



GROWTH ENABLERS & INFRASTRUCTURE DEVELOPMENT



WHERE ARE WE?

Strengths

- Robust Logistics Infrastructure, Extensive Road Network and Expanding Metro Connectivity
- Ease-of-Doing Business and Growing MSME Sector
- Strong Export Performance
- Improved Power Efficiency, Solar Energy Expansion and Biomass Utilisation Initiatives
- Extensive Digital Payment Adoption

Areas of Improvement

- R&D Investment Gaps and Tech Adoption Costs
- Job Creation Beyond Agriculture
- Green Tech Affordability and Rural Digital Access
- Balanced Industrial Spread and Low Industrial Land Availability
- Subsidy Targeting Efficiency
- Water Conservation Measures
- EV Battery Recycling Infrastructure

Opportunities

- EV Uptake
- Carbon Credit Markets
- Startup Ecosystem Growth
- E-Waste Recycling Policy and Circular Economy Promotion
- 6 GW Solar Target
- UHF/VHF Communication Rollout
- Real Estate Monetisation
- International Horticulture Market
- Aviation Hub Development
- Green Hydrogen and Derivatives
- Semiconductors

Threats

- High Technology Costs, Outdated Manufacturing Practices, and Limited Industrial Expansion Space
- Cybersecurity Vulnerabilities
- Labour Unrest Risk
- Carbon Emissions Rise; Climate Change Impacts and EV Environmental Hazards
- IT Services Obsolescence
- Urban-Rural Infrastructure Divide, Perpetuating Disparities in Digital Access, Job Opportunities, and Essential Services

WHERE DO WE WANT TO GO?



VISION

Haryana's approach towards **Future-Envisioned Industrialisation** will be to ensure its infrastructure and industries are the benchmarks of innovation, sustainability, and inclusivity.



MISSION

Under its **Future-Envisioned Industrialisation approach**, Haryana will embrace AI-driven innovation, inclusive economic policies, and global sustainability standards. With its strong manufacturing base in automobiles, textiles, steel, power, and IT, the state is well-positioned to lead the way. The III Approach—AI Innovation, Inclusion, and International Alignment— will be key to ensuring sustainable and future-ready industrial growth.

GOALS

- Manufacturing Value Added (MVA) as a proportion of NSVA at current prices - 14.13%
- Percentage of GSVA in Industries Sectors (at current price) to total GSVA - 35.98%
- MSME Udyam registration per 1,00,000 population - > 5000
- Renewable energy share in total installed capacity - 70%
- AI adoption rate in the manufacturing sector - 60%

ASPIRATIONAL FUTURE

Haryana aspires to follow progressive policies and technological advancements to transform the state into a model of sustainability and innovation, where robust EV policies and a startup ecosystem drive entrepreneurship and significantly reduce pollution levels by adopting responsible waste management. Driven by the global economic shift toward sustainability, Haryana will accelerate its renewable energy transition by integrating green technologies, enhancing efficiency, and fostering cross-sector innovation, all supported by appropriate legal frameworks. This commitment to a greener future includes leveraging AI for governance and actively pursuing carbon capture technology.

HOW WILL WE REACH THERE?

Innovation & MSME Modernisation: Establish Innovation & MSME Councils, deploy Startup Officers, and streamline clearances. Promote entrepreneurship and education, and enable skill development in rural districts with strong industry linkage.

Smart & Resilient Transport Infrastructure: Legislate smart tech adoption in transport systems. Promote low-carbon logistics, multi-modal transport, and resilience planning with nature-based solutions and workforce upskilling.

Decentralised & Clean Energy Systems: Mandate renewable energy targets and microgrid integration. Accelerate clean fuel transition, grid modernisation, and carbon-neutral industrial clusters with circular economy principles.

Sustainable Infrastructure & Green Standards: Set up sustainability governance, SOPs, and financial mechanisms. Mandate energy audits, green retrofits, smart monitoring, and enforce green building codes.

Bridging Digital & Tech Divide: Form digital inclusion task forces and provide rural connectivity through public-private partnerships. Enhance digital literacy and promote universal accessibility with AI, blockchain, and quantum tech integration.

Equitable Infrastructure Access: Reform policies for inclusive infrastructure, prioritise underserved regions, and ensure climate-resilient, locally-managed systems. Use data analytics for equitable planning and future-ready networks.

Export-Ready MSMEs & Startups: Set up MSME Export Acceleration Cells to support product standardisation, certifications, and trade compliance, enabling select enterprises to become export-ready.

Global Value Chain Integration: Establish State Export Promotion Councils and facilitate access to trade finance, market intelligence, and global partnerships to integrate MSMEs into international value chains.

3 BIG ACTIONS

01

AI-Infused Industrial Corridor

03

Global Green Axis

02

She Rise 2.0

INTRODUCTION

Haryana's development journey showcases significant achievements while highlighting aspirations for the future. The state has established itself as a crucial logistics and industrial hub through transformative infrastructure projects like the Integrated Multi-Modal Logistics Hub in Narnaul and the Kundli-Manesar-Palwal (KMP) expressway. These developments have earned Haryana "Achiever" status in the Logistics Ease Across Different States ranking and recognition as a "Top Achiever" in the State Business Reform Action Plan.¹ Economic vibrancy is demonstrated through over 11 lakh registered MSMEs contributing nearly INR 2,75,245 crore in exports during FY 2023-24.² The state has also made notable progress in sustainability by reducing AT&C losses from 30.02% in FY 2015-16 to 10.48% during FY 2023-24³ and implementing green building standards across 265 certified structures.⁴

This chapter examines Haryana's current infrastructure and industrial landscape, presents a vision for 2047, and outlines strategic pathways for transformation. The state faces challenges requiring innovative solutions, including rising emissions—from 39.57 Mt CO₂e in 2005 to 75.72 Mt CO₂e in 2018⁵—and persistent rural-urban disparities in digital connectivity despite improvements in physical infrastructure. As Haryana aims to become an industrial powerhouse by 2047, it must embrace AI-driven innovation, implement inclusive economic policies that empower women and marginalised communities, and align with global sustainability standards. Through these strategic initiatives, Haryana seeks to transform its infrastructure and industrial ecosystem into benchmarks of innovation, sustainability, and inclusivity for the nation and beyond.

WHERE ARE WE?

Current Status

Infrastructure Development

- **Integrated Multi-Modal Logistics Hub in Narnaul**
- Haryana State Industrial & Infrastructure Development Corporation Ltd (HSIIDC) is developing state-of-the-art IT Parks in Panchkula, Rai, and Manesar to attract IT companies and startups
- Construction of bridges and railway overbridges
- Strengthening of Haryana Roadways Depots' infrastructure

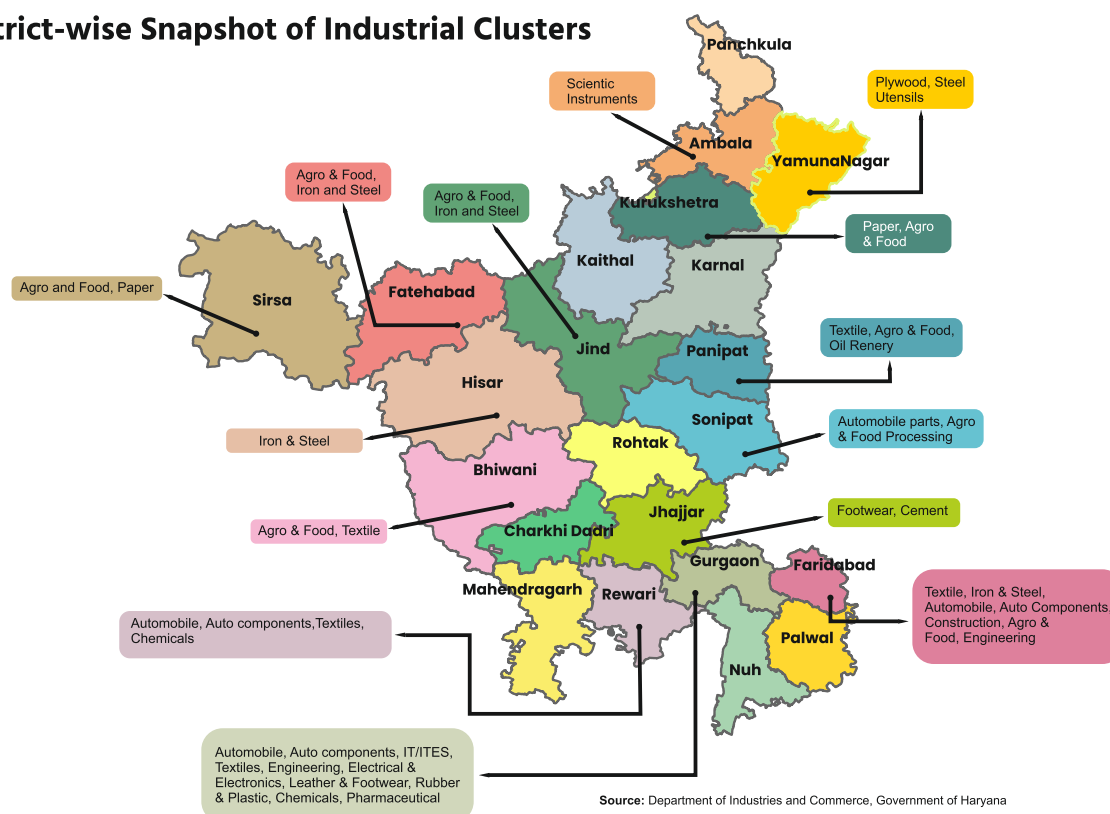
Keystone Infrastructure Projects

- **Orbital Rail Corridor**⁶ anchored alongside KMP expressway - a 121.7 km semi-high-speed rail line from Palwal to Sonapat, designed to connect major freight & passenger nodes without passing through Delhi
- **Panchgram** – Development of a hub of five super-smart cities into alternate urban centres within a 2 km corridor on either side of the 135 km KMP expressway, covering approximately 50,000 hectares and eight districts, under the PPP model
- High-speed rail connectivity between Delhi and Karnal
- Approved expansion of the **Gurugram Metro and the Regional Rapid Transit System (RRTS)**—a new metro line from Millennium City to Cyber Hub in Gurugram at INR 5,500 crores, set to improve intra-city connectivity
- Additionally, the **Namo Metro Corridor** from Serai Kale Khan to Neemrana via Dharuhera is set to redefine inter-city mobility along the Delhi-Gurugram-Rewari growth belt
- Asset monetisation through infrastructure investment trusts and real estate

Investment Thrusts

- **Global City near Manesar on Dwarka Highway** – committed to sustainability and spearheaded by HSIIDC, Phase 1 of the project is underway, covering 587 acres with a budget allocation of INR 940 crore and focused on completing roads and essential amenities like electricity & water by December 2026
- **International Horticulture Market** at Ganaur, Sonapat
- Domestic Airport at Hisar/Integrated Aviation Hub

Figure E.4:
District-wise Snapshot of Industrial Clusters



MSME Development

- A total of 18,12,180 MSME units registered under the online UDYAM registration portal, with 12,66,210 Micro, 22,847 Small, and 1,754 Medium enterprises⁷.

Programme to Accelerate Development for MSME Advancement (PADMA) - to catalyse rural industrialisation by establishing sector-specific mini greenfield industrial parks at the block level. One product in each of the 143 blocks of the 22 districts has been identified under the scheme, and its comprehensive set of support schemes ranges from capital investment subsidies to branding and export promotion.

- The PADMA Cluster Infrastructure Development Scheme (PCIDS) has also been launched to provide assistance for setting up scalable and sustainable industrial infrastructure across blocks.

Four new Industrial Clusters have been approved so far in Jind, Ambala, Faridabad, and Rewari districts.

- As per Haryana's Strategic Investment Plan (SIP) approved by MoMSME under Raising & Accelerating MSME Performance (RAMP), INR 135.17 crores to be spent over the next three years on making Haryana a competitive & resilient MSME hub.

Forward Looking Cluster Development: Cluster Plug and Play Scheme is being implemented to reduce the cost of doing business by establishing modern & affordable operating facilities equipped with essential shared infrastructure. Thirty-three projects approved, primarily in Tier II & Tier III cities, to decentralise industrial growth & empower smaller towns.

State Mini Cluster Development Scheme - implemented under Haryana Enterprises and Employment Policy (HEEP) 2020, aimed at resolving common challenges faced by micro and small enterprises by unlocking economies of scale. This scheme has operationalised 30 Common Facility Centres (CFCs) and approved 11 additional CFCs under the Government of India's Micro Small Enterprise - Cluster Development Programme (MSE-CDP) scheme.

- The state has identified **56 MSME clusters** across 21 districts, demonstrating a widespread focus on decentralised industrial growth.

Economic Development

- 100% of targeted habitations connected by all-weather roads under PMGSY⁸
- "Achiever" status in the State Business Reform Action Plan 2020 Assessment⁹
- Maintained "Achiever" position in LEADS 2023 ranking¹⁰
- Exports worth nearly INR 2,75,245 crore during 2023-24¹¹

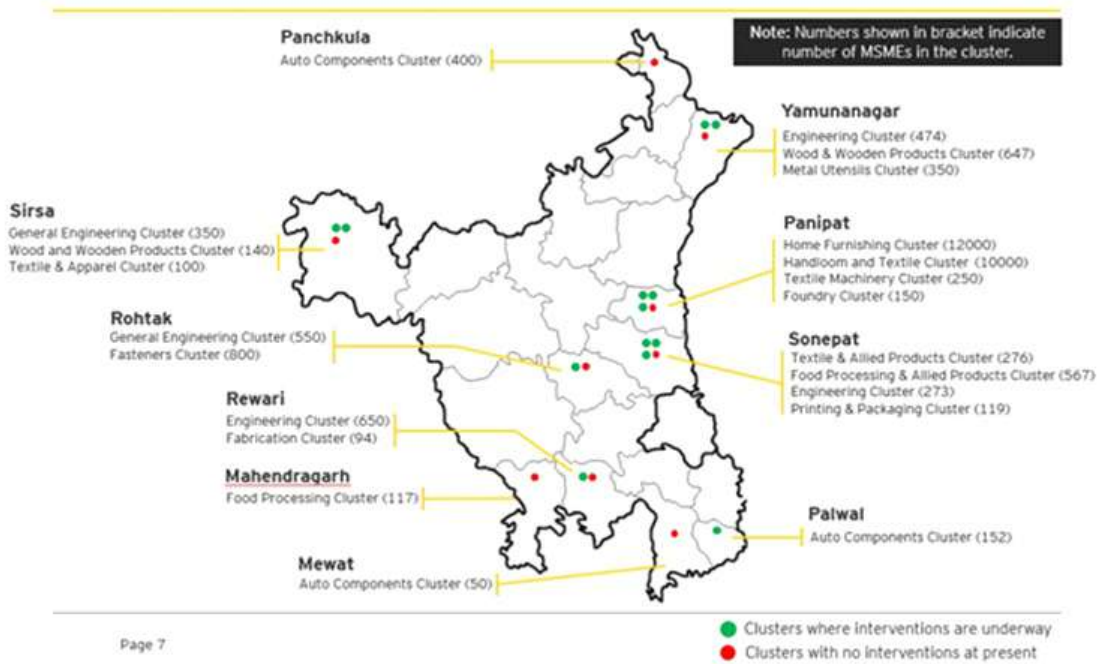
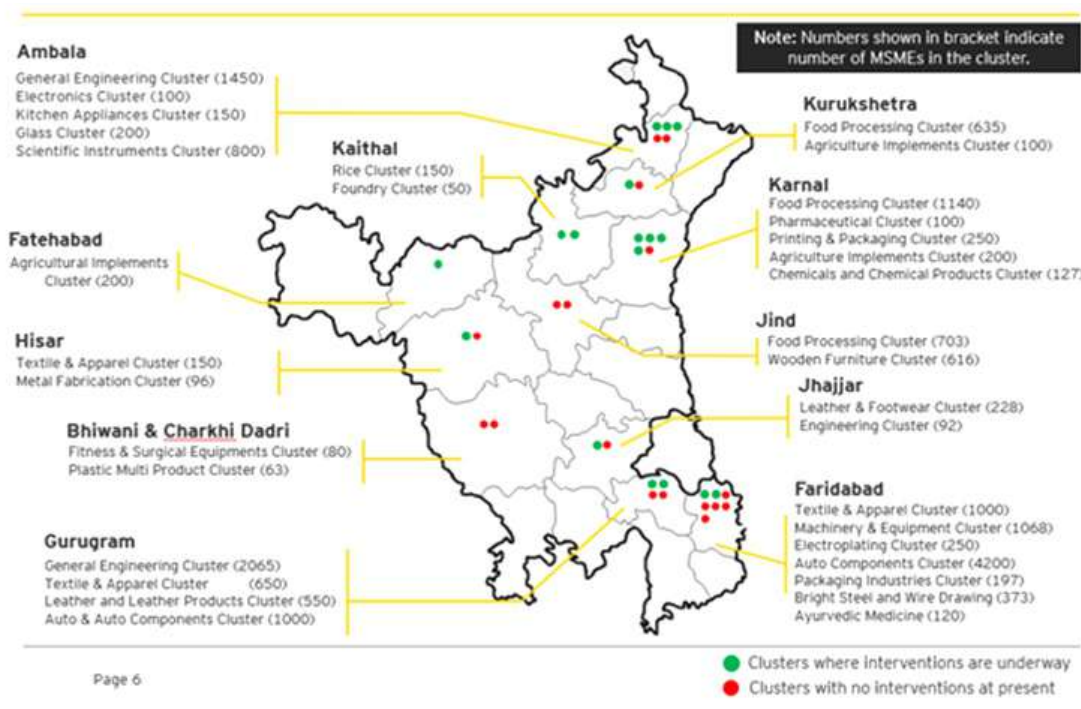
Energy Infrastructure¹²

- Total installed and contracted (2500 units from "installed" and 2100 from "contracted," totaling 4600 units) capacity of 15,936.65 MW as of 31.12.2024
- AT&C losses reduced to 10.48% during FY 2023-24 from 30.02% in FY 2015-16

Transportation Infrastructure¹³

- Total Road Network under Public Works Department (Buildings and Roads) (PWD B&R): 33,543 km
- National Highways: 3,061 km. National Highways under PWD: 330 km
- State Highways: 1,638 km
- Major District Roads: 1,405 km
- Other District Roads: 27,109 km
- Landmark allocation of INR 3,416 crores to strengthen Haryana's Rail network in the Union Budget 2025-26

PM Gati Shakti: Institutional mechanism viz. Empowered Group of Secretaries (EGoS), Network Planning Group (NPG) and a dedicated Technical Support Unit (TSU) have been put in place by the Department of Industries & Commerce to plan **ten major projects (exceeding INR 100 crores)** using the Gati Shakti Portal by December 2025.



Source: <https://msme.haryana.gov.in/clusters/>

FUTURES TRIANGLE (*Refer to page number 28 for an in-depth overview of the Futures Triangle)

To effectively assess Haryana's infrastructure and economic landscape, we must understand how historical investments, present forces, and future opportunities interact to shape development trajectories. The Futures Triangle analysis examines these three dimensions—past weights, present pushes, and future pulls—to identify the dynamic tensions influencing Haryana's growth path. This analysis reveals how legacy systems and policies create inertia, how current initiatives generate momentum, and how emerging trends exert gravitational pull toward new possibilities. By mapping these intersecting forces, we can identify strategic interventions that

leverage strengths, address constraints, and navigate toward Haryana's vision of becoming an infrastructure and industrial powerhouse by 2047. The following analysis highlights critical factors across all three dimensions that will determine whether Haryana achieves incremental improvement and transformative change in its development journey.

Pushes of the Present

Positive

Economic growth and job creation through the **Haryana Enterprise & Employment Policy 2020**

Investment and innovation in the **electronics manufacturing ecosystem**

Agricultural sustainability enhanced through **Solar Water Pumping Programmes** and biomass utilisation

Sustainable energy initiatives implemented in government buildings

Equitable access to clean energy extended to remote areas

Sustainable transportation promotion through EV adoption

Widespread **adoption of solar energy** through low-cost panels

Seamless digital payment systems enhancing **financial inclusion in rural areas**

E-commerce and metro systems generating employment opportunities

Carbon credits and e-waste recycling driving sustainability efforts

Negative

Costly technologies requiring substantial investments for a green transition

Limited budgetary allocation for research and development initiatives

Labour unrest, potential job displacement, and high capital expenditures

Concerns about the effectiveness and targeting of **subsidy programmes**

Water scarcity, rising carbon emissions, and climate change vulnerabilities

Rapid technological advancement causing the obsolescence of existing IT services

Pulls of the Future

Positive

EV policies and foreign investment **reducing energy costs and pollution**

Haryana Startup Policy boosting innovation and entrepreneurship

Draft E-Waste Recycling Policy promoting the circular economy

Upcoming **Haryana Solar Policy targeting** 6 GW of renewable energy by 2030

Implementation of **UHF/VHF communication** for reliable channels in challenging situations

Carbon Capture Technology promising significant Co₂ emission reduction

Negative

Inadequate regulation frameworks for emerging technologies

Environmental challenges from EV battery production and disposal

High acquisition costs for advanced technologies and robotics

Limited availability of **cost-effective land** for industrial expansion

Rising cybersecurity threats jeopardising digital infrastructure and data

Weights of the Past

Positive

Effective policy frameworks fostering innovation and **renewable energy adoption**

Haryana's Ease of Doing Business policies reducing gender and regional disparities

Improved road infrastructure promoting balanced regional growth and connectivity

Increased GST collection strengthening fiscal resources for development

Biomass utilisation providing additional income to farmers while promoting sustainability

Negative

Urban-focused policies exacerbating the rural-urban infrastructure divide, leading to imbalanced development and persistent gaps in access to digital infrastructure, job opportunities, and essential services

Limited job opportunities outside agriculture driving **rural-urban migration**

Restricted internet access in rural areas hampering information distribution

High technology costs hindering widespread adoption and innovation

Outdated manufacturing technologies contributing to environmental pollution

Negative

Overconcentration of industrial infrastructure in the National Capital Region

WHERE DO WE WANT TO GO?

VISION 2047

By 2047, Haryana's approach towards Future-Envisioned Industrialisation will be to ensure its infrastructure and industries are the benchmarks of innovation, sustainability, and inclusivity. With a focus on green, smart, and accessible infrastructure, we are committed to bridging disparities and transforming our energy, logistics, and digital landscapes to pave the way for excellence in both economic metrics and quality of life.

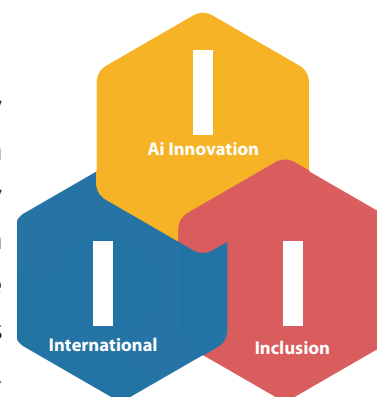
- Position Gurugram as Asia’s Premier Services Hub through cutting-edge finance, technology, and creative industry infrastructure
- Create Future-Ready Cities via the Panchgram Plan to reduce regional disparities and drive balanced urban growth
- Strengthen the Innovation Ecosystem by accelerating R&D in high-value sectors like space tech, aerospace, and defence
- Advance Industries with Globally Aligned Sustainability Policies, fostering circular economy and net-zero growth models
- Modernise Supply Chains and Logistics Infrastructure through innovative, multi-modal, and low-emission transport networks
- Ensure Green, Affordable, and Reliable Energy Access, focusing on clean fuels, renewables, and decentralised energy systems
- Implement Climate-Resilient Infrastructure Standards to promote green buildings, innovative retrofits, and sustainable urban design
- Bridge Rural-Urban, District, and Gender Disparities through inclusive, data-driven infrastructure planning and targeted investments, including dedicated rural infrastructure development to reduce migration pressures and ensure equitable access to digital infrastructure, job opportunities, and essential services.

STRATEGIC MISSION* : Future-Envisioned Industrialisation – The III Approach

Haryana stands at the cusp of industrial transformation, poised to leverage its established manufacturing base across automobiles, textiles, steel, power, and IT sectors to become a global industrial powerhouse. The state's strategic approach focuses on three interconnected pillars that will drive sustainable growth, social equity, and international competitiveness in the industrial landscape of tomorrow.

1. AI INNOVATION: Driving Sustainable Industrial Transformation

AI will revolutionise Haryana's industrial ecosystem, particularly in its key manufacturing sectors. The state will establish AI innovation centres in Gurugram and Panchkula, focusing on applications that enhance productivity while reducing environmental impact. In the automobile sector, where Haryana hosts India's largest manufacturing hub, AI-driven predictive maintenance systems will be deployed to reduce downtime by up to 30%. The textile clusters in Panipat and Sonipat will implement AI-enabled water recycling technologies, targeting zero liquid discharge standards. At the same time, steel manufacturing in Hisar will incorporate AI quality control systems to minimise material wastage. Additionally, advanced AI energy management platforms will optimise the state's renewable energy distribution, improving grid efficiency by an estimated 25%. Furthermore, AI-driven smart factories and automation will be promoted across MSMEs to boost efficiency and competitiveness.



2. INCLUSION: Empowering Women and Non-Binary Individuals

Haryana will address its historically low female labour force participation through targeted policy interventions across the industrial landscape. The state will mandate gender-balanced hiring practices in all new industrial projects, establish subsidised childcare facilities within 5 km of major industrial zones, and implement flexible work policies to accommodate diverse life circumstances. Special economic incentives will be provided to industries exceeding gender diversity targets, with tax benefits scaling up to 15% for those achieving complete gender parity. For entrepreneurs from underrepresented groups, Haryana will create dedicated business incubation centres with specialised mentorship programmes and priority access to government contracts, aiming to support at least 500 women-led and 100 non-binary-led enterprises annually by 2030.

3. INTERNATIONAL: Aligning with Global ESG and Digital Standards

To ensure global competitiveness, Haryana will align its industrial practices with international sustainability standards and digital transformation imperatives. The state will establish ESG compliance centres in major industrial hubs to help businesses adapt to evolving global requirements, particularly focusing on meeting the EU's Carbon Border Adjustment Mechanism standards. Carbon capture technologies will be implemented in high-emission industrial clusters like Hisar, enabling a projected 30% reduction in industrial carbon footprint by 2030. Simultaneously, Haryana will extend digital infrastructure to all villages by 2027, creating rural digital enterprise zones with specialised support for agri-tech startups and rural manufacturing units. Blockchain-based supply chain verification systems will be implemented to certify the sustainability credentials of Haryana's exports, enhancing their acceptance in environmentally conscious global markets. The potential of blockchain will also be leveraged in securing supply chains, reducing fraud in transactions, and enhancing transparency in governance.

*Aligned Departments: Industries & Commerce, MSME, Transport, Civil Aviation, Electronics & Information Technology, Power and Renewable Energy, Science & Technology, Buildings & Roads, Irrigation

GOALS

Indicator	Baseline	Baseline Source	Target 2030	Target 2036	Target 2047	Benchmarks
MSME Udyam Registration per 1,00,000 population	852 (2022)	Udyam Registration Portal, Ministry of MSME	1857	> 2970	> 5,000	Global average for upper-middle- income countries: ~1,800 MSMEs per 100,000 population. Target aims to double registration density by 2030, reaching levels comparable to upper-middle- income countries, and further triple by 2047 to match high-income economies like South Korea and Taiwan.
Percentage of households living in katcha houses	0.2% (July-Dec 2018)	National Family Health Survey	0%		0%	Singapore (0%), Japan (0%), South Korea (0.05%). Targets the complete elimination of inadequate housing by 2030, aligning with SDG 11 (Sustainable Cities and Communities).

Indicator	Baseline	Baseline Source	Target 2030	Target 2036	Target 2047	Benchmarks
Public transport trips per 1,000 population per day	95 (2021)	Haryana Transport Department Annual Report	180	222	300	Singapore (240), Hong Kong (270), European average (150). Target supports sustainable urban mobility and aligns with the National Urban Transport Policy goals of increasing public transport modal share. The 2047 target matches the current high-performing sustainable transport systems.
Logistics Performance Index (LPI) score	3.2 (2022)	LEADS Report 2022, Ministry of Commerce & Industry	4	4.18	4.5	Germany (4.2), Singapore (4.1), Japan (4.05). The 2030 target positions Haryana on par with current global logistics leaders, while the 2047 target aims to establish Haryana as a global benchmark in logistics efficiency.
Growth rate of manufacturing sector	6.67%	Annexure 2	10.61%	12.63%	10.10%	Based on the research paper "Viksit Haryana@2047: A Triad Framework for Inclusive and Sustainable Growth"

Indicator	Baseline	Baseline Source	Target 2030	Target 2036	Target 2047	Benchmarks
AT&C losses in power distribution	10.48% (2023-24)	Haryana Power Utilities	7%	6%	5%	Singapore (2%), Japan (4%), Germany (4%). Builds on significant progress already made (from 30.02% in 2015-16 to 10.48% in 2023-24). The 2047 target aims to achieve efficiency levels comparable to the global best practices.
Number of green-certified buildings per million population	105 (2023)	Indian Green Building Council (IGBC), Green Rating for Integrated Habitat Assessment. (GRIHA) and Green Business Certification Inc. (GBCI)	500		2000	Singapore (380), UAE (350), US (280). Aims for a 5X increase by 2030 and 20X by 2047, aligning with global leaders in sustainable building practices and supporting carbon reduction goals.
Carbon intensity of GSDP (tonnes CO ₂ e/INR crore)	176 (2018)	Trend Analysis of GHG Emissions of Haryana Report	100	72	20	EU average (75), UK (50), Sweden (20). Supports India's nationally determined contributions under Paris Agreement. The 2047 target aligns with pathways for net-zero emissions and positions Haryana as a leader in low-carbon development.

Indicator	Baseline	Baseline Source	Target 2030	Target 2036	Target 2047	Benchmarks
Internet penetration rate (rural-urban gap)	30.4% (2023)	TRAI Quarterly Reports	10%	7.18%	2%	South Korea (3%), Sweden (5%), Finland (4%). Targets a dramatic reduction in digital divide, approaching current gap levels in digitally advanced economies by 2047, supporting inclusive digital growth.
AI adoption rate in manufacturing sector	12% (2023)	Haryana Industrial Survey	20%	34%	60%	South Korea (45%), Singapore (40%), Germany (38%). The target supports Haryana's "AI-Infused Industrial Corridor" initiative and positions the state on par with current global technology leaders by 2030, becoming a global benchmark by 2047.

POSSIBLE FUTURE SCENARIOS

BUSINESS AS USUAL FUTURE

- Government policies continue to focus predominantly on urban development, reinforcing existing patterns of investment
- Rural-urban divide persists as limited job opportunities beyond agriculture in rural areas drive migration to urban centres
- Reliance on the primary sector continues with incremental implementation of renewable energy initiatives like the Haryana Solar Power Policy 2016
- Outdated industries contribute to increasing pollution levels despite some sustainability efforts
- Affordability issues limit widespread adoption of new technologies, affecting employment patterns and social dynamics

NEGATIVE DISRUPTIVE FUTURE (RISKS)

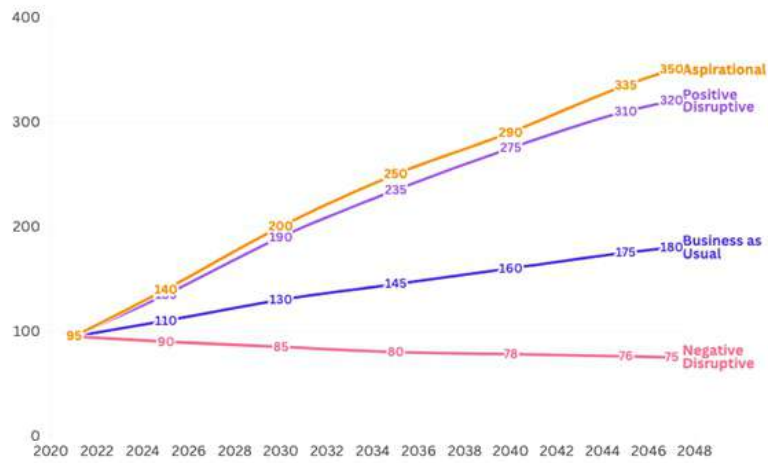
- Unregulated emerging technologies create cybersecurity vulnerabilities, financial scams, and rising unemployment
- Rapid technological advancement renders existing IT services obsolete, creating economic disruption
- Ecological challenges, including water scarcity, threaten industrial operations and environmental sustainability
- High costs of transitioning to greener technologies and regulatory hurdles impede progress
- Job displacement and widening rural-urban divide lead to social tensions without proper intervention
- Without coordinated action, Haryana faces environmental degradation, economic instability, and social unrest

POSITIVE DISRUPTIVE FUTURE (OPPORTUNITIES)

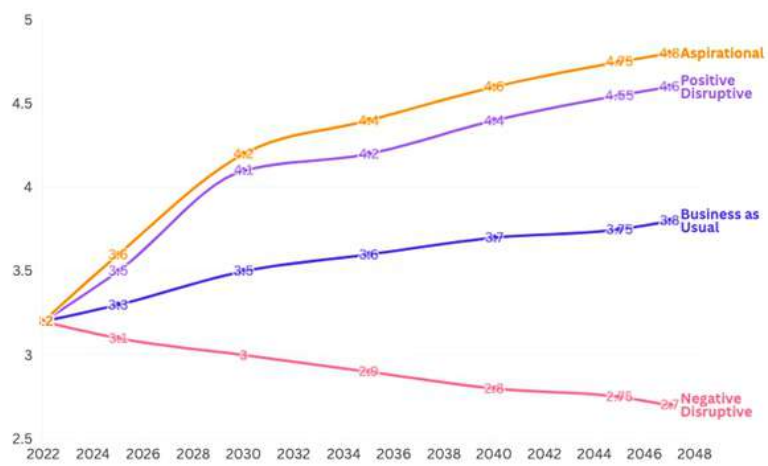
- Leveraging the Haryana Enterprise & Employment Policy 2020 and the Electronic Manufacturing Cluster Policy creates a vibrant ecosystem for innovation and entrepreneurship
- Digital payment systems and targeted subsidies bridge the rural-urban divide while addressing labour challenges
- E-commerce expansion and digital platforms generate economic growth and employment, particularly benefiting rural areas
- EV adoption and bioenergy solutions (biomass utilisation, ethanol generation) align with environmental goals
- Innovation hubs, startup incubation centres, and technology adoption programmes create pathways to economic prosperity

ASPIRATIONAL FUTURE

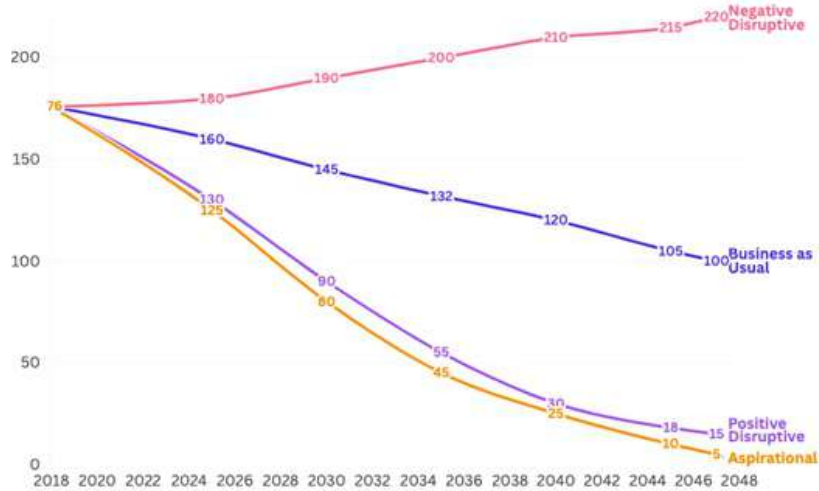
- Favourable policies and technological advancements transform Haryana into a model of sustainability and innovation
- Robust EV policies and a startup ecosystem drive entrepreneurship and significantly reduce pollution levels
- Comprehensive e-waste recycling policies ensure responsible waste management
- Global economic shifts toward sustainability accelerate the transition to renewable energy sources
- Integration of green technologies enhances efficiency and fosters innovation across sectors
- Legal frameworks leveraging AI ensure transparency, while carbon capture technology demonstrates a commitment to a greener future



Graph 30 (a): Public Transport Trips per 1,000 Population per Day



Graph 30 (b): Logistics Performance Index (LPI) Score



Graph 30 (c): Carbon Intensity of GSDP (tonnes CO₂e INR crore)

HOW WILL WE REACH THERE?

To effectively channel resources and personnel towards our vision, we need to tackle key challenges head-on. This includes fostering innovation and startup culture, modernising local businesses, and transforming logistics for energy efficiency. Ensuring green, affordable energy and decentralised grid management are crucial for sustainability. Embracing green technology standards and bridging digital divides are also priorities. Addressing rural-urban and gender disparities in infrastructure is essential, as is adapting industries to meet global sustainability standards and leveraging emerging technologies.

Issues

- 🔍 Promoting Innovation and Start-up Culture and Modernisation of Local MSMEs
- 🔍 Transform Supply Chain Logistics and Transport Infra to be Energy Efficient, Resilient, Smart, Green, Affordable and Accessible Energy and Decentralised Grid Management
- 🔍 Adopting Sustainable, Green Technology Standards, SOPs for Infrastructure and Building
- 🔍 Bridging Multi-Dimensional Digital Divide and Integrating New Technologies for Seamless Public Services
- 🔍 Addressing Rural-Urban/District/Gender Disparities through Accessible Infrastructure
- 🔍 Bridging Disparities through Inclusive and Equitable Infrastructure

ISSUE 1: PROMOTING INNOVATION AND START-UP CULTURE AND MODERNISATION OF LOCAL MSMEs

Haryana is strategically positioning itself as a hub for innovation and entrepreneurship by developing a robust ecosystem for startups and modernising local MSMEs. The state's initiatives are aimed at creating an environment conducive to business growth, technological advancement, and economic development. With targeted policies, infrastructure development, and support mechanisms, Haryana is nurturing a culture that encourages risk-taking, creativity, and business transformation, enabling both new ventures and established MSMEs to thrive in an increasingly competitive global landscape.

Current Status

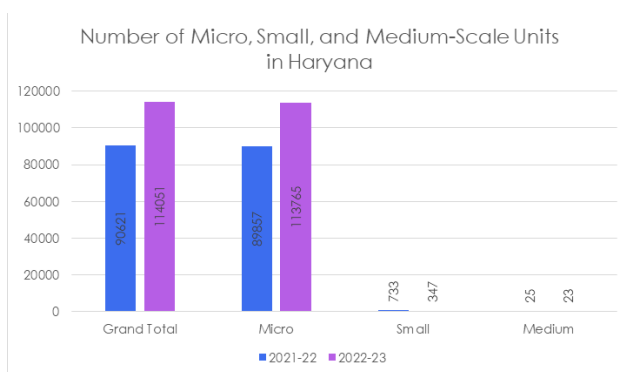
- ✔️ **MSME Registration:** MSME Registration: A total of 1812180 MSME units registered under the online UDYAM registration portal, with 1266210 Micro, 22,847 Small, and 1,754 Medium enterprises¹⁴
- ✔️ **Investment Profile:** Substantial investments across MSME segments, with Micro enterprises attracting INR 1,272.85 crore, Small enterprises INR 304.46 crore, and Medium enterprises INR 409.42 crore.¹⁵ Haryana Aerospace and Defence Production Policy 2022 is paving the way for Haryana as an Aerospace Hub
- ✔️ **Global Information & Market Facilitation Team (GIFT):** Setting up a one-stop export facilitation cell to support export-oriented manufacturing & service sector MSMEs, especially in Tier II & III cities
- ✔️ **Startup Growth:** 8,800 Department for Promotion of Industry and Internal Trade (DPIIT)-recognised startups (as of April 2025) - 45% of which are led by women, and more than 30 incubators, generating employment for 77,800 individuals between 2016 and 2023¹⁶
- ✔️ **Startup Support¹⁷:** Comprehensive assistance through the Haryana State Startup Policy 2022, including:
 - Seed grants up to INR 10 lakh per startup
 - INR 2.5 lakh and INR 5 lakh support for national and international acceleration programmes

- 100% reimbursement for patent registration expenses (maximum INR 25 lakh)
- 50% net SGST reimbursement for seven years (capped at 100% Fixed Capital Investment)
- 75% cloud computing/storage expense reimbursement (up to INR 2.5 lakh annually for 5 years)
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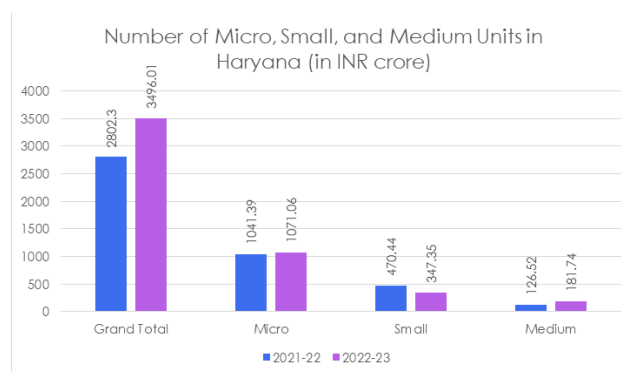
✔ **Innovation Infrastructure:** Operational support facilities including the Startup Warehouse in Gurugram (established 2018), CoE for IoT in Gurugram, and a high-precision hardware lab¹⁸

✔ **Innovation Ranking:** Haryana's Innovation Score stands at 16.35 as per India Innovation Index (2021)¹⁹

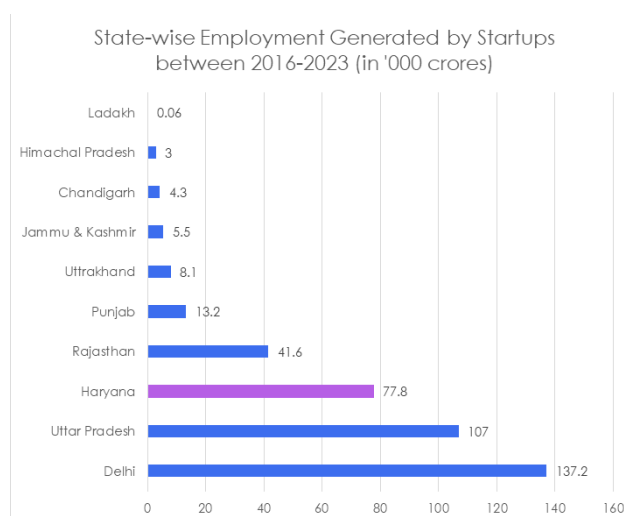
✔ **Future Development:** Position Gurugram as Asia’s Premier Services Hub through cutting-edge finance, technology, and creative industry infrastructure. Global City Project in Gurugram is positioned as the next-generation Central Business District



Graph 31: Number of Micro, Small, and Medium-Scale Units in Haryana
(Source: Department of Economic and Statistical Affairs, Haryana. Statistical Abstract of Haryana 2022-23)



Graph 32: Investment in Micro, Small, and Medium Units in Haryana
(Source: Department of Economic and Statistical Affairs, Haryana. Statistical Abstract of Haryana 2022-23)



Graph 33: State-wise Employment Generated by Startups (Self-Reported) between 2016-2023
(Source: PRABHAAV Powering a Resilient & Agile Bharat for the Advancement of Visionary Startups)

Potential Sectors for Startup and MSME Growth

- ✔ **Manufacturing and Industrial Base:** The State's strong industrial foundation supports significant expansion in Auto/Auto Components, Light Engineering, and Textiles & Apparels. These sectors benefit from existing infrastructure, supply chains, and skilled labour.
- ✔ **Agro-based Industries and Food Processing:** Driven by its rich agricultural zones, Haryana is primed for growth in Agro-based industries and Food Processing. This includes opportunities for value addition, cold chain logistics, and agri-tech innovations.
- ✔ **Specialised Textile Hubs:** Regions like Panipat and Hisar are leading in Textiles and Technical Fabrics, presenting opportunities for advanced textile manufacturing and innovation.
- ✔ **Technology and Digital Services:** Gurugram's established tech ecosystem fosters thriving IT, SaaS (Software as a Service), and FinTech (Financial Technology) startups, driving innovation in software development, cloud computing, and financial solutions.
- ✔ **Emerging High-Growth Sectors:**
 - **Pharmaceuticals and Chemicals:** These industries are gaining momentum, offering scope for new ventures and expansion.
 - **Renewable Energy:** Especially in solar and green hydrogen, this sector is poised for significant development, aligning with national sustainability goals.
 - **Defense and Aerospace Manufacturing:** With dedicated government support, defense and aerospace manufacturing are emerging as key areas for high-tech industrial growth.

These diverse sectors, backed by robust infrastructure, proactive policy incentives, and a growing pool of skilled manpower, collectively position Haryana as a dynamic hub for entrepreneurial and industrial growth.

Factors Influencing the Issue

The development of Haryana's innovation ecosystem and MSME modernisation is influenced by several interconnected factors. Government policies and regulatory frameworks set the foundation for entrepreneurial activity through incentives, funding programmes, and streamlined processes. Access to capital—from venture funds to subsidies—determines the pace of innovation and business growth. Technological advancement provides MSMEs with tools to enhance productivity and market reach, while intellectual property protection safeguards innovation investments. The quality of physical and digital infrastructure significantly impacts operational efficiency and market access. Human capital development through education and skill-building programmes ensures a workforce capable of implementing and managing innovative processes and technologies. Finally, market dynamics and global competition push MSMEs to continuously evolve their business models and adopt cutting-edge practices to remain relevant.

Funding Hurdles: Startups frequently face early-stage funding constraints, with roughly 40% relying on high-interest informal credit due to limited formal banking access. A significant hurdle is low awareness of government schemes (e.g., Seed Funding, MUDRA, Stand-Up India, Startup Haryana); a SIDBI report indicates 70% of semi-urban small businesses are unaware due to inadequate outreach. To counter this, an integrated portal for startups and incubators has been launched, facilitating applications for state-sponsored schemes, and the Haryana Startup Policy 2022 offers six schemes for startups and 10 for incubators.

MSMEs, on the other hand, struggle with a lack of collateral and limited credit history, impeding traditional loan access. Inadequate financial literacy among owners often leads to poor funding decisions. In rural and semi-urban areas, restricted access to formal institutions pushes MSMEs towards informal credit. Regulatory burdens and a shortage of tailored financial products also create difficulties, as lenders frequently perceive MSMEs as high-risk, impacting financing availability.

Impacts of the Issue

Direct Impact

- **Job Creation:** New startups and modernised MSMEs directly generate employment opportunities, contributing to economic growth and stability.
- **Economic Dynamism:** Innovation-driven enterprises inject vitality into the local economy through increased competition, introduction of new products/services, and attraction of investments.
- **Technological Advancement:** The adoption of modern tools and methods directly improves productivity, quality, and operational efficiency of businesses.
- **Revenue Generation:** Improved business models and operational efficiency translate into higher revenue streams and profitability for enterprises.

Indirect Impact

- **Knowledge Ecosystem:** The promotion of innovation fosters environments conducive to knowledge sharing, collaboration, and skill development, leading to an overall enhancement of human capital in the region.
- **Supply Chain Enhancement:** Modernised MSMEs implement improved supply chain management practices, creating efficiency that benefits the broader business ecosystem.
- **Market Diversification:** Innovation-driven businesses are better equipped to identify and capitalise on new market opportunities, enhancing economic resilience through diversification.
- **Community Development:** Successful startups and MSMEs contribute to community well-being through increased local spending, infrastructure development, and philanthropy.

Global Learnings

Global Best Practice

Modular Innovation Hubs for MSME Modernisation

The Philippines has pioneered the establishment of Modular Multi-Industry Innovation Centres (MMICs), also known as "InnoHub sa Pinas," to support MSMEs in product development and technological advancement. Spearheaded by the Department of Science and Technology (DOST), these hubs provide access to advanced equipment, technical expertise, and collaborative spaces, enabling MSMEs to innovate in sectors like food processing and nutraceuticals.²⁰

Disruptive Technologies - Exploring Possibilities with Generative Design

Manufacturers can harness the power of AI frameworks during the design phase to delve into myriad configurations for a solution. By incorporating parameters such as material types, production methods, time constraints, and budget limitations, they can thoroughly explore the potential of generative design.²¹

Possible Pathways

Short-Term Pathway (2030)

Institutional Framework Enhancement

- Establish a State Innovation and MSME Council to streamline regulatory approvals
- Deploy Startup Liaison Officers in each district
- Implement a single-window clearance system, reducing approval times by 50%.
- Operationalise a dedicated portal for Startups to centralise information on tax regulations and government schemes (e.g., SGST reimbursement, seed funding, lease rental subsidy, patent cost reimbursement from Haryana State Startup Policy 2022) to address limited awareness and streamline access.
- Simplify regulatory compliance requirements for MSMEs by reducing the number of licences and permits needed. Establish a mechanism for regular review and updating of MSME policies to ensure their continued relevance and effectiveness.

Global Trade Facilitation

- Launch "Haryana: The Non-Stop Life Force of Viksit Bharat" a global branding campaign highlighting Haryana's excellence in industrial innovation, education and skill development.
- Launch the "Haryana Global Gateway" Initiative—a platform to host biannual roadshows, global investment summits, and G2B engagement in high-potential regions (Africa, ASEAN, Middle East, EU)
- Operationalise a Single Window for Inbound Investor Facilitation, offering sector-specific support, digital investor toolkits, and grievance redressal.
- Establish a Global Cooperation Fund to support outbound delegations, pilot collaborations, and international study missions

- Create a Foreign Cooperation Dashboard for real-time tracking of design and rollout of a Foreign Cooperation Digital Dashboard, capturing Key Performance Indicators (KPIs) such as number/value of FDI MoUs signed, outbound workers placed, countries partnered.

Skill Development Acceleration

- Identify 100 high-potential rural areas for specialised skill centres
- Develop targeted training programmes in digital services, agri-tech, and green energy, green construction, smart city technologies, and sustainable urban planning.
- Partner with industries to ensure at least 70% employment placement
- Establish Haryana Global Skill Centres (HGSCs) in collaboration with HKRN, NSDC-I, and international agencies to train and place skilled youth in global markets

Digital Marketplace Creation

- Launch a comprehensive State-level MSME Marketplace Portal
- Ensure seamless logistics and payment integration
- Provide digital literacy training for MSMEs

Infrastructure Modernisation

- Implement a 5-year plan to upgrade 500 MSME clusters
- Setting up of 10 new industrial clusters in different districts under PADMA
- Introduce subsidised renewable energy adoption
- Establish public-private partnership models for connectivity wherever possible
- Strategic identification and prioritisation of investments in 3-4 core sectors such as Automotive and Evs, textiles, electronics and pharma

Short-Term Pathway (2030)

Targeted Financial & Fiscal Support for MSMEs

- **Funding Access:** Streamline loan application processes by reducing documentation requirements and implementing digital platforms for faster approvals. Promote the growth of microfinance institutions that cater specifically to MSMEs, providing more accessible financing options.
- **Tax Incentives:** Advocate with the Central Government and implement state-level complementary measures for investment allowances for capital expenditures, enabling MSMEs to invest in technology and infrastructure. Introduce state-level tax credits for R&D activities undertaken by MSMEs to foster innovation and competitiveness.

Facilitating MSME Growth and Start-up Development

- Establish District Investment Facilitation Cells as single-window platforms to assist MSMEs and local startups with guidance, approvals, and financial linkages.

Inclusive Entrepreneurship Promotion

- Create Women & Minority Entrepreneurship Funds and integrate gender-balanced hiring incentives and subsidised child-care infrastructure in industrial zones
- Develop rural incubation hubs with mentorship support
- Implement procurement policies with quotas for underrepresented groups

Export Strategy Formulation

- GIFT cell to formulate dedicated state export policy, digital export modules, targeted market intelligence support, etc.
- Formulate guidelines on green standards, carbon labelling, & circular economy practices, improving the state's global competitiveness in sustainable trade
- Develop robust district-wise export promotion plans, leveraging the One District One Product scheme to augment district export potential

Promoting Innovation and Future Technologies

- Adopt a technology-neutral policy framework encouraging clean and environment-friendly innovations across sectors.
- Promote EVs, solar energy, and green hydrogen pilots through targeted incentives and public-private collaboration.
- Establish innovation clusters and incubation hubs to accelerate commercialisation of emerging technologies.

Long-Term Pathway (2047)

Policy Ecosystem Transformation

- Formulate comprehensive state-level innovation policies aligned with industry needs
- Integrate entrepreneurship education into school curricula at the secondary level
- Establish long-term investment funds supporting high-risk innovation projects

Human Capital Development

- Embed entrepreneurship modules in vocational training programmes
- Establish partnerships with private sector entities for hands-on training
- Ensure equitable access to entrepreneurial development opportunities

Long-Term Pathway (2047)

Global Knowledge Integration

- Strengthen international partnerships through exchange programmes
- Develop specialised industry clusters facilitating collaboration
- Create incentive structures for cross-sector partnerships
- Organise an annual "Haryana Pravasi Connect Summit" to leverage diaspora expertise in innovation, investment, and mentorship.
- Leverage a structured database of the global Haryanvi diaspora to drive targeted engagement and align their contributions with Haryana's Vision 2047 goals.

Technological Advancement

- Increase R&D investment in AI, IoT, and automation solutions for MSMEs including for AI-driven smart factories and predictive maintenance.
- Establish secure data-sharing frameworks for market insights
- Create partnerships driving sector-specific technological innovation

Infrastructure Ecosystem Development

- Build 10 new Industrial Cities on the lines of Integrated Manufacturing Township (IMT) Kharkhoda, aimed at creating jobs for 50,000 locals per city

- Formulate country-specific labour mobility agreements for targeted employment in sectors like healthcare, construction, and IT
- Build the Global Haryanvi Network (GHN): An integrated digital platform for diaspora mapping, engagement, and contribution tracking.
- Develop 143 new industrial clusters of MSMEs—one in each block
- Develop smart city infrastructure, enhancing connectivity
- Build specialised industrial zones with sector-specific facilities
- Ensure affordable access to advanced infrastructure for startups

Promoting Innovation and Future Technologies

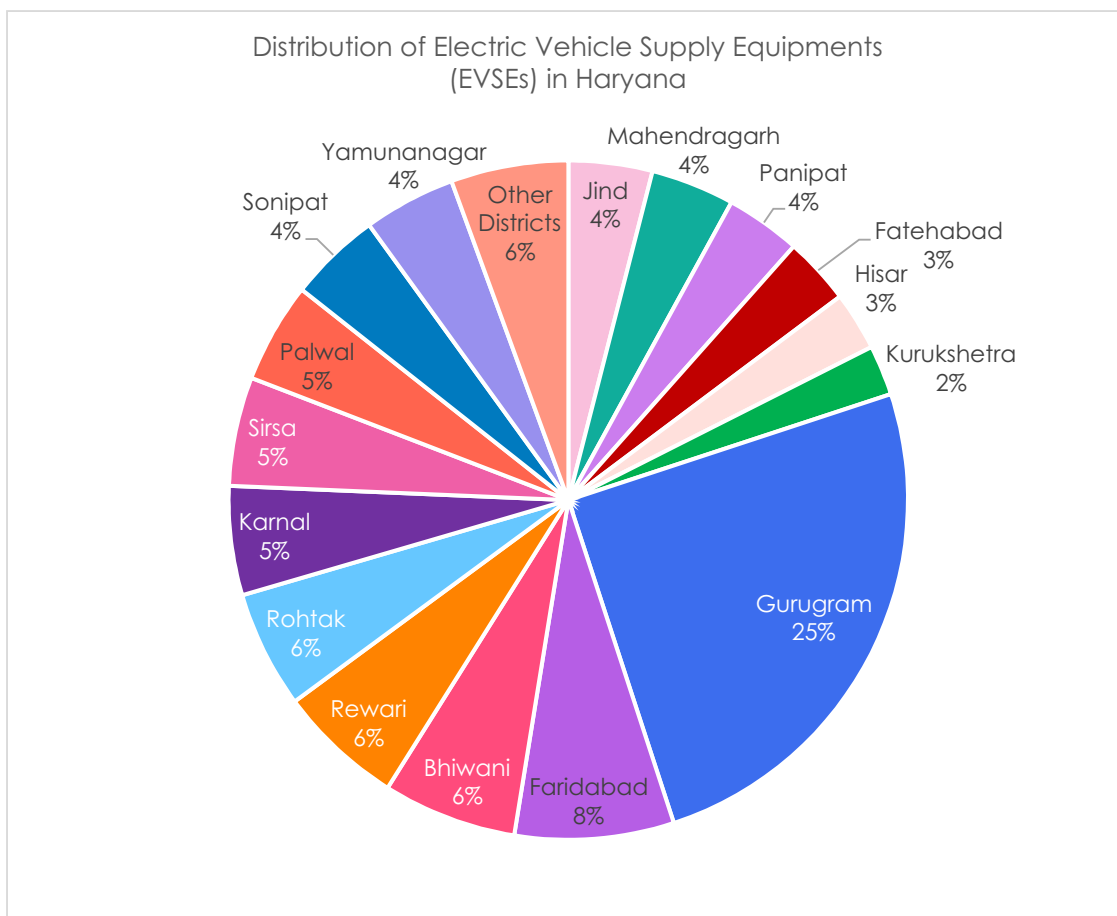
- Foster a statewide innovation ecosystem supporting all transformative technologies—AI, biotech, clean energy, advanced materials, and climate-tech.
- Position Haryana as a national leader in sustainable, inclusive technology-led growth.

ISSUE 2: TRANSFORMING SUPPLY CHAIN LOGISTICS AND TRANSPORT INFRASTRUCTURE TO BE ENERGY EFFICIENT, RESILIENT AND SMART

Haryana's strategic geographic position has established it as a crucial logistics hub in India's economic landscape. The state is undertaking a comprehensive transformation of its supply chain logistics and transport infrastructure to enhance energy efficiency, build resilience against disruptions, and integrate smart technologies. This evolution is critical for supporting industrial growth, reducing environmental impact, and maintaining competitive advantage in a rapidly changing economic environment. By modernising logistics networks and transportation systems, Haryana aims to facilitate seamless trade flows while advancing sustainability goals through reduced energy consumption and emissions.

Current Status

- ✔ **Logistics Performance:** Haryana maintains its position as an 'Achiever' in the Logistics Ease Across Different States (LEADS) report, outperforming national and group averages across all categories of logistics infrastructure²²
- ✔ **Strategic Location:** Over 60% of Haryana's area falls under the Delhi-Mumbai Industrial Corridor (DMIC) and a significant portion under the Amritsar-Kolkata Industrial Corridor (AKIC)²³
- ✔ **Infrastructure Development:** The KMP expressway and Nangal Chowdhary Logistics Park at Bawal (886 acres) are boosting logistics capabilities²⁴
- ✔ **Container Facilities:** Nine Inland Container Depots (ICDs), three Container Freight Stations (CFSs), and eight private freight terminals handling approximately 10 lakh Twenty-Foot Equivalent Unit (TEU) of container traffic annually²⁵
- ✔ **Major Logistics Hubs:** Garhi-Harsaru (Gurugram) handling up to 2,60,000 TEUs annually and ICD Piyala (Faridabad) processing around 1,50,000 TEUs²⁶
- ✔ **Private Sector Investment:** Flipkart's Regional Distribution Centre in Manesar and new grocery Fulfilment Centre in Sonipat (2023) represent significant commercial logistics development²⁷
- ✔ **Future Development:** Three Multi-Modal Logistics Parks planned for Hisar, Ambala, and Mahendragarh districts²⁸
- ✔ **EV Infrastructure:** 454 charging stations (2.9% of India's total) with the highest concentration in Gurugram (25.1% of Haryana's total) and Faridabad (7.6%)²⁹
- ✔ **EV Incentives³⁰:** Comprehensive support for the EV ecosystem, envisaged and laid out as part of the **Haryana EV Policy (2022)**, including:
 - 15% capital subsidy on Fixed Capital Investment (up to INR 1 crore) for battery disposal/recycling facilities
 - 100% stamp duty reimbursement for land/buildings used in EV manufacturing
 - 100% Electricity Duty exemption for 20 years
 - 50% cost reimbursement (up to INR 50 lakh) for water treatment plants for manufacturing units
 - Inclusive job creation offering INR 48,000 annually for 10 years for every local worker employed in the EV sector
 - Strengthening R&D with grants up to INR crores for EV technology and INR 25 lakh for building R&D capacity in 20 academic institutions
- ✔ **Haryana Registered Vehicle Scrappage & Recycling Facility Incentive Policy, 2024:** under which vehicle scrappage and recycling units are recognised as industrial units and are eligible for a range of fiscal incentives, including capital subsidy, SGST reimbursement, and venture capital support. A 10-year land leasing model further promotes the setting up of these environmentally critical units.



Graph 34: Distribution of EVSEs in Haryana
(Source: India's Public EV Charging Infrastructure Readiness – A Case Study of Haryana State)

Factors Influencing the Issue

The transformation of Haryana's supply chain logistics and transport infrastructure is driven by multiple interrelated factors. Government policies promoting sustainability and environmental conservation provide regulatory incentives for adopting energy-efficient practices. Rising operational costs, particularly fuel expenses, encourage businesses to implement smart technologies for optimising transport and logistics management. Heightened environmental awareness among consumers and stakeholders creates market pressure for sustainable supply chain operations. Technological advancements, particularly in IoT, AI, and automation, enable the development of sophisticated logistics solutions that enhance efficiency and resilience. Regulatory frameworks governing emissions, vehicle standards, and transport safety influence implementation timelines and approaches. The imperative to reduce carbon footprints and mitigate climate change impacts drives strategic investments in sustainable transport infrastructure and green logistics practices across the state.

Impacts of the Issue

Direct Impact

- **Cost Reduction:** Energy-efficient logistics systems directly lower operational expenses through reduced fuel consumption, optimised routes, and decreased maintenance requirements.
- **Enhanced Resilience:** Implementation of redundant transportation routes, real-time tracking systems, and disaster preparedness protocols directly strengthen supply chain resilience against disruptions.
- **Operational Efficiency:** Smart technologies like IoT, AI, and blockchain directly improve logistics performance through automated processes, predictive capabilities, and enhanced visibility.
- **Compliance Assurance:** Updated systems ensure adherence to evolving environmental regulations and emissions targets, reducing regulatory risks and potential penalties.

Indirect Impact

- **Environmental Conservation:** Transformed logistics operations contribute to reduced carbon emissions, minimised resource consumption, and mitigation of environmental risks, supporting broader climate goals.
- **Value Chain Optimisation:** Improved logistics enables operational enhancements across entire supply chains, increasing productivity and reducing waste throughout interconnected business networks.
- **Economic Growth Stimulation:** Modernised logistics infrastructure creates new opportunities for innovation, investment, and job creation in technology-related fields and specialised logistics services.
- **Stakeholder Collaboration:** Advanced logistics frameworks foster partnerships among government entities, private enterprises, and technology providers to develop integrated solutions for complex challenges.

Global Learnings

Global Best Practice

Electrified Last-Mile Logistics with E-Bikes and AI Routing: Germany's DHL Group has pioneered sustainable last-mile delivery by deploying over 6,100 e-bikes, 13,500 e-trikes, and 23,000 electric vans, achieving carbon-free deliveries in approximately half of its domestic service areas. This initiative not only reduces emissions but also enhances delivery efficiency; studies indicate that cargo e-bikes can be 60% faster than vans in congested urban settings. Complementing this fleet transformation, DHL employs AI-driven route optimisation to minimise fuel consumption and delivery times, illustrating an integrated approach to decarbonising urban logistics.³¹

Disruptive Technologies - Navigating Uncertainties: The Art of Scenario Planning in Logistics

Scenario planning emerges as a crucial logistics technology for navigating uncertainties within the supply chain. Leveraging digital twin technology, it simulates processes, foresees potential issues, and proposes strategic solutions. For instance, disruptions like those caused by climate change, such as droughts in key shipping routes like the Panama Canal, can be effectively managed through scenario planning. By analysing historical data, this technology can simulate the impact of such events on transportation networks and suggest alternative routes or modes to mitigate disruptions.³²

Possible Pathways

Short-Term Pathway (2030)

Policy and Incentive Framework

- Announcement of a new Haryana State Logistics, Warehousing & Retail Policy 2025 and formulating a Comprehensive Logistics Action Plan (CLAP). These will drive infrastructural development and efficiency by providing fiscal and non-fiscal incentives for multi-modal hubs (ICDs, CFS, warehouses) to shift long-haul freight from road to lower-emission rail/barge and consolidate cargo, reducing empty trips.
- Introduce enhanced tax and non-tax incentives via a revised EV Policy to accelerate electric vehicle adoption, focusing on last-mile delivery electrification, incentivising EV manufacturing and component production, and expanding charging infrastructure.
- Implement accelerated depreciation for low-carbon transport solutions and establish public-private partnerships for scaled adoption.

Resilience Planning Implementation

- Enforce regulations requiring resilience planning in all transport projects
- Mandate risk assessments for new infrastructure to mitigate extreme weather impacts
- Integrate nature-based solutions for flood-resistant and heat-adaptive infrastructure
- Develop Haryana Multi-modal Logistics Plan based on state-wide need assessment for MSME logistics infrastructure

Workforce Capacity Building

- Develop training programmes for transport workers on energy-saving techniques, green construction, smart city technologies, and sustainable urban planning.
- Partner with transport unions and logistics companies for broad participation
- Implement certification programs to standardise best practices

Long-Term Pathway (2047)

Comprehensive Legislation

- Enact comprehensive legislation mandating smart technology integration
- Define state-level standards for IoT-enabled traffic management and AI-driven systems
- Ensure compliance through incentives and phased implementation deadlines

State-Level Sustainable Logistics Strategy

- Develop a comprehensive state-level sustainable logistics strategy that champions green trucking, fuels, and technology, alongside captive solar power generation. This strategy will incentivise green logistics hubs with tax benefits and infrastructure support, promoting sustainable design standards (e.g., LEED/GRIHA) to decarbonise the sector. It will also foster multi-modal transport optimisation and low-carbon supply chains, developing Integrated Multi-Modal Logistics Parks for enhanced freight efficiency.

Centres of Excellence Establishment

- Establish centres of excellence dedicated to sustainable transport research
- Partner with universities and industry leaders for a cutting-edge curriculum
- Provide grants and fellowships to support innovation in transport sustainability

Advanced Technology Deployment

- Deploy blockchain for transparent supply chain tracking
- Implement AI-driven logistics optimisation systems
- Create real-time data exchange platforms for improved coordination

Short-Term Pathway (2030)

Research and Education Enhancement

- Offer scholarships for students specialising in sustainable transportation
- Partner with universities and industry stakeholders for research in smart mobility
- Establish mentorship programmes bridging academia and industry

Data Analytics Implementation

- Invest in advanced data collection tools for tracking efficiency and emissions
- Develop real-time dashboards for optimising energy usage and maintenance
- Deploy predictive analytics for infrastructure vulnerability assessment

EV Battery Disposal Interventions:

- Enforcing strict Extended Producer Responsibility (EPR) norms, mandating producers to ensure collection and recycling of end-of-life batteries.
- Fast-tracking environmental and hazardous waste approvals and simplifying compliance to 3–4 months.
- Setting up a dedicated nodal agency to coordinate lifecycle management and monitor KPIs.
- Enhancing targeted subsidies and tax breaks for startups and recyclers.

Emerging Industrial and Technology Hubs

- Operationalise Hisar Aviation and Integrated Manufacturing Hub as a key node for aerospace and logistics-linked industries.
- Strengthen Gurugram’s Global Capability Centres (GCCs) and attract data centres and tertiary healthcare investments.
- Develop Kurukshetra, Hisar, and Rohtak as alternate IT hubs through academic–industry linkages inspired by the Technopark Thiruvananthapuram model.

Long-Term Pathway (2047)

Zero-Emission Transportation System

- Accelerate the transition to zero-emission vehicles through expanded charging networks
- Implement strict emission reduction targets across all transport modes
- Support localised battery manufacturing and green hydrogen production
- Launch the Haryana EV for Cargo Logistics Scheme to promote electronic cargo vehicles to decarbonise MSME Logistics

Integrated Infrastructure Master Plan

- Develop a comprehensive Integrated Infrastructure Master Plan to synchronise transport, energy, and digital infrastructure for optimal resource use, reduced redundancies, and enhanced resilience. This plan will also promote transit-oriented development (TOD) and expand public transport networks, including Metro and Bus Rapid Transit Systems.

EV Battery Disposal Interventions

- Promoting cutting-edge recycling technologies (hydrometallurgy, robotic disassembly) through PPPs.
- Establishing decentralised modular recycling hubs to cut costs and risks.
- Investing in R&D through universities and industries to build indigenous circular economy solutions.

Emerging Industrial and Technology Hubs

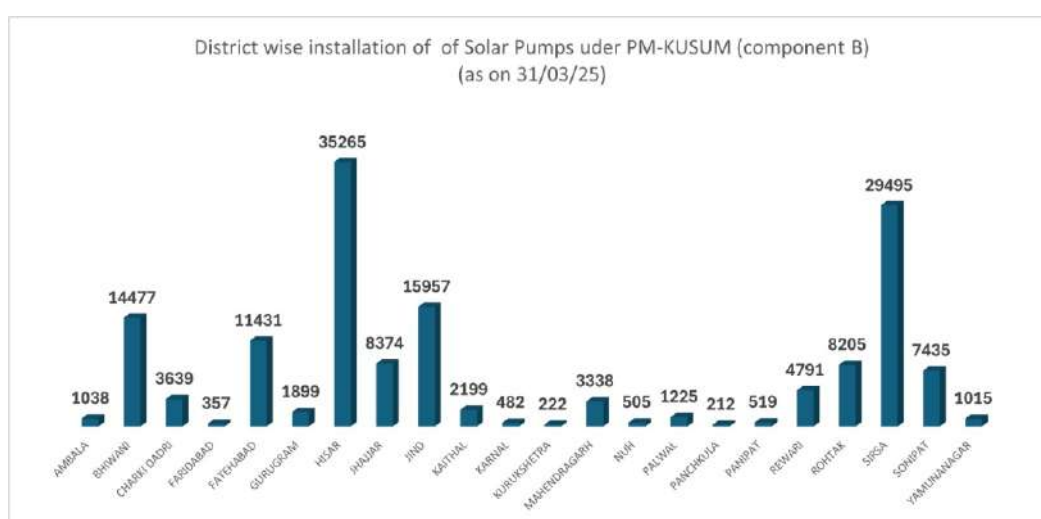
- Evolve a network of smart industrial corridors integrating advanced manufacturing, R&D, and digital infrastructure.
- Position Gurugram and Hisar as global innovation destinations for aerospace, IT, and life sciences sectors.
- Expand regional IT and innovation ecosystems across tier-2 cities for balanced development.

ISSUE 3: GREEN, AFFORDABLE AND ACCESSIBLE ENERGY AND DECENTRALISED GRID MANAGEMENT

Haryana is making significant progress toward establishing a sustainable, equitable energy ecosystem through the development of green, affordable, and accessible energy solutions coupled with decentralised grid management. This transformation is critical for environmental sustainability, economic development, and social equity. The state is strategically investing in renewable energy sources, improving grid efficiency, and ensuring universal energy access while implementing innovative approaches to grid management that enhance resilience, reduce losses, and optimise distribution. These initiatives are positioning Haryana as a leader in sustainable energy practices while ensuring that the benefits of clean energy are equitably distributed across all segments of society. The state is also providing financial incentives towards energy conservation, water audits, solar rooftop support, etc., under its various policies to encourage households and industries to adopt sustainable & green production practices.

Current Status

- ✔ **Renewable Energy Integration:** 8.06% share of renewable energy in total installed electricity generation (2020-21)³³, with a projected increase to 22.92% in state power supply (FY 2022-23)³⁴
- ✔ **Generation Capacity:** Total installed capacity of 15,936.65 MW as of December 2024³⁵
- ✔ **Distribution Efficiency:** AT&C losses reduced to 10.48% during FY 2023-24 from 30.02% in FY 2015-16³⁶
- ✔ **Solar Energy Adoption:** Approximately 3.43% of total energy generated from solar sources (2020-21)³⁷ with Haryana having the highest solar penetration after Delhi (approximately 64% as of February 2024)³⁸
- ✔ **Per Capita Capacity:** 325.08 watts per capita renewable energy generating capacity installed³⁹
- ✔ **Electrification Coverage:** 100% of villages electrified as of March 2023, serving 79,22,316 electricity connections⁴⁰
- ✔ **Solar Irrigation:** 1,52,080 solar pumps with 129.48 MW capacity installed under PM-KUSUM (component-B) by 2024-25⁴¹
- ✔ **Renewable Capacity:** 304.31 MW renewable energy capacity in Haryana in 2023-24⁴²
- ✔ **Budget Allocation:** Projected budget estimate of INR 6,772.36 crore for Developmental Revenue Expenditure on Energy in 2024-25, representing 4.7% of state expenditure (equal to the average allocation by states)⁴³



Graph 35: District wise installation of Solar Pumps under PM-KUSUM (component B) (as on 31/03/25)
(Source: New&Renewable Energy Department, Government of Haryana)

Factors Influencing the Issue

The advancement of green, affordable, and accessible energy, along with decentralised grid management in Haryana, is shaped by several key factors. Government policies and regulatory frameworks create the foundation for renewable energy adoption through targets, subsidies, and incentive structures. Economic considerations, including declining costs of renewable technologies and potential savings through energy efficiency, enhance the financial viability of green energy initiatives. Increasing public awareness about climate change and sustainability drives community support and market demand for environmentally responsible energy solutions. Technological progress in renewable energy generation, energy storage, and smart grid systems enables more efficient, reliable, and distributed energy management. Regulatory standards for energy efficiency, renewable energy integration, and grid operations provide consistent guidelines for implementation. The urgency of climate change mitigation creates an imperative for accelerated transition to low-carbon energy systems, influencing investment priorities and implementation timelines across the state.

Impacts of the Issue

Direct Impact

- **Reduced Fossil Fuel Dependence:** Implementation of green energy solutions directly decreases reliance on coal, oil, and natural gas, lowering associated pollution and resource depletion.
- **Enhanced Energy Affordability:** Strategic pricing mechanisms and subsidy structures directly reduce energy costs for consumers, particularly benefiting low-income households and small businesses.
- **Improved Grid Stability:** Decentralised management systems directly enhance distribution efficiency, reducing transmission losses and improving reliability during peak demand or extreme weather events.
- **Universal Energy Access:** Targeted infrastructure development directly ensures that remote and underserved communities gain reliable electricity connections, supporting basic needs and economic activities.

Indirect Impact

- **Job Creation:** The renewable energy sector generates employment opportunities in manufacturing, installation, maintenance, and grid management, stimulating economic development.
- **Community Empowerment:** Decentralised energy systems enable local control over energy production and consumption, fostering self-sufficiency and economic independence.
- **Environmental Preservation:** Reduced emissions from the energy sector contribute to improved air quality, water conservation, and ecosystem protection throughout the region.
- **Innovation Acceleration:** The transition to sustainable energy stimulates research and development in related technologies, creating opportunities for technological advancement and knowledge transfer.

Global Learnings

Global Best Practice

Smart Grids and Decentralised Energy Management:

Germany's energy transition emphasises decentralised energy generation and smart grid integration. Through initiatives like the SINTEG programme, Germany has developed intelligent energy systems that incorporate renewable energy sources, digital technologies, and consumer participation. The 'Smart Meter Gateway' infrastructure facilitates real-time data exchange between consumers and grid operators, enhancing demand-side management and grid stability.⁴⁴

Disruptive Technologies - Elevating Wind Energy Efficiency: Cutting-Edge Solutions and Grid Innovations

Harnessing advanced computational models and AI algorithms, wind energy optimisation is revolutionising the design and placement of turbines. This entails predictive analytics for maintenance and the adoption of noise reduction technologies to mitigate community impact. In parallel, the evolution of smart grid technology plays a pivotal role in integrating renewable energy sources. Startups are spearheading the development of sophisticated grid management systems, leveraging AI and ML to harmonise supply and demand, optimise energy distribution, and fortify grid resilience.⁴⁵

Possible Pathways

Short-Term Pathway (2030)

Micro-Grid Integration

- Develop regulations for Micro-Grid integration with the National Grid
- Establish technical standards and tariff mechanisms for decentralised generation
- Facilitate public-private partnerships to accelerate micro-grid deployment

Agro-Energy Synergy

- Formulate a Policy on Solar Cultivation promoting dual-use solar farms
- Provide financial incentives for farmers adopting agro-photovoltaic systems including mechanisms to sell unused power back to the grid for additional income.
- Develop demonstration projects showcasing productivity and energy benefits

Long-Term Pathway (2047)

Renewable Energy Mandate

- Establish legally binding renewable energy targets with annual capacity additions
- Create fast-track approval processes for renewable energy infrastructure
- Implement financial penalties for non-compliance with renewable standards

Grid-Scale Storage Deployment

- Deploy grid-scale battery storage projects in high-demand regions
- Integrate AI-driven predictive maintenance for grid optimisation
- Implement IoT-enabled autonomous controls for supply-demand balancing

Critical Infrastructure Enhancement

- Upgrade power lines and elevate substations in flood-prone areas
- Integrate real-time weather monitoring systems for proactive disaster response

Short-Term Pathway (2030)

Industrial Energy Optimisation

- Implement a renewable energy optimisation policy for high-energy sectors
- Introduce time-of-use pricing and demand-response programmes
- Establish energy auditing protocols and benchmarking systems

Clean Fuel Transition

- Implement a Cleaner Fuel Policy mandating the transition to CNG and PNG
- Offer tax incentives and infrastructure support for fueling stations
- Develop conversion subsidy programmes for residential and commercial users

Grid Modernisation

- Upgrade transmission and distribution networks for fluctuating renewable inputs
- Invest in smart grids, energy storage, and digital monitoring systems
- Implement advanced metering infrastructure and automation

Urban Transformation and Connectivity

- Upgrade urban infrastructure and quality of life in all major towns and district headquarters.
- Modernise supply chains and logistics for horticulture and livestock-based products, improving farmer incomes and agro-processing competitiveness.
- Achieve Level-Crossing-Free State status by 2030–2035 to enhance safety and mobility.

Long-Term Pathway (2047)

- Expand microgrid deployment in remote and disaster-prone regions

Corporate Renewable Procurement

- Mandate corporate renewable energy procurement through enforceable obligations
- Incentivise green power purchase agreements with favourable tax treatment
- Create transparent tracking and verification systems for compliance

Carbon-Neutral Energy Ecosystem

- Establish net-zero industrial clusters with waste heat recovery systems
- Develop circular economy principles for energy production and consumption
- Create a comprehensive carbon capture and utilisation infrastructure

Urban Transformation and Connectivity

- Develop future-ready, climate-resilient cities under the Panchgram framework with integrated smart mobility, waste, and water systems.
- Establish regional logistics and agri-processing hubs linked to multi-modal transport networks.
- Institutionalise smart urban governance for real-time service delivery and citizen participation.

ISSUE 4: ADOPTING SUSTAINABLE, GREEN TECHNOLOGY STANDARDS, SOPs FOR INFRASTRUCTURE AND BUILDING

Haryana is actively implementing sustainable and green technology standards along with SOPs for infrastructure and building development. This strategic initiative aims to reduce environmental impacts, enhance resource efficiency, and create healthier living and working environments across the state. By establishing comprehensive frameworks for green construction, energy-efficient systems,

and sustainable materials, Haryana is working to transform its entire built environment—including buildings, infrastructure, and public spaces—to meet evolving environmental challenges while supporting economic growth. The integration of these standards into regulatory frameworks and development practices positions the state as a leader in sustainable infrastructure development with long-term benefits for communities, businesses, and ecosystems.

Current Status

- ✔ **Regulatory Framework:** Energy Conservation Building Code (ECBC) notified and incorporated into the unified building bylaws of Haryana
- ✔ **Green Building Adoption:** 334 certified green buildings in the state (certified by GBCI, IGBC & GRIHA), with 52% being ECBC compliant⁴⁶
- ✔ **Energy Conservation Impact:** 9 Million Units (MU) of energy saved and 7,000 tonnes of CO₂e emissions avoided through energy efficiency programmes in commercial buildings⁴⁷
- ✔ **Annual Energy Savings:** Documented savings of 6,543,330 kWh in FY 2020-2021 and 7,174,950 kWh in FY 2021-2022⁴⁸
- ✔ **Emissions Reduction:** 5,561 tonnes CO₂e avoided in FY 2020-2021 and 6,098 tonnes CO₂e in FY 2021-2022 through energy-efficiency street lighting⁴⁹
- ✔ **Notable Achievements:** Haryana's Model Economic Township awarded the Confederation of Indian Industry's (CII) Indian Green Building Council 'Green Cities Platinum' certification⁵⁰
- ✔ **Waste Management:** Proportion of waste recycled vs. waste generated: 2.20 (2020-21)⁵¹
- ✔ **Municipal Services:** 87% of households have solid waste regularly collected (2021-22)⁵²

Factors Influencing the Issue

The adoption of sustainable, green technology standards and SOPs for infrastructure and building in Haryana is influenced by several interconnected factors. Government policies and international agreements provide the regulatory framework and incentives for sustainable practices, while economic considerations, including cost-benefit analyses and market demand for eco-friendly solutions, drive investment decisions. Public awareness and community engagement shape social acceptance and demand for green infrastructure, with technological advancements enabling innovative solutions in construction materials, energy systems, and waste management. Regulatory compliance with environmental standards and building codes establishes minimum requirements for sustainability performance, while environmental concerns, including climate change impacts and resource scarcity, create urgency for adopting resilient, low-impact development approaches. Together, these factors create a complex ecosystem that determines the pace and scale of sustainable infrastructure development across the state.

Impacts of the Issue

Direct Impact

- **Enhanced Reputation:** Organisations and projects implementing sustainable standards gain recognition as environmentally responsible entities, improving brand value and stakeholder relations.
- **Regulatory Compliance:** Adoption of green standards ensures adherence to environmental regulations, minimising legal risks and avoiding potential penalties for non-compliance.
- **Resource Efficiency:** Green technologies directly reduce energy, water, and material consumption, generating operational cost savings throughout infrastructure lifecycles.
- **Improved Occupant Health:** Green buildings with enhanced air quality, natural lighting, and reduced toxins directly benefit the health, well-being, and productivity of occupants.

Indirect Impact

- **Green Job Creation:** The sustainable infrastructure sector generates specialised employment opportunities in design, construction, certification, and maintenance of green buildings and systems.
- **Knowledge Transfer:** Implementation of sustainable practices facilitates skill development and expertise sharing across industries, fostering innovation and capacity building.
- **Natural Resource Conservation:** Sustainable building practices reduce extraction demands for raw materials, minimise waste generation, and protect ecosystems from development impacts.
- **Community Resilience:** Sustainable infrastructure strengthens local resilience to climate impacts, enhances property values, and creates more livable communities with long-term social benefits.

Global Learnings

Global Best Practice

Singapore's Green Mark 2021: Singapore's Building and Construction Authority has implemented the Green Mark 2021 (GM: 2021) certification scheme, a comprehensive framework tailored for tropical climates to promote sustainable building practices. This scheme emphasises key sustainability outcomes, including energy performance, embodied carbon reduction, smart technology integration, climate resilience, and occupant health.⁵³

Disruptive Technologies -Harnessing Molten Salts for Thermal Energy Storage

Molten salts represent a versatile phase change material widely employed in thermal energy storage systems. Solid at room temperature and atmospheric pressure, they transition into a liquid state when absorbing thermal energy. Typically composed of 60% sodium nitrate and 40% potassium nitrate, these salts melt at around 220°C. Primarily integrated with concentrating solar power (CSP) plants, molten salts serve as reservoirs for excess heat that is not immediately utilised for electricity generation. Stored within insulated tanks, this thermal energy becomes a valuable resource post-sunset. By converting stored thermal energy into steam, CSP plants can

Case Study of Kalundborg Industrial Symbiosis, Denmark

The Kalundborg industrial symbiosis case in Denmark is a pioneering example of industrial ecology, where a network of private and public enterprises collaborates to optimise resource use by exchanging energy, water, and material by-products. Originating in the 1960s with a project to share water resources, the network organically expanded to include major partners such as the Asnæs Power Station, Novo Nordisk, Novozymes, Statoil, and several others. In this system, surplus heat, steam, wastewater, and other by-products from one facility become valuable inputs for another. For example, excess heat from the power plant is used to heat local homes and a fish farm, while gypsum from sulfur scrubbers is supplied to a wallboard manufacturer. This circular approach has transformed what was once industrial waste into revenue streams, delivering significant environmental and economic benefits, including annual savings of €24 million, reductions of 6,35,000 tonnes of CO₂, 3.6 million cubic metres of water, and 100 GWh of energy.

continue generating electricity even in the absence of direct sunlight. Moreover, the capacity for thermal energy storage using molten salts enables CSP plants to smooth out electricity production, reducing the variability inherent in solar photovoltaic (PV) technologies.⁵⁴

Possible Pathways

Short-Term Pathway (2030)

Governance Structure Establishment

- Create a cross-functional sustainability committee with representatives from key departments
- Develop a green technology roadmap with clear SOPs and compliance checklists
- Set measurable targets for implementation across sectors

Financial Mechanism Development

- Identify grants and subsidies from national and international sources

- Allocate initial budget for pilot initiatives in solar installations and retrofits
- Create financial incentives for early adopters of green standards

Capacity Building Implementation

- Conduct mandatory training sessions on green construction, smart city technologies, and sustainable urban planning for staff, contractors and project managers.

Short-Term Pathway (2030)

- Implement certification programmes to ensure compliance with green standards
- Develop professional development pathways for sustainability specialists

Energy Efficiency Programmes

- Perform comprehensive energy audits of existing infrastructure
- Recommend retrofits for lighting, HVAC, and energy management systems
- Establish annual energy performance benchmarks for measuring improvements

Green Building Standards Implementation

- Mandate renewable energy integration and green building certifications
- Implement circular economy principles for materials and water systems
- Integrate climate-resilient design requirements into building codes

Digital Governance Interventions

- Build the Haryana State Data Grid (HSDG) as the Digital Backbone: Establish a unified state-level data grid integrating departmental databases to enable cross-sector analytics, improve service delivery, and support evidence-based policymaking.

- Adopt Data-Driven and AI-Enabled Governance: Deploy AI-based decision dashboards across departments for real-time monitoring, predictive analytics (e.g., drought/stubble alerts, disease mapping, revenue forecasting), and data-driven policymaking.
- Develop an AI-Integrated State Digital Twin: Create a dynamic digital twin of Haryana to support simulation-based urban planning, infrastructure management, and environmental monitoring—drawing inspiration from Singapore’s Virtual Singapore. This will allow real-time simulation for evidence-backed decisions.
- Institutionalise Innovation & Governance Foresight: Set up Data Innovation Labs (in collaboration with universities, startups, and global partners) to develop AI prototypes and predictive tools. Introduce a Foresight-Driven Governance Index to annually assess departments’ innovation readiness, adaptability, and progress.

Energy Efficiency and Governance Innovation

- Institutionalise annual energy audits across all Government departments, PSUs, educational and healthcare institutions.
- Recognise and reward top-performing entities to encourage energy efficiency and responsible governance.

Long-Term Pathway (2047)

Vertical and Aerial Infrastructure Policy

- Formulate comprehensive regulations for high-rise buildings and aerial infrastructure
- Establish safety, sustainability, and zoning regulations for emerging construction types
- Create permitting frameworks ensuring climate resilience and efficient land use

- Enhanced MSME Policy & revamped Cluster Plug & Play Scheme focusing on promoting green buildings & facilities, energy efficiency & reducing carbon footprint

Long-Term Pathway (2047)

Life Cycle Cost Analysis Integration

- Mandate total cost-of-ownership assessments for all public infrastructure projects
- Require life cycle analysis for procurement decisions to demonstrate long-term savings
- Develop standardised methodologies for calculating lifetime environmental and carbon impacts, aligned with international ESG reporting norms

Sustainable Workforce Development

- Establish specialised training programmes and certification courses on green construction, smart city technologies, and sustainable urban planning.
- Create university partnerships for research and education in sustainable construction
- Develop career pathways and mentorship opportunities in the green infrastructure fields

Smart Infrastructure Monitoring

- Deploy IoT sensors and AI-driven analytics for real-time infrastructure monitoring

- Implement predictive maintenance systems and automated fault detection
- Create smart dashboards tracking energy consumption and structural health

Comprehensive Retrofitting Programme

- Launch nationwide programmes to upgrade ageing infrastructure
- Implement high-efficiency insulation and renewable energy systems
- Create performance-based incentives for sustainability retrofits in existing buildings

Energy Efficiency and Governance Innovation

- Embed energy efficiency and carbon accountability systems within governance architecture.
- Create a statewide Green Governance Index benchmarking institutions on sustainability and innovation.

ISSUE 5: BRIDGING MULTI-DIMENSIONAL DIGITAL DIVIDE AND INTEGRATING NEW TECHNOLOGIES FOR SEAMLESS PUBLIC SERVICES

Haryana is addressing the complex challenge of digital inequality while simultaneously leveraging emerging technologies to transform public service delivery. This dual approach aims to ensure that all citizens—regardless of location, socioeconomic status, or technical proficiency—can benefit from the state's digital transformation. By expanding digital infrastructure, enhancing access to devices and connectivity, building digital literacy, and implementing innovative technology solutions for government services, Haryana is working to create an inclusive digital ecosystem that improves quality of life, increases economic opportunities, and strengthens civic participation across all segments of society.

Current Status

- ✔ **Internet Penetration:** 117.13 internet subscriptions per 100 population (December 2024)⁵⁵
- ✔ **Digital Divide:** 10.06 million rural internet subscribers compared to 20.20 million urban subscribers, reflecting geographical disparities⁵⁶
- ✔ **Connectivity Type:** Predominantly broadband connections with 10.06 million rural and 20.20 million urban broadband subscribers, while narrowband connections number 0.20 million in rural and 1.66 million in urban areas⁵⁷
- ✔ **Mobile Connectivity:** 12.19 million wireless subscribers in rural areas versus 23.02 million in urban areas⁵⁸

- ✔ **Device Access:** 92.4% of enrolled school children have smartphone availability at home (2024)⁵⁹
- ✔ **Rural Connectivity:** 6,204 Gram Panchayats declared service-ready under the Bharat Net project⁶⁰
- ✔ **Digital Infrastructure:** 80 applications/websites of various departments hosted on the State Data Centre, with seven Mission Mode Projects operational⁶¹
- ✔ **Cybersecurity:** New security appliance deployed to counter cyber threats⁶²
- ✔ **Digital Governance:** Approximately 10 lakh gate passes issued for transparent food procurement and payment files of more than INR 40,000 crore processed through the e-Kharid portal⁶³
- ✔ **Citizen Services:** 557 State Government-to-Citizen (G2C) services/schemes from 45 departments provided through Antyodaya Saral⁶⁴
- ✔ **Digital Transactions:** Haryana Cashless Consolidated portal monitoring over 483.32 crore digital transactions⁶⁵
- ✔ **Innovation Leadership:** First state to onboard services on UMANG Platform (2018-19)⁶⁶
- ✔ **Citizen Feedback:** 392 services from 33 departments integrated with Haryana-Real time Automated Feedback Dashboard (H-RAFD)⁶⁷

Factors Influencing the Issue

The Efforts to bridge the digital divide and integrate new technologies for public services in Haryana are shaped by multiple interconnected factors. Government policies and priorities determine resource allocation and strategic direction for digital infrastructure and inclusion initiatives. Economic considerations, including budget constraints and development goals, influence the scale and scope of technology adoption across sectors. Societal factors such as educational disparities, language barriers, and demographic characteristics affect digital literacy and technology adoption rates among different population segments. Technological advancement enables innovative solutions for service delivery while creating challenges for keeping pace with rapidly evolving digital landscapes. Regulatory frameworks for data privacy, cybersecurity, and digital rights establish the boundaries for technology implementation and usage. Geographic considerations, including rural-urban disparities and physical infrastructure limitations, impact the feasibility and cost of expanding digital access to remote areas. Together, these factors create a complex environment that require comprehensive, multi-dimensional strategies to achieve digital inclusion and seamless public service delivery.

Impacts of the Issue

Direct Impact

- **Improved Service Accessibility:** Digital integration directly enhances citizen access to essential government services, reducing time, cost, and effort required for service utilisation.
- **Enhanced Digital Literacy:** Targeted initiatives directly increase citizens' ability to navigate digital platforms, access information, and engage with online services effectively.

Indirect Impact

- **Economic Development:** Digital inclusion stimulates entrepreneurship opportunities, particularly in e-commerce and digital services, creating new economic pathways for previously disconnected communities.
- **Educational Advancement:** Improved digital access enables distance learning, research capabilities, and skills development, enhancing human capital across regions.

Direct Impact

- **Reduced Administrative Burden:** Technology integration directly streamlines government processes, reducing paperwork, processing times, and administrative costs.
- **Data-Driven Decision Making:** Integration of digital technologies enables the collection and analysis of comprehensive data, supporting evidence-based policy formulation and resource allocation.

Indirect Impact

- **Enhanced Transparency:** Digital systems facilitate real-time data collection, monitoring, and reporting, strengthening accountability in governance and public expenditure.
- **Social Cohesion:** Expanded digital connectivity fosters community networks, information sharing, and collective action, strengthening social bonds across geographic and demographic boundaries.

Global Learnings

Global Best Practice

High-Speed Broadband as Foundational Infrastructure for Inclusive Digital Growth:

Finland has classified internet access as a legal right since 2010, embedding high-speed broadband within its national infrastructure development strategy. Through the Broadband 2025 programme, the government co-invests with municipalities and telecom companies to ensure gigabit connectivity in rural and remote regions, enabling equal access to digital public services such as healthcare, education, and administrative platforms.⁶⁸

Disruptive Technologies - Breaking Barriers: The Rise of Low-Earth Orbit Satellite Systems

Traditional broadband infrastructure struggles to extend its reach to remote corners of the globe, leaving millions without connectivity. However, the emergence of Low-Earth Orbit (LEO) satellite systems promises to revolutionise global connectivity, ushering in a new era of technological advancement. Operating at altitudes between 500 and 2,000 kilometres, LEO satellites offer a game-changing advantage by significantly reducing signal latency. This breakthrough enables high-speed internet access in rural and underserved areas, transforming distant dreams into tangible realities. Beyond mere connectivity, this innovation empowers communities with access to essential services like education, healthcare, and economic opportunities.⁶⁹

Possible Pathways

Short-Term Pathway (2030)

Digital Inclusion Task Force

- Form a dedicated committee with government agencies, tech experts, and community representatives
- Assess connectivity gaps, affordability issues, and digital literacy barriers
- Develop a comprehensive digital inclusion policy with implementation roadmaps

Digital Literacy Programmes

- Provide structured training for government employees and community leaders
- Establish local digital support centres with trained personnel
- Develop multilingual training materials for diverse user groups

Digital Needs Assessment

- Conduct a nationwide assessment mapping internet access gaps and device availability
- Utilise surveys, focus groups, and data analytics for targeted interventions
- Create baseline measurements for monitoring progress over time

Strategic Outreach Campaign

- Design multi-platform awareness initiatives through social media and local events
- Inform marginalised communities about available programmes and benefits
- Ensure accessibility in multiple languages and formats

Connectivity Enhancement

- Deploy mobile internet hubs and satellite-based connectivity in rural areas
- Establish solar-powered digital access points in underserved regions
- Create community-managed Wi-Fi networks in remote locations

Long-Term Pathway (2047)

Wireless Power Transfer Technology

- Support R&D initiatives through funding pilot projects and university-industry collaborations
- Establish testing facilities to refine efficiency and safety parameters
- Create regulatory frameworks for large-scale implementation

Public-Private Infrastructure Partnership

- Develop high-quality infrastructure through incentivised private investment
- Create transparent policies ensuring efficient risk-sharing and regulatory support
- Establish long-term sustainability frameworks for digital infrastructure projects

Digital Workforce Development

- Invest in specialised training programmes for AI, blockchain, and cybersecurity
- Create industry-academia partnerships for curriculum development
- Establish continuing education frameworks for rapidly evolving technologies

Comprehensive Digitalisation

- Mandate the adoption of AI-driven automation and blockchain technologies for seamless public services, securing supply chains, reducing fraud in transactions, and enhancing transparency in governance.
- Implement interoperable platforms, ensuring secure data exchange
- Develop real-time service delivery mechanisms across sectors

Universal Accessibility Standards

- Establish inclusive design requirements for all digital services
- Enforce universal accessibility guidelines with compliance monitoring
- Develop comprehensive assistive technology integration frameworks

Short-Term Pathway (2030)

Custom Inclusion Solutions

- Implement multilingual digital interfaces for government services
- Develop assistive technologies for persons with disabilities
- Create simplified service portals for users with limited digital literacy

Long-Term Pathway (2047)

Quantum Technology Integration

- Deploy quantum communications infrastructure for ultra-secure government networks
- Implement quantum computing solutions for complex public service challenges
- Establish quantum encryption standards for critical infrastructure protection

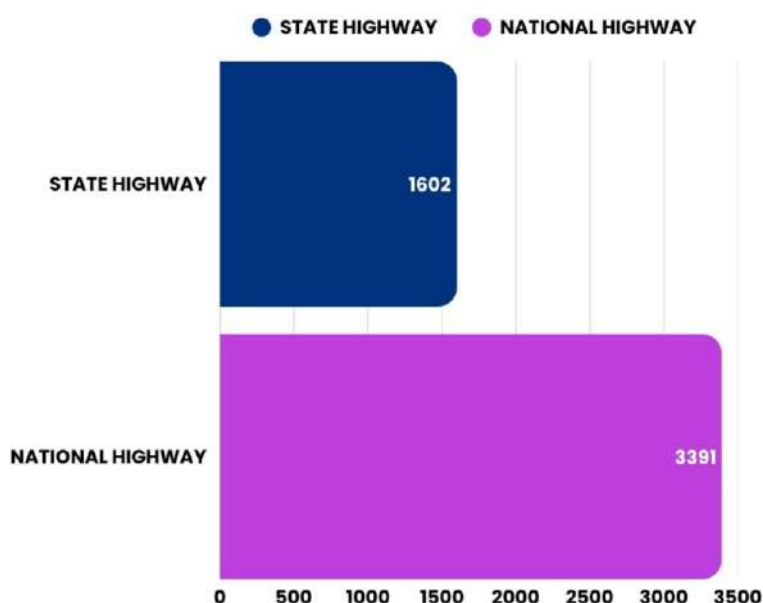
ISSUE 6: BRIDGING DISPARITIES THROUGH INCLUSIVE AND EQUITABLE INFRASTRUCTURE

Haryana is implementing strategic initiatives to address persistent inequalities in infrastructure access across rural-urban divides, between districts, and across gender lines. This multifaceted approach recognises that equitable development requires targeted investment in physical infrastructure—including transportation networks, public facilities, and essential services—that meets the diverse needs of all populations. By enhancing accessibility, improving connectivity, and ensuring gender-responsive design, Haryana aims to reduce geographical and social disparities, improve quality of life for underserved communities, and create more inclusive pathways for economic participation and social integration across the state, thereby reducing migration pressures.

Current Status

- ✓ **Rural Connectivity:** 100% of habitations have access to all-weather roads under the PMGSY⁷⁰
- ✓ **Road Surface Quality:** 79.9% of rural roads and 72.7% of urban roads are surfaced (2019)⁷¹
- ✓ **Highway Network:** Total length of National Highways spanning 3,391 km (representing 2.3% of India's national highways) as of March 2024⁷²
- ✓ **State Road Infrastructure:** State Highways extending 1,638 km⁷³
- ✓ **Infrastructure Quality:** Significant improvements in road quality and connectivity, though variations exist between developed and emerging districts
- ✓ **Gender-Responsive Design:** Increasing focus on infrastructure that addresses women's safety, accessibility, and economic participation needs
- ✓ **Regional Balance:** Ongoing efforts to address infrastructure disparities between the NCR and other parts of the state

Length of Highways (In Km)



Graph 36: Length of Highways
(Source: Ministry of Road Transport and Highways)

Factors Influencing the Issue

Addressing rural-urban, district, and gender disparities in infrastructure access is influenced by a complex interplay of factors. Government policies and priorities determine resource allocation patterns, with historical urban bias often creating imbalanced development. Budget constraints and economic considerations impact the scale and reach of infrastructure projects, affecting implementation timelines and quality standards. Community engagement levels influence the responsiveness of infrastructure design to local needs, particularly for marginalised groups. Technological advancements provide opportunities for innovative infrastructure solutions that can accelerate service delivery in underserved areas. Regulatory frameworks, including land acquisition policies and environmental clearances, affect project implementation speed and cost. Geographic challenges such as terrain diversity and population density variations create differing infrastructure requirements across regions. Social dynamics, including gender norms and power structures, influence how infrastructure benefits are distributed among different population groups. Together, these factors create a complex ecosystem that requires comprehensive strategies to achieve equitable infrastructure development.

Impacts of the Issue

Direct Impact

Enhanced Service Access

- Equitable infrastructure directly improves the availability of essential services, including healthcare, education, and administrative facilities in underserved areas

Social Inclusion:

- Infrastructure designed with gender and accessibility considerations directly enables participation of women, the elderly, and persons with disabilities in economic and social activities

Reduced Travel Burden:

- Enhanced transportation networks directly decrease travel time and costs for rural populations accessing urban services and employment opportunities

Safety Enhancement:

- Gender-responsive infrastructure directly improves safety and security for women and vulnerable groups through features like proper lighting, secure public spaces, and safe transport options

Reduced Rural-Urban Migration:

- Targeted rural infrastructure development directly provides better local opportunities and services, lessening the need for rural populations to migrate to urban centres

Indirect Impact

Economic Opportunity Creation:

- Improved connectivity generates employment opportunities, enhances market access for local products, and stimulates entrepreneurship in previously isolated communities

Health and Educational Outcomes:

- Better infrastructure facilitates access to healthcare facilities and educational institutions, improving community well-being and human capital development

Community Resilience:

- Equitable infrastructure strengthens local governance structures, enhances disaster preparedness, and promotes social cohesion through improved connectivity and service delivery

Demographic Stability:

- Improved rural infrastructure reduces urban migration pressures, maintaining balanced population distribution and preventing excessive urban concentration

Global Learnings

Global Best Practice

Austria – Vienna's Gender Mainstreaming in Urban Planning: Vienna has emerged as a pioneer in integrating gender perspectives into urban planning, ensuring that infrastructure and public spaces cater to the diverse needs of all citizens. Under the leadership of urban planner

Disruptive Technologies - Empowering Communities: The Impact of Gender-Responsive Infrastructure

Infrastructure development, when thoughtfully executed, holds the power to foster women's participation and facilitate access to essential services by considering the unique needs, location, and purpose of buildings. Gender-responsive infrastructure not only addresses practical needs

Eva Kail, the city implemented projects like the Frauen-Werk-Stadt housing complex, designed with features such as on-site childcare, wide stairwells, and proximity to public transport to accommodate women's daily routines.⁷⁴

but also plays a pivotal role in enhancing safety and security. By minimising risks and accidents, it contributes to reducing instances of harassment, violence, and crime, thereby creating a safer environment for all individuals. Moreover, embracing universal design principles ensures that infrastructure is accessible to everyone, including individuals with disabilities, older persons, and caregivers with children. By promoting inclusivity and accessibility, gender-responsive infrastructure not only enhances the quality of life for marginalised groups but also fosters a more equitable and inclusive society.⁷⁵

Possible Pathways

Short-Term Pathway (2030)

Policy Reform

- Conduct a systematic review of existing infrastructure policies
- Develop a comprehensive framework addressing accessibility gaps
- Establish equity-based infrastructure prioritisation criteria

Targeted Funding

- Allocate dedicated resources for underserved regions
- Prioritise community-driven infrastructure solutions
- Develop innovative financing models for inclusive projects
- Allocate dedicated resources for rural infrastructure projects, prioritising enhancements in digital connectivity, essential services (healthcare, education), and local economic development opportunities to mitigate migration.

Data-Driven Planning

- Conduct comprehensive accessibility assessments nationwide

Long-Term Pathway (2047)

Legislative Framework

- Enact legislation requiring accessibility standards in all infrastructure projects
- Establish mandatory compliance through regulatory frameworks and audits
- Implement penalty systems for non-compliance with inclusion standards

Sustainable Financing System

- Create dedicated infrastructure development funds for long-term equity projects
- Design blended financing models leveraging public and private capital
- Implement long-term maintenance funding mechanisms for rural infrastructure

Advanced Planning Tools

- Deploy predictive modelling systems anticipating future infrastructure needs
- Implement real-time infrastructure monitoring for efficient resource allocation
- Develop AI-based decision support systems for infrastructure planning

Short-Term Pathway (2030)

- Utilise GIS mapping and analytics for identifying priority areas
- Establish quantitative equity indicators for measuring progress

Community Infrastructure

- Implement low-cost, locally-managed improvement projects
- Engage citizen groups in design and maintenance processes
- Prioritise high-impact interventions addressing basic needs

Sustainability Integration

- Incorporate green infrastructure in community development projects
- Implement renewable energy solutions for public facilities
- Develop climate-adaptive designs for vulnerable regions

Long-Term Pathway (2047)

Rural-Urban Integration

- Develop integrated infrastructure networks seamlessly connecting rural and urban areas, specifically addressing the rural-urban divide by improving access to digital infrastructure, job opportunities, and essential services in rural areas to reduce migration pressures
- Implement water, energy, and digital infrastructure reaching all communities
- Create circular mobility systems linking production and consumption centres

Climate-Resilient Systems

- Implement comprehensive climate adaptation in all infrastructure
- Deploy flood-resistant construction and natural buffer systems
- Establish self-sustaining infrastructure models with renewable energy integration

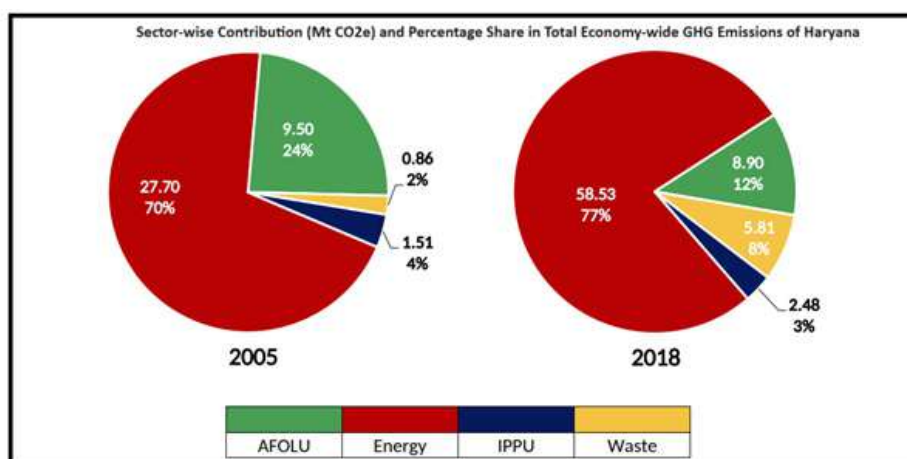
ISSUE 7: ADAPTING INDUSTRIES TO RAPID CHANGES IN GLOBAL SUSTAINABILITY STANDARDS

Haryana's industrial sector faces the dual challenge of adapting to increasingly stringent global sustainability standards while simultaneously integrating rapidly evolving technologies. This transformation is essential for maintaining competitiveness in a global market where ESG criteria are becoming central to investment decisions and business operations. The state must navigate the transition toward carbon neutrality, resource efficiency, and responsible production practices while strategically embracing emerging technologies like AI, additive manufacturing, robotics, and blockchain to enhance productivity, innovation, and sustainability. This synchronised adaptation is critical for ensuring Haryana's industries remain viable, competitive, and aligned with global market expectations while contributing to broader environmental and social goals.

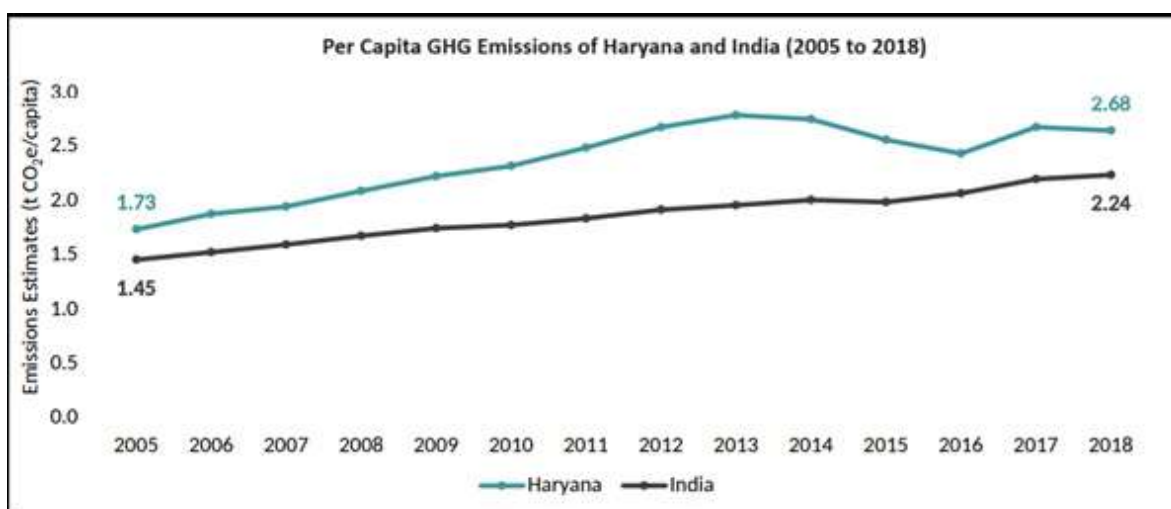
Current Status⁷⁶

- ✔ **Emissions Trajectory:** Haryana's greenhouse gas emissions increased from 39.57 Mt CO₂e in 2005 to 75.72 Mt CO₂e in 2018, growing at a CAGR of 5.12%
- ✔ **Sectoral Distribution:** The Energy sector's share in economy-wide emissions increased from ~70% in 2005 to ~77% in 2018
- ✔ **Industrial Emissions:** The share of emissions from the Industrial Processes and Product Use (IPPU) sector quadrupled from ~2% in 2005 to ~8% in 2018

- ✔ **Agricultural Emissions:** Share of Agriculture, Forestry and Other Land-Use (AFOLU) sector emissions halved from ~24% in 2005 to ~12% in 2018
- ✔ **Waste Management:** Share of waste sector emissions marginally decreased from ~4% in 2005 to ~3% in 2018
- ✔ **Per Capita Impact:** Per capita emissions in Haryana increased from 1.73 tonnes CO₂e/capita in 2005 to 2.68 tonnes CO₂e/capita in 2018 (CAGR 3.42%)
- ✔ **Comparative Standing:** Haryana's per capita emissions remain higher than India's national average throughout the reference period
- ✔ **Technology Adoption:** Varied levels of emerging technology integration across industrial sectors, with larger enterprises leading in adoption rates
- ✔ **ESG Compliance:** Growing awareness and implementation of ESG frameworks, though comprehensive adoption remains a work in progress



Graph 37: Sector-wise Contribution (Mt CO₂e) and Percentage Share in Total Economy-wide GHG Emissions of Haryana
(Source: Trend Analysis of GHG Emissions of Haryana: Analysis of Greenhouse Gas Emissions from 2005 to 2018)



Graph 38: GHG Emissions Estimates of Haryana (2005 to 2018)
(Source: Trend Analysis of GHG Emissions of Haryana: Analysis of Greenhouse Gas Emissions from 2005 to 2018)

Factors Influencing the Issue

The adaptation of Haryana's industries to global sustainability standards and emerging technologies is influenced by several interconnected factors. Regulatory frameworks at international, national, and state levels establish compliance requirements for emissions, resource usage, and corporate governance practices. Market forces, including consumer preferences, investor requirements, and supply chain pressures, drive adoption of sustainable practices and technological innovation as competitive necessities. Financial considerations encompassing implementation costs, return on investment timelines, and access to green finance determine the feasibility and pace of transformation. Technological accessibility, including infrastructure readiness, skilled workforce availability, and technology transfer mechanisms, affects industry capacity to integrate advanced solutions. Industry structure characteristics such as sector composition, firm size distribution, and value chain positions influence adaptation capabilities and priorities. Knowledge and awareness levels among business leaders regarding sustainability practices and technological opportunities shape strategic decision-making. Together, these factors create a dynamic environment requiring coordinated strategies to enable Haryana's industrial sector to effectively navigate the dual transformation toward sustainability and technological advancement.

Impacts of the Issue

Direct Impact

- **Competitive Enhancement:** Adaptation to sustainability standards and emerging technologies directly improves operational efficiency, product quality, and market positioning, strengthening business viability.
- **Regulatory Compliance:** Proactive adaptation ensures adherence to evolving regulatory requirements, minimising legal risks, penalties, and operational disruptions associated with non-compliance.
- **Resource Efficiency:** Implementation of sustainable practices and advanced technologies directly reduces energy, water, and material consumption, generating operational cost savings.
- **Emissions Reduction:** Adoption of clean technologies and processes directly decreases greenhouse gas emissions and pollutants, contributing to environmental improvement and climate change mitigation.

Indirect Impact

- **Innovation Ecosystem Development:** Industrial transformation stimulates supporting networks of research institutions, technology providers, and specialised service firms, creating a broader innovation ecosystem.
- **Supply Chain Optimisation:** Sustainability and technology integration enhance resilience against disruptions, improve traceability, and reduce vulnerability to resource scarcity and climate impacts.
- **Workforce Evolution:** Industrial transformation creates new employment categories requiring advanced skills while phasing out certain traditional roles, reshaping labour market dynamics.
- **Knowledge Transfer:** Best practices in sustainability and technology application spread across industry sectors and to smaller enterprises, elevating overall industrial performance standards.

Global Learnings

Global Best Practice

Fujitsu's AI and Blockchain-Based ESG

Management: Japan's Fujitsu has developed an advanced ESG management platform that integrates AI and blockchain to monitor, analyse, and report environmental and social performance metrics across supply chains. By leveraging AI, the system identifies sustainability risks and opportunities in real time, while blockchain ensures data transparency and traceability, particularly in tracking carbon emissions and responsible sourcing.⁷⁷

Disruptive Technologies - Revolutionising Carbon Credit Systems: Blockchain Integration and Tokenisation

In the realm of carbon credit systems, two significant advancements are reshaping the landscape. Firstly, the integration of blockchain technology brings about a paradigm shift, offering transparent and secure transactions that mitigate fraud risks and bolster overall market integrity. By decentralising record-keeping, blockchain ensures tamper-proof data, fostering trust among stakeholders. Secondly, the tokenisation of carbon credits represents a revolutionary leap forward, transforming them into digital tokens on blockchain platforms. This enables fractional ownership and facilitates trading of smaller units, making carbon credits more accessible to a broader range of market participants. Moreover, tokenisation streamlines transactions, enhancing efficiency and expediting the exchange process. Together, these innovations herald a new era for carbon credit systems, paving the way for greater transparency, accessibility, and efficiency in addressing environmental challenges.⁷⁸

Possible Pathways

Short-Term Pathway (2030)

Policy Framework Development

- Establish clear sustainability policies aligned with global ESG benchmarks
- Ensure industry-wide compliance through mandatory reporting mechanisms
- Provide incentives for early adopters of sustainable practices
- Haryana Industrial Equipment Re-use & Scrappage Scheme to facilitate a circular economy model by incentivising the reuse of industrial equipment & structured scrappage processes

Long-Term Pathway (2047)

Specialised Governance Structure

- Establish the Department of Emergent Technologies with specialised research hubs
- Develop comprehensive regulatory frameworks for emerging technology adoption
- Create sector-specific sustainability standards and verification systems

Sustainable Finance Ecosystem

- Create comprehensive green bond frameworks and sustainability-linked instruments

Short-Term Pathway (2030)

Capacity Building Initiatives

- Dedicate funding for targeted training programmes on sustainability practices
- Partner with academic institutions for knowledge transfer initiatives
- Develop sector-specific educational modules on emerging technologies
- Implement specialised policies to attract and incentivise GCCs, focusing on high-value functions. This could include tax benefits, streamlined regulations, and talent development programmes.

Skills Enhancement Programmes

- Conduct comprehensive workforce skills assessments
- Implement structured upskilling programmes focused on sustainability and digital technologies
- Establish certification standards for green skills and advanced technology competencies

Monitoring System Implementation

- Deploy data collection and analytics systems for sustainability indicators
- Establish real-time reporting tools for compliance tracking
- Develop performance benchmarking mechanisms for industry comparison

Infrastructure Adaptation

- Perform comprehensive audits of existing industrial facilities
- Implement energy efficiency retrofits and waste reduction systems
- Upgrade production facilities for emerging technology compatibility
- **Haryana Green Cluster Scheme:** Identification of energy-intensive & polluting industrial clusters and handholding them for adoption of green technologies through ready-available techno-financial feasibility assessment reports

Long-Term Pathway (2047)

- Establish viability gap funding mechanisms for transformative technologies
- Develop carbon market infrastructure with trading platforms and verification systems

Supply Chain Transformation

- Implement blockchain-based traceability systems for product authentication reducing fraud in transactions and enhancing transparency.
- Deploy AI-driven logistics optimisation frameworks
- Establish circular economy standards for resource recovery and reuse

Smart Infrastructure Integration

- Deploy AI-integrated, IoT-enabled manufacturing systems with predictive maintenance and emissions optimisation to reduce downtime and meet global low-carbon compliance norms
- Implement digital twin technology for infrastructure optimisation
- Develop autonomous energy management systems with AI optimisation

Circular Economy Implementation

- Establish closed-loop production systems with zero-waste targets
- Develop industrial symbiosis networks for resource exchange
- Create comprehensive materials passport systems for full lifecycle tracking

BIG ACTIONS

1. AI-Infused Industrial Corridor

Haryana will develop ultra-sustainable, AI-powered industrial zones aligned with UNIDO's **Eco-Industrial Park framework** and principles of Industrial Symbiosis. The proposed **10 Integrated Manufacturing Townships (IMTs)** will serve as green manufacturing hubs with net-zero carbon goals, resource-efficient infrastructure, and intelligent supply chains—positioning Haryana as a global leader in climate-smart industrialisation.

2. She Rise 2.0

A transformative initiative mandating at least 50% women's workforce participation in all new industrial projects, supported by state-led skill accelerators, subsidised childcare, and inclusive workplace models—amplifying women's economic agency.

3. Global Green Axis

Haryana will design an ultra-sustainable industrial zone adhering to next-generation ecological standards, drawing international companies to set up zero-emission manufacturing facilities and making the state an export powerhouse for green products.

WORKING GROUP - 3

Departments

- | | | | |
|--|---|---|---|
| 1. Department of Industries and Commerce | 2. Directorate of Micro, Small, & Medium Enterprises | 3. Department of Transport | 4. Department of Civil Aviation |
| 5. Citizen Resources Information Department | 6. Energy Department | 7. Directorate of Science & Technology | 8. Public Works Department (B & R) |
| 9. Irrigation & Water Resource Department | | | |

Timeline

14/07/2023



Meeting with the Member Secretary of the Working Group

19/01/2024



First Meeting of the Working Group

09/02/2024



Workshop of the Working Group (Hotel Mount View)



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