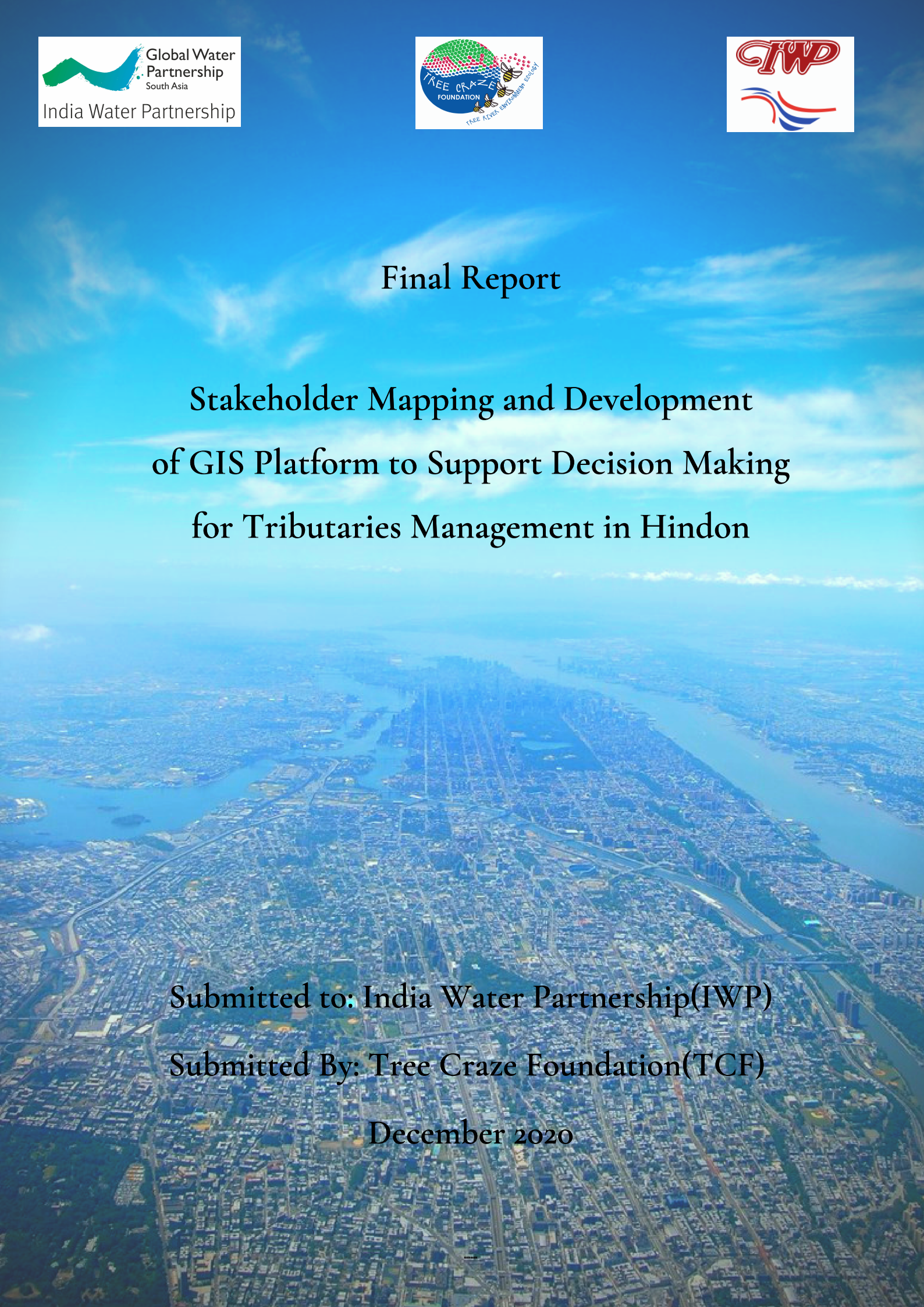

Final Report

Stakeholder Mapping and Development of GIS Platform to Support Decision Making for Tributaries Management in Hindon

Submitted to: India Water Partnership(IWP)

Submitted By: Tree Craze Foundation(TCF)

December 2020

Acknowledgment

We wish to acknowledge Dr. Veena Khanduri, Executive Secretary-cum-Country Coordinator of India Water Partnership for the guidance and mentoring. Our special acknowledgment to Mrs. Sudha Kumari, Mr. Mangla Rai, Mrs. Sushma Sharma, and Mr. Rahul Naithani of India Water Partnership for their constant support. Our sincere thanks to Professor Mohammed Umar Saif of Green India Corporation and Dr. Ravinder Kaur, Regional Council Member, GWP-South Asia; and Principal Scientist, Water Technology Center for their valuable feedback and guidance. We would also like to thank Dr. Somajita Paul, Post- Doctoral Student at Jawahar Lal Nehru University, and Ms. Richa Tomar, Indian Institute of Forest Management to have contributed to the project through short assignments.

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FINAL REPORT

Stakeholder Mapping and Development of GIS Platform to Support Decision Making for Tributaries Management in Hindon River Basin.

Submitted to: India Water Partnership

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December 2020

Brief Summary of the Project

The project aimed at the collation and creation of various spatial and non-spatial datasets of the area on a common and openly accessible platform so that it could aid various stakeholders in the revival of river Hindon. In order to empower stakeholders for river rejuvenation, a dynamic story maps were created for sensitizing children, youth and officials that can play key role in the rejuvenation of river Hindon.

The basic assumption behind the proposed project is that the effectiveness and impacts of remedial action plans for a hydrological sub unit, at local level can be enhanced if an Integrated River Basin Management approach and a coordination mechanism at the hydrological unit of a tributary is juxtaposed with the administrative boundaries in each sub-basin. Therefore, a tributary governance model, which is owned and run by the local community members/citizens in a given hydrological area is envisioned for this project area in the longer term. The project looks forward to act as a conjunction to bring together different stakeholders and sensitizing them to own up their environmental assets.

1. BACKGROUND

The Hindon River

Hindon, a tributary of Yamuna River, originates in Saharanpur District, from Upper Shivalik Hills in Lower Himalayan Range and flows through six districts of Uttar Pradesh namely; Saharanpur, Muzaffarnagar, Meerut, Baghpat, Ghaziabad and Gautambudh Nagar until its confluence with Yamuna River towards south of Tilwara village in Gautambudh Nagar district, downstream of Delhi. The River is entirely rainfed and has an approximate catchment area of 5975 km2. The Hindon River in the past years had clean and safe water, but in the recent years due to substantial water abstraction & severe pollution loads, the river and its tributaries are now at the verge of dying. A lot of efforts have been made by the Government of Uttar Pradesh, NGOs, VOs and the people in the past, however a holistic basin level approach is still needed to rejuvenate the River and its tributaries to bring them in original form.

Brief of Initiatives and Activities Undertaken by India Water Partnership (IWP) for Hindon River Rejuvenation

Hindon River Rejuvenation Initiative

In early June 2015, Jal Jan Jodo Abhiyan ('the union of water and people') launched an initiative to rejuvenate the Hindon River. With the aim to inspire a participatory water resource management approach for the rejuvenation and revival of the Hindon Basin, the Jal Jan Jodo Abhiyan was spearheaded by the Waterman of India, Shri Rajinder Singh. At the first "Hindon River Panchayat" (parliament) meeting on 11th of June, 2015 the forum brought together key actors, including state government representatives, industry, civil society, and academia in order to mobilize public engagement and catalyze cooperation. It was collectively concluded that there is an urgent need for river revival through community engagement. 2030 Water Resources Group (2030 WRG) came forward to support the Government of Uttar Pradesh for rejuvenation of the Hindon river and approached India Water Partnership (IWP) to join hands with them for this initiative.

Mapping of Multi-Stakeholders in Hindon Basin Area

Multi-stakeholder mapping is an important exercise in the stakeholder engagement process. It is important so as to understand who the relevant stakeholders are and therefore draw their key concerns and interests. Multi-stakeholder mapping is a collaborative process of research, debate and discussion including direct interaction with the stakeholders.

Before undertaking ground level implementation activities, several rounds of consultations were held between 2030 WRG and India Water Partnership (IWP) and it was decided to first have mapping of the multi-stakeholders in Hindon River Basin area that can support the process and help in undertaking ground level implementation activities. For the purpose, a structured questionnaire developed by IWP was circulated among the stakeholders through on-line to know their interest and willingness to work for rejuvenation of the Hindon River. The stakeholders were identified on the following criteria:

(i) Their knowledge in water use and water quality levels in the country, especially the Hindon river;

(ii) The expected role they can play in rejuvenation of the river;

(iii) In what type of program they would like to be engaged (Agriculture, Industry, Domestic (urban and rural), Environment);

(iv) Degree of their involvement in the work program, etc.

Some of the respondents who could not respond on-line, were interviewed through telephone and few were also interviewed through personal visits. Based on the responses received, 66 different types of key stakeholders were identified. Type-wise details of the stakeholders are given in the following table below and list of the same is attached as **Annexure -IX**.

S.No.	Type of stakeholder	Number
1.	Civil society	28
2.	Industry	12
3.	Research/Academia	7
4.	Government	19
Total		**66**

Number of stakeholders as per the work program (Agriculture, Industry, Domestic (urban and rural), Environment) are given in the following graph:

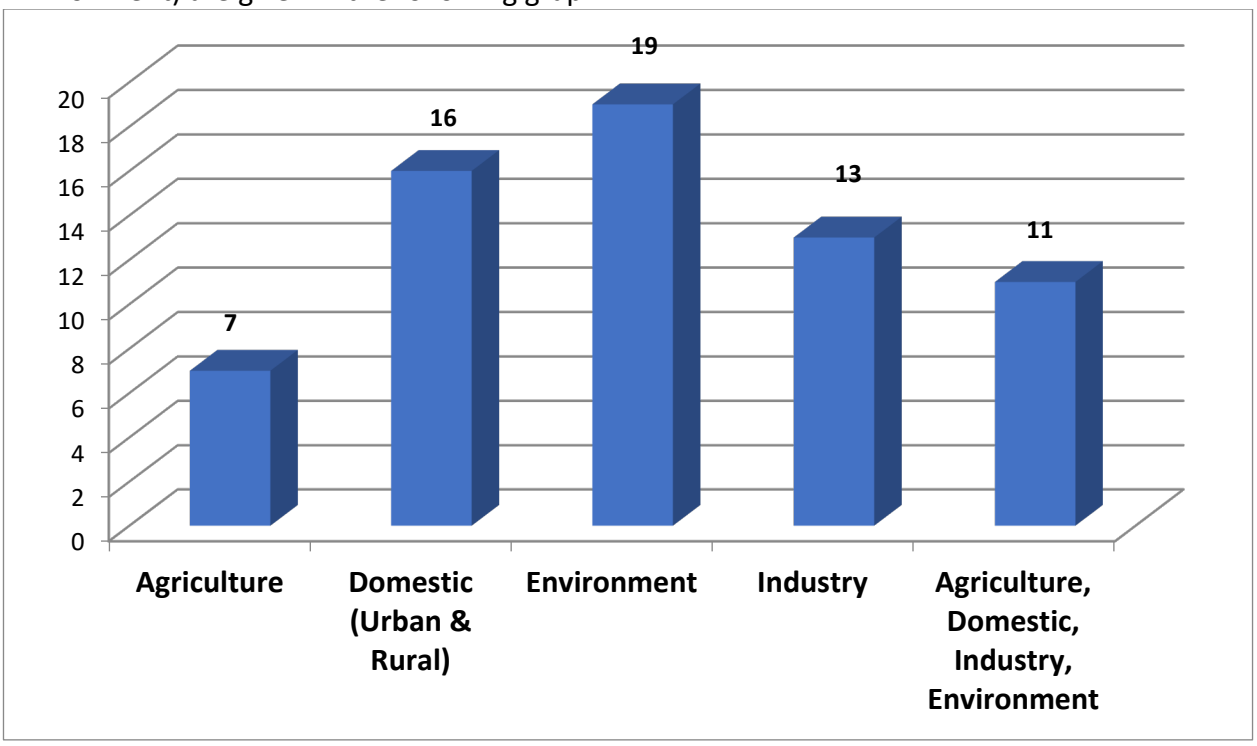


Figure 1 No. of Stakeholders as per the Work Program

Wide stakeholder engagement culminated into constitution of one State Level Committee on March 21, 2016 by Chief Secretary, Uttar Pradesh, followed by one Hindon Basin Committee chaired by Divisional Commissioner, Meerut & Saharanpur. The 2030 WRG and IWP represented and participated as a

member of Committee constituted by Government of Uttar Pradesh and Hindon Basin Committee. Thereafter, a high-level vision was developed with intensive stakeholder consultation through the Hindon Yatra exhibition & workshops in every Hindon District. The exhibition and compendium of good practices was launched by the then Chief Minister of Uttar Pradesh in June 2016. Further, an agreement to establish multi-stakeholders River Rejuvenation Partnership (RRP) was signed on August 25, 2017 between WAPCOS Limited, International Finance Corporation (on behalf of 2030 Water Resources Group) and India Water Partnership.

Divisional Commissioner, Meerut took a note of all these initiatives and supported Hindon Rejuvenation efforts by giving a new name to the existing program as "Nirmal Hindon Initiative (NHI)". The NHI Secretariat is functioning from the Office of Divisional Commissioner, Meerut.

In 2018, IWP supported Divisional Commissioner, Meerut (vested upon the responsibilities of rejuvenating Hindon river by Government of Uttar Pradesh) with the help of 2030 Water Resources Group, INTACH and local stakeholders (Govt. of Uttar Pradesh senior line department officials/ NGOs/VOs/farmers to prepare a Road Map for Hindon river rejuvenation. The Road Map consists of five verticals viz; Afforestation, Organic Farming, Ponds Rejuvenation, Waste Management; and Participation and Governance. Various activities will be undertaken with the help of stakeholders and Government of Uttar Pradesh based on the five identified verticals. For this, Nirmal Hindon Technical Workshop for knowledge sharing and capacity building of stakeholders was organized on 9th June, 2018 at Divisional Commissioner, Meerut (Uttar Pradesh) to seek suggestions of various stakeholders to finalize the Road Map. List of stakeholders who attended the workshop is given in **Annexure-X**.

IWP undertook the following tasks in 2019 to support 2030 WRG for Hindon river rejuvenation:

- Undertook on-site visits to Hindon river area for problem identification to suggest remedial measures;
- Provided support to Indian Institute for Toxicology Research (IITR) in data collection;
- Liaised with key stakeholders from local administration, Government of Uttar Pradesh and National Mission Clean Ganga, NGOs, local community, local industry partners and research institutions for speedy action-oriented tasks to be undertaken;
- Examined the documents prepared by Nirmal Hindon Initiative (NHI) to provide inputs into the Hindon Vision Document;
- Helped 2030 Water Resources Group for preparing draft Vision Document;
- Reviewed draft vision document for finalization and submission to Government of Uttar Pradesh;

All the above initiatives led to formation of a Multi-Stakeholders Platform for Ganga/Hindon Tributary Management on 19th June, 2019 launched by Mr. Anup Chandra Pandey, I.A.S., Chief Secretary of Government of Uttar Pradesh.

Following process was adopted for Hindon river rejuvenation from 2015 to till 2019:

Figure 2 Process for Hindon Rejuvenation

In 2020, IWP with the support of Tree Craze Foundation undertook "Stakeholder mapping and development of GIS platform to support decision making for tributaries management in Hindon River basin". A detailed report on the same is provided below.

2. EXECUTIVE SUMMARY

The project *"Stakeholder Mapping and Development of GIS Platform to Support Decision Making for Tributaries Management in Hindon River Basin"* was primarily designed keeping in mind the tributary level governance model, where the hydrological unit is owned and run by local community members/citizens based on a multi stakeholder partnership approach. It intended to offer a one stop technological solution for a variety of datasets and to a versatile user base for the identified hydrological unit viz. Hindon River Basin in the form of a standard GIS dashboard.

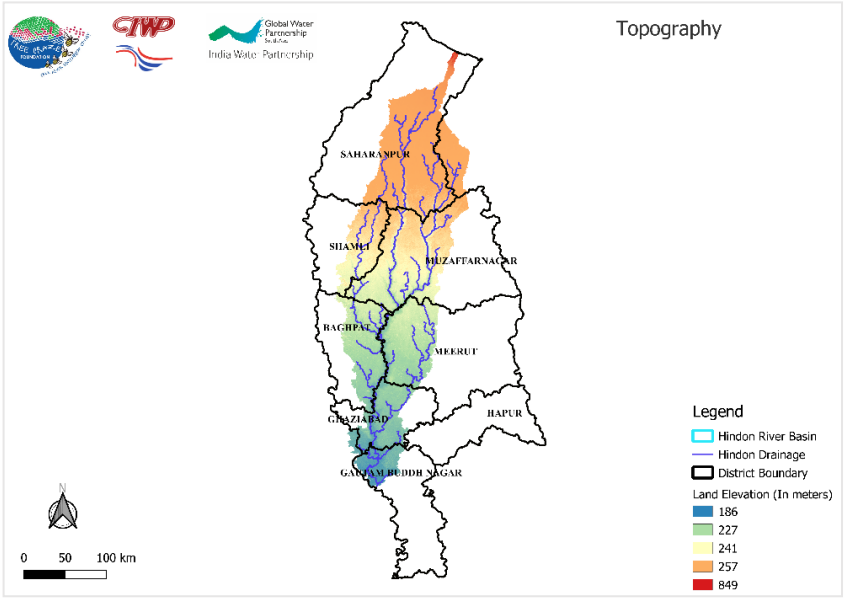


Figure 3: Topography of Hindon River Basin

Also, it is a common experience that no governance model can be successful without the informed and active ownership of the community. Therefore, the project also aimed at sensitizing and bringing together different stakeholders in the community in order to consolidate their efforts, thereby facilitating dialogues, joint fact finding and decision making by organizing community sensitization sessions. Key achievements of the project are enlisted below:

- During stakeholder mapping it was emphasized to present story maps as an educational tool for awareness generation for various stakeholders to know about River rejuvenation as well as about how human interventions has impacted the river health and how to protect the river and its tributaries. Therefore a pilot story map session was organized for various stakeholders of Shamli and Saharanpur districts of Western Uttar Pradesh in the Hindon basin where the participants included District Development Officers, Shamli and Saharanpur; Representative from 2030 Water Resources Group and others to sensitize them for the damage done to the river and their role in its protection and rejuvenation.
- Development of Hindon Basin dashboard with detailed report for each district along with a consolidated report for all districts was created during the project period. This finally paved the way ahead towards designing a decision support system utilizing robust scientific technologies for effective and efficient decision making.
- The project outputs viz. the dashboard and the story maps were also presented before several partner organizations including one of the key authorities of Ministry of Jal Shakti, The National Mission for Clean Ganga (NMCG), in order to gather their perception and their insights on the project.

3. PURPOSE

3.1. The overall objective of the project was to develop a platform that maps all the key stakeholders and key features of Hindon Basin, to develop a shared vision for river Hindon and to strengthen the tributary governance of river Hindon. The project aimed at:

3.1.1. Collation of maximum possible available GIS and non-GIS datasets with different agencies on a common forum and provide all the stakeholders with a one stop GIS solution that contains key information required for decision making, thereby making it a model Decision Support System (DSS) for Hindon & Ganga Tributary Management.

3.1.2. Community sensitization through story maps and initiating workshops for various stakeholders in the basin to bring them together, sensitize them about the challenges of rivers and their role in the revival of their rivers.

3.1.3. How a decision support system for Multi-Stakeholder Platform (MSP) for Hindon & Ganga Tributary Management should be designed and implemented and efficiency of story maps in sensitizing school students for tributary management.

3.2. Broader aim of the project was to bring about a sense of ownership in the society for the rivers and enable key stakeholders to work towards rejuvenation of Hindon River utilizing a robust scientific approach in tandem with the local knowhow.

3.3. This project was envisioned as the first step towards the development of a decision support system that enables efficient decision making by key stakeholders. It is anticipated that this project shall not only support the Nirmal Hindon Initiative of India Water Partnership but will also strengthen the Multi Stakeholder Platform (MSP) for Hindon formed by the State Government of Uttar Pradesh.

4. RESULTS

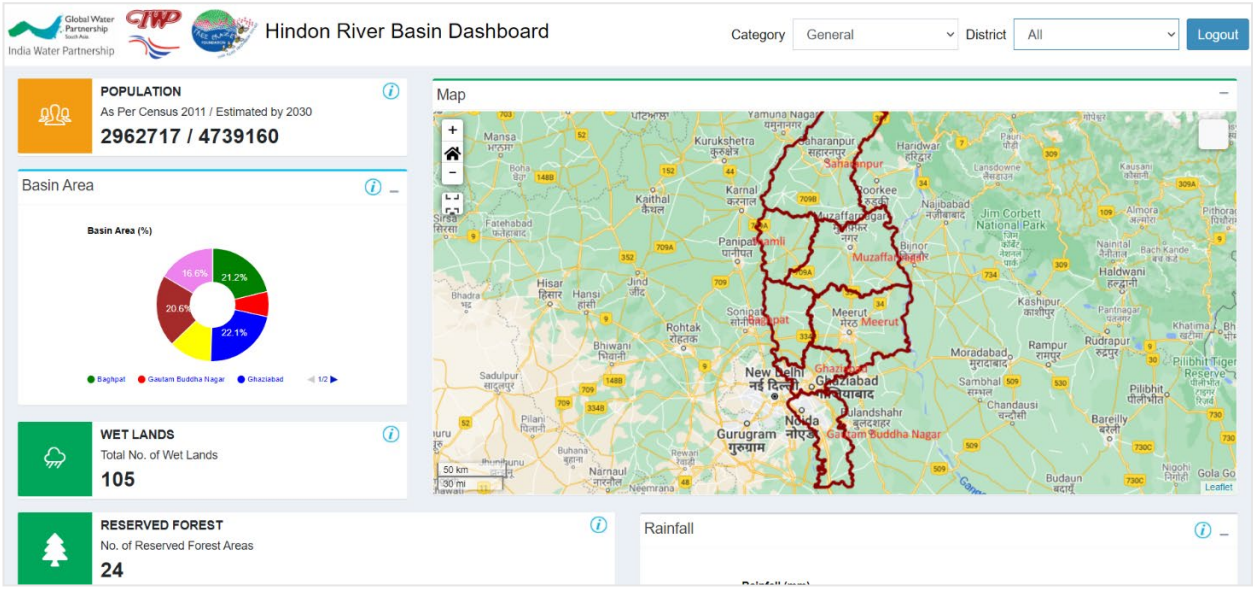


Figure 4 Hindon River Basin Dashboard

4.1. Narrative:

4.1.1. The project has offered a one stop GIS based solution to the key decision makers and various stakeholders in the basin. The data available in public domain and in various recent reports by several agencies was collated during the project period and presented to different stakeholders in the basin as a statistical cum GIS dashboard thereby incorporating their suggestions and making it easily and openly accessible.

4.1.2. Majority of the datasets like the rainfall data; soil texture & depth data; ground water level & ground water status & heavy metal contamination, if any, in ground water; surface water quality data; no. & type of industries & their compliance status in various districts of Hindon Basin; sewage generated v/s STP capacity; biomedical & hazardous waste generated in the districts v/s waste treated statistics; drain type, discharge status and drain tapping status were collated from the most authentic resources available freely, but some data sets like the district boundary, forest cover classification and forest type classification datasets were procured from agencies like Survey of India and Forest Survey of India respectively. Other important datasets for decision makers, which were not openly available like the land cover of the basin, natural drainage and topographical layers etc. were also derived utilizing remote sensing and GIS technology during the project.The creation of openly accessible dashboard would not only reduce the redundant effort of data collection and creation by different agencies using versatile methodologies, but will also ensure the uniformity in

derivations of various outcomes/decisions for the given area by utilizing a common input dataset.

4.1.3. Several datasets of different years like the rainfall, ground water level, surface water quality etc. have been collated together and incorporated in the dashboard as statistical graphs which would assist the users in analyzing trends over a period of time.

4.1.4. An attempt was made to sensitize the community about the natural physiology of river and the impact of human interventions on river physiology, utilizing story maps approach. The stories also pondered upon the little changes in our actions that could go a long way in saving our rivers and our environment. Two story maps were developed for the school students utilizing ESRI (Environmental Systems Research Institute) story map platform. Although the intended audience were the school students but the content was so well appreciated by the partners that a multi-stakeholder sensitization workshop was conducted for various stakeholders of Shamli District.

4.1.5. The dashboard and the story maps developed as a part of this project were shared with several partner organizations including a detailed presentation before senior officials of National Mission for Clean Ganga (NMCG) which include Shri Rajeev Ranjan Mishra, I.A.S., Director General; Shri Ashok Kumar Singh, Executive Director (Projects); and Shri Rozy Aggarwal, Executive Director (Finance).

4.1.6. The dashboard was well appreciated by the NMCG officials. They found the dashboard useful for the implementation of microlevel river management. It was suggested to add GIS based query management in the dashboard to make it even more useful.

4.1.7. The officials also liked the story map approach and found the content not just useful for the school students but also suggested it to be a useful resource for NYKS (Nehru Yuva Kendra Sangathan). An article on the "Physiology of river utilizing the story map approach" was published in the 21st edition of Namami Gange magazine. (*https://nmcg.nic.in/Newsletter/Dec2020/index.html*)

4.2. Outcomes:

4.2.1. The project envisages to bring about several long-term benefits to the society:
Bringing together all the available datasets with different agencies on to a common platform and development of a GIS based dashboard with open access to all the stakeholders would not only save the time and efforts of various partners but also assist the decision makers to arrive at efficient and impactful scientific conclusions in the interest of the environment and community as a whole.

4.2.2. Bringing together of all the stakeholders in the community on a common forum and substantiating the utilization of standard input datasets by different users would lead them to a scientific but uniform solution to a common problem thereby keeping aside the undue conflicts related to the authenticity of the data used by different agencies from a variety of sources.

4.2.3. Sensitizing community towards their role in river rejuvenation and reversal of damage done so far to our rivers would not only bring about a sense of ownership in the community but may also lead to a mass movement to save our environment, which actually is the need of the hour.

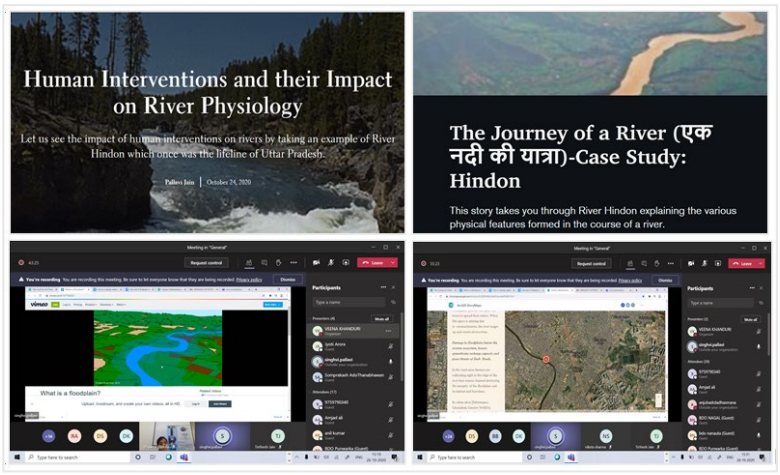


Figure 5 A Glimpse of Story Maps

4.3. Outputs:

The list of datasets collated/created during the project includes:

4.3.1. Creation of natural drainage and topographical map of the area using SRTM 30m dataset

4.3.2. Derivation of Hindon River Basin Boundary based on the topographical map derived.

4.3.3. Creation of Land Cover data for the Basin using Google Earth Engine utilizing Landsat 8 data

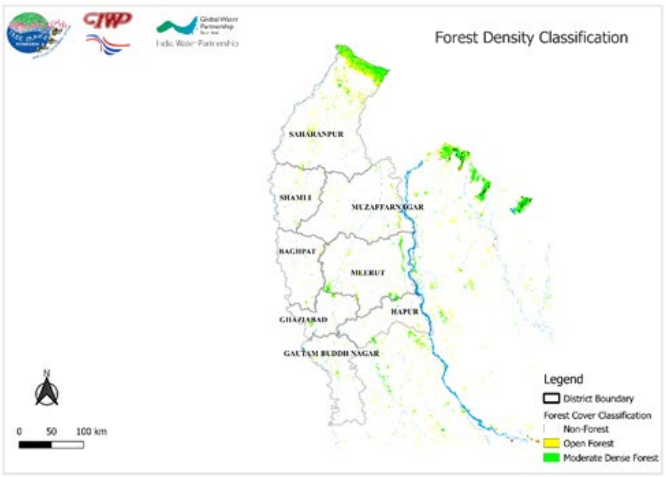


Figure 6 a. Forest Density Classification

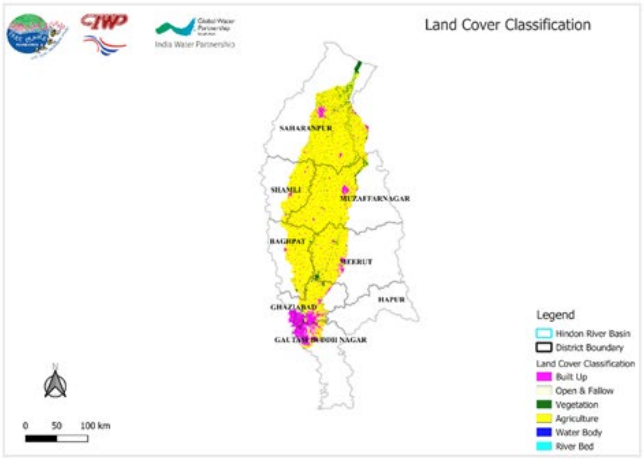


Figure 6 b. Land Cover Classification

4.3.4. Collation of datasets from authentic sources and bringing them to a common platform.

Table 1 Data Type, Source & Year

S.No.	Data	Type	Source	Year
1	Forest Cover and Type	Shapefile	Forest Survey of India	2019
2	Rainfall	Values	India WRIS Portal	2014-2019
3	Soil Texture and Depth	Values	Department of Agriculture, Cooperation & Farmers Welfare	
4	Groundwater Level	Values	India WRIS Portal	2014-2020
5	Land Use Land Cover	Raster	Derived from Landsat 8	2020
6	Agriculture: Cropped and Net Sown Area, Area under different crops, Source irrigated area	Values	Area and Production Statistics, Ministry of Agriculture and Farmers Welfare	2015-16
7	Number of Industries and its Type	Shapefile	UPPCB Action Plan	2018-19
8	Groundwater Status	Values	Ground Water Department, Government of Uttar Pradesh	2017
9	Sewage Generated and STP Capacity – Installed and Proposed	Shapefile -STP	UPPCB Action Plan	2018-19
10	Biomedical Waste – Generated & Treated	Values		
11	Groundwater sampling sites where heavy metal concentration is above compliance limit	Values, Lat/long available for some sampling sites		

12	Drain – Type, Discharge, and Tapping Status	Values, Origin and confluence lat/long available		
13	Industry Compliance Status	Values, Industries location available		
14	Surface Water Quality	Biochemical Oxygen Demand, Faecal Coliform	India WRIS Portal	2010-19

4.3.5. District wise reports (which could be downloaded from the dashboard) – also attached in **Annexure I-VII.**

4.3.6. Development of story maps for two themes listed below.

4.3.6.1. The Journey of a River: Case Study Hindon: https://arcg.is/1jvz

4.3.6.2. Human Interventions and their Impact on River Physiology: https://arcg.is/1f1TS80

These story maps were also translated in Hindi to make it more useful for stakeholders as the Hindon river basin is mainly in the Hindi speaking belt.

4.3.7. Story map sensitization sessions:

India Water Partnership (IWP) organized a webinar displaying "Story Maps for Hindon River" on 26th October, 2020 in association with its network partners; Tree Craze Foundation and Green India Corporation. The purpose of this webinar was to sensitize students and stakeholders about the existing problems in the Hindon River and its tributaries (Krishni & Kali rivers) by explaining the physical features of a river, human interventions and their impact on river physiology taking the case study of Hindon River with an intent to sensitize the audience to stand up for the rejuvenation of Hindon River and its tributaries. More than 35 persons attended the webinar, the details of which are given in Minutes of Meeting given in **Annexure VIII**.

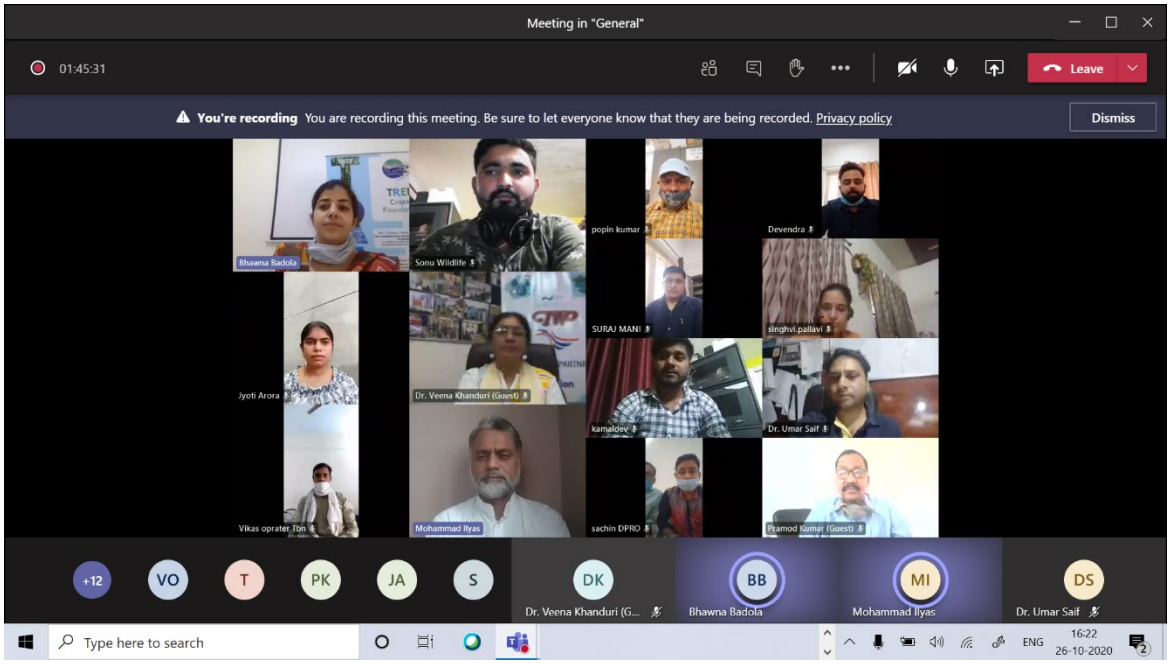


Figure 7 Story Map Workshop for Shamli

4.3.8. Conducted project workshops in order to gather the insights of various stakeholder groups on the work done so far (GIS based Dash Board and Story maps) and to define the further course of action.

Figure 8: Dashboard and Storymaps presentation to NMCG

On 15th December 2020, story maps and dashboard were also shared with senior officials of National Mission for Clean Ganga that includes Mr. Rajiv Ranjan Mishra, I.A.S, Director General; Mr. Rozy Agarwal, Executive Director (Finance); and Mr. Ashok Kumar Singh, Executive Director (Projects). The story maps and dashboard were both appreciated where it was suggested that these story maps can be shared with Nehru Yuva Kendra Sangathan Ganga Doots (Ganga messangers) and the dashboard can be shared with District Ganga Council and concerned District Magistrates.

4.3.9. Meeting with WRG 2030

In January 2021 the story maps and the dashboard created in the project were also presented before the senior officials of WRG 2030 that included Mr. Anil Sinha, Senior Strategic Advisor; Mr. Yuvraj Ahuja, Partnership Coordinator, Uttar Pradesh & Mr. Nitin Verma, Consultant. The story maps were very well appreciated and they agreed to present them in the upcoming meeting of the District Environmental Committee. They also agreed to the fact that the dashboard was also designed thoughtfully but at the same time also insisted on defining its ownership at the earliest so as to keep it updated and ensure its optimum utilization.

5. CHALLENGES, LESSONS LEARNT & BEST PRACTICES

5.1. Story maps sessions which were initially proposed to be conducted as face-to-face sessions in two schools were conducted as virtual sessions for multiple stakeholders due to the unprecedented COVID scenario.

5.2. Also, in order to enhance its reach within different stakeholder groups within the community, a pilot was conducted for various stakeholders including district magistrate of Shamli, members of gram sabha like gram pradhans, gram sachivs and students from schools for Shamli district and members from various partner organizations on 26th October 2020. It was further decided to train the team of trainers which include eco-club students from various schools in different districts, representatives from various youth groups and other stakeholder groups to penetrate the story map content on ground, using the multiplier effect.

5.3. Based on the feedback received from the partners the story maps which were initially developed in English were made bilingual and a lesson was learnt that any community level intervention would be more effective when planned and conducted in a local language.

5.4. Some stakeholders suggested having a real time data collection/validation tool for the field survey team such that the data collected on ground can be directly reflected on dashboard.

6. SUCCESS STORIES (case study)

- Story maps produced for the project was appreciated by almost all stakeholders and was recommended as an effective awareness tool for volunteers that are conducting various awareness drives. It was also mentioned that it can also be shared with Gram Pradhans, other district and state officials along with children and youth as several officials do not understand

the river morphology which is very essential for effective decisions for river rejuvenation efforts.

- Dashboard received a mixed response from the stakeholders where most agreeing that it will be useful for the preparation of Detailed Project Report (DPR) preparation and also for overall river basin management. Some stakeholders also felt that it contains too much information, and it can be customized for the identified users. Some mentioned that there is a need to link it to a mobile app to make it more useful. All these feedbacks are being considered to design the second phase of the project.

7. MONITORING ARRANGEMENTS

7.1. The pilot session of the story maps also included a feedback form to be filled in by the attendees. Although out of the 34 attendees in the session, only seven duly filled forms were received. Following conclusions were derived based on the choices selected by the attendees.

7.1.1. **Effectiveness of story map**: 42% of the attendees strongly agreed to the fact that a story map is more effective than a simple lecture or presentation while 57% agreed to it.

7.1.2. **Content of the story map**: 42% of the attendees strongly agreed that the content presented through the story map was very useful for their current role while 57% of the audience agreed to it.

7.1.3. **Impact and effectiveness of the presentation**: 71% of the audience agreed that their knowledge about rivers and impacts of their collective actions on the river has increased after the webinar.

7.1.4. **Preparation of presenter**: 71% of the audience was satisfied with the flow of the session and the preparation of the presenter.

7.2. An updated backend dataset is the key to the success for an effective decision support system. It shall therefore be our utmost priority to assign the ownership of the dashboard to its administrators so that the data is regularly updated. Though presently it is not yet decided that who will be the administrator, but during feedback with various stakeholder's it was suggested that it is always good to handover the dash board to State government department to ensure regular updation and optimum utilization of the available datasets.

7.3. As per the feedback received from partner organizations on the data collated, a mechanism to validate the collected data on ground should be established in order to authenticate and claim the validity of the collected datasets from various sources. However, ground truthing exercise was not undertaken due to the limited resource availability.

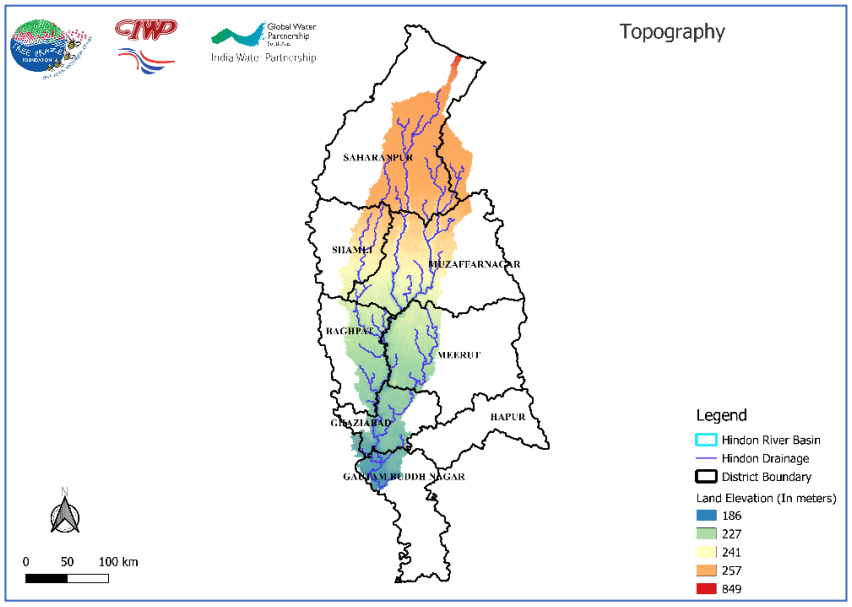
8. Resources

8.1. The proposed project did not had a component of dashboard creation at the time of inception. Due to COVID, as no field excersise were undertaken and hence It was later decided with the mutual consent of IWP and TCF that the project outcomes during the project and their importance could be better displayed and conveyed to the non-GIS community, if we have a statistical cum GIS dashboard.

8.2. Accordingly IWP and TCF team had discussion and it was decided to engage a consultant for a period of 3 months who is having background and expertise for developing a Dashboard for Hindon River Basin. The dashboard designed in the first phase of the project could later on be developed as a GIS based advanced decision support system which could be jointly used by the stakeholders.

Annexure I: Consolidated Report of Hindon River Basin

Geography

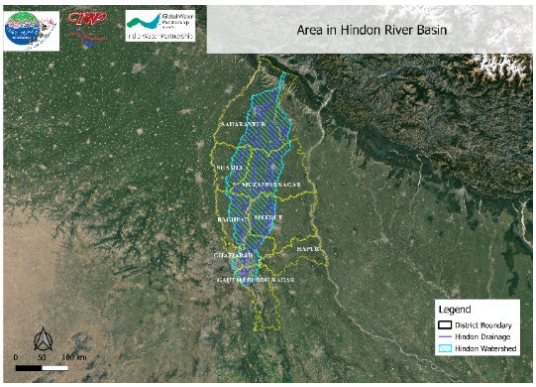


The river is believed to originate in Saharanpur district of Uttar Pradesh. The elevation near Saharanpur city is 267 meters above MSL which declines to 243 meters above MSL downstream at Maheshpur in the same district. It passes through Muzaffarnagar district (which includes Muzaffarnagar and Shamli), Baghpat, Meerut, Ghaziabad and Gautam Buddh Nagar (GB Nagar). Its declines to 197 meters above MSL in GB Nagar.

Figure 9 Topography of Hindon Basin

Source: Derived using SRTM 30 meter data

Basin Area and Population



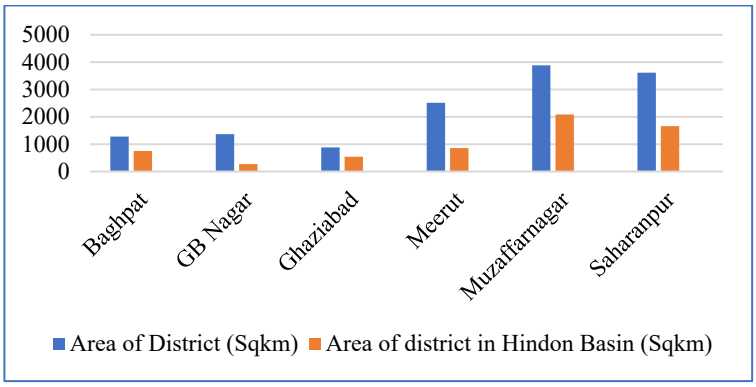


Figure 10 Total area of district v/s Area of district falling in Hindon Basin

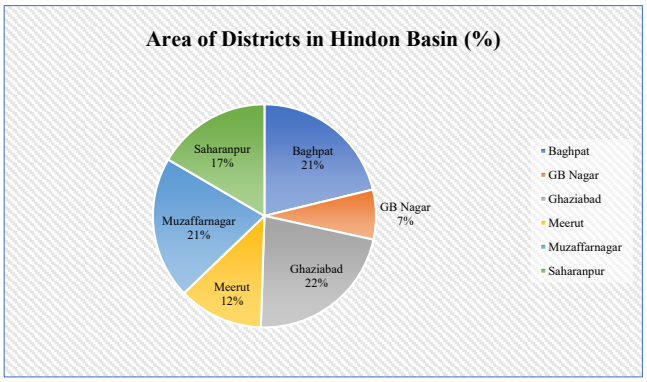


Figure 11 Area statistics of Hindon Basin

Table 2 Area and Population Statistics of Hindon Basin Districts

District	Population* (As per Census 2011)	Estimated Population 2030**	Area of District (Sqkm)	Area of district in Hindon Basin (Sqkm)	Area of district in Hindon Basin (%)
Baghpat	50310	61733	1281.80	752.98	58.74
GB Nagar	-	-	1367.58	273.34	19.98
Ghaziabad	1648643	2972718	882.41	540.22	61.22
Meerut	58252	74732	2512.80	856.70	34.09
Muzaffarnagar (and Shamli)	500034	660975	2657.07	1516.49	57.07
Saharanpur	705478	969002	3612.81	1658.63	45.90
Consolidated Area Statistics	-	-	2052.41	933.06	46.16

Source: Administrative Atlas of Uttar Pradesh Vol 1, Census of India, 2011
/ Population figures are for city only*

Land Cover

Table 3 Land Cover Statistics of Hindon Basin Districts

District Name	Built-up (%)	Open & Fallow (%)	Vegetation (%)	Agriculture (%)	Waterbody (%)	Riverbed (%)
Baghpat	4.08	0.87	1.28	93.65	0.11	-
GB Nagar	48.66	17.98	4.09	29.01	0.26	-
Ghaziabad	25.58	6.81	3.11	63.77	0.72	-
Meerut	6.01	1.46	2.59	89.50	0.44	-
Muzaffarnagar (and Shamli)	4.49	0.38	2.03	92.98	0.12	-
Saharanpur	4.62	0.74	6.05	88.27	0.09	0.22
Consolidated Statistics	15.57	4.71	3.19	76.20	0.29	0.04

Source: Derived using Landsat 8 (30 meter) image, 2020

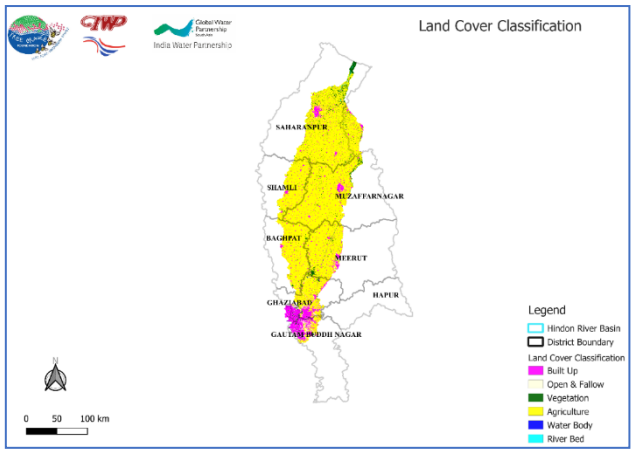


Figure 12 Land Cover Classification of Hindon Basin

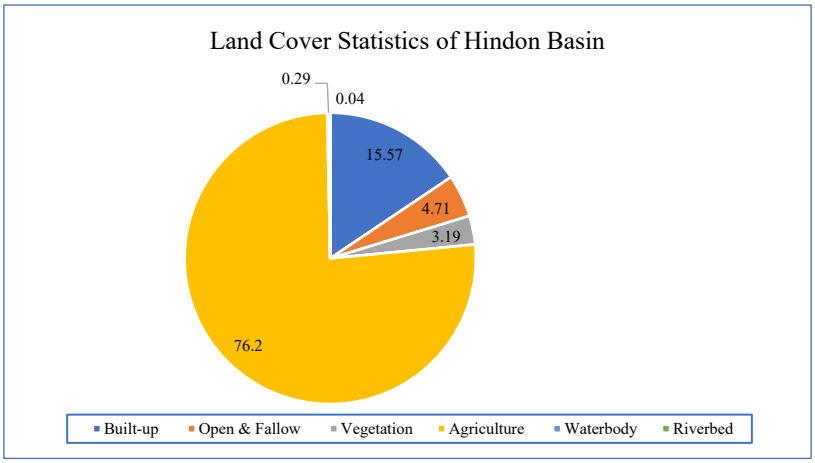


Figure 13 Land Cover Statistics of Hindon Basin

Rainfall

Table 4 Rainfall data of Hindon Basin Districts

District	Normal (mm)	2018-2019 (mm)	2017-2018 (mm)	2016-2017 (mm)	2015-2016 (mm)	2014-2015 (mm)	2013-2014 (mm)
Baghpat	649	902.87	594.58	499.63	637.89	644.01	462.16
GB Nagar	-	667.45	584.76	501.61	572.93	556.75	441.67
Ghaziabad	750.3	767.25	559.75	501.15	570.74	553.7	439.05
Meerut	904.7	1057.02	542.83	489.54	587.3	566.02	437.85
Muzaffarnagar	833.7	1089.23	640.66	514.78	619.31	592.18	451.9
Saharanpur	912.2	1328.24	981.03	663.69	708.17	691.47	605.01
Consolidated Rainfall Data	-	968.68	650.60	528.40	616.06	600.69	472.94

Source: India WRIS portal, 2020

No. of Wetlands

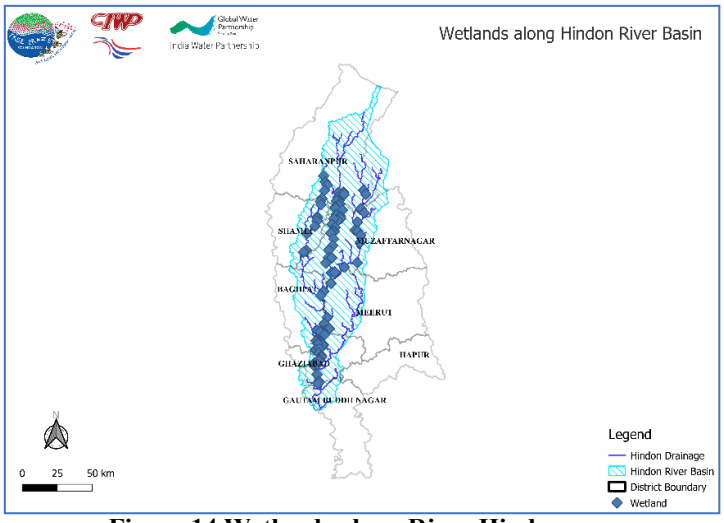


Figure 14 Wetlands along River Hindon

Table 5 Wetlands along River Hindon

District	No. of Wetlands
Baghpat	12
Gb Nagar	1
Ghaziabad	25
Meerut	5
Muzaffarnagar (and Shamli)	47
Saharanpur	15

Source: UPPCB Action Plan for Hindon, 2018

Vegetated Area Classification

Table 6 Classification of Vegetated area

District	Total Area (Hectares)	Forest (%)	Area Under Non Agricultural Uses (%)	Barren and Unculturable Land (%)	Permanent Pasture and Other Grazing Land (%)	Land Under Misc. Tree Crops and Groves not Included in Net Area Sown (%)	Culturable Waste Land (%)	Fallow Lands Other Than Current Fallows (%)	Current Fallow (%)	Net Area Sown (%)
Baghpat	134983	1.21	14.01	1.37	0.07	0.03	1.86	0.73	1.18	79.55
GB Nagar	125422	1.49	32.33	1.53	0.40	0.22	1.47	7.29	13.08	42.20
Ghaziabad	92658	1.97	31.48	1.39	0.02	0.14	2.67	1.75	5.77	54.81
Meerut	273005	7.81	16.12	1.11	0.14	0.06	1.18	0.87	0.72	71.99
Muzaffarnagar	293815	8.19	13.77	0.76	0.03	0.61	0.43	0.94	1.88	73.38
Saharanpur	363791	9.16	14.19	0.08	0.05	0.37	0.16	1.08	1.09	73.83
Consolidated Basin Statistics	213945.67	4.97	20.32	1.04	0.12	0.24	1.30	2.11	3.95	65.96

Source: aps.dac.gov.in/LUS (2015-16)

Area sown more than once

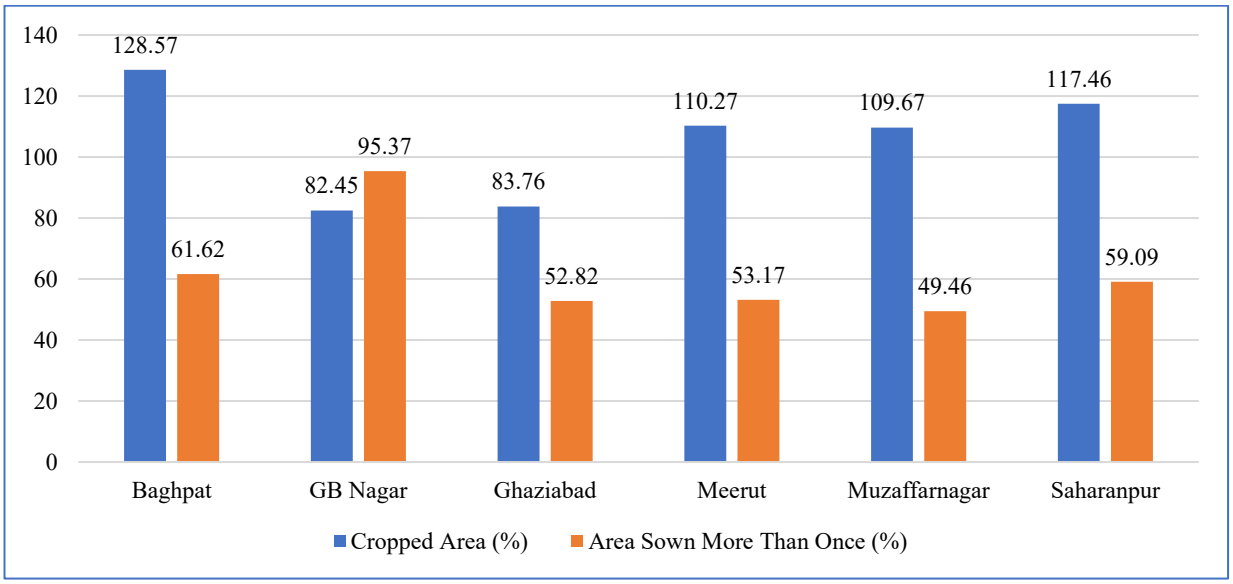


Figure 15 Cropped area v/s Area sown more than once

Table 7 Cropped Area v/s Area sown more than once

District	Cropped Area (%)	Area Sown More Than Once (%)
Baghpat	128.57	61.62
GB Nagar	82.45	95.37
Ghaziabad	83.76	52.82
Meerut	110.27	53.17
Muzaffarnagar	109.67	49.46
Saharanpur	117.46	59.09

Source:aps.dac.gov.in/LUS (2015-16)

Table 8 Source of Irrigation

District	Net Total Canal (Govt & Pvt)	Net Total Tube well and Well	*Net Irrigated Area Total	Gross Total Canal (Govt & Pvt)	Gross Total Tube well and Well	**Gross Irrigated Area Total
Baghpat	2243	105089	107332	3714	169783	173497
Gb Nagar	8822	44084	52906	23480	76905	100385
Ghaziabad	6141	44623	50764	6703	70884	77587
Meerut	29356	167172	196528	41684	259347	301031
Muzaffarnagar	55441	158186	213628	77276	242140	319418
Saharanpur	30384	228688	259072	49832	356298	406130

Source: aps.dac.gov.in/LUS (2015-16)

Unit: Hectares
Net* **Irrigated *Area: It is the area irrigated through any source once in a year.*
***Total/Gross Irrigated Area: It is the total area under crops, irrigated once and/or more than once in a year.*

Major crops grown

Table 9 Major Crops Grown

District/Crop area percentage	Rice	Wheat	Sugarcane	Fodder Crop	Mango	Total Vegetables	Oilseeds	Total Pulses	Others
Baghpat	3.84	31.52	43.00	16.57	0.56	1.99	1.32	0.44	0.80
GB Nagar	30.41	45.96	0.83	15.57	0.00	0.27	0.36	0.63	6.00
Ghaziabad	11.88	35.58	27.75	19.16	0.44	2.50	1.38	0.69	0.60
Meerut	6.28	25.68	42.03	15.33	2.57	4.30	2.09	1.03	0.70
Muzaffarnagar	4.40	25.71	50.06	14.50	1.46	1.16	1.52	0.53	0.70
Saharanpur	16.08	33.51	25.22	13.03	6.40	1.44	1.26	0.74	2.3
Consolidated Data	12.15	32.99	31.48	15.69	1.91	1.94	1.32	0.68	1.85

Source: aps.dac.gov.in/LUS (2015-16)

Biodiversity

Three sampling sites to assess the biodiversity of the Saharanpur district were selected from the districts, viz. Kalurao Reserve Forest, Gagalheri and Maheshpur. The sampling site to assess the biodiversity of Baghpat, GB Nagar, Ghaziabad and Muzaffarnagar district were selected from Baparsi and Balmiki Ashram, Tilwada, Hindon and and Titavi respectively.
Kindly Note: Presence of the species is marked as '**P**'.

Table 10 List of Birds

S. No.	Species	Scientific Name	Baghpat	GB Nagar	Ghaziabad	Muzaffarnagar	Saharanpur
1	Shikra	*Accipiter badius*	P				P
2	Bank Myna	*Acridotheres ginginianus*	P	P	P		
3	Common Myna	*Acridotheres tristis*	P	P	P	P	P

4	Red Avadevat	*Amandava amandava*			P		
5	Whitebreasted Waterhen	*Amaurornis phoenicurus*		P			P
6	Spot-billed Duck	*Anas poecilorhyncha*	P				
7	Indian Darter	*Anhinga melanogaster*				P	
8	Grey Heron	*Ardea cinerea*	P	P	P		
9	Purple Heron	*Ardea purpurea*			P		
10	Pond Heron	*Ardeola grayii*			P	P	
11	Cattle Egret	*Bubulcus ibis*	P	P	P	P	P
12	Indian Grey Hornbill	*Buceros bicornis*	P	P	P		
13	Greater Coucal	*Centropus sinensis*			P		
14	Brown Rockchat	*Cercomela fusca*					P
15	Purple Sunbird	*Cinnyris asiaticus*	P	P	P		P
16	Rock Pegion	*Columba livia*	P	P	P	P	P
17	Indian Robin	*Copsychus fulicatus*	P			P	
18	Oriental Magpie Robin	*Copsychus saularis*	P	P	P	P	P
19	Indian roller	*Coracias benghalensis*					P
20	Large-billed Crow	*Corvus macrorhyncos*	P	P	P		
21	House Crow	*Corvus splendens*	P	P	P		
22	Rufous Treepie	*Dendrocitta vagabanda*	P	P	P		
23	Black Drongo	*Dicrurus macrocercus*	P	P	P		P
24	Asian Koel	*Eudynamys scolopacea*	P	P	P		P
25	Indian Silver Bill	*Euodice malabarica*	P				
26	Common Moorhen	*Gallinula chloropus*			P		
27	Asian pied Myna	*Gracupica contra*					P
28	White-throated Kingfisher	*Halcyon smyrmensis*	P	P	P	P	P
29	Blackwinged Stilt	*Himantopus himantopus*	P	P	P	P	P
30	Scaly-breasted Munia	*Lonchura punctulata*			P		
31	Green Bee-eater	*Merops orientalis*	P	P	P	P	
32	Black Kite	*Milvus migrans*	P	P	P		P
33	White Wagtail	*Motacilla alba*	P	P	P		
34	Citrine Wagtail	*Motacilla citreola*				P	
35	Yellow Wagtail	*Motacilla flava*	P			P	
36	White-browed Wagtail	*Motacilla maderaspatensis*	P	P	P		
37	Egyptian Vulture	*Neophron percnopterus*					P
38	Black-crowned Night Heron	*Nycticorax nycticorax*			P		
39	Common Tailorbird	*Orthotomus sutorius*	P	P	P		
40	Great Tit	*Parus major*	P	P	P		
41	House Sparrow	*Passer domesticus*	P	P	P	P	P
42	Indian Peafowl	*Pavo cristatus*	P	P			
43	Great Cormorant	*Phalacrocorax carbo*				P	P
44	Little Cormorant	*Phalacrocorax niger*	P	P	P		P
45	Baya Weaver	*Ploceus philippinus*	P	P	P		
46	Plain Prinia	*Prinia inornata*			P		

47	Ashy Prinia	*Prinia socialis*	P				
48	Black Ibis	*Pseubidis papillosa*					P
49	Rose-ringed Parakeet	*Psittacula krameri*	P	P	P	P	P
50	Red-vented Bulbul	*Pycnonotus cafer*	P	P	P	P	P
51	Red-whiskered Bulbul	*Pycnonotus jocosus*	P	P	P		
52	Indian Robin	*Saxicoloides fulicatus*	P	P	P		P
53	Eurasian Collared Dove	*Streptopelia decaocto*		P	P		
54	Oriental Dove	*Streptopelia orientalis*	P			P	
55	Laughing Dove	*Streptopelia senegalensis*	P			P	
56	Ruddy Shelduck	*Tadorna ferruginea*		P			
57	Jungle Babbler	*Turdoides striatus*	P	P	P		P
58	Common Hoope	*Upopa epops*	P	P	P		P
59	River Lapwing	*Vanellus duvaucelii*		P			
60	Red-wattled Lapwing	*Vanellus indicus*	P	P	P	P	P
61	Yellow-wattled Lapwing	*Vanellus malabaricus*					P

Table 11 List of Animals

S. No	Common Name	Scientific Name	Baghpat	GBNagar	Ghaziabad	MuzaffarNagar	Saharanpur
1.	Chital	*Axis axis*					P
2.	Common Leopard	*Panthera pardus*					P
3.	Indian Grey Mongoose	*Herpestes edwardsii*					P
4.	Indian Hare	*Lepus nigricolli*	P	P	P	P	P
5.	Indian Palm Squirrel	*Funambulus palmarum*					P
6.	Indian Wolf	*Canis lupus pallipes*					P
7.	Jungle cat	*Felis chaus*					P
8.	Rhesus macaque	*Macaca mulatta*					P
9.	Frog/Toad sp	-	P				
10.	Gray Langur	*Semnopithecus hector*					P
11.	Nilgai	*Boselaphus tragocamelus*	P	P	P		
12.	Rhesus Macaque	*Macaca Mullata*	P		P		P
13.	Sambhar Deer	*Rusa unicolor*					P
14.	Indian Flapshell Turtle	*Lissemys punctata*	P	P	P		
15.	Garden Lizard	*Calotes versicolor*			P		P
16.	Indian Grey Mongoose	*Herpestes edwardsii*					P
17.	Indian Jackal	*Canis aureus indicus*	P	P	P		P
18.	Indian Monitor Lizard	*Varanus bengalensis*	P	P	P	P	P

19.	Indian Palm Squirrel	*Funambulus palmarum*	P			P	P
20.	Various species of snakes	-					
21.	Leaf insects	-					
22.	Assassin Bug	-			P		P
23.	Beetle	Order: Coleoptera		P	P		
24.	Butterflies and Moths	Order: Lepidoptera	P	P	P	P	P
25.	Dragonflies and Damselflies	Order:Odonata	P	P	P	P	P
26.	Grasshoppers and Crickets	Order: Orthoptera	P	P	P	P	P
27.	True Bugs	Order: Hemiptera	P	P	P	P	P
28.	Batla	-	P	P			
29.	Common Carp	-		P			
30.	Cuchia	-			P		
31.	Einghi	-			P		
32.	Eel	-			P		
33.	Hilsa	-			P		
34.	Katla	-	P	P	P		
35.	Labi	-			P		
36.	Mahaser	-			P		
37.	Manghur	*Clarias batrachus*	P	P	P		
38.	Mirgal	-			P		
39.	Mirror Carp	-			P		
40.	Parthen	-			P		
41.	Rasela	-			P		
42.	Rohu	*Labeo rohita*	P	P	P		
43.	Saul	-	P	P	P		
44.	Singhara	-	P				
45.	Tengan	-			P		
46.	Tilapia	-		P			
47.	Trout	-			P		
48.	Vittal	-			P		

Table 12 List of Trees

S. No.	Common Name	Scientific Name	Family	Baghpat	GB Nagar	Ghaziabad	Muzaffarnagar	Saharanpur
1	Siris	*Albizia lebbeck*	Fabaceae	P		P	P	P
2	Neem	*Azadirachta indica*	Meliaceae	P		P	P	P
3	Silk Cotton Tree	*Bombax ciliata*	Bombacaceae					P

4	Kaniar	*Buhinia purpurea*	-					P
5	Shisham	*Dalbergia sisso*	Fabaceae	P			P	P
6	Bistendu	*Diaspyros cordifolia*	Ebinaceae	P				
7	Safeda	*Eucalyptus spp.*	-	P		P	P	P
8	Peepal	*Ficus religiosa*	-				P	P
9	Mango	*Mangifera indica*	-	P		P	P	P
10	White Mulberry	*Morus alba*	-	P		P		P
11	Curry Tree	*Murraya koenigii*	Rutaceae					P
12	Wild Date Palm	*Phoenix sylvestris*	Arecaceae	P	P	P	P	P
13	Jungle Jalebi	*Pithecellobium dulce*	Fabaceae	P		P		
14	Poplar tree	*Populus spp.*	Salicaceae	P		P		P
15	Vilaiti Keekar	*Prosopis juliflora*	-	P	P		P	P
16	Sal	*Shorea robusta*	Dipterocarpaceae					P
17	Jamun	*Syzygium cumini*	Myrtaceae	P			P	P
18	Teak	*Tectona grandis*	Rhamnaceae					P
19	Ber	*Ziziphus mummularia*	Rhamnaceae	P	P	P	P	P
20	Mahaneem	*Ailanthus excelsa*	Simaroubaceae	P				

Table 13 List of Herbs and Shrubs

S. No.	Common Name	Scientific Name	Family	Baghpat	GB Nagar	Ghaziabad	Muzaffar Nagar	Saharanpur
1	Wild Jute	*Corchorus spp.*	Malvaceae					P
2.	Vasaka	*Adathoda vasica*	Acanthaceae					P
3.	Bushmint	*Hyptis suaveolens*	Lamiaceae					P
4.	Crab Eye Creeper	*Abrus precatorius*	Fabaceae					P
5.	Dhatura	*Dhatura innoxia*	Solanaceae					P
6.	Common Lantana	*Lantana camara*	Verbenaceae					P
7.	Kasunda	*Senna spp.*	Fabaceae					P
8.	Mexican Poppy	*Argemone mexicana*	Papaveraceae					P
9.	Yellow Berried Nightshade	*Solanum xanthocarpum*	Solanaceae					P
10.	Flossflower	*Ageratum houstonianum*	Asteraceae					P
11.	Chickweed	*Stellaria media*	Caryophyllaceae					P
12.	Cheeseweed	*Malva parviflora*	Malvaceae					P

13.	Wild Sugarcane	*Sacharaum spontaneum*	Poaceae					P
14.	Aak or Rubber Bush	*Calotropis procera*	Apocynaceae					P
15.	Cactus	*Cactus spp.*	Cactaceae					P
16.	Flossflower	*Ageratum spp.*	Asteraceae					P
17.	Vasaka	*Adathoda vasica*	Acanthaceae					P
18.	Mexican Poppy	*Argemone mexicana*	Papaveraceae					P
19.	Dhatura	*Dhatura innoxia*	Solanaceae					P
20.	Common	*Lantana camara*	Verbenaceae					P
21.	Kasunda	*Senna Sophera*	Fabaceae					P
22.	Cheeseweed	*Malva parviflora*	Malvaceae					P
23.	Chickweed	*Stellaria media*	Caryophyllaceae					P
24.	Scarlet Pimpernel	*Anagallis arvensis*	Primulaceae					P
25.	Country Mallow	*Abutilon indicum*	Malvaceae					P
26.	Castor Oil Plant	*Ricinus communis*	Euphorbiaceae					P
27.	Chirchita	*Achyranthes aspera*	Amaranthaceae					P
28.	Wild Sugarcane	*Sacharaum spontaneum*	Poaceae					P
29.	Aak or Rubber Bush	*Calotropis procera*	Apocynaceae					P
30.	Congress Grass	*Parthenium hysterophorus*	Asteraceae					P
31.	Castor Oil Plant	*Ricinus communis*	Euphorbiaceae					P
32.	Country Mallow	*Abutilon indicum*	Malvaceae					P
33.	Common Indian Nightshade	Solanum indicum	Solanaceae					P
34.	Aak or Rubber Bush	*Calotropis procera*	Apocynaceae					P
35.	Pergularia	Pergularia daemia	Asclepiadaceae					P
36.	Chrichita	*Achyranthes aspera aspera*	Amaranthaceae					P
37.	Wild Sugarcanee	Sacharum spontaneum	Poaceae					P
38.	Asian Mazus,	*Mazus pumilus*	Scrophulariace ae					P
39.	Water Spinach	Ipomea aquatica	Convolvulaceae					P

40.	Nut Grass	*Cyperus rotundus*	Cyperaceae					P
41.	Common Sowthistle	Sonchus oleraceus	Asteraceaeae					P
42.	Congress Grass	*Parthenium hysterophorus*	Asteraceae				P	
43.	Castor Oil Plant	*Ricinus communis*	Euphorbiaceae				P	
44.	Country Mallow	*Abutilon indicum*	Malvaceae				P	
45.	Common Indian Nightshade	*Solanum indicum*	Solanaceae				P	
46.	Common Sowthistle	*Sonchus oleraceus*	Asteraceae				P	
47.	Pergularia	*Pergularia daemia*	Asclepiadaceae				P	
48.	Chrichita	*Achyranthes aspera*	Amaranthaceae				P	
49.	Wild Sugarcane	*Sacharum spontaneum*	Poaceae				P	
50.	Water Spinach	*Ipomea aquatic*	Convolvulaceae				P	
51.	Common Indian Nightshade	*Solanum indicum*	Solanaceae				P	
52.	Common Sowthistle	*Sonchus oleraceus*	Asteraceae	P				
53.	Aak or Rubber Bush	*Calotropis procera*	Apocynaceae	P				
54.	Sugarcane Grass	*Saccharum spontaneum*	Poaceae	P				
55.	Chirchita	*Achyranthes aspera*	Amaranthaceae	P				
56.	Vasaka	*Adathoda vasica*	Acanthaceae	P				
57.	Common Lantana/Wild Sage	*Lantana camara*	Verbenaceae	P				
58.	Coffee Senna	*Cassia occidentalis*	Caesalpiniaceae	P				
59.	Country Mallow	*Abutilon indicum*	Malvaceae	P				
60.	Goatweed	*Ageratum conyzoides*	Asteraceae	P				
61.	Dhatura	*Dhatura innoxia*	Solanaceae	P				
62.	Water Spinach	*Ipomea aquatica*	Convolvulaceae	P				
63.	Mexican Poppy	*Argemone mexicana*	Papaveraceae	P				
64.	Castor Oil Plant	*Ricinus communis*	Euphorbiaceae	P				
65.	Jhar Beri	*Zizyphus mummularia*	Rhamnaceae	P				
66.	Scarlet Pimpernel	*Anagallis arvensis*	Primulaceae	P				
67.	Country Mallow	*Abutilon indicum*	Malvaceae	P				
68.	Flossflower	*Ageratum houstonianum*	Asteraceae	P				

69.	Dhatura	*Dhatura innoxia*	Solanaceae	P				
70.	Common Lantana	*Lantana camara*	Verbenaceae	P				
71.	Coffee Senna	*Cassia occidentalis*	Caesalpiniaceae	P				
72.	Cheeseweed	*Malva parviflora*	Malvaceae	P				
73.	Chickweed	*Stellaria media*	Caryophyllaceae	P				
74.	Vasaka	*Adathoda vasica*	Acanthaceae	P				
75.	Mexican Poppy	*Argemone mexicana*	Papaveraceae	P				
76.	Jhar Beri	*Zizyphus mummularia*	Rhamnaceae	P				
77.	Castor Oil Plant	*Ricinus communis*	Euphorbiaceae	P				
78.	Sugarcane Grass	*Saccharum spontaneum*	Poaceae	P				
79.	Sugarcane Grass	*Saccharum spontaneum*	Poaceae			P		
80.	Chirchita	*Achyranthes aspera*	Amaranthaceae			P		
81.	Vasaka	*Adathoda vasica*	Acanthaceae			P		
82.	Common Lantana/Wild Sage	*Lantana camara*	Verbenaceae			P		
83.	Coffee Senna	*Cassia occidentalis*	Caesalpiniacea e			P		
84.	Scarlet Pimpernel	*Anagallis arvensis*	Primulaceae			P		
85.	Country Mallow	*Abutilon indicum*	Malvaceae			P		
86.	Goatweed	*Ageratum conyzoides*	Asteraceae			P		
87.	Dhatura	*Dhatura innoxia*	Solanaceae			P		
88.	Cheeseweed	*Malva parviflora*	Malvaceae			P		
89.	Water Spinach	*Ipomea aquatica*	Convolvulaceae			P		
90.	Mexican Poppy	*Argemone mexicana*	Papaveraceae			P		
91.	Castor Oil Plant	*Ricinus communis*	Euphorbiaceae			P		
92.	Pergularia	*Pergularia daemia*	Asclepiadaceae			P		
93.	Coat Button	*Tridax procumbens*	Compositeae			P		
94.	Wandering Jew	*Commelina benghalensi*	Commelinaceae			P		
95.	Sarpunkha	*Tephrosa purpurea*	Fabaceae			P		
96.	Congress Grass	*Parthenium hysterophorus*	Asteraceae		P			
97.	Ivy Gourd	*Coccinia Grandis*	Cucurbitaceae		P			
98.	Goat Weed	*Ageratum conyzoides*	Asteraceae		P			
99.	Safed dhatura	*Dhatura innoxia*	Solanaceae		P			
100	Kharbuza, Musk melon	*Cucumis melo*	Cucurbitatceae		P			

101	Creeping Woodsorrel	*Oxalis corniculata*	Oxalidaceae		P			
102	Common Indian Nightshade	*Solanum indicum*	Solanaceae		P			
103	Lamb's Quarter	*Chenopodium album*	Chenopodiaceae		P			
104	Castor Oil Plant	*Ricinus communis*	Euphorbiaceae		P			
105	Kaans	*Sacharum spontaneum*	Poaceae		P			
106	Chirchita	*Achyranthes aspera*	Amaranthaceae		P			
107	Water Spinach	*Ipomea aquatica*	Convolvulaceae		P			
108	Indian Fumitory	*Fumaria officinalis*	Fumariaceae		P			
109	Country Mallow	*Abutilon indicum*	Malvaceae		P			
110	Common Lanatana/Wild Sage	*Lantana camara*	Verbenaceae		P			

Source: 'Reviving Hindon River – A Basin Approach.' By: Natural Heritage Division, Indian National Trust for Art and Cultural Heritage (INTACH), New Delhi, 2017

Forest Classification

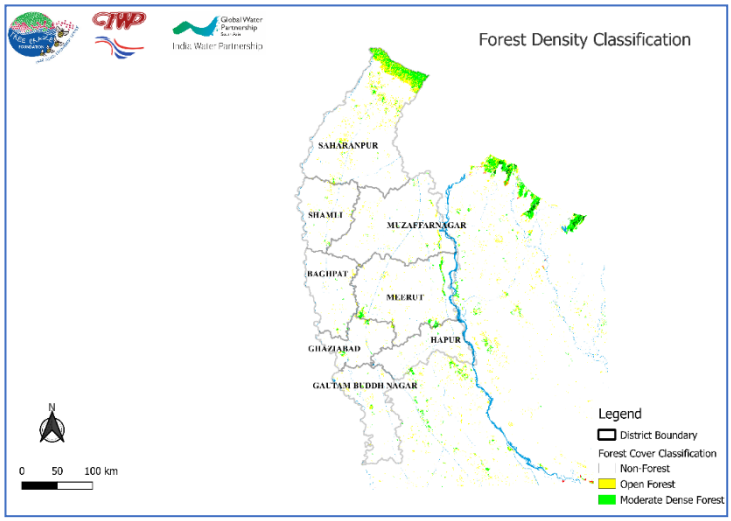


Figure 16 Forest Density Classification

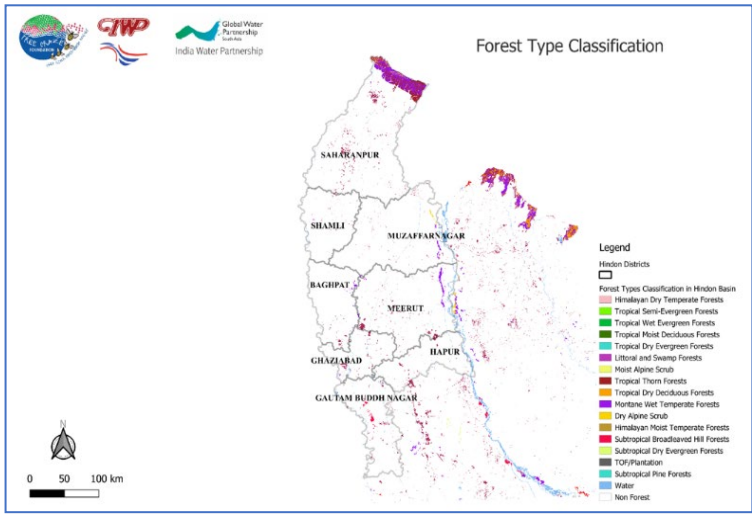


Figure 17 Forest Type Classification

Table 14 Forest Density Classification

District	No Data (%)	Water Bodies (%)	Non Forest (%)	Scrub (%)	Open Forest (%)	Moderately Dense Forest (%)	% of Forest w.r.t. Geographical Area of District	% Change in Forest Cover w.r.t. 2017
Baghpat	0.00	0.43	98.36	0.00	0.93	0.27	1.29	0.06
GB Nagar	0.02	0.70	97.68	0.00	1.29	0.32	1.56	0.00

Ghaziabad	0.00	0.62	97.03	0.00	1.46	0.89	2.14	-0.78
Meerut	0.00	1.69	95.07	0.00	1.90	1.34	2.67	0.41
Muzaffarnagar (and Shamli)	0.00	0.79	97.45	0	1.46	0.31	1.65	26.11
Saharanpur	5.21	0.47	86.24	0	0.84	7.24	12.02	70.26
Consolidated Data	0.87	0.78	95.31	0	1.31	1.73	3.56	16.01

Source: India State of Forest Report, Forest Survey of India, 2019

Soil Texture & Depth

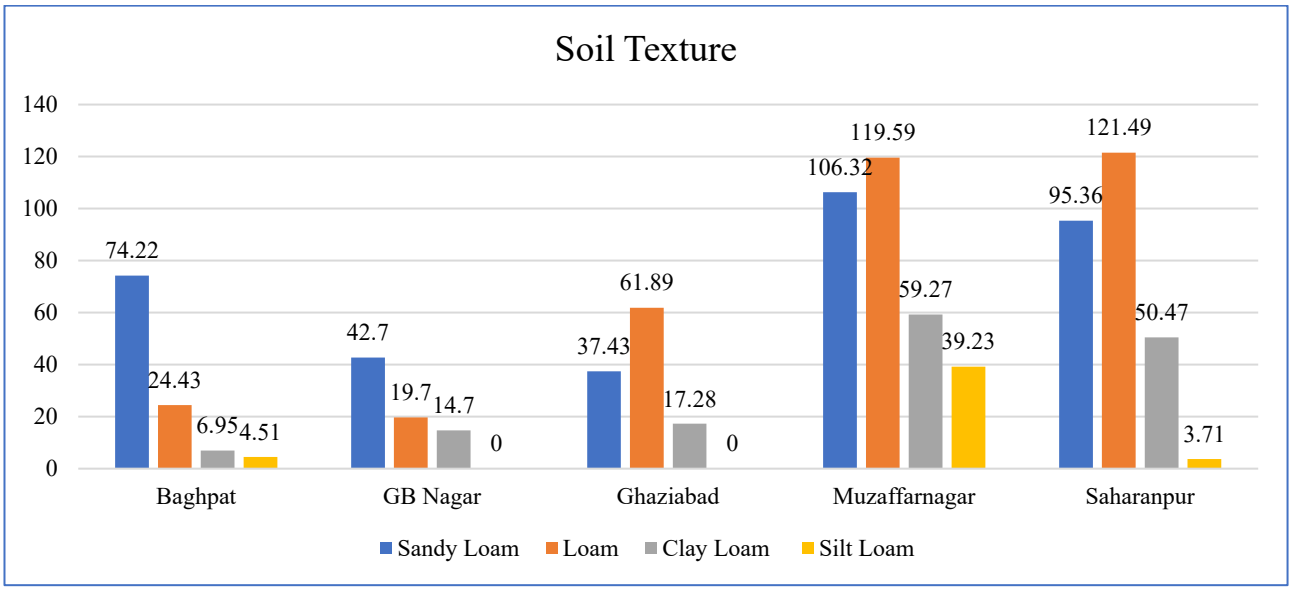


Figure 18 Soil Texture Statistics

Table 15 Soil Texture Statistics

District	Sandy Loam (Thousand Hectares)	Loam (Thousand Hectares)	Clay Loam (Thousand Hectares)	Silt Loam (Thousand Hectares)
Baghpat	74.22	24.43	6.95	4.51
GB Nagar	42.70	19.70	14.70	-
Ghaziabad	37.43	61.89	17.28	-
Meerut	-	-	-	-
Muzaffarnagar	106.32	119.59	59.27	39.23
Saharanpur	95.36	121.49	50.47	3.71

Source:http://agricoop.nic.in/agriculturecontingency/Uttar- Pradesh,2012

Table 16 Soil Depth

District	Soil Depth (cm)

Baghpat	100-150
GB Nagar	100-150
Ghaziabad	100-150
Meerut	-
Muzaffarnagar	100-150
Saharanpur	100-150

Source: NRSC (2016) Soil Data set 2000. NICES/DS (L)/SOIL/2000/Jan2016

Industry Type (No. of Industries)

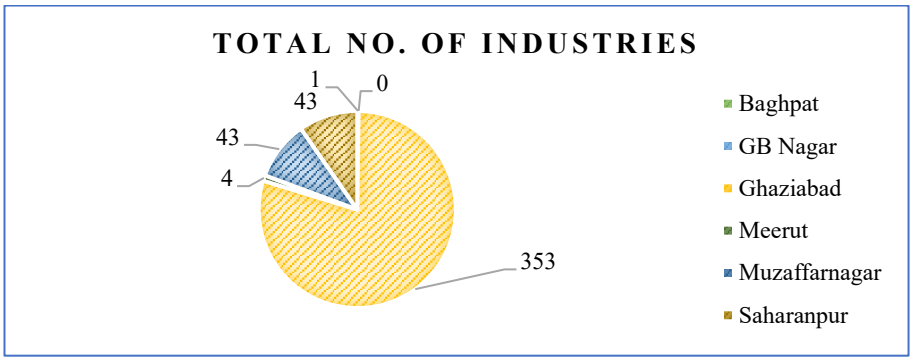


Figure 19 No. of Industries

Table 17 Industry Type

District	Sugar	Pulp and Paper	Distillary	Textile	Slaughter House	Tannery	Others	Total
Baghpat	1	0	-	-	-	-	-	1
Gb Nagar	-	-	-	-	-	-	-	-
Ghaziabad	-	3	-	238	10	3	99	353
Meerut	1	1	-	-	-	-	2	4
Muzaffarnagar	2	36	2	-	1	1	1	43
Saharanpur	4	17	2	16	1	1	2	43

Source: UPPCB Action Plan for Hindon, 2018

Ground Water Data

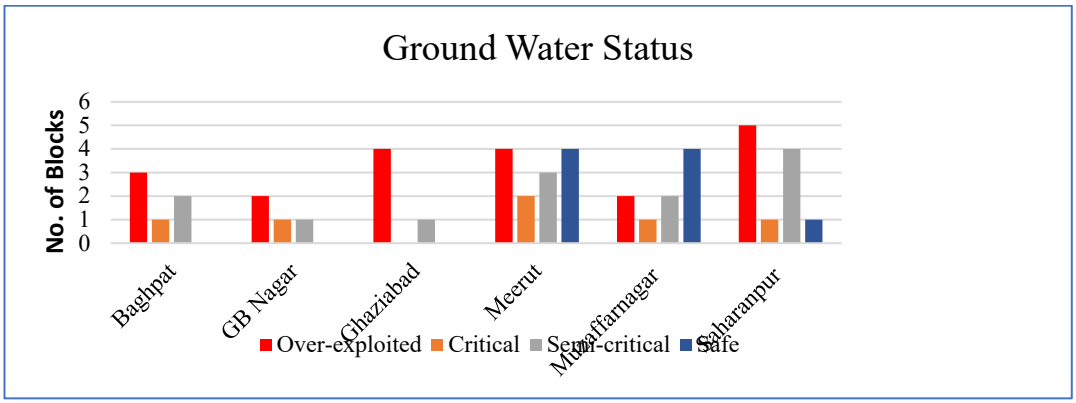


Figure 20 Ground Water Status

Table 18 Blockwise Ground Water Status

District	Total no. of Blocks	Over-exploited	Critical	Semi-critical	Safe
Baghpat	6	3	1	2	0
GB Nagar	4	2	1	1	0
Ghaziabad	5	4	0	1	0
Meerut	13	4	2	3	4
Muzaffarnagar	9	2	1	2	4
Saharanpur	11	5	1	4	1

Source: http://upgwd.gov.in/StaticPages/Atlas2017.aspx

Table 19 Ground Water Level

DISTRICT	2013 (m)	2014 (m)	2015 (m)	2016 (m)	2017 (m)	2018 (m)	2019 (m)	2020 (m)
BAGHPAT	16.16	14.87	16.06	13.11	16.35	13.76	19.5	18.32
GB NAGAR	12.75	13.54	14.95	12.78	15.58	16.84	18.04	19.34
GHAZIABAD	10.15	11.57	12.97	11.8	14.82	14.13	17.91	19.6
MEERUT	10.2	11.27	11.36	12.67	13.41	12.46	16.48	19.98
MUZAFFARNAGAR	11.43	12.89	13.85	14.77	14.36	12.4	16.14	19.54
SAHARANPUR	9.51	9.13	10.09	10.85	10.65	9.54	15.78	20.15

Source: India WRIS Portal (2014-2020)

Table 20 Ground Water Compliance/Heavy metal contamination

District	Total no. of Sampling Sites	Sulphate	Fluoride	Cadmium	Copper	Lead	Iron	Nickel	Zinc	Manganese	Mercury	Oil & Grease	Chromium
Baghpat	1	0	1	0	0	0	0	0	0	0	0	0	0
GB Nagar	-	-	-	-	-	-	-	-	-	-	-	-	-
Ghaziabad	43	2	6	3	5	8	22	0	1	3	20	40	4

Meerut	1	0	1	0	0	0	0	0	0	0	0	0	0
Muzaffarnagar	15	1	0	2	0	1	1	0	1	3	9	4	0
Saharanpur	16	1	0	0	1	2	8	0	2	4	4	9	0

Source: UPPCB Action Plan for Hindon, 2018

Table 21 Sewage Generation Status

City	Water Consumption (MLD) (@135 LPCD)	Sewage Generation (MLD)	Installed Capacity of Existing STP (MLD)	Proposed STP Capacity (MLD)	Gap in STP Capacity Utilisation (MLD)
Baghpat	8.33	6.67	N/A	N/A	6.67
GB Nagar	-	-	-	-	-
Ghaziabad	397.34	317.87	454	N/A	N/A
Meerut	10.09	8.07	N/A	N/A	8.07
Muzaffarnagar	70.09	56.07	32.5	32	N/A
Saharanpur	130.82	104.65	38	93.65	N/A

Source: Desk Inventory of UPPCB, Gap analysis from UPPCB Action Plan for Restoration of Hindon and Its Tributaries (2018-19)

Drain data

Table 22 Type of Drain

District	Total no. of Drains	Domestic Drains	Industrial Drains	Mixed Drains
Baghpat	1	-	0	1
GB Nagar	-	-	-	-
Ghaziabad	9	2	2	5
Meerut	2	-	1	1
Muzaffarnagar	10	7	0	3
Saharanpur	7	0	4	3
Consolidated Basin Statistics	29	9	7	13

Source: UPPCB Action Plan for Hindon, 2018

Table 23 Discharge Status of Drain

District	Total Discharge in the River (MLD)	Total Sewage Discharge (MLD)	Untreated Sewage Discharge (MLD)	Treated Sewage Discharge (MLD)	Treated Effluent (MLD)
Baghpat	0.6	0.1	0.1	0	0.5
GB Nagar	-	-	-	-	-

Ghaziabad	399.69	381.20	195.20	186	18.49
Meerut	**11.86**	**10**	**10**	**0**	**1.86**
Muzaffarnagar	**111.14**	**73.84**	**73.84**	**0**	**37.30**
Saharanpur	**137.89**	**120**	**82**	**38**	**17.89**
Consolidated Discharge Status	**661.18**	**585.14**	**361.14**	**224**	**76.04**

Source: UPPCB Action Plan for Hindon, 2018

Table 24 Tapping Status of Drain

District	No. of Drains	Tapped Drains	Untapped Drains	Partially Tapped Drains
Baghpat	1	-	1	-
GB Nagar	-	-	-	-
Ghaziabad	9	-	7	2
Meerut	2	-	2	-
Muzaffarnagar	10	-	10	-
Saharanpur	7	-	7	-
Consolidated Tapping Status of Drain	29	-	27	2

Source: UPPCB Action Plan for Hindon, 2018

Table 25 Status of Industry Compliance

District Name	No. of Industries	Complying	Non-Complying	Closed	Partly Closed	Status Not Available
Baghpat	1	1	-	-	-	-
GB Nagar	-	-	-	-	-	-
Ghaziabad	353	241	15	74	9	18
Meerut	4	3	-	-	-	1
Muzaffarnagar	50	10	-	-	-	40
Saharanpur	44	23	-	-	-	21
Consolidated Statistics	452	278	15	74	9	80

Source: UPPCB Action Plan for Hindon, 2018

Table 26 Status of Municipal Solid Waste

District	Municipal Solid Waste Generated (TPD)	Waste Collected (TPD)	Treatment Capacity (TPD)	Gap between waste generated and treatment capacity (TPD)
Baghpat	19	19	-	19
GB Nagar	-	-	-	-
Ghaziabad	1000	1000	-	1000
Meerut	22.82	22.82	-	22.82
Muzaffarnagar	230.8	230.8	120	110.8
Saharanpur	371.1	371.1	-	371.1

Source: UPPCB Action Plan for Hindon, 2018

Table 27 Status of Bio Medical Waste

District	Bio Medical Waste generated (Kg/Day)	Bio Medical Waste Treated (Kg/Day)
Baghpat	52	52
GB Nagar	-	-
Ghaziabad	2361	2361
Meerut	764	764
Muzaffarnagar	26	26
Saharanpur	301	301

Source: UPPCB Action Plan for Hindon, 2018

Table 28 Status of Hazardous Waste

District	Total No. of Hazardous Waste Generating Units	Incinerable Hazardous Waste Generated (TPA)	Landfillable Hazardous Waste Generated (TPA)	Recyclable Hazardous Waste Generated (TPA)	Total Hazardous Waste Generated (TPA)
Baghpat	35	0	28.54	0	28.54
GB Nagar	-	-	-	-	-
Ghaziabad	357	3934.90	7120.50	39662.96	50718.36
Meerut	96	358.781	1935.80	1057.50	3352.09
Muzaffarnagar	80	22.5	3281.25	3.5	3307.25

Saharanpur	30	21.37	6155.99	0	6177.37

Source: UPPCB Action Plan for Hindon, 2018

Surface Water Quality

Table 29 Biological Oxygen Demand

DISTRICT	STATION	BOD									
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Meerut	Galeta	39.05	-	41.54	85.43	38.81	53.76	57.02	51.86	42.27	50.76
Saharanpur	Kalanaur	14.54	-	0.75	0.85	5.64	5.74	8.78	3.03	1.88	1.58
Muzaffarnagar	Mawi	3.68	-	2.83	5.49	7.55	7.23	5.52	4.90	2.64	2.92
Ghaziabad	Mohna	3.75	-	18.79	30.96	22.52	16.51	18.73	23.48	19.20	26.35

Table 30 Faecal Coliform

DISTRICT	STATION	Faecal Coliform (MPN)									
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Meerut	Galeta	111.66	966.66	1337.5	-	2560	212457.1	238236.4	280000	1486667	802222.2
Saharanpur	Kalanaur	16.16	5.66	3.083	-	12.33	800	5295	62840	10800	39750
Muzaffarnagar	Mawi	39	29	15.5	-	103	15730	8530.09	67111.11	33422.22	41344.44
Ghaziabad	Mohna	102.5	766.66	1075	-	2410	8654.545	22600	309000	257777.8	521777.8

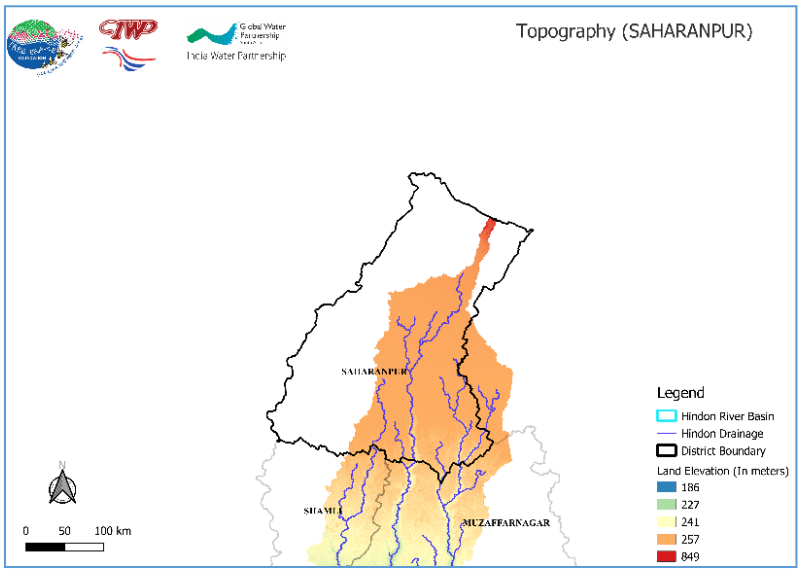
Source: India WRIS Portal (2010-19)

Hindon in Saharanpur

Geography

The river is believed to originate in Saharanpur district. As per Survey of India open series maps H43L12 (2007) and H43L16 (2011), the main channel first known as Chacha Rao and then Kaluwala Rao originates from Kaluwala Rao Reserve Forest in district Saharanpur. The channel remains dry during lean season - clearly visible on satellite imagery and is up to 500-600 m wide at some places (measured approximately on Google Earth).

A steep variation in topography is observed in a very small stretch, in the northernmost notch in Saharanpur district, when the channel originating from Upper Shiwaliks comes down to plains, where the highest elevation reached 849 metres above MSL. The elevation near Saharanpur city is 267 meters above MSL which declines to 243 meters above MSL downstream at Maheshpur in the same district.



Source: Derived using SRTM 30 meter data

Figure 21 Topography of Saharanpur

Basin Area and Population

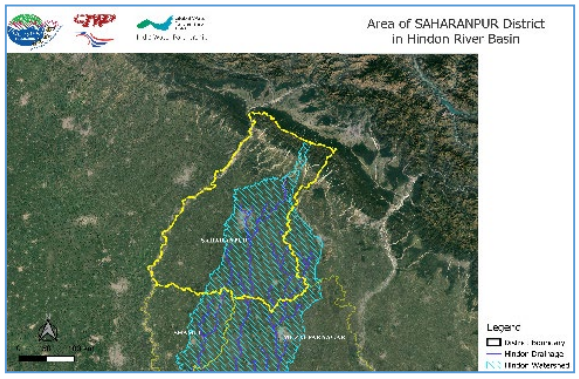


Figure 22 Area of Saharanpur in Hindon Basin

Source: Administrative Atlas of Uttar Pradesh Vol 1, Census of India, 2011

Table 31 Area & Population: Saharanpur

City	Population (As per Census 2011)	Estimated Population 2030	Area of District (Sqkm)	Area of district in Hindon Basin (Sqkm)	Area of district in Hindon Basin %
Saharanpur	705478	969002	3612.82	1658.63	45.90

Land Cover

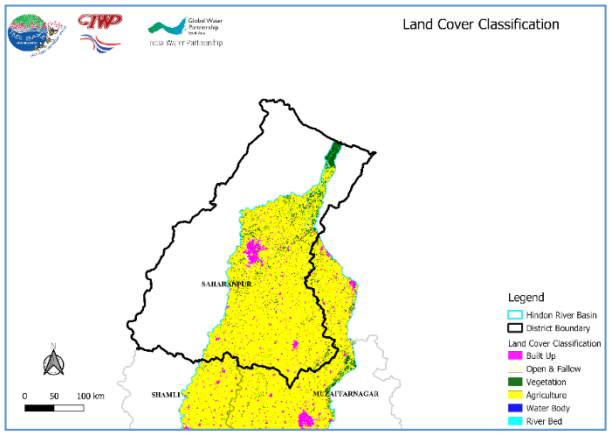


Figure 23 Land Cover of Saharanpur

Table 32 Land Use Statistics: Saharanpur

District Name	Built-up	Open & Fallow	Vegetation	Agriculture	Waterbody	Riverbed
Saharanpur	4.62	0.74	6.05	88.27	0.09	0.22

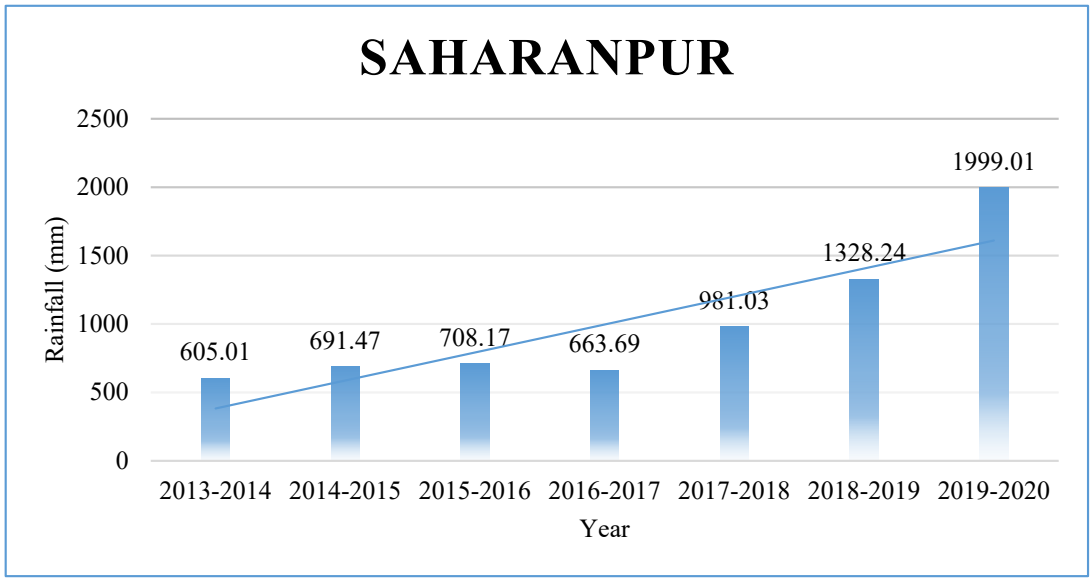
Source: Derived using Landsat 8 (30 meter) image, 2020

Rainfall

Hindon, primarily being a rain-fed river rainfall is the most important parameter of the hydrological cycle of the basin. The district receives major part of its rain from the South-west monsoon in the months of June to September.

Table 33 Rainfall: Saharanpur

District	Normal (mm)	2018-2019 (mm)	2017-2018 (mm)	2016-2017 (mm)	2015-2016 (mm)	2014-2015 (mm)	2013-2014 (mm)
SAHARANPUR	912.2	1328.24	981.03	663.69	708.17	691.47	605.01



Source: India WRIS portal,2020

Figure 24 Rainfall Trend (Saharanpur)

No. of Wetlands

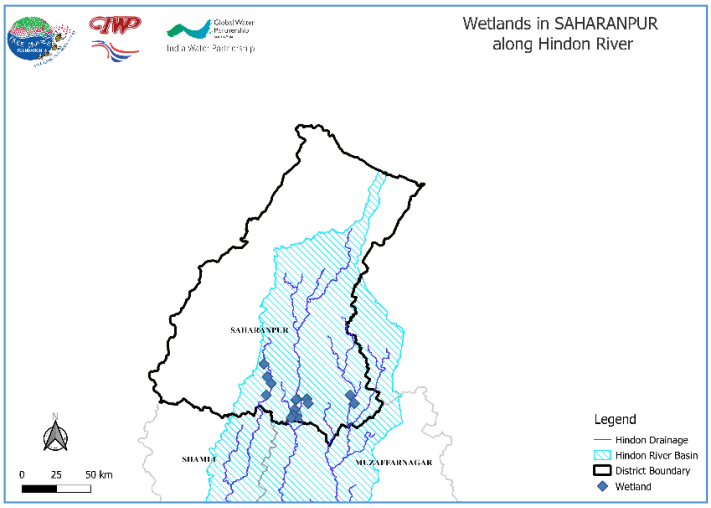


Figure 25 Wetlands in Saharanpur along Hindon River

Table 34 Wetlands: Saharanpur

District	No. of Wetlands
SAHARANPUR	15

Source: UPPCB Action Plan for Hindon, 2018

Table 35 Vegetated Area Classification: Saharanpur

District	Total Area (Hectares)	Forest (%)	Area Under Non Agricultural Uses(%)	Barren and Unculturable Land(%)	Permanent Pasture and Other Grazing Land(%)	Land Under Misc. Tree Crops and Groves not Included in Net Area Sown(%)	Culturable Waste Land(%)	Fallow Lands Other Than Current Fallows(%)	Current Fallow(%)	Net Area Sown(%)
Saharanpur	363791	9.16	14.19	0.08	0.05	0.37	0.16	1.08	1.09	73.83

Source: aps.dac.gov.in/LUS (2015-16)

Area sown more than once

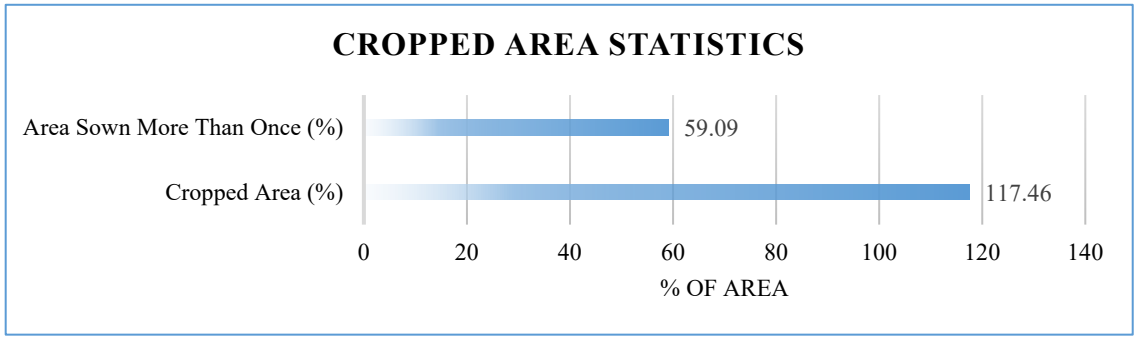


Figure 26 Cropped Area Statistics: Saharanpur

Table 36 Cropped Area: Saharanpur

District	Cropped Area (%)	Area Sown More Than Once (%)
Saharanpur	117.46	59.09

Source:aps.dac.gov.in/LUS 201516)

Source of irrigation

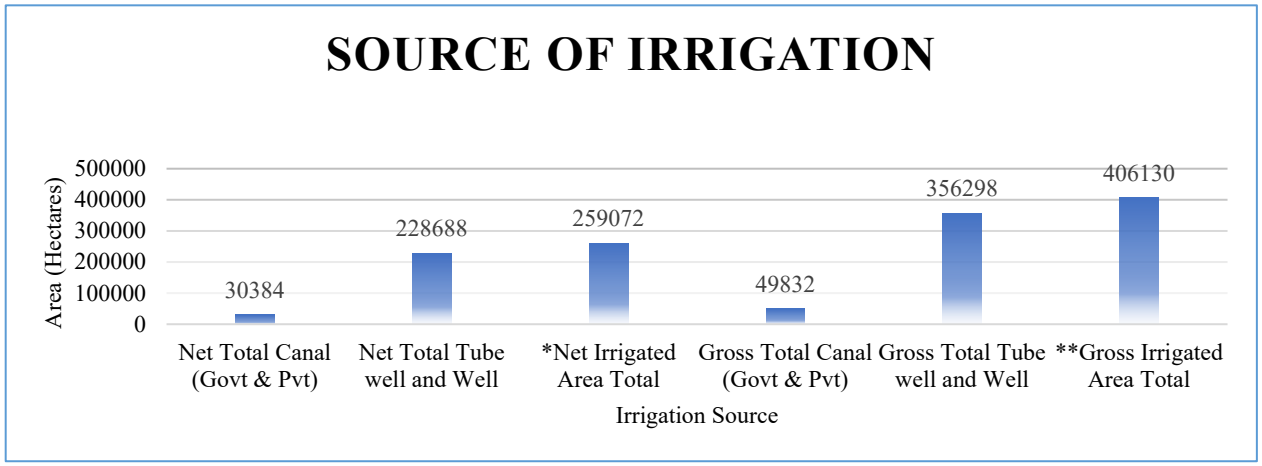


Figure 27 Source of Irrigation: Saharanpur

Table 37 Source of Irrigation: Saharanpur

District	Net Total Canal (Govt & Pvt)	Net Total Tube well and Well	*Net Irrigated Area Total	Gross Total Canal (Govt & Pvt)	Gross Total Tube well and Well	**Gross Irrigated Area Total
Saharanpur	30384	228688	259072	49832	356298	406130

Source: aps.dac.gov.in/LUS (2015-16)
Unit: Hectares
**Net Irrigated Area: It is the area irrigated through any source once in a year.*
***Total/Gross Irrigated Area: It is the total area under crops, irrigated once and/or more than once in a year.*

Major crops grown

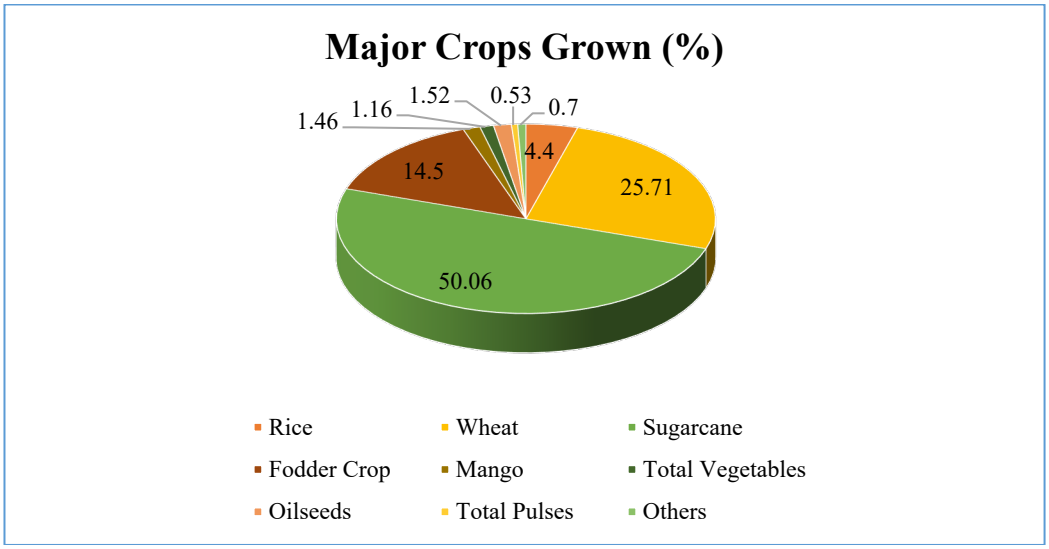


Figure 28 Major Crops Grown: Saharanpur

Table 38 Major Crops Grown: Saharanpur

District/Crop area percentage	Rice	Wheat	Sugarcane	Fodder Crop	Mango	Total Vegetables	Oilseeds	Total Pulses	Others
Saharanpur	16.08	33.51	25.22	13.03	6.40	1.44	1.26	0.74	2.3

Source: aps.dac.gov.in/LUS (2015-16)

Biodiversity

Three sampling sites to assess the biodiversity of the district were selected from the districts, viz. Kalurao Reserve Forest, Gagalheri and Maheshpur.

Table 39 List of Birds: Saharanpur

S. No.	Species	Scientific Name
1	Shikra	*Accipiter badius*
2	Common Myna	*Acridotheres tristis*
3	Whitebreasted Waterhen	*Amaurornis phoenicurus*
4	Cattle Egret	*Bubulcus ibis*
5	Brown Rockchat	*Cercomela fusca*
6	Purple Sunbird	*Cinnyris asiaticus*
7	Rock Pegion	*Columba livia*
8	Oriental Magpie Robin	*Copsychus saularis*
9	Indian roller	*Coracias benghalensis*
10	Black Drongo	*Dicrurus macrocercus*
11	Asian Koel	*Eudynamys scolopacea*
12	Asian pied Myna	*Gracupica contra*
13	White-throated Kingfisher	*Halcyon smyrmensis*
14	Blackwinged Stilt	*Himantopus himantopus*

15	Black Kite	*Milvus migrans*
16	Egyptian Vulture	*Neophron percnopterus*
17	House Sparrow	*Passer domesticus*
18	Great Cormorant	*Phalacrocorax carbo*
19	Little Cormorant	*Phalacrocorax niger*
20	Black Ibis	*Pseubidis papillosa*
21	Rose-ringed Parakeet	*Psittacula krameri*
22	Red-vented Bulbul	*Pycnonotus cafer*
23	Indian Robin	*Saxicoloides fulicatus*
24	Jungle Babbler	*Turdoides striatus*
25	Common Hoope	*Upopa epops*
26	Red wattled Lapwing	*Vanellus indicus*
27	Yellow-wattled Lapwing	*Vanellus malabaricus*

Table 40 List of Animals: Saharanpur

S.No.	Type	Scientific Name	Common Name
1	Animals	*Lepus nigricolli*	Indian Hare
2	Animals	*Calotes versicolor*	Garden Lizard
3	Animals	*Canis aureus indicus*	Indian Jackal
4	Animals	*Varanus bengalensis*	Indian Monitor Lizard
5	Animals	*Funambulus palmarum*	Indian Palm Squirrel
6	Animals	*Herpestes edwardsii*	Indian Grey Mongoose
7	Animals	*Canis aureus indicus*	Indian Jackal
8	Animals	-	Various species of snakes
9	Animals	*Axis axis*	Chital
10	Animals	*Panthera pardus*	Common Leopard
11	Animals	*Funambulus palmarum*	Indian Palm Squirrel
12	Animals	*Canis lupus pallipes*	Indian Wolf
13	Animals	*Felis chaus*	Jungle cat
14	Animals	*Semnopithecus hector*	Gray Langur
15	Animals	*Macaca Mullata*	Rhesus Macaque
16	Animals	*Rusa unicolor*	Sambhar Deer
17	Insects	-	Assassin Bug
18	Insects	Order: Lepidoptera	Butterflies and Moths
19	Insects	Order:Odonata	Dragonflies and Damselflies
20	Insects	Order: Orthoptera	Grasshoppers and Crickets
21	Insects	Order: Hemiptera	True Bugs
22	Insects	-	Leaf insects

Table 41 Trees: Saharanpur

S. No.	Type	Scientific Name	Common Name	Family
1	Trees	*Albizia lebbeck*	Siris	Fabaceae
2	Trees	*Azadirachta indica*	Neem	Meliaceae
3	Trees	*Bombax ciliata*	Silk Cotton Tree	Bombacaceae

4	Trees	*Buhinia purpurea*	Kaniar	-
5	Trees	*Dalbergia sisso*	Shisham	Fabaceae
7	Trees	*Eucalyptus spp.*	Safeda	-
8	Trees	*Ficus religiosa*	Peepal	-
9	Trees	*Mangifera indica*	Mango	-
10	Trees	*Morus alba*	White Mulberry	-
11	Trees	*Murraya koenigii*	Curry Tree	Rutaceae
12	Trees	*Phoenix sylvestris*	Wild Date Palm	Arecaceae
14	Trees	*Populus spp.*	Poplar tree	Salicaceae
15	Trees	*Prosopis juliflora*	Vilaiti Keekar	-
16	Trees	*Shorea robusta*	Sal	Dipterocarpaceae
17	Trees	*Syzygium cumini*	Jamun	Myrtaceae
18	Trees	*Tectona grandis*	Teak	Rhamnaceae
19	Trees	*Ziziphus mummularia*	Ber	Rhamnaceae

Table 42 Herbs & Shrubs:Saharanpur

S. No.	Type	Scientific Name	Common Name	Family
1	Herbs/Shrubs	*Abrus precatorius*	Crab Eye Creeper	Fabaceae
2	Herbs and Shrubs	*Abutilon indicum*	Country Mallow	Malvaceae
3	Herbs and Shrubs	*Achyranthes aspera aspera*	Chrichita	Amaranthaceae
4	Herbs/Shrubs	*Adathoda vasica*	Vasaka	Acanthaceae
5	Herbs/Shrubs	*Ageratum houstonianum*	Flossflower	Asteraceae
6	Herbs and Shrubs	*Anagallis arvensis*	Scarlet Pimpernel	Primulaceae
7	Herbs and Shrubs	*Argemone mexicana*	Mexican Poppy	Papaveraceae
8	Herbs/Shrubs	*Cactus spp.*	Cactus	Cactaceae
9	Herbs and Shrubs	*Calotropis procera*	Aak or Rubber Bush	Apocynaceae
10	Herbs/Shrubs	*Corchorus spp.*	Wild Jute	Malvaceae
11	Herbs and Shrubs	*Cyperus rotundus*	Nut Grass	Cyperaceae
12	Herbs and Shrubs	*Dhatura innoxia*	Dhatura	Solanaceae
13	Herbs/Shrubs	*Hyptis suaveolens*	Bushmint	Lamiaceae
14	Herbs and Shrubs	*Ipomea aquatica*	Water Spinach	Convolvulaceae
15	Herbs and Shrubs	*Lantana camara*	Common	Verbenaceae
16	Herbs and Shrubs	*Malva parviflora*	Cheeseweed	Malvaceae
17	Herbs and Shrubs	*Mazus pumilus*	Asian Mazus,	Scrophulariace ae
18	Herbs and Shrubs	*Parthenium hysterophorus*	Congress Grass	Asteraceae
19	Herbs and Shrubs	*Pergularia daemia*	Pergularia	Asclepiadaceae
20	Herbs and Shrubs	*Ricinus communis*	Castor Oil Plant	Euphorbiaceae
21	Herbs and Shrubs	*Sacharaum spontaneum*	Wild Sugarcane	Poaceae
22	Herbs and Shrubs	*Senna sophera*	Kasunda	Fabaceae
23	Herbs and Shrubs	*Solanum indicum*	Common Indian Nightshade	Solanaceae
24	Herbs/Shrubs	*Solanum xanthocarpum*	Yellow Berried Nightshade	Solanaceae
25	Herbs and Shrubs	*Sonchus oleraceus*	Common Sowthistle	Asteraceaeae
26	Herbs/Shrubs	*Stellaria media*	Chickweed	Caryophyllaceae

Source: 'Reviving Hindon River – A Basin Approach.'
By: Natural Heritage Division, Indian National Trust for Art and Cultural Heritage (INTACH), New Delhi, 2017

Forest Classification

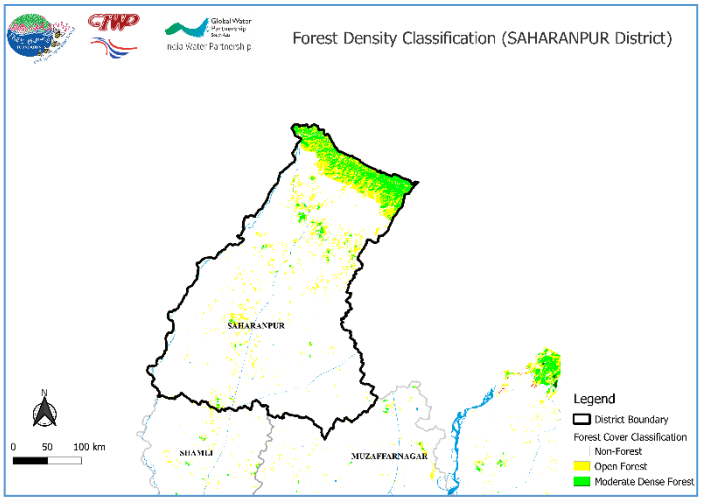


Figure 30 Forest Area Classification Map: Saharanpur

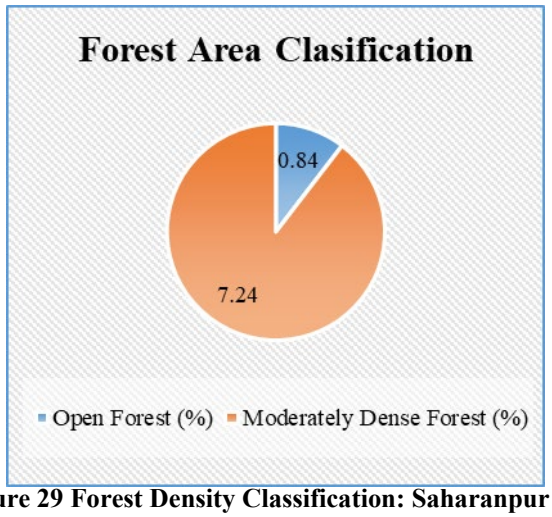


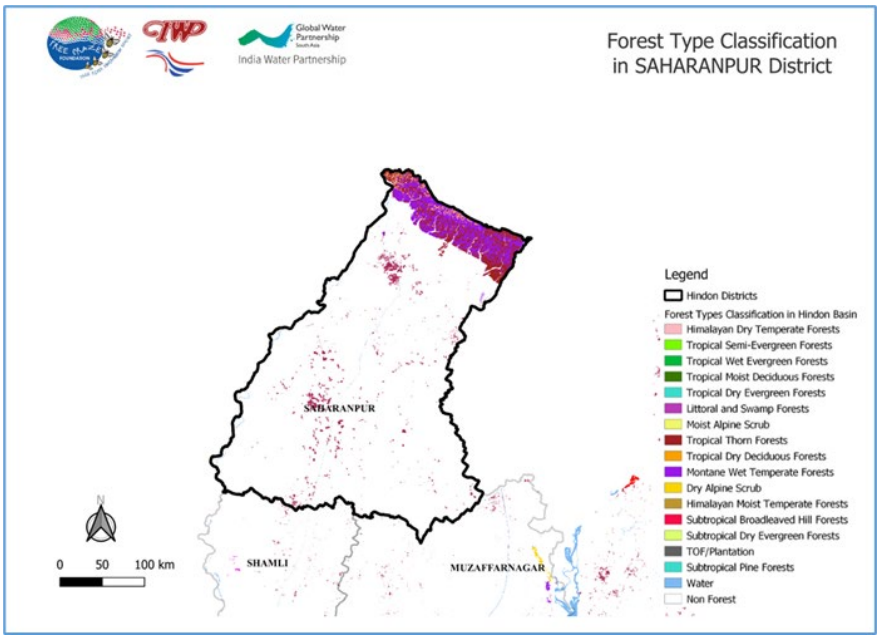
Figure 29 Forest Density Classification: Saharanpur

Table 43Forest Density Classification Statistics: Saharanpur

District	No Data (%)	Water Bodies (%)	Non Forest (%)	Scrub (%)	Open Forest (%)	Moderately Dense Forest (%)	% of Forest w.r.t. Geographical Area of District	% Change in Forest Cover w.r.t. 2017
Saharanpur	5.21	0.47	86.24	0	0.84	7.24	12.02	70.26

Source: India State of Forest Report, Forest Survey of India, 2019

Forest Type in Saharanpur District



Source: India State of Forest Report, Forest Survey of India, 2019

Figure 31 Forest Type in Saharanpur

Soil Texture

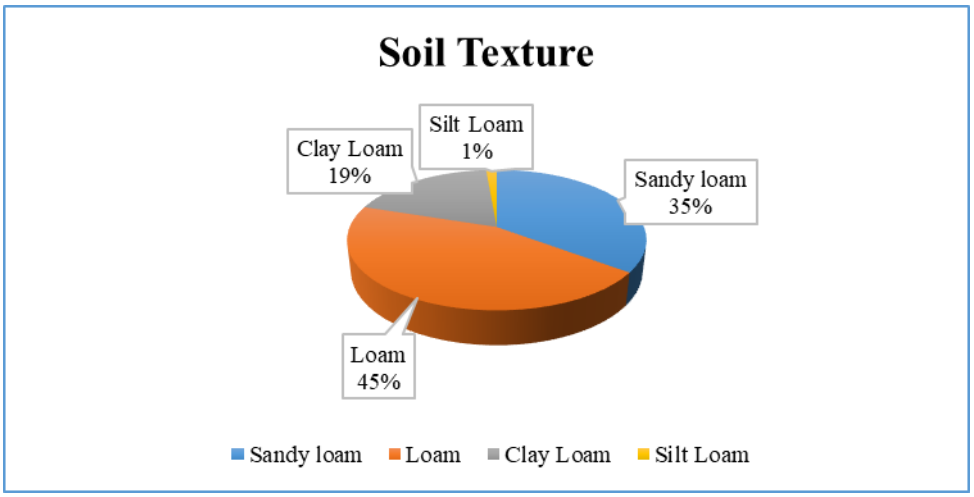


Figure 32 Soil Texture

Table 44 Soil Texture Statistics: Saharanpur

District	Sandy Loam (Thousand Hectares)	Loam (Thousand Hectares)	Clay Loam (Thousand Hectares)	Silt Loam (Thousand Hectares)
Saharanpur	95.36	121.49	50.47	3.71

Source:http://agricoop.nic.in/agriculture contingency/Uttar- Pradesh, 2012

Table 45 Soil Depth: Saharanpur

District	Soil Depth (cm)
Saharanpur	100-150

Source: NRSC (2016) Soil Data set 2000. NICES/DS (L)/SOIL/2000/Jan2016

Industry Type (No. of Industries)

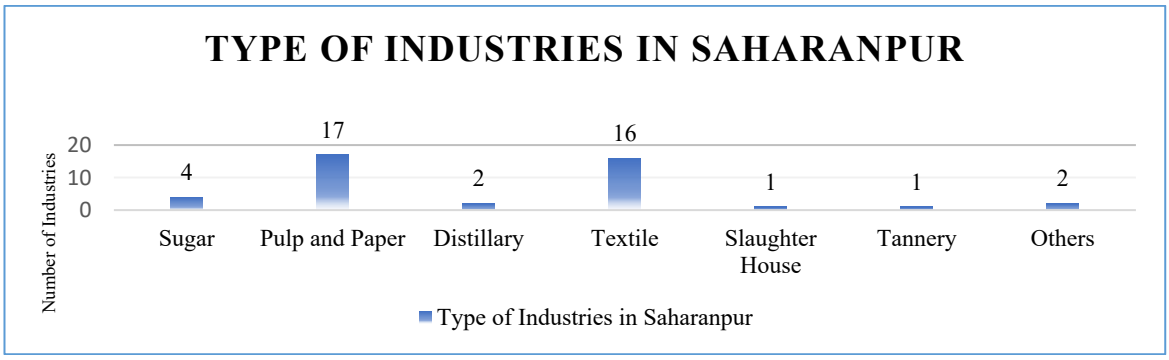


Figure 33 Type of Industries in Saharanpur

Table 46 Industry Type: Saharanpur

District/ No. of Industries	Sugar	Pulp and Paper	Distillary	Textile	Slaughter House	Tannery	Others	Total no. of Industries
Saharanpur	4	17	2	16	1	1	2	43

Source: UPPCB Action Plan for Hindon, 2018

Ground Water Status

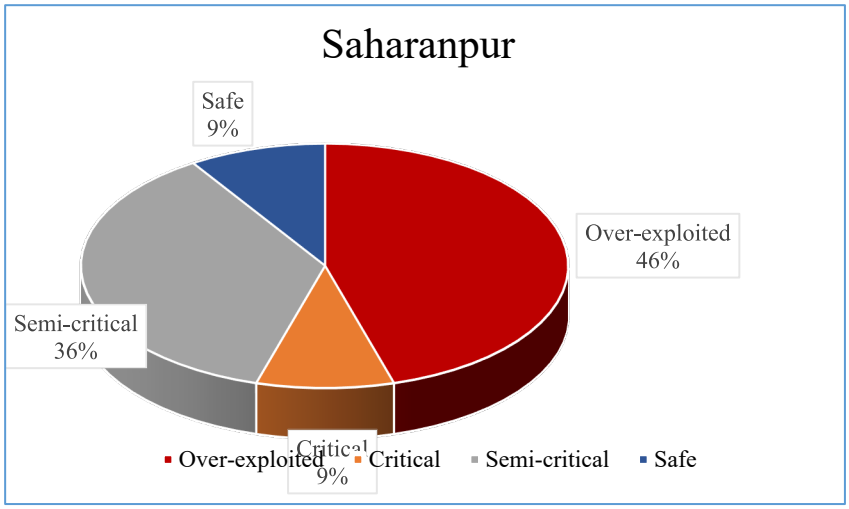


Figure 34 Ground Water Status: Saharanpur

Table 47 Ground Water Staus:Saharanpur

District	Total no. of Blocks	Over-exploited	Critical	Semi-critical	Safe
Saharanpur	11	5	1	4	1

Source: http://upgwd.gov.in/StaticPages/Atlas2017.aspx

Ground Water Compliance/Heavy metal contamination

Table 48 No. of non-complying sampling locations where specific parameter is above the permissible limit: Saharanpur

District	Total no. of Sampling Sites	Sulphate	Flouride	Cadmium	Copper	Lead	Iron	Nickel	Zinc	Manganese	Mercury	Oil & Grease	Chromium
Saharanpur	16	1	0	0	1	2	8	0	2	4	4	9	0

Source: UPPCB Action Plan for Hindon, 2018

Table 49 Sewage Status: Saharanpur

City	Water Consumption (MLD) (@135 LPCD)	Sewage Generation (MLD)	Installed Capacity of Existing STP (MLD)	Proposed STP Capacity (MLD)	Gap in STP Capacity Utilisation (MLD)
Saharanpur	130.82	104.65	38	93.65	N/A

Source: Desk Inventory of UPPCB, Gap analysis from UPPCB Action Plan for Restoration of Hindon and Its Tributaries (2018-19)

Table 50 Drain Type: Saharanpur

District	Total no. of Drains	Domestic Drains	Industrial Drains	Mixed Drains
Saharanpur	7	0	4	3

Source: UPPCB Action Plan for Hindon, 2018

Discharge Status of Drain

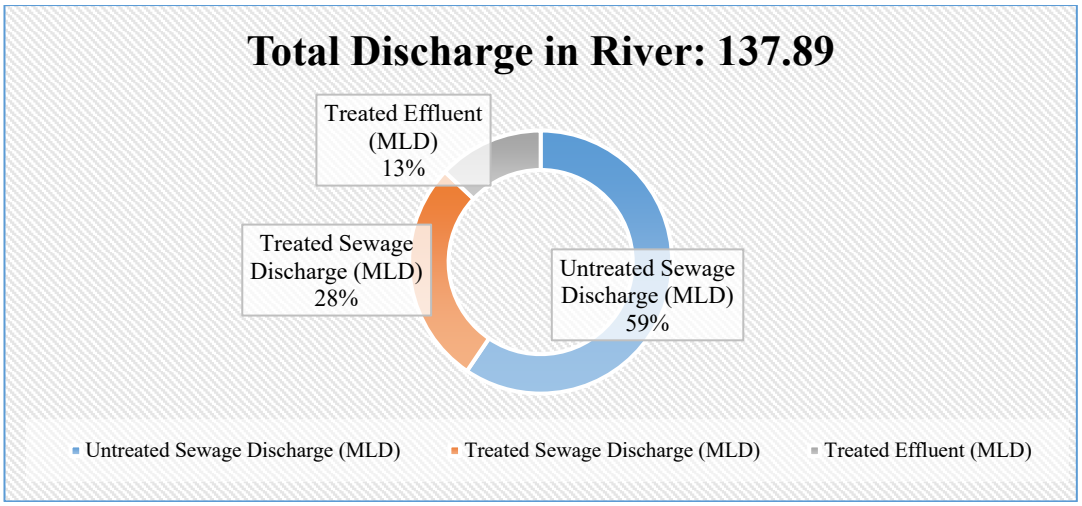


Figure 35 Discharge Status in River

Table 51 Sewage Status: Saharanpur

District	Total Discharge in the River (MLD)	Total Sewage Discharge (MLD)	Untreated Sewage Discharge (MLD)	Treated Sewage Discharge (MLD)	Treated Effluent (MLD)
Saharanpur	137.89	120	82	38	17.89

Source: UPPCB Action Plan for Hindon, 2018

Table 52 Drain Tapping Status: Saharanpur

District	No. of Drains	Tapped Drains	Untapped Drains	Partially Tapped Drains
Saharanpur	7	-	7	-

Source: UPPCB Action Plan for Hindon, 2018

Table 53 Industry Compliance Status: Saharanpur

District Name	No. of Industries	Complying	Non-Complying	Closed	Partly Closed	Status Not Available
Saharanpur	44	23	-	-	-	21

Source: UPPCB Action Plan for Hindon, 2018

Table 54 Status of Municipal Solid Waste: Saharanpur

District	Municipal Solid Waste Generated (TPD)	Waste Collected (TPD)	Treatment Capacity (TPD)	Gap between waste generated and treatment capacity (TPD)
Saharanpur	371.1	371.1	-	371.1

Source: UPPCB Action Plan for Hindon, 2018

Table 55 Status of Bio-Medical Waste: Saharanpur

District	Bio Medical Waste generated (Kg/Day)	Bio Medical Waste Treated (Kg/Day)
Saharanpur	301	301

Source: UPPCB Action Plan for Hindon, 2018

Table 56 Status of Hazardous Waste: Saharanpur

District	Total No. of Hazardous Waste Generating Units	Incinerable Hazardous Waste Generated (TPA)	Landfillable Hazardous Waste Generated (TPA)	Recyclable Hazardous Waste Generated (TPA)	Total Hazardous Waste Generated (TPA)
Saharanpur	30	21.37	6155.99	0	6177.37

Source: UPPCB Action Plan for Hindon,2018

Table 57 Surface Water Quality : Saharanpur

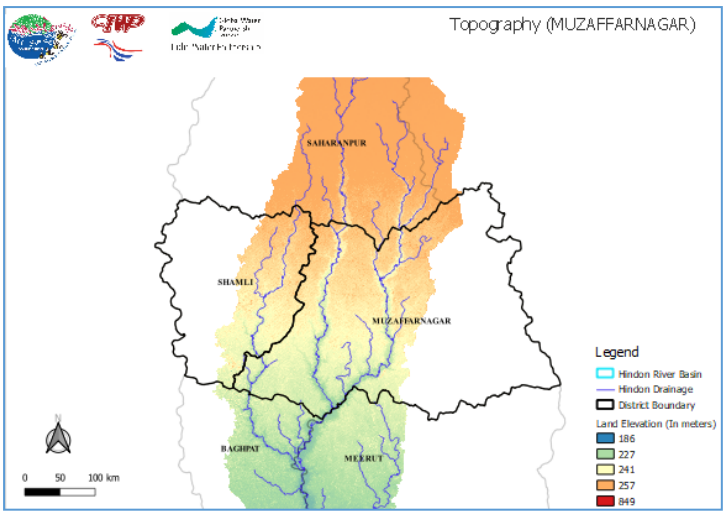
District	Station	Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Saharanpur	Kalanaur	BOD mg/L	14.54	-	0.75	0.85	5.64	5.74	8.78	3.03	1.88	1.58
		Faecal Coliform (MPN)	16.16	5.66	3.08	-	12.33	800	5295	62840	10800	39750

Source: India WRIS Portal (2010-19)

Hindon in Muzaffarnagar

Geography

Muzaffarnagar is a part of National Capital Region (NCR). The elevation near Muzaffarnagar city is 265 meters above MSL which declines to 221 meters above MSL.



Source: Derived using SRTM 30 meter data

Figure 36 Topography: Muzaffarnagar

Basin Area and Population

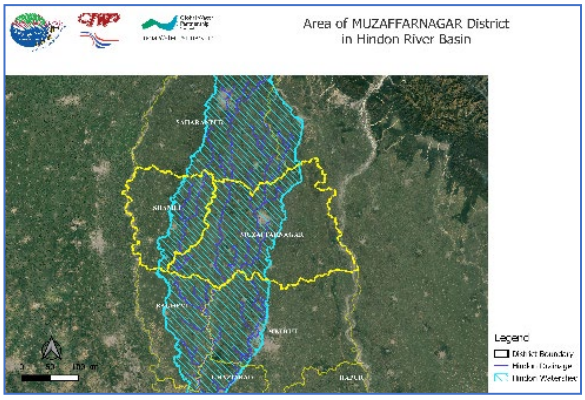


Figure 37 Area of Muzaffarnagar in Hindon Basin

Table 58 Area & Population: Muzaffarnagar

City	Population (As per Census 2011)	Estimated Population 2030	Area of District (Sqkm)	Area of district in Hindon Basin (Sqkm)	Area of district in Hindon Basin %
Muzaffarnagar	500034	660975	2657.07	1516.49	57.07

Source: Administrative Atlas of Uttar Pradesh Vol 1, Census of India, 2011

Land Cover

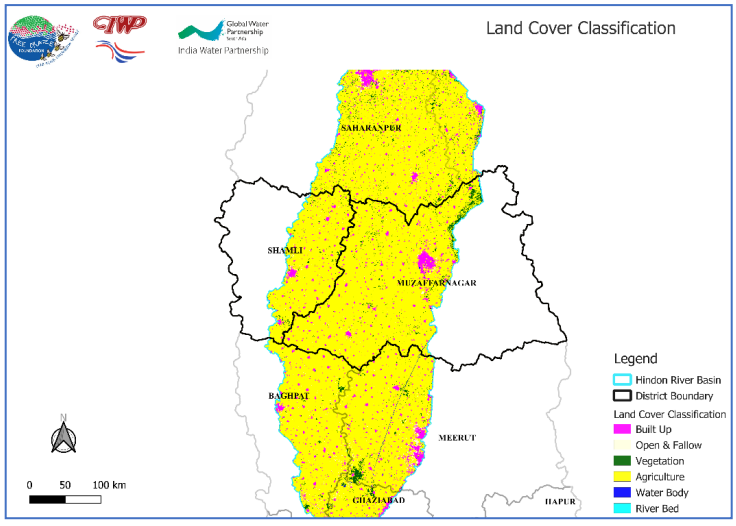


Figure 38 Land Cover Classification

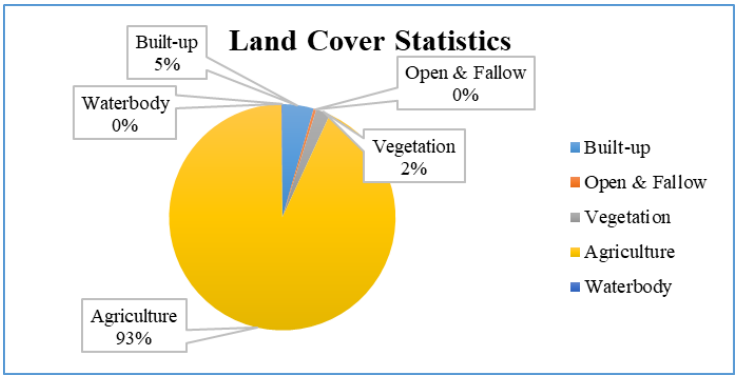


Figure 39 Land Cover Statistics

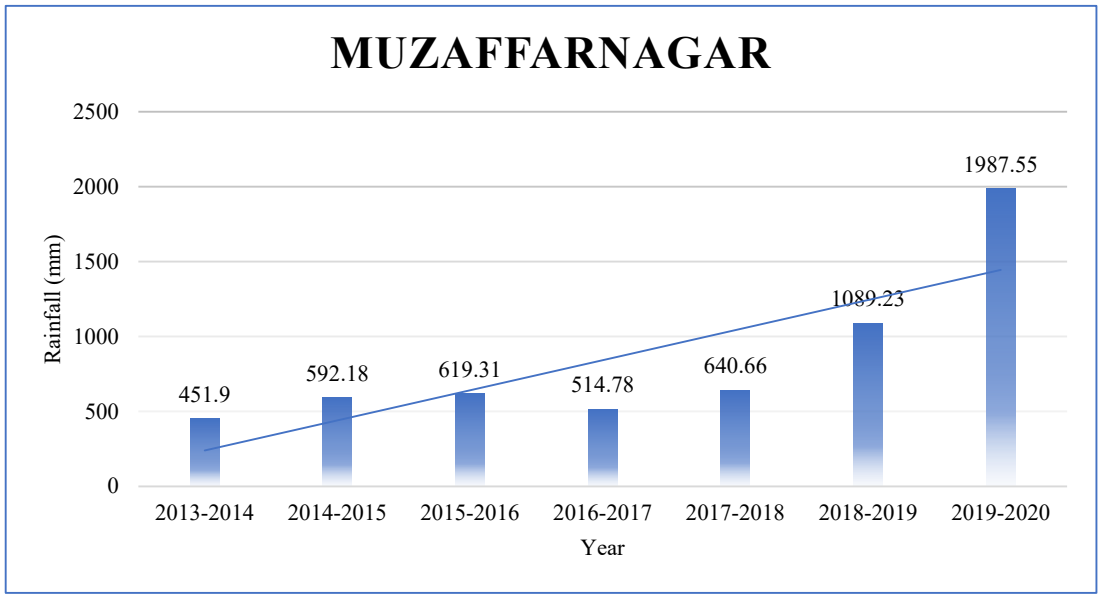
Table 59 Land Cover Statistics: Muzaffarnagar

District Name	Built-up	Open & Fallow	Vegetation	Agriculture	Waterbody
Muzaffarnagar (%)	4.49	0.38	2.03	92.98	0.12

Source: Derived using Landsat 8 (30 meter) image, 2020

Table 60 Rainfall: Muzaffarnagar

District	Normal (mm)	2018-2019 (mm)	2017-2018 (mm)	2016-2017 (mm)	2015-2016 (mm)	2014-2015 (mm)	2013-2014 (mm)
MUZAFFARNAGAR	833.7	1089.23	640.66	514.78	619.31	592.18	451.9



Source: India WRIS portal,2020

Figure 40 Rainfall Trend: Muzaffarnagar

No. of Wetlands

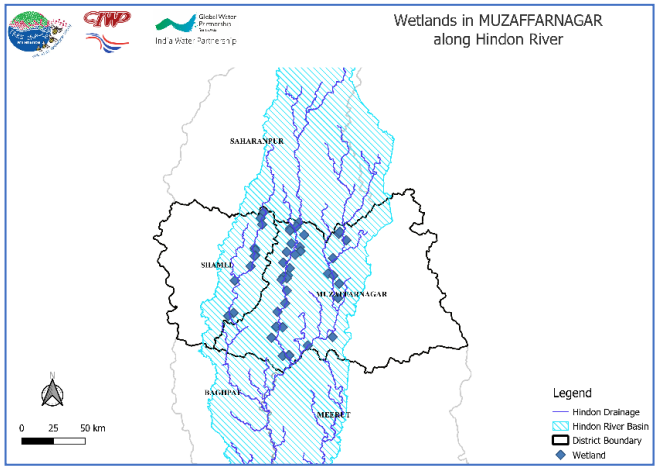


Figure 41 No. of Wetlands along Hindon River in Muzaffarnagar

Table 61: Wetlands: Muzaffarnagar

District	No. of Wetlands
Muzaffarnagar	47

Source: UPPCB Action Plan for Hindon, 2018

Table 62 Vegetated Area Classification:Muzaffarnagar

District	Total Area (Hectares)	Forest (%)	Area Under Non Agricultural Uses (%)	Barren and Unculturable Land (%)	Permanent Pasture and Other Grazing Land (%)	Land Under Misc. Tree Crops and Groves not Included in Net Area Sown (%)	Culturable Waste Land (%)	Fallow Lands Other Than Current Fallows (%)	Current Fallow (%)	Net Area Sown (%
Muzaffarnagar	293815	8.19	13.77	0.76	0.03	0.61	0.43	0.94	1.88	73.38

Source: aps.dac.gov.in/LUS (2015-16)

Area sown more than once

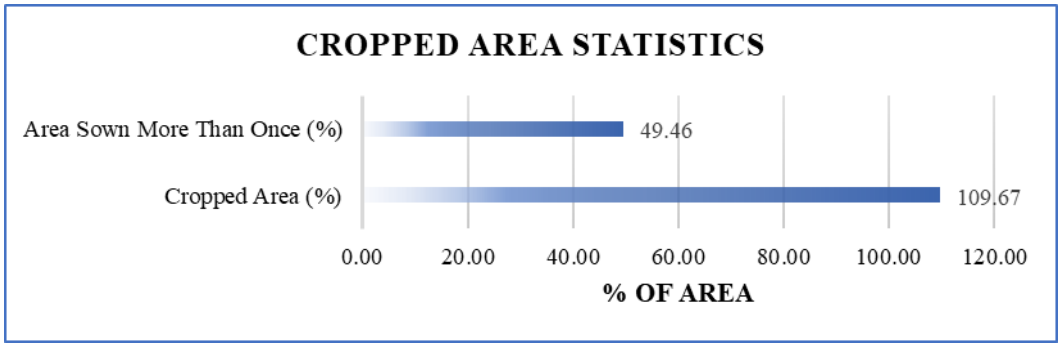


Figure 42 Cropped Area Statistics: Muzaffarnagar

Table 63 Cropped area v/s Area sown more than once: Muzaffarnagar

District	Cropped Area (%)	Area Sown More Than Once (%)
Muzaffarnagar	109.67	49.46

Source:aps.dac.gov.in/LUS 201516)

Source of Irrigation

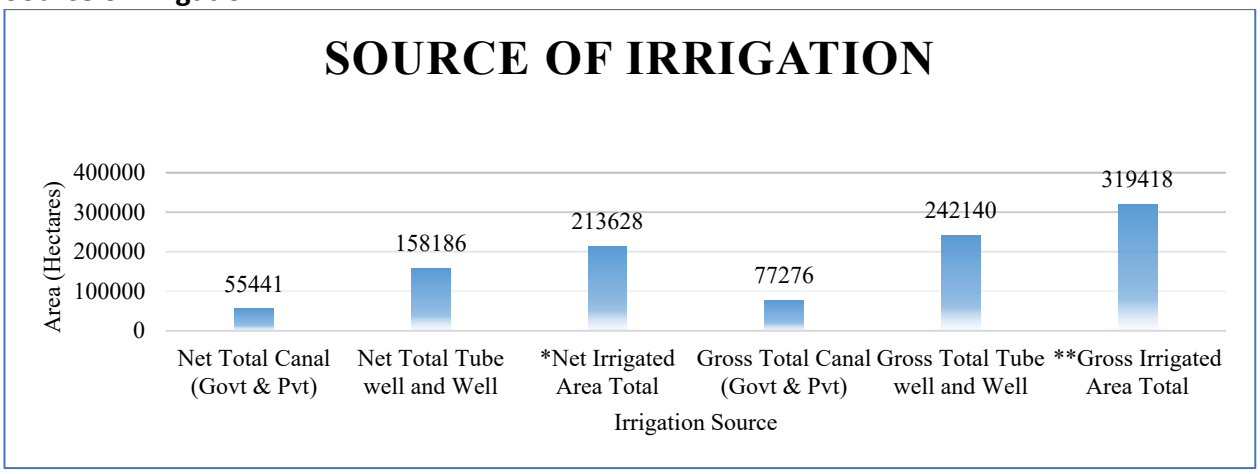


Figure 43 Irrigation Source: Muzaffarnagar

Table 64 Source of Irrigation: Muzaffarnagar

District	Net Total Canal (Govt & Pvt)	Net Total Tube well and Well	*Net Irrigated Area Total	Gross Total Canal (Govt & Pvt)	Gross Total Tube well and Well	**Gross Irrigated Area Total
MUZAFFARNAGAR	55441	158186	213628	77276	242140	319418

Source: aps.dac.gov.in/LUS (2015-16)
Unit: Hectares
**Net Irrigated Area: It is the area irrigated through any source once in a year.*
***Total/Gross Irrigated Area: It is the total area under crops, irrigated once and/or more than once in a year.*

Major crops grown

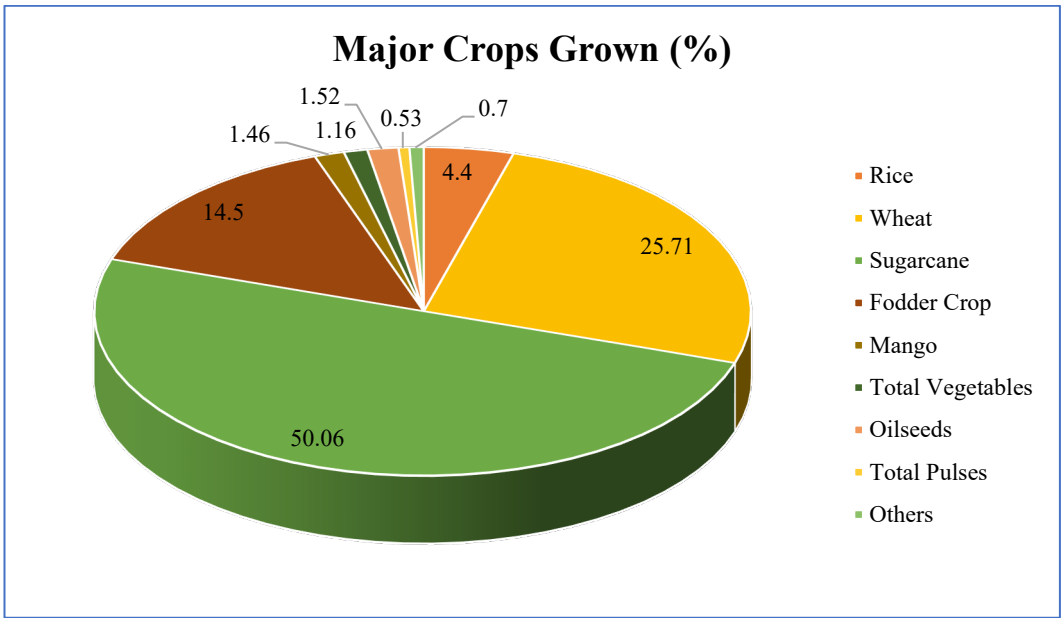


Figure 44 Major Crops Grown: Muzaffarnagar

Table 65 Major Crops Grown: Muzaffarnagar

District/Crop area percentage	Rice	Wheat	Sugarcane	Fodder Crop	Mango	Total Vegetables	Oilseeds	Total Pulses	Others
Muzaffarnagar	4.40	25.71	50.06	14.50	1.46	1.16	1.52	0.53	0.70

Source: aps.dac.gov.in/LUS (2015-16)

Biodiversity

The sampling site to assess the biodiversity of the district was selected from the district, Titavi.

Table 66 List of Birds: Muzaffarnagar

S. No.	Species	Scientific Name
1	Black winged Stilt	Himantopus himantopus
2	Cattle Egret	Bubulcus ibis
3	Citrine Wagtail	Motacilla citreola
4	Common Myna	Acridotheres tristis
5	Great Cormorant	Phalacrocorax carbo
6	Green Bee-eater	Merops orientalis
7	House Sparrow	Passer domesticus
8	Indian Darter	Anhinga melanogaster
9	Indian Robin	Copsychus fulicatus
10	Laughing Dove	Streptopelia senegalensis
11	Oriental Dove	Streptopelia orientalis
12	Oriental Magpie Robin	Copsychus saularis
13	Pond Heron	Ardeola grayii
14	Red wattled Lapwing	Vanellus indicus
15	Red-vented Bulbul	Pycnonotus cafer
16	Rock Pigeon	Columba livia
17	Rose-ringed Parakeet	Psittacula krameri
18	White-throated Kingfisher	Halcyon smyrmensis
19	Yellow Wagtail	Motacilla flava

Table 67 List of Animals: Muzaffarnagar

S. No	Type	Scientific Name	Common Name
1	Animals	*Lepus nigricolli*	Indian Hare
2	Animals	*Varanus bengalensis*	Indian Monitor Lizard
3	Animals	*Funambulus palmarum*	Indian Palm Squirrel
4	Insects	Order: Lepidoptera	Butterflies and Moths
5	Insects	Order:Odonata	Dragonflies and Damselflies
6	Insects	Order: Orthoptera	Grasshoppers and Crickets
7	Insects	Order: Hemiptera	True Bugs

Table 68 Trees: Muzaffarnagar

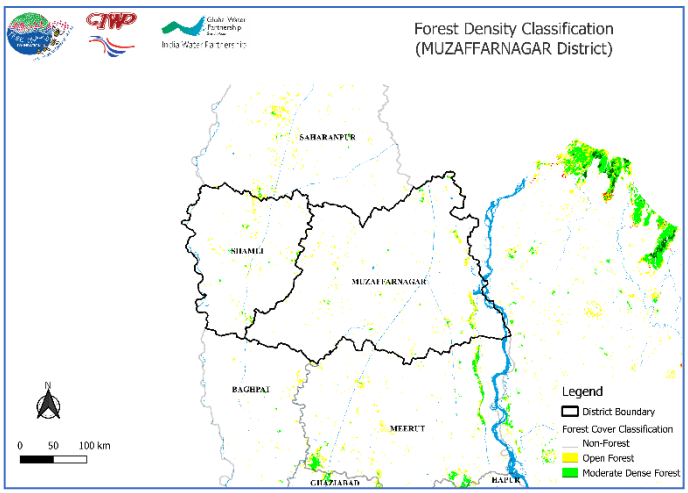
S. NO.	Type	Scientific Name	Common Name	Family
1	Trees	*Albizia lebbeck*	Siris	Fabaceae
2	Trees	*Azadirachta indica*	Neem	Meliaceae
3	Trees	*Dalbergia sisso*	Shisham	Fabaceae
4	Trees	*Eucalyptus spp.*	Safeda	
5	Trees	*Ficus religiosa*	Peepal	
6	Trees	*Mangifera indica*	Mango	
7	Trees	*Phoenix sylvestris*	Wild Date Palm	Arecaceae
8	Trees	*Prosopis juliflora*	Vilaiti Keekar	
9	Trees	*Syzygium cumini*	Jamun	Myrtaceae
10	Trees	*Ziziphus mummularia*	Ber	Rhamnaceae

Table 69 Herbs & Shrubs: Muzaffarnagar

S. NO.	Type	Scientific Name	Common Name	Family
1	Herbs & Shrubs	*Parthenium hysterophorus*	Congress Grass	Asteraceae
2	Herbs & Shrubs	*Ricinus communis*	Castor Oil Plant	Euphorbiaceae
3	Herbs & Shrubs	*Abutilon indicum*	Country Mallow	Malvaceae
4	Herbs & Shrubs	*Solanum indicum*	Common Indian Nightshade	Solanaceae
5	Herbs & Shrubs	*Sonchus oleraceus*	Common Sowthistle	Asteraceae
6	Herbs & Shrubs	*Pergularia daemia*	Pergularia	Asclepiadaceae
7	Herbs & Shrubs	*Achyranthes aspera*	Chrichita	Amaranthaceae
8	Herbs & Shrubs	*Sacharum spontaneum*	Wild Sugarcane	Poaceae
9	Herbs & Shrubs	*Ipomea aquatic*	Water Spinach	Convolvulaceae
10	Herbs & Shrubs	*Solanum indicum*	Common Indian Nightshade	Solanaceae

Source: 'Reviving Hindon River – A Basin Approach.'
By: Natural Heritage Division, Indian National Trust for Art and Cultural Heritage (INTACH), New Delhi, 2017

Forest Classification



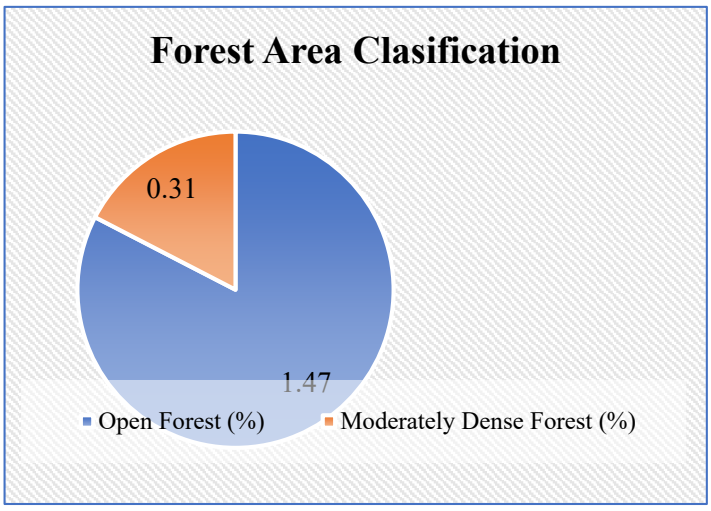


Figure 45 Forest Density Classification (Map)

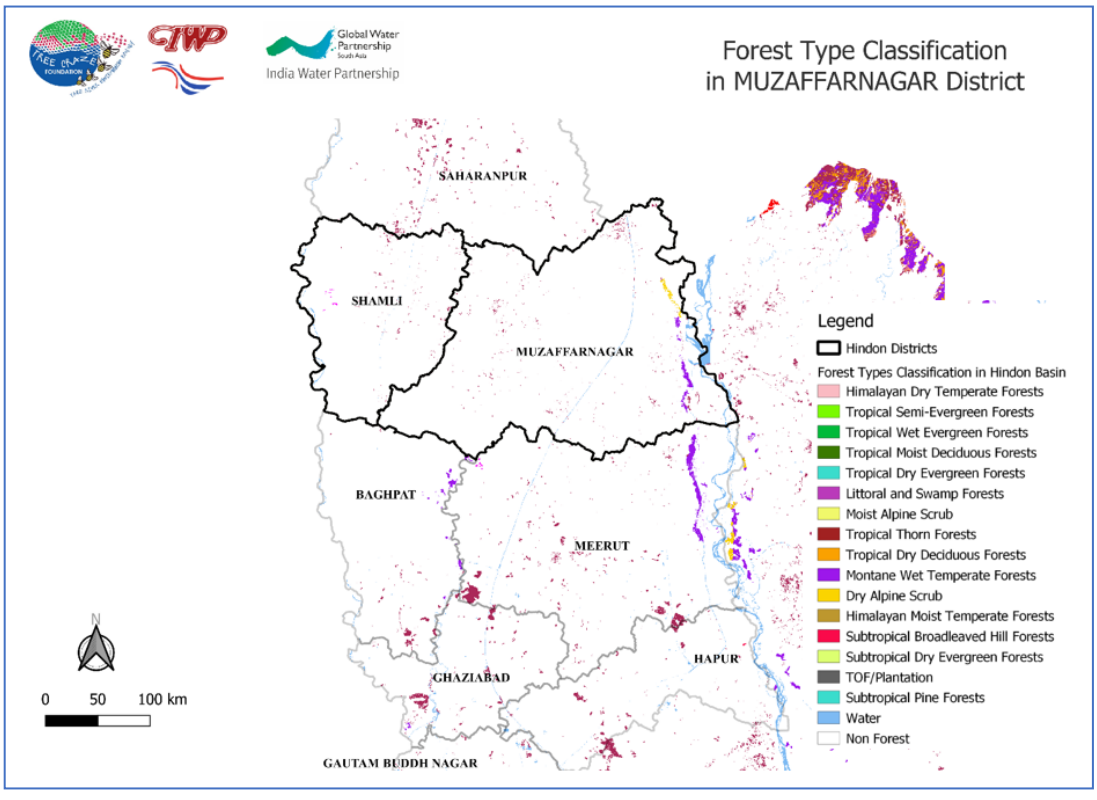
Figure 46 Forest Area Classification (Graph)

Table 70 Forest Density Classification: Muzaffarnagar

District	No Data (%)	Water Bodies (%)	Non Forest (%)	Scrub (%)	Open Forest (%)	Moderately Dense Forest (%)	% of Forest w.r.t. Geographical Area of District	% Change in Forest Cover w.r.t. 2017
Muzaffarnagar	0.00	0.79	97.45	0	1.46	0.31	1.65	26.11

Source: India State of Forest Report, Forest Survey of India, 2019

Forest Type in Muzaffarnagar District



Source: India State of Forest Report, Forest Survey of India, 2019

Figure 47 Forest Type Classification: Muzaffarnagar

Soil Texture

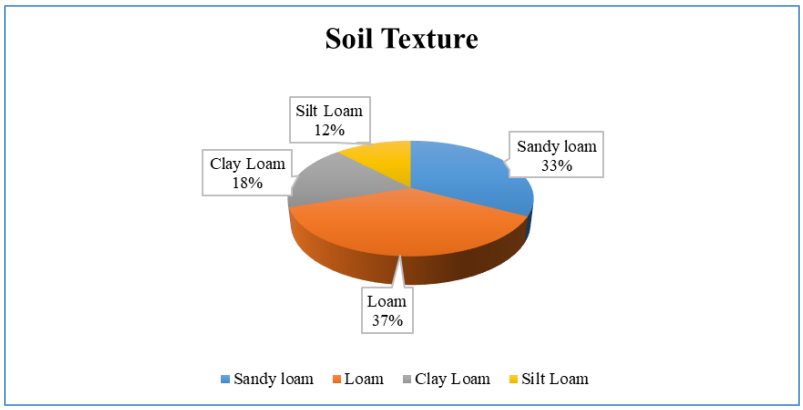


Figure 48 Soil Texture (Graph)

Table 71 Soil Texture Statistics: Muzaffarnagar

District	Sandy Loam (Thousand Hectares)	Loam (Thousand Hectares)	Clay Loam (Thousand Hectares)	Silt Loam (Thousand Hectares)
Muzaffarnagar	106.32	119.59	59.27	39.23

Source:http://agricoop.nic.in/agriculturecontingency/Uttar- Pradesh, 2012

Table 72 Soil Depth: Muzaffarnagar

District	Soil Depth (cm)
Muzaffarnagar	100-150

Source: NRSC (2016) Soil Data set 2000. NICES/DS (L)/SOIL/2000/Jan2016

Industry Type (No. of Industries)

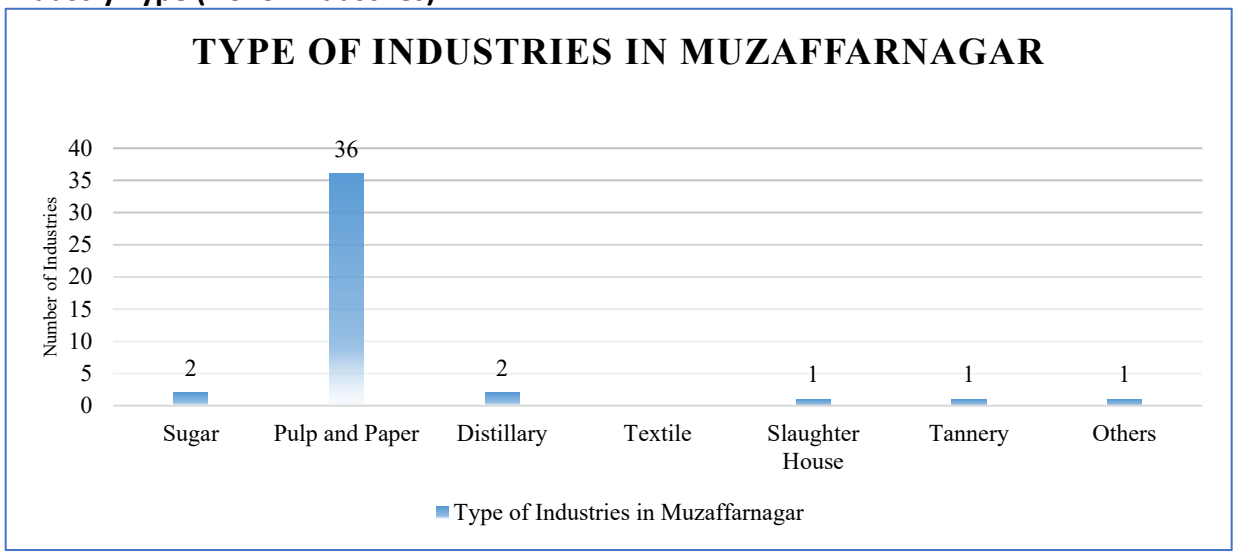


Figure 49 Type of Industries (Graph): Muzaffarnagar

Table 73 Industry Type: Muzaffarnagar

District/ No. of Industries	Sugar	Pulp and Paper	Distillary	Textile	Slaughter House	Tannery	Others	Total no. of Industries
Muzaffarnagar	2	36	2	-	1	1	1	43

Source: UPPCB Action Plan for Hindon, 2018

Ground Water Status

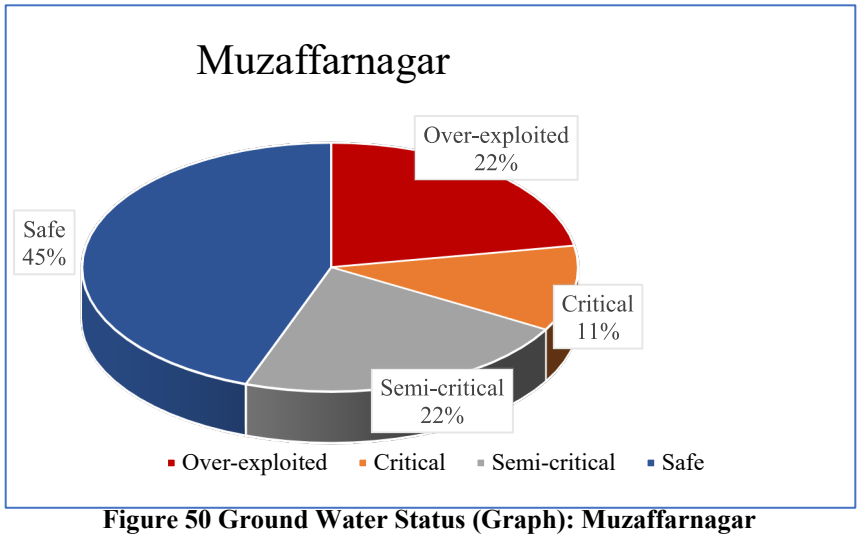


Figure 50 Ground Water Status (Graph): Muzaffarnagar

Table 74 Ground Water Status (Blockwise): Muzaffarnagar

District	Total no. of Blocks	Over-exploited	Critical	Semi-critical	Safe
Muzaffarnagar	9	2	1	2	4

Source: http://upgwd.gov.in/StaticPages/Atlas2017.aspx

Ground Water Compliance/Heavy metal contamination

Table 75 No. of non-complying samples where specific parameter is above the permissible limit: Muzaffarnagar

District	Total no. of Sampling Sites	Sulphate	Fluoride	Cadmium	Copper	Lead	Iron	Nickel	Zinc	Manganese	Mercury	Oil & Grease	Chromium
Muzaffarnagar	15	1	0	2	0	1	1	0	1	3	9	4	0

Source: UPPCB Action Plan for Hindon, 2018

Table 76 Sewage Status: Muzaffarnagar

City	Water Consumption (MLD) (@135 LPCD)	Sewage Generation (MLD)	Installed Capacity of Existing STP (MLD)	Proposed STP Capacity (MLD)	Gap in STP Capacity Utilisation (MLD)
Muzaffarnagar	70.09	56.07	32.5	32	N/A

Source: Desk Inventory of UPPCB, Gap analysis from UPPCB Action Plan for Restoration of Hindon and Its Tributaries (2018-19)

Table 77 Type of Drain: Muzaffarnagar

District	Total no. of Drains	Domestic Drains	Industrial Drains	Mixed Drains
Muzaffarnagar	10	7	0	3

Source: UPPCB Action Plan for Hindon, 2018

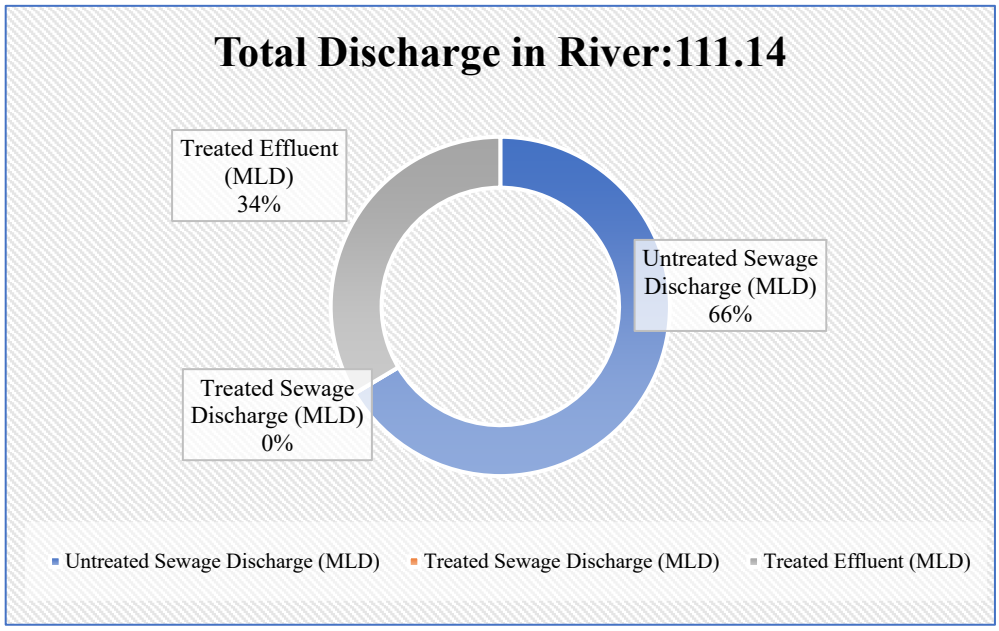


Figure 51 Drain Discharge Status: Muzaffarnagar

Table 78 Discharge Status of Drain: Muzaffarnagar

District	Total Discharge in the River (MLD)	Total Sewage Discharge (MLD)	Untreated Sewage Discharge (MLD)	Treated Sewage Discharge (MLD)	Treated Effluent (MLD)
Muzaffarnagar	111.14	73.84	73.84	0	37.30

Source: UPPCB Action Plan for Hindon, 2018

Table 79 Tapping Status of Drain: Muzaffarnagar

District	No. of Drains	Tapped Drains	Untapped Drains	Partially Tapped Drains
Muzaffarnagar	10	-	10	-

Source: UPPCB Action Plan for Hindon, 2018

Table 80 Status of Industry Compliance: Muzaffarnagar

District Name	No. of Industries	Complying	Non-Complying	Closed	Partly Closed	Status Not Available
Muzaffarnagar	50	10	-	-	-	40

Source: UPPCB Action Plan for Hindon, 2018

Table 81 Status of Municipal Solid Waste: Muzaffarnagar

District	Municipal Solid Waste Generated (TPD)	Waste Collected (TPD)	Treatment Capacity (TPD)	Gap between waste generated and treatment capacity (TPD)
Muzaffarnagar	230.8	230.8	120	110.8

Source: UPPCB Action Plan for Hindon, 2018

Table 82 Status of Bio-Medical Waste: Muzaffarnagar

District	Bio Medical Waste generated (Kg/Day)	Bio Medical Waste Treated (Kg/Day)
Muzaffarnagar	26	26

Source: UPPCB Action Plan for Hindon, 2018

Table 83 Status of Hazardous Waste: Muzaffarnagar

District	Total No. of Hazardous Waste Generating Units	Incinerable Hazardous Waste Generated (TPA)	Landfillable Hazardous Waste Generated (TPA)	Recyclable Hazardous Waste Generated (TPA)	Total Hazardous Waste Generated (TPA)
Muzaffarnagar	80	22.5	3281.25	3.5	3307.25

Source: UPPCB Action Plan for Hindon, 2018

Table 84 Surface Water Quality: Muzaffarnagar

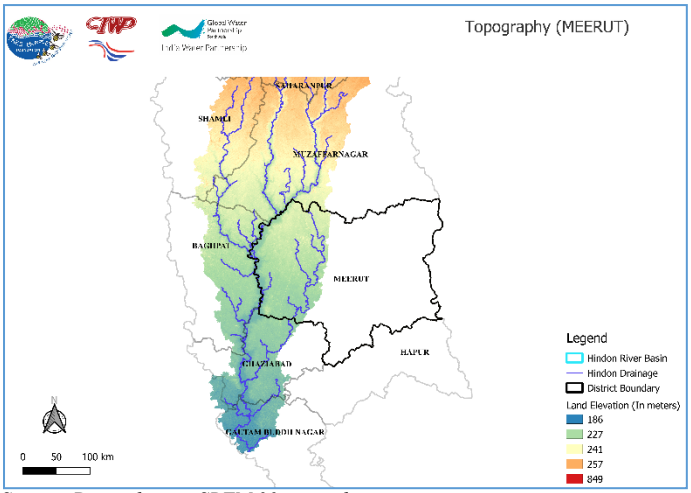
District	Station	Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Muzaffarnagar	Mawi	BOD mg/L	3.68	-	2.83	5.49	7.55	7.23	5.52	4.90	2.64	2.92
		Faecal Coliform (MPN)	39	29	15.5	-	103	15730	8530.09	67111.11	33422.22	41344.44

Source: India WRIS Portal (2010-19)

Hindon in Meerut

Geography

Meerut city lies in the western part of Uttar Pradesh. The elevation near Meerut city is 238 meters above MSL which declines to 211 meters above MSL.



Source: Derived using SRTM 30 meter data

Figure 52 Hindon Basin Topography: Meerut

Basin Area and Population*

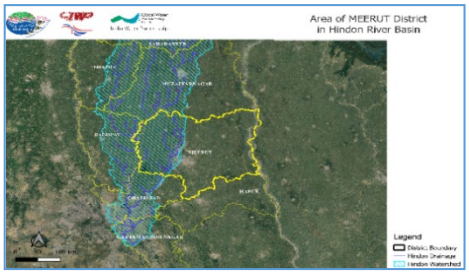


Figure 53 Area of Meerut in Hindon Basin

Table 85 Area & Population: Meerut

City	Population (As per Census 2011)*	Estimated Population 2030*	Area of District (Sqkm)	Area of district in Hindon Basin (Sqkm)	Area of district in Hindon Basin %
Meerut	58252	74732	2512.80	856.70	34.09

Source: Administrative Atlas of Uttar Pradesh Vol 1, Census of India, 2011

Figure 53 Area of Meerut in Hindon Basin

**Hindon river is far away from Meerut town and most of the drains carrying sewage are meeting river Kali (East) hence only for Sardhana town population wise gap analysis of sewage has been included in the table.*

Land Cover

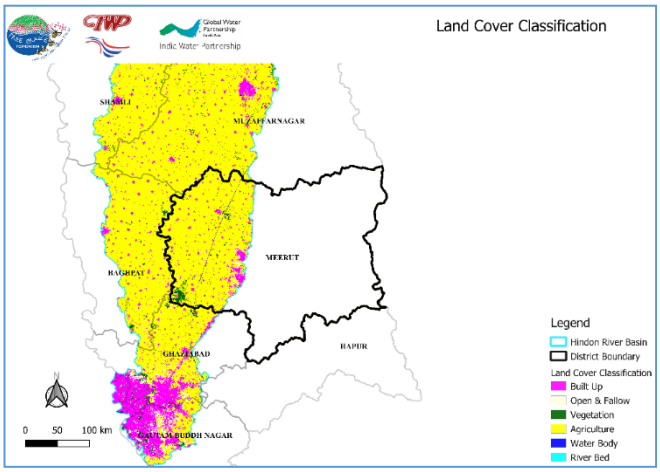


Figure 54 Land Cover Classification (Map)

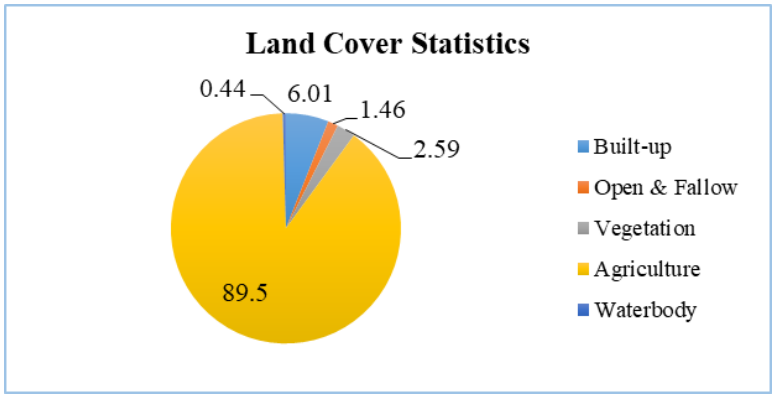


Figure 55 Land Cover Classification (Graph): Meerut

Table 86 Land Cover Statistics: Meerut

District Name	Built-up	Open & Fallow	Vegetation	Agriculture	Waterbody
Meerut (%)	6.01	1.46	2.59	89.50	0.44

Source: Derived using Landsat 8 (30 meter) image, 2020

Table 87 Rainfall: Meerut

District	Normal (mm)	2018-2019 (mm)	2017-2018 (mm)	2016-2017 (mm)	2015-2016 (mm)	2014-2015 (mm)	2013-2014 (mm)
MEERUT	904.7	1057.02	542.83	489.54	587.3	566.02	437.85

Source: India WRIS portal, 2020

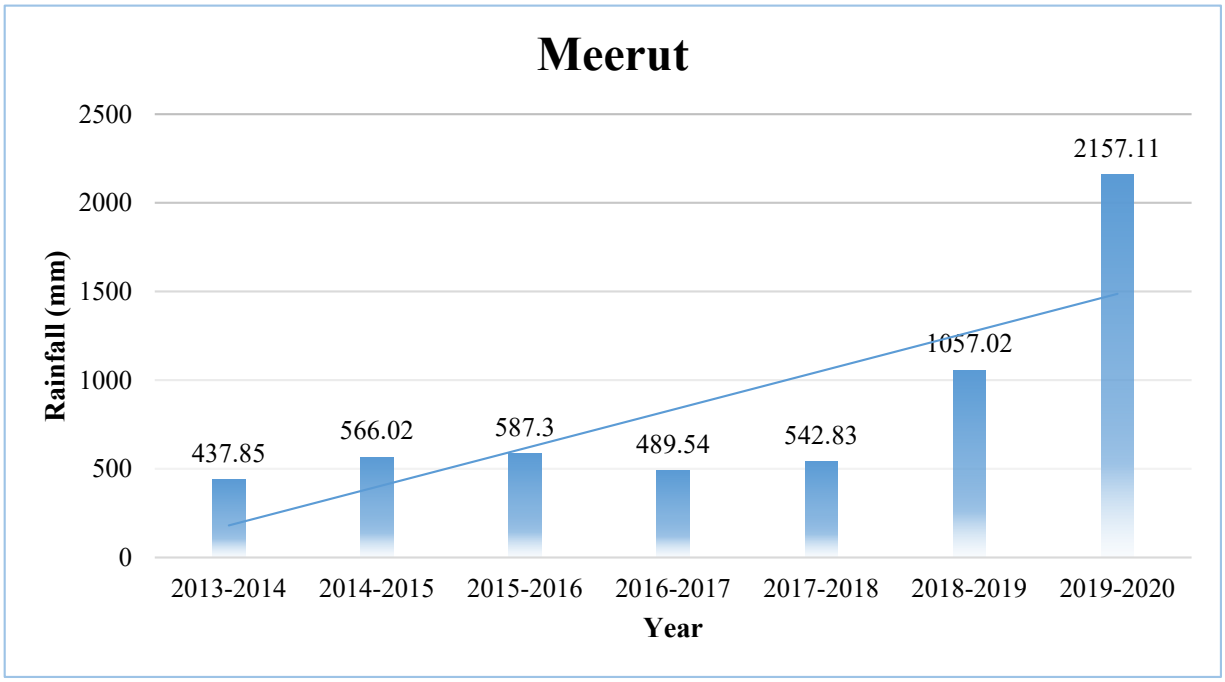


Figure 56 Rainfall Trend: Meerut

No. of Wetlands

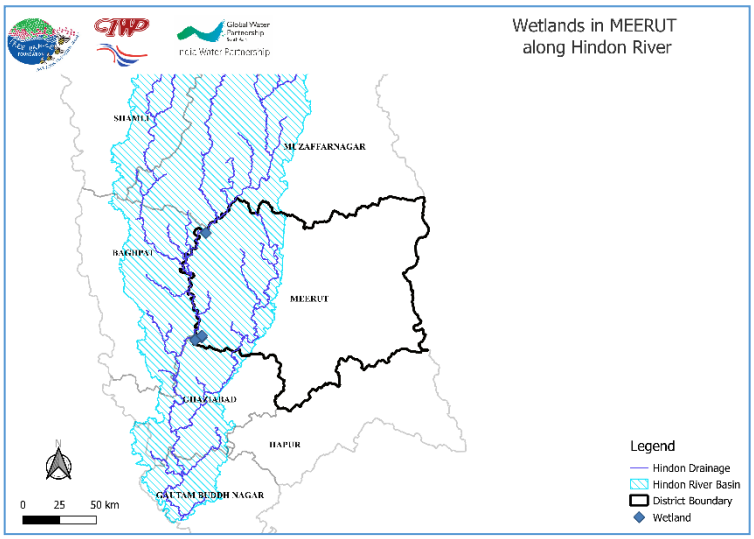


Figure 57 No. of Wetlands along Hindon River: Meerut

Table 88 No. of Wetlands: Meerut

District	No. of Wetlands
MEERUT	5

Source: UPPCB Action Plan for Hindon, 2018

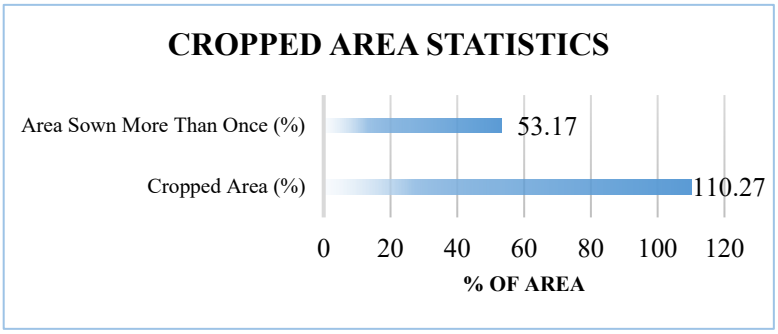
Table 89 Vegetated Area Classification: Meerut

District	Total Area (Hectares)	Forest (%)	Area Under Non Agricultural Uses (%)	Barren and Unculturable Land (%)	Permanent Pasture and Other Grazing Land (%)	Land Under Misc. Tree Crops and Groves not Included in Net Area Sown (%)	Culturable Waste Land (%)	Fallow Lands Other Than Current Fallows (%)	Current Fallow (%)	Net Area Sown (%)
Meerut	273005	7.81	16.12	1.11	0.14	0.06	1.18	0.87	0.72	71.99

Source: aps.dac.gov.in/LUS (2015-16)

Area sown more than once

Table 90 Cropped area v/s Area Sown more than once



District	Cropped Area (%)	Area Sown More Than Once (%)
Meerut	110.27	53.17

Source: aps.dac.gov.in/LUS (2015-16)

Figure 58 Cropped Area Statistics (Graph): Meerut

Source of Irrigation

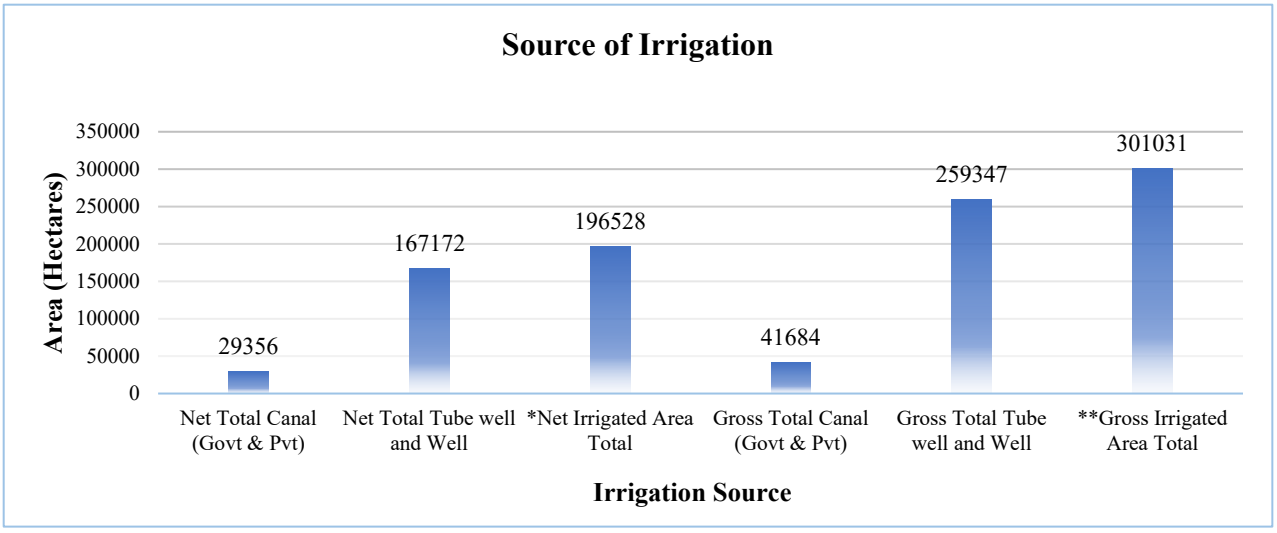


Figure 59 Source of Irrigation: Meerut

Table 91 Source of Irrigation: Meerut

District	Net Total Canal (Govt & Pvt)	Net Total Tube well and Well	*Net Irrigated Area Total	Gross Total Canal (Govt & Pvt)	Gross Total Tube well and Well	**Gross Irrigated Area Total
MEERUT	29356	167172	196528	41684	259347	301031

Source: aps.dac.gov.in/LUS (2015-16)
Unit: Hectares
**Net Irrigated Area: It is the area irrigated through any source once in a year.*
***Total/Gross Irrigated Area: It is the total area under crops, irrigated once and/or more than once in a year.*

Major crops grown

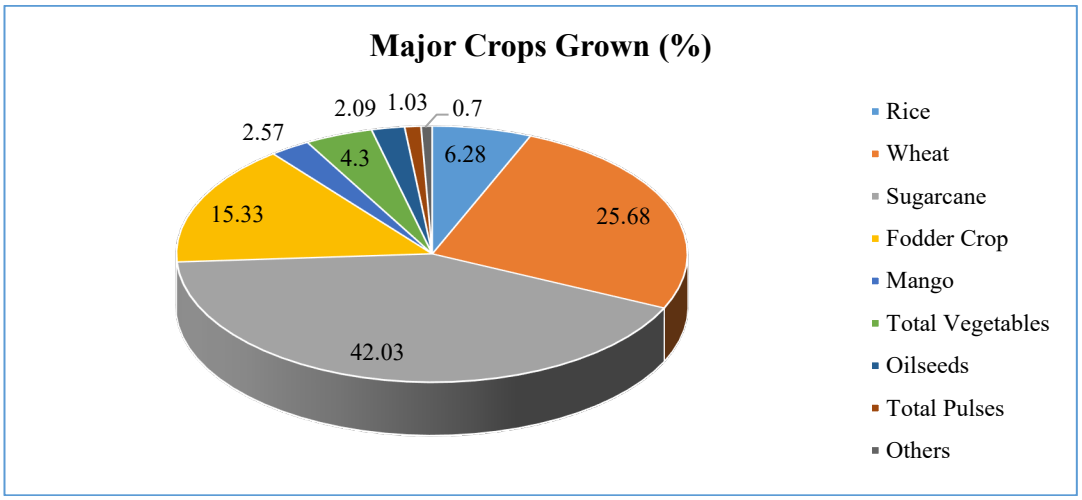


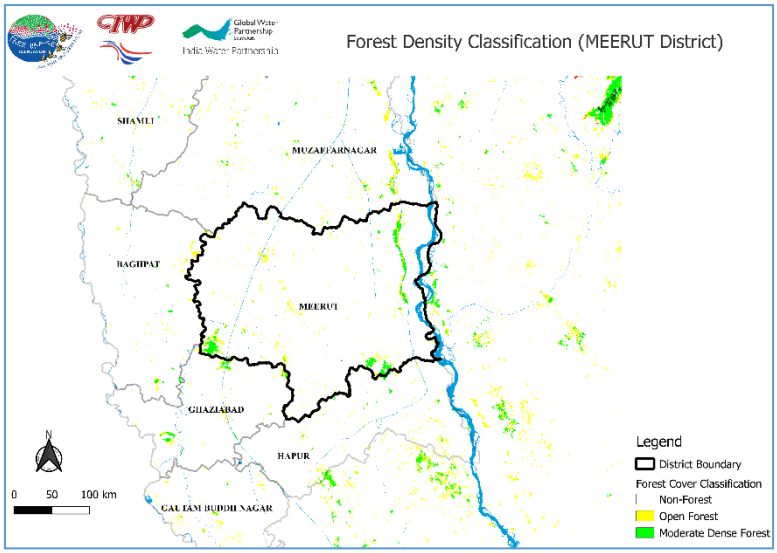
Figure 60 Major Crops Grown: Meerut

Table 92 Major Crops Grown: Meerut

District/Crop area percentage	Rice	Wheat	Sugarcane	Fodder Crop	Mango	Total Vegetables	Oilseeds	Total Pulses	Others
Meerut	6.28	25.68	42.03	15.33	2.57	4.30	2.09	1.03	0.70

Source: aps.dac.gov.in/LUS (2015-16)

Forest Classification



Source: India State of Forest Report, Forest Survey of India, 2019

Figure 61 Forest Area Classification (Map): Meerut

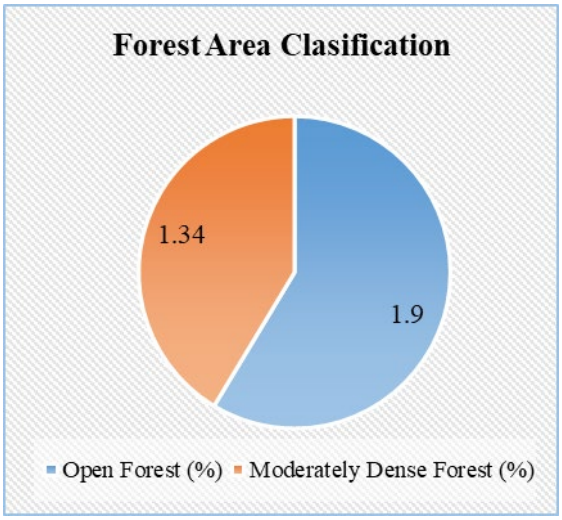


Figure 62 Forest Area Classification (Graph): Meerut

Table 93 Forest Density Classification Statistics

District	No Data (%)	Water Bodies (%)	Non Forest (%)	Scrub (%)	Open Forest (%)	Moderately Dense Forest (%)	% of Forest w.r.t. Geographical Area of District	% Change in Forest Cover w.r.t. 2017
Meerut	0.00	1.69	95.07	0.00	1.90	1.34	2.67	0.41

Source: India State of Forest Report, Forest Survey of India, 2019

Forest Type in Meerut District

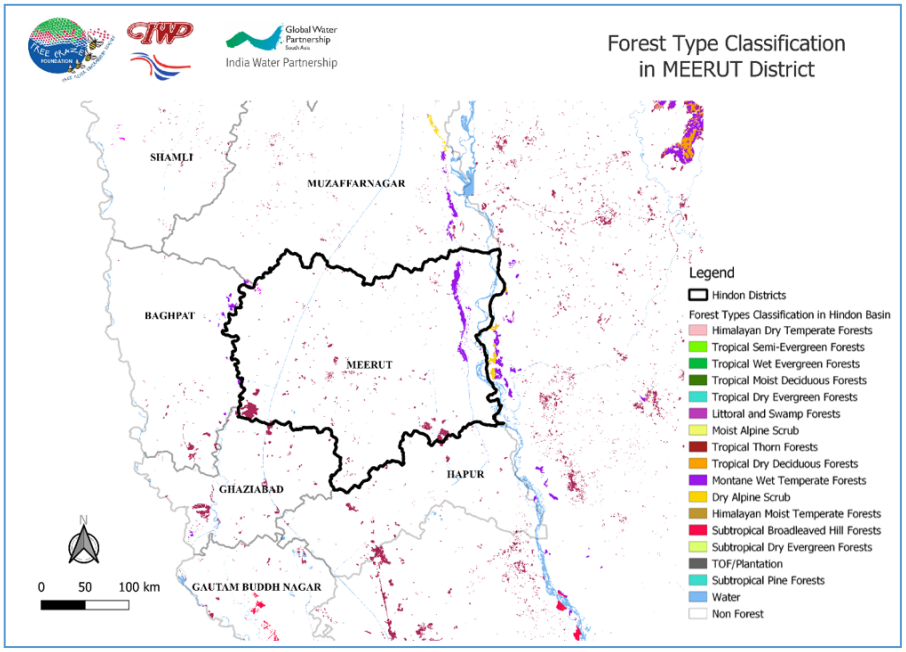


Figure 63 Forest Type: Meerut

Industry Type (No. of Industries)

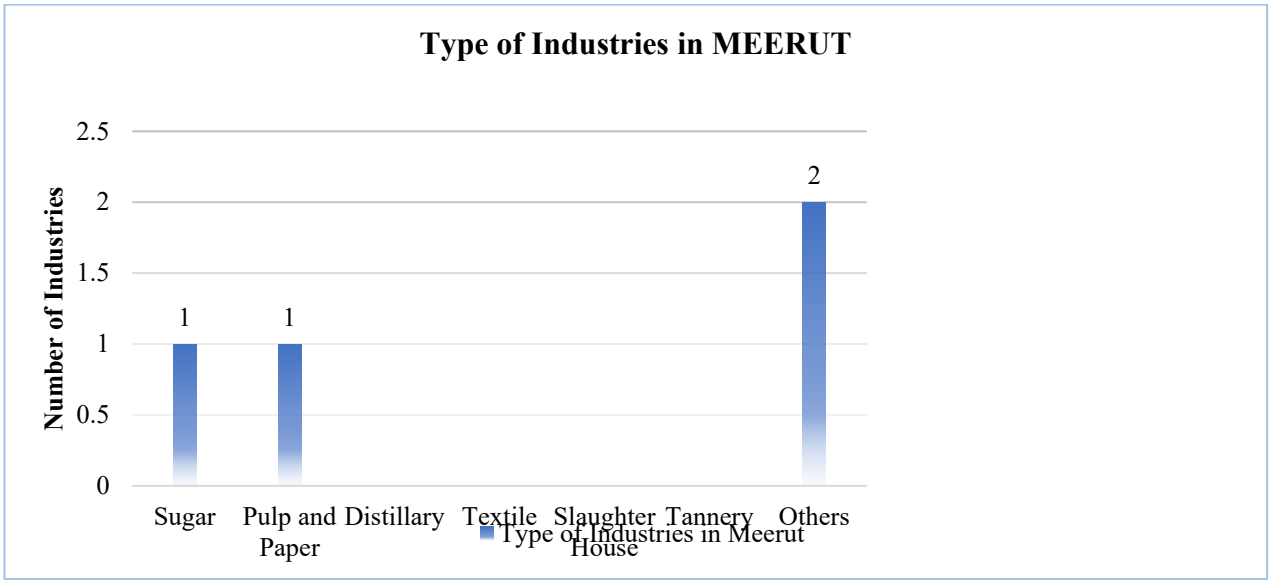


Figure 64 Type of Industries: Meerut

Table 94 Industry Type: Meerut

District/ No. of Industries	Sugar	Pulp and Paper	Distillery	Textile	Slaughter House	Tannery	Others	Total no. of Industries
MEERUT	1	1	-	-	-	-	2	4

Source: UPPCB Action Plan for Hindon, 2018

Ground Water Status

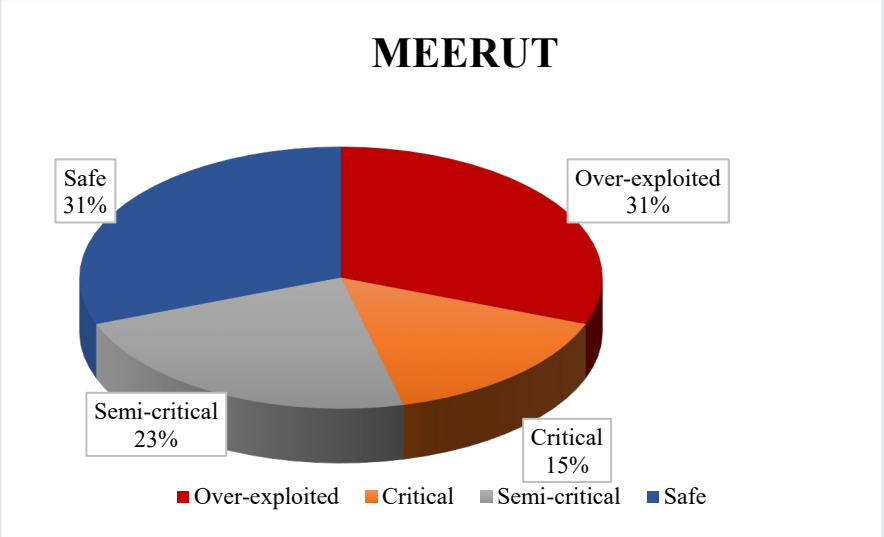


Figure 65 Ground Water Status: Meerut

Table 95 Ground Water Status: Meerut

District	Total no. of Blocks	Over-exploited	Critical	Semi-critical	Safe
Meerut	13	4	2	3	4

Source: http://upgwd.gov.in/StaticPages/Atlas2017.aspx

Ground Water Compliance/Heavy metal contamination

Table 96 No. of non-complying sampling locations where specific parameter is above the permissible limit: Meerut

District	Total no. of Sampling Sites	Sulphate	Fluoride	Cadmium	Copper	Lead	Iron	Nickel	Zinc	Manganese	Mercury	Oil & Grease	Chromium
Meerut	1	0	1	0	0	0	0	0	0	0	0	0	0

Source: UPPCB Action Plan for Hindon, 2018

Table 97 Sewage Status: Meerut

City	Water Consumption (MLD) (@135 LPCD)	Sewage Generation (MLD)	Installed Capacity of Existing STP (MLD)	Proposed STP Capacity (MLD)	Gap in STP Capacity Utilisation (MLD)
Meerut	10.09	8.07	N/A	N/A	8.07

Source: Desk Inventory of UPPCB, Gap analysis from UPPCB Action Plan for Restoration of Hindon and Its Tributaries (2018-19)

Table 98 Type of Drain: Meerut

District	Total no. of Drains	Domestic Drains	Industrial Drains	Mixed Drains
Meerut	2	-	1	1

Source: UPPCB Action Plan for Hindon, 2018

Discharge Status of Drain

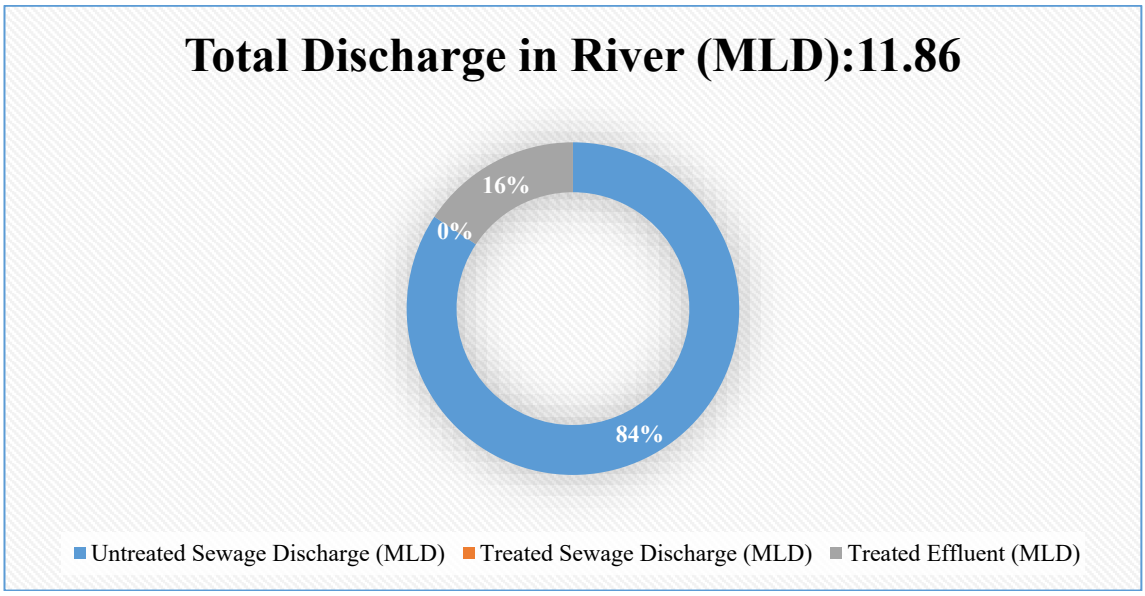


Figure 66 Discharge Status of Drain: Meerut

Table 99 Drain Discharge Status: Meerut

District	Total Discharge in the River (MLD)	Total Sewage Discharge (MLD)	Untreated Sewage Discharge (MLD)	Treated Sewage Discharge (MLD)	Treated Effluent (MLD)
Meerut	11.86	10	10	0	1.86

Source: UPPCB Action Plan for Hindon, 2018

Table 100 Tapping Status of Drain: Meerut

District	No. of Drains	Tapped Drains	Untapped Drains	Partially Tapped Drains
Meerut	2	-	2	-

Source: UPPCB Action Plan for Hindon, 2018

Table 101 Status of Industry Compliance: Meerut

District Name	No. of Industries	Complying	Non-Complying	Closed	Partly Closed	Status Not Available
Meerut	4	3	-	-	-	1

Source: UPPCB Action Plan for Hindon, 2018

Table 102 Status of Municipal Solid Waste: Meerut

District	Municipal Solid Waste Generated (TPD)	Waste Collected (TPD)	Treatment Capacity (TPD)	Gap between waste generated and treatment capacity (TPD)
Meerut	22.82	22.82	-	22.82

Source: UPPCB Action Plan for Hindon, 2018

Table 103 Status of Bio-Medical Waste: Meerut

District	Bio Medical Waste generated (Kg/Day)	Bio Medical Waste Treated (Kg/Day)
Meerut	764	764

Source: UPPCB Action Plan for Hindon, 2018

Table 104 Status of Hazardous Waste: Meerut

District	Total No. of Hazardous Waste Generating Units	Incinerable Hazardous Waste Generated (TPA)	Landfillable Hazardous Waste Generated (TPA)	Recyclable Hazardous Waste Generated (TPA)	Total Hazardous Waste Generated (TPA)
Meerut	96	358.781	1935.80	1057.50	3352.09

Source: UPPCB Action Plan for Hindon, 2018

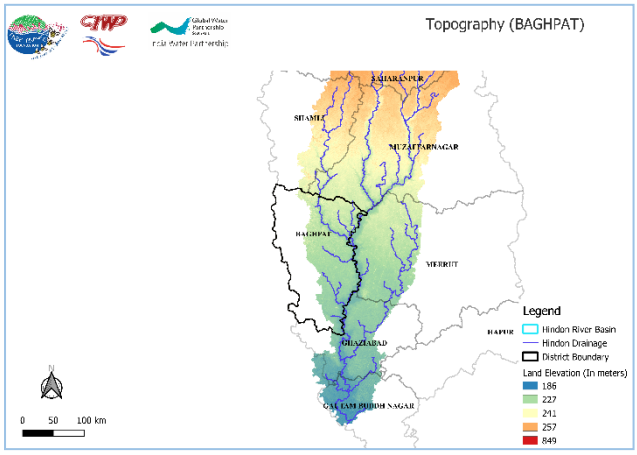
Table 105 Surface Water Quality: Meerut

District	Station	Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Meerut	Galeta	BOD mg/L	39.05	-	41.54	85.43	38.81	53.76	57.02	51.86	42.27	50.76
		Faecal Coliform (MPN)	111.66	966.66	1337.50	-	2560	212457.1	238236.4	280000	1486667	802222.2

Source: India WRIS Portal (2010-19)

Geography

Baghpat is a city located in the western Uttar Pradesh. The elevation near Baghpat city is 239 meters above MSL which declines to 206 meters above MSL.



Source: Derived using SRTM 30 meter data

Figure 67 Population & Area: Baghpat

Basin Area and Population

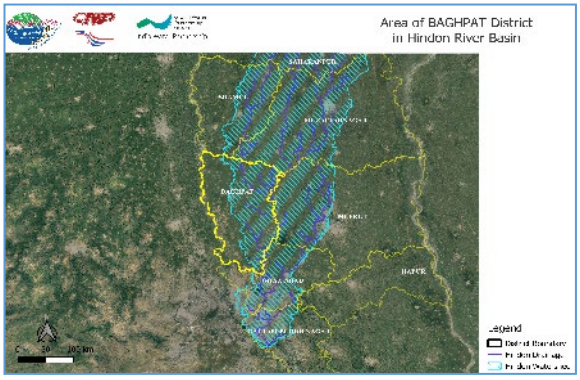


Figure 68 Area of Baghpat in Hindon Basin

Table 106 Area & Population: Baghpat

City	Population (As per Census 2011)	Estimated Population 2030	Area of District (Sqkm)	Area of district in Hindon Basin (Sqkm)	Area of district in Hindon Basin %
Baghpat	50310	61733	1281.80	752.98	58.74

Source: Administrative Atlas of Uttar Pradesh Vol 1, Census of India, 2011

Land Cover

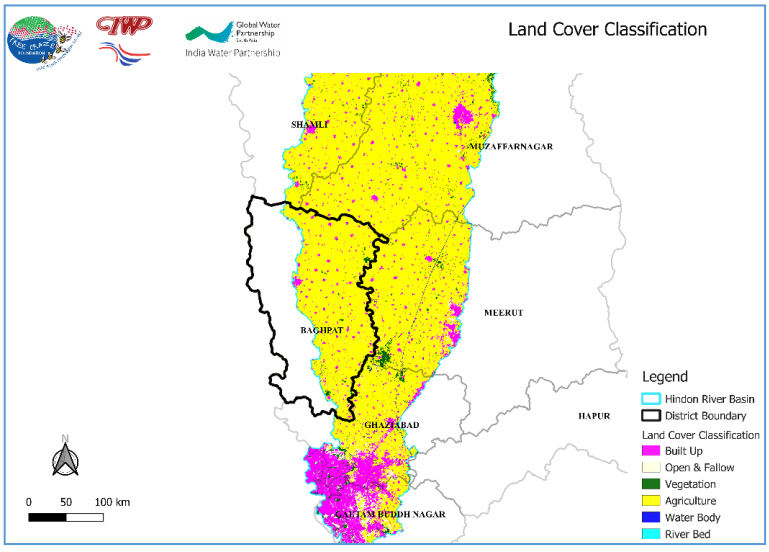


Figure 70 Land Cover Classification: Baghpat

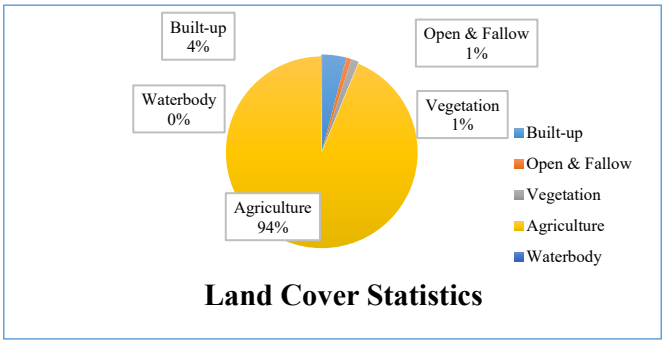


Figure 69 Land Cover Statistics (Graph): Baghpat

Table 107 Land Cover Statistics: Baghpat

District Name	Built-up	Open & Fallow	Vegetation	Agriculture	Waterbody
Baghpat (%)	4.08	0.87	1.28	93.65	0.11

Source: Derived using Landsat 8 (30 meter) image, 2020

Table 108 Rainfall: Baghpat

District	Normal (mm)	2018-2019 (mm)	2017-2018 (mm)	2016-2017 (mm)	2015-2016 (mm)	2014-2015 (mm)	2013-2014 (mm)
BAGHPAT	649	902.87	594.58	499.63	637.89	644.01	462.16

Source: India WRIS portal, 2020

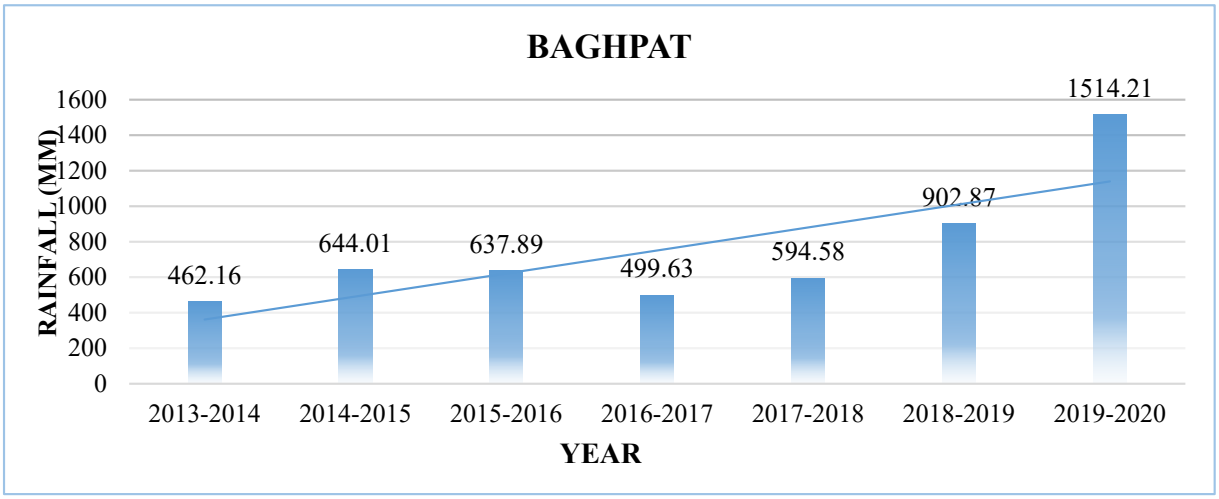


Figure 71

Rainfall Trend: Baghpat

No. of Wetlands

Table 109 No. of Wetlands: Baghpat

District	No. of Wetlands
BAGHPAT	12

Source: UPPCB Action Plan for Hindon, 2018

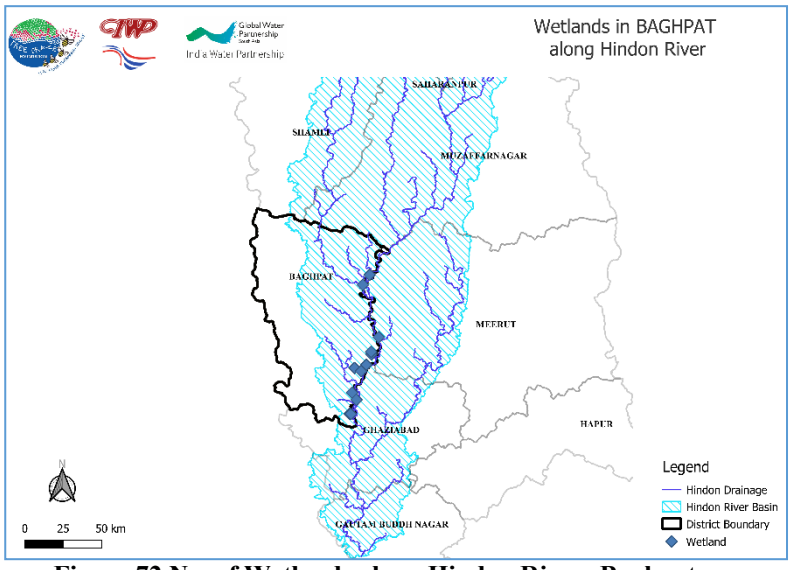


Figure 72 No. of Wetlands along Hindon River: Baghpat

Table 110 Vegetated Area Classification: Baghpat

District	Total Area (Hectares)	Forest (%)	Area Under Non Agricultural Uses (%)	Barren and Unculturable Land (%)	Permanent Pasture and Other Grazing Land (%)	Land Under Misc. Tree Crops and Groves not Included in Net Area Sown (%)	Culturable Waste Land (%)	Fallow Lands Other Than Current Fallows (%)	Current Fallow (%)	Net Area Sown (%)
Baghpat	134983	1.21	14.01	1.37	0.07	0.03	1.86	0.73	1.18	79.55

Source: aps.dac.gov.in/LUS (2015-16)

Area sown more than once

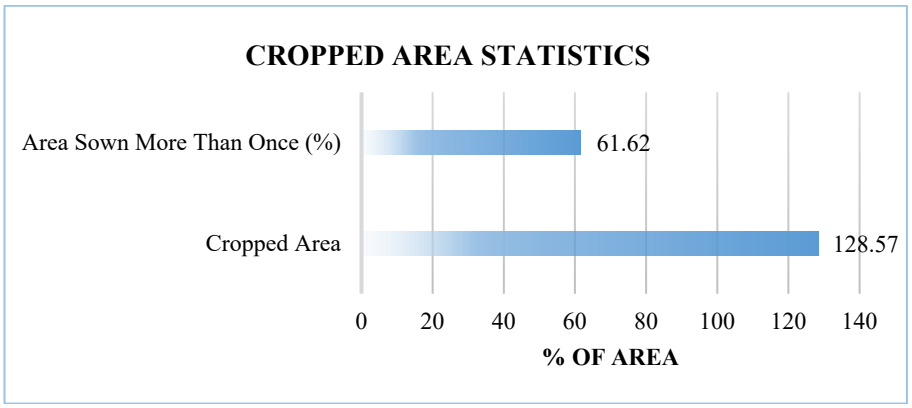


Figure 73 Cropped Area Statistics (Graph): Baghpat

Table 111 Cropped Area v/s Area Sown More than Once: Baghpat

District	Cropped Area (%)	Area Sown More Than Once (%)
Baghpat	128.57	61.62

Source:aps.dac.gov.in/LUS 201516)

Source of Irrigation

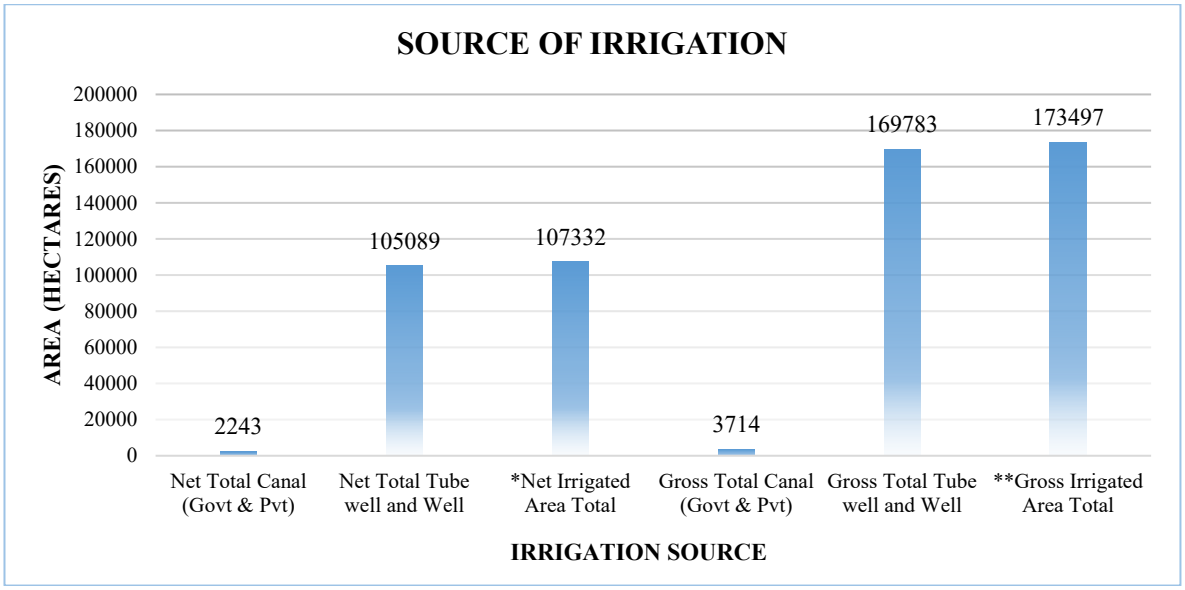


Figure 74 Source of Irrigation: Baghpat

Table 112 Source of Irrigation: Baghpat

District	Net Total Canal (Govt & Pvt)	Net Total Tube well and Well	*Net Irrigated Area Total	Gross Total Canal (Govt & Pvt)	Gross Total Tube well and Well	**Gross Irrigated Area Total
BAGHPAT	2243	105089	107332	3714	169783	173497

Source: aps.dac.gov.in/LUS (2015-16)
Unit: Hectares
**Net Irrigated Area: It is the area irrigated through any source once in a year.*
***Total/Gross Irrigated Area: It is the total area under crops, irrigated once and/or more than once in a year.*

Major crops grown

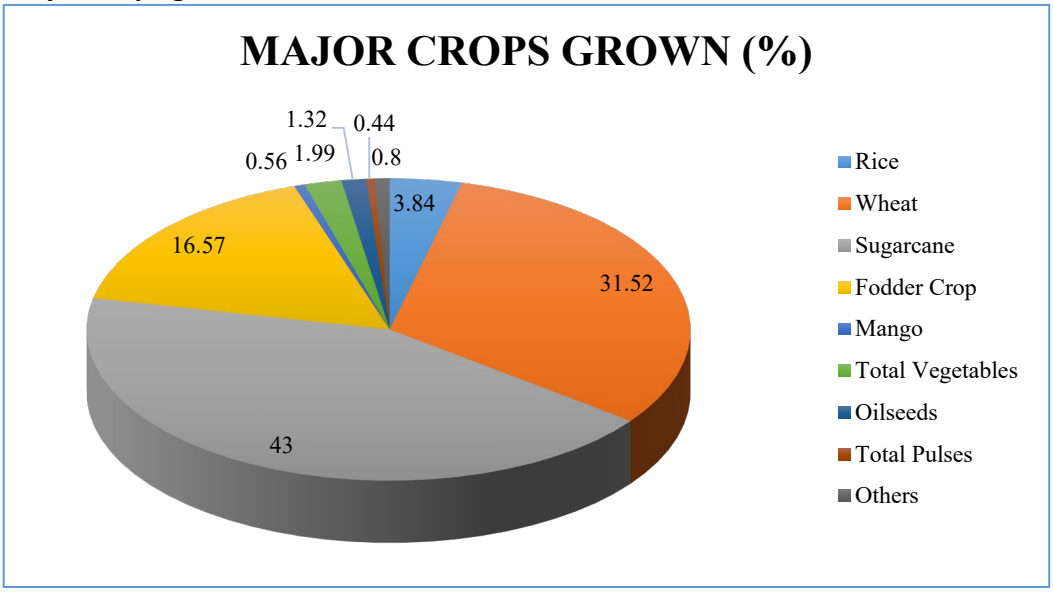


Figure 75 Major Crops Grown: Baghpat

Table 113 Major Crops Grown: Baghpat

District/Crop area percentage	Rice	Wheat	Sugarcane	Fodder Crop	Mango	Total Vegetables	Oilseeds	Total Pulses	Others
Baghpat	3.84	31.52	43.00	16.57	0.56	1.99	1.32	0.44	0.80

Source: aps.dac.gov.in/LUS (2015-16)

Biodiversity

The sampling site to assess the biodiversity of the district was selected from Baparsi and Balmiki Ashram.

Table 114 List of Birds: Baghpat

S. NO.	Species	Scientific Name
1.	Ashy Prinia	Prinia socialis
2.	Asian Koel	Eudynamys scolopacea
3.	Asian pied Myna	Gracupica contra
4.	Bank Myna	Acridotheres ginginianus
5.	Baya Weaver	Ploceus philippinus
6.	Black Drongo	Dicrurus macrocercus
7.	Black Ibis	Pseubidis papillosa
8.	Black Kite	Milvus migrans
9.	Black-crowned Night Heron	Nycticorax nycticorax
10.	Blackwinged Stilt	Himantopus himantopus
11.	Brown Rockchat	Cercomela fusca
12.	Cattle Egret	Bubulcus ibis
13.	Citrine Wagtail	Motacilla citreola
14.	Common Hoope	Upopa epops
15.	Common Moorhen	Gallinula chloropus
16.	Common Myna	Acridotheres tristis
17.	Common Tailorbird	Orthotomus sutorius
18.	Egyptian Vulture	Neophron percnopterus
19.	Eurasian Collared Dove	Streptopelia decaocto
20.	Great Cormorant	Phalacrocorax carbo
21.	Great Tit	Parus major
22.	Greater Coucal	Centropus sinensis
23.	Green Bee-eater	Merops orientalis

24.	Grey Heron	Ardea cinerea
25.	House Crow	Corvus splendens
26.	House Sparrow	Passer domesticus
27.	Indian Darter	Anhinga melanogaster
28.	Indian Grey Hornbill	Buceros bicornis
29.	Indian Peafowl	Pavo cristatus
30.	Indian Robin	Copsychus fulicatus
31.	Indian roller	Coracias benghalensis
32.	Indian Silver Bill	Euodice malabarica
33.	Jungle Babbler	Turdoides striatus
34.	Large-billed Crow	Corvus macrorhyncos
35.	Laughing Dove	Streptopelia senegalensis
36.	Little Cormorant	Phalacrocorax niger
37.	Oriental Dove	Streptopelia orientalis
38.	Oriental Magpie Robin	Copsychus saularis
39.	Plain Prinia	Prinia inornata
40.	Pond Heron	Ardeola grayii
41.	Purple Heron	Ardea purpurea
42.	Purple Sunbird	Cinnyris asiaticus
43.	Red Avadevat	Amandava amandava
44.	Red wattled Lapwing	Vanellus indicus
45.	Red-vented Bulbul	Pycnonotus cafer
46.	Red-whiskered Bulbul	Pycnonotus jocosus
47.	River Lapwing	Vanellus duvaucelii
48.	Rock Pegion	Columba livia
49.	Rose-ringed Parakeet	Psittacula krameri
50.	Ruddy Shelduck	Tadorna ferruginea
51.	Rufous Treepie	Dendrocitta vagabanda
52.	Scaly-breasted Munia	Lonchura punctulata
53.	Shikra	Accipiter badius
54.	Spot-billed Duck	Anas poecilorhyncha
55.	White Wagtail	Motacilla alba
56.	Whitebreasted Waterhen	Amaurornis phoenicurus
57.	White-browed Wagtail	Motacilla maderaspatensis
58.	White-throated Kingfisher	Halcyon smyrmensis
59.	Yellow Wagtail	Motacilla flava
60.	Yellow-wattled Lapwing	Vanellus malabaricus

Table 115 List of Animals: Baghpat

S. No	Type	Scientific Name	Common Name
1.	Animals	*Lepus nigricolli*	Indian Hare
2.	Animals	-	Frog/Toad sp
3.	Animals	*Boselaphus tragocamelus*	Nilgai
4.	Animals	*Macaca Mullata*	Rhesus Macaque
5.	Animals	*Lissemys punctata*	Indian Flapshell Turtle
6.	Animals	*Canis aureus indicus*	Indian Jackal
7.	Animals	*Varanus bengalensis*	Indian Monitor Lizard
8.	Insects	Order: Lepidoptera	Butterflies and Moths
9.	Insects	Order:Odonata	Dragonflies and Damselflies
10.	Insects	Order: Orthoptera	Grasshoppers and Crickets
11.	Insects	Order: Hemiptera	True Bugs
12.	Fish	-	Batla

13.	Fish	-	Katla
14.	Fish	*Clarias batrachus*	Manghur
15.	Fish	*Labeo rohita*	Rohu
16.	Fish	-	Saul
17.	Fish	-	Singhara

Table 116 Trees: Baghpat

S. No.	Type	Scientific Name	Common Name	Family
1.	Trees	*Albizia lebbeck*	Siris	Fabaceae
2.	Trees	*Azadirachta indica*	Neem	Meliaceae
3.	Trees	*Dalbergia sisso*	Shisham	Fabaceae
4.	Trees	*Diaspyros cordifolia*	Bistendu	Ebinaceae
5.	Trees	*Eucalyptus spp.*	Safeda	-
6.	Trees	*Mangifera indica*	Mango	-
7.	Trees	*Morus alba*	White Mulberry	-
8.	Trees	*Phoenix sylvestris*	Wild Date Palm	Arecaceae
9.	Trees	*Prosopis juliflora*	Vilaiti Keekar	-
10.	Trees	*Syzygium cumini*	Jamun	Myrtaceae
11.	Trees	*Ziziphus mummularia*	Ber	Rhamnaceae
12.	Trees	*Ailanthus excelsa*	Mahaneem	Simaroubaceae

Table 117 Herbs & Shrubs: Baghpat

S. No.	Type	Scientific Name	Common Name	Family
1.	Herbs & Shrubs	*Sonchus oleraceus*	Common Sowthistle	Asteraceae
2.	Herbs & Shrubs	*Calotropis procera*	Aak or Rubber Bush	Apocynaceae
3.	Herbs & Shrubs	*Saccharum spontaneum*	Sugarcane Grass	Poaceae
4.	Herbs & Shrubs	*Achyranthes aspera*	Chirchita	Amaranthaceae
5.	Herbs & Shrubs	*Adathoda vasica*	Vasaka	Acanthaceae
6.	Herbs & Shrubs	*Lantana camara*	Common Lantana/Wild Sage	Verbenaceae
7.	Herbs & Shrubs	*Cassia occidentalis*	Coffee Senna	Caesalpiniaceae
8.	Herbs & Shrubs	*Abutilon indicum*	Country Mallow	Malvaceae
9.	Herbs & Shrubs	*Ageratum conyzoides*	Goatweed	Asteraceae
10.	Herbs & Shrubs	*Dhatura innoxia*	Dhatura	Solanaceae
11.	Herbs & Shrubs	*Ipomea aquatica*	Water Spinach	Convolvulaceae
12.	Herbs & Shrubs	*Argemone mexicana*	Mexican Poppy	Papaveraceae
13.	Herbs & Shrubs	*Ricinus communis*	Castor Oil Plant	Euphorbiaceae
14.	Herbs & Shrubs	*Zizyphus mummularia*	Jhar Beri	Rhamnaceae
15.	Herbs & Shrubs	*Anagallis arvensis*	Scarlet Pimpernel	Primulaceae
16.	Herbs & Shrubs	*Abutilon indicum*	Country Mallow	Malvaceae
17.	Herbs & Shrubs	*Ageratum houstonianum*	Flossflower	Asteraceae
18.	Herbs & Shrubs	*Dhatura innoxia*	Dhatura	Solanaceae
19.	Herbs & Shrubs	*Lantana camara*	Common Lantana	Verbenaceae
20.	Herbs & Shrubs	*Cassia occidentalis*	Coffee Senna	Caesalpiniaceae
21.	Herbs & Shrubs	*Malva parviflora*	Cheeseweed	Malvaceae
22.	Herbs & Shrubs	*Stellaria media*	Chickweed	Caryophyllaceae
23.	Herbs & Shrubs	*Adathoda vasica*	Vasaka	Acanthaceae
24.	Herbs & Shrubs	*Argemone mexicana*	Mexican Poppy	Papaveraceae

25.	Herbs & Shrubs	*Zizyphus mummularia*	Jhar Beri	Rhamnaceae
26.	Herbs & Shrubs	*Ricinus communis*	Castor Oil Plant	Euphorbiaceae
27.	Herbs & Shrubs	*Saccharum spontaneum*	Sugarcane Grass	Poaceae

Source: 'Reviving Hindon River – A Basin Approach.'
By: Natural Heritage Division, Indian National Trust for Art and Cultural Heritage (INTACH), New Delhi, 2017

Forest Classification

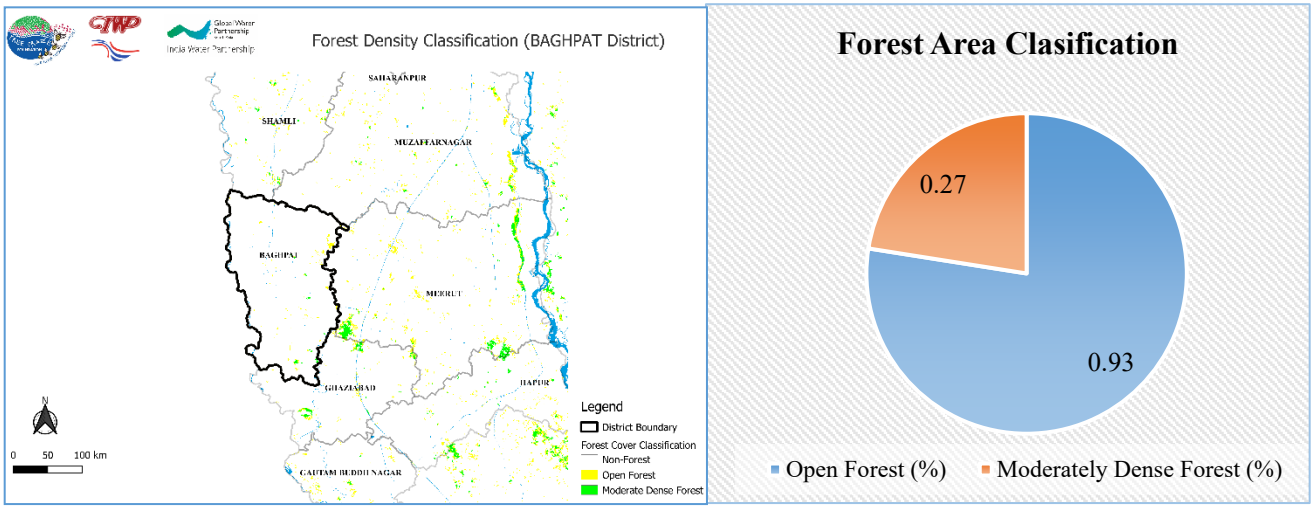


Figure 76 Forest Density Classification: Baghpat

Table 118 Forest Density Classification: Baghpat

District	No Data (%)	Water Bodies (%)	Non Forest (%)	Scrub (%)	Open Forest (%)	Moderately Dense Forest (%)	% of Forest w.r.t. Geographical Area of District	% Change in Forest Cover w.r.t. 2017
Baghpat	0.00	0.43	98.36	0.00	0.93	0.27	1.29	0.06

Source: India State of Forest Report, Forest Survey of India, 2019

Forest Type in Baghpat District

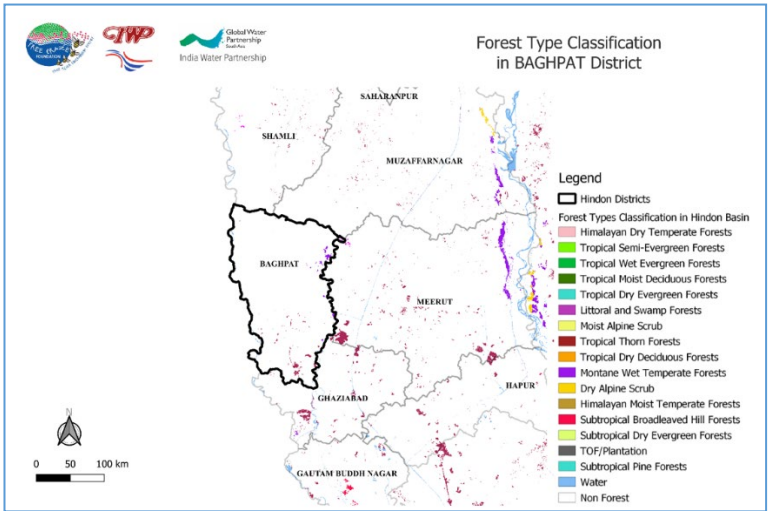


Figure 77 Forest Type: Baghpat

Source: India State of Forest Report, Forest Survey of India, 2019

Soil Texture

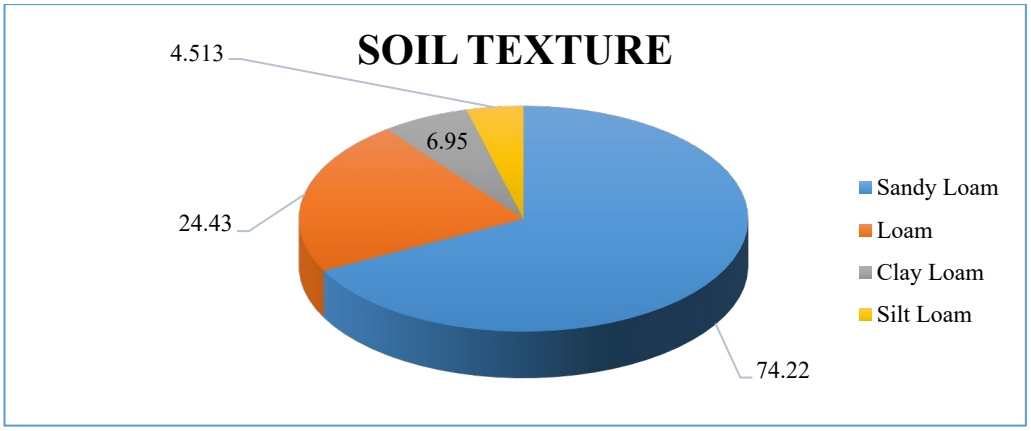


Figure 78 Soil Texture Statistics (Graph): Baghpat

Table 119 Soil Texture Statistics: Baghpat

District	Sandy Loam (Thousand Hectares)	Loam (Thousand Hectares)	Clay Loam (Thousand Hectares)	Silt Loam (Thousand Hectares)
Baghpat	74.22	24.43	6.95	4.51

Source:http://agricoop.nic.in/agriculturecontingency/Uttar- Pradesh, 2012

Table 120 Soil Depth: Baghpat

District	Soil Depth (cm)
Baghpat	100-150

Source: NRSC (2016) Soil Data set 2000. NICES/DS(L)/SOIL/2000/Jan2016

Industry Type (No. of Industries)

Figure 79 Type of Industries: Baghpat

Table 121 Type of Industries: Baghpat

District	Sugar	Pulp and Paper	Distillary	Textile	Slaughter House	Tannery	Others	Total
BAGHPAT	1	0	-	-	-	-	-	1

Source: UPPCB Action Plan for Hindon, 2018

Ground Water Status

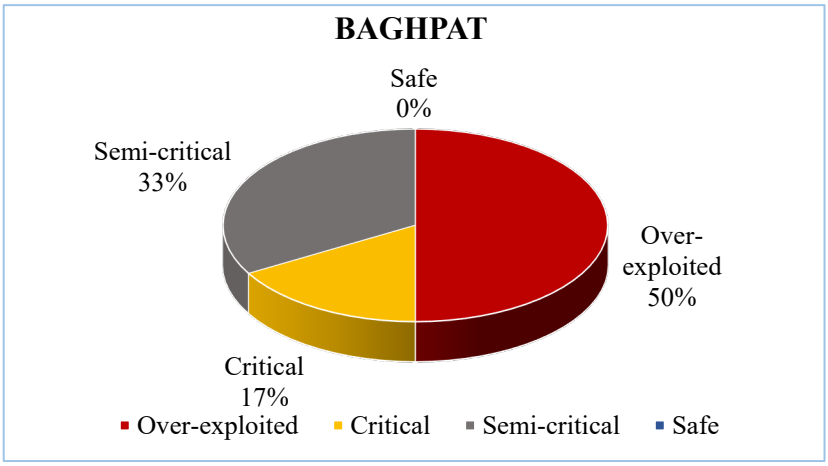


Figure 80 Ground Water Status (Graph): Baghpat

Table 122 Ground Water Status: Baghpat

District	Total no. of Blocks	Over-exploited	Critical	Semi-critical	Safe
Baghpat	6	3	1	2	0

Source: http://upgwd.gov.in/StaticPages/Atlas2017.aspx

Ground Water Compliance/Heavy metal contamination

Table 123 No. of non-complying sampling locations where specific parameter is above the permissible limit: Baghpat

District	Total no. of sampling sites	Sulphate	Flouride	Cadmium	Copper	Lead	Iron	Nickel	Zinc	Manganese	Mercury	Oil & Grease	Chromium
Baghpat	1	0	1	0	0	0	0	0	0	0	0	0	0

Source: UPPCB Action Plan for Hindon, 2018

Table 124 Sewage Status: Baghpat

City	Water Consumption (MLD) (@135 LPCD)	Sewage Generation (MLD)	Installed Capacity of Existing STP (MLD)	Proposed STP Capacity (MLD)	Gap in STP Capacity Utilisation (MLD)
Baghpat	8.33	6.67	N/A	N/A	6.67

Source: Desk Inventory of UPPCB, Gap analysis from UPPCB Action Plan for Restoration of Hindon and Its Tributaries (2018-19)

Table 125 Type of Drain: Baghpat

District	Total no. of Drains	Domestic Drains	Industrial Drains	Mixed Drains
Baghpat	1	-	0	1

Source: UPPCB Action Plan for Hindon, 2018

Discharge Status of Drain

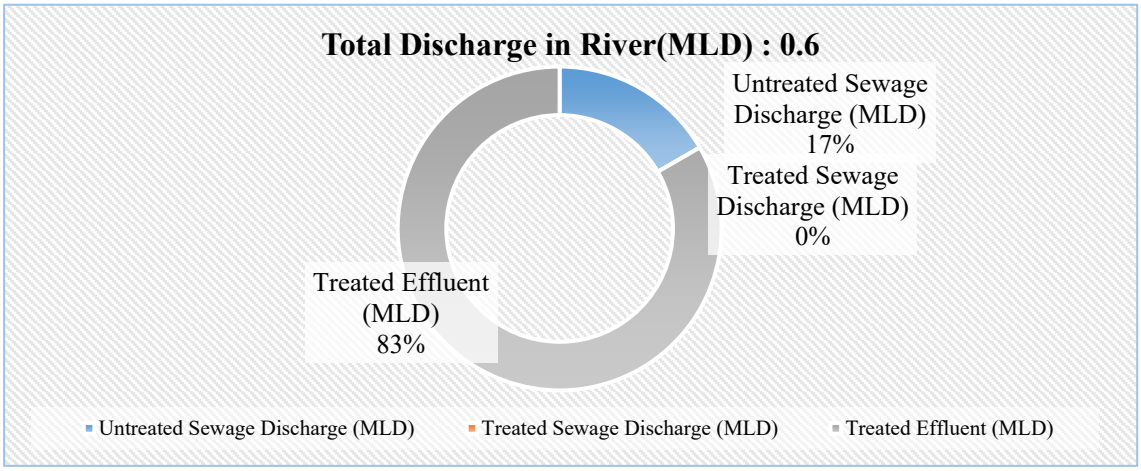


Figure 81 Drain Discharge Status: Baghpat

Table 126 Drain Discharge Status: Baghpat

District	Total Discharge in the River (MLD)	Total Sewage Discharge (MLD)	Untreated Sewage Discharge (MLD)	Treated Sewage Discharge (MLD)	Treated Effluent (MLD)
Baghpat	0.6	0.1	0.1	0	0.5

Source: UPPCB Action Plan for Hindon, 2018

Table 127 Tapping Status of Drain: Baghpat

District	No. of Drains	Tapped Drains	Untapped Drains	Partially Tapped Drains
Baghpat	1	-	1	-

Source: UPPCB Action Plan for Hindon, 2018

Table 128 Status of Industry Compliance: Baghpat

District Name	No. of Industries	Complying	Non-Complying	Closed	Partly Closed	Status Not Available
Baghpat	1	1	-	-	-	-

Source: UPPCB Action Plan for Hindon, 2018

Table 129: Status of Municipal Solid Waste: Baghpat

District	Municipal Solid Waste Generated (TPD)	Waste Collected (TPD)	Treatment Capacity (TPD)	Gap between waste generated and treatment capacity (TPD)
Baghpat	19	19	-	19

Source: UPPCB Action Plan for Hindon, 2018

Table 130 Status of Bio-Medical Waste: Baghpat

District	Bio Medical Waste generated (Kg/Day)	Bio Medical Waste Treated (Kg/Day)
Baghpat	52	52

Source: UPPCB Action Plan for Hindon, 2018

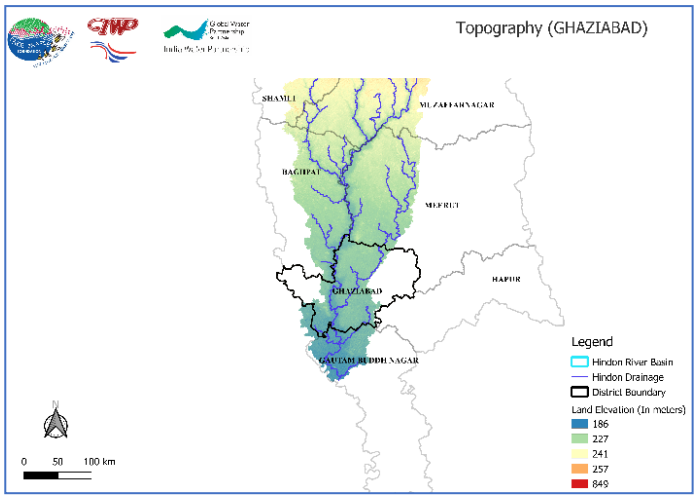
Table 131 Status of Hazardous Waste: Baghpat

District	Total No. of Hazardous Waste Generating Units	Incinerable Hazardous Waste Generated (TPA)	Landfillable Hazardous Waste Generated (TPA)	Recyclable Hazardous Waste Generated (TPA)	Total Hazardous Waste Generated (TPA)
Baghpat	35	0	28.54	0	28.54

Source: UPPCB Action Plan for Hindon, 2018

Geography

Ghaziabad is a part of National Capital Region (NCR). The elevation near Ghaziabad city is 225 meters above MSL which declines to 201 meters above MSL.



Source: Derived using SRTM 30 meter data

Figure 82 Topography of Hindon Basin in Ghaziabad

Basin Area and Population

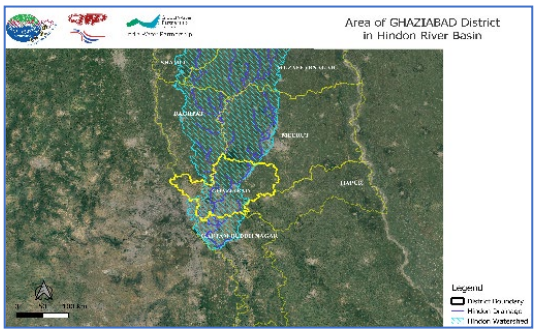


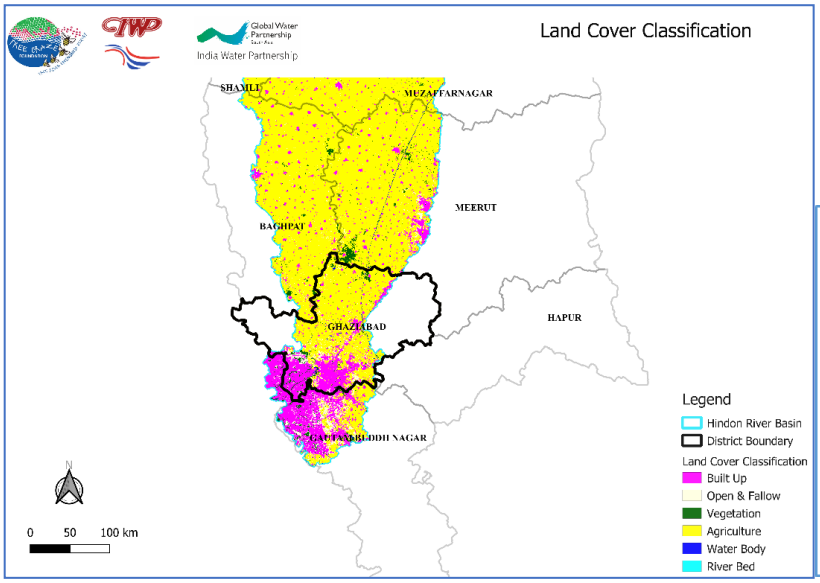
Figure 83Area of Ghaziabad in Hindon Basin

Table 132 Area & Population: Ghaziabad

City	Population (As per Census 2011)	Estimated Population 2030	Area of District (Sq km)	Area of district in Hindon Basin (Sq km)	Area of district in Hindon Basin %
Ghaziabad	1648643	2972718	882.41	540.22	61.22

Source: Administrative Atlas of Uttar Pradesh Vol 1, Census of India, 2011

Land Cover



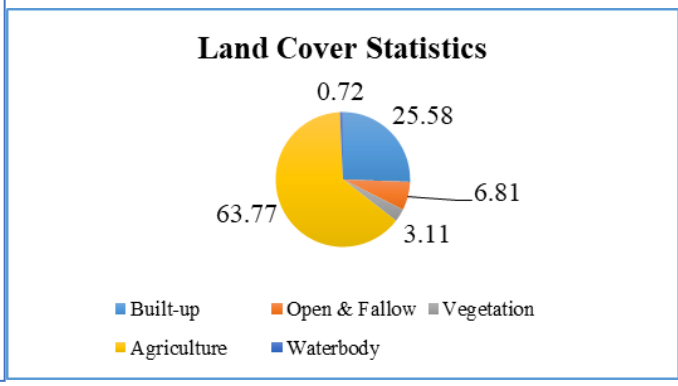


Figure 84 Land Cover Classification: Ghaziabad

Table 133Land Cover Statistics: Ghaziabad

District Name	Built-up	Open & Fallow	Vegetation	Agriculture	Waterbody
Ghaziabad (%)	25.58	6.81	3.11	63.77	0.72

Source: Derived using Landsat 8 (30 meter) image, 2020

Table 134 Rainfall: Ghaziabad

District	Normal (mm)	2018-2019 (mm)	2017-2018 (mm)	2016-2017 (mm)	2015-2016 (mm)	2014-2015 (mm)	2013-2014 (mm)
GHAZIABAD	750.3	767.25	559.75	501.15	570.74	553.7	439.05

Source: India WRIS portal, 2020

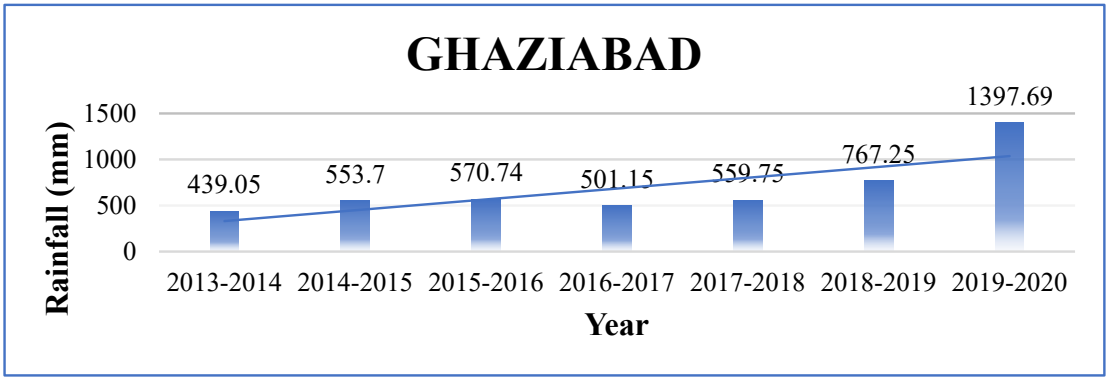


Figure 85 Rainfall Trend: Ghaziabad

No. of Wetlands

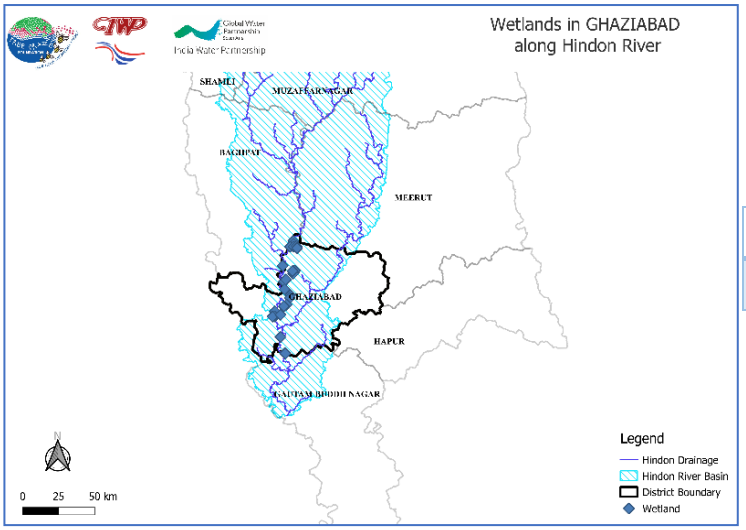


Figure 86 Wetlands in Ghaziabad along Hindon River

Table 135 No. of Wetlands: Ghaziabad

District	No. of Wetlands
GHAZIABAD	25

Source: UPPCB Action Plan for Hindon, 2018

Table 136 Vegetated Area Classification: Ghaziabad

District	Total Area (Hectares)	Forest (%)	Area Under Non Agricultural Uses (%)	Barren and Unculturable Land (%)	Permanent Pasture and Other Grazing Land (%)	Land Under Misc. Tree Crops and Groves not Included in Net Area Sown (%)	Culturable Waste Land (%)	Fallow Lands Other Than Current Fallows (%)	Current Fallow (%)	Net Area Sown (%)
Ghaziabad	92658	1.97	31.48	1.39	0.02	0.14	2.67	1.75	5.77	54.81

Source: aps.dac.gov.in/LUS (2015-16)

Area sown more than once

Table 137 Cropped area v/s Area sown more than once: Ghaziabad

District	Cropped Area (%)	Area Sown More Than Once (%)
Ghaziabad	83.76	52.82

Source:aps.dac.gov.in/LUS (2015-16)

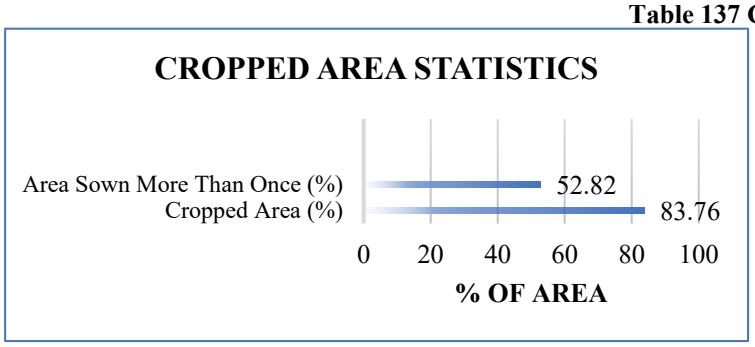


Figure 87 Cropped Area Statistics (Graph): Ghaziabad

Source of irrigation

Table 138 Source of Irrigation: Ghaziabad

District	Net Total Canal (Govt & Pvt)	Net Total Tube well and Well	*Net Irrigated Area Total	Gross Total Canal (Govt & Pvt)	Gross Total Tube well and Well	**Gross Irrigated Area Total
GHAZIABAD	6141	44623	50764	6703	70884	77587

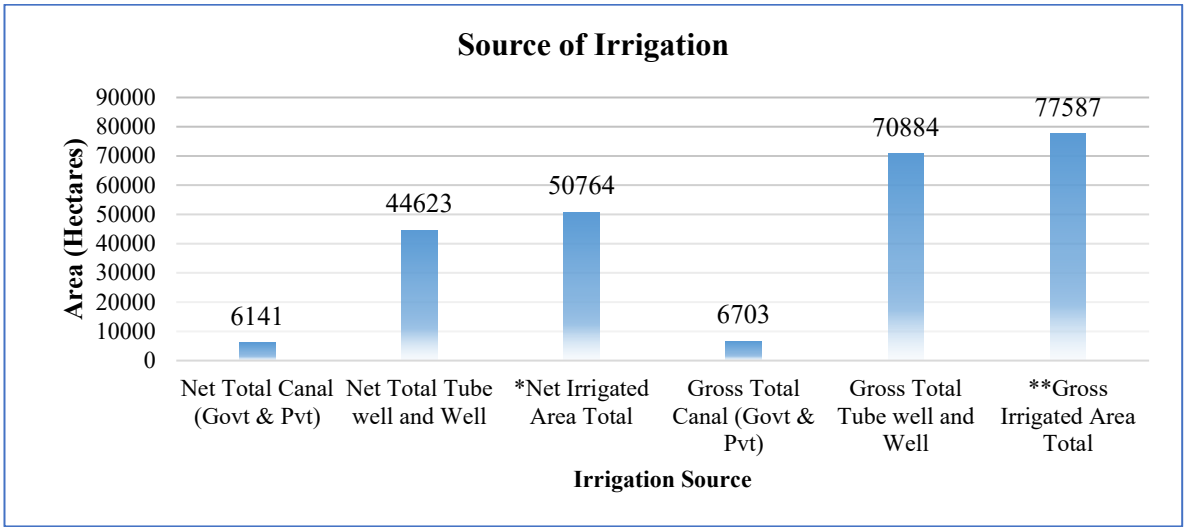


Figure 88 Source of Irrigation: Ghaziabad

Source: aps.dac.gov.in/LUS (2015-16)
Unit: Hectares
**Net Irrigated Area: It is the area irrigated through any source once in a year.*
***Total/Gross Irrigated Area: It is the total area under crops, irrigated once and/or more than once in a year.*

Major crops grown

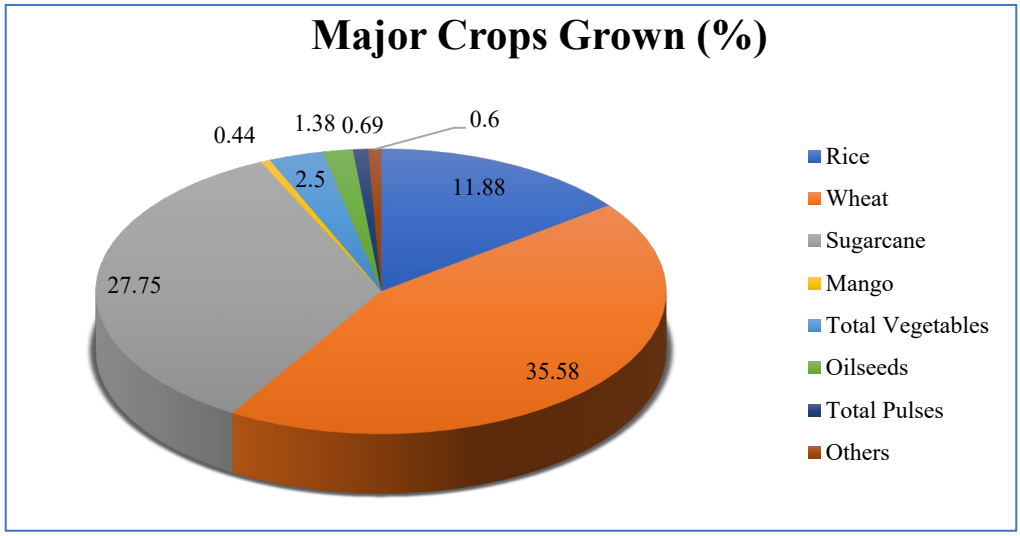


Figure 89 Major Crops Grown: Ghaziabad

Table 139 Major Crops Grown: Ghaziabad

District/Crop area percentage	Rice	Wheat	Sugarcane	Fodder Crop	Mango	Total Vegetables	Oilseeds	Total Pulses	Others
Ghaziabad	11.88	35.58	27.75	19.16	0.44	2.50	1.38	0.69	0.60

Source: aps.dac.gov.in/LUS (2015-16)

Biodiversity

The sampling site to assess the biodiversity of the district was selected from Hindon (Ghaziabad).

Table 140 List of Birds: Ghaziabad

S. No.	Species	Scientific Name
1.	Bank Myna	*Acridotheres ginginianus*
2.	Common Myna	*Acridotheres tristis*
3.	Red Avadevat	*Amandava amandava*
4.	Grey Heron	*Ardea cinerea*
5.	Purple Heron	*Ardea purpurea*
6.	Pond Heron	*Ardeola grayii*
7.	Cattle Egret	*Bubulcus ibis*
8.	Indian Grey Hornbill	*Buceros bicornis*
9.	Greater Coucal	*Centropus sinensis*
10.	Purple Sunbird	*Cinnyris asiaticus*
11.	Rock Pegion	*Columba livia*
12.	Oriental Magpie Robin	*Copsychus saularis*
13.	Large-billed Crow	*Corvus macrorhyncos*
14.	House Crow	*Corvus splendens*
15.	Rufous Treepie	*Dendrocitta vagabanda*
16.	Black Drongo	*Dicrurus macrocercus*
17.	Asian Koel	*Eudynamys scolopacea*
18.	Common Moorhen	*Gallinula chloropus*
19.	White-throated Kingfisher	*Halcyon smyrmensis*

20.	Blackwinged Stilt	*Himantopus himantopus*
21.	Scaly-breasted Munia	*Lonchura punctulata*
22.	Green Bee-eater	*Merops orientalis*
23.	Black Kite	*Milvus migrans*
24.	White Wagtail	*Motacilla alba*
25.	White-browed Wagtail	*Motacilla maderaspatensis*
26.	Black-crowned Night Heron	*Nycticorax nycticorax*
27.	Common Tailorbird	*Orthotomus sutorius*
28.	Great Tit	*Parus major*
29.	House Sparrow	*Passer domesticus*
30.	Little Cormorant	*Phalacrocorax niger*
31.	Baya Weaver	*Ploceus philippinus*
32.	Plain Prinia	*Prinia inornata*
33.	Rose-ringed Parakeet	*Psittacula krameri*
34.	Red-vented Bulbul	*Pycnonotus cafer*
35.	Red-whiskered Bulbul	*Pycnonotus jocosus*
36.	Indian Robin	*Saxicoloides fulicatus*
37.	Eurasian Collared Dove	*Streptopelia decaocto*
38.	Jungle Babbler	*Turdoides striatus*
39.	Common Hoope	*Upopa epops*
40.	Red wattled Lapwing	*Vanellus indicus*

Table 141 Animals in Ghaziabad

S. No.	Type	Scientific Name	Common Name
1.	Animals	*Lepus nigricolli*	Indian Hare
2.	Animals	*Boselaphus tragocamelus*	Nilgai
3.	Animals	*Macaca Mullata*	Rhesus Macaque
4.	Animals	*Lissemys punctata*	Indian Flapshell Turtle
5.	Animals	*Calotes versicolor*	Garden Lizard
6.	Animals	*Canis aureus indicus*	Indian Jackal
7.	Animals	*Varanus bengalensis*	Indian Monitor Lizard
8.	Insects	-	Assassin Bug
9.	Insects	Order: Coleoptera	Beetle
10.	Insects	Order: Lepidoptera	Butterflies and Moths
11.	Insects	Order:Odonata	Dragonflies and Damselflies
12.	Insects	Order: Orthoptera	Grasshoppers and Crickets
13.	Insects	Order: Hemiptera	True Bugs
14.	Fish	-	Cuchia
15.	Fish	-	Einghi
16.	Fish	-	Eel
17.	Fish	-	Hilsa
18.	Fish	-	Katla
19.	Fish	-	Labi
20.	Fish	-	Mahaser
21.	Fish	*Clarias batrachus*	Manghur
22.	Fish	-	Mirgal
23.	Fish	-	Mirror Carp

24.	Fish	-	Parthen
25.	Fish	-	Rasela
26.	Fish	*Labeo rohita*	Rohu
27.	Fish	-	Saul
28.	Fish	-	Tengan
29.	Fish	-	Trout
30.	Fish	-	Vittal

Table 142 Trees: Ghaziabad

S. No.	Type	Scientific Name	Common Name	Family
1.	Trees	*Albizia lebbeck*	Siris	Fabaceae
2.	Trees	*Azadirachta indica*	Neem	Meliaceae
3.	Trees	*Eucalyptus spp.*	Safeda	-
4.	Trees	*Mangifera indica*	Mango	-
5.	Trees	*Morus alba*	White Mulberry	-
6.	Trees	*Phoenix sylvestris*	Wild Date Palm	Arecaceae
7.	Trees	*Pithecellobium dulce*	Jungle Jalebi	Fabaceae
8.	Trees	*Populus spp.*	Poplar tree	Salicaceae
9.	Trees	*Ziziphus mummularia*	Ber	Rhamnaceae

Table 143 Herbs & Shrubs: Ghaziabad

S. No.	Type	Scientific Name	Common Name	Family
1.	Herbs & Shrubs	*Saccharum spontaneum*	Sugarcane Grass	Poaceae
2.	Herbs & Shrubs	*Achyranthes aspera*	Chirchita	Amaranthaceae
3.	Herbs & Shrubs	*Adathoda vasica*	Vasaka	Acanthaceae
4.	Herbs & Shrubs	*Lantana camara*	Common Lantana/Wild Sage	Verbenaceae
5.	Herbs & Shrubs	*Cassia occidentalis*	Coffee Senna	Caesalpiniacea e
6.	Herbs & Shrubs	*Anagallis arvensis*	Scarlet Pimpernel	Primulaceae
7.	Herbs & Shrubs	*Abutilon indicum*	Country Mallow	Malvaceae
8.	Herbs & Shrubs	*Ageratum conyzoides*	Goatweed	Asteraceae
9.	Herbs & Shrubs	*Dhatura innoxia*	Dhatura	Solanaceae
10.	Herbs & Shrubs	Malva parviflora	Cheeseweed	Malvaceae
11.	Herbs & Shrubs	Ipomea aquatica	Water Spinach	Convolvulacea e
12.	Herbs & Shrubs	Argemone mexicana	Mexican Poppy	Papaveraceae
13.	Herbs & Shrubs	Ricinus communis	Castor Oil Plant	Euphorbiaceae
14.	Herbs & Shrubs	Pergularia daemia	Pergularia	Asclepiadaceae
15.	Herbs & Shrubs	Tridax procumbens	Coat Button	Compositeae
16.	Herbs & Shrubs	Commelina benghalensi	Wandering Jew	Commelinacea e
17.	Herbs & Shrubs	Tephrosa purpurea	Sarpunkha	Fabaceae

Source: 'Reviving Hindon River – A Basin Approach.'
By: Natural Heritage Division, Indian National Trust for Art and Cultural Heritage (INTACH), New Delhi, 2017

Forest Classification

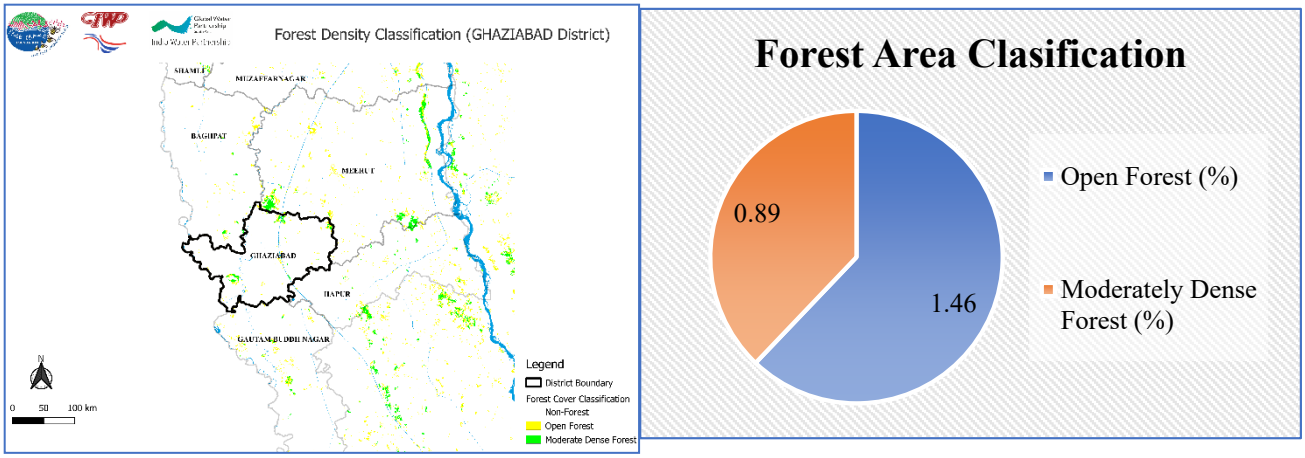


Figure 90 Forest Density Classification: Ghaziabad

Table 144 Forest Density Classification : Ghaziabad

District	No Data (%)	Water Bodies (%)	Non Forest (%)	Scrub (%)	Open Forest (%)	Moderately Dense Forest (%)	% of Forest w.r.t. Geographical Area of District	% Change in Forest Cover w.r.t. 2017
Ghaziabad	0.00	0.62	97.03	0.00	1.46	0.89	2.14	-0.78

Source: India State of Forest Report, Forest Survey of India, 2019

Forest Type in Ghaziabad District

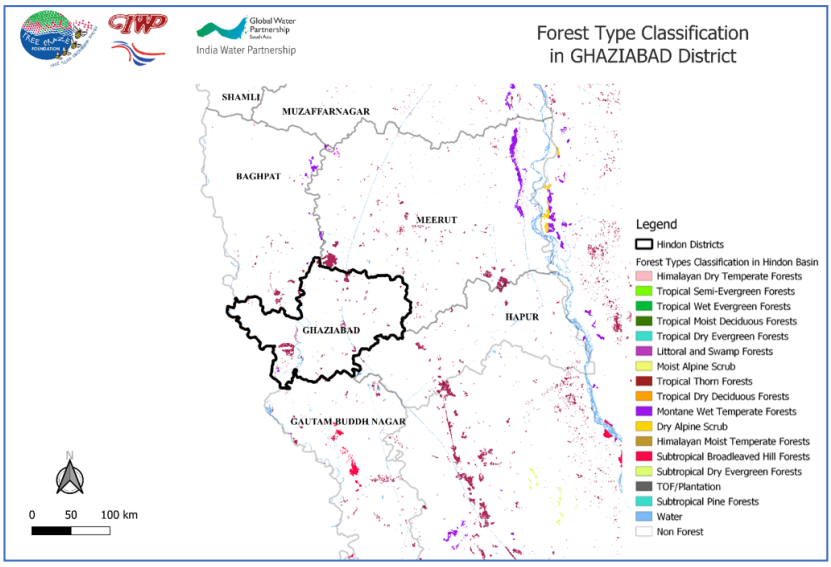


Figure 91 Forest Type: Ghaziabad

Source: India State of Forest Report, Forest Survey of India, 2019

Soil Texture

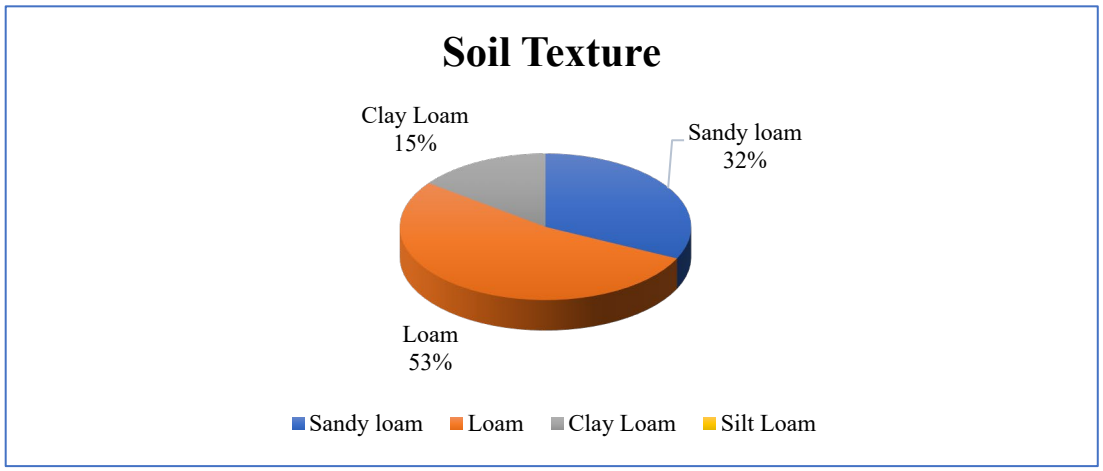


Figure 92 Soil Texture Statistics (Graph): Ghaziabad

Table 145 Soil Texture Statistics: Ghaziabad

District	Sandy Loam (Thousand Hectares)	Loam (Thousand Hectares)	Clay Loam (Thousand Hectares)	Silt Loam (Thousand Hectares)
Ghaziabad	37.43	61.89	17.28	-

Source:http://agricoop.nic.in/agriculturecontingency/Uttar- Pradesh, 2012

Soil Depth

Table 146 Soil Depth: Ghaziabad

District	Soil Depth (cm)
Ghaziabad	100-150

Source: NRSC (2016) Soil Data set 2000. NICES/DS (L)/SOIL/2000/Jan2016

Industry Type (No. of Industries)

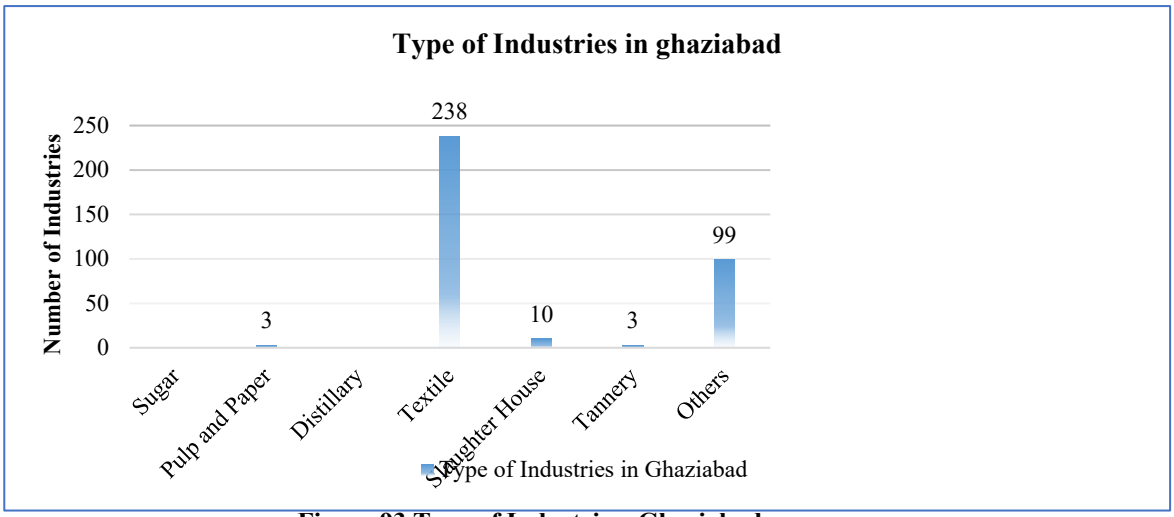


Figure 93 Type of Industries: Ghaziabad

Table 147 Type of Industries: Ghaziabad

District/ No. of Industries	Sugar	Pulp and Paper	Distillery	Textile	Slaughter House	Tannery	Others	Total no. of Industries
GHAZIABAD	-	3	-	238	10	3	99	353

Source: UPPCB Action Plan for Hindon, 2018

Ground Water Status

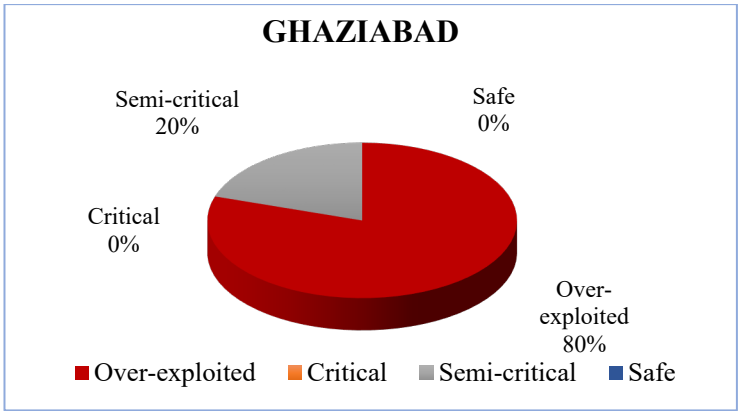


Figure 94 Ground Water Status: Ghaziabad

Table 148 Ground Water Status: Ghaziabad

District	Total no. of Blocks	Over-exploited	Critical	Semi-critical	Safe
Ghaziabad	5	4	0	1	0

Source: http://upgwd.gov.in/StaticPages/Atlas2017.aspx

Ground Water Compliance/Heavy metal contamination

Table 149 No. of non-complying sampling locations where specific parameter is above the permissible limit: Ghaziabad

District	Total no. of sampling sites	Sulphate	Fluoride	Cadmium	Copper	Lead	Iron	Nickel	Zinc	Manganese	Mercury	Oil & Grease	Chromium
Ghaziabad	**43**	**2**	**6**	**3**	**5**	**8**	**22**	**0**	**1**	**3**	**20**	**40**	**4**

Source: UPPCB Action Plan for Hindon, 2018

Table 150 Sewage Status: Ghaziabad

City	Water Consumption (MLD) (@135 LPCD)	Sewage Generation (MLD)	Installed Capacity of Existing STP (MLD)	Proposed STP Capacity (MLD)	Gap in STP Capacity Utilisation (MLD)
Ghaziabad	397.34	317.87	454	N/A	N/A

Source: Desk Inventory of UPPCB, Gap analysis from UPPCB Action Plan for Restoration of Hindon and Its Tributaries (2018-19)

Table 151 Type of Drain: Ghaziabad

District	Total no. of Drains	Domestic Drains	Industrial Drains	Mixed Drains
Ghaziabad	9	2	2	5

Source: UPPCB Action Plan for Hindon, 2018

Discharge Status of Drain

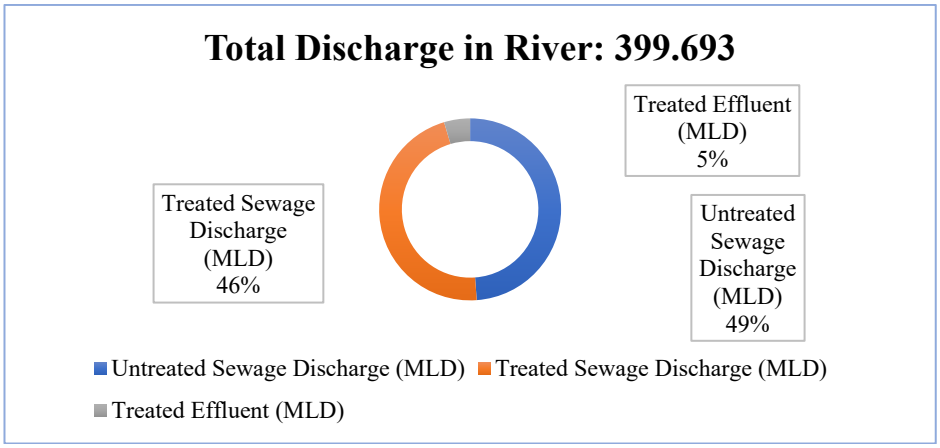


Figure 95 Drain Discharge Status: Ghaziabad

Table 152 Drain Discharge Status: Ghaziabad

District	Total Discharge in the River (MLD)	Total Sewage Discharge (MLD)	Untreated Sewage Discharge (MLD)	Treated Sewage Discharge (MLD)	Treated Effluent (MLD)
Ghaziabad	399.69	381.20	195.20	186	18.49

Source: UPPCB Action Plan for Hindon, 2018

Table 153 Tapping Status of Drain: Ghaziabad

District	No. of Drains	Tapped Drains	Untapped Drains	Partially Tapped Drains
Ghaziabad	9	-	7	2

Source: UPPCB Action Plan for Hindon, 2018

Table 154 Status of Industry Compliance: Ghaziabad

District Name	No. of Industries	Complying	Non-Complying	Closed	Partly Closed	Status Not Available
Ghaziabad	353	241	15	74	9	18

Source: UPPCB Action Plan for Hindon, 2018

Table 155 Status of Municipal Solid Waste: Ghaziabad

District	Municipal Solid Waste Generated (TPD)	Waste Collected (TPD)	Treatment Capacity (TPD)	Gap between waste generated and treatment capacity (TPD)
Ghaziabad	1000	1000	-	1000

Source: UPPCB Action Plan for Hindon, 2018

Table 156 Status of Bio-Medical Waste: Ghaziabad

District	Bio Medical Waste generated (Kg/Day)	Bio Medical Waste Treated (Kg/Day)
Ghaziabad	2361	2361

Source: UPPCB Action Plan for Hindon, 2018

Table 157 Status of Hazardous Waste: Ghaziabad

District	Total No. of Hazardous Waste Generating Units	Incinerable Hazardous Waste Generated (TPA)	Landfillable Hazardous Waste Generated (TPA)	Recyclable Hazardous Waste Generated (TPA)	Total Hazardous Waste Generated (TPA)
Ghaziabad	357	3934.90	7120.50	39662.96	50718.36

Source: UPPCB Action Plan for Hindon, 2018

Table 158 Surface Water Quality : Ghaziabad

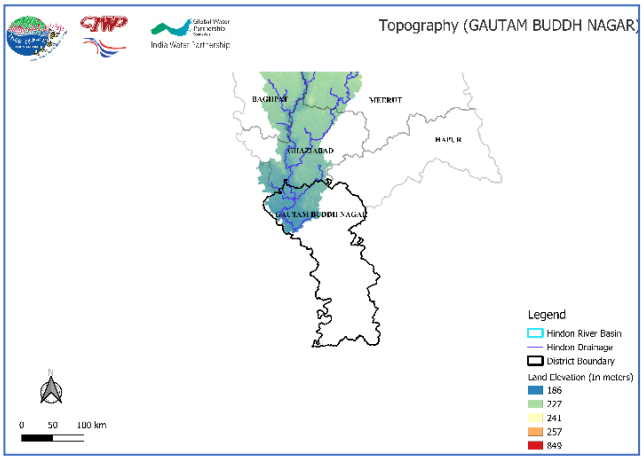
District	Station	Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
GHAZIABAD	Mohna	BOD mg/L	3.75	-	18.79	30.96	22.52	16.51	18.73	23.48	19.20	26.35
		Faecal Coliform (MPN)	102.50	766.66	1075	-	2410	8654.54	22600	309000	257777.80	521777.80

Source: India WRIS Portal (2010-19)

Hindon in Gautam Budh Nagar (GB Nagar)

Geography

Gautam Budh Nagar (GB Nagar) is a part of National Capital Region (NCR). The elevation near GB Nagar is 221 meters above MSL which declines to 197 meters above MSL.



Source: Derived using SRTM 30 meter data

Figure 96 Topography of GB Nagar in Hindon Basin

Basin Area and Population

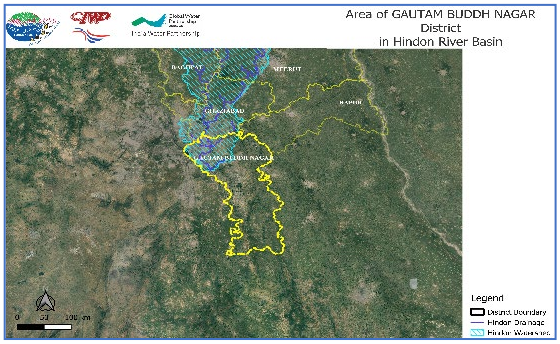


Figure 97 Area of GB Nagar in Hindon Basin

Table 159 Area & Population Statistics: GB Nagar

City	Area of District (Sqkm)	Area of district in Hindon Basin (Sqkm)	Area of district in Hindon Basin %
GB Nagar	1367.58	273.34	19.98

Source: Administrative Atlas of Uttar Pradesh Vol 1, Census of India, 2011

Land Cover

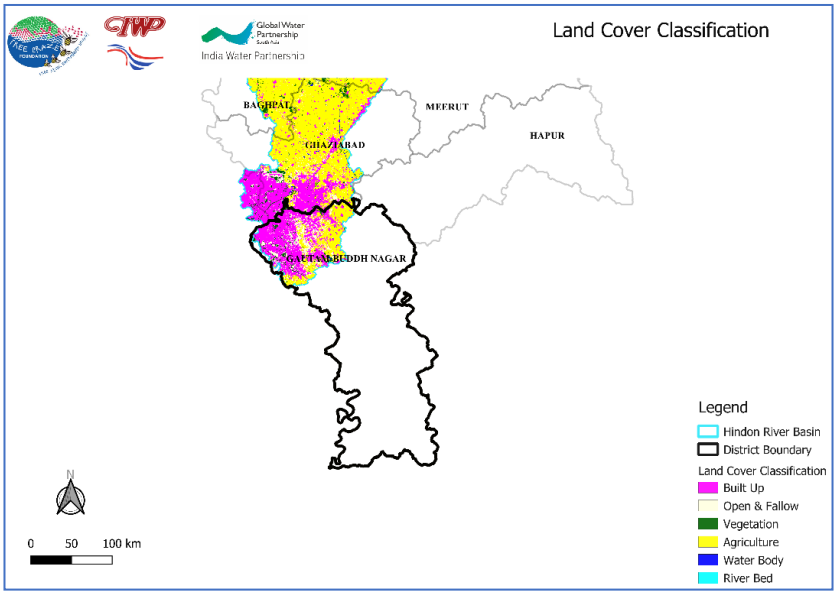


Figure 98 Land Cover Classification: GB Nagar

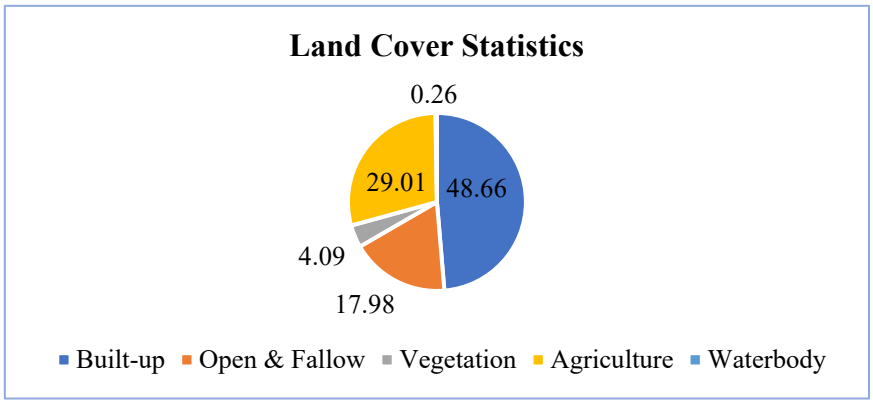


Figure 99 Land Cover Statistics (Graph): GB Nagar

Table 160 Land Cover Statistics: GB Nagar

District Name	Built-up	Open & Fallow	Vegetation	Agriculture	Waterbody
GB Nagar (%)	48.66	17.98	4.09	29.01	0.26

Source: Derived using Landsat 8 (30 meter) image, 2020

Table 161 Rainfall: GB Nagar

District	Normal (mm)	2018-2019 (mm)	2017-2018 (mm)	2016-2017 (mm)	2015-2016 (mm)	2014-2015 (mm)	2013-2014 (mm)
GB NAGAR	-	667.45	584.76	501.61	572.93	556.75	441.67

Source: India WRIS portal, 2020

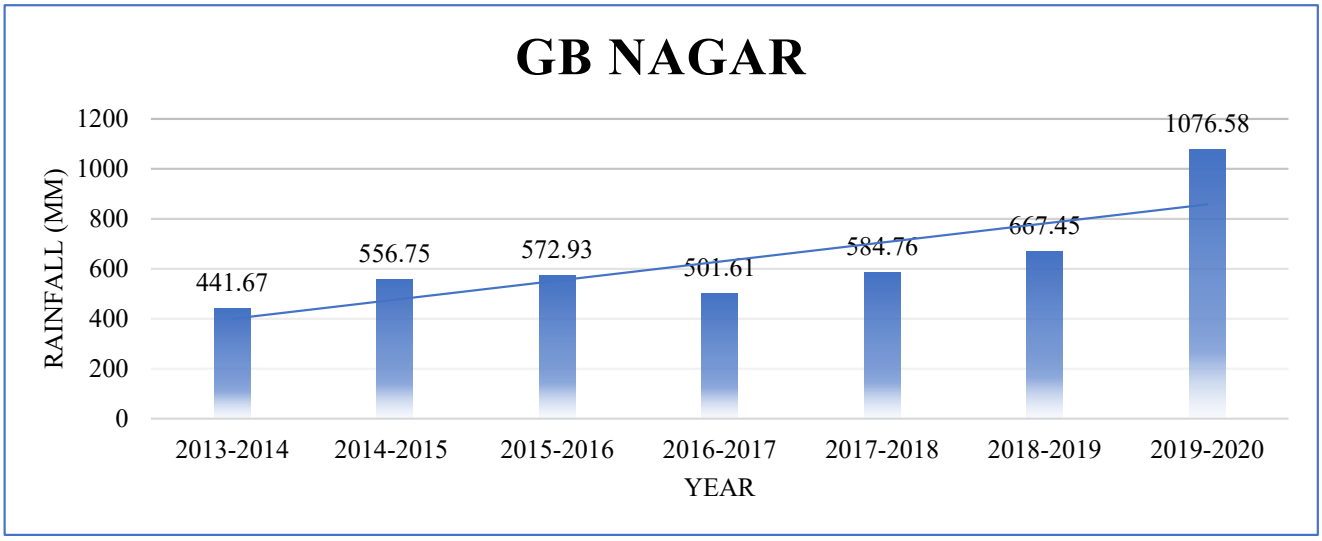


Figure 100 Rainfall Trend: GB Nagar

No. of Wetlands

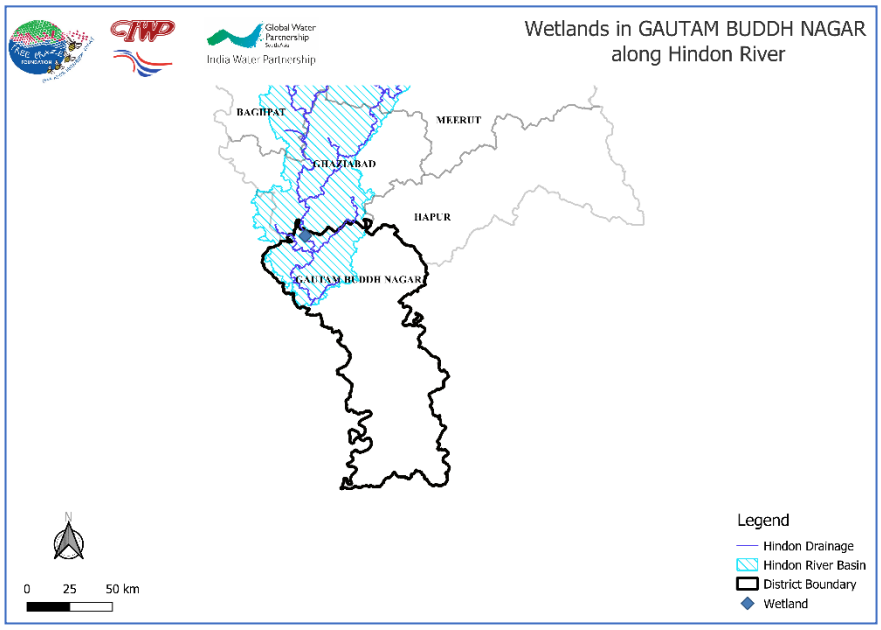


Figure 101 No. of Wetlands along Hindon River in GB Nagar

Table 162 Wetlands along Hindon: GB Nagar

District	No. of Wetlands
GB Nagar	1

Source: UPPCB Action Plan for Hindon, 2018

Table 163 Vegetated Area Classification: GB Nagar

District	Total Area (Hectares)	Forest (%)	Area Under Non Agricultural Uses (%)	Barren and Unculturable Land (%)	Permanent Pasture and Other Grazing Land (%)	Land Under Misc. Tree Crops and Groves not Included in Net Area Sown (%)	Culturable Waste Land (%)	Fallow Lands Other Than Current Fallows (%)	Current Fallow (%)	Net Area Sown (%)
GB Nagar	125422	1.49	32.33	1.53	0.40	0.22	1.47	7.29	13.08	42.20

Source: aps.dac.gov.in/LUS (2015-16)

Area sown more than once

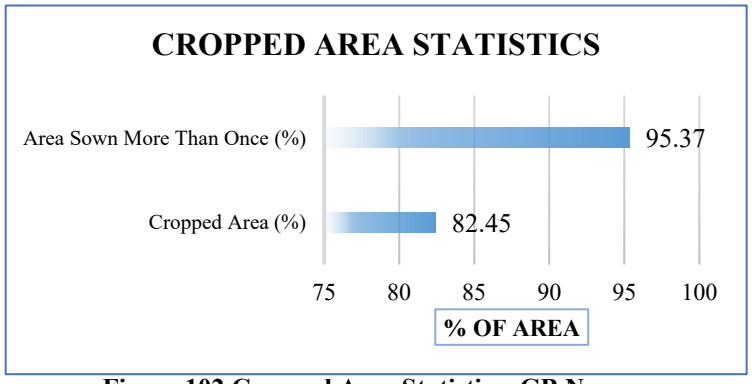


Figure 102 Cropped Area Statistics: GB Nagar

Table 164 Cropped Area v/s Area Sown More than Once

District	Cropped Area (%)	Area Sown More Than Once (%)
GB Nagar	82.45	95.37

Source: aps.dac.gov.in/LUS 201516)

Source of Irrigation

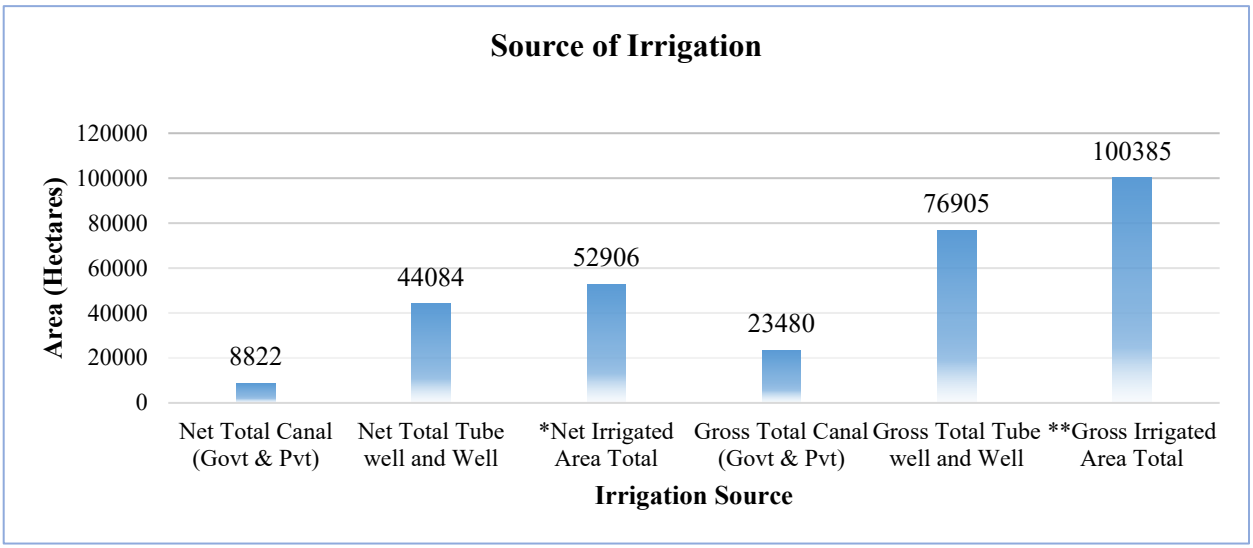


Figure 103 Source of Irrigation: GB Nagar

Table 165 Irrigation Source: GB Nagar

District	Net Total Canal (Govt & Pvt)	Net Total Tube well and Well	*Net Irrigated Area Total	Gross Total Canal (Govt & Pvt)	Gross Total Tube well and Well	**Gross Irrigated Area Total
GB NAGAR	8822	44084	52906	23480	76905	100385

Source: aps.dac.gov.in/LUS (2015-16)
Unit: Hectares
**Net Irrigated Area: It is the area irrigated through any source once in a year.*
***Total/Gross Irrigated Area: It is the total area under crops, irrigated once and/or more than once in a year.*

Major crops grown

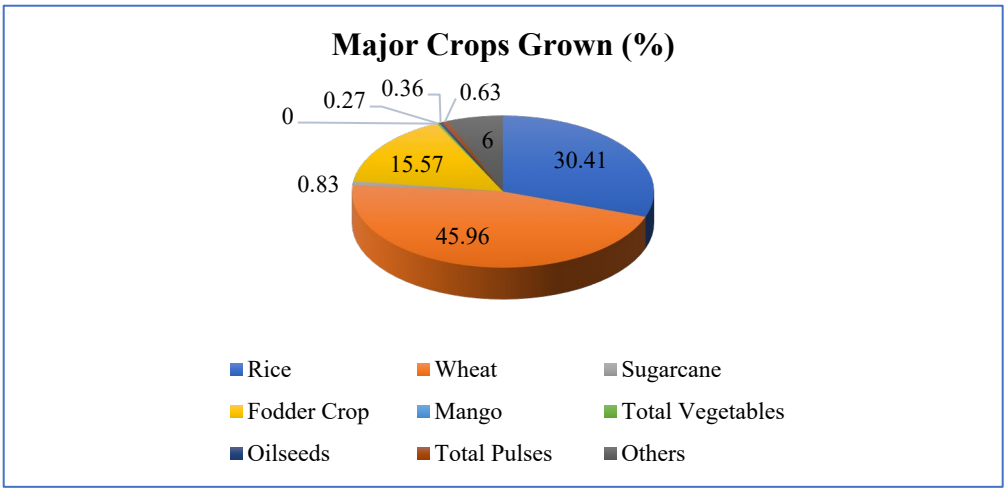


Figure 104 Major Crops Grown: GB Nagar

Table 166 Major Crops Grown: GB Nagar

District/Crop area percentage	Rice	Wheat	Sugarcane	Fodder Crop	Mango	Total Vegetables	Oilseeds	Total Pulses	Others
GB Nagar	30.41	45.96	0.83	15.57	0.00	0.27	0.36	0.63	6.00

Source: aps.dac.gov.in/LUS (2015-16)

Biodiversity

The sampling site to assess the biodiversity of the district was selected from the district, Tilwada (GB Nagar).

Table 167 List of Birds: GB Nagar

S. No.	Species	Scientific Name
1.	Bank Myna	*Acridotheres ginginianus*
2.	Common Myna	*Acridotheres tristis*
3.	Whitebreasted Waterhen	*Amaurornis phoenicurus*
4.	Grey Heron	*Ardea cinerea*
5.	Cattle Egret	*Bubulcus ibis*
6.	Indian Grey Hornbill	*Buceros bicornis*
7.	Purple Sunbird	*Cinnyris asiaticus*
8.	Rock Pegion	*Columba livia*
9.	Oriental Magpie Robin	*Copsychus saularis*
10.	Large-billed Crow	*Corvus macrorhyncos*
11.	House Crow	*Corvus splendens*
12.	Rufous Treepie	*Dendrocitta vagabanda*
13.	Black Drongo	*Dicrurus macrocercus*
14.	Asian Koel	*Eudynamys scolopacea*
15.	White-throated Kingfisher	*Halcyon smyrmensis*
16.	Blackwinged Stilt	*Himantopus himantopus*
17.	Green Bee-eater	*Merops orientalis*
18.	Black Kite	*Milvus migrans*
19.	White Wagtail	*Motacilla alba*
20.	White-browed Wagtail	*Motacilla maderaspatensis*
21.	Common Tailorbird	*Orthotomus sutorius*
22.	Great Tit	*Parus major*
23.	House Sparrow	*Passer domesticus*
24.	Indian Peafowl	*Pavo cristatus*
25.	Little Cormorant	*Phalacrocorax niger*
26.	Baya Weaver	*Ploceus philippinus*
27.	Rose-ringed Parakeet	*Psittacula krameri*
28.	Red-vented Bulbul	*Pycnonotus cafer*
29.	Red-whiskered Bulbul	*Pycnonotus jocosus*
30.	Indian Robin	*Saxicoloides fulicatus*
31.	Eurasian Collared Dove	*Streptopelia decaocto*
32.	Ruddy Shelduck	*Tadorna ferruginea*
33.	Jungle Babbler	*Turdoides striatus*
34.	Common Hoope	*Upopa epops*
35.	River Lapwing	*Vanellus duvaucelii*
36.	Red wattled Lapwing	*Vanellus indicus*

Table 168 Animals in GB Nagar

S. No	Type	Scientific Name	Common Name
1.	Animals	*Lepus nigricolli*	Indian Hare
2.	Animals	*Boselaphus tragocamelus*	Nilgai
3.	Animals	*Lissemys punctata*	Indian Flapshell Turtle

4.	Animals	*Canis aureus indicus*	Indian Jackal
5.	Animals	*Varanus bengalensis*	Indian Monitor Lizard
6.	Insects	Order: Coleoptera	Beetle
7.	Insects	Order: Lepidoptera	Butterflies and Moths
8.	Insects	Order:Odonata	Dragonflies and Damselflies
9.	Insects	Order: Orthoptera	Grasshoppers and Crickets
10.	Insects	Order: Hemiptera	True Bugs
11.	Fish	-	Batla
12.	Fish	-	Common Carp
13.	Fish	-	Katla
14.	Fish	*Clarias batrachus*	Manghur
15.	Fish	*Labeo rohita*	Rohu
16.	Fish	-	Saul
17.	Fish	-	Tilapia

Table 169 Trees in GB Nagar

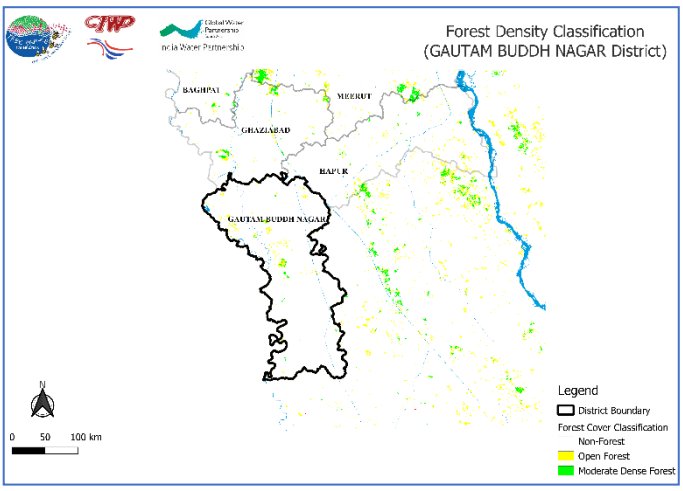
S. NO.	Type	Scientific Name	Common Name	Family
1.	Trees	*Phoenix sylvestris*	Wild Date Palm	Arecaceae
2.	Trees	*Prosopis juliflora*	Vilaiti Keekar	-
3.	Trees	*Ziziphus mummularia*	Ber	Rhamnaceae

Table 170 Herbs & Shrubs: GB Nagar

S. No.	Type	Scientific Name	Common Name	Family
1.	Herbs & Shrubs	*Parthenium hysterophorus*	Congress Grass	Asteraceae
2.	Herbs & Shrubs	*Coccinia Grandis*	Ivy Gourd	Cucurbitaceae
3.	Herbs & Shrubs	*Ageratum conyzoides*	Goat Weed	Asteraceae
4.	Herbs & Shrubs	*Dhatura innoxia*	Safed dhatura	Solanaceae
5.	Herbs & Shrubs	*Cucumis melo*	Kharbuza, Musk melon	Cucurbitatceae
6.	Herbs & Shrubs	*Oxalis corniculata*	Creeping Woodsorrel	Oxalidaceae
7.	Herbs & Shrubs	*Solanum indicum*	Common Indian Nightshade	Solanaceae
8.	Herbs & Shrubs	Chenopodium album	Lamb's Quarter	Chenopodiaceae
9.	Herbs & Shrubs	*Ricinus communis*	Castor Oil Plant	Euphorbiaceae
10.	Herbs & Shrubs	Sacharum spontaneum	Kaans	Poaceae
11.	Herbs & Shrubs	*Achyranthes aspera*	Chirchita	Amaranthaceae
12.	Herbs & Shrubs	Ipomea aquatica	Water Spinach	Convolvulaceae
13.	Herbs & Shrubs	*Fumaria officinalis*	Indian Fumitory	Fumariaceae
14.	Herbs & Shrubs	Abutilon indicum	Country Mallow	Malvaceae
15.	Herbs & Shrubs	*Lantana camara*	Common Lanatana/Wild Sage	Verbenaceae

Source: 'Reviving Hindon River – A Basin Approach.'
By: Natural Heritage Division, Indian National Trust for Art and Cultural Heritage (INTACH), New Delhi, 2017

Forest Classification



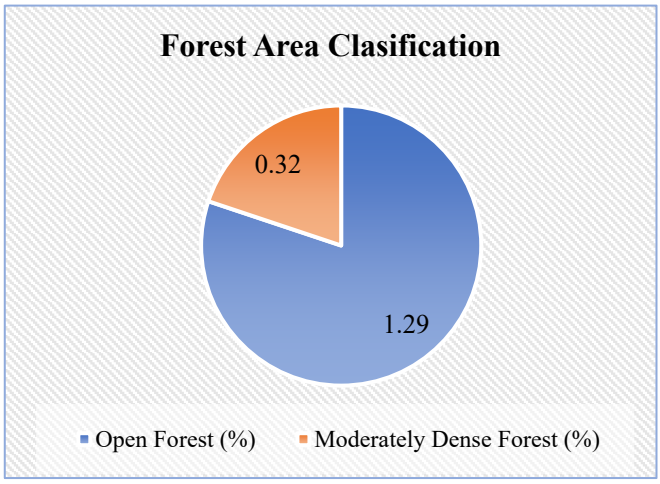


Figure 105 Forest Density Classification: GB Nagar

Table 171 Forest Density Classification: GB Nagar

District	No Data (%)	Water Bodies (%)	Non Forest (%)	Scrub (%)	Open Forest (%)	Moderately Dense Forest (%)	% of Forest w.r.t. Geographical Area of District	% Change in Forest Cover w.r.t. 2017
GB Nagar	0.02	0.70	97.68	0.00	1.29	0.32	1.56	0.00

Source: India State of Forest Report, Forest Survey of India, 2019

Forest Type in GB Nagar District

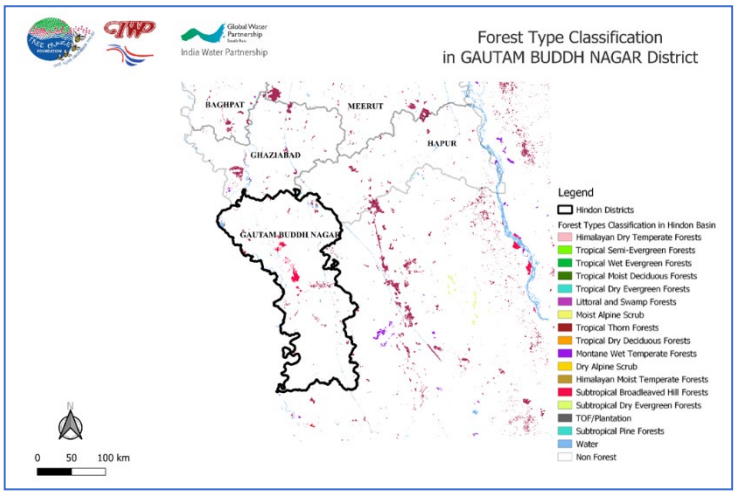


Figure 106 Forest Type: GB Nagar

Source: India State of Forest Report, Forest Survey of India, 2019

Soil Texture

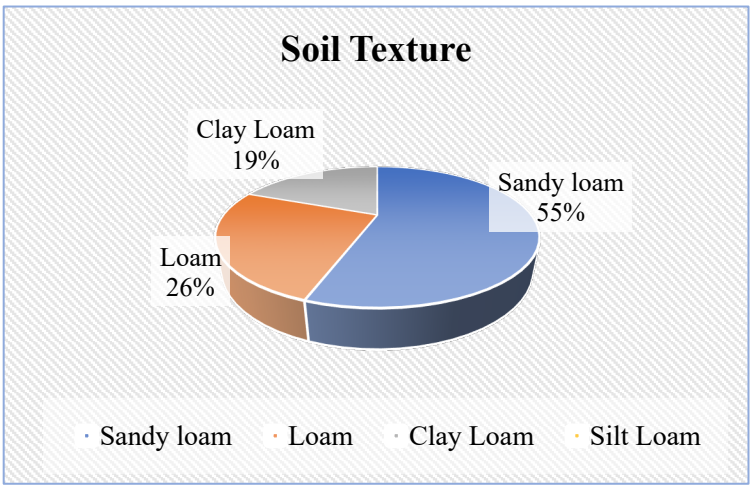


Figure Soil Texture (Graph): GB Nagar

Table 172 Soil Texture Statistics: GB Nagar

District	Sandy Loam (Thousand Hectares)	Loam (Thousand Hectares)	Clay Loam (Thousand Hectares)	Silt Loam (Thousand Hectares)
GB Nagar	42.70	19.70	14.70	-

Source: http://agricoop.nic.in/agriculturecontingency/Uttar- Pradesh, 2012

Table 173 Soil Depth: GB Nagar

District	Soil Depth (cm)
GB Nagar	100-150

Source: NRSC (2016) Soil Data set 2000. NICES/DS(L)/SOIL/2000/Jan2016

Ground Water Status

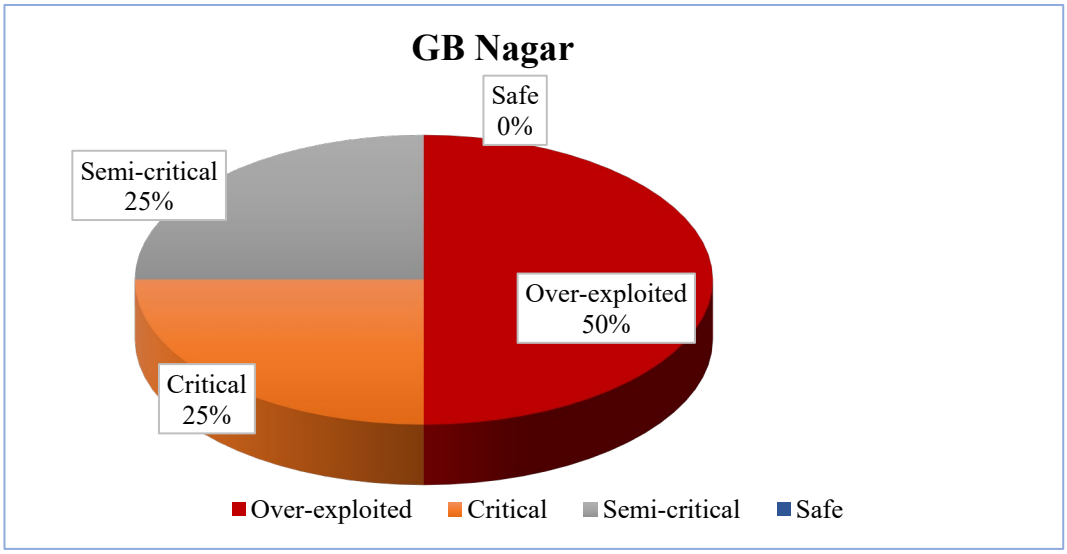


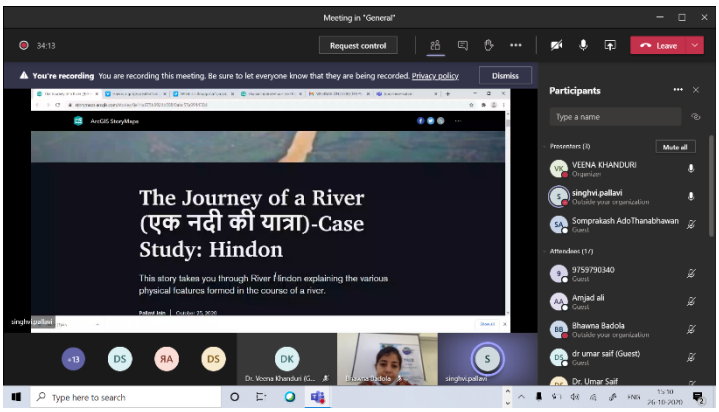
Figure 107 Ground Water Status: GB Nagar

Table 174 Ground Water Status: GB Nagar

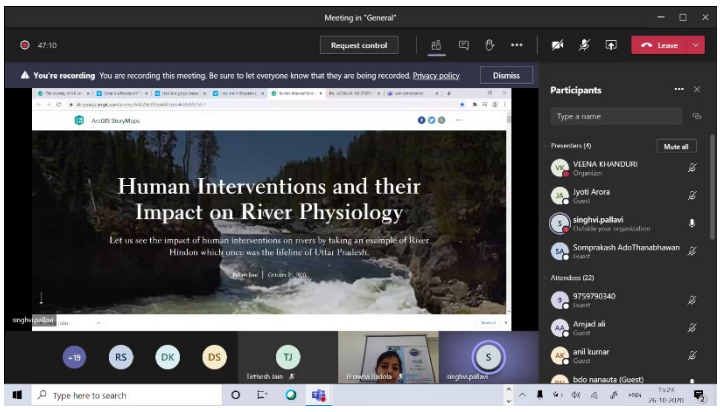
District	Total no. of Blocks	Over-exploited	Critical	Semi-critical	Safe
GB Nagar	4	2	1	1	0

Source: http://upgwd.gov.in/StaticPages/Atlas2017.aspx

Annexure VIII: Minutes of Meeting for Webinar of Story Map

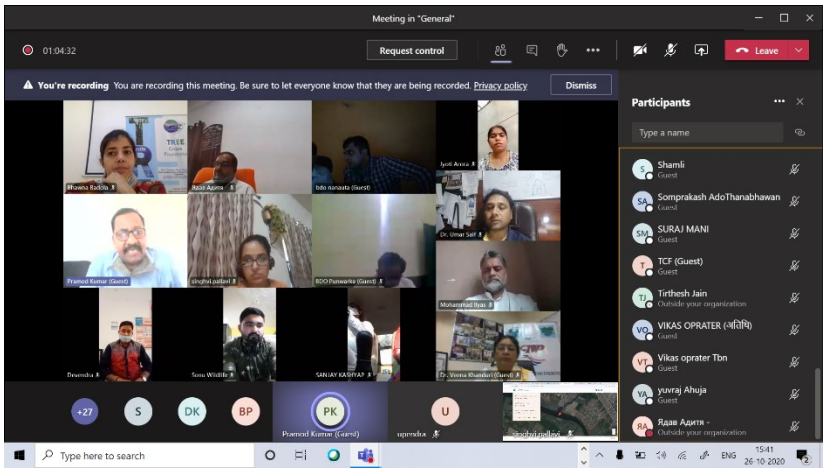


Picture 1 Story Map: The Journey of a River



Picture 2 Story Map: Human Interventions and their impact on River Physiology

India Water Partnership (IWP) organized a webinar displaying "Story Maps for Hindon River" on 26th October, 2020 from 3.00 PM to 5.00 PM in association with its network partners; Tree Craze Foundation and Green India Corporation. The purpose of this webinar was to sensitize students and stakeholders about the existing problems in the Hindon River and its tributaries (Krishni & Kali rivers) by highlighting the physical features of a river, human interventions and their impact on river physiology with the case study of Hindon River with an aim to rejuvenate the Hindon River and its tributaries. More than 35 persons attended the webinar. The main attendees were:-



Picture 3 Story Map Webinar for Shamli

1. Shri Promod Kumar, District Development Officer, Shamli District, Uttar Pradesh
2. Shri Mansa Ram Yadav, District Development Officer, Saharanpur District, Uttar Pradesh
3. Dr. Veena Khanduri, Executive Secretary-cum-Country Coordinator, IWP
4. Prof. Umar Saif, Director, Green India Corporation
5. Ms. Bhawna Badola, Chief Executive Officer, Tree Craze Foundation
6. Ms. Sudha Kumari, Project Associate, IWP
7. Ms. Pallavi Singhvi, Project Director, Tree Craze Foundation
8. Shri Yuvraj Ahuja, State Program Coordinator, 2030 Water Resources Group
9. Shri Sanjay Kashyap, Convener, Centre for Water Peace
10. Gram Pradhans (Village Heads) & Gram Sachivs (Village Secretaries), Shamli, Uttar Pradesh
11. Eco Club In Charge, Shamli District, Uttar Pradesh
12. Students of Eco Club, Shamli District, Uttar Pradesh

At the outset, **Dr. Veena Khanduri** welcomed the participants. She said that Hindon River and its tributaries are gravely polluted and the small channels along the river, which earlier had a perennial flow now have a scanty flow with heavily polluted water. She added that over the years a lot of efforts have been made by the Government of Uttar Pradesh, district administration in the Hindon basin, NGOs, VOs and people in the past, however a holistic basin level approach is still needed to rejuvenate the River and its tributaries to bring them to their original state. IWP along with 2030 Water Resources Group has been working for rejuvenation of Hindon River and its tributaries since 2015 and in this process a Multi-

Stakeholders Platform (MSP) for Hindon-Ganga Tributary Rejuvenation was formed by the Government of Uttar Pradesh in June, 2019. She said that the Hindon Yatra Exhibition & Symposium was first organized by Government of Uttar Pradesh with the support of 2030 Water Resources Group on 27th June, 2016. The Hindon Yatra and exhibition was facilitated by India Water Partnership and Hindon Stakeholders which passed through all the districts of Hindon basin and ended at Delhi taking 3 months' time. She also said that the efforts to rejuvenate Hindon is going through capacity building of farmers, awareness generation of school students and youths. At the same time efforts to bring all stakeholders on one platform resulted to launch of MSP for Hindon and its tributaries in June 2019 by Uttar Pradesh government.

Dr. Veena Khanduri said that IWP has supported the district and the local administration in the Hindon river basin in the past for their capacity building on water management, awareness generation on water conservation and prepared solid liquid waste management plans for selected Gram Panchayats of Shamli District. To take this support forward, IWP is organizing small webinars and meetings for sensitizing students, local communities and administrators on various aspects of Hindon River and its physiology and how it has been impacted by anthropogenic interventions. She said that the participants' suggestions, guidance and support will help us in improving our knowledge and ideas to work further on Hindon and its tributary management.

Ms. Bhawna Badola welcomed all the participants and said that although all the rivers in India are important to us but Hindon becomes more important because we live in Hindon basin and earn our livelihoods in the same basin. Talking about her organization - the Tree Craze Foundation, Ms. Badola told about TCF joining hands with IWP and the combined efforts of the two organizations in saving Hindon and rejuvenating its tributaries are going on. She also told that IWP and Tree Craze Foundation are also developing a GIS platform to support decision making for tributaries management in Hindon river basin.

Ms. Bhawna Badola and **Ms. Pallavi Singhvi** presented – "The Journey of a River", taking Hindon river as a case study, through a story map, emphasizing on the importance of rivers, their flow, river course, formation of gorge, valleys, meanders, oxbow lakes, estuaries, deltas, etc. Also, a story map depicting the impact of human intervention on rivers was presented, explaining the impact of man-made structures like canals, bridges, dams, agricultural pesticides etc. on Hindon and how it has deteriorated from being a free flowing to a dying river.

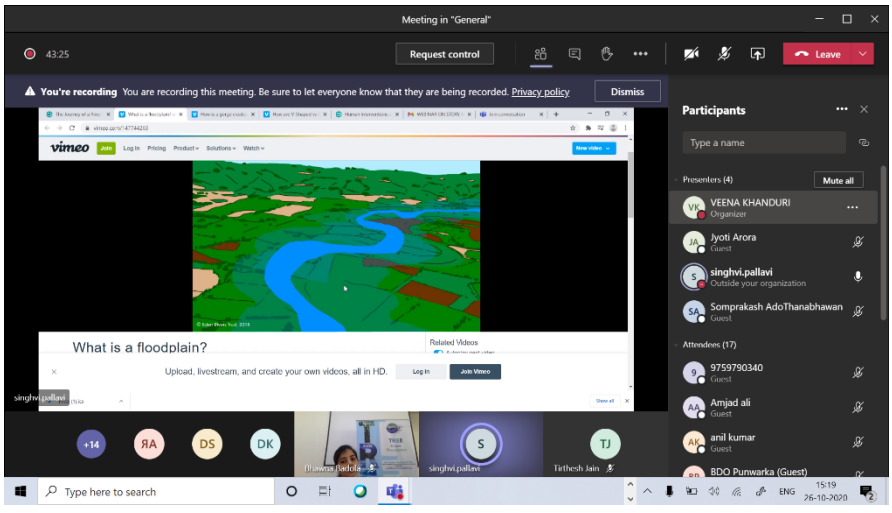


Figure 108 Story Map Webinar

Ms. Bhawna Badola also said that the participants could give their feedback in forms circulated at the end of the meeting if they could not give the suggestions immediately.

Shri Promod Kumar told that even though the Government is making all the efforts for rejuvenation of rivers (Hindon and its tributaries in this context) the authorities have not yet fully succeeded. For this holistic awareness generation and peoples' participation at large scale is lacking. He emphasized for ensuring the participation of common citizens for river rejuvenation efforts and at the same time continues their efforts to protect the local water bodies. He also suggested the Story Maps on Hindon

can be made more interesting by including the historical, social, archeological and cultural mapping related to Hindon and its tributaries. He further said that a lot of work has been done for Krishni river rejuvenation but without peoples' participation achieving complete success will be a distant dream. He added that GPDP (Gram Panchayat Development Plan) is focusing mainly on construction of Nalas, roads, pathways, etc.. However, the water component is yet to be included in it.

Shri Mansa Ram Yadav while appreciating the webinar on story maps as knowledge worthy, suggested that a second Hindon Yatra could be organized in all the seven districts of Hindon basin to attract the attention of common people on the status of Hindon and its tributaries and bring them at one platform for making joint efforts for river rejuvenation. For organizing the Yatra he said that the district administration will also provide its support. He also advocated that Nukkad-Natak can be organized for mass awareness generation among the rural people living along the banks of river Hindon to come forward for rejuvenating the Hindon River and its tributaries and other water bodies in their area. Lastly he added that only Government efforts will not be sufficient for the purpose and a strong Jan Andolan (Peoples' movement) is required to make the outcomes more effective.

Prof. Umar Saif told that we will organize the Hindon Yatra 2.0 in all the seven districts of Hindon basin starting from its source (Shiwalik Hills) with support of all the stakeholders. He also said that we will also organize such webinars/meetings in all the Hindon basin districts for awareness generation on water conservation and restoration of water bodies. He also added that a Dash Board being developed IWP and Tree Craze Foundation will help us for making decisions in time and also help to monitor the various rejuvenation efforts undertaken in the past, being undertaken at present and those which would in taken-up in future.

Shri Yuvraj Ahuja suggested that focus needs to be placed on demand side management of ground water especially in regions of Hindon basin where ground water is over-exploited. He suggested that during the Hindon Yatra 2.0, the stakeholders can focus on Atal Bhujal Yojana mandate so that ground water management can be properly ensured in the basin.

Shri Sanjay Kashyap suggested to continue the research and ground level efforts.

Ms. Sudha Kumari moderated the session and extended vote of thanks to all the stakeholders and participants for their active contributions.

Action points to be included in the story maps

As suggested by **Sh.Pramod Kumar** historical and cultural aspects of the areas in Hindon basin shall be included in the story maps. Also, the archeological facets of the areas shall be incorporated in the story with an aim to build a social connect with the locals.

Annexure IX List of Stakeholders

S.No.	Name, Designation and Organisation	Email	Type
1	Dr Himanshu, Ganga Jal Biradari, Meerut	himansh36@gmail.com	Civil Society
2	Deepak Rawat, Delhi	deepak.rawat@a2zemail.com	Industry
3	Ravendra singh, Green Waste Management LTD, Muzaffarnagar	ravendra.singh@a2zemail.com; ravendras40@gmail.com	Industry
4	Pankaj Aggarwal, Bindlas Duplux Limited	bindlas@hotmail.com	Industry
5	Suresh Babu, WWF-India Secretariat	suresh@wwfindia.net, www.wwindia.org	Civil Society
6	Vittal Boggaram, WRI INDIA	vittal.boggaram@wri.org	Research
7	Henriette Faergemann, Delegation of the European Union to India,	enriette.faergemann@eeas.europa.eu	Government
8	Divisional Forest Officer, Ghaziabad	dfogz-up@nic.in	Government
9	Anil Sagar (IAS)	anilsagar@gmail.com	Government
10	Shailendra Gaur, Department of Irrigation & Water Resources, Government of Uttar Pradesh	shailendraindu@gmail.com	Government
11	VK Mishra, Dept Irr – regional officer in Saharanpur	kumarmishra707@gmail.com	Government
12	Sunil Nanda, JS Water Energy Life Co. Pvt. Ltd.	info@js-wel.com, sunil.nandajs-wel.com	Industry
13	Raghu Babu Nukala, GIZ - deutsche gesellschaft für international	zusammenarbeitnukala.raghu@giz.de, www.giz.de	Government
14	Prashant Pastore, Solidaridad	prashant@solidaridadnetwork.org	Civil Society
15	Sanjiv Saran, Chairman Uttar Pradesh Pollution Control Board	psforest2015@gmail.com	Government
16	Shubha Sekhar, Coca-Cola India Pvt. Ltd.	ssekhar@coca-cola.com	Industry
17	Sanjay Singh, Jal Jan Jodo Abhiyan / Parmarth	sanjaysingh033@gmail.com, www.facebook.com/Jan-Jan-Jodo Abhiyan	Civil Society
18	U.P. Singh, Director General, National Mission Clean Ganga, Minister of Water Resources River Development & Ganga Rejuvenation	upsingh1962@hotmail.com; missionganga@gmail.com	Government
19	Swapna Patil, FICCI - Senior Assistant Director Water	swapna.patil@ficci.com	Industry
20	Rita Roy Choudhury, FICCI - Senior Director & Head - Environment, Climate Change, Renewable Energy & Water Division & Head	Email: rita.roychoudhury@ficci.com Website: www.ficci.com	Industry
21	Dr. Vinod Tare, IIT Kanpur	vinod@iitk.ac.in	Research
22	Bart Jeroen Bierens, Senior Advisor International Cooperation, Netherlands Enterprise Agency /Ministry of Economic Affairs,Department for International Innovation	E: bart.bierens@rvo.nl	Government
23	Mr. Makhan Lal Gupta, Chief Development Officer, District Gautam Budh Nagar (UP Government)	makhan.gupta@gmail.com	Government
24	Arvind Sangal, Chairman Shamli Nagar Palika	Email: arvin_rc@yahoo.com	Government
25	Alpana Talwar, Vividha Kala Evam Gramodyog Sewa Sansthan	alpanatalwar@yahoo.in	Civil Society

26	Vikrant Tongad, Social Action for Forest &Environment (SAFE), Chief Functionary	Vikranttongad@gmail.com; vikrant@safegreen.in	Civil Society
27	Mr. Hriday Shankar Tiwari (IAS),District Magistrate	dmbag@nic.in	Government
28	Sujeet Kumar, District Magistrate	dmshamli2012@gmail.com	Government
29	Mr Alok Sinha, Divisional Commissioner	alok274@hotmail.com	Government
30	Shri. M.P. Agarwal, Divisional Commissioner	commsah@nic.in	Government
31	Dr. R.K. Jain, Ex-Officio Director	dr.rkjain56@rediffmail.com	Research
32	Shri S.C. Yadav, (IFS), Member Secretary	ms@uppcb.com	Government
33	Dr. Neeraj Shukla, Municipal Commissioner	nagarnigamsaharanpur@gmail.com	Government
34	Rajeshwar Bansal, Owner/director and ex-MLA	marutipapers@rediffmail.com; vikasbansal78@ymail.com; shipra_c@yahoo.com	Industry
35	Madhu Sharma, Principal	sdrrps@gmail.com	Civil Society
36	Sanjay Rana	esroindia@gmail.com	Civil Society
37	Dr. Himashu Joshi, IIT Roorkee professor	joshifhy@iitr.ac.in	Research
38	Dhawan/Anil kapoor, Art of Living, Sri Sri Rural Development Programme Trust	rdhawan@ssrdp.org; anilkapoor@ssrdp.org; vingav@yahoo.com; bkyaol@gmail.com	Research
39	Gaurav Bedi, I Say Organic	gaurav@isayorganic.com	Industry
40	Pankaj Nigam, Daily Dump	legacy.for.children@gmail.com	Civil Society
41	Shri Suryakant Kaushik, Arya Mitra Rashtra Seva Sansthan, Loni	suryakantkaushik98@gmail.com	Civil Society
42	Dr. SK Upadhyay, Social Activist, Saharanpur	drsku14feb@gmail.com	Civil Society
43	Shri Vijay Pal Singh Baghel (Greenman),	greenmanbaghel@gmail.com	Civil Society
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47	Praveen Kumar, Art of Living, Meerut	praveenaolkumar@gmail.com	Civil Society
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49	Thakur Sachin Tomar, Nirdhan Kanya Sewa Samiti, Meerut	nirdhankanya2017@gmail.com	Civil Society
50	Mr. Anil Kapoor/Mr. Dhawan, SSRDP	rdhawan@ssrdp.org; anilkapoor@ssrdp.org	Civil Society
51	Mr. MewaLal, Muskan Jyoti, Saharanpur	anandskoshal@gmail.com	Civil Society
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53	Mr. B.D. Sharma, Bharat Vikas Parishad, Meerut	bdsharma1945@gmail.com	Civil Society
54	Dr. Umar Saif, High Feed, Shamli	mohdumarsaif@gmail.com	Civil Society
55	Shri Sanjay Kashyap, Namami Haranandi Mission	sankash@rediffmail.com	Civil Society
56	Mrs. Anita Rana , Jan Hit Foundation , Meerut	janhitfoundation@gmail.com	Civil Society
57	Ms. Sonia Luthra , Art Off Living , Muzaffarnagar	sonialuthrajgd@gmail.com	Civil Society

58	Mrs. Sonia Vohra, Rural Health Care	sonia@graminhealthcare.com	Civil Society
59	Sh. Shivraj Singh, Rtf Chief Engg, Dev.Auth. UP	shivrajsinghce@gmail.com	Civil Society
60	Mrs. Anju Agarwal, Chairperson, M.Nagar Nagar palika	vspl2k@rediffmail.com	Government
61	Central Pulp and Paper Research Institiute, Saharanpur	cppri@yahoo.com	Government
62	Sh. Rajeshwar Bansal, Representative Shamil Chini Udhyog	marutipapers@rediffmail.com	Industry
63	Sh. Pankaj Agarwal, President, Paper Fecuturer Assosiation, Muzaffarnagar	bindlas@hotmail.com	Industry
64	Sh. Vinod Kumar, BIO Engime	vinodchaudhary005@gmail.com	Industry
65	Prof. Naresh, Sardar Vallabh Aggriculture University, Meerut	r.knaresh@yahoo.com	Research
66	Sh. Bharat Bhushan Tyagi, Beehta, Bulandhahar	cvstorganic1997@gmail.com	Research

Annexure X List of Stakeholders who attended Nirmal Hindon Technical Workshop (2018)

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1	Mr. Sajid Idrisi, Consultant & Member, INTACH	idrisisajid1@gmail.com
2	Ms. Renu Tiwari, Chief Development Officer, Shamli	cdoshamli@gmail.com
3	Mr. Sanjeev Dixit, Max Life, Gurgaon	sanjeev.dixit@maxlifeinsurance.com
4	Shri Suryakant Kaushik, Arya Mitra Rashtra Seva Sansthan, Loni	suryakantkaushik98@gmail.com
5	Dr. SK Upadhyay, Social Activist, Saharanpur	drsku14feb@gmail.com
6	Mr. Sanjeev Ranjan, Chief Development Officer, Saharanpur	cdosah@nic.in
7	Mr. P.K. Pandey, District Magistrate, Saharanpur, Sh. Alok Pandey, New DM	dmsah@nic.in
8	Shri Vijay Pal Singh Baghel (Greenman),	greenmanbaghel@gmail.com
9	Mr. Manoj Mishra, Conviner, Yamuna Jee Campaign.	yamunajiye@gmail.com
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18	Sh. Bharat Arya	bharat.aryans@gmail.com
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21	Sh. Bharat Bhushan Tyagi, Beehta, Bulandhahar	cvstorganic1997@gmail.com
22	Sri Bal Krishan, Art of Living	bkyaol@gmail.com
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24	Sh. Mahendra Kumar Sharma, Natural Organic Center, Meerut	nocorganic@gmail.com
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31	Sh. Rajeev Sharma, District Magistrate, Muzaffarnagar	dmmuz@nic.in
32	Ms. Ritu Maheshwari, District Magistrate, Ghaziabad	dmgha@nic.in
33	Sh. Ashok Babu Mishra, Joint Development Commissioner, Meerut	jdc_mrt@yahoo.com
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35	Ganga Kisan Sahkari Chini Mill, Morna	gkscmmorna@gmail.com
36	Sh. Rajeshwar Bansal, Representative Shamil Chini Udhyog	marutipapers@rediffmail.com
37	Sh. Pankaj Agarwal, President, Paper Fecuturer Assosiation, Muzaffarnagar	bindlas@hotmail.com
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39	Mr. Anil Kapoor/Mr. Dhawan, SSRDP	rdhawan@ssrdp.org; anilkapoor@ssrdp.org
40	Mr. Sunil Nanda, M.D. JS Water Energy Life Co	sunil.nanda@js-wel.com
41	Mr. MewaLal, Muskan Jyoti, Saharanpur	anandskoshal@gmail.com
42	Mr. Martijn Rauwers, Dutch Deligates	mra@gc-bv.com
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45	Mr. Ashok Ji , Nagar Palika Muzaffarnagar	
46	Shri Krishan Pal Singh, Gramin & Pryavaran Vikas Samiti, Baghpat	krishan.gpvs@gmail.com
47	Shri Indra Vikram Singh, District Magistrate, Shamli	dmshm@nic.in
48	Mr. Phoolchand Jaiswal, Chief Development Officer, Baghpat	cdo.officebaghpat@gmail.com
49	Mr. B.D. Sharma, Bharat Vikas Parishad, Meerut	bdsharma1945@gmail.com
50	Mr. Hublal, District Development Officer, Baghpat	cdo.officebaghpat@gmail.com
51	Dr. Umar Saif, High Feed, Shamli	mohdumarsaif@gmail.com
52	Shri Sanjay Kashyap, Namami Haranandi Mission	sankash@rediffmail.com
53	Mr. Dharampal Sharma, Sincerai, Meerut	er.dpsingh@icloud.com
54	Federation of Indian Chambers of Commerce & Industry(FICCI)	ficci@ficci.com
55	Professor V.C. Goyal, Roorkee, IIT	vcgoyal@yahoo.com
56	Mr. Ajay Tandon, G.R. Soviet and Allied	grsolvent@gmail.com
57	Shri Makhan Lal Gupta, Ex-CDO, Greator NOIDA	makhan.gupta@gmail.com
58	Dr. Vivek Kumar, IIT, Delhi	vivekfpt@gmail.com
59	Shri Raman, Monitoring Committee, Supreme Court	ramanagra2012@gmail.com
60	Sh. Dinker Saxena, Chartered Engineer (India)	dinker@wateronline.co.in
61	Shri Nitin Verma, 2030WRG	nitinv8@gmail.com
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63	Mr B. N. Singh , District Magistrate , Gautam Buddha Nagar	dmgbn@nic.in
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69	Mrs. Sonia Vohra, Rural Health Care	sonia@graminhealthcare.com
70	Srinivas Chaukakula, Fellow, Center The policy Research, New Delhi	srinivas@cprindia.org
71	Mr Himanshu Thakkar, Founder Director, Sandarp	ht.sandrp@gmail.com
72	Shri Vikrant Sharma, Jal Biradari	vikrantjalbiradari@gmail.com
73	Mr Suresh Babu, World Wild Life fund	suresh@wwfindia.net
74	Shri. A. Radhakrishnan, 2030WRG India Country Head	aradhakrishnan3@worldbank.org
75	Sh. Shivraj Singh, Rtf Chief Engg, Dev.Auth. UP	shivrajsinghce@gmail.com
76	Dr. Manju Gupta, Association for Innovatie Education	manju.meerutcollege@gmail.com
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