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JINDAL INSTITUTE OF HARYANA STUDIES

Sonipat
HUMAN DEVELOPMENT REPORT

2026

Sonipat

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ABOUT JGU

O.P. Jindal Global University (JGU), established in 2009 at Sonipat, is a multidisciplinary, research-oriented university. Recognized as an *Institution of Eminence* by the University Grants Commission under the "Institutions of Eminence (Deemed to be Universities) Regulations, 2017", JGU represents a pioneering model of private higher education in India. It was founded by industrialist and philanthropist Mr. Naveen Jindal, Chancellor of JGU, whose vision of nation-building through education and leadership inspired the creation of a truly global university. Under the academic stewardship of Professor (Dr.) C. Raj Kumar, a distinguished Rhodes Scholar and Founding Vice Chancellor, JGU has evolved into one of India's most prominent education centres for teaching, research, and innovation.

JGU has received wide recognition in national and international rankings. It has been ranked the No. 1 Private University in India by the *QS World University Rankings 2023* for the third consecutive year and stands as the highest-ranked Indian university focused on disciplines such as Law, Business and Management, International Affairs, Public Policy, Liberal Arts and Humanities, Journalism, Architecture, Banking and Finance, Environment and Sustainability, Psychology and Counselling, Languages and Literature, and Public Health and Human Development. JGU is placed among the top 250 universities globally in faculty-student ratio (1:9) and within the top 450 worldwide in employer reputation, reflecting its emphasis on quality learning and graduate preparedness. It also ranks among the top 550 universities in the world for international faculty, who constitute 14 per cent of its academic community. Moreover, JGU is the only Indian private university to feature in the *Top 150 Young Universities in the World (under 50 years of age)* in the *QS Young University Rankings 2022*. The Jindal Global Law School (JGLS) continues to be ranked No. 1 in India and among the Top 150 globally by the *QS World University Rankings by Subject 2024*, sustaining this distinction for the fifth consecutive year.

JGU's excellence has been recognised through multiple international awards. It won the *Digital Innovation of the Year (2021)* honour at the *Times Higher Education (THE) Asia Awards* and was nominated for the *Workplace of the Year* award for three consecutive years (2020–2022). In 2024, it received further nominations for the *Leadership and Management Team of the Year* and *Student Recruitment Campaign of the Year* awards, underscoring the institution's progressive governance and innovative academic ecosystem.

Research is a central pillar of JGU's academic mission. The university hosts over 65 interdisciplinary research centres and 6 research and capacity-building institutes. With more than 8,500 publications, JGU promotes cutting-edge research in law, social sciences, business, and emerging interdisciplinary domains. These centres advance knowledge creation and address global challenges through collaborative research, policy engagement, and academic exchange.

With more than 575 global collaborations spanning over 80 countries, JGU remains committed towards fostering international learning, research partnerships, and faculty exchange.

ABOUT JIHS

The Jindal Institute of Haryana Studies (JIHS), established by O.P. Jindal Global University (JGU), is conceived as a premier research and policy institute dedicated to advancing a deeper understanding of the opportunities and challenges facing the state of Haryana. As the first private university established under the Haryana Private Universities Act, 2006, JGU has demonstrated consistent excellence across diverse academic and research domains. JIHS builds upon this foundation, extending JGU's commitment to scholarly rigour, innovation, and public service, particularly as Haryana reflects upon more than five decades of statehood and development.

While Haryana has made significant progress in multiple sectors, persistent issues relating to governance, social equity, environmental management, and economic diversification continue to demand attention. JIHS serves as a nodal center for data-driven, interdisciplinary research aimed at addressing these challenges. The Institute recognises the state's potential in critical areas such as sustainable agriculture, industrial transformation, renewable energy adoption, and the growth of the information technology sector. By focusing on these domains, JIHS seeks to strengthen Haryana's industrial, agricultural, and entrepreneurial ecosystems and to promote sustainable economic growth and employment generation.

In pursuit of its objectives, JIHS is committed to generating high-impact research and developing robust data systems that inform evidence-based policymaking. The Institute strives to translate academic insight into implementable strategies that deliver enhanced social and economic outcomes for the people of Haryana. It further aims to provide thought leadership in regional development studies by formulating innovative policy recommendations, supporting good governance, and enhancing institutional accountability.

The establishment of JIHS represents a significant step toward strengthening Haryana's research and policy infrastructure. Through the generation of actionable insights and informed policy recommendations, the Institute aspires to contribute to a more equitable, sustainable, and prosperous future for all citizens of the state.

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ABBREVIATIONS

AC	Adaptive Capacities
ADR	Alternative Dispute Resolution
AHP	Affordable Housing in Partnership
AISHE	All-India Survey on Higher Education
AMRUT	Atal Mission for Rejuvenation and Urban Transformation
ANC	Ante-Natal Care
AQI	Air Quality Index
ASER	Annual Status of Education Report
AWC	Anganwadi Centres
AWiFS	Advanced Wide Field Sensor
BCG	Bacillus of Calmette and Guerin
BGL	Below Ground Level
BHEL	Bharat Heavy Electricals Limited
BOD	Biochemical Oxygen Demand
BPL	Below Poverty Line
BS	Bharat Stage
C and D	Construction and Demolition
CAGR	Compounded Annual Growth Rate
CBWTF	Common Biomedical Waste Treatment Facility
CCTV	Closed-Circuit Television
CETP	Common Effluent Treatment Plants
CGWB	Central Ground Water Board
CHC	Community Health Centres
CHE	Catastrophic Health Expenditure
CHEERAG	Chief Minister Equal Education Relief, Assistance and Grant
CHIRAYU	Comprehensive Health Insurance of Antyodaya Units Scheme
CLC	Career Line Channel
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
Co-ed	Co-Education
CPCB	Central Pollution Control Board
CPHEEO	Central Public Health and Environmental Engineering Organisation
CPR	Common Property Resources
CRM	Crop Residue Management

CSO	Central Statistics Office
DALY	Disability Adjusted Life Years
DAY-NRLM	Deendayal Antyodaya Yojana – National Rural Livelihood Mission
DEP	District Environment Plan
DDU-GKY	Deen Dayal Upadhyaya Grameen Kaushalya Yojana
DILRMP	District Innovation in Local Resource Management Programme
DMIC	Delhi-Mumbai Industrial Corrider
DPT	Diphtheria-Tetanus-Pertussis
DSR	Direct Seeded Rice
ECCE	Early Childhood Care and Education
EOI	Expressions of Interest
ESIS	Employees' State Insurance Scheme
ETP	Effluent Treatment Plant
EWS	Economically Weaker Section
FIR	First Information Report
FPO	Farmer Producer Organisation
GDI	Gender Development Index
GDP	Gross Domestic Product
GER	Gross Enrolment Ratio
GFHI	Government Funded Health Insurance
GIS	Geographic Information System
GNI	Gross National Income
GOH	Government of Haryana
GOI	Government of India
GSVA	Gross State Value Added
HARSAC	Haryana Space Application Space
HCAPSD	Haryana Clean Air Project for Sustainable Development
HDI	Human Development Index
HDR	Human Development Report
HIG	High Income Group
HKRNL	Haryana Kaushal Rozgar Nigam Limited
HORC	Haryana Orbital Rail Corridor
HQ	Headquarters
HRIDC	Haryana Rail Infrastructure Development Corporation
HSIIDC	Haryana State Industrial and Infrastructure Development Corporation
HSPCB	Haryana State Pollution Control Board
HSS	Higher Secondary Schools
HSVP	Haryana Shehri Vikas Pradhikaran

HUDA	Haryana Urban Development Corporation
ICDS	Integrated Child Development Services
IIPS	International Institute for Population Sciences
IMR	Infant Mortality Rate
IMT	Industrial Model Township
IPC	Indian Penal Code
IPHS	Indian Public Health Standards
IRS	Indian Remote Sensing
IT	Information Technology
ITI	Industrial Training Institute
JIM	Japan-India Institute for Manufacturing
JSY	Janani Suraksha Yojana
KG	Kindergarten
KMP	Kundli-Manesar-Palwal
LEB	Life Expectancy at Birth
LFPR	Labour Force Participation Rate
LIG	Low Income Group
LMIC	Lower Middle-Income Countries
LPCD	Litres Per Capita per Day
LULC	Land Use Land Coverage
MC	Municipal Corporation
MCM	Million Cubic Meters
MDG	Millenium Development Goals
MGNREGS	Mahatma Gandhi National Rural Employment Guarantee Scheme
MIG	Middle Income Group
MKSP	Mahila Kisan Sashaktikaran Pariyojana
MLD	Millions of Litres per Day
MoHUA	Ministry of Housing and Urban Affairs
MPI	Multidimensional Poverty Index
MRF	Material Recovery Facilities
MRV	Measurement Reporting and Verification
MSME	Micro, Small and Medium Enterprises
MW	Mega Watt
NAMP	National Air Quality Monitoring Programme
NAS	National Achievement Survey
NCD	Non- Communicable Diseases
NCR	National Capital Region
NCRB	National Crime Records Bureau

NCRPB	National Capital Region Planning Board
NCRTC	National Capital Region Transport Corporation
NDPS	Narcotic Drugs and Psychotropic Substances
NEP	National Education Policy
NFHS	National Family Health Survey
NH	National Haighways
NHAI	National Highways Authority of India
NHM	National Health Mission
NITI	National Institution for Transforming India
NO_x	Nitrogen Oxides
NRHM	National Rural Health Mission
NRSA	National Remote Sensing Agency
NRSC	National Remote Sensing Centre
NSS	National Sample Survey
O_3	Ozone
OBC	Other Backward Classes
OECD	Organisation for Economic Co-operation and Development
OOP	Out-Of-Pocket
OPD	Out Patient Department
PG	Postgraduate
pH	Potential of Hydrogen
Ph.D.	Doctor of Philosophy
PHC	Primary Health Centre
PHED	Public Health Engineering Department
PLFS	Periodic Labour Force Survey
PM	Particulate Matter
PMAY	Pradhan Mantri Awas Yojana
PMJAY	Prime Minister's Jan Arogya Yojana
PNB	Punjab National Bank
POCSO	Protection of Children from Sexual Offences
PPR	Police Population Ratio
PRI	Panchayati Raj Institution
PS	Primary School
PTR	Pupil Teacher Ratio
PWD	Person with Disability
P.W.D (B and R)	Public Works Department (Buildings and Roads)
RGEC	Rajiv Gandhi Education City
RGTPP	Rajiv Gandhi Thermal Power Plant

RRTS	Regional Rapid Transit System
RSETI	Rural Self-Employment Training Institute
RTE	Right to Education
SAPCC	State Action Plan on Climate Change
SARAL	Simple, All Inclusive, Real Time, Action Oriented, Long lasting
SBI	State Bank of India
SC	Scheduled Caste
SDG	Sustainable Development Goals
SDH	Social Determinants of Health
SDSN	Sustainable Development Solutions Network
SECC	Socio Economic and Caste Census
SEP	State Environment Plan
SHC	Soil Health Card
SHG	Self Help Group
SMDA	Sonipat Metropolitan Development Authority
SO_2	Sulphur Dioxide
SPI	Social Progress Index
SS	Secondary School
ST	Scheduled Tribe
STP	Sewerage Treatment Plant
TB	Tuberculosis
TDS	Total Dissolved Solid
TOD	Transit-Oriented Development
TPD	Tonnes Per Day
TRAI	Telecom Regulatory Authority of India
TSDF	Treatment, Storage and Disposal Facilities
UDISE	Unified District Information System for Education
UG	Undergraduate
ULB	Urban Local Bodies
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNICEF	United Nations Children's Fund
UP	Uttar Pradesh
UPS	Upper Primary School
UPSS	Usual Principal and Subsidiary Status
VOC	Volatile Organic Compound
WHO	World Health Organisation
WPR	Workforce Participation Rate
WTE	Waste to Energy

PREFACE

Mr. Naveen Jindal
Chancellor
O.P. Jindal Global University

It gives me great pride to present the Sonipat Human Development Report 2026, the first district-level report of its kind in Haryana, prepared by the Jindal Institute of Haryana Studies (JIHS) at O.P. Jindal Global University (JGU). JGU was founded as a philanthropic initiative and as a tribute to my father, Shri O.P. Jindal, whose vision of nation-building through education and industry continues to guide us. His belief in the power of philanthropy and the role of universities in shaping the destiny of nations through teaching, research, and public service remains our enduring inspiration.

This report reflects our steadfast commitment to advancing human development and contributing to the prosperity of Haryana. It also demonstrates the importance of collaboration between universities, government agencies, and civil society in developing evidence-based public policy initiatives. By combining rigorous academic research with practical policy relevance, we aim to ensure that our scholarship leads to tangible social progress. I congratulate the University and the JIHS team for their visionary and rigorous work that will inform future policymaking and development planning in Haryana.

FOREWORD

Professor (Dr.)
C. Raj Kumar
Founding Vice Chancellor
O.P. Jindal Global University

The Sonipat Human Development Report 2026 marks a historic milestone for both Haryana and O.P. Jindal Global University. It presents a multidimensional understanding of human development that transcends traditional economic measures, integrating quantitative analysis with voices from local communities. Sonipat stands at the confluence of Haryana's agrarian roots and its rapid urban and industrial transformation. Aligned with the United Nations Development Programme's vision, this report reaffirms that genuine progress is measured not only by income or infrastructure, but by the enhancement of human freedoms, opportunities, and well-being.

This initiative also reflects JGU's broader mission—to connect world-class research with societal needs and to nurture a generation of scholars committed to justice, equity, and sustainability. I commend Professor (Dr.) Mrinalini Jha and her exceptional team at JIHS for their scholarly excellence and dedication. This report symbolizes both commitment and renewal: a step towards evidence-driven governance and a collective pursuit of a more inclusive, equitable, and sustainable future for Sonipat, for Haryana, and for India.

EXECUTIVE SUMMARY

The United Nations Human Development Programme's Human Development Report (HDR) 2025 ranked India 130 out of 193 countries on the Human Development Index (HDI), marking a steady rise in the country's ranking over the years. India continues to remain in the medium human development category. In India, 14 states were in the high human development category in 2017-18, and Haryana was one of them. The contribution of HDRs to a better understanding of critical development parameters has been well acknowledged and reflected in the continued production of these reports at the global level (documenting the progress of countries) and at the national level (documenting the progress of states within a country). While India has been producing HDRs at the sub-state level for over two decades now, they have been prepared for only some districts across eight states. With this district HDR for Sonipat, the number of states with at least one district HDR increases to nine.

Sonipat is one of the 22 districts of Haryana, located in the western part of the state, sharing borders with the national capital, Delhi, and the state of Uttar Pradesh. The district holds historical significance and is classified today as a peri-urban area undergoing significant contemporary agrarian, ecological, and spatial transformations. The Sonipat Human Development Report casts light not only on prevailing outcomes but also on the processes, disparities, and choices that shape the district's future. The Report strives to provide disaggregated, context-sensitive evidence across seven themes – governance, health, education, livelihoods, spatial transformation, basic services, and environment – to support targeted development in the district's shifting landscape and evolving challenges. It draws upon the rich tapestry of local knowledge, demographic detail, administrative records, and available secondary representative datasets to benchmark the district's performance for each theme. The formulation of HDI has not been attempted in the report for want of the necessary data enabling district-wise comparison. Cross-district comparisons of HDI may be misleading owing to limited and often outdated district-level data. This report focuses on Sonipat's intra-district dynamics, highlighting its progress over time while capturing the nuances and barriers to human development across communities.

Governance

Governance is the cornerstone required for transforming development priorities into actual lived realities for people. The district of Sonipat demonstrates strong foundational infrastructure, such as complete road connectivity and significant advances in e-governance. However, they remain shadowed by persistent challenges in law and order, judicial delays, participation gaps, and the resilience of exclusionary social institutions.

Based on a careful study of the district's administrative and institutional setup, this report proposes policies to improve governance by focusing on peace, justice, and strong institutions. Below are some of the recommendations made towards this pursuit –

- Deepen decentralised governance by **strengthening block- and panchayat-level capacities** for participatory planning, budgeting, and monitoring.
- Prioritise **legal literacy**, access to justice, and expansion of alternative dispute resolution to address pendency, reduce crime, and improve responsiveness to vulnerable groups.
- Promote **inclusive representation** and leadership among women, Scheduled Castes, minorities, and youth within local governance structures.
- Leverage **technology platforms** for transparency, direct beneficiary engagement, grievance redress, and monitoring service delivery in real-time.
- Collaborate with universities and civil society to create district "observatories" for human development—tracking progress, convening dialogue, and amplifying citizen voice.

Health

A healthy population is foundational to improving well-being and economic productivity. Sonipat is doing better than most other districts in the state of Haryana and, by comparison, the state and national averages on many indicators. An assessment of Sonipat's health metrics reveals positive advances in increased institutional deliveries and life expectancy. The infant mortality rate (IMR) in the district is also nearing the Sustainable Development Goal (SDG) target for IMR. Alongside, however, it also underscores gaps in child and maternal health, nutritional status, mental health, and non-communicable diseases. These get further aggravated by socio-economic inequities, climate-linked vulnerabilities, and a large informal migrant population.

Based on the analysis for the Sonipat HDR, below are some of the key takeaways and recommendations for enhancing health outcomes for the population of Sonipat –

- Prioritise universal and equitable access to primary care by setting up of **200 additional Sub-Centres (SCs)** to existing 164 functioning centres, **30 additional primary health centres (PHCs)** from the existing 33 PHCs, and **9 additional community health centres (CHCs)** to the 7 functioning centres to bridge infrastructural gaps and reduce out-of-pocket costs.
- Correspondingly all the **human resource positions** in these facilities needs to be filled on a permanent basis.
- Payment of **minimum wages** to all ASHA and Anganwadi workers.
- Boost social health protection for migrants, low-income workers, and informal-sector workers through **portable entitlements and mobile health units.**

Education

The district's journey in education reflects both its position as an institutional hub and the persistence of stark disparities that undermine human capital formation. Access to education has expanded significantly, with literacy rates among youth and primary school attendance reaching near universality. Haryana's flagship schemes for girls, Scheduled Castes, and Economically Weaker Sections have strengthened inclusion and retention. Yet, challenges in learning quality, dropout rates among the marginalised and rural populations, gender gaps, and digital divides remain critical. At the same time, the composition of the education workforce reveals a mixed picture with Sonipat's higher education cadre achieving notable gender balance but non-teaching cadre continuing to be male-dominated, highlighting persistent occupational segregation.

Using analysis from representative, large-scale survey data, we put forth the following key recommendations for improving the education landscape of Sonipat –

- Connect **industrial corridors to digital and vocational training facilities for women and young people** in the community. Currently, institutes like Japan-India Institute for Manufacturing (JIM) Sonipat provide manufacturing skills but have limited outreach to women and rural youth, which could be further expanded.
- Expansion of ITI Centres: Establish **ITIs specifically for Persons with Disabilities** (PWD). Currently, there are none.
- **Promote private investment in ITIs**. In Haryana, approximately 55 per cent of ITI centres are government-run. In Sonipat, about 70% are government-owned, leaving only 30% managed by private entities, which suggests limited private participation in this sector.
- **Expanding Vocational Training Institutes**: Sonipat currently has only six vocational training institutes, while the average district in Haryana has about ten. Expanding these centers will enhance skill development and employability among the youth.
- Increase share of **Scheduled Castes (SCs)** in teaching staff from the current 3.1 percent to 9 percent, to match the SC student share in higher education.

Livelihood

Decent, productive employment is imperative for India to optimise the benefits of its ongoing demographic dividend. Sonipat's structural transformation has seen labour move from the low-productivity agricultural sector to high-productivity manufacturing and services sectors. However, precarious, informal employment, wage stagnation, and gendered barriers persist. The feminisation of labour, especially in manufacturing and services, has emerged as a positive district hallmark, but wage growth and job quality lag behind. The increase in earnings in Sonipat has been slower than in the rest of the country, despite the positive trend in structural transformation, posing a pressing challenge for well-being. The analysis shows that this is because earnings for women in the services sector have fallen significantly in the last six years.

The study suggests the following recommendations to ensure that the benefits of structural transformation are realised for the entire workforce of the district –

- Target livelihood and employment schemes to align with skills gaps, new economic clusters in the industrial corridor, and the potential of the rural non-farm sector.
- **Expand, monitor, and adapt skill development initiatives, targeting women, Scheduled Castes, and youth** to have access to meaningful skilling and improved linkages to the expanding job markets.
- Protect and enable informal-sector workers (including migrants) through social protection, registration, and inclusion in state and central schemes.
- Prioritise financial inclusion, entrepreneurial training, and access to credit for smallholders, women, and youth, addressing gaps in land ownership, digital literacy, and market access.
- Reward diversification and innovation in rural and peri-urban contexts – linking agrarian transitions, MSME promotion, and digital livelihoods.

Spatial Transformation

Sonipat has witnessed an extraordinary spatial transformation over the last few decades, notably its dynamic industrial and educational expansion, its strategic location within the National Capital Region, and increased connectivity driven by significant infrastructure projects. A diverse set of urban centres, strong industrial nodes, major educational hubs, and new transit corridors propels the district's spatial transformation. These strengths have attracted investment, spurred economic growth, and improved connectivity, anchoring Sonipat as a crucial regional node. However, rapid urbanisation, driven by fragmented governance and speculative markets, has produced uneven development and deepened socio-spatial inequalities, particularly for low-income and migrant populations.

Some of the key recommendations proposed to ensure an equitable and planned transformation of the district include –

- Constitution of a **District Spatial Coordination Committee**, chaired by the Deputy Commissioner to align HSVP, HSIIDC, and municipal plans over the next two years. The committee should develop an integrated District Spatial Framework (2025–2035) linking transport, industrial, and residential zoning to employment and environmental sustainability.
- Strengthen regulation of land and housing markets through **transparent licensing, caps on speculative holdings, and enforcement of inclusionary zoning** for affordable housing.
- Reform land acquisition to guarantee **fair compensation and rights protection**, introducing district-level forums to mediate disputes and improve community participation.
- Provide free bus service for women across the district, enhancing their mobility and economic outcomes.

Basic Services

Sonipat district exhibits notable strengths in basic services, including widespread access to improved water sources, with nearly universal piped or borewell water supply; organised solid waste management with door-to-door collection across urban and rural areas; and steady expansion of electricity connections supporting households and agriculture. The district has multiple sewage treatment plants and is making gradual progress in extending sewerage networks, especially in urban centres. There is a robust waste-to-energy facility and recycling efforts, underscoring effective urban local body management. Despite rapid urban growth, the district's basic infrastructure systems provide a foundation for improving quality of life, though gaps remain in rural and peri-urban sanitation.

The analysis brings forth the following recommendations to improve access to basic services in Sonipat –

- Accelerate expansion and modernisation of sewerage networks and treatment capacity, focusing on peri-urban and rural fringes, to reduce environmental pollution and health risks.
- Extend networked underground drainage to villages closer to at least two industrial estates (Rai, Kharkhoda), to reduce environmental pollution and health risks.
- Implement integrated water resource management to address groundwater overexploitation, promote surface water supply, and regulate private borewell extraction to ensure sustainability.
- Increase affordable housing supply by providing basic infrastructure through coordinated planning that links housing development and service provision, especially for low-income migrant workers. At least 20 per cent of all affordable housing units should be allocated in localities around HSIIDC units.
- Strengthen flood management and drainage maintenance by preventing encroachments, desilting drains regularly, upgrading infrastructure, and enhancing disaster preparedness.

Environment

Environmental and climate vulnerability have emerged as the biggest threats to human existence in recent decades, and the existential challenges they pose for Sonipat are no different. These challenges, specifically in the district, are further aggravated by land degradation, groundwater depletion, air and water pollution, and the loss of common property resources. Environmental health is also entwined with the well-being and economic security of the most marginalised.

Ongoing government interventions, such as the Haryana Clean Air Project (HCAPSD), State Environment Plan (SEP), AMRUT, and the Jal Jeevan Mission, strengthen pollution control, stubble management, and effluent treatment. Scaling these alongside water conservation and equitable land reforms can safeguard health, improve livelihoods, and foster sustainable growth.

The key recommendations emerging from the analysis are listed below –

- Incentivise **adoption of sustainable agricultural practices** (low-residue, organic, diversified cropping, water-saving irrigation) and mechanisation, especially for smallholders and women farmers.
- **Promote women-led Farmer Producer Organizations (FPOs)**: As of June 2025, Haryana has established 179 FPOs, which is fewer than many other states in India. Among these, only a small number are led by women. Supporting the creation of women-led FPOs can enhance market connections and improve access to institutional credit, thereby providing diverse income-generating opportunities.
- Promote **micro-irrigation techniques** and climate-smart land and water management in peri-urban agricultural areas of Sonipat. Currently, the majority of irrigation in Sonipat is done through canals (55.9 per cent) and borewells (44.1 per cent). Micro-irrigation systems such as drip and sprinkler can **reduce water use by 40–60 per cent and increase yields by 15–20 per cent.**

- Introduce incentives **(minimum support prices, buy-back arrangements)** for climate-resilient crops – Diversification into pulses and vegetables increases net returns by over 13 per cent (at a national level) compared to monocropping wheat–paddy.

- Expand **community awareness and school-based environmental education** to foster district-wide stewardship for climate action.

Sonipat is taking steady strides to improve the lived realities of its citizens. However, challenges remain. Data gaps persist in understanding informal livelihoods, local climate impacts, and the needs of vulnerable groups, especially at a district level. Although increasingly participatory, governance mechanisms still face limitations in autonomy and accountability. Gender inequalities continue to shape access to land, employment, health, and political representation, demanding continued, persistent action. The existing challenges have been exacerbated by climate volatility and urban expansion, requiring new forms of adaptive policy and stakeholder engagement. By grounding analysis in multidimensional indicators, foregrounding both structural barriers and creative solutions, and seeking convergence and coordination across groups and sectors, the Sonipat HDR aspires to drive not only short-term interventions but also long-term, resilient transformation.

Attention must be focused on integrating sectoral initiatives — such as education with livelihoods, climate action with health, and governance with social inclusion — to foster cross-cutting solutions and maximise the return on public expenditure. Women's empowerment, land rights, innovative housing and rental schemes, environmental stewardship, and strategic spatial reforms are proposed as the necessary levers for promoting inclusive progress in the district. Further, monitoring, periodic review, and adaptive planning will be essential prerequisites for translating policy into sustained change. The Sonipat HDR is thus designed not as a static assessment but as an ongoing venture to facilitate the government, civil society, researchers, and citizens in benchmarking progress, adjusting priorities, and keeping transparency and accountability at the heart of local development. The Report is intended to be a catalyst for collective action. Policy-makers, administrators, civil society organisations, researchers, educators, and Sonipat's communities all form part of the audience and the engine for change. Sonipat HDR marks a new chapter for the district – a district aware of its strengths and challenges, determined to the cause of achieving a long, healthy, and creative life for every resident, regardless of gender, caste, or circumstances.

Chapter 1

HUMAN DEVELOPMENT INDEX-

ORIGIN, EVOLUTION, AND RELEVANCE

Namesh Killemsetty and Mrinalini Jha

1 HUMAN DEVELOPMENT INDEX: ORIGIN, EVOLUTION, AND RELEVANCE

Namesh Killemsetty and Mrinalini Jha

1.1 Introduction

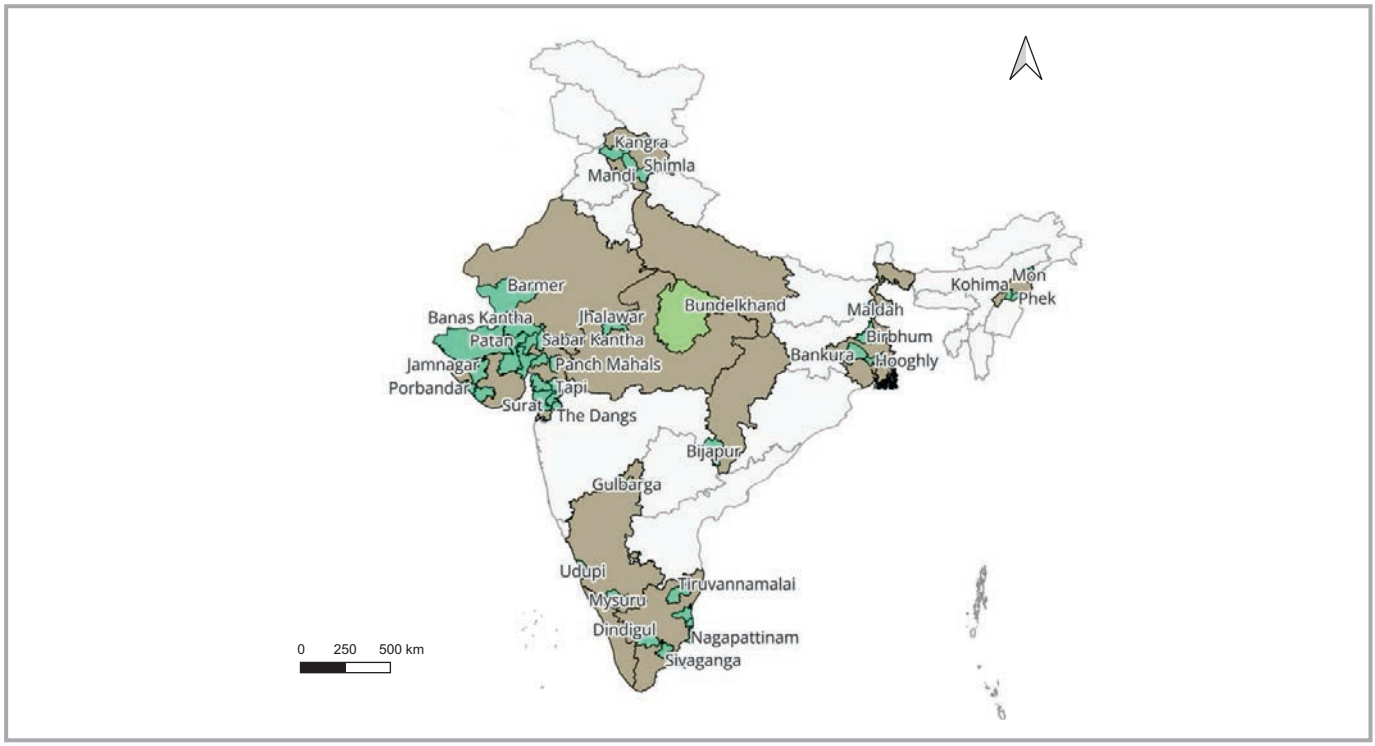
The idea of human development was introduced in the early 20th century as a holistic concept meant to transcend the traditional focus on income or economic growth, and instead encompass a broader spectrum of human well-being. It fundamentally emphasises on enhancing people's well-being, capabilities, and choices, enabling them to live long, healthy, and creative lives rather than simply accumulating wealth. This conceptual framework of human development was built by Mahbub-ul-Haq, Amartya Sen, Martha Nussbaum, among others. It was adopted by the United Nations Development Programme's (UNDP) Human Development Reports (HDRs) starting in the early 1990s, which sought to recast the focus of development discourse from GDP alone to outcomes in education, health and income.

HDRs were designed with the aim of shifting policy focus away from purely economic measures of human progress towards multidimensional social development indices of well-being, which include health, education, and living standards. Initially framed at the national level, India was among the pioneering countries to adapt and localise the HDR methodology, first through state reports (Madhya Pradesh in 1995, Karnataka in 1998, Sikkim in 2002) and then the national report in 2003, eventually leading to the proliferation of district-level assessments designed to reveal nuanced intra-state disparities.

District HDRs were initiated with the intention of addressing the methodological and policy gaps which continued to remain even with the national HDRs. They were envisioned to offer granular portraits of both development and deprivation at a district level. Reports for Ahmedabad (Gujarat), Bankura (West Bengal), Barmer (Rajasthan), Bundelkhand (Uttar Pradesh and Madhya Pradesh), Mysore (Karnataka), and many others have demonstrated the transformative power of local data, participatory analysis, and context-sensitive recommendations for inclusive development.

India's experience with district HDRs thus far provides a robust reference point for the Sonipat HDR. Over the years, numerous districts (Figure 1.1)

Figure 1.1: Districts in India with HDRs.



Sources and Notes: Authors' visualisation.

including Kachchh, Kangra, Gulbarga, Uttar Dinajpur, and South 24 Parganas, have utilised HDRs to analyse local needs, highlight development gaps, and mobilise policy action in areas of health outcomes, education infrastructure, livelihood opportunities, and better representation of marginalised vulnerable groups. These reports have consistently demonstrated the best practices in collaborative research, stakeholder engagement, and evidence-based priority setting.

Lessons from these earlier HDRs also help us appreciate the importance of iterative dialogues between policy makers, service providers, academic experts, and affected communities in the design, dissemination, and follow-up phases. The strategic integration of district HDRs into the state and national policy architectures has further amplified their impact in terms of resource allocation and programme adaptation. However, even as we have made significant advances in producing HDRs at the national and state level, focus on timely and continued production of district HDRs remains a concern. India's socio-economic landscape is marked by deep sub-regional disparities between urban and rural pockets, between various caste and minority groups, and across gender axes, which aggregate state-level statistics fail to capture. District-level assessments provide the fine-grained insight required for precisely targeted interventions.

In Haryana, rapid economic development coexists with uneven human development indicators, with districts exhibiting significant inter- and intra-district variations in literacy, health, gender empowerment, and access to public services. For Sonipat, which sits at the intersection of agricultural and peri-urban growth corridors, a district HDR offers an opportunity to measure development progress, spotlight exclusions, and mobilise local knowledge for policy innovation.

The Sonipat HDR seeks to address critical knowledge and action gaps in the region's development trajectory. It aims to provide a comprehensive assessment of human development progress within the district by utilising a blend of quantitative and qualitative indicators which highlight its complexities. By systematically analysing human development indicators rather than relying on anecdotal evidence or administrative data alone, the report aims to:

- Offer a baseline study documenting the current state of affairs across different human development indicators, not limited to only education, health, and income.
- Illuminate disparities between communities and demographic groups at the district level.
- Identify clusters for whom the outcomes lag behind the district average.
- Capture emerging challenges tied to urbanisation, industrialisation, climate vulnerability, and migration.
- Strengthen the local evidence base for social protection, targeted service delivery, and development planning.

Through analysis of robust, representative data sources, usage of participatory methods, and insights from primary survey, the Sonipat HDR provides actionable recommendations, fosters intersectoral dialogue, and serves as a benchmark for monitoring and accountability.

The anticipated impact of the Sonipat HDR is two-fold. First, the report is poised to inform district-level planning, scheme targeting, and convergence between government and non-government actors. By providing an empirical basis for prioritisation, the HDR ensures policy responses resonate with local realities rather than abstract targets. By identifying disparities and exclusions across diverse population groups, administrative blocks, and settlement types, the report will facilitate targeted policy responses that address specific needs. Further, it will serve as a valuable resource for guiding interventions in critical areas such as primary health care, education, social protection, gender empowerment, and sustainable livelihoods, ultimately fostering a more equitable and developed community. Second, by establishing baseline estimates and tracking progress across multiple dimensions, the HDR will serve as an essential tool for monitoring government initiatives (such as those under the Fifteen-Year Vision, Sustainable Development Goals (SDGs), and local mandates). The report will reveal successes, highlight persistent gaps, and facilitate course correction through periodic reviews.

With the Sonipat HDR we take a first step toward fostering inclusive growth, transparency, and accountability in district development in Haryana. By combining technical rigour with local engagement, the Report aims to be both an instrument of policy reform and a reflection of Sonipat's aspirations.

1.2 Audience

The Sonipat HDR is designed with a diverse audience in mind, recognising that the impact of such an exercise depends on how effectively its findings travel beyond the realm of documentation into actual action. The intended readership encompasses policy makers, administrators, civil society organisations, research institutions, and the community itself, each of whom engages with the questions of development from a distinct position. The report, therefore, seeks not only to present an assessment of Sonipat's social and economic landscape but also to offer pathways that different stakeholders can adopt in pursuit of a more inclusive and equitable vision for the district.

At the heart of the HDR are district and block-level officials, who face the task of turning broad development priorities into operational realities. For them, the Report will offer actionable policy insights and concrete frameworks for implementation so that inclusive approaches do not remain aspirational but instead are embedded in governance practice. Alongside them are elected representatives, who constantly navigate competing demands and difficult trade-offs in local governance. Through evidence-based recommendations, the HDR aims to equip them with the tools to weigh options that balance economic growth with social justice and environmental sustainability.

Civil society organisations represent another critical actor in this ecosystem. NGOs and community-based groups, which often work at the interface between people and government, need data and analysis to design programmes which help address ground realities. The HDR thus serves as both a reference and a catalyst for innovative interventions informed by evidence. Researchers and educators too are essential to this process, translating knowledge into capacity-building, teaching, and deeper inquiry into development dynamics. Their work ensures that learnings from the HDR contribute not just to immediate policies but to long-term academic and institutional growth. Ultimately, the Report envisions a collective engagement, making human development a shared responsibility across state, society, and community.

1.3 Defining Human Development

Human development measurement has undergone a significant evolution since the introduction of the Human Development Index (HDI) by the UNDP in 1990. The HDI represented a major advancement by shifting focus from purely economic growth, as measured by Gross Domestic Product (GDP), to a more comprehensive view that includes health (life expectancy), education (mean and expected years of schooling), and income (GNI[1] per capita). However, as understandings of well-being deepened globally, new frameworks and indices emerged to capture the complex, multidimensional realities of development and deprivation.

In line with the SDGs, which emphasise inclusive and sustainable improvement across 17 dimensions, human development measurement now encompasses indicators that go far beyond the HDI's initial focus. For health, measurements extend to child and maternal mortality, nutritional status (including stunting and wasting in children), and overall health system access. Education indicators expand to literacy rates, gender parity, quality of educational provision, and attainment gaps, highlighting disparities not just in access but in meaningful outcomes. Living standards are now measured using indicators like access to safe drinking water, improved sanitation, housing quality, electrification rates, and social protection coverage.

Some well-known reports and indices built to measure human development include:

- **Human Development Index (HDI)[2]:** The original, broad-based index measuring life expectancy, education, and income, developed by the UNDP. The HDI measures a country's achievements in life expectancy, education, and per capita income

- **Multidimensional Poverty Index (MPI)[3]:** Launched by UNDP and Oxford Poverty & Human Development Initiative, MPI assesses acute deprivations in education, health, and living standards, highlighting overlapping forms of poverty within households.

[1] Gross National Income
[2] HDR (UNDP), *Human Development Index Data Center*, https://hdr.undp.org/data-center/human-development-index
[3] OPHI (Oxford Poverty and Human Development Initiative), *Global MPI*, https://ophi.org.uk/global-mpi

- **Global Gender Gap Report[4]:** Published by the World Economic Forum, the index evaluates disparities between men and women in health, education, economic participation, and political empowerment.

- **Gender Development Index (GDI)[5]:** Introduced by the UNDP in the Human Development Report 1995 as a gender-sensitive extension of the HDI.

- **Sustainable Development Goals Index (SDG Index)[6]:** Compiled by various research organisations, constructed and annually released by the Sustainable Development Solutions Network (SDSN) in partnership with other academic institutions. The index tracks the performance of all UN member states across all seventeen SDG targets, integrating economic, social, and environmental development.

- **Social Progress Index (SPI)[7]:** Developed by the Social Progress Imperative, the SPI provides a holistic view of social and environmental wellbeing outcomes exclusive of economic indicators.

- **World Happiness Report[8]:** Published by a partnership between Gallup, the Oxford Wellbeing Research Centre, the United Nations SDSN, and an editorial board of independent experts. The report uses survey and statistical data on subjective well-being, social support, freedom, generosity, and corruption to map national well-being beyond purely material metrics.

- **OECD Better Life Index[9]:** Developed by the Organisation for Economic Co-operation and Development (OECD) in 2011 to assess well-being across multiple dimensions beyond GDP.

The expansion of indices and composite measurements provides multiple advantages. Quantitative data facilitates benchmarking, international comparisons, and monitoring of progress which are vital for policy evaluation, funding allocation, and public accountability. These indices help identify those at greatest risk, especially when further broken down by gender, ethnicity, or geography, where caste, gender, and livelihood insecurities create overlapping exclusions. Quantitative indicators, including those used in the HDI, MPI, and SDG Index, enable consistent tracking over time and comparability across nations and regions, a critical requirement for global governance, aid allocation, and benchmarking. However, such indicators can obscure locally relevant dimensions, such as the role of informal networks, social capital, or cultural cohesion.

The formulation of Human Development Index (HDI) has not been attempted in the report for want of the necessary data enabling district-wise comparison. The core purpose of having an HDI at the district level is to empower us to make inter-district comparisons and therefore facilitate forming district-specific strategies. However, in the absence of publicly-available comparative data across different districts, comparison of outcomes driven from such data may be misleading. Further, since some of the available data at the district level have become dated, calculation of an index may not capture the current dynamics. This report highlights the intra-district dynamics of Sonipat through an in-depth analysis of available data, focusing on the significant progress made over time and capturing the nuances and barriers to human development across the district's communities. With comparable data made available for all the district of Haryana, the JIHS can compute district-level HDIs to help the respective districts prioritise expenditure accordingly.

Thus, ongoing challenges in human development measurement include striking of a balance – the balance between standardisation for comparability, and the flexibility required to meaningfully address diverse social, cultural, and environmental contexts. Participatory approaches, mixed-methods research, and localised frameworks are increasingly advocated for, ensuring that measurement systems empower communities and foster inclusive development pathways.

[4] World Economic Forum, *Global Gender Gap Report 2025*, https://www.weforum.org/reports/global-gender-gap-report-2025
[5] HDR (UNDP), *Gender Development Index (GDI)*, https://hdr.undp.org/gender-development-index#/indicies/GDI
[6] Sustainable Development Report / SDG Index, *SDG Index Dashboard*, https://dashboards.sdgindex.org
[7] Social Progress Imperative, *Social Progress*, https://www.socialprogress.org
[8] World Happiness Report, *About*, https://www.worldhappiness.report/about/
[9] OECD, *OECD Better Life Index*, https://www.oecd.org/en/data/tools/oecd-better-life-index.html

1.4 Lessons for District-Level Reporting

A strict and concise approach drawn from UNDP's district HDRs informs the methodology for the Sonipat HDR. District-level HDRs are increasingly recognised as crucial tools for advancing sustainable, locally responsive development strategies. The drive for such reports is rooted in the limitations of aggregated national data, which can mask substantial disparities within districts, across communities, and between demographic groups. The UNDP's district HDRs provide methodological rigour and policy relevance by foregrounding disaggregated data collection, participatory processes, and mixed-method evidence synthesis.

District HDRs offer several strategic opportunities for policymakers and development practitioners. First, they facilitate the identification of spatial and demographic disparities, such as gaps in health, education access, or infrastructure, enabling interventions tailored to local realities. The Sonipat HDR adopts this logic, aiming to surface region-specific needs and vulnerabilities which might otherwise be invisible in higher-level, aggregate statistics. This granularity enhances policy precision. Targeted approaches save resources, increase impact, and foster the legitimacy of government action by directly addressing the concerns of marginalised groups, whether related to caste, gender, geography, or livelihood insecurity. Another opportunity lies in building local ownership and accountability by involving stakeholders at every stage, from conceptualisation, data collection, interpretation, to dissemination. Civil society groups, government bodies, academia, and community representatives all contribute unique perspectives, making the reports richer and more actionable.

District-level reporting also encourages innovation and responsiveness in data collection. Diverse sources such as census figures, administrative records, household surveys, and qualitative fieldwork can be blended to provide a multidimensional picture of well-being and poverty. By harmonising these inputs, the methodology draws out subtle but critical indicators, such as informal employment dynamics or micro-level governance barriers, critical in the context of Sonipat's urban and peri-urban landscape.

Despite the promise, there are significant challenges. One is the inconsistency or lack of availability of high-quality, granular data at the district level, which can undermine robust analysis. Administrative and survey data may have gaps, be outdated, or lack comparability across sectors or regions, necessitating investments in capacity-building for local data systems. Integrating qualitative inputs, while essential for capturing lived realities and social capital, can pose challenges for standardised analysis and may require new approaches to validation and synthesis.

Similarly, stakeholder engagement, while necessary for legitimacy and relevance, can slow processes and introduce conflicting priorities. Building consensus among actors with divergent interests that include government agencies, NGOs, local leaders, and marginalised groups demands careful facilitation, transparency, and a commitment to participatory methods. Furthermore, harmonising data from multiple sources requires technical expertise and rigorous quality assurance to ensure findings are reliable and actionable.

Another challenge is sustainability. The effectiveness of district HDRs depends on continuous investment in local capacity, not only for data collection and reporting but also for policy follow-up. Unless mechanisms are put in place for ongoing monitoring and evaluation, there is a risk that HDRs become static documents rather than living guides for change.

The Sonipat HDR is framed within this tested, participatory, and data-driven methodology. It draws on lessons from UNDP's district HDRs, emphasising disaggregated indicators, participatory engagement, and harmonisation of diverse data sources to ensure findings are both context-specific and rigorous. By applying these principles, the Report seeks not only to map the existing disparities but also to foster local dialogue, enable adaptive policy interventions, and contribute to enduring improvements in human development outcomes at the district level.

1.5 Relevance of Selected Verticals

The Sonipat HDR concentrates on seven strategic verticals: Education, Health, Livelihood, Environment, Spatial Transformation, Basic Services, and Governance. These were selected both for their intrinsic importance to individual and community well-being and their synergistic roles in shaping the district's development trajectory.

Education is foundational to human development, enabling individuals to access knowledge, skills, and opportunities across their lifetimes. In Sonipat, with its diverse socio-economic landscape, education emerges as a primary lever for breaking cycles of poverty, enhancing gender equity, and fostering social mobility. Attention to education encompasses access, quality, and inclusiveness across early childhood, primary, secondary, and adult learning sectors.

Health directly influences life expectancy and quality of life, impacting productivity and resilience. Sonipat faces some of the typical health challenges of urbanising districts, including maternal and child health disparities, rising non-communicable diseases, and environmental health risks. Examining health infrastructure, service delivery, and health outcomes is critical in shaping interventions that reduce preventable morbidity and mortality.

Livelihood represents the economic dimension of human development, linking employment, income, and social protection with household well-being. Given Sonipat's mix of rural agriculture, peri-urban industry, and informal sector activities, livelihoods are highly varied yet often precarious. The report explores the adequacy of livelihood opportunities, emerging patterns in earnings, and structural transformation in the district.

Environment is an emerging and vital are of focus given the growing exposure to climate variability and environmental degradation in Haryana. Sonipat's agricultural base, water resources, and urban expansion are increasingly vulnerable to climate impacts such as erratic rainfall, heat stress, and pollution. Integrating climate resilience into human development analysis underlines the need for sustainable, adaptive pathways that protect livelihoods and well-being.

Spatial Transformation examines the district's rapid urbanisation, infrastructure development, and land use changes. These transformations have profound implications for access to services, housing quality, environmental sustainability, and social cohesion. Analysing spatial dynamics provides insight into patterns of inequality and the challenges of inclusive urban governance.

Basic Services highlight the situation assessment of all basic infrastructure services, such as availability of water supply, sanitation and sewerage networks, transportation across rural and urban areas in Sonipat district. An understanding of basic services provides an idea of the extent of accessibility that citizens in the Sonipat district have to these fundamental requirements for survival.

Governance underpins all other verticals by shaping policy effectiveness, service delivery, transparency, and citizen participation. Good governance in Sonipat involves multilevel coordination, participatory planning, and empowered local institutions capable of responding to diverse community needs. Strengthening governance mechanisms is crucial to realising the full benefits of investments across other sectors.

Together, these verticals embody the multidimensionality of human development, reflecting both the structural factors and lived experiences of citizens influencing the district's progress. Their interdependencies, such as the link between education and livelihoods, or climate impacts on health and urban infrastructure, highlight the necessity of integrated, cross-sectoral approaches to sustainable development in Sonipat.

1.6 Methodology

The Sonipat HDR is grounded in a rich mixture of quantitative and qualitative evidence, ensuring that the analysis is both data-driven and contextually nuanced. Quantitative data drawn from official statistics, surveys, and administrative records provide a robust foundation for assessing trends, disparities, and progress across multiple development dimensions. Complementing this, qualitative data, including community narratives, key informant interviews, focus groups, and participatory research outputs, bring lived experiences and local perspectives into sharper focus. These narratives humanise the data and reveal complexities that may otherwise remain obscured in aggregate statistics.

Local case studies and best practices are woven throughout the report to illustrate successful interventions, innovative policy approaches, and

community-driven solutions within Sonipat. These detailed examples serve multiple purposes: they provide practical lessons, inspire replication and scaling, and demonstrate the agency of local actors in shaping their development pathways.

This mixed-methods approach, integrating rigorous data analysis with rich qualitative insights and grounded case studies, enhances the relevance, credibility, and usability of the Report. It not only ensures that development challenges are well understood but also that solutions are rooted in real-world contexts and actionable knowledge.

A primary challenge we encountered was handling data gaps, especially concerning informal livelihoods and localised climate impacts. Analytical challenges included harmonising heterogeneous data sources and ensuring representativeness for vulnerable groups. The report acknowledges these constraints, outlining the assumptions made and recommending directions for future research.

Throughout the research, ethical standards were rigorously maintained. Informed consent was secured for all primary data collection, with strict confidentiality assured to protect participant identities. The team adhered to principles of transparency and data integrity, employing systematic validation and triangulation to minimise bias and ensure the reliability of findings.

1.7 Chapter-wise Overview

The report is organised into thematic chapters corresponding to the seven selected verticals: Governance, Education, Health, Livelihood, Spatial Transformation, Basic Services, and Environment. Each chapter adheres to a consistent structure designed to provide a clear and comprehensive narrative that captures both empirical detail and strategic insight.

Chapters begin with an overall summary statement, offering a concise abstract that synthesises the broad story emerging from the analysis. This summary situates the vertical within the district's human development context, highlighting key findings and overarching themes. Each chapter delves into the current state of relevant indicators, comparing Sonipat's performance over time not only within the district but also against benchmarks at the Haryana state and national level. This comparative lens enriches understanding of local progress and gaps. Where available, primary survey findings and beneficiary incidence data add granularity to the analysis. Special attention is given to the differential experiences of key groups such as women, youth, and other vulnerable or disadvantaged communities to foreground issues of equity and inclusion.

Following this, the chapters outline the major programmes and initiatives that have been implemented over the past five years under each vertical. This section details coverage in terms of geographic reach and number of beneficiaries and highlights notable innovations or best practices within the district. It provides the ground reality on policy responses in relation to the development challenges identified earlier. The chapters synthesise insights emerging from the analysis, with a focus on the status and empowerment of women, youth, and vulnerable populations, reflecting the cross-cutting importance of these groups across all verticals.

And finally, chapters close with a forward-looking perspective, identifying drivers of growth and priority actions to improve the district's weakest indicators. It attempts to delineate the shared roles and responsibilities for government institutions, civil society, and other stakeholders in advancing inclusive and sustainable human development.

Chapter 2

SONIPAT-
DISTRICT PROFILE

Aniket Raykar, Namesh Killemsetty, and Mrinalini Jha

2 SONIPAT - DISTRICT PROFILE

Aniket Raykar, Namesh Killemsetty, and Mrinalini Jha

2.1 Introduction

Sonipat is one of the 22 districts in the northern Indian state of Haryana. It was carved out of Rohtak and became a full-fledged district on 22 December 1972. Sonipat serves as the district headquarters. It is also part of the National Capital Region, at a distance of 52 km by road and 44 km by rail from Delhi.

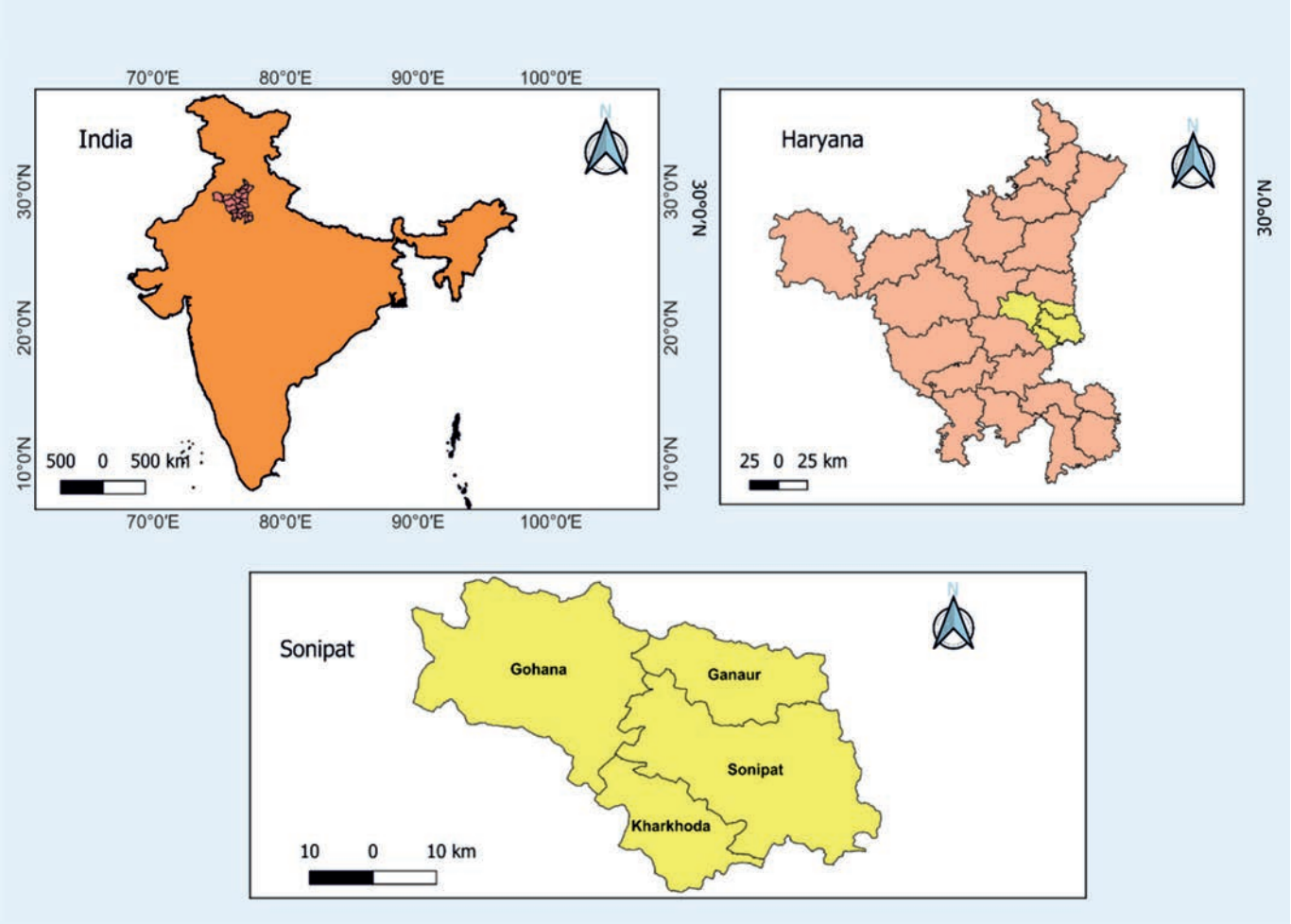
The district of Sonipat is divided into eight blocks: Ganaur, Sonipat, Rai, Kharkhoda, Gohana, Kathura, Murthal, and Mundlana. Sonipat is the largest tehsil, followed by Gohana. The district has one municipal corporation, Sonipat, and four municipal committees: Ganaur, Gohana, Kundli, and Kharkhoda.

2.2 Historical Significance

Historically, Sonipat has been one of the nodal settlements that contributed to the making of the region of Haryana. As with all such places of historical significance, a number of traditions have grown about Sonipat, with varying mixes of history and myth. The region boasts of a rich archaeological heritage, right from pre-Harappan times onwards, i.e., from more than five thousand years ago. The name itself is traceable in the great grammar of Pānini, dating back to the 5th-4th century BCE, in the form Sonaprastha (शोणाप्रस्थ).

As per available historical information from early medieval times onwards, Sonipat, with its strategic location, is seen to be influencing regional power

Figure 2.1: Location of Sonipat district



Sources and Notes: Authors' visualisation

dynamics, particularly among the Jats and Rajputs, and thereby shaping the larger political landscape. It is of some interest to know how, when the Jats, Rohillas, Sikhs, and Marathas were vying with one another to bring this region under their sway in the late 18th century, an Irish adventurer George Thomas, known as Jahaz Sahib, carved an independent principality in Haryana with Maratha support.

It is no wonder, then, that this key sub-region of North India should have played a pivotal role in the First War of Independence in 1857, been a centre of the social and educational movement led by the Arya Samaj, participated in the Freedom Struggle, and contributed with equal distinction to nation-building after Independence. The legacy is being perpetuated, as it must be.

2.3 Demographic and Socio-economic Characteristics

Population Growth: Between 2011 and 2021, Sonipat's population was expected to grow from 1.45 million to 1.69 million, marking a decadal growth of 16.29 per cent, the same as the overall growth rate of 16.30 per cent of Haryana. Sonipat has a primarily rural population, with about 69 per cent living in rural areas (Table 2.1).

Though the **overall sex ratio** has improved from 856 in 2011 to 864 in 2021, it is still below the state average of 887 in 2021 and the national average of 1,020[1] (Table 2.1).

Population Density: The population density of the district has increased from 683 people per square km in 2011 to 795 people per square km in 2021, which is much higher than the Haryana average of 667 people per square km, increasing pressure on land, housing, and public services (Table 2.1).

Age Structure and Dependency Ratio: The share of children (0-14 years) was about 29 per cent in 2011 and 2021, but slightly above Haryana's 25 per cent in 2021. The working-age population (15–59 years) too remained stable at 62 per cent, but below the state's 65.2 per cent in 2021. This shows that Sonipat has a relatively higher burden of child dependency. The

Table 2.1: District at a Glance (Cross Comparison with Haryana)

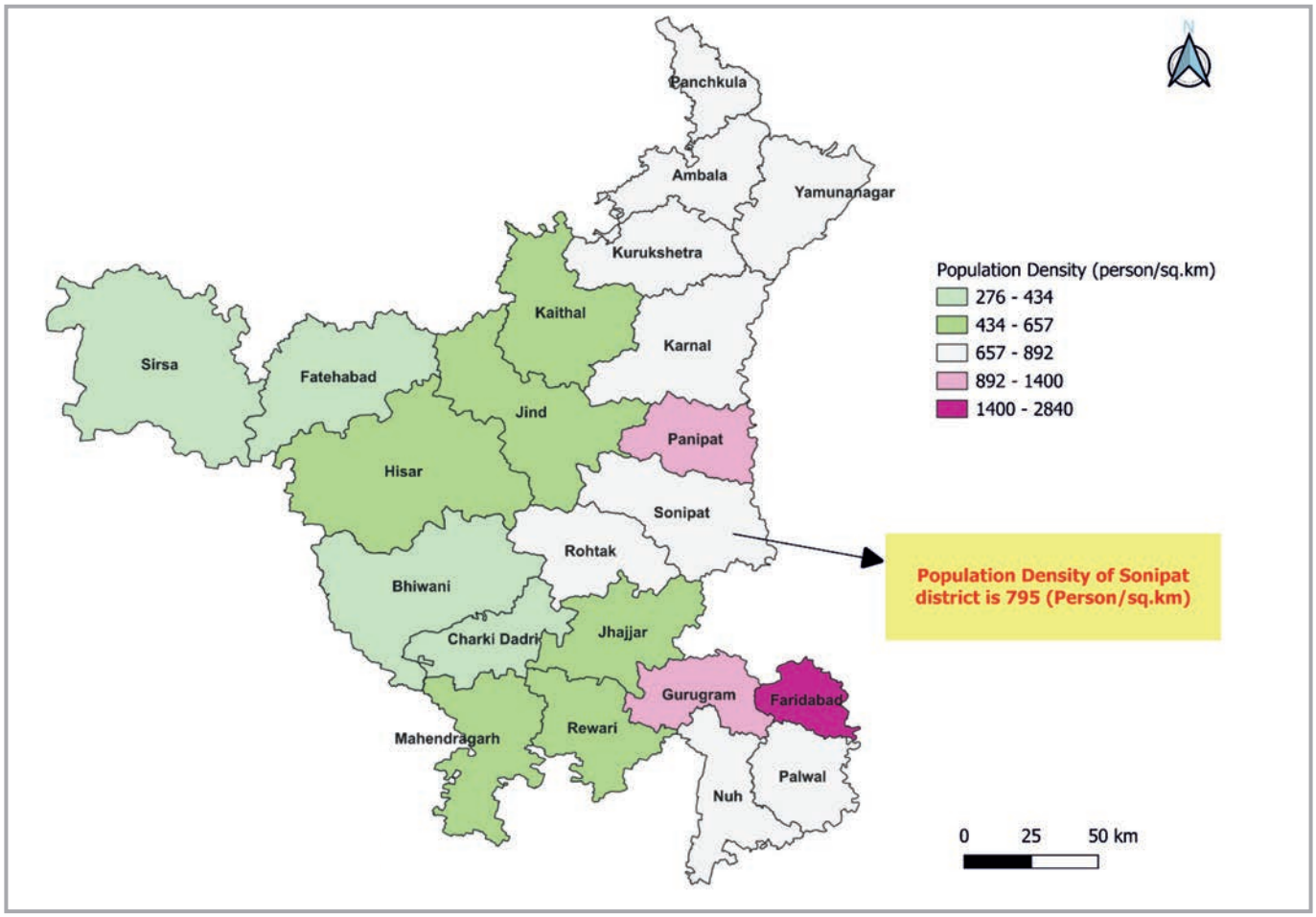
Socio-Economic Characteristics	Sonipat		Haryana	
	2011	2021	2011	2021
Geographical Area (sq. km)	2122	2122	44212	44212
Population (000')	1450	1686	25351	29483
Male (%)	53.88	53.64	53.23	52.99
Female (%)	46.12	46.36	46.77	47.01
Rural Population (%)	68.73	68.73	65.12	62.27
Urban Population (%)	31.27	31.27	34.88	37.73
Sex Ratio (Females per 1000 Males)	856	864	879	887
Population Density (per sq. km)	683	795	573	667
Population by broad age-group (%)				
0-14	29	29.1	29.7	25
15-59	62	62	61.7	65.2
60+	8.9	9	8.6	9.8
Dependency Ratio				
Young (0-14)	469	468	482	383
Old (60+)	144	144	139	150
Total (Young and old)	613	612	621	533
Population growth rate (2011-2021) (%)	**16.29**		**16.3**	

Sources and Notes: Census 2011 and 2021 projections by the International Institute for Population Sciences (IIPS)[2]. Colours indicate performance where blue, red, and yellow show whether the magnitude of the indicator has increased, decreased, or remained unchanged, respectively, in the year 2021 as against the last census year 2011.

[1] Government of India, Ministry of Health and Family Welfare, *National Family Health Survey (NFHS-5), 2019–21: India Report* (Mumbai: International Institute for Population Sciences, 2021), https://dhsprogram.com/pubs/pdf/FR375/FR375.pdf

[2] Murali Dhar, *Projection of District-Level Annual Population by Quinquennial Age-Group and Sex from 2012 to 2031 in India* (International Institute for Population Sciences, 2022), https://www.iipsindia.ac.in/sites/default/files/FULL_REPORT_WITH_FINAL_TABLES.pdf

Figure 2.2: District-wise Population Density of Haryana (2021)



Source and Notes: Authors' visualisation based on data from Dhar M., 2022 [3]

share of the elderly population (60 years and above) has seen a negligible increase from 8.9 per cent in 2011 to 9 per cent in 2021, comparable to Haryana's rising share of elderly individuals at 9.8 per cent. Sonipat's dependency ratio (the number of dependents per 1000 working-age individuals) is 613 in 2021, slightly up from 612 in 2011. This is significantly higher than Haryana's 533 in 2021, showing a greater demographic burden on Sonipat's workforce due to its larger child population (Table 2.1).

As per the 2011 census, Haryana has a total population of 25,351,462. Hindus make up 87.46 per cent of this population, making them the majority. Muslims account for 7.03 per cent, primarily from the Meo community, while Sikhs represent 4.91 per cent.

Sonipat district is mainly Hindu-dominant. In 2011, about 95.87 per cent of the population identified as Hindu, while 3.11 per cent were Muslim. The percentages for other religions are Sikh at 0.31 per cent and Others at 0.54 per cent (Table 2.2).

Per Capita Income of Sonipat District: In 2022-23, Sonipat had a per capita income of INR 2.65 lakh, placing it 9th among the 22 districts. This is slightly below the state average of INR 2.97 lakh. The northern (Panchkula) and southern districts, like Gurugram and Faridabad, report the highest incomes. In contrast, western and southern districts such as Bhiwani, Palwal, and Nuh have lower per capita incomes (Figure 2.3).

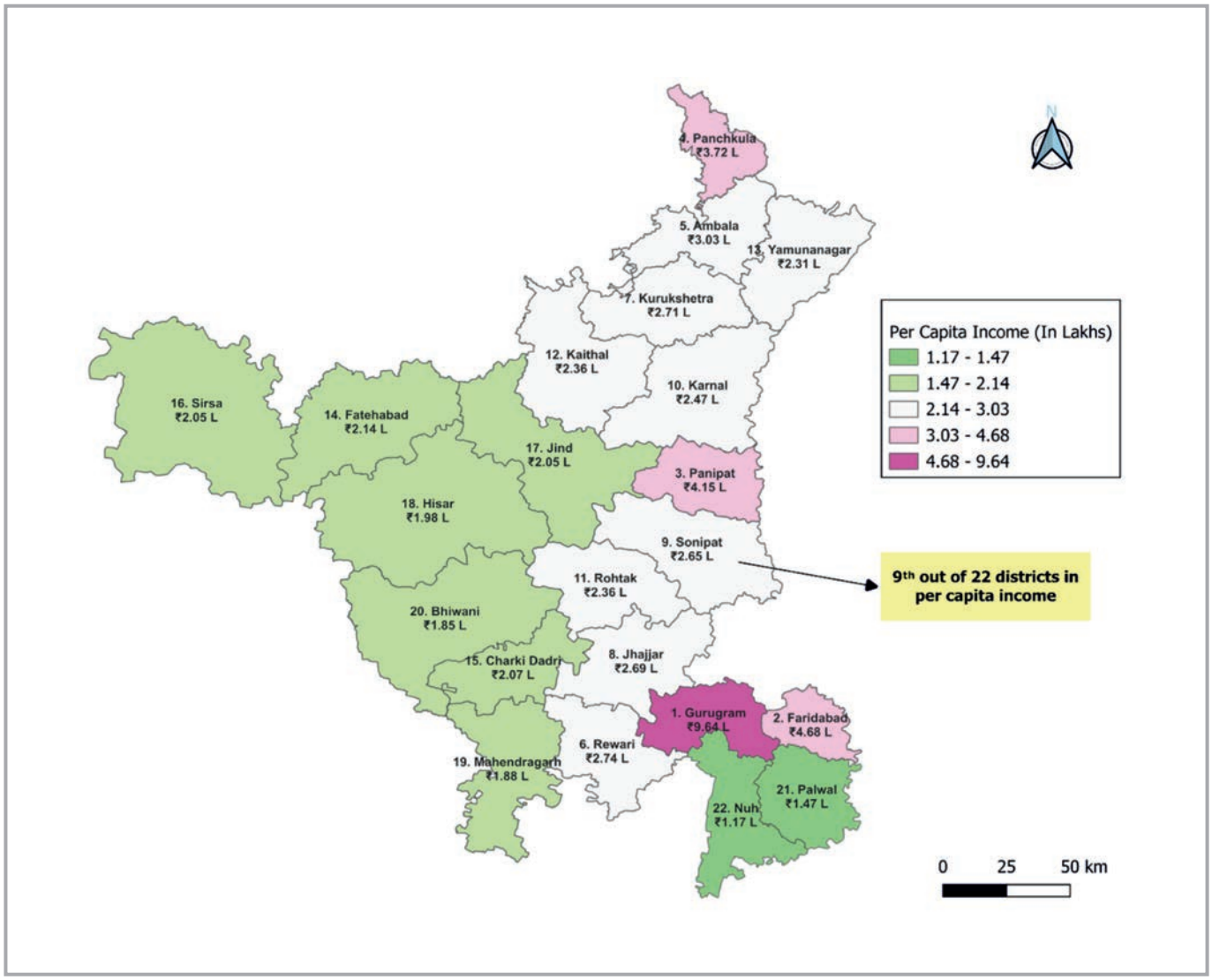
Table 2.2: District-wise Distribution of Population by Religion (in %)

District	Hindu	Muslim	Sikh	Others*
Sonipat	95.87	3.11	0.31	0.54
Haryana	87.46	7.03	4.91	0.44

Source and Notes: Census 2011; Others include Christian, Buddhist, and Jain.

[3] Dhar, *Projection of District-Level Annual Population by Quinquennial Age-Group and Sex from 2012 to 2031 in India*, 2022.

Figure 2.3: District-wise Per Capita Income of Haryana (2021)



Source and Notes: Authors' visualisation based on data from Department of Economic and Statistical Affairs Haryana

2.4 Administrative Setup

Figure 2.4 shows the administrative divisions of Sonipat district and its parliamentary and assembly constituencies, giving an overview of governance and electoral representation.

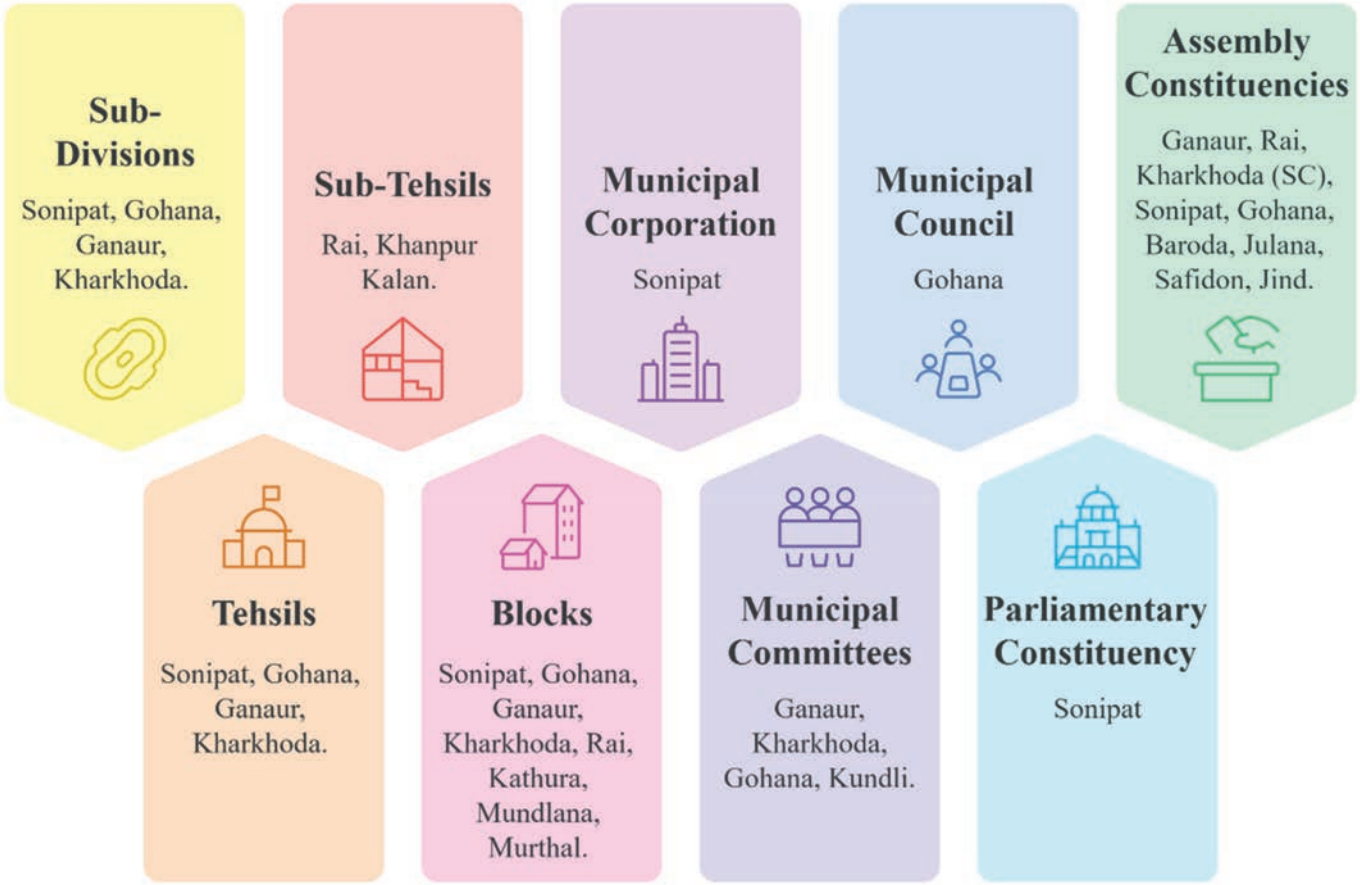
2.5 Topography and Natural Resources

Topography: Sonipat is located at 28.98°N 77.02°E and has an average elevation of 224.15 meters above sea level (735.4 ft). Sonipat district spans 2,260 sq.km, containing 2039.99 sq.km of rural area and 82.01 sq.km of urban area, and is situated in the southeastern part of Haryana. It is located just north of Delhi and borders the districts of Rohtak, Jind, and Panipat. On its eastern side, Sonipat shares an interstate border with Meerut district in Uttar Pradesh. The Yamuna River flows along this eastern edge, creating a natural boundary between Sonipat and Uttar Pradesh.

Water Bodies: The central water system in the district is the Yamuna River, and the irrigation canals are connected to it. The river runs along the rural area on the eastern side of the district. It also serves as a natural boundary between Haryana and Uttar Pradesh.

Tributaries: Only three tributaries, Somb, Thapana, and Sahibi, join the Yamuna River over a distance of about 300 km. The Somb River, which rises from the Shivalik hills in Yamuna Nagar, is a seasonal stream. Downstream at the Dadupur barrage in Yamuna Nagar, the river acts as an escape channel. The total length of the Yamuna River that passes through Sonipat is approximately 60 km.

Figure 2.4: Administrative divisions and constituencies



Sources and Notes: Authors' visualisation based on information from District Disaster Management Plan, Sonipat 2020-21

The underground water resources vary by area. The water table is lowest in the Khader area along the Yamuna, dropping below 10 ft. In some western and southeastern parts of the district, it rises to 30 to 40 ft. The groundwater is salty in certain areas, and the district has brackish water and waterlogging issues in the eastern regions.

Sonipat district may be divided into three regions based on landforms: the Khadar, Upland Plain, and Sandy Region. Sonipat city is located in the upland plains. These plains consist of old alluvium and can be well productive with proper irrigation.

- **The Khadar**: This region is formed along the river Yamuna's course, and it is a narrow flood plain, 3-6 km wide. The Khader plain is 20-30 ft lower than the adjoining plain. The soil here consists of fine clay loam deposited by receding floods of the river Yamuna. This soil supports rice, sugar cultivation, and, more recently, banana and papaya.
- **The Upland Plain** is the largest of the three regions. It includes the Sonipat tehsil, which is located west of the Khadar. Old alluvium covers the Upland Plain, and crops, oil seeds, vegetables, and flowers are farmed. The Gohana tehsil's ridges symbolise the Aravallis' northernmost extension.
- **The Sandy Region:** A small part of the district is covered with sand or sandy loam soil. Some areas in this region have a high pH value, resulting in kallor land.

Forest Coverage: The forests have been crucial to the district's economy by supplying timber and firewood for local needs. The Forest Department has raised essential tree species like Shisham, Kikkar, Neem, and Eucalyptus. The Social Forestry Division was established in 1982-83. Since then, the district has implemented strong social and farm forestry programs. The district includes Gohana, Rai, and Sonipat Forest Ranges, each led by a Range Forest Officer. These ranges fall under the Sonipat Forest Division, which is managed by the Deputy Conservator of Forests based in Sonipat.

Climate: The district has a subtropical semi-arid climate with extremely hot summers and cold winters.

It becomes mild only during the three monsoon months from July to September. During summer, the temperature often exceeds 47 °C while during winters, primarily in January, it drops to around 6-7 °C. The average annual rainfall is 612.3 mm. About 74 per cent of this rainfall occurs during the monsoon season.[4]

2.6 Economic Profile

Main economic activities (agriculture, industry, services): As per the census 2011, in the Sonipat district, there were 5,23,179 workers in total. Of these, 27.2 per cent were cultivators, 19.5 per cent agricultural laborers, 3.5 per cent worked in household industries, and the remaining 49.9 per cent were in other sectors. This shows a significant shift towards non-agricultural activity, with almost half the workforce working outside traditional farming.

Sectoral Distribution of Gross State Value Added (GSVA): The sectoral distribution of GSVA in Haryana shows a gradual structural change in the economy.[5] The share of the primary sector has dropped from 23.6 per cent in 2011-12 to 16.3 per cent at constant prices in 2023-24. This shows a lower dependence on agriculture. The secondary sector's contribution remained stable at about 31 per cent to 33 per cent. In contrast, the tertiary sector has increased significantly, from 44.9 per cent in 2011-12 to over 50.7 per cent in 2023-24, indicating the growing importance of services in the state's economy (Figure 2.5).

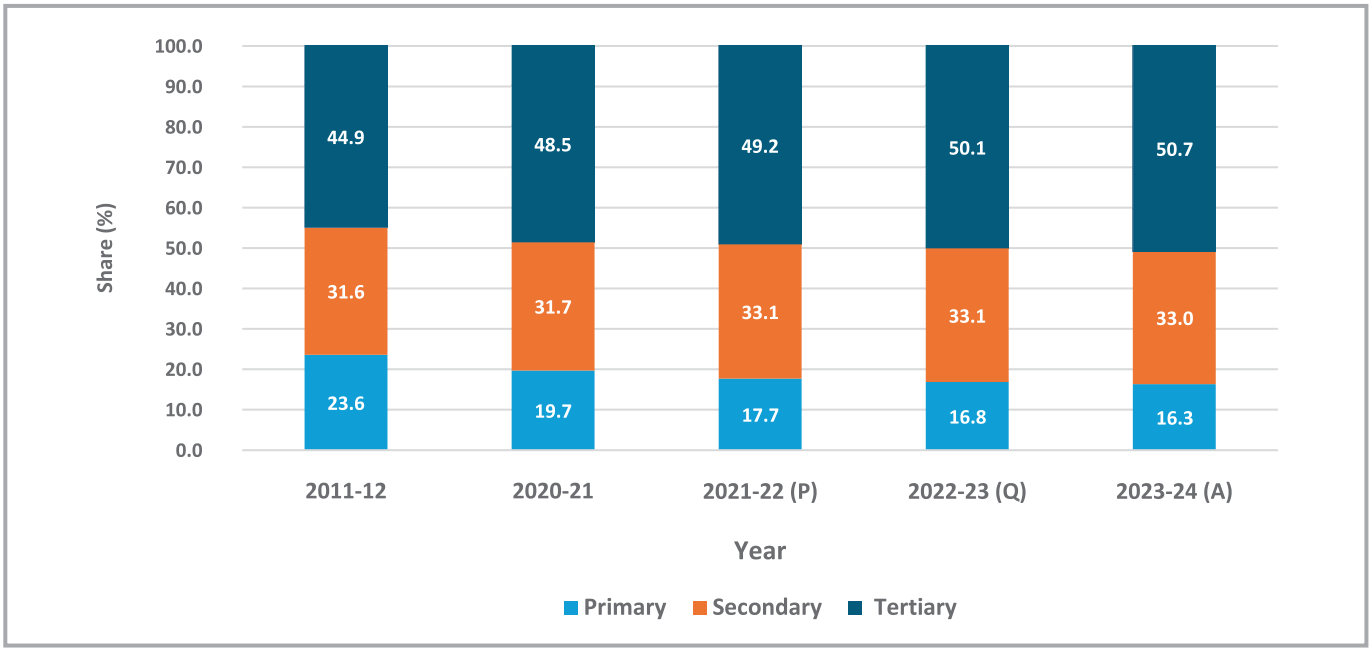
The growth of GSVA in the state at constant (2011-12) prices is estimated at 7.6 per cent for 2023-24 and 2024-25. The industry sector is expected to grow by 8.1 per cent, while the services sector is projected to grow by 8.4 per cent. This contributed to the overall growth of 7.6 per cent in 2024-25. The year-over-year (YoY) growth in GSVA in real terms is shown in Figure 2.6.

2.6.1 Agriculture

The primary crops cultivated are categorised into kharif (summer) and rabi (winter) seasons, with zaid crops not fitting neatly into either category. Toria is grown as a zaid kharif crop, while vegetables, melons, and green fodder are classified as zaid rabi crops.

Major kharif crops in the district are paddy, jowar, bajra, pulses, and sugarcane. Minor crops consist of maize and cotton. The main rabi crops grown in the district are wheat, rapeseed, and mustard. Vegetables, potatoes, and onions are also grown during the rabi and kharif seasons.

Figure 2.5: Gross State Value Added by economic activity at Constant (2011-12) Prices (in crore)

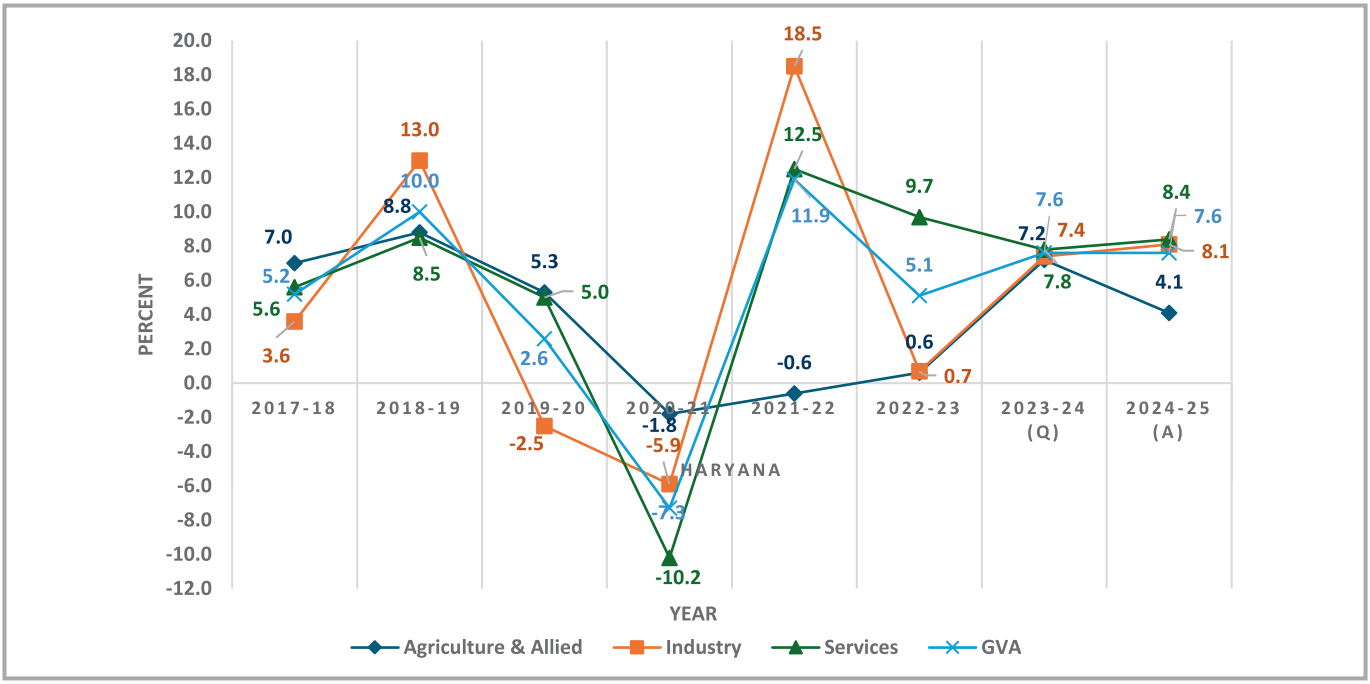


Sources and Notes: Department of Economic and Statistical Affairs, Haryana; P: Provisional Estimates; Q: Quick Estimates; A: Estimates

[4] Government of Haryana, Sonipat, https://sonipat.gov.in/about-district/

[5] In the absence of district data for certain parameters, we project the trends using state level data.

Figure 2.6: Growth of Gross State Value Added (GSVA) in Haryana at constant (2011-12) prices (in %)

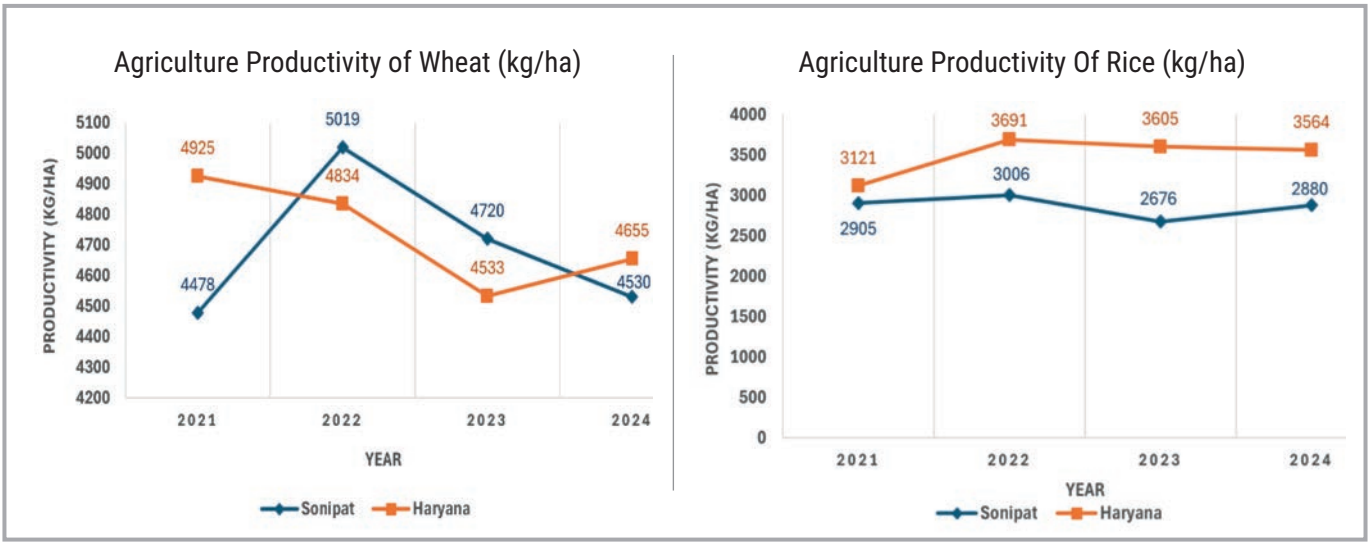


Source and Notes: Department of Economic and Statistical Affairs, Haryana. Q stands for quick estimates, A stands for advance estimates.

Average Size of Operational Land Holdings: According to the Agricultural Census, the average operational holding in Sonipat district was 1.35 hectares in 2010. It increased to 2.1 hectares in 2015.[6] This change shows a land consolidation and a growth in the average farm size. In 2010, marginal landholdings (under 1 hectare) make up 62.6 per cent, while small (1 to 2 hectares) and semi-medium (2 to 4 hectares) hold 18.1 per cent and 12.1 per cent respectively. Medium (4 to 10 hectares) account for 6.3 per cent, and large landholdings (10 hectares or more) represent only 0.9 per cent.[7]

In Sonipat, wheat productivity (minimum 4,478 to maximum 5,019 kg/ha) has been close to the state average but has dropped slightly in recent years. Rice yields, on the other hand, are consistently below the Haryana average, showing gaps in paddy cultivation in the region. Despite this, Sonipat has a higher percentage of net sown area than cultivable land (over 97 per cent until 2023). However, this figure fell sharply to 76.5 per cent in 2024, showing increased pressure on land use (Figure 2.7 and Figure 2.8).

Figure 2.7: Agricultural Productivity for major Rabi (Wheat) and Kharif (Rice) Crops:

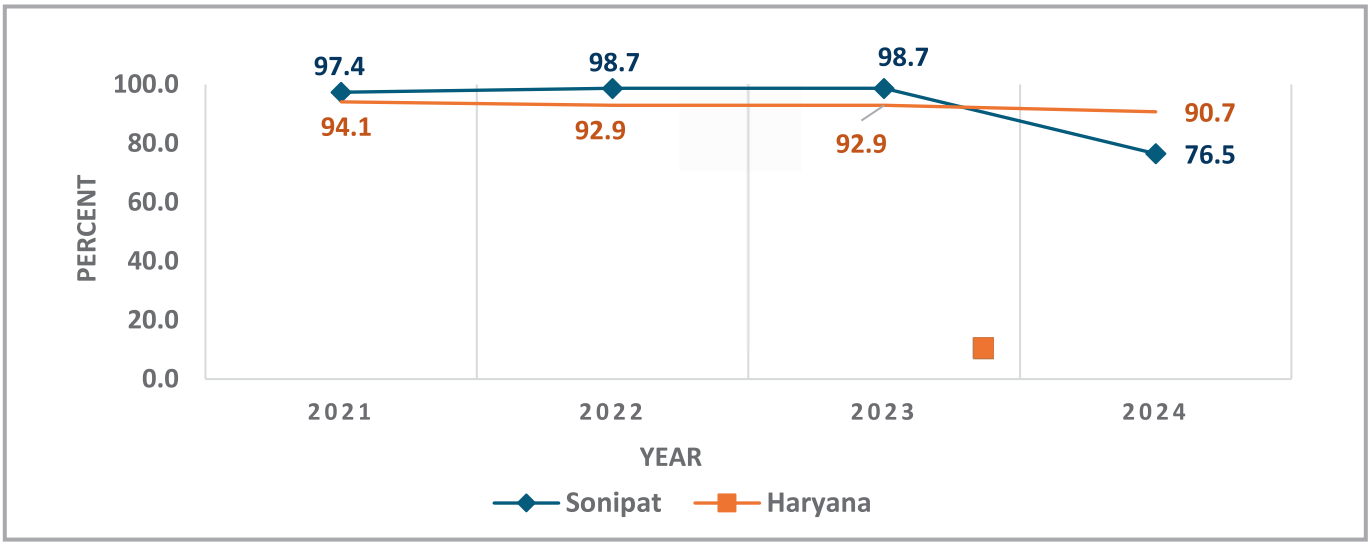


Sources and Notes: Department of Agriculture and Farmers Welfare

[6] Government of India, Ministry of Agriculture and Farmers Welfare, Department of Agriculture, Cooperation and Farmers Welfare, *All India Report on Agriculture Census 2010–11* (Agriculture Census Division, 2015), https://agcensus.da.gov.in/document/ac/air2010-11%20complete_compressed.pdf

[7] Dhar, *Projection of District-Level Annual Population by Quinquennial Age-Group and Sex from 2012 to 2031 in India*, 2022.

Figure 2.8: Proportion of Net sown area to Cultivable land:



Sources and Notes: Department of Agriculture and Farmers Welfare (Statistical Abstract of Haryana, DESA)

2.6.2 Industry

Sonipat district's diverse industrial clusters in Barhi, Rai, and Kundli drive the local economy through manufacturing in sectors like auto parts, textiles, and food processing (Figure 2.9).

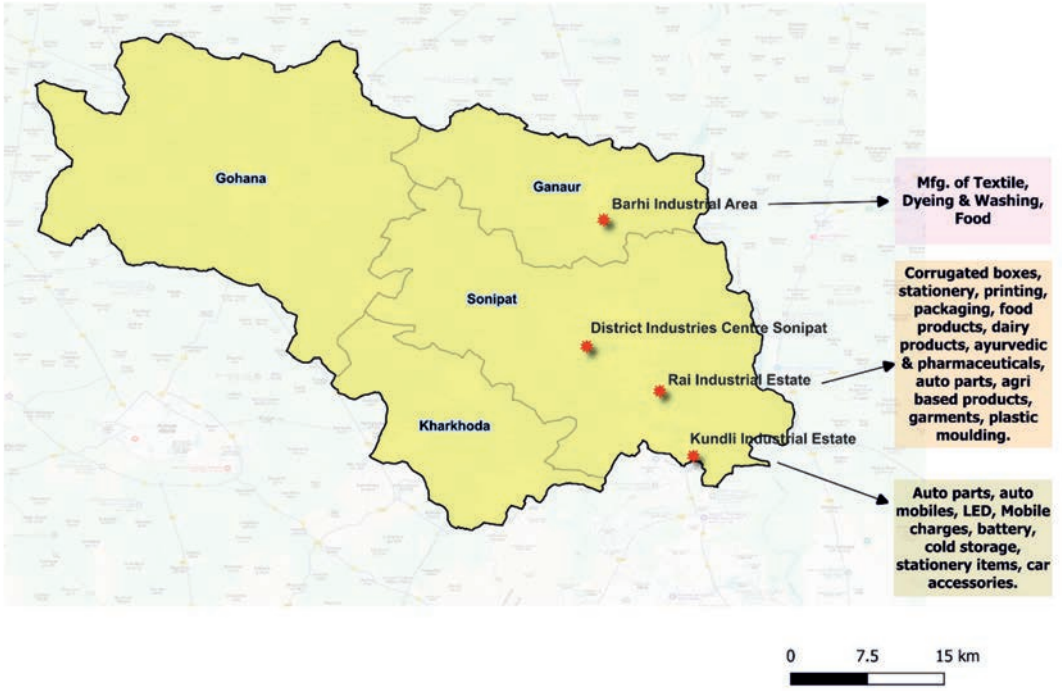
The industrial share of Haryana in GSVA went up a bit from 31 per cent in 2021 to 33 per cent in 2024, reflecting steady industrial growth across Haryana. Sonipat's share of GSVA increased from 34 per cent in 2021 to 38 per cent in 2024, reflecting the development of the textile, automobile, and agro-food processing industries (Table 2.3).

2.7 Patterns of Urbanisation and Migration

2.7.1 Urbanisation

Haryana is experiencing a steady increase in its urban population. It is expected to grow from about 8.8 million in 2011 to 15.4 million in 2031. In contrast, the rural population remains nearly unchanged at around 17.5 million. This shows that urbanisation is happening quickly. Sonipat shows a similar trend. The urban population is projected to rise from 0.45 million in 2011 to 0.59 million in 2031.

Figure 2.9: Industrial clusters in Sonipat



Sources and Notes: Ministry of MSME (GOI); HSIIDC

Table 2.3: Percentage of Gross State Value Added in Industry Sectors (at current price) to total GSVA.

District	2021	2022	2022	2022
Sonipat	34	34	38	38
Haryana	31	31	33	33

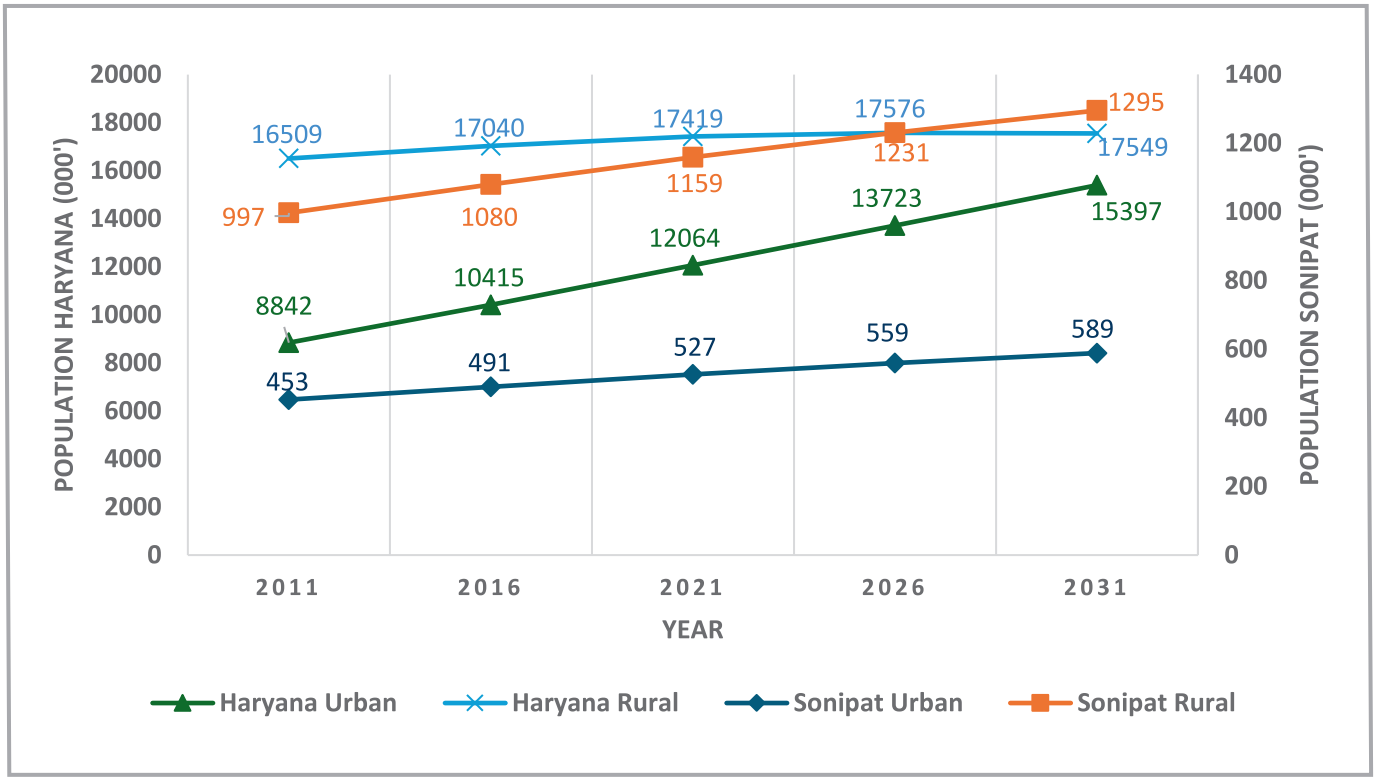
Sources and Notes: Department of Economic and Statistical Analysis, Government of Haryana.

Meanwhile, the rural population will increase slowly, from 1.0 million to 1.3 million. This indicates that urban growth is the main factor driving changes in the overall population. The rural areas are only seeing slight increases (Figure 2.10).

2.7.2 Migration

According to the 2011 census data on migration, migration in Haryana is primarily driven by work and marriage. Workers mainly come from Madhya Pradesh (33.3 per cent), Uttarakhand (27.2 per cent), and Uttar Pradesh (27.1 per cent), with significant outflow to Maharashtra (25.8 per cent), Chandigarh (24.8 per cent), and Madhya Pradesh (21.2 per cent). Marriage accounts for a considerable part of migration, with inflows predominantly from Rajasthan (63.5 per cent), Punjab (51 per cent), and Uttar Pradesh (29.4 per cent), while significant outflows for marriage are Rajasthan (69.9 per cent), Uttar Pradesh (61.8 per cent), and Punjab (52 per cent). Additionally, household migration sees inflows from Delhi (32.9 per cent), Uttarakhand (33.7 per cent), and Uttar Pradesh (31.1 per cent), and a significant portion of outflows is directed towards Maharashtra (33.3 per cent), Gujarat (38.3 per cent), and Delhi (30.4 per cent).[8]

Figure 2.10: Projected Population by Region (Urban / Rural) (in 000')



Sources and Notes: Source: Census 2011 and Dhar M., 2022[9]; Ratio Method-3 is used to project the Rural and Urban population of Sonipat District, where we assume that the proportion observed for the latest census year (2011) will remain constant till the projection period (2012-2031)

[8] Rahul (2022)
[9] Dhar, *Projection of District-Level Annual Population by Quinquennial Age-Group and Sex from 2012 to 2031 in India, 2022.*

Table 2.4: Distribution of Migrants by Streams of Migration Based on Place of Last Residence, 2011 (in %)

District	Intradistrict	Interdistrict	Interstate	Immigrants
Sonipat	43.8	30.1	25.1	1.1
Haryana	33.8	30.4	34.3	1.5

Sources and Notes: Table D-2, Census of India 2011

Table 2.4 shows that the interstate migration is dominant in the Haryana state. The share of interstate migrants in the district of Sonipat is 25.1 per cent of total migrants. In contrast, the share of intra-district and inter-district migration is 43.8 per cent and 30.1 per cent, respectively.

Figure 2.11 shows the top 10 states' inflows to Haryana and outflows from Haryana in 2011. Haryana was a state with more people moving in than moving out. The inflows were 36.3 lakh, while the outflows were 23.1 lakh, resulting in an outflow-to-inflow ratio of 0.64. Most immigrants came from Uttar Pradesh, Bihar, Rajasthan, and Punjab. At the same time, significant outflows went to Delhi, Punjab, and Rajasthan.

A significant population moving into Haryana comes from Bihar and Uttar Pradesh. On the other hand, high outflow-inflow ratios for Delhi (1.42), Maharashtra (1.57), and Gujarat (2.86) suggest that Haryana also loses migrants to major urban and industrial centres.

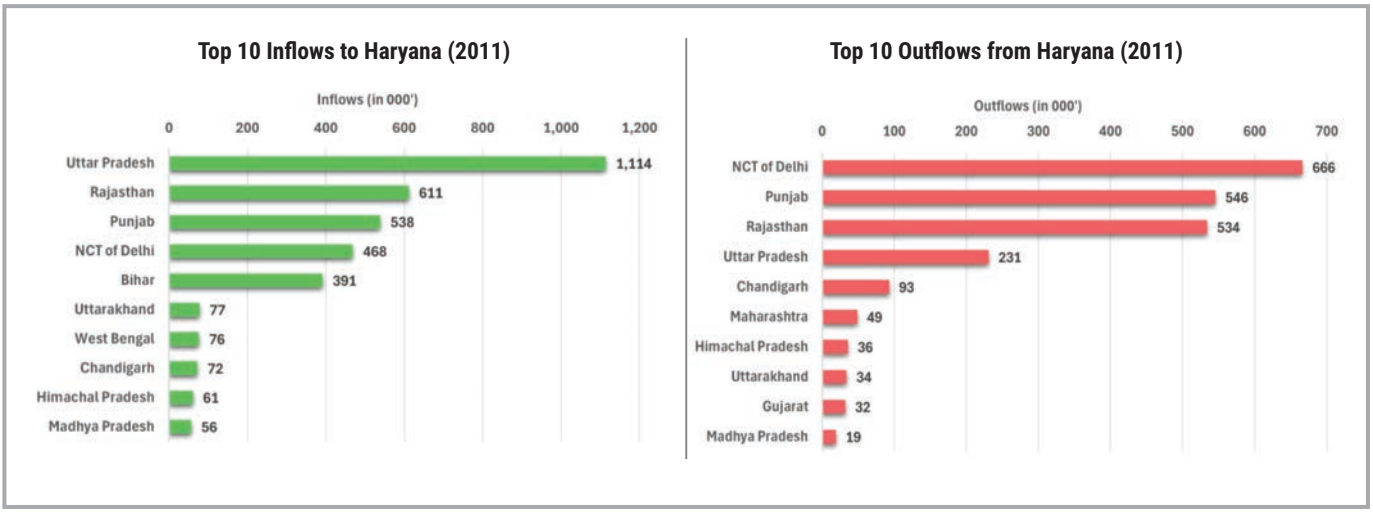
2.8 Major Infrastructure and Institutions

Rajiv Gandhi Education City: Rajiv Gandhi Education City is a planned education city in Sonipat, Haryana. The city is part of the National Capital Region, Delhi, and falls under the Municipal Corporation and Urban Agglomeration of Sonipat City. It aims to host at least 13 educational institutions, including universities, medical colleges, and engineering colleges. The park is set to span over 2,000 acres, with foundation stones laid in June 2012.[10]

Road Infrastructure: Haryana has a total road length of 30,514 km, and all these roads are metalled. This ensures complete rural connectivity, with all villages in the state linked by pucca roads. Sonipat district has 1,860 km of road length, about 6 per cent of Haryana's total network. Metalled roads fully connect all 343 villages in this district (Table 2.6).

In 2023, Haryana had a total road length of 32,616 km. Of this, 2,504 km (7.7 per cent) were National

Figure 2.11: Outflows, Inflows, and Outflow to Inflows Ratio for Haryana, 2011



Sources and Notes: Table D-2, Census of India 2011

[10] Jain (2024)

Table 2.5: Educational Institutions

University	Type	Established	Specialisation
Ashoka University	Private	2014	General
Bharti Vidyapeeth, Sonipat	Private	2013	General
Dr. B.R. Ambedkar National Law University	State	2013	Law
Fore School of Management, Sonipat	Deemed	2013	Management and research
Indian Institute of Information Technology, Sonipat	Central	2014	Information Technology
Indian Institute of Technology Delhi, Sonipat campus	Central	2013	Technical
National Institute of Food Technology Entrepreneurship and Management, Sonipat	Deemed	2013	Technology
O. P. Jindal Global University	Deemed	2009	Arts and Law
Skyline Business School, Sonipat campus	Private	2013	Management
SRM University, Haryana	Private	2013	General
World University of Design	Private	2017	Design

Sources and Notes: Authors' compilation.

Highways, while 30,112 km (92.3 per cent) were state roads. Sonipat contributed 2,113 km, 6.5 per cent of Haryana's total road length. This includes 253 km of National Highways, accounting for 10.1 per cent of Haryana's National Highways network, and 1,860 km of state roads, making up 6.2 per cent of the state's total. This shows Sonipat's strong connectivity within Haryana's road network (Table 2.7).

Sonipat today represents a dynamic blend of agrarian heritage and rapid industrial and urban transformation. Moreover, its proximity to the National Capital Region, fertile agricultural base, expanding industrial clusters, and emerging educational institutions together make the district an important growth centre in the state of Haryana. At the same time, challenges persist ranging from demographic pressure to environmental stress and the need for inclusive development. Understanding Sonipat's demographic, socio-economic, and spatial features thus provides an essential foundation for assessing its human development trajectory in the following chapters.

Table 2.6: Road Length and Number of villages connected with metalled roads in the State (in km)

District	Road-length (Km) 2023-24 (P)			
	Metalled	Un-metalled	Total	No. of Villages connected with metalled roads in the State (% in bracket)
Sonipat	1,860	0	1,860	343 (100)
Haryana	30,514	0	30,514	7412 (100)

Sources and notes: P.W.D. (B and R) Department of Haryana; P: Provisional

Table 2.7: Classification of road: National Highways and State Roads (in km)

District / State	National Highways (km)	State Roads (km)	Total Road Length (km)
Sonipat	253.39	1,860	2,113
Haryana	2,504.40	30,112	32,616

Sources and Notes: P.W.D. (B and R) Department of Haryana; P: Provisional

Chapter 3

TOWARDS BETTER GOVERNANCE OF SONIPAT DISTRICT: PEACE, JUSTICE AND STRONG INSTITUTIONS

Suraj Kumar and R. Sudarshan

3 TOWARDS BETTER GOVERNANCE OF SONIPAT DISTRICT: PEACE, JUSTICE AND STRONG INSTITUTIONS

Suraj Kumar and R. Sudarshan

This chapter assesses governance in Sonipat District through the lens of SDG 16 (Peace, Justice, and Strong Institutions). Sonipat, characterised by rapid industrial-urban growth alongside entrenched agrarian traditions, faces significant governance challenges. The district demonstrates strong foundational infrastructure, such as complete road connectivity. However, it grapples with a crime rate exceeding state and national averages, high pendency in police investigations and courts, and the complex influence of traditional institutions like Khap Panchayats. The chapter first provides a diagnostic of the current state across key SDG 16 indicators before outlining a prescriptive pathway for reform focused on strengthening institutions, enhancing access to justice, and fostering inclusive participation.

3.1 Introduction: The SDG 16 Framework

The analysis of good governance in Sonipat district is grounded in SDG 16 – Peace, Justice and Strong Institutions. This enables us to go beyond the instrumentalism of the concept of "governance" and align with the pillars of human development, namely, equity, efficiency, sustainability, and participation. It also aligns with the SDG analysis guidance from NITI Aayog and the SDG Dashboard of the Government of Haryana.

SDG 16 statement reads: "Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels". India's vision statement for SDG 16 is: "Significantly reduce violent and organised crimes by effective rule of law, access to justice, ensure participation of vulnerable sections in political and public institutions by effective implementation of various state and central statutes for fostering a peaceful and inclusive society."

In Sonipat district, trends of rapid urban and industrial growth coexist with deeply entrenched rural and agrarian traditions. The district has benefited from a combination of green revolution agriculture and a modest degree of industrialisation, now accelerated by the spillover investment and enterprise from the National Capital Region. "These areas have reaped the fruits of modernisation and access to various facilities such as educational institutions, health centres, modernised roads and multinational business establishments that have encouraged foreign investment. There exists a vast gulf between this modernisation and the almost feudal mindsets of people like the 'Khap Panchayats' who force couples who have entered intra-gotra marriages to return to the community fold, even to the extent of forcing the couples to live like siblings."[1] This duality presents a unique set of challenges for the governance structure in Sonipat, which is tasked with steering the district towards inclusive and sustainable development.

Sonipat, in many ways, is an archetypal district of Haryana that has achieved tremendous progress since its foundation on 1 November 1966. "Haryana has a creditable record of all-round development. It set the trend by adopting the Green Revolution strategy during the mid-sixties, which has made the State No. 2 in the Country in food-grain production.

Haryana has transformed itself from a backward Socio-economic State into a vibrant, economically progressive one. Today, Haryana is not only the granary of India, exporting large quantities of food grains to other states, but is also the hub for producing a wide range of industrial products. Its importance lies in the fact that 30 per cent of its total area, comprising the districts of Faridabad, Mewat, Gurgaon, Rewari, Jhajjar, Rohtak, Sonipat and Panipat, falls into the National Capital Region (NCR) of India. Differently stated, 40 per cent of the total area of the National Capital Region (NCR) is that of Haryana State."[2]

[1] Bharadwaj (2012)

[2] Planning Commission of India, *Haryana Development Report* (New Delhi: Government of India, 2009).

3.2 A Diagnostic of Governance in Sonipat

Sonipat's proximity to Delhi has triggered a real estate and manufacturing boom, particularly among small and medium-sized enterprises, as well as the logistics sector. This has led to unplanned urban sprawl, overwhelming existing civic infrastructure. Issues such as water scarcity, inadequate sewage systems, traffic congestion, and solid waste management are acute, especially in transitional zones like Kundli and Ganaur.

Sonipat's society, like much of Haryana, is marked by a rigid caste hierarchy. This perpetuates discrimination and limits the access of marginalised communities (Scheduled Castes, backward classes) to resources, justice, and political representation. Despite reservations in Panchayati Raj Institutions (PRIs), the real power often lies with dominant groups, which can hinder equitable development. At the same time, Sonipat has an electorally significant number of households from non-dominant OBCs.

The district faces a severe crisis of air and water pollution. Industrial effluents, untreated sewage, and agricultural runoff (from paddy cultivation) have polluted the Yamuna River and groundwater. Air quality frequently dips to hazardous levels due to industrial emissions, vehicular pollution, and seasonal burning of stubble. This environmental crisis is a direct consequence of regulatory and enforcement failures.

The chapter focuses on the following three themes:

- Peace and inclusion in Sonipat, for which the metrics to be addressed pertain to violent crime rates and cybercrime.
- Access to Justice in Sonipat, as indicated by Police per lakh population, Pendency/Disposal Rate and Number of posts sanctioned and filled in all courts.
- Local Governance Institutions – assessed under women's participation as elected representatives.

3.3 Situational Analysis

According to the 2011 Census, the Scheduled Castes (Scs) in Sonipat comprise 18.62 per cent of the district's total population. There are no Scheduled Tribes in the district. Hindus comprise 95.97 per cent of the population, while religious minorities, as defined in Article 25 of the Constitution, constitute 3.96 per cent of the district's population.

The tables below provide an overview with details regarding issues of good governance that confront the Sonipat district as it transitions from an agrarian Green Revolution setting to one of industry- and infrastructure-driven growth in the National Capital Region.

Table 3.1: Police and Public Order-This relates to SDG Targets 16.1 (reduce violence) and 16.a (strengthen relevant institutions).

Indicator	Sonipat District	Haryana State Average	All-India Average	Analysis & Implication
Police Population Ratio (Police per lakh population)	180	182	152.8	Sonipat is likely near the state average, which is significantly higher than the national average. This suggests better police availability, but it must be weighed against efficiency and public trust.
Percentage of Women in Police	Not Available	10.7%	11.7%	Haryana lags slightly behind the national average in representation of women in the Police, which is crucial for addressing gender-based crimes and improving community policing.
Cognisable Crimes Rate (IPC Crimes per lakh pop.)	260.2	258.3	238.8	Sonipat's crime rate is marginally higher than the state average and notably higher than the national average. This indicates a significant law and order workload for the police force.

Sources and Notes: NCRB, 2022 and Police per lakh population estimated from Haryana data.

Table 3.2: Access to Justice and Judicial Capacity- This relates to SDG Target 16.3 (promote the rule of law and equal access to justice).

Indicator	Sonipat District	Haryana State Context	All-India Average	Analysis & Implication
Number of Courts	District Court Complex in Sonipat City. The specific count of courts is dynamic.	Haryana has a total of 435 Courts (District & Subordinate).	India has over 20,000 District & Subordinate Courts.	The physical infrastructure exists. The key metric is the caseload per court.
Case Pendency Rate	Data Specific to Sonipat Not Readily Available	In Haryana District Courts, 85.4% of all IPC cases were pending at the end of 2022.	At the All-India level, 75.5% of IPC cases were pending in District Courts.	Haryana's pendency rate is 10 percentage points higher than the national average, indicating severe strain on the judicial system and delayed justice for residents of Sonipat and the State.
Police Pendency (Cases Under Investigation)	40.8% of IPC cases were pending investigation at year-end in Sonipat.	36.9%	31.1%	Sonipat's investigation pendency is worse than both the state and national averages, pointing to potential resource constraints or complex cases within the police department.

Sources and Notes: NCRB, 2022

Table 3.3: Infrastructure and Connectivity (Enablers of Development)-This relates to SDG Target 16.7 (ensure inclusive decision-making) by ensuring physical access to administrative centres.

Indicator	Sonipat	Haryana	All-India	Analysis & Implication
Road Connectivity to Villages	100% of inhabited villages have access to a pucca road.	99.8% of inhabited villages have access to a pucca road.	90.4% of inhabited villages have access to a pucca road (Pradhan Mantri Gram Sadak Yojana, 2023).	Sonipat is fully connected, outperforming the national average by a significant margin. This represents a considerable governance achievement, enabling access to markets, schools, healthcare facilities, and government offices.
Digital Connectivity	53.98% Internet penetration	55.47%	52%	Near state and national averages. Digital connectivity is crucial for accessing e-governance services (e.g., Haryana's SARAL portal) and promoting transparency.

Sources and Notes: Census 2011; TRAI, 2023. Internet penetration estimated from Haryana data.

Table 3.4: Civic Participation and Inclusion-This relates to SDG Target 16.7 (ensure responsive, inclusive, and participatory decision-making).

Indicator	Sonipat District	Haryana State Average	All-India Average	Analysis & Implication
Voter Turnout	Sonipat Lok Sabha Constituency: 66.48% (2019 General Election)	65.5%	65.8% (2024 Lok Sabha Election)	Turnout in the Sonipat constituency was near the State and national averages in the last major election, indicating a moderate level of civic engagement.
Female Voter Turnout	Data Specific to Sonipat Not Readily Available	66.7%	67.2%	Haryana's female voter turnout has historically been slightly below the national average; however, it has been rising, a positive sign of increasing inclusive participation.
Representation in Local Governance	Data on elected women & SC representatives in Sonipat's PRIs/ULBs is maintained at the state level.	Haryana has 33% reservation for women in Panchayats and Urban Local Bodies.	Constitutionally mandated 33% reservation for women in PRIs.	The institutional framework for inclusive representation is strong. The effectiveness of this representation is a qualitative measure of governance.

Sources and Notes: Lok Sabha Election, 2024; and General Election, 2019.

3.4 Peace and Security: A Strained Law and Order System

A summary snapshot of the situation is the following:

Violent Crime: Sonipat's rate of cognisable crimes (260.2 per lakh population) is above both the Haryana state (258.3) and All-India (238.8) averages. While the rate dipped in 2021, it increased again in 2022.

Crimes Against Vulnerable Groups:

Women: The rate of crimes against women in Sonipat is a significant concern and does not follow the relative slowdown observed at the state and national levels.

Children: Crimes under the POCSO Act remain persistently high, indicating a serious challenge despite not showing a sharply increasing trend.

Scheduled Castes: While the rate of crimes against SCs under the Prevention of Atrocities Act is lower than state and national averages, Sonipat has experienced a sharp recent increase, contrary to broader trends.

The data indicate a law and order machinery under significant stress, with particular implications for the safety and security of vulnerable sections.

Law and order, being a public good, are a prerequisite for an inclusive society. This entails ensuring overall law and order, as well as enforcing protective legislation for vulnerable sections of society. Though the Police, as an organisation authorised by a collectivity to regulate social relations within itself by utilising, if need be, physical force, are of relatively recent vintage, the functional relationship of policing and order is 'ubiquitous in human society'.

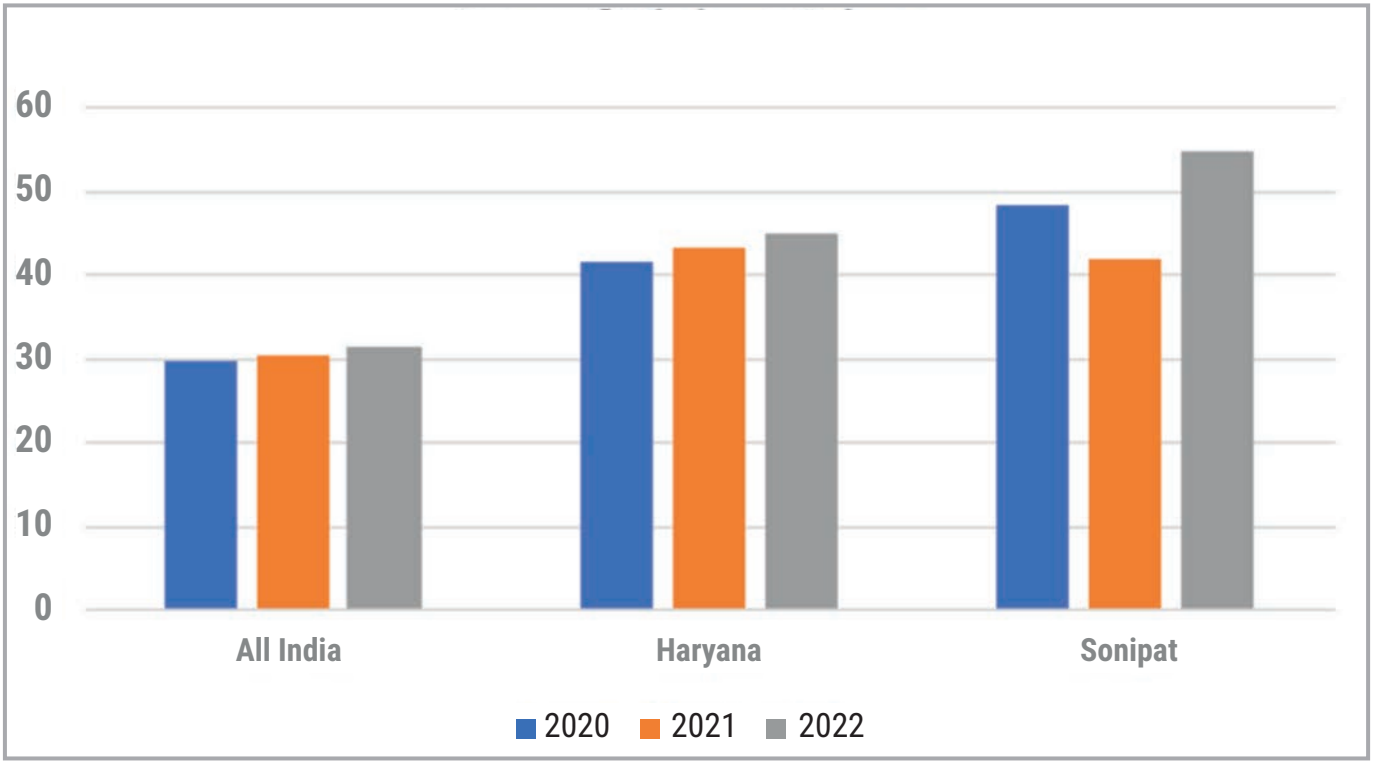
Sonipat, being an industrial and educational hub bordering Delhi, faces unique law and order challenges. The crime rate is a key indicator of peace and security.

National Crime Records Bureau data and Police HQ data are important sources of information to assess the status of peace and security in Sonipat district, concerning overall incidence of violent crime (including deaths due to violent crime), crimes against women and children and crimes against SCs as covered by the Prevention of Atrocities Act.

Figure 3.1 indicates that the rate of violent crimes in Sonipat is higher than the All-India figure. It recorded a sharp decline between 2020 and 2021, followed by an uptick in 2022, adhering to the trend for the State as a whole.

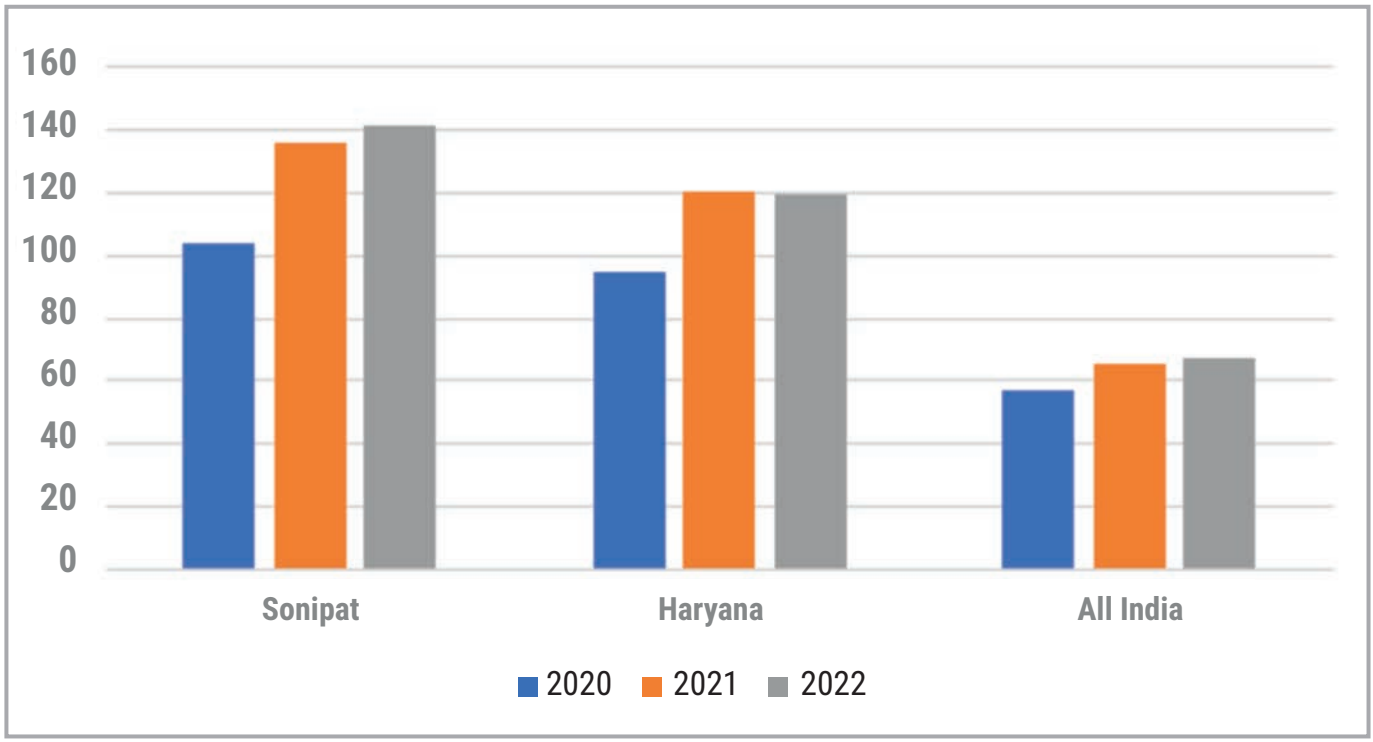
Figure 3.2 indicates that Sonipat district as a whole (thus far, the data do not provide an insight into intra-district variations) has a problem of violence against women that does not conform to the relative slowing down of violence against women in Haryana and India.

Figure 3.1: Rate of Violent Crime



Sources and Notes: NCRB, 2022. The figure plots the violent crime rate in Sonipat vis-à-vis the state and national average.

Figure 3.2: Rate of Crime against Women



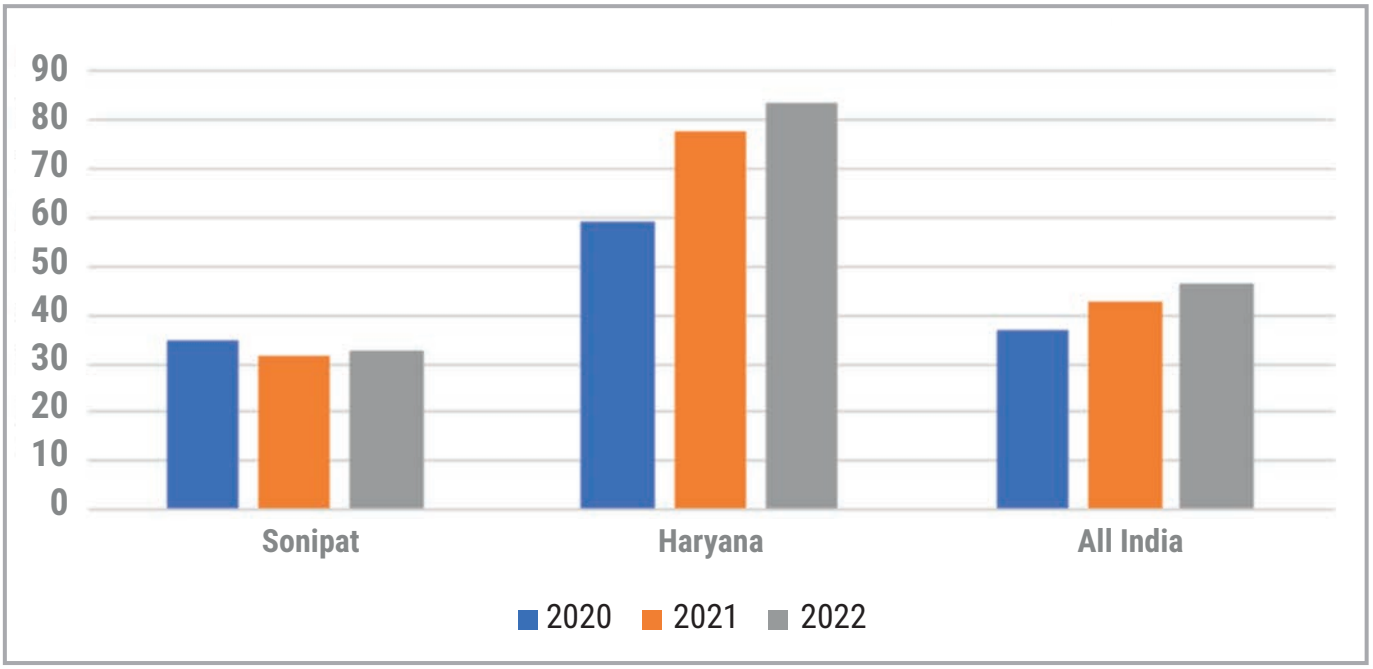
Sources and Notes: NCRB, 2022.

Figure 3.3 indicates that while Crimes against Children (as covered under POCSO) in Sonipat do not exhibit an increasing trend, similar to that of Haryana and the all-India rate, the rates are still high, and the efforts underway in the district need to be further strengthened.

The rate of incidence of crimes against Dalits (as covered under the Prevention of Atrocities Act) in Sonipat district is lower than the average for Haryana and all-India. At the same time, Figure 3.4 indicates that the trend is one of a significant increase in crimes against Dalits in Sonipat, unlike that in Haryana, where the rate does not increase, or all-India, where the rate of increase is lower.

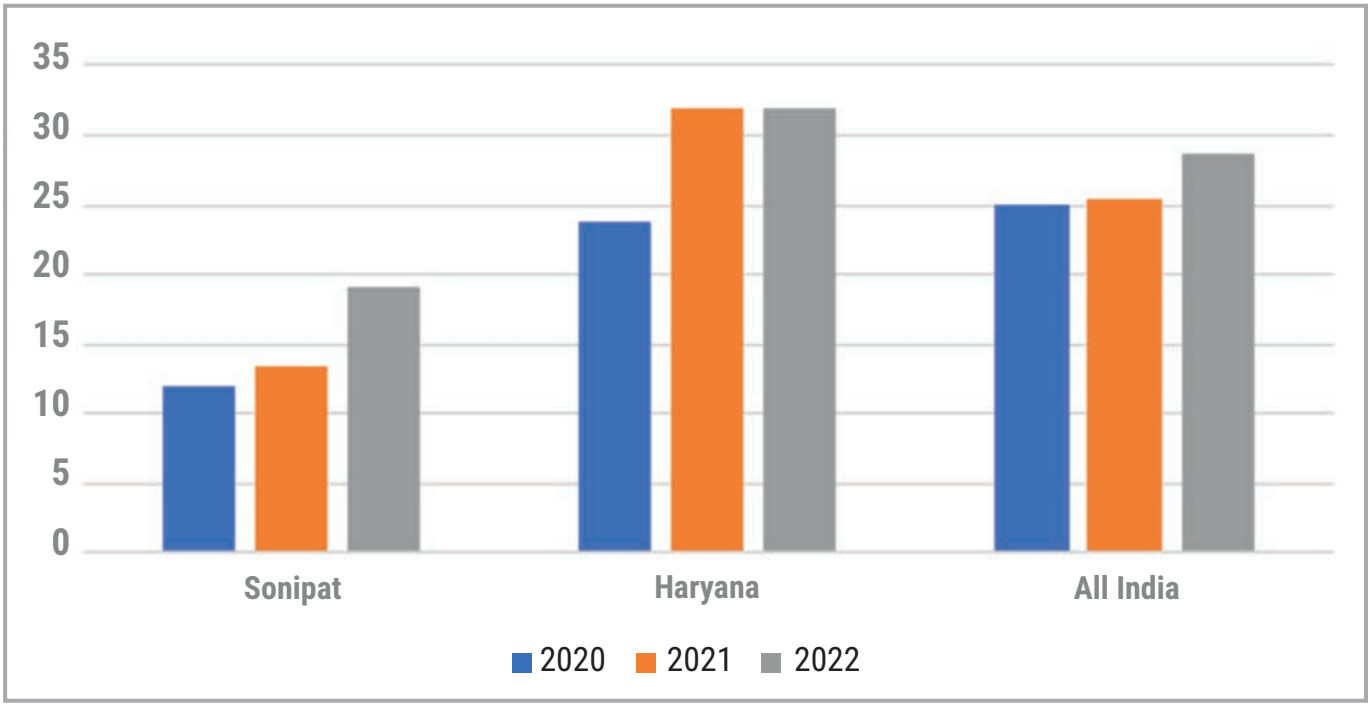
Sonipat is part of a state (Haryana) that has a crime rate slightly above the national average. However, due to its socio-economic profile, Sonipat's own rate is among the higher in the State. An effective response of the law enforcement machinery to violence against vulnerable sections of the society,

Figure 3.3: Rate of Crime against Children



Sources and Notes: NCRB, 2022.

Figure 3.4 Rate of Crime against SC



Sources and Notes: NCRB, 2022.

namely women, children, SCs and senior citizens, goes a long way in ensuring peace and inclusivity. Steven Luke asserts that "power, expected to be unchallenged, still requires the participation of the powerless, who thus set limits to power." It is the popular perception of law-and-order management that holds the key to good governance.

The overall control of violent crimes is a function of the effective implementation of relevant laws, programmes, and schemes, such as the victim compensation scheme, which can enable a positive change in social and educational status.

3.5 Access to Justice: Institutional Capacity Constraints

A quick snapshot of the situation under this head is as follows:

Policing: The Police Population Ratio in Haryana (~195/lakh) is higher than the national average (152.8), but vacancies are common. Sonipat's police investigation pendency rate (40.8% for IPC cases) is worse than both the state (36.9%) and national (31.1%) averages, suggesting resource constraints or procedural inefficiencies.

Judiciary: The justice system faces severe delays. At the state level, 85.4% of IPC cases were pending in District Courts, significantly higher than the national pendency rate of 75.5%. This indicates a systemic backlog that directly impedes timely justice for residents of Sonipat.

Policing in Sonipat

The capacity and accessibility of the Police are crucial for justice and security.

- **Police Population Ratio (PPR):** The sanctioned PPR for Haryana is approximately 195 police per lakh population (against the national average of around 152.8 per lakh as of 2022). However, the actual strength often has vacancies. Sonipat is likely to face similar staffing challenges, which could impact beat policing and response times.

- **Infrastructure:** Sonipat has a modern District Police Headquarters. It is divided into multiple police ranges and circles, with numerous police stations and posts. The district has actively adopted technology, including the use of CCTV surveillance in urban areas and social media for public interaction.

- Initiatives, such as all-women police stations and dedicated helplines for women and cybercrime, exist. However, public perception of police effectiveness and accessibility can vary, with typical grievances related to delays in FIR registration and investigation.

Judiciary in Sonipat

A strong judiciary is the backbone of the justice delivery system.

- **Structure:** Sonipat has a District & Sessions Court complex, which houses courts of Additional District Judges, Civil Judges, and Judicial Magistrates. It also has specialised courts for cases like POCSO and NDPS.

- **Case Pendency:** This is a critical challenge. Like most of India, Sonipat's courts face a significant backlog of cases. While exact district-level pendency rates are not publicly consolidated, Haryana's judiciary faces a considerable burden. Delays in the delivery of justice remain a primary concern for citizens and institutions.

- **Alternative Dispute Resolution (ADR):** Lok Adalats (People's Courts) are regularly organised in Sonipat to settle disputes (especially motor accident claims, matrimonial, and civil cases) outside the formal court system, providing a faster, though not always comprehensive, form of justice.

To ensure access to justice for all, the Government of Haryana is supporting a network of courts and other judicial bodies, including for the specific resolution of disputes and for legal research relating to sexual violence against women and children.

3.6 Strong Institutions: Contrasting Infrastructure with Governance Gaps

- **Strengths:** Sonipat has 100% road connectivity to inhabited villages, a considerable achievement that facilitates access to services and markets. Digital connectivity is near State and national averages, enabling e-governance.

- **Challenges:** Despite constitutional mandates for representation, the effectiveness of local governance is hampered by the inadequate devolution of funds, functions, and functionaries to PRIs and ULBs. This limits their autonomy and accountability.

Sonipat district was carved out of Rohtak district in 1972, within six years after the creation of the Haryana state on 1 November 1966. The basic structure of the district administration is outlined in Figure 3.5, which covers civil administration, Police, judiciary, and local governance institutions.

The empowerment of vulnerable sections is covered under constitutional provisions for reservation in the three-tier panchayat institutions. This is to ensure adequate representation of all sections of society. Women constitute 50 per cent of sarpanches in Sonipat, as they do across Haryana.

A significant challenge is the inadequate devolution of funds, functions, and functionaries. Gram Panchayats remain heavily dependent on grants from the state and district administration, limiting their ability to plan and execute projects based on local priorities. This undermines the very essence of "strong institutions" at the grassroots level.

The state government must operationalise the provisions of the Haryana Panchayati Raj Act in letter and spirit. This involves clearly defining and transferring the "list of functions" to PRIs and ULBs, along with commensurate financial grants and the authority to generate own-source revenue.

The foregoing analysis reveals Sonipat as a district with strong foundational infrastructure (100% road connectivity and increasing digital access). Yet, it faces significant challenges in the efficiency and capacity of its justice and law enforcement systems.

- **The Strength**: Excellent rural connectivity facilitates access to government services and economic opportunities, forming a solid physical foundation for governance.

- **The Challenge:** Sonipat's higher-than-average crime rate, coupled with Police and judicial pendency rates that exceed both state and national levels, indicates a system under significant stress. This directly impedes the "access to justice for all" principle of SDG16.

Figure 3.5 District Administration Structure of Sonipat.

Sources and Notes: Sonipat district administration
Please note that updated data regarding the deployment of staff (including those under contractual appointment) is not available in the public domain; however, it could possibly be generated from existing records of the state government and district treasury.

3.6.1 Fiscal Decentralisation: Grant-in -Aid to Local Bodies in Sonipat District

A critical dimension of strengthening institutions at the grassroots level is ensuring fiscal decentralization through predictable and adequate financial transfers. The Central Finance Commission (CFC), also known as the Finance Commission of India, is constituted under Article 280 of the Constitution of India and has the mandate to set guidelines for grants-in-aid of state revenues out of the Consolidated Fund of India, as per Article 275. In recent years, the Finance Commission has focused on improving local governance by giving grants to Panchayati Raj Institutions and Urban Local Bodies. The 15th Finance Commission recommends both tied and untied grants for rural local bodies. Tied grants are allocated explicitly to Panchayati Raj Institutions for basic services like drinking water

supply, rainwater harvesting, and sanitation. Untied grants can be used to address specific local needs. These transfers supplement state resources and are intended to promote fiscal decentralization, enhance accountability, and ensure the delivery of basic public services at the grassroots level.

For the Sonipat district, such grants constitute an important fiscal support mechanism for rural local bodies, helping them to improve the delivery of basic services at the regional level. The district has one municipal corporation, Sonipat, and four municipal committees: Ganaur, Gohana, Kundli, and Kharkhoda.

Grant-in-Aid to Rural Local Bodies (RLBs) in Sonipat

Figure 3.6 presents the allocation of grant-in-aid to rural local bodies in Sonipat. While the absolute transfers to Sonipat have fluctuated over the years, the district's share in Haryana's overall allocation has remained relatively steady at about 5.6 to 6 percent. The significant increase in 2024-25 (RE) reflects higher central transfers, particularly under the tied component related to drinking water and sanitation, which are critical for sustaining basic rural infrastructure and services.[3]

Grant-in-Aid to Urban Local Bodies (ULBs) in Sonipat

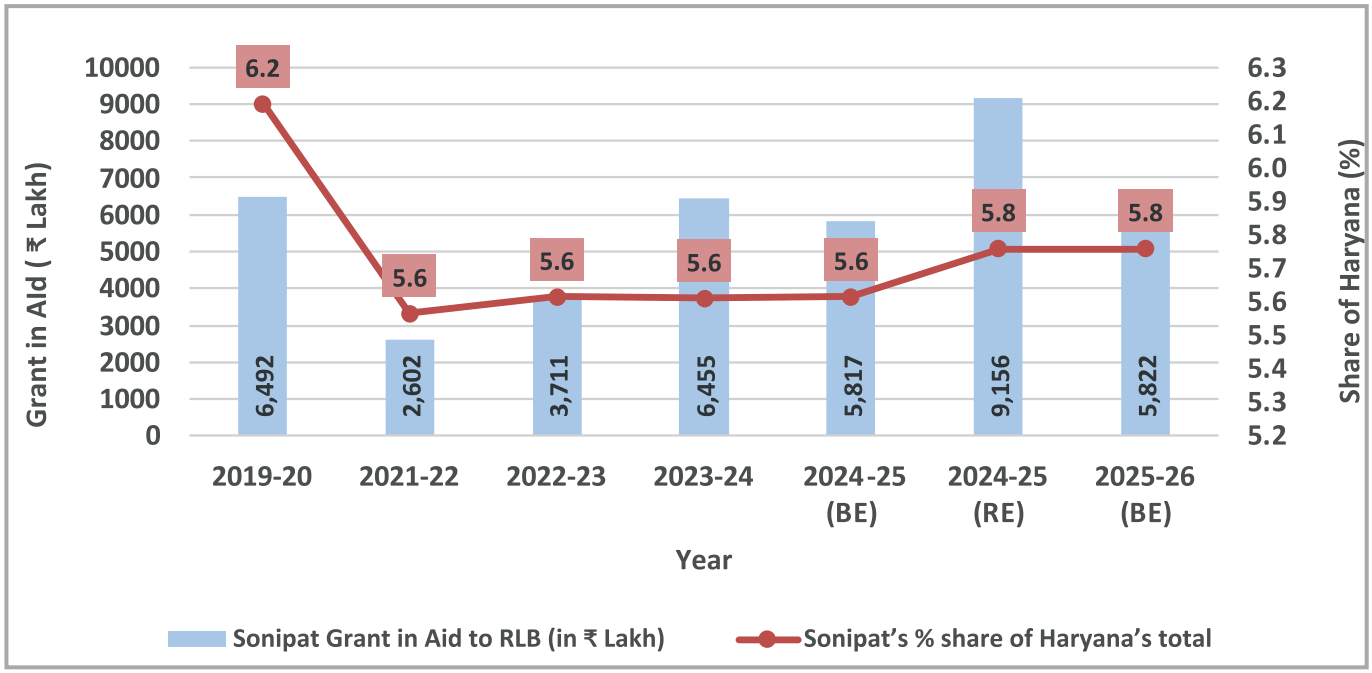
Figure 3.7 shows the grant-in-aid allocations to the Sonipat Municipal Corporation and its percentage share of Haryana's total. While the absolute transfers were highest in 2019-20, they dropped sharply in 2023-24 before increasing in the following years. The Sonipat Municipal Corporation's share of Haryana's total grant-in-aid has been between 3% and 9% over the last 5 years.

Municipal Committee-wise Allocations

Figure 3.8 shows grant-in-aid allocations to Municipal Councils and Committees in Sonipat District over the period. While Gohana and Kundli receive comparatively higher allocations, Kharkoda and Gannaur have smaller but relatively stable shares. Gohana, being one of the largest towns in the Sonipat district, attracts higher allocations. In particular, Kundli has experienced significant industrial and residential development, resulting in an increase in allocations over the years.

Overall, these fiscal transfers highlight the importance of financial empowerment for local institutions in achieving SDG 16's goal of effective, accountable, and inclusive institutions at all levels. Ensuring that such grants are used transparently and effectively through regular audits and participatory planning can significantly strengthen local governance in Sonipat.

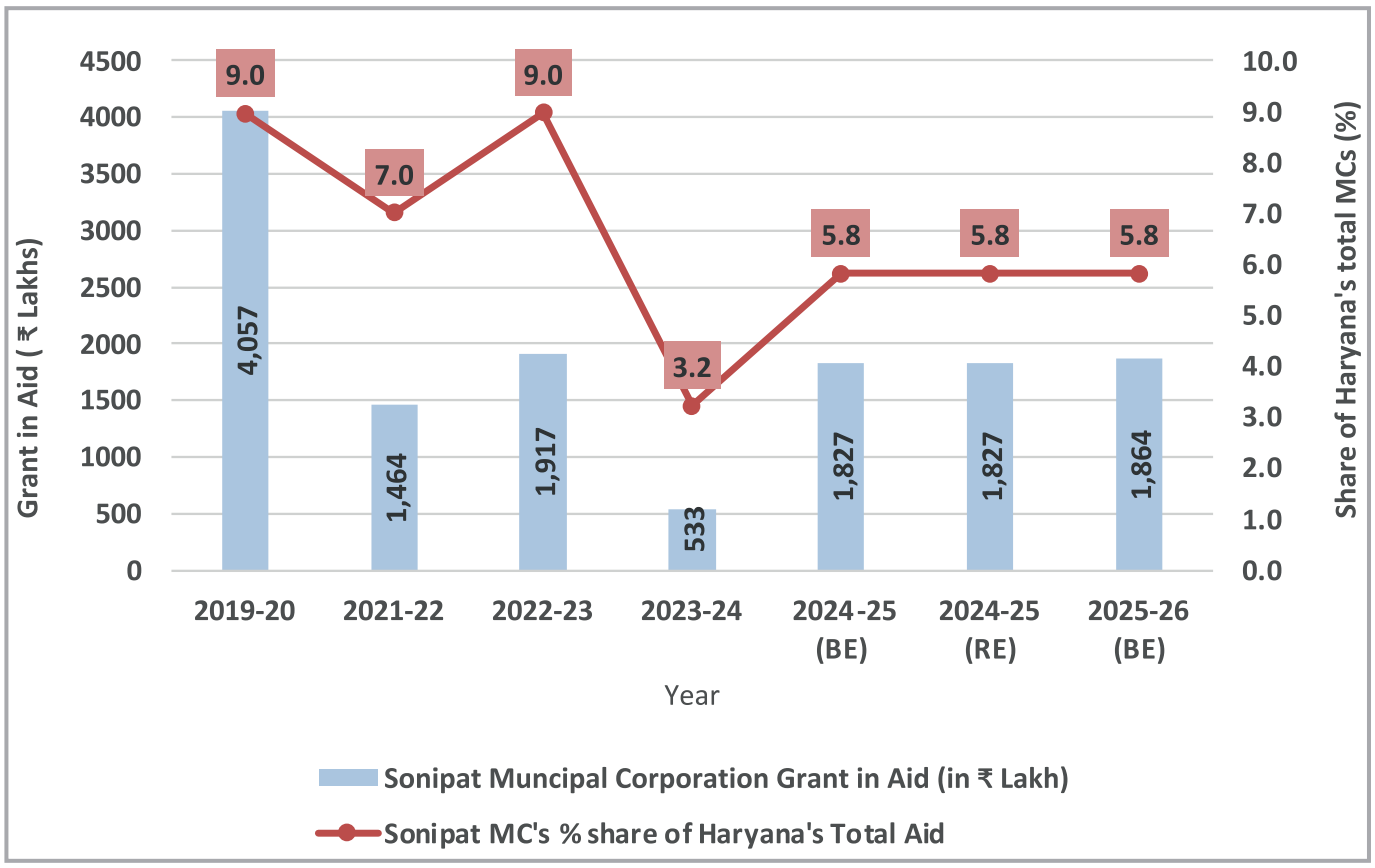
Figure. 3.6: Grant-in-Aid to Rural Local Bodies in Sonipat (Lakh) and Share in Haryana (in %)



Sources and Notes: Finance Department, Government of Haryana

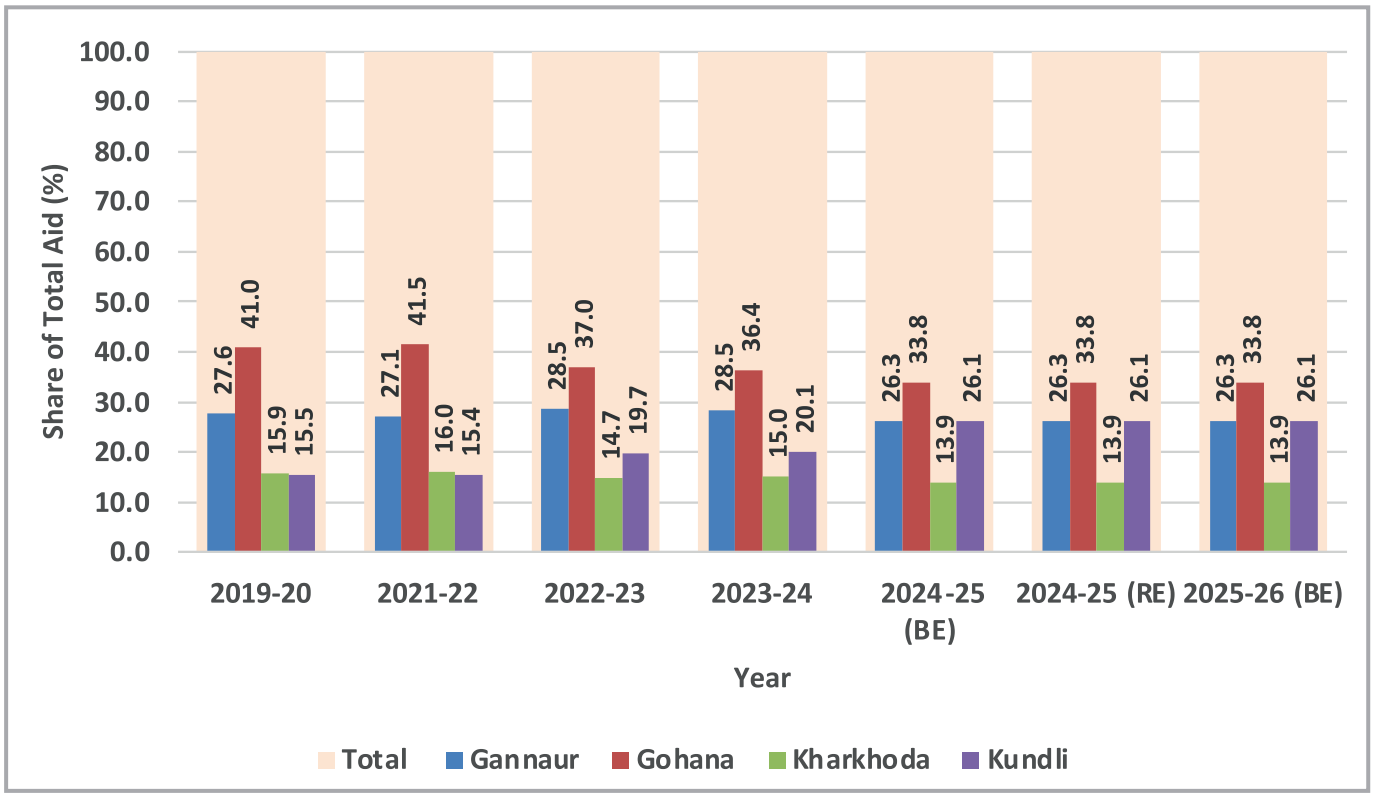
[3] Haryana Finance Department, *Budgetary Transfers to Local Bodies: Budget 2024-25* (Government of Haryana, February 2024), https://finhry.gov.in/budget-2025-26/

Figure. 3.7: Grant-in-Aid to Sonipat Municipal Corporation (Lakh) and Share in Haryana (in %)



Sources and Notes: Finance Department, Government of Haryana

Figure 3.8 : Municipal Committees-wise allocations of Grant-in-Aid (in %)



Sources and Notes: Finance Department, Government of Haryana

3.6.2 The Khap Panchayat Dynamic

Khaps are traditional, extra-constitutional institutions that wield significant influence in rural Sonipat. They operate as parallel mechanisms for dispute resolution and social control. While they offer speed and cultural familiarity, their relationship with formal legal frameworks and modern principles of gender and caste equality is complex and often contentious. Their role represents a significant, data-poor variable in Sonipat's institutional landscape.

These traditional village institutions, dating back to the medieval period (13th to 14th centuries CE), replicate conventional power relationships in the village and enjoy considerable influence in rural society in Sonipat, as they do across Haryana, Delhi, western Uttar Pradesh, and Rajasthan.

Khaps, as a generic category, comprise more than one village organised into a council, but they are of various types in terms of leadership and jurisdiction. Some of the khaps have leadership preponderantly from one gotra (clan), belonging to the dominant land-owning community. At the same time, members of other gotras and communities are also present, but in smaller numbers in terms of population and with a minimal area of land. Some of the khap villages are dominated by one community, but with more than one gotra. Many other khaps, which cover several villages, comprise multiple communities and castes and gotras. In some villages, leaders may be from a single community, while in other villages, leaders may represent multiple communities and various gotras. In sum, khap leadership and jurisdiction can be quite diverse.

"Khap Panchayats remain popular among the people for many reasons: they do not involve any money; they are less time-consuming; there is a direct negotiated settlement between both parties before a large audience that includes persons of authority in the panchayat; they help to maintain social order among people of different castes; and they act as an important agency of social control. These factors have contributed to its long-term survival.

The State and the local administration usually do not interfere in the functioning of the Khap Panchayats, avoiding any confrontation with them even when the courts decide against them, which is a pointer to the entrenchment of the Khap Panchayat in rural society."[4]

Khaps throughout history and in the present times have had a significant utility in the political sphere. "Khaps and their authority were made use of for various purposes by political overlords, including the Mughals and the British, and this also benefited those at the helm of khap affairs. With independence, a democracy based on secular principles, courts and the principle of the rule of law, khaps ought to have faded away, but an asymmetrical pattern of landownership combined with a potent mix of caste, customs and patrilineal norms of inheritance, to name only a few, has ensured their survival in many rural areas."[5]

These bodies exist and operate outside the ambit of formal institutions of law, order, and justice, and as such, are extra-constitutional mechanisms that cannot and need not be wished away. It is also true that the relationship between khap panchayats and movements has evolved. "From their active participation during the farmers' movement of 2020–21 to their extension of support to the protesting wrestlers in 2023, khaps have sought to regain legitimacy by addressing rural–agrarian concerns amid perceived socio-economic and political shifts. Khaps, which had long been viewed as sites of patriarchal control and authority, are being recast. They also act as an instance of interaction of the traditional authority of institutions like khaps with the modern state."[6]

When it comes to issues such as quick justice, safety concerns in the village under a Khap panchayat, or negotiating with other villages in socio-cultural matters, Khap panchayats can and do play a significant role. In the absence of reliable data on the provenance of Khap panchayats, their membership, class and caste composition and descriptive statistics regarding the issues taken up by Khap panchayats in Sonipat, it is difficult to arrive at any firm conclusions except that traditional village institutions can and do play a significant role in sustaining the fabric of rural society. It would be crucial to take the Khap panchayats seriously and clearly demarcate their jurisdiction, while adhering to Supreme Court judgments. This could reinforce

[4] Sangwan (2008)
[5] Kumar (2012)
[6] Hooda (2024)

efforts towards greater community participation and sustenance of programmes and schemes that require grievance articulation and timely redressal. While there are legitimate concerns regarding the persistence of patriarchy and casteism, the institution of Khap could also supplement efforts already underway to promote alternative dispute resolution modalities, reduce the caseload on official judicial institutions, and possibly contribute toward justice for all.

3.7 The Prescriptive Pathway: A Framework for Action

Based on the diagnostic above, the following normative actions are proposed to bridge the gap between the current state and the goals of SDG 16.

The pathway to achieving SDG16 must be paved with deliberate reforms that prioritise decentralisation, leverage technology for transparency, strengthen the justice system, and foster inclusive and participatory governance. A capsule of action points follows:

Strengthening Law Enforcement and Enhancing Security

- **Address Capacity and Sensitivity:** Conduct targeted recruitment to fill police vacancies and implement mandatory, continuous training for Police on handling crimes against women, SCs, and children.
- **Build Community Partnerships:** Expand community policing initiatives and promote youth awareness programs on the impact of crime. Strengthen helplines and integrate them with One-Stop Centres (Sakhi) and hospitals for a robust survivor support system.
- **Leverage Technology:** Enhance the use of CCTV and data analytics for predictive policing in high-crime areas, while ensuring civil liberties protections.

Reforming the Justice Delivery System for Equity and Speed

- **Reduce Judicial Pendency:** Prioritise increasing the number of courts and judicial officers in Sonipat. Systematically promote Alternative Dispute Resolution (ADR), including Lok Adalats, and research the role and practices of Khap Panchayats to identify areas for constructive engagement within the constitutional framework.
- **Enhance Legal Awareness and Aid:** Collaborate with law schools (e.g., O.P. Jindal Global University) to run legal literacy campaigns and strengthen the capacity of Legal Aid Clinics to reach underserved populations.

Building Effective, Accountable, and Transparent Institutions

- **Empower Local Governance:** Operationalise the Haryana Panchayati Raj Act by ensuring genuine devolution of powers and resources to PRIs and ULBs. Provide robust training for elected representatives, especially women and SC members, in governance, budgeting, and project management.
- **Drive Digital Integration:** Create a unified district dashboard on the Antyodaya Saral portal, integrating land records, FIR tracking, municipal services, and court case statuses to enhance transparency and accessibility.
- **Implement Social Audits:** Institutionalise regular social audits of all major government schemes and panchayat projects to ensure accountability and community participation.

Ensuring Inclusive and Participatory Decision-Making

- **Build Leadership Capacity:** Offer specialised training for women and candidates from marginalised communities to effectively contest elections and discharge their duties, particularly in light of the National Women's Reservation Act 2024.
- **Leverage Technology for Planning:** Equip PRIs with GIS tools for evidence-based planning and monitoring of development activities, integrating community inputs from Gram Sabhas.

Create a Bridge Cadre: Develop a cadre of young volunteers to facilitate citizen access to welfare schemes and government services, improving last-mile connectivity.

Policy and Institutional Coherence

Recognising the crucial roles that other partners play in improving human development outcomes, including mobilising citizens and assisting with more effective implementation, it is critical to create a well-

defined space for effective engagement between governments, CSOs, academics, development practitioners, and businesses. Such partnerships could help the government gather additional data to track progress and establish networks to reach citizens, share tools, and exchange experiences.

Data, monitoring and accountability

To make further progress on human development outcomes, a substantial amount of data will need to be produced and analysed – and this might pose a significant challenge for existing statistical systems and data generators. Governments already generate a substantial amount of development data. As a result, data-driven decision-making has become the norm. At the same time, development data can get separated into silos and disconnected systems. As it is challenging to unify development data, policymakers are often compelled to make critical decisions based on incomplete or inadequate data. Frequently, policymakers must rely on readily available data or data they already possess, rather than drawing on the full range of available data on interconnected issues. Administrative data can be an essential source of panel data.

There needs to be a better alignment of administrative and statistical data. Efforts need to be made to rationalise data generation at the district level and simplify utilisation of data at the district level. This would also involve developing the architecture of an integrated monitoring system at the district level and building capacity to conduct regular monitoring. Easy-to-use tools, such as human development scorecards, can be designed to enable the tracking of development at the community, panchayat/ward, block, and district levels. In doing so, technological solutions will also be explored to ensure that errors are minimised, and data collected can be utilised with less time lag.

Furthermore, a district data platform can be established to promote data-driven decision-making with data that is timely, granular, and reliable. The data can reveal the interlinkages of different sectors and allow policymakers to identify the root causes of barriers to policy effectiveness.

3.8 Conclusion: The Imperative of Collaborative Governance

Achieving good governance in Sonipat requires a deliberate shift from business-as-usual to a collaborative, multi-stakeholder model. The Sonipat district administration alone cannot surmount the challenges of crime, judicial delay, and institutional strengthening. Progress hinges on forging active partnerships between government, universities, civil society, industry, and citizens. By aligning the district's strong infrastructure with a renewed commitment to efficient, equitable, and participatory institutions, Sonipat can truly transform into a model of sustainable and inclusive development as envisioned by SDG 16.

Chapter 4

HEALTH IN HUMAN DEVELOPMENT

"The real wealth of a nation is its people. And the purpose of development is to create an enabling environment for people to enjoy long, healthy, and creative lives. This simple but powerful truth is too often forgotten in the pursuit of material and financial wealth." – Mahbub ul Haq

Indranil Mukhopadhyay and Mushruff S

4 HEALTH IN HUMAN DEVELOPMENT

*Indranil Mukhopadhyay and Mushruff S**

This current assessment of the health situation in Sonipat is primarily drawn from existing publicly available secondary data sources. Our analysis clearly points out that Sonipat is doing better than most districts in the state and even the state and national averages in terms of many indicators. For instance, it has achieved universal coverage of institutional deliveries, which goes a long way in achieving safe motherhood. Connected to this is the lower IMR in the district, which is near the achievement of the SDG on IMR. However, Sonipat lags behind the state and national averages on specific indicators. High prevalence of TB, low female sex ratio, poorer nutritional status, low ANC and immunisation coverage need greater policy attention. The delivery of primary care, particularly for services beyond maternal and child, especially for NCD, needs considerable attention. Particularly, the impact of the Ayushman Bharat scheme needs better evaluation and understanding. Sonipat is also a land of drastic socio-economic transformations, with rapid urbanisation and migration, considerable inequities based on caste, gender and wealth. A large part of the Sonipat workforce and residents are migrants from other parts of the country, and typically without any social health protection. Any efforts towards development of Sonipat and improving the health condition of the people have to take into account the migrant people, Dalits, and women, not only for its ethical and constitutional reasons of social justice but even from the perspective of economic prosperity of the district, since these sections constitute a major share of the workforce in the district. We need continuous engagement with the district health system and the different authorities engaged in delivering public services to foster a sustainable partnership to contribute to the cause these institutions are already committed to and engaged with.

4.1 Introduction

A close linkage exists between improvements in health status and overall well-being, and development and prosperity at an individual and societal level. The interesting feature of health is that it is not a consumption good which will give instant improvements in well-being. Instead, it is an investment that gives future returns in the sense of capital investment. As one ages, their stock of health depreciates like any other capital. This is one way of looking at health, where health is a human capital and is a fundamental requirement for economic development.

Across the world, the major responsibility of creating this capital at an individual level or at a societal level rest with governments. It is now much better understood that a well-educated, healthy, and well-nourished workforce pays bigger dividends to the economy than mere investment in building new roads and bridges. Literature suggests that investment in the health of pregnant women, young children and adolescents supports people throughout the lifecycle and yields rich returns decades later. Conversely, shocks like chronic malnutrition experienced early in life compromise physical and cognitive development and set people on low production trajectories for life.

Health has its instrumental and intrinsic importance. This calls for public action or an active role of the state in enhancing health outcomes, creating capabilities, and fostering development. In understanding health as capability, it is important to recognise the role of equity and justice. Equity implies a progressive arrangement of social justice. The differences that are socially unjust and avoidable would be iniquitous. Distributing limited resources in line with the principle of proportional justice, i.e., treating similar cases alike and different

* Indranil Mukhopadhyay was involved with the data analysis and report writing. Mushruff S was involved with data analysis for the chapter.

cases differently, is critical. Such appropriately disproportionate efforts are necessary to bring individuals as close as possible to a basic threshold of functioning, thereby enabling them to lead flourishing lives. Thus, health capabilities should be the central focal variable for assessing the equity and efficiency of health policy and law.

In this chapter, we bring out some of the key achievements and challenges, in terms of health outcomes and access to services, with a special focus on marginalised localities, communities, and social groups. We also analyse the healthcare system of Sonipat, which involves public, autonomous and private entities, with their diversities and complexities, identifying key challenges. This involves a thorough understanding of the inputs (human resources, finances, physical infrastructure and services, and medicines and technologies) and processes (governance and accountability). We bring in an assessment of key schemes and programs like Prime Minister's Jan Arogya Yojana (PMJAY)+ Chirayu, Ayushman Arogya Mandir, National Health Mission and Employees' State Insurance Scheme (ESIS) with a specific focus on their impact on improving access to care for the marginalised communities (migrant workers, Women, Dalits and other vulnerable groups). We also try to identify some geographies or sections of the population that need special attention.

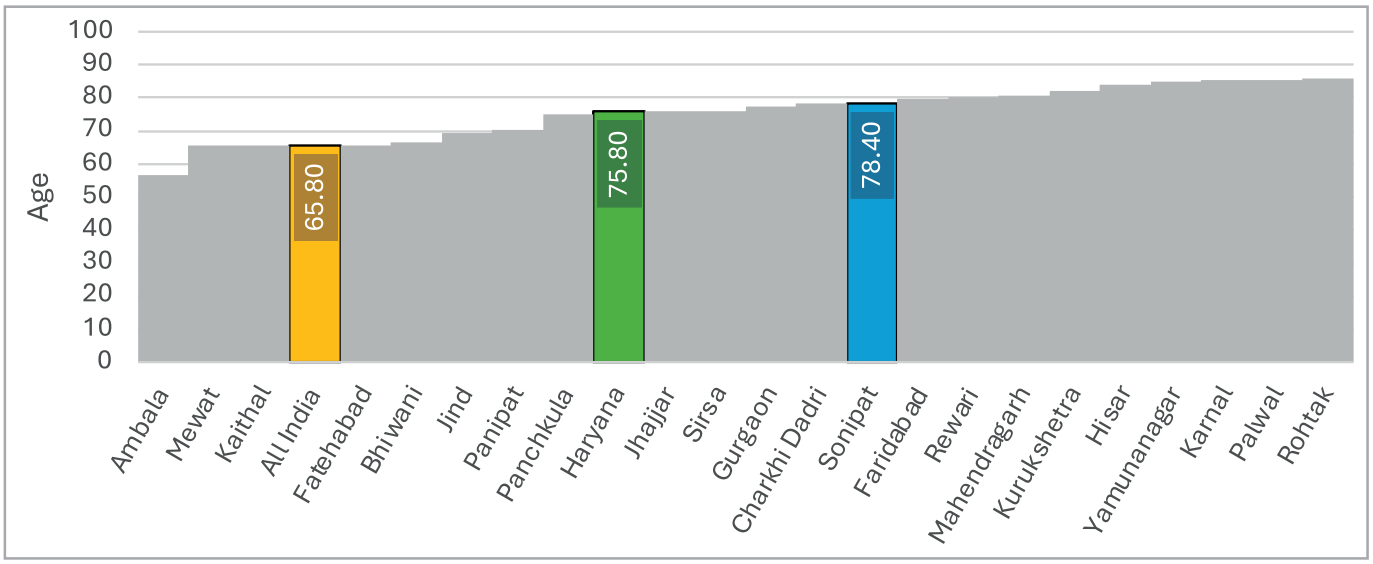
4.2 Health Status

In this section, we provide a comparative assessment of the key health outcomes, comparing people of Sonipat with other districts of Haryana and National averages. We consider a few critical indicators - Life Expectancy at Birth, Infant Mortality Rate, Sex Ratio, and nutritional status of children. We also discuss the changing disease patterns, focusing on a few important diseases or conditions related to women and children.

Life Expectancy at Birth (LEB) is one of the most comprehensive indicators to assess mortality and health status of the population. It summarises the mortality pattern that prevails across all age groups - children and adolescents, adults and the elderly.[1] LEB for the period 2019-21 for Sonipat district is 78.4 years, which is higher than the Haryana average of 75.8 years and the national average of 65.8 years (Figure 4.1). Sonipat's higher LEB reflects better health and socio-economic status in the district compared to the rest of the state and the country. It has to be noted that LEB has declined considerably due to the COVID pandemic across the country, which may not be captured well by NFHS data.

Female LEB is observed to be higher for women globally and this difference is centrally linked to complexity and interaction of biological, social and

Figure 4.1 : Life Expectancy at Birth in districts of Haryana: 2019-21



Sources and Notes: NFHS V (2019-21), Haryana State Report

[1] WHO defines LEB as "The average number of years that a newborn could expect to live, if he or she were to pass through life exposed to the sex- and age-specific death rates prevailing at the time of his or her birth, for a specific year, in a given country, territory, or geographic area."
https://www.who.int/data/gho/indicator-metadata-registry/imr-details/65

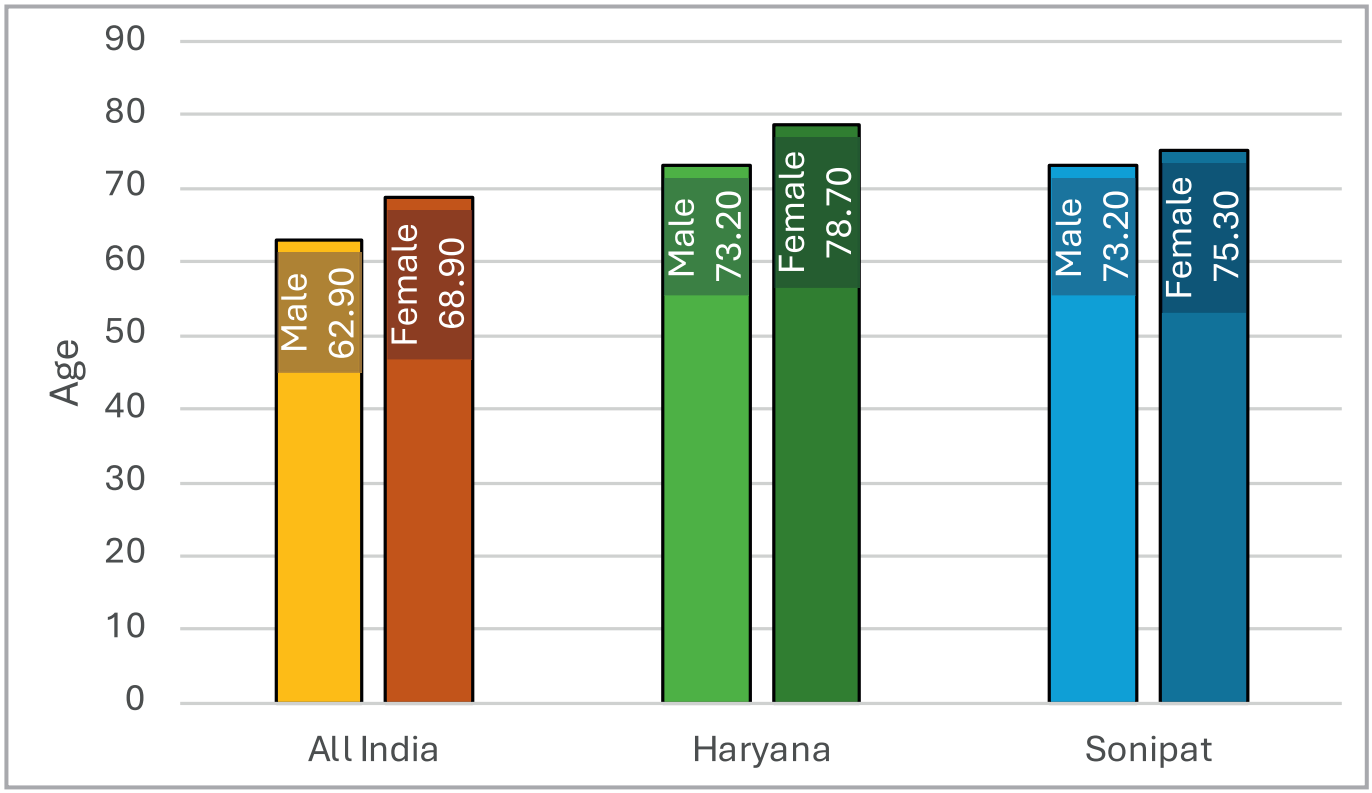
health service factors.[2] It has also been noted that the relative contribution of these factors varies across contexts. It is important to note that many Haryana districts have lower LEB for women. Among many other things, this reflects the poor social status of women in the state. However, for the district of Sonipat, female LEB (75.3) is higher than male (73.2) (Figure 4.2).

Infant and child mortality have traditionally been considered key indicators for assessing the social and economic well-being of the region, specifically, and the country in general.[3] Since the introduction of the National Rural Health Mission in 2005, there has been a considerable decline in the infant mortality rate (IMR). However, India could not meet the MDG target on IMR, and there remains considerable variation across states, districts, and social groups. It has always been a challenge to capture mortality data in India through surveys. There have been efforts to generate indirect estimates of Infant Mortality Rates for districts.[4] The latest available estimate is for the year 2017.

Here we have compared IMR estimates of 2017 with 2011. As depicted in Figure 4.3, there is an overall decline in IMR across districts. However, IMR in Sonipat (35.3) remains higher than the state and national average. Moreover, the extent of decline (depicted by the perpendicular gap between the orange and blue lines) remains much lower than in most districts in the state. Compared to the mean decline across districts of 35 per cent in this period, Sonipat experienced a 21 per cent decline. Given that Sonipat has experienced considerable migration, it is critical that issues of infant and child health are addressed more effectively.

It is also crucial to note that IMR has been negatively related to per capita income.[5] Haryana, being among the richer states of the country, and Sonipat, one of India's most prosperous districts, its performance in bringing IMR down needs introspection. As depicted in Figure 4.4, most districts in Haryana have higher per capita income compared to the national average, yet many districts continue to have higher IMR too.

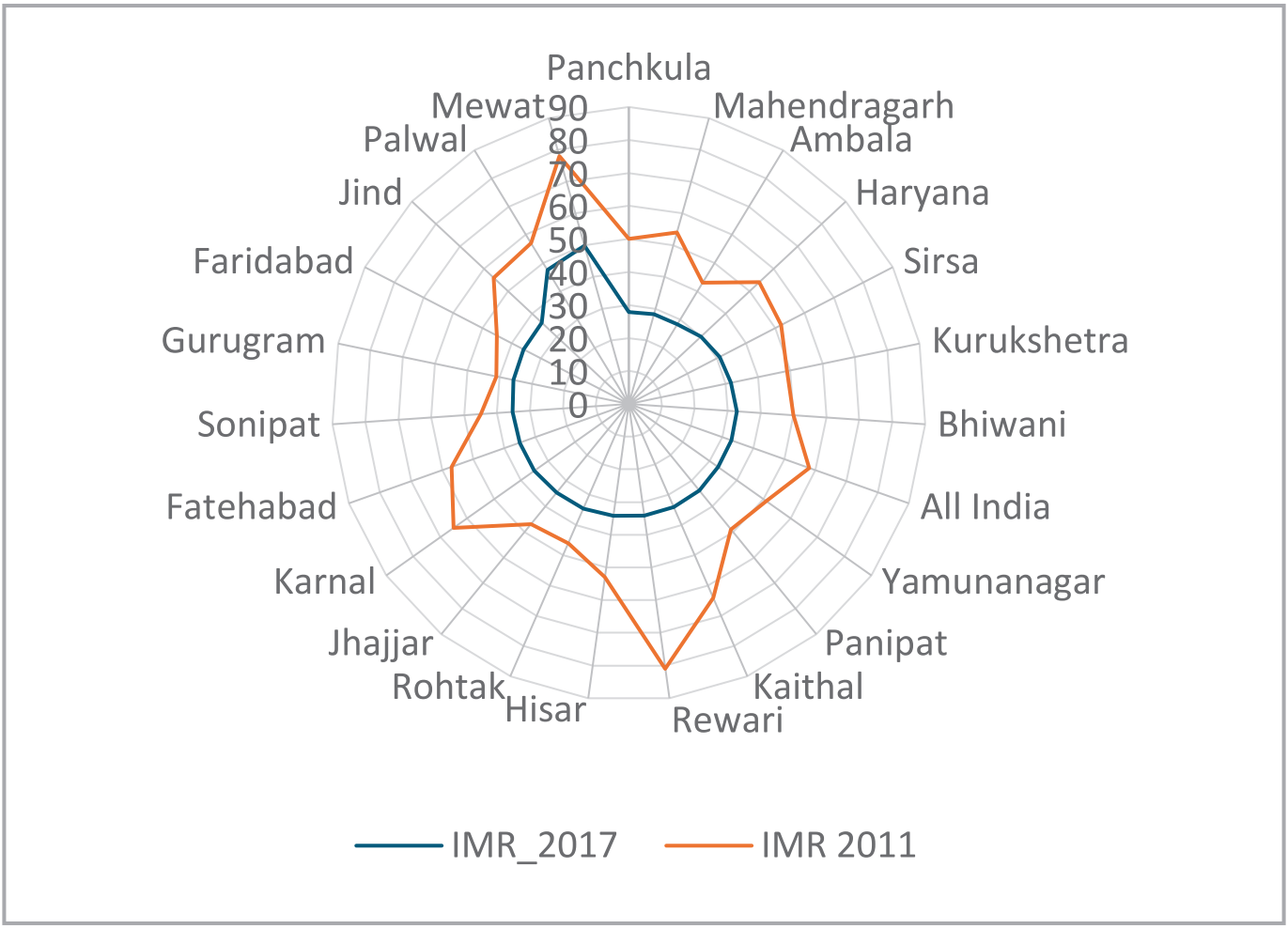
Figure 4.2: Life Expectancy at Birth by gender: 2019-21



Sources and Notes: NFHS V (2019-21), Haryana State Report

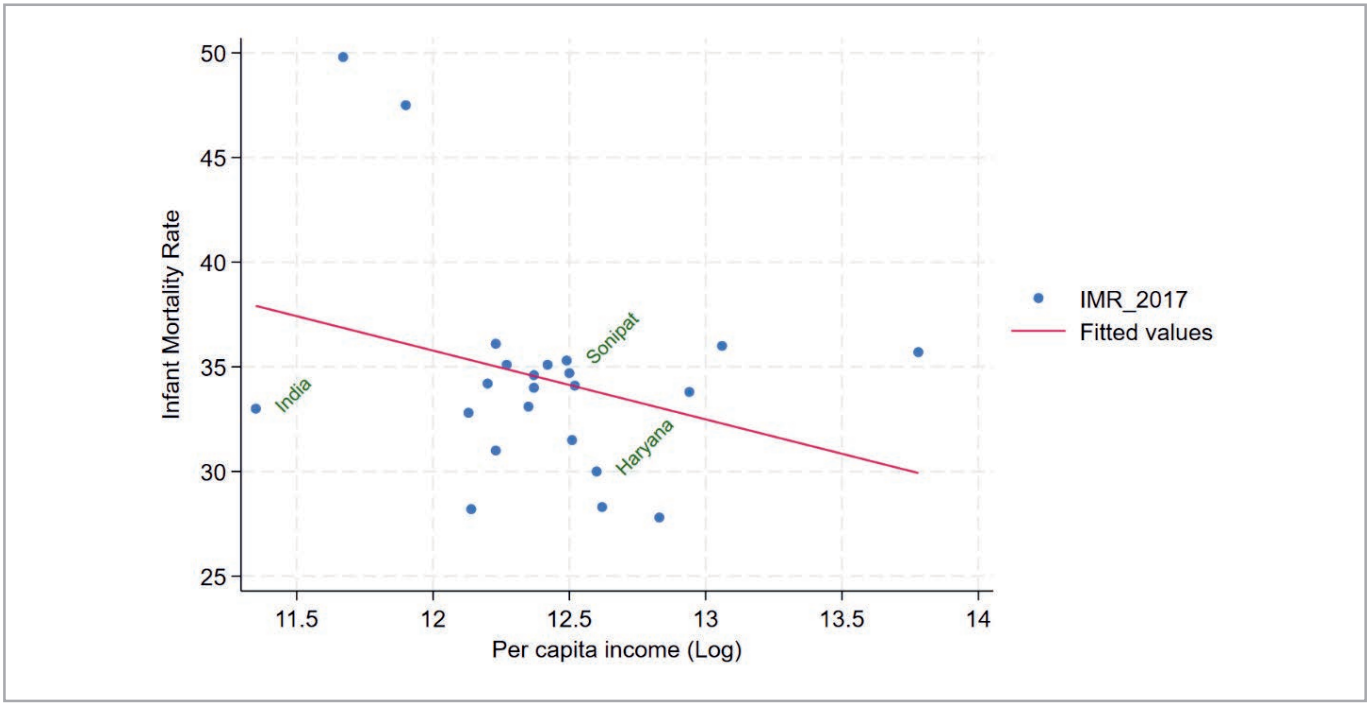
[2] Baum et al.(2021)
[3] Chandrasekhar (2012)
[4] Dandona et al. (2020)
[5] O'Hare et al. (2013)

Figure 4.3: Infant Mortality Rates for districts of Haryana: 2011 and 2017



Sources and Notes: Dandona et al. (2020) and Ahuja S[6] (2021)

Figure 4.4: Per Capita Income and Infant Mortality Rates



Sources and Notes: District level per capita income for 2022-23 (DESA, Haryana); IMR is for 2017, Dandona et al. (2020)

[6] Sandhya Ahuja, Indirect Estimates of District wise IMR and Under 5 Mortality using Census 2011 Data (National Health Systems Resource Centre, 2021), https://nhsrcindia.org/sites/default/files/2021-04/Indirect%20Estimations%20of%20Districtwise%20IMR%20U5M%20with%20Census%202011%20Data_0.pdf

Nutrition profoundly impacts a country's human capital as it directly influences physical and cognitive development. Optimum nutrition is linked to better learning outcomes, higher productivity and economic growth. Improving nutritional outcomes among children under five is especially critical for harnessing India's demographic dividend and enhancing human capabilities. India's supposed economic prosperity has not reflected in corresponding improvements in the outcomes for children and women.

Among districts in Haryana, Sonipat has a high prevalence of under-nutrition. More than three in every ten children under five years were under-nourished in Sonipat in 2015-16. More than a fifth of children are wasted[7] and one in every ten is severely wasted[8] (Table 4.1).

Schemes and Programmes related to children's nutrition: Two national schemes related to children's nutrition are of critical importance - Integrated Child Development Services (ICDS) and the Poshan Abhiyaan. ICDS was launched by the Government of India in 1975 to improve the nutritional and health status of preschool children in the 0-6 years of age group, and to improve the nutritional and health status of pre-school children in the age-group of 0-6 years, among other objectives. As per the government sources, there are nine ICDS projects comprising 1482 Anganwadi Centres (AWCs) in the district (2016).[9]

Poshan Abhiyaan was launched in March 2018 in Jhunjhunu district of Rajasthan. The focus of the Abhiyaan or mission is to lay emphasis on nutritional status of adolescent girls, pregnant women, lactating

Table 4.1 : State of nutrition of children under five years: 2015-16 (in %)

Districts	Wasted	Severely Wasted	Underweight
Faridabad	19.7	8.9	20.5
Jhajjar	15.5	5.5	21
Rewari	18.3	7	23
Hisar	23.5	9.3	23.5
Rohtak	13.6	4.5	25.2
Mahendragarh	19.2	6.8	26.1
Panchkula	31.8	13.6	26.2
Bhiwani	15.7	4.9	26.9
Kurukshetra	24.1	11.9	27.1
Palwal	21.4	10.2	27.5
Jind	26.7	14	29.3
Fatehabad	20.7	8	30
Sirsa	22.5	7.2	30.1
Sonipat	21.6	9.7	30.4
Gurugram	17.9	9.5	30.6
Yamunanagar	26.8	11.6	31.8
Karnal	19.8	7.1	32.5
Ambala	37.9	18.4	32.9
Kaithal	23.8	10.2	37.5
Mewat	17.2	7.5	40.2
Panipat	25.1	11.8	40.8
Haryana	21	9	29.5

Sources and Notes: Authors' calculations using NFHS IV (2014-15)

[7] WHO defines Wasted as "Prevalence of wasting (weight for height <-2 standard deviation from the median of the World Health Organization (WHO) Child Growth Standards) among children under 5 years of age." https://www.who.int/data/gho/indicator-metadata-registry/imr-details/302.

[8] WHO defines Severely Wasted as "Prevalence of severe wasting (weight for height <-3 standard deviation from the median of the World Health Organization (WHO) Child Growth Standards) among children under 5 years of age." https://www.who.int/data/gho/indicator-metadata-registry/imr-details/3410.

[9] Women and Child Development Department, Haryana, *Annual Administrative Report (2015–2016)*, https://cdnbbsr.s3waas.gov.in/s34c144c47ecba6f8318128703ca9e2601/uploads/2025/06/20250617754369055.pdf

mothers, and children in the 0-6 years age bracket. The programme, through use of technology, convergence and community involvement with a targeted approach strives to reduce the level of stunting[10], under-nutrition, anaemia, and low birth weight in children, and also focus on adolescent girls, pregnant women, and lactating mothers, thus holistically addressing malnutrition.

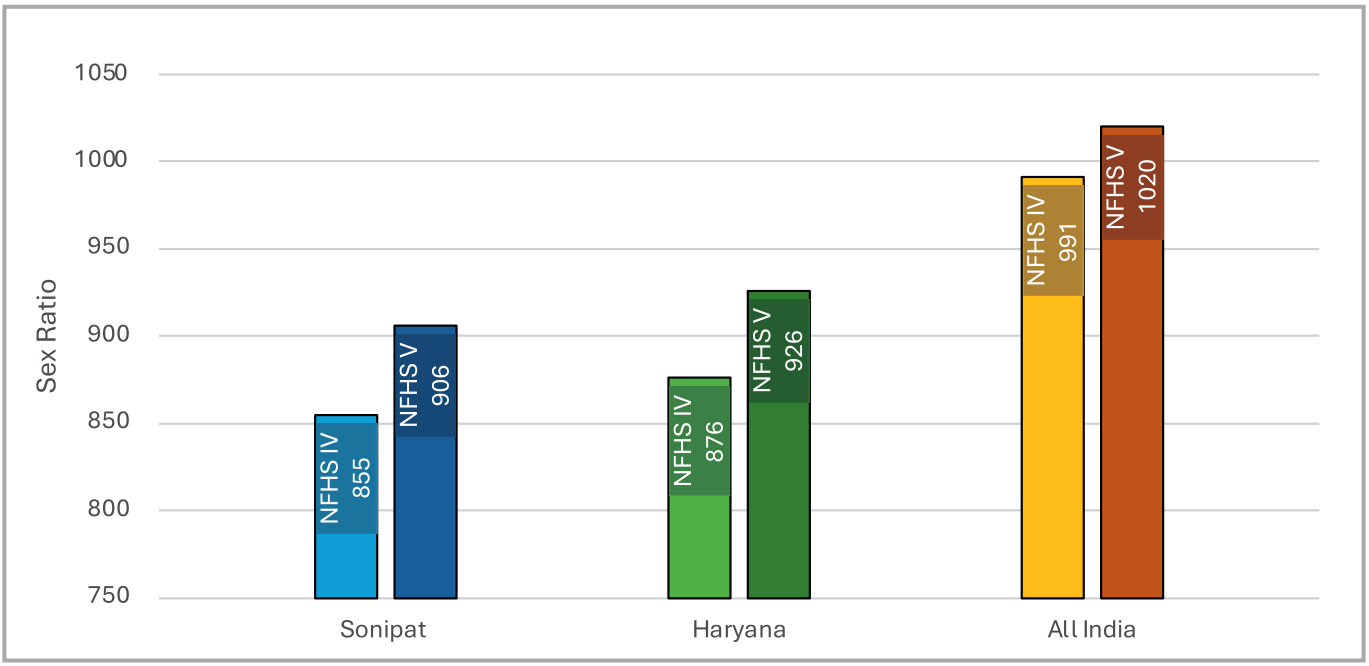
In Sonipat, the Poshan Abhiyan was launched during its second phase of implementation. A detailed assessment of the two schemes, focusing on the vulnerable sections of Sonipat, will be very timely. Particularly, the migrant people and their children remain perpetually deprived of the benefits due to countless technological follies and errors of wrong exclusion.

Sex ratio is a significant marker of gender inequality. There were improvements in many districts between 2015-16 and 2019-21, as depicted in Figure 4.5. However, the female sex ratio remained lower than the state and national average in Sonipat, with a mere 51-point increase during this period. Recent news report shows a considerable decline in the sex ratio at birth in a few districts of Haryana since 2019, which raises serious concerns. Government officials have also raised concerns related to increased incidences of sex-selective abortion and female foeticides, induced by privatisation of health services in the state and particularly under PMJAY.[11]

Though the *Beti Bachao Beti Padhao* scheme[12] seems to have contributed to the initial improvements in child sex ratio since its inception in 2015, recent developments are alarming. A comprehensive approach is needed—one that actively promotes gender equity, combats sex-selective practices, ensures both legal and social protection for women, and encourages meaningful changes in societal attitudes towards gender. Only by addressing the socio-cultural roots of the declining sex ratio and gender-based violence can Haryana move toward a more equitable and socially just society.

It is a major cause of concern that in the state of Haryana, respiratory infections and TB have emerged as the most crucial cause of Disability Adjusted Life Years (DALY). Though there are efforts at the state and national level, which have improved registration of TB cases, successful completion of treatment remains a challenge. While we do not have sub-state estimates currently, it remains critical that such estimates are generated to identify policy priorities within the districts.

Figure 4.5: Sex ratio in Haryana districts: 2015-16 and 2019-21



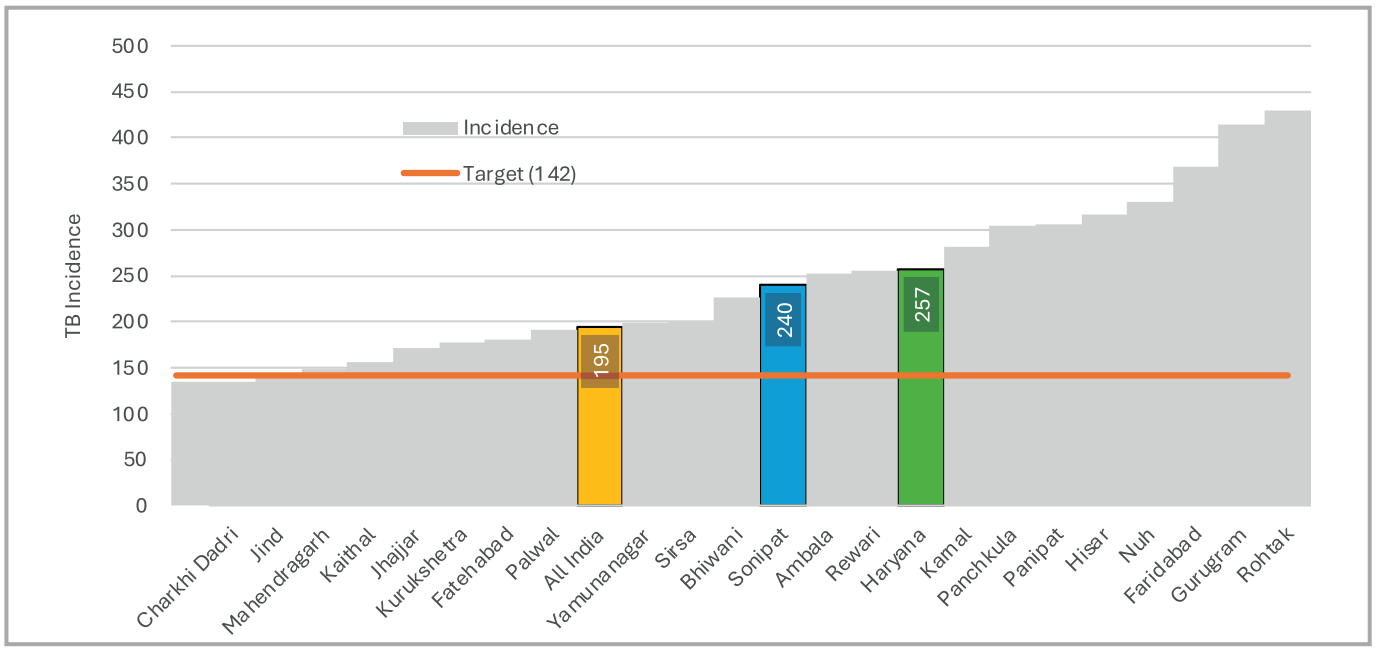
Sources and Notes: Authors' calculations using NFHS IV and V (2015-16 and 2019-21)

[10] WHO defines Stunting as "Prevalence of stunting (height-for-age <-2 standard deviation from the median of the World Health Organization (WHO) Child Growth Standards) among children under 5 years of age" https://www.who.int/data/gho/indicator-metadata-registry/imr-details/72.

[11] Pawan Sharma, "6 Haryana Districts See Sharp Fall in Birth Sex Ratio." *Hindustan Times* (Chandigarh), August 10, 2025, https://www.hindustantimes.com/cities/chandigarh-news/6-haryana-districts-see-sharp-fall-in-birth-sex-ratio-101754763483053.html.

[12] Women and Child Development Department, Haryana, Beti Bachao Beti Padhao, https://wcdhry.gov.in/schemes-for-women/beti-bachao-beti-padhao/

Figure 4.6: Incidence of TB per 1,00,000 people in Haryana districts: 2021-22



Sources and Notes: Department of Health and Family Welfare (Nikshay Portal)

As depicted in Figure 4.6, most Haryana districts have a higher incidence of TB than the national average. Barring Charkhi Dadri and Jind, the incidence rate is above the SDG target in the rest of the districts. Though performing better than the state average, Sonipat continues to remain significantly above the target. In a worrying trend, the notification of TB cases have increased since the launch of the *TB Mukt Bharat Abhiyaan*[13], This can also be reflecting the increased reporting after the launch of the mission which is a positive trend. However, much progress is needed before the incidence rate can be significantly reduced, let alone eliminated.

4.3 Climate and Health Vulnerabilities

More than half (56 per cent) of India's population, living in 344 districts across the country, are facing high or very high health vulnerability induced by climate change.[14] People are increasingly exposed to prolonged summers, heavy and unpredictable rains, floods and droughts, and rising sea levels. Vulnerability is a vector produced out of the dynamics between exposure, sensitivity, and people's ability to adapt or fight. Climate change impacts the poor and vulnerable disproportionately compared to others.

Though there are certain universal aspects of climate change, the nature of exposures is diverse and are very localised – within a state, different regions or districts have different levels and nature of exposures; consequences also vary and hence vulnerabilities differ. Naturally, the adaptation and mitigation efforts and strategies must be localised along with certain universal strategies.

A recent study measures district-level exposures, sensitivities, adaptive capacities (ACs) and health vulnerabilities in 640 Census 2011 districts of India, using 50 indicators from 8 national data sources – 14 for exposure, 20 for sensitivity, and 16 for AC.[15] Findings suggest that all 22 districts of Haryana have high or very high levels of exposure.[16] Seven districts are faced with high sensitivity and rest moderate levels of sensitivity. Only six districts, including Sonipat, have moderate levels of vulnerability, and the rest of the 15 have either high or very high levels. This essentially means districts where seven out of ten people of Haryana reside have high levels of health vulnerability towards climate change.

Addressing inequalities in the distribution of various social determinants of health (SDH) could reduce health vulnerability. Providing sustainable livelihood

[13] Central Tuberculosis Division, Ministry of Health and Family Welfare, Government of India. *India TB Report 2024*, (Government of India, 2024), https://tbcindia.mohfw.gov.in/2024/10/11/india-tb-report-2024/.

[14] Chaudhry and Mukhopadhyay (2023)

[15] Ibid

[16] Note that 0–0.249 indicates low, 0.25 0.49 indicates moderate, 0.5–0.749 indicates high, and 0.75–1 indicates very high scores across all the four components, namely exposure, sensitivity, adaptive capacity and vulnerability.

opportunities, improving working conditions, providing people with social safety nets, and improving both the education status of the population and its employability could contribute to reducing sensitivity and enhancing AC. Climate crisis calls for radical rethinking of the developmental paradigm. However, none of these can be achieved without making institutions of local self-governance engaged with the climate and health agenda and making the health system more accountable to people.

4.4 Access

Access refers to the ability of patients to use the services that they want to use, and that experts believe they should use. Access also involves social values, economic interests, and political processes. Access requires a product as well as services and is linked to how health systems perform in practice[17]. In this section, we bring in two critical elements of access: utilisation of some key services related to women and children and aspects of financial protection.

Faced by the glaring need to improve maternal and child health outcomes in rural areas Government of India launched in 2005 the National Rural Health Mission (NRHM). Its core objective was to provide accessible, affordable and quality health care services in rural areas particularly around safe motherhood and child survival, though the scope expanded subsequently. A major reformative character of this programme was its focus on rebuilding rural health infrastructure, in line with the needs of primary health care and addressing the decline in public spending on health. Several crucial reforms related to financing, governance, human resources, and management information systems were brought in under the National Health Mission (NHM).

Learning about incentive-based approaches from other low and middle-income countries (LMICs) like Brazil, the NRHM also introduced innovative mechanisms such as the Janani Suraksha Yojana (JSY) to increase institutional deliveries to reduce maternal mortality. NHM's success in improving institutional delivery has been well recognised. For instance, during 2005-06, just at the start of NRHM, the rate of institutional delivery was 39.4 per cent (NFHS III), meaning that six out of every ten mothers were delivering at home. The latest available data (NFHS V-2019-21) shows that 95 per cent of deliveries are happening in institutions in Haryana. Between 2015-16 and 2019-21, there is a considerable increase across all districts (Table 4.2). In Sonipat, institutional delivery has reached almost universal levels.

Suppose we break total institutional delivery into the type of provider, it becomes quite apparent that the increase in institutional delivery is largely on account of increased utilisation of private sector hospitals for childbirth in Sonipat. Greater economic prosperity, declining fertility rate, higher age of conception and overall privatisation of healthcare are factors leading to higher willingness among families to spend more on childbirth, even though public services are also experiencing a higher share in utilisation. One reflection of these trends is increased cesarean section rates across districts of Haryana. However, in the case of Sonipat, more than 60 per cent of deliveries occur in public hospitals and C-section rates (16.7 per cent) remain largely similar to the desired levels of 10-15 per cent of births.

While safe delivery is a key way to ensure safe motherhood, another critical area is to ensure universal access to ante-natal care (ANC) services. A key objective of NHM is to improve access to ANC. Though the NHM has succeeded considerably in improving institutional deliveries, its success in universalising access to ANC has remained limited. For instance, something as basic as four ANC visits by mothers during pregnancy is not available to four out of every ten pregnant women in Haryana and more than two-thirds (36 per cent) of women in Sonipat (Figure 4.7).

It is of significant concern that in some districts of Haryana the ANC coverage has declined 2019-21 compared to 2015-16 period (Figure 4.7). Though this could be attributed to COVID related disruptions, it is quite likely that the marginalised sections of the society, particularly women belonging to migrant worker families are particularly affected. A deeper understanding of the socio-economic breakdown of those unable to access services would be useful in identifying key gaps.

Immunising children against vaccine-preventable diseases can significantly reduce childhood

[17] Frost and Reich (2008)

morbidity and mortality. Compared to ANC coverage, full vaccination among children[18] seems to have better achievements. Between the two rounds of NFHS (2015-16 and 2019-21) vaccination coverage seems to have increased in majority of districts including Sonipat (Figure 4.8). Sonipat has experienced more than 29 per cent growth in coverage, which is quite commendable. However, there remains stark caste, class and gender-based variations in coverage. For instance, only 52 per cent of children among SCs have been fully vaccinated in Sonipat, compared to the state average of 73 per cent for SCs. More concerning is that only 51 per cent of children from the poorest wealth quintile and 56 per cent residing in urban areas have full vaccination coverage.

However, around 17 per cent of children either do not receive any coverage or drop out after taking few doses.

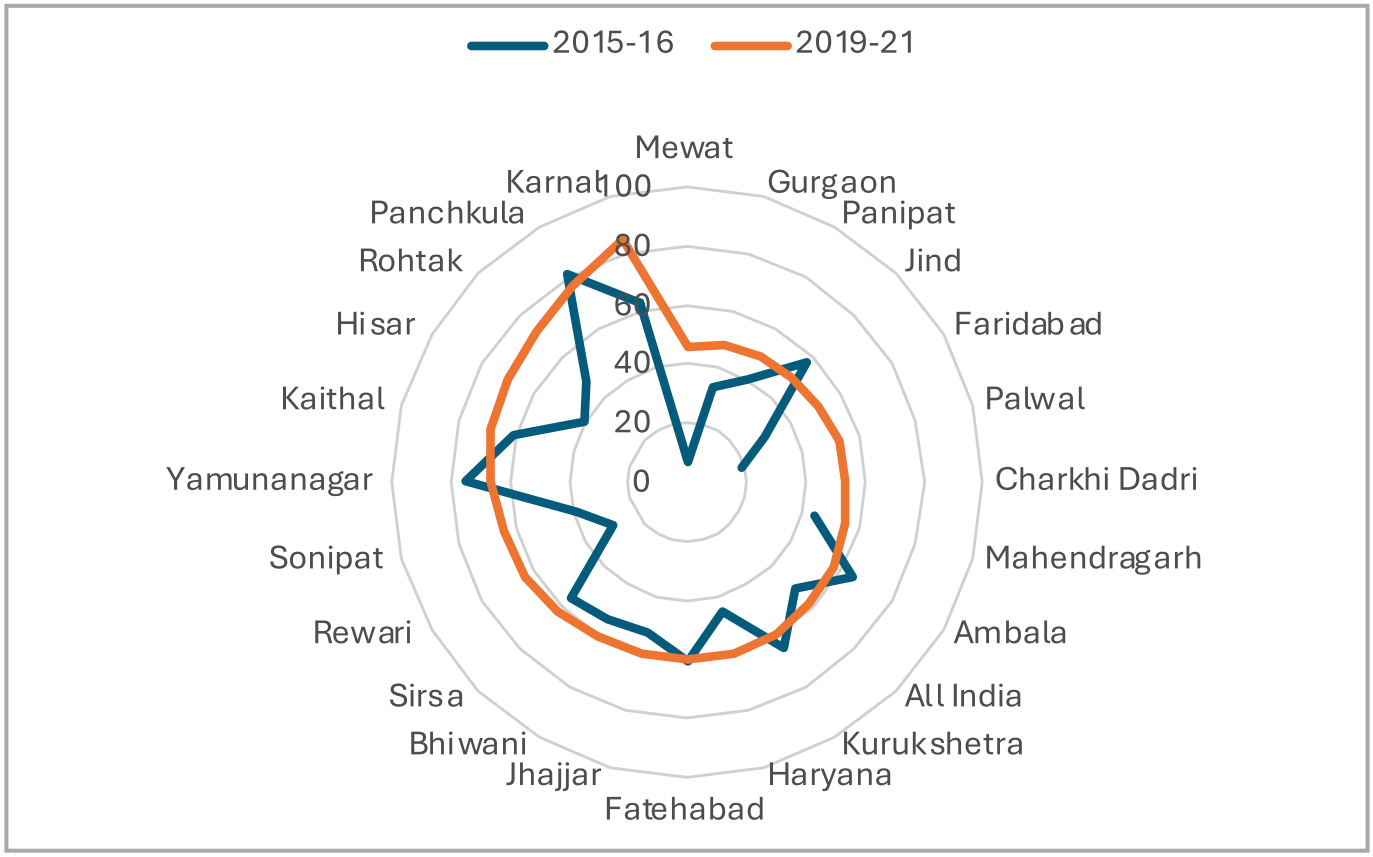
Table 4.2: Institutional Delivery by facility types (percentage of total births)

	2019-21				2015-16		
District Names	**Total**	**Public**	**Private**	**C-section (%)**	**Total**	**Public**	**Private**
Faridabad	92.5	42.9	49.6	23.47	72	45.6	26.4
Hisar	98.2	46.1	52.1	18.23	90.8	55.9	34.9
Palwal	78.3	46.5	31.9	11.65	56.3	29.9	26.4
Bhiwani	97.7	49.3	48.4	13.1	87.2	46.5	40.7
Panipat	97.1	52.6	44.5	20.34	78.2	46.7	31.5
Rewari	98.7	53.9	44.9	25.98	90.2	49.8	40.4
Yamunanagar	94.8	55.8	39.0	28	94.4	61.3	33.1
Charkhi Dadri	98.9	55.9	43.0	14.18			
Gurgaon	96.7	56.9	39.7	18.57	74.2	37.6	36.6
Haryana	95.0	57.5	37.5	19.0	80.5	52	28.5
Fatehabad	97.9	58.9	39.0	22.16	91.2	62.4	28.8
Mewat	74.6	59.2	15.5	4.16	37.7	23.8	13.9
Jhajjar	97.2	60.6	36.6	21.28	86.9	66.3	20.6
Ambala	97.8	61.7	36.2	34.21	96.1	72.3	23.8
Rohtak	97.4	62.1	35.3	19.85	86.3	66.3	20
Sonipat	99.7	62.4	37.3	16.67	83.7	54.5	29.2
Karnal	99.0	62.5	36.5	18.71	92.7	65.5	27.2
Kurukshetra	98.4	63.1	35.3	21.94	91.7	53.3	38.4
Mahendragarh	98.9	65.3	33.6	22.62	96.8	75.9	20.9
Kaithal	98.2	65.4	32.9	24.91	83.6	52.6	31
Jind	98.7	66.5	32.2	14.47	92.9	73.3	19.6
Sirsa	99.3	67.3	32.0	27.21	85.1	51.1	34
Panchkula	97.0	81.0	16.0	32.65	96.5	78.2	18.3

Sources and Notes: NFHS IV and V (2015-16 and 2019-21). Taken from survey reports.

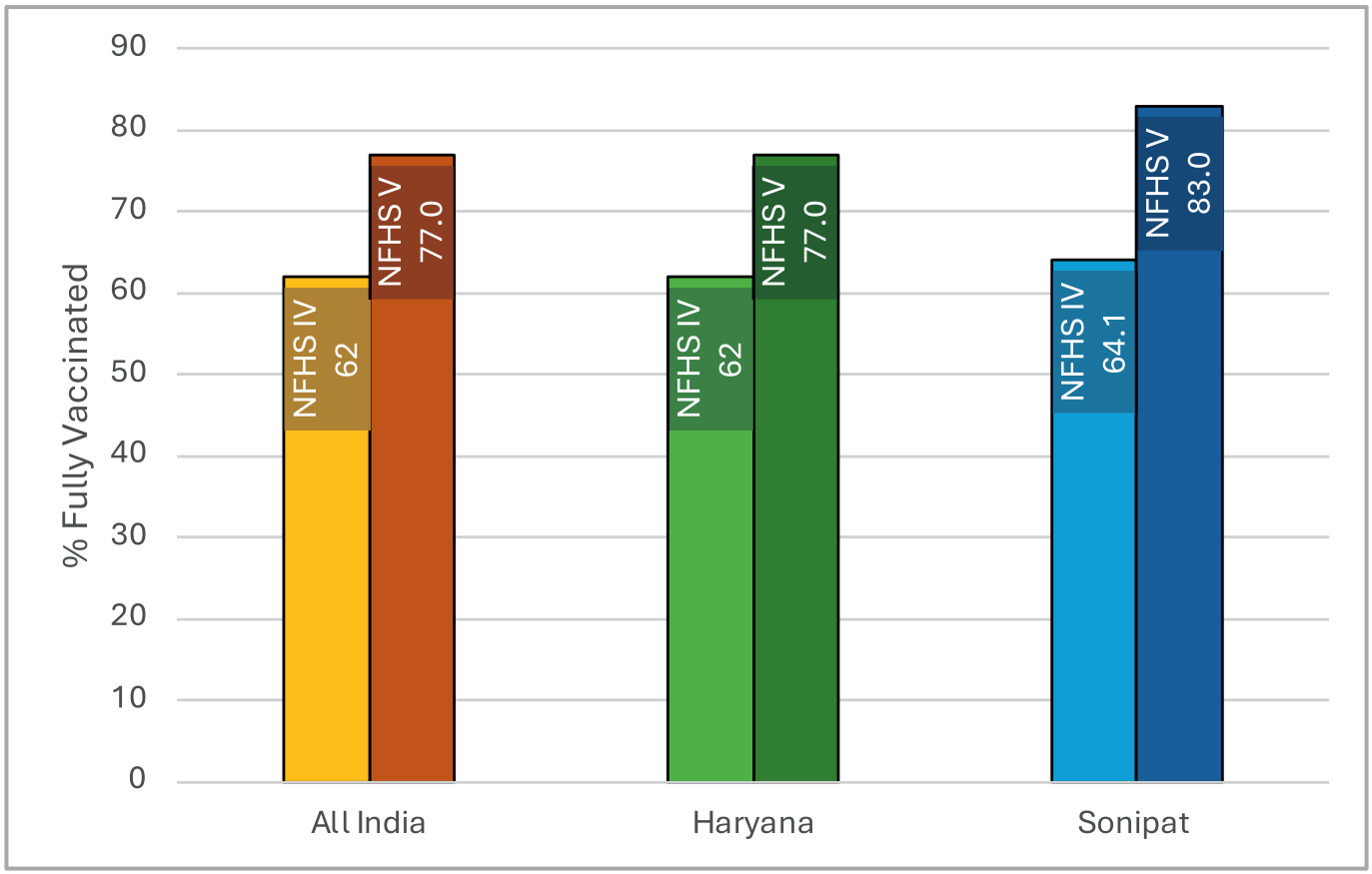
[18] NFHS defines full vaccination as Children age 12-23 months who received specific vaccines at any time before the survey (according to a vaccination card or the mother's report). To have received all basic vaccinations, a child must receive at least: one dose of BCG vaccine, which protects against tuberculosis, three doses of DPT vaccine, which protects against diphtheria, pertussis (whooping cough), and tetanus, three doses of polio vaccine, one dose of measles vaccine Sample: Living children age 12-23 months.

Figure 4.7: Four ANC visits by women during pregnancy (per cent of pregnancies)



Sources and notes: NFHS IV and V (2015-16 and 2019-21), State Reports

Figure 4.8: Children aged 12-23 months fully vaccinated based on information from either vaccination card or mother's recall (in %)



Source and notes: Authors' calculations using NFHS IV and V (2015-16 and 2019-21)

4.5 Health System

According to WHO, a health system is defined as

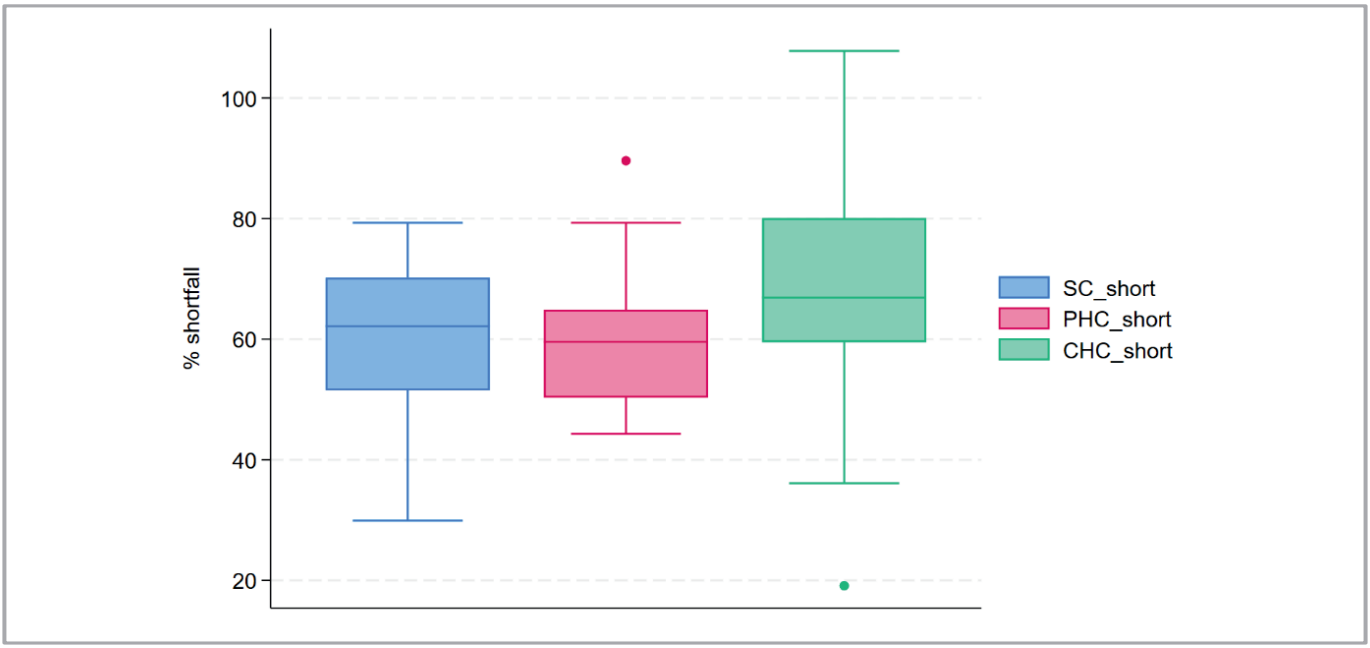
"A health system consists of all organisations, people and actions whose primary intent is to promote, restore or maintain health. This includes efforts to influence determinants of health as well as more direct health-improving activities."

A health system is therefore more than the pyramid of publicly owned facilities that deliver personal health services. It includes, for example, a mother caring for a sick child at home; private providers; behaviour change programmes; vector-control campaigns; health insurance organisations; and occupational health and safety legislation. It includes inter-sectoral action by health staff, for example, encouraging the Ministry of Education to promote female education, a well-known determinant of better health.

Over the years, improving access to primary healthcare has been a major priority for governments. The efforts initiated under NHM got further boost under the *Aayushman Bharat Yojana*[19]; a key component of which is the expansion of NCD care through Sub Centres, which have been renamed as Ayushman Arogya Mandir since 2024. Despite the name change, the main aim of the scheme remains the same. According to Indian Public Health Standards (IPHS)[20] there should be a Sub Centre per 5000 people in plain areas and a Primary Health Centres (PHC) in 50000 population. Figure 4.9 measures the percentage shortfall in Sub Centre, PHC and Community Health Centres (CHC). At every level, median shortfall seems to be higher than 60 per cent, implying that 60 per cent more facilities are required to ensure desirable access to care. In Sonipat, there is a requirement of around 61.4 per cent, 67.1 per cent and 59.5 per cent increase in Sub Centres, PHCs and CHCs, respectively.

Lack of functional public facilities mean high utilisation of private sector for care. In Sonipat, out of every ten hospitalisation cases, only two go to public facilities, and another one goes to both public and private facilities (Figure 4.10). Almost seven out of every ten hospitalisations take place in the private sector. Having close proximity to Delhi, high purchasing power and lack of tertiary public facilities within the district leads to low utilisation of public hospitals in Sonipat. According to NSS 75 round estimates, about 15 per cent of those requiring hospitalisation go outside the district in Sonipat, which is almost close to the state average.

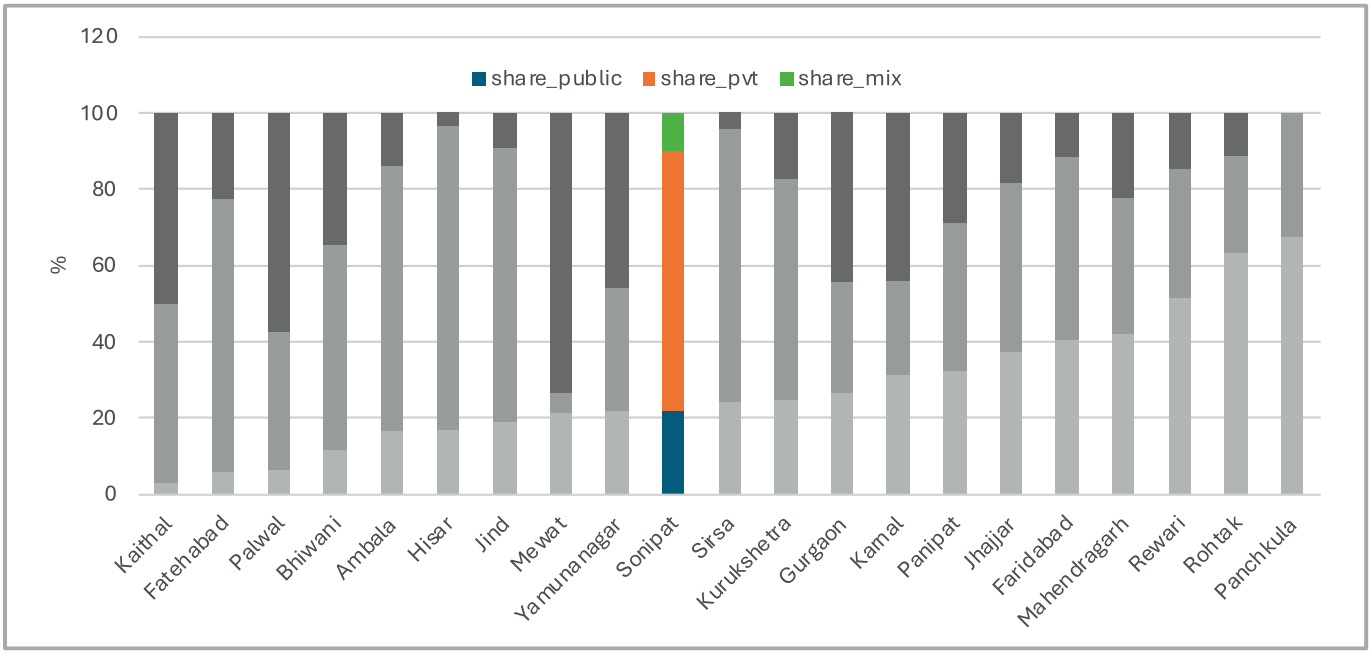
Figure 4.9: Shortfall (in %) of Sub Centres, PHCs and CHCs (as of March 2022) across the districts of Haryana



Sources and Notes: Facility shortfall is calculated as a percentage of existing facilities. The requirement has been calculated using population projections.

[19] Government of India, *Ayushman Bharat – Pradhan Mantri Jan Arogya Yojana*, https://www.india.gov.in/spotlight/ayushman-bharat-pradhan-mantri-jan-arogya-yojana
[20] Ministry of Health and Family Welfare, Government of India, *Indian Public Health Standards (IPHS)*, https://iphs.mohfw.gov.in/

Figure 4.10: Share of public, private and mix of both in hospitalisation: 2022-23



Sources and Notes: Unit records NSS Consumer Expenditure Survey 2022-23

4.6 Health Financing

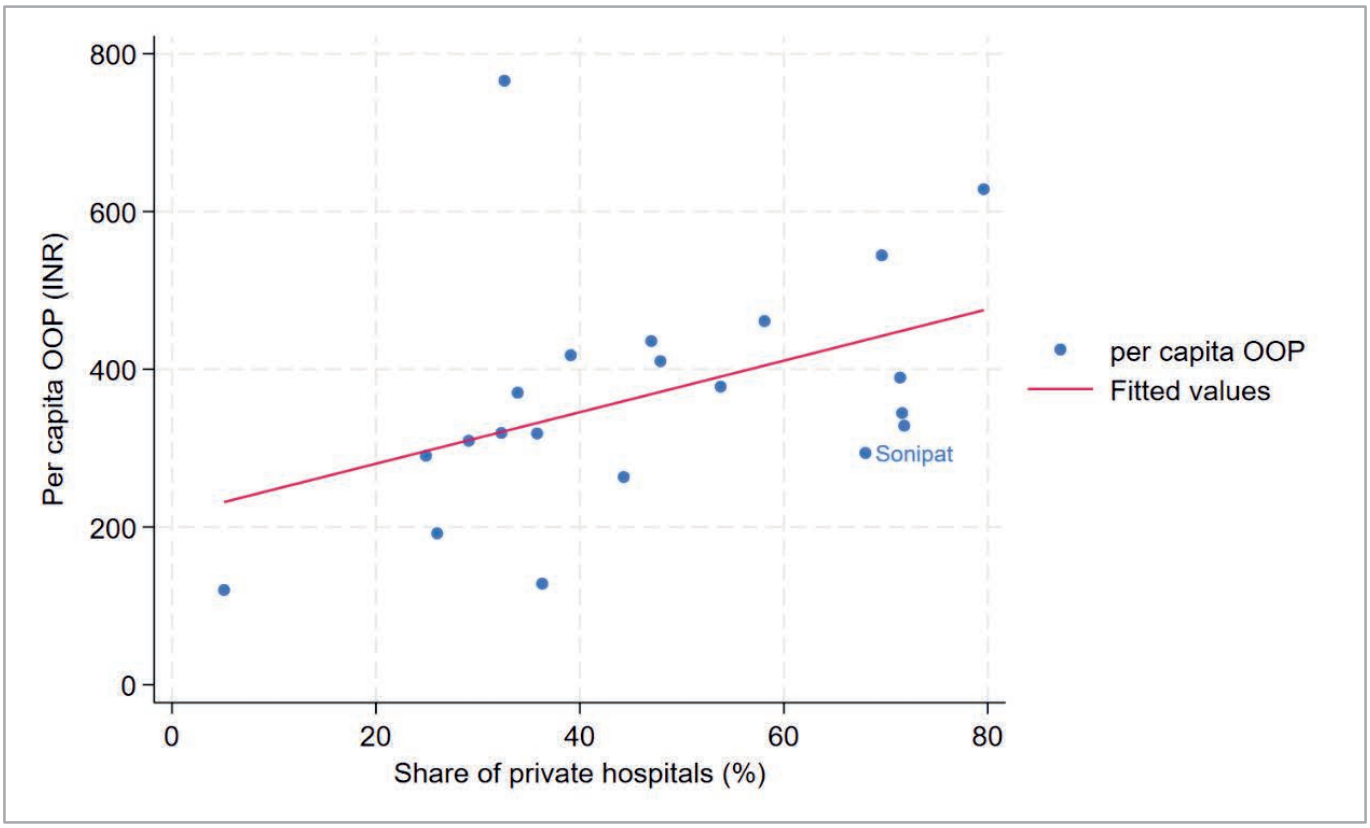
India's health system is typically characterised by fragmented financing mechanisms, where people largely pay out of their pockets to meet healthcare needs. Out-of-pocket (OOP) is the most regressive form of financing, leading to massive inequities. In an OOPs-based system, when a family member falls ill, we either draw from our savings, sell assets or borrow to meet health care expenditure. If one is poor, the option is to either forego care and get further sick or even die, or get pushed to further destitution due to the costs. Children are taken out of school, women work longer hours to earn a little more, and make do with meagre meals. As families cope with health shocks, the vicious cycle of poverty and ill-health continues. Unfortunately, healthcare is predominantly financed by OOP.

Expectedly, there is a high correlation between higher utilisation of private sector and out-of-pocket expenses (OOP). This holds true for districts in Haryana as well. As depicted in Figure 4.11, an increase in the private sector share leads to an increase in the mean OOP for a district. Sonipat, which has almost 68 per cent of hospitalisation in the private sector, has one of the highest OOP in the state, much higher than the state average.

India has witnessed a plethora of Government Funded Health Insurance (GFHI) Schemes being introduced both at the national and state levels since 2003 to address the issue of high OOP. Prime Minister's Jan Arogya Yojana (PMJAY) is a major extension of these schemes, which aims to merge all the existing schemes and provide coverage up to INR 5 lakh for hospitalisation. The idea of the scheme is to use tax resources to pay for hospitalisation of people belonging to marginalised groups. In 2022, Haryana launched its state-specific Ayushman Bharat Scheme - CHIRAYU or Comprehensive Health Insurance of Antyodaya Units Scheme - for families whose annual income range goes up to INR 1.80 lakh. In 2023, the state government extended CHIRAYU for families whose annual income is greater than INR 1.80 lakh and up to INR 3 lakh through a nominal contribution of INR 1500 per family per year.

In the following section we have tried to understand the expansion of the scheme in terms of coverage and its implications on financial protection. Figure 4.12 a & b tries to draw a correlation between the percentage of households covered under PMJAY and two of its critical stated outcomes- bringing down OOP (as a percentage share of household non-food expenses) and incidence of catastrophic health expenses (at 10 per cent of household budget). Both these indicators show a positive relationship with PMJAY coverage, in contrast to the expected outcome. Higher coverage of PMJAY should ideally be associated with lower Catastrophic Health Expenditure (CHE) and lower share of non-food budget going for OOP. However, we don't observe such negative relationship in the case of districts of

Figure 4.11: Share of private hospitals in total hospitalisation (in %) and per capita out-of-pocket expenses on health (INR)



Sources and Notes: Unit records NSS Consumer Expenditure Survey 2022-23

Haryana. Needless to say, the relationship between the expansion of GFHIs and its impact on declining OOP and CHE is quite complex and negotiated through various factors, including governance of the schemes and the relative strength of the public and private sectors in healthcare.

4.7 Public Spending on Health

Public Spending on health in India is among the lowest in the world when compared in terms of share in GDP and per capita spending. Only a few countries in the world spent a smaller proportion of GDP on health in 2010 (WHO 2013). Some developing countries like Brazil, Chile, Costa Rica, Cuba, Colombia, Thailand, Malaysia and South Africa, have made significant efforts in recent history towards provisioning of universal access to health, spend much higher proportions of GDP on health. Governments in neighbouring countries like Sri Lanka, China, and Nepal could mobilise more resources towards health than what was done in India. Per capita public investment in health is almost at the same level as the average of the low-income countries (LICs) and much lower than the LMICs. Huge variations continue to remain across states. In Haryana, public spending is slightly higher than the national average per capita terms, but there remains huge potential to raise more resources, given the state's booming economy.

A healthcare system in the district receives funding from multiple channels. These multiple sources of funds are associated with different payment mechanisms and create different incentives that influence the health care providers, affecting the health system's equity, efficiency, and quality goals. It is important for us to track the devolution of funds from states to districts from its multiple channels. This requires a comprehensive mapping of treasury route funds and society funds under NHM to be tracked.

4.8 Lessons from the Trend and Road Ahead

Our above analysis clearly points out that Sonipat is doing better than most districts in the state and national averages in terms of many indicators. However, on specific indicators Sonipat lags behind state and national averages. It is also a land of drastic socio-economic transformations, with rapid urbanisation and migration, considerable inequities based on caste, gender and wealth. A large part of the Sonipat workforce and residents are migrants

Figure 4.12: PMJAY coverage and its linkages with incidence of catastrophic health spending and OOP in household non-food budget

Figure 4.12a: Share of households facing CHE (percent)

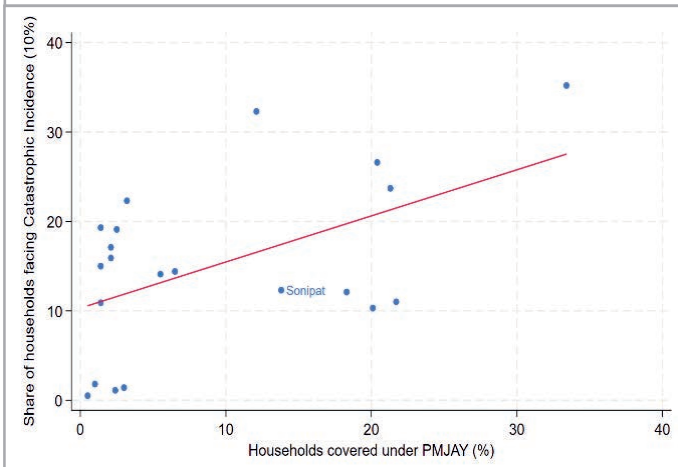
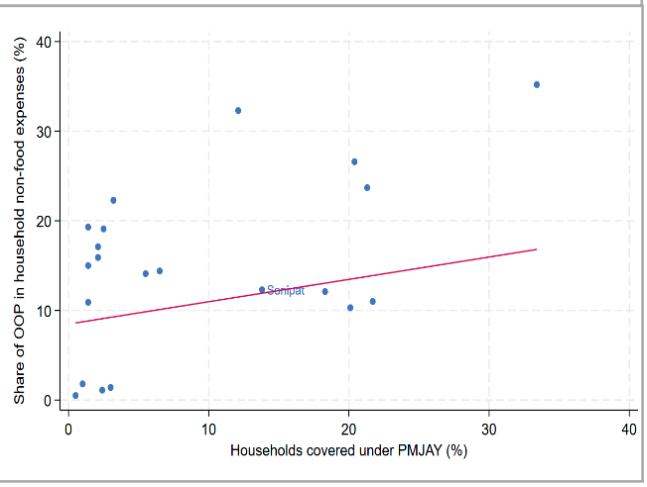


Figure 4.12a: Share of households facing CHE (percent)



Sources and Notes: Unit records NSS Consumer Expenditure Survey 2022-23.

from other parts of the country, and without any social health protection. Any efforts towards developing Sonipat and improving the people's health have to take into account the concerns of migrant people, Dalits, and women, not only for its ethical and Constitutional reasons of social justice but merely economic prosperity of the district as these sections constitute major workforce in the district.

High prevalence of TB remains a major concern. It is important to recognise the role of socio-economic factors, particularly working conditions, housing and nutrition. Given rapid and unplanned industrialisation that Sonipat has experienced and the relative neglect of the living conditions of the working people, a majority of whom are migrants, challenges of continuity of treatment, housing and nutrition would need to receive greater attention in the current discourse.

Though there have been efforts to improve child sex ratio and sex ratio at birth, Sonipat's progress remains mixed in this regard. Regressive social attitudes, including resistance to inter-caste marriages, honour killings, entrenched patriarchy, crimes against women, and female foeticide, have been attributed to the low female sex ratio in Haryana.[21] Such practices have contributed to a shortage of marriageable women and a growing marriage crisis. In response, there has been a significant influx of cross-regional brides into the state, with surplus bachelors seeking spouses from other regions of India, particularly from the Northeast, South, Central, and Eastern parts of the country, as well as from transnational sources such as Nepal and Bangladesh. Scholars have also attributed this decline to alarmingly high rates of crimes against women in the state.[22] In a district where almost every mother is undergoing institutional deliveries, which is a notable success of NHM it is important to note why a good section of them are not receiving ANC care they require. A handful of their children are missing out on getting complete vaccination. Though this needs further analysis, it could be opined that, unlike childbirth, which needs one hospitalisation, services which require repeated encounters with the health system, like ANC visits and vaccinations, inequities in access are becoming critical. Among the three services discussed, ANC has the least coverage. Does it reflect gender-based disparities in the society where women's health needs are given the least priority within the household, or is it that there are systemic challenges that need to be addressed? We need further investigation to make sense of these questions.

[21] Kumar et al.(2025)

[22] Ibid

Haryana continues to struggle with triple burden of disease, like the rest of the country. While communicable diseases are resurging post-COVID, non-communicable diseases (NCDs) are also on the rise and maternal and child health-related deaths and disabilities continue to affect a large section of the population, particularly the vulnerable sections of society. A rapid increase in road infrastructure and expansion of transport, without adequate road safety measures, have also contributed to injuries. It is worth noting that compared to 1990s, when four out of top five causes were related to communicable, maternal and nutritional diseases; in 2021 three of the top five are related to NCDs.[23] Various earlier studies and reports suggest that the state's response in delivering required treatment and intervention related to NCDs remained limited and there is a higher dependence of private sector in delivering care for NCDs which remains a fundamental cause of inequality in access. It is unlikely that Sonipat would be an exception to this. Ayushman Bharat and the expansion of diagnostics and treatment for NCDs through the primary care infrastructure seems to a step in the positive direction. There are concrete improvements in providing medicines, diagnostics services and conducting medical camps and OPDs under the scheme. With proper human resource support, filling up the positions of Community Health Officers and Medical Officers under the scheme, there is potential to improve access to care for NCDs.

Our focus group discussions from Kathura, Manouli, and Pipli suggest emerging challenges due to the district's rapid industrialisation and climate change. There are increasing concerns about groundwater contamination, which has been discussed in our environment and climate chapter. These are likely to have considerable health impacts and a district needs to develop strategies to assess and respond to these challenges. It needs health system and social determination approach, which goes far beyond providing basis curative services for a selective set of services.

It is challenging to conduct any assessment of health system performance in the absence of proper data from both the public and private sectors and their relative performance. In fact, there is minimal comprehensive data on even physical and human resources available in both public and private sector. This needs efforts to conduct further survey of health providers in the district. Such an assessment would be crucial in identifying key gaps in service provisioning.

Our current effort has been to understand the state of health and healthcare from existing secondary data. In the absence of a Census, we need a more comprehensive assessment of emerging health challenges in the district to understand the state's response and market to these challenges and identify vulnerable sections of the population that need special attention. We need continuous engagement with the district health system to foster a sustainable partnership to contribute to the cause these institutions are already committed to and engaged with.

With Sonipat emerging as an educational hub, Universities in the region should join the effort of the health system to deliver better healthcare for people of Sonipat. One of the first step could be to conduct a thorough health system assessment for the district and identify some key priority areas, in partnership with the district health system and frontline workers. The universities are well-equipped to provide necessary research and technical support to the health system, wherever there is a need. Regular health dialogues between local community groups and health system, some of which are already being undertaken by the system, can be strengthened and made more participative. In such efforts, role of elected representatives from the district, including the MP, MLAs, Sarpanchs and Council members would play a critical role

[23] Disability Adjusted Life Years (DALYs) is a measure of disease burden which captures deaths and disabilities, both temporary and permanent. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/482351468764408897/the-disability-adjusted-life-year-daly-definition-measurement-and-potential-use.

KEY INSIGHTS FROM THE FOCUS GROUP DISCUSSIONS IN KATHURA, MANOULI, PIPLI-R VILLAGES OF SONIPAT DISTRICT

- ASHA workers reported a rise in miscarriages in the first trimester and infertility issues among women and cattle in Kathura and attributed it to declining quality of water and food consumed by villagers.
- Respondents across villagers expressed concern over excessive use of chemical fertilizers and pesticides for cultivation that affects the quality of food and nutrition intake in the recent times.
- Pipli-R and Manouli villagers showed their concern over the reduced consumption of protein sources such as pulses and dairy products as their prices have rapidly increased in recent times while their incomes remained stagnant or lower which is affecting their overall food and nutrition intake.
- Respondents across the villages mentioned a rise in the incidence of lifestyle diseases such as Blood Pressure, Diabetes, Joint pains. Kathura's respondents mentioned that three out of ten deaths in the village are caused by cancer. Pipli-R respondents mentioned increasing incidence of cancer and Tuberculosis (TB).
- Access to health care in rural areas in Sonipat district is mainly delivered by PHCs. Villagers visit nearby towns or cities for major ailments and surgeries. Respondents across villages mentioned that commuting to hospitals in the cities is expensive as they rely on private modes of transportation such as taxis, autos, or motor vehicles.

Chapter 5

EDUCATION

Manini Ojha, Narbadeshwar Mishra

5 EDUCATION

Manini Ojha, Narbadeshwar Mishra

Education in India has been a central pillar of human development policy. While universal access, gender equity, and social inclusion have been a priority, the absence of a decennial census since 2011 has created a significant statistical vacuum. Relying on alternative nationally representative data sources, we provide some important insights into the evolving educational landscape of the country, the state of Haryana, and the district of Sonipat in particular.

According to Periodic Labour Force Survey 2022–23, literacy in India has risen steadily, reaching around 77–78 per cent among individuals above 15. Female literacy stands at 71 per cent, while male literacy has crossed 84 per cent. Haryana performs better than the national average. Among youth aged 15–24, literacy rates approach universal levels. However, large disparities remain across social groups and between rural-urban sectors.

The National Family Health Survey, 2019–21, too shows that school attendance is nearly universal at the primary level, aided by the Right to Education (RTE) and expansion in school infrastructure. Yet, there are large dropouts in secondary and higher-secondary stages, particularly among girls, and those from disadvantaged caste groups and the poorest wealth quintiles.

Per the Annual Status of Education Report (ASER) 2024[1], the proportion of children from class III who can read a text from class II or do at least subtraction show a sharp decline from 2018 to 2022 in Haryana. This is true for Sonipat too.[2] Such learning loss during the period is unsurprising with the COVID-19 pandemic causing country-wide school closures. After 2022, there is a reversal in learning levels at classes III, V, and VIII.

At the tertiary level, PLFS (2022-23)[3] data indicate rising enrolments with the Gross Enrolment Ratio (GER) in higher education reaching about 28 per cent. However, this expansion is uneven with the urban youth, general category groups, and wealthier households being far more likely to pursue higher education relative to their disadvantaged counterparts. Haryana's experience reflects strong improvements in literacy and enrolments but sharp divides across caste, gender, and socio-economic groups. Against this backdrop, we turn to a focused analysis of Sonipat district situating its performance within the broader context of Haryana and India. Analysis of school and higher education trends from 2017 to 2022 alongside the state's evolving policy landscape highlights how government interventions are beginning to address gaps and also denote where challenges remain.

5.1 Status of Education

5.1.1 Status of Pre-school education

The National Education Policy (NEP) 2020 brought early childhood care and education (ECCE) for children aged 3–6 years into sharper policy focus recognizing it as the foundation for lifelong learning. Currently, the bulk of preschool services in India are delivered through the Integrated Child Development Services (ICDS) scheme which operates over 13.9 lakh Anganwadi centers across the country. Though their quality and coverage remain uneven, these centers provide nutrition, health services, and early learning opportunities to children under six. Despite this vast network, NFHS-5[4] data reveal that only about 20 per cent of children aged 3 - 5 years nationally attend a formal preschool programme. Haryana

[1] ASER Centre, *Annual Status of Education Report (Rural) 2024: Provisional* (New Delhi: ASER Centre, January 28, 2025), https://asercentre.org/wp-content/uploads/2022/12/ASER_2024_Final-Report_13_2_24.pdf

[2] ASER 2024 Report clubs Sonipat into the sub-division including Rohtak, Bhawani, Jhajjar, and Sonipat.

[3] Government of India, Ministry of Statistics and Programme Implementation, National Sample Survey Office, *Annual Report: Periodic Labour Force Survey (PLFS)* (July 2022 – June 2023) (Ministry of Statistics and Programme Implementation, 2023), https://dge.gov.in/dge/sites/default/files/2023-10/Annual_Report_PLFS_2022-23.pdf.

[4] Government of India, Ministry of Health and Family Welfare, *National Family Health Survey (NFHS-5), 2019–21: India Report* (Mumbai: International Institute for Population Sciences, 2021), https://dhsprogram.com/pubs/pdf/FR375/FR375.pdf.

performs somewhat better with 30 per cent enrolment (29.9 per cent for boys and 31.2 per cent for girls). In Sonipat, these figures are more nuanced. Among urban children, 45.05 per cent of boys are enrolled in formal preschool compared to 37.93 per cent girls. Interestingly, in rural areas, this pattern is reversed with 52.05 per cent of girls enrolled versus 44.42 per cent of boys. While these figures position Sonipat above the state and national averages in girls' enrollment, they also reveal gender and spatial asymmetry in early childhood access. Strengthening preschool education is therefore critical to enhancing learning outcomes, reducing early dropouts, and ensuring equity from of a child's educational journey.

5.1.2 Status of School Education

In Sonipat, the education system's performance reveals not only a complex story of uneven inclusion but also its emerging opportunities. We track indicators like enrolment patterns, school infrastructure, pupil-teacher ratios, and management types utilizing data from the ASER and the Unified District Information System for Education (UDISE), Department of School Education and Literacy, Ministry of Education, Government of India.

a. Growth in Gross Enrolment (2017-2022)

The enrolment trend in Sonipat between 2017-18 and 2021-22 shows modest but uneven progress. Growth remained almost stagnant in 2018-19 but improved the following year before falling sharply during the pandemic. Encouragingly, enrolment recovered in 2021-22, with Sonipat performing better than the national average but slower than Haryana overall (Figure 5.1).

Heterogeneity by social groups: Growth in both General and OBC categories is weaker than the state as a whole and neighboring districts. SC enrolment slipped further behind signaling structural challenges in ensuring equity. By 2019-20, Sonipat showed a recovery with improvements across all categories, particularly SC students who outpace both state and national averages. The pandemic disrupted this progress severely with overall enrolment falling steeply than in Haryana. These losses are concentrated among socially disadvantaged groups of OBC and SC students underlining their heightened vulnerability in crisis periods. Encouragingly, in 2021-22, Sonipat performed better than the national average though it is still below Haryana overall. The most notable recovery comes from SC enrolment which shows striking improvement surpassing both state and

Figure 5.1: Enrolment growth rate: overall and by social groups

Sources and Notes: Authors' calculation using UDISE (2017-2022) data

national levels. General and OBC categories also recover moderately. Taken together, these trends highlight resilience in Sonipat's schooling system, but it also highlights the need for focused support to sustain progress among disadvantaged groups (Figure 5.1).

Heterogeneity by caste and gender: In 2018-19, Sonipat displayed a mixed pattern, with overall enrolment rising slightly for girls (0.28 per cent) but falling for boys (0.25 per cent). While this gender gap in enrolment was worse at the all-India level, Sonipat was performing better than the Haryana average. The General category enrolment showed modest gains but OBC boys registered a significant fall pointing to retention issues. SC enrolment also fell for both genders. In 2019-20, Sonipat's performance strengthened with balanced improvements across caste and gender. Enrolment grew by 1.66 per cent for girls and 1.16 per cent for boys narrowing the gap with the Haryana average and surpassing national figures. General and OBC groups recorded steady improvements while SC enrolment reversed the decline of the previous year for both boys and girls. This suggests better outreach and retention, particularly among the disadvantaged groups. The year 2020-21 marked a setback with the pandemic showing sharp declines across most categories. Overall enrolment fell by 2.01 per cent for girls and 3.52 per cent for boys, a steeper contraction than Haryana's averages and below the national fall. Losses were particularly severe for OBC and SC boys again highlighting the disproportionate impact of school closures on marginalized groups. By 2021-22, the district witnessed a strong rebound with enrolment increasing for both genders broadly in line with Haryana and well above India. General and OBC groups for the district recorded moderate growth though they are still lagging behind state averages. The standout recovery came from SC students where enrolment surged by over 4 per cent for girls and nearly 7 per cent for boys outperforming both state and national levels (Figure 5.1).

Overall, Sonipat's four-year trajectory highlights incremental improvements in inclusivity, pandemic-related setbacks, and a strong recovery led by SC enrolment gains. Sustained progress will depend on continued focus on gender equity and caste-sensitive interventions to consolidate these gains as given below:

Box 5.1: Post-Matric Scholarship Scheme for SC Students

The Haryana Government provides scholarships to SC students studying from Post-Matric to Post-Graduate classes. The scholarship amount ranges from INR 2,500 to INR 13,500 per year, along with reimbursement of compulsory non-refundable fees. Students whose parents' annual income is up to INR 2.5 lakh and are also domiciled in Haryana are eligible for the scholarship[5]. Some other caste-targeted schemes are financial assistance for higher competitive entrance examinations for SC/BC candidates through private institutions[6] and a scheme of hostels for other backward classes (OBC) boys and girls[7].

b. Growth in the number of schools (2017-2022):

Between 2018–19 and 2021–22, Sonipat's total number of schools (PS, UPS, SS, HSS)[8] showed remarkable stability, with minor yearly changes. The district recorded a marginal fall in 2018–19 (0.23 per cent), a slight rise in 2019–20 (0.08 per cent), another dip in 2020–21 (0.23 per cent), and a modest recovery in 2021–22 (0.47 per cent). In comparison, Haryana experienced stronger early growth but ended with a net fall in 2021–22.

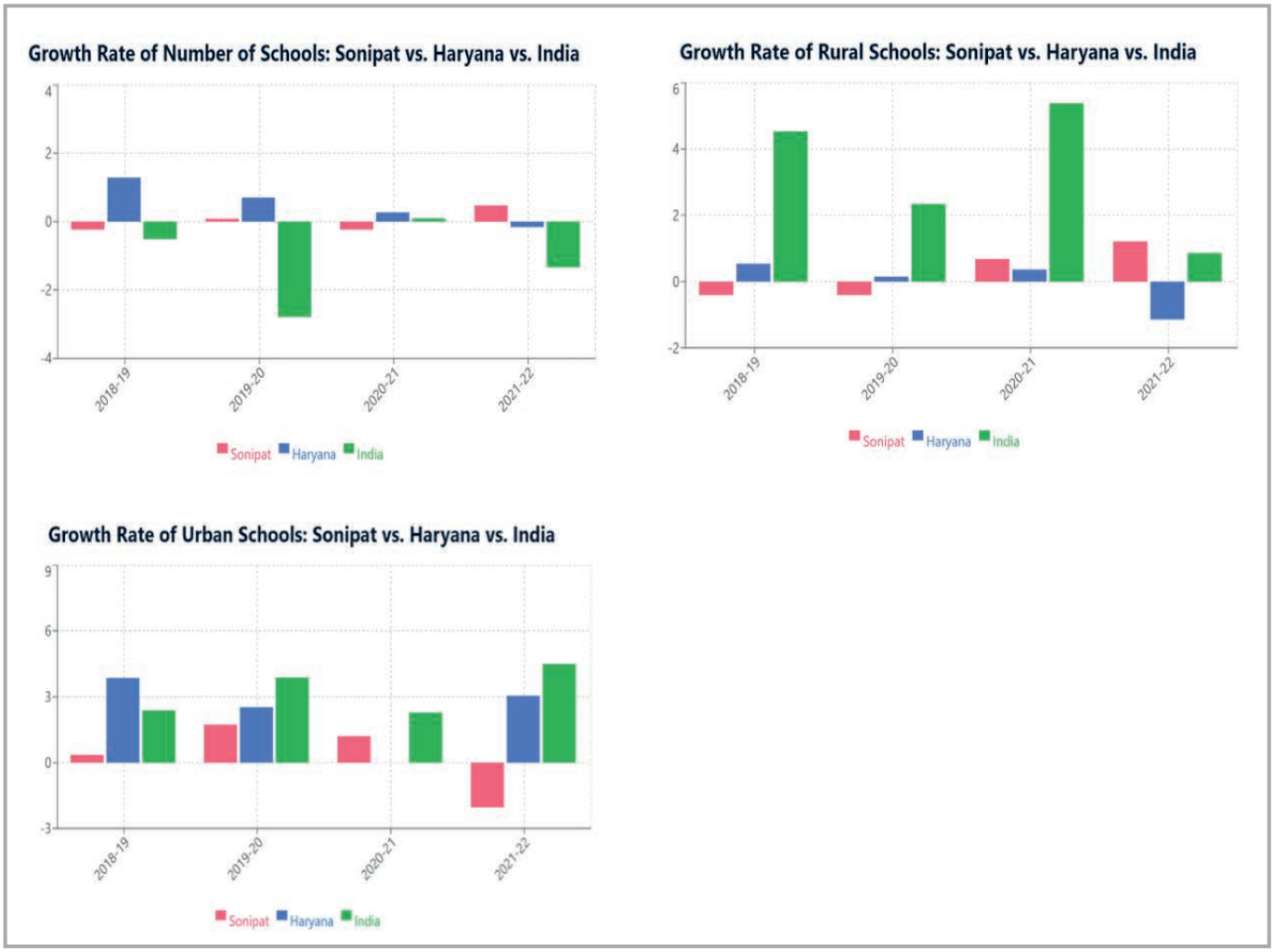
[5] Government of India, Ministry of Social Justice and Empowerment, Department of Social Justice and Empowerment, *Guidelines: Post Matric Scholarships to the Students Belonging to Scheduled Castes for Studies in India (2020–2021 to 2025–26)* (March 2021), https://haryanascbc.gov.in/sites/default/files/2019-07/PMS_for_SCs_Scheme_Guidelines%202020-21%20to%202025-26_compressed.pdf

[6] Haryana State Commission for Backward Classes, *Financial Assistance for Higher Competitive Entrance Examinations to SC/BC Candidates*, https://haryanascbc.gov.in/financial-assistance-for-higher-competitive-entrance-examinations-to-scbc-candidates-through

[7] Haryana State Commission for Backward Classes, *Scheme of Hostels for Other Backward Classes (OBC) Boys and Girls*, https://haryanascbc.gov.in/scheme-of-hostels-for-other-backward-classes-obc-boys-and-girls

[8] PS refers to primary schools, UPS refers to upper primary school SS refers to secondary schools and HS refers to high secondary schools.

Figure 5.2: Growth rate of number of schools: overall and by rural/urban



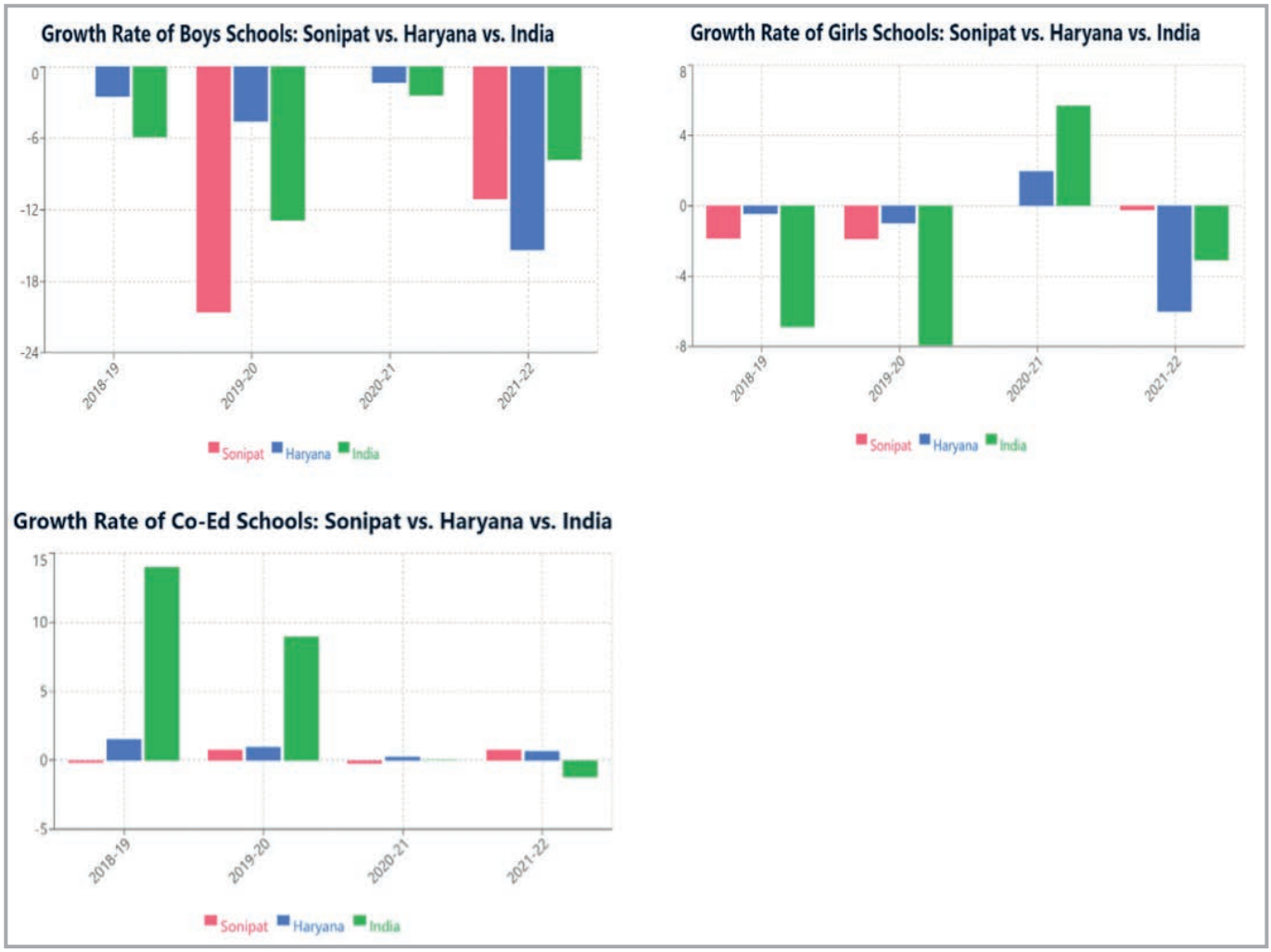
Sources and Notes: Authors' calculations using UDISE(2017-2022) data.

Rural versus Urban: Looking at the growth in schools for urban versus rural areas, in 2018–19, rural schools declined by 0.40 per cent as compared to 2017-18, while urban schools increased by 0.35 per cent, suggesting an urban-centric expansion. The trend continues in 2019–20 as well. However, in 2020–21, the number of rural schools increases by 0.50 per cent while urban schools expanded by 0.68 per cent. In 2021–22, the trajectory reversed with rural schools registering the highest growth while urban schools contracted. Compared with Haryana, Sonipat's urban growth remained weaker. Sonipat, however, outperformed Haryana in rural growth during 2021–22. At the national level, Sonipat lagged, since India consistently reported robust growth in both rural and urban schools over this period (Figure 5.2).

Sonipat's near-flat trajectory highlights a mature schooling network with minimal expansion and limited closures suggesting that the district has largely achieved stability in school availability. There also seems to be a shift in focus towards strengthening rural schooling access even as urban growth shows signs of saturation.

Gender segregated vs Co-ed: Between this period, boys' schools witnessed repeated contractions with the sharpest decline in 2019–20, while co-educational schools expanded modestly, suggesting a gradual preference for mixed-gender formats. Compared with Haryana, Sonipat experienced a steeper fall in boys' schools and missed the modest expansion of girls' schools, which the state registered in 2020–21. Co-educational schools, however, showed similar gradual growth in both Sonipat and Haryana. At the national level, the same broad patterns emerged with a sharp fall in single-gender schools around 2019–20, some recovery in girls' institutions, and steady stability in co-educational ones. Sonipat's experience mirrors these national shifts but reflects more severe pressures on boys' schools and a lost opportunity to strengthen girls' schooling (Figure5.3).

Figure 5.3: Growth rate of the number of schools: gender segregated and co-ed schools



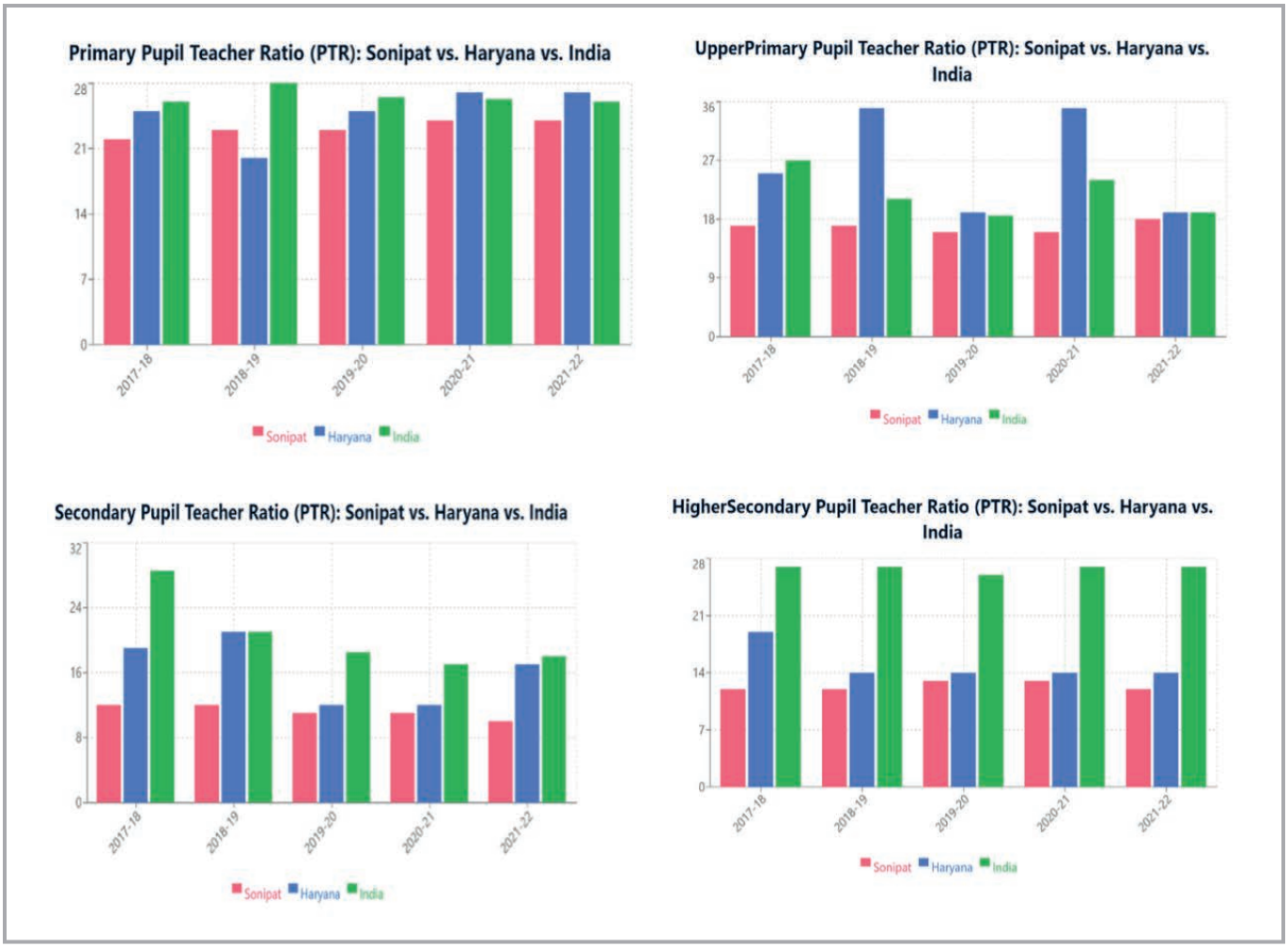
Sources and Notes: Authors' calculations using UDISE(2017-2022) data.

c. Pupil Teacher Ratio (PTR) (2017-2022):

Sonipat's PTR across all school stages remained consistently below the state and national averages, indicating relatively favorable classroom sizes. PTR fluctuated mildly between 22 and 24 at the primary level, ending the period at its highest point of 24. In contrast, Haryana's primary PTR peaked at 27 in 2020–21 whereas India remained stable between 26 and 28. Sonipat maintained ratios between 16 and 18 at the UPS reflecting balanced teacher deployment. The state's figures were erratic, ranging from 19 to 35, while India's figures hovered between 18.5 and 27. For SS, Sonipat showed marked improvement, falling steadily from 2017–18 to 2021–22. Nationally, PTR at the SS level improved but remained far higher than both Haryana and Sonipat. At the HS level, Sonipat remained almost flat until 2020–21 before inching up in 2021–22. Haryana showed sharper early improvement before stabilizing, while India stagnated at 27 across all years (Figure 5.4).

Government Aided vs Private Unaided: The composition of schools by management type has been broadly stable. The Department of Education school showed only minor yearly changes. However, government-aided schools displayed extreme volatility, disappearing in one year, re-emerging the next, and remaining static. The main driver of growth was the Private Unaided sector which expanded steadily across most years, even after a brief dip during the pandemic. Centrally managed institutions such as Kendriya Vidyalayas and Jawahar Navodaya Vidyalayas remained unchanged reflecting their fixed presence. At the state level, Haryana recorded steadier but broader expansion with the private sector acting as the main growth engine. The role of centrally managed schools remained marginal overall. Nationally, the system was more volatile. Government-aided schools stagnated, and private schools despite steady growth in the early years were hit hard during the pandemic. Centrally managed schools fluctuated sharply, likely due to administrative adjustments rather than demand (Figure 5.4).

Figure 5.4: Pupil Teacher Ratio: by levels of schools



Sources and Notes: Authors' calculations using UDISE(2017-2022) data.

5.1.3 Status of Higher Education:

Higher education is a crucial driver of economic growth and while Sonipat exhibits movement toward both gender parity and greater academic engagement, it grapples with under-representation across social groups. From 2018-19 to 2021–22, Haryana's higher-education system has exhibited both continuity and gradual shifts in who enters college and at which level. Sonipat has emerged as one of the more dynamic centers of higher education. Between 2018–19 and 2019–20, the district experienced a sharp surge in enrolments outpacing both the state and national averages. However, the growth slowed by 2020–21, converging with broader state and national levels.

The expansion of higher education in Sonipat is not uniform across programme levels. Over the last two years, enrolments at undergraduate (UG), postgraduate (PG), and Ph.D. levels show that while Sonipat sits in the upper tier of UG growth, highlighting its base as a hub for undergraduate education, the increase in PG enrolments points to growing demand for advanced degrees. Sonipat has become a private higher-education hub with universities such as Ashoka University, O.P. Jindal Global University, Rishihood University, and SRM University drawing students nationally and internationally, clustering around the Rai education zone. National data also show rising private participation in higher education implying opportunities for partnerships and local skilling linkages alongside equity safeguards. Sonipat has the potential to emerge as a center for advanced research and doctoral training.

Sonipat's teacher workforce in higher education has expanded in its distribution with women comprising about 55 per cent of higher education teachers, above the state and national average. However, the composition of social groups shows persistent gaps. In contrast, the non-teaching staff cadre remains male-dominated, with women accounting for only 39–44 per cent of positions. This highlights occupational segregation where women are concentrated in teaching but underrepresented in administrative and support roles.

Utilising data from the All-India Survey on Higher Education (AISHE), Department of Higher Education, Ministry of Education, Government of India, this analysis provides the detailed trends in the status of higher education in Sonipat comparing its performance with its neighboring districts and benchmarking them against the national averages.

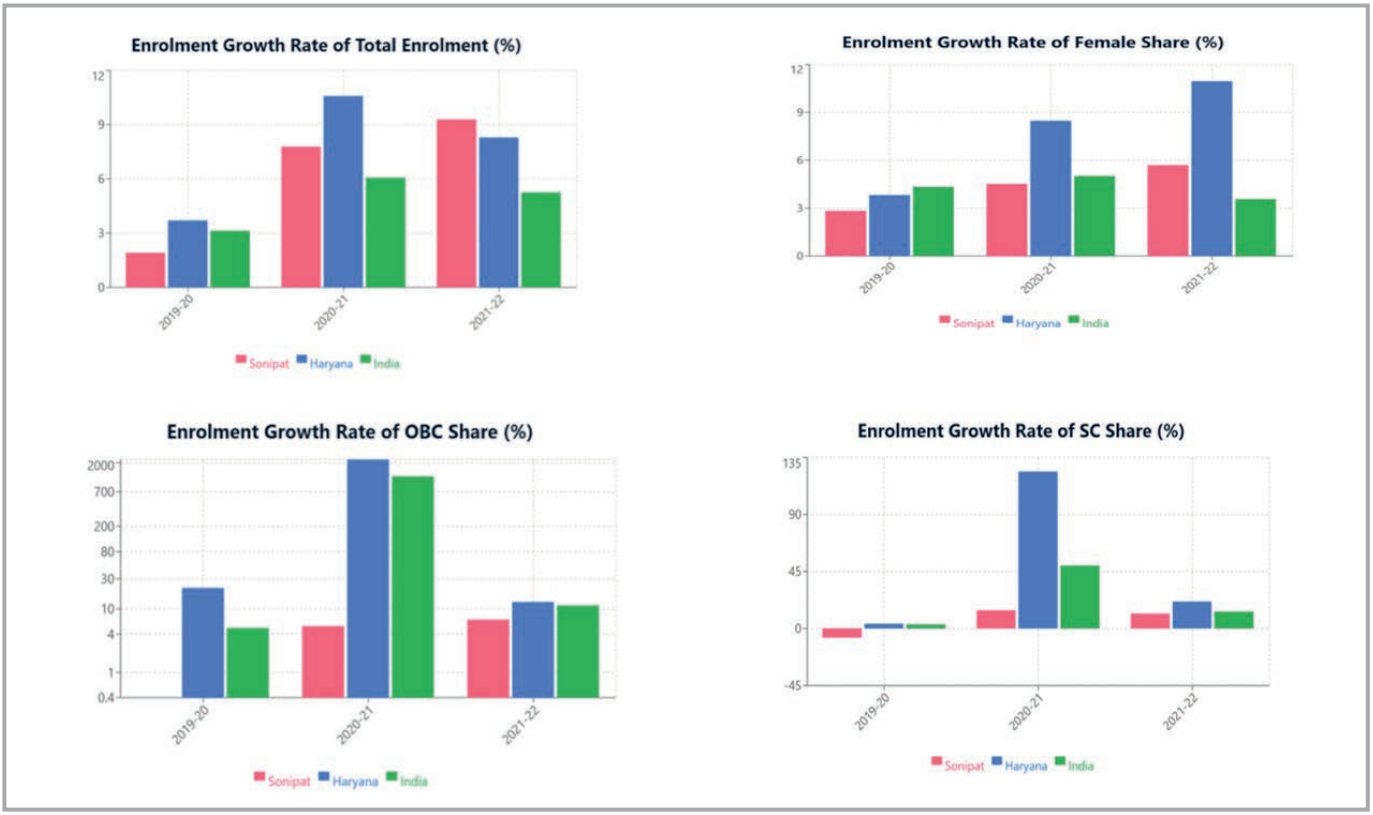
a. Overall growth in enrolment levels (2018-2022)

Sonipat experienced a sharp acceleration in enrolment growth between 2018–19 and 2019–20 rising above both Haryana and the national average. By 2020–21, the growth decelerated although it remained higher than the state's but was closer to the national trend. Sonipat initially trailed behind some districts but recorded a surge around 2019–20 overtaking Jhajjar and Panipat and narrowing the gap between high-growth districts like Rohtak (Figure 5.5).

Female share: Sonipat's growth in female enrolment share has been consistently positive, though more modest than the state and national averages. Haryana and India registered sharp increases between 2019–20 and 2020–21 with national female share growth exceeding 10 per cent while Sonipat's increase was closer to 5–6 per cent. Sonipat's trajectory is flatter than those of its neighbours. While female participation is improving, Sonipat has not yet fully capitalised on the momentum. Sustained policy focus on women's access, through scholarships, hostel facilities, and safety infrastructure, would be beneficial for closing this gap and ensuring that enrolment growth translates into equitable gender representation (Figure 5.5).

Heterogeneity by social groups: Nationally, the SC enrolment share in higher education saw a significant positive surge around 2019–20 with Haryana following the trend. Sonipat, however, recorded only modest and inconsistent gains. Sonipat's line is flatter among districts suggesting limited expansion of SC participation in higher education compared to its neighbors. OBC enrolment share nationally and at the state level grew significantly, particularly in 2019–20. While OBC enrolment is improving in Sonipat, it is slower relative to Haryana, India, and some neighbours leaving the district behind in inclusive participation. The evidence across social groups underscores Sonipat's recurring challenge with limited progress in integrating disadvantaged groups into higher education. The district's expansion in total enrolments has not translated into broad-based social inclusion (Figure 5.5).

Figure 5.5: Growth rate of enrolment in higher education – by gender and social groups



Sources and Notes: Authors' calculations using AISHE(2018-22) data.

Heterogeneity in share of programme level enrolments[9]:

Undergraduate level: Sonipat registered UG enrolment growth of nearly 10 per cent between 2020-21 and 2021-22, outperforming both Haryana and the national average. Haryana's UG growth rate stood at around 6 per cent, and India's growth rate appears to be even lower. In comparison to its neighbours, Sonipat is among the better performers in UG expansion, though not the leader, with its growth positioned between the strong rise in Jhajjar and Panipat and the decline in Rohtak (Figure 5.6).

Postgraduate level: Sonipat registered a PG enrolment share growth of about 15 per cent in 2021-22 as compared to 2020-21 showing distinct expansion. Sonipat is performing above the national average in expanding postgraduate enrolments indicating that though the district emerges as a hub for PG education, Haryana's broader higher education system is expanding PG opportunities at an even faster pace, as can be seen in Figure 5.6.

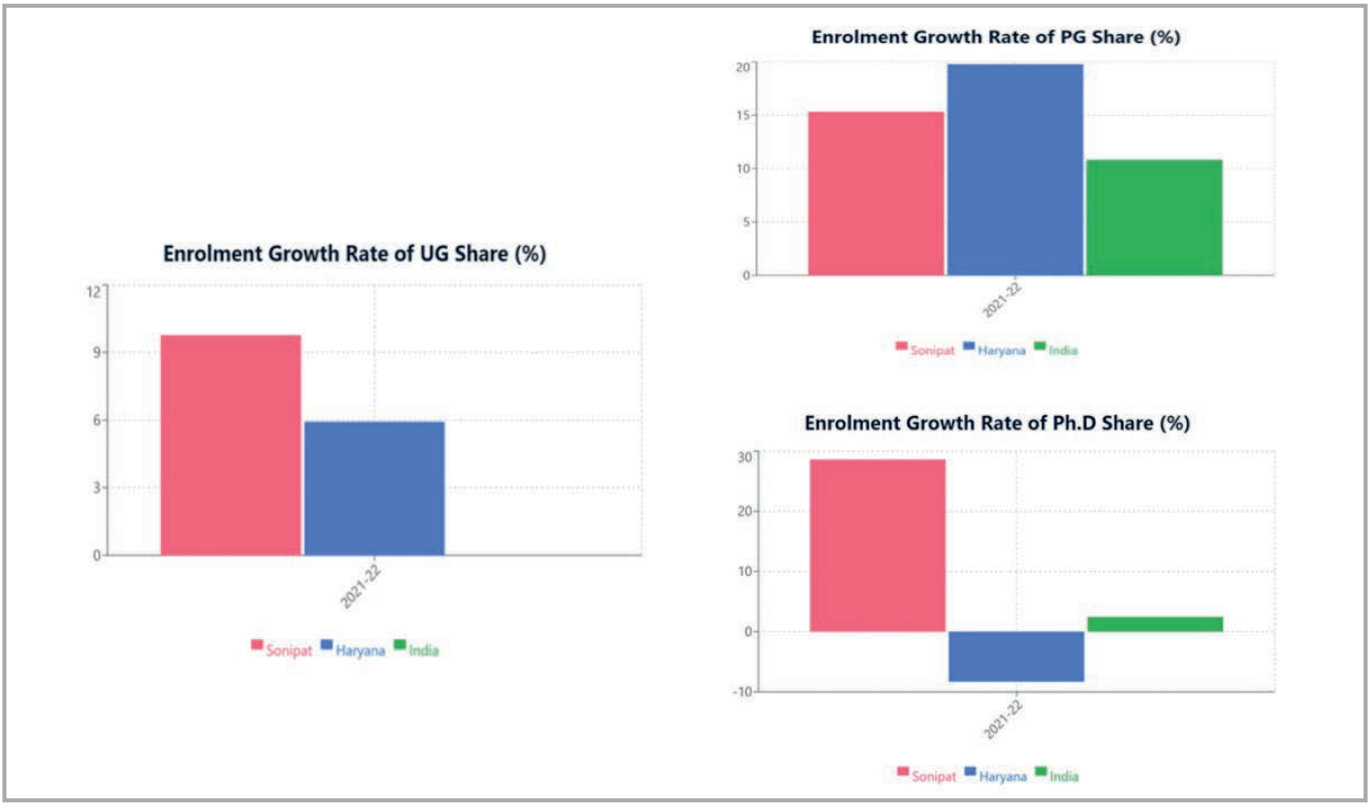
Ph.D. level: The share of PhD students enrolled in higher education in Sonipat outpaces both Haryana and India highlighting its role as a growing center for advanced research training. Compared to the neighbouring districts, Sonipat, alongside Rohtak and Panipat, appears to be emerging as a major hub for doctoral studies in the region while districts like Karnal are falling behind (Figure 5.6).

b. Overall growth in teaching staff in higher education

Sonipat's teaching staff growth has remained robust, consistently exceeding both Haryana and national averages, but with some variation in momentum. The district peaked in 2019–20, slowed slightly in 2020–21, and rebounded strongly in 2021–22.

Female share: Sonipat outperformed both Haryana and India every year with the gap most pronounced in 2020–21 when Haryana's growth fell to just 2.0 per cent and India's growth to 3.0 per cent, while Sonipat maintained a robust 10.0 per cent. Sonipat led across the period compared to neighbouring districts with only Panipat's sharp recovery in 2021–22 narrowing the gap (Figure 5.7).

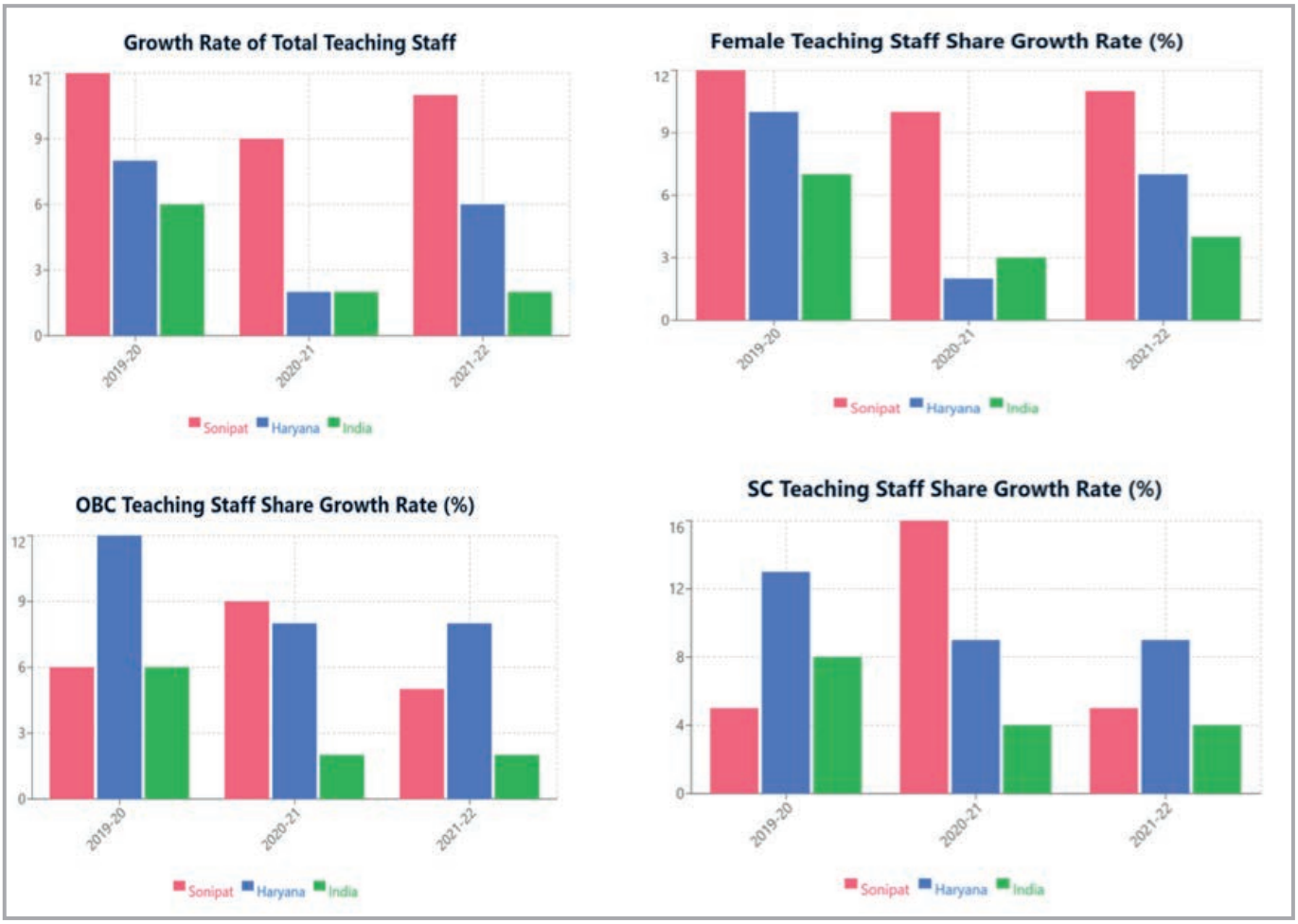
Figure 5.6: Growth rate of enrolment in higher education – by level of education.



Sources and Notes: Authors' calculations using AISHE data.

[9] Data available only for 2020-21 and 2021-22

Figure 5.7: Growth rate of teaching staff in higher education – by gender and social groups



Sources and Notes: Authors' calculations using AISHE(2018-22) data.

Heterogeneity by social groups: The SC teaching staff share grew from 2019-20 to 2020-21 but moderated back to 2019-20 levels in 2021–22. The spike from 2019-20 to 2020-21 was far above Haryana's and India's share highlighting a strong but temporary push in SC representation. Even in the lower-growth years, Sonipat stayed close to or above the national rate but lower than Haryana in 2019–20 and 2021–22. Sonipat's 2020–21 jump in the district comparison placed it among the stronger performers. The OBC teaching staff's share of growth was 6.0 per cent in 2019–20, dipped to 9.0 per cent in 2020–21, and fell further to 5.0 per cent in 2021–22, remaining consistently below Haryana's peak of 12.0 per cent in 2019–20. District-wise, Sonipat's trend for OBCs was steady but moderate compared to its neighbours (Figure 5.7).

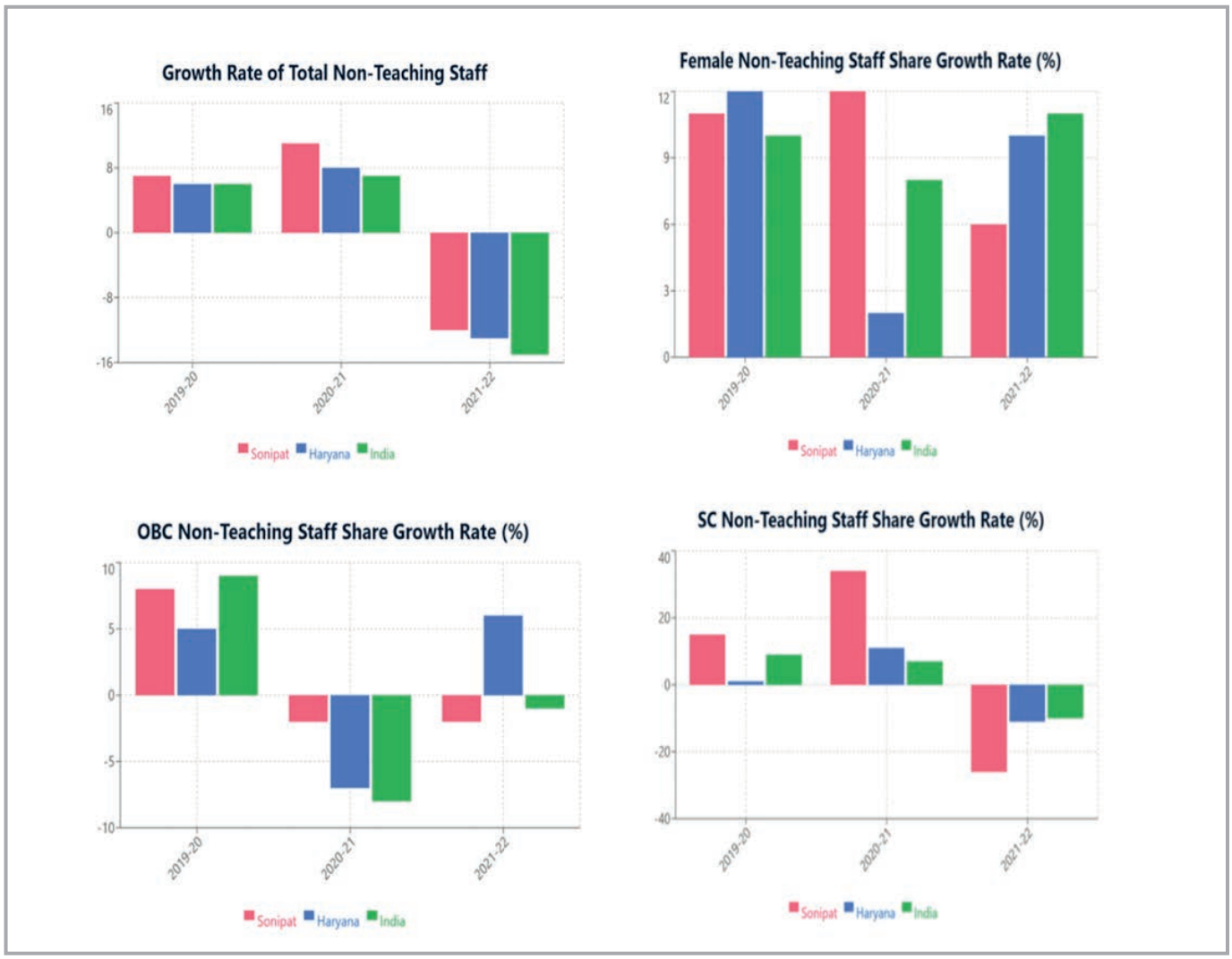
Other disadvantaged groups: Sonipat's Muslim teaching staff share growth was high from 2019 to 2021, before dropping in 2021–22. Yet it was well above Haryana and India. Person with Disability (PWD) teaching staff share rose sharply until 2020–21 before easing though continuing to stay ahead of the state and national trends (Figure 5.7).

c. Overall Growth in Non-teaching staff in higher education

Overall, Sonipat's non-teaching staff growth broadly mirrored the Haryana and national patterns with modest and positive growth in 2019–20 and 2020–21 followed by a sharp decline in 2021–22. Sonipat showed relatively stable but low growth compared to neighbouring districts, lacking the sharp surge seen in Jhajjar during 2020–21. The 2021–22 contraction was common across districts (Figure 5.8).

Female share: From 2018–19 to 2021–22, Sonipat's female share in non-teaching staff declines from 11.0 per cent to 6 per cent – below 9.5 percent in Haryana and 11 percent in India. Similarly, the growth rate of total non-teaching staff has declined in recent years indicating slower overall cadre expansion. Haryana's female share in non-teaching roles remains well below the national level reversing its advantage in teaching positions (Figure 5.8).

Figure 5.8: Growth rate of non-teaching staff in higher education – by gender and social groups.



Sources and Notes: Authors' calculations using AISHE(2018-22) data.

Heterogeneity by social groups: Sonipat's SC share in non-teaching staff rose from 16 per cent in 2019–20 to 35 per cent in 2020–21 but falls by 20 percent in 2021-22, well below Haryana's average (10 per cent) and the national average (9 per cent). All neighbouring districts have higher SC representation with Panipat and Rohtak far ahead. Sonipat's OBC share in non-teaching staff increased marginally but effectively showed no improvement over four years. This level is well below Haryana's and the national average (28.5 per cent) and all neighbouring districts record higher OBC representation. Growth rate data indicate stagnation with no sustained upward movement reflecting persistent under-representation despite quota provisions (Figure 5.8).

Other disadvantaged groups: Between 2018–19 and 2021–22, Sonipat's Muslim share in non-teaching staff rose from 0.2 to 0.6 per cent remaining well below the national average of 3.5 per cent. PWD staff growth in Sonipat was consistently above or on par with national levels peaking in 2021–22 when Haryana recorded a steep drop.

Box 5.2: Aapki Beti Hamari Beti – A Success in Girls' Empowerment

Launched in 2015, Aapki Beti Hamari Beti provides a financial deposit of INR 21,000 for the first girl child in SC and BPL families (and for the second girl child in all families), which matures to about INR 1 lakh at age 18. By 2023, over 4.6 lakh girls had been covered, with nearly 36,000 new beneficiaries added in just six months. Beyond its monetary benefit, the scheme has been credited with changing household attitudes toward daughters, encouraging families to invest in girls' schooling and reducing early drop-outs. In districts like Sonipat, where female enrolment is already relatively strong, the scheme reinforces long-term gains in gender equity.

5.2 Action Analysis: Interventions and Gaps in Haryana's Education Policy

Haryana's education policy framework combines financial incentives, scholarships, and fee relief to promote inclusion across disadvantaged groups. Post-matric scholarships for SC, ST, and OBC students, along with stipends for children from BPL families, have reduced dropouts and supported continuation into higher education. Special merit scholarships such as the Dr. Ambedkar Medhavi Chhattar Yojana reward academic performance, while schemes like CHEERAG allow children from economically weaker sections to study in private schools at government expense. Monthly financial assistance of INR 2,400 is provided to students with disabilities who cannot attend school while centrally sponsored scholarships are used to support higher education. These schemes are critical in light of Sonipat's weak record of inclusion in terms of the poorer outcomes for the disadvantaged caste groups. Yet, despite this wide range of provisions, Sonipat continues to report lower SC and OBC enrolment shares than the state average suggesting that financial aid alone cannot overcome the structural and social barriers faced by these groups. More intensive outreach, mentoring, and institutional reforms will be required to bring disadvantaged groups into the higher education fold. The NEP 2020 reshapes schooling and higher education via the 5+3+3+4 structure, flexible curricula, multiple entry–exit with credit banks, and a higher-education expansion agenda. For Sonipat, aligning district plans and budgeting to these reforms can unlock access and quality gains across stages.

The state has also invested heavily in improving girls' education and empowerment. The flagship *Aapki Beti Hamari Beti* scheme, which provides financial deposits at birth, seeks to alter household attitudes toward daughters and secure their educational futures. Complementary measures such as free materials for SC girls, scholarships for high-performing female students, and toolkit reimbursements for girls have helped to improve retention. Meanwhile, *Beti Bachao, Beti Padhao*, first launched in Haryana, has contributed to narrowing gender gaps in enrolment and literacy.

Alongside these equity-focused interventions, Haryana has undertaken systemic reforms in quality and modernisation. The *e-Adhigam* scheme has distributed tablets to over five lakh students, aiming to bridge the digital divide. At the same time, Model Sanskriti Schools and Centres of Excellence in sports and skills seek to deliver quality comparable to private schools. Vocational training has been embedded in school curricula through the National Skills Qualification Framework, and higher education has been strengthened with the Super-100 Programme, new government colleges, and the establishment of Shri Vishwakarma Skill University. These reforms embody Haryana's ambition for a "KG to PG" model that integrates access, quality, and employability.

5.3 Lessons from Trends

Overall, Sonipat's school education landscape shows moderate improvement across key indicators compared to neighboring districts, Haryana, and India. That said, trends from 2017 to 2022 suggest that further improvements in school education may require improvements in the quality of education rather than quantitative interventions.

The growth rate of schools in urban areas is lower than in rural regions, highlighting the need for more schools in towns and cities to meet rising demand and balance rural–urban educational access. Another concern is the low growth rate of co-educational schools while the number of only boys' and girls' schools has declined. Expanding co-educational institutions can address this imbalance and ensure inclusivity. On a positive note, Sonipat has a better pupil–teacher ratio (PTR) compared to Haryana and India and policy efforts should focus on retaining this advantage through regular teacher recruitment and rational allocation.

In terms of the quality of school education in Sonipat, the learning outcomes of school children in Sonipat are among the top five districts of Haryana. However, there was a sharp dip due to the pandemic following which, while the trend has reversed, the levels have yet to reach 2018 levels. ASER 2022[10] reports nationwide gains in basic reading but dips in arithmetic underscoring the need to double down on

[10] ASER Centre, *Annual Status of Education Report (Rural) 2022: Provisional* (New Delhi: ASER Centre, January 18, 2023), https://asercentre.org/wp-content/uploads/2022/12/aserreport2022-1.pdf.

early numeracy and remedial support. To this end, the National Achievement Survey (NAS) 2021 provides district-wise benchmarks Sonipat can use for targeted improvement, instructional coaching, and assessment-led planning across classes III to VIII.

Sonipat has consolidated its position in higher education as a hub in Haryana with consistent female-majority enrolments and steady growth across UG, PG, and doctoral programmes. Women account for over half of total students and dominate across levels, placing Sonipat above the state and national averages in gender inclusion. The weakest link in Sonipat's higher education system is social inclusion. The enrolments of SC, and OBCs remain well below state and national levels, and PWD participation continues to be marginal.

The composition of the higher education workforce mirrors similar patterns. The teaching cadre has expanded by more than a third over the last four years and remains a female-majority, but SC and OBC representation is the lowest among neighboring districts. Non-teaching staff have seen a modest rise in female participation, yet overall growth has stagnated and disadvantaged groups remain under-represented.

Sonipat's experience shows that while gender parity in enrolments has been achieved, female participation in non-teaching staff roles and in socially disadvantaged groups remains weak. Stronger quota enforcement for SCs, OBCs, and EWS categories, targeted outreach to minorities, and inclusive hiring practices are needed to close persistent gaps. At the same time, mentorship and leadership programmes should translate Sonipat's gender-progressive teaching workforce into greater representation in senior academic and administrative roles. Aligning institutional expansion with equity-focused policies will be critical to ensure that Sonipat's growth in higher education also drives inclusive human development.

Box 5.3: CHEERAG – Expanding Access, Facing Uptake Challenges

Introduced in 2022, the Chief Minister Equal Education Relief, Assistance and Grant (CHEERAG) scheme allows children from families earning less than INR 1.8 lakh annually to attend budget private schools for free, with the government reimbursing fees. Nearly 25,000 seats were made available in the first year, but uptake has been modest. Barriers include lack of awareness among eligible families, reluctance to shift children from government schools, and concerns about hidden costs such as uniforms or transportation. For Sonipat, where SC and OBC students remain under-represented, the limited reach of CHEERAG highlights the need for stronger outreach campaigns, better monitoring of private school participation, and complementary support to ensure disadvantaged students can fully benefit.

5.4 Road Ahead:

Sonipat's performance highlights the need to extend gender-sensitive policies beyond access into leadership, employment, and representation. Uneven uptake of state schemes, digital access gaps in rural areas, and the persistent under-representation of SC and OBC in higher education and staff roles illustrate that the effectiveness of these policies depends not only on their design but on localised outreach, more vigorous quota enforcement, and sustained institutional support.

If Sonipat is to consolidate and maintain its place as a leading education hub in Haryana, its progress must be inclusive. The state's ambitious reforms have created a strong scaffolding. The next step is to ensure these schemes translate into tangible change on the ground through better awareness, district-level monitoring, and context-sensitive implementation. In doing so, Sonipat can deliver a dynamic and equitable education system, laying the foundation for inclusive human development.

KEY INSIGHTS FROM FOCUS GROUP DISCUSSIONS IN KATHURA, MANOULI, AND PIPLI-R VILLAGES IN SONIPAT DISTRICT

- Respondents from Kathura, Manouli, and Pipli-R reported that almost all children including girls and boys under the age of14 are going to school during the last five years.
- ASHA and Anganwadi workers reported with pride that almost all girls in these villages are recieving primary and secondary education. Increasingly, female students are accessing tertiary education and seeking work in the nearby towns and cities.
- While every village has at least one primary school within it, students travel to nearby villages to attend public or private schools for secondary education in Manouli and Pipli-R given their smaller population size.
- None of the villages have colleges for tertiary education (UG, PG, or PhD programs). Students travel to nearby cities such as Gohana, Rohtak, Sonipat, or Delhi for tertiary education.
- Respondents across the villages reported increasing tuition fee for secondary and tertiary education as a challenge due to stagnant or slowly rising household incomes.
- Respondents across villages reported that there is high demand for public sector jobs in the services sector including teaching, banking and financial sector and Military among the younger generations.
- Preparation for public sector jobs is unavailable in these villages and students are forced to move to nearby cities in Sonipat district or other districts and Delhi pushing up the cost of preparation besides the tuition fee paid to colleges and Universities.

Chapter 6

SONIPAT'S STRUCTURAL TRANSFORMATION

Rahul Menon, Mrinalini Jha, Aniket Raykar

6 SONIPAT'S STRUCTURAL TRANSFORMATION

Rahul Menon, Mrinalini Jha, Aniket Raykar

The process of structural transformation or the movement of labour from low-productivity sectors such as agriculture to high-productivity manufacturing has long been recognised as a way for developing economies to increase incomes and transition to high-income status. In India, the process of structural transformation has slowed down recently and has even reversed following the pandemic, with the share of employment in agriculture increasing. In contrast to the all-India experience, the district of Sonipat has seen an increase in manufacturing employment, particularly in women's employment.

While on the one hand, this is a positive trend, it is of concern that the increase in manufacturing employment has not led to an increase in aggregate wages. The increase in earnings in Sonipat has been slower than in the rest of the country, despite the positive direction in structural transformation. We find that this is because earnings for women in the Services sector have fallen significantly. This divergence in fortunes for Sonipat's working women requires urgent intervention to ensure that the fruits of structural transformation are realised for the entire workforce of the district.

6.1 Introduction

The Human Development Index (HDI) is a measure to understand, assess, and track a country's achievements in ensuring its citizens' long and healthy lives, access to education, and a decent standard of living. The component of longevity is measured through life expectancy at birth; access to education is measured through mean years of schooling; and the third component of decent standard of living is calculated using gross national income per capita. While income is not the sole indicator of development, it is nonetheless an integral part. This chapter studies the livelihood and earnings statistics for the district of Sonipat in Haryana, tracking the changing dynamics for different demographic groups over time.

Structural transformation, or labour movement from low-productivity sectors such as agriculture to high-productivity sectors of manufacturing and services, has long been recognised in the development economics literature as a path towards high-income status for developing economies. The district of Sonipat has witnessed strong signs of structural transformation since 2017, with an increase in the labour share in manufacturing. However, despite a rise in employment in high-productivity sectors, there has been, at the aggregate level, no real gains in terms of earnings for its workforce, with earnings in India and the state of Haryana showing faster growth, even though Sonipat has seen a relative increase in manufacturing employment. This is a surprising outcome for a district so close to the national capital, which has seen beneficial outcomes with respect to its occupational and livelihood structure.

This chapter utilises data from two rounds of the Periodic Labour Force Survey (PLFS) to examine incomes and livelihoods in Sonipat from 2017-18 to 2022-23. While PLFS is not designed to be representative at the district level, we rely on the sufficiently large sample size of Sonipat district within Haryana for the analysis to get indicative measures of employment and income. In the absence of representative income and livelihoods data at the district level after 2011-12, PLFS gives access to information on a sizeable section of the population of the district, hence offering the best possible estimates. Furthermore, PLFS district level estimates are found to be highly correlated with district level estimates from NSS Health Survey 2017-18, which is representative at the district level.[1] We study the reasons behind the relative decline in income, in terms of earnings for workers, despite the positive trends of structural transformation. We first consider the monthly earnings of individuals employed according to the Usual Principal and Subsidiary Status (UPSS) as recorded by the PLFS. According to UPSS, the employment status of individuals is recorded as per the nature of the activity they were engaged in for one year prior to the date on which they were surveyed.

[1] Deshpande and Singh (2024).

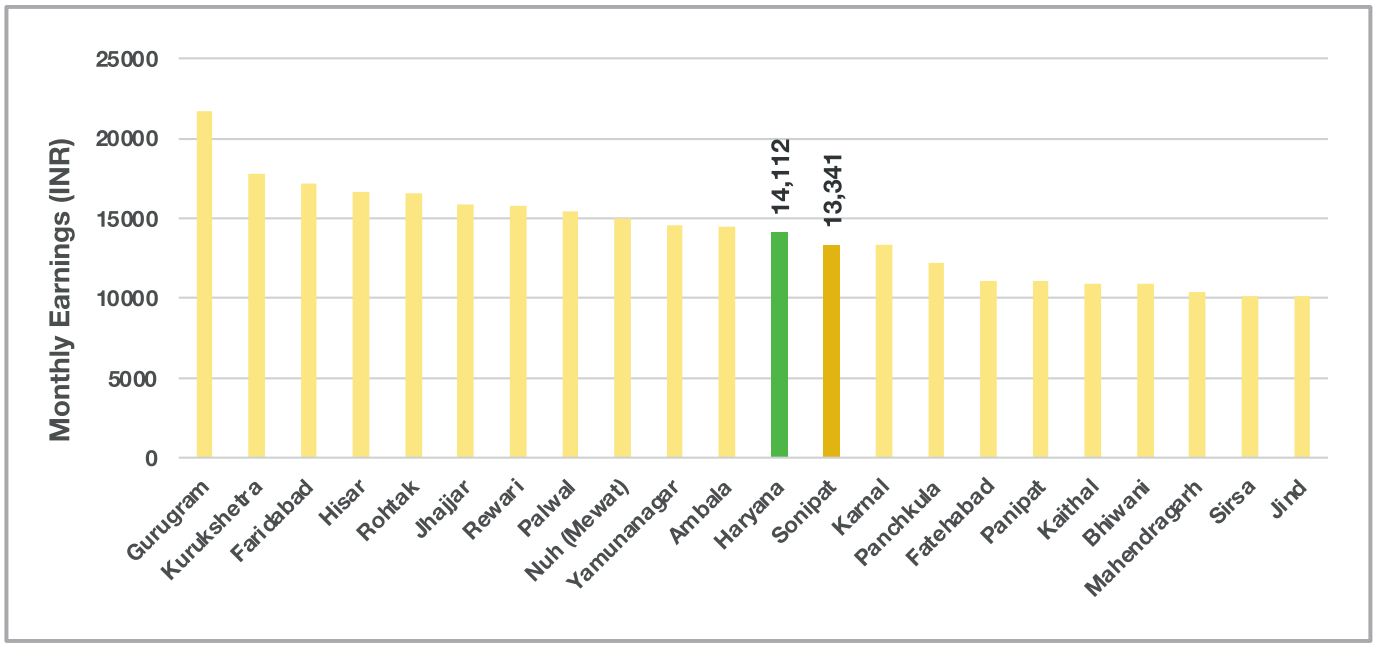
Employed individuals are engaged in self-employment, regular wage, or casual wage labour. The monthly income from the work they spend most of their time doing is calculated for all employed individuals over the age of 15. We compute the monthly earnings, which are the reward for work, and do not consider earnings from capital or other sources of income, or profits generated. Thus, this is seen as a limited notion of income, but it gives us an essential insight into the livelihoods and incomes of individuals in India, Haryana, and Sonipat.

In 2017-18, the average monthly earnings in Sonipat were nearly 28 per cent higher than the all-India average. Though the district was significantly more affluent than the rest of the country, the average monthly incomes in Sonipat remained roughly 5 per cent lower than that for the state of Haryana. In 2017-18, Sonipat was only the 12th most affluent district among the 21 state districts.[2] For instance, in 2017-18, the average monthly earnings for workers in Sonipat were INR 13,340 (Figure 6.1), while those of India were INR 10,396. By 2022-23, Sonipat's average monthly income rose to roughly INR 15,000 (Figure 6.2). In contrast, the average monthly earnings for the rest of the country were INR 13,707.

Even as monthly incomes have grown from 2017-18 to 2022-23, Sonipat's income growth has been slower than that of India and Haryana, leading to a relative fall in its standing. By 2022-23, Sonipat's monthly earnings were only 9 per cent higher than the rest of the country, implying faster income growth in the rest of the country. Nominal incomes in India grew at a compounded annual rate of 5.32 per cent over this period, while Sonipat only grew at 2.36 per cent. However, the average rate of inflation for Haryana over this period was roughly 5.2 per cent, indicating a significant reduction in real earnings for Sonipat's working population over this period.

The relative performance for Sonipat has been even worse when compared to Haryana. Sonipat's monthly earnings, which were 5 per cent lower than the rest of the state in 2017-18, became 13 per cent lower than the average earnings in the rest of the state in 2022-23. Monthly earnings in Haryana grew at almost 4 per cent between 2017-18 and 2022-23. In 2017-18, the average monthly earnings in Haryana were around INR 14,123, increasing to INR 17,326 by 2022-23. This is faster than the rise in earnings in Sonipat district, yet slower relative to inflation. By 2022-23, Sonipat was 14th amongst 22 districts when ranked by monthly earnings. This fall in the relative ranking of Sonipat within Haryana from 12th to 14th over five years indicates a serious concern – that of slow-growing nominal earnings and falling real earnings over this five-year period for Sonipat; seeing it fall behind other districts of Haryana; and seeing it grow slower relative to the rest of the country.

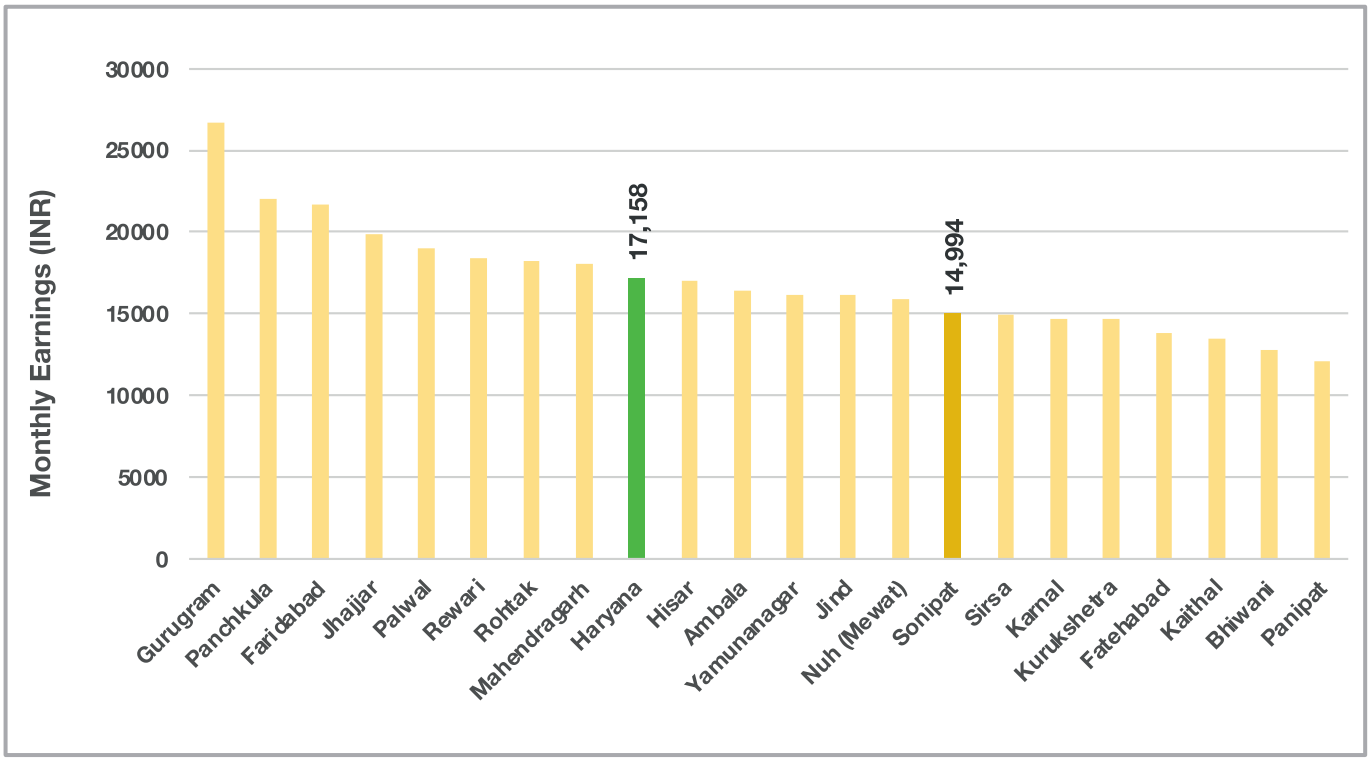
Figure 6.1: Average monthly nominal earnings for districts in Haryana: 2017-18 (INR)



Sources and Notes: Authors' calculation using PLFS 2017-18. The graph plots the average nominal monthly earnings from employment for all individuals above 15, for all districts in Haryana in 2017-18.

[2] At the time of collecting data for PLFS 2017-18, Haryana had only 21 districts.

Figure 6.2: Average monthly nominal earnings for districts in Haryana: 2022-23 (INR)



Sources and Notes: Authors' calculation using PLFS 2022-23. The graph plots the average nominal monthly earnings from employment for all individuals above 15, for all districts in Haryana in 2022-23

6.2 Labour Force and Workforce Participation in Sonipat

One of the significant differences between Sonipat and the rest of the country lies in the lower workforce participation and labour force participation rates (WPR and LFPR, respectively)[3] as seen in Table 6.1. Though the district experienced a similar increase in WPRs and LFPRs as the rest of the country, there was no significant gap closing between the two. For example, India's WPR (LFPR) was 6 percentage points (7 percentage points) higher than Sonipat's in 2017-18, and 5.3 percentage points (6.7 percentage points) higher in 2022-23. Broad changes in Sonipat's labour market indicators proceeded at a similar trend relative to the rest of the country over this period.

However, the increase in these district labour force indicators relative to the state of Haryana is of interest. In 2017-18, Sonipat's WPR was similar to Haryana's, while its LFPR was lower. However, by 2022-23, both indicators were much higher than Haryana's. Sonipat has seen a significant increase in workforce and labour force participation, which, on the face of it, can be seen as a positive outcome. However, this increase in labour force participation has been accompanied by a reduction in monthly earnings, leading to Sonipat seeing rising employment but falling earnings, which is a worrying outcome.

Similar to the nationwide trend, the rise in the WPR and LFPR has primarily increased women's work. The LFPR of men have stayed roughly constant, and the WPR has increased, indicating a fall in the unemployment rate for men. In sharp contrast, there has been a significant increase in the WPR and LFPR of women, almost doubling in 2022-23 compared to their 2017-18 levels. The WPR and LFPR of women in Sonipat are lower than the all-India levels, though the divergence in these levels has come down since 2017-18. For instance, the LFPR for women aged 15 and above in 2017-18 in Sonipat was 15 per cent, relative to 22 per cent at the all-India level. By 2022-23, the earlier gap of 7 percentage points came down to 4, with the female LFPR for Sonipat and India at 32 per cent and 36 per cent, respectively. However, the effect of this increase has been an increase in women's unemployment rates. Women's unemployment was negligible in 2017-18, but due to

[3] WPR is defined as the percentage of employed individuals in the total working age population.
LFPR is defined as the percentage of the working-age population who are either employed or actively seeking work.

Table 6.1: Workforce and Labour force indicators (in %)

	2017-18			2022-23		
	All-India	Sonipat	Harayana	All-India	Sonipat	Harayana
WPR (Above 15)	48.1	42.1	42.67	57.36	52.02	46.15
LFPR (Above 15)	51.04	43.97	46.54	59.23	52.47	49.08

Sources and Notes: Authors' calculation using PLFS 2017-18 and 2022-23.

the rise in LFPRs relative to WPRs by 2022-23, women's unemployment rates have risen to 1.8 per cent. This is the same period over which men's unemployment rates have fallen. What is striking is that the increase in women's LFPRs and WPRs in Sonipat has been far greater than what is seen at the aggregate level for Haryana. Women's WPRs (LFPRs) in Haryana rose from 13.08 per cent (14.64 per cent) in 2017-18 to 20.18 per cent (21.14 per cent) in 2022-23, far less than that of Sonipat (Table 6.2).

The rise in women's LFPRs across the country hides widespread weaknesses and precarity. Much of the increased employment for women has come in the form of unpaid family work, a form of non-remunerative self-employment which keeps women within the realm of the household, and cannot be counted as sustainable or sufficiently productive employment. As seen in Table 6.3, the share of women working as unpaid family help rose from 31.6 per cent in 2017-18 to 37.38 per cent in 2022-23. The share of self-employment - including unpaid family help - has increased at the expense of wage employment. The proportion of working women in regular wage jobs - seen as an indicator of non-precarious employment - has fallen from 21.08 per cent to 15.9 per cent, a worrying development. The impact of the pandemic has been to reverse earlier gains in expanding wage employment for women.

The trend is slightly different for the state of Haryana. Haryana has much higher participation in regular wage employment for both men and women than the rest of India. In Haryana, the proportion of women in unpaid family work has significantly increased, from 7.74 per cent of the workforce to 18.68 per cent, a significant rise in just five years. Similar to national-level trends, the proportion of women in casual wage employment has also reduced. However, the proportion of women in regular wage employment has increased, from 27.9 per cent to 30.06 per cent, in contrast to the national trend.

In comparison, Sonipat has seen some distinctive trends, primarily shifting from casual labour to regular wage and self-employment. The proportion of women in casual wage employment has seen a massive reduction, from 30.5 per cent to roughly 3.24 per cent. Women have shifted towards self-employment, with the share of women in self-employment excluding unpaid family work rising from 39.37 per cent to 46.43 per cent, and the share of unpaid family help rising from 3.07 per cent to 14.14 per cent. While significant, the share of women in unpaid family help in Sonipat is less than that of Haryana, and much less than the levels seen at the all-India level. The district has also seen a healthy rise in the proportion of women in regular wage work, rising from 27.04 per cent to 36.19 per cent, a marked improvement compared to the rest of the country.

Table 6.2: Women's Labour Force Participation (in %)

	2017-18			2022-23		
	All-India	Sonipat	Harayana	All-India	Sonipat	Harayana
WPR (Above 15)	22.52	15.53	13.08	36.66	31.75	20.18
LFPR (Above 15)	23.87	15.53	14.64	37.77	32.34	21.14

Sources and Notes: Authors' calculation using PLFS 2017-18 and 2022-23.

Table 6.3: Forms of Employment (in %)

Shares of employment, above 15 years, by sex				
India	**2017-2018**		**2022-2023**	
	Men	**Women**	**Men**	**Women**
Self-Employment	44.36	20.24	44.43	27.9
Unpaid family help	7.93	31.61	9.08	37.38
Regular Wage	23.41	21.08	23.22	15.91
Casual	24.3	27.07	23.27	18.81
Total	100	100	100	100
Haryana	**2017-2018**		**2022-2023**	
	Men	**Women**	**Men**	**Women**
Self-Employment	38.94	34.73	37.95	31.53
Unpaid family help	5.33	7.74	5.99	18.68
Regular Wage	36.87	27.9	39.17	30.06
Casual	18.86	29.63	16.89	19.73
Total	100	100	100	100
Sonipat	**2017-2018**		**2022-2023**	
	Men	**Women**	**Men**	**Women**
Self-Employment	42.52	39.37	32.96	46.43
Unpaid family help	3.83	3.07	8.73	14.14
Regular Wage	36.47	27.04	48.45	36.19
Casual	17.18	30.52	9.86	3.24
Total	100	100	100	100

Sources and Notes: Authors' calculations using PLFS 2017-18 and 2022-23. The table above indicates the employment shares for men and women in India, Haryana, and the Sonipat district.

6.3 Structural Transformation and Earnings

The sections above indicate a central puzzle concerning Sonipat's economic performance over the last five years. Sonipat has seen a relative improvement in employment and women's labour force participation. Women have increased their participation in the workforce and the labour force. Unlike the rest of the country, they have actually seen an improvement in the forms of employment, with a rise in the proportion of women engaged in regular wage work. Coupled with an increase in LFPR and WPRs, this should indicate an increase in earnings and more sustainable, remunerative livelihoods. That has not occurred. Sonipat has seen a relative reduction in earnings compared to the country and other districts in Haryana.

The puzzle is further compounded when looking at the rate of structural transformation occurring

across the Indian economy. Structural transformation is defined as a reduction in the proportion of working individuals engaged in agriculture and an increase in non-agricultural employment. Structural transformation aids income growth by shifting individuals away from low-productive activities like agriculture into more productive sectors such as manufacturing and services, leading to rising incomes and boosting output growth.

The process of structural transformation has stalled, or even reversed, at the all-India level. As can be seen in Table 6.4, the share of the workforce in agriculture increased from 44.12 per cent to roughly 47 per cent at the all-India level over this entire period. This is a stark outcome, for economic growth in the modern era worldwide has always led to a reduction of the agricultural sector. However, we have seen the opposite in India, with a rise in the share of agriculture workers and a decrease in manufacturing and services. This can be seen in the state of Haryana as well. In Haryana, the share of individuals employed in agriculture has risen from 27.5 per cent to 30.26 per cent. In contrast, the share employed in manufacturing has actually reduced, from 19.5 per cent to 16 per cent.

Sonipat has bucked the trend. The share of agricultural employment has seen a dramatic fall, from around 35 per cent to 26 per cent, a dramatic fall when compared to the rest of the country, and even to Haryana. Employment shares have risen in all other sectors, with the share of employment in Services rising from 40 per cent to 43 per cent. Even more significantly, the proportion of employment in manufacturing has increased from 18.6 per cent to 23 per cent, a significant outcome given the debate about 'premature deindustrialisation' of the Indian economy. The proximity of Sonipat to the National Capital Region may have led to large-scale shifting of manufacturing enterprises to the district, as witnessed by the rise of manufacturing hubs such as Kundli. This has led to rising manufacturing employment in the Sonipat district.

Moreover, the structural transformation in Sonipat has been beneficial to women, in sharp contrast to that seen in Haryana and India. At the all-India level and at the level of Haryana, there has been an increase in the share of women engaged in agriculture (Table 6.5). Haryana has also seen a rise in the share of men, in contrast to what is seen at the all-India level. At the all-India level, there has been a marked reduction in the share of women engaged in manufacturing and services, with an increase in those seen in agriculture. In Haryana, though there has been an increase in women engaged in Services, there has been an increase in women in agriculture and a reduction in those in manufacturing.

This is in stark contrast to the outcomes seen in Sonipat district. From 2017-18 to 2022-23, there has been a marked reduction in the share of women engaged in agriculture. Over half - nearly 57 per cent - of women in the workforce of Sonipat were involved in agriculture in 2017-18, yet that figure fell to 40 per cent by 2022-23, a remarkable reduction over the last five years. The share of women in Construction has also reduced, with the shift seeing a significant increase in women in Manufacturing and Services. A clear pattern has emerged; Sonipat's proximity to manufacturing hubs in NCR has led to a shift in manufacturing into the district, allowing the district to weather the reversal of structural transformation seen elsewhere. Moreover, this has seen an increase in more secure forms of employment, particularly for women.

Table 6.4: Sectoral Employment Shares (in %)

	India		Sonipat		Haryana	
	2017-18	2022-23	2017-18	2022-23	2017-18	2022-23
Agriculture	44.12	46.94	34.9	25.7	27.5	30.26
Construction	11.69	12.74	6.48	7.92	12.8	12.48
Manufacturing	12.12	11.21	18.61	23.32	19.49	15.93
Services	32.08	29.11	40.01	43.07	40.2	41.33
Total	100	100	100	100	100	100

Sources and Notes: Authors' calculation using PLFS 2017-18.

Table 6.5: Gender and Shares of Employment (in %)

2017-18						
	India		Sonipat		Haryana	
	Men	Women	Men	Women	Men	Women
Agriculture	40.22	56.96	30.18	57.25	24.08	47.35
Construction	13.71	5.04	6.96	4.22	14.48	3.09
Manufacturing	12.02	12.44	21.23	6.20	20.04	16.27
Services	34.05	25.55	41.64	32.33	41.39	33.29
All Activities	100	100	100	100	100	100
2022-23						
	India		Sonipat		Haryana	
	Men	Women	Men	Women	Men	Women
Agriculture	38.63	64.69	18.88	40.92	25.24	49.02
Construction	16.88	3.89	11.46	0.00	14.89	3.48
Manufacturing	11.30	11.01	27.47	14.03	17.16	11.34
Services	33.18	20.41	42.18	45.04	42.71	36.17
Total	100	100	100	100	100	100

Sources and Notes: Authors' calculation using PLFS 2017-18.

6.4 Income and Earnings

The central puzzle, therefore, is why there has been a relative reduction in earnings even though there has been such a positive change with regard to employment in the district. Even though women have increased their presence in wage work and manufacturing, relative earnings at the aggregate level have reduced. Table 6.6 outlines Sonipat's relative monthly earnings across all sectors, relative to India and Haryana. In 2017-18, monthly nominal earnings in Sonipat were almost 28 per cent higher than in India, falling to 9 per cent by 2022-23. Sonipat's monthly earnings were 5 per cent less than Haryana's in 2017-18, and 13 per cent less by 2022-23.

The process of structural transformation has led to an increase in manufacturing earnings. Earnings from manufacturing in Sonipat were 3 per cent lower than the all-India level in 2017-18, rising to 7 per cent higher in 2022-23. Average monthly earnings from manufacturing in Sonipat grew from INR 10,218 in 2017-18 to INR 14,478 by 2022-23. However, the sector that has seen a significant reduction is services. In 2017-18, monthly earnings in Services in Sonipat were only 5 per cent less than those of Haryana, but the gap widened by 2022-23. The fall is even more significant at the all-India level, from a premium of 16 per cent to being lower by 18 per cent relative to national level earnings in just five years. Services earnings fell from INR 16,866 in 2017-18 to around INR 15,555 by 2022-23. It is clear, thus, that a reduction in earnings in Services has primarily driven the decrease in Sonipat's relative earnings.

Table 6.7 outlines the CAGR[4] of monthly earnings for each sector, disaggregated by gender, for India, Sonipat and Haryana. We do not include Construction because the PLFS surveys have not captured the

[4] Compounded Annual Growth Rate.

Table 6.6: Relative Earnings (Ratio) by Sector of Employment

	India		Haryana	
	2017-2018	2022-2023	2017-2018	2022-2023
Agriculture	1.63	1.52	1.03	1.00
Construction	1.14	1.25	0.95	1.17
Manufacturing	0.97	1.07	0.81	0.89
Services	1.16	0.82	0.95	0.77
Total	1.28	1.09	0.95	0.87

Sources and Notes: Authors' calculations using PLFS 2017-18 and 2022-23. Each figure outlines the ratio of Sonipat's average monthly earnings relative to India and Haryana. For instance, a figure of 1.63 for Agriculture in 2017-18 implies that Sonipat's average monthly earnings in agriculture are 63% higher than the all-India average monthly earnings in agriculture.

presence of any women in Construction in Sonipat for 2022-23. The rate of growth of earnings in agriculture has been high for men and women at the all-India level, and extremely high for Sonipat men and the women of Haryana. The highest rate of growth has been for Sonipat women in Manufacturing, indicating the positive effects of structural transformation and the shift of manufacturing into Sonipat.

The women workers in Sonipat have experienced the steepest rise but also the sharpest fall in earnings based on their employment sector. Monthly earnings for Sonipat women in Manufacturing increased by around 19 per cent. It fell for those in Services by almost 12 per cent per year, even while male workers saw an annual rise of 2.34 per cent. Sonipat women earned an average of around INR 17,500 in Services in 2017-18 which fell to INR 9,500 by 2022-23. This large fall in Services has caused a significant reduction in the average monthly earnings of Sonipat women, falling by almost 3.68 per cent annually, from INR 9,722 in 2017-18 to INR 8,062 by 2022-23. The fall in earnings for Services is an outcome seen in Haryana as well, where monthly earnings for women in Services have reduced by 1.3 per cent annually, though the fall is much larger for Sonipat. In contrast, earnings for women in Services at the all-India level have shown relatively high growth.

This explains the puzzling outcome of a reduction in earnings alongside an increase in structural transformation. The increase in manufacturing has benefited Sonipat, especially Sonipat women, who have seen a high rise in monthly earnings due to being employed in the expanding manufacturing sector. However, this has been accompanied by a significant fall in monthly earnings for the women in Services. This is compounded by the fact that the services sector employs the most significant proportion of working women in Sonipat. At the aggregate all-India level, and for Haryana, nominal monthly earnings have risen at a rate lower than the rate of inflation, implying a reduction or stagnation in real terms. The situation for women in Sonipat is worse, for nominal earnings themselves have seen a significant reduction for the largest share of women.

6.5 Government Schemes

Several programmes and schemes of the Government of India (GOI) and Government of Haryana (GOH) are active in Sonipat, providing employment and income assistance to residents. Deendayal Antyodaya Yojana-National Rural Livelihoods Mission (DAY-NRLM) is a key initiative by the GOI, implemented in Haryana since April 1, 2013. The programme is designed to reduce poverty by promoting self-employment and wage opportunities for poor households. The programme has reached 143 blocks across 22 districts, covering 5,87,737 households through 59,102 Self Help Groups (SHGs), supported by 4,429 village organisations and 225 Cluster Level Federations. Financial assistance includes a revolving fund of INR 10,000 and a community investment fund of INR 50,000 per SHG. The programme has disbursed INR 65.24 crore in revolving funds and INR 393.93 crore in community investment funds to support various livelihood

Table 6.7: Rate of Growth of Monthly Nominal Earnings between 2017-18 and 2022-23 (in %)

All-India		Male	Female	Total
	Agriculture	8.79	5.27	6.84
	Manufacturing	6.38	4.28	5.15
	Services	5.71	4.90	5.48
	Total	6.60	3.31	5.68
Sonipat		**Male**	**Female**	**Total**
	Agriculture	11.00	2.53	5.32
	Manufacturing	8.00	18.78	7.22
	Services	2.34	-11.76	-1.60
	Total	5.01	-3.68	2.36
Haryana		**Male**	**Female**	**Total**
	Agriculture	5.39	10.63	5.91
	Manufacturing	5.15	5.51	5.05
	Services	3.45	-1.31	2.57
	Total	4.29	3.96	3.99

Sources and Notes: Authors' calculation using PLFS data.

activities.[5] In 2024-25, 4,167 new SHGs were formed under the programme, receiving a total of INR 42.01 crore worth of funds in revolving and community investment funds.[6]

Next, Deen Dayal Upadhyaya Grameen Kaushalya Yojana (DDU-GKY), a skill development and placement initiative by the Ministry of Rural Development, GOI, aims to enhance the employability of rural youth. Originating from the Aajeevika Skills Programme and the 'Special Projects' component of the Swarnjayanti Gram Swarozgar Yojana, the programme has made a significant impact, with 22 districts covered, 14 active project implementing agencies, and 16 active training centres. So far, 53,612 candidates have been trained under the programme, 51,503 assessed, 23,487 certified, and 30,828 placed in jobs. The programme has 3,328 individuals currently training.[7]

The Rural Self-Employment Training Institutes (RSETIs) aim to develop entrepreneurial skills among youth, enabling them to establish their own ventures with or without bank support. Currently, Haryana has 21 RSETIs, focusing on training rural youth below the poverty line (BPL). Out of 21 RSETIs, 17 are set up by PNB, three by Canara Bank, and one by SBI. The programme provides free training in different skills, particularly in agri-based activities and entrepreneurship development, to achieve a high settlement rate for candidates. Additionally, RSETIs offer support for two years, assisting participants in overcoming initial challenges and facilitating access to bank credit.[8]

During the Kharif 2023 season, the GOH launched the 'Haryana Fasal Suraksha Yojana' to protect cotton crops in seven districts, including Sonipat. Farmers

[5] Government of Haryana, Haryana State Rural Livelihoods Mission, https://hsrlm.gov.in/Day-NRLM.aspx

[6] Government of Haryana, Department of Economic and Statistical Affairs. *Economic Survey of Haryana*, 2024–25. (Government of Haryana, 2025), https://cdnbbsr.s3waas.gov.in/s32b0f658cbffd284984fb11d90254081f/uploads/2025/03/20250317378593833.pdf

[7] Government of Haryana, Haryana State Rural Livelihoods Mission.

[8] Ibid

registered online by paying INR 1,500 per acre. The programme benefitted 15,317 farmers from a total financial assistance of INR 65.09 crore. For Kharif 2024, the government announced a bonus of INR 2,000 per acre for farmers affected by adverse weather, distributing approximately INR 800 crore. An outlay of INR 1,000 crore has been allocated for this scheme for the financial year 2025-26.[9]

Haryana Kaushal Rozgar Nigam Limited (HKRNL) is a government initiative established under the Companies Act of 2013 to deploy contractual manpower in various government and private entities. Its primary mission is to empower socio-economically disadvantaged individuals by providing them with skill training and ensuring their employment. HKRNL has successfully deployed approximately 1.26 lakh contractual employees, offering social security benefits and ensuring timely salary payments in accordance with government policies.

The GOH also launched the Deen Dayal Lado Lakshmi Yojana, 2025[10], to empower women by providing monthly financial assistance of INR 2,100 to eligible women aged 23 and above from families with an annual income of up to INR 1 lakh. The benefits of the programme will be delivered through a Direct Benefit Transfer system.

And finally, under the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), the state has spent INR 585.11 crore to create 89.59 lakh person days as of January 20, 2025. During 2023-24, in the Sonipat district, 23.96 per cent of households received social protection benefits under MGNREGS, which is lower than the state average of 31.69 per cent. However, in terms of responsiveness to the demand, 100 per cent of individuals who sought employment under the scheme were offered jobs, reflecting efficient implementation of the scheme in the district.[11]

6.6 Conclusion

At a broad level, it could be argued that policy for Sonipat has actually performed relatively well, in that it has ensured a rising share of manufacturing employment and an increase in women's remunerative employment in the growing manufacturing sector (notwithstanding the other problems that may arise due to structural transformation). However, the benefits of this move have been countered by the surprising outcome of a significant reduction in Services earnings for women, leading to a relative decrease in revenues. The task for policy will be to investigate and understand the various factors leading to this change to ensure that the benefits of structural transformation are not lost. With PLFS modifying its sampling strategy to make the survey representative at the district level, the upcoming rounds of the survey will assist researchers in understanding the underlying trends with greater precision. Supplemented with findings from our smaller surveys, this will further help policymakers towards designing schemes for strengthening the positive trend of Sonipat's structural transformation towards both better productivity as well as better livelihood for the citizens.

[9] Government of Haryana, *Economic Survey of Haryana*, 2024–25

[10] Government of Haryana, Directorate of Social Justice, Empowerment, Welfare Of Scheduled Castes And Backward Classes And Antyodaya (SEWA) Department, *Haryana Government Gazette Extraordinary*, (Government of Haryana, 2025), https://cdnbbsr.s3waas.gov.in/s392bbd31f8e0e43a7da8a6295b251725f/uploads/2025/09/20250917408358572.pdf

[11] Government of Haryana, Finance Department, Sustainable Development Goals Coordination Centre, Swarna Jayanti Haryana Institute for Fiscal Management, *Haryana SDG District Index, June 2024* (Government of Haryana, 2024), https://sdgcc.in/wp-content/uploads/2024/10/SDGDI2024.pdf

Box 6.1: Livelihood-based successful case study of the district

Case Study[12]: Impact of MGNREGA in Sanpera Village, Sonipat

MGNREGA is one of the ambitious schemes of the Government of India. A village, Sanpera in Sonipat district, shows that the scheme not only generates livelihood but also plays a vital role in the village development. Rural areas often face water logging and soil erosion due to an improper drainage system, which might affect land fertility.

Near Kaseri Pond, in the Sanpera Gram Panchayat of the Murthal Block in the Sonipat district, there is about 4 acres of Panchayat land on one side and 40 acres of private farmland on the other, owned by local farmers. A road is used to connect these two areas. During the rainy season, these fields would flood, and water would accumulate on the adjacent Panchayat land. This would cause mass soil erosion, and sometimes the existing road would wash away.

To protect the land from erosion, the villagers requested the construction of a culvert. The culvert and road construction in Sanpera was then done under the MGNREGA scheme for the public interest. After constructing the culvert and the road, water that once collected in the fields no longer flows onto the panchayat land. Instead, it is now directed to the Kaseri pond using the culvert.

Figure 6.3: Work done under MGNREGA in Sanpera Village, Sonipat

Sources and Notes: Construction of Culvert (Pulia) for Community GP Sanpera, Government of Haryana

Outcome

This change benefited in many ways. Water logging no longer affects the farmers' fields, keeping around 50 farmers' fields safe. The crop won't spoil. The panchayat land will also be free from erosion. The fertile land will remain intact, and its fertility will be preserved.

A 1.5 km road was built alongside the culvert, connected to Shahpur Road, which links to the GT road shortly afterward. Villagers can now easily commute to and from the culvert. Farmers no longer face crop damage due to water logging, increasing their income.

This initiative shows how MGNREGA provides employment opportunities and ensures sustainable rural development, enhancing agricultural productivity and infrastructure.

Figure 6.4: Work done under MGNREGA in Sanpera Village, Sonipat

Sources and Notes: Construction of Culvert (Pulia) for Community GP Sanpera, Government of Haryana

[12] Government of Haryana, Construction of Culvert (Pulia) for Community, Gram Panchayat Sanpera, District Sonipat, Block Murthal, 2021–2022. (Haryana: Gram Panchayat Sanpera, 2022). https://cdnbbsr.s3waas.gov.in/s3c3614206a443012045cfd75d2600af2d/uploads/2023/02/2023020715.pdf

KEY INSIGHTS FROM THE FOCUS GROUP DISCUSSIONS IN KATHURA, MANOULI, AND PIPLI-R VILLAGES OF SONIPAT DISTRICT

- Households in the villages of Manouli and Pipli-R which are closer to the city of Delhi and closer to either Eastern or Western Peripheral Expressways are more diversified in terms of economic activities and employment opportunities compared to Kathura village which is farther from the city as well as expressways.
- Respondents in Manouli reported that there has been an increase in non-farm employment opportunities in the last five years due to factories in Kundli and Rai areas and the TDI mall. Similarly, respondents in Pipli-R reported rise in non-farm jobs due to nearby tape factory, plywood factory and the upcoming Maruti Suzuki plant in Kharkhoda.
- In contrast, respondents in Kathura reported that majority of their households still rely on agriculture and allied activities for income due to lack of non-farm employment opportunities in the village and the nearby town of Gohana.
- In line with findings mentioned in the chapter, respondents from Manouli and Pipli-R mentioned that real wages from the available non-farm jobs are lower while the working hours are longer.
- Respondents from these villages also mentioned that women are increasingly travelling to nearby industrial areas for work. However, they are mainly engaged in low-paid service sector jobs such as cleaning and maintenance in factories or service sector enterprises.
- Female respondents in these villages reported that self-help groups exist in the village. However, they are currently not engaged in any income-generating activities. Few young female respondents expressed keen interest in obtaining necessary skills through government training programs so that they can work part-time or work from home when they are not taking care of children or household work.
- Kathura respondents reported that women are participating more than men in the jobs offered by MGNREGA, partly also due to reduced incomes from loss of cattle and dairy business.

Chapter 7

SPATIAL TRANSFORMATION OF SONIPAT DISTRICT

Bhuvaneswari Raman, Shubham Shekhar, Rithish GP and Bharath R

7 SPATIAL TRANSFORMATION OF SONIPAT DISTRICT

Bhuvaneswari Raman, Shubham Shekhar, Rithish GP and Bharath R

Sonipat district in Haryana is urbanising steadily, marked by the rapid conversion of agricultural land into urban infrastructure and built-up spaces. This chapter examines the district's spatial transformation and its quality in terms of inclusivity and equity (SDG 11.3 and 1.4). Analysis of demographic and spatial data shows steady but uneven urbanisation concentrated along the main thoroughfare. Spatial histories of four major urban centers reveal diverse trajectories, yet contemporary transformation is largely driven by three forces: rising land demand for public and private educational institutions, industrial estates, and mega-infrastructure projects such as highways and proposed metro or monorail extensions. These have, in turn, catalysed private developer-led gated housing and luxury apartments targeting higher-income groups. Concentration of state-led infrastructure along major corridors has intensified agricultural land conversion and fuelled a speculative land and housing market. Meanwhile, small and medium industries attract low-wage migrant labourers who depend on underserviced villages and informal rental housing. The result is a fragmented landscape where well-serviced enclaves coexist with overcrowded, underserviced villages and colonies offering cheap rentals. Land ownership patterns dominated by the Jat community reinforce inequality, excluding low-income and migrant groups from formal housing and infrastructure. Multiple institutions—local governments, regional authorities, parastatals, and special purpose vehicles—shape Sonipat's growth, yet without coordinated reform in governance, planning, and housing regulation, these inequalities risk deepening. Redirecting growth towards equity and sustainability remains crucial to making Sonipat's urbanisation inclusive, resilient, and socially just.

7.1 Introduction

Sonipat district, on the northern side of India's National Capital Region (NCR) in the State of Haryana, is urbanising steadily. Its physical landscape, once dominated by land under agriculture and rural settlements, is being reshaped by gated housing complexes, universities and new connectivity infrastructure. In this chapter, we examine the patterns of spatial transformation in the district, defined as the reorganisation of land use and built form. We discuss these changes concerning SDG goals 11.3 (inclusivity of urbanisation) and 1.4 (equitable access to land, housing, and basic services).

Much of this transformation unfolds in peri-urban and 'rurban' areas, which may lie outside urban administrative jurisdiction. These are shaped by State-led project-based interventions in land and infrastructure investments predominantly aimed at expanding economic growth.

As observed in other cities across the Global South, Sonipat's spatial transformation is constituted by State-led and spontaneous urbanisation processes. Field observations reveal labour colonies, informal markets, and street vending clusters. However, data on informal housing and land markets remain scarce. These overlapping processes have produced a fragmented urban landscape, characterised by speculative real estate development, private gated enclaves, and state-supported industrial zones, juxtaposed with overcrowded and underserviced villages and informal settlements.

These patterns of spatial transformation risk deepening spatial inequalities and undermining inclusive urban development. We argue for a coordinated approach to planning and investment processes, balancing efforts to drive economic growth and creating livable and equitable urban spaces.

The rest of this chapter is organised into three sections. Section 7.2 lays out evidence on: rate of urbanisation and land-use changes. Section 7.3 examines key drivers of transformation, followed by tentative recommendations in Section 7.4.

7.2 Evidence on Spatial Transformation

Sonipat district's spatial transformation patterns can be inferred through three key indicators:

demographic trends and quantitative and spatial data on land use changes. While quantitative data helps measure the scale of change, spatial imagery reveals how it unfolds across space, revealing diverse urbanisation trajectories of the district.

Rate of Urbanization

Sonipat district has been steadily urbanising since 2001, as can be inferred from Table 7.1. Haryana State is experiencing rapid urbanisation. The percentage of the population living in urban areas increased from 28.92 per cent in 2001 to 34.88 per cent in 2011. It is projected to rise significantly to 46.7 per cent by 2031, which is notably higher than the national average. The rate of urbanisation in Sonipat is lower than in Faridabad and Gurgaon, the most urbanised districts in the state.

Data for 2021 and 2031 in Table 7.1 are based on projections, but the spatial data on land-use changes in Figure 7.1 support evidence of a steady yet uneven pace of urbanisation in the district.

Given its proximity to Delhi, ongoing investments along the National Capital Region's growth corridors, and rapid industrial expansion in Sonipat, it is reasonable to expect that the district's urbanisation will continue to accelerate—approaching the state average—driven by strong spillover effects from Delhi and the NCR growth zones. The gradual but uneven conversion of agricultural land into built-up areas reflects this broader transformation.

Urban Settlement Patterns and Demographic Trends

Urban settlements in Sonipat comprise a hierarchy of metropolitan cities, large towns, and small urban centres. These are administered by different scales of local governments – municipal corporation, municipal council and municipal committees, as can be inferred from Table 7.2. Moreover, Sonipat and Gohana have longer urban histories as statutory towns. Both were upgraded in 2015 – Sonipat to be administered by a Municipal Corporation and Gohana, by a Municipal Council. Despite being a major industrial node with a population of more than 5000, Rai remains classified as a rural settlement

Not all towns are officially recognised as statutory urban centers—for example, Rai continues to be classified as a rural area. This has significant implications for governing the urbanisation process and for directing investments into the basic network infrastructure essential for building livable and equitable urban spaces.

As can be inferred from Table 7.3, the share of the urban population has significantly increased across all four statutory towns. These are located along the NH-44 (previously NH-1) corridor connecting to Delhi. Sonipat Municipal Council and its surrounding outgrowth grew rapidly, particularly after 2011, where one can find campuses of higher institutions, densifying rural settlements, labour colonies and gated housing complexes. While Kharkhoda's earlier growth in the 2000s was modest, it is expected to increase due to the location of the Industrial Model Township (IMT). Kharkhoda and Sonipat population growth is projected to grow rapidly, while smaller towns like Ganaur and Gohana are experiencing steady growth.

The land use distribution data of the Haryana Sub-region (1999–2012, with 2021 projections), which includes Sonipat district, is summarised in Table 7.4.

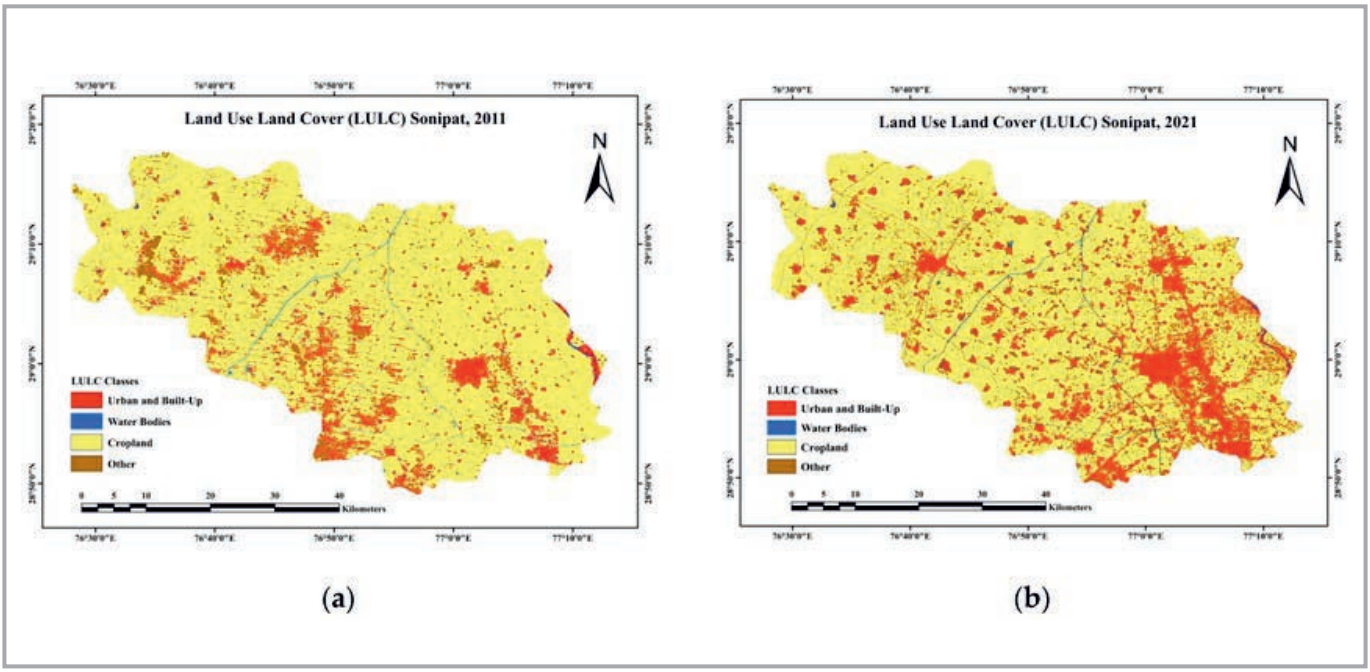
As inferred from Table 7.4, agriculture continues to dominate in the Haryana sub-region. However, its share has gradually declined from 83.73 per cent in 1999 to a projected fall to 81.90 per cent by 2021. Built-up areas have expanded significantly, from 6.98 per cent in 1999 to 9.83 per cent in 2012, indicating steady urbanisation; the proposed 2021 level (9.89 per cent) suggests a stabilisation after major expansions in the 2000s. Forest/green areas increased between 1999 and 2008

Table 7.1: Urbanisation Rate (in %)

	2001	2011	2021	2031
India	27.81	31.16	34.5	37.9
Haryana	28.92	34.88	40.9	46.7
Sonipat	25.15	31.27	NA	NA

Sources and Notes: Authors' compilation from Census of India – 2001 & 2011; Handbook of Urban Statistics 2022, NIUA

Figure 7.1: Land Use Land Cover



Sources and Notes: Sonipat district LULC classification: (a) 2011 classification; (b) 2021 classification

Table 7.2: Administrative Status of Urbanising Areas in Sonipat

Town	First Census	Status in 2011 Census	Status in 2025
Sonipat	Before 1961 - had municipal governance in pre-Independence era; continued thereafter	Statutory Town (Municipal Council + OG)	Statutory Town (Municipal Corporation, 2015)
Ganaur	1970s - notified as Municipal Committee before 1981 Census	Statutory Town (Municipal Committee)	Statutory Town (Municipal Committee)
Kharkhoda	1980s - first appears as statutory town in 1991 Census	Statutory Town (Municipal Committee)	Statutory Town (Municipal Committee)
Gohana	Before 1961 – had municipal governance in pre-Independence era; continued thereafter	Statutory Town (Municipal Committee)	Statutory Town (Municipal Council, 2015)
Kundli	2011 - became Census Town	Census Town	Census Town (Municipal Committee, 2018)
Fazalpur	2011 - became Census Town	Census Town	Census Town
Bayyanpur	2011 - became Census Town	Census Town	Census Town
Badh Malak	2011 - became Census Town	Census Town	Census Town
Rai	Rural	Rural	Rural

Sources and Notes: Authors' compilation from Census of India – 2001 & 2011; Handbook of Urban Statistics 2022, NIUA

Table 7.3: Projected Population Growth in Urban Centres of Sonipat District

Towns	2011	2021	Change (in %)	2031	Change (in %)	2041	Change (in %)
Sonipat	4,59,352	10,00,000	117.7	25,06,600	150	–	–
Ganaur	51,576	87,679	70	1,53,418	75	2,74,500	78.9
Gohana	81,568	1,48,464	82	1,95,763	31.9	3,23,000	65
Kharkhoda	40,963	1,25,000	205	2,40,000	92	5,80,500	141.9

Sources and Notes: Authors' compilation (City Development Plan, Department of Town & Country Planning)

(3.43 per cent to 3.83 per cent) but sharply declined to 2.75 per cent in 2012, before a projected rebound to 7.08 per cent in 2021. Wastelands have continuously reduced, from 4.95 per cent in 1999 to just 3.19 per cent in 2012. Water bodies and "other uses" remain relatively marginal, though "others" rose to 1.12 per cent in 2012, suggesting reclassification or diversified land utilisation.

Overall, the data at the Haryana sub-regional level points to a steady transition toward urban-land use and ecological restoration, accompanied by a slow but steady shrinkage of farmland. However, data beyond the COVID-19 period is not available. The figures released in the 2021 Sub-Regional Plan for Haryana were based on pre-COVID assessments. It is highly likely that the share of built-up area has further increased since then, particularly with the expansion of several Industrial Estates and upcoming IMT projects in the state.

District-level land use data from 2006 and 2008 show Sonipat's continued agrarian dominance and signal the early momentum of urbanisation. In 2006, agriculture accounted for 87.18% of the total district area, which further rose to 88.81% in 2008—likely reflecting reclassification of marginal lands or reclamation for cultivation. However, the more telling indicator of transformation lies in the steady growth of built-up areas, which expanded from 10,716 hectares (5.05 per cent) in 2006 to 12,934 hectares (5.95 per cent) in 2008 (Table 7.5). Although modest in percentage terms, this upward trend in urban land use marks the early phase of land conversion for residential, commercial, and industrial development—especially around the transport corridors and town peripheries.

As can be inferred from Figure 7.1, land use changes has occurred unevenly but significantly along the main thoroughfares. Overall, the data points to a dual trend of intensifying agriculture alongside a steady increase in built-up land, characteristic of Sonipat's transition toward urban-industrial growth while gradually reducing wastelands. The growth of built-up areas in Sonipat has accelerated significantly over the past two decades, driven by the establishment of Industrial Estates, the IMT projects, and several Transit-Oriented

Table 7.4: Land Use distribution of Haryana Sub-region (1999–2021) (in ha)

	1999		2008		2012		2021	
	Area (in Ha.)	%	Area (in Ha.)	%	Area (in Ha.)	%	Area (in Ha.)	%
Built- up	93597	6.98	96940	7.22	132028.1	9.83	132788.95	9.89
Agriculture	1123017	83.73	1124922	83.77	1106384	82.39	1099827.73	81.90
Forest/Green Area	46002	3.43	51496	3.83	36938.73	2.75	95077.32	7.08
Wasteland	66392	4.95	57608	4.29	42773.78	3.19	3271.99	0.25
Water Bodies	9953	0.74	8220	0.61	9660.6	0.72	8220	0.61
Others	2339	0.17	3714	0.28	15014.6	1.12	3714	0.28

Sources and Notes: Authors' compilation from 1999: Report on Urban Sprawl and Land Use/Land Cover mapping for NCR, NRSA,1999; 2008: Sub-Regional Plan for Haryana Sub-Region of NCR-2021: Draft Report, 2012: Study Report 'Creation and Updation of Landuse for Review of Regional Plan-2021 for NCRPB, 2013' and State Forest Dept.; and 2021: Sub-Regional Plan for Haryana Sub-Region of NCR-2021: Draft Report.

Development (TOD) initiatives, as reported in various newspaper articles. However, comprehensive district-level land use data is unavailable beyond 2008, with only tehsil-level developmental plan data publicly accessible post-2010s.

Diverse urbanisation Trajectories: Spatial Data and Spatial Histories

Besides quantitative indicators, spatial data, proposed development plans, and spatial histories allow us to infer the trajectory of spatial transformation in the Sonipat district. The first two highlight how land uses and urban forms are being reorganised in measurable ways across the district over time, while the third situates these transformations within the diverse urbanisation trajectories of Sonipat's statutory towns and their surrounding hinterlands. Together, they reveal the uneven but interconnected processes shaping Sonipat's integration into the larger National Capital Region (NCR).

Table 7.6 illustrates the land use distribution in the four main urban centres in the district. The 2041 development plans for the four key sub-districts illuminate distinct growth models: Kharkhoda is designed to be highly industrial with 44.15% of land allocated to industry and limited residential space, positioning it mainly as a production centre. Ganaur takes a more balanced approach, combining significant residential development (39.46%) with industrial (22.23%), commercial, and transport functions, reflecting its mixed-use, semi-urban character. Sonipat city shows a diversified profile, blending residential (37.22%), industrial (26%), green spaces, and public uses to support its role as both a liveable centre and industrial hub. Gohana, in contrast, emphasizes residential and service sectors, with only 10.36% land for industry, positioning it as less of an industrial node and more as a housing-focused town. Uneven spatial allocation has led to challenges such as Kharkhoda's inability to address residential pressure, congestion around NH-44, particularly near clustered industrial estates and new colonies, and persistence of regional imbalances, especially in Gohana which remains excluded from major growth dynamics. Poorly planned proximity between zones has caused traffic, environmental problems, and inflated land prices.

Satellite imagery analysis from 1985 to 2025 shows a dramatic progression from compact, agriculture-dominated landscapes to sprawling, fragmented urban expansion driven by policy changes, infrastructure projects, and speculative development. Regulatory measures, such as revised building byelaws and building codes, have fuelled vertical growth and mixed-use sprawl, activated land markets and caused ecological and social exclusion despite their control aims. The district's urbanisation thus reflects a complex interplay of policy, market speculation, and infrastructure, resulting in uneven and real estate-led spatial development.

Spatial Histories: Diverse Urbanisation Trajectories

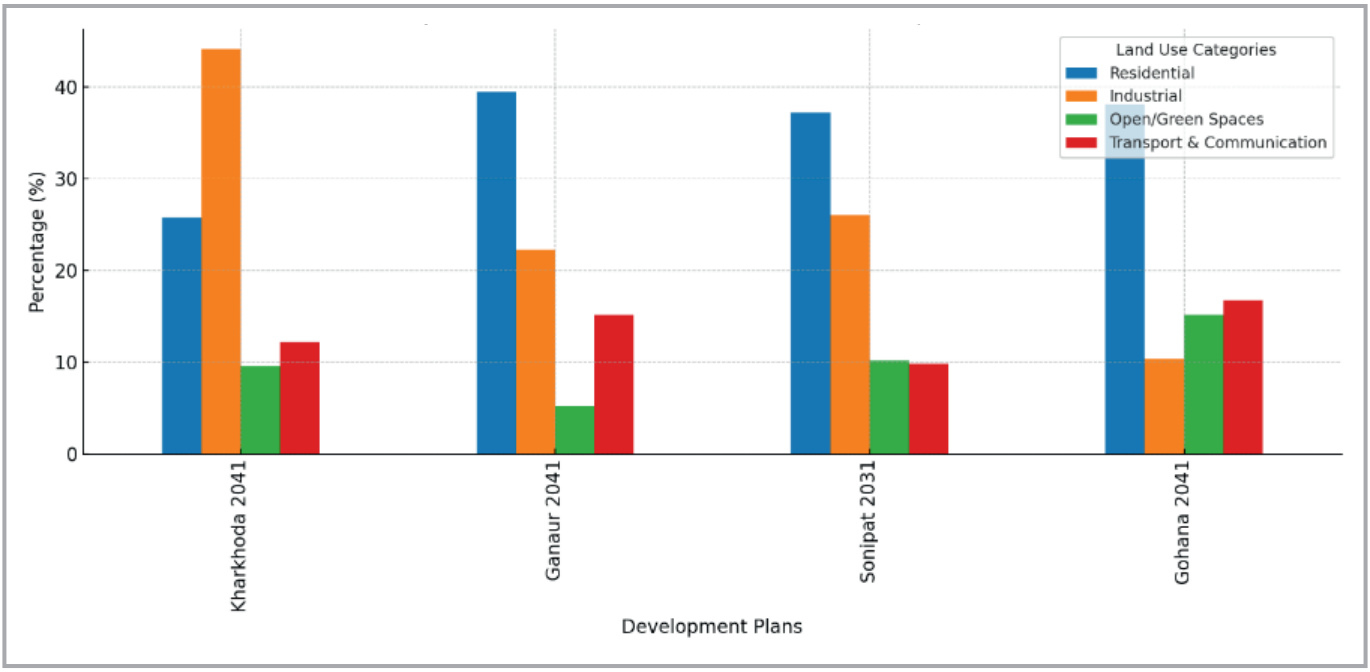
Sonipat's (Figure 7.3) urbanisation is best understood through the unique historical trajectories of its main statutory towns, each reflecting distinctive pathways of transformation. Sonipat city, with roots stretching back to the 7th century BCE, evolved from a significant mandi town during the Mughal era and consolidated further under colonial rule with key infrastructure such as the Grand Trunk Road and the railway. The Partition era marked the city's shift as a hub for refugee resettlement and early industrialisation, with landmark industries like Atlas Cycles and Apollo Tyres embedding the city in the NCR's industrial economy. The city's post-Green Revolution period saw local entrepreneurial investment in trade, real estate, education, and hospitals, which fostered expansion. The 1990s marked a new phase of growth, driven by group housing licensing that benefited large developers and ushered in major private projects. From 2005, parastatal agencies enabled suburbanisation, with Delhi-based developers introducing gated housing

Table 7.5: Existing Land use breakup (in Hac) of Sonipat

Years	Built Up	%	Agri.	%	Forest	%	Waste land	%	Water Bodies	%	Other	%	Total
2006	10716.1	5.05	185000	87.18	7359	3.47	7556	3.56	1357.9	0.64	211	0.1	212200
2008	12934	5.95	193099	88.81	7357	3.38	2441	1.12	1388	0.64	211	0.1	217430

Sources and Notes: 2006: Sub-Regional Plan for Haryana Sub-Region of NCR-2021: Interim Report -II and 2008: Satellite imagery 2008, data provided by the forest dept. For the year 2009-10

Figure 7.2: Proposed Land Use in Four Tehsils of Sonipat District (in %)



Source and Notes: Authors' compilation from the data on Land Use Distribution in City Development Plans 2031 and 2041, Department of Town & Country Planning

and large-scale commercial projects. By the 2010s, Sonipat transformed from a compact core to a fragmented urban sprawl, marked by speculative real estate and high-rise enclaves.

Kundli (Figure 7.4) in contrast, embodies frontier speculative urbanism. Until the early 1990s, it was rural farmland, but the construction of the KMP Expressway and Delhi-Mumbai Industrial Corridor stimulated massive private investment. By 2011, land had rapidly converted to logistics, warehousing, and residential complexes, evolving by 2025 into a city defined by high-rise apartments and investment-driven colonies.

Kharkhoda (Figure 7.5) presents a state-driven model, remaining rural until 2011 before industrialisation by the Haryana State Industrial and Infrastructure Development Corporation, which anchored the area as an industrial and logistics hub. Here, state-led land assembly for the IMT project marginalised local landowners and small developers, reinforcing closed circuits of industrial and public-private capital.

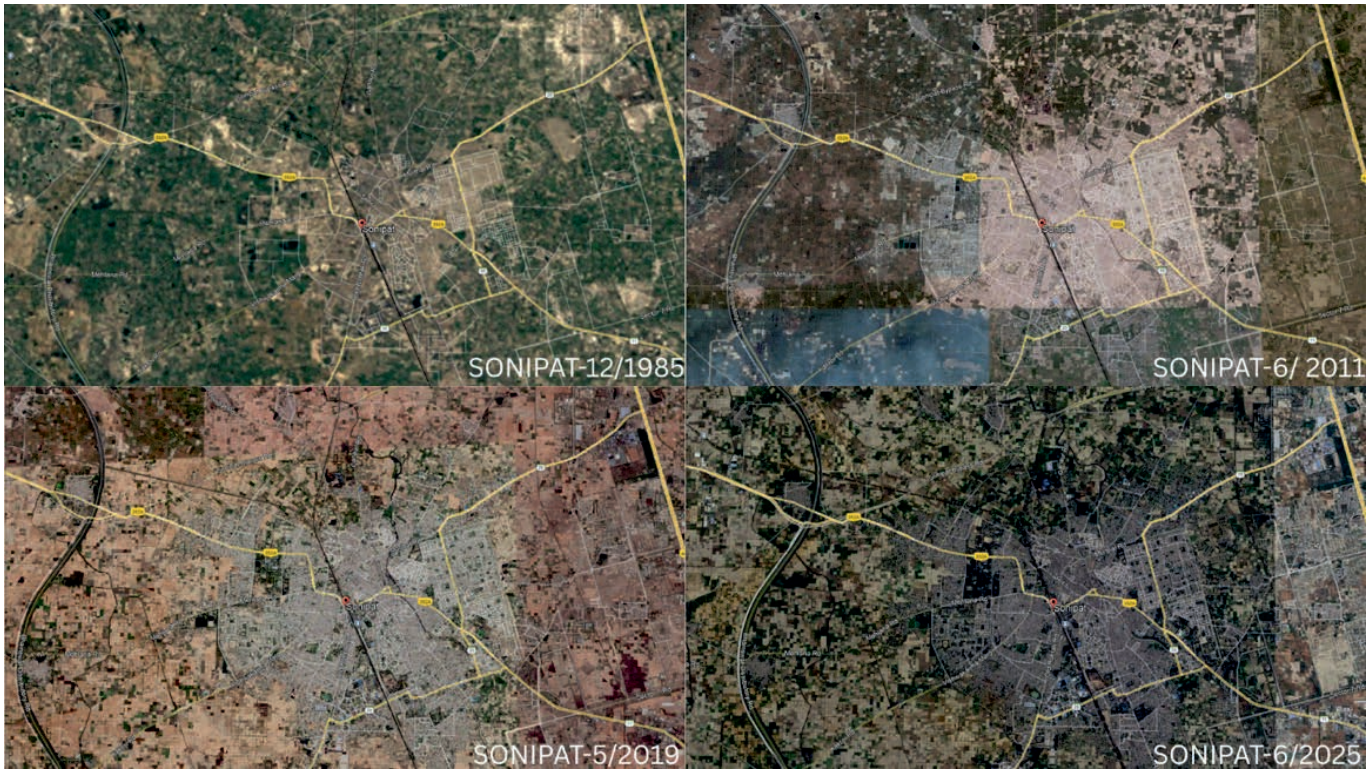
Ganaur (Figure 7.6), north of Sonipat, has grown incrementally, shaped by small-scale, informal developers and homeowners rather than grand state or private initiatives. Its ribbon-like expansion along highways maintains an organic morphology distinct from the intense speculation of Kundli or the industrial planning of Kharkhoda.

Together, these patterns reveal how varying institutional actors—state agencies, private developers, local landowners, and informal operators produce divergent urban landscapes across the district, reflecting Sonipat city's layered development, Kundli's speculative capital flows, Kharkhoda's state-driven industrial logic, and Ganaur's incremental, grassroots growth.

7.3 Drivers of Spatial Transformation and Impacts

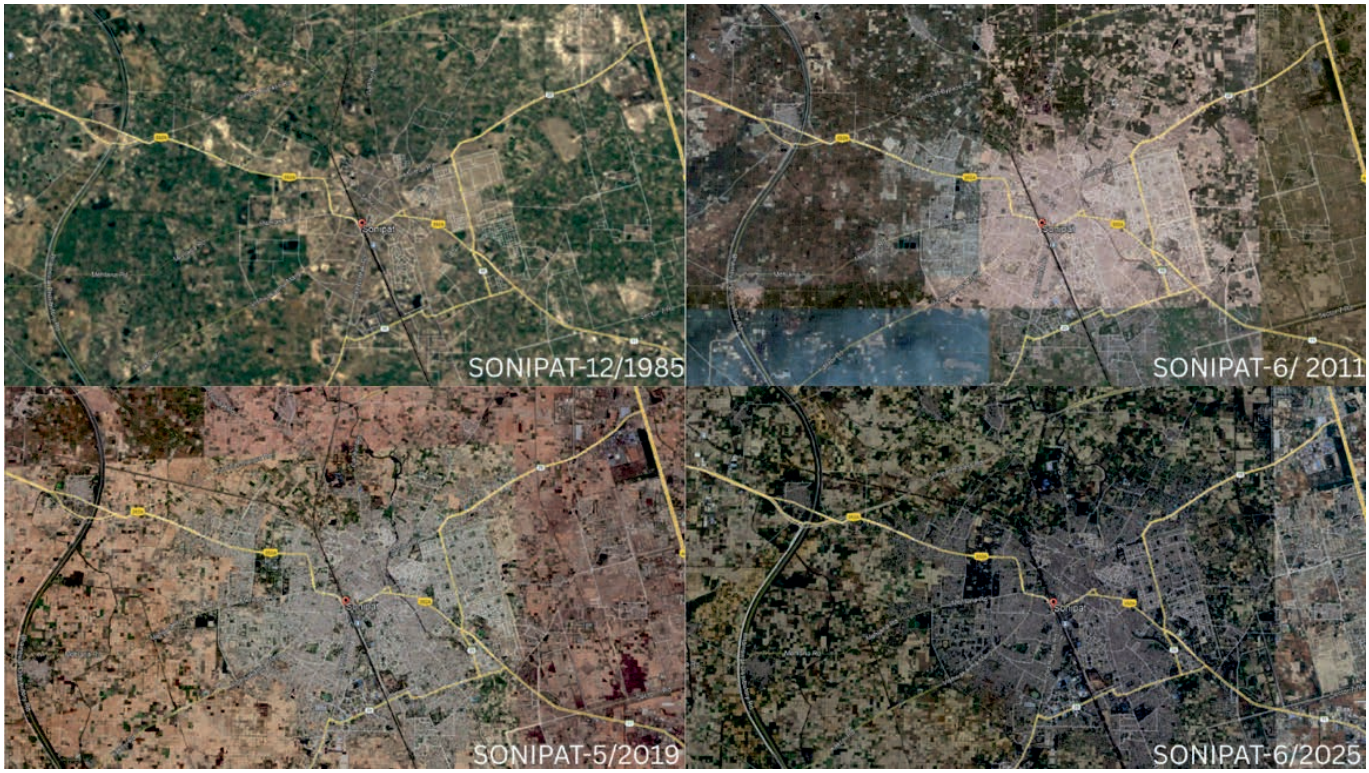
The state's role is central in shaping spatial transformation as it regulates land use and property, channels investments in infrastructure, and influences housing and land markets via regulatory frameworks and direct investment. Understanding the institutional architecture that underpins these processes is therefore critical. Evidence from Sonipat indicates that transformation has been driven primarily by project-based interventions, while statutory master plans remain confined to the jurisdiction of urban local governments. State-led projects are largely oriented toward economic acceleration, whereas market-led growth in land and housing has been predominantly speculative and targeted towards upper-income groups.

Figure 7.3: Land Use Changes in Sonipat



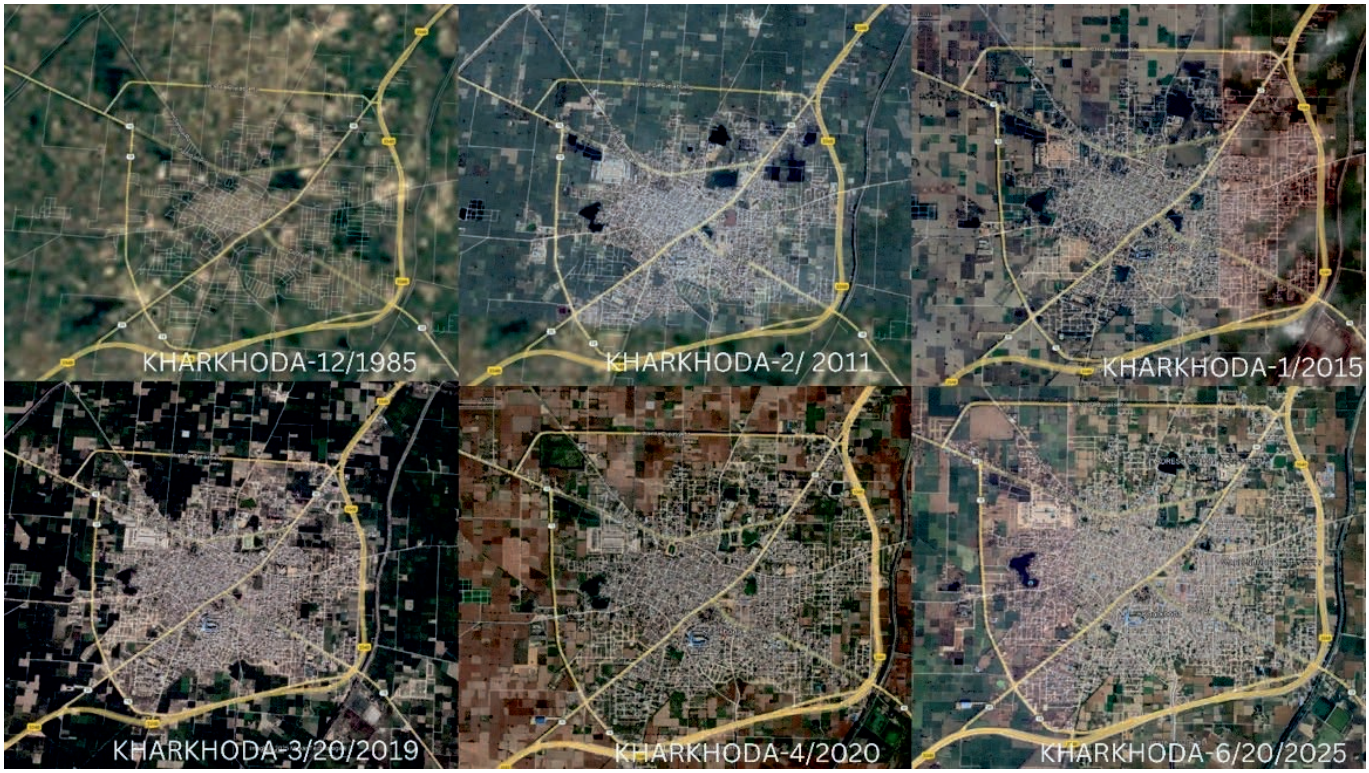
Source and Notes: Land Use Changes, 1985, 2011,2019,2025. Google Earth

Figure 7.4: Land Use Changes in Kundli



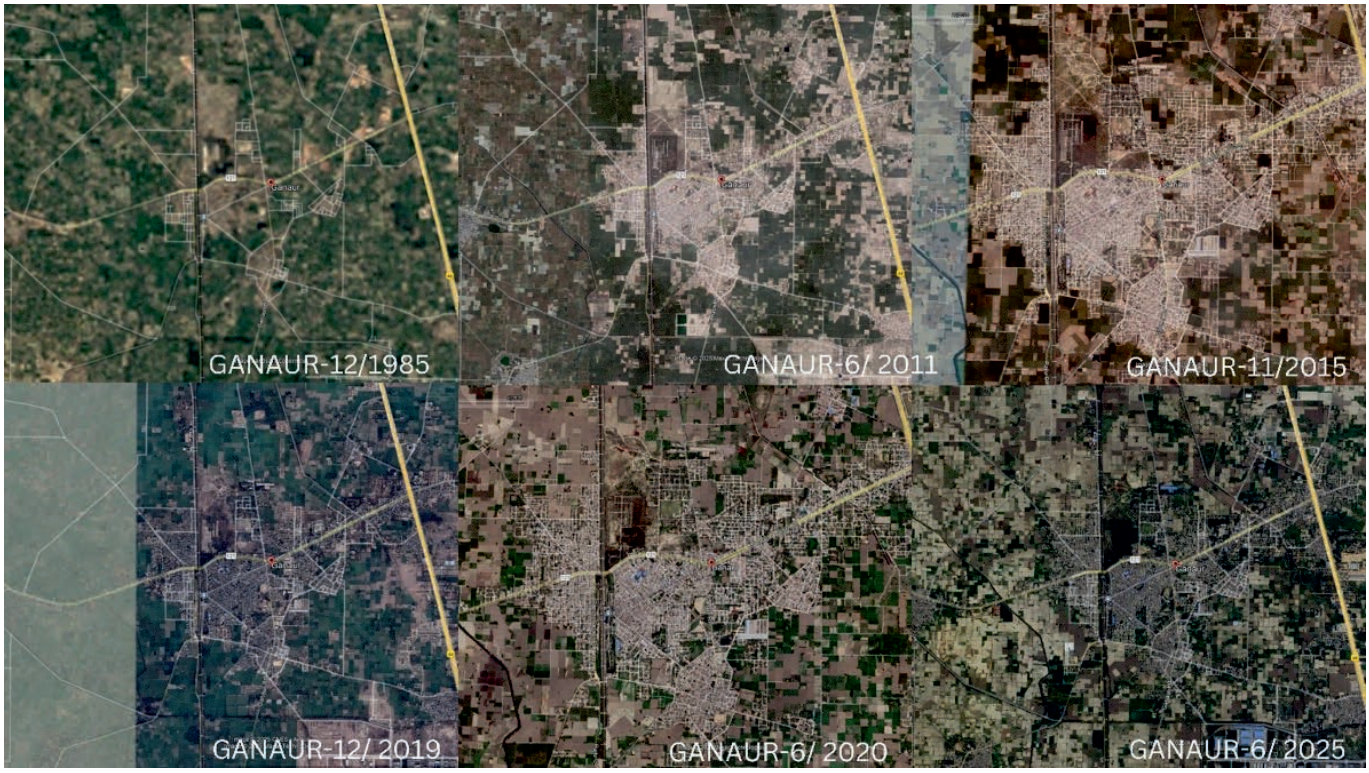
Source and Notes: Land Use Changes, 1985, 2011,2019,2025. Google Earth

Figure 7.5: Land Use Changes in Kharkhoda



Source: Google Pro Images 1985,2011,2015,2019,2020, 2025

Figure 7.6: Land Use Changes in Ganaur



Source: Land Use Changes, 1985, 2011,2019,2025. Google Earth

Governance of Spatial Transformation

Spatial transformation in Sonipat is governed by multiple institutions operating at national, regional, and local levels.

At the supra-regional level, the National Capital Region Planning Board (NCRPB), constituted in 1985, is the statutory body responsible for formulating the Regional Plan for the NCR. Haryana, particularly Sonipat, falls within the NCR region. The NCRPB facilitates the preparation of sub-regional plans by the constituent states and coordinates the monitoring and financing of significant infrastructure investments within the region. Currently, the Board is formulating the 2041 plan and subregional plan.

National and regional agencies have prioritised large-scale infrastructure, such as the KMP Expressway, Delhi–Panipat RRTS, and Rajiv Gandhi Education City, and land allocation for industrial development. In contrast, land assembly and housing are primarily left to the market under the oversight of the Haryana Urban Development Authority (HUDA) and its successor, HSVP, whose licensing systems tend to favour large developers.

At the regional level, the Haryana State Industrial and Infrastructure Development Corporation (HSIIDC) and Haryana Urban Development Corporation (HUDA) and its successor Haryana Shehri Vikas Pradhikaran (HSVP) play a pivotal role in regulating land use and land development for industries and housing. The former agency is involved in setting up industrial estates and implementing infrastructure projects. The latter regulates housing development, increasingly through licensing, which often favours large-scale private housing projects.[1] HSIIDC has rolled out a large-scale acquisition for their industrial estate and infrastructure projects.

As can be inferred from section 7.1, the four subdistricts experiencing rapid transformation are governed by different levels of urban and rural bodies, such as municipal corporations, municipal councils, committees and gram panchayats. Although the 74th Constitutional Amendment empowers municipalities to regulate urbanisation, they are constrained due to three factors: (i) urbanisation occurs outside their administrative limits; (ii) limited planning powers; and (iii) the project-based interventions by parastatals and special purpose vehicles. This governance architecture has enabled a pattern of splintered urbanism largely driven by projects.

Drivers of Spatial Transformation

Post 2000, spatial transformation was driven by state intervention in land and infrastructure, including industrial estates, infrastructure projects, and educational hubs. In this section, we discuss three drivers of spatial transformation, which include the development of: (a) industrial estate; (b) educational hubs; and (c) large-scale connectivity infrastructure projects.

Industrial estate-driven transformation

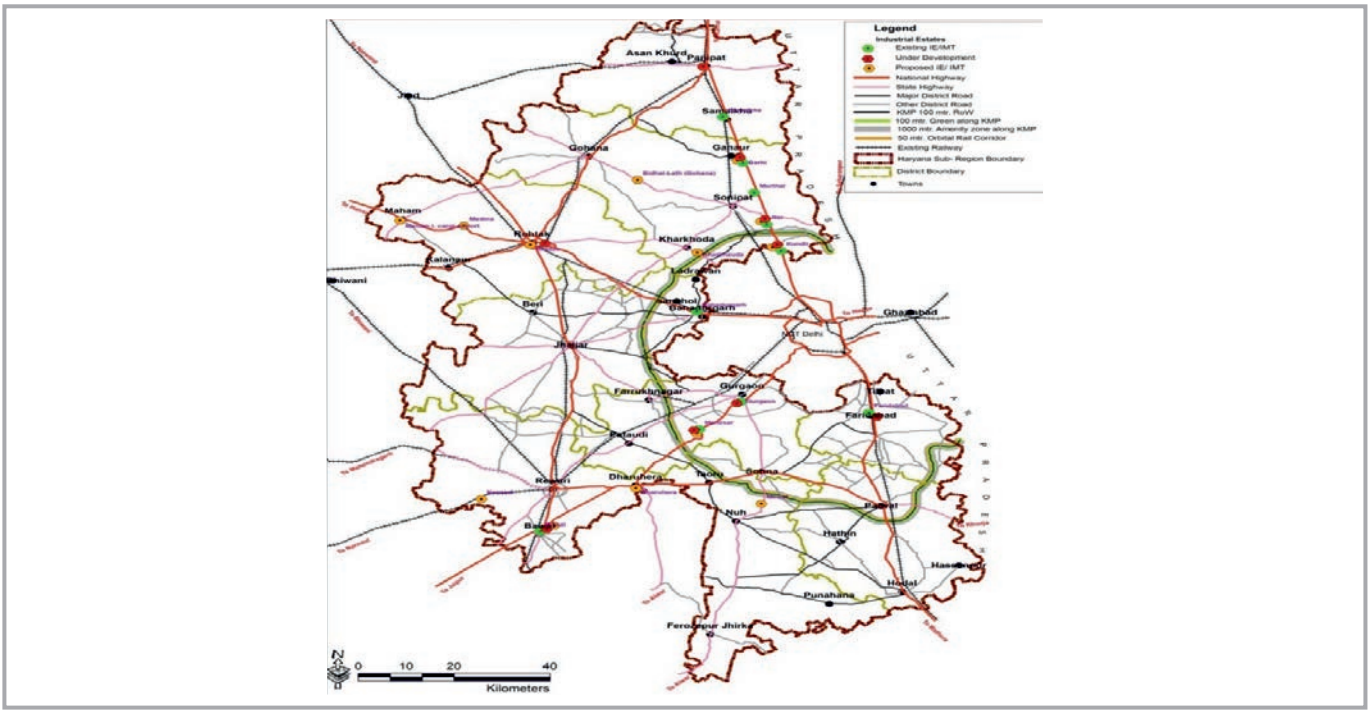
Industrial estates promoted by the Haryana State Industrial and Infrastructure Development Corporation (HSIIDC) are one of the key drivers catalysing land use change in Sonipat district. HSIIDC, a key parastatal agency, has strategically acquired and developed over 10,234 acres of industrial land across clusters such as Kundli, Rai, Murthal, and Barhi, creating a robust industrial corridor along the NH-44. Kundli, being closest to Delhi, acts as the gateway to the region, followed by other nodes extending towards Barhi. Additionally, Kharkhoda on the KMP Expressway and the smaller Bidhai-Lath estate near Gohana indicate attempts at further diversifying and decentralising industrialisation, although at different scales.

The industrial estate profile reveals a diversified mix of sectors, with each estate developing distinct industrial specialisations, as can be inferred from Figure 7.7.

HSIIDC's policies have evolved from small, localised clusters (such as early Murthal developments) to massive integrated townships like IMT Kharkhoda and Gohana, reflecting a shift in scale and ambition over fifty years. The 1990s and 2000s witnessed expanded land acquisition and the establishment of agro-industrial parks, cementing Sonipat's regional economic significance. Landmark projects such as IMT Kharkhoda (over 3,218 acres) blend industrial, commercial, and residential functions, with major companies like Suzuki beginning operations in 2025. These new townships link local industry to expressways and regional rail, positioning Sonipat as a critical node in the NCR's economic strategy.

[1] Raman (2015)

Figure 7.7: Location of Industrial Estates and Corridor Projects



Source and Notes: NCR Subregional Development Plan 2021, NCRPB

However, industrial expansion has spurred structural challenges, notably around land acquisition and compensation. Since 2004, notifications for acquiring agricultural land, especially in Jatheri, Rai, and Akbar Barota, have triggered protracted legal disputes over compensation, valuation, and rehabilitation. Farmers have raised concerns over undervaluation, exclusion from decision-making, and lack of basic infrastructure in allotted plots. Although the Supreme Court dismissed petitions in 2017, rehabilitation issues persisted with further scrutiny over state compliance in 2020 by the High Court. Negotiations continue, as landowners seek better terms in anticipation of future projects and market dynamics.

Table 7.6: Industrial Estates and Sectoral Distribution of Industries in Sonipat District

Industrial Estates	Industries
Sonipat	Light industries
Kundli	Auto components (parts, automobiles), lead equipment, mobile chargers, batteries, cold storage products, stationery items, car accessories, etc.
Rai	Packaging and food-related products – corrugated boxes, printing & packaging materials, food and dairy products, ayurvedic & pharmaceutical goods; also auto parts, Agri-based products, garments, plastic moulding, IT park, Anant Raj, DLF
Barhi	General industrial development, Agri-processing, integrated cold storage, hosiery
Murthal	Textiles, auto-ancillary, ceramics, general engineering, maltery, chemicals and cycle parts.
Gohana (Stalled) Township	L&T, M3M, Mahindra World City & IL&FS Township submitted expressions of interest (EOI) but the project has been put on hold.
Kharkhoda Township	Automobiles, IT services, medical equipment, etc; major allottees are Housing, Commercial sites

Source and Notes: Authors' compilation from information available in HSIIDC Website accessed on 23 August 2025

Industrialisation in Sonipat is heavily reliant on migrant labour. Most village land has been acquired for industry and residential real estate by developers, resulting in densification and vertical expansion of housing in old villages, often lacking adequate infrastructure. Migrant industrial workers predominantly live in rented accommodations within these villages, with some temporary housing units and instances of squatting on public land noted. Despite the prevalence, there is limited research on migrant living conditions and squatter settlements.

The district's transformation is thus marked by rapid economic growth as well as significant institutional and social tensions. Land ownership remains concentrated among the Jat community, who benefit the most, raising ongoing questions about the impact on historically disadvantaged caste communities. This duality reflects both the promise and complexity of Sonipat's evolving industrial landscape.

a. Transformation Driven by Educational Hubs

Educational institutions have emerged as powerful agents of spatial transformation in Sonipat district, along the NH-1 /NH-44 corridor, particularly in Sonipat city's peri urban and Rurban areas since 2006. This is exemplified by the two landmark university projects along NH-44, which have acted as catalysts of spatial transformation in nearby villages. Their establishment not only triggered an increased demand for land for institutions as well as catalysed several private gated housing and high-rise housing projects. The institutions also signalled the anticipation of rising land values, encouraging speculative investment. Together, these dynamics have substantially reshaped the local real estate market and intensified peri-urban transformation, illustrating how large institutional projects can anchor uneven development and land value capture in emerging urban regions.

The first project was announced in 2006 as a major government-led initiative aiming to create a 5,000-acre knowledge cluster. Land for the project was acquired through the Land Acquisition Act of 1894, which justified compulsory acquisition for public purposes. Initial compensation to farmers was set low, at 12.6 lakh per acre, resulting in widespread farmer protests and eventual revision to 45.15 lakh per acre by 2011. Movements such as the Bhoomi Adhigrahan Virodhi Sangharsh Samiti highlighted the unequal bargaining power and speculative nature of urbanisation driven by the state. The conversion of farmland into institutional land opened opportunities for private developers, who quickly invested to shape future development in the form of gated residential complexes, luxury apartments, and malls.

The transformation of land values has been dramatic. Agricultural land in the Rai-Kundli zone, which was priced below 80 per sq. ft before 2000, soared to between 2,800 and 5,000 per sq. ft for developed plots by 2015. Premium institutional parcels have reached circle rates of 2.75–3.5 crore per acre by 2025, with actual market rates often higher than benchmarks set by HSIIDC. The surge in prices has benefited institutional actors and developers but also resulted in delays and contestations that adversely affect farmers and original landowners.

The second, established in 2009, adopted a market-driven approach for land acquisition, relying on direct negotiations between its trust and local farmers, with facilitation from panchayat leaders and brokers. This method largely bypassed state-led compulsory acquisition and minimised overt conflict, but bargaining remained asymmetric. Farmers originally sold at rural benchmarks, but prices for university-adjacent land later appreciated sharply, reaching nine crore per acre. The university's expansion and the development of Jindal Global City turned the surrounding zone into a fast-growing residential and commercial hub. Retail and informal vending clusters have formed alongside major thoroughfares to the university, further transforming the city's landscape.

Both institutions have anchored a wave of speculative residential enclaves and luxury housing catering to upper-income groups. Developers anticipated strong demand from faculty, staff, and students, reflected in projects like Tulip Grand, Max Heights, and Jindal Global City. Real estate activity intensified after the pandemic, attracting pan-India developers and local landowning groups, leading to niche gated township projects in proximity to the university. Institutional investment in housing is also rising, with firms like Good Host (backed by Goldman Sachs) managing student housing as a financial

asset class, deepening the financialisation of local property markets. Expansions, such as Jindal's plan to grow its campus from 80 to 300 acres, are driving sustained upward pressure on land values and reinforcing a high-value housing regime.

Landholding groups such as Jats have strategically converted farmland near transit nodes into rental housing and gated enclaves, while pastoral groups have repositioned their estates for elite buyers. Though prices dipped during the COVID period, they quickly stabilised, and the market revived with investment from other cities and corporate developers announcing new projects. Despite attracting upper-income migrants, Sonipat still houses many working migrants who lack access to affordable rental housing, living in densified old villages or poorly provisioned labour colonies. This academic-led urban transformation illustrates how higher education institutions can act as strong urban anchors, stimulate enclave development while deepen inequalities in access to land and housing.

b. Infrastructure Led Transformation

Another key driver of spatial transformation in Sonipat district is infrastructure investments, particularly three of the major connectivity projects—the Kundli–Manesar–Palwal (KMP) Expressway, Haryana Orbital Rail Corridor (HORC), and Delhi–Panipat Regional Rapid Transit System, and the expansion of National Highway 44. These projects were rolled out to catalyse an integrated regional economy in the NCR, where Sonipat is a key node. These projects have been central to Sonipat's transformation into an industrial-logistics corridor within the NCR.

The KMP Expressway's trajectory, illustrated in Table 7.7, also known as the Western Peripheral Expressway, is a 135.6 km, six-lane corridor envisioned to decongest Delhi and catalyse economic activity in the NCR districts, particularly Sonipat. Originally proposed in 2003 and approved in 2005, the expressway became operational in 2016.[2]

The HORC (121.7 km), approved in 2020, is a semi-high-speed freight and passenger corridor intersecting key nodes like Kharkhoda and Kundli. The Delhi–Panipat RRTS (103 km), approved in 2020, positions Sonipat as a regional transit hub.[3] As a 103 km semi-high-speed corridor along NH-44 with 17 planned stations, including Kundli, Rajiv Gandhi Education City (RGEC), Murthal, Barhi, and Ganaur, the RRTS repositions Sonipat from a peri-urban buffer zone to a transit-linked regional growth node in the northern NCR. An additional 25 km extension to Karnal is under consideration.

Each of these projects is implemented by different agencies, including the National Highways Authority of India (NHAI), Haryana Rail Infrastructure Development Corporation (HRIDC), and the National Capital Region Transport Corporation (NCRTC).

c. Contentious Land Assembly and Development Practices

A common feature across these projects is the prolonged delays in implementation due to contentious land acquisition, conflicts over concession agreements, and, in some instances, complex negotiations between regional governments. The table below captures the timeline of three key infrastructure projects—the KMP Expressway, the Haryana Orbital Rail Corridor (HORC), and the Delhi–Panipat Regional Rapid Transit System (RRTS).

Land Acquisition (land Area acquired for each project): The Kundli–Manesar–Palwal (KMP) Expressway, Haryana Orbital Rail Corridor (HORC), and the Delhi–Panipat Regional Rapid Transit System (RRTS) have all triggered waves of land acquisition.

Vast tracts of land were notified for the implementation of different infrastructure projects. The Government of Haryana notified around 62000 acres of land for the formation of 135 km of the expressway and new townships.[4] Information on the exact area acquired in Sonipat district is unavailable.

[2] Government of India, Ministry of Road Transport and Highways, *Annual Report 2019–20* (MoRTH, 2019), https://morth.nic.in/sites/default/files/Ministry%20Annual%20Report_2019-20.pdf;

[3] Government of India and Participating State Governments, National Capital Region Transport Corporation, *Annual Report 2022-23* (NCRTC, 2023), https://ncrtc.in/wp-content/uploads/2023/10/NCRTC-Annual-Report-2022-23-English.pdf.

[4] Government of India, Ministry of Urban Development, National Capital Region Transport Corporation, *Annual Report 2012-13.* (NCRPB 2013), https://ncrpb.nic.in/pdf_files/annual%20report%20_2012-13.pdf.

However, court documents indicate that villagers from nearly 18 villages were affected.[5] Similarly, an estimated 720 hectares of land under public and private ownership, including water and land commons, have been notified for acquisition for the HORC project.[6] The HORC project and RRTP are aligned closer to the KMP Express. In addition to compensation, as land notified for acquisition included both vacant land and buildings, compensation packages included money, land for land or relocation.

Contestations around Land Acquisition, Concession Agreements and Role of the Courts

Like HSIIDC trajectory discussed in earlier sections, land conflicts and litigation have been central to the rollout of major infrastructure projects in Sonipat district. There were two types of legal disputes – one around the compensation filed by landowners of different villages and another, around the concession agreement between special purpose agencies formed to implement the project, parastatals and financing institutions. This is exemplified by the conflicts relating to KMP. Between 2004 and 2011, farmers from different villages affected by land acquisition for KMP protested, demanding higher compensation rates. Compensation initially fixed was revised from 16 lakhs per acre to 23 lakhs. Further, conflicts also emerged between special purpose agency – KMP expressway formed by three concessionaires, the HSIIDC and financial institutions; as well as complex negotiations over funding by different regional governments, leading to delayed project implementation. As a result, the KMP project implementation extended to nearly 15 years, and the Delhi–Panipat RRTS approved in 2020 was delayed due to the initial refusal of the Delhi government.

Another example is the triggering of local resistance when land was notified for HORC project, which was originally planned to be completed in 2023-24. The project is still in the early stages of implementation. While surveys and notifications have begun for depot and station lands in Murthal, Barhi, and Ganaur, farmer unions have raised concerns around low compensation, inadequate resettlement, and asymmetries in upzoning benefits.

Legal records also document that farmers owning smaller tracts of agricultural land were disproportionately affected. In contrast, developers with prior land holdings were exempted from acquisition, further fuelling discontent.[7] These dynamics reflect not only economic dispossession but also institutional bias in acquisition governance, a phenomenon common to many infrastructure projects across India.[8]

The role of the courts – the high court and the supreme court is critical in shaping the trajectories of these projects. Conflicts between landowners and parastatal institutions like HSIIDC and between the parastatals, special purpose institutions such as KMP expressway and financial institutions play out in the high court and the supreme court. A landmark 2023 Supreme Court ruling on compensation under Section 28-A of the Land Acquisition Act mandated uniform compensation, rejecting the Haryana government's "belting method" that proposed differential rates based on proximity to the expressway.[9] Similarly, a Supreme Court judgement on the legal petition by MC Mehta versus Union of India led to the court setting up a committee for overseeing project implementation in 2015. The project was also delayed as one of the concessionaires filed a case in the High Court, followed by financial institutions appealing to the court for direction.

Impact on Land Prices

With the announcement of infrastructure-led investments such as the KMP Expressway, Haryana Orbital Rail Corridor (HORC), and Delhi–Panipat Regional Rapid Transit System (RRTS), rapid land price escalation and speculative real estate activity in Sonipat have been triggered. Fieldwork conducted by one of the authors at Kharkhoda revealed that

[5] Government of India, Ministry of Urban Development, National Capital Region Planning Board (NCRPB), *Functional Plan for Transport for National Capital Region–2032* (Chapter 13) (NCRPB, 2009), https://ncrpb.nic.in/pdf_files/Chapter%2013_FNPLTr_RP%20&%20Other%20Prop..pdf.

[6] Overseas Min-Tech Consultant, *Draft Resettlement Plan for Haryana Orbital Rail Corridor Project* (Haryana Rail Infrastructure Development Corporation Limited, 2022).

[7] Supreme Court of India, Meharwal Khewaji Trust Registered Vs. Government of Punjab and Others, (2012), https://www.casemine.com/judgement/in/5609af19e4b014971141598e

[8] Sarkar (2015)

[9] Supreme Court of India, Haryana State Industrial and Infrastructural Development Corporation Limited Vs. Satpal, (2023), https://www.casemine.com/judgement/in/63e54a509441c66aea931a80; Manraj Grewal Sharma, "NHAI Must Compensate Haryana Landowners for Land Acquired between 1997–2015, Rules HC," Indian Express, October 5, 2025, https://indianexpress.com/article/cities/chandigarh/haryana-landowners-extra-compensation-land-acquired-hc-nhai-9906860/.

between 2018 and 2023, land prices in Kharkhoda, Kundli, and Rai doubled or tripled; Kharkhoda alone saw rates jump from INR 50 lakh to INR 6 crore per acre. Developers backed by institutional capital have aggressively acquired land near planned nodes, particularly around HORC and RRTS stations, anticipating value appreciation from transit-oriented development.

The speculative spiral has driven a sharp transformation of the housing market. Gated townships, villa plots, and mid- to high-rise apartments have proliferated along NH-44 and key logistics hubs, catering primarily to middle- and upper-income buyers. While developers like Raheja, Ansal API, TDI, and Godrej position their projects as connectivity-driven investments, affordable housing remains marginal. Rental housing for migrant industrial workers, especially in areas like Rai and Barhi, remains informal and unregulated, with no formal EWS (Economically Weaker Section) stock or rental frameworks in place.

The absence of clear zoning around station areas and ambiguous land acquisition and compensation policies has deepened anxieties among landowners. Protests in Barhi, Ganaur, and Murthal reflect concerns over low compensation and exclusion from future land value gains. Farmer unions have begun demanding equity stakes in TOD projects or offering land for land, compensation with higher solatium, highlighting a broader shift in the politics of land absorption and spatial restructuring in the NCR.

7.4 Conclusion and Recommendations

Analysis of spatial transformation in Sonipat district reveals several distinct patterns. Although still dominantly agricultural, the district is steadily urbanising. Despite its predominantly rural character, Sonipat's urban settlements are diverse, consisting of metropolitan, large, and small towns, each with unique urban histories and trajectories. However, urban growth is heavily skewed towards the national corridor, particularly along NH-44, where state-led and private infrastructure projects are concentrated. This has triggered intense land speculation around statutory towns, resulting in distorted land and housing markets, increased inequality, and changing settlement patterns.

Multiple actors—local governments, regional planning authorities, parastatals, and special purpose vehicles, shape Sonipat's spatial development. Although local governments are responsible for land regulation, the expansion of statutory towns has largely occurred due to the initiatives of industrial bodies, transit-oriented development, and private developers serving affluent populations. These interventions have left migrants and lower-income groups excluded from homeownership, with limited access to affordable rental housing. The resulting urban landscape is fragmented, featuring privatised, well-serviced enclaves adjacent to older villages suffering from infrastructural deficits, and fostering exclusion and inequality.

Land ownership patterns further reinforce this inequality, as the Jat community holds most land and benefits disproportionately from land markets, whereas historically disadvantaged groups are excluded from land value gains. Widespread land acquisition for industrial estates and infrastructure has also driven landowners to redevelop village plots into dense, substandard rental housing. This juxtaposition of overcrowded low-income units and affluent colonies exacerbates social and environmental concerns, particularly in the absence of safeguards like affordable housing quotas or balanced zoning policies.

The district's spatial transformation has been engineered by major projects such as the KMP Expressway, the Delhi–Panipat RRTS, and IMT Kharkhoda, which prioritise economic growth and connectivity while neglecting social inclusion and balanced service provision. Industrial development is clustered in specific nodes - Kundli, Kharkhoda, Rai, Barhi, and Murthal, adding pressure on land and infrastructure in the southeast, while central and western Sonipat lag in development. Planning remains top-down and fragmented, as state and NCR agencies control the agenda, and district-level, integrated frameworks are lacking. Local governments, despite constitutional mandates, have limited capacity to manage land use change or ensure equitable growth.

The document recommends a set of reforms to address these challenges. First, it calls for district-level integrated planning through a new District Spatial Planning Authority to coordinate land use, housing, infrastructure, and development with clear equity objectives. It proposes tighter regulation of land and

housing markets, transparency in developer licensing, caps on speculative land holdings, and enforcement of inclusionary zoning and community-based initiatives for affordability. Strategic policies are needed to distribute investments more evenly across the district and foster balanced growth, backed by improved social infrastructure, especially water, sanitation, health, and gender-responsive planning. Land acquisition processes should be reformed to protect rights and ensure fair compensation, and disputes should be mediated through district forums. The document also advocates for inclusive transit-oriented development, integrating affordable housing and pedestrian infrastructure.

Ultimately, Sonipat stands at a pivotal moment: while growth has brought industrialisation and better connectivity, the accompanying social and ecological costs threaten to undermine inclusive development. Without comprehensive reforms in governance, planning, and housing market regulation, these inequalities risk deepening, but redirecting the district's growth towards equity and sustainability can make Sonipat more inclusive and resilient.

KEY INSIGHTS FROM FOCUS GROUP DISCUSSIONS IN KATHURA, MANOULI, AND PIPLI-R VILLAGES OF SONIPAT DISTRICT

- Pipli-R village is located near Kharkhoda while Manouli is located near Rai and Sonipat. These towns are more industrialised and urbanised compared to Gohana closer to which Kathura is located.
- In line with the findings from this chapter on spatial transformation, Pipli-R and Manouli which are closer to urban and industrial towns demonstrate greater rural household economic diversification compared to Kathura village which is least diversified.
- Respondents from Pipli-R reported experiencing major changes in land use pattern due to urbanisation and industrialisation projects around the village.
- Respondents from Pipli-R reported that approximately half of the agricultural land in and around the village has been converted for non-agricultural and commercial purposes due to the express highways and IMT projects in Kharkhoda.
- Interestingly, respondents reported that households that sold land to private or public parties have either purchased residential homes or purchased agricultural land in other villages in Haryana.
- On the contrary, respondents from Kathura and Manouli reported that there have not been any significant reductions in the total agricultural land in the village in the last five years.
- Respondents across the three villages reported rapid rise in land prices in the village as these villages due to the expansion of Delhi-NCR region.
- Respondents from Pipli-R also experienced increase in rental incomes on residential properties due to influx of migrant workers currently working for urban and industrial projects in Kahrkhoda and surrounding villages. There is no such impact on rental incomes on housing in Kathura or Manouli.
- Respondents across the villages also reported decline in the availability of grazing lands and fodder for the cattle.

Chapter 8

QUALITY OF LIFE IN URBANISING SONIPAT DISTRICT: ACCESS TO BASIC SERVICES

Bhuvaneswari Raman, Shubham Shekhar, Rithish GP, Bharath R

8 QUALITY OF LIFE IN URBANISING SONIPAT DISTRICT: ACCESS TO BASIC SERVICES

Bhuvaneswari Raman, Shubham Shekhar, Rithish GP, Bharath R

This chapter examines how rapid urban transformation in Sonipat district has influenced the quality of life, focusing on access to housing, water, sanitation, waste management, electricity, and disaster resilience. Urbanisation has been driven by state-led efforts to accelerate regional growth through setting up industrial estates, an education city, and rolling out major infrastructure projects. These have attracted private investment in real estate in land and housing, and in higher education. However, these are unevenly distributed across space. These developments have drawn migrants of varied income groups to these growth centres, intensifying the demand for safe and affordable housing, defined as secure physical units with access to clean water, safe disposal of liquid and solid waste, and protection from disasters. However, much of the physical growth in the district is shaped by a combination of projects and master plan. As a result spatial development remains largely uncoordinated and fragmented, creating significant gaps in service delivery. While statutory master plans exist for delimited urban areas in the district, much of the actual growth has occurred outside these boundaries, in peri-urban and rural frontiers. This growth is spontaneous without adequate access to affordable and safe housing. Aligned with the Sustainable Development Goals (SDGs) 3, 6, and 11, the chapter suggests that Sonipat's growth has outpaced the supply of affordable housing and the provision of basic networked infrastructure (water supply, sanitation, storm water drainage and waste disposal), reinforcing spatial inequality and ecological vulnerability. Affordable housing welfare schemes is a significant supply source, more than half serves Below Poverty Line households, leaving low- and middle-income groups underserved. Welfare housing schemes implemented in the district is limited to delimited urban boundaries, whereas the demand for affordable rental and ownership housing is predominantly from migrants working in industrial estates in the peri-urban areas. Groundwater extraction has reached 139% of recharge, and sanitation coverage remains incomplete. Despite gains in electrification and waste management, institutional fragmentation persists. Deficiencies in water supply, sewage networks, and waste management directly affect public health and housing quality as well as enhance disaster risks. Addressing these gaps requires both integrated planning and innovative financing to expand affordable housing and upgrade infrastructure.

8.1 Introduction

The chapter examines how spatial transformation in Sonipat district has influenced the quality of life of its citizens, with a particular focus on basic infrastructure services such as housing, water supply, waste management, and sanitation. As highlighted in the chapter on Spatial Transformation, urban transformation in Haryana is shaped by state-led infrastructure projects, such as industrial estates and connectivity corridors, and by spontaneous development driven by private developers. While statutory master plans exist for delimited urban areas, much of the actual growth has occurred outside these boundaries, in peri-urban and rural frontiers. This growth is largely uncoordinated and fragmented, creating significant gaps in service delivery.

Deficiencies in water supply, sewage networks, drainage, and waste disposal systems pose critical challenges for everyday life. These gaps directly affect public health, environmental quality, and housing affordability. Addressing them requires not only improved planning but also innovative financial strategies to accelerate supply of regulated affordable housing and large scale investments in basic infrastructure networks to ensure long-term sustainability.

This discussion is framed within the targets of the Sustainable Development Goals (SDGs), particularly SDG 6, 11 and 3, which are about access to clean water and sanitation; sustainable cities and communities; and reducing health and environmental risks from poor water, sanitation, and waste management, respectively.

By analysing the state of housing and access to water, sanitation and waste, this chapter highlights

the urgent need for integrated strategies combining infrastructure investment, institutional coordination, and inclusive planning to improve quality of life across urban and rural contexts.

8.1.1 Housing Access

Housing in Sonipat is characterised by a stark dualism: on one hand, villa-style gated townships and high-end apartments dominate the private developers led formal real estate market, while on the other, a large share of the population - particularly migrant industrial workers - are housed in units on Abadi (inhabited parts of villages) land, slums, unregulated labour colonies in peri-urban fringe areas with minimal infrastructure. This dual character reflects both the failure of market mechanisms as well as the inadequacies of public housing provisioning in meeting diverse needs.

Data on public housing from the Haryana Statistical Report 2023–24 and the Housing Board Haryana reveal that while Sonipat accounts for over 10.17% of total housing units constructed in Haryana (10,073 out of 99,049), the distribution across income groups shows a skewed emphasis on BPL (Below Poverty Line) housing. Over 58.12% of all housing in the district is BPL, more than double the state average of 27.18%. In contrast, EWS and LIG categories, crucial for addressing affordability for low and lower-middle-income groups, are underrepresented (Table 8.1)

This overconcentration of welfare housing at the extreme bottom of the pyramid leaves significant gaps for the growing low- and middle-income workforce, particularly migrants employed in HSIIDC industrial estates. For many low-income migrants and local households, housing options are confined to overcrowded, underserviced villages absorbed into urban areas or privately developed unregulated settlements. These settlements exhibit the typical characteristics of slums—areas where buildings are unfit for habitation due to dilapidation, overcrowding, or lack of sanitation, light, and ventilation.[1] However, this definition excludes squatter settlements, which are widespread in Sonipat's peri-urban zones but remain outside formal recognition.

Accurate estimates of households living in such slums are unavailable. According to Census 2011, 18.9% of Haryana's population lived in slums, ranking the state 12th nationally and second after Maharashtra in terms of slum concentration. In Sonipat, the proportion was even higher at 25.7%, compared to the state average of 17.1%. Although the overall slum population in Haryana declined between 2001 and 2011, the reduction in Sonipat was modest—from 33.5% to 25.7% (Table 8.2) suggesting a continuation of housing stress in its peri-urban centres. These figures indicate that the unmet housing needs of EWS and LIG segments are being absorbed through informal, often substandard settlements, rather than through formal supply.

Table 8.1: Distribution of Residential Flats by Income Category in Sonipat and Haryana (2023–24)

Category	Sonipat	% of Sonipat Total	Haryana	% of Haryana Total
BPL Flats	5,854	58.12%	26,919	27.18%
EWS (Economically Weaker Section)	805	7.99%	13,181	13.31%
LIG (Low Income Group)	1,923	19.09%	34,727	35.07%
MIG (Middle Income Group)	742	7.37%	12,143	12.26%
HIG (High Income Group)	223	2.21%	4,006	4.04%
Others	526	5.22%	8,073	8.15%
Total	10,073	100%	99,049	100

Source and Notes: Haryana Statistical Report – 2023-24

[1] Government of Haryana, Department of Town and Country Planning Department, *Sub-Regional Plan for Haryana Sub Region of NCR 2021* (Department of Town and Country Planning, 2014), chap. 11, https://tcpharyana.gov.in/policypanelNCRPB.htm

Table 8.2: Distribution of Residential Flats by Income Category in Sonipat and Haryana (2023–24)

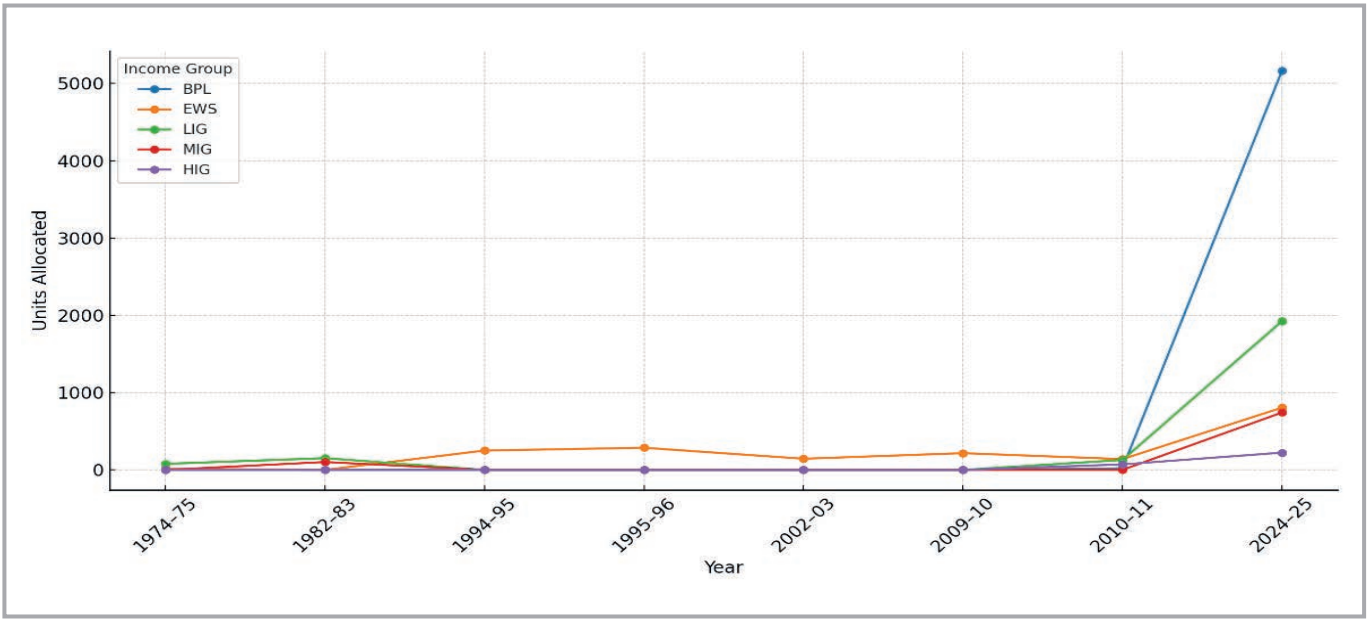
	2001			2011		
Major Urban Centres	**Population**	**Slum Population**	**% of Total Population**	**Population**	**Slum Population**	**% of Total Population**
Panipat	268823	102853	38.26	294150	11438	3.89
Sonipat	225151	75481	33.52	383181	98508	25.71
Rohtak	294537	90609	30.76	373133	40779	10.93
Bahadurgarh	126746	39478	31.15	170426	63933	37.51
Rewari	100946	51754	51.27	140864	61600	43.73
Gurgaon	201759	33570	16.64	876824	144805	16.51
Faridabad (MC)	1054981	491131	46.55	1404653	215053	15.31
Palwal	100528	15589	15.51	127931	10373	8.11
Total	2373471	2373471	37.94	3771162	646489	17.14

Source and Notes: Town and Country Planning, Haryana 2014

The NCR draft Regional Plan 2041 acknowledges the imbalance in the supply of affordable housing in the region (which includes Sonipat district), noting that while the net housing supply in Haryana exceeds demand with nearly 11% of urban housing stock lying vacant, there remains a severe shortage of affordable housing for the EWS and LIG categories. The coexistence of vacant formal housing and overcrowded informal settlements underscores deep structural inequalities in access to adequate affordable quality housing.

Although rental housing has been recognised by the State of Haryana as a key strategy to expand affordable options, its implementation is limited particularly in industrial towns and peri-urban villages where migrant workers depend on dense, informal rentals. Expanding and operationalising a robust rental housing policy, alongside upgrading existing informal stock, will be essential to addressing the housing deficit and ensuring inclusive, equitable, and sustainable urban development.

Figure 8.1: Housing Units Allocated in Sonipat by Income Group (1974–2024)



Source and Notes: Authors' visualisation.

Table 8.3: Year wise allocation of Houses in Sonipat

Year	Location	BPL	EWS	LIG	MIG	HIG	Other	Total
1974-75	Sonipat (Phase- I)	128	16	78				222
1978-79	Sonipat (Phase- II)		80	64	35			179
1982-83	Sonipat (Phase- III)		106	151	102			359
1992-93	Sonipat				4			4
1994-95	Sonipat Sector -12		250					250
1995-96	Sonipat Sector -12		286					286
	Sonipat Sector -15		80					80
1996-97	Sonipat Sector -15		46					46
1997-98	Sonipat Sector -15		139	128	16			288
2001-2002	Sonipat Sector -12		140					140
	Sonipat Sector -15		50					50
2002-2003	Sonipat Sector -7		144					144
	Sonipat Sector -15			72	23			95
	Sonipat Sector -23		132					132
2003-2004	Sonipat Sector -23		14					14
2007-2008	Sonipat Sector -15	112						112
2009-2010	Sonipat Sector -23		216					216
2010-2011	Sonipat Sector -15	22						22
	Sonipat Sector -23		176			152		328

Source and Notes: Housing Board, Haryana

Data on house allotment by the Haryana Housing Board shows that higher allocations for middle-income categories (LIG and MIG) dominated early development phases, between 1974 and 1982. A strategic shift toward EWS housing became evident by the 1990s, as can be inferred from Figure 8.1.

However, MIG and HIG allocations sharply declined post-1980s, indicating a shift away from public provisioning of housing for higher-income segments public housing (Table 8.3).

Data on spatial clustering on public housing projects, particularly the BPL houses, show that these are restricted to wards within the Sonipat Municipal Boundary. Housing Board allocations are also spatially clustered in selected sectors: Sector 15, Sector 60, Sector 12, and Sector 7 (Figure 8.2).

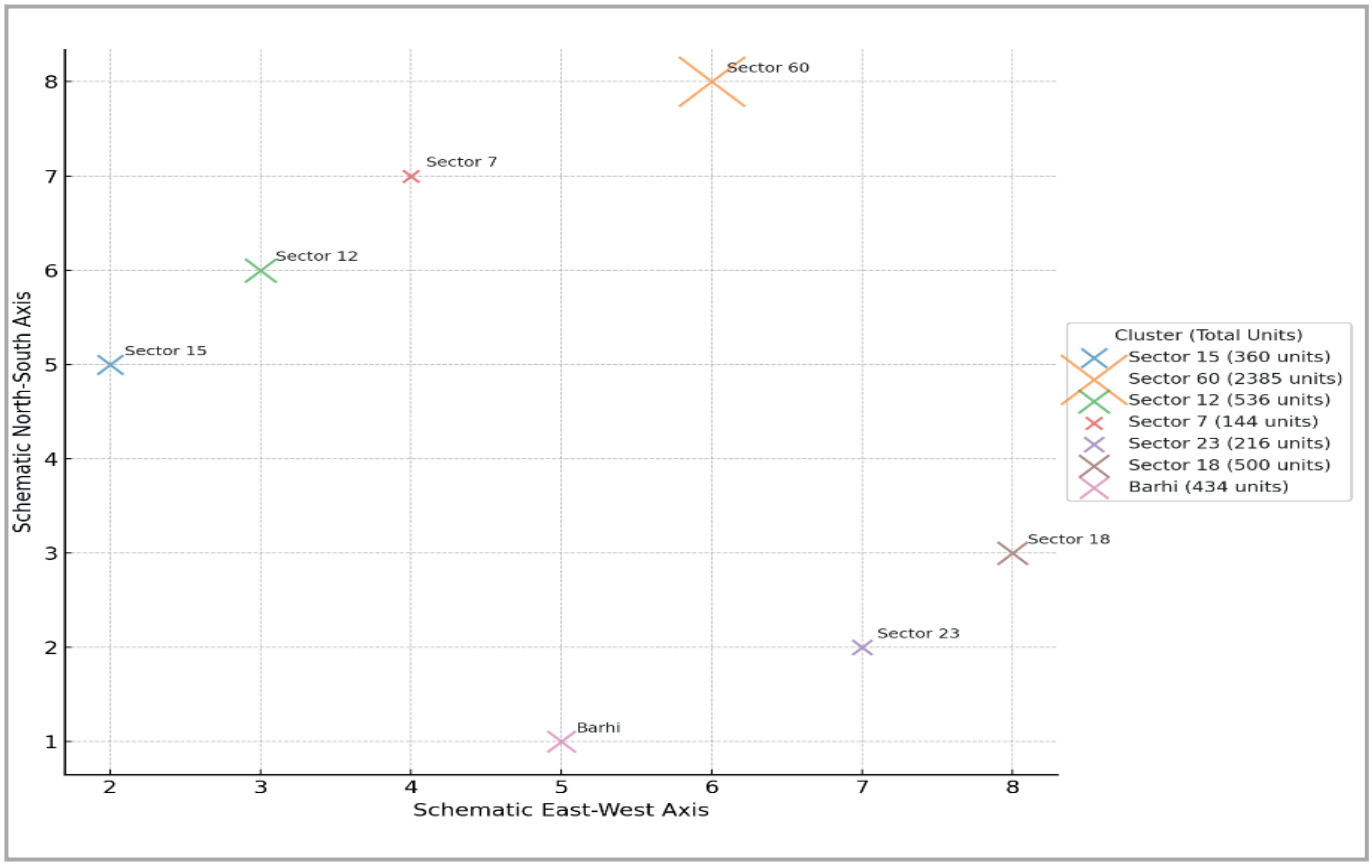
These neighbourhoods function as hubs for mass BPL and EWS housing. Sector 60, for instance, includes over 2,385 units entirely allocated to BPL families, while Sector 12 hosted over 536 EWS units in the mid-1990s. Besides, access to housing (ownership) is limited to Haryana residents; these units are not in sectors such as sector 34 and 35, where HSIIDC enclaves are located. This spatial pattern raises concerns of segregation and infrastructure burden in low-income clusters, often poorly integrated into the urban form.

Moreover, centrally and state-sponsored schemes like Affordable Housing in Partnership (AHP) and PMAY (Urban) faced implementation challenges due to administrative delays, land availability and infrastructure gaps.[2] Issues of location and affordability persist, with many units built far from

[2] Government of India, Ministry of Housing and Urban Affairs, *Affordable Housing* (MoHUA, 2024).

[3] Ministry of Housing and Urban Affairs, *Affordable Housing: Press Information Bureau, Affordable Housing* (Ministry of Housing and Urban Affairs), press release, March 2024, Government of India, https://www.pib.gov.in/PressReleasePage.aspx?PRID=2110726; Government of India, National Housing Bank, Annual report 2023–24 (NHB, 2025), NHB-Annual-Report-2023-24.pdf.

Figure 8.2: Housing clusters in Sonipat by location and size of allocation



Source and Notes: Authors' visualisation

economic activity centres or absorbed into market-rate housing – undermining their intended affordability objectives.[3]

Despite significant public housing investments, the bulk of new housing in Sonipat is market-driven dominated by villa-style gated communities, luxury flats, and townships developed by private players. Often priced above INR 40–50 lakh, these projects remain unaffordable to workers and lower-middle-income households. Simultaneously, labour colonies have proliferated in peri-urban villages, especially around Barhi, Rai, and Kundli, offering rentals under INR 6,000/month but often lacking tenure security, sanitation, or transit connectivity. Such housing near HSIIDC estates caters to thousands of migrant workers, mainly from Bihar and eastern UP, in unregulated conditions.

The Haryana Budget (2025) underscores the state's fiscal commitment to housing, which has increased by 303.8% in the housing budget allocation (from INR 605.30 crore in 2024–25 to INR 2,4 44.27 crore in 2025–26). Still, the housing policy lacks spatial and affordability targeting. Furthermore:

- EWS and LIG segments remain underserved relative to need.
- No data exists on rental housing provision, despite high in-migration.
- Housing Board efforts largely overlook tenancy reforms, dormitories, or social rental housing for industrial labourers.

8.1.2 Water Sustainability: Supply and Sources

Water resources in Sonipat district are under acute stress, with groundwater over-exploitation and surface water deterioration threatening long-term supply. Data is primarily available at the district scale, supplemented by NFHS (2019–21), the NCR Sub-Regional Plan (2021), CGWB assessments (2022), and Jal Jeevan Mission monitoring. Analysis focuses on access, quantity, quality, and sustainability of supply.

Access to Supply: NFHS data shows almost universal access to improved water sources: 98–99% of households use piped or borewell water in rural and urban areas. The data provided suggest that

disparities persist in the water supplied. In Sonipat town, municipal and Haryana Shehri Vikas Pradhikaran(HSVP) utilities supply ~60.2 MLD against a requirement of 69.2 MLD, leaving a 13% shortfall relative to Central Public Health and Environmental Engineering Organisation (CPHEEO) benchmarks. In rural blocks, per capita supply averages 41–55 Litres Per Capita per Day (LPCD), well below the 55 LPCD target under Jal Jeevan Mission—indicating a growing rural-urban divide.

Further available information in the NCR master plan document suggests that there are also intra-urban disparities. Information provided in different reports varies. The NCR regional planning document indicates that the per capita rate of water supply varies from 110 LPCD in Ganaur to 145 LPCD in Panipat, as compared the benchmark of 135 LPCD set by the Ministry of Housing and Urban Affairs

Groundwater Stress: The stage of groundwater development has reached 139% district-wide, with Rai (229%), Ganaur (141%), Sonipat (145%), Kharkhoda (143%), and Gohana (135%) all classified as over-exploited. Only Kathura (78%) and Mundlana (80%) remain safe. Net groundwater availability is in deficit by 173.64 MCM, and tables are falling 2–4 m per decade.[4] These trends reflect unregulated borewell extraction, particularly by new townships and apartment enclaves outside public supply networks.

Water Quality: Monitoring indicates mixed results. Jal Jeevan Mission sample survey conducted between February and March 2022 shows most chemical parameters within permissible limits, but bacteriological contamination in ~4% of samples.[5] Groundwater quality varies widely: electrical conductivity ranges from 438 to 6,660 µS/cm, with high salinity and fluoride (0.25–2.75 mg/L) in western and southern blocks.[6] Government reports, newspaper accounts and studies note that 68% of urban groundwater sources are unfit for drinking due to salinity and fluoride, while rural aquifers, especially near the Yamuna, retain relatively better quality.[7]

Surface Water Dependence: The Yamuna River and the Western Yamuna Canal are the district's primary surface sources, supporting ~850 km² of irrigation and supplying domestic/industrial use. Yet the Yamuna's deteriorating condition, compounded by untreated sewage and industrial effluent, undermines water quality. Ranney Wells supplement supply, but ageing tubewell infrastructure (93% shallow wells stressed) requires urgent modernisation.[8]

Urbanisation Pressures: Rapid urban expansion along NH-44, particularly around Sonipat, Rai, and Ganaur, intensifies pressure on supply.[9] Large, licensed colonies and institutional campuses are expanding faster than public networks, relying heavily on private borewells. This pattern reinforces unsustainable extraction and accelerates aquifer decline. COVID-19 temporarily shifted demand—domestic use spiked while industrial draw slowed—but the net effect was further pressure on already stressed domestic systems.

Disparities and Risks: Rural areas face lower service levels and higher dependence on declining groundwater, while urban estates enjoy closer alignment with benchmarks. Block-level disparities mirror urbanisation patterns: the fastest-urbanising tehsils (Rai, Kharkhoda, Ganaur) are also the most over-exploited. This duality highlights how unbalanced growth threatens equitable water access.

Implications: Sonipat's water security is at a critical juncture. Both surface and groundwater resources are overdrawn, quality is compromised, and infrastructure is failing to keep pace with growth. Without stronger regulation of groundwater extraction, expansion of treated surface water supply, and integration of township development into the public grid, the district risks long-term depletion of its most vital resource.

[4] Department of Town and Country Planning, *Sub-Regional Plan for Haryana Sub Region of NCR 2021*.

[5] Government of India, Ministry of Jal Shakti, Department of Water Resources, River Development and Ganga Rejuvenation, Central Government Water Board, *National compilation on dynamic ground water resources of India, 2022* (Ministry of Jal Sakti, 2022), 2022-11-11-gwra_2022_1_compressed.pdf.

[6] Ibid.

[7] Ibid; Jal Jeevan Mission, *Functionality Assessment of Household Tap Connection under National Jal Jeevan Mission – 2022: District Report, Sonipat, Haryana* (Government of India, 2022), https://jaljeevanmission.gov.in/sites/default/files/2022-12/FHTC_Sonipat.pdf; Singh (2022); Dhankhar et al. (2024); Shukla et al. (2025)

[8] Ministry of Jal Shakti, *National Compilation on Dynamic Ground Water Resources of India, 2022*; Shukla et al. (2025); Singhal et al.(2025); Sharma et al. (2024)

[9] Raman (2016)

8.1.3 Access to Sewage Network

Liquid waste in Sonipat district comprises two components: sullage and sewage. The National Capital Regional Plan 2021 notes that sewerage systems in many towns of Sonipat and Haryana, more broadly, are outdated. Leakage is a persistent concern, as it risks polluting groundwater. The report also highlights that untreated sewage is often discharged directly into rivers and drains, violating pollution control laws. During the non-monsoon months, some sewage is diverted for irrigation, but this practice is limited to small areas and only for a few months each year. Integration of housing and institutions into networked sewerage systems for safe disposal continues to lag.

As can be inferred from Table 8.5, access to sewerage networks ranges between 79% and 89% within urban areas, while rural areas remain almost entirely unserved. Similarly, access to individual toilets is estimated at 80–90% in towns, compared with only 48% in rural areas. A major limitation of official data is that it reports only within municipal boundaries. In contrast, rapid urban transformation occurs in peri-urban and rural frontiers, with no networked water supply or sewage systems.

Sonipat is also crisscrossed by an extensive drainage network, with more than 100 drains, including Diversion Drain No. 8, Drain No. 6, and the East and West Juan Drains. These are designed to carry rainwater and excess flows from the Yamuna and surrounding catchments. Smaller link and field drains extend coverage across Gohana, Kharkhoda, Sonipat, and Rai blocks, reaching even villages like Teori, Sardhana, and Bhadana. However, repeated flood events—particularly when Yamuna discharge exceeds 600,000 cusecs, as in 2010, 2013, and 2019—have revealed the vulnerability of this system.[10]

The flood control order for Sonipat identifies several persistent challenges: delays in desilting, encroachment into drain corridors, damaged bunds, and shortages of patrolling staff. Ring bunds are often in poor condition before the monsoon season and require urgent annual repairs. These shortcomings persist despite yearly inspections and the deployment of sandbags and pumps by ULBs. Urban centres such as Sonipat and Gohana, which slope naturally to the south and east, are especially vulnerable: poor surface drainage and the spread of impermeable concrete surfaces block effective water flow. Currently, the district relies on more than 16 permanent pump houses to dewater about 800 acres of low-lying farms and built-up rural areas. Yet, villages such as Toki Manoli, Garhi, Ashadpur, and Gorar continue to experience seasonal flooding.

There are also significant gaps in sewerage infrastructure. Sonipat has seven sewage treatment plants (STPs) with a combined capacity of 84.3 Millions of Liters per Day (MLD). Yet nearly 41 MLD of sewage remains untreated or only partially treated, out of the 79 MLD generated by Class II towns and above. Untreated flows routinely enter the Yamuna, further degrading river quality. Sewer pipelines are still being laid in many areas, and municipal corporations face ongoing challenges in acquiring land for new STPs. This is particularly pressing in Kundli, where new facilities are planned for 2025.

Table 8.4: Existing Water Supply and Sewage Infrastructure in Sonipat District (2011)

Area	Population 2011	Actual coverage Water supply (%)	Actual water supply in lpcd	Actual Water Deman (mld)	Actual Sewage Generation @80% of water demand	Coverage of Sewage networks (%)	Coverage by Individual toilets (%)
Sonepat Town	327,002	90	121	39.57	31.65	89	80
Gohana	65708	129	128	8.48	6.78	71	80
Ganaur	35,603	100	255	9.08	7.26	85	90
Kharkhoda	25,051	95	130	3.26	2.61	79	90
Rural	996,637	59	55	54.82	43.85	0	48

Source and Notes: Department of Town and Country Planning, NCR Planning 2021

[10] Government of Haryana, Haryana State Pollution Control Board, *District Environment Plan: Sonipat* (HSPCB, 2023).

Efforts by the Public Health Engineering Department (PHED) and ULBs to redirect illegal drains into STPs have had mixed success. Of 33 known discharge points into Drain No. 6, 24 have been rerouted to the Rathdhana STP, while the remainder are being connected gradually. New projects—such as the 25 MLD STP at Kakroi Road in Sonipat and planned facilities in Kundli—signal ongoing action. However, the supporting systems remain fragmented, under-resourced, and reactive rather than anticipatory.

Within Sonipat city, partial sewerage coverage exists, but networks are old, inadequate, and serve only select neighbourhoods. Recent allocations (INR 4.95 crore)[11] have targeted localised upgrades in flood-prone areas such as the commercial areas in the city. While the Sonipat Metropolitan Development Authority (SMDA) is preparing a more comprehensive plan that includes new sewage treatment facilities in Kundli but the coverage remains piecemeal. For example, the plan to extend the sewage network in the Sonipat–Kundli zone, one of the district's fast urbanising areas, is limited to municipal boundaries and regulated areas, leaving sewerage fractured and incomplete.

Integrating housing and institutions into the network sewage system for safe disposal is lagging. Land transformation is driven by various institutions with different development agendas. As a result, a coordinated provision of networked infrastructure has lagged in the district. The rapid expansion of urban and peri-urban settlements in Sonipat district has not been matched by equivalent growth in sewerage infrastructure, resulting in stark disparities between municipal cores and rural or fringe areas.

Moreover, rapidly urbanising towns like Kharkhoda and Ganaur currently have no dedicated sewerage network in their municipal zones. Even though Ganaur municipal infrastructure includes a 7 MLD STP constructed in 2010 at a cost of INR 4.99 crores. However, a 2014 audit exposed severe defects: no filter media and no laboratory were installed, and wastewater began being discharged untreated before commissioning was completed. At the same time, Rai remains within the rural administrative jurisdiction. Outside the MC jurisdiction, there is a lack of comprehensive sewer connectivity; systems serving the industrial estate are limited and project-oriented.

As industrial parastatals or private developers primarily drive land development, wastewater is let onto public spaces. Although the discharge of industrial wastewater is the responsibility of pollution control board, it is let out into irrigation channels or public space untreated. An example is the frequent flooding due to sewerage discharge outside HSIDC estate located along the road leading to National Highway 1. Adjoining the land are densely built labour colonies affected by both a lack of safe sanitation facilities and sewage flooding in the public space adjoining their settlement, posing environmental and health risks.

Some temporary or unauthorised wastewater connections are reportedly discharged into nearby water bodies, a concerning practice leading to localised pollution. In contrast, rural and peri-urban settlements—where much of the new housing and township development is concentrated—lack engineered sewerage systems.

Licensed colonies developed outside Master Plan boundaries, as well as informal settlements, rely on septic tanks, open drains, or direct disposal, creating risks of groundwater contamination and localised health hazards. These deficits underscore the structural disconnect between land development and service provision.

Table 8.5: Status of Sewerage and Sanitation Infrastructure in Sonipat Urban and Peri-Urban Areas

Area Type	Sewerage/ Sanitation Infrastructure
Sonipat Municipal Area	Partial, aging sewer network; targeted upgrades
SMDA/Kundli Sector	Sewer plans in progress; no functional network
Rural & Peri-Urban Zones	No formal sewerage; rely on septic/open drains

Source and Notes: Town and Country Planning Department 2021

[11] Government of Haryana, Finance Department. *Haryana Budget 2025-26* (Finance Department, 2025), https://finhry.gov.in/budget-2025-26/

Haryana has achieved nearly universal rural toilet coverage at the household level under the Swachh Bharat Mission, but this represents toilet access rather than sewer network connectivity. In Sonipat town alone, over 85,000 households exist, yet many in fringe zones remain unconnected to the municipal system. The result is a dual landscape: a municipal core with partial and strained coverage, and vast peri-urban belts where sanitation relies on ad hoc, unsafe arrangements.

There are also gaps in the sewerage infrastructure. Sonipat has seven sewage treatment plants (STPs) with a combined capacity of 84.3 MLD. Yet nearly 41 MLD of sewage remains untreated or only partially treated. This is from the 79 MLD generated by Class II towns and above. These untreated flows usually go into the Yamuna and pollute the river. Pipelines are still being laid in many areas. The DEP notes that Municipal Corporations are still trying to find land for new treatment plants. This is especially the case for fast-growing Kundli, which has sewer projects planned for 2025. Efforts by the Public Health Engineering Department (PHED) and ULBs to redirect illegal drains into STPs have seen mixed results. Out of 33 known discharge points into Drain No. 6, 24 have been rerouted to Rathdhana STP. The rest are being linked gradually. Projects like the STP at Kakroi Road (25 MLD capacity) in Sonipat, and others planned for Kundli, suggest action on the ground. However, the formal supporting systems remain inadequate and under-resourced, calling towards immediate action.

Overall, Sonipat's sanitation trajectory highlights a deep spatial inequity: while speculative real estate and institutional projects expand rapidly, the absence of comprehensive sewerage networks beyond municipal limits has left rural and peri-urban populations disproportionately exposed to environmental and health risks. Closing this gap requires urgent integration of sanitation planning into land development and infrastructure policies.

8.1.4 Solid Waste Management

Information presented in the 2023 District Environment Plan (DEP) of Sonipat, prepared by the Haryana State, presents a picture of a district with a well-organised solid waste management system organised by the Urban Local Bodies. It highlights the provision of door-to-door waste collection systems across all municipal wards and village panchayats. A dedicated fleet of collection vehicles - around 67 in Sonipat Municipal Corporation- ensures that waste is picked up daily and transported to designated transfer points or processing facilities.

The waste processing infrastructure of Sonipat district includes multiple facilities to handle different waste streams. A key component of the disposal mechanism is the Waste to Energy (WTE) plant located in Murthal, which handles both wet and dry waste, primarily from Sonipat city and its surrounding areas. The plant has a reported capacity to hold 750 Tonnes Per Day (TPD). This facility receives waste collected in Sonipat city and its surrounding ULBs tons per day. Across all urban local bodies, Sonipat generates about 287 tons of solid waste per day. Of this, the Murthal waste-to-energy facility received waste collected in Sonipat up to 200 tons per day, while from other municipalities such as Kharkhoda, Gohana, Ganaur, and Kundli, 20 tons, 32 tons, 18 tons, and 17 tons per day, respectively. However, this information has to be read with caution, as comprehensive data on waste generated in ULBs other than Sonipat is unavailable in the public domain.

Some of the waste generated within the district is diverted to Material Recovery Facilities (MRFs). Two such facilities operate within Sonipat city, with additional units in other towns. These MRFs focus mainly on dry waste, sorting recyclables such as plastics, paper, and metals for onward recycling, with residue transferred to the WTE plant or landfills. Plastic waste alone accounts for about 20 TPD in Sonipat city, which is collected door-to-door and sent to two dedicated plastic waste centres. In addition, two mechanised composting units handle organic waste from markets and bulk generators within the city. At the same time, 42 compost pits have been set up in village panchayats for composting kitchen and agricultural waste at the local level. Recent newspaper accounts suggest that waste from other districts, such as Gurgaon, may be routed to this facility, outstripping the capacity.

Despite these measures, the DEP acknowledges the shortcomings of construction and demolition (C and D) waste management. C and D waste is collected at decentralised sites—Village Lehrada (Sonipat city), Rohtak Road (Kharkhoda), Thaska dumpsite (Gohana), Badshai Road near ITI (Ganaur), and near GT Road (Kundli). However, none of these sites has a

formal recycling mechanism. The issue is particularly acute in Sonipat city, which alone generates 17 TPD of C and D waste, far exceeding other towns in the district.

Biomedical waste from 415 healthcare facilities is collected daily and transported to a Common Biomedical Waste Treatment Facility (CBWTF) in Jind, amounting to 831 kg/day. Although incineration and tracking systems are in place at Jind (with barcoding under consideration), Sonipat lacks a local facility and does not use deep burial methods.

Hazardous industrial waste is generated by 705 registered units, amounting to 71,993 metric tonnes annually. This waste is stored temporarily onsite before being transferred to authorised Treatment, Storage and Disposal Facilities (TSDFs) outside the district, as Sonipat has no centralised hazardous waste facility.

Finally, the district produces an estimated 19,256 metric tonnes of e-waste annually, mainly from bulk generators and institutions. This is channelled to two registered dismantlers and four authorised recyclers outside Sonipat. Currently, ULBs do not operate public collection points for e-waste, although proposals for such systems are under consideration.

8.1.5 Access to Electricity

Information in the Haryana Statistical report 2023-24 shows that Sonipat has 4,67,186 electricity connections, of which domestic households account for 3,77,291 connections - over 80 per cent of the total in the district. This is followed by agriculture (37,370 connections) and the commercial sector (41,468 connections). Industrial connections, at 9,372, form only a small proportion of the overall profile, consistent with Sonipat's predominantly micro- and small-scale industrial structure. Other categories include public lighting (298 connections), public water works (1,107 connections), bulk users (62), and miscellaneous others (218). This pattern underscores the centrality of residential and agrarian demand.

At the state level, the Haryana government has significantly expanded investment in the energy sector. In the 2025–26 budget, the government allocated INR 6,379.63 crore to the Energy Department, building on a decade of reforms that have reduced transmission and commercial losses from 30 per cent in 2014–15 to 10.4 per cent in 2024–25. A flagship initiative, the Mhara Gaon Jagmag Gaon Yojana, aimed to provide 24-hour electricity across rural areas. The government claims that continuous power is now supplied to 5,877 villages, and to extend this to the remaining 1,376 villages, a new initiative will be introduced in 2025–26.

Power availability in Haryana has also expanded steadily. In 2014, the state had a capacity of 10,729 MW, which increased to 16,015 MW in 2024–25. The government's target is to raise this to 24,000 MW within seven years to ensure universal and uninterrupted supply. Several large-scale thermal power projects are planned to meet this demand, including a 1x800 MW ultra-supercritical thermal plant in Yamunanagar at a cost of INR 7,272 crore, expected to be completed by March 2029 with support from BHEL. Proposals are also underway for a 1x800 MW expansion unit at RGTPP, Hisar, and a 2x800 MW ultra-supercritical project at Panipat.

Alongside thermal generation, the state diversifies its energy mix through renewable sources. The Haryana Power Procurement Centre has signed a supply agreement with Satluj Jal Vidyut Nigam Limited for 800 MW of firm and dispatchable renewable energy, expected by May 2026. This package includes 1,115 MW of solar, 896 MW of wind, and 938 MW of battery energy storage system capacity, signalling a shift toward integrated renewable energy systems.

The state is scaling up rooftop solar adoption at the household level under the Pradhan Mantri Surya Ghar Muft Bijli Yojana. So far, panels have been installed on 14,250 houses, with a target of 2,22,000 systems by March 2027. Subsidies are designed to support low-income families: Antyodaya households with connections up to 2 kW will receive up to INR 1,10,000 in subsidy. Complementary measures include support for solar-powered public lighting, with INR 4,000 subsidies for village road and Amrit Sarovar lights and INR 20,000 subsidies for high-pole installations. Twenty thousand solar lights are planned for installation in 2025–26.

8.1.6 Disaster Risks and Responses

Sonipat's spatial transformation has been shaped by the conversion of agricultural land into industrial, residential, and institutional uses and by the stress these uses place on its traditional water and drainage systems. The district is traversed by over one hundred engineered drains, including Diversion Drain No. 8, Drain No. 6, and the East and West Juan Drains, supported by smaller field drains that run across Rai, Kharkhoda, Sonipat, and Gohana urban and periurban areas.[12] Designed initially to evacuate rainwater and excess flows from the Yamuna, these drains were meant to safeguard both farmland and settlements. These also served as irrigation canals.

With urbanisation, encroachment into drain corridors, conversion of wetland along the drains into built environment, delayed desilting, and poorly maintained ring bunds have weakened traditional water routes. An example is the drain no. 6, which runs through Sonipat city and along NH-44.[13] The industrial, residential and education hubs have large impermeable surfaces. Further, in many locations, wetland and overflow areas along the drain have been paved or converted into built spaces, increasing the runoff water into the drain. With limited provision for stormwater infrastructure, runoff accumulates in built-up areas, overwhelming existing drains. Moreover, Urban areas like Sonipat and Gohana naturally slope towards the south and east.[14] This slope, poor surface drainage, and increasing concrete surfaces prevent adequate water flow.[15]

Floods in 2010, 2013, and 2019 showed that the drainage network is unable to cope when the Yamuna discharge exceeds 600,000 cusecs.[16] Backflows and overtopping leave peri-urban villages like Manoli Toki, Garhi, Ashadpur, and Gorar submerged, despite the operation of 16 pump houses intended to dewater around 800 acres of low-lying land. The pollution load has also risen sharply, with untreated household wastewater and industrial effluent from Rai and Kundli entering drains designed only for stormwater. These water bodies now function less as flood safety mechanisms and more as carriers of sewage and pollutants. Further, without networked sanitation, institutions and housing complexes let out their wastewater into these drains.[17]

While extreme events are becoming a regular occurrence in the district, there is little data on how people respond to these situations.

The pattern of spatial transformation presents a paradox. While Sonipat is celebrated as a growth hub with universities, townships, and industrial estates, the basic hydrological systems underpinning its safety and ecology have been degraded. What were once protective infrastructures now mirror the fragmented, speculative nature of urbanisation—expansion driven by land conversion without parallel investment in sustainable drainage, sanitation, or environmental safeguards.

Urban centres like Sonipat and Gohana have partial sewerage networks, while peri-urban hubs such as Kundli, Rai, and Kharkhoda remain largely uncovered, discharging waste into open drains. Rural settlements on the fringes such as Manoli Toki, Garhi, and Ashadpur - face the combined burden of flooding and polluted inflows. This juxtaposition shows how speculative, corridor-driven urbanisation has created wealth and new vulnerabilities, where infrastructure lags land-use change.

8.2 Conclusion

Data available in the public domain shows that housing supply is skewed, particularly in the peri urban areas around industrial estates. The supply gap is particularly acute in the lower segments of the market, specifically, housing for Economically Weaker Section and Below Poverty Line households.

While the shift in the Housing Board Haryana strategies to deliver many BPL housing units (over 58% of public housing in Sonipat), this has not been adequate to address the supply gap. Supply gaps of

[12] Haryana State Pollution Control Board, *District Environment Plan: Sonipat*

[13] Sushil Manav, "How Choked Drains in Haryana Threaten to Disturb 'Water Supply' to President's Estate, PM House," The Print, March 11, 2024, https://theprint.in/india/how-choked-drains-in-haryana-threaten-to-disturb-water-supply-to-presidents-estate-pm-house/1995129/

[14] Haryana State Pollution Control Board, *District Environment Plan: Sonipat*

[15] Ibid

[16] Ibid; Government of India, Ministry of Housing and Urban Affairs, National Capital Region Planning Board, *Draft Regional Plan 2041 for NCR* (Ministry of Housing and Urban Affairs, 2021), https://ncrpb.nic.in/pdf_files/DraftRegionalPlan-2041_English.pdf.

[17] Haryana State Pollution Control Board, *District Environment Plan: Sonipat*

both ownership and rental housing persist in the lower segments of the market. Migrant workers working in the industrial estates are adversely affected by the limited supply of affordable rental housing. Consequently, they rely on rental units on crowded and under-serviced abadi land or privately developed unregulated labour colonies, particularly in peri-urban industrial areas like Rai and Barhi.

Moreover, existing housing schemes such as PMAY and state-run EWS/LIG programmes designed to address the supply gaps in housing for EWS households remain limited relative to the demand. There is also a risk of schemes benefits not reaching the intended households largely due to mismatches between eligibility norms and the realities of EWS in informal work. Many affordable housing developments are gentrified, poorly located, and either not aligned with employment centres or transit access. The quality and adequacy of housing remain a persistent challenge. There is a need to expand housing for household Below Poverty Line.

While HUDA's instrument of regulating housing development through licensing arrangements has favoured large developers' promoted housing development aimed at the higher end of the market, public provisioning is aimed at enhancing housing access to households below the poverty line. As a result, there is a significant supply gap for housing, particularly for low to lower-middle-income and middle-income households.

Accelerating the supply of affordable housing is critically important for achieving the goal of housing for all. Such efforts should focus on expanding both ownership and rental housing, as the demand for the latter will increase due to the expansion of manufacturing sector in the district. Similarly, large scale programme to regularise unlicensed colonies and extend basic infrastructure would enhance the quality of life for all in the district. Infrastructure services like water and sanitation remain unevenly distributed. The NCR Sub-Regional Plan for Sonipat recognises the overexploitation of groundwater in blocks like Ganaur, Rai, and Sonipat, which has reached a critical status in Kharkhoda and Gohana. Despite central water supply schemes improving coverage, sanitation infrastructure is inadequate. The Yamuna River framework lacks operational sewage treatment networks to support ecological restoration.

Disaster preparedness in Sonipat has improved, with Haryana's disaster management strategy increasingly responsive to climate risks. However, the region lacks integrated planning to address the cumulative dangers of unregulated urban expansion, industrial pollution, and water insecurity.

In sum, Sonipat's urban transformation has occurred with adequate provision of basic infrastructure services. The absence of coordinated development of land and basic infrastructure networks undermines the possibility of inclusive, sustainable development. Addressing these gaps requires an integrated approach to spatial planning, land development, and housing policy to ensure that infrastructure-led transformation delivers equitable benefits for all.

Chapter 9

ENVIRONMENT DYNAMICS IN SONIPAT DISTRICT

Jannet John and Bramha Gupta

9 ENVIRONMENT DYNAMICS IN SONIPAT DISTRICT

Jannet John and Bramha Gupta

This section examines the environmental dynamics of Sonipat district, Haryana, focusing on interconnections between air, water, and land resources and their implications for livelihoods and socio-economic stability. Drawing on secondary data from scientific and government sources, we show how rapid urbanisation, industrial growth, and population expansion—driven by Sonipat's location within the National Capital Region (NCR)—accelerate environmental degradation.

According to government database (Central Pollution Control Board), air pollutants include particulate matter, sulphur dioxide, and nitrogen oxides. Water pollutants include nitrates and total dissolved solids often exceed permissible limits. Air quality is deteriorated by urbanisation and stubble burning while untreated sewage, industrial effluents, and agricultural runoff pollute water. These issues increase illness, medical costs, and financial losses, especially for underprivileged groups. This report highlights significant government activities for Sonipat's sustainable environmental management and proposes integrated solutions.

Land resources are also shifting. From 2011 to 2021, agricultural land fell 11 per cent while barren land rose 7 per cent reflecting industrial expansion. Soil fertility, reduced by falling organic carbon, can be restored through organic amendments and crop diversification. Water stress remains severe: Sonipat is in Haryana's "Red Zone" for groundwater depletion with five of seven blocks over-exploited. Yet water-saving technologies, efficient irrigation, and recharge policies offer reversal pathways. Addressing land inequities is vital: 42 per cent of holdings are small and fragmented while Scheduled Caste households face landlessness. Cooperative farming, pooling, and equitable access can enhance productivity. Women, though key contributors to farming, have limited land rights; policy innovations and awareness are gradually improving access.

Sonipat's semi-arid climate shows rising temperatures and rainfall variability. Identified as a "relatively high vulnerable" district in Haryana's climate risk profile, the region faces crop stress in staples. This emphasises the potential to adopt adaptive agricultural strategies. Measures such as introducing heat-tolerant crop varieties, adjusting sowing times, and promoting short-duration crops can mitigate risks and secure farmer incomes under changing conditions.

Ongoing interventions—the Haryana Clean Air Project (HCAPSD), State Environment Plan (SEP), Atal Mission for Rejuvenation and Urban Transformation (AMRUT) and the Jal Jeevan Mission—strengthen pollution control, stubble management, and effluent treatment. Scaling these alongside water conservation and equitable land reforms (e.g., DILRMP) can safeguard health, improve livelihoods, and foster sustainable growth.

9.1 Introduction and Context

This report provides an overview of the environment, i.e., air, water, and land-related dynamics impacting human development in the Sonipat district of Haryana. We draw upon various scientific and governmental sources to indicate the current state and attempt to chalk out a strategy for progress based on current trends of these indicators.

Sonipat district in Haryana is experiencing significant land-use changes, environmental degradation, and socio-economic challenges, which directly influence the well-being and livelihoods of its population. Key issues include declining drinking water quality, air quality, surface and groundwater quantity, agricultural land, depletion of soil nutrients, scarcity and pollution of water resources, lack of inclusive land rights, and gaps in policy integration. The insights presented here are based on a range of secondary data sources, such as census data, satellite analysis, data from government portals, academic research, reports from organisations, and primary data based on an ongoing rural survey in multiple villages across Sonipat. We aim to understand the complex interplay between environment (air, water, and land) and human development in the region.

9.2 Status of Water and Air Pollutants

One of the most urgent environmental issues facing the world today is air and water pollution, which is mostly caused by urbanisation, industrialisation, and population expansion.[1] The World Health Organisation (WHO) estimates that 99 per cent of people on the planet breathe air that is overly polluted, and that delicate particulate matter (PM2.5) causes an estimated 7 million premature deaths per year from cardiovascular and respiratory illnesses.[2] Carbon monoxide, nitrogen oxides, sulphur dioxide, ground-level ozone, and particulate matter from industry, cars, and stubble burning are examples of major air pollutants.[3] In a similar vein, water pollution causes approximately 4,85,000 deaths annually from diarrheal illnesses, affecting roughly 2 billion people globally who drink tainted water.[4] Untreated sewage, industrial effluents, pesticide and fertiliser-containing agricultural runoff, and plastic debris are the major causes of water pollution that endanger human health, aquatic life, and biodiversity.[5] Considering the concern of water and air pollution, a ray of water and air pollutants (maximum average concentrations) have been reported in the district of Sonipat, in the state of Haryana, and in India as a whole. The government database was extracted over a decade to visualise their impacts on human health, socio-economic, education, and gender inequalities.

9.3 Water Pollutants: Trends, Impacts, and Critical Viewpoints

Based on the occurrence of the water pollutants, industrial effluent release, and health impacts, numerous water pollutants, including nitrate, chloride, hardness, alkalinity, total dissolved solids (TDS; concentration of all inorganic and organic substances dissolved in water), biochemical oxygen demand (BOD; amount of oxygen required by microorganisms to decompose organic matter in water), chemical oxygen demand (COD; amount of oxygen required to chemically oxidize both organic and inorganic substances in water), and other pollutants, have been reported in Sonipat district, in Haryana, and India. Using the secondary data from published scientific and government databases, the graphical representation is shown in the subsequent figures.

From Figure 9.1 and 9.2, it can be seen that the most commonly occurring average maximum concentrations of nitrate, chloride, fluoride, total hardness, alkalinity, TDS, BOD, COD, and total nitrogen were found as 35, 255, 1.05, 460, 300, 1950, 290, 580, and 48 mg/L respectively in Sonipat district.[6] Out of these, hardness, TDS, and COD are extremely high as compared to their permissible limits. However, from Figure 9.3, the concentrations of nitrate, chloride, fluoride, total hardness, alkalinity, and TDS were reported with maximum average concentrations of 86.4, 1000, 4, 1000, 2000, and 3800 mg/L respectively in Haryana, whereas at the India level, these pollutants were found as 200, 2500, 10, 3000, 3000, and 10000 mg/L.[7] This suggests that if urbanisation and industrialisation continue at the same pace as at present, the state of Sonipat district will also deteriorate further to match the pollution level of Haryana and India.

From Figure 9.3, it is also evident that most of the pollutants exceed the safe permissible limits decided by the Bureau of Indian Standards for drinking and standard guidelines for wastewater. These exceeding concentrations are depleting the freshwater resources for humans and animals and threatening the lives of other creatures on the earth.

[1] United Nations Environment Programme (UNEP), *Frontiers 2022: Noise, Blazes and Mismatches—Emerging Issues of Environmental Concern* (Nairobi: UNEP, 2022).

[2] World Health Organization (WHO), *Air Quality and Health* (Geneva: World Health Organization, 2022), https://www.who.int.

[3] Centre for Science and Environment (CSE), *State of India's Environment 2021: In Figures* (New Delhi: CSE, 2021).

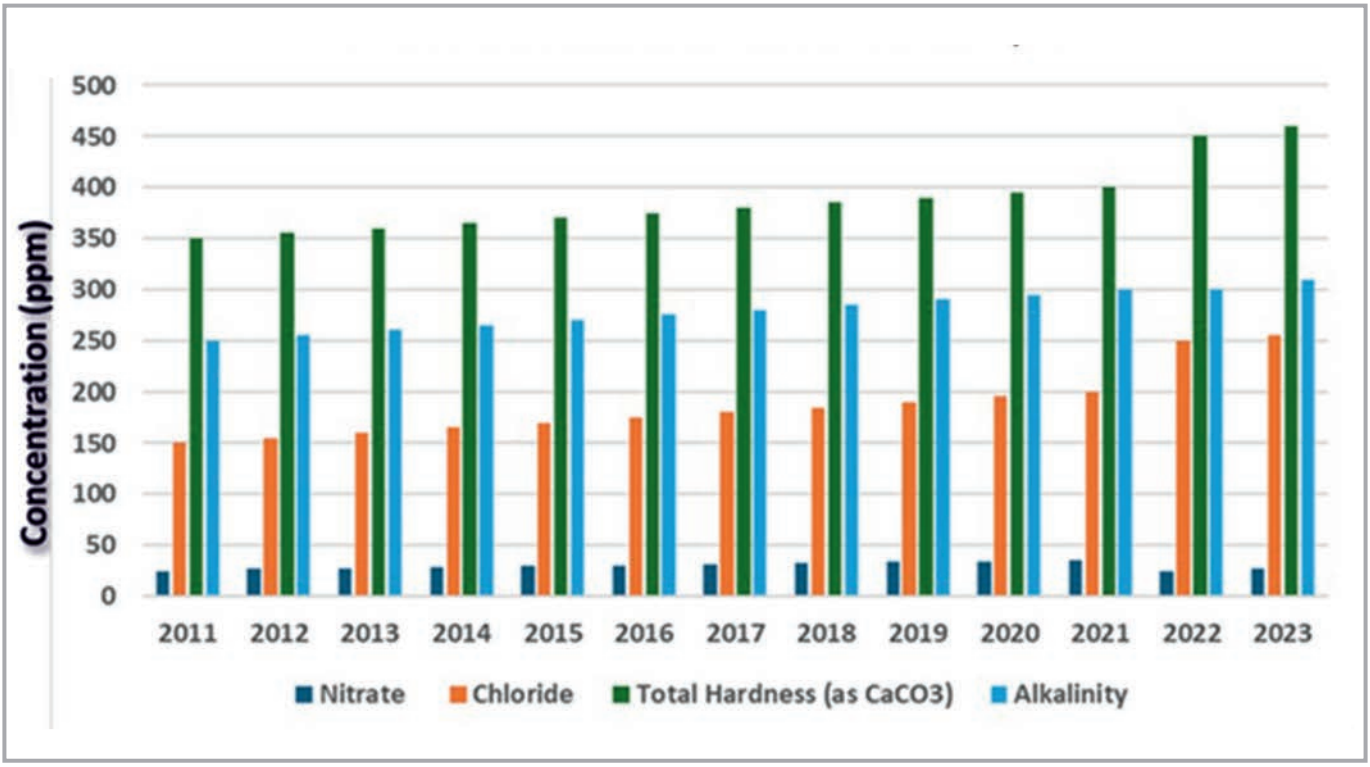
[4] World Health Organization (WHO) and United Nations Children's Fund (UNICEF), *Progress on Household Drinking Water, Sanitation and Hygiene 2000–2020: Five Years into the SDGs* (New York: WHO and UNICEF, 2021).

[5] UNEP, *Frontiers 2022.*

[6] Haryana State Pollution Control Board (HSPCB), *Reports and Notifications on Air and Water Quality in Haryana* (2023), https://hspcb.gov.in.

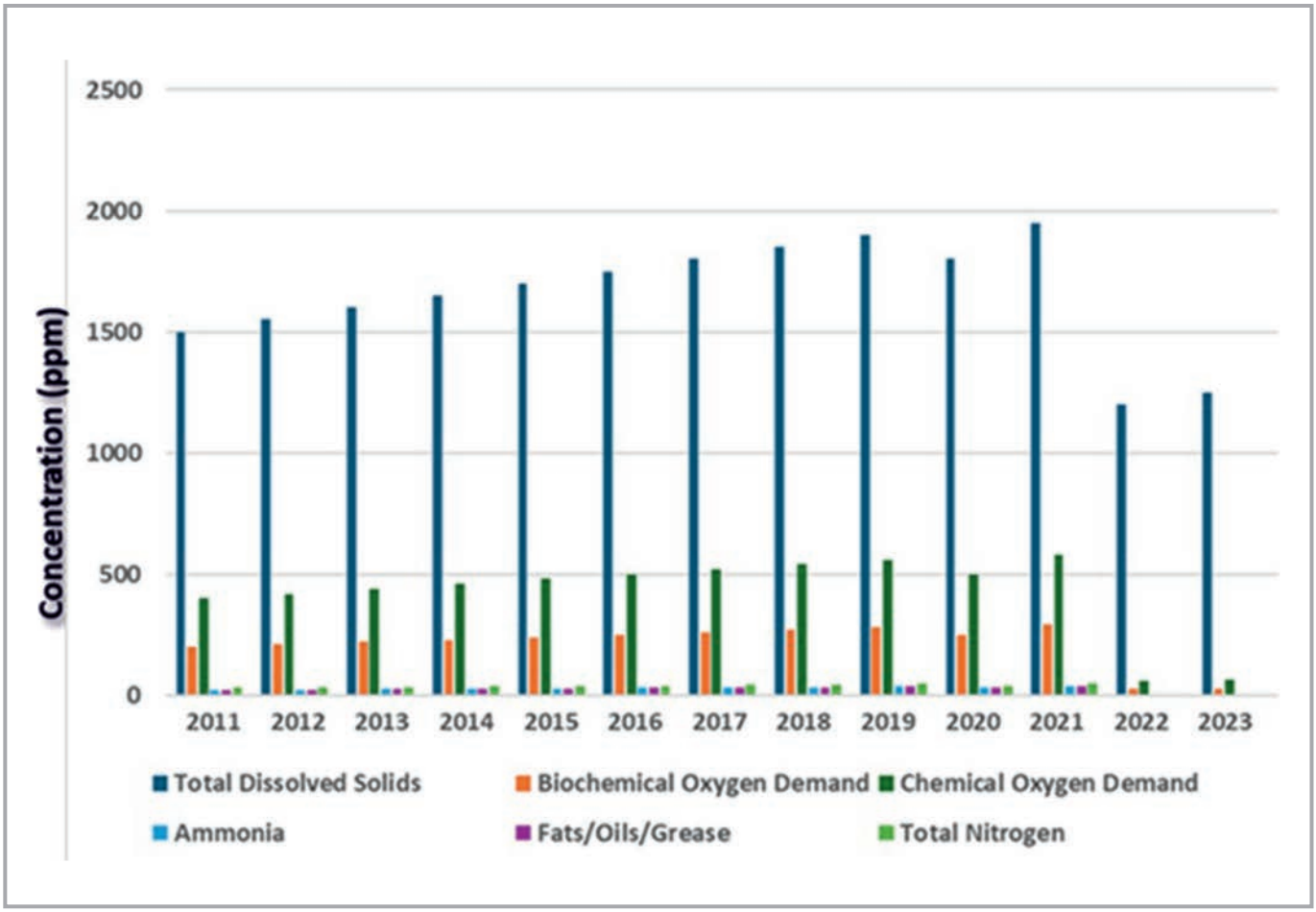
[7] Government of India, Ministry of Jal Shakti, *Official Website – Jal Shakti Ministry* (2023), https://jalshakti-dowr.gov.in; HSPCB, *Reports and Notifications on Air and Water Quality in Haryana*; Central Pollution Control Board (CPCB), *National Ambient Air Quality Status and Trends in India, 2022* (New Delhi: CPCB, 2022).

Figure 9.1: Distribution of Prominent Water Pollutants over the Years (in mg/L)



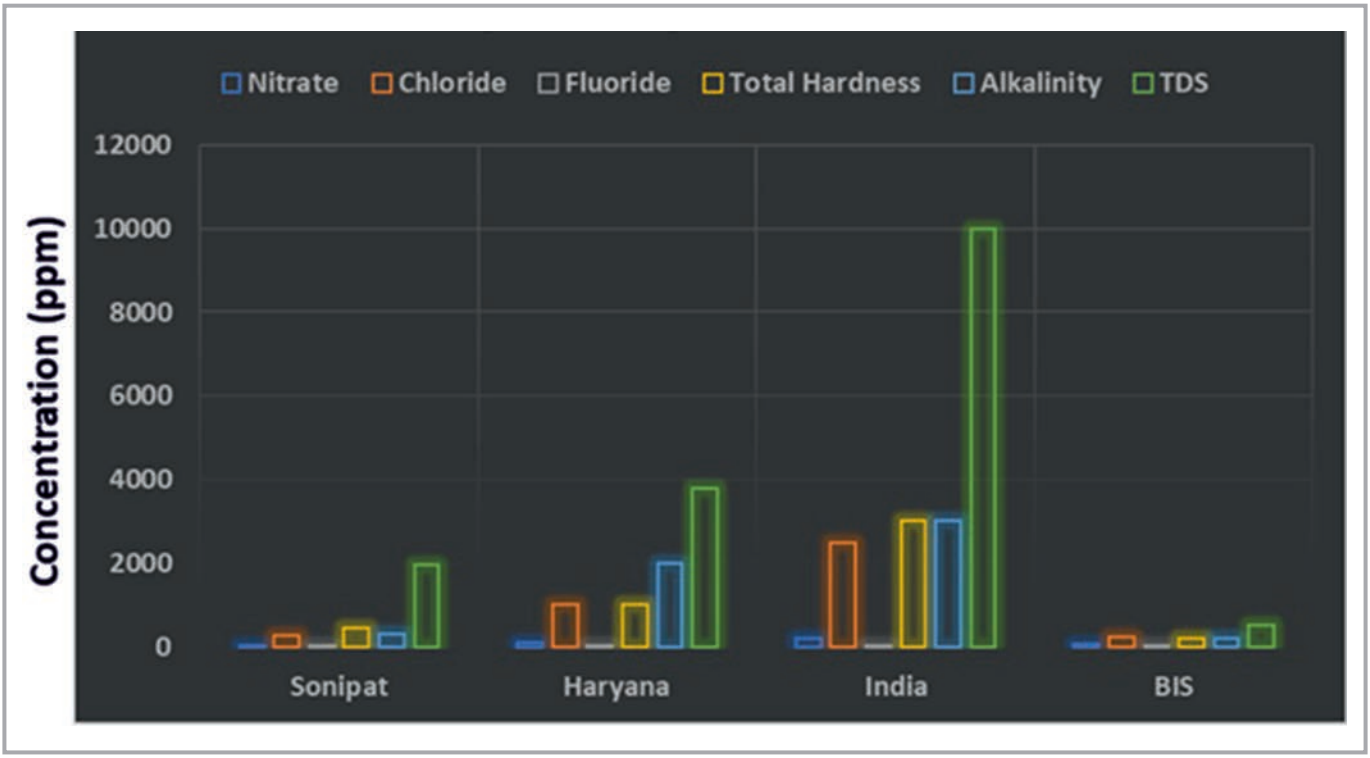
Sources and Notes: CGWB, 2023; Ministry of Jal Shakti, 2022; HSPCB, 2023; CPCB, 2022.

Figure 9.2: Distribution of Industry-Specific Water Pollutants over the Years (in mg/L)



Sources and Notes: CGWB, 2023; Ministry of Jal Shakti, 2022; HSPCB, 2023; CPCB, 2022.

Figure 9.3: Trend Analysis of Water Pollutants in Sonipat, Haryana, and India with BIS Comparison (in mg/L)



Sources and Notes: CGWB, 2023; Ministry of Jal Shakti, 2022; HSPCB, 2023; CPCB, 2022.

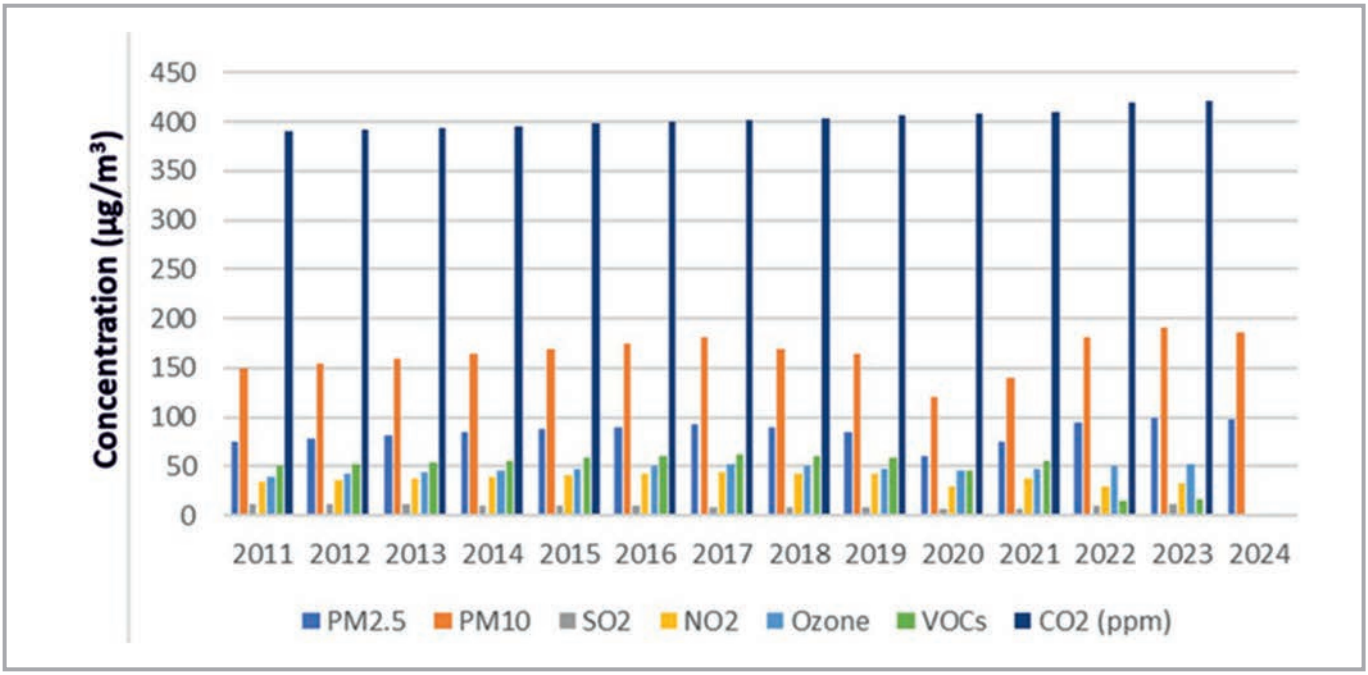
9.4 Air Pollutants: Trends, Impacts, and Critical Viewpoints

When dangerous pollutants are released into the atmosphere, they deteriorate air quality and endanger human health and the ecosystem, making air pollution one of the most important environmental problems of our time.[8] Natural phenomena like volcanic eruptions, wildfires, and human activity like automobile exhaust, industrial emissions, burning fossil fuels, and agricultural practices all contribute to its occurrence.[9] In addition to causing climate change and harming ecosystems, pollutants such as sulphur dioxide (SO_2), nitrogen oxides (NO_x), carbon monoxide (CO), particulate matter ($PM_{2.5}$ and PM_{10}), and ground-level ozone (O_3) also cause respiratory and cardiovascular disorders.[10] Air pollution has become a global issue due to the fast urbanisation and industrialisation of the world, especially in developing countries, where the effects are exacerbated by expanding populations and a lack of effective pollution control methods.[11]

Furthermore, stubble burning is a major seasonal (during winter) contributor to air pollution in Sonipat, particularly during the post-harvest months of October and November when farmers burn paddy residue to quickly clear fields for the next crop cycle. Being a part of Haryana and within the NCR region, emissions from stubble burning in Sonipat combine with those from neighbouring districts of Punjab and western Uttar Pradesh, leading to sharp spikes in particulate matter ($PM_{2.5}$ and PM_{10}) and smog formation.[12] This worsens the district's Air Quality Index (AQI), which often crosses hazardous levels during this period, reducing visibility and aggravating respiratory illnesses among vulnerable populations. Despite government initiatives such as subsidies for Happy Seeders, awareness drives, and penalties, stubble burning remains widespread due to high costs of residue management and limited alternatives, thereby maintaining its strong linkage with seasonal air pollution in Sonipat.[13]

[8] WHO, *Air Quality and Health.*
[9] UNEP, *Frontiers 2022.*
[10] CPCB, *National Ambient Air Quality Status and Trends in India, 2022*; WHO, *Air Quality and Health.*
[11] CPCB, *National Ambient Air Quality Status and Trends in India, 2022.*
[12] HSPCB, *Reports and Notifications on Air and Water Quality in Haryana*; Government of India, Ministry of Jal Shakti, *Official Website – Jal Shakti Ministry.*
[13] Ibid

Figure 9.4: Distribution of Prominent Air Pollutants over the Years (in µg/m³)

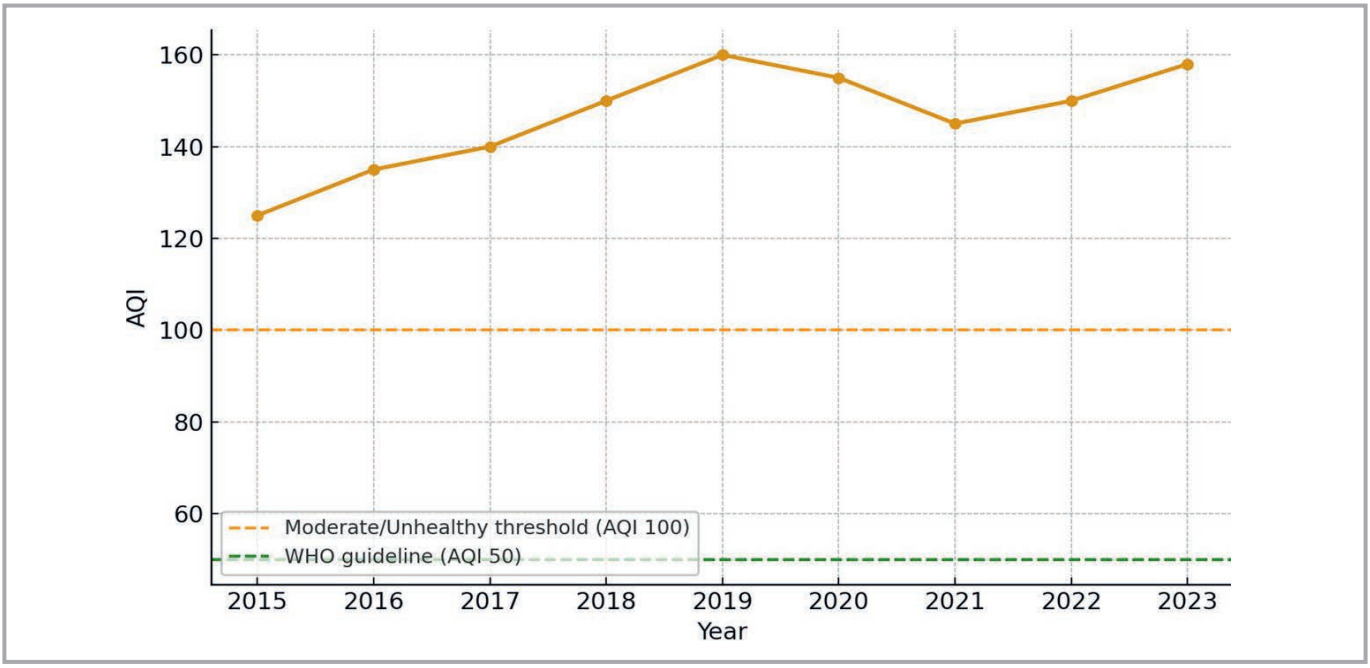


Sources and Notes: CPCB, 2022; HSPCB, 2024. CO2 is in ppm

Based on the list of jeopardising air pollutants from the Government of India, the severe impacts on living organisms, and their occurrences on a global scale, the prominent air pollutants in Sonipat district have been reported. From the Figure 9.4, it can be seen that the $PM_{2.5}$, PM_{10}, So_2, NO_2, O_3, and volatile organic compounds (VOCs) were reported with maximum average concentrations of 100, 190, 12, 44, 52, and 62 µg/m³, respectively, whereas CO_2 was reported with a maximum concentration of 422 ppm.[14] The alarming concentrations of these air pollutants continuously threaten living organisms' survival in the Sonipat district.

Further, Sonipat's annual average Air Quality Index (AQI) from 2015 to 2023 is depicted in Figure 9.5 indicating a consistent pattern of bad air quality significantly beyond acceptable limits.[15] The AQI rose

Figure 9.5: Air Quality Index (AQI) in Sonipat



Sources and Notes: HSPCB, 2023

[14] Ibid

[15] HSPCB, *Reports and Notifications on Air and Water Quality in Haryana.*

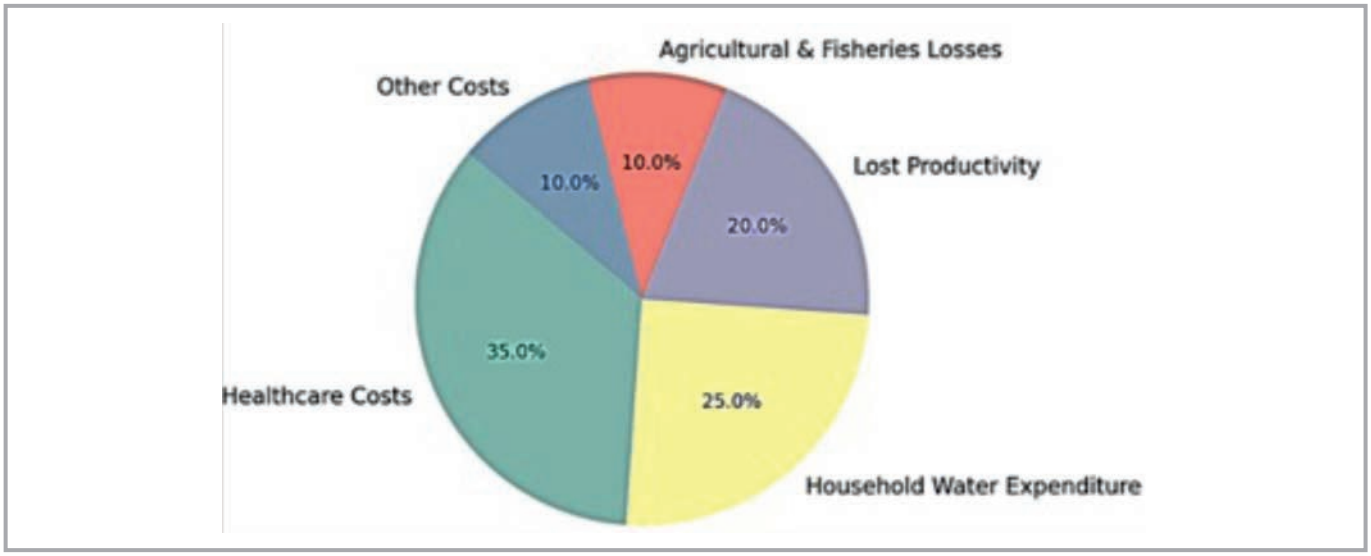
gradually from roughly 125 in 2015 to a peak of about 160 in 2019. In the following years, it fluctuated somewhat, staying between 145 and 158. The graph also shows two reference standards which Sonipat routinely surpasses by a significant margin: the considerably stricter WHO recommendation of 50 and the moderate/unhealthy level of 100 set by CPCB.[16] This suggests that residents have been exposed to harmful air regularly for the past ten years, adversely impacting their productivity, respiratory health, and general socioeconomic well-being.[17]

9.5 Socio-economic Impacts of Water and Air Pollutants in Sonipat

Beyond environmental deterioration, Sonipat's air and water pollution have major socioeconomic repercussions that harm livelihoods, general development, and health. The risk of respiratory and cardiovascular disorders is increased by high concentrations of air pollutants such as carbon monoxide, particulate matter, nitrogen oxides, and sulphur dioxide (Figure 9.6).[18] This raises healthcare expenses and lowers worker productivity. Families frequently shoulder the cost of medical care, and recurrent sickness results in missed workdays, which directly affects household incomes, particularly for those who receive daily pay.[19] Prolonged exposure to air pollution also impacts the cognitive development of youngsters and the health of the elderly, resulting in intergenerational socioeconomic problems.

Sonipat's water pollution threatens public health and economic stability, caused mainly by untreated sewage, industrial effluents, and agricultural runoff.[20] Waterborne illnesses, including cholera, hepatitis, and diarrhoea, are exacerbated by contaminated drinking water, which disproportionately affects low-income populations that have less access to clean water and medical care.[21] Additionally, contaminating irrigation sources and degrading soil fertility, contaminated water bodies lower agricultural production, endangering farmers' livelihoods in this predominantly agrarian district.[22] Water treatment costs are also greater for industrial sectors, and deteriorating water quality deters investment and impedes sustainable growth.[23] When combined, air and water pollution hinder Sonipat's economic development, widen social divides, and create long-term obstacles to progress.

Figure 9.6: Socio-economic Impacts of Water and Air Pollution (in %)



Sources and Notes: HSPCB, 2023

[16] Central Pollution Control Board (CPCB), *National Air Quality Monitoring Programme (NAMP) and Continuous Ambient Air Quality Monitoring Data* (2023), https://cpcb.nic.in; https://app.cpcbccr.com/AQI_India; WHO and UNICEF, *Progress on Household Drinking Water, Sanitation and Hygiene 2000–2020.*
[17] WHO and UNICEF, *Progress on Household Drinking Water, Sanitation and Hygiene 2000–2020.*
[18] CPCB, *National Ambient Air Quality Status and Trends in India, 2022*: CPCB; WHO, *Air Quality and Health.*
[19] World Bank, *The Cost of Air Pollution: Strengthening the Economic Case for Action* (Washington, DC: World Bank, 2021).
[20] HSPCB, *Reports and Notifications on Air and Water Quality in Haryana.*
[21] Government of India, Ministry of Jal Shakti, *Official Website – Jal Shakti Ministry*; WHO and UNICEF, *Progress on Household Drinking Water, Sanitation and Hygiene 2000–2020.*
[22] Government of India, Ministry of Jal Shakti, *Official Website – Jal Shakti Ministry.*
[23] Ibid

9.6 Demographic Linkages with Water and Air Pollution

Rapid urbanisation, increasing population density, and the growth of industrial clusters are some of the demographic factors that significantly affect the extent and consequences of air and water pollution in Sonipat. The district's position in the National Capital Region (NCR) and close proximity to Delhi have spurred in-migration, increasing energy demand, construction activity, and vehicle density—all of which deteriorate ambient air quality. Inadequate sewage treatment stresses nearby water bodies and groundwater, while industrial estates like Kundli and Rai majorly contribute to air pollutants and effluent discharges. Due to their increased exposure to contaminated air and frequent reliance on contaminated water sources, vulnerable populations—such as low-income households, women, children, and the elderly—face disproportionate health and financial burdens. Therefore, the patterns, intensity, and uneven effects of pollution are closely related to Sonipat's socioeconomic diversity and population increase.

9.7 Sustainable Solutions to Water and Air Pollution

An integrated strategy integrating technology, policy, and community involvement is needed to address Sonipat's air and water pollution in a sustainable manner. The use of eco-friendly stubble management techniques, the extension of green belts, the promotion of cleaner public transport, and the rigorous enforcement of BS-VI emission standards can all considerably lower particle emissions in the air.[24] Enhancing sewage treatment capacity, promoting rainwater harvesting and decentralised wastewater reuse, and fortifying common effluent treatment facilities (CETPs) in industrial clusters like Kundli are all essential for water resources.[25] Long-term compliance can be ensured by combining incentives for businesses and farmers to adopt sustainable practices with community awareness efforts.[26] Accountability will be further improved by including local governance organisations and utilising digital monitoring tools for real-time pollution tracking.[27] When combined, these actions can produce a well-rounded model that protects public health, fosters economic expansion, and conserves Sonipat's natural resources for coming generations.

9.8 Government Schemes for the Prevention/Mitigation of Water and Air Pollution in Sonipat

A multifaceted strategy involving government-led programmes and regulations is needed to address Sonipat's air and water pollution. In order to improve air quality management, upgrade monitoring infrastructure, and implement sector-specific pollution abatement measures throughout the Indo-Gangetic Plain region (including Sonipat), the Haryana government announced the Haryana Clean Air Project for Sustainable Development (HCAPSD) with assistance from the World Bank. In addition, the state unveiled the State Environment Plan (SEP) 2025–26, which calls for actions like better sewage treatment, rainwater harvesting, water reuse systems, electrification of public transport, and the expansion of air quality monitoring stations to lower air and water pollution. Several strategies are essential to lower emissions and enhance Sonipat's environmental infrastructure.

Controlling industrial pollution is the goal of several specialised programmes. Micro, small, and medium-sized businesses (MSMEs) can receive financial assistance under the Assistance for Environment Compliance Scheme to install air pollution control devices and effluent treatment plants (ETPs). According to the Ministry of Environment, Forest and Climate Change, this is in line with the central government's Common Effluent Treatment Plants (CETPs) Scheme, which assists industrial clusters

[24] CPCB, *National Air Quality Monitoring Programme (NAMP) and Continuous Ambient Air Quality Monitoring Data.*
[25] HSPCB, *Reports and Notifications on Air and Water Quality in Haryana*; Government of India, Ministry of Jal Shakti, *Official Website – Jal Shakti Ministry.*
[26] UNEP, *Frontiers 2022.*
[27] World Bank, *The Cost of Air Pollution.*

like Kundli in Sonipat in treating industrial wastewater collectively prior to disposal. Such actions have the potential to drastically lower the district's industrial pollution of the air and water.

The sources of agricultural contamination are also being addressed. One of the main causes of particulate pollution in Sonipat and the larger NCR is the burning of seasonal stubble. In order to decrease residue burning, the state has implemented a Crop Residue Management (CRM) programme and incentives for Direct Seeded Rice (DSR), giving farmers financial and equipment help. In order to reduce air pollution during the post-harvest months, these actions are essential. In a similar vein, the Ministry of Jal Shakti's nationwide Atal Bhujal Yojana (Atal Jal) encourages community-based groundwater management and conservation techniques, assisting in addressing issues of water scarcity and quality in over-used districts such as Sonipat.[28]

Furthermore, large-scale infrastructure development initiatives like the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) and the Jal Jeevan Mission (Har Ghar Jal) seek to enhance urban sanitation and sewage systems while also supplying safe drinking water.[29] Together, these initiatives decrease waterborne illnesses, increase access to clean water, and lessen the amount of untreated sewage that enters nearby waterways. These government initiatives work together to protect public health and promote sustainable development by addressing the causes and effects of Sonipat's air and water pollution.

The next section of the report will delve into land use patterns, land quality and degradation metrics, land ownership and access, urban versus rural land pressure, and critical gender-based disparities in land ownership and access highlighting the need for integrated policy interventions and sustainable practices.

9.9 Land Use Patterns

Sonipat district, covering approximately 2,260 km², has undergone significant shifts in its land use patterns between 2011 and 2021[30] , primarily driven by rapid urban and industrial expansion. These changes have profound implications for agricultural productivity, environmental sustainability, and the livelihoods of the local population.

a) Agricultural Land

The most striking trend in Sonipat's land use is the decline of agricultural land, or cropland. From 2011 to 2021, the net cropland area decreased from 1,843.6 km² to 1,595.1 km², representing an approximate 11 per cent reduction.[31] Remote-sensing analysis data corroborate this, as seen in the figure below, showing a decrease of approximately 220 km² (or 22,000 hectares) over a decade due to industrial and urban expansion, particularly in the south and southeast regions of the district.

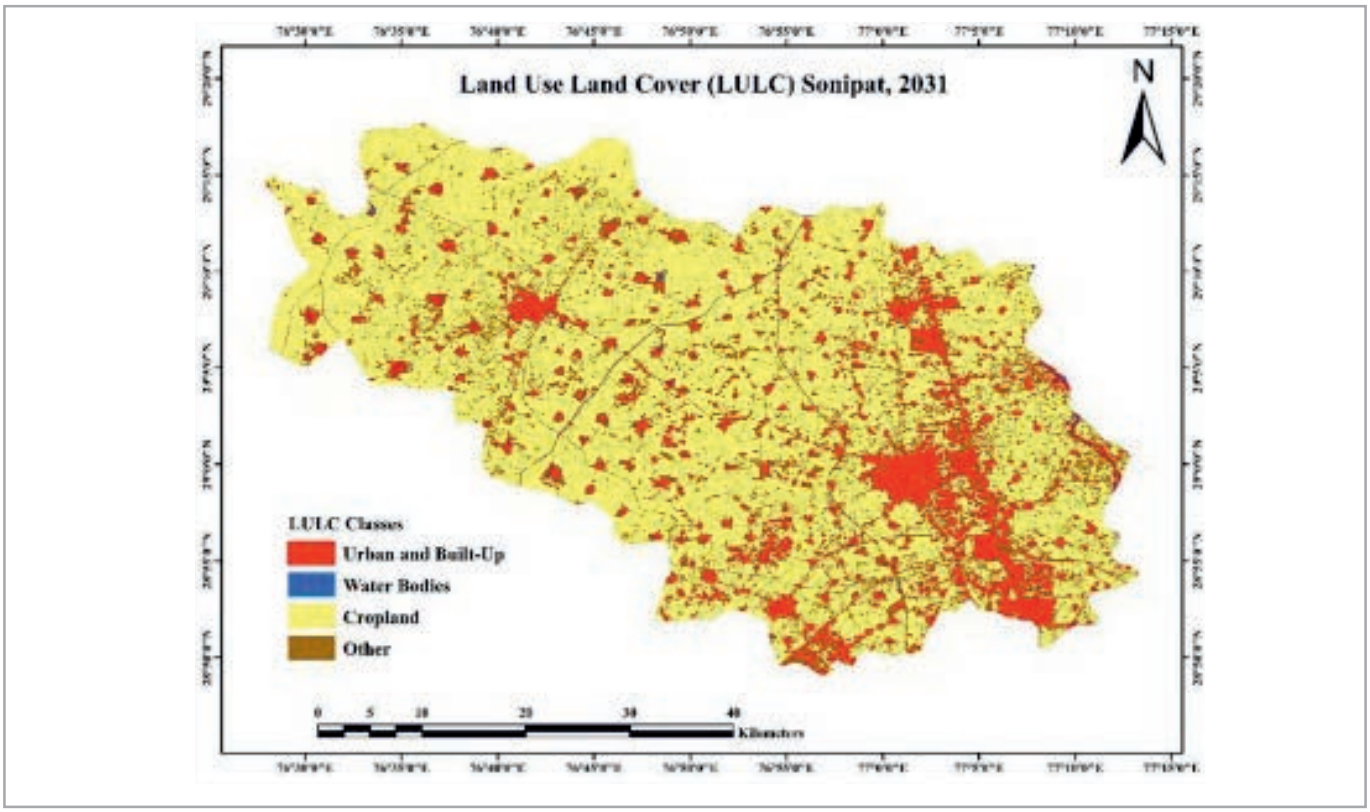
Forecast models further predict that cropland could fall further indicating a continued and aggressive earmarking of land for non-agricultural development. Loss of agricultural land due to rezoning and industrial effluent poses a significant threat to food security and the agrarian economy of Sonipat.

b) Forest and Green Cover

Sonipat's forest and green cover present a concerning picture. While in 2001, forest cover was recorded at 7,361 hectares, one of the highest in Haryana, the district has experienced a modest but continuous loss. Between 2001 and 2024, Sonipat lost approximately 4 hectares of tree cover.[32] More broadly, Haryana lost 8 hectares of natural forest and 13 hectares of tree cover, the highest in the last 11 years. As per the Forest Survey of India's India State of Forest Report (2017)[33], the recorded forest area of the State is around 3.62 per cent.

[28] Government of India, Ministry of Jal Shakti, *Official Website – Jal Shakti Ministry.*
[29] HSPCB, *Reports and Notifications* on Air and Water Quality in Haryana.
[30] Sharma et al. (2025).
[31] Rana et al. (2022)
[32] Global Forest Watch, Tree Cover Loss in Sonipat, Haryana, India (2001–2023) (World Resources Institute, 2024), https://www.globalforestwatch.org/dashboards/country/IND/12/20/.
[33] Government of India, Ministry of Environment, Forest and Climate Change, Forest Survey of India, *India State of Forest Report 2017* (Forest Survey of India, 2017).

Figure 9.7: Forecast LULC map of Sonipat for the year 2031



Sources and Notes: Rana et al., 2022

Critically, Sonipat's natural forest cover is near zero (approximately zero hectares), with non-forest tree cover being minimal (around 3 hectares in 2020). Historical data from the India State of Forest Report 2019 indicates that Sonipat had roughly 7,361 hectares of Recorded Forest Area. Sonipat's green cover remains extremely low, and while the state-level loss marginally affects the district, the existing deficit could affect the environmental balance.

Box 9.1: An Example of Community Conservation

The spirit of community conservation is alive at the grassroots. In the Thaska village of Gohana subdivision, communities took charge of their ecological future when construction plans of government buildings threatened the survival of centuries-old Salvadora trees. The villagers united to protect them, recognising these groves as part of their heritage and identity. Their efforts led to the creation of a 21-member body, the Rashtriya Paryavaran Ayum Van Suraksha Parmarth Trust, dedicated to safeguarding these trees.

c) Common and Grazing Lands

Common and grazing lands are largely negligible in Sonipat, reflecting a broader trend across Haryana. State-wide data from 2014–15 indicates permanent pastures, and grazing lands constitute a mere 0.57 per cent of the total land area.[34] Sonipat mirrors this pattern, with similarly negligible commons, a fact confirmed by NRSC/HARSAC spatial data. The ongoing urbanisation within the district of Sonipat, as well as across the State strongly suggests the likely conversion of the common grazing lands even though official figures for such conversions are not readily available. Access to these vital Common Property Resources (CPRs) is minimal due to land privatisation and encroachments, further stressing the need for precise quantification through spatial Measurement Reporting and Verification (MRV) analysis.

d) Land Degradation and Risk Zones

Land degradation is an escalating problem in Sonipat with barren land increasing significantly from 112.1 km² in 2011 to 267.8 km² in 2021, marking a 7 per cent rise.[35] This signals intensifying degradation, the decline in ground coveralong with the rise in

[34] Haryana Forest Department, *Introduction* (Government of Haryana, 2023), https://haryanaforest.gov.in/content-category/introduction/
[35] Rana et al. (2021)

Figure 9.8: District-Wise forest cover in Sonipat, India

District	Geographical Area (GA)	2019 Assessment				% of GA	Change wrt 2017 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Panipat	1,268	0.00	2.95	12.93	15.88	1.25	-0.12	1.00
Rewari	1,594	0.00	10.00	52.45	62.45	3.92	3.45	8.44
Rohtak	1,745	0.00	2.97	18.16	21.13	1.21	2.13	0.39
Sirsa	4,277	0.00	3.01	53.59	56.60	1.32	-0.40	0.00
Sonipat	2,122	0.00	3.00	17.97	20.97	0.99	0.97	0.97
Yamunanagar	1,768	22.00	89.00	82.36	193.36	10.94	-0.64	0.93
Grand Total	**44,212**	**28.00**	**450.90**	**1,123.54**	**1,602.44**	**3.62**	**14.44**	**154.29**

Sources and Notes: State of Forest Report (2017)

industrialisation and eroding land vitality. While precise district-level numbers post-2011 are not available, satellite-derived land use and land cover (LULC) data for 2011–2021 indicate a ~7 per cent increase in "other" land which likely includes these degraded or barren areas.

Waterlogging and salinisation have been reported in the Yamuna floodplain, particularly in Khadar near Sonipat.[36] Several villages in Sonipat situated along the Yamuna floodplain and near major irrigation canals face periodic risks of flooding during heavy rainfall or when embankments are stressed. Along with waterlogging, these areas are particularly vulnerable to canal breaches, disrupting agriculture and rural life and affecting wider water management systems. In 2023, the Career Line Channel (CLC) breached near Barwasni village in Sonipat, where an 80-foot-wide rupture in the canal's embankment led to the inundation of nearly 150 acres of agricultural land in Barwasni and Kilhorad villages, causing significant crop damage. It also demonstrated the interconnected nature of regional water management, as the CLC is partly responsible for supplying water to Delhi, thereby linking village-level occurrences with urban water security.

This rise in land degradation highlights the need to explore ecological approaches that can restore vitality to the district's landscapes. Biodiversity plays a central role here—not only in reviving degraded lands through natural regeneration but also in enhancing resilience by supporting pollination, pest control, and microclimate regulation. A study in Sonipat district counted 161 plant species across 54 families (trees, shrubs, herbs) from green spaces, indicating floristic diversity supporting ecosystem resilience via biodiversity.[37] Dominant crop systems like wheat in Haryana are natural enemies (predators, parasitoids) present, which help in biological pest control.

9.10 Land Quality and Degradation Metrics

Beyond land use patterns, the quality of land in Sonipat is impacted by soil health, groundwater depletion, and pollution, posing significant threats to agricultural sustainability and human well-being. This has been further substantiated through our findings from the ongoing primary survey across multiple villages in the Sonipat district. Soil health and groundwater pollution affecting health were the most common complaints shared by respondents of the primary survey.

[36] Government of India, Ministry of Jal Shakti, Central Ground Water Board. District Groundwater Information Booklet: Sonipat District, Haryana. *Central Ground Water Board, 2013*. http://cgwb.gov.in/District_Profile/Haryana/Sonipat.pdf.

[37] Devi et al. (2021)

a) Soil Health

Efforts to assess and improve soil health in Sonipat are underway through the Soil Health Card (SHC) initiative. In 2020, 1000 soil samples were collected and tested across the Mundlana block via block-level laboratories.[38] A detailed survey conducted in Baroda Mor village (covering 3,000 acres) yielded critical insights: the soil was found to be moderately alkaline (average pH 7.7±0.4), and a significant 78 per cent of samples were deficient in organic carbon, alongside low levels of nitrogen and phosphorus.[39] Sonipat's soil is primarily alluvial (fine loam) with sandy patches, and its Khadar zone is particularly prone to waterlogging and saline buildup. The widespread adoption of the SHC scheme, with over 70 lakh tests executed and around 86 lakh SHCs issued across Haryana,[40] suggests progress in testing. However, its impact on fertiliser usage behaviour remains limited. This nutrient depletion severely threatens yield resilience in the district.

b) Groundwater and Subsidence Risk

Sonipat falls within Haryana's "Red Zone" for groundwater depletion, indicating an aquifer drop of over 30 meters. A striking 47 per cent of villages in the State are classified as water-stressed.[41] Significant declines in groundwater levels elevate the risk of soil salinisation and land sinking.

Historically, in 2011, the Central Groundwater Board (CGWB) had classified groundwater in 71 blocks in the State as over-exploited. By June 2024, 5 out of 7 blocks in Sonipat were classified as "over-exploited," with the water table at 18–20 meters below ground level (bgl) as per The Tribune.[42] The issue of waterlogging in the Khadar region points to disrupted drainage patterns often attributed to land-use changes. Furthermore, the replacement of cropland by industrial zones alters natural recharge patterns, reducing benefits to the groundwater system. The alarming rate of aquifer depletion and water-stressed villages contributes directly to the region's irrigation stress and subsoil degradation.

c) Pollution-Driven Degradation

Pollution significantly contributes to land degradation in Sonipat. A 2024 district-level study linked a ~19 per cent decline in agricultural land (between 2000 and 2024) to rezoning and industrial effluent disposal. This pollution resulted in an estimated 1.5 million kg crop loss, highlighting industrial activities' severe economic and environmental impact on agricultural land.[43] Rural women are disproportionately affected as they often use polluted water for domestic work, leading to chronic illnesses and affecting family health. Focus group discussions across Kathura, Manouli, and Rai similarly point to the significant impact of land and water pollution on the reproductive health of women in these villages.

9.11 Land Ownership and Access

Sonipat is facing increasing competition between urban expansion and agricultural use, resulting in the rapid conversion of farmland into residential, industrial, and commercial zones. This transformation reshapes the district's landscape, with long-term implications for food security, livelihoods, and ecological balance.

a) Land Conversion

The built-up areas in Sonipat expanded dramatically from 234.8 km² to 319.9 km² between 2011 and 2021, an increase of approximately 85 km² or three percentage points.[44] This expansion directly correlates with an 11 per cent fall in cropland during the same period. A Tribune article in June 2025 states that the Sonipat Master Plan 2031 outlines the development of approximately 20,220 hectares, with 7,092 hectares for residential, 4,940 hectares for industrial, and 606 hectares for commercial use. This signals an aggressive appropriation of rural land for urban and industrial development, emphasising the shift toward urban-industrial growth. The land-pooling processes

[38] Kanaujia et al.(2020)
[39] Kanaujia et al. (2021)
[40] Prasar Bharati News Services, "Haryana's 'Har Khet Swasth Khet' Campaign Aims to Provide Soil Health Cards to All Farmers," News On Air, August 12, 2023.
[41] Ipsita Pati, "Urban Growth, Agricultural Practices Drain Haryana's Aquifers: 14 Districts Water-Stressed," Times of India, May 11, 2025, https://timesofindia.indiatimes.com/city/gurgaon/urban-growth-agricultural-practices-drain-haryanas-aquifers-14-districts-water-stressed/articleshow/121065627.cms.
[42] Government of India, Ministry of Water Resources, Central Ground Water Board, State Profile: Haryana (Central Ground Water Board, 2011), http://cgwb.gov.in/gw_profiles/st_Haryana.htm.
[43] Kumar et al. (2025)
[44] Rana et al. (2022)

implemented under urban land policies have faced resistance from farmers due to concerns over compensation adequacy and the impact on agricultural land rights.

Land ownership and access in Sonipat reveal significant disparities, particularly concerning smallholders, marginalised communities, and women.

b) Landholding Distribution

According to the Agricultural Census and Census 2011, approximately 42 per cent of farmers in Sonipat are smallholders, owning less than 2 hectares of land.[45] This figure shows a fragmented landholding pattern. The Scheduled Caste (SC) population constitutes about 18.6 per cent of Sonipat's total population as per Census 2011, yet scattered data on SC/ST (Scheduled Caste/ Scheduled Tribes) landless households limit a clear assessment of their socio-economic vulnerabilities, particularly about land access, agricultural livelihoods, and dependence on wage labour.

c) Landlessness and Marginalisation

The fact that the SC population constitutes about 18.6 per cent of Sonipat's total population[46] highlights the importance of understanding their landholding patterns and the prevalence of landlessness for any meaningful human development assessment. At the state level, SECC 2011 reveals that over half (54.7 per cent) of SC households in rural Haryana are landless and dependent primarily on manual labour. Given its agrarian structure, this trend likely applies to Sonipat.[47] The lack of inclusive land rights, characterised by the high proportion of smallholders, low female land ownership, and unquantified SC/ST landlessness, points to deep-rooted inequity in the district.

9.12 Gender and Land Ownership in Sonipat

Land ownership and access patterns in Sonipat reflect broader trends in Haryana and India. While women's participation in agriculture is significant, their land ownership remains comparatively limited. Expanding secure land rights for women can strengthen household bargaining power, improve access to credit and schemes, and promote inclusive rural development.

a) Land Ownership by Women

According to the Agriculture Census (2018–19) and NFHS-5 (2019–21), 13.3 per cent of rural women in Haryana own land, below the national average of 28.3 per cent. In Sonipat, most female landholders acquire property through inheritance. Although fewer women currently make independent land purchases due to income and mobility constraints, increasing awareness and policy support create opportunities to enhance women's control over assets. Census 2011 data showed 12.7 per cent of female-headed households had irrigated land—an important base from which ownership can be strengthened.

b) Factors Influencing Women's Land Rights

Several social and institutional factors shape women's access to land:

Customary Practices: Traditions such as haq tyag (voluntary surrender of inheritance rights) still influence outcomes, though younger generations show growing awareness of their legal entitlements.

Procedural Access: Land titling and mutation processes have historically been male dominated but digitisation under DILRMP is opening space for more equitable access.

Awareness: Expanding legal literacy campaigns can ensure more women understand and exercise their inheritance rights.

Institutional Support: Simplifying bureaucratic processes and strengthening institutional backing can encourage greater participation of women in asserting land claims.

c) Women's Role in Agriculture

Despite lower levels of land ownership, women remain central to agriculture. Nationally, 75–80 per cent of rural women are engaged in farming activities, primarily as labourers. In Sonipat, they contribute as family workers in wheat and paddy cultivation and as wage earners in vegetable farming in areas such as Murthal. Although fewer women currently make decisions on crop selection or marketing, their strong involvement in agricultural

[45] Kumar and Kumar (2018)

[46] Directorate of Census Operations, Registrar General and Census Commissioner, India, *District Census Handbook: Sonipat, Haryana, Part XII-A: Village and Town Directory (Series-07)* (Directorate of Census Operations, Haryana, 2011).

[47] Government of India, Ministry of Rural Development, *Socio-Economic and Caste Census 2011: State Report for Haryana* (Ministry of Rural Development, 2011), https://secc.gov.in.

labour highlights the potential for increasing their role in management and enterprise.

Government Initiatives supporting women in agriculture

Several schemes provide avenues for enhancing women's participation and benefits from agriculture:

- **PM-KISAN:** While designed for landowners, this scheme highlights the importance of title ownership, exacerbating the marginalisation of women without land titles.

- **DILRMP:** Designed for digitising land records, this scheme is gender-neutral. However, uptake by women remains low due to procedural challenges and awareness gaps. Sonipat's land records are being digitised, but integration and public access remain inconsistent.

- **Mahila Kisan Sashaktikaran Pariyojana (MKSP):** This programme supports women farmers and SHGs, and scaling up its implementation in Haryana can strengthen collective action and entrepreneurship.

- **Soil Health Card Scheme (SHC):** With over 4,400 tests conducted in Sonipat by 2024–25, this programme provides valuable input advice. Linking its benefits more directly to women farmers can enhance productivity and resource management.

Women's land ownership is still evolving in Sonipat, but their high participation in agricultural labour highlights their importance to the rural economy. Progress in digitisation, legal literacy, and targeted schemes demonstrates pathways for improvement. Strengthening awareness, facilitating procedural access, and ensuring gender-sensitive implementation can significantly expand women's role as landowners and decision-makers. With supportive policies and social change, Sonipat has the potential to set an encouraging example of inclusive and equitable rural development.

9.13 Climate Profile- Seasonality and trends

The climate of Sonipat is classified as subtropical semi-arid—with intensely hot summers, cold winters, and most rainfall concentrated in the monsoon. Summer highs often exceed 47 °C in May–June, while the coldest nights in January drop to about 6–7 °C.

Rainfall trend

Approximately 75 per cent of Sonipat's annual rainfall occurs during the monsoon (July – September). July is the wettest — district records show about 24 rainy days with ≥2.5 mm, while October is the driest.[48] Rainfall patterns influence agriculture, groundwater recharge, and overall climate resilience. It has potential effects on farming practices and water availability. The data compares Haryana's annual rainfall with Sonipat's estimated levels from 2010 to 2023.

The graph indicates a steady upward trend in annual rainfall across both Haryana and Sonipat. In 2010, Haryana recorded around 534 mm of rainfall while Sonipat's estimated rainfall was slightly lower at about 520 mm. Over the years, rainfall levels in both regions gradually increased with only minor fluctuations. By 2023, Haryana and Sonipat reached nearly identical levels of around 572 mm.

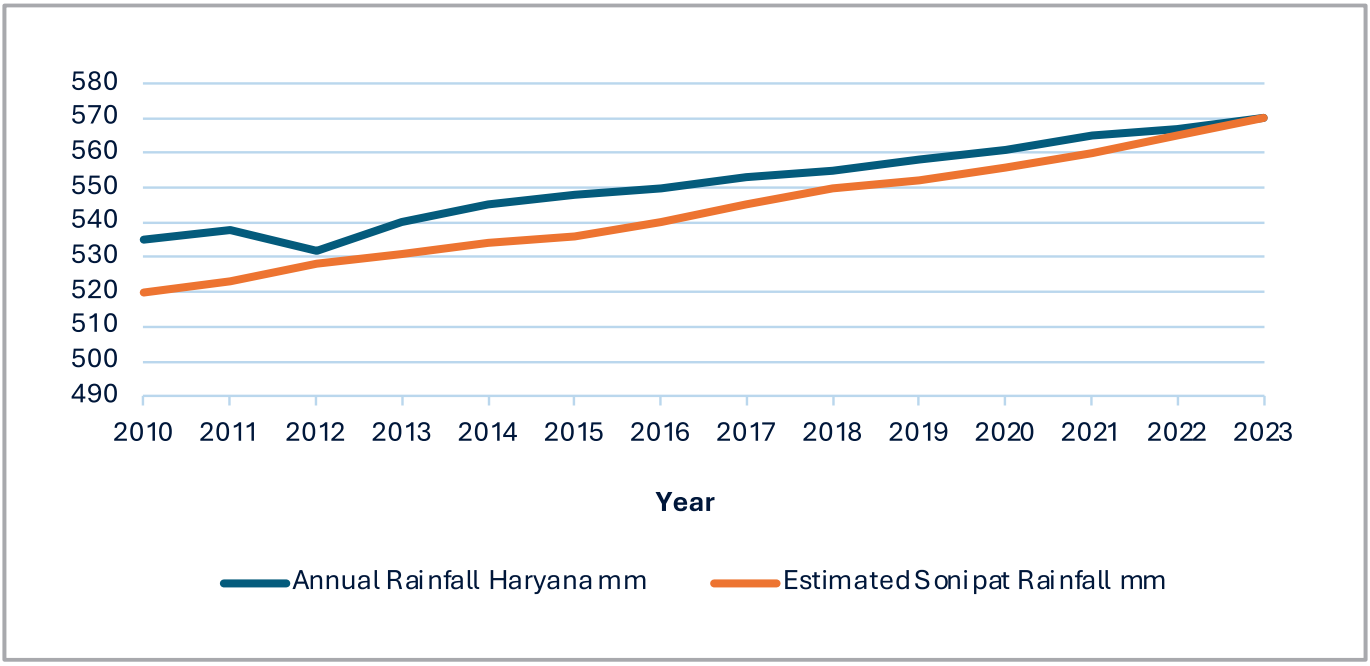
Sonipat's rainfall levels have grown faster, aligning closely with the state's average. This steady rise may help improve water availability for agriculture though it also raises the possibility of greater variability in rainfall distribution which could affect farming cycles and water management.

Temperature trend

Temperature patterns are a key indicator of climate variability and its potential impact on agriculture, health, and rural livelihoods. Analysing long-term trends helps in understanding regional changes and planning adaptive strategies. The data presented compares Haryana's maximum and minimum temperature trends with estimated values for Sonipat between 2010 and 2023.

[48] Government of Haryana, Sonipat, https://sonipat.gov.in/about-district/

Figure 9.9: Comparing rainfall trends in Haryana and Sonipat (in mm)

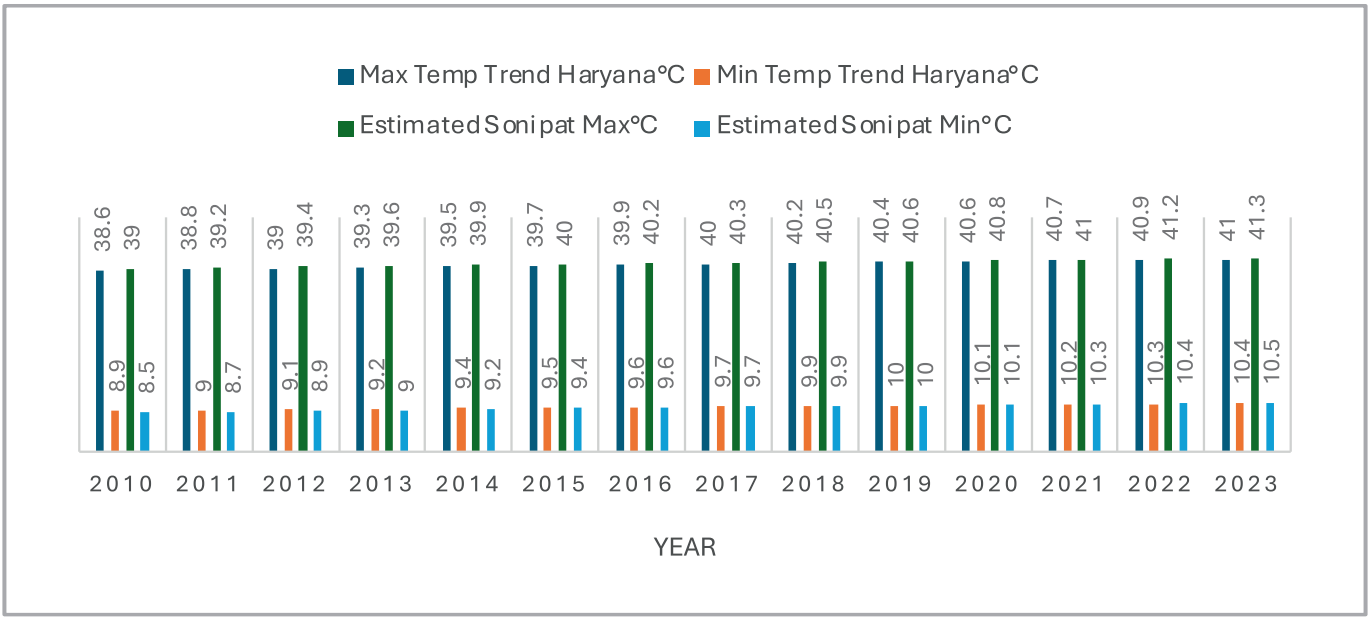


Sources and Notes: Authors' visualisation

Figure 9.10 shows a gradual but consistent rise in both maximum and minimum temperatures over the period. Haryana's maximum temperature increased from about 38.6°C in 2010 to 41.3°C in 2023 while minimum temperatures rose from 8.9°C to 10.5°C in the same period. Sonipat reflects a similar pattern, with estimated maximum temperatures starting near 39.2°C in 2010 and rising to 41.3°C by 2023, and minimum temperatures increasing from 8.5°C to 10.4°C. The overall upward trajectory highlights a warming trend with both highs and lows rising steadily. Notably, the narrowing difference between maximum and minimum temperatures suggests intensifying heat stress, which may affect agricultural productivity and urban heat conditions.

This consistent warming underscores the need for adaptive agriculture, water management, and urban planning measures. Strengthening local resilience strategies will be crucial to mitigate the long-term impacts of rising temperatures on livelihoods and ecosystems in the region.

Figure 9.10: Comparing temperature trends in Haryana and Sonipat (in °C)



Sources and Notes: Authors' visualisation

Vulnerability Index

The vulnerability map of Haryana highlights considerable regional disparities in climate risk exposure. Districts in the southern and eastern belts—particularly Gurugram, Faridabad, Mewat (Nuh), and parts of Rohtak and Sonipat—fall within the "relatively moderate vulnerable" category. These regions face intensified risks due to rising temperatures, urban pressures, and groundwater stress. In contrast, central and western districts like Hisar, Fatehabad, and Bhiwani are categorised as "relatively low vulnerable," reflecting more stable conditions in comparative terms. This uneven distribution shows how geography, land use, and socio-economic factors intersect to shape climate vulnerability across the state (Figure 9.11).

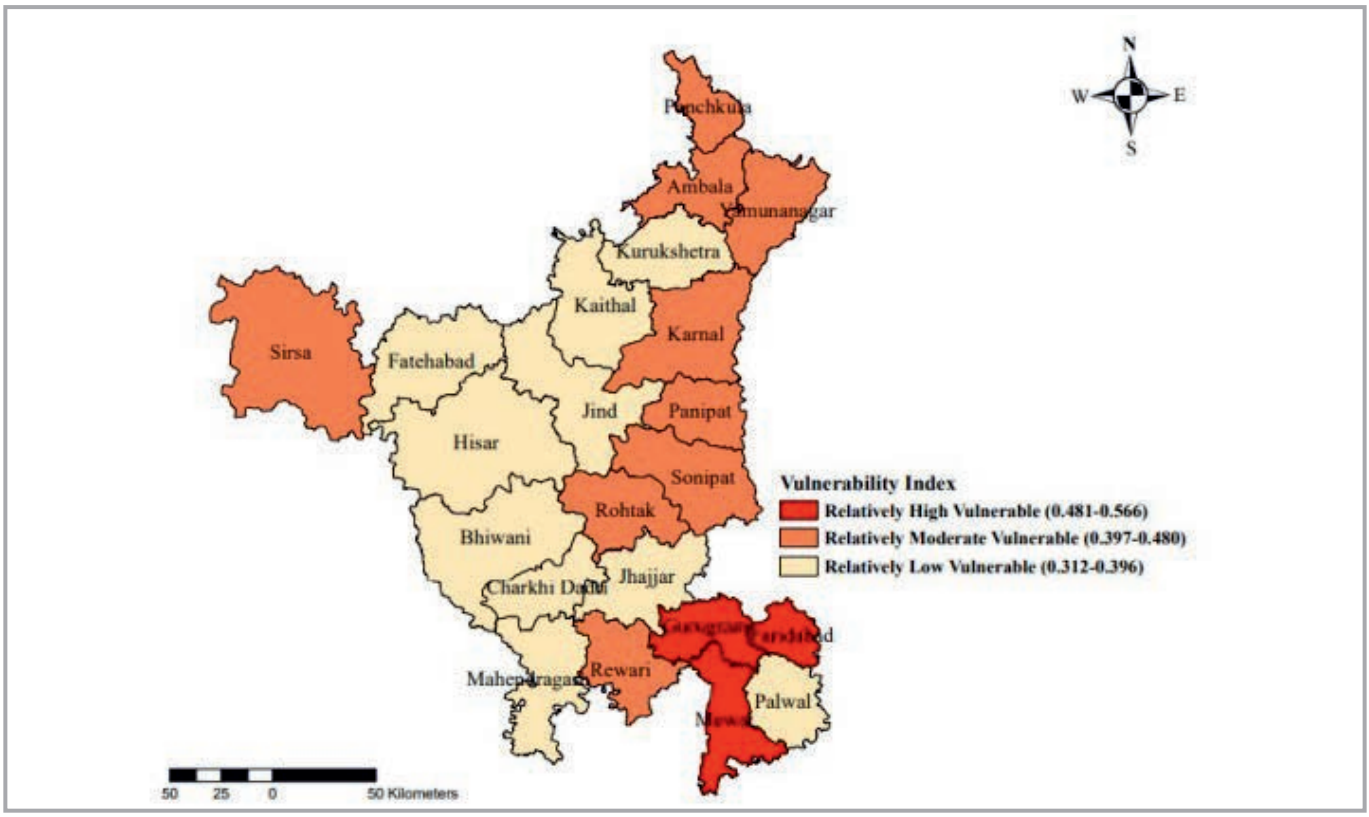
Sonipat's classification as a relatively high-vulnerability district places it alongside fast-urbanising regions, where agricultural systems are especially exposed to climatic fluctuations. The map illustrates that Sonipat, located in Haryana's north-western plains, is situated at the confluence of climate stressors—heat, water scarcity, and changing rainfall patterns. The district's dual identity as both an agricultural hub and an area experiencing urban expansion adds complexity to its vulnerability. This makes it particularly important to understand how climatic changes translate into local agricultural outcomes and farmers' broader livelihood challenges.

Climate Stress, Agricultural Vulnerability, and Ecological Impacts in Sonipat

Given the evidence of shifting rainfall and temperature patterns in Sonipat, and the district's identification as moderately vulnerable within Haryana's climate risk profile, we analyse how these changes translate into on-the-ground agricultural impacts. Rising temperatures and altered weather patterns intensify the district's exposure and directly affect crop physiology and yields.

Farmers in Sonipat report visible crop stress and changes in growth cycles linked to rising temperatures. A recent field survey conducted across Hisar and Sonipat shows that growers have noticed higher-than-usual heat events during critical crop stages, with outcomes such as reduced crop vigour, premature drying, and altered flowering times. These conditions for staple crops like wheat, paddy, and cotton translate into lower yields and greater production risks, providing direct ground-level evidence of climate stressors influencing agricultural output.

Figure 9.11: Vulnerability Index of Haryana districts as computed in the DST study using 15 Indicators



Sources and Notes: Haryana State Action Plan on Climate Change, 2023.

Sonipat faces elevated heat and drought risks in the north-western plains. Analyses of long-term temperature records highlight that both maximum and minimum temperatures are on the rise, creating unfavourable conditions during sensitive phases of crop growth. For instance, exposure to elevated temperatures during the grain-filling stage in wheat accelerates maturation and reduces grain weight, leading to measurable yield declines.[49] Such dynamics are evidence for the increasingly reported reduced harvests, particularly in years when late-season heatwaves coincide with crop maturity in the region.

Adaptive strategies are beginning to take shape in Haryana's agricultural landscape in response to these challenges. The development of heat-tolerant wheat varieties such as WH 1309 by Chaudhary Charan Singh Haryana Agricultural University (Hisar) offers farmers options better suited to rising late-season temperatures. Similarly, agronomic practices like adjusting sowing dates, adopting short-duration paddy varieties, and improving irrigation scheduling are being promoted to help farmers reduce exposure to heat stress during critical crop stages. At the community level, diversification into vegetables and pulses that are relatively more resilient is also seen as a pathway to reduce climate-related risks.

While the district faces significant challenges due to shifting climatic patterns and intensive chemical input use, ongoing efforts to develop adaptive agricultural practices and promote sustainable input use offer pathways to mitigate these impacts. Continued research, farmer education, and policy support are essential to fostering Sonipat's more resilient agricultural system.

9.14 Strategy for Progress: Enhancing Human Development and Environmental Sustainability in Sonipat

Achieving a sustainable balance between environmental integrity, economic prosperity, and human well-being is at the heart of Sonipat's future vision. With quantifiable drops in air and water pollution metrics, the district should strive to become a model for green urban-industrial growth in Haryana by 2035. This calls for phasing out excessively polluting industrial operations, switching to greener energy sources, and implementing circular economy strategies that reduce waste production. Low-residue farming must become the norm in agricultural systems, and stubble burning must be gradually eradicated through incentives, mechanisation, and farmer cooperatives.

Decentralised wastewater reuse, rainfall collection, universal sewage treatment, and stringent industrial effluent control would all improve water security. Data for governance, enforcement, and public transparency must be available in real-time through a digital pollution monitoring network. Building awareness and guaranteeing local ownership of environmental achievements will mostly depend on community-led activities, particularly those engaging women and youth.

Equitable land management and socioeconomic inclusion should be a strategic priority. In the context of rapid urban expansion, future planning must safeguard agricultural land and food security while accommodating urban and industrial development. Institutional reforms are essential to address problems of land inequities. DILRMP should be leveraged to simplify land titling processes and enhance public access, particularly for marginalised communities with limited awareness of their rights. Inclusive development strategies must also target the Scheduled Caste population, which represents 18.6 per cent of the district and experiences high rates of landlessness. Strengthening rural women's capacity through legal literacy programmes regarding inheritance rights and challenging restrictive customary practices is critical. Full utilisation of platforms like the Mahila Kisan Sashaktikaran Pariyojana (MKSP) and streamlined implementation of initiatives like the Soil Health Card (SHC) scheme can empower women and smallholders, fostering equitable socioeconomic growth and resilience for future generations.

In line with national and state objectives, Sonipat has the potential to develop into a climate-smart and resilient district where safe water, clean air, and

[49] Rana et al. (2021)

robust ecosystems support equitable socio-economic growth for both the current and future generations. The way ahead involves shifting from reactive mitigation to proactive, integrated resource governance. By strategically aligning infrastructure investment with stringent regulatory oversight, climate-adaptive agricultural research, and institutional support for equitable land rights, the district can foster sustainable economic expansion while protecting the public health of its vulnerable populations.

KEY INSIGHTS FROM THE FOCUS GROUP DISCUSSIONS IN KATHURA, MANOULI, AND PIPLI-R VILLAGES IN SONIPAT DISTRICT

- A 14-year-old male respondent in Pipli-R mentioned that rural development to him would constitute access to clean drinking water and lot of trees in the village.
- Respondents in Pipli-R reported challenges in inequitable and infrequent access to clean drinking water in the village. They have also reported varied levels of groundwater for agricultural purposes.
- Respondents in Kathura reported increased salinity levels in the groundwater is adversely affecting crop diversification, fertility levels and reproductive health among women and female cattle.
- Respondents across Kathura, Manouli, and Pipli-R reported declining soil quality due to excessive usage of chemical fertilizers and pesticides.
- The respondents also reported lack of adequate measures by government and market incentives for farmers to practice crop holiday, crop rotation, or to switch to organic cultivation that can improve soil and water quality.
- Respondents across the villages mentioned that crop yields are unaffected when there is regular rainfall as predicted. However, increasing uncertainty in temperature and weather conditions in the district are adversely affecting crop outcomes.
- None of the respondents in the villages of Kathura, Manouli, and Pipli-R reported any major concerns due to air pollution however, respondents in more urbanised and industrialised

Chapter 10

WAY FORWARD

Mrinalini Jha and Namesh Killemsetty

10 WAY FORWARD

Mrinalini Jha and Namesh Killemsetty

As Sonipat undergoes significant social and economic transformation, its future trajectory depends not only on the strengths and gaps highlighted across the chapters of this Report but equally on the ability to forge meaningful connections among the district's diverse communities, policies, and aspirations. This concluding chapter offers a collective narrative, inviting all stakeholders – government, civil society, youth, women, migrants, farmers, industry, and local institutions to play an active role in reimagining the trajectory towards a prosperous, equitable, and just future. The lessons that have emerged throughout the chapters reveal that Sonipat's progress must be understood as an intersectional and integrated process, where every advance in education, health, livelihoods, climate, spatial planning, services, and governance is shaped by and in turn shapes the others.

The next phase therefore needs to be grounded in a collective approach, one which balances the district's agricultural history with the dynamism of contemporary urban and industrial growth, focuses on most vulnerable, and recognises that the most lasting solutions are those that draw upon the wisdom and agency of the community itself.

10.1 Neighbourhoods of Opportunity: Connecting Education, Livelihoods, and Inclusion

The educational institutions of the district, from government schools in rural blocks to global universities in Rajiv Gandhi Education City, have the potential to be more than sites of formal learning. They have been known to have a profound impact on livelihoods, gender equity, health awareness, social mobility, and civic participation. For children coming from Scheduled Castes, OBCs, and other minority groups, as well as those navigating migration and poverty, educational spaces are a lifeline to increased opportunity. The persistent barriers through gaps in infrastructure, digital access, quality of instruction, and psychosocial support are not simply 'educational' issues, but also the roots of livelihood precarity, early marriage, low female workforce participation, and intergenerational poverty.

Bridging these divides will require cross-sectoral partnerships, wherein local government must work closely with school administrations and panchayats to identify the children most at risk; universities and vocational institutes should be actively linked with industry and service sector employers to provide pathways for upskilling and decent job placement. Policies need to focus on connecting industrial corridors to digital and vocational training facilities for women and young people in the community. While institutes like Japan-India Institute for Manufacturing (JIM) Sonipat are providing manufacturing skills but they have limited outreach to women and rural youth. Additionally, with zero Industrial Training Institute (ITI) centres for Persons with Disabilities (PWD), there is an urgent need to expand the existing network of ITI Centres. There should also be enhanced private investment in ITIs. In Haryana, approximately 55 per cent of ITI centres are government-run. In Sonipat, about 70 per cent are government-owned, which leaves only 30 per cent managed by private entities. Skills agendas cannot remain abstract; they must reflect local market opportunities, digital transitions, the aspirations of working youth and women, and the new realities of the rural non-farm economy. At present, Sonipat has only six vocational training institutes, while the average district in Haryana has about ten. Increasing such centres will enhance skill development and employability among the youth. Further, share of (SCs) in teaching staff from schooling to the current 3.1per cent to 9 per cent, to match the SC student share in higher education

Special attention must be paid to the digital divide, which risks deepening old inequities as the world becomes more interconnected. Free access to devices, community-based digital learning sessions, and targeted teacher training can ensure the benefits of technology are shared more equitably. At every stage, deliberate action should be taken to position women and individuals from historically marginalised backgrounds as educational leaders, mentors, and role models, amplifying their capacity to support others and to drive transformation within their communities.

10.2 Health at the Heart of Human Development

The persistent interplay between health outcomes and other facets of development is well-established. Children of healthy mothers are more likely to perform well in school, participate in the workforce, and contribute to their neighbourhoods' social and economic fabric. Yet, Sonipat continues to face challenges: declining but still elevated infant and child mortality rates, high prevalence of undernutrition and tuberculosis, below par immunisation coverage in some blocks, and significant disparities in life expectancy and reproductive health outcomes.

Ensuring better health is not just a matter of hospital construction or programme roll-outs. It is about supporting a complex web of determinants: clean water and sanitation infrastructure, nutrition and food security, gender norms, education, housing quality, and public health awareness. Policies need to prioritise universal and equitable access to primary care by setting up of 200 additional Sub-Centres (SCs) to existing 164 functioning centres, 30 additional primary health centres (PHCs) from the existing 33 PHCs, and 9 additional community health centres (CHCs) to the 7 functioning centres to bridge infrastructural gaps and reduce out-of-pocket costs.

Strategies for healthy lives must be embedded into everyday spaces, in schools, anganwadis, workplaces, panchayats, markets, and through digital platforms. Migrants, Dalits, women, and informal sector workers, often on the margins of state entitlement systems, require targeted social protection, health insurance portability, and mobile outreach services. All the human resource positions in all health facilities needs to be filled on a permanent basis, and all ASHA and Anganwadi workers should be paid minimum wages. Focus should also be on ensuring that the public facilities have supply of the required essential medicines throughout the year.

Investments in community health workers, continuous professional development for the medical cadre, and integration of preventive health and mental health support are critical. Regular district-level research, conducted in collaboration with academic institutions, will help ensure programmes are both evidence-informed and adaptive to emerging challenges, such as climatic shifts or epidemiological transitions.

10.3 Livelihoods in Transition: Integrating Agriculture, Industry, Services, and Social Protection

Sonipat's economic landscape is in flux. Though agriculture continues to dominate, the industrial clusters in Rai, Barhi, and Kundli, and the dynamism of peri-urban service economies, have produced new opportunities and vulnerabilities. Rural-urban migration, feminisation of the workforce, and the diversification of jobs across the formal and informal sectors alter how households earn, save, and invest in their children's future. Insights from the analysis highlight the need for targeting livelihood and employment schemes such that they address the existing skills gaps and align with the new economic clusters in the industrial corridor, while exploring and utlising the potential of the rural non-farm sector. Further, while there is increased participation of female workers in manufacturing and services sector in Sonipat, their earnings remain low. Sonipat is seeing a puzzling development of a favourable trend towards structural transformation combined with a reduction in earnings of workers, which needs to be investigated further to ensure that the benefits of structural transformation truly lead to better livelihoods for the citizens of Sonipat.

The growth of the informal sector, especially among migrants, demands more exhaustive coverage of social protection and the integration of marginalised workers into district planning. Programmes like MGNREGA, skill development missions, and MSME promotion must not be isolated but linked to sectoral growth hubs, school-to-work transitions, microfinance for women entrepreneurs, and livelihood diversification projects resilient to drought or industrial downturns.

10.4 Climate, Environment, and the Urgency of Sustainability

The report focuses on how the environmental realities of Sonipat, land degradation, water stress, stubble burning, and air pollution, are not simply “green” issues, but decisive for human health, agricultural productivity, and well-being, particularly among the most vulnerable. The future lies in shifting from reactive, siloed responses to climate change towards integrated governance, where rural water management, urban planning, industry regulation,

and agricultural research work in synchrony. Stubble management, waste recycling, and sustainable agricultural practices should be incentivised. The policies should promote micro-irrigation techniques and climate-smart land and water management in peri-urban agricultural areas of Sonipat. Currently, the majority of irrigation in Sonipat is done through canals (55.9 per cent) and borewells (44.1 per cent). Micro-irrigation systems such as drip and sprinkler can reduce water use by 40–60 per cent and increase yields by 15–20 per cent.

At the same time, climate adaptation must go hand in hand with inclusive land management: legal support for women and Dalits in accessing and retaining productive land, enrolment of smallholders in agri-science pilot projects, and community-based monitoring of air and water quality, enabled by digital tools and local research collaborations, will help create resilient, self-aware governance structures. As of June 2025, Haryana had established 179 Farmer Producer Organisations (FPOs), which is fewer than many other states in India. Among these, only a small number are led by women. Supporting the creation of women-led FPOs can enhance market connections and improve access to institutional credit, thereby providing diverse income-generating opportunities. Further, farmers should be incentivised through minimum support prices, buy-back arrangements, etc. to switch to climate-resilient crops. Diversification into pulses and vegetables increases net returns by over 13 per cent (at a national level) compared to monocropping wheat–paddy.

Schools, youth groups, and community organisations offer fertile ground for environmental education and stewardship. When environmental sustainability becomes a district-wide ethos, where everyone from students to small entrepreneurs and farmers sees tangible benefits, Sonipat can set new benchmarks for green, equitable development in Haryana.

10.5 Spatial Transformation in Urbanising Sonipat

Sonipat's rapid urban expansion has brought both opportunities and stark challenges. The proliferation of private real estate, informal settlements, and peri-urban growth corridors has accentuated spatial inequities in access to basic services, secure housing, affordable transport, and green spaces. The margin between rural and urban has blurred, yet unplanned growth, service shortages, exclusion of migrants from public entitlements, and new pockets of poverty too often reinforce the differences. The way forward must be anchored in integrated spatial planning that is transparent, participatory, and inclusive of informal and migrant residents. Statutory urban plans should expand their ambit to the peri-urban and rural peripheries, match investments in infrastructure with innovative financing and social audits, and create flexible policy instruments to address service needs as they change with demographic and economic shifts.

Affordable housing cannot be viewed purely as a matter of public distribution; it must be linked to transport networks, rental markets, industrial planning, and worker mobility. It should be attempted that at least 20 per cent of all affordable housing units are allocated in localities around HSIIDC units. Institutional land management reforms should simplify titling, make grievance redressal more accessible, and foster stable, secure land and tenancy rights for the Scheduled Castes, women-headed households, and migrants.

The promise of human development in Sonipat will rise or fall with the ability to provide reliable, equitable, and quality basic services. Whether it is piped water, sewage networks, electricity, digital connectivity, or solid waste management, progress here reverberates across all other facets of well-being. For this reason, district investments must prioritise underserved blocks and populations and invest in community feedback mechanisms, public dashboards, and decentralised monitoring platforms. There should be an extended networked underground drainage to villages closer to at least two industrial estates (Rai, Kharkhoda), to reduce environmental pollution and health risk. It is suggested that there should be a District Spatial Coordination Committee, chaired by the Deputy Commissioner which aligns the HSVP, HSIIDC, and municipal plans over the next two years. The committee should develop an integrated District Spatial Framework (2025–2035) linking transport, industrial, and residential zoning to employment and environmental sustainability.

Interventions like rural Wi-Fi hubs, affordable device schemes, piped water expansion, and slum upgrading programmes should be timed and sequenced to support school attendance, women's participation in the workforce, and small business growth, thus leveraging every unit of money spent for maximum multiplier effects. Provision of free public bus service, especially for women, also is known to play a significant role in enhancing their mobility and their economic outcomes.

10.6 Participatory, Accountable, and Collaborative Governance

Effective governance underpins every recommendation outlined in this report. Progress has been made in rural connectivity, e-government services, and women's representation in panchayats. However, governance gaps persist, especially in law enforcement, judicial delivery, institutional devolution, and grievance redressal. The challenge is twofold: to deepen the autonomy and creativity of local governance, and to build trust and shared responsibility among state actors, civil society, and citizens.

Institutional reforms should be fast-tracked to ensure genuine devolution of funds, functions, and functionaries to the Panchayati Raj Institutions and Urban Local Bodies, so that planning reflects local needs and frontline accountability is possible. Social audits, regular public consultations, digital planning tools, and legal awareness campaigns can help reinforce a culture of transparency and participation. Alternative dispute resolution and innovative technology deployment can ease pendency and enhance trust, especially among the marginalised groups. Meanwhile, despite their complexities, traditional institutions like khap panchayats can become partners in mobilisation and advocacy if their roles are clearly defined within the constitutional framework and encouraged to promote inclusion and non-discrimination.

10.7 Towards an Adaptive, Evidence-Driven, and Inclusive District Future

Insights from the chapters of this report converges on a single, unavoidable pathway: progress in Sonipat is deeply interconnected. Education, health, livelihoods, environmental stewardship, spatial planning, social protection, and governance must not be seen as isolated silos, but as a single living system in which sustained improvements can only be achieved by recognising and fostering their interdependencies. This calls for an adaptive, evidence-driven approach, rooted in a commitment to learning. Expanding capacity for district-level data collection, integrating administrative and community-generated evidence, and investing in local research and dialogue with academia and civil society will allow programmes to calibrate, adjust, and innovate over time.

Intersectionality must become both a lens for diagnosis and a logic for action. For instance, programmes that improve nutrition can also reduce early school dropout and boost future productivity. Insurance portability for migrants can make them both healthier and more productive workers. Land title reforms can empower women, improve agricultural output, and foster climate resilience simultaneously. Harnessing these synergies is essential, especially amid climate shocks, pandemics, or gender-based inequalities that cut across sectoral boundaries.

10.8 Conclusion: The Collective Project

The road ahead for Sonipat holds immense promise but also demands profound commitment and collaboration across all sectors of society. This report has illuminated the enormous stride which the district has taken and the urgent challenges which require our enduring attention. What becomes clear from the comprehensive analysis is that the path to a more equitable, resilient, and inclusive Sonipat is not linear, but a complex, iterative process that calls for adaptability, grounded local knowledge, and cohesive action. Across education, health, livelihoods, environment, spatial planning, services, and governance, Sonipat stands as a representative of the opportunities and tensions faced by many rapidly transforming districts in India. The intricate interplay between these domains necessitates a holistic vision which acknowledges the lived realities of the people, especially those who have been historically marginalised. It recognises that their empowerment is critical for sustainable development. It means envisioning education not just as school attendance, but as the foundation for lifelong opportunity, linked to health, employability, and social mobility. It means viewing health as medical treatment availability and as part of a web that includes clean water, nutrition, gender equity, and mental well-being. It means perceiving livelihoods not solely as jobs earned but as pathways out of poverty that connect formal and informal economies underpinned by social protection and skill development.

The district's environmental challenges are equally intertwined with these issues. Climate change, pollution, and resource scarcity are not standalone problems but factors that threaten agricultural sustainability, public health, and urban livelihoods. The solutions, therefore, cannot be piecemeal. Instead, integrated policies that foster green growth, sustainable land management, community stewardship, and inclusive urban development are imperative. Governance is the key which holds this mosaic together. Sonipat's progress, whether in expanding access to education or modernising health systems, hinges critically on participatory, accountable, and empowered local institutions. Enhancing transparency, decentralising decision-making, and building coalitions between government, citizens, academia, and civil society will be critical to turn plans into lived realities.

This concluding reflection recognises that while the challenges are significant, so is the capacity for transformation. Sonipat possesses dynamic human capital, institutional expertise, and a vibrant civil society poised to collaborate. The district's recent achievements, from better connectivity to expanding education infrastructure, are testimony to this potential. For this promise to be fulfilled, every stakeholder must commit to bridging divides between rural and urban, formal and informal, men and women, majority and minority, old and young. This means fostering genuine inclusion at every policy stage, building capacities to implement, innovate, and pivot when required. It also requires investing in robust data systems and research partnerships that provide timely insights and cultivate a culture of continuous learning.

Most importantly, it needs us to hold fast to the core principle underpinning human development: that development is about expanding every person's fundamental freedoms and capabilities to live a life of dignity, creativity, and opportunity. It is a collective project that demands that all of Sonipat's residents, whether in its sprawling urban corridors or its remote villages, become co-creators of their shared future.

Thus, this report does not mark an end but a beginning, an open invitation to scholars, policymakers, activists, and citizens to engage deeply with the district's human development journey. By working with imagination, empathy, and shared resolve, Sonipat can become a model of growth and equitable, sustainable, and human-centred development, ultimately ensuring that no one is left behind as the district moves forward into its next chapter.

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