

GENDER EQUALITY AND ITS SPILL OVER EFFECTS ON EDUCATION, EMPLOYMENT, AND INSTITUTIONS WITHIN SUSTAINABLE DEVELOPMENT: AN INDIAN PERSPECTIVE

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As the world approaches the 2030 deadline for the Sustainable Development Goals (SDGs), gender equality remains essential for inclusive and sustainable growth. No country can progress socially or economically without ensuring equal opportunities for women and men. India, with its vast and diverse population, plays a key role in achieving SDG 5 globally. Despite multiple policy initiatives, significant gender disparities persist across states, affecting education, employment, and institutional effectiveness. This study evaluates India's progress toward gender equality by analysing SDG 5 and its linkages with SDGs 4 (Quality Education), 8 (Decent Work), and 16 (Peace and Justice). Using SDG indicators and text analytics of government schemes and reports, the research applies clustering, network analysis, topic modelling, sentiment analysis, and N-gram mapping across 28 states and 8 Union Territories from 2018 to 2024. Findings highlight key indicators such as sex ratio at birth, female labour force participation, and pupil-teacher ratios as critical drivers of development. While some states show steady progress, others face persistent structural challenges. The study further integrates ESG dimensions and provides actionable policy recommendations to enhance gender-responsive development.

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1 Introduction

The Sustainable Development Goals (SDGs) provide a comprehensive global framework aimed at achieving inclusive and sustainable development by 2030. Among these goals, gender equality (SDG 5) holds a pivotal position due to its strong interconnections with education, economic development, and institutional governance. India's performance is particularly significant in this context, as it represents a substantial proportion of the global population and exhibits wide socio-economic diversity across its states. The achievement of SDG targets in India will therefore have a profound impact on global development outcomes.

Gender equality is also a central component of Environmental, Social, and Governance (ESG) frameworks, particularly within the social and governance dimensions. Ensuring equitable access to education, employment, and decision-making opportunities contributes not only to social justice but also to economic productivity and institutional effectiveness. Inclusive governance structures and gender-diverse leadership are increasingly recognized as essential for sustainable development.

Despite several national-level initiatives such as Beti Bachao Beti Padhao, Skill India, and various women empowerment programs, disparities persist across Indian states in key indicators such as education, labour force participation, and institutional representation. These variations highlight the importance of conducting state-level analysis to identify region-specific challenges and policy gaps. This study therefore examines the interlinkages between gender equality and key development outcomes by integrating quantitative SDG indicators with qualitative policy analysis, offering a comprehensive and data-driven perspective.

2 Review of Literature

Gender equality has been widely acknowledged as a critical determinant of economic and social development. Duflo (2012) emphasizes the bidirectional relationship between gender equality and economic growth, arguing that improvements in one reinforce the other. Sen's (1999) capability approach further highlights that expanding women's access to education, employment, and decision-making enhances overall societal well-being and development outcomes.

In the Indian context, Sahni (2024) identifies significant disparities in gender indicators across states, emphasizing the need for targeted interventions. Chatterjee (2021) highlights the role of governance and institutional capacity in influencing SDG performance, while Tamuli and Mishra (2023) focus on women's empowerment through education, skill development, and labour participation. Asadullah et al. (2024) point out the disconnect between educational attainment and employment outcomes, particularly in developing economies, which limits the effectiveness of gender-focused policies.

From an ESG perspective, gender equality is increasingly recognized as a key component of sustainable development. Reports by the World Bank (2023), UN Women (2022), and OECD (2021) indicate that gender inclusion enhances productivity, strengthens governance, and contributes to long-term sustainability. However, existing literature is limited by its reliance on structured indicators, lack of integration between SDGs, and limited use of advanced analytical techniques. This study addresses these gaps by adopting an integrated analytical framework combining quantitative and qualitative approaches.

3 Theoretical Framework

This study develops a Gender-SDG-ESG Integrated Analytical Framework that conceptualizes gender equality as a systemic driver of sustainable development. Unlike existing approaches that treat SDGs as independent goals, this framework positions gender equality as a central variable generating spillover effects across education, employment, and institutional governance.

The framework is grounded in three theoretical perspectives. The capability approach emphasizes that expanding women's access to resources and opportunities enhances human development. Human capital theory highlights the role of education and skill development in improving productivity and economic outcomes. Institutional theory underscores the importance of governance structures and policies in shaping gender equality outcomes.

The framework identifies three key pathways through which gender equality influences development. The first pathway operates through education, where improved access to education enhances human capital and long-term productivity.

The second pathway operates through labour markets, where increased female participation contributes to economic growth and income equality. The third pathway operates through institutions, where greater representation of women improves governance quality, transparency, and accountability. These pathways are further embedded within ESG dimensions, where gender equality strengthens both social inclusion and governance effectiveness, making it a critical component of sustainable development strategies.

4 Methodology

This study adopts a mixed-methods approach integrating quantitative SDG indicators with qualitative policy text analysis. Structured data were obtained from the NITI Aayog SDG India Index (2018–2024), along with supplementary datasets from the World Bank and UNDP. Unstructured data were collected from government policy documents, scheme reports, and official publications related to gender equality, education, labour, and governance.

The quantitative analysis employs K-means clustering to classify states based on SDG performance indicators. The optimal number of clusters was determined using the Elbow Method and validated through Silhouette Scores to ensure robustness. Network analysis was conducted to examine relationships among SDG indicators, using degree and betweenness centrality measures to identify key variables acting as connectors between SDGs.

Qualitative analysis was conducted using natural language processing techniques. Topic modelling was performed using Latent Dirichlet Allocation, with coherence scores used to determine the optimal number of topics. Sentiment analysis was conducted using the VADER lexicon to assess the tone of policy documents, while N-gram analysis was used to identify recurring themes and policy priorities.

The study follows a hierarchical analytical structure, beginning with descriptive analysis to identify trends, followed by clustering to group states, network analysis to explore interdependencies, and text analytics to interpret policy narratives. This structured approach ensures coherence and allows each method to complement the others.

To ensure validity, clustering results were tested through multiple iterations, network relationships were examined for robustness, and topic models were validated using coherence scores. Despite these measures, the study has certain limitations. It relies primarily on secondary data, which may not fully capture ground-level realities. Policy documents may reflect institutional biases, and natural language processing techniques may not fully capture contextual nuances. Additionally, the absence of primary data such as interviews or surveys limits the empirical depth of the analysis. Future research can address these limitations by incorporating field-based data and stakeholder perspectives.

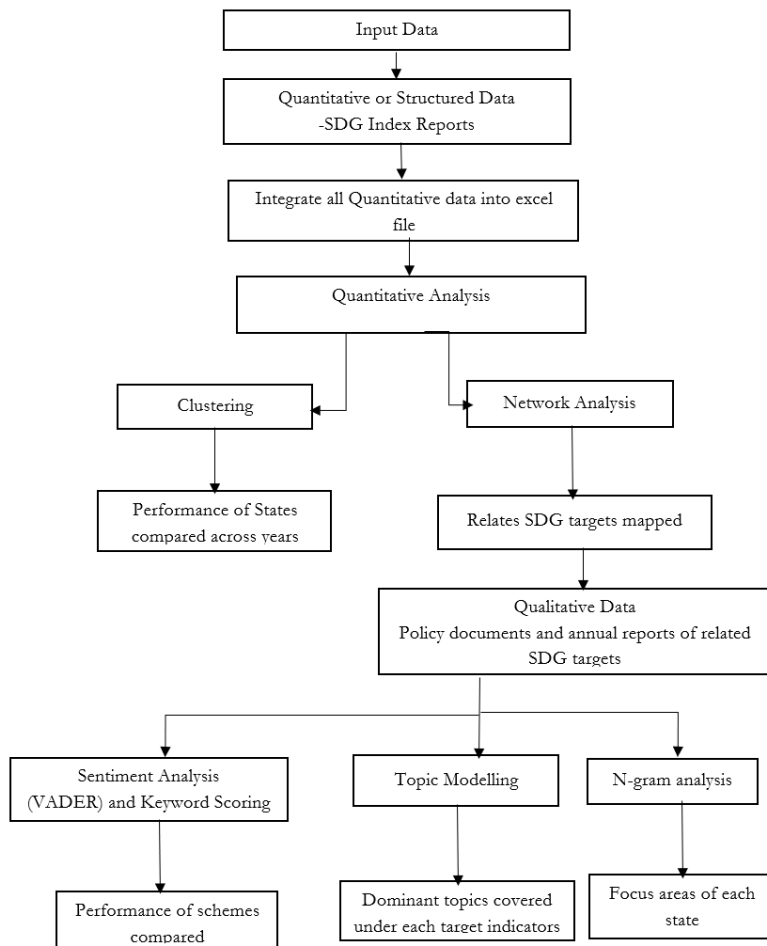


Figure 1: Research Design

The findings reveal that key indicators such as female labour force participation, sex ratio at birth, and pupil–teacher ratios serve as critical connectors linking gender equality with education, employment, and institutional outcomes. Network analysis demonstrates that these indicators function as bridging variables across SDGs, highlighting the interconnected nature of development.

Clustering results indicate significant regional disparities. Southern states and certain hill regions consistently perform better due to stronger educational systems, progressive policies, and effective governance. In contrast, several northern and eastern states face structural challenges related to socio-cultural norms and institutional capacity. The COVID-19 pandemic further widened these disparities, although partial recovery has been observed in subsequent years.

Text analytics reveals that policy focus is concentrated on labour welfare, women’s safety, and digital education initiatives. However, relatively less emphasis is placed on financial inclusion and institutional reforms, indicating potential gaps in policy priorities. Sentiment analysis suggests that policies related to education and employment are more action-oriented, whereas governance-related policies tend to be more descriptive. These findings highlight the need for improved policy implementation and monitoring mechanisms.

Sentiment patterns further reveal that education and labour schemes employ more action-oriented and implementation-focused language compared to welfare and judicial reform programmes. This indicates that policies related to education and employment are framed with clearer operational intent, measurable targets, and a stronger emphasis on outcomes such as skill development, job creation, and workforce participation. In contrast, welfare and judicial reform programmes tend to adopt more descriptive and normative language, focusing on rights, protection, and long-term institutional goals rather than immediate execution. This divergence suggests a potential imbalance in policy prioritization, where sectors directly linked to economic productivity receive more concrete and actionable planning, while governance and justice-related areas remain less operationalized. Such patterns may affect the effectiveness of institutional reforms, as the absence of clearly defined implementation mechanisms can limit policy impact. Strengthening the actionability of governance-related policies through measurable targets, accountability

frameworks, and periodic evaluation mechanisms could enhance their contribution to overall development outcomes and improve alignment across SDGs.

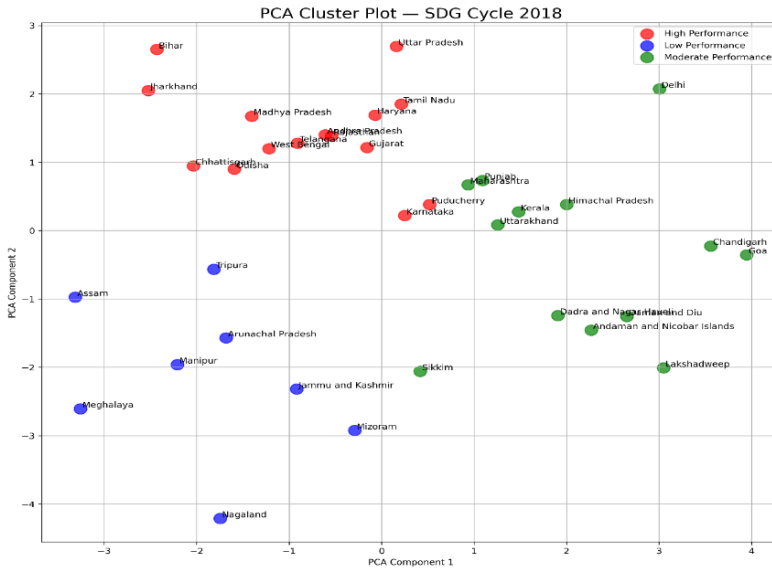


Figure 2: SDG Cycle 2018

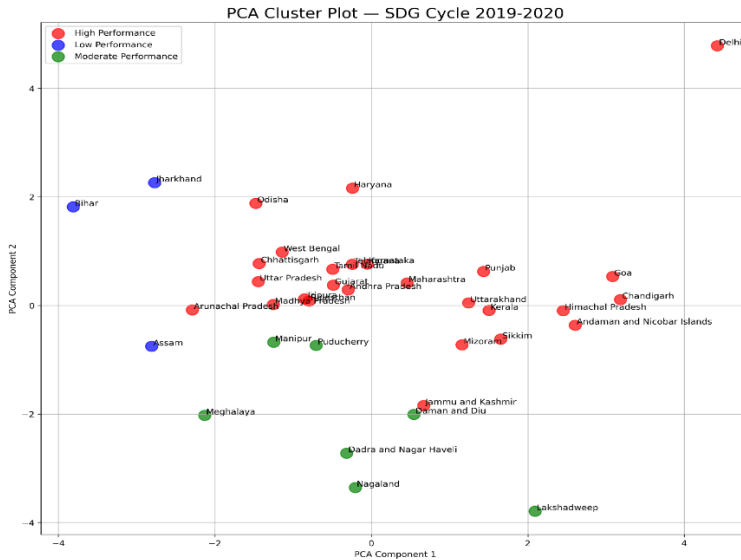


Figure 3: SDG Cycle 2019-2020

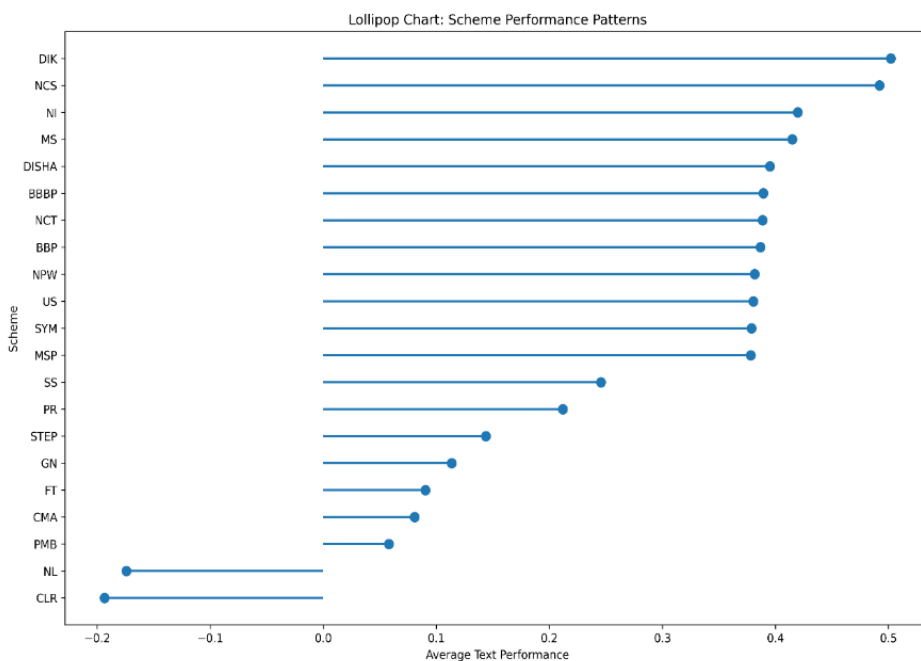


Figure 6: Scheme Performance Patterns

The scheme performance patterns illustrated in Figure 6 reveal significant variations in the effectiveness and orientation of gender-related policies across states and sectors. The analysis indicates that schemes linked to education and labour tend to demonstrate relatively stronger performance outcomes, reflecting better alignment between policy design and implementation mechanisms. These schemes often incorporate clearly defined targets, measurable indicators, and structured delivery frameworks, which contribute to more tangible improvements in female participation in education and the workforce.

In contrast, schemes related to welfare and judicial reforms exhibit comparatively moderate or inconsistent performance patterns. This can be attributed to their broader and often less quantifiable objectives, such as social protection, legal awareness, and institutional strengthening. The absence of clearly defined performance metrics and monitoring mechanisms in these areas may limit their effectiveness and reduce their ability to generate immediate, observable outcomes.

The variation in scheme performance also highlights the role of state capacity, governance quality, and socio-economic conditions in determining policy effectiveness. States with stronger administrative systems, higher levels of human development, and better institutional coordination tend to achieve more consistent results across multiple schemes. Conversely, states facing structural challenges such as resource constraints, socio-cultural barriers, and weaker governance frameworks show slower progress and uneven outcomes.

Furthermore, the analysis suggests that policy coherence and inter-sectoral coordination are critical in maximizing the impact of gender-focused interventions. Schemes that are integrated across education, employment, and governance domains tend to produce stronger spillover effects, reinforcing the interconnected nature of SDGs. The findings therefore emphasize that gender equality is not an isolated objective but a cross-cutting factor that influences broader development outcomes. Strengthening implementation mechanisms, improving monitoring systems, and enhancing coordination across sectors can significantly improve the overall effectiveness of gender-related schemes and accelerate progress toward multiple SDG targets.

6 Gender Equality within ESG Framework

Gender equality plays a crucial role within ESG frameworks, particularly in the social and governance dimensions. From a social perspective, it promotes inclusion, equity, and access to opportunities, contributing to human capital development and economic growth. From a governance perspective, gender diversity in leadership enhances institutional transparency, accountability, and decision-making effectiveness. Women also play an important role in environmental sustainability, particularly in resource management and climate adaptation.

Integrating gender equality into ESG frameworks provides a holistic approach to sustainable development. Aligning SDG and ESG objectives can enhance policy effectiveness, improve governance outcomes, and support long-term sustainability.

7 Policy Recommendations

The findings of this study suggest the need for targeted and actionable policy interventions. Policymakers should adopt a differentiated approach by prioritizing interventions based on state-specific performance levels. Low-performing states should focus on improving education access, labour market opportunities, and institutional capacity, while high-performing states should focus on sustaining progress through innovation and governance reforms.

Efforts to increase female labour force participation should include targeted skill development programs aligned with industry needs, incentives for employers, and improvements in workplace safety and childcare infrastructure. Education policies should prioritize reducing dropout rates among girls, improving infrastructure, and promoting digital learning. Governance reforms should focus on increasing women's representation in decision-making roles and strengthening institutional mechanisms. Financial inclusion initiatives should expand access to credit and support women-led enterprises. Integrating ESG principles into policy frameworks can further enhance the effectiveness of these interventions.

8 Conclusion

This study demonstrates that gender equality is a fundamental driver of sustainable development in India. By influencing education, employment, and institutional outcomes, it generates significant spillover effects across multiple SDGs. While progress has been made, persistent disparities highlight the need for targeted and context-specific policies. Integrating ESG frameworks with SDG strategies can further strengthen development outcomes. A comprehensive, gender-responsive approach will be essential for achieving inclusive and sustainable growth by 2030.

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End notes

The SDG indicators used in this study are primarily derived from the NITI Aayog SDG India Index (2018–2024) along with supplementary datasets from the United Nations Development Programme and the World Bank. Text analytics was conducted using Python-based libraries including Scikit-learn and natural language processing techniques such as topic modelling and sentiment analysis.

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Summary

This study analyses the role of gender equality in advancing sustainable development in India by examining its connections with education, employment, and institutional effectiveness. Using SDG indicator data from NITI Aayog, along with datasets from the United Nations Development Programme and the World Bank, the research evaluates state-wise progress between 2018 and 2024.

Analytical techniques including clustering, network analysis, and natural language processing are applied to identify relationships among SDG 5, SDG 4, SDG 8, and SDG 16. The findings highlight key indicators influencing development outcomes and reveal regional disparities, emphasizing the importance of gender-responsive and context-specific policy interventions.

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