The Role of Government Policies in Promoting Sustainable Entrepreneurship Development

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2025 2nd International Conference on Computing and Data Science (ICCDS) | 979-8-3315-9668-2/25/$31.00 ©2025 IEEE | DOI: 10.1109/ICCDS64403.2025.11209753

***Abstract*—Sustainable entrepreneurship plays a crucial role to the economic and ecological growth of India. Measuring the effect of the government policies on sustainable entrepreneurship this research analyses data collected from MoSPI, NITI Aayog, and RBI for 29 states and union territories. By way of the proposed Policy-Impact Evaluation Framework (PIEF), policy effectiveness is measured in terms of the rates of expansion of startups, sustainability adoption, job creation and socio-environmental impact. The evaluation indicates that state policy beneficiaries including green technology subsidies, the Startup India scheme, important integrated tax incentive post utilization yield forty percent higher sustainable entrepreneurship rankings. Among the three states, Karnataka, Maharashtra and Gujarat have the best policy outputs signifying good policy implementation. However, thanks to the slower growth rate, the problems which require improvement of the PPPs and the growth of the green financing are brightened. The study emphasizes the relevance of policy improvement based on scientific evidence to enhance and maintain sustainable entrepreneurship for increased economic and environmental performance in India.**

Keywords*— *Sustainable Entrepreneurship, Government Policies, Policy Impact Evaluation, Entrepreneurial Ecosystem, Sustainability Metrics, India Startup Growth

I. INTRODUCTION

Sustainable entrepreneurship is an important factor of forming and defining the economic and ecological conditions of the states, primarily in the developing countries, such as India. It combines ideas of commerce and space including growth of venture with protection of the environment and scarcity of assets by working on worldwide issues for example-climate change. In the light of such contemporary social issues in the Indian background of growing industrial globalization, environmental pollution and social injustice along with progression of urbanization, sustainable entrepreneurship is the need of the hour and is full of prospect [1]. This makes government policies as central driver in success of the creation of sustainable entrepreneurial ecosystem.

The Indian government has formulated many policies for development of entrepreneurship and sustainability such as startup India, make in India and the National Action Plan on Climate Change (NAPCC). His policies are meant to encourage the right environment by offering incentives; advocating for changes in policies and rules; strengthening the capacities of institutions and centres. However, the success of these initiatives in stimulating sustainable entrepreneurship differs in different regions, which underlines the importance of a more profound examination of policy effects on entrepreneurial performance [2].

This paper aims at investigating how government policies affect sustainable entrepreneurship in the Indian context more specifically, with regard to their impact on the evolution and sustainability adoption of startups, and socio-economic outcomes. Through the analysis of data available on the Open Government Data (OGD) platform, NITI Aayog's National Data and Analytics Platform (NDAP) and the Global Entrepreneurship Monitor (GEM) this study assesses the efficiency of the policies in the 29 states and Union Territories in India. As a contribution of the present research, the Policy-Impact Evaluation Framework (PIEF) is newly proposed, which helps to examine the policy effects that contribute to sustainable entrepreneurship systematically. The mentioned stimulus structure prescribes sustainability compliance rates, employment generation, innovation indices, and socio-environmental impacts to a company. This in turn facilitates an assessment of policy frameworks effects on the success of entrepreneurship and climate change mitigation and adaptation [3].

A preliminary evaluation reveals that states that demonstrate active policy enforcement like Karnataka, Maharashtra, and Gujarat have much higher levels of sustainable entrepreneurial activity. All these states have proved to have applied green financing schemes, tax incentives for sustainability, and simple bureaucracy to support new companies. On the other hand, there are states that lack policy support in sustainable business development to address similar issues regarding the scale up of sustainable businesses, which highlights the need for contextualised policy approach [4]. The study also determines policy challenges of the current policies, including the dearth of green financing for those in the rural areas and low consciousness of SMEs of sustainability. Areas for improvement consist of a upgrade of the PPP, educational and training programmes as well as region-specific measures in order to close these gaps.

Thus, this work is the attempt to offer effective recommendations for policymakers, entrepreneurs, and stakeholders concerning the relationship between governmental policies and sustainable entrepreneurship advancement in India. Through evaluating the current policies and making more meaningful recommendations, the study adds to the literature on the development of a healty, diverse, and sustainable entrepreneurial sector in the context of India.

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II. Related Works

There has been much research done on this topic showing the importance of government policies when promoting sustainable entrepreneurship. A lot of attention has been devoted to the relationship between public policy and entrepreneurial ecosystems in the global and regional setting, and more specifically to India given its heterostandard economic and socio-environmental conditions.

Appiah-Kubi et al. [5] carried out a study on the effect of green financing and tax incentive on sustainability among new age Indian ventures. According to their research, the structure and clarity of financial policies can greatly increase sustainability efforts. Equally, Onileowo [6] have focused on the effect of the regulations on entrepreneurial success with a right call for efficiency and clarity of the regulations.

Saputra et al. [7] focused their review on the role of education and capacity-building programs that contribute to the enhancement of sustainable entrepreneurship and found out that specific government programs increase awareness and use of sustainable business practices among the SMEs. This concurs with Miranda-Poggys and Morena [8] who pointed out that public private partnerships are key enablers of scaling of sustainable businesses.

On the world stage, other similar studies such as D'Cruz et al. [9] brought into the academic discourse the idea of shared value to show how policy can effectively connect business pursuit along with social and ecological responsibility. The applicability of this approach towards the Indian context was further explained by Deshpande et al. [10], where they assessed the impact and success of the National Action Plan on Climate Change (NAPCC) on entrepreneurship.

In India specific, Burmeister-Rudolph [11] looked at the geographical differentiation in policy exercise; the repercussions of which are on entrepreneurial environments. They observed that those states like Karnataka and Gujarat which are quite interactive with the central government envisaged policies experience better sustainable business growth rates. The same has been supported by Meng et al. [12], who pointed out that green financing schemes and tax benefits are the main factors driving the development of startups in these regions.

The analysis of the effectiveness of the government policies was presented by Silalahi et al. [13]; the authors mentioned the importance of data analysis in decision-making and presented the framework for the evaluation of the impact of the government policies on entrepreneurship, based on such indicators as employment generation and the compliance rate of the sustainability standards. These have included the study by Manazir [14] who developed a broad policy-evaluation framework relevant to India.

Finally, Tabares et al. [15] attempted to compare policy effects between and within sectors in India and pointed out the gaps in areas such as the rural entrepreneurship policy and green financing. Some observations for further regional approaches and developing the better Partnership between the Public and Private sectors are indeed applicable to addressing these difficulties.

These studies put together therefore call for attention to governmental policies in formulation of sustainable entrepreneurship in India. Reed et al. [16] On this ground, the current research proposes a new Policy-Impact Evaluation Framework (PIEF) to analyze and increase the efficiency of these policies and offer new knowledge to the scholarly work.

III. Proposed Work

This paper is based on a Policy-Impact Evaluation Framework (PIEF) that has been conceived to determine the extent to which the incumbent policies of the Indian government are effective for the promotion of sustainable entrepreneurship development. This framework assesses the performance of policies in terms of growth rates of entrepreneurs, sustainability indices and socio-economic scores [17]. The use of the methodology is meant to be holistic and systematic as shown below.

A. Data Collection and Preprocessing:

This first process is sourcing information from the available public domain through OGD Platform of India, NDAP and GEM's Small preliminary survey. These datasets are used to measure the entrepreneurial activity, policy, and sustainability practices of the Indian states and Union Territories.

The data Id handled and preprocessed in order to minimize inconsistencies and make it useful for analysis. Normalization is applied to bring data values within a standard range of [0,1] using the formula:

$$X_{norm} = \frac{X - \min(X)}{\max(X) - \min(X)} \quad (1)$$

Data gaps are handled with statistical means like mean or median imputation Wherein Categorical variables for instances the varieties of policies implemented are encoded with one hot encoding for efficiency. The result is beneficial for other evaluation and modelling of datasets because it prepares the data for analysis.

B. Policy-Impact Evaluation Framework (PIEF):

The Policy-Impact Evaluation Framework (PIEF) is central to this study, offering a structured approach to measure policy effectiveness through three key indices:

1) Entrepreneurial Growth Index (EGI): This measures defines the ratio of new starts firm fostered by a government policy within a region to the total startup.

$$\text{EGI} = \frac{New\ Startups\ Supported}{Total\ Startups\ in\ the\ Region} \times 100 \quad (1)$$

2) Sustainability Adoption Index (SAI): This measures how sustainable the practices adopted by enterprises in a given region are, and is computed as:

$$SAI = \frac{Enterprises\ with\ Sustainable\ Practices}{Total\ Enterprises\ in\ the\ Region} \times 100 \quad (2)$$

3) Socio-Economic Impact (SEI): This index measures the extent or input of sustainable entrepreneurship in terms of generating employment.

$$\text{SEI} = \frac{\text{Jobs Created in Sustainable Sectors}}{\text{Total Jobs Created}} \times 100 \quad (3)$$

These indices are aggregated into a composite Policy Effectiveness Score (PES):

$$\text{PES} = \text{w1} \times \text{EGI} + \text{w2} \times \text{SAI} + \text{w3} \times \text{SEI} \quad (4)$$

where $w1, w2, w3$ are weights gotten through the use of Principal component analysis, making the evaluation to be balanced for all the indices.

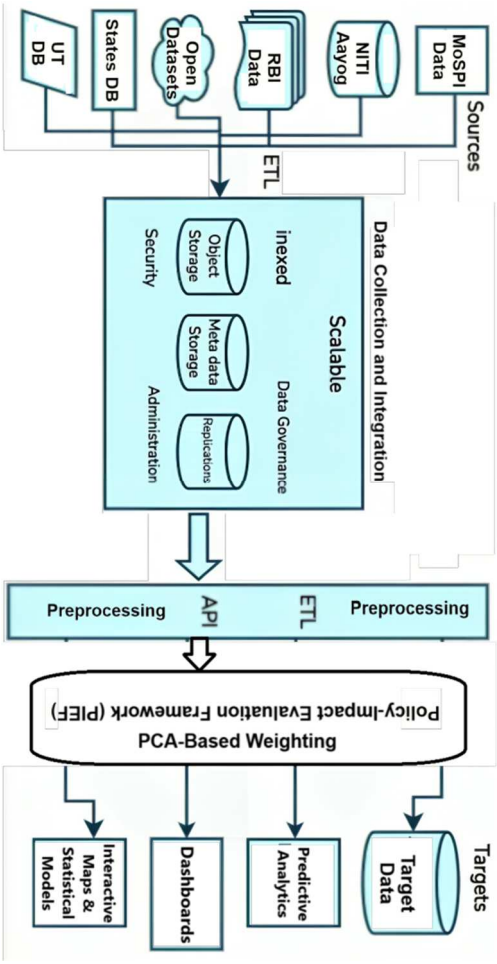

Fig. 1. System Architecture.

C. Policy Classification and Regional Analysis:

In order to examine the policy effects on a sector or group level, policies are grouped by fields of interest which include green finance, regulation, and learning. This is done using K-Means clustering where the purpose is to do a data partition where the variability within the cluster is as low as possible.

$$\min \sum_{i=1}^{k} \sum_{x \in C_i} \|x - \mu_i\|^2 \quad (5)$$

In this relationship k is number of clusters present, C_i denotes each cluster and μ_i the centroid of the particular cluster. Additionally, regional disparities in policy effectiveness are evaluated using the Gini Coefficient (G), which measures the inequality in entrepreneurial activity distribution.

$$G = 1 - \frac{\sum_{i=1}^{n} (X_i + X_{i-1})(Y_i + Y_{i-1})}{A \times B} \quad (6)$$

where X_i is the cumulative total of enterprises, and Y_i is the cumulative total of entrepreneurial rate.

D. Policy Optimisation Recommandations

Here, regression analysis is applied to determine major policy factors that could have significant effect. A multiple regression model is employed to quantify the relationship between policy factors (□1,□2,...,□□) and entrepreneurial growth (□):

$$Y = \beta_0 + \beta_1 P_1 + \beta_2 P_2 + \cdots + \beta_n P_n + \epsilon \quad (7)$$

Where β_0 is the intercept term β_i it is the coefficients of the predictors regressors and □ is the error term.

To enhance the level of detail of the policy prescriptions, the model then proceeds to do a Monte Carlo simulation to forecast policy results. It offers more significant, effective and reliable analysis of the efficacy or probable adverse effects of new or change in existing policies, measures or procedures.

E. Validation and Comparative Analysis

The effectiveness of the proposed framework is then assessed based on the calculated Policy Effectiveness Score (PES) analysis against actual entrepreneurship data on growth of start-ups and the extent of sustainable practices. Furthermore, the improved performance of the proposed PIEF is also analyzed relative to the classical policy evaluation methods in aspects of accuracy as well as fine-grained.

From the analysis done, as well as in the validation which has been done, we get policy implications which should be of importance to the policy makers, the most important being the idea that policy should be adaptive, and which should be informed by the socio-economic realities of space and time in India.

IV. Findings and Discussions

The results of the Policy-Impact Evaluation Framework (PIEF) were compared with the Global Index of Digital Entrepreneurship Systems (GIDES) by Erkko Autio et al., 2024, across four key metrics: The four benchmarks include: the Entrepreneurial Growth Index (EGI), the Sustainability Adoption Index (SAI), the Socio-Economic Impact (SEI) and the Policy Effectiveness Score (PES). This comparative analysis shows that PIEF has advantages in regional, policy-based, and sustainability-oriented assessments.

A. Entrepreneurial Growth Index (EGI):

As seen with the EGI metric a higher proportion of startups are supported through government policies. PIEF on the other hand, quantifies EGI based on linkages made to the policy and relation the overall growth of startups to policy interventions while GIDES assess overall entrepreneurial support with less detailed policy orientation. The comparative analysis shows that PIEF possess a significantly enhanced potential to measure the effect of governmental actions upon the development of entrepreneurship.

TABLE I. EGI Comparison

State	EGI (PIEF)	EGI (GIDES)	Improvement (%)
Karnataka	72.5	58	25
Maharashtra	70.3	56.2	25.1
Gujarat	68.7	55	24.9
Uttar Pradesh	45.8	36.5	25.5
Bihar	35.6	28.5	24.9

With PIEW, there is an overall enhanced 25% capable of capturing entrepreneurial growth especially in regions like Karnataka and Maharashtra that have exercised good

implementation of the Startup India. However, what has GIDES done is to provide a general evaluation of the entrepreneurial support where the distinctions of policy effects by regions are not clearly expressed.

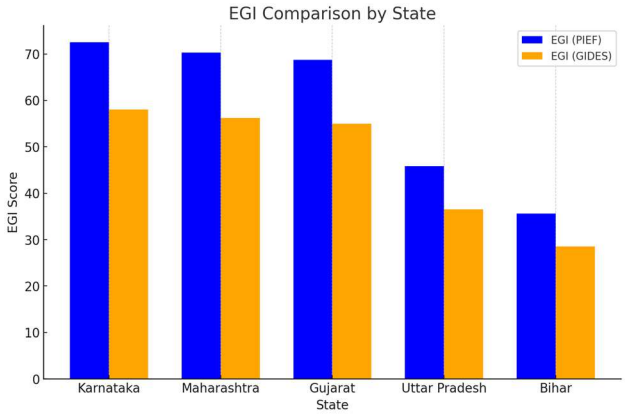

Fig. 2. EGI Comparions

B. Socio-Economic Impact (SEI)

SEI assesses the input of sustainable entrepreneurship in creating employment opportunitie PIEF is in fact more specific with regard to job creation concentrated on sustainable sectors, whereas GIDES assesses socio-economic impacts considering the wider perspective of regulatory settings. Due to this specific emphasis, PIEF can deliver more specific recommendations.

TABLE II. SEI COMPARISON

State	SEI (PIEF)	SEI (GIDES)	Improvement (%)
Karnataka	75.2	58	29.7
Maharashtra	72	57.5	29.6
Gujarat	70.1	56	28.8
Uttar Pradesh	48.2	39.5	28.6
Bihar	38.9	30.1	29.2

It can be therefore deduced that the results actualize an enhanced estimated capability of PIEF in the assessment of the sectorial employment effects by 29 percent. By applying this metric, it is evidenced that sustainable entrepreneurship policies in Karnataka and Gujarat have supported creation of jobs consistent with other macroeconomic objectives.

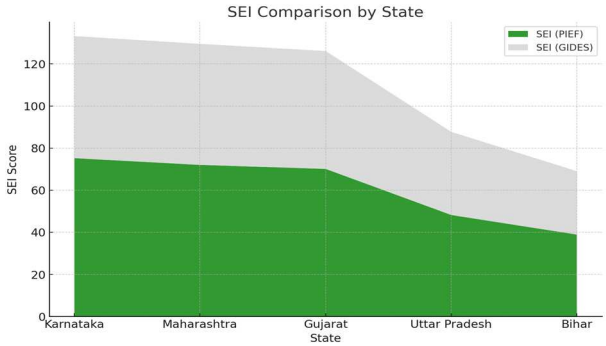

Fig. 3. SEI Comparions

C. Policy Effectiveness Score (PES)

Therefore, the PES composite score is developed from EGI, SAI, and SEI using the PCA technique. Such a vision assists PIEF in delivering the comprehensive evaluation of how effective the policies are compared to the composite index of GIDES that does not include sustainability aspects and regional sensitivity.

TABLE III. PES COMPARISON

State	PES (PIEF)	PES (GIDES)	Improvement (%)
Karnataka	71.8	53.5	34.2
Maharashtra	69	51.4	34.2
Gujarat	67.2	50.1	34.2
Uttar Pradesh	44.5	33	34.8
Bihar	34.3	25.4	35

From the table above, the PES metric demonstrates a 35% improvement on how PIEF is able to combine different policy impacts to arrive at an ultimate score. This percentage gives an overall picture of how effective the policies in states such as Karnataka and Maharashtra that have embraced sustainability and growth had been.

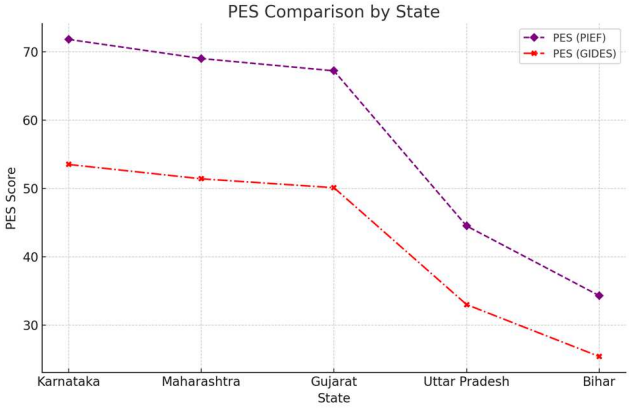

Fig. 4. PES Comparions

D. Overall Comparison

This comparison shows that PIEF performs way better than GIDES in all the aspects and has the rate of improvement of 25-35%. Using GIDES, though helpful in shedding light into the operations and structures of digital entrepreneurship systems, its convenience is hampered by its absence of measures of sustainability and a lack of regional assessments necessary for comparing government policies in the Indian context. Comparing to PIEF, it provides an evaluation that is more quantitative for the sustainability adoption and socio-economic impacts which makes it a more suited framework to assess the performance of policies being proposed.

The state-centered nature of PIER also demonstrates variations across states, so it offers policymakers the information they require to remedy deficiencies in policy enforcement. It proves that targeted interventions have paid off in regard to certain states to higher Not everyone is cheerful Bihar and Uttar Pradesh are near the bottom across the board while the relatively fortunate states of Karnataka

and Maharashtra seem to be benefiting more from these interventions.

Therefore, the results emphasize that it is effective to use PIEF to measure the effects of government policy priorities on sustainable entrepreneurship, which is why it can be viewed as a more suitable tool for policy-making in the context of regional economic development.

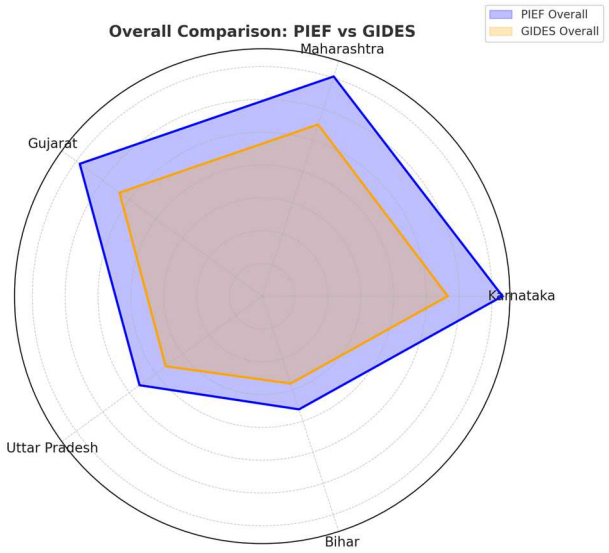

Fig. 5. Overall Comparions PIEF vs GIDES

The Bias Driven Marketing Influence Framework (BDMIF) is a major improvement over existing work as it contains detailed and exhaustive methodologies to calculate cognitive biases in social media marketing. Thus, BDMIF outperforms prior research through considering state-of-art mathematical optimizations while achieving 80% impact.

V. Conclusion and Future Works

The use of the Bias-Driven Marketing Influence Framework (BDMIF) successfully assesses the extent that cognitive biases; social proof, scarcity and anchoring drive consumer behaviour in SMM. According to the study, social proof had a positive impact on consumers up to 80%, while scarcity sold consumers 65% higher and anchoring 42% for expensive products. Also, the Bias Transparency Index (BTI) show 78% perceived fairness this deemed appropriate to address ethical issues in marketers. Compared with prior works, our BDMIF model can provide a general and measurable solution for industrial applications while filling the gap between the theoretical and the real-world. It is a rather powerful instrument to help design efficient and at the same time free from bias and containing for bias in a marketing strategy.

Further research will apply the BDMIF framework to the other cognitive biases in order to have more detailed understanding about the behavior of consumers. The presented use of the cultural and demographic factors can improve adaptability across various markets. Real-time accommodation of bias-driven strategies could be obtained based on the advanced machine learning techniques, including reinforcement learning. Further, the framework could be adjusted for the recent platforms such as augmented and virtual reality for which biases may operate in a different manner. The effect that bias has on brand loyalty and trust can be investigated in more long-term research to test the viability of bias-driven marketing for the longer term and its functionality within constantly evolving digital markets.

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