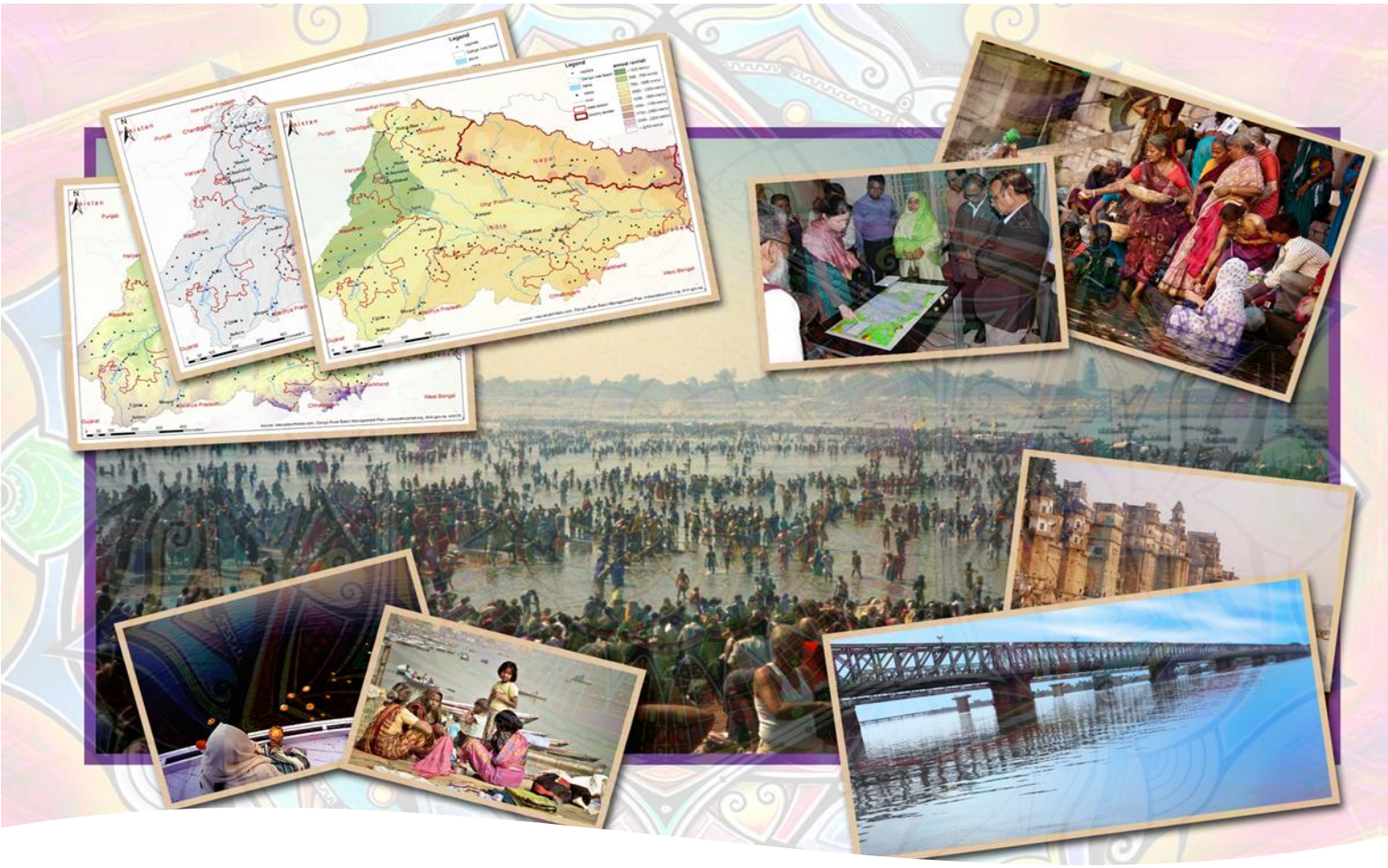
AECOM FutureWater Deltares

Strategic Basin Planning for Ganga River Basin in India



Ganga River Basin Planning Assessment Report

Appendices

Final
November 2018

Deltares

Title
Ganga River Basin Planning Assessment (Report: appendices)

Client	Project	Reference	Pages
World Bank and Government of India	1220123-002	1220123-002-ZWS-0004	

Keywords
India, Ganga, Model, Information System, Hydrology, Geohydrology, Water quality, Ecology, Water allocation, Integrated Water Resources Management

Summary
The World Bank has assigned Deltares and its partners AECOM India and FutureWater to carry out the project "*Analytical Work and Technical Assistance to support Strategic Basin Planning for Ganga River Basin in India*" in cooperation with the Government of India. The objectives of the project are 1) to strengthen the capacity with respect to strategic basin planning, 2) to develop a set of scenarios for the development of the Ganga basin, 3) to build a strong and accessible knowledge base and 4) to establish a multi-stakeholder engagement process to support strategic basin planning. This report contains:

- The assessment of scenario and strategy modelling;
- The environmental flow assessment;
- The surface water – groundwater interaction assessment.

This report contributes to project milestone 5 of the project.
This volume contains the appendices to the report.

Reference
Bons, C.A. (Ed.), 2018. Ganga River Basin Planning Assessment Report. Main volume and Appendices. Deltares with AECOM and FutureWater for the World Bank and the Government of India, Report 1220123-002-ZWS-0004.

State
Final

Contents

Abbreviations and Acronyms **iii**

Preamble **1**

A Indicators for E-flow Assessment **3**

B Ecozones **5**

C Hydrological Alteration Present versus Pristine for all Zones **9**

D Ecological Scores Present versus Pristine for all Zones **45**
D.1 Class Distributions per Species 45
D.2 Total Ecological Scores 51

E Socio-economic Scores Present versus Pristine for all Zones **55**
E.1 Class Distributions per Service 55
E.2 Total Socio-economic Scores 58

F Scenario Results for E-flow Indicators **61**
F.1 Classes per Zone for Hydrological Indicators 61
F.2 Classes per Zone for Ecological Indicators 64
F.3 Classes per Zone for Socio-economic Indicators 68

G Strategy Results for E-flow Indicators in the Present Situation **73**
G.1 Classes per Zone for Hydrological Indicators 73
G.2 Classes per Zone for Ecological Indicators 76
G.3 Classes per Zone for Socio-economic Indicators 80

H Strategy Results for E-flow Indicators under the 2040 RCP4.5 Scenario **85**
H.1 Classes per Zone for Hydrological Indicators 85
H.2 Classes per Zone for Ecological Indicators 88
H.3 Classes per Zone for Socio-economic Indicators 92

I Species List of IUCN Protected Species **97**

J Waste Water Treatment Settings **101**
J.1 Treatment Facilities per Modelling Node 101
J.2 Treatment Efficiencies 114

K Physical Geographic and Geologic Characteristics of the Ganga Basin **119**
K.1 Geography of the Basin 119
K.2 Drainage System and Water Infrastructure 120
K.3 Ganga River Styles 121
K.4 Historical Timeline 122
K.5 Historical Land Use and Drainage Pattern 123
K.6 Physical Geography Conclusions 123
K.7 Geology 124
K.8 Sub-surface Geology and Tectonic Framework 125
K.9 Stratigraphy 126
K.10 Geomorphology 129

K.11 Hydrogeology 131
K.11.1 Pre-tertiary Rocks: 131
K.11.2 Hydrogeology of the Quaternary Regions: 131

L Subsidence 135
L.1 Introduction 135
L.2 Natural Geological Subsidence and Subsidence by Groundwater Pumping 135
L.3 Cracking Soils 137
L.4 Conclusions 138

M Methods to Improve Groundwater Recharge 139

N Groundwater Management Unit Maps 143

Abbreviations and Acronyms

AIR	Advanced Irrigation
ArcGIS	Geographic Information System developed by ESRI
ASCII	American Standard Code for Information Interchange
BIN	Binary
BOD	Biological Oxygen Demand
CCCR	Centre for Climate Change Research
CDM	Common Data Model
CGWB	Central Ground Water Board
CI	Chloride Ion
CIFRI	Central Inland Fisheries Research Institute
COD	Chemical Oxygen Demand
CPCB	Central Pollution Control Board
CRS	Coordinate Reference System
CSW	Catalogue Service for the Web
CWC	Central Water Commission
DAP	Data Access Protocol
DBF	Data Base File
DDFDG	Degree Day Factor for Debris-covered Glaciers
DDFG	Degree Day Factor for non-debris-covered Glaciers
DDFS	Degree Day Factor for Snow
DDV	Delta Data Viewer developed by Deltares
Delft-FEWS	Flood Early Warning System software developed by Deltares
DEM	Digital Elevation Model
DHS	Delft Hydraulic Software
DLL	Dynamic-Link Library
DSS	Decision Support System
DTM	Digital Terrain Model
DWAQ	Delft Water Quality Module developed by Deltares
E FLOW	Environmental flow
EC	Electrical Conductivity
ENVISAT	Environmental Satellite operated by ESA
EPSG	European Petroleum Survey Group
ERD	Entity Relation Diagram
ESM	Earth System Model
ESRI	Environmental Systems Research Institute is an international supplier of geographic information system (GIS) software
EUWATCH	European Union Integrated Project Water and Global Change
FAO	Food and Agricultural Organization
FEWS	Flood Early Warning System
GangaWIS	Ganga Water information system
GDAL	Geospatial Data Abstraction Library
GIS	Geographical Information System

GLIMS	Global Land Ice Measurements from Space
GLOBCOVER	Project of ESA which is now evolving to an international collaboration
GMT	Greenwich Mean Time
GST	Goods and Services Tax
GTiff	Geo Tagged Image File Format
GUI	Graphical User Interface
GW	Groundwater
HDF	Hierarchical Data Format
HTML	Hypertext Markup Language
IASME	International Association of Mechanical Engineers
IBRD	International Bank for Reconstruction and Development
ICAR	Indian Council of Agricultural Research
IHA	Indicators for Hydrological Assessment
IIASA	International Institute for Applied Systems Analysis
IIT	Indian Institute of Technology
IITM	Indian Institute of Tropical Meteorology
IMD	India Meteorological Department
iMOD	A Graphical User Interface + an accelerated Deltares-version of MODFLOW
IndiaWRIS	India Water Resource Information System
IPH	Irrigation and Public Health Department
ISPRS	International Society for Photogrammetry and Remote Sensing
ISRIC	International Soil Reference and Information Centre
ISRO	Indian Space Resources Organization
ISSCAS	Institute of Soil Science, Chinese Academy of Sciences
IWRM	Integrated Water Resources Management
JRC	Joint Research Center of the EU
LCC	Lambert Conformal Conic
LOG	Logarithm
LOGNSE	NSE with logarithmic values
MERIS	MEdium Resolution Imaging Spectrometer
MLD	Million Liter per Day
MODFLOW	USGS's modular hydrologic model
MOU	Memorandum of Understanding
MoWR,RD&GR	Ministry of Water Resources, River Development and Ganga Rejuvenation
MS	MicroSoft
MW	Mega Watt
NB	Nota Bene
NetCDF	Network Common Data Form
NIH	National Institute of Hydrology
NMCG	National Mission for Clean Ganga
NRSC	National Remote Sensing Center
NSE	Nash-Sutcliffe Efficiency
OGC	Open Geospatial Consortium
ONGC	Oil and Natural Gas Commission
OOXDEN	Optimal oxygen concentration for denitrification

OOXNIT	Optimal oxygen concentration for nitrification
OPeNDAP	Open-source Project for a Network Data Access Protocol
OXY	Oxygen
PC	Personal Computer
PHP	Hypertext Preprocessor.
PNG	Portable Network Graphics
PostGIS	An open source software program that adds support for geographic objects to the PostgreSQL object-relational database
PostgreSQL	A powerful, open source object-relational database system developed by the PostgreSQL Global Development Group
PWS	Web Processing Service
PyWPS	Web Processing Service written in Python
QGIS.	Quantum Geographic Information System
RAM	Random Access Memory
RDBMS	Relational Database Management System
REV	Relative Error in Volume
RIBASIM	River Basin Simulation Model developed by Deltares
SAGA	System for Automated Geoscientific Analyses
SEQ	Sequence
SLD	Styled Layer Descriptors
SPHY	Spatial Processes in Hydrology, a distributed hydrological model developed by FutureWater
SQL	Structured Query Language.
SRID	Spatial Reference ID
SRS	Spatial Reference System
SRTM	Shuttle Radar Topography Mission
SRTM DEM	Digital Elevation Model based on SRTM
SVN	Apache Subversion
SW	Surface Water
TDS	Total Dissolved Solids
TDS	THREDDS Data Server
THREDDS	Thematic Real-time Environmental Distributed Data Services
TSS	Time Series
UI	User Interface
UNESCO-IHE	IHE Delft Institute for Water Education
URI	Uniform Resource Identifier
USA	United States of America
USB	Universal Serial Bus
WAQ	Water Quality
WATCH	Integrated Project Water and Global Change
WCS	Web Coverage Service
WFDEI	WATCH Forcing ERA-Interim
Wflow	A distributed hydrological model platform developed by Deltares
WFS	Web Feature Service
WGS	World Geodetic System
WIS	Water Information System
WMS	Web Map Services

WPS	Web Processing Service
WQ	Water Quality
WRIS	Water Resources Information System
XML	Extensible Markup Language

Preamble

The Ganga River basin is the most populated river basin in the world and is home to half the population of India including two-thirds of the nation's poor people. The basin provides over one-third of the available surface water in India and contributes to more than half the national water use of which 90 percent is diverted to irrigation.

The ecological health of the Ganga river and some if its tributaries has deteriorated significantly as a result of high pollution loads from point and non-point sources; high levels of water abstraction for consumptive use, mostly for irrigation, but also for municipal and industrial uses; and flow regime and river modifications caused by water resources infrastructure, dams and barrages for diverting and regulating the river and generating hydropower.

The Government of India has committed itself to an ambitious goal of rejuvenating the Ganga and has assigned significant funds to address the problem. However, in addition to the technical complexity and scale, the rejuvenation of the Ganga is an inherently "wicked problem" given the wide diversity of stakeholder values and perspectives and the political and institutional dimensions that come from distributed responsibilities across multiple jurisdictions and institutions.

The World Bank has assigned Deltares and its partners AECOM India and FutureWater to carry out the present project "*Analytical Work and Technical Assistance to support Strategic Basin Planning for Ganga River Basin in India*".

The key project objectives are:
- Significantly strengthen the capability of relevant central and state government agencies to undertake comprehensive evidence-based strategic basin planning for the Ganga river basin;
- Develop, document and disseminate, through detailed analytical work and stakeholder engagement, a set of plausible scenarios and strageties that balance significantly improving the health of the river and maintaining an acceptable level of economic productivity;
- Build a stronger and more accessible information and knowledge base to guide on-going dialogue and management of the Ganga river basin; and
- Establish on-going multi-stakeholder engagement processes in the basin to support strategic basin planning.

These objectives will be achieved by:
- Developing a detailed and robust water resources planning model for the entire Ganga River basin in India and training central and state government engineers and planners in its use;
- Characterizing and analyzing surface-groundwater interactions across the basin, using this information to refine the river modelling;
- Undertaking a multi-scale environmental flow assessment across the basin and using these assessments to inform the scenario modelling;
- Developing, modelling and disseminating a series of plausible scenarios that explore alternative options for improving water management including improving river health;
- Establishing and facilitating a multi-stakeholder consultation process, inside and outside of government, to guide and share the work above; and
- Ensuring wide access to the models and analyses, with quality documentation.

The main final deliverables of the project consist of:
- Report on river basin modelling and documentation of information systems;

- Software and data files of the river basin model and the water information system for strategic planning of the Ganga River basin, including the model input and output for the plausible scenarios;
- Report on surface–groundwater analysis;
- Report on environmental flow assessment;
- Report on scenario modelling; and
- Final project management report including stakeholder engagement processes and executive summaries of technical reports.

This report contributes to project milestone 5 of the project and combines three of the above deliverables in one report:
- The assessment of scenario and strategy modelling;
- The environmental flow assessment.
- The surface water–groundwater interaction assessment;

This volume contains the report appendices.

A Indicators for E-flow Assessment

This appendix lists the parameters that are included in the calculation of an indicator or sub-indicator. This information explains changes in indicator response to scenarios and strategies. More detailed descriptions of the indicators can be found in the Ganga River Basin Model and WIS report and documentation (Deltares, 2018).

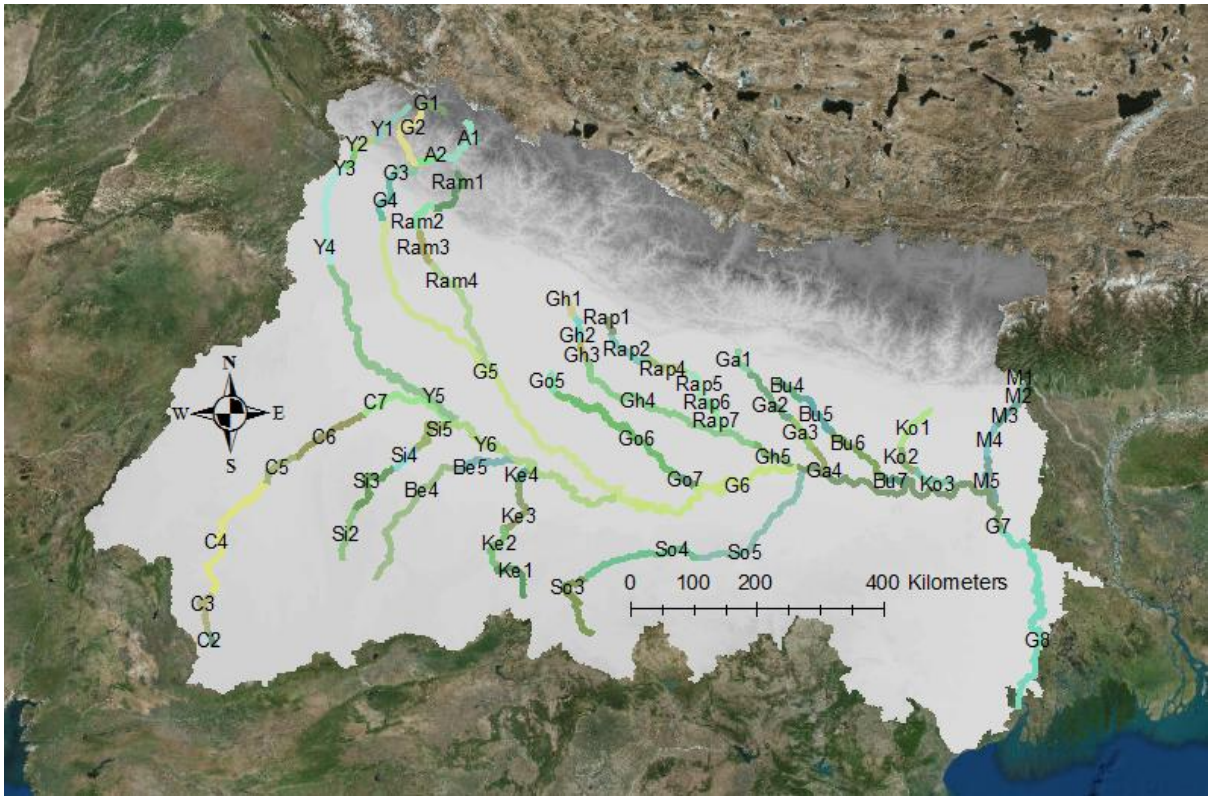
Main indicator	Sub-indicator	*Affected by changes in:
Hydrology	20th percentile annual minimum discharge	Discharge magnitude of very low flow
Hydrology	Average annual minimum discharge	Discharge magnitude low flows
Hydrology	Average annual average discharge	Discharge magnitude average flows
	Average annual maximum discharge	Discharge magnitude intra-annual high flows
Hydrology	80th percentile annual maximum discharge	Discharge magnitude inter-annual high flows
Hydrology	Annual maximum discharge month	Timing inter-annual high flows
Hydrology	Average number of months in year with Q < Q25	Duration low flows
Hydrology	Frequency of pristine 0.8 percentile annual minimum discharge (exceedance)	Very low flow frequency
Hydrology	Frequency of pristine annual minimum discharge	Low flow frequency
Hydrology	Frequency of pristine annual maximum discharge	Intra-annual high flow frequency
Ecology	Mottled eal *(Anguilla bengalensis bengalensis)*	Dissolved oxygen, average annual water depth
Ecology	Snowtrout *(Schizothorax richardsonii)*	Water temperature, dissolved oxygen, water depth during monsoon, lean and in between seasons
Ecology	Golden Mahseer *(Tor putitora)*	Water temperature, dissolved oxygen, water depth during monsoon, lean and in between seasons
Ecology	Rohu *(Labeo rohita)*	Water temperature, dissolved oxygen, water depth during monsoon and lean season
Ecology	Indian major carp *(Catla catla)*	Water temperature, dissolved oxygen, water depth during monsoon
Ecology	Indian shad *(Tenualosa ilisha)*	Water depth during monsoon and average annual water depth
Ecology	Indian flapshell turtle *(Lissemys punctate)*	Average annual water depth
Ecology	Gharial *(Gavialis gangeticus)*	Average annual water depth
Ecology	Ganga River Dolphin *(Platanista gangetica)*	Average annual water depth
Socio-economics	Floodplain agriculture	Difference between maximum suitable water depth during monsoon (>20 cm) previous year and unsuitable water depth in current year (<10 cm)

Socio-economics	Religious bathing	Average annual water depth and BOD
Socio-economics	Fisheries	Habitat suitability of the fish species (all ecological sub-indicators except the turtle gharial and dolphin)

* Monsoon season is from July until October, lean season is from March until June, in-between season are all other months (January, February, November, December)

B Ecozones

Because the Ganga River basin is very hereogeneous, the Ganga river and its tributaries are split into 70 ‘eco-zones’. These zones represent river reaches with relatively homogeneous geomorphological, ecological and anthropogenic characteristics. The zonation process was detailed in the Ganga River Basin Model and WIS Report and Documentation (Deltares, 2018). The zonation map and list of zones is presented in this appendix. Zones in grey font are not included in the Ganga River Basin Model.



Main river	Eco-code	Extent
Alaknanda	ECO_Al1	Satopanth-Bhagirath Khadak to Rudraprayag
Alaknanda	ECO_Al2	Rudraprayag to Devprayag
Betwa	ECO_Be1	Barkheda to Bhojpur
Betwa	ECO_Be2	Bhojpur to Bais
Betwa	ECO_Be3	Bais to Padochha
Betwa	ECO_Be4	Padochha to Jhingaria
Betwa	ECO_Be5	Jhingaria to Merapur Daria
Burhi Gandak	ECO_Bu1	Valmiki National Park to Gardi
Burhi Gandak	ECO_Bu2	Gardi to Imrit Katharwa
Burhi Gandak	ECO_Bu3	Imrit Katharwa to Lauria Nandangarh
Burhi Gandak	ECO_Bu4	Lauria Nandangarh to Sapaha
Burhi Gandak	ECO_Bu5	Sapaha to Dumaria
Burhi Gandak	ECO_Bu6	Dumaria to Dharampur
Burhi Gandak	ECO_Bu7	Dharampur to Tarapur Diara
Chambal	ECO_C1	Achana to Bhainsla
Chambal	ECO_C2	Bhainsla to Piploda
Chambal	ECO_C3	Piploda to Khejariya
Chambal	ECO_C4	Khejariya to Itawa
Chambal	ECO_C5	Itawa to Sawai Madhopur
Chambal	ECO_C6	Sawai Madhopur to Kasba Nagar
Chambal	ECO_C7	Kasba Nagar to Achrauli
Ganges	ECO_G1	Gomukh to Lata (Bhatwari)
Ganges	ECO_G2	Lata (Bhatwari) to Devprayag
Ganges	ECO_G3	Devprayag to Jonk (Rishikesh)
Ganges	ECO_G4	Jonk (Rishikesh) to Ujiyali (Bijnor)
Ganges	ECO_G5	Ujiyali (Bijnor) to Allahabad
Ganges	ECO_G6	Allahabad to Chhapra
Ganges	ECO_G7	Chhapra to Farakka
Ganges	ECO_G8	Farakka to Ganga Sagar
Gandak	ECO_Ga1	Tribeni to Ausani
Gandak	ECO_Ga2	Ausani to Sangrampur
Gandak	ECO_Ga3	Sangrampur to Raepura
Gandak	ECO_Ga4	Raepura to Sonepur
Ghagra	ECO_Gh1	Ghosiyana to Girgitti
Ghagra	ECO_Gh2	Girgitti to Jatpurwa
Ghagra	ECO_Gh3	Jatpurwa to Sonarakhi
Ghagra	ECO_Gh4	Sonarakhi to Dumarahar
Ghagra	ECO_Gh5	Dumarahar to Revelganj
Gomti	ECO_Go1	Gomat Taal to Jadaupur Khurd

Main river	Eco-code	Extent
Gomti	ECO_Go2	Jadaupur Khurd to Mahua Kala
Gomti	ECO_Go3	Mahua Kala to Dadhnamau
Gomti	ECO_Go4	Dadhnamau to Hindaura
Gomti	ECO_Go5	Hindaura to Ghaila
Gomti	ECO_Go6	Ghaila to Bijaipur
Gomti	ECO_Go7	Bijaipur to Kaithi
Ken	ECO_Ke1	Kaimur Hills to Patna Kalan
Ken	ECO_Ke2	Patna Kalan to Garhaghat
Ken	ECO_Ke3	Garhaghat to Banda
Ken	ECO_Ke4	Banda to Chilla
Kosi	ECO_Ko1	Bhimnagar to Akardh
Kosi	ECO_Ko2	Akardh to Dhamra Ghat
Kosi	ECO_Ko3	Dhamra Ghat to Patthar Tola
Mahananda	ECO_M1	Latpanechar Forest to Sisabari
Mahananda	ECO_M2	Sisabari to Budharugaon
Mahananda	ECO_M3	Budharugaon to Deshiatoli
Mahananda	ECO_M4	Deshiatoli to Neamatpur
Mahananda	ECO_M5	Neamatpur to Janakiramtola
Ramganga	ECO_Ram1	Dudhatoli Dhar to Kalagarh
Ramganga	ECO_Ram2	Kalagarh to Wazirpur Ahatmali
Ramganga	ECO_Ram3	Wazirpur Ahatmali to Ali Rajapur
Ramganga	ECO_Ram4	Ali Rajapur to Katri Chandapur
Rapti	ECO_Rap1	Ghumani to Mahdewa
Rapti	ECO_Rap2	Mahdewa to Paigapur
Rapti	ECO_Rap3	Paigapur to Domariyaganj
Rapti	ECO_Rap4	Domariyaganj to Hata Khas
Rapti	ECO_Rap5	Hata Khas to Tal Natawa
Rapti	ECO_Rap6	Tal Natawa to Gorakhpur
Rapti	ECO_Rap7	Gorakhpur to Kanael
Rapti	ECO_Rap8	Kanael to Kaparwar Ghat
Sind	ECO_Si1	Korwai to Sepra
Sind	ECO_Si2	Sepra to Kolaras
Sind	ECO_Si3	Kolaras to Dabra
Sind	ECO_Si4	Dabra to Medpura
Sind	ECO_Si5	Medpura to Kanjausa
Sone	ECO_So1	Sonmuda to Mauhari
Sone	ECO_So2	Mauhari to Khairi
Sone	ECO_So3	Khairi to Bansagar
Sone	ECO_So4	Bansagar to Kota

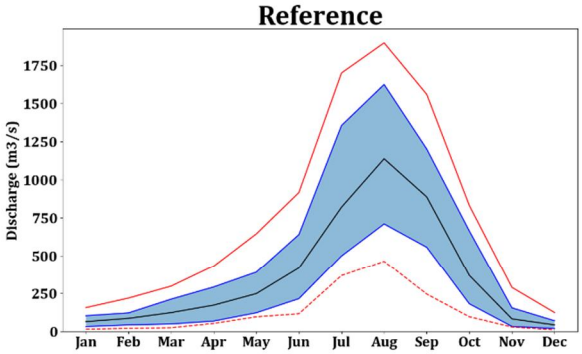
Main river	Eco-code	Extent
Sone	ECO_So5	Kota to Todarpur
Yamuna	ECO_Y1	Yamunotri to Kalsi
Yamuna	ECO_Y2	Kalsi to Paonta Sahib
Yamuna	ECO_Y3	Paonta Sahib to Yamuna Nagar
Yamuna	ECO_Y4	Yamuna Nagar to Wazirabad
Yamuna	ECO_Y5	Wazirabad to Bhareh
Yamuna	ECO_Y6	Bhareh to Allahabad

C Hydrological Alteration Present versus Pristine for all Zones

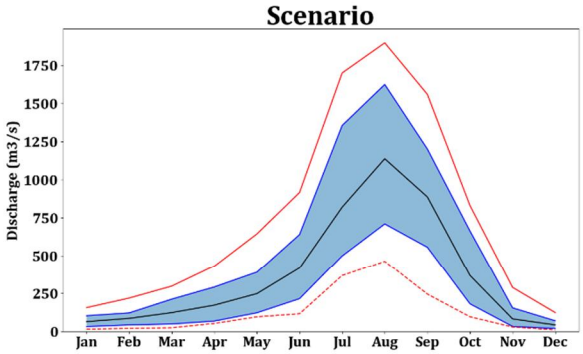
The Ganga River Basin model computes discharges for a long timeseries from 1980 to 2014. To assess hydrological alteration with potentially negative impacts on the river ecosystem, these discharges have been processed into a set of 10 ecologically-relevant hydrological characteristics; for details see the Ganga River Basin Model and WIS Report and Documentation (Deltares, 2018).

The figures in this appendix show the long term monthly minimum, maximum and mean discharge, and the discharge exceeded in 10 percent and in 90 percent of the time. All statistics are determined over the entire time series. Information is given for both the pristine situation (figure on the lefthand side – reference) and for the present situation (figure on the righthand side – scenario). Below each figure the calculated values for the 10 indicators are given. Graphs and scores are included in alphabetical order, starting from the upstream zones in each river.

ECO-ZONE A1



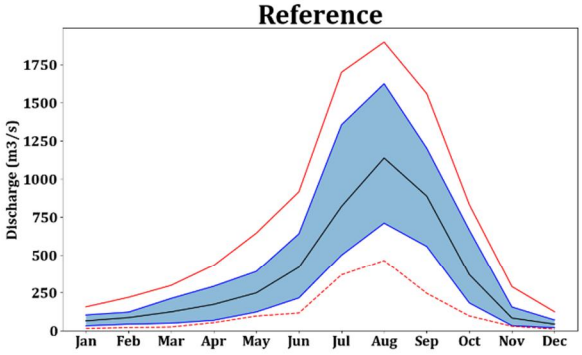
20 % non exceedance annual minimum (m3/s):	22
Median annual minimum (m3/s):	32
Average annual median (m3/s):	205
Median annual maximum (m3/s):	1094
80 % non exceedance annual maximum (m3/s):	1446
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.83
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49



20 % non exceedance annual minimum (m3/s):	22
Median annual minimum (m3/s):	32
Average annual median (m3/s):	205
Median annual maximum (m3/s):	1094
80 % non exceedance annual maximum (m3/s):	1446
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.83
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

ECO-ZONE A2

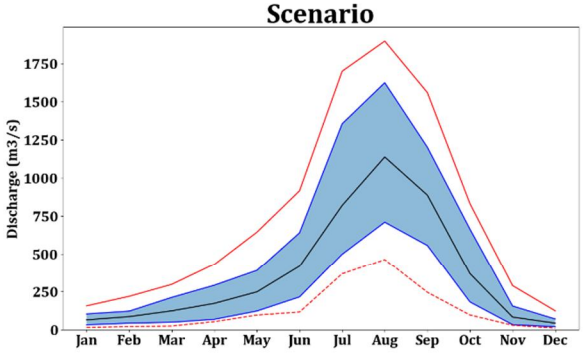
Reference



20 % non exceedance annual minimum (m3/s):	22
Median annual minimum (m3/s):	33
Average annual median (m3/s):	205
Median annual maximum (m3/s):	1093
80 % non exceedance annual maximum (m3/s):	1446
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.83
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

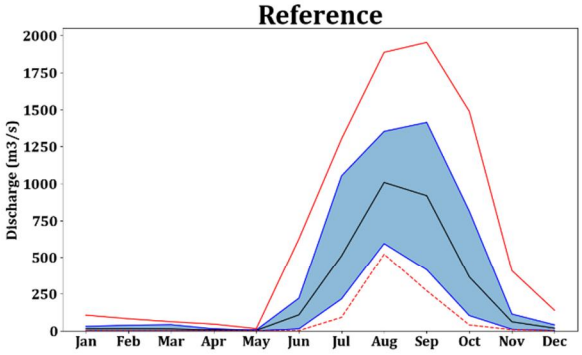


20 % non exceedance annual minimum (m3/s):	22
Median annual minimum (m3/s):	33
Average annual median (m3/s):	205
Median annual maximum (m3/s):	1093
80 % non exceedance annual maximum (m3/s):	1446
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.83
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Be4

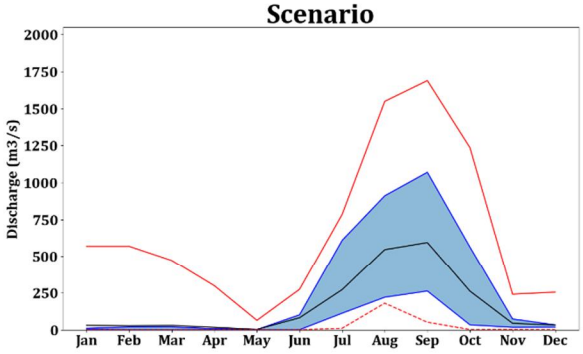
Reference



20 % non exceedance annual minimum (m3/s):	0
Median annual minimum (m3/s):	1
Average annual median (m3/s):	28
Median annual maximum (m3/s):	1039
80 % non exceedance annual maximum (m3/s):	1321
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.46
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

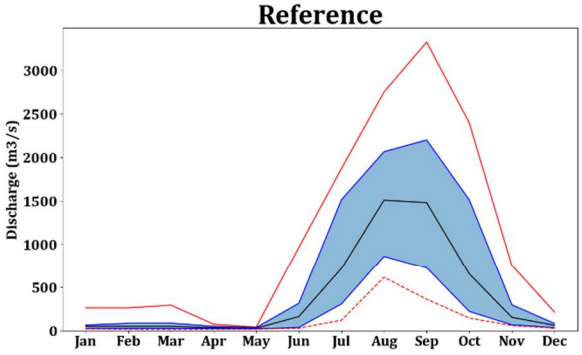


20 % non exceedance annual minimum (m3/s):	0
Median annual minimum (m3/s):	0
Average annual median (m3/s):	37
Median annual maximum (m3/s):	583
80 % non exceedance annual maximum (m3/s):	910
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	4
Relative frequency: 20% non-exceedance (min):	0.14
Relative frequency: 50% non-exceedance (min):	0.97
Relative frequency: 50% non-exceedance (max):	0.17

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Be5

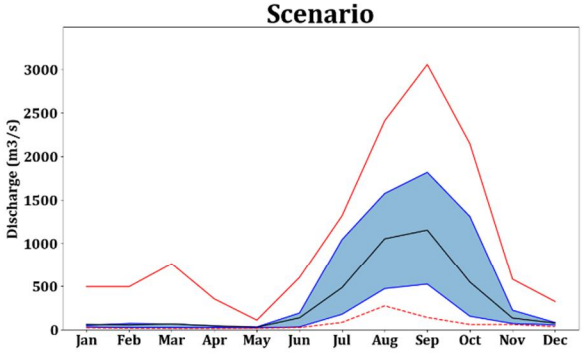
Reference



20 % non exceedance annual minimum (m3/s):	20
Median annual minimum (m3/s):	24
Average annual median (m3/s):	78
Median annual maximum (m3/s):	1718
80 % non exceedance annual maximum (m3/s):	2111
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

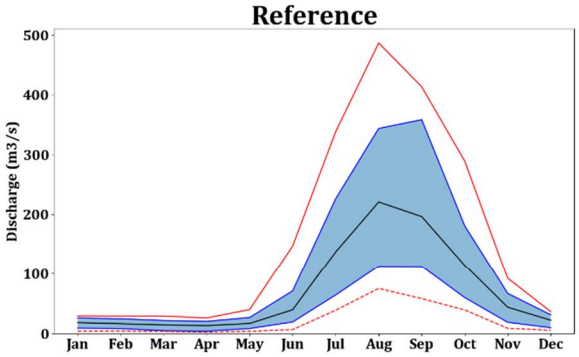


20 % non exceedance annual minimum (m3/s):	19
Median annual minimum (m3/s):	22
Average annual median (m3/s):	92
Median annual maximum (m3/s):	1222
80 % non exceedance annual maximum (m3/s):	1744
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	4
Relative frequency: 20% non-exceedance (min):	0.74
Relative frequency: 50% non-exceedance (min):	0.66
Relative frequency: 50% non-exceedance (max):	0.23

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Bu4

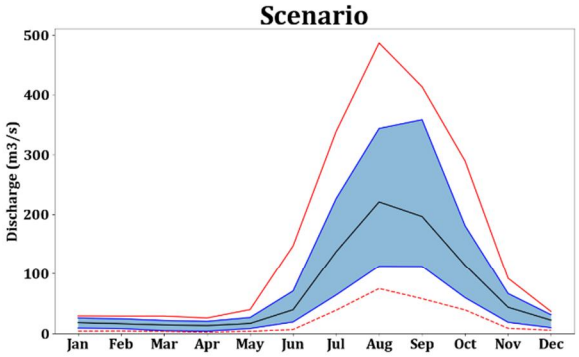
Reference



20 % non exceedance annual minimum (m3/s):	7
Median annual minimum (m3/s):	13
Average annual median (m3/s):	27
Median annual maximum (m3/s):	235
80 % non exceedance annual maximum (m3/s):	315
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

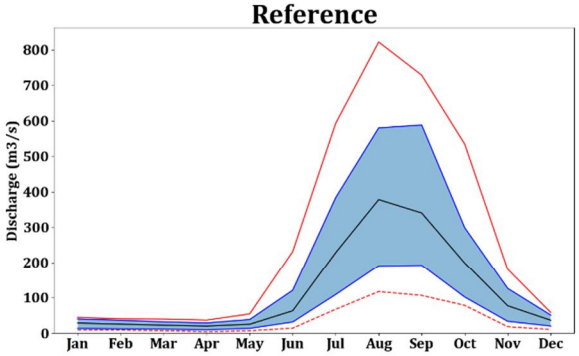


20 % non exceedance annual minimum (m3/s):	7
Median annual minimum (m3/s):	13
Average annual median (m3/s):	27
Median annual maximum (m3/s):	235
80 % non exceedance annual maximum (m3/s):	315
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Bu5

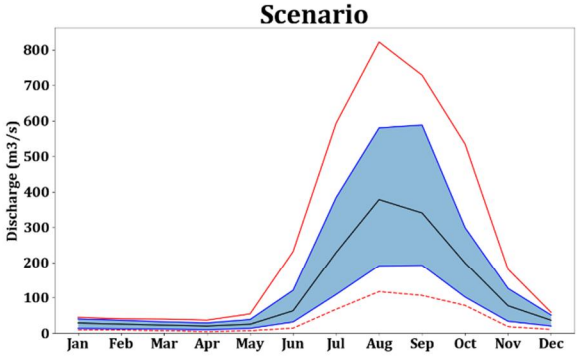
Reference



20 % non exceedance annual minimum (m3/s):	12
Median annual minimum (m3/s):	21
Average annual median (m3/s):	43
Median annual maximum (m3/s):	388
80 % non exceedance annual maximum (m3/s):	567
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

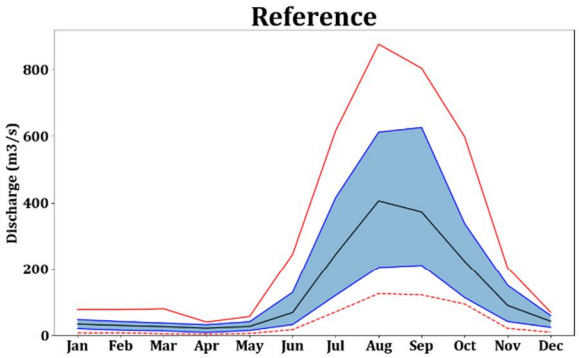


20 % non exceedance annual minimum (m3/s):	12
Median annual minimum (m3/s):	21
Average annual median (m3/s):	43
Median annual maximum (m3/s):	388
80 % non exceedance annual maximum (m3/s):	567
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Bu6

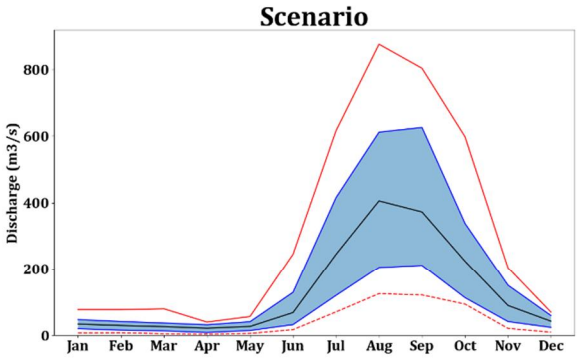
Reference



20 % non exceedance annual minimum (m3/s):	13
Median annual minimum (m3/s):	23
Average annual median (m3/s):	51
Median annual maximum (m3/s):	412
80 % non exceedance annual maximum (m3/s):	605
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

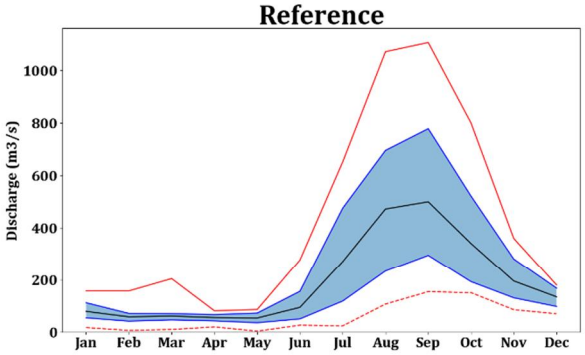


20 % non exceedance annual minimum (m3/s):	13
Median annual minimum (m3/s):	23
Average annual median (m3/s):	51
Median annual maximum (m3/s):	412
80 % non exceedance annual maximum (m3/s):	605
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Bu7

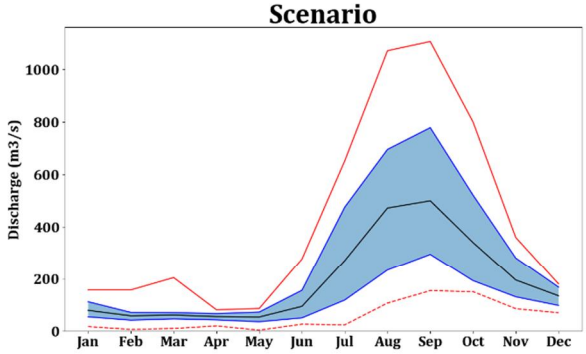
Reference



20 % non exceedance annual minimum (m3/s):	40
Median annual minimum (m3/s):	50
Average annual median (m3/s):	116
Median annual maximum (m3/s):	518
80 % non exceedance annual maximum (m3/s):	707
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

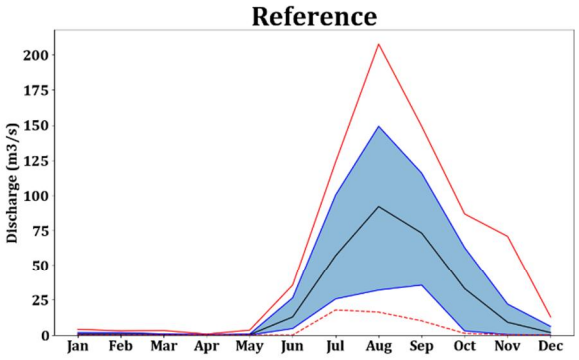


20 % non exceedance annual minimum (m3/s):	40
Median annual minimum (m3/s):	50
Average annual median (m3/s):	116
Median annual maximum (m3/s):	518
80 % non exceedance annual maximum (m3/s):	707
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE C2

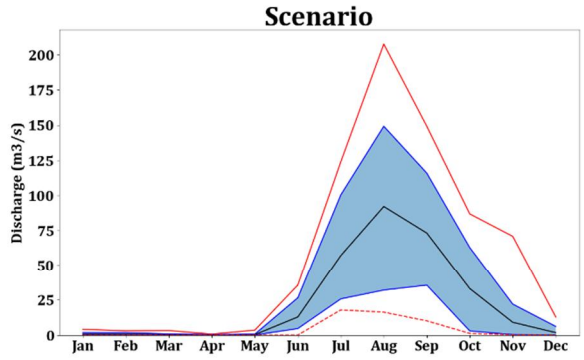
Reference



20 % non exceedance annual minimum (m3/s):	0
Median annual minimum (m3/s):	0
Average annual median (m3/s):	4
Median annual maximum (m3/s):	92
80 % non exceedance annual maximum (m3/s):	133
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	2
Relative frequency: 20% non-exceedance (min):	1.00
Relative frequency: 50% non-exceedance (min):	0.00
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

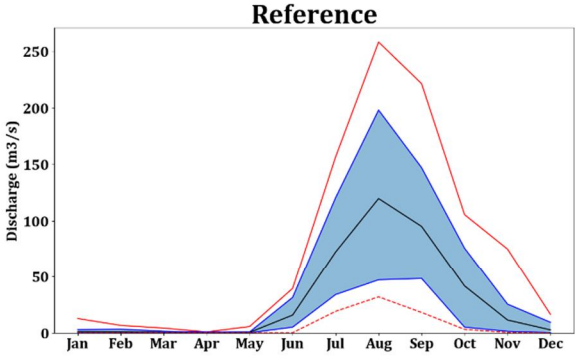


20 % non exceedance annual minimum (m3/s):	0
Median annual minimum (m3/s):	0
Average annual median (m3/s):	4
Median annual maximum (m3/s):	92
80 % non exceedance annual maximum (m3/s):	133
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	2
Relative frequency: 20% non-exceedance (min):	1.00
Relative frequency: 50% non-exceedance (min):	0.00
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE C3

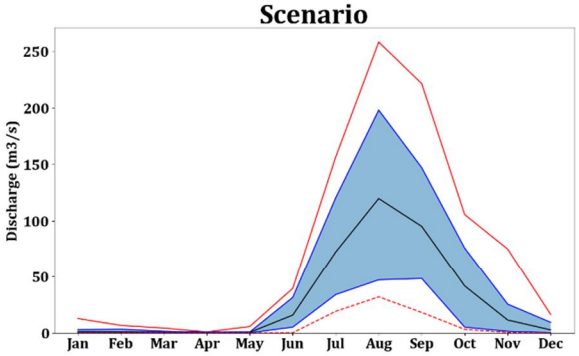
Reference



20 % non exceedance annual minimum (m3/s):	0
Median annual minimum (m3/s):	0
Average annual median (m3/s):	5
Median annual maximum (m3/s):	121
80 % non exceedance annual maximum (m3/s):	169
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	1.00
Relative frequency: 50% non-exceedance (min):	0.00
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

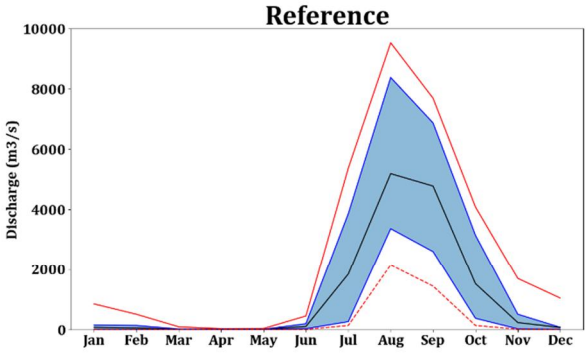


20 % non exceedance annual minimum (m3/s):	0
Median annual minimum (m3/s):	0
Average annual median (m3/s):	5
Median annual maximum (m3/s):	121
80 % non exceedance annual maximum (m3/s):	169
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	1.00
Relative frequency: 50% non-exceedance (min):	0.00
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE C4

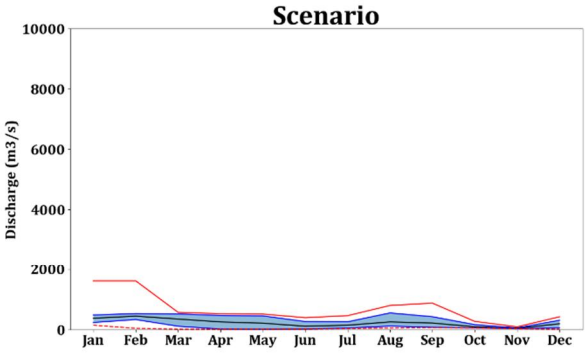
Reference



20 % non exceedance annual minimum (m3/s):	0
Median annual minimum (m3/s):	1
Average annual median (m3/s):	83
Median annual maximum (m3/s):	5356
80 % non exceedance annual maximum (m3/s):	6952
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.46
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

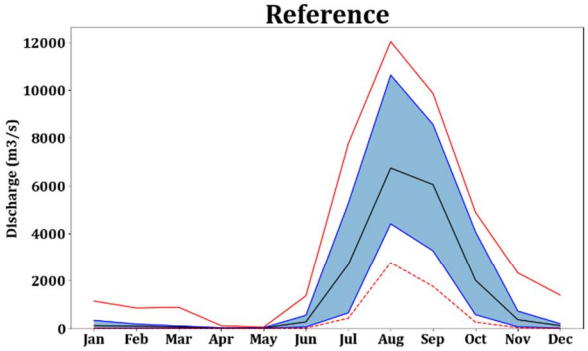


20 % non exceedance annual minimum (m3/s):	13
Median annual minimum (m3/s):	22
Average annual median (m3/s):	181
Median annual maximum (m3/s):	483
80 % non exceedance annual maximum (m3/s):	540
Most frequent month of maximum:	Feb
Average no. of months with Q < Q25 (reference):	0
Relative frequency: 20% non-exceedance (min):	1.00
Relative frequency: 50% non-exceedance (min):	0.00
Relative frequency: 50% non-exceedance (max):	0.00

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE C5

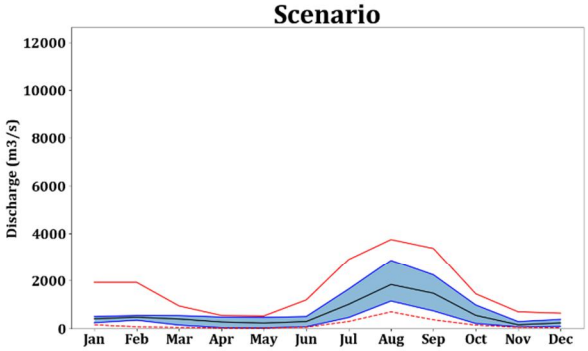
Reference



20 % non exceedance annual minimum (m3/s):	8
Median annual minimum (m3/s):	11
Average annual median (m3/s):	173
Median annual maximum (m3/s):	6811
80 % non exceedance annual maximum (m3/s):	8554
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

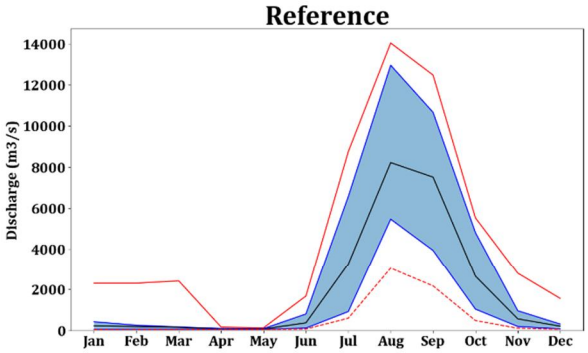


20 % non exceedance annual minimum (m3/s):	34
Median annual minimum (m3/s):	60
Average annual median (m3/s):	397
Median annual maximum (m3/s):	1737
80 % non exceedance annual maximum (m3/s):	2403
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	0
Relative frequency: 20% non-exceedance (min):	1.00
Relative frequency: 50% non-exceedance (min):	0.00
Relative frequency: 50% non-exceedance (max):	0.00

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE C6

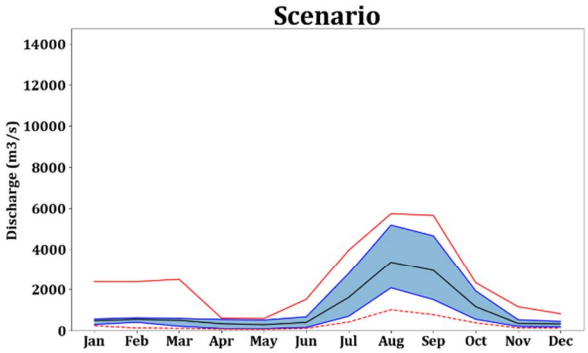
Reference



20 % non exceedance annual minimum (m3/s):	46
Median annual minimum (m3/s):	55
Average annual median (m3/s):	299
Median annual maximum (m3/s):	7873
80 % non exceedance annual maximum (m3/s):	10644
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

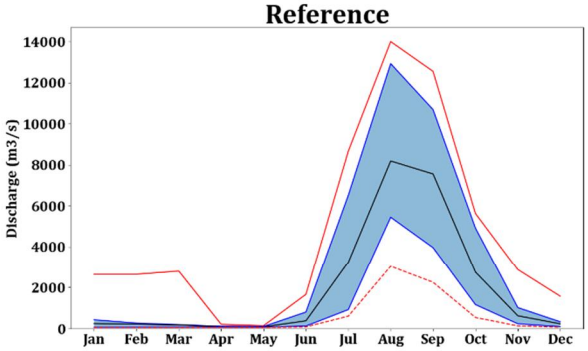


20 % non exceedance annual minimum (m3/s):	88
Median annual minimum (m3/s):	154
Average annual median (m3/s):	491
Median annual maximum (m3/s):	3338
80 % non exceedance annual maximum (m3/s):	4787
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	0
Relative frequency: 20% non-exceedance (min):	1.00
Relative frequency: 50% non-exceedance (min):	0.03
Relative frequency: 50% non-exceedance (max):	0.00

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE C7

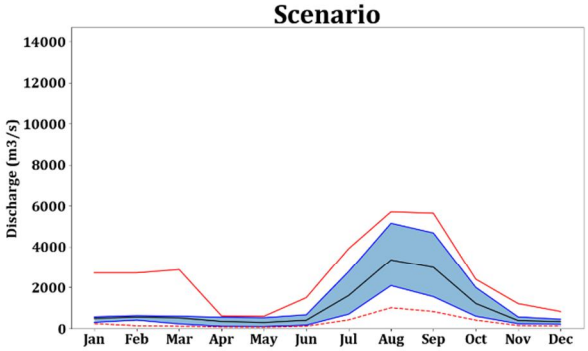
Reference



20 % non exceedance annual minimum (m3/s):	55
Median annual minimum (m3/s):	64
Average annual median (m3/s):	326
Median annual maximum (m3/s):	7846
80 % non exceedance annual maximum (m3/s):	10671
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

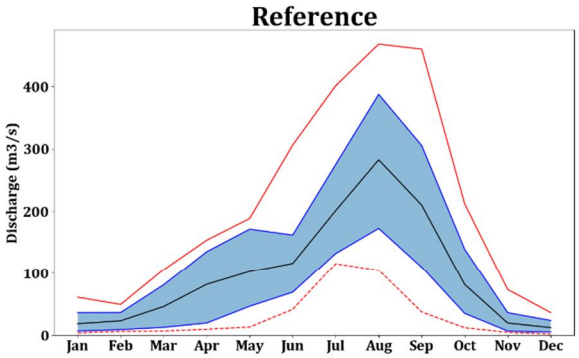


20 % non exceedance annual minimum (m3/s):	106
Median annual minimum (m3/s):	176
Average annual median (m3/s):	504
Median annual maximum (m3/s):	3358
80 % non exceedance annual maximum (m3/s):	4788
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	0
Relative frequency: 20% non-exceedance (min):	1.00
Relative frequency: 50% non-exceedance (min):	0.03
Relative frequency: 50% non-exceedance (max):	0.00

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE G1

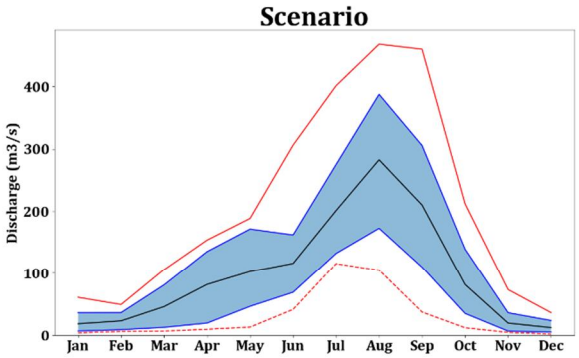
Reference



20 % non exceedance annual minimum (m3/s):	5
Median annual minimum (m3/s):	8
Average annual median (m3/s):	72
Median annual maximum (m3/s):	296
80 % non exceedance annual maximum (m3/s):	373
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

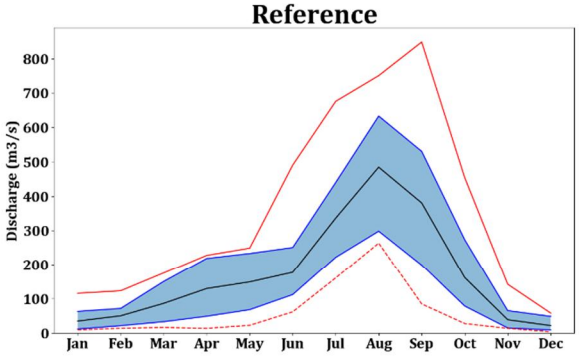


20 % non exceedance annual minimum (m3/s):	5
Median annual minimum (m3/s):	8
Average annual median (m3/s):	72
Median annual maximum (m3/s):	296
80 % non exceedance annual maximum (m3/s):	373
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE G2

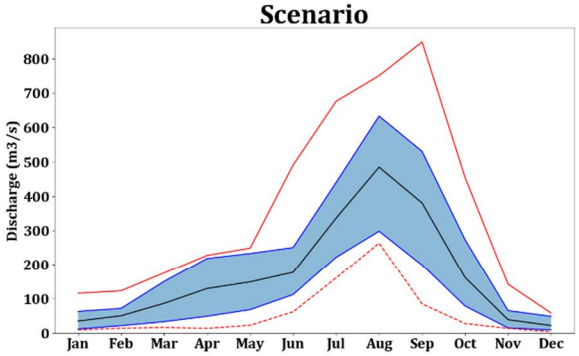
Reference



20 % non exceedance annual minimum (m3/s):	9
Median annual minimum (m3/s):	15
Average annual median (m3/s):	117
Median annual maximum (m3/s):	510
80 % non exceedance annual maximum (m3/s):	607
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.83
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

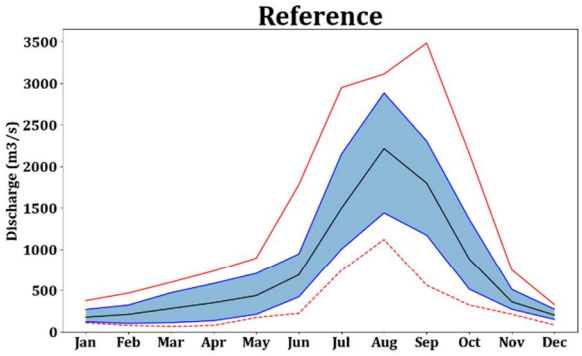


20 % non exceedance annual minimum (m3/s):	9
Median annual minimum (m3/s):	15
Average annual median (m3/s):	117
Median annual maximum (m3/s):	510
80 % non exceedance annual maximum (m3/s):	607
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.83
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE G3

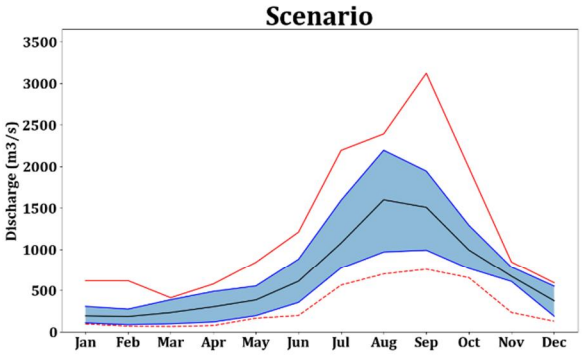
Reference



20 % non exceedance annual minimum (m3/s):	108
Median annual minimum (m3/s):	147
Average annual median (m3/s):	424
Median annual maximum (m3/s):	2368
80 % non exceedance annual maximum (m3/s):	2657
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

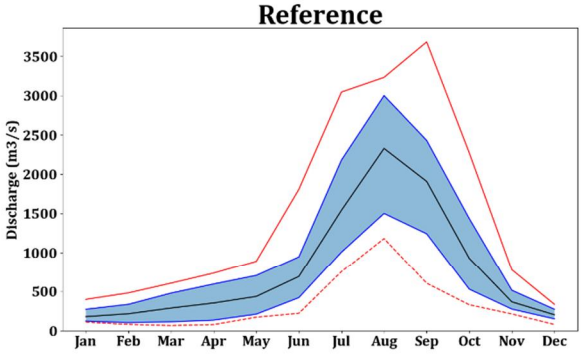


20 % non exceedance annual minimum (m3/s):	95
Median annual minimum (m3/s):	133
Average annual median (m3/s):	505
Median annual maximum (m3/s):	1656
80 % non exceedance annual maximum (m3/s):	2031
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.71
Relative frequency: 50% non-exceedance (min):	0.60
Relative frequency: 50% non-exceedance (max):	0.06

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE G4

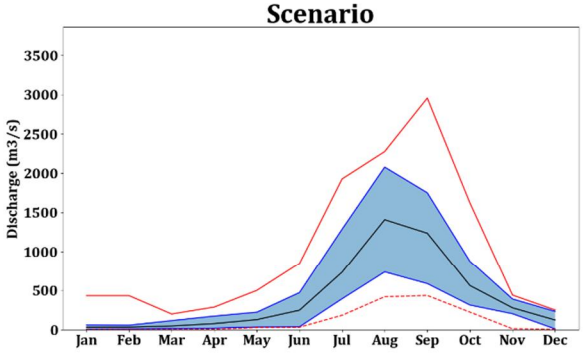
Reference



20 % non exceedance annual minimum (m3/s):	109
Median annual minimum (m3/s):	146
Average annual median (m3/s):	426
Median annual maximum (m3/s):	2499
80 % non exceedance annual maximum (m3/s):	2858
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

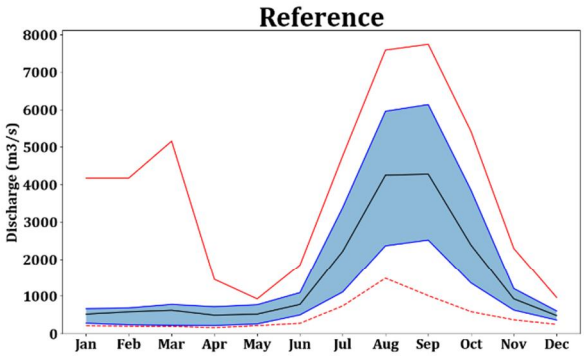


20 % non exceedance annual minimum (m3/s):	4
Median annual minimum (m3/s):	8
Average annual median (m3/s):	183
Median annual maximum (m3/s):	1394
80 % non exceedance annual maximum (m3/s):	1914
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	6
Relative frequency: 20% non-exceedance (min):	0.00
Relative frequency: 50% non-exceedance (min):	1.00
Relative frequency: 50% non-exceedance (max):	0.03

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE G5

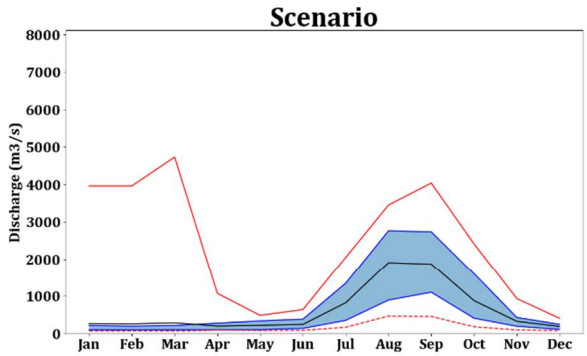
Reference



20 % non exceedance annual minimum (m3/s):	214
Median annual minimum (m3/s):	319
Average annual median (m3/s):	715
Median annual maximum (m3/s):	4562
80 % non exceedance annual maximum (m3/s):	5849
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

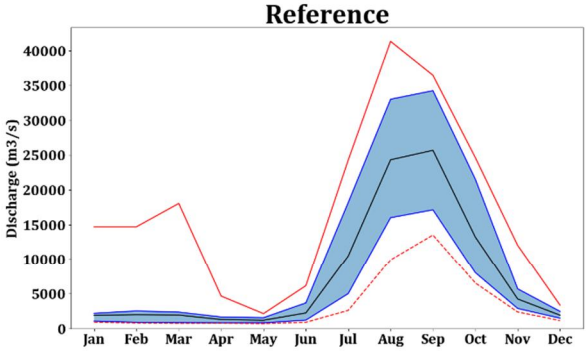


20 % non exceedance annual minimum (m3/s):	86
Median annual minimum (m3/s):	116
Average annual median (m3/s):	251
Median annual maximum (m3/s):	2159
80 % non exceedance annual maximum (m3/s):	2714
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	8
Relative frequency: 20% non-exceedance (min):	0.06
Relative frequency: 50% non-exceedance (min):	1.00
Relative frequency: 50% non-exceedance (max):	0.03

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE G6

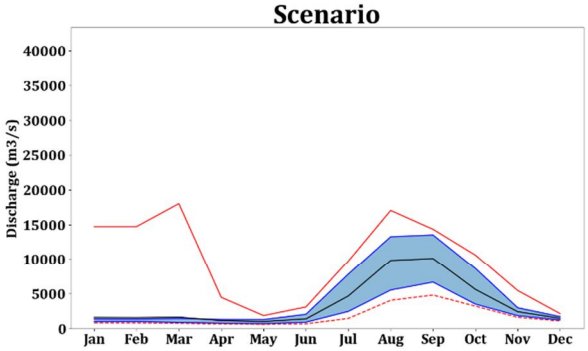
Reference



20 % non exceedance annual minimum (m3/s):	817
Median annual minimum (m3/s):	1048
Average annual median (m3/s):	2478
Median annual maximum (m3/s):	28555
80 % non exceedance annual maximum (m3/s):	34131
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

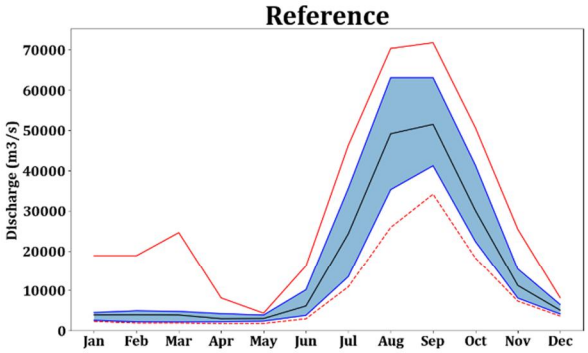


20 % non exceedance annual minimum (m3/s):	722
Median annual minimum (m3/s):	954
Average annual median (m3/s):	1571
Median annual maximum (m3/s):	11780
80 % non exceedance annual maximum (m3/s):	13484
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	5
Relative frequency: 20% non-exceedance (min):	0.69
Relative frequency: 50% non-exceedance (min):	0.71
Relative frequency: 50% non-exceedance (max):	0.00

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE G7

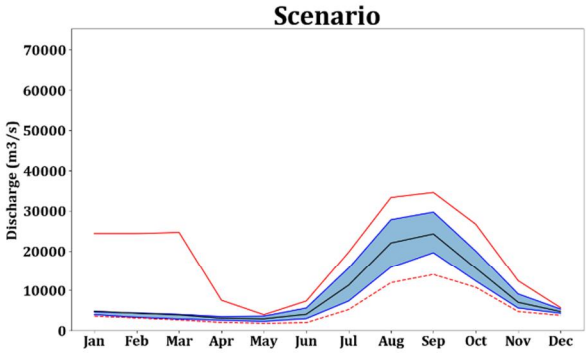
Reference



20 % non exceedance annual minimum (m3/s):	2113
Median annual minimum (m3/s):	2445
Average annual median (m3/s):	6048
Median annual maximum (m3/s):	55687
80 % non exceedance annual maximum (m3/s):	62922
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

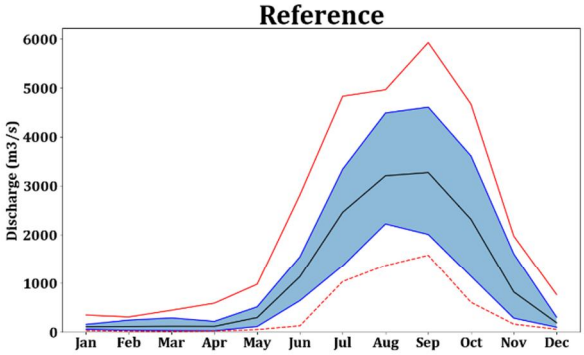


20 % non exceedance annual minimum (m3/s):	2465
Median annual minimum (m3/s):	2812
Average annual median (m3/s):	4959
Median annual maximum (m3/s):	25684
80 % non exceedance annual maximum (m3/s):	28087
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	2
Relative frequency: 20% non-exceedance (min):	0.91
Relative frequency: 50% non-exceedance (min):	0.20
Relative frequency: 50% non-exceedance (max):	0.00

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE G8

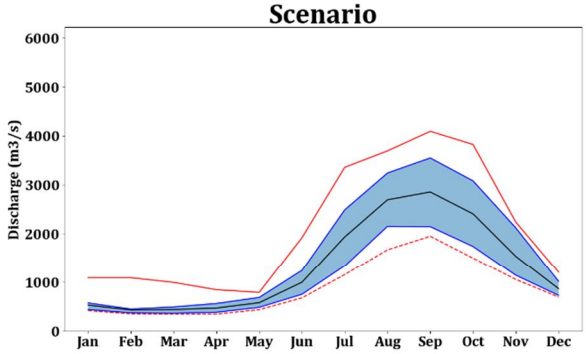
Reference



20 % non exceedance annual minimum (m3/s):	22
Median annual minimum (m3/s):	36
Average annual median (m3/s):	518
Median annual maximum (m3/s):	3562
80 % non exceedance annual maximum (m3/s):	4061
Most frequent month of maximum:	Aug/Sep
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

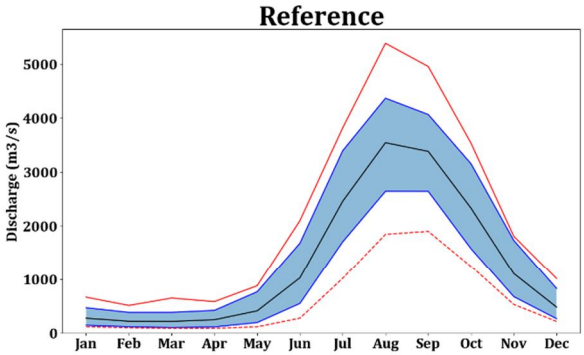


20 % non exceedance annual minimum (m3/s):	371
Median annual minimum (m3/s):	394
Average annual median (m3/s):	926
Median annual maximum (m3/s):	2952
80 % non exceedance annual maximum (m3/s):	3292
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	0
Relative frequency: 20% non-exceedance (min):	1.00
Relative frequency: 50% non-exceedance (min):	0.00
Relative frequency: 50% non-exceedance (max):	0.11

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Ga1

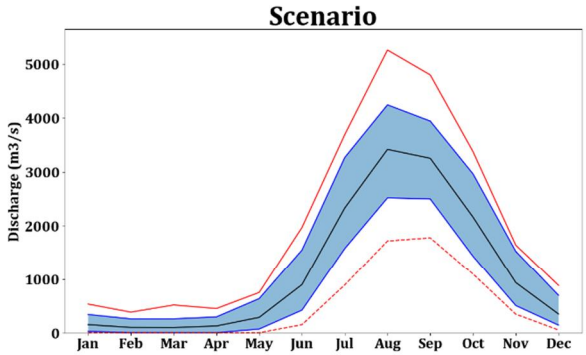
Reference



20 % non exceedance annual minimum (m3/s):	108
Median annual minimum (m3/s):	132
Average annual median (m3/s):	717
Median annual maximum (m3/s):	3601
80 % non exceedance annual maximum (m3/s):	4121
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

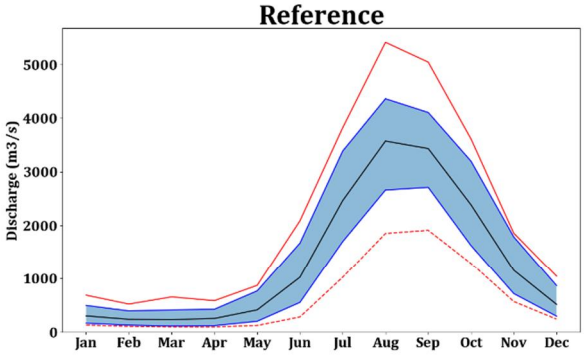


20 % non exceedance annual minimum (m3/s):	2
Median annual minimum (m3/s):	29
Average annual median (m3/s):	587
Median annual maximum (m3/s):	3477
80 % non exceedance annual maximum (m3/s):	3998
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	4
Relative frequency: 20% non-exceedance (min):	0.34
Relative frequency: 50% non-exceedance (min):	0.71
Relative frequency: 50% non-exceedance (max):	0.43

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Ga2

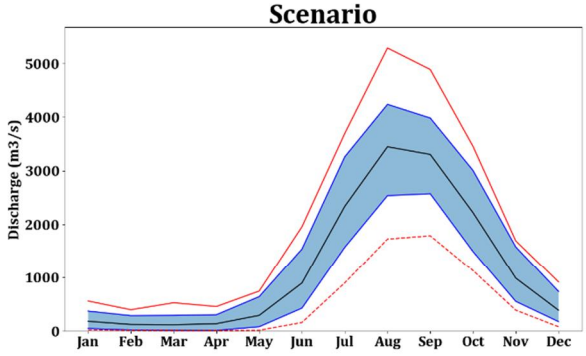
Reference



20 % non exceedance annual minimum (m3/s):	116
Median annual minimum (m3/s):	157
Average annual median (m3/s):	740
Median annual maximum (m3/s):	3634
80 % non exceedance annual maximum (m3/s):	4148
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

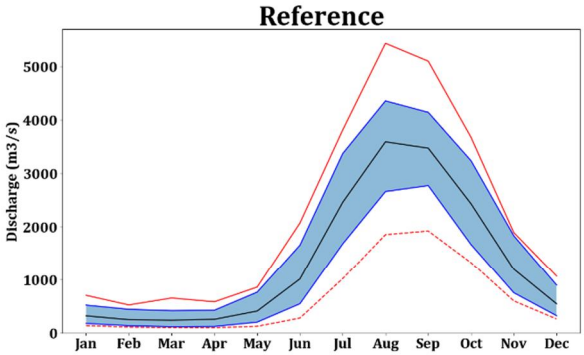


20 % non exceedance annual minimum (m3/s):	10
Median annual minimum (m3/s):	37
Average annual median (m3/s):	610
Median annual maximum (m3/s):	3510
80 % non exceedance annual maximum (m3/s):	4025
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	4
Relative frequency: 20% non-exceedance (min):	0.34
Relative frequency: 50% non-exceedance (min):	0.77
Relative frequency: 50% non-exceedance (max):	0.43

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Ga3

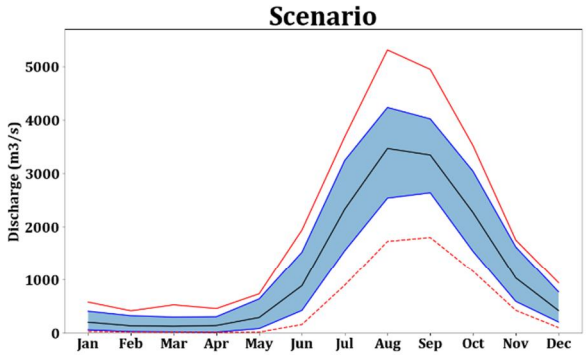
Reference



20 % non exceedance annual minimum (m3/s):	121
Median annual minimum (m3/s):	162
Average annual median (m3/s):	758
Median annual maximum (m3/s):	3678
80 % non exceedance annual maximum (m3/s):	4177
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

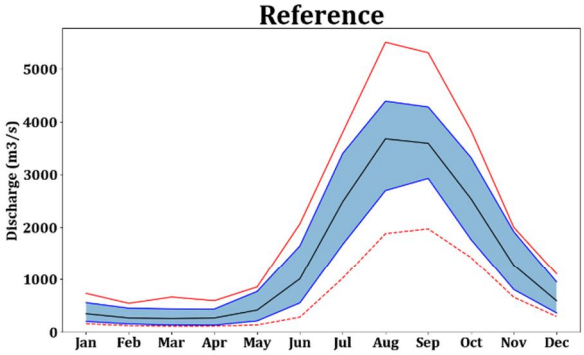


20 % non exceedance annual minimum (m3/s):	14
Median annual minimum (m3/s):	42
Average annual median (m3/s):	628
Median annual maximum (m3/s):	3523
80 % non exceedance annual maximum (m3/s):	4053
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	4
Relative frequency: 20% non-exceedance (min):	0.34
Relative frequency: 50% non-exceedance (min):	0.77
Relative frequency: 50% non-exceedance (max):	0.43

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Ga4

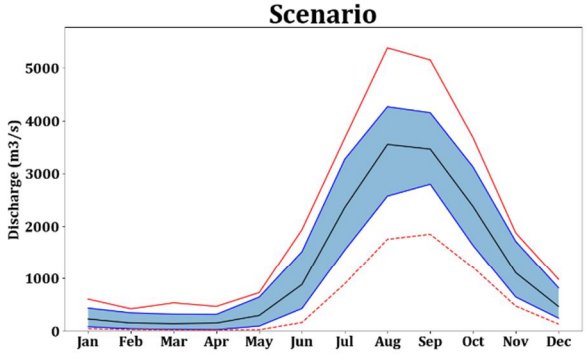
Reference



20 % non exceedance annual minimum (m3/s):	130
Median annual minimum (m3/s):	168
Average annual median (m3/s):	783
Median annual maximum (m3/s):	3788
80 % non exceedance annual maximum (m3/s):	4252
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

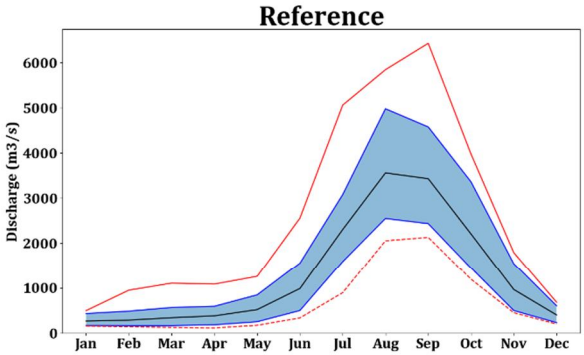


20 % non exceedance annual minimum (m3/s):	27
Median annual minimum (m3/s):	48
Average annual median (m3/s):	654
Median annual maximum (m3/s):	3662
80 % non exceedance annual maximum (m3/s):	4123
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	4
Relative frequency: 20% non-exceedance (min):	0.34
Relative frequency: 50% non-exceedance (min):	0.71
Relative frequency: 50% non-exceedance (max):	0.43

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Gh1

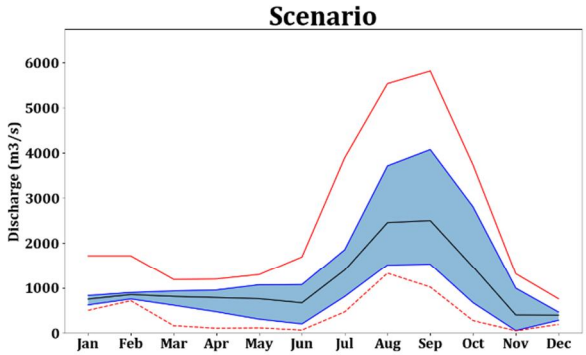
Reference



20 % non exceedance annual minimum (m3/s):	160
Median annual minimum (m3/s):	186
Average annual median (m3/s):	657
Median annual maximum (m3/s):	3512
80 % non exceedance annual maximum (m3/s):	4322
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

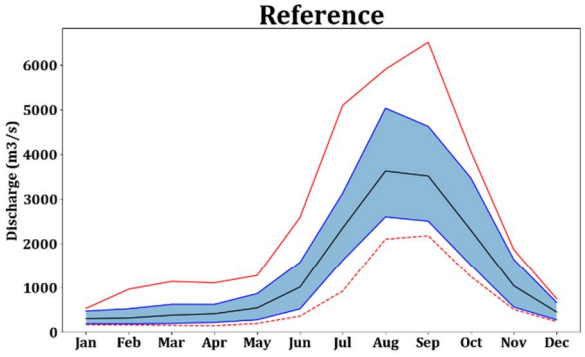


20 % non exceedance annual minimum (m3/s):	60
Median annual minimum (m3/s):	156
Average annual median (m3/s):	851
Median annual maximum (m3/s):	2279
80 % non exceedance annual maximum (m3/s):	3315
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	1
Relative frequency: 20% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (min):	0.57
Relative frequency: 50% non-exceedance (max):	0.20

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Gh2

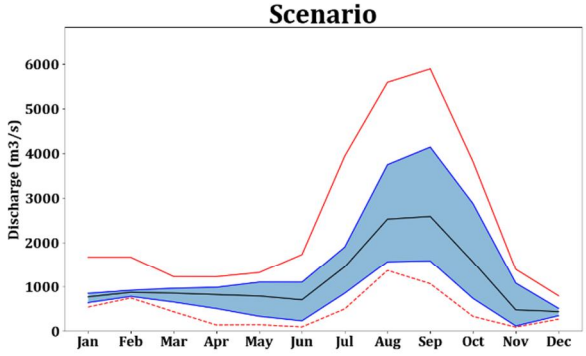
Reference



20 % non exceedance annual minimum (m3/s):	179
Median annual minimum (m3/s):	214
Average annual median (m3/s):	700
Median annual maximum (m3/s):	3610
80 % non exceedance annual maximum (m3/s):	4414
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

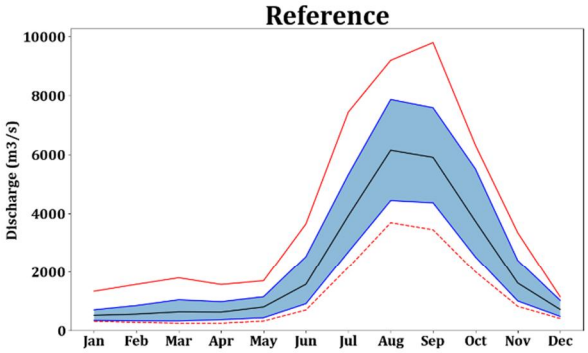


20 % non exceedance annual minimum (m3/s):	119
Median annual minimum (m3/s):	218
Average annual median (m3/s):	880
Median annual maximum (m3/s):	2361
80 % non exceedance annual maximum (m3/s):	3375
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	1
Relative frequency: 20% non-exceedance (min):	0.63
Relative frequency: 50% non-exceedance (min):	0.46
Relative frequency: 50% non-exceedance (max):	0.20

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Gh3

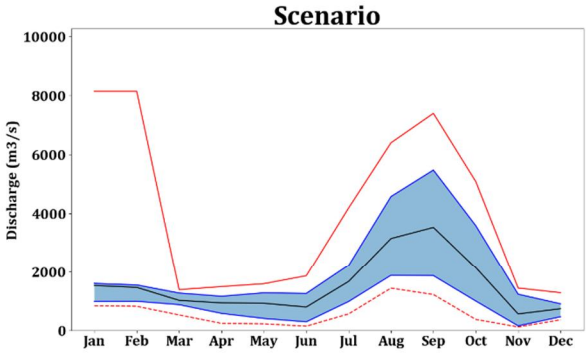
Reference



20 % non exceedance annual minimum (m3/s):	323
Median annual minimum (m3/s):	390
Average annual median (m3/s):	1082
Median annual maximum (m3/s):	6272
80 % non exceedance annual maximum (m3/s):	7530
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

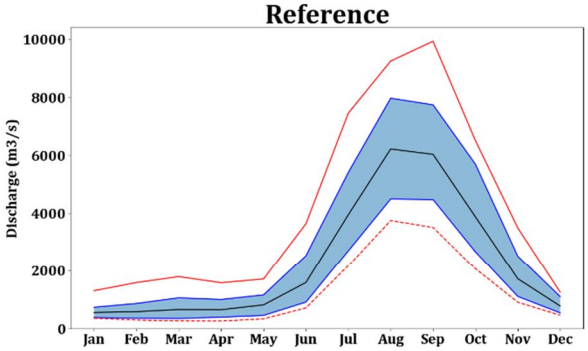


20 % non exceedance annual minimum (m3/s):	164
Median annual minimum (m3/s):	292
Average annual median (m3/s):	1150
Median annual maximum (m3/s):	3518
80 % non exceedance annual maximum (m3/s):	4742
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	1
Relative frequency: 20% non-exceedance (min):	0.40
Relative frequency: 50% non-exceedance (min):	0.63
Relative frequency: 50% non-exceedance (max):	0.11

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Gh4

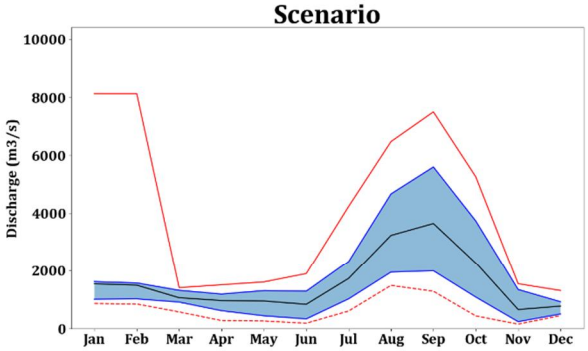
Reference



20 % non exceedance annual minimum (m3/s):	372
Median annual minimum (m3/s):	425
Average annual median (m3/s):	1127
Median annual maximum (m3/s):	6374
80 % non exceedance annual maximum (m3/s):	7605
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

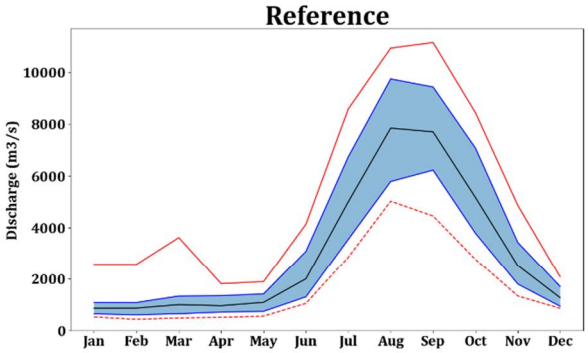


20 % non exceedance annual minimum (m3/s):	252
Median annual minimum (m3/s):	389
Average annual median (m3/s):	1190
Median annual maximum (m3/s):	3629
80 % non exceedance annual maximum (m3/s):	4893
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	1
Relative frequency: 20% non-exceedance (min):	0.54
Relative frequency: 50% non-exceedance (min):	0.60
Relative frequency: 50% non-exceedance (max):	0.11

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Gh5

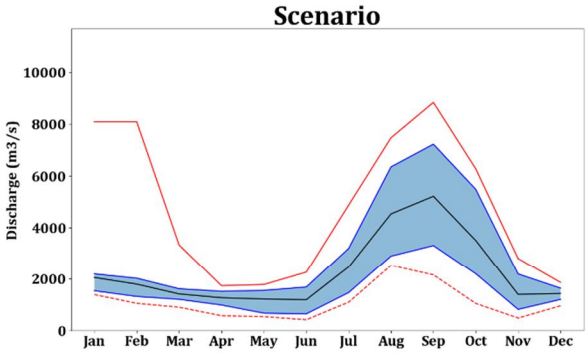
Reference



20 % non exceedance annual minimum (m3/s):	616
Median annual minimum (m3/s):	693
Average annual median (m3/s):	1600
Median annual maximum (m3/s):	8272
80 % non exceedance annual maximum (m3/s):	9510
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

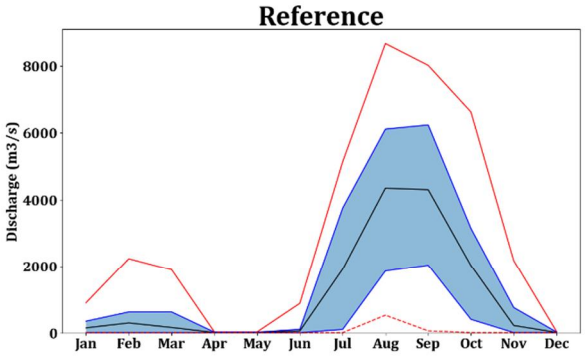
Scenario



20 % non exceedance annual minimum (m3/s):	610
Median annual minimum (m3/s):	1075
Average annual median (m3/s):	1642
Median annual maximum (m3/s):	5212
80 % non exceedance annual maximum (m3/s):	6573
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	1
Relative frequency: 20% non-exceedance (min):	0.77
Relative frequency: 50% non-exceedance (min):	0.26
Relative frequency: 50% non-exceedance (max):	0.06

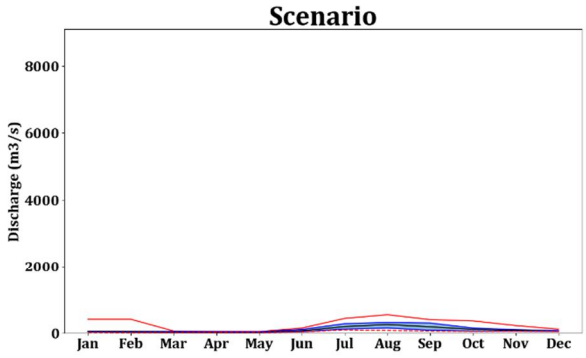
Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Go5



20 % non exceedance annual minimum (m3/s):	5
Median annual minimum (m3/s):	7
Average annual median (m3/s):	171
Median annual maximum (m3/s):	5108
80 % non exceedance annual maximum (m3/s):	6214
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.83
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

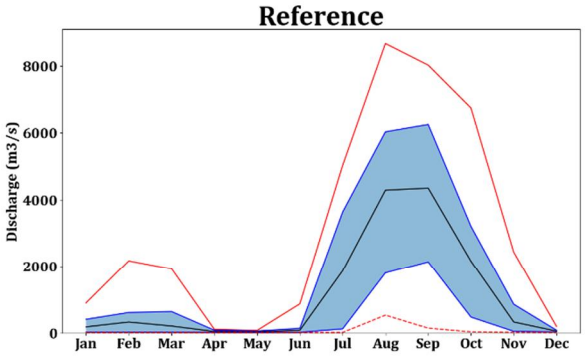
Maximum
Q90
Mean
Q10
Minimum



20 % non exceedance annual minimum (m3/s):	14
Median annual minimum (m3/s):	16
Average annual median (m3/s):	54
Median annual maximum (m3/s):	276
80 % non exceedance annual maximum (m3/s):	305
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	0
Relative frequency: 20% non-exceedance (min):	1.00
Relative frequency: 50% non-exceedance (min):	0.00
Relative frequency: 50% non-exceedance (max):	0.00

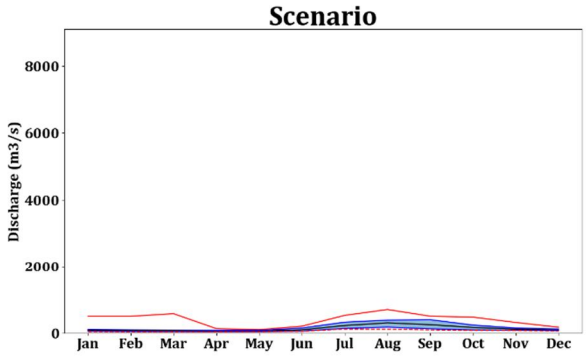
Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Go6



20 % non exceedance annual minimum (m3/s):	16
Median annual minimum (m3/s):	23
Average annual median (m3/s):	221
Median annual maximum (m3/s):	5092
80 % non exceedance annual maximum (m3/s):	6184
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

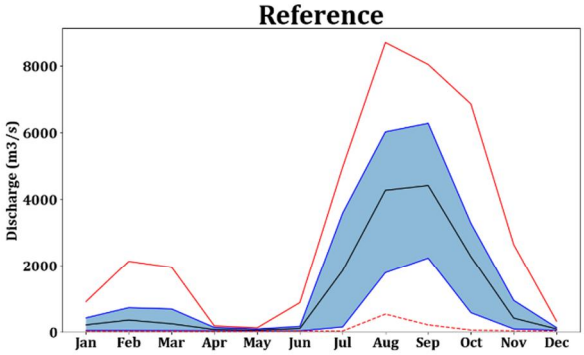


20 % non exceedance annual minimum (m3/s):	34
Median annual minimum (m3/s):	40
Average annual median (m3/s):	91
Median annual maximum (m3/s):	303
80 % non exceedance annual maximum (m3/s):	382
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	0
Relative frequency: 20% non-exceedance (min):	1.00
Relative frequency: 50% non-exceedance (min):	0.00
Relative frequency: 50% non-exceedance (max):	0.00

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Go7

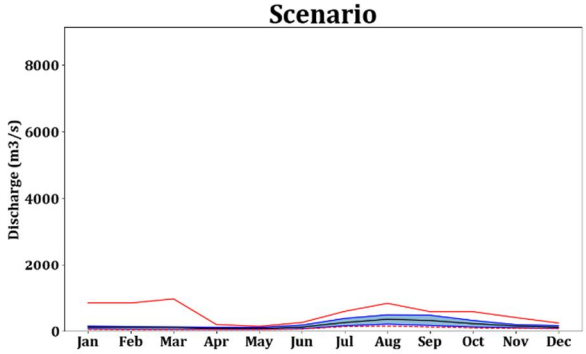
Reference



20 % non exceedance annual minimum (m3/s):	27
Median annual minimum (m3/s):	46
Average annual median (m3/s):	267
Median annual maximum (m3/s):	5130
80 % non exceedance annual maximum (m3/s):	6245
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

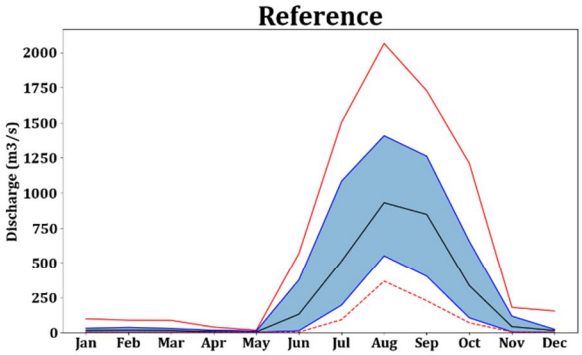


20 % non exceedance annual minimum (m3/s):	48
Median annual minimum (m3/s):	60
Average annual median (m3/s):	120
Median annual maximum (m3/s):	344
80 % non exceedance annual maximum (m3/s):	467
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	2
Relative frequency: 20% non-exceedance (min):	1.00
Relative frequency: 50% non-exceedance (min):	0.11
Relative frequency: 50% non-exceedance (max):	0.00

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Ke1

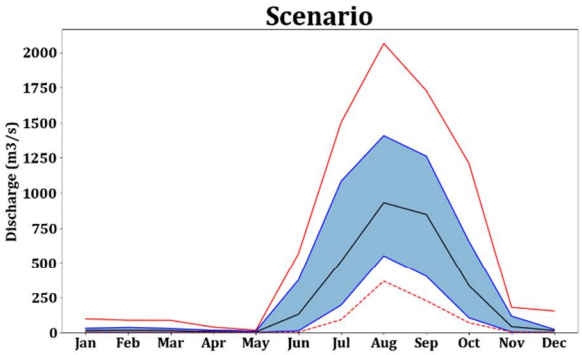
Reference



20 % non exceedance annual minimum (m3/s):	0
Median annual minimum (m3/s):	0
Average annual median (m3/s):	29
Median annual maximum (m3/s):	1041
80 % non exceedance annual maximum (m3/s):	1355
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.94
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

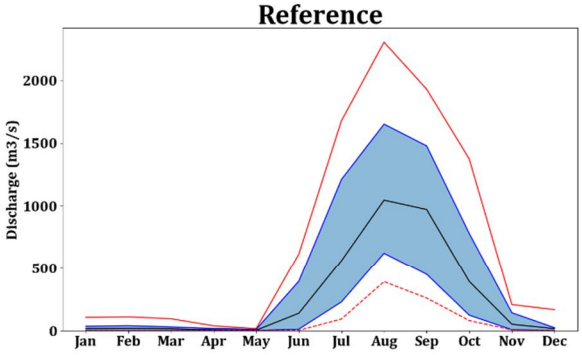


20 % non exceedance annual minimum (m3/s):	0
Median annual minimum (m3/s):	0
Average annual median (m3/s):	29
Median annual maximum (m3/s):	1041
80 % non exceedance annual maximum (m3/s):	1355
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.94
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Ke2

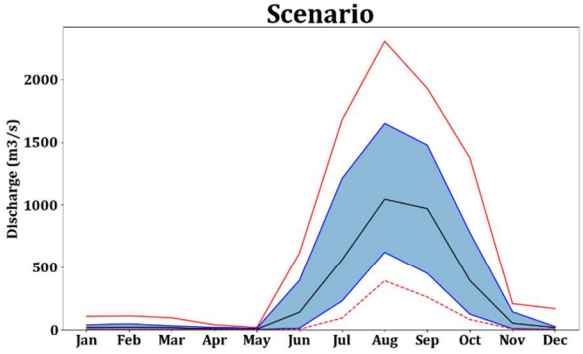
Reference



20 % non exceedance annual minimum (m3/s):	0
Median annual minimum (m3/s):	0
Average annual median (m3/s):	32
Median annual maximum (m3/s):	1147
80 % non exceedance annual maximum (m3/s):	1545
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.46
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

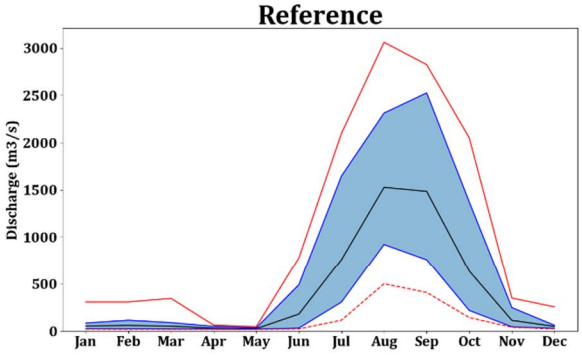


20 % non exceedance annual minimum (m3/s):	0
Median annual minimum (m3/s):	0
Average annual median (m3/s):	32
Median annual maximum (m3/s):	1146
80 % non exceedance annual maximum (m3/s):	1544
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.46
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Ke3

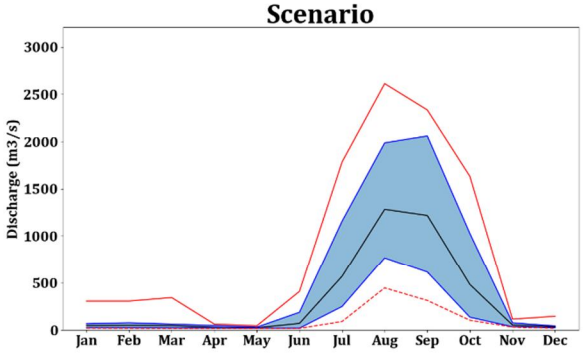
Reference



20 % non exceedance annual minimum (m3/s):	17
Median annual minimum (m3/s):	19
Average annual median (m3/s):	75
Median annual maximum (m3/s):	1692
80 % non exceedance annual maximum (m3/s):	2402
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

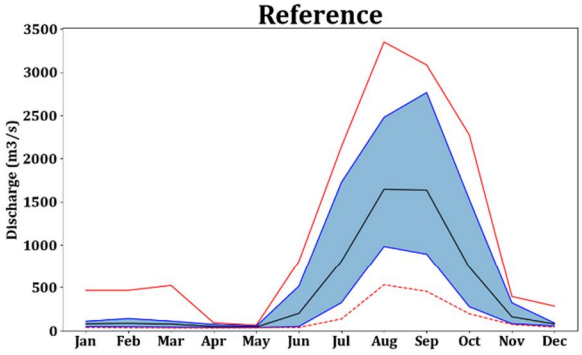


20 % non exceedance annual minimum (m3/s):	16
Median annual minimum (m3/s):	18
Average annual median (m3/s):	49
Median annual maximum (m3/s):	1430
80 % non exceedance annual maximum (m3/s):	1964
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	4
Relative frequency: 20% non-exceedance (min):	0.63
Relative frequency: 50% non-exceedance (min):	0.71
Relative frequency: 50% non-exceedance (max):	0.26

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Ke4

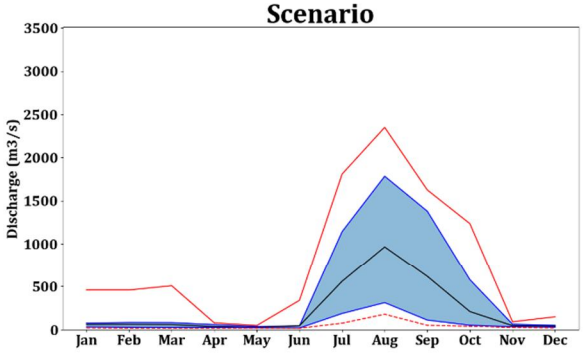
Reference



20 % non exceedance annual minimum (m3/s):	34
Median annual minimum (m3/s):	37
Average annual median (m3/s):	108
Median annual maximum (m3/s):	1809
80 % non exceedance annual maximum (m3/s):	2580
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

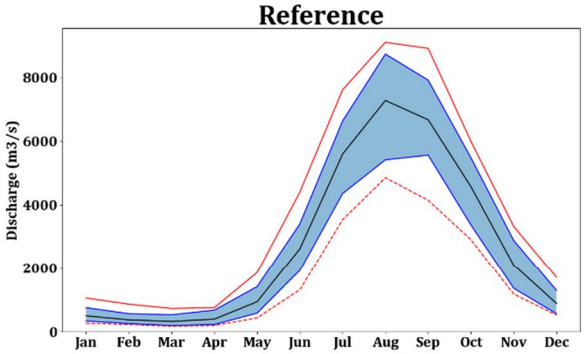


20 % non exceedance annual minimum (m3/s):	17
Median annual minimum (m3/s):	21
Average annual median (m3/s):	51
Median annual maximum (m3/s):	953
80 % non exceedance annual maximum (m3/s):	1470
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	7
Relative frequency: 20% non-exceedance (min):	0.03
Relative frequency: 50% non-exceedance (min):	1.00
Relative frequency: 50% non-exceedance (max):	0.11

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Ko1

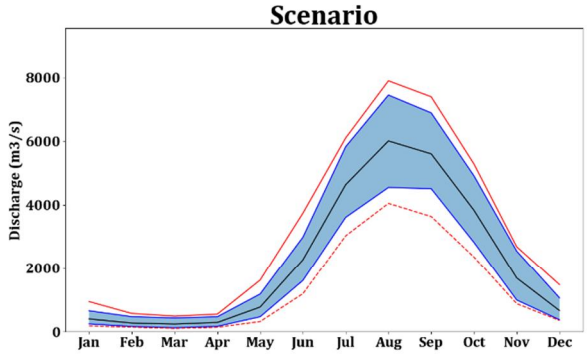
Reference



20 % non exceedance annual minimum (m3/s):	209
Median annual minimum (m3/s):	240
Average annual median (m3/s):	1519
Median annual maximum (m3/s):	7214
80 % non exceedance annual maximum (m3/s):	8607
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

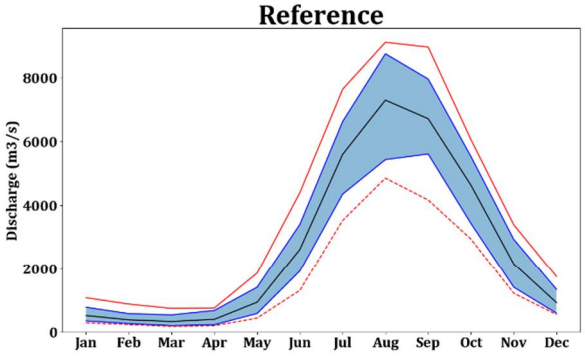


20 % non exceedance annual minimum (m3/s):	141
Median annual minimum (m3/s):	172
Average annual median (m3/s):	1234
Median annual maximum (m3/s):	5914
80 % non exceedance annual maximum (m3/s):	7162
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	4
Relative frequency: 20% non-exceedance (min):	0.34
Relative frequency: 50% non-exceedance (min):	0.66
Relative frequency: 50% non-exceedance (max):	0.20

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Ko2

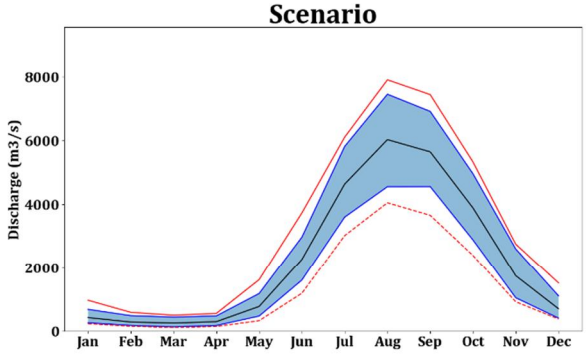
Reference



20 % non exceedance annual minimum (m3/s):	218
Median annual minimum (m3/s):	249
Average annual median (m3/s):	1548
Median annual maximum (m3/s):	7216
80 % non exceedance annual maximum (m3/s):	8607
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

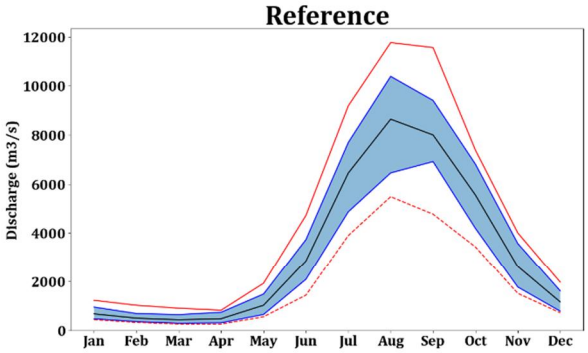


20 % non exceedance annual minimum (m3/s):	149
Median annual minimum (m3/s):	180
Average annual median (m3/s):	1262
Median annual maximum (m3/s):	5936
80 % non exceedance annual maximum (m3/s):	7190
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	4
Relative frequency: 20% non-exceedance (min):	0.37
Relative frequency: 50% non-exceedance (min):	0.66
Relative frequency: 50% non-exceedance (max):	0.20

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Ko3

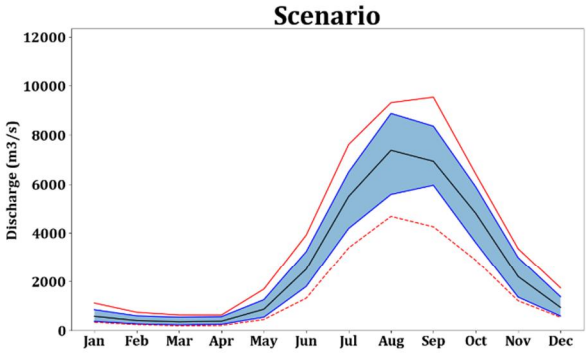
Reference



20 % non exceedance annual minimum (m3/s):	307
Median annual minimum (m3/s):	346
Average annual median (m3/s):	1823
Median annual maximum (m3/s):	8763
80 % non exceedance annual maximum (m3/s):	10120
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

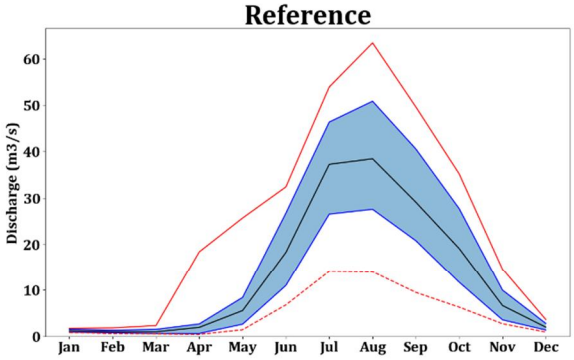


20 % non exceedance annual minimum (m3/s):	239
Median annual minimum (m3/s):	280
Average annual median (m3/s):	1536
Median annual maximum (m3/s):	7360
80 % non exceedance annual maximum (m3/s):	8572
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	4
Relative frequency: 20% non-exceedance (min):	0.37
Relative frequency: 50% non-exceedance (min):	0.66
Relative frequency: 50% non-exceedance (max):	0.17

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE M1

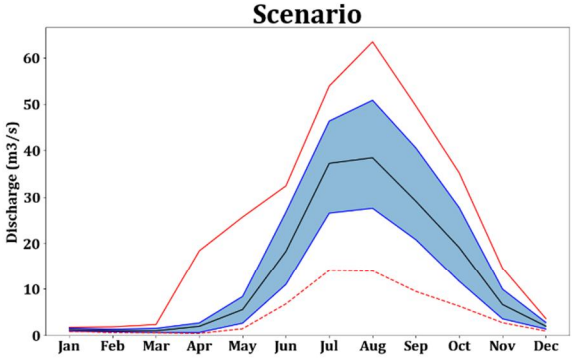
Reference



20 % non exceedance annual minimum (m3/s):	1
Median annual minimum (m3/s):	1
Average annual median (m3/s):	6
Median annual maximum (m3/s):	42
80 % non exceedance annual maximum (m3/s):	50
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.86
Relative frequency: 50% non-exceedance (min):	0.37
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

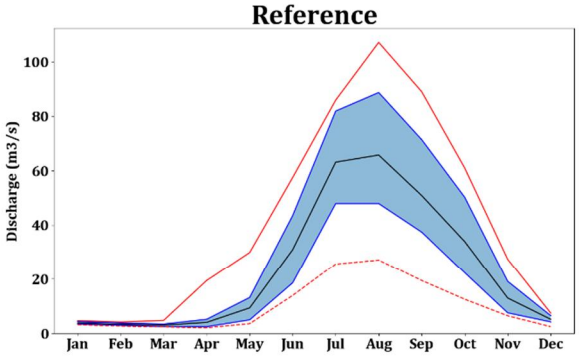


20 % non exceedance annual minimum (m3/s):	1
Median annual minimum (m3/s):	1
Average annual median (m3/s):	6
Median annual maximum (m3/s):	42
80 % non exceedance annual maximum (m3/s):	50
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.86
Relative frequency: 50% non-exceedance (min):	0.37
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE M2

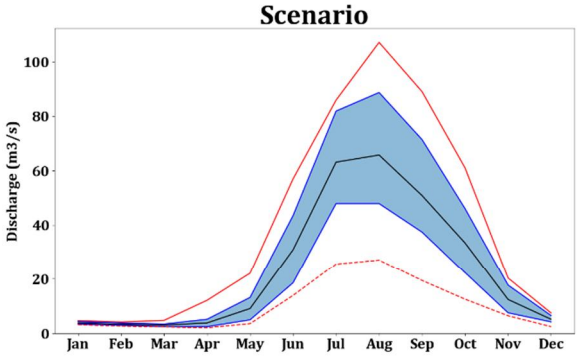
Reference



20 % non exceedance annual minimum (m3/s):	2
Median annual minimum (m3/s):	3
Average annual median (m3/s):	11
Median annual maximum (m3/s):	73
80 % non exceedance annual maximum (m3/s):	82
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.89
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

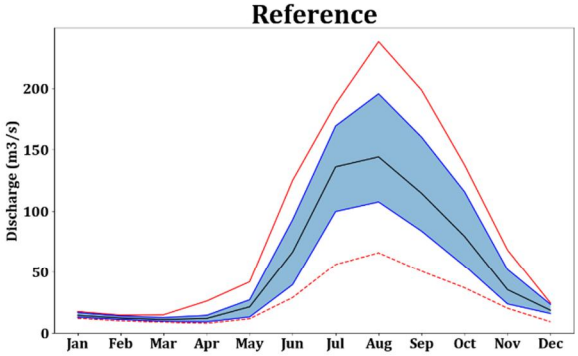


20 % non exceedance annual minimum (m3/s):	2
Median annual minimum (m3/s):	3
Average annual median (m3/s):	11
Median annual maximum (m3/s):	73
80 % non exceedance annual maximum (m3/s):	82
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.89
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE M3

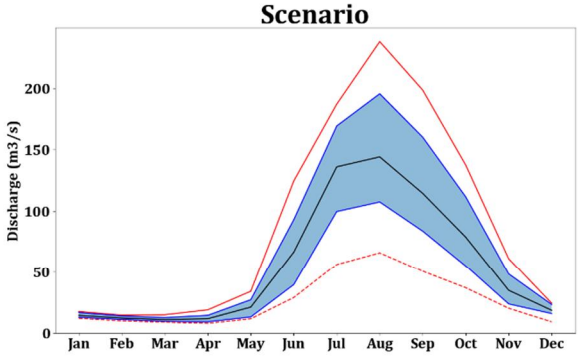
Reference



20 % non exceedance annual minimum (m3/s):	9
Median annual minimum (m3/s):	10
Average annual median (m3/s):	29
Median annual maximum (m3/s):	155
80 % non exceedance annual maximum (m3/s):	182
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

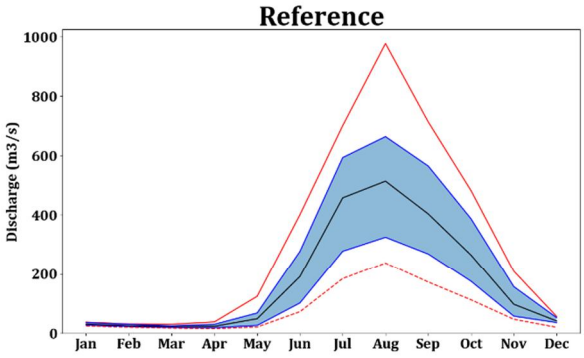


20 % non exceedance annual minimum (m3/s):	9
Median annual minimum (m3/s):	10
Average annual median (m3/s):	29
Median annual maximum (m3/s):	155
80 % non exceedance annual maximum (m3/s):	182
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE M4

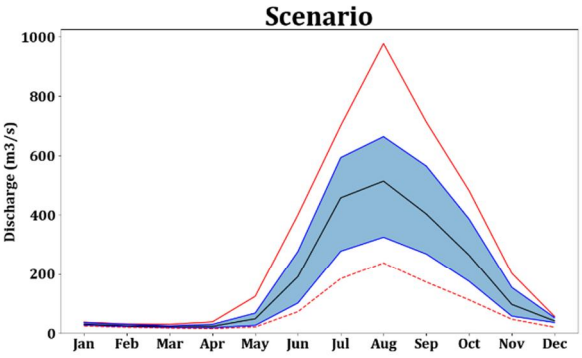
Reference



20 % non exceedance annual minimum (m3/s):	18
Median annual minimum (m3/s):	19
Average annual median (m3/s):	74
Median annual maximum (m3/s):	555
80 % non exceedance annual maximum (m3/s):	641
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.86
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

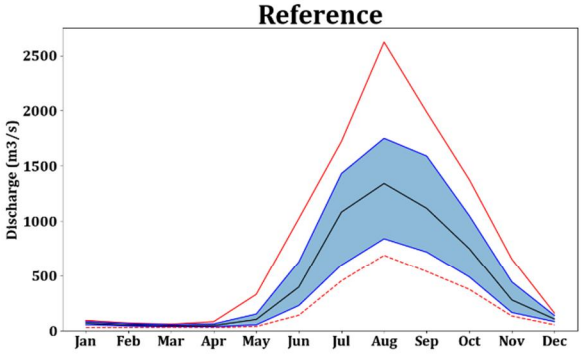


20 % non exceedance annual minimum (m3/s):	18
Median annual minimum (m3/s):	19
Average annual median (m3/s):	74
Median annual maximum (m3/s):	555
80 % non exceedance annual maximum (m3/s):	641
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.86
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE M5

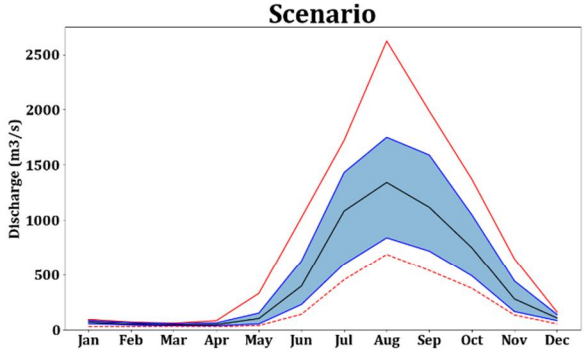
Reference



20 % non exceedance annual minimum (m3/s):	34
Median annual minimum (m3/s):	36
Average annual median (m3/s):	185
Median annual maximum (m3/s):	1385
80 % non exceedance annual maximum (m3/s):	1620
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

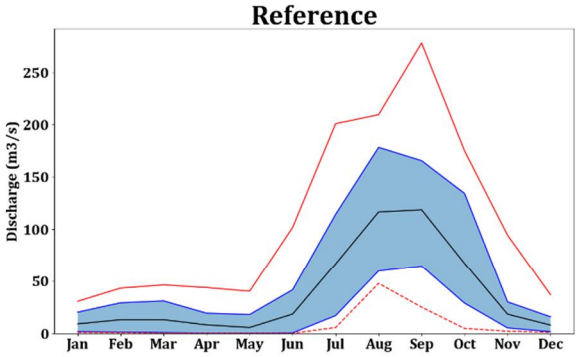


20 % non exceedance annual minimum (m3/s):	34
Median annual minimum (m3/s):	36
Average annual median (m3/s):	185
Median annual maximum (m3/s):	1385
80 % non exceedance annual maximum (m3/s):	1620
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Ram1

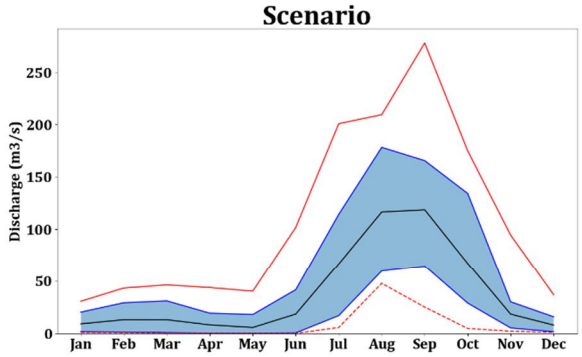
Reference



20 % non exceedance annual minimum (m3/s):	0
Median annual minimum (m3/s):	1
Average annual median (m3/s):	15
Median annual maximum (m3/s):	138
80 % non exceedance annual maximum (m3/s):	167
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

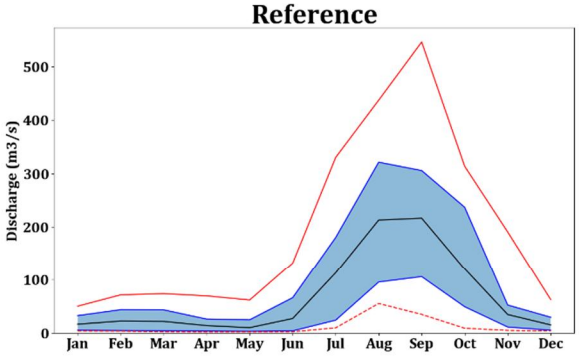


20 % non exceedance annual minimum (m3/s):	0
Median annual minimum (m3/s):	1
Average annual median (m3/s):	15
Median annual maximum (m3/s):	138
80 % non exceedance annual maximum (m3/s):	167
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Ram2

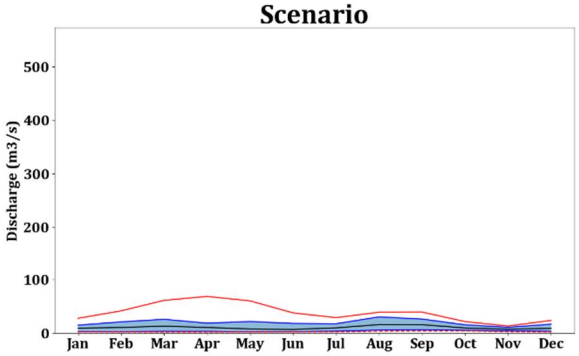
Reference



20 % non exceedance annual minimum (m3/s):	3
Median annual minimum (m3/s):	4
Average annual median (m3/s):	25
Median annual maximum (m3/s):	226
80 % non exceedance annual maximum (m3/s):	318
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

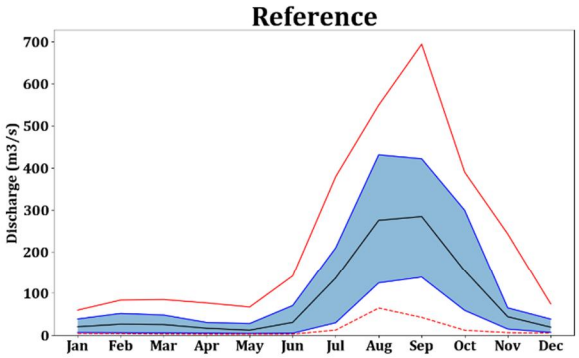


20 % non exceedance annual minimum (m3/s):	2
Median annual minimum (m3/s):	3
Average annual median (m3/s):	8
Median annual maximum (m3/s):	19
80 % non exceedance annual maximum (m3/s):	32
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	7
Relative frequency: 20% non-exceedance (min):	0.23
Relative frequency: 50% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (max):	0.00

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Ram3

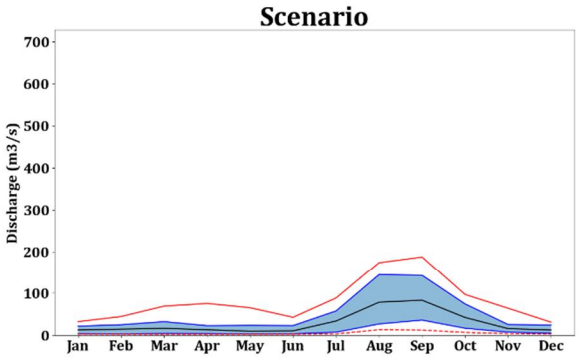
Reference



20 % non exceedance annual minimum (m3/s):	4
Median annual minimum (m3/s):	5
Average annual median (m3/s):	30
Median annual maximum (m3/s):	296
80 % non exceedance annual maximum (m3/s):	414
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.83
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

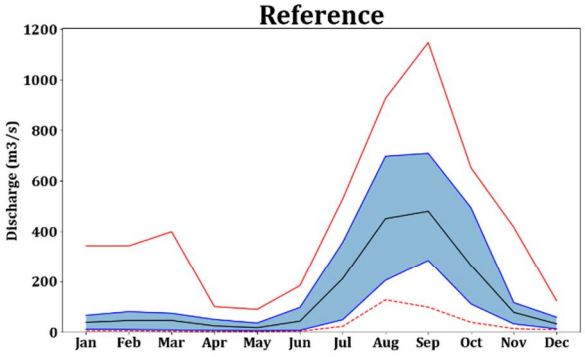


20 % non exceedance annual minimum (m3/s):	3
Median annual minimum (m3/s):	4
Average annual median (m3/s):	16
Median annual maximum (m3/s):	90
80 % non exceedance annual maximum (m3/s):	142
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	5
Relative frequency: 20% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (min):	0.74
Relative frequency: 50% non-exceedance (max):	0.00

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Ram4

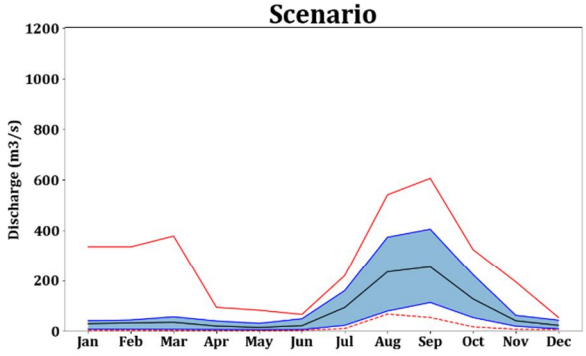
Reference



20 % non exceedance annual minimum (m3/s):	5
Median annual minimum (m3/s):	8
Average annual median (m3/s):	51
Median annual maximum (m3/s):	518
80 % non exceedance annual maximum (m3/s):	647
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

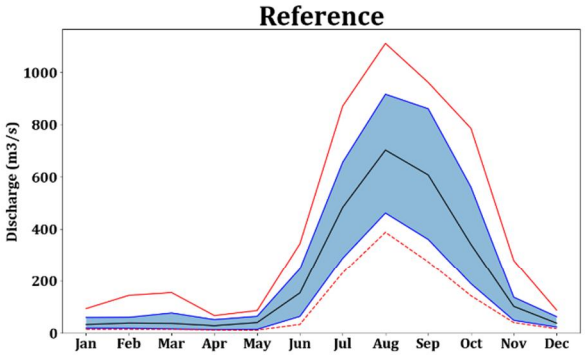


20 % non exceedance annual minimum (m3/s):	4
Median annual minimum (m3/s):	7
Average annual median (m3/s):	31
Median annual maximum (m3/s):	284
80 % non exceedance annual maximum (m3/s):	353
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	4
Relative frequency: 20% non-exceedance (min):	0.60
Relative frequency: 50% non-exceedance (min):	0.69
Relative frequency: 50% non-exceedance (max):	0.06

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Rap1

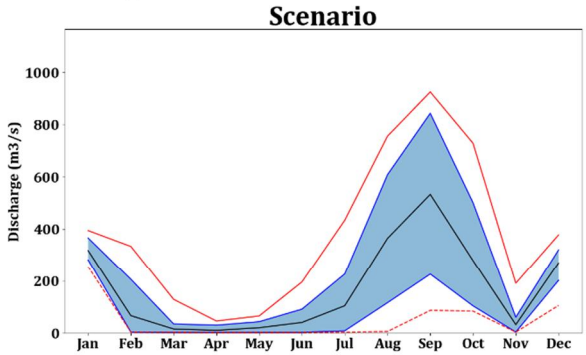
Reference



20 % non exceedance annual minimum (m3/s):	13
Median annual minimum (m3/s):	18
Average annual median (m3/s):	73
Median annual maximum (m3/s):	731
80 % non exceedance annual maximum (m3/s):	914
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

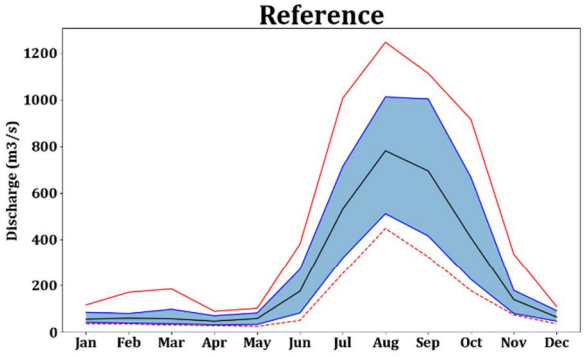


20 % non exceedance annual minimum (m3/s):	2
Median annual minimum (m3/s):	2
Average annual median (m3/s):	96
Median annual maximum (m3/s):	571
80 % non exceedance annual maximum (m3/s):	740
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	4
Relative frequency: 20% non-exceedance (min):	0.03
Relative frequency: 50% non-exceedance (min):	0.97
Relative frequency: 50% non-exceedance (max):	0.23

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Rap2

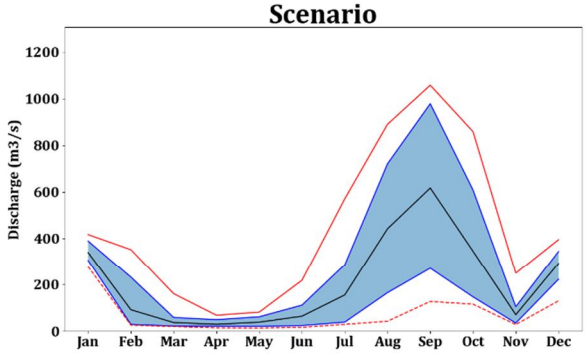
Reference



20 % non exceedance annual minimum (m3/s):	32
Median annual minimum (m3/s):	37
Average annual median (m3/s):	99
Median annual maximum (m3/s):	818
80 % non exceedance annual maximum (m3/s):	1007
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

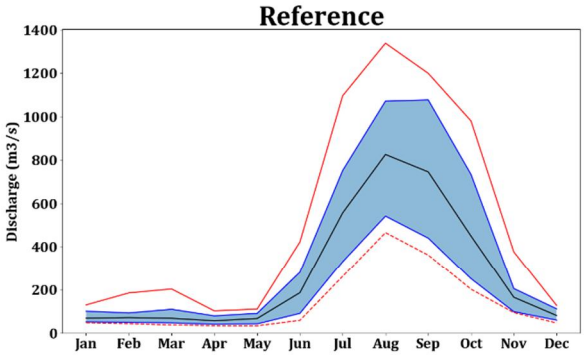


20 % non exceedance annual minimum (m3/s):	19
Median annual minimum (m3/s):	21
Average annual median (m3/s):	130
Median annual maximum (m3/s):	642
80 % non exceedance annual maximum (m3/s):	850
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	4
Relative frequency: 20% non-exceedance (min):	0.11
Relative frequency: 50% non-exceedance (min):	0.94
Relative frequency: 50% non-exceedance (max):	0.23

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Rap3

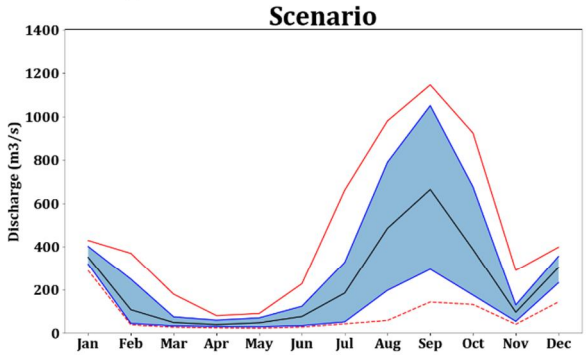
Reference



20 % non exceedance annual minimum (m3/s):	42
Median annual minimum (m3/s):	48
Average annual median (m3/s):	114
Median annual maximum (m3/s):	857
80 % non exceedance annual maximum (m3/s):	1078
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

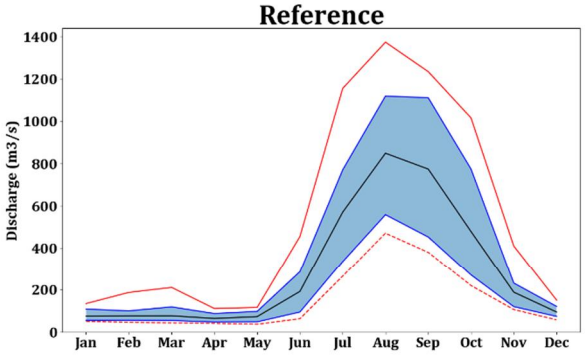


20 % non exceedance annual minimum (m3/s):	29
Median annual minimum (m3/s):	31
Average annual median (m3/s):	151
Median annual maximum (m3/s):	676
80 % non exceedance annual maximum (m3/s):	906
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	4
Relative frequency: 20% non-exceedance (min):	0.11
Relative frequency: 50% non-exceedance (min):	0.91
Relative frequency: 50% non-exceedance (max):	0.26

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Rap4

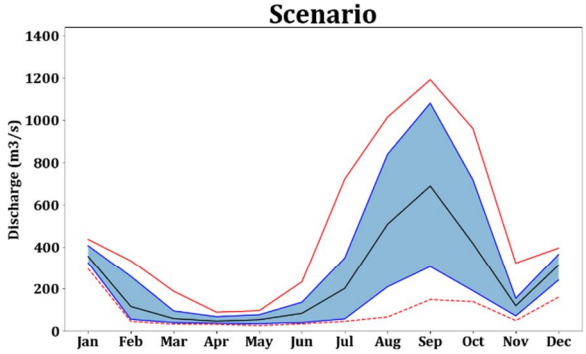
Reference



20 % non exceedance annual minimum (m3/s):	49
Median annual minimum (m3/s):	56
Average annual median (m3/s):	127
Median annual maximum (m3/s):	879
80 % non exceedance annual maximum (m3/s):	1113
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

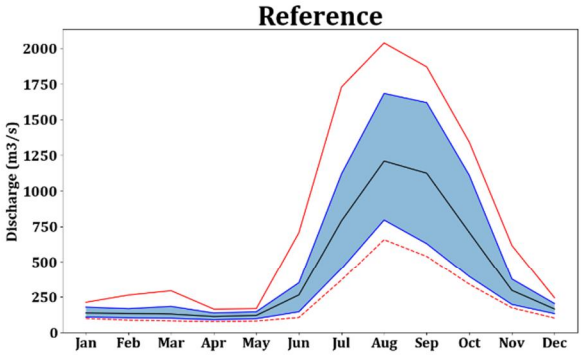


20 % non exceedance annual minimum (m3/s):	34
Median annual minimum (m3/s):	38
Average annual median (m3/s):	166
Median annual maximum (m3/s):	695
80 % non exceedance annual maximum (m3/s):	942
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	4
Relative frequency: 20% non-exceedance (min):	0.14
Relative frequency: 50% non-exceedance (min):	0.91
Relative frequency: 50% non-exceedance (max):	0.26

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Rap5

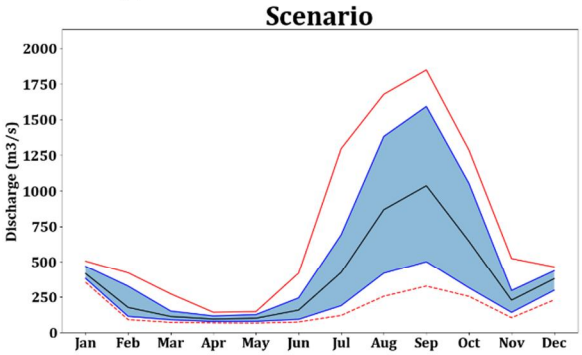
Reference



20 % non exceedance annual minimum (m3/s):	96
Median annual minimum (m3/s):	103
Average annual median (m3/s):	200
Median annual maximum (m3/s):	1319
80 % non exceedance annual maximum (m3/s):	1640
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

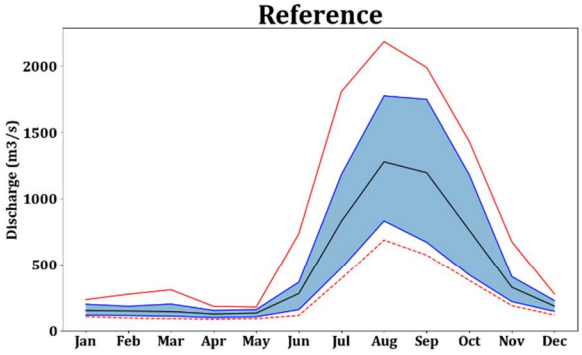


20 % non exceedance annual minimum (m3/s):	77
Median annual minimum (m3/s):	86
Average annual median (m3/s):	279
Median annual maximum (m3/s):	1135
80 % non exceedance annual maximum (m3/s):	1423
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.23
Relative frequency: 50% non-exceedance (min):	0.83
Relative frequency: 50% non-exceedance (max):	0.34

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Rap6

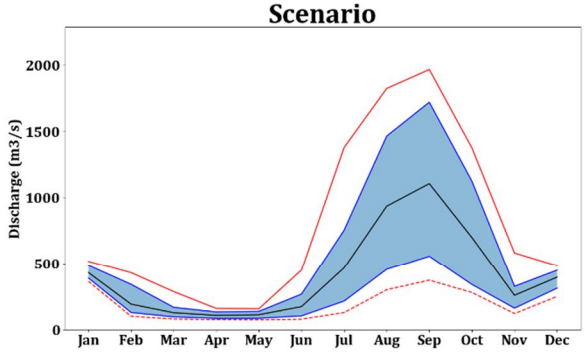
Reference



20 % non exceedance annual minimum (m3/s):	104
Median annual minimum (m3/s):	115
Average annual median (m3/s):	219
Median annual maximum (m3/s):	1401
80 % non exceedance annual maximum (m3/s):	1740
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

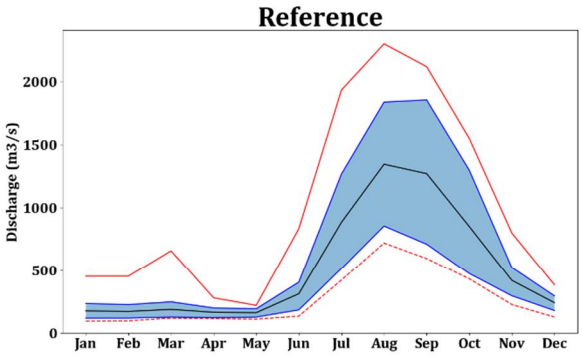


20 % non exceedance annual minimum (m3/s):	89
Median annual minimum (m3/s):	100
Average annual median (m3/s):	303
Median annual maximum (m3/s):	1209
80 % non exceedance annual maximum (m3/s):	1518
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.34
Relative frequency: 50% non-exceedance (min):	0.86
Relative frequency: 50% non-exceedance (max):	0.29

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Rap7

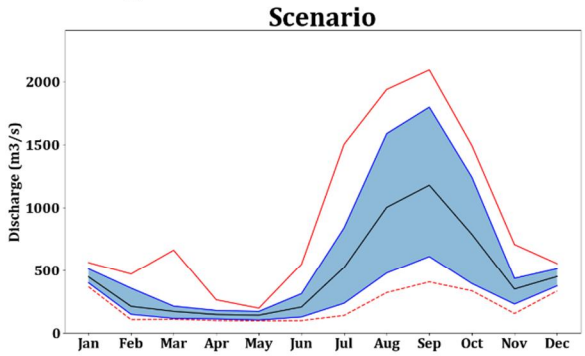
Reference



20 % non exceedance annual minimum (m3/s):	116
Median annual minimum (m3/s):	141
Average annual median (m3/s):	267
Median annual maximum (m3/s):	1447
80 % non exceedance annual maximum (m3/s):	1824
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

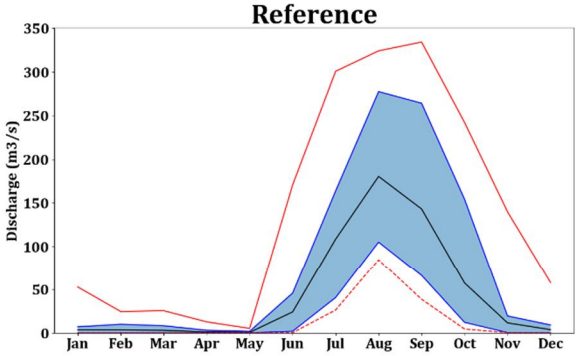


20 % non exceedance annual minimum (m3/s):	116
Median annual minimum (m3/s):	132
Average annual median (m3/s):	360
Median annual maximum (m3/s):	1283
80 % non exceedance annual maximum (m3/s):	1611
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.63
Relative frequency: 50% non-exceedance (max):	0.34

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Si2

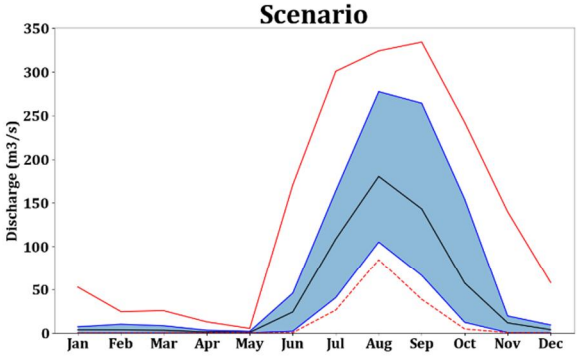
Reference



20 % non exceedance annual minimum (m3/s):	0
Median annual minimum (m3/s):	0
Average annual median (m3/s):	6
Median annual maximum (m3/s):	182
80 % non exceedance annual maximum (m3/s):	266
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	2
Relative frequency: 20% non-exceedance (min):	1.00
Relative frequency: 50% non-exceedance (min):	0.00
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

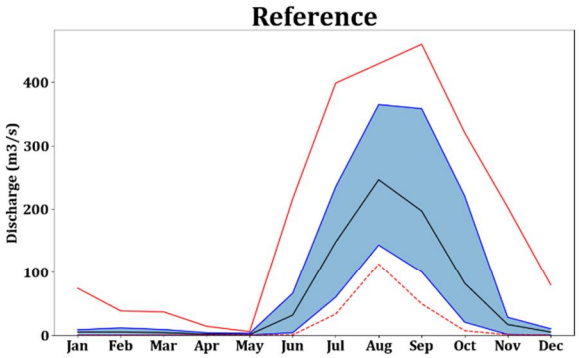


20 % non exceedance annual minimum (m3/s):	0
Median annual minimum (m3/s):	0
Average annual median (m3/s):	6
Median annual maximum (m3/s):	182
80 % non exceedance annual maximum (m3/s):	266
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	2
Relative frequency: 20% non-exceedance (min):	1.00
Relative frequency: 50% non-exceedance (min):	0.00
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Si3

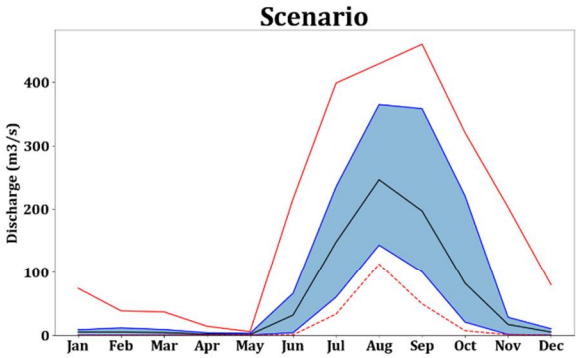
Reference



20 % non exceedance annual minimum (m3/s):	0
Median annual minimum (m3/s):	0
Average annual median (m3/s):	8
Median annual maximum (m3/s):	249
80 % non exceedance annual maximum (m3/s):	357
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	1.00
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

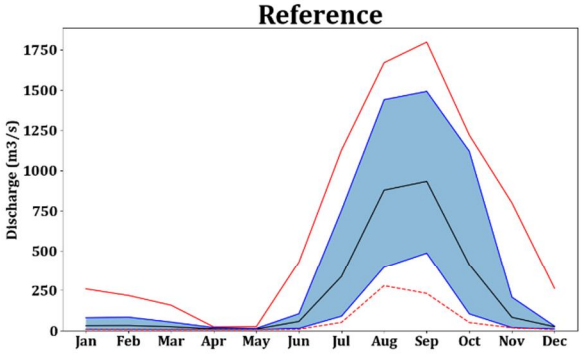


20 % non exceedance annual minimum (m3/s):	0
Median annual minimum (m3/s):	0
Average annual median (m3/s):	8
Median annual maximum (m3/s):	249
80 % non exceedance annual maximum (m3/s):	357
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	1.00
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Si4

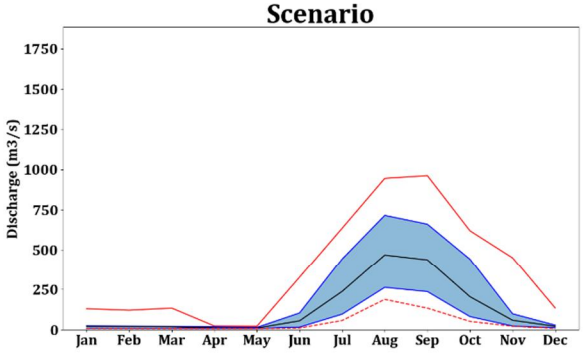
Reference



20 % non exceedance annual minimum (m3/s):	7
Median annual minimum (m3/s):	8
Average annual median (m3/s):	32
Median annual maximum (m3/s):	1055
80 % non exceedance annual maximum (m3/s):	1453
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

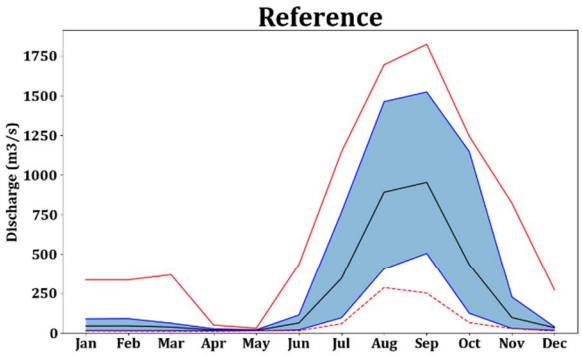


20 % non exceedance annual minimum (m3/s):	7
Median annual minimum (m3/s):	8
Average annual median (m3/s):	28
Median annual maximum (m3/s):	531
80 % non exceedance annual maximum (m3/s):	658
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.86
Relative frequency: 50% non-exceedance (min):	0.46
Relative frequency: 50% non-exceedance (max):	0.00

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Si5

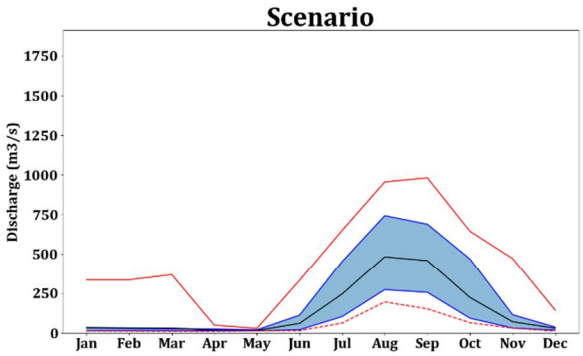
Reference



20 % non exceedance annual minimum (m3/s):	12
Median annual minimum (m3/s):	13
Average annual median (m3/s):	43
Median annual maximum (m3/s):	1072
80 % non exceedance annual maximum (m3/s):	1474
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.83
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

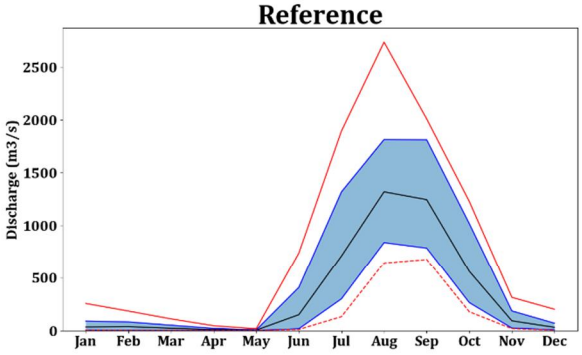


20 % non exceedance annual minimum (m3/s):	12
Median annual minimum (m3/s):	13
Average annual median (m3/s):	37
Median annual maximum (m3/s):	565
80 % non exceedance annual maximum (m3/s):	685
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.77
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.00

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE So3

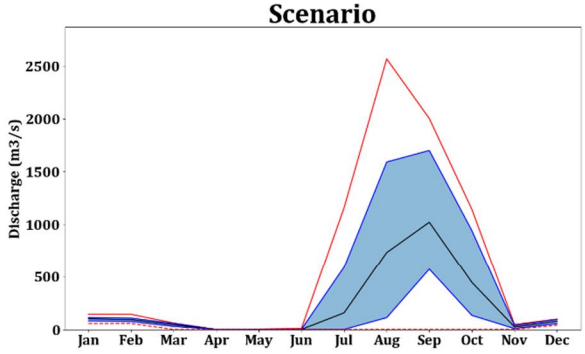
Reference



20 % non exceedance annual minimum (m3/s):	1
Median annual minimum (m3/s):	2
Average annual median (m3/s):	57
Median annual maximum (m3/s):	1416
80 % non exceedance annual maximum (m3/s):	1811
Most frequent month of maximum:	Aug/Sep
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.86
Relative frequency: 50% non-exceedance (min):	0.46
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

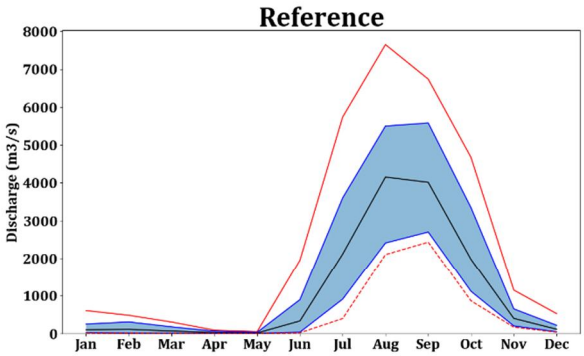


20 % non exceedance annual minimum (m3/s):	0
Median annual minimum (m3/s):	0
Average annual median (m3/s):	64
Median annual maximum (m3/s):	1041
80 % non exceedance annual maximum (m3/s):	1484
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	4
Relative frequency: 20% non-exceedance (min):	0.00
Relative frequency: 50% non-exceedance (min):	1.00
Relative frequency: 50% non-exceedance (max):	0.23

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE So4

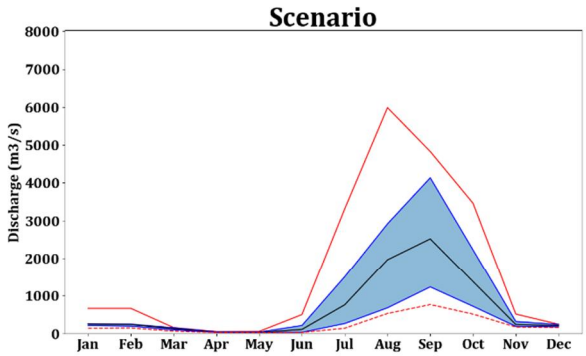
Reference



20 % non exceedance annual minimum (m3/s):	3
Median annual minimum (m3/s):	6
Average annual median (m3/s):	197
Median annual maximum (m3/s):	4563
80 % non exceedance annual maximum (m3/s):	5457
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

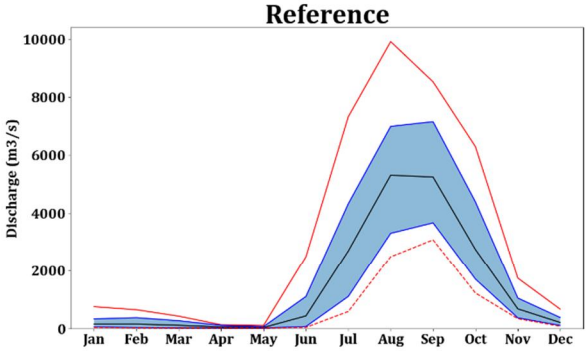


20 % non exceedance annual minimum (m3/s):	22
Median annual minimum (m3/s):	23
Average annual median (m3/s):	231
Median annual maximum (m3/s):	2512
80 % non exceedance annual maximum (m3/s):	3608
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	2
Relative frequency: 20% non-exceedance (min):	1.00
Relative frequency: 50% non-exceedance (min):	0.00
Relative frequency: 50% non-exceedance (max):	0.09

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE So5

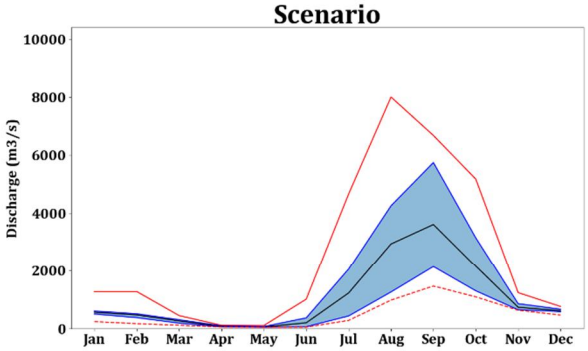
Reference



20 % non exceedance annual minimum (m3/s):	18
Median annual minimum (m3/s):	23
Average annual median (m3/s):	307
Median annual maximum (m3/s):	5790
80 % non exceedance annual maximum (m3/s):	7024
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

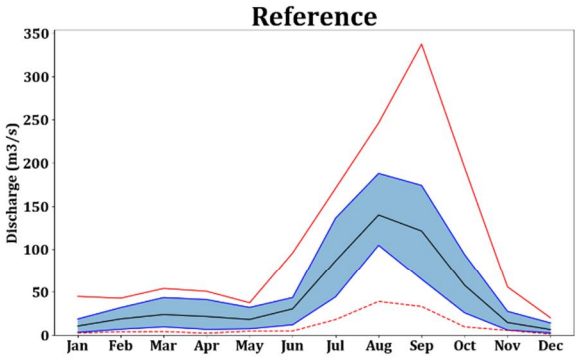


20 % non exceedance annual minimum (m3/s):	42
Median annual minimum (m3/s):	46
Average annual median (m3/s):	576
Median annual maximum (m3/s):	3577
80 % non exceedance annual maximum (m3/s):	4999
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	2
Relative frequency: 20% non-exceedance (min):	1.00
Relative frequency: 50% non-exceedance (min):	0.00
Relative frequency: 50% non-exceedance (max):	0.11

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Y1

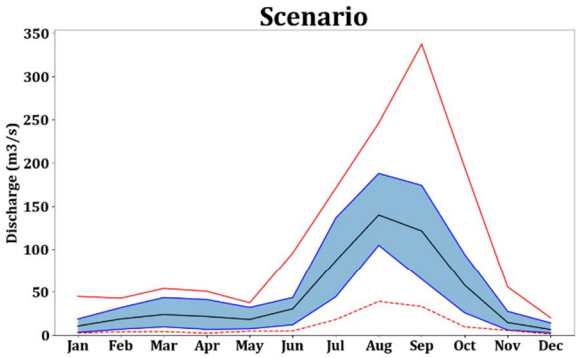
Reference



20 % non exceedance annual minimum (m3/s):	3
Median annual minimum (m3/s):	4
Average annual median (m3/s):	24
Median annual maximum (m3/s):	140
80 % non exceedance annual maximum (m3/s):	174
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

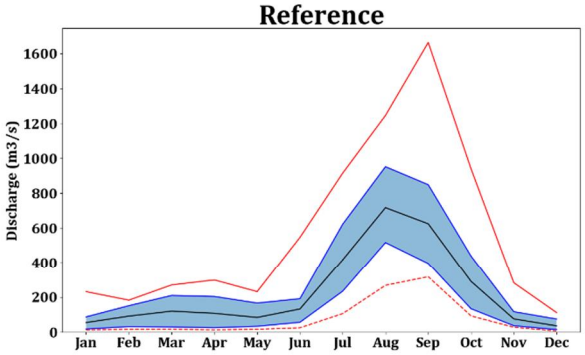


20 % non exceedance annual minimum (m3/s):	3
Median annual minimum (m3/s):	4
Average annual median (m3/s):	24
Median annual maximum (m3/s):	140
80 % non exceedance annual maximum (m3/s):	174
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Y2

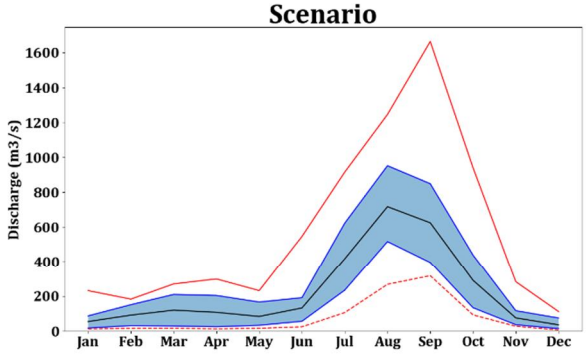
Reference



20 % non exceedance annual minimum (m3/s):	12
Median annual minimum (m3/s):	24
Average annual median (m3/s):	112
Median annual maximum (m3/s):	732
80 % non exceedance annual maximum (m3/s):	937
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.83
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

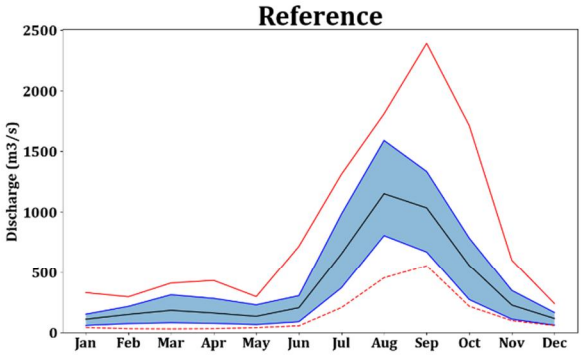


20 % non exceedance annual minimum (m3/s):	12
Median annual minimum (m3/s):	24
Average annual median (m3/s):	112
Median annual maximum (m3/s):	732
80 % non exceedance annual maximum (m3/s):	937
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.83
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Y3

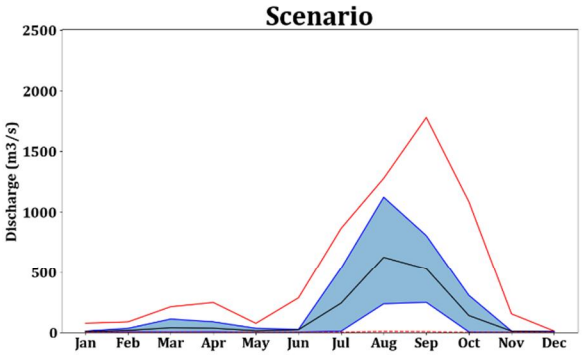
Reference



20 % non exceedance annual minimum (m3/s):	56
Median annual minimum (m3/s):	77
Average annual median (m3/s):	195
Median annual maximum (m3/s):	1212
80 % non exceedance annual maximum (m3/s):	1464
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

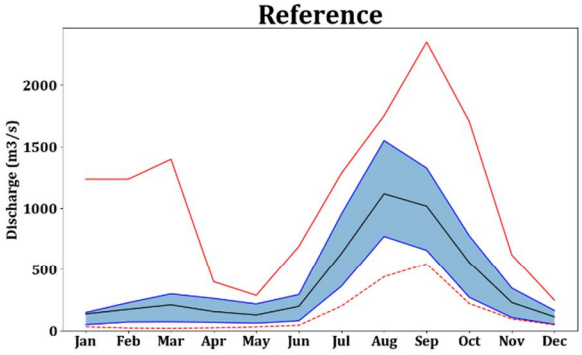


20 % non exceedance annual minimum (m3/s):	0
Median annual minimum (m3/s):	2
Average annual median (m3/s):	21
Median annual maximum (m3/s):	633
80 % non exceedance annual maximum (m3/s):	951
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	9
Relative frequency: 20% non-exceedance (min):	0.00
Relative frequency: 50% non-exceedance (min):	1.00
Relative frequency: 50% non-exceedance (max):	0.09

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Y4

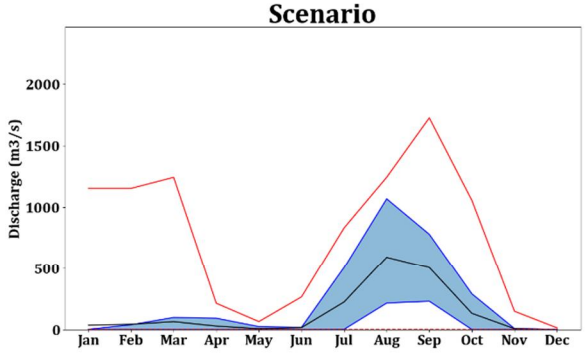
Reference



20 % non exceedance annual minimum (m3/s):	47
Median annual minimum (m3/s):	71
Average annual median (m3/s):	201
Median annual maximum (m3/s):	1176
80 % non exceedance annual maximum (m3/s):	1451
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

Scenario

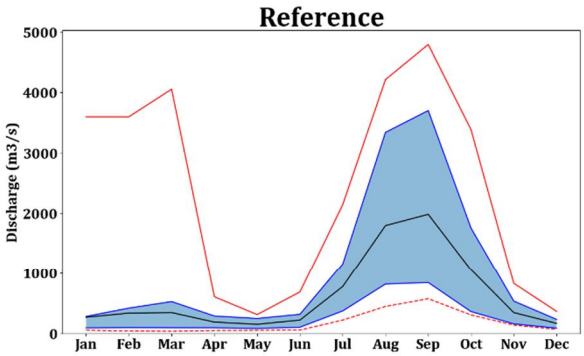


20 % non exceedance annual minimum (m3/s):	0
Median annual minimum (m3/s):	0
Average annual median (m3/s):	21
Median annual maximum (m3/s):	582
80 % non exceedance annual maximum (m3/s):	969
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	9
Relative frequency: 20% non-exceedance (min):	0.00
Relative frequency: 50% non-exceedance (min):	1.00
Relative frequency: 50% non-exceedance (max):	0.11

Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Y5

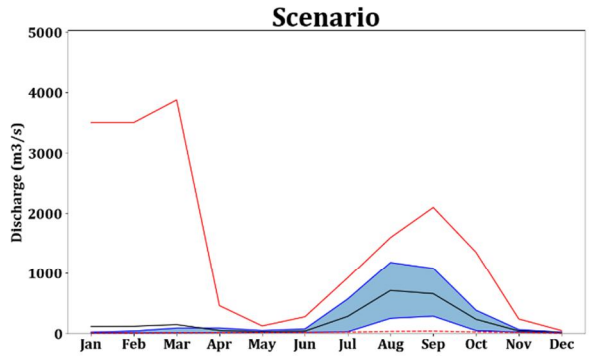
Reference



20 % non exceedance annual minimum (m3/s):	79
Median annual minimum (m3/s):	94
Average annual median (m3/s):	280
Median annual maximum (m3/s):	1843
80 % non exceedance annual maximum (m3/s):	3377
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum

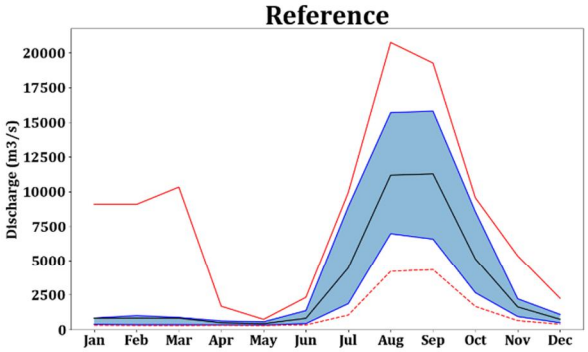
Scenario



20 % non exceedance annual minimum (m3/s):	10
Median annual minimum (m3/s):	12
Average annual median (m3/s):	45
Median annual maximum (m3/s):	694
80 % non exceedance annual maximum (m3/s):	1064
Most frequent month of maximum:	Aug
Average no. of months with Q < Q25 (reference):	9
Relative frequency: 20% non-exceedance (min):	0.00
Relative frequency: 50% non-exceedance (min):	1.00
Relative frequency: 50% non-exceedance (max):	0.06

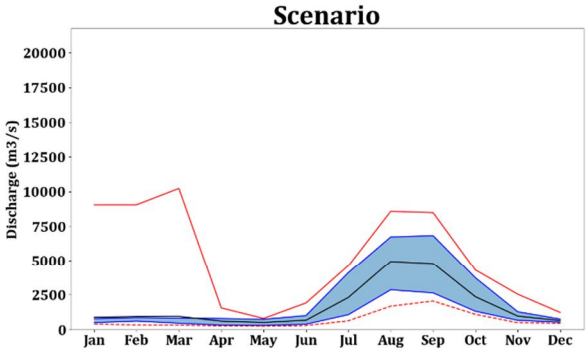
Maximum
Q90
Mean
Q10
Minimum

ECO-ZONE Y6



20 % non exceedance annual minimum (m3/s):	328
Median annual minimum (m3/s):	375
Average annual median (m3/s):	894
Median annual maximum (m3/s):	12425
80 % non exceedance annual maximum (m3/s):	14980
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	3
Relative frequency: 20% non-exceedance (min):	0.80
Relative frequency: 50% non-exceedance (min):	0.49
Relative frequency: 50% non-exceedance (max):	0.49

Maximum
Q90
Mean
Q10
Minimum



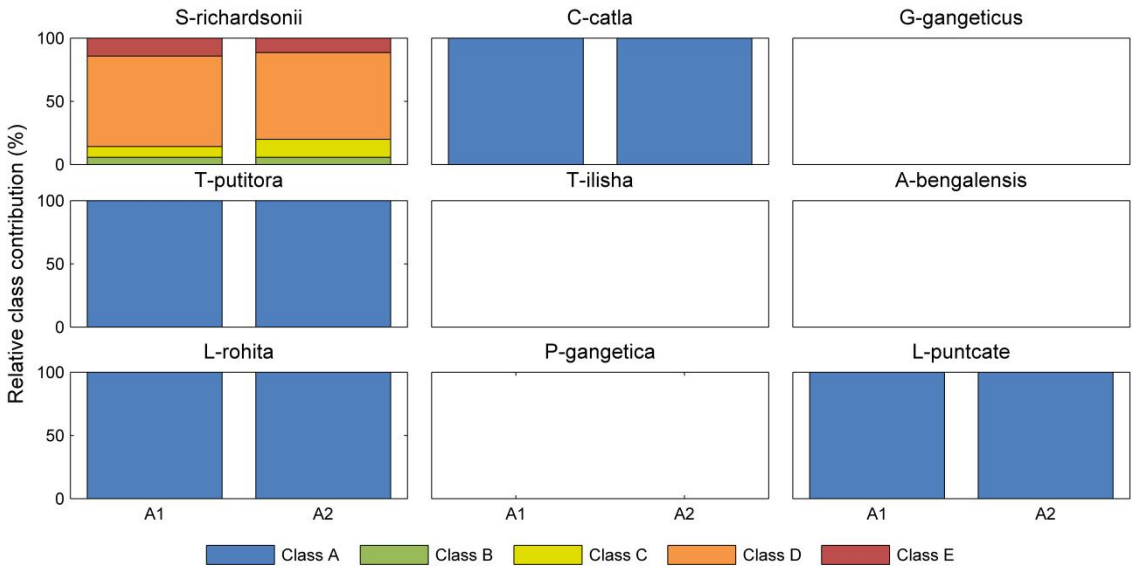
20 % non exceedance annual minimum (m3/s):	298
Median annual minimum (m3/s):	443
Average annual median (m3/s):	781
Median annual maximum (m3/s):	5432
80 % non exceedance annual maximum (m3/s):	6775
Most frequent month of maximum:	Sep
Average no. of months with Q < Q25 (reference):	1
Relative frequency: 20% non-exceedance (min):	0.66
Relative frequency: 50% non-exceedance (min):	0.37
Relative frequency: 50% non-exceedance (max):	0.00

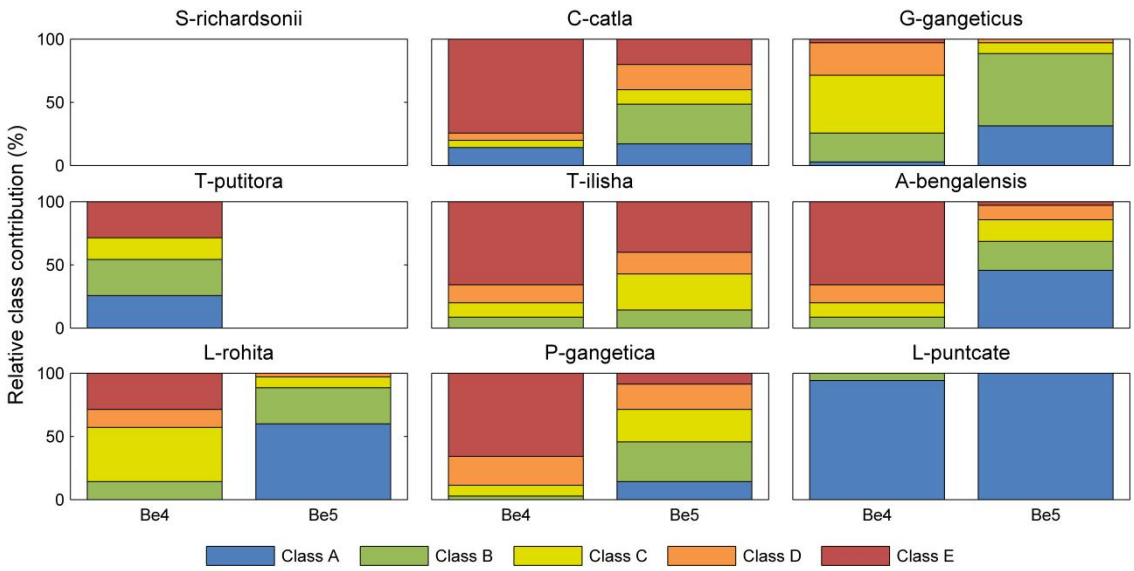
Maximum
Q90
Mean
Q10
Minimum

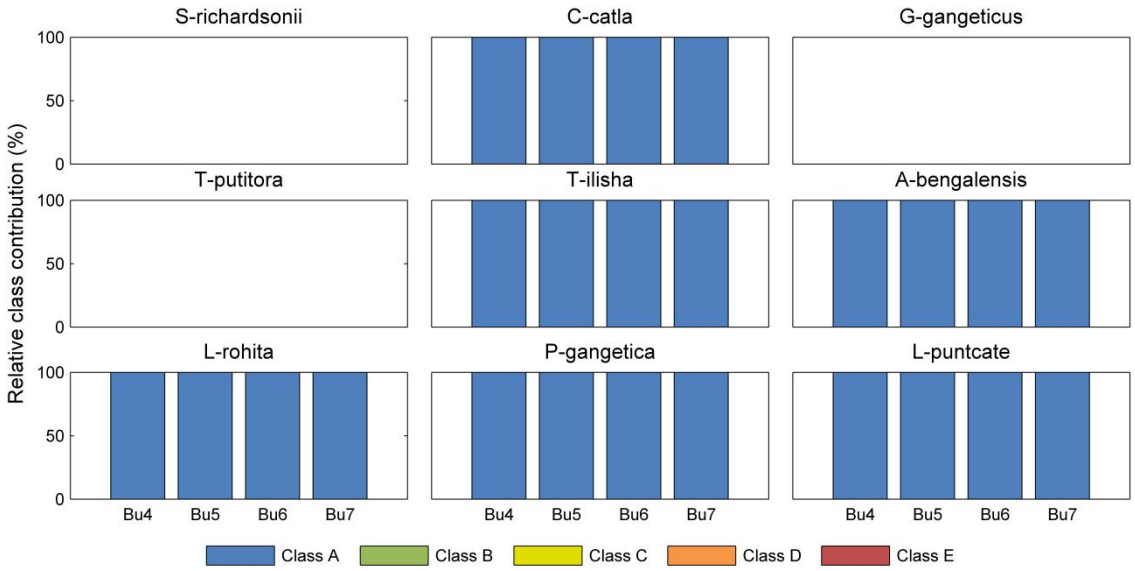
D Ecological Scores Present versus Pristine for all Zones

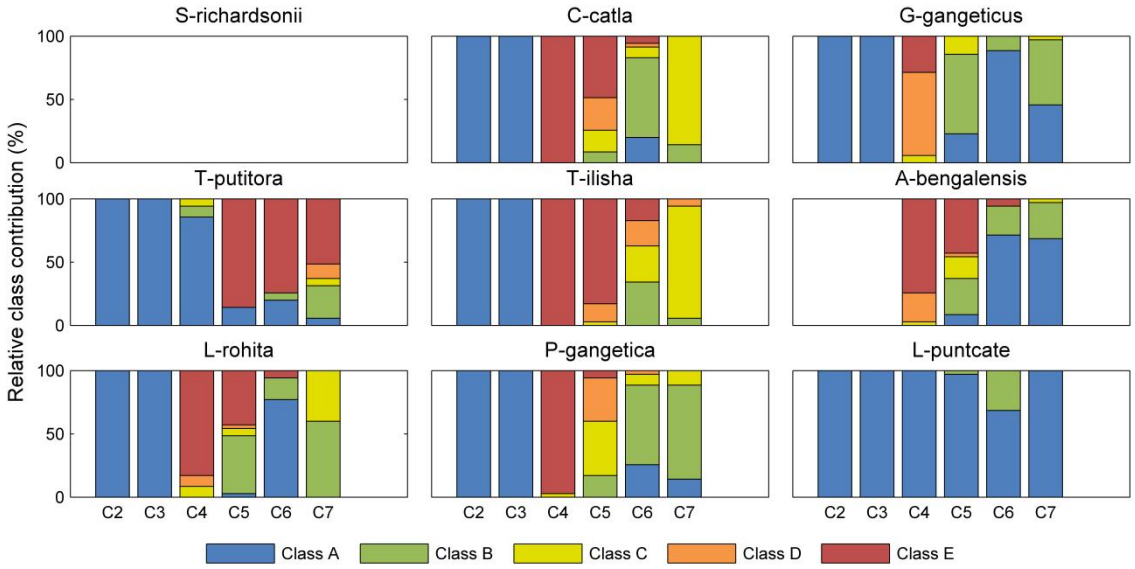
For all simulated years, model output is processed into suitability classes by species. The figures in this appendix present the suitability class distribution per species (D.1) and the overall ecological score (D.2) over the entire simulated period per river, for all river zones. Suitability classes in the present situation are determined as the change compared to the pristine situation. The graphs with all zones per river provide an overview of suitability variations along the river.

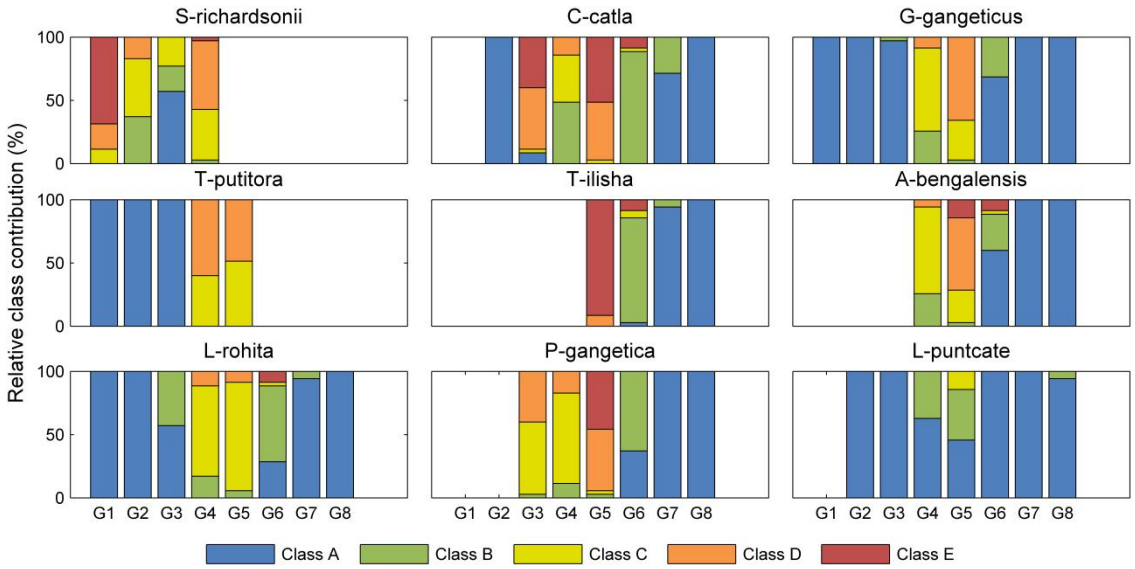
D.1 Class Distributions per Species

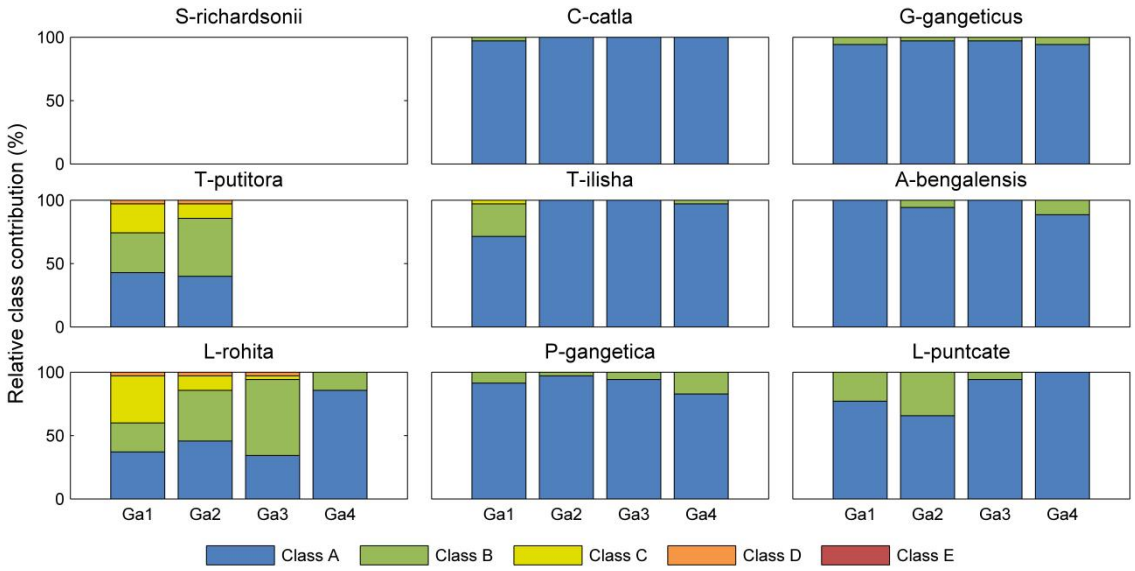


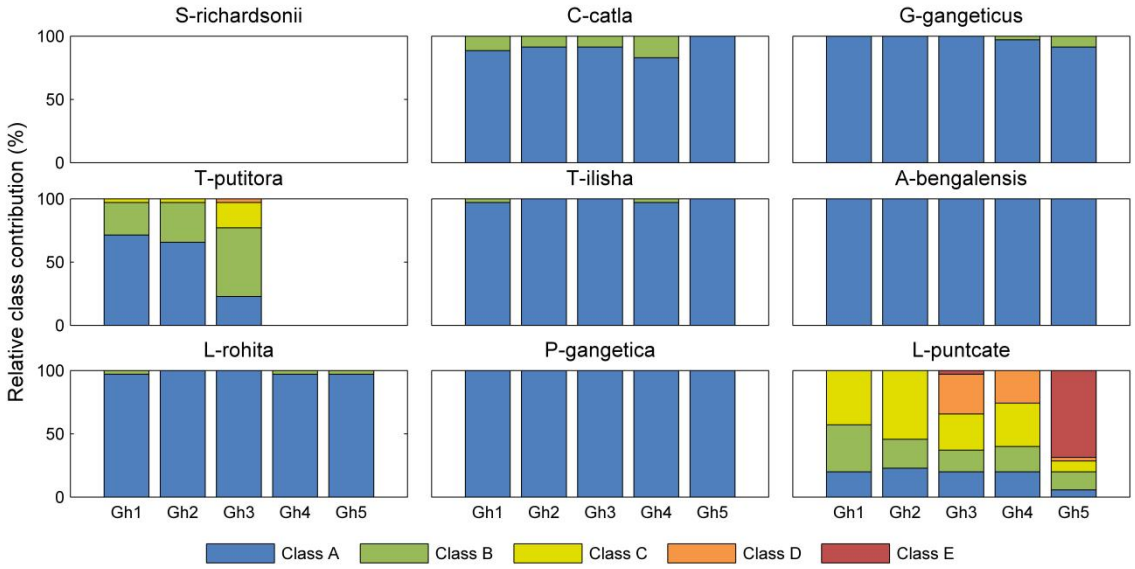


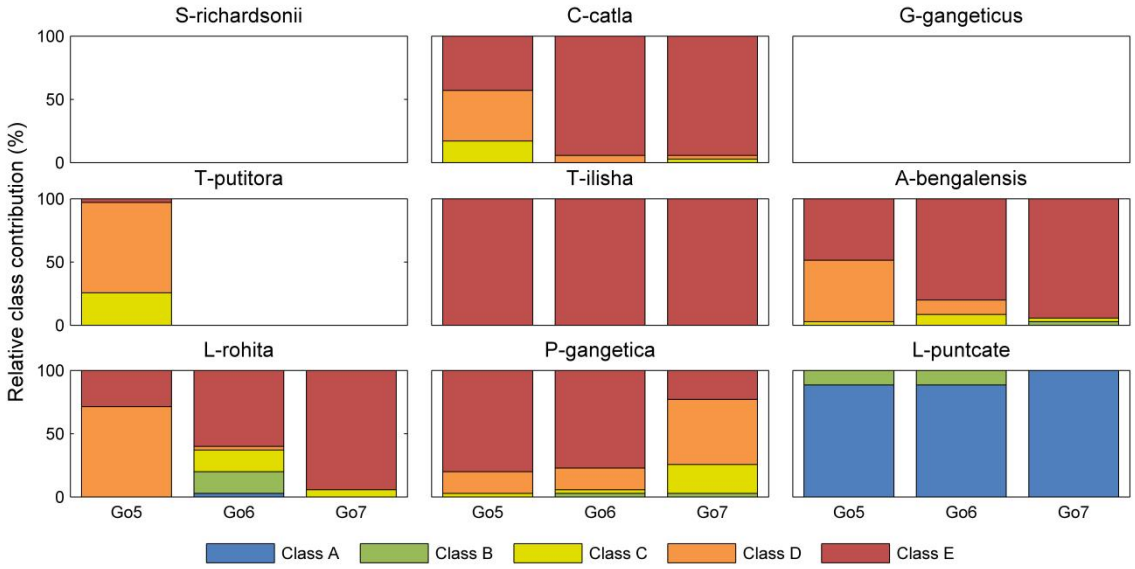

S-richardsonii
C-catla
G-gangeticus
T-putitora
T-ilisha
A-bengalensis
L-rohita
P-gangetica
L-puntcate
Relative class contribution (%)
100
50
0
Bu4
Bu5
Bu6
Bu7
Class A
Class B
Class C
Class D
Class E

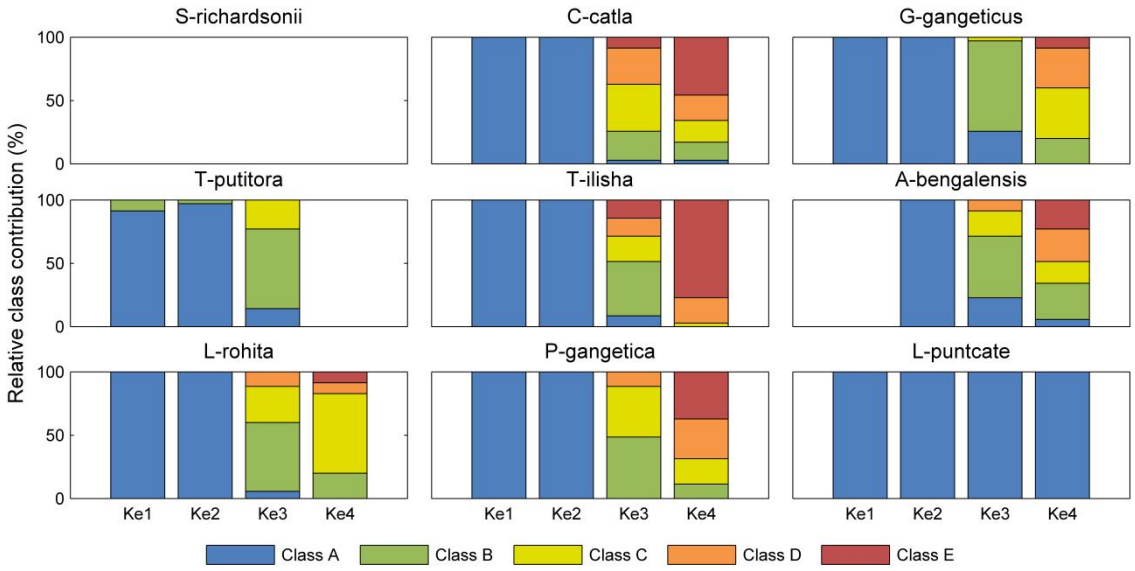

S-richardsonii
C-catla
G-gangeticus
T-putitora
T-ilisha
A-bengalensis
L-rohita
P-gangetica
L-puntcate
Relative class contribution (%)
100
50
0
C2
C3
C4
C5
C6
C7
Class A
Class B
Class C
Class D
Class E

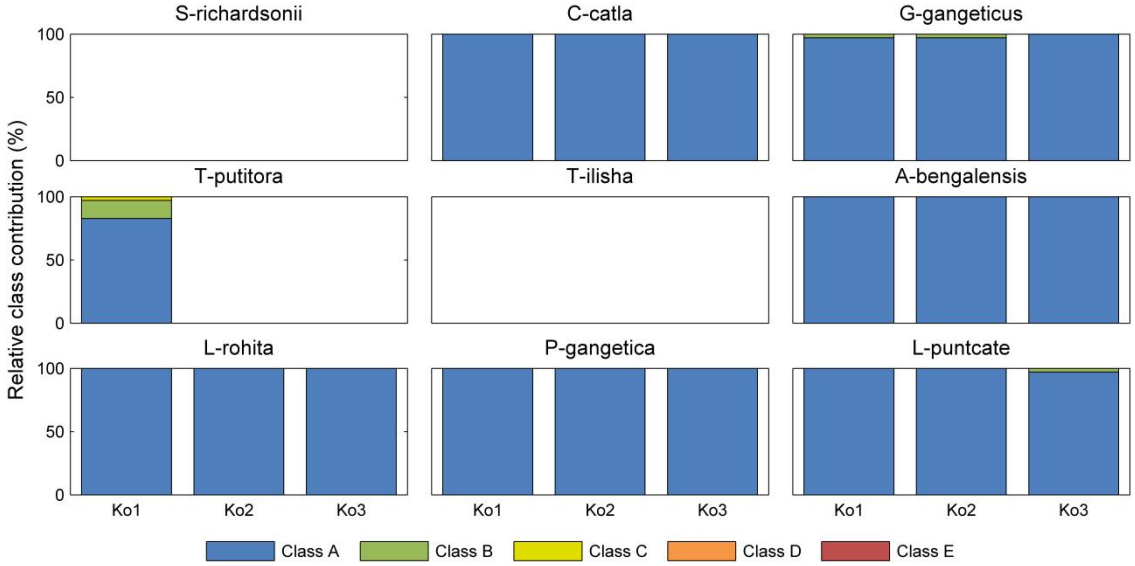

S-richardsonii
C-catla
G-gangeticus
T-putitora
T-ilisha
A-bengalensis
L-rohita
P-gangetica
L-puntcate
Relative class contribution (%)
100
50
0
G1
G2
G3
G4
G5
G6
G7
G8
Class A
Class B
Class C
Class D
Class E

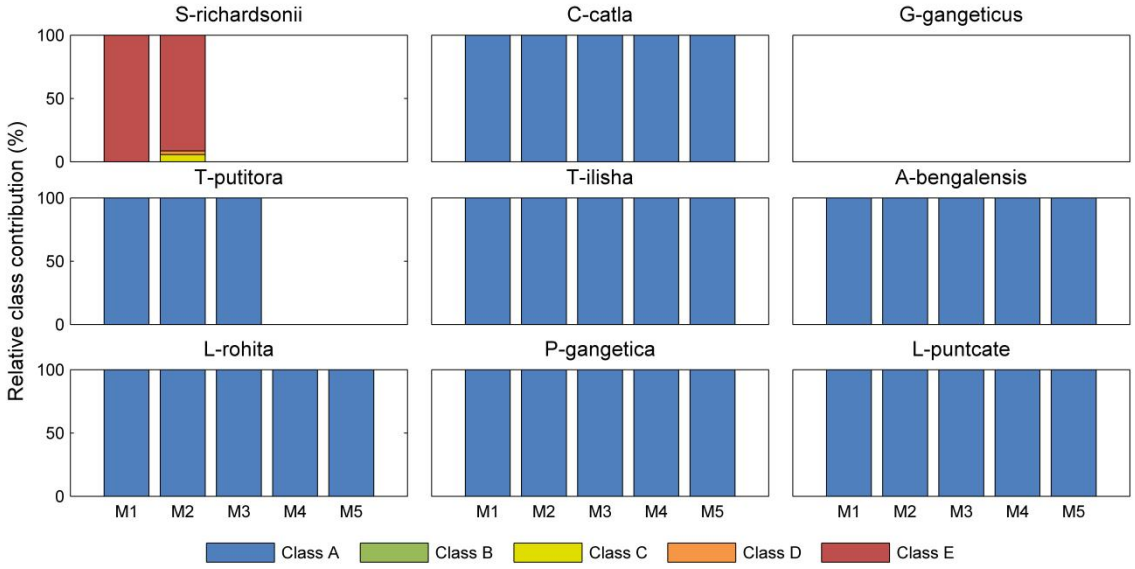

S-richardsonii
C-catla
G-gangeticus
T-putitora
T-ilisha
A-bengalensis
L-rohita
P-gangetica
L-puntcate
Relative class contribution (%)
100
50
0
Ga1
Ga2
Ga3
Ga4
Class A
Class B
Class C
Class D
Class E

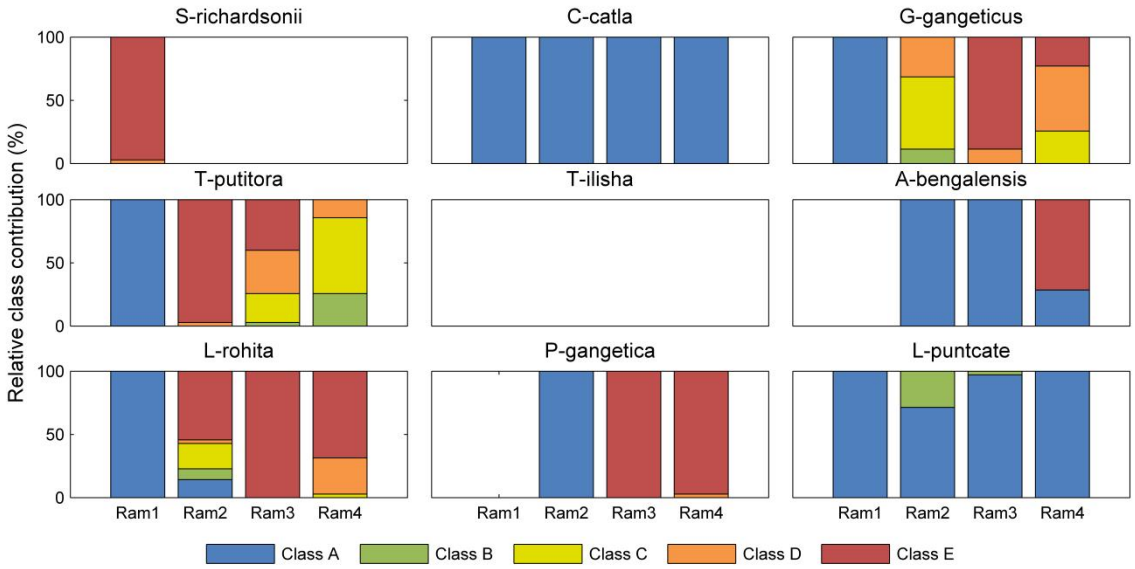

S-richardsonii
C-catla
G-gangeticus
T-putitora
T-ilisha
A-bengalensis
L-rohita
P-gangetica
L-puntcate
Relative class contribution (%)
100
50
0
Gh1
Gh2
Gh3
Gh4
Gh5
Class A
Class B
Class C
Class D
Class E

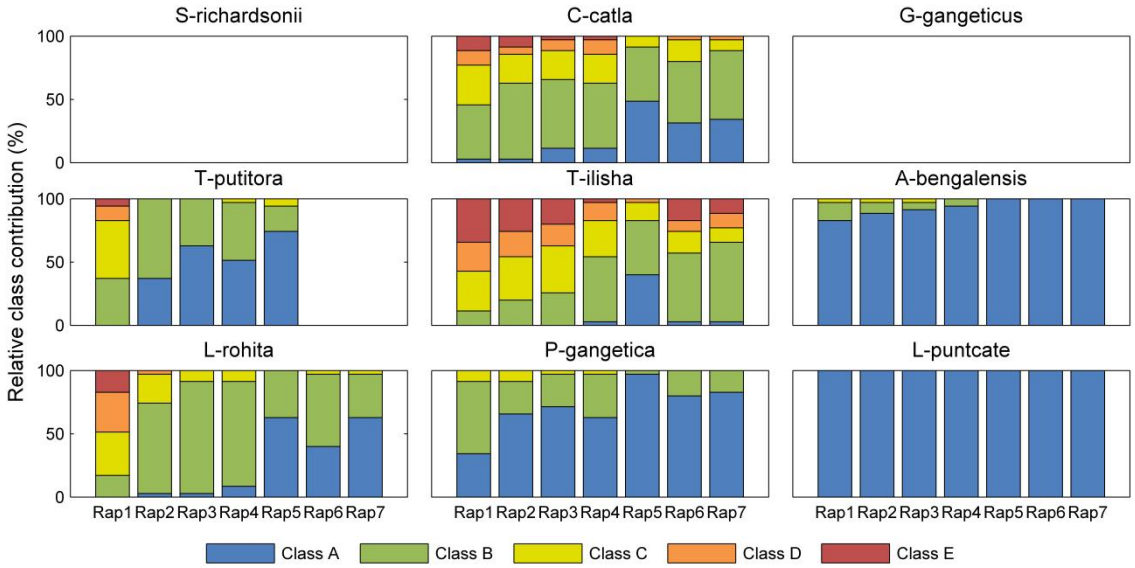

S-richardsonii
C-catla
G-gangeticus
T-putitora
T-ilisha
A-bengalensis
L-rohita
P-gangetica
L-puntcate
Relative class contribution (%)
100
50
0
Go5
Go6
Go7
Class A
Class B
Class C
Class D
Class E

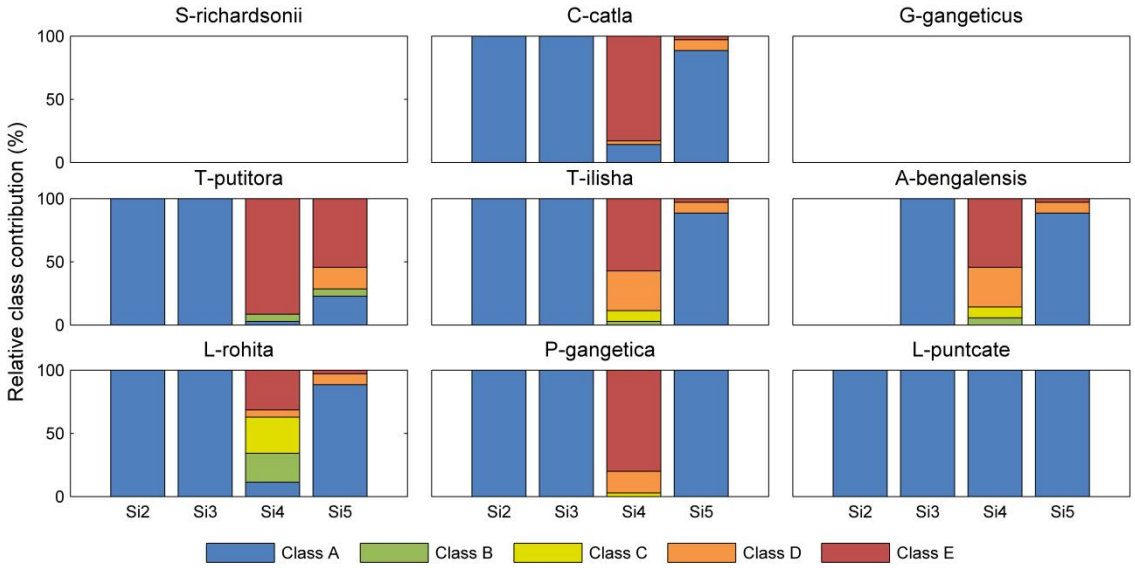

S-richardsonii
C-catla
G-gangeticus
T-putitora
T-ilisha
A-bengalensis
L-rohita
P-gangetica
L-puntcate
Relative class contribution (%)
100
50
0
Ke1
Ke2
Ke3
Ke4
Class A
Class B
Class C
Class D
Class E

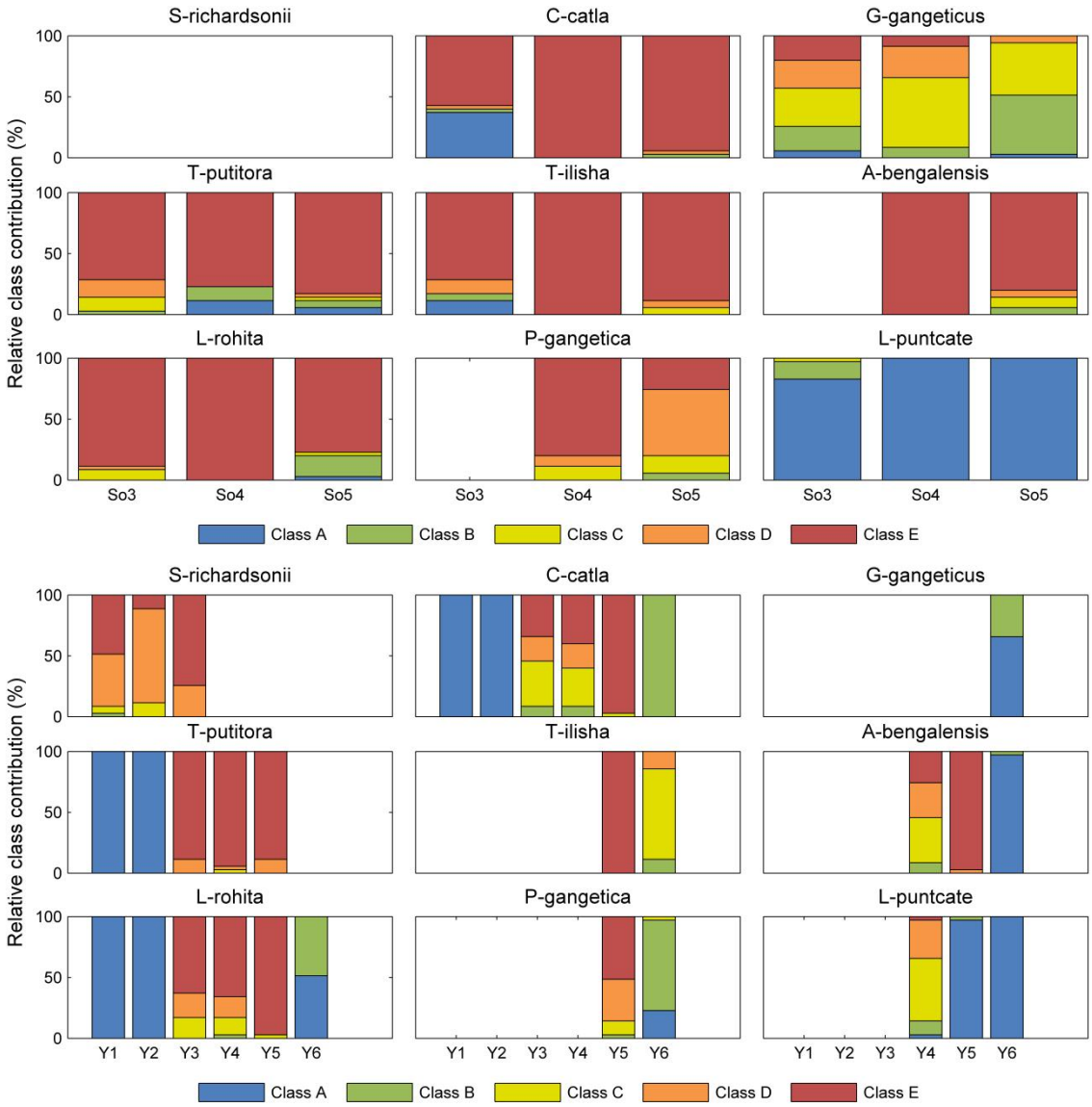

S-richardsonii
C-catla
G-gangeticus
T-putitora
T-ilisha
A-bengalensis
L-rohita
P-gangetica
L-puntcate
Relative class contribution (%)
100
50
0
Ko1
Ko2
Ko3
Class A
Class B
Class C
Class D
Class E


S-richardsonii
C-catla
G-gangeticus
T-putitora
T-ilisha
A-bengalensis
L-rohita
P-gangetica
L-puntcate
Relative class contribution (%)
100
50
0
M1
M2
M3
M4
M5
Class A
Class B
Class C
Class D
Class E

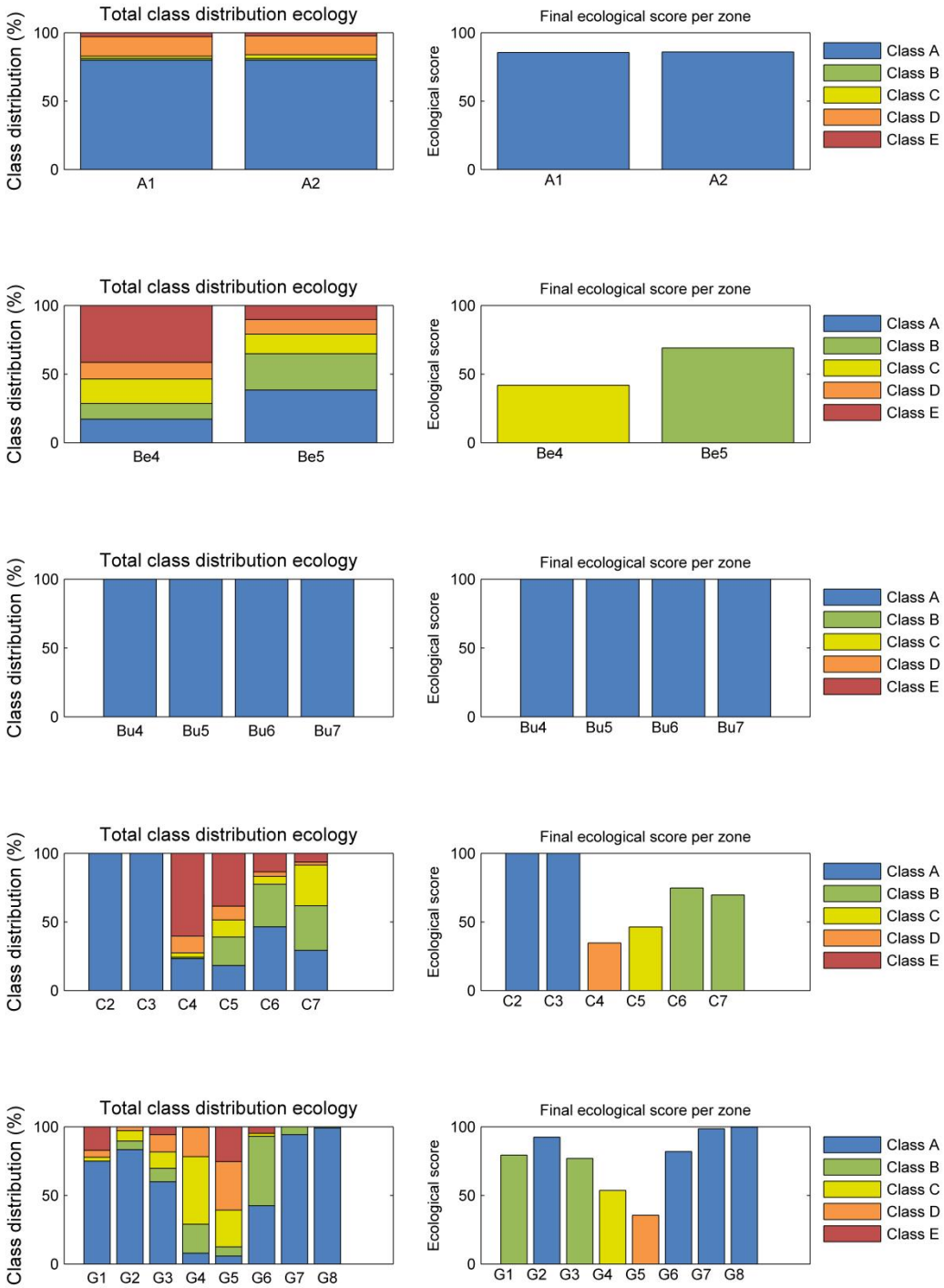

S-richardsonii
C-catla
G-gangeticus
T-putitora
T-ilisha
A-bengalensis
L-rohita
P-gangetica
L-puntcate
Relative class contribution (%)
100
50
0
Ram1
Ram2
Ram3
Ram4
Class A
Class B
Class C
Class D
Class E

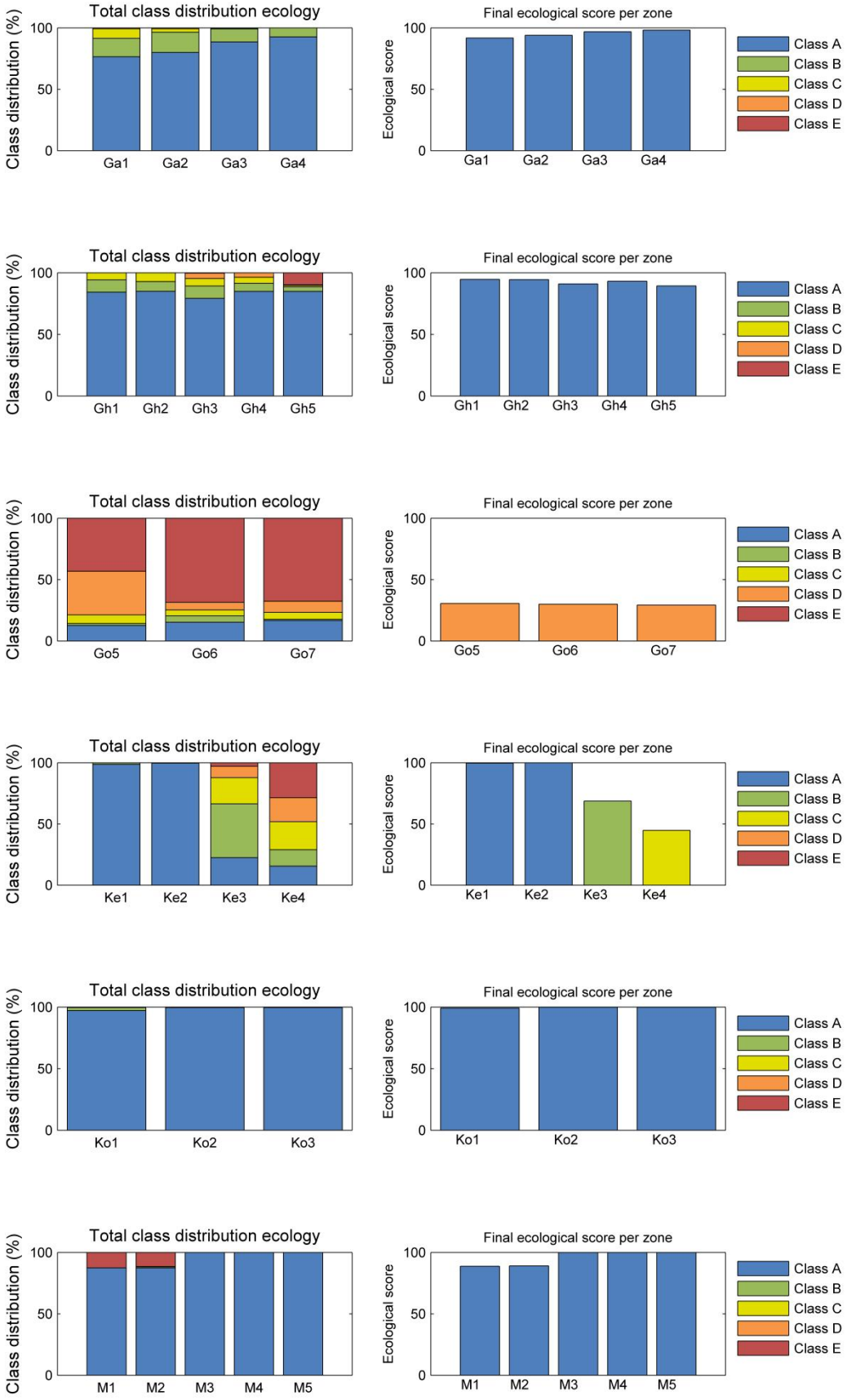

S-richardsonii
C-catla
G-gangeticus
T-putitora
T-ilisha
A-bengalensis
L-rohita
P-gangetica
L-puntcate
Relative class contribution (%)
100
50
0
Rap1
Rap2
Rap3
Rap4
Rap5
Rap6
Rap7
Class A
Class B
Class C
Class D
Class E

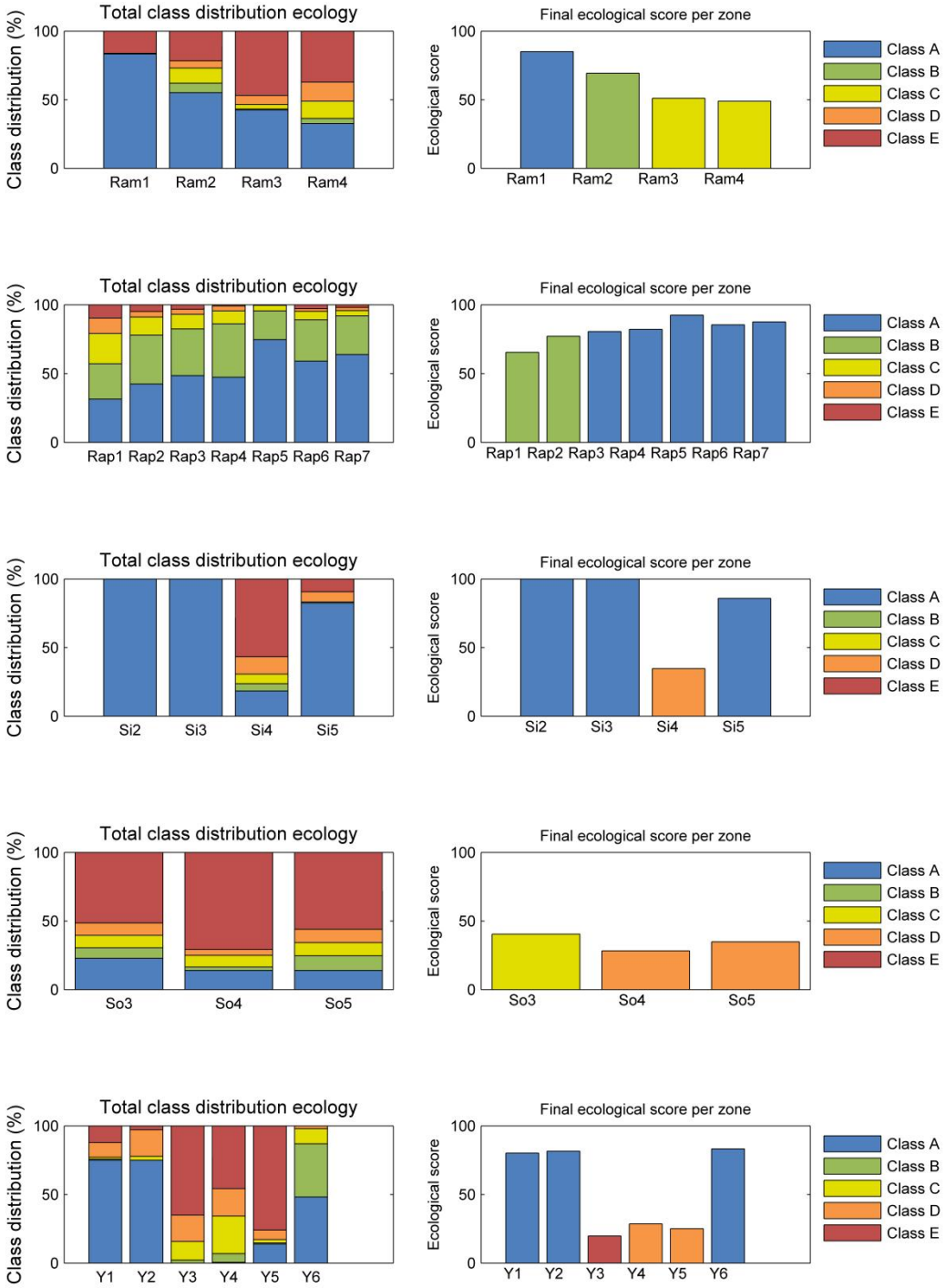

S-richardsonii
C-catla
G-gangeticus
T-putitora
T-ilisha
A-bengalensis
L-rohita
P-gangetica
L-puntcate
Relative class contribution (%)
100
50
0
Si2
Si3
Si4
Si5
Class A
Class B
Class C
Class D
Class E


S-richardsonii
C-catla
G-gangeticus
T-putitora
T-ilisha
A-bengalensis
L-rohita
P-gangetica
L-puntcate
Relative class contribution (%)
100
50
0
So3
So4
So5
Y1
Y2
Y3
Y4
Y5
Y6
Class A
Class B
Class C
Class D
Class E

D.2 Total Ecological Scores



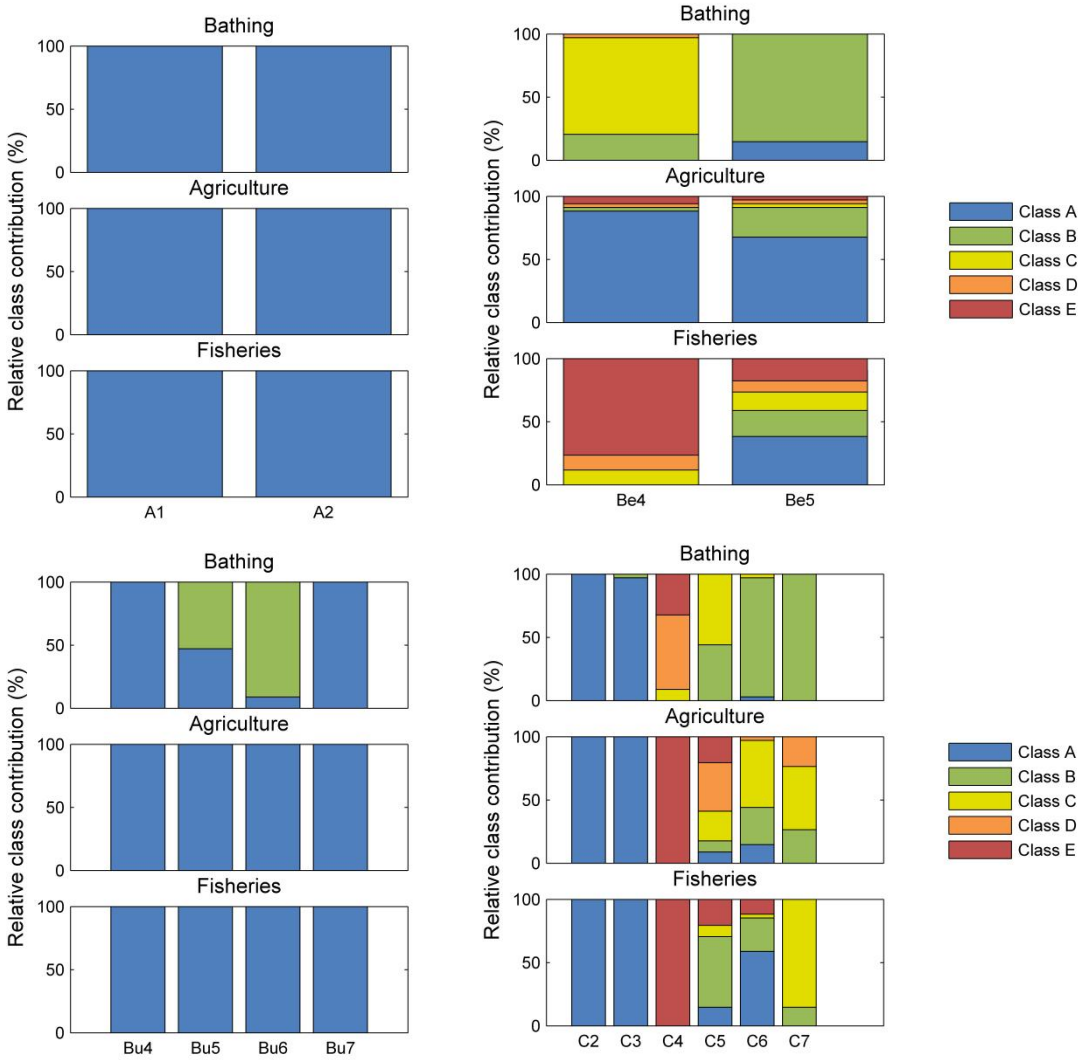

Total class distribution ecology
Class distribution (%)
Final ecological score per zone
Ecological score
Ga1
Ga2
Ga3
Ga4
Gh1
Gh2
Gh3
Gh4
Gh5
Go5
Go6
Go7
Ke1
Ke2
Ke3
Ke4
Ko1
Ko2
Ko3
M1
M2
M3
M4
M5
Class A
Class B
Class C
Class D
Class E

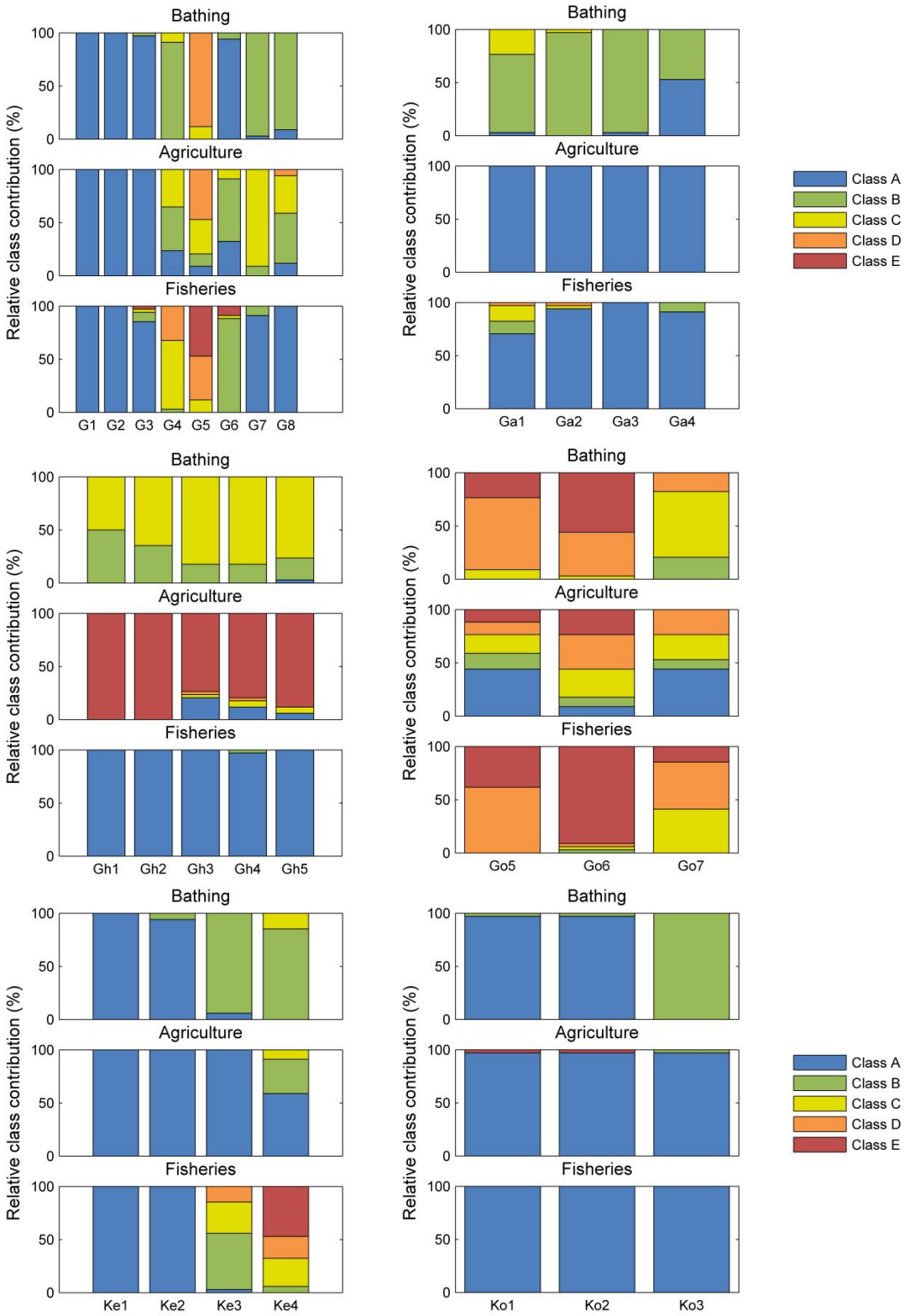

Total class distribution ecology
Class distribution (%)
100
50
0
Ram1 Ram2 Ram3 Ram4
Final ecological score per zone
Ecological score
Rap1 Rap2 Rap3 Rap4 Rap5 Rap6 Rap7
Si2 Si3 Si4 Si5
So3 So4 So5
Y1 Y2 Y3 Y4 Y5 Y6
Class A
Class B
Class C
Class D
Class E

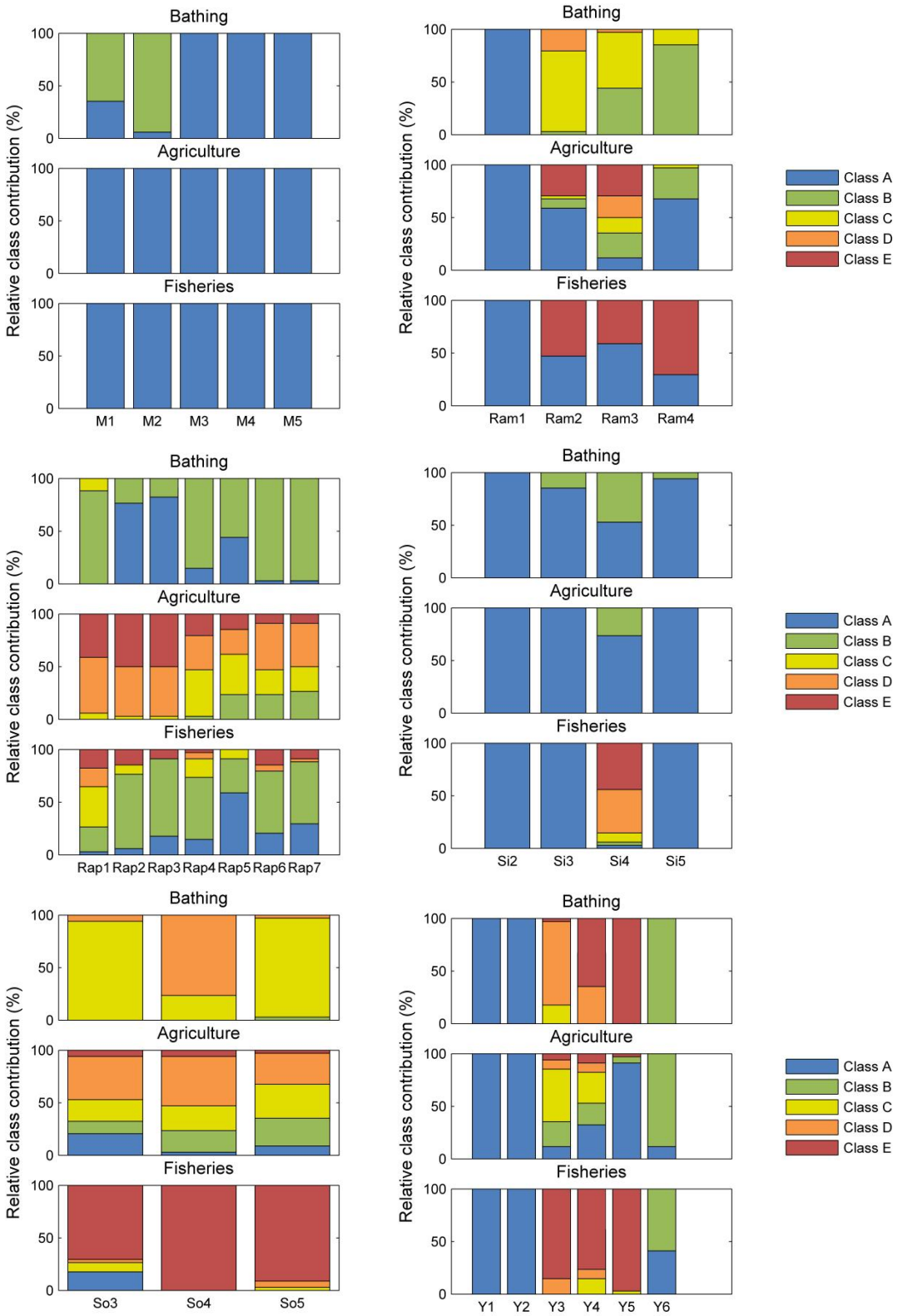
E Socio-economic Scores Present versus Pristine for all Zones

Model output is processed into suitability classes for socio-economic ecosystem services for all simulated years. The figures in this appendix present the suitability class distribution per service (E.1) and the overall socio-economic score (E.2) over the entire simulated period per river, for all river zones. Suitability classes in the present situation are determined as the change compared to the pristine situation. The graphs with all zones per river provide an overview of suitability variations along the river.

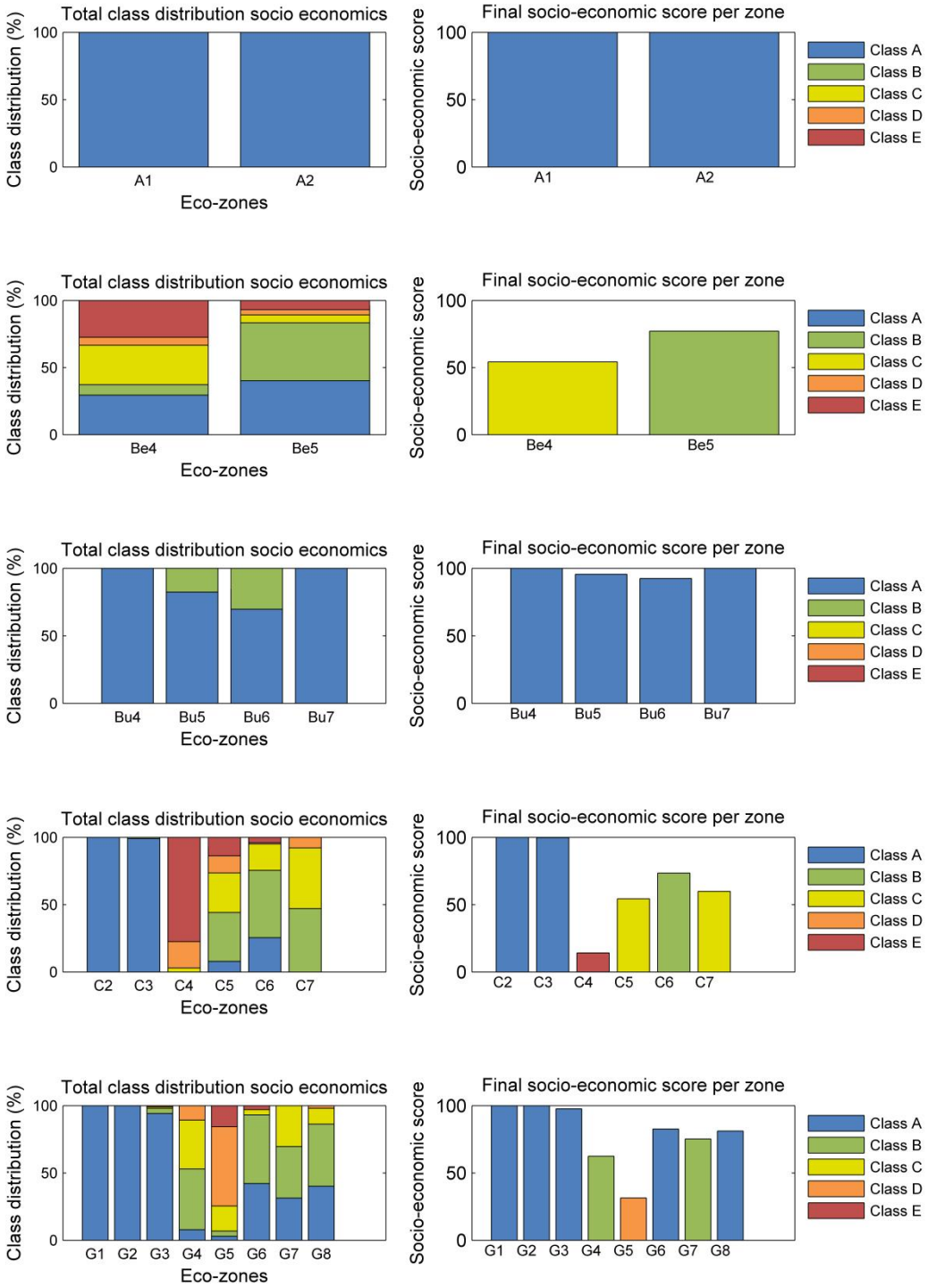
E.1 Class Distributions per Service

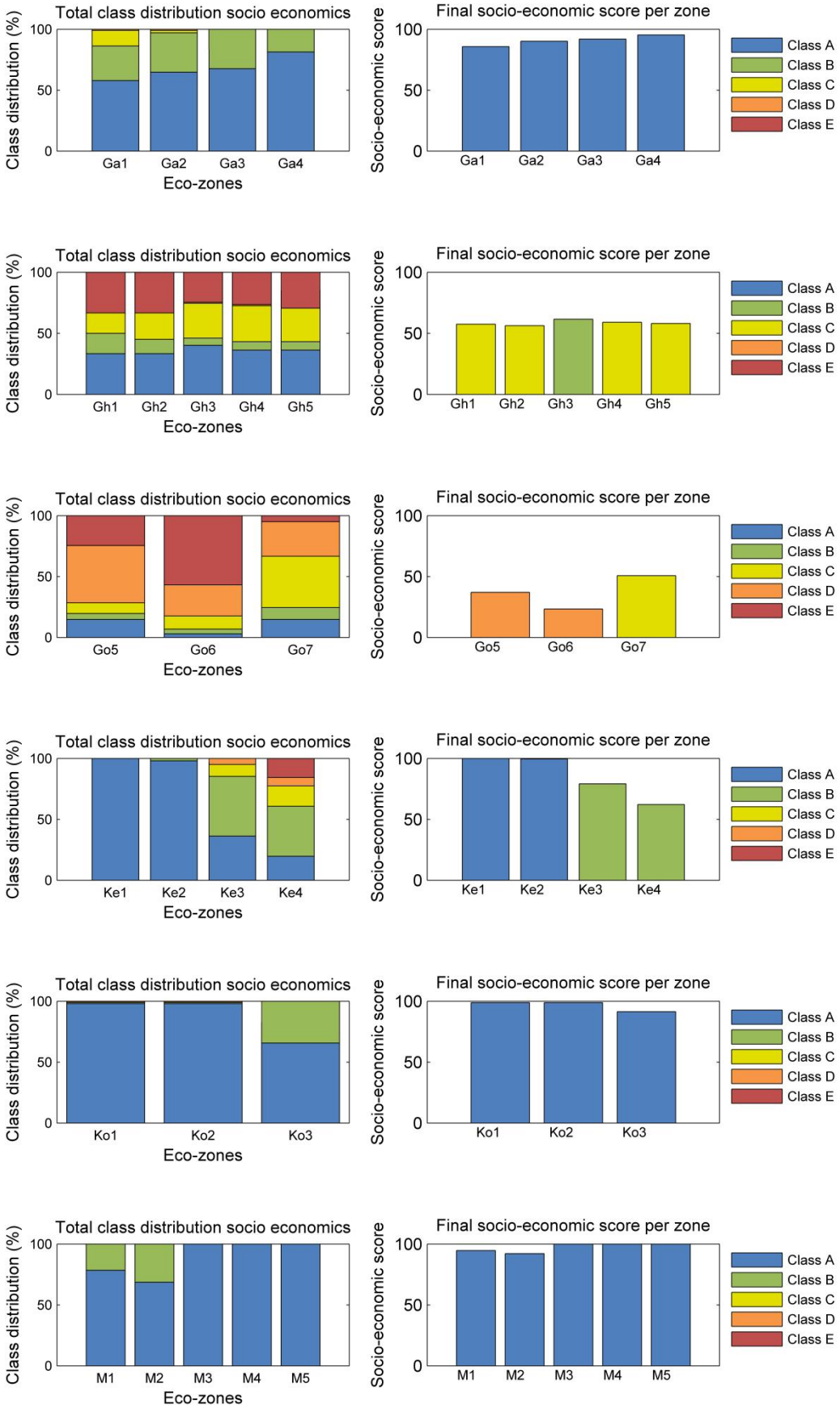


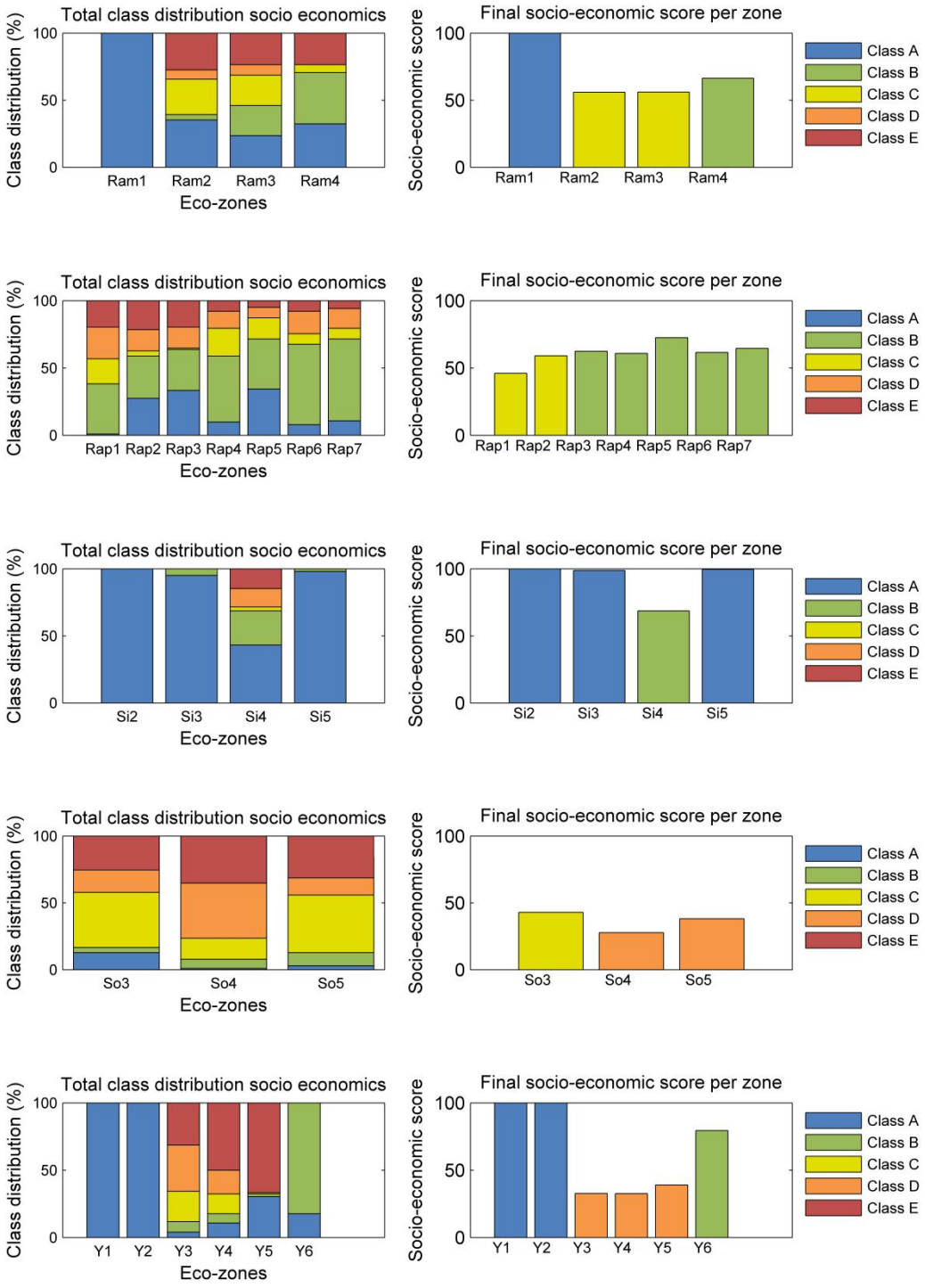

Bathing
Agriculture
Fisheries
Relative class contribution (%)
100
50
0
G1 G2 G3 G4 G5 G6 G7 G8
Ga1 Ga2 Ga3 Ga4
Gh1 Gh2 Gh3 Gh4 Gh5
Go5 Go6 Go7
Ke1 Ke2 Ke3 Ke4
Ko1 Ko2 Ko3
Class A
Class B
Class C
Class D
Class E


Bathing
Agriculture
Fisheries
Relative class contribution (%)
100
50
0
M1
M2
M3
M4
M5
Ram1
Ram2
Ram3
Ram4
Rap1
Rap2
Rap3
Rap4
Rap5
Rap6
Rap7
Si2
Si3
Si4
Si5
So3
So4
So5
Y1
Y2
Y3
Y4
Y5
Y6
Class A
Class B
Class C
Class D
Class E

E.2 Total Socio-economic Scores




Total class distribution socio economics
Class distribution (%)
Eco-zones
Ga1
Ga2
Ga3
Ga4
Final socio-economic score per zone
Socio-economic score
Gh1
Gh2
Gh3
Gh4
Gh5
Go5
Go6
Go7
Ke1
Ke2
Ke3
Ke4
Ko1
Ko2
Ko3
M1
M2
M3
M4
M5
Class A
Class B
Class C
Class D
Class E


Total class distribution socio economics
Class distribution (%)
Eco-zones
Ram1 Ram2 Ram3 Ram4
Final socio-economic score per zone
Socio-economic score
Rap1 Rap2 Rap3 Rap4 Rap5 Rap6 Rap7
Si2 Si3 Si4 Si5
So3 So4 So5
Y1 Y2 Y3 Y4 Y5 Y6
Class A
Class B
Class C
Class D
Class E

F Scenario Results for E-flow Indicators

This appendix includes the resulting classes for all e-flow indicators for all scenarios and river zones, the analysis considers the impacts of the scenarios on hydrological indicators (F.1) ecological indicators (F.2) and socio-economic indicators (F.3). Indicator results are first presented for Ganga and Yamuna and subsequently for Himalayan tributaries (from west to east) and tributaries flowing from the south (from west to east).

F.1 Classes per Zone for Hydrological Indicators

River	Scenario	Eco-zones 1	2	3	4	5	6	7	8
Ganges	rcp00_DoNothing	1	1	2	4	4	3	3	4
	rcp00_2040_DoNothing	1	1	2	4	4	3	2	4
	rcp45_2040_DoNothing	2	2	2	4	5	4	4	4
	rcp85_2040_DoNothing	2	2	2	4	5	5	4	4

		1	2	3	4	5	6
Yamuna	rcp00_DoNothing	1	1	5	4	5	2
	rcp00_2040_DoNothing	1	1	5	5	5	2
	rcp45_2040_DoNothing	2	2	4	4	5	3
	rcp85_2040_DoNothing	1	1	5	5	5	4

		1	2
Alaknanda	rcp00_DoNothing	1	1
	rcp00_2040_DoNothing	1	1
	rcp45_2040_DoNothing	2	2
	rcp85_2040_DoNothing	2	2

		1	2	3	4
Ramganga	rcp00_DoNothing	1	4	3	3
	rcp00_2040_DoNothing	1	4	3	3
	rcp45_2040_DoNothing	2	5	5	4
	rcp85_2040_DoNothing	2	5	5	4

		5	6	7
Gomti	rcp00_DoNothing	5	4	4
	rcp00_2040_DoNothing	5	5	4
	rcp45_2040_DoNothing	5	4	4
	rcp85_2040_DoNothing	5	4	4

River	Scenario	Eco-zones 1	2	3	4	5	6	7
Ghaghra	rcp00_DoNothing	3	2	3	3	3		
	rcp00_2040_DoNothing	3	3	3	3	3		
	rcp45_2040_DoNothing	3	3	3	3	3		
	rcp85_2040_DoNothing	3	3	4	4	4		
Rapti	rcp00_DoNothing	4	3	3	3	2	2	2
	rcp00_2040_DoNothing	4	3	3	3	3	3	2
	rcp45_2040_DoNothing	4	3	3	3	3	3	3
	rcp85_2040_DoNothing	4	4	4	4	4	4	4
Gandak	rcp00_DoNothing	3	3	3	3			
	rcp00_2040_DoNothing	3	3	3	3			
	rcp45_2040_DoNothing	3	3	3	3			
	rcp85_2040_DoNothing	3	3	3	3			
Burigandak	rcp00_DoNothing				1	1	1	1
	rcp00_2040_DoNothing				1	1	1	1
	rcp45_2040_DoNothing				2	2	3	3
	rcp85_2040_DoNothing				4	4	4	4
Kosi	rcp00_DoNothing	2	2	2				
	rcp00_2040_DoNothing	2	2	2				

	rcp45_2040_DoNothing	2	2	3
	rcp85_2040_DoNothing	2	3	3

		1	2	3	4	5
Mahanandа	rcp00_DoNothing	1	1	1	1	1
	rcp00_2040_DoNothing	1	1	1	1	1
	rcp45_2040_DoNothing	2	1	2	2	2
	rcp85_2040_DoNothing	3	3	4	3	3

		2	3	4	5	6	7
Chambal	rcp00_DoNothing	1	1	5	4	4	4
	rcp00_2040_DoNothing	1	1	5	4	4	4
	rcp45_2040_DoNothing	1	2	5	4	4	4
	rcp85_2040_DoNothing	1	2	5	4	3	3

River	Scenario	Eco-zones			
		2	3	4	5
Sind	rcp00_DoNothing	1	1	2	2
	rcp00_2040_DoNothing	1	1	3	3
	rcp45_2040_DoNothing	2	2	4	4
	rcp85_2040_DoNothing	2	2	4	5

		4	5
Betwa	rcp00_DoNothing	4	2
	rcp00_2040_DoNothing	4	2
	rcp45_2040_DoNothing	4	4
	rcp85_2040_DoNothing	4	4

		1	2	3	4
Ken	rcp00_DoNothing	1	1	2	4
	rcp00_2040_DoNothing	1	1	2	4
	rcp45_2040_DoNothing	2	2	3	4
	rcp85_2040_DoNothing	2	2	4	5

		3	4	5
Son	rcp00_DoNothing	3	4	4
	rcp00_2040_DoNothing	4	4	4
	rcp45_2040_DoNothing	4	4	4
	rcp85_2040_DoNothing	4	4	3

F.2 Classes per Zone for Ecological Indicators

River	Scenario	Eco-zone							
		1	2	3	4	5	6	7	8
Ganges	rcp00_DoNothing	2	1	2	3	4	1	1	1
	rcp00_2040_DoNothing	2	1	2	3	4	2	1	1
	rcp45_2040_DoNothing	2	1	1	3	5	3	1	1
	rcp85_2040_DoNothing	2	1	2	3	5	4	2	1

		1	2	3	4	5	6
Yamuna	rcp00_DoNothing	2	1	5	4	5	1
	rcp00_2040_DoNothing	2	1	5	5	5	1
	rcp45_2040_DoNothing	2	2	5	5	5	2
	rcp85_2040_DoNothing	2	1	5	5	5	3

Deltares

River	Scenario	Eco-zone 1	2	3	4	5	6	7
Alaknanda	rcp00_DoNothing	1	1					
	rcp00_2040_DoNothing	1	1					
	rcp45_2040_DoNothing	1	1					
	rcp85_2040_DoNothing	1	1					
Ramganga	rcp00_DoNothing	1	2	3	3			
	rcp00_2040_DoNothing	1	2	3	3			
	rcp45_2040_DoNothing	2	3	3	4			
	rcp85_2040_DoNothing	2	3	4	4			
Gomti	rcp00_DoNothing					4	4	4
	rcp00_2040_DoNothing					4	4	4
	rcp45_2040_DoNothing					4	4	4
	rcp85_2040_DoNothing					4	4	4
Ghaghra	rcp00_DoNothing	1	1	1	1	1		
	rcp00_2040_DoNothing	1	1	1	1	1		
	rcp45_2040_DoNothing	1	1	1	1	1		
	rcp85_2040_DoNothing	1	1	1	1	1		
Rapti	rcp00_DoNothing	2	2	1	1	1	1	1
	rcp00_2040_DoNothing	3	2	2	2	1	1	1
	rcp45_2040_DoNothing	3	2	2	2	1	2	2

	rcp85_2040_DoNothing	3	3	3	4	3	3	4

		1	2	3	4
Gandak	rcp00_DoNothing	1	1	1	1
	rcp00_2040_DoNothing	1	1	1	1
	rcp45_2040_DoNothing	1	1	1	1
	rcp85_2040_DoNothing	1	1	1	1

		4	5	6	7
Buriganda k	rcp00_DoNothing	1	1	1	1
	rcp00_2040_DoNothing	1	1	1	1
	rcp45_2040_DoNothing	2	1	1	2
	rcp85_2040_DoNothing	3	2	2	3

River	Scenario	Eco-zone 1	2	3	4	5	6	7
Kosi	rcp00_DoNothing	1	1	1				
	rcp00_2040_DoNothing	1	1	1				
	rcp45_2040_DoNothing	1	1	1				
	rcp85_2040_DoNothing	1	1	1				
Mahanandа	rcp00_DoNothing	1	1	1	1	1		
	rcp00_2040_DoNothing	1	1	1	1	1		
	rcp45_2040_DoNothing	1	1	1	1	1		
	rcp85_2040_DoNothing	1	2	2	1	1		
Chambal	rcp00_DoNothing		1	1	4	3	2	2
	rcp00_2040_DoNothing		1	1	4	3	2	2
	rcp45_2040_DoNothing		1	2	4	3	3	3
	rcp85_2040_DoNothing		1	1	4	3	3	3
Sind	rcp00_DoNothing		1	1	4	1		
	rcp00_2040_DoNothing		1	1	4	1		
	rcp45_2040_DoNothing		2	3	4	1		
	rcp85_2040_DoNothing		2	2	4	1		
Betwa	rcp00_DoNothing				4	2		
	rcp00_2040_DoNothing				4	2		
	rcp45_2040_DoNothing				4	4		

	rcp85_2040_DoNothing			4	4

		1	2	3	4
Ken	rcp00_DoNothing	1	1	2	3
	rcp00_2040_DoNothing	1	1	2	4
	rcp45_2040_DoNothing	2	3	3	4
	rcp85_2040_DoNothing	2	2	4	5

		3	4	5
Son	rcp00_DoNothing	4	4	4
	rcp00_2040_DoNothing	4	4	4
	rcp45_2040_DoNothing	4	5	4
	rcp85_2040_DoNothing	4	5	4

F.3 Classes per Zone for Socio-economic Indicators

River	Scenario	Eco-zone 1	2	3	4	5	6	7	8
Ganges	rcp00_DoNothing	1	1	1	2	4	1	2	1
	rcp00_2040_DoNothing	1	1	1	3	4	2	2	2
	rcp45_2040_DoNothing	1	1	1	2	4	2	2	2
	rcp85_2040_DoNothing	1	1	1	2	4	3	2	2

		1	2	3	4	5	6
Yamuna	rcp00_DoNothing	1	1	4	4	4	2
	rcp00_2040_DoNothing	1	1	4	4	4	2
	rcp45_2040_DoNothing	1	1	4	4	4	2
	rcp85_2040_DoNothing	1	1	4	4	4	3

		1	2
Alaknanda	rcp00_DoNothing	1	1

	rcp00_2040_DoNothing	1	1
	rcp45_2040_DoNothing	1	1
	rcp85_2040_DoNothing	1	1

		1	2	3	4
Ramganga	rcp00_DoNothing	1	2	2	2
	rcp00_2040_DoNothing	1	3	2	2
	rcp45_2040_DoNothing	1	3	3	3
	rcp85_2040_DoNothing	1	3	3	3

		5	6	7
Gomti	rcp00_DoNothing	4	4	3
	rcp00_2040_DoNothing	4	5	3
	rcp45_2040_DoNothing	4	5	4
	rcp85_2040_DoNothing	4	5	4

		1	2	3	4	5
Ghaghra	rcp00_DoNothing	3	3	3	3	3
	rcp00_2040_DoNothing	3	3	3	2	2
	rcp45_2040_DoNothing	3	3	3	3	2
	rcp85_2040_DoNothing	3	3	3	3	2

		1	2	3	4	5	6	7
Rapti	rcp00_DoNothing	3	3	2	2	2	2	2
	rcp00_2040_DoNothing	4	3	2	2	2	2	2
	rcp45_2040_DoNothing	4	2	3	3	2	2	2
	rcp85_2040_DoNothing	3	3	3	3	2	3	3

River Scenario Eco-zone

		1	2	3	4
Gandak	rcp00_DoNothing	1	1	1	1
	rcp00_2040_DoNothing	1	1	1	1
	rcp45_2040_DoNothing	1	1	1	1
	rcp85_2040_DoNothing	1	1	1	1

		4	5	6	7
Burigandak	rcp00_DoNothing	1	1	1	1
	rcp00_2040_DoNothing	1	1	1	1
	rcp45_2040_DoNothing	1	1	1	1
	rcp85_2040_DoNothing	3	2	2	2

		1	2	3
Kosi	rcp00_DoNothing	1	1	1
	rcp00_2040_DoNothing	1	1	1
	rcp45_2040_DoNothing	1	1	1
	rcp85_2040_DoNothing	1	1	1

		1	2	3	4	5
Mahanandа	rcp00_DoNothing	1	1	1	1	1
	rcp00_2040_DoNothing	1	1	1	1	1
	rcp45_2040_DoNothing	1	1	1	1	1
	rcp85_2040_DoNothing	1	1	1	1	1

		2	3	4	5	6	7
Chambal	rcp00_DoNothing	1	1	5	3	2	2
	rcp00_2040_DoNothing	1	1	5	3	2	2
	rcp45_2040_DoNothing	1	1	5	4	3	3

	rcp85_2040_DoNothing	1	1	5	4	3	3

		2	3	4	5
Sind	rcp00_DoNothing	1	1	2	1
	rcp00_2040_DoNothing	1	1	2	1
	rcp45_2040_DoNothing	1	2	3	1
	rcp85_2040_DoNothing	1	1	3	1

		4	5
Betwa	rcp00_DoNothing	3	2
	rcp00_2040_DoNothing	4	2
	rcp45_2040_DoNothing	4	3
	rcp85_2040_DoNothing	4	3

River	Scenario	Eco-zone 1	2	3	4
Ken	rcp00_DoNothing	1	1	1	2
	rcp00_2040_DoNothing	1	1	2	3
	rcp45_2040_DoNothing	2	2	2	3
	rcp85_2040_DoNothing	1	1	3	3

		3	4	5
Son	rcp00_DoNothing	3	4	4
	rcp00_2040_DoNothing	4	5	4
	rcp45_2040_DoNothing	4	5	4
	rcp85_2040_DoNothing	4	5	4

G Strategy Results for E-flow Indicators in the Present Situation

This appendix includes the resulting classes for all e-flow indicators for all strategies and all zones per river; the analysis considers the impacts of the strategies on hydrological indicators (F.1) ecological indicators (F.2) and socio-economic indicators (F.3). Indicator results are first presented for Ganga and Yamuna and subsequently for Himalayan tributaries (from west to east) and tributaries flowing from the south (from west to east).

G.1 Classes per Zone for Hydrological Indicators

River	Strategy	Eco-zone 1	2	3	4	5	6	7	8
Ganges	rcp00_DoNothing	1	1	2	4	4	3	3	4
	rcp00_ApprInfra	1	1	2	4	4	3	3	4
	rcp00_ConjUse	1	1	2	4	4	3	3	4
	rcp00_IncrEff	1	1	2	4	4	3	3	4
	rcp00_PlannedTreat	1	1	2	4	4	3	3	4
	rcp00_ImprTreat	1	1	2	4	4	3	3	4
	rcp00_Eflow	1	1	2	3	3	3	3	4

		1	2	3	4	5	6
Yamuna	rcp00_DoNothing	1	1	5	4	5	2
	rcp00_ApprInfra	1	1	5	4	5	2
	rcp00_ConjUse	1	1	5	5	5	3
	rcp00_IncrEff	1	1	5	4	5	2
	rcp00_PlannedTreat	1	1	5	4	5	2
	rcp00_ImprTreat	1	1	5	4	5	2
	rcp00_Eflow	1	1	2	2	3	3

		1	2
Alaknanda	rcp00_DoNothing	1	1
	rcp00_ApprInfra	1	1
	rcp00_ConjUse	1	1
	rcp00_IncrEff	1	1
	rcp00_PlannedTreat	1	1
	rcp00_ImprTreat	1	1
	rcp00_Eflow	1	1

River	Strategy	Eco-zone			
		1	2	3	4
Ramganga	rcp00_DoNothing	1	4	3	3
	rcp00_ApprInfra	1	4	3	3
	rcp00_ConjUse	1	4	4	3
	rcp00_IncrEff	1	4	3	3
	rcp00_PlannedTreat	1	4	3	3
	rcp00_ImprTreat	1	4	3	3
	rcp00_Eflow	1	3	2	2

		5	6	7
Gomti	rcp00_DoNothing	5	4	4
	rcp00_ApprInfra	5	4	4
	rcp00_ConjUse	5	4	4
	rcp00_IncrEff	5	4	4
	rcp00_PlannedTreat	5	4	4
	rcp00_ImprTreat	5	4	4
	rcp00_Eflow	5	4	4

		1	2	3	4	5
Ghaghra	rcp00_DoNothing	3	2	3	3	3
	rcp00_ApprInfra	2	2	3	2	3
	rcp00_ConjUse	3	2	3	2	3
	rcp00_IncrEff	3	2	2	2	3
	rcp00_PlannedTreat	3	2	3	3	3
	rcp00_ImprTreat	3	2	3	3	3
	rcp00_Eflow	1	1	2	2	2

		1	2	3	4	5	6	7
Rapti	rcp00_DoNothing	4	3	3	3	2	2	2
	rcp00_ApprInfra	4	3	3	3	2	2	2
	rcp00_ConjUse	4	3	3	3	2	2	2
	rcp00_IncrEff	4	3	3	3	3	2	2
	rcp00_PlannedTreat	4	3	3	3	2	2	2
	rcp00_ImprTreat	4	3	3	3	2	2	2
	rcp00_Eflow	3	3	2	2	2	2	2

		1	2	3	4
Gandak	rcp00_DoNothing	3	3	3	3
	rcp00_ApprInfra	3	3	3	3
	rcp00_ConjUse	3	3	3	3
	rcp00_IncrEff	3	3	3	3
	rcp00_PlannedTreat	3	3	3	3
	rcp00_ImprTreat	3	3	3	3
	rcp00_Eflow	3	3	3	3

River	Strategy	Eco-zone					
				4	5	6	7
Burigandak	rcp00_DoNothing			1	1	1	1
	rcp00_ApprInfra			1	1	1	1
	rcp00_ConjUse			1	1	1	1
	rcp00_IncrEff			1	1	1	1
	rcp00_PlannedTreat			1	1	1	1
	rcp00_ImprTreat			1	1	1	1
	rcp00_Eflow			1	1	1	1

		1	2	3
Kosi	rcp00_DoNothing	2	2	2
	rcp00_ApprInfra	2	2	2
	rcp00_ConjUse	2	2	2
w	rcp00_IncrEff	2	2	2
	rcp00_PlannedTreat	2	2	2
	rcp00_ImprTreat	2	2	2
	rcp00_Eflow	2	2	2

		1	2	3	4	5
Mahananda	rcp00_DoNothing	1	1	1	1	1
	rcp00_ApprInfra	2	2	2	2	1
	rcp00_ConjUse	1	1	1	1	1
	rcp00_IncrEff	1	1	1	1	1
	rcp00_PlannedTreat	1	1	1	1	1
	rcp00_ImprTreat	1	1	1	1	1
	rcp00_Eflow	1	1	1	1	1

		2	3	4	5	6	7
Chambal	rcp00_DoNothing	1	1	5	4	4	4
	rcp00_ApprInfra	1	1	5	4	4	4
	rcp00_ConjUse	1	1	5	4	4	4
	rcp00_IncrEff	1	1	5	4	4	4
	rcp00_PlannedTreat	1	1	5	4	4	4
	rcp00_ImprTreat	1	1	5	4	4	4
	rcp00_Eflow	1	1	4	4	3	3

		2	3	4	5
Sind	rcp00_DoNothing	1	1	2	2
	rcp00_ApprInfra	1	1	2	2
	rcp00_ConjUse	1	1	2	2
	rcp00_IncrEff	1	1	2	2
	rcp00_PlannedTreat	1	1	2	2
	rcp00_ImprTreat	1	1	2	2
	rcp00_Eflow	1	1	2	2

River	Strategy	Eco-zone	
		4	5
Betwa	rcp00_DoNothing	4	2
	rcp00_ApprInfra	3	2
	rcp00_ConjUse	4	2
	rcp00_IncrEff	4	2
	rcp00_PlannedTreat	4	2
	rcp00_ImprTreat	4	2
	rcp00_Eflow	3	2

		1	2	3	4
Ken	rcp00_DoNothing	1	1	2	4
	rcp00_ApprInfra	2	3	2	4
	rcp00_ConjUse	1	1	2	4
	rcp00_IncrEff	1	1	2	4
	rcp00_PlannedTreat	1	1	2	4
	rcp00_ImprTreat	1	1	2	4
	rcp00_Eflow	1	1	2	3

		3	4	5
Son	rcp00_DoNothing	3	4	4
	rcp00_ApprInfra	4	4	4
	rcp00_ConjUse	3	4	4
	rcp00_IncrEff	3	4	4
	rcp00_PlannedTreat	3	4	4
	rcp00_ImprTreat	3	4	4
	rcp00_Eflow	3	3	3

G.2 Classes per Zone for Ecological Indicators

River	Strategy	Eco-zone							
		1	2	3	4	5	6	7	8
Ganges	rcp00_DoNothing	2	1	2	3	4	2	1	1
	rcp00_ApprInfra	2	1	2	3	4	1	1	1
	rcp00_ConjUse	2	1	2	3	4	1	1	1
	rcp00_IncrEff	2	1	2	3	4	1	1	1
	rcp00_PlannedTreat	2	1	2	3	4	1	1	1
	rcp00_ImprTreat	2	1	2	3	4	1	1	1
	rcp00_Eflow	2	1	1	1	3	3	3	1

River	Strategy	Eco-zone 1	2	3	4	5	6
Yamuna	rcp00_DoNothing	2	1	5	5	5	1
	rcp00_ApprInfra	2	1	5	4	5	1
	rcp00_ConjUse	2	1	5	4	4	1
	rcp00_IncrEff	2	1	5	4	5	1
	rcp00_PlannedTreat	2	1	5	4	5	1
	rcp00_ImprTreat	2	1	5	4	4	1
	rcp00_Eflow	2	1	1	1	4	1

		1	2
Alaknanda	rcp00_DoNothing	1	1
	rcp00_ApprInfra	1	1
	rcp00_ConjUse	1	1
	rcp00_IncrEff	1	1
	rcp00_PlannedTreat	1	1
	rcp00_ImprTreat	1	1
	rcp00_Eflow	1	1

		1	2	3	4
Ramganga	rcp00_DoNothing	1	2	3	3
	rcp00_ApprInfra	1	2	3	3
	rcp00_ConjUse	1	2	3	3
	rcp00_IncrEff	1	2	3	3
	rcp00_PlannedTreat	1	2	3	3
	rcp00_ImprTreat	1	2	3	3
	rcp00_Eflow	1	2	2	1

		5	6	7
Gomti	rcp00_DoNothing	4	4	4
	rcp00_ApprInfra	4	4	4
	rcp00_ConjUse	4	4	4
	rcp00_IncrEff	4	4	4
	rcp00_PlannedTreat	4	4	4
	rcp00_ImprTreat	4	5	4
	rcp00_Eflow	4	4	4

River	Strategy	Eco-zone				
		1	2	3	4	5
Ghaghra	rcp00_DoNothing	1	1	1	1	1
	rcp00_ApprInfra	1	1	1	1	1
	rcp00_ConjUse	1	1	1	1	1
	rcp00_IncrEff	1	1	1	1	1
	rcp00_PlannedTreat	1	1	1	1	1
	rcp00_ImprTreat	1	1	1	1	1
	rcp00_Eflow	1	1	1	1	1

		1	2	3	4	5	6	7
Rapti	rcp00_DoNothing	3	2	2	2	1	1	1
	rcp00_ApprInfra	2	2	1	1	1	1	1
	rcp00_ConjUse	2	2	1	1	1	1	1
	rcp00_IncrEff	2	2	1	1	1	1	1
	rcp00_PlannedTreat	2	2	1	1	1	1	1
	rcp00_ImprTreat	2	2	1	1	1	1	1
	rcp00_Eflow	1	1	1	1	1	1	1

		1	2	3	4
Gandak	rcp00_DoNothing	1	1	1	1
	rcp00_ApprInfra	1	1	1	1
	rcp00_ConjUse	1	1	1	1
	rcp00_IncrEff	1	1	1	1
	rcp00_PlannedTreat	1	1	1	1
	rcp00_ImprTreat	1	1	1	1
	rcp00_Eflow	1	1	1	1

		4	5	6	7
Burigandak	rcp00_DoNothing	1	1	1	1
	rcp00_ApprInfra	1	1	1	1
	rcp00_ConjUse	1	1	1	1
	rcp00_IncrEff	1	1	1	1
	rcp00_PlannedTreat	1	1	1	1
	rcp00_ImprTreat	1	1	1	1
	rcp00_Eflow	1	1	1	1

		1	2	3
Kosi	rcp00_DoNothing	1	1	1
	rcp00_ApprInfra	1	1	1
	rcp00_ConjUse	1	1	1
	rcp00_IncrEff	1	1	1
	rcp00_PlannedTreat	1	1	1
	rcp00_ImprTreat	1	1	1
	rcp00_Eflow	1	1	1

River	Strategy	Eco-zone 1	2	3	4	5
Mahananda	rcp00_DoNothing	1	1	1	1	1
	rcp00_ApprInfra	1	1	1	1	1
	rcp00_ConjUse	1	1	1	1	1
	rcp00_IncrEff	1	1	1	1	1
	rcp00_PlannedTreat	1	1	1	1	1
	rcp00_ImprTreat	1	1	1	1	1
	rcp00_Eflow	1	1	1	1	1

		2	3	4	5	6	7
Chambal	rcp00_DoNothing	1	1	4	3	2	2
	rcp00_ApprInfra	1	1	4	3	2	2
	rcp00_ConjUse	1	1	4	3	2	2
	rcp00_IncrEff	1	1	4	3	2	2
	rcp00_PlannedTreat	1	1	4	3	2	2
	rcp00_ImprTreat	1	1	4	4	2	2
	rcp00_Eflow	1	1	3	3	3	2

		2	3	4	5
Sind	rcp00_DoNothing	1	1	4	1
	rcp00_ApprInfra	1	1	4	1
	rcp00_ConjUse	1	1	4	1
	rcp00_IncrEff	1	1	4	1
	rcp00_PlannedTreat	1	1	4	1
	rcp00_ImprTreat	1	1	4	1
	rcp00_Eflow	1	1	4	1

		4	5
Betwa	rcp00_DoNothing	4	2
	rcp00_ApprInfra	4	3
	rcp00_ConjUse	4	2
	rcp00_IncrEff	4	2
	rcp00_PlannedTreat	4	2
	rcp00_ImprTreat	4	2
	rcp00_Eflow	2	1

		1	2	3	4
Ken	rcp00_DoNothing	1	1	2	4
	rcp00_ApprInfra	1	1	2	4
	rcp00_ConjUse	1	1	2	3
	rcp00_IncrEff	1	1	2	3
	rcp00_PlannedTreat	1	1	2	3
	rcp00_ImprTreat	1	1	2	3
	rcp00_Eflow	1	1	1	1

River	Strategy	Eco-zone 3	4	5
Son	rcp00_DoNothing	4	4	4
	rcp00_ApprInfra	4	4	4
	rcp00_ConjUse	4	4	4
	rcp00_IncrEff	4	4	4
	rcp00_PlannedTreat	4	4	4
	rcp00_ImprTreat	4	4	3
	rcp00_Eflow	3	4	4

G.3 Classes per Zone for Socio-economic Indicators

River	Strategy	Eco-zone 1	2	3	4	5	6	7	8
Ganges	rcp00_DoNothing	1	1	1	2	4	1	2	1
	rcp00_ApprInfra	1	1	1	2	4	1	2	1
	rcp00_ConjUse	1	1	1	3	4	1	2	1
	rcp00_IncrEff	1	1	1	2	4	1	2	1
	rcp00_PlannedTreat	1	1	1	2	4	1	2	1
	rcp00_ImprTreat	1	1	1	2	4	1	2	1
	rcp00_Eflow	1	1	1	1	3	3	3	2

		1	2	3	4	5	6
Yamuna	rcp00_DoNothing	1	1	4	4	4	2
	rcp00_ApprInfra	1	1	4	4	4	2
	rcp00_ConjUse	1	1	4	4	4	2
	rcp00_IncrEff	1	1	4	4	4	2
	rcp00_PlannedTreat	1	1	4	4	4	2
	rcp00_ImprTreat	1	1	4	4	4	2
	rcp00_Eflow	1	1	1	1	4	1

		1	2
Alaknanda	rcp00_DoNothing	1	1
	rcp00_ApprInfra	1	1
	rcp00_ConjUse	1	1
	rcp00_IncrEff	1	1
	rcp00_PlannedTreat	1	1
	rcp00_ImprTreat	1	1
	rcp00_Eflow	1	1

River	Strategy	Eco-zone 1	2	3	4
Ramganga	rcp00_DoNothing	1	2	2	2
	rcp00_ApprInfra	1	2	2	2
	rcp00_ConjUse	1	2	2	2
	rcp00_IncrEff	1	2	2	2
	rcp00_PlannedTreat	1	2	2	2
	rcp00_ImprTreat	1	2	2	2
	rcp00_Eflow	1	1	1	1

River	Strategy	5	6	7
Gomti	rcp00_DoNothing	4	4	3
	rcp00_ApprInfra	4	4	3
	rcp00_ConjUse	4	4	3
	rcp00_IncrEff	4	4	3
	rcp00_PlannedTreat	4	4	3
	rcp00_ImprTreat	3	4	3
	rcp00_Eflow	4	5	4

River	Strategy	1	2	3	4	5
Ghaghra	rcp00_DoNothing	3	3	3	3	3
	rcp00_ApprInfra	3	3	3	3	3
	rcp00_ConjUse	3	3	3	3	3
	rcp00_IncrEff	3	3	3	3	3
	rcp00_PlannedTreat	3	3	3	3	3
	rcp00_ImprTreat	3	3	3	3	3
	rcp00_Eflow	1	1	1	1	1

River	Strategy	1	2	3	4	5	6	7
Rapti	rcp00_DoNothing	3	3	2	2	2	2	2
	rcp00_ApprInfra	3	3	2	2	2	2	2
	rcp00_ConjUse	3	3	2	2	2	2	2
	rcp00_IncrEff	3	3	2	2	2	2	2
	rcp00_PlannedTreat	3	3	2	2	2	2	2
	rcp00_ImprTreat	3	3	2	2	2	2	2
	rcp00_Eflow	1	1	1	1	1	1	1

River	Strategy	1	2	3	4
Gandak	rcp00_DoNothing	1	1	1	1
	rcp00_ApprInfra	1	1	1	1
	rcp00_ConjUse	1	1	1	1
	rcp00_IncrEff	1	1	1	1
	rcp00_PlannedTreat	1	1	1	1
	rcp00_ImprTreat	1	1	1	1
	rcp00_Eflow	1	1	1	1

River	Strategy	Eco-zone						
					4	5	6	7
Burigandak	rcp00_DoNothing				1	1	1	1
	rcp00_ApprInfra				1	1	1	1
	rcp00_ConjUse				1	1	1	1
	rcp00_IncrEff				1	1	1	1
	rcp00_PlannedTreat				1	1	1	1
	rcp00_ImprTreat				1	1	1	1
	rcp00_Eflow				1	1	1	1
		1	2	3				
Kosi	rcp00_DoNothing	1	1	1				
	rcp00_ApprInfra	1	1	1				
	rcp00_ConjUse	1	1	1				
	rcp00_IncrEff	1	1	1				
	rcp00_PlannedTreat	1	1	1				
	rcp00_ImprTreat	1	1	1				
	rcp00_Eflow	1	1	1				
		1	2	3	4	5		
Mahananda	rcp00_DoNothing	4	3	1	2	2		
	rcp00_ApprInfra	3	3	1	2	2		
	rcp00_ConjUse	4	3	1	2	2		
	rcp00_IncrEff	4	3	1	2	2		
	rcp00_PlannedTreat	4	3	1	2	2		
	rcp00_ImprTreat	4	3	1	2	2		
	rcp00_Eflow	4	3	1	2	2		
			2	3	4	5	6	7
Chambal	rcp00_DoNothing		1	1	5	3	2	2
	rcp00_ApprInfra		1	1	5	3	2	2
	rcp00_ConjUse		1	1	5	3	2	2
	rcp00_IncrEff		1	1	5	3	2	2
	rcp00_PlannedTreat		1	1	5	3	2	2
	rcp00_ImprTreat		1	1	5	3	2	2
	rcp00_Eflow		1	1	4	3	3	2
			2	3	4	5		
Sind	rcp00_DoNothing		1	1	2	1		
	rcp00_ApprInfra		1	1	2	1		
	rcp00_ConjUse		1	1	2	1		
	rcp00_IncrEff		1	1	2	1		
	rcp00_PlannedTreat		1	1	2	1		
	rcp00_ImprTreat		1	1	2	1		
	rcp00_Eflow		1	1	2	1		

River	Strategy	Eco-zone				
					4	5
Betwa	rcp00_DoNothing				3	2
	rcp00_ApprInfra				3	2
	rcp00_ConjUse				3	2
	rcp00_IncrEff				3	2
	rcp00_PlannedTreat				3	2
	rcp00_ImprTreat				3	2
	rcp00_Eflow				2	1

		1	2	3	4
Ken	rcp00_DoNothing	1	1	1	2
	rcp00_ApprInfra	1	1	2	3
	rcp00_ConjUse	1	1	1	2
	rcp00_IncrEff	1	1	1	2
	rcp00_PlannedTreat	1	1	1	2
	rcp00_ImprTreat	1	1	1	2
	rcp00_Eflow	1	1	1	1

		3	4	5
Son	rcp00_DoNothing	3	4	4
	rcp00_ApprInfra	4	5	4
	rcp00_ConjUse	3	4	4
	rcp00_IncrEff	3	4	4
	rcp00_PlannedTreat	3	4	4
	rcp00_ImprTreat	3	3	3
	rcp00_Eflow	2	4	3

H Strategy Results for E-flow Indicators under the 2040 RCP4.5 Scenario

This appendix includes the resulting classes for all e-flow indicators for all strategies under the 2040 RCP 4.5 scenario for all zones per river; the analysis considers the impacts of the sstrategies on hydrological indicators (F.1) ecological indicators (F.2) and socio-economic indicators (F.3). Indicator results are first presented for Ganga and Yamuna and subsequently for Himalayan tributaries (from west to east) and tributaries flowing from the south (from west to east).

H.1 Classes per Zone for Hydrological Indicators

River	Strategy	Eco-zone							
		1	2	3	4	5	6	7	8
Ganges	rcp45_2040_DoNothing	2	2	2	4	5	4	4	4
	rcp45_2040_ApprInfra	2	2	2	4	5	4	3	4
	rcp45_2040_ConjUse	2	2	2	4	4	4	3	4
	rcp45_2040_IncrEff	2	2	2	4	5	4	4	4
	rcp45_2040_PlannedTreat	2	2	2	4	5	4	4	4
	rcp45_2040_ImprTreat	2	2	2	4	5	4	4	4
	rcp45_2040_Eflow	2	2	1	3	4	4	4	4

		1	2	3	4	5	6
Yamuna	rcp45_2040_DoNothing	2	2	4	4	5	3
	rcp45_2040_ApprInfra	2	2	4	4	5	4
	rcp45_2040_ConjUse	2	2	4	4	5	4
	rcp45_2040_IncrEff	2	2	4	4	5	4
	rcp45_2040_PlannedTreat	2	2	4	4	5	3
	rcp45_2040_ImprTreat	2	2	4	4	5	3
	rcp45_2040_Eflow	2	2	2	2	4	4

		1	2
Alaknanda	rcp45_2040_DoNothing	2	2
	rcp45_2040_ApprInfra	2	2
	rcp45_2040_ConjUse	2	2
	rcp45_2040_IncrEff	2	2
	rcp45_2040_PlannedTreat	2	2
	rcp45_2040_ImprTreat	2	2
	rcp45_2040_Eflow	2	2

River	Strategy	Eco-zone			
		1	2	3	4
Ramganga	rcp45_2040_DoNothing	2	5	5	4
	rcp45_2040_ApprInfra	2	5	5	4
	rcp45_2040_ConjUse	2	4	3	3
	rcp45_2040_IncrEff	2	5	5	4
	rcp45_2040_PlannedTreat	2	5	5	4
	rcp45_2040_ImprTreat	2	5	5	4
	rcp45_2040_Eflow	2	4	3	3

		5	6	7
Gomti	rcp45_2040_DoNothing	5	4	4
	rcp45_2040_ApprInfra	5	4	4
	rcp45_2040_ConjUse	5	4	3
	rcp45_2040_IncrEff	5	4	4
	rcp45_2040_PlannedTreat	5	4	4
	rcp45_2040_ImprTreat	5	4	4
	rcp45_2040_Eflow	5	4	4

		1	2	3	4	5
Ghaghra	rcp45_2040_DoNothing	3	3	3	3	3
	rcp45_2040_ApprInfra	3	3	3	3	3
	rcp45_2040_ConjUse	3	3	3	3	3
	rcp45_2040_IncrEff	3	3	3	3	3
	rcp45_2040_PlannedTreat	3	3	3	3	3
	rcp45_2040_ImprTreat	3	3	3	3	3
	rcp45_2040_Eflow	2	2	2	2	3

		1	2	3	4	5	6	7
Rapti	rcp45_2040_DoNothing	4	3	3	3	3	3	3
	rcp45_2040_ApprInfra	4	3	3	3	3	3	3
	rcp45_2040_ConjUse	4	3	3	3	3	3	3
	rcp45_2040_IncrEff	4	3	3	3	3	3	3
	rcp45_2040_PlannedTreat	4	3	3	3	3	3	3
	rcp45_2040_ImprTreat	4	3	3	3	3	3	3
	rcp45_2040_Eflow	3	3	3	3	3	3	3

		1	2	3	4
Gandak	rcp45_2040_DoNothing	3	3	3	3
	rcp45_2040_ApprInfra	3	3	3	3
	rcp45_2040_ConjUse	3	3	3	3
	rcp45_2040_IncrEff	3	3	3	3
	rcp45_2040_PlannedTreat	3	3	3	3
	rcp45_2040_ImprTreat	3	3	3	3
	rcp45_2040_Eflow	2	2	2	2

River	Strategy	Eco-zone						
					4	5	6	7
Buriganda k	rcp45_2040_DoNothing				2	2	3	3
	rcp45_2040_ApprInfra				2	2	3	3
	rcp45_2040_ConjUse				3	3	3	3
	rcp45_2040_IncrEff				2	2	3	3
	rcp45_2040_PlannedTreat				2	2	3	3
	rcp45_2040_ImprTreat				2	2	3	3
	rcp45_2040_Eflow				2	2	3	3

		1	2	3
Kosi	rcp45_2040_DoNothing	2	2	3
	rcp45_2040_ApprInfra	2	2	3
	rcp45_2040_ConjUse	2	2	3
	rcp45_2040_IncrEff	2	2	3
	rcp45_2040_PlannedTreat	2	2	3
	rcp45_2040_ImprTreat	2	2	3
	rcp45_2040_Eflow	2	2	3

		1	2	3	4	5
Mahananda	rcp45_2040_DoNothing	2	1	2	2	2
	rcp45_2040_ApprInfra	2	2	2	2	2
	rcp45_2040_ConjUse	2	1	2	2	2
	rcp45_2040_IncrEff	2	1	2	2	2
	rcp45_2040_PlannedTreat	2	1	2	2	2
	rcp45_2040_ImprTreat	2	1	2	2	2
	rcp45_2040_Eflow	2	1	2	2	2

		2	3	4	5	6	7
Chambal	rcp45_2040_DoNothing	1	2	5	4	4	4
	rcp45_2040_ApprInfra	1	2	5	4	4	4
	rcp45_2040_ConjUse	1	2	5	4	4	4
	rcp45_2040_IncrEff	1	2	5	4	4	4
	rcp45_2040_PlannedTreat	1	2	5	4	4	4
	rcp45_2040_ImprTreat	1	2	5	4	4	4
	rcp45_2040_Eflow	1	2	4	4	3	2

		2	3	4	5
Sind	rcp45_2040_DoNothing	2	2	4	4
	rcp45_2040_ApprInfra	2	2	4	4
	rcp45_2040_ConjUse	2	2	4	4
	rcp45_2040_IncrEff	2	2	4	4
	rcp45_2040_PlannedTreat	2	2	4	4
	rcp45_2040_ImprTreat	2	2	4	4
	rcp45_2040_Eflow	2	2	4	4

River	Strategy	Eco-zone							
						4	5		
Betwa	rcp45_2040_DoNothing					4	4		
	rcp45_2040_ApprInfra					4	4		
	rcp45_2040_ConjUse					4	4		
	rcp45_2040_IncrEff					4	4		
	rcp45_2040_PlannedTreat					4	4		
	rcp45_2040_ImprTreat					4	4		
	rcp45_2040_Eflow					4	4		
		1	2	3	4				
Ken	rcp45_2040_DoNothing	2	2	3	4				
	rcp45_2040_ApprInfra	2	3	4	4				
	rcp45_2040_ConjUse	2	2	3	4				
	rcp45_2040_IncrEff	2	2	3	4				
	rcp45_2040_PlannedTreat	2	2	3	4				
	rcp45_2040_ImprTreat	2	2	3	4				
	rcp45_2040_Eflow	2	2	3	3				
				3	4	5			
Son	rcp45_2040_DoNothing			4	4	4			
	rcp45_2040_ApprInfra			4	4	4			
	rcp45_2040_ConjUse			4	4	4			
	rcp45_2040_IncrEff			4	4	4			
	rcp45_2040_PlannedTreat			4	4	4			
	rcp45_2040_ImprTreat			4	4	4			
	rcp45_2040_Eflow			4	4	4			

H.2 Classes per Zone for Ecological Indicators

River	Strategy	Eco-zone							
		1	2	3	4	5	6	7	8
Ganges	rcp45_2040_DoNothing	2	1	1	3	5	3	1	1
	rcp45_2040_ApprInfra	2	1	1	3	5	3	1	1
	rcp45_2040_ConjUse	2	1	1	3	4	3	1	1
	rcp45_2040_IncrEff	2	1	1	3	5	3	1	1
	rcp45_2040_PlannedTreat	2	1	1	3	5	3	1	1
	rcp45_2040_ImprTreat	2	1	1	3	5	2	1	1
	rcp45_2040_Eflow	2	1	1	1	4	4	3	1

River	Strategy	Eco-zone 1	2	3	4	5	6
Yamuna	rcp45_2040_DoNothing	2	2	5	5	5	2
	rcp45_2040_ApprInfra	2	2	5	5	5	2
	rcp45_2040_ConjUse	2	2	5	5	5	2
	rcp45_2040_IncrEff	2	2	5	5	5	2
	rcp45_2040_PlannedTreat	2	2	5	5	5	2
	rcp45_2040_ImprTreat	2	2	5	5	5	2
	rcp45_2040_Eflow	2	2	1	1	4	3

		1	2
Alaknanda	rcp45_2040_DoNothing	1	1
	rcp45_2040_ApprInfra	1	1
	rcp45_2040_ConjUse	1	1
	rcp45_2040_IncrEff	1	1
	rcp45_2040_PlannedTreat	1	1
	rcp45_2040_ImprTreat	1	1
	rcp45_2040_Eflow	1	1

		1	2	3	4
Ramganga	rcp45_2040_DoNothing	2	3	3	4
	rcp45_2040_ApprInfra	2	3	3	4
	rcp45_2040_ConjUse	2	2	3	3
	rcp45_2040_IncrEff	2	3	3	4
	rcp45_2040_PlannedTreat	2	3	3	4
	rcp45_2040_ImprTreat	2	3	3	4
	rcp45_2040_Eflow	2	2	2	3

		5	6	7
Gomti	rcp45_2040_DoNothing	4	4	4
	rcp45_2040_ApprInfra	4	4	5
	rcp45_2040_ConjUse	4	4	5
	rcp45_2040_IncrEff	4	4	4
	rcp45_2040_PlannedTreat	4	4	5
	rcp45_2040_ImprTreat	4	5	5
	rcp45_2040_Eflow	4	4	4

		1	2	3	4	5
Ghaghra	rcp45_2040_DoNothing	1	1	1	1	1
	rcp45_2040_ApprInfra	1	1	1	1	1
	rcp45_2040_ConjUse	1	1	1	1	1
	rcp45_2040_IncrEff	1	1	1	1	1
	rcp45_2040_PlannedTreat	1	1	1	1	1
	rcp45_2040_ImprTreat	1	1	1	1	1
	rcp45_2040_Eflow	1	1	1	1	1

River	Strategy	Eco-zone 1	2	3	4	5	6	7
Rapti	rcp45_2040_DoNothing	3	2	2	2	1	1	2
	rcp45_2040_ApprInfra	3	2	2	2	1	1	2
	rcp45_2040_ConjUse	3	2	2	2	1	1	2
	rcp45_2040_IncrEff	3	2	2	2	1	1	2
	rcp45_2040_PlannedTreat	3	2	2	2	1	1	2
	rcp45_2040_ImprTreat	3	2	2	2	1	1	2
	rcp45_2040_Eflow	1	1	1	1	1	1	1

		1	2	3	4
Gandak	rcp45_2040_DoNothing	1	1	1	1
	rcp45_2040_ApprInfra	1	1	1	1
	rcp45_2040_ConjUse	1	1	1	1
	rcp45_2040_IncrEff	1	1	1	1
	rcp45_2040_PlannedTreat	1	1	1	1
	rcp45_2040_ImprTreat	1	1	1	1
	rcp45_2040_Eflow	1	1	1	1

		4	5	6	7
Burigandak	rcp45_2040_DoNothing	2	1	1	2
	rcp45_2040_ApprInfra	2	1	1	2
	rcp45_2040_ConjUse	2	1	1	2
	rcp45_2040_IncrEff	2	1	1	2
	rcp45_2040_PlannedTreat	2	1	1	2
	rcp45_2040_ImprTreat	2	1	1	2
	rcp45_2040_Eflow	2	1	1	2

		1	2	3
Kosi	rcp45_2040_DoNothing	1	1	1
	rcp45_2040_ApprInfra	1	1	1
	rcp45_2040_ConjUse	1	1	1
	rcp45_2040_IncrEff	1	1	1
	rcp45_2040_PlannedTreat	1	1	1
	rcp45_2040_ImprTreat	1	1	1
	rcp45_2040_Eflow	1	1	1

		1	2	3	4	5
Mahananda	rcp45_2040_DoNothing	1	1	1	1	1
	rcp45_2040_ApprInfra	1	1	1	1	1
	rcp45_2040_ConjUse	1	1	1	1	1
	rcp45_2040_IncrEff	1	1	1	1	1
	rcp45_2040_PlannedTreat	1	1	1	1	1
	rcp45_2040_ImprTreat	1	1	1	1	1
	rcp45_2040_Eflow	1	1	1	1	1

River	Strategy	Eco-zone 2	3	4	5	6	7
Chambal	rcp45_2040_DoNothing	1	2	4	3	3	3
	rcp45_2040_ApprInfra	1	2	4	3	3	3
	rcp45_2040_ConjUse	1	2	4	4	3	3
	rcp45_2040_IncrEff	1	2	4	3	3	3
	rcp45_2040_PlannedTreat	1	2	4	3	3	3
	rcp45_2040_ImprTreat	1	2	4	4	2	3
	rcp45_2040_Eflow	1	2	3	3	4	3

		2	3	4	5
Sind	rcp45_2040_DoNothing	2	3	4	1
	rcp45_2040_ApprInfra	2	3	4	1
	rcp45_2040_ConjUse	2	3	4	1
	rcp45_2040_IncrEff	2	3	4	1
	rcp45_2040_PlannedTreat	2	3	4	1
	rcp45_2040_ImprTreat	2	3	4	1
	rcp45_2040_Eflow	2	3	4	1

		4	5
Betwa	rcp45_2040_DoNothing	4	4
	rcp45_2040_ApprInfra	5	4
	rcp45_2040_ConjUse	4	3
	rcp45_2040_IncrEff	4	3
	rcp45_2040_PlannedTreat	4	4
	rcp45_2040_ImprTreat	4	4
	rcp45_2040_Eflow	4	2

		1	2	3	4
Ken	rcp45_2040_DoNothing	2	3	3	4
	rcp45_2040_ApprInfra	2	3	3	4
	rcp45_2040_ConjUse	2	3	3	4
	rcp45_2040_IncrEff	2	3	3	4
	rcp45_2040_PlannedTreat	2	3	3	4
	rcp45_2040_ImprTreat	2	3	3	4
	rcp45_2040_Eflow	2	3	3	2

		3	4	5
Son	rcp45_2040_DoNothing	4	5	4
	rcp45_2040_ApprInfra	4	5	4
	rcp45_2040_ConjUse	4	5	4
	rcp45_2040_IncrEff	4	5	4
	rcp45_2040_PlannedTreat	4	5	4
	rcp45_2040_ImprTreat	4	4	4
	rcp45_2040_Eflow	4	4	4

H.3 Classes per Zone for Socio-economic Indicators

River	Strategy	Eco-zone 1	2	3	4	5	6	7	8
Ganges	rcp45_2040_DoNothing	1	1	1	2	4	2	2	2
	rcp45_2040_ApprInfra	1	1	1	2	4	2	2	2
	rcp45_2040_ConjUse	1	1	1	2	4	3	2	2
	rcp45_2040_IncrEff	1	1	1	2	4	2	2	2
	rcp45_2040_PlannedTreat	1	1	1	2	4	2	2	2
	rcp45_2040_ImprTreat	1	1	1	2	4	1	2	2
	rcp45_2040_Eflow	1	1	1	1	4	4	3	3

		1	2	3	4	5	6
Yamuna	rcp45_2040_DoNothing	1	1	4	4	4	2
	rcp45_2040_ApprInfra	1	1	4	4	4	2
	rcp45_2040_ConjUse	1	1	4	4	4	2
	rcp45_2040_IncrEff	1	1	4	4	4	2
	rcp45_2040_PlannedTreat	1	1	4	4	4	2
	rcp45_2040_ImprTreat	1	1	4	4	4	2
	rcp45_2040_Eflow	1	1	1	1	4	3

		1	2
Alaknanda	rcp45_2040_DoNothing	1	1
	rcp45_2040_ApprInfra	1	1
	rcp45_2040_ConjUse	1	1
	rcp45_2040_IncrEff	1	1
	rcp45_2040_PlannedTreat	1	1
	rcp45_2040_ImprTreat	1	1
	rcp45_2040_Eflow	1	1

		1	2	3	4
Ramganga	rcp45_2040_DoNothing	1	3	3	3
	rcp45_2040_ApprInfra	1	3	3	3
	rcp45_2040_ConjUse	1	2	2	2
	rcp45_2040_IncrEff	1	3	3	3
	rcp45_2040_PlannedTreat	1	3	3	3
	rcp45_2040_ImprTreat	1	3	3	3
	rcp45_2040_Eflow	1	2	2	2

River	Strategy	Eco-zone						
						5	6	7
Gomti	rcp45_2040_DoNothing					4	5	4
	rcp45_2040_ApprInfra					4	5	4
	rcp45_2040_ConjUse					4	5	4
	rcp45_2040_IncrEff					4	5	4
	rcp45_2040_PlannedTreat					4	5	4
	rcp45_2040_ImprTreat					3	4	3
	rcp45_2040_Eflow					4	5	4
		1	2	3	4	5		
Ghaghra	rcp45_2040_DoNothing	3	3	3	3	2		
	rcp45_2040_ApprInfra	3	3	3	3	2		
	rcp45_2040_ConjUse	3	3	3	3	2		
	rcp45_2040_IncrEff	3	3	3	3	2		
	rcp45_2040_PlannedTreat	3	3	3	3	2		
	rcp45_2040_ImprTreat	3	3	3	3	2		
	rcp45_2040_Eflow	2	2	1	1	1		
		1	2	3	4	5	6	7
Rapti	rcp45_2040_DoNothing	4	2	3	3	2	2	2
	rcp45_2040_ApprInfra	4	2	3	3	2	2	2
	rcp45_2040_ConjUse	4	2	2	2	2	2	2
	rcp45_2040_IncrEff	4	3	3	3	2	2	2
	rcp45_2040_PlannedTreat	4	2	3	3	2	2	2
	rcp45_2040_ImprTreat	4	2	3	3	2	2	2
	rcp45_2040_Eflow	1	1	1	1	1	1	1
		1	2	3	4			
Gandak	rcp45_2040_DoNothing	1	1	1	1			
	rcp45_2040_ApprInfra	1	1	1	1			
	rcp45_2040_ConjUse	1	1	1	1			
	rcp45_2040_IncrEff	1	1	1	1			
	rcp45_2040_PlannedTreat	1	1	1	1			
	rcp45_2040_ImprTreat	1	1	1	1			
	rcp45_2040_Eflow	1	1	1	1			
					4	5	6	7
Burigandak	rcp45_2040_DoNothing				1	1	1	1
	rcp45_2040_ApprInfra				1	1	1	1
	rcp45_2040_ConjUse				2	1	1	1
	rcp45_2040_IncrEff				1	1	1	1
	rcp45_2040_PlannedTreat				1	1	1	1
	rcp45_2040_ImprTreat				1	1	1	1
	rcp45_2040_Eflow				1	1	1	1

River	Strategy	Eco-zone		
		1	2	3
Kosi	rcp45_2040_DoNothing	1	1	1
	rcp45_2040_ApprInfra	1	1	1
	rcp45_2040_ConjUse	1	1	1
	rcp45_2040_IncrEff	1	1	1
	rcp45_2040_PlannedTreat	1	1	1
	rcp45_2040_ImprTreat	1	1	1
	rcp45_2040_Eflow	1	1	1

		1	2	3	4	5
Mahananda	rcp45_2040_DoNothing	1	1	1	1	1
	rcp45_2040_ApprInfra	1	1	1	1	1
	rcp45_2040_ConjUse	1	1	1	1	1
	rcp45_2040_IncrEff	1	1	1	1	1
	rcp45_2040_PlannedTreat	1	1	1	1	1
	rcp45_2040_ImprTreat	1	1	1	1	1
	rcp45_2040_Eflow	1	1	1	1	1

		2	3	4	5	6	7
Chambal	rcp45_2040_DoNothing	1	1	5	4	3	3
	rcp45_2040_ApprInfra	1	1	5	4	3	3
	rcp45_2040_ConjUse	1	1	5	4	2	3
	rcp45_2040_IncrEff	1	1	5	4	3	3
	rcp45_2040_PlannedTreat	1	1	5	4	3	3
	rcp45_2040_ImprTreat	1	1	5	3	2	3
	rcp45_2040_Eflow	1	1	4	4	3	3

		2	3	4	5
Sind	rcp45_2040_DoNothing	1	2	3	1
	rcp45_2040_ApprInfra	1	2	3	1
	rcp45_2040_ConjUse	1	2	3	1
	rcp45_2040_IncrEff	1	2	3	1
	rcp45_2040_PlannedTreat	1	2	3	1
	rcp45_2040_ImprTreat	1	2	3	1
	rcp45_2040_Eflow	1	2	3	1

		4	5
Betwa	rcp45_2040_DoNothing	4	3
	rcp45_2040_ApprInfra	4	3
	rcp45_2040_ConjUse	4	3
	rcp45_2040_IncrEff	4	3
	rcp45_2040_PlannedTreat	4	3
	rcp45_2040_ImprTreat	4	3
	rcp45_2040_Eflow	3	2

River	Strategy	Eco-zone 1	2	3	4
Ken	rcp45_2040_DoNothing	2	2	2	3
	rcp45_2040_ApprInfra	2	2	2	3
	rcp45_2040_ConjUse	2	2	2	3
	rcp45_2040_IncrEff	2	2	2	3
	rcp45_2040_PlannedTreat	2	2	2	3
	rcp45_2040_ImprTreat	2	2	2	3
	rcp45_2040_Eflow	2	2	2	2

		3	4	5
Son	rcp45_2040_DoNothing	4	5	4
	rcp45_2040_ApprInfra	4	5	5
	rcp45_2040_ConjUse	4	5	4
	rcp45_2040_IncrEff	4	5	4
	rcp45_2040_PlannedTreat	4	5	4
	rcp45_2040_ImprTreat	4	4	4
	rcp45_2040_Eflow	3	4	4

I Species List of IUCN Protected Species

This Appendix includes the list of IUCN protected species that workshop participants agreed were relevant to include in an environmental flow assessment. Due to data limitations, only a sub-set of these species was included in the current e-flow assessment (See Appendix A). This list can be considered for possible expansion in the set of response curves.

Mammals

Sr. No.	Scientific Name	Common Name	IUCN Status	Link to IUCN Range Map
1	*Prionailurus viverrinus*	Fishing Cat	VU	http://maps.iucnredlist.org/map.html?id=18150
2	*Lutrogale perspicillata*	Smooth-coated Otter	VU	http://maps.iucnredlist.org/map.html?id=12427
3	*Lutra lutra*	Eurasian Otter	NT	http://maps.iucnredlist.org/map.html?id=12419
4	*Aonyx cinereus*	Asian Small-clawed Otter	VU	http://maps.iucnredlist.org/map.html?id=44166
5	*Platanista gangetica*	Ganges River Dolphin	EN	http://maps.iucnredlist.org/map.html?id=41758

Birds

Sr. No.	Scientific Name	Common Name	IUCN Status	Link to IUCN Range Map
1	*Mareca falcata*	Falcated Duck	NT	http://maps.iucnredlist.org/map.html?id=22680153
2	*Aythya ferina*	Common Pochard	VU	http://maps.iucnredlist.org/map.html?id=22680358
3	*Aythya baeri*	Baer's Pochard	CR	http://maps.iucnredlist.org/map.html?id=22680384
4	*Oxyura leucocephala*	White-headed Duck	EN	http://maps.iucnredlist.org/map.html?id=22679814
5	*Mycteria leucocephala*	Painted Stork	NT	http://maps.iucnredlist.org/map.html?id=22697658
6	*Ciconia episcopus*	Asian Woollyneck	VU	http://maps.iucnredlist.org/map.html?id=22727255
7	*Ephippiorhynchus asiaticus*	Black-necked Stork	NT	http://maps.iucnredlist.org/map.html?id=22697702
8	*Threskiornis melanocephalus*	Black-headed Ibis	NT	http://maps.iucnredlist.org/map.html?id=22697516
9	*Pelecanus crispus*	Dalmatian Pelican	VU	http://maps.iucnredlist.org/map.html?id=22697599
10	*Anhinga melanogaster*	Oriental Darter	NT	http://maps.iucnredlist.org/map.html?id=22696712
11	*Haliaeetus leucoryphus*	Pallas's Fish Eagle	VU	http://maps.iucnredlist.org/map.html?id=22695130
12	*Ichthyophaga humilis*	Lesser Fish Eagle	NT	http://maps.iucnredlist.org/map.html?id=22695156

13	*Icthyophaga ichthyaetus*	Grey-headed Fish Eagle	NT	http://maps.iucnredlist.org/map.html?id=22695163
14	*Circus macrourus*	Pallid Harrier	NT	http://maps.iucnredlist.org/map.html?id=22695396
15	*Clanga clanga*	Greater Spotted Eagle	VU	http://maps.iucnredlist.org/map.html?id=22696027
16	*Houbaropsis bengalensis*	Bengal Florican	CR	http://maps.iucnredlist.org/map.html?id=22692015
17	*Grus leucogeranus**	Siberian Crane	CR	http://maps.iucnredlist.org/map.html?id=22692053
18	*Antigone antigone*	Sarus Crane	VU	http://maps.iucnredlist.org/map.html?id=22692064
19	*Esacus recurvirostris*	Great Thick-knee	NT	http://maps.iucnredlist.org/map.html?id=22693604
20	*Vanellus vanellus*	Northern Lapwing	NT	http://maps.iucnredlist.org/map.html?id=22693949
21	*Vanellus duvaucelii*	River Lapwing	NT	http://maps.iucnredlist.org/map.html?id=22693992
22	*Gallinago nemoricola*	Wood Snipe	VU	http://maps.iucnredlist.org/map.html?id=22693082
23	*Limosa limosa*	Black-tailed Godwit	NT	http://maps.iucnredlist.org/map.html?id=22693150
24	*Numenius arquata*	Eurasian Curlew	NT	http://maps.iucnredlist.org/map.html?id=22693190
25	*Sterna aurantia*	River Tern	NT	http://maps.iucnredlist.org/map.html?id=22694537
26	*Sterna acuticauda*	Black-bellied Tern	EN	http://maps.iucnredlist.org/map.html?id=22694711
27	*Rynchops albicollis*	Indian Skimmer	VU	http://maps.iucnredlist.org/map.html?id=22694268
28	*Emberiza aureola*	Yellow-breasted Bunting	EN	http://maps.iucnredlist.org/map.html?id=22720966

**Considered regionally extinct*

Reptiles

Sr. No.	Scientific Name	Common Name	IUCN Status	Link to IUCN Range Map
1	*Crocodylus palustris*	Mugger	VU	http://maps.iucnredlist.org/map.html?id=5667
2	*Gavialis gangeticus*	Gharial	CR	http://maps.iucnredlist.org/map.html?id=8966
3	*Batagur kachuga*	Red-crowned Roofed Turtle	CR	http://maps.iucnredlist.org/map.html?id=10949
4	*Batagur dhongoka*	Three-striped Roofed Turtle	EN	http://maps.iucnredlist.org/map.html?id=10953
5	*Chitra indica*	Indian Narrow-headed Softshell Turtle	EN	http://maps.iucnredlist.org/map.html?id=4696

6	*Pelochelys cantorii*	Cantor's Giant Softshell Turtle	EN	http://maps.iucnredlist.org/map.html?id=16502
7	*Nilssonia gangetica*	Indian Softshell Turtle	VU	http://maps.iucnredlist.org/map.html?id=39618
8	*Nilssonia hurum*	Indian Peacock Softshell Turtle	VU	http://maps.iucnredlist.org/map.html?id=39619
9	*Geoclemys hamiltonii*	Spotted Pond Turtle	VU	http://maps.iucnredlist.org/map.html?id=9029

Fishes

Sr. No.	Scientific Name	Common Name	IUCN Status	Link to IUCN Range Map
1	*Anguilla bengalensis*	Indian Mottled Eel	NT	http://maps.iucnredlist.org/map.html?id=61668607
2	*Neolissochilus hexagonolepis*	Copper Mahseer / Katli	NT	http://maps.iucnredlist.org/map.html?id=166479
3	*Tor putitora*	Golden / Putitor Mahseer	EN	http://maps.iucnredlist.org/map.html?id=166645
4	*Tor tor*	Tor Mahseer	NT	http://maps.iucnredlist.org/map.html?id=166534
5	*Ompok bimaculatus*	Indian Butter Catfish	NT	http://maps.iucnredlist.org/map.html?id=166616
6	*Wallago attu*	Boal	NT	http://maps.iucnredlist.org/map.html?id=166468
7	*Cyprinion semiplotum*	Assamese Kingfish	VU	http://maps.iucnredlist.org/map.html?id=166578
8	*Labeo pangusia*	Pangusia Labeo	NT	http://maps.iucnredlist.org/map.html?id=166497
9	*Poropuntius clavatus*	Stedman Barb	NT	http://maps.iucnredlist.org/map.html?id=166589
10	*Naziritor chelynoides*	Dark Mahseer	VU	http://maps.iucnredlist.org/map.html?id=166420
11	*Schizothorax richardsonii*	(A Snow Trout)	VU	http://maps.iucnredlist.org/map.html?id=166525
12	*Balitora brucei*	(A Stone Loach)	NT	http://maps.iucnredlist.org/map.html?id=166923
13	*Ompok pabda*	-	NT	http://maps.iucnredlist.org/map.html?id=166509
14	*Ailia coila*	Gangetic Ailia	NT	http://maps.iucnredlist.org/map.html?id=166451
15	*Bagarius bagarius*	-	NT	http://maps.iucnredlist.org/map.html?id=166529
16	*Glyphis gangeticus*	Ganges Shark	CR	http://maps.iucnredlist.org/map.html?id=9281

J Waste Water Treatment Settings

The Ganga river basin model simulates the domestic waste water sources based on the population of the area and multiplies it with the waste assumed to be generated per person. The model than allows for treatment facilities to be included that will reduce the amount of pollutants with a given efficiency as long as the volume of waste water is within its capacity. Treatment can be any facility or process that reduces the amount of pollutants, so it does not necessarily be a formal sewage treatment plant. The effect of open defacation, for example, where most of the pollutants remain in the soil can also be simulated. For each included facility the model requires information on which percentage of the waste water flow of that node is directed to it (%Volume2Facility), the treatment process and its capacity. Appendix J.1 provides a list of all facilities included in the present strategy with planned NMCG treatment plants as well as the changes made in the improved treatment strategy where the rural treatment is enhanced. Appendix J.2 provides an overview of the efficiency settings as used for each facility. Sometimes different names are used for similar types of facilities. This is done when different sources use differend names.

J.1 Treatment Facilities per Modelling Node

		Present plus NMCG planned			Changed in Improved treatment strategy		
Node	TreatmentFacilityID	%Volume2 Facility	TreatmentProcess	Treatment Capacity (MLD)	%Volume2 Facility	TreatmentProcess	Treatment Capacity (MLD)
'PWS_Patna_Urban'	'1_Beurenhancement'	3.6	'unknown_future_trt_eff'	11		'unknown_improved_future_trt_eff'	11
	'2_Beur_Patna'	11.77	'ASP'	35			
	'3_Bihar_Karmalichak'	0.3	'Aerated lagoon'	4			
	'4_Chapara_Patna(Notoperational)'	0.67	'OP'	2			
	'5_Karmalichakenhancement'	11.1	'unknown_future_trt_eff'	33		'unknown_improved_future_trt_eff'	33
	'6_Paharienhancement'	11.8	'unknown_future_trt_eff'	35		'unknown_improved_future_trt_eff'	35
	'7_Pahari_Patna'	8.41	'Aerated lagoon'	25			
	'8_Patna_Digha'	0	'unknown_future_trt_eff'	100		'unknown_improved_future_trt_eff'	100
	'9_Patna_Barh'	3.6	'unknown_future_trt_eff'	11		'unknown_improved_future_trt_eff'	11
	'10_Patna_Kankarbagh'	16.8	'unknown_future_trt_eff'	50		'unknown_improved_future_trt_eff'	50
	'11_Patna_Mokama'	2.6	'unknown_future_trt_eff'	8		'unknown_improved_future_trt_eff'	8
	'12_patna_no treatment'	10	'no treatment'	unlimited			
	'13_patna_septictank'	2.7	'No information'	unlimited		'unknown_improved_future_trt_eff'	unlimited
	'14_Saidpur_Oldunit_Patna'	1.51	'ASP'	4.5			
	'15_Saidpur_Patna'	15.13	'ASP'	45			
'PWS_Rural_Bihar'	'16_Rural_Bihar_no treatment'	50	'natural rural treatment'	unlimited	30	'unknown_improved_future_trt_eff'	unlimited

	'17_Rural_Bihar_septictank'	50	'septic and natural rual treat'	unlimited	70		unlimited
'PWS_Urban_Bihar'	'18_Bihar_Bhagalpur'	0.82	'Aerated lagoon'	11			
	'19_Bihar_notreatment'	34.78	'no treatment'	14		'septic and natural urban treat'	14
	'20_Bihar_septictank'	60	'No information'	unlimited		'unknown_improved_future_trt_eff'	unlimited
	'21_Buxar'	1.1	'unknown_future_trt_eff'	16		'unknown_improved_future_trt_eff'	16
	'22_Munger'	2	'unknown_future_trt_eff'	27		'unknown_improved_future_trt_eff'	27
	'23_Naugachia'	0.6	'unknown_future_trt_eff'	9		'unknown_improved_future_trt_eff'	9
	'24_Sultanganj'	0.7	'unknown_future_trt_eff'	10		'unknown_improved_future_trt_eff'	10
'PWS_Rural_Chattisgar'	'25_Rural_Chattis_no treatment'	50	'natural rural treatment'	unlimited	30	'unknown_improved_future_trt_eff'	unlimited
	'26_Rural_Chattis_septictank'	50	'septic and natural rual treat'	unlimited	70		unlimited
'PWS_Urban_Chattisgar'	'27_Urban_chattis_no treatment'	50	'No information'	0		'septic and natural urban treat'	0
	'28_urban_chattis_septictank'	50	'No information'	unlimited		'unknown_improved_future_trt_eff'	unlimited
'PWS_Urban_Delhi'	'29_Delhi_Akshardham'	0.13	'MBR'	4.5			
	'30_Delhi_Chilla'	1.14	'SBR'	40.5			
	'31_Delhi_Coronationpill'	2.54	'ASP'	90			
	'32_Delhi_Coronationpill1'	1.27	'Trickling Filter'	45			
	'33_Delhi_Delhigate'	0.28	'Biofar'	9.9			
	'34_Delhi_Dr.Sen_nursing'	0.56	'Biofar'	20			
	'35_Delhi_Ghitorni'	0.63	'ASP'	22.5			
	'36_Delhi_KeshopurI'	1.52	'ASP'	54			
	'37_Delhi_KeshopurII'	2.54	'ASP'	90			
	'38_Delhi_KeshopurIII'	5.07	'ASP'	unlimited			
	'39_Delhi_KeshopurIV'	5.07	'ASP'	unlimited			
	'40_Delhi_Kondli_phaseI'	1.27	'ASP'	45			
	'41_Delhi_Kondli_phaseII'	3.17	'ASP'	unlimited			
	'42_Delhi_Kondli_phaseIII'	1.27	'ASP'	45			
	'43_Delhi_Kondli_phaseIV'	5.71	'ASP'	unlimited			
	'44_Delhi_Mehrauli'	0.63	'ASP'	22.5			
	'45_Delhi_NarelaI'	0.76	'ASP'	27			
	'46_Delhi_NarelaI'	1.27	'ASP'	45			
	'47_Delhi_Nazafgarh'	0.68	'EA'	24			
	'48_Delhi_no treatment'	0	'no treatment'	0			

	'49_Delhi_OkhlaPhaseI'	3.8	'ASP'	unlimited			
	'50_Delhi_OkhlaPhaseII'	1.52	'ASP'	54			
	'51_Delhi_OkhlaPhaseIII'	5.71	'ASP'	unlimited			
	'52_Delhi_OkhlaPhaseIV'	4.69	'ASP'	unlimited			
	'53_Delhi_OkhlaPhaseV'	2.03	'ASP'	72			
	'54_Delhi_OkhlaPhaseVI'	3.8	'ASP'	unlimited			
	'55_Delhi_Papankalla'	2.54	'ASP'	90			
	'56_Delhi_rithalanew'	5.07	'ASP'	unlimited			
	'57_Delhi_rIthalaOld'	5.07	'ASP'	unlimited			
	'58_Delhi_Rohini'	1.9	'ASP'	67.5			
	'59_Delhi_septictank'	20.11	'No information'	0		'unknown_improved_future_trt_eff'	0
	'60_Delhi_Timarpur'	0.76	'OP'	27			
	'61_Delhi_VasantKunj-II'	0.56	'EA'	20			
	'62_Delhi_vasantkunj'	0.63	'EA'	22.5			
	'63_Delhi_vasantkunjIII'	0.38	'EA'	13.5			
	'64_Delhi_Yamunaviharphase I'	1.27	'ASP'	45			
	'65_Delhi_YamunaviharphaseII'	1.27	'ASP'	45			
	'66_low_income_community'	0.28	'FAB'	10			
'PWS_Rural_Haryana'	'67_rural_Haryana_no treatment'	50	'natural rural treatment'	unlimited	30	'unknown_improved_future_trt_eff'	unlimited
	'68_rural_Haryana_septictank'	50	'septic and natural rual treat'	unlimited	70		unlimited
'PWS_Rural_South_Hary'	'69_R_south_hary_no treatment'	0	'natural rural treatment'	unlimited	30	'unknown_improved_future_trt_eff'	unlimited
	'70_R_south_hary_septictank'	0	'septic and natural rual treat'	unlimited	70		unlimited
'PWS_Urban_Delhi'	'71_FaridabadBadshapur'	1.83	'UASB + SBR'	65			
	'72_FaridabadMirzapur'	1.27	'UASB'	45			
'PWS_urban_Gurgaon'	'73_Gurgaon_no treatment'	0	'no treatment'	0			
	'74_Gurgaon_Phase I'	50	'UASB'	unlimited			
	'75_Gurgaon_PhaseII'	45.63	'ASP'	67.5			
	'76_Gurgaon_septictank'	4.37	'No information'	unlimited		'unknown_improved_future_trt_eff'	unlimited
'PWS_Urban_Haryana'	'77_Badshapur_faridabad'	7.5	'UASB'	45			
	'78_Bahadurgarh(a)'	0	'unknown_future_trt_eff'	unlimited		'unknown_improved_future_trt_eff'	unlimited
	'79_Bahadurgarh(b)'	6	'unknown_future_trt_eff'	36		'unknown_improved_future_trt_eff'	36
	'80_GharondaRailwayRoad_karnal'	0.5	'unknown_future_trt_eff'	3		'unknown_improved_future_trt_eff'	3
	'81_HaryanaGohana_Sonepa'	0.5	'OP'	3			

	'82_Haryana_faridabad_Sec4'	6.73	'UASB'	40			
	'83_Haryana_Hodal'	1.51	'MBR'	9			
	'84_Haryana_Jhajjar'	0.93	'MBBR'	5.5			
	'85_Haryana_Karnal'	1.6	'OP'	9.5			
	'86_Haryana_Karnalsec4'	6.73	'UASB'	40			
	'87_Haryana_notreatment'	3.07	'no treatment'	0		'septic and natural urban treat'	0
	'88_Haryana_Palwal'	1.51	'SBR'	9			
	'89_Haryana_Panipat'	11.27	'UASB'	67			
	'90_Haryana_Pratapgarh'	8.41	'SBR'	50			
	'91_Haryana_Rewari_Panch'	3.03	'ASP'	18			
	'92_Haryana_Rewari_Kaluwa'	1.09	'MBBR'	6.5			
	'93_Haryana_septictank'	10	'No information'	unlimited		'unknown_improved_future_trt_eff'	unlimited
	'94_Haryana_Sonepat'	7.57	'UASB'	45			
	'95_Haryana_YamunaNagar'	4.21	'UASB'	25			
	'96_Haryana_YamunaNagarbaddi'	0.34	'OP'	10			
	'97_Mirjapur_faridabad'	7.5	'UASB'	45			
	'98_NearShvColonyWCJ_karnal'	1.35	'Oxidation Pond'	8			
	'99_NewAnajMandiIndri_karnal'	0.25	'unknown_future_trt_eff'	1.5		'unknown_improved_future_trt_eff'	1.5
	'100_Pratapgarh_faridabad'	8.4	'UASB'	50			
'PWS_Urban_South_Hary'	'101_U_south_hary_no treatment'	50	'no treatment'	unlimited		'septic and natural urban treat'	unlimited
	'102_U_south_hary_septictank'	50	'No information'	unlimited		'unknown_improved_future_trt_eff'	unlimited
'PWS_Rural_Himachal_P'	'103_Rural_Himachal_no treatment'	50	'natural rural treatment'	unlimited	30	'unknown_improved_future_trt_eff'	unlimited
	'104_Rural_Himachal_septictank'	50	'septic and natural rual treat'	unlimited	70		unlimited
'PWS_Shimla_Urban'	'105_KotkhaizoneI'	1.7	'EA'	0.3			
	'106_KotkhaizoneII'	0.89	'EA'	0.2			
	'107_Narkanda'	2.51	'EA'	0.5			
	'108_Shimla_Dhalli'	4.25	'EA'	0.8			
	'109_Shimla_Jubbal'	3.63	'EA'	0.7			
	'110_Shimla_Ialpani'	24	'UASB'	19.4			
	'111_Shimla_Northdisposal'	10	'EA'	5.8			
	'112_shimla_no treatment'	0	'no treatment'	unlimited	25	'unknown_improved_future_trt_eff'	unlimited
	'113_Shimla_Rampur'	8.38	'ASP'	1.5			

	'114_Shimla_roharoo'	5.59	'EA'	1			
	'115_shimla_septictank'	10.43	'No information'	unlimited		'unknown_improved_future_trt_eff'	unlimited
	'116_Shimla_snowdown'	7.54	'EA'	1.4			
	'117_Shimla_Summerhill'	6	'EA'	3.9			
	'118_Shimla_sunjuali'	5	'EA'	4.4			
	'119_Suni'	3.63	'EA'	0.7			
	'120_Theog'	6.43	'EA'	1.2			
'PWS_Urban_Himachal_P'	'121_Himachal_P_Kinnaur'	0	'Non operational'	0			
	'122_Himachal_P_Kinnaurrek'	11.98	'ASP'	1			
	'123_Himachal_P_sirmaur'	35.95	'ASP Non operational'	3		'septic and natural urban treat'	3
	'124_Himachal_P_solan'	34.75	'EA'	2.9			
	'125_urban_himachal_no treatment'	7	'no treatment'	unlimited		'septic and natural urban treat'	unlimited
	'126_urban_himachal_septictank'	10.31	'No information'	unlimited		'unknown_improved_future_trt_eff'	unlimited
'PWS_E-Jhark_rural'	'127_E_Jhark_rural_no treatment'	50	'natural rural treatment'	unlimited	30	'unknown_improved_future_trt_eff'	unlimited
	'128_E_Jhark_rural_septictank'	50	'septic and natural rual treat'	unlimited	70		unlimited
'PWS_E-Jhark_urban'	'129_E_Jhark_Urban_no treatment'	40	'no treatment'	unlimited	30	'unknown_improved_future_trt_eff'	unlimited
	'130_E_Jhark_Urban_septictank'	51.53	'septic and natural rual treat'	unlimited	61.53	'septic and natural urban treat'	unlimited
	'131_Jhark_Bokaro_BGH'	0.2	'Lagoon'	1.2			
	'132_Jhark_Bokaro_BSLtownship_Sec11'	0.98	'Lagoon'	5.9			
	'133_Jhark_Bokaro_BSLtownship_Sec12'	1.75	'Lagoon'	10.4			
	'134_Jhark_Bokaro_BSLtownship_Sec7'	0.43	'Lagoon'	2.6			
	'135_Jhark_Bokaro_CampII'	0.1	'Lagoon'	0.6			
	'136_Jhark_Bokaro_Dhandabara'	1.91	'Lagoon'	11.4			
	'137_Jhark_Bokaro_Gomiatow'	1.09	'SAS'	6.5			
	'138_Sahibganj'	2.01	'unknown_future_trt_eff'	12		'unknown_improved_future_trt_eff'	12
'PWS_rural_Hazaribag'	'139_Rural_Hazaribag_no treatment'	50	'natural rural treatment'	unlimited	30	'unknown_improved_future_trt_eff'	unlimited
	'140_Rural_Hazaribag_septictank'	50	'septic and natural rual treat'	unlimited	70		unlimited
'PWS_urban_Hazaribag'	'141_Urban_Hazaribag_no treatment'	50	'no treatment'	25		'septic and natural urban treat'	25
	'142_Urban_Hazaribag_septictank'	50	'No information'	unlimited		'unknown_improved_future_trt_eff'	unlimited
'PWS-W-Jhark_rural'	'143_W_Jhark_rural_no treatment'	0	'natural rural treatment'	unlimited	30	'unknown_improved_future_trt_eff'	unlimited

	'144_W_Jhark_rural_septictank'	0	'septic and natural rual treat'	unlimited	70		unlimited
'PWS-W-Jhark_urban'	'145_Jhark_Bokaro_BGH'	0.6	'Lagoon'	1.2			
	'146_Jhark_Bokaro_BSLtowns'	0.6	'Lagoon'	1.2			
	'147_Jhark_Bokaro_BSLtowns'	1.2	'Lagoon'	2.6			
	'148_Jhark_Bokaro_BSLtowns'	1.2	'Lagoon'	2.6			
	'149_Jhark_Bokaro_CampII'	2.8	'Lagoon'	5.9			
	'150_Jhark_Bokaro_Dhandaba'	2.8	'Lagoon'	5.9			
	'151_Jhark_Bokaro_Gomiatow'	5	'Lagoon'	10.4			
	'152_W_Jhark_notreatment'	5	'Lagoon'	10.4			
	'153_Jhark_Bokaro_CampII'	0.3	'Lagoon'	0.6			
	'154_Jhark_Bokaro_CampII'	0.3	'Lagoon'	0.6			
	'155_Jhark_Bokaro_Dhandaba'	5.5	'Lagoon'	11.4			
	'156_Jhark_Bokaro_Dhandaba'	5.5	'Lagoon'	11.4			
	'157_Jhark_Bokaro_Gomiatow'	0.8	'SAS'	1.6			
	'158_Jhark_Bokaro_Gomiatow'	0.8	'SAS'	1.6			
	'159_W_Jhark_notreatment'	67.6	'no treatment'	unlimited		'septic and natural urban treat'	unlimited
'PWS_Rural_Madhya_Pra'	'160_R_Madhya_pra_no treatment'	50	'natural rural treatment'	unlimited	30	'unknown_improved_future_trt_eff'	unlimited
	'161_R_Madhya_pra_septictank'	50	'septic and natural rual treat'	unlimited	70		unlimited
'PWS_urban_Bhopal'	'162_Bhopal_Badwai'	5.85	'OP'	17			
	'163_Bhopal_Bawadia'	4.68	'OP'	13.6			
	'164_Bhopal_Ekantpark'	2.75	'OP'	8			
	'165_Bhopal_Gondermau'	0.81	'OP'	2.4			
	'166_Bhopal_kotra'	3.44	'WSP'	10			
	'167_Bhopal_Maholi'	8.6	'WSP'	25			
	'168_Bhopal_MataMandir'	1.57	'Biofilteration plant'	4.6			
	'169_Bhopal_no treatment'	20	'no treatment'	unlimited		'septic and natural urban treat'	unlimited
	'170_Bhopal_septictank'	52.3	'No information'	unlimited		'unknown_improved_future_trt_eff'	unlimited
'PWS_Urban_Madhya_Pra'	'171_Madhya_pra_Gwalior'	3.58	'WSP'	50			
	'172_Madhya_Pra_Indore'	0.86	'UASB'	12			
	'173_Madhya_Pra_Indore'	5.59	'UASB'	78			
	'174_Madhya_Pra_Jabalpur'	10.75	'FAB'	unlimited			
	'175_Madhya_Pra_sadawal'	3.8	'OPS Karnal Technology'	53			

	'176_Madhya_Pra_Ujjain'	3.73	'WSP'	52			
	'177_Nagda'	0	'OPS Karnal Technology'	unlimited			
	'178_U_Madhya_pra_no treatment'	20	'no treatment'	unlimited		'septic and natural urban treat'	unlimited
	'179_U_Madhya_pra_septictank'	51.7	'No information'	unlimited		'unknown_improved_future_trt_eff'	unlimited
	'180_Vidisha'	0	'OPS Karnal Technology'	unlimited			
'PWS_Rural_Jaipur'	'181_Rural_jaipur_no treatment'	50	'natural rural treatment'	unlimited	30	'unknown_improved_future_trt_eff'	unlimited
	'182_Rural_Jaipur_septictank'	50	'septic and natural rual treat'	unlimited	70		unlimited
'PWS_rural_Rajastan'	'183_Rural_Rajastan_septictank'	50	'septic and natural rual treat'	unlimited	70		unlimited
	'184_Rural_rajasthan_no treatmnet'	50	'natural rural treatment'	unlimited	30	'unknown_improved_future_trt_eff'	unlimited
'PWS_Urban_Jaipur'	'185_Jaipur_VidyadharNag'	0.23	'MBBR'	1			
	'186_Jaipur_Amerroad'	6.16	'ASP'	27			
	'187_Jaipur_Centralpark'	0.23	'MBBR'	1			
	'188_Jaipur_DelawasI'	14.27	'ASP'	62.5			
	'189_Jaipur_DelawasII'	14.27	'ASP'	62.5			
	'190_Jaipur_Gajodhar'	6.85	'ASP'	30			
	'191_Jaipur_jaisinghpura'	11.42	'ASP'	50			
	'192_Jaipur_jawaharcircle'	0.23	'MBBR'	1			
	'193_Jaipur_notreatment'	10	'no treatment'	unlimited		'septic and natural urban treat'	unlimited
	'194_jaipur_Ralawata(under construction)'	6.85	'ASP'	30			
	'195_Jaipur_Ramniwasgarden'	0.23	'MBBR'	1			
	'196_jaipur_SahakarMarg'	0.46	'no information'	2		'septic and natural urban treat'	2
	'197_jaipur_septictank'	28.58	'No information'	unlimited		'unknown_improved_future_trt_eff'	unlimited
	'198_jaipur_Talkatora'	0.23	'no information'	1		'septic and natural urban treat'	1
'PWS_urban_Rajastan'	'199_bharatpur(proposed)'	1.94	'SBR'	8			
	'200_bundi(underconstruction)'	1.94	'WSP'	8			
	'201_dholpur(underconstruction)'	2.42	'UASB'	10			
	'202_Jhalawar(proposed)'	0.73	'WSP'	3			
	'203_Jhalawar_Jhalrapatan(proposed)'	1.45	'ASP'	6			
	'204_Karauli(proposed)'	1.21	'UASB'	5			
	'205_kota_Balita(under construction)'	1.45	'SBR'	6			
	'206_Kota_Kishopura(under construction)'	7.26	'SBR'	30			

	'207_Rajasthan_Alwar_Bhiwadi'	0.97	'SBR'	4			
	'208_Rajasthan_Alwar_Ramga'	4.84	'WSP'	20			
	'209_Rajasthan_Bhilwara'	2.42	'SBR'	10			
	'210_Rajasthan_chittorgarh'	6.05	'UASB'	25			
	'211_Rajasthan_kotadeviroad'	4.84	'No information'	20		'septic and natural urban treat'	20
	'212_Rajasthan_notreatment'	20	'no treatment'	34		'septic and natural urban treat'	34
	'213_Rajasthan_rajsamand_ nathdwara'	1.04	'No information'	4.3		'septic and natural urban treat'	4.3
	'214_Rajasthan_sawaimadhop'	2.42	'WSP facultative'	10			
	'215_Rajasthan_septictank'	32.71	'No information'	unlimited		'unknown_improved_future_trt_eff'	unlimited
	'216_Rajasthan_Udaipur_ekl'	4.84	'MBBR'	20			
	'217_rajsamand_pratappura (proposed)'	1.21	'UASB'	5			
	'218_tonk(proposed)'	0.25	'septic tank'	1		'septic and natural urban treat'	1
'PWS_Lucknow_Urban'	'219_Lucknow_Daulatganj'	7.26	'FAB'	42			
	'220_Lucknow_Gomatinagar'	64.84	'No information'	unlimited		'unknown_improved_future_trt_eff'	unlimited
	'221_Lucknow_no treatment'	7.9	'no treatment'	unlimited			
	'222_Lucknow_septictank'	20	'No information'	unlimited		'unknown_improved_future_trt_eff'	unlimited
'PWS_Rural_CE_East_Ga'	'223_CE_ruralEast_Ga_no treatment'	50	'natural rural treatment'	unlimited	30	'unknown_improved_future_trt_eff'	unlimited
	'224_CE_ruralEast_Ga_septictank'	50	'septic and natural rual treat'	unlimited	70		unlimited
'PWS_Rural_CE_Gandak'	'225_rural_Gandak_no treatment'	50	'natural rural treatment'	unlimited	30	'unknown_improved_future_trt_eff'	unlimited
	'226_rural_Gandak_septictank'	50	'septic and natural rual treat'	unlimited	70		unlimited
'PWS_Rural_CE_Ganga'	'227_Rural_CE_Ganga_no treatment'	50	'natural rural treatment'	unlimited	30	'unknown_improved_future_trt_eff'	unlimited
	'228_Rural_CE_Ganga_septictank'	50	'septic and natural rual treat'	unlimited	70		unlimited
'PWS_Rural_CE_Kanhar'	'229_Rural_CE_Kanhar_no treatment'	50	'natural rural treatment'	unlimited	30	'unknown_improved_future_trt_eff'	unlimited
	'230_Rural_CE_Kanhar_septictank'	50	'septic and natural rual treat'	unlimited	70		unlimited
'PWS_Rural_CE_Ramgang'	'231_Rural_Ramganga_no treatment'	50	'natural rural treatment'	unlimited	30	'unknown_improved_future_trt_eff'	unlimited
	'232_Rural_Ramganga_septictank'	50	'septic and natural rual treat'	unlimited	70		unlimited
'PWS_Rural_CE_Sarda'	'233_rural_Sarda_notreatment'	50	'natural rural treatment'	unlimited	30	'unknown_improved_future_trt_eff'	unlimited
	'234_rural_Sarda_septictank'	50	'septic and natural rual treat'	unlimited	70		unlimited
	'235_facility1'	0	'UASB'	unlimited			

'PWS_rural_CE_Sarda_S'	'236_facility2'	0	'OP'	unlimited			
	'237_R_CE_Sarda_S_notreatment'	50	'natural rural treatment'	unlimited	30	'unknown_improved_future_trt_eff'	unlimited
	'238_R_CE_Sarda_S_septictank'	50	'septic and natural rual treat'	unlimited	70		unlimited
'PWS_Rural_CE_Saryu_P'	'239_rural_Saryu_notreatment'	50	'natural rural treatment'	unlimited	30	'unknown_improved_future_trt_eff'	unlimited
	'240_rural_Saryu_septictank'	50	'septic and natural rual treat'	unlimited	70		unlimited
'PWS_Rural_CE_Son'	'241_R_CE_Son_notreatment'	50	'natural rural treatment'	unlimited	30	'unknown_improved_future_trt_eff'	unlimited
	'242_R_CE_Son_septictank'	50	'septic and natural rual treat'	unlimited	70		unlimited
'PWS_urban_CE_Betwa&B'	'243_CE_Betwa_notreatment'	50	'no treatment'	0		'septic and natural urban treat'	0
	'244_CE_Betwa_septictank'	50	'No information'	unlimited		'unknown_improved_future_trt_eff'	unlimited
'PWS_Urban_CE_East_Ga'	'245_Moradabad(nonavailabilityofsewage)'	1.42	'ASP'	20			
	'246_Rampur(nonavailabilityofsewage)'	1.07	'UASB'	15			
	'247_U_CE_East_ganga_no treatment'	47.51	'no treatment'	unlimited		'septic and natural urban treat'	unlimited
	'248_U_CE_East_ganga_septictank'	50	'No information'	unlimited		'unknown_improved_future_trt_eff'	unlimited
'PWS_Urban_CE_Gandak'	'249_urban_Gandak_notreatment'	50	'no treatment'	unlimited		'septic and natural urban treat'	unlimited
	'250_Urban_Gandak_septictank'	50	'No information'	unlimited		'unknown_improved_future_trt_eff'	unlimited
'PWS_Urban_CE_Ganga'	'251_CE_Ganga_Shradhapuri'	0.43	'ASP'	6			
	'252_CE_Ganga_STP_Shradhapuri-I_Phase-II'	0.43	'ASP'	6			
	'253_CE_Ganga_Agrabhurikanagla'	0.16	'WSP'	2.3			
	'254_CE_Ganga_Anoopsheher'	0.07	'OP'	1			
	'255_CE_Ganga_Anoopsheher'	0.14	'OP'	2			
	'256_CE_Ganga_BhimNagri'	0.85	'UASB'	12			
	'257_CE_Ganga_Dhandhupura'	5.54	'UASB'	78			
	'258_CE_Ganga_Dhandhupuranew'	1.71	'UASB'	24			
	'259_CE_Ganga_Jaganpur_Si'	1	'UASB'	14			
	'260_CE_Ganga_KalindiViha'	0.32	'UASB'	4.5			
	'261_CE_Ganga_MDAGanganagar'	0.71	'ASP'	10			
	'262_CE_Ganga_MDASTPPallavpurm-II'	0.36	'ASP'	5			
	'263_CE_Ganga_MDALohiaNagar'	1.28	'ASP'	18			
	'264_CE_Ganga_MDAPallavpurm-I_meerut'	0.5	'ASP'	7			
	'265_CE_Ganga_MDAPandavnagar'	0.07	'ASP'	1			

	'266_CE_Ganga_MDAShatabdinagar'	1.92	'ASP'	27			
	'267_CE_Ganga_meerutRakshapuram'	0.43	'ASP'	6			
	'268_CE_Ganga_muzaffarnaga'	2.35	'OP'	33			
	'269_CE_Ganga_notreatment'	18.29	'no treatment'	50		'septic and natural urban treat'	50
	'270_CE_Ganga_Pilakhar'	0.74	'WSP'	10.4			
	'271_CE_Ganga_Sadarwan(Bi'	2.56	'UASB'	36			
	'272_CE_Ganga_Sadarwan(Bi'	2.84	'UASB'	40			
	'273_CE_Ganga_Saharanpur'	2.7	'UASB'	38			
	'274_CE_Ganga_septictank'	50	'septic and natural rual treat'	unlimited			
	'275_CE_Ganga_Shradhapuri'	0.43	'ASP'	6			
	'276_CE_Ganga_sportsComplex_Meerut'	0.5	'ASP'	7			
	'277_CE_Ganga_SportsVedvyaspuri_Meerut'	1.07	'ASP'	15			
	'278_CE_Ganga_STP_Shradhapuri-I_Phase-II'	0.43	'ASP'	6			
	'279_CE_Ganga_TransYamuna'	1.07	'OP'	15			
	'280_LaxmiNagar_Mathura'	1.03	'WSP'	14.5			
	'281_MasaniNalla_Mathura'	0.96	'OP'	13.5			
'PWS_Urban_CE_Kanhar'	'282_Urban_CE_Kanhar_no treatment'	50	'no treatment'	36		'septic and natural urban treat'	36
	'283_Urban_CE_Kanhar_septictank'	50	'No information'	unlimited		'unknown_improved_future_trt_eff'	unlimited
'PWS_Urban_CE_Ramgang'	'284_CE_Ramganga_Etawah'	1.2	'OP'	10.4			
	'285_CE_Ramganga_Etawah'	1.5	'OP'	13.5			
	'286_CE_Ramganga_Jajmau_Ka'	0.58	'UASB'	5			
	'287_CE_Ramganga_Jajmau_Ka'	15.2	'ASP'	unlimited			
	'288_CE_Ramganga_notreatment'	20	'no treatment'	unlimited		'septic and natural urban treat'	unlimited
	'289_CE_Ramganga_septictank'	22.12	'No information'	unlimited		'unknown_improved_future_trt_eff'	unlimited
	'290_Farrukhabad'	0.46	'OP'	4			
	'291_kanpur_baniyapur(proposed)'	1.75	'UASB'	15			
	'292_kanpur_bingava_JNNURM (proposed)'	24.55	'UASB'	unlimited			
	'293_kanpur_jajmau_JNNURM (proposed)'	5.03	'ASP'	43			

	'294_kanpur_sajari(proposed)'	4.91	'ASP'	42			
	'295_mainpuri'	2.69	'UASB'	23			
'PWS_Urban_CE_Sarda'	'296_Unnao'	2.4	'unknown_future_trt_eff'	13		'unknown_improved_future_trt_eff'	13
	'297_urban_Sarda_no treatment'	47.6	'no treatment'	unlimited		'septic and natural urban treat'	unlimited
	'298_urban_Sarda_septictank'	50	'No information'	unlimited		'unknown_improved_future_trt_eff'	unlimited
'PWS_urban_CE_Sarda_S'	'299_CE_Sarda_S_notreatment'	47.7	'no treatment'	100		'septic and natural urban treat'	100
	'300_CE_Sarda_S_septictank'	50	'No information'	unlimited		'unknown_improved_future_trt_eff'	unlimited
	'301_Unnao'	2.3	'unknown_future_trt_eff'	13		'unknown_improved_future_trt_eff'	13
'PWS_Urban_CE_Saryu_P'	'302_urban_Saryu_no treatment'	50	'no treatment'	unlimited		'septic and natural urban treat'	unlimited
	'303_urban_Saryu_septictank'	50	'No information'	unlimited		'unknown_improved_future_trt_eff'	unlimited
'PWS_Urban_CE_Son'	'304_CE_Son_Bhagwanpurvillage'	1.9	'ASP'	9.8			
	'305_CE_Son_Dinapur'	15.51	'Trickling Filter'	80			
	'306_CE_Son_Kodra_Allahab'	4.85	'BTR (Bio Tower Reactor)'	25			
	'307_CE_Son_Pongahat_Alla'	1.94	'BTR (Bio Tower Reactor)'	10			
	'308_CE_Son_Rajapur_Allah'	11.63	'UASB & Aerated Lag'	60			
	'309_CE_Son_SaloriAll'	6.3	'FAB'	32.5			
	'310_CE_Son_STPNaini_All'	15.51	'ASP'	80			
	'311_CE_SonNumayadahi_All'	9.69	'BTR (Bio Tower Reactor)'	50			
	'312_Jhusi_Allahabad'	0	'unknown_future_trt_eff'	16		'unknown_improved_future_trt_eff'	16
	'313_Naini'	0	'unknown_future_trt_eff'	42		'unknown_improved_future_trt_eff'	42
	'314_Phaphamau_Allahabad'	0	'unknown_future_trt_eff'	14		'unknown_improved_future_trt_eff'	14
	'315_U_CE_Son_no treatment'	0	'no treatment'	unlimited			
	'316_U_CE_Son_septictank'	9	'No information'	unlimited		'unknown_improved_future_trt_eff'	unlimited
	'317_Varanasi_bhagwanpur'	1.94	'ASP'	10			
	'318_Varanasi_dinapur'	15.51	'Trickling Filter'	80			
	'319_Varanasi_DLW'	2.33	'ASP'	12			
	'320_varanasi_Ramana'	0	'unknown_future_trt_eff'	50		'unknown_improved_future_trt_eff'	50
'PWS_urban_Noida_&_Ga'	'321_Gaziabad_bharwara'	5	'UASBR'	unlimited			
	'322_Gaziabad_Daulatganj'	6	'FAB'	56			
	'323_Gaziabad_madhubanhindon(Proposed)'	0	'SBR'	56			
	'324_Gaziabad_morti(under construction)'	0	'SBR'	56			
	'325_Gaziabad_Sultanpur'	1.09	'OP'	6.4			

	'326_Ghaziabad_Dudahera'	9.53	'SBR'	56			
	'327_Ghaziabad_Dudahera'	4	'UASB'	70			
	'328_Ghaziabad_Govindpuram'	4	'SBR'	56			
	'329_Ghaziabad_Indirapuram'	4	'SBR'	56			
	'330_Ghaziabad_Indirapuram'	9.53	'UASB'	56			
	'331_Ghaziabad_Indirapuram'	5	'SBR'	74			
	'332_Ghaziabad_Sadullabad'	5.1	'SBR'	30			
	'333_Noida_&_Ga_no treatment'	0	'no treatment'	0			
	'334_Noida_&_Ga_septictank'	3.5	'No information'	unlimited		'unknown_improved_future_trt_eff'	unlimited
	'335_Noida_Kansa'	6	'SBR'	unlimited			
	'336_Noida_sec123'	5.95	'SBR'	35			
	'337_Noida_sec168'	8.51	'SBR'	50			
	'338_Noida_sec50'	4.25	'SBR'	25			
	'339_Noida_sec50'	5.78	'UASB'	34			
	'340_Noida_sec54'	1.7	'OP'	10			
	'341_Noida_sec54'	4.59	'UASB'	27			
	'342_Noida_sec54'	5.61	'SBR'	33			
	'343_Noida_sec91'	0.85	'OP'	5			
'PWS_Urban_CE_Son'	'344_CE_Son_PakkaPokharamirzapur_All'	2.71	'UASB'	14			
	'345_CE_Son_WSB_Vindhyachalmirzapur'	1.36	'WSP'	7	1.18		
'PWS_Dehradun_Urban'	'346_Bhattafall_Mussoorie'	0	'unknown_future_trt_eff'	3.1		'unknown_improved_future_trt_eff'	3.1
	'347_Indira_Nagar'	0	'unknown_future_trt_eff'	5		'unknown_improved_future_trt_eff'	5
	'348_Jagjeetpur_Enhancement_hardwar'	0	'unknown_future_trt_eff'	64		'unknown_improved_future_trt_eff'	64
	'349_Jakhan'	0	'unknown_future_trt_eff'	1		'unknown_improved_future_trt_eff'	1
	'350_Kaulagarh'	0	'unknown_future_trt_eff'	3		'unknown_improved_future_trt_eff'	3
	'351_Kulri_Mussoorie'	0	'unknown_future_trt_eff'	0.9		'unknown_improved_future_trt_eff'	0.9
	'352_Landhor_North_Mussoorie'	0	'unknown_future_trt_eff'	0.8		'unknown_improved_future_trt_eff'	0.8
	'353_Landhor_South_Mussoorie'	0	'unknown_future_trt_eff'	1.3		'unknown_improved_future_trt_eff'	1.3
	'354_Mothorowala'	0	'unknown_future_trt_eff'	20		'unknown_improved_future_trt_eff'	20
	'355_Mothorowala'	0	'unknown_future_trt_eff'	20		'unknown_improved_future_trt_eff'	20
	'356_Salawala'	0	'unknown_future_trt_eff'	0.7		'unknown_improved_future_trt_eff'	0.7

	'357_Uttrakhand_Haridwar'	0	'unknown_future_trt_eff'	82		'unknown_improved_future_trt_eff'	82
	'358_Uttrakhand_Haridwar_ Jagjeetpur'	6.04	'ASP'	18			
	'359_Uttrakhand_Haridwar_ Jagjeetpur'	9.06	'SBR'	27			
	'360_Uttrakhand_Haridwar_ saraijawalapur'	6.04	'SBR'	18			
	'361_Vijay_Colony'	0	'unknown_future_trt_eff'	0.4		'unknown_improved_future_trt_eff'	0.4
'PWS_Rural_ Uttarakhan'	'362_Rural_Uttrakhan_no treatment'	50	'natural rural treatment'	unlimited	30	'unknown_improved_future_trt_eff'	unlimited
	'363_Rural_Uttrakhan_septictank'	50	'septic and natural rual treat'	unlimited	70		unlimited
'PWS_Urban_ Uttarakhan'	'364_Badrinathpuri'	0.34	'unknown_future_trt_eff'	1		'unknown_improved_future_trt_eff'	1
	'365_Bah_Bazar_Devaprayag'	0.47	'unknown_future_trt_eff'	1.4		'unknown_improved_future_trt_eff'	1.4
	'366_Chamoli_Gopeshwar'	1.47	'unknown_future_trt_eff'	4.4		'unknown_improved_future_trt_eff'	4.4
	'367_Gangotri'	0.34	'unknown_future_trt_eff'	1		'unknown_improved_future_trt_eff'	1
	'368_Joshimath'	1.27	'unknown_future_trt_eff'	3.8		'unknown_improved_future_trt_eff'	3.8
	'369_Karnaprayag'	0.05	'unknown_future_trt_eff'	0.2		'unknown_improved_future_trt_eff'	0.2
	'370_Kirtinagar'	0.02	'unknown_future_trt_eff'	0.1		'unknown_improved_future_trt_eff'	0.1
	'371_Lakkarghat_Enhancement'	7.05	'unknown_future_trt_eff'	21		'unknown_improved_future_trt_eff'	21
	'372_MuniKi_Reti'	4.19	'unknown_future_trt_eff'	12.5		'unknown_improved_future_trt_eff'	12.5
	'373_Nandprayag'	0.5	'unknown_future_trt_eff'	1.5		'unknown_improved_future_trt_eff'	1.5
	'374_Rudraprayag'	0.18	'unknown_future_trt_eff'	0.5		'unknown_improved_future_trt_eff'	0.5
	'375_Srinagar_new'	0.34	'unknown_future_trt_eff'	1		'unknown_improved_future_trt_eff'	1
	'376_Tapovan_Tehri'	1.17	'unknown_future_trt_eff'	3.5		'unknown_improved_future_trt_eff'	3.5
	'377_urban_uttrakhand_no treatment'	19.67	'no treatment'	unlimited		'septic and natural urban treat'	unlimited
	'378_urban_uttrakhand_septictank'	41.6	'septic and natural urban treat'	unlimited			
	'379_Uttarkashi'	0.05	'unknown_future_trt_eff'	0.2		'unknown_improved_future_trt_eff'	0.2
	'380_Uttarkashi'	0.17	'unknown_future_trt_eff'	0.5		'unknown_improved_future_trt_eff'	0.5
	'381_Uttarkashi_gyansu'	0.67	'MBBR'	2			
	'382_Uttrakhand_Almora'	0.67	'MBBR'	2			
	'383_Uttrakhand_Nainital_bhimtal'	0.42	'UASB'	1.3			
	'384_Uttrakhand_Nainital_rushi'	3.36	'Trickling Filter'	10			
	'385_Ved_Niketan'	1.01	'unknown_future_trt_eff'	3		'unknown_improved_future_trt_eff'	3
'PWS_rural_CE_ Betwa&B'	'386_Rural_CE_Betwa&B_no treatment'	50	'natural rural treatment'	unlimited	30	'unknown_improved_future_trt_eff'	unlimited

	'387_Rural_CE_Betwa&B_septictank'	50	'septic and natural rual treat'	unlimited	70		unlimited
'PWS_Dehradun_Urban'	'388_Dehradun_7stp(Under construction)'	35.19	'SBR'	50			
	'389_Dehradun_notreatment'	9.45	'No information'	unlimited		'unknown_improved_future_trt_eff'	unlimited
	'390_Dehradun_septictank'	30	'No information'	unlimited		'unknown_improved_future_trt_eff'	unlimited
	'391_Mussoorie(Under construction)'	4.22	'SBR'	6			
'PWS_Urban_Uttarakhan'	'392_lakkarghat_Rishikesh'	2.01	'OP'	6			
	'393_Ranipur'	1.4	'unknown_future_trt_eff'	4.2		'unknown_improved_future_trt_eff'	4.2
	'394_Rishikesh'	1.01	'SBR'	3			
	'395_Srinagar'	1.17	'FAB'	3.5			
	'396_SwargAshram_Rishikesh'	1.01	'UASB+PP'	3			
	'397_Uttrakhand_Haridwar_J'	2.4	'ASP'	18			
	'398_Uttrakhand_Haridwar_J'	3.6	'SBR'	27			
	'399_Uttrakhand_Haridwar_s'	2.4	'SBR'	18			
'PWS_Kolkata_urban'	'400_kolkata_notreatment'	50	'no treatment'	unlimited		'septic and natural urban treat'	unlimited
	'401_Kolkata_septictank'	50	'No information'	unlimited		'unknown_improved_future_trt_eff'	unlimited
'PWS_rural_West-Benga'	'402_rural_WestBengal_notreatment'	50	'natural rural treatment'	unlimited	30	'unknown_improved_future_trt_eff'	unlimited
	'403_rural_WestBengal_septictank'	50	'septic and natural rual treat'	unlimited	70		unlimited
'PWS_urban_West-Bengal'	'404_Asanol'	1.28	'No information'	12		'unknown_improved_future_trt_eff'	12
	'405_Baharampur'	0.39	'OP'	3.7			
	'406_Jiaganj_Azimpur'	0.15	'OP'	1.4			
	'407_Konnagar'	2.34	'OP'	22			
	'408_Nabadwip'	1.06	'OP'	10			
	'409_Titagarh'	0.53	'ASP'	5			
	'410_Titagarh(nonoperational)'	0.53	'OP'	5			
	'411_Urban_WestBengal_no treatment'	30	'no treatment'	unlimited		'septic and natural urban treat'	unlimited
	'412_Urban_WestBengal_septictank'	63.71	'No information'	unlimited		'unknown_improved_future_trt_eff'	unlimited

J.2 Treatment Efficiencies

	NH4	NO3	Norg	Tot_P	PO4	BOD	COD	Cl	FColi	TColi	TSS

Activated sludge	80	20	80	60	20	80	70	0	25	25	75
Aerated lagoon	70	20	70	40	20	70	60	0	25	25	75
Aqua life	50	50	50	40	20	50	40	0	25	25	75
'ASP'	94.63	20	94.63	60	20	93.57	92	0	99.82	25	96.06
ASP non operation	0	0	0	0	0	0	0	0	0	0	0
'Bhopal_septic'	70	20	70	40	20	70	60	0	25	25	75
'Bihar_septic'	70	20	70	40	20	70	60	0	25	25	75
'BioFar'	88.89	90	88.89	90	90	95	89.8	90	99.69	90	97
'Biofar'	90	90	90	90	90	90	90	90	90	90	90
Biofilteration plant	50	50	50	80	80	90	90	90	90	90	98
'Biological'	80	20	80	60	20	80	70	0	25	25	75
BTR (bio Tower Reactor)'	90	90	90	90	90	85.27	80.72	90	90	90	72
'CE_Ganga_septic'	70	20	70	40	20	70	60	0	25	25	75
'CE_Ramganga_septic'	70	20	70	40	20	70	60	0	25	25	75
'CE_Son_septic'	70	20	70	40	20	70	60	0	25	25	75
'completed'	0	0	0	0	0	0	0	0	0	0	0
'Delhi_septic'	70	20	70	40	20	70	60	0	25	25	75
'EA'	70	50	70	50	20	93	89	0	25	25	93
Extended aeration'	70	50	70	50	20	70	60	0	25	25	75
'FAB'	90	90	90	90	90	65	55	90	62	52	90
'FSP'	90	90	90	90	90	75	90	90	60	90	90
'Gurgaon_septic'	70	20	70	40	20	70	60	0	25	25	75
'Haryana_septic'	70	20	70	40	20	70	60	0	25	25	75
'Jaipur_septic'	70	20	70	40	20	70	60	0	25	25	75
'Lagoon'	70	20	70	40	20	70	60	0	25	25	75
'LargeRetention'	90	90	90	90	90	90	90	90	90	90	90
'Madhya_septic'	70	20	70	40	20	70	60	0	25	25	75
'MBBR'	90	90	90	90	90	90	95	90	90	90	65

'MBR'	97	97	97	96	96	98	99	90	90	90	99
'MediumRetention'	50	50	50	50	50	50	50	50	50	50	50
No info	0	0	0	0	0	0	0	0	0	0	0
no treatment	0	0	0	0	0	0	0	0	0	0	0
'Noida_Ga_septic'	70	20	70	40	20	70	60	0	25	25	75
Non operation'	0	0	0	0	0	0	0	0	0	0	0
'none'	0	0	0	0	0	0	0	0	0	0	0
'Non-Operational'	0	0	0	0	0	0	0	0	0	0	0
'OP'	60	50	60	40	20	69	50	0	86	95	81
'Operational'	80	20	80	60	20	80	70	0	25	25	75
OPS Karnal technology'	90	90	90	90	90	90	90	90	90	90	90
Oxidation ditch'	60	50	60	40	20	60	50	0	25	25	75
Oxidation pond'	60	50	60	40	20	69	50	0	86	95	81
Primary settling'	5	5	25	20	5	25	20	0	10	10	70
'Rajasthan_septic'	70	20	70	40	20	70	60	0	25	25	75
'SAS'	94.63	20	94.63	60	20	93.57	92	0	99.82	25	96.06
'SBR'	69	90	69	90	55.9	96.8	93	90	90	90	96.7
'Secondary'	80	20	80	60	20	80	70	0	25	25	75
septic tank	70	20	70	40	20	70	60	0	25	25	75
'SmallRetention'	10	10	10	10	10	10	10	10	10	10	10
some treatment'	75	75	75	75	75	75	75	75	75	75	75
Trickling filter	70	20	70	50	20	61	60	0	25	25	46
'UASB'	90	90	90	90	90	41	46	90	90	90	90
UASB & Aerated Lag'	90	90	90	90	90	90	90	90	90	90	90
UASB + SBR'	90	90	90	90	90	96.8	90	90	90	90	96.7
UASB followed by extended aeration'	90	90	90	90	90	41	46	90	90	90	90
'UASB+PP'	90	90	90	90	90	41	46	90	90	90	90

'UASBR'	90	90	90	90	90	41	46	90	90	90	90
Under construction'	0	0	0	0	0	0	0	0	0	0	0
Under tendering'	0	0	0	0	0	0	0	0	0	0	0
'Uttrakhand_septic'	70	20	70	40	20	70	60	0	25	25	75
'W_Jhark_septic'	70	20	70	40	20	70	60	0	25	25	75
'WSP'	90	90	90	90	90	75	90	90	60	90	90
WSP facultative'	0	0	0	0	0	0	0	0	0	0	0
natural rural treatment'	60	60	60	60	60	60	60	60	60	60	60
septic and natural rual treat'	90	90	90	90	90	90	90	90	90	90	90
septic and natural urban treat'	80	80	80	80	80	80	80	80	80	80	80
natural urban reatment	50	50	50	50	50	50	50	50	50	50	50
'unknown_future_trt_eff'	75	75	75	75	75	75	75	75	75	75	75
'unknown_improved_future_trt_eff'	90	90	90	90	90	90	90	90	90	90	90

K Physical Geographic and Geologic Characteristics of the Ganga Basin

K.1 Geography of the Basin

The Ganga river is a part of the composite Ganga-Brahmaputra-Meghna basin draining 1,086,000 square kilometers in China, Nepal, India and Bangladesh. The Ganga originates as the Bhagirathi at an elevation of about 3,892 m above mean sea level in the ice cave of Gaumukh at the snout of the Gangotri glacier in Uttrakhand State. The Bhagirathi and the Alaknanda, join at DevPrayag to continue as the Ganga river. The entire basin drains through 11 states: Bihar, Delhi, Haryana, Himachal Pradesh, Uttar Pradesh, Madhya Pradesh, Rajasthan, West Bengal, Uttrakhand, Jharkhand and Chhattisgarh (Figure 2.1) and flows for over 2,500 km to its outfall into the Bay of Bengal through the former main course of the Bhagirathi-Hooghly.

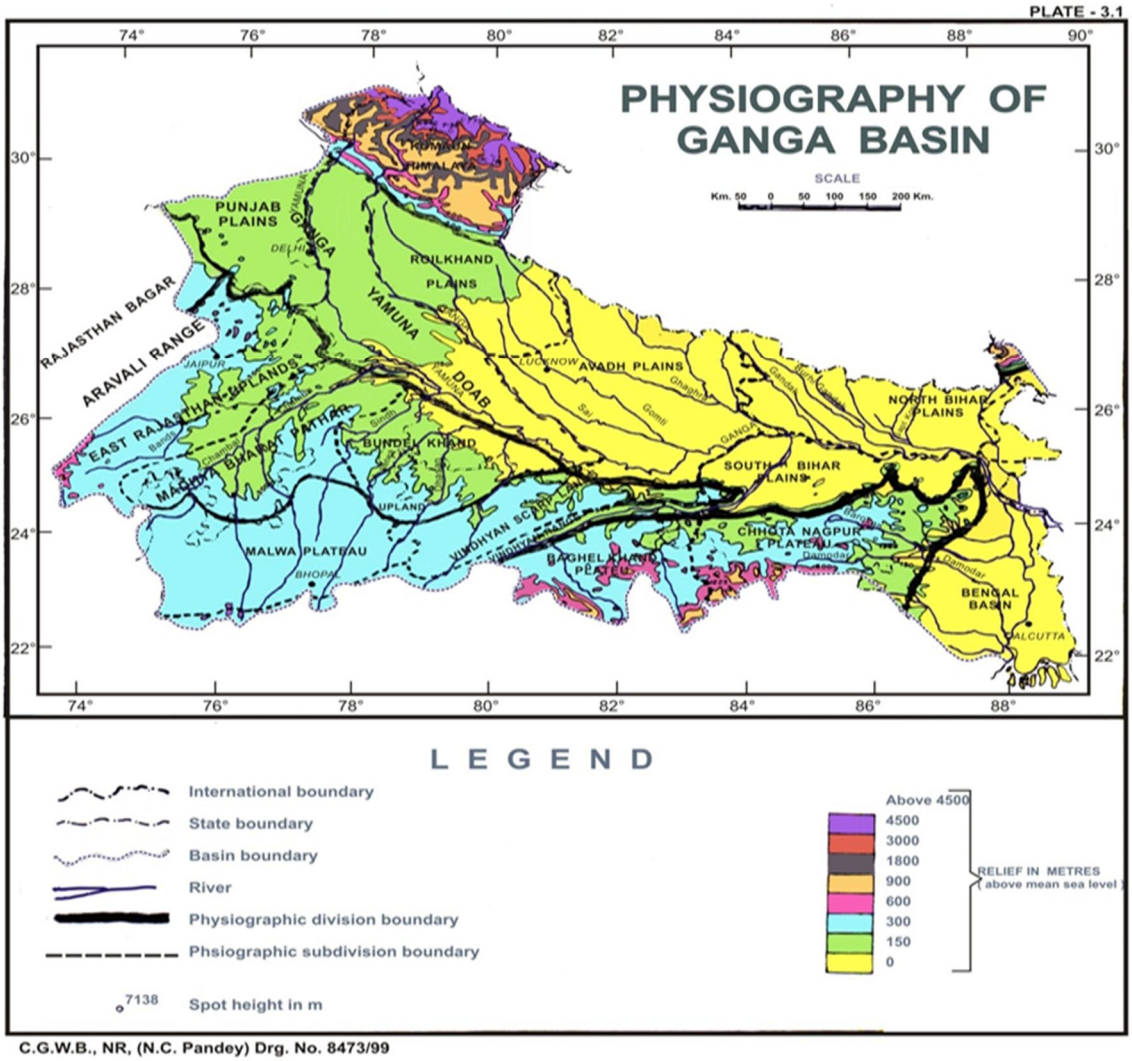


Figure K-1: Topography of Ganga river basin according to Pandey.

The principal tributaries joining the river are the Yamuna, the Ramganga, the Ghaghra, the Gandak, the Kosi, the Mahananda and the Sone. Chambal and Betwa are the two important sub-tributaries.

Major Himalayan rivers and their tributaries are flowing north to southeast, while rivers from the Peninsular Craton are flowing northwards. At Allahabad, the Yamuna, the largest tributary, joins the Ganga on its southern bank and contributes a large volume of water and sediment load collected mainly from discharge of several rivers of the Indian Peninsula flowing in a northeast direction. From Allahabad downstream, the Ganga River is the axial river acting as the water divide between Himalayan and cratonic rivers. Many important tributaries, namely Varuna, Gomti, Ghaghra, Gandak and Kosi join from the north and Tons, Son, Punpun, Phalgu and many other rivers join the Ganga from the south.

K.2 Drainage System and Water Infrastructure

In Figure K-2 and Figure K-3 the drainage system is simply characterized: streams with very steep gradients from a height of approximately 4,700 meters above sea level towards approximately 10-20 meters above sea level in the very low gradient Ganga plain. At the foothills of the Himalaya and at the south side of the basin, land is more elevated, approximately 200-300 meters above sea level. At the foothills of the Himalayas this area is characterized by a dense system of streams (Figure K-4). The drainage area can be classified into five units:

1. The Himalaya headwater streams (200/300-4,700 meters above sea level). A very important water source, containing more than 60 percent of the total Ganga discharge, originating from high precipitation and melting glaciers and snow;
2. The Himalaya foothill zone with a dense network of streams, resulting from heavy rainfall in the adjacent lower mountains, and groundwater discharge;
3. The Ganga basin higher plain at approximately 200 meters above sea level, in the west;
4. The Ganga basin lower plain with elevations lower than 100 meters above sea level downstream.
5. The streams draining the southern hard rock craton area.

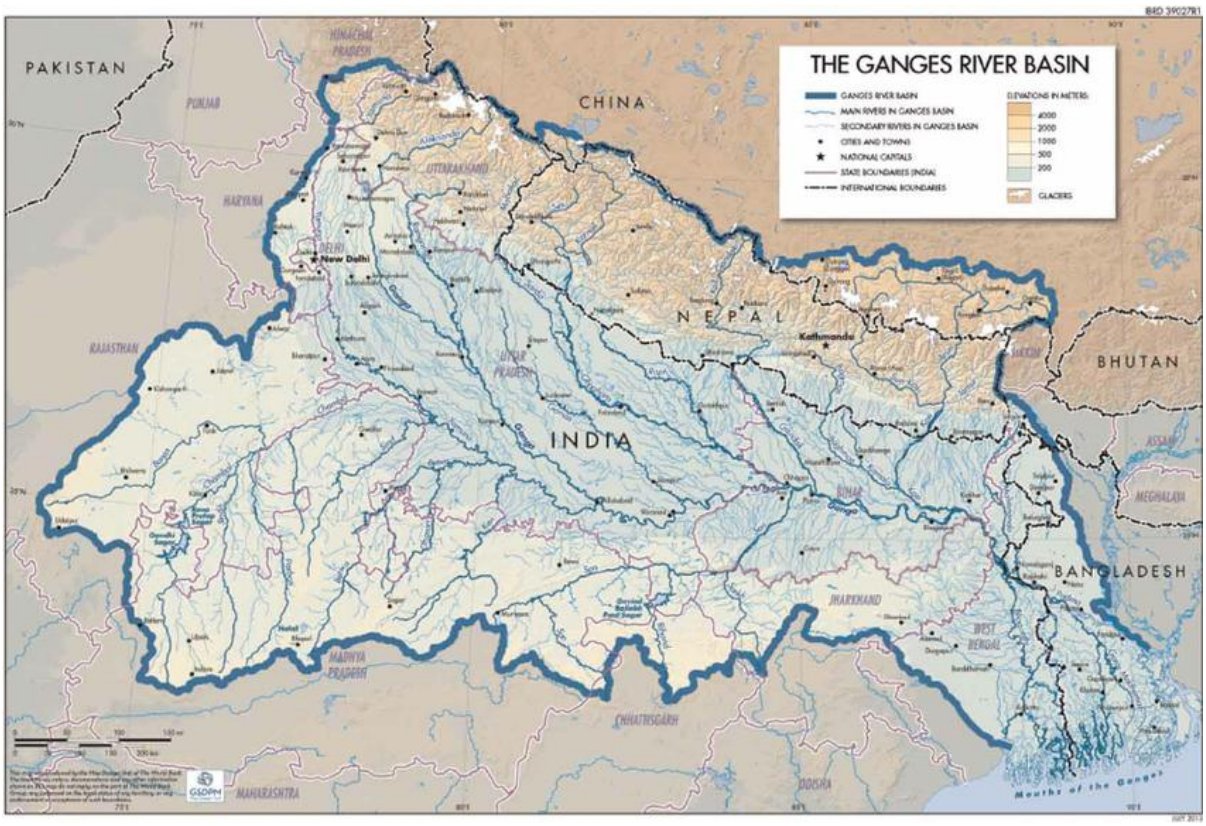


Figure K-2: Basin boundaries, land elevation and drainage pattern (Sadoff et all, 2013).

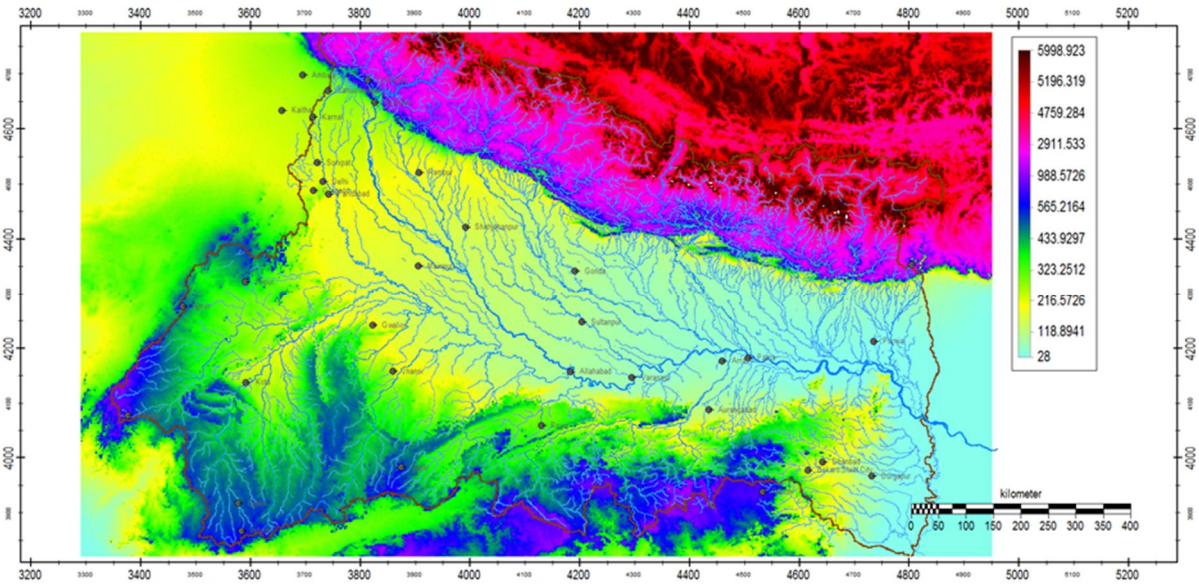


Figure K-3: Elevation, the distribution of streams and the boundary of the study area.

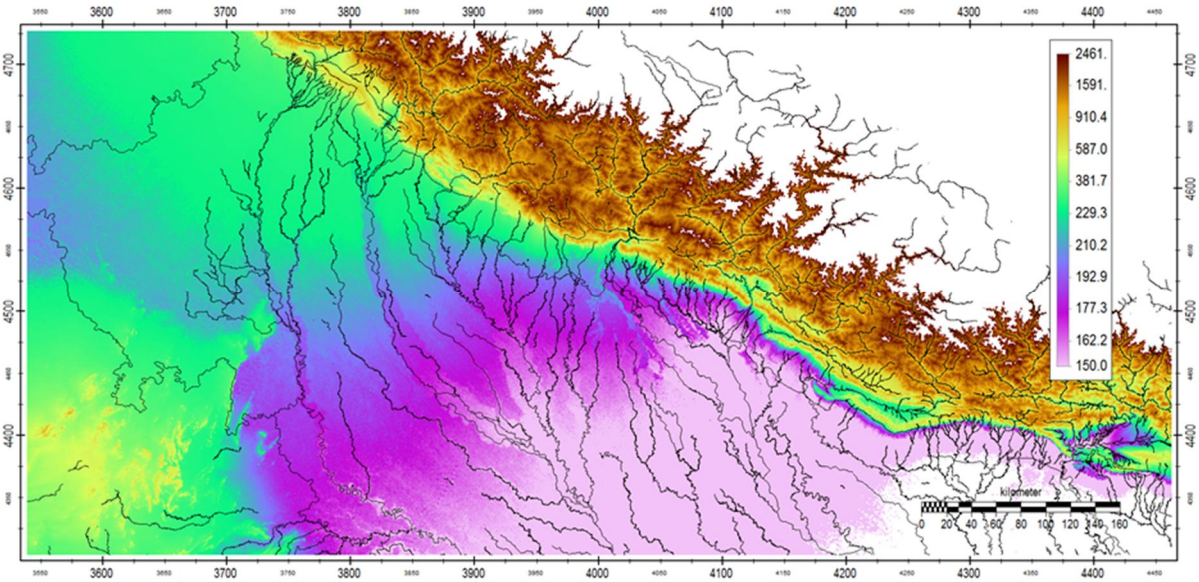


Figure K-4: Elevation and stream distribution showing a dense system streams at the foothills (< 300 meters above sea level) of the Himalaya.

K.3 Ganga River Styles

The River Styles framework (Fluvial Geomorphology Group, 2012) explains the mutual linkages between the river forms and the geomorphic processes within a specific river zone. Attributes at different scales provide a platform to distinguish different types of rivers (Figure K-5). This study could be an additional tool to improve the understanding of groundwater–surface water interaction. The River Styles framework provides a present base line to evaluate the physical status of a river with respect to the geomorphological character: present day condition in terms of geomorphology, flow characteristics and biota. The framework allows for comparison between past conditions and future trends of the river. Following the River Style framework approach is an efficient way to address river restoration and management.

Although mapping is mainly focused on river geomorphology, it can become input for groundwater–surface water interaction analysis. For example, the River Styles units can be used for the design of a groundwater-surface water monitoring network.

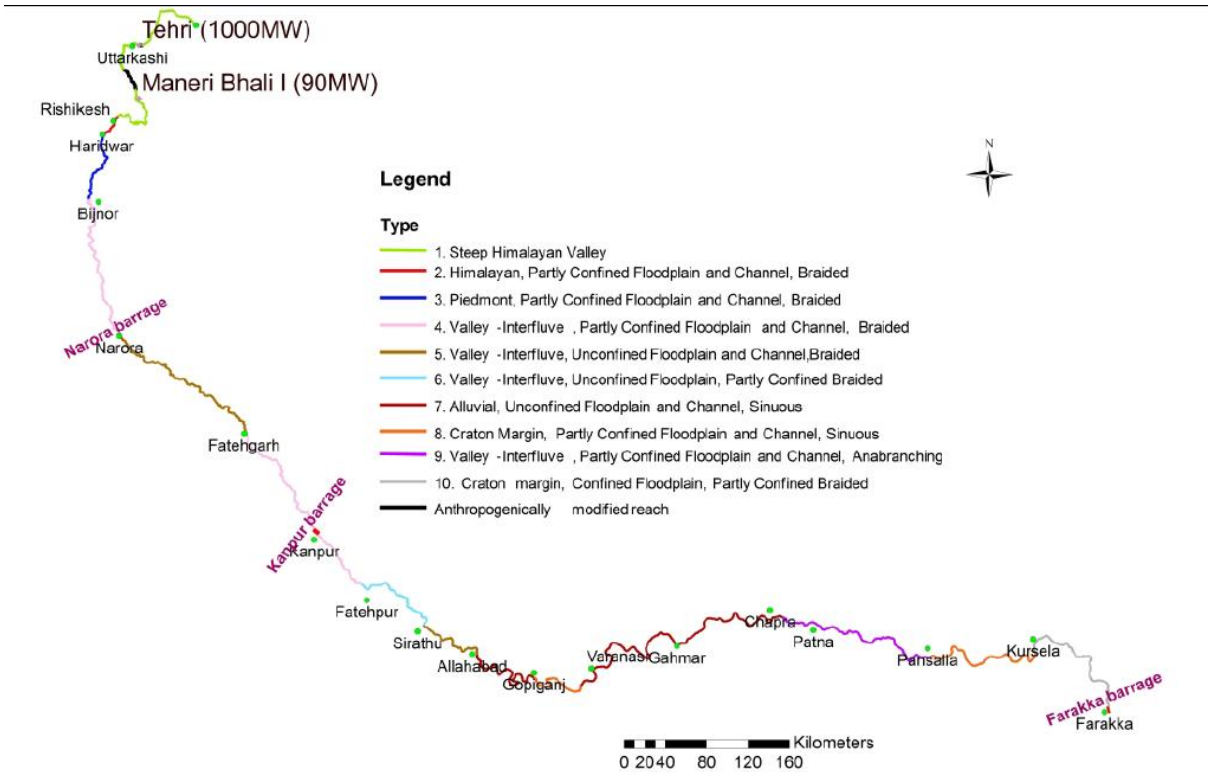


Figure K-5: Distribution of River Styles in Ganga River from Gomukh to Farakka (Fluvial Geomorphology Group, 2012).

K.4 Historical Timeline

Understanding historical interventions provides insight into present water system characteristics and how past negative developments could be restored. Table K-1 graphically illustrates how a basin with abundant clean water deteriorated into a polluted basin with water scarcity in approximately 150 years.

In the past, the river system was subject to fluvial processes and continued deposition of sediments, mainly originating from the Himalaya. These basin-wide sedimentation processes compensated for geological subsidence. The last centuries the sedimentation processes in the floodplains dramatically changed. Based on climate information, the Ganga Plain area was covered mainly with wet shrubs along the streams and forest in the interfluve areas between rivers. The existence of many streams at the interfluves, e.g. between Ganga and Yamuna, suggests that groundwater levels had a bulging distribution. The dense number of streams in the foothill area of the Himalayas suggests regional high groundwater levels and the existence of groundwater discharge areas.

With the reclamation of natural forests and shrubs to agriculture, land use changed, gradually transforming the area into one continuous agricultural area. Rivers were controlled by levees stopping the natural sedimentation around rivers, thus creating higher river levels during peak discharges. In the beginning small local irrigation projects were in use, capturing river water, distributed by small irrigation canals. After the great Agra Famine (1837) the irrigation system was transformed into a massive regional-national scale water distribution system. This system

benefitted agricultural growth and reduced famine disasters. However, these canal projects completely changed the natural groundwater-surface water interaction and reduced water discharge towards the Ganga delta.The next big change in groundwater-surface water interaction occurred when irrigation was “improved” by installing a growing number of groundwater irrigation wells.

Table K-1: Summary of main historic developments.

Period	Basin conditions
Historical times	Mainly forest. Plenty of water. Interfluves with relative high groundwater levels drained by streams. Active sedimentation.
Around 1700	Basin area, including floodplains, already reclaimed into agriculture. Increase of surface water irrigation at local scale.
1794	Still woods and spring zones predominant in Himalaya foothills.
1837-1838	Agra Famine due to calamitous drought event._More than 800,000 people died. Funding for irrigation study.
1854	Opening of Ganges Canal Works creating a completely new groundwater situation. Increased number of levees resulting in sedimentation reduction in Ganga valley;
>1900	Increasing population, increasing water demand.
>1980	Multiple harvest → increased water demand, increased use of fertilizers. Increased number of pumping wells. Growing cities → dropping groundwater levels, subsidence.

K.5 Historical Land Use and Drainage Pattern

The most detailed illustration of the dense drainage system in the Ganga river basin is the 1794 map by James Renel of the East India Company (Figure K-6). At that time most of the plain area was already reclaimed into agriculture land, but the river system was still natural. Note the wide, continuous forest zone at the foothills of the Himalaya, the source area of many streams. These wet conditions in the foothill area most likely result from relatively high groundwater recharge, rain and losing (infiltrating) streams in the higher parts of the hills. Renel’s map only shows a few swamp areas or lakes. The largest lake was near Buckra, the still existing Bakhira Taal in northeastern Uttar Pradesh. Downstream of Agra a large swamp zone existed in the area between the Yamuna and Sumbal rivers. This swamp no longer exists.

K.6 Physical Geography Conclusions

Renel’s map suggests a bulging groundwater level between the main rivers; groundwater levels at the groundwater divides were much higher than river levels. The map depicts a long, wet forest zone at the foothills of the Himalaya Mountains, which was the origin for numerous small streams and rivers. These conditions created a sponge function, resulting in longer time base flow.

Construction of the irrigation canal system completely changed the groundwater system in the Ganga river basin. Before construction, groundwater was recharged by rain and water losing streams and rivers; after construction, canal water loss and irrigation loss became important.

Figure K-6: The historical map of James Renel (1794).

K.7 Geology

The Ganga river basin shows all the major components of a foreland basin system, namely an orogen (the Himalaya), deformed foreland basin deposits adjacent to the orogen (Siwalik Hills), a depositional basin (Ganga Plain) and peripheral cratonic bulge (Bundelkhand Plateau) (Singh, 1996). The latter component possibly originated in the Early Miocene period. The foreland basin had small dimensions with comparatively minor subsidence (France-Lanord et al., 1983). The foreland basin further developed in the Middle Miocene period, after considerable lithosphere flexure and subsidence of the basin. During the Middle Miocene to Middle Pleistocene, deposition of Lower to Upper Siwalik Group, the northern part of the Ganga plain was uplifted and thrust basinward, and the Ganga basin shifted southward (towards the craton) in response to thrust loading in the orogen (Singh, 1996).

Covey (1986) applied the term “under-filled basin” to the Ganga foreland basin at this time, which represents a topographic low between the thrust belt (Himalaya) and the peripheral bulge. The under-filled condition developed due to an efficient transport system for the sediment, which removed the bulk of the sediment to the Ganga delta and Bengal fan. Burbank (1992) suggested that the Ganga foreland basin has been dominated by transverse river systems since the Pliocene due to erosion-driven uplift, symmetric subsidence of the foreland, whereas the Indus foreland basin is dominated by longitudinal river systems due to tectonically driven uplift, asymmetric subsidence of the foreland.

Large Plio-Pleistocene sediment fluxes combined with less asymmetric subsidence and uplift of the proximal foreland led to the progradation of the transverse drainage systems that displaced the Ganga River to the edge of the foreland basin. The present river position is consistent with erosion driven uplift in the adjacent Himalaya. Further, the sediment accumulation rates generally exceeded the subsidence rates of the foreland throughout the history of the Ganga basin.

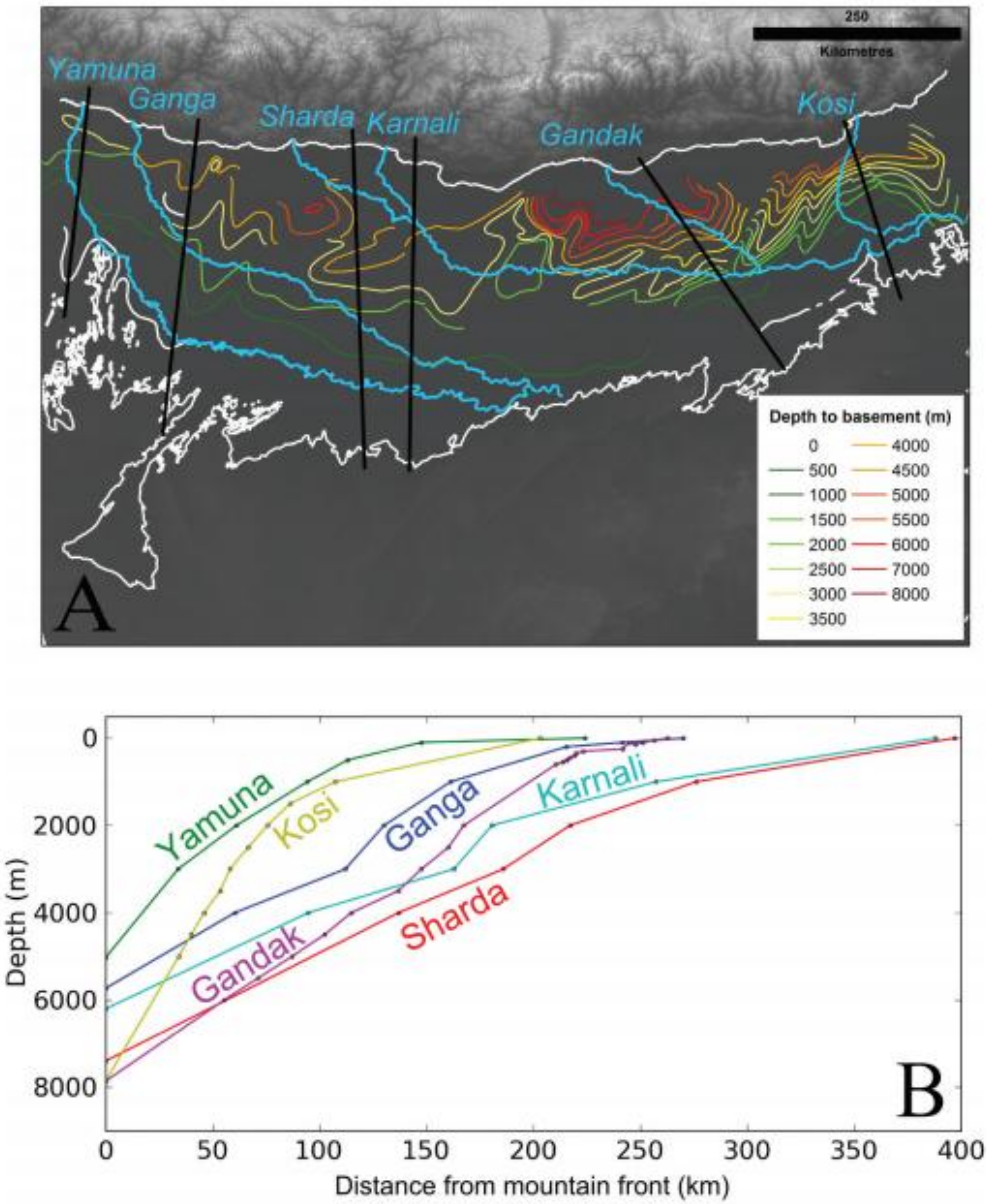


Figure K-7: Depth of basement by Dingle (2016).

K.8 Sub-surface Geology and Tectonic Framework

Geophysical studies in the Ganga river basin have included gravity, seismic and aeromagnetic surveys coupled with some deep drilling carried out by the Oil and Natural Gas Commission for oil exploration. These data have been used to interpret the basement structure and sub-surface geology (Rao, 1973; Sastri et al., 1971; Karunakaran & Ranga Rao, 1979; Raiverman et al., 1983; Lyon-Caen & Molnar, 1985).

The bottom of the Ganga basin is characterized by three subsurface ridges in the metamorphic basement (Figure K-8), i.e. Delhi-Hardwar ridge in the west, Faizabad ridge in the middle, and Monghyr-Saharsa ridge in the east (Rao, 1973; Parkash & Kumar, 1991). There are two important depressions in this area, namely the Gandak and the Sarda deep. The foreland sediments rest on these basement ridges. In the area between the Delhi-Hardwar ridge and the Faizabad ridge, the

sediments rest on Late Proterozoic unmetamorphosed sediments, which are part of the Vindhyan basin in the south and the Krol basin in the north. East of the Monhgyr-Saharsa ridge, the foreland sediments lie on a thick succession of Gondwana rocks. The Ganga basin is traversed by several transverse and oblique subsurface faults (Agarwal, 1977; Dasgupta et al., 1987).

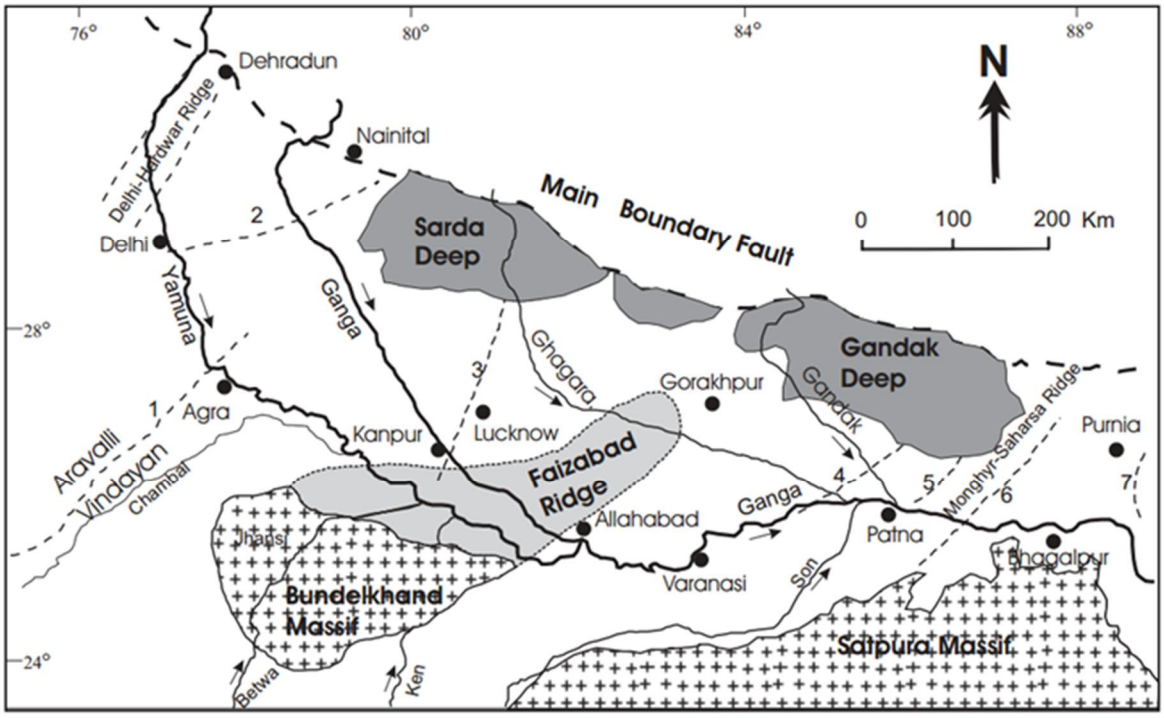


Figure K-8: Subsurface geology and tectonic framework of the upper and middle Ganga basin; numbers indicate the major sub-surface faults identified by geophysical surveys (based on Sinha et al, 2005). 1- Great Boundary Fault, 2- Delhi-Moradabad Fault, 3-Lucknow Fault, 4- west Patna Fault, 5- East Patna Fault, 6-Monghyr-Saharasa Ridge Fault, 7- Malda-Kishanganj Fault.

Seismic data have shown that many of these faults are still active as evidenced by recent seismic activities; major earthquakes occurred in 1833, 1906, 1934 and 1987, and the possibility exists of large earthquakes in the near future (Bilham, 1995; Bilham et al., 2001).

K.9 Stratigraphy

The (bedrock) basement in the Ganga basin is at many locations extremely deep, sometimes more than 6000-8000 meters. Figure K-7 presents these basement depth characteristics (Dingle, 2016). The Ganga plain occupies a central position in the extensive alluvial plain of the Ganga, Indus and Brahmaputra. It formed after the collision of Indian and Asian plates. The basin has different depositional phases which are tabulated in Table K-2.

The basin is underlain by the basement of different igneous and metamorphic rocks of pre-Tertiary period varying from Precambrian to tertiary (Figure K-9). The basement is overlain by the varying size alluvial sediments, from boulder to clay.

Singh (1996) constructed several sections presenting these basin characteristics (Figure K-9). The sections show again the very deep basement in the north, which rises towards the southern craton. Present-day hydrogeological studies mostly consider the area between surface level and about 200 m below the surface. Only a few studies present information of the deeper hydrogeology up

to 700 m. There is little knowledge about the hydrogeologic characteristics of the very deep and very thick layer of Proterozoic sediments below the alluvial deposits.

Table K-2: General stratigraphy of the Ganga basin.

Period	Formation	Lithology	Age
Quaternary (Pleistocecne-Rececnt)	Alluvium	Sand of various grade, clays & kankar	Recent
	Terai/Sirowal	Alternate bands of Sand and Clay	
	Bhabhar/Kandi	Bolder, pebble, sand & thin clays intercalation	
---------- Disconformity ----------			
Tertiary	Upper Siwalik	Greywaeke & conglomarates	Lower Pleistocene to Lower Pliocene
	Middle Siwalik	Shale sand & greywaeke	Lower Pliocene to upper miocene
Pre-tertiary rocks			

Singh (1996) produced a better understanding of the shallow (100 m) lithology. In a generalized cross-section between Himalaya and the southern craton the rather chaotic built-up in course and fine sediment layers is presented. Not only does the Piedmont Fan area (Bhabar and Terai) seem to have a hydro-geological build-up supporting recharge of deeper aquifers but also depositional structures at the craton-side of the plain benefit recharge of deeper layers (Figure K-10 and Figure K-11).

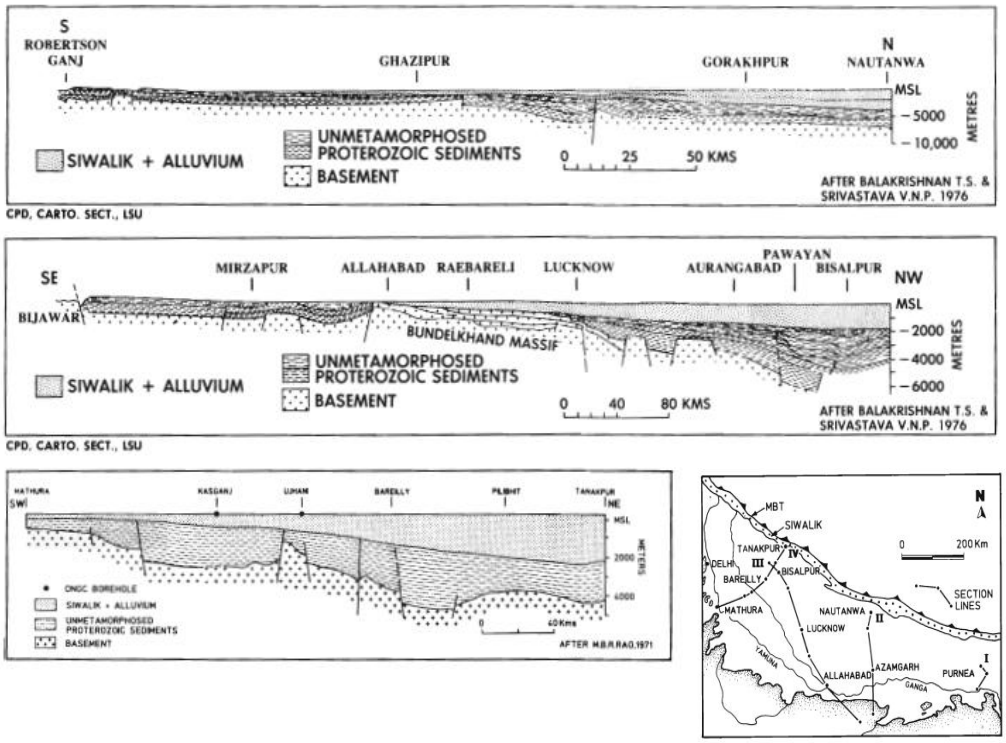


Figure K-9: Main sediment geology in cross-sections (Singh, 1996).

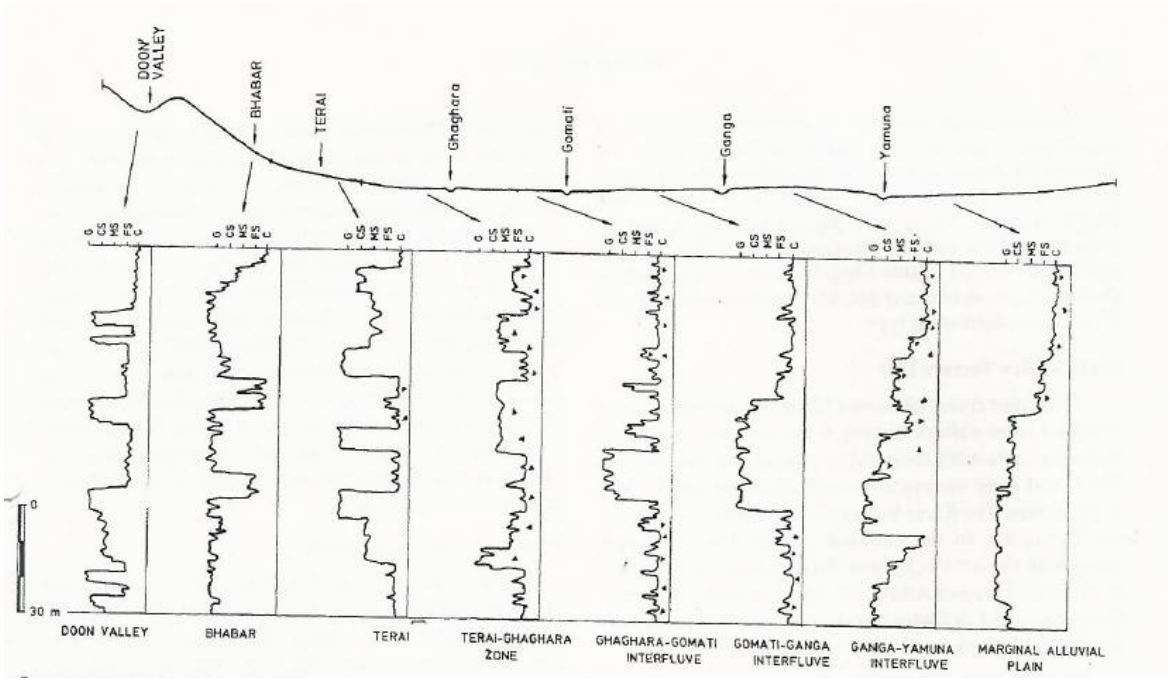


Figure K-10: Generalized lithology of subsurface across Ganga plain, depicted as idealized 100 m thick vertical succession (Singh, 1996). G=gravel, CS= coarse sand, MS = Medium sand, FS = Fine sand, C = Clay. This figure presents the very heterogeneous vertical distribution of permeable and impermeable sediments.

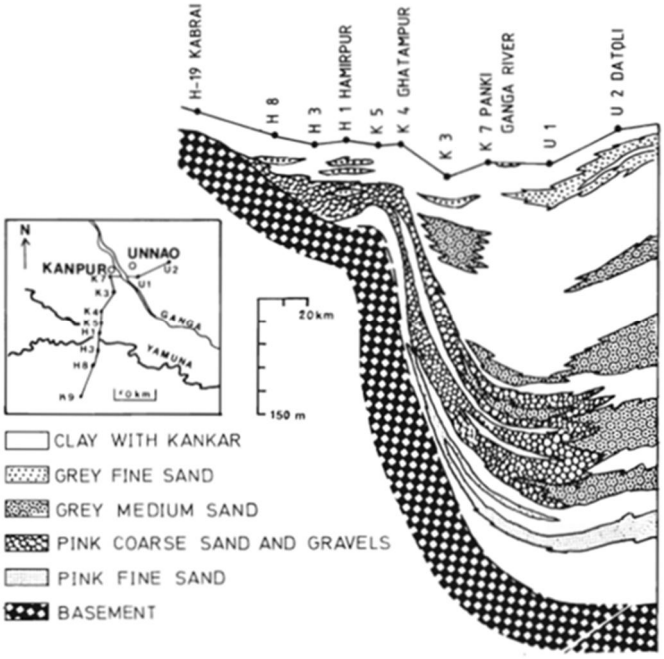


Figure K-11: Subsurface stratigraphy of the southern part of the Ganga plain showing on lap of Himalayan derived sediments over craton derived sediments (Singh, 1996).

Knowledge of the shallow alluvium is gradually improving. Van Dijk et al., (2016) schematized the Mega-fan alluvium in the northwestern part of the basin with a system of coarse channel deposits in a matrix of fine sediments making use of geo-statistical calculations (Figure K-12). On both sides of the Ganga plain a complex hydro-geological build-up exists, potentially of great importance for the recharge of deep aquifers.

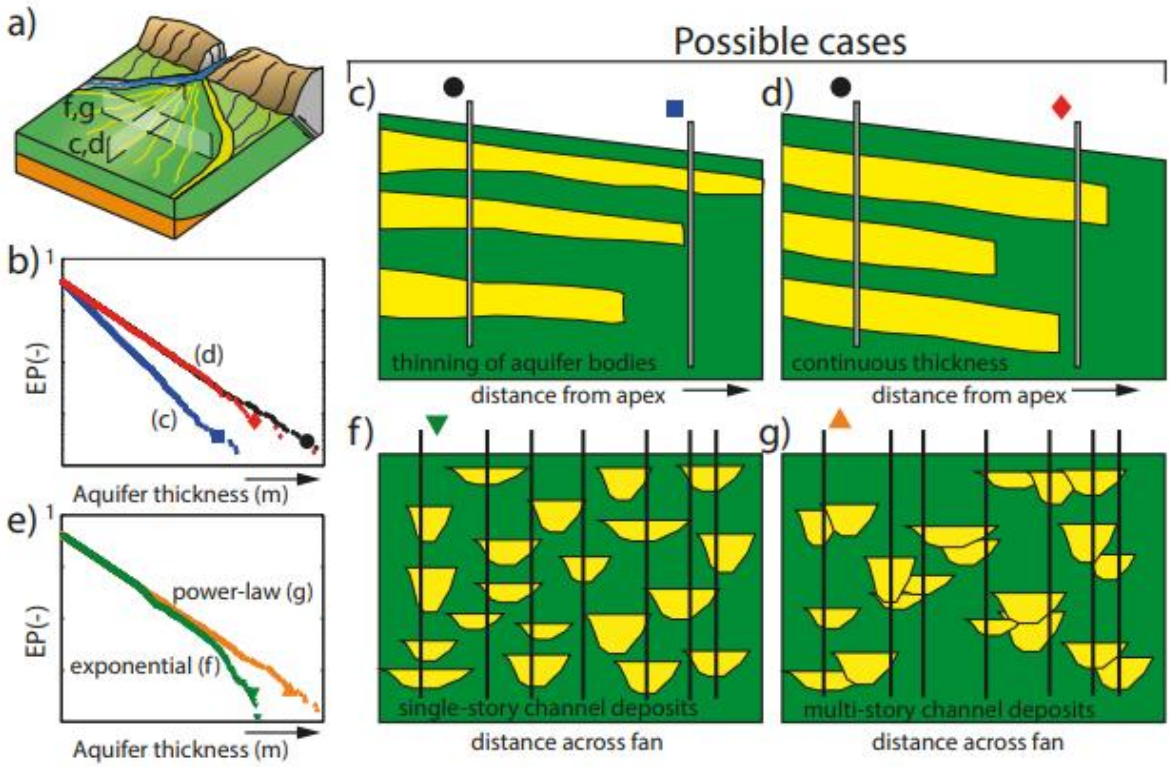


Figure K-12: Links between statistical aquifer body thickness distributions and the overall fan stratigraphy and cross-sectional geometry near Yamuna Mega fan (van Dijk et al, 2016). EP is hypothetical exceedance probability curves for aquifer body thickness showing potential variations in the down fan direction.

K.10 Geomorphology

The Ganga basin geomorphology is very well presented by Shukla (2001) (Figure 3.7). This map provides basic information for understanding the groundwater systems. The higher Piedmont Fan (PF), small fans surface with relative coarse sediments, can act as a potential regional recharge area fed by local rain water and by water losing streams which drain the adjacent northern Himalaya. The megafans represent important potential, relatively high, recharge areas. This geomorphological and hydrogeological situation is also visualized by Singh in Figure 3.8. This figure shows interfingering of very course sediment layers from the Piedmont Fan and the craton area into the Ganga plain alluvial deposits. This pattern has important potential for the recharge of the Ganga basin.

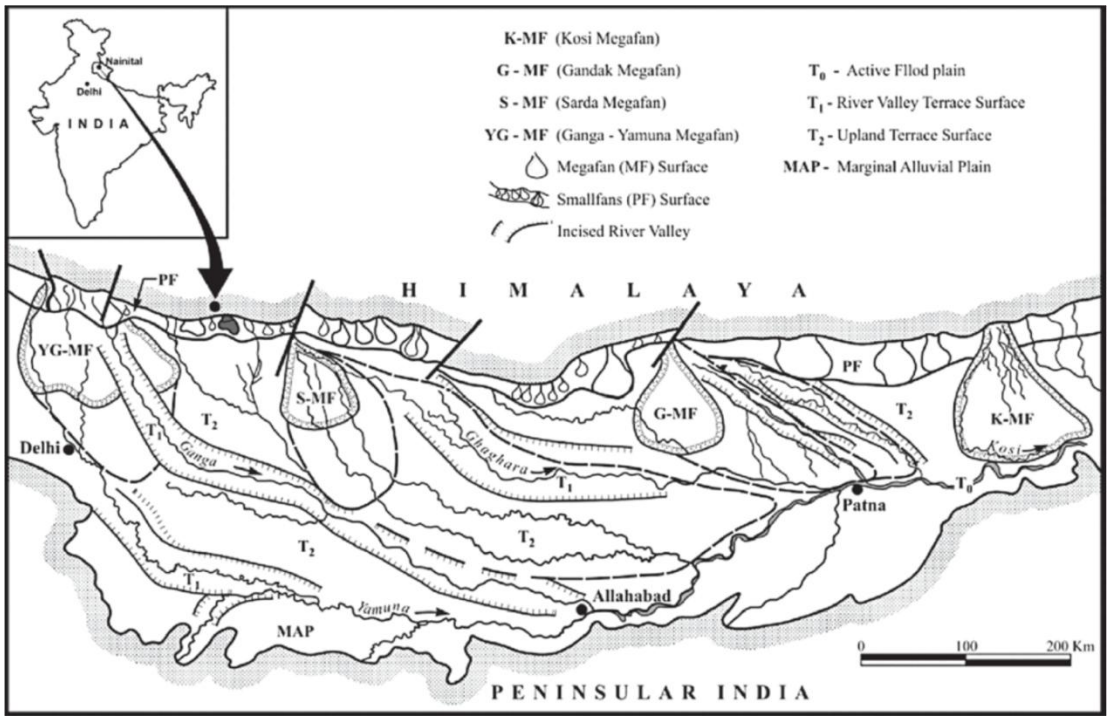


Figure K-13: The geomorphology map of the Ganga basin by Shukla (2001).

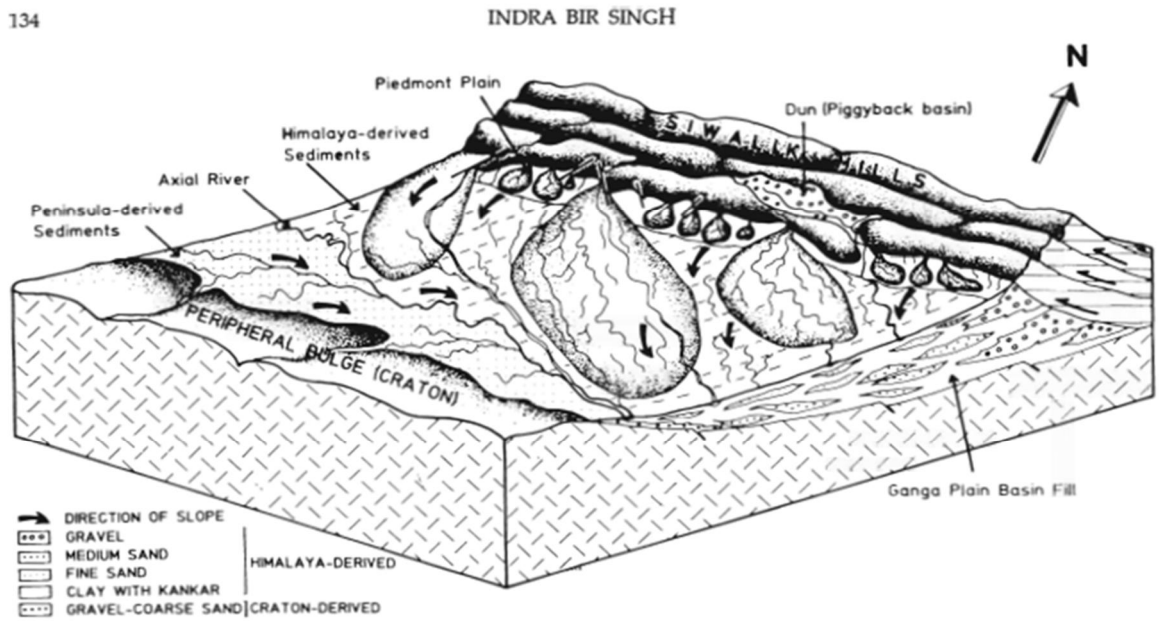


Figure K-14: A 3-dimensional view of the geomorphology and related hydrogeology of the Ganga river basin (Singh, 1996).

K.11 Hydrogeology

K.11.1 Pre-tertiary Rocks:

Most of the southern part of the Ganga basin is occupied by rocks of mainly igneous metamorphic type with many intrusives: granite, basalt, charnockite, khondalite, shale, schist, and sandstone. Similar kinds of rocks are present in the northern most part of the basin in and around the region of Gangotri, Shimla, Dehradun. These hard rocks have relatively low permeabilities.

K.11.2 Hydrogeology of the Quaternary Regions:

The hydrogeology of the Ganga basin has been discussed in different ways. The British Geological Survey identified seven major typological units across the Indo-Gangetic basin (Figure K-15).

Most of the region is covered with terraces or channel alluvium. There is variation in the lithology of the quaternary subsurface of the basin based on variation in the different aquifer material, the basin is divided into three types:

- Bhabhar/Kandi belt;
- Terai/Sirowal belt;
- Recent alluvium deposits.

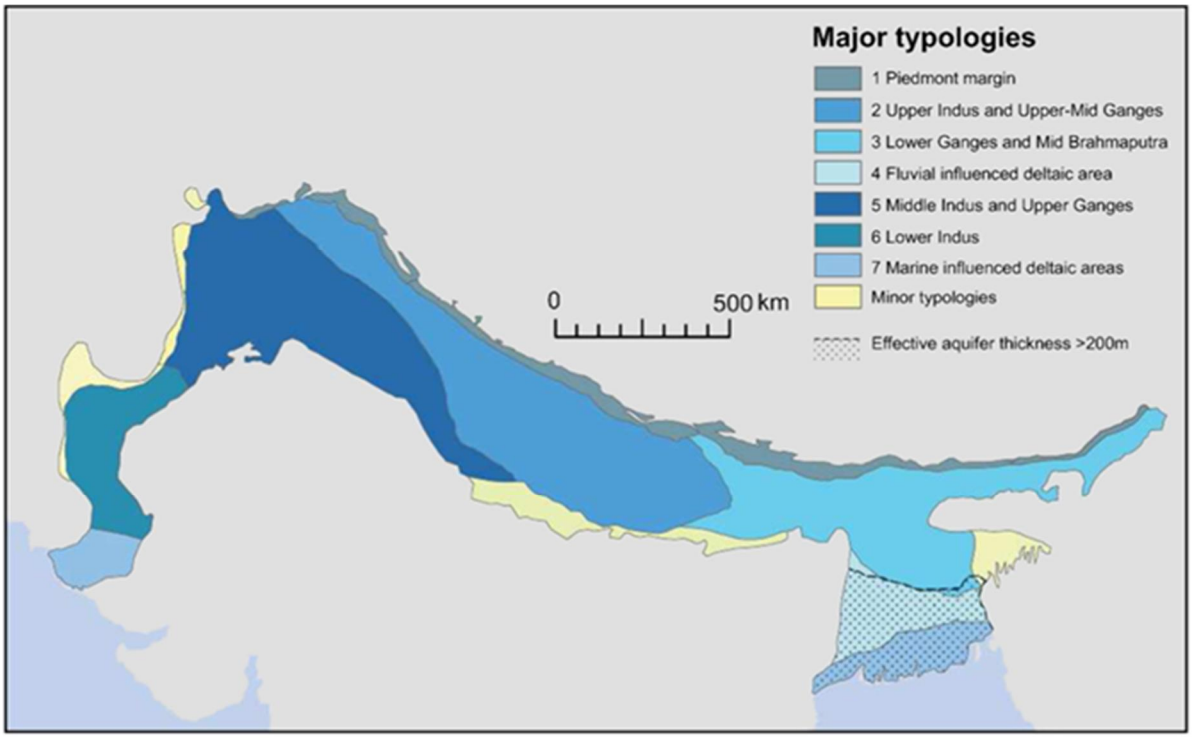


Figure K-15: Major typologies in the Indo-Gangetic basin (Source: BGS; Bonsor et al., 2017).

Bhabhar/Kandi belt

Bhabhar is also known as Kandi belt. This Piedmont alluvial fan area is the main groundwater intake area along the foot hills of Siwalik in the northwest to southeast direction (blue shaded area in Figure 3.10). Its lithology is of unconsolidated poorly sorted material comprising grains of the size of boulders to clay. These sediments are deposited in the form of alluvial fans. (Day 1971; Singhal et al., 2010).

The belt varies in width from 10 to 30 km along the foothills from Uttar Pradesh to West Bengal. The hydraulic conductivity may vary between 56 m/day and 825 m/day sustaining a groundwater yield of 5,540 L/min.

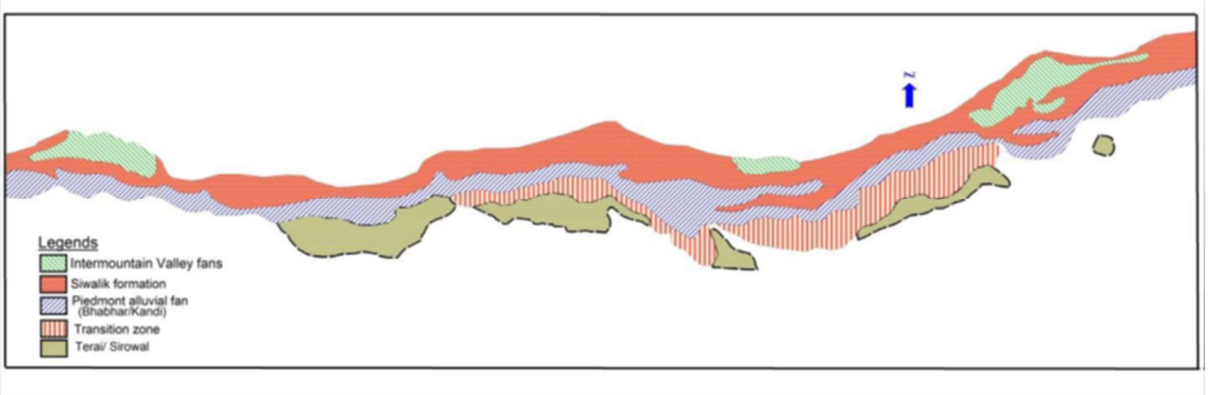


Figure K-16: Geological map of Haridwar district, Uttrakhand.

Terai/Sirowal belt

The Terai zone is also known as Sirowal belt. It lies to the south of the Bhabhar/Kandi belt and is demarcated by the spring line, where plenty of water logged areas are common during the monsoon period. The zone is of variable width of 8 to 16 kilometers. The lithology is mainly dominated by clay and silt with the presence of horizons of well sorted grains ranging from sand to boulders.

The Sirowal belt has both an unconfined and confined aquifer. The confined aquifer is found below 50 m depth with higher artesian head, where water is tapped by tightly cased tubewells. The mainly phreatic aquifers in the Sirowal belt have a hydraulic conductivity in the range between 17 and 108 meter per day and have a capacity to yield up to 3,100 L/min.

Recent alluvium deposits

The alluvial deposits in the Ganga Basin are characterized by low relief. The alluvial plain occupies the area south of the Terai/Sirowal belts and can further be divided in two sub units, younger alluvium and older alluvium. The younger alluvium occurs mostly along the present floodplain area. The older alluvium occupies comparatively higher areas and covers the major part of the plain. A typical characteristic of older alluvium is the formation of calcareous nodules or beds ‘kankar’ due to leaching of calcium carbonate under favorable climatic conditions.

Vertically four major aquifers are identified in the zone to 700 meter depth. Sinha (2015) summarized these aquifers for the Lucknow area (Table K-3). The yield of tube wells ranges from 90 to 200 m^3/hr.

Table K-3: Description of Aquifer at Lucknow (Sinha, 2015).

Aquifer Group	Depth Range (mbgl)	Discharge Potential (lpm)	Draw Down (m)	Transmissivity (T) (m^2/day)	Hydraulic Conductivity (K) (m/day)	Storativity	Quality
I	WL-155	1100-1500	4-10	250-1050	1.8-7.6	$4.2x10^{-4}$	Good
II	160-240	300-600	23-31	40-70	1.2-1.7	-	Inferior/ Saline
III	260-370	1000-1500	25-33	140-160	3.0-4.0	-	Good
IV	380-485/680	1400-1600	18-33	140-280	2.0-3.0	$3.65x10^{-3}$	Good

The CGWB–UttarPradesh Ganga basin atlas presents valuable information on the lithological variation from the Siwalik rocks to the Centre of the Ganga Basin (Figure K-17 to Figure K-19). In the north there are thick granular horizons comprised of coarse grained sands, gravels and boulders within the Bhabhar zone. The thickness diminishes towards the south and there is an increase in the content of clay minerals. In the Nainital district, the granular zones are not extensive, and they are interconnected with the upper and lower zones. However, in Bareilly district four to five granular zones can be demarcated to 750 m depth, but the thickness reduces appreciably towards the south as evident in the Pachomi borehole.

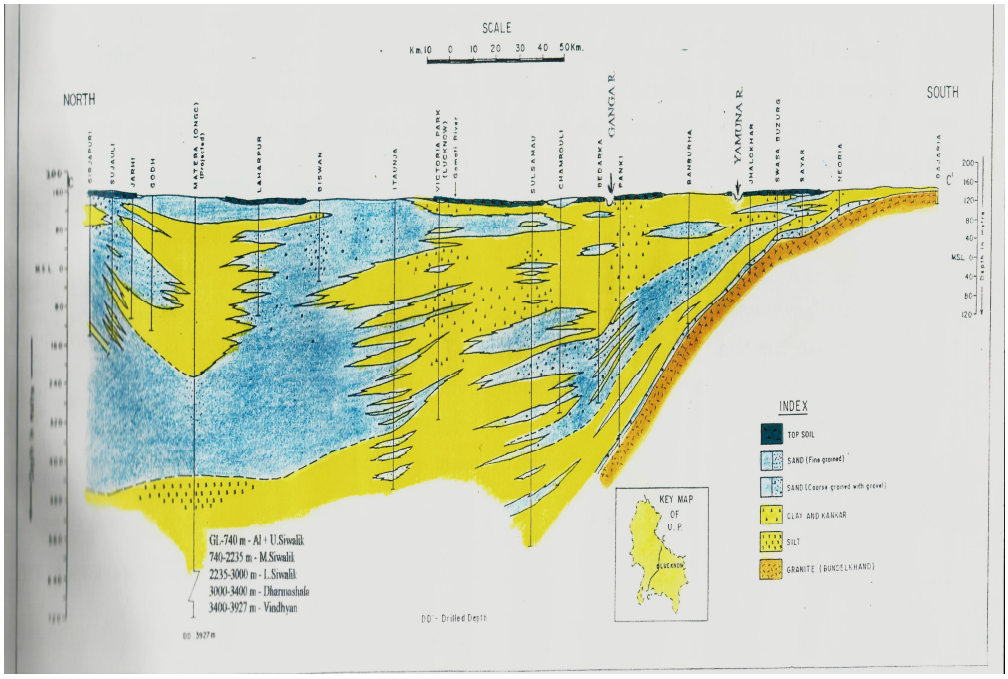


Figure K-17: Sub-surface cross section along Girjapuri and Bajaria. Blue=sand, yellow=clay. (CGWB–Uttar Pradesh Ganga basin atlas).

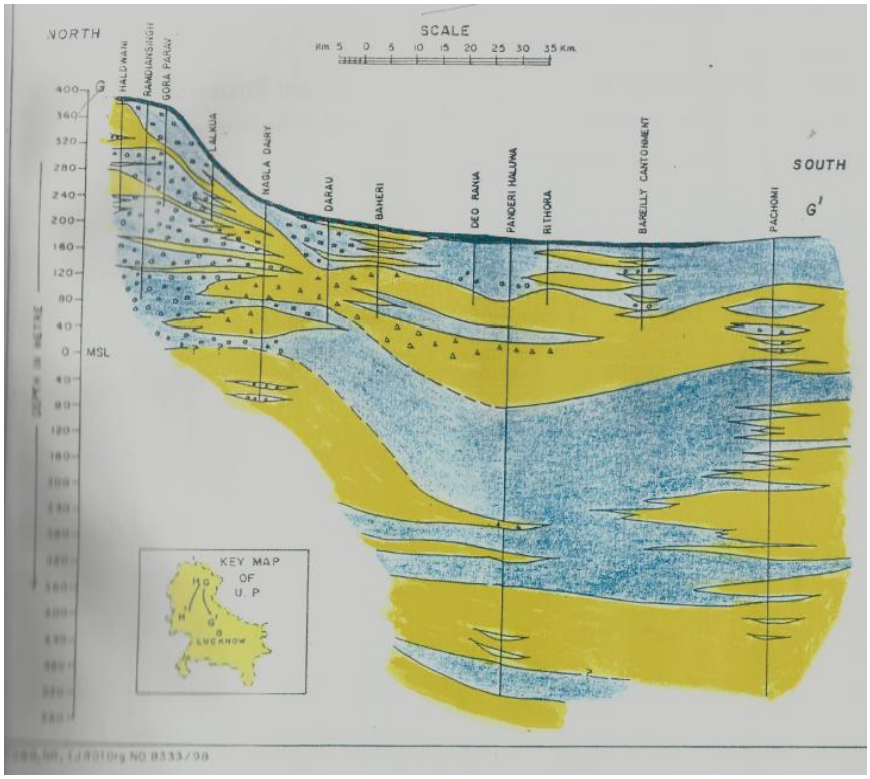


Figure K-18: Subsurface cross section along Haldwani and Pachomi. Blue=sand, yellow=clay. (CGWB–UttarPradesh Ganga basin atlas).

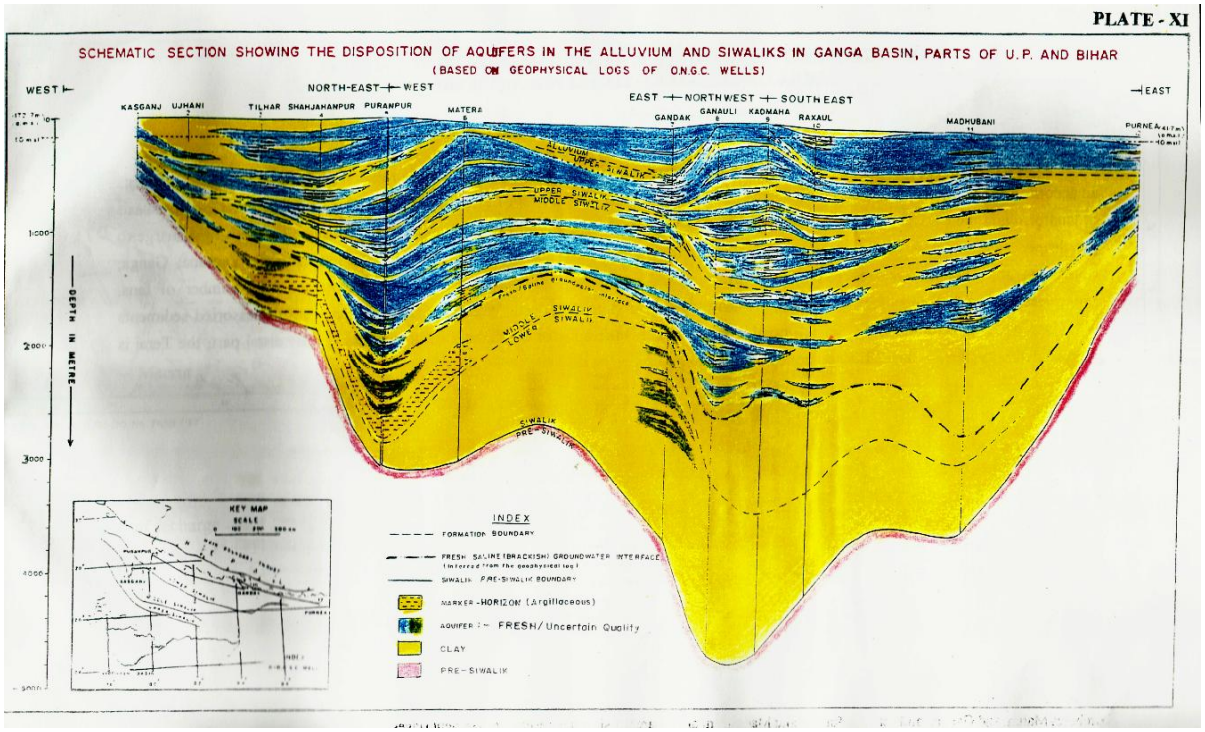


Figure K-19: Schematic section showing the deposition of aquifers in the alluvium and siwaliks in the Ganga river basin. Blue=sand, yellow=clay. (CGWB–Uttar Pradesh Ganga basin atlas).

L Subsidence

L.1 Introduction

Little is known about groundwater related subsidence processes in the Indian part of the Ganga Basin. No large-scale studies are available; several local studies, mainly by universities, indicate that subsidence cannot be ignored. Subsidence can have many drivers, some natural, but more often, man-made (Figure L-1). Natural, geological subsidence, “earth crust dynamics”, causes a continuous subsiding Ganga river basin. In the past this subsidence was partly compensated by river sedimentation processes. This process ended after levee construction. There are several examples of local subsidence caused by groundwater pumping, but a regional study is lacking.

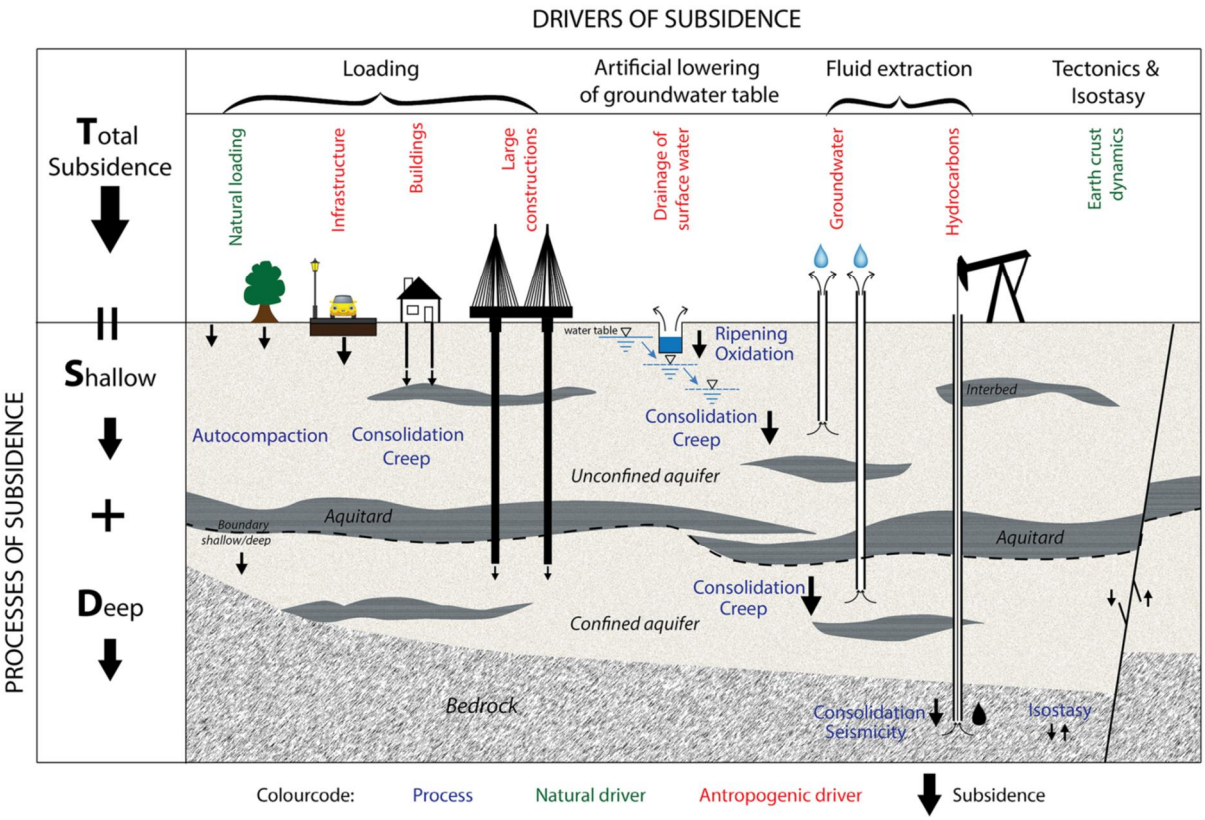


Figure L-1: Schematization of the main subsidence drivers and processes within the upper (phreatic) aquifer and deeper (confined) aquifer(s). Natural and anthropogenic drivers are distinguished. The subsidence balance equation is given on the left side, being the total sum of all shallow and deep subsidence rates (Minderhoud et al., 2015).

L.2 Natural Geological Subsidence and Subsidence by Groundwater Pumping

Geological subsidence was studied to better understand the river morphology (Dingle, 2016). The basin shows a low natural subsidence rate in the southwestern part of the river system and relative high subsidence in the northern Himalaya foothill area.

In Delhi, as well as in Lucknow, subsidence is becoming a serious threat. A few local studies in New Delhi prove that groundwater pumping is actively causing subsidence due to aquifer compaction in this urban area (Figure L-2). Using satellite data (Interferometric Synthetic Aperture Radar (InSAR) which allow generation of digital elevation models and measurement of millimetre surface deformations of the terrain). the subsidence velocity in Dwarka neighbourhood was

estimated at approximately 4.4 cm/year, of which 0.5 cm/year is considered elastic, reversible, and 3.9 cm/year is considered inelastic, irreversible.

Location	Average Piezometric decline (m/year)	Thickness of the aquifer	Thicknes s of the confining layers Due to capillary rise (meters)	Elastic Compaction of the aquifer cm/year (Min-Max)	Inelastic Compaction cm/year (Min-Max)	Total Compaction Cm/year (Min-Max)
Dwaraka (Well 1)	1.7	15.2	18.2	0.5 (0.32-1.58)	3.9 (3.30-4.58)	4.4 (3.62-6.16)
Gurgaon (Well 2)	0.7	15	21	0.5 (0.39-0.81)	2.9 (2.42-3.37)	2.1 (2.81-4.18)

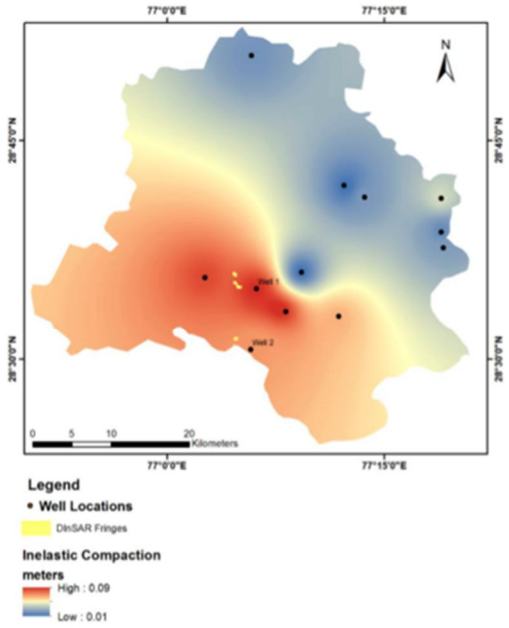


Figure L-2: Results of land subsidence in the Delhi metropolitan area. The Dwarka map left shows area with considerable irreversible subsidence (Kala, Sumi, 2015).

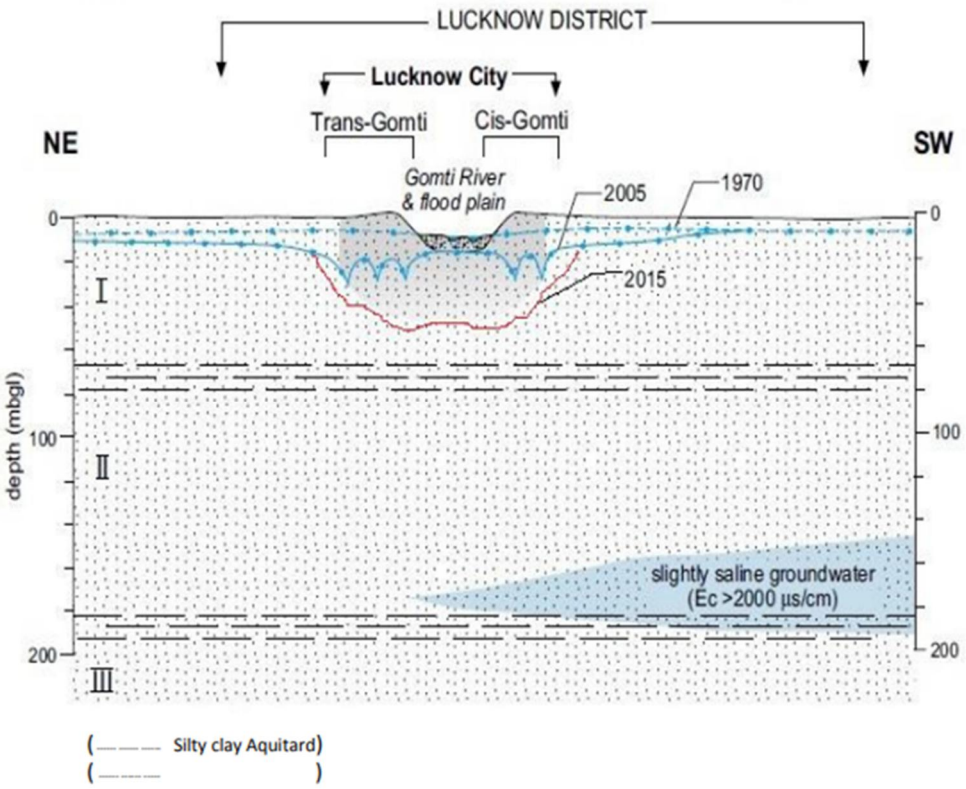


Figure L-3: Hydrogeological cross-section of Lucknow district (Sinha et al., 2015).

In Lucknow land subsidence has already alarmed the newspapers and is being studied by the Central Groundwater Board. Because of increased groundwater pumping, groundwater levels dropped more than 40 meters, creating subsidence. The CGWB predicts a deteriorating situation for the near future. Land subsidence makes cities vulnerable to urban flooding: (1) local depressions develop and rain water cannot be drained, (2) subsidence causes levees to drop thus making urban areas more vulnerable to breaking levees or overtopping disasters and (3) groundwater flooding because of temporal high river water levels or structural impediments.

Figure L-3 presents a hydrogeological cross-section of the changing groundwater situation in and around Lucknow. Around 1970 the groundwater levels were relatively similar to the river water levels. Because of pumping, the groundwater levels gradually decreased to alarming depths, causing surface subsidence. Although subsidence causing processes have not been researched, subsidence may be related to ripening and oxidation of shallow organic layers, and also to dewatering of deeper clay layers.

L.3 Cracking Soils

Recently, land splitting (Figure L-4) in Uttar Pradesh created panic (Chillymanjaro in The Watchers, 2011). It was first suggested that this phenomenon was related to fault movements in the hard rock basement and not related to groundwater pumping.

Figure L-4: Image of cracked soil in Uttar Pradesh (The Watchers, 2011).

Further study of these ground fissures proved they were related to underground water erosion (Srivastava, 2009; Gaur, 2015). The fissures are developed on Alluvium comprising silty clay with clay and kankar layers and occurred when sudden heavy rainfall occurred after several drought years. Depending on soil type, lowered river and groundwater levels, a subsurface system of piping developed, which later collapsed. Because most of the cracks were found near river banks, a relation with river sand mining is possible.

L.4 Conclusions

Geological subsidence is studied by geologists and geomorphologists and is fairly well understood. Subsidence from groundwater pumping in Delhi and Lucknow results in serious subsidence velocities. Minimal information is available on subsidence from pumping in other cities and in agriculture areas.

Little information exists on subsidence caused by (surface water: ditches, canals) drainage of shallow groundwater. Some incidents of cracking and swelling soils have been reported.

M Methods to Improve Groundwater Recharge

Many opportunities exist to collect and store storm drainage water. Ten ideas are summarized in Table M-1.

Table M-1: Methods to improve groundwater recharge.

1	Collect & infiltrate local rainfall from buildings, streets & rice paddy's	a. Dry wells, b. Recharge basins, c. Rice system
2	Improved rainfall harvesting ponds	a. improved design b. Adding infiltration wells
3	Water reservoir optimalization	a. Increasing water level b. Adding infiltration wells
4	Retain intermittent stream water	a. Adding small dams or weirs b. Divert into infiltration depressions c. Increase stream bottom elevation
5	Harvest monsoon river water	a. Divert into infiltration basins b. Add IT-drains
6	Reduce groundwater drainage	a. Increase bottom elevation b. Install vertical underground dams
7	Collect Piedmont area drainage water & infiltrate in alluvium area	a. Divert water into infiltration basins along the Piedmont – alluvium border
8	Reduce evaporation Infiltration areas	a. Improve land use (planning)
9	Infiltration by IT-drains	a. Rain water b. Pond, Reservoir or River water
10	Re-use waste water	

These methods are further visualized in Figure M-1 and Figure M-2 (Stuurman, 2018).

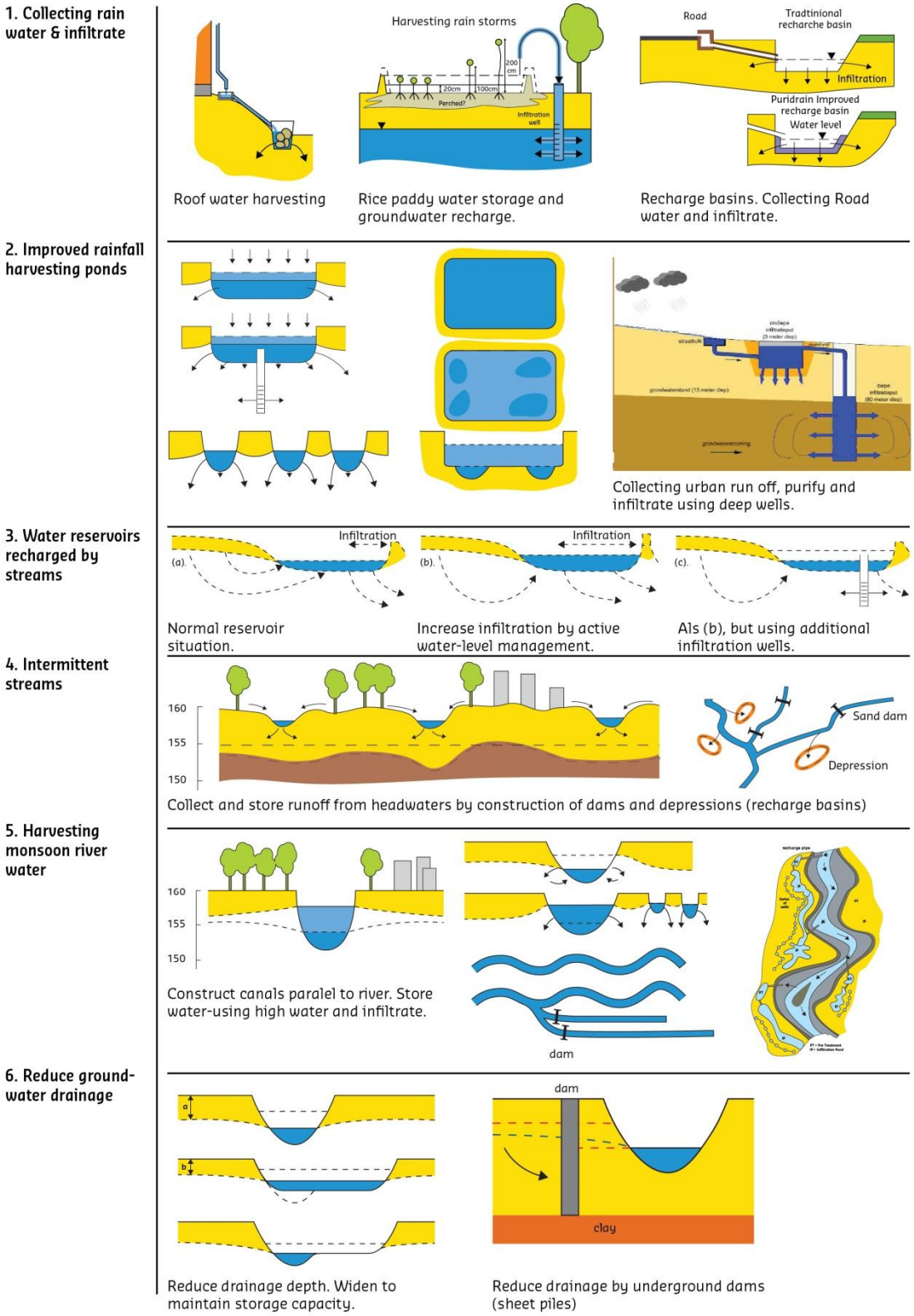
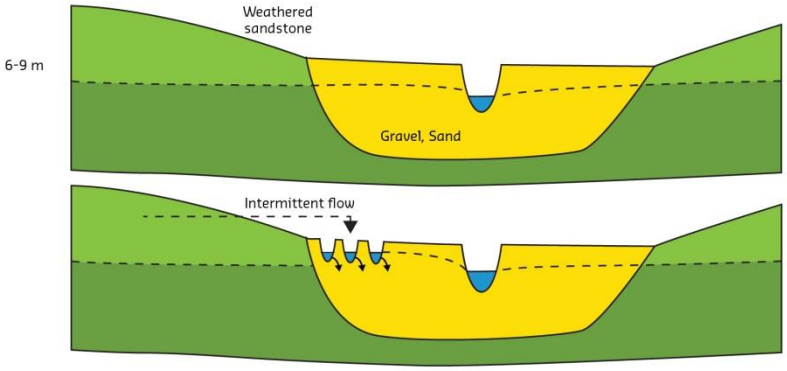


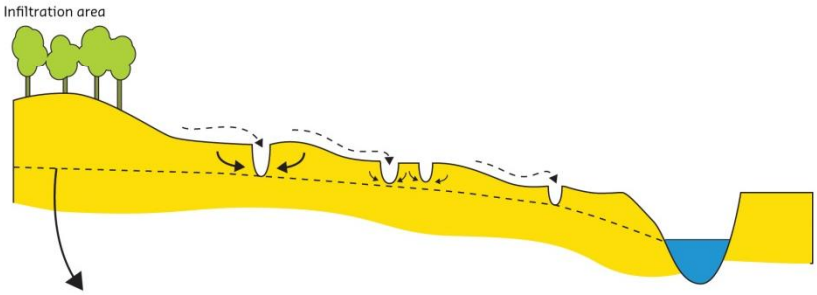
Figure M-1: visualization of water storage opportunities 1-6.

7. Collect "hill area storm drainage water"



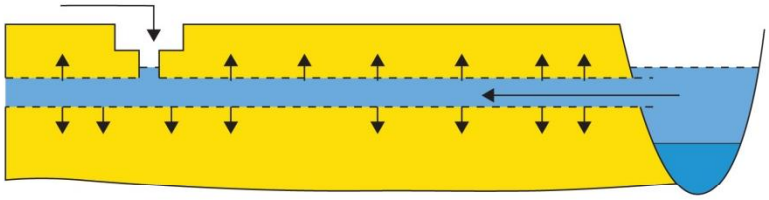
Collect, store and infiltrate hill slope water.

8. Reduce evaporation in infiltration areas



Take in account land use evapotransporation characteristics at infiltration area.

9. Infiltrate using IT drains



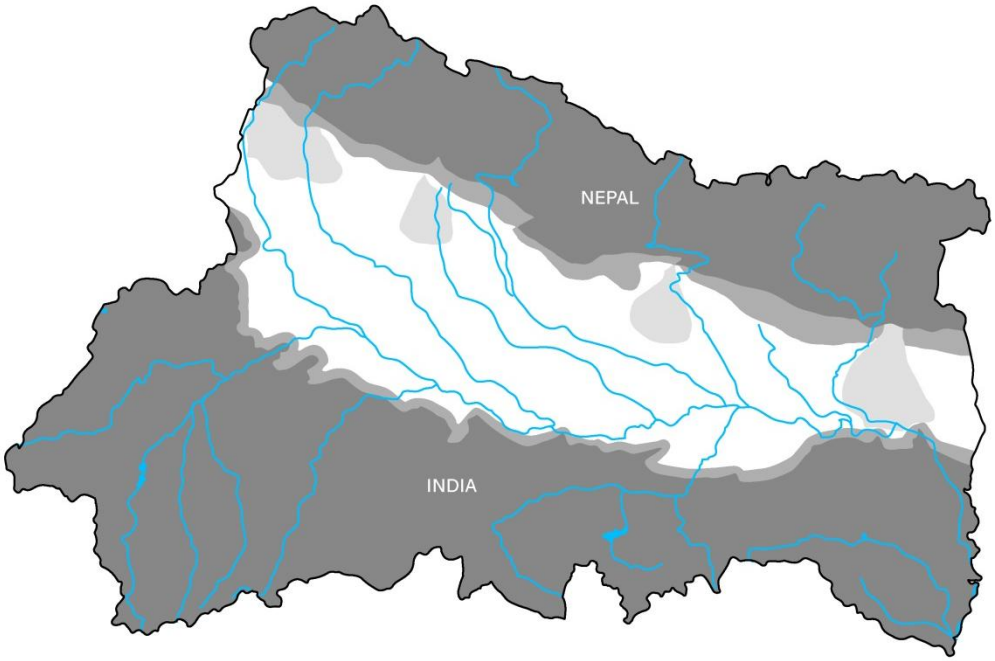
Capture peak flows by horizontal infiltration.

10. Re-use & infiltrate treated wastewater

Waste water is a resource. Treatment need to be adapted to users needs. For irrigation, keep nutrients.

Figure M-2: Visualization of water storage opportunities 7–10.

N Groundwater Management Unit Maps



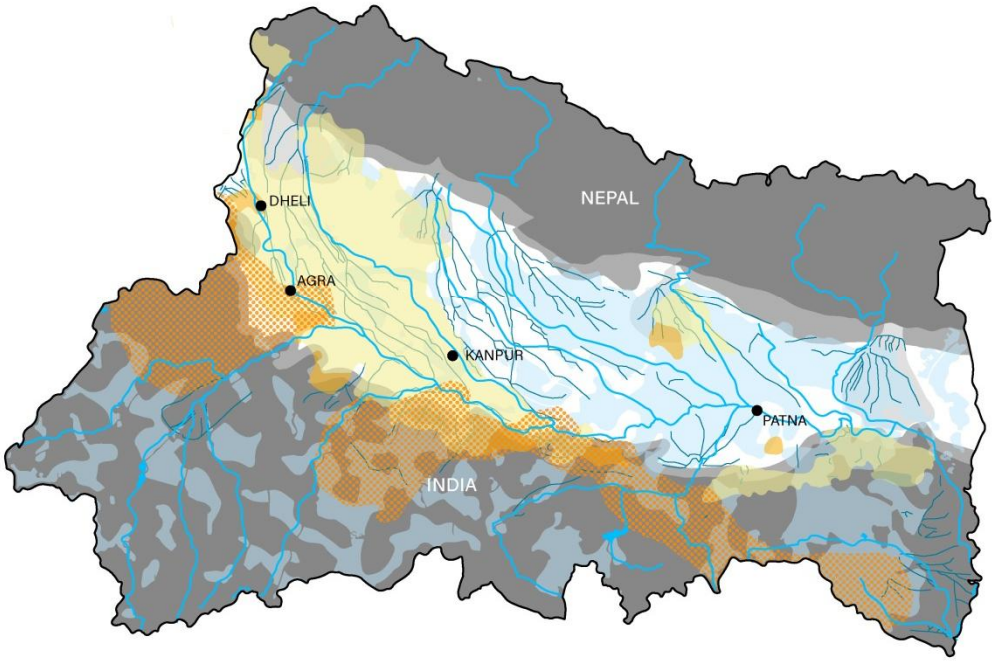
LEGEND

Geomorphological units:

- 1 Alluvial valley + 2 Deep alluvial plain (>200m below surface level)
- 3+5 Piedmont fan & southern marginal alluvial plain
- 4 Mega fan
- 6 Himalaya & Peninsular units

- Main rivers
- Irrigation canals
- International limit
- Ganges River basin

Figure N-1:Tthe geomorphological basis of the groundwater units.



LEGEND

Geomorphological units:
- Himalaya & Peninsular units
- Piedmont fan & southern marginal alluvial plain
- Mega fan
- Alluvial valley

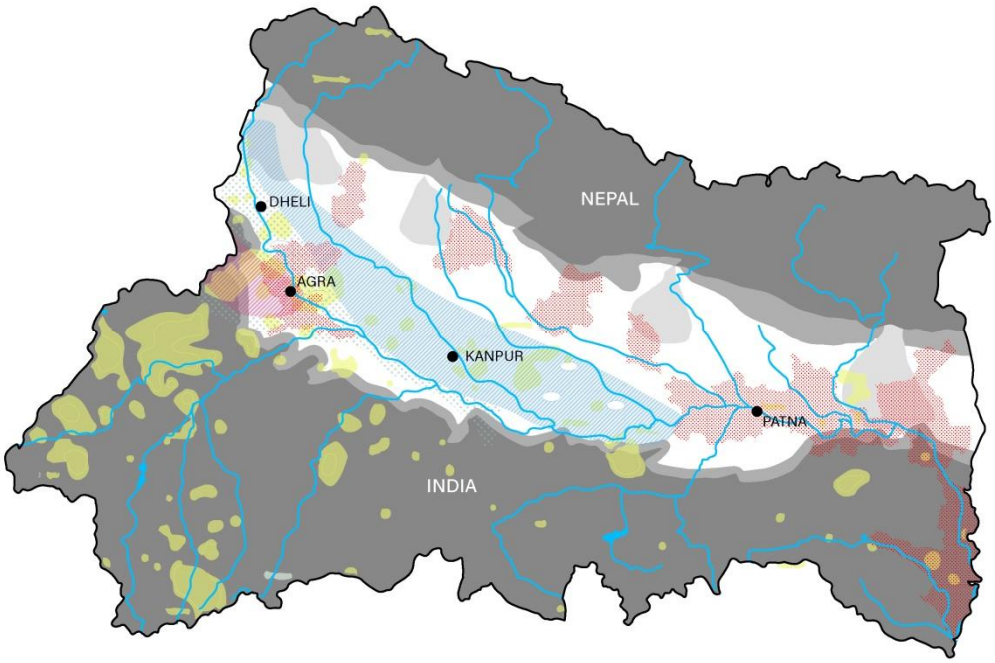
- Main rivers
- International limit
- Ganges River basin

Drought:
- Drought prone area

Water table trend 2002-2012 (Mac Donald, 2017)
- -25 to -50 cm/year
- -75 to -25 cm/year

Water logging:
- Water logging area
- Irrigation canals

Figure N-2: Geomorphology combined with locations of quantitative groundwater stress issues.



LEGEND

Geomorphological units:
- Himalaya & Peninsular units
- Piedmont fan & southern marginal alluvial plain
- Mega fan
- Alluvial valley

- Main rivers
- International limit
- Ganges River basin

Presence of Fluoride*:
- > 1mg/l

*Remaining areas < 1mg/l

Salinity:
- Fresh water underlain by Saline ground water
- Saline groundwater at all levels except local Fresh water pockets
- Saline water overlain and underlain by Fresh ground water
- Local Saline water pockets

Presence of arsenic**:
- > 0.05mg/l (above permisible limit)

**Remaining areas <0.05mg/l

Figure N-3: Geomorphology combined with locations of qualitative stress issues.

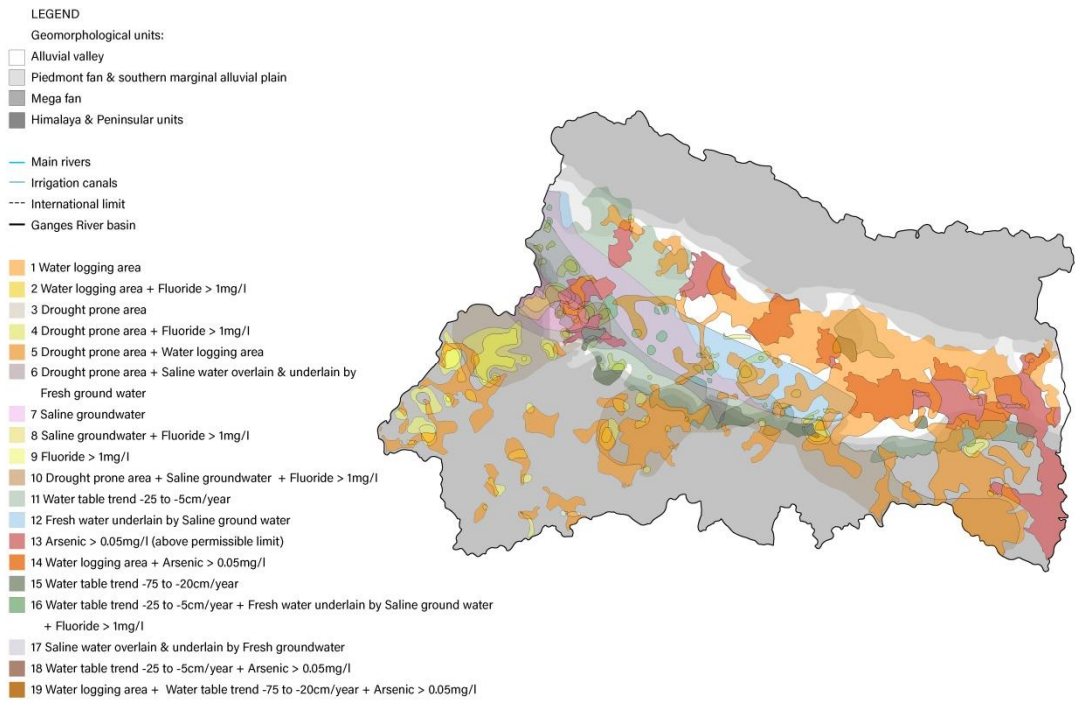


Figure N-4: Combination map of detailed water management units.

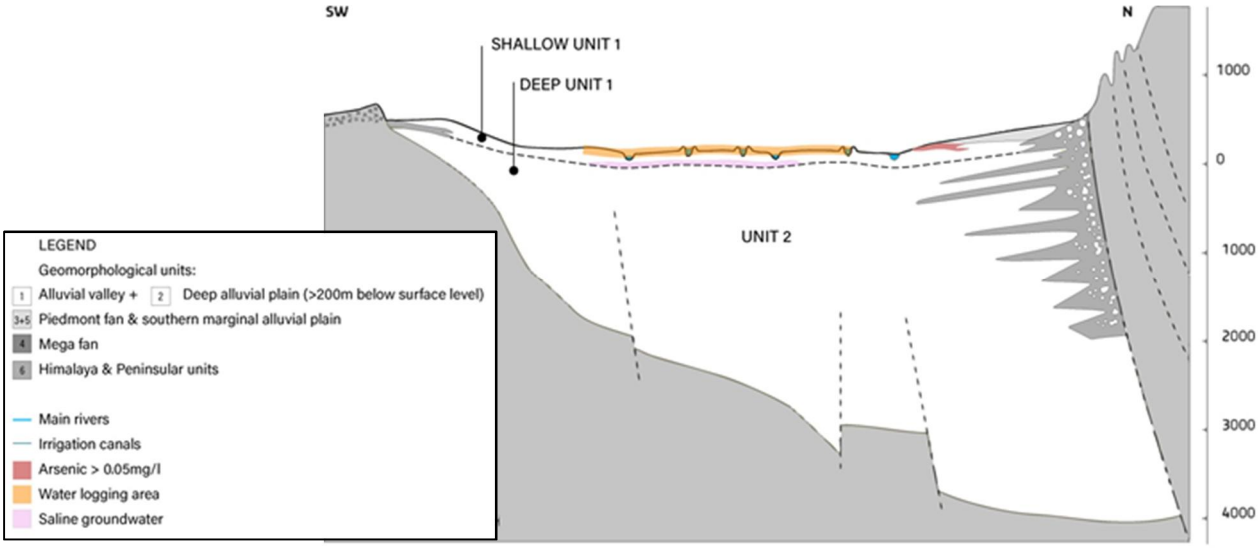


Figure N-5 : Schematic cross section showing the units 1 & 2, including sub-management units.

AECOM FutureWater Deltares