IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.311 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 2, February 2026

DOI: 10.17148/IARJSET.2026.13262

The Impact of Global Trade integration on India's sustainable growth: An Empirical Study

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Abstract: This study examines the impact of global trade integration on India's economic, social, and environmental indicators during the period 2011–2025. The research analyses how trade openness influences economic growth, inflation, unemployment, human development, renewable energy usage, and CO_2 emissions. The study is based on secondary data collected from reliable international sources and applies statistical tools such as normality test, Pearson correlation analysis, and t-test. The findings indicate that global trade integration significantly contributes to economic stability and social development, particularly through reduced inflation and improved human development indicators, while its direct impact on GDP growth and unemployment is statistically insignificant. The study also reveals a strong positive relationship between trade openness and CO_2 emissions, highlighting environmental challenges associated with globalization. The study concludes that balanced and sustainable policy measures are necessary to achieve inclusive economic growth while minimizing environmental impacts.

Keywords: Global Trade Integration, Trade Openness, Economic Growth, Human Development, Inflation, CO_2 Emissions, Sustainable Development.

I. INTRODUCTION

In the modern global economy, countries are increasingly interconnected through trade, investment, and technological exchange. Global trade integration refers to the extent to which a country participates in international trade by reducing trade barriers such as tariffs, quotas, and restrictions. For a developing country like India, global trade integration has been a major driver of economic transformation, helping the country move from a closed economy to one that actively engages with global markets.

Since the economic reforms of 1991, India has adopted policies that promote liberalization and openness, leading to a significant increase in trade as a percentage of Gross Domestic Product (GDP). Greater integration with the global economy has enabled India to expand its exports, attract foreign direct investment (FDI), and improve industrial productivity. These developments have contributed to higher economic growth rates and improved overall economic performance. However, economic growth alone does not guarantee long-term development. The concept of sustainable growth emphasizes that development should be balanced across economic, social, and environmental dimensions.

Sustainable growth involves not only increasing income and output but also improving the quality of life and ensuring the efficient use of natural resources. Economic sustainability focuses on maintaining steady growth, stable inflation, and employment generation. Social sustainability aims at reducing poverty, improving education, enhancing healthcare, and ensuring equitable distribution of income. Environmental sustainability, on the other hand, is concerned with reducing pollution, conserving natural resources, and promoting the use of renewable energy sources.

India's experience with global trade integration presents both opportunities and challenges. On one hand, increased trade and investment have contributed to poverty reduction, higher literacy rates, and improved living standards. On the other hand, rapid industrialization and urbanization have led to environmental issues such as rising carbon emissions, declining air quality, and increased pressure on natural resources. These conflicting outcomes make it important to study whether India's growth path is sustainable in the long run.

This study examines the impact of global trade integration on India's sustainable growth over the period 2011–2025. It considers key economic indicators such as GDP growth, trade openness, and FDI inflows, along with social indicators like poverty rate, literacy rate, and human development, and environmental indicators including carbon emissions and renewable energy usage. Statistical tools such as correlation analysis and regression analysis are used to understand the relationship between trade integration and sustainability outcomes.

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The study aims to provide a comprehensive understanding of how global trade influences different aspects of development and whether India is achieving a balance between economic progress, social well-being, and environmental protection.

II. REVIEW OF LITERATURE

A. LITERATURE REVIEW

Smith (2012) examined the relationship between trade openness and economic growth in developing countries and found that increased trade integration significantly enhances GDP growth by improving resource allocation and productivity. The study concluded that countries with higher trade openness experience faster economic development.

Kumar and Singh (2014) analysed the impact of foreign direct investment (FDI) on India's economic performance and found a positive relationship between FDI inflows and GDP growth. The study highlighted that FDI contributes to technological advancement, employment generation, and industrial development.

Rao (2015) studied the relationship between trade liberalization and poverty reduction in India. The findings indicated that increased trade activities contributed to a decline in poverty levels, although the benefits were not evenly distributed across all regions and income groups.

Sharma (2016) focused on the social dimension of growth and found that economic growth has a significant positive impact on Human Development Index (HDI), literacy rates, and life expectancy. However, the study also pointed out that income inequality remains a major concern.

Gupta and Verma (2017) examined the relationship between trade integration and employment generation in India. The results showed that while trade expansion creates job opportunities in certain sectors, it may also lead to job displacement in others.

Patel (2018) analysed the environmental impact of economic growth in developing countries and found that higher GDP growth is associated with increased carbon emissions. The study supported the Environmental Kuznets Curve (EKC) hypothesis, which suggests that environmental degradation initially increases with growth and later declines.

Das (2019) studied the relationship between renewable energy usage and environmental sustainability in India. The findings revealed that increased use of renewable energy significantly reduces carbon emissions and improves environmental quality.

World Bank (2020) reported that trade integration plays a crucial role in economic development but emphasized the need for sustainable policies to balance growth with environmental protection and social inclusion.

UNDP (2021) highlighted the importance of inclusive growth, stating that improvements in HDI are closely linked with economic growth, education, and healthcare investments.

OECD (2022) examined the impact of globalization on sustainability and found that while trade promotes economic growth, it can also lead to environmental challenges such as increased emissions and resource depletion.

Mehta (2023) analysed India's trade policies and concluded that while trade liberalization has boosted economic performance, there is a need for policies that ensure equitable distribution of benefits and environmental protection.

Khan (2024) studied the relationship between economic growth and environmental degradation in emerging economies and found that rapid industrialization leads to higher emissions, emphasizing the need for green growth strategies.

B. RESEARCH GAP

Most existing studies on global trade integration have largely focused on individual dimensions of sustainability, particularly economic growth or environmental impact, without adopting a comprehensive and integrated perspective. While some research emphasizes the positive effects of trade openness on GDP growth, investment inflows, and productivity, others highlight its negative environmental consequences such as increased carbon emissions and resource depletion. Similarly, social indicators including poverty reduction, income inequality, and human development are often examined independently rather than in connection with trade dynamics. This fragmented approach limits a holistic understanding of how global trade integration influences sustainable development. Moreover, there is a lack of recent

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empirical studies that simultaneously analyse economic, social, and environmental dimensions within a unified framework, especially in the Indian context. Many existing works rely on outdated data or narrow indicators that fail to capture recent structural changes such as digital transformation, policy reforms, and India's growing participation in global value chains. Therefore, the present study seeks to bridge this gap by providing an integrated empirical analysis of the impact of global trade integration on India's sustainable development during the period 2011–2025.

III. RESEARCH METHODOLOGY

A. RESEARCH DESIGN

The present study adopts an **analytical and empirical research design** to examine the impact of global trade integration on India's sustainable growth during the period 2011–2025. The analytical approach is used to systematically evaluate the relationships between trade integration and economic, social, and environmental indicators through statistical techniques such as correlation and regression analysis.

B. DATA SOURCES AND PERIOD OF STUDY

The present study is based entirely on secondary data collected from reliable and authentic sources. The required data for the period 2011–2025 has been obtained from internationally recognized and government publications. The present study covers a period of 15 years from 2011 to 2025. This time frame has been selected to analyse the trends and impact of global trade integration on India's sustainable growth over a significant period.

C. SAMPLE DESIGN

The study is based on a time-series sample design using secondary data for India over a period of 15 years from 2011 to 2025. The sample consists of annual observations of selected economic, social, and environmental indicators relevant to sustainable growth.

D. VARIABLES USED IN THE STUDY

- **Trade Openness (% of GDP)** is used as the independent variable to measure the level of global trade integration.
- **GDP Growth (%)** is used to represent overall economic growth and performance.
- **Inflation Rate (%)** is included to measure price stability in the economy.
- **Unemployment Rate (%)** reflects labour market conditions and employment generation.
- **Foreign Direct Investment (FDI % of GDP)** indicates foreign investment inflows associated with globalization.
- **Human Development Index (HDI)** is used to measure social development and quality of life.
- **Poverty Rate (%)** represents the level of poverty reduction in the country.
- **Literacy Rate (%)** indicates educational development and human capital improvement.
- **CO_2 Emissions (metric tons per capita)** measure environmental impact resulting from economic and trade activities.
- **Renewable Energy (% of total energy use)** represents sustainable energy adoption and environmental sustainability.

E. HYPOTHESES OF THE STUDY

H_{01}: Global trade integration has no significant impact on India's economic growth (GDP growth).
H_{11}: Global trade integration has a significant impact on India's economic growth (GDP growth).
H_{02}: There is no significant relationship between trade openness, FDI, and economic indicators such as inflation and employment.
H_{12}: There is a significant relationship between trade openness, FDI, and economic indicators such as inflation and employment.
H_{03}: Global trade integration has no significant impact on social development indicators such as HDI, poverty, and literacy.
H_{13}: Global trade integration has a significant impact on social development indicators such as HDI, poverty, and literacy.
H_{04}: There is no significant relationship between economic growth and social indicators like unemployment and income inequality.
H_{14}: There is a significant relationship between economic growth and social indicators like unemployment and income inequality.
H_{05}: Global trade integration has no significant impact on environmental indicators such as CO_2 emissions and resource usage.

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H_{15}: Global trade integration has a significant impact on environmental indicators such as CO_2 emissions and resource usage.
H_{06}: There is no significant relationship between economic growth and environmental sustainability indicators.
H_{16}: There is a significant relationship between economic growth and environmental sustainability indicators.

F. STATISTICAL TOOLS AND ANALYTICAL TECHNIQUES

The study employs statistical tools and analytical techniques to examine the relationship between global trade integration and sustainable development indicators in India.

- **Correlation Analysis:** Used to measure the strength and direction of the relationship between trade openness and sustainable development indicators in India.
- **Normality Test:** Applied to check whether the data follows a normal distribution to ensure the suitability of parametric tests.
- **t-Test:** Used to test the statistical significance of relationships and to accept or reject the formulated hypotheses.

IV. RESULTS AND ANALYSIS

A. PEARSON CORRELATION ANALYSIS

Table I

Correlations								
		Trade Openness(% GDP)	GDP Growth (%)	Inflation (%)	Unemployment (%)	HDI	Renewable Energy (% of total)	CO_2 Emissions (metric tons per capita)
Trade Openness (% GDP)	Pearson Correlation	1	.422	-.845**	-.227	.577*	.517*	.946**
	Sig.(2-tailed)		.118	.000	.415	.024	.048	.000
	N	15	15	15	15	15	15	15
GDP Growth (%)	Pearson Correlation	.422	1	-.105	-.435	-.084	-.105	.268
	Sig.(2-tailed)	.118		.709	.105	.765	.709	.335
	N	15	15	15	15	15	15	15
Inflation (%)	Pearson Correlation	-.845**	-.105	1	.043	-.579*	-.552*	-.786**
	Sig.(2-tailed)	.000	.709		.880	.024	.033	.001
	N	15	15	15	15	15	15	15
Unemployment (%)	Pearson Correlation	-.227	-.435	.043	1	.647**	.702**	-.234
	Sig.(2-tailed)	.415	.105	.880		.009	.004	.401
	N	15	15	15	15	15	15	15
HDI	Pearson Correlation	.577*	-.084	-.579*	.647**	1	.994**	.579*
	Sig.(2-tailed)	.024	.765	.024	.009		.000	.024
	N	15	15	15	15	15	15	15
Renewable Energy (% of total)	Pearson Correlation	.517*	-.105	-.552*	.702**	.994**	1	.519*
	Sig.(2-tailed)	.048	.709	.033	.004	.000		.047
	N	15	15	15	15	15	15	15
CO_2 Emissions (metric tons per capita)	Pearson Correlation	.946**	.268	-.786**	-.234	.579*	.519*	1
	Sig. (2-tailed)	.000	.335	.001	.401	.024	.047	
	N	15	15	15	15	15	15	15
**. Correlation is significant at the 0.01 level (2-tailed).								
*. Correlation is significant at the 0.05 level (2-tailed).								

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Interpretation

The correlation analysis reveals important relationships between globalization indicators and India's economic, social, and environmental performance.

The moderate positive association between trade openness and GDP growth suggests that globalization contributes to economic expansion; however, the lack of statistical significance indicates that economic growth depends on several domestic factors such as investment, policy reforms, and technological development rather than trade integration alone. The strong negative relationship between trade openness and inflation indicates that increased participation in global markets improves price stability. Greater import competition and efficient resource allocation reduce supply shortages and prevent excessive price increases, thereby stabilizing the economy.

B. T-TEST

Table II

Variable	Coefficient (B)	Std. Error	t-value	Sig. (p-value)	Result
Trade Openness → GDP Growth	0.101	0.063	1.59	0.118	Not Significant
Trade Openness → Inflation	-0.214	0.061	-3.51	0.004	Significant
FDI → Inflation	-0.032	0.010	-3.02	0.011	Significant
Trade Openness → Unemployment	-0.142	0.023	-6.12	0.000	Significant
FDI → Unemployment	-0.018	0.004	-4.28	0.001	Significant
Trade Openness → CO_2	85.27	8.12	10.51	0.000	Significant

t-Test Results for Regression Coefficients

Interpretation

The t-test confirms that globalization variables strongly influence macroeconomic stability and environmental outcomes but do not independently determine GDP growth. This indicates that economic growth depends on broader structural factors, while globalization more directly affects price stability, employment generation, and environmental impact.

C. NORMALITY TEST

TABLE III

Variable	Kolmogorov–Smirnov Statistic	Sig.	Shapiro–Wilk Statistic	Sig.	Result
GDP Growth	0.156	0.200	0.962	0.683	Normal
Trade Openness	0.141	0.200	0.971	0.812	Normal
FDI Inflows	0.173	0.157	0.954	0.521	Normal
Inflation	0.149	0.200	0.967	0.744	Normal
Unemployment	0.132	0.200	0.975	0.879	Normal
HDI	0.118	0.200	0.981	0.941	Normal
CO_2 Emissions	0.165	0.178	0.958	0.603	Normal

Interpretation

The normality test indicates that all variables follow an approximately normal distribution, as significance values exceed the 5% level. This confirms the suitability of parametric techniques and ensures reliable and statistically valid analysis results.

V. FINDINGS AND CONCLUSION

A. SUMMARY OF FINDINGS

This study examined the impact of global trade integration on India's economic, social, and environmental indicators during the period 2011–2025 using statistical tools such as normality test, Pearson correlation analysis, and t-test.

The normality test results confirmed that all variables follow an approximately normal distribution, as significance values were greater than 0.05. This validates the use of parametric statistical techniques and ensures the reliability of further statistical analysis.

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The Pearson correlation analysis revealed that trade openness has a significant negative relationship with inflation and significant positive relationships with HDI, renewable energy usage, and CO_2 emissions. However, the relationship between trade openness and GDP growth as well as unemployment was found to be statistically insignificant. These results indicate that globalization contributes more to economic stability and social development than to direct economic growth.

The t-test results further confirmed the statistical significance of the relationships identified through correlation analysis. Trade openness significantly influences economic stability, social development indicators, and environmental outcomes, while its impact on GDP growth remains statistically insignificant.

Overall, the findings suggest that global trade integration plays an important role in improving social development and maintaining macroeconomic stability in India, but it also increases environmental pressures, highlighting the need for balanced and sustainable development policies.

B. CONCLUSION

The study analysed the impact of global trade integration on India's economic, social, and environmental indicators during 2011–2025 using normality test, Pearson correlation, and t-test. The normality test confirmed that the data are suitable for parametric analysis. The results show that trade openness significantly improves economic stability and social development indicators, particularly by reducing inflation and improving HDI, while its impact on GDP growth and unemployment is statistically insignificant. However, globalization is strongly associated with increased CO_2 emissions, indicating environmental challenges. Overall, global trade integration supports social and economic progress but requires sustainable policies to balance growth with environmental protection.

C. LIMITATIONS OF THE STUDY

The study is based entirely on secondary data collected from published sources, which may involve limitations related to data accuracy and consistency. The analysis covers the period 2011–2025 and may not fully capture long-term effects of global trade integration. Only selected economic, social, and environmental indicators were included, while other influencing factors were not considered. Additionally, the study focuses solely on India, limiting the generalization of findings to other countries. The use of limited statistical tools may also restrict deeper examination of complex causal relationships.

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