Brahmaputra | | 28.8945 | 90.4054 | 4529 | 44 | 20 | -54.55 | WB |
| 80 | CH_417 | 03_71G_008 | | | China | Brahmaputra | | 29.5586 | 85.8807 | 5184 | 60 | 27 | -55.00 | WB |
| 81 | CH_526 | 03_77L_010 | | | China | Brahmaputra | | 28.8113 | 90.4929 | 4459 | 47 | 21 | -55.32 | WB |
| 82 | CH_609 | 03_78E_017 | | | China | Brahmaputra | | 27.8766 | 89.2961 | 5236 | 65 | 29 | -55.38 | GL |
| 83 | CH_188 | 02_71L_034 | | | China | Ganga | Sun Kosi | 28.0336 | 86.4962 | 5057 | 46 | 20 | -56.52 | GL |
| 84 | CH_716 | 03_82D_010 | | | China | Brahmaputra | Dangme Chu | 28.1915 | 92.043 | 5036 | 76 | 33 | -56.58 | WB |
| 85 | CH_598 | 03_78A_018 | | | China | Brahmaputra | Amo Chu | 27.8554 | 88.9448 | 4874 | 67 | 29 | -56.72 | WB |
| 86 | CH_207 | 02_71P_019 | | | China | Ganga | Arun Kosi | 28.3524 | 87.8751 | 4199 | 48 | 20 | -58.33 | GL |
| 87 | UK_10 | 02_53P_002 | Uthrakhand | Udham Singh Nagar | India | Ganga | Ramganga | 28.9515 | 79.5869 | 213 | 734 | 289 | -60.63 | WB |
| 88 | CH_62 | 01_61G_001 | | | China | Indus | Indus | 33.8202 | 81.6446 | 4968 | 85 | 33 | -61.18 | WB |
| 89 | CH_5 | 01_52O_002 | | | China | Indus | Indus | 33.9803 | 79.5432 | 5259 | 135 | 52 | -61.48 | WB |
| 90 | JK_191 | 01_52G_003 | J&K | Ladakh (Leh) | India | Indus | Indus | 33.3107 | 77.997 | 4531 | 1502 | 566 | -62.32 | WB |
| 91 | CH_106 | 02_62B_001 | | | China | Ganga | Karnal | 30.618 | 80.6304 | 5214 | 47 | 17 | -63.83 | WB |
| 92 | CH_1085 | 03_91C_052 | | | China | Brahmaputra | Luhit | 29.1745 | 96.3256 | 4375 | 64 | 23 | -64.06 | WB |

| S.NO. | UID | Lake_ID | State/ UT | District | Country | Basin | River | LAT | LONG | Elevation | Water spread area in Ha | | % diff | GL/ WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 2009 (Inventory) | Sept-2021 | | |
| 93 | NP_41 | 02_63M_002 | Nepal | | Nepal | Ganga | Rapti | 27.6211 | 83.1017 | 110 | 153 | 51 | -66.67 | WB |
| 94 | CH_73 | 01_62B_001 | | | China | Indus | Satluj | 30.823 | 80.743 | 4527 | 440 | 136 | -69.09 | WB |
| 95 | CH_576 | 03_77P_005 | | | China | Brahmaputra | | 28.7653 | 91.675 | 4616 | 110 | 31 | -71.82 | WB |
| 96 | CH_320 | 03_62N_003 | | | China | Brahmaputra | | 30.7106 | 83.6086 | 5210 | 57 | 16 | -71.93 | WB |
| 97 | CH_403 | 03_71C_010 | | | China | Brahmaputra | | 29.311 | 84.4304 | 4558 | 49 | 12 | -75.51 | WB |
| 98 | CH_347 | 03_62O_002 | | | China | Brahmaputra | | 29.9607 | 83.2699 | 4585 | 52 | 9 | -82.69 | WB |
| 99 | CH_373 | 03_62O_028 | | | China | Brahmaputra | | 29.7947 | 83.5558 | 4574 | 932 | 149 | -84.01 | WB |

## Table 6 (a) – Comparison of Water Spread Area for GL/WBs showing INCREASE in water spread area (>20% in October, 2021) from 2016 – October 2021 with inventory area

| S.No. | UID | Lake_ID | Water spread area in Ha | | % Diff in Water Spread Area | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2009 (Inventory) | October, 2021 | October-2021 | 2020 | 2019 | 2018 | 2017 | 2016 |
| 1 | CH_33 | 01_61C_005 | 139 | 537 | 286.33 | 273.38 | 238.13 | 176.62 | -54.98 | 150.39 |
| 2 | HP_5 | 01_52H_004 | 46 | 137 | 197.83 | 260.87 | 252.17 | 243.48 | 157.88 | 202.37 |
| 3 | CH_206 | 02_71P_018 | 51 | 128 | 150.98 | 203.92 | 74.51 | -3.92 | -11.25 | -17.49 |
| 4 | CH_1176 | 03_91H_011 | 50 | 96 | 92.00 | Cloud | 44.00 | -21.86 | Cloud | -13.80 |
| 5 | AP_206 | 03_92E_001 | 45 | 74 | 64.44 | Cloud | 35.56 | -8.89 | -8.46 | -15.56 |
| 6 | CH_423 | 03_71G_014 | 140 | 221 | 57.86 | 86.43 | 95.71 | 78.57 | 22.21 | -18.73 |
| 7 | SK_20 | 03_78A_014 | 94 | 146 | 55.32 | 59.57 | 65.96 | 65.96 | 5.20 | 5.20 |
| 8 | CH_1175 | 03_91H_010 | 79 | 119 | 50.63 | Cloud | 25.32 | -4.53 | 5.20 | -11.39 |
| 9 | CH_244 | 02_72I_004 | 121 | 181 | 49.59 | 73.55 | 97.52 | 75.21 | 71.92 | 86.55 |
| 10 | CH_132 | 02_71H_012 | 89 | 129 | 44.94 | 59.55 | 56.18 | 56.18 | 42.15 | 51.43 |
| 11 | CH_39 | 01_61C_011 | 408 | 581 | 42.40 | 53.43 | 45.59 | 33.33 | 27.30 | 19.81 |
| 12 | CH_590 | 03_77P_019 | 220 | 311 | 41.36 | 50.91 | 64.09 | 4.19 | 4.19 | -2.86 |
| 13 | NP_64 | 02_72I_011 | 100 | 141 | 41.00 | 69.00 | 92.00 | 75.00 | 44.68 | 56.65 |
| 14 | CH_101 | 01_62F_010 | 45 | 61 | 35.56 | 68.89 | 64.44 | 85.66 | 49.72 | 26.09 |
| 15 | HP_3 | 01_52H_002 | 62 | 83 | 33.87 | 70.97 | 72.58 | 74.57 | 44.58 | 29.27 |
| 16 | CH_551 | 03_77L_042 | 50 | 66 | 32.00 | 96.00 | 104.00 | 62.00 | Cloud | 49.52 |
| 17 | CH_6 | 01_52O_003 | 148 | 194 | 31.08 | 50.68 | 71.62 | 40.54 | 48.13 | 54.95 |
| 18 | CH_38 | 01_61C_010 | 88 | 115 | 30.68 | 59.09 | 61.36 | 35.23 | 27.78 | 656.22 |
| 19 | CH_1190 | 03_91H_025 | 85 | 110 | 29.41 | -11.76 | 28.24 | 1.53 | -3.83 | NA |
| 20 | CH_552 | 03_77L_043 | 181 | 234 | 29.28 | 38.12 | 41.99 | 37.02 | Cloud | 16.41 |
| 21 | CH_420 | 03_71G_011 | 1192 | 1540 | 29.19 | 33.64 | 37.58 | 33.05 | 7.27 | -6.14 |
| 22 | NP_67 | 02_72I_014 | 137 | 175 | 27.74 | 32.12 | 44.53 | 21.90 | 20.37 | 63.67 |

| S.No. | UID | Lake_ID | Water spread area in Ha | | % Diff in Water Spread Area | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2009 (Inventory) | October, 2021 | October-2021 | 2020 | 2019 | 2018 | 2017 | 2016 |
| 23 | CH_446 | 03_71O_010 | 813 | 1031 | 26.81 | 43.67 | 45.51 | 7.75 | 77.54 | 1.99 |
| 24 | CH_269 | 02_78A_003 | 124 | 156 | 25.81 | 20.16 | 37.90 | 33.87 | 22.35 | -12.90 |
| 25 | CH_369 | 03_62O_024 | 721 | 906 | 25.66 | 42.16 | 43.83 | 19.97 | 9.45 | 3.23 |
| 26 | CH_303 | 03_62J_031 | 166 | 205 | 23.49 | 33.13 | 50.00 | 46.99 | 36.51 | 22.75 |
| 27 | CH_1170 | 03_91H_005 | 58 | 71 | 22.41 | Cloud | 43.10 | Cloud | 249.67 | -8.90 |
| 28 | CH_404 | 03_71C_011 | 119 | 145 | 21.85 | 72.27 | 52.10 | 18.49 | 11.33 | 2.56 |
| 29 | CH_159 | 02_71L_004 | 86 | 104 | 20.93 | 40.70 | 54.65 | 35.26 | 38.86 | -100.00 |
| 30 | CH_426 | 03_71K_003 | 72 | 87 | 20.83 | 58.33 | 72.22 | 23.61 | -6.54 | -11.11 |
| 31 | SK_5 | 03_77D_005 | 79 | 95 | 20.25 | 40.51 | 49.37 | 41.77 | -23.83 | -24.76 |

## Table 6 (b) – Comparison of Water Spread Area for GL/WBs showing DECREASE in water spread area (>20% in October, 2021) from 2016 – October 2021 with inventory area

| S.No. | UID | Lake_ID | Water spread area in Ha | | % Diff in Water Spread Area | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2009 (Inventory) | October, 2021 | October-2021 | 2020 | 2019 | 2018 | 2017 | 2016 |
| 1 | CH_88 | 01_62E_013 | 166 | 131 | -21.08 | 7.83 | 7.83 | 9.12 | 4.52 | -12.05 |
| 2 | BH_60 | 03_78E_007 | 61 | 48 | -21.31 | -9.84 | 22.95 | -11.48 | Cloud | -10.76 |
| 3 | CH_550 | 03_77L_041 | 56 | 44 | -21.43 | 19.64 | 42.86 | 0.12 | -11.59 | 26.80 |
| 4 | CH_640 | 03_82B_014 | 157 | 123 | -21.66 | 15.29 | 14.01 | 6.45 | -14.75 | 3.83 |
| 5 | UK_2 | 02_53K_002 | 1597 | 1243 | -22.17 | -20.66 | -3.82 | -8.27 | -16.62 | -54.38 |
| 6 | JK_198 | 01_52J_002 | 67 | 52 | -22.39 | 8.96 | 4.48 | 4.72 | -13.97 | -16.52 |
| 7 | CH_273 | 03_62J_001 | 147 | 114 | -22.45 | 8.16 | 7.48 | 7.48 | -4.91 | -3.68 |
| 8 | CH_385 | 03_62O_040 | 107 | 82 | -23.36 | 24.30 | 21.50 | 21.25 | 22.96 | 29.36 |
| 9 | NP_58 | 02_72I_002 | 67 | 51 | -23.88 | -5.97 | 8.96 | 5.97 | -11.23 | -4.55 |
| 10 | CH_709 | 03_82D_003 | 50 | 38 | -24.00 | -12.00 | -6.00 | 2.79 | -16.69 | -7.50 |
| 11 | JK_227 | 01_52L_003 | 648 | 492 | -24.07 | -9.10 | -4.78 | -4.78 | -6.77 | -6.91 |
| 12 | JK_111 | 01_43K_010 | 66 | 50 | -24.24 | 10.61 | 22.73 | 6.72 | 4.13 | -0.83 |
| 13 | CH_622 | 03_82A_003 | 99 | 75 | -24.24 | 4.04 | 3.03 | -2.00 | -10.90 | -11.86 |
| 14 | JK_201 | 01_52J_005 | 44 | 33 | -25.00 | 9.09 | 20.45 | 7.11 | -5.18 | -14.52 |
| 15 | CH_28 | 01_61B_003 | 224 | 168 | -25.00 | -8.48 | -7.14 | 6.23 | 2.43 | -24.96 |
| 16 | CH_647 | 03_82B_021 | 48 | 36 | -25.00 | 14.58 | 33.33 | 16.42 | Cloud | 0.65 |
| 17 | JK_98 | 01_43J_020 | 191 | 143 | -25.13 | -10.47 | -2.09 | -12.95 | -10.46 | -4.82 |
| 18 | JK_128 | 01_43N_001 | 127 | 95 | -25.20 | 11.81 | 10.24 | 1.00 | -5.28 | -1.36 |
| 19 | CH_591 | 03_77P_020 | 63 | 47 | -25.40 | -4.76 | 0.00 | -17.46 | Cloud | 17.03 |
| 20 | UK_8 | 02_53O_005 | 1510 | 1126 | -25.43 | -36.82 | 26.09 | 26.09 | 21.17 | -6.21 |
| 21 | CH_372 | 03_62O_027 | 47 | 35 | -25.53 | -19.15 | 4.26 | 4.26 | -18.17 | 6.68 |
| 22 | CH_492 | 03_77H_023 | 47 | 35 | -25.53 | 0.00 | Cloud | 26.59 | 36.52 | -100.00 |
| 23 | CH_495 | 03_77H_030 | 66 | 49 | -25.76 | -6.06 | -6.06 | 3.99 | -22.02 | -22.73 |

| S.No. | UID | Lake_ID | Water spread area in Ha | | % Diff in Water Spread Area | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2009 (Inventory) | October, 2021 | October-2021 | 2020 | 2019 | 2018 | 2017 | 2016 |
| 24 | CH_483 | 03_77H_012 | 76 | 56 | -26.32 | 18.42 | 18.42 | 18.42 | 19.19 | -2.63 |
| 25 | JK_99 | 01_43J_021 | 1238 | 911 | -26.41 | -11.79 | -11.15 | -11.15 | -11.51 | -15.06 |
| 26 | HP_6 | 01_52H_005 | 45 | 33 | -26.67 | 17.78 | 20.00 | 8.89 | -10.13 | -7.54 |
| 27 | BH_194 | 03_78M_019 | 55 | 40 | -27.27 | 1.82 | 12.73 | Cloud | 11.75 | -20.00 |
| 28 | CH_460 | 03_77C_006 | 102 | 74 | -27.45 | -11.76 | 10.78 | 10.78 | -6.46 | -9.05 |
| 29 | CH_612 | 03_78E_023 | 58 | 42 | -27.59 | -6.90 | 8.62 | -5.17 | -18.41 | 188.89 |
| 30 | CH_387 | 03_62O_042 | 57 | 41 | -28.07 | 24.56 | 24.56 | 3.51 | -5.32 | 7.04 |
| 31 | CH_398 | 03_71C_005 | 57 | 41 | -28.07 | 5.26 | 10.53 | 10.53 | 4.61 | 1.37 |
| 32 | SK_3 | 03_77D_003 | 96 | 69 | -28.13 | 18.75 | 30.21 | 20.40 | 7.90 | -21.06 |
| 33 | JK_157 | 01_43N_030 | 86 | 61 | -29.07 | -3.49 | 3.49 | 2.17 | -7.31 | 65.77 |
| 34 | JK_154 | 01_43N_027 | 48 | 34 | -29.17 | 0.00 | -4.17 | 0.32 | -14.36 | -12.31 |
| 35 | CH_166 | 02_71L_011 | 58 | 41 | -29.31 | 5.17 | 6.90 | 1.72 | 1.57 | 1.72 |
| 36 | CH_259 | 02_77D_004 | 1273 | 897 | -29.54 | -63.00 | -38.10 | -1.96 | -41.75 | -41.75 |
| 37 | CH_155 | 02_71H_035 | 45 | 31 | -31.11 | -6.67 | 26.67 | 26.67 | 11.06 | 3.14 |
| 38 | CH_604 | 03_78E_006 | 67 | 46 | -31.34 | 0.00 | 5.97 | 6.14 | -8.48 | -30.78 |
| 39 | CH_157 | 02_71L_002 | 76 | 52 | -31.58 | 9.21 | 23.68 | 2.63 | 19.91 | 2.63 |
| 40 | CH_611 | 03_78E_019 | 60 | 41 | -31.67 | 0.00 | 10.00 | 12.18 | 31.11 | 5.00 |
| 41 | CH_64 | 01_61G_003 | 63 | 43 | -31.75 | -4.76 | 46.03 | 14.29 | 0.85 | 22.22 |
| 42 | BH_188 | 03_78M_010 | 50 | 34 | -32.00 | -8.00 | 2.00 | -3.04 | Cloud | -15.38 |
| 43 | JK_149 | 01_43N_022 | 72 | 48 | -33.33 | 15.28 | 15.28 | 0.40 | 10.19 | 0.59 |
| 44 | CH_587 | 03_77P_016 | 251 | 165 | -34.26 | -2.39 | 5.98 | 3.19 | -13.34 | -13.12 |
| 45 | CH_55 | 01_61D_003 | 46 | 30 | -34.78 | 63.04 | 65.22 | 63.42 | 66.97 | 26.46 |
| 46 | CH_613 | 03_78E_026 | 60 | 39 | -35.00 | Cloud | 3.33 | -1.67 | -10.18 | -1.64 |
| 47 | JK_205 | 01_52J_009 | 57 | 37 | -35.09 | 24.56 | 42.11 | 25.32 | -6.53 | -26.89 |

| S.No. | UID | Lake_ID | Water spread area in Ha | | % Diff in Water Spread Area | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2009 (Inventory) | October, 2021 | October-2021 | 2020 | 2019 | 2018 | 2017 | 2016 |
| 48 | CH_77 | 01_62E_002 | 161 | 104 | -35.40 | 8.07 | 12.42 | 2.48 | 2.55 | -12.60 |
| 49 | CH_530 | 03_77L_014 | 48 | 31 | -35.42 | 10.42 | 16.67 | 12.50 | Cloud | 0.69 |
| 50 | CH_204 | 02_71P_016 | 137 | 88 | -35.77 | 21.90 | 27.01 | 15.13 | 17.37 | -100.00 |
| 51 | CH_256 | 02_77D_001 | 5831 | 3722 | -36.17 | -36.32 | -18.28 | -18.28 | -38.10 | #N/A |
| 52 | HP_10 | 01_53A_002 | 13679 | 8717 | -36.27 | -13.26 | 7.29 | -1.29 | -2.89 | -18.56 |
| 53 | CH_187 | 02_71L_032 | 55 | 35 | -36.36 | -7.27 | 16.36 | 3.64 | 0.83 | -2.05 |
| 54 | CH_85 | 01_62E_010 | 156 | 99 | -36.54 | 8.33 | 61.54 | 6.41 | -0.26 | -13.18 |
| 55 | CH_388 | 03_62O_043 | 86 | 54 | -37.21 | 6.98 | 18.60 | 8.14 | -5.38 | -8.85 |
| 56 | CH_338 | 03_62N_021 | 197 | 119 | -39.59 | 7.11 | 14.72 | 8.12 | 5.45 | -5.57 |
| 57 | NP_59 | 02_72I_003 | 45 | 27 | -40.00 | -6.67 | 20.00 | 0.21 | -2.30 | -8.91 |
| 58 | CH_168 | 02_71L_013 | 64 | 38 | -40.63 | 0.00 | 20.31 | 4.69 | -10.79 | -2.88 |
| 59 | CH_646 | 03_82B_020 | 49 | 29 | -40.82 | 2.04 | 26.53 | 2.98 | -17.72 | 20.31 |
| 60 | CH_606 | 03_78E_010 | 49 | 29 | -40.82 | -14.29 | -8.16 | 11.95 | 2.54 | -22.45 |
| 61 | CH_589 | 03_77P_018 | 154 | 91 | -40.91 | -14.94 | -12.99 | 0.87 | -5.73 | -5.73 |
| 62 | JK_147 | 01_43N_020 | 63 | 37 | -41.27 | 25.40 | 17.46 | -1.22 | -9.71 | 10.56 |
| 63 | CH_671 | 03_82C_016 | 54 | 31 | -42.59 | -1.85 | 7.41 | 0.65 | -10.26 | 1.13 |
| 64 | CH_377 | 03_62O_032 | 49 | 28 | -42.86 | 30.61 | 32.65 | 20.41 | 31.10 | -4.57 |
| 65 | JK_30 | 01_43E_006 | 71 | 40 | -43.66 | 12.68 | 2.82 | -1.66 | -11.32 | 56.03 |
| 66 | CH_422 | 03_71G_013 | 244 | 137 | -43.85 | 31.15 | 47.54 | 37.30 | 19.99 | 3.06 |
| 67 | CH_725 | 03_82E_007 | 71 | 39 | -45.07 | 1.41 | 45.07 | 7.04 | -21.53 | -10.03 |
| 68 | BH_104 | 03_78I_023 | 51 | 28 | -45.10 | 3.92 | 25.49 | -17.65 | -18.18 | -38.55 |
| 69 | UK_11 | 02_53P_003 | 1078 | 591 | -45.18 | -12.24 | 3.71 | 2.38 | -31.82 | -29.75 |
| 70 | CH_479 | 03_77H_004 | 201 | 110 | -45.27 | -35.82 | 0.00 | 7.75 | -3.57 | -37.31 |
| 71 | CH_258 | 02_77D_003 | 88 | 47 | -46.59 | -31.82 | 21.59 | 7.95 | 12.52 | 631.22 |
| 72 | CH_418 | 03_71G_009 | 178 | 95 | -46.63 | -4.49 | 3.93 | -1.12 | -12.32 | -12.32 |
| 73 | CH_419 | 03_71G_010 | 304 | 152 | -50.00 | -33.55 | 18.75 | 16.52 | 2.74 | -18.66 |
| 74 | CH_452 | 03_77B_001 | 52 | 26 | -50.00 | -1.92 | 3.85 | -4.87 | -13.31 | 2.73 |

| S.No. | UID | Lake_ID | Water spread area in Ha | | % Diff in Water Spread Area | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2009 (Inventory) | October, 2021 | October-2021 | 2020 | 2019 | 2018 | 2017 | 2016 |
| 75 | SK_8 | 03_77D_008 | 46 | 23 | -50.00 | -2.17 | 10.87 | 12.21 | 37.00 | -100.00 |
| 76 | CH_90 | 01_62E_015 | 51 | 25 | -50.98 | 21.57 | 5.88 | 8.95 | -5.97 | -19.84 |
| 77 | CH_53 | 01_61D_001 | 70 | 33 | -52.86 | 38.57 | 34.29 | 30.14 | 28.93 | -75.69 |
| 78 | CH_524 | 03_77L_008 | 85 | 39 | -54.12 | 40.00 | 22.35 | 1.18 | -9.89 | 5.67 |
| 79 | CH_522 | 03_77L_006 | 44 | 20 | -54.55 | 6.82 | 18.18 | 9.09 | -80.74 | 10.89 |
| 80 | CH_417 | 03_71G_008 | 60 | 27 | -55.00 | 10.00 | 11.67 | 4.76 | 18.41 | 13.02 |
| 81 | CH_526 | 03_77L_010 | 47 | 21 | -55.32 | 27.66 | 23.40 | 4.26 | -38.06 | -11.89 |
| 82 | CH_609 | 03_78E_017 | 65 | 29 | -55.38 | -23.08 | Cloud | -4.62 | -14.63 | 2.17 |
| 83 | CH_188 | 02_71L_034 | 46 | 20 | -56.52 | 69.57 | 89.13 | 73.91 | 29.97 | 34.22 |
| 84 | CH_716 | 03_82D_010 | 76 | 33 | -56.58 | -22.37 | -7.89 | 0.35 | -77.53 | 39.47 |
| 85 | CH_598 | 03_78A_018 | 67 | 29 | -56.72 | Cloud | -17.91 | Cloud | Cloud | -100.00 |
| 86 | CH_207 | 02_71P_019 | 48 | 20 | -58.33 | -12.50 | 164.58 | 32.50 | -29.88 | -29.17 |
| 87 | UK_10 | 02_53P_002 | 734 | 289 | -60.63 | -50.68 | -39.10 | -38.56 | -40.59 | -36.48 |
| 88 | CH_62 | 01_61G_001 | 85 | 33 | -61.18 | 14.12 | 24.71 | 13.40 | 11.51 | -14.05 |
| 89 | CH_5 | 01_52O_002 | 135 | 52 | -61.48 | 7.41 | 12.59 | 2.22 | -11.07 | -46.67 |
| 90 | JK_191 | 01_52G_003 | 1502 | 566 | -62.32 | -1.86 | 6.46 | 6.47 | -7.27 | -10.56 |
| 91 | CH_106 | 02_62B_001 | 47 | 17 | -63.83 | -4.26 | 25.53 | 25.53 | 0.51 | -10.64 |
| 92 | CH_1085 | 03_91C_052 | 64 | 23 | -64.06 | Cloud | -21.88 | -31.00 | -29.00 | -26.94 |
| 93 | NP_41 | 02_63M_002 | 153 | 51 | -66.67 | -65.36 | -1.31 | -0.12 | -33.76 | -33.76 |
| 94 | CH_73 | 01_62B_001 | 440 | 136 | -69.09 | -27.73 | -2.73 | -2.60 | -26.14 | -18.94 |
| 95 | CH_576 | 03_77P_005 | 110 | 31 | -71.82 | -21.82 | 9.09 | 7.55 | -4.78 | 27.94 |
| 96 | CH_320 | 03_62N_003 | 57 | 16 | -71.93 | -7.02 | 12.28 | 12.28 | -5.64 | -24.56 |
| 97 | CH_403 | 03_71C_010 | 49 | 12 | -75.51 | 2.04 | 18.37 | 18.37 | 121.38 | -25.10 |
| 98 | CH_347 | 03_62O_002 | 52 | 9 | -82.69 | 38.46 | 26.92 | 5.77 | -22.27 | -12.52 |
| 99 | CH_373 | 03_62O_028 | 932 | 149 | -84.01 | -2.68 | 8.91 | 8.91 | 0.19 | -14.88 |

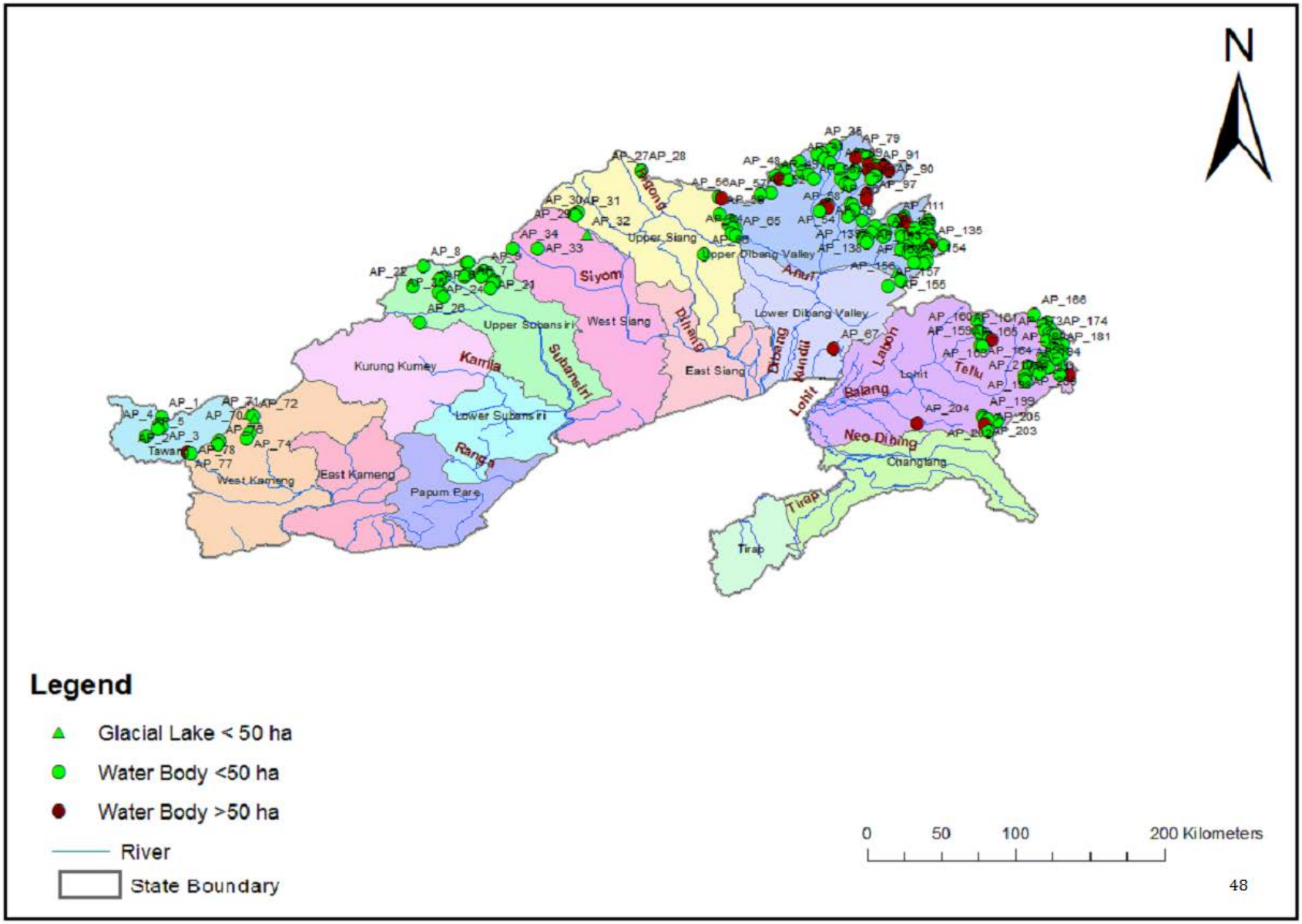



**Figure 3 (a): Glacial Lakes & Water Bodies in Arunachal Pradesh**

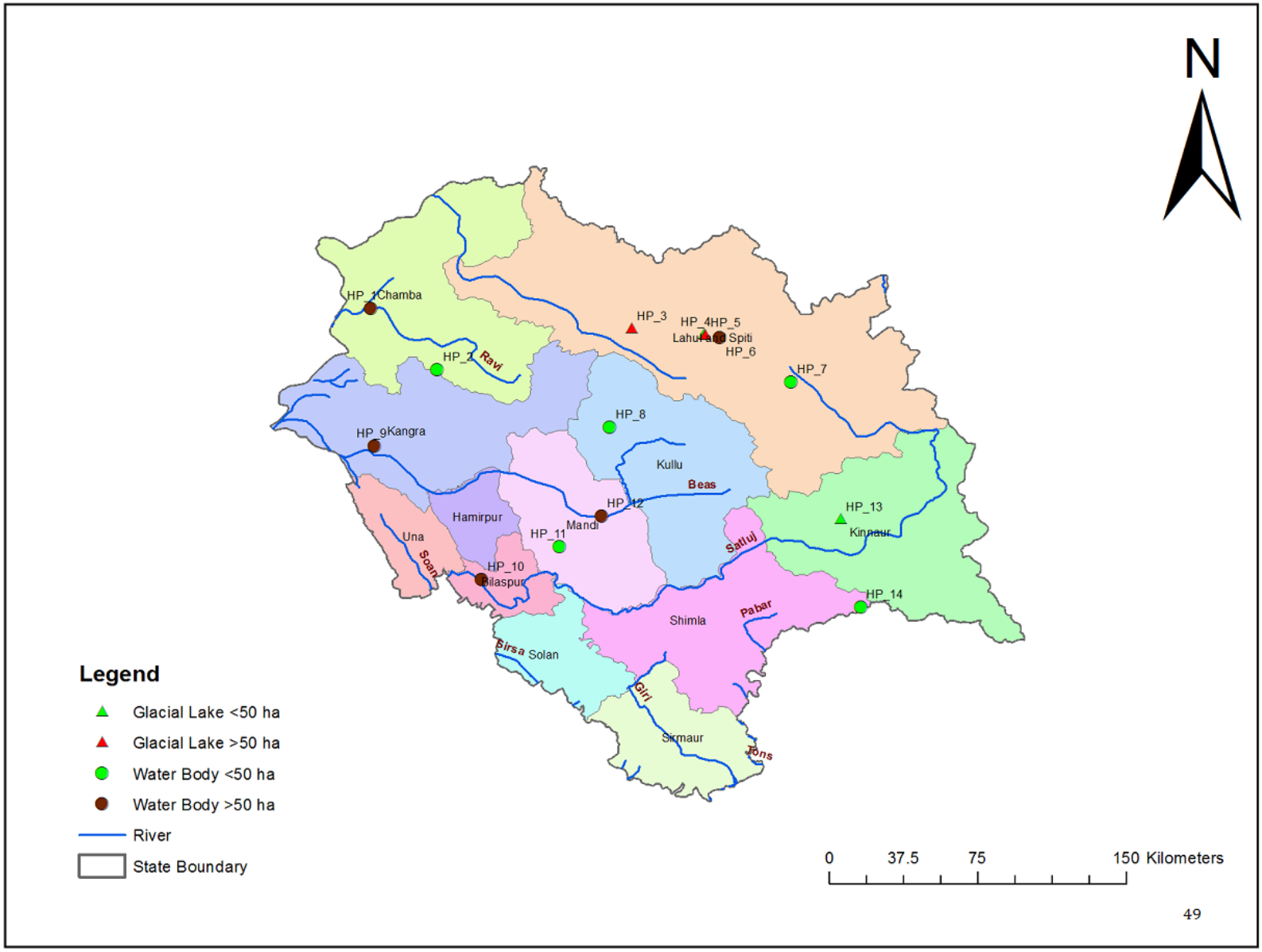



**Figure 3 (b): Glacial Lakes & Water Bodies in Himachal Pradesh**

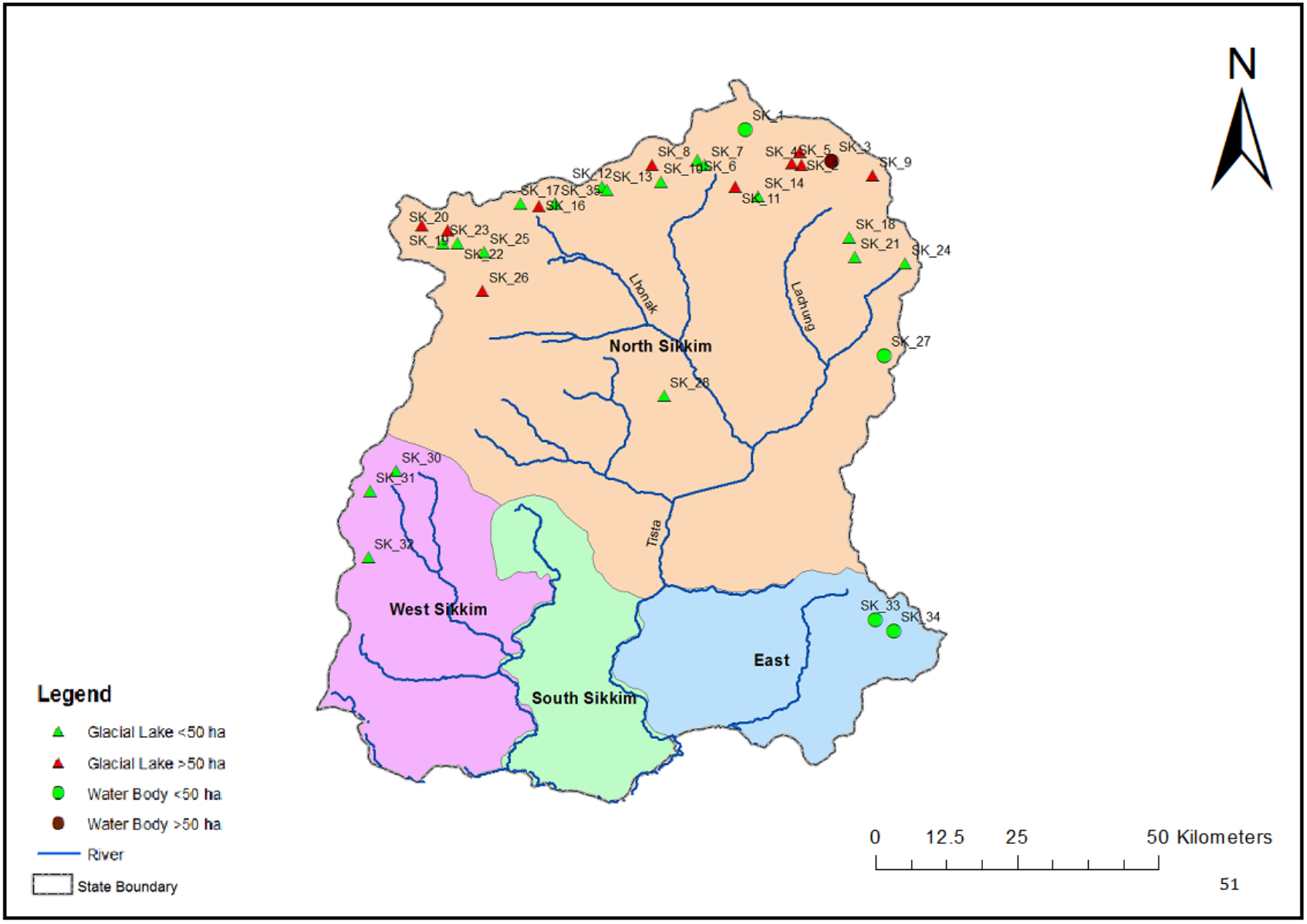



**Figure 3 (c): Glacial Lakes & Water Bodies in Sikkim**

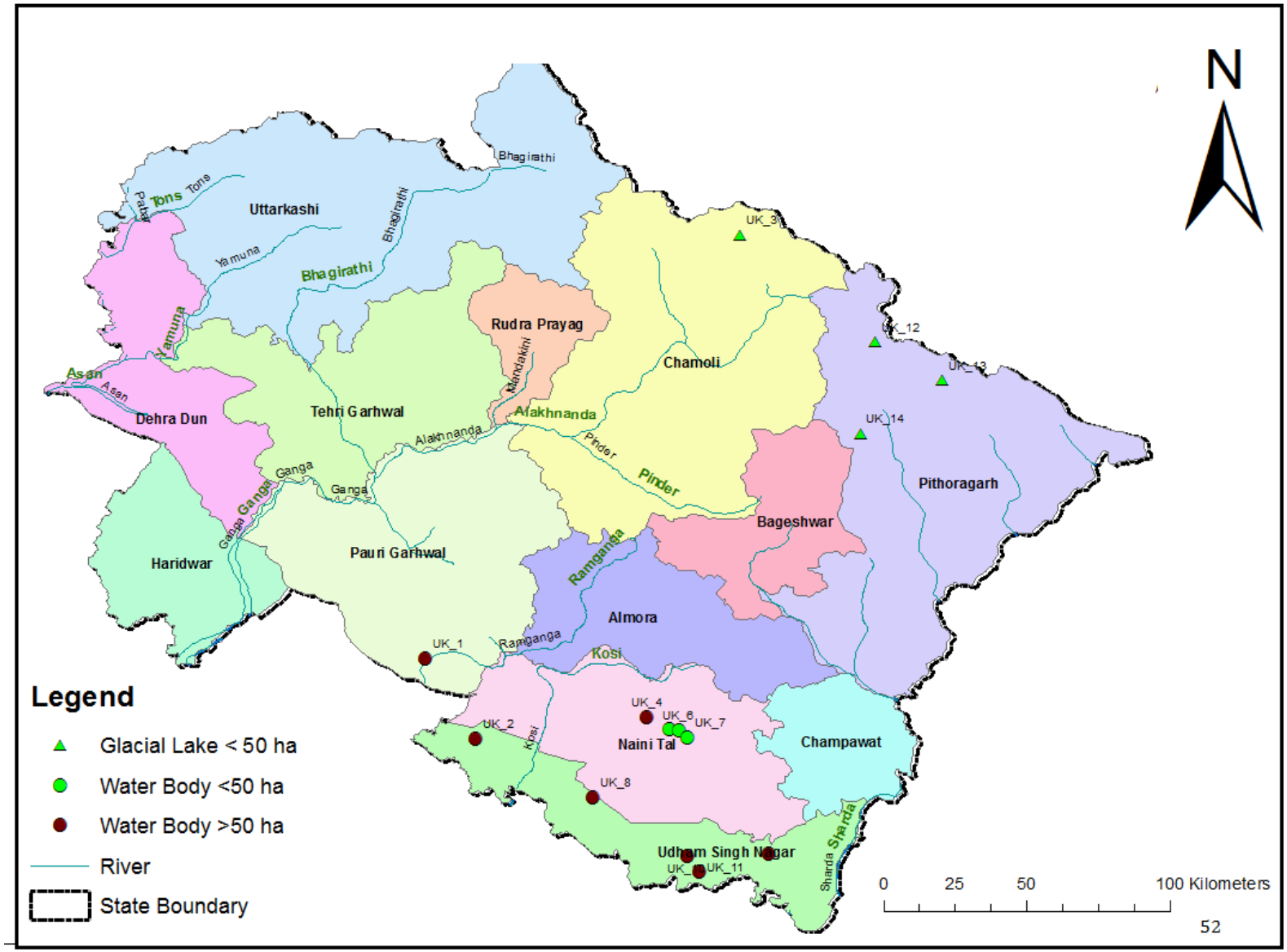



**Figure 3 (d): Glacial Lakes & Water Bodies in Uttrakhand**

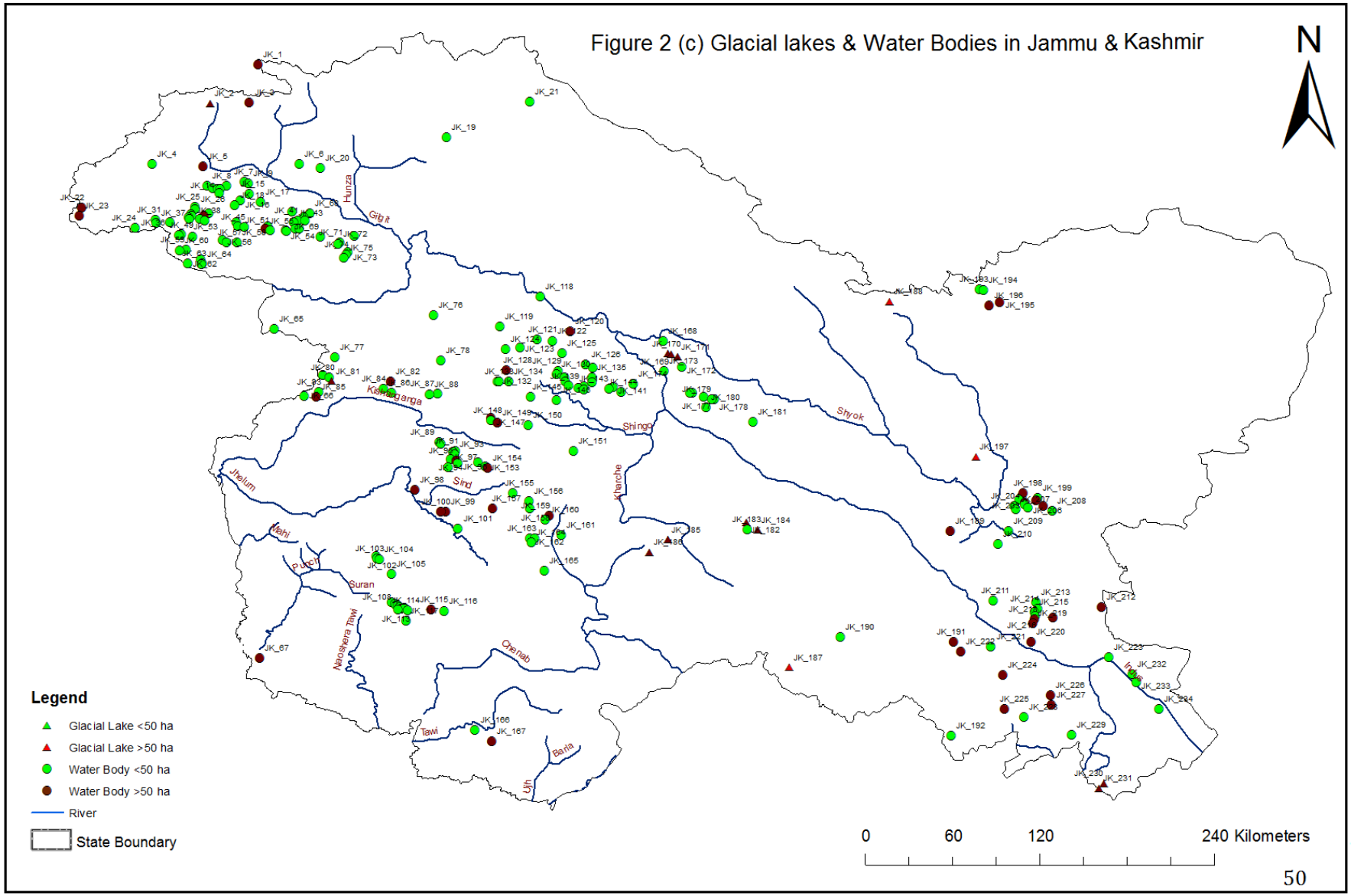
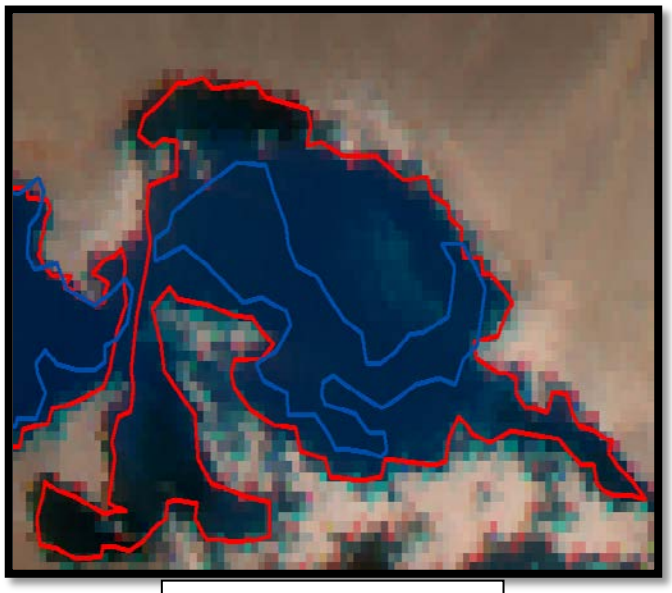
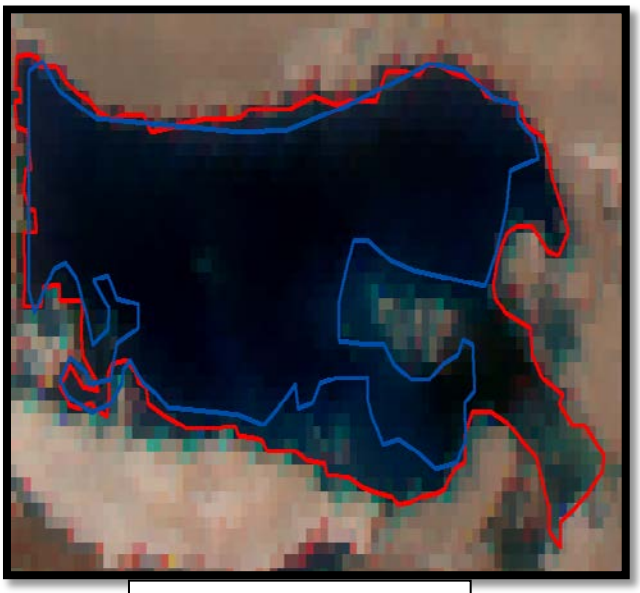



**Figure 3 (e): Glacial Lakes & Water Bodies in Jammu & Kashmir including Ladakh**

**Figure 3 (f): Satellite Imageries of GL & WB that have shown INCREASE in water spread area (> 40%)**



**UID: CH_33**



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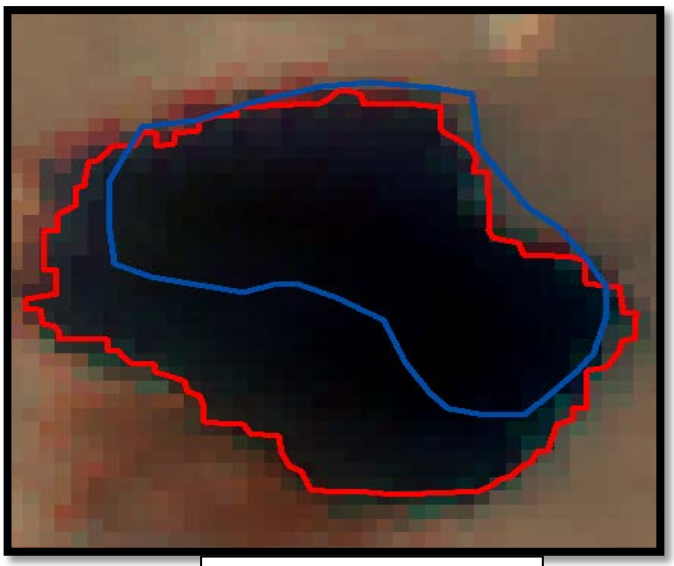

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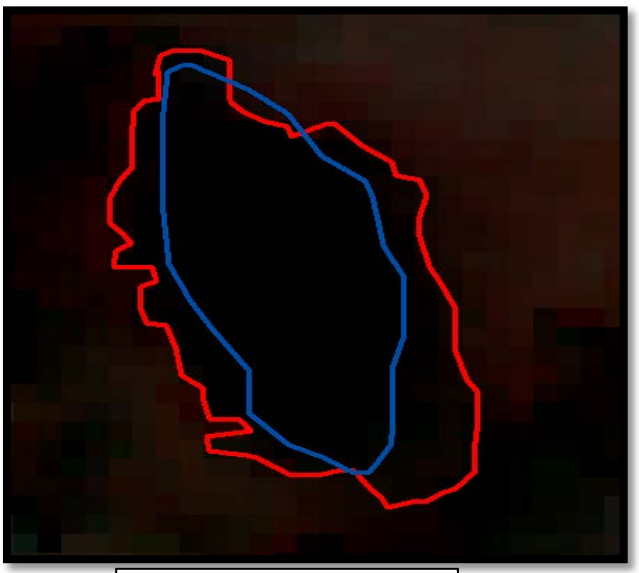

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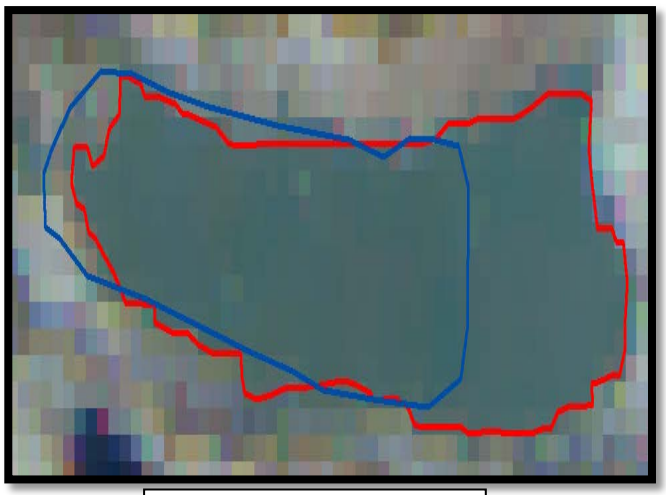

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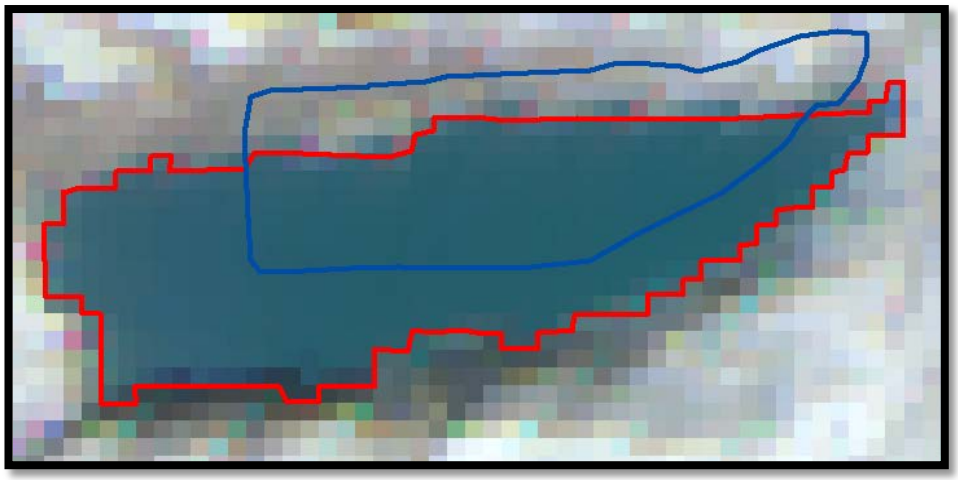

UID: SK_20

Area mapped in 2009 (Inventory)

Area mapped for the Month of October, 2021

## References


NRSC, July 2011. *Final Report of "Inventory and Monitoring of Glacial Lakes / Water Bodies in the Himalayan Region of Indian River Basins"*, Technical Report Published by National Remote Sensing Centre, Hyderabad.

NRSC, April 2012. *Report on "Monitoring of Glacial Lakes/Water Bodies in the Himalayan Region of Indian River Basins during 2011"*, Technical Report Published by National Remote Sensing Centre, Hyderabad.

NRSC, March 2013. *Report on "Monitoring of Glacial Lakes/Water Bodies in the Himalayan Region of Indian River Basins during 2012"*, Technical Report Published by National Remote Sensing Centre, Hyderabad.

NRSC, December 2013. *Report on "Monitoring of Glacial Lakes/Water Bodies in the Himalayan Region of Indian River Basins during 2013"*, Technical Report Published by National Remote Sensing Centre, Hyderabad.

NRSC, December 2014. *Report on "Monitoring of Glacial Lakes/Water Bodies in the Himalayan Region of Indian River Basins during 2014"*, Technical Report Published by National Remote Sensing Centre, Hyderabad.

NRSC, December 2015. *Report on "Monitoring of Glacial Lakes/Water Bodies in the Himalayan Region of Indian River Basins during 2015"*, Technical Report Published by National Remote Sensing Centre, Hyderabad.

CWC, February 2017. *Report on "Monitoring of Glacial Lakes/Water Bodies in the Himalayan Region of Indian River Basins for 2016"*, Technical Report Published by Climate Change & IAD Directorate, CWC, New Delhi.

CWC, March 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.