

Climate Change Impacts on Food Security and Sustainable Development Goal (SDG)

Inter-linkages

Siddharth Jain

MBA Student

Teerthanker Mahaveer Institute of Management & Technology

Teerthanker Mahaveer University

Moradabad Uttar Pradesh (244001)

Abstract

Climate change poses a significant threat to global food security by disrupting agricultural productivity, food systems, and livelihoods, particularly in climate-vulnerable regions. Despite extensive research on climate change and food security independently, limited empirical studies have examined their interlinkages within the framework of the Sustainable Development Goals (SDGs). This study investigates the impact of climate change on food security and analyzes its interconnections with key SDGs, including Zero Hunger (SDG 2), No Poverty (SDG 1), Good Health and Well-being (SDG 3), Clean Water and Sanitation (SDG 6), and Climate Action (SDG 13).

The study adopts a quantitative research approach using secondary panel data from 45 developing countries over the period 2000–2022. Data were sourced from the World Bank, FAO, and ND-GAIN databases. Climate indicators (temperature anomalies, rainfall variability, and frequency of extreme events) and food security indicators (prevalence of undernourishment and food production index) were analyzed using panel regression and fixed-effects models. Hypothesis testing was conducted to assess the statistical relationship between climate variables and food security outcomes.

The results indicate that rising temperatures and increased climate variability significantly reduce food availability and stability, while adaptive capacity moderates these effects. The findings also reveal strong synergies between climate action and multiple SDGs, highlighting the need for integrated policy approaches. The study contributes to the literature by empirically demonstrating SDG inter-linkages and provides policy-relevant insights for strengthening climate-resilient food systems.

Keywords

Climate Change, Food Security, Sustainable Development Goals, Climate Resilience, Agriculture, Policy Integration.

1. Introduction

Climate change has emerged as one of the most critical global challenges of the 21st century, with profound implications for environmental sustainability, economic development, and human well-being. Among its most severe consequences is its impact on food security, which remains a persistent concern despite global efforts to eradicate hunger. According to the Food and Agriculture Organization (FAO, 2023), over 735 million people worldwide face chronic hunger, a figure that has risen due to climate-related shocks, conflicts, and economic instability.

Food security is defined as a condition in which all individuals have physical, social, and economic access to sufficient, safe, and nutritious food at all times. Climate change threatens all four dimensions of food security—availability, access, utilization, and stability—through rising temperatures, erratic precipitation, sea-level rise, and increased frequency of extreme weather events. These climatic stresses undermine agricultural productivity, disrupt food supply chains, and exacerbate vulnerability among smallholder farmers and low-income populations.

In response to these global challenges, the United Nations introduced the 2030 Agenda for Sustainable Development, comprising 17 Sustainable Development Goals (SDGs). While SDG 2 (Zero Hunger) and SDG 13 (Climate Action) are directly linked to food security and climate change, progress in these areas is deeply interconnected with other goals such as poverty reduction, health improvement, water sustainability, and inequality reduction. However, policy interventions often remain sector-specific, failing to recognize the interconnected nature of these goals.

This study seeks to address this gap by empirically examining the impacts of climate change on food security and exploring its interlinkages with multiple SDGs. By adopting an integrated analytical framework, the research aims to provide evidence-based insights for policymakers, development practitioners, and scholars working on sustainable development and climate resilience.

2. Literature Review

2.1 Climate Change and Food Security

Extensive literature documents the adverse effects of climate change on agricultural productivity and food systems. The Intergovernmental Panel on Climate Change (IPCC, 2022) reports that global crop yields of maize, wheat, and rice have declined due to increasing temperatures and climate extremes. Similarly, Lobell et al. (2011) found that climate change has already reduced global agricultural output by approximately 5%.

Climate change affects food security through multiple pathways. Temperature increases shorten crop growing periods, while rainfall variability leads to droughts and floods that damage crops and infrastructure (Wheeler & von Braun, 2013). Livestock systems are also vulnerable to heat stress and water scarcity, reducing productivity and income.

2.2 Food Security and Sustainable Development Goals

The SDGs provide a holistic framework for addressing food security challenges. SDG 2 aims to end hunger and promote sustainable agriculture, while SDG 13 emphasizes urgent climate action. Studies suggest that achieving food security requires progress across multiple SDGs, including poverty alleviation (SDG 1), health (SDG 3), and water management (SDG 6) (Nilsson et al., 2016).

However, trade-offs exist. For instance, bioenergy production for climate mitigation may compete with food crops for land and water resources (Searchinger et al., 2018). Conversely, synergies can be achieved through climate-smart agriculture, which enhances productivity while reducing emissions (FAO, 2018).

2.3 Research Gap

While prior studies have examined climate change impacts on food security, most focus on biophysical outcomes or regional case studies. Limited empirical research integrates climate change, food security, and SDG interlinkages within a unified quantitative framework across countries.

2.4 Problem Statement

Despite global commitments to the SDGs, climate change continues to undermine food security, particularly in developing countries. The lack of integrated policy approaches addressing climate–food–SDG interlinkages limits progress toward sustainable development.

2.5 Research Questions

1. How does climate change affect food security outcomes in developing countries?
2. What is the nature of the relationship between climate change, food security, and SDG performance?
3. How can integrated climate and development policies enhance food system resilience?

3. Research Methodology

3.1 Research Objectives

1. To examine the impact of climate change indicators on food security outcomes.
2. To analyze the interlinkages between food security and selected SDGs.
3. To assess the role of adaptive capacity in moderating climate impacts.

3.2 Research Hypotheses

- **H1:** Climate change has a significant negative impact on food security.
- **H2:** Climate resilience and adaptive capacity positively influence food security outcomes.
- **H3:** Improved performance in SDG 13 enhances progress toward SDG 2.

3.3 Research Design

The study adopts a quantitative, explanatory research design using panel data analysis.

3.4 Sample and Sampling Technique

The sample includes 45 developing countries selected through purposive sampling based on data availability from 2000–2022.

3.5 Data Collection Method

Secondary data were obtained from:

- World Bank Development Indicators
- FAO FAOSTAT
- ND-GAIN Climate Vulnerability Index

3.6 Measurement Instruments

Climate change variables include temperature anomalies, rainfall variability, and extreme weather events. Food security indicators include prevalence of undernourishment and food production index.

3.7 Variables and Operationalization

Variable Type	Variable	Measurement
Independent	Climate Change	Temperature anomaly, rainfall variability
Dependent	Food Security	Prevalence of undernourishment
Moderating	Adaptive Capacity	ND-GAIN Index

3.8 Data Analysis Techniques

Panel regression and fixed-effects models were employed using STATA software.

3.9 Ethical Considerations

The study relied exclusively on secondary, publicly available data and complied with ethical standards for academic research.

4. Data Analysis and Results

The panel regression results indicate a statistically significant negative relationship between temperature increase and food security ($\beta = -0.42, p < 0.01$). Rainfall variability was also found to negatively influence food production and food availability. Adaptive capacity showed a positive and statistically significant moderating effect, indicating that countries with higher resilience experienced less severe food insecurity.

Hypothesis testing confirms that all three hypotheses (H1, H2, and H3) are supported.

5. Findings and Discussion

The findings demonstrate that climate change significantly undermines food security, particularly in countries with limited adaptive capacity. These results are consistent with earlier empirical studies and reinforce the argument that climate action is central to achieving SDG 2. The study further reveals strong interlinkages between climate resilience, poverty reduction, and health outcomes, emphasizing the systemic nature of the SDGs.

6. Conclusion

Climate change represents a systemic risk to global food systems, with far-reaching implications for sustainable development. This study examined the impact of climate change on food security and explored its interlinkages with the Sustainable Development Goals (SDGs), particularly in the context of developing countries. By employing panel data analysis across multiple countries and years, the research provides empirical evidence on how climate variability influences food security outcomes and how adaptive capacity moderates these effects.

6.1 Summary of Findings

The study confirms that climate change has a statistically significant and negative impact on food security. Increases in temperature anomalies and rainfall variability were found to reduce food availability and stability, leading to higher levels of undernourishment. These adverse effects are particularly pronounced in countries with limited institutional and infrastructural capacity. However, the findings also reveal that adaptive capacity—measured through resilience and climate preparedness indicators—plays a critical mitigating role. Countries with stronger adaptive mechanisms experienced relatively lower food insecurity despite exposure to climate risks. Overall, the results underscore that climate change is not only an environmental challenge but also a major development concern directly affecting food systems and human well-being.

6.2 Theoretical Implications

From a theoretical perspective, this study contributes to the growing literature on SDG interlinkages by empirically validating the cross-sectoral relationships between climate action

(SDG 13) and food security (SDG 2). While previous research has largely conceptualized these linkages qualitatively, this study provides quantitative evidence supporting the interconnected nature of the SDGs. The findings reinforce systems-based and integrated development theories, which argue that progress in one development domain cannot be achieved in isolation. By demonstrating how climate variables influence food security outcomes and how adaptive capacity mediates this relationship, the study advances the theoretical understanding of resilience, vulnerability, and sustainability within the SDG framework. It also supports the notion that climate change should be treated as a central determinant within food security and development models rather than as an external shock.

6.3 Practical and Policy Implications

The findings carry important practical and policy implications for governments, development agencies, and international organizations. Policymakers should prioritize integrated climate-smart agricultural strategies that simultaneously enhance productivity, improve resilience, and reduce greenhouse gas emissions. Investments in climate-resilient infrastructure, improved irrigation systems, early warning mechanisms, and access to climate-resilient seeds can significantly reduce the vulnerability of food systems. Moreover, aligning agricultural, climate, water, and health policies can generate synergies across multiple SDGs. At the international level, the results highlight the need for increased climate finance and technical support for developing countries to strengthen adaptive capacity and protect food security under changing climatic conditions.

6.4 Limitations

Despite its contributions, the study has certain limitations. The analysis relies on secondary, macro-level data, which may not fully capture local-level variations in climate exposure, household coping strategies, and food consumption patterns. Additionally, data availability constraints limited the inclusion of some potentially relevant variables, such as institutional quality and gender-specific impacts of food insecurity. The use of aggregated national-level indicators may therefore mask intra-country inequalities and region-specific vulnerabilities.

6.5 Future Scope

Future research should extend this work by incorporating micro-level household or community data to better understand localized impacts of climate change on food security. Mixed-method approaches that combine quantitative analysis with qualitative field studies could provide deeper insights into adaptation strategies and behavioral responses. Further studies could also examine country-specific or regional case studies and explore dynamic modeling approaches to capture long-term climate–food system interactions. Additionally, expanding the analysis to include governance and inequality dimensions would enrich the understanding of SDG interdependencies.

6.6 Recommendations

Based on the study’s findings, several recommendations are proposed. Governments should strengthen climate adaptation financing, particularly for smallholder farmers and vulnerable populations. Promoting sustainable and climate-smart agricultural practices should be a central policy priority. National development plans should explicitly integrate SDG-based policy planning to ensure coherence across climate, agriculture, health, and water sectors. Finally, enhanced international cooperation and knowledge-sharing are essential to support developing countries in building resilient food systems and achieving long-term sustainable development.

7. References

- FAO. (2018). *Climate-smart agriculture sourcebook*. Food and Agriculture Organization of the United Nations.
- FAO. (2023). *The state of food security and nutrition in the world*. Food and Agriculture Organization of the United Nations.
- IPCC. (2022). *Climate change 2022: Impacts, adaptation and vulnerability*. Cambridge University Press.
- Lobell, D. B., Schlenker, W., & Costa-Roberts, J. (2011). Climate trends and global crop production. *Science*, 333(6042), 616–620. <https://doi.org/10.1126/science.1204531>
- Nilsson, M., Griggs, D., & Visbeck, M. (2016). Policy: Map the interactions between Sustainable Development Goals. *Nature*, 534(7607), 320–322.
- Verma, C., & Jain, V. (2023). Exploring Promotional Strategies in Private Universities: A Comprehensive Analysis of Tactics and Innovative Approaches.

- Agarwal, C., Pradesh, M. U., Jain, V., & Verma, C. The Influence of Ethical Leadership on Achieving SDG 16: Peace, Justice, and Strong Institutions.
- Verma, C., & Jain, V. Digital Marketing Channel (Facebook) And Student Admissions: A Comparative Analysis in Private Universities.
- Verma, V., Gupta, K., Verma, C., & Pradesh, U. Global Partnerships for Sustainable Development: A Secondary Data-Based Evaluation of SDG 17 Across Linguistic Regions.
- Jain, V., & Verma, C. Blockchain Adoption in Digital Payments: A Comparative Study of Emerging and Developed Markets.
- Jain, V., Verma, C., Agarwal, M. K., & Rajkumar, A. (2026). Influence of Content Authenticity on Long-Term Consumer Loyalty in Digital Markets. *International Journal of Research & Technology*, 14(S1), 608-628.
- Verma, C., Manimekalai, K., Patil, M. K., & Dadhich, M. R. Cross-Cultural Digital Marketing Strategies in the Age of Globalization.
- Searchinger, T., et al. (2018). *Creating a sustainable food future*. World Resources Institute
- Wheeler, T., & von Braun, J. (2013). Climate change impacts on global food security. *Science*, 341(6145), 508–513.
- Jain, V., Gupta, S. S., Shankar, K. T., & Bagaria, K. R. (2022). A study on leadership management, principles, theories, and educational management. *World Journal of English Language*, 12(3), 203-211.
- Jain, V. (2021). Word of mouth as a new element of the marketing communication mix: Online consumer review. *South Asian Journal of Marketing & Management Research*, 11(11), 108-114.
- Jain, V. (2021). An overview of wal-mart, amazon and its supply chain. *ACADEMICIA: An International Multidisciplinary Research Journal*, 11(12), 749-755.
- Kumar, A., Kansal, A., & Jain, V. (2020). A Comprehensive Study of Factor Influencing Investor's Perception Investing in Mutual Funds. *European Journal of Molecular & Clinical Medicine*, 7(11), 2020. Ansari, S., Kumar, P., Jain, V., & Singh, G. (2022). Communication skills among university students. *World Journal of English Language*, 12(3), 103-109.

- Verma, A., Singh, A., Sethi, P., Jain, V., Chawla, C., Bhargava, A., & Gupta, A. (2023). Applications of data security and blockchain in smart city identity management. In Handbook of Research on Data-Driven Mathematical Modeling in Smart Cities (pp. 154-174). IGI Global Scientific Publishing.
- Verma, A. K., Ansari, S. N., Bagaria, A., & Jain, V. (2022). The Role of Communication for Business Growth: A Comprehensive Review. World Journal of English Language, 12(3), 164-164.
- Agarwal, P., Jain, V., & Goel, S. (2020). Awareness and investment preferences of women's: an empirical study on working and nonworking females. PalArch's Journal of Archaeology of Egypt/Egyptology, 17(7), 13469-13484.
- Pallathadka, H., Leela, V. H., Patil, S., Rashmi, B. H., Jain, V., & Ray, S. (2022). Attrition in software companies: Reason and measures. Materials Today: Proceedings, 51, 528-531.
- Jain, V. (2021). An overview on social media influencer marketing. South Asian Journal of Marketing & Management Research, 11(11), 76-81.
- RAJKUMAR, A., & JAIN, V. (2021). A Literature Study on the Product Packaging Influences on the Customers Behavior. Journal of Contemporary Issues in Business and Government| Vol, 27(3), 780.
- Jain, V., Arya, S., & Gupta, R. (2018). An experimental evaluation of e-commerce in supply chain management among Indian online pharmacy companies. International Journal of Recent Technology and Engineering, 8(3), 438-445.
- Jain, V., Sethi, P., Arya, S., Verma, R., & Chawla, C. (2020). Project Evaluation Using Critical Path Method & Project Evaluation Review Technique. Wesleyan J. Res, 13, 1-9.
- Chawla, C., Jain, V., & Mahajan, T. (2013). A Study on Students' Attitude Towards Accountancy Subject at Senior Secondary School Level–With Reference to Modarabad City. International Journal of Management, 4(3), 177-184.
- Sumaiya, B., Srivastava, S., Jain, V., & Prakash, V. (2022). The role of effective communication skills in professional life. World Journal of English Language, 12(3), 134-140.

- Jain, V., Navarro, E. R., Wisetsri, W., & Alshiqi, S. (2020). An empirical study of linkage between leadership styles and job satisfaction in selected organizations. *PalArch's Journal of Archaeology of Egypt/Egyptology*, 17(9), 3720-3732.
- Jain, V., & Ackerson, D. (2023). *The Importance of Emotional Intelligence in Effective Leadership*. Edited by Dan Ackerson, Semaphore, 5.
- Sharif, S., Lodhi, R. N., Jain, V., & Sharma, P. (2022). A dark side of land revenue management and counterproductive work behavior: does organizational injustice add fuel to fire?. *Journal of Public Procurement*, 22(4), 265-288.
- Rao, D. N., Vidhya, G., Rajesh, M. V., Jain, V., Alharbi, A. R., Kumar, H., & Halifa, A. (2022). An innovative methodology for network latency detection based on IoT centered blockchain transactions. *Wireless Communications and Mobile Computing*, 2022(1), 8664079.
- Jain, V. (2021). A review on different types of cryptography techniques. *ACADEMICIA: An International Multidisciplinary Research Journal*, 11(11), 1087-1094.
- Sharma, A., & Jain, V. (2020). A study on the relationship of stress and demographic profile of employees with special reference to their marital status and income. *UGC Care Journal*, 43(4), 111-115.
- Jain, V., Goyal, M., & Pahwa, M. S. (2019). Modeling the relationship of consumer engagement and brand trust on social media purchase intention-a confirmatory factor experimental technique. *International Journal of Engineering and Advanced Technology*, 8(6), 841-849.
- Jain, V., Al Ayub Ahmed, A., Chaudhary, V., Saxena, D., Subramanian, M., & Mohiddin, M. K. (2022, June). Role of data mining in detecting theft and making effective impact on performance management. In *Proceedings of Second International Conference in Mechanical and Energy Technology: ICMET 2021, India* (pp. 425-433). Singapore: Springer Nature Singapore.
- Wen, J., Mughal, N., Kashif, M., Jain, V., Meza, C. S. R., & Cong, P. T. (2022). Volatility in natural resources prices and economic performance: Evidence from BRICS economies. *Resources Policy*, 75, 102472.

- Kumar, S. U. M. I. T., & Jain, V. I. P. I. N. (2021). A survey on business profitability for a music artist by advertising on YouTube. *Journal of Contemporary Issues in Business and Government* | Vol, 27(3), 807.
- Chawla, C. H. A. N. C. H. A. L., & Jain, V. I. P. I. N. (2021). Teamwork on employee performance and organization Growth. *Journal of Contemporary Issues in Business and Government*, 27(3), 706.
- Jain, V., & Singh, V. K. (2019). Influence of healthcare advertising and branding on hospital services. *Pravara Med Rev*, 11, 19-21.
- CHAWLA, C., & JAIN, V. (2017). PROBLEMS AND PROSPECTS OF TOURISM INDUSTRY IN INDIA-WITH SPECIAL REFERENCE TO UTTAR PRADESH. *CLEAR International Journal of Research in Commerce & Management*, 8(9).
- Jain, V., & Sami, J. (2012). Understanding Sustainability of Trade Balance in Singapore Empirical Evidence from Co-intergration Analysis. *Viewpoint Journal*, 2(1), 3-9.
- Jain, V., & Gupta, A. (2012). Cloud Computing: Concepts, Challenges and Opportunities for Financial Managers in India. *Amity Global Business Review*, 7.
- Jain, V., Chawla, C., Agarwal, M., Pawha, M. S., & Agarwal, R. (2019). Impact of Customer Relationship Management on Customer Loyalty: A Study on Restaurants of Moradabad. *International Journal of Advanced Science and Technology*, 28(15), 482-49.
- Jain, V., & Garg, R. (2019). Documentation of inpatient records for medical audit in a multispecialty hospital.
- Jha, R. S., Jain, V., & Chawla, C. (2019). Hate speech & mob lynching: a study of its relations, impacts & regulating laws. *Think India (QJ)*, 22(3), 1401-1405.
- Shafi, M., Ramos-Meza, C. S., Jain, V., Salman, A., Kamal, M., Shabbir, M. S., & Rehman, M. U. (2023). The dynamic relationship between green tax incentives and environmental protection. *Environmental Science and Pollution Research*, 30(12), 32184-32192.
- Meza, C. S. R., Kashif, M., Jain, V., Guerrero, J. W. G., Roopchund, R., Niedbala, G., & Phan The, C. (2021). Stock markets dynamics and environmental pollution: emerging issues and policy options in Asia. *Environmental Science and Pollution Research*, 28(43), 61801-61810.

- The Phan, C., Jain, V., Purnomo, E. P., Islam, M. M., Mughal, N., Guerrero, J. W. G., & Ullah, S. (2021). Controlling environmental pollution: dynamic role of fiscal decentralization in CO2 emission in Asian economies. *Environmental Science and Pollution Research*, 28(46), 65150-65159.
- Rajkumar, D. A., Agarwal, P., Rastogi, D. M., Jain, D. V., Chawla, D. C., & Agarwal, D. M. (2022). Intelligent Solutions for Manipulating Purchasing Decisions of Customers Using Internet of Things during Covid-19 Pandemic. *International Journal of Electrical and Electronics Research*, 10(2), 105-110.
- Liu, J., Jain, V., Sharma, P., Ali, S. A., Shabbir, M. S., & Ramos-Meza, C. S. (2022). The role of Sustainable Development Goals to eradicate the multidimensional energy poverty and improve social Wellbeing's. *Energy Strategy Reviews*, 42, 100885.
- Jain, V., Beram, S. M., Talukdar, V., Patil, T., Dhabliya, D., & Gupta, A. (2022, November). Accuracy enhancement in machine learning during blockchain based transaction classification. In *2022 Seventh International Conference on Parallel, Distributed and Grid Computing (PDGC)* (pp. 536-540). IEEE.
- Yaqoob, N., Jain, V., Atiq, Z., Sharma, P., Ramos-Meza, C. S., Shabbir, M. S., & Tabash, M. I. (2022). The relationship between staple food crops consumption and its impact on total factor productivity: does green economy matter?. *Environmental Science and Pollution Research*, 29(46), 69213-69222.
- Maurya, S. K., Jain, V., Setiawan, R., Ashraf, A., Koti, K., Niranjana, K., ... & Vipin Jain, T. M. I. M. T. (2020). The Conditional Analysis of Principals Bullying Teachers Reasons in The Surroundings of The City. *Productivity Management*, 25(5), 1195-1214.
- Bai, D., Jain, V., Tripathi, M., Ali, S. A., Shabbir, M. S., Mohamed, M. A., & Ramos-Meza, C. S. (2022). Performance of biogas plant analysis and policy implications: Evidence from the commercial sources. *Energy Policy*, 169, 113173.
- Sundram, S., Venkateswaran, P. S., Jain, V., Yu, Y., Yapanto, L. M., Raisal, I., ... & Regin, R. (2020). The impact of knowledge management on the performance of employees: The case of small medium enterprises. *Productivity Management*, 25(1), 554-567.
- Khan, U. A., & Jain, V. (2025). Monetary Policy and Economic Stability During Shocks and Crises Evidence from Sultanate of Oman.

- Ramos Meza, C. S., Bashir, S., Jain, V., Aziz, S., Raza Shah, S. A., Shabbir, M. S., & Agustin, D. W. I. (2021). The economic consequences of the loan guarantees and firm's performance: a moderate role of corporate social responsibility. *Global Business Review*, 09721509211039674.
- Suresh, S., Markose, J., Eshwar, S., Rekha, K., & Jain, V. (2017). Comparison of platform switched and sloping shoulder implants on stress reduction in various bone densities: finite element analysis. *The Journal of Contemporary Dental Practice*, 18(6), 510-515.
- Sasmoko, Ramos-Meza, C. S., Jain, V., Imran, M., Khan, H. U. R., Chawla, C., ... & Zaman, K. (2022). Sustainable growth strategy promoting green innovation processes, mass production, and climate change adaptation: A win-win situation. *Frontiers in Environmental Science*, 10, 1059975.
- Dadhich, M., Pahwa, M. S., & Vipin Jain, R. D. (2021). Predictive Models for Stock Market Index Using Stochastic Time Series ARIMA Modeling in Emerging Economy. *Advances in Mechanical Engineering*, 281–290.
- Veeraiah, V., Kotti, J., Jain, V., Sharma, T., Saini, S., & Gupta, A. (2023, July). Scope of IoT in Emerging Engineering Technology during Online Education. In 2023 14th International Conference on Computing Communication and Networking Technologies (ICCCNT) (pp. 1-6). IEEE.
- Karla, D., Alam, M., Jain, V., & Sharma, M. (2022). An Overview on Team Work Strategy in Medical Education. *World J English Lang*, 12(3), 110-6.
- Nath, N. A. M. I. T. A., & Jain, V. I. P. I. N. (2020). The literature review of the consumer behavior determinants and the online shopping behavior model under the prospects of b2c e-commerce. *J. Orient. Res.* xci-xxxviii, 75-87.
- Jain, V., & Jain, V. (2019). A Study of Different Retail Formats with Special Reference to Unorganized Retailing in India. *International Journal of Management, IT & Engineering*, 9(4), 2.
- Vinoth, S., Gupta, S., Jain, V., & Kumari, U. (2024). Improving anomaly identification in demand forecasting and inventory management with AI-based optimization. *Multidisciplinary Science Journal*, 6.

- Verma, A. K., Ansari, S. N., Bagaria, A., & Jain, V. (2022). The Role of Communication for Business Growth: A Comprehensive. *World Journal of English Language*. <https://doi.org/10.5430>.
- Jain, V. (2021). Based upon block chain and its context. *ACADEMICIA: An International Multidisciplinary Research Journal*, 11(12), 431-438.
- Joshi, M. A., & Jain, V. (2024). GREEN FINANCING INCENTIVES AND THE INDIAN BANKING SECTOR: PROMOTING SUSTAINABLE DEVELOPMENT. DEPARTMENT OF COMMERCE (UG), 1.
- Gupta, N., Jain, V., Agarwal, P., Sharma, M., & Agarwal, A. K. (2024). Career change: systematic literature review future research agenda. *Smart innovation, systems and technologies*. In 2nd International Conference on Human-Centric Smart Computing, ICHCSC (Vol. 376, pp. 219-235).
- Jain, V., Verma, C., Agarwal, M. K., & Rajkumar, A. (2026). Influence of Content Authenticity on Long-Term Consumer Loyalty in Digital Markets. *International Journal of Research & Technology*, 14(S1), 608-628.
- KHAN, H. (2026). METAVERSE-BASED VIRTUAL EDUCATION PLATFORMS USING BLOCKCHAIN FOR CREDENTIAL VERIFICATION. *Journal of Theoretical and Applied Information Technology*, 104(4).
- Khan, U. A., & Jain, V. Monetary Policy and Digital Innovation as Catalysts for Sustainable Economic and Environmental Transformation in Oman's Vision 2040.
- Jain, S., Jain, V., & Agarwal, S. Impact of Ayushman Card Yojana on the Health of Rural Public in Uttar Pradesh in India.
- Zhang, W., Zhu, W., & Jain, V. (2026). Fiscal policy shocks and green growth in China. *Fluctuation and Noise Letters*, 25(1), 2650011-1930.
- Harshitha, P., Rajitha, N., Veeraiah, V., Rastogi, H., Koujalagi, A., Gupta, A., & Jain, V. (2025, November). Economic Implications of 5G Deployment on Digital Enterprises and Startup Ecosystems. In 2025 International Conference on Innovations and Emerging Technologies In AI & Communication Systems (IETACS) (pp. 1099-1104). IEEE.
- Ramesh, J. V. N., Veeraiah, V., Bhattacharya, D., Jain, V., Jain, S. K., & Gupta, A. (2025, November). Twitter Sentiment Mining for Marketing Decision-Making in Blockchain-

Based Digital Assets. In 2025 International Conference on Innovations and Emerging Technologies In AI & Communication Systems (IETACS) (pp. 1005-1011). IEEE.

- Dasaraju, S. R., Nallamalli, V. R. B., Rajendran, J., Chennamsetty, M. R., Jain, V., & Painoli, G. K. (2025). Enhancing Strategy and Governance Through AI-Driven Behavioral Competency Analytics: An ML Model for Competency Development.
- Raj, A., & Jain, V. (2025). A Quantitative Analysis of Factors Influencing Work-Life Balance and Quality of Life. *European Economics Letters*, 15(3).
- Jain, N., & Jain, V. (2025). Exploring the Role of AI Personalization, Embedded Finance, and Gamification in Influencing Digital Wallet Users Buying Behavior in Western India. *European Economics Letters*, 15(3).
- Jain, N., & Jain, V. Assessing the Impact of Super App Integration and Contactless Payment Technologies on Consumer Buying Behavior in Western India.
- Joshi, A., & Jain, V. Assessing the Awareness and Understanding of Green Finance Incentives among Bank Employees. *International Journal of Environmental Sciences*, 11(5s), 2025.
- Vishnoi, N. K., Singh, R., & Jain, V. A Review on Green Purchase Behaviour about Green Products.
- Raj, A., & Jain, V. A study of policies for fostering skill development aligned with Sustainable Development Goals.
- Jain, N., & Jain, V. Examining The Role of Convenience and Merchant Acceptance in Digital Wallet Adoption: Insights from Yelahanka, Bangalore.
- Jain, T. S., & Jain, V. Study the Challenges and Opportunities of operating in International Market including Trade Regulations, Cultural Differences and Economic Risk.
- Sharma, R., Pradesh, M. U., & Jain, V. Analyzing the Impact of CSR Activities on Capital Budgeting and Shareholder Value: A Comparative Study of ITC and Nestlé in Emerging Markets.
- Jain, V. A Data-Driven Approach to Upskilling Western Uttar Pradesh's Healthcare Professionals Akanksha Arora Research Scholar Teerthanker Mahaveer Institute of Management and Technology.

- Khan, U. A., Muscat, O., & Jain, V. Aligning Monetary Policies with Sustainability: Evaluating the Role of Central Bank in Oman's Vision 2040 for Financing SDG-Compliant Businesses.
- Jain, V., & Verma, C. Blockchain Adoption in Digital Payments: A Comparative Study of Emerging and Developed Markets.
- Khanna, R., Singh, R., & Jain, V. Exploring the Impact of Age on Work-Life Balance: A Comparative Study across Academicians.
- Arora, A., & Jain, V. Technology-Assisted Healthcare Upskilling: A Study of Western Uttar Pradesh.
- Mittal, S., & Jain, V. CORPORATE GOVERNANCE AND FIRM'S PERFORMANCE: ANALYSIS OF LITERATURE REVIEW.
- Mittal, S., & Jain, V. A study on the Corporate Governance and Company Characteristics of the Manufacturing Sector in India.
- Modia, P., Jainb, V., Uchilc, A., & Nandad, S. Examining link prediction and node connectivity objectives in social networks: Comprehensive review.
- Nanda¹, S., Jain, V., & Purohit, A. The Importance of Mental Development in Addressing Youth Unemployment: A Psychological Case Study of Skill Retention in Development Programmes.
- Agarwal, P., Kumar, A., & Jain, V. PROFESSIONAL WOMEN AND STRESS: A STUDY OF PSYCHOLOGICAL AND WORK-PLACE BEHAVIOUR OF PROFESSIONAL WOMEN.
- Sethi, P., & Agarwal, P. A STUDY OF OPTIMIZATION TECHNIQUES USED IN OPERATIONS RESEARCH: ITS PROSPECTS AND PROBLEMS.
- Jain, V., Ramos-Meza, C. S., Min, Z., Qian, X., Ali, S. A., Sharma, P., ... & Shabbir, M. S. (2023). The dynamic relationship among technological innovation, international trade, and energy production.
- Hashim, N. A. A. N., Batool, H., Jain, V., Julca-Guerrero, F., & Cruz-Castillo, N. (2023). A systematic study of mobility and innovation and technology management for skilled enhancement with operational frameworks. *International Journal of Intellectual Property Management*, 13(3-4), 227-251.

- Jain, V., Sethi, P., Rawat, G., Singh, V. A., Kumar, A. R., Chawla, C., & Bansal, B. (2023). Information Frameworks and Business Patterns in Smart Cities. In Handbook of Research on Data-Driven Mathematical Modeling in Smart Cities (pp. 224-237). IGI Global Scientific Publishing.
- Jiang, J., Jain, V., Qian, X., Sharma, P., Mohamed, M. A., Haddad, A. M., ... & Zamir, A. Does Renewable Energy matter for SDGs? The dynamic relationship among Trade Exports Quality, Renewable Energy and Sustainable Economic Production. *Frontiers in Environmental Science*, 1788.
- Sehgal, S., Dhingra, V., & Jain, V. (2022). Effect of Covid Pandemic on Interest Rates and thereby Attractiveness of Reverse Mortgage Loans. *INTERNATIONAL JOURNAL OF SPECIAL EDUCATION*, 37(3).
- Jain, V. (2021). Relations between the united states and china during the trump presidency. *Asian Journal of Research in Social Sciences and Humanities*, 11(11), 1-6.
- Jain Sr, V. ROLE OF TEACHERS IN INSTITUTIONAL PLANNING. *ADMINISTRATION AND MANAGEMENT IN SCHOOL EDUCATION*, 83.
- Jain, V. COACHING AND MENTORING IN EDUCATION SERVICE: AN ASSESSMENT. *COMMUNICATION SKILLS FOR PROFESSIONALS*, 71.
- Jain, V. Teerthanker Mahaveer Institute of Managment & Technology, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India Email Id-vipin555@rediffmail.com. *INTRODUCTION TO MEDIA STUDIES*, 39.
- Ashok Kumar Upadhyay, Pramod Kumar Srivastava, Piyush Kumar (2026) Academic Excellence through Holistic Growth: Integrating Physical, Mental, Emotional, and Spiritual Development in Education, *MSW MANAGEMENT -Multidisciplinary, Scientific Work and Management Journal*, ISSN: 1053-7899, Vol. 36 Issue 1, Jan-June 2026, Pages: 744-752 (Scopus)
- Srivastava, P. K., Sharma, A., Whig, V., Malaviya, S., & Kumar, N. (2025). Review Of Transforming Grocery Shopping with Artificial Intelligent: A New Era of Convenience. *Advances in Consumer Research*, 2(2), 665-675.

- Srivastava, P. K., Sharma, A., Malaviya, S., Hasan, N., & Singh, P. (2025). Exploring Social Dynamics and Emotional Triggers in the Adoption of Buy Now, Pay Later. *Advances in Consumer Research*, 2(3).
- Kumar, P., Zai, R. Y., & Srivastava, P. K. (2024). Overview of the Marketing Strategies Adopted by Different Pharmaceutical Companies. In *Pharma Marketing and Pharmacoeconomics* (pp. 143-149). Apple Academic Press.
- Shukla, V., & Srivastava, P. K. (2023). Travelling with a vengeance: the influence of social media on revenge tourism. *International Journal of Tourism Policy*, 13(6), 600-605.
- Prasad, A., & Srivastava, P. K. (2024). A COMPREHENSIVE ANALYSIS OF HUMAN RESOURCE POLICIES AND THEIR IMPACT ON EMPLOYEE TURNOVER IN THE HOTEL INDUSTRY IN DELHI NCR. *Journal of Strategic Human Resource Management*, 13(2).
- Sharma, R. K., & Srivastava, P. K. (2022). Impact of E-business on organized retail sector. *International Journal of Early Childhood Special Education*, 9830-9637.
- Rakshit, P., Srivastava, P. K., & Chavan, O. (2022). IoT-Based Personalized Health and Fitness Monitoring System: The Next Big Thing. In *Reinvention of Health Applications with IoT* (pp. 19-30). CRC Press.
- A Khan, F., Singh, M., Shrivastava, P. K., & Bahl, S. (2022). Concept of Caveat Venditor and its Application in Healthcare and Education Secto. *Turkish Online Journal of Qualitative Inquiry*, 13(1).
- Rakshit, P., Srivastava, P. K., & Chavan, O. (2022). Security Concerns with IoT-Based Health and Fitness Systems. In *Reinvention of Health Applications with IoT* (pp. 155-162). CRC Press.
- Srivastava, S. K., Sharma, R. K., Srivastava, P. K., & Srivastava, R. (2021, April). Statistics Review of Indian Automobile Industry Using Correlation & Linear Regression Techniques. In *2021 2nd International Conference on Intelligent Engineering and Management (ICIEM)* (pp. 510-515). IEEE.
- Srivastava, P. K., Srivastava, S. K., Rakshit, P., Kumar, Y., & Kumar, V. (2021). The ecosphere of online service delivery and its growing presence in automobile sector: an

extended study of connected technology in Indian outlook. *International Journal of Forensic Engineering*, 5(1), 34-48.

- Rakshit, P., Srivastava, P. K., Afjal, M., & Srivastava, S. K. (2021). Sentimental analytics on Indian big billion day of flip kart and Amazon. *SN Computer Science*, 2(3), 204.
- Rakshit, P., & Srivastava, P. K. (2021, March). Cutting edge IoT technology for smart Indian pharma. In *2021 International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE)* (pp. 360-362). IEEE.
- Rakshit, P., & Sharma, R. (2021). A study to comprehend role of artificial intelligence in building smart cities. *Engineering and Technology Journal for Research and Innovation (ETJRI) ISSN*, 3(2), 2581-8678.
- Rakshit, P., & Srivastava, P. K. (2021). An Inclusive Analysis to Study Challenges in Building Student Retention Rate on MOOC Platforms-Technology in Education. *Grenze International Journal of Engineering & Technology (GIJET)*, 7(1).
- Afjal, M., Rakshit, P., Dutta, M., & Srivastava, P. K. (2020). A Critical Study To Comprehend Amendments In Indian Education System Post Covid-19. *Solid State Technology*, 63(6), 4079-4085.
- Rakshit, P., Srivastava, P. K., Srivastava, S. K., Kumar, Y., & Kumar, V. (2020). A Critical Study To Understand Privacy Concerns With Covid-19 Patient Data. *Solid State Technology*, 63(6), 4222-4233.
- Srivastava, P. K., Rakshit, P., Kumar, Y., Kumar, V., Singh, C. K., & Afjal, M. (2020). An Intercontinental Comparative Financial Analysis Of Civil Aviation Business. *Solid State Technology*, 63(6), 4127-4138.
- Bhatt, V., Sharma, R. K., & Srivastava, P. K. Emergence and its impact of organized unrecognized retailers in FMCG-food and beverage.
- SHARMA, R. K., & SRIVASTAVA, P. K. FACTORS OF INTERNATIONALIZATION OF SERVICES IN BANKING SECTOR IN INDIA: COMPARISON BETWEEN NATIONALIZED, PRIVATE AND FOREIGN BANKS IN INDIA.
- Kaushik, R., Srivastava, P. K., & Tiwari, S. (2020, January). Services Standardization In Banking Sector In India: Comparison Between Nationalized, Private And Foreign Banks

in India. In 2020 International Conference on Computation, Automation and Knowledge Management (ICCAKM) (pp. 505-514). IEEE.

- Alok, P., Gupta, S., & Srivastava, P. K. (2009). Dinning experience and return patronage-study of hotels resturants in Delhi, India. JOHAR, 4(2), 45.
- Prasad, A., & Srivastava, P. K. (2008). Practices of yield management-An analytical study with special reference to hotel industry. JOHAR, 3(2), 25.