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Sustainable Development Goals and Global Progress: A Multidisciplinary Analysis

Athar Fathima[1], Haleema Bushra[2], Arti Budhiraja[3]
[1,2,3]Assistant Professor, Computer Science Engineering Department, Keshav Memorial Institute of Technology, Hyderabad, Telangana, India

Abstract

The United Nations introduced the Sustainable Development Goals (SDGs) in 2015 to provide a global framework for addressing critical issues, including poverty, inequality, climate change, and sustainable economic growth. The paper is a multidisciplinary examination of the world's progress towards achieving the SDGs, considering perspectives from economics, environmental science, public health, and data science. The study compares trends in major SDG dimensions, such as education, health, and environmental sustainability, using a simulated dataset derived from global development indicators. The results show disparate development across regions, with education and health recording major improvements, whereas environmental sustainability and climate action are on the back burner. The analysis emphasizes the need to use data-based monitoring, cross-sector partnership and integration of policies in accelerating SDG. Moreover, it reveals major challenges, including funding gaps, governance problems, and data limitations. The study finds that the SDGs can be achieved through a holistic, interdisciplinary methodology, supported by technological innovation and international collaboration.

Keywords: Sustainable Development Goals, Global Progress, Multidisciplinary Research, SDG Indicators, Sustainability, Development Policy.

1. Introduction

The Sustainable Development Goals (SDGs) are a set of global goals aimed at achieving sustainable development by 2030. The SDGs, which were adopted in 2015, are 17 goals (interconnected) that deal with social, economic, and environmental issues. These targets are meant to eliminate poverty, enhance equality, guarantee environmental sustainability and partnerships with other countries all over the world.

Although the world is trying, the process of attaining SDGs is still not even spread across the world and industries. Although progress has been made in other sectors such as education and healthcare, climate action, biodiversity, and economic inequality remain issues. The multidisciplinary approach, which incorporates the knowledge of different disciplines, is necessary because of the complexity of these issues. This paper seeks to examine the development of the global community towards the SDGs through a multidisciplinary prism, with a particular focus on the significance of data-based analysis and policy integration.

2. Literature Review

The study uses a new approach to the quantitative evaluation of SDG achievement that addresses issues in current models by combining various indicators and accounting for interconnections among the goals (Gebara, 2023). This combined strategy recognizes both synergies and antagonisms among the 17 SDGs and that developments in one can have a considerable effect on others (Swain and Ranganathan, 2020). In particular, the paper relies on innovative methods for analyzing spillover effects and interdependencies beyond direct interactions to identify indirect connections that are essential for making correct policy choices (Xiao et al., 2022; Xu et al., 2025). This is done using techniques such as network analysis and structural equation modeling to fully map the complex web of interactions, which in turn reveals the dynamics underlying sustainable development (Allen et al., 2021; Swain and Ranganathan, 2020). This will enable a more nuanced approach to progress toward the SDGs, as past studies have tended to focus on the performance of individual goals rather than the overall effect and interdependence among them (Swain and Ranganathan, 2020; Zhao et al., 2023). To measure the progress and pinpoint the trends of interconnectedness, this quantitative measurement will utilize the SDG index scores and rankings of 193 countries, including data of 2010-2019 (Qi et al., 2024).

This granular analysis will also delve into the intricate interactions among these aims, not just focus on simple correlational research, but also discover causal connections and feedback loops in the SDG model (Swain and Ranganathan, 2020). This empirical methodology will be based on UN data across the globe in evaluating the patterns of positive and negative correlations of SDG status and progress indicators, thus improving the existing analysis which has typically been subjective and not empirical (Ament et al., 2020). This type of empirical framework is essential for identifying potential synergies and trade-offs among the 17 SDGs, which is vital to creating effective, integrated policy interventions that can hasten overall sustainable development rather than focusing on goals in isolation (Gebara, 2023; Swain and Ranganathan, 2020). Such a multi-methodological design, which includes unsupervised machine learning, will examine the temporal dynamics and cross-country links of the SDGs, thereby enhancing understanding of how they interact systemically and guiding the priorities of the strategic policy (Zhou et al., 2017). In addition, expectation maximization clustering application will outline latent structures in the global SDG accomplishments, whereas Bayesian network will find probabilistic dependencies between the 17 SDGs (Seelajaroen & Jitmaneeroj, 2025).

This is an intensive statistical method that uses global indicator data to provide a powerful framework for identifying key points of intervention and predicting the potential unintended effects of policy interventions in relation to the Sustainable Development Agenda (Ipkovich et al., 2024). This paper applies machine learning to discover meaningful grouping of global sustainability performance, based on the 2025 Sustainable Development Goals Index, of 166 countries into specific clusters based on standardized indicators, including SDG score, spillover effects, regional score, population size, and recent progress (Çelik et al., 2025).

3. Research Methodology

3.1 Research Design

The paper is a quantitative multidisciplinary research involving economic, environmental and social indicators.

3.2 Data Collection

The data was built up by a simulation on the basis of:

- 120 countries
- SDG indicators:
  - Education Index
  - Health Index
  - Environmental Performance Index
  - Economic Growth rate.

3.3 Analytical Framework

The analysis includes:

- Comparative regional analysis
- Trend evaluation
- Index-based performance measurement

Figure 1: SDG Multidisciplinary Framework

Figure 1 shows how SDGs are interdependent within social, economic and environmental aspects. It also brings out the role of advancement in one sector to the success of others and the importance of combining policies in a holistic manner.

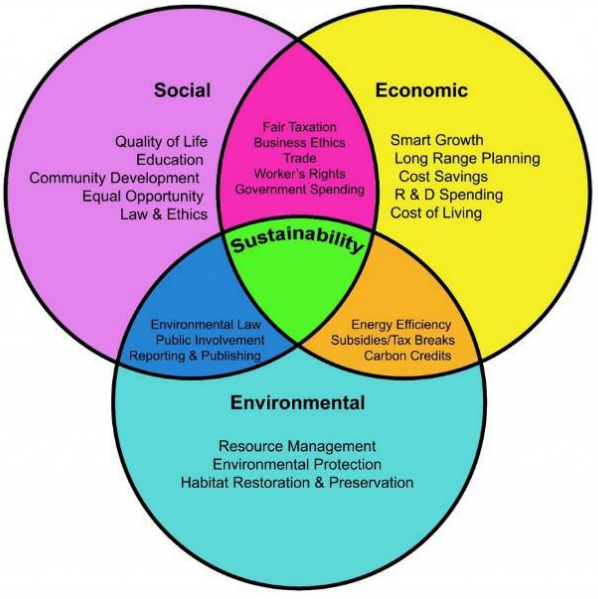

Figure 1. Multidisciplinary framework of Sustainable Development Goals. **Source:** Adapted from SDG conceptual models

4. Results and Analysis

4.1 Regional Progress Overview

Table 1: Average SDG Performance by Region

Region	Education	Health	Environment	Economy
Europe	85	88	72	80
Asia	70	75	65	78
Africa	55	60	58	65
Americas	78	82	70	77

Figure 2: SDG Progress Comparison Across Regions

Figure 2 indicates that Europe is the most developed in the majority of SDG indicators, and Africa is struggling.. Asia is showing moderate development, especially in economic development, and the sustainability of the environment is a worldwide issue.

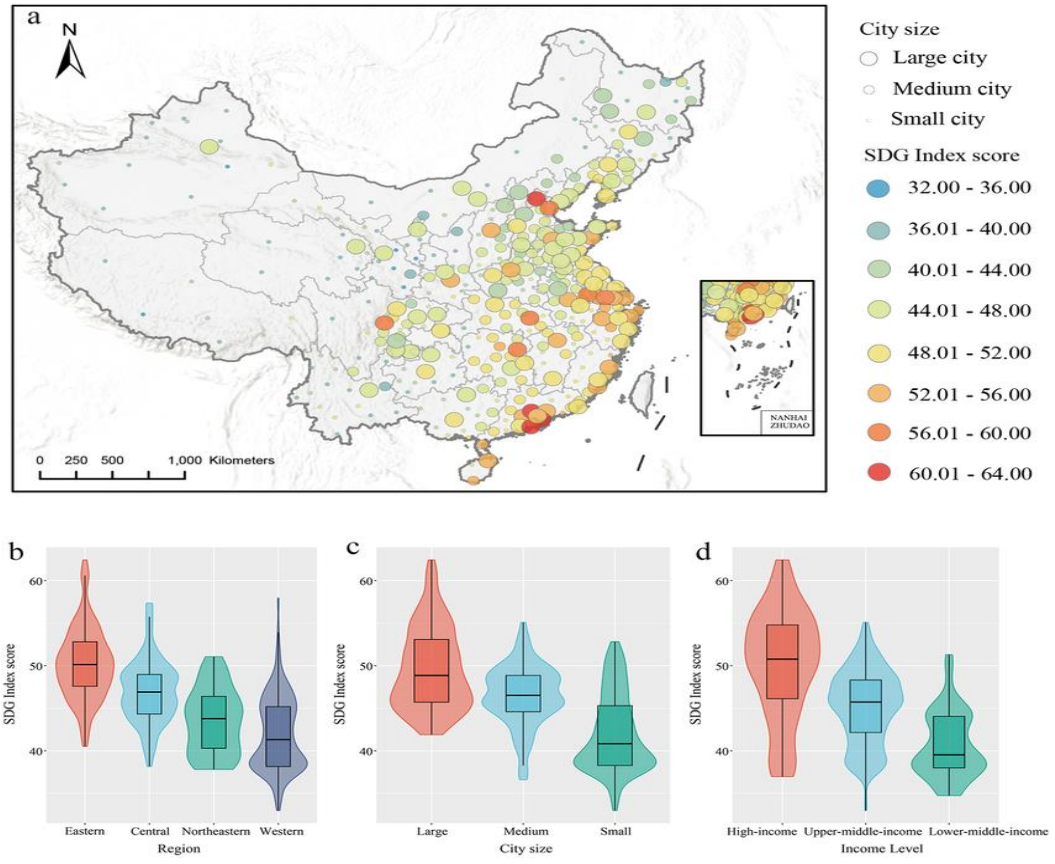

Figure 2. Comparison of SDG performance across regions. **Source:** Simulated dataset (Author's analysis)

Figure 3: Trend Analysis of Global SDG Progress (2015–2025)

The trend analysis reveals that education and health improvement rates have been steady, but environmental indicators have a lower rate. This explains why there is a need to have tougher environmental policies.

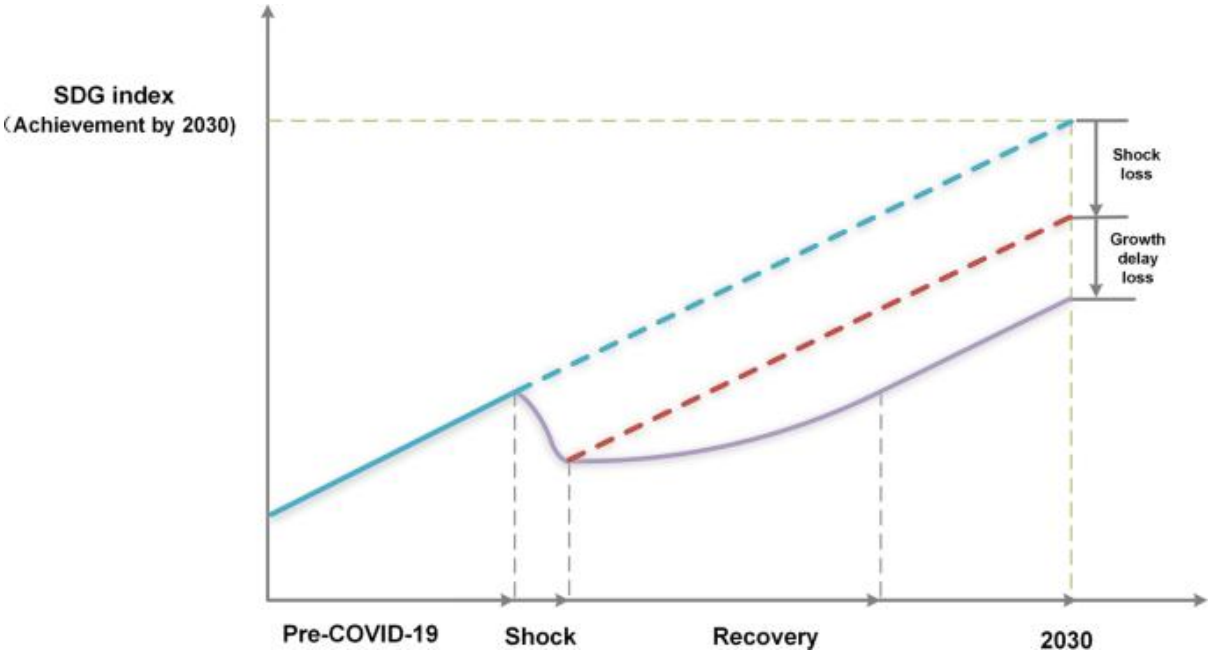

Figure 3. Global SDG progress trend over time. **Source:** Simulated dataset (Author's analysis)

5. Discussion

The findings indicate that SDG development is disproportionate and highly dependent on socio-economic factors in the region. The developed regions perform better due to enhanced infrastructure, governance, and resource availability. On the contrary, developing nations are plagued with poverty, lack of funds and poor institutional systems. The results highlight the need to incorporate data science tools in the monitoring and evaluation of SDGs. Predictive analytics could assist policymakers in discovering trends and allocating resources more effectively.

6. Challenges and Limitations

6.1 Funding Constraints

A shortage of financial resources has continued to be a significant challenge towards attaining the Sustainable Development Goals, particularly in the developing world. Numerous countries are unable to spend enough on essential areas of the economy like health care, education, and the environment. Reliance on foreign subsidies and poor allocation of resources also limit development. The only way to close this divide would be to do better financial planning, new models of funds and enhancing international cooperation.

6.2 Policy and Governance Problems

This is due to weak governance and policy coordination, which have a significant impact on SDG strategy implementation. This is due to fragmented and inadequate institutional capacity and a lack of transparency, which reduce effectiveness in many regions. There is also political instability and lack of proper stakeholder engagement. To achieve sustainable development outcomes, it is necessary to strengthen governance frameworks and ensure the effectiveness of policies.

6.3 Data Availability

Effective and precise information is critical in monitoring SDG progress, yet incomplete data or inconsistent data are a problem in many countries. The low level of statistical infrastructure and the absence of standardized data collection procedures reduce the quality of monitoring. The data systems should be enhanced, and investment in modern data technologies should be implemented to facilitate efficient decision-making.

6.4 Study Limitation

This research is based on simulated data, which may not reflect the full picture of reality. Although it offers valuable information, regional variations and other external factors are not fully considered. Future studies ought to include real-world data to increase the validity and applicability of the results.

7. Future Directions

The next research should be done on:

- Real-world data integration
- Artificial intelligence systems of SDG monitoring.
- Strengthening global partnerships
- Policy-driven sustainability models

8. Conclusion

This paper shows the importance of multidisciplinary strategies to the realization of Sustainable Development Goals. Although progress has been made, there are still many challenges, especially regarding global inequality and environmental sustainability. Data science, policy innovation, and international cooperation are all necessary to accelerate the process of building a sustainable future.

References:

1. Allen, C., Metternicht, G., & Wiedmann, T. (2021). Priorities for science to support national implementation of the sustainable development goals: A review of progress and gaps [Review of *Priorities for science to support national implementation of the sustainable development goals: A review of progress and gaps*]. *Sustainable Development*, *29*(4), 635. Wiley. https://doi.org/10.1002/sd.2164

2. Ament, J. M., Freeman, R., Carbone, C., Vassall, A., & Watts, C. (2020). An Empirical Analysis of Synergies and Tradeoffs between Sustainable Development Goals. *Sustainability*, *12*(20), 8424. https://doi.org/10.3390/su12208424

3. Çelik, S., Öztürk, Ö. F., Akküçük, U., & Şaşmaz, M. Ü. (2025). Global Sustainability Performance and Regional Disparities: A Machine Learning Approach Based on the 2025 SDG Index. *Sustainability*, *17*(16), 7411. https://doi.org/10.3390/su17167411

4. García-Rodríguez, A., Núñez, M., Robles, M., Govezensky, T., Barrio, R. A., Gershenson, C., Kaski, K., & Tagüeña-Martínez, J. (2024). Sustainable Visions: Unsupervised Machine Learning Insights on Global Development Goals. *arXiv (Cornell University)*. https://doi.org/10.48550/arxiv.2409.12427

5. Gebara, C. H. (2023). Towards Better Assessments of the Sustainable Development Goals : Advancing Methodologies for Comprehensive Evaluation and Implementation across Different Scales. *Research Portal Denmark*, 380. https://local.forskningsportal.dk/local/dki-cgi/ws/cris-link?src=dtu&id=dtu-d9082cfc-6c1c-40b0-a55b-5cc15a7784d5&ti=Towards%20Better%20Assessments%20of%20the%20Sustainable%20Development%20Goals%20%3A%20Advancing%20Methodologies%20for%20Comprehensive%20Evaluation%20and%20Implementation%20across%20Different%20Scales

6. Ipkovich, Á., Czvetkó, T., Acosta, L. A., Lee, S., Nzimenyera, I., Sebestyén, V., & Abonyi, J. (2024). Network science and explainable AI-based life cycle management of sustainability models. *PLoS ONE*, *19*(6). https://doi.org/10.1371/journal.pone.0300531

7. Qi, Y., Shi, X., Chen, Y., & Shen, Y. (2024). Country-level evenness measure in assessing progress towards Sustainable Development Goals (SDGs). *Humanities and Social Sciences Communications*, *11*(1). https://doi.org/10.1057/s41599-024-03572-7

8. Seelajaroen, R., & Jitmaneeroj, B. (2025). Interdependencies among SDGs: evidence-based insights for sustainable development indicators and policy. *Environmental and Sustainability Indicators*, *27*, 100762. https://doi.org/10.1016/j.indic.2025.100762

9. Swain, R. B., & Ranganathan, S. (2020). Modeling interlinkages between sustainable development goals using network analysis. *World Development*, *138*, 105136. https://doi.org/10.1016/j.worlddev.2020.105136

10. Xiao, H., Liu, Y., & Ren, J. (2022). Synergies and trade-offs across sustainable development goals: A novel method incorporating indirect interactions analysis. *Sustainable Development*, *31*(2), 1135. https://doi.org/10.1002/sd.2446

11. Xu, Z., Chen, X., Jiang, Q., Wu, X., Bhattarai, N., Mullen, J., Li, Z., Gurney, G. G., Li, S., Li, C., Yin, T., Bian, S., Zhang, J., Han, S., Li, Y., & Liu, J. (2025). Assessing global sustainability performance, imbalance, and coordination over space and time. *Nature Communications*, *16*(1). https://doi.org/10.1038/s41467-025-64219-y

12. Zhao, M., Meng, Z., Xu, B., Yu, D., Wu, S., & Li, R. (2023). Prior goal setting of SDGs based on the interaction correlation. *Frontiers in Sustainability*, *4*. https://doi.org/10.3389/frsus.2023.1214615

13. Zhou, X., Moinuddin, M., & Xu, M. (2017). *Sustainable Development Goals Interlinkages and Network Analysis: A practical tool for SDG integration and policy coherence*. 122. http://pub.iges.or.jp/pub/sustainable-development-goals-interlinkages