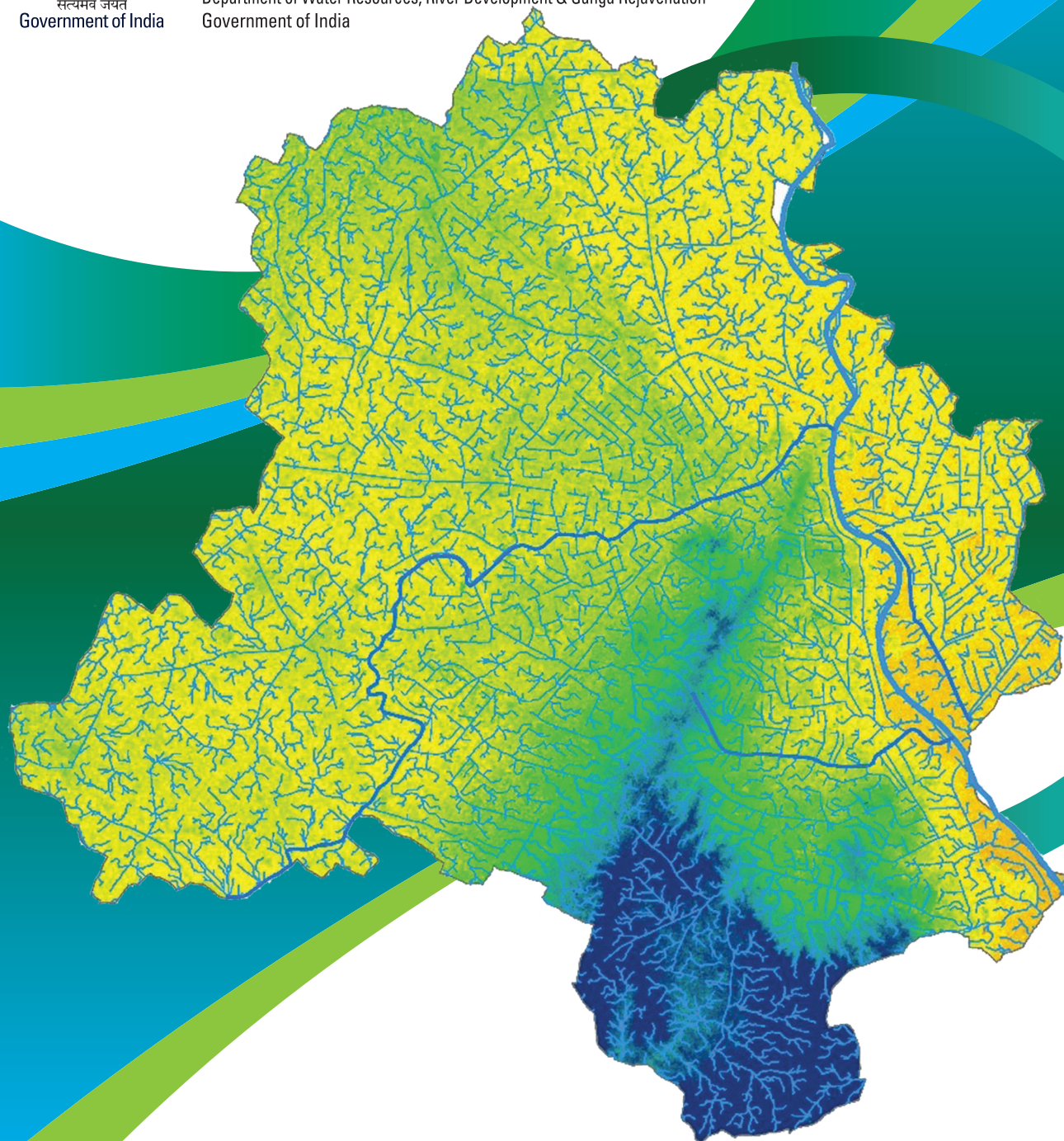


National Mission for Clean Ganga

Ministry of Jal Shakti

Department of Water Resources, River Development & Ganga Rejuvenation
Government of India



ATLAS OF RIVERS IN DELHI



cGanga
Centre for Ganga River Basin Management and Studies
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December 2022

Version - 1

ATLAS OF RIVERS IN DELHI

DECEMBER 2022

Version - 1



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National Mission for Clean Ganga (NMCG)

NMCG is the implementation wing of National Ganga Council which was setup in October 2016 under the River Ganga Authority order 2016. Initially NMCG was registered as a society on 12th August 2011 under the Societies Registration Act 1860. It acted as implementation arm of National Ganga River Basin Authority (NGRBA) which was constituted under the provisions of the Environment (Protection) Act (EPA) 1986. NGRBA has since been dissolved with effect from the 7th October 2016, consequent to constitution of National Council for Rejuvenation, Protection and Management of River Ganga (referred to as National Ganga Council).

www.nmcg.in

Centre for Ganga River Basin Management and Studies (cGanga)

cGanga is a think tank formed under the aegis of NMCG, and one of its stated objectives is to make India a world leader in river and water science. The Centre is headquartered at IIT Kanpur and has representation from most leading science and technological institutes of the country. cGanga's mandate is to serve as think-tank in implementation and dynamic evolution of Ganga River Basin Management Plan (GRBMP) prepared by the Consortium of 7 IITs. In addition to this, it is also responsible for introducing new technologies, innovations, and solutions into India.

www.cganga.org

Acknowledgment

This river atlas document is a collective effort of a number of experts, institutions and organisations, some who had been associated with preparing the Ganga River Basin Management Plan (GRBMP) submitted to the Government of India in 2015, and others who joined later with their own independent expertise and enthusiasm. Contributions to the photographs and images for this document by individuals are gratefully acknowledged.

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PREFACE

The Centre for Ganga River Basin Management and Studies (“cGanga”) was established in the year 2016 as a comprehensive think-tank for river restoration and to assist the National Mission for Clean Ganga (NMCG), Jal Shakti Ministry, GoI, for “continual scientific support in the implementation and dynamic evolution of the Ganga River Basin Management Plan” for conservation of National River Ganga. In keeping with this goal, cGanga has been actively developing detailed knowledge capsules, tools and procedures to enable comprehensive and early rejuvenation of the Ganga River network across the whole basin. While a river basin approach is essential for analyzing and comprehending the Ganga river’s status and needs to regain her wholesomeness, the implementation strategies of the required interventions must keep in mind the role and individuality of each State. Thus, it is necessary to focus on state-level sub-strategies of natural resource management for holistic revival of River Ganga.

The present document attempts to provide a comprehensive picture of the river network in the National Capital Territory (NCT) of Delhi. This Atlas was created entirely by cGanga, with original mapping of all identifiable rivers, and with selective additional information culled from different sources for completeness. Many of the rivers and maps given here are not readily available elsewhere, and we expect them to prove useful to the many Central, State, and other organizations engaged in the river, water or natural resource management in the NCT Delhi.

In preparing this document dedicated members of cGanga spent a lot of time in diligently studying, analysing, acquiring and compiling diverse information from diverse sources. Many people and organisations outside cGanga also helped in its preparation, which aided in its comprehensiveness. We are grateful to one and all of them.

VINOD TARE

*Professor & Founding Head, cGanga
IIT Kanpur*

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ACRONYMS AND ABBREVIATIONS

GW	: Groundwater
NCT	: National Capital Territory
cGanga	: Centre for Ganga River Basin Management and Studies
Cumec	: Cubic meter per second
CWC	: Central Water Commission
DEM	: Digital Elevation Model
GIS	: Geographic Information System
GRBMP	: Ganga River Basin Management Plan
Km	: Kilometer
LULC	: Land Use/ Land Cover
M	: Meter
mm	: millimeter
Sol	: Survey of India
Sq. Km	: Square Kilometer
SWAT	: Soil & Water Assessment Tool

INTRODUCTION

Delhi, officially the National Capital Territory (NCT) of Delhi, is a union territory of India containing New Delhi, the capital of India. Delhi shares borders with the state of Uttar Pradesh in the east and with the state of Haryana in the remaining direction. The NCT covers an area of 1,484 square kilometers (573 sq mi). The Yamuna is the second-largest tributary of the Ganges flowing through Delhi. The present volume is an attempt to map the rich river network of the NCT of Delhi in as fine a detail as possible. cGanga team has taken Delhi Drainage Report as a base for engineered stormwater drainage of the city. Much of the information contained in this River Atlas is created from available earth images and Delhi Drainage Report with appropriate data and image processing tools and software on the GIS platform. Naturally, there may be shortcomings in some of the maps herein, including missing small streams, which can be expected to be duly refined and included in later versions. Also, a river atlas is often useful in conjunction with other natural resource and anthropogenic information such as the distribution of rainfall and other climatic data, other waterbodies, forest cover, elevations, soil types, other physiographic information, land use, tourist and pilgrimage centres, and infrastructure including roads and highways. Such other relevant information is also expected to be processed, assembled, and included later in a fuller version of this Atlas. In the meanwhile, it is hoped that this Atlas will provide a useful window to the NCT of Delhi River resources.

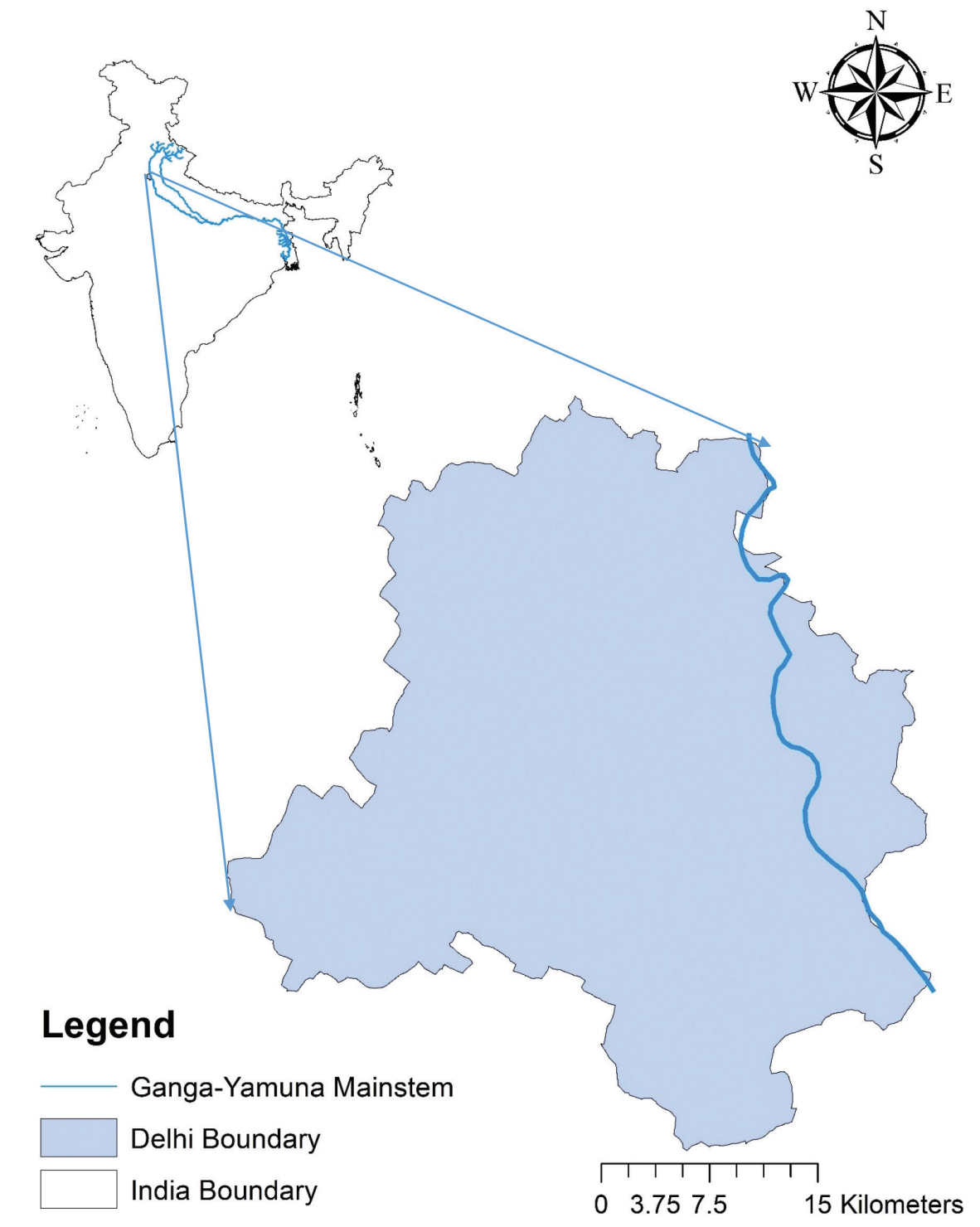


Figure: Location of National Capital Territory (NCT) of Delhi

NATIONAL CAPITAL TERRITORY (NCT) OF DELHI: SALIENT FEATURES

S No	Particulars	Details
1	State Extent	Latitude: 28.7041° N Longitude: 77.1025° E
2	Total Geographical Area (sq. km)	1,934.89
3	Area contributing to Ganga Basin (sq km)	1,934.89
4	Percentage of the Ganga Basin Area (%)	0.22
5	Districts (Census 2011)	11
6	Towns (Census 2011)	(Class I: 15; Class II: 21; Class III: 23; Class IV: 33; Class V: 17; Class VI: 04)
7	Total Population (Census 2011)	16,787,941
8	% Population in Ganga Basin	3.74
9	Gram Panchayats	NA
10	Census Villages (Census 2011)	417
11	Average Annual Rainfall (mm)	790
12	Average Temperature Range (oC)	5.0 - 44.0
13	Major Rivers (Inter and Intra-state)	Inter State Rivers: Sahibi, Ghazipur drain Intra State Rivers: Mungeshpur drain, Supplementary drain, Palam drain, Gokulpur drain, Chirag Delhi drain
14	Number of Major Basins	03
15	Number of Water Resources Structures	(Dams: 00, Barrages: 02, Weir: , Anicuts, Lifts, Power houses)
16	Number of Ground Water Observation wells	Level: 129 Quality: 143
17	Number of CWC Sites	03





NATIONAL CAPITAL TERRITORY (NCT) OF DELHI: RIVERS TRAVERSING THROUGH VARIOUS DISTRICTS IN BASIN AREA

S.No	State	District	Area (sq km)	Population (census 2011)	Growth Rate (%)	Density	River
1	NCT Delhi	East Delhi	63	1,709,346	16.79	27132	Gokulpur Drain, Khichiripur Drain, Shahdara Drain, Shahdara Drain1, Truck Drain Number-1, Truck Drain NO-2/Gazipur Drain, Vinod Nagar Drain, Yamuna.
2		West Delhi	130	2,543,243	19.46	19563	Madanpur Drain, Najafgarh Drain, Pankha Road Drain, Ramesh Nagar Drain, Shakoor Basti Drain, Subhash Nagar Drain, Tartarpur Drain.
3		North Delhi	61	887,978	13.62	14557	Burari Creek Drain, Daryyalla Drain, Model town STP Outlet, Najafgarh Drain, Suplemntary Drain.
4		South Delhi	247	2,731,929	20.51	11060	Ali Drain, Barapulla Drain, Chirag Delhi Drain ,Noroji Nagar Drain, Sahadra Drain, Sahadra Drain1, Yamuna River.
5		Central Delhi	21	582,320	-9.91	27730	Daryalla Drain, Yamuna River,
6		North East Delhi	62	2,241,624	26.78	36155	Balbir Nagar Drain, Gokulpur Drain, Karawal Nagar Drain, Sahadra1B Drain, Truck Drain No-1, Trunk Drain No-2/ Gazipur Drain
7		North West Delhi	443	3,656,539	27.81	8254	Bawana scape Drain, Bazidpur Drain, Drain No-6AB3, Madanpur Drain, Model Town STP Outlet STP, Mungeshpur Drain Thanakhurd Drain, Najafgarh Drain, Najafgarh Drain, Nangloi Drain, Shakoor Basti Drain, Suplemntary Drain, Yamuna River.
8		South East Delhi					Yamuna River
9		South West Delhi	421	2,292,958	30.65	5446	Bagraulla Airport Drain, Bijwasan Drain, Chaudania Bhupaniya Drain, Mungeshpur Drain Najafgarh Drain, Noroji Nagar Drain, Palam Drain, Palam Nalla, Ramesh Nagar Drain, SahadraMohd.pur Drain, Yamuna River.
10		New Delhi	35	142,004	-20.72	4057	Yamuna River

NATIONAL CAPITAL TERRITORY (NCT) OF DELHI: MAJOR BARRAGE AND WEIR

NATIONAL CAPITAL TERRITORY (NCT) OF DELHI: MAJOR BARRAGE AND WEIR											
S No	District	Name	Type	River	Status	Completion Year	Length (m)	Height upto Crest (m)	Pond level (m)	Design flood discharge (cumec)	Purpose
1	North Delhi	Wazirabad Barrage	Barrage	Yamuna	Completed	1959	454.46				Drinking Water Supply
2	South Delhi	Yamuna Barrage	Barrage	Yamuna	Completed		552				Power Generation





CWC BASINS

Basin Code	Basin Name
1	Indus (Up to border)
2a	Ganga
2b	Brahmaputra
2c	Barak and others
3	Godavari
4	Krishna
5	Cauvery
6	Subernarekha
7	Brahmani and Baitarni
8	Mahanadi
9	Pennar
10	Mahi
11	Sabarmati
12	Narmada
13	Tapi
14	West flowing rivers from Tapi to Tadri
15	West flowing rivers from Tadri to Kanyakumari
16	East flowing rivers between Mahanadi and Pennar
17	East flowing rivers between Pennar and Kanyakumari
18	West flowing rivers of Kutch and Saurashtra including Luni
19	Area of inland drainage in Rajasthan
20	Minor rivers draining into Myanmar (Burma and Bangladesh)

Source: River Basin Atlas of India, Ministry of Water Resources, Gol (October 2012)

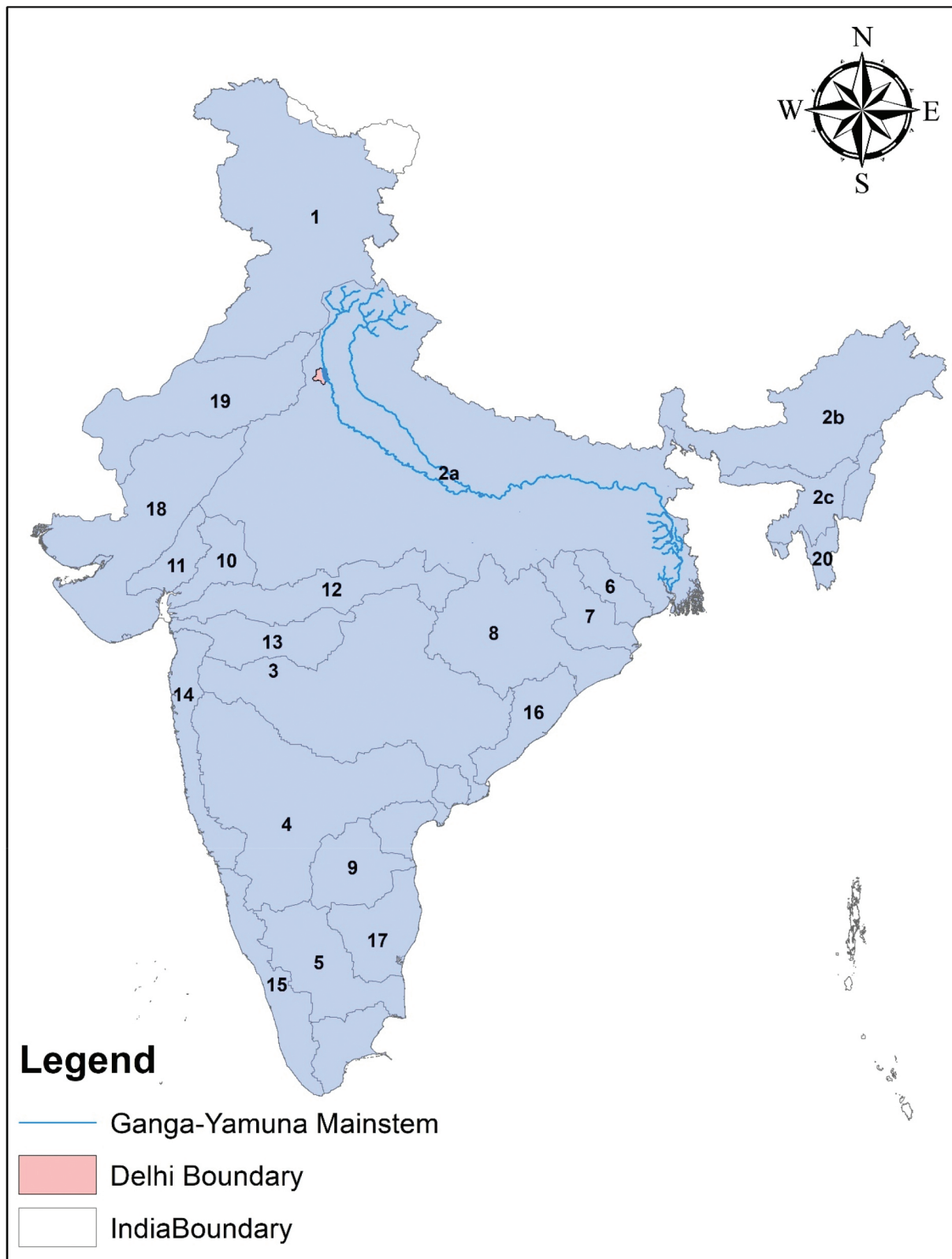
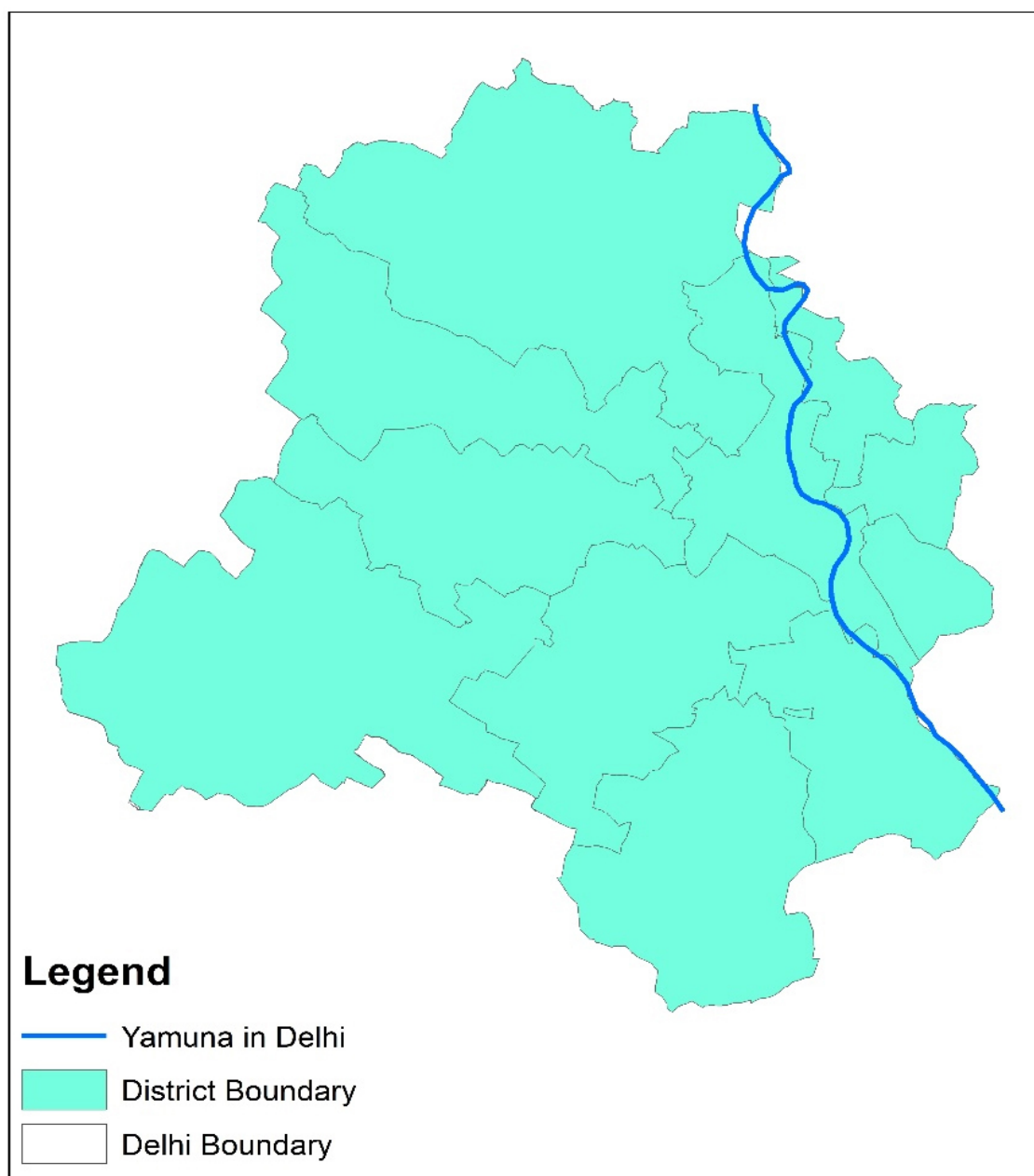


Figure: CWC Basins in India

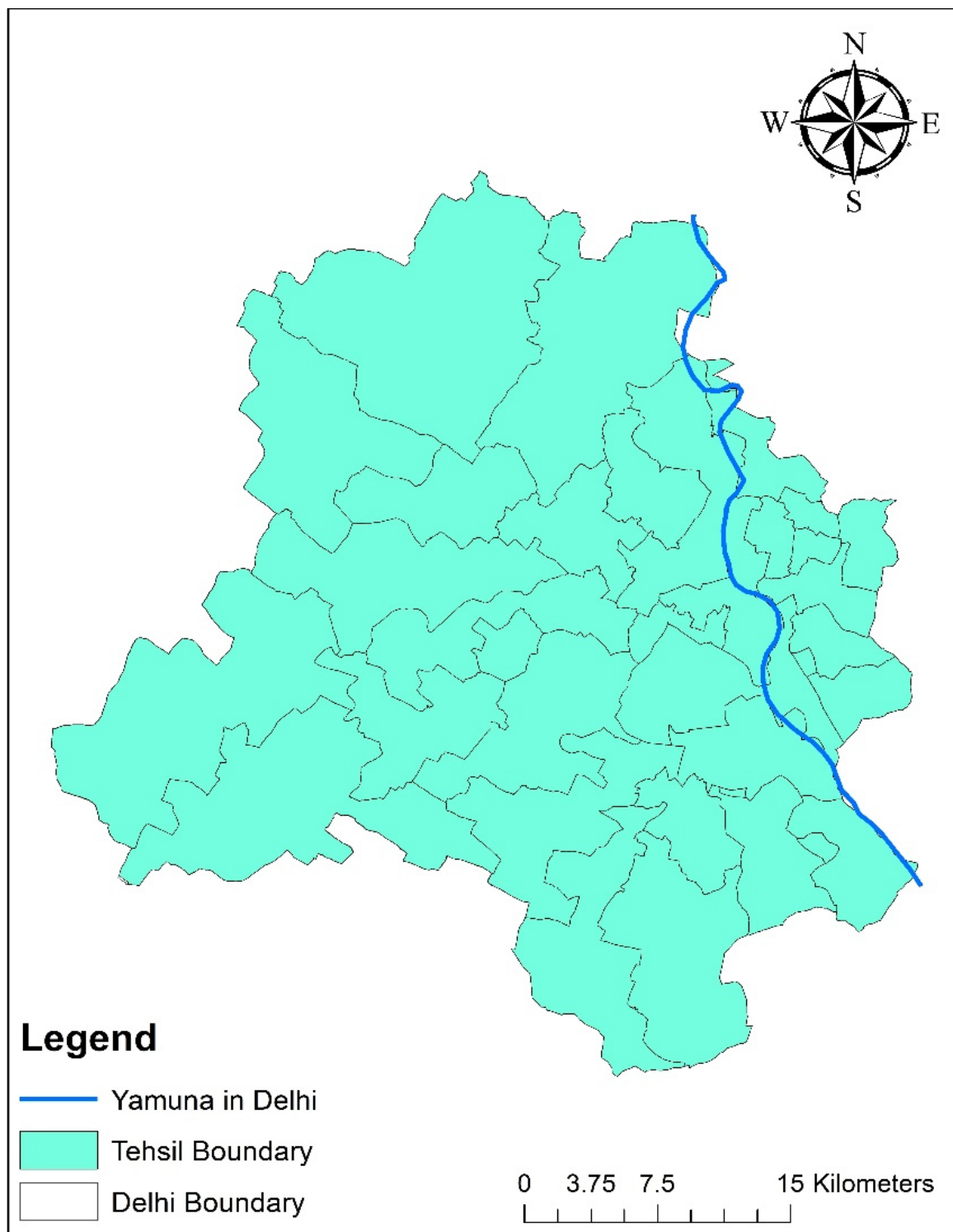


NATIONAL CAPITAL TERRITORY (NCT) OF DELHI: ADMINISTRATIVE STRUCTURE



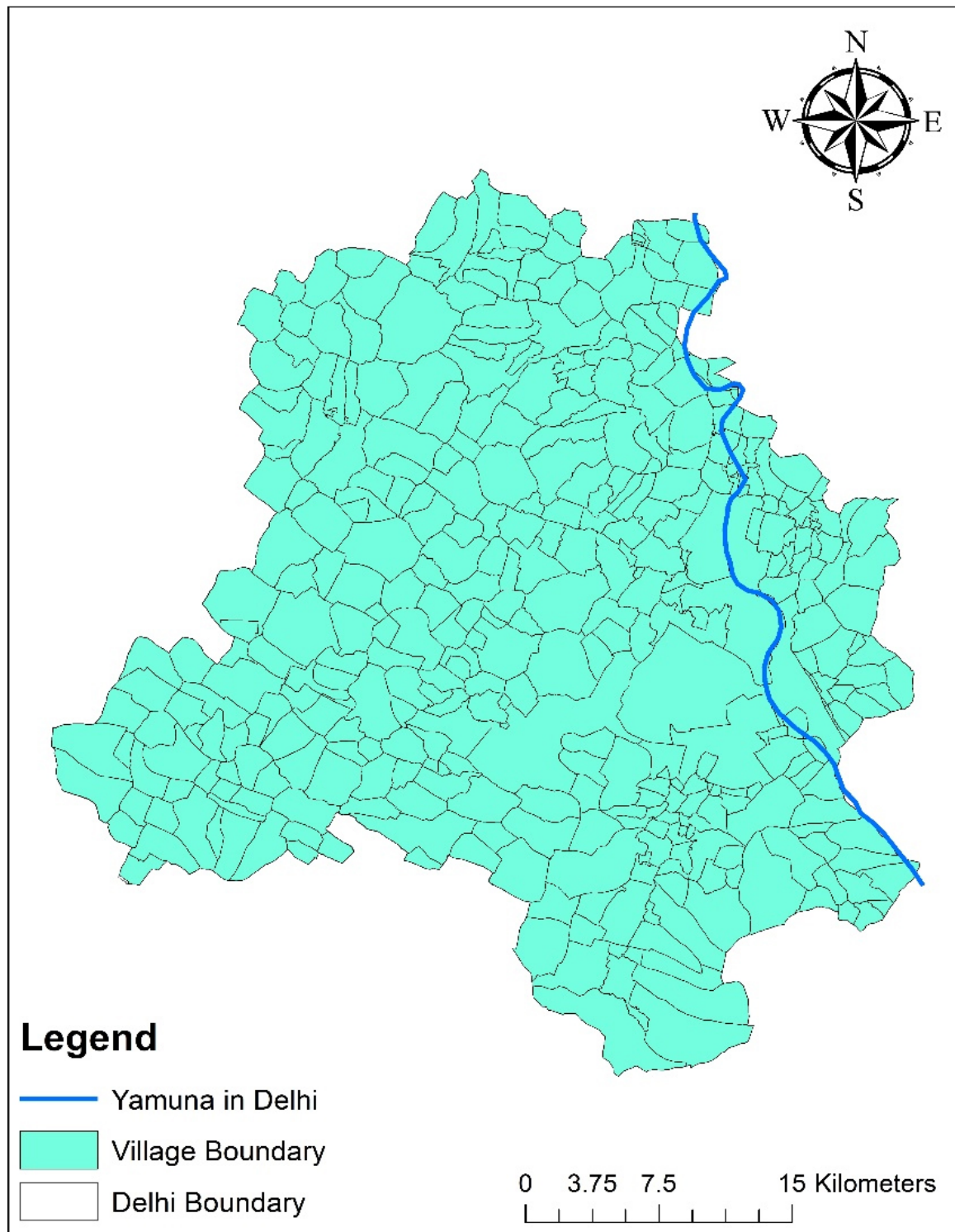
Districts: 11

Figure: Administrative Boundary of Delhi State, Source: S01



Tehsil: 35

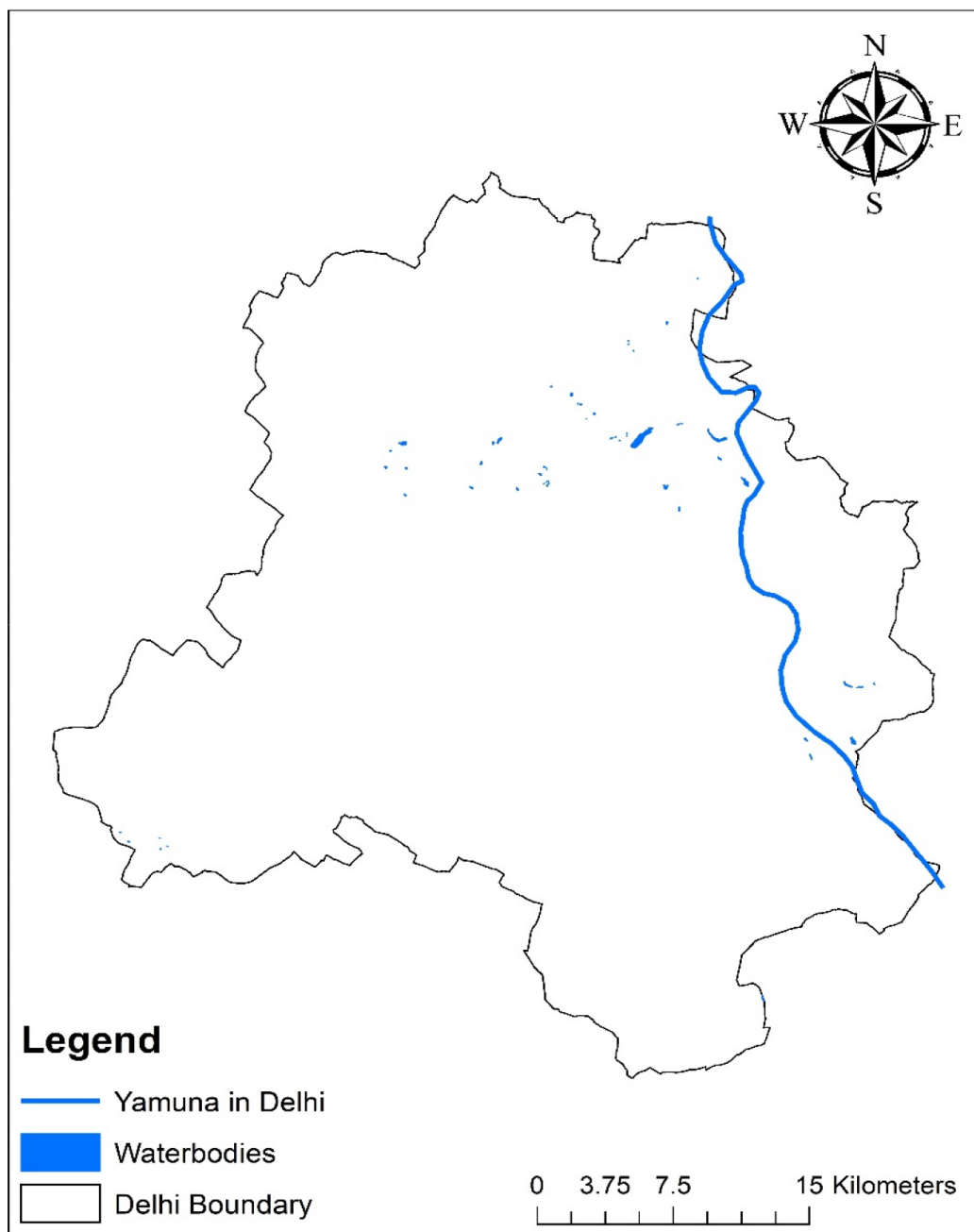
Figure: Administrative Division of Delhi State; Source: S01



Villages: 417

Figure: Village boundaries in Delhi State; Source: S01

NATIONAL CAPITAL TERRITORY (NCT) OF DELHI: WATERBODIES MAP



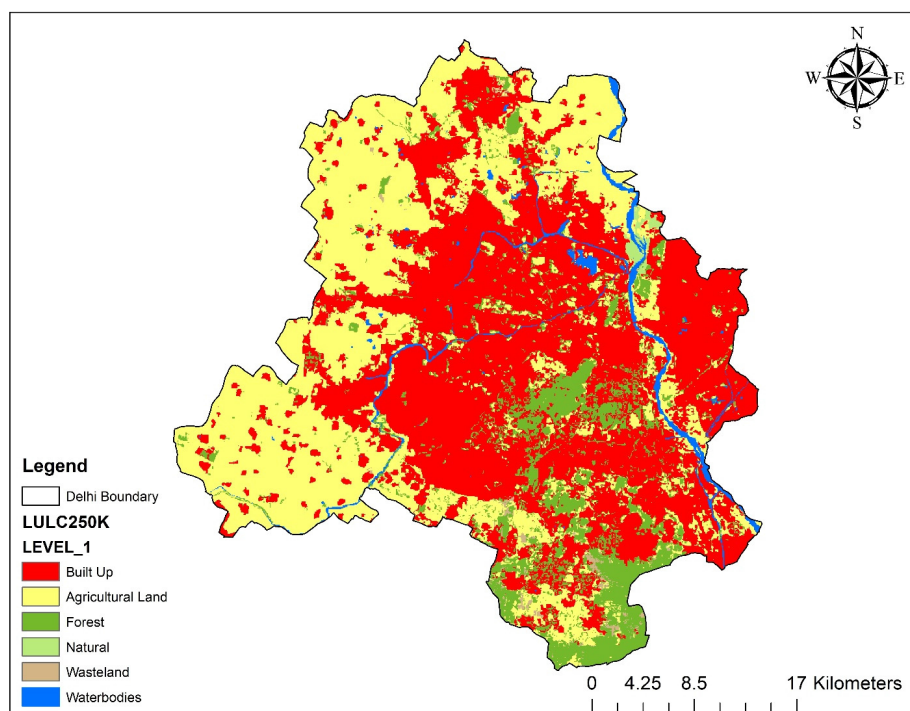
Total No. of waterbodies: 52

Figure: Waterbody Map of Delhi State, Source: NWIC

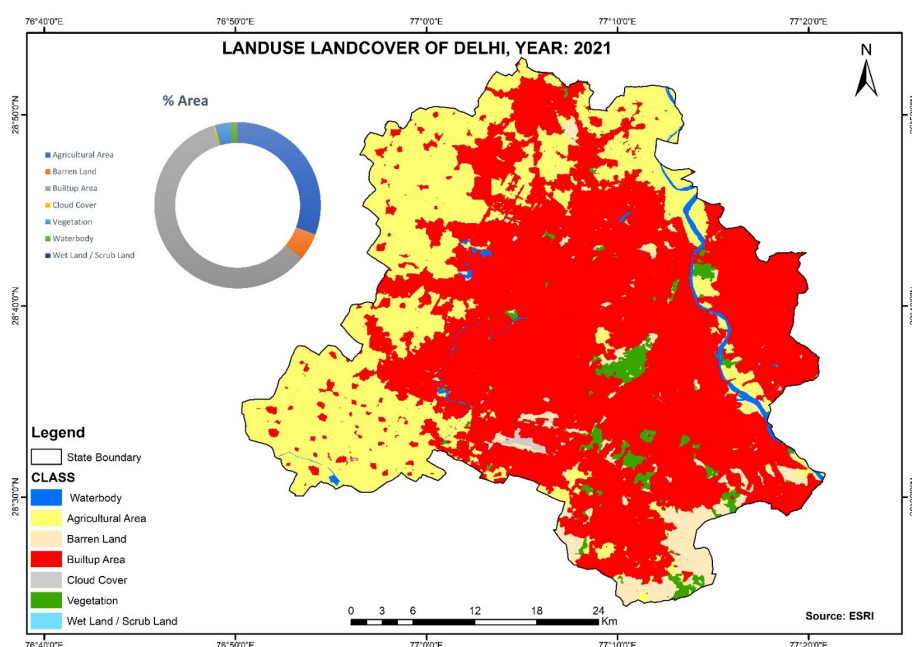




NATIONAL CAPITAL TERRITORY (NCT) OF DELHI: LAND USE LAND COVER [250K]



Imagery: multi-temporal satellite data of IRS AWiFS sensor
 Year: 2017-18
 Accuracy: 90.07 % with a range of 86 to 95 % in different states.



Imagery: Sentinel-2
 Year: 2021
 Accuracy: 85.96%
 Source: ESRI

Figure: Comparative Land Use-Land Cover representation of Delhi State between years 2015-16 and 2021

NATIONAL CAPITAL TERRITORY (NCT) OF DELHI: ANNUAL RAINFALL [1960 – 2020]

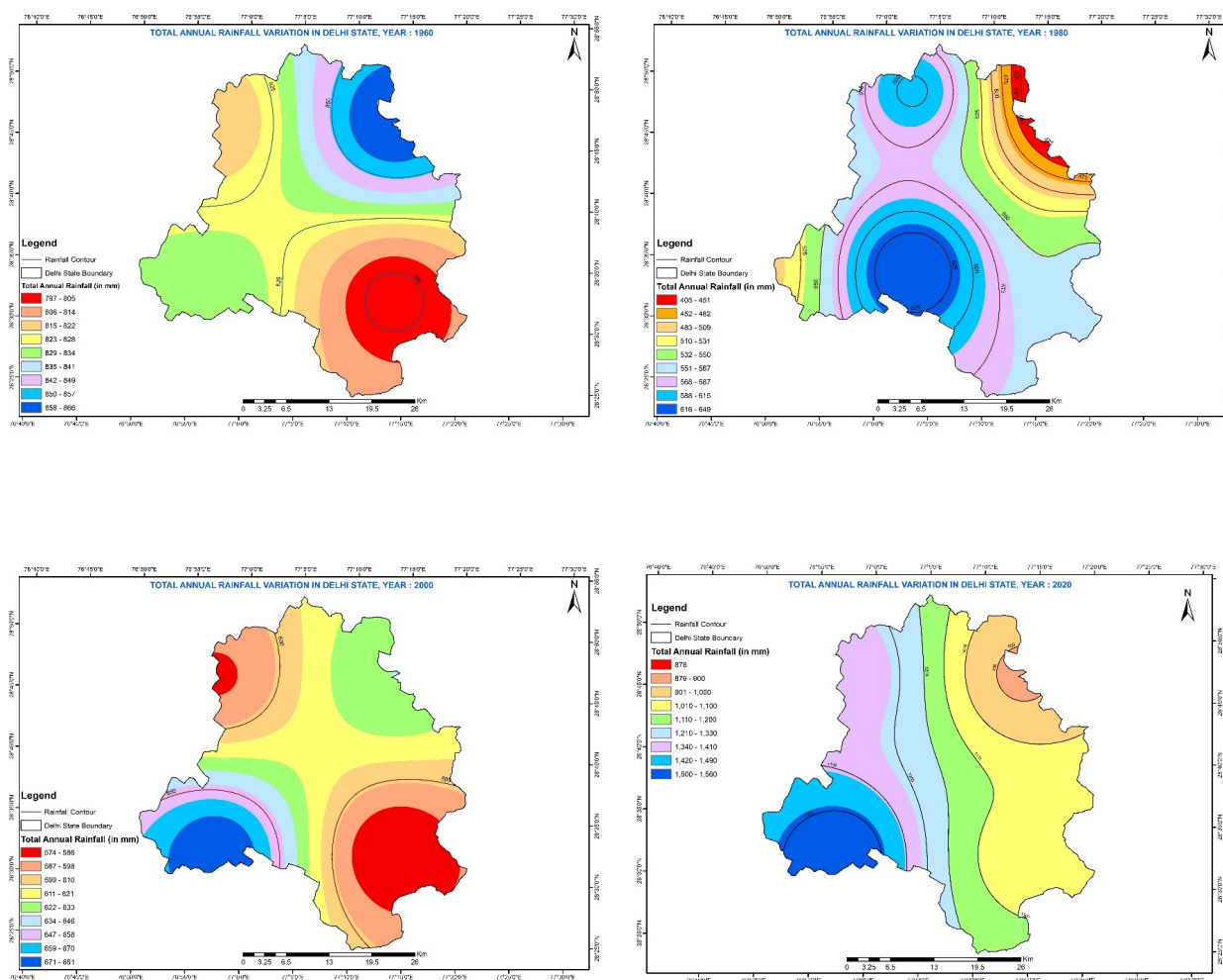


Figure: Rainfall pattern variation in Delhi State from year 1960 to 2020, Source: IMD rainfall data



NATIONAL CAPITAL TERRITORY (NCT) OF DELHI: GW LEVEL STATION

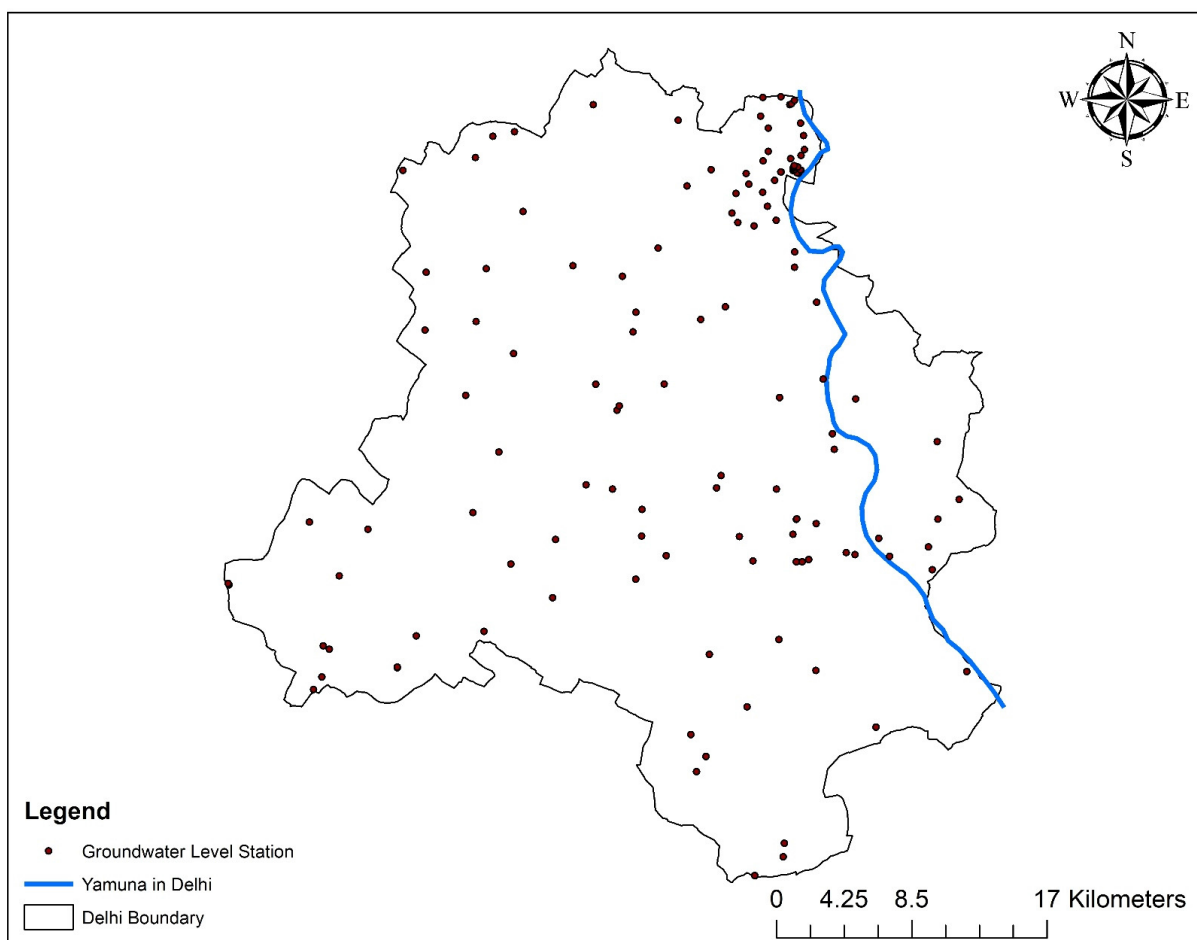


Figure: Groundwater level stations in Delhi state, source: CGWB

NATIONAL CAPITAL TERRITORY (NCT) OF DELHI: GW QUALITY STATION

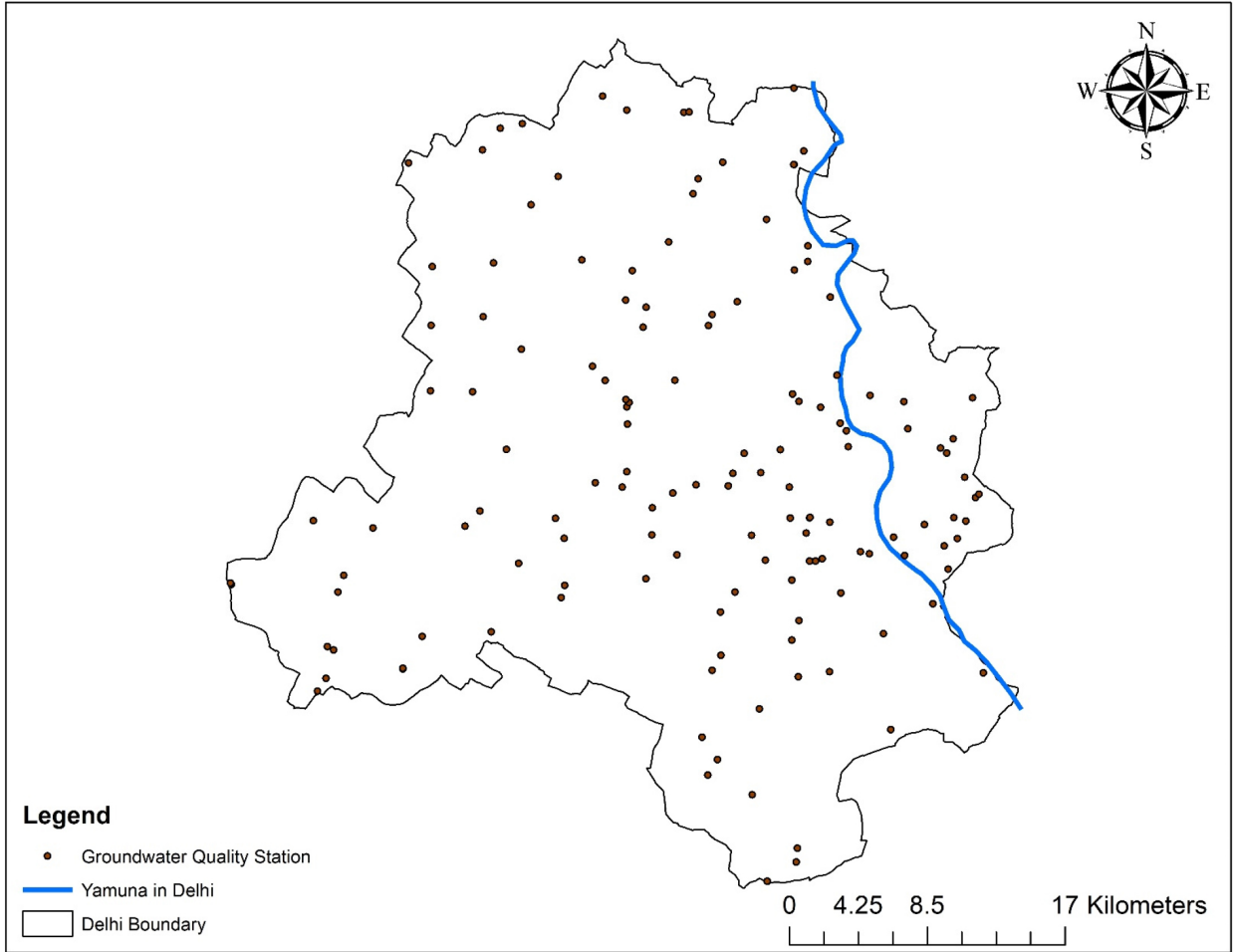
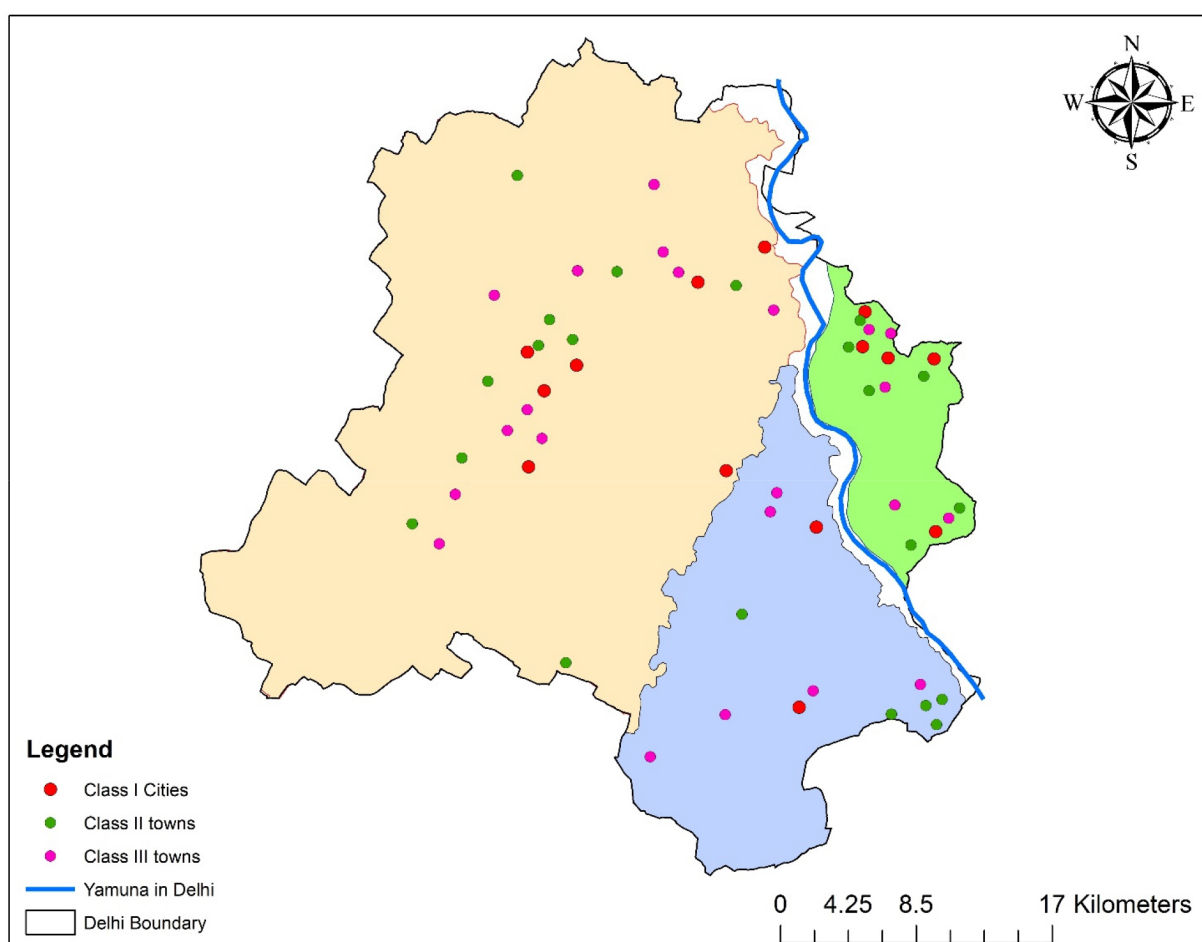


Figure: Groundwater Quality stations in Delhi state, source: CGWB



NATIONAL CAPITAL TERRITORY (NCT) OF DELHI: CLASS I, II AND III CITIES



15 Class I cities,
21 Class II and 23 Class III towns

Figure: Class-wise representation of population of the Delhi state, source: Census-2011

NATIONAL CAPITAL TERRITORY (NCT) OF DELHI: CWC SITE LOCATION

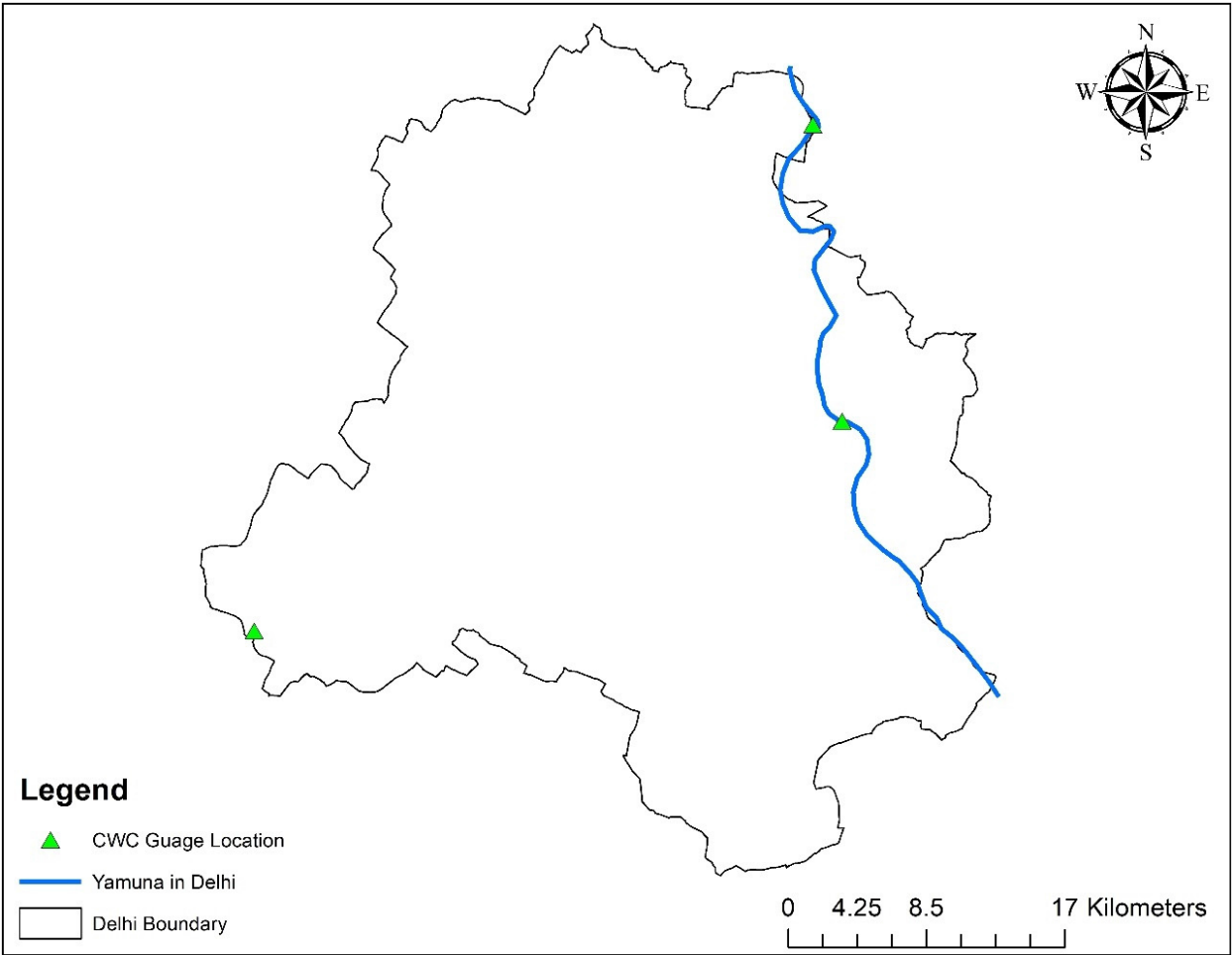
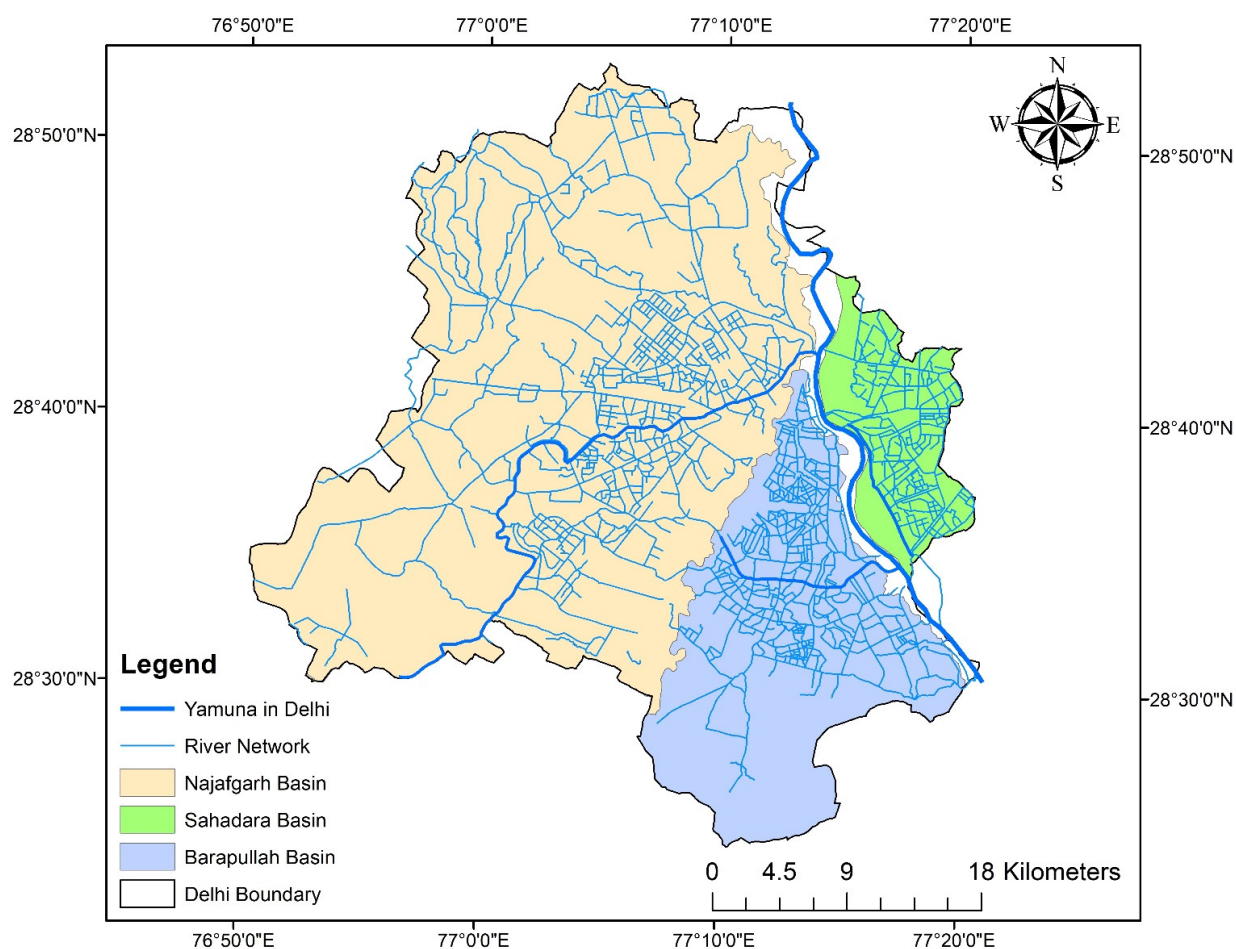


Figure: CWC site locations in Delhi state. Source: CWC

S No.	Station Name	River	District	Measurement Type	Data Available
1	Palla	Yamuna	New Delhi	GDQ	5/1/1991 Onwards
2	Delhi, Rly, Bridge	Yamuna	Delhi	GDQ	1/1/1963 Onwards
3	Dhansa	Sahibi	Jhajjar	GD	1/1/1965 Onwards



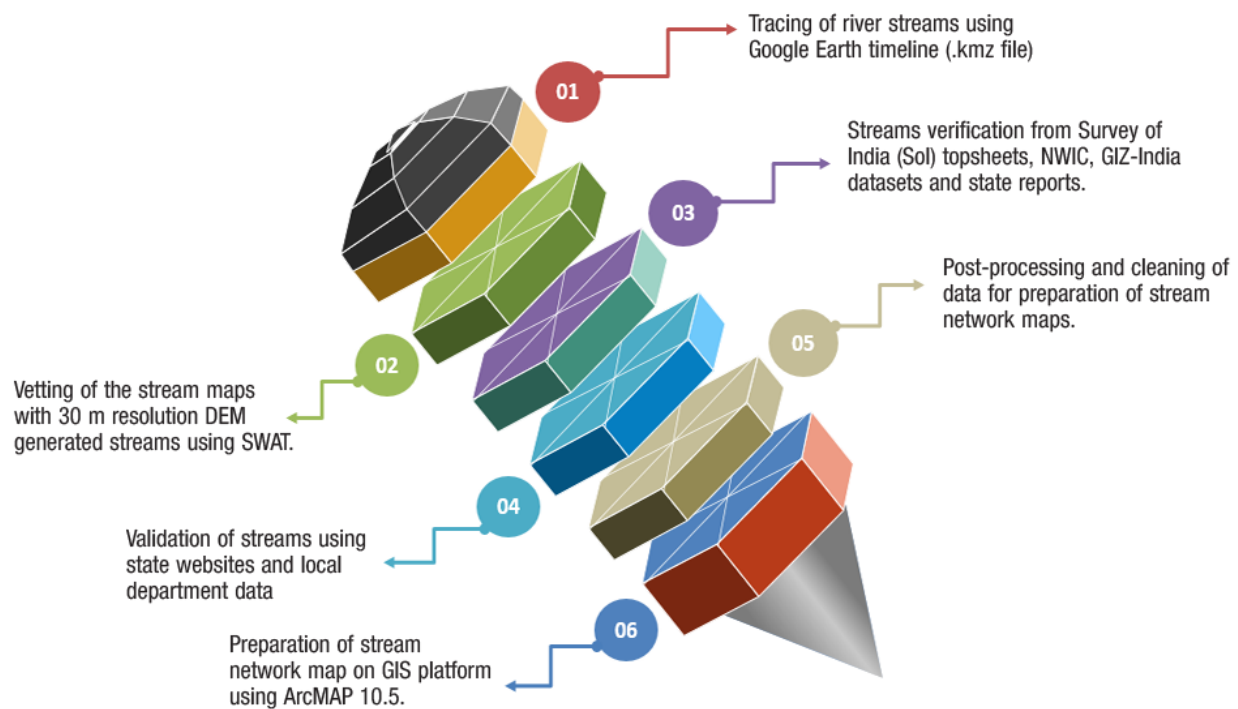
NATIONAL CAPITAL TERRITORY (NCT) OF DELHI: BASINS AND RIVER NETWORK



Area: 1934.89 Sq. Km.
 Number of Rivers- 201
 Length of Rivers- 454.53 Km
 Length of Engineered storm drain: 3311.54 Km

RIVER NETWORK PREPARATION METHODOLOGY

The method adopted, in brief, to obtain the river network are stepwise as follows:



- Streams less than 2.5 km and coming from local agriculture land is not covered.
- All streams covered which are coming from populated area (Urban or Rural) even if they are less than 1 km. (if it is visible).
- Delhi Drainage Report is used as a base for the preparation of engineered storm water drainage of the city.

Disclaimer: The accuracies of the maps generated by the above method are subject to the limitations of the data processing tools and software used for the particular geographical regions as represented in Google Earth images, and are subject to future refinement.



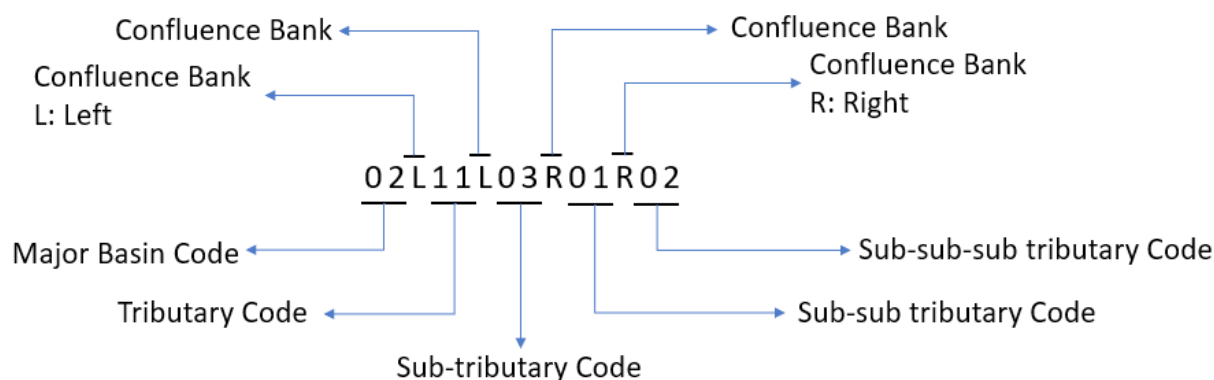
RIVER CODIFICATION SYSTEM

In the present Atlas alphanumeric characters are used for coding the river systems within natural and administrative boundaries. Each sub step in codification system is assigned a digit which reflects the length of the code up to that sub step. The coding has been done for the two different types of compartmentalizing river basins as stated below.

- a) Codification system based on natural delineation
- b) Codification system based on administrative delineation

The natural delineation approach is better suited to study and understand the basin area as a natural ecological unit while administrative delineation is good for determining specific interventions and fixing responsibilities in the implementation of any project relevant to rivers. Both approaches are important for their own reasons and, therefore, it was decided to develop the codification system for both natural as well as administrative delineations.

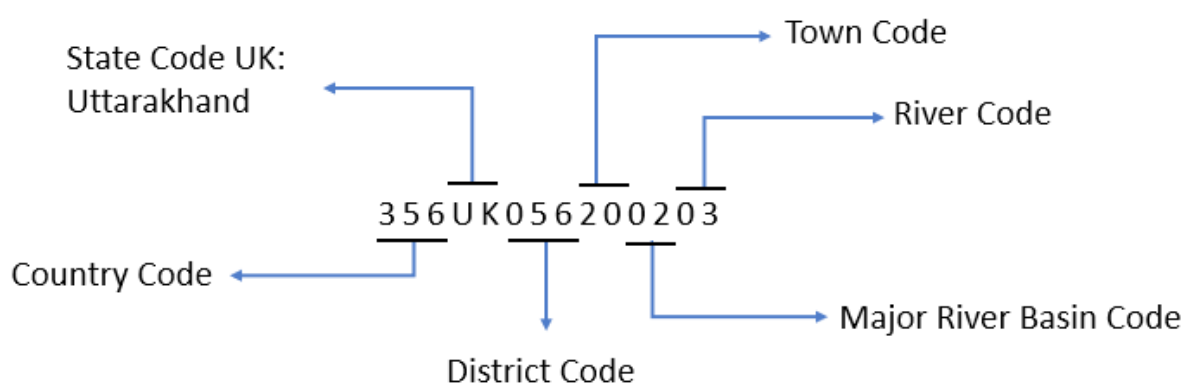
a) Codification system based on natural delineation: In the natural delineation approach, major basin codes given by CWC in River Basin Atlas of India, jointly published by CWC and NRSC, ISRO in October 2012, have been adopted here. These codes are accepted at regional level. In the second step, tributary code is given based on their confluence bank and their sequential number from the origin of the major river. R and L represents Right Bank and Left Bank, respectively, for the confluence bank in this code. For example, L11 in the code represents the 11th tributary (from the head of the major river) joining the major river at the left bank. In steps 3, 4, 5,



etc. the same coding procedure as in step 2 is followed for sub-tributaries joining the tributaries and so on. Thus, the code can be extended without any alteration until it reaches down to the lowest order river.

b) Codification system based on administrative delineation: In administrative delineation codes are generated separately for areas coming under urban and rural jurisdictions as further described.

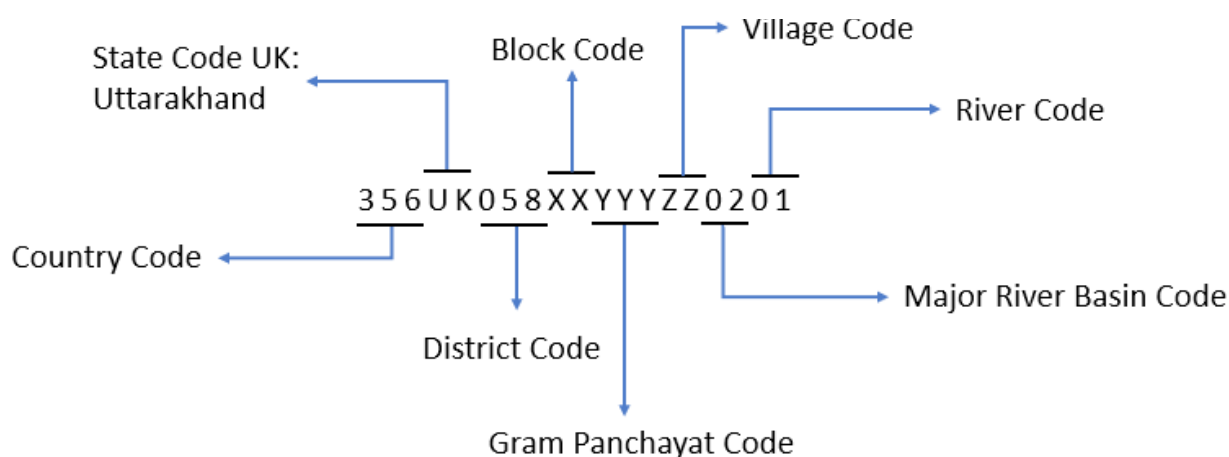
Codification system based on administrative delineation – Urban: In administrative delineation-urban the first 3 digits of the code represent the country code adopted from ISO 3166-1. The next 5 digits give the state code and district code. State code is taken from transportation department and district code is adopted from Census codes. The next 2





digits represent the town, which adopted from the census town codes. In the next step, 2 digits are assigned for major river basins and the codes are adopted from River Basin Atlas of India given by CWC. The last 2 digits of the code represent the river based on higher to lower river order approach, and if there are more than one river of the same order then code is allotted in alphabetical order.

Codification system based on administrative delineation-Rural: In administrative delineation-rural the first 3 digits of the code represent the country code adopted from ISO 3166-1. The next 5 digits give the state code and district code State code is taken from transportation department and district code is adopted from Census codes. Block, Gram Panchayat and Village codes are further generated based on district codes. In the next step, 2 digits are assigned for major river basin as per the River Basin Atlas of India given by CWC. The last 2 digits of the code represent the river code based on higher to lower river order approach, and if there be more than one river of same order then the code is allotted in alphabetical order.



NAJAFGARH BASIN

Najafgarh drain UID Code:
 Basin Area: 942.96 Sq. Km.
 Major Rivers: Mungeshpur drain,
 Supplementary drain, Palam drain
 Number of rivers: 123
 River network: 1626.82 Km

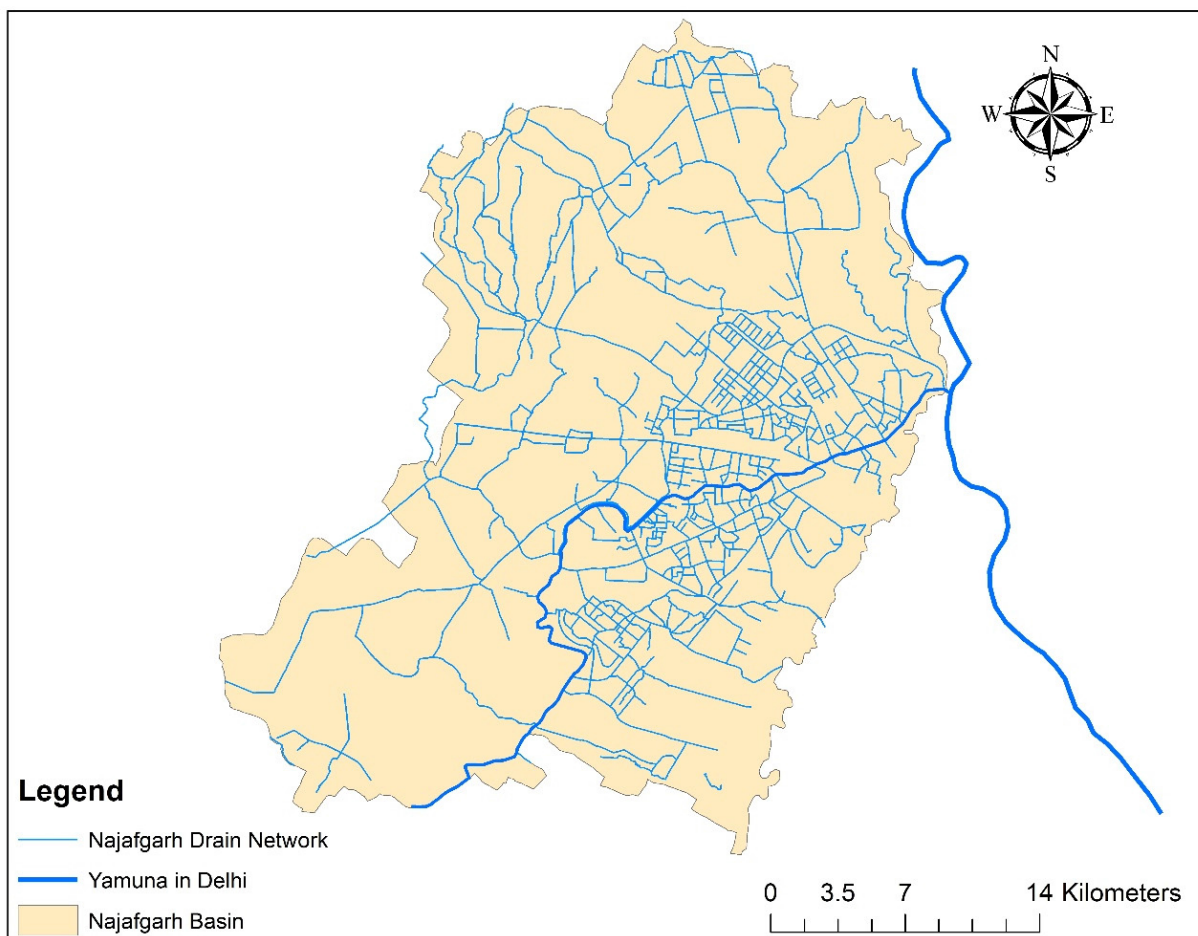
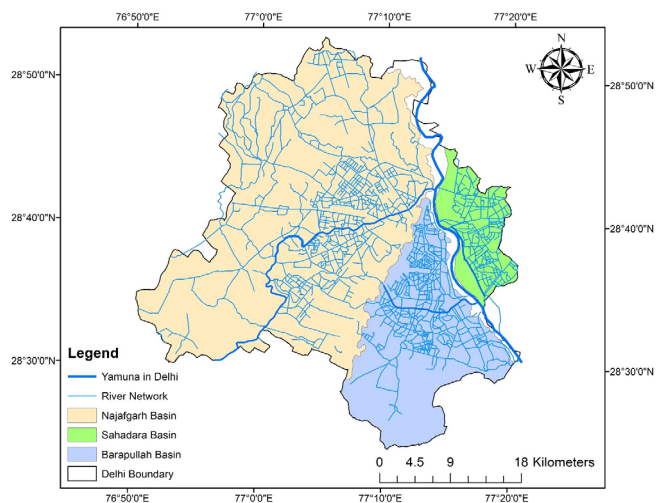


Figure: Najafgarh river network.



NAJAFGARH DRAIN MAIN STEM FLOW DIAGRAM

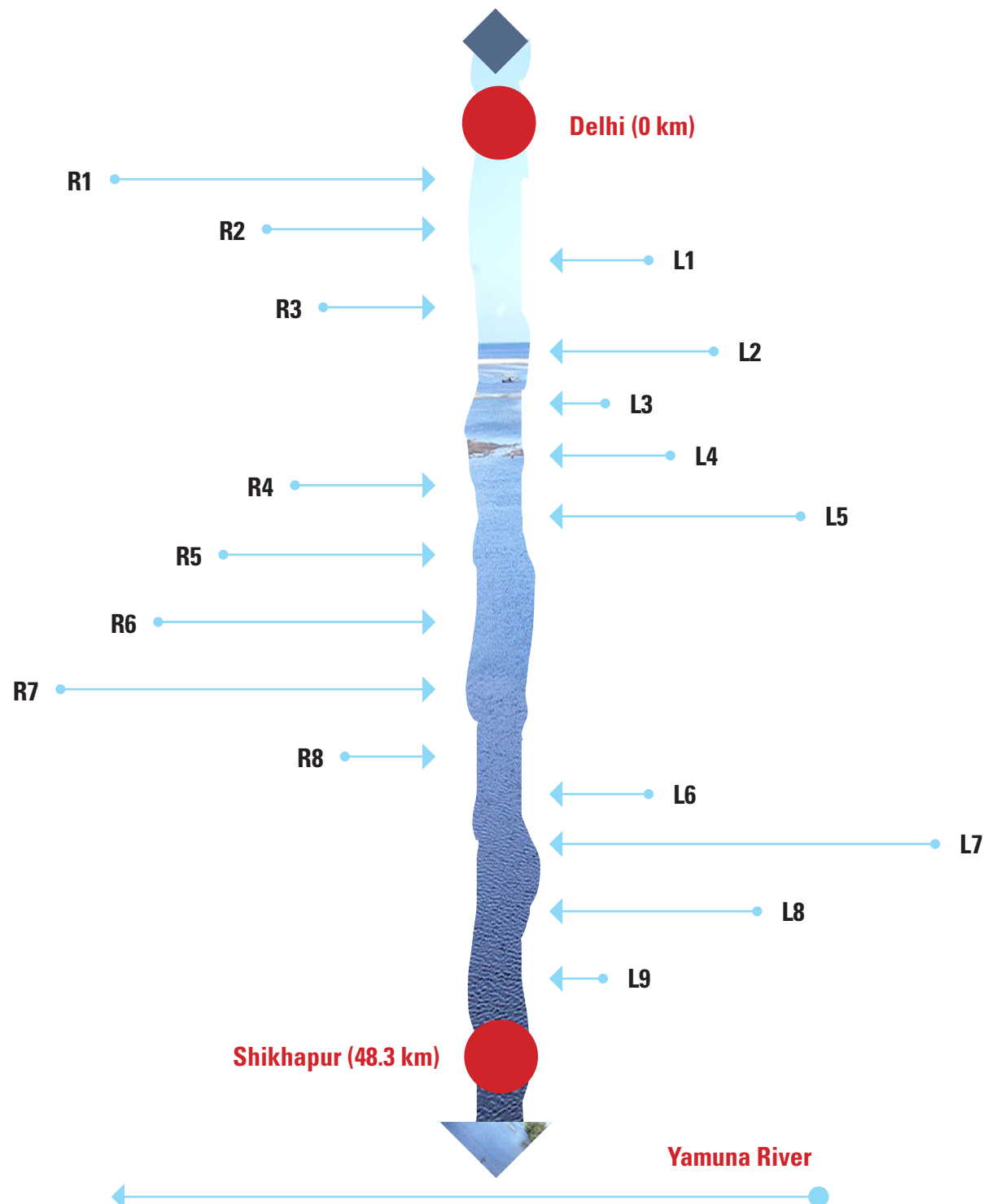


Figure: Flow Diagram of Nazafgarh Drain

NAJAFGARH DRAIN MAINSTEM NETWORK						
S.No.	River Name	Confluence Bank	River Length (Km)	Confluence Co-ordinate		Distance from origin (km)
				Lat	Long	
1	Supplementary Drain	R1	33.8	28.71	77.23	0.39
2	Model Town STP Outlet	R2	6.2	28.71	77.22	1.35
3	Daryalla Nalla	L1	3.21	28.68	77.18	6
4	Sakoor Basti Drain	R3	3.62	28.67	77.16	8.67
5	Ramesh Nagar Drain	L2	5.28	28.67	77.14	11.3
6	Tartarpur Drain	L3	0.96	28.66	77.12	12.6
7	Subhash Nagar Drain	L4	4.25	28.65	77.09	16.3
8	Stream 3	R4	5.23	28.65	77.08	17.9
9	Stream 2	R5	8	28.64	77.06	19.9
10	Pankha Road Drain	L5	7.1	28.64	77.06	20
11	Kirari Suleman Nagar Drain	R6	8.19	28.65	77.05	22.3
12	Mungespur Drain	R7	40.5	28.63	77.02	40.5
13	Nangloi Pond Drain	R8	2	28.61	77.01	29
14	Stream 4	L6	3.9	28.60	77.02	30
15	Palam Drain	L7	12.2	28.58	77.04	34.6
16	Bagraula Drain	L8	5.26	28.57	77.03	36
17	Bijwasan Drain	L9	0.95	28.53	77.00	41.2



SHAHDARA BASIN

Shahdara drain UID Code:

Basin Area: 110.86 Sq. Km.

Major Rivers: Ghazipur drain, Gokulpur drain

Number of rivers: 34

River network: 560 Km

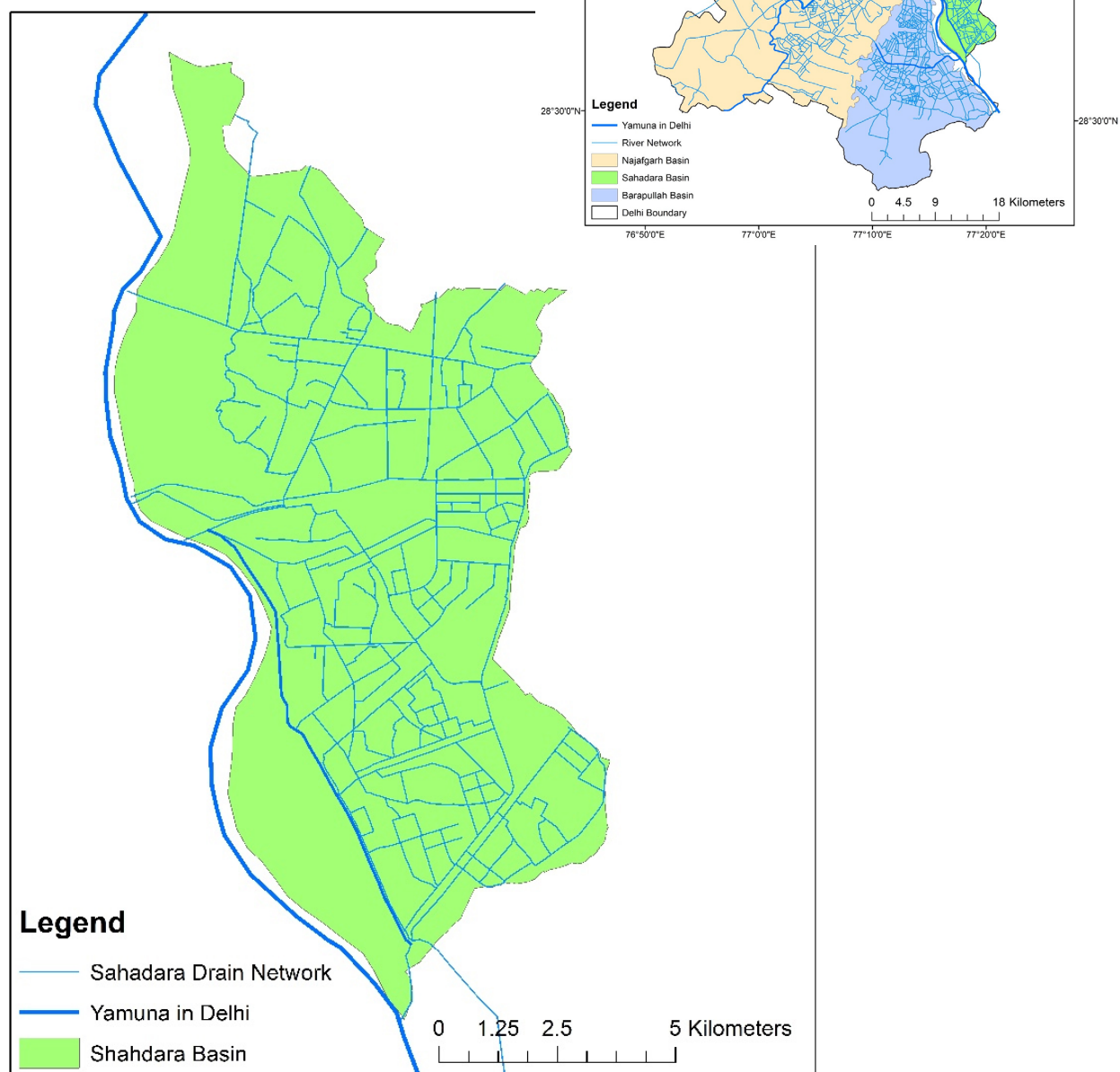


Figure: Sahadara river network.

SHAHDARA DRAIN MAIN STEM FLOW DIAGRAM

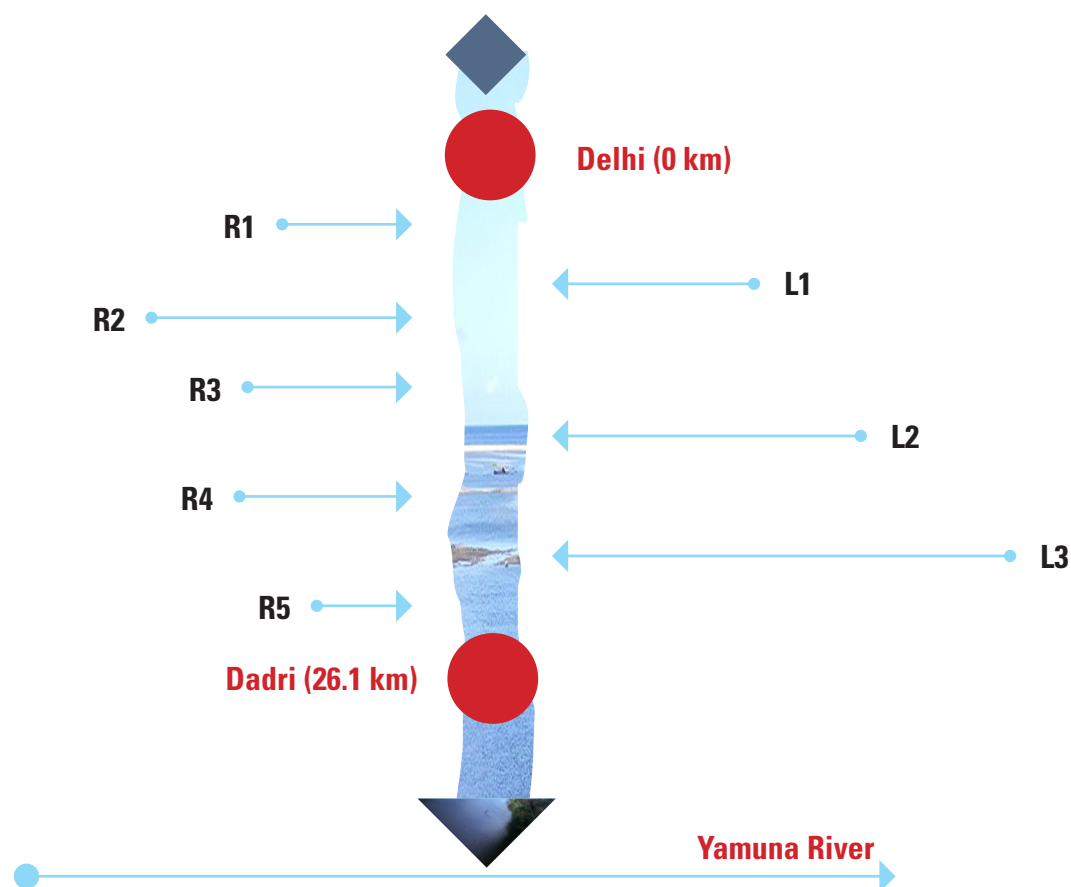


Figure: Flow Diagram of Shahdara Drain

SHAHDARA DRAIN MAINSTEM NETWORK						
S.No.	River Name	Confluence Bank	River Length (Km)	Confluence Co-ordinate		Distance from origin (km)
				Lat	Long	
1	Karawal Nagar Drain	R1	2.47	28.72	77.28	1.1
2	Balbir Nagar Drain	L1	2.52	28.68	77.28	5.5
3	Gokulpur Drain	R2	5.41	28.68	77.27	6.24
4	Stream	R3	4.84	28.64	77.30	11.7
5	Trunk Drain No.2 Ghazipur Drain	L2	6.86	28.64	77.31	13.5
6	Vinod Nagar Drain	R4	2.72	28.63	77.32	14.7
7	Sahadara 1B	L3	10.6	28.62	77.32	16.09
8	Khichripur Drain	R5	1.21	28.60	77.31	17.62



BARAPULLAH BASIN

Barapullah drain UID Code:

Basin Area: 326.07 Sq. Km.

Major Rivers: Chirag Delhi drain

Number of rivers: 44

River network: 1124.72 Km

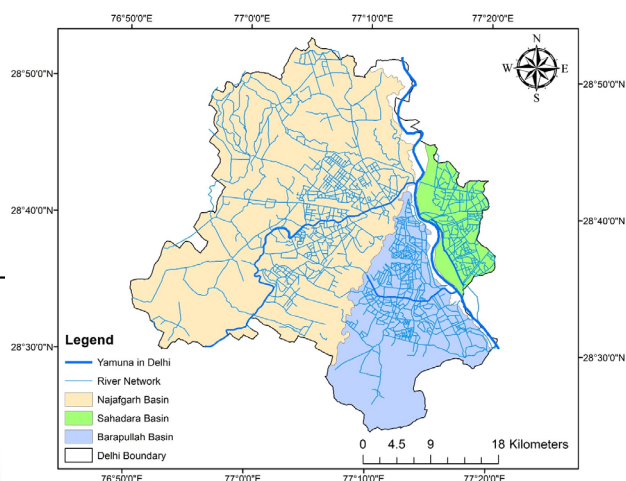
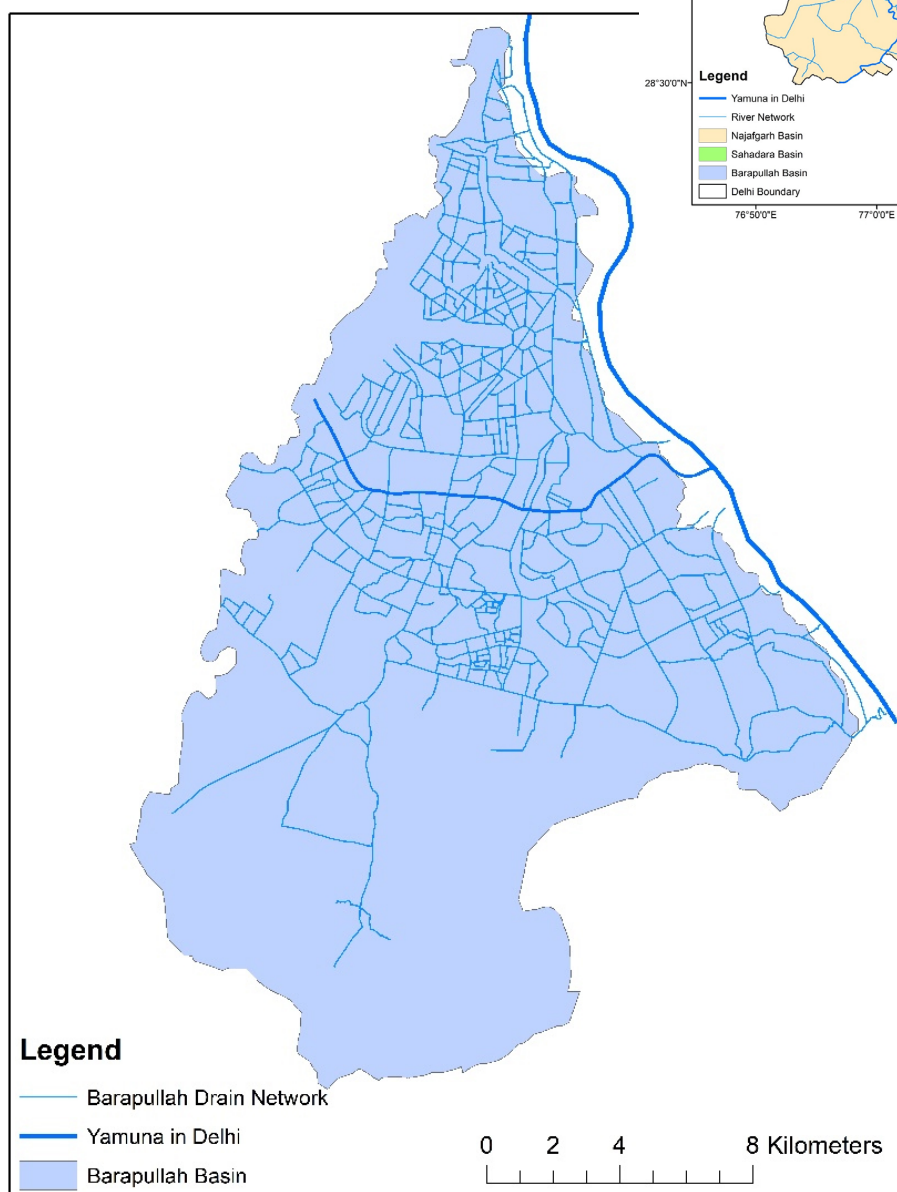


Figure: Barapulla river network.





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