23rd May 2021

Interactive Atlas of

Rivers & Streams of India

Project 3 Presentation

Presented by Deepika Tiwari

Faculty guide Prof Venkatesh Rajamanickam

| OBJECTIVES

- Introduction
  - Project scope
  - Limitations
  - Scope of maps & why river maps
- Secondary Research
  - Existing resources
  - Issues with the resources
  - Historical maps and what they get right
- Understanding Visualization Intent
- Exploring Datasets
  - Dataset format & challenges
  - Choosing dataset format
- Collecting Data
- Sketching Ideas
- Final Concept
- Future Work
- Discussion
- Reflection
- References

| CORE AIM

To explore how we can create an exhaustive web database of rivers in India that utilize information visualization techniques for better understanding

| INTRODUCTION

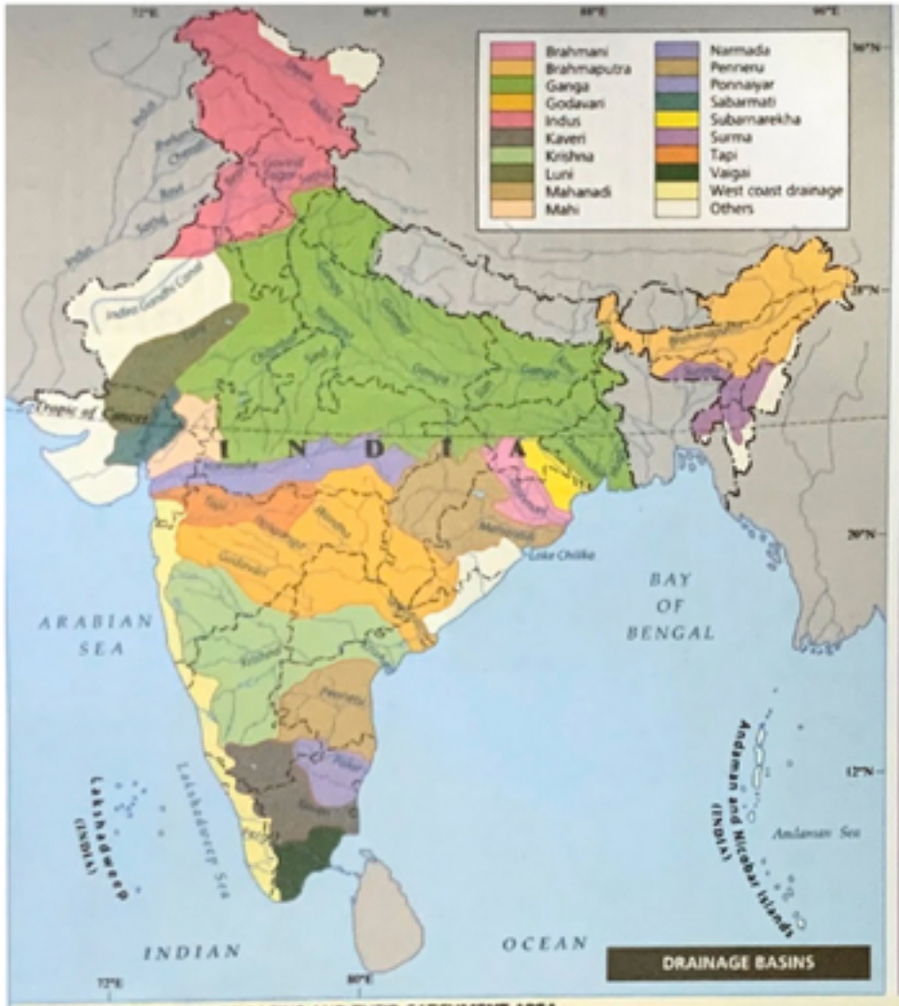
Why maps

- ➔ Tool for spatial communication in a comprehensible scale
- ➔ Tool for understanding the world
- ➔ Tools for information visualization
  Ex- Distribution maps

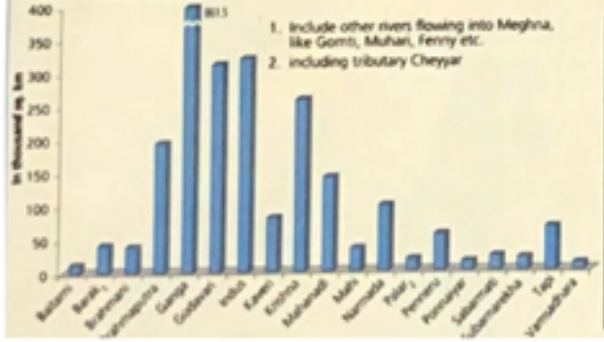
| EXPLAINING SCOPE

Why river atlas?

- ➔ No singular resource to search for rivers of India
- ➔ Data is spread all over the web in form of lists
- ➔ Most GIS/ GPS products focus on terrain. River data is still present in raw format



MAJOR DRAINAGE BASINS AND THEIR CATCHMENT AREA



MAJOR RIVER BASINS OF THE COUNTRY (Figures within brackets indicate total length of rivers and basin area)

Sl. No.	Name of the River	Origin	Length (km)	Catchment Area (sq. km)
	East flowing rivers			
1	Baitarani	Keonjhar (Odisha)	365	12,789
2	Brahmani	Ranchi (Jharkhand)	799	39,033
3	Brahmaputra	Kailash Range (Tibet)	916 (2,900)	194,413 (580,000)
4	Ganga	Gangotri (Uttarakhand)	2,525	861,452 (1,186,000)
5	Godavari	Nasik (Maharashtra)	1,465	312,812
6	Kaveri	Coorg (Karnataka)	800	81,155
7	Krishna	Mahabaleshwar (Maharashtra)	1,401	258,948
8	Mahanadi	Nazri Town (Madhya Pradesh)	851	141,589
9	Palar (including tributary Cheyyar)	Kolar (Karnataka)	348	17,871
10	Pennaru	Kolar (Karnataka)	597	55,213
11	Ponnaiyar	Kolar (Karnataka)	396	14,130
12	Subarnarekha	Nagri/Ranchi (Jharkhand)	395	19,296
13	Vamsadhara	Kalahandi (Odisha)	221	10,830
	West flowing rivers			
14	Indus	Mansarovar (Tibet)	1,114 (2,880)	321,289 (1,165,500)
15	Mahi	Dhar (Madhya Pradesh)	583	34,842
16	Narmada	Amarkantak (Madhya Pradesh)	1,312	98,796
17	Sabarmati	Aravalli Hills (Rajasthan)	371	21,674
18	Tapi	Betul (Madhya Pradesh)	724	65,145
		Total		2,403,000

Oxford Students Atlas (3rd Edition 2020) dedicates a single page to hydrology. Being a paper-based medium, Atlas is constrained in the amount of information it can offer, ending up catering to general information rather than specific insights in a single book

| INTRODUCTION

Why Interactive?

- ➔ Data is spread all over the web
- ➔ Most GIS/ GPS products focus on terrain. River data is still present in raw format
- ➔ Digital medium allows for comprehensive collection

Search result of keyword 'Ganga' from Google Earth includes a stroke indicating river flow with zoomable map and information cards on right

| INTRODUCTION

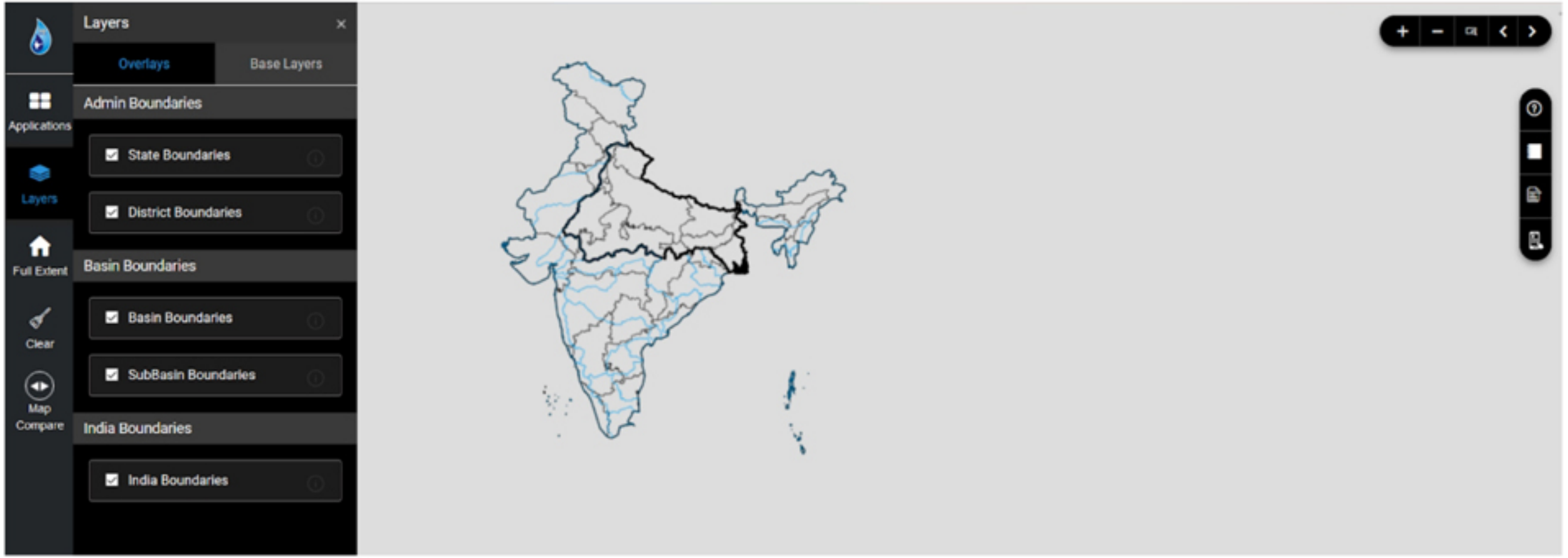
What does the project NOT DO? ➔ DOES NOT present data stories on rivers.

| SECONDARY RESEARCH

| EXISTING PROJECTS

India WRIS Project

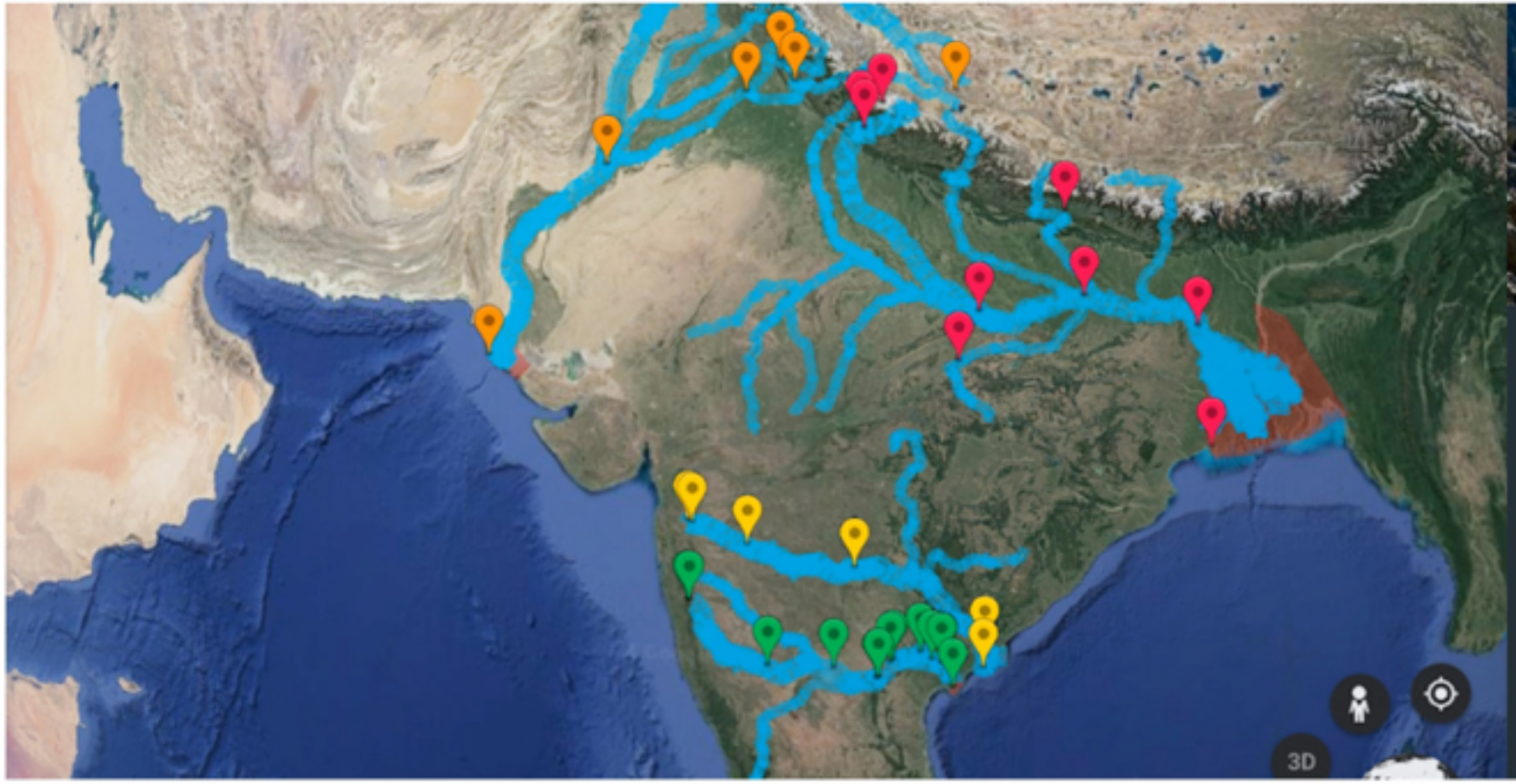
Aims to provide up-to-date information on water resources and be a ‘Single Window’ solution for all water resources & related data



| EXISTING PROJECTS

Google Earth Indian Rivers

An initiative by India Literacy Project, the dashboard allows interactive navigation of geographical path 4 major rivers of India cover.



The Ganges

The River Ganga, also known as River Ganges crosses national and international borders of India and Bangladesh during its long extensive flow. Rising in the state of Uttarakhand in the Himalayas, it commences its 2,525 km (1,569 mi) journey eventually reaching the Bay of Bengal, flowing south and east, traversing the Gangetic Plain of North India, moving into Bangladesh, and eventually emptying into the Bay of Bengal.

| EXISTING PROJECTS: ISSUES

Little care for information visualization

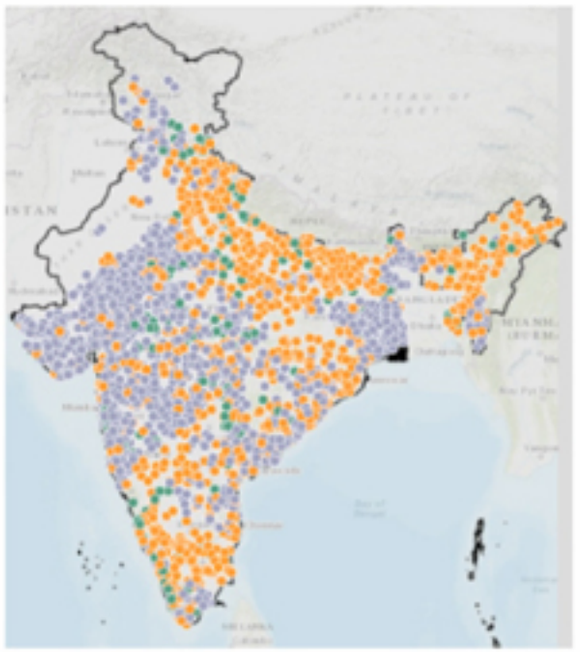
Focus on station monitoring than rivers

3,578
NUMBER OF STATIONS MONITORED

earch..

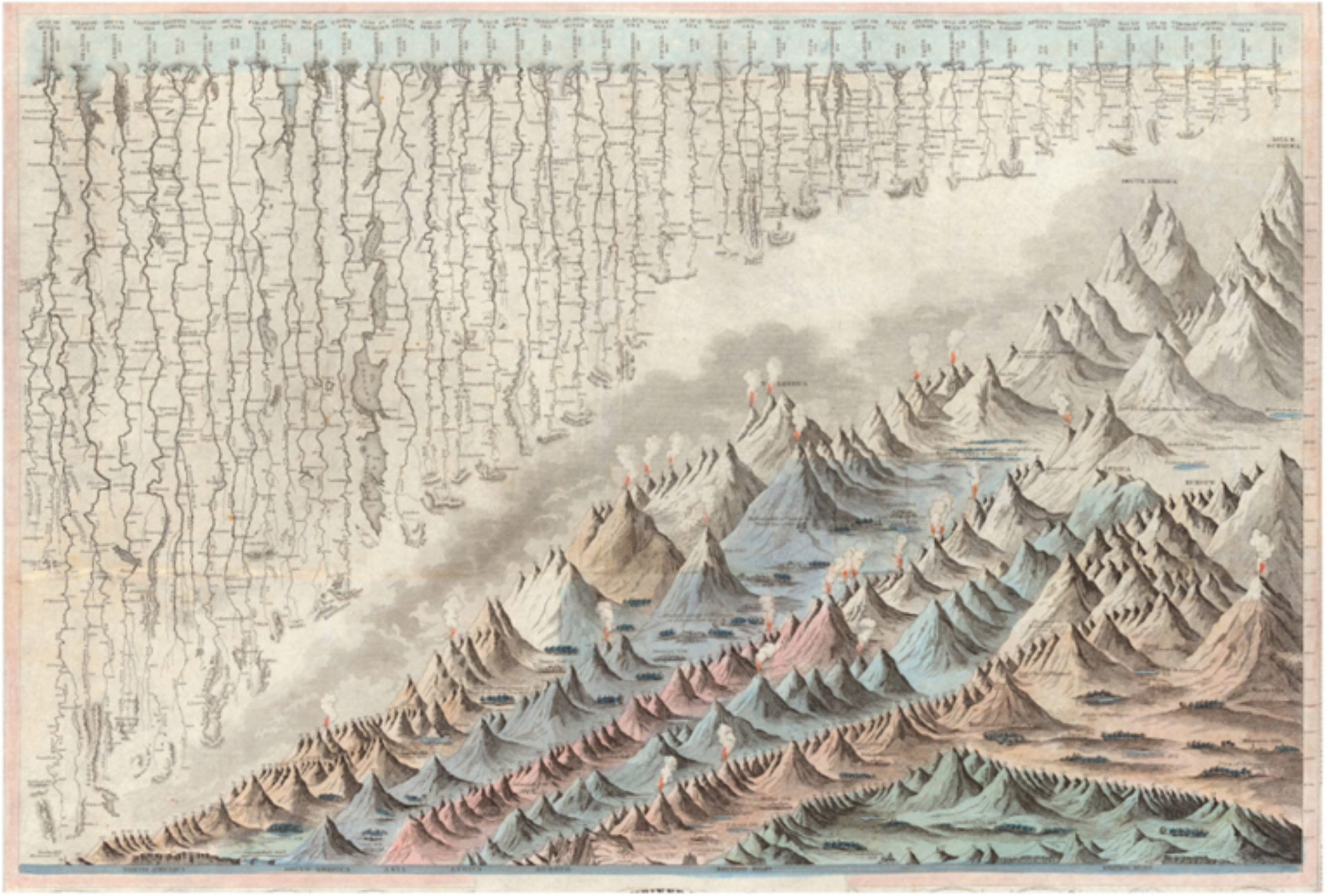
RIVER	Total Stations	Number of Manual Stations	Number of Telemetry Stations
Achan Nala	1	1	0
Achankovil Ar	1	1	0
Adhoi Nadi	1	1	0
Agasti Nala	1	1	0
Agrani	1	1	0
Agula	1	1	0
Ahar nadi	2	2	0
Aharan	1	1	0
Aie	2	1	1
Aiyar	1	1	0

Difficult to navigate data

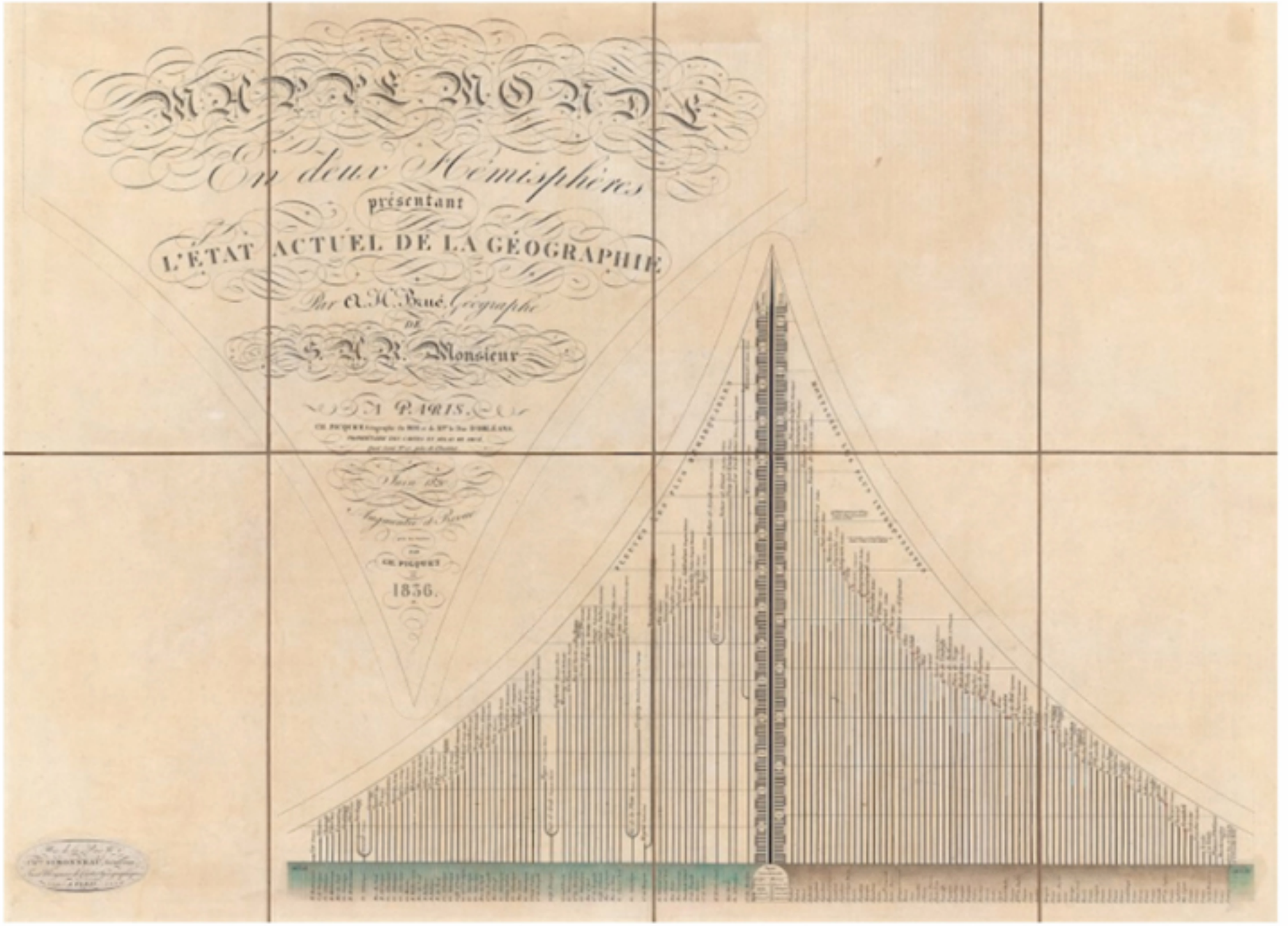


Clunky experience

| LESSONS FROM PAST: HISTORICAL MAPS



Mountains & Rivers
of the World
1849
Map by G. Woolworth Colton



Mappe Monde en deux Hemispheres (with) Fleuves les Plus Remarquables; Montagnes les Plus Intéressante
1836
Brue, Adrien Hubert

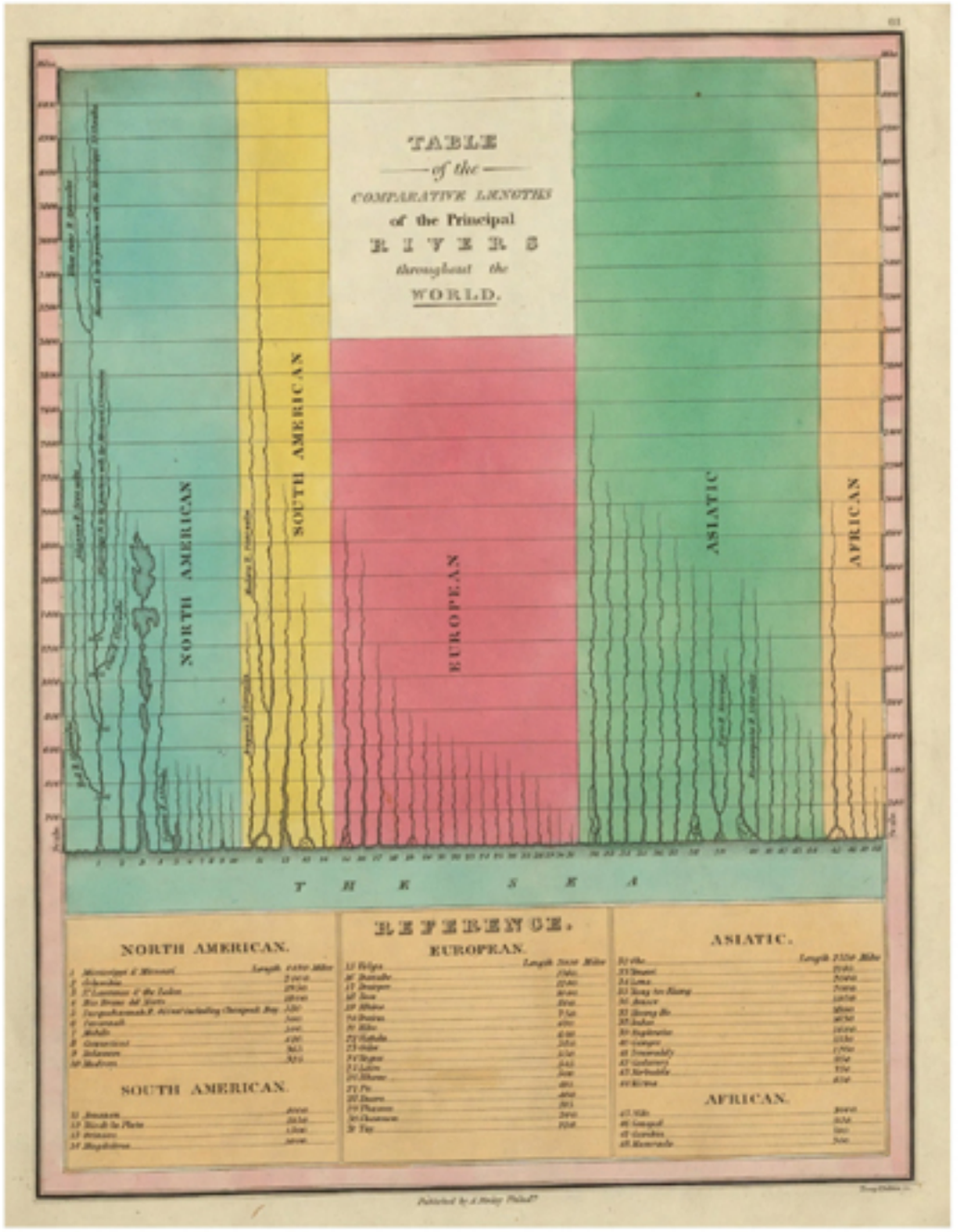


Table of the Comparative Lengths of Principal Rivers Throughout the World
1831
Published by A Finley Philad

Ribbon Map Of The Father Of Waters
1866
By Coloney, Fairchild & Co.

| SECONDARY RESEARCH

What historical maps get right

- ➔ Present novel methods to represent river maps
- ➔ Expand and present meaningful association
- ➔ Provide context for understanding and comparison

| VISUALIZATION INTENT

| VISUALIZATION INTENT

What can we do with this data?

- ➔ Narrative VS Simulation VS Exploratory VS Instruction
- ➔ Visualization as a resource

Knowledge level of audience	Non specialized, preferably anyone above grade 9 with basic understanding of English

| VISUALIZATION INTENT

How can we visualize this well?

- ➔ Tackling comprehension challenges
- ➔ Identifying structures and patterns
- ➔ Allow users to build relationships and association

Knowledge level of audience	Non specialized, preferably anyone above grade 9 with basic understanding of English

| EXPLORING DATASETS

1. OSM
Openstreetmap

Collaborative open source project that utilizes resources like GPS, aerial photography to crowdsource data.

2. HydroSHEDS
Rivers Basins

Esri is an international supplier of geographic information system software, web GIS and geodatabase. The river layer is based from HydroSHEDS data.

3. ESRI
River & Streams

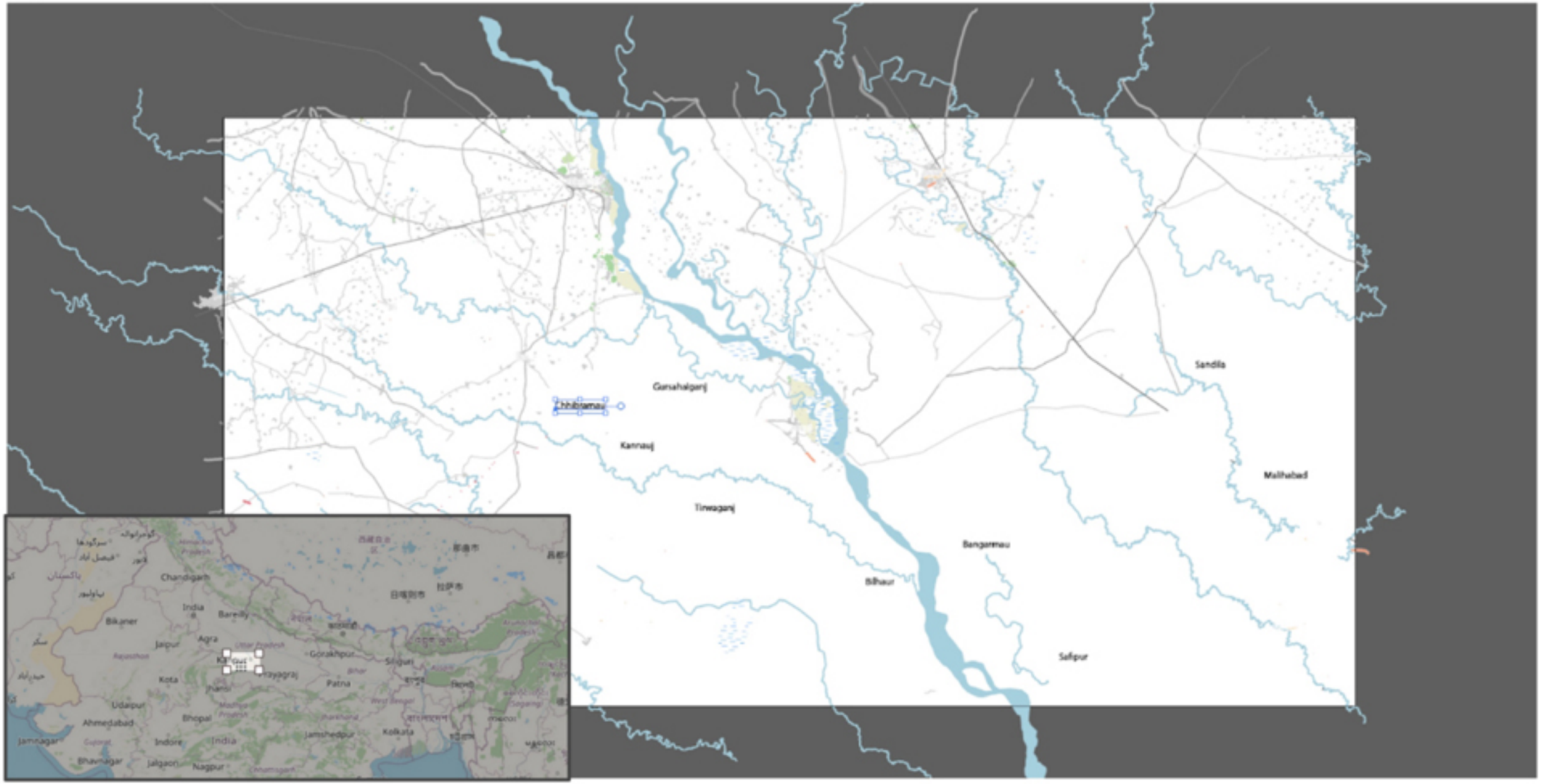
Geo-referenced data sets (vector & raster) of river networks, watershed boundaries, drainage directions, and flow accumulations.

Openstreetmap in QGIS

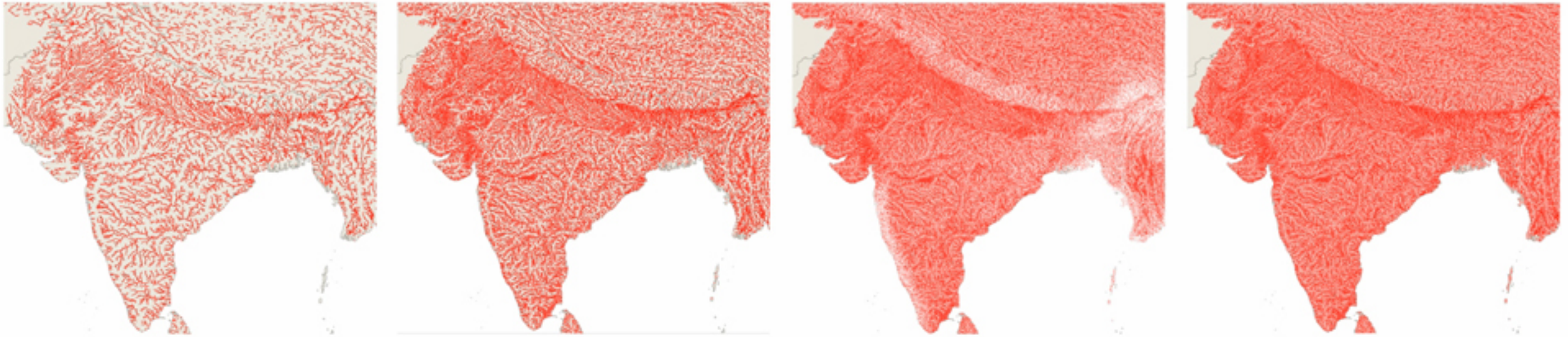
User can query on values like
- City
- Administrative level
- Crop
- Cuisine
- Cycleway
- Historic
- Land Use
- Railway
- Trees
- Waterway

OSM maps are integrated into QGIS and allow for searching data through the QuickOSM vector plugin. One can simply query for river streams by specifying query key, value, and area of search

Openstreetmap in QGIS

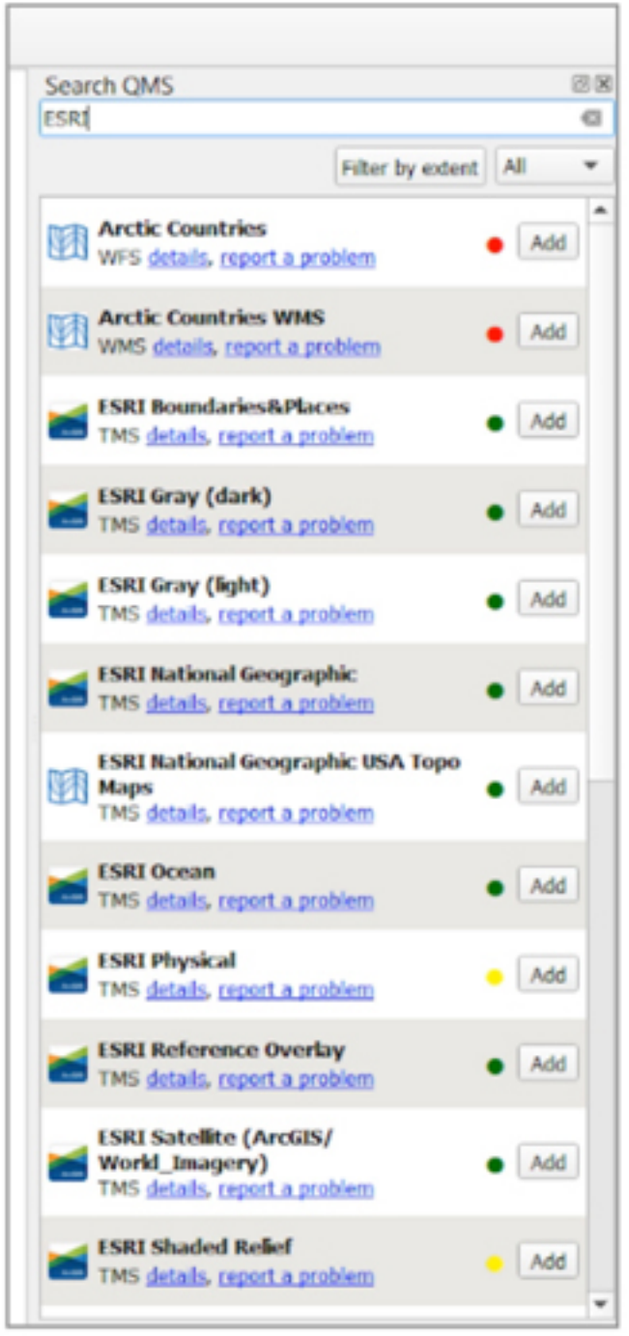


HydroSHEDS



River and streams categorized by river length (upstream)

ESRI Rivers & Streams



ESRI maps available as separate base layers on QMS (Quick map services)

| CHOOSING DATASET

- ➔ QuickOSM & QMS integration for OSM & ESRI
- ➔ Manual challenges with sorting Hydrosheds data

| COLLECTING DATA

						STATES	Type	Length in km	Basin Size km sq	Source	Mouth	Tributaries(all/ left)	Tributaries (right)
Ganges River Basin						Uttarakhand, Uttar Pradesh, Bihar, West Bengal	Rivermain	2704	1,320,000	Confluence of Alaknanda and Bhagirathi river	Bay of Bengal	Ramganga, Garra, Gomti, Ghaghara, Gandak, Burhi Gandak, Kosbi, Mahananda, Bramhaputra	Yamuna, Tamsa (also called Tons), Karamnasa, Sone, Punpun, Falgu, Kiul, Chandan, Ajoy, Damodar, Rupnarayan
	Hooghly River					West Bengal	distributary	260		Gira, Murshidabad	Rath, Bay of Bengal		
		Damodar River				Jharkhand, West Bengal	tributary	592		Chota Nagpur Plateau	Howrah, Hoogly River	Barakar, Konar, Jamunia, Nunia	Sali
			Barakar River			Jharkhand, West Bengal	tributary (damodar)	225		Padma, Hazaribagh	Dishergarh, Asansol, Bardhaman	Usri	Barsoti
		Jahnavi River				Uttarakhand	tributary	45					
		Jalangi River				West Bengal	tributary	233	2815.33	Padma River, Nadia District, Gopalpur Ghat	Bhagirathi, Swarupganj	Bhairab Khal	(1) Sialmari (2) Bhairab River (3) Chhoto Bhairab (4)Gobra-Sidi Nala (5) Kalma Khal
		River Churni				West Bengal	distributary (padma)	56		Padma River, Nadia District, Majhdhia	Shirpur		
		Ichamati River				Transboundary (Bangladesh)	distributary	19.5+ 35.5		Mathbhanga ()	--		
		Rupnarayan River				west Bengal	tributary	80		Purlia	Hoogly		
		Ajay River				Bihar, Jharkhand, West Bengal	tributary	288		Jamui, Bihar	Kalwa, Bhagirathi		Pathro and Jayanti in Jharkhand. Tumuni and Kunur in Bardhaman district of West Bengal
		Mayurakshi River				Jharkhand, West Bengal	tributary	250		Trikut Hill	Hoogly	Kopai, Brahmani,Dwaraka, Bakreshwar	
		Dwarakeswar River				west Bengal	tributary	32		Tibloni Hill	Rupnarayan River, Bardhman	Gandheswari River, Kukhra River, Eirai River	righShilabati River
		Mundeswari River				west Bengal	tributary	42		Damodar River	Rupnarayan River		
	Meghna River					Bangladesh, Assam							
	Punarbhaba River					Bangladesh, West Bengal		160		Dhepa River, Dinajpur, Rangpur, Bangladesh	Mahananda /Nawabganj District Bangladesh		
	Atrai River/ Abeyee					Bangladesh, West Bengal	tributary	390		Jorapani river, siliguri	Chalan Beel		
GANGES	Mahananda River					Bihar, West Bengal,							

| VISUALIZING CONCEPTS

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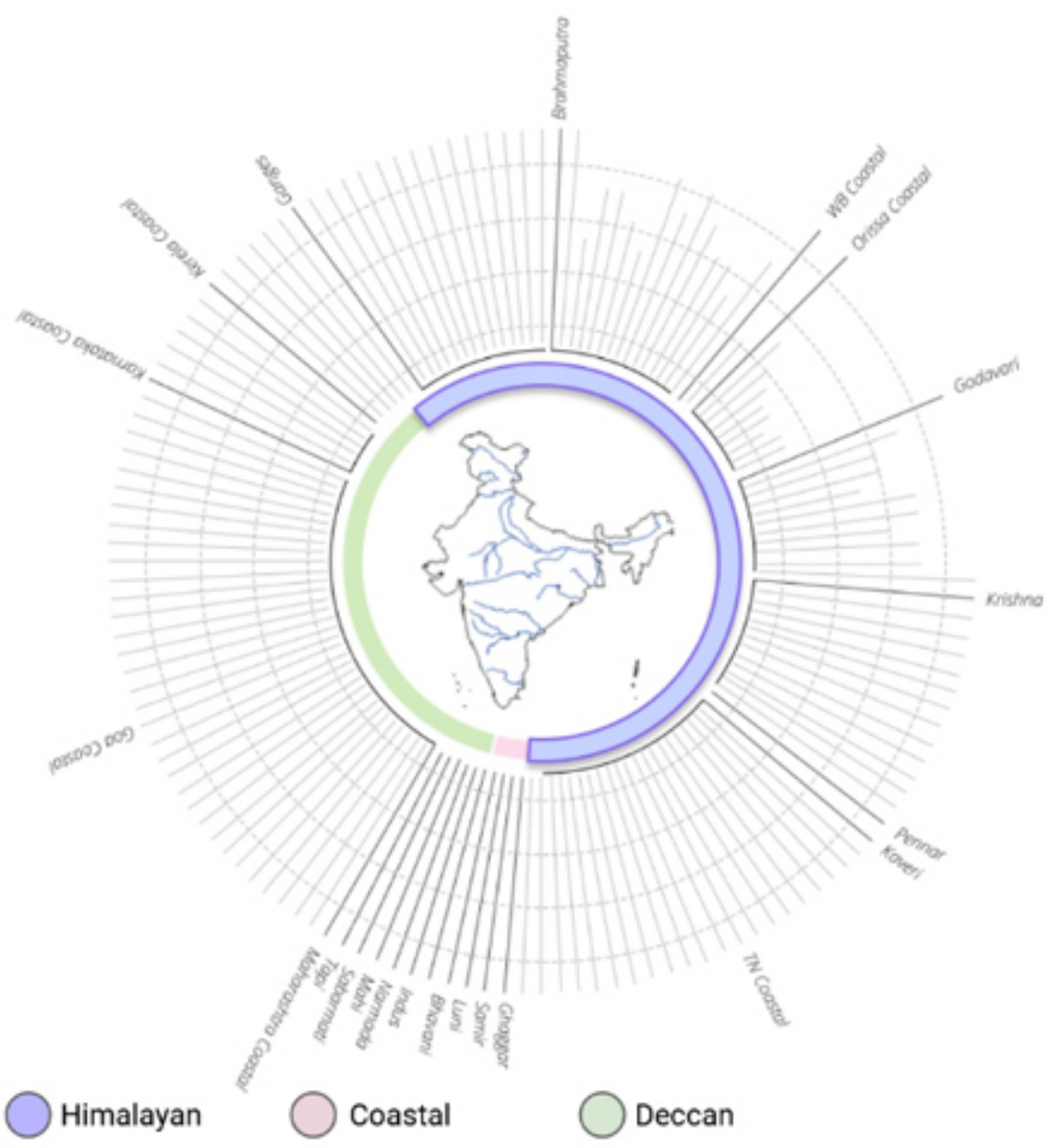
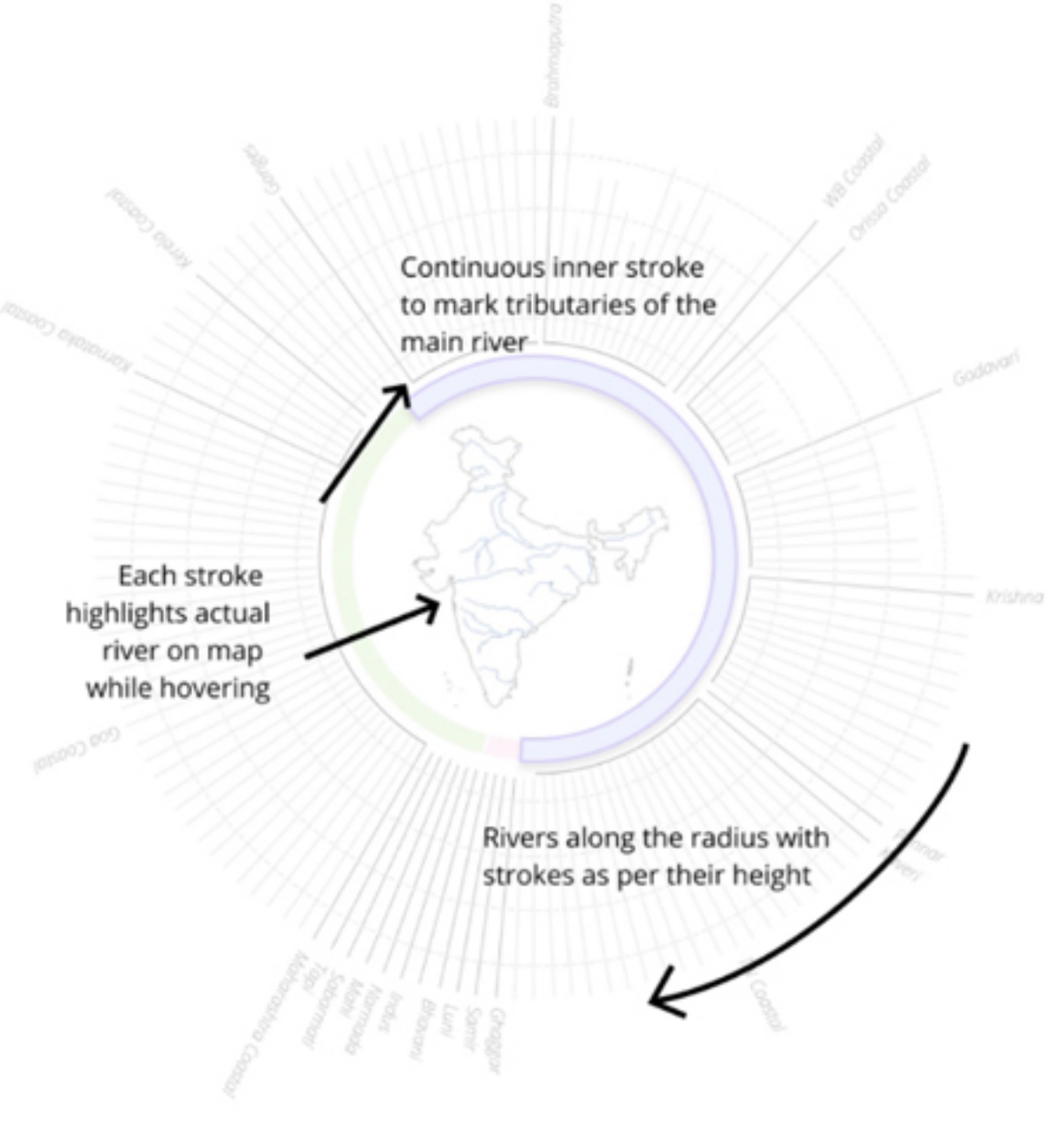
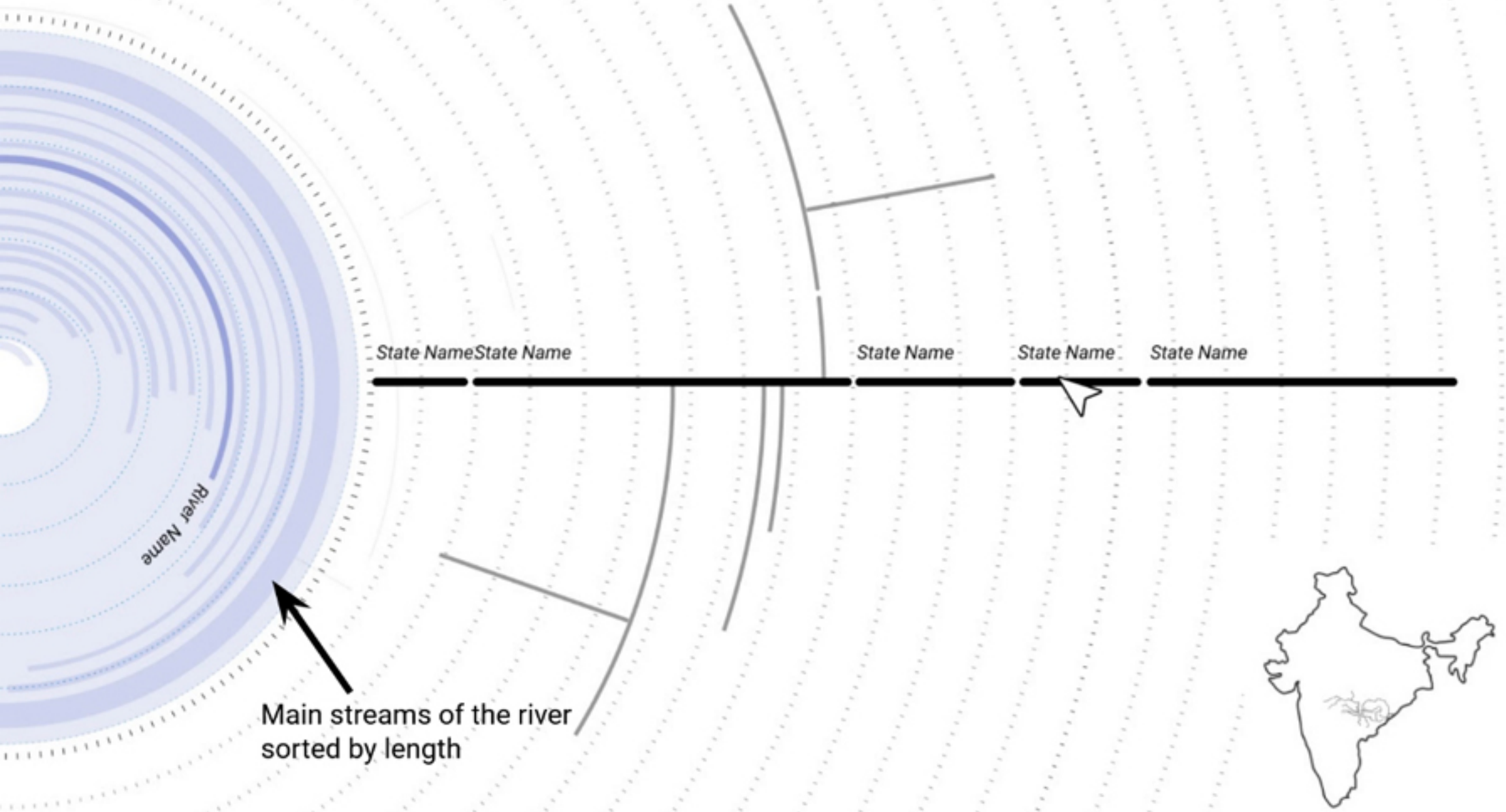
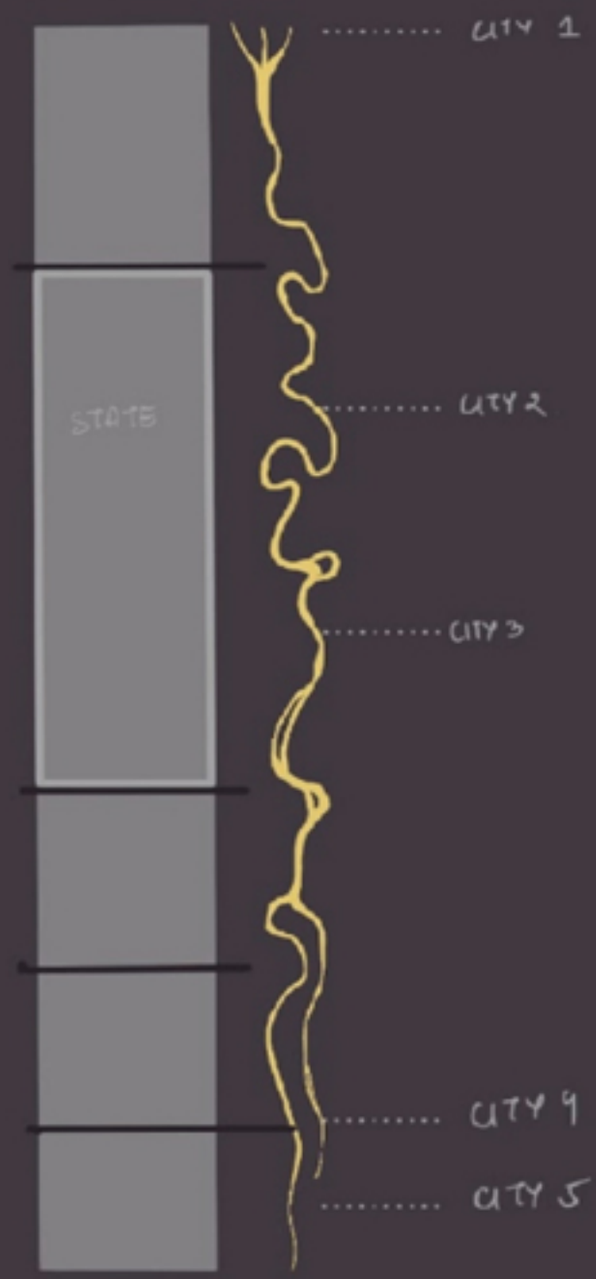
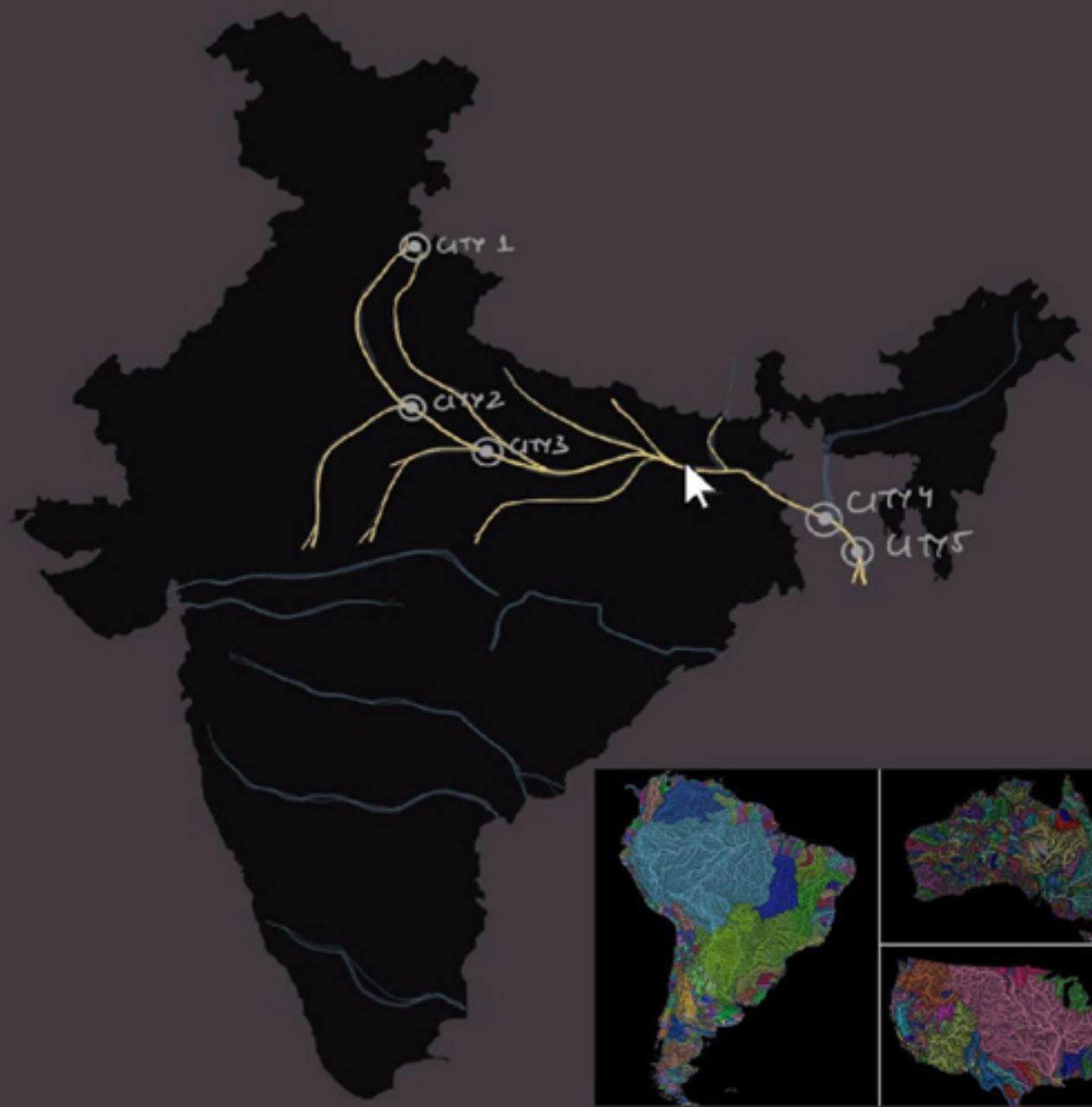




| VISUALIZING CONCEPTS




CITY 1
STATE
CITY 2
CITY 3
CITY 4
CITY 5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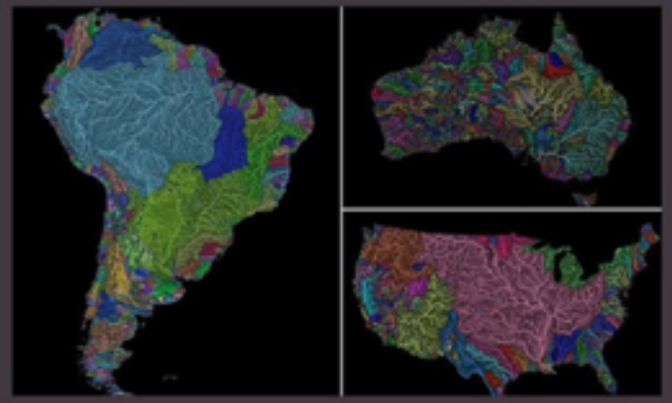
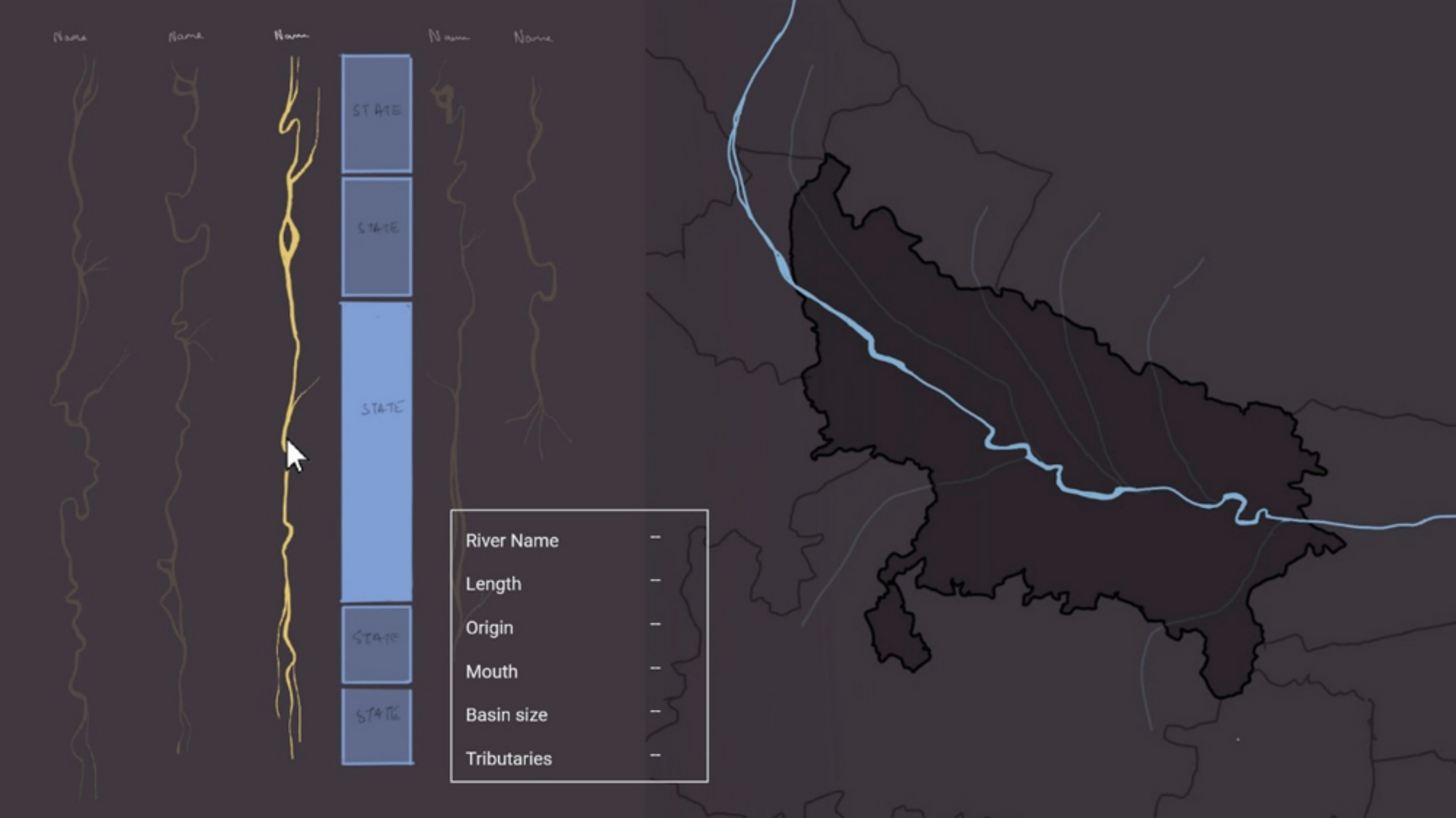
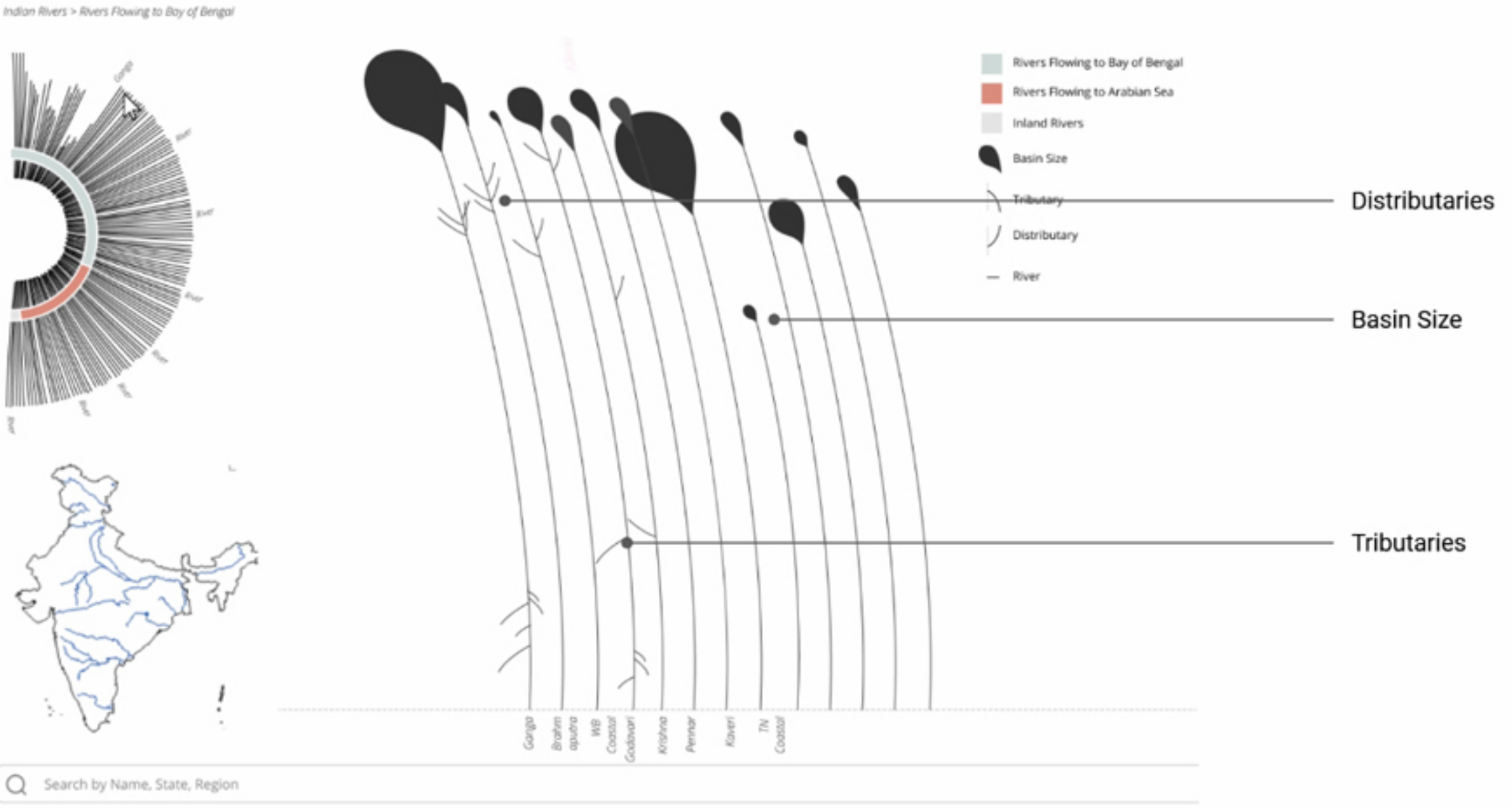



STATE
STATE
STATE
STATE
STATE
River Name –
Length –
Origin –
Mouth –
Basin size –
Tributaries –

| VISUALIZING CONCEPTS



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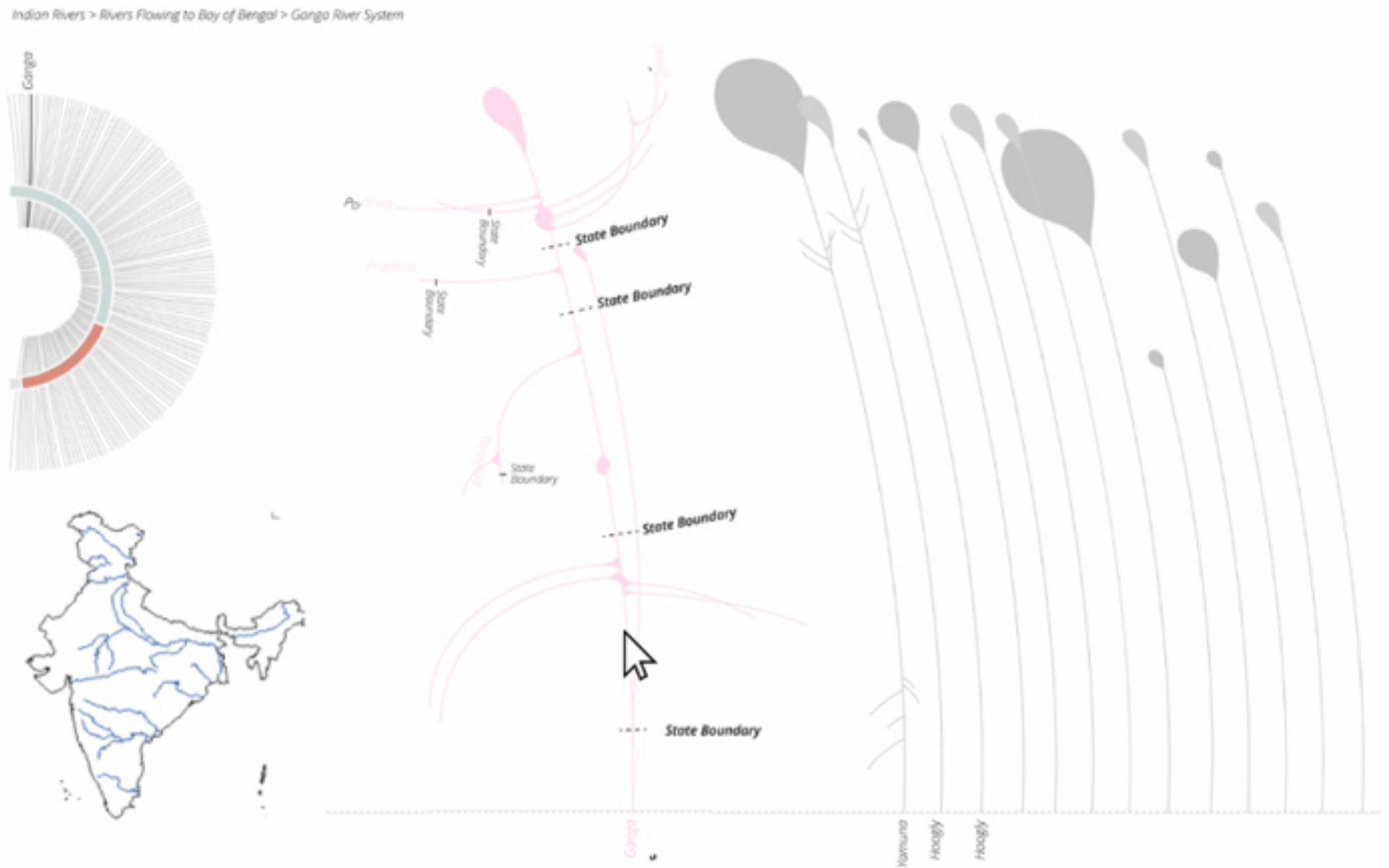


River Name	--
Length	--
Origin	--
Mouth	--
Basin size	--
Tributaries	--

Search by Name, State, Region

| FEEDBACK ON THE CONCEPTS

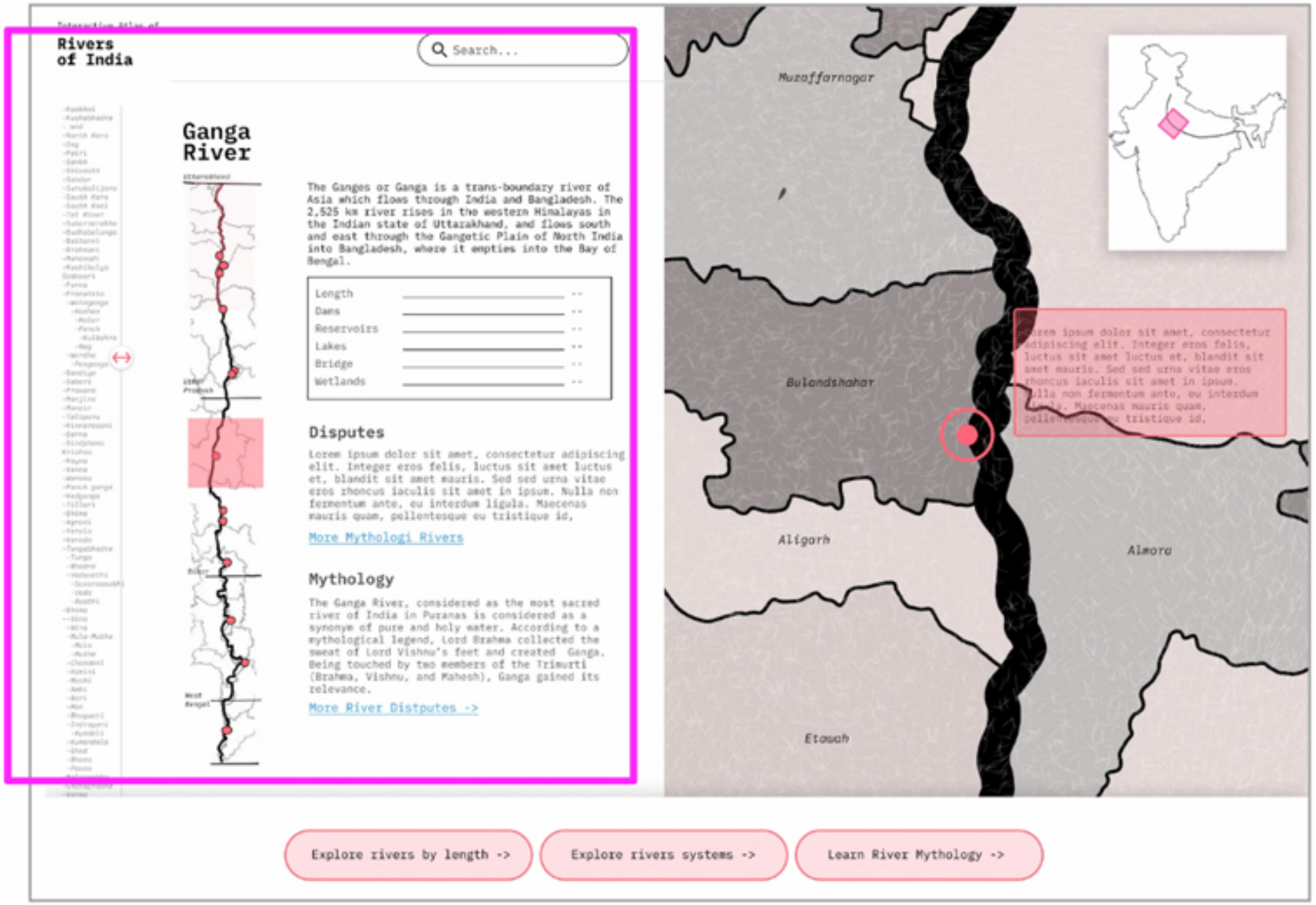
- ➔ Reducing the friction of search
- ➔ Allowing sorting and filters
- ➔ Thinking about the visualization as a Google for rivers
- ➔ Adding more datasets to stream visualization
- ➔ Little motivation to explore dashboard

| RETHINKING SCOPE

How can I make this data interesting?

| FINAL WIREFRAME

Fixed layout
& contents



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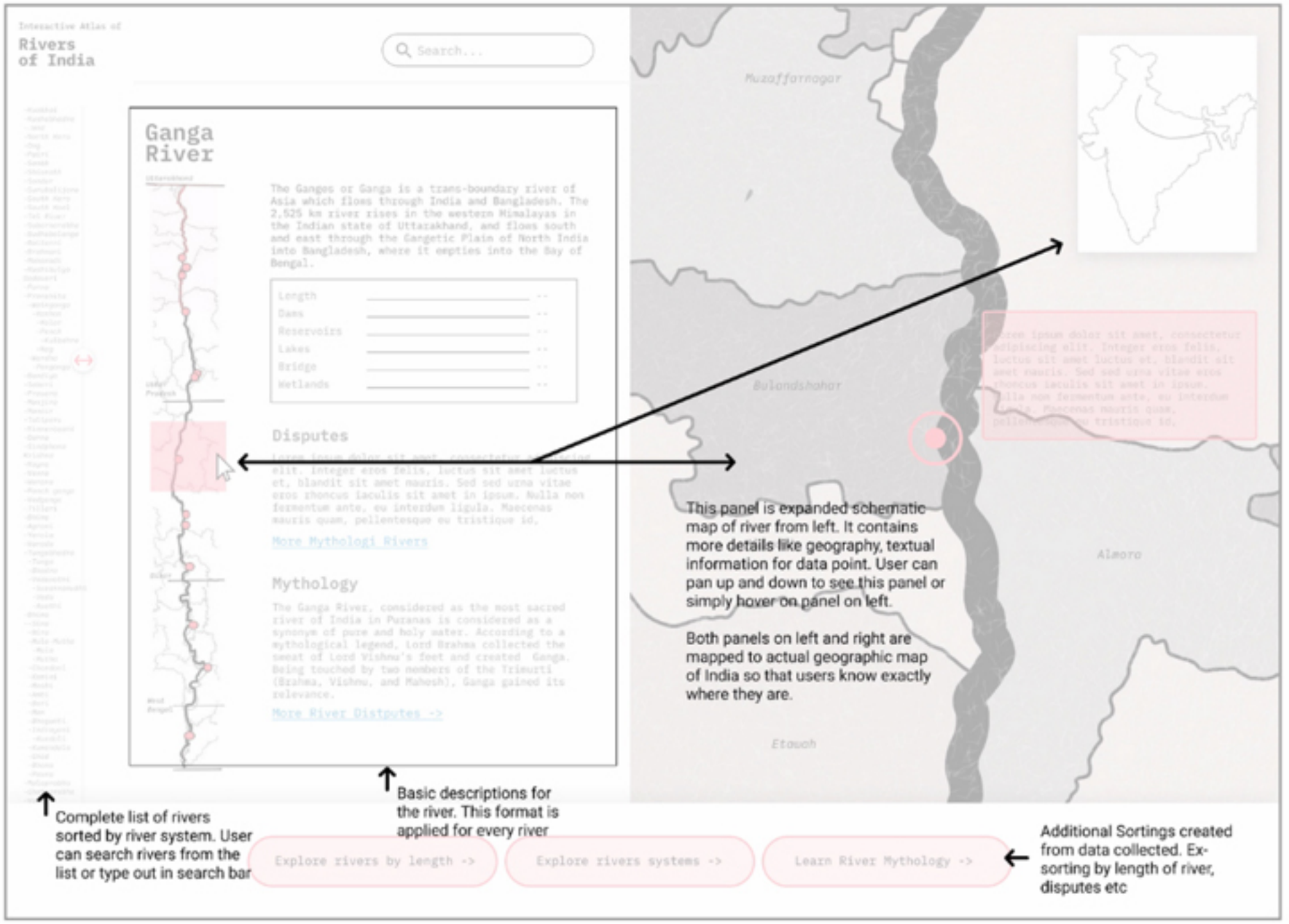


Interactive Atlas of

Rivers & Streams of India

This dashboard is an interactive visualization of Indian Rivers. Simply search rivers by name and discover information.

Interactive Atlas of

Rivers & Streams of India

DISCLAIMER

Data shown on the dashboard has been taken from Wikipedia, ESRI map services and OSM. Since the project does not focus on correcting data, there can be occasional errors in the visualization

Explore Now ->

Interactive Atlas of

Rivers & Streams of India

Search river by name

Sort By Geography Data Sources

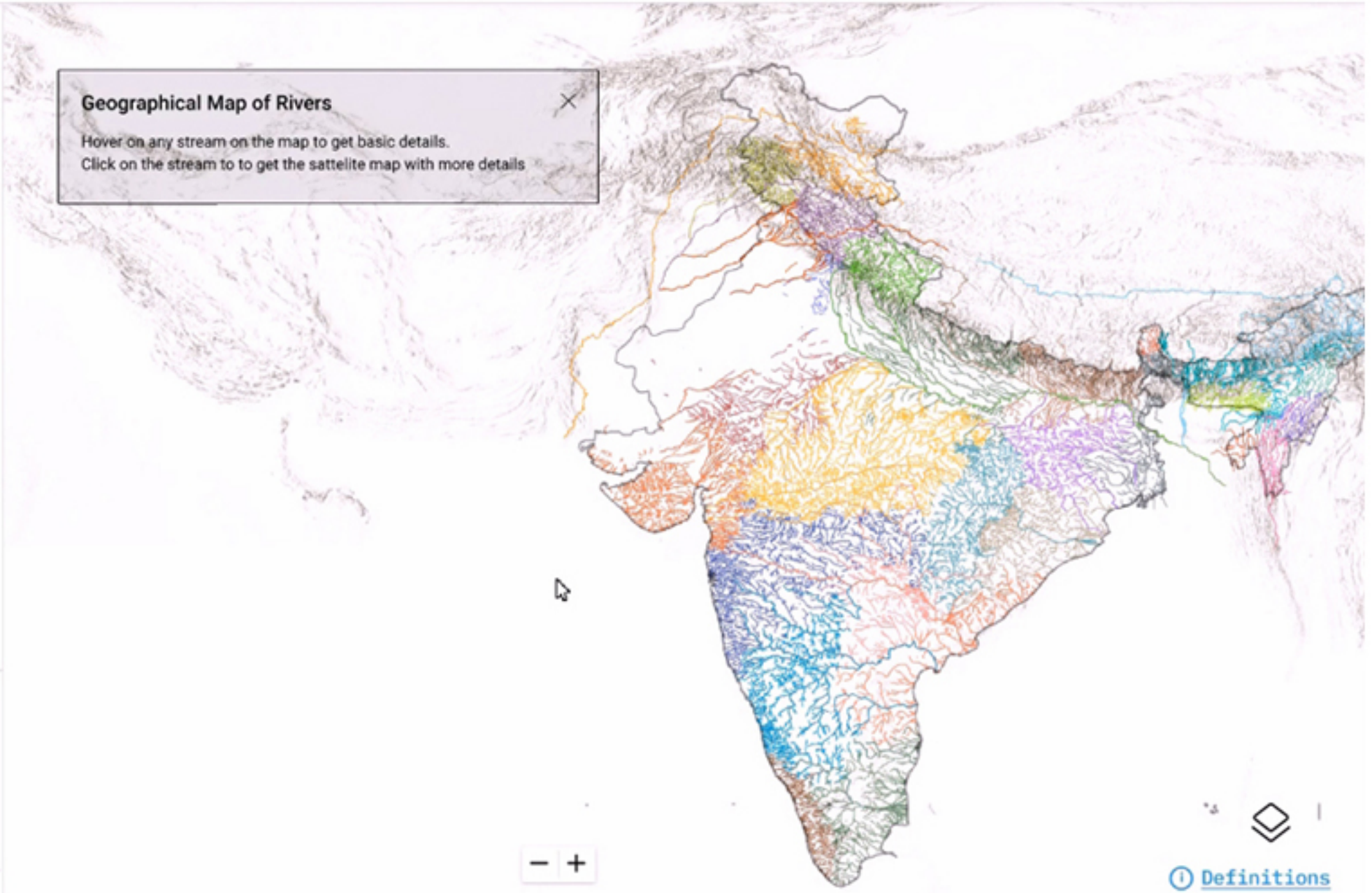
- Andhra & Telangana
- Arunachal Pradesh
- Assan
- Bihar
- Chattisgarh
- Gujrat
- Jharkhand
- Kerala
- Karnataka
- Ladakh
- Madhya Pradesh
- Maharashtra
- Manipur
- Meghalaya
- Mizoram
- Nagaland
- Odisha
- Rajasthan
- Sikkim
- Tamil Nadu
- Uttarakhand
- Uttar Pradesh
- West Bengal

- Andaman & Nzzz
- Chandigarh
- Daman Diu
- Delhi
- Lakshadweep
- Puducherry
- Ladakh

View Complete River list

Geographical Map of Rivers

Hover on any stream on the map to get basic details.
Click on the stream to to get the sattelite map with more details



Definitions

Interactive Atlas of

Rivers & Streams of India

Search river by name

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- Madhya Pradesh
- Maharashtra
- Manipur
- Meghalaya
- Mizoram
- Nagaland
- Odisha
- Rajasthan
- Sikkim
- Tamil Nadu
- Uttarakhand
- Uttar Pradesh
- West Bengal

- Andaman & Nzzz
- Chandigarh
- Daman Diu
- Delhi
- Lakshadweep
- Puducherry
- Ladakh

View Complete River list

Ganga River

2510 km

Type: Main river system

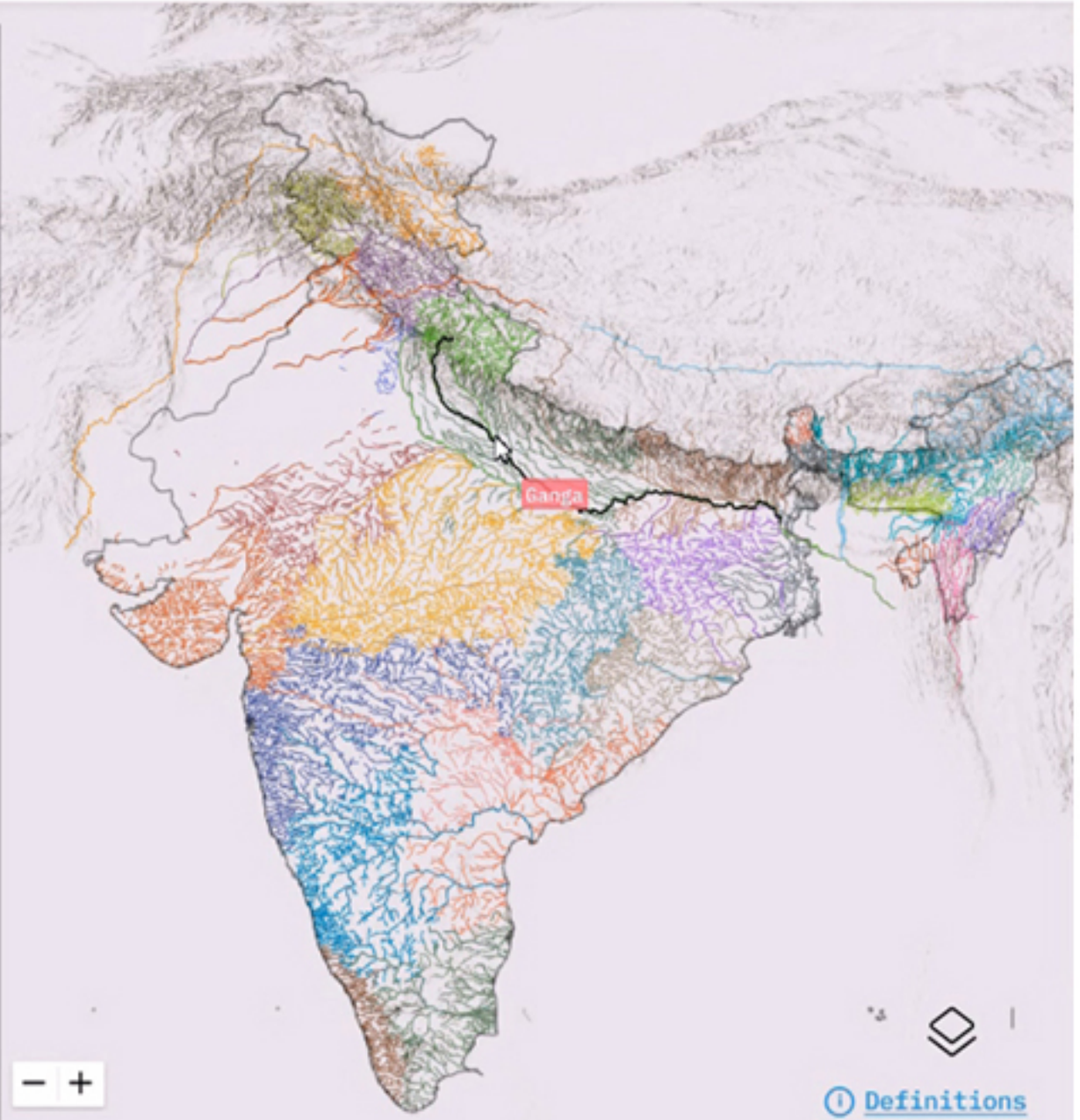
Originates: Devprayag

Flows to: Bay of Bengal

The Ganges or Ganga is a trans-boundary river of Asia which flows through India and Bangladesh. The 2,525 km river rises in the western Himalayas in the Indian state of Uttarakhand, and flows south and east through the Gangetic Plain of North India into Bangladesh, where it empties into the Bay of Bengal.

Tributaries	14
Distributaries	1

- Dams & Reservoirs
- Wetlands
- Waterfall



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Rivers & Streams of India

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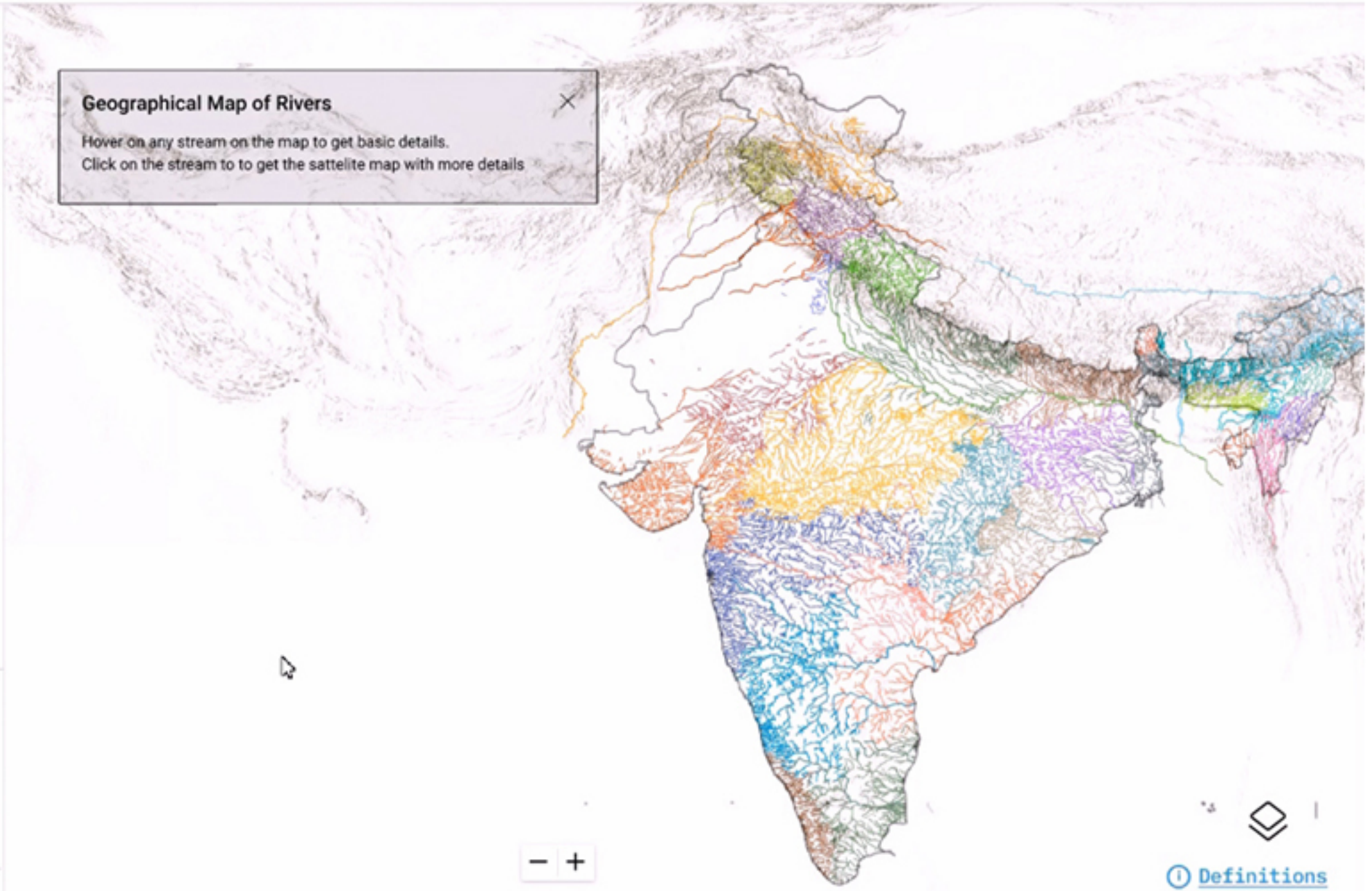

Definitions

Interactive Atlas of

Rivers & Streams of India

Search river by name

Sort By Geography Data Sources

Uttar Pradesh

- Ahar
- Ajay River
- Alaknanda River
- amanat
- Atrai River/ Atreyee
- Bagmati River
- Ban Ganga
- Banas River
- Banas River
- Bandi
- Barakar
- Berach
- Betwa
- Bhagirathi River
- Bhilangna River
- Bhurhi Gandak River
- chambal
- Damodar River
- Darma River
- Dhasan River
- Dhauliganga River
- Dwarakeswar River
- Gambhir
- Gandaki River
- Ganga
- Ghaghara River/ Gogra
- Goini
- Gomati River
- Gopad River
- Gori Ganga River/ Goriganga
- Halali River
- Hindon
- Hooghly River
- Ichamati River
- Jahnavi River
- Jalakar
- Jalangi River
- Johilla River

| Uttar Pradesh

Rivers	Wetlands	Lakes
72	8	36

Rivers Boundaries Names

Definitions

Interactive Atlas of

Rivers & Streams of India

Search river by name

Sort By Geography Data Sources

Uttar Pradesh

- Ahar
- Ajay River
- Alaknanda River
- amanat
- Atrai River/ Atreyee
- Bagmati River
- Ban Ganga
- Banas River
- Banas River
- Bandi
- Barakar
- Berach
- Betwa
- Bhagirathi River
- Bhilangna River
- Bhurhi Gandak River
- chambal
- Damodar River
- Darma River
- Dhasan River
- Dhauliganga River
- Dwarakeswar River
- Gambhir
- Gandaki River
- Ganga
- Ghaghara River/ Gogra
- Goini
- Gomati River
- Gopad River
- Gori Ganga River/ Goriganga
- Halali River
- Hindon
- Hooghly River
- Ichamati River
- Jahnavi River
- Jalakar
- Jalangi River
- Johilla River

Ganga River

2510 km

Type: Main river system

Originates: Devprayag

Flows to: Bay of Bengal

The Ganges or Ganga is a trans-boundary river of Asia which flows through India and Bangladesh. The 2,525 km river rises in the western Himalayas in the Indian state of Uttarakhand, and flows south and east through the Gangetic Plain of North India into Bangladesh, where it empties into the Bay of Bengal.

Tributaries 14

Distributaries

Dams & Reservoirs

Wetlands

Waterfall

| Uttar Pradesh

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| Uttar Pradesh

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Rivers Boundaries Names

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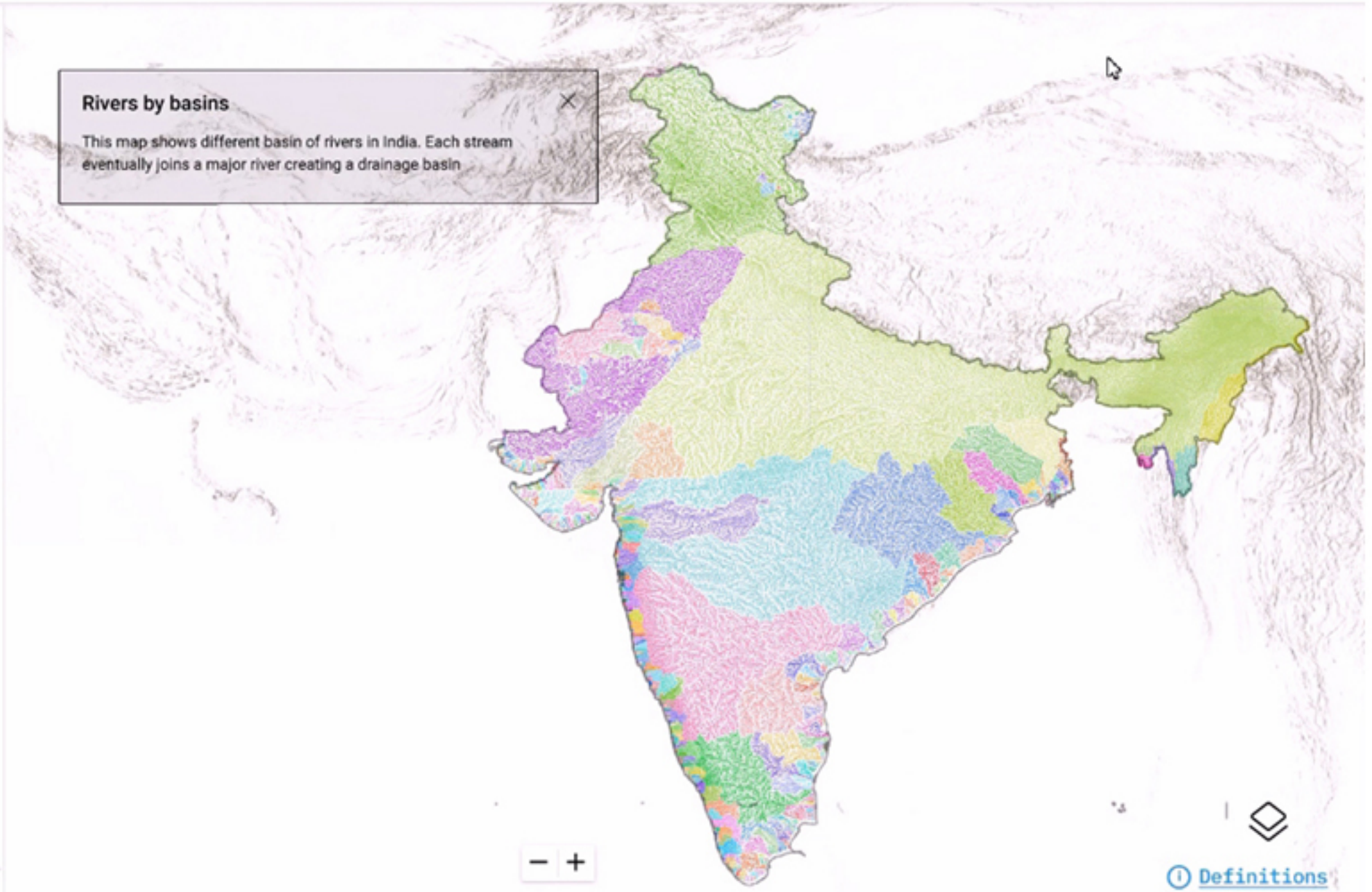
- Cauvery Basin
- East Coastal
- Ganga Basin
- Godavari Basin
- Indus Basin
- Krishna Basin
- Luni Basin
- Mahanadi Basin
- Mahi Basin
- Minor River Northeast
- Sabarmati Basin
- Subarnarekha Basin
- West Coastal

View Complete River list

Rivers by basins

This map shows different basin of rivers in India. Each stream eventually joins a major river creating a drainage basin



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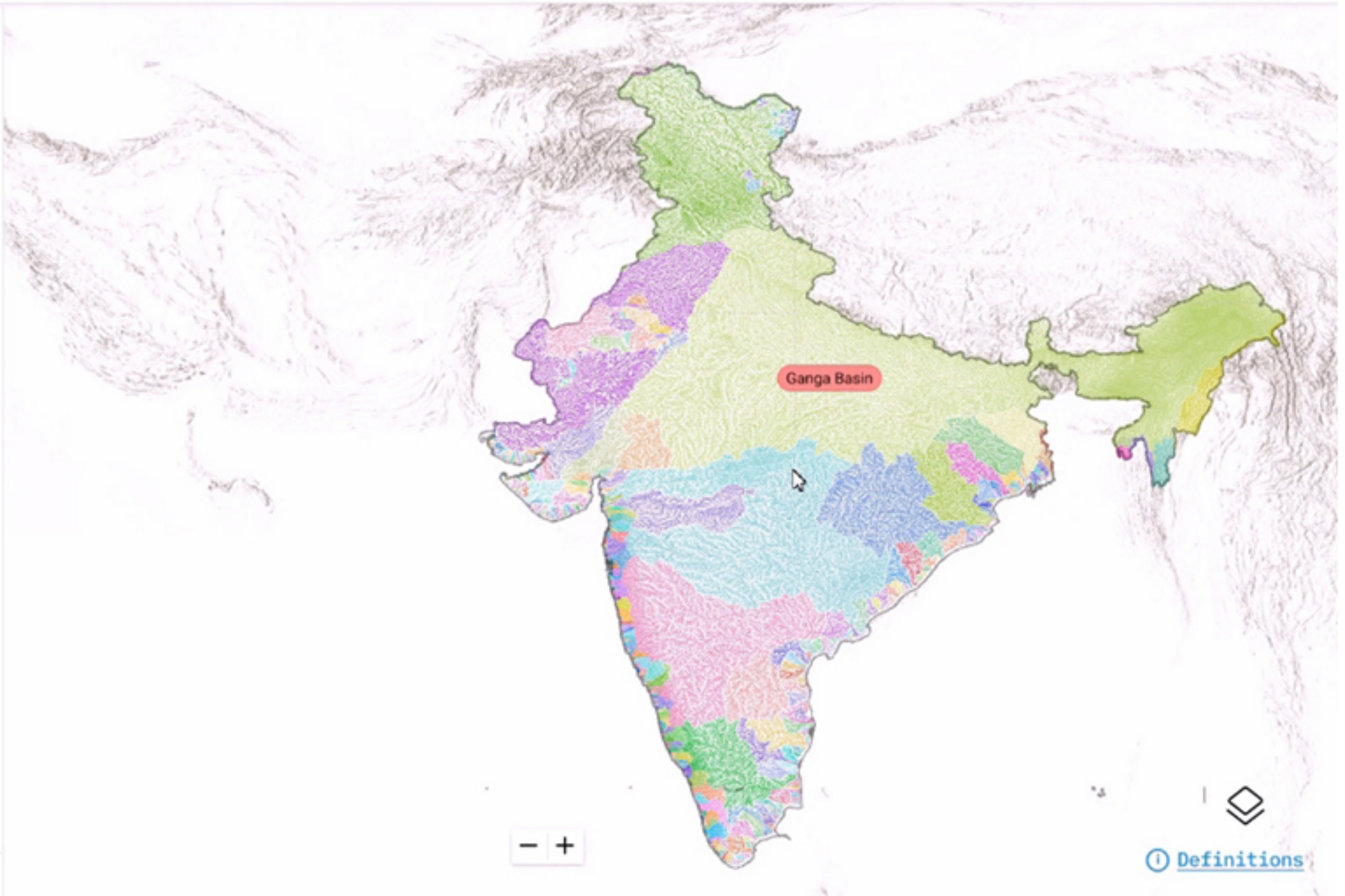

View Complete River list

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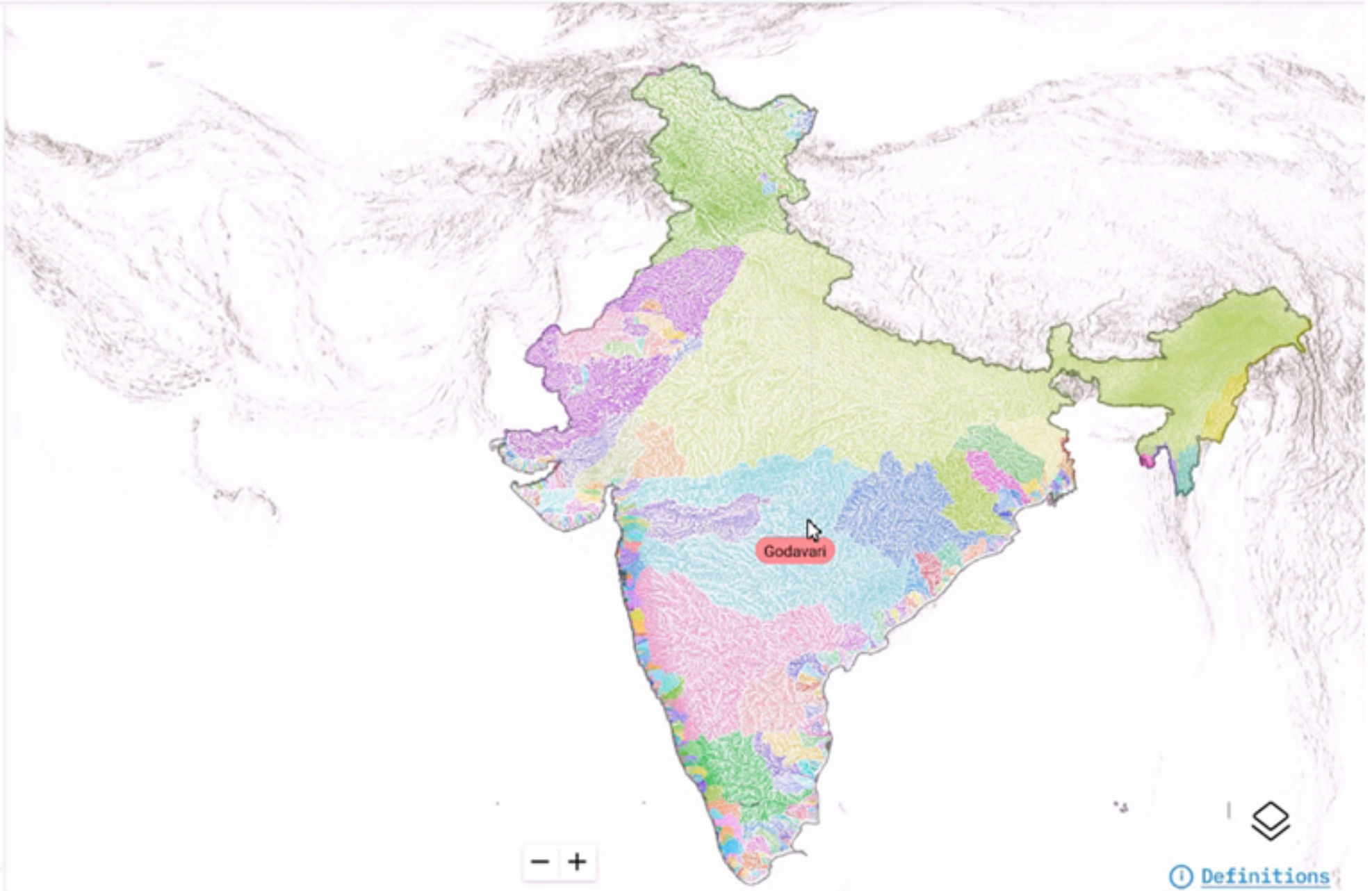

View Complete River list

Definitions

Interactive Atlas of

Rivers & Streams of India

Search river by name

Sort By Geography | Data Sources

Interactive Atlas of
Rivers & Streams of India

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Sort By Geography | Data Sources

← Ganga River | Origin | Pollution | Conflicts | Mouth | Read More

Ganga River
2510 km

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- Bhurhi Gandak River
- Phalgu
- Gandaki River
- Son River
- Ghaghara River/ Gogra
- Gomati River
- Yamuna River
- Ramganga River

Distributaries 1

- Hoogly

- Dams & Reservoirs
- Wetlands
- Waterfall

Formed by confluence of Bhagirathi & Alaknanda, river Ganga is formed in the state of Uttarakhand

| WHAT GAPS DOES THE PROJECT ADDRESS

- ➔ Tackling comprehension challenges due to colossal nature of data
- ➔ Identifying structures and patterns
- ➔ Presenting unique ways to view geographical information
- ➔ Explore on scope for presenting river specific data stories

| EVALUATION

Questions asked?

- ➔ Do you use atlas?
- ➔ When was the last time you used it? Why?
- ➔ Impressions on interactive atlas?
- ➔ Things you didn't like?
- ➔ Things you liked
- ➔ How can we expand this atlas?
- ➔ Will you use this? When?

| FUTURE WORK

- ➔ Automating ribbon map creation
- ➔ Implementing prototype
- ➔ Completing data stories
- ➔ Usability evaluation

| LIMITATIONS

- ➔ Visual nature of data
- ➔ Manual process of working with data
- ➔ Limited knowledge of GIS software

| FINAL THOUGHTS