



National Mission for Clean Ganga

Ministry of Jal Shakti

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

HINDON

RIVER BASIN ATLAS

December 2022



cGanga
Centre for Ganga River Basin Management and Studies
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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 Hindon basin river network in the States of Uttar Pradesh and Uttarakhand. This Atlas for the selected basins 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 Hindon basin.

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

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ACRONYMS AND ABBREVIATIONS

BCM	: Billion Cubic Meter
cGanga	: Centre for Ganga River Basin Management and Studies
Cumec	: Cubic meter per second
CWC	: Central Water Commission
EPA	: Environmental (Protection) Act
GIS	: Geographic Information System
GRBMP	: Ganga River Basin Management Plan
Km	: Kilometer
LULC	: Land Use/ Land Cover
M	: Meter
MCM	: Million Cubic Meter
mm	: millimeter
NGRBA	: National Ganga River Basin Authority
NMCG	: National Mission for Clean Ganga
Sol	: Survey of India
Sq. Km.	: Square Kilometer
SWAT	: Soil and Water Assessment Tool
UK	: Uttarakhand

INTRODUCTION

Hindon River is an important tributary of Yamuna River of Indo-Gangetic plains. River originates in the lower Himalaya in Saharanpur district and flowing through the important cities of Uttarakhand (Haridwar) and Uttar Pradesh (Saharanpur, Muzaffarnagar, Shamli, Meerut, Baghpat, Ghaziabad and Gautam Buddha Nagar). The present volume is a first attempt to map the rich river network of Hindon basin in as fine a detail as possible. Much of the information contained in this River Atlas is not available in any other document and was created in original from available earth images with appropriate data and image processing tools and software on 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 are 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 Hindon basin river resources.

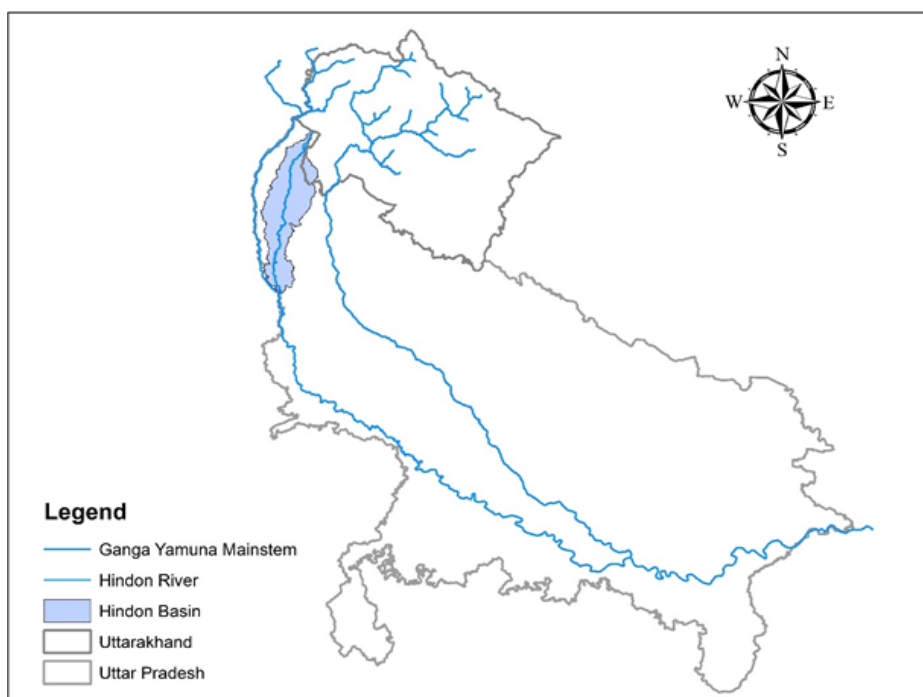


Figure: Location of Hindon Basin



HINDON BASIN: SALIENT FEATURES

S No	Particulars	Details
1	Basin Extent	The latitude: 28°4' to 35°5'N & longitude: 77°8' to 77° 4' E
2	Total Geographical Area (sq. km)	6950.04
3	Forest Area (Reference Year 2016) (sq. km)	Dense Forest: 26.04 Open Forest/Scrub Land: 89.89
4	Area contributing to Ganga Basin (sq km)	6950.04
5	Percentage of the Ganga Basin Area (%)	0.81
6	Districts (Census 2011)	UP: 08; UK: 01
7	Towns (Census 2011)	(Class I: 06; Class II: 06; Class III: 19; Class IV: ; Class V: ; Class VI:)
8	Total Population (Census 2011)	99,89,871
9	Percentage population in Ganga Basin	2.23
10	Gram Panchayats	1904
11	Number of villages (Census 2011)	2363
12	Average Annual Rainfall (mm) (1951 - 2000)	887.7
13	Average Temperature Range (oC)	6.5 - 40.31
14	Major Rivers	Kaliwest, Krishni, Dhamola, Nagdehi
15	Number of Major Basins	04
16	Number of Water Resources Structures	(Dams: 00, Barrages: 01, Weir: 00, Anicuts, Lifts, Power houses: 00)
17	Number of Ground Water Observation wells	Level: 340 Quality: 34
18	Number of CWC Sites	05

HINDON BASIN: RIVERS TRAVERSING THROUGH VARIOUS DISTRICTS IN BASIN AREA

S.No	State	District	Area (sq km)	Population (census 2011)	Growth Rate (%)	Density	River
1	Uttra-khand	Haridwar	2360	1,890,422	30.63	801	Sila Khala, Uchagaon Drainage Cut, Sadharanpur Cut, Paniala Drain, Narsen Cut, Nagla Koyal Drain, Mandet Drain, Tansipur Cut, Pila Khara Nala, Jenkisons Drain.
2	Uttar Pradesh	Saharanpur	3689	3,466,382	19.66	940	Hindon, Hindon 2nd path, Nagdev Nadi, Kothri Rao, Nailawala Khala, Padil Nadi, Star Paper Mill Drain, Krishni River, Tifra Ainabad Nala, Thaska Drain, Kallarpur Cut, Rampur Cut, Jandhera Drain, Doharki Drain, Balpur Drain, Khala Nala or Chakwali Nala, Kali West, Sila Khala, Uchagaon Drainage Cut, Bhainisini Cut, Sadharanpur Cut, Kapuri Drain, Kali East, Pila khara Nala, Jenkisons Drain, Jatauli Cut, Imliya Nala, Jhabiran Drain, Gadmalpur Drain, Deoband Ghalauli Drain, Dhamola River, Paondhoi River, Shankerpuri Khal, Matki Minor, Datauli Drain, Naini Nala.
3	Uttar Pradesh	Muzaffarnagar	4008	4,143,512	16.94	1034	Hindon, Sluice Drain, Roni Drain, Muhammadpur Drain, Krishni River, Tifra Ainabad Nala, Salawar Drain, Rajhar Drain, Harhar Drain, Garhi Pukta Drain, Dhanena Drain, Kheri Escape, Shamli Drain, Goharni Drain, Bhainswal NNew Drain, Karuda Drain, Kandhala Drain, Kandhala Drain Branch, Fatepur Drain, Malakpur Drain, Aldi Drain, Gujarpur Drain, Ailam Drain, Khusarpur Drain, Khala Nala or Chakwali Nala, Kali West, Bainisini Cut, Purkazi Drainage Cut, Barla Chhaper Drain, Kutubpur Drain, Mehari Drain, Khuda Drain, Kurka Drain, Naspur Drainage Cut, Meghakheri Drain, Dhandhera Drain, Jat Mujhara Drain, Tejal Hera, Chandrapur Drain, Khatauli Escape, Imliya Nala, Harsauli Drain, Abu Escape, Chartawal Escape, Kotesara Drain, Dahchanda Ghisukhera Drain.
4	Uttar Pradesh	Baghpat	1321	1,303,048	11.95	986	Hindon, Tehra Drain, krishni River, Kandhala Drain, Ailam Drain, Kali West, Jani Escape, Daula Drain, Rampur Drain.
5	Uttar Pradesh	Meerut	2559	3,443,689	14.89	1346	Hindon, Siwal Drain, Sardhana Drain, Patahuli Drain, Chharbariya Drain, Kali West, Jani Escape.
6	Uttar Pradesh	Ghaziabad	1179	4,681,645	42.27	3971	Hindon, Sonda Drain, Siwal Drain, Jauli Drain, Dasna Drain, Dohai Drain, Bhikhampur Drain, Khurrampur Drain.
7	Uttar Pradesh	Gautam Buddha Nagar	1282	1,648,115	37.11	1286	Hindon, Lohiya River or Palla Drain, Dhum Dujana Drain, Chitehra Drain, Dasna Drain.





HINDON BASIN: MAJOR BARRAGE AND WEIR ON THE HINDON RIVER AND ITS TRIBUTARIES

Major Barrages of Uttar Pradesh in Ganga River Basin														
S.No	State	District	Name	Lat	Long	River	Year Completed	Status	Type	Length (m)	Max ht. Above Foundation (m)	Total Volume (cumec)	Design Flood (cumec)	Purpose
1	Uttar Pradesh	Ghazia-bad	Hindon Barrage	28.664301°	77.399352°	Hindon River	1979	Completed	Barrage	162				

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)



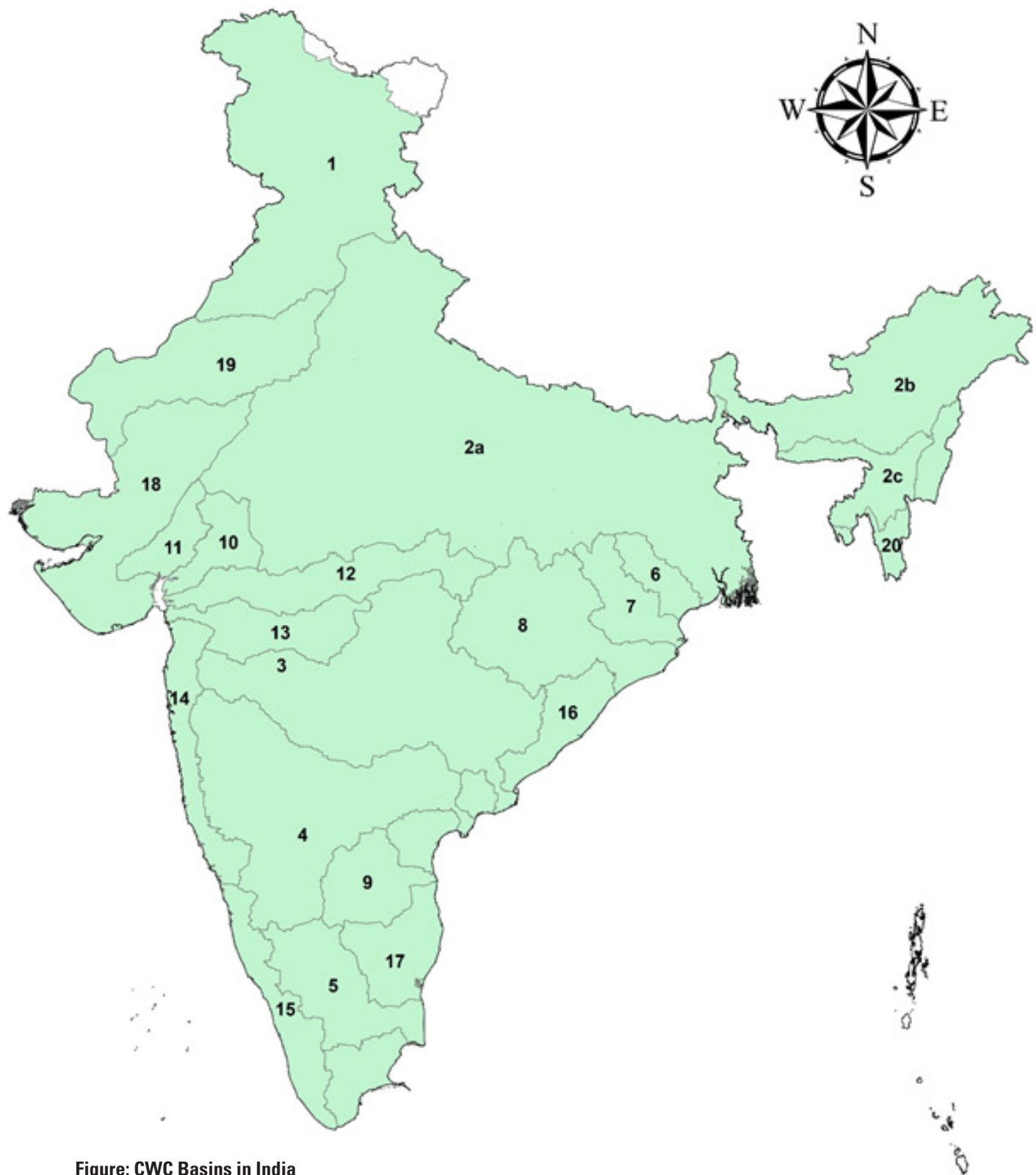


Figure: CWC Basins in India

HINDON BASIN: ADMINISTRATIVE STRUCTURE



Districts:
UP: 08; UK: 01



Tehsil:
UP: 20; UK: 01



Blocks:
UP: 43; UK: NA

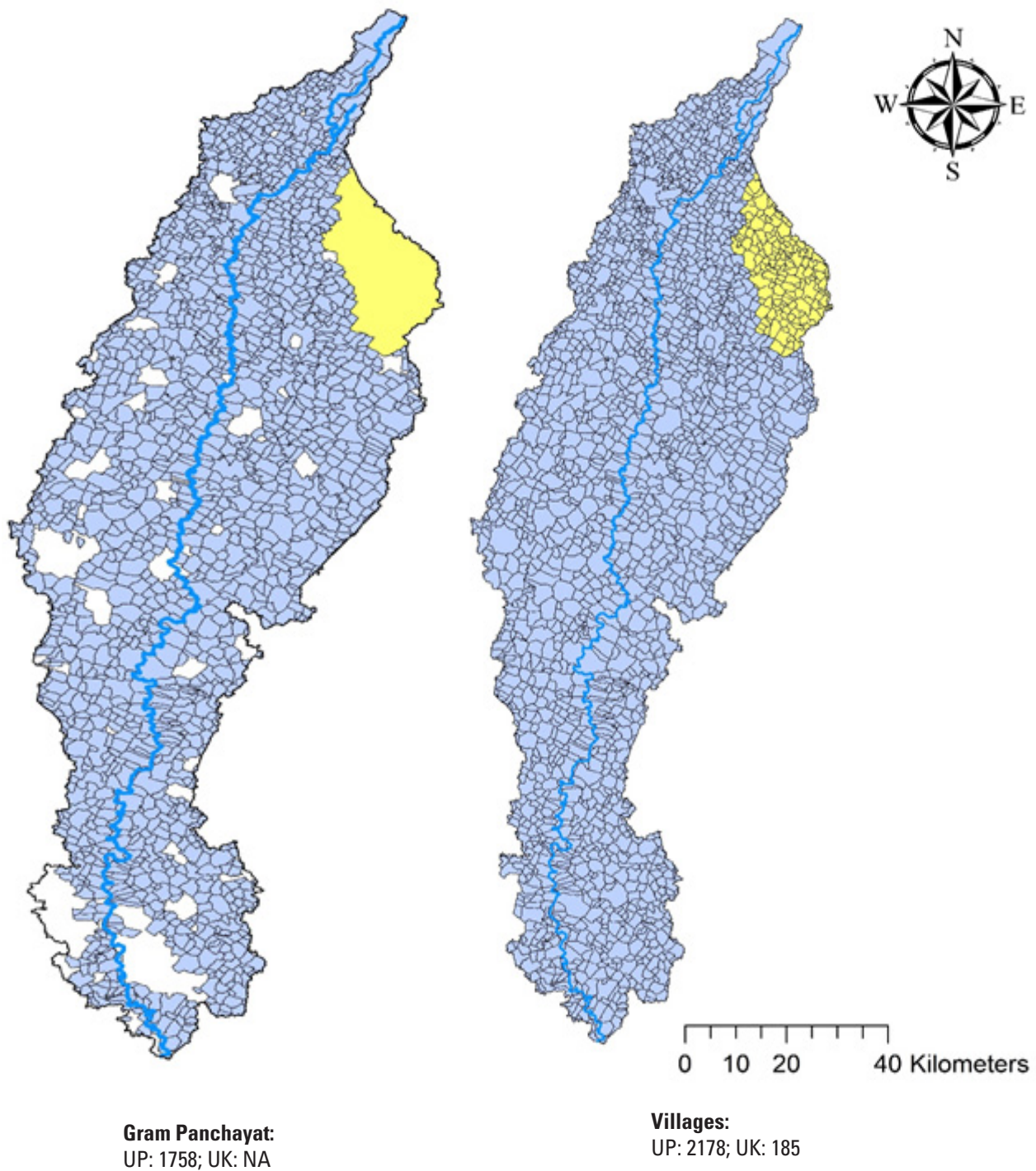
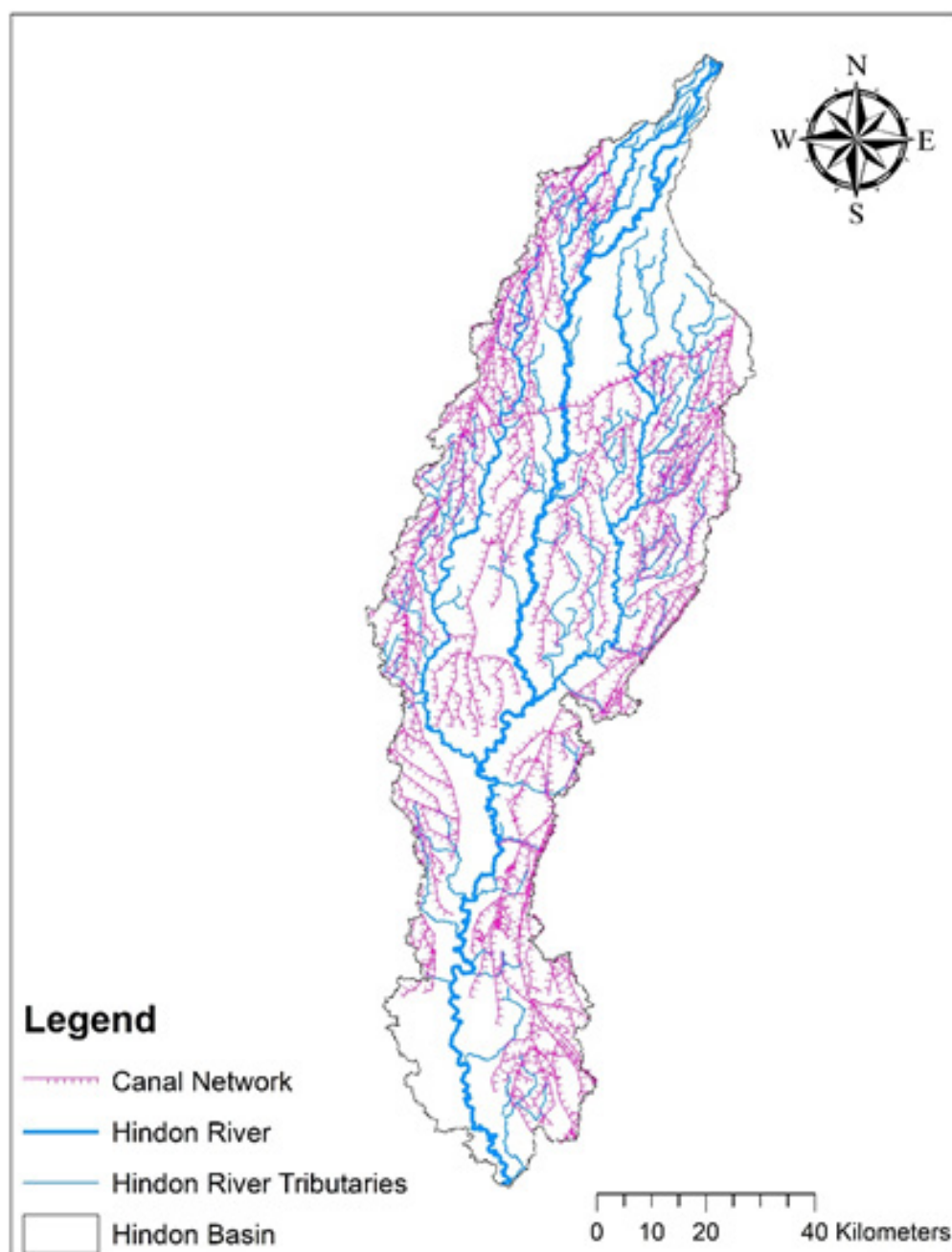


Figure: Administrative Structure of the Hindon River Basin

Source: Sol and Rural Development

HINDON BASIN: CANAL NETWORK



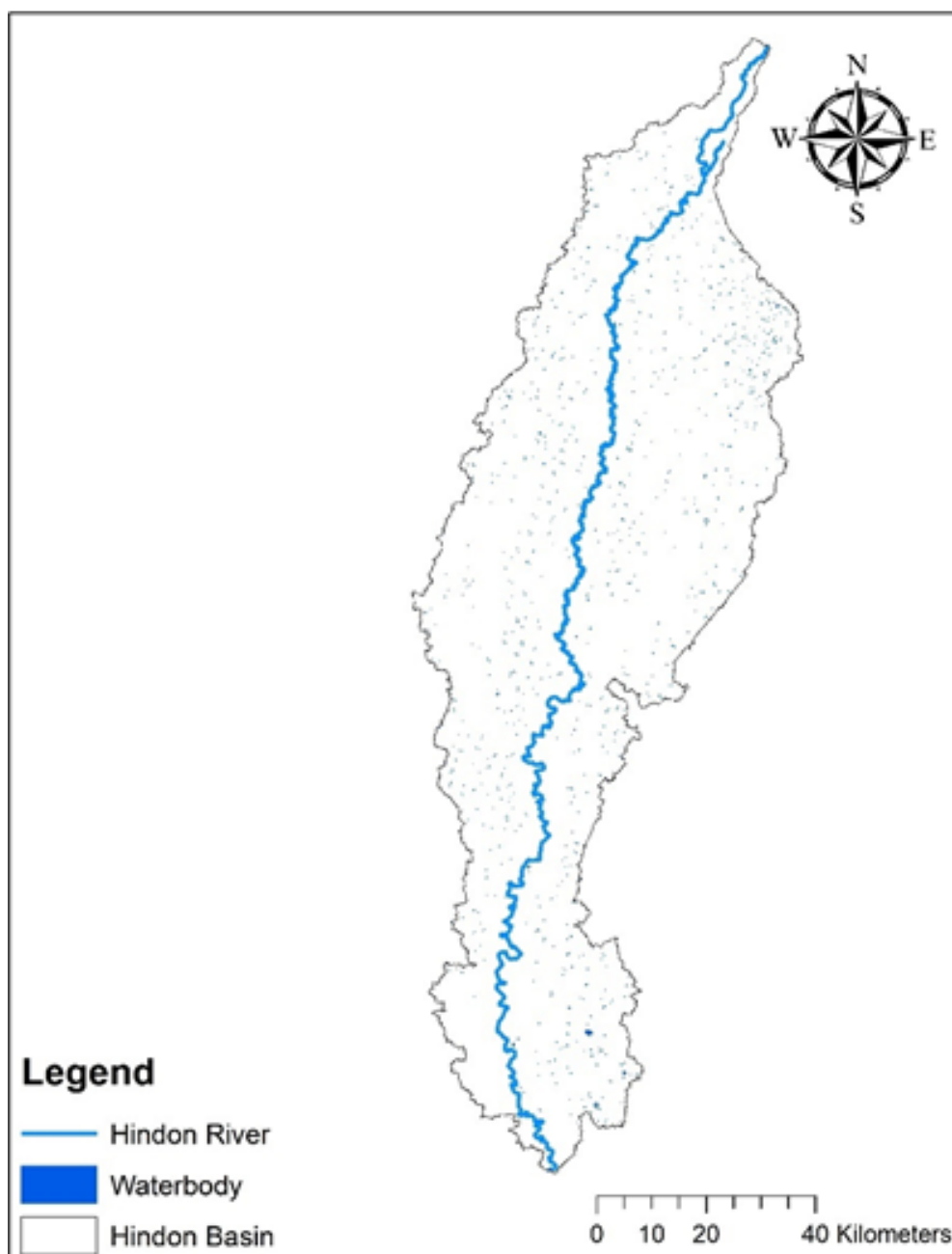
Source: NWIC

Total Canal Network: 2664.61 Km
Eastern Yamuna Canal Major Irrigation: 1058.31 Km
Hindon Krishna Doab: 99.09 Km
Madhya Ganga Canal: 157.04 Km
Upper Ganga Canal Major Irrigation: 1350.16 Km





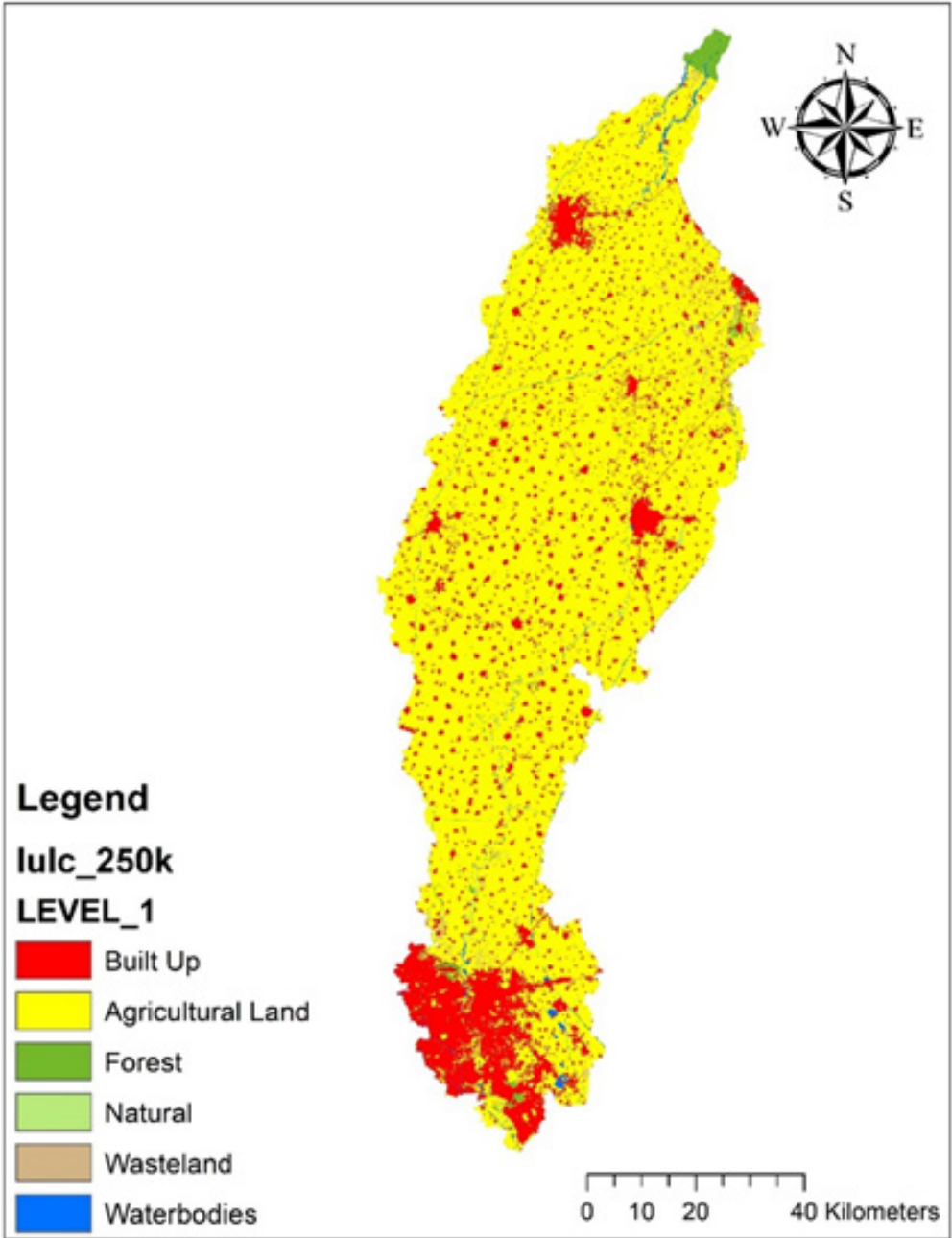
HINDON BASIN: WATERBODIES MAP



Source: NWIC

Total No. of waterbodies: 1032

HINDON BASIN: LAND USE LAND COVER [250K]



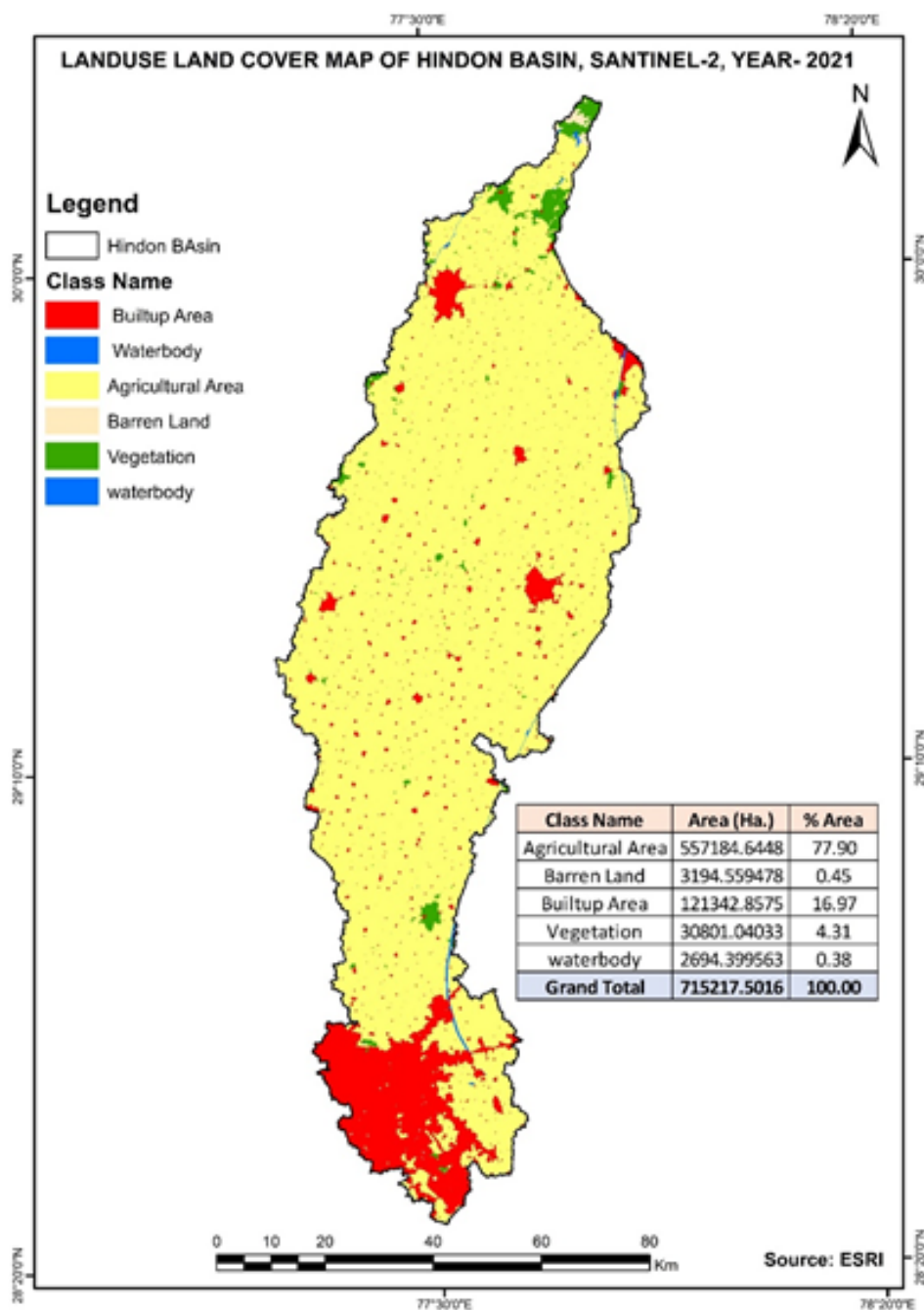
Source: NRSC

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.



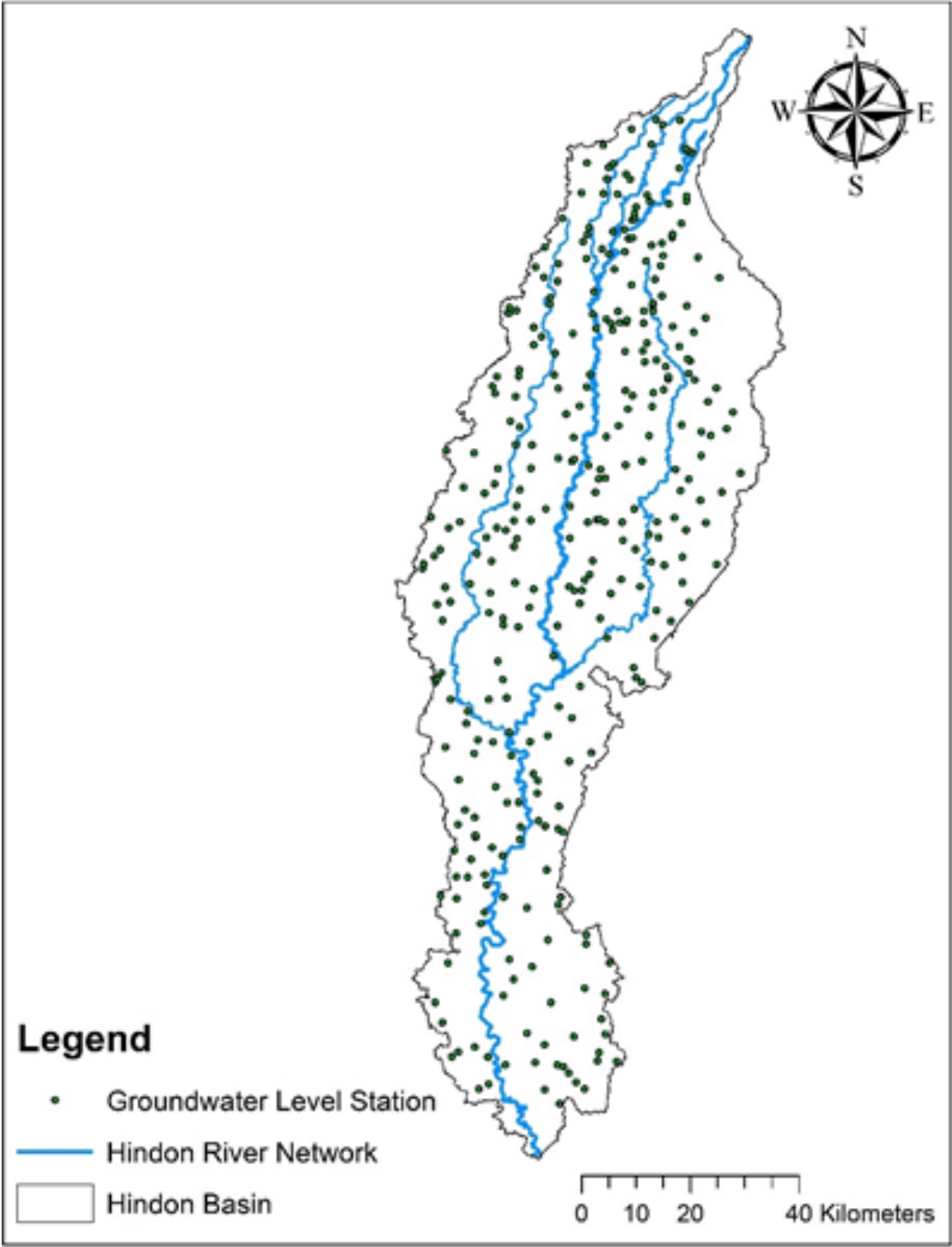


HINDON BASIN: LAND USE LAND COVER



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

GW LEVEL AND QUALITY STATION



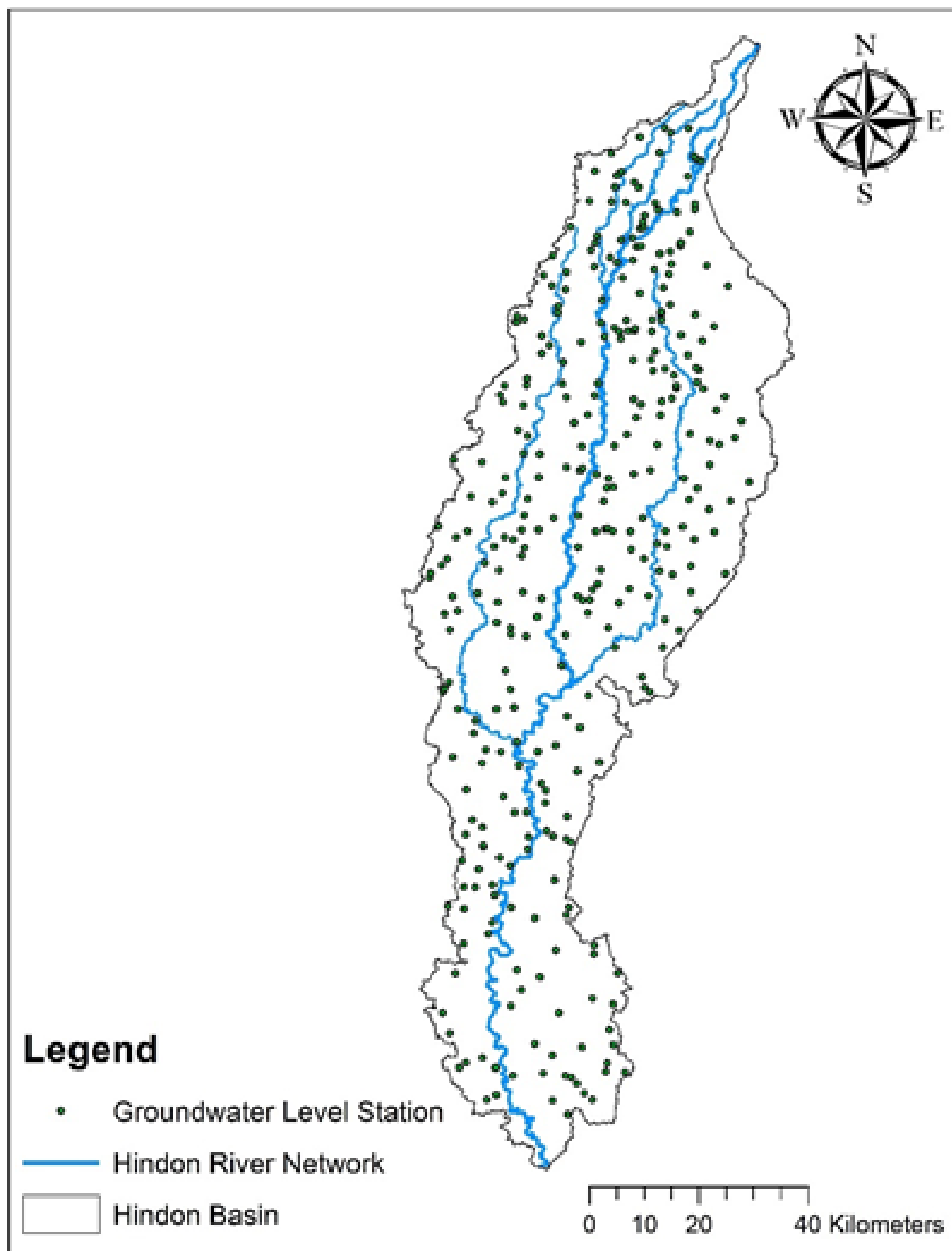
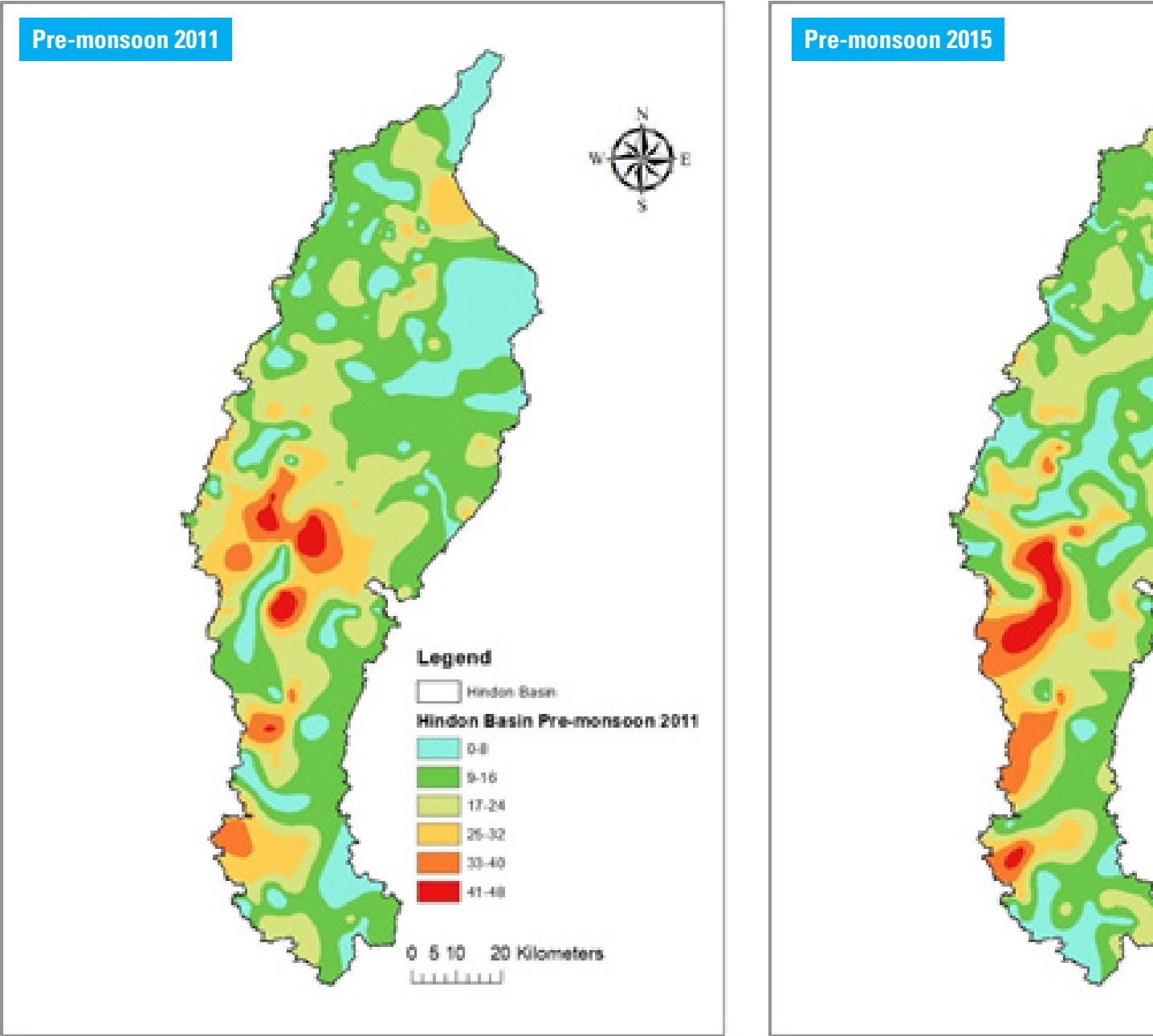
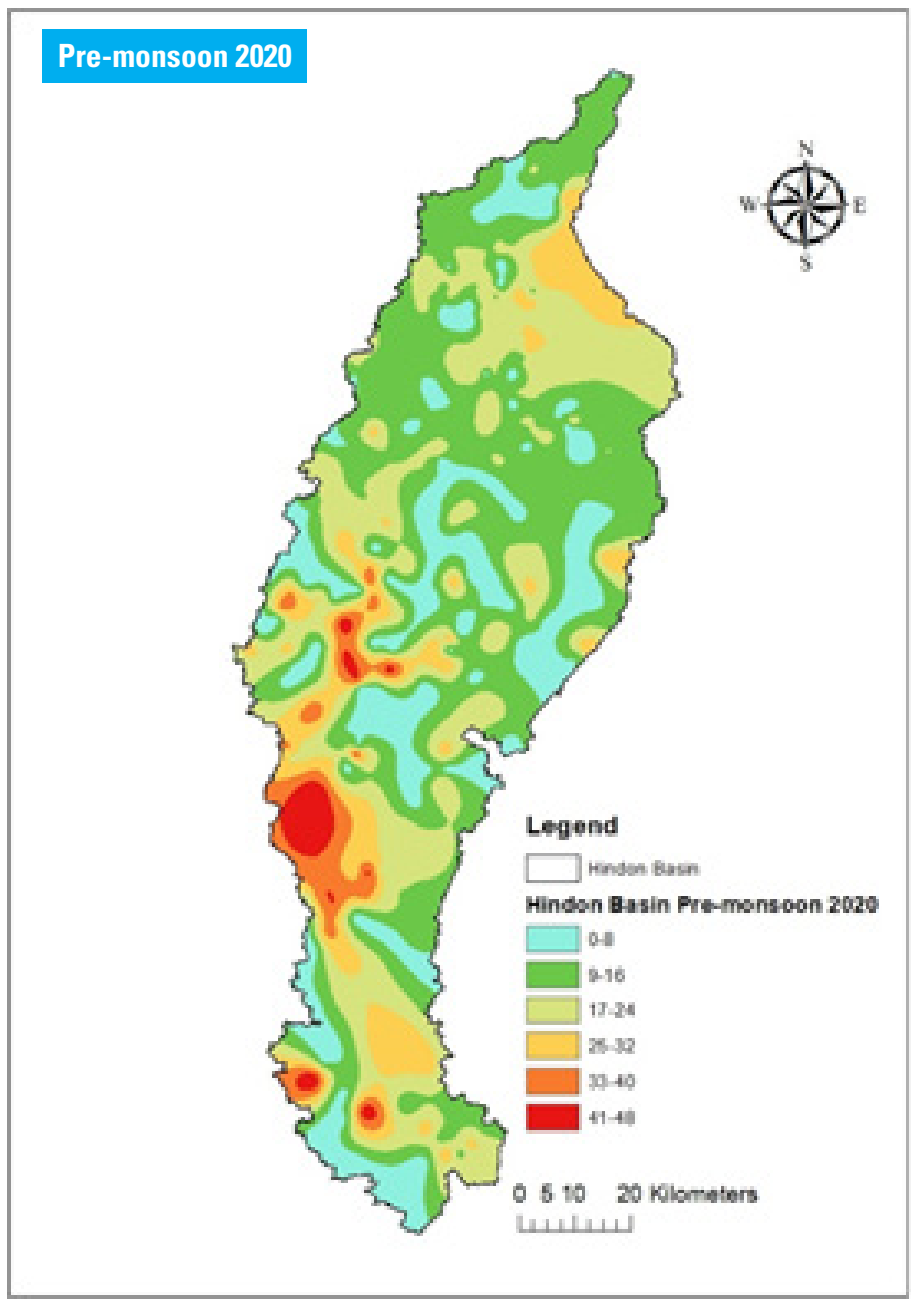
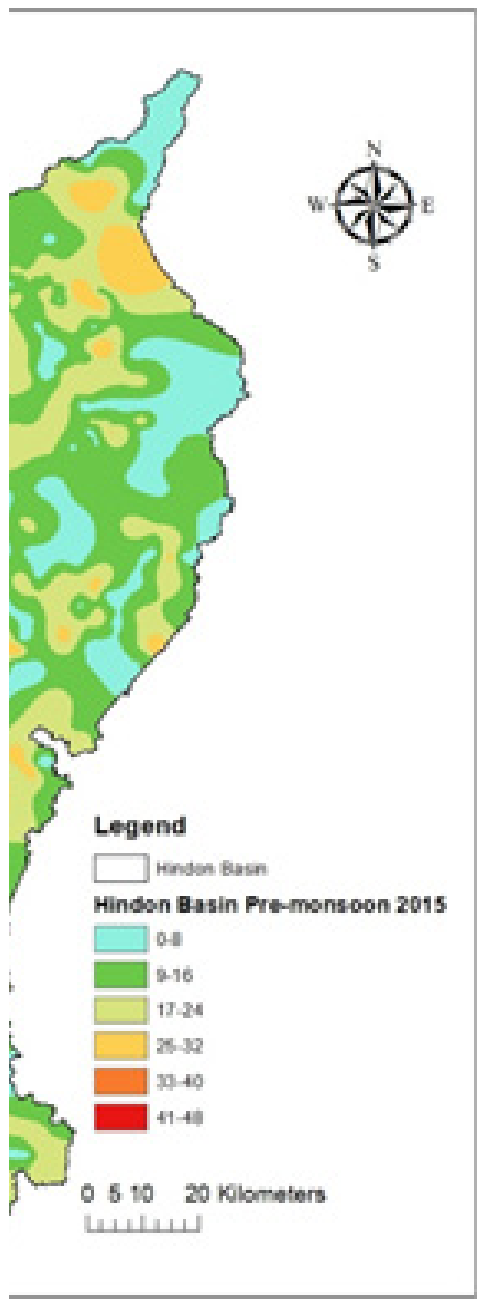


Figure: Representation of quality stations in Hindon River Basin

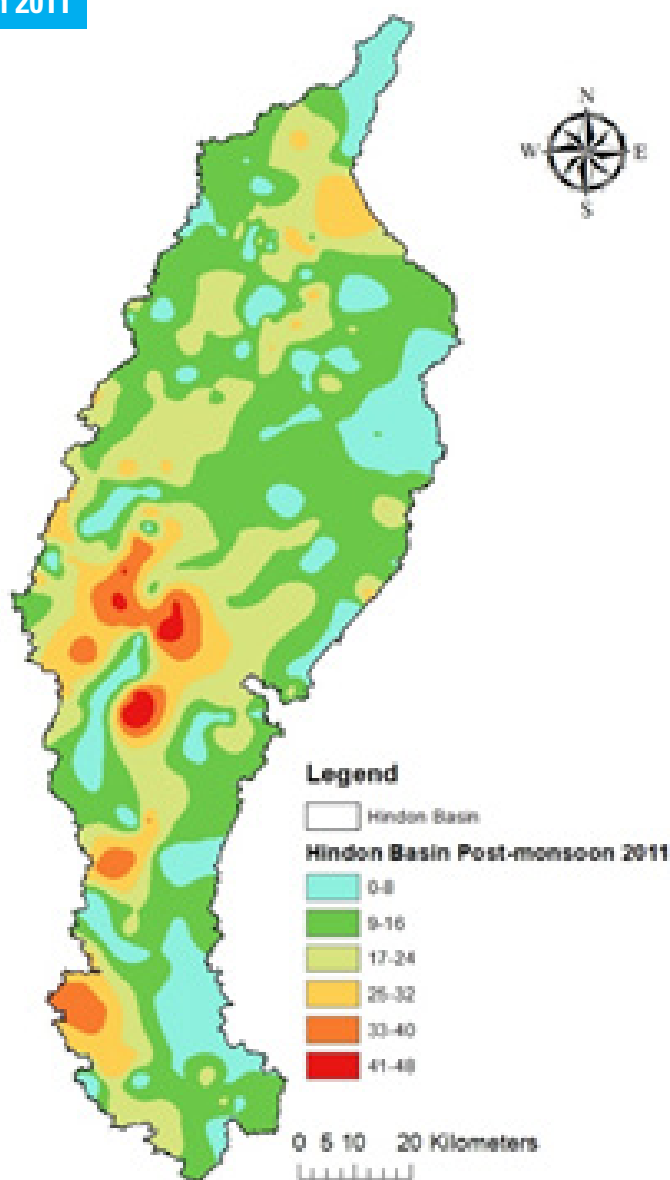
Source: CGWC

GROUNDWATER ELEVATION CONTOUR

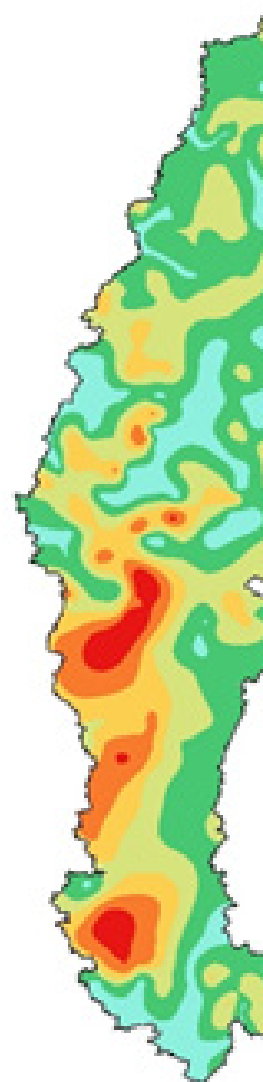




Post-monsoon 2011



Post-monsoon 2015



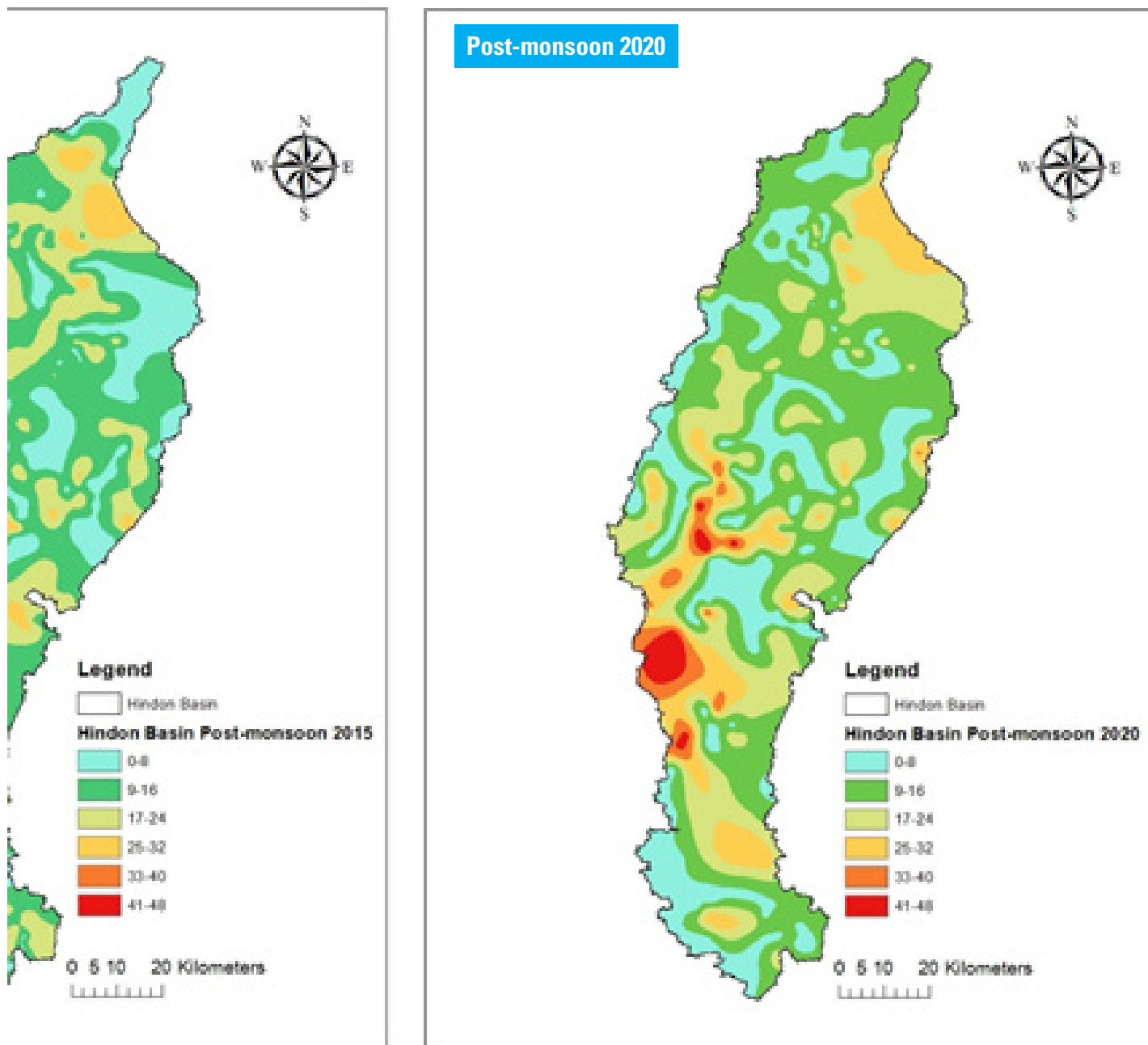
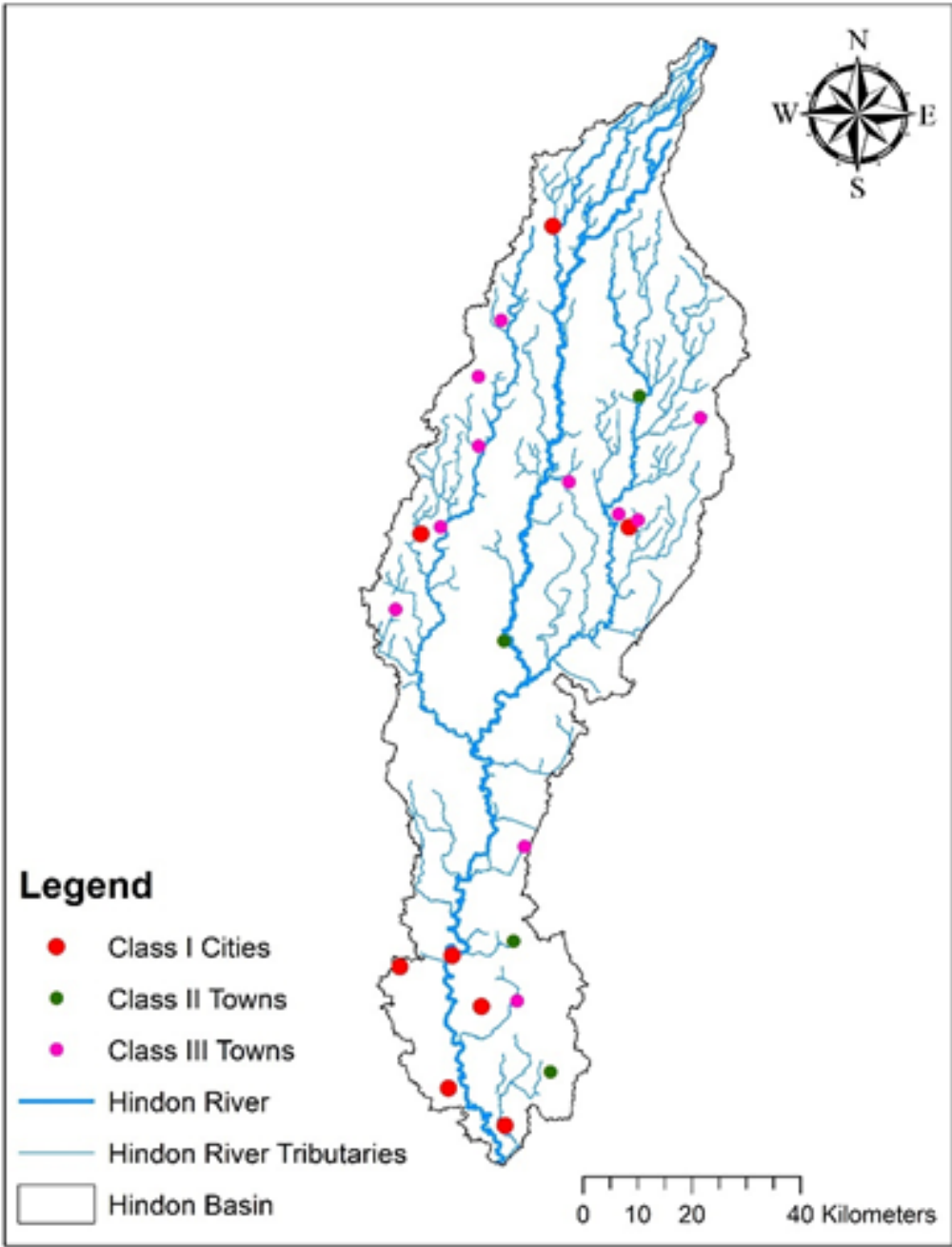


Figure: Groundwater Level (in mbgl) contour maps of Hindon River Basin

Source: CGWB

CLASS I, II AND III CITIES



08 Class I cities,
04 Class II and 11 Class III towns

Source: Census 2011

Figure: Classwise representation of cities in Hindon River Basin

CWC SITE LOCATION

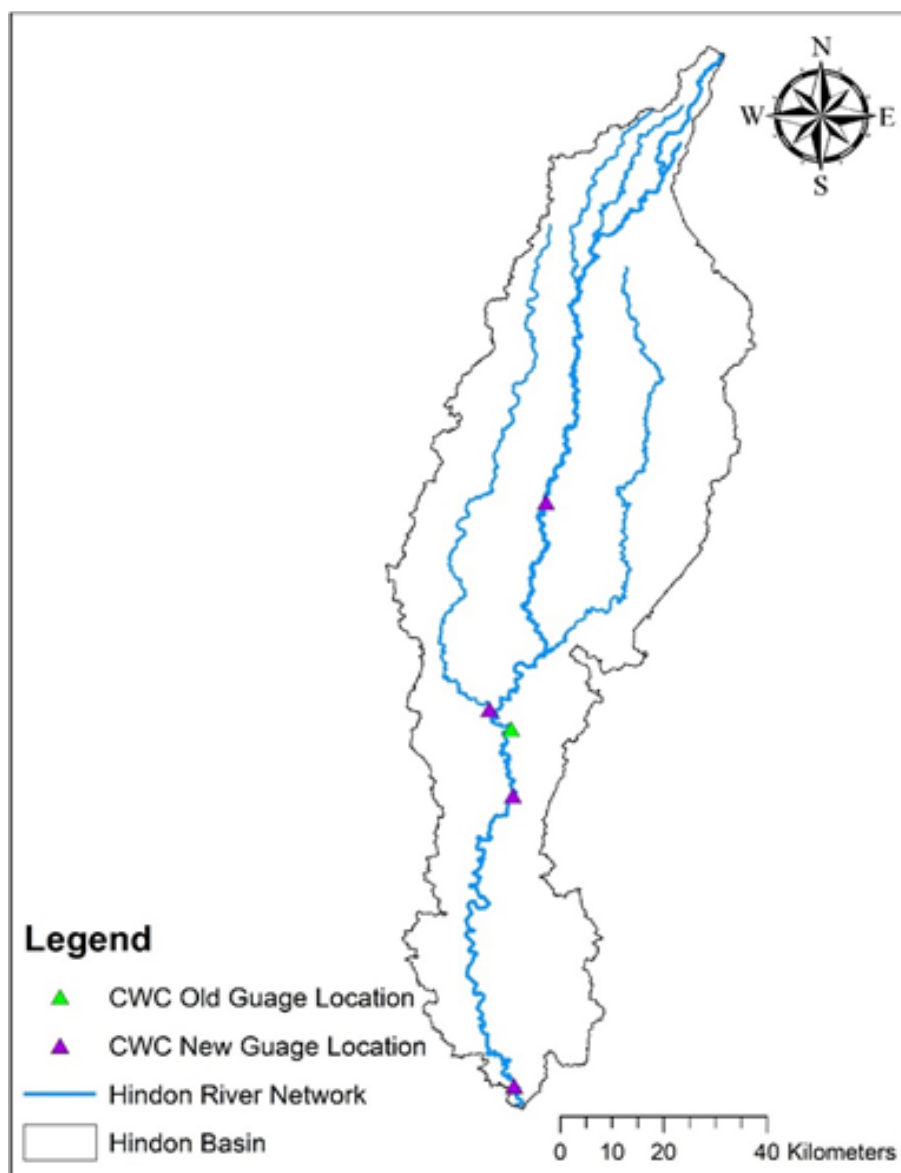


Figure: CWC Site Stations in Hindon River Basin

Source: CWC

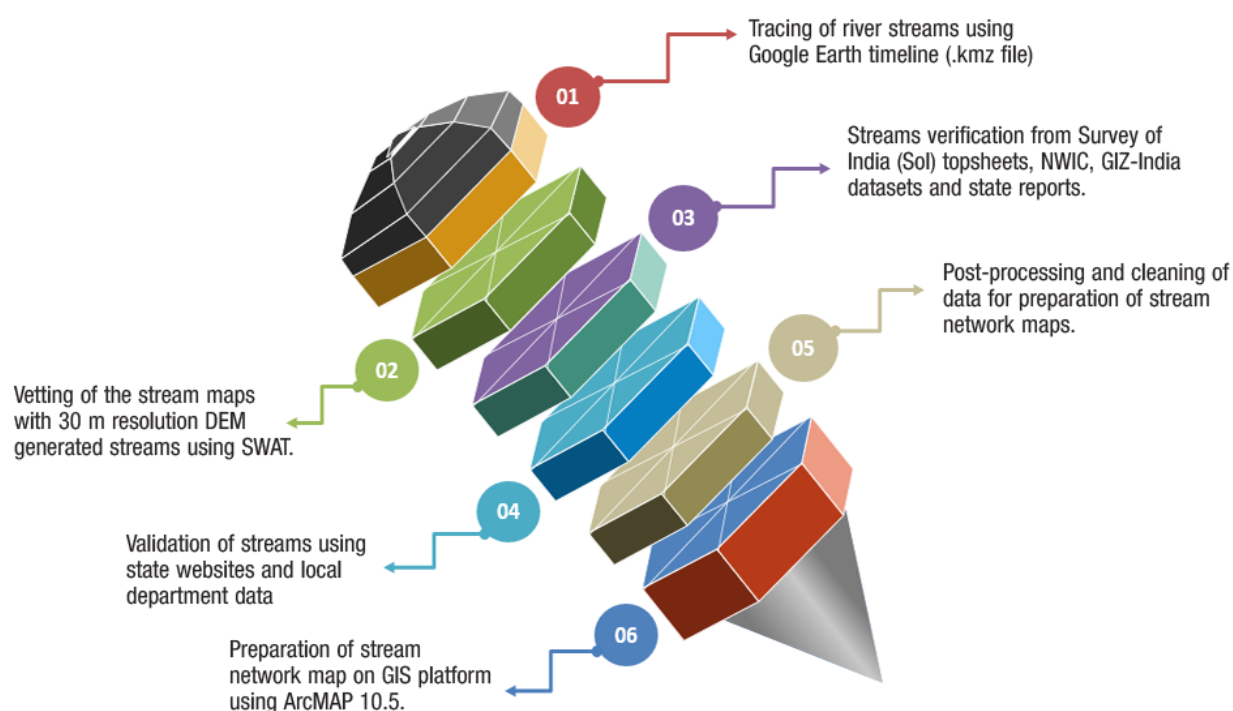
S No.		Location	River	Measurement Type	Data Available
1	Old Location	Galeta, Meerut	Hindon	GDQ	1980 onwards
2	New Location	Titawi, Muzaffarnagar	Hindon	GD	2018 onwards
3		Baleni, Baghpat	Hindon	GD	2018 onwards
4		Greater Noida, GB Nagar	Hindon	GDSQ	2018 onwards
5		Shekpura, Baghpat	Krishni	G	2018 onwards





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).

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.

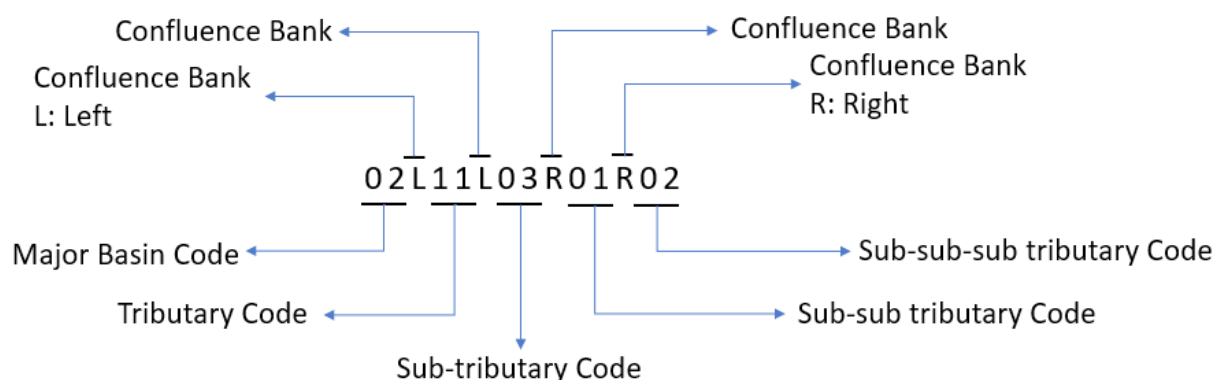
RIVER CODIFICATION SYSTEM

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,

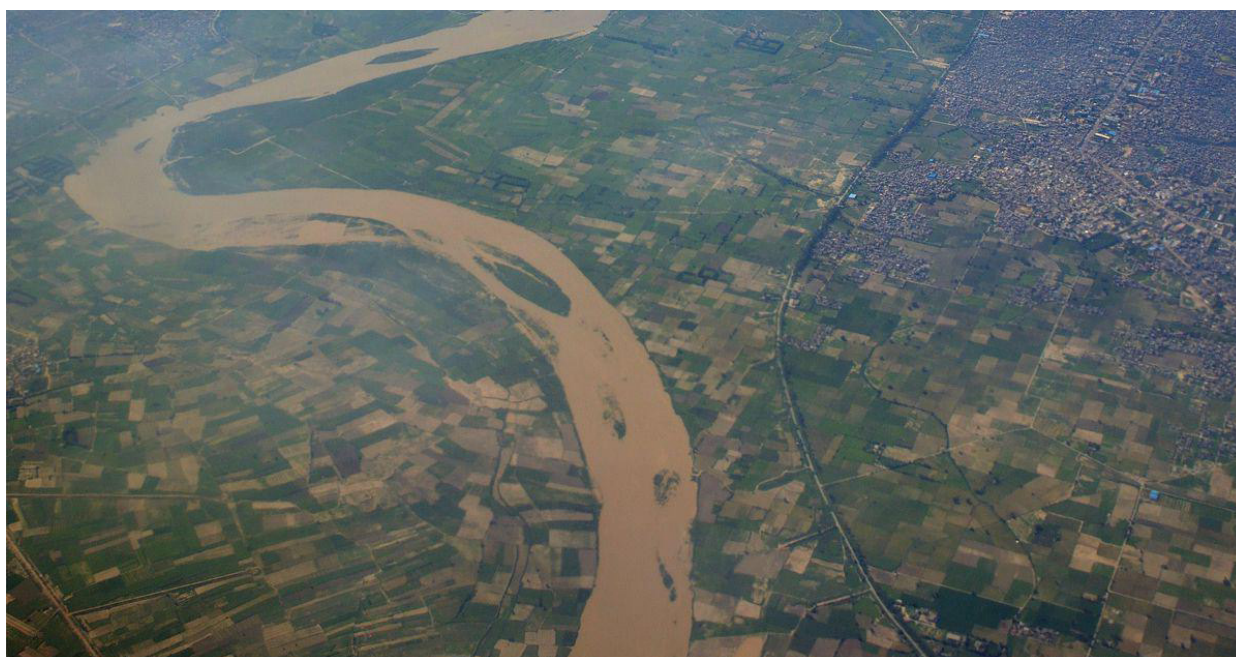
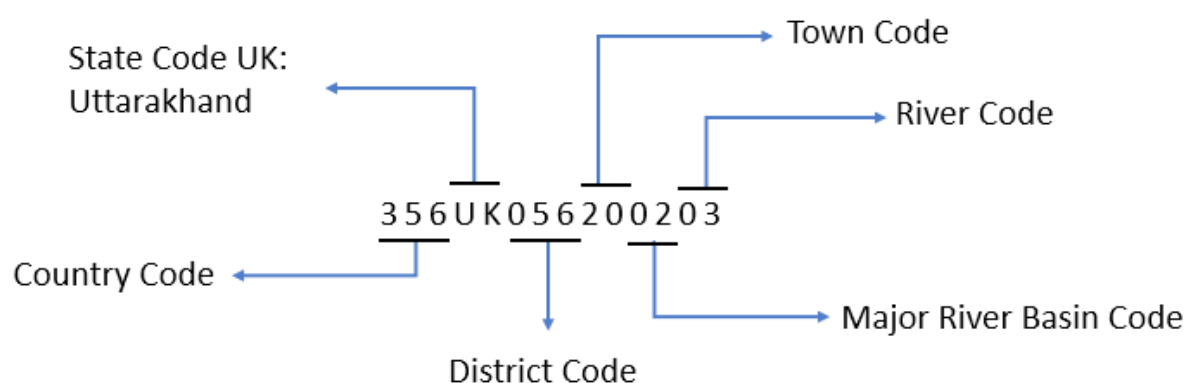




etc. the same coding procedure as in step 2 is followed for sub-tributaries joining the tributaries and so on. Thus, the code can be extended without any alteration until it reaches down to the lowest order river.

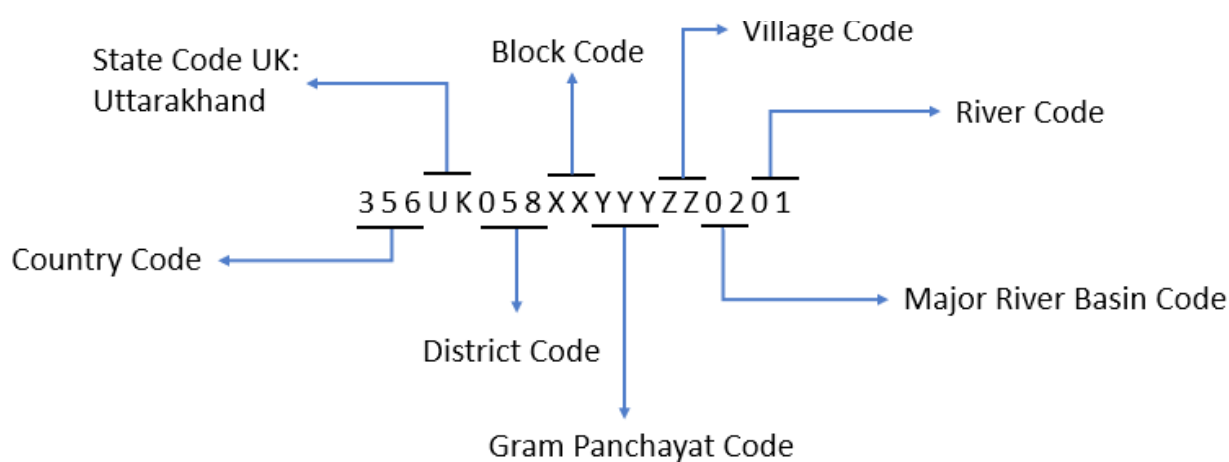
b) Codification system based on administrative delineation: In administrative delineation codes are generated separately for areas coming under urban and rural jurisdictions as further described.

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.





HINDON BASIN AND ITS RIVER NETWORK

Hindon River UID Code:

Basin Area: 6950.04 sq. Km.

Major Rivers: Krishni, Kali West, Dhamola, Nagdehi

Number of rivers- 231

River network- 2150 Km

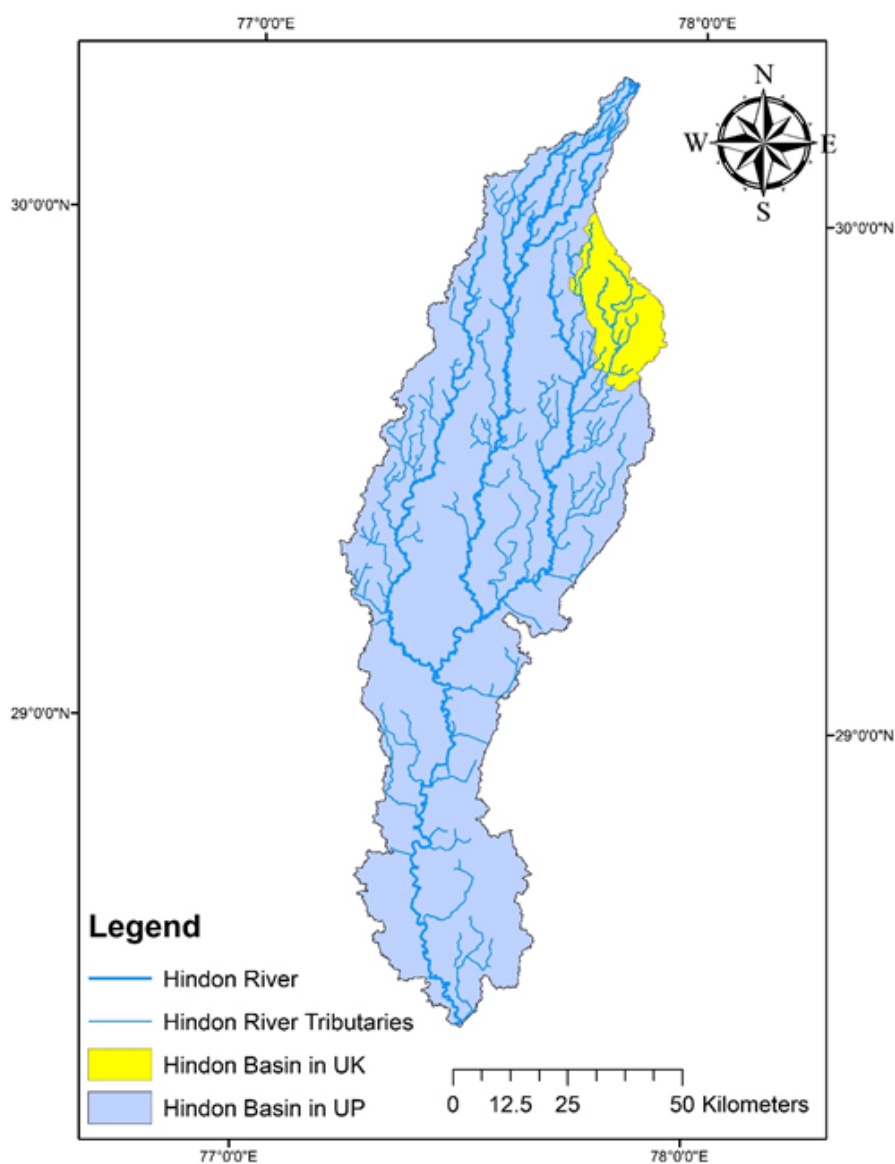
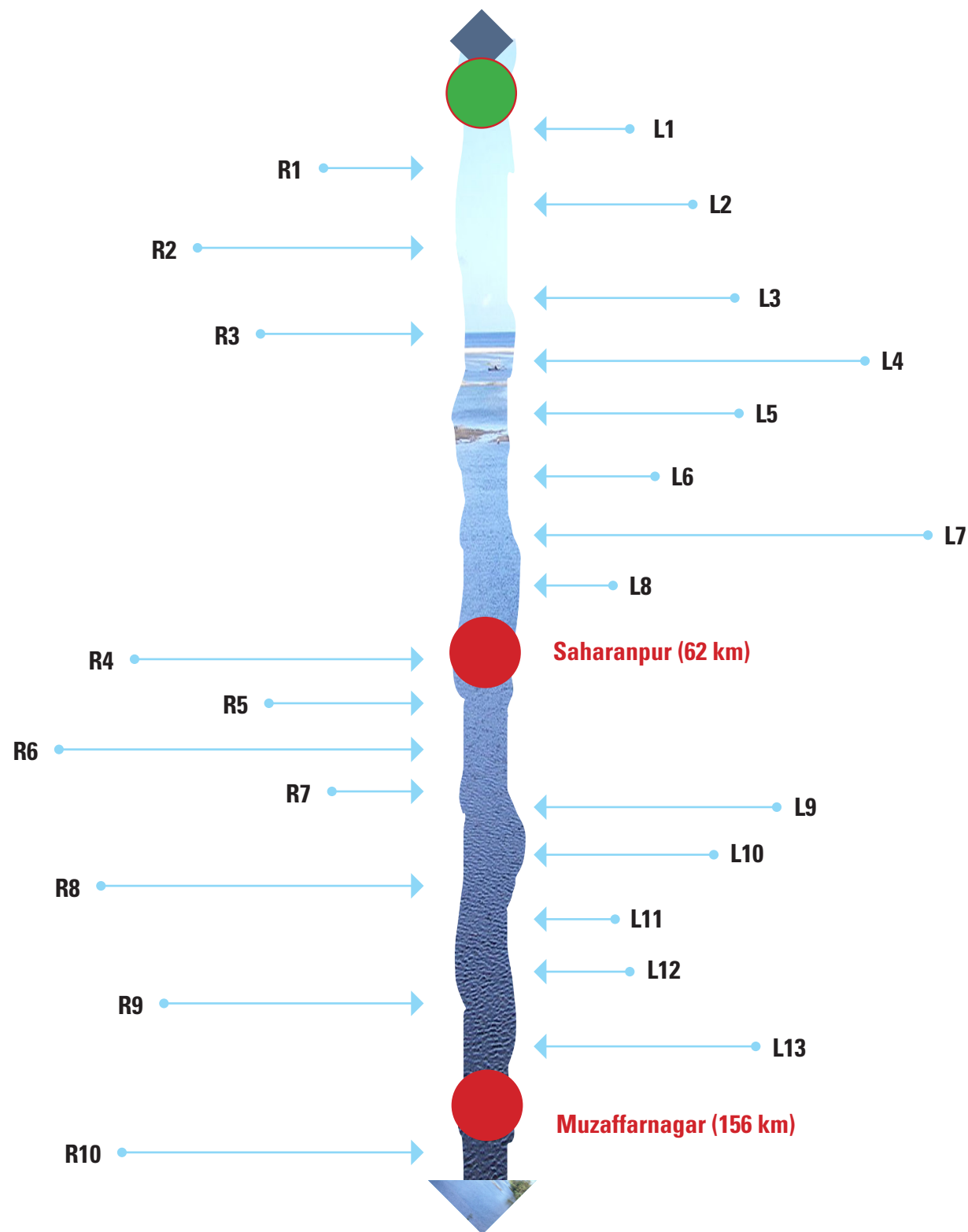


Figure: Hindon basin river network.

HINDON RIVER MAINSTIM FLOW DIAGRAM



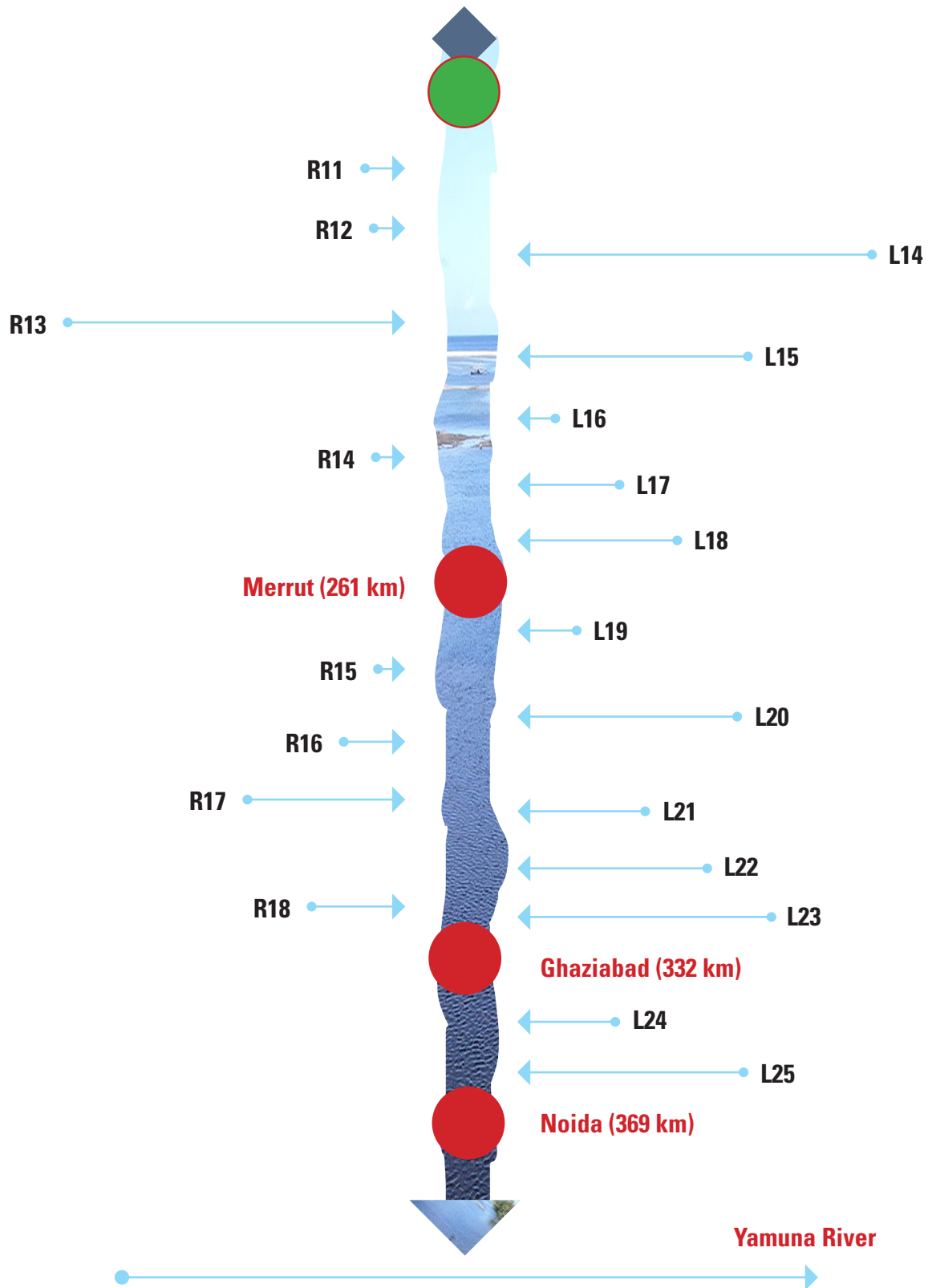


Figure: Flow diagram of Hindon River

HINDON RIVER MAINSTEM NETWORK					
River Name	Confluence Bank	River Length (km)	Co-ordinates		Distance from origin (Km)
			lat	log	
Stream 21	L1	0.94	30.265778°	77.840010°	2
Stream 20	R1	1.56	30.262496°	77.837769°	2
Stream 19	L2	1.35	30.257788°	77.836460°	3
Stream 18	R2	3.8	30.253027°	77.824859°	5
Stream 17	L3	3.51	30.196535°	77.797842°	14
Stream 16	R3	2.95	30.183358°	77.785525°	16
Stream 15	L4	7.1	30.163968°	77.780302°	18
Stream 14	L5	4.62	30.158175°	77.780921°	19
Stream 13	L6	2.13	30.139961°	77.767820°	21
Hindon 2nd Path	L7	9.12	30.060651°	77.729133°	35
Stream 12	L8	1.71	30.047163°	77.729320°	37
Nagdev Nadi	R4	50.5	29.942810°	77.605265°	62
Star Paper Mill	R5	2.58	29.924266°	77.590370°	66
Dhamola River	R6	56.5	29.855069°	77.567477°	80
Pahansu Escape	R7	3.79	29.822713°	77.553834°	87
Stream 11	L9	11	29.773664°	77.576769°	95
Stream 10	L10	6.12	29.612360°	77.572099°	127
Khala Nala Or Chakwali Nala	R8	36	29.605215°	77.551802°	131
Stream 9	L11	2.26	29.565542°	77.560887°	138
Chartawal Escape	L12	2.89	29.548044°	77.551392°	142
Sluice Drain	R9	13.4	29.538037°	77.536104°	144
Khusrapur Drain	L13	9.33	29.480393°	77.520290°	156



HINDON RIVER MAINSTEM NETWORK					
River Name	Confluence Bank	River Length (km)	Co-ordinates		Distance from origin (Km)
			lat	log	
Stream 8	R11	0.42	29.295077°	77.476984°	192
Stream 7	R12	0.19	29.287640°	77.481538°	193
Kali west	L14	159	29.214286°	77.532712°	207
Krishni River	R13	162	29.101721°	77.431004°	235
Sardhana Drain	L15	22.5	29.074696°	77.462824°	242
Stream 6	L16	1.92	29.052149°	77.454547°	246
Stream 5	R14	0.94	29.031950°	77.450556°	251
Stream 4	L17	3.56	28.986058°	77.470577°	259
Jani Esacpe	L18	9.27	28.973857°	77.466354°	261
Stream 3	L19	2.88	28.923475°	77.458458°	268
Stream 2	R15	0.45	28.922361°	77.438220°	270
Siwal Drain	L20	15	28.884097°	77.428992°	274.9
Terha Drain	R16	22.8	28.883796°	77.404162°	277.7
Daula Drain	R17	23.6	28.820338°	77.395927°	289.2
Sonda Drain	L21	7.46	28.767288°	77.429544°	300.6
Bhikampur Drain	L22	12	28.760010°	77.423272°	301.7
Jauli Drain	R18	5.42	28.740327°	77.387471°	309.2
Dasna Drain	L23	25.1	28.606762°	77.421859°	331.9
Stream 1	L24	0.54	28.572675°	77.422638°	336.6
Lohiya River	L25	28.5	28.417860°	77.506326°	369.2





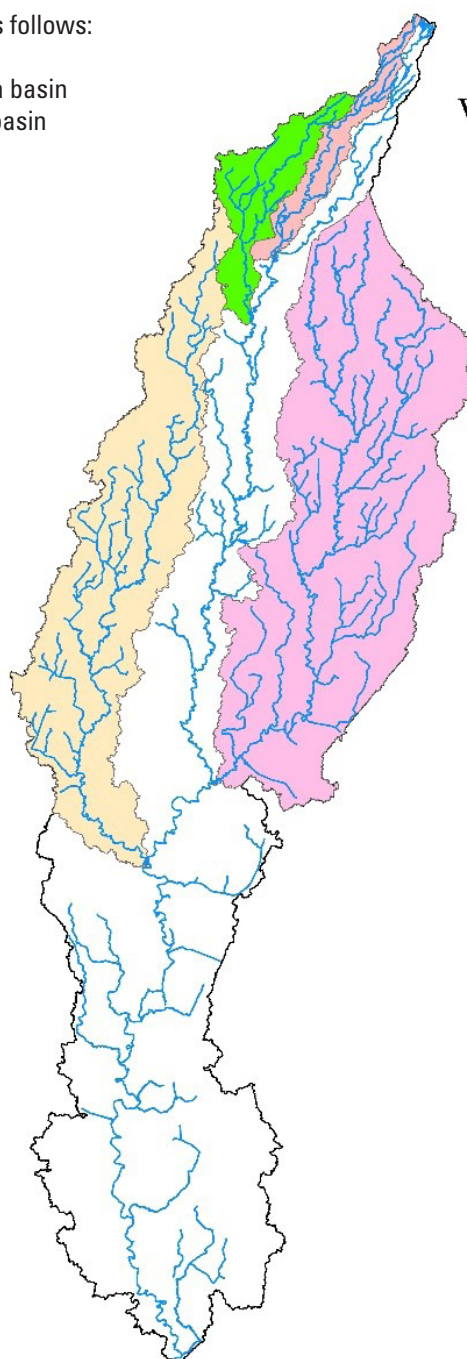
HINDON BASIN: MAJOR SUB-BASINS

Major sub-basins of Hindon River are as follows:

- Nagdehi basin
- Kali West basin
- Dhamola basin
- Krishni basin

Legend

-  Hindon River Network
-  Kaliwest Basin
-  Krishni Basin
-  Dhamola Basin
-  Nagdehi Basin
-  Hindon Basin



0 10 20 40 Kilometers

NAGDEHI BASIN

Nagdehi River UID Code:
Basin Area: 160.38 Sq. Km.
Number of rivers- 13
River network- 119 Km

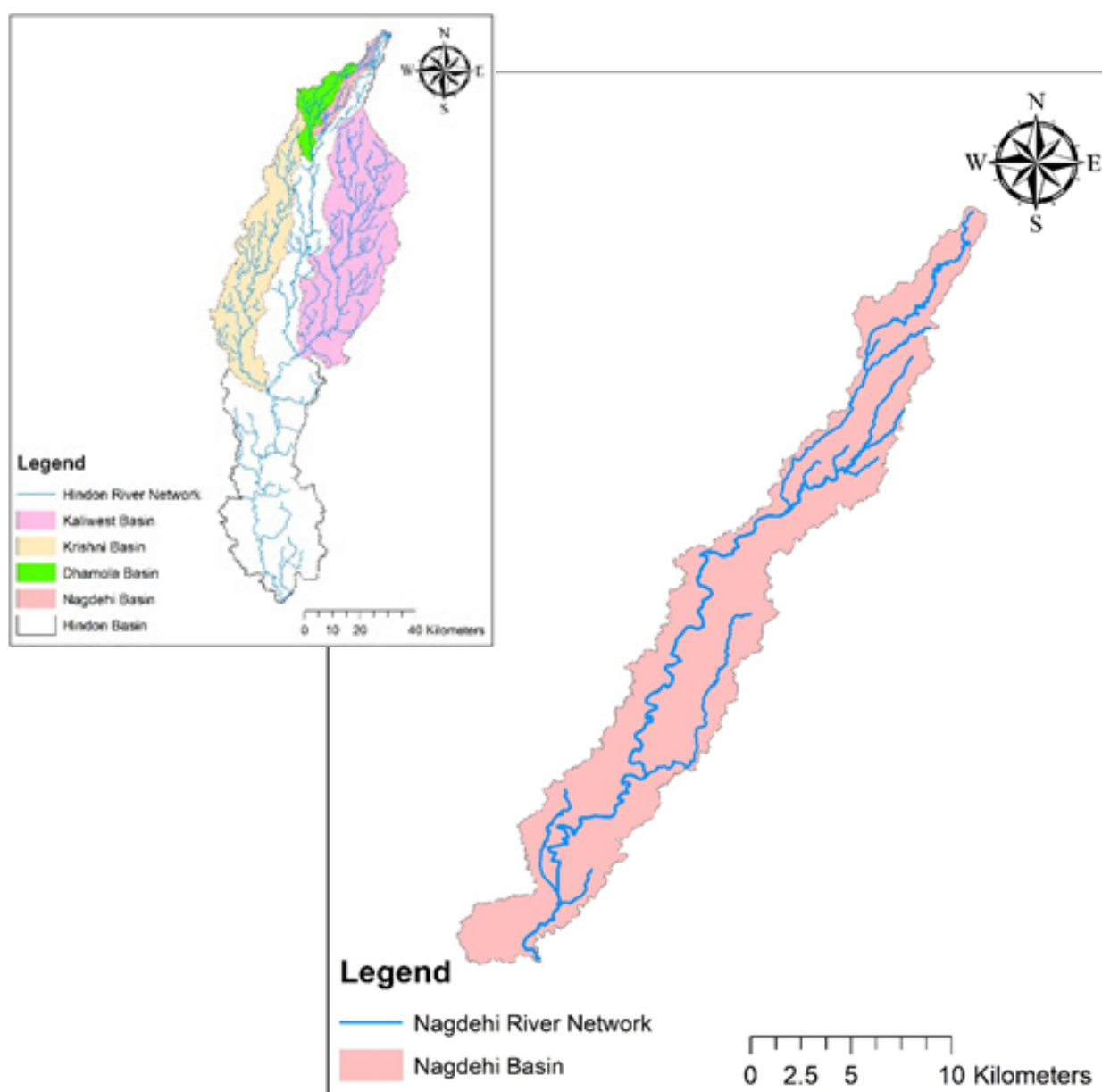


Figure: Nagdehi River Network



NAGDEHI RIVER MAINSTEM FLOW DIAGRAM

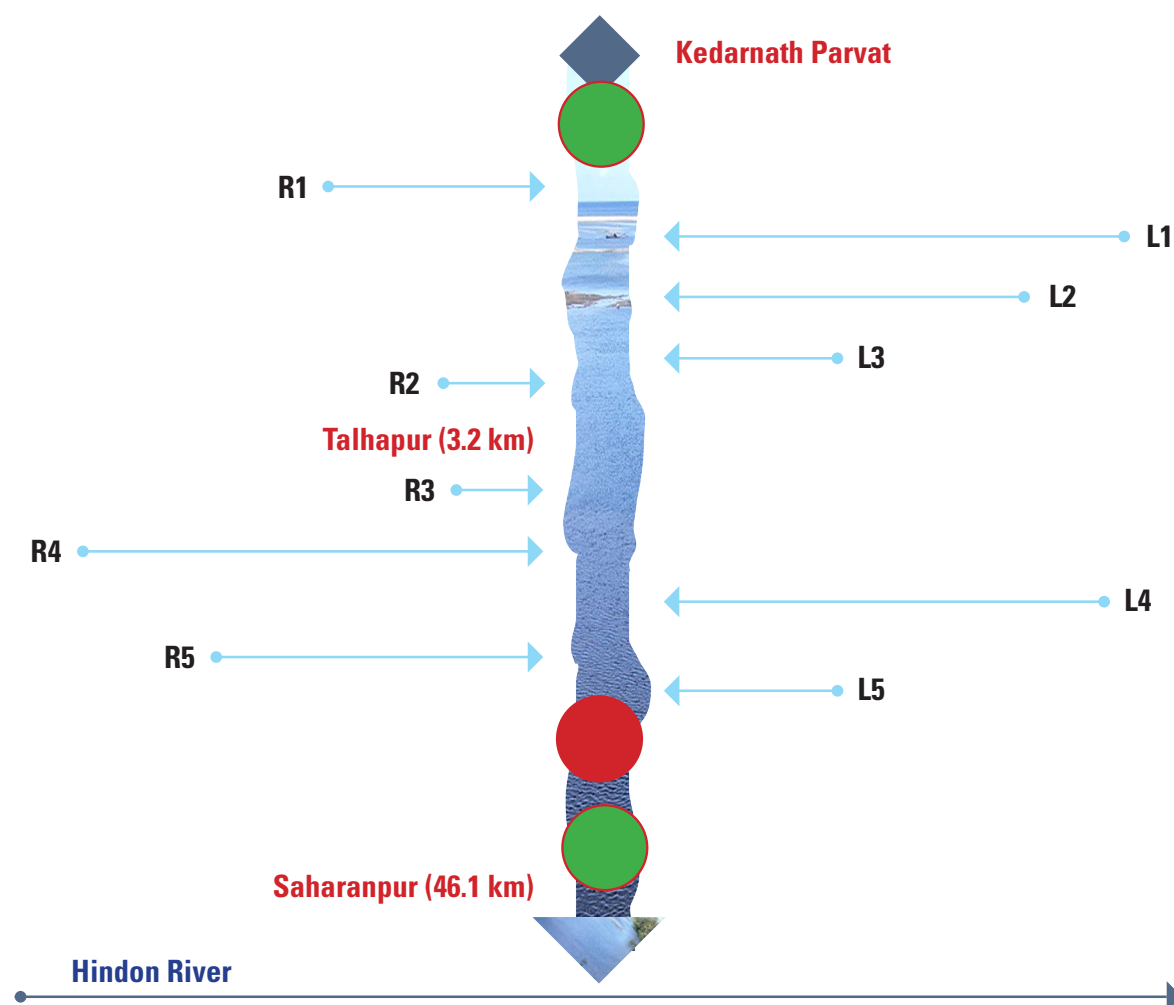


Figure: Flow Diagram of Nagdehi River

NAGDEHI RIVER MAINSTEM NETWORK					
River Name	Confluence Bank	River Length	Co-ordinate		Distance from Origin
			Latitude	Longitude	
Stream 7	R1	4.83	30.182726°	77.767980°	0.3
Stream 6	L1	3.31	30.178376°	77.764856°	0.7
Stream 5	L2	3.31	30.176818°	77.764392°	0.9
Stream 4	L3	2.42	30.167031°	77.754257°	2.8
Stream 3	R2	1.75	30.165823°	77.750761°	3.2
Stream 2	R3	1.7	30.160013°	77.734072°	5.7
Kothari Rao	R4	20.3	30.146571°	77.724502°	7.8
Nailawali Khala	L4	13.4	30.025937°	77.656678°	32.2
Padil River	R5	7.56	29.973463°	77.613092°	45.3
Stream 1	L5	3.15	29.966509°	77.613647°	46.15

DHAMOLA BASIN

Dhamola River UID Code:
Basin area: 249.43 Sq. Km.
Number of rivers- 13
River network- 111.3 Km

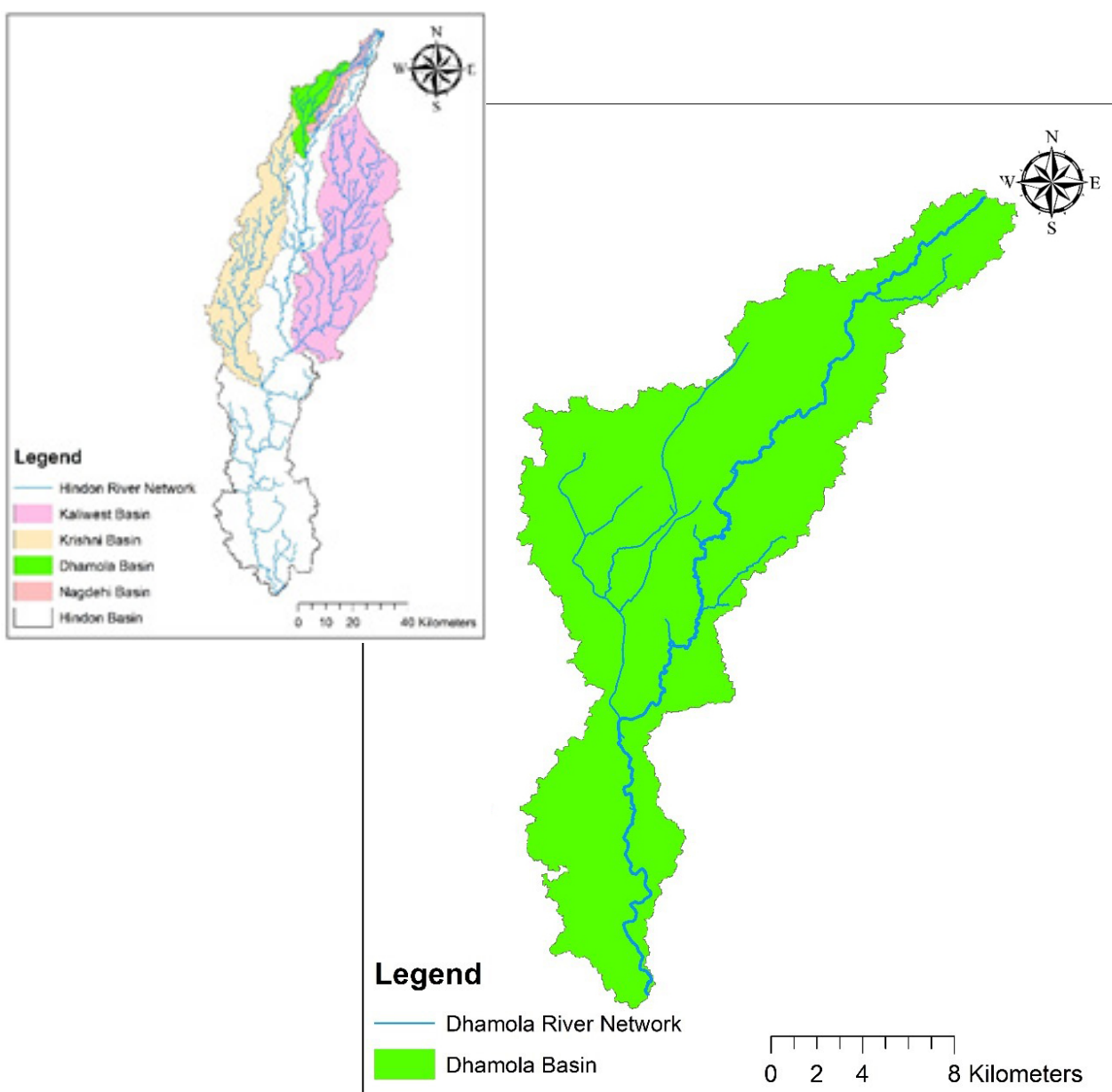


Figure: Dhamola River network



DHAMOLA RIVER MAINSTEM FLOW DIAGRAM

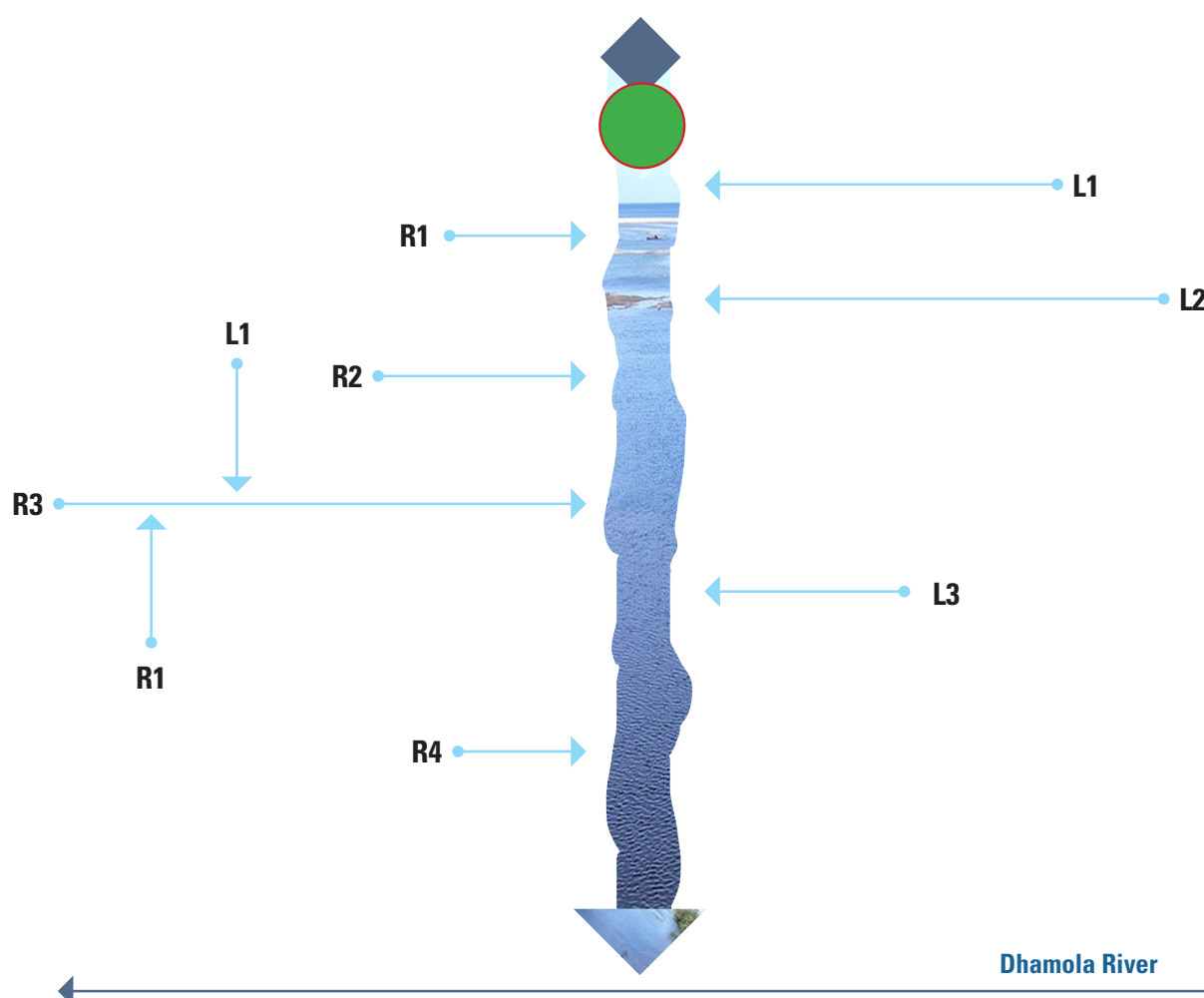


Figure: Flow Diagram of Dhamola River

DHAMOLA RIVER MAINSTEM NETWORK							
River Name	Confluence Bank	River Length	Co-ordinate		Distance from Origin		
			Latitude	Longitude			
Stream 5		L1	5.56	30.133979°	77.659767°	7.8	
Stream 4		R1	0.98	30.033697°	77.585174°	27.3	
Naini Nala		L2	5.78	30.006438°	77.586146°	31.6	
Stream 3		R2	1.16	29.994353°	77.573733°	34.6	
Paondhoi River		R3	13.1	29.963235°	77.550991°	40.5	
	Datauli Drain	R1	4.6	30.034777°	77.532685°		3.25
	Shankarpuri Khal	L1	6.41	30.011116°	77.542124°		6.92
Stream 2		L3	0.31	29.957361°	77.550802°	41.1	
Stream 1		R4	0.24	29.927947°	77.558760°	45.3	

KALI WEST BASIN

Kali West River UID Code:
Basin Area: 2055.25 sq. Km.
Number of rivers - 81
River network- 717.15 Km

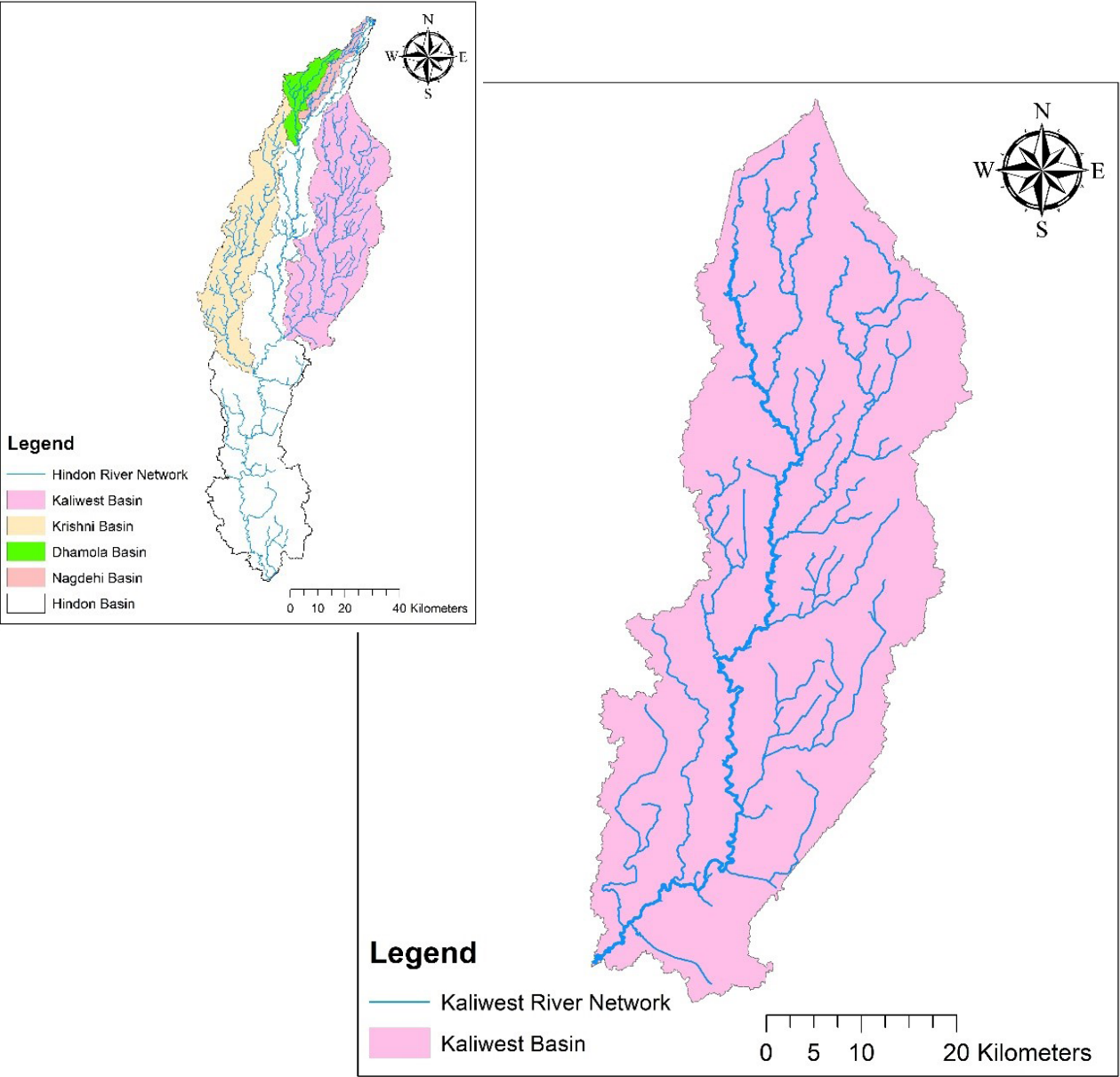
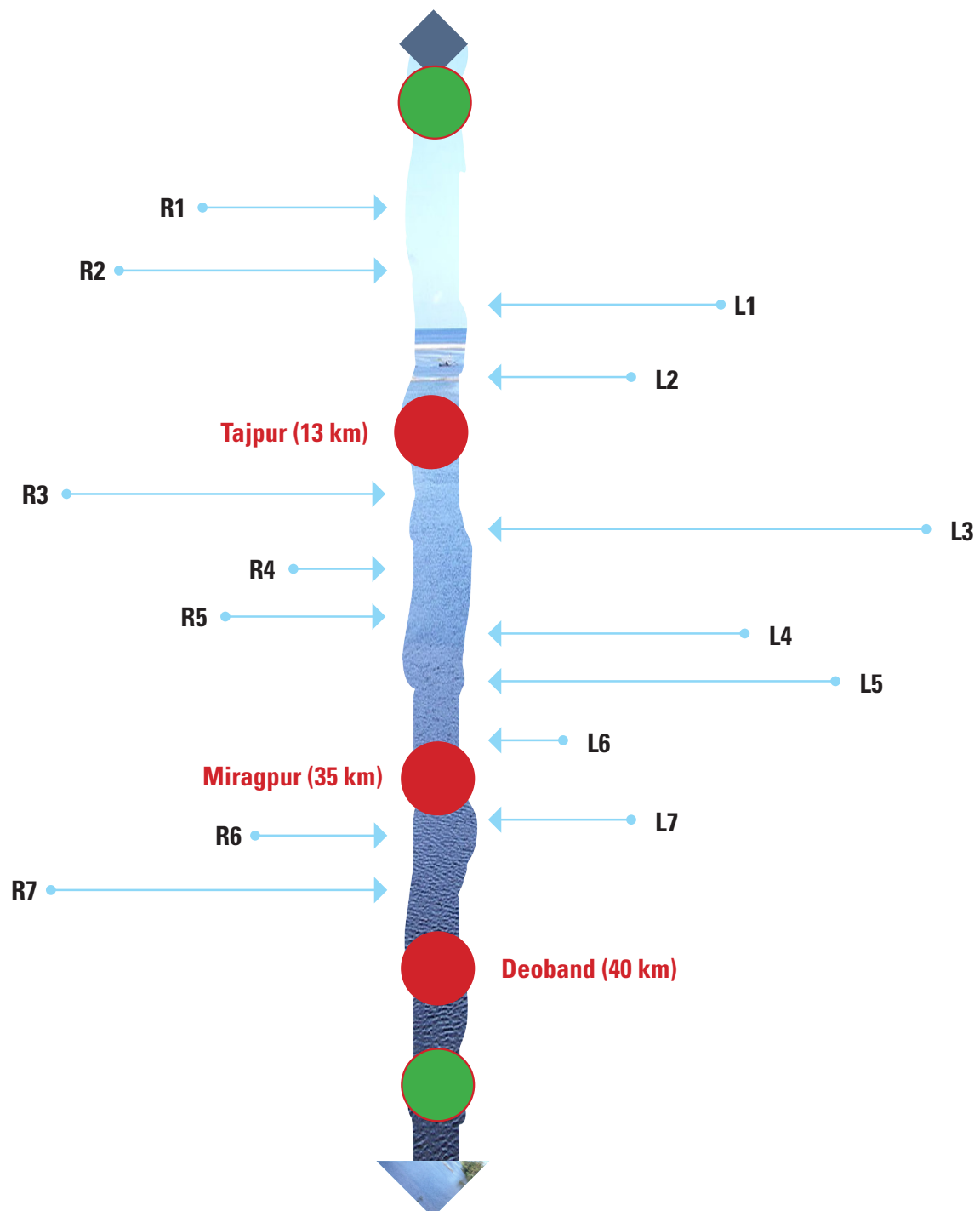
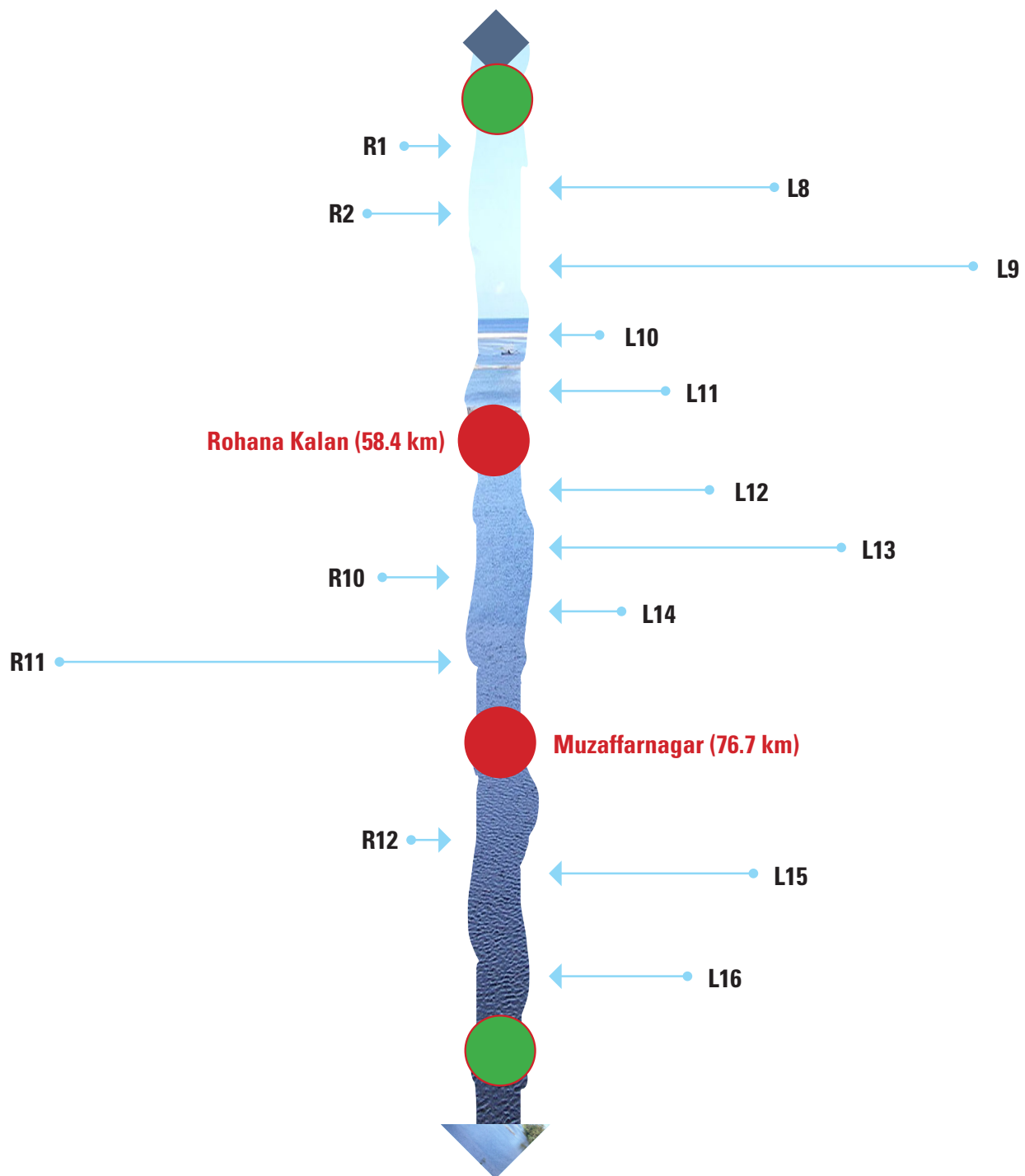


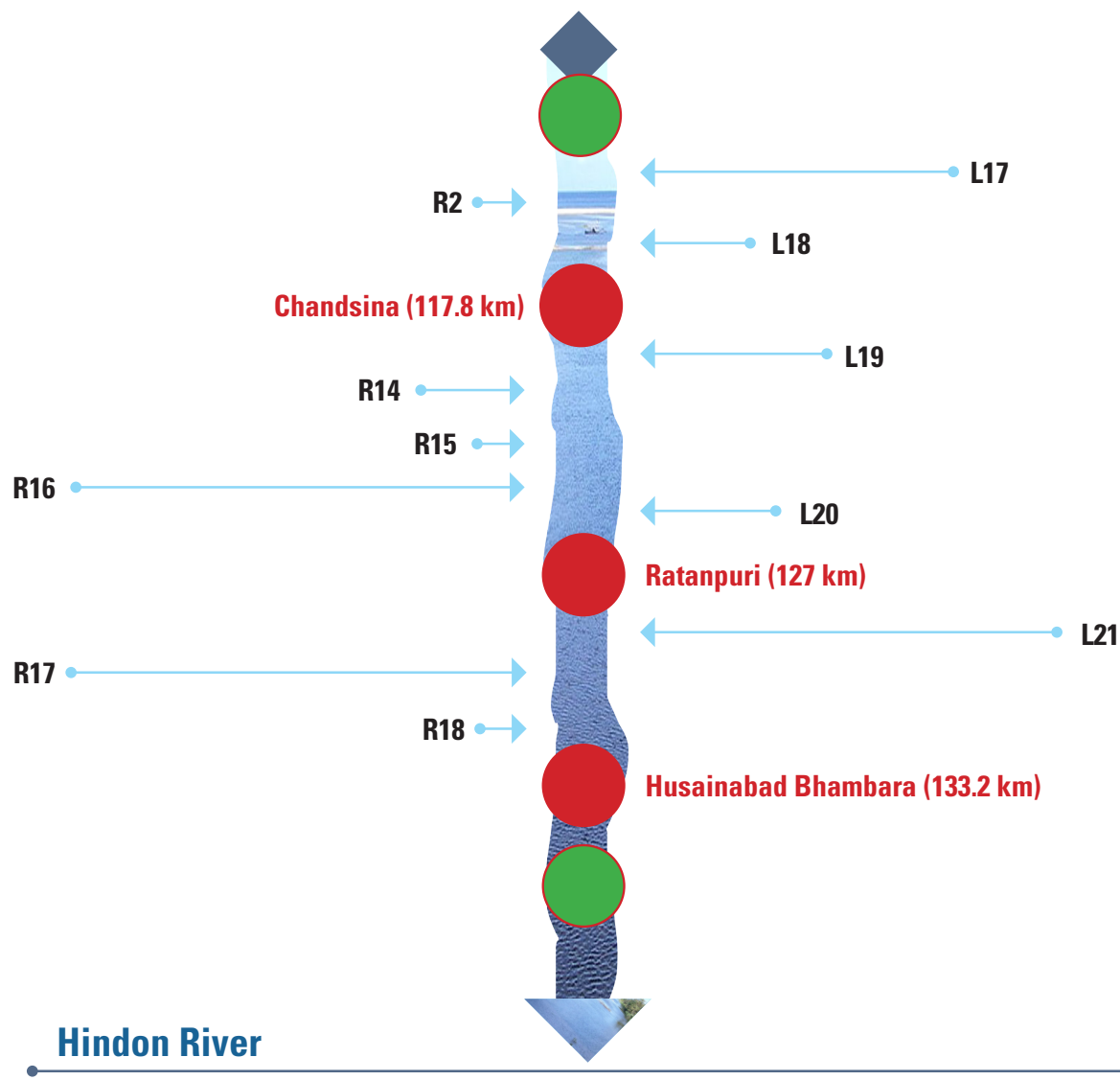
Figure: Kali West River Basin network



KALI WEST RIVER MAINSTEM FLOW DIAGRAM







Hindon River

Figure: Flow Diagram of Kali West River

KALI WEST RIVER MAINSTEM NETWORK					
River Name	Confluence Bank	River Length	Co-ordinate		Distance from Origin
			Latitude	Longitude	
Stream 27	R1	0.61	29.880725°	77.661742°	19
Stream 26	R2	0.9	29.851063°	77.660689°	25
Sttream 25	L1	3.72	29.848017°	77.666345°	26
Sttream 24	L2	1.77	29.817786°	77.670613°	31
Sttream 23	R3	2.14	29.774123°	77.684550°	38
Kali East	L3	35.3	29.761380°	77.702709°	41
Stream 22	R4	0.34	29.733677°	77.712818°	46
Stream 21	R5	0.91	29.730286°	77.717639°	47
Kapuri Drain	L4	8.47	29.716407°	77.735666°	50

KALI WEST RIVER MAINSTREAM NETWORK					
River Name	Confluence Bank	River Length	Co-ordinate		Distance from Origin
			Latitude	Longitude	
Jatauli Cut	L5	13.8	29.700875°	77.744084°	53
Stream 20	L6	0.15	29.697709°	77.743351°	53
Stream 19	L7	0.81	77.743351°	77.739137°	54
Stream 18	R6	0.43	29.682183°	77.725751°	57
Jenkisons Drain	R7	4.7	29.674245°	77.720382°	58
Stream 17	R8	0.29	29.672298°	77.717582°	59
Stream 16	L8	0.55	29.663490°	77.719506°	60.3
Stream 15	R9	0.66	29.629686°	77.709267°	66.7
Sila Khala	L9	62.5	29.613001°	77.715325°	70
Stream 14	L10	0.55	29.602941°	77.719718°	71.8
Stream 13	L11	0.8	29.580390°	77.711587°	76.4
Stream 12	L12	0.92	29.555390°	77.717630°	81.5
Purkazi Drainage Cut	L13	22.8	29.538604°	77.712428°	85
Stream 11	R10	0.6	29.534067°	77.697362°	87
Stream 10	L14	1	29.516098°	77.686683°	90.1
Imliya Drain	R11	33.4	29.504102°	77.658518°	94.6
Stream 9	R12	0.45	29.406669°	77.669581°	113
Main Muzaffarnagar Drain	L15	16.2	29.364759°	77.688794°	120.4
Stream 8	L16	4.9	29.359164°	77.687968°	121.3
Khatauli Escape	L17	6	29.306121°	77.672953°	130.7
Stream 7	R13	0.16	29.304635°	77.652167°	134.7
Stream 6	L18	0.98	29.295907°	77.652131°	135.7
Stream 5	L19	2.65	29.284910°	77.643570°	137.5
Stream 4	R14	2.14	29.288749°	77.640723°	138.5
Stream 3	R15	0.13	29.290011°	77.637724°	141
Pina Drain	R16	37.12	29.293830°	77.616879°	145
Stream 2	L20	0.41	29.274371°	77.602074°	147
Abu Escape	L21	12.4	29.251198°	77.569718°	149.47
Harsauli Drain	R17	35.7	29.247374°	77.565276°	150.6
Stream 1	R18	0.21	29.241368°	77.561870°	151.23



KRISHNI BASIN

Krishi River UID Code:
 Basin Area: 1250.60 Sq. Km.
 Number of rivers- 60
 River network- 415.40 Km

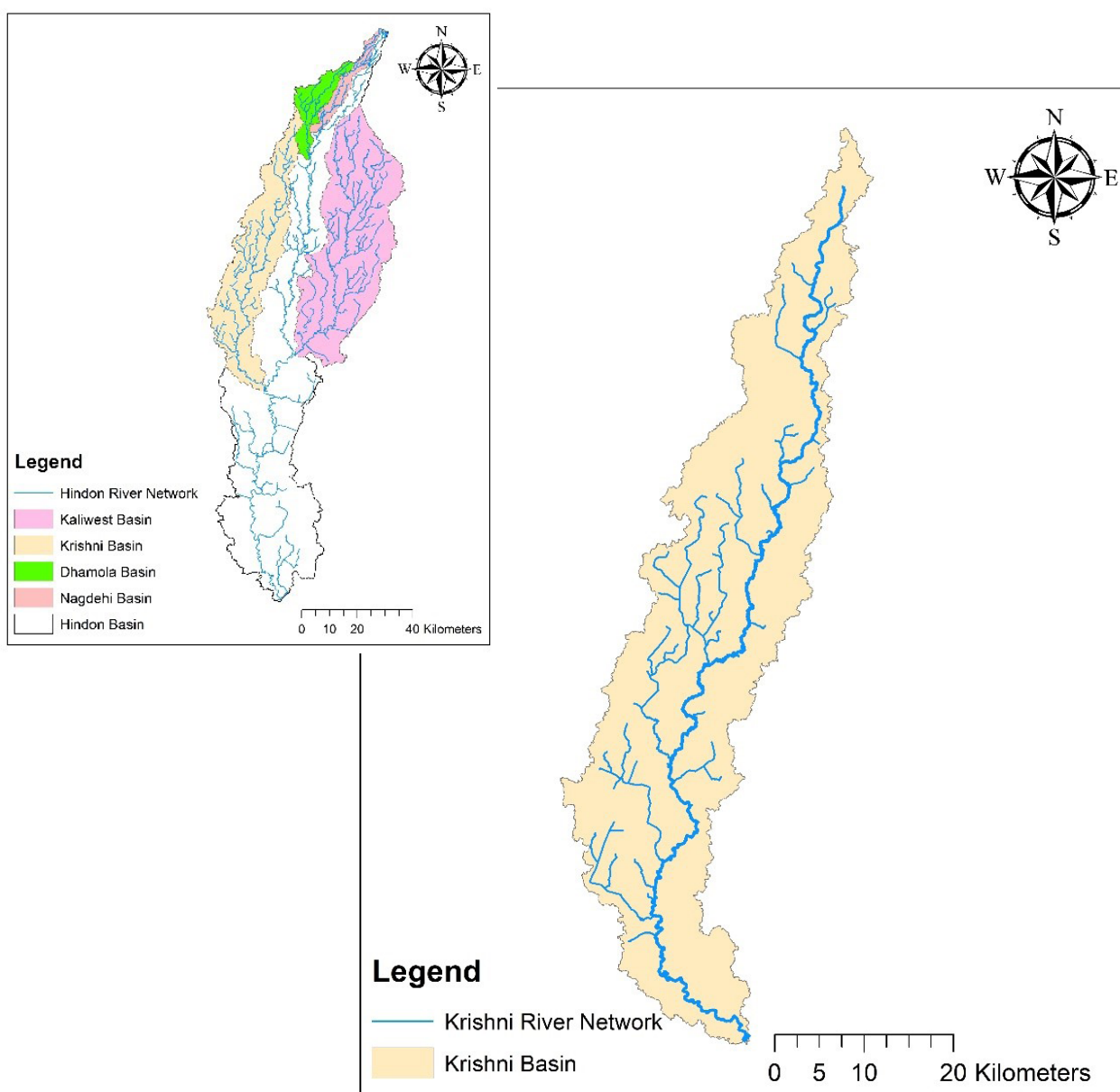
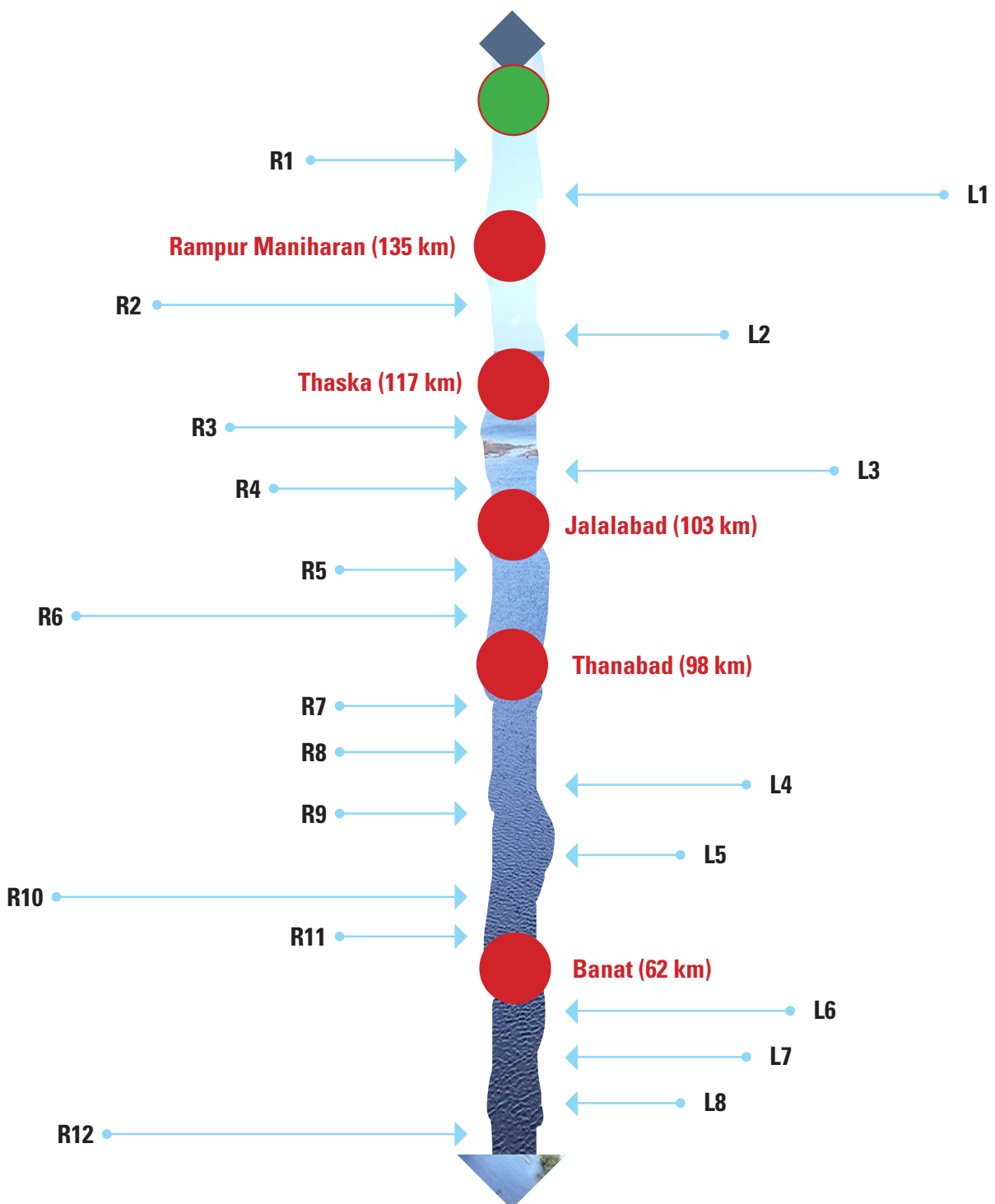


Figure: Krishni River network

KRISHNI RIVER MAINSET FLOW DIAGRAM



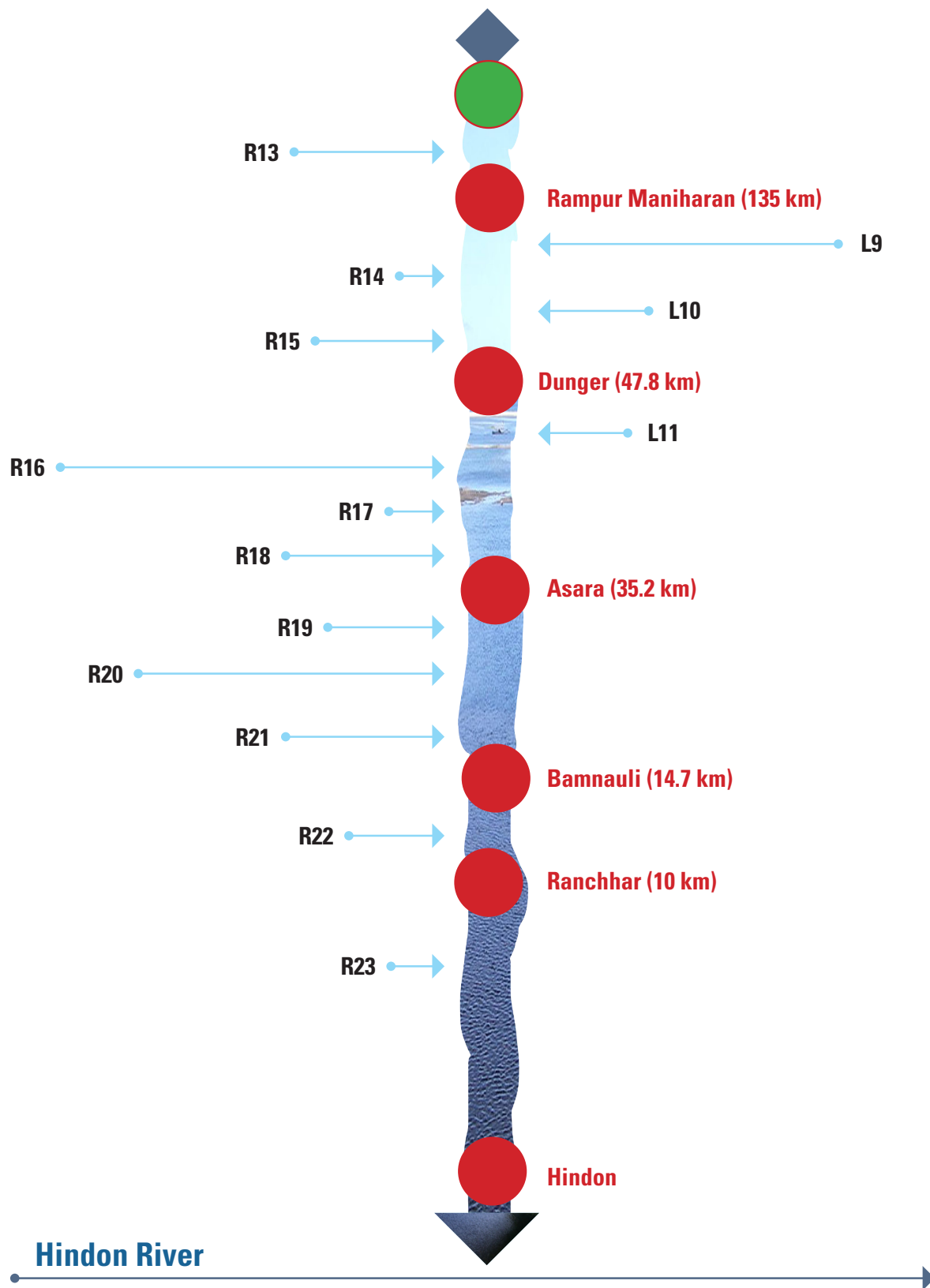


Figure: Flow Diagram of Krishni River

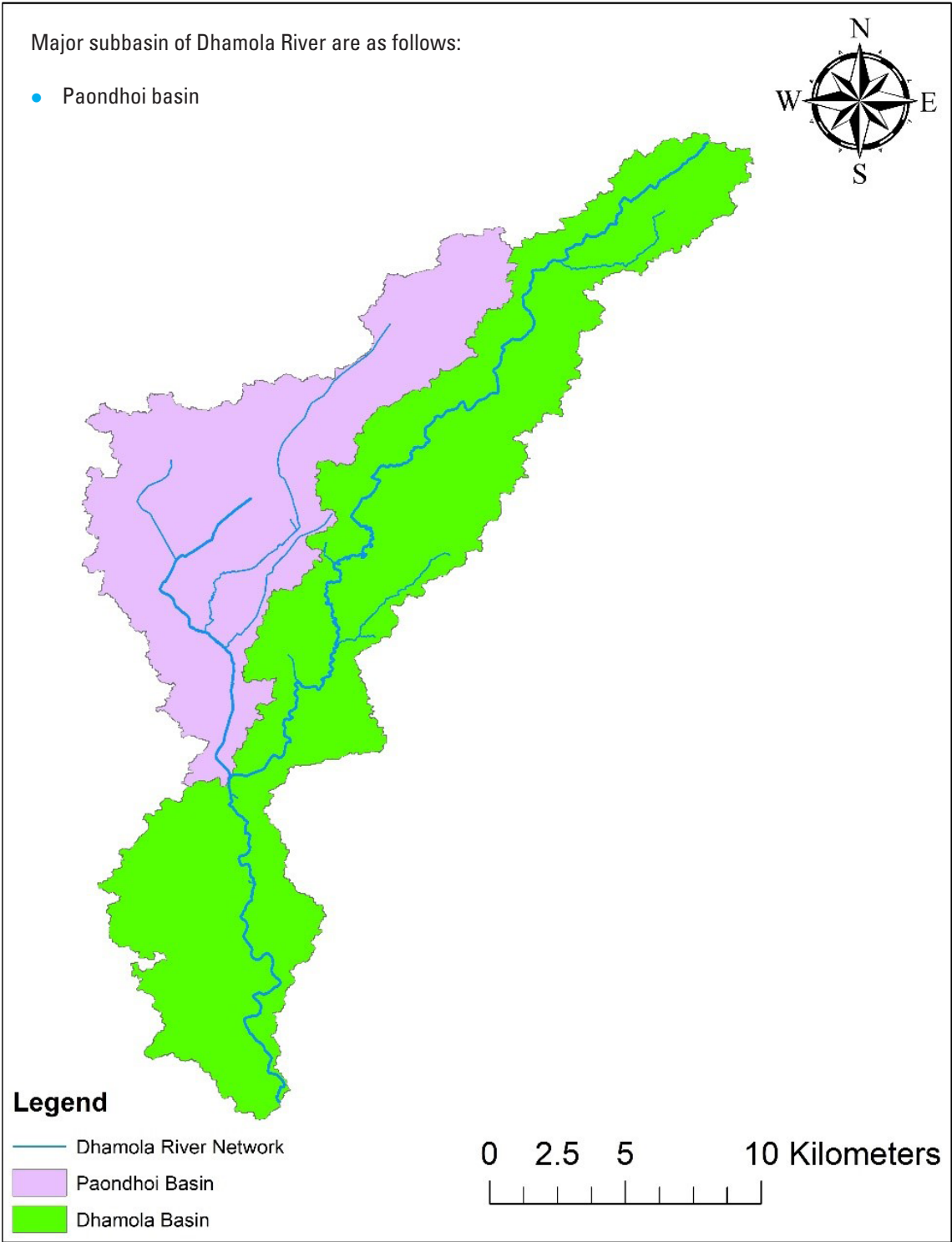
KRISHNI RIVER MAINSTREAM NETWORK					
River Name	Confluence Bank	River Length	Co-ordinate		Distance from Origin
			Latitude	Longitude	
Balpur Drain	R1	3.91	29.863770°	77.478069°	149
Jandhera Drain	L1	6.46	29.818039°	77.479897°	140
Rampur Cut	R2	10.5	29.788911°	77.465636°	135
Stream 21	L2	1.15	29.709016°	77.481900°	122
Thaska Drain	R3	4.14	29.681722°	77.446387°	117
ifra Aindabad Drain	L3	3.64	29.660549°	77.457861°	113
Stream 20	R4	4.1	29.636214°	77.439750°	109
Stream 19	R5	1	29.610261°	77.438681°	103
Khanpur Drain	R6	13.65	29.588549°	77.427824°	98
Stream 18	R7	0.31	29.582858°	77.422030°	97
Stream 17	R8	0.22	29.532513°	77.413919°	89
Stream 16	L4	2.34	29.520347°	77.415400°	87
Stream 15	R9	0.3	29.504190°	77.406958°	86
Stream 14	L5	0.54	29.487668°	29.487668°	81
Salawar Drain	R10	24.6	29.477054°	77.366940°	75
Stream 13	R11	0.4	29.468838°	77.360735°	74
Stream 12	L6	2	29.422602°	77.357237°	65
Stream 11	L7	0.32	29.405456°	77.347746°	62
Stream 10	L8	0.3	29.390971°	77.340116°	60
Kheri Escaoep	R12	12.5	29.383005°	77.331574°	58
Stream 9	R13	0.34	29.373177°	77.328046°	57
Karauda Drain	L9	7.46	29.358064°	77.333990°	54.6
Stream 8	R14	0.1	29.350487°	77.333567°	53.5
Stream 7	L10	0.44	29.332684°	77.353712°	50.2



KRISHNI RIVER MAINSTREAM NETWORK					
River Name	Confluence Bank	River Length	Co-ordinate		Distance from Origin
			Latitude	Longitude	
Stream 6	R15	0.26	29.321079°	77.356116°	48.7
Stream 5	L11	0.24	29.316637°	77.362529°	47.8
Fatehpur Drain	R16	20.9	29.275967°	77.325526°	39.5
Stream 4	R17	0.19	29.270899°	77.323948°	38.9
Ailam Drain	R18	4.63	29.248138°	77.316011°	35.2
Stream 3	R19	1.49	29.234839°	77.314118°	33.3
Kandhla Drain	R20	16.7	29.221296°	77.316941°	31
Kishanpur	R21	3.49	29.201308°	77.318876°	26.8
Stream 2	R22	0.35	29.145663°	77.353950°	14.7
Stream 1	R23	0.3	29.126655°	77.375881°	10



DHAMOLA BASIN: MAJOR SUB-BASINS





PAONDHOI RIVER BASIN

Paondhoi River UID Code:

Basin area: 94.44 Sq. Km.

Number of rivers: 04

River network: 33.21 Km

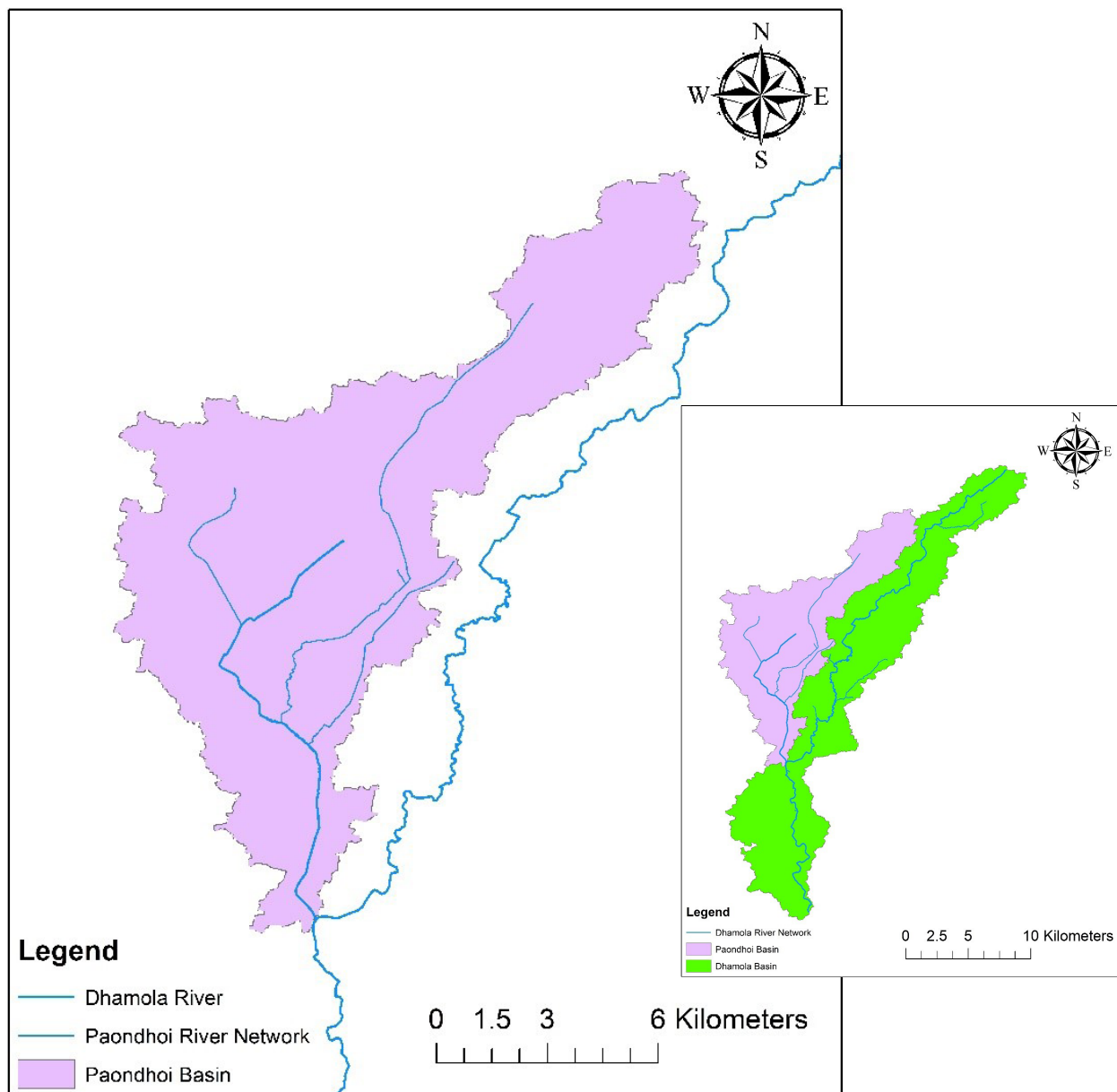


Figure: Paondhoi River Network

PAONDHOI RIVER MAINSTEM FLOW DIAGRAM

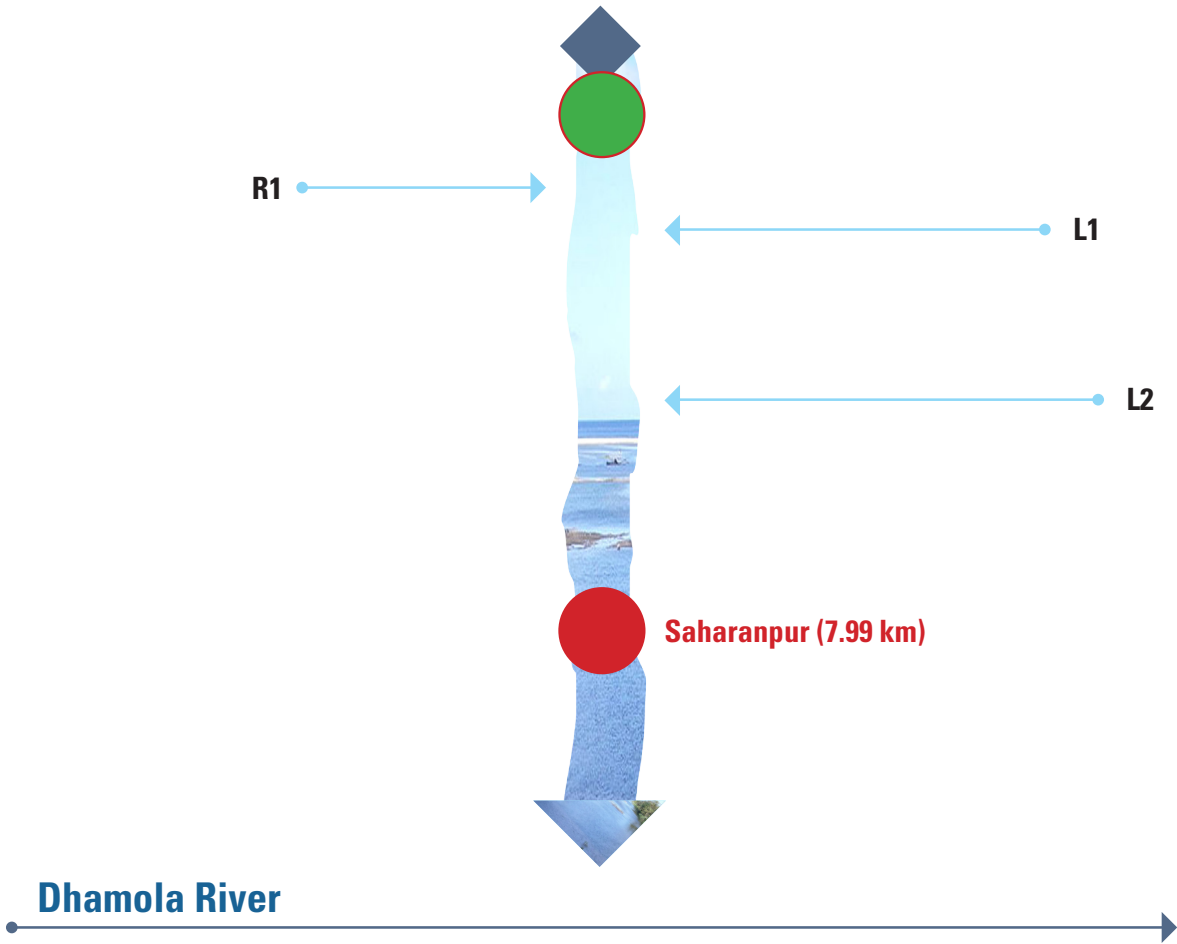
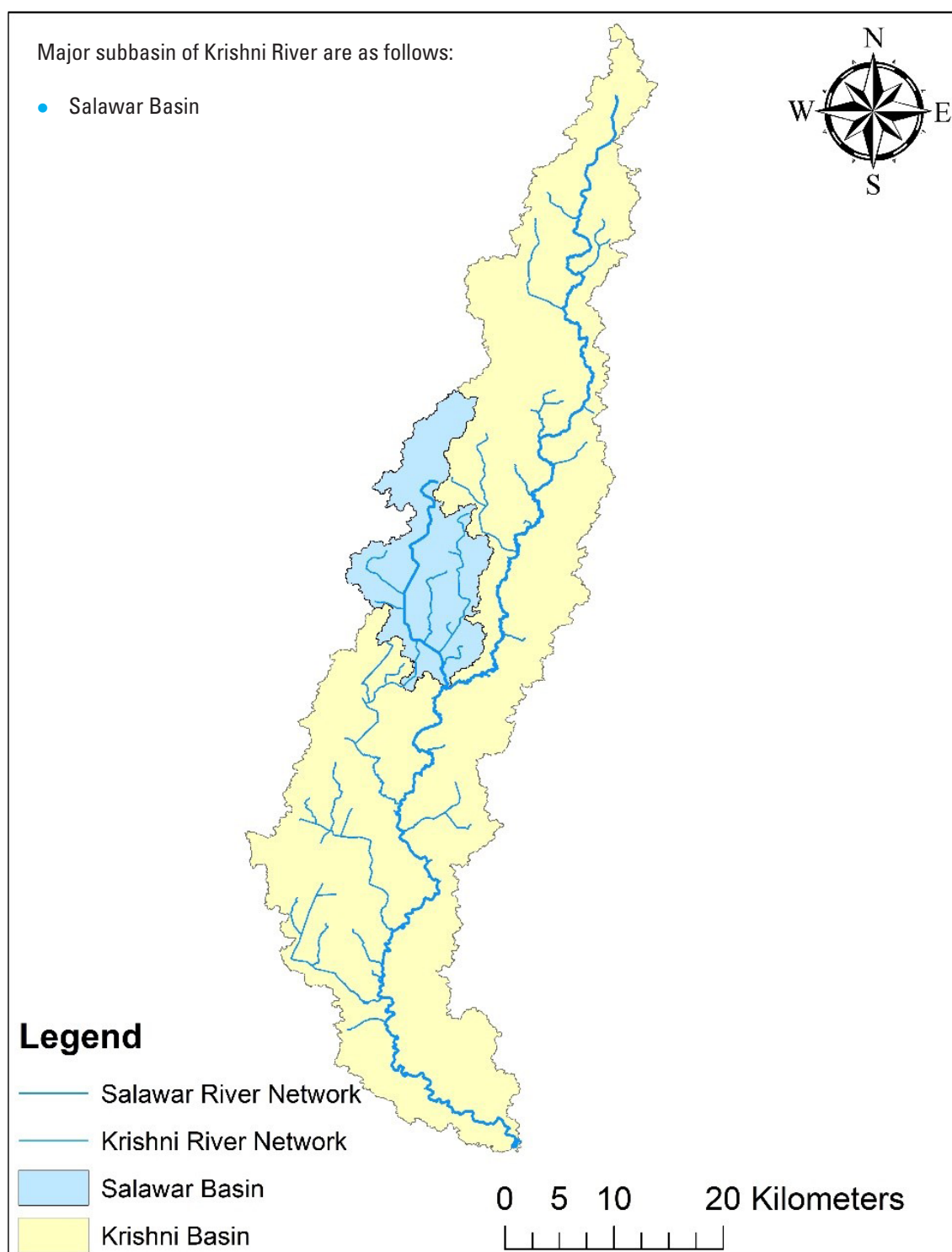


Figure: Flow Diagram of Paondhoi River

PAONDHOI RIVER MAINSTEM NETWORK					
River Name	Confluence Bank	River Length	Co-ordinate		Distance from Origin
			Latitude	Longitude	
Datauli Drain	R1	4.6	30.034777°	77.532685°	3.47
Shankarpuri Khal	L1	6.41	30.011116°	77.542124°	7
Shankalpur Drain	L2	6.48	30.005751°	77.548919°	7.99



KRISHNI BASIN: MAJOR SUB-BASINS



SALAWAR RIVER BASIN

Salawar River UID Code:
 Basin area: 157.99 Sq. Km.
 Number of rivers: 05
 River network: 58.04 Km

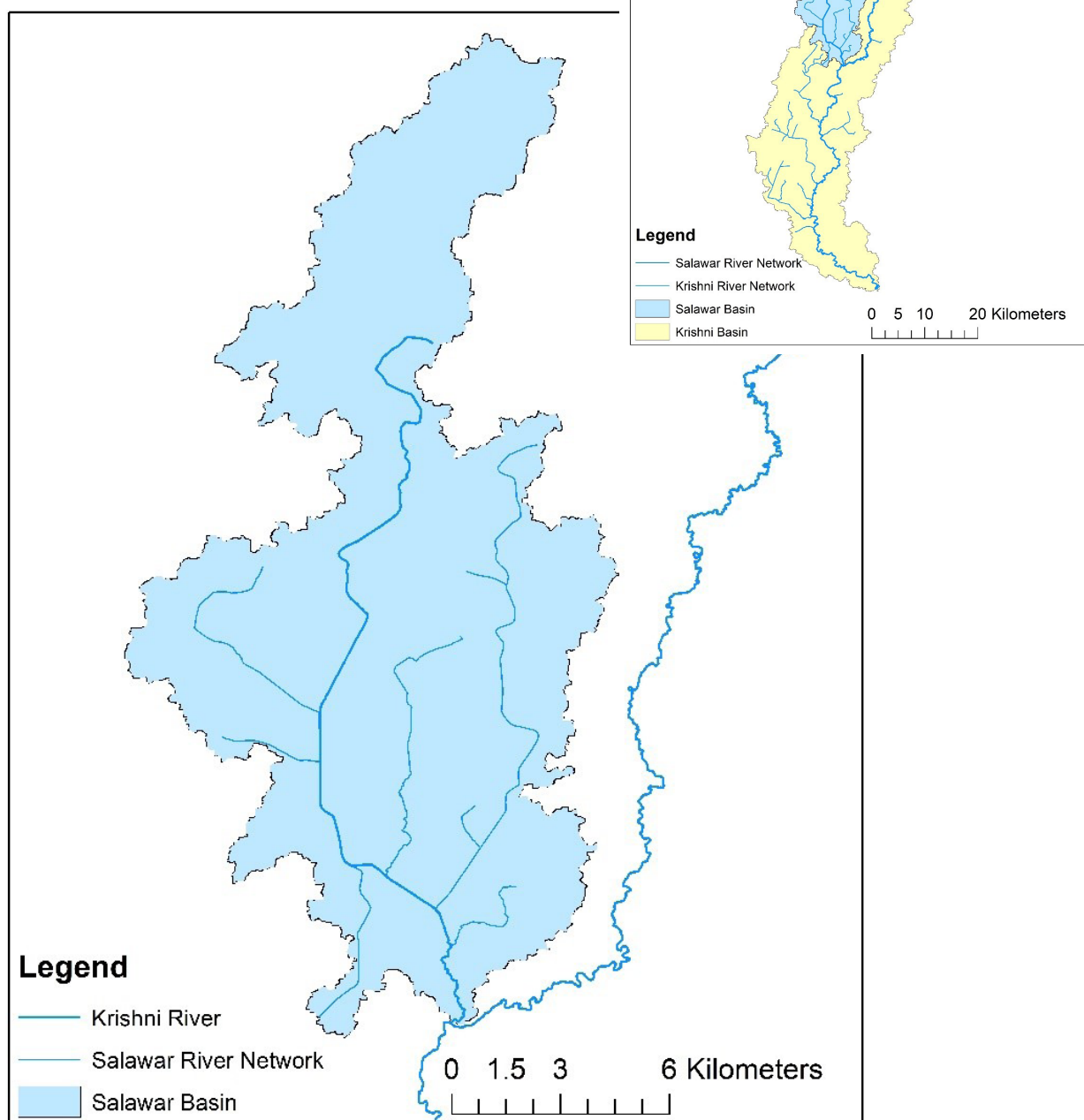


Figure: Salawar River Network



SALAWAR RIVER MAINSTEM FLOW DIAGRAM

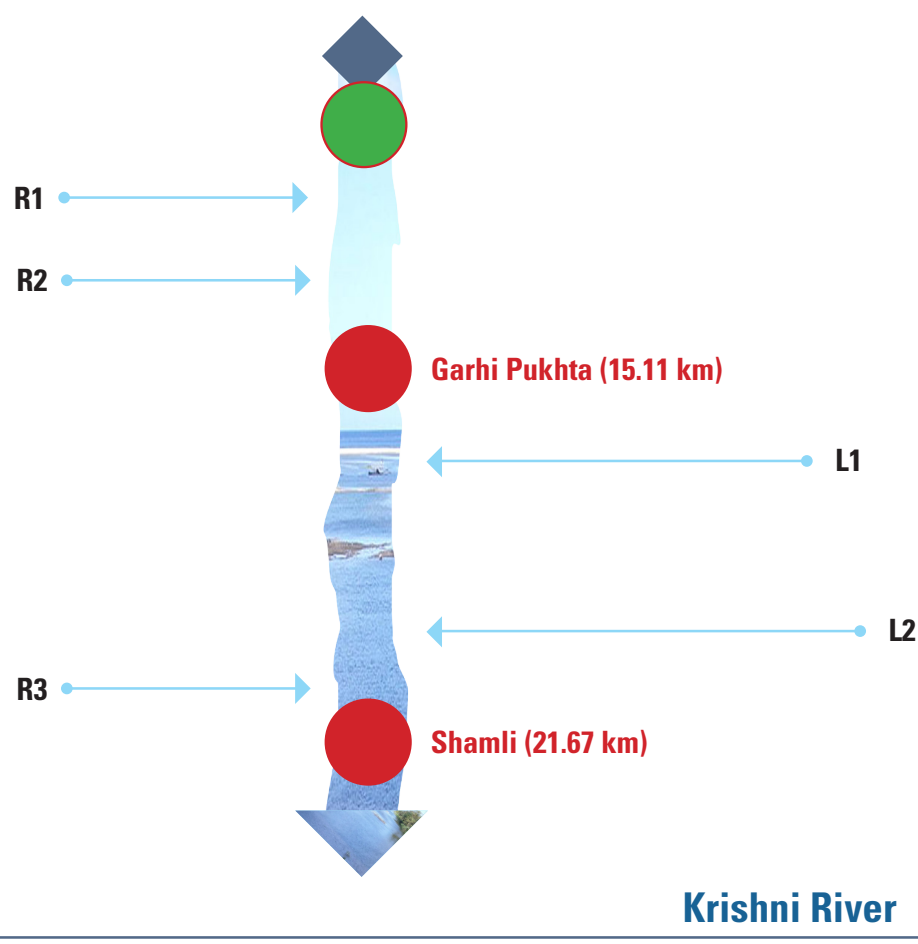
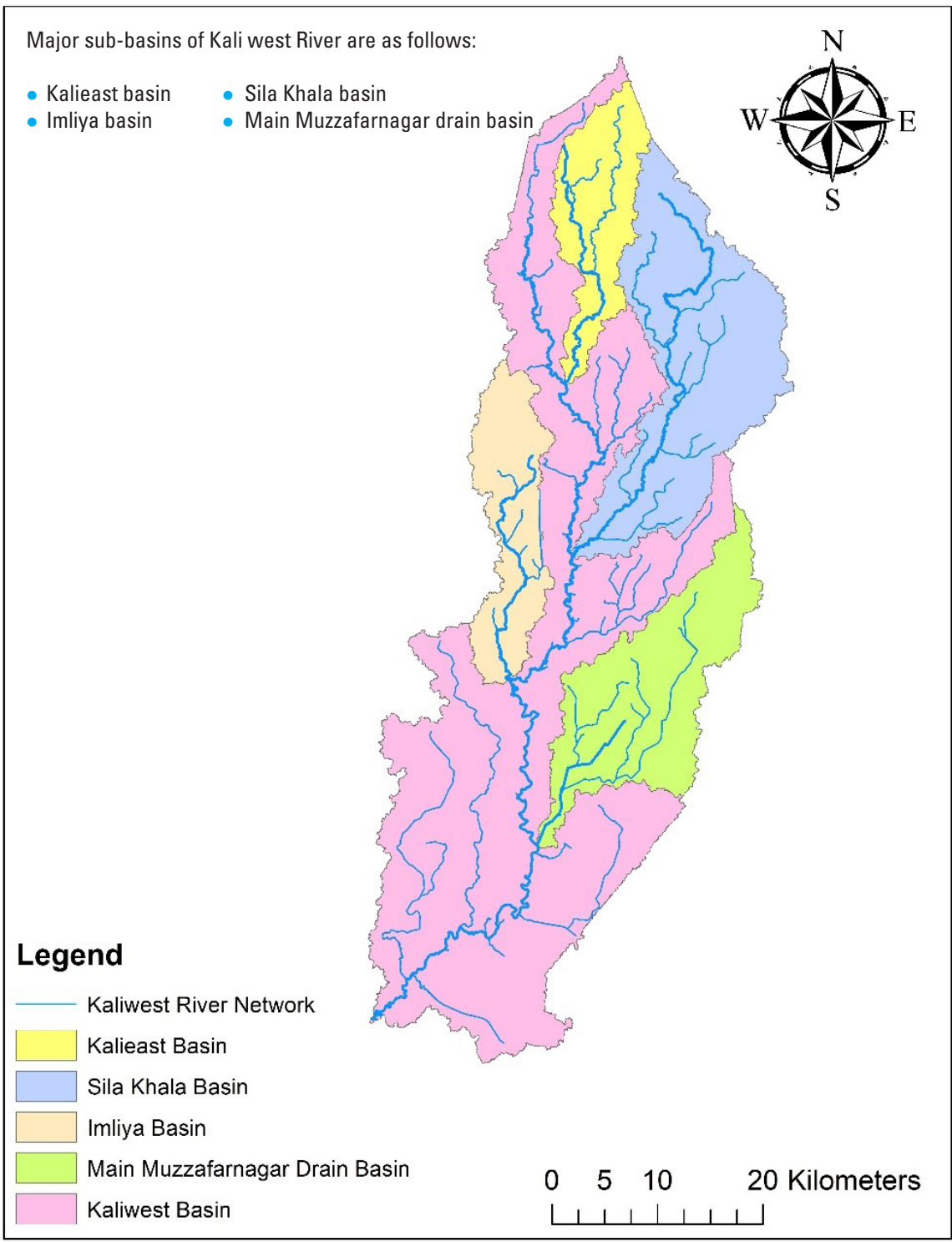


Figure: Flow Diagram of Salawar River

SALAWAR RIVER MAINSTEM NETWORK					
River Name	Confluence Bank	River Length	Co-ordinate		Distance from Origin
			Latitude	Longitude	
Rajhart Drain	R1	6.68	29.553842°	77.334431°	13.7
Garhi Phukta Drain	R2	2.58	29.541735°	77.334216°	15.11
Dhanena Drain	L1	8.58	29.513516	77.350712°	19.16
Harhar Drain	L2	15.6	29.505359°	77.363498	20.69
Mahabatpur Drain	L3	3.23	29.496109°	77.366867°	21.67

KALI WEST BASIN: MAJOR SUB-BASINS





KALI EAST RIVER BASIN

Kali East River UID Code:
 Basin area: 147.54 Sq. Km.
 Number of rivers: 05
 River network: 67.69 Km

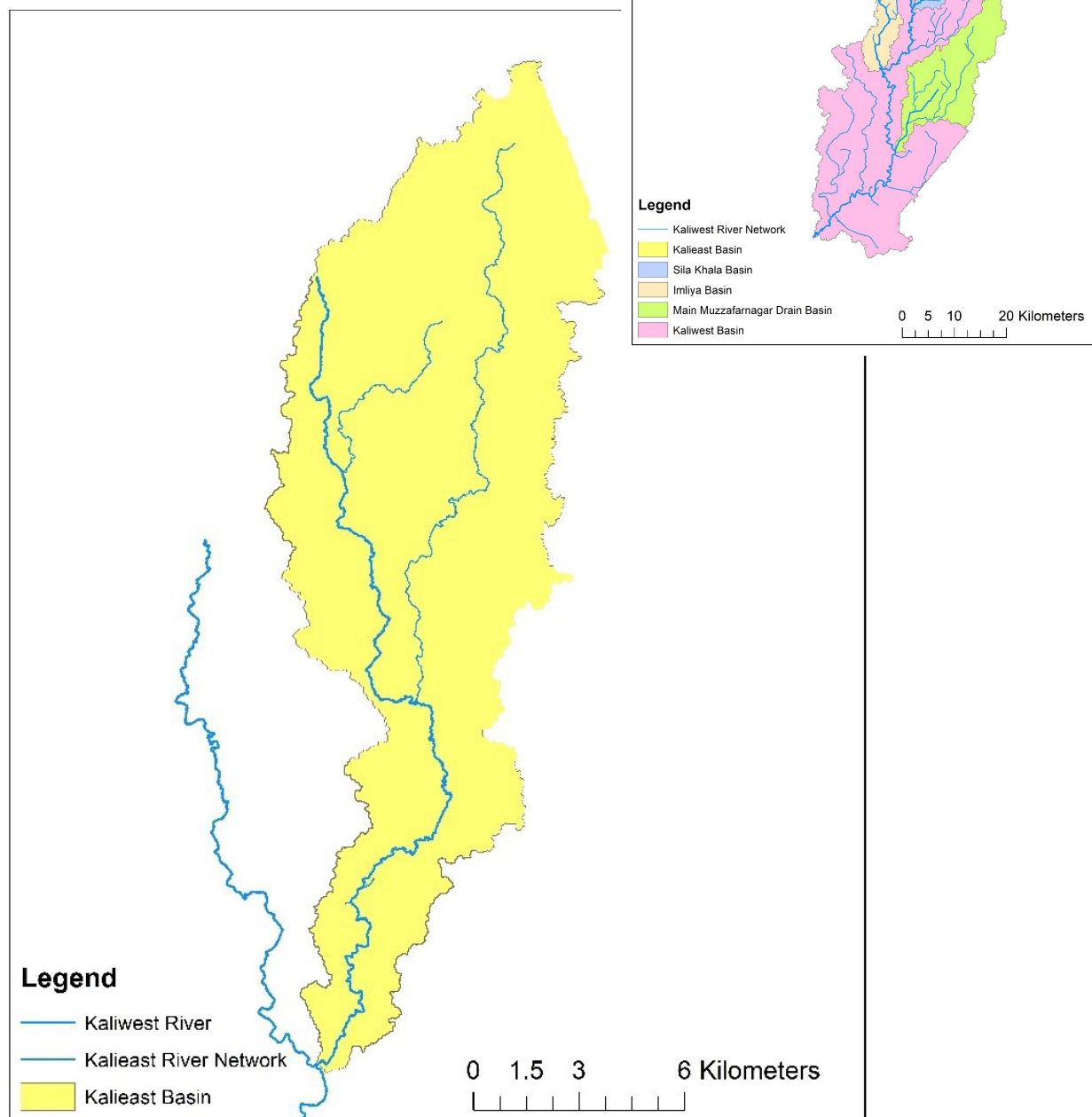


Figure: Kaliwest River Network

KALI EAST RIVER MAINSTEM FLOW DIAGRAM

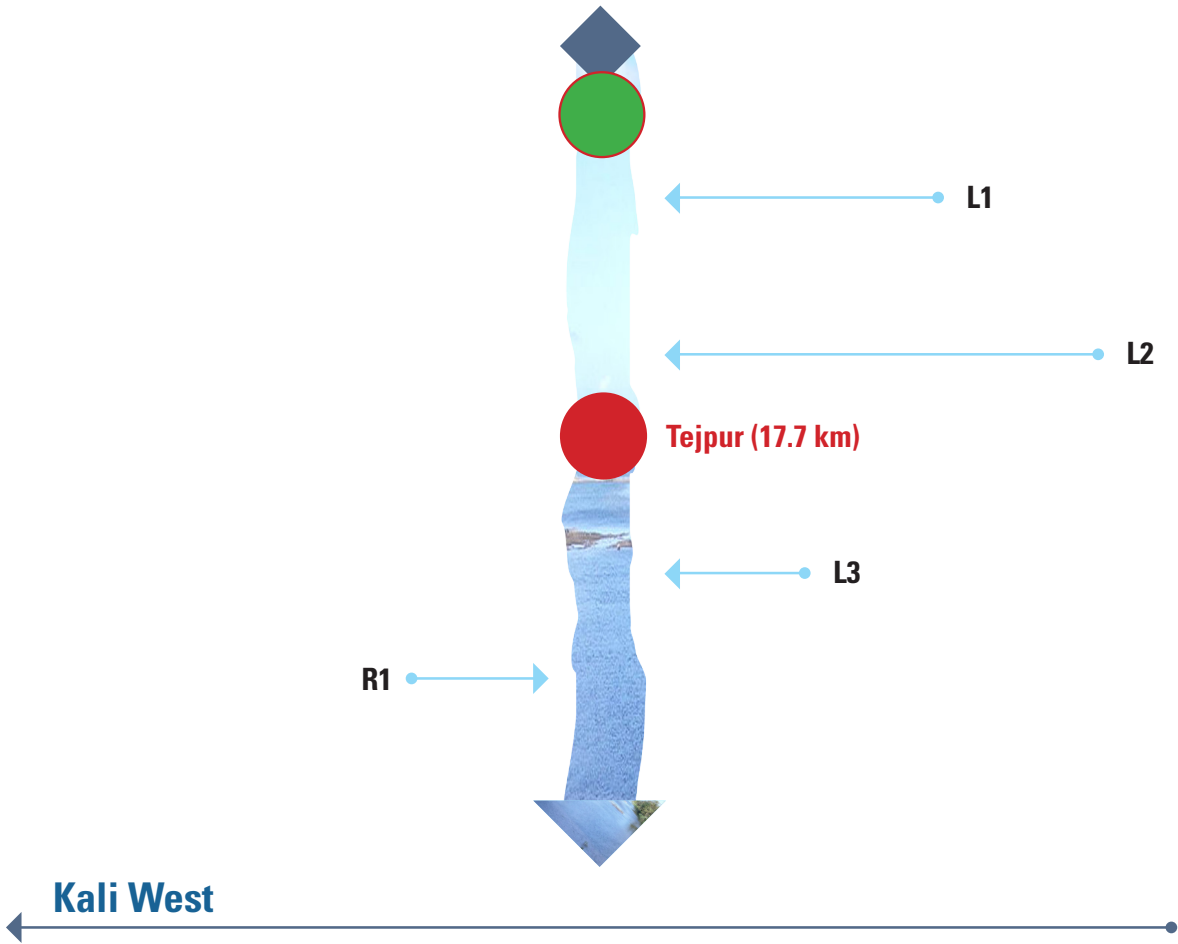


Figure: Flow Diagram of Kali East River

KALI EAST RIVER MAINSTEM NETWORK					
River Name	Confluence Bank	River Length	Co-ordinate		Distance from Origin
			Latitude	Longitude	
Stream 3	L1	7.95	29.913181°	77.704629°	7.2
PilaKhar Drain	L2	23.7	29.854613°	77.728197°	17.7
Stream 2	L3	0.5	29.806692°	77.713846°	26.99
Stream 1	R1	0.24	29.802495°	77.711115°	27.59



SILA KHALA RIVER BASIN

Sila Khala River UID Code:

Basin area: 379.77 Sq. Km.

Number of rivers: 13

River network: 143.27 Km

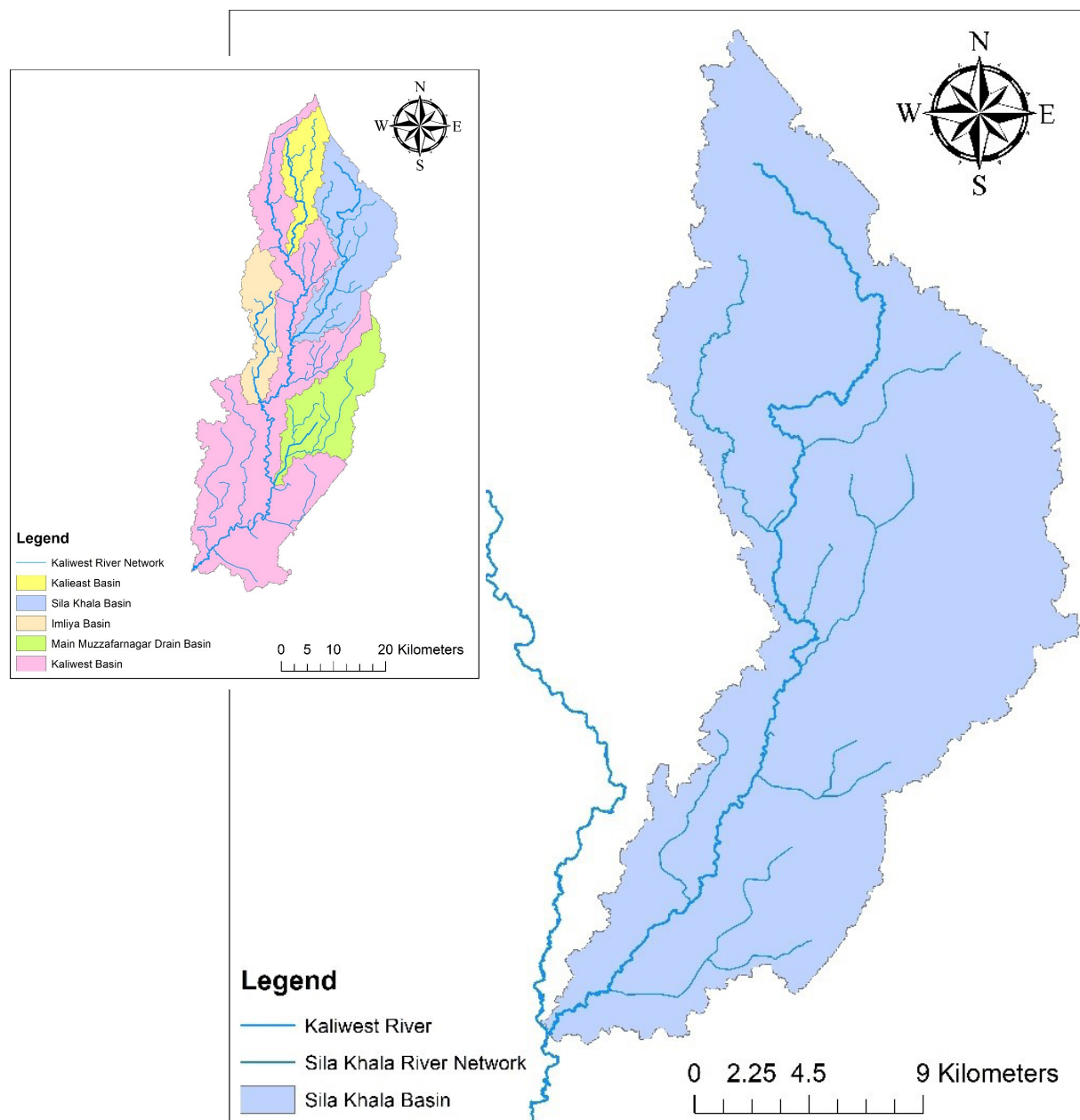


Figure: Sila Khala River Network

SILA KHALA RIVER MAINSTEM FLOW DIAGRAM

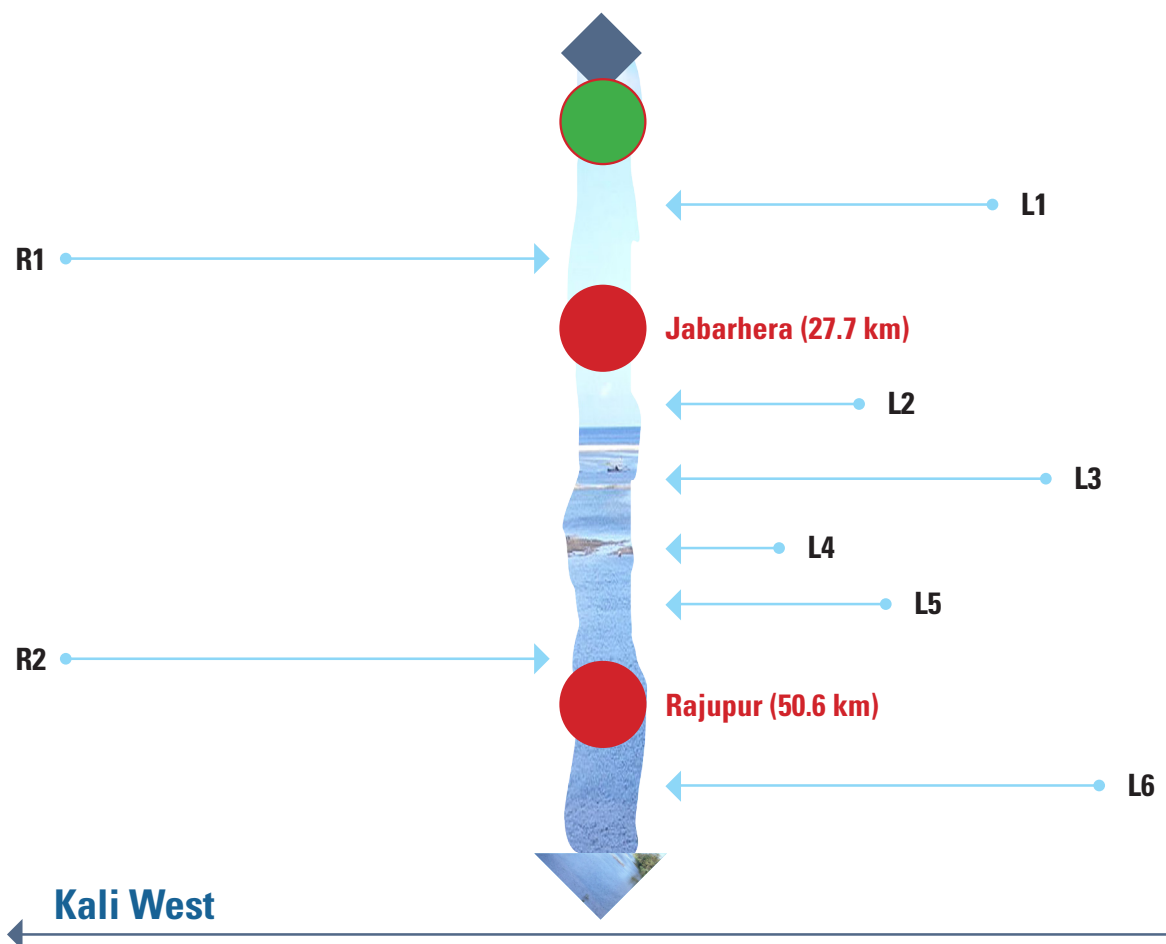


Figure: Flow Diagram of Sila Khala River

SILA KHALA RIVER MAINSTEM NETWORK					
River Name	Confluence Bank	River Length	Co-ordinate		Distance from Origin
			Latitude	Longitude	
River Name	L1	8.54	29.823288°	77.813095°	23.4
Stream 3	R1	19.8	29.793522°	77.802599°	27.7
Stream2	L2	3.54	29.762086°	77.814470°	32.8
Mandet Drain	L3	9.58	29.745834°	77.813619°	36.3
Stream 1	L4	0.4	29.720882°	77.800676°	40.3
Narsen cut	L5	6.11	29.706762°	77.797060°	42.5
Sadharanpur cut	R2	8.88	29.660652°	77.771479°	50.6



IMLIYA NALA BASIN

Imliya Nala River UID Code:

Basin area: 157.17 Sq. Km.

Number of rivers: 08

River network: 56.16 Km

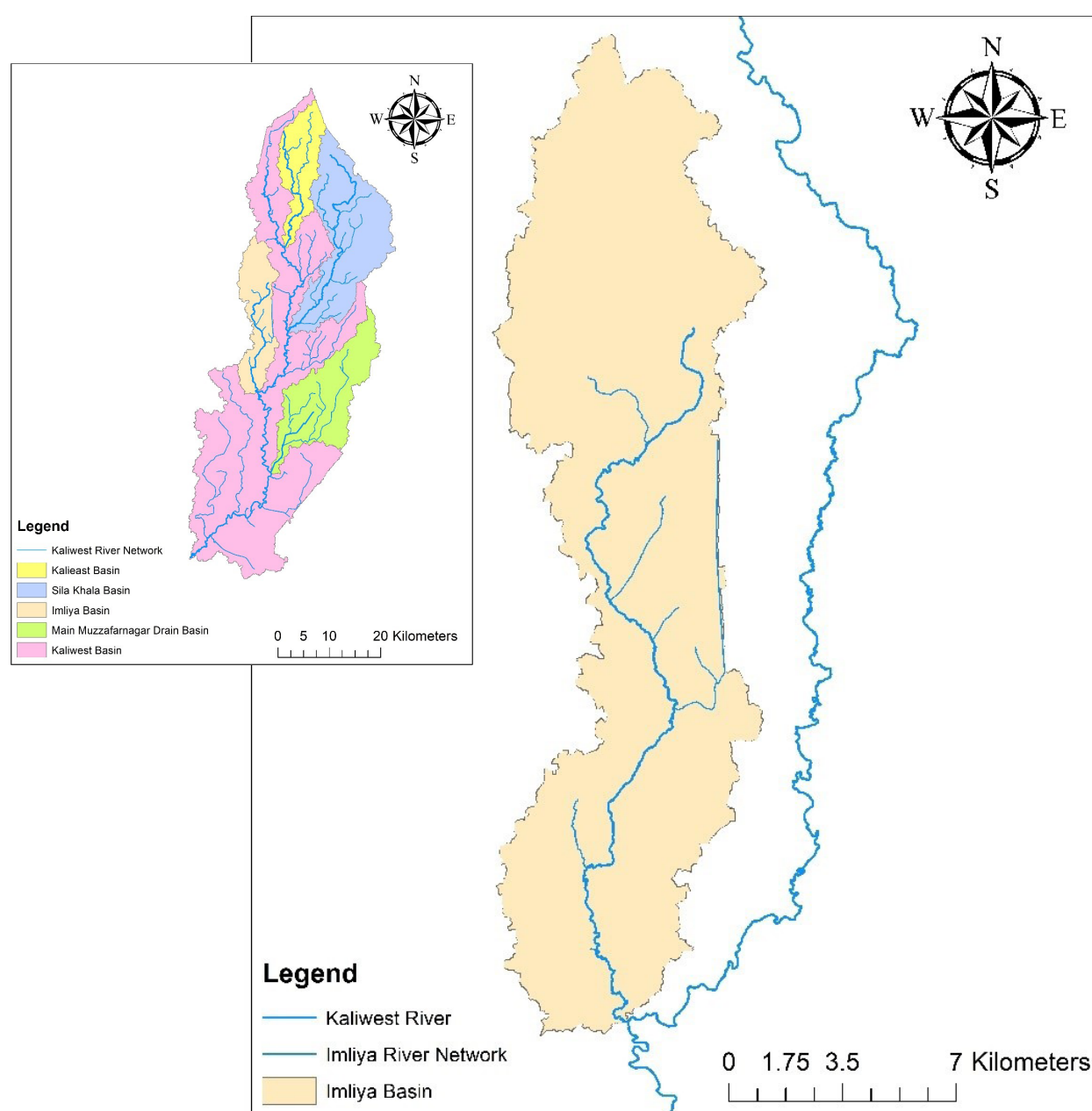


Figure: Imliya River Network

IMLIYA NALA MAINSTREAM FLOW DIAGRAM

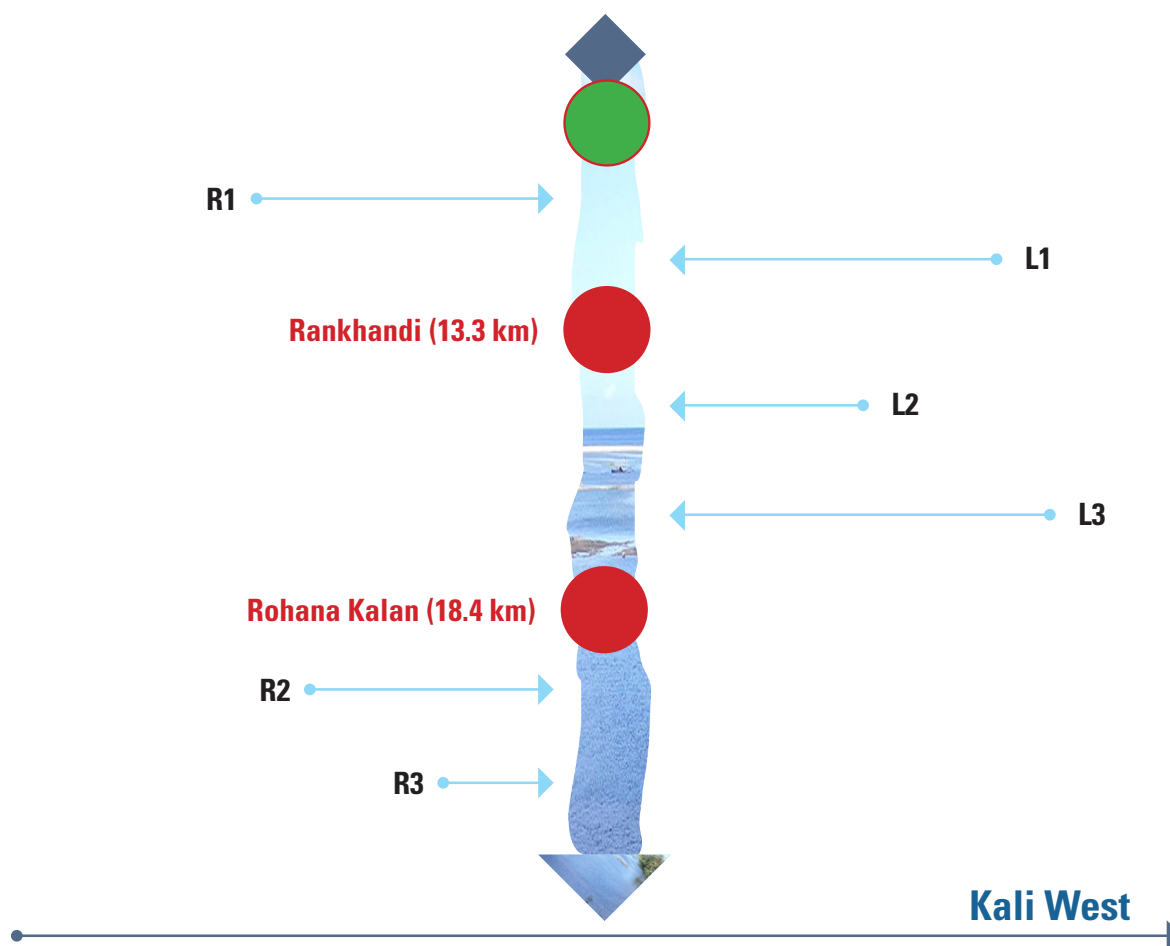


Figure: Flow Diagram of Imliya Nala

IMLIYA NALA RIVER MAINSTREAM NETWORK					
River Name	Confluence Bank	River Length	Co-ordinate		Distance from Origin
			Latitude	Longitude	
Jhabiran Drain	R1	3.57	29.665703°	77.659221°	5.1
Stream 3	L1	3.86	29.621861°	77.649007°	13.3
Gadmalpur Drain	L2	1.34	29.611301°	77.662779°	15.4
Deoband Ghalau Drain	L3	9.81	29.592844°	77.670308°	18.4
Stream 2	R2	2.57	29.547036°	77.643843°	25.7
Stream 1	R3	0.24	29.524844°	77.648280°	29.1



MAIN MUZAFFARNAGAR DRAIN BASIN

Main Muzaffarnagar Drain UID Code:

Basin area: 264.96 Sq. Km.

Number of rivers: 08

River network: 79.45 Km

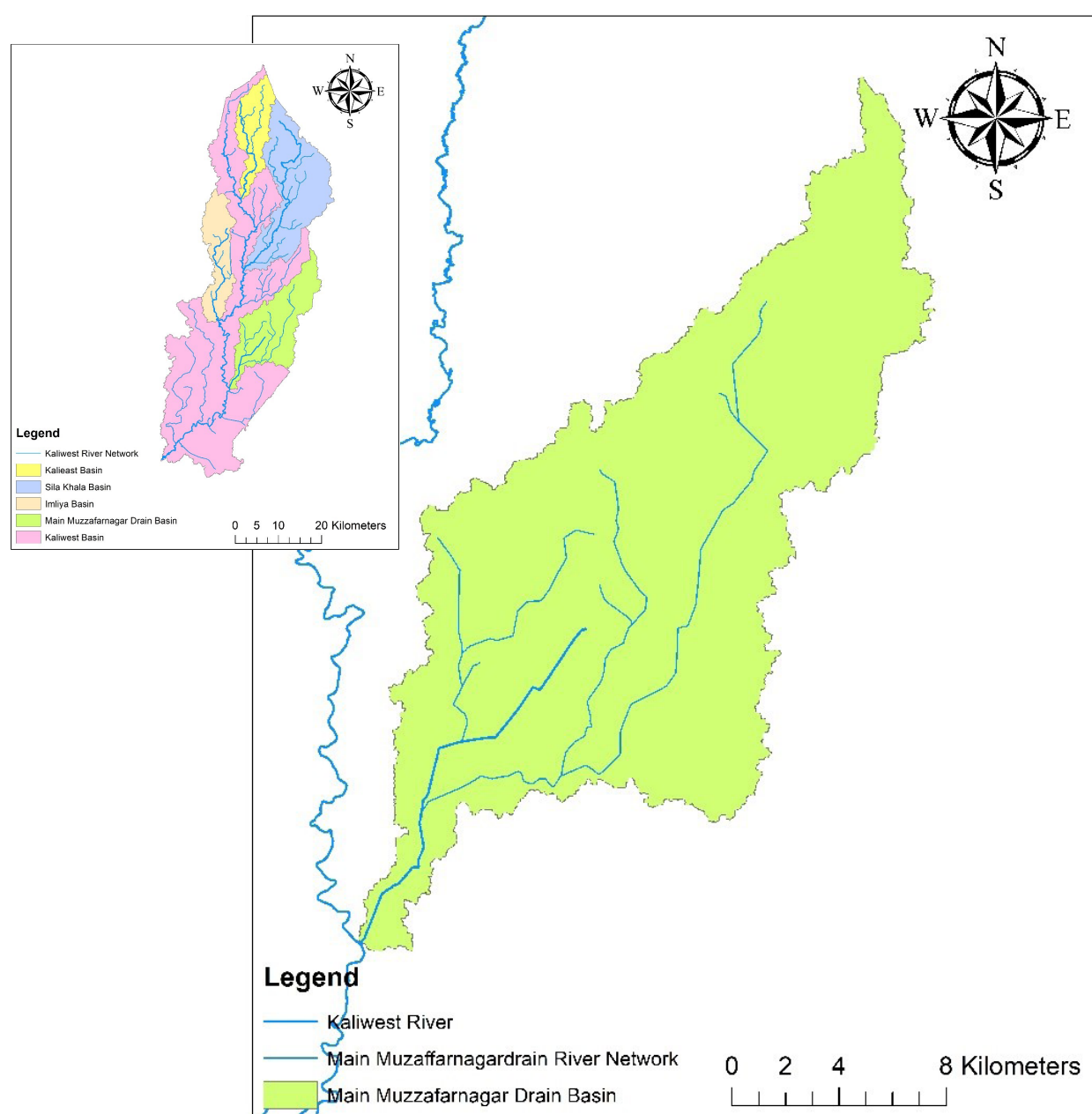


Figure: Muzaffarnagar Drain Network

MAIN MUZAFFARNAGAR DRAIN MAINSTEM FLOW DIAGRAM

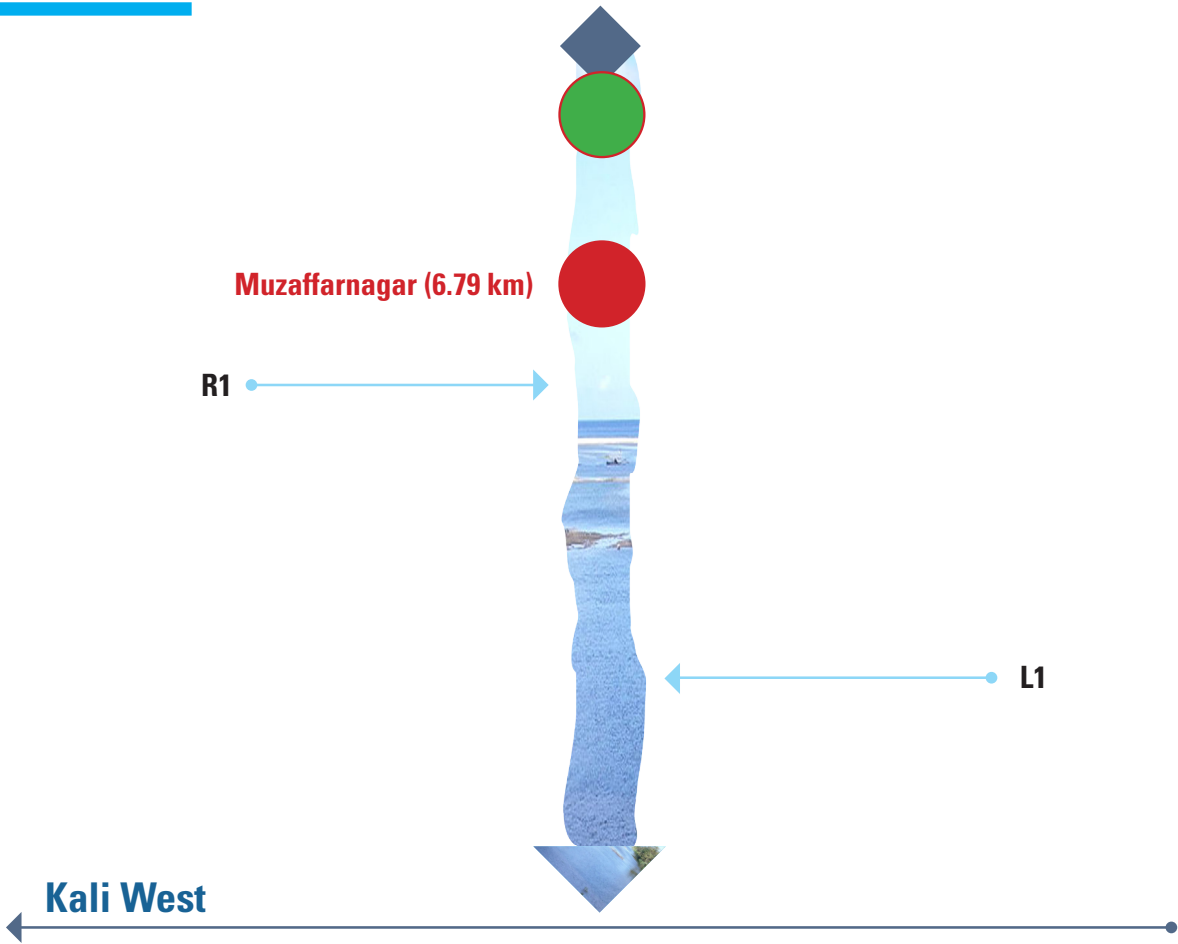
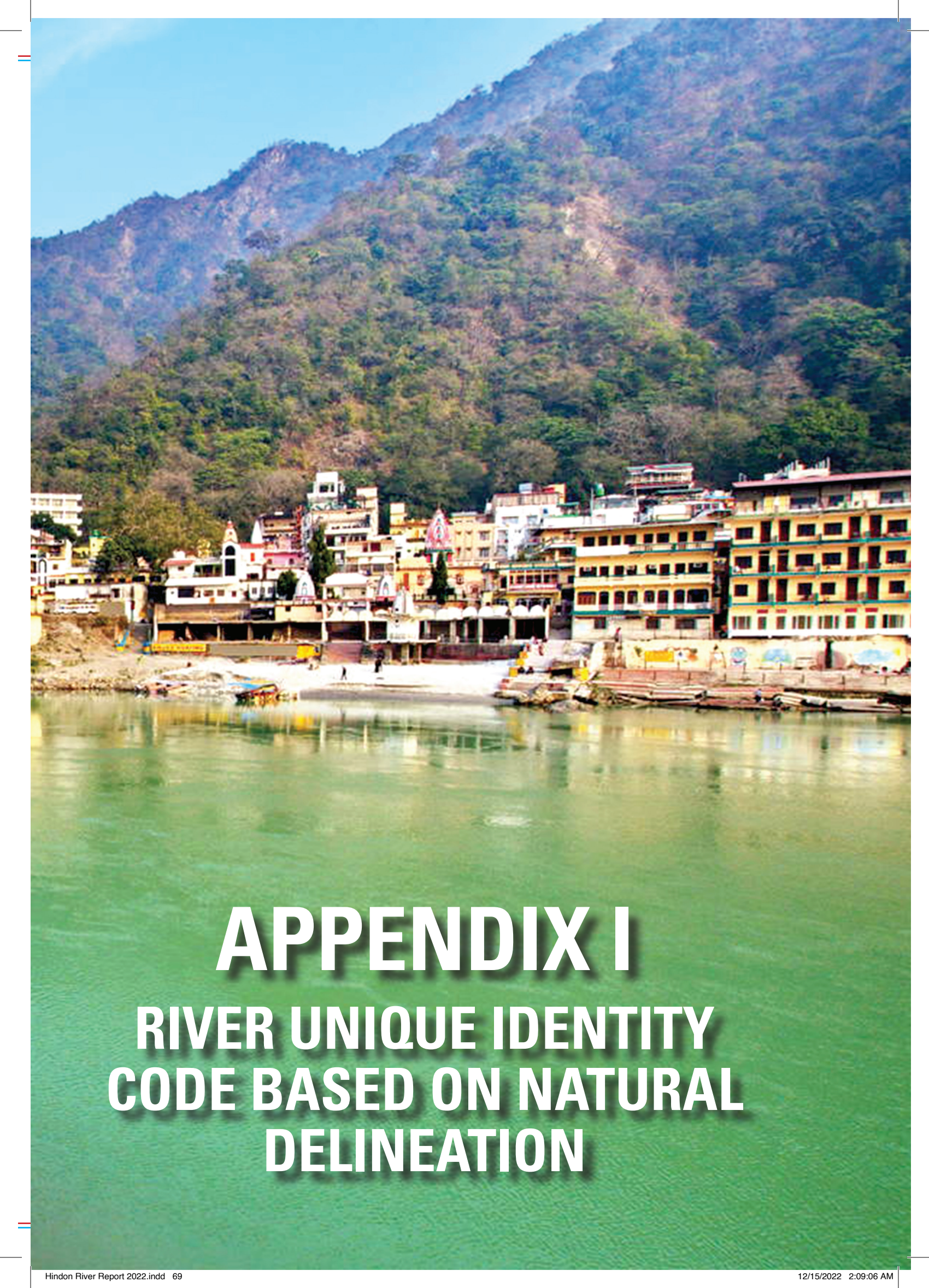


Figure: Flow Diagram of Main Muzzafarnagar Drain

MAIN MUZAFFARNAGAR DRAIN MAINSTEM NETWORK					
River Name	Confluence Bank	River Length	Co-ordinate		Distance from Origin
			Latitude	Longitude	
Kukra Drain	R1	3.58	29.434448°	77.725072°	6.79
Dhandedra Datiyana Drain	L1	19.8	29.410582°	77.710565°	10.2



APPENDIX I

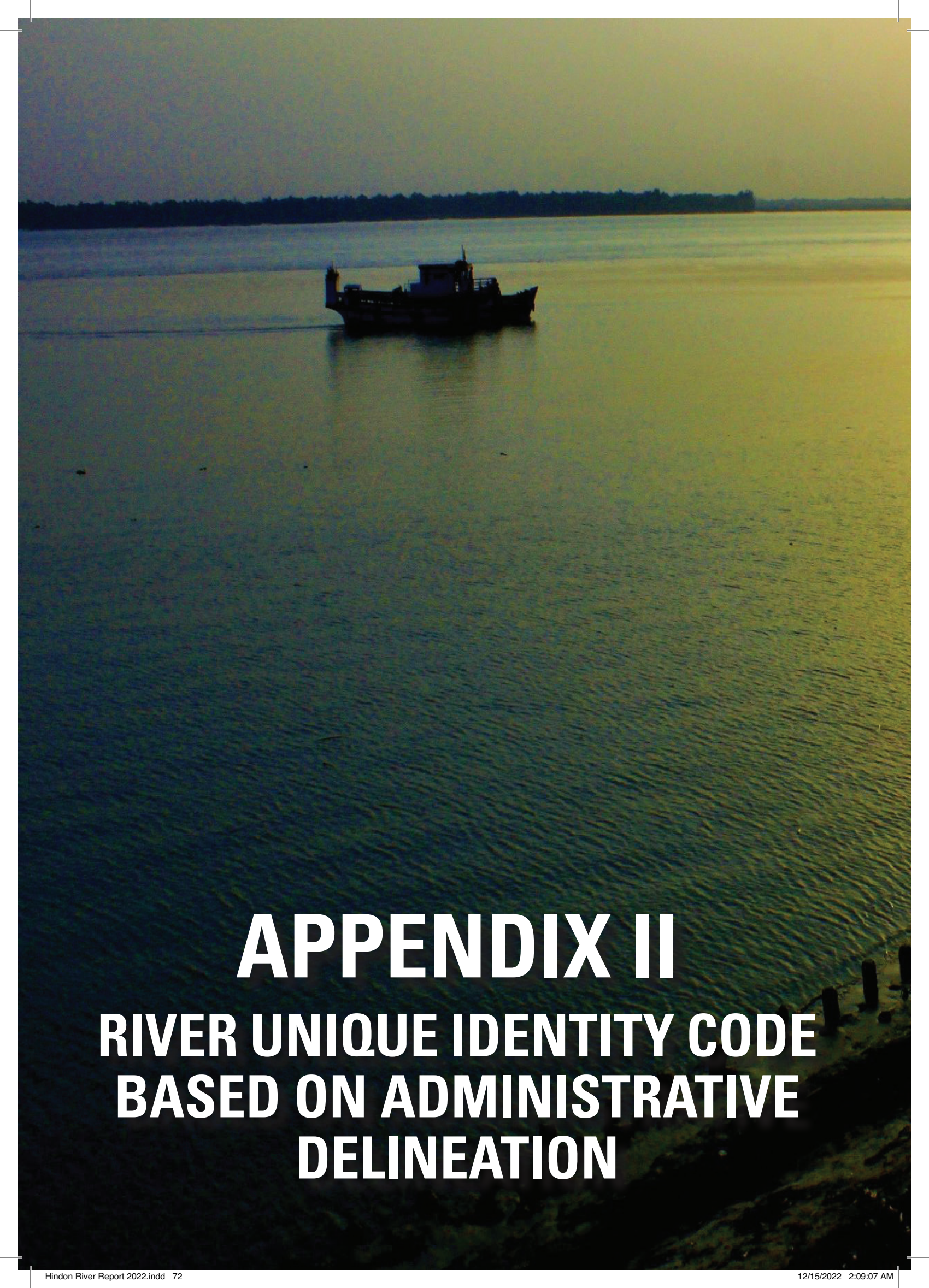
RIVER UNIQUE IDENTITY CODE BASED ON NATURAL DELINEATION

RIVER UNIQUE IDENTITY CODE BASED ON NATURAL DELINEATION: HINDON BASIN

S.No	River Code	Origin Data			Confluence Data					
	Unique Identification Number	Co-ordinate		Ele (m)	Co-ordinate		Ele (m)	Confluence with		Length Of the river (km.)
		Lat	Long		Lat	Long				
1	02-R-23-L-XX	30.28	77.84	761	28.41	77.49	189	Yamuna	371	
2	02-R-23-L-XX-L-01	30.27	77.85	742	30.27	77.84	632	Hindon	0.94	
3	02-R-23-L-XX-R-01	30.27	77.84	728	30.27	77.84	609	Hindon	1.56	
4	02-R-23-L-XX-R-01-R-01	30.27	77.84	717	30.27	77.84	664	Stream 20	0.41	
5	02-R-23-L-XX-L-02	30.26	77.84	659	30.26	77.84	587	Hindon	1.35	
6	02-R-23-L-XX-R-02	30.28	77.83	714	30.25	77.82	536	Hindon	3.80	
7	02-R-23-L-XX-R-02-L-02	30.27	77.84	723	30.26	77.83	583	Stream 18	1.58	
8	02-R-23-L-XX-R-02-L-02	30.28	77.83	699	30.27	77.83	603	Stream 18	1.69	
9	02-R-23-L-XX-R-02-R-01	30.28	77.83	760	30.27	77.82	622	Stream 18	1.86	
10	02-R-23-L-XX-L-03	30.22	77.81	443	30.20	77.80	386	Hindon	3.51	
11	02-R-23-L-XX-R-03	30.21	77.79	401	30.18	77.79	361	Hindon	2.95	
12	02-R-23-L-XX-L-04	30.20	77.82	419	30.16	77.78	342	Hindon	7.11	
13	02-R-23-L-XX-L-05	30.18	77.81	384	30.16	77.78	336	Hindon	4.62	
14	02-R-23-L-XX-L-06	30.15	77.79	348	30.14	77.77	327	Hindon	2.13	
15	02-R-23-L-XX-L-07	30.12	77.77	322	30.06	77.73	290	Hindon	9.12	
16	02-R-23-L-XX-L-08	30.06	77.74	298	30.05	77.73	290	Hindon	1.71	

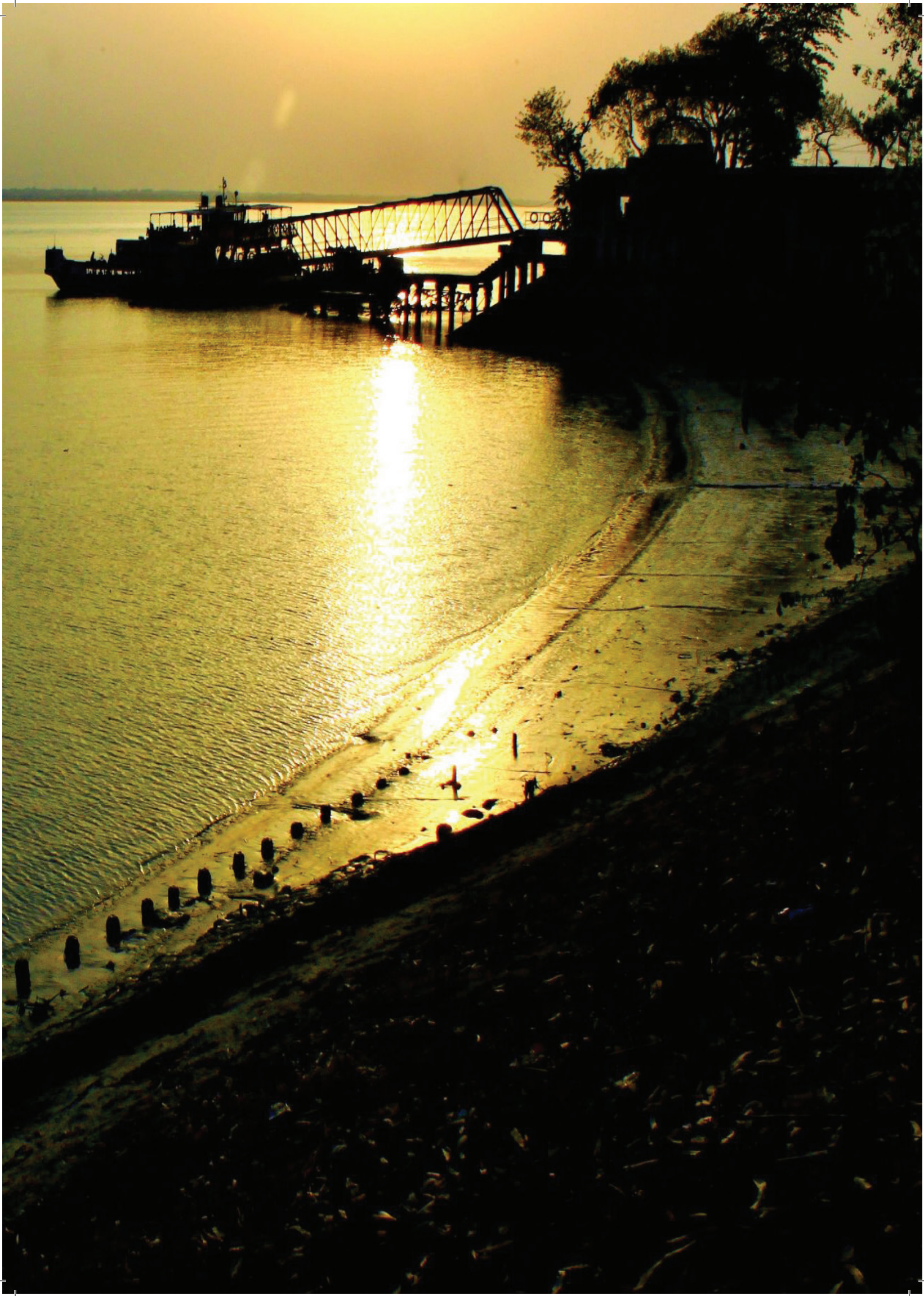


S.No	River Code	Origin Data			Confluence Data				Length Of the river (km.)
	Unique Identification Number	Co-ordinate		Ele (m)	Co-ordinate		Ele (m)	Confluence with	
		Lat	Long		Lat	Long			
17	02-R-23-L-XX-R-04	30.18	77.77	356	29.94	77.61	270	Hindon	50.5
18	02-R-23-L-XX-R-04-R-01	30.22	77.79	421	30.18	77.77	355	Nagdev	4.83
19	02-R-23-L-XX-R-04-L-01	30.20	77.79	389	30.18	77.76	349	Nagdev	3.97
20	02-R-23-L-XX-R-04-L-02	30.19	77.78	383	30.18	77.76	348	Nagdev	3.31
21	02-R-23-L-XX-R-04-L-03	30.17	77.77	351	30.17	77.75	336	Nagdev	2.42
22	02-R-23-L-XX-R-04-R-02	30.18	77.76	348	30.17	77.75	332	Nagdev	1.75
23	02-R-23-L-XX-R-04-R-03	30.17	77.74	336	30.16	77.73	321	Nagdev	1.70
24	02-R-23-L-XX-R-04-R-04	30.26	77.80	548	30.15	77.72	312	Nagdev	20.3
25	02-R-23-L-XX-R-04-R-04-L-01	30.23	77.77	410	30.22	77.76	392	Kothari Rao	1.12
26	02-R-23-L-XX-R-04-R-04-L-02	30.23	77.80	540	30.21	77.77	382	Kothari Rao	5.14
27	02-R-23-L-XX-R-04-L-04	30.10	77.71	307	30.03	77.66	285	Nagdev	13.4
28	02-R-23-L-XX-R-04-R-05	30.02	77.62	287	29.97	77.61	275	Nagdev	7.56
29	02-R-23-L-XX-R-04-L-05	29.98	77.63	280	29.97	77.61	273	Nagdev	3.15
30	02-R-23-L-XX-R-05	29.93	77.58	276	29.92	77.59	267	Hindon	2.58
31	02-R-23-L-XX-L-09	29.85	77.59	266	29.77	77.57	258	Hindon	11

A wide-angle photograph of a large body of water, likely a river or lake, under a hazy, overcast sky. In the middle distance, a small, dark-colored boat is visible, moving across the water. The water's surface is textured with small ripples. In the far background, a dark, silhouetted line of trees or land is visible against the horizon. The overall color palette is muted, with greys, blues, and greens.

APPENDIX II

RIVER UNIQUE IDENTITY CODE BASED ON ADMINISTRATIVE DELINEATION



ADMINISTRATIVE DELENEATION CODES FOR HINDON BASIN

S.No	River Code	Vilage/ Town Entry Data		Vilage/ Town Exit Data		
	Uniquw Identification Number	Coordinates		Coordinates		Village/Town
		Lat	Long	Lat	Long	
1	356-UP-132-XX-02-01	30.28	77.84	30.21	77.80	Barkala Reserved Forest
2	356-UP-132-XX-02-01	30.21	77.80	30.19	77.79	Kaluwala Paharipur
3	356-UP-132-XX-02-01	30.19	77.79	30.17	77.78	Naurangpur
4	356-UP-132-XX-02-01	30.17	77.78	30.14	77.76	Jayantipur
5	356-UP-132-XX-02-01	30.14	77.76	30.13	77.75	Jayantipur
6	356-UP-132-XX-02-01	30.13	77.75	30.12	77.73	Fakirpur
7	356-UP-132-XX-02-01	30.12	77.73	30.10	77.72	Khujnawar
8	356-UP-132-XX-02-01	30.10	77.72	30.08	77.73	Muradnagar
9	356-UP-132-XX-02-01	30.08	77.73	30.06	77.73	Nasrullapur
10	356-UP-132-XX-02-01	30.06	77.73	30.04	77.73	Chaundaheri
11	356-UP-132-XX-02-01	30.04	77.73	30.03	77.72	Ibrahimpur
12	356-UP-132-XX-02-01	30.03	77.72	30.03	30.03	Jajner
13	356-UP-132-XX-02-01	30.03	30.03	30.01	77.69	Budakhara
14	356-UP-132-XX-02-01	30.01	77.69	30.00	77.69	Muhammadpur Tiwaya
15	356-UP-132-XX-02-01	30.00	77.69	29.99	77.66	Haraura
16	356-UP-132-XX-02-01	29.99	77.66	29.98	77.66	Tiwaya
17	356-UP-132-XX-02-01	29.98	77.66	29.98	77.66	Gagalheri
18	356-UP-132-XX-02-01	29.98	77.66	29.97	77.65	Dinarpura
19	356-UP-132-XX-02-01	29.97	77.65	29.95	77.64	Khajuri Akbarpur
20	356-UP-132-XX-02-01	29.95	77.64	29.95	77.62	Papreki Rasulpur
21	356-UP-132-XX-02-01	29.95	77.62	29.94	77.61	Beherki
22	356-UP-132-XX-02-01	29.94	77.61	29.93	77.59	Hasanpur Bhalsua
23	356-UP-132-XX-02-01	29.93	77.59	29.91	77.61	Kapasa
24	356-UP-132-XX-02-01	29.91	77.61	29.89	77.59	Lakhanpur
25	356-UP-132-XX-02-01	29.89	77.59	29.88	77.58	Belra Zunarsar
26	356-UP-132-XX-02-01	29.88	77.58	29.87	77.57	Firozpur
27	356-UP-132-XX-02-01	29.87	77.57	29.86	77.57	Nanandi
28	356-UP-132-XX-02-01	29.86	77.57	29.86	77.57	Zainpur
29	356-UP-132-XX-02-01	29.86	77.57	29.85	77.57	Saragthal Rampur



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