



# A Study on Strategic, Financial, and Sustainable Dimensions of Skill Development in India

Mansi Khatri<sup>1</sup> and Vishesh Desai<sup>2</sup>

<sup>1</sup> Undergraduate Research Scholar\*, TransStadia University, Ahmedabad, India

<sup>2</sup> Assistant Professor, TransStadia University, Ahmedabad, India

<sup>1</sup>mansikhatri2918@gmail.com

**Abstract.** India's demographic structure, with over 65 percent of its population below thirty-five, represents a critical opportunity for economic and social transformation. To harness this potential, the country requires a skill development architecture capable of anticipating labour market shifts, technological disruption, and sustainability imperatives. This paper evaluates the strategic, financial, and sustainable dimensions of India's skill development framework. It emphasizes strategic alignment, innovative financing, and the inclusion of green and equitable skills to reveal gaps between policy intent and execution. Using a conceptual framework grounded in human capital and sustainable development theories, this study applies a thematic synthesis approach. Data sources include academic databases, government portals, and institutional repositories, ensuring inclusion of peer-reviewed, relevant, and up-to-date studies from 2015 to 2025.

Findings highlight ongoing fragmentation in implementation, limited industry involvement (fewer than 20 percent of employer's co-design curricula), dependence on state funding, and slow adoption of green and gender-inclusive initiatives.

Recommendations include establishing a National Skill Development Grid, introducing outcome-based funding, embedding green skills in all sectoral training, and promoting gender equity and inclusivity. These measures are essential for transforming India's demographic advantage into sustained, equitable, and resilient growth.

**Keywords:** Skill Development, Policy Integration, Financial Innovation, Sustainability, Industry Linkages

## 1 Introduction

Skill development forms the foundation of human capital and serves as a vital driver of economic competitiveness in the modern era. In a global economy shaped by technology and innovation, nations that effectively equip their people with relevant skills are better placed to achieve inclusive and sustainable growth.

For India, home to over 1.4 billion people, this challenge is immense. With 65 percent of its population under the age of 35, the country possesses one of the largest youth

© The Author(s) 2026

R. Mehta et al. (eds.), *Proceedings of the International Conference on Infrastructure Development and Sustainability (ICIDS 2025)*, Atlantis Highlights in Sustainable Development 9,

[https://doi.org/10.2991/978-94-6239-685-2\\_32](https://doi.org/10.2991/978-94-6239-685-2_32)

populations in the world. This demographic dividend has the potential to power economic growth, but only if the workforce is skilled, adaptable, and employable.

### **1.1 Background and Context**

India's skill development efforts have evolved over time. In the early post-independence period, vocational training was limited to industrial training institutes and polytechnic colleges. Economic liberalization in 1991 exposed the inadequacies of this system, prompting the government to adopt comprehensive policies.

The National Skill Development Policy (2009) introduced an institutionalized framework, followed by the National Skill Development Corporation (NSDC)[1] a public-private partnership to promote industry-led skilling. Later, the National Skill Development Mission (2015) and Pradhan Mantri Kaushal Vikas Yojana (PMKVY) became flagship schemes under the Skill India Mission, aiming to train and upskill over 400 million individuals by 2025.

Technological advances associated with the Fourth Industrial Revolution automation, AI, and digital transformation have redefined the concept of employability. Traditional skills are rapidly becoming obsolete, demanding a shift toward creative, digital, and adaptive competencies.

### **1.2 Rationale for the Study**

Despite numerous initiatives, India's skill development system faces major challenges. Policy fragmentation and weak coordination between ministries lead to duplication of programs and inefficient resource utilization. Industry participation remains minimal, with only a fraction of employers engaged in curriculum development [2].

Financial dependence on public funds restricts innovation, and sustainable development objectives such as environmental awareness and gender inclusion remain underemphasized.

As India commits to the UN Sustainable Development Goals, particularly SDG 4 (Quality Education) and SDG 8 (Decent Work), integrating sustainability into skilling programs becomes crucial. This study therefore examines the strategic, financial, and sustainable aspects of skill development in a unified framework.

### **1.3 Objectives and Scope**

This study seeks to critically analyse India's skill development framework across three interlinked dimensions: strategic, financial, and sustainable. Specifically, it aims to:

1. Evaluate the strategic alignment between national policies, institutional mechanisms, and industry participation in the skill ecosystem.
2. Assess the financial architecture of skill development programs, including the role of government funding, private participation, and innovative financing models.
3. Examine the extent to which sustainability both environmental and social has been integrated into the design and delivery of skill development initiatives.

By addressing these dimensions holistically, the study endeavours to bridge the analytical gap between policy intent and implementation reality. The paper uses a conceptual, literature-based approach, drawing insights from government reports, international benchmarks, and academic research to generate actionable recommendations.

#### **1.4 Significance of the Study**

The research treats skill development not as an isolated sectoral issue but as a strategic policy for national transformation. In a country where most workers are employed informally, skill development can drive formalization and inclusive growth.

By comparing India's experience with successful global models such as Germany, Singapore, and South Korea, the paper identifies actionable lessons for reform.

## **2 Literature Review**

1. [3] examined the employability and earning differentials among technically and vocationally trained youth in India. Although many young people have received formal technical or vocational education, the study found limited translation of these credentials into meaningful or well-paying jobs. Workforce participation among the technically trained has declined, and most continue to work in informal or low-wage sectors such as agriculture or basic services. The authors highlighted significant wage disparities, especially across gender and caste lines, observing both "sticky-floor" and "glass-ceiling" effects that restrict career mobility.
2. [4] investigated innovative financing mechanisms for skills development in India, emphasizing the potential of impact investing and social impact bonds. While most prior research focused on government grants or donor aid, Tyagi's analysis demonstrated that results-based funding models can enhance accountability and efficiency. However, the study noted persistent institutional barriers, weak standardization of metrics, and low investor confidence as obstacles to scaling such financing instruments.
3. [5] provided a comprehensive review of skill development policies in India, discussing challenges and future directions. They found that while government

initiatives such as the Pradhan Mantri Kaushal Vikas Yojana (PMKVY), Skill India Mission, and the National Education Policy 2020 have improved outreach, persistent issues remain in aligning curricula with industry demand. Problems of data tracking, quality assurance, regional imbalance, and social inclusion (especially gender and rural representation) continue to limit effectiveness. The study also noted a growing trend toward digital and private-sector-driven skilling models.

4. [6], in the *India Higher Education Report 2020: Employment and Employability of Higher Education Graduates in India*, emphasized the persistent gap between formal education and employability. The report highlighted that graduates often lack job-ready competencies, with professional and technical programs performing better than general degrees. Industry-academia linkages remain weak, particularly outside metropolitan regions. The authors also identified the influence of gender, caste, and socio-economic background on employment outcomes.
5. [7] released *Gearing Up the Workforce for a Green Economy*, estimating that India could generate as many as thirty-five million green jobs by 2047. The authors reported gaps in funding, policy coordination, and training infrastructure. Awareness among youth was relatively high, yet knowledge of specific green career pathways remained limited. Marginalized populations, particularly women and rural workers, continued to face structural barriers to participation.
6. The joint Assessment of India's Green Jobs and Just Transition Policy Readiness by the ILO and UNEP [8] provided a contemporary evaluation of India's preparedness for a just energy transition. It found that although green skill gap studies are increasingly common, implementation and curriculum design remain inconsistent. Teacher training, planning, and inter-sectoral coordination were identified as continuing weaknesses. The report concluded that readiness for green employment is improving overall but remains uneven across states and sectors.
7. [9] analysed vocational training and employability in the Indian context, focusing particularly on rural regions. The study demonstrated that vocational education moderately enhances employability; however, many rural graduates continue to accept informal or low-wage jobs. Its effectiveness was found to depend strongly on local industry alignment and demand conditions.
8. [10] explored the integration of green skills in India's Industrial Training Institutes (ITIs). The study revealed that most instructors possessed limited awareness or confidence in teaching sustainability-related competencies. Institutional support and targeted teacher training were found necessary to embed green concepts effectively into vocational curricula.

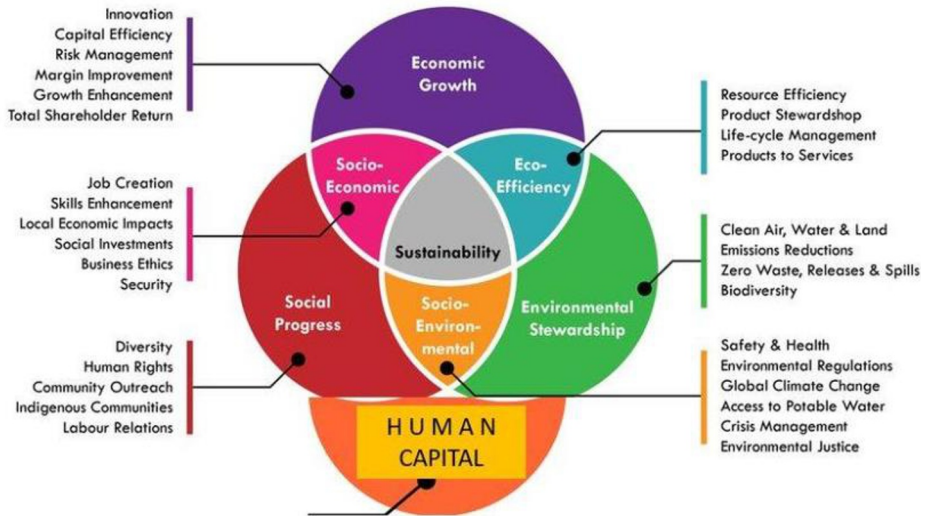
9. [11] differentiated between green and carbon-intensive employment categories within India's labour market. While green jobs are expanding, the study noted that a substantial portion of employment remains concentrated in carbon-heavy industries. Ham suggested that national skill systems must adapt proactively to shifting occupational structures to ensure a smooth transition toward sustainable employment.
10. [12] conducted an in-depth case study on the *Skill India Mission*, highlighting persistent institutional and operational challenges. The analysis revealed uneven state-level performance, weak employer involvement, delays in job placements, and limited alignment between training content and labour-market realities.
11. [13] reviewed the evolving landscape of skill development in the post-COVID era. They observed persistent issues of infrastructure gaps, regional disparity, and inadequate industry-academia collaboration. Their work emphasized the rising relevance of digital competencies, hybrid learning, and cross-sector reforms for future workforce resilience.
12. The collaborative report by the International Centre for Research (ICR), NISTADS, and [14], *Skills for Green Jobs in India*, connected climate goals with skill-development priorities. It mapped emerging green sectors, estimated future skill gaps, and recommended incentive-based policies to attract private participation. The report further advised integrating green modules into existing vocational programs to enhance employability in sustainable industries.
13. [7] reiterated in a subsequent national assessment that India could create up to thirty-five million green jobs by 2047. They identified renewable energy, waste management, and water conservation as leading growth sectors and highlighted the need for investment in training infrastructure and faculty development.

### 3 Research Methodology

#### 3.1 Conceptual Framework

This study employs a three-dimensional framework (See figure 1) encompassing:

- **Strategic Dimension:** Policy design, institutional governance, and industry linkages.
- **Financial Dimension:** Funding mechanisms and sustainability of financial flows.
- **Sustainable Dimension:** Environmental consciousness, gender inclusivity, and lifelong employability.



**Fig.1.** Current Structural Framework of the Education and Skill Development Sector in India  
*Source: Kumar, S. (2017). Current structural framework of the education and skill development sector in India. In Skill Development and Vocational Training in India (ResearchGate figure, based on Ministry of Human Resource Development and National Skill Development Corporation data). Retrieved from <https://www.researchgate.net/publication/317417467>*

### 3.2 Data Sources

The study relies on secondary data from:

- Government reports and performance evaluations (PMKVY, NSDC, MSDE).
- Institutional and intergovernmental studies by ILO, UNESCO, World Bank, and SCGJ.
- Peer-reviewed journal articles (2015–2025).
- Sectoral reports and policy briefs from credible think tanks such as ICRIER.

### 3.3 Analytical Approach

Steps followed include (See figure 2):

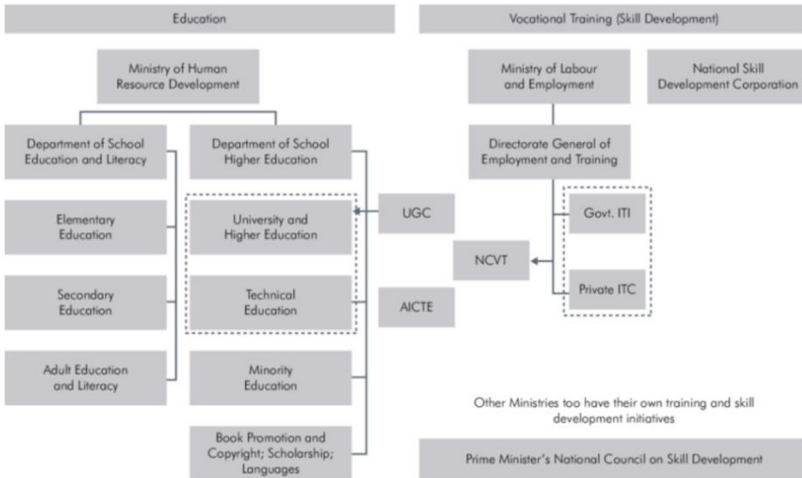
1. Classification of literature by focus dimension.
2. Thematic content analysis to extract patterns and gaps.

3. Comparative synthesis against global best practices.
4. Framework mapping to visualize strengths and weaknesses.
5. Derivation of policy recommendations based on evidence.

### 3.4 Limitations

- Dependence on secondary data: Because primary interviews or surveys were not carried out, some recent on-ground developments, especially at sub-national (state or district) level, may be underrepresented.
- Data inconsistency: Different reports use different metrics (e.g., some measure enrolment, others measure placements; cost per trainee bars vary), making direct quantitative comparison difficult.
- Time lag: Program evaluations and reports may have delays; thus, the data may reflect conditions that have since changed.
- Geographic generalization: National-level studies sometimes mask regional disparities (between states, rural/urban), so findings may be less applicable to specific local contexts.

## 4 Analysis and Discussion



**Fig.2.** Four Pillars of Sustainability and Human Capital Integration

Source: Mamula-Nikolić, T. (2021). *Four pillars of sustainable development: The role of human capital*. ResearchGate post image, adapted from UN Sustainable Development frameworks. [https://www.researchgate.net/post/Four\\_pillars\\_of\\_sustainable\\_developmenthow\\_important\\_is\\_human\\_capital\\_today\\_What\\_does\\_need\\_to\\_be\\_sustainable\\_in\\_the\\_eco-system](https://www.researchgate.net/post/Four_pillars_of_sustainable_developmenthow_important_is_human_capital_today_What_does_need_to_be_sustainable_in_the_eco-system)

India’s skill development system shows significant progress yet continues to face issues of coordination and quality. While initiatives such as Skill India and NSDC have

widened training reach, many programs still emphasize certification rather than real employability. Overlapping responsibilities among ministries often lead to inefficiency, and limited industry participation reduces the practical value of training.

Comparative evidence from countries such as Germany and Singapore demonstrates that close collaboration between government, industry, and academia ensures relevance and long-term employability. India can adapt this approach by involving employers in course design, strengthening apprenticeship models, and embedding vocational learning into formal education. This would also help restore the social respectability of skill-based careers.

Financially, India's skilling ecosystem remains heavily dependent on public funds. Expanding blended financing through CSR, private investments, and outcome-based models would strengthen accountability and sustainability. Integrating green and digital skill pathways can further align national programs with the future of work and sustainable development goals.

Overall, India must transition from fragmented schemes to a unified and adaptive skill ecosystem. A system that links policy design, financial innovation, and sustainable practices will enable the country to convert its demographic strength into a productive and resilient workforce.

## **5 Implications**

### **5.1 Policy Implications**

The study suggests that policies should focus on quality rather than quantity of training. Measuring success by employment outcomes and income growth, rather than by enrolment numbers, will make programs more effective. A unified national framework could reduce duplication and improve coordination. Integrating vocational education within the school system, encouraging micro-credentials, and updating qualifications to reflect green and digital skills will make the ecosystem future-ready. Greater private sector participation, along with targeted support for women, rural youth, and marginalized communities, is also crucial for inclusive growth.

### **5.2 Practical Implications**

For industries and training institutions, stronger collaboration is key. Employers should co-design programs, support apprenticeships, and treat skill development as an investment. Training institutes must emphasize competency-based learning supported by digital platforms to reach a wider audience. Building real-time data systems will improve accountability and outcomes, while consistent trainer development and performance recognition will enhance quality across programs.

### 5.3 Academic Implications

Academically, the study highlights the importance of viewing skill development through strategic, financial, and sustainable dimensions together. Future research should focus on long-term outcomes of training programs and explore financing innovations like impact bonds and employer levies. Studies on green and digital skills will also help shape future-ready education models.

### 5.4 Holistic System Implications

At a systemic level, India needs an ecosystem where government provides policy direction, industry drives relevance, academia ensures quality, and civil society promotes inclusion. Moving from short-term training targets to long-term capability building will ensure that people not only find jobs but remain employable throughout life, making India's demographic strength a lasting economic advantage.

## 6 Conclusion and Recommendations

India's demographic potential can become its greatest asset if policy, finance, and sustainability function cohesively.

### 6.1 Key Conclusions

#### 1. Strategic Integration Is Essential

Sustainable progress requires merging multiple programs under a common governance and accountability structure. Clearer delineation of responsibilities among ministries and stronger employer participation will make training more relevant and outcome oriented.

#### 2. Diversified and Accountable Financing Is the Next Frontier

Sole reliance on annual budgets is unsustainable. Blended finance, CSR participation, and impact-based instruments can supplement public funds while embedding accountability and innovation.

#### 3. Sustainability Must Become a Core Principle, not a Peripheral Theme

Green and digital skills should be treated as mainstream competencies, not optional modules. Aligning national curricula with Sustainable Development Goals (SDGs 4 and 8) will help India position its workforce for future global demand.

#### 4. Inclusion Strengthens the System

Policies that encourage participation of women, rural youth, and marginalized groups will enlarge the talent pool and improve social equity two essential ingredients of long-term national resilience.

## 6.2 Recommendations

### For Policymakers:

- Establish a unified National Skill Development Grid.
- Institutionalize performance-linked financing.
- Embed vocational education from the secondary level.
- Mandate green skills integration across all sectors.

### For Industry:

- Co-design and co-fund training infrastructure.
- Utilize CSR strategically for inclusive skilling initiatives.

### For Training Institutions:

- Adopt competency-based and hybrid learning models.
- Build alumni-based feedback loops for continuous improvement.

### For Researchers and Financial Stakeholders:

- Pilot blended finance and impact bond models.
- Conduct tracer studies to assess real-world employability.
- Support research on sustainable and digital skill trends.

## Acknowledgement

I, Mansi Khatri, an undergraduate research scholar, would like to express my sincere gratitude to my research guide, Dr. Vishesh Desai, for his constant guidance, valuable insights, and unwavering support throughout the course of this research. His mentorship has been instrumental in shaping the direction and successful completion of my study. I also extend my heartfelt thanks to my parents for their continuous encouragement, motivation, and unconditional support throughout my academic journey. I am equally grateful to my faculty and peers for their cooperation and inspiration during this endeavour.

## Declaration on Generative AI Usage

I acknowledge that generative AI tools, including ChatGPT and Perplexity, were used solely to assist in refining the language, formatting, and structure of this research report. All ideas, analyses, and interpretations presented are my original work, and AI assistance was used in compliance with ethical academic writing.

## References

1. National Skill Development Corporation (NSDC), UNESCO: Case study: The role of NSDC in India. UNESCO–UNEVOC Publications (2019)
2. Kapoor, R., Sinha, S.: Employability and skills in the Indian labour market. ICRIER, New Delhi (2020)

3. Singh, S., Parida, J.K., Awasthi, I.C.: Employability and earning differentials among technically and vocationally trained youth in India. *Indian Journal of Labour Economics* 63(2), 219–242 (2020)
4. Tyagi, P.: Innovative skills development financing in India: Scope of impact investing in financing skilling in India. *Development Management Review* 2(1), 41–56 (2018)
5. Pratap, S., Biragoni, P.: Skill development in India: Policies, challenges, and the road ahead. *International Journal of Research and Scientific Innovation* 12(3), 88–97 (2025)
6. Khare, M., Varghese, N.V.: India higher education report 2020: Employment and employability of higher education graduates in India. Routledge (2022)
7. Skill Council for Green Jobs (SCGJ), Sattva Consulting: Gearing up the Indian workforce for a green economy: Skills landscape for green jobs report. SCGJ (2023)
8. International Labour Organization: Skills for a greener future: India report. ILO, Geneva (2022)
9. Srivastava, A.K.: Vocational training and employability: A study in reference to India. *International Journal of Educational Development* 105, 102098 (2025)
10. Albertz, A.: Green skills at Industrial Training Institutes in India. *Computers & Education* 213, 105–128 (2025)
11. Ham, A.: Characterizing green and carbon-intensive employment in India. *Ecological Economics* 220, 108–121 (2025)
12. Prasad, R.: A case study of Skill India Mission: Operational challenges and outcomes. *Journal of Vocational Education and Training* 77(2), 145–167 (2025)
13. Mehta, J., Bha, P., Raval, V.: Skill development in India: Challenges, current and future perspectives. *International Journal of Vocational Education and Training Research* 10(4), 65–80 (2024)
14. International Labour Organization: Skills for green jobs in India. ILO Research Repository (2018)

**Open Access** This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

