WATER RESOURCE MANAGEMENT PROBLEMS AND CHALLENGES IN GANGA RIVER BASIN

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INTRODUCTION

- Ganga is a very large river system, with several tributaries and sub-tributaries. The river basin is a little over 1.0 million sq. km in the drainage area; it is an international river basin, extending over three countries; the Indian part of the river basin, which is **8,69,000** sq. km, is spread over seven states, viz., Uttarakhand, Haryana, UP, Rajasthan, Bihar, West Bengal and Jharkhand
- The river basin is spread over several climate zones--from cold & humid to hot & semi-arid to hot & humid
- The river passes through rocky and mountainous terrains to flat alluvial areas; the morphology of the river is very complex
- The geological formations underlying the river system is heterogeneous—from crystalline formations to sedimentary rocks to alluvium in very large parts

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THE BASIN'S WATER RESOURCES

- At the aggregate level, the basin has huge amount of water resource, both on the surface and underground
- The total surface water resource of the basin, in the form of annual runoff from rainfall and snowmelt, is estimated to be **525 Billion Cubic Metres** (within India)
- The utilizable fraction of the surface water resources in several of the sub-basins in the middle and lower Ganga basins is low, as the potential sites for building reservoirs are a few. The utilizable fraction is around **48 per cent (250.0 BCM)**
- The total dynamic groundwater resources of the basin is estimated to be **171.57 Billion Cubic Metres**, as direct infiltration from precipitation + irrigation return flows and canal seepage and recharge from small & large water bodies. The latter is nearly 40% of the total dynamic groundwater
- In addition to the dynamic groundwater, there is a huge groundwater stock in the basin, estimated to be **7,769.0 Billion Cubic Metres**; groundwater availability is highly heterogeneous

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THE BASIN'S WATER PROBLEMS

- The surface water resources of the basin are largely under-utilized at the aggregate level
- Yet many stretches of the river experience environmental water stress; in some sub-basins, there is **physical scarcity of water**.
- Some stretches of the river are heavily polluted--the problems are more in the naturally water-scarce areas of the basin that also witness high water demands
- Overall, **groundwater in the basin is under-developed**, with total draft remaining far below the annual replenishment
- Yet there are pockets that are witnessing depletion (western UP, for instance), whereas in some other cases, there is ***financial scarcity of water***

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WATER RESOURCES MANAGEMENT CHALLENGES OF THE BASIN

- **Huge spatial mismatch between resource availability and demand**--in the regions where resources are plenty, the demand is quite low (owing to very low per capita land availability and ecological problems) and often the problem is of floods; in the regions where resources are scarce, the demand for water for agriculture and other uses is quite high

- **The region is economically very poor**; there are thousands of small towns located in the basin that do not have proper sewage collection and treatment infrastructure; the untreated sewage directly enters the rivers

- There is very high concentration of polluting industries in certain pockets; effective enforcement of pollution control norms depends on close monitoring

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WATER RESOURCE MANAGEMENT CHALLENGES IN THE BASIN

- The basin is **very intensively cultivated with double to triple cropping in the plains**--paddy-wheat system of cultivation in the middle Ganga (UP and Bihar); and three season paddy in the lower Ganges (West Bengal); the hills of the Upper Ganga have large area under forests and grassland

- Heavy use of fertilizers and pesticides for irrigated crop production which has been increasing for sometime; it is a highly potential source of non-point pollution of both surface and groundwater

- **So far *non-point pollution* has not received much attention**; dealing this will be a much bigger challenge than that of 'point pollution' from municipal sewage and industrial effluent as it is directly linked to rural people's livelihoods

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WATER RESOURCE MANAGEMENT CHALLENGES OF THE BASIN

- There is large-scale investment for wastewater treatment already made, or in progress or planned, under "***Namami Gange***"
- The total investment made since 2012 till March 2023 is **36,512.93 crore rupees (US $ 4.5 billion)**.
- However, demand for treated wastewater in agriculture is very limited and is concentrated in the water-scarce regions (in and around Delhi, and parts of Haryana, and in Bundelkhand region)
- These investments are not financially viable; funds for O & M can be an issue in future
- Taking treated water to some of the places of demand (like the Bundelkhand) is a challenge

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CONCLUSIONS

- Water resource management problems in the Ganga river basin requires a holistic approach, that takes into account the different components of the hydrological system--river flows, groundwater
- It also has to take cognizance of the different sources of water pollution; not merely point pollution, but also non-point pollution from agriculture
- Water quality management in the basin also has to look at areas which require greater attention and where the WWT is economically and commercially viable
- Pollution prevention through the use of market instruments (water resource fee, water pricing, pollution tax, etc.) should receive as much attention as 'pollution treatment'

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PROGRESS IN WASTEWATER TREATMENT

- No. of sewage management projects under implementation: 48
- No of sewage management projects completed: 99
- States covered: Uttarakhand, Uttar Pradesh, Bihar, Jharkhand, West Bengal, Delhi, Himachal Pradesh, Haryana and Rajasthan.
- No of sewage projects under tendering: 27
- No of New sewage projects launched in these states: 8
- For creating a sewerage capacity of 5658.37 MLD, construction work is under progress

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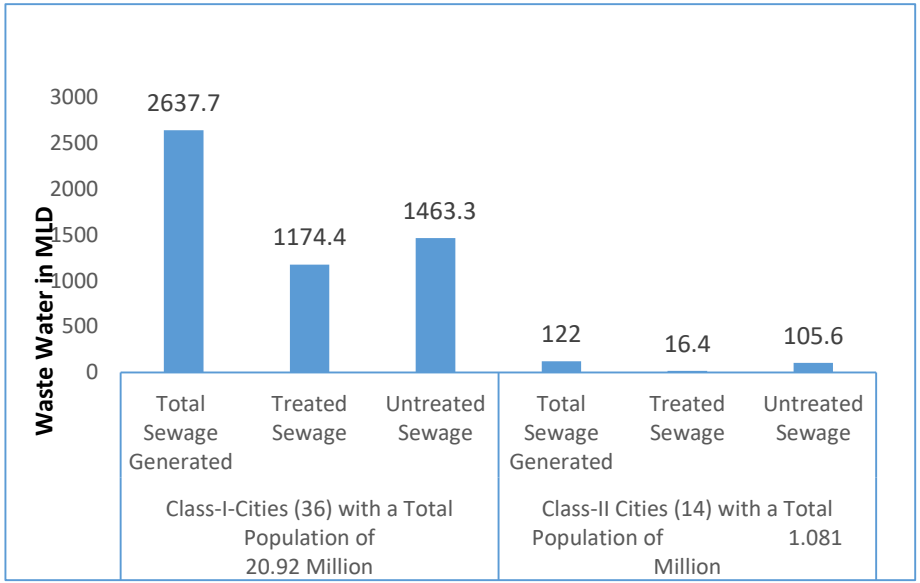
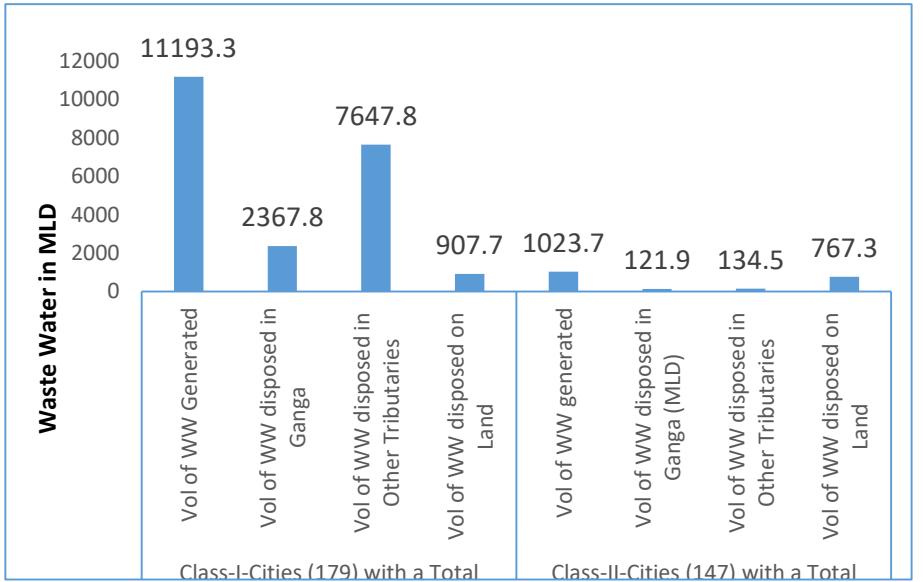
WASTEWATER GENERATION, COLLECTION AND TREATMENT IN THE GANGA BASIN





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STATUS OF EFFLUENT MONITORING

- The number of Grossly Polluting Industries (GPIs) in April, 2019 was 1072.
- Enforcement through regular and surprise inspections of GPIs is carried out for compliance verification against stipulated environmental norms.
- The GPIs are also inspected on annual basis for compliance verification of the pollution norms and process modification, wherever required through a third party.
- First round of inspection of GPIs by the third-party was carried out in 2017 and second round in 2018, and it was observed that out of 961 GPIs inspected in 2018, 636 are complying, 110 are non-complying and 215 are 'closed'.
- Action had been taken against 110 non-complying GPIs and are issued 'closure notice' under Section 5 of the E (P) Act.
- Online **Continuous Effluent Monitoring Stations (OCEMS)** connectivity established to CPCB server in 885 out of 1072 GPIs

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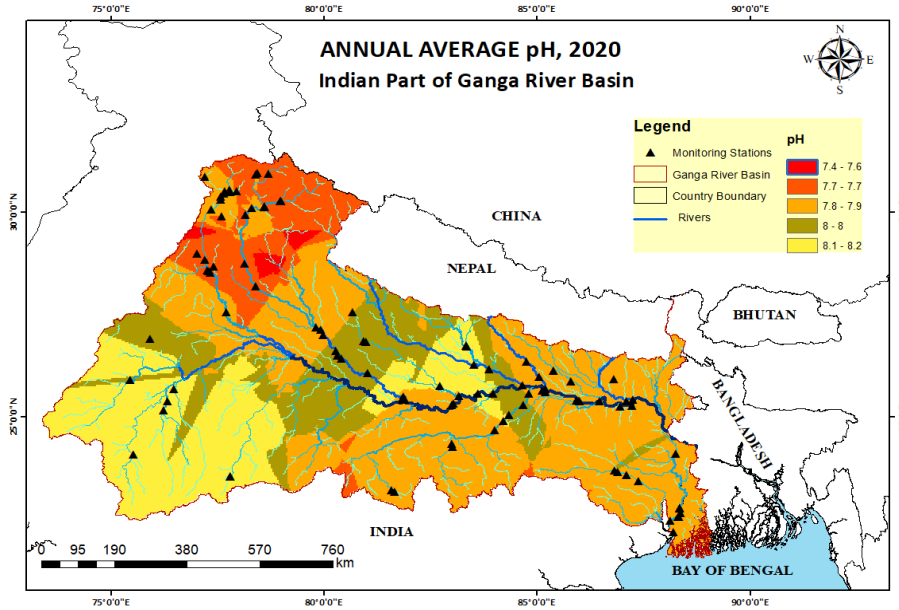
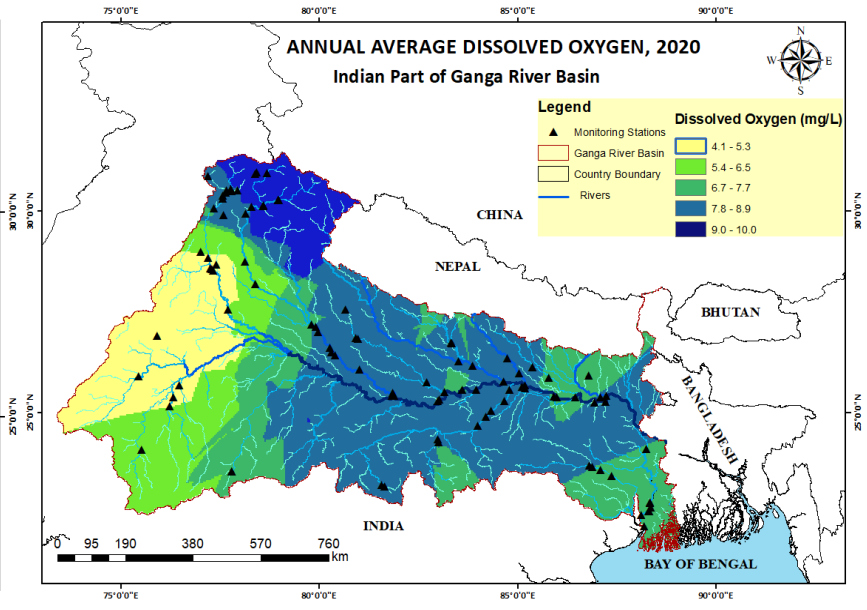
PH AND DISSOLVED EXYGEN IN THE GANGA WATERS: 2020





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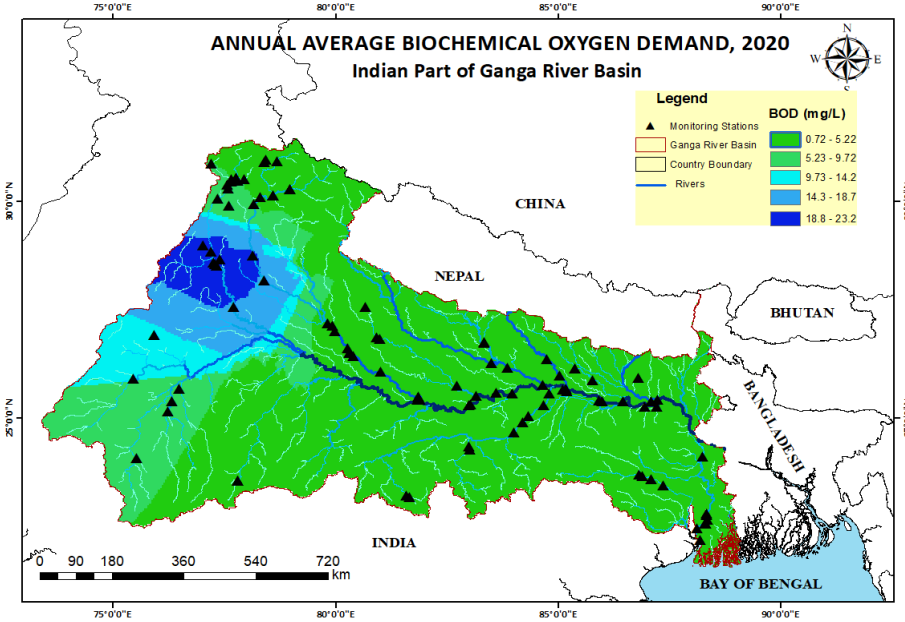
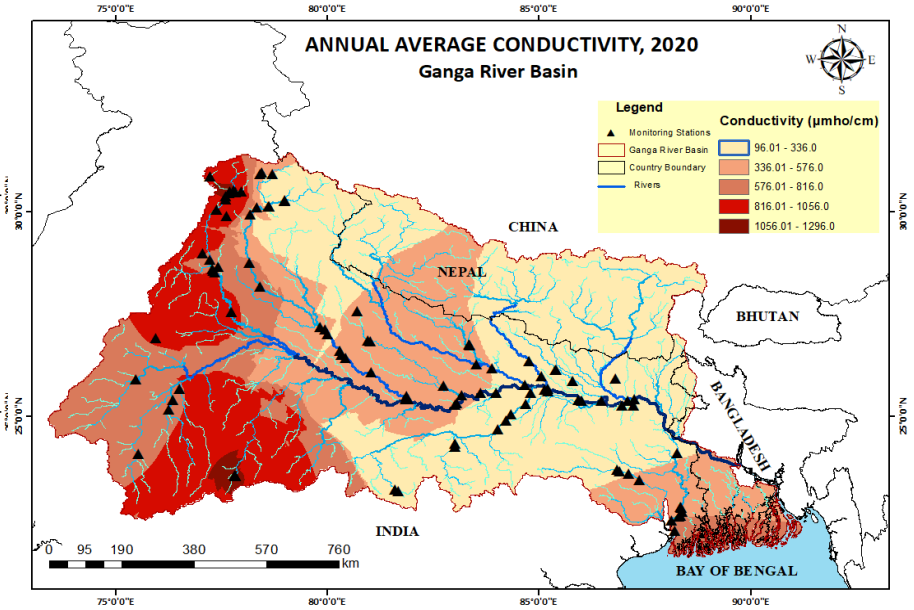
BOD AND AVERAGE CONDUCTIVITY OF GANGA WATERS: 2020





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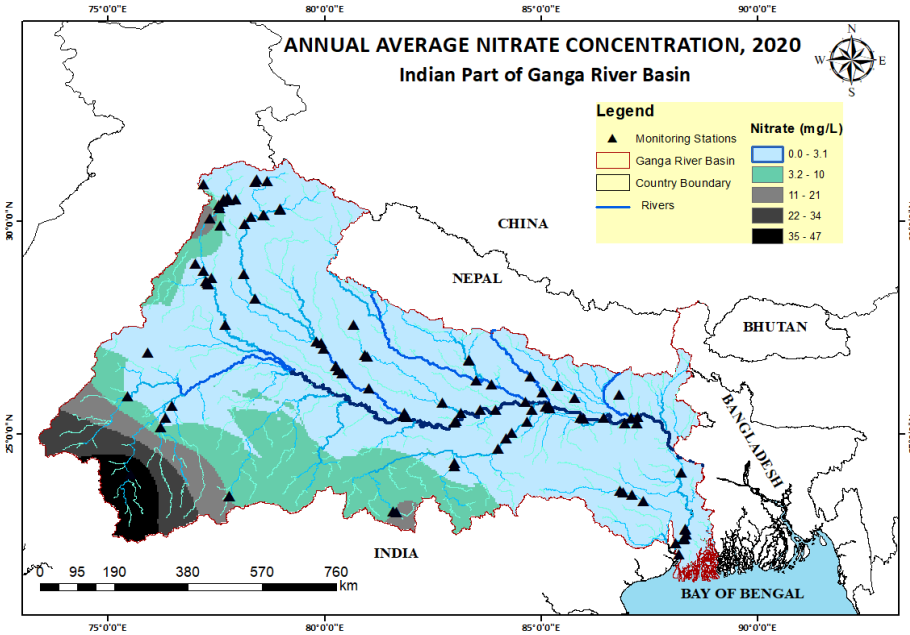
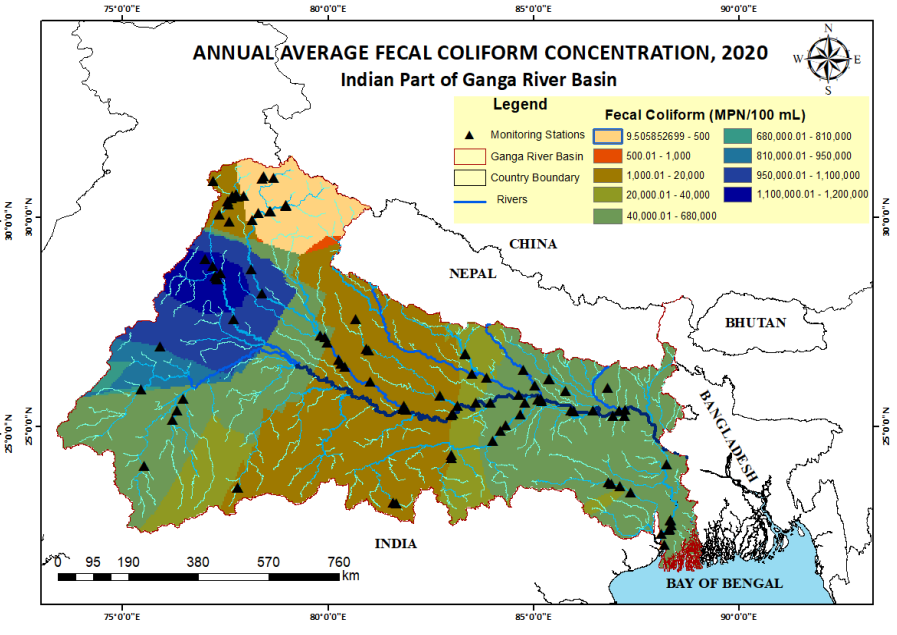
NITRATE CONCENTRATION AND FAECAL COLIFORM IN GANGA WATERS: 2020





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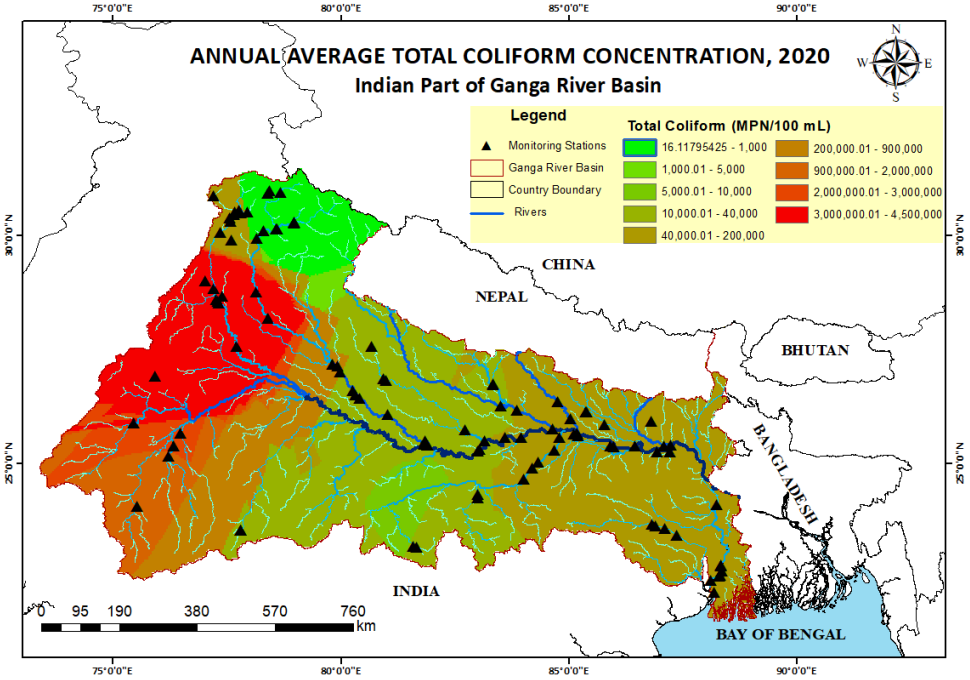
TOTAL COLIFORM IN GANGA WATERS: 2020



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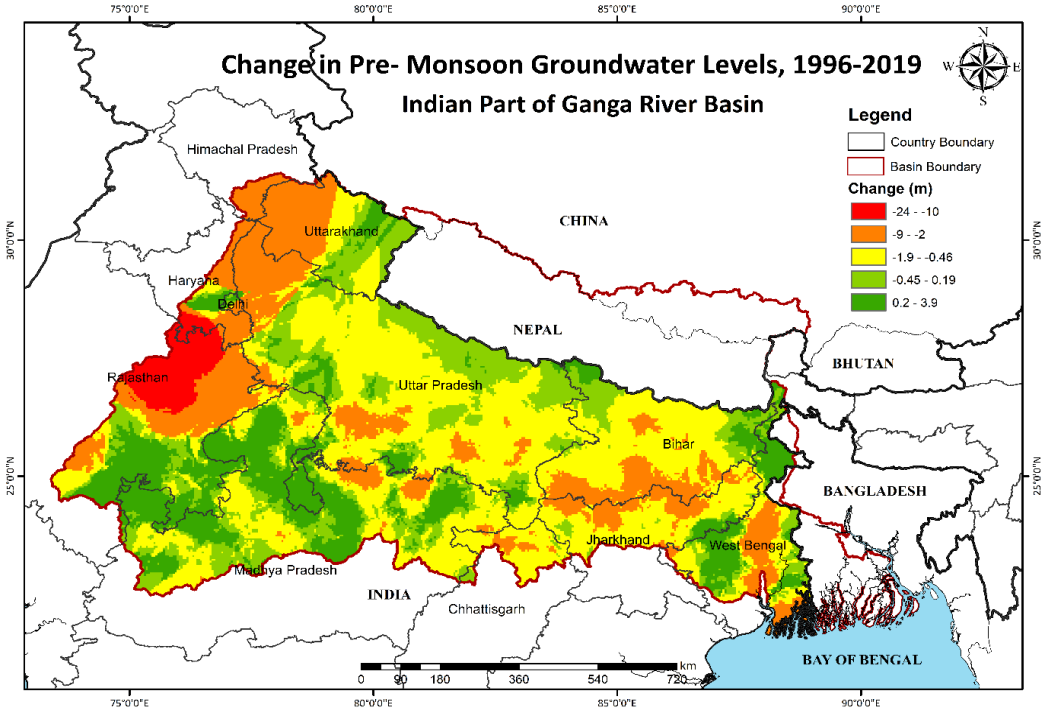
GROUNDWATER LEVEL FLUCTUATIONS IN GANGA BASIN: 1996-2019



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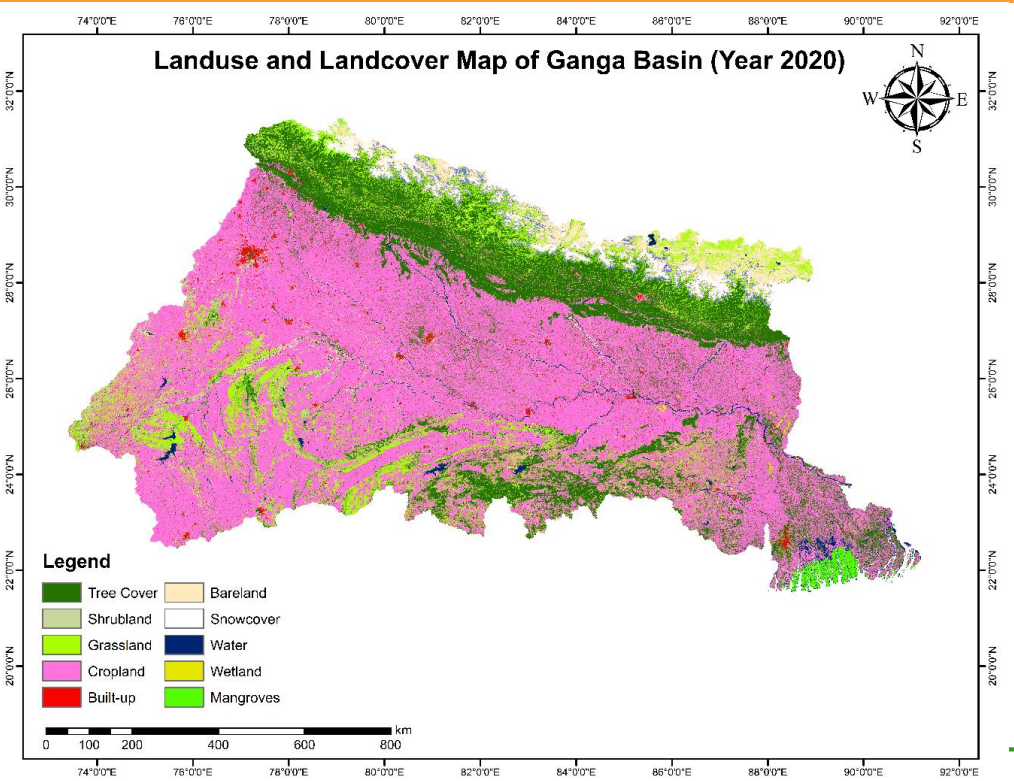
LAND USE IN GANGA RIVER BASIN



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