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Tracing The Evolution of Najafgarh Wetland: Spatial Insights and Governance Dynamics

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Abstract:
Riverine wetlands represent vital ecosystems within river floodplains, offering multifaceted functions ranging from flood control to biodiversity conservation. The Najafgarh Wetland, an emerging ecosystem located along the borders of Delhi and Haryana's Gurugram, is nourished by the River Sahibi and serves as a crucial floodplain wetland. This study investigates the wetland's evolution, governance, and ecological dynamics, examining the role of multiple administrative entities in its management. Using satellite imagery from Landsat 5 TM (2001) and Landsat 9 OLI (2023), the research conducts spatial analysis to assess changes in land use and the wetland's functional development, with a focus on nine surrounding villages. The change analysis, showing shifts across seven land use classes, indicates that the wetland has fully developed by 2023. However, challenges such as undefined boundaries, insufficient security measures, and governance gaps persist. Field observations reveal concerns among local farmers about submerged agricultural lands and water pollution, with compensation issues remaining unresolved. While government stakeholders acknowledge legal disputes over wetland status, no substantial action has been taken despite directives from the National Green Tribunal (NGT). Bird watchers report declining avian populations, further corroborating concerns over water quality and diminishing migratory bird presence. The findings highlight the complex relationship between environmental conservation, administrative governance, and stakeholder involvement in the wetland's preservation. The study emphasizes the need for an integrated and collaborative approach, advocating for the establishment of a strategic framework that includes sustainable land use planning, enhanced legal protections, and robust monitoring mechanisms to ensure the long-term sustainability and biodiversity of the Najafgarh Wetland.
Keywords: Najafgarh wetland, Transboundary ecosystems, Spatial analysis, Wetland governance.

INTRODUCTION

Wetland habitats are very productive and diversified in terms of life (Keddy et al., 2009). They offer a wide range of ecosystem services, including water purification, reducing runoff and river discharge, producing food and fibre, and promoting ecotourism (Mitsch & Gosselink, 2000; Keddy, 2010; Junk et al., 2013). Many of the world's wetlands have historically been inhabited and heavily utilised by humans due to their high production, fertile soils, and significance for the provision of water. For local inhabitants, particularly in developing nations, wetlands continue to be a source of sustenance. They are also highly revered by many traditional civilizations (Keddy, 2010; Maltby & Acreman, 2011; Gopal, 2013; Reis et al., 2017).

An inland wetland, which is characterized by the presence of water, either temporarily or permanently, and the prevalence of unique hydrological, soil, and vegetation features, refers to a type of wetland ecosystem that is situated away from the coastline and is not directly influenced by tidal or marine processes. Wetlands in urban areas are the best examples of Inland wetlands. Often referred to as urban wetlands or marshes, these are wetland ecosystems that exist within or adjacent to cities and towns. These are some of the best natural resources in urban settings. With their extensive range of services, wetlands are one of the most significant green-blue infrastructure elements. When wetlands, or blue infrastructure, are used to their full potential, urban areas are more socially and environmentally sustainable (Working Paper, 2004). Particularly important to urban ecosystems are wetlands that are located there. Urban wetlands offer a range of environmental functions for human societies (Boyer & Polasky, 2004). Regulating Urban heat islands (UHI) is one of

the other benefits of blue infrastructure. This impact is mainly caused by modifications to the surface's physical characteristics, which increase solar radiation absorption while decreasing convection cooling and water evaporation (Ampatzidis & Kershaw, 2020). Furthermore, urban wetlands exhibit their microclimate and are typically cooler than the surroundings (Gunawardena et al., 2017; Şimşek & Ödül, 2018). As a result, they contribute to raising both the environment's quality of life and sustainable urban growth (Seifollahi-Aghmiuni et al., 2019).

According to Wetlands International South Asia estimates, about 30% of India's natural wetlands have been lost over the past three decades, primarily as a result of illegal building, unsustainable urbanisation, agricultural development, and pollution. Due to uncontrolled urbanisation, Chennai lost 90% of its wetlands, forcing the city to deal with difficulties related to water security and a deteriorated environment. Between 2005 and 2018, Vadodara's wetlands were reduced by 30.5%. Due to poor waste management, increasing pollution, and unrestrained urban development, Hyderabad lost 55% of its wetlands. Mumbai lost 71% of its wetlands, Ahmedabad 57%, Bengaluru 56%, Pune 37%, and Delhi-National Capital Region lost 38%, primarily due to eutrophication from pollution and construction of buildings. This extensive loss can be attributed to various factors, including the need for urbanisation and a lack of understanding of wetlands and their ecosystem functions. In January 2021, the National Mission for Clean Ganga developed a toolkit for managing wetlands and waterbodies in urban areas and researched the issues associated with rising urbanization. Later, the Union Ministry of Jal Shakti (water resources) launched a significant scientific and community-based campaign to create health cards and manage ten wetlands in the more than 50 Ganga districts during World Wetland Day. The Master Plan Delhi 2041 (MPD 2041), which aims to preserve and expand a network of "green and blue assets" in Delhi to preserve its biodiversity and microclimate, was released to the public in June 2021 (Jain 2021). The present research takes one such issue related to one of the wetlands situated at the borders of the capital of the country.

STUDY AREA

The focal area for the current research is situated along the course of the Sahibi River, also known as Najafgarh Drain, creating a transboundary waterbody that spans the national capital of India, i.e. Delhi, and the neighbouring state Haryana's district Gurugram. Geographically, this region encompasses a natural depression in southwest Delhi, adjacent to National Highway 48 and near the Gurugram-Rajokri border.

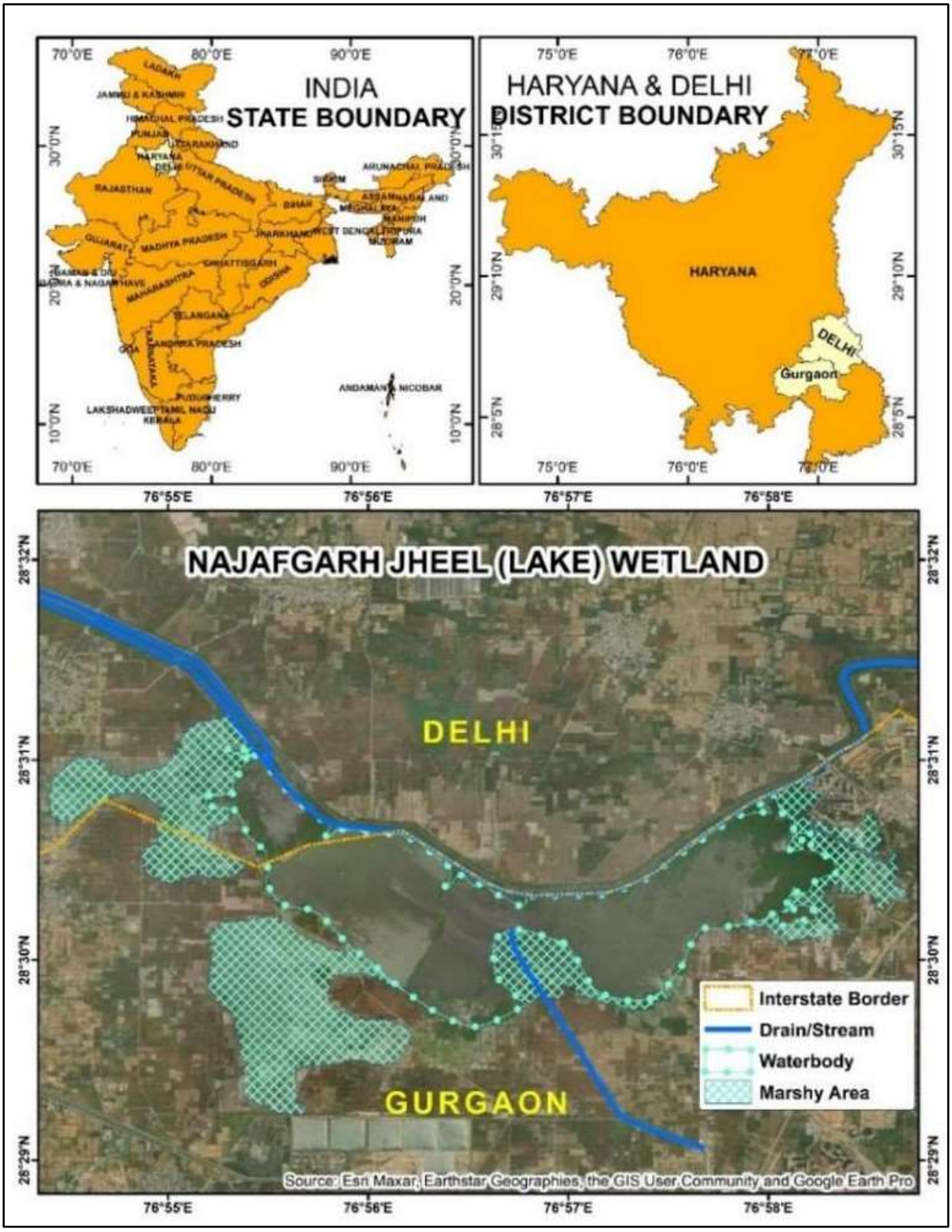
The Najafgarh Drain follows its course through Delhi and eventually converges with the Yamuna River. Notably, it forms an integral part of the Sahibi River, originating in the Aravalis at the border of Rajasthan and Haryana. The discharge from this drain contributes significantly to the formation and sustenance of Najafgarh Lake (Roy, 2021 & Pati, 2022). This 7-kilometer-long lake spans both Delhi and Haryana, serving as a key focal point for the study (Map 1). There are 9 villages surrounding the wetland, which have been considered under the study area.

Table 1

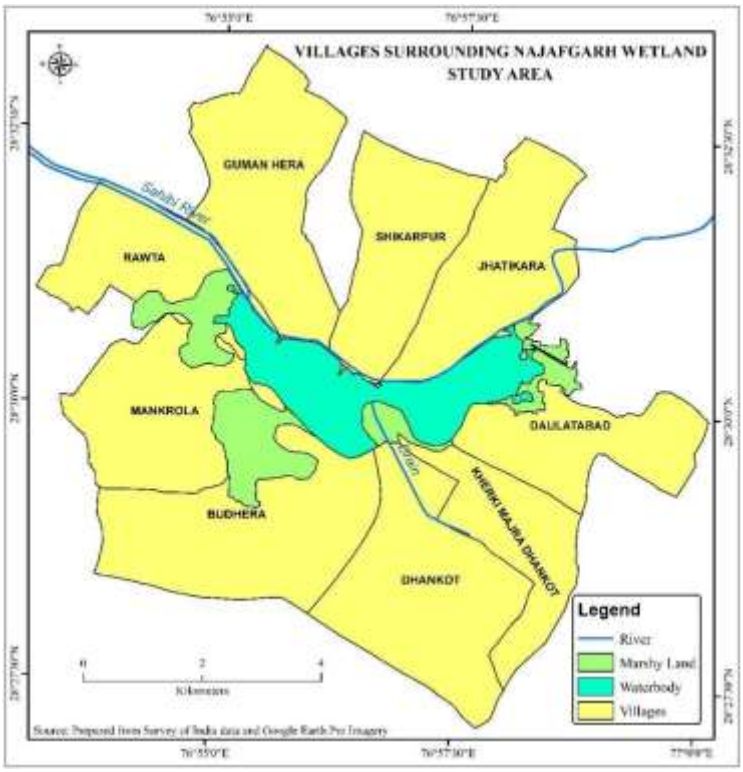
Villages considered under the study

Sr.No.	STATE	DISTRICT	TEHSIL	VILLAGE
1	Delhi	South West	Kapashera	SHIKARPUR
2	Delhi	South West	Kapashera	JHATIKARA
3	Delhi	South West	Kapashera	GOMAN HERA
4	Delhi	South West	Kapashera	RAOTA
5	Haryana	Gurugram	Gurugram	DAULATABAD
6	Haryana	Gurugram	Gurugram	KHERKI MAJRA
7	Haryana	Gurugram	Gurugram	DHANKOT
8	Haryana	Gurugram	Gurugram	BUDHERA
9	Haryana	Gurugram	Gurugram	MANKROLA

Map 1: Location Map of the study area



Map 2: Delineated Study Area



The geographical positioning of the study area (Map 2), delineated by the flow of the Sahibi River and the formation of Najafgarh Lake, highlights its significance in the broader landscape. It also pinpoints the fact that the site, covered by villages, clearly refers to a rural area. The transboundary nature of the waterbody, extending from the capital city into the neighbouring state, emphasizes its ecological and hydrological importance. This context sets the stage for a comprehensive investigation into the dynamics, challenges, and sustainable management strategies for Najafgarh Wetland.

OBJECTIVES

The present research work takes into account the following objectives:

- *To Assess Najafgarh Wetland's Evolution:*
  Investigate the historical evolution of the Najafgarh wetland from 2001 to 2023 using satellite imagery and change detection techniques.
- *To Examine Governance Dynamics:*
  Scrutinize the governance dynamics of the Najafgarh wetland, analyzing administrative structures and policies governing wetland management across Delhi and Haryana's Gurugram.
- *To Propose Management Strategies:*
  Formulate recommendations for enhancing wetland governance and management, informed by the analysis of governance challenges, stakeholder perspectives, and environmental concerns identified during the study.

MATERIAL AND METHODS

The research employs a multifaceted approach in its methodology, utilizing both primary and secondary data sources to comprehensively investigate the Najafgarh wetland. Primary data acquisition involves the utilization of satellite images LANDSAT TM (2001) and PLANETSCOPE (2023) and extensive field surveys, allowing for an in-depth exploration of the wetland's locational dynamics. The selection of the base year i.e. 2001 depends on the fact that, in the year 2005, the Central Pollution Control Board (CPCB) of India declared Najafgarh Wetland as exceedingly polluted, categorizing it under 'D' (Khuntia et al. 2005). The interview method and systematic field observations are employed to assess and evaluate disruptions within the ecosystem.

Furthermore, secondary data is drawn from the Census of India to obtain population-related information for the villages surrounding the Najafgarh wetland. These nine villages are, namely, shikarpur, jhatikara, goman hera, raota, daulatabad, kherki majra dhankot, dhankot, budhera, and mankrola. This demographic data is then analyzed in conjunction with

focused group discussions, forming a robust framework to understand the social and environmental impacts exerted on the Najafgarh wetland by the resident populations. By integrating both primary and secondary data, the research aims to derive a comprehensive understanding of the various dimensions affecting the Najafgarh wetland, laying the groundwork for informed analyses and sustainable management strategies.

ANALYSIS

After conducting a pilot survey of the study area in October 2023, seven land use and land cover classes have been identified to classify the satellite images of selected years. Utilizing the Maximum Likelihood algorithm within ERDAS Image software, supervised classification is executed across six predefined land use and land cover classes, determined through field surveys and extensive literature reviews. These classes encompass Built-Up, Crop Land, Fallow Land, Marshy Land, Open Space, Vegetation, and Waterbody.

Each class undergoes supervised classification using 30 signatures per class, ensuring accuracy and reliability in delineating spatial patterns across the study area. An accuracy assessment of the 2023 imagery yields an overall accuracy of 82.85% and kappa statistics of 0.69, validating the classification results. The classified images of both years serve as the basis for generating individual land use and land cover maps, highlighting the spatial distribution and proportional area coverage of each class within the study area.

Post-processing steps involve quantifying area changes for each land use and land cover class between the initial and terminal years, facilitating the identification of trends over time. Overall changes from 2001 to 2023 are also computed to discern broader trends across the entire study period.

The analysis discerns noticeable shifts in land use and land cover classes, thereby elucidating the evolving physical characteristics of the Najafgarh wetland and its environs. The study aims to comprehend the underlying processes shaping the wetland ecosystem, informed by both remote sensing-derived data and ground-based field surveys. By correlating observed changes with field investigations, the research seeks to elucidate causal factors driving land use dynamics and their implications for wetland management and conservation.

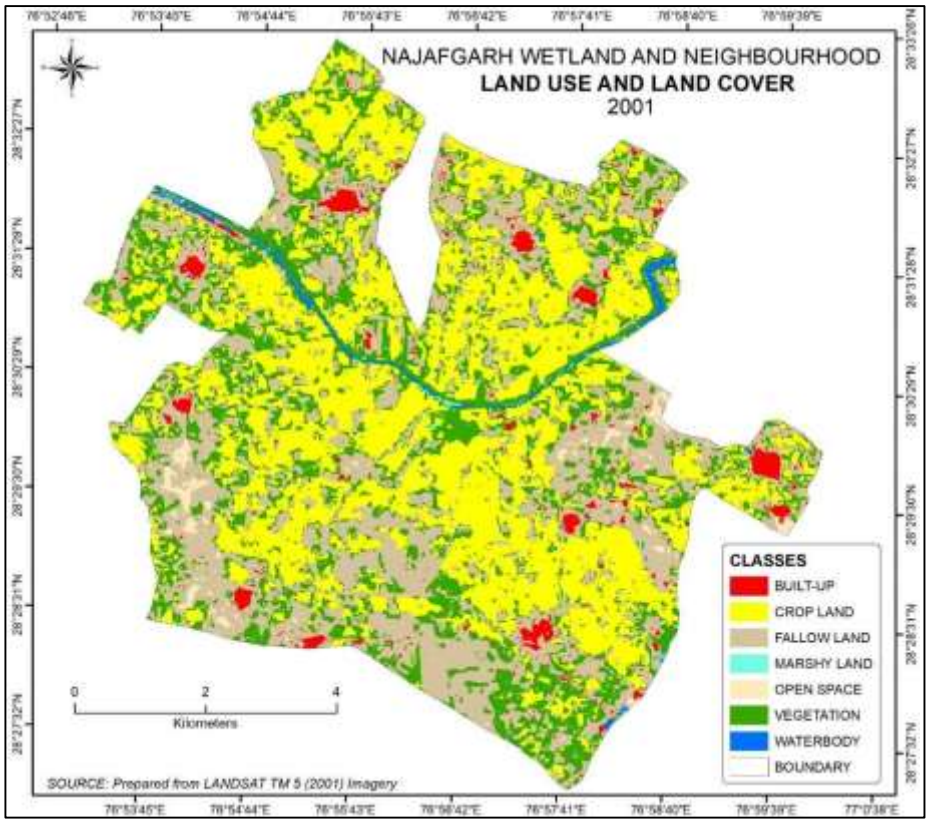
RESULTS

The outcome of the land use and land cover analysis of 2001 and 2023 highlights the ongoing landscape scenario of the Najafgarh wetland and its surroundings. Maps 3 and 4 of the outcomes show the transformational setting of the study area. The year 2001 map (3) shows only one prominent waterbody as a linear stream across the study area, which refers to the Sahibi River. Along with this, there is prominent agricultural land (crop land + fallow land), constituting a massive 71 per cent (Table 2) of the entire study area. It explicitly refers to the rural nature of the study area, catered to by the villages. There are a few built-up patches on the map, showing the rural settlements. Around 24 per cent of the area is under vegetation. In 2023 (map 4), there is a stark change in the studied landscape, which has seen the arrival of a massive waterbody and marshy land. These two classes depict the Najafgarh wetland area. As it has come over the area naturally by spreading primarily over the agricultural land, its actual demarcation is vague. This is a matter of concern between the landowners and the governments of both states.

Spreading at the centre of the study area, the wetland along Sahibi River caters to 7.32 km^2 of study area which is an increase of 9 per cent from 2001. Along with this, the study area has seen the construction of a 66 MGD Water Treatment Plant at Chandu Budhera, to the south of the map, with blue square-shaped tanks. The area also witnesses the spread of built-up area, over the studied 23 years. The red patches on Map 4 clearly depict the encroachment of the built-up infrastructure in the form of roads and buildings, especially in the west and southwest of the study area which demarcates to area of modern-day sectors (102-107) of the Gurugram. The vegetation class has experienced an alarming decline of 89 per cent. There are hardly any vegetation patches left on the 2023 map.

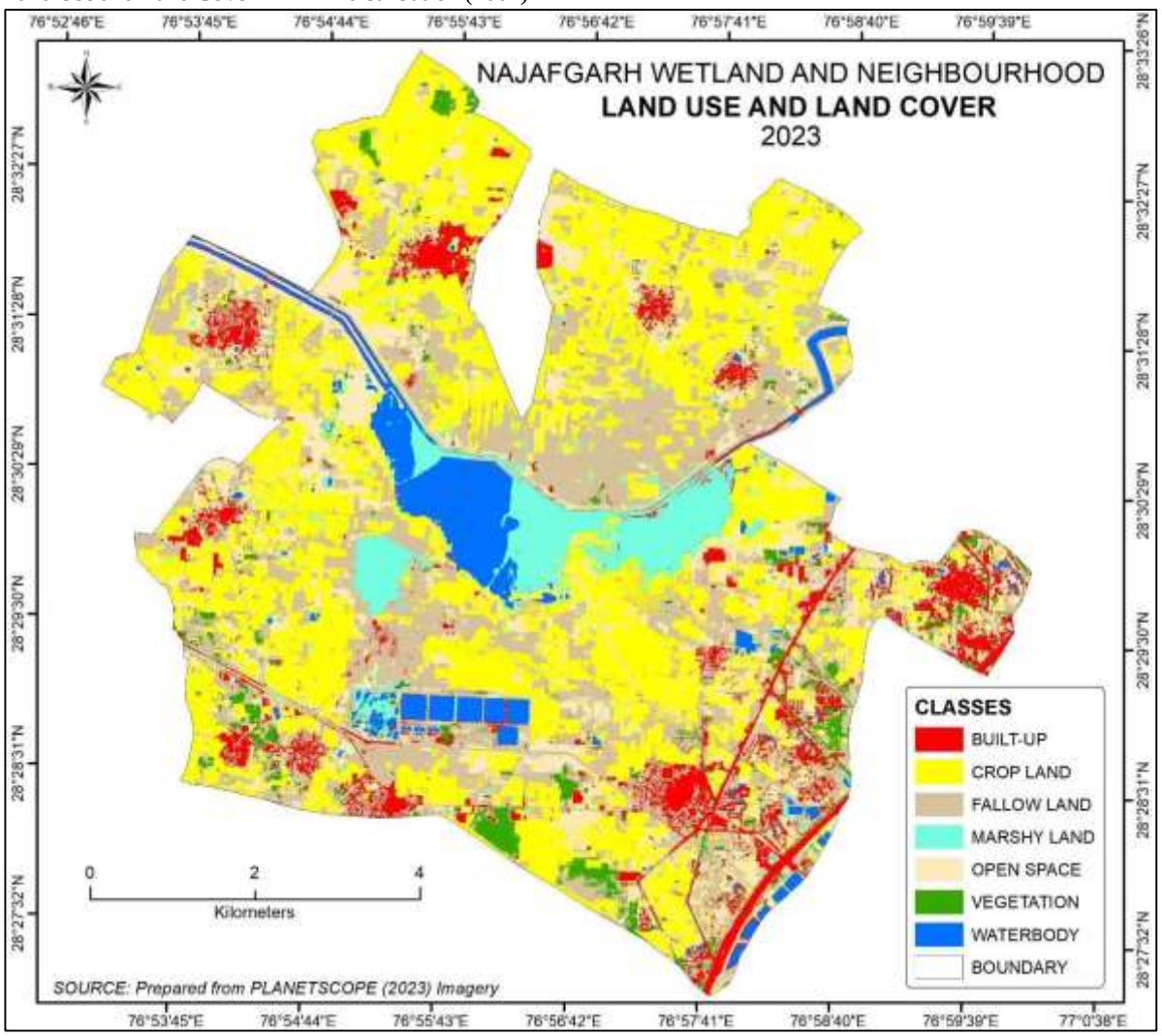
After delineating the individual areas of the selected classes, the post-classification analysis was carried out and a change map 5 was prepared, highlighting the spots of the study area which experienced the change over the study period.

Map 3 Land Use and Land Cover classes' distribution 2001)



Map 4

Land Use and Land Cover Classes' distribution (2001)



Map 5

Land Use and Land Cover Classes' changing pattern of distribution (2001-2023)

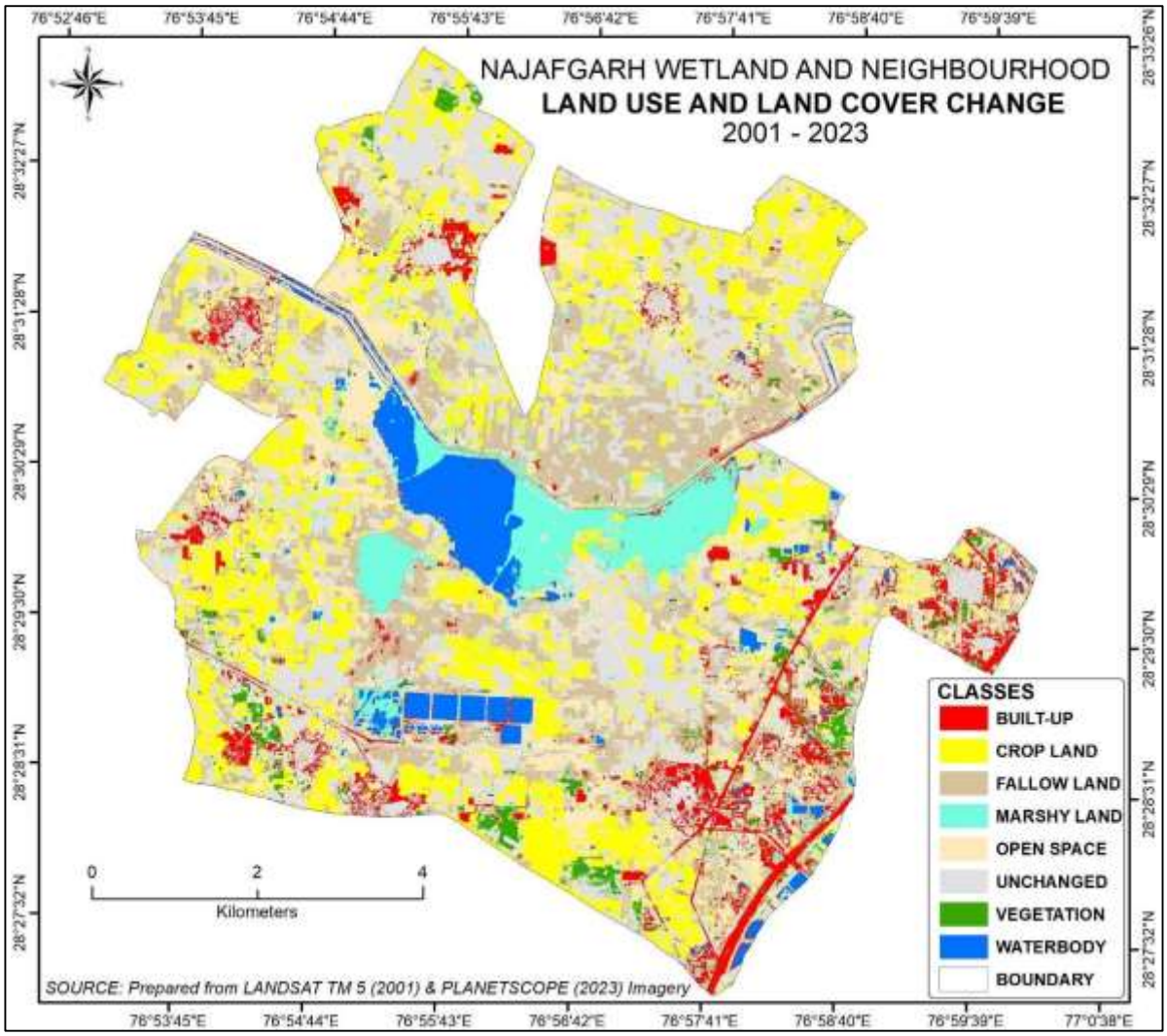


Table 2

Proportional coverage of land use and land cover classes in the study area along with percentage change between 2001 and 2023

Classes	2001		2023		Percentage Change
	Area (sq. km.)	%	Area (sq. km.)	%	
Built-Up	1.51	2	4.83	7	220
Crop Land	26.33	39	24.13	36	-8
Fallow Land	21.17	32	19.4	29	-8
Marshy Land	0.14	1	4.03	6	2779
Open Space	0.72	1	9.2	14	1178
Vegetation	16.35	24	1.88	3	-89
Waterbody	0.54	1	3.29	5	509
GRAND TOTAL	66.76	100	66.76	100	

Table 3

Transformation Matrix depicting the change in land use and land cover classes from 2001 to 2023

	2023

2001	Classes	Built-Up	Crop Land	Fallow Land	Marshy Land	Open Space	Vegetation	Waterbody	Total
	Built-Up	0.79	0.13	0.36	0.03	0.12	0.04	0.04	1.51
	Crop Land	1.01	10.83	7.72	1.99	2.92	0.34	1.51	26.33
	Fallow Land	1.89	6.85	6.51	0.64	3.46	0.96	0.85	21.17
	Marshy Land	0.02	0.01	0.02	0.05	0.01	0	0.03	0.14
	Open Space	0.1	0.2	0.23	0.01	0.1	0.06	0.02	0.72
	Vegetation	0.97	6.08	4.54	1.18	2.55	0.47	0.56	16.35
	Waterbody	0.06	0.01	0.02	0.12	0.04	0	0.28	0.54
	Gain	4.04	13.3	12.89	3.98	9.1	1.4	3.01	
	Total	4.83	24.13	19.4	4.03	9.2	1.88	3.29	66.76

This is followed by the preparation of the transformation matrix (table 3) which clearly points out the arrival of one particular class at the cost of others over the years in the Najafgarh wetland area. The matrix shows that 2.36 km^2 of the agricultural land (Crop land and fallow land) has been converted to the waterbody and 2.63 km^2 of the agricultural area has been converted to the marshy land. Subsequently, around 11 km^2 of vegetation area is converted to agricultural land. And 2.55 km^2 of the vegetated area is converted to open space. Even 6.38 km^2 of agricultural land is converted to open space, which justifies the encroachment of built-up in the study area, where builders and property dealers buy the land first-hand and leave it idle for a year and two to get ease in the land conversion laws from agricultural land use to non-agricultural ones. The conversion of 2.90 km^2 of agricultural land to built-up also proves this. The conversion values of built-up in 2001 to other classes in 2023 are erroneous in most of the spots as stated above under the accuracy assessment point.

DISCUSSION

The unregulated expansion of urban areas in India has been the primary driver behind the extensive transformation of rural land (Ratnam & Kaur, 2023). Even Ramsar sites have not been immune to encroachment due to infrastructure development, which has both beneficial and detrimental impacts on wetland ecosystems (Sharma et al., 2024). This pattern is evident in the Najafgarh wetland and its surroundings. Villages such as Dhankot and Kherki Majra have transitioned from rural to urban characteristics, as seen in the development of sectors 102, 103, and 104 in Gurugram. The construction of roads and highways, particularly the Dwarka Expressway, has further stimulated built-up growth in the southwestern part of the study area, on the Haryana side. Field surveys indicate a shift in the livelihood of residents from agriculture to employment in the private or corporate sectors of the NCR region.

During the study period, the area has seen significant infrastructure developments, such as the establishment of a water treatment plant in Budhera (Chandu Budhera) Village. This plant, initially set up to support the expanding urban area by treating wastewater and sewage, is now being expanded by the Gurugram Metropolitan Development Authority (GMDA) to a capacity of 500 million litres per day (MLD) due to the growing population and infrastructure demands (ERI, 2023). Additionally, the village has witnessed the establishment of the Shree Guru Gobind Singh Tricentenary Medical College, Hospital & Research Institute in 2013, transforming the surrounding rural land with urban amenities. The Gurugram-Badli Road has also been widened from two lanes to four lanes.

Encroachment towards the Najafgarh wetland is also evident in Village Daulatabad, where high-rise residential complexes in sector 107 of Gurugram are expanding. On the Delhi side, the major transformation includes the establishment of the Power Grid Corporation of India Limited, 765/400kV Jhatikra Substation in Village Jhatikara, with construction starting in 2011. Beyond this, the expansion of rural built-up areas in Delhi-side villages remains relatively modest.

The study area has also experienced an increase in agricultural land. Locals reported that submerged land under the wetland has forced them to relocate to other village pockets for crop cultivation. They acknowledge the rising food demand due to the influx of the working population in the NCR region. However, they express dissatisfaction with the slow and ineffective management of the wetland by government stakeholders. Despite numerous complaints about crop submergence, polluted water, and foul-smelling air, villagers receive minimal response or action from the government. Some villagers prefer not to have the wetland regularized, as selling their land to builders and property dealers in Gurugram is lucrative. They hope the court will grant them additional land equivalent to their submerged land.

The government's role is crucial in addressing these issues. Understanding and managing the physical changes in the land is essential for the future sustainability of the wetland and its surroundings.

Government Role in Managing the Najafgarh Wetland: A Critical Review

The Najafgarh Wetland, recognized as the second-largest water body in the National Capital Region (NCR) following the Yamuna, is currently at significant risk of vanishing due to extensive encroachment (Rao, 2020). The part of the government and legal stakeholders is ultimate in deciding the fate of the studied wetland. Therefore, this review section explores the role of government in managing and restoring the wetland, examining key interventions, challenges, and the progress made over the years, chronologically.

The Najafgarh Wetland, originally the natural floodplain of the Sahibi River, has been severely impacted by urbanization and industrial activities. The reduction of the wetland from 226 sq. km to just seven sq. km due to encroachment has led to increased flood risks and decreased groundwater levels. The wetland is now primarily composed of sewage from Delhi's neighbouring villages and Gurugram, leading to further degradation (PTI, 2021).

2005: Initial Pollution Classification

In 2005, the Central Pollution Control Board (CPCB), India classified the Najafgarh Wetland as exceedingly polluted, categorizing it under 'D'. This classification highlighted the urgent need for remedial measures to address the severe pollution levels affecting the wetland's ecosystem (Khuntia et al., 2018).

2014: INTACH's Petition

In 2014, the Indian National Trust for Art and Cultural Heritage (INTACH) filed a petition with the National Green Tribunal (NGT) seeking legal protection for the wetland. INTACH emphasized the imminent threat of extinction due to human apathy and called for urgent conservation efforts. The petition drew attention to the wetland's critical condition and the need for government intervention (TNS, 2024).

2016: MoEF&CC Notification Compliance:

In October 2016, the Ministry of Environment, Forest and Climate Change (MoEF&CC) issued a notification prohibiting construction along the banks of the Ganga and its tributaries or active floodplain areas. Although Najafgarh Lake, an extension of the Yamuna, which is a tributary of the Ganga, should be protected under this notification, construction activities have persisted, partially or entirely within the 100-year flood level of the lake. (INTACH & IWP, 2017).

2017: Government Recognition

The Haryana Government, in response to the petition, acknowledged the wetland as a water body in 2017. Despite this recognition, official notification and conservation efforts remained stalled, impeding progress in protecting the wetland. The Union Environment Ministry's directive to notify wetlands listed in the wetland atlas or those larger than two hectares further emphasized the importance of formal recognition and protection (Pati, 2024).

2017: In an order issued on February 20, 2017, the National Green Tribunal (NGT) mandated the declaration of Najafgarh Jheel as a wetland, following the application by the Indian National Trust for Art & Cultural Heritage (INTACH) in Original Application No. 153/2014 against the Government of NCT of Delhi (NGT, 2024).

2021: Prioritization of Wetlands

In 2021, the Delhi Government compiled a list of over 1,000 wetlands, prioritizing 10 for legal protection, including the Najafgarh Jheel. This initiative aimed to safeguard critical wetlands and promote sustainable management practices to ensure their long-term viability (TNS, 2024).

2022: NGT Directive and EMP

In January 2022, the NGT directed the Union Environment Ministry to prepare an integrated Environmental Management Plan (EMP) for the transboundary Najafgarh Wetland. The NGT expressed hope that an inter-ministerial expert group would protect the wetland and maintain water quality to at least Class 'C', making it suitable for drinking. A water quality report submitted to the NGT revealed that the current pH and dissolved oxygen (DO) levels were insufficient to support wildlife and fish reproduction (TNS, 2024).

2023: On December 22, 2023, the NGT acknowledged the position of the NCT of Delhi, which had already decided to designate the Najafgarh water body as a wetland (NGT, 2024).

2024: Finally! Conservation Cover and Legal Developments

On March 5, 2024, after over a decade of efforts, the Najafgarh Wetlands are set to receive the conservation cover they deserve. The Haryana Government has sought additional time to designate the water body as a transboundary wetland. The wetland's conservation matter, which was previously before the Supreme Court, is now under the NGT's purview. The NGT has directed the state to update the EMP and ensure the wetland's protection (TNS, 2024).

On June 30, 2024: According to the NGT's directives on these dates (February 16, 2024, and April 25, 2024), a status report was submitted by the State Wetland Authority of Haryana. The report detailed the state's decision to notify 75 acres (with dimensions of 60 meters in width and 5000 meters in length) of the Najafgarh Jheel as a designated water body or wetland (NGT, 2024). The proposal includes various water management initiatives aimed for completion by 2027. INTACH, the NGO that initiated the petition, contended that the designated wetland area is significantly underestimated,

referencing earlier environmental assessments and concerns about water leakage impacting the wetland's condition (Pati, 2024).

Role of NGOs and Community Involvement

Non-governmental organizations (NGOs) and community involvement have been pivotal in advocating for the wetland's conservation. INTACH's continuous efforts to seek legal protection and raise awareness about the wetland's plight have underscored the importance of civil society in environmental conservation. Collaboration between government bodies, NGOs, and local communities is essential for the successful management and restoration of the wetland.

CONCLUSION

The Najafgarh Wetland has undergone significant ecological and socio-political transformations over the past two decades. The detailed land use and land cover analysis reveals the dynamic nature of the wetland and the surrounding landscape, characterized by the expansion of water bodies and marshy lands, urban encroachment, and significant vegetation loss. The study highlights the complex interplay of natural processes and human activities in shaping the wetland's evolution.

The governance dynamics surrounding the Najafgarh Wetland reflect a combination of legal, administrative, and community-driven efforts aimed at conservation. The recognition of the wetland's ecological importance, coupled with legal advocacy and government directives, underscores the critical need for a coordinated approach to sustainable management. Recent developments, including the granting of conservation cover, represent positive steps toward protecting this vital ecosystem, but allocating a mere 75 acres to the wetland poses a question. And this is why INTACH argued that the entire submerged area of Najafgarh Jheel within Haryana's jurisdiction should be designated as a wetland, rather than limiting it to just 75 acres. The council was granted permission to submit objections to the status report and provide all pertinent evidence for consideration within four weeks of the order (NGT, 2024). Therefore, there is a dire need for a strategic framework for the Najafgarh Wetland to address these complex challenges effectively.

Strategic Framework for the Najafgarh Wetland

To ensure the long-term sustainability of the Najafgarh Wetland, developing a strategic management framework is crucial. This framework should encompass integrated land use planning, reinforced legal protections, active community and stakeholder involvement, and robust monitoring and evaluation systems.

- Integrated Land Use Planning: It is essential to address the ongoing encroachment and promote balanced land use to safeguard the wetland ecosystem. Strategic planning can mitigate the adverse effects of urban sprawl, as evidenced by the rural-to-urban transformation around the wetland.
- Enhanced Legal Protections: Strengthening legal frameworks and ensuring the timely enforcement of conservation policies are critical. Advocacy efforts, such as those by INTACH, highlight the necessity for comprehensive legal measures to protect the wetland.
- Community and Stakeholder Engagement: Effective conservation requires the active participation of local communities, NGOs, and other stakeholders. Engaging these groups fosters a sense of ownership and responsibility towards the wetland, enhancing conservation efforts.
- Monitoring and Evaluation: Establishing robust monitoring systems is vital to track changes in land use and water quality. Continuous evaluation allows for the timely implementation of adaptive management strategies to address emerging challenges.

Incorporating these key elements can ensure the long-term sustainability of the Najafgarh Wetland. This approach will enable the wetland to continue providing valuable ecosystem services and supporting regional biodiversity.

In conclusion, the evolution of the Najafgarh Wetland underscores the importance of comprehensive and strategic conservation efforts. The lessons learned from past initiatives, combined with a strategic framework, will guide future actions, ensuring the preservation of this critical wetland ecosystem for future generations. The need for a strategic framework is underscored by the complex interplay of natural processes and human activities shaping the wetland, necessitating a coordinated approach to its sustainable management.

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