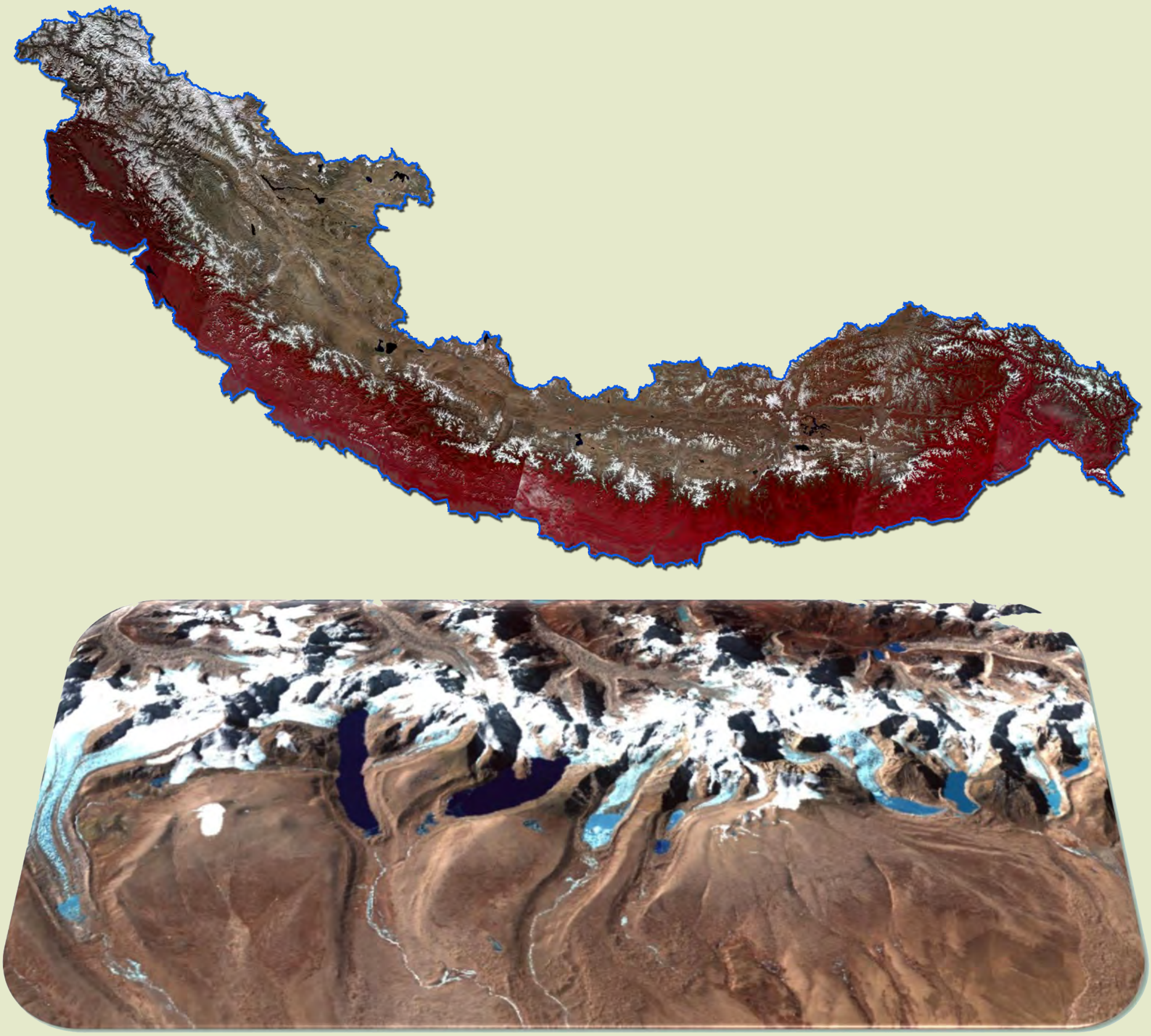
GLACIAL LAKE ATLAS

OF

INDIAN HIMALAYAN RIVER BASINS

Prepared under: National Hydrology Project



National Remote Sensing Centre
Indian Space Research Organisation
Department of Space, Government of India
Hyderabad - 500 037

March 2023

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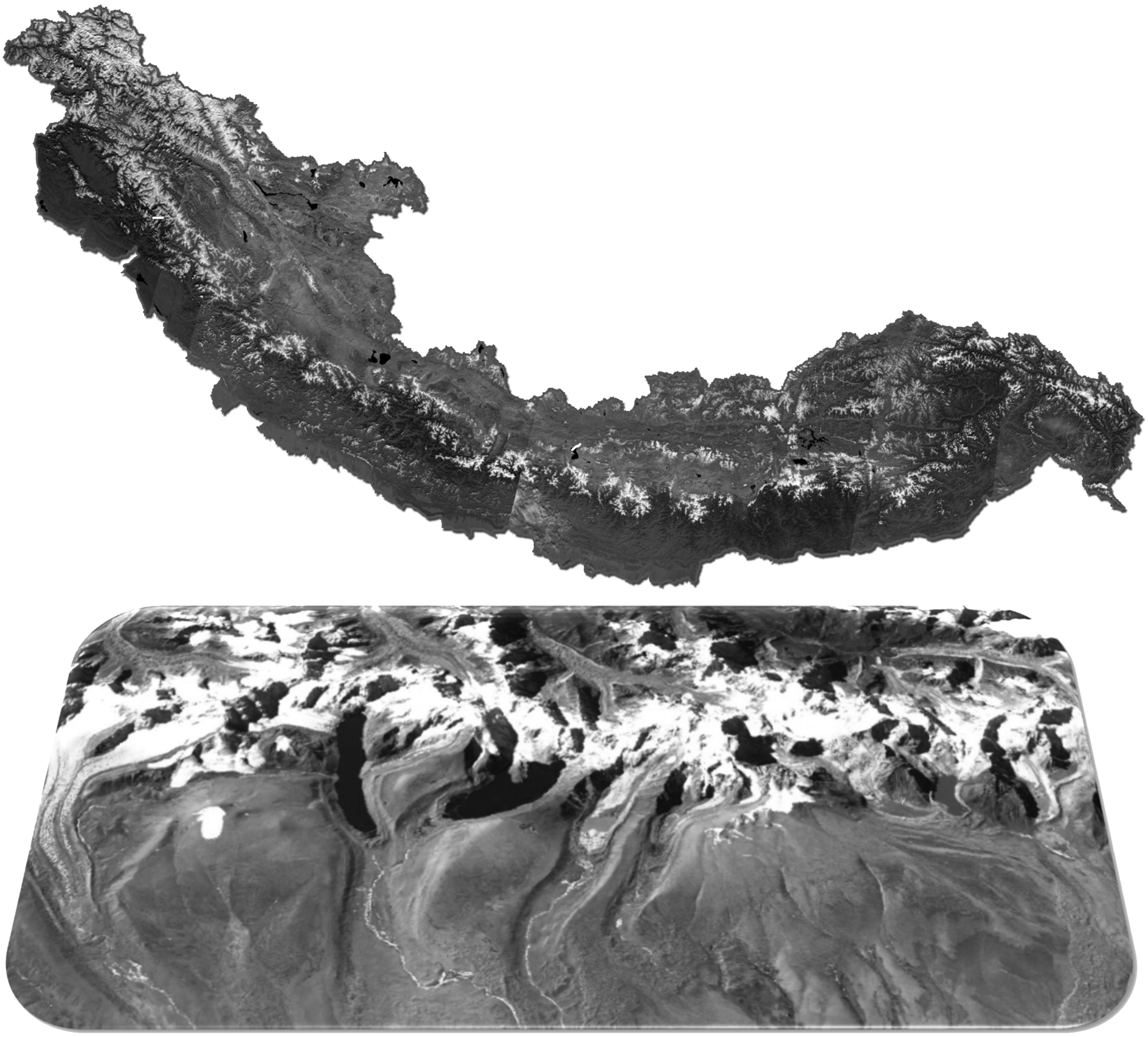

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Photos
Front cover page: Glacial Lakes of Kangpenqing (also Gang Benchhen) group of glaciers in Kosi Subbasin, located in Ganga Basin, as seen in False Colour Composite (FCC) satellite image of RS-2 LISS-IV MX, acquired on 26.11.2016
Back cover page: Shershong Glacial Lake at the snout of Glacier in Kosi Subbasin, located in Ganga Basin, as seen in FCC satellite image of RS-2 LISS-IV MX, acquired on 07.11.2016

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16	**Abstract:** This atlas provides the details of glacial lakes present in the Indian Himalayan River basins namely Indus, Ganga and Brahmaputra including their hydrological, geometrical, geographical, and topographical attributes. The satellite data used and methodology followed in delineating the lakes are also discussed. The information on glacial lake types, their areal extent and elevation variations at basin level, and administrative units like India, State, and District are provided. Glacial lake maps and respective satellite images are also presented in corresponding to 2^0 X 2^0 grids covering all three River basins. A total of 28,043 glacial lakes (≥ 0.25 ha) are mapped using Resourcesat-2 LISS-IV satellite images for the entire Indian Himalayan River Basins, with a total lake water spread area of 1,31,070.90 ha. All ten different types of glacial lakes are identified and categorised into four major classes, viz., Moraine-dammed lake, Ice-dammed lake, Glacier Erosion lake, and Other Glacial lake. Out of 10 types of glacial lakes, Other Glacial Erosion Lake type are found to be the maximum with 16,106 in number occupying a total lake extent of 61,228.37 ha in the Indian Himalayan Region. **Keywords:** Glacial Lakes, Remote Sensing, RS-2 LISS-IV, Indian Himalayan River basins, Lake Type				

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डॉ. प्रकाश चौहान / Dr. Prakash Chauhan
निदेशक / Director

MESSAGE

The Himalayan Mountain region, widely recognised as third pole, abode of huge number of glaciers, glacial lakes and vast tracts of snow cover. Rapid accumulation of water in the glacial lakes, particularly in those adjacent to receding glaciers, can lead to a sudden breach of their unstable moraine dams. The resultant extremely high peak flood discharges by sudden dam failure called Glacial Lake Outburst Flood (GLOF) have catastrophic effects on downstream of the lakes along the river stretch. Knowledge of these glacial lakes seems a critical requirement for management & mitigation of disaster risk and climate change impact assessment. Their systematic inventory & monitoring will manifest the recognisable and dynamic impacts of global warming.

Indian Earth Observation programme and its applications are focussed towards building systematic, reliable & dynamic geospatial information on various natural resources of the country including land, soil, water resources, etc. The Indian satellite remote sensing data with its multi-spectral and temporal coverage enables systematic inventory of glacial lakes in the Himalayan Region where the terrain is rugged, inaccessible and inhospitable.

The present atlas was brought out under National Hydrology Project funded by Ministry of Jal Shakti, DoWR, RD&GR, Govt. of India provides information on glacial lakes with size >0.25ha, their type characterization and describes their geospatial distribution in-terms of elevation, hydrological and administrative scales in Indian Himalayan River Basins i.e. Indus, Ganga and Brahmaputra basins. I hope that this exclusive atlas will be of immense use for technical and administrative management at state/central level supporting disaster risk reduction preparedness and climate change impact assessment.

I complement the technical team of NRSC for taking this progressive step and for bringing out this exclusive atlas on Glacial Lakes in Indian Himalayan River Basins. I am sure that the atlas will be of immense scientific use for GLOF risk management and disaster risk reduction including climate change studies.

(Prakash Chauhan)

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PREFACE

Glacial Lake Outburst Floods (GLOF) are sudden release of melt-water and sediments from glacial lakes dammed by temporary moraines or glacier ice, resulting in catastrophic floods in the downstream area, with significant socio-economic impacts. It is essential to have knowledge on location of glacial lakes, their susceptibility and the probable consequences of GLOF risk. The Earth Observation satellite data is useful in mapping & monitoring of glacial lakes, which by traditional means is difficult task due to highly rugged and inhospitable topography.

The present atlas is brought out as part of activity on Glacial Lake Outburst Flood (GLOF) Risk Assessment of Glacial Lakes in the Himalayan Region of Indian River Basins taken up under National Hydrology Project funded by Ministry of Jal Shakti, DoWR, RD&GR, Govt. of India. As part of this, detailed glacial lake inventory using high resolution satellite data from Resourcesat-2 LISS-IV MX, prioritization for Glacial Lake Outburst Flood (GLOF) risk, and simulation of GLOF for selected lakes are taken up for entire catchment of Indian Himalayan Rivers. Basin-wise Glacial lake atlases (Indus, Ganga, and Brahmaputra) were released during 2020-22 and web-hosted for visualisation and access.

The present Atlas is for entire Indian Himalayan River catchment region (both within Indian and transboundary region) and depicts glacial lakes of size greater than 0.25 ha for Basins. The details of glacial lakes are systematically documented at basin, administrative and transboundary region including lake type, area and elevation distribution.

The Atlas forms as an authentic & recent reference data and is useful in monitoring glacial lake dynamics, GLOF risk assessment and long-term climate impact analysis.

I sincerely hope that this exhaustive atlas will be of immense value to Central/State water resources, environmental & disaster Organisations and academicians/researchers in scientific and sutainable management of Himalayan Ecosystem.

(V. Venkateshwar Rao)
Associate Director, NRSC

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The Indian Himalayan River Basins Atlas is brought out under the National Hydrology Project (NHP), which is funded by the Department of Water Resources, River Development and Ganga Rejuvenation (DoWR, RD&GR), Ministry of Jal Shakti, Government of India, and the Project Team acknowledges the initiative with great sincerity. Project team expresses their gratitude to Sri Pankaj Kumar, Secretary, Ministry of Jal Shakti, under whose stewardship National Hydrology Project is contributing to the national development with specific emphasis on water sector. The project team places on record the ardent support and guidance extended by Dr.S. Somanth, Chairman, Indian Space Research Organisation (ISRO) and Secretary, Department of Space, which immensely helped in successful execution of the project activity. Special mention of thanks to Dr. Anju Gaur, Consultant, World Bank and her regular interaction and opinions with Project Team benefitted hugely in focusing the project activity and its outcomes.

The National Project Monitoring Unit (NPMU) and Technical Assistance and Management Consultancy (TAMC) of the NHP played key role in formulating the NRSC-NHP project activities and their administrative & technical support immensely facilitated smooth execution of the project, and bringing out this exclusive atlas. The project team is very thankful to Sri Rakesh Kashyap, Sr. Jt. Commissioner (SJC-1, NHP) and Sri Kushagra Sharma (SJC-2, NHP) for their unstinted support and cooperation extended towards project execution.

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PROJECT TEAM

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Abbreviations

amsl	Above Mean Sea Level
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
AWiFS	Advanced Wide Field Sensor
BCM	Billion Cubic Metre
CWC	Central Water Commission
DEM	Digital Elevation Model
DPR	Detailed Project Report
DoWR, RD&GR	Department of Water Resources, River Development and Ganga Rejuvenation
DSS	Decision Support System
E(c)	Cirque Erosion Lake
E(o)	Other Glacial Erosion Lake
E(v)	Glacier Trough Valley Erosion Lake
ETM+	Enhanced Thematic Mapper Plus
FCC	False Colour Composite
GL	Glacial Lake
GLOF	Glacial Lake Outburst Flood
GOI	Government of India
ha	Hectare
HIS	Hydrological Information System
HKH	Hindu Kush Himalayas
HP	Himachal Pradesh
I(d)	Glacier Ice-dammed Lake
I(s)	Supra-glacial Lake
ICIMOD	International Centre for Integrated Mountain Development
IHR	Indian Himalayan Region
India-WRIS	India - Water Resources Information System
IRS	Indian Remote Sensing Satellite
ISRO	Indian Space Research Organisation
Km^2	Square Kilometre
Landsat	Land Resources Satellite
LISS-III	Linear Imaging Self Scanning Sensor - III
LISS-IV	Linear Imaging Self Scanning Sensor - IV
m	Metre
M(e)	End-moraine Dammed Lake
M(l)	Lateral Moraine Dammed Lake
M(lg)	Lateral Moraine Dammed Lake (with Ice)
M(o)	Other Moraine Dammed Lake
NDGI	Normalized Difference Glacier Index
NDVI	Normalized Difference Vegetation Index
NDWI	Normalized Difference Water Index
NHP	National Hydrology Project
NIR	Near InfraRed
NRSC	National Remote Sensing Centre
NWIC	National Water Informatics Centre
O	Other Glacial Lake
RS	Remote Sensing
RS-2	Resourcesat-2
SK	Sikkim
SOI	Survey of India
TM	Thematic Mapper
UK	Uttarakhand
USGS	United States Geological Survey
WB	Water Body

SUMMARY

National Remote Sensing Centre (NRSC), Indian Space Research Organisation (ISRO), Hyderabad as one of the Implementing Agency under the National Hydrology Project (NHP), is carrying out hydrological studies using satellite data and geospatial techniques. As part of this, detailed glacial lake inventory, prioritization for Glacial Lake Outburst Flood (GLOF) risk, and simulation of GLOF for selected lakes are taken up for entire catchment of Indian Himalayan Rivers covering Indus, Ganga, and Brahmaputra River Basins. Under this activity, an updated inventory of glacial lakes using high resolution satellite data was prepared for the Indus, Ganga and Brahmaputra River basins and published in December 2020 (NRSC-RSAA-WRG-WRAD-Nov2020-TR-0001702-V1.0), June 2021 (NRSC-RSAA-WRG-WRAD-Mar2021-TR-0001818-V1.0), and July 2022 (NRSC-RSAA-WRG-WRAD-May2022-TR-0002026-V1.0) respectively, and currently an updated inventory of glacial lakes has been prepared for the Indian Himalayan River basins. The present glacial lake atlas is based on the inventoried glacial lakes in part of Indus, Ganga and Brahmaputra River basins from its origin to foothills of Himalayas covering a total catchment area of 9,89,784 Km^2.

The study portion of all the three river basins covers part of India and transboundary region. Elevation in the river basin varies from the minimum 45 m to the maximum 8,848 m above mean sea level (amsl). In India, the study area falls in four states viz., Himachal Pradesh, Uttarakhand, Sikkim and Arunachal Pradesh and 2 Union-Territories namely Jammu & Kashmir and Ladakh.

In the present study, glacial lakes with water spread area ≥ 0.25 ha have been mapped using Resourcesat-2 (RS-2) Linear Imaging Self Scanning Sensor-IV (LISS-IV) satellite data using visual interpretation techniques. Based on its process of lake formation, location, and type of damming material, glacial lakes are identified in all ten different types, majorly grouped into four categories viz., Moraine-dammed, Ice-dammed, Glacier Erosion, and Other glacial lakes.

A total of 28,043 glacial lakes have been mapped in the Indian Himalayan River basins using a total of 397 high resolution multispectral RS-2 LISS-IV images, with a total lake water spread area of 1,31,070.90 ha. Each glacial lake has been given a 12 alpha-numeric unique glacial lake ID, along with several attributes that include hydrological, geometrical, geographical, and topographical characteristics. About 23,167 (82.61%) lakes are with < 5 ha lake area contributing to 23.72% of total lake area. The remaining lakes with > 5 ha in size are 4,876 (17.39%) contributing to 76.28% of total lake area in the Indian Himalayan River Basins. There are only 299 glacial lakes in the Indian Himalayan River basins having an area of greater than 50 ha. Other Glacial Erosion Lake type are found to be the maximum with 16,106 (57.43%) occupying a total lake extent of 61,228.37 ha at 46.71% in the basin. Majority (i.e. 93.08%) of the lakes are situated above the high altitude range of greater than 4,000 m amsl and dominated by Other Glacial Erosion lake type i.e., 57.32%.

Glacial lakes are predominantly distributed in Brahmaputra basin (64.19%) followed by Indus basin (19.02%) and Ganga basin (16.78%), with a total lake extent of 92,990.74 ha, 17,395.03 ha and 20,685.13 ha at 70.95%, 13.27% and 15.78% respectively in the entire basins. In terms of very large size lakes i.e. ≥ 50 ha, Brahmaputra basin has majority i.e. 207 out of 299 large lakes within it. Other Glacial Erosion lakes, which are dominant lake type in Indian Himalayan River basins are distributed in all basins, and found maximum in count in Brahmaputra basin (73.55%) and minimum in Ganga basin (10.83%). However, Glacier Ice-dammed lakes are only five in

the entire Indian Himalayan River basins and is located two each in Brahmaputra & Indus and one in Ganga basin. Indus basin consists of higher number of Supra-Glacial Lakes in the entire Indian Himalayan River basins, whereas Brahmaputra basin contains highest number of Other Moraine Dammed lakes.

A total of 7,570 (i.e. 26.99%) glacial lakes lies within Indian region covering 23.00% of the total lake area, whereas remaining 73.01% of lakes are located in transboundary region with a 77.00% of the total lake area. In Indian region, majority of glacial lakes are of Other Glacial Erosion Lake type (56.64%), followed by Other Moraine Dammed lakes (12.85%). Arunachal Pradesh, Sikkim, Himachal Pradesh, and Uttarakhand share 28.90%, 9.68%, 7.09%, and 4.58% of lake count with a total area of 41.43%, 10.84%, 3.26%, and 1.86% respectively. A total of 24 (i.e., 41.38%) glacial lakes with lake area > 50 ha are situated in the Union-Territories of Jammu & Kashmir and Ladakh. Sikkim state has 288 (20.67%) number of glacial lakes lying above 5,000 m elevation.

In this atlas, map sheets (plates) are prepared on the basis of 2° X 2° grids which are 42 in number covering the entire Indian Himalayan River basins. Out of 42 plates, only 39 plates have glacial lakes and corresponding plates are incorporated in atlas. The map sheets are arranged in such a way that glacial lake map is on the right page and its corresponding satellite image is on the left page. At the end of the atlas, an annexure is provided containing list of glacial lakes of size ≥ 10 ha inventoried in the Indian Himalayan River basins with their unique glacial lake ID, latitude, longitude, subbasin, glacial lake type, area (ha), and elevation (m). Glacial Lake ID number of 12 alpha-numeric character has 3 characters bold with dark red colour depicting the corresponding toposheet number of the SOI of 1:250,000 scale.

1. INTRODUCTION

1.1 About Project

The National Hydrology Project (NHP) sponsored by Department of Water Resources, River Development and Ganga Rejuvenation (DoWR, RD&GR), Ministry of Jal Shakti, Government of India (GOI) with financial aid from the World Bank. The objective of the project is to improve the extent and accessibility of water resources information and strengthen institutional capacity to enable improved water resources planning and management across India. The mission is to establish an effective and sound hydrologic database and Hydrological Information System (HIS), together with the development of consistent and scientifically based tools and design aids, to assist in the effective water resources planning and management of the implementing agencies.

NHP is intended for setting up of a system for timely and reliable water resources data acquisition, storage, collation and management. It will also provide tools/systems for informed decision making through Decision Support Systems (DSS) for water resources assessment, flood management, reservoir operations, drought management, etc. NHP also seeks to build capacity of the State and Central sector organisations in water resources management through the use of Information Systems and adoption of State-of-the-art technologies like Remote Sensing. NHP will improve and expand hydrology data and information systems, strengthen water resources operation and planning systems, and enhance institutional capacity for water resources management. NHP will contribute to the GOI Digital India initiative by integrating water resources information across State and Central agencies.

National Remote Sensing Centre (NRSC), as one of the Implementing Agency under NHP, is engaged with generation of geo-spatial products & services pertaining to water resources sector, generation of high-resolution Digital Elevation Models (DEM), development of flood early warning systems, decision support system development for irrigation water management, modelling & dissemination of hydrological products to support water resources management and capacity building to NHP stakeholders. The satellite data based geo-spatial products & services, mainly encompassing the following:

- Satellite Data/Geo-Spatial Data Hosting & Services through Bhuvan Web Portal
- Water Resources Information Products & Services (Satellite/Model derived – Bhuvan/India- Water Resources Information System (India-WRIS)/National Water Informatics Centre (NWIC))
- Customized Applications Development (Flood Forecasting, Irrigation Water Management)
- Hydro-conditioned Digital Elevation Model (Satellite & Aerial)
- Capacity Building (Customized Training & Hand Holding)

As part of various NHP technical studies carried out, NRSC has taken up “Glacial Lake Outburst Flood (GLOF) Risk Assessment of Glacial Lakes in the Himalayan Region of Indian River Basins”. In this activity, it was proposed to prepare an updated inventory of glacial lakes, prioritization and selection of critical glacial lakes based on certain characteristics (such as glacial lake, glacier, topography and others), GLOF modelling and flood inundation simulation for selected few lakes using high resolution Digital Elevation Model (DEM) for downstream of the lakes along their river reach, and to assess GLOF risk.

As a result of initial outcome of this activity, an updated inventory of glacial lakes in Indus, Ganga and Brahmaputra

River basins was generated using multispectral (MX) high resolution satellite data of Resourcesat-2 (RS-2) Linear Imaging Self Scanning Sensor-IV (LISS-IV) for mapping lakes with size ≥ 0.25 ha. The geo-spatial database of glacial lakes has been used to publish "Glacial Lake Atlas of Indus River Basin" (NRSC-RSAA-WRG-WRAD-Nov2020-TR-0001702-V1.0), "Glacial Lake Atlas of Ganga River Basin" (NRSC-RSAA-WRG-WRAD-Mar2021-TR-0001818-V1.0), "Glacial Lake Atlas of Brahmaputra River Basin" (NRSC-RSAA-WRG-WRAD-May2022-TR-0002026-V1.0), and presently the atlas of "Glacial Lake Atlas of Indian Himalayan River Basins".

1.2 Glacial Lakes

Indian Himalayan Region (IHR) contains the world's largest number of glaciers and snow outside the Polar Regions and are aptly called third pole of the world. Many studies undertaken globally showed that glaciers around the world have been retreating since the industrial revolution, which began around eighteenth century. As the glaciers are thinning and retreating, resulting in associated glacier melt water lakes are expanding in size and new lakes continue to be formed. The lakes receiving melt water from glaciers are generally known as glacial lakes. A glacial lake is defined as water mass existing in a sufficient amount and extending with a free surface in, under, besides, and/or in front of a glacier and originating from glacier activities and/or retreating processes of a glacier. As glaciers retreat, the formation of glacial lakes takes place behind moraine or ice 'dam'. These damming materials are generally weak and can breach suddenly due to various triggering factors, leading to catastrophic floods. Such outburst floods are known as GLOF. GLOFs are characterized by extreme peak discharges, with an exceptional erosion/transport potential; therefore, they can turn into flow-type movements (Emmer, 2017). Failure of such lake happens due to many factors which include erosion process, increase in water pressure, merging of an avalanche/rock into lake, nature of the damming materials etc., and this may lead to a GLOF event which could be highly disastrous in nature and create long-term degradation in the valleys, both physically and socio-economically (Mool et al., 2001b). Accordingly, Emmer et al., (2016) showed an annual nonlinear increase in the number of scientific publications focusing on GLOFs recently. Hence, monitoring of glacier associated lakes is very useful in the IHR to identify critical glacial lakes, for which a detailed inventory of glacial lakes and its type is required. According to their position relative to the glacier and damming mechanism, these glacial lakes can be classified into several types (Panda et al., 2014).

Inventorying glacial lakes located in these remote mountain areas with rugged terrain and inclement weather by traditional means is very tedious and difficult, hence Remote Sensing (RS) data plays a greater role in generating information on glacial lakes (Kulkarni, 1991; Berither et al., 2007; Wagnon et al., 2007; Raj, 2010; Cogley et al., 2011; Pratap et al., 2016; Gupta et al., 2019, Guru et al., 2019). Satellites with high spatial, spectral and temporal resolution sensors are useful in deriving lake information with better accuracy and repeatedly.

1.3 Previous Studies

Several studies have been taken up in the past to assess the glacial lake distribution in the Hindu Kush Himalayas (HKH), covering parts of eight countries viz., Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan, and lies within five river basins of Amu Darya, Indus, Ganga, Brahmaputra, and Irrawaddy (Komori, 2007; Gardelle et al., 2011; Wang et al., 2011; Wang et al., 2012; Nie et al., 2013; Raj et al., 2013; Wang et al., 2013; Worni et al., 2013; Che et al., 2014; Bambari et al., 2015; Zhang et al., 2015; Nie et al., 2017; Rounce et al., 2017; Nagai et al., 2017; Gupta et al., 2019; Guru et al., 2019; Shugar et al., 2020). But only few glacial lake inventories are available in public domain, amongst which the first inventory was prepared by the

International Centre for Integrated Mountain Development (ICIMOD), Nepal, for the entire HKH region (covering the entire IHR within it), using satellite data of the Land Observation Satellite (Landsat) Thematic Mapper (TM) of the United States Geological Survey (USGS) and the Indian Remote Sensing satellite (IRS-1D) Linear Imaging and Self-scanning Sensor-III (LISS-III) during 1999-2005, along with topographic maps published between the 1950s and 1982 (Mool et al., 2001a; Mool et al., 2001b; Mool et al., 2003; Bhagat et al., 2004; Roohi et al., 2005; Sah et al., 2005; Wu et al., 2005, Ives et al., 2010). This inventory has been revised in 2018 using Landsat TM and Enhanced Thematic Mapper Plus (ETM+) data of years 2004-07 ± 3 (Maharjan et al., 2018). Both glacial lake inventories prepared by the ICIMOD, have mapped lakes with size > 0.3 ha. Second inventory of glacial lakes and water bodies in the IHR (within India only) was carried out by the NRSC, Hyderabad in collaboration with the Central Water Commission (CWC), New Delhi. Glacial lakes and water bodies located in all three major basins of Indus, Ganga, and Brahmaputra, of size > 10 ha were mapped using Indian Remote Sensing (IRS) Advanced Wide Field Sensor (AWiFS) data for the year 2009 (Hakeem et al., 2011). Subsequently, monthly monitoring of these lakes (> 50 ha) was carried out using satellite data for the months of June to October during the years 2011 to 2015. Third latest glacial lake inventory is prepared by the Space Application Centre (SAC), Ahmedabad i.e. "National Wetland Atlas: High Altitude Lakes of India", using IRS-P6 LISS-III, comprising high altitude lake information of the IHR, within Indian administrative region only (Panigrahy et al., 2012). In this atlas, wetlands of size > 2.25 ha were mapped as polygons and less than that were mapped as a points, using satellite data for the period of 2006-08.

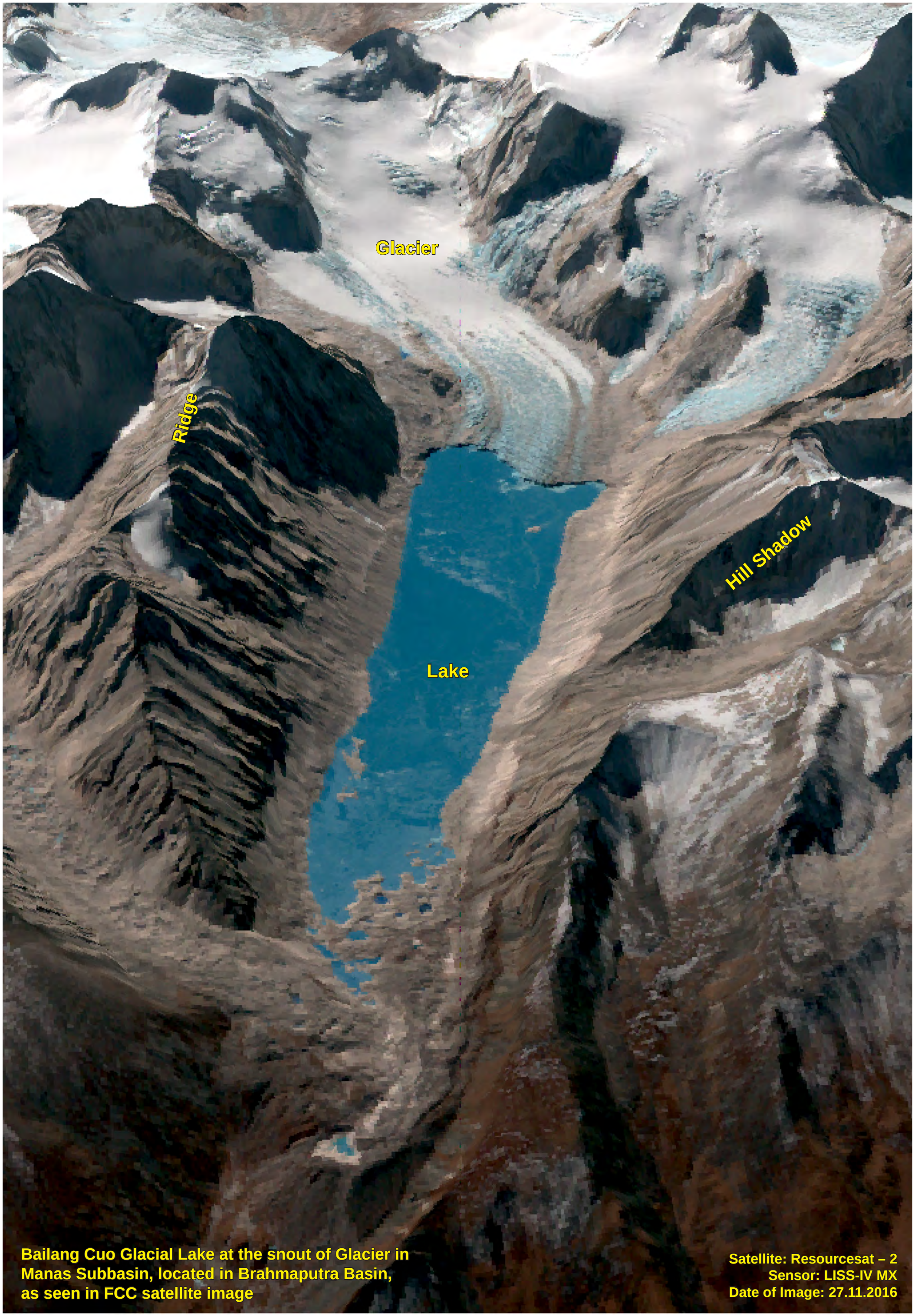
1.4 Highlights of the Atlas

The highlights of the present atlas:

- The present atlas is depicting spatial distribution of glacial lakes of size ≥ 0.25 ha in Indian Himalayan River basins mapped using high resolution satellite data
- The atlas provides the details of all the glacial lakes in entire catchment of Indian Himalayan River basins, both within Indian and transboundary region
- The atlas contains details of area range-wise glacial lakes along with all 10 categories of types. Further, the atlas presents the distribution of glacial lakes in terms of area vs. type, elevation, area vs. elevation and type vs. elevation, at basin, administrative and transboundary regions
- The atlas also provides comprehensive list of all glacial lakes with unique ID considering hydrological, geometrical, geographical, topographical attribute information

The expected utility of the atlas:

- The atlas provides a comprehensive & systematic glacial lake database for Indian Himalayan River basins with size ≥ 0.25 ha
- In the context of climate change impact analysis, the atlas can be used as reference data for carrying out change analysis, both with respect to historical and future time periods
- The atlas also provides authentic database for regular or periodic monitoring changes in spatial extent (expansion/shrinkage), and formation of new lakes
- The atlas can also be used in conjunction with glacier information for their retreat and climate impact studies
- The information on glacial lakes like their type, hydrological, topographical, and associated glaciers are useful in identifying the potential critical glacial lakes and consequent GLOF risk
- Central and State Disaster Management Authorities can make use of the atlas for disaster mitigation planning and related programs
- The glacial lake database can be used in Detailed Project Report (DPR) preparation for new hydropower / multi-purpose projects.



Bailang Cuo Glacial Lake at the snout of Glacier in Manas Subbasin, located in Brahmaputra Basin, as seen in FCC satellite image

Satellite: Resourcesat – 2
Sensor: LISS-IV MX
Date of Image: 27.11.2016

2. STUDY AREA

2.1 Overview

The IHR consists of three major river systems of Indus, Ganga, and Brahmaputra stretches over five countries viz., India, China, Nepal, Pakistan and Bhutan, and on the basis of physiography it has been divided into four mountain regions viz., Eastern Himalayas, Central Himalayas, Western Himalayas, and the Karakoram Mountain range. The Indian Himalayan River Basins cover a total drainage area of 9,89,784 Sq.Km. In India it has a share of about 38.78% which is 3,83,880 Sq.Km cutting across the states of Arunachal Pradesh, Assam, Himachal Pradesh, Uttarakhand, West Bengal, Meghalaya, Nagaland and Sikkim and union territories of Jammu & Kashmir, and Ladakh. Figure 1 shows the origin of the Ganga, and the Brahmaputra river of the Indian Himalayan River Basins.

Brahmaputra Basin

Topographically River Brahmaputra is unique in terms of its diverse environment as it has cold plateau in Tibet, rainy Himalayan region, alluvial lands of Assam and the large deltaic plains of Bangladesh. The Brahmaputra River also known as Yarlung Tsangpo (in Tibet) originates in the glacier mass from the Kailash ranges of Himalayas at an altitude of 5,150 m south of the lake 'Konggyu Tsho'. The higher elevation zones in the basin causes snow fall mostly over the northern region. The river flows through a length of 2,900 Km out of which 916 Km in the Indian Territory and joins finally in the Bay of Bengal. The catchment area receives number of tributaries at its north and south banks especially in Indian region. The catchment receives heavy rainfall with significant spatial variability. The land use/cover of the basin consist extensive forest cover, plantations, crop fields and swampy water lands, the northern part of the basin (outside India) covers mostly snow. There are number of hydraulic structures constructed across the tributaries in terms of weirs, barrages for the purpose of Irrigation and Dams for the hydro power utilization. The Brahmaputra River basin from its origin to foothills of Himalayas with a catchment area of 3,99,833 Sq.Km which extends from latitude 26.70° N to 32.70° N and from longitude 82.00° E to 97.77° E.

Ganga Basin

The Ganga River basin is unique in the sense that it contains 9 of the 14 highest peaks in the world over 8,000 m in height, including Mt. Everest which is the high peak of Ganga River basin. The other peaks over 8,000 m in the basin are Kanchenjunga, Lhotse, Makalu, Cho Oyu, Dhaulagiri, Manaslu, Annapurna, and Shishapangma. The Ganga River basin extends over Central Himalayas in India, Nepal, Tibet (China), and Bangladesh.

The Ganga River originates as the Bhagirathi from the Gangotri group of glaciers in the Himalayas at an elevation of about 7,010 m amsl, in the Uttarkashi district of Uttarakhand, which has been joined by the Alaknanda at Devprayag, and the combined stream assumes the name 'Ganga'. River flows through the highly terrain mountain region and debouches into the plains at Sukhi (near Rishikesh). It is joined by a large number of tributaries on both the banks in the course of its total run of about 2,525 km before its outfall into the Bay of Bengal. The delta of the Ganga River is said to begin at the Farakka barrage in West Bengal, where the river divides into two arms namely the Padma which flows to Bangladesh and the Ganga which flows through West Bengal. Ganga River basin from its origin to the foothills of Himalayas with a catchment area of 2,47,110 Km^2 which extends from latitude 26.35° N to 31.46° N and from longitude 77.05° E to 88.95° E.

Indus Basin

The Indus River basin is unique in the sense that it contains seven of the world's highest peaks after Mt. Everest, among these are K2 (8,557 m), Nanga Parbat (8,100 m) and Rakaposhi (7,800 m). The Indus basin extends over Western Himalayas and Karakoram Mountain range in India, China, and Nepal.

Indus River originates from Bokhar Chu (glacier) in northern slopes of Mt. Kailash (6,714 m) from the Tibet Autonomous Region of China (Husain, 2012; CWC, 2019). The Indus River follows a long and straight course in Ladakh region (flowing in northwest direction in India), running between the Ladakh and the Zaskar ranges. The gradient of the river is also gentle here. It forms a spectacular gorge near Gilgit (at Bunzi, north of Nanga Parbat Glacier) in Jammu & Kashmir. Downstream, the river passes by the Nanga Parbat Glacier, crossing the Himalayas, it turns into south-west and enters Pakistan near Chillar in the Dardistan region. Finally, the Indus River drains into the Arabian Sea near the port city of Karachi, Pakistan after forming a huge delta. It has a total length of 2,880 Km, of which 709 Km lies in India. The Indus River basin from its origin to foothills of Himalayas has a catchment area of 3,42,841 Km^2 which extends from latitude 30.32° N to 37.09° N and from longitude 72.50° E to 82.45° E.

Figure 1: The confluence of Bhagirathi with Alaknanda at Devprayag (left) and The Brahmaputra River in Tibet (right) (Source: Left image – Wikipedia, 01.03.2010; Right image – sandrp.in)

2.2 Hydrological Divide

Brahmaputra Basin

The entire Brahmaputra River basin is sub divided into three reaches namely upper, middle and lower. In the upper reach the river is fed by glaciers. In the lower and middle reaches, it is joined by number of tributaries. The principal tributaries of the Brahmaputra River joining from right are the Lohit, the Dibang, the Subansiri, the Jiabharali, the Dhansiri, the Manas, the Torsa, the Sankosh and the Teesta whereas the Burhidihing, the Desang, the Dikhow, the Dhansiri and the Kopili joins it from left.

Ganga Basin

Major rivers flowing in the Ganga River basin is Yamuna, joining the main river on the right, whereas rivers like Sarda, Ghaghara, Gandak, and Kosi joining on the left.

Indus Basin

Major rivers flowing in the Indus River basin are Satluj, Beas, Ravi, Chenab, Jhelum, and Zaskar joining the main river on the left, whereas rivers like Sengee Tsangpo, Shyok, and Gilgit joining on the right.

Figure 2 shows the location of the study area with Resourcesat-2 (RS-2) Linear Imaging Self Scanner (LISS-IV) satellite images. Table 1 shows the catchment area of each of the above basins.

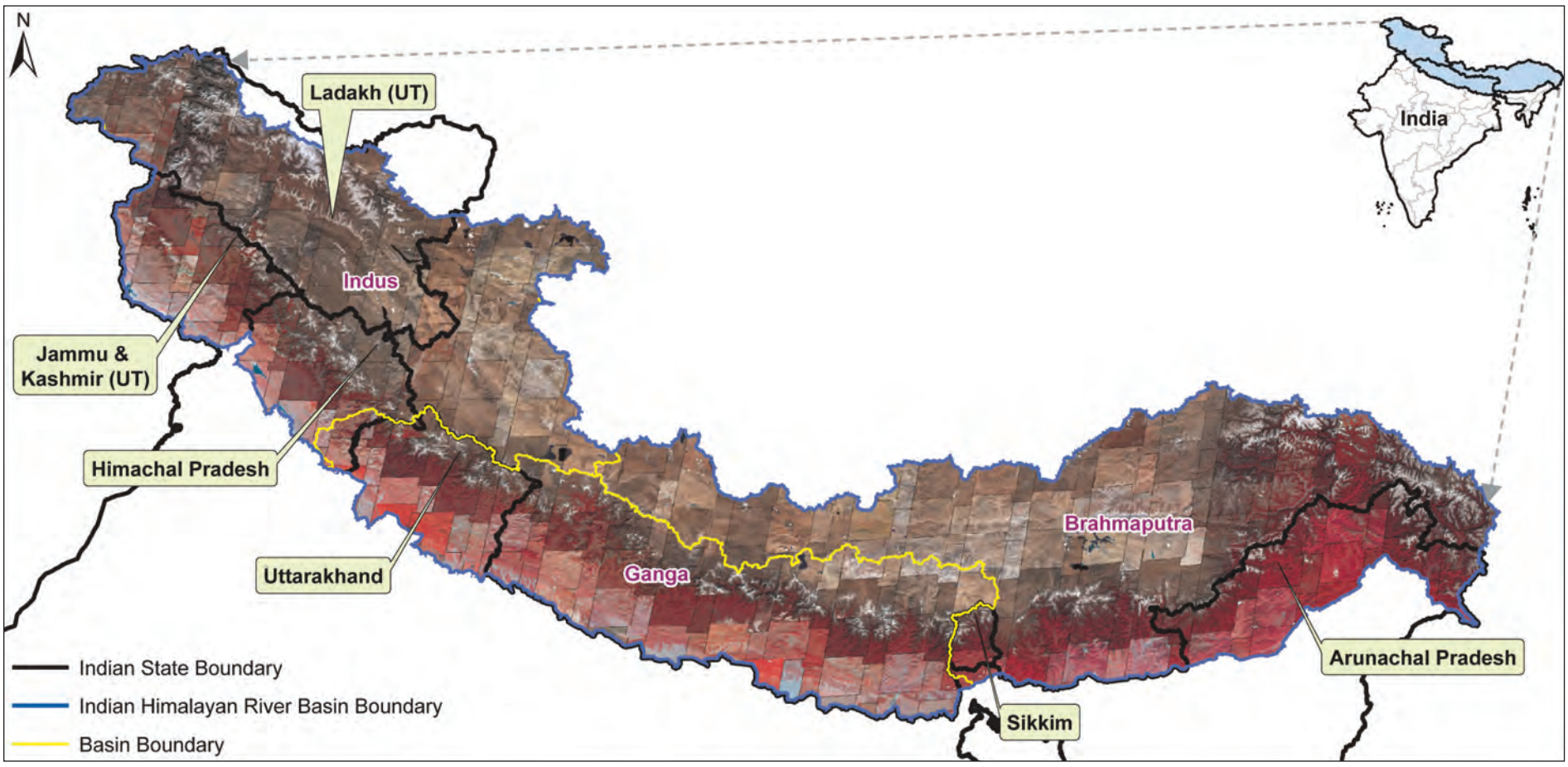


Figure 2: Location of Indian Himalayan River basins showing RS-2 LISS-IV images

Table 1: Basin Details of Indian Himalayan River Basins

S. No.	Basin	Area (Km²)	Area (%)
1	Brahmaputra	3,99,833	40.40
2	Ganga	2,47,110	24.96
3	Indus	3,42,841	34.64
Total		**9,89,784**	**100.00**

2.3 Hydrology

Brahmaputra Basin

The Upper reach of the River Brahmaputra flows through 1,625 Km from the source of origination point to the Indo-China border through Tibetan plateau and enters India at Kobo, Arunachal Pradesh, Upper reach of the river is mostly fed by snow and glaciers. In the middle reach between India and Bangladesh border it flows through a length of 916 Km where it has numerous riverine islands because of its low gradient. The entire lower reach falls within the Bangladesh flows about a length of 337 Km and drains into Bay of Bengal. The river flows are at low in winter season, gradually increases in summer season (due to melting of snow and glaciers in upper reaches) and reaches peak in monsoon season. The average water resources potential (In India) of the basin is 537.24 BCM out of which utilizable surface water resource is 24 BCM (Brahmaputra Basin Report, 2014).

Ganga Basin

All the principal tributaries of the Ganga River system are fed by snow and glaciers in the upper parts of their mountainous catchments. The snow accumulation in their upper catchments usually starts from October to March months reaching peak in January/February. The river flows are at minimum during the winter months of December to March. When snow and glaciers start melting during summer months of April to June, river flows gradually increase and accelerated further by rainy season of July to September. The Ganga River basin carries average annual water potential of about 525 Billion Cubic Metre (BCM), of which total utilizable surface water resource in the basin is 250 BCM. The Ghaghara, Kosi, and Gandak combined carry almost half, and the Yamuna, Ramganga, and other major and minor tributaries combined constitute the remainder of the total supply of the system (Ganga Basin Report, 2014).

Indus Basin

All the principal tributaries of the Indus River system are fed by snow and glaciers in the upper parts of their mountainous catchments. The snow accumulation in their upper catchments usually starts from October to March months reaching peak in January/February. The river flows are at minimum during the winter months of December to March. When snow and glaciers start melting during summer months of April to June, river flows gradually increase and accelerated further by rainy season of July to September. Annually, the upper Indus carries about 110 Billion Cubic Metre (BCM) slightly less than half the total supply of water in the Indus River system. The Jhelum and Chenab combined carry roughly one-fourth, and the Ravi, Beas, and Satluj combined constitute the remainder of the total supply of the system.

2.4 Topography

Brahmaputra Basin

The Brahmaputra basin mainly resides in the middle and eastern Himalayan region, which is also known as one of the main topographic divisions of the Indian subcontinent. The Himalayas comprises the Himalayan ranges including their numerous snow peaks and each of these peaks is surrounded by snow fields and glaciers. The elevation ranges between 450 m and 8,352 m amsl, where glaciers and glacial lakes are mostly distributed in the higher altitude region. The mean elevation of the study area is about 4,048 m amsl.

Ganga Basin

The Ganga basin mainly resides in the Central Himalayan region, which is also known as one of the main topographic divisions of the Indian subcontinent (Ganga Basin Report, 2014). The Central Himalayas comprises the Himalayan ranges including their numerous snow peaks rising above 7,000 m and each of these peaks is surrounded by snow fields and glaciers. All the tributaries are characterized by well regulated flows and assured supply of water throughout the year by these glaciers. The elevation ranges between 45 m and 8,848 m amsl, where glaciers and glacial lakes are mostly distributed in the higher altitude region. The mean elevation of the study area is 4,374 m amsl. Slope in the Ganga basin varies up to a maximum of 86.60°, while the mean slope in the Ganga River basin is 22.31°.

Indus Basin

The elevation of the Indus basin ranges between 153 m and 8,557 m above mean sea level (amsl), where glaciers and glacial lakes are mostly distributed in the higher altitude region. The mean elevation of the study area is 4,355 m amsl. The transverse glaciers present in the basin at different locations and occasional landslides may also dam the river resulting in formation of temporary lakes. Downwards, the Indus crosses the Central Himalayan Range through a huge synclinal gorge. The Indus makes several deep gorges, amongst which the deepest of all is at Gilgit, which is 5,200 m in height amsl. Slope in the entire study area varies up to a maximum of 87.76°, while the mean slope in the Indus River basin is 22.23°.

Hypsometric curve shown in figure 3 depicts the proportion of land area that exists at various elevations by plotting relative area against relative height for the Indian Himalayan River basins.

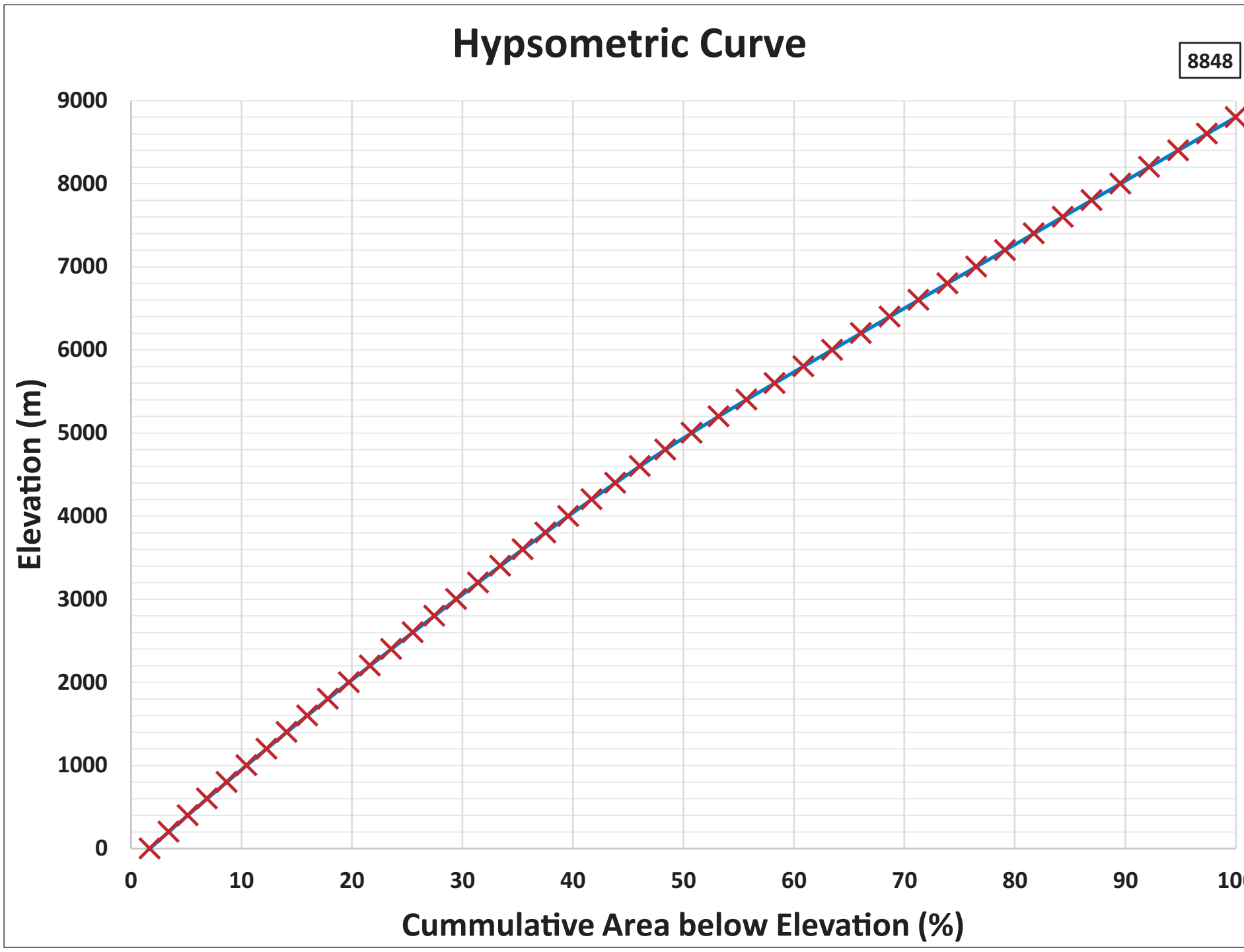


Figure 3: Hypsometric curve of the Indian Himalayan River basins

2.5 Climate

Brahmaputra Basin

The climate of the Brahmaputra River basin varies from the harsh cold, and dry conditions found in Tibet to the generally hot and humid conditions prevailing in Assam state. Tibetan winters are severely cold, with average

temperatures below 0°C, while summers are mild and sunny. The upper river valley lies in the rain shadow of the Himalayas, and precipitation there is relatively light (Lhasa receives about 400 mm annually). Climate over the Brahmaputra River basin mainly comprises of four seasons in a year namely winter, summer, and monsoon and post monsoon. The winter season begins in December and continues to the end of February. From March onwards, the hot weather starts and continues up to the last week of May. The monsoon begins in the last week of May or in early June and the basin receives heavy rainfall spatially distributed over the basin.

Ganga Basin

Climate over the Ganga River basin is mainly tropical and subtropical to temperate subhumid on the plains. The higher elevation zones in the Himalayan ranges especially in parts of Uttarakhand and Himachal Pradesh, experience lower temperatures than the other parts of the basin within India. Lowest annual precipitation < 500 mm is observed in the lowlands to a maximum of > 2,200 mm in upper region. The study area receives total average annual precipitation of approximately 1,200 mm. The average temperature in the basin ranges between 9°C to 40°C, where the minimum temperature is usually high mainly because of the lower plains of the basin.

Indus Basin

Climate over the Indus River basin varies from subtropical arid and semiarid to temperate subhumid on the plains of Sindh and Punjab provinces to alpine in the mountainous highlands of the north. Annual precipitation ranges between 100 and 500 mm in the lowlands to a maximum of 2,000 mm on mountain slopes. In the lower plains, December to February is the cold season and mean monthly temperatures vary from 14°C to 20°C. Mean monthly temperatures during March to June vary from 42°C to 44°C. Whereas, in the upper plains mean temperature ranges from 23°C to 49°C during summer and from 2°C to 23°C during winter.

3. DATA USED

Earth observation satellites capture the data repeatedly in various spectral ranges and at different spatial and radiometric resolutions. For inventorying glacial lakes, high to medium resolution datasets are proved to be useful by many research studies (Bolch et al., 2010; Mergili et al., 2013; Wang et al., 2013; Zhang et al., 2015; Gupta et al., 2019, Guru et al., 2019). Data captured between September and December were mostly used because the presence of snow or cloud cover during this period is minimum. USGS satellite data of Landsat 5 and 7 (TM and ETM+) has been used widely for mapping glacial lakes due to free accessibility. Whereas, IRS satellite data from sensors of AWiFS, LISS-III, LISS-IV has also been used for such inventory.

In the present study, high resolution Resourcesat-2 LISS-IV satellite images with spatial resolution of 5.8 m covering a swath of 70 × 70 Km have been used for inventorying glacial lakes. Maximum of the images used for inventorying were of 2016-2021 (71.54%) and remaining images procured were of previous years due to non-availability of cloud-free and snow-free images for the recent years. Majority of images were of September and December months (76.32%) due to less snow and cloud cover, and rest 23.68% images of other months. Figure 4 shows the layout of the RS-2 LISS-IV scenes (path-wise) procured for the Indian Himalayan River basins along with its details in Table 2. The layout of satellite scenes is divided into paths (shown in separate colours) and rows (row numbers shown in the layout).

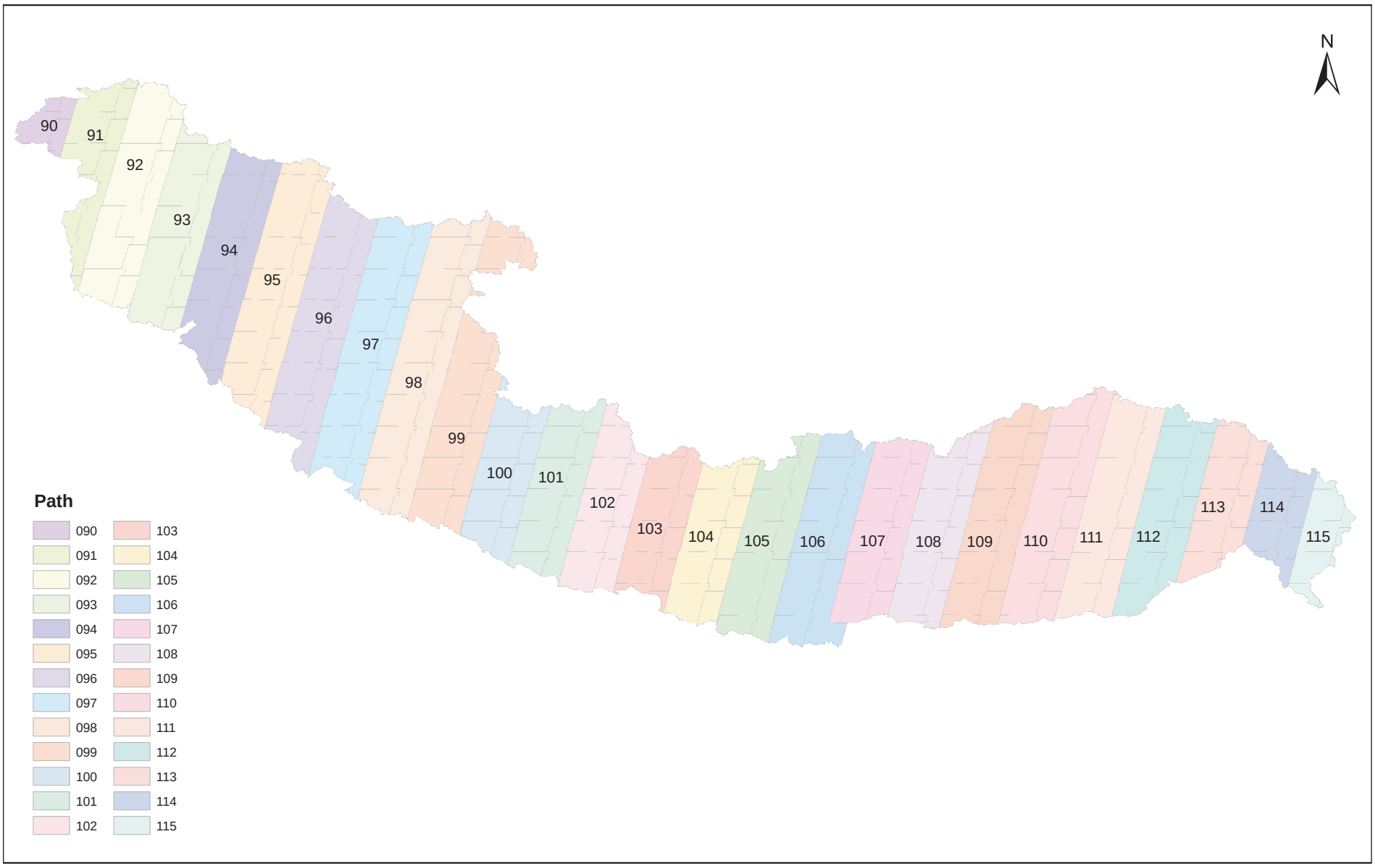


Figure 4: Layout of Resourcesat-2 LISS-IV scenes used in this study

Table 2: Details of satellite scenes used for inventory

	Other Months	Sep - Dec	Total
Prior to 2016	33	80	113
2016-21	61	223	284
Total	**94**	**303**	**397**

Digital Elevation Model (DEM) of Cartosat satellite with 10 m spatial resolution has been used for topographic information and watershed boundary generation. Figure 5 shows elevation range map of the study area i.e. Indian Himalayan River basins. Other information like names of lakes and rivers has been gathered from digital toposheets available from University of Texas - Toposheet Library at 1:250,000 scale and Tibet Map Institute at 1:100,000 scale (U.S. Army Map Service 1955; Andre 2017).

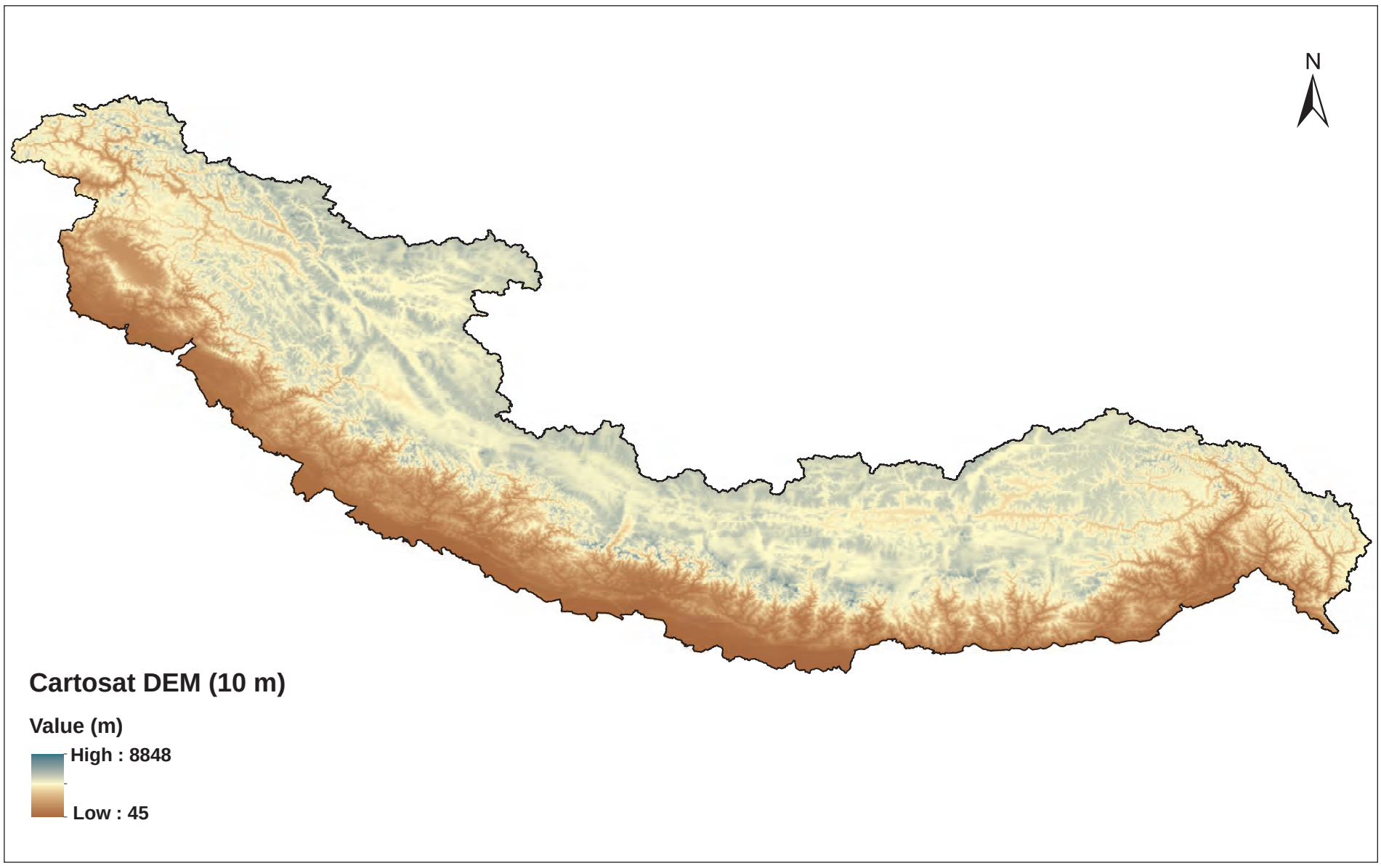


Figure 5: Cartosat DEM of 10 m spatial resolution covering the Indian Himalayan River basins

4. METHODOLOGY

4.1 Satellite Data Interpretation

The spectral reflectance curve of water in the visible spectrum starts with a low in Blue region (0.4 to 0.5 μm), reaches peak in Green region (0.5 to 0.6 μm), decreases in Red region (0.6 to 0.7 μm) and probably the most distinctive characteristic is the energy absorption at Near InfraRed (NIR) wavelengths. Identifying and delineating water bodies with remote sensing data are carried out easily in near infrared wavelengths because of this absorption property in IR region. However, various physical conditions of water bodies (water depth, turbidity, chlorophyll content, etc.) manifest spectral changes. As a result of various conditions of lakes, the water in satellite images in False Colour Composite (FCC) ranges in appearance from light to dark blue to black. In the case of frozen lakes, it appears white.

Glacial lake sizes are generally small, having circular, semi-circular, or elongated shapes with very fine texture and are generally associated with glaciers in high altitude areas. Certain types of glacial lakes, like erosion and cirque lakes are not necessarily associated with glaciers. Knowledge of the physical characteristics of the glacial lakes, and their associated features is always essential for the interpretation of the images.

Satellite data interpretation can be done using visual image interpretation keys such as colour, size, tone, texture, pattern, association, shape, shadow, and orientation. A number of remote sensing methods had been developed for glacial lake detection and mapping or development of inventory (Kääb 2000; Mool et al., 2001a; Huggel et al., 2002; Huggel et al., 2006; Ives et al., 2010). Manual or automated lake mapping methods have certain difficulties in identifying the lakes, which are described in the following section. An attempt was made to study the accuracy of mapping of glacial lakes using multiple automated methods along with visual interpretation, the details of which are given in Annexure-1. From this study, it was concluded that visual interpretation method was best accurate method. Hence, in the present study glacial lakes and their different types are identified and mapped using RS-2 LISS-IV multispectral images using visual interpretation method.

Difficulties in Lake Identification:

Glacial lake identification can be done either using visual interpretation or automatic mapping methods. The automatic mapping procedures have limitations due to varying terrain conditions like lakes situated in the shadow portions of mountains, presence of snow cover, cloud cover, and partly frozen lakes, etc. In the presence of snow cover on the glacier tongue or glacier's ablation area where many Supra-glacial lakes may be present, both methods have limitations and difficulties.

As lake water absorbs the incident radiation making it appear in darker tone and colour in the standard FCC of satellite data, similar response also prevails over shadow region of clouds or mountains on surface, which may lead to incorrect mapping. In fact, a mountain shadow covering a lake partly/completely within its vicinity, making it difficult to accurately map the lake boundary.

Many lakes due to inclement terrain condition, can be under shadow of high peaks and will get missed in both ways of mapping. On the contrary, a lake can also present in white colour while it is in frozen form due to cold

weather conditions over the area, then definitely it will not get classified while automatic mapping. Whereas, frozen lakes can be identified and mapped using visual interpretation to some extent.

Challenges in Automatic Mapping:

In the IHR, due to high and inclement terrain surface and due to near vertical acquisition of satellite images, some lakes get covered with shadows of mountains, which create problems in identifying glacial lakes. Also, identification of lakes with high turbidity, partial ice-covered lakes and the lakes in shadow areas are misclassified by automatic methods. Glacial lake mapping is always a semi-automatic approach because even after applying any of those methods, it should always be followed by the post processing i.e. correcting the errors using visual interpretation. Even in all cases, automatic mapping will never give the exact and accurate boundary of the lake, leading to necessary manual corrections.

Reasoning for Visual Interpretation:

Although automatic mapping methods can speed up the detection of glacial lakes, but these methods could not be applied to the entire Himalayan region due to lot of variations in satellite scenes (seasons/years) and problems mentioned above. For example, if lakes are frozen or covered with snow or cloud and lies in a shadow area, they cannot be detected using these automatic methods. In such cases, the manual interpretation method will be helpful to map these lakes. Thus, any mapping of glacial lakes can be automated up to a certain extent only. So, visual image interpretation keys and technique will give accurate results and avoids misclassification. Therefore, in this present study, glacial lakes and its type identification, and its mapping for the entire Indian Himalayan River Basins has been done manually using visual interpretation. High resolution satellite data available on Bhuvan/ Google Earth has been used on need basis in finalizing various features of glacial lake database.

Limitations:

The RS-2 LISS-IV MX data used for glacial lake database preparation sporadically covered with cloud and seasonal/ permanent snow. Also, the Himalayan region being highly varying topography with steep slopes, the satellite data has hill shadows. Thus, few glacial lakes would not have been mapped owing to the following constraints:

- Presence of snow or cloud over the glacial lakes
- Glacial lakes under frozen condition
- Glacial lakes under mountain shadow

4.2 Types of Glacial Lake

Various researchers have proposed glacial lakes classification schemes based on dam type, process of lake formation, topographic feature, and geographical position (Hewitt 1982; Liu and Sharma 1988; Clague and Evans 2000; Mool et al., 2001a, 2001b). Lakes located on the glacier surface can be mapped using satellite data, but there are englacial and subglacial lakes that may also exist, but cannot be mapped from aerial/optical satellite images, requires ground-based instrument (Yao et al., 2018). Majorly surface glacial lakes are classified in 4 classes and 10 subclasses, i.e. Moraine-dammed lake, Ice-dammed lake, Glacier Erosion lake (also known as Bed-rock lake), and Other Glacial lake. Two-character symbol has been used for glacial lake classification, in which first letter (uppercase) represents lake type and second letter (lowercase) within brackets represents lake

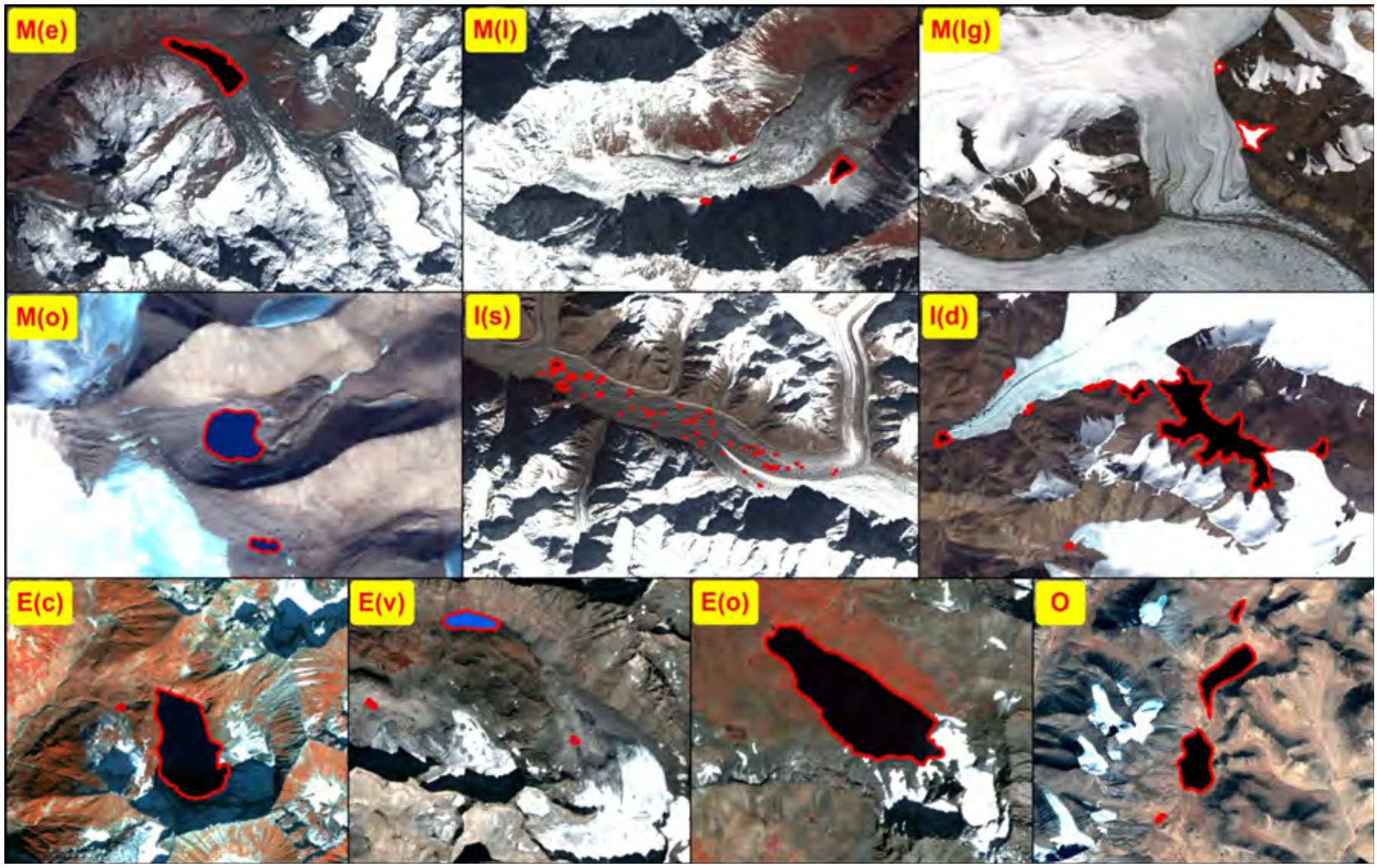


Figure 6: Types of Glacial Lake

subtype, for example, M(e) for End-moraine dammed lake. Details of types of lakes are given in Table 3 and their appearance in satellite images are shown in Figure 6.

Table 3: Glacial lake types and their identification keys

S. No.	Lake Type	Lake Subtype	Code	Identification Keys
1	**Moraine-dammed Lake**	End-moraine Dammed Lake	**M(e)**	Lake dammed by end (terminal) moraines
2		Lateral Moraine Dammed Lake	**M(l)**	Lake dammed by lateral moraine(s) not in contact with glacial ice
3		Lateral Moraine Dammed Lake (with Ice)	**M(lg)**	Lake dammed by lateral moraine(s) in contact with glacial ice
4		Other Moraine Dammed Lake	**M(o)**	Lake dammed by other moraines
5	**Ice-dammed Lake**	Supra-glacial Lake	**I(s)**	Pond or lake on the surface of a glacier
6		Glacier Ice-dammed Lake	**I(d)**	Lake dammed by glacier ice with no lateral moraines
7	**Glacier Erosion Lake**	Cirque Erosion Lake	**E(c)**	A small pond occupying a cirque
8		Glacier Trough Valley Erosion Lake	**E(v)**	Lakes formed in the glacier trough as a result of the glacier erosion process
9		Other Glacial Erosion Lake	**E(o)**	Bodies of water occupying depressions formed by the glacial erosion process
10	**Other Glacial Lake**	Other Glacial Lake	**O**	Lakes formed in a glaciated valley, and fed by glacial melt, but damming material not directly part of the glacial process

4.3 Lake Attribute Information

A total of 22 attributes has been given to all mapped lake features in the geodatabase, which are broadly consisting information grouped in five different categories as shows in Table 4.

Table 4: Details of glacial lake attributes

S.No.	Category	Attribute
1	Hydrological	Basin, subbasin, river, lake name
2	Geometrical	Maximum length, mean width, surface area
3	Geographical	Latitude, longitude, region, state, district, toposheet 250k, toposheet 50k
4	Topographical	Elevation, aspect
5	Lake Information	Feature types, glacial lake type, lake ID
6	Data Source Information	Source of database, source of elevation, date of pass

Typically, lake ID is given in 12 alpha-numeric character format like "0378A1303118", where first two digits '03' refers to Basin code which is Brahmaputra (01-Indus and 02- Ganga), next five characters '78A13' refers to the 1:250,000 (78A) and 1:50,000 (78A13) scale SOI Toposheet number, and the last five digits refers to the sequential number of each lake sorted from top left to bottom right. A typical example of the glacial lake database generated is given below in Table 5 along with fields and format.

Table 5: Typical example of glacial lake attribute database

S. No.	Database Fields	Type	Format / Unit	Lake Attribute
1	ID No	String	Text	0378A1303118
2	Toposheet 250K	String	Text	78A
3	Toposheet 50K	String	Text	78A13
4	Latitude*	Float	Decimal Degree	27.990
5	Longitude*	Float	Decimal Degree	88.816
6	Basin	String	Text	Brahmaputra
7	Subbasin	String	Text	Teesta
8	River	String	Text	Teesta River
9	Type (GL/WB)	String	Text	Glacial Lake
10	Name	String	Text	Khangchung Tso
11	Glacial Lake Type	String	Text	M(e): End-moraine Dammed Lake
12	Surface Area	Float	ha	174.29
13	Length	Float	Km	3.13
14	Mean Width	Float	Km	0.75
15	Elevation	Integer	m (amsl)	5303
16	Aspect	String	Text	NW
17	Source of Database	String	Text	RS-2 LISS-IV
18	Date of Pass	Date	DDMMYYYY	17112016
19	Source of Elevation	String	Text	Cartosat DEM
20	Region	String	Text	India
21	State	String	Text	Sikkim
22	District	String	Text	North Sikkim

* Latitude and longitude has been taken at the centroid of the lake

5. RESULTS

The mapped glacial lakes are analyzed for their distribution in terms of area, type, and elevation, at catchment, basin, administrative and transboundary level. Area of mapped glacial lakes is ranging from a minimum of 0.25 ha to a maximum of 2,658.49 ha in Brahmaputra basin, 540.55 ha in Ganga basin, and 262.56 ha in Indus basin. Details of glacial lakes of size ≥ 10 ha inventoried for the Himalayan River catchment is given in Annexure-II. The results are discussed in subsequent sections:

5.1 Indian Himalayan River Basins Statistics

Area range-wise Distribution

A total of 28,043 glacial lakes (≥ 0.25 ha) were identified and mapped using RS-2 LISS-IV images for the entire Himalayan River catchment, with a total lake water spread area of 1,31,070.90 ha. Table 6 and Figure 7 shows the area range-wise distribution of glacial lakes for the entire catchment. About 23,167 (82.61%) lakes are with < 5 ha lake area contributing to 23.72% of total lake area. The remaining lakes with > 5 ha in size are 4,876 (17.39%) contributing to 76.28% of total lake area in the basin. Details of lakes ≥ 50 ha is given in Annexure-III.

Table 6: Area range-wise distribution of Glacial Lakes (GL) in Indian Himalayan River Basins

S. No.	Lake Area Range (ha)	No. of Lakes	Total Lake Area	
			(ha)	(%)
1	0.25 - 0.5	6,284	2,244.06	1.71
2	0.5 - 1	6,252	4,473.30	3.41
3	1 - 5	10,631	24,370.94	18.59
4	5 - 10	2,445	17,180.97	13.11
5	10 - 50	2,132	41,281.30	31.50
6	> 50	299	41,520.33	31.68
Total		**28,043**	**1,31,070.90**	**100.00**

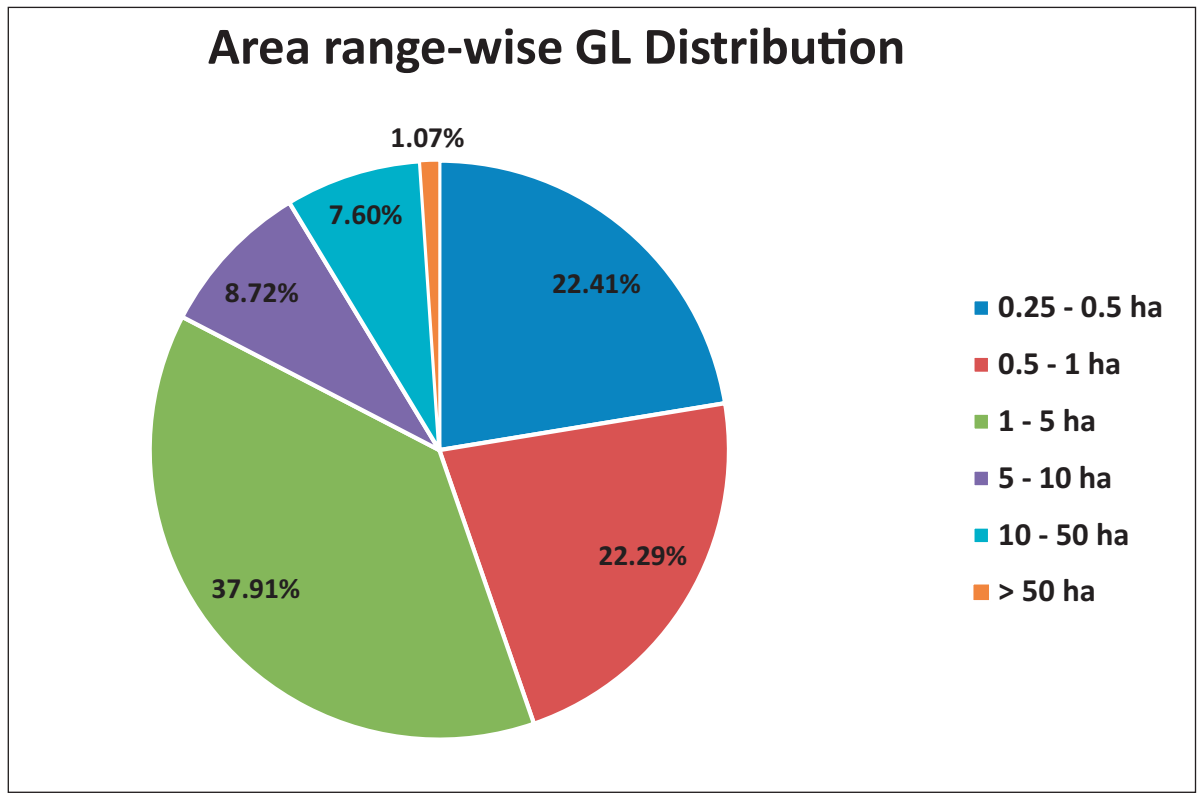


Figure 7: Area range-wise distribution of GL in Indian Himalayan River Basins

Type-wise Distribution

Distribution of different types of glacial lakes in the entire Indian Himalayan River Basins is given in Table 7 and Figure 8. Out of 10 types of lakes described above, all types of lakes are present in the catchment. Out of 10 types of glacial lakes, Other Glacial Erosion lakes are found to be the maximum with 16,106 (57.43%) occupying a total lake extent of 61,228.37 ha at 46.71% in the Indian Himalayan River basins. Two other types of lake, namely, Other Moraine Dammed and Other Glacial lakes are 5,664 (20.20%) and 1,798 (6.41%), extend over an area of 15,159.27 ha (11.57%) and 15,331.89 ha (11.70%) respectively.

Table 7: Type-wise distribution of GL in Indian Himalayan River basins

S. No.	Code	Types of Glacial Lake	No. of Lakes	Total Lake Area	
				(ha)	(%)
1	M(e)	End-moraine Dammed Lake	1,058	21,479.58	16.39
2	M(l)	Lateral Moraine Dammed Lake	363	1,145.38	0.87
3	M(lg)	Lateral Moraine Dammed Lake with Ice	56	118.33	0.09
4	M(o)	Other Moraine Dammed Lake	5,664	15,159.27	11.57
5	I(s)	Supra-glacial Lake	1,698	1,438.32	1.10
6	I(d)	Glacier Ice-dammed Lake	5	239.48	0.18
7	E(c)	Cirque Erosion Lake	1,286	11,467.10	8.75
8	E(v)	Glacier Trough Valley Erosion Lake	9	3,463.16	2.64
9	E(o)	Other Glacial Erosion Lake	16,106	61,228.37	46.71
10	O	Other Glacial Lake	1,798	15,331.89	11.70
Total			**28,043**	**1,31,070.90**	**100.00**

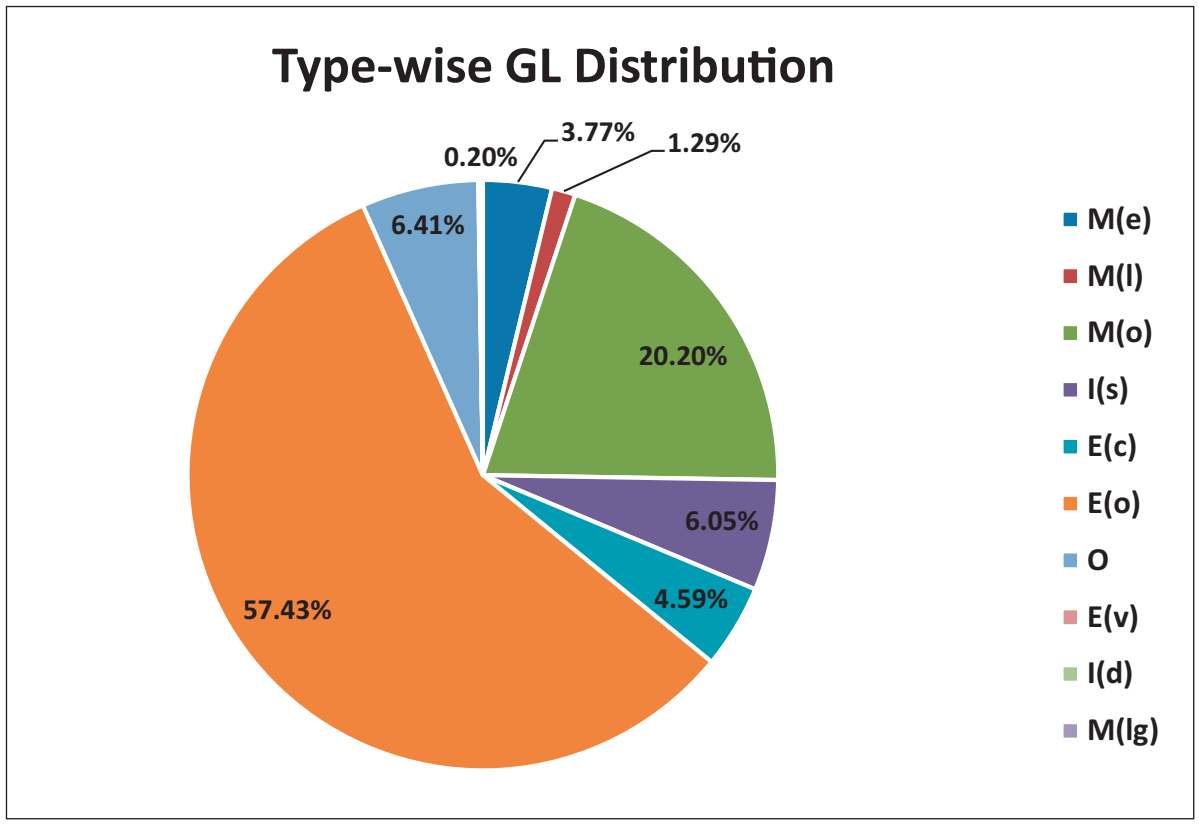


Figure 8: Type-wise distribution of GL in Indian Himalayan River Basins

Area range-Type-wise Distribution

Glacial lake distribution by area range vs. type-wise is given in Table 8 and Figure 9. The lakes with < 5 ha in size (82.61%) are dominant with Other Glacial Erosion Lake type (58.25%) followed by Other Moraine Dammed (21.78%) and Other Glacial Lake (6.46%). The lakes with > 5 ha (17.39%) are dominated by Other Glacial Erosion lakes (53.57%) followed by Cirque Erosion Lake (13.97%) and Other Moraine Dammed Lake (12.69%). All types of Moraine-dammed glacial lakes, which constitute about 25.46% are predominantly with < 5 ha in water spread.

Table 8: Area range-wise vs. Type-wise distribution of GL in Indian Himalayan River Basins

S. No.	Lake Area Range (ha)	Types of Glacial Lake										Total
		M(e)	M(l)	M(lg)	M(o)	I(s)	I(d)	E(c)	E(v)	E(o)	O	
1	0.25 - 0.5	60	102	18	1,513	939	0	24	0	3,155	473	6,284
2	0.5 - 1	68	99	10	1,488	504	1	65	0	3,597	420	6,252
3	1 - 5	353	123	23	2,044	223	3	516	1	6,742	603	10,631
4	5 - 10	179	15	3	369	20	0	331	0	1,422	106	2,445
5	10 - 50	301	19	2	231	12	0	337	1	1,089	140	2,132
6	> 50	97	5	0	19	0	1	13	7	101	56	299
Total		**1,058**	**363**	**56**	**5,664**	**1,698**	**5**	**1,286**	**9**	**16,106**	**1,798**	**28,043**

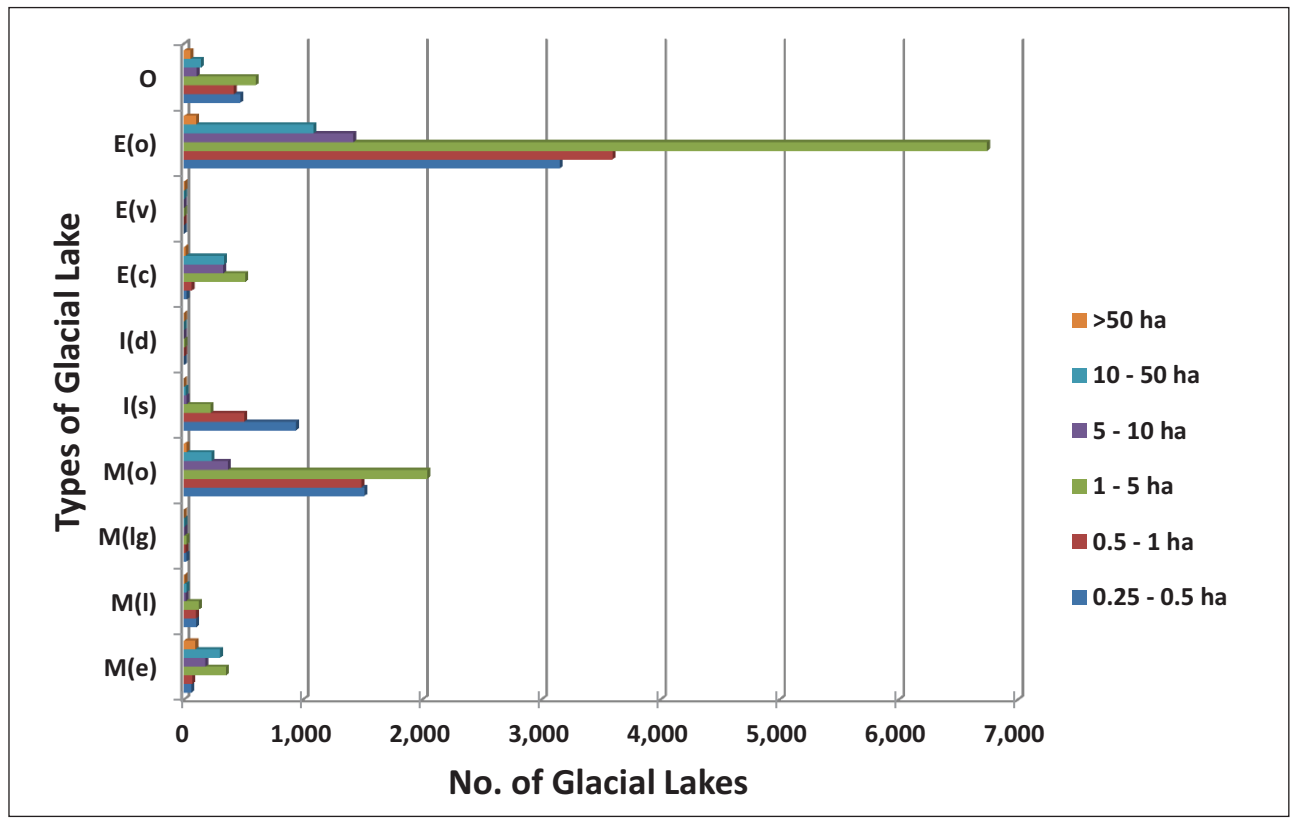


Figure 9: Area range-wise vs. Type-wise distribution of GL in Indian Himalayan River Basins

Elevation range-wise Distribution

Elevation ranges over the entire study area has been classified into four different categories viz., low altitude (up to 3,000 m), medium altitude (3,001 - 4,000 m), high altitude (4,001 - 5,000 m), and very high altitude (> 5,000 m). Table 9 and Figure 10 shows the distribution of the glacial lakes in the Himalayan River Catchment as per elevation range-wise. Majority of glacial lakes are situated above 4,000 m elevation i.e. 26,103 (93.08%) with total lake area of 1,15,750.40 ha (88.31%) and remaining 6.92% glacial lakes are below 4,000 m elevation.

Table 9: Elevation range-wise distribution of GL in Indian Himalayan River Basins

S. No.	Elevation Range (m)	No. of Lakes	Total Lake Area	
			(ha)	(%)
1	up to 3,000	33	209.78	0.16
2	3,001 - 4,000	1,907	15,110.70	11.53
3	4,001 - 5,000	14,322	68,201.49	52.03
4	> 5,000	11,781	47,548.91	36.28
Total		**28,043**	**1,31,070.90**	**100.00**

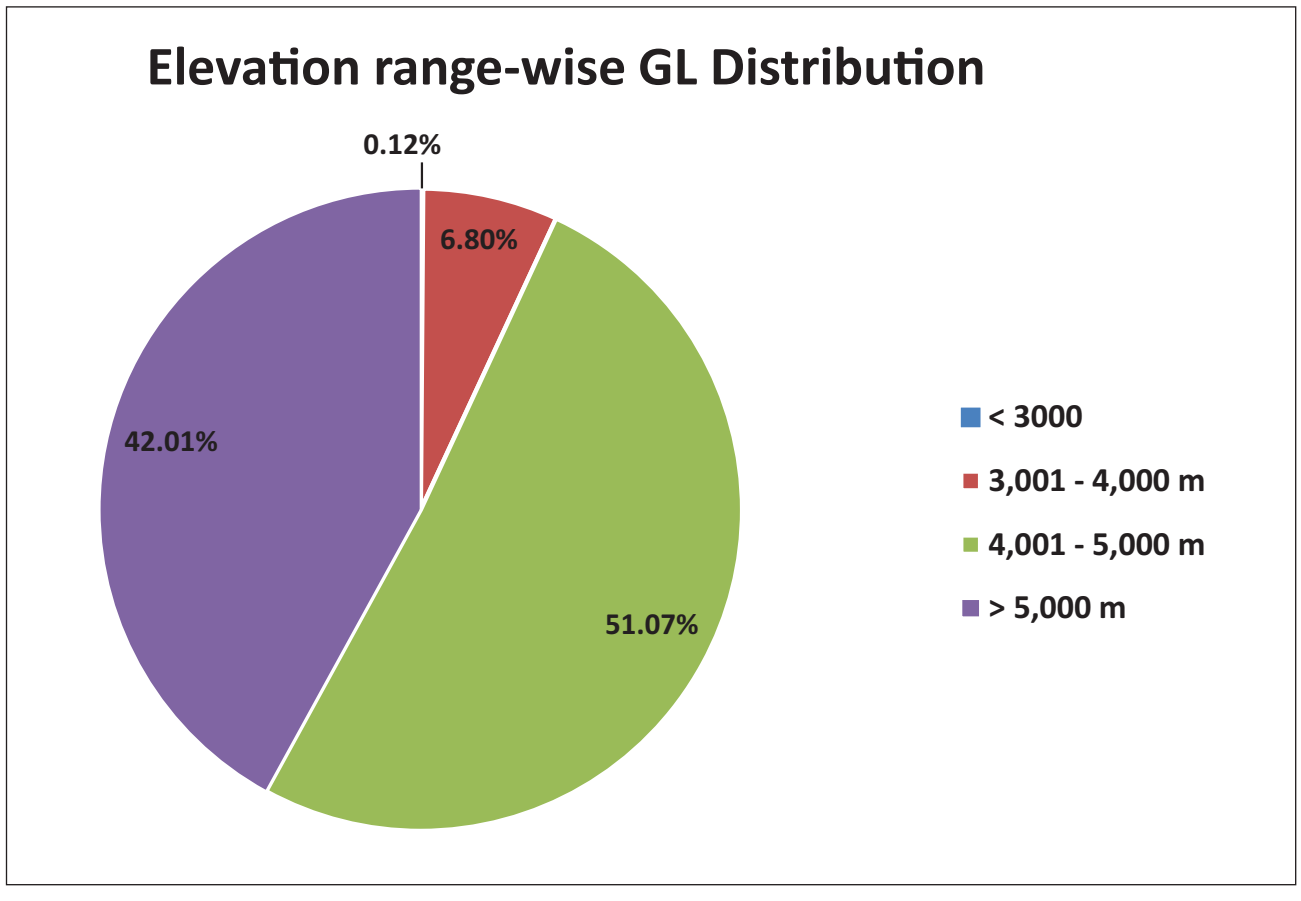


Figure 10: Elevation range-wise distribution of GL in Indian Himalayan River Basins

Area-Elevation range-wise Distribution

Glacial lake distribution has been analyzed as per area range vs. elevation range-wise, given in Table 10 and Figure 11. It is noted that, about 42.01% of glacial lakes (11,781) are situated in very high-altitude range i.e. > 5,000 m amsl, which also constitutes total lake area within that range i.e. 36.28%. However, very few glacial lakes (33) lie below 3,000 m amsl, has maximum of its lakes with 0.25 - 5 ha lake area range. Figure 11 shows that maximum of lakes lying in very high-altitude range is of size ranging 1 - 5 ha (i.e. 4,333), followed by lakes in high altitude range within in 0.25 – 0.5 ha (i.e. 2,978).

Table 10: Area range vs. Elevation range-wise distribution of GL in Indian Himalayan River Basins

S. No.	Lake Area Range (ha)	Elevation Range (m)								Total	
		up to 3,000		3,001 - 4,000		4,001 - 5,000		> 5,000			
		No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Lake Area (ha)
1	0.25 - 0.5	10	3.48	338	122.49	2,958	1,061.35	2,978	1,056.75	6,284	2,244.06
2	0.5 - 1	5	3.26	282	200.37	3,032	2,178.56	2,933	2,091.14	6,252	4,473.30
3	1 - 5	8	22.25	703	1,729.26	5,587	12,977.12	4,333	9,642.23	10,631	24,370.94
4	5 - 10	2	15.64	263	1,885.54	1,378	9,713.04	802	5,566.77	2,445	17,180.97
5	10 - 50	8	165.17	286	5,875.04	1,215	23,137.02	623	12,104.00	2,132	41,281.30
6	> 50	0	0.00	35	5,297.95	152	19,134.18	112	17,087.95	299	41,520.33
Total		**33**	**209.78**	**1,907**	**15,110.70**	**14,322**	**68,201.49**	**11,781**	**47,548.91**	**28,043**	**1,31,070.90**

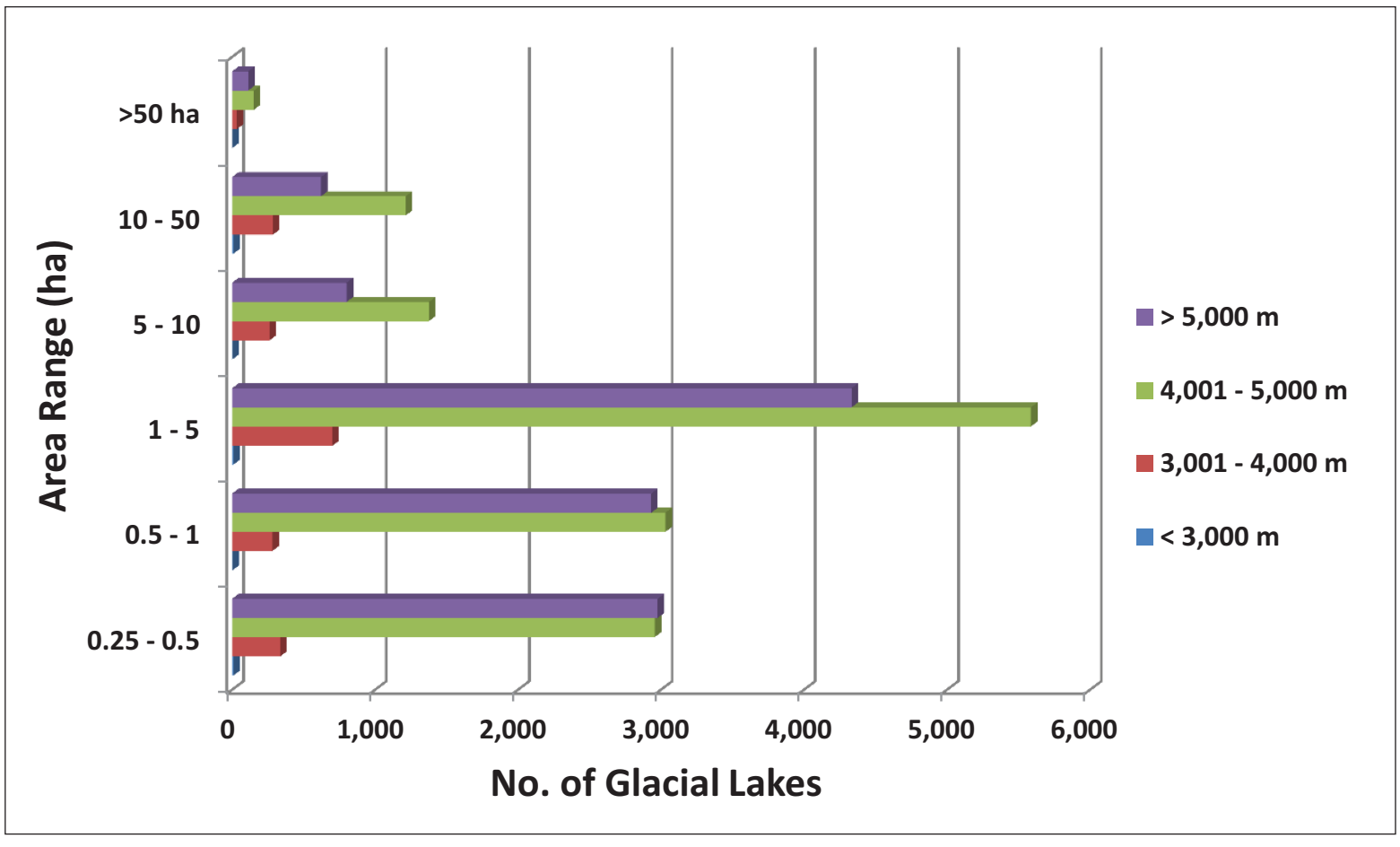


Figure 11: Area range vs. Elevation range-wise distribution of GL in Indian Himalayan River Basins

Type-Elevation range-wise Distribution

Glacial lake distribution has been analyzed as per type-wise vs. elevation range-wise, given in Table 11 and Figure 12. The dominant lake type in the Indian Himalayan River basin i.e., Other Glacial Erosion lakes (57.43%) are predominantly located in the elevation range of 4,001 - 5,000 m (60.03%). The two other dominant lake types, namely, Other Moraine Dammed and Other Glacial lakes are mostly distributed in both 4,001 - 5,000 m and > 5,000 m elevation ranges. 70.12% of Moraine-dammed glacial lakes, which constitute 25.46% of the total lakes, lies in the very high-altitude range of > 5,000 m amsl. Elevation range-type-wise distribution of glacial lakes has been represented in Figure 13.

Table 11: Type-wise vs. Elevation range-wise distribution of GL in Indian Himalayan River Basins

S.No.	Elevation Range (m)	Types of Glacial Lake										Total
		M(e)	M(l)	M(lg)	M(o)	I(s)	I(d)	E(c)	E(v)	E(o)	O	
1	up to 3,000	2	1	0	10	11	0	0	0	5	4	33
2	3,001 - 4,000	34	35	0	75	270	0	207	3	1,138	145	1,907
3	4,001 - 5,000	326	207	15	1,429	841	0	905	5	9,668	926	14,322
4	> 5,000	696	120	41	4,150	576	5	174	1	5,295	723	11,781
Total		**1,058**	**363**	**56**	**5,664**	**1,698**	**5**	**1,286**	**9**	**16,106**	**1,798**	**28,043**

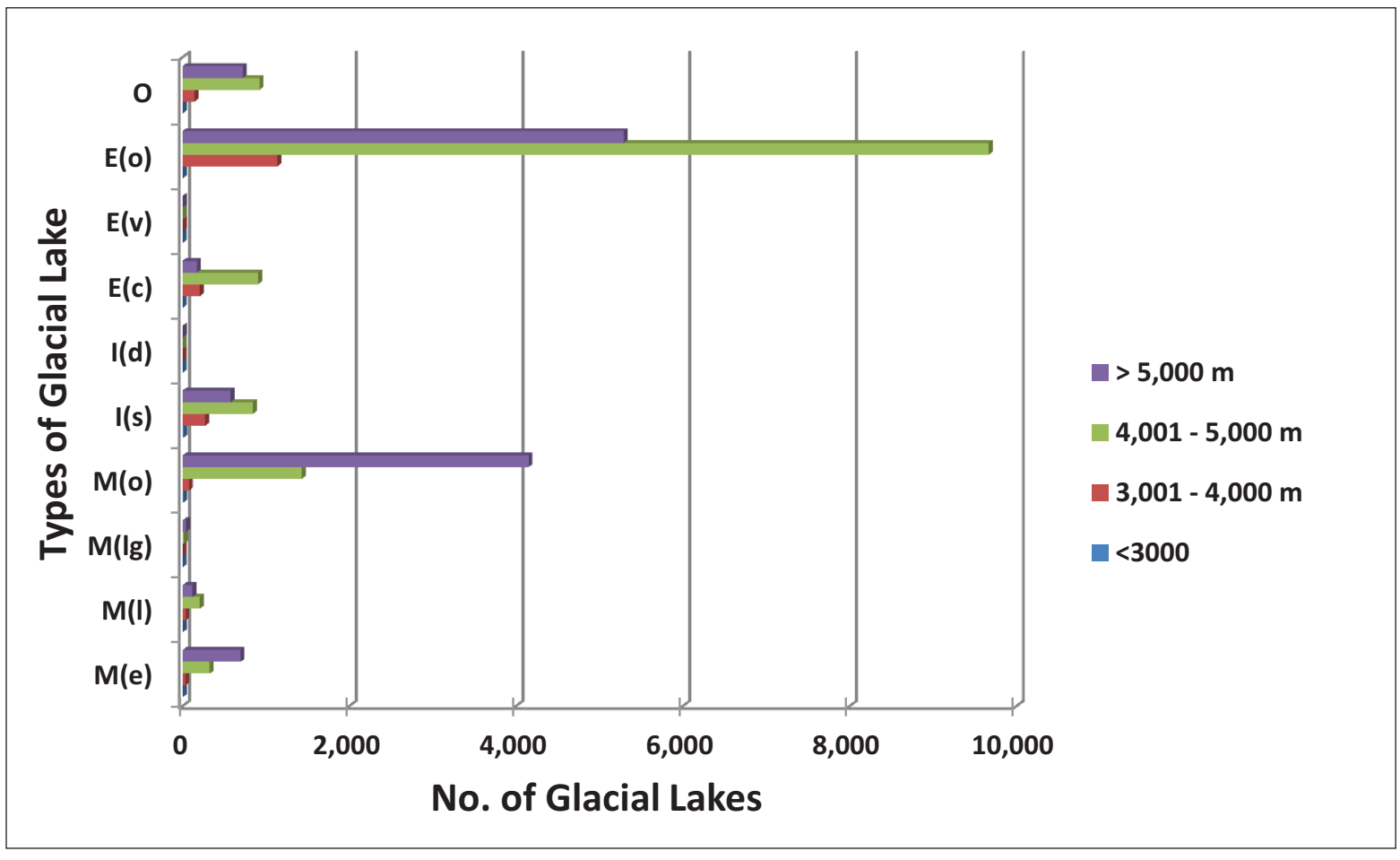


Figure 12: Type-wise vs. Elevation range-wise distribution of GL in Indian Himalayan River Basins

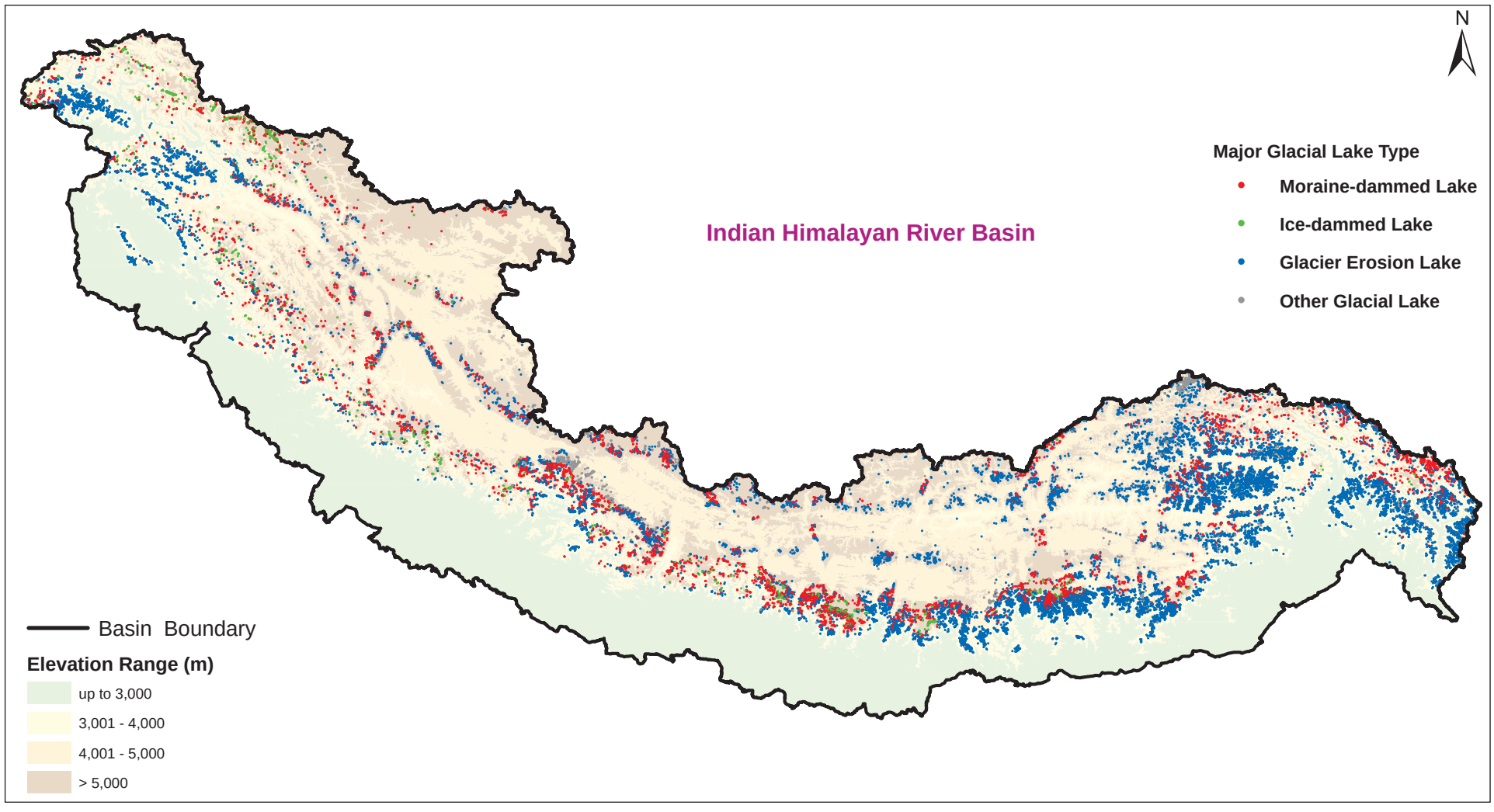


Figure 13: Elevation range-Type-wise spatial distribution of GL in Indian Himalayan River Basins

5.2 Basin-Wise Statistics

5.2.1 Brahmaputra Basin

Topographically River Brahmaputra is unique in terms of its diverse environment as it has cold plateau in Tibet, rainy Himalayan region, alluvial lands of Assam and the large deltaic plains of Bangladesh. The Brahmaputra River also known as Yarlung Tsangpo (in Tibet) originates in the glacier mass from the Kailash ranges of Himalayas at an altitude of 5,150 m south of the lake 'Konggyu Tsho'. The river flows through a length of 2,900 Km out of which 916 Km in the Indian Territory and joins finally in the Bay of Bengal. The catchment area receives number of tributaries at its north and south banks especially in Indian region. The Brahmaputra River basin from its origin to foothills of Himalayas with a catchment area of 3,99,833 Sq.Km is considered in the present study, which extends from latitude 26.70° N to 32.70° N and from longitude 82.00° E to 97.77° E. A total of 18,001 glacial lakes has been mapped, covering a total area of 92,990.74 ha (Figure 14).

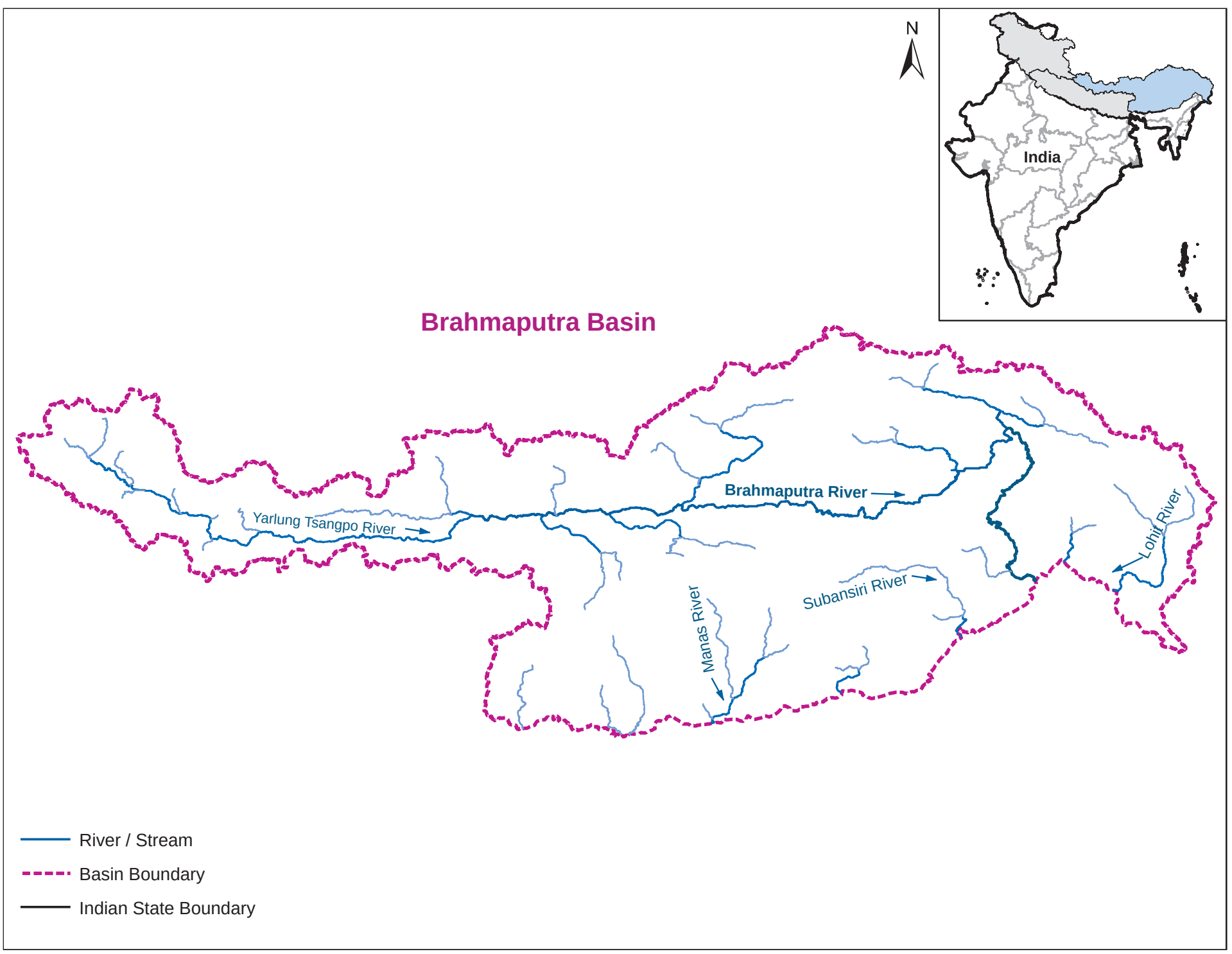


Figure 14: Location Map of the Brahmaputra Basin

Area range-wise Distribution

A total of 18,001 glacial lakes (≥ 0.25 ha) were identified and mapped using RS-2 LISS-IV images for the entire Brahmaputra River basin, with a total lake water spread area of 92,990.74 ha. Table 12 and Figure 15 shows the area range-wise distribution of glacial lakes for the entire basin. About 14,499 (80.55%) lakes are with < 5 ha lake area contributing to 21.92% of total lake area. The remaining lakes with > 5 ha in size are 3,502 (19.45%) contributing to 78.08% of total lake area in the basin.

Table 12: Area range-wise distribution of Glacial Lakes (GL) in Brahmaputra River basin

S. No.	Lake Area Range (ha)	No. of Lakes	Total Lake Area	
			(ha)	(%)
1	0.25 - 0.5	3,627	1,294.83	1.39
2	0.5 - 1	3,856	2,771.84	2.98
3	1 - 5	7,016	16,315.71	17.55
4	5 - 10	1,749	12,348.79	13.28
5	10 - 50	1,546	30,040.25	32.31
6	> 50	207	30,219.32	32.50
Total		**18,001**	**92,990.74**	**100.00**

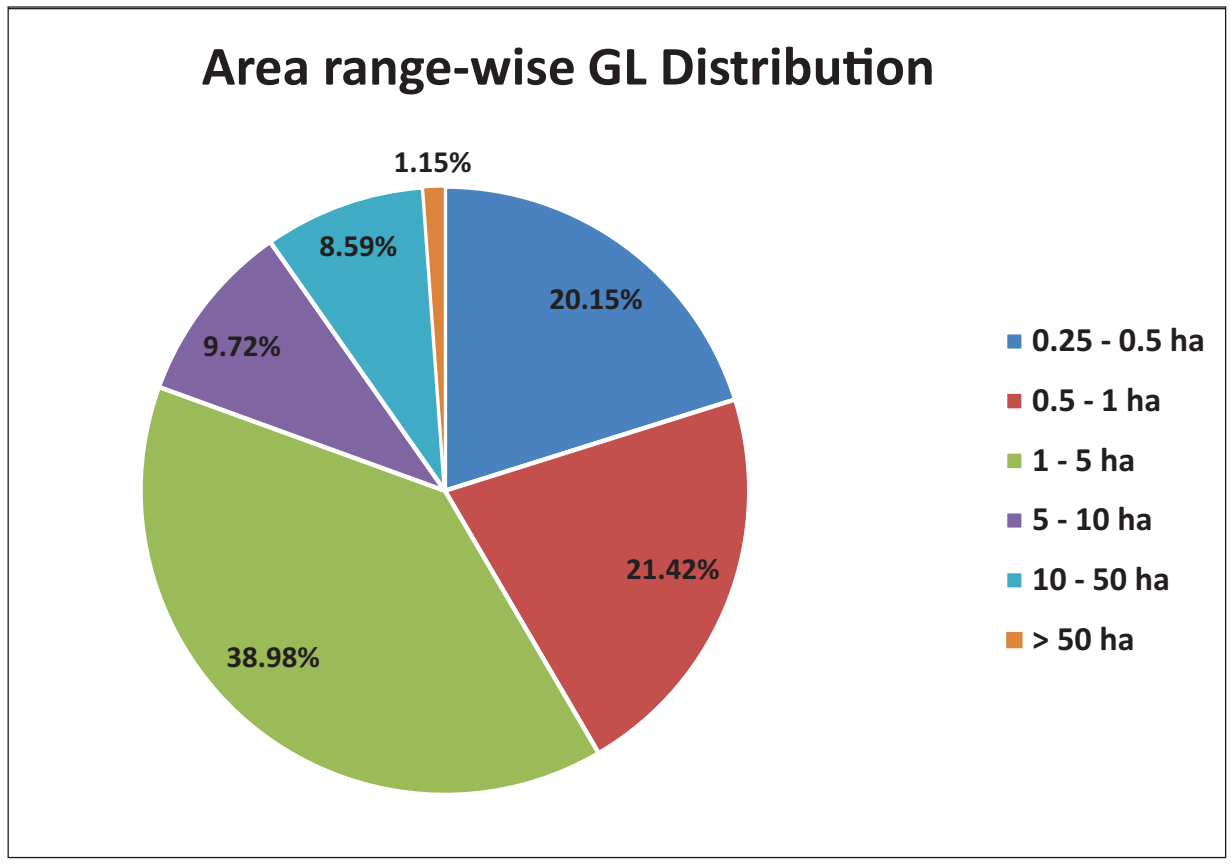


Figure 15: Area range-wise distribution of GL in Brahmaputra River basin

Type-wise Distribution

Distribution of different types of glacial lakes in the entire Brahmaputra River basin is given in Table 13 and Figure 16. Out of 10 types of lakes described above, all types of lakes are present in the basin. Out of 10 types of glacial lakes, Other Glacial Erosion lakes are found to be the maximum with 11,846 (65.81%) occupying a total lake extent of 48,368.91 ha at 52.01% in the basin. Two other types of lake, namely, Other Moraine Dammed and Other Glacial lakes are 3,019 (16.77%) and 1,481 (8.23%), extend over an area of 9,457.52 ha (10.17%) and 12,049.76 ha (12.96%) respectively.

Table 13: Type-wise distribution of GL in Brahmaputra River basin

S.No.	Code	Types of Glacial Lake	No. of Lakes	Total Lake Area	
				(ha)	(%)
1	M(e)	End-moraine Dammed Lake	391	10,620.51	11.42
2	M(l)	Lateral Moraine Dammed Lake	38	259.67	0.28
3	M(lg)	Lateral Moraine Dammed Lake with Ice	2	0.93	0.00
4	M(o)	Other Moraine Dammed Lake	3,019	9,457.52	10.17
5	I(s)	Supra-glacial Lake	272	263.13	0.28
6	I(d)	Glacier Ice-dammed Lake	2	2.50	0.00
7	E(c)	Cirque Erosion Lake	943	8,521.90	9.16
8	E(v)	Glacier Trough Valley Erosion Lake	7	3,445.91	3.71
9	E(o)	Other Glacial Erosion Lake	11,846	48,368.91	52.01
10	O	Other Glacial Lake	1,481	12,049.76	12.96
Total			**18,001**	**92,990.74**	**100.00**

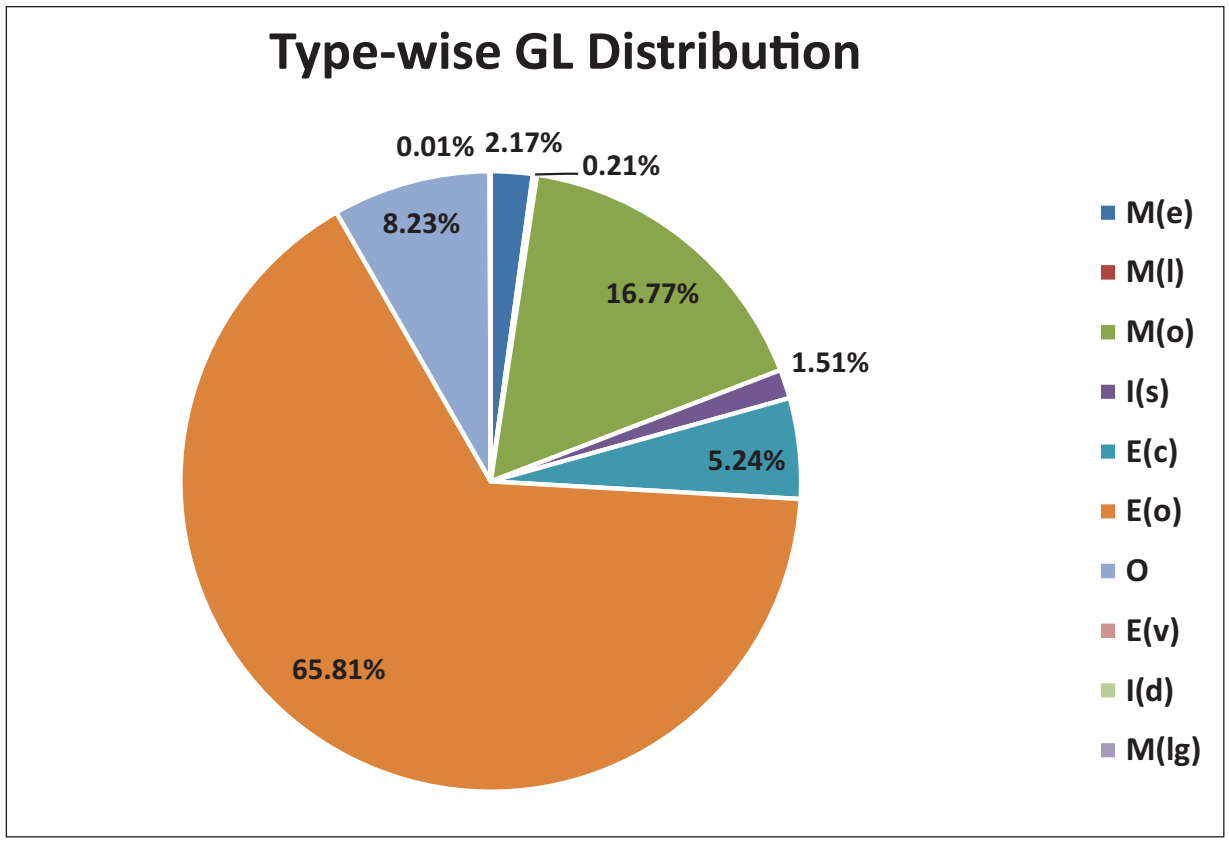


Figure 16: Type-wise distribution of GL in Brahmaputra River basin

Area range-Type-wise Distribution

Glacial lake distribution by area range vs. type-wise is given in Table 14 and Figure 17. The lakes with < 5 ha in size (80.55%) are dominant with Other Glacial Erosion Lake type (67.58%) followed by Other Moraine Dammed (18.02%) and Other Glacial Lake (8.66%). The lakes with > 5 ha (19.45%) are dominated by Other Glacial Erosion lakes (58.45%) followed by Cirque Erosion Lake (14.85%) and Other Moraine Dammed Lake (11.62%). All types of Moraine-dammed glacial lakes, which constitute about 18.99% are predominantly with < 5 ha in water spread.

Table 14: Area range-wise vs. Type-wise distribution of GL in Brahmaputra River basin

S. No.	Lake Area Range (ha)	Types of Glacial Lake										Total
		M(e)	M(l)	M(lg)	M(o)	I(s)	I(d)	E(c)	E(v)	E(o)	O	
1	0.25 - 0.5	6	6	1	718	153	0	13	0	2,324	406	3,627
2	0.5 - 1	12	6	1	743	75	1	46	0	2,636	336	3,856
3	1 - 5	93	17	0	1,151	38	1	364	0	4,839	513	7,016
4	5 - 10	78	3	0	236	4	0	250	0	1,092	86	1,749
5	10 - 50	152	5	0	156	2	0	262	0	868	101	1,546
6	> 50	50	1	0	15	0	0	8	7	87	39	207
Total		**391**	**38**	**2**	**3,019**	**272**	**2**	**943**	**7**	**11,846**	**1,481**	**18,001**

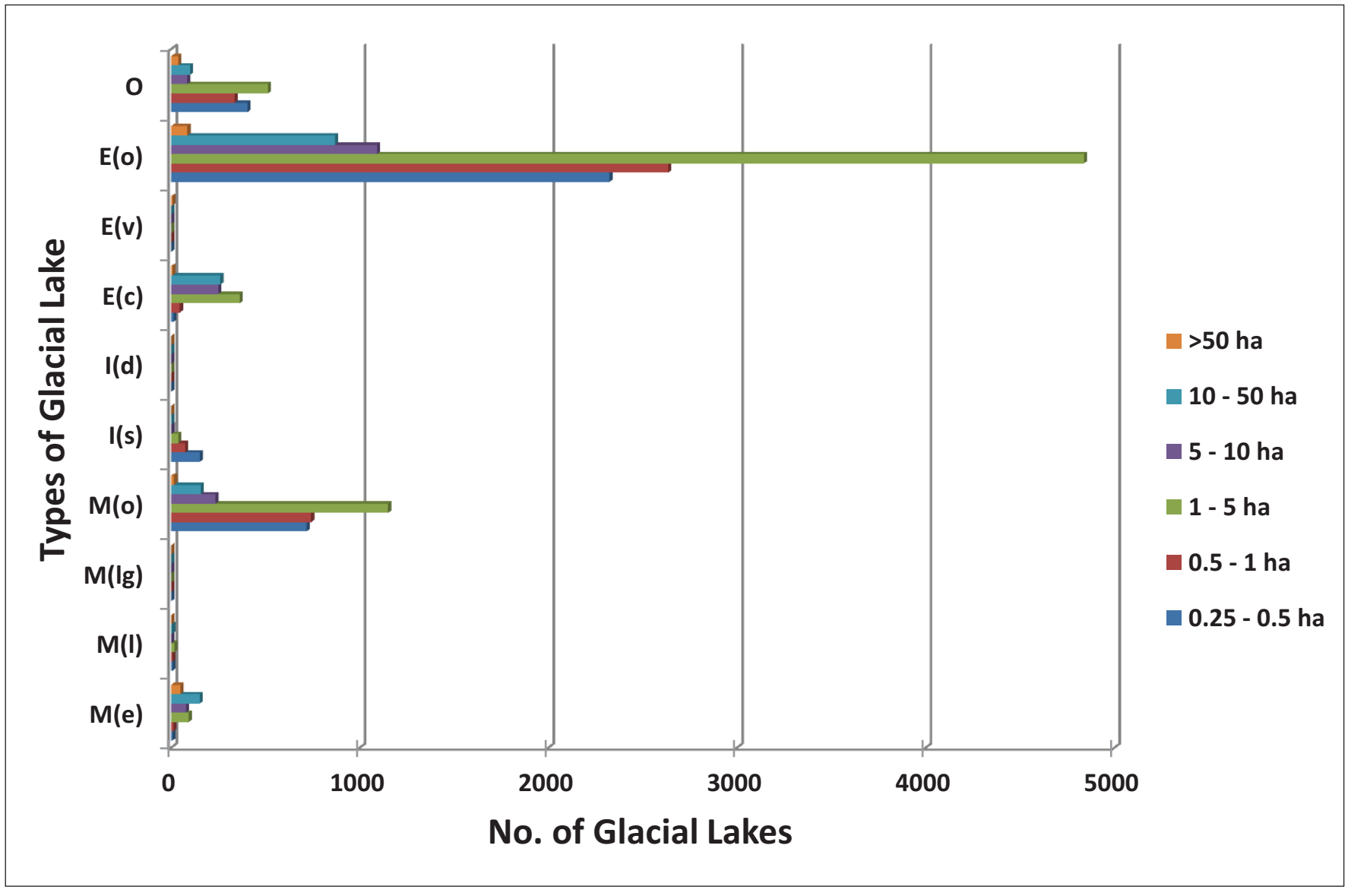


Figure 17: Area range-wise vs. Type-wise distribution of GL in Brahmaputra River basin

Elevation range-wise Distribution

Elevation ranges over the entire study area has been classified into four different categories viz., low altitude (up to 3,000 m), medium altitude (3,001 - 4,000 m), high altitude (4,001 - 5,000 m), and very high altitude (> 5,000 m). Table 15 and Figure 18 shows the distribution of the glacial lakes in the Brahmaputra basin as per elevation range-wise. Majority of glacial lakes are situated above 4,000 m elevation i.e. 16,802 (93.34%) with total lake area of 81,290.89 ha (87.41%) and remaining 6.66% glacial lakes are below 4,000 m elevation.

Table 15: Elevation range-wise distribution of GL in Brahmaputra River basin

S. No.	Elevation Range (m)	No. of Lakes	Total Lake Area	
			(ha)	(%)
1	up to 3,000	11	152.21	0.16
2	3,001 - 4,000	1,188	11,547.28	12.42
3	4,001 - 5,000	9,670	52,525.25	56.48
4	> 5,000	7,132	28,765.99	30.93
Total		**18,001**	**92,990.74**	**100.00**

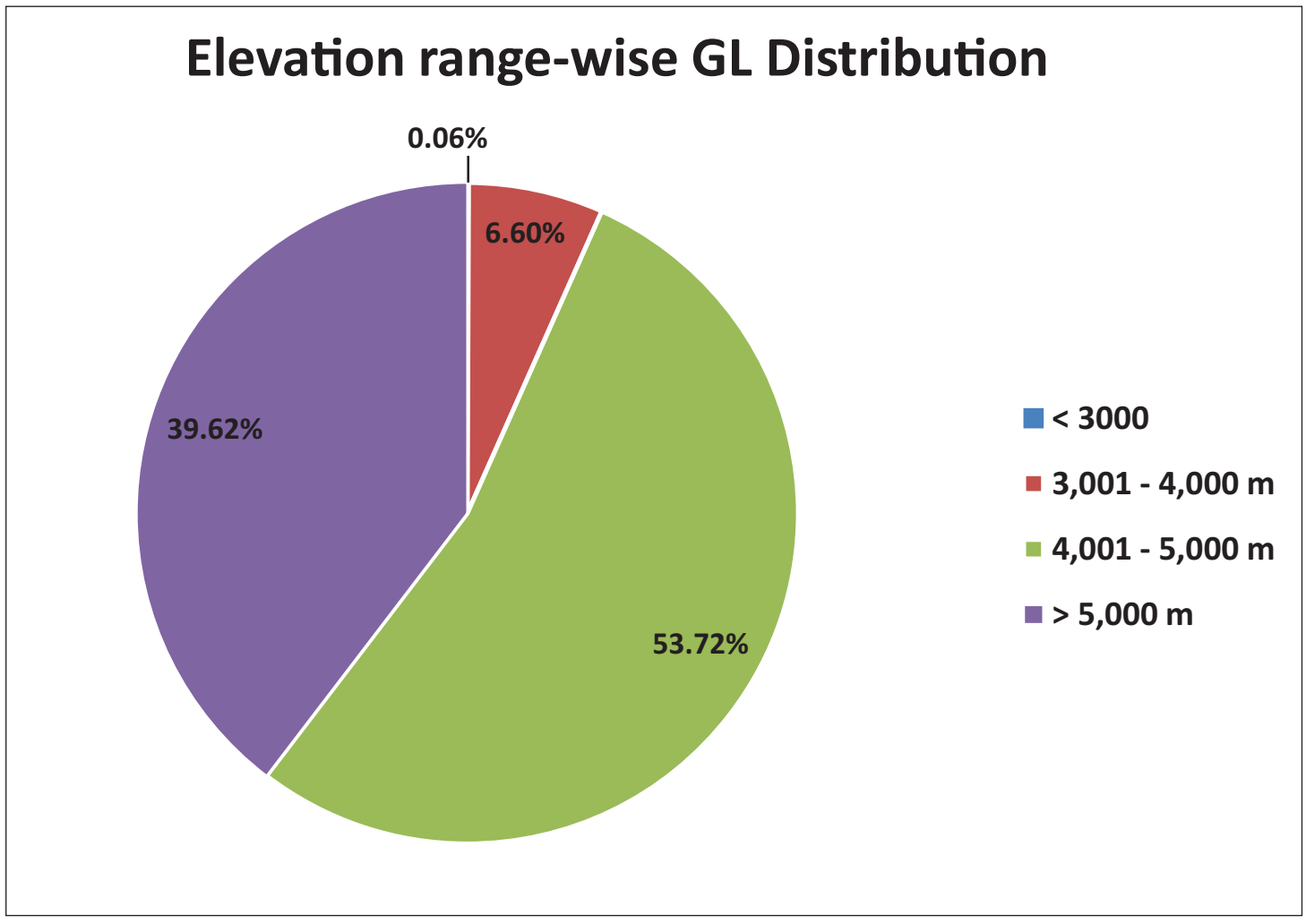


Figure 18: Elevation range-wise distribution of GL in Brahmaputra River basin

Area-Elevation range-wise Distribution

Glacial lake distribution has been analyzed as per area range vs. elevation range-wise, given in Table 16 and Figure 19. It is noted that, about 39.62% of glacial lakes (7,132) are situated in very high-altitude range i.e. > 5,000 m amsl, which also constitutes total lake area within that range i.e. 30.93%. However, very few glacial lakes (11) lie below 3,000 m amsl, has maximum of its lakes with 10 - 50 ha lake area range. Figure 19 shows that maximum of lakes lying in very high-altitude range is of size ranging 1 - 5 ha (i.e. 2,728), followed by lakes in high altitude range within in 1 - 5 ha (i.e. 3,772).

Table 16: Area range-wise vs. Elevation range-wise distribution of GL in Brahmaputra River basin

S. No.	Lake Area Range (ha)	Elevation Range (m)								Total	
		up to 3,000		3,001 - 4,000		4,001 - 5,000		> 5,000			
		No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Lake Area (ha)
1	0.25 - 0.5	0	0.00	98	36.60	1,824	655.23	1,705	603.00	3,627	1,294.83
2	0.5 - 1	1	0.64	124	90.74	1,966	1,417.19	1,765	1,263.30	3,856	2,771.84
3	1 - 5	3	10.07	513	1,299.91	3,772	8,855.14	2,728	6,150.52	7,016	16,315.71
4	5 - 10	1	5.77	219	1,576.08	1,035	7,306.45	494	3,460.51	1,749	12,348.79
5	10 - 50	6	135.75	209	4,288.89	952	18,351.30	379	7,264.24	1,546	30,040.25
6	> 50	0	0.00	25	4,255.00	121	15,939.70	61	10,024.36	207	30,219.32
Total		**11**	**152.21**	**1,188**	**11,547.28**	**9,670**	**52,525.25**	**7,132**	**28,765.99**	**18,001**	**92,990.74**

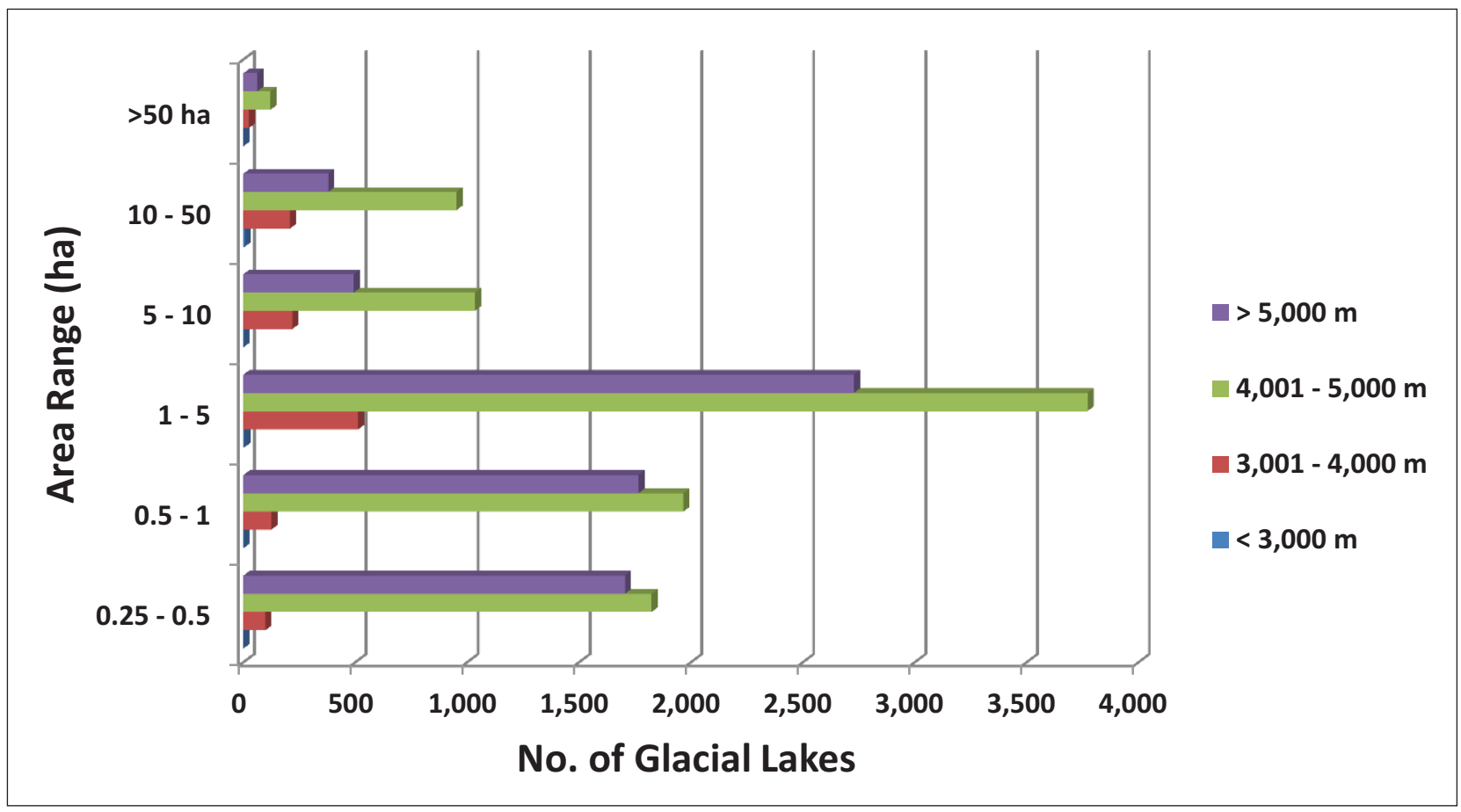


Figure 19: Area range-wise vs. Elevation range-wise distribution of GL in Brahmaputra River basin

Type-Elevation range-wise Distribution

Glacial lake distribution has been analyzed as per type-wise vs. elevation range-wise, given in Table 17 and Figure 20. The dominant lake type in the basin i.e., Other Glacial Erosion lakes (65.81%) are predominantly located in the elevation range of 4,001 - 5,000 m (60.20%). The two other dominant lake types, namely, Other Moraine Dammed and Other Glacial lakes are mostly distributed in both 4,001 - 5,000 m and > 5,000 m elevation ranges. 72.98% of Moraine-dammed glacial lakes, which constitute 13.98% of the total lakes, lies in the very high-altitude range of > 5,000 m amsl. Elevation range-type-wise distribution of glacial lakes has been represented in Figure 21.

Table 17: Type-wise vs. Elevation range-wise distribution of GL in Brahmaputra River basin

S. No.	Elevation Range (m)	Types of Glacial Lake										Total
		M(e)	M(l)	M(lg)	M(o)	I(s)	I(d)	E(c)	E(v)	E(o)	O	
1	up to 3,000	0	0	0	4	0	0	0	0	4	3	11
2	3,001 - 4,000	11	0	0	26	16	0	158	2	869	106	1,188
3	4,001 - 5,000	147	25	1	718	159	0	687	4	7,131	798	9,670
4	> 5,000	233	13	1	2,271	97	2	98	1	3,842	574	7,132
Total		**391**	**38**	**2**	**3,019**	**272**	**2**	**943**	**7**	**11,846**	**1,481**	**18,001**

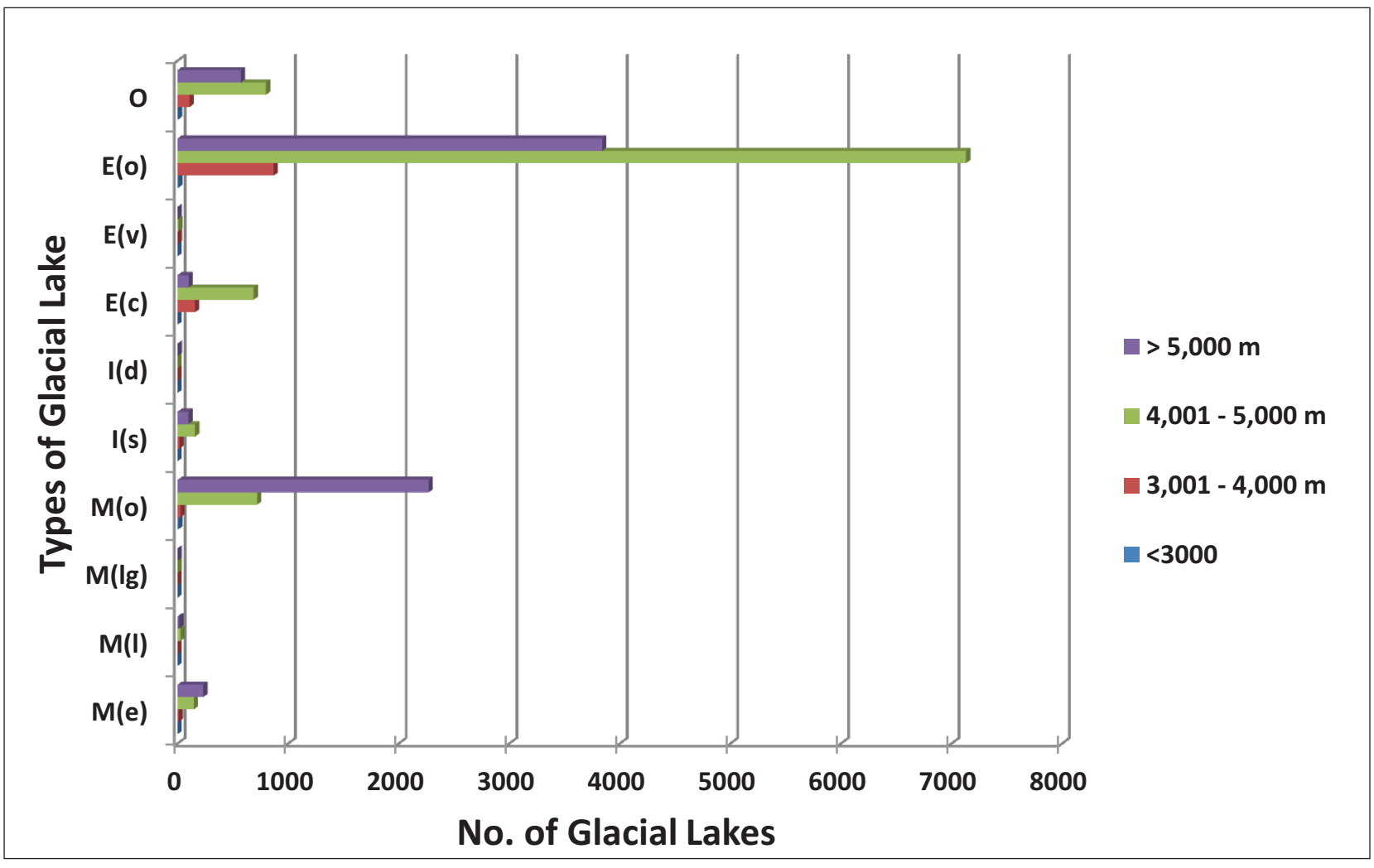


Figure 20: Type-wise vs. Elevation range-wise distribution of GL in Brahmaputra River basin

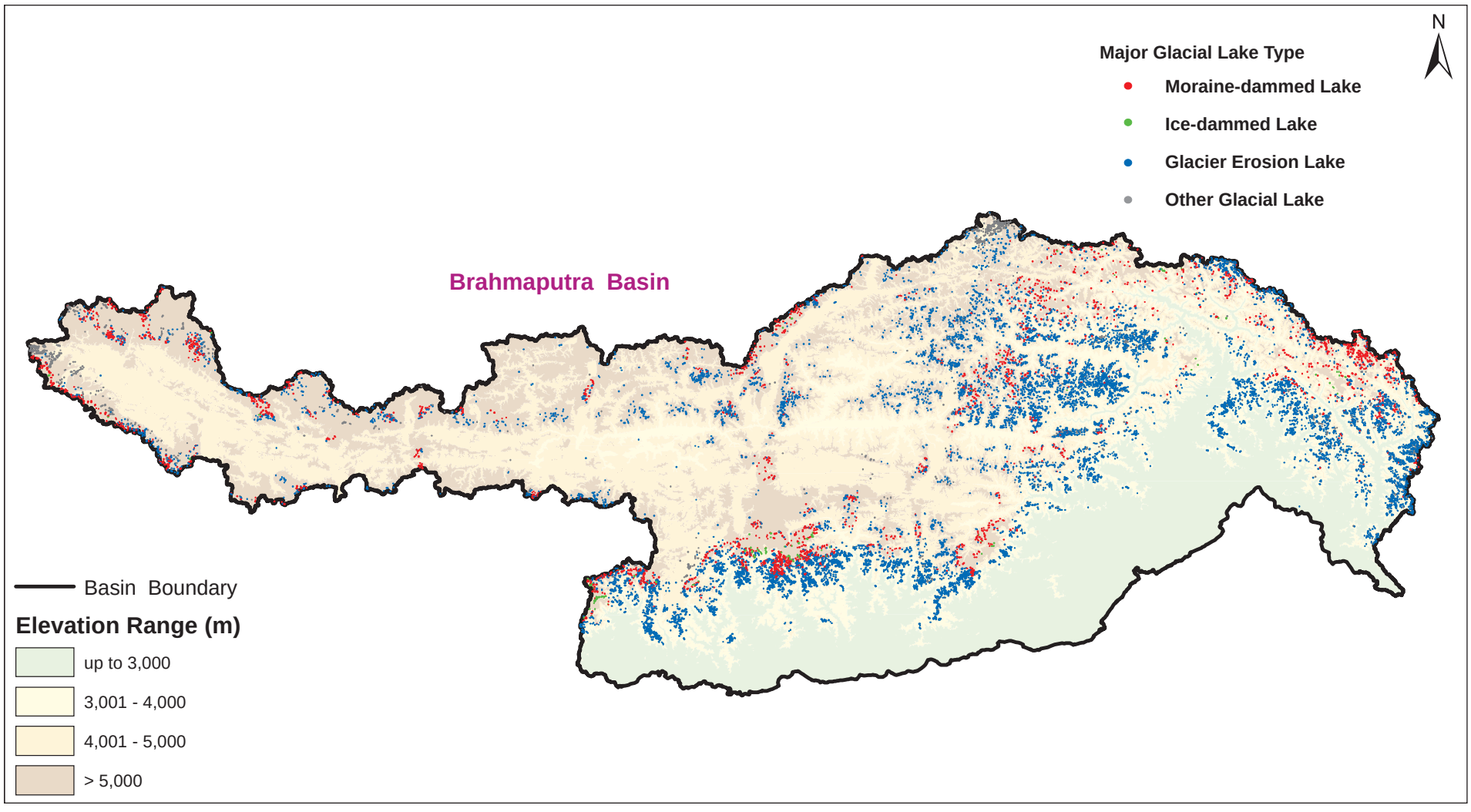


Figure 21: Elevation range-Type-wise spatial distribution of GL in Brahmaputra River basin

5.2.2 Ganga Basin

The Ganga River originates as the Bhagirathi from the Gangotri group of glaciers in the Himalayas at an elevation of about 7,010 m amsl, in the Uttarkashi district of Uttarakhand, which has been joined by the Alaknanda at Devprayag, and the combined stream assumes the name 'Ganga'. River flows through the highly terrain mountain region and debouches into the plains at Sukhi (near Rishikesh). It is joined by a large number of tributaries on both the banks in the course of its total run of about 2,525 km before its outfall into the Bay of Bengal. The delta of the Ganga River is said to begin at the Farakka barrage in West Bengal, where the river divides into two arms namely the Padma which flows to Bangladesh and the Ganga which flows through West Bengal. Ganga River basin from its origin to the foothills of Himalayas with a catchment area of 2,47,110 Km^2 is considered in the present study, which extends from latitude 26.35° N to 31.46° N and from longitude 77.05° E to 88.95° E (Figure 22).

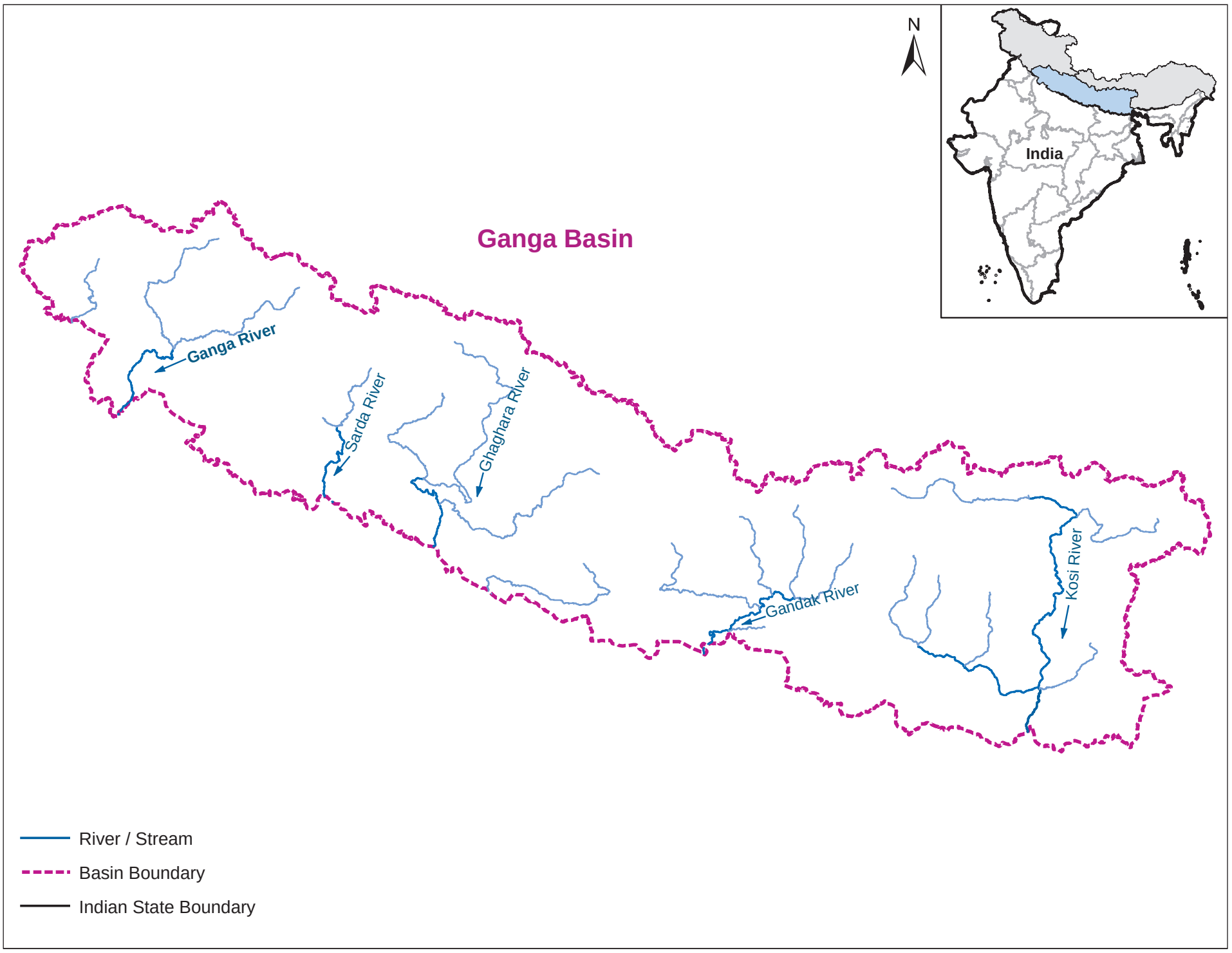


Figure 22: Location Map of the Ganga Basin

Area range-wise Distribution

A total of 4,707 glacial lakes ≥ 0.25 ha were identified and mapped using RS-2 LISS-IV images for the entire Ganga River basin, with a total lake water spread area of 20,685.12 ha. Table 18 and Figure 23 shows the area range-wise distribution of glacial lakes for the entire basin. About 4,035 (85.72%) lakes are with < 5 ha lake area contributing to 23.13% of total lake area. The remaining lakes with > 5 ha in size are 672 (14.28%) contributing to 76.87% of total lake area in the basin.

Table 18: Area range-wise distribution of Glacial Lakes (GL) in Ganga River basin

S. No.	Lake Area Range (ha)	No. of Lakes	Total Lake Area	
			(ha)	(%)
1	0.25 - 0.5	1,279	452.30	2.19
2	0.5 - 1	1,157	824.04	3.98
3	1 - 5	1,599	3,508.94	16.96
4	5 - 10	315	2,184.89	10.56
5	10 - 50	299	5,938.21	28.71
6	> 50	58	7,776.74	37.60
Total		**4,707**	**20,685.12**	**100.00**

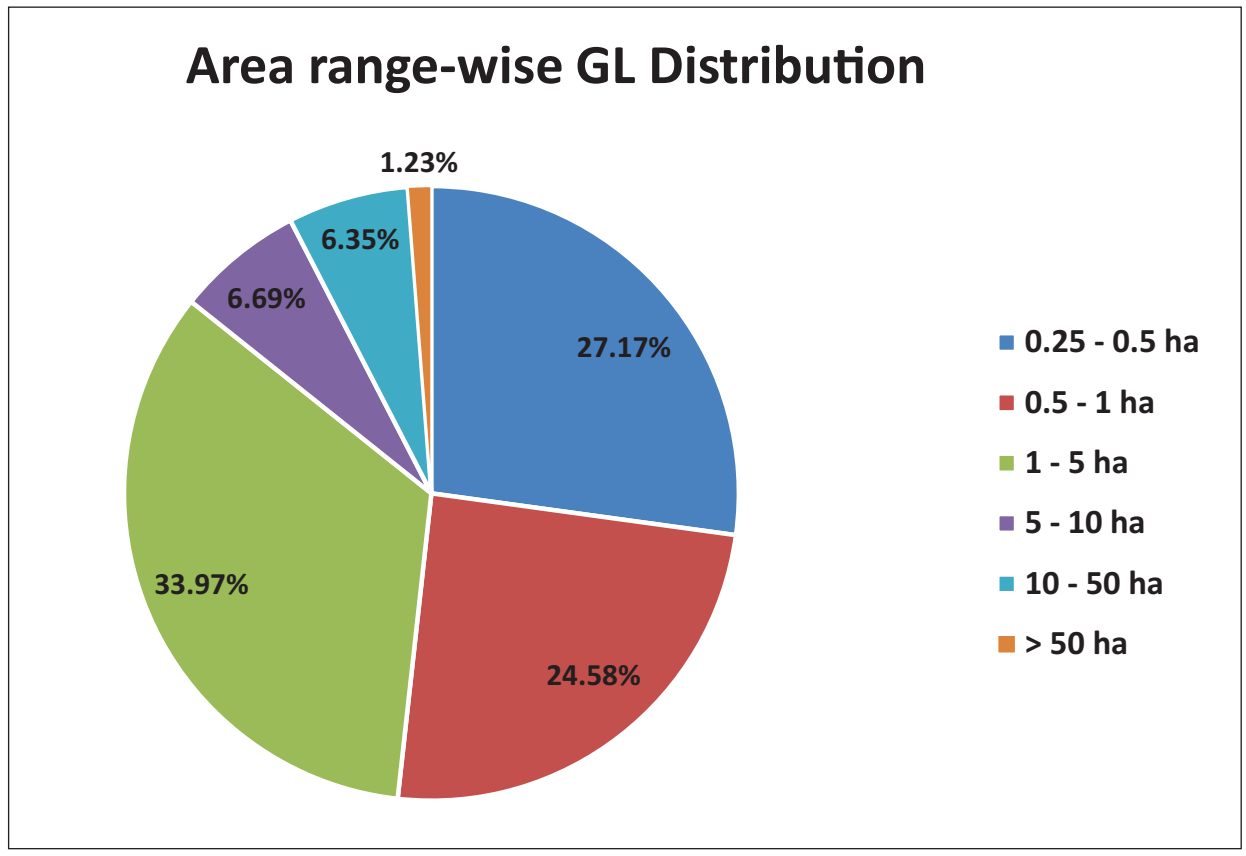


Figure 23: Area range-wise distribution of GL in Ganga River basin

Type-wise Distribution

Distribution of different types of glacial lakes in the entire Ganga River basin is given in Table 19 and Figure 24. Out of 10 types of lakes described above, 9 types of lakes are present in the basin except Glacier Trough Valley Erosion Lake. Out of 9 types of glacial lakes, Other Glacial Erosion lakes are found to be the maximum with 1,744 (37.05%) occupying a total lake extent of 4,612.02 ha at 22.30% in the basin. Two other types of lake, namely, Other Moraine Dammed and Supra-glacial lake are 1,740 (36.97%) and 617 (13.11%), extend over an area of 4,489.35 ha (21.70%) and 566.14 ha (2.74%) respectively.

Table 19: Type-wise distribution of GL in Ganga River basin

S. No.	Code	Types of Glacial Lake	No. of Lakes	Total Lake Area	
				(ha)	(%)
1	M(e)	End-moraine Dammed Lake	260	8,591.78	41.53
2	M(l)	Lateral Moraine Dammed Lake	100	568.12	2.75
3	M(lg)	Lateral Moraine Dammed Lake with Ice	9	5.48	0.03
4	M(o)	Other Moraine Dammed Lake	1,740	4,489.35	21.70
5	I(s)	Supra-glacial Lake	617	566.14	2.74
6	I(d)	Glacier Ice-dammed Lake	1	2.45	0.01
7	E(c)	Cirque Erosion Lake	123	973.77	4.71
8	E(o)	Other Glacial Erosion Lake	1,744	4,612.02	22.30
9	O	Other Glacial Lake	113	876.01	4.23
Total			**4,707**	**20,685.12**	**100.00**

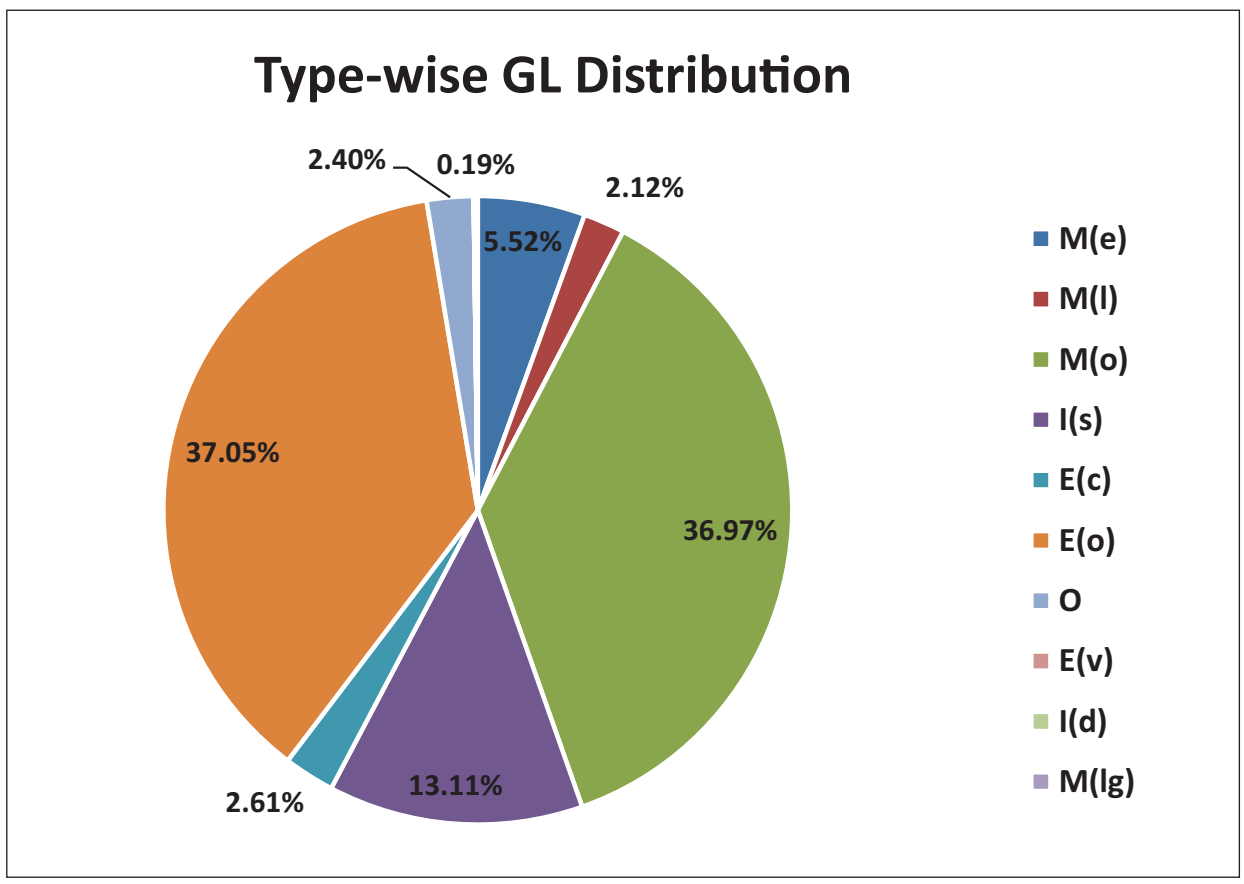


Figure 24: Type-wise distribution of GL in Ganga River basin

Area range-Type-wise Distribution

Glacial lake distribution by area range vs. type-wise is given in Table 20 and Figure 25. The lakes with < 5 ha in size (85.72%) are dominant with Other Moraine Dammed Lake type (38.74%) followed by Other Glacial Erosion (38.64%) and Supra-glacial lake (14.94%). The lakes with > 5 ha (14.28%) are dominated by Other Glacial Erosion lakes (27.53%) followed by End Moraine Dammed Lake (27.23%) and Other Moraine Dammed Lake (26.34%). All types of Moraine-dammed glacial lakes, which constitute about 44.81% are predominantly with < 5 ha in water spread.

Table 20: Area range-wise vs. Type-wise distribution of GL in Ganga River basin

S. No.	Lake Area Range (ha)	Types of Glacial Lake									Total
		M(e)	M(l)	M(lg)	M(o)	I(s)	I(d)	E(c)	E(o)	O	
1	0.25 - 0.5	5	22	4	462	354	0	4	400	28	1,279
2	0.5 - 1	12	24	4	484	166	0	5	433	29	1,157
3	1 - 5	60	35	1	617	83	1	49	726	27	1,599
4	5 - 10	41	6	0	106	6	0	34	115	7	315
5	10 - 50	100	9	0	68	8	0	31	65	18	299
6	> 50	42	4	0	3	0	0	0	5	4	58
Total		**260**	**100**	**9**	**1,740**	**617**	**1**	**123**	**1,744**	**113**	**4,707**

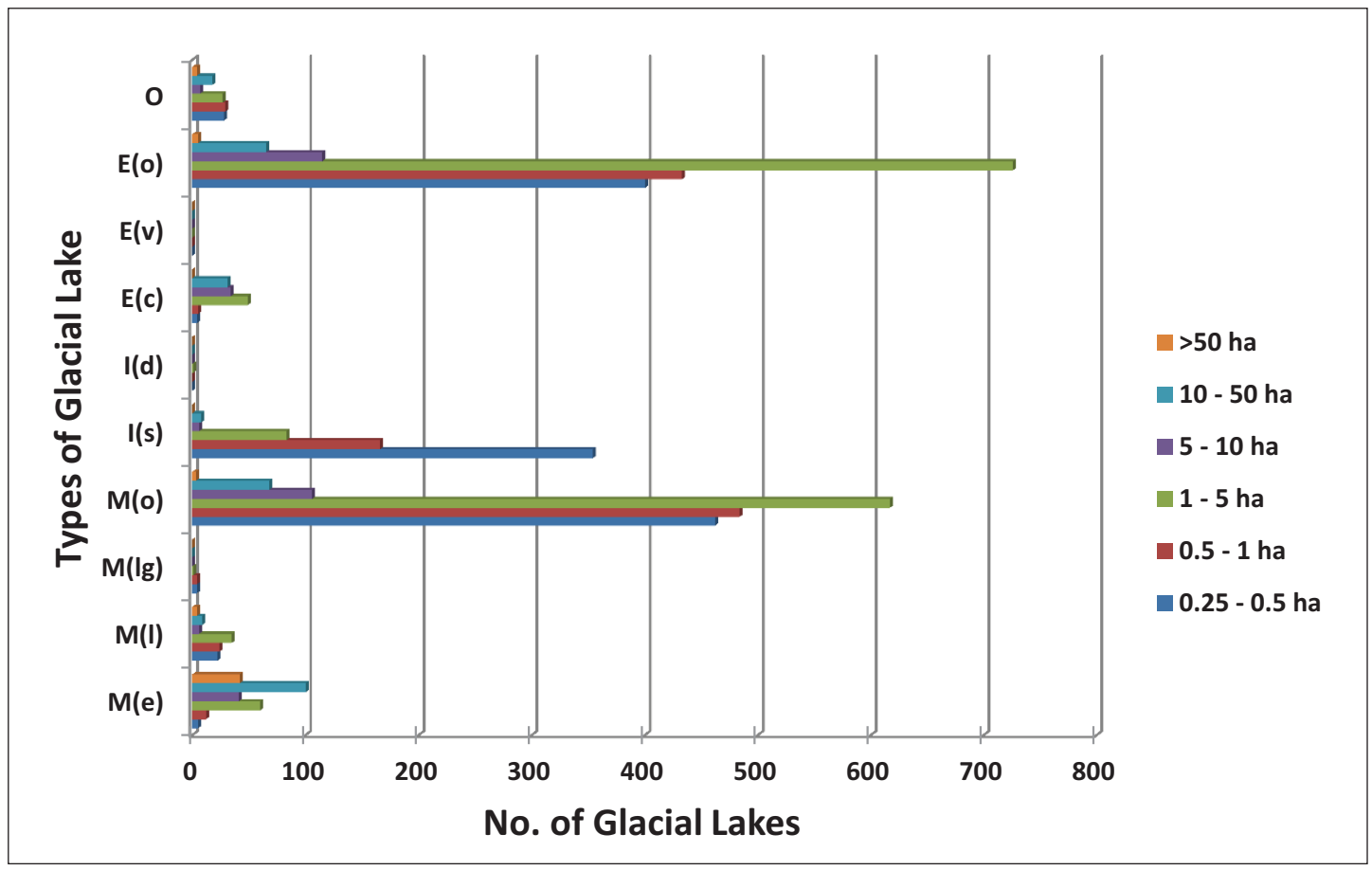


Figure 25: Area range-wise vs. Type-wise distribution of GL in Ganga River basin

Elevation range-wise Distribution

Elevation ranges over the entire study area has been classified into four different categories viz., low altitude (up to 3,000 m), medium altitude (3,001 - 4,000 m), high altitude (4,001 - 5,000 m), and very high altitude (> 5,000 m). Table 21 and Figure 26 shows the distribution of the glacial lakes in the Ganga basin as per elevation range-wise. Majority of glacial lakes are situated above 4,000 m elevation i.e. 4,644 (98.66%) with total lake area of 20,451.70 ha (98.87%) and remaining 1.34% glacial lakes are below 4,000 m elevation.

Table 21: Elevation range-wise distribution of GL in Ganga River basin

S. No.	Elevation Range (m)	No. of Lakes	Total Lake Area	
			(ha)	(%)
1	up to 3,000	1	9.87	0.05
2	3,001 - 4,000	62	223.55	1.08
3	4,001 - 5,000	1,855	7,374.89	35.65
4	> 5,000	2,789	13,076.81	63.22
Total		**4,707**	**20,685.12**	**100.00**

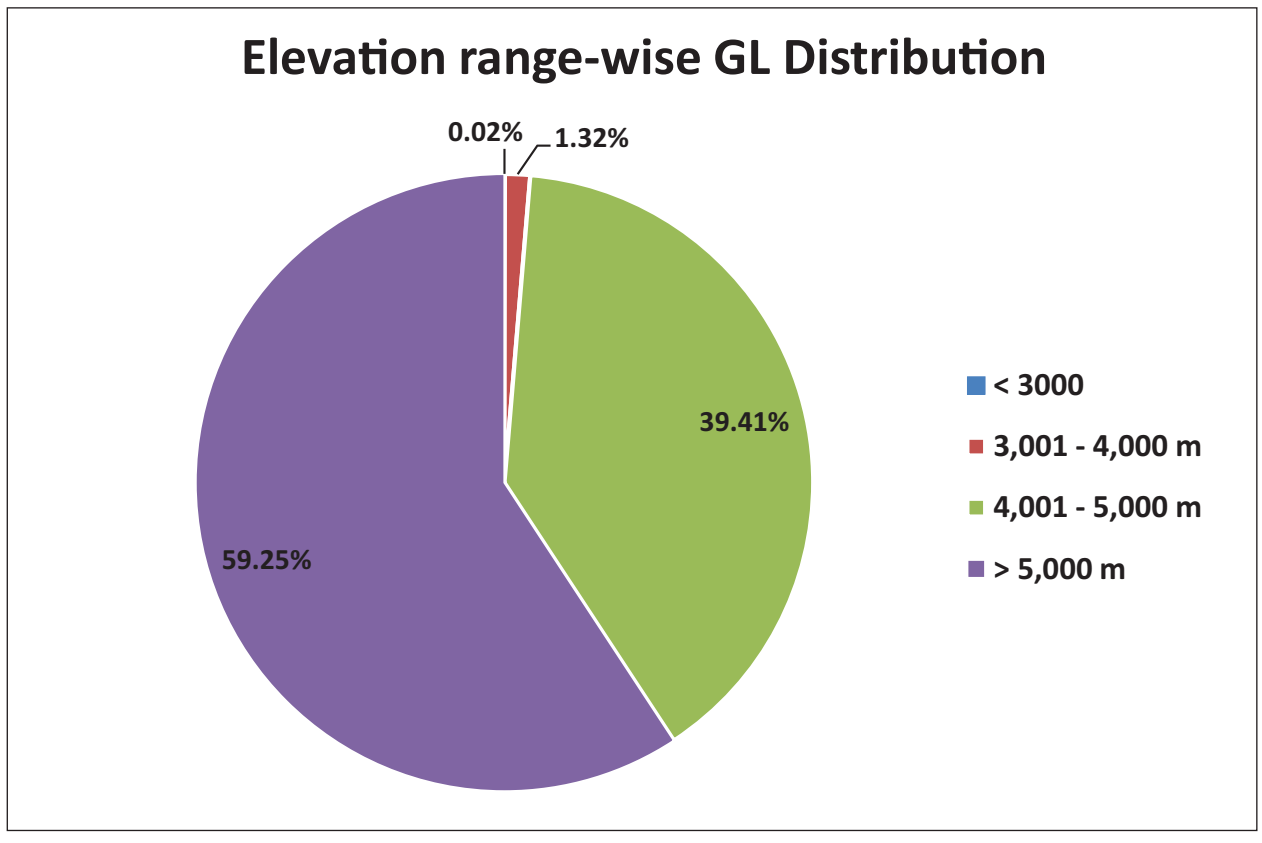


Figure 26: Elevation range-wise distribution of GL in Ganga River basin

Area-Elevation range-wise Distribution

Glacial lake distribution has been analyzed as per area range vs. elevation range-wise, given in Table 22 and Figure 27. It is noted that, about 59.25% of glacial lakes (2,789) are situated in very high-altitude range i.e. > 5,000 m amsl, which also constitutes maximum total lake area within that range i.e. 63.22%. However, very few glacial lakes (63) lie up to 4,000 m amsl, has maximum of its lakes with 0.25 - 0.5 ha lake area range. Figure 27 shows that maximum of lakes lying in very high-altitude range is of size ranging 1 - 5 ha (i.e. 928), followed by lakes in high altitude range within in 1 - 5 ha (i.e. 659).

Table 22: Area range-wise vs. Elevation range-wise distribution of GL in Ganga River basin

S. No.	Lake Area Range (ha)	Elevation Range (m)								Total	
		up to 3,000		3,001 - 4,000		4,001 - 5,000		> 5,000			
		No. of Lakes	Total Lake Area (ha)	No. of Lakes	Total Lake Area (ha)	No. of Lakes	Total Lake Area (ha)	No. of Lakes	Total Lake Area (ha)	No. of Lakes	Lake Area (ha)
1	0.25 - 0.5	0	0.00	21	6.90	486	173.33	772	272.07	1,279	452.30
2	0.5 - 1	0	0.00	17	12.44	426	305.22	714	506.38	1,157	824.04
3	1 - 5	0	0.00	12	33.16	659	1,465.56	928	2,010.22	1,599	3,508.94
4	5 - 10	1	9.87	5	34.15	137	967.00	172	1,173.87	315	2,184.89
5	10 - 50	0	0.00	7	136.90	128	2,392.37	164	3,408.94	299	5,938.21
6	> 50	0	0.00	0	0.00	19	2,071.42	39	5,705.32	58	7,776.74
Total		**1**	**9.87**	**62**	**223.55**	**1,855**	**7,374.90**	**2,789**	**13,076.80**	**4,707**	**20,685.12**

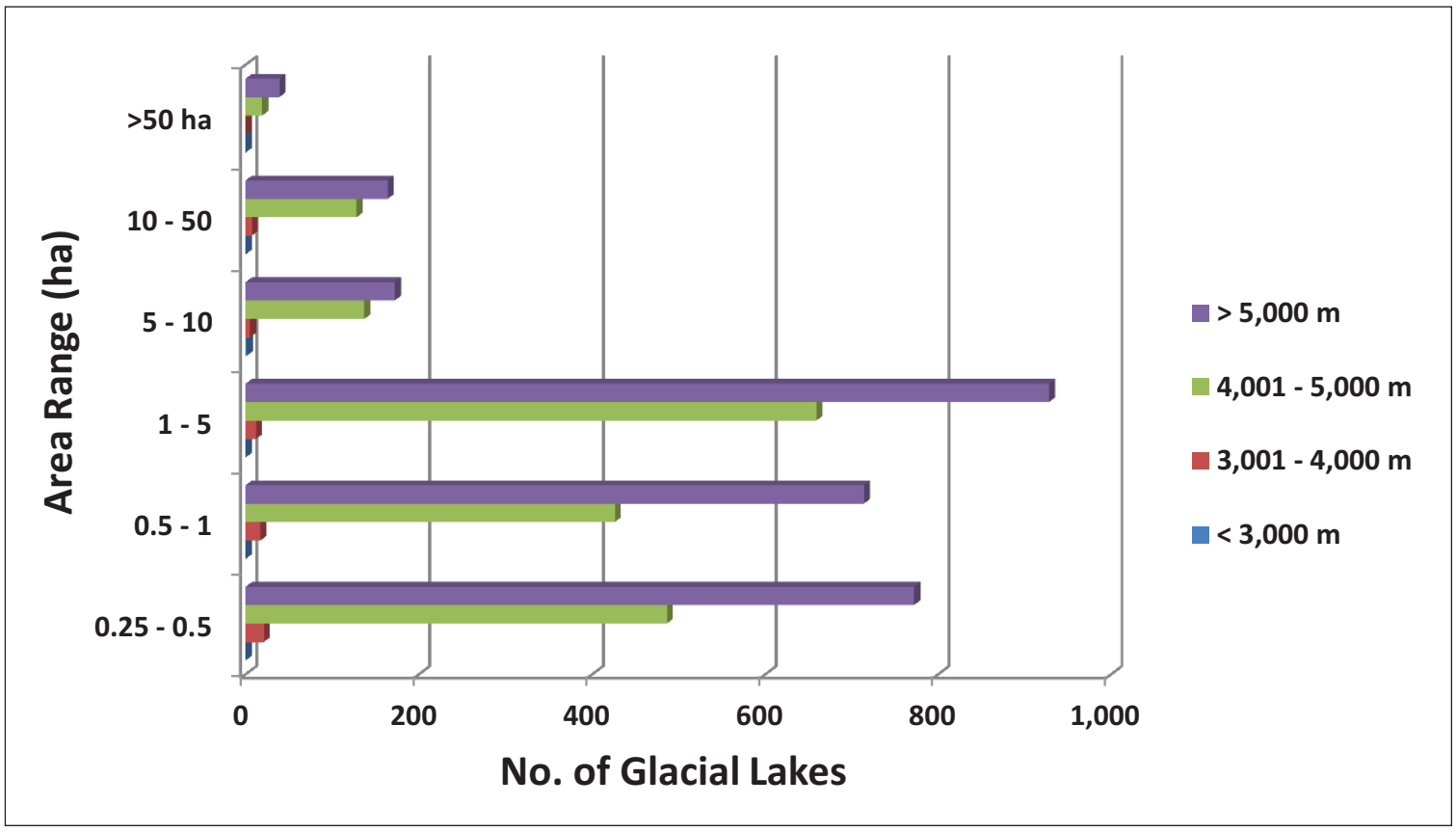


Figure 27: Area range-wise vs. Elevation range-wise distribution of GL in Ganga River basin

Type-Elevation range-wise Distribution

Glacial lake distribution has been analyzed as per type-wise vs. elevation range-wise, given in Table 23 and Figure 28. The dominant lake type in the Ganga River basin i.e., Other Glacial Erosion lakes (37.05%) are predominantly located in the elevation range of 4,001 - 5,000 m (52.18%). The two other dominant lake types, namely, Other Moraine Dammed and Supra-glacial lake are mostly distributed in both 4,001 - 5,000 m and > 5,000 m elevation ranges. 75.82% of Moraine-dammed glacial lakes, which constitute 44.81% of the total lakes, lies in the very high-altitude range of > 5,000 m amsl. Elevation range-type-wise distribution of glacial lakes has been represented in Figure 29.

Table 23: Type-wise vs. Elevation range-wise distribution of GL in Ganga River basin

S. No.	Elevation Range (m)	Types of Glacial Lake									Total
		M(e)	M(l)	M(lg)	M(o)	I(s)	I(d)	E(c)	E(o)	O	
1	up to 3,000	0	0	0	0	0	0	0	1	0	1
2	3,001 - 4,000	3	1	0	8	14	0	1	23	12	62
3	4,001 - 5,000	77	54	1	366	286	0	93	910	68	1,855
4	> 5,000	180	45	8	1,366	317	1	29	810	33	2,789
Total		**260**	**100**	**9**	**1,740**	**617**	**1**	**123**	**1,744**	**113**	**4,707**

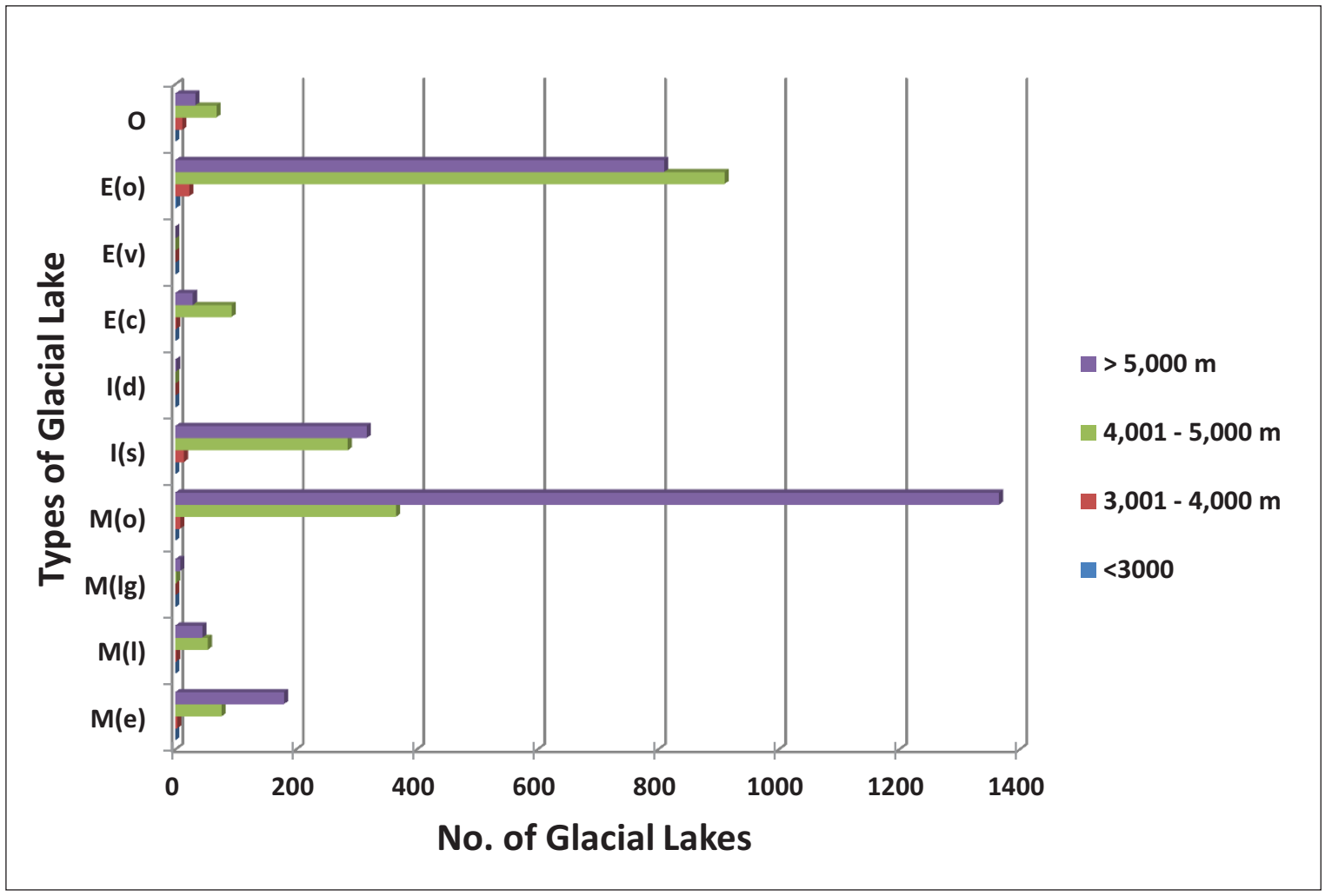


Figure 28: Type-wise vs. Elevation range-wise distribution of GL in Ganga River basin

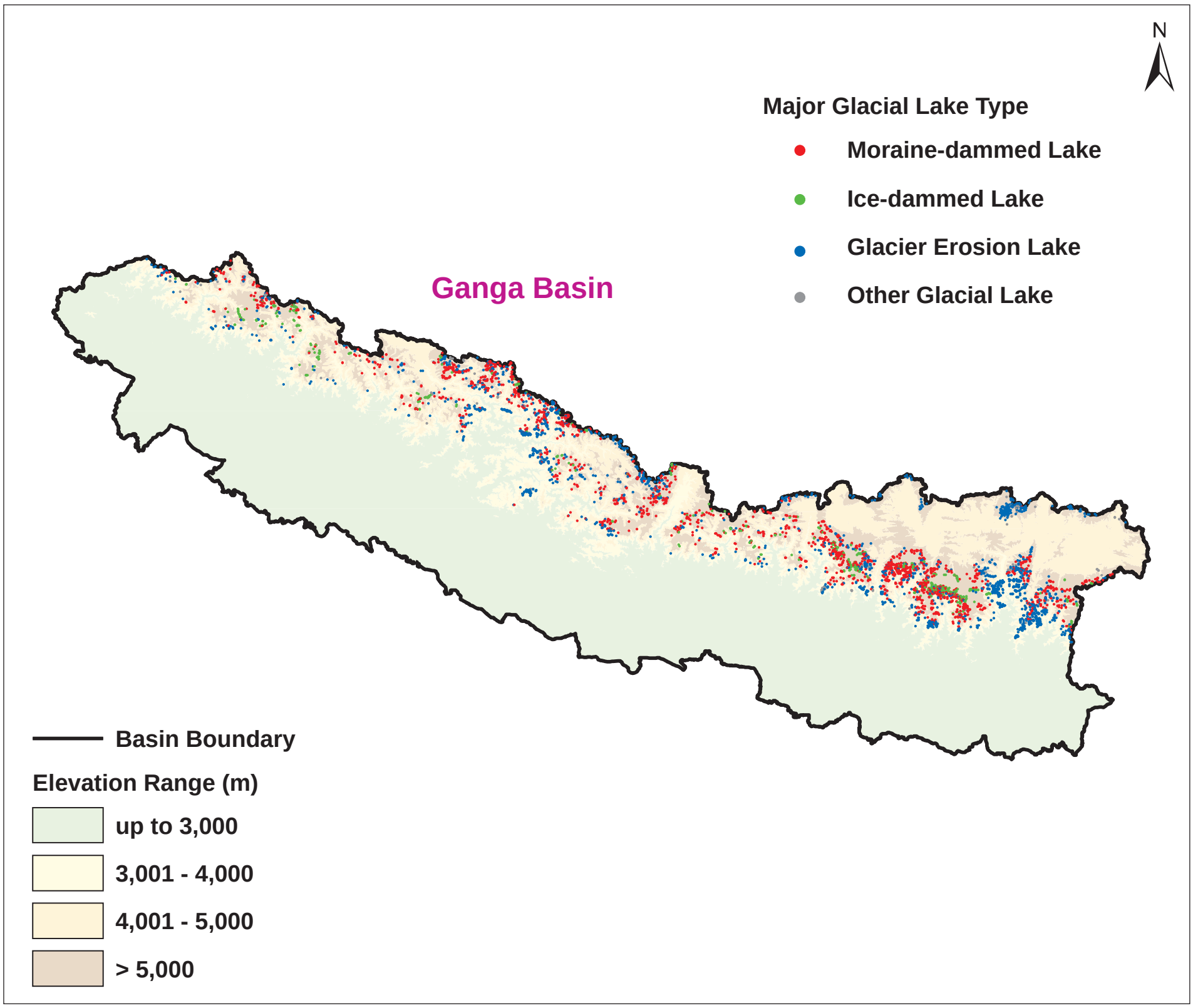


Figure 29: Elevation range-Type-wise spatial distribution of GL in Ganga River basin

5.2.3 Indus Basin

Indus River originates from Bokhar Chu (glacier) in northern slopes of Mt. Kailash (6,714 m) from the Tibet Autonomous Region of China (Husain, 2012; CWC, 2019). The Indus River follows a long and straight course in Ladakh region (flowing in northwest direction in India), running between the Ladakh and the Zaskar ranges. The gradient of the river is also gentle here. It forms a spectacular gorge near Gilgit (at Bunzi, north of Nanga Parbat Glacier) in Jammu & Kashmir. Downstream, the river passes by the Nanga Parbat Glacier, crossing the Himalayas, it turns into south-west and enters Pakistan near Chillar in the Dardistan region. Finally, the Indus River drains into the Arabian Sea near the port city of Karachi, Pakistan after forming a huge delta. It has a total length of 2,880 Km, of which 709 Km lies in India. The present study area extends from latitude 30.32° N to 37.09° N and from longitude 72.50° E to 82.45° E (Figure 30).

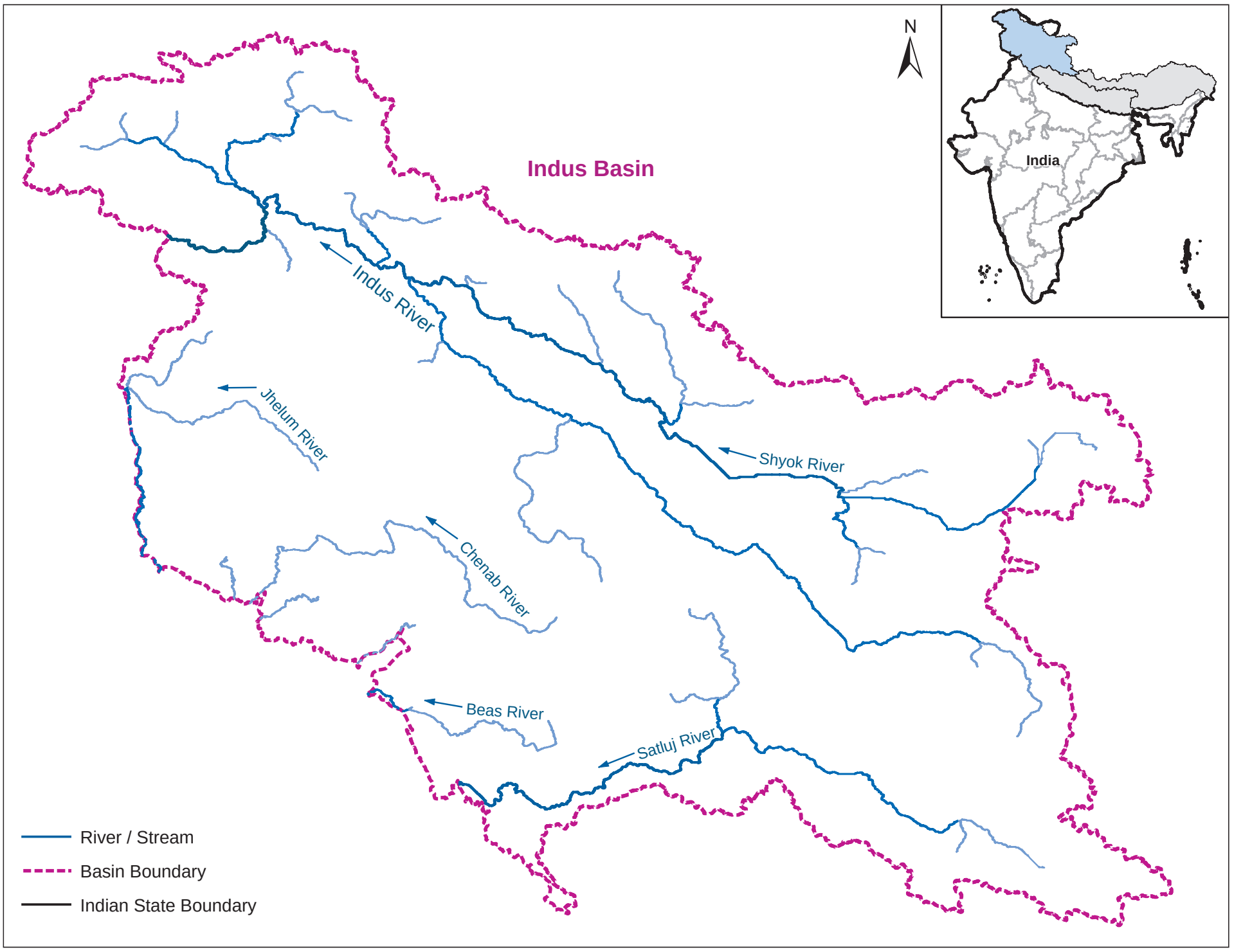


Figure 30: Location map of the Indus Basin

Area range-wise Distribution

A total of 5,335 glacial lakes (≥ 0.25 ha) were identified and mapped using RS-2 LISS-IV images for the entire Indus River basin, with a total lake water spread area of 17,395.03 ha. Table 24 and Figure 31 shows the area range-wise distribution of glacial lakes for the entire basin. About 4,633 (86.84%) lakes are with < 5 ha lake area contributing to 34.04% of total lake area. The remaining lakes with > 5 ha in size are 702 (13.16%) contributing to 65.96% of total lake area in the basin.

Table 24: Area range-wise distribution of Glacial Lakes (GL) in Indus River basin

S. No.	Lake Area Range (ha)	No. of Lakes	Total Lake Area	
			(ha)	(%)
1	0.25 - 0.5	1,378	496.93	2.86
2	0.5 - 1	1,239	877.42	5.04
3	1 - 5	2,016	4,546.28	26.14
4	5 - 10	381	2,647.29	15.22
5	10 - 50	287	5,302.84	30.48
6	> 50	34	3,524.27	20.26
Total		**5,335**	**17,395.03**	**100.00**

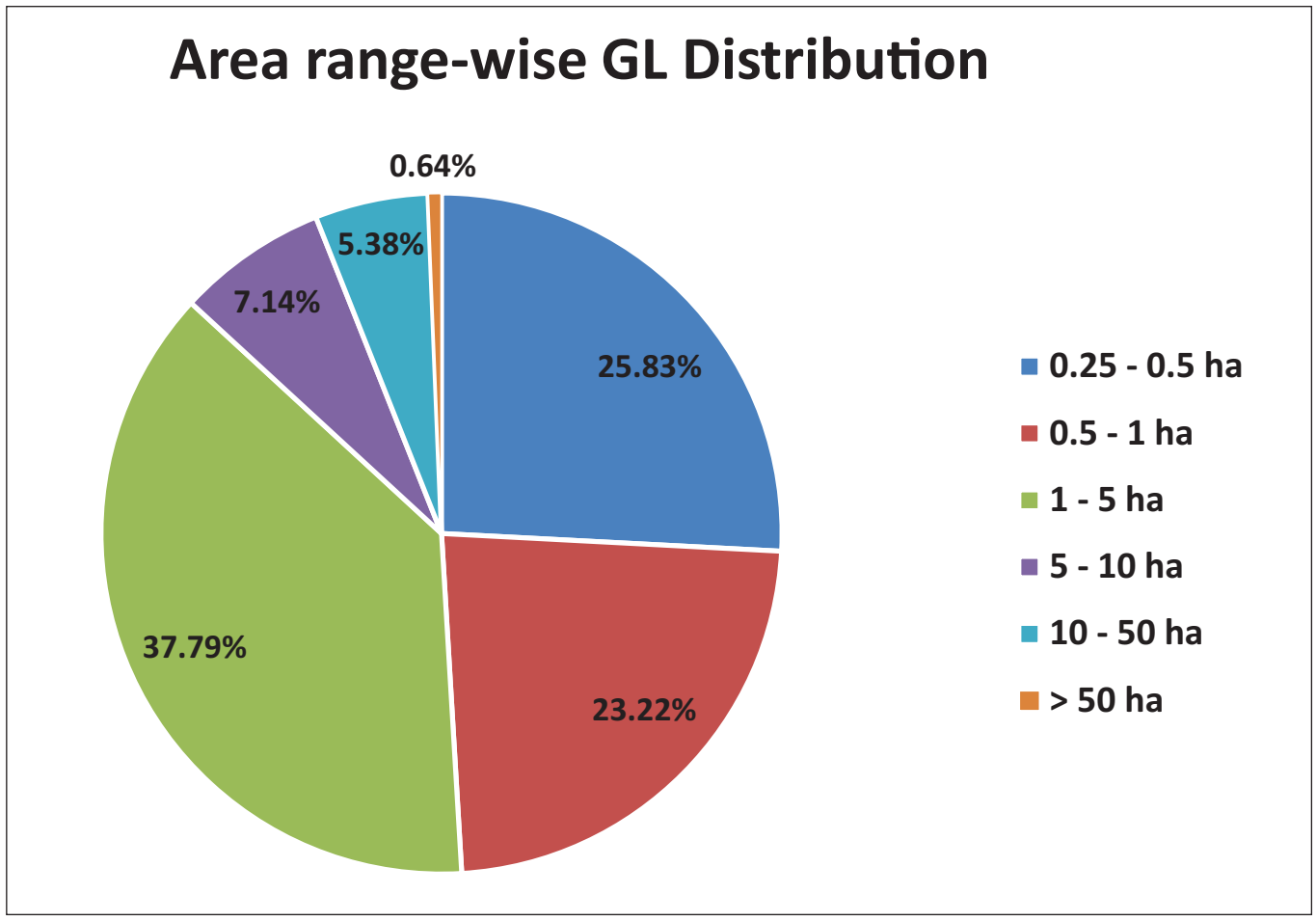


Figure 31: Area range-wise distribution of GL in Indus River basin

Type-wise Distribution

Distribution of different types of glacial lakes in the entire Indus River basin is given in Table 25 and Figure 32. Out of 10 types of glacial lakes, Other Glacial Erosion lakes are found to be the maximum with 2,516 (47.16%) occupying a total lake extent of 8,247.44 ha at 47.42% in the basin. Two other types of lake, namely, Other Moraine Dammed and Supra-glacial lake are 905 (16.96%) and 809 (15.16%), extend over an area of 1,212.40 ha (6.97%) and 609.05 ha (3.50%) respectively.

Table 25: Type-wise distribution of GL in Indus River basin

S. No.	Code	Types of Glacial Lake	No. of Lakes	Total Lake Area	
				(ha)	(%)
1	M(e)	End-moraine Dammed Lake	407	2,267.29	13.03
2	M(l)	Lateral Moraine Dammed Lake	225	317.59	1.83
3	M(lg)	Lateral Moraine Dammed Lake with Ice	45	111.92	0.64
4	M(o)	Other Moraine Dammed Lake	905	1,212.40	6.97
5	I(s)	Supra-glacial Lake	809	609.05	3.50
6	I(d)	Glacier Ice-dammed Lake	2	234.53	1.35
7	E(c)	Cirque Erosion Lake	220	1,971.43	11.33
8	E(v)	Glacier Trough Valley Erosion Lake	2	17.25	0.10
9	E(o)	Other Glacial Erosion Lake	2,516	8,247.44	47.42
10	O	Other Glacial Lake	204	2,406.12	13.83
Total			**5,335**	**17,395.03**	**100.00**

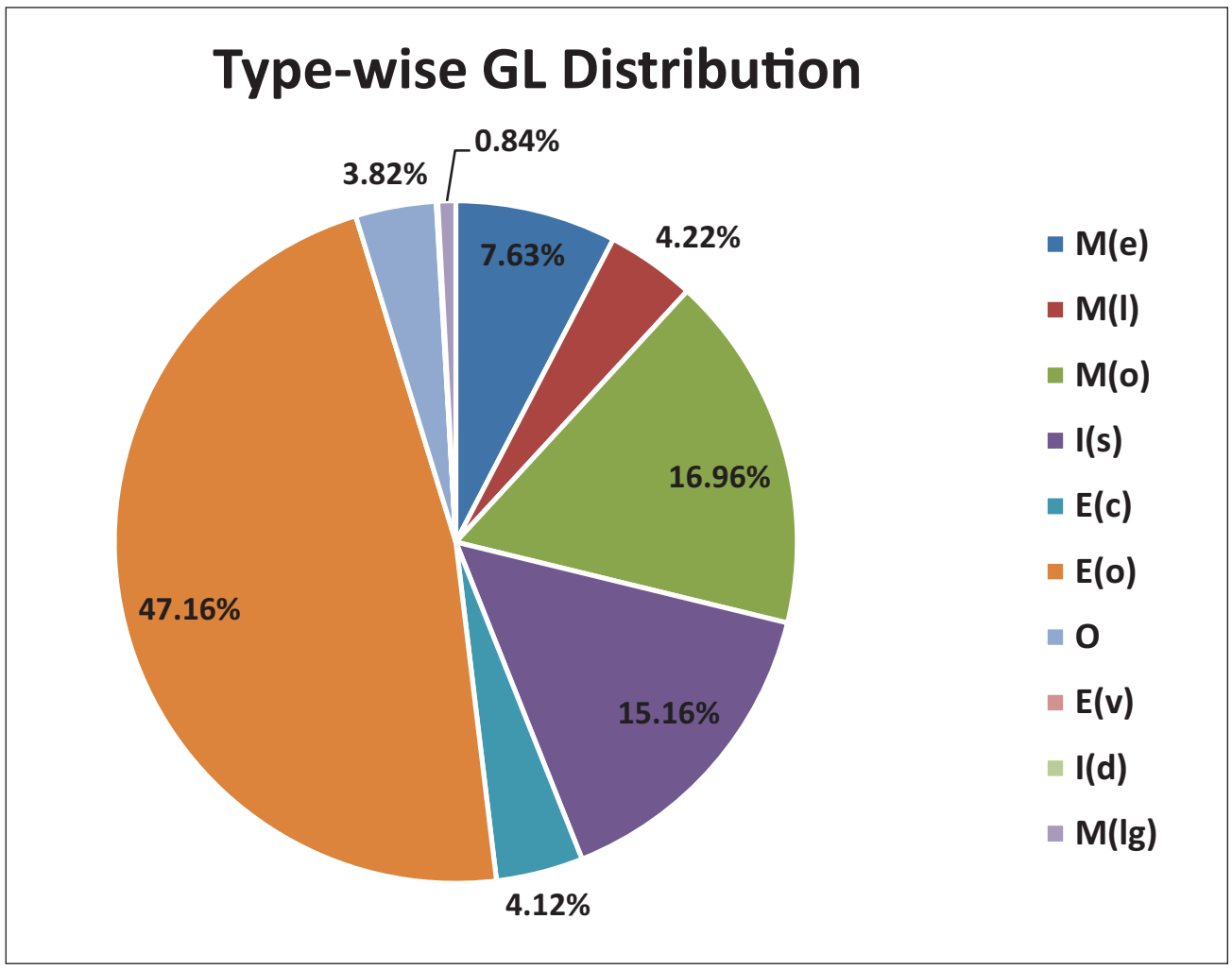


Figure 32: Type-wise distribution of GL in Indus River basin

Area range-Type-wise Distribution

Glacial lake distribution by area range vs. type-wise is given in Table 26 and Figure 33. The lakes with < 5 ha in size (86.84%) are dominant with Other Glacial Erosion Lake type (46.10%) followed by Other Moraine Dammed (18.80%) and Supra-glacial lake (17.20%). The lakes with > 5 ha (13.16%) are also dominated by Other Glacial Erosion lakes (54.10%) with remaining 9 types together contributing to 45.90%. All types of Moraine-dammed glacial lakes, which constitute about 29.64% are predominantly with < 5 ha in water spread.

Table 26: Area range-wise vs. Type-wise distribution of GL in Indus River basin

S. No.	Lake Area Range (ha)	Types of Glacial Lake										Total
		M(e)	M(l)	M(lg)	M(o)	I(s)	I(d)	E(c)	E(v)	E(o)	O	
1	0.25 - 0.5	49	74	13	333	432	0	7	0	431	39	1,378
2	0.5 - 1	44	69	5	261	263	0	14	0	528	55	1,239
3	1 - 5	200	71	22	276	102	1	103	1	1,177	63	2,016
4	5 - 10	60	6	3	27	10	0	47	0	215	13	381
5	10 - 50	49	5	2	7	2	0	44	1	156	21	287
6	> 50	5	0	0	1	0	1	5	0	9	13	34
Total		**407**	**225**	**45**	**905**	**809**	**2**	**220**	**2**	**2,516**	**204**	**5,335**

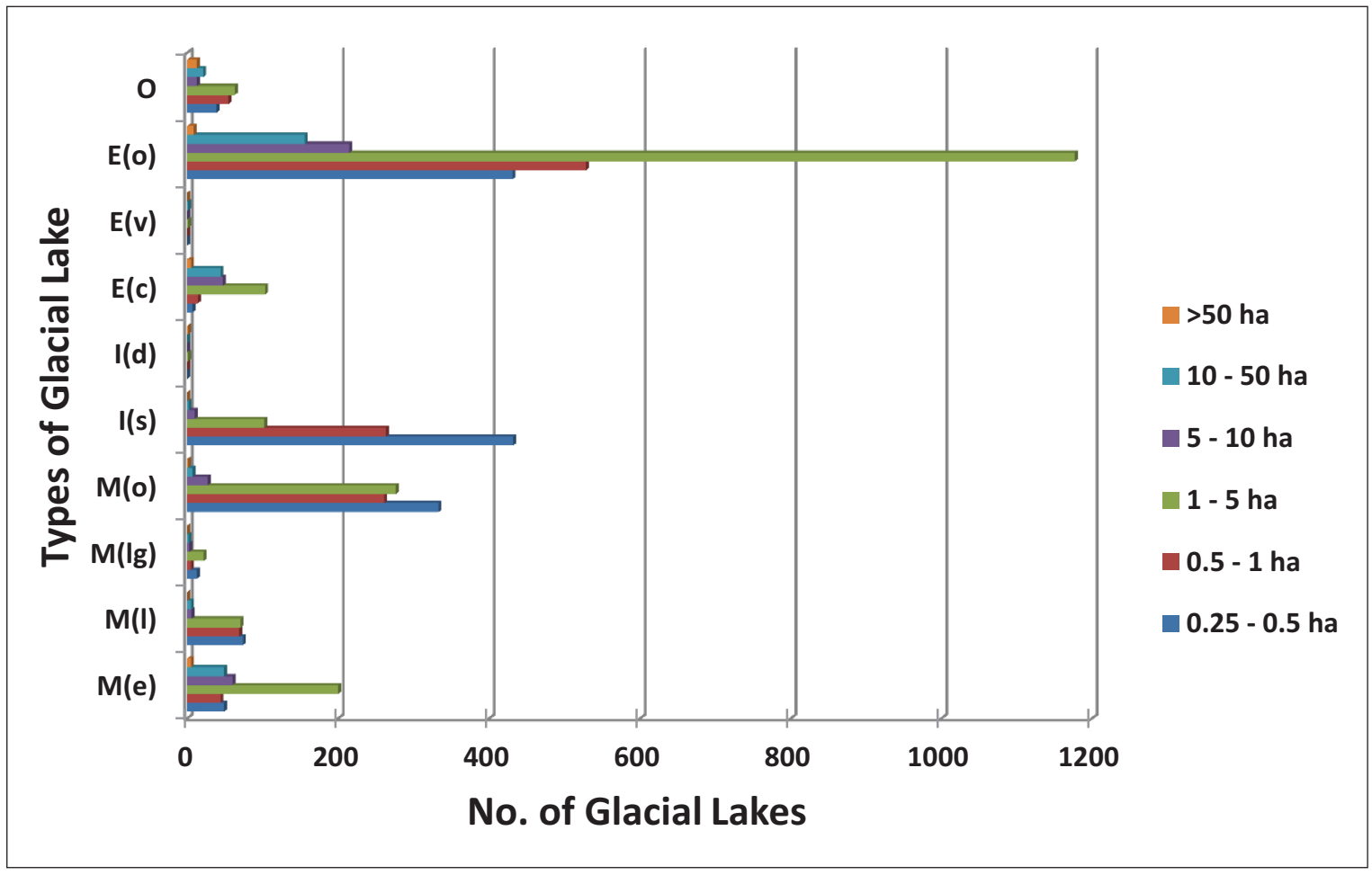


Figure 33: Area range-wise vs. Type-wise distribution of GL in Indus River basin

Elevation range-wise Distribution

Elevation ranges over the entire study area has been classified into four different categories viz., low altitude (up to 3,000 m), medium altitude (3,001 - 4,000 m), high altitude (4,001 - 5,000 m), and very high altitude (> 5,000 m). Table 27 and Figure 34 shows the distribution of the glacial lakes in the Indus basin as per elevation range-wise. Majority of glacial lakes are situated above 4,000 m elevation i.e. 4,657 (87.29% of the total lake count) with total lake area of 14,007.46 ha (80.53%) and remaining 12.71% glacial lakes are below 4,000 m elevation

Table 27: Elevation range-wise distribution of GL in Indus River basin

S. No.	Elevation Range (m)	No. of Lakes	Total Lake Area	
			(ha)	(%)
1	up to 3,000	21	47.70	0.27
2	3,001 - 4,000	657	3,339.87	19.20
3	4,001 - 5,000	2,797	8,301.35	47.73
4	> 5,000	1,860	5,706.11	32.80
Total		**5,335**	**17,395.03**	**100.00**

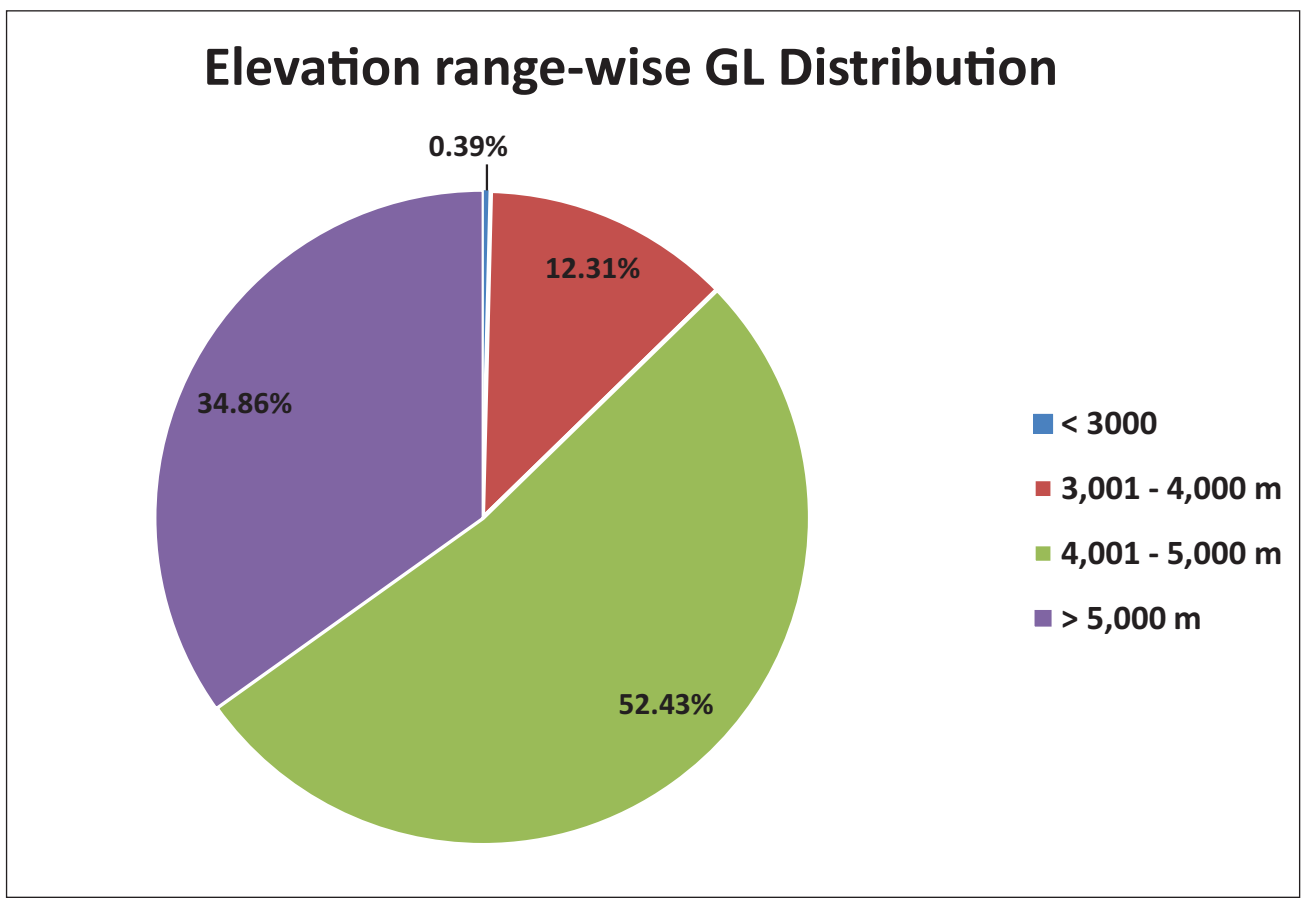


Figure 34: Elevation range-wise distribution of GL in Indus River basin

Area-Elevation range-wise Distribution

Glacial lake distribution has been analyzed as per area range vs. elevation range-wise, given in Table 28 and Figure 35. It is noted that, more than 50% of glacial lakes (2,797) are situated in high altitude range i.e. 4,001 - 5,000 m amsl, which also constitutes maximum total lake area within that range i.e. 47.73%. However, very few glacial lakes (only 21) lies up to 3,000 m amsl, has maximum of its lakes with 0.25 - 0.5 ha lake area range. Figure 35 shows that maximum of lakes lying-in high-altitude range is of size ranging 1 - 5 ha (i.e. 1,156), followed by lakes in very high altitude range within in 1 - 5 ha (i.e. 677).

Table 28: Area range-wise vs. Elevation range-wise distribution of GL in Indus River basin

S. No.	Lake Area Range (ha)	Elevation Range (m)								Total	
		up to 3,000		3,001 - 4,000		4,001 - 5,000		> 5,000			
		No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Lake Area (ha)
1	0.25 - 0.5	10	3.48	219	78.99	648	232.79	501	181.68	1,378	496.93
2	0.5 - 1	4	2.62	141	97.19	640	456.15	454	321.46	1,239	877.42
3	1 - 5	5	12.18	178	396.19	1,156	2,656.42	677	1,481.49	2,016	4,546.28
4	5 - 10	0	0.00	39	275.31	206	1,439.59	136	932.39	381	2,647.29
5	10 - 50	2	29.42	70	1,449.25	135	2,393.35	80	1,430.82	287	5,302.84
6	> 50	0	0.00	10	1,042.95	12	1,123.06	12	1,358.27	34	3,524.27
Total		**21**	**47.70**	**657**	**3,339.87**	**2,797**	**8,301.35**	**1,860**	**5,706.11**	**5,335**	**17,395.03**

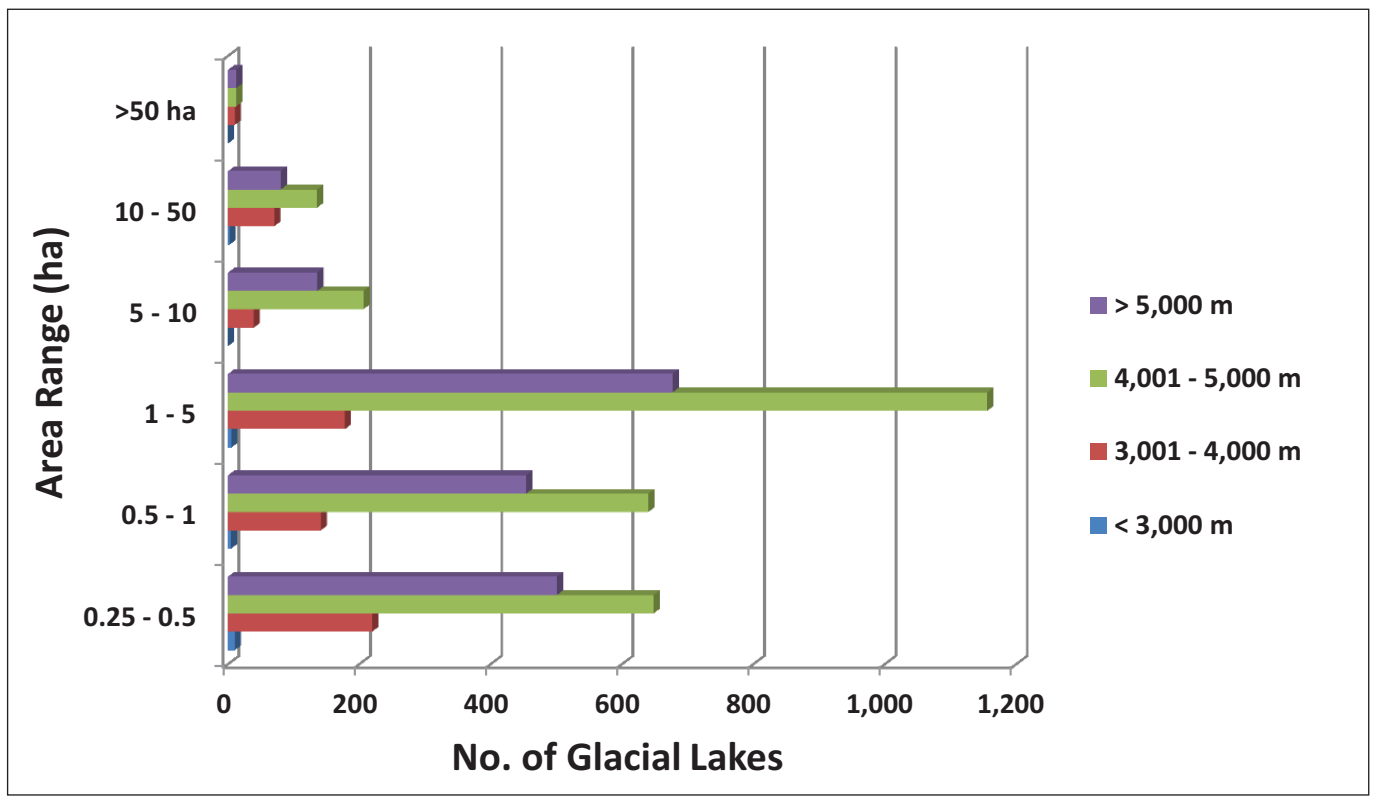


Figure 35: Area range-wise vs. Elevation range-wise distribution of GL in Indus River basin

Type-Elevation range-wise Distribution

Glacial lake distribution has been analyzed as per type-wise vs. elevation range-wise, given in Table 29 and Figure 36. The dominant lake type in the basin i.e., Other Glacial Erosion lakes (i.e. 47.16% in number and 47.41% in extent) are predominantly located in the elevation range of 4,001 - 5,000 m (64.67%). The two other dominant lake types, namely, Other Moraine Dammed and Supra-glacial lake are distributed in both 4,001 - 5,000 m and > 5,000 m elevation ranges. 56.26% of Moraine-dammed glacial lakes, which constitute 29.65% of the total lakes, lies in the very high-altitude range of > 5,000 m amsl. Elevation range-type-wise distribution of glacial lakes has been represented in Figure 37.

Table 29: Type-wise vs. Elevation range-wise distribution of GL in Indus River basin

S. No.	Elevation Range (m)	Types of Glacial Lake										Total
		M(e)	M(l)	M(lg)	M(o)	I(s)	I(d)	E(c)	E(v)	E(o)	O	
1	up to 3,000	2	1	0	6	11	0	0	0	0	1	21
2	3,001 - 4,000	20	34	0	41	240	0	48	1	246	27	657
3	4,001 - 5,000	102	128	13	345	396	0	125	1	1,627	60	2,797
4	> 5,000	283	62	32	513	162	2	47	0	643	116	1,860
Total		**407**	**225**	**45**	**905**	**809**	**2**	**220**	**2**	**2,516**	**204**	**5,335**

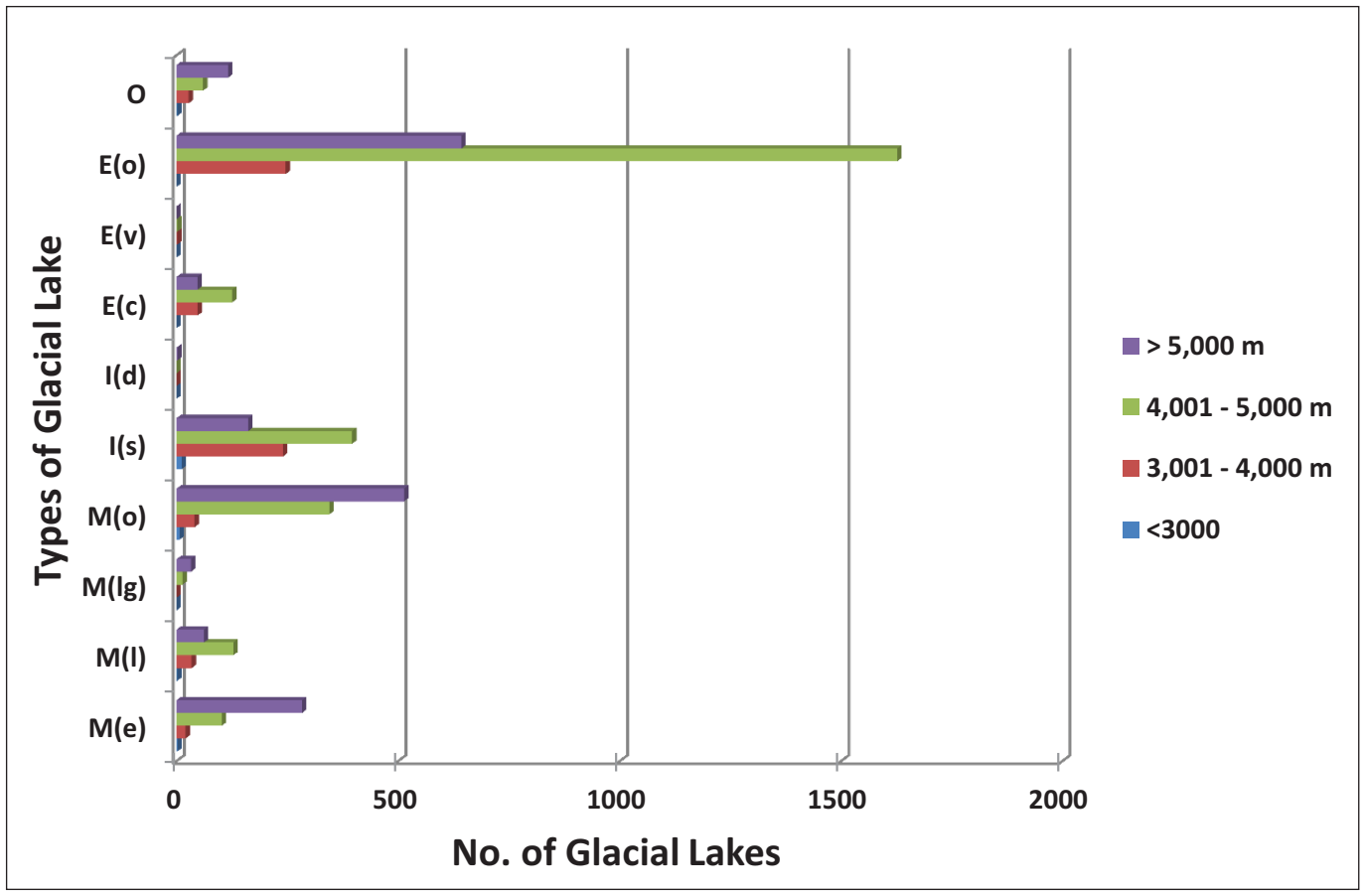


Figure 36: Type-wise vs. Elevation range-wise distribution of GL in Indus River basin

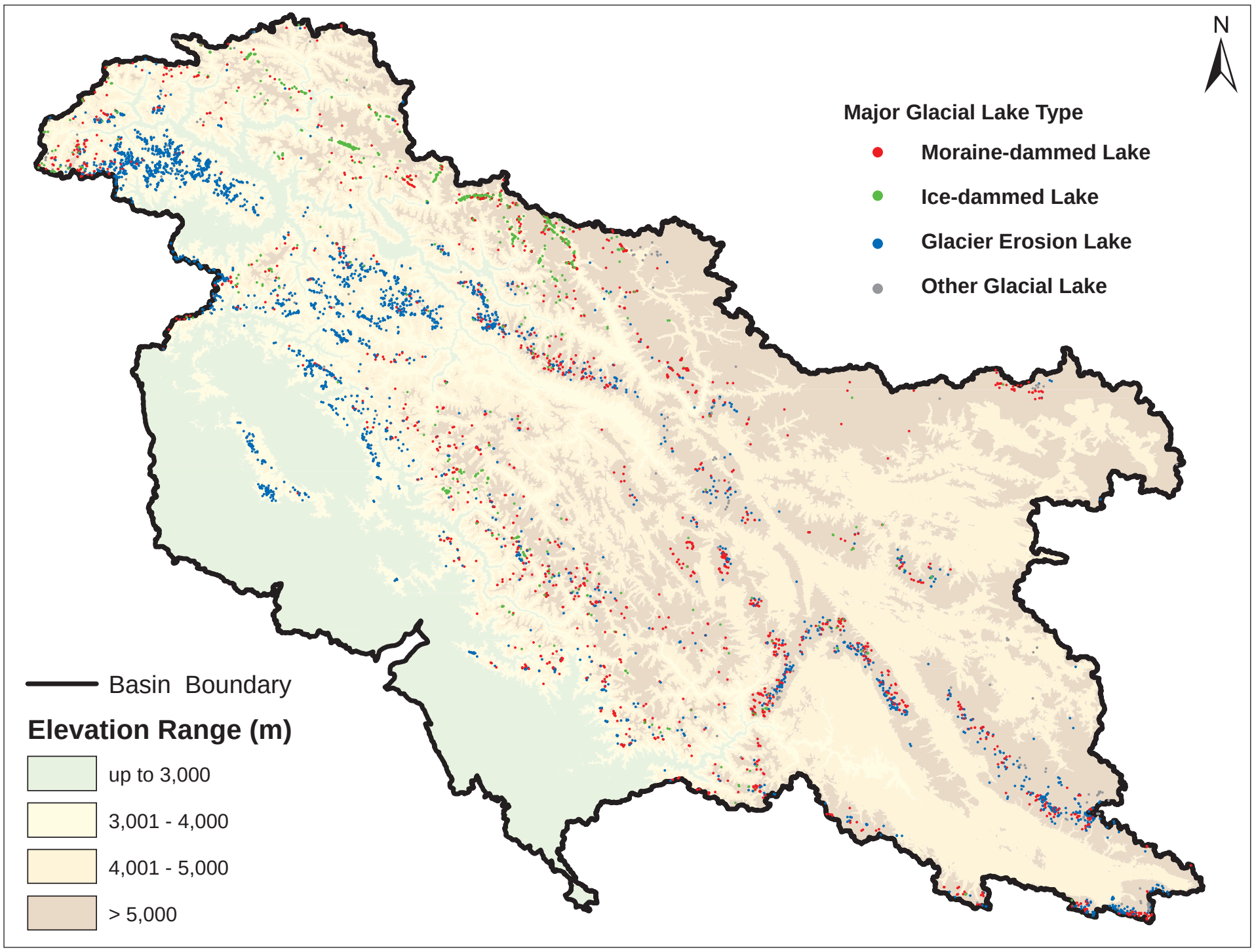


Figure 37: Elevation range-Type-wise spatial distribution of GL in Indus River basin

5.3 Inter Comparison of Basins

Glacial lakes in all the three basins namely Brahmaputra, Ganga, and Indus River basin are compared for number of glacial lakes, total lake area, lake types and their elevation ranges in the following sections.

Basin-wise Distribution

Table 30 shows the basin-wise distribution of number of glacial lakes and their water spread area for the Indian Himalayan River Basins. Figure 38 shows the basin-wise distribution of number of glacial lakes for the Indian Himalayan River Basins. Lakes are predominantly distributed in Brahmaputra basin (64.19%) followed by Indus basin (19.02%), occupying a total lake extent of 92,990.74 ha and 17,395.03 ha respectively.

Table 30: Basin-wise distribution of GL in Indian Himlayan River Basins

S. No.	Basin	No. of Lakes	Total Lake Area	
			(ha)	(%)
1	Brahmaputra	18,001	92,990.74	70.95
2	Ganga	4,707	20,685.12	15.78
3	Indus	5,335	17,395.03	13.27
Total		**28,043**	**1,31,070.90**	**100.00**

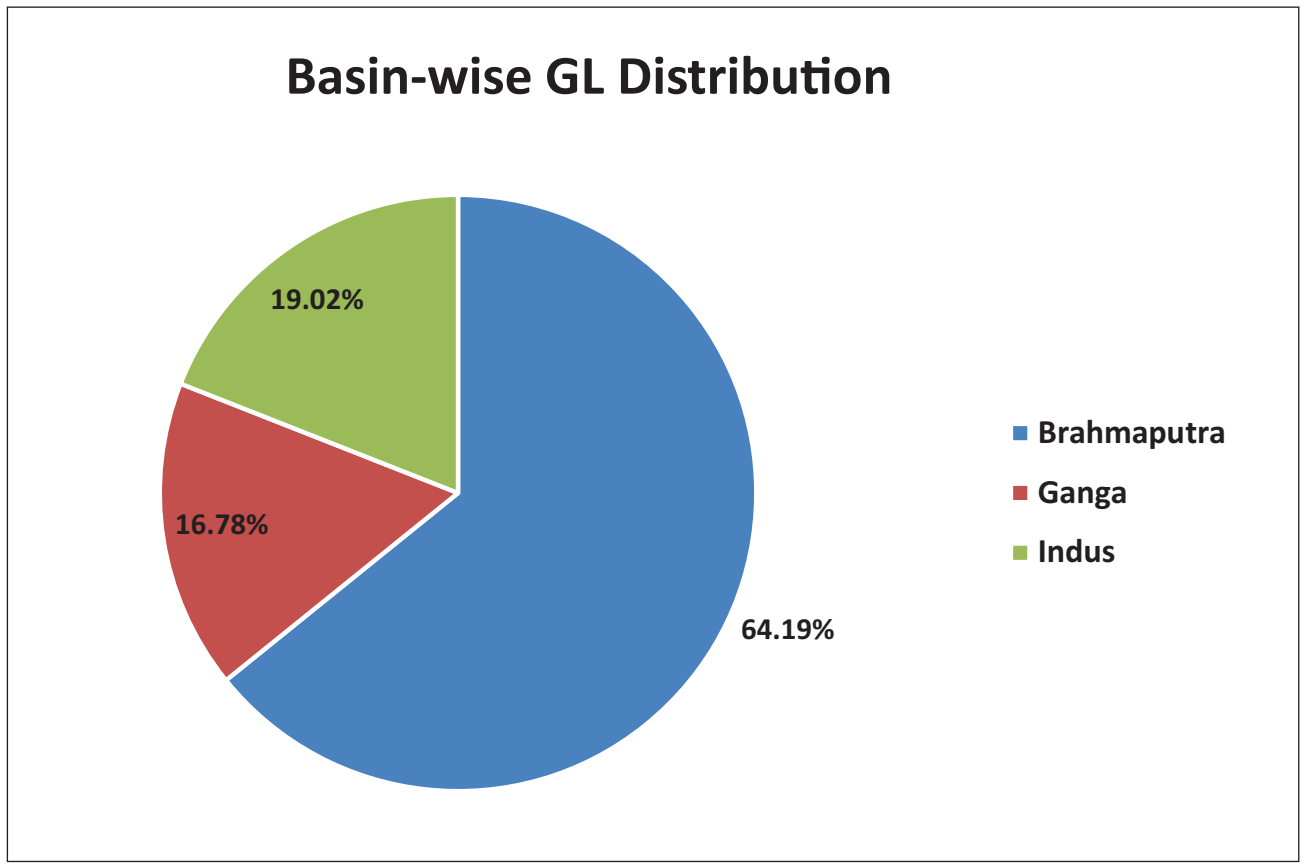


Figure 38: Basin-wise distribution of GL in Indian Himlayan River Basins

Basin-Area range-wise Distribution

Glacial lakes have been distributed in all basins for 6 classes of area ranges. Table 31 and Figure 39 shows basin-area range-wise distribution of glacial lakes for the Indian Himalayan River Basins. All basins contain glacial lakes in all area ranges. Majority of lakes > 50 ha i.e. 207 are found to be situated in Brahmaputra basin.

Table 31: Basin-wise vs. Area range-wise distribution of GL in Indian Himalayan River Basins

S. No.	Basin	Lake Area Range (ha)											
		0.25 - 0.5		0.5 - 1		1 - 5		5 - 10		10 - 50		> 50	
		No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Lake Area (ha)
1	Brahmaputra	3,627	1,294.83	3,856	2,771.84	7,016	16,315.71	1,749	12,348.79	1,546	30,040.25	207	30,219.32
2	Ganga	1,279	452.30	1,157	824.04	1,599	3,508.94	315	2,184.89	299	5,938.21	58	7,776.74
3	Indus	1,378	496.93	1,239	877.42	2,016	4,546.28	381	2,647.29	287	5,302.84	34	3,524.27
Total		**6,284**	**2,244.06**	**6,252**	**4,473.30**	**10,631**	**24,370.94**	**2,445**	**17,180.97**	**2,132**	**41,281.30**	**299**	**41,520.33**

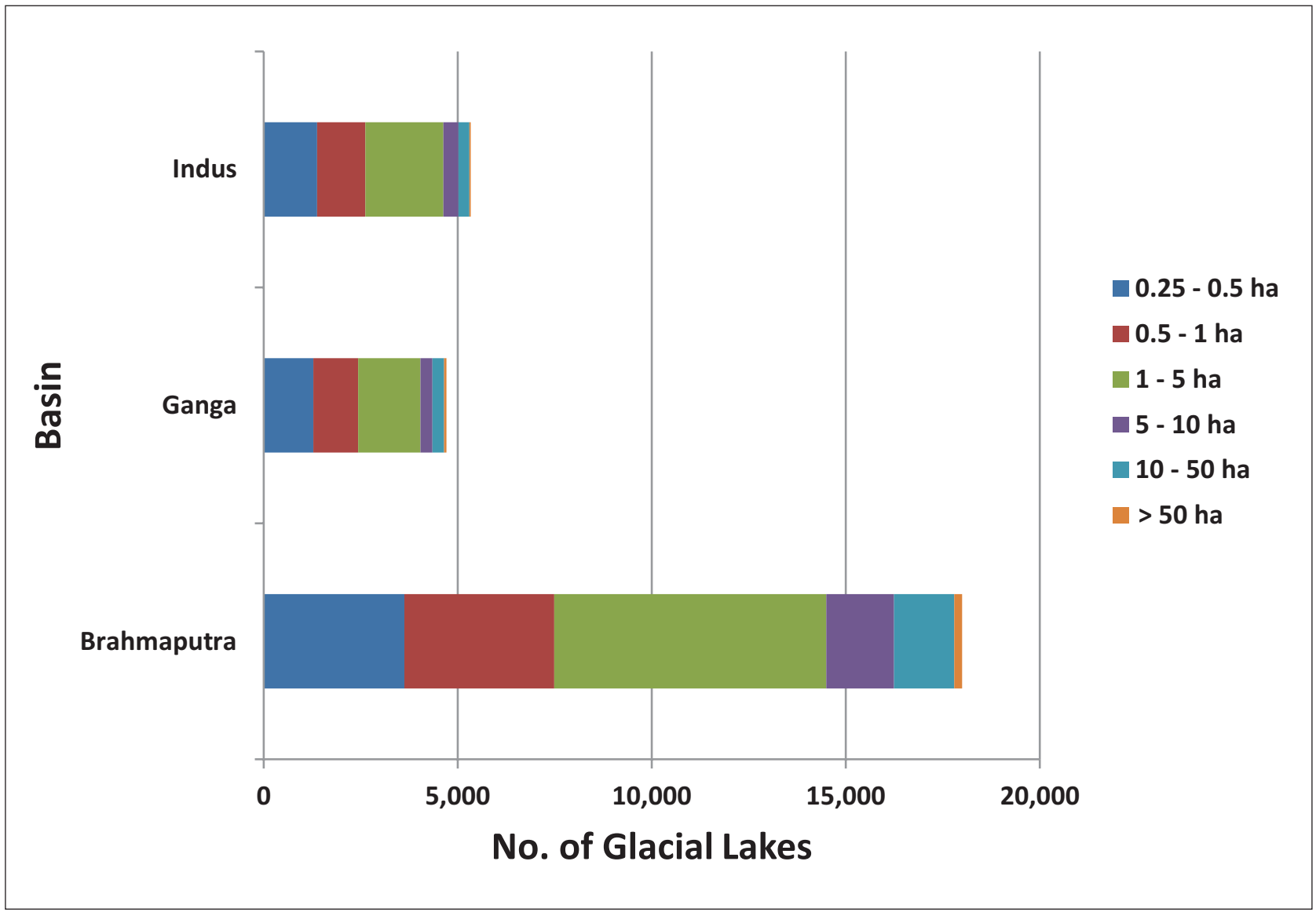


Figure 39: Basin-wise vs. Area range-wise distribution of GL in Indian Himalayan River Basins

Basin-Type-wise Distribution

Glacial lake distribution by basin vs. type-wise is given in Table 32 and Figure 40. It has been observed that, in descending order of total lake count, 3 types of lakes viz., Other Glacial Erosion, Other Moraine Dammed, and Other glacial lakes are distributed in all basins, and their total is found predominantly in Brahmaputra (58.28%), Indus (12.92%), and Ganga (12.82%) basin respectively. Indus basin consists higher number of Supra-glacial lakes i.e. 47.64%. Glacier Trough Valley Erosion Lake are not present in Ganga basin.

Table 32: Basin-wise vs. Type-wise distribution of GL in Indian Himalayan River Basins

S. No.	Basin	Types of Glacial Lake										Total
		M(e)	M(l)	M(lg)	M(o)	I(s)	I(d)	E(c)	E(v)	E(o)	O	
1	Brahmaputra	391	38	2	3,019	272	2	943	7	11,846	1,481	18,001
2	Ganga	260	100	9	1,740	617	1	123	0	1,744	113	4,707
3	Indus	407	225	45	905	809	2	220	2	2,516	204	5,335
Total		**1,058**	**363**	**56**	**5,664**	**1,698**	**5**	**1,286**	**9**	**16,106**	**1,798**	**28,043**

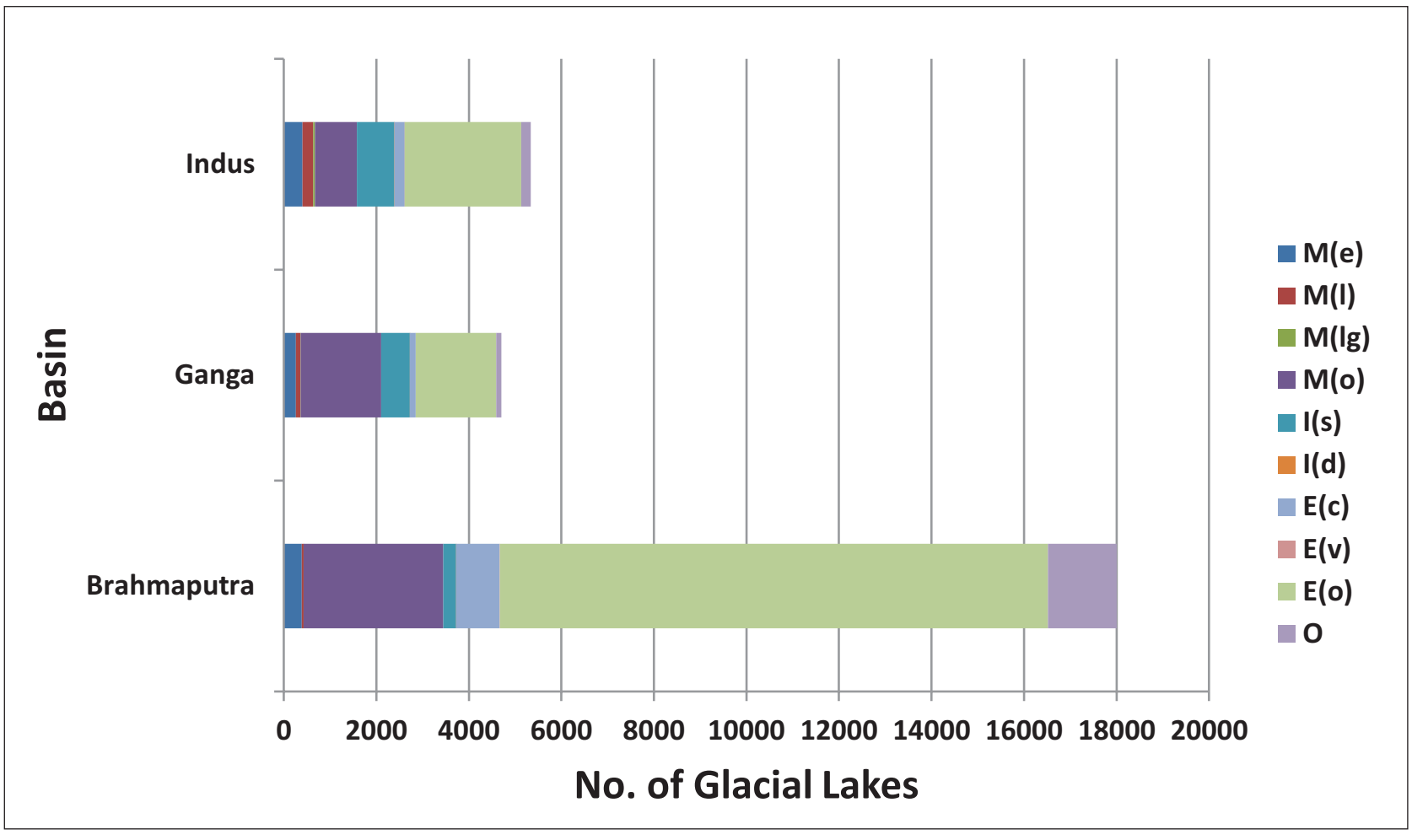


Figure 40: Basin-wise vs. Type-wise distribution of GL in Indian Himalayan River Basins

Basin-Elevation range-wise Distribution

Glacial lake distribution has been analyzed as per basin vs. elevation-range wise, given in Table 33 and Figure 41. Majority of glacial lakes are situated in all basins in high altitude range i.e. 4,001 - 5,000 m. After that, majority of glacial lakes in all basins are located in very high and medium altitude range i.e. > 5,000 m and 3,001 - 4,000 m. Only 33 lakes are located in all the basins in the elevation range < 3,000 m.

Table 33: Basin-wise vs. Elevation range-wise distribution of GL in Indian Himalayan River Basins

S. No.	Basin	Elevation Range (m)							
		up to 3,000		3,001 - 4,000		4,001 - 5,000		> 5,000	
		No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)
1	Brahmaputra	11	152.21	1,188	11,547.28	9,670	52,525.25	7,132	28,765.99
2	Ganga	1	9.87	62	223.55	1,855	7,374.89	2,789	13,076.81
3	Indus	21	47.70	657	3,339.87	2,797	8,301.35	1,860	5,706.11
Total		**33**	**209.78**	**1,907**	**15,110.70**	**14,322**	**68,201.49**	**11,781**	**47,548.91**

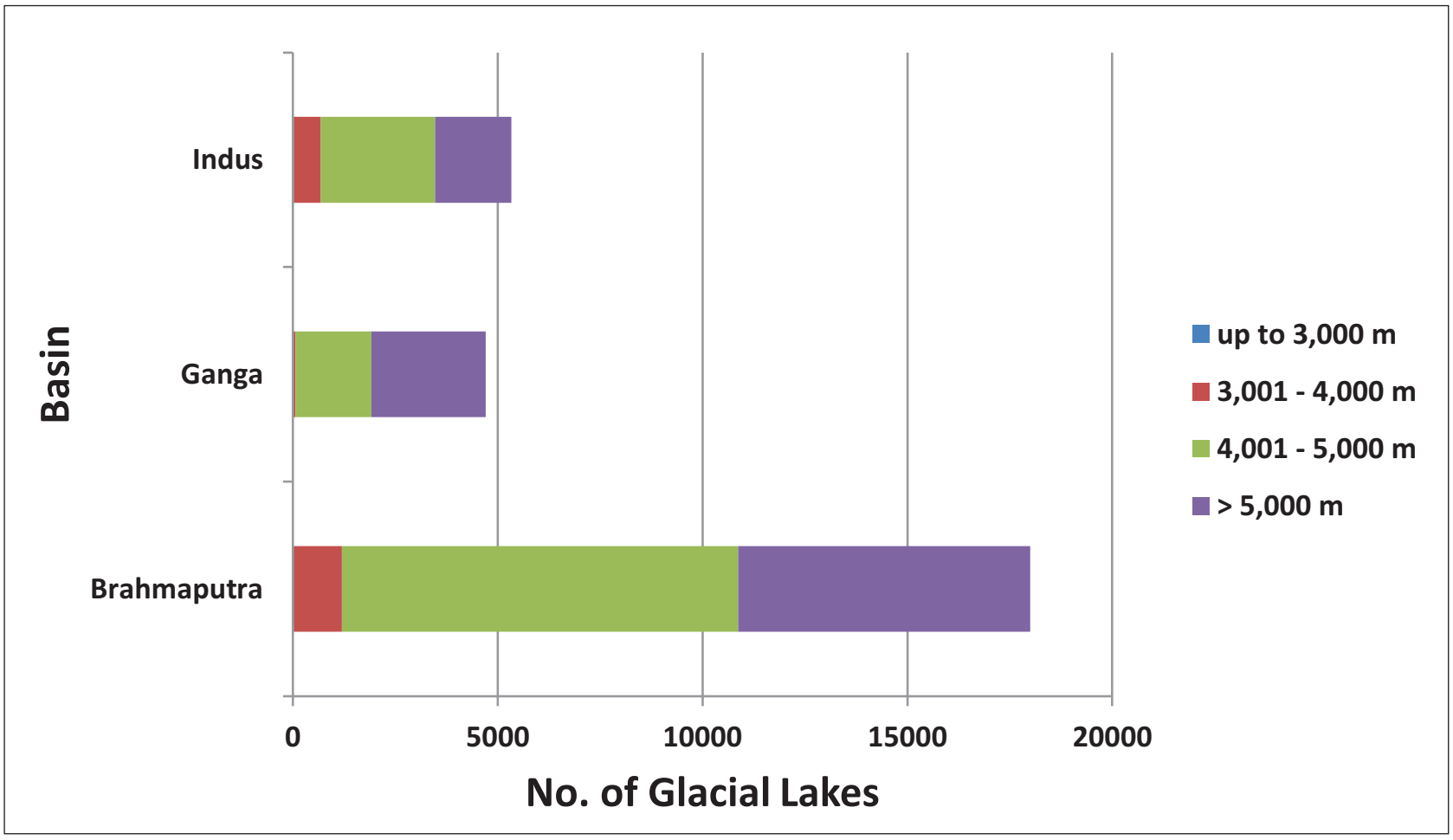


Figure 41: Basin-wise vs. Elevation range-wise distribution of GL in Indian Himalayan River Basins

5.4 India Level Statistics

Indian Himalayan River Basins covers part of India and transboundary region, where in India it is covering a total area of 3,83,880 Km^2 i.e. 38.78% of the catchment area. In India, catchment area has been spread in four states viz., Arunachal Pradesh, Sikkim, Himachal Pradesh, Uttarakhand and two union territories (UT's) viz., Jammu & Kashmir and Ladakh respectively. A total of 7,570 glacial lakes lies within Indian region, covering a total area of 30,148.53 ha.

Area Range-wise Distribution

In Indian region, glacial lakes have been distributed in all 6 classes of area ranges. Table 34 and Figure 42 shows the area range-wise distribution of glacial lakes for the Indian region. About 6,204 (81.96%) lakes are with < 5 ha lake area contributing to 27.95% of total lake area. The remaining lakes with > 5 ha in size are 1,366 (18.04%) but contributing to 72.05% of total lake area in the region.

Table 34: Area range-wise distribution of GL in India

S. No.	Lake Area Range (ha)	No. of Lakes	Total Lake Area	
			(ha)	(%)
1	0.25 - 0.5	1,736	620.24	2.06
2	0.5 - 1	1,606	1,143.71	3.79
3	1 - 5	2,862	6,662.04	22.10
4	5 - 10	712	5,026.33	16.67
5	10 - 50	596	11,428.48	37.91
6	> 50	58	5,267.70	17.47
Total		**7,570**	**30,148.53**	**100.00**

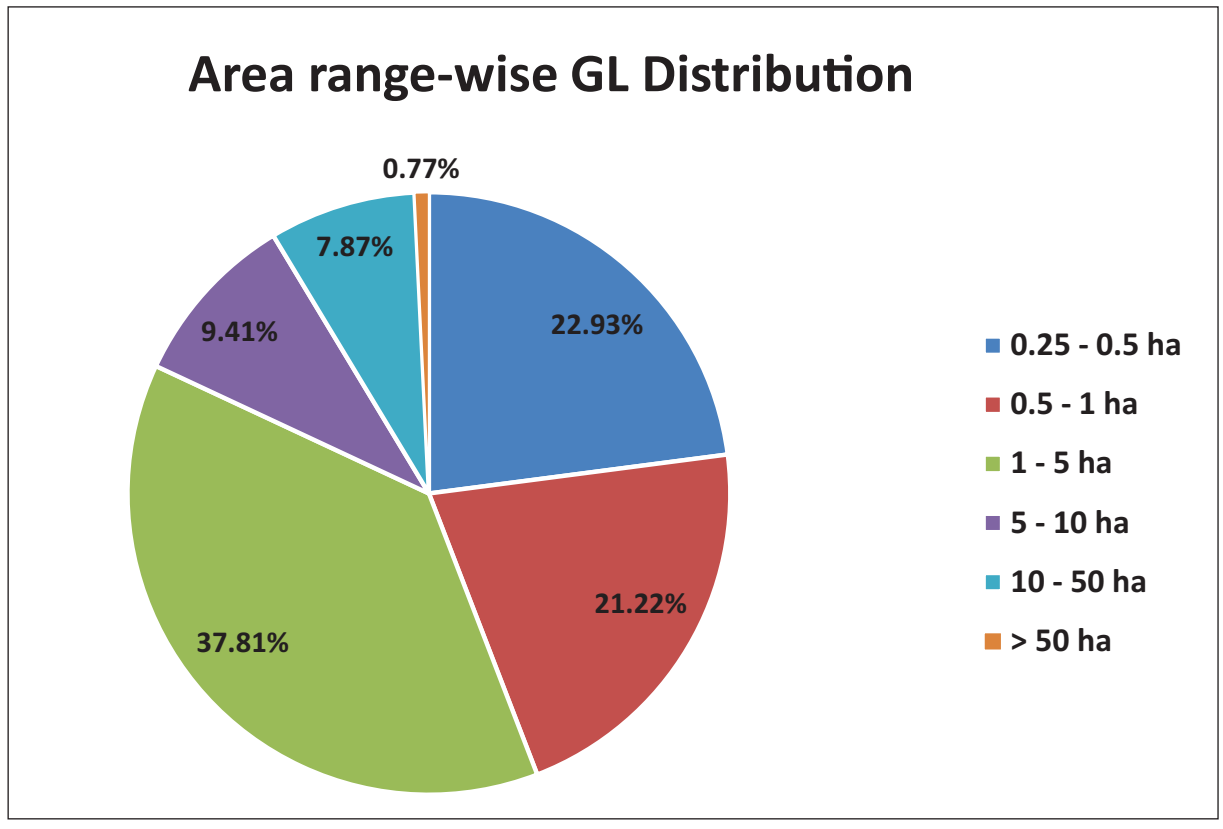


Figure 42: Area range-wise distribution of GL in India

Type-wise Distribution

Distribution of different types of glacial lakes in the Indian region is given in Table 35 and Figure 43. All 10 different types of glacial lakes are present in the Indian region, where Other Glacial Erosion lakes are found to be the maximum with 4,288 (56.64%) occupying a total lake extent of 16,240.17 ha at 53.87% in the region. After that, Other Moraine Dammed Lakes and Supra-glacial Lake are in majority with 973 (12.85%) and 939 (12.40%) and extend over a total area of 2,194.51 ha (7.28%) and 700.78 ha (2.32%) respectively.

Table 35: Type-wise distribution of GL in India

S. No.	Code	Types of Glacial Lake	No. of Lakes	Total Lake Area	
				(ha)	(%)
1	M(e)	End-moraine Dammed Lake	344	3,135.38	10.40
2	M(l)	Lateral Moraine Dammed Lake	236	356.05	1.18
3	M(lg)	Lateral Moraine Dammed Lake with Ice	30	65.88	0.22
4	M(o)	Other Moraine Dammed Lake	973	2,194.51	7.28
5	I(s)	Supra-glacial Lake	939	700.78	2.32
6	I(d)	Glacier Ice-dammed Lake	1	2.19	0.01
7	E(c)	Cirque Erosion Lake	539	4,951.41	16.42
8	E(v)	Glacier Trough Valley Erosion Lake	1	3.90	0.01
9	E(o)	Other Glacial Erosion Lake	4,288	16,240.17	53.87
10	O	Other Glacial Lake	219	2,498.26	8.29
Total			**7,570**	**30,148.53**	**100.00**

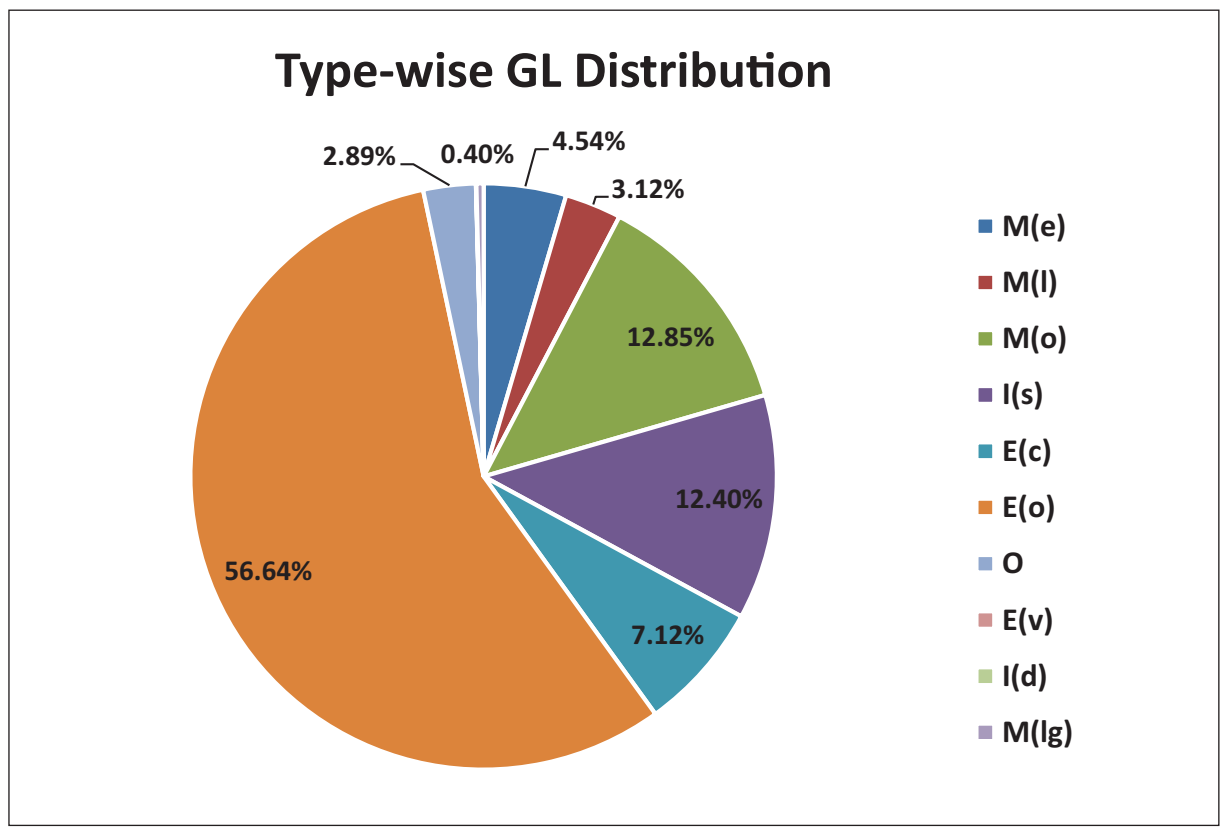


Figure 43: Type-wise distribution of GL in India

Area range-Type-wise Distribution

Glacial lake distribution by area range vs. type-wise is given in Table 36 and Figure 44. The lakes with < 5 ha in size (81.95%) are dominant with Other Glacial Erosion Lakes (56.09%) and Supra-glacial Lakes (14.87%). Lakes with > 5 ha (18.05%) are dominated by Other Glacial Erosion Lakes (61.05%). All types of Moraine-dammed lakes, which constitute about 20.91% are predominantly with < 5 ha in water spread.

Table 36: Area range-wise vs. Type-wise distribution of GL in India

S. No.	Lake Area Range (ha)	Types of Glacial Lake										Total
		M(e)	M(l)	M(lg)	M(o)	I(s)	I(d)	E(c)	E(v)	E(o)	O	
1	0.25 - 0.5	44	73	11	317	537	0	8	0	699	47	1,736
2	0.5 - 1	36	71	4	286	278	0	23	0	858	50	1,606
3	1 - 5	152	79	12	290	108	1	224	1	1,923	72	2,862
4	5 - 10	47	7	2	47	12	0	146	0	439	12	712
5	10 - 50	52	6	1	28	4	0	130	0	350	25	596
6	> 50	13	0	0	5	0	0	8	0	19	13	58
Total		**344**	**236**	**30**	**973**	**939**	**1**	**539**	**1**	**4,288**	**219**	**7,570**

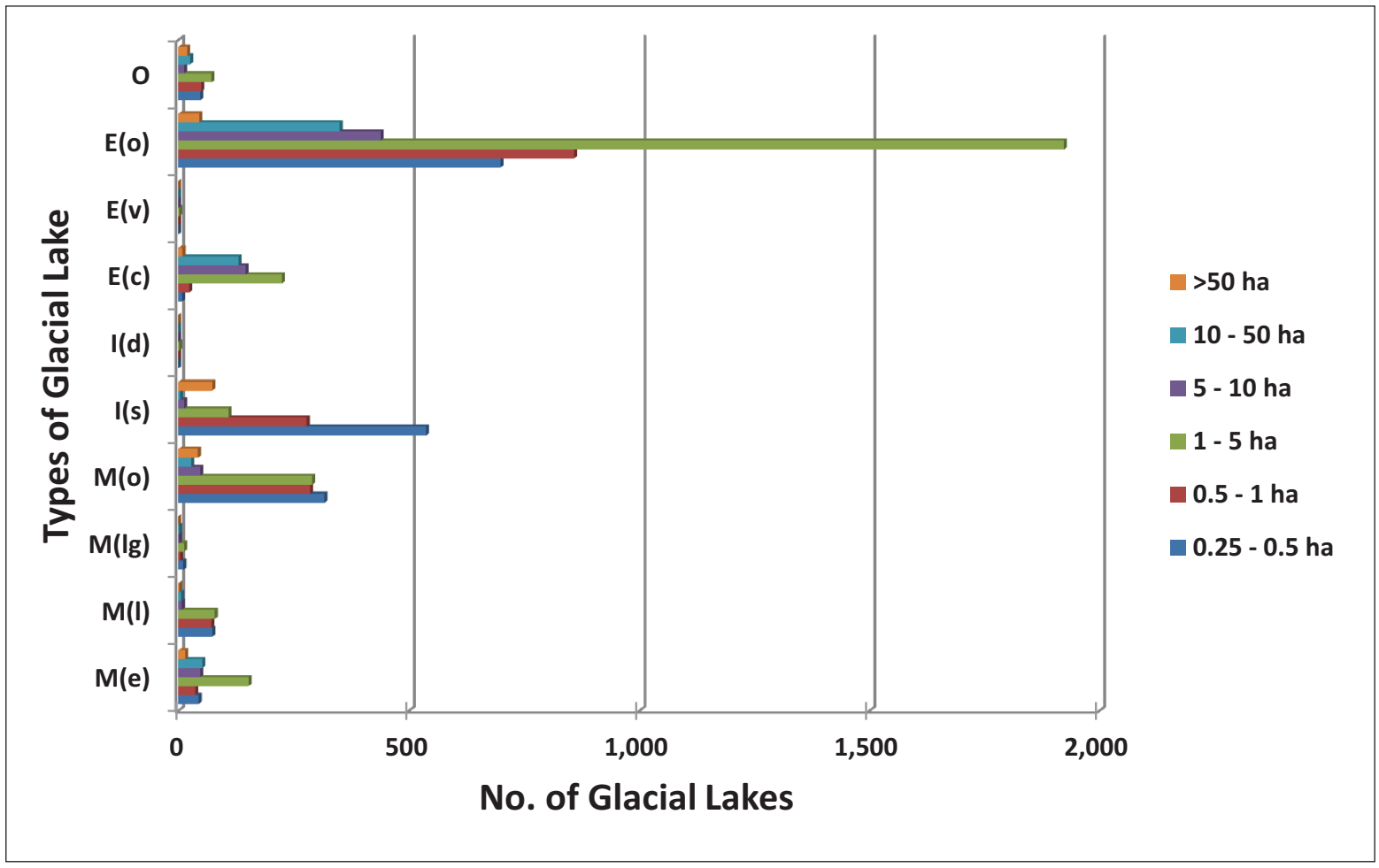


Figure 44: Area range-wise vs. Type-wise distribution of GL in India

Elevation range-wise Distribution

Elevation range-wise distribution of the glacial lakes in the Indian region has been shown in Table 37 and Figure 45. Majority of glacial lakes are situated above 4,000 m elevation range i.e. 6,113 (80.75%) with total lake area of 20,960.88 ha (69.52%) and remaining 19.25% glacial lakes are below 4,000 m elevation.

Table 37: Elevation range-wise distribution of GL in India

S. No.	Elevation Range (m)	No. of Lakes	Total Lake Area	
			(ha)	(%)
1	up to 3,000	25	92.43	0.31
2	3,001 - 4,000	1,432	9,095.22	30.17
3	4,001 - 5,000	4,720	16,247.11	53.89
4	> 5,000	1,393	4,713.77	15.64
Total		**7,570**	**30,148.53**	**100.00**

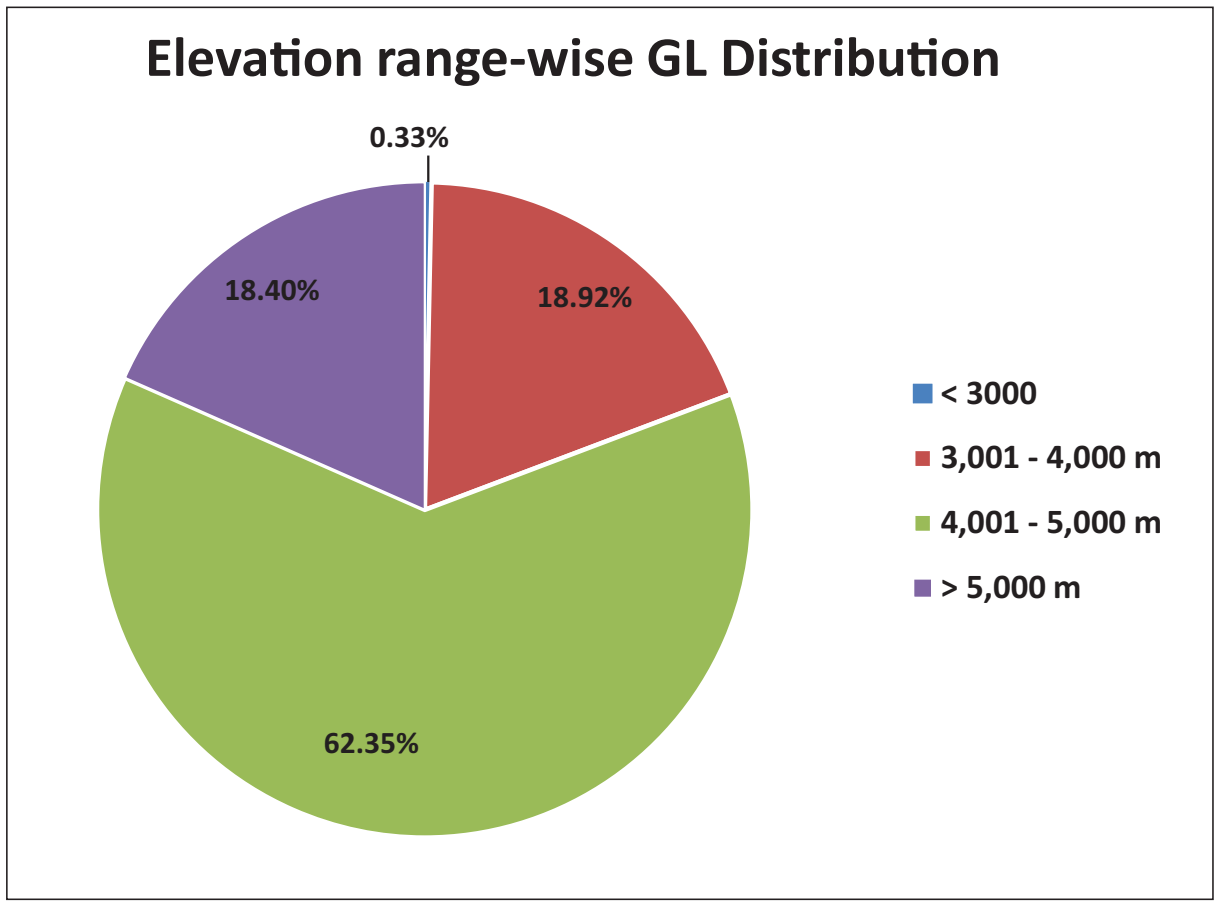


Figure 45: Elevation range-wise distribution of GL in India

Area-Elevation range-wise Distribution

Glacial lake distribution has been analyzed as per area range vs. elevation range-wise, given in Table 38 and Figure 46. It is noted that, 62.35% of glacial lakes (4,720) are situated in high altitude range i.e. 4,001 - 5,000 m, which also constitutes majority of total lake area within that range i.e. 53.89%. However, 25 glacial lakes lie below 3,000 m. 1,231 number of glacial lakes (88.37%) lying in very high altitude range are < 5 ha, predominantly of size ranging 1 – 5 ha (i.e. 451), followed by lakes of size 0.25 – 0.5 ha (i.e. 425).

Table 38: Area range-wise vs. Elevation range-wise distribution of GL in India

S. No.	Lake Area Range (ha)	Elevation Range (m)								Total	
		up to 3,000		3,001 - 4,000		4,001 - 5,000		> 5,000			
		No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Lake Area (ha)
1	0.25 - 0.5	10	3.48	272	98.56	1,029	367.40	425	150.80	1,736	620.24
2	0.5 - 1	4	2.62	221	157.64	1,026	734.48	355	248.97	1,606	1,143.71
3	1 - 5	6	16.89	514	1,239.00	1,891	4,411.74	451	994.41	2,862	6,662.04
4	5 - 10	0	0.00	188	1,354.05	431	3,018.56	93	653.74	712	5,026.33
5	10 - 50	5	69.44	216	4,388.03	322	5,937.65	53	1,033.38	596	11,428.48
6	> 50	0	0.00	21	1,857.95	21	1,777.28	16	1,632.48	58	5,267.70
Total		**25**	**92.43**	**1,432**	**9,095.22**	**4,720**	**16,247.11**	**1,393**	**4,713.77**	**7,570**	**30,148.53**

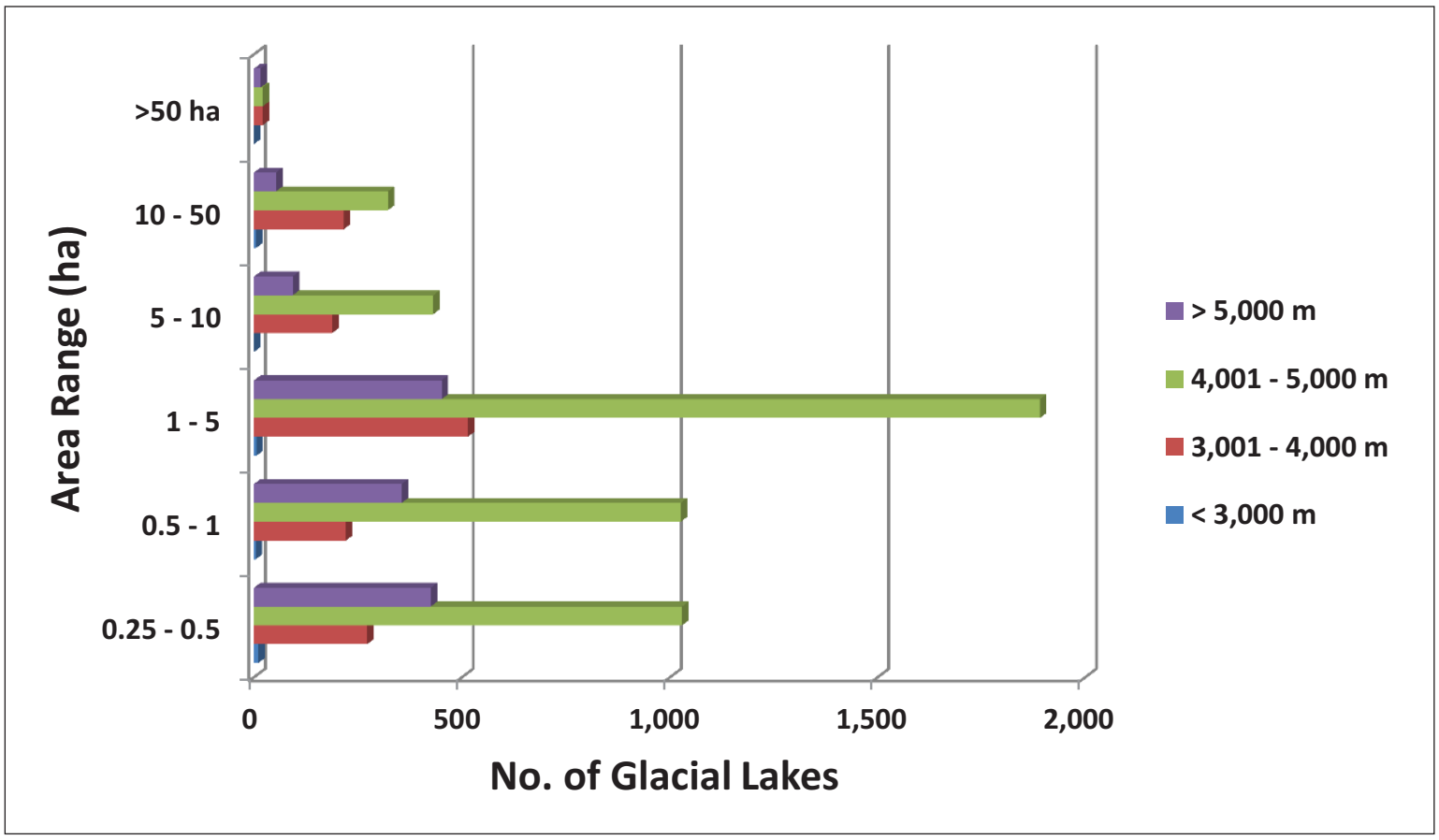


Figure 46: Area range-wise vs. Elevation range-wise distribution of GL in India

Type-Elevation range-wise Distribution

Glacial lake distribution has also been analyzed as per type-wise vs. elevation range-wise, given in Table 39 and Figure 47. The dominant lake type in the region i.e., Other Glacial Erosion Lakes (56.64%) are predominantly located in the elevation range of 4,001 - 5,000 m (71.53%). The other dominant lake type, namely, Supra Glacial Lakes and Other Moraine Dammed lakes are distributed predominantly in altitude range of 4,001 - 5,000 m. In very high altitude range, Other Moraine Dammed lakes are distributed predominantly 487 (50.05%). Majority i.e. 93.18% of all types of Moraine-dammed lakes lies above 4,000 m.

Table 39: Type-wise vs. Elevation range-wise distribution of GL in India

S. No.	Elevation Range (m)	Types of Glacial Lake										Total
		M(e)	M(l)	M(lg)	M(o)	I(s)	I(d)	E(c)	E(c)	E(o)	O	
1	up to 3,000	2	1	0	6	11	0	0	0	1	4	25
2	3,001 - 4,000	22	34	0	43	241	0	160	1	835	96	1,432
3	4,001 - 5,000	120	140	13	437	522	0	346	0	3,067	75	4,720
4	> 5,000	200	61	17	487	165	1	33	0	385	44	1,393
Total		**344**	**236**	**30**	**973**	**939**	**1**	**539**	**1**	**4,288**	**219**	**7,570**

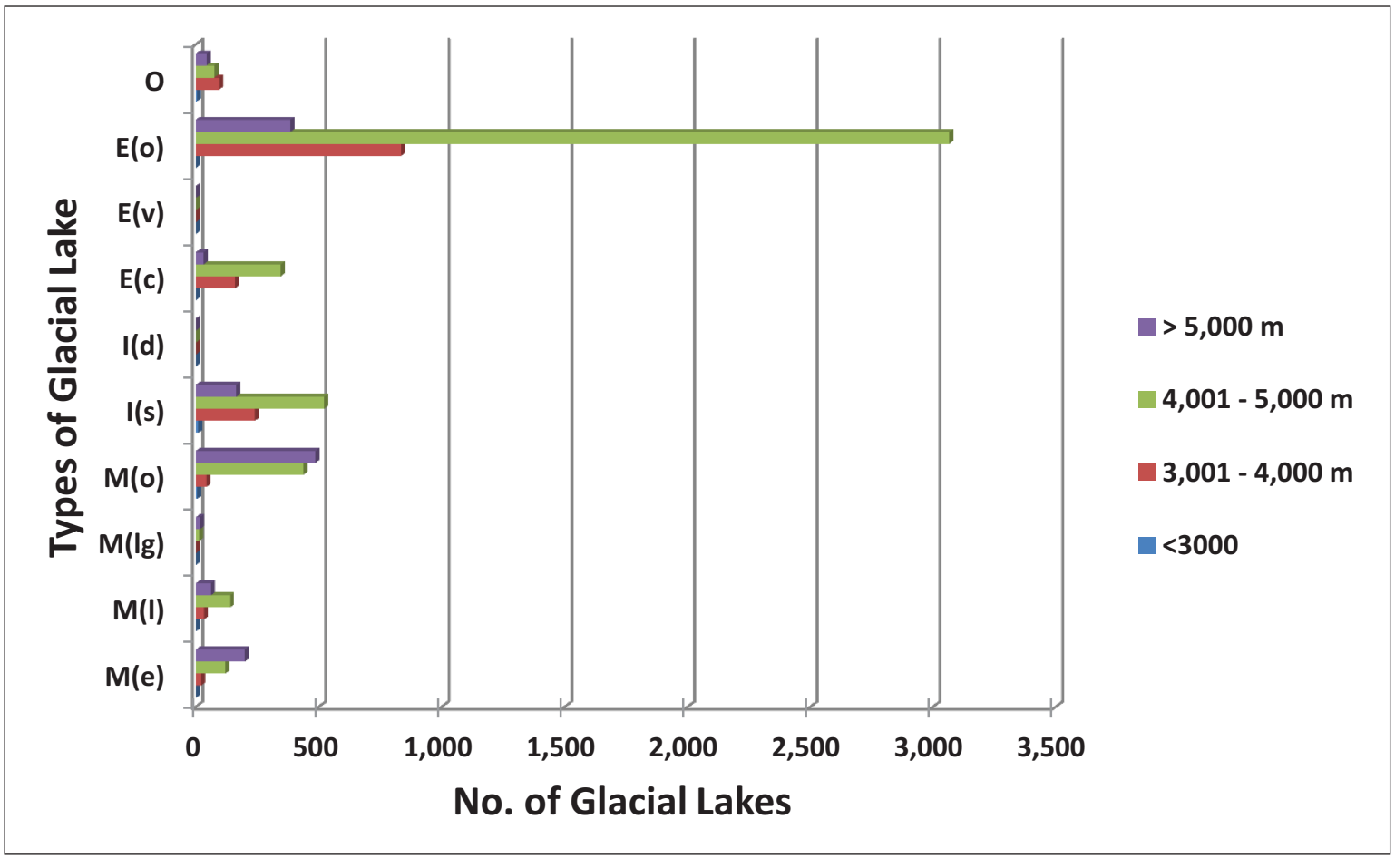


Figure 47: Type-wise vs. Elevation range-wise distribution of GL in India

5.5 Indian State's and UT's Statistics

Glacial lakes located in 4 states and 2 Union-Territories of Indian regions are compared for lake count, total lake area, lake types and their elevation ranges in the following sections.

State/UT-wise Distribution

Table 40 and Figure 48 shows the State/UT-wise distribution of glacial lakes of Indian region. Ladakh (UT) contains maximum of 3,219 glacial lakes (42.52%) extend over an area of 9,965.34 ha (33.05%). Total Lakes in Arunachal Pradesh are 2,188 (28.90%) occupying a total lake extent of 12,490.77 ha at 41.43% in the region.

Table 40: State/UT-wise distribution of GL in India

S.No.	Code	State/UT	No. of Lakes	Total Lake Area	
				(ha)	(%)
1	AP	Arunachal Pradesh	2,188	12,490.77	41.43
2	SK	Sikkim	733	3,267.28	10.84
3	HP	Himachal Pradesh	537	983.74	3.26
4	UK	Uttarakhand	347	560.61	1.86
5	JK	Jammu & Kashmir (UT)	546	2,880.79	9.56
6	LA	Ladakh (UT)	3,219	9,965.34	33.05
		Total	**7,570**	**30,148.53**	**100.00**

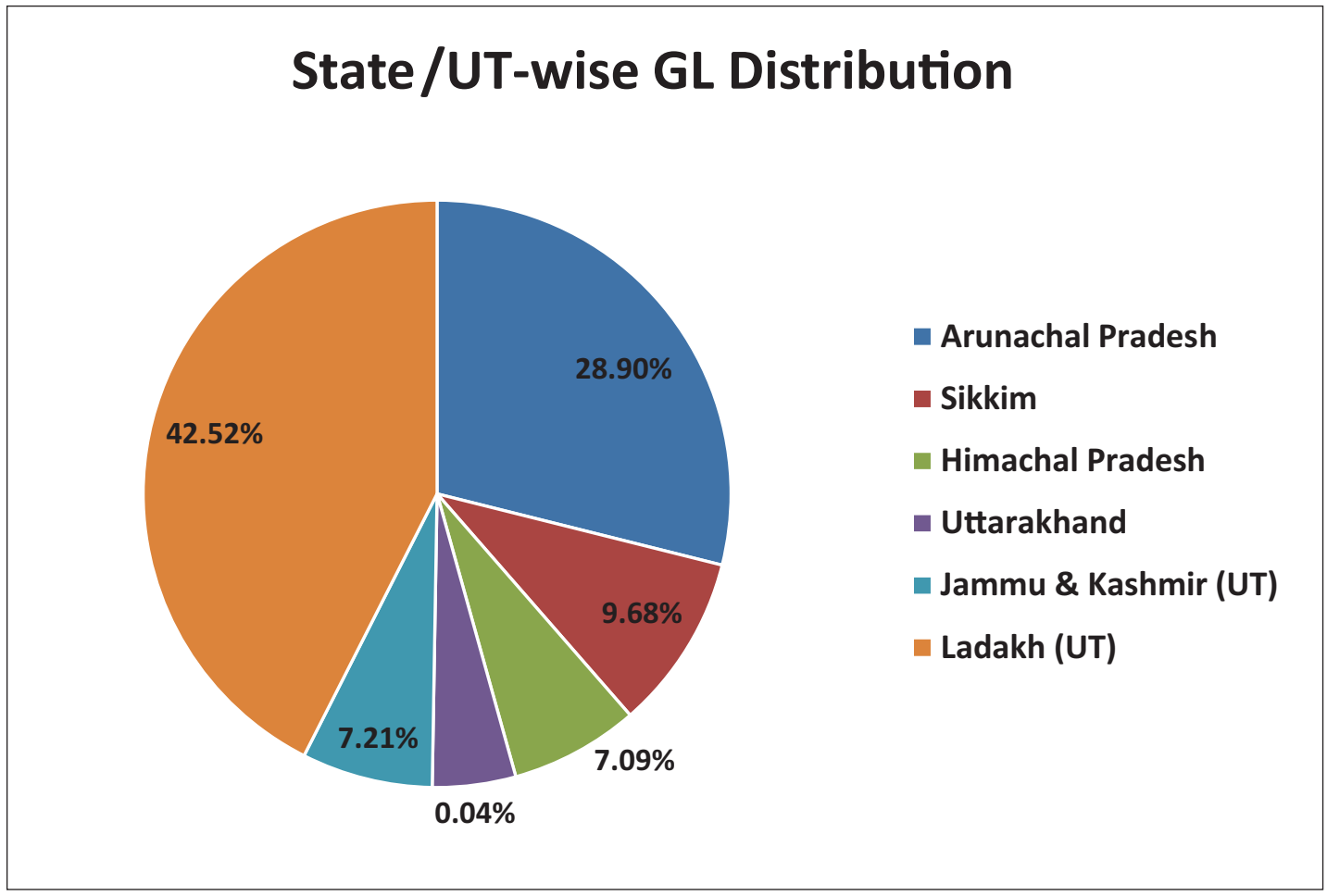


Figure 48: State/UT-wise distribution of GL in India

State/UT-Area range-Type-wise Distribution

Glacial lakes have been distributed in all states and UTs for all classes of area range. Table 41 and Figure 49 shows the State/UT-area range-wise distribution of glacial lakes for the Indian region. It has been observed that, glacial lakes in Arunachal Pradesh (AP) are predominantly < 5 ha (69.70%), majority of which are within 1 - 5 ha in size i.e. 60.85%, followed by lakes of 0.5 - 1 ha in size i.e. 22.62%. Not only in Arunachal Pradesh (AP), maximum number of lakes < 5 ha are (84.31%) located in Sikkim.

Table 41: State/UT-wise vs. Area range-wise distribution of GL in India

S. No.	Lake Area Range (ha)	State/UT											
		Arunachal Pradesh		Sikkim		Himachal Pradesh		Uttarakhand		Jammu & Kashmir (UT)		Ladakh (UT)	
		No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Lake Area (ha)
1	0.25 - 0.5	252	92.35	206	69.95	208	73.3	140	48	123	45.05	807	291.60
2	0.5 - 1	345	250.31	164	119.43	135	92.83	96	67.2	125	88.08	741	525.86
3	1 - 5	928	2,303.41	248	562.68	168	334.67	83	179.19	179	423.41	1,256	2,858.67
4	5 - 10	341	2,418.08	50	374.34	16	119.00	19	127.5	49	358.24	237	1,629.17
5	10 - 50	301	5,900.86	54	1,057.19	8	157.64	9	138.73	63	1,315.91	161	2,858.15
6	> 50	21	1,525.76	11	1,083.69	2	206.28	0	0.00	7	650.10	17	1,801.88
Total		**2,188**	**12,490.77**	**733**	**3,267.28**	**537**	**983.74**	**347**	**560.61**	**546**	**2,880.79**	**3,219**	**9,965.34**

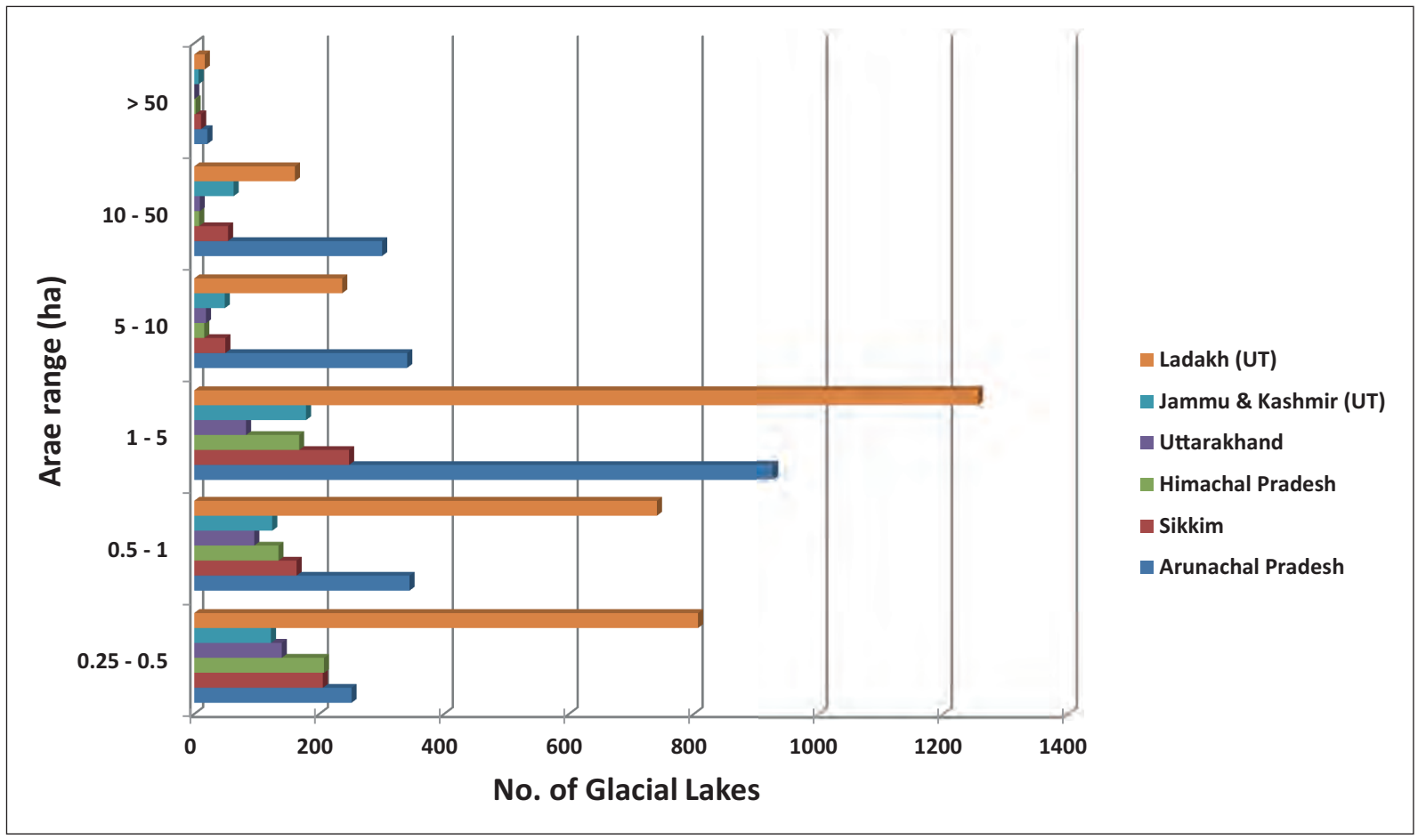


Figure 49: State/UT-wise vs. Area range-wise distribution of GL in India

State/UT-Type-wise Distribution

Glacial lake distribution by State/UT vs. type-wise is given in Table 42 and Figure 50. It has been observed that, Arunachal Pradesh and Sikkim contains same types of glacial lakes except Supra-Glacial Lake in Sikkim, with majority of Other Glacial Erosion Lakes i.e. 78.93%, followed by Cirque Erosion Lakes i.e. 12.89%. All types of moraine dammed lakes in Sikkim are 184 with 25.10%.

Table 42: State/UT-wise vs. Type-wise distribution of GL in India

S. No.	State/UT	Types of Glacial Lake										Total
		M(e)	M(l)	M(lg)	M(o)	I(s)	I(d)	E(c)	E(c)	E(o)	O	
1	Arunachal Pradesh	7	1	0	83	0	0	282	0	1,727	88	2,188
2	Sikkim	31	5	0	148	72	0	46	0	423	8	733
3	Himachal Pradesh	46	28	1	216	65	0	6	0	167	8	537
4	Uttarakhand	25	11	0	103	106	0	23	0	67	12	347
5	Jammu & Kashmir (UT)	20	9	0	69	54	0	66	0	319	9	546
6	Ladakh (UT)	215	182	29	354	642	1	116	1	1,585	94	3,219
Total		**344**	**236**	**30**	**973**	**939**	**1**	**539**	**1**	**4,288**	**219**	**7,570**

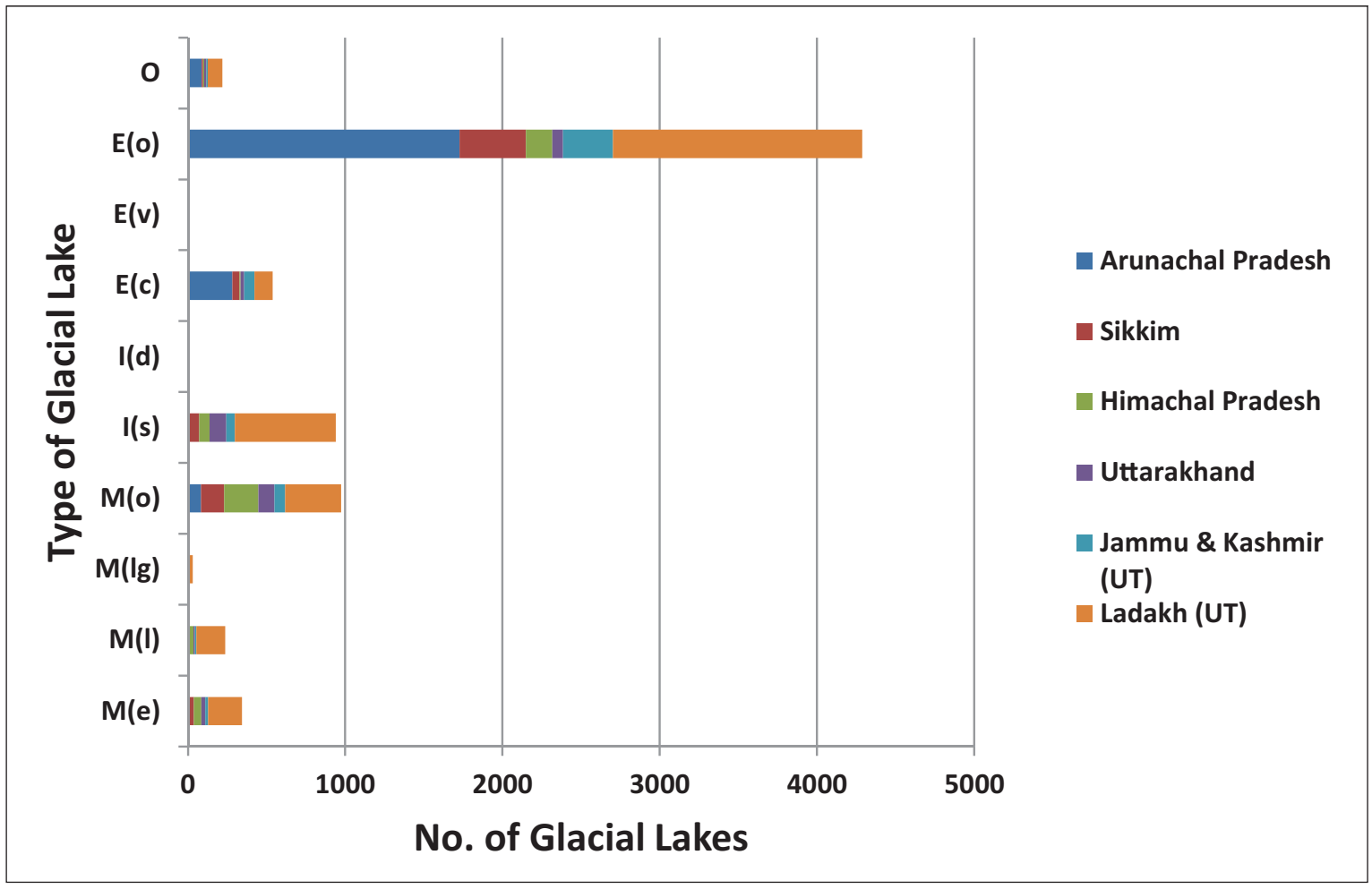


Figure 50: State/UT-wise vs. Type-wise distribution of GL in India

State/UT-Elevation range-wise Distribution

Glacial lake distribution has been analyzed as per State/UT vs. elevation-range wise, given in Table 43 and Figure 51. It has been observed that, majority of glacial lakes (62.35%) are located in high altitude range i.e. 4,001 - 5,000 m in all the states. This is followed by medium altitude range i.e. 3,001 - 4,000 m in all states and UTs (18.92%).

Table 43: State/UT-wise vs. Elevation range-wise distribution of GL in India

S. No.	Elevation Range (m)	State/UT											
		Arunachal Pradesh		Sikkim		Himachal Pradesh		Uttarakhand		Jammu & Kashmir (UT)		Ladakh (UT)	
		No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Lake Area (ha)
1	up to 3,000	4	44.73	0	0.00	0	0.00	0	0.00	0	0.00	21	47.70
2	3,001 - 4,000	739	5,610.27	25	139.44	22	45.85	11	5.64	277	2,087.45	358	1,206.57
3	4,001 - 5,000	1,363	6,610.21	420	1,170.71	318	711.08	183	345.98	268	792.42	2,168	6,616.71
4	> 5,000	82	225.56	288	1,957.14	197	226.81	153	208.99	1	0.93	672	2,094.36
Total		**2,188**	**12,490.77**	**733**	**3,267.28**	**537**	**983.74**	**347**	**560.61**	**546**	**2,880.79**	**3,219**	**9,965.34**

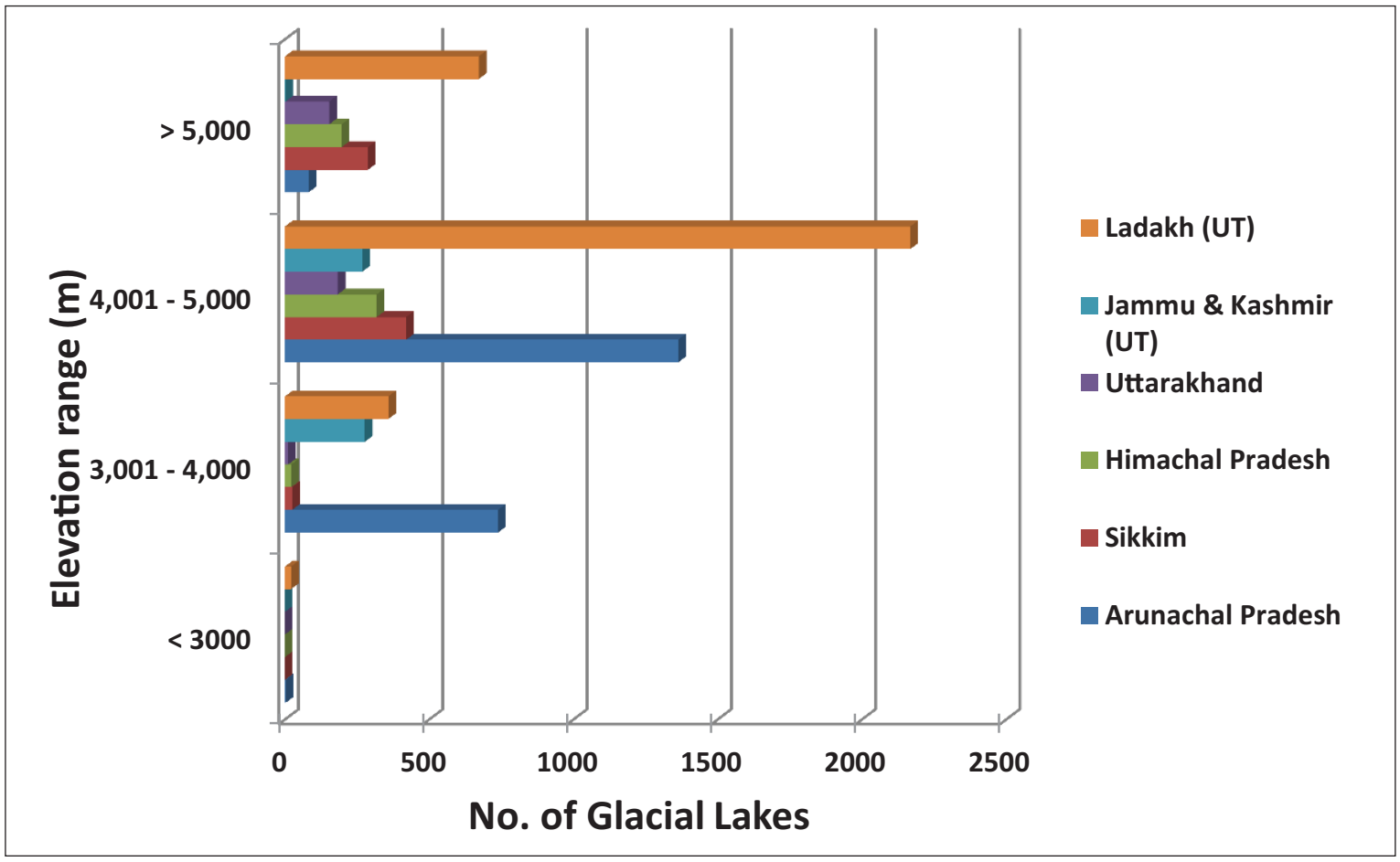


Figure 51: State/UT-wise vs. Elevation range-wise distribution of GL in India

5.5.1 District Level Statistics of Arunachal Pradesh

Arunachal Pradesh is the largest state covering area of Brahmaputra River basin, contains glacial lakes only in fourteen districts. Amongst which, Dibang Valley covers the majority of the total lake area.

Area range-wise Distribution

Glacial lakes have been distributed in 14 districts for 6 classes of area ranges, and area range-wise distribution for 14 districts has been shown in Table 44 and Figure 52. Glacial lakes in Dibang Valley district are found to be the maximum with 669 (30.58%) occupying a total lake extent of 5746.19 ha at 46.00%. About 1,525 (69.70%) lakes are with < 5 ha lake area contributing to 21.18% of total lake area in Arunachal Pradesh.

Table 44: Area range-wise distribution of GL in Districts of Arunachal Pradesh

S. No.	District	Lake Area Range (ha)											
		0.25 - 0.5		0.5 - 1		1 - 5		5 - 10		10 - 50		> 50	
		No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)
1	Anjaw	52	18.60	75	56.11	193	451.54	65	471.47	61	1,149.56	3	172.29
2	Changlang	4	1.59	0	0.00	1	1.93	2	15.25	2	25.18	0	0.00
3	Dibang Valley	30	11.97	76	55.56	282	747.80	124	891.21	145	3,042.37	12	997.29
4	East Kameng	5	1.78	11	8.02	28	71.67	12	86.32	7	150.02	0	0.00
5	Kra Daadi	1	0.25	0	0.00	1	1.19	2	17.19	0	0.00	0	0.00
6	Kurung Kumey	9	3.31	20	15.55	33	73.39	7	52.67	5	86.20	1	55.58
7	Lohit	0	0.00	0	0.00	2	7.52	0	0.00	1	12.55	0	0.00
8	Lower Dibang Valley	0	0.00	0	0.00	3	13.81	2	14.26	1	16.14	0	0.00
9	Siang	2	0.69	2	1.65	6	17.88	2	14.06	1	18.47	0	0.00
10	Tawang	95	34.09	77	54.43	196	466.16	53	362.67	18	317.63	4	249.94
11	Upper Siang	1	0.48	9	6.29	36	91.11	20	141.17	21	383.11	0	0.00
12	Upper Subansiri	9	3.33	21	14.02	64	172.45	34	230.52	26	490.47	0	0.00
13	West Kameng	42	15.47	45	32.11	63	142.52	14	91.60	9	141.81	0	0.00
14	West Siang	2	0.78	9	6.58	20	44.44	4	29.69	4	67.35	1	50.66
Total		**252**	**92.34**	**345**	**250.32**	**928**	**2,303.41**	**341**	**2,418.08**	**301**	**5,900.86**	**21**	**1,525.76**

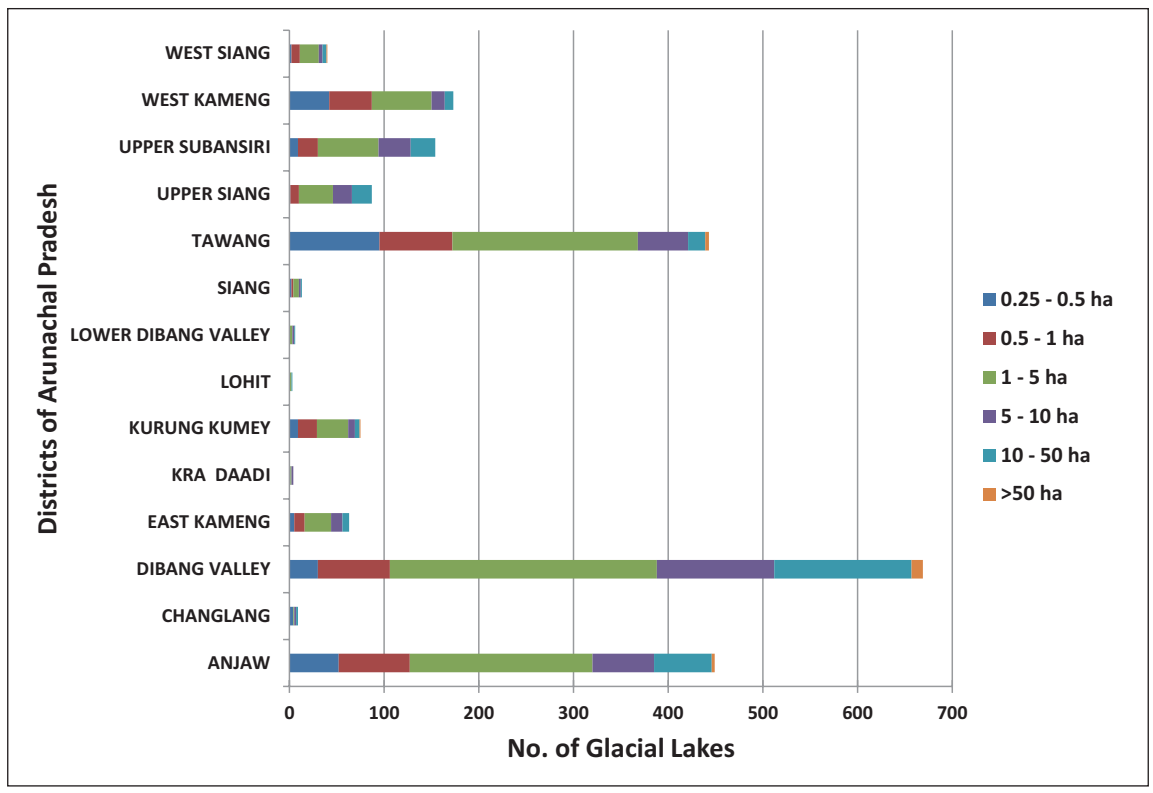


Figure 52: Area range-wise distribution of GL in Districts of Arunachal Pradesh

Type-wise Distribution

Distribution of different types of glacial lakes in the districts of Arunachal Pradesh is given in Table 45 and Figure 53. It has been observed that, Other Glacial Erosion lakes are maximum with 489 (73.09%) in the Dibang Valley district, followed by Cirque Erosion Lake with 117 (17.49%). Total Glacial Erosion Lakes are 2,009 (91.82%) out of total lakes in the Arunachal Pradesh

Table 45: Type-wise distribution of GL in Districts of Arunachal Pradesh

S. No.	District	Types of Glacial Lake										Total	
		M(e)	M(l)	M(lg)	M(o)	I(s)	I(d)	E(c)	E(v)	E(o)	O	No. of Lakes	Lake Area (ha)
1	Anjaw	0	0	0	3	0	0	28	0	393	25	449	2,319.57
2	Changlang	0	0	0	0	0	0	2	0	6	1	9	43.95
3	Dibang Valley	4	0	0	29	0	0	117	0	489	30	669	5,746.20
4	East Kameng	0	0	0	0	0	0	4	0	59	0	63	317.81
5	Kra Daadi	0	0	0	0	0	0	2	0	2	0	4	18.63
6	Kurung Kumey	2	0	0	9	0	0	14	0	50	0	75	286.70
7	Lohit	0	0	0	0	0	0	0	0	2	1	3	20.07
8	Lower Dibang Valley	0	0	0	0	0	0	2	0	4	0	6	44.21
9	Siang	0	0	0	0	0	0	2	0	11	0	13	52.75
10	Tawang	0	0	0	14	0	0	50	0	365	14	443	1,484.92
11	Upper Siang	0	0	0	1	0	0	22	0	62	2	87	622.16
12	Upper Subansiri	1	0	0	0	0	0	21	0	125	7	154	910.79
13	West Kameng	0	1	0	27	0	0	9	0	132	4	173	423.51
14	West Siang	0	0	0	0	0	0	9	0	27	4	40	199.50
Total		**7**	**1**	**0**	**83**	**0**	**0**	**282**	**0**	**1,727**	**88**	**2,188**	**12,490.77**

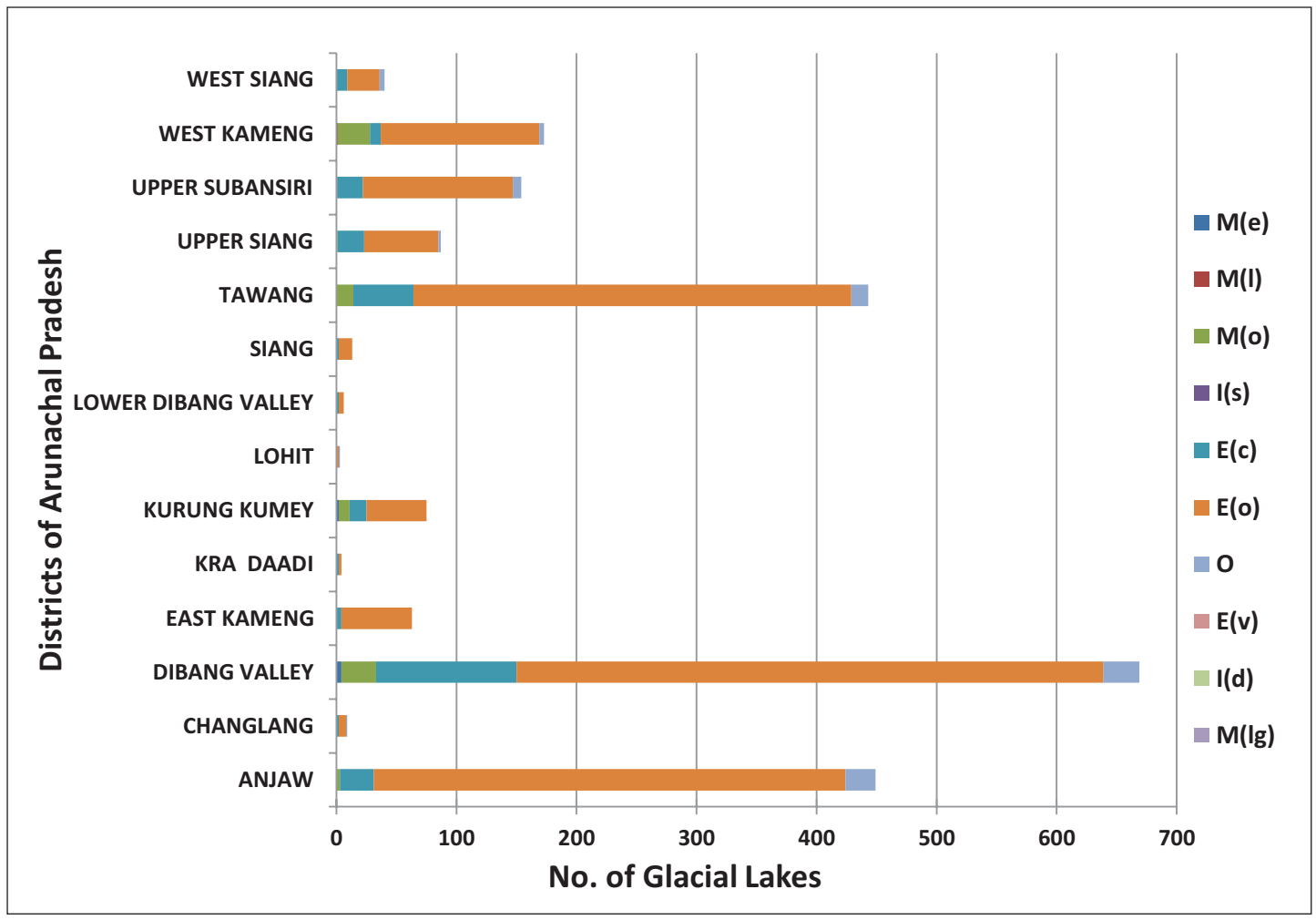


Figure 53: Type-wise distribution of GL in Districts of Arunachal Pradesh

Elevation range-wise Distribution

Elevation range-wise distribution of the glacial lakes in the districts of Arunachal Pradesh has been shown in Table 46 and Figure 54. Majority of glacial lakes are situated in the elevation range of 4,001 – 5,000 i.e. 1,363 with total lake area of 6,610.22 ha. Tawang district contains maximum number of glacial lakes in the elevation range of > 5,000 m i.e. 54. Elevation range-type-wise distribution of glacial lakes has been represented in Figure 55.

Table 46: Elevation range-wise distribution of GL in Districts of Arunachal Pradesh

S. No.	District	Elevation Range (m)							
		up to 3,000		3,001 - 4,000		4,001 - 5,000		> 5,000	
		No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)
1	Anjaw	0	0.00	174	1,049.58	275	1,269.99	0	0.00
2	Changlang	0	0.00	9	43.95	0	0.00	0	0.00
3	Dibang Valley	2	27.47	345	3,151.43	322	2,567.30	0	0.00
4	East Kameng	0	0.00	12	86.34	51	231.47	0	0.00
5	Kra Daadi	0	0.00	3	11.43	1	7.20	0	0.00
6	Kurung Kumey	0	0.00	10	28.21	65	258.49	0	0.00
7	Lohit	2	17.27	1	2.80	0	0.00	0	0.00
8	Lower Dibang Valley	0	0.00	5	40.00	1	4.21	0	0.00
9	Siang	0	0.00	9	27.28	4	25.47	0	0.00
10	Tawang	0	0.00	14	69.60	373	1,254.93	56	160.39
11	Upper Siang	0	0.00	63	495.71	24	126.45	0	0.00
12	Upper Subansiri	0	0.00	63	454.02	91	456.77	0	0.00
13	West Kameng	0	0.00	3	6.39	144	351.94	26	65.16
14	West Siang	0	0.00	28	143.50	12	56.00	0	0.00
Total		**4**	**45.74**	**739**	**5,610.24**	**1,363**	**6,610.22**	**82**	**226.55**

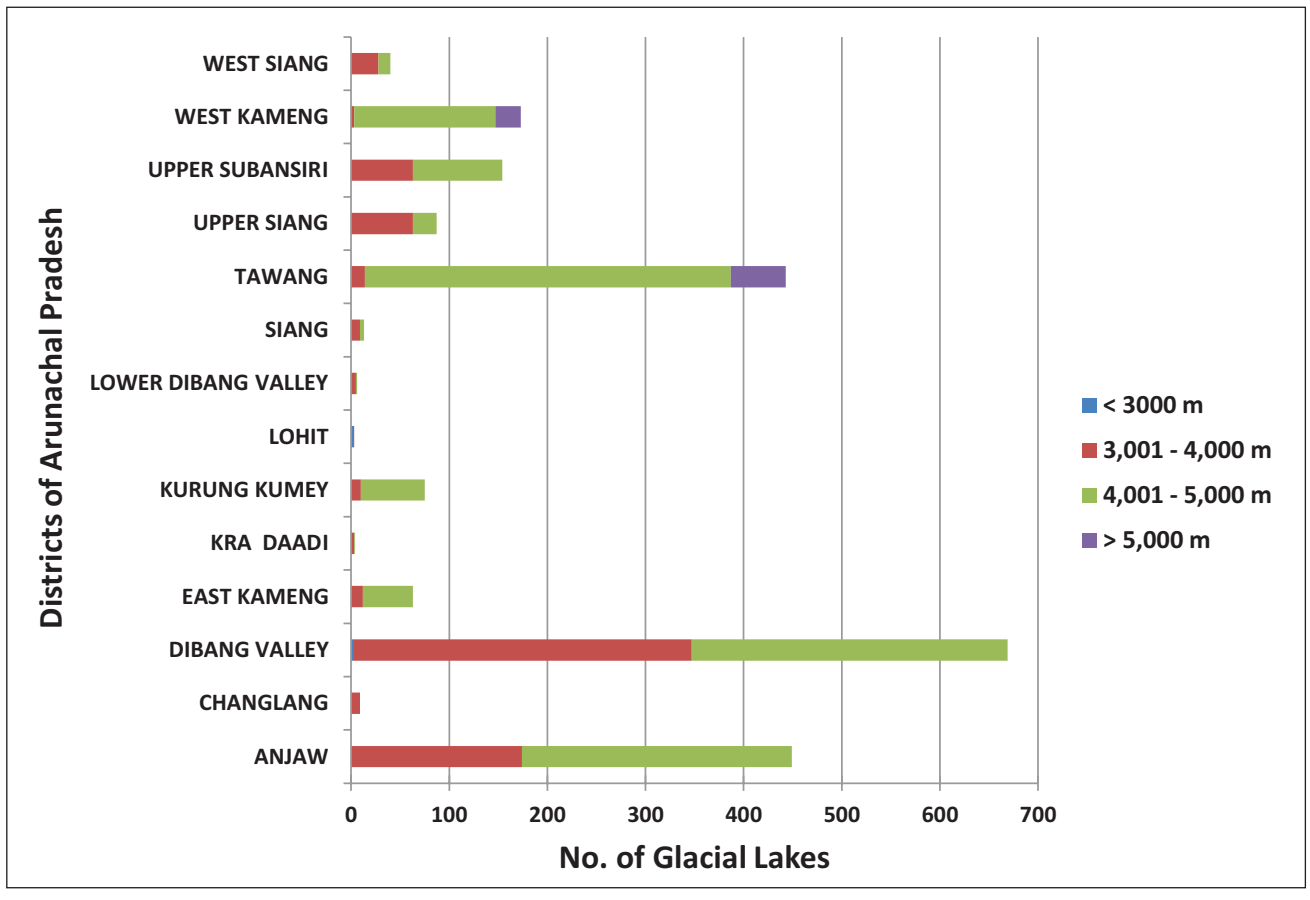


Figure 54: Elevation range-wise distribution of GL in Districts of Arunachal Pradesh

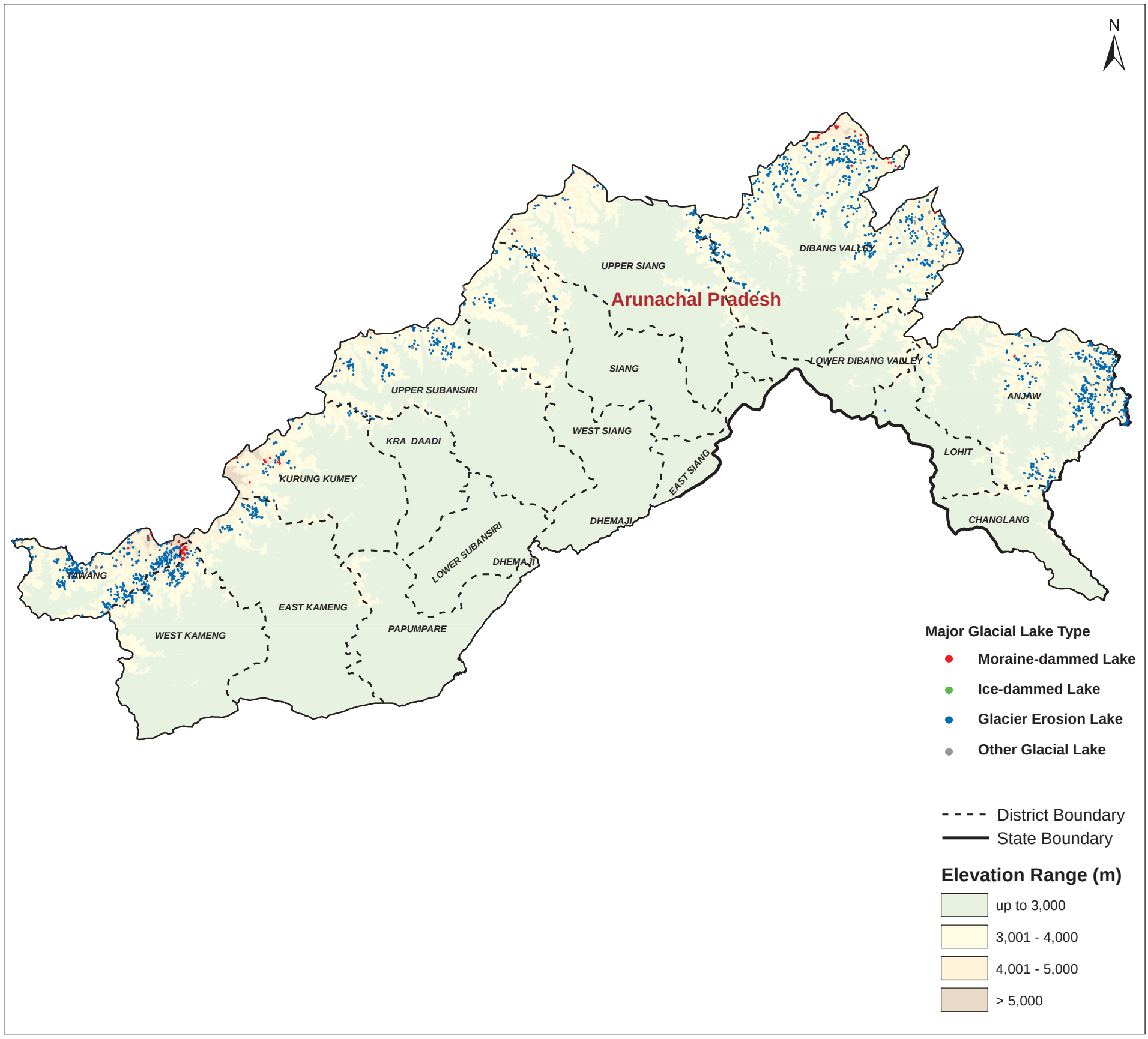


Figure 55: Elevation range-Type-wise spatial distribution of GL in Arunachal Pradesh

5.5.2 District Level Statistics of Sikkim

Sikkim is the second largest state covering area of Brahmaputra River basin, contains glacial lakes in four districts viz., North Sikkim, South Sikkim, West Sikkim, and East Sikkim. Amongst which, North Sikkim has the majority of glacial lakes covering 88.89% of the total lake area in Sikkim.

Area range-wise Distribution

Glacial lakes have been distributed in 4 districts of Sikkim for 6 classes of area ranges, and area range-wise distribution for those has been shown in Table 47 and Figure 56. Glacial lakes in North Sikkim district are found to be the maximum with 589 (80.35%) occupying a total lake extent of 2,904.39 ha at 88.89%. About 618 (84.31%) lakes are with < 5 ha lake area contributing to 23.02% of total lake area in the district. Whereas, remaining lakes in the district with > 5 ha in size are only 15.69%, predominantly of 5 - 50 ha in size.

Table 47: Area range-wise distribution of GL in Districts of Sikkim

S. No.	District	Lake Area Range (ha)											
		0.25 - 0.5		0.5 - 1		1 - 5		5 - 10		10 - 50		> 50	
		No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)
1	North Sikkim	165	56.86	126	90.55	200	462.75	40	301.17	47	909.39	11	1,083.67
2	South Sikkim	1	0.44	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
3	West Sikkim	18	5.85	18	14.22	17	34.61	3	22.22	3	60.83	0	0.00
4	East Sikkim	22	6.80	20	14.66	31	65.32	7	50.96	4	86.98	0	0.00
Total		**206**	**69.95**	**164**	**119.43**	**248**	**562.68**	**50**	**374.35**	**54**	**1,057.20**	**11**	**1,083.67**

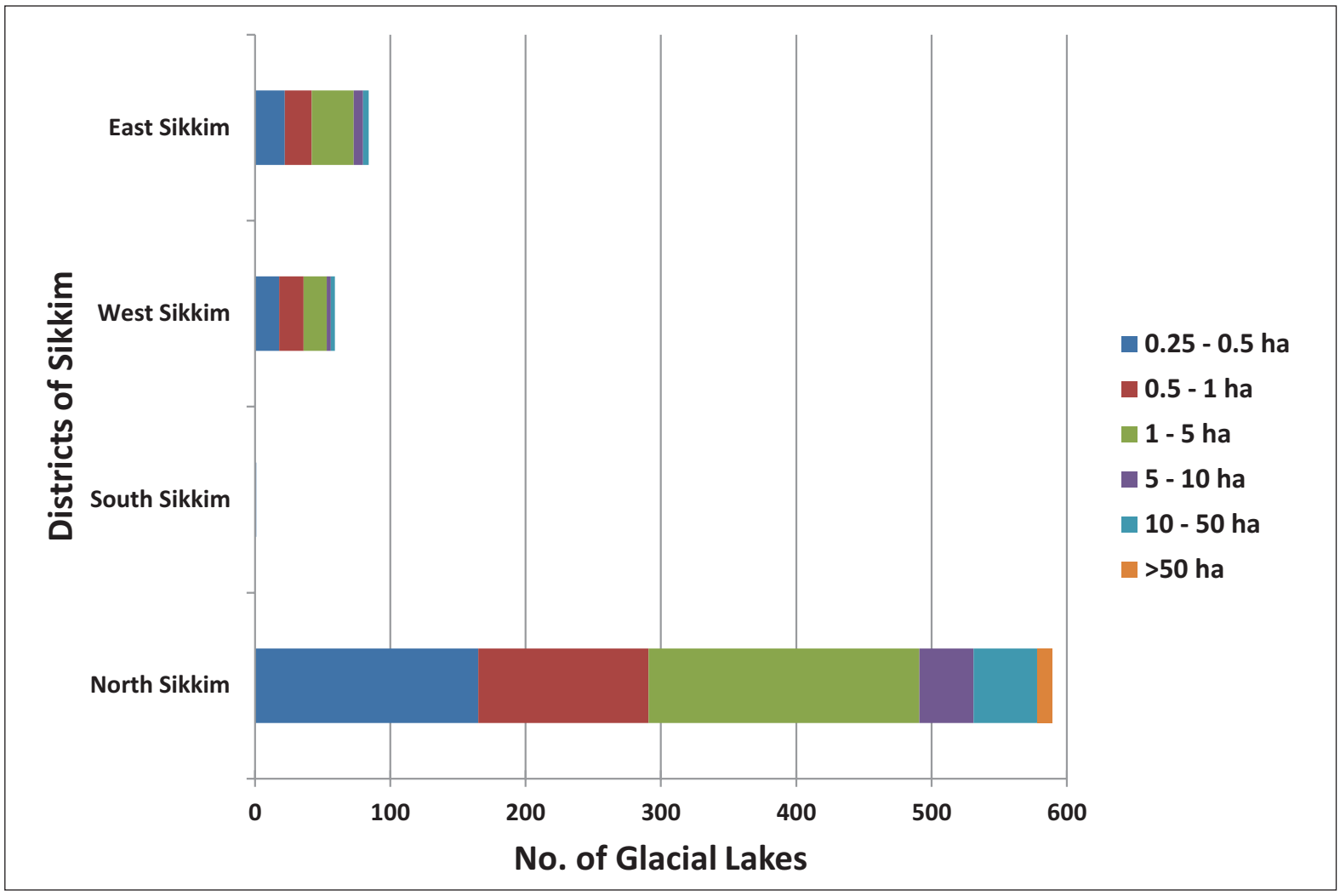


Figure 56: Area range-wise distribution of GL in Districts of Sikkim

Type-wise Distribution

Distribution of different types of glacial lakes in the districts of Sikkim is given in Table 48 and Figure 57. It has been observed that, only 7 types of glacial lakes are distributed in Sikkim, where Other Glacial Erosion Lakes are found to be the maximum with 423 (57.70%) in Sikkim, followed by Other Moraine Dammed lakes with 148 (20.19%). North Sikkim district contains maximum number of glacial lakes in comparison with other districts in Sikkim, with majority of Other Glacial Erosion Lakes (51.78%), followed by Other Moraine Dammed lakes i.e. 23.93%.

Table 48: Type-wise distribution of GL in Districts of Sikkim

S. No.	District	Types of Glacial Lake										Total	
		M(e)	M(l)	M(lg)	M(o)	I(s)	I(d)	E(c)	E(v)	E(o)	O	No. of Lakes	Lake Area (ha)
1	North Sikkim	30	2	0	141	68	0	36	0	305	7	589	2,904.39
2	South Sikkim	0	0	0	0	0	0	0	0	1	0	1	0.44
3	West Sikkim	1	3	0	7	4	0	2	0	42	0	59	137.73
4	East Sikkim	0	0	0	0	0	0	8	0	75	1	84	224.72
Total		**31**	**5**	**0**	**148**	**72**	**0**	**46**	**0**	**423**	**8**	**733**	**3,267.28**

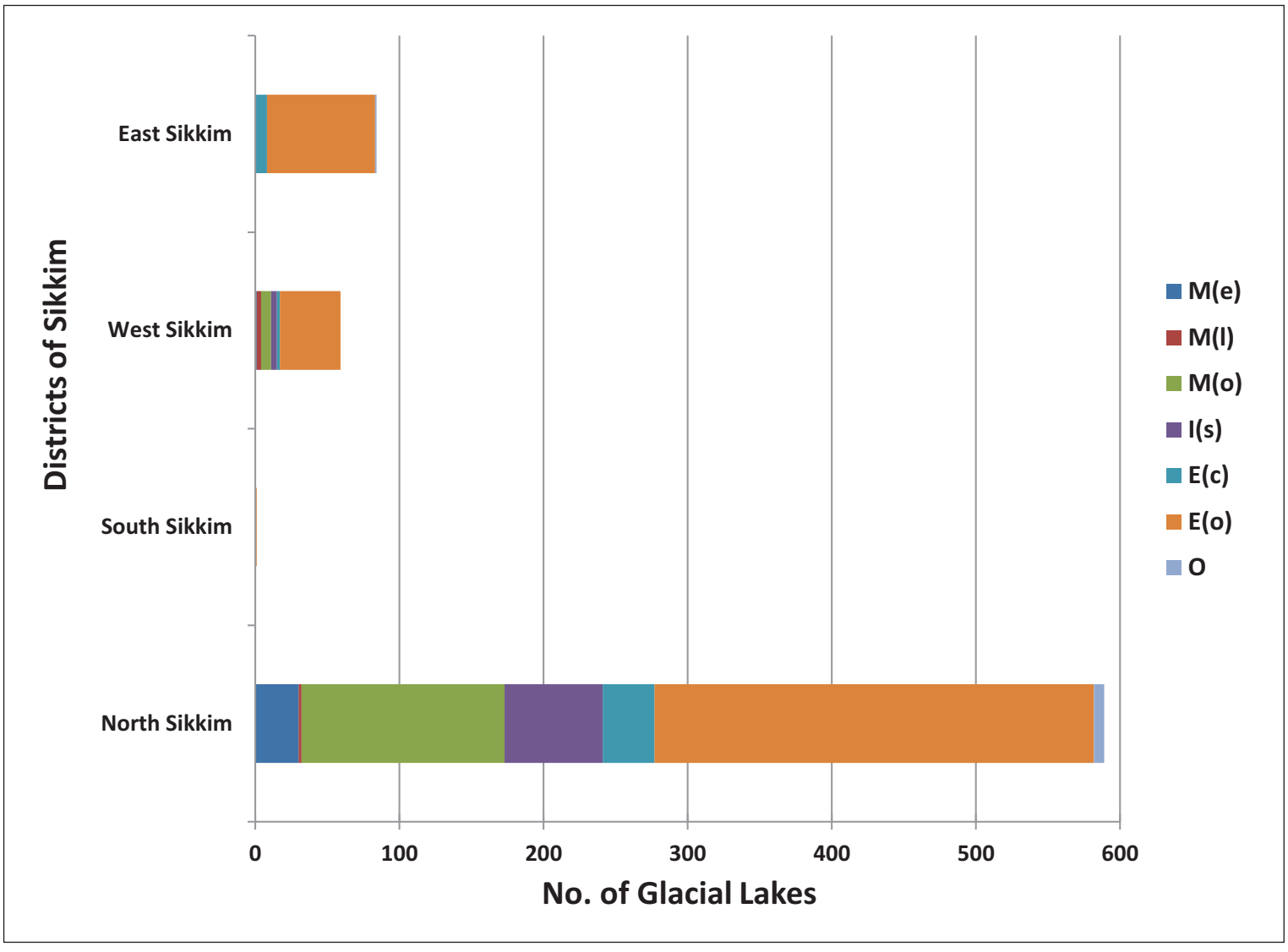


Figure 57: Type-wise distribution of GL in Districts of Sikkim

Elevation range-wise Distribution

Elevation range-wise distribution of the glacial lakes in the districts of Sikkim has been shown in Table 49 and Figure 58. Majority of glacial lakes (57.29%) are situated in high altitude i.e. 4,001 - 5,000 m elevation range with total lake area of 1,170.72 ha (35.83%). This is followed by glacial lakes in very high-altitude elevation range with 39.29%. North Sikkim district contains maximum number of glacial lakes above 4,000 m elevation in comparison with any other district in Sikkim, with majority of them falling in high altitude range i.e. 4,001 - 5,000 m. Elevation range-type-wise distribution of glacial lakes has been represented in Figure 59.

Table 49: Elevation range-wise distribution of GL in Districts of Sikkim

S. No.	District	Elevation Range (m)							
		up to 3,000		3,001 - 4,000		4,001 - 5,000		> 5,000	
		No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)
1	North Sikkim	0	0.00	10	33.76	293	914.45	286	1,956.18
2	South Sikkim	0	0.00	0	0.00	1	0.44	0	0.00
3	West Sikkim	0	0.00	0	0.00	57	136.79	2	0.94
4	East Sikkim	0	0.00	15	105.68	69	119.04	0	0.00
Total		**0**	**0.00**	**25**	**139.44**	**420**	**1,170.72**	**288**	**1,957.12**

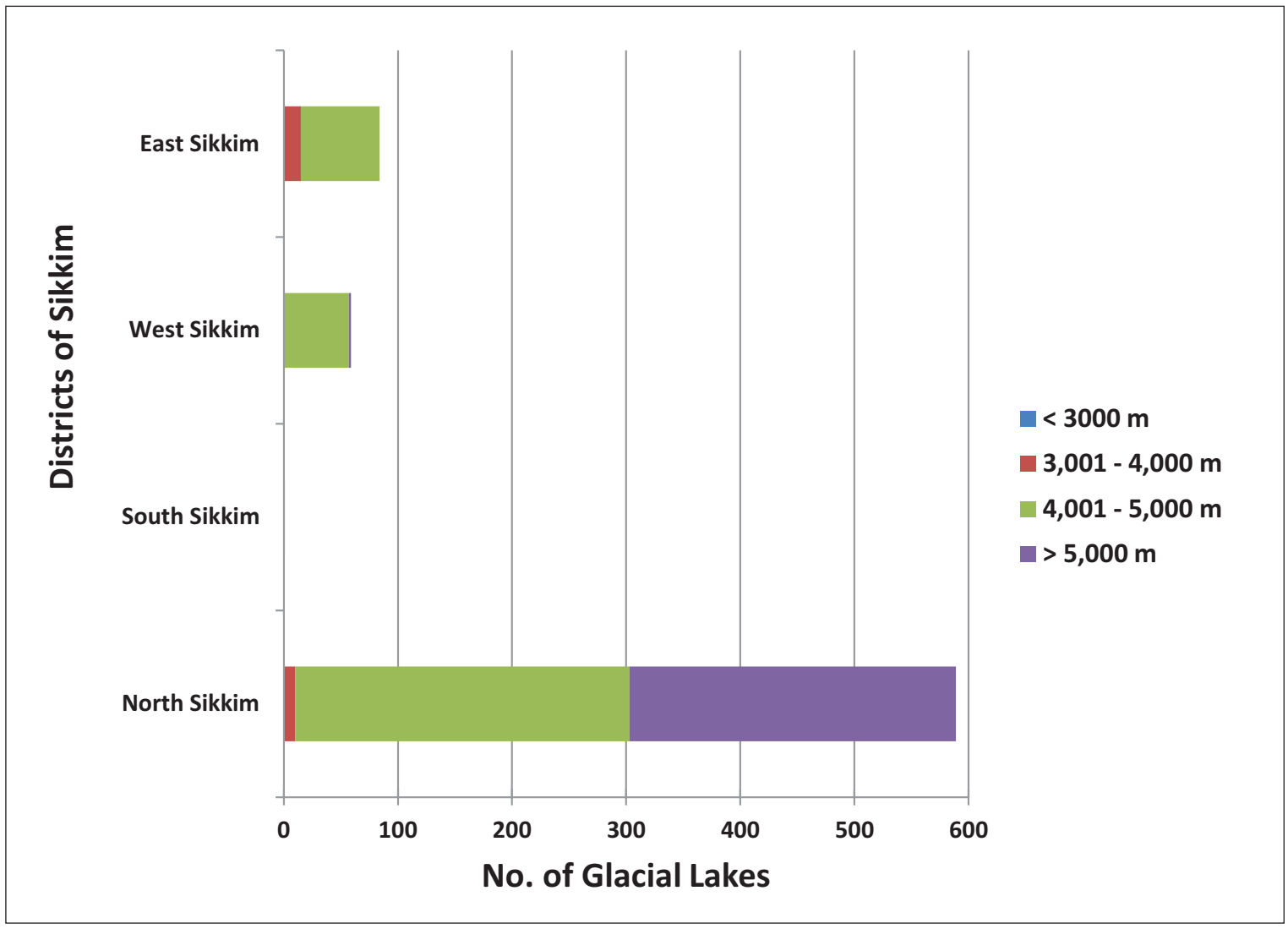


Figure 58: Elevation range-wise distribution of GL in Districts of Sikkim

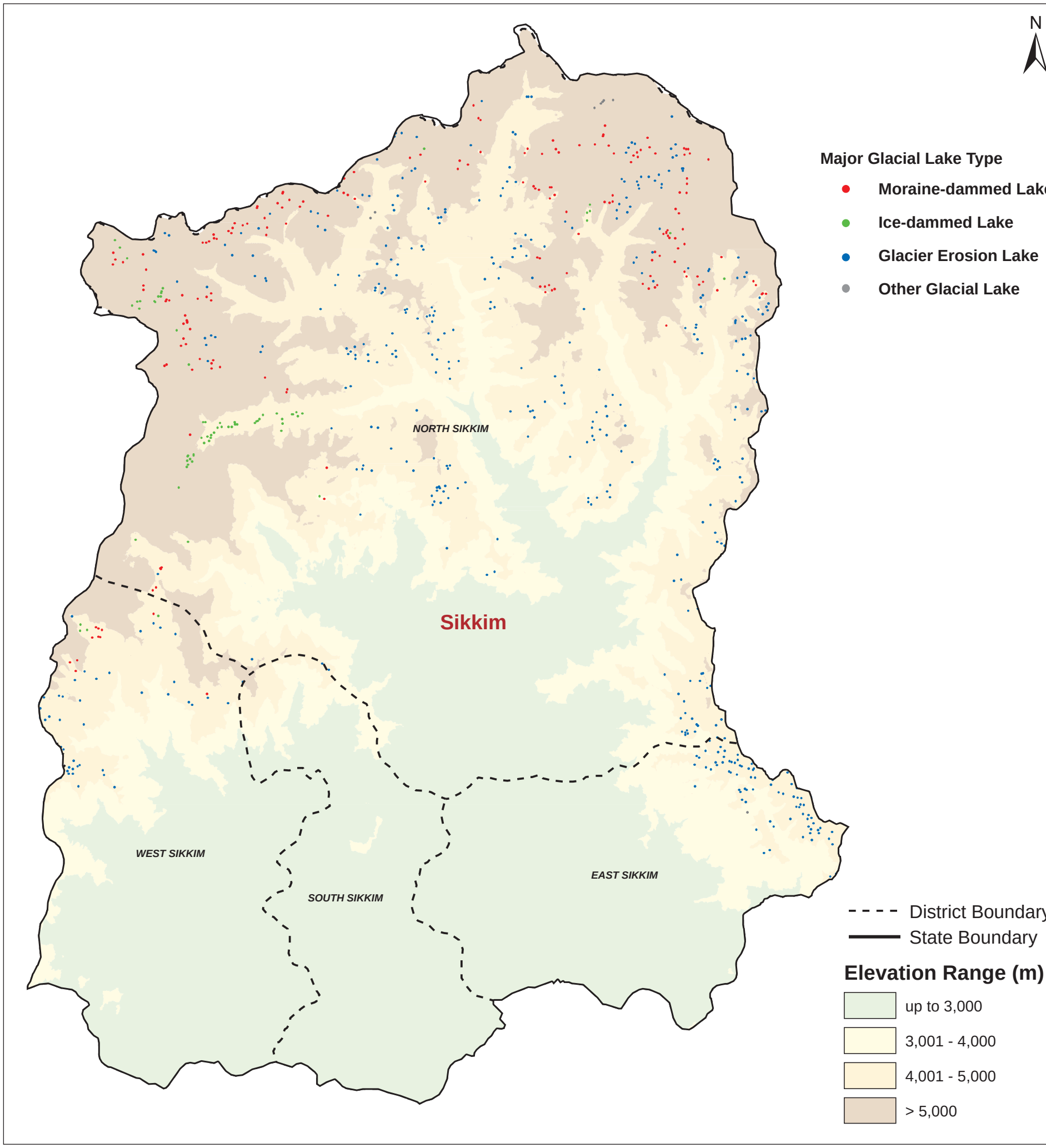


Figure 59: Elevation range-Type-wise spatial distribution of GL in Sikkim

5.5.3 District Level Statistics of Himachal Pradesh

Himachal Pradesh state has a total 12 districts but only 6 districts has glacial lakes in it viz., Chamba, Kangra, Kinnaur, Kullu, Lahul & Spiti, and Shimla. Amongst which, Lahul & Spiti has the majority of glacial lakes covering 47.80% of the total lake area in Himachal Pradesh.

Area range-wise Distribution

Glacial lakes have been distributed in 6 districts of Himachal Pradesh for all 6 classes of area ranges, and area range-wise distribution for those has been shown in Table 50 and Figure 60. Glacial lakes in Lahul & Spiti district are found to be the maximum with 185 (34.45%) occupying a total lake extent of 470.18 ha at 47.8%. About 511 (95.16%) lakes are with < 5 ha lake area contributing to 50.91% of total lake area in the district. Whereas, remaining lakes in Himachal Pradesh with > 5 ha in size are only 4.84%, majorly of 5 - 10 ha in size.

Table 50: Area range-wise distribution of GL in Districts of Himachal Pradesh

S. No.	District	Lake Area Range (ha)											
		0.25 - 0.5		0.5 - 1		1 - 5		5 - 10		10 - 50		> 50	
		No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)
1	Chamba	21	7.71	14	10.4	29	60.41	1	9.7	1	25.65	0	0.00
2	Kangra	14	4.82	11	7.43	13	25.05	1	8.15	0	0.00	0	0.00
3	Kinnaur	57	19.33	38	25.46	28	59.39	2	13.31	3	45.32	0	0.00
4	Kullu	25	9.23	24	16.27	41	79.27	3	25.84	0	0.00	0	0.00
5	Lahul & Spiti	82	29.08	42	28.28	49	91.92	8	53.73	2	60.89	2	206.28
6	Shimla	9	3.13	6	4.99	8	18.63	1	8.26	2	25.77	0	0.00
Total		**208**	**73.30**	**135**	**92.83**	**168**	**334.67**	**16**	**118.99**	**8**	**157.63**	**2**	**206.28**

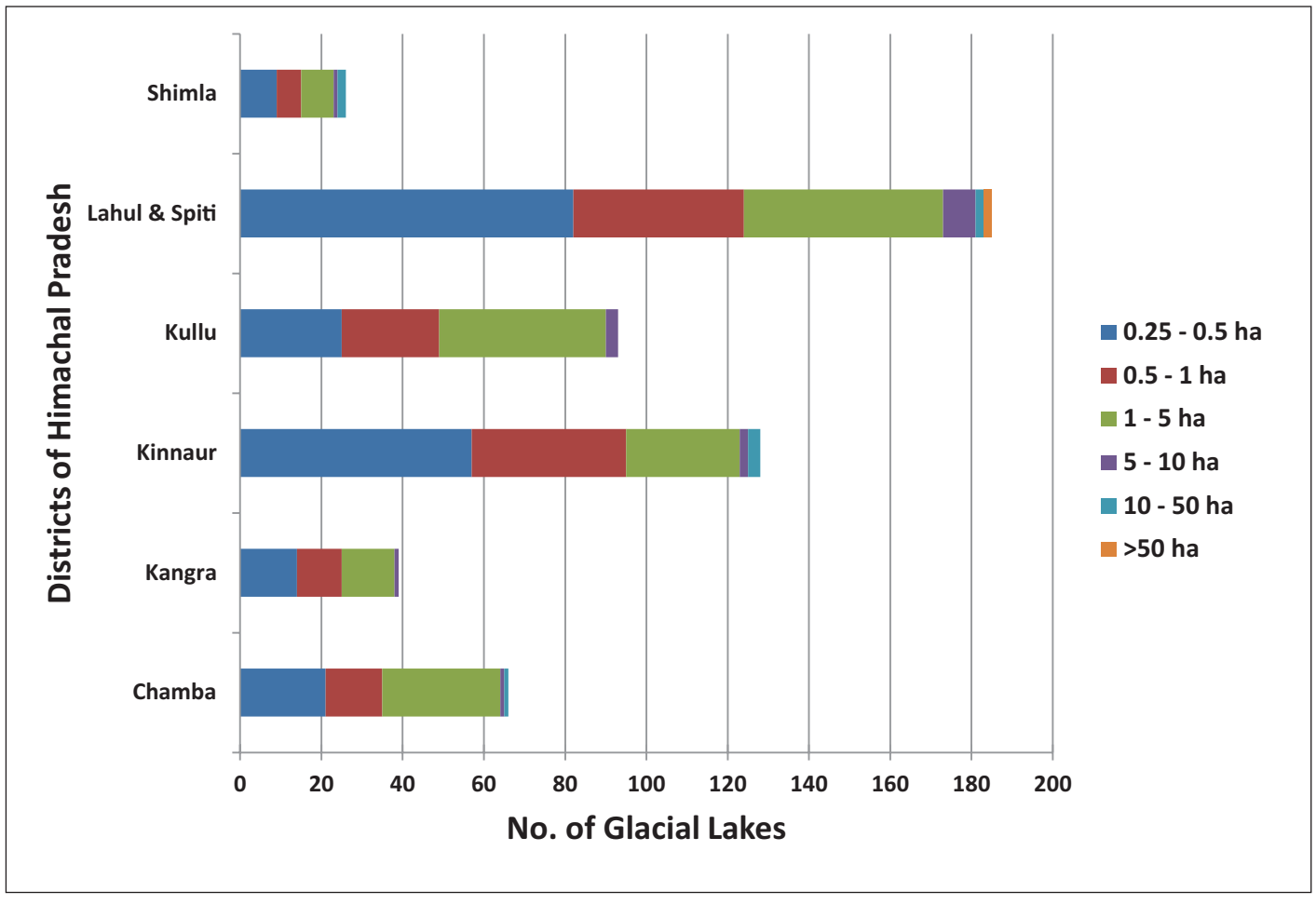


Figure 60: Area range-wise distribution of GL in Districts of Himachal Pradesh

Type-wise Distribution

Distribution of different types of glacial lakes in the districts of Himachal Pradesh is given in Table 51 and Figure 61. It has been observed that, only 8 types of glacial lakes are distributed in Himachal Pradesh, where Other Moraine Dammed lakes are found to be the maximum with 216 (40.22%) lakes, followed by Other Glacial Erosion lakes with 167 (31.10%). Lahul & Spiti district contains maximum number of glacial lakes in comparison with other districts in Himachal Pradesh, with majority of Other Moraine Dammed lakes (35.14%), followed by Supra-glacial and Other Glacial Erosion lakes in equal proportion i.e. 22.70%.

Table 51: Type-wise distribution of GL in Districts of Himachal Pradesh

S. No.	District	Types of Glacial Lake										Total	
		M(e)	M(l)	M(lg)	M(o)	I(s)	I(d)	E(c)	E(v)	E(o)	O	No. of Lakes	Lake Area (ha)
1	Chamba	8	2	0	19	3	0	0	0	34	0	66	113.88
2	Kangra	2	3	0	20	2	0	0	0	12	0	39	45.45
3	Kinnaur	6	10	0	67	13	0	2	0	25	5	128	162.82
4	Kullu	8	0	0	38	5	0	1	0	39	2	93	130.61
5	Lahul & Spiti	21	13	1	65	42	0	0	0	42	1	185	470.18
6	Shimla	1	0	0	7	0	0	3	0	15	0	26	60.78
Total		**46**	**28**	**1**	**216**	**65**	**0**	**6**	**0**	**167**	**8**	**537**	**983.74**

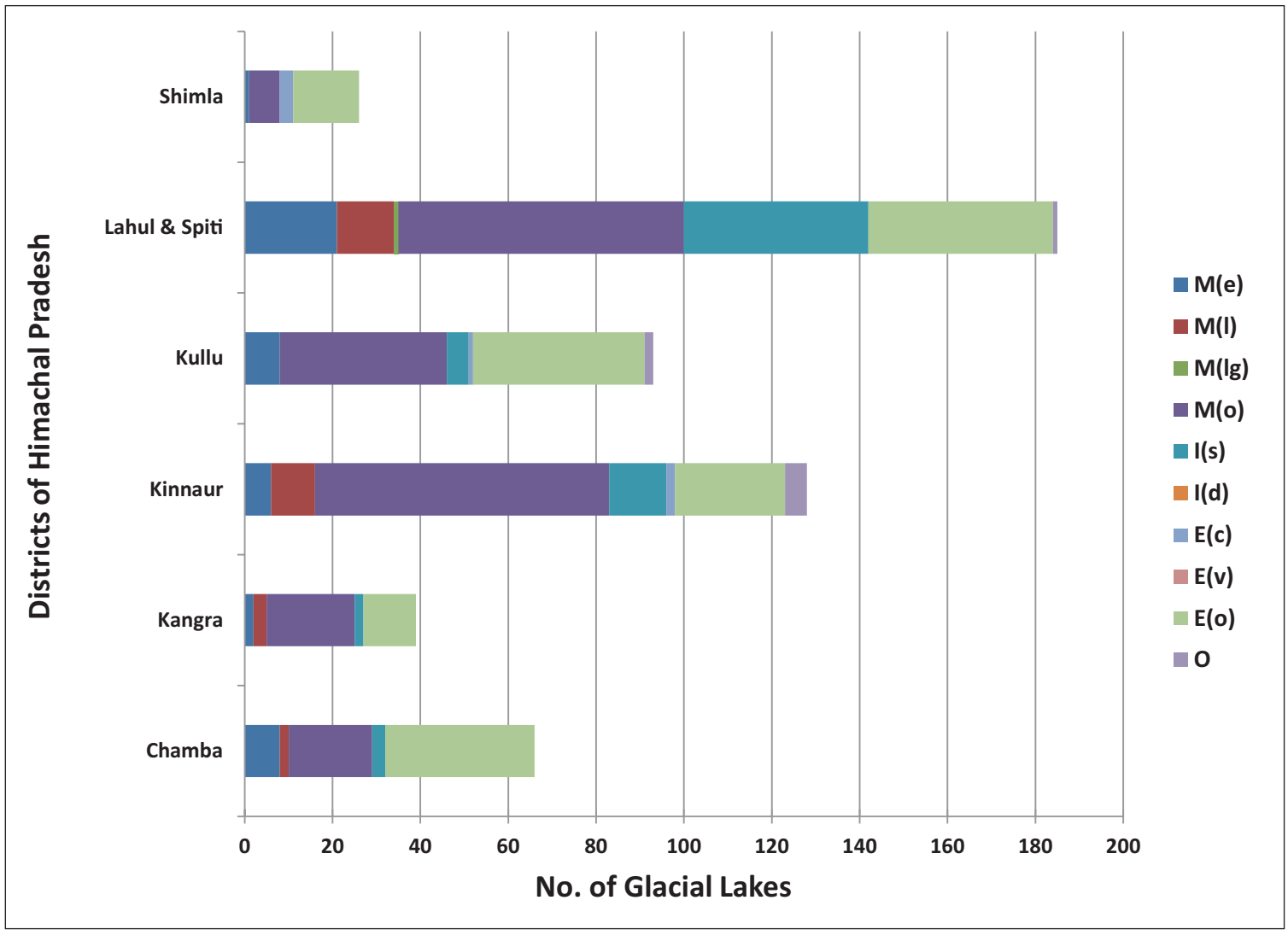


Figure 61: Type-wise distribution of GL in Districts of Himachal Pradesh

Elevation range-wise Distribution

Elevation range-wise distribution of the glacial lakes in the districts of Himachal Pradesh has been shown in Table 52 and Figure 62. Majority of glacial lakes are situated above 4,000 m elevation range i.e. 515 (95.90%) with total lake area of 937.88 ha (95.34%), with majority of them situated in high altitude range i.e. 4,001 - 5,000 m. Whereas, remaining 4.10% glacial lakes are below 4,000 m elevation, all situated in medium altitude range. Lahul & Spiti district contains maximum number of glacial lakes above 4,000 m elevation in comparison with any other district in the state, with majority of them falling in very high altitude range i.e. > 5,000 m i.e. 54.31%. No lake is present in low altitude range in the state. Elevation range-type-wise distribution of glacial lakes has been represented in Figure 63.

Table 52: Elevation range-wise distribution of GL in Districts of Himachal Pradesh

S. No.	District	Elevation Range (m)							
		up to 3,000		3,001 - 4,000		4,001 - 5,000		> 5,000	
		No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)
1	Chamba	0	0.00	9	39.47	50	69.39	7	5.02
2	Kangra	0	0.00	0	0.00	39	45.45	0	0.00
3	Kinnaur	0	0.00	3	2.39	44	81.11	81	79.32
4	Kullu	0	0.00	3	1.23	88	128.14	2	1.25
5	Lahul & Spiti	0	0.00	7	2.76	71	326.21	107	141.21
6	Shimla	0	0.00	0	0.00	26	60.78	0	0.00
	Total	**0**	**0**	**22**	**45.85**	**318**	**711.08**	**197**	**226.80**

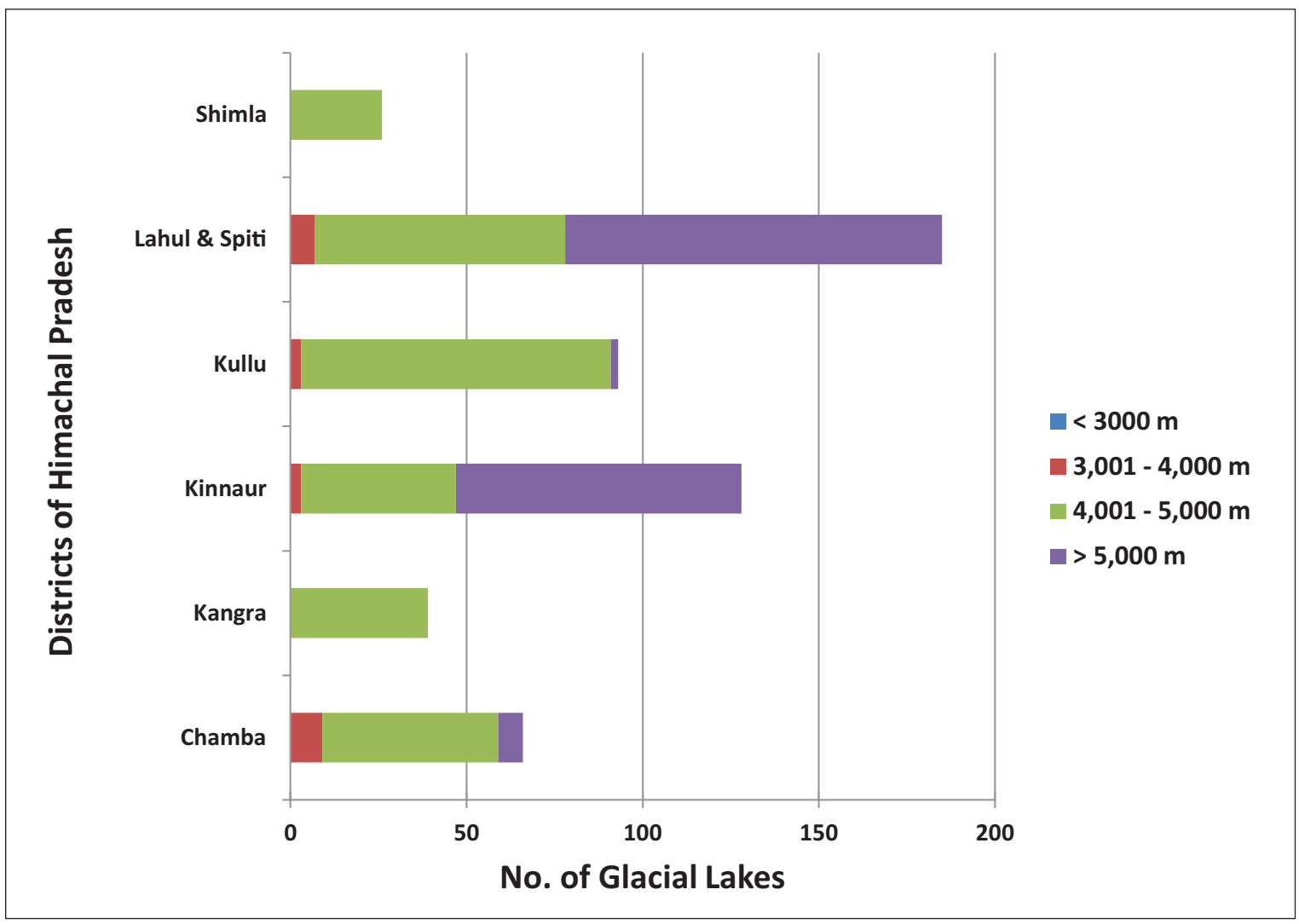


Figure 62: Elevation range-wise distribution of GL in Districts of Himachala Pradesh

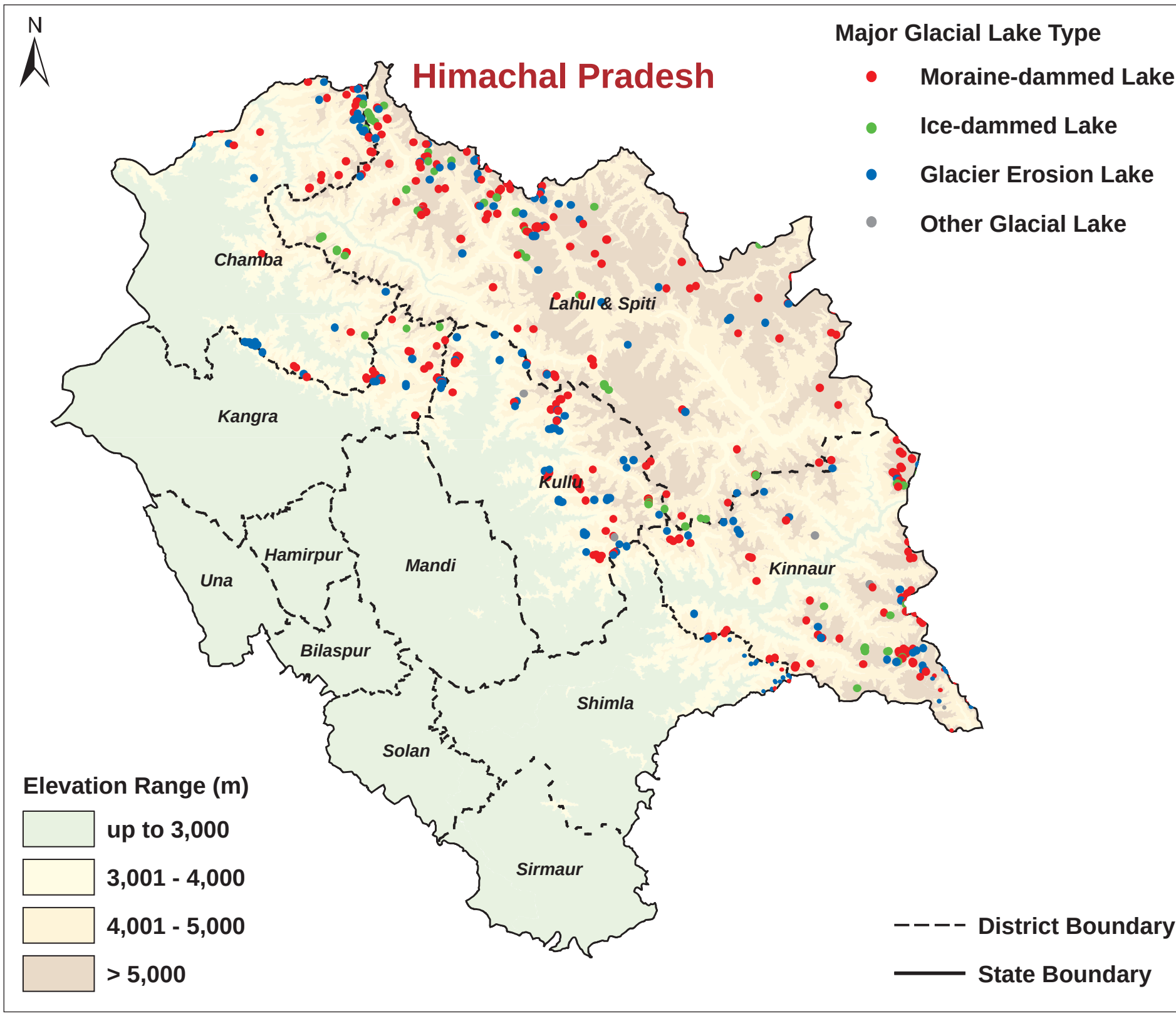


Figure 63: Elevation range-Type-wise spatial distribution of GL in Himachal Pradesh

5.5.4 District Level Statistics of Uttarkhand

Uttarakhand state contains glacial lakes in six districts viz., Bageshwar, Chamoli, Pithoragarh, Rudraprayag, Tehri Garhwal, and Uttarkashi. Amongst which, Chamoli has the majority of glacial lakes covering 45.08% of the total lake area in the state.

Area range-wise Distribution

Glacial lakes have been distributed in 6 districts of Uttarakhand for 5 classes of area ranges except >50 ha area range, and area range-wise distribution for those has been shown in Table 53 and Figure 64. Glacial lakes in Chamoli district are found to be the maximum with 192 (55.34%) occupying a total lake extent of 252.71 ha at 45.08%. About 319 (91.93%) lakes are with < 5 ha lake area contributing to 52.51% of total lake area in the district. Whereas, remaining lakes in the district with > 5 ha in size are only 8.07%, predominantly of 5 - 10 ha in size.

Table 53: Area range-wise distribution of GL in Districts of Uttarakhand

S. No.	District	Lake Area Range (ha)											
		0.25 - 0.5		0.5 - 1		1 - 5		5 - 10		10 - 50		> 50	
		No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)
1	Bageshwar	3	0.99	3	2.18	2	6.02	0	0.00	0	0.00	8	9.19
2	Chamoli	92	31.17	53	37.13	36	75.72	7	47.18	4	61.51	192	252.72
3	Pithoragarh	13	4.53	10	6.51	13	25.08	3	20.42	4	51.65	43	108.18
4	Rudraprayag	2	0.68	1	0.55	6	14.68	2	15.15	0	0.00	11	31.05
5	Tehri Garhwal	0	0.00	4	3.18	3	5.34	2	12.91	1	25.56	10	46.99
6	Uttarkashi	30	10.53	25	17.65	23	52.36	5	31.84	0	0.00	83	112.47
Total		**140**	**47.99**	**96**	**67.20**	**83**	**179.20**	**19**	**127.50**	**9**	**138.72**	**347**	**560.60**

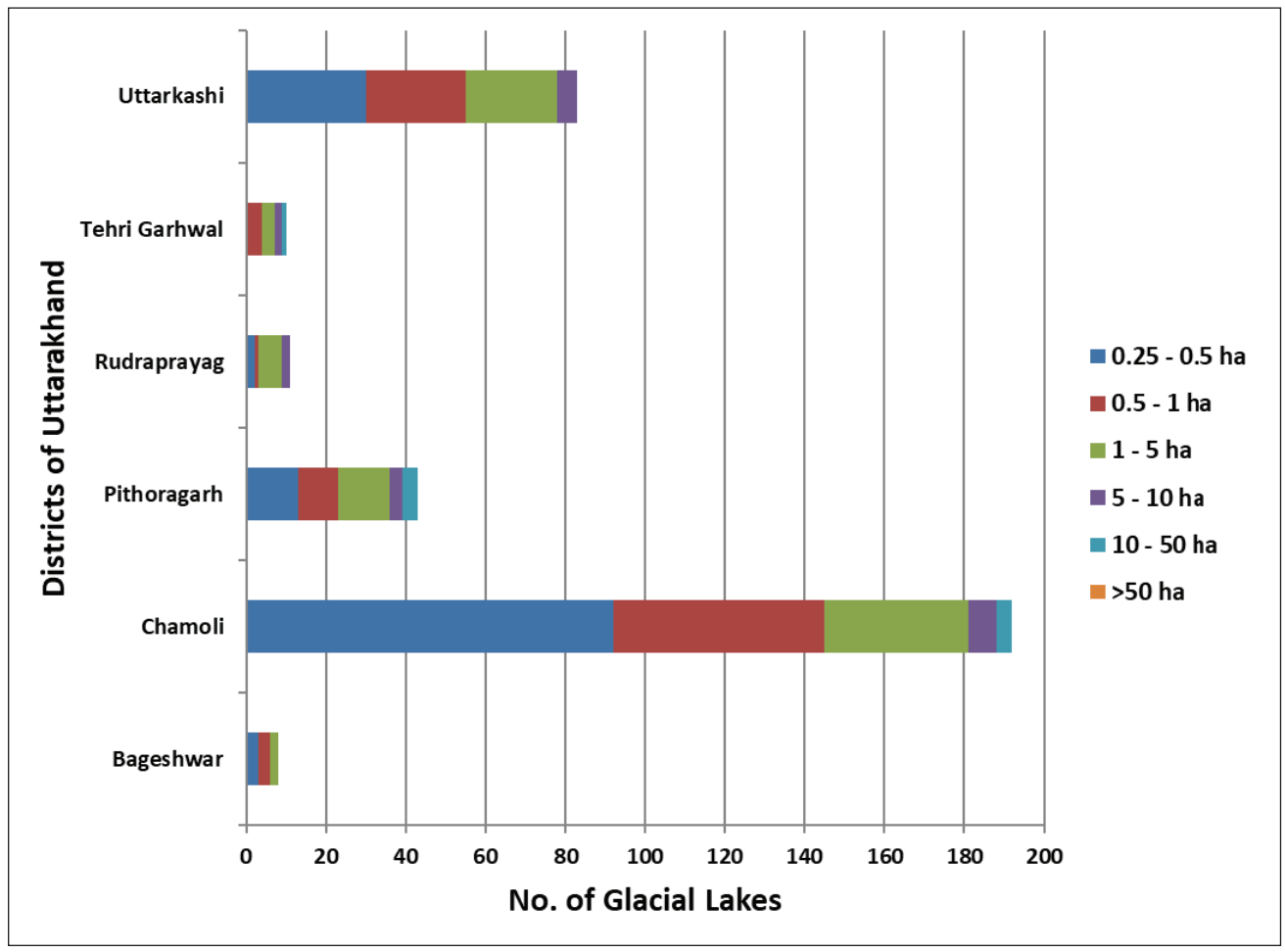


Figure 64: Area range-wise distribution of GL in Districts of Uttarakhand

Type-wise Distribution

Distribution of different types of glacial lakes in the districts of Uttarakhand is given in Table 54 and Figure 65. It has been observed that, only 7 types of glacial lakes are distributed in the state, where Supra-glacial lakes are found to be the maximum with 106 (30.55%) in the state, followed by Other Moraine Dammed lakes with 103 (29.68%). Chamoli district contains maximum number of glacial lakes in comparison with other districts in the state, with majority of Supra-glacial lakes (38.02%), followed by Other Moraine Dammed lakes i.e. 32.29%.

Table 54: Type-wise distribution of GL in Districts of Uttarakhand

S. No.	District	Types of Glacial Lake										Total	
		M(e)	M(l)	M(lg)	M(o)	I(s)	I(d)	E(c)	E(v)	E(o)	O	No. of Lakes	Lake Area (ha)
1	Bageshwar	0	0	0	0	4	0	1	0	2	1	8	9.19
2	Chamoli	8	4	0	62	73	0	11	0	30	4	192	252.71
3	Pithoragarh	6	0	0	20	4	0	3	0	9	1	43	108.19
4	Rudraprayag	0	0	0	0	2	0	4	0	5	0	11	31.06
5	Tehri Garhwal	1	1	0	1	0	0	1	0	5	1	10	46.99
6	Uttarkashi	10	6	0	20	23	0	3	0	16	5	83	112.47
Total		**25**	**11**	**0**	**103**	**106**	**0**	**23**	**0**	**0**	**12**	**347**	**560.61**

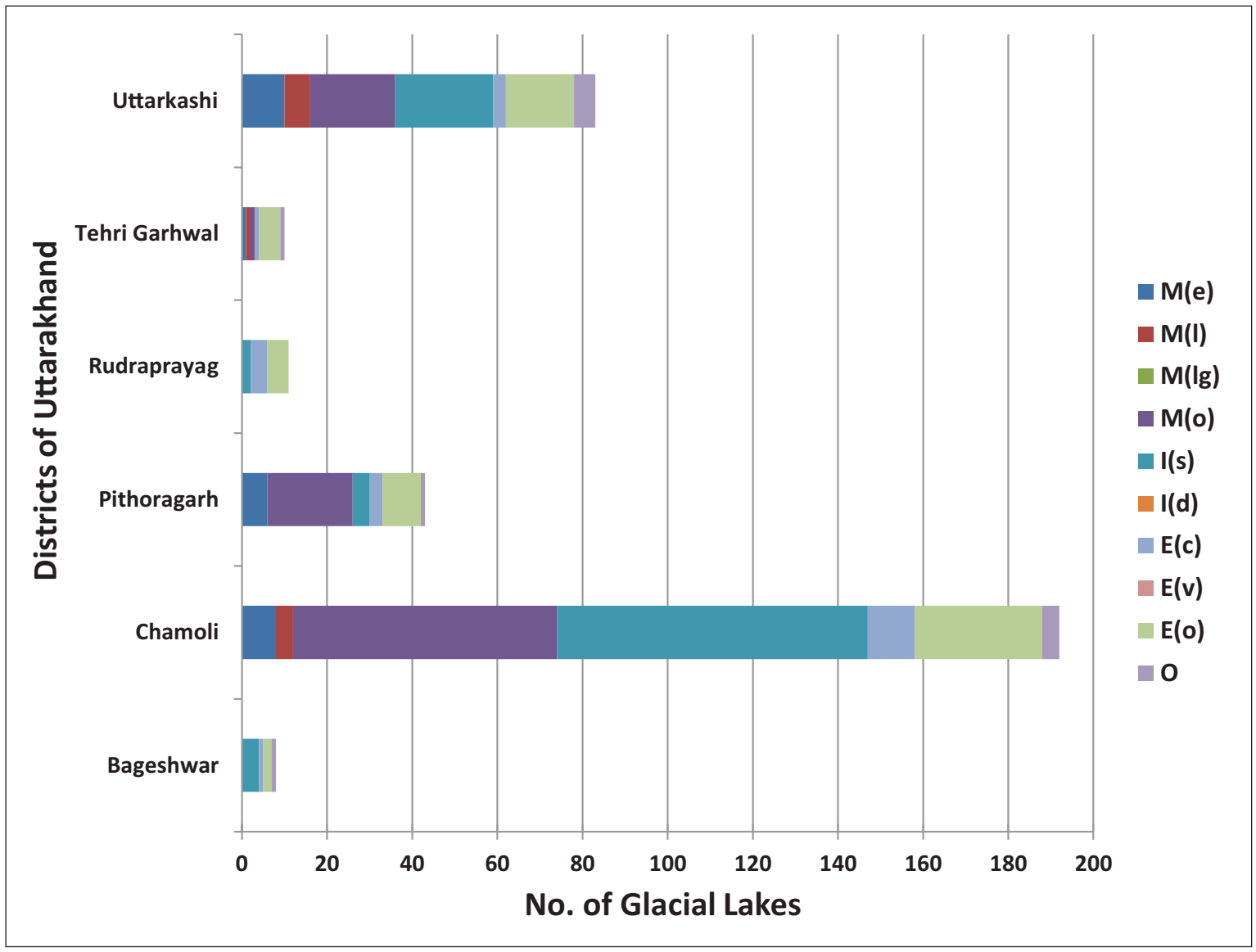


Figure 65: Type-wise distribution of GL in Districts of Uttarakhand

Elevation range-wise Distribution

Elevation range-wise distribution of the glacial lakes in the districts of Uttarakhand has been shown in Table 55 and Figure 66. Majority of glacial lakes (52.74%) are situated in high altitude i.e. 4,001 - 5,000 m elevation range with total lake area of 345.99 ha (61.72%). This is followed by glacial lakes in very high altitude elevation range with 44.09%. Chamoli district contains maximum number of glacial lakes above 4,000 m elevation in comparison with any other district in the state, with majority of them falling in very high altitude range i.e. > 5,000 m. Elevation range-type-wise distribution of glacial lakes in Uttarakhand has been represented in Figure 67.

Table 55: Elevation range-wise distribution of GL in Districts of Uttarakhand

S. No.	District	Elevation Range (m)							
		up to 3,000		3,001 - 4,000		4,001 - 5,000		> 5,000	
		No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)
1	Bageshwar	0	0.00	1	0.41	7	8.78	0	0.00
2	Chamoli	0	0.00	1	0.74	85	121.99	106	129.99
3	Pithoragarh	0	0.00	3	0.93	22	72.18	18	35.08
4	Rudraprayag	0	0.00	0	0.00	11	31.05	0	0.00
5	Tehri Garhwal	0	0.00	1	1.11	9	45.89	0	0.00
6	Uttarkashi	0	0.00	5	2.45	49	66.1	29	43.92
Total		**0**	0.00	**11**	**5.64**	**183**	**345.99**	**153**	**208.99**

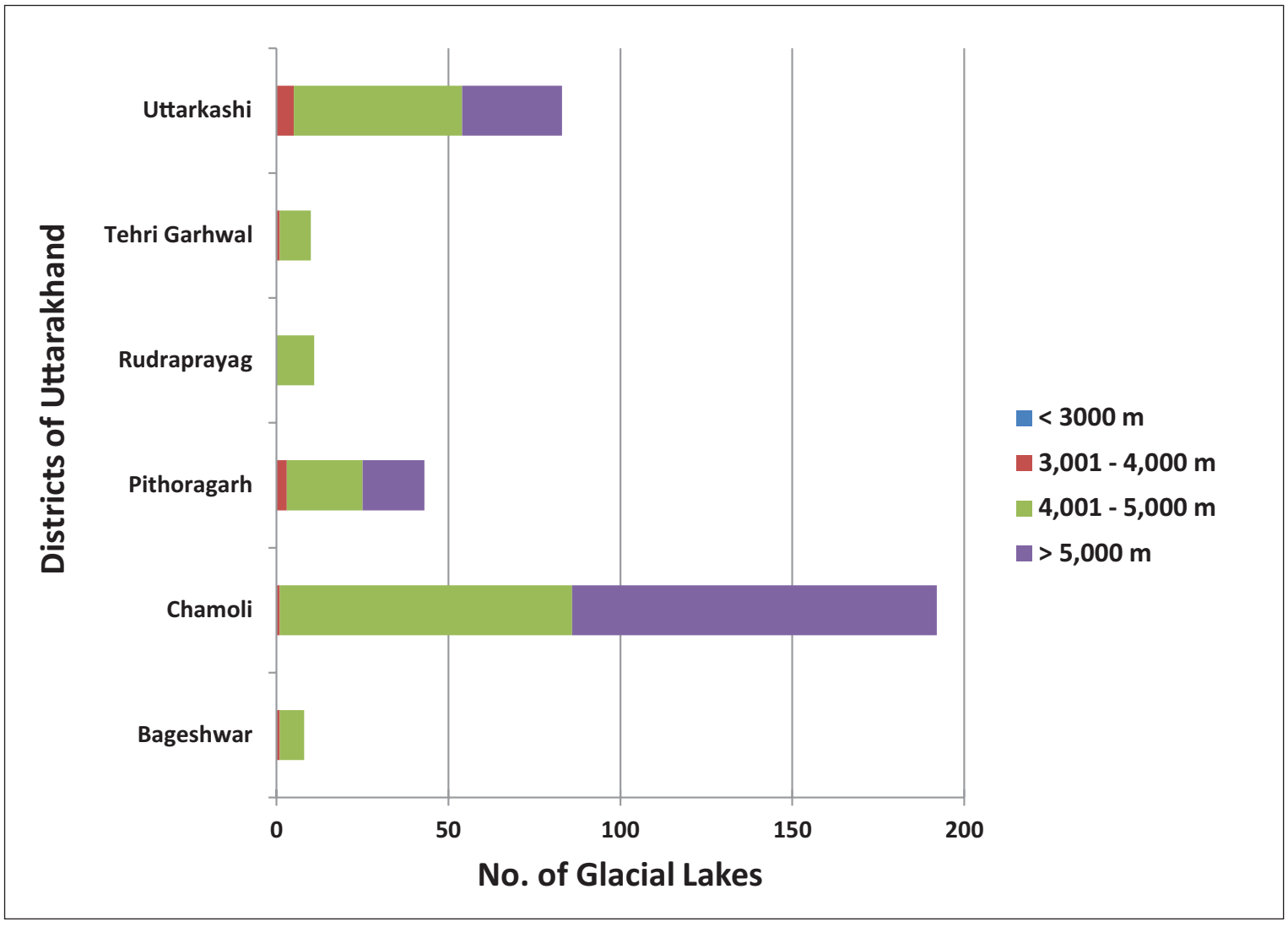


Figure 66: Elevation range-wise distribution of GL in Districts of Uttarakhand

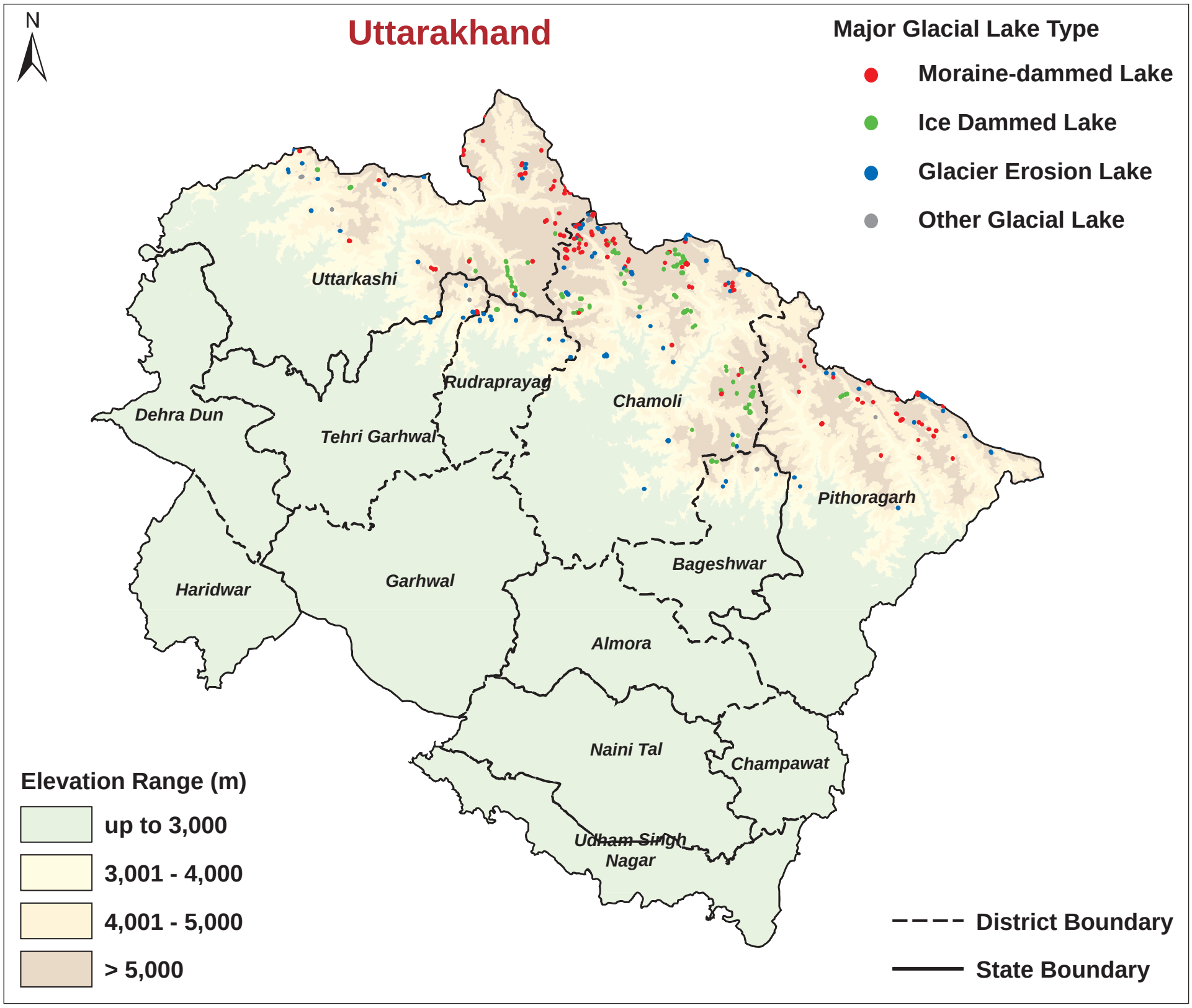


Figure 67: Elevation range-Type-wise spatial distribution of GL in Uttarakhand

5.5.4 District Level Statistics of Ladakh (UT)

Ladakh (UT) is the largest union territory of all in terms of area, divided in two districts viz., Kargil and Leh. Amongst which, Leh covers the majority of the total area.

Area range-wise Distribution

Glacial lakes have been distributed in both districts for all 6 classes of area ranges, and area range-wise distribution for both districts has been shown in Table 56 and Figure 68. Glacial lakes in Leh district are found to be the maximum with 2,912 (90.46%) occupying a total lake extent of 9,014.22 ha at 90.45%. About 2,547 (87.46%) lakes are with < 5 ha lake area contributing to 36.64% of total lake area in the district. Whereas, remaining lakes in the district with > 5 ha in size are only 12.54%, predominantly of 5 - 10 ha in size.

Table 56: Area range-wise distribution of GL in Districts of Ladakh (UT)

S. No.	Lake Area Range (ha)	District					
		Kargil		Leh		Total	
		No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)
1	0.25 - 0.5	59	20.99	748	270.61	807	291.60
2	0.5 - 1	59	43.17	682	482.69	741	525.86
3	1 - 5	139	308.73	1,117	2,549.94	1,256	2,858.67
4	5 - 10	30	209.11	207	1,420.06	237	1,629.17
5	10 - 50	19	309.33	142	2,548.82	161	2,858.15
6	> 50	1	59.78	16	1,742.10	17	1,801.88
Total		**307**	**951.12**	**2,912**	**9,014.22**	**3,219**	**9,965.34**

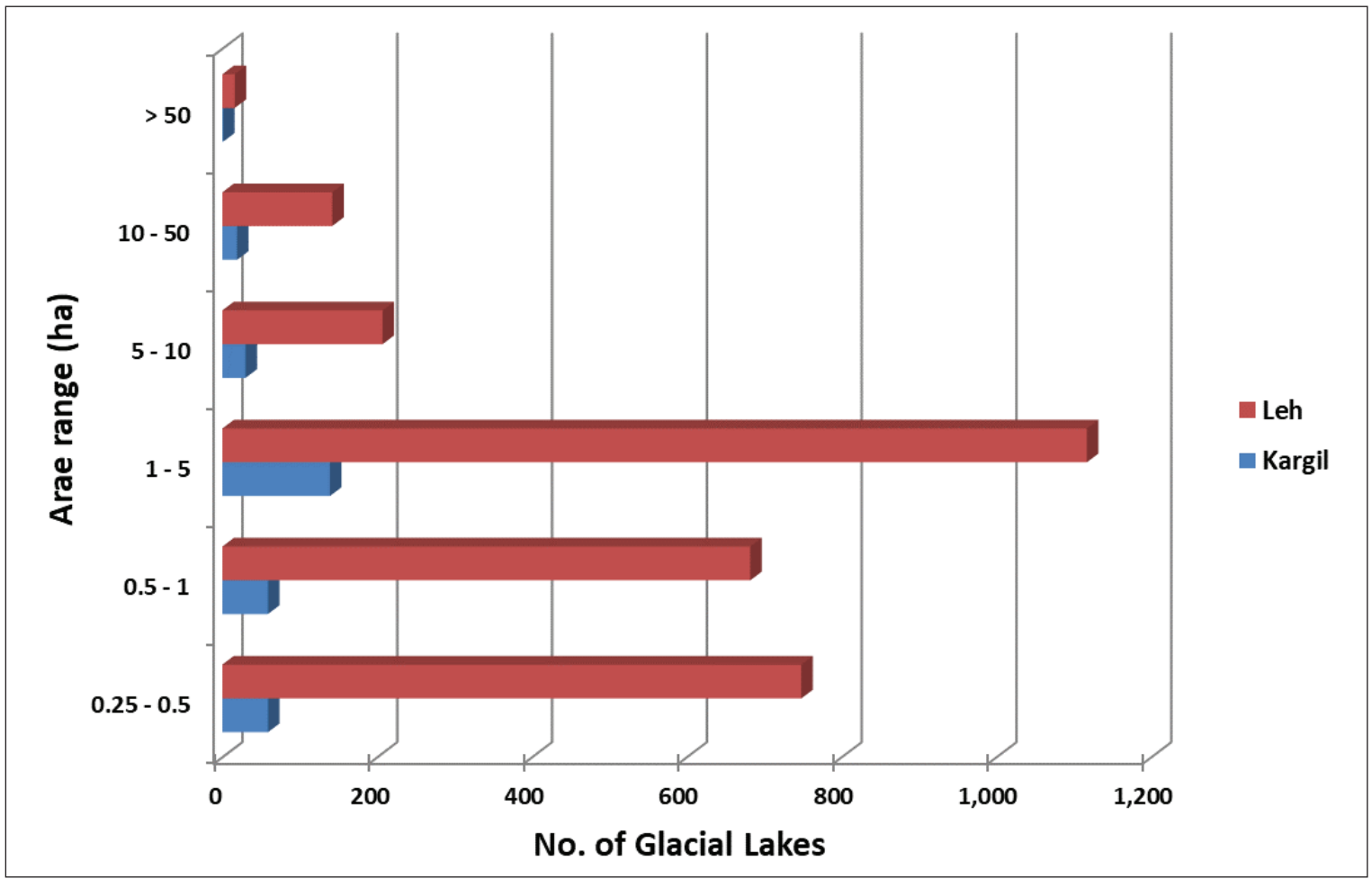


Figure 68: Area range-wise distribution of GL in Districts of Ladakh (UT)

Type-wise Distribution

Distribution of different types of glacial lakes in the districts of Ladakh (UT) is given in Table 57 and Figure 69. It has been observed that, Other Glacial Erosion lakes are maximum with 1,585 (49.24%) in the UT, followed by Supra-glacial lakes with 642 (19.94%). Leh district contains maximum number of all types of glacial lakes in comparison with Kargil district in the UT, with majority of Other Glacial Erosion lakes (87.63%), followed by Supra-glacial lakes i.e. 38.92%.

Table 57: Type-wise distribution of GL in Districts of Ladakh (UT)

S. No.	District	Types of Glacial Lake										Total	
		M(e)	M(l)	M(lg)	M(o)	I(s)	I(d)	E(c)	E(v)	E(o)	O	No. of Lakes	Lake Area (ha)
1	Kargil	16	6	1	52	25	0	8	0	196	3	307	951.12
2	Leh	199	176	28	302	617	1	108	1	1,389	91	2,912	9,014.22
Total		**215**	**182**	**29**	**354**	**642**	**1**	**116**	**1**	**1,585**	**94**	**3,219**	**9,965.34**

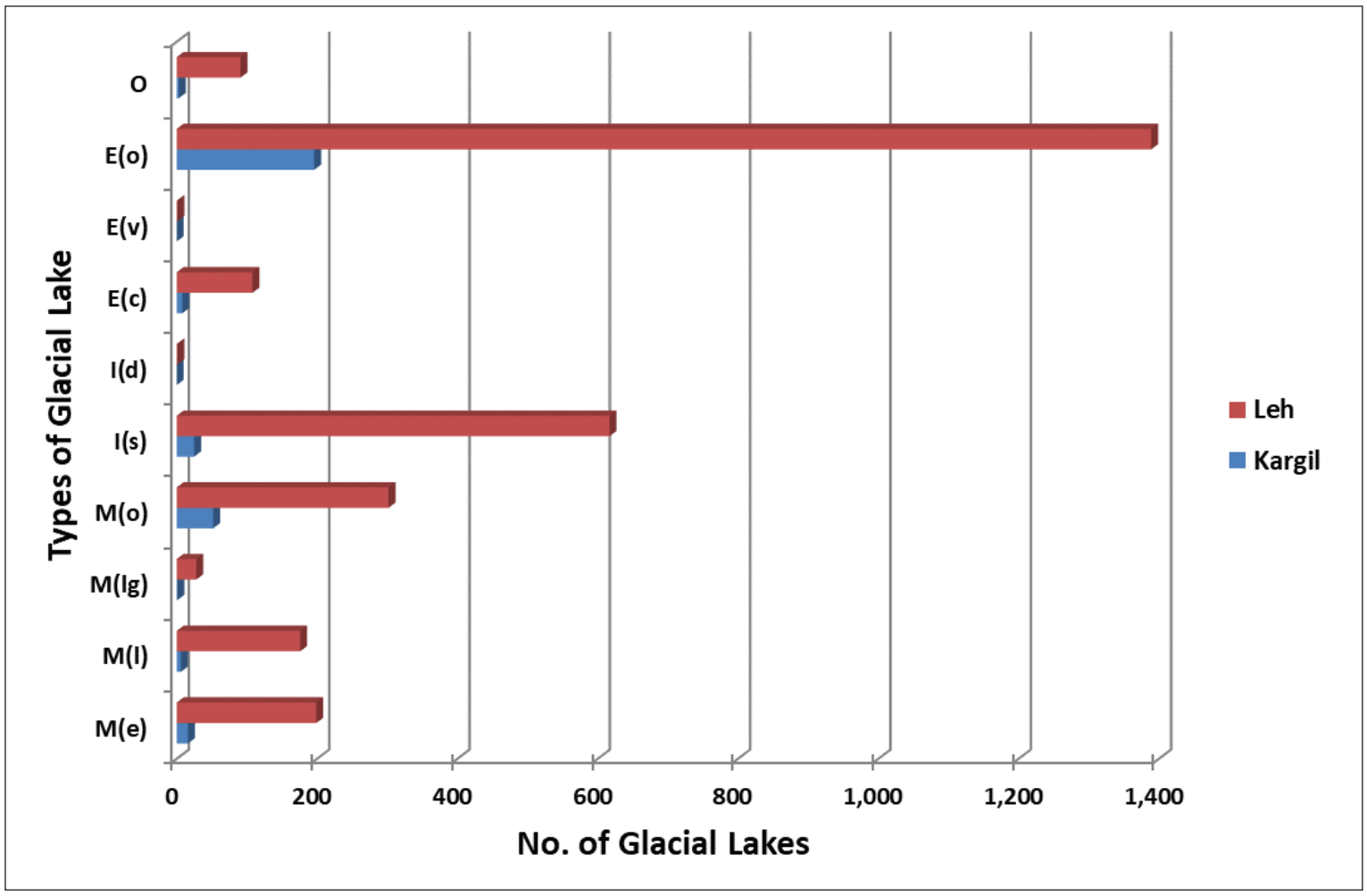


Figure 69: Type-wise distribution of GL in Districts of Ladakh (UT)

Elevation range-wise Distribution

Elevation range-wise distribution of the glacial lakes in the districts of Ladakh (UT) has been shown in Table 58 and Figure 70. Majority of glacial lakes are situated above 4,000 m elevation range i.e. 2,840 (88.22%) with total lake area of 8,711.07 ha (87.41%) and remaining 11.78% glacial lakes are below 4,000 m elevation. Leh district contains maximum number of glacial lakes above 4,000 m in comparison with other district in the UT, with majority of them falling in high altitude range i.e. 4,001 - 5,000 m. 100% low altitude lakes of Ladakh (UT) also situated in Leh. Elevation range-type-wise distribution of glacial lakes has been represented in Figure 71.

Table 58: Elevation range-wise distribution of GL in Districts of Ladakh (UT)

S. No.	Elevation Range (m)	District				Total	
		Kargil		Leh			
		No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)
1	up to 3,000	0	0.00	21	47.70	21	47.70
2	3,001 - 4,000	2	4.78	356	1,201.80	358	1,206.57
3	4,001 - 5,000	269	904.15	1,899	5,712.56	2,168	6,616.71
4	> 5,000	36	42.19	636	2,052.17	672	2,094.36
Total		**307**	**951.12**	**2,912**	**9,014.22**	**3,219**	**9,965.34**

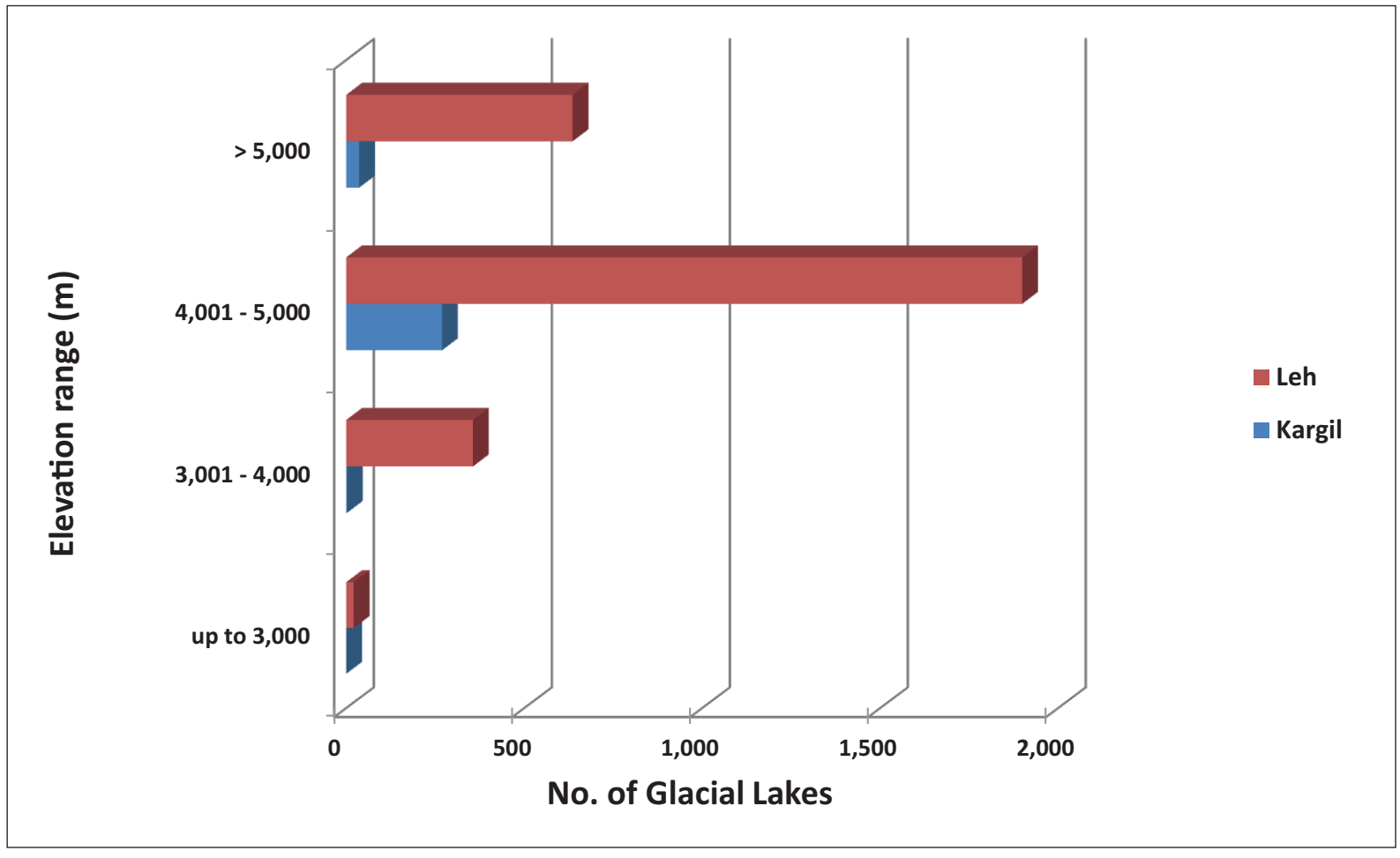


Figure 70: Elevation range-wise distribution of GL in Districts of Ladakh (UT)

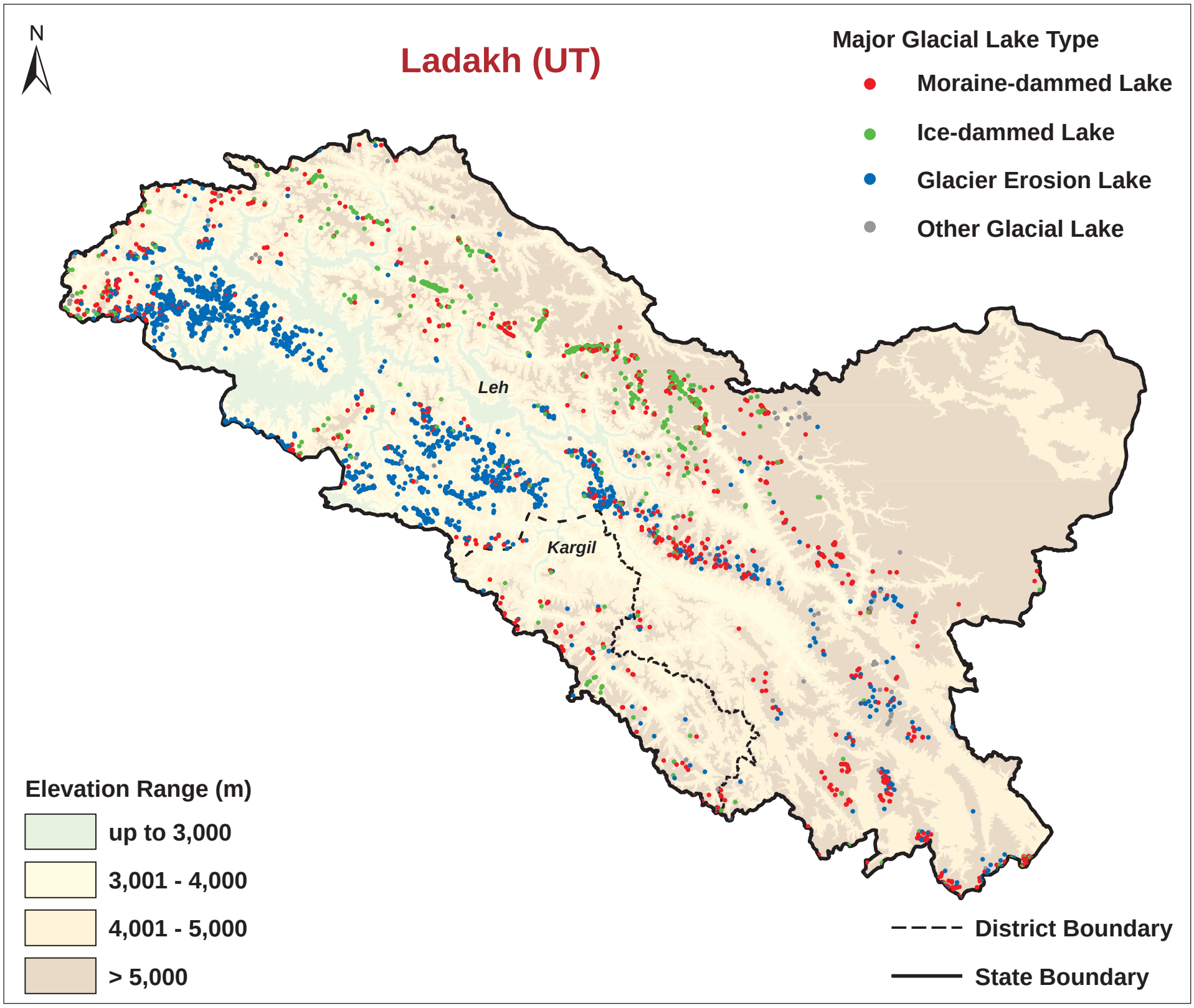


Figure 71: Elevation range-Type-wise spatial distribution of GL in Ladakh (UT)

5.5.6 District Level Statistics of Jammu & Kashmir (UT)

Jammu & Kashmir (UT) is the second largest union territory of all in terms of area, has total 22 districts but only 15 districts have glacial lakes.

Area range-wise Distribution

Glacial lakes have been distributed in all 15 districts of J&K (UT) for all 6 classes of area ranges, and area range-wise distribution for those has been shown in Table 59 and Figure 72. Glacial lakes in Kishtwar district are found to be the maximum with 197 (36.08%) occupying a total lake extent of 392.64 ha at 13.63%. About 179 (90.86%) lakes are with < 5 ha lake area contributing to 46.57% of total lake area in the district. Whereas, remaining lakes in the district with > 5 ha in size are only 9.14%, predominantly of 5 - 10 ha in size.

Table 59: Area range-wise distribution of GL in Districts of Jammu & Kashmir (UT)

S. No.	District	Lake Area Range (ha)											
		0.25 - 0.5		0.5 - 1		1 - 5		5 - 10		10 - 50		> 50	
		No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)
1	Anantnag	11	4.30	5	3.54	15	40.89	7	50.78	12	200.10	2	135.20
2	Badgam	2	0.86	2	1.47	8	20.30	7	57.63	6	127.53	0	0.00
3	Bandipore	6	2.44	10	7.31	29	73.84	7	50.27	12	322.77	0	0.00
4	Baramula	4	1.64	2	1.12	2	3.67	0	0.00	0	0.00	0	0.00
5	Doda	2	0.61	3	1.78	6	8.35	2	19.20	0	0.00	0	0.00
6	Ganderbal	8	3.03	9	6.70	20	42.83	2	13.67	5	86.00	1	161.04
7	Kishtwar	70	24.81	55	37.26	54	120.81	13	92.22	5	117.54	0	0.00
8	Kulgam	5	2.09	3	2.30	6	18.18	2	12.59	10	188.03	2	199.37
9	Kupwara	0	0.00	1	0.68	0	0.00	0	0.00	0	0.00	0	0.00
10	Muzaffarabad	10	3.29	24	17.66	25	59.61	5	35.24	8	168.94	2	154.50
11	Punch	2	0.79	9	6.79	6	13.41	2	12.56	3	46.65	0	0.00
12	Rajauri	2	0.83	0	0.00	5	12.64	2	14.08	1	14.88	0	0.00
13	Reasi	1	0.36	1	0.75	2	4.13	0	0.00	0	0.00	0	0.00
14	Srinagar	0	0.00	1	0.70	0	0.00	0	0.00	1	43.47	0	0.00
15	Udhampur	0	0.00	0	0.00	1	4.73	0	0.00	0	0.00	0	0.00
Total		**123**	**45.05**	**125**	**88.08**	**179**	**423.41**	**49**	**358.24**	**63**	**1,315.91**	**7**	**650.10**

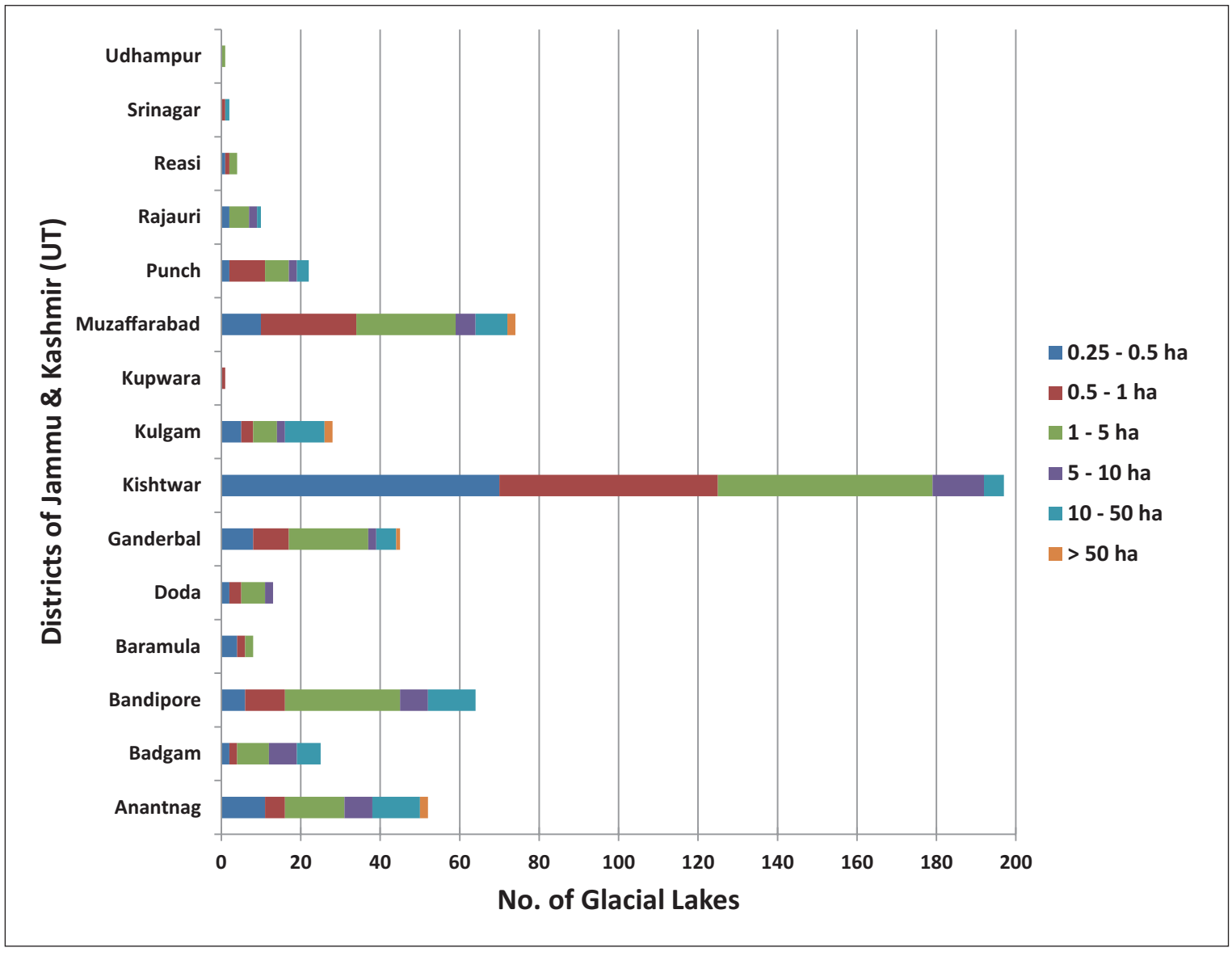


Figure 72: Area range-wise distribution of GL in Districts of Jammu & Kashmir (UT)

Type-wise Distribution

Distribution of different types of glacial lakes in the districts of J&K (UT) is given in Table 60 and Figure 73. It has been observed that, only 7 types of glacial lakes are distributed in the UT, where Other Glacial Erosion lakes are found to be the maximum with 319 (58.42%) in the UT, followed by Other Moraine Dammed lakes with 69 (12.64%). Kishtwar district contains maximum number of all types of glacial lakes in comparison with other districts in the UT, with majority of Other Glacial Erosion lakes (35.03%), followed by Supra-glacial lakes i.e. 23.86%.

Table 60: Type-wise distribution of GL in Districts of Jammu & Kashmir (UT)

S. No.	District	Types of Glacial Lake										Total	
		M(e)	M(l)	M(lg)	M(o)	I(s)	I(d)	E(c)	E(v)	E(o)	O	No. of Lakes	Lake Area (ha)
1	Anantnag	1	1	0	3	0	0	4	0	42	1	52	434.82
2	Badgam	0	0	0	0	0	0	2	0	23	0	25	207.80
3	Bandipore	0	0	0	11	0	0	13	0	39	1	64	456.63
4	Baramula	0	0	0	0	0	0	1	0	7	0	8	6.43
5	Doda	1	0	0	3	0	0	3	0	6	0	13	29.94
6	Ganderbal	0	0	0	0	1	0	5	0	39	0	45	313.26
7	Kishtwar	15	8	0	40	47	0	14	0	69	4	197	392.64
8	Kulgam	1	0	0	0	0	0	2	0	24	1	28	422.55
9	Kupwara	0	0	0	0	0	0	0	0	1	0	1	0.68
10	Muzaffarabad	2	0	0	12	6	0	13	0	39	2	74	439.24
11	Punch	0	0	0	0	0	0	2	0	20	0	22	80.21
12	Rajauri	0	0	0	0	0	0	5	0	5	0	10	42.43
13	Reasi	0	0	0	0	0	0	1	0	3	0	4	5.25
14	Srinagar	0	0	0	0	0	0	0	0	2	0	2	44.17
15	Udhampur	0	0	0	0	0	0	1	0	0	0	1	4.73
Total		**20**	**9**	**0**	**69**	**54**	**0**	**66**	**0**	**319**	**9**	**546**	**2,880.79**

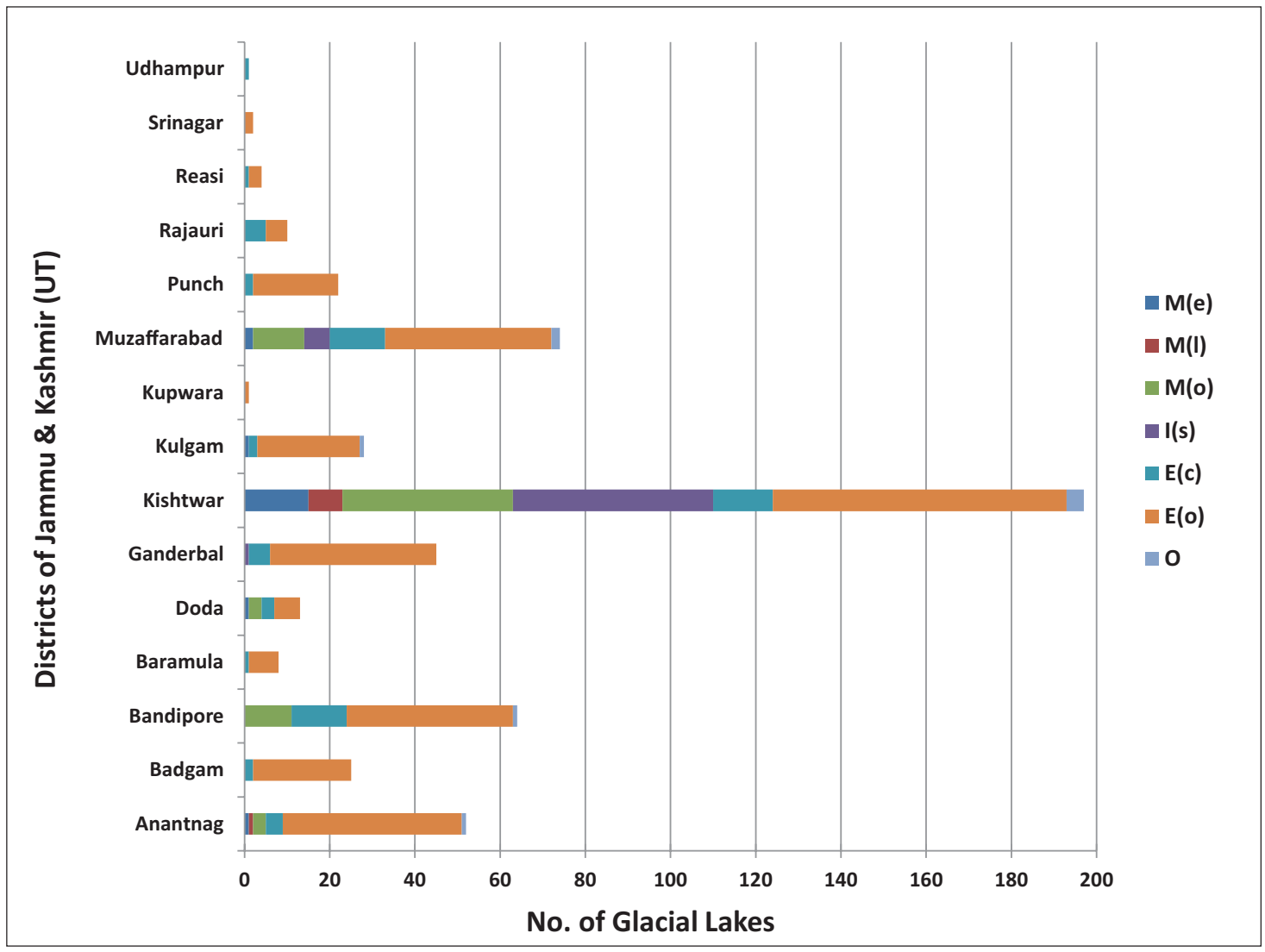


Figure 73: Type-wise distribution of GL in Districts of Jammu & Kashmir (UT)

Elevation range-wise Distribution

Elevation range-wise distribution of the glacial lakes in the districts of J&K (UT) has been shown in Table 61 and Figure 74. Majority of glacial lakes are situated below 4,000 m elevation range i.e. 277 (50.73%) with total lake area of 2,087.45 ha (72.46%), all in medium altitude range only. Whereas, remaining 49.27% glacial lakes are above 4,000 m elevation, majorly in high altitude range. Kishtwar district contains maximum number of glacial lakes above and below 4,000 m elevation in comparison with any other district in the UT, with majority of them falling in high altitude range i.e. 4,001 - 5,000 m i.e. 70.01%. Elevation range-type-wise distribution of glacial lakes has been represented in Figure 75.

Table 61: Elevation range-wise distribution of GL in Districts of Jammu & Kashmir (UT)

S. No.	District	Elevation Range (m)							
		up to 3,000		3,001 - 4,000		4,001 - 5,000		> 5,000	
		No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)
1	Anantnag	0	0.00	35	368.53	17	66.29	0	0.00
2	Badgam	0	0.00	11	123.49	14	84.32	0	0.00
3	Bandipore	0	0.00	46	413.64	18	42.99	0	0.00
4	Baramula	0	0.00	7	6.02	1	0.41	0	0.00
5	Doda	0	0.00	5	13.99	8	15.95	0	0.00
6	Ganderbal	0	0.00	27	278.90	18	34.37	0	0.00
7	Kishtwar	0	0.00	58	83.66	138	308.04	1	0.93
8	Kulgam	0	0.00	23	365.56	5	56.98	0	0.00
9	Kupwara	0	0.00	1	0.68	0	0.00	0	0.00
10	Muzaffarabad	0	0.00	30	262.87	44	176.37	0	0.00
11	Punch	0	0.00	18	76.19	4	4.02	0	0.00
12	Rajauri	0	0.00	9	39.77	1	2.67	0	0.00
13	Reasi	0	0.00	4	5.25	0	0.00	0	0.00
14	Srinagar	0	0.00	2	44.17	0	0.00	0	0.00
15	Udhampur	0	0.00	1	4.73	0	0.00	0	0.00
Total		**0**	**0.00**	**277**	**2,087.45**	**268**	**792.42**	**1**	**0.93**

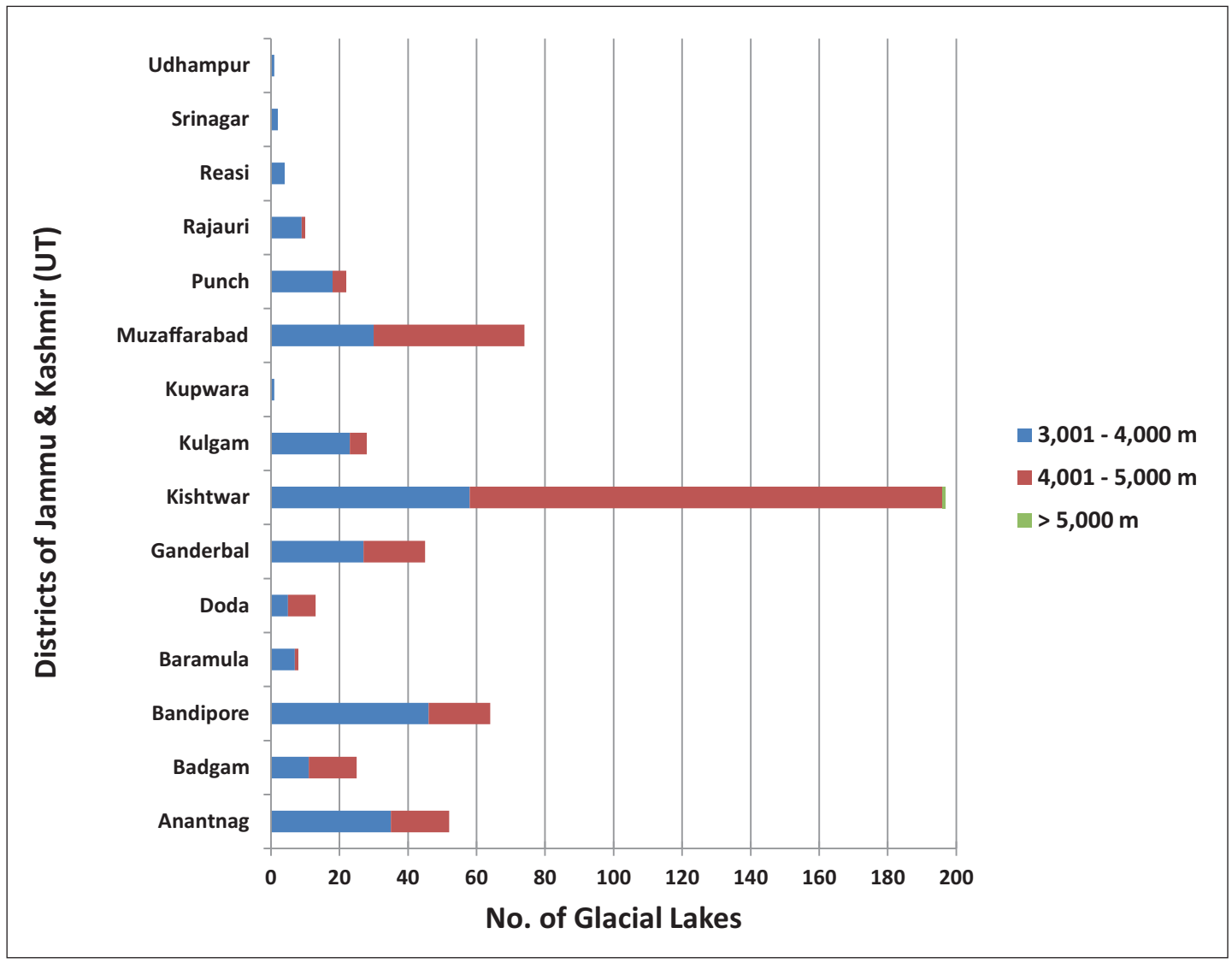


Figure 74: Elevation range-wise distribution of GL in Districts of Jammu & Kashmir (UT)

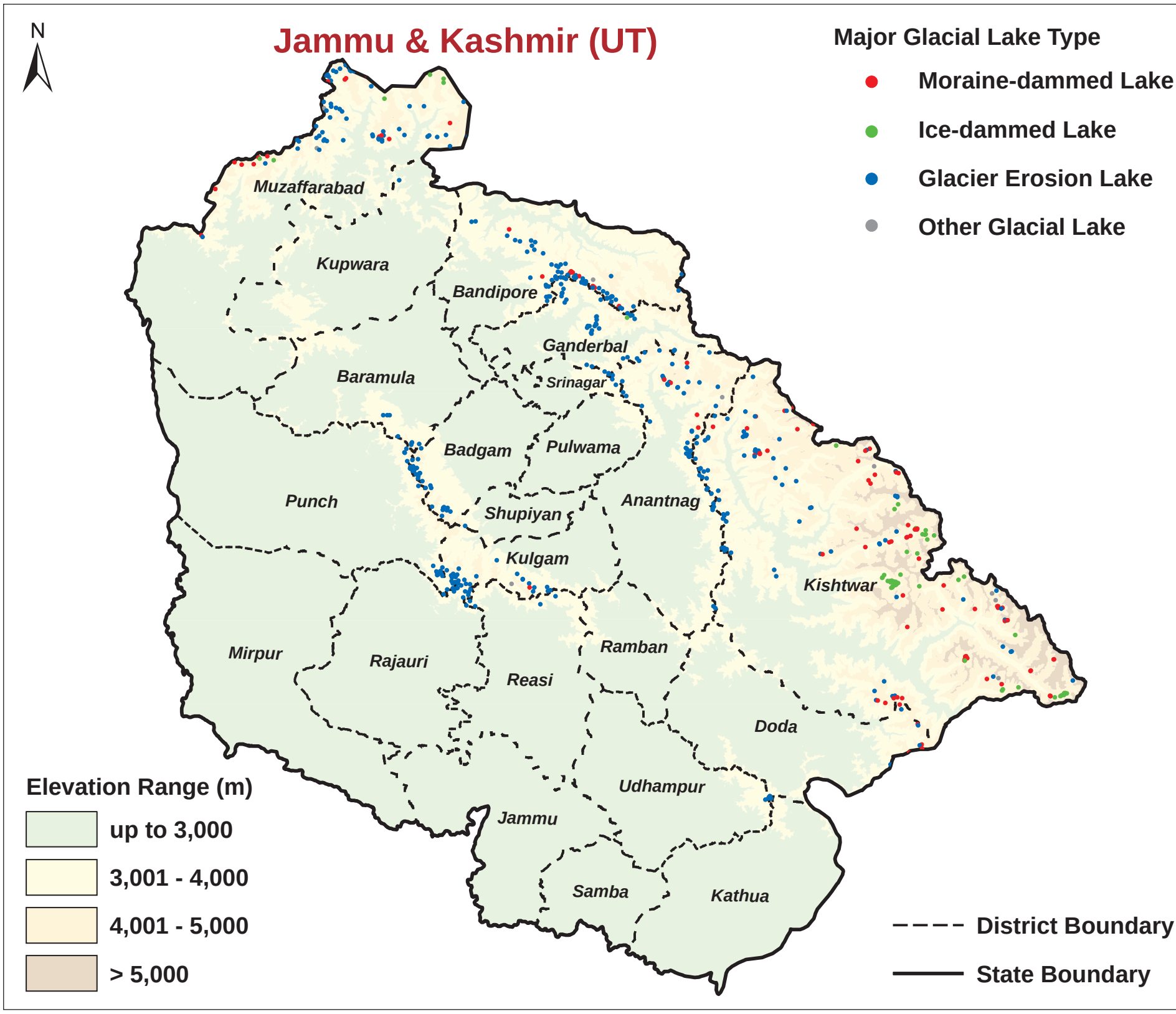


Figure 75: Elevation range-Type-wise spatial distribution of GL in Jammu & Kashmir (UT)

5.6 Transboundary Region Statistics

Transboundary area of Indian Himalayan River Basins has a total area of 6,05,904 Km^2 i.e. 61.22%. This transboundary region covers majority part of it in China, Nepal and Bhutan. A total of 20,473 glacial lakes lies within transboundary region, covering a total area of 1,00,922.36 ha i.e. 16.66% of the total area of the Indian Himalayan River Basins under transboundary region.

Area range-wise Distribution

In Transboundary region, glacial lakes have been distributed in all 6 classes of area ranges. Table 62 and Figure 76 shows the area range-wise distribution of glacial lakes for the Transboundary region. About 16,963 (82.86%) lakes are with < 5 ha lake area contributing to 22.46% of total lake area. The remaining lakes with > 5 ha in size are only 3,510 (17.14%) but contributing to 77.54% of total lake area in the region.

Table 62: Area range-wise distribution of GL in Transboundary region

S. No.	Lake Area Range (ha)	No. of Lakes	Total Lake Area	
			(ha)	(%)
1	0.25 - 0.5	4,548	1,623.80	1.61
2	0.5 - 1	4,646	3,329.63	3.30
3	1 - 5	7,769	17,708.90	17.55
4	5 - 10	1,733	12,154.62	12.04
5	10 - 50	1,536	29,852.91	29.58
6	> 50	241	36,252.50	35.92
Total		**20,473**	**1,00,922.36**	**100.00**

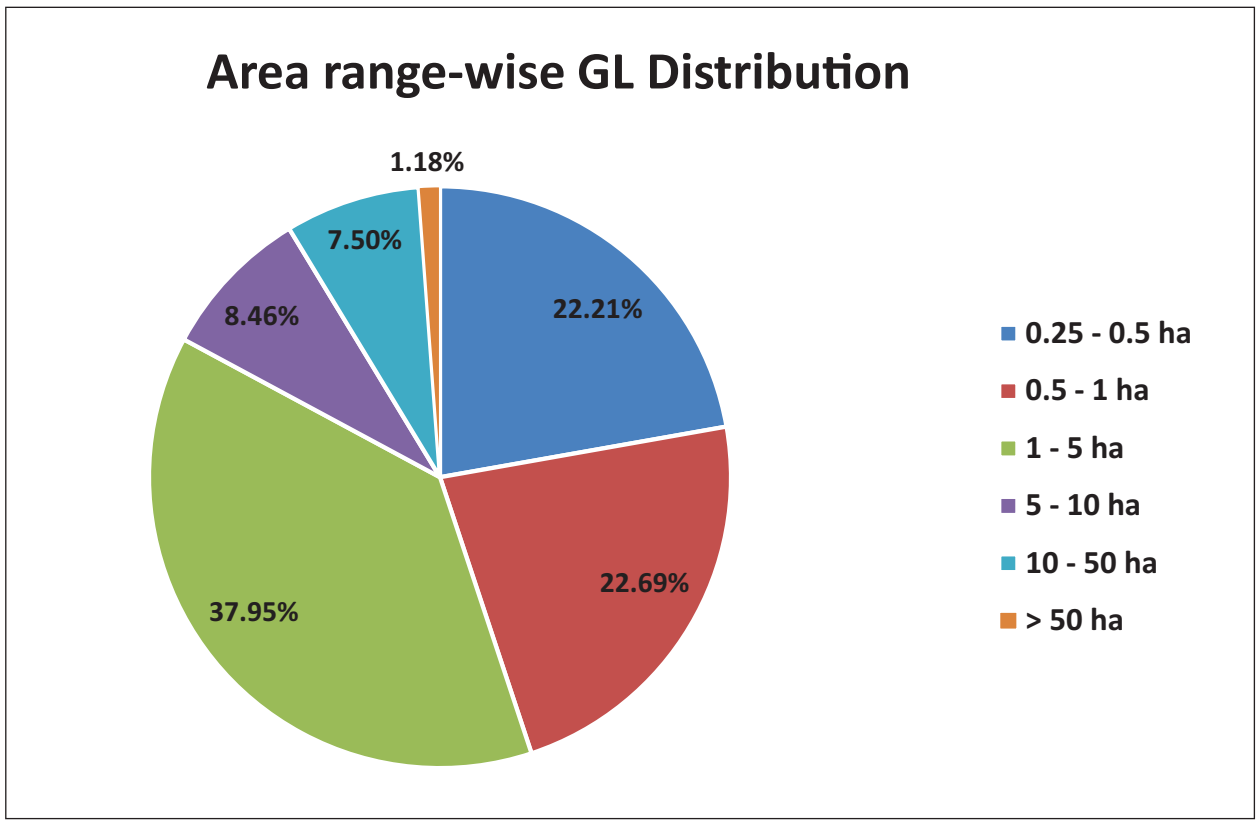


Figure 76: Area range-wise distribution of GL in Transboundary region

Type-wise Distribution

Distribution of different types of glacial lakes in the Transboundary region is given in Table 63 and Figure 77. All types of glacial lakes are present in the Transboundary region, where Other Glacial Erosion lakes are found to be the maximum with 11,818 (57.72%) occupying a total lake extent of 44,988.30 ha at 44.58% in the region. After that, Other Moraine Dammed and Other Glacial lakes are in majority with 4,691 (22.91%) and 1,579 (7.71%) and extend over a total area of 12,964.75 ha (12.85%) and 12,833.52 ha (12.72%) respectively.

Table 63: Type-wise distribution of GL in Transboundary region

S. No.	Code	Types of Glacial Lake	No. of Lakes	Total Lake Area	
				(ha)	(%)
1	M(e)	End-moraine Dammed Lake	714	18,344.22	18.18
2	M(l)	Lateral Moraine Dammed Lake	127	789.33	0.78
3	M(lg)	Lateral Moraine Dammed Lake with Ice	26	52.45	0.05
4	M(o)	Other Moraine Dammed Lake	4,691	12,964.75	12.85
5	I(s)	Supra-glacial Lake	759	737.54	0.73
6	I(d)	Glacier Ice-dammed Lake	4	237.29	0.24
7	E(c)	Cirque Erosion Lake	747	6,515.70	6.46
8	E(v)	Glacier Trough Valley Erosion Lake	8	3,459.26	3.43
9	E(o)	Other Glacial Erosion Lake	11,818	44,988.30	44.58
10	O	Other Glacial Lake	1,579	12,833.52	12.72
Total			**20,473**	**1,00,922.36**	**100.00**

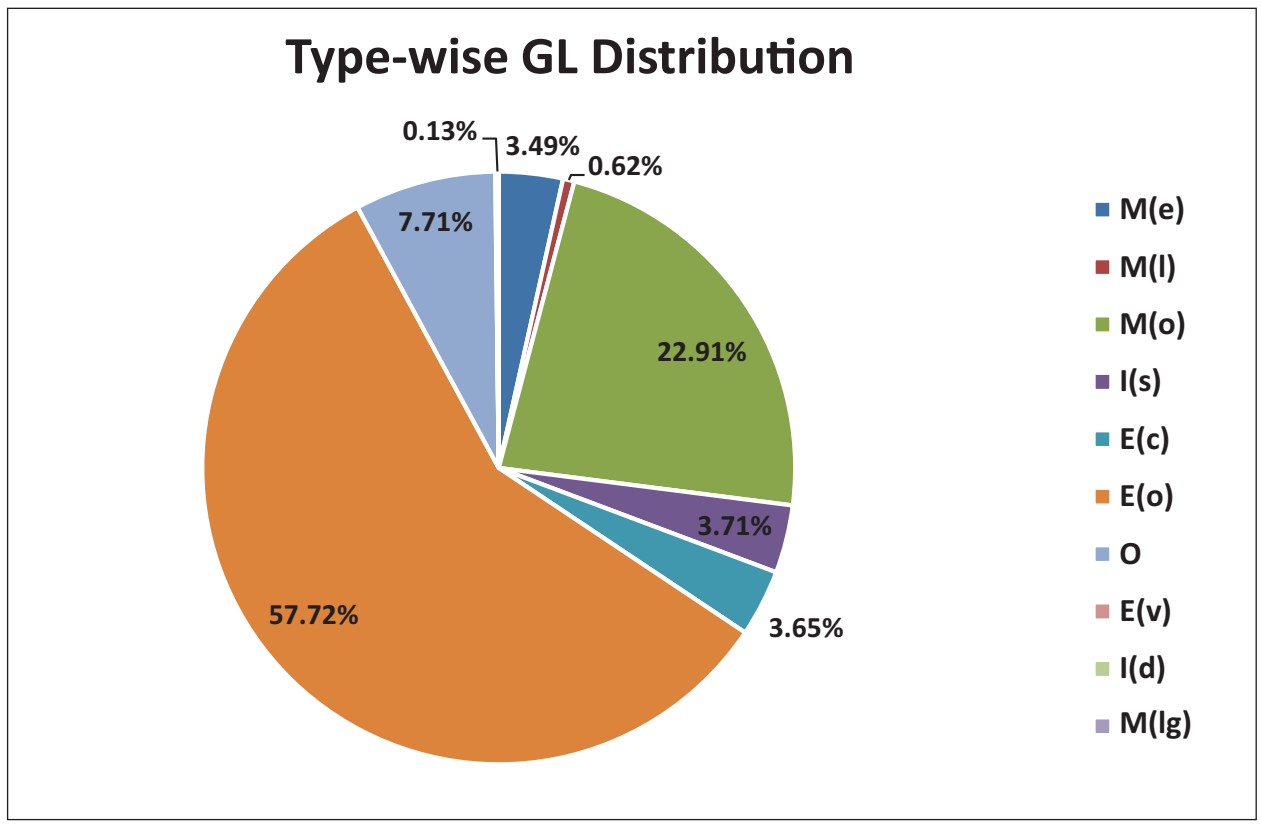


Figure 77: Type-wise distribution of GL in Transboundary region

Area range-Type-wise Distribution

Glacial lake distribution by area range vs. type-wise is given in Table 64 and Figure 78. The lakes with < 5 ha in size (82.86%) are dominant with Other Glacial Erosion (59.03%) and Other Moraine Dammed lakes (24.48%). Lakes with > 5 ha (17.14%) are also dominated by Other Glacial Erosion lakes (51.40%). All types of Moraine-dammed lakes, which constitute about 27.15%, are majorly with < 5 ha in water spread.

Table 64: Area range-wise vs. Type-wise distribution of GL in Transboundary region

S. No.	Lake Area Range (ha)	Types of Glacial Lake										Total
		M(e)	M(l)	M(lg)	M(o)	I(s)	I(d)	E(c)	E(v)	E(o)	O	
1	0.25 - 0.5	16	29	7	1,196	402	0	16	0	2,456	426	4,548
2	0.5 - 1	32	28	6	1,202	226	1	42	0	2,739	370	4,646
3	1 - 5	201	44	11	1,754	115	2	292	0	4,819	531	7,769
4	5 - 10	132	8	1	322	8	0	185	0	983	94	1,733
5	10 - 50	249	13	1	203	8	0	207	1	739	115	1,536
6	> 50	84	5	0	14	0	1	5	7	82	43	241
Total		**714**	**127**	**26**	**4,691**	**759**	**4**	**747**	**8**	**11,818**	**1,579**	**20,473**

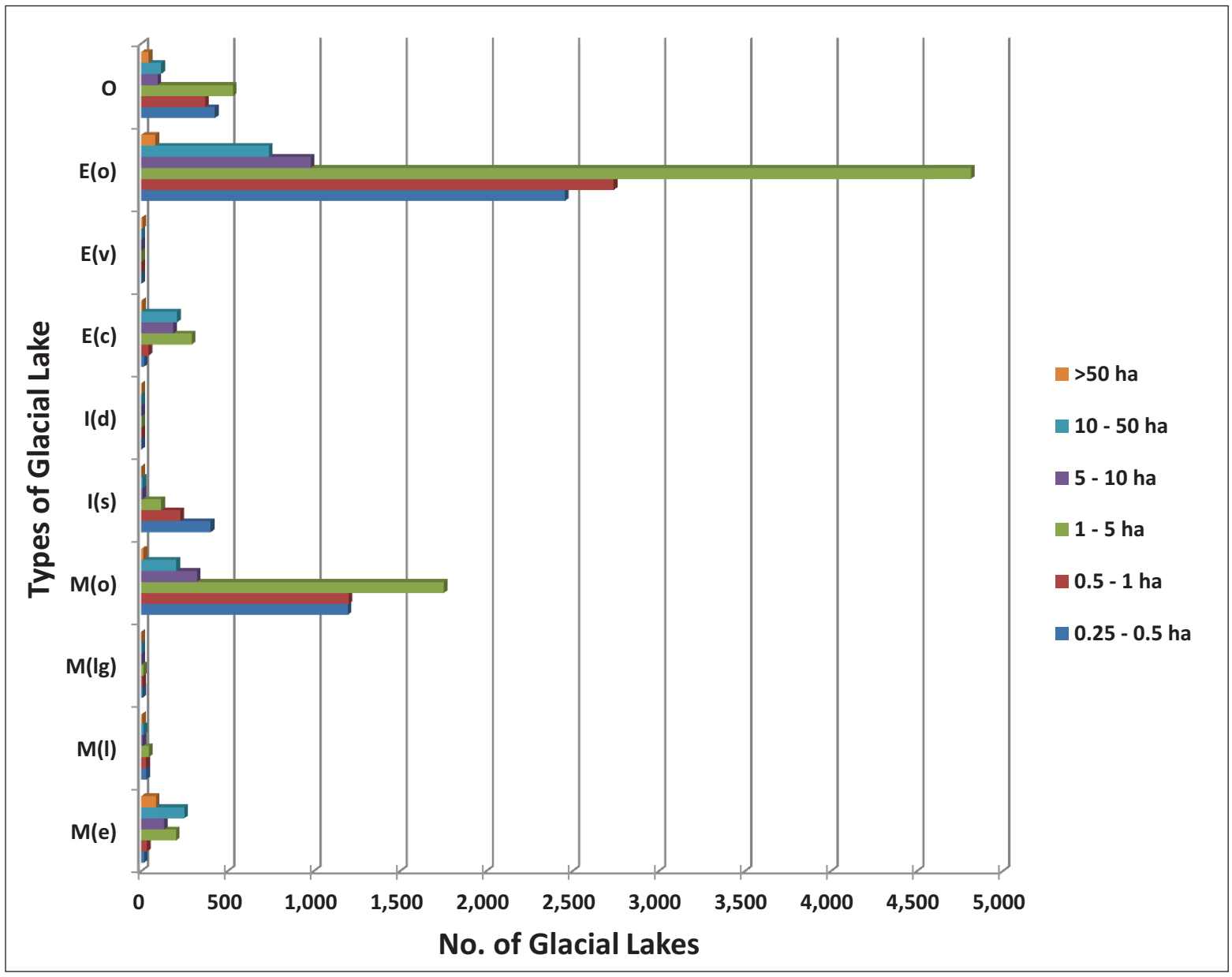


Figure 78: Area range-wise vs. Type-wise distribution of GL in Transboundary region

Elevation range-wise distribution

Elevation range-wise distribution of the glacial lakes in the Transboundary region has been shown in Table 65 and Figure 79. Majority of glacial lakes are situated above 4,000 m elevation range i.e. 19,990 (97.64%) with total lake area of 94,789.30 ha, contributing 93.92% of lake area.

Table 65: Elevation range-wise distribution of GL in Transboundary region

S. No.	Elevation range (m)	No. of lakes	Total Lake Area	
			(ha)	(%)
1	up to 3,000	8	117.28	0.12
2	3,001 - 4,000	475	6,015.78	5.96
3	4,001 - 5,000	9,602	51,953.95	51.48
4	> 5,000	10,388	42,835.35	42.44
Total		**20,473**	**1,00,922.36**	**100.00**

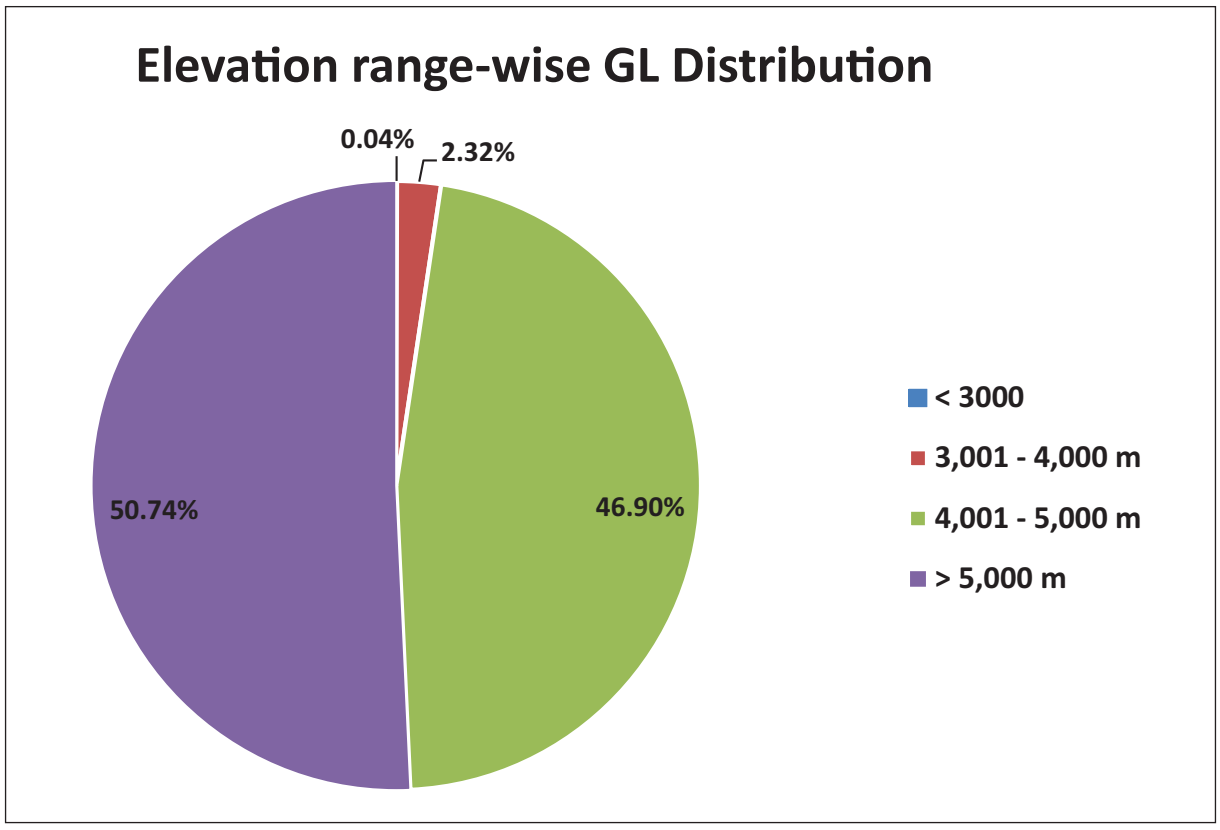


Figure 79: Elevation range-wise distribution of GL in Transboundary region

Area Elevation-range-wise Distribution

Glacial lake distribution has been analyzed as per area range vs. elevation range-wise, given in Table 66 and Figure 80. It is noted that, 46.90% of glacial lakes (9,602) are situated in high altitude range i.e. 4,001 - 5,000 m, which also constitutes majority of total lake area within that range i.e. 51.48%. However, 8 glacial lakes lies below 3,000 m, has 37.50% of its lakes < 5 ha in size. 86.76% of lakes lying in very high-altitude range are < 5 ha, majorly of size ranging 1 - 5 ha (i.e. 3,882), followed by lakes of size 0.5 - 1 ha (i.e. 2,578). It has been further noticed that, 39.17% of lakes > 5 ha are lying within in the very high altitude range, majority of them falling in size ranging of 5 - 10 ha.

Table 66: Area range-wise vs. Elevation range-wise distribution of GL in Transboundary region

S. No.	Lake Area Range (ha)	Elevation Range (m)								Total	
		up to 3,000		3,001 - 4,000		4,001 - 5,000		> 5,000			
		No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)	No. of lakes	Total Lake Area (ha)
1	0.25 - 0.5	0	0.00	66	23.93	1,929	693.92	2,553	905.95	4,548	1,623.80
2	0.5 - 1	1	0.62	61	42.87	2,006	1,443.66	2,578	1,842.47	4,646	3,329.63
3	1 - 5	2	5.34	189	490.16	3,696	8,565.48	3,882	8,647.91	7,769	17,708.90
4	5 - 10	2	15.62	75	531.29	947	6,694.58	709	4,913.13	1,733	12,154.62
5	10 - 50	3	95.70	70	1,486.91	893	17,199.67	570	11,070.63	1,536	29,852.91
6	> 50	0	0.00	14	3,440.62	131	17,356.62	96	15,455.26	241	36,252.50
Total		**8**	**117.28**	**475**	**6,015.78**	**9,602**	**51,953.95**	**10,388**	**42,835.36**	**20,473**	**1,00,922.36**

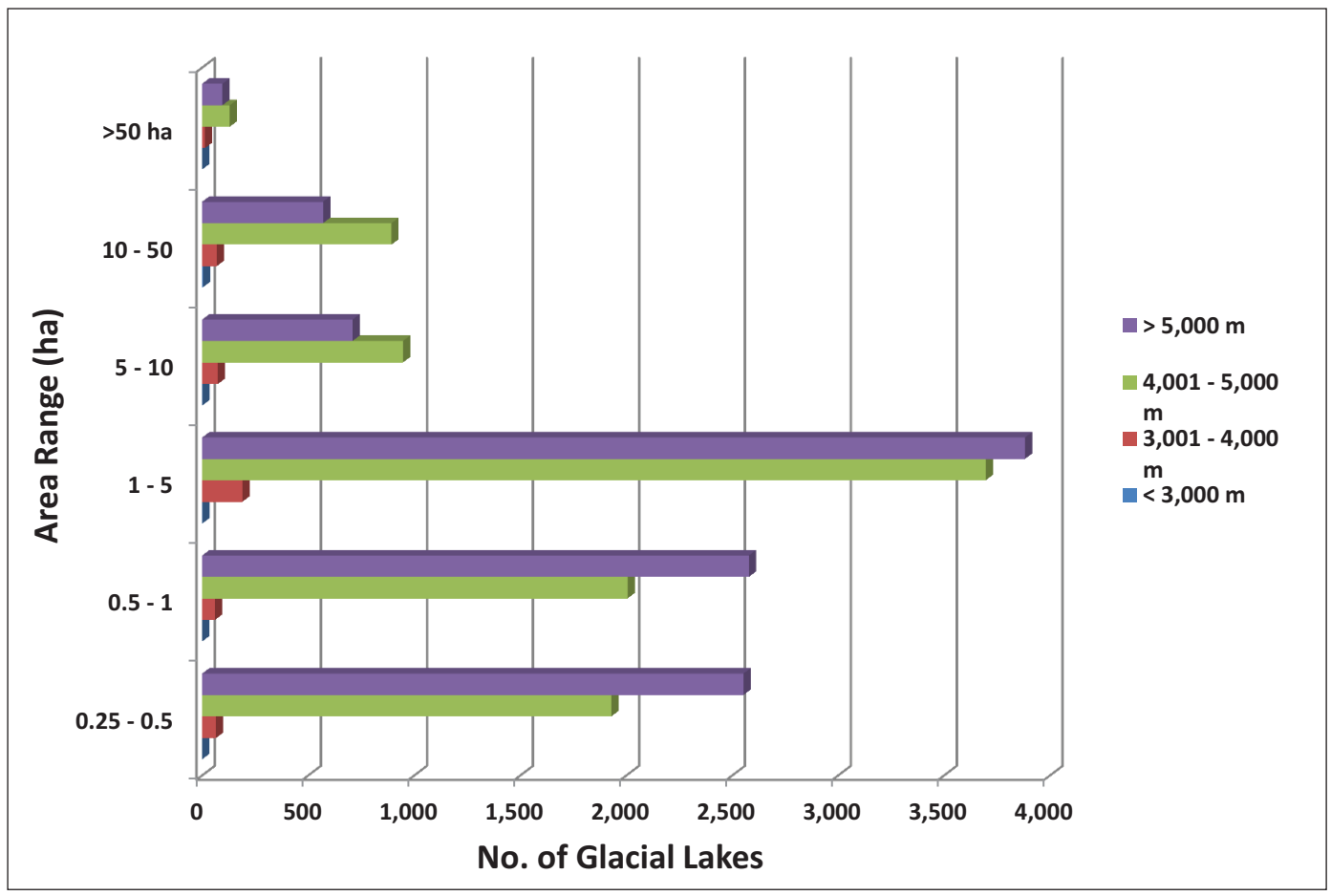


Figure 80: Area range-wise vs. Elevation range-wise distribution of GL in Transboundary region

Type-Elevation range-wise distribution

Glacial lake distribution has also been analyzed as per type-wise vs. elevation range-wise, given in Table 67 and Figure 81. The dominant lake type in the Transboundary i.e., Other Glacial Erosion lakes (57.72%) are predominantly located in the elevation range 4,001 - 5,000 m (55.86%). The other dominant lake type, namely, Other Moraine Dammed and Other Glacial Lakes are also majorly distributed in very high-altitude range > 5,000 m and 4001 – 5,000 m elevation range, i.e. 78.08% and 53.89% respectively. Majority i.e. 76.33% of all types of Moraine-dammed lakes lies in > 5,000 m.

Table 67: Type-wise vs. Elevation range-wise distribution of GL in Transboundary region

S. No.	Elevation Range	Types of Glacial Lake										Total
		M(e)	M(l)	M(lg)	M(o)	I(s)	I(d)	E(c)	E(v)	E(o)	O	
1	up to 3,000	0	0	0	4	0	0	0	0	4	0	8
2	3,001 - 4,000	12	1	0	32	29	0	47	2	303	49	475
3	4,001 - 5,000	206	67	2	992	319	0	559	5	6,601	851	9,602
4	> 5,000	496	59	24	3,663	411	4	141	1	4,910	679	10,388
Total		**713**	**127**	**26**	**4,691**	**759**	**4**	**747**	**8**	**11,818**	**1,579**	**20,473**

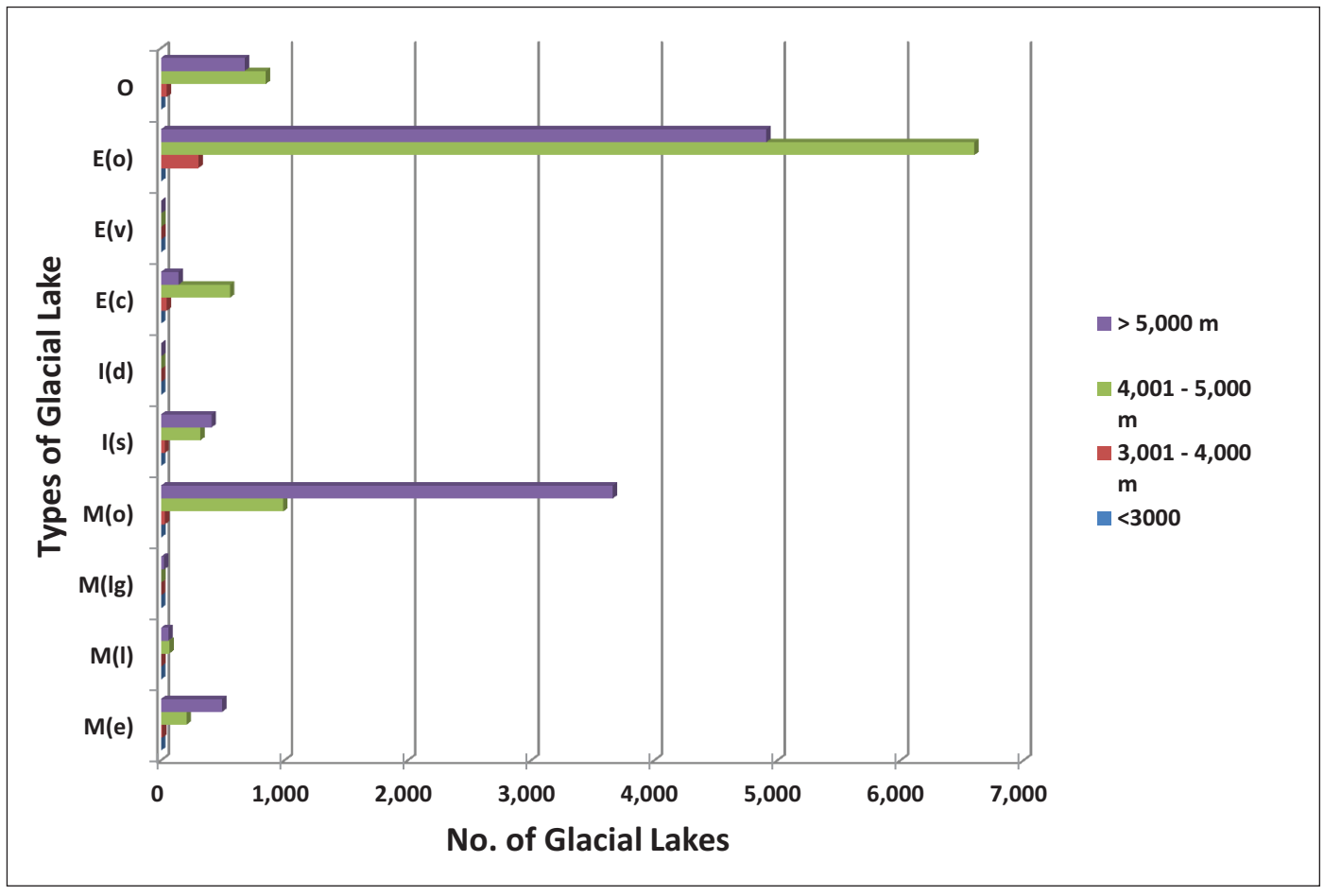


Figure 81: Type-wise vs. Elevation range-wise distribution of GL in Transboundary region

End Moraine Glacial Lakes at the snout of Glacier
in Kosi Subbasin, located in Ganga Basin
as seen in FCC satellite image

Satellite: Resourcesat-2
Sensor: LISS-IV MX
Date of Image: 26.11.2016

6. INDEX OF MAP SHEETS

Figure 82 shows the layout map representing 2^0 X 2^0 grid overlaid on satellite image acquisition year layer covering the Indian Himalayan River basins. A total of 42 grids covered the entire study area, of which 39 grids contain glacial lakes.

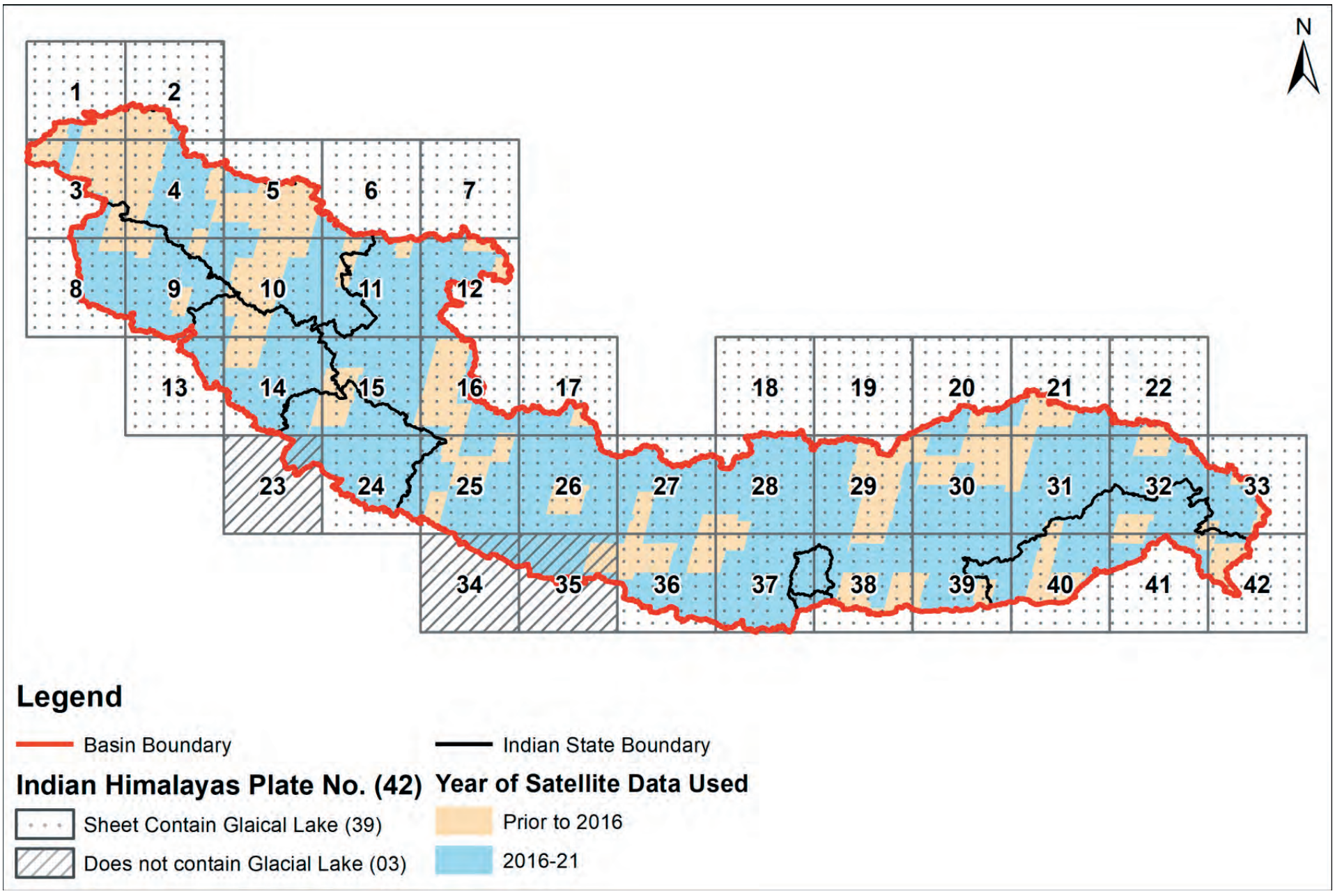
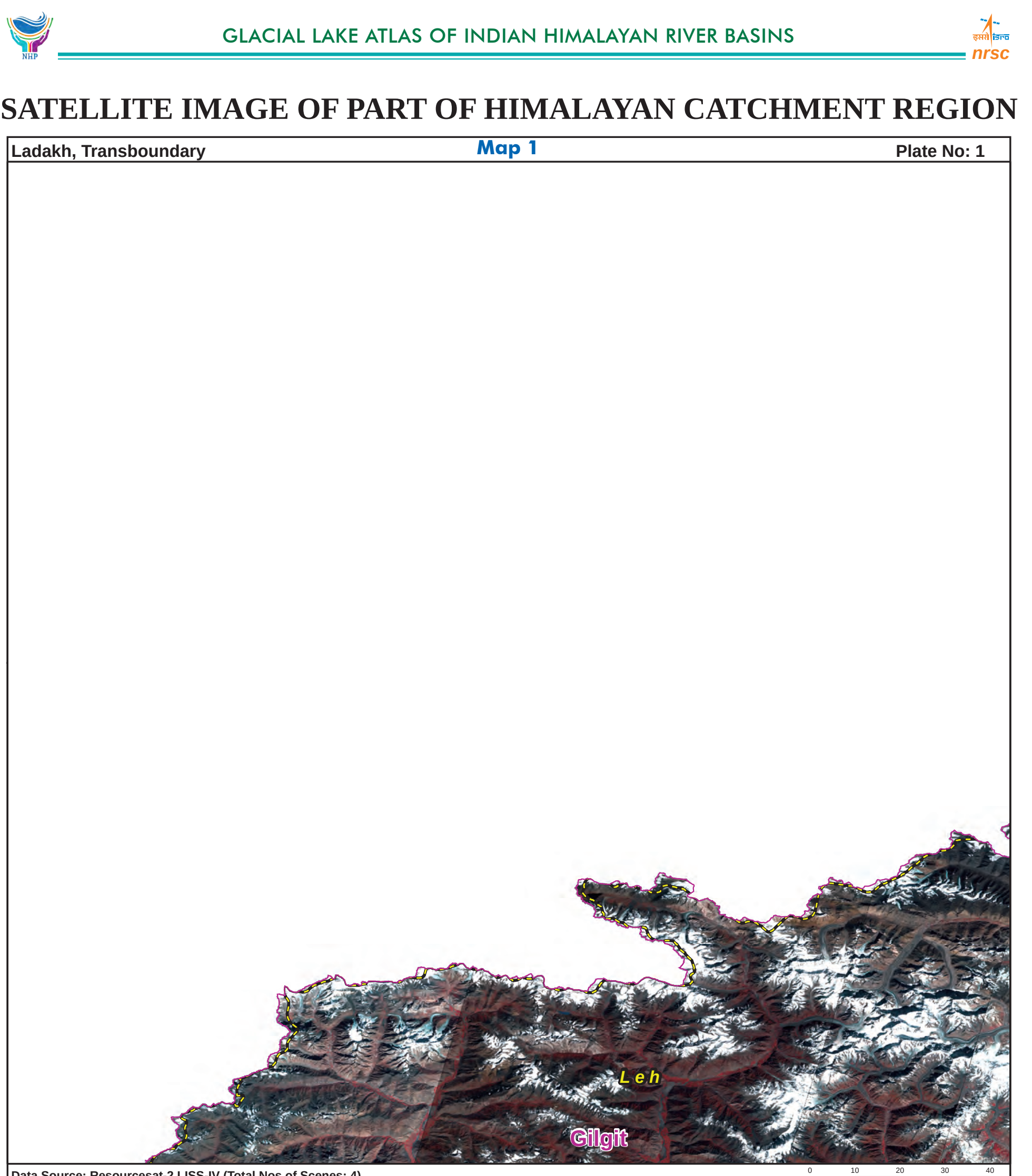


Figure 82: Layout of 2^0 X 2^0 grid and year of satellite data used

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Ladakh, Transboundary — **Map 1** — **Plate No: 1**



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 4)

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	7	1	0	7	33	0	1	0	6	3	**58**
2	**0.5 - 1**	2	5	0	6	8	0	1	0	6	1	**29**
3	**1 - 5**	8	4	0	1	2	0	0	1	1	1	**18**
4	**5 - 10**	0	0	0	0	0	0	0	0	0	1	**1**
5	**10 - 50**	2	0	0	0	0	0	0	0	2	0	**4**
6	**> 50**	0	0	0	0	0	0	0	0	0	2	**2**
Total		**19**	**10**	**0**	**14**	**43**	**0**	**2**	**1**	**15**	**8**	**112**

Legend

Subbasin Boundary — District Boundary

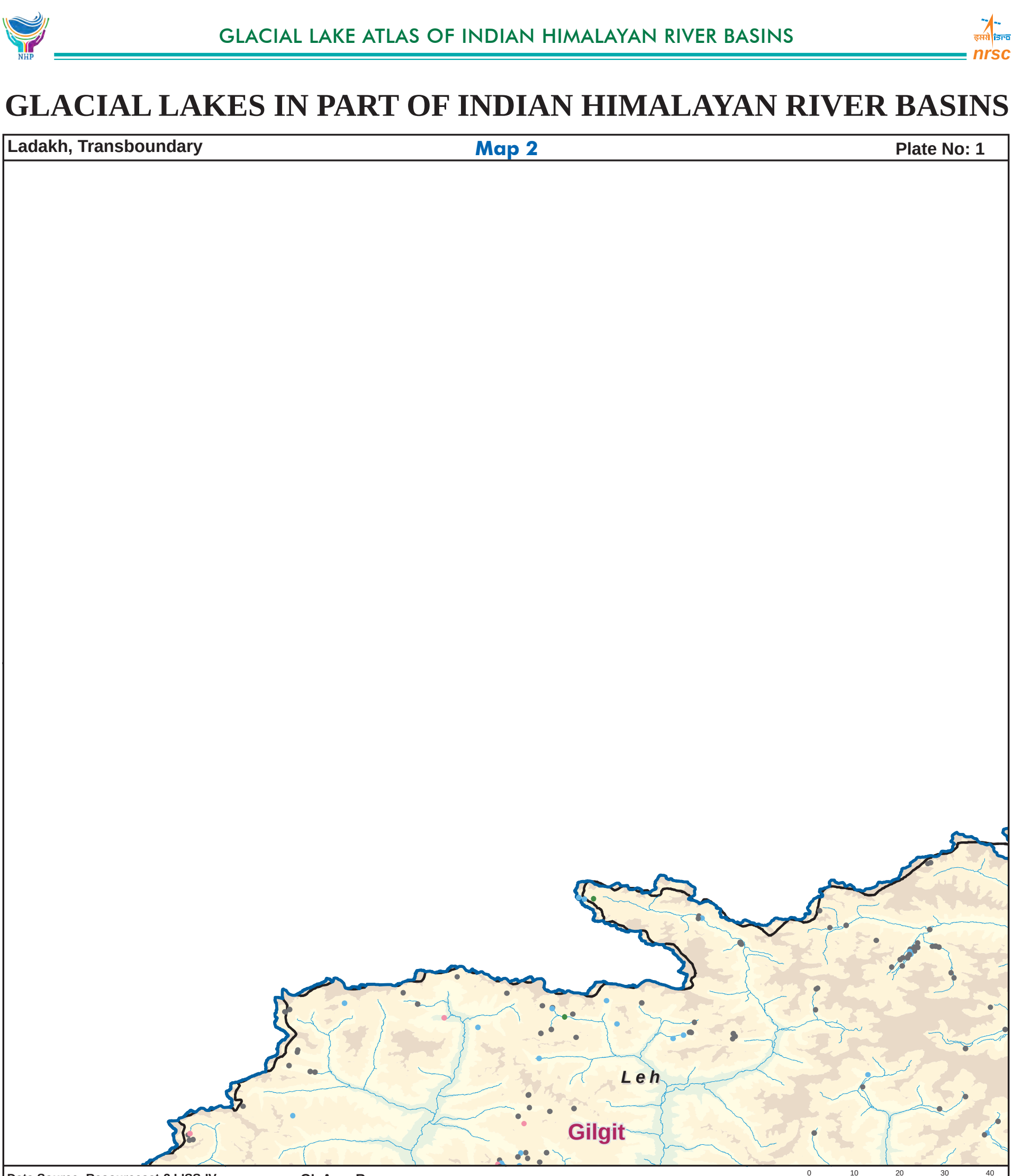
DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Ladakh, Transboundary | **Map 2** | **Plate No: 1**

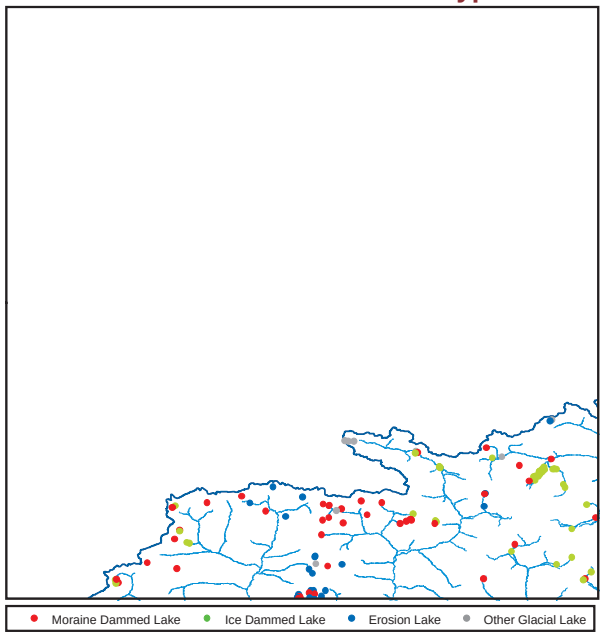


Data Source: Resourcesat-2 LISS-IV

GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

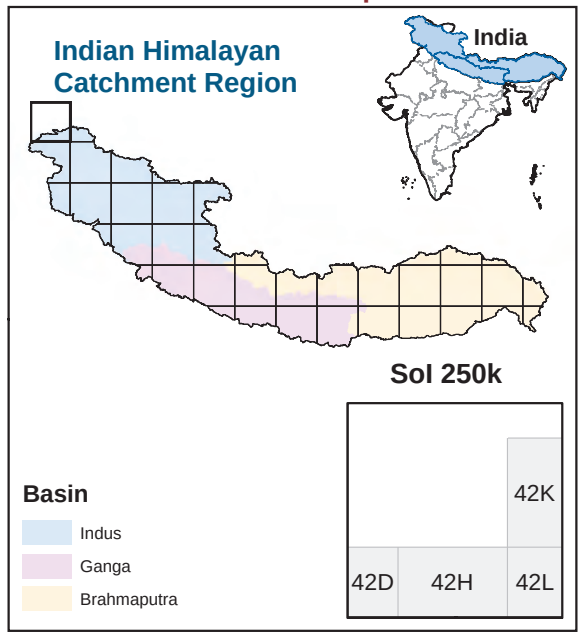
0 10 20 30 40 Km

Distribution of Glacial Lake Types



Moraine Dammed Lake · Ice Dammed Lake · Erosion Lake · Other Glacial Lake

Location Map



Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	1	14.1
2	3,001 - 4,000	58	149.2
3	4,001 - 5,000	53	344.1
4	> 5,000	0	0.0
Total		**112**	**507.4**

Legend

Glacial Lake
River / Stream
Basin Boundary
Subbasin Boundary
District Boundary
State / UT Boundary
International Boundary

Elevation Range (m)
up to 3,000
3,001 - 4,000
4,001 - 5,000
> 5,000

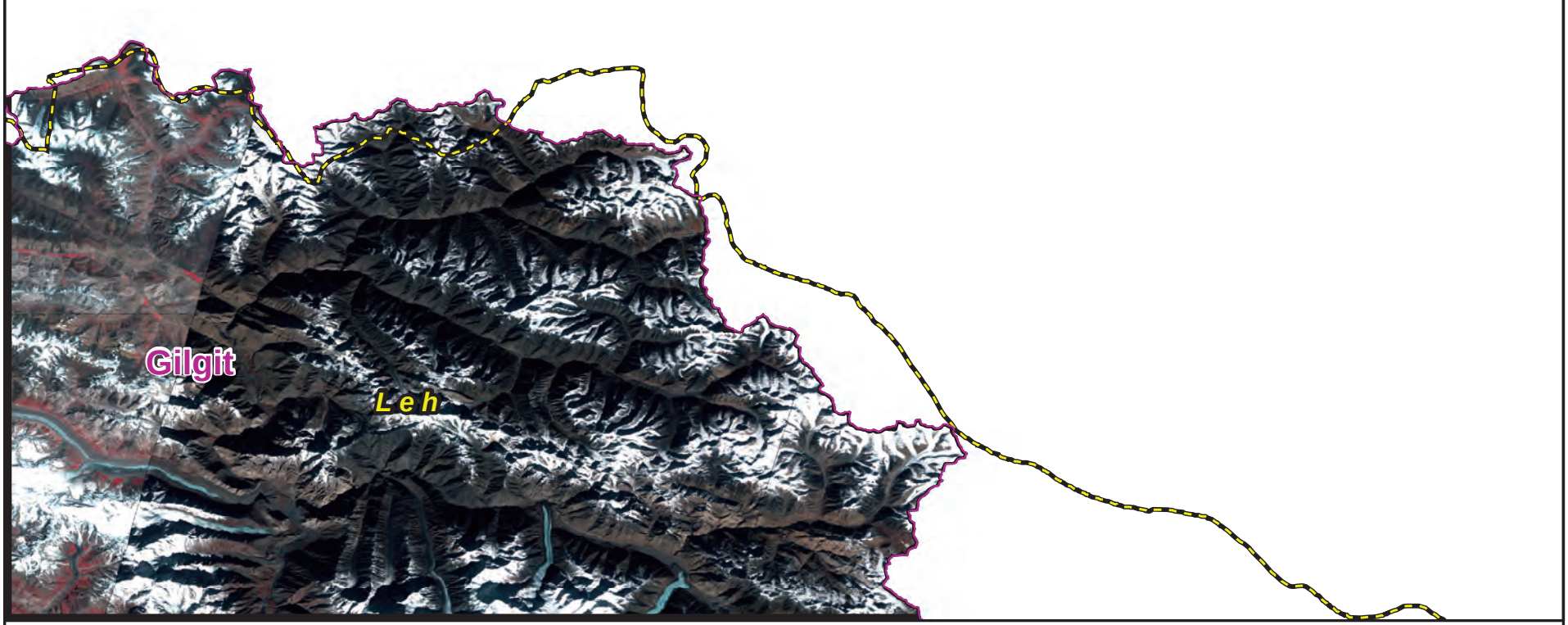
Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Ladakh, Transboundary — **Map 3** — **Plate No: 2**



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 4)

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	3	2	0	0	28	0	0	0	0	0	**33**
2	**0.5 - 1**	2	0	0	0	7	0	0	0	1	1	**11**
3	**1 - 5**	3	4	0	2	4	0	0	0	1	1	**15**
4	**5 - 10**	0	0	0	0	0	0	0	0	1	1	**2**
5	**10 - 50**	0	0	0	0	0	0	0	0	1	0	**1**
6	**> 50**	0	0	0	0	0	0	0	0	0	0	**0**
Total		**8**	**6**	**0**	**2**	**39**	**0**	**0**	**0**	**4**	**3**	**62**

Legend

Subbasin Boundary — District Boundary

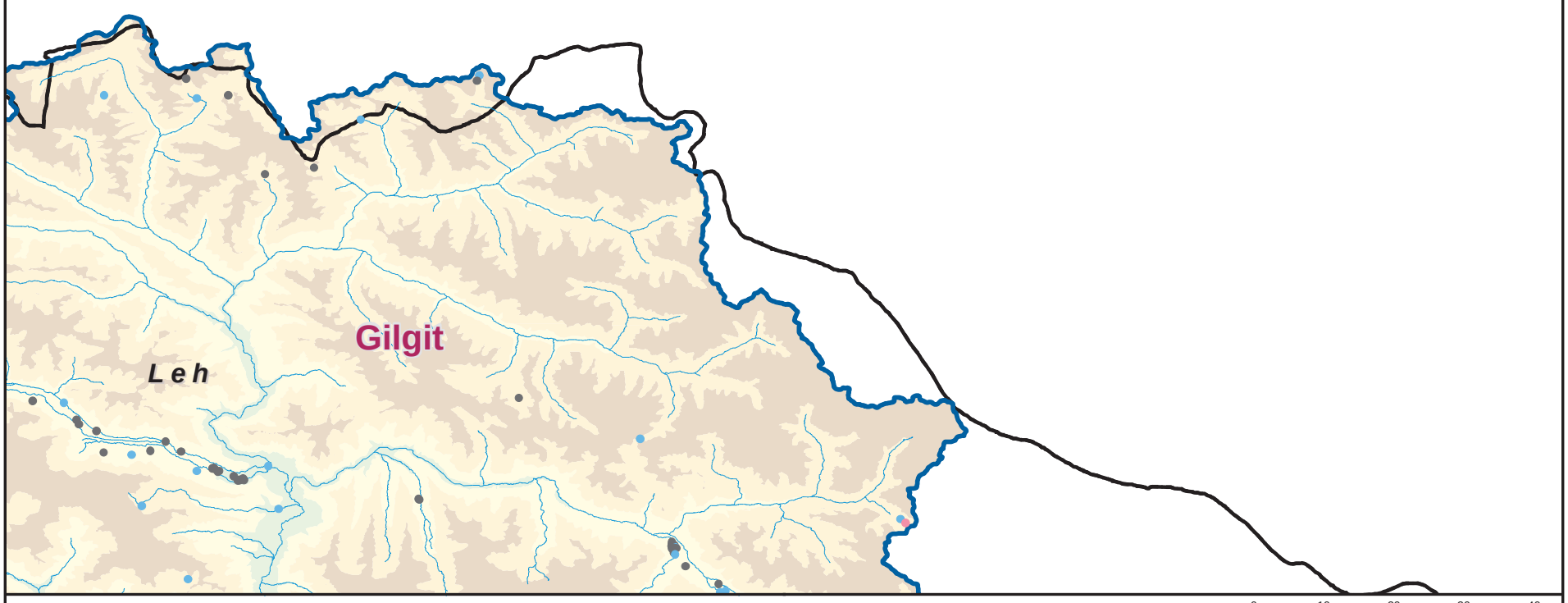
DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

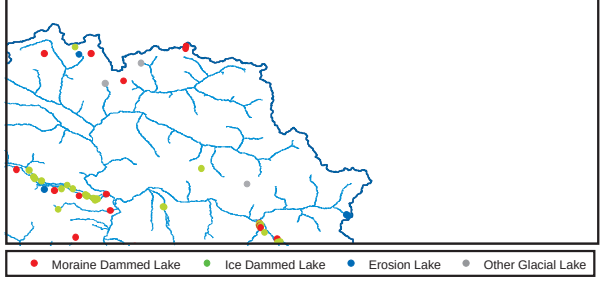
(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

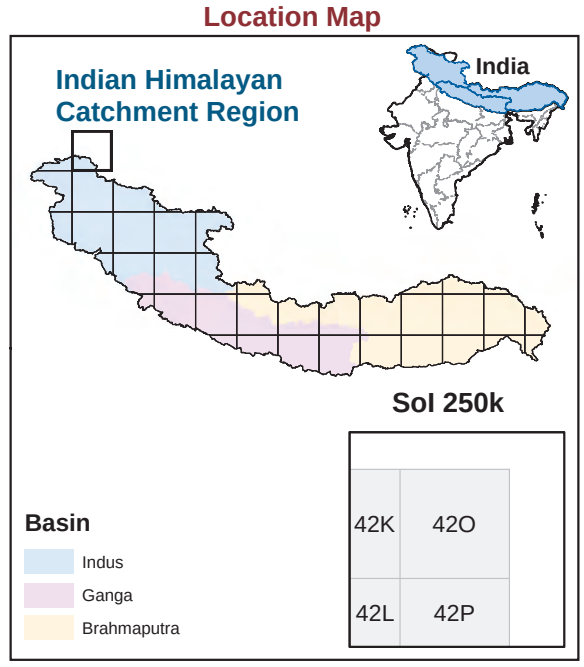
Ladakh, Transboundary | **Map 4** | **Plate No: 2**



Distribution of Glacial Lake Types



Location Map



Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	9	8.7
2	3,001 - 4,000	38	24.9
3	4,001 - 5,000	13	57.7
4	> 5,000	2	2.1
Total		**62**	**93.4**

Legend

Glacial Lake
River / Stream
Basin Boundary
Subbasin Boundary
District Boundary
State / UT Boundary
International Boundary

Elevation Range (m)
up to 3,000
3,001 - 4,000
4,001 - 5,000
> 5,000

Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

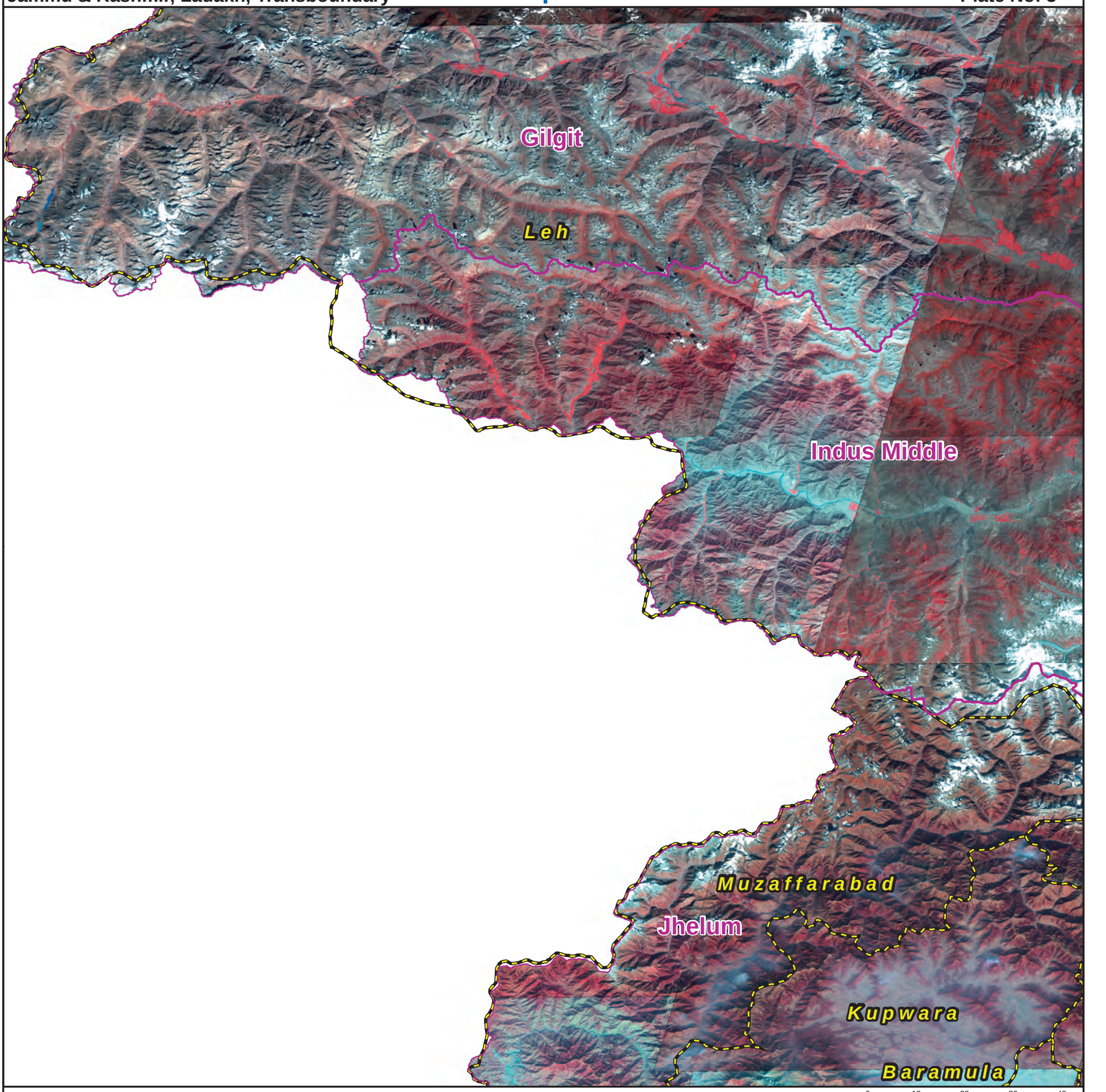
DISCLAIMER: The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Jammu & Kashmir, Ladakh, Transboundary

Map 5

Plate No: 3



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 13)

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	4	4	1	44	33	0	3	0	123	0	**212**
2	**0.5 - 1**	0	3	0	28	11	0	3	0	152	8	**205**
3	**1 - 5**	4	0	0	28	5	0	24	0	401	8	**470**
4	**5 - 10**	1	0	0	4	1	0	17	0	63	3	**89**
5	**10 - 50**	0	0	0	0	0	0	16	1	50	5	**72**
6	**> 50**	1	0	0	0	0	0	2	0	2	2	**7**
Total		**10**	**7**	**1**	**104**	**50**	**0**	**65**	**1**	**791**	**26**	**1055**

Legend

Subbasin Boundary

District Boundary

DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Jammu & Kashmir, Ladakh, Transboundary

Map 6

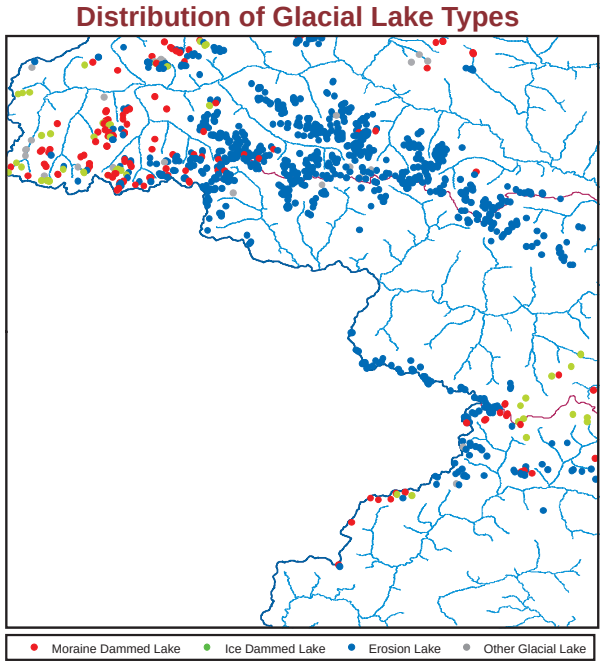
Plate No: 3

Data Source: Resourcesat-2 LISS-IV

GL Area Range <1 ha · 1 - 10 ha · 10 - 50 ha · > 50 ha

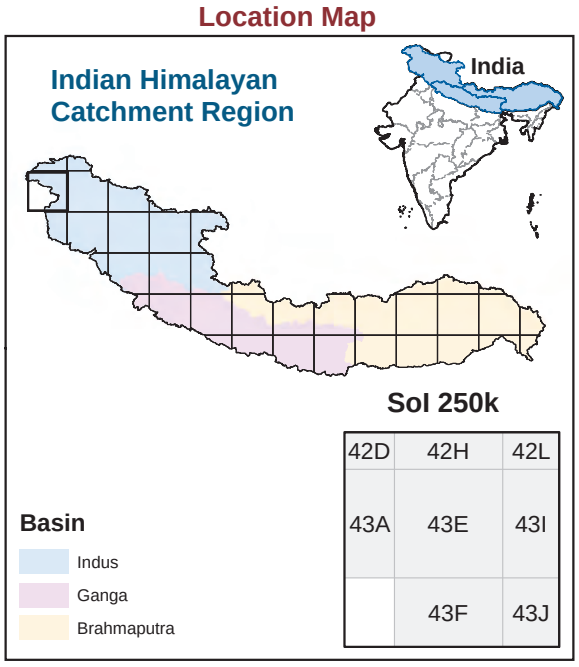
0 10 20 30 40 Km

Distribution of Glacial Lake Types



Moraine Dammed Lake · Ice Dammed Lake · Erosion Lake · Other Glacial Lake

Location Map



Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	1	15.4
2	3,001 - 4,000	81	855.3
3	4,001 - 5,000	969	3,042.2
4	> 5,000	4	3.0
Total		**1055**	**3,915.8**

Legend

Glacial Lake · River / Stream · Basin Boundary · Subbasin Boundary

District Boundary · State / UT Boundary · International Boundary

Elevation Range (m)

up to 3,000 · 3,001 - 4,000 · 4,001 - 5,000 · > 5,000

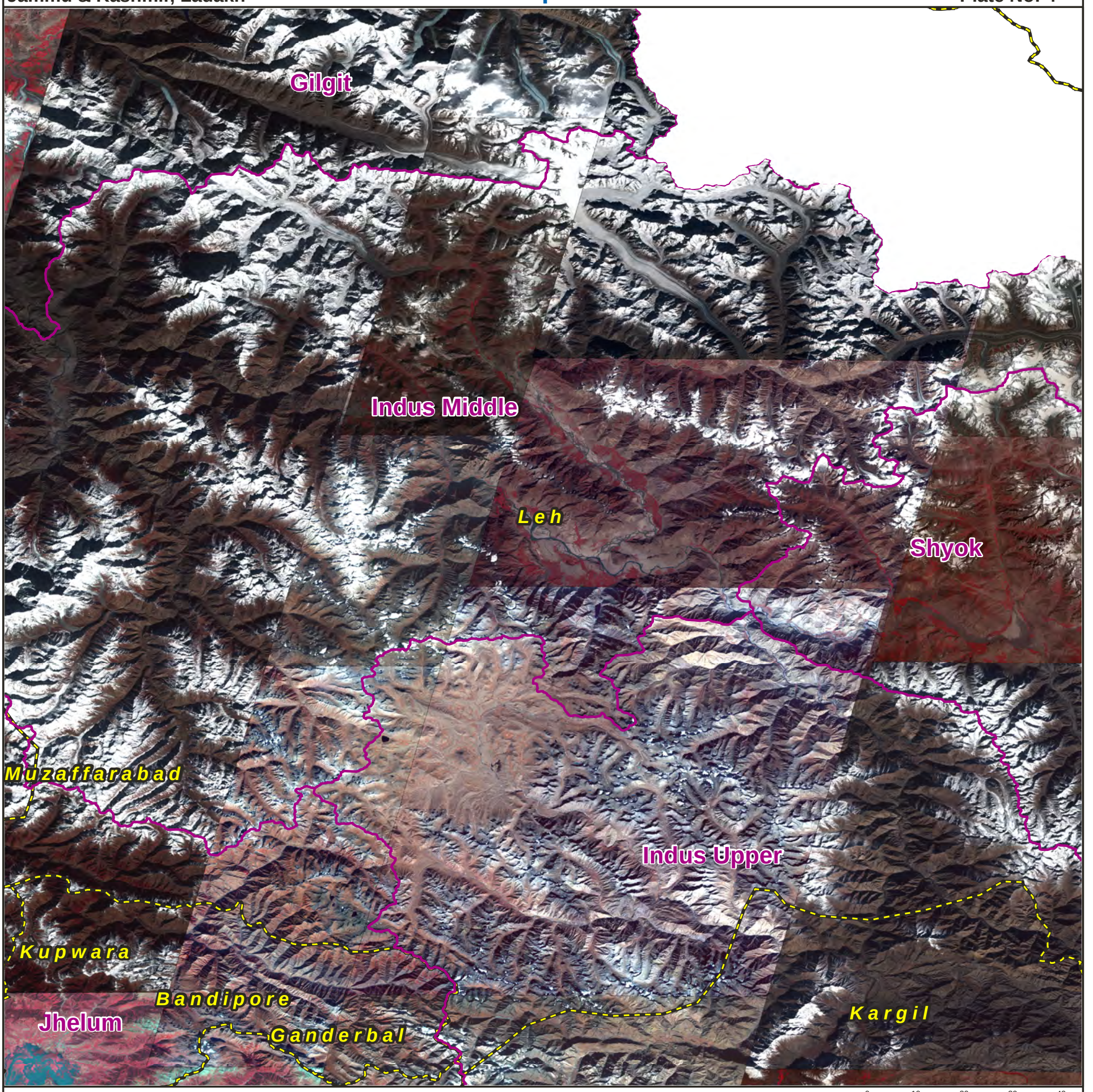
Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Jammu & Kashmir, Ladakh — **Map 7** — Plate No: 4



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 18)

0 10 20 30 40 Km

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	3	17	2	6	105	0	0	0	69	2	**204**
2	**0.5 - 1**	3	26	1	20	80	0	3	0	137	1	**271**
3	**1 - 5**	10	26	2	30	36	0	30	0	348	5	**487**
4	**5 - 10**	3	5	0	3	7	0	19	0	64	0	**101**
5	**10 - 50**	3	4	0	1	2	0	16	0	51	1	**78**
6	**> 50**	0	0	0	0	0	0	2	0	2	1	**5**
Total		**22**	**78**	**5**	**60**	**230**	**0**	**70**	**0**	**671**	**10**	**1146**

Legend

Subbasin Boundary — District Boundary

DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Jammu & Kashmir, Ladakh

Map 8

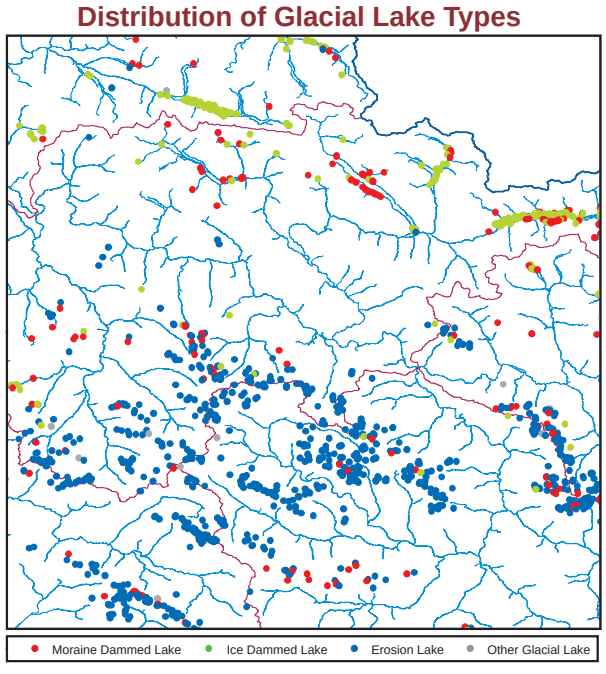
Plate No: 4

Data Source: Resourcesat-2 LISS-IV

GL Area Range <1 ha · 1 - 10 ha · 10 - 50 ha · > 50 ha

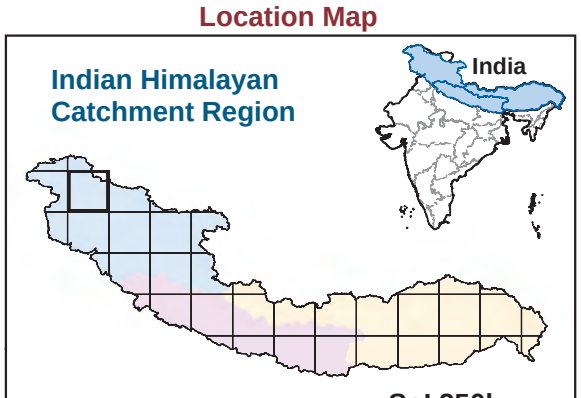
0 10 20 30 40 Km

Distribution of Glacial Lake Types



Moraine Dammed Lake · Ice Dammed Lake · Erosion Lake · Other Glacial Lake

Location Map



Basin

- Indus
- Ganga
- Brahmaputra

SoI 250k

42L	42P	
43I	43M	52A
43J	43N	52B

Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	10	9.6
2	3,001 - 4,000	224	1,075.5
3	4,001 - 5,000	901	2,864.5
4	> 5,000	11	17.6
Total		**1146**	**3,967.1**

Legend

- Glacial Lake
- River / Stream
- Basin Boundary
- Subbasin Boundary
- *District Boundary*
- State / UT Boundary
- International Boundary

Elevation Range (m)

- up to 3,000
- 3,001 - 4,000
- 4,001 - 5,000
- > 5,000

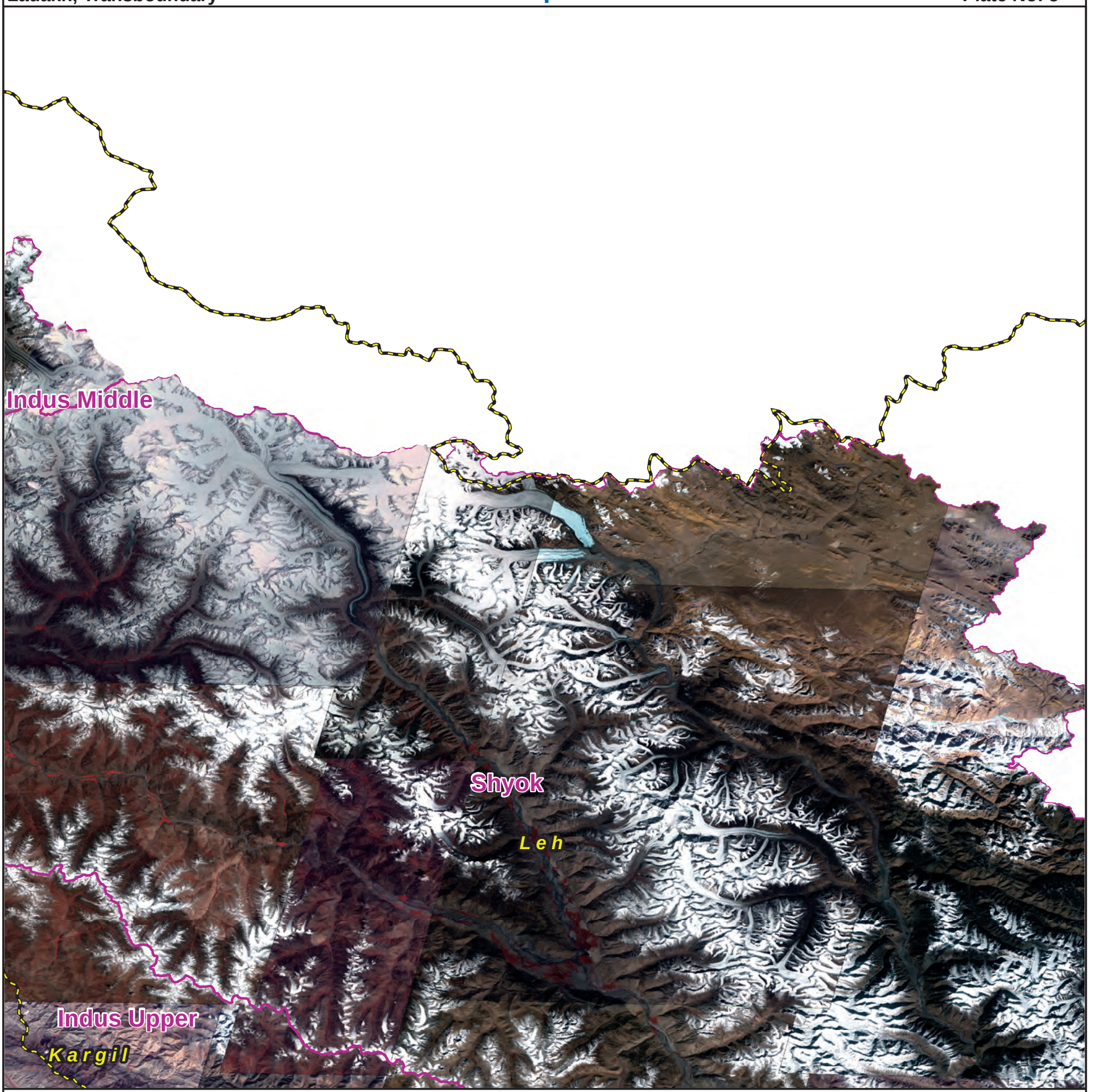
Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Ladakh, Transboundary — **Map 9** — Plate No: 5



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 14)

0 10 20 30 40 Km

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	11	24	7	19	124	0	0	0	17	4	**206**
2	**0.5 - 1**	11	20	3	27	91	0	0	0	19	7	**178**
3	**1 - 5**	38	28	9	18	34	0	3	0	42	6	**178**
4	**5 - 10**	8	1	2	0	1	0	0	0	10	1	**23**
5	**10 - 50**	6	1	1	0	0	0	0	0	3	1	**12**
6	**> 50**	0	0	0	1	0	0	0	0	0	0	**1**
Total		**74**	**74**	**22**	**65**	**250**	**0**	**3**	**0**	**91**	**19**	**598**

Legend

Subbasin Boundary

District Boundary

DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Ladakh, Transboundary | **Map 10** | Plate No: 5

Indus Middle

Leh

Shyok

Indus Upper

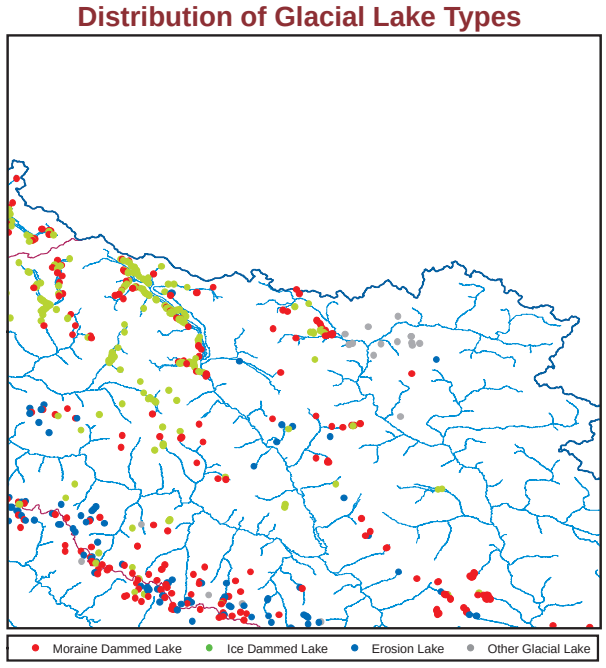
Kargil

Data Source: Resourcesat-2 LISS-IV

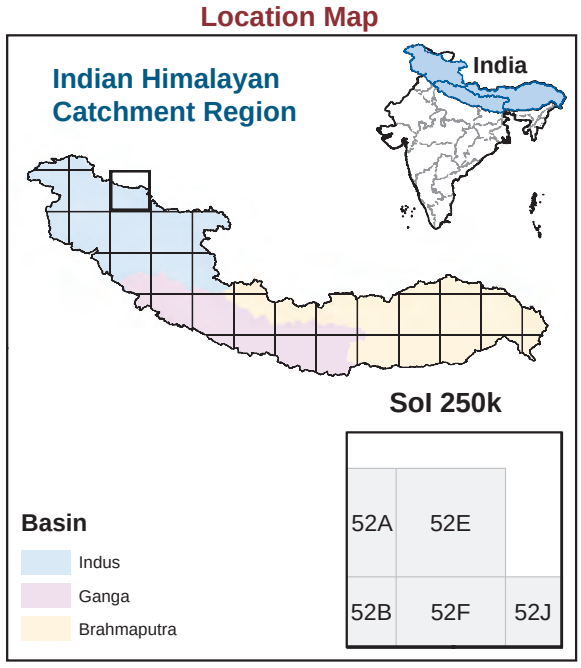
GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

0 10 20 30 40 Km

Distribution of Glacial Lake Types



Location Map



Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	0	0.0
2	3,001 - 4,000	46	25.7
3	4,001 - 5,000	261	353.6
4	> 5,000	291	669.6
Total		**598**	**1,048.9**

Legend

Glacial Lake
River / Stream
Basin Boundary
Subbasin Boundary
District Boundary
State / UT Boundary
International Boundary

Elevation Range (m)
up to 3,000
3,001 - 4,000
4,001 - 5,000
> 5,000

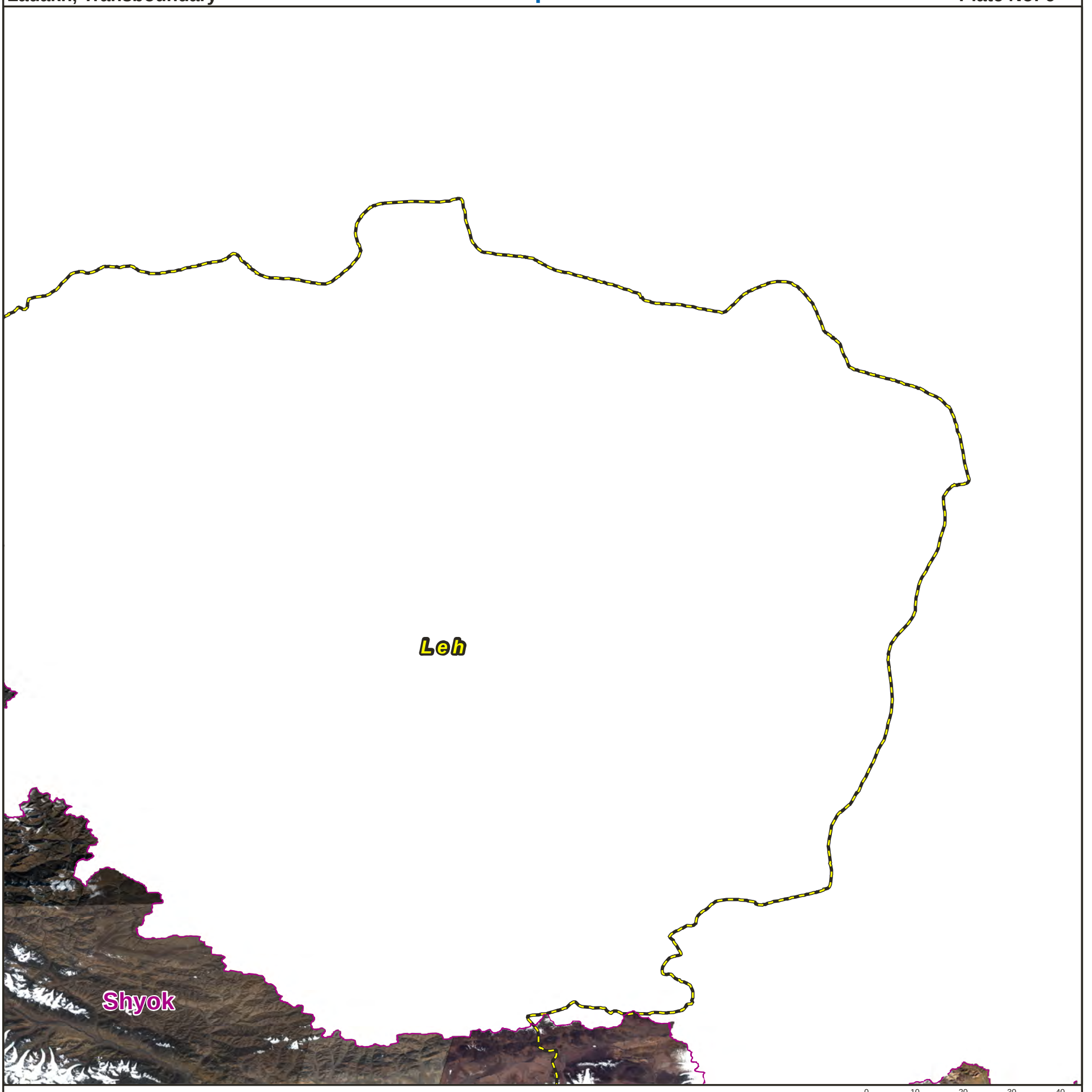
Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Ladakh, Transboundary | **Map 11** | Plate No: 6



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 5)

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	0.25 - 0.5	0	0	0	0	0	0			0	1	1
2	0.5 - 1	0	0	0	0	0	0	0	0	0	0	0
3	1 - 5	0	0	0	0	0	0	0	0	0	0	0
4	5 - 10	1	0	0	0	0	0	0	0	0	0	1
5	10 - 50	0	0	0	0	0	0	0	0	0	0	0
6	> 50	0	0	0	0	0	0	0	0	0	0	0
Total		1	0	0	0	0	0	0	0	0	1	2

Legend

Subbasin Boundary

District Boundary

DISCLAIMER:

(a) The Administrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

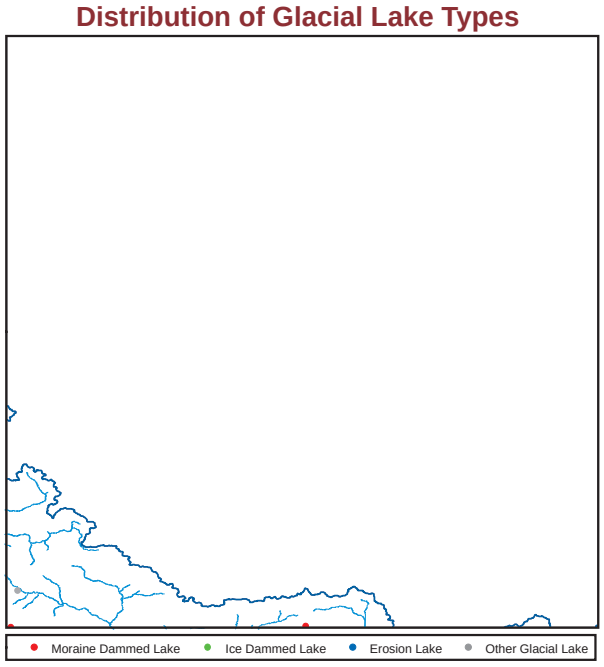
Ladakh, Transboundary | **Map 12** | **Plate No: 6**

Data Source: Resourcesat-2 LISS-IV

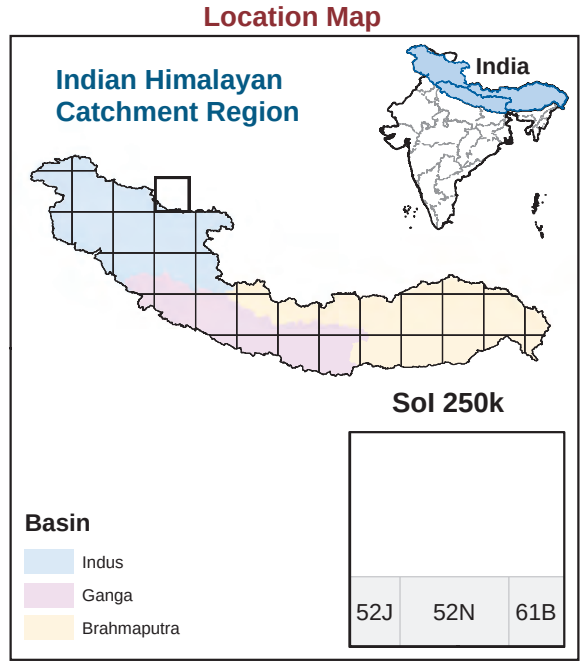
GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

0 10 20 30 40 Km

Distribution of Glacial Lake Types



Location Map



Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	0	0.0
2	3,001 - 4,000	0	0.0
3	4,001 - 5,000	0	0.0
4	> 5,000	2	7.0
	Total	**2**	**7.0**

Legend

Glacial Lake
River / Stream
Basin Boundary
Subbasin Boundary
District Boundary
State / UT Boundary
International Boundary

Elevation Range (m)
up to 3,000
3,001 - 4,000
4,001 - 5,000
> 5,000

Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Administrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Transboundary | **Map 13** | Plate No: 7

Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 3)

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	0	0	0	0	0	0	0	0	0	0	**0**
2	**0.5 - 1**	0	0	0	0	0	0	0	0	0	0	**0**
3	**1 - 5**	0	0	2	0	0	0	0	0	0	0	**2**
4	**5 - 10**	0	0	0	0	0	0	0	0	0	0	**0**
5	**10 - 50**	0	0	0	0	0	0	0	0	0	0	**0**
6	**> 50**	0	0	0	0	0	0	0	0	0	0	**0**
Total		**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**

Legend

Subbasin Boundary

District Boundary

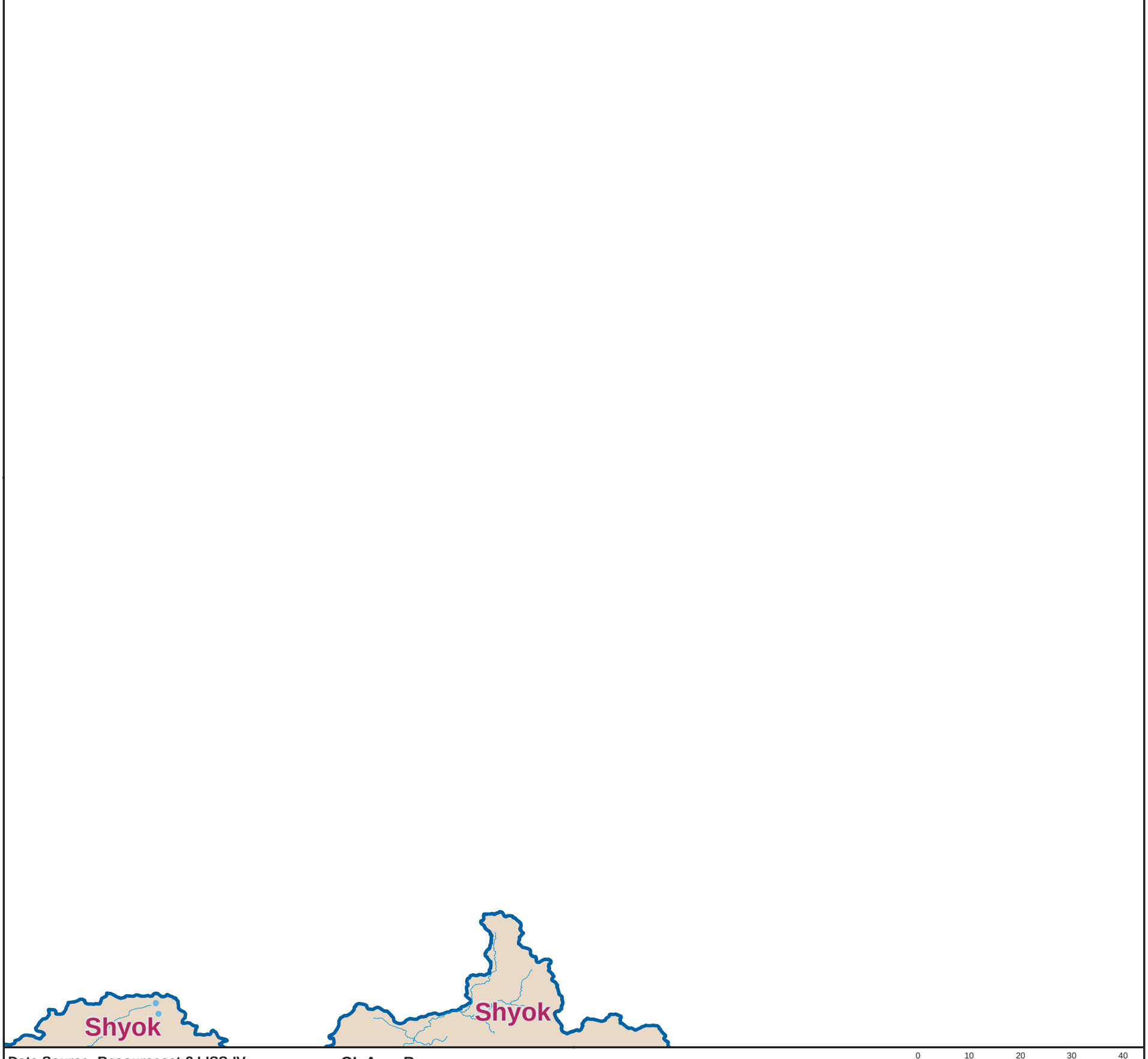
DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Transboundary | **Map 14** | **Plate No: 7**

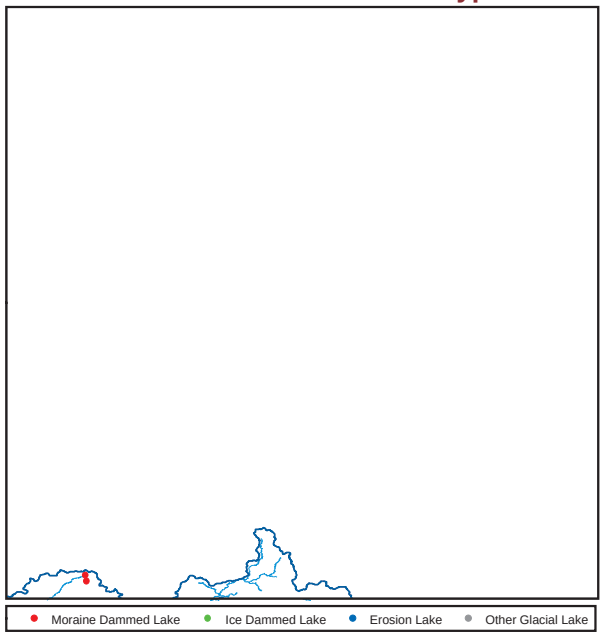


Data Source: Resourcesat-2 LISS-IV

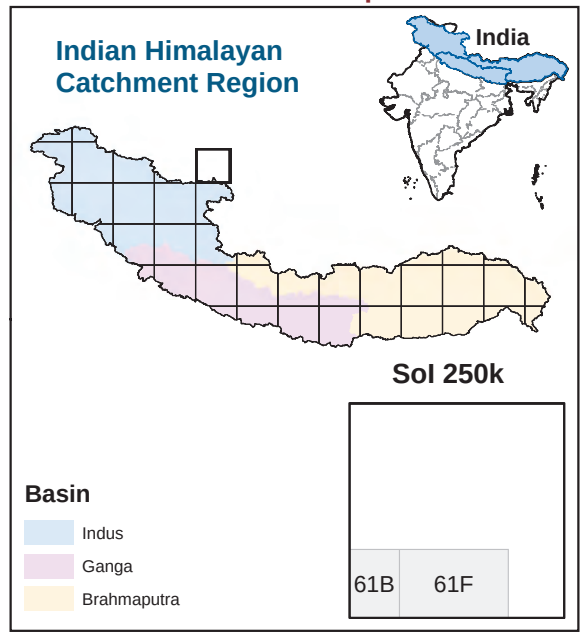
GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

0 10 20 30 40 Km

Distribution of Glacial Lake Types



Location Map



Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	0	0.0
2	3,001 - 4,000	0	0.0
3	4,001 - 5,000	0	0.0
4	> 5,000	2	5.2
Total		**2**	**5.2**

Legend

Glacial Lake
River / Stream
Basin Boundary
Subbasin Boundary
District Boundary
State / UT Boundary
International Boundary

Elevation Range (m)
up to 3,000
3,001 - 4,000
4,001 - 5,000
> 5,000

Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Administrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Jammu & Kashmir — Map 15 — Plate No: 8

Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 9)

0 10 20 30 40 Km

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	0	0	0	0	0	0	0	0	7	0	**7**
2	**0.5 - 1**	0	0	0	0	0	0	0	0	11	0	**11**
3	**1 - 5**	0	0	0	0	0	0	2	0	11	0	**13**
4	**5 - 10**	0	0	0	0	0	0	0	0	8	0	**8**
5	**10 - 50**	0	0	0	0	0	0	2	0	6	0	**8**
6	**> 50**	0	0	0	0	0	0	0	0	0	0	**0**
Total		**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**43**	**0**	**47**

Legend

Subbasin Boundary

District Boundary

DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Jammu & Kashmir

Map 16

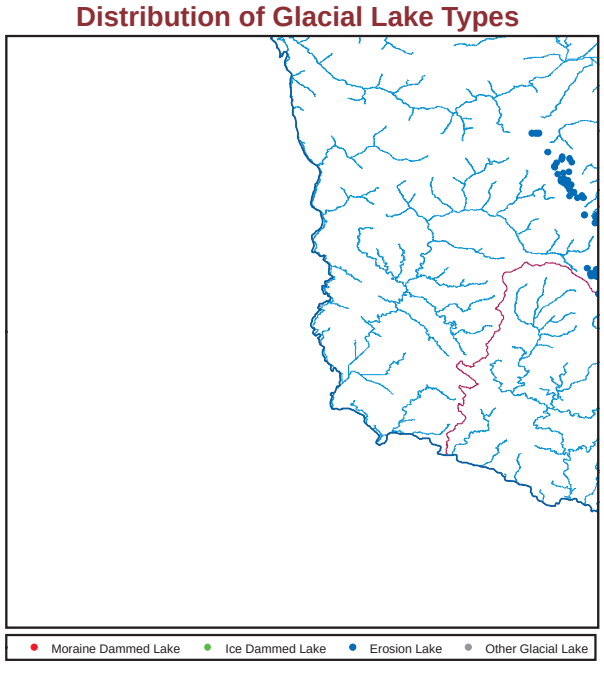
Plate No: 8

Data Source: Resourcesat-2 LISS-IV

GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

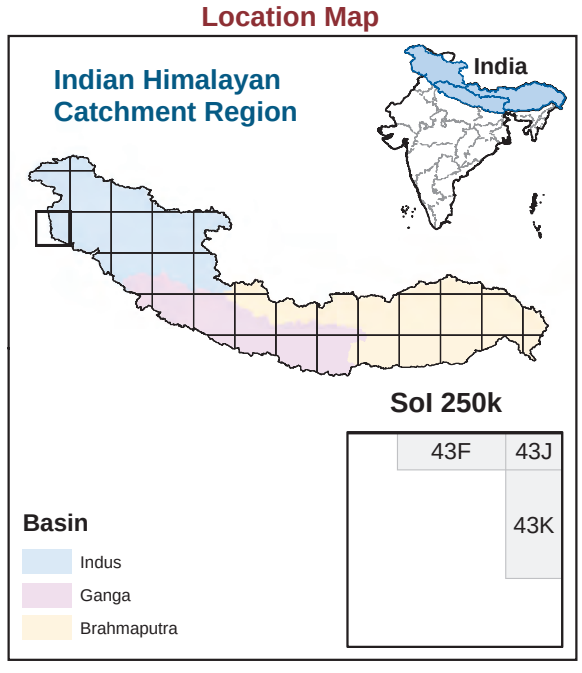
0 10 20 30 40 Km

Distribution of Glacial Lake Types



Moraine Dammed Lake · Ice Dammed Lake · Erosion Lake · Other Glacial Lake

Location Map



Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	0	0.0
2	3,001 - 4,000	32	184.8
3	4,001 - 5,000	15	83.1
4	> 5,000	0	0.0
Total		**47**	**267.9**

Legend

Glacial Lake
River / Stream
Basin Boundary
Subbasin Boundary
District Boundary
State / UT Boundary
International Boundary

Elevation Range (m)

up to 3,000
3,001 - 4,000
4,001 - 5,000
> 5,000

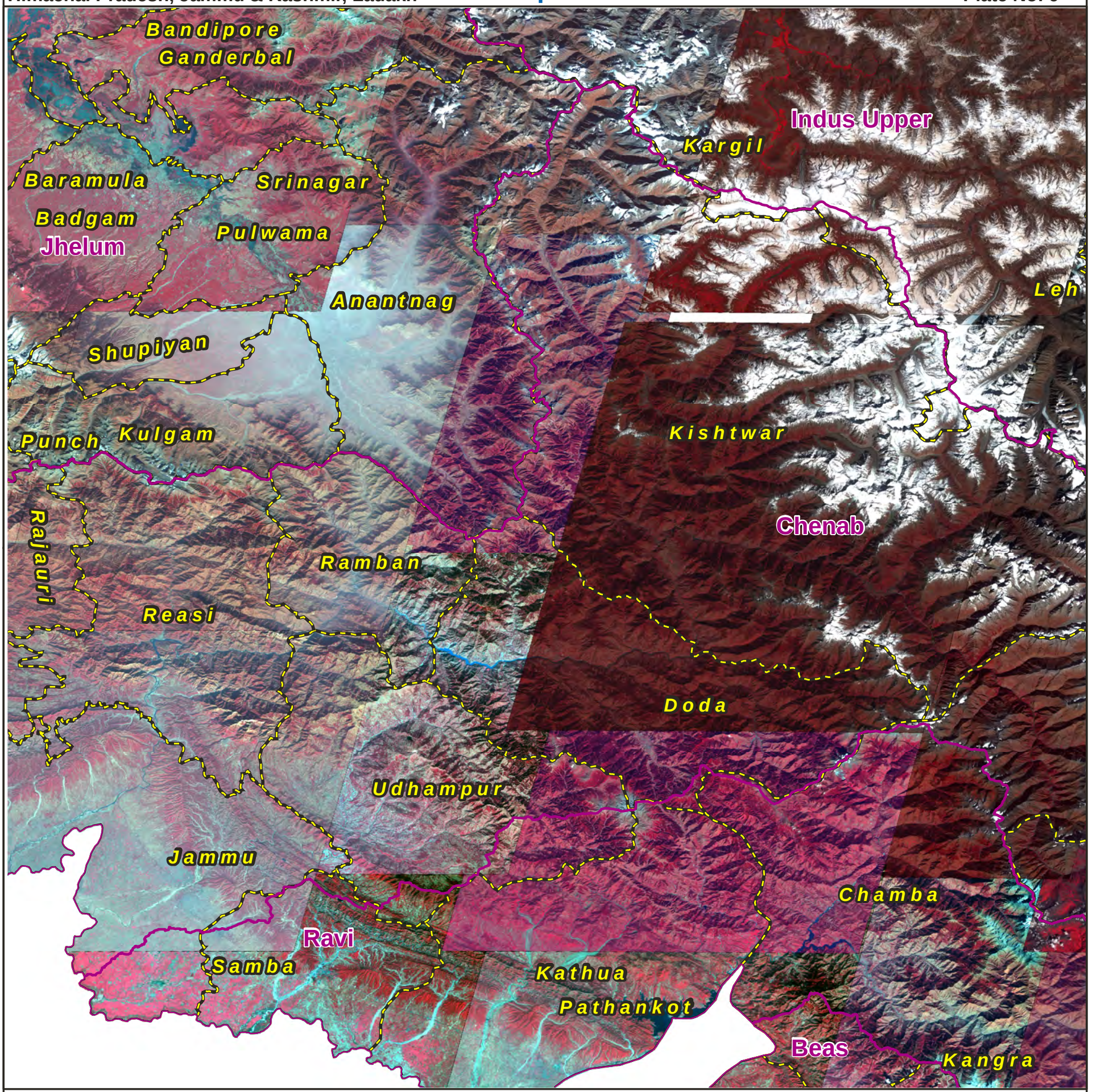
Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Administrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Himachal Pradesh, Jammu & Kashmir, Ladakh — **Map 17** — Plate No: 9



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 17)

0 10 20 30 40 Km

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	1	7	0	24	37	0	1	0	48	0	**118**
2	**0.5 - 1**	3	6	0	16	18	0	2	0	39	1	**85**
3	**1 - 5**	12	2	0	25	2	0	11	0	75	2	**129**
4	**5 - 10**	4	0	0	2	1	0	9	0	14	0	**30**
5	**10 - 50**	5	0	0	0	0	0	8	0	20	1	**34**
6	**> 50**	0	0	0	0	0	0	1	0	1	2	**4**
Total		**25**	**15**	**0**	**67**	**58**	**0**	**32**	**0**	**197**	**6**	**400**

Legend

Subbasin Boundary — District Boundary

DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Himachal Pradesh, Jammu & Kashmir, Ladakh

Map 18

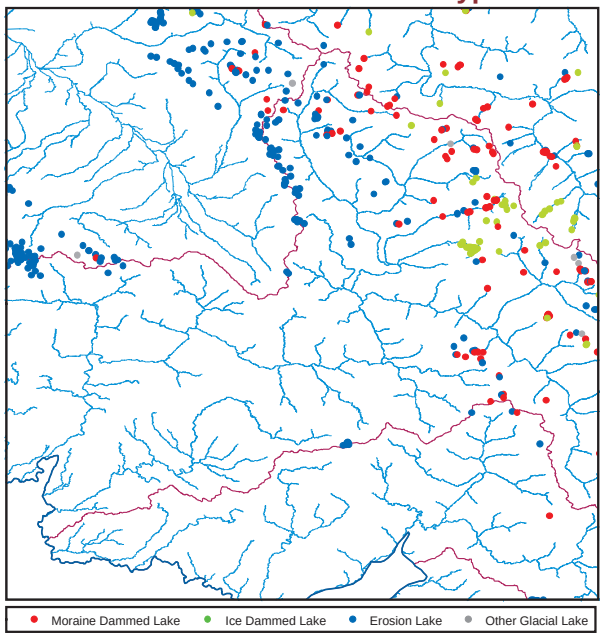
Plate No: 9

Data Source: Resourcesat-2 LISS-IV

GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

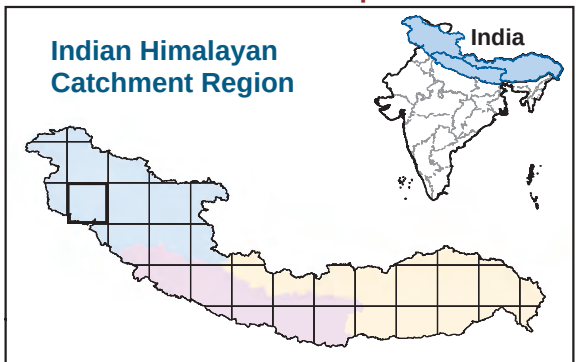
0 10 20 30 40 Km

Distribution of Glacial Lake Types



Moraine Dammed Lake ● Ice Dammed Lake ● Erosion Lake ● Other Glacial Lake

Location Map



Sol 250k

43J	43N	52B
43K	43O	52C
	43P	52D

Basin

- Indus
- Ganga
- Brahmaputra

Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	0	0.0
2	3,001 - 4,000	156	978.7
3	4,001 - 5,000	235	632.0
4	> 5,000	9	6.5
Total		**400**	**1,617.2**

Legend

- Glacial Lake
- River / Stream
- Basin Boundary
- Subbasin Boundary
- *District Boundary*
- State / UT Boundary
- International Boundary

Elevation Range (m)

- up to 3,000
- 3,001 - 4,000
- 4,001 - 5,000
- > 5,000

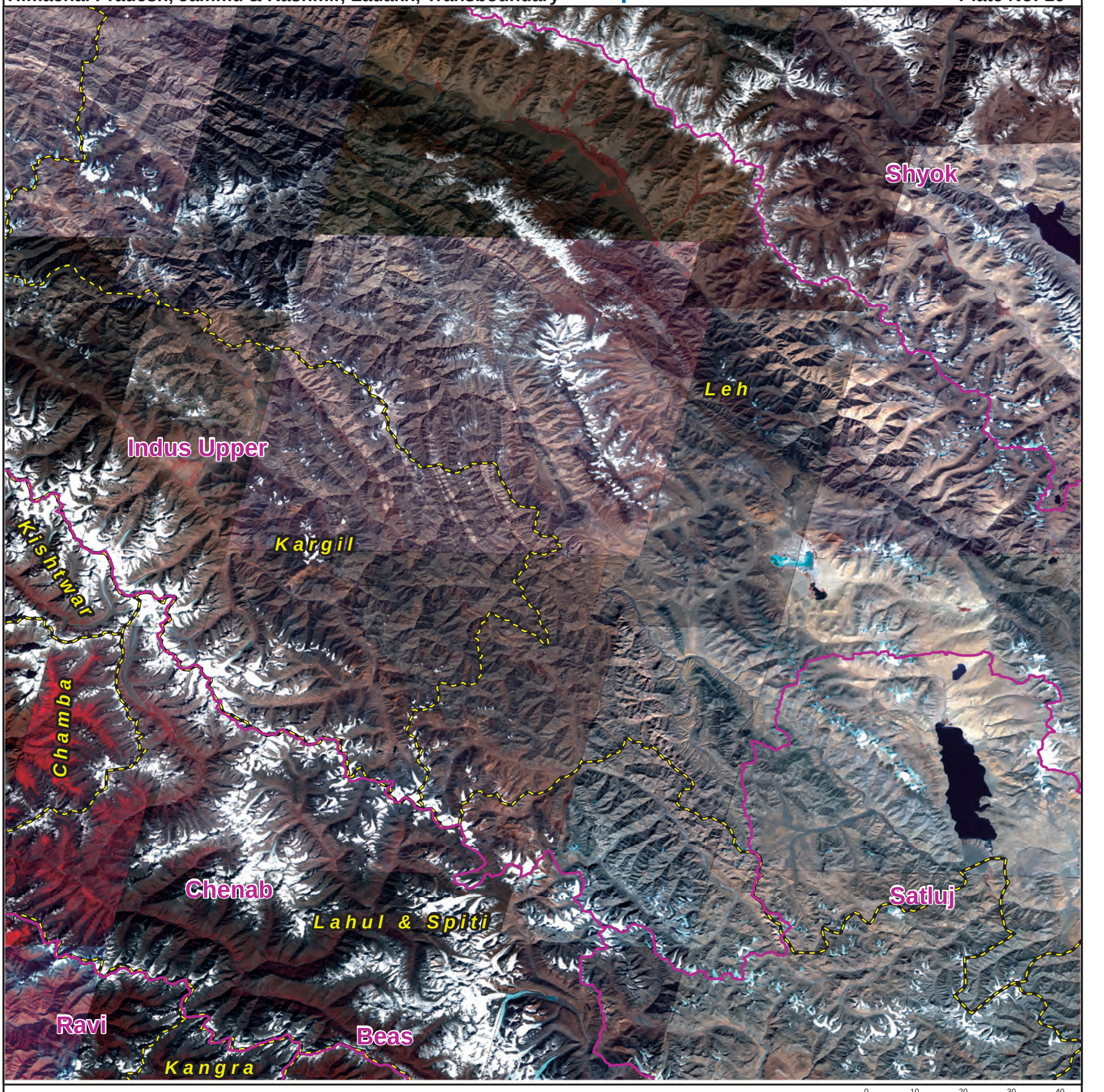
Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Administrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Himachal Pradesh, Jammu & Kashmir, Ladakh, Transboundary **Map 19** Plate No: 10



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 19)

0 10 20 30 40 Km

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	11	6	3	52	39	0	0	0	45	9	**165**
2	**0.5 - 1**	11	6	0	43	17	0	1	0	29	7	**114**
3	**1 - 5**	35	5	0	44	6	0	4	0	50	7	**151**
4	**5 - 10**	15	0	0	5	0	0	1	0	12	1	**34**
5	**10 - 50**	4	0	0	2	0	0	1	0	5	3	**15**
6	**> 50**	3	0	0	0	0	0	0	0	0	3	**6**
Total		**79**	**17**	**3**	**146**	**62**	**0**	**7**	**0**	**141**	**30**	**485**

Legend

Subbasin Boundary

District Boundary

DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

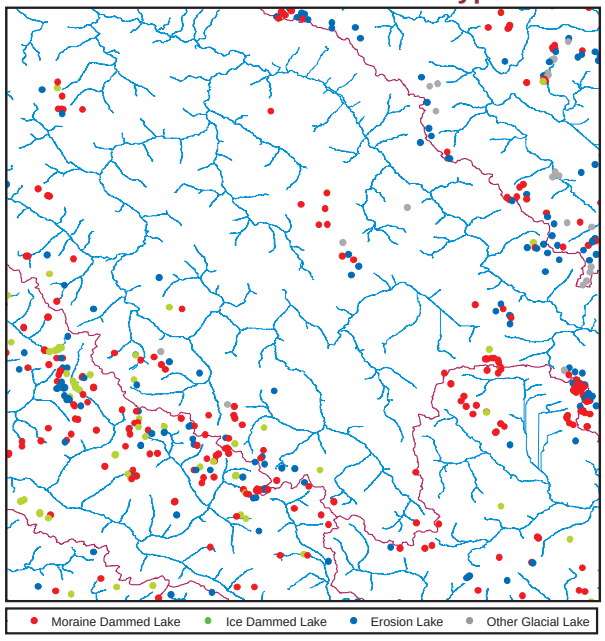
Himachal Pradesh, Jammu & Kashmir, Ladakh, Transboundary **Map 20** Plate No: 10

Data Source: Resourcesat-2 LISS-IV

GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

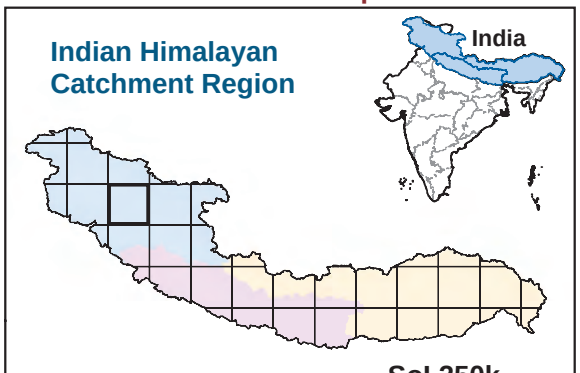
0 10 20 30 40 Km

Distribution of Glacial Lake Types



Moraine Dammed Lake · Ice Dammed Lake · Erosion Lake · Other Glacial Lake

Location Map



Basin

- Indus
- Ganga
- Brahmaputra

Sol 250k

52B	52F	52J
52C	52G	52K
52D	52H	52L

Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	0	0.0
2	3,001 - 4,000	8	9.3
3	4,001 - 5,000	130	489.1
4	> 5,000	347	1,177.7
Total		**485**	**1,676.1**

Legend

Glacial Lake · River / Stream · Basin Boundary · Subbasin Boundary

District Boundary · State / UT Boundary · International Boundary

Elevation Range (m)

up to 3,000 · 3,001 - 4,000 · 4,001 - 5,000 · > 5,000

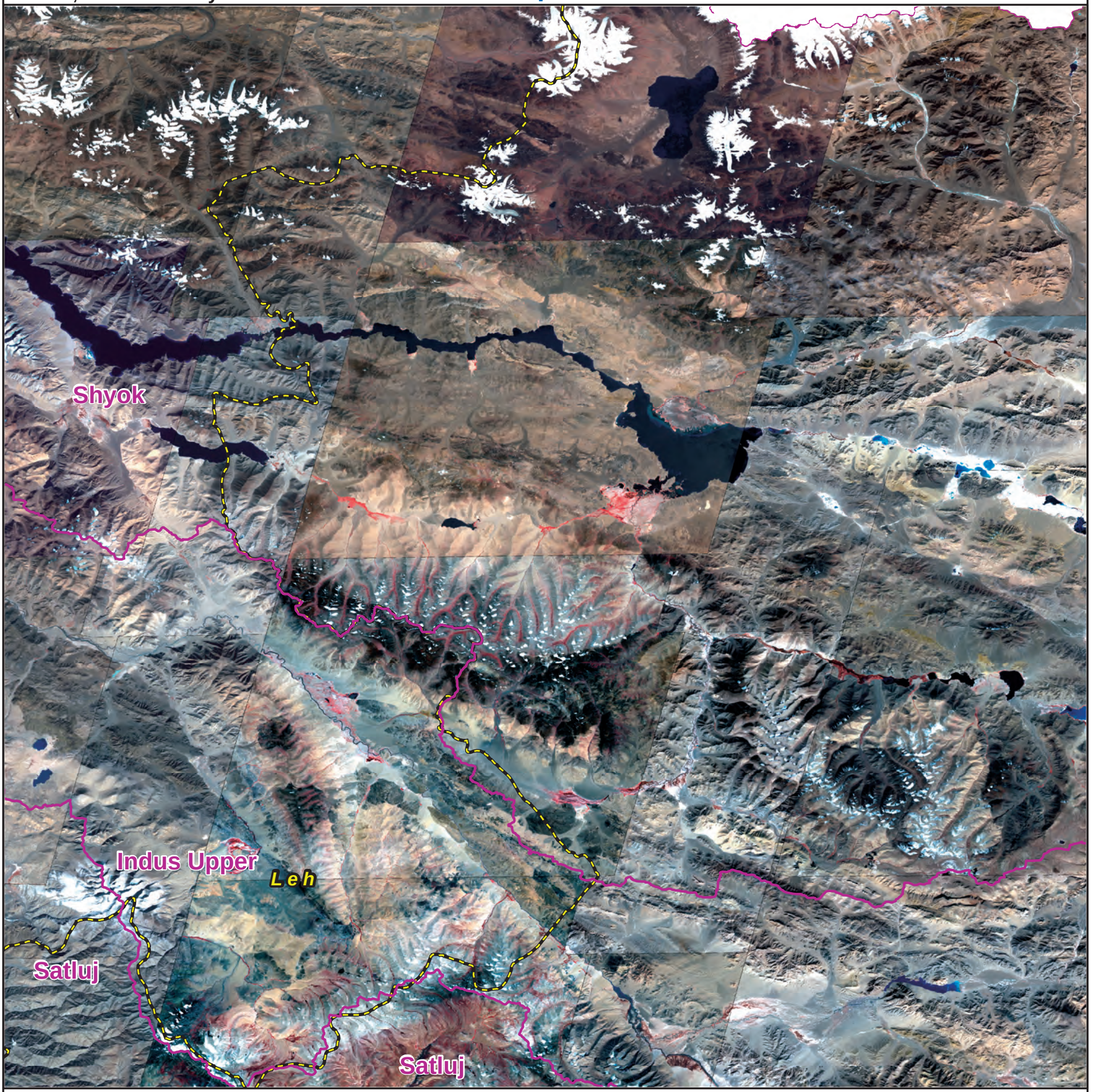
Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Administrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Ladakh, Transboundary — **Map 21** — Plate No: 11



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 17)

0 10 20 30 40 Km

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	0	0	1	32	9	0	1	0	10	3	**56**
2	**0.5 - 1**	6	0	0	24	14	0	0	0	17	4	**65**
3	**1 - 5**	23	0	0	29	2	1	8	0	45	4	**112**
4	**5 - 10**	7	0	0	6	0	0	0	0	8	0	**21**
5	**10 - 50**	6	0	0	0	0	0	0	0	1	1	**8**
6	**> 50**	0	0	0	0	0	0	0	0	1	0	**1**
Total		**42**	**0**	**1**	**91**	**25**	**1**	**9**	**0**	**82**	**12**	**263**

Legend

Subbasin Boundary — District Boundary

DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Ladakh, Transboundary

Map 22

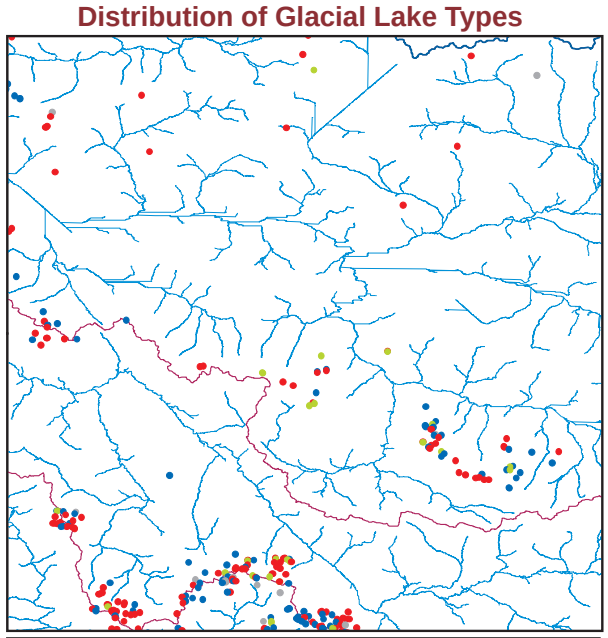
Plate No: 11

Data Source: Resourcesat-2 LISS-IV

GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

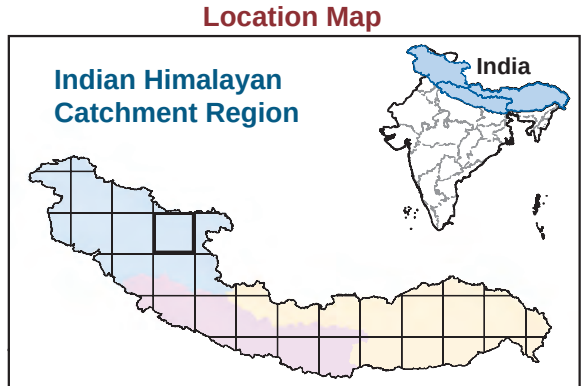
0 10 20 30 40 Km

Distribution of Glacial Lake Types



Moraine Dammed Lake · Ice Dammed Lake · Erosion Lake · Other Glacial Lake

Location Map



Basin

- Indus
- Ganga
- Brahmaputra

Sol 250k

52J	52N	61B
52K	52O	61C
52L	52P	61D

Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	0	0.0
2	3,001 - 4,000	0	0.0
3	4,001 - 5,000	0	0.0
4	> 5,000	263	694.8
Total		**263**	**694.8**

Legend

- Glacial Lake
- River / Stream
- Basin Boundary
- Subbasin Boundary
- *District Boundary*
- State / UT Boundary
- International Boundary

Elevation Range (m)

- up to 3,000
- 3,001 - 4,000
- 4,001 - 5,000
- > 5,000

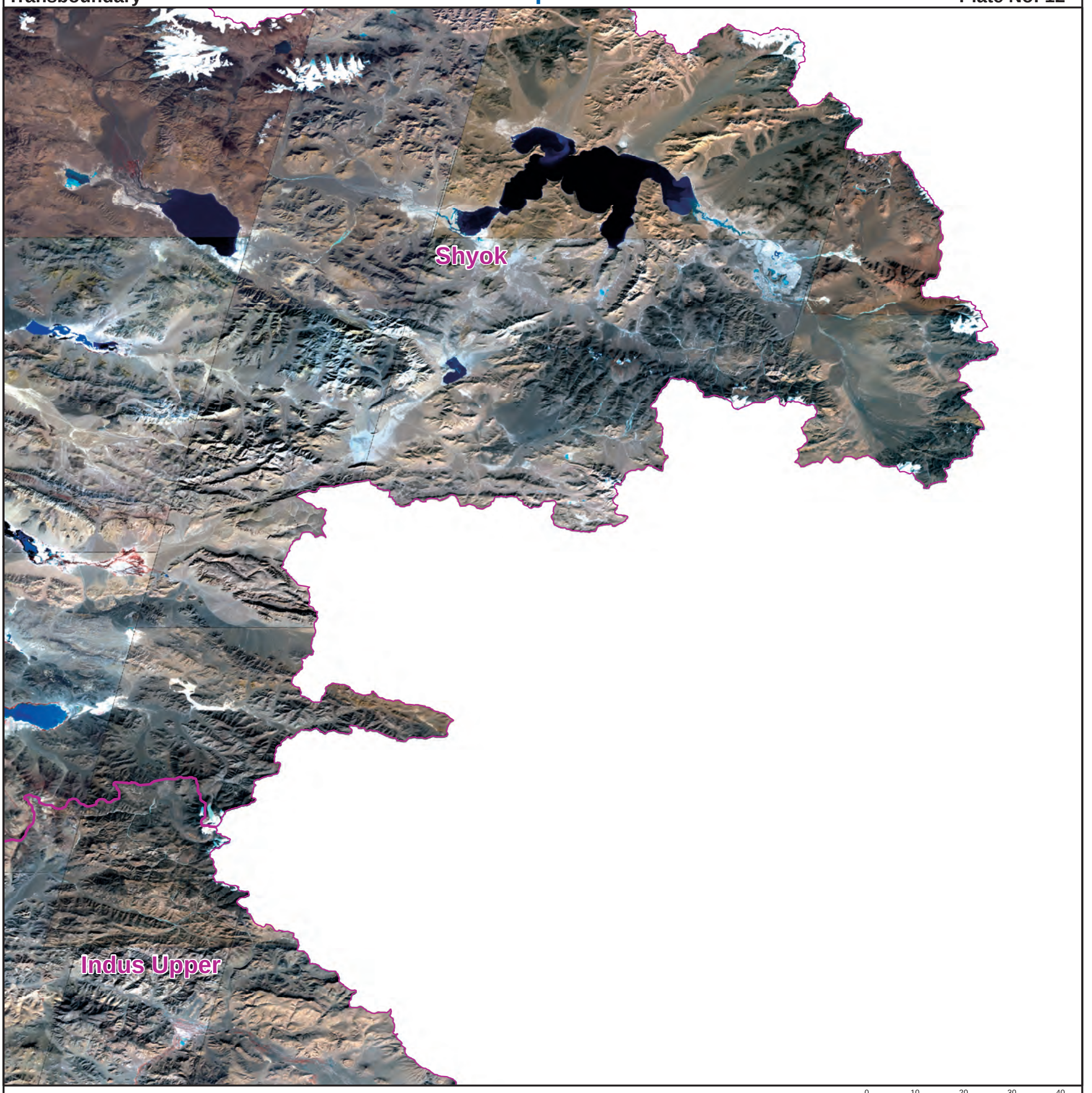
Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Transboundary | **Map 23** | Plate No: 12



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 13)

0 10 20 30 40 Km

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	0	0	0	4	0	0	0	0	0	1	**5**
2	**0.5 - 1**	2	0	0	3	0	0	0	0	1	5	**11**
3	**1 - 5**	6	0	4	3	0	0	0	0	3	8	**24**
4	**5 - 10**	3	0	1	0	0	0	0	0	0	0	**4**
5	**10 - 50**	1	0	1	0	0	0	0	0	0	0	**2**
6	**> 50**	0	0	0	0	0	1	0	0	1	2	**4**
Total		**12**	**0**	**6**	**10**	**0**	**1**	**0**	**0**	**5**	**16**	**50**

Legend

Subbasin Boundary

District Boundary

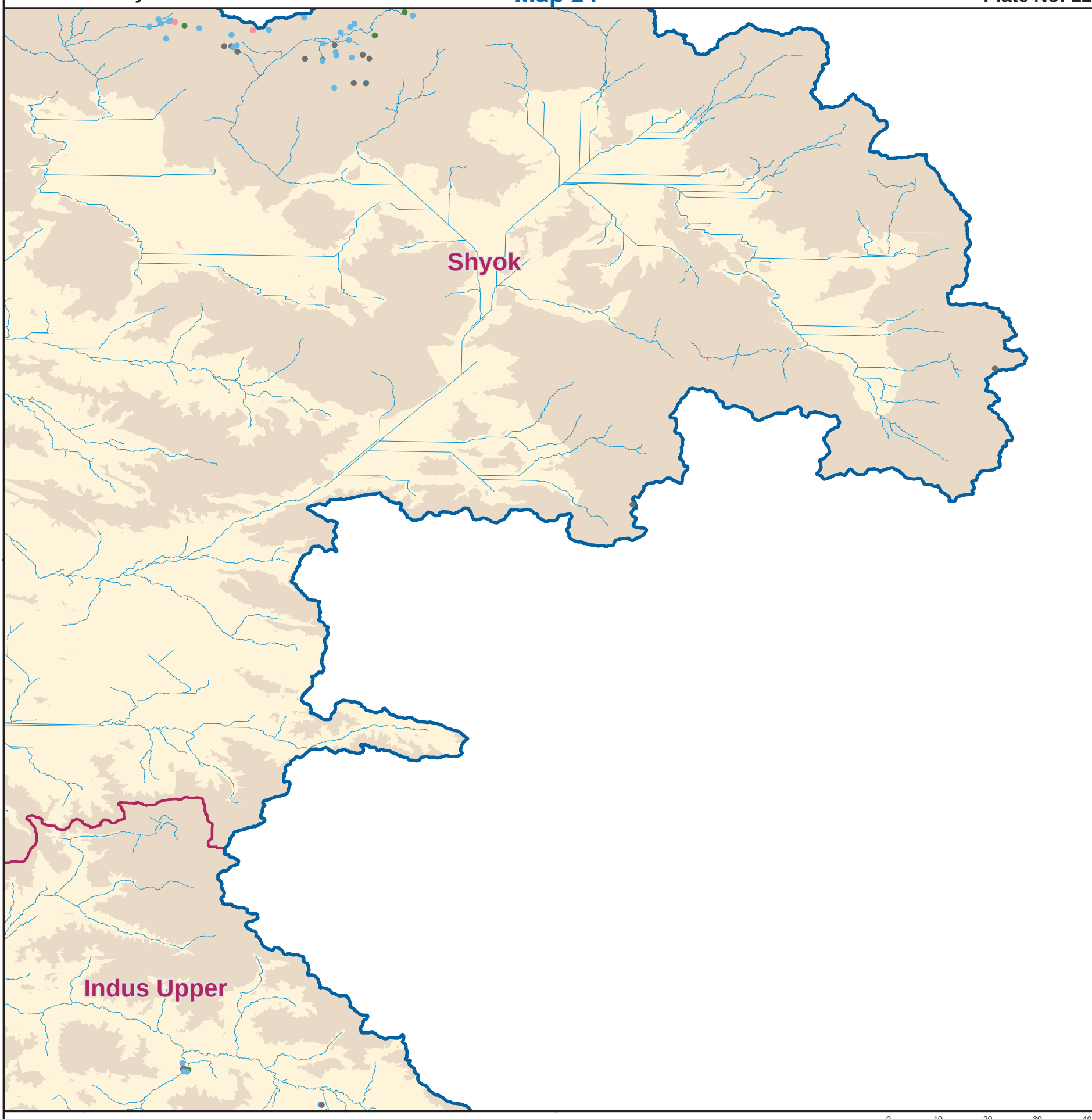
DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Transboundary | **Map 24** | Plate No: 12

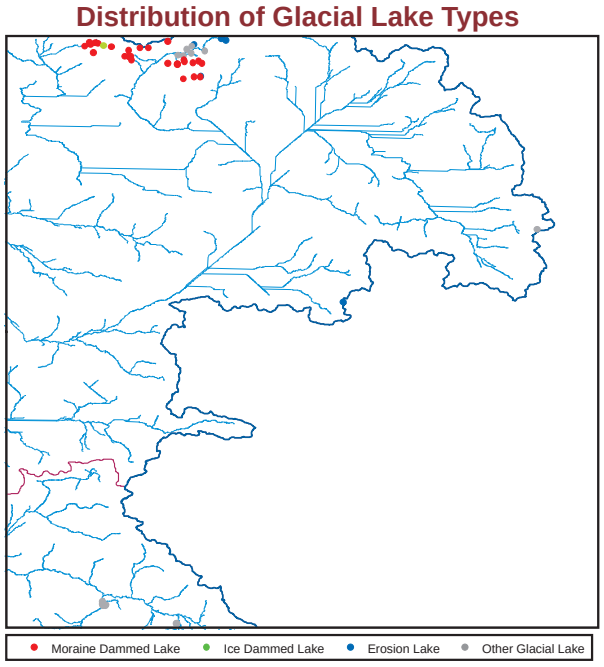


Data Source: Resourcesat-2 LISS-IV

GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

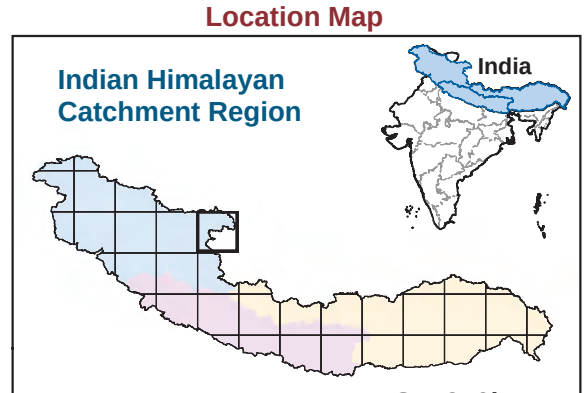
0 10 20 30 40 Km

Distribution of Glacial Lake Types



Moraine Dammed Lake · Ice Dammed Lake · Erosion Lake · Other Glacial Lake

Location Map



SoI 250k

61B	61F	
61C	61G	61K
61D	61H	

Basin

- Indus
- Ganga
- Brahmaputra

Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	0	0.0
2	3,001 - 4,000	0	0.0
3	4,001 - 5,000	9	71.6
4	> 5,000	41	472.8
Total		**50**	**544.4**

Legend

- Glacial Lake
- River / Stream
- Basin Boundary
- Subbasin Boundary
- *District Boundary*
- State / UT Boundary
- International Boundary

Elevation Range (m)

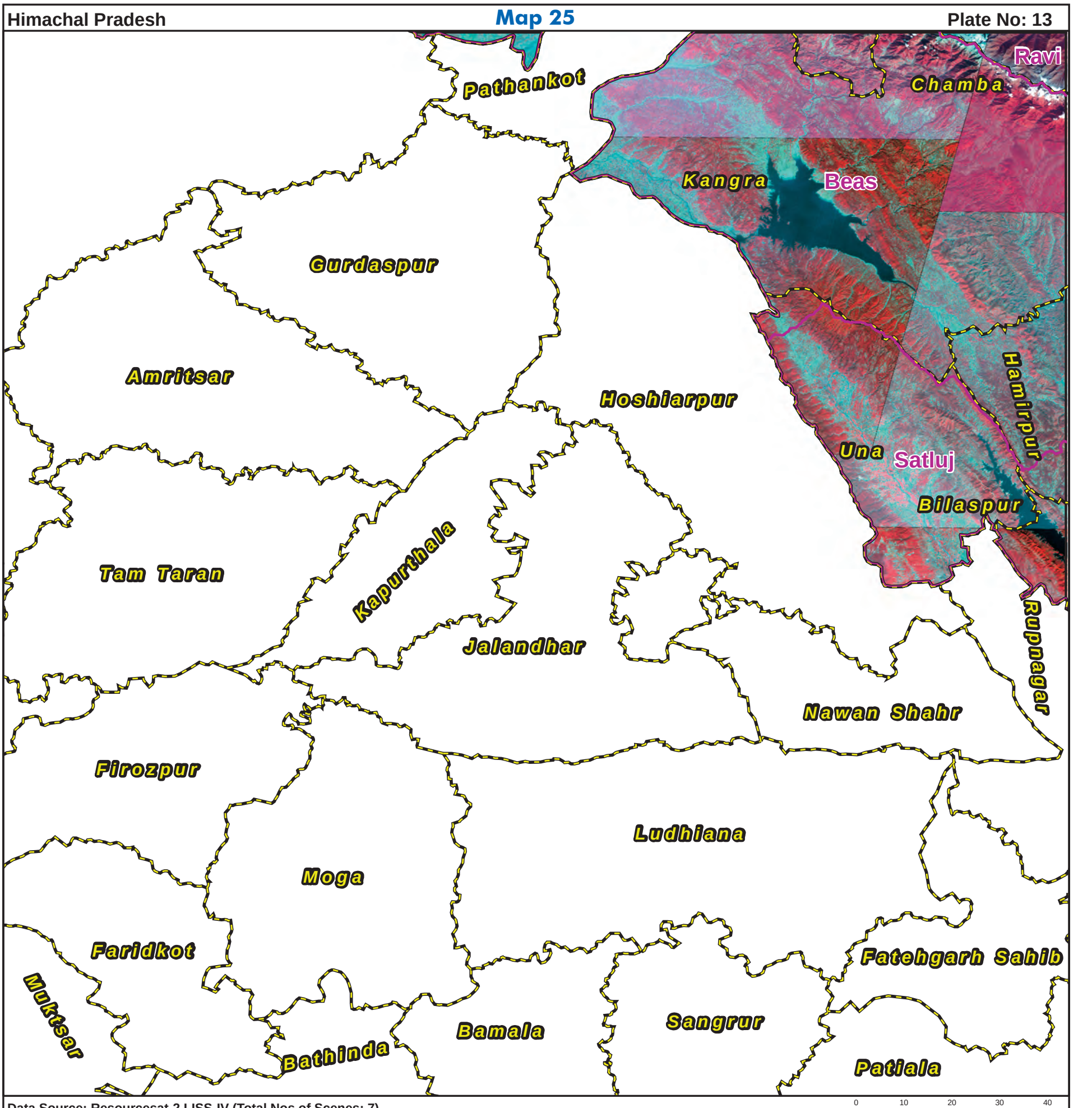
- up to 3,000
- 3,001 - 4,000
- 4,001 - 5,000
- > 5,000

Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION



Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	0	0	0	1	0	0	0	0	1	0	**2**
2	**0.5 - 1**	0	0	0	0	0	0	0	0	1	0	**1**
3	**1 - 5**	0	0	0	1	0	0	0	0	8	0	**9**
4	**5 - 10**	0	0	0	0	0	0	0	0	0	0	**0**
5	**10 - 50**	0	0	0	0	0	0	0	0	1	0	**1**
6	**> 50**	0	0	0	0	0	0	0	0	0	0	**0**
Total		**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**11**	**0**	**13**

Legend

Subbasin Boundary

District Boundary

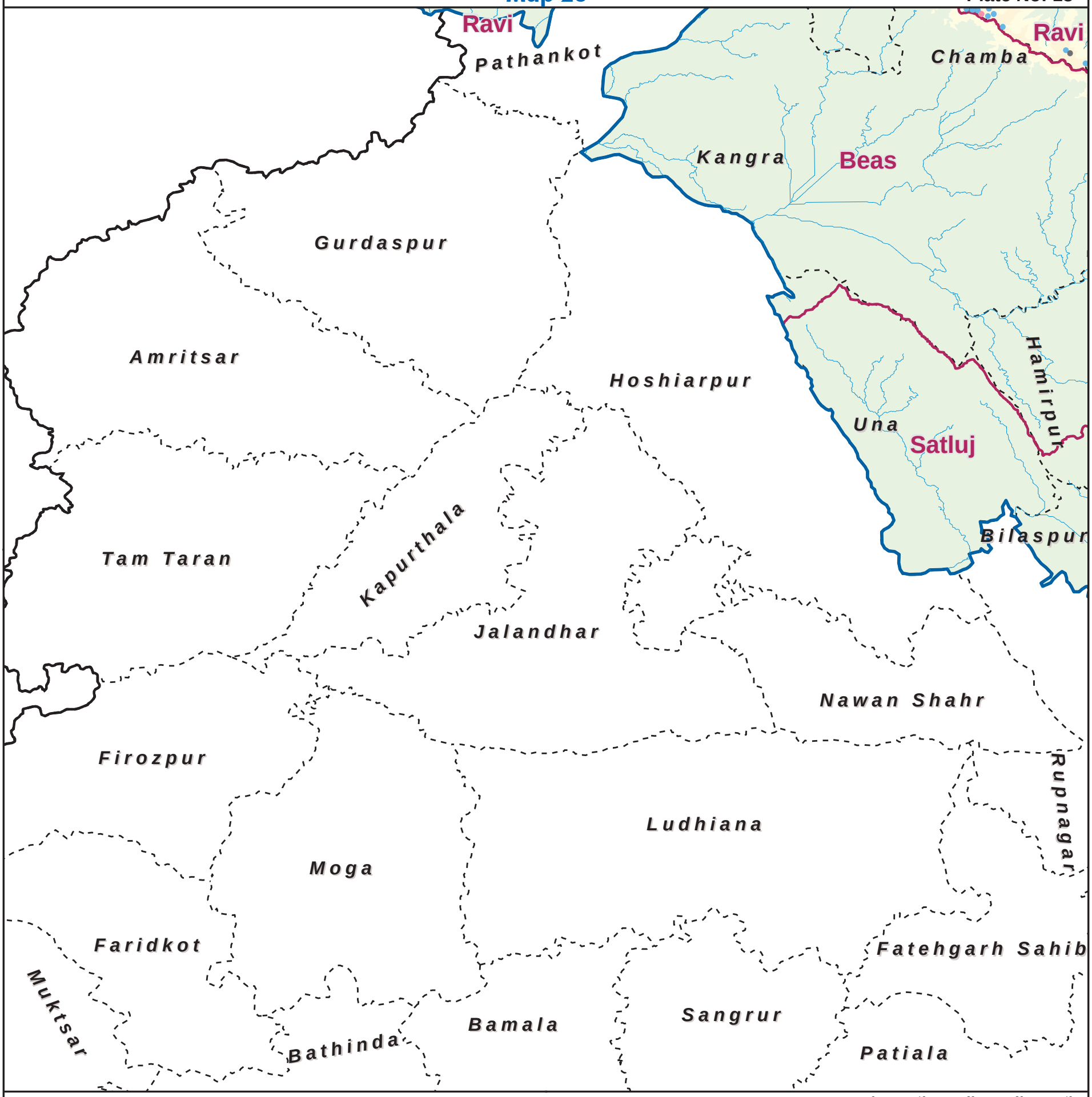
DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Himachal Pradesh | Map 26 | Plate No: 13

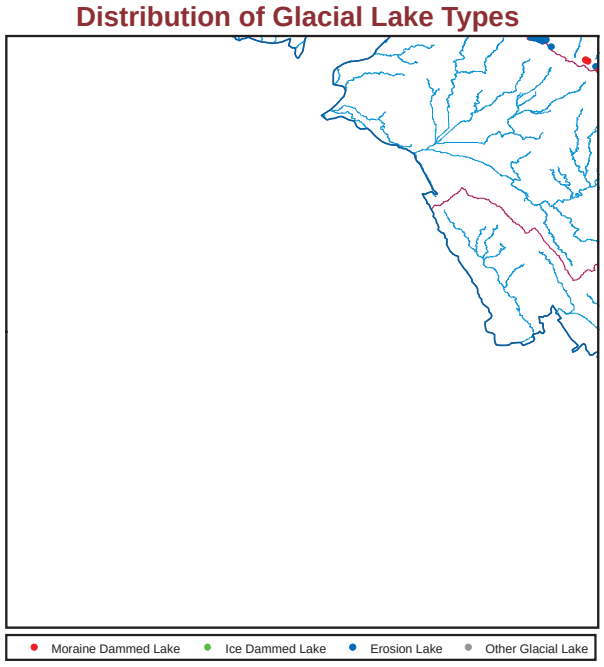


Data Source: Resourcesat-2 LISS-IV

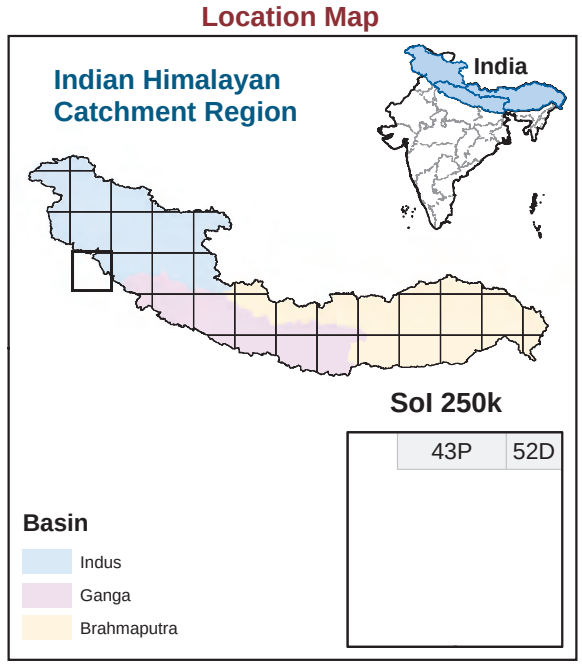
GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

0 10 20 30 40 Km

Distribution of Glacial Lake Types



Location Map



Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	0	0.0
2	3,001 - 4,000	6	32.1
3	4,001 - 5,000	7	12.8
4	> 5,000	0	0.0
	Total	**13**	**44.9**

Legend

Glacial Lake
River / Stream
Basin Boundary
Subbasin Boundary
District Boundary
State / UT Boundary
International Boundary

Elevation Range (m)
up to 3,000
3,001 - 4,000
4,001 - 5,000
> 5,000

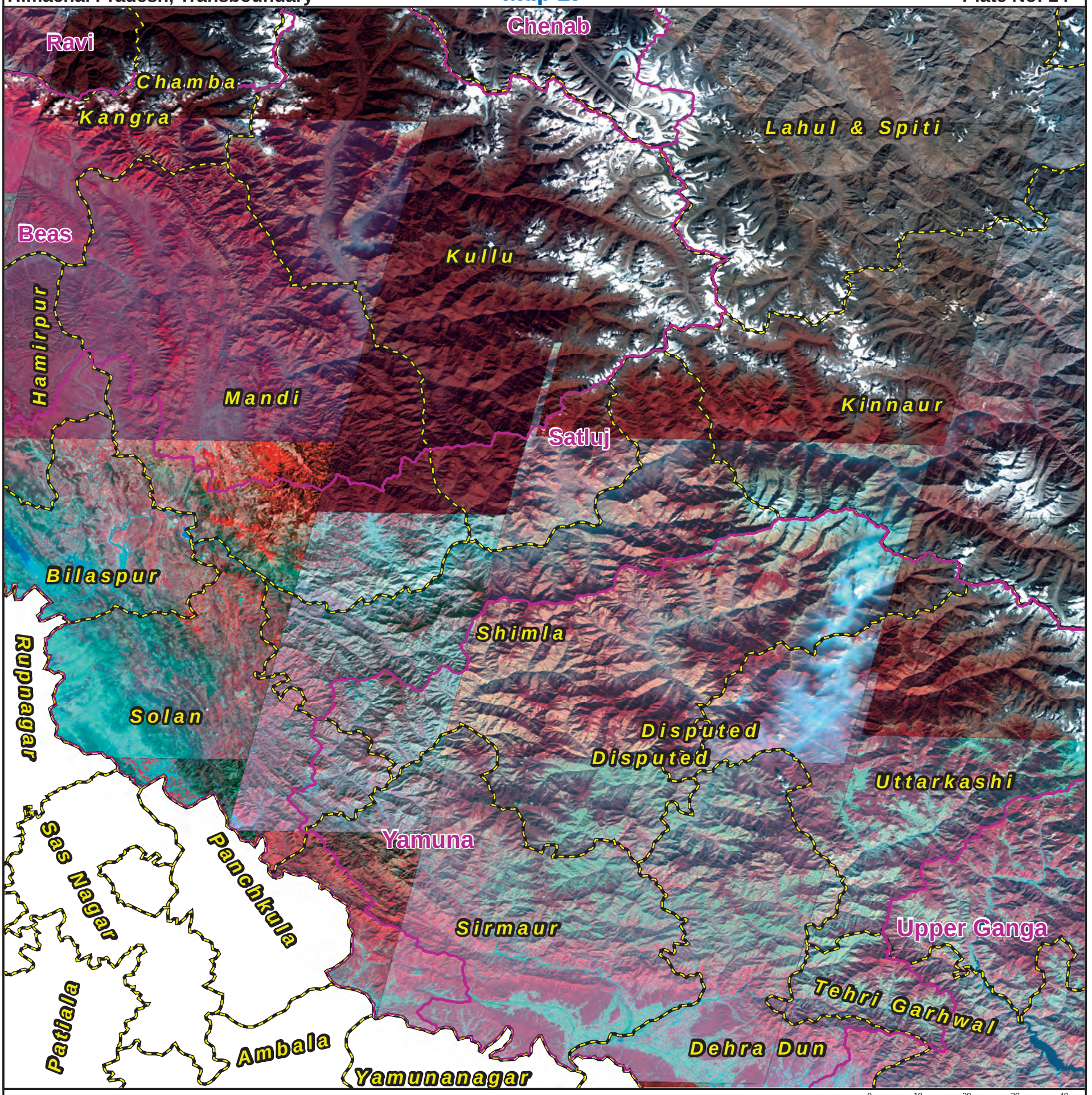
Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Administrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Himachal Pradesh, Transboundary — **Map 27** — Plate No: 14



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 19)

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	3	4	0	42	11	0	0	0	20	3	**83**
2	**0.5 - 1**	2	0	0	31	3	0	0	0	26	3	**65**
3	**1 - 5**	12	1	0	29	6	0	2	0	40	1	**91**
4	**5 - 10**	4	0	0	1	0	0	1	0	2	0	**8**
5	**10 - 50**	1	0	0	1	0	0	1	0	1	0	**4**
6	**> 50**	0	0	0	0	0	0	0	0	0	0	**0**
Total		**22**	**5**	**0**	**104**	**20**	**0**	**4**	**0**	**89**	**7**	**251**

Legend

Subbasin Boundary — District Boundary

DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Himachal Pradesh, Transboundary

Map 28

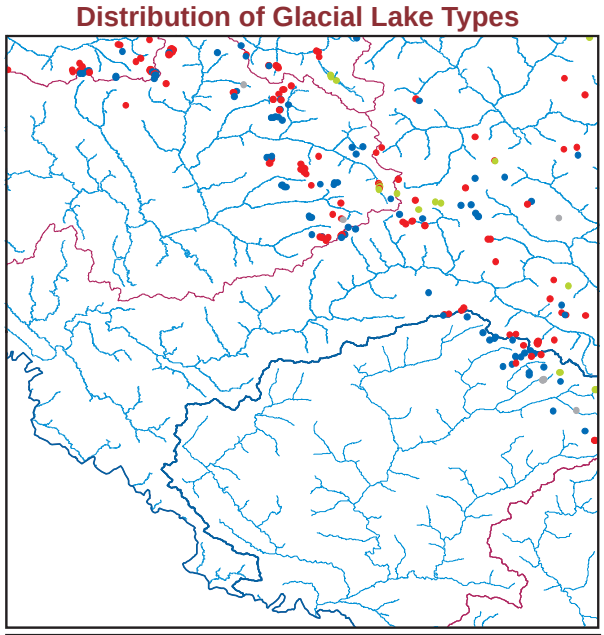
Plate No: 14

Data Source: Resourcesat-2 LISS-IV

GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

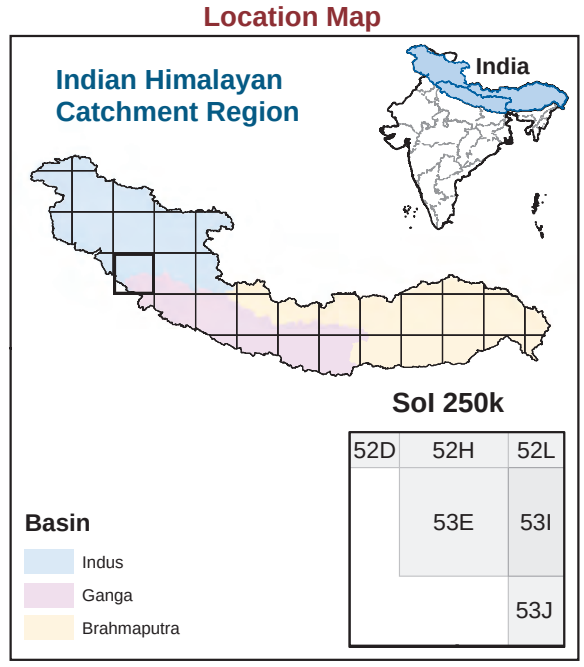
0 10 20 30 40 Km

Distribution of Glacial Lake Types



Moraine Dammed Lake · Ice Dammed Lake · Erosion Lake · Other Glacial Lake

Location Map



Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	0	0.0
2	3,001 - 4,000	12	6.5
3	4,001 - 5,000	209	338.1
4	> 5,000	30	39.4
Total		**251**	**384.0**

Legend

Glacial Lake
River / Stream
Basin Boundary
Subbasin Boundary
District Boundary
State / UT Boundary
International Boundary

Elevation Range (m)
up to 3,000
3,001 - 4,000
4,001 - 5,000
> 5,000

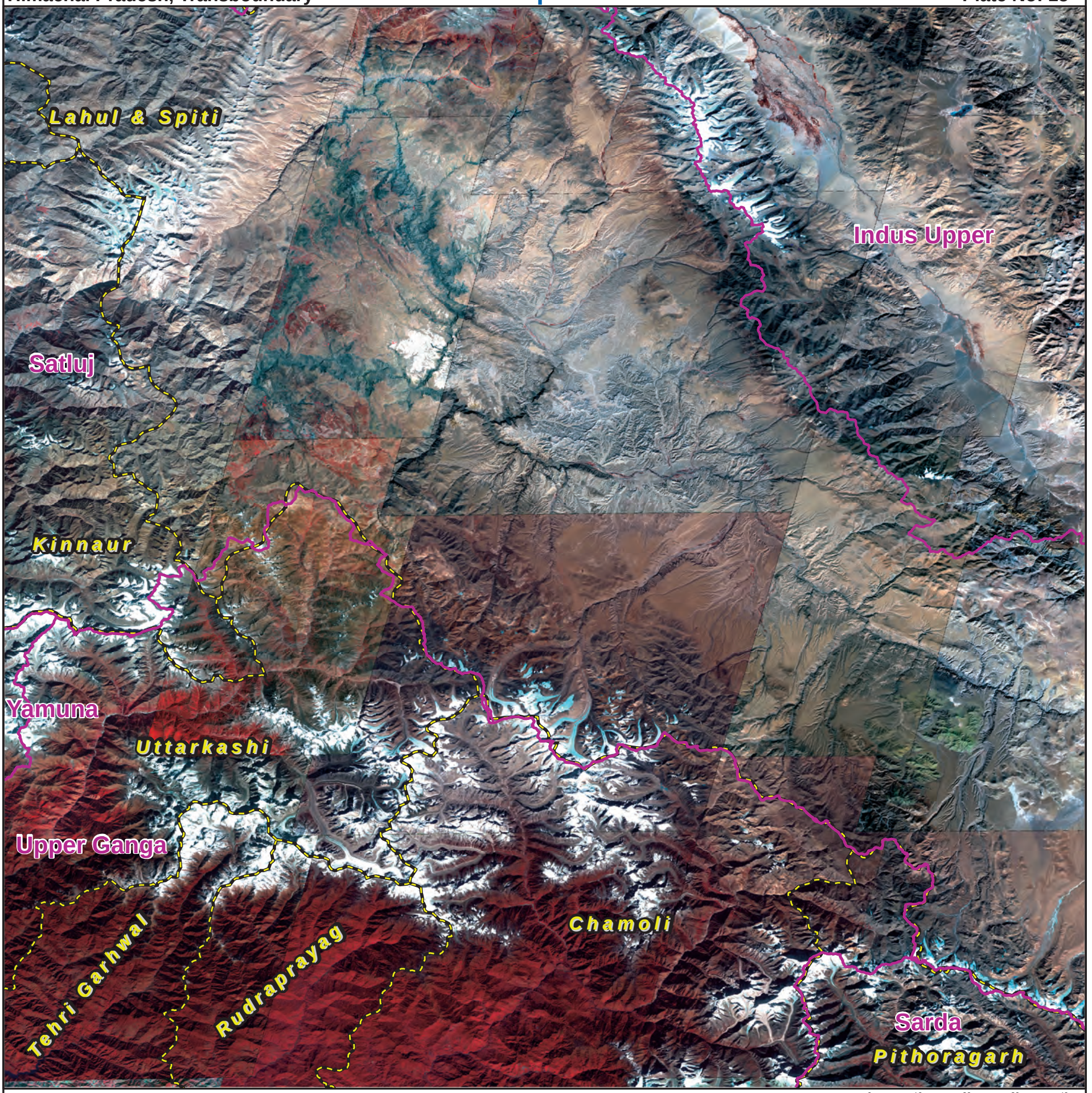
Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Administrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Himachal Pradesh, Transboundary — **Map 29** — Plate No: 15



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 20)

0 10 20 30 40 Km

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	4	10	0	100	81	0	1	0	58	7	**261**
2	**0.5 - 1**	2	6	0	79	35	0	7	0	51	5	**185**
3	**1 - 5**	37	5	2	55	10	0	17	0	81	9	**216**
4	**5 - 10**	8	1	0	7	1	0	6	0	14	2	**39**
5	**10 - 50**	14	0	0	1	2	0	1	0	6	1	**25**
6	**> 50**	0	0	0	0	0	0	0	0	0	0	**0**
Total		**65**	**22**	**2**	**242**	**129**	**0**	**32**	**0**	**210**	**24**	**726**

Legend

Subbasin Boundary — District Boundary

DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

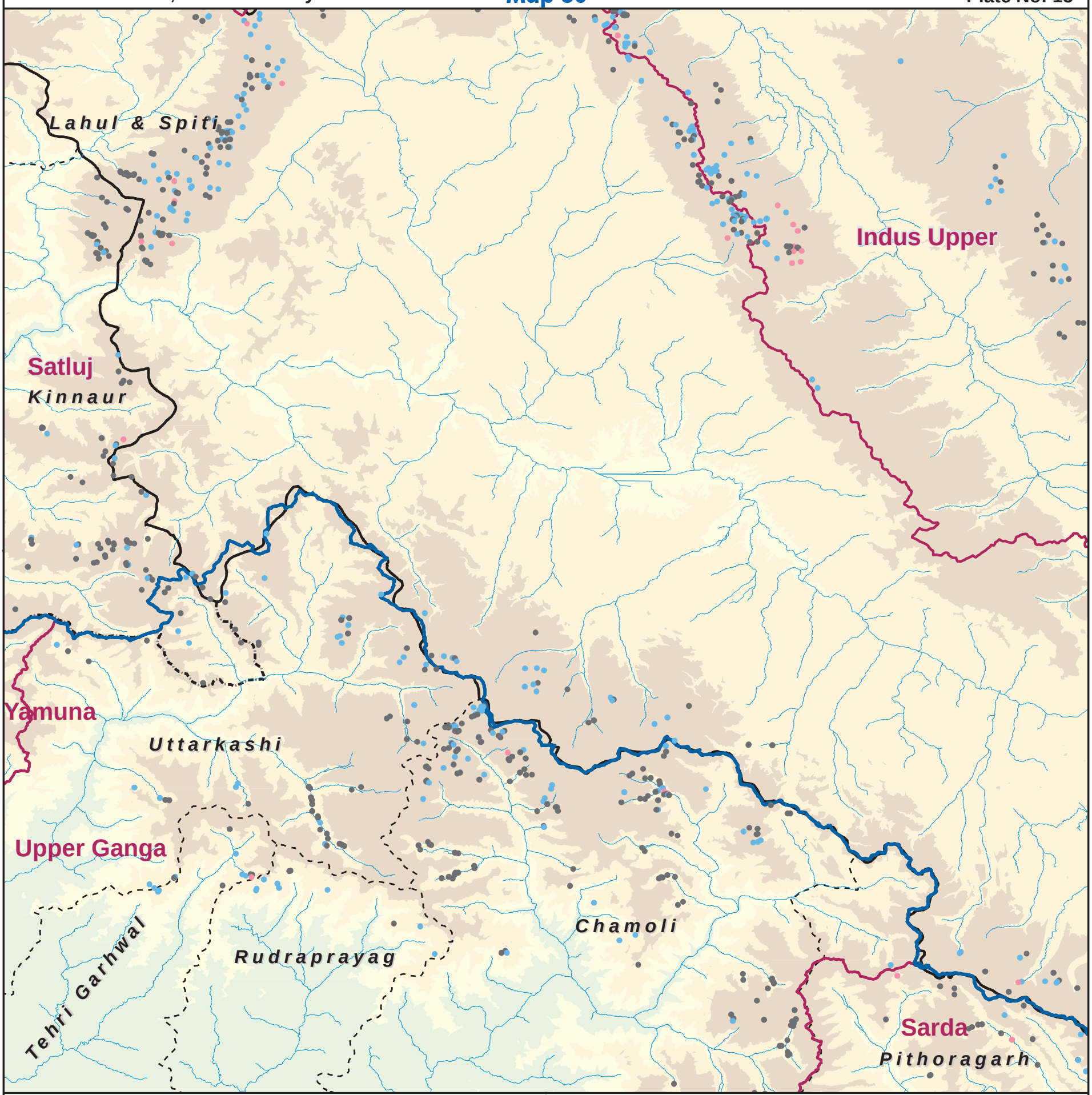
(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Himachal Pradesh, Transboundary

Map 30

Plate No: 15

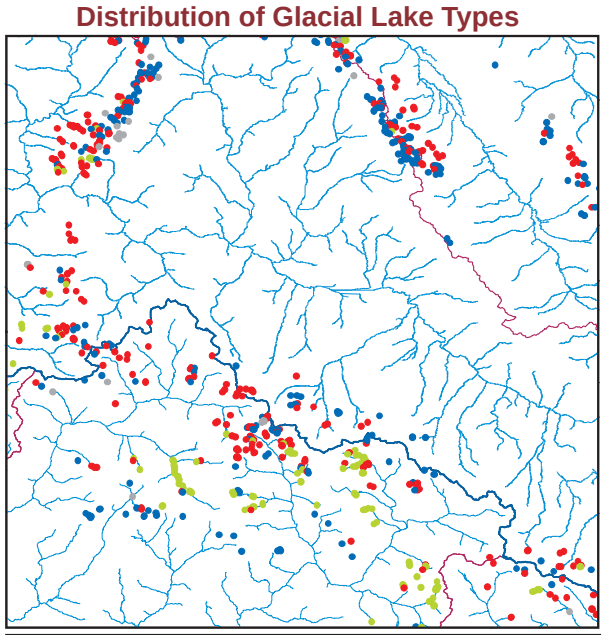


Data Source: Resourcesat-2 LISS-IV

GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

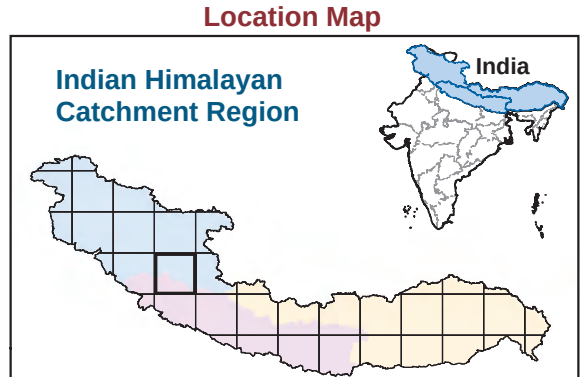
0 10 20 30 40 Km

Distribution of Glacial Lake Types



Moraine Dammed Lake · Ice Dammed Lake · Erosion Lake · Other Glacial Lake

Location Map



Basin

- Indus
- Ganga
- Brahmaputra

SoI 250k

52L	52P	61D
53I	53M	62A
53J	53N	62B

Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	0	0.0
2	3,001 - 4,000	5	2.4
3	4,001 - 5,000	162	328.4
4	> 5,000	559	1,062.9
Total		**726**	**1,393.7**

Legend

- Glacial Lake
- River / Stream
- Basin Boundary
- Subbasin Boundary
- *District Boundary*
- State / UT Boundary
- International Boundary

Elevation Range (m)

- up to 3,000
- 3,001 - 4,000
- 4,001 - 5,000
- > 5,000

Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

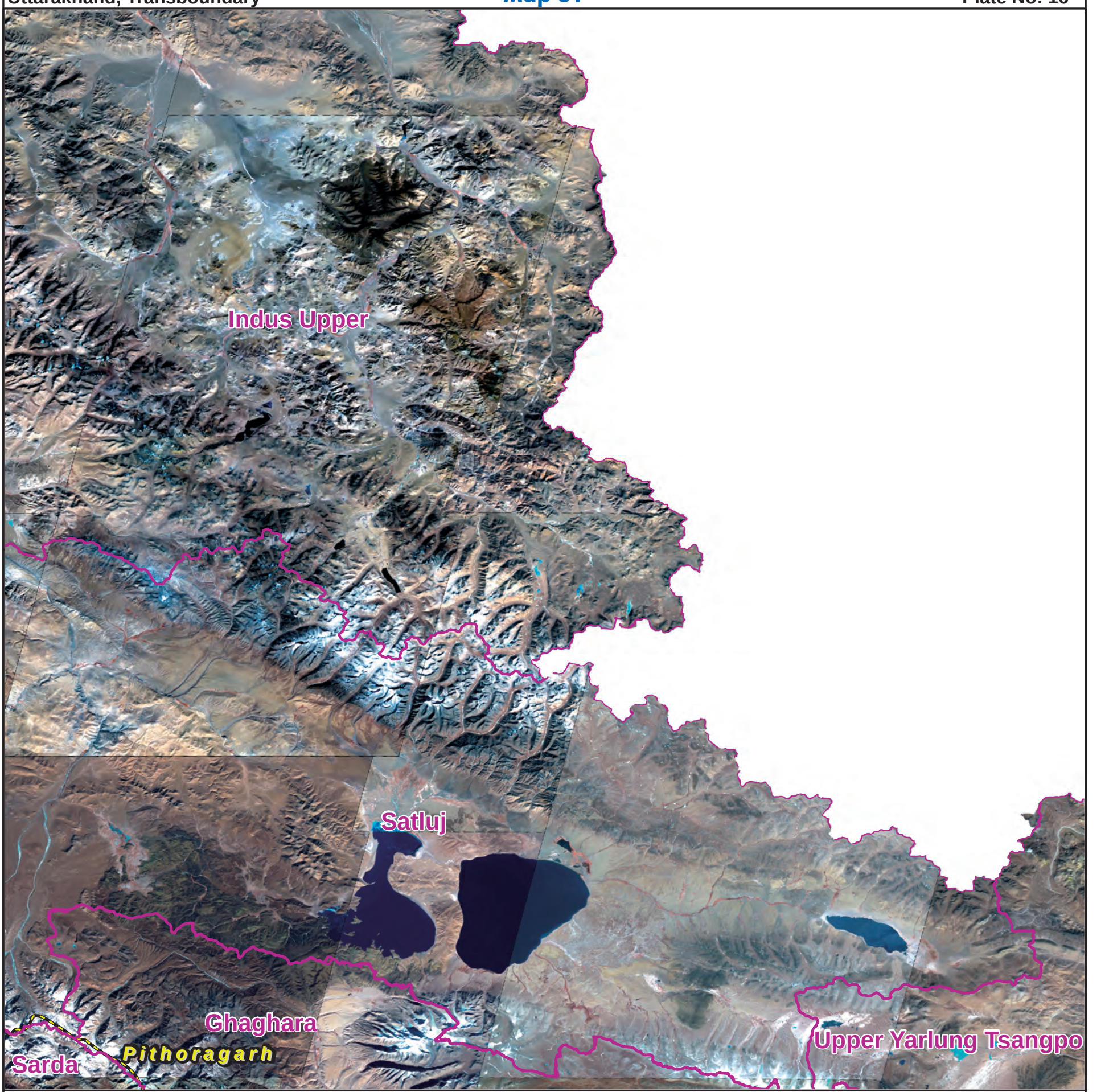
DISCLAIMER: The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Uttarakhand, Transboundary

Map 31

Plate No: 16



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 14)

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	3	0	1	54	7	0	1	0	57	80	**203**
2	**0.5 - 1**	1	2	0	36	4	0	2	0	64	83	**192**
3	**1 - 5**	27	0	1	46	1	0	13	0	100	84	**272**
4	**5 - 10**	7	0	0	8	0	0	2	0	24	10	**51**
5	**10 - 50**	14	0	0	3	0	0	0	0	13	20	**50**
6	**> 50**	2	0	0	0	0	0	0	0	3	4	**9**
Total		**54**	**2**	**2**	**147**	**12**	**0**	**18**	**0**	**261**	**281**	**777**

Legend

Subbasin Boundary

District Boundary

DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Uttarakhand, Transboundary

Map 32

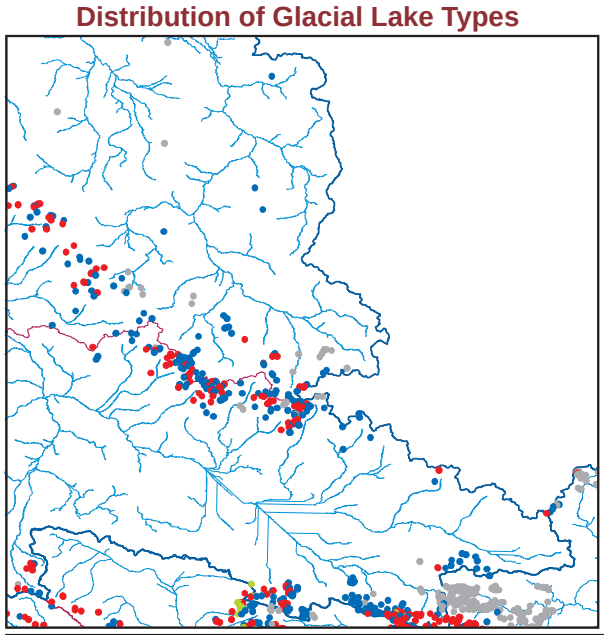
Plate No: 16

Data Source: Resourcesat-2 LISS-IV

GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

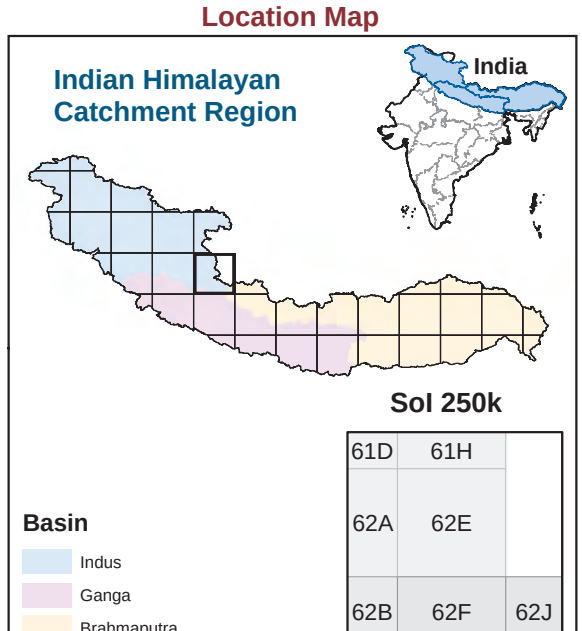
0 10 20 30 40 Km

Distribution of Glacial Lake Types



Moraine Dammed Lake · Ice Dammed Lake · Erosion Lake · Other Glacial Lake

Location Map



Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	0	0.0
2	3,001 - 4,000	0	0.0
3	4,001 - 5,000	67	1,243.7
4	> 5,000	710	2,865.1
	Total	**777**	**4,108.8**

Legend

Glacial Lake
River / Stream
Basin Boundary
Subbasin Boundary
District Boundary
State / UT Boundary
International Boundary

Elevation Range (m)
up to 3,000
3,001 - 4,000
4,001 - 5,000
> 5,000

Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Administrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Transboundary | **Map 33** | Plate No: 17

Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 7)

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	0	0	0	75	0	0	0	0	39	24	**138**
2	**0.5 - 1**	1	0	0	61	1	0	1	0	37	11	**112**
3	**1 - 5**	5	0	0	90	1	0	1	0	35	31	**163**
4	**5 - 10**	5	0	0	14	0	0	0	0	3	3	**25**
5	**10 - 50**	4	0	0	7	0	0	0	0	6	9	**26**
6	**> 50**	0	0	0	0	0	0	0	0	2	2	**4**
Total		**15**	**0**	**0**	**247**	**2**	**0**	**2**	**0**	**122**	**80**	**468**

Legend

Subbasin Boundary

District Boundary

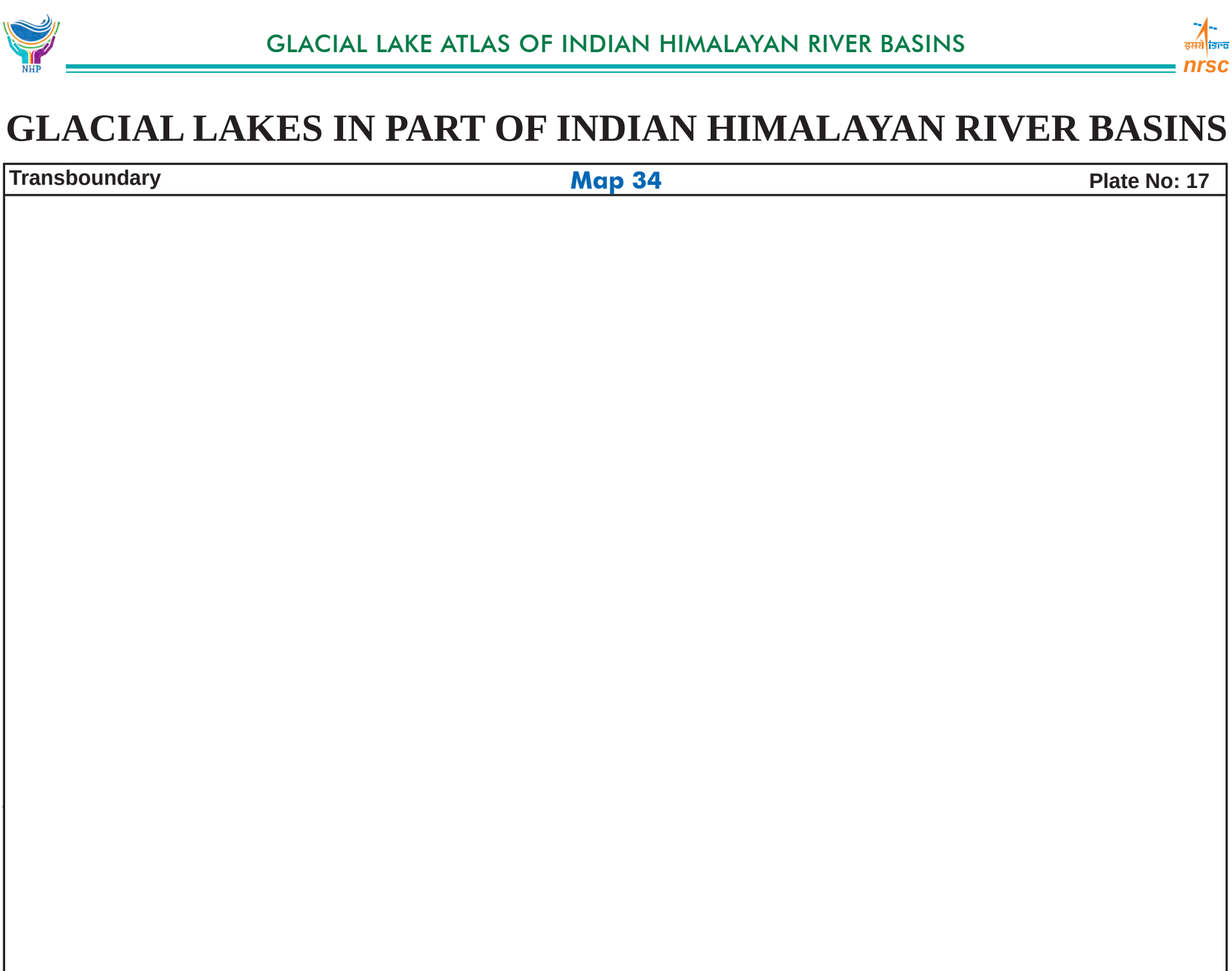
DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

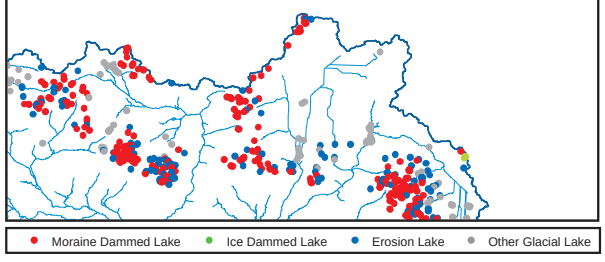
(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

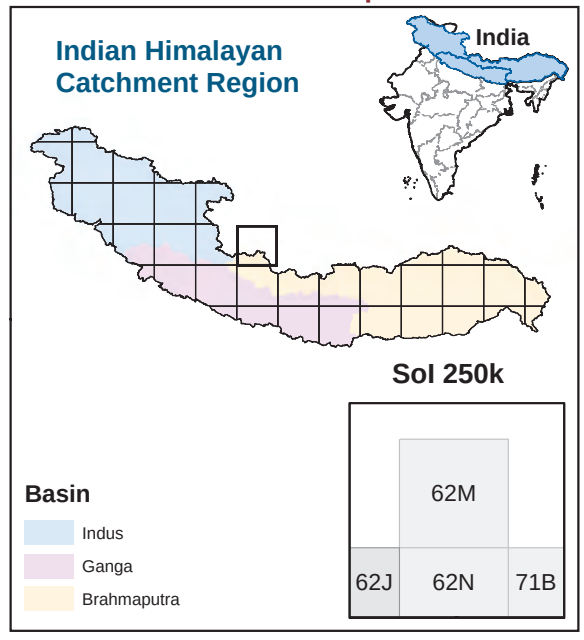
Transboundary | **Map 34** | Plate No: 17



Distribution of Glacial Lake Types



Location Map



Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	0	0.0
2	3,001 - 4,000	0	0.0
3	4,001 - 5,000	0	0.0
4	> 5,000	468	1,921.2
Total		**468**	**1,921.2**

Legend

Glacial Lake
River / Stream
Basin Boundary
Subbasin Boundary
District Boundary
State / UT Boundary
International Boundary

Elevation Range (m)
up to 3,000
3,001 - 4,000
4,001 - 5,000
> 5,000

Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Administrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Transboundary | **Map 35** | Plate No: 18

Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 2)

0 10 20 30 40 Km

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	0	0	0	0	0	0	0	0	0	0	**0**
2	**0.5 - 1**	0	0	0	0	0	0	0	0	1	0	**1**
3	**1 - 5**	0	0	0	0	0	0	0	0	0	0	**0**
4	**5 - 10**	0	0	0	0	0	0	0	0	0	0	**0**
5	**10 - 50**	0	0	0	0	0	0	0	0	0	0	**0**
6	**> 50**	0	0	0	0	0	0	0	0	0	0	**0**
Total		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**

Legend

Subbasin Boundary

District Boundary

DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Transboundary | **Map 36** | **Plate No: 18**

Data Source: Resourcesat-2 LISS-IV

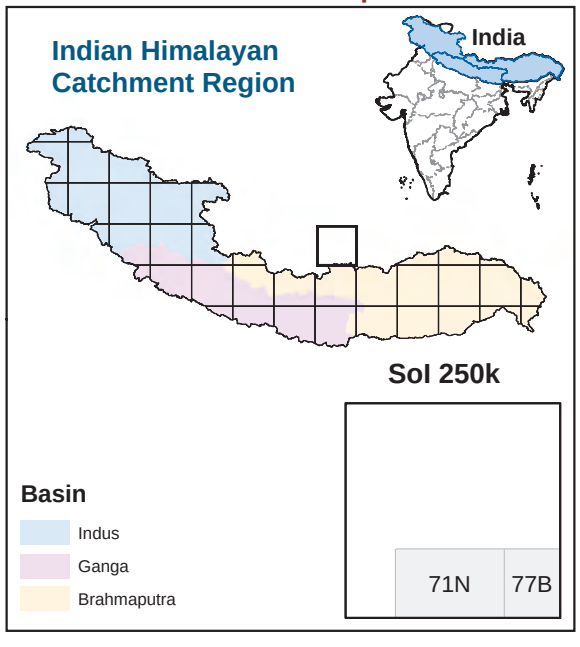
GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

0 10 20 30 40 Km

Distribution of Glacial Lake Types

● Moraine Dammed Lake ● Ice Dammed Lake ● Erosion Lake ● Other Glacial Lake

Location Map



Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	0	0.0
2	3,001 - 4,000	0	0.0
3	4,001 - 5,000	0	0.0
4	> 5,000	1	0.5
Total		**1**	**0.5**

Legend

Glacial Lake
River / Stream
Basin Boundary
Subbasin Boundary
District Boundary
State / UT Boundary
International Boundary

Elevation Range (m)
up to 3,000
3,001 - 4,000
4,001 - 5,000
> 5,000

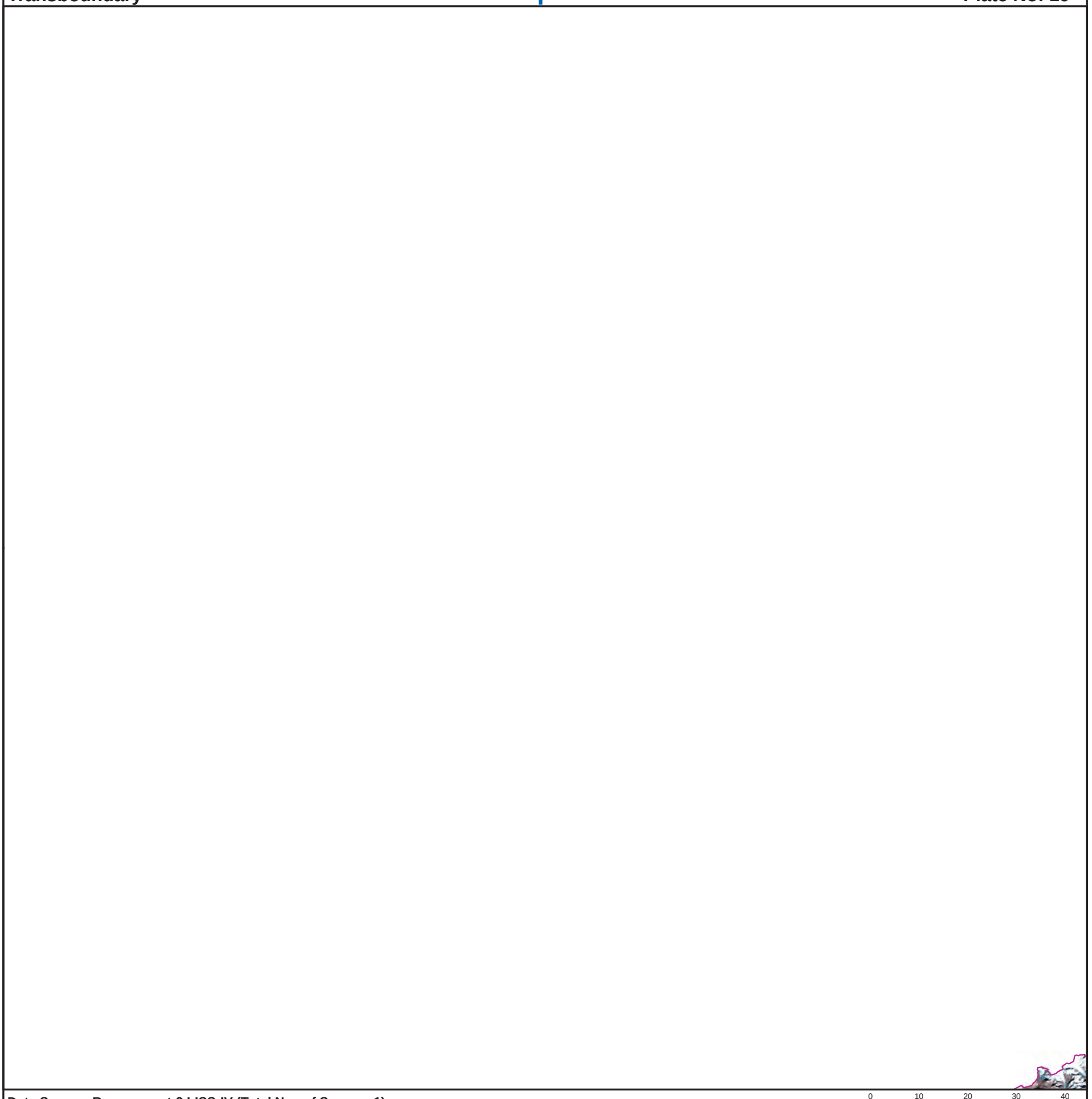
Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Transboundary | **Map 37** | Plate No: 19



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 1)

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	0	0	0	1	0	0	0	0	0	0	**1**
2	**0.5 - 1**	0	0	0	0	0	0	0	0	0	0	**0**
3	**1 - 5**	0	0	0	1	0	0	0	0	0	0	**1**
4	**5 - 10**	0	0	0	1	0	0	0	0	0	0	**1**
5	**10 - 50**	1	0	0	1	0	0	0	0	0	0	**2**
6	**> 50**	0	0	0	0	0	0	0	0	0	0	**0**
Total		**1**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**5**

Legend

Subbasin Boundary

District Boundary

DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Transboundary | **Map 38** | **Plate No: 19**

Data Source: Resourcesat-2 LISS-IV

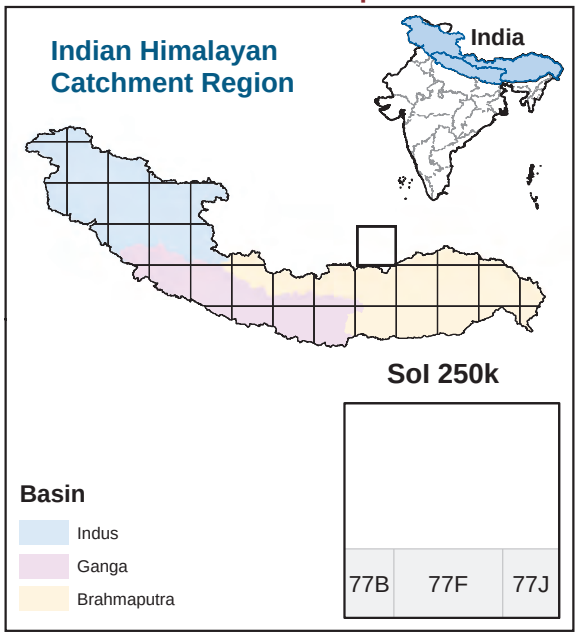
GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

0 10 20 30 40 Km

Distribution of Glacial Lake Types

Moraine Dammed Lake | Ice Dammed Lake | Erosion Lake | Other Glacial Lake

Location Map



Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	0	0.0
2	3,001 - 4,000	0	0.0
3	4,001 - 5,000	0	0.0
4	> 5,000	5	31.1
Total		**5**	**31.1**

Legend

Glacial Lake
River / Stream
Basin Boundary
Subbasin Boundary
District Boundary
State / UT Boundary
International Boundary

Elevation Range (m)
up to 3,000
3,001 - 4,000
4,001 - 5,000
> 5,000

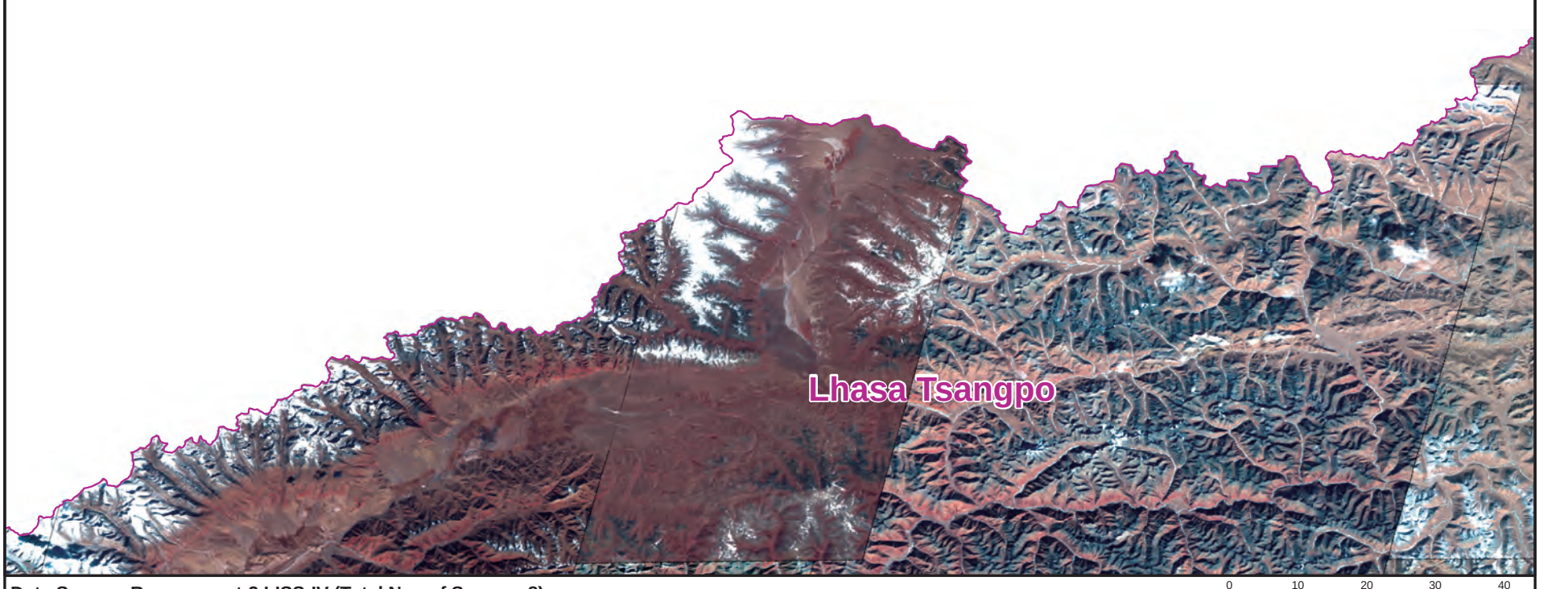
Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Administrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Transboundary | **Map 39** | Plate No: 20



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 8)

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	0	0	0	11	1	0	0	0	45	1	**58**
2	**0.5 - 1**	0	0	0	14	2	0	0	0	39	4	**59**
3	**1 - 5**	0	0	0	27	0	0	1	0	59	3	**90**
4	**5 - 10**	0	0	0	2	0	0	0	0	8	2	**12**
5	**10 - 50**	1	1	0	2	0	0	0	0	2	1	**7**
6	**> 50**	0	0	0	0	0	0	0	0	1	0	**1**
Total		**1**	**1**	**0**	**56**	**3**	**0**	**1**	**0**	**154**	**11**	**227**

Legend

Subbasin Boundary

District Boundary

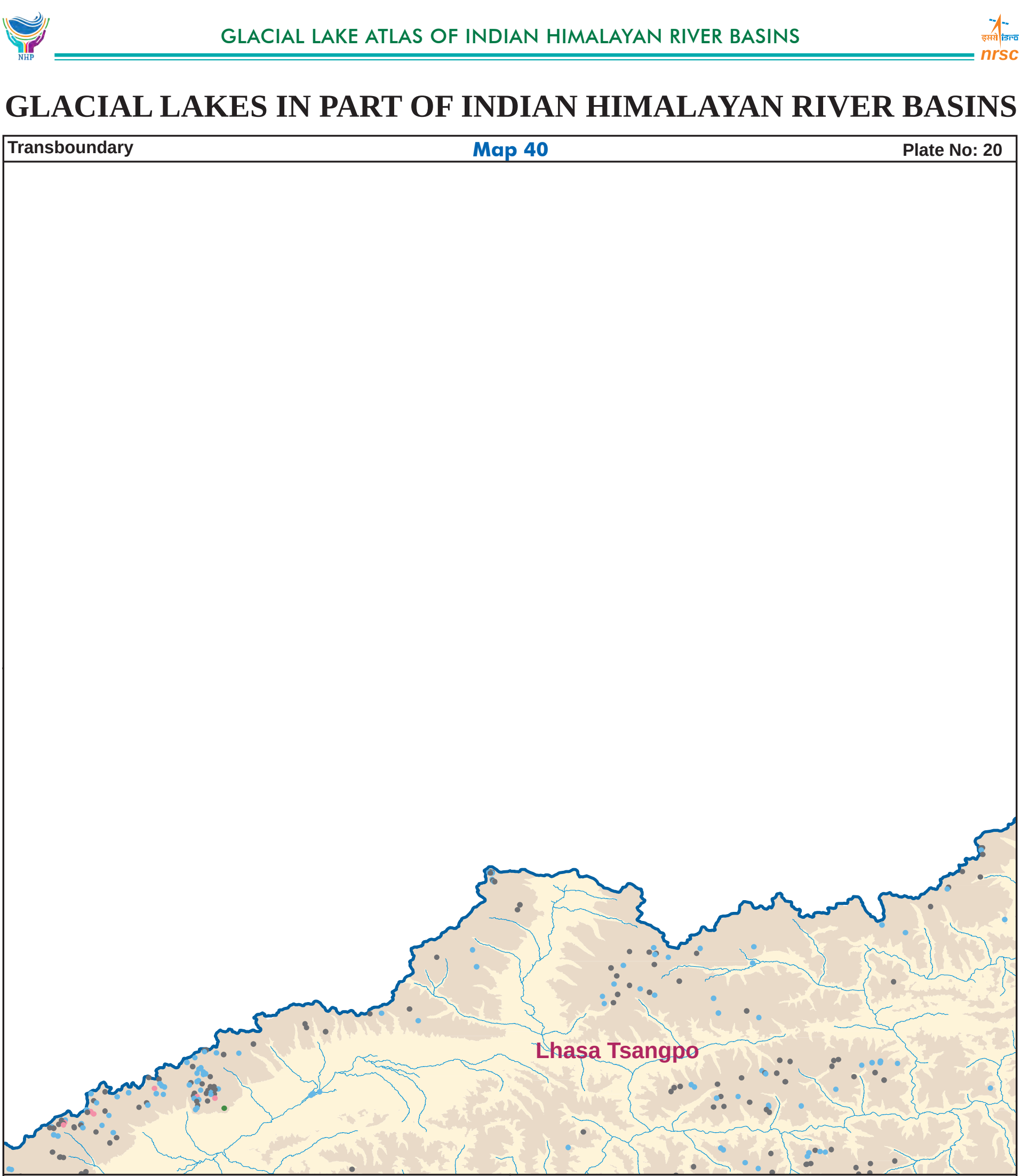
DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Transboundary | **Map 40** | **Plate No: 20**

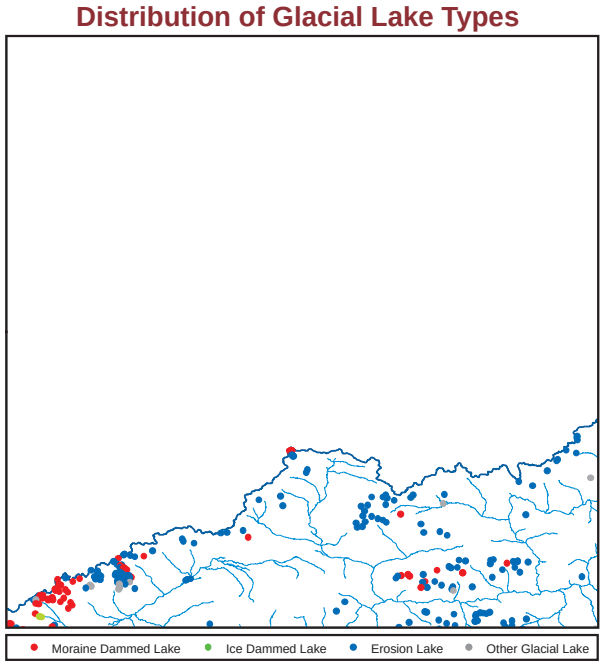


Data Source: Resourcesat-2 LISS-IV

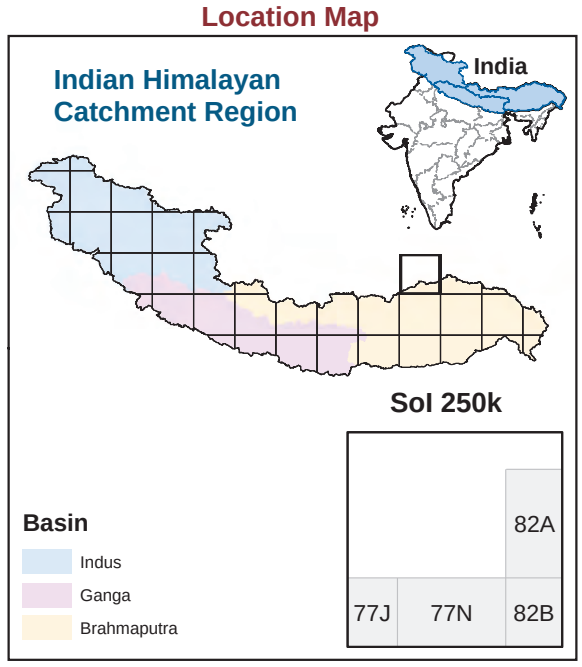
GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

0 10 20 30 40 Km

Distribution of Glacial Lake Types



Location Map



Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	0	0.0
2	3,001 - 4,000	0	0.0
3	4,001 - 5,000	9	17.1
4	> 5,000	218	505.6
Total		**227**	**522.7**

Legend

Glacial Lake
River / Stream
Basin Boundary
Subbasin Boundary
District Boundary
State / UT Boundary
International Boundary

Elevation Range (m)
up to 3,000
3,001 - 4,000
4,001 - 5,000
> 5,000

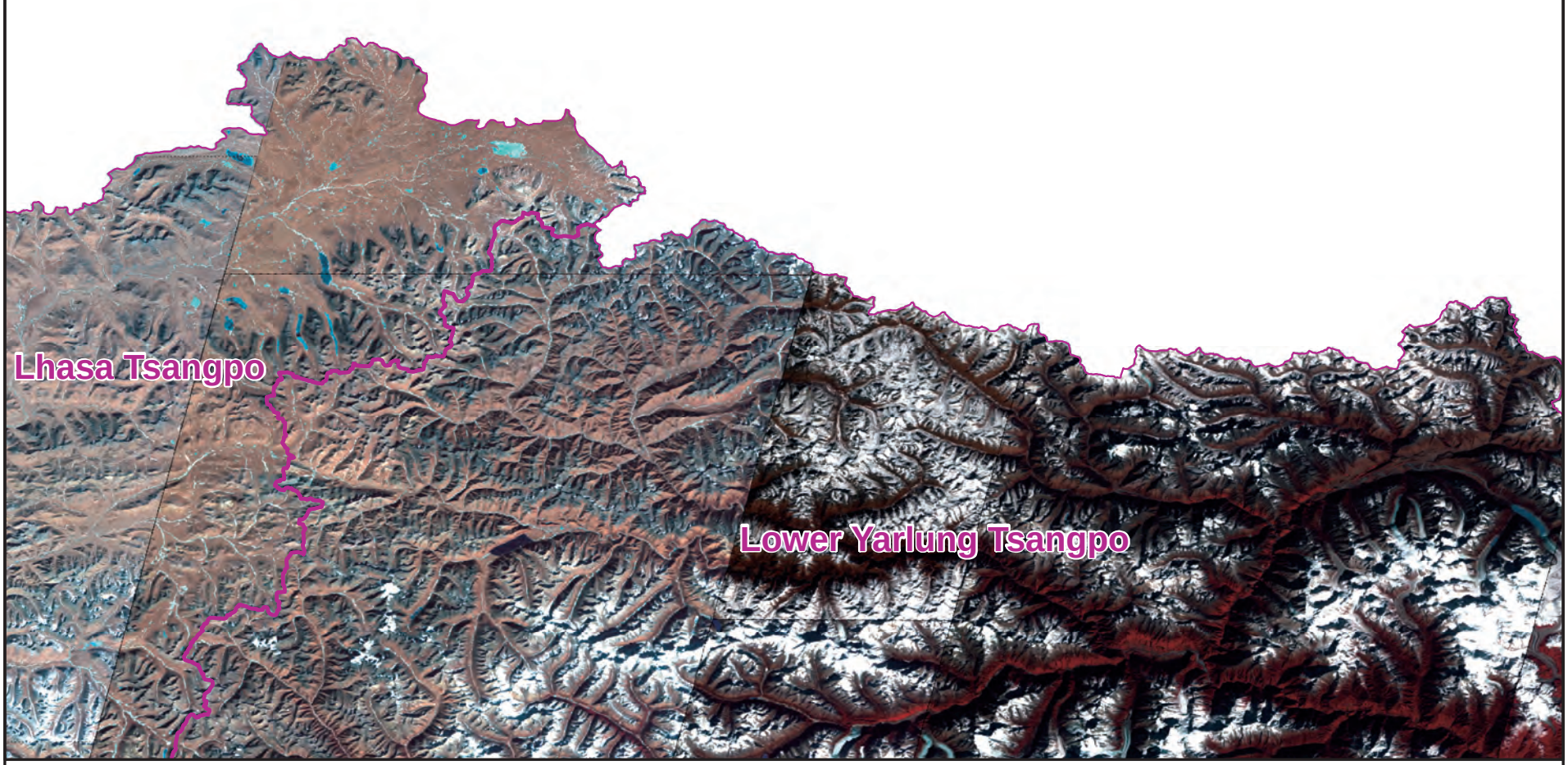
Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Transboundary | **Map 41** | Plate No: 21



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 10)

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	0	0	0	16	2	0	0	0	40	94	**152**
2	**0.5 - 1**	0	1	0	28	3	0	1	0	54	72	**159**
3	**1 - 5**	5	2	0	68	1	0	0	0	120	118	**314**
4	**5 - 10**	7	0	0	11	0	0	1	0	21	26	**66**
5	**10 - 50**	10	1	0	6	0	0	0	0	20	13	**50**
6	**> 50**	3	0	0	1	0	0	0	0	12	8	**24**
Total		**25**	**4**	**0**	**130**	**6**	**0**	**2**	**0**	**267**	**331**	**765**

Legend

Subbasin Boundary

District Boundary

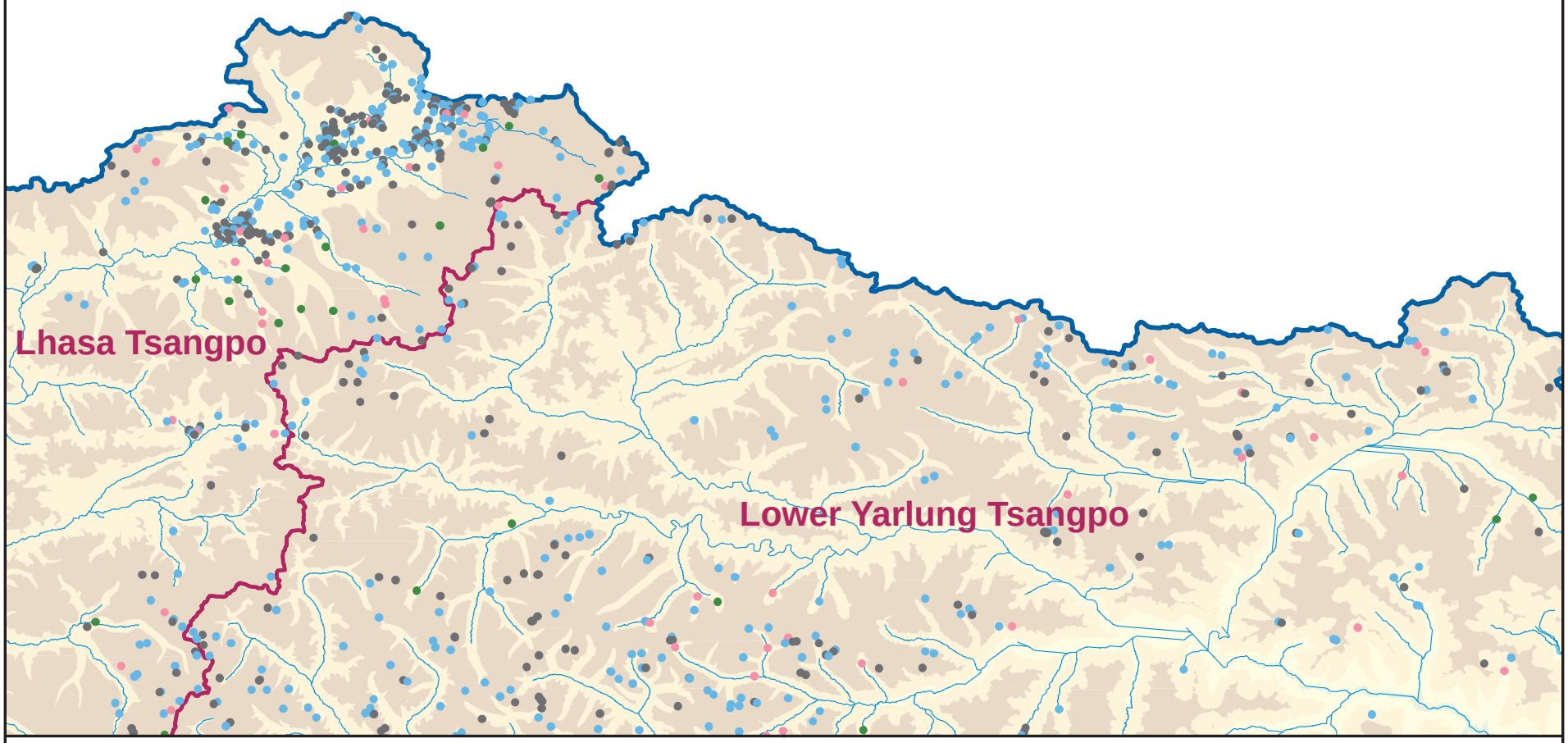
DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Transboundary | **Map 42** | Plate No: 21

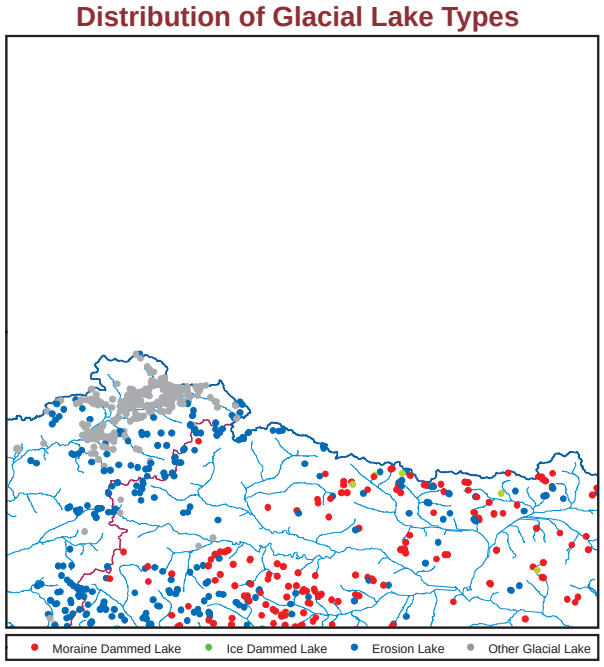


Data Source: Resourcesat-2 LISS-IV

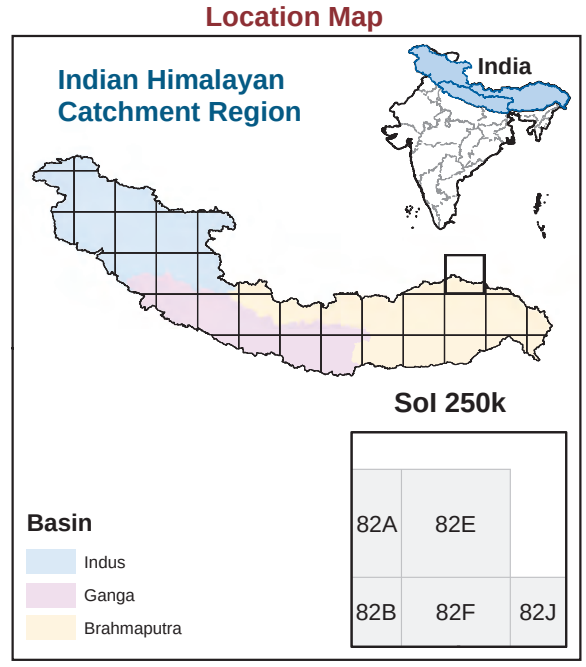
GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

0 10 20 30 40 Km

Distribution of Glacial Lake Types



Location Map



Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	0	0.0
2	3,001 - 4,000	4	546.7
3	4,001 - 5,000	420	4,749.0
4	> 5,000	341	1,946.0
	Total	**765**	**7,241.7**

Legend

Glacial Lake
River / Stream
Basin Boundary
Subbasin Boundary
District Boundary
State / UT Boundary
International Boundary

Elevation Range (m)
up to 3,000
3,001 - 4,000
4,001 - 5,000
> 5,000

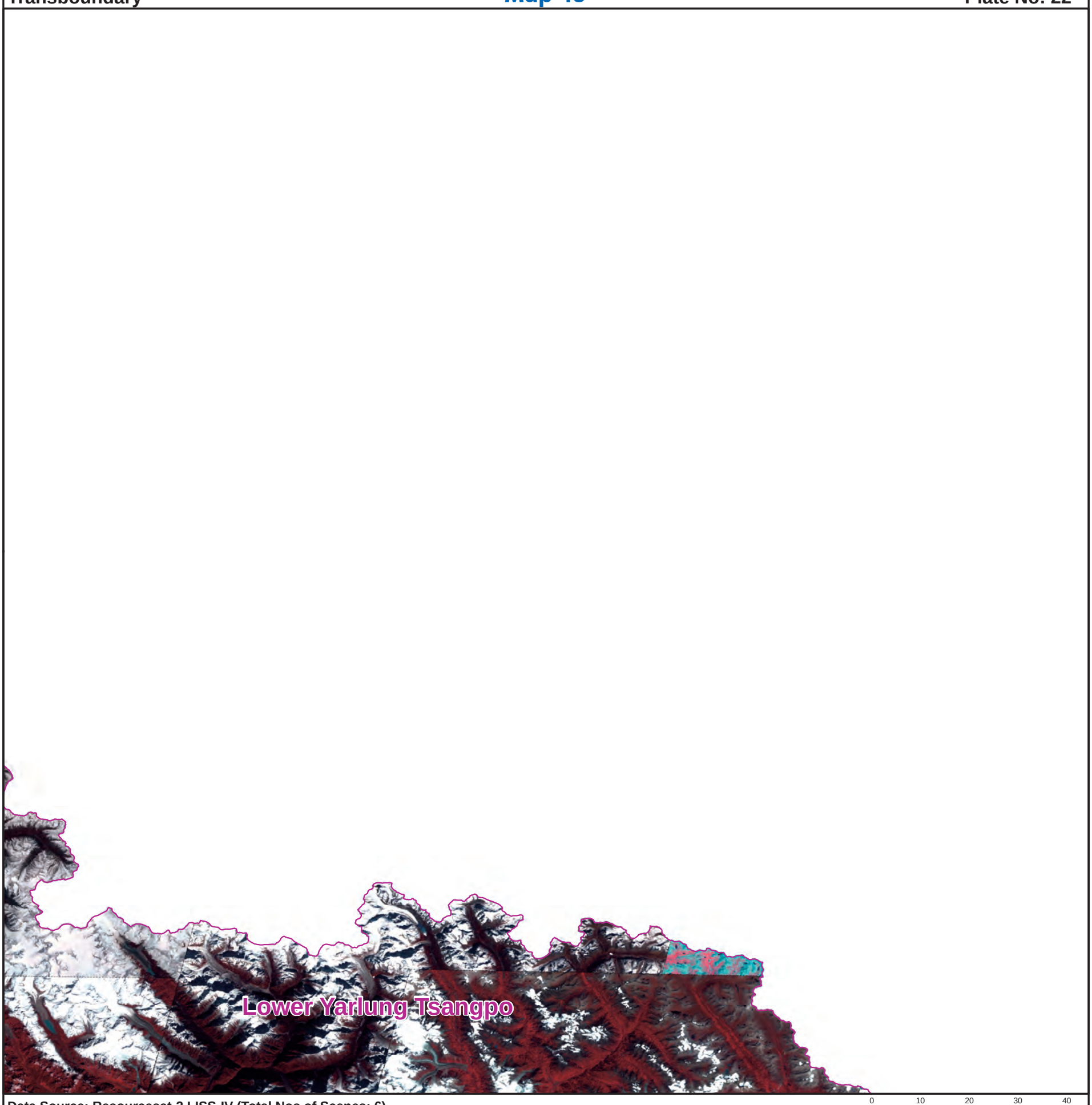
Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Administrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Transboundary | **Map 43** | Plate No: 22



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 6)

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	0	1	0	19	5	0	0	0	51	3	**79**
2	**0.5 - 1**	0	2	0	17	2	0	1	0	31	2	**55**
3	**1 - 5**	2	0	0	21	1	0	1	0	72	2	**99**
4	**5 - 10**	1	1	0	3	0	0	0	0	21	1	**27**
5	**10 - 50**	3	0	0	3	0	0	0	0	16	1	**23**
6	**> 50**	3	0	0	0	0	0	0	0	1	0	**4**
Total		**9**	**4**	**0**	**63**	**8**	**0**	**2**	**0**	**192**	**9**	**287**

Legend

Subbasin Boundary

District Boundary

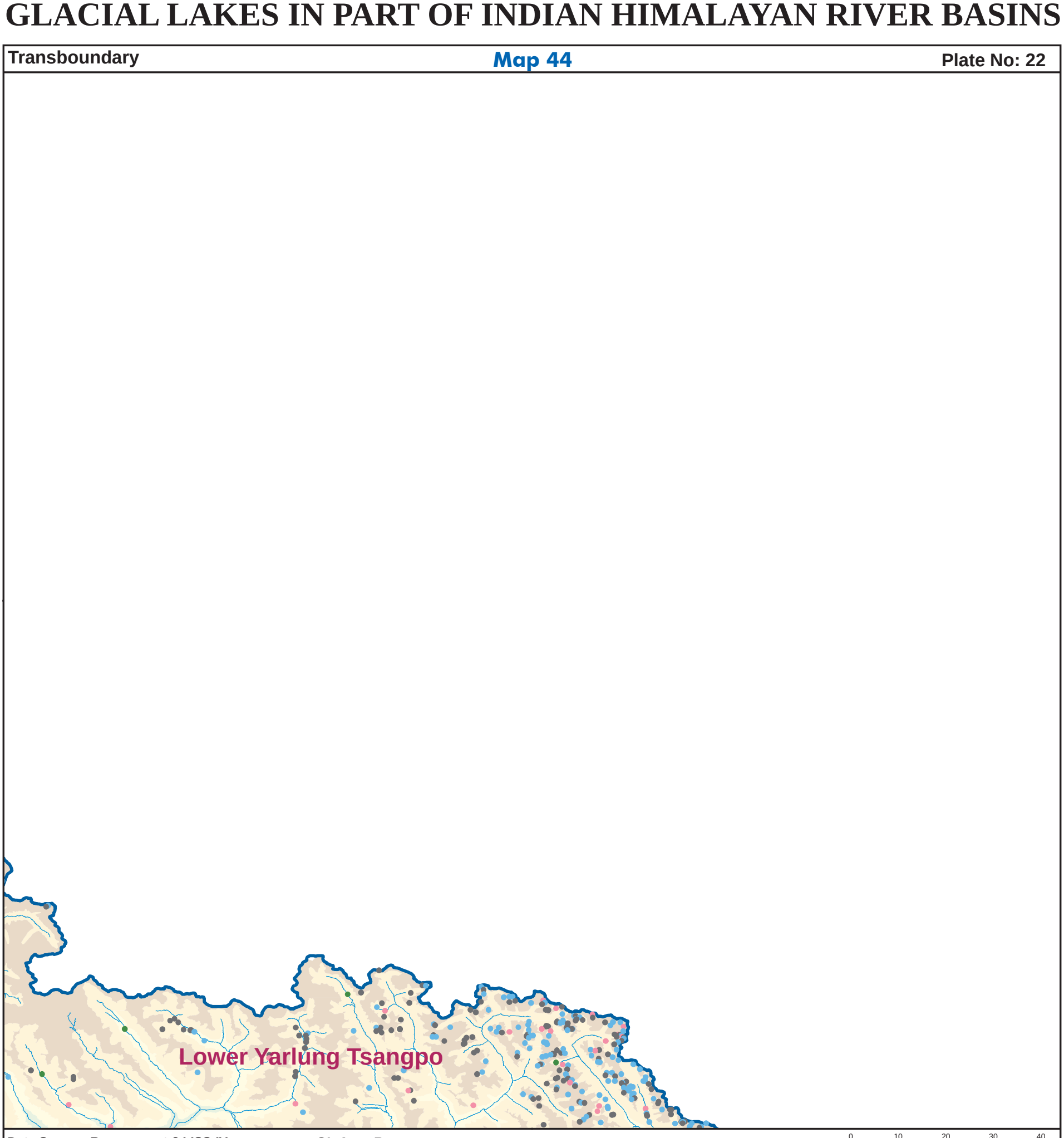
DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Transboundary | **Map 44** | **Plate No: 22**

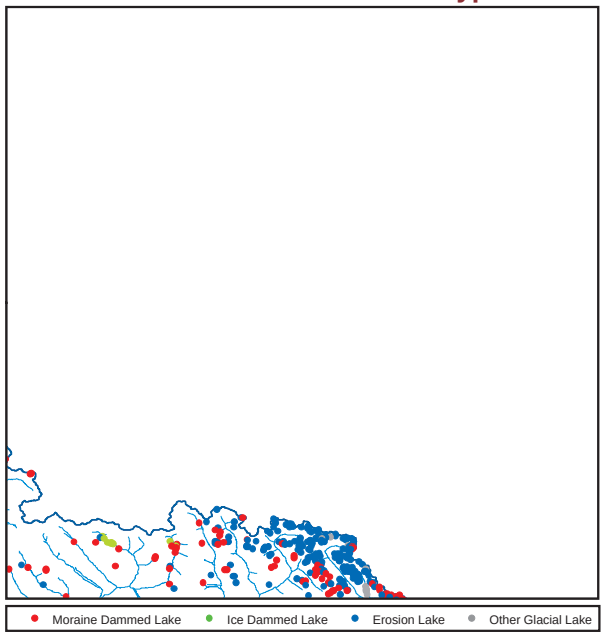


Data Source: Resourcesat-2 LISS-IV

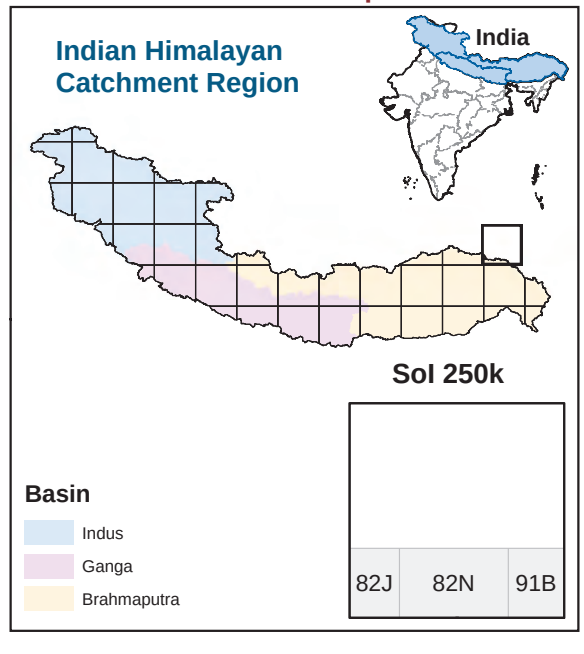
GL Area Range <1 ha · 1 - 10 ha · 10 - 50 ha · > 50 ha

0 10 20 30 40 Km

Distribution of Glacial Lake Types



Location Map



Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	1	36.1
2	3,001 - 4,000	9	238.1
3	4,001 - 5,000	161	751.0
4	> 5,000	116	288.4
Total		**287**	**1,313.6**

Legend

Glacial Lake
River / Stream
Basin Boundary
Subbasin Boundary
District Boundary
State / UT Boundary
International Boundary

Elevation Range (m)
up to 3,000
3,001 - 4,000
4,001 - 5,000
> 5,000

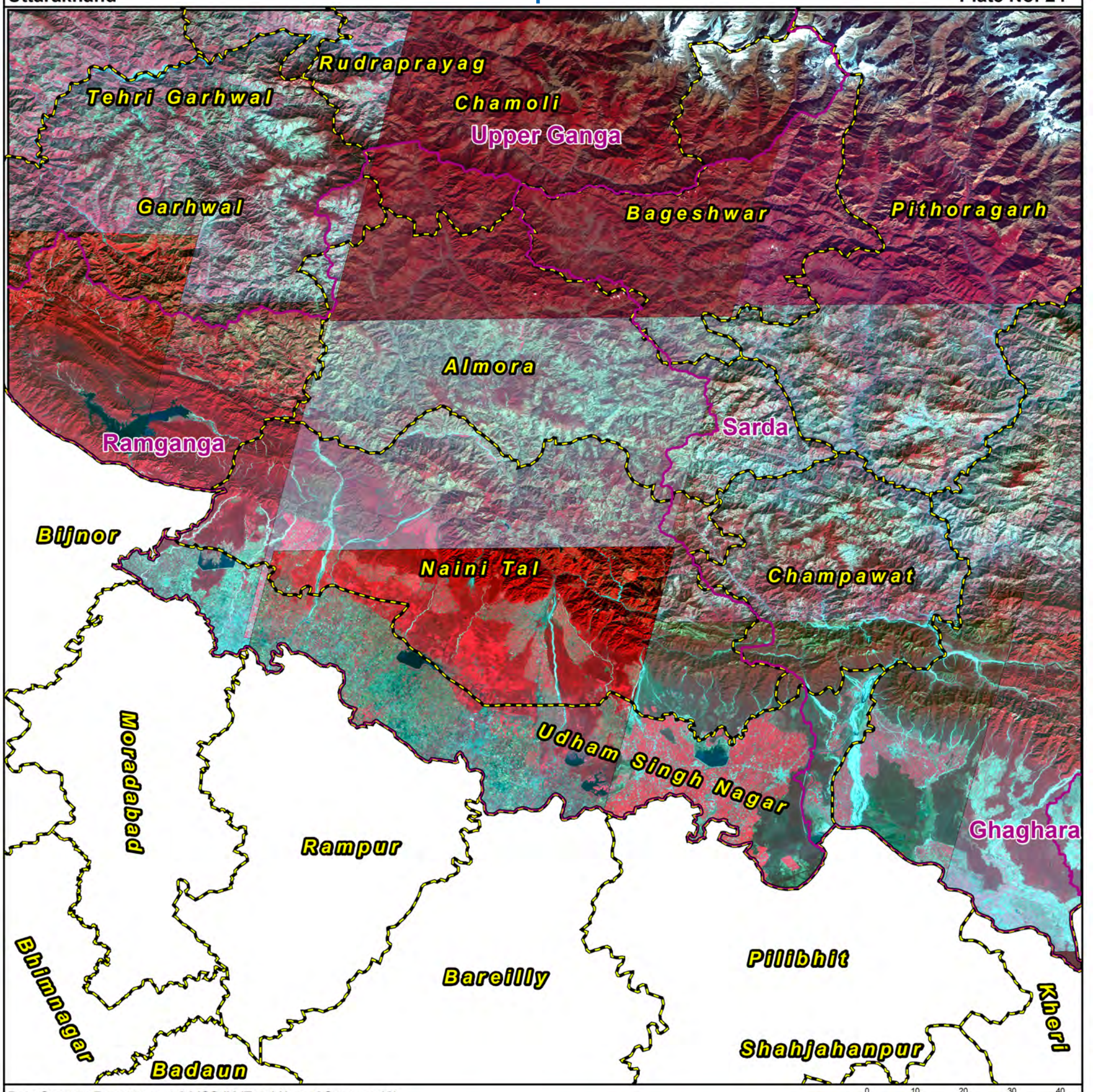
Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Administrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Uttarakhand — Map 45 — Plate No: 24



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 13)

0 10 20 30 40 Km

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	0.25 - 0.5	0	0	0	0	3	0	0	0	1	1	5
2	0.5 - 1	0	0	0	1	3	0	0	0	5	0	9
3	1 - 5	0	0	0	0	0	0	1	0	3	0	4
4	5 - 10	0	0	0	0	0	0	1	0	0	0	1
5	10 - 50	0	0	0	0	0	0	0	0	0	0	0
6	> 50	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	0	1	6	0	2	0	9	1	19

Legend

Subbasin Boundary — District Boundary

DISCLAIMER:

(a) The Administrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Uttarakhand

Map 46

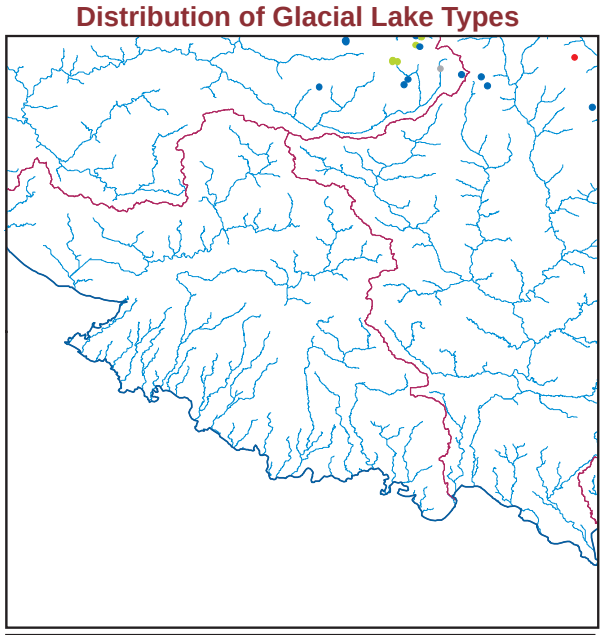
Plate No: 24

Data Source: Resourcesat-2 LISS-IV

GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

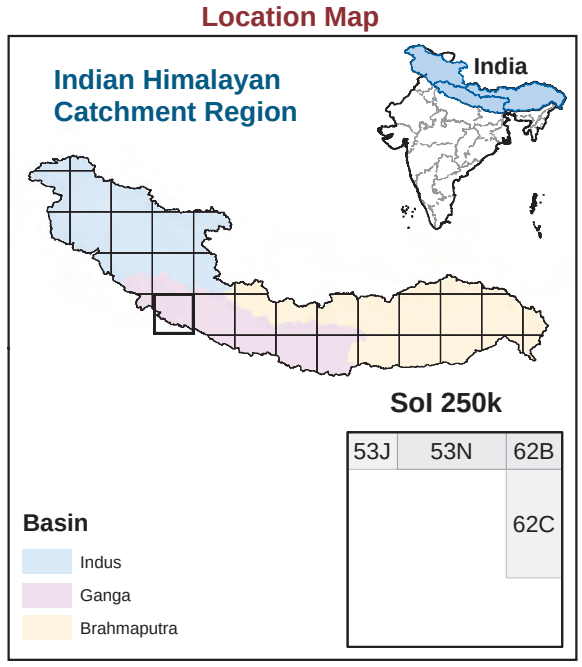
0 10 20 30 40 Km

Distribution of Glacial Lake Types



Moraine Dammed Lake · Ice Dammed Lake · Erosion Lake · Other Glacial Lake

Location Map



Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	0	0.0
2	3,001 - 4,000	2	1.2
3	4,001 - 5,000	17	24.4
4	> 5,000	0	0.0
Total		**19**	**25.6**

Legend

Glacial Lake
River / Stream
Basin Boundary
Subbasin Boundary
District Boundary
State / UT Boundary
International Boundary

Elevation Range (m)
up to 3,000
3,001 - 4,000
4,001 - 5,000
> 5,000

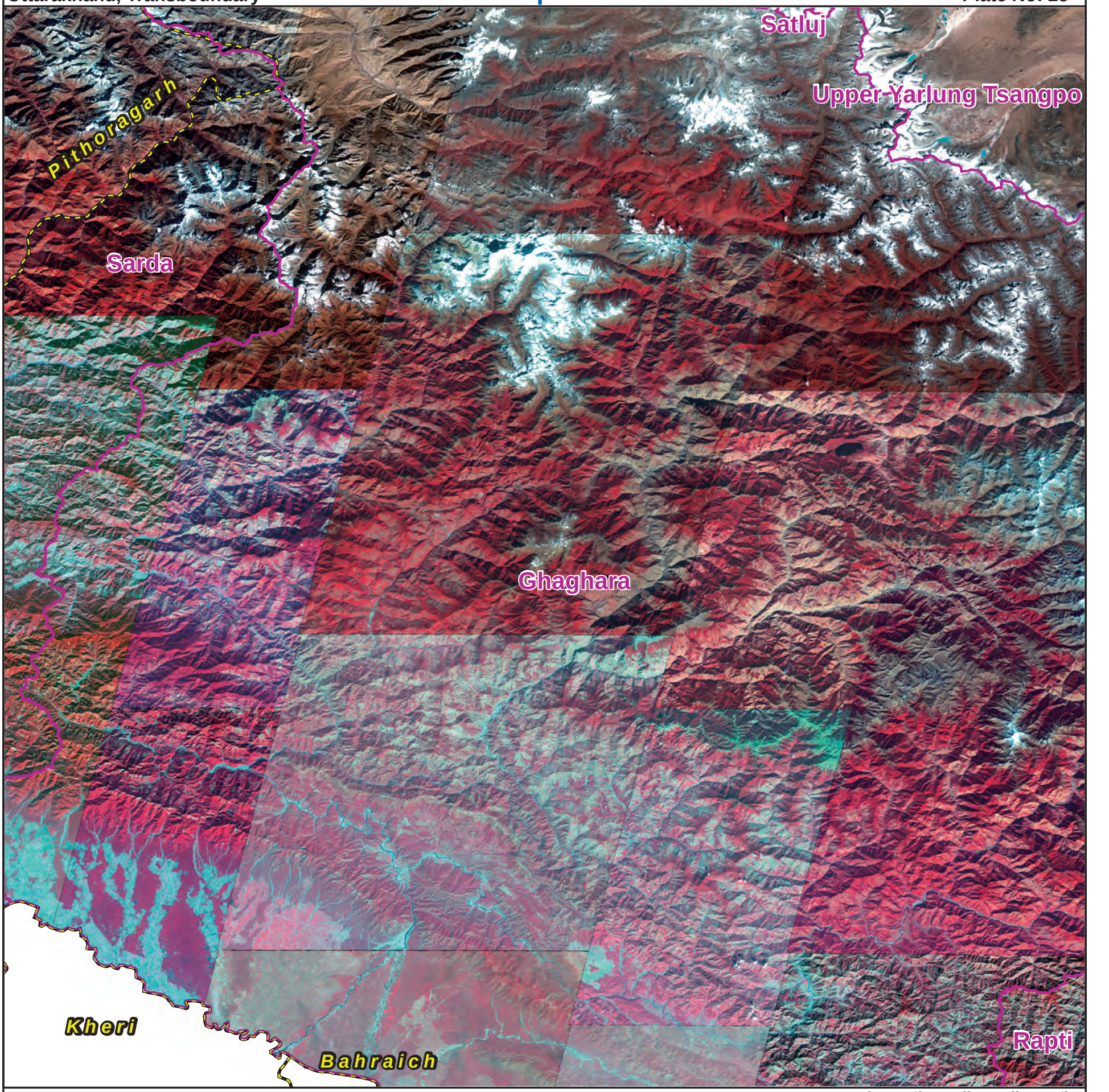
Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Uttarakhand, Transboundary — **Map 47** — Plate No: 25



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 16)

0 10 20 30 40 Km

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	2	8	0	96	25	0	1	0	87	29	**248**
2	**0.5 - 1**	5	4	3	98	15	0	0	0	76	19	**220**
3	**1 - 5**	13	11	1	116	8	0	7	0	145	23	**324**
4	**5 - 10**	10	4	0	20	0	0	8	0	28	4	**74**
5	**10 - 50**	24	3	0	10	0	0	9	0	19	6	**71**
6	**> 50**	4	1	0	0	0	0	0	0	0	2	**7**
Total		**58**	**31**	**4**	**340**	**48**	**0**	**25**	**0**	**355**	**83**	**944**

Legend

Subbasin Boundary — District Boundary

DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

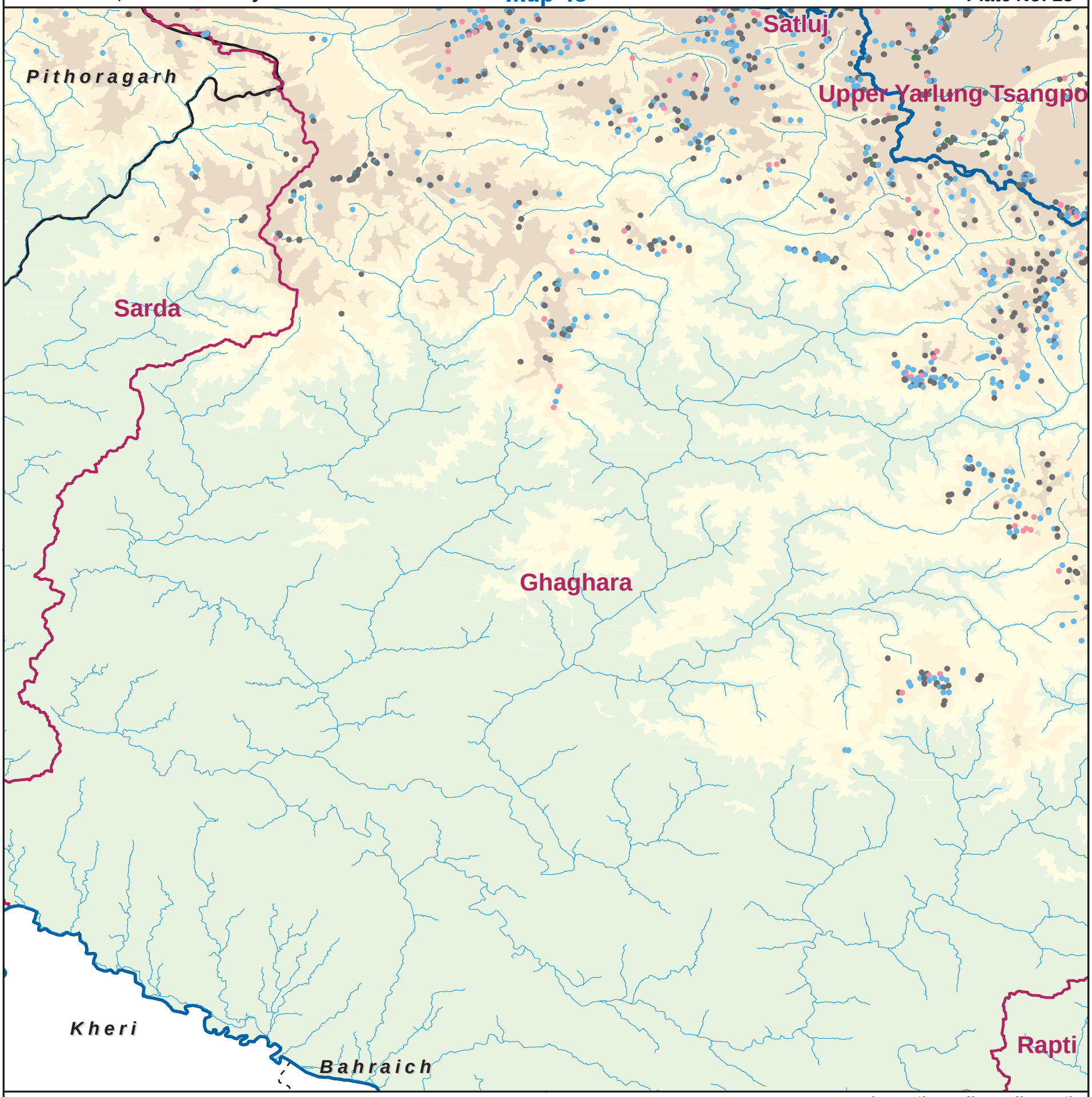
(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Uttarakhand, Transboundary

Map 48

Plate No: 25

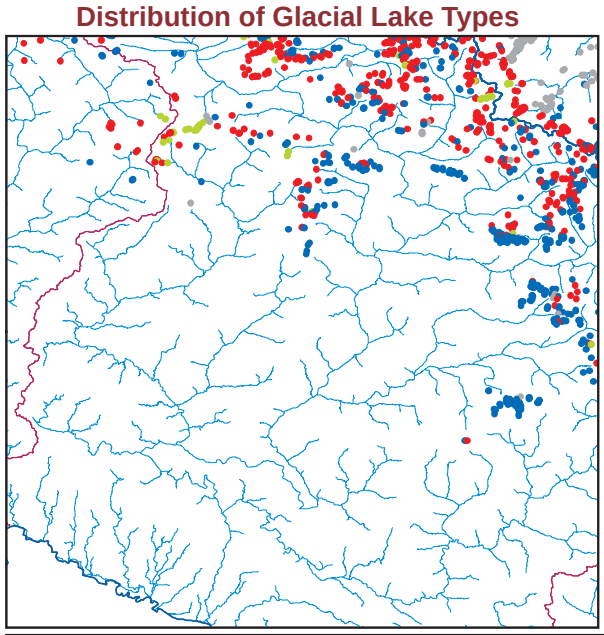


Data Source: Resourcesat-2 LISS-IV

GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

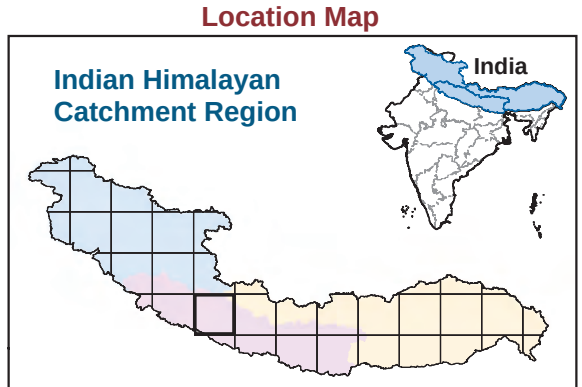
0 10 20 30 40 Km

Distribution of Glacial Lake Types



Moraine Dammed Lake · Ice Dammed Lake · Erosion Lake · Other Glacial Lake

Location Map



Basin

- Indus
- Ganga
- Brahmaputra

Sol 250k

62B	62F	62J
62C	62G	62K
		62L

Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	0	0.0
2	3,001 - 4,000	8	58.9
3	4,001 - 5,000	511	2,121.5
4	> 5,000	425	1,316.0
	Total	**944**	**3,496.4**

Legend

- Glacial Lake
- River / Stream
- Basin Boundary
- Subbasin Boundary
- *District Boundary*
- State / UT Boundary
- International Boundary

Elevation Range (m)

- up to 3,000
- 3,001 - 4,000
- 4,001 - 5,000
- > 5,000

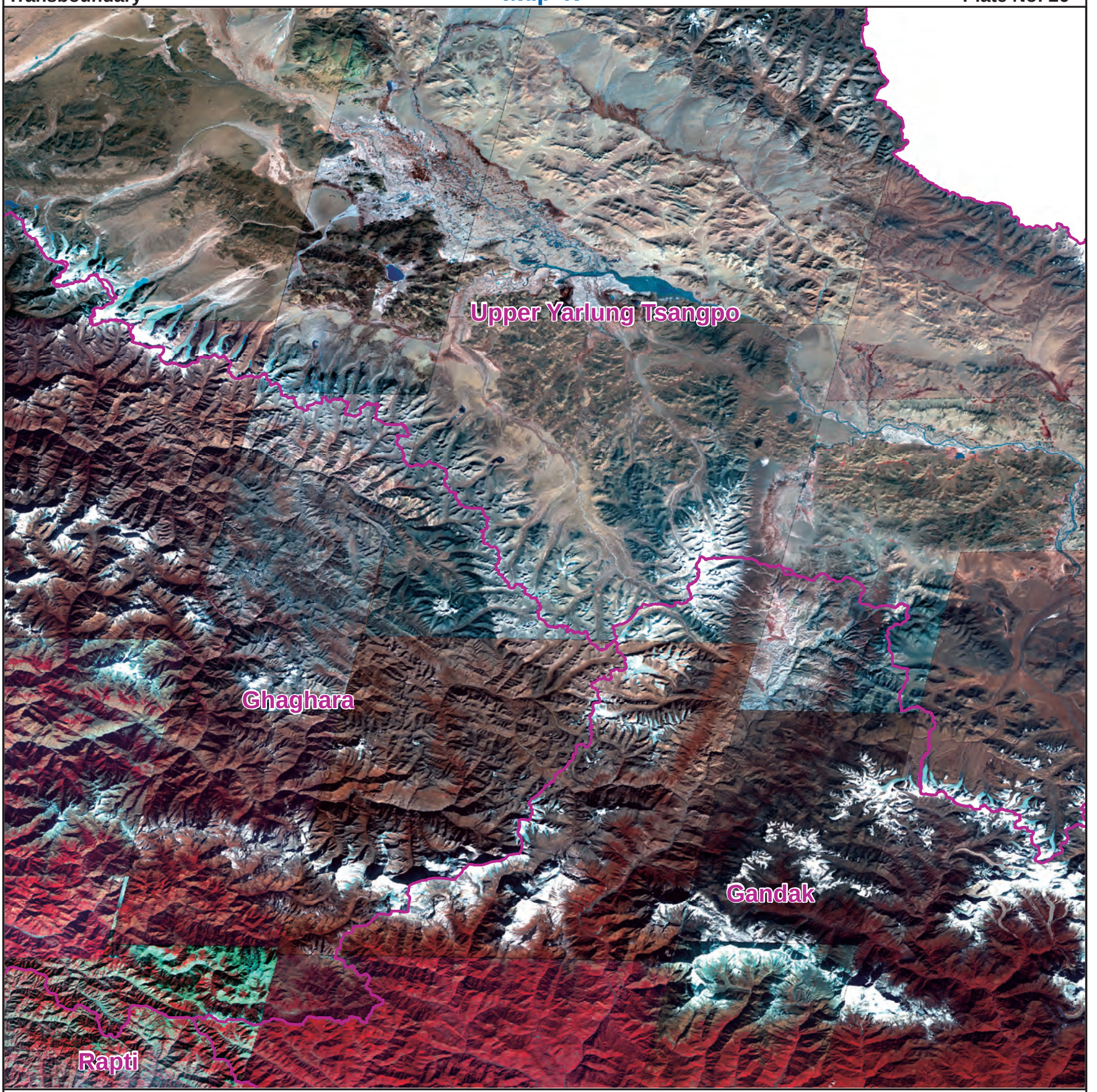
Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Administrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Transboundary | **Map 49** | Plate No: 26



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 18)

0 10 20 30 40 Km

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	0	3	4	133	34	0	2	0	107	36	**319**
2	**0.5 - 1**	1	4	2	142	15	0	0	0	93	26	**283**
3	**1 - 5**	11	6	0	167	6	1	3	0	179	42	**415**
4	**5 - 10**	8	1	0	20	0	0	0	0	21	2	**52**
5	**10 - 50**	19	2	0	10	0	0	1	0	11	6	**49**
6	**> 50**	4	0	0	1	0	0	0	0	1	7	**13**
Total		**43**	**16**	**6**	**473**	**55**	**1**	**6**	**0**	**412**	**119**	**1131**

Legend

Subbasin Boundary

District Boundary

DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

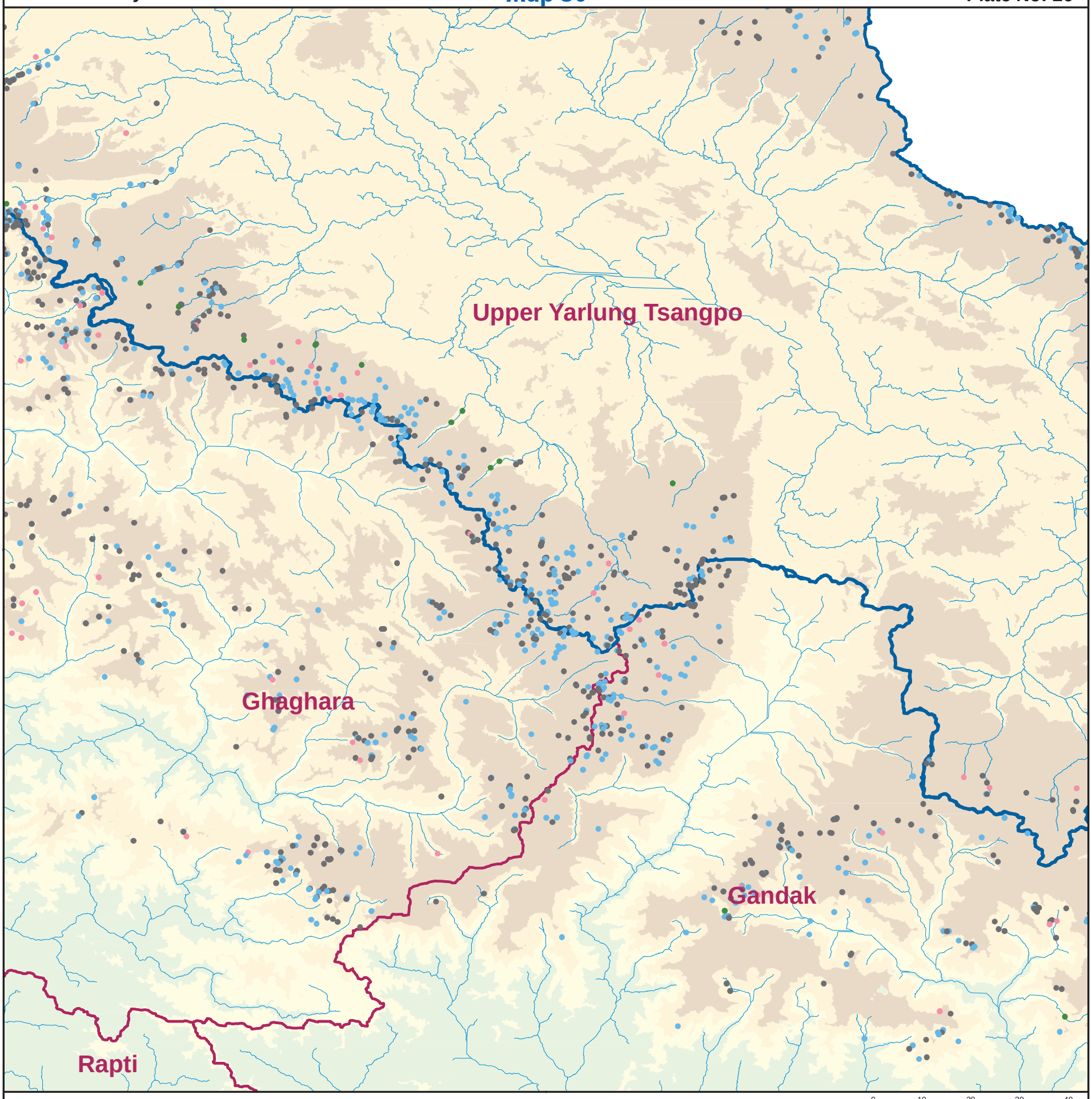
(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Transboundary

Map 50

Plate No: 26

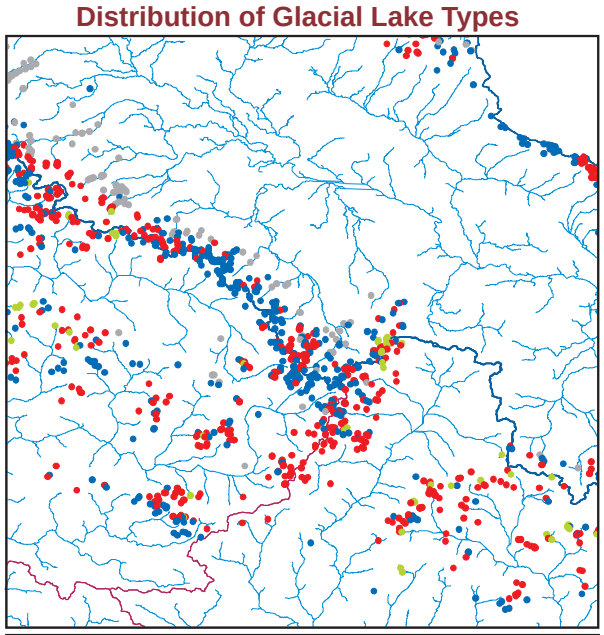


Data Source: Resourcesat-2 LISS-IV

GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

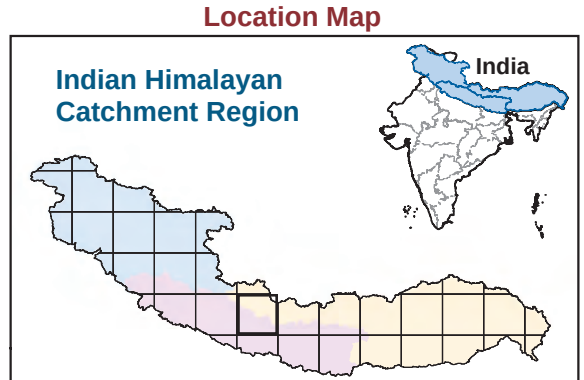
0 10 20 30 40 Km

Distribution of Glacial Lake Types



Moraine Dammed Lake · Ice Dammed Lake · Erosion Lake · Other Glacial Lake

Location Map



Basin

- Indus
- Ganga
- Brahmaputra

Sol 250k

62J	62N	71B
62K	62O	71C
62L	62P	71D

Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	1	9.9
2	3,001 - 4,000	3	6.5
3	4,001 - 5,000	238	2,114.5
4	> 5,000	889	2,541.8
Total		**1131**	**4,672.7**

Legend

- Glacial Lake
- River / Stream
- Basin Boundary
- Subbasin Boundary
- *District Boundary*
- State / UT Boundary
- International Boundary

Elevation Range (m)

- up to 3,000
- 3,001 - 4,000
- 4,001 - 5,000
- > 5,000

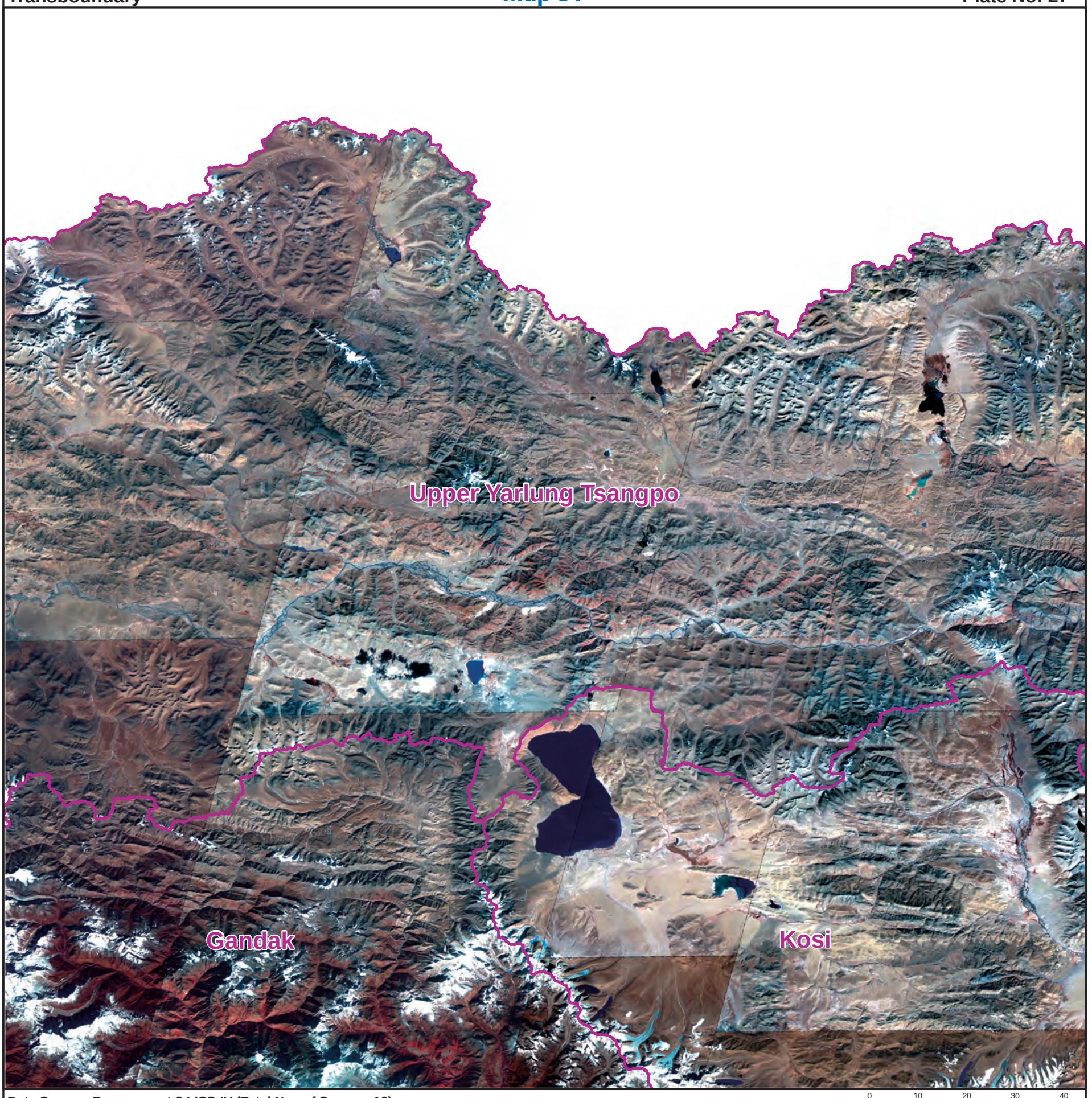
Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Administrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Transboundary | **Map 51** | Plate No: 27



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 16)

0 10 20 30 40 Km

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	1	3	0	108	41	0	0	0	74	10	**237**
2	**0.5 - 1**	1	4	1	99	20	0	4	0	98	8	**235**
3	**1 - 5**	10	3	0	159	6	0	3	0	123	16	**320**
4	**5 - 10**	4	0	0	22	1	0	2	0	16	4	**49**
5	**10 - 50**	17	0	0	11	1	0	1	0	13	1	**44**
6	**> 50**	11	0	0	0	0	0	0	0	3	1	**15**
Total		**44**	**10**	**1**	**399**	**69**	**0**	**10**	**0**	**327**	**40**	**900**

Legend

Subbasin Boundary

District Boundary

DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

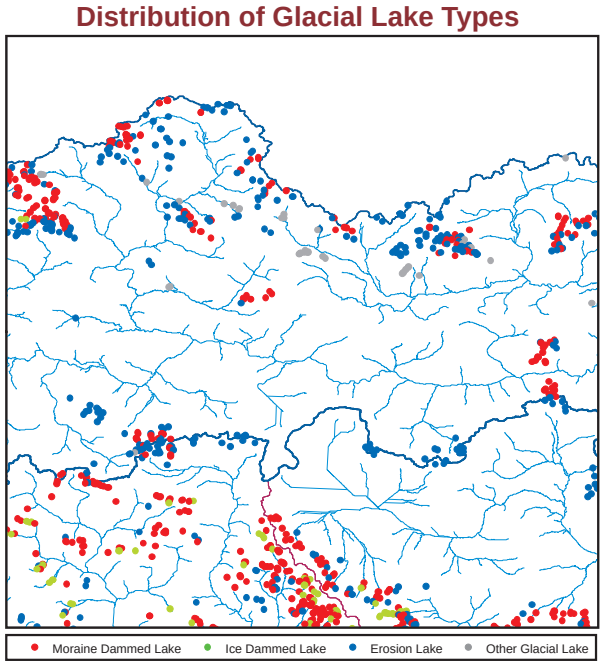
Transboundary | **Map 52** | Plate No: 27

Data Source: Resourcesat-2 LISS-IV

GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

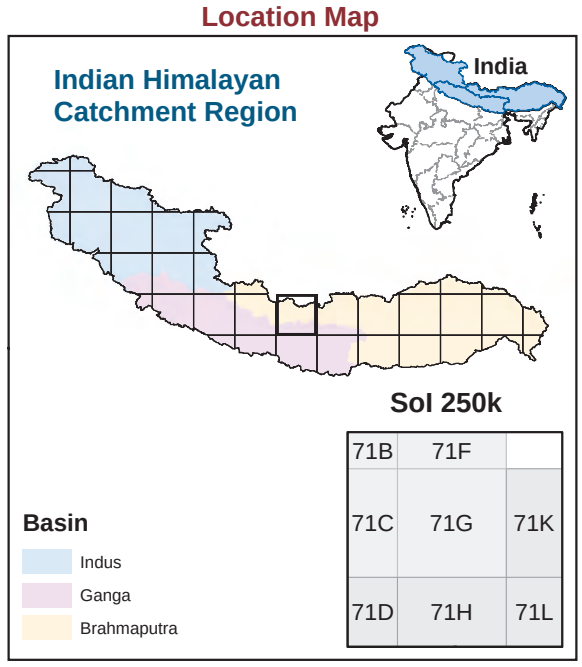
0 10 20 30 40 Km

Distribution of Glacial Lake Types



Moraine Dammed Lake · Ice Dammed Lake · Erosion Lake · Other Glacial Lake

Location Map



Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	0	0.0
2	3,001 - 4,000	16	56.1
3	4,001 - 5,000	104	380.0
4	> 5,000	780	4,741.4
Total		**900**	**5,177.5**

Legend

Glacial Lake · River / Stream · Basin Boundary · Subbasin Boundary

District Boundary · State / UT Boundary · International Boundary

Elevation Range (m)

up to 3,000 · 3,001 - 4,000 · 4,001 - 5,000 · > 5,000

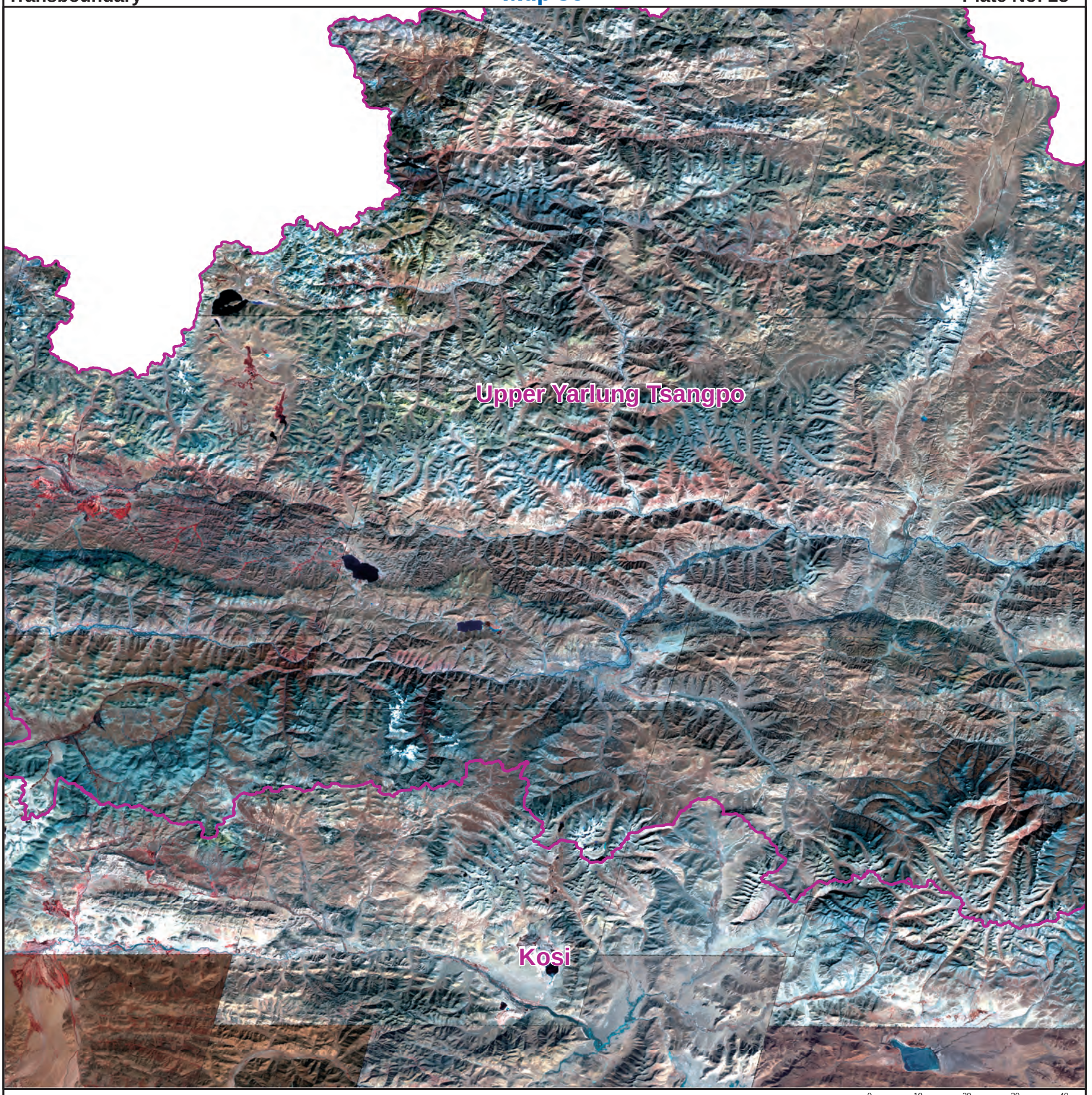
Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Administrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Transboundary | Map 53 | Plate No: 28



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 17)

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	0	0	0	13	0	0	0	0	74	6	**93**
2	**0.5 - 1**	0	0	0	19	0	0	0	0	88	8	**115**
3	**1 - 5**	0	0	0	26	0	0	4	0	139	10	**179**
4	**5 - 10**	0	0	0	7	0	0	0	0	27	3	**37**
5	**10 - 50**	2	0	0	1	0	0	1	0	18	6	**28**
6	**> 50**	0	0	0	0	0	0	0	0	1	2	**3**
Total		**2**	**0**	**0**	**66**	**0**	**0**	**5**	**0**	**347**	**35**	**455**

Legend

Subbasin Boundary

District Boundary

DISCLAIMER:

(a) The Administrative Boundaries shown are for scientific study and not for statutory purpose

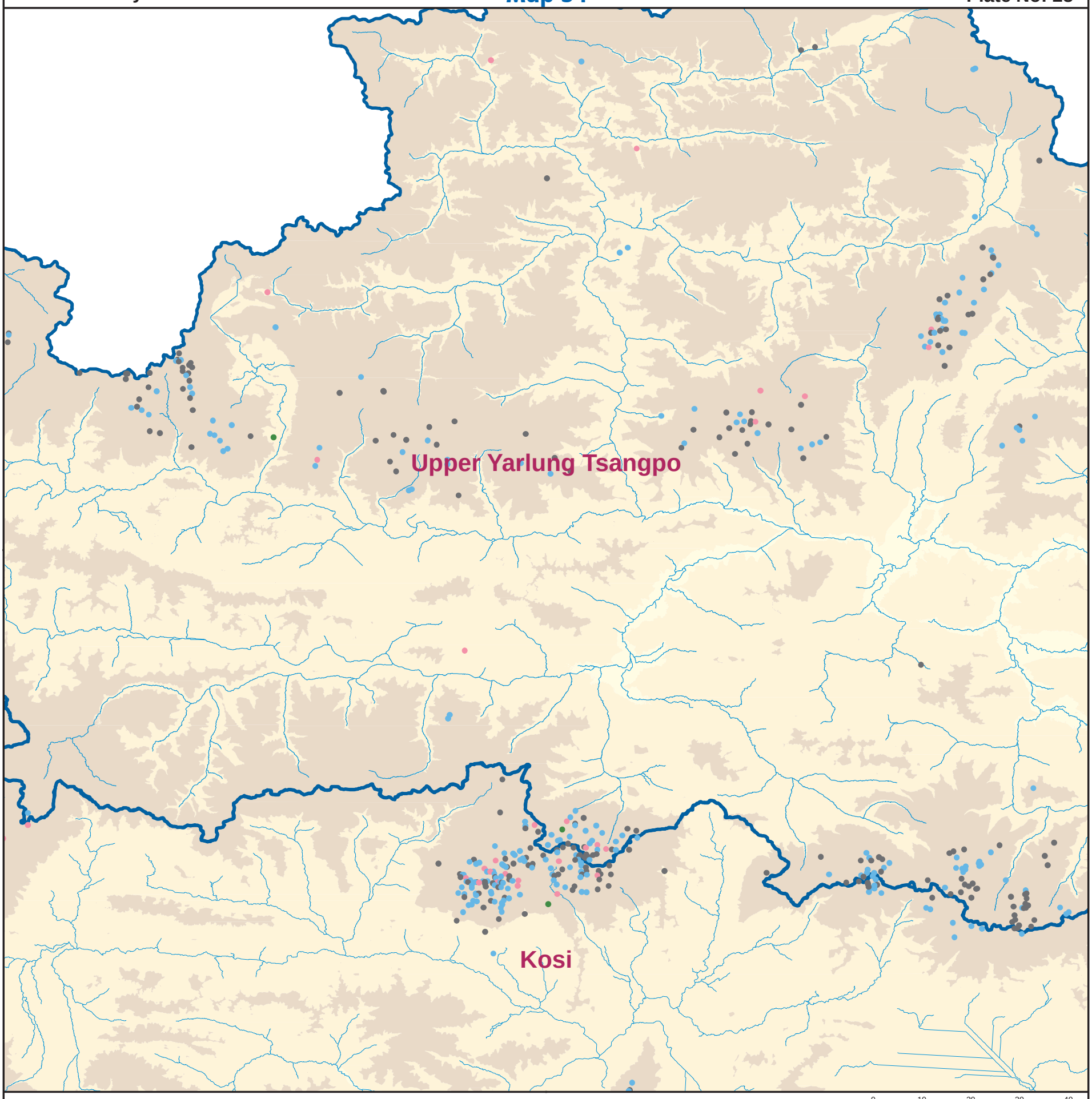
(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Transboundary

Map 54

Plate No: 28

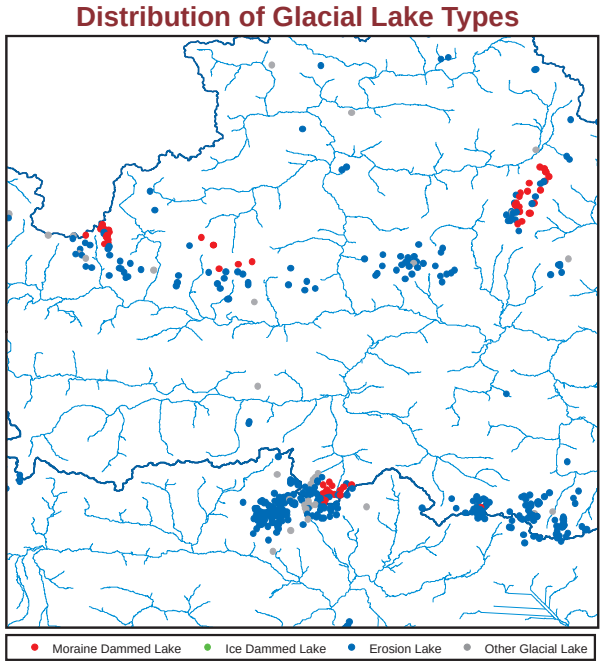


Data Source: Resourcesat-2 LISS-IV

GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

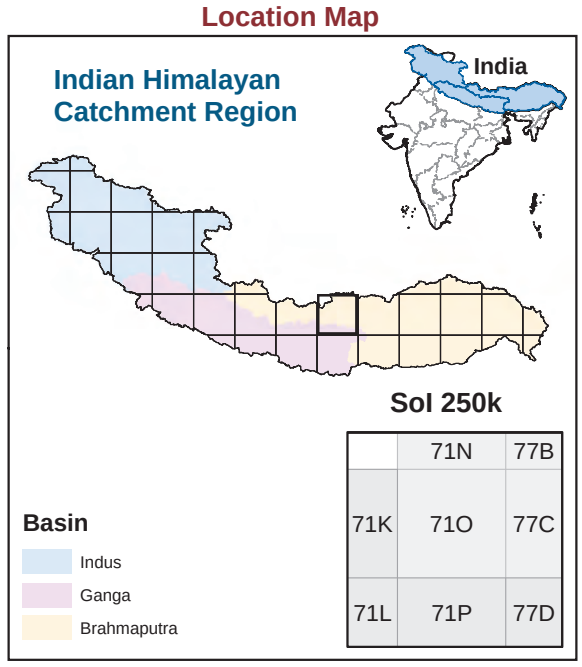
0 10 20 30 40 Km

Distribution of Glacial Lake Types



Moraine Dammed Lake · Ice Dammed Lake · Erosion Lake · Other Glacial Lake

Location Map



Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	0	0.0
2	3,001 - 4,000	0	0.0
3	4,001 - 5,000	18	229.9
4	> 5,000	437	1,434.7
	Total	**455**	**1,664.5**

Legend

Glacial Lake
River / Stream
Basin Boundary
Subbasin Boundary
District Boundary
State / UT Boundary
International Boundary

Elevation Range (m)
up to 3,000
3,001 - 4,000
4,001 - 5,000
> 5,000

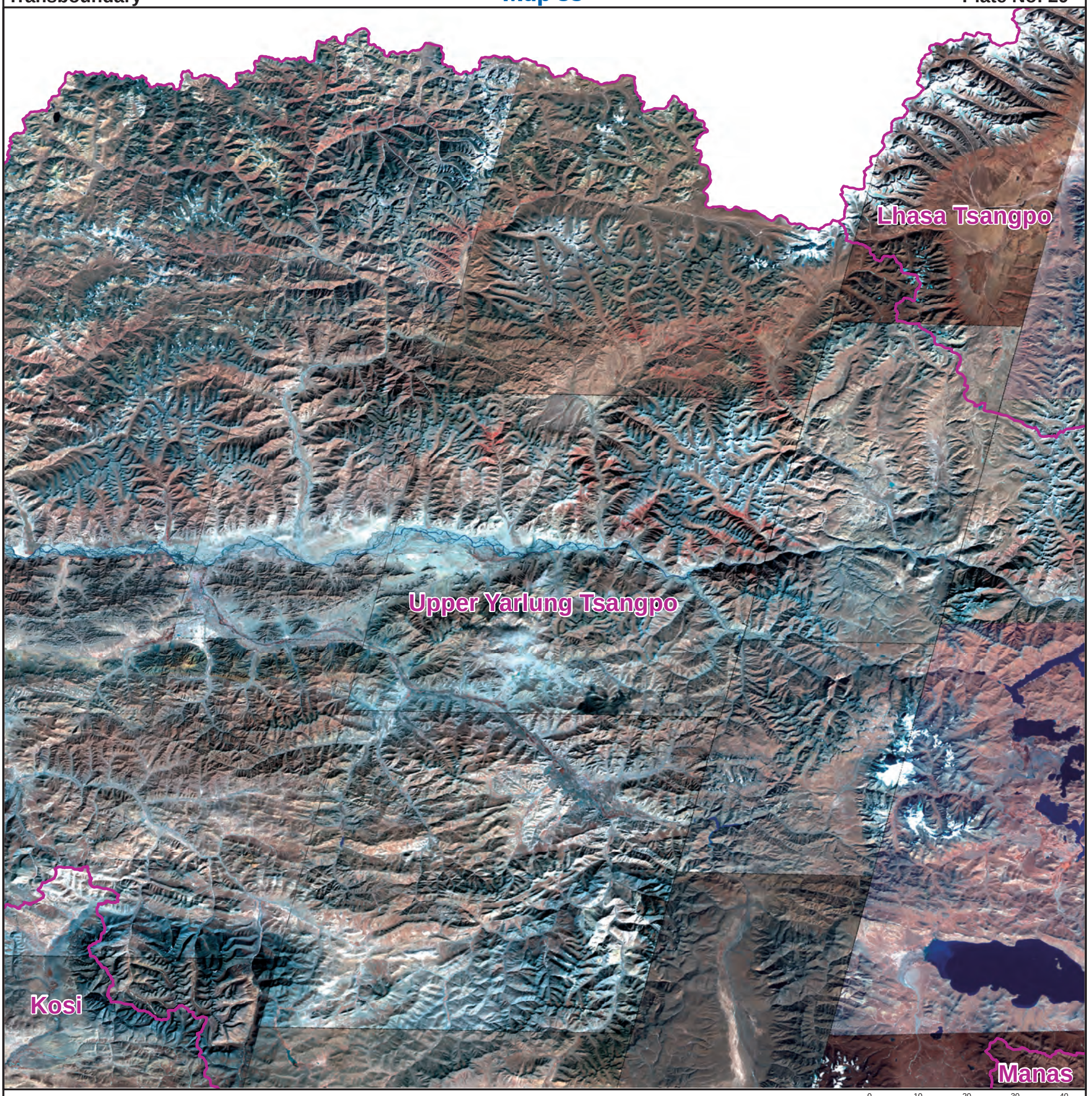
Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Transboundary | **Map 55** | Plate No: 29



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 18)

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	0	0	0	28	1	0	2	0	108	9	**148**
2	**0.5 - 1**	1	0	0	46	1	0	2	0	149	6	**205**
3	**1 - 5**	4	0	0	67	0	0	2	0	197	7	**277**
4	**5 - 10**	4	0	0	10	0	0	2	0	26	2	**44**
5	**10 - 50**	4	0	0	3	0	0	0	0	19	2	**28**
6	**> 50**	0	0	0	0	0	0	0	0	2	1	**3**
Total		**13**	**0**	**0**	**154**	**2**	**0**	**8**	**0**	**501**	**27**	**705**

Legend

Subbasin Boundary

District Boundary

DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

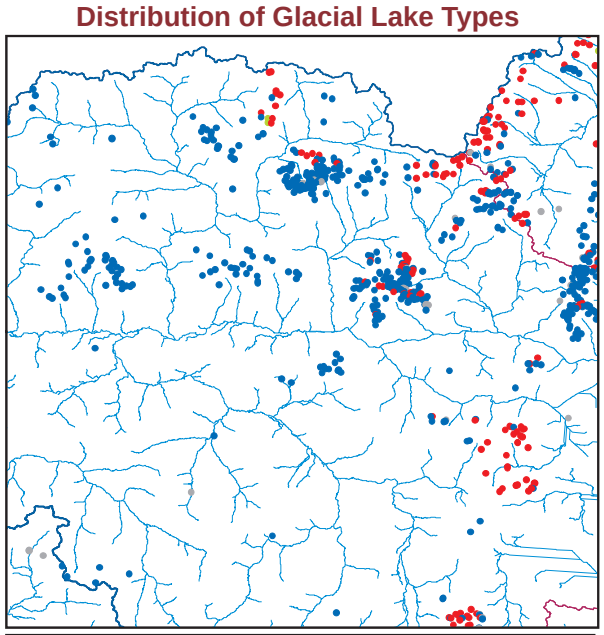
Transboundary | **Map 56** | Plate No: 29

Data Source: Resourcesat-2 LISS-IV

GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

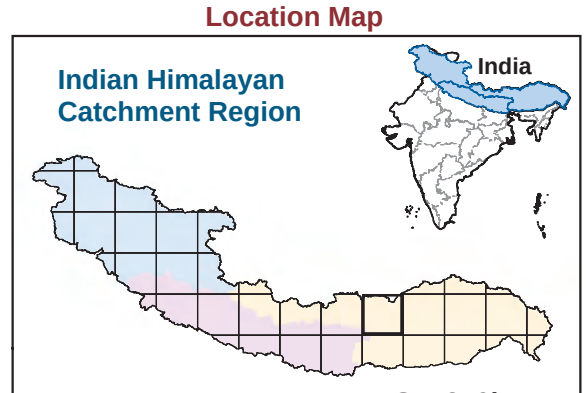
0 10 20 30 40 Km

Distribution of Glacial Lake Types



Moraine Dammed Lake | Ice Dammed Lake | Erosion Lake | Other Glacial Lake

Location Map



Basin

- Indus
- Ganga
- Brahmaputra

SoI 250k

77B	77F	77J
77C	77G	77K
77D	77H	77L

Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	0	0.0
2	3,001 - 4,000	2	5.2
3	4,001 - 5,000	16	125.1
4	> 5,000	687	1,873.2
Total		**705**	**2,003.5**

Legend

- Glacial Lake
- River / Stream
- Basin Boundary
- Subbasin Boundary
- *District Boundary*
- State / UT Boundary
- International Boundary

Elevation Range (m)

- up to 3,000
- 3,001 - 4,000
- 4,001 - 5,000
- > 5,000

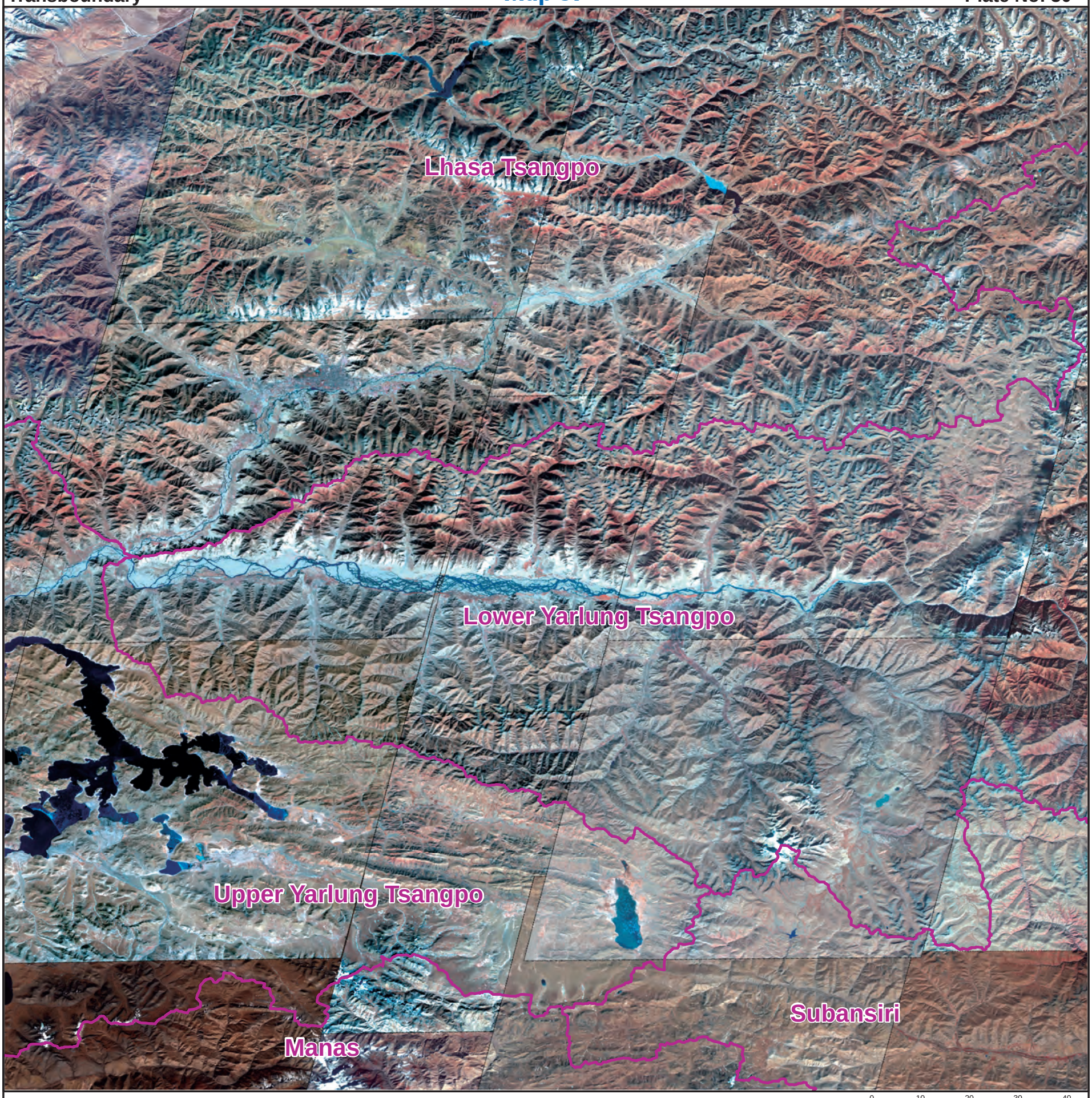
Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Administrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Transboundary | **Map 57** | Plate No: 30



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 18)

0 10 20 30 40 Km

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	0	0	0	33	3	0	1	0	112	25	**174**
2	**0.5 - 1**	1	0	0	34	1	0	4	0	179	15	**234**
3	**1 - 5**	4	0	0	47	0	0	16	0	331	38	**436**
4	**5 - 10**	3	0	0	6	0	0	4	0	58	7	**78**
5	**10 - 50**	3	0	0	2	0	0	2	0	44	12	**63**
6	**> 50**	1	0	0	0	0	0	0	0	3	1	**5**
Total		**12**	**0**	**0**	**122**	**4**	**0**	**27**	**0**	**727**	**98**	**990**

Legend

Subbasin Boundary

District Boundary

DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

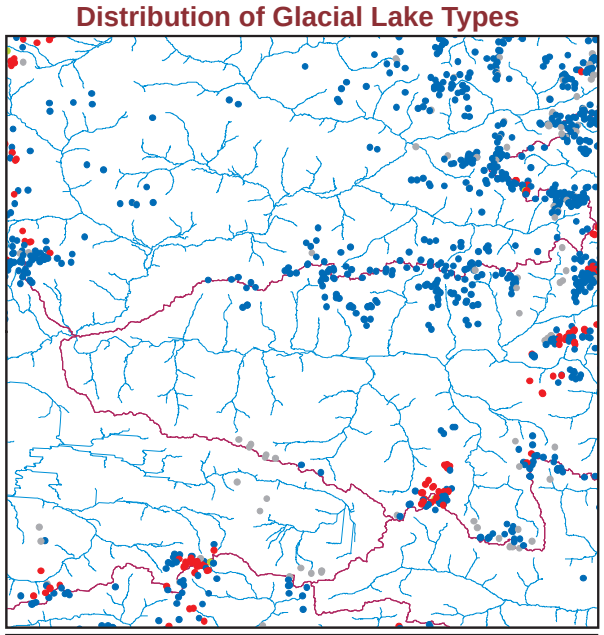
Transboundary | **Map 58** | Plate No: 30

Data Source: Resourcesat-2 LISS-IV

GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

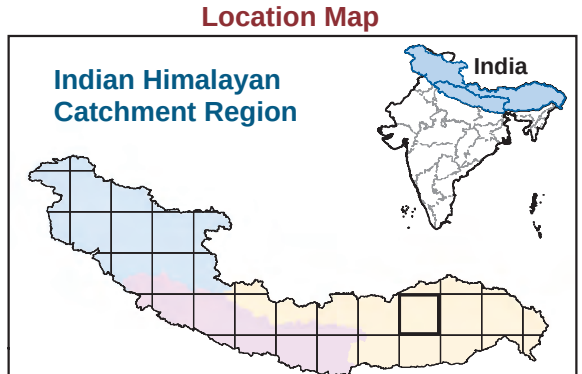
0 10 20 30 40 Km

Distribution of Glacial Lake Types



Moraine Dammed Lake | Ice Dammed Lake | Erosion Lake | Other Glacial Lake

Location Map



Basin

- Indus
- Ganga
- Brahmaputra

SoI 250k

77J	77N	82B
77K	77O	82C
77L	77P	82D

Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	0	0.0
2	3,001 - 4,000	1	0.5
3	4,001 - 5,000	128	1,007.0
4	> 5,000	861	2,372.6
Total		**990**	**3,380.1**

Legend

- Glacial Lake
- River / Stream
- Basin Boundary
- Subbasin Boundary
- *District Boundary*
- State / UT Boundary
- International Boundary

Elevation Range (m)

- up to 3,000
- 3,001 - 4,000
- 4,001 - 5,000
- > 5,000

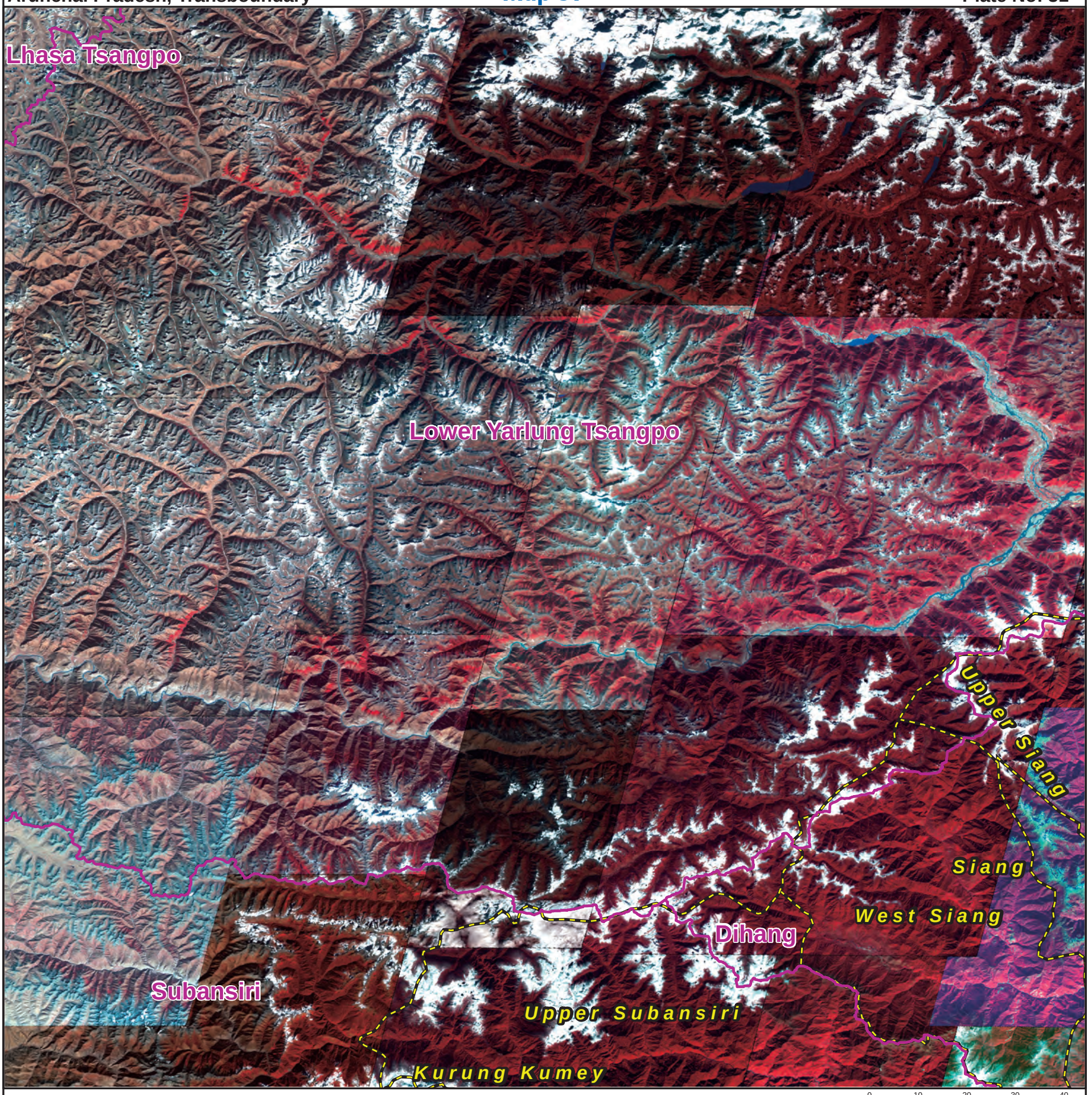
Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Arunchal Pradesh, Transboundary — **Map 59** — Plate No: 31



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 19)

0 10 20 30 40 Km

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	3	1	1	69	1	0	3	0	562	31	**671**
2	**0.5 - 1**	6	0	0	74	1	0	5	0	627	33	**746**
3	**1 - 5**	8	0	0	134	1	0	57	0	1293	48	**1541**
4	**5 - 10**	13	0	0	21	0	0	43	0	332	19	**428**
5	**10 - 50**	10	0	0	17	0	0	33	0	264	18	**342**
6	**> 50**	4	0	0	1	0	0	2	3	21	4	**35**
Total		**44**	**1**	**1**	**316**	**3**	**0**	**143**	**3**	**3099**	**153**	**3763**

Legend

Subbasin Boundary — District Boundary

DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Arunchal Pradesh, Transboundary

Map 60

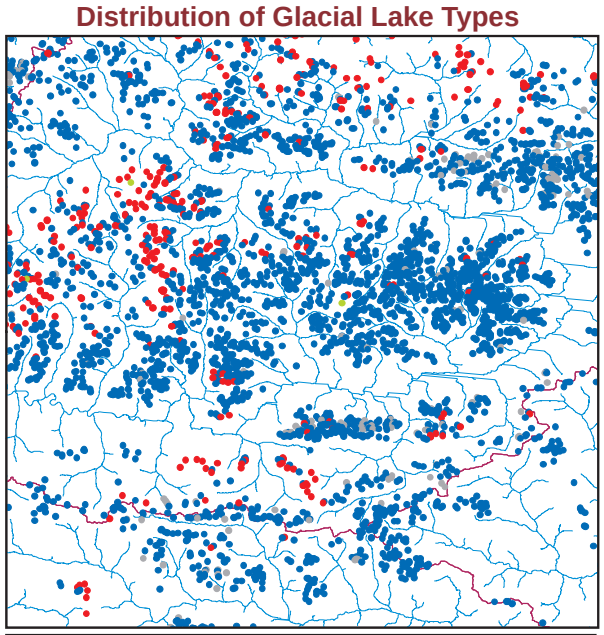
Plate No: 31

Data Source: Resourcesat-2 LISS-IV

GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

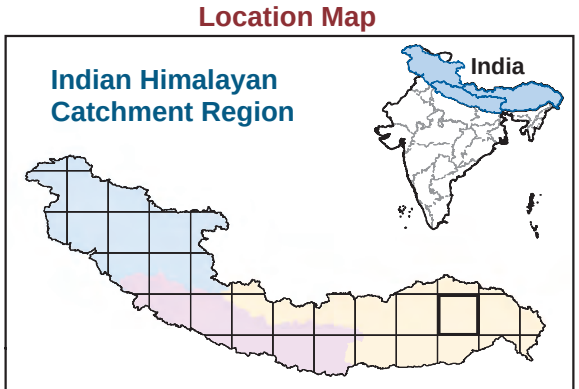
0 10 20 30 40 Km

Distribution of Glacial Lake Types



Moraine Dammed Lake · Ice Dammed Lake · Erosion Lake · Other Glacial Lake

Location Map



Basin

- Indus
- Ganga
- Brahmaputra

Sol 250k

82B	82F	82J
82C	82G	82K
82D	82H	82L

Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	1	5.8
2	3,001 - 4,000	113	3,947.0
3	4,001 - 5,000	1274	7,089.3
4	> 5,000	660	1,395.7
Total		**2048**	**12,437.7**

Legend

- Glacial Lake
- River / Stream
- Basin Boundary
- Subbasin Boundary
- *District Boundary*
- State / UT Boundary
- International Boundary

Elevation Range (m)

- up to 3,000
- 3,001 - 4,000
- 4,001 - 5,000
- > 5,000

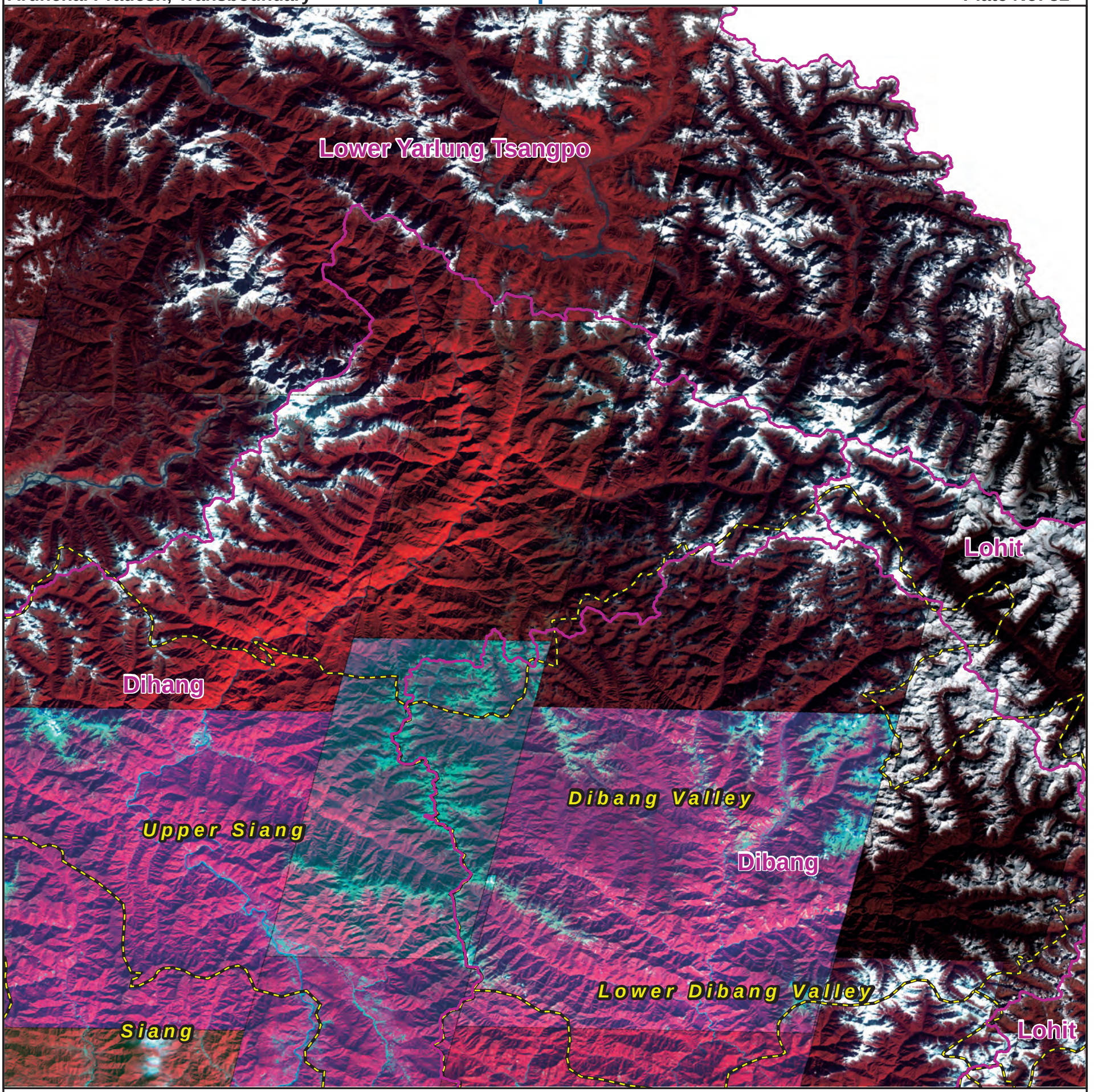
Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Administrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Arunchal Pradesh, Transboundary — **Map 61** — Plate No: 32



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 19)

0 10 20 30 40 Km

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	1	1	0	24	7	0	1	0	117	11	**162**
2	**0.5 - 1**	1	1	0	45	4	0	4	0	229	10	**294**
3	**1 - 5**	9	0	0	64	0	0	61	0	542	22	**698**
4	**5 - 10**	2	0	0	26	0	0	65	0	170	3	**266**
5	**10 - 50**	11	0	0	20	0	0	91	0	167	11	**300**
6	**> 50**	1	0	0	5	0	0	2	4	12	1	**25**
Total		**25**	**2**	**0**	**184**	**11**	**0**	**224**	**4**	**1237**	**58**	**1745**

Legend

Subbasin Boundary — District Boundary

DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Arunchal Pradesh, Transboundary

Map 62

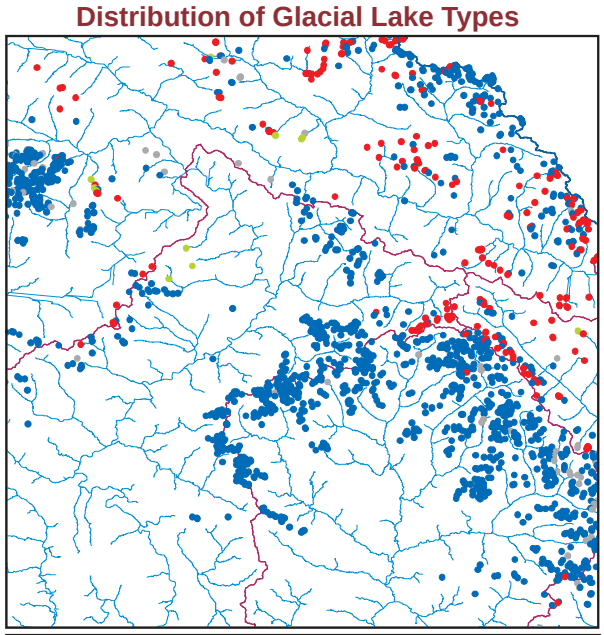
Plate No: 32

Data Source: Resourcesat-2 LISS-IV

GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

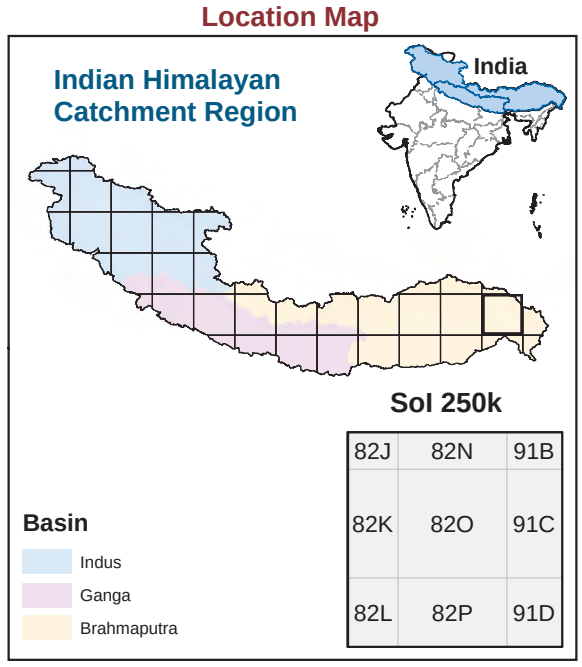
0 10 20 30 40 Km

Distribution of Glacial Lake Types



Moraine Dammed Lake · Ice Dammed Lake · Erosion Lake · Other Glacial Lake

Location Map



SoI 250k

82J	82N	91B
82K	82O	91C
82L	82P	91D

Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	4	52.2
2	3,001 - 4,000	625	4,937.9
3	4,001 - 5,000	1063	7,302.8
4	> 5,000	53	85.2
Total		**1745**	**12,378.1**

Legend

Glacial Lake
River / Stream
Basin Boundary
Subbasin Boundary
District Boundary
State / UT Boundary
International Boundary

Elevation Range (m)

up to 3,000
3,001 - 4,000
4,001 - 5,000
> 5,000

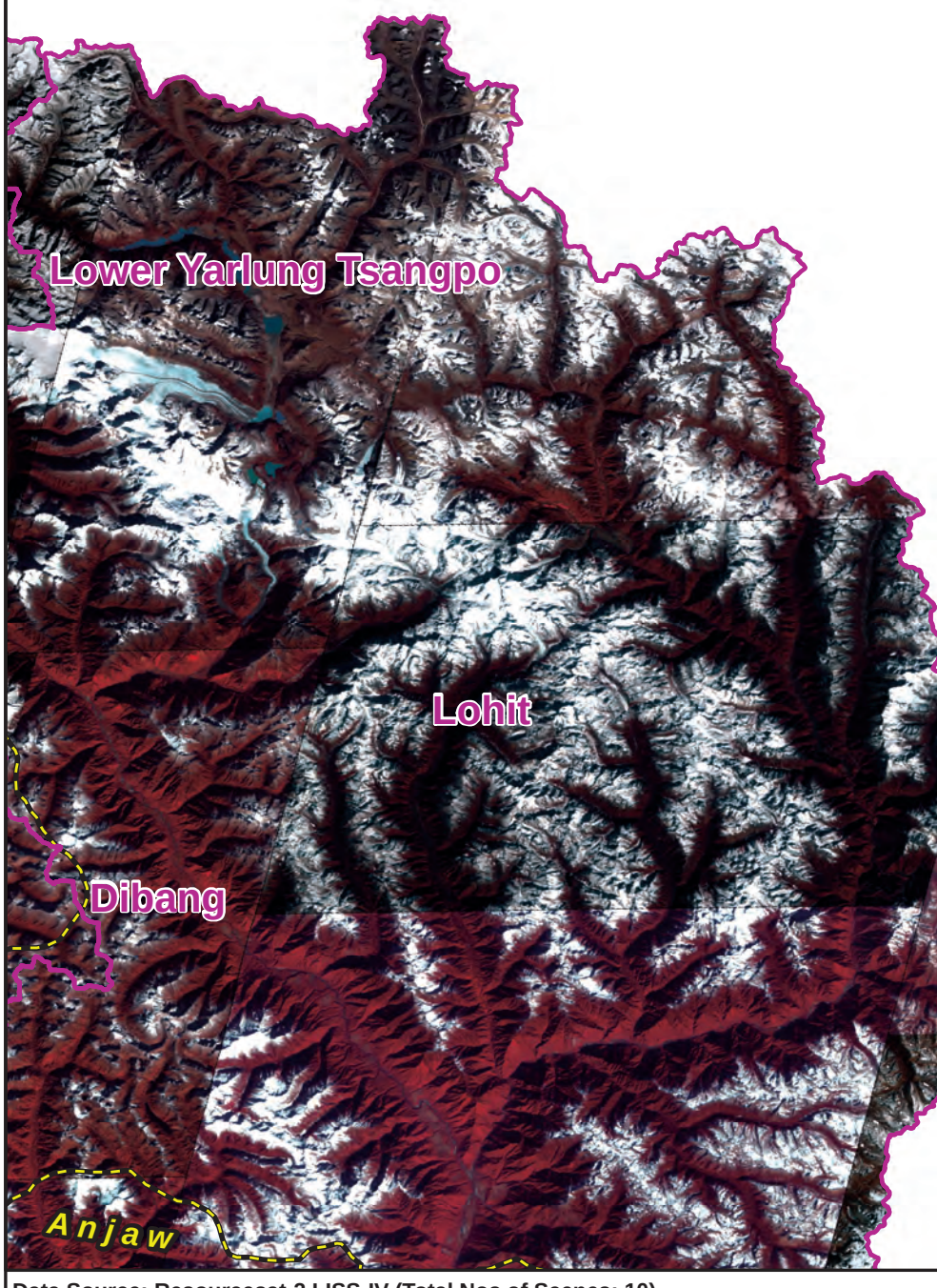
Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Arunchal Pradesh, Transboundary | **Map 63** | Plate No: 33



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 10)

0 10 20 30 40 Km

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	2	1	0	89	5	0	0	0	250	46	**393**
2	**0.5 - 1**	1	0	0	88	2	0	1	0	264	31	**387**
3	**1 - 5**	23	3	0	121	4	0	21	0	413	36	**621**
4	**5 - 10**	9	0	0	30	0	0	9	0	100	3	**151**
5	**10 - 50**	15	0	0	18	0	0	21	0	74	6	**134**
6	**> 50**	2	1	0	2	0	0	0	0	7	3	**15**
Total		**52**	**5**	**0**	**348**	**11**	**0**	**52**	**0**	**1108**	**125**	**1701**

Legend

Subbasin Boundary

District Boundary

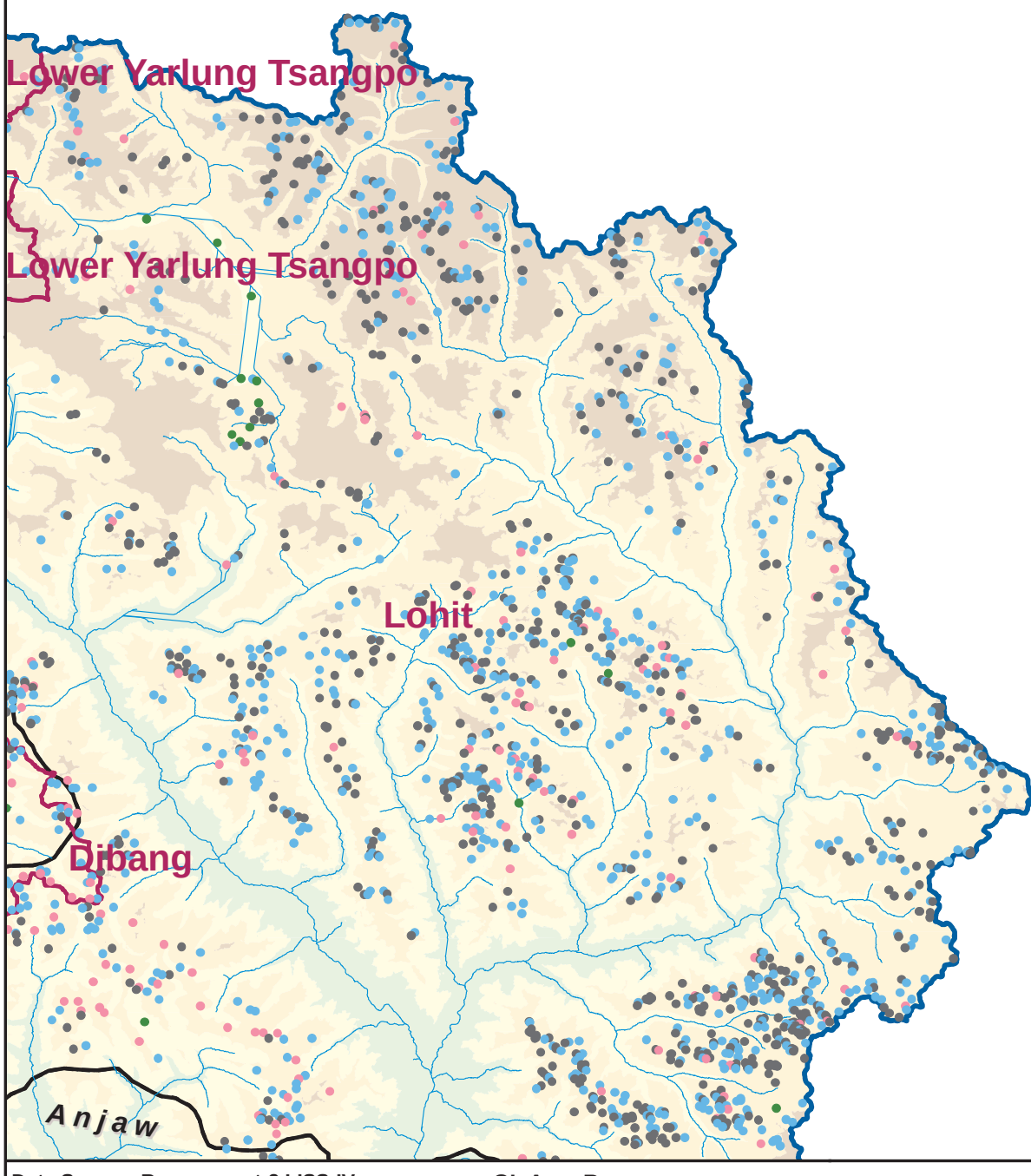
DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Arunchal Pradesh, Transboundary | **Map 64** | **Plate No: 33**

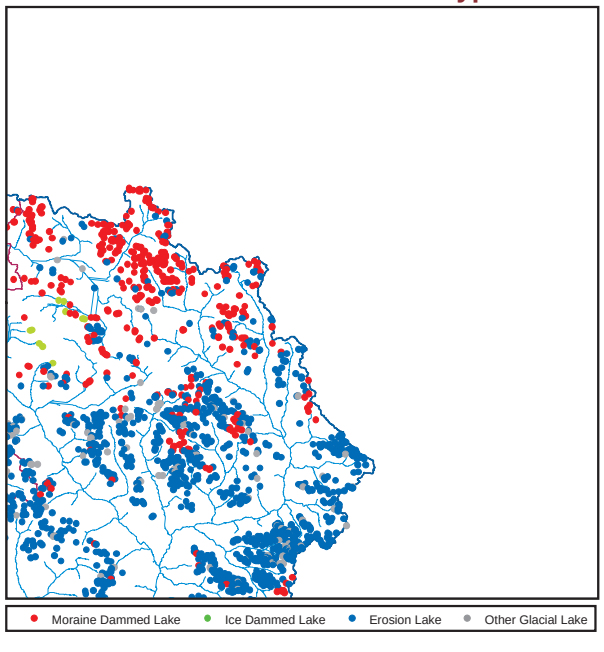


Data Source: Resourcesat-2 LISS-IV

GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

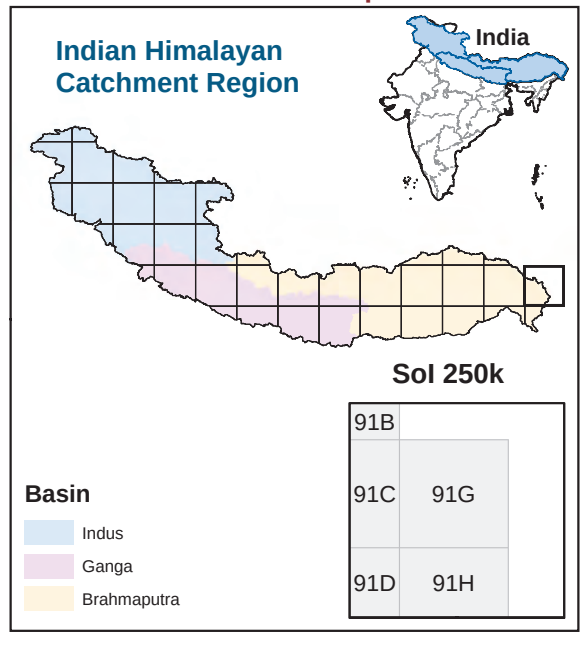
0 10 20 30 40 Km

Distribution of Glacial Lake Types



Moraine Dammed Lake · Ice Dammed Lake · Erosion Lake · Other Glacial Lake

Location Map



Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	3	40.8
2	3,001 - 4,000	87	2,903.9
3	4,001 - 5,000	1356	5,182.5
4	> 5,000	255	551.3
Total		**1701**	**8,678.5**

Legend

Glacial Lake
River / Stream
Basin Boundary
Subbasin Boundary
District Boundary
State / UT Boundary
International Boundary

Elevation Range (m)
up to 3,000
3,001 - 4,000
4,001 - 5,000
> 5,000

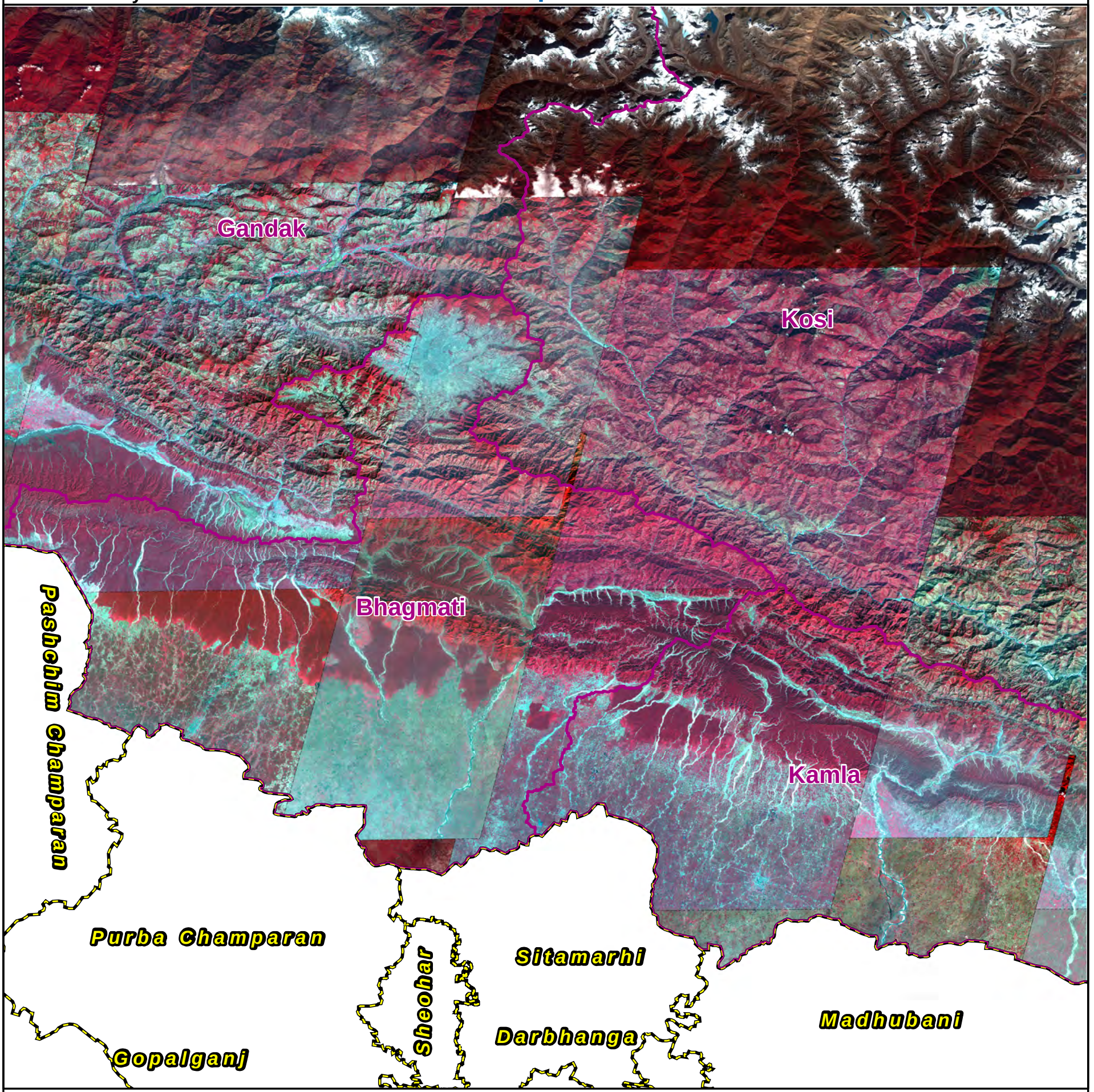
Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Administrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Transboundary | Map 65 | Plate No: 36



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 18)

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	0	5	0	107	56	0	0	0	51	6	**225**
2	**0.5 - 1**	3	2	0	104	29	0	0	0	49	9	**196**
3	**1 - 5**	8	6	0	122	21	0	1	0	76	10	**244**
4	**5 - 10**	6	0	0	32	0	0	0	0	8	2	**48**
5	**10 - 50**	11	0	0	17	2	0	1	0	2	4	**37**
6	**> 50**	8	1	0	1	0	0	0	0	0	0	**10**
Total		**36**	**14**	**0**	**383**	**108**	**0**	**2**	**0**	**186**	**31**	**760**

Legend

Subbasin Boundary

District Boundary

DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Transboundary | **Map 66** | Plate No: 36

Gandak
Kosi
Bhagmati
Kamla
Pashchim Champaran
Purba Champaran
Sitamarhi
Sheohar
Madhubani
Darbhanga
Gopalganj

Data Source: Resourcesat-2 LISS-IV

GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

0 10 20 30 40 Km

Distribution of Glacial Lake Types

Moraine Dammed Lake | Ice Dammed Lake | Erosion Lake | Other Glacial Lake

Location Map

Indian Himalayan Catchment Region

India

SoI 250k

71D	71H	71L
	72E	72I

Basin

- Indus
- Ganga
- Brahmaputra

Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	0	0.0
2	3,001 - 4,000	3	5.7
3	4,001 - 5,000	256	809.6
4	> 5,000	501	2,415.7
Total		**760**	**3,231.0**

Legend

- Glacial Lake
- River / Stream
- Basin Boundary
- Subbasin Boundary
- *District Boundary*
- State / UT Boundary
- International Boundary

Elevation Range (m)

- up to 3,000
- 3,001 - 4,000
- 4,001 - 5,000
- > 5,000

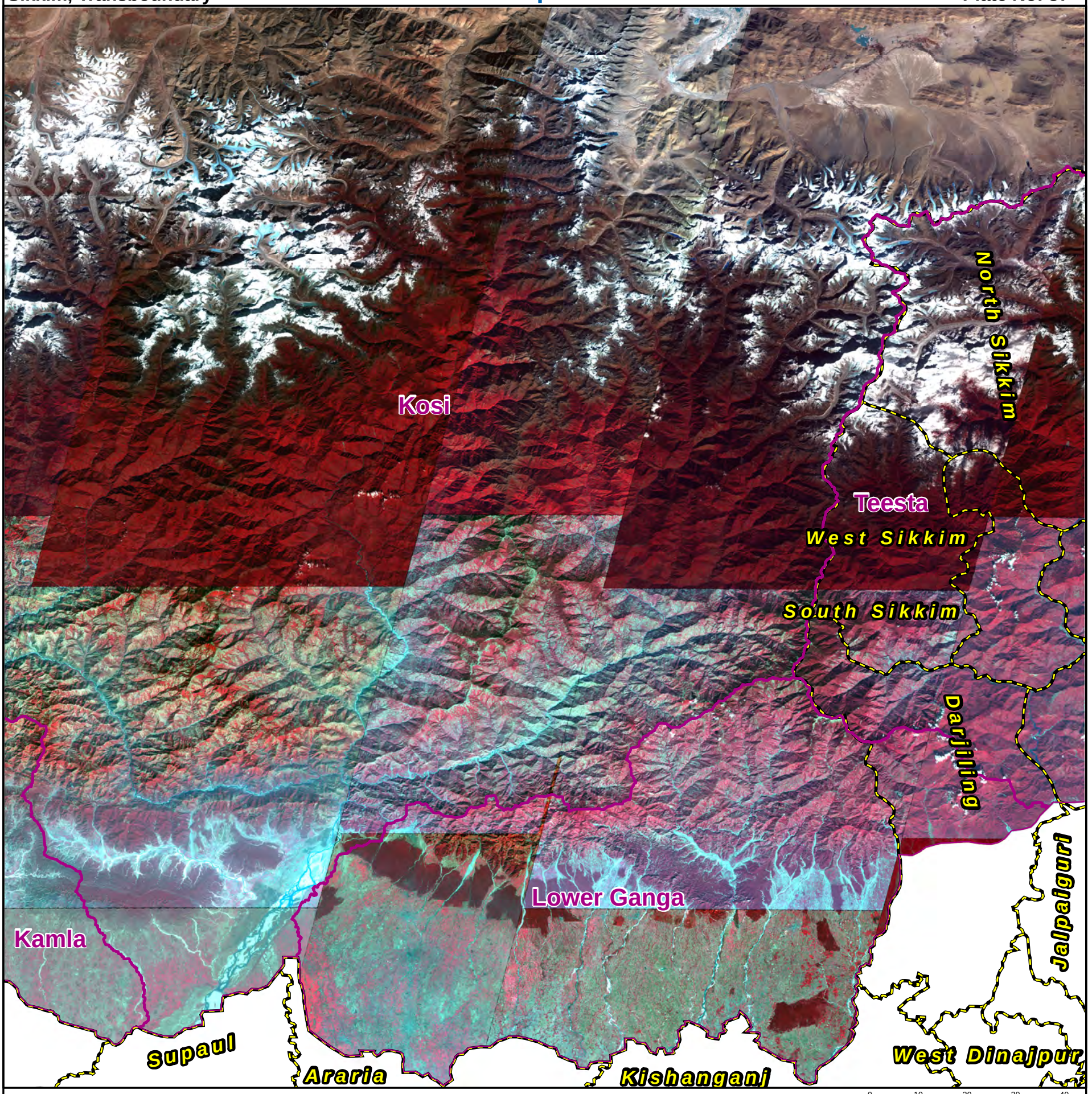
Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Sikkim, Transboundary — **Map 67** — Plate No: 37



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 18)

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	1	4	0	115	170	0	2	0	172	2	**466**
2	**0.5 - 1**	2	6	0	116	74	0	2	0	214	3	**417**
3	**1 - 5**	9	10	0	200	45	0	33	0	315	3	**615**
4	**5 - 10**	15	1	0	41	5	0	19	0	53	1	**135**
5	**10 - 50**	46	4	0	32	3	0	21	0	18	5	**129**
6	**> 50**	25	2	0	2	0	0	0	0	1	4	**34**
Total		**98**	**27**	**0**	**506**	**297**	**0**	**77**	**0**	**773**	**18**	**1796**

Legend

Subbasin Boundary — District Boundary

DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

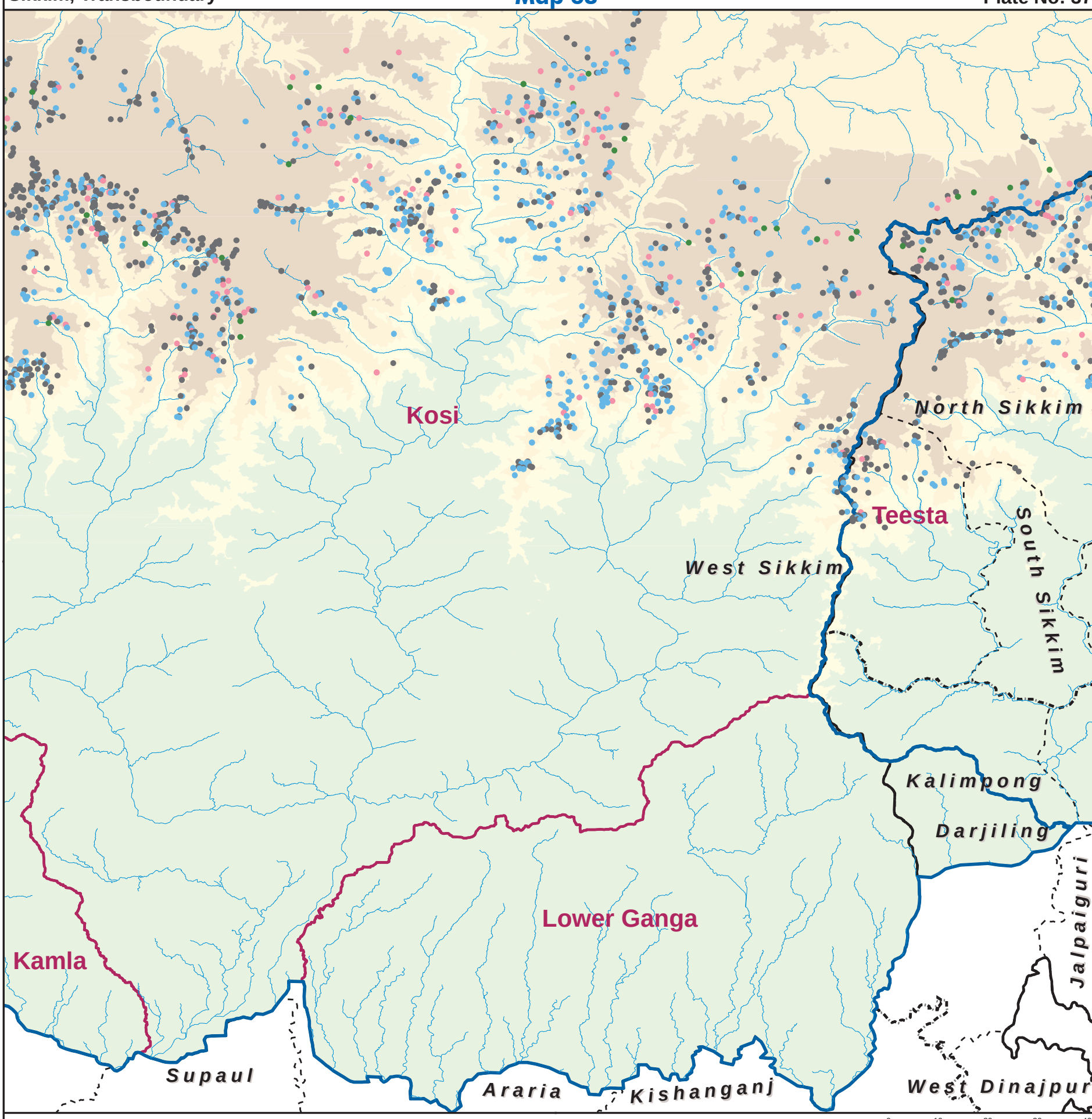
(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Sikkim, Transboundary

Map 68

Plate No: 37

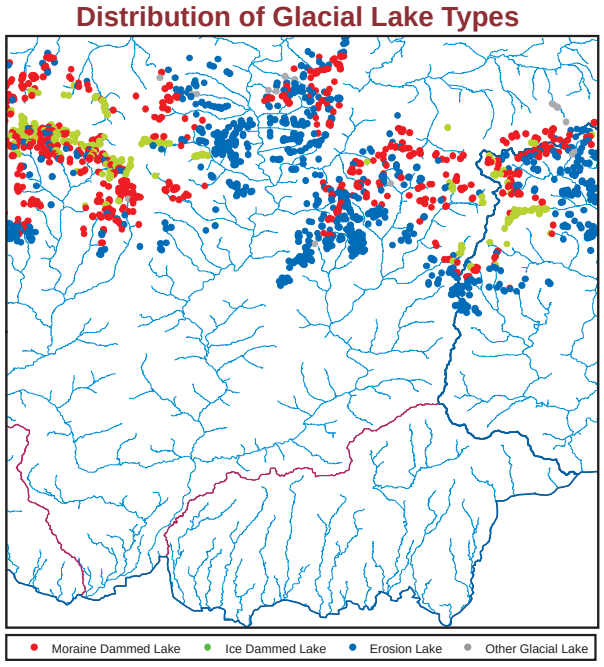


Data Source: Resourcesat-2 LISS-IV

GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

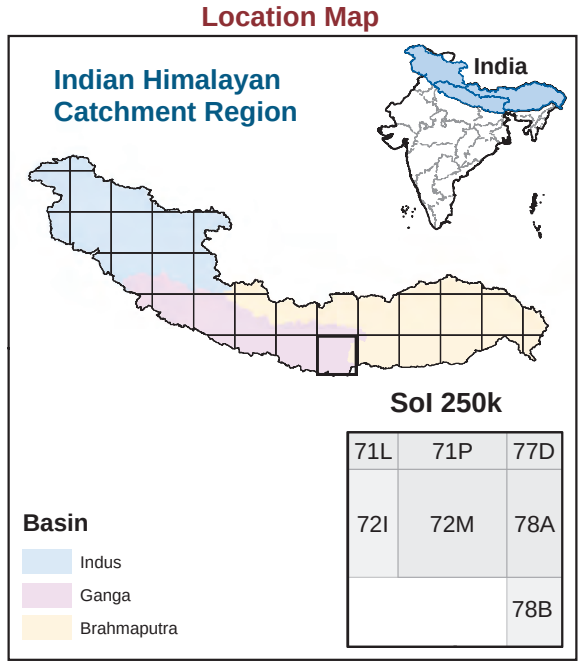
0 10 20 30 40 Km

Distribution of Glacial Lake Types



Moraine Dammed Lake · Ice Dammed Lake · Erosion Lake · Other Glacial Lake

Location Map



Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	0	0.0
2	3,001 - 4,000	24	111.3
3	4,001 - 5,000	859	3,817.5
4	> 5,000	913	4,768.6
Total		**1796**	**8,697.4**

Legend

Glacial Lake
River / Stream
Basin Boundary
Subbasin Boundary
District Boundary
State / UT Boundary
International Boundary

Elevation Range (m)
up to 3,000
3,001 - 4,000
4,001 - 5,000
> 5,000

Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

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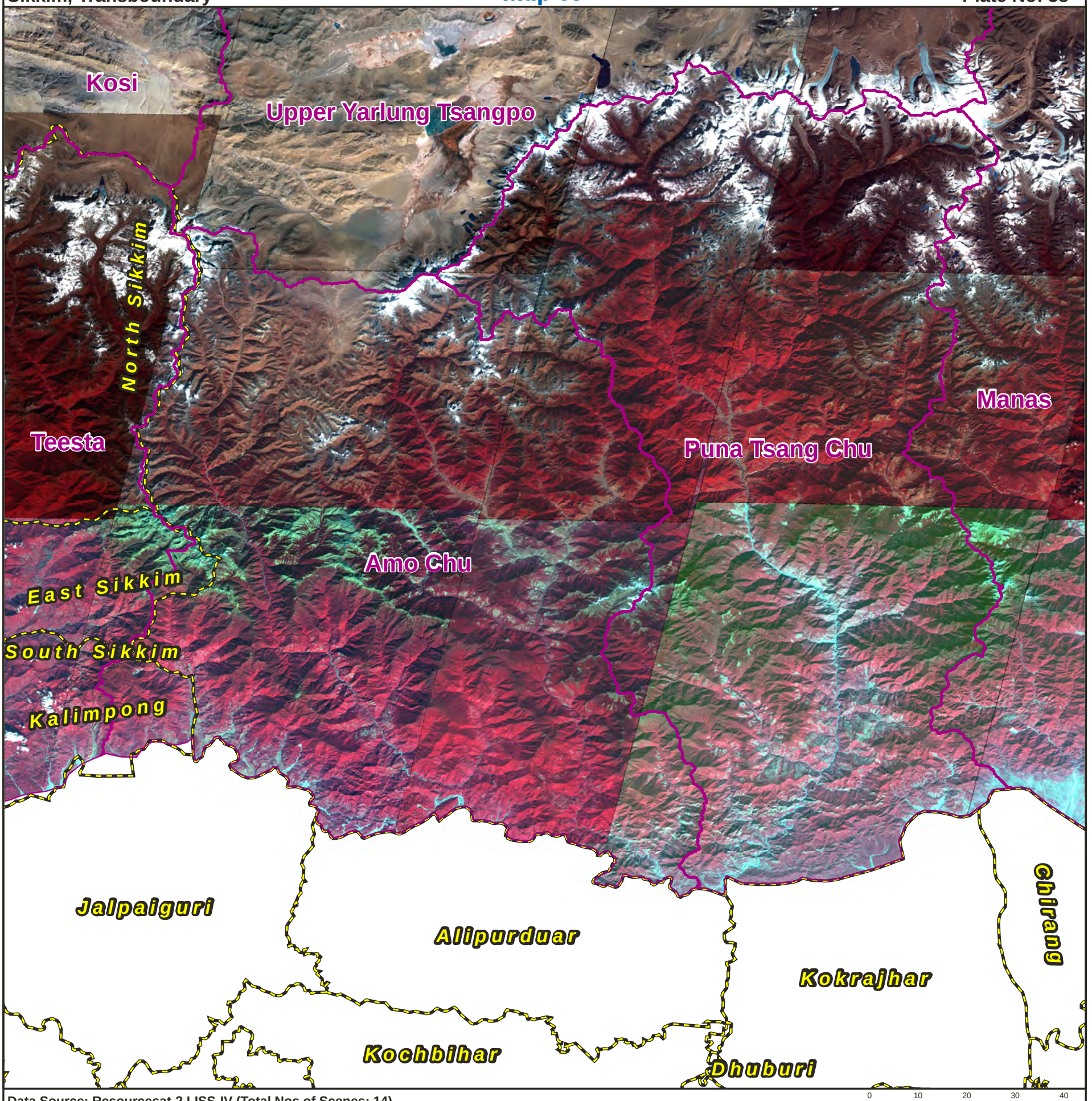
SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Sikkim, Transboundary — **Map 69** — Plate No: 38



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 14)

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	0	0	0	101	56	0	0	0	339	9	**505**
2	**0.5 - 1**	0	1	0	119	36	0	12	0	339	21	**528**
3	**1 - 5**	10	5	0	187	18	0	71	0	579	28	**898**
4	**5 - 10**	12	1	0	43	3	0	47	0	100	2	**208**
5	**10 - 50**	43	2	0	41	1	0	51	0	73	2	**213**
6	**> 50**	18	0	0	3	0	0	1	0	10	1	**33**
Total		**83**	**9**	**0**	**494**	**114**	**0**	**182**	**0**	**1440**	**63**	**2385**

Legend

Subbasin Boundary — District Boundary

DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Sikkim, Transboundary

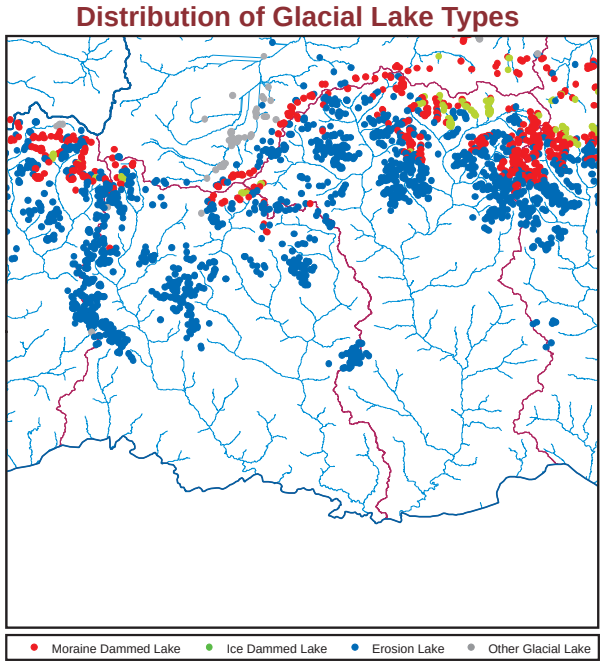
Map 70

Plate No: 38

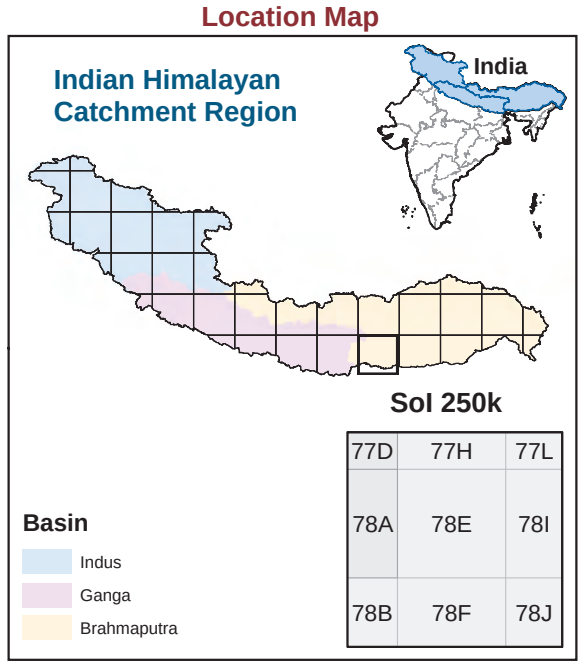
Data Source: Resourcesat-2 LISS-IV

GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

Distribution of Glacial Lake Types



Location Map



SoI 250k

77D	77H	77L
78A	78E	78I
78B	78F	78J

Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	0	0.0
2	3,001 - 4,000	26	129.4
3	4,001 - 5,000	1397	7,484.4
4	> 5,000	625	3,808.7
Total		**2048**	**11,422.4**

Legend

Glacial Lake
River / Stream
Basin Boundary
Subbasin Boundary
District Boundary
State / UT Boundary
International Boundary

Elevation Range (m)

up to 3,000
3,001 - 4,000
4,001 - 5,000
> 5,000

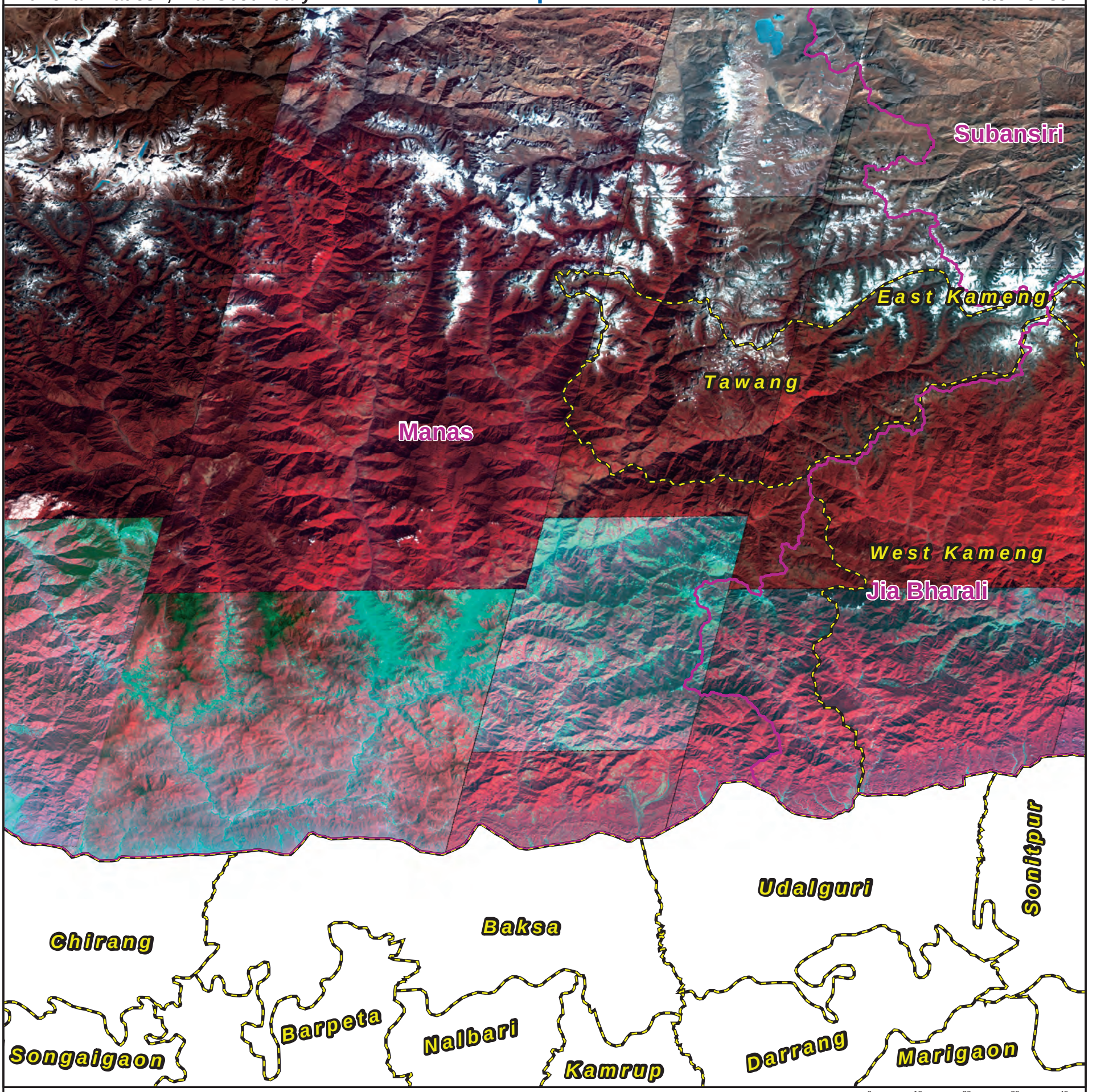
Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Administrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Arunchal Pradesh, Transboundary | **Map 71** | Plate No: 39



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 14)

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	0	0	0	79	20	0	3	0	394	9	**505**
2	**0.5 - 1**	0	0	0	57	5	0	7	0	364	9	**442**
3	**1 - 5**	10	2	0	97	2	0	101	0	671	15	**898**
4	**5 - 10**	8	0	0	22	0	0	57	0	135	2	**224**
5	**10 - 50**	17	1	0	18	1	0	45	0	99	2	**183**
6	**> 50**	6	0	0	2	0	0	2	0	9	3	**22**
Total		**41**	**3**	**0**	**275**	**28**	**0**	**215**	**0**	**1672**	**40**	**2274**

Legend

Subbasin Boundary — District Boundary

DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

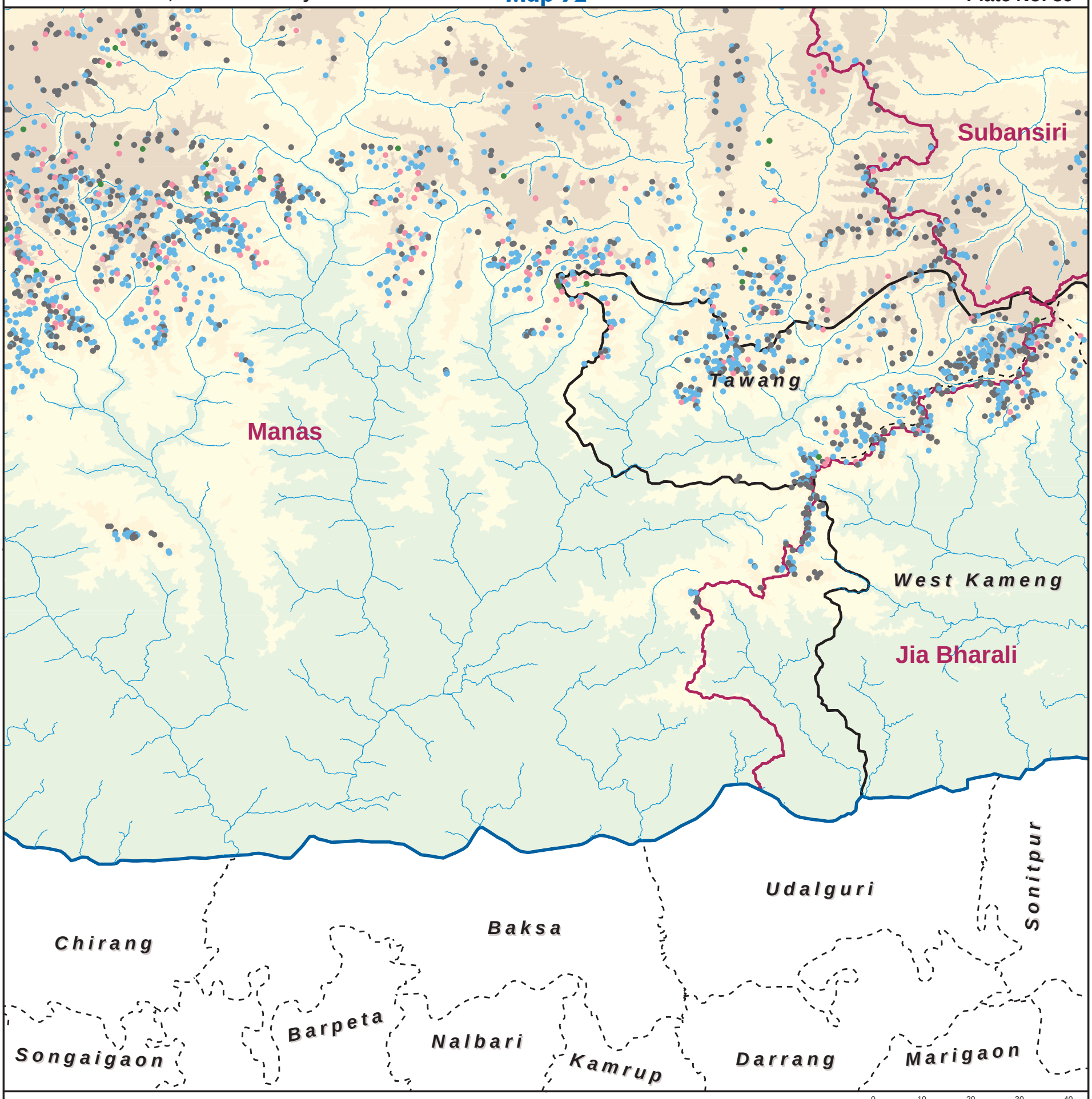
(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Arunchal Pradesh, Transboundary

Map 72

Plate No: 39

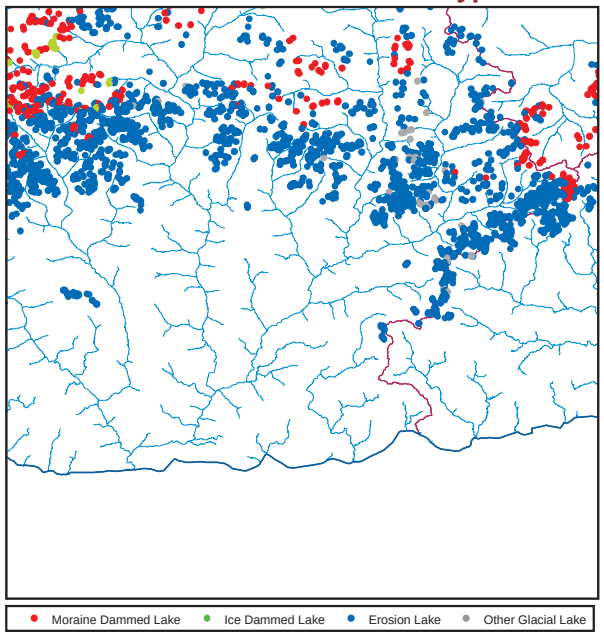


Data Source: Resourcesat-2 LISS-IV

GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

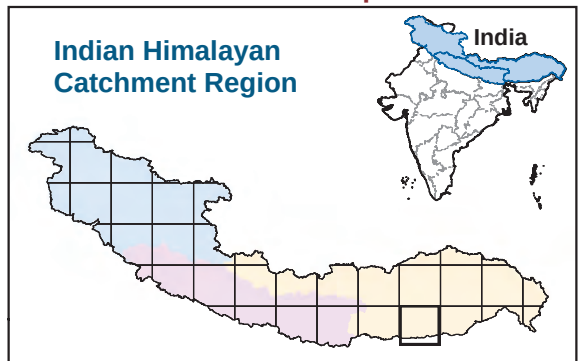
0 10 20 30 40 Km

Distribution of Glacial Lake Types



Moraine Dammed Lake · Ice Dammed Lake · Erosion Lake · Other Glacial Lake

Location Map



SoI 250k

77L	77P	82D
78I	78M	83A
78J	78N	83B

Basin

- Indus
- Ganga
- Brahmaputra

Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	0	0.0
2	3,001 - 4,000	44	201.4
3	4,001 - 5,000	1421	6,816.5
4	> 5,000	583	1,864.2
Total		**2048**	**8,882.1**

Legend

- Glacial Lake
- River / Stream
- Basin Boundary
- Subbasin Boundary
- *District Boundary*
- State / UT Boundary
- International Boundary

Elevation Range (m)

- up to 3,000
- 3,001 - 4,000
- 4,001 - 5,000
- > 5,000

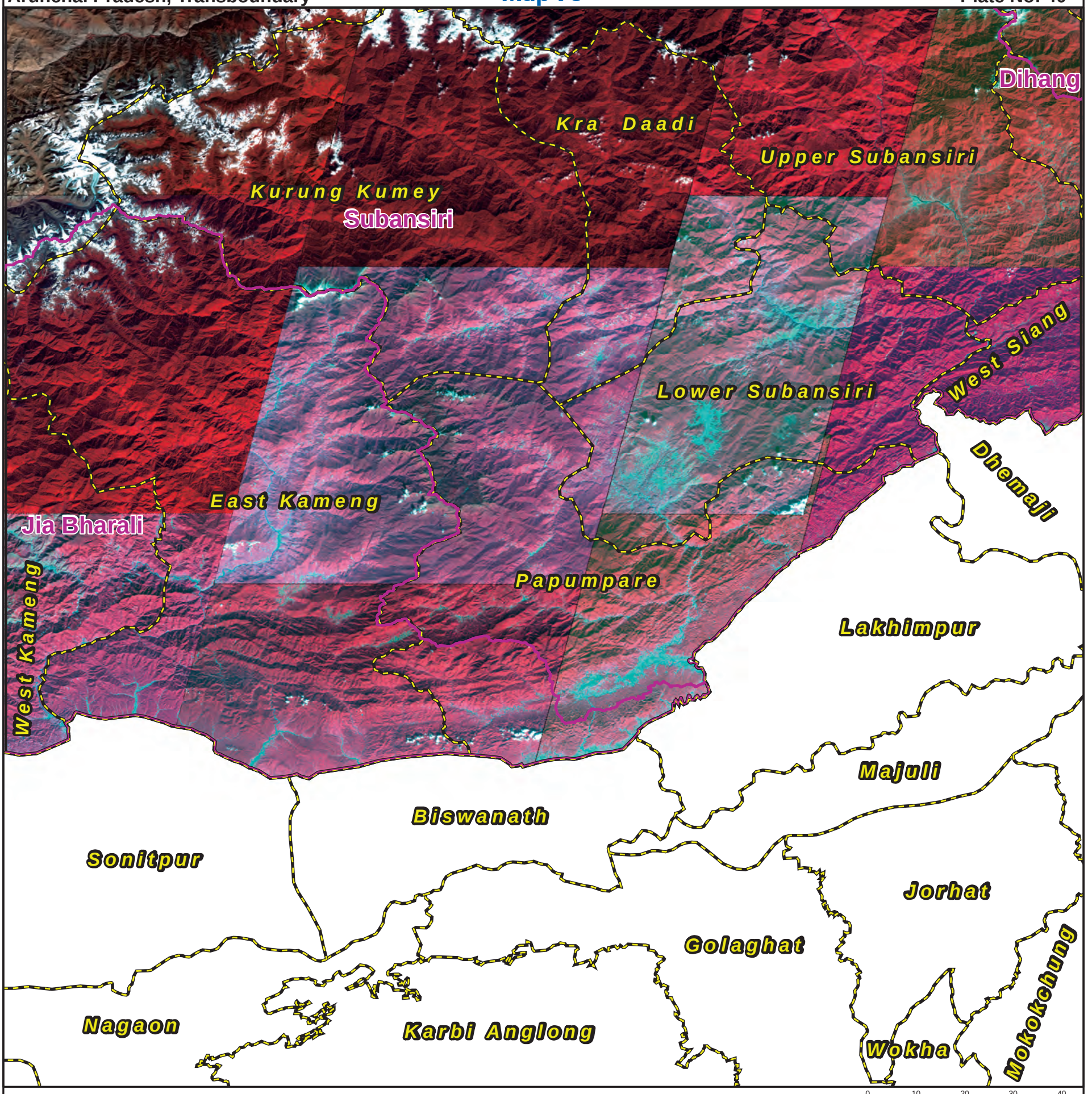
Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Administrative Boundaries shown are for scientific study and not for statutory purpose

SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Arunchal Pradesh, Transboundary — **Map 73** — Plate No: 40



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 11)

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	0	0	0	11	2	0	1	0	17	0	**31**
2	**0.5 - 1**	0	0	0	12	2	1	2	0	28	1	**46**
3	**1 - 5**	7	0	0	17	1	1	10	0	54	1	**91**
4	**5 - 10**	11	0	0	1	0	0	6	0	19	0	**37**
5	**10 - 50**	4	0	0	2	0	0	3	0	10	1	**20**
6	**> 50**	1	0	0	0	0	0	1	0	2	0	**4**
Total		**23**	**0**	**0**	**43**	**5**	**2**	**23**	**0**	**130**	**3**	**229**

Legend

Subbasin Boundary — District Boundary

DISCLAIMER:

(a) The Administrative Boundaries shown are for scientific study and not for statutory purpose

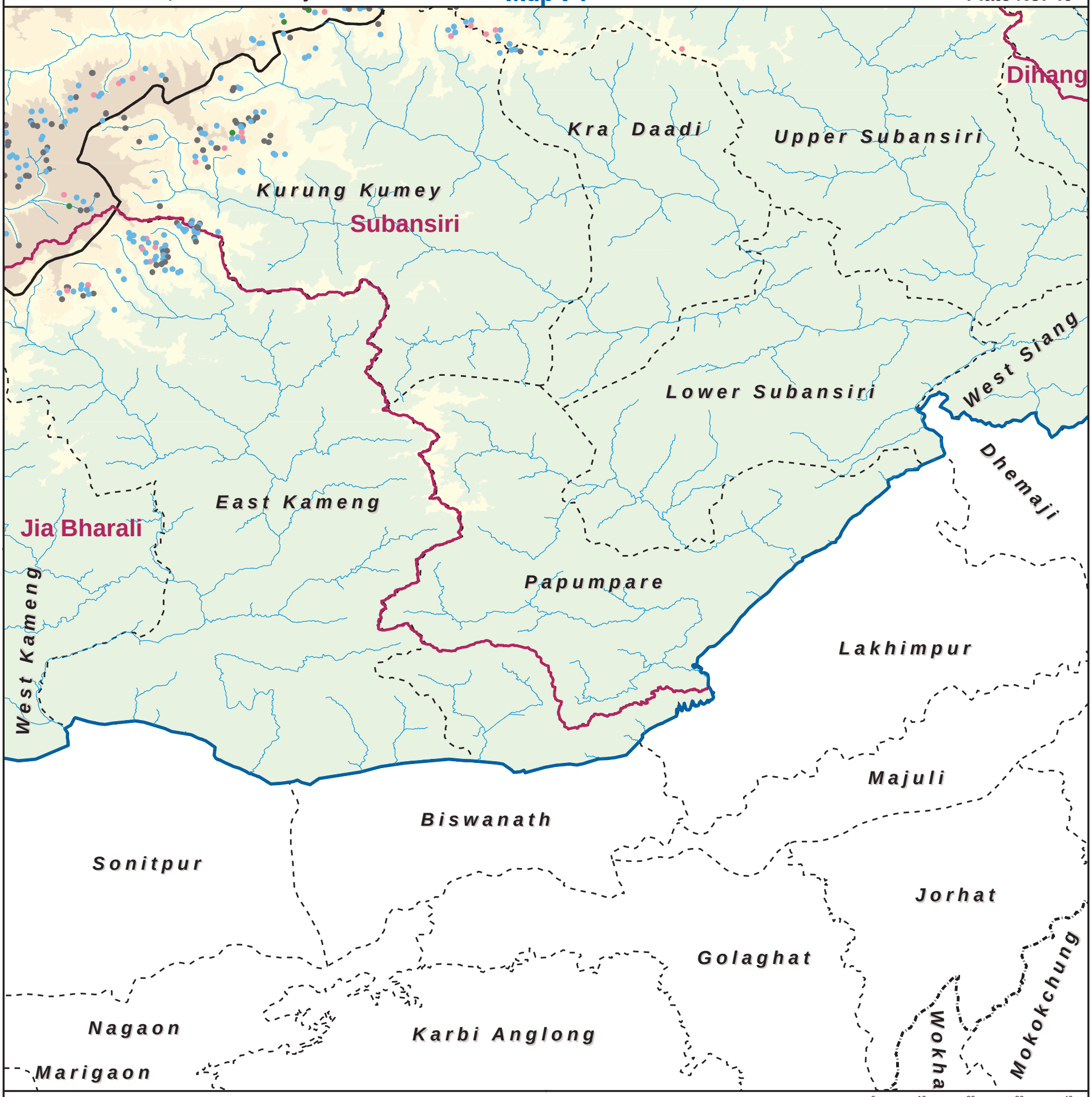
(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Arunchal Pradesh, Transboundary

Map 74

Plate No: 40

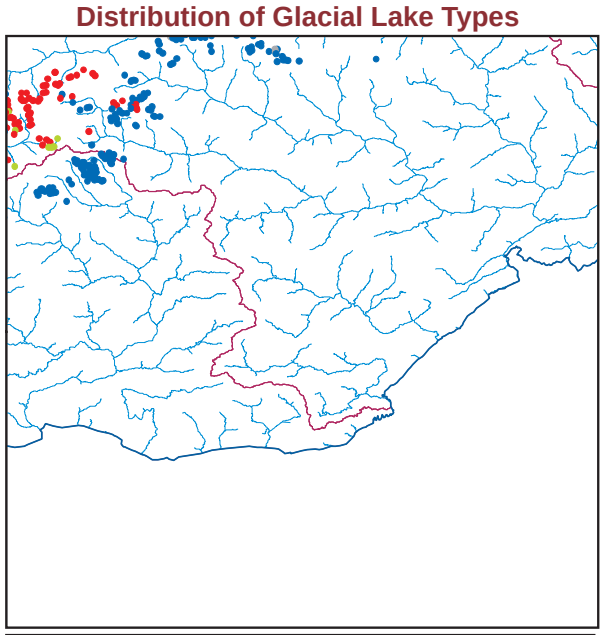


Data Source: Resourcesat-2 LISS-IV

GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

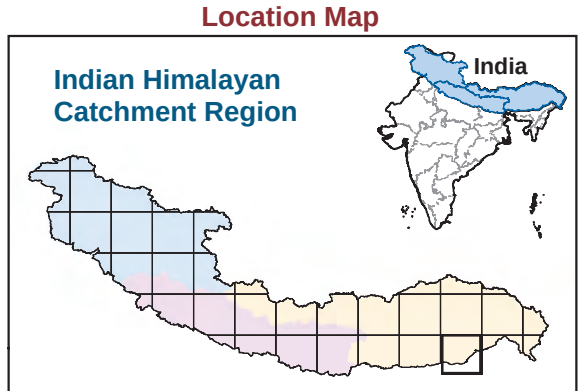
0 10 20 30 40 Km

Distribution of Glacial Lake Types



● Moraine Dammed Lake ● Ice Dammed Lake ● Erosion Lake ● Other Glacial Lake

Location Map



Basin

- Indus
- Ganga
- Brahmaputra

SoI 250k

82D	82H	82L
83A	83E	83I
83B	83F	

Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	0	0.0
2	3,001 - 4,000	29	187.4
3	4,001 - 5,000	142	793.6
4	> 5,000	58	182.7
Total		**229**	**1,163.8**

Legend

- Glacial Lake
- River / Stream
- Basin Boundary
- Subbasin Boundary
- *District Boundary*
- State / UT Boundary
- International Boundary

Elevation Range (m)

- up to 3,000
- 3,001 - 4,000
- 4,001 - 5,000
- > 5,000

Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

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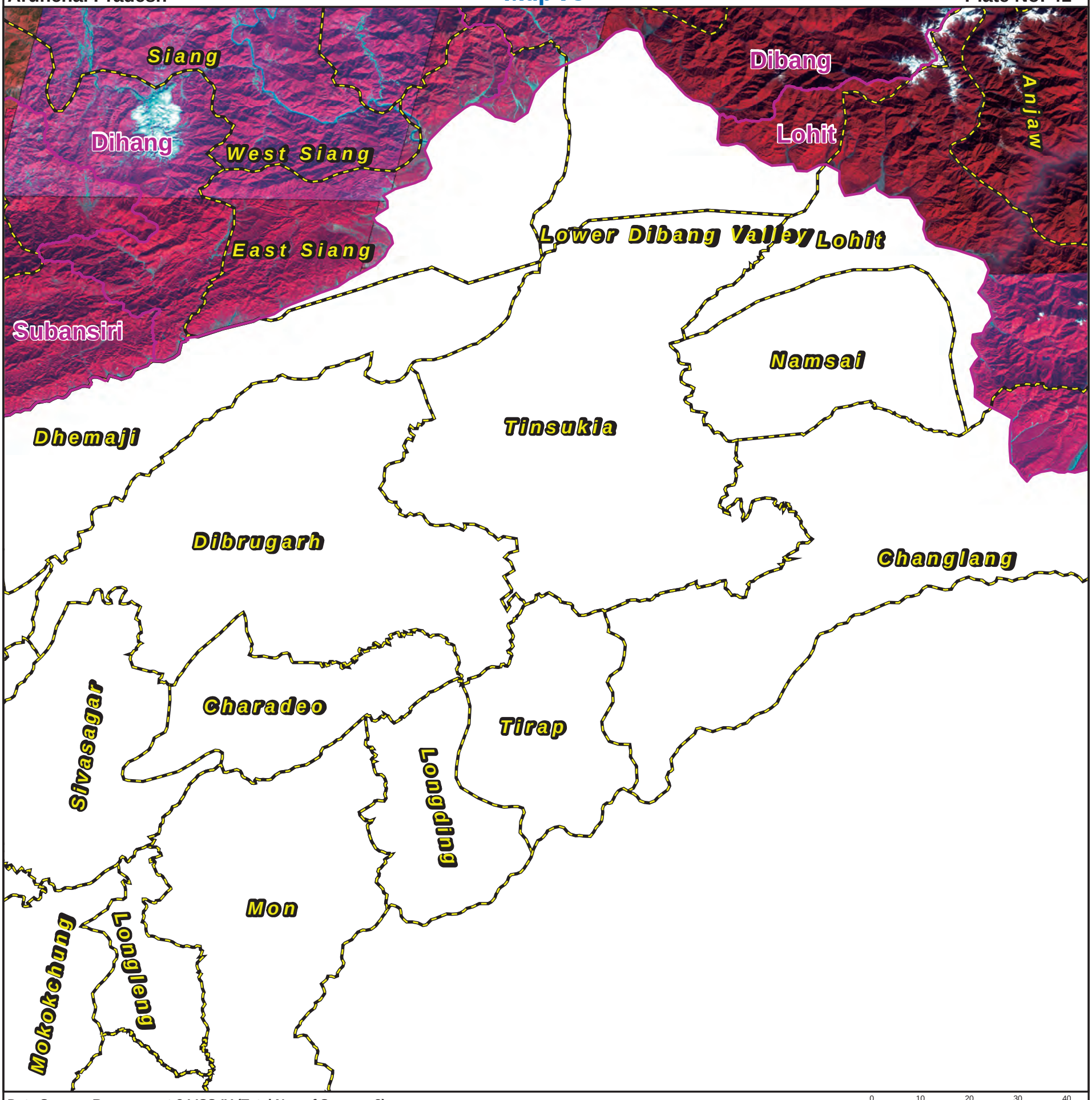
SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Arunchal Pradesh — Map 75 — Plate No: 41



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 8)

0 10 20 30 40 Km

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	0.25 - 0.5	0	0	0	0	0	0	0	0	0	0	**0**
2	0.5 - 1	0	0	0	0	0	0	0	0	0	0	**0**
3	1 - 5	0	0	0	0	0	0	0	0	4	0	**4**
4	5 - 10	0	0	0	0	0	0	1	0	2	0	**3**
5	10 - 50	0	0	0	0	0	0	0	0	0	1	**1**
6	> 50	0	0	0	0	0	0	0	0	0	0	**0**
Total		**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**6**	**1**	**8**

Legend

Subbasin Boundary

District Boundary

DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Arunchal Pradesh

Map 76

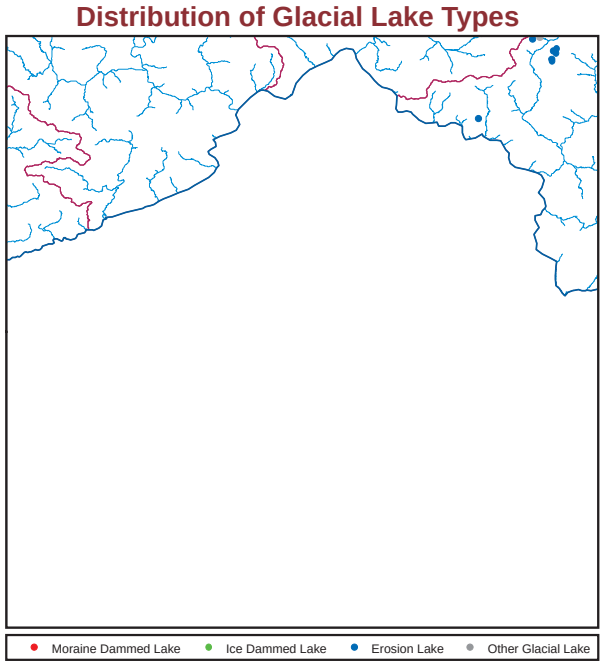
Plate No: 41

Data Source: Resourcesat-2 LISS-IV

GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

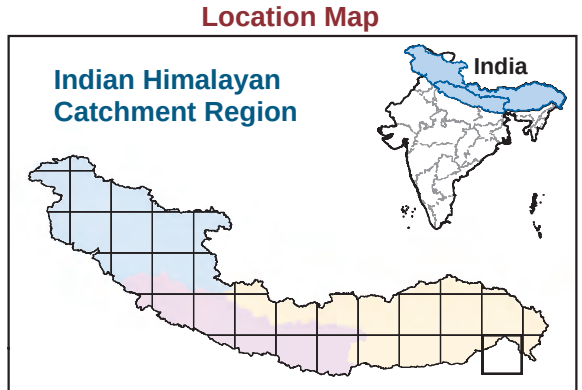
0 10 20 30 40 Km

Distribution of Glacial Lake Types



Moraine Dammed Lake · Ice Dammed Lake · Erosion Lake · Other Glacial Lake

Location Map



Basin

- Indus
- Ganga
- Brahmaputra

SoI 250k

82L	82P	91D
83I	83M	92A

Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	2	17.3
2	3,001 - 4,000	5	20.7
3	4,001 - 5,000	1	8.1
4	> 5,000	0	0.0
Total		**8**	**46.1**

Legend

Glacial Lake · River / Stream · Basin Boundary · Subbasin Boundary

District Boundary · State / UT Boundary · International Boundary

Elevation Range (m)

up to 3,000 · 3,001 - 4,000 · 4,001 - 5,000 · > 5,000

Prepared By:
Water Resources Group
National Remote Sensing Centre, ISRO
Department of Space, Government of India

Under:
National Hydrolgy Project
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

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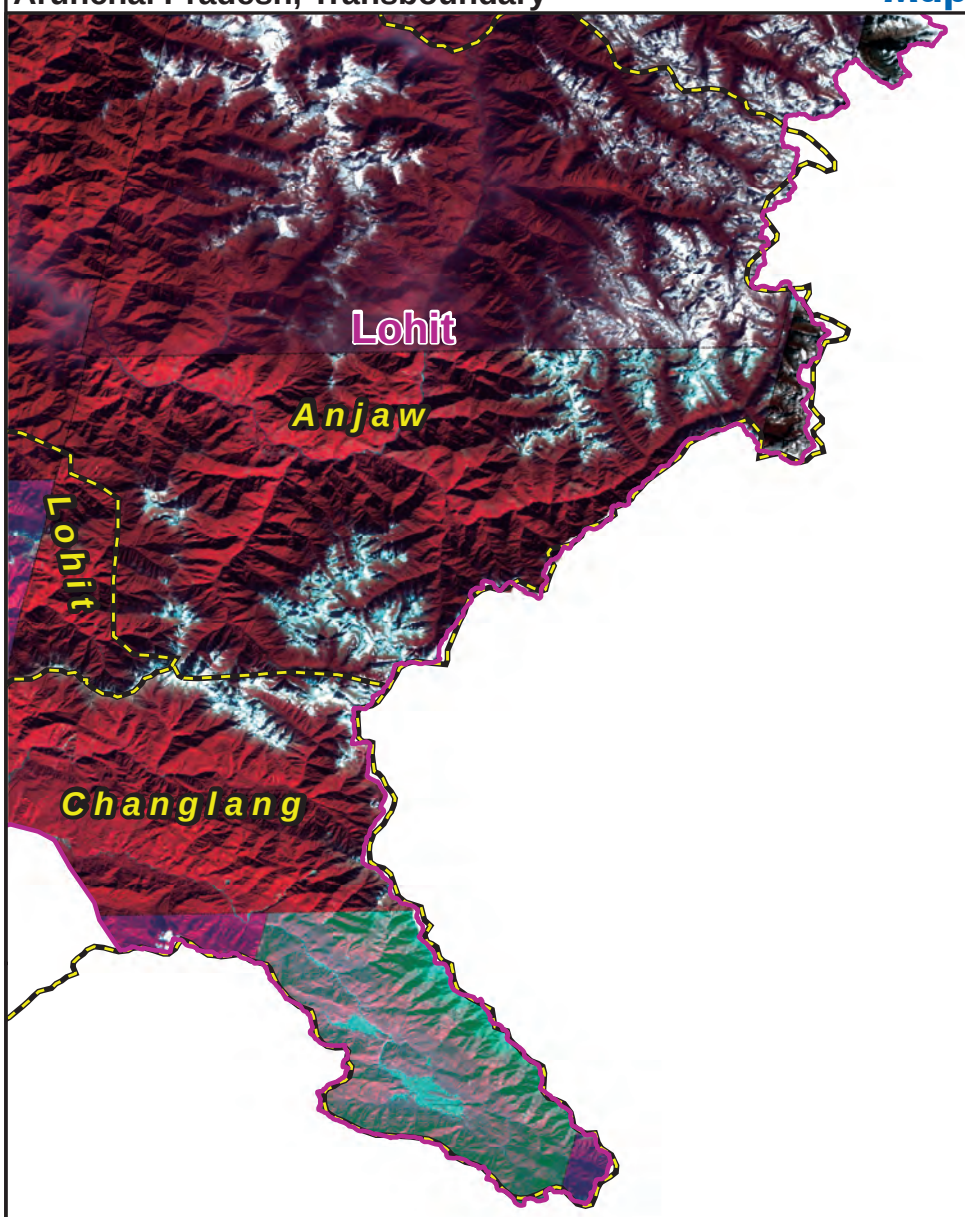
SATELLITE IMAGE OF PART OF HIMALAYAN CATCHMENT REGION

Arunchal Pradesh, Transboundary — **Map 77** — Plate No: 42



Data Source: Resourcesat-2 LISS-IV (Total Nos of Scenes: 7)

0 10 20 30 40 Km

Distribution of Glacial Lake Types vs. Area-wise

S.No.	Glacial Lake Area Range (ha)	Types of Glacial Lakes										Total
		Moraine Dammed Lake				Ice Dammed Lake		Erosion Lake			Other Glacial Lake	
		End-moraine Dammed Lake	Lateral Moraine Dammed Lake	Lateral Moraine Dammed Lake with Ice	Other Moraine Dammed Lake	Supra-glacial Lake	Glacier Ice-dammed Lake	Cirque Erosion Lake	Glacier Trough Valley Erosion Lake	Other Glacial Erosion Lake		
1	**0.25 - 0.5**	0	0	0	0	0	0	0	0	54	8	**62**
2	**0.5 - 1**	0	0	0	1	0	0	0	0	79	6	**86**
3	**1 - 5**	0	0	0	1	0	0	8	0	187	14	**210**
4	**5 - 10**	0	0	0	1	0	0	11	0	54	1	**67**
5	**10 - 50**	0	0	0	2	0	0	12	0	54	0	**68**
6	**> 50**	0	0	0	0	0	0	0	0	3	0	**3**
Total		**0**	**0**	**0**	**5**	**0**	**0**	**31**	**0**	**431**	**29**	**496**

Legend

Subbasin Boundary — District Boundary

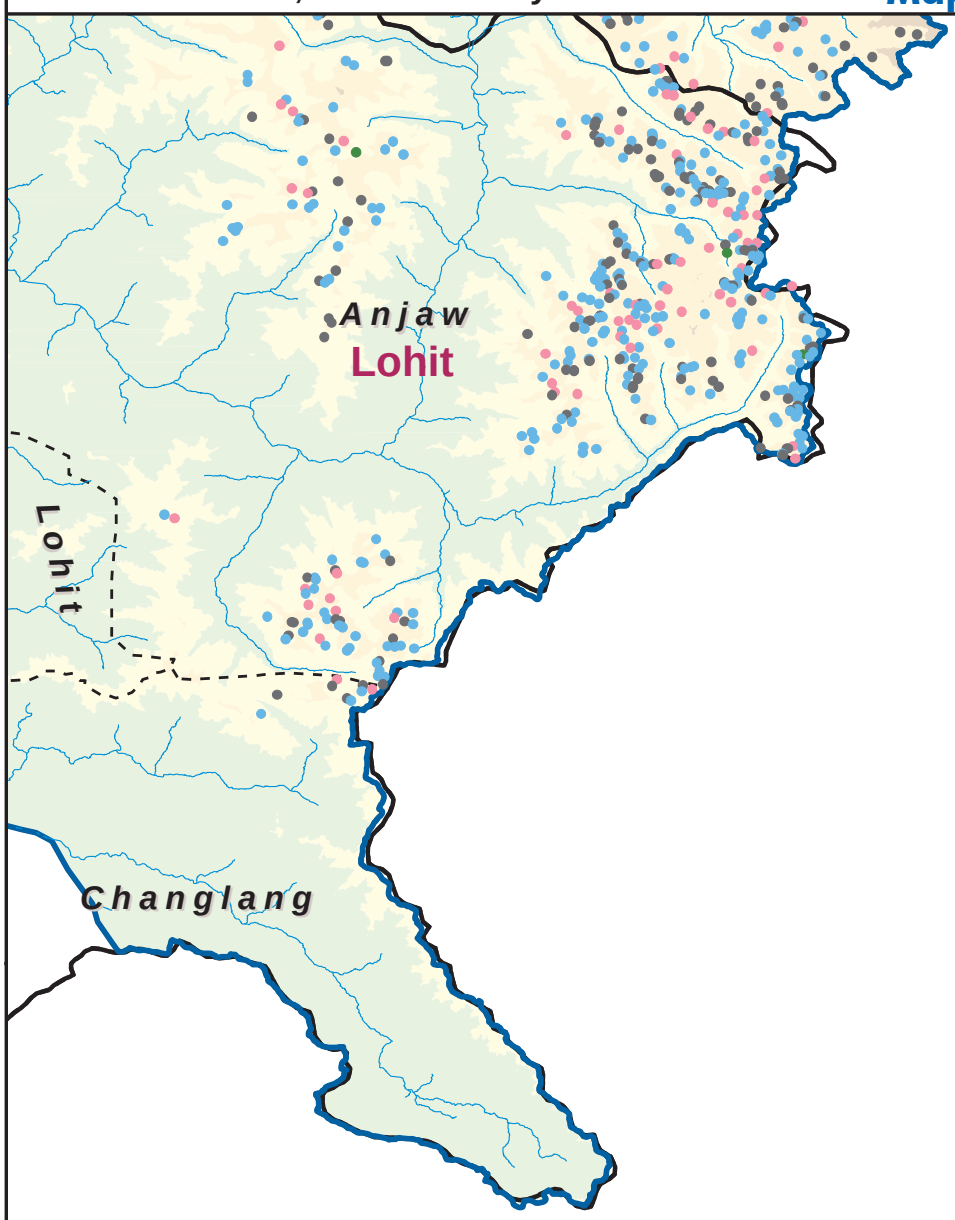
DISCLAIMER:

(a) The Adminitrative Boundaries shown are for scientific study and not for statutory purpose

(b) Satellite image depicts both Glacial Lakes and Water Bodies, but only glacial lakes were mapped

GLACIAL LAKES IN PART OF INDIAN HIMALAYAN RIVER BASINS

Arunchal Pradesh, Transboundary | **Map 78** | **Plate No: 42**

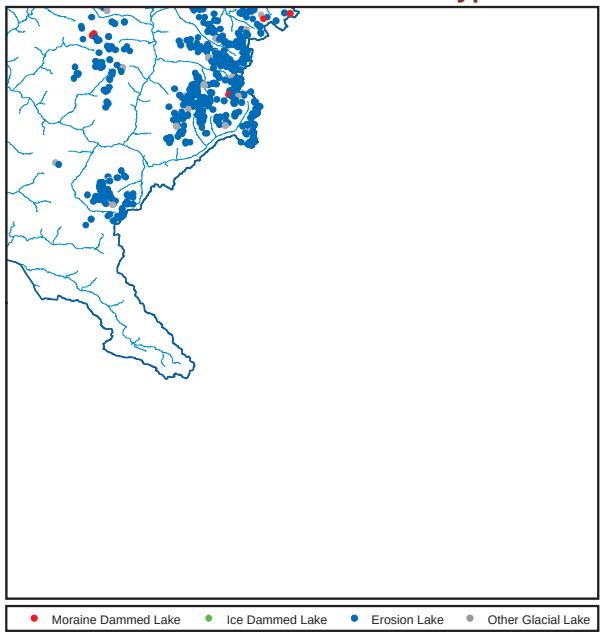


Data Source: Resourcesat-2 LISS-IV

GL Area Range ● <1 ha ● 1 - 10 ha ● 10 - 50 ha ● > 50 ha

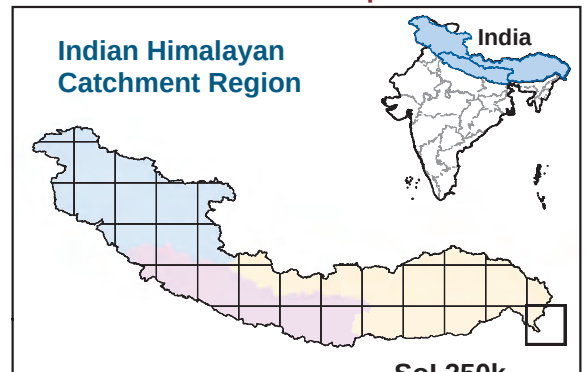
0 10 20 30 40 Km

Distribution of Glacial Lake Types



Moraine Dammed Lake ● Ice Dammed Lake ● Erosion Lake ● Other Glacial Lake

Location Map



Sol 250k

91D	91H
92A	92E

Basin

- Indus
- Ganga
- Brahmaputra

Elevation-wise Glacial Lake Distribution

S.No.	Elevation Range (m)	No. of Glacial Lakes	Glacial Lake Area (ha)
1	up to 3,000	0	0.0
2	3,001 - 4,000	178	1,071.7
3	4,001 - 5,000	318	1,422.1
4	> 5,000	0	0.0
Total		**496**	**2,493.8**

Legend

- Glacial Lake
- River / Stream
- Basin Boundary
- Subbasin Boundary
- *District Boundary*
- State / UT Boundary
- International Boundary

Elevation Range (m)

- up to 3,000
- 3,001 - 4,000
- 4,001 - 5,000
- > 5,000

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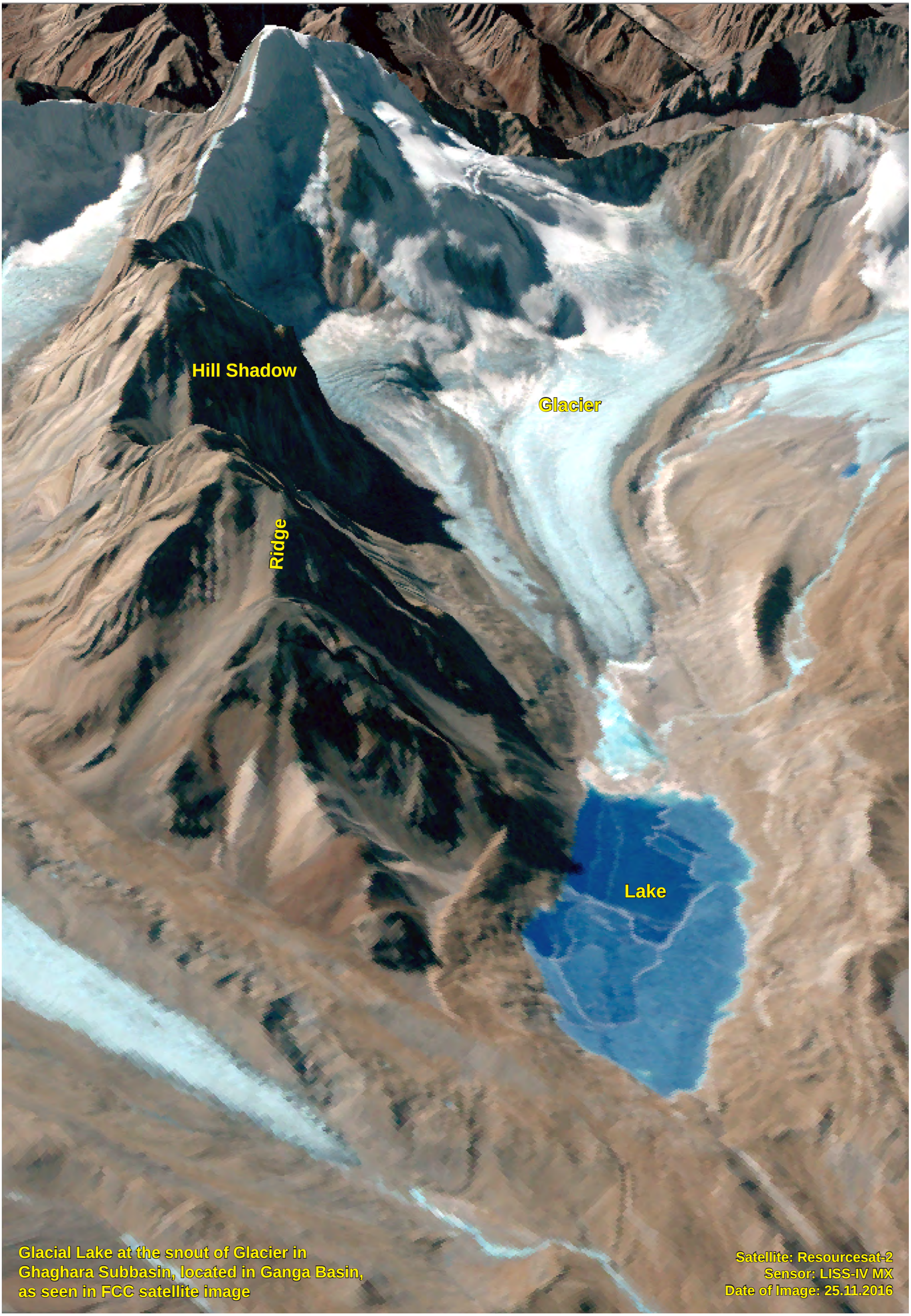
Department of Water Resources, RD & GR
Ministry of Jal Shakti, Government of India

DISCLAIMER: The Adminitrative Boundaries shown are for scientific study and not for statutory purpose



Glacial Lake at the snout of Glacier in Ghaghara Subbasin, located in Ganga Basin, as seen in FCC satellite image

Satellite: Resourcesat-2
Sensor: LISS-IV MX
Date of Image: 25.11.2016

References

Andre, C. (2017). "Atlas du Tibet" (5th Eds.). www.tibetmap.com

Bambari, B., Mehta, M., Dobhal, D.P., Gupta, A.K. (2015). "Glacier Lake Inventory of Uttarakhand". Center for Glaciology, Wadia Institute of Himalayan, Dehradun.

Berthier, E., Arnaud, Y., Kumar, R., Ahmad, S., Wagnon, P., Chevallier, P. (2007). "Remote sensing estimates of glacier mass balances in the Himachal Pradesh (Western Himalaya, India)". Remote Sensing of Environment, vol. 108(3), pp. 327-338. https://doi.org/10.1016/j.rse.2006.11.017

Bhagat, R.M., Kalia, V., Sood, C., Mool, P.K., Bajracharya, S. (2004). "Inventory of glaciers and glacial lakes and the identification of potential glacial lake outburst floods (GLOFs) affected by global warming in the mountains of the Himalayan region: Himachal Pradesh Himalaya, India". Unpublished project report, with database on CD-ROM, prepared for APN and ICIMOD, Kathmandu, by Himachal Pradesh Agricultural University, Palampur, India.

Bolch, T., Menounos, B., Wheate, R. (2010). "Landsat-based inventory of glaciers in western Canada, 1985-2005". Remote Sensing of Environment, vol. 114(1), pp. 127-137. https://doi.org/10.1016/j.rse.2009.08.015

Che, T., Xiao, L., Liou, Y.A. (2014). "Changes in Glaciers and Glacial Lakes and the Identification of Dangerous Glacial Lakes in the Pumqu River Basin, Xizang (Tibet)". Advances in Meteorology, vol. 2014, pp. 1-8. https://doi.org/10.1155/2014/903709

Clague, J.J. and Evans, S.G. (2000). "A review of catastrophic drainage of moraine-dammed lakes in British Columbia". Quaternary Science Reviews, vol. 19(17-18), pp. 1763-1783. https://doi.org/10.1016/S0277-3791(00)00090-1

Cogley, J.G. (2011). "Present and future states of Himalaya and Karakoram glaciers". Annals of Glaciology, vol. 52(59), pp. 69-73. https://doi.org/10.3189/172756411799096277

Cogley, J.G., Hock, R., Rasmussen, L.A., Arendt, A.A., Bauder, A., Braithwaite, R.J., Jansson, P., Kaser, G., Möller, M., Nicholson L., Zemp, M. (2011). "Glossary of Glacier Mass Balance and Related Terms", IHP-VII Technical Documents in Hydrology No. 86, IACS Contribution No. 2, UNESCO-IHP, Paris.

CWC (2019). Basin Details: Indus Basin Organisation - Description about Indus Basin and its Sub Basins. http://cwc.gov.in/ibo/about-basins (page last updated on 11.10.2019)

Emmer, A., Vilímek, V., Huggel, C., Klimes, J., Schaub, Y. (2016). "Limits and challenges to compiling and developing a database of glacial lake outburst floods". Landslides, vol. 13(6), pp. 1579-1584. https://doi.org/10.1007/s10346-016-0686-6

Emmer, A. (2017). "Glacier Retreat and Glacial Lake Outburst Floods (GLOFs)". Oxford Research Encyclopedia of Natural Hazard Science, pp. 1-37. https://doi.org/10.1093/acrefore/9780199389407.013.275

Ganga Basin Report (2014). India-Water Resources Information System: www.india-wris.nrsc.gov.in

Gardelle, J., Arnaud, Y., Berthier, E. (2011). "Contrasted evolution of glacial lakes along the Hindu Kush Himalaya mountain range between 1990 and 2009". Global and Planetary Change, vol. 75(1-2), pp. 47-55. https://doi.org/10.1016/j.gloplacha.2010.10.003

GCW (2016). "Global Cryosphere watch implementation plan", version 1.7. World Meteorological Organization. https://library.wmo.int/opac/doc_num.php?explnum_id=3538

Gupta, A., Guru, N., Maheshwari, R., Sweta, Rao, B.S. (2019). "Inventory of Glacial Lakes in Gilgit Subbasin of Indus Basin using high resolution satellite imagery". Journal of Indian Cartographer, vol. 38, pp. 212-219. https://incaindia.org/cartographic-volume/

Guru, N, Gupta, A., Sweta, Maheshwari, R., Rao, B.S., Raju, P.V., Rao, V.V. (2019). "Identification of potential lakes susceptible to GLOF in Jhelum Subbasin of Indus Basin". In: Naik GM et al., (Eds.), Hydraulics, Water Resources, Coastal and Environmental Engineering, Ch 155, pp. 1452-1462, BS Publications, Hyderabad, India.

Hakeem.K.A and Siva Shankar.E (2011). "Inventory and Monitoring of Glacial Lakes/Water Bodies in the Himalayan Region of Indian River Basins". National Remote Sensing Centre, ISRO, Hyderabad, India, pp. 1-98.

Hewitt, K. (1982). "Natural dams and outburst floods of the Karakoram Himalaya". In: Glen, J.W. (Eds.), Hydrological Aspects of Alpine and High Mountain Area. Proceedings of the Exeter Symposium, July 1982: IAHS Publ. no. 138, pp. 259-269.

Huggel, C., Kääb, A., Haeberli, W., Teysseire, P., Paul, F. (2002). "Remote sensing based assessment of hazards from glacier lake outbursts: a case study in the Swiss Alps". Canadian Geotechnical Journal, vol. 39(2), pp. 316-330. https://doi.org/10.1139/t01-099

Huggel, C., Kääb, A., Salzmann, N. (2006). "Evaluation of QuickBird and Ikonos Imagery for Assessment of High-Mountain Hazards". In: EARSeL eProceedings, vol. 5(1), pp. 51-62. https://doi.org/10.5167/uzh-77921

Husain, M. (2012). "Geography of India". Tata McGraw-Hill Education. ISBN: 978-1-25-900089-8

Ives, J.D., Shrestha, R.B., Mool, P.K. (2010). "Formation of Glacial Lakes in the Hindu-Kush Himalayas and GLOF Risk Assessment". ICIMOD, Kathmandu, Nepal.

Kääb, A. (2000). "Photogrammetry for early recognition of high mountain hazards: new techniques and applications". Physics and Chemistry of the Earth, Part B: Hydrology, Oceans and Atmosphere, vol. 25(9), pp. 765-770. https://doi.org/10.1016/S1464-1909(00)00099-X

Kääb, A., Huggel, C., Paul, F., Wessels, R., Raup, B., Kieffer, H., Kargel, J. (2002). "Glacier monitoring from ASTER imagery: accuracy and applications". In: Proceedings of EARSeL-LISSIG-workshop observing our cryosphere from space, vol. 2, pp. 43-53.

Kirkbride, M.P. (2011). "Debris-covered glaciers". In Singh, V.P. et al., (Eds.). "Encyclopedia of snow, ice and glaciers". Dordrecht: Springer Science + Business Media B.V., pp. 190-191.

Komori, J. (2007). "Recent expansions of glacial lakes in the Bhutan Himalayas". Quaternary International, vol. 184(1), pp. 177-186. https://doi.org/10.1016/j.quaint.2007.09.012

Kulkarni, A.V. (1991). "Glacier inventory in Himachal Pradesh using satellite data". Journal of Indian Society of Remote Sensing, vol. 19(3), pp. 195-203. https://doi.org/10.1007/BF03030771

Liu, C. and Sharma, C.K. (1988). "Report on the first expedition to glaciers and Glacier Lake in the Pumqu (Arun) and Poiqu (Bhote-Kosi) River Basins, Xizang (Tibet)". Science Press (Eds.), Beijing, China.

Maharjan, S.B., Mool, P.K., Lizong, W., Xiao, G., Shrestha, F., Shrestha, R.B., Khanal, N.R., Bajracharya, S.R., Joshi, S., Shai, S., Baral, P. (2018). "The status of glacial lakes in the Hindu Kush Himalaya". ICIMOD Research Report 2018/1. ICIMOD, Kathmandu, Nepal.

Mergili, M., Müller, J.P., Schneider, J.F. (2013). "Spatio-temporal development of high mountain lakes in the headwaters of the Amu Darya River (Central Asia)". Global and Planetary Change, vol. 107, pp. 13-24. https://doi.org/10.1016/j.gloplacha.2013.04.001

Mool, P.K., Bajracharya, S.R., Joshi, S.P. (2001a). "Inventory of Glaciers, Glacial Lakes, and Glacial Lake Outburst Floods: Monitoring and early warning systems in the Hindu Kush-Himalayan Regions - Nepal". ICIMOD, Kathmandu, Nepal. ISBN: 92-9115-331-1, pp. 1-365.

Mool, P.K., Wangda, D., Bajracharya, S.R., Kunzang, K., Gurung, D.R., Joshi, S.P. (2001b). "Inventory of Glaciers, Glacial Lakes, and Glacial Lake Outburst Floods: Monitoring and early warning systems in the Hindu Kush-Himalayan Region - Bhutan". ICIMOD, Kathmandu, Nepal. ISBN: 92-9115-345-1, pp. 1-227.

Mool, P.K. and Bajracharya, S.R. (2003). "Inventory of Glaciers, Glacial Lakes and the Identification of Potential Glacial Lake Outburst Floods (GLOFs) Affected by Global Warming in the Mountains of Himalayan Region: Tista Basin, Sikkim Himalaya, India". ICIMOD, Kathmandu, Nepal, pp. 1-134.

Nagai, H., Ukita, J., Narama, C., Fujita, K., Sakai, A., Tadono, T., Yamanokuchi, T. and Tomiyama, N. (2017). "Evaluating the Scale and Potential of GLOF in the Bhutan Himalayas Using a Satellite-Based Integral Glacier-Glacial Lake Inventory". Geosciences, vol. 7(3), 77, pp. 1-18. https://doi.org/10.3390/geosciences7030077

Nie, Y., Liu, Q., Liu, S. (2013). "Glacial lake expansion in the central Himalayas by Landsat images, 1990-2010". PLoS One, vol. 8(12), e83973. https://doi.org/10.1371/journal.pone.0083973

Nie, Y., Sheng, Y., Liu, Q., Liu, L., Liu, S., Zhang, Y., Song, C. (2017). "A regional-scale assessment of Himalayan glacial lake changes using satellite observations from 1990 to 2015". Remote Sensing of Environment, vol. 189, pp. 1-13. https://doi.org/10.1016/j.rse.2016.11.008

Panda, R., Padhee, S.K., Dutta, S. (2014). "GLOF Study in Tawang River Basin, Arunachal Pradesh, India". In: The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, vol. XL-8, pp. 101-109. https://doi.org/10.5194/isprsarchives-XL-8-101-2014

Pandey, A. (2019). Glossary. In: Wester et al., (Eds.). "The Hindu Kush Himalaya Assessment". Springer Nature, pp. 579-607. https://doi.org/10.1007/978-3-319-92288-1

Panigrahy, S., Patel, J.G., Parihar, J.S. (2012). "National Wetland Atlas: High Altitude Lakes of India" (Eds). Space Application Centre, ISRO, Ahmedabad, India, pp. 1-108.

Pratap, B., Dobhal, D.P., Bhambri, R., Mehta, M., Tewari, V.C. (2016). "Four decades of glacier mass balance observations in the Indian Himalaya". Regional Environmental Change, vol. 16(3), pp. 643-658. https://doi.org/10.1007/s10113-015-0791-4

Raj, K.B.G. (2010). "Remote sensing based hazard assessment of glacial lakes: a case study in Zanskar basin, Jammu and Kashmir, India". Geomatics, Natural Hazards and Risk, vol. 1(4), pp. 339-347. https://doi.org/10.1080/19475705.2010.532973

Raj, K.B.G., Kumar, K.V., Remya, S.N. (2013). "Remote sensing-based inventory of glacial lakes in Sikkim Himalaya: Semiautomated approach using satellite data". Geomatics, Natural Hazards and Risk, vol. 4(3), pp. 241-253. https://doi.org/10.1080/19475705.2012.707153

Roohi, R., Ashraf, R., Naz, R., Hussain, S.A., Chaudhary, M.H. (2005). "Inventory of glaciers and glacial lakes outburst floods (GLOFs) affected by global warming in the mountains of Himalayan region, Indus Basin, Pakistan Himalaya". Report prepared for ICIMOD, Kathmandu, Nepal.

Rounce, D.R., Watson, C.S., McKinney, D.C. (2017). "Identification of hazard and risk for glacial lakes in the Nepal Himalaya using satellite imagery from 2000-2015". Remote Sensing, vol. 9(7), 654, pp. 1-18. https://doi.org/10.3390/rs9070654

Sah, M., Philip, G., Mool, P.K., Bajracharya, S., Shrestha, B. (2005). "Inventory of glaciers and glacial lakes and the identification of potential glacial lake outburst floods (GLOFs) affected by global warming in the mountains of Himalayan region: Uttaranchal Himalaya, India". Unpublished project report, with database on CD-ROM, prepared for APN and ICIMOD, Kathmandu.

Shugar, D.H., Burr, A., Haritashya, U.K., Kargel, J.S., Watson, C.S., Kennedy, M.C., Bevington, A.R., Betts, R.A., Harrison, S., Strattman, K. (2020). "Rapid worldwide growth of glacial lakes since 1990". Nature Climate Change, vol. 10, pp. 939-945. https://doi.org/10.1038/s41558-020-0855-4

U.S. Army Map Service (1955). "University of Texas Libraries, India and Pakistan 1:250,000, Series U505". http://legacy.lib.utexas.edu/maps/ams/india

UNFCCC (2013). "Reporting and accounting of LULUCF activities under the Kyoto Protocol". United Nations

Framework Convention on Climatic Change (UNFCCC), Bonn, Germany. http://unfccc.int/methods/lulucf/items/4129.php

UNISDR (2017). "Terminology on disaster risk reduction". https://www.unisdr.org/we/inform/terminology

Wagnon, P., Linda, A., Arnaud, Y., Kumar, R., Sharma, P., Vincent, C., Pottakkal, J.G., Berthier, E., Ramanathan, A., Hasnain, S.I., Chevallier, P. (2007). "Four years of mass balance on Chhota Shigri Glacier, Himachal Pradesh, India, a new benchmark glacier in the Western Himalaya". Journal of Glaciology, vol. 53(183), pp. 603-611. https://doi.org/10.3189/002214307784409306

Wang, W., Yao, T., Gao, Y., Yang, X., Kattel, D.B. (2011). "A First-order Method to Identify Potentially Dangerous Glacial Lakes in a Region of the Southeastern Tibetan Plateau". Mountain Research and Development, vol. 31(2), pp. 122-130. https://doi.org/10.1659/MRD-JOURNAL-D-10-00059.1

Wang, W., Yang, X., Yao, T. (2012). "Evaluation of ASTER GDEM and SRTM and their suitability in hydraulic modelling of a glacial lake outburst flood in southeast Tibet". Hydrological Processes, vol. 26(2), pp. 213-225. https://doi.org/10.1002/hyp.8127

Wang, X., Ding, Y., Liu, S., Jiang, L., Wu, K., Jiang, Z., Guo, W. (2013). "Changes of glacial lakes and implications in Tian Shan, central Asia, based on remote sensing data from 1990 to 2010". Environmental Research Letters, vol. 8(4), p.044052. https://doi.org/10.1088/1748-9326/8/4/044052

Wang, X., Siegert, F., Zhou, A., Franke, J. (2013). "Glacier and glacial lakes changes and their relationship in the context of climate change, Central Tibetan Plateau 1972-2010". Global and Planetary Change, vol. 111, pp. 246-257. https://doi.org/10.1016/j.gloplacha.2013.09.011

Wangchuk, S., Bolch, T., Zawadzki, J. (2019). "Towards automated mapping and monitoring of potentially dangerous glacial lakes in Bhutan Himalaya using Sentinel-1 Synthetic Aperture Radar data". International Journal of Remote Sensing, vol. 40(12), pp. 4642-4667.

Worni, R., Huggel, C., Stoffel, M. (2013). "Glacial lakes in the Indian Himalayas-from an area-wide glacial lake inventory to on-site and modeling based risk assessment of critical glacial lakes". Science of the Total Environment, vol. 468-469, Supplement, pp. S71-S84. https://doi.org/10.1016/j.scitotenv.2012.11.043

Wu, L., Che, T., Jin, R., Li, X., Gong, T., Xie, Y., Mool, P.K., Bajracharya, S., Shrestha, B., Joshi, S. (2005). "Inventory of glaciers, glacial lakes and the identification of potential glacial lake outburst floods (GLOFs) affected by global warming in the mountains of Himalayan region: Pumqu, Rongxer, Poiqu, Zangbuqin, Jilongcangbu, Majiacangbu, Daoliqu, and Jiazhagangge basins, Tibet Autonomous Region, People's Republic of China". Unpublished project report, with database on CD-ROM, prepared for APN and ICIMOD, Kathmandu.

Yao, X., Liu, S., Han, L., Sun, M., Zhao, L. (2018). "Definition and classification of glacial lake for inventory and hazards study". Journal of Geographical Sciences, vol. 28(2), pp. 193-205. https://doi.org/10.1007/s11442-018-1467-z

Zhang, G., Yao, T., Xie, H., Wang, W., Yang, W. (2015). "An inventory of glacial lakes in the Third Pole region and their changes in response to global warming". Global and Planetary Change, vol. 131, pp. 148-157. https://doi.org/10.1016/j.gloplacha.2015.05.013

Annexure - I: Automatic Identification and Mapping of Glacial Lakes

Overview:

There are several automatic and semi-automatic glacial lake mapping method reported in the literature, but no method produce good and accurate results of mapping. Kääb et al. (2002), attempted the automatic classification of glacial lakes using Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) data, but the algorithm was not robust enough to be applied to other images except ASTER images. Using LANDSAT images, Huggel et al. (2002) suggested the Normalized Difference Water Index (NDWI) according to theory low water reflectance in the NIR band and high reflectance in blue band but glacial lakes get misclassified as shadow area using this method.

Wangchuk et al. (2019), delineated glacial lakes using Sentinel-1 SAR images, a semi-automated approach, based on a radar signal intensity threshold between water and non-water feature classes followed by post-processing including elevations, slopes, vegetation and size thresholds, but drawback still persist as lakes which are severely affected by the wind and waves that increase the roughness and thus the backscatter would neither be identified correctly, partially or at all, due to the use of a single threshold. Hence, to ensure correct classifications of lakes, visual inspection of images and quality control is required for final accurate results.

Mapping methods:

The NDWI, which provides an automatic way to detect water bodies including glacial lakes was adopted by many researchers for inventorying purpose. It is a ratio combining two different spectral bands that enhance water spectral signals by contrasting the reflectance between different wavelengths and removing a large portion of noise components in different wavelengths, can be expressed as:

$$NDWI = (Green\ Band - NIR\ Band) / (Green\ Band + NIR\ Band)$$

Other than NDWI, two more pixel-based classification techniques i.e. supervised (by giving homogeneous signature sites) and unsupervised (by giving certain number of feature classes to classify based on spectral behavior) classification techniques can also be applied. Object-based classification using eCognition software can also be done using various factors like by giving threshold values and suitable membership functions, by including indices like NDWI, Normalized Difference Vegetation Index (NDVI) and Normalized Difference Glacier Index (NDGI), and by using layers such as slope and NIR band.

Mapping results:

A study was attempted using RS-2 LISS-IV data to compare the mapping accuracy of lakes using 4 automated methods (NDWI, Supervised, Unsupervised and Object based) with visual interpretation method. All four automatic mapping methods along with visual interpretation technique were used in an area which has deep water bodies and snow covered glacial lakes along with shadowed region (upper mountainous parts of Teesta basin). Using NDWI method, most of lakes got classified, but it also classify shadow areas as water pixels due to the similar spectral reflectance conditions. Even if the threshold value of NDWI is changed in such a way that all water pixels

in a lake should get classified, many deep water bodies and shadowed portions having same spectral reflectance values will get misclassified as water pixels or in some glacial lakes water pixels are missing.

Unsupervised classification technique misclassifies not only shadows as lakes, but also some part of glaciers that are in retreating condition and having similar spectral reflectance values of lakes (light blue in colour). In supervised classification output, with good amount of signature sites, cloud/mountain shadows are classified as water pixels. Overall, using pixel-based classification methods, it is difficult to distinguish between deep water bodies and shadows as they have same spectral reflectance values. Pixel-based classified output of all three methods along with the total area of lakes in the study area is shown in Figure 83.

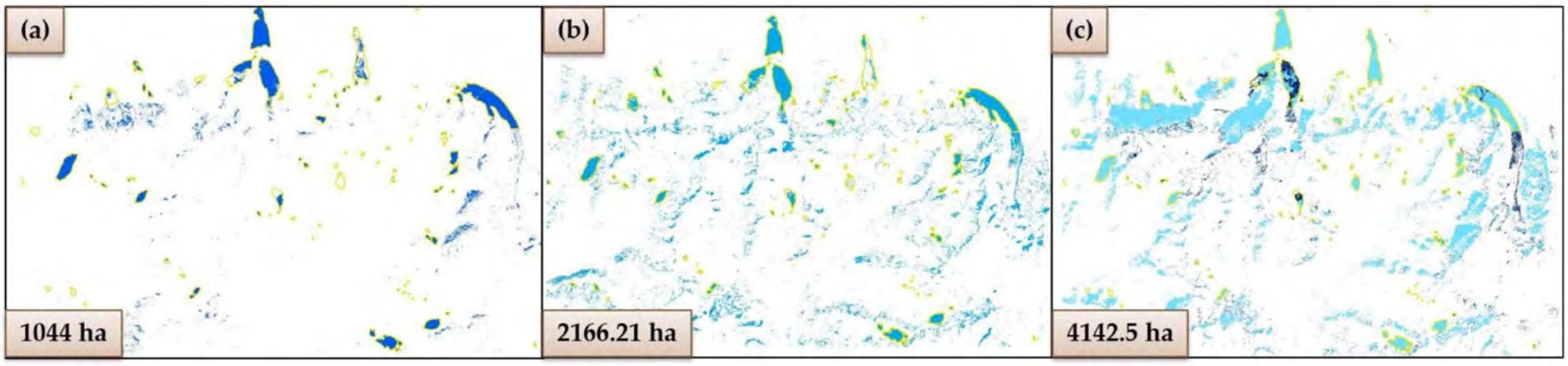


Figure 83: Pixel-based classified output, (a): NDWI, (b): Supervised, (c): Unsupervised

Using object-based classification method, along with various layers like slope (as the glacial lakes are located at higher elevation) and NIR band, results misclassification of shadows, though it is less in comparison to the pixel-based classified output, but at many locations water pixels are not classified. Also, if we compare the areas of lakes that is being classified using automatic method that with the area of manually mapped lakes, automatic mapped lakes has huge difference and extent of misclassification, which need to be corrected again using visual interpretation method. Figure 84 shows the comparison of the glacial lake extents of object-based classification and manual mapping using visual interpretation keys.

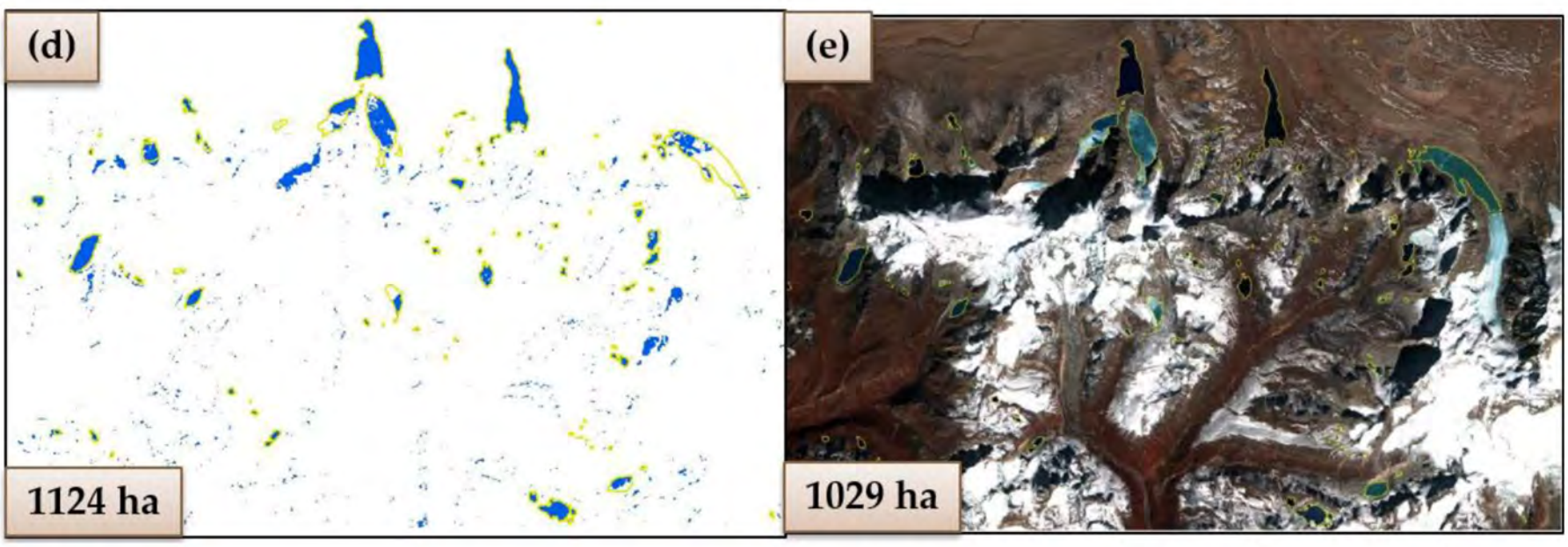


Figure 84: (d): Object-based classified output, (e) manual mapping output

Annexure - II: List of Glacial Lakes

Each lake is given a unique ID, formatted in 12 alpha-numeric character. First two digit of ID refers to the basin code, next five characters refers to the SOI 250k and 50K Toposheet No., and the last five digit refers to the sequential number of each lake sorted from top left to bottom right. For example:

03	78A01		15656
	78A	01	
Basin Code	SOI 250K Toposheet No.	SOI 50K Toposheet No.	Lake No.

Table 68 shows the details of 2,431 glacial lakes (≥10 ha) mapped in the Indian Himalayan River Basins along with few important attributes.

Table 68: List of glacial lakes (≥10 ha) of the Indian Himlayan River Basins with few attributes

S.No.	Glacial Lake ID No	Lat	Long	Subbasin	GL Type	Area (ha)	Elev (m)
1	01 42D15 00009	36.412	72.901	Gilgit	M(e)	11.23	4,256
2	01 42H03 00089	36.263	73.048	Gilgit	0	21.68	4,618
3	01 42H06 00150	36.642	73.407	Gilgit	M(e)	14.06	2,748
4	01 42H08 00166	36.131	73.384	Gilgit	E(o)	23.35	4,503
5	01 42H08 00171	36.116	73.423	Gilgit	E(o)	21.76	4,437
6	01 42H08 00173	36.112	73.449	Gilgit	E(o)	11.22	4,427
7	01 42H08 00174	36.108	73.465	Gilgit	E(o)	21.58	4,488
8	01 42H08 00179	36.086	73.461	Gilgit	E(o)	13.98	4,577
9	01 42H08 00185	36.024	73.328	Gilgit	E(o)	10.65	4,559
10	01 42H08 00198	36.000	73.312	Gilgit	E(o)	13.08	4,615
11	01 42H09 00200	36.879	73.704	Gilgit	0	262.57	4,286
12	01 42H10 00208	36.644	73.646	Gilgit	0	105.07	3,821
13	01 42H11 00220	36.431	73.566	Gilgit	E(o)	12.25	4,030
14	01 42H11 00230	36.351	73.514	Gilgit	E(o)	17.25	4,420
15	01 42H12 00249	36.154	73.616	Gilgit	E(o)	13.83	4,545
16	01 42H12 00250	36.145	73.639	Gilgit	E(o)	17.96	4,484
17	01 42H12 00253	36.129	73.505	Gilgit	E(o)	23.11	4,482
18	01 42H12 00262	36.096	73.668	Gilgit	E(c)	10.48	4,423
19	01 42H12 00268	36.080	73.646	Gilgit	0	28.87	4,344
20	01 42H12 00295	36.039	73.592	Gilgit	E(o)	18.87	4,274
21	01 42H12 00301	36.030	73.714	Gilgit	E(o)	10.47	4,320
22	01 42H12 00327	36.011	73.558	Gilgit	E(o)	24.48	4,232
23	01 42H15 00357	36.265	73.955	Gilgit	0	27.89	3,706
24	01 42L04 00386	36.239	74.084	Gilgit	E(o)	20.57	3,453
25	01 42P04 00481	36.137	75.136	Gilgit	I(s)	24.88	3,697
26	01 42P04 00492	36.126	75.140	Gilgit	I(s)	12.99	3,725
27	01 42P11 00571	36.440	75.686	Gilgit	E(o)	28.09	4,709
28	01 43A09 00583	35.994	72.613	Gilgit	0	201.58	3,622
29	01 43A09 00591	35.944	72.595	Gilgit	0	96.35	3,761
30	01 43A13 00645	35.869	72.940	Gilgit	E(o)	20.01	4,378
31	01 43A13 00649	35.855	72.980	Gilgit	E(v)	13.35	4,325
32	01 43E01 00682	35.920	73.064	Gilgit	0	21.34	4,303
33	01 43E01 00689	35.906	73.155	Gilgit	E(o)	24.24	4,328
34	01 43E01 00708	35.871	73.073	Gilgit	E(o)	15.95	4,617
35	01 43E01 00726	35.829	73.228	Indus Middle	E(o)	12.38	4,195
36	01 43E01 00728	35.825	73.211	Indus Middle	E(c)	26.44	4,271
37	01 43E02 00735	35.730	73.216	Indus Middle	E(o)	26.36	3,970
38	01 43E05 00742	35.987	73.313	Gilgit	E(o)	10.23	4,583
39	01 43E05 00757	35.962	73.397	Gilgit	E(o)	18.84	4,349
40	01 43E05 00769	35.949	73.289	Gilgit	E(o)	54.23	4,228
41	01 43E05 00774	35.945	73.365	Gilgit	E(c)	67.34	4,162
42	01 43E05 00781	35.936	73.269	Indus Middle	E(o)	11.45	4,362
43	01 43E05 00790	35.925	73.274	Indus Middle	E(o)	11.46	4,227
44	01 43E05 00791	35.925	73.342	Indus Middle	E(o)	11.69	4,396
45	01 43E05 00795	35.918	73.371	Gilgit	E(o)	12.25	4,502
46	01 43E05 00837	35.817	73.297	Indus Middle	0	15.36	2,981
47	01 43E06 00854	35.739	73.256	Indus Middle	E(c)	18.92	4,016
48	01 43E06 00855	35.675	73.344	Indus Middle	E(c)	25.12	3,428
49	01 43E06 00856	35.652	73.357	Indus Middle	E(o)	19.01	3,735
50	01 43E06 00858	35.643	73.352	Indus Middle	E(o)	13.95	3,747
51	01 43E09 00912	35.904	73.568	Gilgit	E(o)	18.03	4,109
52	01 43E09 00919	35.889	73.692	Gilgit	E(o)	11.02	3,995
53	01 43E09 00928	35.880	73.577	Gilgit	E(c)	30.86	4,059
54	01 43E09 00929	35.877	73.615	Gilgit	E(o)	14.58	3,993
55	01 43E09 00941	35.865	73.746	Gilgit	E(o)	84.31	4,140
56	01 43E09 00961	35.783	73.507	Indus Middle	E(o)	12.26	3,918
57	01 43E09 00962	35.782	73.572	Indus Middle	E(o)	22.07	4,082
58	01 43E13 00983	35.972	73.911	Gilgit	E(c)	29.25	4,426
59	01 43E13 01005	35.939	73.985	Gilgit	E(o)	19.57	4,258
60	01 43E13 01012	35.917	73.945	Gilgit	E(o)	12.08	4,178
61	01 43E13 01013	35.916	73.992	Gilgit	E(o)	11.42	4,312
62	01 43E13 01022	35.906	73.922	Gilgit	E(o)	15.98	4,223
63	01 43E13 01036	35.882	73.763	Gilgit	E(o)	40.94	4,104
64	01 43E13 01045	35.868	73.929	Gilgit	E(o)	17.55	4,064
65	01 43E13 01053	35.858	73.869	Gilgit	E(o)	15.26	4,211
66	01 43E13 01054	35.856	73.775	Indus Middle	E(o)	28.28	3,962
67	01 43E13 01057	35.852	73.877	Gilgit	E(o)	19.43	4,166
68	01 43E16 01082	35.247	73.799	Indus Middle	E(o)	17.06	3,988
69	01 43E16 01096	35.184	73.958	Indus Middle	E(o)	10.49	4,120
70	01 43F13 01107	34.830	73.985	Jhelum	E(o)	20.67	3,873
71	01 43I01 01122	35.962	74.019	Gilgit	E(o)	15.37	4,285
72	01 43I01 01141	35.817	74.083	Gilgit	E(c)	16.71	4,269
73	01 43I01 01158	35.779	74.205	Gilgit	E(o)	12.36	4,304
74	01 43I01 01159	35.773	74.196	Gilgit	E(c)	11.01	4,368
75	01 43I02 01186	35.707	74.243	Indus Middle	E(o)	15.89	4,318
76	01 43I02 01192	35.686	74.230	Indus Middle	E(o)	14.12	4,336
77	01 43I04 01224	35.073	74.177	Jhelum	E(c)	11.97	4,042
78	01 43I05 01239	35.821	74.294	Gilgit	E(c)	12.04	4,313
79	01 43I06 01249	35.722	74.256	Indus Middle	E(o)	10.77	4,254
80	01 43I11 01289	35.400	74.676	Indus Middle	E(o)	13.97	3,386
81	01 43I15 01319	35.332	74.941	Indus Middle	E(o)	11.74	4,427
82	01 43I15 01320	35.330	74.786	Indus Middle	M(l)	15.07	3,475
83	01 43I15 01322	35.315	74.937	Indus Middle	M(e)	20.13	4,197
84	01 43I16 01333	35.082	74.961	Indus Middle	E(o)	30.64	4,317
85	01 43I16 01334	35.075	74.958	Indus Middle	E(o)	10.45	4,413
86	01 43J01 01345	34.962	74.100	Jhelum	E(o)	29.65	3,603
87	01 43J01 01350	34.948	74.138	Jhelum	E(c)	20.03	4,011
88	01 43J01 01352	34.926	74.155	Jhelum	E(c)	21.64	3,926
89	01 43J01 01353	34.902	74.048	Jhelum	E(c)	21.58	3,896
90	01 43J01 01360	34.858	74.077	Jhelum	E(c)	20.51	3,680
91	01 43J01 01363	34.829	74.062	Jhelum	E(c)	93.90	3,681
92	01 43J05 01374	34.876	74.477	Jhelum	E(c)	12.31	3,592
93	01 43J09 01397	34.920	74.521	Jhelum	M(e)	60.60	4,041
94	01 43J09 01404	34.908	74.680	Indus Middle	E(c)	23.48	3,864
95	01 43J09 01414	34.849	74.523	Jhelum	E(c)	22.54	4,016
96	01 43J09 01417	34.840	74.676	Jhelum	E(c)	10.66	3,868
97	01 43J13 01448	34.846	74.787	Indus Middle	E(o)	14.18	3,883
98	01 43J13 01449	34.845	74.809	Indus Middle	E(c)	50.44	3,992
99	01 43J13 01450	34.840	74.761	Indus Middle	E(c)	25.43	3,979
100	01 43J14 01457	34.548	74.819	Jhelum	E(c)	31.47	3,872

S.No.	Glacial Lake ID No	Lat	Long	Subbasin	GL Type	Area (ha)	Elev (m)
101	01 43J14 01458	34.537	74.828	Jhelum	E(c)	30.51	3,922
102	01 43J15 01462	34.493	74.921	Jhelum	E(o)	38.39	3,881
103	01 43J15 01464	34.489	74.906	Jhelum	E(c)	11.89	4,097
104	01 43J15 01467	34.470	74.913	Jhelum	E(o)	10.44	3,852
105	01 43J15 01473	34.457	74.985	Jhelum	M(o)	10.33	3,748
106	01 43J15 01480	34.452	74.932	Jhelum	E(o)	12.30	3,889
107	01 43J15 01485	34.448	74.909	Jhelum	E(c)	15.48	3,979
108	01 43J15 01486	34.444	74.892	Jhelum	E(c)	33.95	3,846
109	01 43J15 01489	34.432	74.924	Jhelum	E(c)	161.04	3,571
110	01 43J15 01493	34.418	74.936	Jhelum	E(o)	36.65	3,503
111	01 43J15 01499	34.392	74.874	Jhelum	E(o)	27.31	3,556
112	01 43J15 01500	34.385	74.944	Jhelum	E(c)	11.22	3,722
113	01 43J15 01501	34.380	74.876	Jhelum	E(o)	11.58	3,738
114	01 43K05 01515	33.866	74.417	Jhelum	E(c)	13.62	3,968
115	01 43K05 01525	33.841	74.428	Jhelum	E(o)	45.46	3,954
116	01 43K05 01527	33.829	74.435	Jhelum	E(o)	15.18	4,043
117	01 43K05 01528	33.820	74.451	Jhelum	E(c)	29.43	3,997
118	01 43K10 01537	33.740	74.526	Jhelum	E(o)	10.16	4,018
119	01 43K10 01538	33.735	74.523	Jhelum	E(o)	13.69	4,064
120	01 43K10 01544	33.559	74.526	Jhelum	E(o)	22.97	3,851
121	01 43K10 01546	33.550	74.543	Jhelum	E(o)	16.04	3,912
122	01 43K10 01550	33.540	74.523	Jhelum	E(o)	10.32	3,812
123	01 43K10 01551	33.540	74.565	Jhelum	E(o)	21.73	3,967
124	01 43K10 01554	33.536	74.555	Jhelum	E(o)	31.85	4,006
125	01 43K10 01558	33.530	74.574	Jhelum	E(o)	12.27	3,955
126	01 43K10 01559	33.528	74.561	Jhelum	E(c)	11.15	4,096
127	01 43K10 01560	33.522	74.605	Jhelum	E(o)	12.33	3,844
128	01 43K10 01561	33.519	74.584	Jhelum	E(o)	70.83	3,934
129	01 43K10 01565	33.510	74.564	Jhelum	E(o)	25.15	3,909
130	01 43K10 01567	33.509	74.625	Jhelum	E(o)	33.70	3,937
131	01 43K10 01568	33.505	74.594	Jhelum	E(c)	11.35	4,089
132	01 43K11 01571	33.496	74.565	Jhelum	E(o)	11.18	3,812
133	01 43K11 01582	33.444	74.614	Chenab	E(c)	14.88	3,580
134	01 43K14 01588	33.512	74.769	Jhelum	0	128.54	3,486
135	01 43K14 01591	33.503	74.850	Jhelum	E(o)	14.64	3,623
136	01 43M03 01632	35.264	75.194	Indus Middle	E(o)	19.03	4,551
137	01 43M04 01638	35.231	75.182	Indus Middle	E(o)	11.26	4,547
138	01 43M04 01664	35.119	75.228	Indus Upper	E(o)	17.81	4,586
139	01 43M04 01679	35.049	75.198	Indus Middle	E(c)	12.71	4,398
140	01 43M04 01682	35.016	75.001	Indus Middle	E(o)	10.87	3,931
141	01 43M08 01717	35.182	75.422	Indus Middle	E(o)	14.33	4,530
142	01 43M08 01728	35.143	75.261	Indus Upper	E(o)	11.84	4,659
143	01 43M08 01730	35.132	75.321	Indus Upper	E(o)	19.58	4,526
144	01 43M12 01758	35.172	75.521	Indus Upper	E(o)	10.30	4,551
145	01 43M12 01776	35.096	75.579	Indus Middle	E(o)	10.98	4,375
146	01 43M12 01789	35.027	75.725	Indus Upper	E(o)	12.92	4,647
147	01 43N01 01839	34.991	75.236	Indus Upper	0	129.62	4,138
148	01 43N01 01842	34.972	75.051	Indus Middle	E(c)	14.29	4,265
149	01 43N01 01852	34.922	75.250	Indus Upper	E(o)	14.22	4,152
150	01 43N01 01854	34.920	75.177	Indus Upper	E(o)	14.54	4,257
151	01 43N01 01856	34.919	75.189	Indus Upper	E(o)	14.34	4,225
152	01 43N02 01885	34.697	75.137	Jhelum	E(o)	64.95	4,103
153	01 43N02 01889	34.684	75.140	Jhelum	E(o)	21.41	4,133
154	01 43N02 01897	34.666	75.179	Jhelum	E(o)	74.54	4,234
155	01 43N03 01929	34.422	75.058	Jhelum	E(c)	40.12	3,570
156	01 43N03 01932	34.397	75.103	Jhelum	E(c)	29.55	3,812
157	01 43N03 01937	34.388	75.119	Jhelum	E(c)	47.25	3,663
158	01 43N04 01966	34.207	75.147	Jhelum	E(o)	10.35	3,699
159	01 43N04 01967	34.203	75.205	Jhelum	E(o)	15.92	3,682
160	01 43N04 01973	34.156	75.113	Jhelum	E(o)	10.27	3,941
161	01 43N04 01974	34.144	75.110	Jhelum	E(o)	43.47	3,810
162	01 43N04 01975	34.140	75.148	Jhelum	E(c)	82.93	3,780
163	01 43N04 01978	34.093	75.161	Jhelum	E(o)	17.80	3,919
164	01 43N04 01979	34.063	75.216	Jhelum	E(o)	13.36	3,691
165	01 43N05 01997	34.825	75.382	Indus Upper	E(c)	22.94	4,315
166	01 43N05 02010	34.775	75.480	Indus Upper	E(o)	10.80	4,626
167	01 43N08 02045	34.234	75.275	Jhelum	E(o)	18.23	3,830
168	01 43N08 02049	34.193	75.321	Jhelum	E(c)	10.81	3,734
169	01 43N08 02050	34.184	75.373	Jhelum	E(c)	16.80	4,276
170	01 43N08 02055	34.139	75.377	Jhelum	E(o)	33.45	3,709
171	01 43N08 02065	34.094	75.498	Jhelum	0	52.27	3,575
172	01 43N08 02066	34.067	75.475	Jhelum	E(o)	17.85	3,724
173	01 43N09 02074	34.987	75.553	Indus Upper	E(o)	17.86	4,269
174	01 43N09 02078	34.965	75.545	Indus Upper	E(o)	13.70	4,412
175	01 43N09 02089	34.947	75.592	Indus Upper	E(o)	24.89	4,558
176	01 43N09 02115	34.896	75.617	Indus Upper	E(o)	11.97	4,547
177	01 43N09 02117	34.893	75.713	Indus Upper	E(o)	19.39	4,589
178	01 43N09 02124	34.883	75.680	Indus Upper	E(o)	13.31	4,627
179	01 43N09 02126	34.873	75.716	Indus Upper	E(o)	15.83	4,664
180	01 43N09 02149	34.808	75.545	Indus Upper	E(o)	12.86	4,687
181	01 43N11 02173	34.491	75.649	Indus Upper	E(o)	15.37	4,521
182	01 43N13 02194	34.947	75.763	Indus Upper	E(o)	25.14	4,778
183	01 43N13 02207	34.888	75.892	Indus Upper	E(o)	10.29	4,882
184	01 43N13 02212	34.878	75.871	Indus Upper	E(o)	18.96	4,687
185	01 43N13 02218	34.859	75.942	Indus Upper	E(o)	13.73	4,796
186	01 43N16 02259	34.040	75.844	Indus Upper	M(e)	25.26	4,094
187	01 43O05 02269	33.953	75.378	Jhelum	E(o)	15.37	3,644
188	01 43O05 02270	33.952	75.411	Chenab	E(c)	26.79	4,082
189	01 43O05 02273	33.929	75.389	Jhelum	E(c)	19.34	4,048
190	01 43O05 02294	33.754	75.470	Jhelum	E(o)	10.88	3,921
191	01 43O06 02296	33.619	75.537	Chenab	E(c)	10.85	3,852
192	01 52A01 02354	35.954	76.030	Indus Middle	M(l)	10.62	4,276
193	01 52A04 02407	35.171	76.205	Shyok	0	30.72	3,301
194	01 52A04 02408	35.097	76.234	Shyok	E(o)	22.96	4,512
195	01 52A06 02465	35.730	76.410	Indus Middle	M(l)	13.28	4,161
196	01 52A06 02485	35.720	76.375	Indus Middle	M(l)	12.14	4,140
197	01 52A08 02503	35.092	76.252	Shyok	M(e)	24.01	4,533
198	01 52A08 02509	35.074	76.293	Shyok	E(c)	12.08	4,599
199	01 52A08 02513	35.056	76.261	Indus Upper	E(o)	16.89	4,881
200	01 52A08 02526	35.011	76.320	Indus Upper	E(o)	15.36	4,753
201	01 52B03 02731	34.351	76.075	Indus Upper	M(e)	10.63	4,435
202	01 52B05 02771	34.854	76.383	Indus Upper	E(o)	13.61	4,688
203	01 52B05 02772	34.854	76.368	Indus Upper	E(o)	13.27	4,821
204	01 52B05 02780	34.833	76.352	Indus Upper	E(o)	10.34	4,818
205	01 52B05 02784	34.827	76.456	Shyok	E(o)	19.82	4,648
206	01 52B05 02787	34.818	76.409	Indus Upper	E(o)	10.20	4,816
207	01 52B05 02808	34.772	76.500	Indus Upper	E(o)	10.53	4,761
208	01 52B05 02816	34.762	76.469	Indus Upper	E(o)	17.67	4,895
209	01 52B09 02844	34.813	76.517	Shyok	E(o)	20.60	4,771
210	01 52B09 02845	34.811	76.502	Shyok	E(o)	12.91	4,762
211	01 52B09 02855	34.765	76.711	Shyok	E(o)	10.06	5,123
212	01 52B12 02878	34.051	76.718	Indus Upper	M(e)	15.80	5,093
213	01 52B12 02881	34.005	76.721	Indus Upper	M(e)	18.32	5,050
214	01 52B14 02898	34.671	76.758	Shyok	E(o)	29.88	4,965
215	01 52B16 02938	34.006	76.788	Indus Upper	M(e)	14.15	5,126
216	01 52C01 02941	33.945	76.230	Indus Upper	M(e)	49.66	4,357
217	01 52C01 02942	33.942	76.019	Chenab	M(e)	24.05	4,197
218	01 52C01 02950	33.868	76.121	Chenab	M(e)	39.44	4,071
219	01 52C05 03044	33.844	76.375	Indus Upper	M(e)	18.49	4,116
220	01 52C06 03061	33.507	76.450	Chenab	0	16.41	4,219
221	01 52C16 03156	33.159	76.984	Indus Upper	M(e)	59.78	4,479
222	01 52D07 03191	32.336	76.332	Ravi	E(o)	25.65	3,971
223	01 52E11 03389	35.476	77.513	Shyok	M(lg)	21.93	5,342
224	01 52E12 03425	35.032	77.700	Shyok	M(l)	18.02	5,161
225	01 52E16 03441	35.060	77.856	Shyok	0	32.78	4,679
226	01 52F09 03545	34.905	77.616	Shyok	M(e)	14.51	5,125
227	01 52F15 03582	34.398	77.983	Shyok	M(e)	28.02	5,344
228	01 52G10 03609	33.556	77.664	Indus Upper	0	10.15	5,222
229	01 52G13 03615	33.999	77.979	Shyok	0	43.72	4,991
230	01 52H02 03651	32.526	77.220	Chenab	M(e)	77.59	4,069
231	01 52H11 03771	32.499	77.547	Chenab	M(e)	128.69	4,150
232	01 52H11 03772	32.483	77.615	Chenab	E(o)	47.30	4,276
233	01 52J02 03794	34.521	78.090	Shyok	M(e)	10.62	5,270
234	01 52J02 03796	34.520	78.101	Shyok	M(e)	10.28	5,265
235	01 52J03 03811	34.457	78.136	Shyok	M(o)	95.68	5,295
236	01 52J03 03815	34.446	78.143	Shyok	M(e)	20.53	5,311
237	01 52J03 03821	34.401	78.079	Shyok	M(e)	20.39	5,307
238	01 52J03 03822	34.390	78.089	Shyok	E(o)	11.16	5,226
239	01 52J08 03836	34.233	78.426	Shyok	0	64.78	5,350
240	01 52J12 03865	34.200	78.516	Shyok	E(o)	24.44	5,386
241	01 52J12 03868	34.151	78.553	Shyok	E(o)	65.02	5,566
242	01 52K03 03890	33.281	78.230	Indus Upper	E(o)	34.70	5,646
243	01 52K04 03898	33.137	78.197	Indus Upper	M(o)	10.30	5,733
244	01 52K07 03937	33.496	78.498	Shyok	E(o)	16.54	5,428
245	01 52K07 03939	33.455	78.498	Shyok	0	147.89	5,308
246	01 52K07 03940	33.427	78.488	Shyok	0	177.73	5,284
247	01 52K08 03964	33.055	78.470	Satluj	M(o)	36.49	5,745
248	01 52K10 03984	33.558	78.506	Shyok	E(c)	25.33	5,665

S.No.	Glacial Lake ID No	Lat	Long	Subbasin	GL Type	Area (ha)	Elev (m)
249	01 52K10 03986	33.517	78.519	Shyok	E(o)	13.66	5,404
250	01 52K11 03987	33.474	78.502	Shyok	0	15.10	5,312
251	01 52L07 04043	32.363	78.272	Satluj	M(e)	13.59	5,357
252	01 52L10 04049	32.736	78.726	Indus Upper	M(e)	34.79	5,626
253	01 52L15 04075	32.492	78.852	Indus Upper	M(e)	11.12	5,706
254	01 52L15 04080	32.441	78.925	Indus Upper	M(e)	10.65	5,680
255	01 52L15 04092	32.409	78.900	Indus Upper	M(e)	30.44	5,468
256	01 52L15 04109	32.320	78.979	Satluj	M(o)	10.51	5,498
257	01 52L16 04178	32.029	78.845	Satluj	M(e)	15.62	5,621
258	01 52P04 04252	32.210	79.044	Satluj	0	21.55	5,272
259	01 52P07 04308	32.377	79.393	Satluj	0	24.86	5,448
260	01 52P11 04322	32.399	79.622	Indus Upper	E(o)	23.72	5,058
261	01 52P11 04326	32.389	79.659	Indus Upper	M(e)	12.30	5,720
262	01 52P11 04368	32.298	79.662	Indus Upper	E(o)	17.15	5,690
263	01 53I02 04530	31.661	78.168	Satluj	M(e)	23.20	4,255
264	01 53I07 04552	31.339	78.254	Satluj	M(o)	11.46	4,676
265	01 53I13 04615	31.993	78.845	Satluj	M(e)	20.90	5,613
266	01 53I13 04639	31.919	78.784	Satluj	M(e)	13.44	5,351
267	01 53I13 04640	31.914	78.840	Satluj	M(e)	18.03	5,583
268	01 53I14 04650	31.554	78.751	Satluj	M(e)	10.67	5,276
269	01 53M13 04700	31.984	79.958	Indus Upper	M(e)	15.73	5,544
270	01 53M13 04720	31.950	79.986	Indus Upper	M(e)	10.43	5,449
271	01 53M13 04722	31.937	79.994	Indus Upper	M(e)	14.46	5,494
272	01 53M13 04727	31.925	79.865	Satluj	E(o)	31.43	5,356
273	01 53M13 04734	31.909	79.988	Indus Upper	E(o)	14.06	5,558
274	01 53M13 04738	31.900	79.986	Indus Upper	E(c)	10.24	5,663
275	01 53M13 04741	31.878	79.984	Indus Upper	E(o)	27.77	5,514
276	01 61B03 04748	34.282	80.090	Shyok	M(e)	25.66	5,697
277	01 61B15 04755	34.324	80.840	Shyok	M(lg)	13.22	5,742
278	01 61B15 04757	34.316	80.858	Shyok	I(d)	232.34	5,709
279	01 61B15 04760	34.307	80.982	Shyok	M(e)	42.60	5,729
280	01 61D15 04804	32.423	80.865	Indus Upper	0	58.84	4,452
281	01 61F03 04813	34.299	81.202	Shyok	0	61.15	5,274
282	01 61F07 04829	34.341	81.257	Shyok	E(o)	51.89	5,298
283	01 62A01 04838	31.900	80.001	Indus Upper	E(o)	20.08	5,476
284	01 62A01 04839	31.881	79.999	Indus Upper	E(o)	13.93	5,511
285	01 62A10 04888	31.694	80.664	Indus Upper	M(e)	14.11	5,532
286	01 62A15 04911	31.499	80.948	Indus Upper	0	19.60	5,238
287	01 62A15 04913	31.495	80.985	Indus Upper	0	24.74	5,386
288	01 62A15 04919	31.474	80.992	Indus Upper	0	26.90	5,408
289	01 62B06 04942	30.552	80.400	Satluj	M(e)	26.56	4,990
290	01 62B11 04954	30.477	80.592	Satluj	M(e)	12.63	5,263
291	01 62E01 04958	31.985	81.063	Indus Upper	0	11.79	4,734
292	01 62E03 04961	31.442	81.157	Indus Upper	0	13.01	5,240
293	01 62E03 04969	31.285	81.032	Satluj	M(e)	13.53	5,617
294	01 62E03 04970	31.285	81.176	Indus Upper	E(o)	18.10	5,171
295	01 62E03 04979	31.260	81.133	Indus Upper	E(o)	12.43	5,530
296	01 62E04 04993	31.234	81.138	Satluj	M(e)	10.92	5,562
297	01 62E04 05008	31.182	81.195	Satluj	E(o)	52.48	5,413
298	01 62E04 05012	31.179	81.152	Satluj	M(e)	19.91	5,514
299	01 62E04 05027	31.153	81.243	Indus Upper	E(o)	15.57	5,651
300	01 62E11 05111	31.284	81.631	Indus Upper	0	25.89	5,259
301	01 62E11 05114	31.274	81.595	Indus Upper	0	156.89	5,229
302	01 62E11 05115	31.272	81.518	Indus Upper	0	28.77	5,172
303	01 62F07 05179	30.431	81.433	Satluj	E(o)	192.62	5,484
304	01 62F07 05180	30.430	81.463	Satluj	M(o)	13.70	5,572
305	01 62F07 05190	30.416	81.468	Satluj	M(e)	10.02	5,603
306	01 62F07 05197	30.409	81.476	Satluj	M(o)	11.76	5,542
307	01 62F10 05203	30.515	81.702	Satluj	E(o)	10.17	4,818
308	01 62F11 05218	30.430	81.714	Satluj	E(o)	23.45	5,184
309	01 62F11 05221	30.421	81.721	Satluj	E(o)	18.94	5,247
310	01 62F11 05228	30.393	81.533	Satluj	E(o)	17.49	5,128
311	01 62F15 05243	30.463	81.993	Satluj	0	20.76	5,161
312	01 62F15 05253	30.427	81.871	Satluj	E(o)	21.31	5,338
313	01 62F15 05256	30.419	81.868	Satluj	E(o)	14.11	5,356
314	01 62F15 05269	30.399	81.853	Satluj	M(e)	13.91	5,722
315	01 62F15 05278	30.392	81.964	Satluj	M(e)	20.83	5,675
316	01 62F15 05285	30.390	81.818	Satluj	M(e)	14.51	5,544
317	01 62F15 05286	30.390	81.895	Satluj	M(e)	10.27	5,441
318	01 62F15 05295	30.385	81.930	Satluj	M(e)	59.79	5,224
319	01 62F15 05296	30.385	81.841	Satluj	M(e)	12.42	5,571
320	01 62J02 05311	30.592	82.084	Satluj	E(o)	10.15	5,382
321	01 62J03 05333	30.376	82.020	Satluj	M(e)	11.62	5,493
322	02 53I04 00008	31.231	78.211	Yamuna	E(o)	10.66	4,264
323	02 53I07 00018	31.260	78.255	Yamuna	E(c)	15.10	4,403
324	02 53J14 00068	30.746	78.987	Bhagirathi	M(e)	25.56	4,734
325	02 53N05 00173	30.976	79.460	Alaknanda	M(e)	17.02	5,537
326	02 53N09 00232	30.904	79.747	Alaknanda	I(s)	11.05	4,683
327	02 53N09 00235	30.901	79.746	Alaknanda	I(s)	11.41	4,689
328	02 53N13 00271	30.901	79.754	Alaknanda	M(e)	22.04	4,677
329	02 62B02 00331	30.565	80.179	Sarda	M(e)	17.81	4,872
330	02 62B07 00349	30.446	80.387	Sarda	M(e)	10.00	4,306
331	02 62B11 00358	30.392	80.532	Sarda	M(e)	11.21	4,753
332	02 62B15 00372	30.402	80.784	Humla	M(e)	43.35	5,088
333	02 62B15 00379	30.347	80.886	Humla	E(o)	12.47	5,253
334	02 62F07 00441	30.424	81.330	Humla	M(o)	12.68	5,807
335	02 62F07 00447	30.417	81.427	Humla	0	17.88	5,496
336	02 62F07 00453	30.405	81.427	Humla	0	11.18	5,472
337	02 62F07 00461	30.378	81.421	Humla	E(o)	25.56	5,659
338	02 62F07 00464	30.364	81.376	Humla	E(o)	10.33	5,756
339	02 62F07 00475	30.343	81.413	Humla	E(o)	30.39	5,734
340	02 62F07 00485	30.322	81.376	Humla	M(e)	13.96	5,542
341	02 62F07 00489	30.319	81.445	Humla	M(o)	12.20	5,497
342	02 62F07 00494	30.312	81.409	Humla	M(e)	13.27	5,634
343	02 62F07 00500	30.302	81.399	Humla	M(e)	11.68	5,580
344	02 62F07 00504	30.297	81.388	Humla	M(e)	26.15	5,516
345	02 62F07 00520	30.266	81.349	Humla	M(e)	20.37	5,207
346	02 62F08 00523	30.233	81.350	Humla	M(e)	26.79	5,297
347	02 62F11 00543	30.254	81.689	Humla	0	27.78	4,264
348	02 62F12 00548	30.378	81.574	Humla	0	22.49	5,097
349	02 62F12 00551	30.328	81.512	Humla	E(o)	12.27	5,221
350	02 62F12 00560	30.284	81.574	Humla	E(o)	14.32	5,077
351	02 62F12 00585	30.162	81.748	Humla	M(o)	16.11	5,046
352	02 62F12 00591	30.140	81.685	Humla	M(o)	21.34	4,655
353	02 62F15 00612	30.346	81.861	Humla	M(e)	15.56	5,431
354	02 62F15 00614	30.345	81.831	Humla	M(o)	10.48	5,520
355	02 62F15 00619	30.338	81.913	Humla	M(o)	28.20	5,135
356	02 62F15 00620	30.336	81.920	Humla	M(e)	10.09	5,130
357	02 62F15 00631	30.324	81.833	Humla	M(e)	11.65	5,571
358	02 62F15 00637	30.313	81.876	Humla	M(e)	10.69	5,546
359	02 62F15 00638	30.307	81.866	Humla	M(e)	10.94	5,492
360	02 62F16 00677	30.216	81.802	Humla	M(e)	19.31	5,343
361	02 62F16 00678	30.214	81.758	Humla	M(e)	12.12	5,368
362	02 62F16 00679	30.204	81.878	Humla	M(e)	12.66	5,518
363	02 62F16 00708	30.129	81.781	Humla	M(e)	75.65	5,015
364	02 62F16 00728	30.059	81.955	Humla	0	11.43	4,440
365	02 62F16 00729	30.057	81.941	Humla	M(e)	13.87	4,564
366	02 62G01 00744	29.921	81.031	West Seti	M(e)	18.61	4,821
367	02 62G09 00762	29.936	81.674	Kawari	E(o)	11.23	4,569
368	02 62G09 00775	29.898	81.747	Kawari	E(o)	12.90	4,692
369	02 62G09 00776	29.898	81.578	Kawari	M(e)	28.51	3,581
370	02 62G09 00799	29.773	81.527	West Seti	M(e)	49.99	4,576
371	02 62G10 00816	29.648	81.556	Karnal	E(c)	11.64	4,551
372	02 62G10 00819	29.610	81.544	Karnal	E(c)	13.28	4,467
373	02 62J04 00865	30.149	82.161	Humla	M(l)	16.65	4,994
374	02 62J04 00880	30.067	82.127	Humla	M(l)	62.33	4,829
375	02 62K01 00905	29.993	82.197	Humla	M(l)	24.67	4,379
376	02 62K01 00909	29.971	82.250	Humla	E(c)	17.27	4,881
377	02 62K01 00912	29.935	82.208	Humla	E(c)	12.01	4,562
378	02 62K01 00916	29.929	82.207	Humla	E(c)	32.97	4,550
379	02 62K01 00917	29.928	82.235	Humla	0	12.27	4,236
380	02 62K02 00945	29.702	82.245	Humla	M(o)	10.53	4,671
381	02 62K02 00953	29.675	82.193	Humla	M(o)	15.17	4,223
382	02 62K02 00957	29.669	82.222	Humla	E(o)	11.34	4,577
383	02 62K02 00958	29.668	82.194	Humla	E(o)	12.67	4,379
384	02 62K02 00959	29.666	82.203	Humla	E(c)	19.44	4,388
385	02 62K02 00972	29.654	82.223	Mugu	E(o)	13.57	4,492
386	02 62K04 00982	29.116	82.236	Tila	E(o)	10.84	4,270
387	02 62K04 00994	29.084	82.186	Tila	E(o)	11.01	4,242
388	02 62K05 01015	29.878	82.383	Humla	M(o)	12.59	4,967
389	02 62K05 01073	29.754	82.415	Mugu	E(c)	42.40	4,692
390	02 62K06 01085	29.714	82.250	Humla	M(l)	11.54	4,651
391	02 62K06 01094	29.698	82.373	Mugu	M(o)	13.27	4,842
392	02 62K07 01158	29.432	82.361	Tila	E(o)	27.07	4,398
393	02 62K07 01165	29.408	82.430	Tila	E(c)	19.81	4,415
394	02 62K07 01167	29.391	82.394	Tila	E(o)	16.79	3,954
395	02 62K07 01169	29.387	82.416	Tila	E(o)	13.31	4,447
396	02 62K07 01172	29.384	82.424	Tila	E(c)	46.79	4,434

S.No.	Glacial Lake ID No	Lat	Long	Subbasin	GL Type	Area (ha)	Elev (m)
397	02 62K07 01173	29.382	82.410	Tila	E(o)	10.19	4,287
398	02 62K07 01181	29.309	82.474	Tila	E(o)	15.73	4,081
399	02 62K08 01187	29.119	82.256	Tila	E(o)	13.37	4,430
400	02 62K09 01222	29.893	82.514	Mugu	E(o)	11.14	5,031
401	02 62K09 01247	29.822	82.712	Mugu	M(o)	19.68	5,037
402	02 62K09 01258	29.798	82.671	Mugu	M(e)	13.70	4,654
403	02 62K10 01276	29.743	82.705	Mugu	M(o)	11.27	5,346
404	02 62K10 01282	29.723	82.644	Mugu	M(o)	18.86	4,978
405	02 62K10 01286	29.696	82.561	Mugu	E(o)	11.37	4,830
406	02 62K11 01320	29.297	82.705	Bheri	M(e)	10.03	5,003
407	02 62K11 01321	29.270	82.590	Bheri	M(e)	10.04	4,335
408	02 62K12 01324	29.249	82.564	Bheri	M(o)	29.00	4,647
409	02 62K12 01333	29.194	82.546	Tila	E(o)	35.80	4,693
410	02 62K12 01334	29.185	82.563	Tila	E(o)	16.36	4,597
411	02 62L13 01400	28.819	82.867	Bheri	E(o)	18.36	4,429
412	02 62L13 01402	28.790	82.981	Bheri	E(c)	10.60	4,796
413	02 62O04 01431	29.108	83.026	Bheri	M(o)	12.95	4,884
414	02 62O07 01459	29.377	83.390	Mugu	E(o)	11.85	5,175
415	02 62O12 01512	29.218	83.702	Kali Gandak	M(o)	42.49	5,426
416	02 62O12 01514	29.201	83.684	Kali Gandak	M(e)	22.46	5,482
417	02 62O12 01533	29.175	83.748	Kali Gandak	0	17.07	5,360
418	02 62O12 01551	29.117	83.738	Kali Gandak	M(o)	11.61	5,517
419	02 62O12 01587	29.046	83.674	Kali Gandak	M(e)	12.14	5,431
420	02 62P01 01643	28.993	83.173	Bheri	M(e)	15.98	4,821
421	02 62P01 01651	28.959	83.187	Bheri	M(e)	27.62	5,071
422	02 62P05 01734	28.787	83.330	Bheri	M(e)	43.57	4,445
423	02 62P09 01759	28.886	83.527	Kali Gandak	M(e)	30.92	5,578
424	02 62P14 01790	28.726	83.890	Marsyangdi	M(e)	14.99	5,103
425	02 62P14 01797	28.712	83.920	Marsyangdi	E(o)	10.97	4,986
426	02 62P14 01803	28.691	83.852	Marsyangdi	M(o)	340.21	4,910
427	02 71D01 01825	28.826	84.150	Marsyangdi	M(e)	10.74	5,406
428	02 71D06 01863	28.663	84.472	Marsyangdi	M(l)	24.93	4,088
429	02 71D06 01866	28.657	84.458	Marsyangdi	M(l)	10.57	4,039
430	02 71D07 01880	28.497	84.256	Marsyangdi	M(e)	11.38	4,987
431	02 71D07 01882	28.488	84.486	Marsyangdi	M(e)	89.44	4,038
432	02 71D10 01909	28.596	84.629	Budhi Gandak	M(e)	22.25	3,632
433	02 71D11 01929	28.372	84.579	Marsyangdi	E(o)	11.03	4,430
434	02 71D14 01952	28.617	84.912	Budhi Gandak	M(e)	10.08	4,683
435	02 71D14 01959	28.505	84.802	Budhi Gandak	E(o)	21.26	3,684
436	02 71D15 01962	28.380	84.780	Budhi Gandak	E(c)	16.80	4,656
437	02 71H01 01972	28.961	85.084	Trisuli	E(o)	17.03	5,388
438	02 71H02 02020	28.585	85.022	Budhi Gandak	M(o)	11.99	5,047
439	02 71H03 02038	28.292	85.170	Trisuli	M(e)	20.33	4,724
440	02 71H06 02053	28.676	85.410	Trisuli	M(e)	21.04	5,447
441	02 71H06 02056	28.662	85.475	Bum Chu	M(e)	20.42	5,217
442	02 71H06 02059	28.644	85.491	Bum Chu	M(e)	50.98	4,985
443	02 71H06 02060	28.642	85.474	Bum Chu	M(e)	33.30	5,135
444	02 71H06 02072	28.568	85.457	Trisuli	M(e)	23.60	4,495
445	02 71H06 02075	28.566	85.464	Trisuli	M(e)	16.35	4,428
446	02 71H06 02078	28.559	85.333	Trisuli	I(s)	12.60	4,973
447	02 71H06 02097	28.508	85.494	Trisuli	M(e)	26.42	4,798
448	02 71H08 02119	28.124	85.469	Trisuli	M(o)	14.08	4,787
449	02 71H08 02127	28.083	85.413	Trisuli	0	12.59	4,393
450	02 71H08 02130	28.080	85.407	Trisuli	0	15.16	4,327
451	02 71H08 02141	28.061	85.389	Trisuli	0	16.50	4,205
452	02 71H10 02153	28.623	85.510	Bum Chu	M(e)	118.78	5,127
453	02 71H10 02154	28.616	85.527	Bum Chu	M(e)	103.58	5,113
454	02 71H10 02158	28.580	85.596	Bum Chu	M(o)	26.15	5,436
455	02 71H10 02159	28.575	85.583	Bum Chu	M(o)	22.13	5,438
456	02 71H10 02160	28.573	85.659	Bum Chu	E(o)	10.62	5,238
457	02 71H10 02162	28.562	85.602	Bum Chu	M(e)	129.19	5,361
458	02 71H10 02164	28.548	85.616	Bum Chu	E(o)	21.83	5,443
459	02 71H10 02165	28.532	85.609	Bum Chu	M(e)	540.55	5,352
460	02 71H10 02166	28.527	85.638	Bum Chu	M(o)	31.01	5,299
461	02 71H10 02177	28.494	85.636	Bum Chu	M(e)	490.68	5,278
462	02 71H11 02183	28.485	85.736	Bum Chu	M(e)	51.99	5,335
463	02 71H11 02190	28.468	85.519	Trisuli	M(e)	43.67	4,445
464	02 71H11 02194	28.460	85.684	Bum Chu	M(o)	18.49	5,705
465	02 71H11 02209	28.426	85.564	Trisuli	M(e)	29.39	4,873
466	02 71H11 02224	28.405	85.588	Trisuli	M(o)	10.51	5,251
467	02 71H11 02228	28.404	85.605	Trisuli	M(o)	12.01	5,265
468	02 71H11 02252	28.358	85.538	Trisuli	M(o)	10.83	4,390
469	02 71H12 02318	28.163	85.630	Trisuli	M(o)	13.05	4,986
470	02 71H15 02349	28.442	85.780	Bum Chu	M(e)	48.25	5,577

S.No.	Glacial Lake ID No	Lat	Long	Subbasin	GL Type	Area (ha)	Elev (m)
471	02 71H15 02387	28.371	85.890	Sun Kosi	E(o)	27.07	5,242
472	02 71H15 02391	28.360	85.871	Sun Kosi	M(e)	463.78	5,212
473	02 71H15 02402	28.329	85.869	Sun Kosi	M(o)	213.52	5,167
474	02 71H15 02403	28.323	85.908	Sun Kosi	M(o)	14.56	5,387
475	02 71H15 02405	28.322	85.838	Sun Kosi	M(e)	540.35	5,067
476	02 71H15 02406	28.321	85.930	Sun Kosi	M(o)	11.18	5,298
477	02 71H15 02416	28.313	85.948	Sun Kosi	M(o)	25.06	5,227
478	02 71H15 02428	28.297	85.819	Sun Kosi	E(c)	28.10	5,080
479	02 71H15 02430	28.293	85.830	Sun Kosi	M(o)	28.50	5,023
480	02 71H15 02460	28.261	85.915	Sun Kosi	0	15.97	5,106
481	02 71H16 02493	28.211	85.847	Sun Kosi	M(e)	61.34	4,374
482	02 71H16 02496	28.182	85.923	Sun Kosi	E(o)	47.08	4,355
483	02 71H16 02501	28.151	85.905	Sun Kosi	I(s)	12.60	4,495
484	02 71H16 02503	28.139	85.919	Sun Kosi	M(o)	10.15	4,865
485	02 71L03 02551	28.347	86.225	Sun Kosi	M(e)	55.90	5,348
486	02 71L03 02555	28.335	86.192	Sun Kosi	M(e)	55.00	5,422
487	02 71L03 02556	28.321	86.158	Sun Kosi	M(o)	22.44	5,549
488	02 71L03 02557	28.303	86.157	Sun Kosi	M(e)	59.05	5,307
489	02 71L03 02560	28.295	86.151	Sun Kosi	M(e)	16.51	5,346
490	02 71L03 02561	28.294	86.131	Sun Kosi	M(e)	23.99	5,244
491	02 71L03 02574	28.270	86.187	Tama Kosi	M(e)	12.64	5,335
492	02 71L03 02596	28.253	86.103	Sun Kosi	M(e)	14.98	5,189
493	02 71L04 02600	28.249	86.150	Tama Kosi	M(o)	13.16	5,331
494	02 71L04 02606	28.243	86.196	Tama Kosi	M(e)	17.69	5,338
495	02 71L04 02665	28.183	86.226	Tama Kosi	M(o)	12.34	5,223
496	02 71L04 02702	28.067	86.066	Sun Kosi	M(o)	32.50	4,630
497	02 71L07 02732	28.392	86.415	Bum Chu	M(e)	20.17	5,502
498	02 71L07 02734	28.381	86.384	Bum Chu	M(e)	13.92	5,551
499	02 71L07 02736	28.374	86.305	Bum Chu	M(e)	391.50	5,346
500	02 71L07 02737	28.374	86.259	Sun Kosi	M(e)	27.54	5,544
501	02 71L07 02745	28.348	86.493	Bum Chu	M(e)	34.51	5,524
502	02 71L07 02788	28.199	86.582	Bum Chu	M(e)	134.64	5,094
503	02 71L08 02800	28.245	86.321	Tama Kosi	M(o)	21.56	5,361
504	02 71L08 02806	28.240	86.365	Tama Kosi	M(e)	24.72	5,327
505	02 71L08 02854	28.194	86.314	Tama Kosi	M(e)	27.79	5,245
506	02 71L08 02856	28.193	86.351	Tama Kosi	M(e)	19.87	5,339
507	02 71L08 02932	28.033	86.500	Tama Kosi	M(e)	60.86	5,057
508	02 71L09 02947	28.887	86.514	Bum Chu	E(o)	98.23	5,098
509	02 71L09 02948	28.840	86.575	Bum Chu	E(o)	26.39	5,465
510	02 71L09 02949	28.815	86.529	Bum Chu	E(o)	32.37	5,326
511	02 71L11 02952	28.321	86.511	Bum Chu	M(o)	10.75	5,321
512	02 71L11 02963	28.283	86.502	Bum Chu	I(s)	22.63	5,157
513	02 71L12 03006	28.207	86.629	Bum Chu	M(e)	27.78	5,539
514	02 71L12 03013	28.185	86.532	Tama Kosi	M(e)	67.68	5,025
515	02 71L12 03024	28.151	86.535	Tama Kosi	M(o)	18.48	5,220
516	02 71L12 03032	28.135	86.531	Tama Kosi	M(e)	97.85	4,984
517	02 71L12 03051	28.073	86.520	Tama Kosi	M(e)	23.11	5,216
518	02 71L12 03072	28.044	86.514	Tama Kosi	M(l)	57.94	5,241
519	02 71L12 03082	28.038	86.710	Dudh Kosi	M(e)	15.44	5,363
520	02 71L12 03105	28.026	86.682	Dudh Kosi	M(o)	18.71	5,149
521	02 71L12 03123	28.017	86.721	Dudh Kosi	M(o)	19.81	5,066
522	02 71L12 03139	28.006	86.682	Dudh Kosi	M(l)	17.13	4,947
523	02 71L16 03164	28.112	86.863	Arun Kosi	I(s)	39.40	5,218
524	02 71P03 03176	28.274	87.150	Arun Kosi	E(o)	11.91	5,012
525	02 71P03 03177	28.270	87.246	Arun Kosi	E(o)	15.31	5,166
526	02 71P04 03181	28.226	87.053	Arun Kosi	M(e)	17.19	5,050
527	02 71P04 03182	28.208	87.101	Arun Kosi	E(o)	101.93	4,852
528	02 71P04 03183	28.205	87.052	Arun Kosi	0	65.11	4,980
529	02 71P04 03196	28.166	87.122	Arun Kosi	E(o)	12.23	5,219
530	02 71P04 03197	28.159	87.143	Arun Kosi	E(o)	18.93	5,154
531	02 71P04 03201	28.152	87.158	Arun Kosi	0	94.74	5,141
532	02 71P04 03202	28.152	87.174	Arun Kosi	0	10.97	5,075
533	02 71P04 03208	28.142	87.105	Arun Kosi	M(o)	16.53	5,472
534	02 71P04 03209	28.142	87.112	Arun Kosi	M(o)	25.06	5,470
535	02 71P04 03214	28.130	87.082	Arun Kosi	M(e)	19.29	5,518
536	02 71P04 03222	28.111	87.065	Arun Kosi	M(o)	31.03	5,468
537	02 71P04 03231	28.069	87.134	Arun Kosi	M(e)	25.49	4,879
538	02 71P04 03232	28.068	87.047	Arun Kosi	M(e)	78.93	5,589
539	02 71P04 03233	28.065	87.193	Arun Kosi	M(o)	10.78	4,837
540	02 71P04 03235	28.039	87.167	Arun Kosi	M(e)	24.07	4,739
541	02 71P04 03237	28.032	87.190	Arun Kosi	E(c)	27.29	5,013
542	02 71P04 03245	28.007	87.028	Arun Kosi	M(e)	14.23	5,509
543	02 71P04 03246	28.005	87.142	Arun Kosi	M(e)	43.70	4,450
544	02 71P05 03264	28.775	87.437	Bum Chu	E(o)	21.80	5,553

S.No.	Glacial Lake ID No	Lat	Long	Subbasin	GL Type	Area (ha)	Elev (m)
545	02 71P05 03275	28.760	87.417	Bum Chu	E(o)	15.68	5,458
546	02 71P05 03278	28.754	87.427	Bum Chu	E(o)	13.58	5,511
547	02 71P05 03279	28.750	87.455	Bum Chu	E(o)	31.67	5,680
548	02 71P06 03290	28.742	87.382	Bum Chu	E(o)	41.57	5,501
549	02 71P06 03293	28.737	87.479	Bum Chu	E(o)	23.55	5,415
550	02 71P06 03299	28.735	87.440	Bum Chu	E(o)	23.96	5,577
551	02 71P06 03305	28.734	87.406	Bum Chu	E(o)	18.44	5,600
552	02 71P06 03311	28.728	87.478	Bum Chu	E(o)	24.81	5,384
553	02 71P07 03342	28.393	86.379	Bum Chu	M(e)	100.11	5,482
554	02 71P08 03345	28.213	87.470	Arun Kosi	0	131.39	4,781
555	02 71P08 03350	28.172	87.479	Arun Kosi	M(e)	23.91	5,290
556	02 71P08 03352	28.165	87.418	Arun Kosi	0	10.93	4,818
557	02 71P08 03353	28.161	87.487	Arun Kosi	M(e)	10.29	5,298
558	02 71P08 03355	28.160	87.443	Arun Kosi	0	32.33	4,854
559	02 71P08 03360	28.148	87.469	Arun Kosi	M(o)	39.58	5,106
560	02 71P08 03365	28.137	87.428	Arun Kosi	M(e)	25.85	5,191
561	02 71P08 03384	28.064	87.354	Arun Kosi	E(o)	13.08	4,190
562	02 71P08 03407	28.023	87.270	Arun Kosi	E(o)	10.23	4,636
563	02 71P08 03412	28.016	87.259	Arun Kosi	E(o)	33.07	4,672
564	02 71P08 03413	28.012	87.297	Arun Kosi	E(o)	12.13	4,416
565	02 71P09 03420	28.858	86.519	Bum Chu	E(o)	81.24	5,254
566	02 71P09 03421	28.841	87.509	Bum Chu	E(o)	25.20	5,486
567	02 71P09 03422	28.832	86.522	Bum Chu	E(o)	281.32	5,319
568	02 71P09 03438	28.773	87.553	Yeru Chu	0	25.64	5,319
569	02 71P10 03461	28.747	87.625	Yeru Chu	E(o)	17.28	5,545
570	02 71P10 03474	28.712	87.548	Yeru Chu	0	41.20	5,188
571	02 71P10 03475	28.694	87.534	Bum Chu	E(o)	60.74	5,158
572	02 71P11 03497	28.268	87.634	Arun Kosi	M(o)	10.04	5,674
573	02 71P12 03510	28.236	87.501	Arun Kosi	M(o)	20.48	5,225
574	02 71P12 03514	28.230	87.591	Arun Kosi	M(e)	78.90	5,410
575	02 71P12 03516	28.228	87.578	Arun Kosi	M(e)	21.94	5,247
576	02 71P12 03521	28.206	87.560	Arun Kosi	M(e)	15.95	5,337
577	02 71P12 03524	28.195	87.641	Yeru Chu	M(e)	47.42	5,352
578	02 71P12 03527	28.178	87.563	Arun Kosi	M(e)	104.19	5,011
579	02 71P12 03532	28.167	87.623	Yeru Chu	M(e)	20.87	5,375
580	02 71P12 03534	28.164	87.578	Arun Kosi	M(e)	20.22	5,171
581	02 71P12 03540	28.155	87.612	Arun Kosi	M(o)	13.82	5,241
582	02 71P12 03556	28.131	87.599	Arun Kosi	M(o)	14.18	5,261
583	02 71P12 03559	28.118	87.615	Arun Kosi	M(e)	35.67	5,052
584	02 71P12 03560	28.116	87.586	Arun Kosi	M(e)	12.43	5,050
585	02 71P12 03561	28.114	87.655	Arun Kosi	M(e)	146.34	4,954
586	02 71P12 03562	28.107	87.584	Arun Kosi	M(e)	15.91	4,968
587	02 71P12 03566	28.093	87.637	Arun Kosi	M(e)	72.47	5,178
588	02 71P12 03579	28.052	87.627	Arun Kosi	M(e)	18.40	5,066
589	02 72I05 03634	27.947	86.446	Tama Kosi	M(e)	156.76	5,046
590	02 72I05 03638	27.929	86.433	Tama Kosi	M(o)	31.99	5,025
591	02 72I05 03642	27.927	86.420	Tama Kosi	M(o)	15.72	5,020
592	02 72I05 03643	27.917	86.465	Tama Kosi	M(o)	17.56	5,259
593	02 72I05 03644	27.916	86.477	Tama Kosi	M(o)	14.08	5,110
594	02 72I05 03648	27.861	86.476	Tama Kosi	M(e)	158.40	4,550
595	02 72I05 03652	27.850	86.356	Tama Kosi	E(o)	11.18	4,424
596	02 72I09 03725	27.975	86.681	Dudh Kosi	M(l)	57.83	4,834
597	02 72I09 03749	27.951	86.690	Dudh Kosi	M(l)	42.11	4,741
598	02 72I09 03759	27.941	86.699	Dudh Kosi	M(l)	18.00	4,709
599	02 72I09 03783	27.874	86.586	Dudh Kosi	M(e)	40.18	4,368
600	02 72I09 03794	27.791	86.621	Dudh Kosi	M(o)	46.73	5,157
601	02 72I09 03801	27.779	86.612	Dudh Kosi	M(e)	117.31	4,831
602	02 72I09 03802	27.778	86.643	Dudh Kosi	M(o)	29.27	5,163
603	02 72I13 03864	27.997	86.835	Dudh Kosi	M(o)	11.55	5,321
604	02 72I13 03881	27.975	86.804	Dudh Kosi	I(s)	24.84	5,183
605	02 72I13 03932	27.924	86.786	Dudh Kosi	M(l)	54.85	4,512
606	02 72I13 03950	27.898	86.925	Dudh Kosi	M(e)	139.77	5,003
607	02 72I13 03952	27.894	86.913	Dudh Kosi	E(c)	11.28	4,986
608	02 72I13 03977	27.857	86.937	Dudh Kosi	M(o)	21.45	5,473
609	02 72I13 03979	27.850	86.928	Dudh Kosi	M(o)	48.86	5,411
610	02 72I13 03983	27.837	86.935	Dudh Kosi	M(e)	29.39	5,209
611	02 72I13 03986	27.832	86.917	Dudh Kosi	M(o)	33.07	5,360
612	02 72I13 04000	27.805	86.974	Dudh Kosi	M(e)	16.77	5,516
613	02 72I13 04004	27.799	86.966	Dudh Kosi	M(e)	21.36	5,396
614	02 72I13 04007	27.794	86.911	Dudh Kosi	M(o)	18.87	5,274
615	02 72I13 04008	27.793	86.838	Dudh Kosi	M(o)	22.89	5,351
616	02 72I13 04014	27.783	86.957	Dudh Kosi	M(e)	87.28	5,198
617	02 72I13 04024	27.766	86.871	Dudh Kosi	I(s)	13.68	4,931
618	02 72I13 04032	27.755	86.958	Dudh Kosi	M(o)	86.50	4,927
619	02 72I14 04037	27.743	86.844	Dudh Kosi	M(e)	25.73	4,362
620	02 72I14 04048	27.719	86.910	Dudh Kosi	M(o)	14.93	4,989
621	02 72I14 04052	27.696	86.792	Dudh Kosi	M(o)	12.95	4,951
622	02 72I14 04055	27.687	86.858	Dudh Kosi	M(e)	31.80	4,764
623	02 72I14 04056	27.681	86.853	Dudh Kosi	E(o)	11.85	4,694
624	02 72M01 04093	27.959	87.247	Arun Kosi	E(c)	12.02	4,457
625	02 72M01 04106	27.906	87.188	Arun Kosi	E(c)	33.14	4,490
626	02 72M01 04113	27.844	87.081	Arun Kosi	M(e)	41.15	4,847
627	02 72M01 04118	27.829	87.095	Arun Kosi	M(o)	12.06	5,225
628	02 72M01 04125	27.798	87.092	Arun Kosi	M(e)	182.16	4,543
629	02 72M02 04132	27.691	87.206	Arun Kosi	E(c)	11.49	4,088
630	02 72M05 04150	27.983	87.345	Arun Kosi	E(o)	26.18	3,728
631	02 72M05 04175	27.948	87.349	Arun Kosi	E(c)	10.13	3,991
632	02 72M05 04182	27.932	87.293	Arun Kosi	E(o)	12.13	4,373
633	02 72M05 04192	27.918	87.306	Arun Kosi	E(c)	11.15	4,416
634	02 72M05 04202	27.837	87.341	Arun Kosi	E(c)	19.17	4,243
635	02 72M09 04233	27.997	87.522	Arun Kosi	E(c)	12.38	4,720
636	02 72M09 04240	27.986	87.583	Arun Kosi	E(o)	12.33	4,826
637	02 72M09 04245	27.979	87.557	Arun Kosi	E(c)	11.03	4,767
638	02 72M09 04259	27.900	87.699	Arun Kosi	M(e)	11.27	5,226
639	02 72M09 04267	27.864	87.737	Arun Kosi	E(c)	13.98	5,337
640	02 72M09 04296	27.816	87.749	Tamur Kosi	M(e)	17.17	4,903
641	02 72M10 04374	27.681	87.694	Tamur Kosi	E(c)	13.30	4,633
642	02 72M10 04375	27.681	87.517	Arun Kosi	E(c)	10.10	4,472
643	02 72M10 04416	27.651	87.703	Tamur Kosi	E(o)	14.36	4,460
644	02 72M10 04425	27.645	87.573	Tamur Kosi	0	11.78	3,860
645	02 72M10 04429	27.639	87.633	Tamur Kosi	E(c)	16.45	4,289
646	02 72M10 04438	27.630	87.696	Tamur Kosi	E(c)	14.11	4,179
647	02 72M10 04440	27.629	87.706	Tamur Kosi	E(o)	13.01	4,319
648	02 72M10 04445	27.620	87.712	Tamur Kosi	E(o)	12.63	4,454
649	02 72M10 04447	27.617	87.543	Tamur Kosi	E(c)	10.93	4,471
650	02 72M13 04478	27.969	87.884	Yeru Chu	M(l)	17.90	5,597
651	02 72M13 04482	27.964	87.814	Arun Kosi	M(e)	40.61	5,249
652	02 72M13 04484	27.952	87.908	Yeru Chu	M(e)	64.79	5,165
653	02 72M13 04486	27.950	87.930	Yeru Chu	M(e)	83.66	5,106
654	02 72M13 04495	27.928	88.002	Yeru Chu	M(e)	113.22	5,348
655	02 72M13 04496	27.926	87.771	Arun Kosi	M(e)	97.66	4,913
656	02 72M13 04507	27.881	87.805	Tamur Kosi	M(e)	34.32	4,690
657	02 72M13 04515	27.869	87.866	Tamur Kosi	M(e)	68.12	4,910
658	02 72M13 04523	27.849	87.831	Tamur Kosi	0	33.50	4,437
659	02 72M13 04535	27.793	87.974	Tamur Kosi	M(e)	22.32	5,183
660	02 72M13 04537	27.790	87.934	Tamur Kosi	M(o)	14.10	4,938
661	02 72M13 04544	27.757	87.777	Tamur Kosi	E(c)	25.46	4,708
662	02 72M14 04551	27.745	87.782	Tamur Kosi	E(c)	19.69	4,775
663	02 72M14 04553	27.738	87.778	Tamur Kosi	E(o)	22.06	4,705
664	02 77D04 04602	28.004	88.241	Yeru Chu	M(e)	41.80	5,269
665	02 77D08 04614	28.054	88.427	Yeru Chu	0	101.66	4,888
666	02 77D08 04617	28.033	88.461	Yeru Chu	E(o)	13.87	5,156
667	02 77D08 04622	28.022	88.355	Yeru Chu	M(e)	56.29	5,195
668	02 77D08 04624	28.017	88.288	Yeru Chu	M(e)	50.43	5,268
669	02 77D08 04627	28.009	88.259	Yeru Chu	M(e)	59.70	5,256
670	02 77D08 04628	28.005	88.320	Yeru Chu	M(e)	38.58	5,104
671	02 78A01 04636	27.988	88.221	Yeru Chu	M(e)	11.94	5,372
672	02 78A01 04637	27.946	88.075	Yeru Chu	M(e)	148.59	5,488
673	02 78A01 04638	27.943	88.041	Yeru Chu	M(o)	10.32	5,821
674	02 78A01 04639	27.933	88.066	Yeru Chu	M(e)	83.35	5,563
675	02 78A01 04640	27.928	88.019	Yeru Chu	M(e)	13.25	5,692
676	02 78A01 04653	27.835	88.078	Tamur Kosi	M(e)	16.48	5,604
677	02 78A02 04691	27.545	88.050	Tamur Kosi	M(o)	25.72	5,020
678	02 78A05 04702	27.994	88.402	Yeru Chu	M(e)	18.97	5,171
679	03 62J03 00022	30.478	82.173	Upper YarlungTsangpo	0	31.29	5,250
680	03 62J03 00044	30.468	82.060	Upper YarlungTsangpo	0	378.80	5,180
681	03 62J03 00049	30.461	82.108	Upper YarlungTsangpo	0	16.73	5,177
682	03 62J03 00085	30.431	82.181	Upper YarlungTsangpo	0	32.23	5,000
683	03 62J03 00123	30.413	82.171	Upper YarlungTsangpo	0	37.71	5,002
684	03 62J03 00151	30.398	82.192	Upper YarlungTsangpo	E(o)	86.53	5,203
685	03 62J03 00161	30.366	82.156	Upper YarlungTsangpo	E(o)	12.73	5,450
686	03 62J03 00163	30.362	82.055	Upper YarlungTsangpo	M(e)	56.83	5,283
687	03 62J03 00175	30.352	82.238	Upper YarlungTsangpo	0	29.81	5,106
688	03 62J03 00177	30.340	82.141	Upper YarlungTsangpo	M(e)	16.12	5,580
689	03 62J03 00180	30.310	82.200	Upper YarlungTsangpo	M(e)	19.08	5,530
690	03 62J03 00188	30.282	82.169	Upper YarlungTsangpo	M(e)	16.58	5,339
691	03 62J03 00201	30.255	82.209	Upper YarlungTsangpo	M(e)	128.70	5,057
692	03 62J03 00207	30.221	82.232	Upper YarlungTsangpo	M(e)	44.31	5,582

S.No.	Glacial Lake ID No	Lat	Long	Subbasin	GL Type	Area (ha)	Elev (m)
693	03 62J07 00243	30.432	82.362	Upper YarlungTsangpo	O	152.61	4,882
694	03 62J07 00244	30.419	82.302	Upper YarlungTsangpo	O	901.40	4,931
695	03 62J07 00247	30.407	82.355	Upper YarlungTsangpo	O	23.16	4,870
696	03 62J07 00248	30.406	82.256	Upper YarlungTsangpo	O	14.10	4,936
697	03 62J07 00274	30.371	82.273	Upper YarlungTsangpo	O	10.68	4,966
698	03 62J07 00289	30.342	82.271	Upper YarlungTsangpo	O	69.03	4,993
699	03 62J07 00296	30.329	82.270	Upper YarlungTsangpo	O	58.67	4,990
700	03 62J07 00301	30.318	82.272	Upper YarlungTsangpo	O	15.62	4,996
701	03 62J07 00306	30.311	82.259	Upper YarlungTsangpo	O	25.33	4,997
702	03 62J08 00316	30.217	82.486	Upper YarlungTsangpo	O	25.14	4,791
703	03 62J08 00341	30.106	82.404	Upper YarlungTsangpo	E(o)	48.23	4,912
704	03 62J08 00344	30.103	82.270	Upper YarlungTsangpo	M(e)	203.15	4,875
705	03 62J08 00354	30.079	82.343	Upper YarlungTsangpo	M(e)	91.73	4,849
706	03 62J09 00379	30.832	82.526	Upper YarlungTsangpo	O	14.79	5,307
707	03 62J09 00388	30.807	82.750	Upper YarlungTsangpo	M(o)	14.74	5,547
708	03 62J10 00420	30.608	82.652	Upper YarlungTsangpo	O	20.59	5,088
709	03 62J11 00424	30.257	82.589	Upper YarlungTsangpo	O	19.38	4,778
710	03 62J13 00456	30.881	82.859	Upper YarlungTsangpo	O	146.23	5,446
711	03 62J13 00475	30.811	82.754	Upper YarlungTsangpo	M(o)	10.06	5,551
712	03 62J14 00495	30.654	82.880	Upper YarlungTsangpo	O	12.36	5,322
713	03 62J14 00535	30.572	82.906	Upper YarlungTsangpo	M(o)	14.28	5,553
714	03 62J14 00544	30.563	82.921	Upper YarlungTsangpo	M(o)	26.68	5,607
715	03 62J14 00556	30.551	82.958	Upper YarlungTsangpo	M(o)	29.39	5,558
716	03 62J15 00566	30.116	82.756	Upper YarlungTsangpo	O	12.66	4,842
717	03 62K05 00573	29.984	82.479	Upper YarlungTsangpo	M(o)	11.89	5,223
718	03 62K05 00578	29.969	82.496	Upper YarlungTsangpo	M(e)	23.18	4,995
719	03 62K09 00585	29.985	82.535	Upper YarlungTsangpo	E(o)	392.72	4,829
720	03 62K09 00586	29.980	82.567	Upper YarlungTsangpo	E(o)	19.61	4,845
721	03 62K09 00587	29.980	82.589	Upper YarlungTsangpo	M(o)	48.60	4,853
722	03 62K09 00604	29.962	82.508	Upper YarlungTsangpo	M(e)	25.57	5,084
723	03 62K09 00611	29.940	82.603	Upper YarlungTsangpo	M(e)	28.46	4,891
724	03 62K09 00613	29.924	82.618	Upper YarlungTsangpo	M(e)	41.72	4,960
725	03 62K13 00646	29.840	82.782	Upper YarlungTsangpo	M(e)	291.26	5,058
726	03 62K13 00664	29.796	82.853	Upper YarlungTsangpo	M(e)	53.83	5,160
727	03 62K13 00676	29.762	82.885	Upper YarlungTsangpo	M(e)	40.66	5,118
728	03 62K14 00680	29.735	82.974	Upper YarlungTsangpo	M(e)	80.86	5,337
729	03 62K14 00683	29.688	82.984	Upper YarlungTsangpo	M(e)	45.06	5,089
730	03 62N02 00710	30.538	83.044	Upper YarlungTsangpo	E(o)	26.81	5,375
731	03 62N02 00714	30.529	83.073	Upper YarlungTsangpo	E(o)	27.15	5,609
732	03 62N05 00756	30.751	83.327	Upper YarlungTsangpo	M(o)	12.34	5,631
733	03 62N06 00777	30.580	83.365	Upper YarlungTsangpo	M(e)	10.59	5,719
734	03 62N10 00819	30.591	83.519	Upper YarlungTsangpo	O	270.94	5,227
735	03 62N10 00824	30.563	83.518	Upper YarlungTsangpo	O	42.47	5,240
736	03 62N10 00828	30.551	83.512	Upper YarlungTsangpo	O	16.57	5,239
737	03 62N14 00842	30.669	83.764	Upper YarlungTsangpo	O	12.51	5,193
738	03 62N14 00843	30.662	83.763	Upper YarlungTsangpo	O	13.83	5,192
739	03 62N14 00849	30.617	83.754	Upper YarlungTsangpo	O	25.44	5,181
740	03 62N14 00851	30.612	83.764	Upper YarlungTsangpo	O	13.40	5,180
741	03 62N15 00872	30.500	83.963	Upper YarlungTsangpo	E(o)	14.70	5,497
742	03 62N15 00877	30.492	83.842	Upper YarlungTsangpo	M(o)	23.49	5,633
743	03 62N15 00888	30.480	83.908	Upper YarlungTsangpo	E(o)	41.76	5,521
744	03 62N15 00896	30.465	83.984	Upper YarlungTsangpo	E(o)	84.88	5,450
745	03 62N15 00899	30.461	83.898	Upper YarlungTsangpo	E(o)	18.62	5,536
746	03 62N15 00900	30.461	83.973	Upper YarlungTsangpo	E(o)	19.08	5,448
747	03 62N15 00912	30.431	83.996	Upper YarlungTsangpo	E(o)	206.16	5,429
748	03 62O02 00936	29.731	83.073	Upper YarlungTsangpo	E(o)	21.82	5,086
749	03 62O02 00938	29.726	83.105	Upper YarlungTsangpo	O	113.22	5,010
750	03 62O02 00942	29.693	83.025	Upper YarlungTsangpo	M(e)	30.18	5,371
751	03 62O02 00944	29.689	83.190	Upper YarlungTsangpo	O	54.50	5,007
752	03 62O02 00946	29.686	83.097	Upper YarlungTsangpo	O	25.38	5,040
753	03 62O02 00952	29.674	83.182	Upper YarlungTsangpo	O	25.01	5,011
754	03 62O02 00966	29.655	83.106	Upper YarlungTsangpo	M(o)	32.58	5,241
755	03 62O02 00976	29.632	83.151	Upper YarlungTsangpo	M(o)	20.93	5,367
756	03 62O02 00978	29.627	83.131	Upper YarlungTsangpo	E(o)	10.61	5,366
757	03 62O06 01004	29.604	83.376	Upper YarlungTsangpo	O	145.71	4,889
758	03 62O06 01010	29.582	83.355	Upper YarlungTsangpo	O	118.74	4,888
759	03 62O06 01021	29.511	83.444	Upper YarlungTsangpo	O	211.06	4,959
760	03 62O07 01027	29.499	83.428	Upper YarlungTsangpo	O	59.80	4,959
761	03 62O11 01091	29.322	83.646	Upper YarlungTsangpo	O	15.53	5,159
762	03 62O11 01117	29.268	83.618	Upper YarlungTsangpo	E(o)	30.54	5,168
763	03 71B02 01169	30.580	84.068	Upper YarlungTsangpo	M(e)	28.04	5,675
764	03 71B03 01177	30.391	84.096	Upper YarlungTsangpo	O	24.88	5,396
765	03 62N15 01196	30.457	83.861	Upper Yarlung Tsangpo	M(e)	17.69	5,710
766	03 62N15 01198	30.453	83.846	Upper Yarlung Tsangpo	M(e)	22.55	5,580
767	03 62O15 01246	29.470	83.764	Upper Yarlung Tsangpo	O	77.62	5,282
768	03 71C09 01307	29.887	84.537	Upper Yarlung Tsangpo	M(o)	10.44	5,638
769	03 71C12 01365	29.122	84.744	Upper Yarlung Tsangpo	E(o)	14.81	5,049
770	03 71C16 01371	29.076	84.839	Upper Yarlung Tsangpo	E(o)	11.36	5,434
771	03 71D05 01384	28.928	84.300	Upper Yarlung Tsangpo	M(e)	20.69	5,431
772	03 71D05 01386	28.909	84.348	Upper Yarlung Tsangpo	E(o)	11.92	5,356
773	03 71D09 01391	28.908	84.508	Upper Yarlung Tsangpo	M(e)	35.26	5,539
774	03 71O08 01473	29.162	87.380	Upper Yarlung Tsangpo	O	11.04	4,485
775	03 71O14 01476	29.642	87.925	Upper Yarlung Tsangpo	E(o)	11.38	5,282
776	03 71O14 01481	29.584	87.916	Upper Yarlung Tsangpo	E(o)	12.16	5,424
777	03 71P09 01495	28.847	87.568	Upper Yarlung Tsangpo	O	10.39	5,288
778	03 71P09 01500	28.832	87.560	Upper Yarlung Tsangpo	O	140.16	5,296
779	03 71P09 01513	28.804	87.625	Upper Yarlung Tsangpo	M(e)	17.10	5,528
780	03 71P09 01516	28.799	87.603	Upper Yarlung Tsangpo	M(o)	11.84	5,591
781	03 71P09 01517	28.796	87.641	Upper Yarlung Tsangpo	M(e)	26.55	5,344
782	03 77C01 01528	29.754	88.240	Upper Yarlung Tsangpo	E(o)	29.88	5,600
783	03 77C02 01534	29.722	88.236	Upper Yarlung Tsangpo	E(o)	14.30	5,422
784	03 77C02 01535	29.631	88.007	Upper Yarlung Tsangpo	E(o)	12.11	5,410
785	03 77C15 01589	29.500	88.950	Upper Yarlung Tsangpo	E(o)	14.97	5,391
786	03 77G06 01624	29.563	89.354	Upper Yarlung Tsangpo	E(o)	10.26	5,427
787	03 77G09 01633	29.887	89.592	Upper Yarlung Tsangpo	E(o)	10.01	5,407
788	03 77G09 01640	29.873	89.596	Upper Yarlung Tsangpo	E(o)	39.71	5,342
789	03 77G09 01657	29.843	89.718	Upper Yarlung Tsangpo	E(o)	13.60	5,296
790	03 77G14 01752	29.509	89.882	Upper Yarlung Tsangpo	E(o)	11.90	5,420
791	03 77G15 01760	29.495	89.831	Upper Yarlung Tsangpo	E(o)	13.37	5,493
792	03 77G15 01767	29.489	89.867	Upper Yarlung Tsangpo	E(o)	13.26	5,478
793	03 77G15 01776	29.477	89.932	Upper Yarlung Tsangpo	M(o)	13.27	5,408
794	03 77K01 01818	29.912	90.063	Upper Yarlung Tsangpo	M(e)	36.30	5,131
795	03 77K01 01822	29.873	90.008	Upper Yarlung Tsangpo	M(e)	14.55	5,290
796	03 77K01 01831	29.818	90.183	Upper Yarlung Tsangpo	E(o)	18.71	5,356
797	03 77K01 01840	29.773	90.151	Upper Yarlung Tsangpo	E(o)	13.83	5,271
798	03 77K06 01885	29.504	90.439	Upper Yarlung Tsangpo	O	11.03	5,352
799	03 77K07 01891	29.484	90.436	Upper Yarlung Tsangpo	E(o)	12.88	5,332
800	03 77K07 01893	29.475	90.414	Upper Yarlung Tsangpo	E(o)	20.72	5,325
801	03 77K07 01901	29.437	90.495	Upper Yarlung Tsangpo	E(o)	11.37	5,373
802	03 71B16 01960	30.040	84.926	Upper Yarlung Tsangpo	M(o)	20.07	5,730
803	03 71C09 01985	29.866	84.624	Upper Yarlung Tsangpo	M(e)	49.03	5,395
804	03 71C09 01987	29.856	84.632	Upper Yarlung Tsangpo	M(e)	14.63	5,557
805	03 71C09 01990	29.845	84.676	Upper Yarlung Tsangpo	M(e)	51.54	5,536
806	03 71C09 01994	29.818	84.691	Upper Yarlung Tsangpo	M(e)	20.93	5,471
807	03 71C10 02002	29.751	84.672	Upper Yarlung Tsangpo	M(o)	10.35	5,554
808	03 71G02 02092	29.728	85.211	Upper Yarlung Tsangpo	E(o)	13.64	5,374
809	03 71G06 02128	29.740	85.314	Upper Yarlung Tsangpo	E(o)	12.09	5,307
810	03 71G14 02181	29.733	85.783	Upper Yarlung Tsangpo	E(o)	15.71	5,384
811	03 71G14 02213	29.558	85.880	Upper Yarlung Tsangpo	O	56.48	5,186
812	03 71K05 02256	29.935	86.422	Upper Yarlung Tsangpo	O	10.79	5,477
813	03 71K06 02277	29.672	86.380	Upper Yarlung Tsangpo	E(o)	11.06	5,512
814	03 71O02 02336	29.556	87.028	Upper Yarlung Tsangpo	O	119.59	4,729
815	03 71O02 02339	29.514	87.108	Upper Yarlung Tsangpo	E(c)	11.54	5,432
816	03 71N07 02358	30.251	87.428	Upper Yarlung Tsangpo	O	20.33	4,878
817	03 71N12 02360	30.088	87.697	Upper Yarlung Tsangpo	O	19.81	4,731
818	03 71O01 02363	29.824	87.016	Upper Yarlung Tsangpo	E(o)	26.33	4,954
819	03 77B12 02407	30.168	88.620	Upper Yarlung Tsangpo	E(o)	50.13	5,029
820	03 77B12 02408	30.148	88.627	Upper Yarlung Tsangpo	E(o)	213.67	5,011
821	03 77B12 02409	30.105	88.618	Upper Yarlung Tsangpo	E(o)	26.87	4,903
822	03 77G09 02514	29.899	89.639	Upper Yarlung Tsangpo	E(o)	33.92	5,260
823	03 77G09 02516	29.894	89.620	Upper Yarlung Tsangpo	E(o)	12.12	5,460
824	03 77G09 02520	29.877	89.544	Upper Yarlung Tsangpo	E(o)	12.30	5,475
825	03 77G09 02530	29.850	89.534	Upper Yarlung Tsangpo	O	25.71	5,298
826	03 77G09 02535	29.835	89.547	Upper Yarlung Tsangpo	E(o)	12.28	5,394
827	03 77D08 02611	28.006	88.494	Teesta	M(e)	45.02	5,023
828	03 77D12 02614	28.059	88.631	Teesta	E(o)	14.81	4,917
829	03 77D12 02625	28.026	88.710	Teesta	M(e)	113.46	5,148
830	03 77D12 02630	28.014	88.652	Teesta	M(e)	11.65	5,522
831	03 77D12 02631	28.014	88.561	Teesta	E(c)	26.21	5,073
832	03 77D12 02636	28.008	88.698	Teesta	M(e)	99.32	5,209
833	03 77D12 02638	28.007	88.571	Teesta	M(o)	26.00	4,998
834	03 77D12 02640	28.006	88.713	Teesta	M(e)	119.15	5,238
835	03 77D12 02645	28.002	88.639	Teesta	M(e)	32.04	5,424
836	03 77D16 02649	28.011	88.756	Teesta	M(o)	108.12	5,094
837	03 78A01 02664	27.920	88.159	Teesta	M(e)	83.63	5,441
838	03 78A01 02665	27.913	88.196	Teesta	M(e)	128.14	5,194
839	03 78A01 02669	27.893	88.191	Teesta	M(o)	21.27	5,496
840	03 78A01 02689	27.852	88.240	Teesta	M(e)	30.59	5,190

S.No.	Glacial Lake ID No	Lat	Long	Subbasin	GL Type	Area (ha)	Elev (m)
841	03 78A02 02729	27.563	88.123	Teesta	M(o)	10.47	4,710
842	03 78A02 02737	27.533	88.086	Teesta	M(e)	36.80	4,860
843	03 78A03 02764	27.437	88.083	Teesta	E(c)	13.56	4,280
844	03 78A05 02787	27.976	88.418	Teesta	M(o)	16.35	5,224
845	03 78A05 02788	27.974	88.422	Teesta	M(o)	12.85	5,185
846	03 78A05 02795	27.969	88.430	Teesta	M(o)	14.31	4,974
847	03 78A05 02810	27.951	88.355	Teesta	M(o)	40.34	4,989
848	03 78A05 02813	27.949	88.305	Teesta	M(e)	35.90	5,049
849	03 78A05 02815	27.947	88.332	Teesta	M(o)	60.49	5,034
850	03 78A05 02851	27.881	88.250	Teesta	M(e)	14.40	5,198
851	03 78A05 02874	27.822	88.249	Teesta	M(e)	70.94	5,414
852	03 78A05 02880	27.817	88.261	Teesta	M(e)	12.31	5,487
853	03 78A05 02904	27.759	88.484	Teesta	E(c)	13.57	4,467
854	03 78A06 02928	27.723	88.453	Teesta	E(o)	14.30	4,199
855	03 78A06 02939	27.678	88.376	Teesta	M(e)	18.05	3,915
856	03 78A09 02955	27.992	88.545	Teesta	M(e)	68.28	5,161
857	03 78A09 02956	27.991	88.602	Teesta	E(c)	10.11	4,778
858	03 78A09 02957	27.988	88.736	Teesta	M(o)	10.61	5,188
859	03 78A09 02958	27.982	88.508	Teesta	M(e)	34.12	4,917
860	03 78A09 02961	27.975	88.616	Teesta	M(e)	57.86	4,960
861	03 78A09 02964	27.971	88.593	Teesta	E(o)	10.09	4,748
862	03 78A09 02974	27.962	88.743	Teesta	E(o)	19.61	5,065
863	03 78A09 02975	27.961	88.650	Teesta	M(e)	18.36	4,964
864	03 78A09 02978	27.957	88.714	Teesta	M(e)	26.39	5,078
865	03 78A09 03032	27.864	88.747	Teesta	M(e)	18.95	5,084
866	03 78A09 03047	27.816	88.657	Teesta	E(o)	14.59	4,603
867	03 78A10 03077	27.723	88.690	Teesta	E(o)	12.13	4,472
868	03 78A10 03086	27.695	88.716	Teesta	E(o)	11.40	4,207
869	03 78A10 03095	27.671	88.513	Teesta	E(c)	36.34	4,525
870	03 78A10 03096	27.668	88.687	Teesta	E(c)	14.75	4,117
871	03 78A10 03100	27.662	88.690	Teesta	E(c)	15.70	4,298
872	03 78A11 03108	27.466	88.751	Teesta	E(o)	22.25	4,052
873	03 78A13 03118	27.990	88.816	Teesta	M(e)	174.29	5,303
874	03 78A13 03125	27.969	88.797	Teesta	M(e)	18.44	5,361
875	03 78A13 03128	27.963	88.797	Teesta	M(o)	11.97	5,350
876	03 78A13 03133	27.936	88.784	Teesta	M(o)	10.36	5,332
877	03 78A13 03145	27.901	88.782	Teesta	M(o)	28.28	5,118
878	03 78A13 03148	27.895	88.761	Teesta	M(e)	45.77	5,232
879	03 78A13 03158	27.873	88.789	Teesta	M(e)	10.41	4,962
880	03 78A13 03166	27.864	88.863	Teesta	M(e)	13.90	4,781
881	03 78A13 03171	27.854	88.806	Teesta	E(o)	11.38	5,051
882	03 78A14 03204	27.730	88.833	Teesta	E(o)	14.60	4,446
883	03 78A15 03225	27.477	88.776	Teesta	E(c)	11.04	4,633
884	03 78A15 03228	27.442	88.752	Teesta	E(c)	10.91	4,055
885	03 78A15 03272	27.375	88.763	Teesta	E(o)	27.26	3,744
886	03 78A15 03276	27.368	88.826	Teesta	E(o)	13.48	3,930
887	03 78A15 03286	27.346	88.819	Teesta	0	18.43	3,546
888	03 77H01 03295	28.805	89.155	Upper Yarlung Tsangpo	0	68.23	4,219
889	03 77H07 03298	28.327	89.430	Upper Yarlung Tsangpo	E(o)	140.50	4,426
890	03 77H08 03302	28.144	89.396	Upper Yarlung Tsangpo	0	62.48	4,473
891	03 77H08 03303	28.136	89.402	Upper Yarlung Tsangpo	0	26.78	4,474
892	03 77H08 03312	28.087	89.481	Upper Yarlung Tsangpo	M(e)	22.37	4,904
893	03 77H08 03328	28.025	89.428	Upper Yarlung Tsangpo	E(o)	63.43	4,791
894	03 77H12 03343	28.241	89.695	Upper Yarlung Tsangpo	E(o)	70.85	4,693
895	03 77H12 03344	28.228	89.638	Upper Yarlung Tsangpo	E(o)	1273.72	4,568
896	03 77H12 03345	28.210	89.745	Upper Yarlung Tsangpo	M(o)	44.90	4,909
897	03 77H12 03347	28.203	89.713	Upper Yarlung Tsangpo	M(o)	13.94	4,795
898	03 77H12 03349	28.186	89.598	Upper Yarlung Tsangpo	M(e)	33.00	4,895
899	03 77H12 03350	28.185	89.661	Upper Yarlung Tsangpo	E(c)	21.81	4,886
900	03 77H12 03352	28.181	89.535	Upper Yarlung Tsangpo	E(o)	82.15	4,694
901	03 77H12 03354	28.150	89.564	Upper Yarlung Tsangpo	M(o)	20.05	4,897
902	03 77H12 03357	28.137	89.534	Upper Yarlung Tsangpo	M(e)	49.92	5,292
903	03 77H12 03361	28.123	89.514	Upper Yarlung Tsangpo	M(o)	10.96	5,202
904	03 77H15 03362	28.279	89.994	Upper Yarlung Tsangpo	I(s)	24.20	5,087
905	03 77H16 03363	28.248	89.851	Upper Yarlung Tsangpo	M(o)	15.47	5,127
906	03 77H16 03367	28.238	89.963	Upper Yarlung Tsangpo	M(e)	13.77	5,501
907	03 77H16 03368	28.230	89.887	Upper Yarlung Tsangpo	M(e)	151.09	4,921
908	03 77L03 03383	28.378	90.095	Upper Yarlung Tsangpo	M(o)	15.01	5,671
909	03 77L03 03390	28.354	90.098	Upper Yarlung Tsangpo	M(o)	10.18	5,624
910	03 77L03 03394	28.264	90.068	Upper Yarlung Tsangpo	M(e)	188.07	5,149
911	03 77L04 03395	28.236	90.104	Upper Yarlung Tsangpo	M(e)	585.02	5,126
912	03 78A13 03396	27.965	88.895	Upper Yarlung Tsangpo	M(e)	23.97	5,423
913	03 78E05 03419	27.992	89.424	Upper Yarlung Tsangpo	E(o)	16.31	4,713
914	03 78E05 03424	27.969	89.379	Upper Yarlung Tsangpo	E(o)	66.73	4,568
915	03 78E05 03427	27.963	89.413	Upper Yarlung Tsangpo	E(o)	45.42	4,576
916	03 78E05 03429	27.959	89.397	Upper Yarlung Tsangpo	E(o)	181.69	4,576
917	03 78E05 03433	27.941	89.389	Upper Yarlung Tsangpo	E(o)	279.30	4,572
918	03 78E05 03450	27.884	89.351	Upper Yarlung Tsangpo	M(e)	17.43	4,991
919	03 78E05 03452	27.881	89.325	Upper Yarlung Tsangpo	M(o)	13.54	5,123
920	03 78E05 03453	27.878	89.296	Upper Yarlung Tsangpo	M(o)	41.23	5,236
921	03 78E05 03454	27.878	89.312	Upper Yarlung Tsangpo	M(e)	61.73	5,001
922	03 78E05 03460	27.855	89.267	Upper Yarlung Tsangpo	M(o)	42.55	5,213
923	03 78A13 03469	27.900	88.930	Amo Chu	M(o)	16.40	5,121
924	03 78A13 03482	27.854	88.945	Amo Chu	E(o)	49.31	4,874
925	03 78A13 03487	27.844	88.940	Amo Chu	E(o)	27.95	4,863
926	03 78A14 03535	27.654	88.858	Amo Chu	E(c)	11.65	4,755
927	03 78A14 03541	27.636	88.817	Amo Chu	E(c)	15.32	4,870
928	03 78A14 03549	27.616	88.881	Amo Chu	E(c)	12.81	4,670
929	03 78A14 03551	27.612	88.904	Amo Chu	E(c)	37.14	4,036
930	03 78A14 03557	27.599	88.858	Amo Chu	E(c)	12.48	4,581
931	03 78A15 03602	27.496	88.791	Amo Chu	E(c)	15.53	4,807
932	03 78A15 03615	27.465	88.818	Amo Chu	E(c)	16.84	4,753
933	03 78A15 03616	27.464	88.829	Amo Chu	E(c)	21.74	4,531
934	03 78A15 03628	27.420	88.812	Amo Chu	E(c)	16.12	4,434
935	03 78A15 03660	27.274	88.944	Amo Chu	E(c)	15.80	3,897
936	03 78E01 03664	27.809	89.230	Amo Chu	M(e)	52.68	5,137
937	03 78E02 03723	27.536	89.168	Amo Chu	E(o)	30.73	4,462
938	03 78E02 03742	27.506	89.079	Amo Chu	E(c)	22.56	4,145
939	03 78E03 03744	27.499	89.066	Amo Chu	E(o)	13.28	4,149
940	03 78E03 03745	27.498	89.093	Amo Chu	E(c)	10.96	4,569
941	03 78E03 03749	27.492	89.149	Amo Chu	E(c)	27.58	4,064
942	03 78E03 03788	27.402	89.156	Amo Chu	E(c)	13.62	4,180
943	03 78E03 03803	27.325	89.140	Amo Chu	E(o)	11.05	4,092
944	03 78E05 03815	27.803	89.350	Amo Chu	M(e)	12.41	4,349
945	03 78E05 03827	27.766	89.369	Amo Chu	E(o)	10.47	4,396
946	03 78E06 03844	27.687	89.408	Amo Chu	M(o)	18.51	4,798
947	03 78E06 03847	27.644	89.462	Amo Chu	E(o)	35.14	4,220
948	03 78E06 03854	27.584	89.487	Amo Chu	E(o)	46.34	4,313
949	03 78E06 03858	27.569	89.378	Amo Chu	E(c)	22.78	4,239
950	03 78E10 03890	27.583	89.499	Amo Chu	E(o)	24.77	4,421
951	03 78E10 03895	27.574	89.525	Amo Chu	E(o)	10.62	4,344
952	03 78E10 03897	27.568	89.524	Amo Chu	E(o)	11.36	4,450
953	03 78E10 03904	27.557	89.565	Amo Chu	E(o)	10.06	4,189
954	03 78E11 03938	27.267	89.706	Amo Chu	E(o)	10.38	4,447
955	03 78A15 03962	27.330	88.846	Amo Chu	E(o)	27.80	3,901
956	03 77H12 03979	28.171	89.684	Puna Tsang Chu	M(e)	11.00	4,781
957	03 77H12 03982	28.139	89.742	Puna Tsang Chu	E(c)	12.81	4,842
958	03 77H12 04015	28.042	89.627	Puna Tsang Chu	E(c)	16.83	4,698
959	03 77H16 04051	28.172	89.848	Puna Tsang Chu	M(e)	23.57	4,514
960	03 77H16 04060	28.145	89.841	Puna Tsang Chu	E(o)	12.19	5,123
961	03 77H16 04076	28.114	89.909	Puna Tsang Chu	M(e)	43.78	4,347
962	03 77H16 04078	28.105	89.898	Puna Tsang Chu	M(e)	25.05	4,270
963	03 77H16 04132	28.030	89.893	Puna Tsang Chu	M(o)	10.59	5,036
964	03 77H16 04154	28.011	89.884	Puna Tsang Chu	M(o)	22.23	5,015
965	03 77H16 04159	28.007	89.863	Puna Tsang Chu	E(o)	23.34	4,846
966	03 77H16 04164	28.005	89.956	Puna Tsang Chu	E(c)	12.55	4,622
967	03 77L04 04181	28.112	90.028	Puna Tsang Chu	M(e)	37.11	4,689
968	03 77L04 04187	28.107	90.247	Puna Tsang Chu	M(e)	132.27	4,369
969	03 77L04 04188	28.102	90.231	Puna Tsang Chu	M(e)	34.98	4,332
970	03 77L04 04214	28.066	90.231	Puna Tsang Chu	E(o)	11.03	4,739
971	03 77L04 04241	28.022	90.179	Puna Tsang Chu	E(o)	17.58	5,081
972	03 77L04 04243	28.016	90.210	Puna Tsang Chu	E(o)	54.12	5,127
973	03 77L04 04252	28.011	90.187	Puna Tsang Chu	E(o)	19.51	5,144
974	03 77L04 04261	28.007	90.106	Puna Tsang Chu	E(c)	10.94	4,544
975	03 77L04 04265	28.003	90.150	Puna Tsang Chu	E(o)	14.27	5,018
976	03 77L04 04269	28.002	90.139	Puna Tsang Chu	M(e)	15.71	5,063
977	03 77L08 04272	28.092	90.301	Puna Tsang Chu	M(e)	153.89	4,513
978	03 77L08 04273	28.086	90.326	Puna Tsang Chu	M(e)	10.19	4,706
979	03 77L08 04295	28.028	90.271	Puna Tsang Chu	M(e)	20.07	5,211
980	03 77L08 04300	28.012	90.280	Puna Tsang Chu	M(e)	14.82	5,286
981	03 78E05 04319	27.839	89.389	Puna Tsang Chu	M(e)	17.71	4,333
982	03 78E09 04350	27.970	89.612	Puna Tsang Chu	E(o)	14.65	4,679
983	03 78E09 04377	27.948	89.649	Puna Tsang Chu	E(c)	10.24	4,310
984	03 78E09 04398	27.922	89.636	Puna Tsang Chu	E(o)	10.95	4,269
985	03 78E09 04402	27.911	89.651	Puna Tsang Chu	E(o)	13.05	4,226
986	03 78E09 04414	27.840	89.600	Puna Tsang Chu	E(o)	11.62	4,180
987	03 78E11 04429	27.266	89.726	Puna Tsang Chu	E(o)	14.47	4,420
988	03 78E11 04430	27.260	89.730	Puna Tsang Chu	E(o)	12.20	4,340

S.No.	Glacial Lake ID No	Lat	Long	Subbasin	GL Type	Area (ha)	Elev (m)
989	03 78E13 04446	27.988	89.892	Puna Tsang Chu	M(o)	10.90	5,130
990	03 78E13 04451	27.982	89.896	Puna Tsang Chu	M(o)	33.80	5,143
991	03 78E13 04456	27.974	89.896	Puna Tsang Chu	M(e)	22.77	5,137
992	03 78E13 04457	27.973	89.930	Puna Tsang Chu	E(c)	65.00	5,076
993	03 78E13 04481	27.940	89.930	Puna Tsang Chu	M(o)	72.67	5,002
994	03 78E13 04482	27.940	89.906	Puna Tsang Chu	E(o)	14.09	5,030
995	03 78E13 04497	27.928	89.900	Puna Tsang Chu	E(o)	24.90	4,946
996	03 78E13 04506	27.920	89.810	Puna Tsang Chu	E(c)	14.55	4,260
997	03 78E13 04524	27.903	89.898	Puna Tsang Chu	E(c)	12.96	4,784
998	03 78E13 04536	27.896	89.885	Puna Tsang Chu	E(o)	11.89	4,573
999	03 78E13 04539	27.894	89.944	Puna Tsang Chu	E(o)	20.69	4,858
1000	03 78E13 04561	27.870	89.843	Puna Tsang Chu	E(o)	24.07	4,509
1001	03 78E13 04573	27.864	89.926	Puna Tsang Chu	E(o)	37.61	4,524
1002	03 78E13 04577	27.859	89.969	Puna Tsang Chu	E(c)	12.27	4,326
1003	03 78E13 04591	27.843	89.910	Puna Tsang Chu	E(o)	16.26	4,317
1004	03 78E13 04601	27.833	89.960	Puna Tsang Chu	E(c)	16.28	4,127
1005	03 78E13 04603	27.829	89.944	Puna Tsang Chu	E(c)	36.57	4,456
1006	03 78E13 04615	27.815	89.939	Puna Tsang Chu	E(c)	17.11	4,146
1007	03 78I01 04644	27.997	90.233	Puna Tsang Chu	E(c)	11.26	4,990
1008	03 78I01 04645	27.995	90.222	Puna Tsang Chu	E(o)	23.03	4,936
1009	03 78I01 04648	27.991	90.216	Puna Tsang Chu	E(o)	18.37	4,936
1010	03 78I01 04653	27.988	90.131	Puna Tsang Chu	M(e)	19.20	5,045
1011	03 78I01 04654	27.985	90.149	Puna Tsang Chu	M(o)	14.07	4,911
1012	03 78I01 04657	27.982	90.245	Puna Tsang Chu	M(o)	17.66	5,095
1013	03 78I01 04658	27.977	90.233	Puna Tsang Chu	M(o)	67.28	5,072
1014	03 78I01 04665	27.964	90.147	Puna Tsang Chu	E(o)	23.28	4,882
1015	03 78I01 04690	27.941	90.190	Puna Tsang Chu	E(o)	17.54	4,626
1016	03 78I01 04703	27.931	90.209	Puna Tsang Chu	E(c)	12.41	4,997
1017	03 78I01 04704	27.931	90.090	Puna Tsang Chu	E(o)	14.52	4,521
1018	03 78I01 04711	27.920	90.075	Puna Tsang Chu	E(o)	10.13	4,326
1019	03 78I01 04718	27.915	90.244	Puna Tsang Chu	M(o)	12.93	5,171
1020	03 78I01 04729	27.901	90.173	Puna Tsang Chu	E(o)	45.13	4,671
1021	03 78I01 04734	27.894	90.180	Puna Tsang Chu	E(o)	15.99	4,812
1022	03 78I01 04735	27.893	90.219	Puna Tsang Chu	M(o)	16.23	5,013
1023	03 78I01 04750	27.877	90.185	Puna Tsang Chu	E(o)	14.13	4,828
1024	03 78I01 04753	27.875	90.207	Puna Tsang Chu	M(e)	40.55	4,913
1025	03 78I01 04762	27.857	90.191	Puna Tsang Chu	E(o)	16.19	4,733
1026	03 78I01 04767	27.850	90.191	Puna Tsang Chu	E(o)	24.59	4,770
1027	03 78I01 04768	27.850	90.213	Puna Tsang Chu	E(o)	10.53	4,855
1028	03 78I01 04770	27.848	90.246	Puna Tsang Chu	E(o)	10.80	4,803
1029	03 78I01 04784	27.836	90.186	Puna Tsang Chu	E(c)	11.59	4,573
1030	03 78I01 04790	27.829	90.157	Puna Tsang Chu	E(c)	23.89	4,428
1031	03 78I01 04792	27.827	90.222	Puna Tsang Chu	E(o)	30.71	4,657
1032	03 78I01 04805	27.802	90.239	Puna Tsang Chu	E(o)	12.45	4,762
1033	03 78I01 04807	27.800	90.231	Puna Tsang Chu	E(o)	74.59	4,758
1034	03 78I01 04810	27.793	90.200	Puna Tsang Chu	E(o)	17.25	4,556
1035	03 78I01 04821	27.761	90.172	Puna Tsang Chu	E(c)	15.44	4,333
1036	03 78I01 04824	27.757	90.196	Puna Tsang Chu	E(o)	19.73	4,442
1037	03 78I01 04826	27.753	90.164	Puna Tsang Chu	E(c)	13.22	4,226
1038	03 78I02 04836	27.740	90.187	Puna Tsang Chu	E(c)	10.68	4,287
1039	03 78I02 04838	27.738	90.160	Puna Tsang Chu	E(o)	11.91	4,447
1040	03 78I05 04855	27.996	90.288	Puna Tsang Chu	M(e)	41.92	5,327
1041	03 78I05 04856	27.995	90.261	Puna Tsang Chu	M(e)	13.30	5,148
1042	03 78I05 04858	27.992	90.299	Puna Tsang Chu	M(e)	11.73	5,345
1043	03 78I05 04860	27.964	90.259	Puna Tsang Chu	M(o)	33.51	5,226
1044	03 78I05 04866	27.952	90.255	Puna Tsang Chu	M(o)	15.09	5,184
1045	03 78I05 04870	27.925	90.259	Puna Tsang Chu	M(e)	11.54	5,126
1046	03 78I05 04871	27.919	90.262	Puna Tsang Chu	M(e)	22.69	5,144
1047	03 77J04 04900	30.075	90.157	Lhasa Tsangpo	M(e)	13.75	5,743
1048	03 77J07 04917	30.366	90.457	Lhasa Tsangpo	M(o)	10.71	5,598
1049	03 77J07 04919	30.351	90.498	Lhasa Tsangpo	M(e)	12.41	5,507
1050	03 77J11 04956	30.473	90.702	Lhasa Tsangpo	M(l)	20.39	5,534
1051	03 77J11 04958	30.467	90.708	Lhasa Tsangpo	M(e)	15.90	5,512
1052	03 77J11 04962	30.451	90.651	Lhasa Tsangpo	M(o)	11.83	5,597
1053	03 77J11 04966	30.446	90.649	Lhasa Tsangpo	M(o)	16.19	5,576
1054	03 77J14 05033	30.518	90.828	Lhasa Tsangpo	E(o)	27.52	5,352
1055	03 77J14 05048	30.502	90.912	Lhasa Tsangpo	E(o)	27.02	5,342
1056	03 77J15 05050	30.499	90.947	Lhasa Tsangpo	0	12.73	5,236
1057	03 77J15 05060	30.479	90.966	Lhasa Tsangpo	E(o)	85.72	5,035
1058	03 77K01 05093	29.791	90.246	Lhasa Tsangpo	E(o)	33.69	5,120
1059	03 77K10 05153	29.615	90.605	Lhasa Tsangpo	0	22.03	5,248
1060	03 77K10 05165	29.603	90.657	Lhasa Tsangpo	E(o)	10.93	5,451
1061	03 77N16 05290	30.209	91.966	Lhasa Tsangpo	E(o)	12.88	4,993
1062	03 77N16 05292	30.187	91.988	Lhasa Tsangpo	E(c)	18.95	5,159
1063	03 77N16 05294	30.177	91.995	Lhasa Tsangpo	E(o)	10.11	5,098
1064	03 77O10 05326	29.556	91.638	Lhasa Tsangpo	E(o)	16.92	5,276
1065	03 82A12 05348	31.102	92.699	Lhasa Tsangpo	E(o)	48.57	5,003
1066	03 82A12 05349	31.086	92.724	Lhasa Tsangpo	E(o)	17.75	5,025
1067	03 82A16 05359	31.154	92.817	Lhasa Tsangpo	0	23.78	5,030
1068	03 82A16 05366	31.138	92.998	Lhasa Tsangpo	0	13.99	4,894
1069	03 82A16 05382	31.120	92.833	Lhasa Tsangpo	0	388.59	4,902
1070	03 82A16 05393	31.112	92.815	Lhasa Tsangpo	0	68.03	4,905
1071	03 82A16 05396	31.109	92.952	Lhasa Tsangpo	0	97.67	4,894
1072	03 82A16 05442	31.052	92.961	Lhasa Tsangpo	0	12.85	4,922
1073	03 82A16 05443	31.051	92.812	Lhasa Tsangpo	E(o)	35.43	4,930
1074	03 82A16 05447	31.036	92.787	Lhasa Tsangpo	0	94.42	4,908
1075	03 82B04 05560	30.192	92.009	Lhasa Tsangpo	E(o)	26.71	5,203
1076	03 82B04 05566	30.170	92.002	Lhasa Tsangpo	E(o)	13.35	5,027
1077	03 82B08 05623	30.199	92.413	Lhasa Tsangpo	0	10.72	4,955
1078	03 82B08 05639	30.081	92.390	Lhasa Tsangpo	E(o)	13.71	4,971
1079	03 82B08 05640	30.078	92.406	Lhasa Tsangpo	E(o)	28.02	5,038
1080	03 82B09 05662	30.754	92.745	Lhasa Tsangpo	E(o)	18.70	4,872
1081	03 82B10 05668	30.507	92.735	Lhasa Tsangpo	E(o)	29.87	5,140
1082	03 82B11 05671	30.494	92.646	Lhasa Tsangpo	E(o)	98.02	4,817
1083	03 82B11 05675	30.438	92.679	Lhasa Tsangpo	E(o)	11.44	5,111
1084	03 82B11 05683	30.381	92.743	Lhasa Tsangpo	E(o)	15.70	5,132
1085	03 82B11 05688	30.350	92.735	Lhasa Tsangpo	E(o)	87.32	5,112
1086	03 82B11 05697	30.292	92.682	Lhasa Tsangpo	E(o)	14.59	5,168
1087	03 82B11 05700	30.288	92.511	Lhasa Tsangpo	0	11.27	5,182
1088	03 82B11 05710	30.256	92.596	Lhasa Tsangpo	E(o)	17.98	5,021
1089	03 82B11 05711	30.253	92.503	Lhasa Tsangpo	0	21.86	5,056
1090	03 82B12 05720	30.237	92.549	Lhasa Tsangpo	E(o)	33.39	5,061
1091	03 82B12 05724	30.231	92.563	Lhasa Tsangpo	0	23.52	5,048
1092	03 82B12 05732	30.218	92.536	Lhasa Tsangpo	0	12.44	5,017
1093	03 82B12 05733	30.217	92.569	Lhasa Tsangpo	E(o)	17.84	5,037
1094	03 82B12 05734	30.216	92.517	Lhasa Tsangpo	0	48.36	4,981
1095	03 82B12 05737	30.210	92.573	Lhasa Tsangpo	E(o)	32.43	5,037
1096	03 82B12 05741	30.189	92.541	Lhasa Tsangpo	0	42.22	4,955
1097	03 82B13 05749	30.999	92.990	Lhasa Tsangpo	E(o)	18.44	5,010
1098	03 82B13 05755	30.996	92.832	Lhasa Tsangpo	0	23.34	4,830
1099	03 82B13 05777	30.988	92.889	Lhasa Tsangpo	0	13.11	4,956
1100	03 82B13 05785	30.976	92.941	Lhasa Tsangpo	E(o)	441.76	4,904
1101	03 82B13 05789	30.957	92.825	Lhasa Tsangpo	0	16.94	4,920
1102	03 82B13 05790	30.956	92.867	Lhasa Tsangpo	0	23.23	4,890
1103	03 82B13 05792	30.949	92.890	Lhasa Tsangpo	0	118.54	4,892
1104	03 82B13 05795	30.935	92.828	Lhasa Tsangpo	0	222.71	4,886
1105	03 82B13 05797	30.934	92.775	Lhasa Tsangpo	E(o)	122.17	4,835
1106	03 82B13 05803	30.906	92.817	Lhasa Tsangpo	E(o)	177.10	4,960
1107	03 82B13 05804	30.896	92.910	Lhasa Tsangpo	E(o)	266.63	4,923
1108	03 82B13 05805	30.894	92.951	Lhasa Tsangpo	E(o)	205.95	4,958
1109	03 82B13 05806	30.893	92.860	Lhasa Tsangpo	0	12.43	4,921
1110	03 82B13 05808	30.879	92.881	Lhasa Tsangpo	E(o)	52.44	4,982
1111	03 82B13 05809	30.878	92.860	Lhasa Tsangpo	E(o)	21.32	4,925
1112	03 82B14 05818	30.739	92.775	Lhasa Tsangpo	E(o)	11.70	4,864
1113	03 82B14 05821	30.736	92.875	Lhasa Tsangpo	E(o)	20.95	4,911
1114	03 82C01 05833	29.989	92.191	Lhasa Tsangpo	E(o)	13.63	5,123
1115	03 82C01 05855	29.928	92.068	Lhasa Tsangpo	E(o)	14.00	4,939
1116	03 82C01 05867	29.866	92.208	Lhasa Tsangpo	E(o)	16.79	5,227
1117	03 82C01 05880	29.830	92.242	Lhasa Tsangpo	E(o)	15.07	5,179
1118	03 82C02 05894	29.570	92.043	Lhasa Tsangpo	E(o)	13.57	5,312
1119	03 82C05 05903	29.808	92.395	Lhasa Tsangpo	E(o)	24.92	5,052
1120	03 82C05 05909	29.796	92.413	Lhasa Tsangpo	E(o)	15.75	4,975
1121	03 82C05 05911	29.795	92.389	Lhasa Tsangpo	E(o)	17.68	4,976
1122	03 82C05 05928	29.779	92.388	Lhasa Tsangpo	E(o)	154.54	4,916
1123	03 82C05 05929	29.778	92.457	Lhasa Tsangpo	E(o)	11.84	4,996
1124	03 82C05 05932	29.770	92.442	Lhasa Tsangpo	E(o)	14.89	4,924
1125	03 82C06 05938	29.734	92.387	Lhasa Tsangpo	0	16.53	4,746
1126	03 82C06 05941	29.667	92.394	Lhasa Tsangpo	E(o)	53.86	4,677
1127	03 82C06 05942	29.639	92.253	Lhasa Tsangpo	E(o)	35.47	4,862
1128	03 82C06 05943	29.619	92.327	Lhasa Tsangpo	E(o)	11.54	4,974
1129	03 82E04 06002	31.148	93.097	Lhasa Tsangpo	0	10.32	4,994
1130	03 82E04 06005	31.147	93.119	Lhasa Tsangpo	0	27.83	5,002
1131	03 82E04 06022	31.132	93.177	Lhasa Tsangpo	0	692.16	5,007
1132	03 82E04 06068	31.103	93.144	Lhasa Tsangpo	E(o)	101.01	5,024
1133	03 82E04 06083	31.081	93.163	Lhasa Tsangpo	E(o)	14.03	5,071
1134	03 82E04 06086	31.078	93.050	Lhasa Tsangpo	0	40.27	4,950
1135	03 82E04 06096	31.004	93.088	Lhasa Tsangpo	E(o)	71.50	5,040
1136	03 82E08 06104	31.065	93.292	Lhasa Tsangpo	E(o)	51.21	5,047

S.No.	Glacial Lake ID No	Lat	Long	Subbasin	GL Type	Area (ha)	Elev (m)
1137	03 82E08 06106	31.054	93.301	Lhasa Tsangpo	E(o)	20.60	5,055
1138	03 82F01 06111	30.909	93.016	Lhasa Tsangpo	O	15.25	4,958
1139	03 82F01 06112	30.903	93.018	Lhasa Tsangpo	E(o)	11.34	4,957
1140	03 77L01 06141	28.928	90.223	Upper Yarlung Tsangpo	M(e)	48.29	5,109
1141	03 77L03 06157	28.278	90.226	Upper Yarlung Tsangpo	M(e)	86.59	5,301
1142	03 77L03 06160	28.257	90.192	Upper Yarlung Tsangpo	M(e)	10.09	5,451
1143	03 77L04 06161	28.245	90.185	Upper Yarlung Tsangpo	M(e)	60.02	5,455
1144	03 77L07 06182	28.265	90.276	Upper Yarlung Tsangpo	M(e)	11.44	5,829
1145	03 77L11 06199	28.454	90.622	Upper Yarlung Tsangpo	M(e)	19.35	5,286
1146	03 77P02 06204	28.592	91.115	Upper Yarlung Tsangpo	E(o)	11.65	5,362
1147	03 77P02 06206	28.587	91.155	Upper Yarlung Tsangpo	E(o)	10.48	5,563
1148	03 77P10 06238	28.546	91.525	Upper Yarlung Tsangpo	O	101.76	5,083
1149	03 77P10 06239	28.538	91.597	Upper Yarlung Tsangpo	O	26.23	5,070
1150	03 77P10 06242	28.530	91.562	Upper Yarlung Tsangpo	O	45.15	5,153
1151	03 77L08 06252	28.238	90.496	Manas	M(e)	15.24	5,608
1152	03 77L08 06255	28.204	90.384	Manas	M(e)	33.11	5,424
1153	03 77L11 06277	28.333	90.674	Manas	M(e)	11.37	4,650
1154	03 77L11 06285	28.303	90.741	Manas	E(c)	10.96	4,769
1155	03 77L11 06288	28.300	90.647	Manas	M(e)	28.67	5,467
1156	03 77L11 06289	28.299	90.607	Manas	M(e)	11.67	5,354
1157	03 77L11 06298	28.273	90.736	Manas	M(e)	167.03	4,510
1158	03 77L11 06300	28.272	90.589	Manas	M(e)	45.40	5,414
1159	03 77L12 06307	28.247	90.712	Manas	M(e)	18.15	4,689
1160	03 77L12 06313	28.244	90.743	Manas	M(e)	11.99	4,657
1161	03 77L12 06314	28.241	90.724	Manas	M(e)	88.56	4,654
1162	03 77L12 06315	28.241	90.506	Manas	M(e)	21.53	5,470
1163	03 77L12 06348	28.129	90.604	Manas	M(e)	10.46	5,199
1164	03 77L12 06349	28.123	90.566	Manas	M(e)	67.52	5,172
1165	03 77L12 06358	28.096	90.738	Manas	M(e)	67.74	5,004
1166	03 77L12 06362	28.086	90.605	Manas	M(e)	35.31	5,202
1167	03 77L12 06363	28.081	90.652	Manas	E(o)	18.65	4,999
1168	03 77L12 06366	28.078	90.743	Manas	M(o)	17.78	5,172
1169	03 77L12 06369	28.078	90.661	Manas	M(e)	10.04	5,074
1170	03 77L12 06370	28.078	90.584	Manas	M(o)	10.66	5,312
1171	03 77L12 06377	28.071	90.656	Manas	M(o)	40.30	5,020
1172	03 77L12 06381	28.064	90.648	Manas	M(o)	24.57	5,105
1173	03 77L12 06383	28.059	90.602	Manas	M(e)	40.10	4,862
1174	03 77L12 06385	28.049	90.597	Manas	M(e)	31.09	4,990
1175	03 77L15 06389	28.353	90.851	Manas	E(o)	14.81	4,624
1176	03 77L15 06409	28.307	90.852	Manas	E(o)	14.10	4,648
1177	03 77L15 06422	28.281	90.750	Manas	M(o)	30.82	4,722
1178	03 77L16 06450	28.086	90.787	Manas	M(e)	216.41	5,165
1179	03 77L16 06456	28.059	90.903	Manas	E(o)	52.05	4,768
1180	03 77L16 06460	28.049	90.953	Manas	E(o)	40.51	4,642
1181	03 77L16 06461	28.046	90.919	Manas	M(o)	16.66	4,933
1182	03 77L16 06463	28.040	90.907	Manas	M(o)	11.45	4,924
1183	03 77L16 06481	28.021	90.840	Manas	M(o)	15.82	4,985
1184	03 77L16 06486	28.018	90.843	Manas	M(o)	18.96	4,957
1185	03 77L16 06488	28.016	90.929	Manas	E(o)	18.07	4,801
1186	03 77L16 06489	28.015	90.979	Manas	E(o)	12.17	4,252
1187	03 77L16 06492	28.013	90.984	Manas	E(c)	20.90	4,277
1188	03 77L16 06503	28.003	90.905	Manas	E(o)	87.32	4,754
1189	03 77L16 06505	28.001	90.932	Manas	E(o)	13.93	4,663
1190	03 77P03 06540	28.351	91.079	Manas	M(e)	77.20	4,787
1191	03 77P03 06545	28.305	91.070	Manas	M(e)	18.87	4,727
1192	03 77P04 06564	28.075	91.234	Manas	E(c)	11.43	4,686
1193	03 77P04 06578	28.045	91.004	Manas	E(o)	12.84	4,085
1194	03 77P04 06580	28.034	91.003	Manas	E(o)	76.90	4,200
1195	03 77P04 06585	28.023	91.036	Manas	E(o)	11.43	4,260
1196	03 77P04 06594	28.013	91.044	Manas	E(o)	10.44	4,421
1197	03 77P04 06596	28.010	91.027	Manas	E(o)	12.41	4,251
1198	03 77P06 06605	28.518	91.487	Manas	O	16.29	5,125
1199	03 77P08 06632	28.088	91.257	Manas	E(o)	56.11	4,630
1200	03 77P08 06651	28.045	91.261	Manas	E(o)	12.47	4,600
1201	03 77P08 06652	28.043	91.294	Manas	E(o)	12.82	4,780
1202	03 77P08 06659	28.012	91.292	Manas	E(c)	11.21	4,622
1203	03 77P08 06666	28.001	91.262	Manas	E(o)	18.16	4,464
1204	03 78I13 06682	27.988	90.817	Manas	E(o)	10.54	4,905
1205	03 78I13 06683	27.984	90.827	Manas	E(o)	10.85	4,737
1206	03 78I13 06688	27.967	90.894	Manas	E(o)	22.10	4,579
1207	03 78I13 06708	27.956	90.955	Manas	E(o)	12.03	4,606
1208	03 78I13 06724	27.947	90.974	Manas	E(c)	11.20	4,426
1209	03 78I13 06735	27.939	90.945	Manas	E(o)	11.87	4,504
1210	03 78I13 06769	27.913	90.845	Manas	E(o)	14.42	4,509

S.No.	Glacial Lake ID No	Lat	Long	Subbasin	GL Type	Area (ha)	Elev (m)
1211	03 78I13 06774	27.903	90.980	Manas	E(c)	13.54	4,290
1212	03 78I13 06782	27.896	90.997	Manas	E(o)	33.11	4,361
1213	03 78I13 06785	27.891	90.966	Manas	E(c)	25.72	4,359
1214	03 78I13 06789	27.875	90.999	Manas	E(c)	11.54	4,203
1215	03 78I13 06792	27.866	90.850	Manas	E(o)	10.38	4,600
1216	03 78M01 06823	27.985	91.215	Manas	E(o)	15.78	4,311
1217	03 78M01 06831	27.956	91.056	Manas	E(o)	13.72	4,055
1218	03 78M01 06835	27.909	91.241	Manas	E(o)	14.74	4,347
1219	03 78M01 06836	27.902	91.242	Manas	E(o)	10.02	4,180
1220	03 78M01 06839	27.877	91.014	Manas	E(o)	12.25	4,162
1221	03 78M01 06846	27.803	91.240	Manas	E(o)	15.09	4,077
1222	03 78M05 06848	27.996	91.287	Manas	E(c)	17.81	4,522
1223	03 78M05 06859	27.963	91.426	Manas	E(c)	13.31	4,858
1224	03 78M05 06868	27.931	91.270	Manas	E(c)	39.76	4,732
1225	03 78M05 06869	27.929	91.300	Manas	E(o)	20.27	4,371
1226	03 78M05 06875	27.914	91.260	Manas	E(c)	26.95	4,744
1227	03 78M05 06877	27.904	91.290	Manas	E(c)	31.66	4,625
1228	03 78M05 06880	27.893	91.306	Manas	E(c)	21.44	4,060
1229	03 78M05 06884	27.884	91.281	Manas	E(o)	12.54	4,802
1230	03 78M05 06889	27.843	91.271	Manas	E(c)	19.59	3,980
1231	03 77L08 06899	28.046	90.355	Manas	M(o)	48.12	5,278
1232	03 77L08 06904	28.037	90.364	Manas	M(e)	84.10	5,216
1233	03 77L08 06928	28.014	90.374	Manas	M(e)	72.68	5,182
1234	03 77L08 06930	28.014	90.353	Manas	M(o)	16.95	5,300
1235	03 77L08 06943	28.005	90.328	Manas	M(o)	35.64	5,376
1236	03 77L08 06949	28.002	90.311	Manas	M(o)	10.53	5,461
1237	03 77L12 06962	28.040	90.537	Manas	E(c)	17.91	5,002
1238	03 77L12 06963	28.038	90.546	Manas	M(o)	15.05	4,993
1239	03 77L12 06970	28.034	90.625	Manas	M(o)	26.46	5,172
1240	03 77L12 06971	28.034	90.664	Manas	E(o)	31.04	4,715
1241	03 77L12 07005	28.022	90.709	Manas	M(e)	145.52	4,868
1242	03 77L12 07028	28.006	90.572	Manas	M(o)	13.49	5,155
1243	03 77L12 07031	28.003	90.705	Manas	E(o)	33.03	4,927
1244	03 77L12 07032	28.003	90.540	Manas	I(s)	23.97	4,700
1245	03 78I05 07058	27.990	90.418	Manas	M(l)	33.10	5,178
1246	03 78I05 07064	27.987	90.380	Manas	M(o)	13.26	5,242
1247	03 78I05 07071	27.984	90.437	Manas	M(l)	21.73	5,093
1248	03 78I05 07073	27.980	90.381	Manas	M(o)	20.26	5,233
1249	03 78I05 07079	27.970	90.331	Manas	M(o)	22.19	5,314
1250	03 78I05 07084	27.968	90.412	Manas	M(o)	22.89	5,208
1251	03 78I05 07112	27.946	90.378	Manas	M(o)	10.42	5,273
1252	03 78I05 07125	27.940	90.397	Manas	M(o)	19.37	5,203
1253	03 78I05 07132	27.931	90.295	Manas	M(o)	10.00	5,183
1254	03 78I05 07142	27.918	90.408	Manas	M(o)	17.69	5,143
1255	03 78I05 07154	27.906	90.276	Manas	M(o)	22.46	5,160
1256	03 78I05 07173	27.890	90.290	Manas	M(e)	114.20	5,059
1257	03 78I05 07183	27.883	90.298	Manas	M(o)	15.99	5,116
1258	03 78I05 07189	27.876	90.280	Manas	M(o)	24.66	5,038
1259	03 78I05 07192	27.872	90.303	Manas	M(e)	41.54	5,033
1260	03 78I05 07202	27.861	90.295	Manas	M(e)	18.64	4,959
1261	03 78I05 07215	27.849	90.333	Manas	M(o)	13.41	5,050
1262	03 78I05 07219	27.846	90.302	Manas	E(o)	19.16	4,902
1263	03 78I05 07257	27.819	90.272	Manas	E(o)	21.42	4,898
1264	03 78I05 07258	27.819	90.394	Manas	E(c)	12.12	4,764
1265	03 78I05 07262	27.814	90.363	Manas	E(o)	11.15	4,776
1266	03 78I05 07263	27.813	90.254	Manas	E(o)	11.48	4,815
1267	03 78I05 07267	27.810	90.406	Manas	E(c)	33.42	4,701
1268	03 78I05 07272	27.803	90.398	Manas	E(c)	11.36	4,825
1269	03 78I05 07279	27.792	90.409	Manas	E(c)	14.60	4,759
1270	03 78I05 07282	27.792	90.398	Manas	E(c)	10.94	4,826
1271	03 78I05 07283	27.792	90.421	Manas	E(c)	27.76	4,527
1272	03 78I05 07294	27.781	90.442	Manas	E(o)	12.78	4,563
1273	03 78I05 07295	27.780	90.400	Manas	E(c)	11.02	4,532
1274	03 78I05 07302	27.770	90.416	Manas	E(c)	25.82	4,689
1275	03 78I05 07312	27.756	90.298	Manas	E(c)	10.83	4,630
1276	03 78I06 07315	27.749	90.293	Manas	E(o)	17.20	4,569
1277	03 78I06 07316	27.738	90.296	Manas	E(c)	10.21	4,389
1278	03 78I06 07318	27.720	90.326	Manas	E(c)	30.88	4,231
1279	03 78I06 07319	27.716	90.290	Manas	E(o)	15.98	4,322
1280	03 78I09 07358	27.997	90.592	Manas	E(o)	11.39	5,103
1281	03 78I09 07375	27.987	90.505	Manas	M(e)	18.16	5,199
1282	03 78I09 07382	27.983	90.594	Manas	M(e)	12.14	5,028
1283	03 78I09 07396	27.972	90.508	Manas	E(o)	25.00	5,101
1284	03 78I09 07438	27.944	90.743	Manas	E(o)	11.20	4,848

S.No.	Glacial Lake ID No	Lat	Long	Subbasin	GL Type	Area (ha)	Elev (m)
1285	03 78I09 07447	27.939	90.535	Manas	E(c)	59.94	5,036
1286	03 78I09 07468	27.925	90.555	Manas	E(o)	29.18	4,774
1287	03 78I09 07470	27.921	90.503	Manas	E(o)	13.38	5,082
1288	03 78I09 07471	27.919	90.537	Manas	E(c)	38.13	4,935
1289	03 78I09 07474	27.915	90.559	Manas	M(o)	11.08	4,939
1290	03 78I09 07487	27.895	90.552	Manas	E(c)	24.13	4,977
1291	03 78I09 07488	27.895	90.598	Manas	E(o)	12.32	4,640
1292	03 78I09 07499	27.884	90.712	Manas	E(o)	12.81	4,875
1293	03 78I09 07500	27.881	90.566	Manas	E(o)	18.83	4,666
1294	03 78I09 07503	27.878	90.571	Manas	E(o)	23.37	4,664
1295	03 78I09 07504	27.876	90.581	Manas	E(o)	16.89	4,599
1296	03 78I09 07510	27.861	90.591	Manas	E(o)	74.98	4,770
1297	03 78I09 07514	27.857	90.740	Manas	E(o)	11.88	4,406
1298	03 78I09 07528	27.844	90.618	Manas	E(o)	12.54	4,767
1299	03 78I09 07537	27.827	90.701	Manas	E(o)	10.37	4,363
1300	03 78I09 07553	27.805	90.577	Manas	E(c)	10.11	4,704
1301	03 78I09 07554	27.803	90.585	Manas	E(o)	10.15	4,647
1302	03 78I09 07557	27.798	90.620	Manas	E(c)	18.31	4,574
1303	03 78I09 07559	27.796	90.634	Manas	E(c)	40.52	4,462
1304	03 78I09 07565	27.787	90.646	Manas	E(o)	26.59	4,550
1305	03 78I09 07590	27.765	90.625	Manas	E(o)	10.80	4,338
1306	03 78I09 07592	27.764	90.636	Manas	E(o)	12.42	4,614
1307	03 78I09 07601	27.757	90.624	Manas	E(c)	12.45	4,410
1308	03 78I13 07685	27.942	90.756	Manas	M(o)	16.41	5,031
1309	03 78I13 07694	27.907	90.812	Manas	M(o)	35.67	4,804
1310	03 78I13 07697	27.897	90.816	Manas	E(o)	44.54	4,712
1311	03 78I13 07703	27.886	90.830	Manas	E(o)	16.34	4,845
1312	03 78I13 07706	27.880	90.791	Manas	E(o)	10.66	4,807
1313	03 78I13 07709	27.873	90.803	Manas	E(o)	27.12	4,453
1314	03 78I13 07712	27.867	90.816	Manas	E(o)	53.98	4,135
1315	03 78I13 07719	27.841	90.831	Manas	E(o)	18.14	4,568
1316	03 78I13 07723	27.830	90.811	Manas	E(o)	18.02	4,367
1317	03 78I13 07726	27.821	90.810	Manas	E(c)	14.45	4,613
1318	03 78I13 07729	27.810	90.864	Manas	E(o)	22.79	4,112
1319	03 78I13 07736	27.790	90.784	Manas	E(o)	10.15	4,263
1320	03 78I13 07738	27.784	90.811	Manas	E(c)	10.09	4,126
1321	03 78I13 07759	27.757	90.807	Manas	E(c)	18.25	4,181
1322	03 78I14 07764	27.748	90.821	Manas	E(c)	11.59	4,438
1323	03 78I14 07780	27.707	90.960	Manas	E(o)	11.57	3,952
1324	03 77P08 07817	28.037	91.452	Manas	M(o)	56.24	4,737
1325	03 77P12 07829	28.164	91.511	Manas	M(e)	11.98	5,221
1326	03 77P12 07834	28.143	91.664	Manas	M(e)	19.31	5,139
1327	03 77P12 07845	28.024	91.597	Manas	M(e)	36.52	4,804
1328	03 77P12 07847	28.014	91.676	Manas	E(o)	14.26	4,422
1329	03 77P15 07853	28.355	91.960	Manas	E(o)	20.15	4,774
1330	03 77P16 07886	28.102	91.942	Manas	E(o)	117.73	4,705
1331	03 77P16 07892	28.059	91.939	Manas	E(o)	240.03	4,631
1332	03 78M05 07903	27.916	91.450	Manas	E(c)	13.44	4,422
1333	03 78M05 07915	27.879	91.449	Manas	E(c)	10.23	4,229
1334	03 78M05 07923	27.871	91.459	Manas	E(c)	12.59	3,832
1335	03 78M05 07928	27.860	91.495	Manas	E(o)	10.51	3,913
1336	03 78M09 07942	27.996	91.511	Manas	M(o)	12.13	5,319
1337	03 78M09 07958	27.912	91.577	Manas	E(o)	13.64	4,628
1338	03 78M09 07965	27.901	91.620	Manas	E(o)	14.82	4,938
1339	03 78M09 07966	27.898	91.535	Manas	E(c)	27.53	4,430
1340	03 78M09 07972	27.893	91.649	Manas	E(c)	24.45	4,819
1341	03 78M09 07982	27.888	91.596	Manas	E(c)	16.69	4,626
1342	03 78M09 07990	27.878	91.517	Manas	E(c)	32.71	4,248
1343	03 78M09 07993	27.877	91.717	Manas	E(o)	18.45	4,533
1344	03 78M09 07994	27.877	91.634	Manas	E(o)	44.48	4,480
1345	03 78M09 08006	27.869	91.671	Manas	E(o)	45.27	4,054
1346	03 78M09 08010	27.861	91.629	Manas	E(o)	10.38	4,581
1347	03 78M09 08017	27.854	91.500	Manas	E(c)	31.88	4,049
1348	03 78M09 08020	27.851	91.604	Manas	E(c)	31.40	4,509
1349	03 78M09 08021	27.847	91.583	Manas	E(c)	49.42	4,656
1350	03 78M09 08027	27.841	91.565	Manas	E(o)	16.27	4,558
1351	03 78M09 08030	27.838	91.605	Manas	0	66.35	4,125
1352	03 78M09 08032	27.834	91.553	Manas	E(c)	67.23	4,521
1353	03 78M09 08034	27.824	91.559	Manas	E(c)	10.93	4,674
1354	03 78M09 08035	27.815	91.595	Manas	E(c)	14.20	4,678
1355	03 78M09 08040	27.811	91.501	Manas	E(c)	17.12	4,213
1356	03 78M09 08042	27.809	91.549	Manas	E(c)	19.04	4,297
1357	03 78M09 08044	27.806	91.590	Manas	E(o)	13.80	4,406
1358	03 78M09 08045	27.802	91.643	Manas	E(c)	12.24	4,504
1359	03 78M09 08046	27.801	91.579	Manas	E(o)	19.76	4,617
1360	03 78M09 08047	27.798	91.593	Manas	E(c)	16.43	4,066
1361	03 78M09 08055	27.757	91.650	Manas	E(o)	16.67	4,152
1362	03 78M09 08057	27.756	91.529	Manas	E(o)	15.81	3,868
1363	03 78M10 08072	27.702	91.634	Manas	E(o)	16.42	4,319
1364	03 78M13 08075	27.992	91.952	Manas	0	40.89	4,354
1365	03 78M13 08095	27.901	91.896	Manas	0	217.48	4,452
1366	03 78M13 08106	27.874	91.833	Manas	E(o)	10.26	4,340
1367	03 78M13 08127	27.849	91.948	Manas	E(o)	19.90	4,630
1368	03 78M13 08130	27.841	91.892	Manas	0	145.65	4,638
1369	03 78M13 08161	27.796	91.925	Manas	E(o)	22.77	4,499
1370	03 78M13 08162	27.795	91.838	Manas	E(c)	19.81	4,667
1371	03 78M13 08172	27.785	91.948	Manas	E(o)	13.08	4,484
1372	03 78M14 08191	27.746	91.870	Manas	E(o)	44.61	4,345
1373	03 78M14 08209	27.734	91.871	Manas	E(o)	12.54	4,456
1374	03 78M14 08244	27.698	91.903	Manas	E(o)	13.14	4,047
1375	03 78M14 08247	27.697	91.873	Manas	E(o)	13.11	4,467
1376	03 78M14 08256	27.693	91.857	Manas	E(o)	17.65	4,283
1377	03 78M14 08289	27.673	91.875	Manas	E(o)	33.23	4,222
1378	03 78M14 08320	27.625	91.803	Manas	E(c)	10.79	4,329
1379	03 78M14 08324	27.620	91.779	Manas	E(o)	11.38	3,978
1380	03 82D04 08346	28.239	92.033	Manas	E(o)	12.05	5,130
1381	03 82D04 08348	28.230	92.042	Manas	E(o)	15.97	5,107
1382	03 82D04 08349	28.228	92.023	Manas	E(o)	11.52	5,115
1383	03 82D04 08350	28.223	92.043	Manas	E(o)	15.06	5,099
1384	03 82D04 08354	28.193	92.039	Manas	E(o)	25.64	5,036
1385	03 82D04 08362	28.068	92.147	Manas	E(o)	16.73	4,973
1386	03 83A01 08421	27.851	92.161	Manas	E(o)	16.55	4,824
1387	03 83A01 08435	27.789	92.048	Manas	M(o)	11.07	4,952
1388	03 83A01 08449	27.753	92.041	Manas	E(c)	10.23	4,084
1389	03 83A02 08517	27.588	92.222	Manas	E(o)	13.08	4,455
1390	03 83A02 08537	27.566	92.216	Manas	E(o)	19.59	4,348
1391	03 83A02 08539	27.565	92.065	Manas	E(o)	14.28	4,326
1392	03 83A02 08572	27.519	92.033	Manas	E(o)	60.79	4,274
1393	03 83A02 08576	27.514	92.048	Manas	E(o)	14.07	4,088
1394	03 83A02 08580	27.509	92.101	Manas	0	18.91	4,148
1395	03 83A02 08584	27.505	92.045	Manas	E(o)	10.80	4,170
1396	03 83A05 08626	27.774	92.315	Manas	E(o)	13.13	4,870
1397	03 83A05 08628	27.771	92.435	Manas	M(o)	55.56	5,179
1398	03 83A05 08631	27.763	92.425	Manas	M(o)	19.37	5,094
1399	03 83A05 08637	27.756	92.401	Manas	E(o)	13.46	4,967
1400	03 83A06 08676	27.715	92.386	Manas	E(o)	12.28	5,117
1401	03 82E04 08784	31.030	93.163	Lower Yarlung Tsangpo	0	13.30	5,195
1402	03 82F02 08814	30.621	93.181	Lower Yarlung Tsangpo	0	689.79	4,499
1403	03 82F02 08824	30.535	93.058	Lower Yarlung Tsangpo	E(o)	86.74	4,817
1404	03 82F06 08849	30.527	93.419	Lower Yarlung Tsangpo	M(o)	31.64	4,758
1405	03 82F06 08851	30.521	93.445	Lower Yarlung Tsangpo	M(o)	114.42	4,780
1406	03 82F07 08854	30.493	93.357	Lower Yarlung Tsangpo	M(e)	22.25	4,702
1407	03 82F07 08860	30.463	93.390	Lower Yarlung Tsangpo	M(e)	12.41	4,788
1408	03 82F07 08862	30.425	93.492	Lower Yarlung Tsangpo	E(o)	32.69	4,496
1409	03 82F09 08884	30.803	93.683	Lower Yarlung Tsangpo	M(l)	11.10	5,130
1410	03 82F10 08895	30.532	93.516	Lower Yarlung Tsangpo	M(e)	36.56	4,778
1411	03 82F11 08900	30.474	93.535	Lower Yarlung Tsangpo	M(o)	24.84	5,015
1412	03 82F11 08905	30.461	93.509	Lower Yarlung Tsangpo	E(o)	12.12	4,785
1413	03 82F11 08913	30.441	93.630	Lower Yarlung Tsangpo	M(o)	12.45	4,685
1414	03 82F11 08921	30.355	93.632	Lower Yarlung Tsangpo	M(e)	54.25	4,442
1415	03 82F11 08922	30.354	93.529	Lower Yarlung Tsangpo	M(e)	11.42	4,750
1416	03 82F11 08923	30.348	93.507	Lower Yarlung Tsangpo	M(e)	43.13	4,537
1417	03 82F13 08926	30.883	93.831	Lower Yarlung Tsangpo	M(e)	13.43	4,801
1418	03 82F14 08949	30.659	93.894	Lower Yarlung Tsangpo	M(e)	25.13	4,791
1419	03 82F15 08965	30.489	93.823	Lower Yarlung Tsangpo	E(o)	10.41	4,933
1420	03 82J01 08974	30.831	94.000	Lower Yarlung Tsangpo	M(e)	35.39	4,760
1421	03 82J01 08980	30.789	94.117	Lower Yarlung Tsangpo	E(o)	12.40	4,656
1422	03 82J02 08987	30.732	94.211	Lower Yarlung Tsangpo	M(e)	10.54	4,550
1423	03 82J02 08993	30.706	94.118	Lower Yarlung Tsangpo	E(o)	17.53	4,741
1424	03 82J03 09007	30.262	94.134	Lower Yarlung Tsangpo	M(e)	12.60	4,161
1425	03 82J05 09013	30.849	94.344	Lower Yarlung Tsangpo	M(o)	22.22	5,015
1426	03 82J05 09014	30.842	94.353	Lower Yarlung Tsangpo	M(o)	11.70	4,973
1427	03 82J06 09024	30.683	94.323	Lower Yarlung Tsangpo	M(e)	24.02	4,121
1428	03 82J06 09026	30.654	94.492	Lower Yarlung Tsangpo	M(e)	530.64	3,942
1429	03 82J06 09027	30.626	94.444	Lower Yarlung Tsangpo	M(e)	66.04	4,095
1430	03 82J07 09034	30.487	94.266	Lower Yarlung Tsangpo	E(o)	25.30	4,456
1431	03 82J07 09037	30.431	94.455	Lower Yarlung Tsangpo	M(o)	13.03	3,902
1432	03 82J08 09048	30.181	94.288	Lower Yarlung Tsangpo	M(o)	16.21	4,363

S.No.	Glacial Lake ID No	Lat	Long	Subbasin	GL Type	Area (ha)	Elev (m)
1433	03 82J08 09049	30.176	94.282	Lower Yarlung Tsangpo	M(o)	13.91	4,607
1434	03 82J11 09055	30.452	94.603	Lower Yarlung Tsangpo	M(e)	181.75	3,998
1435	03 82J11 09059	30.393	94.653	Lower Yarlung Tsangpo	E(o)	18.96	4,007
1436	03 82J11 09060	30.352	94.732	Lower Yarlung Tsangpo	M(o)	36.07	2,698
1437	03 82J14 09067	30.537	94.759	Lower Yarlung Tsangpo	M(e)	51.12	3,631
1438	03 82N03 09084	30.482	95.032	Lower Yarlung Tsangpo	M(e)	14.85	4,335
1439	03 82N03 09087	30.395	95.082	Lower Yarlung Tsangpo	M(e)	12.22	4,151
1440	03 82B08 09097	30.093	92.485	Lower Yarlung Tsangpo	E(o)	11.49	5,158
1441	03 82B08 09101	30.072	92.457	Lower Yarlung Tsangpo	E(o)	10.98	5,096
1442	03 82B08 09108	30.049	92.443	Lower Yarlung Tsangpo	E(o)	52.80	4,993
1443	03 82B11 09122	30.327	92.720	Lower Yarlung Tsangpo	E(o)	14.10	5,213
1444	03 82B12 09143	30.089	92.533	Lower Yarlung Tsangpo	E(o)	11.30	5,084
1445	03 82B12 09183	30.006	92.742	Lower Yarlung Tsangpo	E(o)	14.10	5,108
1446	03 82B15 09215	30.297	92.925	Lower Yarlung Tsangpo	E(o)	29.42	4,831
1447	03 82B16 09228	30.229	92.968	Lower Yarlung Tsangpo	E(o)	10.60	4,851
1448	03 82B16 09232	30.219	92.941	Lower Yarlung Tsangpo	E(o)	12.89	5,208
1449	03 82B16 09246	30.197	92.976	Lower Yarlung Tsangpo	E(o)	24.87	4,995
1450	03 82C01 09280	29.918	92.180	Lower Yarlung Tsangpo	E(o)	37.73	5,161
1451	03 82C01 09281	29.905	92.192	Lower Yarlung Tsangpo	E(o)	25.14	4,992
1452	03 82C05 09326	29.816	92.399	Lower Yarlung Tsangpo	E(o)	13.49	5,068
1453	03 82C06 09339	29.601	92.490	Lower Yarlung Tsangpo	E(o)	15.90	4,951
1454	03 82C10 09386	29.590	92.716	Lower Yarlung Tsangpo	E(o)	13.21	5,381
1455	03 82C10 09413	29.539	92.636	Lower Yarlung Tsangpo	M(e)	14.07	5,179
1456	03 82C13 09433	29.777	92.925	Lower Yarlung Tsangpo	E(o)	10.33	5,093
1457	03 82C14 09443	29.750	92.778	Lower Yarlung Tsangpo	M(e)	14.19	5,210
1458	03 82F03 09503	30.296	93.216	Lower Yarlung Tsangpo	M(o)	12.34	4,942
1459	03 82F04 09548	30.028	93.197	Lower Yarlung Tsangpo	E(o)	32.59	5,014
1460	03 82F07 09574	30.327	93.351	Lower Yarlung Tsangpo	E(o)	23.62	4,549
1461	03 82F07 09576	30.319	93.343	Lower Yarlung Tsangpo	M(e)	47.25	4,613
1462	03 82F07 09585	30.287	93.480	Lower Yarlung Tsangpo	E(o)	16.83	4,544
1463	03 82F07 09589	30.267	93.457	Lower Yarlung Tsangpo	M(o)	70.57	4,076
1464	03 82F08 09609	30.167	93.480	Lower Yarlung Tsangpo	E(o)	14.34	4,873
1465	03 82F08 09625	30.116	93.274	Lower Yarlung Tsangpo	E(o)	32.70	4,630
1466	03 82F08 09627	30.099	93.272	Lower Yarlung Tsangpo	M(o)	33.54	4,704
1467	03 82F08 09638	30.079	93.359	Lower Yarlung Tsangpo	E(o)	10.08	4,950
1468	03 82F08 09647	30.072	93.357	Lower Yarlung Tsangpo	M(o)	11.84	5,065
1469	03 82F08 09651	30.065	93.334	Lower Yarlung Tsangpo	E(o)	10.38	4,888
1470	03 82F08 09654	30.059	93.277	Lower Yarlung Tsangpo	E(o)	17.78	4,928
1471	03 82F08 09663	30.025	93.406	Lower Yarlung Tsangpo	E(o)	21.26	4,772
1472	03 82F08 09672	30.008	93.437	Lower Yarlung Tsangpo	E(o)	40.99	4,696
1473	03 82F12 09686	30.249	93.614	Lower Yarlung Tsangpo	E(o)	11.57	4,482
1474	03 82F12 09688	30.242	93.638	Lower Yarlung Tsangpo	M(e)	108.96	4,181
1475	03 82F12 09690	30.233	93.577	Lower Yarlung Tsangpo	E(o)	11.77	4,337
1476	03 82F12 09691	30.228	93.636	Lower Yarlung Tsangpo	E(o)	10.00	4,171
1477	03 82F12 09699	30.208	93.512	Lower Yarlung Tsangpo	M(o)	12.21	4,227
1478	03 82F12 09706	30.172	93.718	Lower Yarlung Tsangpo	M(e)	13.41	4,601
1479	03 82F12 09707	30.163	93.729	Lower Yarlung Tsangpo	E(o)	13.86	4,178
1480	03 82F12 09710	30.153	93.527	Lower Yarlung Tsangpo	M(e)	15.56	4,847
1481	03 82F12 09724	30.112	93.501	Lower Yarlung Tsangpo	E(o)	16.31	4,516
1482	03 82F15 09750	30.261	93.764	Lower Yarlung Tsangpo	M(e)	64.75	4,019
1483	03 82F16 09751	30.249	93.989	Lower Yarlung Tsangpo	E(o)	23.37	4,320
1484	03 82F16 09753	30.200	93.798	Lower Yarlung Tsangpo	M(e)	20.39	4,195
1485	03 82F16 09767	30.088	93.755	Lower Yarlung Tsangpo	E(c)	21.21	4,840
1486	03 82F16 09768	30.075	93.974	Lower Yarlung Tsangpo	E(c)	15.80	4,615
1487	03 82F16 09771	30.059	93.781	Lower Yarlung Tsangpo	0	20.24	3,751
1488	03 82F16 09776	30.020	93.967	Lower Yarlung Tsangpo	E(v)	2,658.4	3,475
1489	03 82G01 09827	29.809	93.018	Lower Yarlung Tsangpo	M(o)	11.17	5,360
1490	03 82G01 09854	29.764	93.115	Lower Yarlung Tsangpo	E(c)	23.92	5,076
1491	03 82G01 09862	29.758	93.123	Lower Yarlung Tsangpo	E(o)	10.51	5,099
1492	03 82G02 09867	29.747	93.149	Lower Yarlung Tsangpo	E(o)	15.14	4,943
1493	03 82G02 09880	29.693	93.068	Lower Yarlung Tsangpo	E(o)	16.51	4,939
1494	03 82G02 09942	29.580	93.199	Lower Yarlung Tsangpo	E(o)	16.98	5,180
1495	03 82G02 09954	29.532	93.236	Lower Yarlung Tsangpo	E(o)	11.28	5,018
1496	03 82G02 09959	29.520	93.177	Lower Yarlung Tsangpo	E(o)	13.09	5,210
1497	03 82G05 09974	30.000	93.385	Lower Yarlung Tsangpo	E(c)	20.57	4,873
1498	03 82G05 10004	29.948	93.250	Lower Yarlung Tsangpo	E(o)	10.39	5,069
1499	03 82G06 10036	29.732	93.498	Lower Yarlung Tsangpo	E(o)	30.64	4,476
1500	03 82G06 10041	29.716	93.427	Lower Yarlung Tsangpo	E(o)	12.70	5,001
1501	03 82G06 10054	29.658	93.275	Lower Yarlung Tsangpo	E(o)	13.27	4,967
1502	03 82G06 10055	29.650	93.337	Lower Yarlung Tsangpo	M(e)	26.37	4,738
1503	03 82G06 10057	29.648	93.253	Lower Yarlung Tsangpo	M(o)	11.73	5,137
1504	03 82G06 10072	29.603	93.427	Lower Yarlung Tsangpo	E(o)	11.69	4,512
1505	03 82G06 10075	29.601	93.465	Lower Yarlung Tsangpo	E(o)	32.35	4,604
1506	03 82G06 10090	29.555	93.269	Lower Yarlung Tsangpo	E(o)	13.97	4,784
1507	03 82G06 10094	29.541	93.345	Lower Yarlung Tsangpo	E(o)	100.03	4,631
1508	03 82G10 10174	29.644	93.548	Lower Yarlung Tsangpo	E(o)	19.85	4,738
1509	03 82G10 10183	29.630	93.561	Lower Yarlung Tsangpo	E(o)	44.35	4,563
1510	03 82G10 10195	29.606	93.588	Lower Yarlung Tsangpo	E(o)	17.97	4,734
1511	03 82G10 10196	29.605	93.528	Lower Yarlung Tsangpo	E(o)	20.77	4,995
1512	03 82G10 10200	29.598	93.524	Lower Yarlung Tsangpo	E(o)	12.48	4,945
1513	03 82G10 10203	29.594	93.731	Lower Yarlung Tsangpo	E(o)	34.03	4,549
1514	03 82G10 10208	29.585	93.746	Lower Yarlung Tsangpo	E(c)	10.59	4,699
1515	03 82G10 10246	29.520	93.673	Lower Yarlung Tsangpo	E(o)	30.15	4,549
1516	03 82G10 10253	29.513	93.620	Lower Yarlung Tsangpo	0	79.97	4,362
1517	03 82G10 10255	29.512	93.714	Lower Yarlung Tsangpo	E(o)	39.25	4,344
1518	03 82G11 10262	29.477	93.631	Lower Yarlung Tsangpo	E(o)	82.79	4,369
1519	03 82G11 10269	29.458	93.621	Lower Yarlung Tsangpo	E(o)	15.28	4,856
1520	03 82G11 10273	29.452	93.620	Lower Yarlung Tsangpo	E(o)	11.10	4,894
1521	03 82G11 10276	29.443	93.715	Lower Yarlung Tsangpo	E(o)	14.82	4,414
1522	03 82G13 10286	29.950	93.972	Lower Yarlung Tsangpo	E(o)	21.53	4,239
1523	03 82G13 10291	29.924	93.889	Lower Yarlung Tsangpo	E(o)	11.86	4,453
1524	03 82G13 10300	29.907	93.897	Lower Yarlung Tsangpo	E(o)	13.27	4,492
1525	03 82G13 10312	29.891	93.993	Lower Yarlung Tsangpo	E(c)	16.50	4,552
1526	03 82G13 10313	29.878	93.839	Lower Yarlung Tsangpo	E(o)	18.71	4,592
1527	03 82G14 10346	29.657	93.752	Lower Yarlung Tsangpo	E(c)	15.21	4,490
1528	03 82G14 10370	29.621	93.779	Lower Yarlung Tsangpo	E(o)	15.45	4,409
1529	03 82G14 10373	29.613	93.910	Lower Yarlung Tsangpo	E(o)	11.21	4,622
1530	03 82G14 10392	29.589	93.929	Lower Yarlung Tsangpo	E(o)	18.93	4,669
1531	03 82G14 10393	29.587	93.897	Lower Yarlung Tsangpo	E(o)	33.63	4,786
1532	03 82G14 10405	29.568	93.902	Lower Yarlung Tsangpo	E(o)	11.96	4,610
1533	03 82G14 10415	29.558	93.879	Lower Yarlung Tsangpo	0	11.57	4,479
1534	03 82G14 10423	29.545	93.910	Lower Yarlung Tsangpo	E(c)	21.21	4,840
1535	03 82G14 10427	29.542	93.830	Lower Yarlung Tsangpo	E(o)	56.22	4,419
1536	03 82G14 10443	29.524	93.981	Lower Yarlung Tsangpo	E(o)	11.62	4,276
1537	03 82G14 10448	29.506	93.911	Lower Yarlung Tsangpo	E(o)	40.89	4,555
1538	03 82G14 10450	29.506	93.806	Lower Yarlung Tsangpo	E(o)	21.65	4,504
1539	03 82G14 10453	29.504	93.888	Lower Yarlung Tsangpo	E(o)	17.72	4,619
1540	03 82G14 10455	29.502	93.937	Lower Yarlung Tsangpo	E(o)	56.29	4,444
1541	03 82G15 10459	29.491	93.963	Lower Yarlung Tsangpo	E(c)	13.03	4,704
1542	03 82J04 10481	30.132	94.123	Lower Yarlung Tsangpo	E(o)	12.34	4,318
1543	03 82J04 10483	30.126	94.090	Lower Yarlung Tsangpo	E(o)	276.68	3,802
1544	03 82J04 10484	30.115	94.188	Lower Yarlung Tsangpo	M(e)	94.40	3,905
1545	03 82J04 10486	30.064	94.189	Lower Yarlung Tsangpo	E(o)	35.47	4,616
1546	03 82J04 10489	30.046	94.157	Lower Yarlung Tsangpo	E(o)	107.17	4,294
1547	03 82J04 10493	30.019	94.123	Lower Yarlung Tsangpo	E(o)	11.82	4,356
1548	03 82J08 10499	30.099	94.270	Lower Yarlung Tsangpo	M(e)	68.10	3,924
1549	03 82K01 10514	29.948	94.161	Lower Yarlung Tsangpo	0	19.33	4,052
1550	03 82K01 10520	29.941	94.093	Lower Yarlung Tsangpo	0	16.70	4,059
1551	03 82K01 10544	29.896	94.209	Lower Yarlung Tsangpo	E(o)	28.27	4,444
1552	03 82K01 10558	29.881	94.207	Lower Yarlung Tsangpo	E(o)	13.62	4,448
1553	03 82K01 10568	29.856	94.155	Lower Yarlung Tsangpo	E(o)	10.11	4,320
1554	03 82K01 10584	29.834	94.160	Lower Yarlung Tsangpo	E(o)	12.74	4,390
1555	03 82K01 10585	29.833	94.135	Lower Yarlung Tsangpo	E(o)	16.20	4,723
1556	03 82K01 10590	29.817	94.133	Lower Yarlung Tsangpo	E(c)	45.22	4,558
1557	03 82K02 10599	29.658	94.212	Lower Yarlung Tsangpo	E(o)	16.43	4,583
1558	03 82K02 10605	29.645	94.185	Lower Yarlung Tsangpo	E(o)	11.91	4,503
1559	03 82K02 10608	29.636	94.169	Lower Yarlung Tsangpo	E(o)	12.66	4,808
1560	03 82K02 10609	29.632	94.099	Lower Yarlung Tsangpo	E(o)	17.46	4,711
1561	03 82K02 10613	29.622	94.163	Lower Yarlung Tsangpo	E(o)	12.48	4,716
1562	03 82K02 10616	29.611	94.154	Lower Yarlung Tsangpo	E(o)	25.65	4,690
1563	03 82K02 10620	29.601	94.076	Lower Yarlung Tsangpo	E(o)	20.80	4,730
1564	03 82K02 10638	29.578	94.113	Lower Yarlung Tsangpo	E(o)	14.46	4,509
1565	03 82K02 10643	29.573	94.139	Lower Yarlung Tsangpo	E(o)	12.26	4,673
1566	03 82K02 10655	29.556	94.242	Lower Yarlung Tsangpo	E(o)	17.57	4,598
1567	03 82K02 10657	29.555	94.087	Lower Yarlung Tsangpo	E(o)	12.53	4,751
1568	03 82K02 10659	29.551	94.111	Lower Yarlung Tsangpo	E(o)	12.32	4,578
1569	03 82K02 10660	29.550	94.120	Lower Yarlung Tsangpo	E(o)	24.97	4,579
1570	03 82K02 10661	29.545	94.067	Lower Yarlung Tsangpo	E(o)	50.77	4,299
1571	03 82K02 10664	29.543	94.086	Lower Yarlung Tsangpo	E(o)	14.75	4,631
1572	03 82K02 10670	29.538	94.113	Lower Yarlung Tsangpo	E(o)	36.72	4,520
1573	03 82K02 10673	29.537	94.034	Lower Yarlung Tsangpo	E(o)	25.24	4,509
1574	03 82K02 10684	29.529	94.076	Lower Yarlung Tsangpo	E(c)	13.47	4,691
1575	03 82K02 10685	29.529	94.001	Lower Yarlung Tsangpo	E(o)	31.13	4,262
1576	03 82K02 10688	29.526	94.057	Lower Yarlung Tsangpo	E(o)	78.00	4,533
1577	03 82K02 10693	29.522	94.098	Lower Yarlung Tsangpo	E(o)	11.80	4,520
1578	03 82K02 10696	29.518	94.121	Lower Yarlung Tsangpo	E(o)	118.34	4,501
1579	03 82K02 10701	29.507	94.028	Lower Yarlung Tsangpo	E(o)	11.22	4,737
1580	03 82K02 10703	29.505	94.133	Lower Yarlung Tsangpo	E(o)	101.69	4,577

S.No.	Glacial Lake ID No	Lat	Long	Subbasin	GL Type	Area (ha)	Elev (m)
1581	03 82K03 10706	29.499	94.192	Lower Yarlung Tsangpo	E(o)	10.99	4,490
1582	03 82K03 10707	29.499	94.155	Lower Yarlung Tsangpo	E(o)	13.64	4,720
1583	03 82K03 10711	29.493	94.178	Lower Yarlung Tsangpo	E(o)	15.99	4,512
1584	03 82K03 10715	29.491	94.131	Lower Yarlung Tsangpo	E(o)	12.02	4,608
1585	03 82K03 10726	29.475	94.151	Lower Yarlung Tsangpo	E(o)	14.43	4,632
1586	03 82K03 10727	29.475	94.194	Lower Yarlung Tsangpo	E(o)	14.33	4,420
1587	03 82K03 10730	29.472	94.236	Lower Yarlung Tsangpo	E(o)	50.80	4,509
1588	03 82K03 10731	29.472	94.213	Lower Yarlung Tsangpo	E(o)	16.17	4,432
1589	03 82K03 10732	29.470	94.162	Lower Yarlung Tsangpo	E(o)	12.19	4,602
1590	03 82K03 10753	29.447	94.168	Lower Yarlung Tsangpo	E(o)	10.83	4,730
1591	03 82K03 10763	29.426	94.186	Lower Yarlung Tsangpo	E(o)	10.18	4,487
1592	03 82K03 10764	29.424	94.197	Lower Yarlung Tsangpo	E(o)	18.25	4,316
1593	03 82K05 10780	29.965	94.251	Lower Yarlung Tsangpo	E(o)	19.39	4,289
1594	03 82K05 10788	29.915	94.280	Lower Yarlung Tsangpo	E(c)	183.14	4,385
1595	03 82K05 10792	29.906	94.365	Lower Yarlung Tsangpo	E(o)	11.51	4,391
1596	03 82K05 10796	29.897	94.294	Lower Yarlung Tsangpo	E(o)	13.12	4,465
1597	03 82K05 10800	29.894	94.284	Lower Yarlung Tsangpo	E(o)	24.56	4,288
1598	03 82K05 10804	29.886	94.266	Lower Yarlung Tsangpo	E(o)	26.51	4,265
1599	03 82K05 10806	29.881	94.377	Lower Yarlung Tsangpo	O	12.37	4,575
1600	03 82K05 10842	29.829	94.363	Lower Yarlung Tsangpo	E(o)	15.32	4,612
1601	03 82K05 10843	29.829	94.282	Lower Yarlung Tsangpo	E(o)	14.73	4,403
1602	03 82K05 10845	29.828	94.462	Lower Yarlung Tsangpo	E(o)	57.27	4,133
1603	03 82K05 10848	29.819	94.358	Lower Yarlung Tsangpo	E(o)	24.21	4,439
1604	03 82K05 10852	29.813	94.433	Lower Yarlung Tsangpo	O	228.43	4,083
1605	03 82K05 10862	29.780	94.448	Lower Yarlung Tsangpo	E(o)	23.84	4,412
1606	03 82K05 10872	29.768	94.465	Lower Yarlung Tsangpo	E(o)	13.38	4,463
1607	03 82K05 10873	29.767	94.482	Lower Yarlung Tsangpo	E(o)	18.00	4,417
1608	03 82K06 10880	29.744	94.461	Lower Yarlung Tsangpo	E(c)	16.75	4,534
1609	03 82K06 10883	29.732	94.483	Lower Yarlung Tsangpo	E(o)	37.20	4,552
1610	03 82K06 10889	29.682	94.494	Lower Yarlung Tsangpo	E(o)	17.55	4,529
1611	03 82K06 10899	29.574	94.276	Lower Yarlung Tsangpo	M(o)	10.49	4,609
1612	03 82K06 10916	29.528	94.343	Lower Yarlung Tsangpo	E(o)	14.61	4,312
1613	03 82K09 10959	29.849	94.519	Lower Yarlung Tsangpo	E(o)	17.70	4,594
1614	03 82K09 10962	29.808	94.501	Lower Yarlung Tsangpo	O	55.81	4,305
1615	03 82K09 10964	29.785	94.516	Lower Yarlung Tsangpo	E(o)	27.91	4,497
1616	03 82K09 10965	29.782	94.527	Lower Yarlung Tsangpo	E(o)	18.97	4,585
1617	03 77O11 10998	29.462	91.646	Lower Yarlung Tsangpo	E(o)	10.39	5,296
1618	03 77O15 11036	29.430	91.971	Lower Yarlung Tsangpo	E(o)	20.31	5,197
1619	03 77P13 11055	28.802	91.937	Lower Yarlung Tsangpo	M(o)	11.76	5,207
1620	03 82C02 11078	29.536	92.020	Lower Yarlung Tsangpo	E(o)	18.57	5,130
1621	03 82C06 11110	29.560	92.451	Lower Yarlung Tsangpo	E(o)	20.94	4,921
1622	03 82C06 11112	29.547	92.479	Lower Yarlung Tsangpo	E(o)	15.93	5,077
1623	03 82C06 11123	29.526	92.491	Lower Yarlung Tsangpo	E(o)	11.23	5,279
1624	03 82C06 11135	29.510	92.459	Lower Yarlung Tsangpo	E(o)	23.75	5,077
1625	03 82C06 11136	29.505	92.464	Lower Yarlung Tsangpo	E(o)	12.37	5,103
1626	03 82C06 11137	29.503	92.470	Lower Yarlung Tsangpo	E(o)	11.62	5,161
1627	03 82C07 11154	29.355	92.453	Lower Yarlung Tsangpo	M(e)	12.87	5,072
1628	03 82C07 11161	29.334	92.373	Lower Yarlung Tsangpo	O	12.30	5,065
1629	03 82C07 11165	29.331	92.431	Lower Yarlung Tsangpo	M(o)	20.13	5,217
1630	03 82C07 11184	29.316	92.434	Lower Yarlung Tsangpo	E(o)	12.78	4,911
1631	03 82C07 11192	29.287	92.453	Lower Yarlung Tsangpo	E(c)	23.36	4,890
1632	03 82C08 11206	29.195	92.443	Lower Yarlung Tsangpo	E(o)	22.46	4,984
1633	03 82C10 11217	29.541	92.687	Lower Yarlung Tsangpo	E(o)	15.98	5,120
1634	03 82C10 11220	29.532	92.521	Lower Yarlung Tsangpo	E(o)	22.44	5,249
1635	03 82C10 11226	29.524	92.511	Lower Yarlung Tsangpo	E(o)	15.08	5,266
1636	03 82C10 11232	29.517	92.739	Lower Yarlung Tsangpo	E(o)	24.01	4,930
1637	03 82C10 11233	29.517	92.681	Lower Yarlung Tsangpo	E(o)	11.55	5,276
1638	03 82C11 11247	29.488	92.644	Lower Yarlung Tsangpo	M(e)	12.89	5,225
1639	03 82C11 11267	29.390	92.549	Lower Yarlung Tsangpo	E(o)	33.54	4,947
1640	03 82C11 11311	29.300	92.651	Lower Yarlung Tsangpo	E(c)	22.22	5,149
1641	03 82C11 11319	29.283	92.656	Lower Yarlung Tsangpo	E(o)	15.24	5,050
1642	03 82C12 11338	29.226	92.625	Lower Yarlung Tsangpo	E(o)	16.34	5,115
1643	03 82C14 11365	29.666	92.800	Lower Yarlung Tsangpo	E(o)	36.70	5,126
1644	03 82C14 11367	29.656	92.783	Lower Yarlung Tsangpo	E(o)	14.97	5,123
1645	03 82C14 11368	29.656	92.835	Lower Yarlung Tsangpo	E(o)	20.35	4,997
1646	03 82C14 11382	29.581	92.791	Lower Yarlung Tsangpo	E(o)	15.11	4,884
1647	03 82C15 11441	29.276	92.802	Lower Yarlung Tsangpo	E(o)	15.87	5,207
1648	03 82C16 11454	29.250	92.996	Lower Yarlung Tsangpo	E(o)	27.64	4,810
1649	03 82C16 11476	29.202	92.984	Lower Yarlung Tsangpo	E(o)	12.02	5,013
1650	03 82D02 11538	28.705	92.111	Lower Yarlung Tsangpo	O	38.58	4,780
1651	03 82D02 11550	28.648	92.160	Lower Yarlung Tsangpo	E(o)	19.85	4,976
1652	03 82D05 11555	28.976	92.253	Lower Yarlung Tsangpo	O	14.68	4,824
1653	03 82G03 11641	29.437	93.173	Lower Yarlung Tsangpo	E(o)	16.23	5,034
1654	03 82G03 11683	29.310	93.093	Lower Yarlung Tsangpo	E(o)	14.42	4,819
1655	03 82G03 11705	29.284	93.117	Lower Yarlung Tsangpo	E(o)	13.20	4,765
1656	03 82G04 11725	29.246	93.043	Lower Yarlung Tsangpo	E(o)	12.13	5,086
1657	03 82G04 11732	29.238	93.038	Lower Yarlung Tsangpo	E(o)	13.89	4,976
1658	03 82G04 11768	29.157	93.069	Lower Yarlung Tsangpo	E(o)	15.68	4,461
1659	03 82G06 11780	29.555	93.454	Lower Yarlung Tsangpo	E(o)	13.05	4,911
1660	03 82G06 11787	29.533	93.390	Lower Yarlung Tsangpo	E(o)	26.45	4,799
1661	03 82G06 11788	29.525	93.470	Lower Yarlung Tsangpo	E(o)	46.03	4,686
1662	03 82G06 11793	29.514	93.367	Lower Yarlung Tsangpo	E(o)	19.73	4,869
1663	03 82G06 11802	29.503	93.497	Lower Yarlung Tsangpo	E(o)	10.36	4,822
1664	03 82G07 11803	29.494	93.303	Lower Yarlung Tsangpo	E(o)	11.32	4,971
1665	03 82G07 11808	29.485	93.299	Lower Yarlung Tsangpo	E(o)	24.69	4,947
1666	03 82G07 11810	29.476	93.299	Lower Yarlung Tsangpo	E(o)	20.93	4,846
1667	03 82G07 11825	29.444	93.412	Lower Yarlung Tsangpo	E(o)	10.74	4,797
1668	03 82G07 11830	29.439	93.254	Lower Yarlung Tsangpo	E(o)	14.15	4,755
1669	03 82G07 11835	29.421	93.291	Lower Yarlung Tsangpo	E(o)	44.79	4,644
1670	03 82G07 11839	29.399	93.319	Lower Yarlung Tsangpo	E(o)	24.37	4,757
1671	03 82G07 11856	29.322	93.265	Lower Yarlung Tsangpo	E(o)	26.11	4,951
1672	03 82G07 11875	29.296	93.424	Lower Yarlung Tsangpo	E(o)	15.29	4,648
1673	03 82G07 11896	29.270	93.285	Lower Yarlung Tsangpo	E(o)	10.41	5,066
1674	03 82G08 11911	29.240	93.276	Lower Yarlung Tsangpo	E(o)	58.59	4,914
1675	03 82G08 11922	29.220	93.306	Lower Yarlung Tsangpo	E(o)	35.12	4,887
1676	03 82G08 11939	29.197	93.346	Lower Yarlung Tsangpo	E(o)	10.94	4,841
1677	03 82G08 11940	29.196	93.327	Lower Yarlung Tsangpo	E(c)	17.01	4,728
1678	03 82G08 11942	29.190	93.275	Lower Yarlung Tsangpo	E(o)	11.02	5,021
1679	03 82G08 11946	29.180	93.272	Lower Yarlung Tsangpo	E(o)	17.38	4,932
1680	03 82G08 11949	29.178	93.298	Lower Yarlung Tsangpo	M(o)	11.66	4,915
1681	03 82G08 11960	29.125	93.326	Lower Yarlung Tsangpo	E(o)	10.42	4,886
1682	03 82G11 11984	29.497	93.502	Lower Yarlung Tsangpo	E(o)	15.32	4,702
1683	03 82G11 11988	29.466	93.590	Lower Yarlung Tsangpo	E(o)	30.38	4,615
1684	03 82G11 11989	29.462	93.556	Lower Yarlung Tsangpo	E(o)	21.52	4,719
1685	03 82G11 12002	29.419	93.739	Lower Yarlung Tsangpo	E(o)	14.71	4,594
1686	03 82G11 12004	29.417	93.691	Lower Yarlung Tsangpo	E(o)	38.87	4,557
1687	03 82G11 12006	29.405	93.708	Lower Yarlung Tsangpo	E(o)	74.32	4,505
1688	03 82G11 12007	29.404	93.650	Lower Yarlung Tsangpo	E(o)	31.08	4,624
1689	03 82G11 12015	29.396	93.682	Lower Yarlung Tsangpo	E(o)	15.84	4,888
1690	03 82G11 12019	29.389	93.610	Lower Yarlung Tsangpo	E(o)	15.44	4,772
1691	03 82G11 12023	29.383	93.640	Lower Yarlung Tsangpo	E(o)	39.57	4,717
1692	03 82G11 12030	29.370	93.694	Lower Yarlung Tsangpo	E(o)	48.66	4,725
1693	03 82G11 12043	29.331	93.721	Lower Yarlung Tsangpo	E(o)	49.58	4,610
1694	03 82G11 12045	29.329	93.749	Lower Yarlung Tsangpo	E(o)	24.59	4,528
1695	03 82G11 12046	29.328	93.677	Lower Yarlung Tsangpo	E(o)	33.31	4,628
1696	03 82G11 12053	29.312	93.627	Lower Yarlung Tsangpo	E(c)	16.09	4,835
1697	03 82G11 12065	29.287	93.736	Lower Yarlung Tsangpo	E(o)	59.16	4,562
1698	03 82G11 12066	29.287	93.701	Lower Yarlung Tsangpo	E(o)	18.25	4,643
1699	03 82G12 12093	29.056	93.694	Lower Yarlung Tsangpo	E(o)	16.82	4,576
1700	03 82G12 12102	29.046	93.741	Lower Yarlung Tsangpo	O	11.84	4,201
1701	03 82G12 12110	29.037	93.735	Lower Yarlung Tsangpo	O	22.43	4,202
1702	03 82G12 12113	29.034	93.602	Lower Yarlung Tsangpo	E(o)	21.73	4,602
1703	03 82G12 12124	29.025	93.567	Lower Yarlung Tsangpo	O	10.65	4,553
1704	03 82G12 12126	29.024	93.731	Lower Yarlung Tsangpo	O	11.04	4,214
1705	03 82G12 12139	29.017	93.713	Lower Yarlung Tsangpo	E(o)	25.14	4,411
1706	03 82G12 12160	29.003	93.566	Lower Yarlung Tsangpo	E(o)	14.37	4,824
1707	03 82G12 12161	29.003	93.668	Lower Yarlung Tsangpo	E(o)	17.11	4,558
1708	03 82G14 12167	29.507	93.840	Lower Yarlung Tsangpo	M(o)	24.29	4,449
1709	03 82G15 12175	29.488	93.826	Lower Yarlung Tsangpo	E(o)	13.43	4,741
1710	03 82G15 12186	29.474	93.864	Lower Yarlung Tsangpo	E(o)	13.98	4,422
1711	03 82G15 12196	29.465	93.996	Lower Yarlung Tsangpo	E(o)	20.29	4,471
1712	03 82G15 12204	29.454	93.978	Lower Yarlung Tsangpo	E(o)	16.10	4,670
1713	03 82G15 12214	29.420	93.864	Lower Yarlung Tsangpo	E(o)	11.53	4,611
1714	03 82G15 12221	29.414	93.783	Lower Yarlung Tsangpo	E(o)	11.71	4,291
1715	03 82G15 12229	29.404	93.775	Lower Yarlung Tsangpo	E(o)	11.71	4,666
1716	03 82G15 12250	29.359	93.823	Lower Yarlung Tsangpo	E(c)	21.53	4,518
1717	03 82G15 12260	29.341	93.788	Lower Yarlung Tsangpo	E(o)	27.07	4,497
1718	03 82G15 12262	29.337	93.758	Lower Yarlung Tsangpo	E(o)	14.33	4,540
1719	03 82G15 12268	29.311	93.806	Lower Yarlung Tsangpo	E(o)	10.51	4,623
1720	03 82G15 12274	29.305	93.835	Lower Yarlung Tsangpo	E(o)	13.90	4,614
1721	03 82G16 12324	29.038	93.762	Lower Yarlung Tsangpo	E(o)	21.96	4,242
1722	03 82G16 12326	29.035	93.836	Lower Yarlung Tsangpo	O	67.89	4,116
1723	03 82G16 12334	29.029	93.982	Lower Yarlung Tsangpo	E(o)	31.69	4,072
1724	03 82G16 12338	29.021	93.815	Lower Yarlung Tsangpo	E(o)	12.30	4,729
1725	03 82G16 12339	29.021	93.756	Lower Yarlung Tsangpo	E(c)	15.06	4,696
1726	03 82H01 12359	28.871	93.224	Lower Yarlung Tsangpo	M(o)	21.82	4,801
1727	03 82H01 12365	28.773	93.172	Lower Yarlung Tsangpo	O	11.23	4,522
1728	03 82H01 12368	28.767	93.073	Lower Yarlung Tsangpo	O	16.39	4,149

S.No.	Glacial Lake ID No	Lat	Long	Subbasin	GL Type	Area (ha)	Elev (m)
1729	03 82H01 12371	28.757	93.079	Lower Yarlung Tsangpo	E(o)	22.39	4,161
1730	03 82H09 12465	28.771	93.631	Lower Yarlung Tsangpo	E(c)	17.84	4,688
1731	03 82H10 12487	28.672	93.723	Lower Yarlung Tsangpo	E(o)	12.09	4,361
1732	03 82H13 12506	28.856	94.000	Lower Yarlung Tsangpo	E(o)	73.89	3,868
1733	03 82H13 12512	28.847	93.784	Lower Yarlung Tsangpo	E(o)	24.48	4,057
1734	03 82H13 12515	28.841	93.752	Lower Yarlung Tsangpo	E(o)	31.25	4,120
1735	03 82H13 12520	28.790	93.912	Lower Yarlung Tsangpo	E(o)	17.23	4,226
1736	03 82H13 12524	28.785	93.923	Lower Yarlung Tsangpo	E(o)	13.50	4,147
1737	03 82K03 12559	29.487	94.099	Lower Yarlung Tsangpo	E(o)	10.43	4,733
1738	03 82K03 12564	29.484	94.034	Lower Yarlung Tsangpo	E(o)	22.22	4,470
1739	03 82K03 12567	29.481	94.118	Lower Yarlung Tsangpo	E(o)	19.23	4,601
1740	03 82K03 12582	29.467	94.131	Lower Yarlung Tsangpo	E(o)	11.02	4,487
1741	03 82K03 12583	29.465	94.103	Lower Yarlung Tsangpo	E(o)	11.99	4,516
1742	03 82K03 12586	29.464	94.045	Lower Yarlung Tsangpo	E(o)	40.19	4,509
1743	03 82K03 12591	29.457	94.052	Lower Yarlung Tsangpo	E(c)	13.35	4,692
1744	03 82K03 12595	29.454	94.015	Lower Yarlung Tsangpo	E(o)	16.67	4,391
1745	03 82K03 12596	29.454	94.006	Lower Yarlung Tsangpo	E(o)	20.79	4,391
1746	03 82K03 12599	29.450	94.155	Lower Yarlung Tsangpo	E(c)	16.57	4,610
1747	03 82K03 12619	29.417	94.150	Lower Yarlung Tsangpo	E(o)	11.51	4,438
1748	03 82K03 12630	29.402	94.199	Lower Yarlung Tsangpo	E(o)	14.59	4,616
1749	03 82K03 12631	29.401	94.208	Lower Yarlung Tsangpo	E(o)	10.07	4,485
1750	03 82K03 12641	29.396	94.066	Lower Yarlung Tsangpo	E(o)	16.68	4,523
1751	03 82K03 12658	29.375	94.019	Lower Yarlung Tsangpo	E(o)	19.85	4,418
1752	03 82K03 12668	29.361	94.147	Lower Yarlung Tsangpo	E(o)	16.26	4,551
1753	03 82K03 12691	29.343	94.161	Lower Yarlung Tsangpo	E(o)	11.01	4,564
1754	03 82K03 12699	29.321	94.119	Lower Yarlung Tsangpo	E(c)	12.58	4,553
1755	03 82K03 12709	29.296	94.202	Lower Yarlung Tsangpo	0	42.94	3,931
1756	03 82K03 12710	29.291	94.146	Lower Yarlung Tsangpo	E(o)	15.72	4,468
1757	03 82K03 12718	29.271	94.167	Lower Yarlung Tsangpo	E(o)	10.00	4,523
1758	03 82K04 12729	29.101	94.124	Lower Yarlung Tsangpo	E(c)	45.28	4,562
1759	03 82K04 12738	29.054	94.002	Lower Yarlung Tsangpo	M(e)	13.14	4,966
1760	03 82K04 12739	29.052	94.097	Lower Yarlung Tsangpo	E(o)	24.12	4,338
1761	03 82K04 12743	29.031	94.055	Lower Yarlung Tsangpo	E(o)	18.78	4,240
1762	03 82K04 12746	29.025	94.066	Lower Yarlung Tsangpo	M(o)	11.70	4,289
1763	03 82K04 12747	29.017	94.039	Lower Yarlung Tsangpo	E(c)	19.69	4,107
1764	03 82K07 12752	29.397	94.304	Lower Yarlung Tsangpo	E(o)	11.24	4,321
1765	03 82K08 12780	29.077	94.271	Lower Yarlung Tsangpo	0	17.08	3,682
1766	03 82K08 12781	29.075	94.296	Lower Yarlung Tsangpo	E(o)	11.64	4,377
1767	03 82K08 12782	29.069	94.300	Lower Yarlung Tsangpo	M(o)	12.91	4,435
1768	03 82K11 12795	29.311	94.611	Lower Yarlung Tsangpo	E(c)	20.77	4,253
1769	03 82K11 12796	29.308	94.637	Lower Yarlung Tsangpo	E(c)	15.03	4,142
1770	03 82K14 12810	29.545	94.965	Lower Yarlung Tsangpo	E(c)	91.95	4,300
1771	03 82K15 12816	29.374	94.892	Lower Yarlung Tsangpo	M(e)	27.56	4,455
1772	03 82L01 12818	28.995	94.006	Lower Yarlung Tsangpo	M(o)	13.40	4,578
1773	03 82L01 12825	28.906	94.004	Lower Yarlung Tsangpo	E(o)	12.97	4,423
1774	03 82L01 12826	28.888	94.030	Lower Yarlung Tsangpo	E(o)	16.96	4,104
1775	03 82L01 12827	28.880	94.040	Lower Yarlung Tsangpo	E(o)	14.86	4,130
1776	03 82L01 12829	28.870	94.018	Lower Yarlung Tsangpo	E(o)	11.77	4,303
1777	03 82L05 12837	28.986	94.270	Lower Yarlung Tsangpo	E(o)	50.66	3,478
1778	03 77P13 12844	28.776	91.981	Subansiri	M(e)	16.44	5,013
1779	03 82D04 12864	28.046	92.133	Subansiri	E(o)	12.58	5,113
1780	03 82D12 12912	28.206	92.742	Subansiri	M(e)	10.79	5,176
1781	03 82D12 12915	28.185	92.696	Subansiri	M(e)	27.82	5,162
1782	03 82D12 12968	28.001	92.641	Subansiri	M(e)	10.94	5,269
1783	03 82D16 13006	28.216	92.768	Subansiri	M(e)	13.27	5,164
1784	03 82H02 13015	28.721	93.217	Subansiri	E(o)	17.01	4,474
1785	03 82H02 13034	28.658	93.144	Subansiri	E(o)	11.84	4,518
1786	03 82H03 13095	28.342	93.092	Subansiri	E(o)	62.44	4,251
1787	03 82H03 13097	28.320	93.047	Subansiri	E(o)	72.68	4,255
1788	03 82H06 13111	28.650	93.462	Subansiri	E(o)	16.59	4,046
1789	03 82H06 13124	28.541	93.380	Subansiri	E(o)	16.25	4,307
1790	03 82H06 13135	28.524	93.394	Subansiri	E(o)	12.17	4,249
1791	03 82H06 13138	28.520	93.377	Subansiri	E(o)	13.61	4,247
1792	03 82H07 13154	28.313	93.391	Subansiri	E(o)	20.03	4,066
1793	03 82H07 13156	28.305	93.437	Subansiri	0	35.07	3,952
1794	03 82H07 13157	28.297	93.419	Subansiri	E(o)	20.77	3,841
1795	03 82H10 13161	28.668	93.734	Subansiri	E(c)	19.78	4,016
1796	03 82H10 13168	28.594	93.726	Subansiri	E(c)	25.13	4,208
1797	03 82H10 13171	28.585	93.743	Subansiri	E(o)	11.14	3,758
1798	03 82H10 13172	28.585	93.712	Subansiri	E(o)	14.16	3,873
1799	03 82H10 13180	28.576	93.578	Subansiri	E(o)	36.88	3,842
1800	03 82H10 13183	28.568	93.563	Subansiri	E(o)	16.13	4,074
1801	03 82H11 13195	28.489	93.555	Subansiri	E(o)	13.67	4,647
1802	03 82H11 13197	28.483	93.603	Subansiri	E(o)	12.34	3,987
1803	03 82H11 13203	28.459	93.605	Subansiri	E(o)	11.86	3,957
1804	03 82H11 13204	28.458	93.579	Subansiri	E(o)	47.52	3,922
1805	03 82H14 13211	28.616	93.820	Subansiri	E(o)	46.32	3,590
1806	03 82H14 13212	28.597	93.805	Subansiri	E(o)	12.29	4,163
1807	03 82H14 13216	28.587	93.839	Subansiri	E(o)	11.27	4,296
1808	03 82H14 13218	28.583	93.812	Subansiri	E(o)	11.42	3,799
1809	03 82H14 13226	28.549	93.884	Subansiri	E(o)	15.78	4,070
1810	03 82H15 13236	28.270	93.781	Subansiri	E(o)	12.78	3,537
1811	03 83A05 13281	27.831	92.345	Subansiri	M(e)	22.14	5,032
1812	03 83A09 13285	27.980	92.651	Subansiri	M(e)	52.21	4,988
1813	03 82D16 13317	28.117	92.969	Subansiri	M(o)	18.06	4,214
1814	03 82D16 13318	28.116	92.951	Subansiri	E(c)	55.58	4,648
1815	03 82D16 13323	28.106	92.970	Subansiri	M(o)	12.93	4,340
1816	03 82D16 13331	28.087	92.937	Subansiri	E(o)	21.48	4,328
1817	03 82D16 13337	28.062	92.884	Subansiri	E(o)	23.64	4,365
1818	03 82H03 13344	28.339	93.122	Subansiri	E(c)	14.38	4,086
1819	03 82H07 13364	28.294	93.355	Subansiri	E(c)	10.09	3,597
1820	03 83A06 13468	27.728	92.436	Jia Bharali	M(l)	13.80	4,995
1821	03 83A06 13506	27.637	92.407	Jia Bharali	E(o)	21.73	4,325
1822	03 83A06 13534	27.602	92.385	Jia Bharali	E(o)	10.47	4,227
1823	03 83A09 13546	27.835	92.685	Jia Bharali	E(o)	18.24	3,951
1824	03 83A09 13551	27.825	92.647	Jia Bharali	E(o)	49.71	4,609
1825	03 83A10 13559	27.742	92.515	Jia Bharali	E(o)	13.05	3,863
1826	03 83A13 13581	27.920	92.793	Jia Bharali	E(o)	10.67	4,291
1827	03 83A13 13589	27.904	92.810	Jia Bharali	E(c)	12.25	4,306
1828	03 83A13 13593	27.901	92.786	Jia Bharali	E(o)	10.15	4,248
1829	03 83A13 13602	27.877	92.800	Jia Bharali	E(o)	35.96	3,943
1830	03 82J08 13613	30.248	94.356	Lower Yarlung Tsangpo	E(c)	14.76	4,853
1831	03 82J08 13614	30.219	94.336	Lower Yarlung Tsangpo	M(o)	11.64	4,565
1832	03 82J08 13615	30.214	94.383	Lower Yarlung Tsangpo	E(o)	26.99	4,715
1833	03 82J08 13620	30.175	94.408	Lower Yarlung Tsangpo	E(o)	28.00	3,566
1834	03 82J08 13621	30.174	94.346	Lower Yarlung Tsangpo	E(v)	180.80	3,654
1835	03 82J08 13625	30.142	94.301	Lower Yarlung Tsangpo	M(o)	11.45	4,405
1836	03 82J08 13633	30.098	94.483	Lower Yarlung Tsangpo	0	15.50	3,289
1837	03 82J08 13634	30.073	94.464	Lower Yarlung Tsangpo	E(o)	90.19	4,110
1838	03 82J08 13639	30.053	94.358	Lower Yarlung Tsangpo	E(o)	25.92	4,730
1839	03 82J08 13644	30.028	94.396	Lower Yarlung Tsangpo	E(o)	11.01	4,664
1840	03 82J08 13653	30.017	94.444	Lower Yarlung Tsangpo	E(c)	11.69	4,609
1841	03 82J08 13655	30.013	94.472	Lower Yarlung Tsangpo	E(c)	66.38	4,327
1842	03 82J08 13657	30.005	94.384	Lower Yarlung Tsangpo	E(o)	59.09	4,020
1843	03 82K05 13668	29.985	94.342	Lower Yarlung Tsangpo	E(o)	10.51	4,407
1844	03 82K05 13670	29.984	94.328	Lower Yarlung Tsangpo	E(o)	11.45	4,515
1845	03 82K05 13679	29.959	94.292	Lower Yarlung Tsangpo	E(v)	134.02	4,282
1846	03 82K05 13681	29.954	94.320	Lower Yarlung Tsangpo	0	10.03	4,232
1847	03 82K05 13682	29.954	94.486	Lower Yarlung Tsangpo	E(o)	10.30	4,550
1848	03 82K05 13686	29.947	94.358	Lower Yarlung Tsangpo	E(o)	109.97	4,148
1849	03 82K05 13690	29.942	94.287	Lower Yarlung Tsangpo	E(o)	27.11	4,296
1850	03 82K05 13696	29.932	94.388	Lower Yarlung Tsangpo	E(o)	13.30	4,238
1851	03 82K05 13707	29.913	94.499	Lower Yarlung Tsangpo	E(o)	34.40	4,443
1852	03 82K05 13714	29.896	94.461	Lower Yarlung Tsangpo	E(o)	85.25	4,346
1853	03 82K05 13716	29.884	94.446	Lower Yarlung Tsangpo	E(o)	16.18	4,632
1854	03 82K09 13737	29.943	94.717	Lower Yarlung Tsangpo	E(o)	10.75	4,554
1855	03 82K09 13740	29.941	94.613	Lower Yarlung Tsangpo	E(o)	10.19	4,546
1856	03 82K09 13741	29.941	94.589	Lower Yarlung Tsangpo	E(o)	48.08	4,509
1857	03 82K09 13747	29.933	94.720	Lower Yarlung Tsangpo	E(c)	23.31	4,372
1858	03 82K09 13772	29.910	94.711	Lower Yarlung Tsangpo	E(o)	10.29	4,411
1859	03 82K09 13777	29.902	94.561	Lower Yarlung Tsangpo	E(o)	16.26	4,495
1860	03 82K09 13778	29.902	94.528	Lower Yarlung Tsangpo	E(o)	10.55	4,591
1861	03 82K09 13779	29.900	94.533	Lower Yarlung Tsangpo	E(o)	15.42	4,615
1862	03 82K09 13781	29.899	94.701	Lower Yarlung Tsangpo	E(c)	21.07	4,500
1863	03 82K09 13789	29.892	94.727	Lower Yarlung Tsangpo	E(o)	13.60	4,288
1864	03 82K09 13791	29.890	94.569	Lower Yarlung Tsangpo	E(v)	158.02	4,149
1865	03 82K09 13795	29.885	94.646	Lower Yarlung Tsangpo	E(o)	27.76	4,308
1866	03 82K09 13797	29.882	94.582	Lower Yarlung Tsangpo	E(o)	18.69	4,418
1867	03 82K09 13798	29.879	94.541	Lower Yarlung Tsangpo	E(o)	37.67	4,266
1868	03 82K09 13800	29.877	94.630	Lower Yarlung Tsangpo	E(o)	22.63	4,490
1869	03 82K09 13802	29.875	94.616	Lower Yarlung Tsangpo	E(o)	15.79	4,588
1870	03 82K09 13806	29.869	94.687	Lower Yarlung Tsangpo	E(o)	24.37	4,378
1871	03 82K09 13824	29.861	94.531	Lower Yarlung Tsangpo	E(o)	17.89	4,592
1872	03 82K09 13842	29.852	94.583	Lower Yarlung Tsangpo	E(o)	13.48	4,688
1873	03 82K09 13855	29.829	94.633	Lower Yarlung Tsangpo	E(v)	60.20	4,231
1874	03 82K09 13861	29.825	94.550	Lower Yarlung Tsangpo	0	12.85	4,275
1875	03 82K09 13863	29.824	94.599	Lower Yarlung Tsangpo	E(o)	11.98	4,564
1876	03 82K09 13869	29.815	94.572	Lower Yarlung Tsangpo	E(o)	13.32	4,400

S.No.	Glacial Lake ID No	Lat	Long	Subbasin	GL Type	Area (ha)	Elev (m)
1877	03 82K09 13880	29.796	94.577	Lower Yarlung Tsangpo	E(o)	29.63	4,351
1878	03 82K09 13886	29.779	94.601	Lower Yarlung Tsangpo	E(v)	184.22	4,146
1879	03 82K09 13888	29.777	94.560	Lower Yarlung Tsangpo	E(o)	32.49	4,161
1880	03 82K09 13889	29.776	94.573	Lower Yarlung Tsangpo	E(o)	47.72	4,161
1881	03 82H13 13922	28.763	93.987	Dihang	E(c)	20.22	3,957
1882	03 82H14 13926	28.742	93.915	Dihang	E(o)	10.10	4,150
1883	03 82H14 13937	28.728	93.795	Dihang	E(c)	10.98	4,205
1884	03 82H14 13941	28.707	93.792	Dihang	E(o)	17.92	3,793
1885	03 82H14 13964	28.606	93.845	Dihang	E(c)	12.39	4,022
1886	03 82H14 13975	28.562	93.887	Dihang	E(c)	13.03	3,938
1887	03 82L01 13989	28.757	94.153	Dihang	E(o)	13.33	3,875
1888	03 82L01 13993	28.754	94.134	Dihang	E(o)	10.91	4,057
1889	03 82L01 13994	28.753	94.001	Dihang	E(c)	22.89	4,019
1890	03 82L05 14004	28.963	94.372	Dihang	E(c)	18.95	4,145
1891	03 82L05 14005	28.953	94.383	Dihang	E(o)	19.27	3,858
1892	03 82L05 14019	28.837	94.451	Dihang	E(o)	18.47	4,136
1893	03 82N02 14031	30.603	95.182	Lower Yarlung Tsangpo	M(e)	110.12	4,278
1894	03 82N03 14046	30.269	95.217	Lower Yarlung Tsangpo	E(o)	12.18	3,938
1895	03 82N06 14063	30.571	95.252	Lower Yarlung Tsangpo	M(e)	34.62	4,520
1896	03 82N06 14076	30.531	95.487	Lower Yarlung Tsangpo	E(o)	10.31	4,783
1897	03 82N07 14096	30.420	95.296	Lower Yarlung Tsangpo	E(o)	22.11	4,404
1898	03 82N07 14098	30.392	95.419	Lower Yarlung Tsangpo	E(o)	10.82	4,317
1899	03 82N10 14116	30.591	95.551	Lower Yarlung Tsangpo	E(o)	36.70	5,043
1900	03 82N10 14121	30.576	95.576	Lower Yarlung Tsangpo	E(o)	15.48	4,924
1901	03 82N10 14125	30.564	95.644	Lower Yarlung Tsangpo	E(o)	18.17	5,073
1902	03 82N10 14150	30.541	95.703	Lower Yarlung Tsangpo	E(o)	15.73	5,053
1903	03 82N10 14154	30.537	95.548	Lower Yarlung Tsangpo	E(o)	13.31	4,811
1904	03 82N10 14159	30.533	95.565	Lower Yarlung Tsangpo	E(o)	10.34	4,918
1905	03 82N10 14161	30.527	95.693	Lower Yarlung Tsangpo	E(o)	12.41	4,988
1906	03 82N10 14171	30.522	95.701	Lower Yarlung Tsangpo	M(o)	13.86	4,991
1907	03 82N10 14176	30.514	95.669	Lower Yarlung Tsangpo	E(o)	16.25	4,761
1908	03 82N10 14193	30.473	95.575	Lower Yarlung Tsangpo	E(o)	56.47	4,866
1909	03 82N11 14200	30.496	95.650	Lower Yarlung Tsangpo	E(o)	11.52	4,954
1910	03 82N11 14210	30.470	95.588	Lower Yarlung Tsangpo	E(o)	13.82	4,876
1911	03 82N11 14235	30.436	95.602	Lower Yarlung Tsangpo	E(o)	33.96	5,002
1912	03 82N11 14266	30.391	95.657	Lower Yarlung Tsangpo	E(o)	18.30	4,734
1913	03 82N11 14270	30.386	95.745	Lower Yarlung Tsangpo	0	10.71	4,257
1914	03 82N11 14272	30.381	95.654	Lower Yarlung Tsangpo	M(o)	25.10	4,751
1915	03 82N11 14287	30.326	95.611	Lower Yarlung Tsangpo	M(o)	17.32	4,916
1916	03 82N11 14296	30.300	95.548	Lower Yarlung Tsangpo	M(o)	13.14	4,419
1917	03 82N11 14300	30.269	95.606	Lower Yarlung Tsangpo	M(e)	38.89	4,459
1918	03 82N11 14301	30.251	95.604	Lower Yarlung Tsangpo	M(o)	134.45	4,442
1919	03 82N12 14303	30.238	95.603	Lower Yarlung Tsangpo	M(o)	15.95	4,394
1920	03 82N12 14304	30.229	95.592	Lower Yarlung Tsangpo	M(o)	25.71	4,354
1921	03 82N12 14305	30.223	95.543	Lower Yarlung Tsangpo	M(e)	12.71	4,173
1922	03 82N12 14308	30.221	95.584	Lower Yarlung Tsangpo	M(e)	85.49	4,342
1923	03 82N15 14337	30.341	95.856	Lower Yarlung Tsangpo	M(o)	18.58	4,851
1924	03 82N15 14358	30.288	95.871	Lower Yarlung Tsangpo	E(o)	11.60	4,724
1925	03 82N16 14379	30.180	95.857	Lower Yarlung Tsangpo	E(o)	21.83	4,442
1926	03 82N16 14390	30.008	95.917	Lower Yarlung Tsangpo	M(o)	12.77	4,670
1927	03 82O09 14396	29.805	95.642	Lower Yarlung Tsangpo	M(e)	24.48	4,131
1928	03 82O09 14401	29.796	95.512	Lower Yarlung Tsangpo	E(o)	29.47	4,133
1929	03 82O13 14404	29.992	95.866	Lower Yarlung Tsangpo	M(e)	46.26	4,312
1930	03 82O13 14407	29.982	95.905	Lower Yarlung Tsangpo	E(o)	19.77	4,189
1931	03 82O13 14420	29.905	95.909	Lower Yarlung Tsangpo	E(o)	13.26	4,168
1932	03 82O13 14426	29.870	95.982	Lower Yarlung Tsangpo	M(o)	11.87	4,707
1933	03 91C02 14526	29.598	96.141	Lower Yarlung Tsangpo	M(o)	65.09	4,025
1934	03 91C02 14528	29.579	96.161	Lower Yarlung Tsangpo	M(o)	13.00	3,874
1935	03 91C05 14535	29.907	96.257	Lower Yarlung Tsangpo	E(o)	19.83	4,578
1936	03 91C05 14536	29.904	96.399	Lower Yarlung Tsangpo	E(o)	10.21	4,892
1937	03 91C05 14537	29.893	96.380	Lower Yarlung Tsangpo	E(o)	22.74	4,681
1938	03 91C05 14541	29.883	96.391	Lower Yarlung Tsangpo	M(o)	27.39	4,691
1939	03 91C05 14547	29.874	96.325	Lower Yarlung Tsangpo	M(e)	19.41	4,117
1940	03 91C05 14548	29.867	96.370	Lower Yarlung Tsangpo	M(o)	15.47	4,775
1941	03 91C05 14550	29.823	96.351	Lower Yarlung Tsangpo	M(o)	101.06	4,870
1942	03 91C05 14568	29.762	96.375	Lower Yarlung Tsangpo	E(o)	12.04	4,810
1943	03 91C06 14592	29.706	96.308	Lower Yarlung Tsangpo	E(c)	23.92	4,845
1944	03 91C06 14612	29.626	96.470	Lower Yarlung Tsangpo	E(o)	12.62	4,364
1945	03 91C06 14616	29.571	96.375	Lower Yarlung Tsangpo	E(c)	27.01	4,279
1946	03 91C07 14620	29.465	96.500	Lower Yarlung Tsangpo	M(e)	32.33	3,818
1947	03 91C10 14628	29.664	96.553	Lower Yarlung Tsangpo	M(e)	21.41	4,696
1948	03 82K12 14643	29.177	94.526	Dihang	E(o)	14.84	4,258
1949	03 82K14 14646	29.504	94.969	Dihang	E(c)	15.54	4,451
1950	03 82K15 14652	29.330	94.816	Dihang	E(c)	27.40	4,151
1951	03 82K15 14654	29.316	94.922	Dihang	E(o)	31.30	3,657
1952	03 82K15 14659	29.256	94.770	Dihang	0	12.67	3,294
1953	03 82K16 14663	29.226	94.783	Dihang	E(c)	13.12	3,683
1954	03 82K16 14664	29.222	94.780	Dihang	E(c)	19.59	3,754
1955	03 82L05 14665	28.978	94.398	Dihang	E(o)	24.66	3,111
1956	03 82O03 14676	29.483	95.038	Dihang	E(o)	40.06	3,897
1957	03 82O03 14679	29.478	95.074	Dihang	E(o)	40.76	3,474
1958	03 82O03 14682	29.254	95.227	Dihang	E(o)	20.72	1,441
1959	03 82O04 14687	29.069	95.242	Dihang	E(o)	18.51	3,823
1960	03 82O04 14692	29.058	95.237	Dihang	E(c)	10.02	3,743
1961	03 82O08 14707	29.188	95.453	Dihang	E(c)	15.04	3,866
1962	03 82O08 14708	29.183	95.451	Dihang	E(c)	10.73	3,922
1963	03 82O08 14709	29.180	95.486	Dihang	E(o)	93.81	3,533
1964	03 82O08 14712	29.163	95.491	Dihang	E(o)	34.65	3,544
1965	03 82O08 14715	29.161	95.464	Dihang	E(o)	19.76	3,826
1966	03 82O08 14728	29.144	95.493	Dihang	E(o)	17.69	3,673
1967	03 82O08 14730	29.140	95.405	Dihang	E(o)	20.64	3,765
1968	03 82O08 14738	29.062	95.263	Dihang	E(o)	48.24	3,668
1969	03 82O09 14741	29.763	95.546	Dihang	E(c)	47.44	3,474
1970	03 82O10 14747	29.723	95.528	Dihang	E(o)	13.44	3,065
1971	03 82O10 14765	29.633	95.613	Dihang	E(c)	39.40	4,320
1972	03 82O10 14773	29.599	95.740	Dihang	E(o)	14.79	4,010
1973	03 82O10 14774	29.596	95.691	Dihang	E(c)	11.35	4,314
1974	03 82O10 14778	29.557	95.679	Dihang	E(o)	10.64	4,199
1975	03 82O10 14781	29.513	95.693	Dihang	E(c)	37.79	3,922
1976	03 82O11 14793	29.377	95.630	Dihang	E(o)	33.66	3,750
1977	03 82O11 14797	29.374	95.558	Dihang	E(o)	12.79	4,049
1978	03 82O11 14798	29.374	95.718	Dihang	E(o)	12.83	4,046
1979	03 82O11 14799	29.372	95.712	Dihang	E(o)	13.60	4,042
1980	03 82O11 14803	29.367	95.696	Dihang	E(c)	12.43	4,282
1981	03 82O11 14806	29.363	95.598	Dihang	E(o)	15.57	4,150
1982	03 82O11 14807	29.359	95.583	Dihang	E(o)	33.71	4,193
1983	03 82O11 14808	29.359	95.656	Dihang	E(o)	13.11	3,951
1984	03 82O11 14811	29.356	95.664	Dihang	E(c)	16.40	4,091
1985	03 82O11 14818	29.347	95.732	Dihang	E(c)	11.27	4,140
1986	03 82O11 14819	29.347	95.695	Dihang	E(c)	11.54	4,101
1987	03 82O11 14823	29.336	95.741	Dihang	E(c)	11.33	4,111
1988	03 82O11 14831	29.324	95.590	Dihang	E(o)	25.10	4,016
1989	03 82O11 14834	29.304	95.640	Dihang	E(v)	70.17	3,322
1990	03 82O11 14835	29.304	95.725	Dihang	E(o)	12.17	3,952
1991	03 82O11 14845	29.283	95.740	Dihang	E(o)	20.05	4,168
1992	03 82O11 14846	29.273	95.739	Dihang	E(c)	11.19	4,023
1993	03 82O12 14856	29.237	95.659	Dihang	E(o)	12.70	4,016
1994	03 82O12 14857	29.234	95.596	Dihang	E(o)	14.68	3,750
1995	03 82O12 14858	29.233	95.654	Dihang	E(c)	17.08	3,915
1996	03 82O12 14869	29.202	95.545	Dihang	E(c)	21.83	3,838
1997	03 82O12 14870	29.200	95.505	Dihang	E(o)	24.28	4,104
1998	03 82O12 14873	29.195	95.592	Dihang	E(c)	43.26	3,708
1999	03 82O14 14884	29.539	95.795	Dihang	E(c)	22.16	3,895
2000	03 82O14 14885	29.535	95.804	Dihang	E(c)	20.81	4,065
2001	03 82G08 11928	29.206	93.316	Lower Yarlung Tsangpo	E(o)	6.75	4,650
2002	03 82G08 11935	29.200	93.278	Lower Yarlung Tsangpo	E(o)	5.29	4,870
2001	03 82O15 14899	29.387	95.987	Dihang	M(o)	42.62	4,251
2002	03 82O15 14901	29.375	95.951	Dihang	M(o)	17.15	4,296
2003	03 82O15 14903	29.371	95.873	Dihang	E(o)	103.75	4,344
2004	03 82O15 14906	29.354	95.927	Dihang	M(o)	37.97	4,357
2005	03 82O15 14907	29.352	95.902	Dihang	M(o)	20.65	4,212
2006	03 82O15 14908	29.352	95.915	Dihang	M(o)	46.14	4,357
2007	03 82O15 14909	29.335	95.871	Dihang	E(o)	27.26	4,025
2008	03 82O15 14911	29.327	95.847	Dihang	E(o)	27.90	4,290
2009	03 82O15 14913	29.323	95.857	Dihang	E(o)	15.01	4,169
2010	03 82P02 14923	28.720	95.160	Dihang	E(c)	21.86	3,640
2011	03 82P05 14924	28.964	95.252	Dihang	E(o)	19.91	3,717
2012	03 82P05 14928	28.943	95.298	Dihang	E(o)	11.19	3,780
2013	03 82P05 14929	28.922	95.323	Dihang	E(o)	16.42	3,841
2014	03 82P05 14934	28.899	95.313	Dihang	E(o)	20.34	3,788
2015	03 82P05 14937	28.876	95.316	Dihang	E(o)	14.98	3,847
2016	03 82O08 14954	29.176	95.447	Dibang	E(o)	14.14	3,906
2017	03 82O08 14955	29.167	95.450	Dibang	E(o)	21.38	3,945
2018	03 82O08 14963	29.141	95.437	Dibang	0	21.42	3,322
2019	03 82O08 14974	29.129	95.439	Dibang	E(o)	53.88	3,284
2020	03 82O08 14977	29.120	95.397	Dibang	E(o)	11.15	3,914
2021	03 82O08 14979	29.117	95.480	Dibang	E(c)	12.98	3,706
2022	03 82O08 14991	29.085	95.438	Dibang	E(o)	20.76	3,706

S.No.	Glacial Lake ID No	Lat	Long	Subbasin	GL Type	Area (ha)	Elev (m)
2023	03 82O08 14998	29.074	95.427	Dibang	E(c)	11.42	3,670
2024	03 82O08 15000	29.072	95.405	Dibang	E(o)	19.08	3,864
2025	03 82O12 15012	29.208	95.742	Dibang	E(o)	10.44	3,913
2026	03 82O12 15018	29.176	95.617	Dibang	0	41.23	3,063
2027	03 82O12 15020	29.172	95.736	Dibang	E(o)	10.14	3,652
2028	03 82O12 15024	29.166	95.674	Dibang	E(o)	18.91	3,771
2029	03 82O12 15049	29.092	95.566	Dibang	E(o)	29.05	3,247
2030	03 82O12 15052	29.084	95.501	Dibang	E(o)	26.85	3,480
2031	03 82O15 15072	29.294	95.887	Dibang	E(c)	28.29	3,517
2032	03 82O15 15078	29.270	95.925	Dibang	0	16.04	2,605
2033	03 82O16 15082	29.251	95.957	Dibang	E(o)	10.41	3,738
2034	03 82O16 15084	29.250	95.993	Dibang	E(o)	29.10	4,204
2035	03 82O16 15087	29.239	95.980	Dibang	E(o)	16.96	4,155
2036	03 82O16 15096	29.232	95.981	Dibang	E(o)	30.93	4,167
2037	03 82O16 15098	29.229	95.962	Dibang	E(o)	14.29	4,328
2038	03 82O16 15103	29.219	95.749	Dibang	E(o)	17.46	3,951
2039	03 82O16 15105	29.202	95.797	Dibang	E(o)	15.02	4,054
2040	03 82O16 15108	29.173	95.826	Dibang	E(o)	14.92	3,790
2041	03 82O16 15113	29.153	95.772	Dibang	E(o)	10.39	3,864
2042	03 82O16 15124	29.074	95.946	Dibang	E(o)	12.93	4,165
2043	03 82O16 15126	29.019	95.910	Dibang	E(c)	17.62	3,671
2044	03 82O16 15129	29.011	95.885	Dibang	E(o)	55.15	3,778
2045	03 82P05 15133	28.977	95.263	Dibang	E(c)	10.42	3,769
2046	03 82P05 15143	28.917	95.340	Dibang	E(o)	10.79	3,901
2047	03 82P05 15145	28.911	95.334	Dibang	E(o)	12.17	3,789
2048	03 82P05 15151	28.875	95.377	Dibang	E(c)	11.85	3,504
2049	03 82P05 15152	28.875	95.334	Dibang	E(o)	20.54	3,756
2050	03 82P05 15153	28.873	95.350	Dibang	E(o)	22.84	3,647
2051	03 82P05 15157	28.863	95.340	Dibang	E(o)	10.28	3,789
2052	03 82P05 15164	28.848	95.320	Dibang	E(o)	21.89	3,913
2053	03 82P05 15166	28.831	95.350	Dibang	E(c)	17.90	4,046
2054	03 82P06 15169	28.746	95.398	Dibang	E(o)	11.06	3,787
2055	03 82P13 15195	29.005	95.905	Dibang	E(o)	54.45	3,598
2056	03 82P13 15198	28.979	95.861	Dibang	E(c)	19.07	3,622
2057	03 91C03 15203	29.338	96.082	Dibang	M(o)	27.72	4,290
2058	03 91C03 15204	29.335	96.008	Dibang	E(c)	28.30	3,985
2059	03 91C03 15206	29.325	96.114	Dibang	E(o)	11.06	3,962
2060	03 91C03 15208	29.321	96.117	Dibang	E(o)	10.94	3,975
2061	03 91C03 15211	29.315	96.125	Dibang	E(o)	11.69	3,996
2062	03 91C03 15218	29.309	96.136	Dibang	E(o)	26.81	4,204
2063	03 91C03 15221	29.304	96.142	Dibang	E(o)	27.95	4,221
2064	03 91C03 15223	29.302	96.082	Dibang	E(o)	119.59	4,274
2065	03 91C03 15235	29.292	96.001	Dibang	E(o)	14.80	4,079
2066	03 91C03 15240	29.288	96.134	Dibang	E(o)	10.04	4,045
2067	03 91C03 15243	29.283	96.091	Dibang	E(o)	12.82	4,204
2068	03 91C03 15250	29.269	96.157	Dibang	E(o)	102.66	3,991
2069	03 91C03 15257	29.257	96.138	Dibang	E(o)	23.81	3,766
2070	03 91C03 15259	29.256	96.209	Dibang	E(c)	43.26	4,623
2071	03 91C04 15262	29.249	96.028	Dibang	E(o)	11.97	4,133
2072	03 91C04 15268	29.241	96.074	Dibang	E(o)	12.88	4,199
2073	03 91C04 15278	29.229	96.192	Dibang	E(o)	106.39	3,473
2074	03 91C04 15282	29.226	96.072	Dibang	E(c)	30.15	3,992
2075	03 91C04 15283	29.226	96.160	Dibang	E(o)	57.36	3,313
2076	03 91C04 15289	29.211	96.069	Dibang	E(o)	31.43	3,816
2077	03 91C04 15295	29.197	96.192	Dibang	E(c)	15.74	4,321
2078	03 91C04 15296	29.196	96.203	Dibang	E(o)	64.06	4,246
2079	03 91C04 15301	29.191	96.112	Dibang	E(c)	26.85	3,775
2080	03 91C04 15303	29.185	96.216	Dibang	E(o)	12.55	3,965
2081	03 91C04 15304	29.183	96.087	Dibang	E(c)	23.74	4,263
2082	03 91C04 15305	29.176	96.175	Dibang	E(o)	19.66	3,523
2083	03 91C04 15313	29.155	96.069	Dibang	E(o)	26.03	3,588
2084	03 91C04 15315	29.147	96.017	Dibang	E(c)	18.77	3,758
2085	03 91C04 15316	29.145	96.066	Dibang	E(c)	30.82	3,949
2086	03 91C04 15318	29.141	96.036	Dibang	E(c)	29.50	4,139
2087	03 91C04 15328	29.107	96.230	Dibang	E(o)	11.56	4,333
2088	03 91C04 15330	29.100	96.173	Dibang	E(o)	21.89	3,949
2089	03 91C04 15332	29.096	96.223	Dibang	E(c)	15.85	4,355
2090	03 91C04 15333	29.096	95.997	Dibang	E(c)	22.23	3,346
2091	03 91C04 15335	29.092	96.243	Dibang	E(c)	26.44	4,117
2092	03 91C04 15336	29.091	96.211	Dibang	E(o)	100.77	4,188
2093	03 91C04 15337	29.091	96.162	Dibang	E(o)	10.98	3,822
2094	03 91C04 15341	29.083	96.201	Dibang	E(o)	10.69	4,049
2095	03 91C04 15344	29.079	96.145	Dibang	E(c)	86.02	3,945
2096	03 91C04 15345	29.077	96.230	Dibang	E(o)	24.43	4,217

S.No.	Glacial Lake ID No	Lat	Long	Subbasin	GL Type	Area (ha)	Elev (m)
2097	03 91C04 15353	29.069	96.147	Dibang	E(c)	12.17	4,031
2098	03 91C04 15358	29.061	96.220	Dibang	E(o)	16.61	4,451
2099	03 91C04 15360	29.051	96.144	Dibang	0	79.93	3,602
2100	03 91C04 15362	29.044	96.193	Dibang	E(c)	44.26	4,164
2101	03 91C04 15363	29.042	96.220	Dibang	E(o)	39.66	4,317
2102	03 91C04 15365	29.036	96.178	Dibang	E(o)	19.74	3,944
2103	03 91C04 15367	29.030	96.223	Dibang	E(c)	44.32	4,199
2104	03 91C04 15368	29.030	96.193	Dibang	E(o)	24.55	4,235
2105	03 91C04 15371	29.026	96.044	Dibang	E(o)	11.17	3,564
2106	03 91C04 15374	29.024	96.178	Dibang	E(o)	24.34	4,067
2107	03 91C04 15378	29.018	96.062	Dibang	E(o)	15.99	3,757
2108	03 91C04 15384	29.009	96.084	Dibang	E(c)	14.55	4,018
2109	03 91C04 15386	29.008	96.218	Dibang	E(o)	47.18	3,664
2110	03 91C04 15388	29.008	96.182	Dibang	E(o)	10.34	3,914
2111	03 91C08 15390	29.244	96.245	Dibang	E(o)	50.88	4,360
2112	03 91C08 15393	29.094	96.260	Dibang	E(c)	39.01	4,001
2113	03 91C08 15396	29.060	96.303	Dibang	E(c)	11.53	4,152
2114	03 91C08 15397	29.050	96.331	Dibang	E(c)	23.00	4,385
2115	03 91C08 15402	29.040	96.304	Dibang	E(o)	10.97	3,986
2116	03 91C08 15403	29.031	96.318	Dibang	E(c)	16.99	4,139
2117	03 91C08 15405	29.023	96.311	Dibang	E(c)	14.87	4,253
2118	03 91C08 15406	29.022	96.297	Dibang	E(c)	14.98	4,165
2119	03 91D01 15410	29.001	96.184	Dibang	E(c)	11.95	4,009
2120	03 91D01 15418	28.989	96.188	Dibang	E(o)	11.30	4,316
2121	03 91D01 15419	28.987	96.069	Dibang	E(c)	37.26	3,627
2122	03 91D01 15421	28.985	96.197	Dibang	E(o)	16.06	4,033
2123	03 91D01 15427	28.952	96.038	Dibang	E(c)	20.31	3,634
2124	03 91D01 15429	28.948	96.168	Dibang	E(c)	17.21	3,886
2125	03 91D01 15431	28.941	96.020	Dibang	E(o)	11.66	3,449
2126	03 91D01 15437	28.923	96.190	Dibang	E(c)	18.07	4,001
2127	03 91D01 15438	28.913	96.178	Dibang	E(o)	27.91	3,802
2128	03 91D01 15440	28.889	96.151	Dibang	E(c)	22.47	4,079
2129	03 91D01 15441	28.887	96.197	Dibang	E(o)	43.53	3,255
2130	03 91D01 15442	28.886	96.137	Dibang	E(o)	12.38	3,720
2131	03 91D01 15447	28.852	96.171	Dibang	E(o)	17.47	3,976
2132	03 91D01 15450	28.846	96.127	Dibang	E(o)	11.19	3,697
2133	03 91D01 15463	28.828	96.244	Dibang	E(o)	12.78	3,740
2134	03 91D01 15465	28.821	96.121	Dibang	E(o)	39.49	4,060
2135	03 91D01 15466	28.820	96.145	Dibang	E(c)	14.12	3,723
2136	03 91D01 15467	28.814	96.122	Dibang	E(c)	13.42	4,115
2137	03 91D01 15473	28.803	96.155	Dibang	E(c)	17.21	3,866
2138	03 91D01 15478	28.793	96.055	Dibang	E(c)	10.25	3,948
2139	03 91D01 15479	28.792	96.148	Dibang	E(o)	32.99	3,676
2140	03 91D02 15486	28.542	96.125	Dibang	E(o)	10.62	4,031
2141	03 91D05 15494	28.992	96.257	Dibang	E(c)	15.12	4,077
2142	03 91D05 15511	28.944	96.371	Dibang	E(o)	12.61	4,236
2143	03 91D05 15517	28.935	96.369	Dibang	E(o)	18.54	4,001
2144	03 91D05 15522	28.928	96.339	Dibang	E(o)	48.39	4,011
2145	03 91D05 15526	28.924	96.311	Dibang	E(o)	15.64	3,851
2146	03 91D05 15527	28.924	96.368	Dibang	E(c)	10.38	4,109
2147	03 91D05 15529	28.919	96.383	Dibang	0	48.87	3,302
2148	03 91D05 15534	28.890	96.494	Dibang	E(o)	17.29	3,366
2149	03 91D05 15539	28.879	96.372	Dibang	E(o)	27.50	4,090
2150	03 91D05 15540	28.877	96.477	Dibang	E(o)	34.69	3,166
2151	03 91D05 15542	28.875	96.394	Dibang	0	41.33	3,119
2152	03 91D05 15543	28.874	96.436	Dibang	0	16.76	3,220
2153	03 91D05 15547	28.862	96.440	Dibang	0	11.42	2,979
2154	03 91D05 15548	28.861	96.249	Dibang	E(c)	11.21	3,847
2155	03 91D05 15554	28.847	96.355	Dibang	E(o)	14.96	3,760
2156	03 91D05 15561	28.832	96.250	Dibang	E(o)	15.75	3,835
2157	03 91D05 15566	28.823	96.359	Dibang	E(c)	19.15	3,941
2158	03 91D05 15570	28.809	96.459	Dibang	E(c)	35.25	4,078
2159	03 91D05 15572	28.802	96.440	Dibang	E(o)	30.97	4,114
2160	03 91D05 15573	28.801	96.484	Dibang	E(o)	34.81	3,819
2161	03 91D05 15576	28.765	96.386	Dibang	E(o)	13.52	3,855
2162	03 91D06 15578	28.749	96.375	Dibang	E(o)	25.74	3,784
2163	03 91D06 15579	28.748	96.353	Dibang	E(o)	34.00	3,618
2164	03 91D06 15582	28.740	96.413	Dibang	E(c)	12.04	4,105
2165	03 91D06 15586	28.729	96.446	Dibang	E(o)	21.19	4,086
2166	03 91D06 15588	28.727	96.485	Dibang	E(c)	28.63	4,084
2167	03 91D06 15589	28.727	96.392	Dibang	E(c)	19.81	4,176
2168	03 91D06 15590	28.725	96.422	Dibang	E(o)	16.86	4,218
2169	03 91D06 15596	28.721	96.405	Dibang	E(o)	17.45	4,097
2170	03 91D06 15605	28.666	96.426	Dibang	E(c)	20.84	4,238

S.No.	Glacial Lake ID No	Lat	Long	Subbasin	GL Type	Area (ha)	Elev (m)
2171	03 91D06 15612	28.660	96.486	Dibang	E(c)	30.67	4,125
2172	03 91D06 15617	28.617	96.439	Dibang	E(c)	10.66	3,914
2173	03 91D06 15618	28.614	96.312	Dibang	E(o)	11.33	3,968
2174	03 91D06 15620	28.608	96.320	Dibang	E(c)	23.55	4,239
2175	03 91D06 15629	28.565	96.408	Dibang	E(o)	14.11	4,124
2176	03 91D06 15631	28.563	96.355	Dibang	E(o)	10.39	4,152
2177	03 91D06 15632	28.563	96.366	Dibang	E(c)	10.25	3,897
2178	03 91D06 15645	28.545	96.443	Dibang	E(o)	12.55	4,297
2179	03 91D06 15649	28.539	96.394	Dibang	E(o)	11.72	4,010
2180	03 91D06 15654	28.524	96.424	Dibang	E(c)	14.09	4,096
2181	03 91D06 15657	28.522	96.444	Dibang	E(c)	10.03	4,157
2182	03 91D06 15658	28.521	96.250	Dibang	E(o)	16.14	3,636
2183	03 91D06 15660	28.519	96.398	Dibang	E(c)	15.49	4,247
2184	03 91D06 15664	28.513	96.398	Dibang	E(c)	26.12	4,345
2185	03 91D06 15667	28.505	96.391	Dibang	E(o)	21.90	4,560
2186	03 91D07 15670	28.421	96.377	Dibang	E(c)	12.36	3,763
2187	03 91D09 15673	28.923	96.515	Dibang	E(o)	13.69	4,091
2188	03 91D09 15674	28.872	96.510	Dibang	E(o)	18.70	3,926
2189	03 91D09 15680	28.838	96.497	Dibang	E(o)	21.00	3,388
2190	03 91D09 15682	28.829	96.532	Dibang	E(o)	37.63	3,584
2191	03 91D09 15687	28.807	96.538	Dibang	E(c)	17.48	4,187
2192	03 91D09 15688	28.801	96.512	Dibang	E(o)	26.17	4,344
2193	03 91D09 15690	28.776	96.531	Dibang	0	101.67	3,510
2194	03 91D09 15695	28.764	96.517	Dibang	0	14.33	3,502
2195	03 91D10 15700	28.745	96.511	Dibang	0	24.68	3,219
2196	03 91D10 15702	28.707	96.505	Dibang	E(o)	26.84	4,018
2197	03 91D10 15705	28.697	96.572	Dibang	E(c)	20.56	4,133
2198	03 91D10 15707	28.694	96.551	Dibang	E(c)	33.52	4,220
2199	03 91D10 15710	28.687	96.584	Dibang	E(c)	21.37	4,132
2200	03 91D10 15712	28.685	96.633	Dibang	E(o)	12.10	4,299
2201	03 91D10 15715	28.676	96.510	Dibang	E(o)	20.27	4,310
2202	03 91D10 15716	28.668	96.611	Dibang	E(o)	22.91	4,492
2203	03 91D10 15718	28.666	96.632	Dibang	E(o)	17.58	4,217
2204	03 91C03 15738	29.365	96.124	Lohit	M(e)	25.07	3,995
2205	03 91C03 15741	29.329	96.195	Lohit	E(o)	25.27	4,286
2206	03 91C03 15744	29.324	96.209	Lohit	E(o)	25.02	4,333
2207	03 91C03 15752	29.305	96.156	Lohit	E(c)	21.00	4,233
2208	03 91C03 15759	29.264	96.245	Lohit	M(o)	17.37	4,408
2209	03 91C03 15760	29.257	96.246	Lohit	M(o)	89.30	4,432
2210	03 91C07 15761	29.387	96.375	Lohit	M(e)	29.13	4,997
2211	03 91C08 15774	29.224	96.279	Lohit	M(o)	66.27	4,207
2212	03 91C08 15782	29.175	96.346	Lohit	E(c)	27.74	4,298
2213	03 91C08 15783	29.175	96.327	Lohit	M(e)	46.20	4,379
2214	03 91C08 15786	29.130	96.324	Lohit	M(o)	26.67	4,392
2215	03 91C08 15787	29.127	96.399	Lohit	M(o)	10.09	4,066
2216	03 91C10 15816	29.597	96.617	Lohit	M(e)	10.44	5,104
2217	03 91C10 15818	29.589	96.674	Lohit	M(e)	19.10	4,631
2218	03 91C10 15826	29.561	96.630	Lohit	M(e)	12.40	4,919
2219	03 91C11 15833	29.491	96.701	Lohit	0	610.17	3,916
2220	03 91C11 15840	29.421	96.627	Lohit	M(e)	31.33	4,079
2221	03 91C11 15843	29.406	96.681	Lohit	M(o)	11.75	4,834
2222	03 91C12 15863	29.124	96.660	Lohit	E(c)	17.71	4,329
2223	03 91C14 15953	29.502	96.977	Lohit	M(e)	12.44	5,145
2224	03 91C15 15967	29.462	96.787	Lohit	0	518.00	3,916
2225	03 91C15 15982	29.397	96.828	Lohit	E(o)	401.62	3,917
2226	03 91C15 15998	29.298	96.816	Lohit	M(e)	292.36	3,954
2227	03 91C15 16000	29.295	96.835	Lohit	M(l)	95.04	4,013
2228	03 91C15 16004	29.268	96.837	Lohit	E(o)	108.04	4,119
2229	03 91C15 16008	29.263	96.938	Lohit	M(e)	12.30	4,676
2230	03 91C15 16011	29.254	96.965	Lohit	M(o)	10.15	4,631
2231	03 91C16 16015	29.248	96.966	Lohit	M(e)	25.60	4,673
2232	03 91C16 16019	29.238	96.826	Lohit	M(o)	209.76	4,219
2233	03 91C16 16020	29.230	96.805	Lohit	M(o)	144.00	4,266
2234	03 91C16 16024	29.221	96.814	Lohit	M(e)	52.51	4,279
2235	03 91C16 16029	29.179	96.857	Lohit	M(e)	13.26	4,412
2236	03 91C16 16031	29.171	96.867	Lohit	M(o)	12.68	4,458
2237	03 91C16 16048	29.071	96.799	Lohit	M(o)	38.92	2,466
2238	03 91D05 16058	28.952	96.493	Lohit	M(o)	15.31	4,493
2239	03 91D06 16060	28.518	96.421	Lohit	M(e)	16.11	4,086
2240	03 91D07 16069	28.345	96.334	Lohit	0	12.55	2,990
2241	03 91D09 16085	28.954	96.561	Lohit	E(o)	15.69	4,277
2242	03 91D09 16094	28.939	96.740	Lohit	E(o)	10.73	4,352
2243	03 91D09 16102	28.924	96.564	Lohit	E(o)	12.74	4,447
2244	03 91D09 16105	28.921	96.553	Lohit	E(o)	25.07	4,463
2245	03 91D09 16114	28.908	96.525	Lohit	E(c)	14.85	4,295
2246	03 91D09 16120	28.898	96.550	Lohit	0	10.31	3,712
2247	03 91D09 16129	28.810	96.606	Lohit	E(c)	10.76	4,362
2248	03 91D09 16135	28.777	96.606	Lohit	E(o)	15.99	4,601
2249	03 91D09 16137	28.770	96.617	Lohit	E(c)	21.18	4,255
2250	03 91D10 16161	28.647	96.645	Lohit	E(c)	18.36	4,068
2251	03 91D10 16163	28.644	96.589	Lohit	E(c)	24.51	4,368
2252	03 91D10 16166	28.637	96.685	Lohit	E(c)	14.50	4,418
2253	03 91D10 16171	28.628	96.533	Lohit	E(c)	10.94	4,260
2254	03 91D10 16174	28.627	96.565	Lohit	0	16.84	3,282
2255	03 91D10 16179	28.613	96.522	Lohit	E(c)	10.32	4,213
2256	03 91D10 16180	28.611	96.723	Lohit	E(o)	14.21	4,107
2257	03 91D10 16186	28.586	96.652	Lohit	E(o)	30.13	4,068
2258	03 91D10 16189	28.580	96.681	Lohit	E(o)	32.17	3,999
2259	03 91D10 16194	28.565	96.636	Lohit	E(o)	30.27	3,368
2260	03 91D10 16196	28.562	96.715	Lohit	E(o)	16.48	4,019
2261	03 91D10 16197	28.559	96.692	Lohit	0	11.58	3,483
2262	03 91D10 16202	28.541	96.618	Lohit	E(c)	42.11	4,268
2263	03 91D10 16203	28.541	96.602	Lohit	E(c)	25.61	4,487
2264	03 91D10 16204	28.534	96.644	Lohit	E(o)	29.38	4,311
2265	03 91D10 16206	28.530	96.622	Lohit	E(o)	23.40	3,907
2266	03 91D10 16207	28.527	96.650	Lohit	E(o)	14.17	4,125
2267	03 91D10 16210	28.516	96.699	Lohit	E(o)	299.20	3,330
2268	03 91D10 16211	28.512	96.502	Lohit	E(o)	27.13	4,027
2269	03 91D11 16215	28.492	96.692	Lohit	E(c)	20.67	4,046
2270	03 91D13 16288	28.864	96.830	Lohit	E(o)	10.83	4,306
2271	03 91D13 16293	28.850	96.928	Lohit	E(c)	14.85	4,299
2272	03 91D13 16298	28.843	96.818	Lohit	E(o)	24.08	4,625
2273	03 91D13 16303	28.832	96.820	Lohit	E(o)	20.11	4,305
2274	03 91D13 16304	28.829	96.789	Lohit	0	31.87	3,683
2275	03 91D14 16350	28.576	96.756	Lohit	E(o)	17.36	3,646
2276	03 91D14 16352	28.536	96.766	Lohit	E(o)	25.91	3,918
2277	03 91D14 16355	28.510	96.800	Lohit	E(c)	14.77	4,075
2278	03 91D14 16356	28.504	96.833	Lohit	E(c)	15.18	4,058
2279	03 91D14 16357	28.503	96.843	Lohit	E(o)	12.74	3,945
2280	03 91D14 16358	28.503	96.860	Lohit	E(o)	17.34	3,522
2281	03 91D15 16363	28.470	96.882	Lohit	E(o)	23.66	3,849
2282	03 91D15 16366	28.447	96.885	Lohit	E(o)	18.22	4,113
2283	03 91D15 16370	28.432	96.924	Lohit	E(c)	36.83	4,384
2284	03 91D15 16372	28.425	96.872	Lohit	E(o)	36.05	3,980
2285	03 91D15 16378	28.403	96.837	Lohit	E(o)	16.14	4,171
2286	03 91D15 16387	28.394	96.869	Lohit	E(o)	11.69	4,215
2287	03 91D15 16388	28.392	96.858	Lohit	E(c)	30.18	4,390
2288	03 91D15 16389	28.381	96.859	Lohit	E(o)	19.10	4,049
2289	03 91D15 16399	28.315	96.817	Lohit	E(o)	19.89	3,879
2290	03 91D15 16407	28.253	96.819	Lohit	M(o)	16.22	4,030
2291	03 91D16 16409	28.245	96.832	Lohit	E(o)	42.50	3,900
2292	03 91D16 16415	28.214	96.885	Lohit	E(c)	21.24	3,960
2293	03 91D16 16419	28.202	96.898	Lohit	E(o)	67.30	3,731
2294	03 91D16 16423	28.165	96.830	Lohit	E(c)	20.69	3,890
2295	03 91D16 16425	28.159	96.848	Lohit	E(c)	16.81	3,926
2296	03 91G02 16450	29.701	97.002	Lohit	M(o)	12.26	5,122
2297	03 91G02 16461	29.609	97.075	Lohit	M(o)	13.92	5,279
2298	03 91G02 16474	29.507	97.061	Lohit	M(o)	13.60	5,275
2299	03 91G03 16480	29.496	97.104	Lohit	M(e)	25.92	5,219
2300	03 91G03 16495	29.472	97.035	Lohit	M(e)	14.95	5,238
2301	03 91G03 16498	29.460	97.085	Lohit	M(e)	15.56	4,994
2302	03 91G03 16519	29.403	97.012	Lohit	M(o)	10.40	5,156
2303	03 91G03 16524	29.392	97.022	Lohit	M(e)	20.49	5,007
2304	03 91G04 16550	29.228	97.029	Lohit	M(e)	22.63	3,952
2305	03 91G04 16561	29.087	97.155	Lohit	M(o)	25.64	4,222
2306	03 91G04 16585	29.039	97.095	Lohit	M(o)	10.02	4,430
2307	03 91G04 16608	29.015	97.249	Lohit	E(o)	15.19	4,409
2308	03 91G04 16619	29.004	97.134	Lohit	E(o)	12.94	4,401
2309	03 91G07 16631	29.466	97.376	Lohit	M(o)	18.87	5,011
2310	03 91G08 16680	29.229	97.333	Lohit	M(o)	13.94	4,761
2311	03 91G08 16685	29.216	97.378	Lohit	E(o)	14.43	4,303
2312	03 91G08 16692	29.200	97.370	Lohit	M(o)	16.42	4,623
2313	03 91G12 16726	29.066	97.536	Lohit	E(o)	12.18	4,795
2314	03 91G12 16731	29.032	97.512	Lohit	E(o)	14.82	4,141
2315	03 91H01 16738	28.995	97.231	Lohit	E(o)	14.62	4,597
2316	03 91H01 16757	28.977	97.215	Lohit	E(o)	63.42	4,092
2317	03 91H01 16776	28.956	97.195	Lohit	E(o)	13.06	4,271
2318	03 91H01 16783	28.947	97.100	Lohit	E(o)	47.64	4,412

S.No.	Glacial Lake ID No	Lat	Long	Subbasin	GL Type	Area (ha)	Elev (m)
2319	03 91H01 16802	28.916	97.153	Lohit	E(o)	15.22	4,513
2320	03 91H01 16808	28.904	97.149	Lohit	E(o)	33.69	4,319
2321	03 91H01 16812	28.898	97.165	Lohit	E(o)	15.17	4,713
2322	03 91H01 16837	28.848	97.092	Lohit	M(o)	14.66	4,448
2323	03 91H01 16838	28.846	97.130	Lohit	E(o)	42.05	4,446
2324	03 91H01 16843	28.835	97.148	Lohit	E(o)	18.10	4,392
2325	03 91H01 16856	28.821	97.152	Lohit	E(o)	12.28	4,288
2326	03 91H01 16862	28.813	97.170	Lohit	E(o)	19.35	4,401
2327	03 91H01 16868	28.808	97.126	Lohit	E(o)	17.39	4,189
2328	03 91H01 16888	28.796	97.183	Lohit	E(o)	16.32	4,457
2329	03 91H01 16896	28.786	97.219	Lohit	M(o)	22.91	4,270
2330	03 91H01 16898	28.783	97.153	Lohit	E(o)	83.11	3,712
2331	03 91H01 16907	28.767	97.101	Lohit	E(o)	12.38	4,326
2332	03 91H01 16908	28.763	97.058	Lohit	O	39.04	3,285
2333	03 91H01 16916	28.753	97.137	Lohit	E(o)	20.19	4,176
2334	03 91H02 16921	28.747	97.097	Lohit	E(o)	10.90	4,438
2335	03 91H02 16922	28.744	97.217	Lohit	E(o)	21.99	4,318
2336	03 91H02 16935	28.702	97.142	Lohit	E(o)	16.78	4,378
2337	03 91H03 16992	28.351	97.157	Lohit	E(o)	15.17	4,079
2338	03 91H03 17002	28.303	97.234	Lohit	E(o)	23.39	4,279
2339	03 91H03 17005	28.291	97.218	Lohit	E(o)	15.73	4,071
2340	03 91H03 17013	28.264	97.225	Lohit	E(o)	12.77	4,167
2341	03 91H03 17014	28.262	97.232	Lohit	E(c)	26.62	4,183
2342	03 91H04 17026	28.226	97.175	Lohit	E(o)	11.64	3,898
2343	03 91H04 17029	28.220	97.120	Lohit	E(o)	11.79	3,986
2344	03 91H04 17041	28.200	97.236	Lohit	E(o)	29.04	3,900
2345	03 91H04 17073	28.087	97.240	Lohit	E(o)	21.98	4,507
2346	03 91H04 17079	28.084	97.215	Lohit	E(o)	18.46	4,023
2347	03 91H04 17094	28.058	97.226	Lohit	E(o)	18.41	4,113
2348	03 91H04 17095	28.054	97.166	Lohit	E(o)	13.67	4,131
2349	03 91H04 17105	28.041	97.193	Lohit	E(o)	11.33	4,217
2350	03 91H04 17106	28.041	97.218	Lohit	E(o)	38.26	3,936
2351	03 91H04 17107	28.040	97.126	Lohit	E(o)	35.71	3,969
2352	03 91H04 17110	28.035	97.132	Lohit	E(o)	13.21	3,977
2353	03 91H04 17111	28.034	97.241	Lohit	E(o)	18.18	4,299
2354	03 91H04 17119	28.025	97.186	Lohit	E(o)	14.89	4,227
2355	03 91H04 17123	28.024	97.175	Lohit	E(o)	13.28	4,037
2356	03 91H04 17124	28.020	97.194	Lohit	E(o)	11.00	4,040
2357	03 91H04 17127	28.016	97.215	Lohit	E(o)	10.80	4,303
2358	03 91H04 17133	28.008	97.176	Lohit	E(o)	15.42	4,240
2359	03 91H05 17139	28.989	97.268	Lohit	E(o)	14.17	4,416
2360	03 91H05 17147	28.973	97.327	Lohit	E(o)	16.29	4,541
2361	03 91H05 17154	28.958	97.335	Lohit	E(o)	14.08	4,595
2362	03 91H05 17161	28.947	97.320	Lohit	E(o)	29.34	4,607
2363	03 91H05 17163	28.944	97.304	Lohit	M(o)	43.16	4,732
2364	03 91H05 17167	28.940	97.262	Lohit	E(o)	93.63	4,412
2365	03 91H05 17181	28.915	97.350	Lohit	E(o)	43.77	4,016
2366	03 91H05 17188	28.892	97.336	Lohit	E(o)	13.58	4,429
2367	03 91H05 17192	28.877	97.355	Lohit	M(o)	44.22	4,569
2368	03 91H06 17226	28.691	97.337	Lohit	E(c)	12.00	4,422
2369	03 91H06 17241	28.595	97.439	Lohit	E(o)	14.46	4,271
2370	03 91H06 17280	28.548	97.366	Lohit	E(o)	14.71	4,306
2371	03 91H06 17282	28.548	97.393	Lohit	E(o)	12.59	4,331
2372	03 91H06 17332	28.514	97.493	Lohit	O	20.47	4,469
2373	03 91H07 17380	28.482	97.322	Lohit	E(o)	13.10	4,348
2374	03 91H07 17399	28.472	97.380	Lohit	E(o)	12.22	4,388
2375	03 91H07 17413	28.464	97.409	Lohit	E(o)	10.72	4,420
2376	03 91H07 17428	28.432	97.253	Lohit	E(o)	12.87	4,315
2377	03 91H07 17433	28.426	97.401	Lohit	E(o)	14.03	4,289
2378	03 91H07 17452	28.412	97.465	Lohit	E(o)	56.61	4,300
2379	03 91H07 17456	28.411	97.406	Lohit	E(o)	11.28	4,443
2380	03 91H07 17478	28.400	97.393	Lohit	E(o)	10.29	4,472
2381	03 91H07 17524	28.369	97.446	Lohit	M(o)	15.15	4,054
2382	03 91H07 17528	28.340	97.369	Lohit	E(o)	14.89	4,230
2383	03 91H07 17541	28.313	97.343	Lohit	E(o)	16.19	4,146
2384	03 91H07 17548	28.274	97.253	Lohit	E(c)	20.87	4,290
2385	03 91H07 17560	28.243	97.331	Lohit	E(o)	11.86	4,333
2386	03 91H08 17563	28.240	97.250	Lohit	E(o)	11.79	3,980
2387	03 91H08 17567	28.227	97.269	Lohit	E(o)	16.83	4,145
2388	03 91H08 17570	28.223	97.285	Lohit	E(o)	32.29	4,189
2389	03 91H08 17576	28.214	97.318	Lohit	E(c)	12.12	4,373
2390	03 91H08 17587	28.174	97.329	Lohit	E(o)	14.32	4,307
2391	03 91H08 17599	28.162	97.320	Lohit	E(o)	10.73	4,038
2392	03 91H08 17618	28.149	97.274	Lohit	E(o)	14.13	3,953
2393	03 91H08 17620	28.140	97.290	Lohit	E(o)	26.03	4,055
2394	03 91H08 17621	28.136	97.306	Lohit	E(o)	21.99	4,225
2395	03 91H08 17622	28.136	97.321	Lohit	E(o)	17.77	4,276
2396	03 91H08 17624	28.116	97.300	Lohit	E(o)	17.74	4,029
2397	03 91H08 17626	28.107	97.311	Lohit	E(o)	21.72	4,343
2398	03 91H08 17627	28.106	97.320	Lohit	E(o)	12.40	4,358
2399	03 91H08 17629	28.101	97.270	Lohit	E(c)	14.99	4,169
2400	03 91H08 17635	28.096	97.289	Lohit	E(o)	53.06	3,762
2401	03 91H08 17639	28.080	97.304	Lohit	E(o)	23.71	4,304
2402	03 91H08 17649	28.061	97.357	Lohit	E(c)	15.82	4,344
2403	03 91H08 17651	28.054	97.330	Lohit	E(o)	25.72	4,424
2404	03 91H08 17652	28.053	97.281	Lohit	M(o)	10.51	4,499
2405	03 91H08 17656	28.045	97.293	Lohit	E(o)	10.43	4,472
2406	03 91H09 17669	28.991	97.549	Lohit	M(e)	17.75	4,390
2407	03 91H09 17672	28.938	97.522	Lohit	E(c)	21.47	4,392
2408	03 91H09 17695	28.863	97.612	Lohit	E(o)	11.56	4,558
2409	03 91H09 17706	28.852	97.631	Lohit	E(o)	12.69	4,523
2410	03 91H10 17809	28.556	97.548	Lohit	E(o)	12.30	4,363
2411	03 91H10 17824	28.536	97.621	Lohit	E(o)	15.42	4,616
2412	03 91H10 17838	28.518	97.527	Lohit	E(o)	24.32	4,449
2413	03 92A09 17844	27.816	96.707	Lohit	E(o)	10.89	3,488
2414	03 92A13 17852	27.759	96.878	Lohit	E(c)	10.40	3,857
2415	03 92A14 17856	27.742	96.845	Lohit	E(o)	18.26	3,778
2416	03 92A14 17859	27.732	96.871	Lohit	E(o)	12.07	4,012
2417	03 92A14 17860	27.726	96.848	Lohit	E(o)	18.83	3,669
2418	03 92A14 17861	27.719	96.877	Lohit	E(o)	20.25	3,664
2419	03 92A14 17866	27.712	96.938	Lohit	E(o)	12.92	3,751
2420	03 92A14 17882	27.690	96.860	Lohit	E(o)	49.45	3,373
2421	03 92A14 17896	27.646	96.878	Lohit	E(o)	15.08	3,263
2422	03 92A14 17900	27.637	96.916	Lohit	E(c)	10.10	3,689
2423	03 92E01 17907	27.996	97.187	Lohit	E(c)	40.63	4,091
2424	03 92E01 17909	27.990	97.098	Lohit	E(o)	12.28	3,687
2425	03 92E01 17933	27.959	97.105	Lohit	E(o)	17.42	3,831
2426	03 92E01 17937	27.949	97.108	Lohit	E(o)	12.82	3,874
2427	03 92E01 17938	27.948	97.131	Lohit	E(c)	11.08	3,819
2428	03 92E05 17957	27.994	97.316	Lohit	E(o)	13.95	4,270
2429	03 92E05 17959	27.989	97.369	Lohit	E(o)	51.93	4,188
2430	03 92E05 17994	27.893	97.358	Lohit	E(o)	21.52	3,931
2431	03 92E05 18001	27.879	97.360	Lohit	E(o)	40.18	4,158

Annexure - III

Glacial Lakes of Indian Himalayan River Basins with area ≥ 50 ha

There are 299 lakes having an area ≥ 50 ha, which is just 1.07% of the total glacial lake count, but covers total of 31.67% of the total glacial lakes area. Spatial distribution of these very large sized lakes i.e. ≥ 50 ha in area has been represented below in Figure 85 and details of these are given in Table 69, along with its area, type, geographic as well as hydrological location, and elevation at which they are situated. Among these 299 lakes, 176, 94 and 29 lakes are in the lake area range of < 100 ha, 100-250 ha and > 250 ha respectively. Out of these 299 large lakes, majority (101) is other glacier erosion lakes followed by end moraine-dammed glacial lakes (97) and few are glacial trough valley erosion lakes (7) and lateral moraine-dammed glacial lake (5).

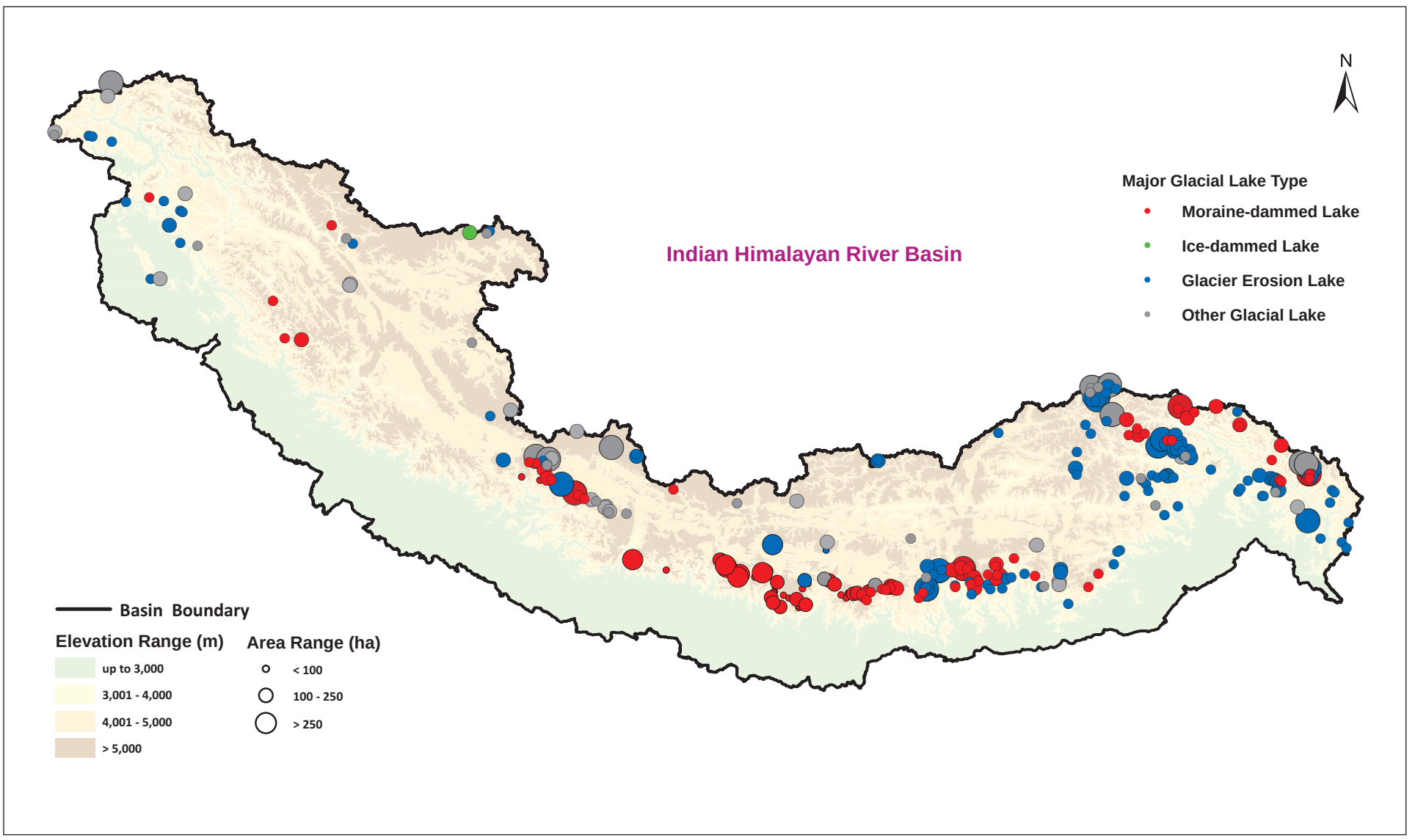


Figure 85: Spatial distribution of glacial lakes with area ≥ 50 ha

Table 69: List of glacial lakes with area ≥ 50 ha

S.No.	Glacial Lake ID Number			Latitude	Longitude	Subbasin	GL Type	Area (ha)	Elevation (m)
1	01	42H09	00200	36.879	73.704	Gilgit	O	262.57	4,286
2	01	42H10	00208	36.644	73.646	Gilgit	O	105.07	3,821
3	01	43A09	00583	35.994	72.613	Gilgit	O	201.58	3,622
4	01	43A09	00591	35.944	72.595	Gilgit	O	96.35	3,761
5	01	43E05	00769	35.949	73.289	Gilgit	E(o)	54.23	4,228
6	01	43E05	00774	35.945	73.365	Gilgit	E(c)	67.34	4,162
7	01	43E09	00941	35.865	73.746	Gilgit	E(o)	84.31	4,140
8	01	43J01	01363	34.829	74.062	Jhelum	E(c)	93.90	3,681
9	01	43J09	01397	34.920	74.521	Jhelum	M(e)	60.60	4,041
10	01	43J13	01449	34.845	74.809	Indus Middle	E(c)	50.44	3,992
11	01	43J15	01489	34.432	74.924	Jhelum	E(c)	161.04	3,571
12	01	43K10	01561	33.519	74.584	Jhelum	E(o)	70.83	3,934
13	01	43K14	01588	33.512	74.769	Jhelum	O	128.54	3,486
14	01	43N01	01839	34.991	75.236	Indus Upper	O	129.62	4,138
15	01	43N02	01885	34.697	75.137	Jhelum	E(o)	64.95	4,103
16	01	43N02	01897	34.666	75.179	Jhelum	E(o)	74.54	4,234
17	01	43N04	01975	34.140	75.148	Jhelum	E(c)	82.93	3,780
18	01	43N08	02065	34.094	75.498	Jhelum	O	52.27	3,575
19	01	52C16	03156	33.159	76.984	Indus Upper	M(e)	59.78	4,479
20	01	52H02	03651	32.526	77.220	Chenab	M(e)	77.59	4,069
21	01	52H11	03771	32.499	77.547	Chenab	M(e)	128.69	4,150
22	01	52J03	03811	34.457	78.136	Shyok	M(o)	95.68	5,295
23	01	52J08	03836	34.233	78.426	Shyok	O	64.78	5,350
24	01	52J12	03868	34.151	78.553	Shyok	E(o)	65.02	5,566
25	01	52K07	03939	33.455	78.498	Shyok	O	147.89	5,308
26	01	52K07	03940	33.427	78.488	Shyok	O	177.73	5,284
27	01	61B15	04757	34.316	80.858	Shyok	I(d)	232.34	5,709
28	01	61D15	04804	32.423	80.865	Indus Upper	O	58.84	4,452
29	01	61F03	04813	34.299	81.202	Shyok	O	61.15	5,274
30	01	61F07	04829	34.341	81.257	Shyok	E(o)	51.89	5,298
31	01	62E04	05008	31.182	81.195	Satluj	E(o)	52.48	5,413
32	01	62E11	05114	31.274	81.595	Indus Upper	O	156.89	5,229
33	01	62F07	05179	30.431	81.433	Satluj	E(o)	192.62	5,484
34	01	62F15	05295	30.385	81.930	Satluj	M(e)	59.79	5,224
35	02	62F16	00708	30.129	81.781	Humla	M(e)	75.65	5,015
36	02	62J04	00880	30.067	82.127	Humla	M(l)	62.33	4,829
37	02	62P14	01803	28.691	83.852	Marsyangdi	M(o)	340.21	4,910
38	02	71D07	01882	28.488	84.486	Marsyangdi	M(e)	89.44	4,038
39	02	71H06	02059	28.644	85.491	Bum Chu	M(e)	50.98	4,985
40	02	71H10	02153	28.623	85.510	Bum Chu	M(e)	118.78	5,127
41	02	71H10	02154	28.616	85.527	Bum Chu	M(e)	103.58	5,113
42	02	71H10	02162	28.562	85.602	Bum Chu	M(e)	129.19	5,361
43	02	71H10	02165	28.532	85.609	Bum Chu	M(e)	540.55	5,352

S.No.	Glacial Lake ID Number			Latitude	Longitude	Subbasin	GL Type	Area (ha)	Elevation (m)
44	02	71H10	02177	28.494	85.636	Bum Chu	M(e)	490.68	5,278
45	02	71H11	02183	28.485	85.736	Bum Chu	M(e)	51.99	5,335
46	02	71H15	02391	28.360	85.871	Sun Kosi	M(e)	463.78	5,212
47	02	71H15	02402	28.329	85.869	Sun Kosi	M(o)	213.52	5,167
48	02	71H15	02405	28.322	85.838	Sun Kosi	M(e)	540.35	5,067
49	02	71H16	02493	28.211	85.847	Sun Kosi	M(e)	61.34	4,374
50	02	71L03	02551	28.347	86.225	Sun Kosi	M(e)	55.90	5,348
51	02	71L03	02555	28.335	86.192	Sun Kosi	M(e)	55.00	5,422
52	02	71L03	02557	28.303	86.157	Sun Kosi	M(e)	59.05	5,307
53	02	71L07	02736	28.374	86.305	Bum Chu	M(e)	391.50	5,346
54	02	71L07	02788	28.199	86.582	Bum Chu	M(e)	134.64	5,094
55	02	71L08	02932	28.033	86.500	Tama Kosi	M(e)	60.86	5,057
56	02	71L09	02947	28.887	86.514	Bum Chu	E(o)	98.23	5,098
57	02	71L12	03013	28.185	86.532	Tama Kosi	M(e)	67.68	5,025
58	02	71L12	03032	28.135	86.531	Tama Kosi	M(e)	97.85	4,984
59	02	71L12	03072	28.044	86.514	Tama Kosi	M(l)	57.94	5,241
60	02	71P04	03182	28.208	87.101	Arun Kosi	E(o)	101.93	4,852
61	02	71P04	03183	28.205	87.052	Arun Kosi	O	65.11	4,980
62	02	71P04	03201	28.152	87.158	Arun Kosi	O	94.74	5,141
63	02	71P04	03232	28.068	87.047	Arun Kosi	M(e)	78.93	5,589
64	02	71P07	03342	28.393	86.379	Bum Chu	M(e)	100.11	5,482
65	02	71P08	03345	28.213	87.470	Arun Kosi	O	131.39	4,781
66	02	71P09	03420	28.858	86.519	Bum Chu	E(o)	81.24	5,254
67	02	71P09	03422	28.832	86.522	Bum Chu	E(o)	281.32	5,319
68	02	71P10	03475	28.694	87.534	Bum Chu	E(o)	60.74	5,158
69	02	71P12	03514	28.230	87.591	Arun Kosi	M(e)	78.90	5,410
70	02	71P12	03527	28.178	87.563	Arun Kosi	M(e)	104.19	5,011
71	02	71P12	03561	28.114	87.655	Arun Kosi	M(e)	146.34	4,954
72	02	71P12	03566	28.093	87.637	Arun Kosi	M(e)	72.47	5,178
73	02	72I05	03634	27.947	86.446	Tama Kosi	M(e)	156.76	5,046
74	02	72I05	03648	27.861	86.476	Tama Kosi	M(e)	158.40	4,550
75	02	72I09	03725	27.975	86.681	Dudh Kosi	M(l)	57.83	4,834
76	02	72I09	03801	27.779	86.612	Dudh Kosi	M(e)	117.31	4,831
77	02	72I13	03932	27.924	86.786	Dudh Kosi	M(l)	54.85	4,512
78	02	72I13	03950	27.898	86.925	Dudh Kosi	M(e)	139.77	5,003
79	02	72I13	04014	27.783	86.957	Dudh Kosi	M(e)	87.28	5,198
80	02	72I13	04032	27.755	86.958	Dudh Kosi	M(o)	86.50	4,927
81	02	72M01	04125	27.798	87.092	Arun Kosi	M(e)	182.16	4,543
82	02	72M13	04484	27.952	87.908	Yeru Chu	M(e)	64.79	5,165
83	02	72M13	04486	27.950	87.930	Yeru Chu	M(e)	83.66	5,106
84	02	72M13	04495	27.928	88.002	Yeru Chu	M(e)	113.22	5,348
85	02	72M13	04496	27.926	87.771	Arun Kosi	M(e)	97.66	4,913
86	02	72M13	04515	27.869	87.866	Tamur Kosi	M(e)	68.12	4,910
87	02	77D08	04614	28.054	88.427	Yeru Chu	O	101.66	4,888

S.No.	Glacial Lake ID Number			Latitude	Longitude	Subbasin	GL Type	Area (ha)	Elevation (m)
88	02	77D08	04622	28.022	88.355	Yeru Chu	M(e)	56.29	5,195
89	02	77D08	04624	28.017	88.288	Yeru Chu	M(e)	50.43	5,268
90	02	77D08	04627	28.009	88.259	Yeru Chu	M(e)	59.70	5,256
91	02	78A01	04637	27.946	88.075	Yeru Chu	M(e)	148.59	5,488
92	02	78A01	04639	27.933	88.066	Yeru Chu	M(e)	83.35	5,563
93	03	62J03	00044	30.468	82.060	Upper Yarlung Tsangpo	O	378.80	5,180
94	03	62J03	00151	30.398	82.192	Upper Yarlung Tsangpo	E(o)	86.53	5,203
95	03	62J03	00163	30.362	82.055	Upper Yarlung Tsangpo	M(e)	56.83	5,283
96	03	62J03	00201	30.255	82.209	Upper Yarlung Tsangpo	M(e)	128.70	5,057
97	03	62J07	00243	30.432	82.362	Upper Yarlung Tsangpo	O	152.61	4,882
98	03	62J07	00244	30.419	82.302	Upper Yarlung Tsangpo	O	901.40	4,931
99	03	62J07	00289	30.342	82.271	Upper Yarlung Tsangpo	O	69.03	4,993
100	03	62J07	00296	30.329	82.270	Upper Yarlung Tsangpo	O	58.67	4,990
101	03	62J08	00344	30.103	82.270	Upper Yarlung Tsangpo	M(e)	203.15	4,875
102	03	62J08	00354	30.079	82.343	Upper Yarlung Tsangpo	M(e)	91.73	4,849
103	03	62J13	00456	30.881	82.859	Upper Yarlung Tsangpo	O	146.23	5,446
104	03	62K09	00585	29.985	82.535	Upper Yarlung Tsangpo	E(o)	392.72	4,829
105	03	62K13	00646	29.840	82.782	Upper Yarlung Tsangpo	M(e)	291.26	5,058
106	03	62K13	00664	29.796	82.853	Upper Yarlung Tsangpo	M(e)	53.83	5,160
107	03	62K14	00680	29.735	82.974	Upper Yarlung Tsangpo	M(e)	80.86	5,337
108	03	62N10	00819	30.591	83.519	Upper Yarlung Tsangpo	O	270.94	5,227
109	03	62N15	00896	30.465	83.984	Upper Yarlung Tsangpo	E(o)	84.88	5,450
110	03	62N15	00912	30.431	83.996	Upper Yarlung Tsangpo	E(o)	206.16	5,429
111	03	62O02	00938	29.726	83.105	Upper Yarlung Tsangpo	O	113.22	5,010
112	03	62O02	00944	29.689	83.190	Upper Yarlung Tsangpo	O	54.50	5,007
113	03	62O06	01004	29.604	83.376	Upper Yarlung Tsangpo	O	145.71	4,889
114	03	62O06	01010	29.582	83.355	Upper Yarlung Tsangpo	O	118.74	4,888
115	03	62O06	01021	29.511	83.444	Upper Yarlung Tsangpo	O	211.06	4,959
116	03	62O07	01027	29.499	83.428	Upper Yarlung Tsangpo	O	59.80	4,959
117	03	62O15	01246	29.470	83.764	Upper Yarlung Tsangpo	O	77.62	5,282
118	03	71P09	01500	28.832	87.560	Upper Yarlung Tsangpo	O	140.16	5,296
119	03	71C09	01990	29.845	84.676	Upper Yarlung Tsangpo	M(e)	51.54	5,536
120	03	71G14	02213	29.558	85.880	Upper Yarlung Tsangpo	O	56.48	5,186
121	03	71O02	02336	29.556	87.028	Upper Yarlung Tsangpo	O	119.59	4,729
122	03	77B12	02407	30.168	88.620	Upper Yarlung Tsangpo	E(o)	50.13	5,029
123	03	77B12	02408	30.148	88.627	Upper Yarlung Tsangpo	E(o)	213.67	5,011
124	03	77D12	02625	28.026	88.710	Teesta	M(e)	113.46	5,148
125	03	77D12	02636	28.008	88.698	Teesta	M(e)	99.32	5,209
126	03	77D12	02640	28.006	88.713	Teesta	M(e)	119.15	5,238
127	03	77D16	02649	28.011	88.756	Teesta	M(o)	108.12	5,094
128	03	78A01	02664	27.920	88.159	Teesta	M(e)	83.63	5,441
129	03	78A01	02665	27.913	88.196	Teesta	M(e)	128.14	5,194
130	03	78A05	02815	27.947	88.332	Teesta	M(o)	60.49	5,034
131	03	78A05	02874	27.822	88.249	Teesta	M(e)	70.94	5,414

S.No.	Glacial Lake ID Number			Latitude	Longitude	Subbasin	GL Type	Area (ha)	Elevation (m)
132	03	78A09	02955	27.992	88.545	Teesta	M(e)	68.28	5,161
133	03	78A09	02961	27.975	88.616	Teesta	M(e)	57.86	4,960
134	03	78A13	03118	27.990	88.816	Teesta	M(e)	174.29	5,303
135	03	77H01	03295	28.805	89.155	Upper Yarlung Tsangpo	O	68.23	4,219
136	03	77H07	03298	28.327	89.430	Upper Yarlung Tsangpo	E(o)	140.50	4,426
137	03	77H08	03302	28.144	89.396	Upper Yarlung Tsangpo	O	62.48	4,473
138	03	77H08	03328	28.025	89.428	Upper Yarlung Tsangpo	E(o)	63.43	4,791
139	03	77H12	03343	28.241	89.695	Upper Yarlung Tsangpo	E(o)	70.85	4,693
140	03	77H12	03344	28.228	89.638	Upper Yarlung Tsangpo	E(o)	1,273.72	4,568
141	03	77H12	03352	28.181	89.535	Upper Yarlung Tsangpo	E(o)	82.15	4,694
142	03	77H16	03368	28.230	89.887	Upper Yarlung Tsangpo	M(e)	151.09	4,921
143	03	77L03	03394	28.264	90.068	Upper Yarlung Tsangpo	M(e)	188.07	5,149
144	03	77L04	03395	28.236	90.104	Upper Yarlung Tsangpo	M(e)	585.02	5,126
145	03	78E05	03424	27.969	89.379	Upper Yarlung Tsangpo	E(o)	66.73	4,568
146	03	78E05	03429	27.959	89.397	Upper Yarlung Tsangpo	E(o)	181.69	4,576
147	03	78E05	03433	27.941	89.389	Upper Yarlung Tsangpo	E(o)	279.30	4,572
148	03	78E05	03454	27.878	89.312	Upper Yarlung Tsangpo	M(e)	61.73	5,001
149	03	78E01	03664	27.809	89.230	Amo Chu	M(e)	52.68	5,137
150	03	77L04	04187	28.107	90.247	Puna Tsang Chu	M(e)	132.27	4,369
151	03	77L04	04243	28.016	90.210	Puna Tsang Chu	E(o)	54.12	5,127
152	03	77L08	04272	28.092	90.301	Puna Tsang Chu	M(e)	153.89	4,513
153	03	78E13	04457	27.973	89.930	Puna Tsang Chu	E(c)	65.00	5,076
154	03	78E13	04481	27.940	89.930	Puna Tsang Chu	M(o)	72.67	5,002
155	03	78I01	04658	27.977	90.233	Puna Tsang Chu	M(o)	67.28	5,072
156	03	78I01	04807	27.800	90.231	Puna Tsang Chu	E(o)	74.59	4,758
157	03	77J15	05060	30.479	90.966	Lhasa Tsangpo	E(o)	85.72	5,035
158	03	82A16	05382	31.120	92.833	Lhasa Tsangpo	O	388.59	4,902
159	03	82A16	05393	31.112	92.815	Lhasa Tsangpo	O	68.03	4,905
160	03	82A16	05396	31.109	92.952	Lhasa Tsangpo	O	97.67	4,894
161	03	82A16	05447	31.036	92.787	Lhasa Tsangpo	O	94.42	4,908
162	03	82B11	05671	30.494	92.646	Lhasa Tsangpo	E(o)	98.02	4,817
163	03	82B11	05688	30.350	92.735	Lhasa Tsangpo	E(o)	87.32	5,112
164	03	82B13	05785	30.976	92.941	Lhasa Tsangpo	E(o)	441.76	4,904
165	03	82B13	05792	30.949	92.890	Lhasa Tsangpo	O	118.54	4,892
166	03	82B13	05795	30.935	92.828	Lhasa Tsangpo	O	222.71	4,886
167	03	82B13	05797	30.934	92.775	Lhasa Tsangpo	E(o)	122.17	4,835
168	03	82B13	05803	30.906	92.817	Lhasa Tsangpo	E(o)	177.10	4,960
169	03	82B13	05804	30.896	92.910	Lhasa Tsangpo	E(o)	266.63	4,923
170	03	82B13	05805	30.894	92.951	Lhasa Tsangpo	E(o)	205.95	4,958
171	03	82B13	05808	30.879	92.881	Lhasa Tsangpo	E(o)	52.44	4,982
172	03	82C05	05928	29.779	92.388	Lhasa Tsangpo	E(o)	154.54	4,916
173	03	82C06	05941	29.667	92.394	Lhasa Tsangpo	E(o)	53.86	4,677
174	03	82E04	06022	31.132	93.177	Lhasa Tsangpo	O	692.16	5,007
175	03	82E04	06068	31.103	93.144	Lhasa Tsangpo	E(o)	101.01	5,024

S.No.	Glacial Lake ID Number			Latitude	Longitude	Subbasin	GL Type	Area (ha)	Elevation (m)
176	03	82E04	06096	31.004	93.088	Lhasa Tsangpo	E(o)	71.50	5,040
177	03	82E08	06104	31.065	93.292	Lhasa Tsangpo	E(o)	51.21	5,047
178	03	77L03	06157	28.278	90.226	Upper Yarlung Tsangpo	M(e)	86.59	5,301
179	03	77L04	06161	28.245	90.185	Upper Yarlung Tsangpo	M(e)	60.02	5,455
180	03	77P10	06238	28.546	91.525	Upper Yarlung Tsangpo	O	101.76	5,083
181	03	77L11	06298	28.273	90.736	Manas	M(e)	167.03	4,510
182	03	77L12	06314	28.241	90.724	Manas	M(e)	88.56	4,654
183	03	77L12	06349	28.123	90.566	Manas	M(e)	67.52	5,172
184	03	77L12	06358	28.096	90.738	Manas	M(e)	67.74	5,004
185	03	77L16	06450	28.086	90.787	Manas	M(e)	216.41	5,165
186	03	77L16	06456	28.059	90.903	Manas	E(o)	52.05	4,768
187	03	77L16	06503	28.003	90.905	Manas	E(o)	87.32	4,754
188	03	77P03	06540	28.351	91.079	Manas	M(e)	77.20	4,787
189	03	77P04	06580	28.034	91.003	Manas	E(o)	76.90	4,200
190	03	77P08	06632	28.088	91.257	Manas	E(o)	56.11	4,630
191	03	77L08	06904	28.037	90.364	Manas	M(e)	84.10	5,216
192	03	77L08	06928	28.014	90.374	Manas	M(e)	72.68	5,182
193	03	77L12	07005	28.022	90.709	Manas	M(e)	145.52	4,868
194	03	78I05	07173	27.890	90.290	Manas	M(e)	114.20	5,059
195	03	78I09	07447	27.939	90.535	Manas	E(c)	59.94	5,036
196	03	78I09	07510	27.861	90.591	Manas	E(o)	74.98	4,770
197	03	78I13	07712	27.867	90.816	Manas	E(o)	53.98	4,135
198	03	77P08	07817	28.037	91.452	Manas	M(o)	56.24	4,737
199	03	77P16	07886	28.102	91.942	Manas	E(o)	117.73	4,705
200	03	77P16	07892	28.059	91.939	Manas	E(o)	240.03	4,631
201	03	78M09	08030	27.838	91.605	Manas	O	66.35	4,125
202	03	78M09	08032	27.834	91.553	Manas	E(c)	67.23	4,521
203	03	78M13	08095	27.901	91.896	Manas	O	217.48	4,452
204	03	78M13	08130	27.841	91.892	Manas	O	145.65	4,638
205	03	83A02	08572	27.519	92.033	Manas	E(o)	60.79	4,274
206	03	83A05	08628	27.771	92.435	Manas	M(o)	55.56	5,179
207	03	82F02	08814	30.621	93.181	Lower Yarlung Tsangpo	O	689.79	4,499
208	03	82F02	08824	30.535	93.058	Lower Yarlung Tsangpo	E(o)	86.74	4,817
209	03	82F06	08851	30.521	93.445	Lower Yarlung Tsangpo	M(o)	114.42	4,780
210	03	82F11	08921	30.355	93.632	Lower Yarlung Tsangpo	M(e)	54.25	4,442
211	03	82J06	09026	30.654	94.492	Lower Yarlung Tsangpo	M(e)	530.64	3,942
212	03	82J06	09027	30.626	94.444	Lower Yarlung Tsangpo	M(e)	66.04	4,095
213	03	82J11	09055	30.452	94.603	Lower Yarlung Tsangpo	M(e)	181.75	3,998
214	03	82J14	09067	30.537	94.759	Lower Yarlung Tsangpo	M(e)	51.12	3,631
215	03	82B08	09108	30.049	92.443	Lower Yarlung Tsangpo	E(o)	52.80	4,993
216	03	82F07	09589	30.267	93.457	Lower Yarlung Tsangpo	M(o)	70.57	4,076
217	03	82F12	09688	30.242	93.638	Lower Yarlung Tsangpo	M(e)	108.96	4,181
218	03	82F15	09750	30.261	93.764	Lower Yarlung Tsangpo	M(e)	64.75	4,019
219	03	82F16	09776	30.020	93.967	Lower Yarlung Tsangpo	E(v)	2,658.49	3,475

S.No.	Glacial Lake ID Number			Latitude	Longitude	Subbasin	GL Type	Area (ha)	Elevation (m)
220	03	82G06	10094	29.541	93.345	Lower Yarlung Tsangpo	E(o)	100.03	4,631
221	03	82G10	10253	29.513	93.620	Lower Yarlung Tsangpo	O	79.97	4,362
222	03	82G11	10262	29.477	93.631	Lower Yarlung Tsangpo	E(o)	82.79	4,369
223	03	82G14	10427	29.542	93.830	Lower Yarlung Tsangpo	E(o)	56.22	4,419
224	03	82G14	10455	29.502	93.937	Lower Yarlung Tsangpo	E(o)	56.29	4,444
225	03	82J04	10483	30.126	94.090	Lower Yarlung Tsangpo	E(o)	276.68	3,802
226	03	82J04	10484	30.115	94.188	Lower Yarlung Tsangpo	M(e)	94.40	3,905
227	03	82J04	10489	30.046	94.157	Lower Yarlung Tsangpo	E(o)	107.17	4,294
228	03	82J08	10499	30.099	94.270	Lower Yarlung Tsangpo	M(e)	68.10	3,924
229	03	82K02	10661	29.545	94.067	Lower Yarlung Tsangpo	E(o)	50.77	4,299
230	03	82K02	10688	29.526	94.057	Lower Yarlung Tsangpo	E(o)	78.00	4,533
231	03	82K02	10696	29.518	94.121	Lower Yarlung Tsangpo	E(o)	118.34	4,501
232	03	82K02	10703	29.505	94.133	Lower Yarlung Tsangpo	E(o)	101.69	4,577
233	03	82K03	10730	29.472	94.236	Lower Yarlung Tsangpo	E(o)	50.80	4,509
234	03	82K05	10788	29.915	94.280	Lower Yarlung Tsangpo	E(c)	183.14	4,385
235	03	82K05	10845	29.828	94.462	Lower Yarlung Tsangpo	E(o)	57.27	4,133
236	03	82K05	10852	29.813	94.433	Lower Yarlung Tsangpo	O	228.43	4,083
237	03	82K09	10962	29.808	94.501	Lower Yarlung Tsangpo	O	55.81	4,305
238	03	82G08	11911	29.240	93.276	Lower Yarlung Tsangpo	E(o)	58.59	4,914
239	03	82G11	12006	29.405	93.708	Lower Yarlung Tsangpo	E(o)	74.32	4,505
240	03	82G11	12065	29.287	93.736	Lower Yarlung Tsangpo	E(o)	59.16	4,562
241	03	82G16	12326	29.035	93.836	Lower Yarlung Tsangpo	O	67.89	4,116
242	03	82H13	12506	28.856	94.000	Lower Yarlung Tsangpo	E(o)	73.89	3,868
243	03	82K14	12810	29.545	94.965	Lower Yarlung Tsangpo	E(c)	91.95	4,300
244	03	82L05	12837	28.986	94.270	Lower Yarlung Tsangpo	E(o)	50.66	3,478
245	03	82H03	13095	28.342	93.092	Subansiri	E(o)	62.44	4,251
246	03	82H03	13097	28.320	93.047	Subansiri	E(o)	72.68	4,255
247	03	83A09	13285	27.980	92.651	Subansiri	M(e)	52.21	4,988
248	03	82D16	13318	28.116	92.951	Subansiri	E(c)	55.58	4,648
249	03	82J08	13621	30.174	94.346	Lower Yarlung Tsangpo	E(v)	180.80	3,654
250	03	82J08	13634	30.073	94.464	Lower Yarlung Tsangpo	E(o)	90.19	4,110
251	03	82J08	13655	30.013	94.472	Lower Yarlung Tsangpo	E(c)	66.38	4,327
252	03	82J08	13657	30.005	94.384	Lower Yarlung Tsangpo	E(o)	59.09	4,020
253	03	82K05	13679	29.959	94.292	Lower Yarlung Tsangpo	E(v)	134.02	4,282
254	03	82K05	13686	29.947	94.358	Lower Yarlung Tsangpo	E(o)	109.97	4,148
255	03	82K05	13714	29.896	94.461	Lower Yarlung Tsangpo	E(o)	85.25	4,346
256	03	82K09	13791	29.890	94.569	Lower Yarlung Tsangpo	E(v)	158.02	4,149
257	03	82K09	13855	29.829	94.633	Lower Yarlung Tsangpo	E(v)	60.20	4,231
258	03	82K09	13886	29.779	94.601	Lower Yarlung Tsangpo	E(v)	184.22	4,146
259	03	82N02	14031	30.603	95.182	Lower Yarlung Tsangpo	M(e)	110.12	4,278
260	03	82N10	14193	30.473	95.575	Lower Yarlung Tsangpo	E(o)	56.47	4,866
261	03	82N11	14301	30.251	95.604	Lower Yarlung Tsangpo	M(o)	134.45	4,442
262	03	82N12	14308	30.221	95.584	Lower Yarlung Tsangpo	M(e)	85.49	4,342
263	03	91C02	14526	29.598	96.141	Lower Yarlung Tsangpo	M(o)	65.09	4,025

S.No.	Glacial Lake ID Number			Latitude	Longitude	Subbasin	GL Type	Area (ha)	Elevation (m)
264	03	91C05	14550	29.823	96.351	Lower Yarlung Tsangpo	M(o)	101.06	4,870
265	03	82O08	14709	29.180	95.486	Dihang	E(o)	93.81	3,533
266	03	82O11	14834	29.304	95.640	Dihang	E(v)	70.17	3,322
267	03	82O15	14903	29.371	95.873	Dihang	E(o)	103.75	4,344
268	03	82O08	14974	29.129	95.439	Dibang	E(o)	53.88	3,284
269	03	82O16	15129	29.011	95.885	Dibang	E(o)	55.15	3,778
270	03	82P13	15195	29.005	95.905	Dibang	E(o)	54.45	3,598
271	03	91C03	15223	29.302	96.082	Dibang	E(o)	119.59	4,274
272	03	91C03	15250	29.269	96.157	Dibang	E(o)	102.66	3,991
273	03	91C04	15278	29.229	96.192	Dibang	E(o)	106.39	3,473
274	03	91C04	15283	29.226	96.160	Dibang	E(o)	57.36	3,313
275	03	91C04	15296	29.196	96.203	Dibang	E(o)	64.06	4,246
276	03	91C04	15336	29.091	96.211	Dibang	E(o)	100.77	4,188
277	03	91C04	15344	29.079	96.145	Dibang	E(c)	86.02	3,945
278	03	91C04	15360	29.051	96.144	Dibang	O	79.93	3,602
279	03	91C08	15390	29.244	96.245	Dibang	E(o)	50.88	4,360
280	03	91D09	15690	28.776	96.531	Dibang	O	101.67	3,510
281	03	91C03	15760	29.257	96.246	Lohit	M(o)	89.30	4,432
282	03	91C08	15774	29.224	96.279	Lohit	M(o)	66.27	4,207
283	03	91C11	15833	29.491	96.701	Lohit	O	610.17	3,916
284	03	91C15	15967	29.462	96.787	Lohit	O	518.00	3,916
285	03	91C15	15982	29.397	96.828	Lohit	E(o)	401.62	3,917
286	03	91C15	15998	29.298	96.816	Lohit	M(e)	292.36	3,954
287	03	91C15	16000	29.295	96.835	Lohit	M(l)	95.04	4,013
288	03	91C15	16004	29.268	96.837	Lohit	E(o)	108.04	4,119
289	03	91C16	16019	29.238	96.826	Lohit	M(o)	209.76	4,219
290	03	91C16	16020	29.230	96.805	Lohit	M(o)	144.00	4,266
291	03	91C16	16024	29.221	96.814	Lohit	M(e)	52.51	4,279
292	03	91D10	16210	28.516	96.699	Lohit	E(o)	299.20	3,330
293	03	91D16	16419	28.202	96.898	Lohit	E(o)	67.30	3,731
294	03	91H01	16757	28.977	97.215	Lohit	E(o)	63.42	4,092
295	03	91H01	16898	28.783	97.153	Lohit	E(o)	83.11	3,712
296	03	91H05	17167	28.940	97.262	Lohit	E(o)	93.63	4,412
297	03	91H07	17452	28.412	97.465	Lohit	E(o)	56.61	4,300
298	03	91H08	17635	28.096	97.289	Lohit	E(o)	53.06	3,762
299	03	92E05	17959	27.989	97.369	Lohit	E(o)	51.93	4,188

Annexure - IV: Glossary

Ablation: The process that reduce the mass of the glacier (Cogley et al., 2011).

Ablation area/zone: The part of the glacier where ablation exceeds accumulation in magnitude, that is, where the cumulative mass balance relative to the start of the mass-balance year is negative. The extent of the ablation zone can vary strongly from year to year (Cogley et al., 2011).

Accumulation: The process that add to the mass of the glacier (Cogley et al., 2011).

Accumulation area/zone: The part of the glacier where accumulation exceeds ablation in magnitude, that is, where the cumulative mass balance relative to the start of the mass-balance year is positive. The extent of the accumulation zone can vary strongly from year to year. The accumulation zone is not the same as the firn area (Cogley et al., 2011).

Altitude: The vertical distance of a point above a datum, which is usually an estimate of mean sea level. Altitude and elevation are synonyms in common usage (Cogley et al., 2011).

Aspect: The compass direction towards which a slope faces; measured clockwise in degrees from the North.
Attribute: Non-spatial descriptive characteristics of a real-world phenomenon, often a measurement or value associated with spatial locations.

Attribute: Non-spatial descriptive characteristics of a real-world phenomenon, often a measurement or value associated with spatial locations.

Avalanche: A slide or flow of a mass of snow, firn or ice that becomes detached abruptly, often entraining additional material such as snow, debris and vegetation as it descends. The duration of an avalanche is typically seconds to minutes (Cogley et al., 2011).

Band: One layer of multispectral image representing data values for a specific range of the electromagnetic spectrum of reflected light or heat.

Climate: Climate is usually defined as the average weather or as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years. The classical period for averaging these variables is 30 years. The relevant quantities are most often surface variables such as temperature, precipitation and wind (Pandey, 2019).

Climate change: Climate change refers to a change in the state of the climate that can be identified by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. UNFCCC defines climate change as: 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods'. (Pandey, 2019).

Climate variability: Climate variability refers to variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the climate on all spatial and temporal scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (internal variability), or to variations in natural or anthropogenic external forcing (external variability) (Pandey, 2019).

Cryosphere: The cryosphere is the part of the Earth system that contains ice, for example snow on the ground, glaciers, ice sheets, lake ice, river ice, sea ice, seasonally and perennially frozen ground (GCW 2016).

Database: An organized, integrated collection of data related by a common fact or purpose.

Debris-covered glacier: A glacier that is covered at its tongue with supra-glacial debris across its full width (Kirkbride, 2011). In the accumulation zone any deposited debris is buried by later snowfalls, but in the ablation zone debris remains at the surface and englacial debris is added to the surface layer from beneath as ice ablates away. The debris cover affects the rate of ablation, with very thin debris resulting in accelerated melt and debris thicker than a few tens of millimetres reducing the melting rate (Cogley et al., 2011).

Digital Elevation Model (DEM): An array of numbers representing the elevation of part or all of the Earth's surface as samples or averages at fixed spacing in two horizontal coordinate directions (Cogley et al., 2011).

Disaster: A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts (UNISDR 2017).

Disaster risk: The potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability and capacity (UNISDR 2017).

Early warning system: The set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations threatened by a hazard to prepare to act promptly and appropriately to reduce the possibility of harm or loss (Pandey, 2019).

Electromagnetic spectrum: The spectrum of wavelengths of electromagnetic radiation.

Englacial: Pertaining to the interior of the glacier, between the summer surface and the bed (Cogley et al., 2011).

Exposure: The presence or situation of people, livelihoods, species, ecosystems, environmental functions, services, and resources, infrastructure, or economic, social, or cultural assets in places and settings, and other tangible human assets located in hazard-prone areas that could be adversely affected (UNISDR, 2017; Pandey, 2019).

Feature: A real-world phenomenon, often used in cartography to name classes of elements shown on a map.

Firn: Snow (in which the pore space is at least partially interconnected, allowing air and water to circulate) that has survived at least one ablation season but has not been transformed to glacier ice (Cogley et al., 2011).

Flood: The overflowing of the normal confines of a stream or other body of water, or the accumulation of water over areas not normally submerged. Floods include river (fluvial) floods, flash floods, urban floods, pluvial floods, sewer floods, coastal floods and glacial lake outburst floods (Pandey, 2019).

Format: The pattern into which data are systematically arranged for use on a computer.

Geographic Information System (GIS): A set of tools for collecting, storing, retrieving, transforming, and displaying spatial data from the real world for a particular set of circumstances.

Glacial Lake Outburst Flood (GLOF): Flood caused by the outburst of a glacial lake due to rapid accumulation of water in it, resulting to extreme damage in loss of lives and infrastructure in the downstream area.

Glacial Lake: As a result of glacier thinning and retreating, melt water gets accumulated at terminal moraines or on it covered by glacier ice, is known as glacial lake.

Glacier Erosion Lake: These are the water bodies formed in a depression after the glacier has retreated in a form of cirque or trough valley, might be isolated and far away from the present glaciated area, and mostly stable in nature.

Glacier: A perennial mass of ice, and possibly firn and snow, originating on the land surface by their crystallization of snow or other forms of solid precipitation and showing evidence of past or present flow (Cogley et al., 2011).

Global Positioning System (GPS): A GPS is a position-fixing system that uses the time taken for signals to travel from at least three GPS satellites in a known orbit to a receiver on the ground.

Hazard: The potential occurrence of a natural or human-induced physical event or trend or physical impact that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems and environmental resources (Pandey, 2019).

Ice-dammed Lake: An Ice-dammed Lake is produced on the side(s) of a glacier, when an advancing glacier happens to intercept a tributary/tributaries pouring into a main glacier valley.

Impacts: The term impacts is used primarily to refer to the effects on natural and human systems of extreme weather and climate events and of climate change. Impacts generally refer to effects on lives, livelihoods, health, ecosystems, economies, societies, cultures, services and infrastructure due to the interaction of climate changes or hazardous climate events occurring within a specific time period and the vulnerability of an exposed society or system. Impacts are also referred to as consequences and outcomes. The impacts of climate change on geophysical systems, including floods, droughts and sea level rise, are a subset of impacts called physical impacts (Pandey, 2019).

Latitude: Angle measured in a north-south direction from the Earth's center to locations on the Earth's surface.

Longitude: Angle measured in an east-west direction from the Earth's center to locations on the Earth's surface.

Layer: Usually represents a theme or a feature type within the database.

Map: An abstract representation of the physical features of a portion of the Earth's surface graphically displayed on a planar surface. Map display signs, symbols and spatial relationships among the features.

Melt water: The liquid resulting from melting of ice, firn or snow (Cogley et al., 2011).

Moraine-dammed Lake: In the retreating process of a glacier, ice tends to melt in the lowest part of the glacier surrounded by Lateral-moraines and End-moraines, and forms into a lake known as Moraine-dammed Lake or Proglacial Lake.

Pixel: Smallest discrete element that makes up an image, generally represents either a small square or portion of the Earth's surface, scanned by satellite or aircraft.

Precipitation: Liquid or solid products of the condensation of water vapour that fall from clouds or are deposited from the air onto the surface (Cogley et al., 2011).

Remote sensing: The technique of obtaining data about the environment and surface of the earth from a distance, e.g. from an aircraft or satellite.

Resolution: It is the accuracy at which a given map scale can depict the location and shape of geographic features.

Retreat: Decrease of the length of a flow line (in case of glacier which is its terminus), measured from a fixed point. Advance is the opposite of retreat, that is, advance of the terminus (Cogley et al., 2011).

Risk: The potential for consequences where something of value is at stake and where the outcome is uncertain, recognizing the diversity of values. Risk is often represented as probability or likelihood of occurrence of hazardous events or trends multiplied by the impacts if these events or trends occur. In this report, the term risk is often used to refer to the potential, when the outcome is uncertain, for adverse consequences on lives, livelihoods, health, ecosystems and species, economic, social and cultural assets, services (including environmental services) and infrastructure (Pandey, 2019).

Scale: The ratio or fraction between the distance on a map, chart or photograph and the corresponding distance on the surface of the Earth.

Slope: A measure of change on surface value over distance, expressed in degrees or as a percentage.

Snow: Solid precipitation in the form of ice crystals, chiefly in complex branched hexagonal form and often agglomerated into snowflakes; or an accumulation of the same on the Earth's surface. It is also known as solid precipitation that has accumulated on the summer surface on a glacier and that transforms to firn at the end of the mass-balance year (Cogley et al., 2011).

Subglacial: Pertaining to the glacier bed or to the material below the bed (Cogley et al., 2011).

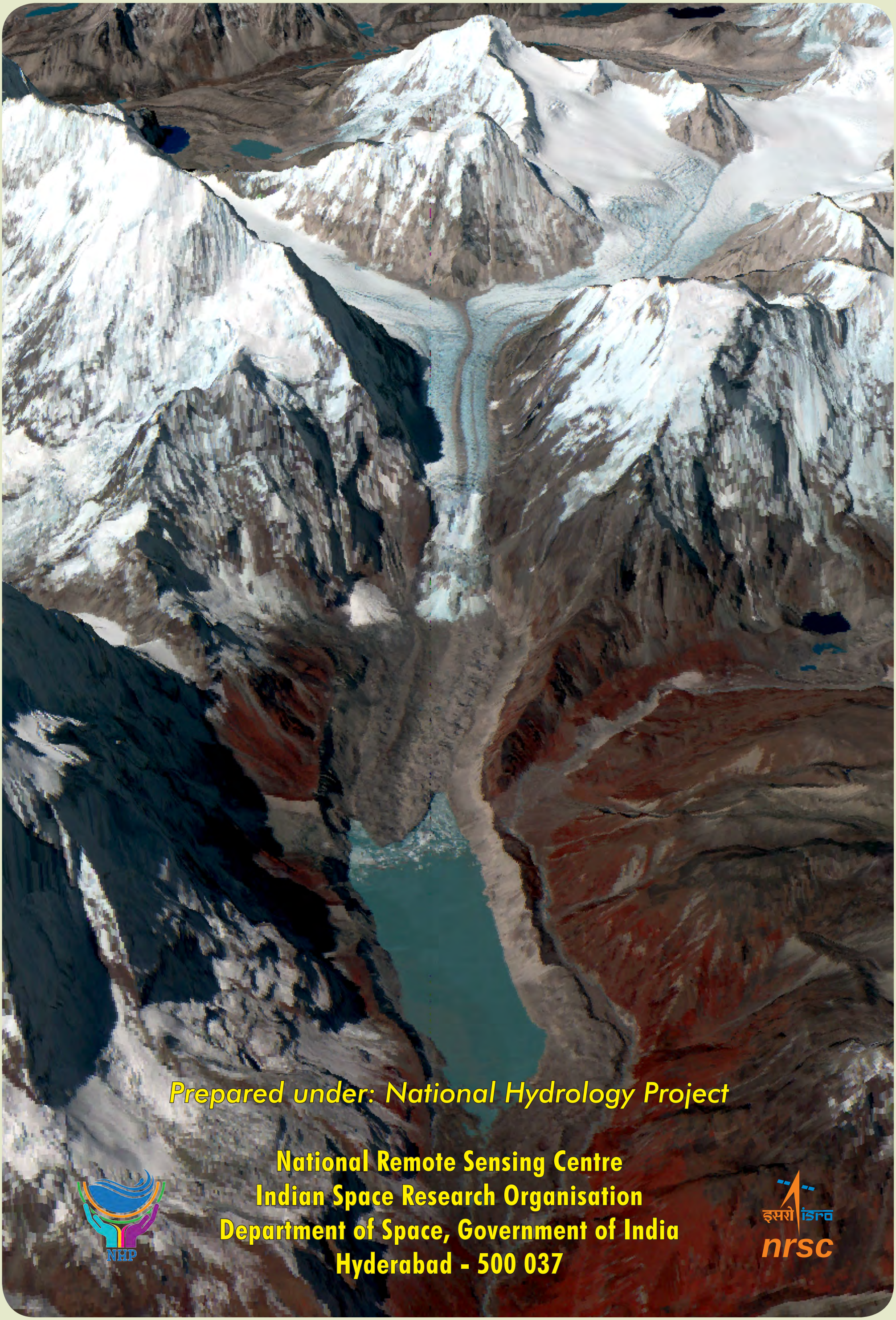
Supra-glacial Lake: Water bodies develop within the ice mass in any position of the glacier, but away from the terminal moraines are known as Supra-glacial lakes. Its basic characteristics are shifting, merging, and draining.

Terminus: The lowest end of a glacier, also called glacier snout, glacier front or glacier toe (Cogley et al., 2011).

Tongue: The lower, elongate part of a valley glacier or outlet glacier or a floating extension of a glacier or ice stream, laterally unconfined but markedly longer than wide (Cogley et al., 2011).

Topographic Map: A map showing the features that describes the surface of a particular place or region. It contains contours indicating lines of equal surface elevation (relief), often referred to a topo maps.

Vulnerability: The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt (Pandey, 2019).



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