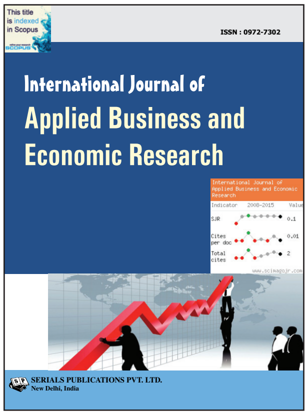

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An Exploration of the Impact of Economic Growth, Infrastructure and CO_2 Emissions on Foreign Tourist Arrivals in India

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ABSTRACT

India is one of the foremost destinations for travel and tourism in the world. Over the decades, the Indian tourism sector has been growing, deepening and contributing consistently in country's economic development. At present, tourism sector accounts the largest share of being a part of Indian service industry, with a contribution of 7.45 percentand 8.70 percent to the national GDP and total employment respectively in economy. This sector is third largest foreign exchange earner in the country. But still it cannot be said that India fully uses its tourism potential which stems from its geographical and historical wealth. Therefore, in order to develop the sectorin a most planned manner, it is important to look at the factors/ variables which have impact on the inbound tourist flows.Also, to determine the proportionality between tourist arrival and chosen variables in India, research done in the past years is limited to scope as well as in number. Thus, the present research work investigates the impact of chosen variables on tourists' arrival in India (especially from top 15 countries) based on the OLS, Co-integration, VECM and Granger Causality models framework for the period starting from 1981 to 2014. Resultshows that 1) the long-term relationship exists among the variables; 2) selected variables seem to have impact on the touristscoming to India 3) majority of the selected variables causes change in foreign tourists from top 15 countries. Thus, our study suggests that policy makers should specify certain policies targeting on the tourism development while preserving the environment.

Keywords: CO_2 emissions, Infrastructure and Real GDP, Tourist Arrival and Indian Tourism Sector etc.

1. INTRODUCTION

Tourism has grown to be as a vital aspect of the world economy. It has been progressing with a drastic change and has matured now into a multi-dimensional industry involving social and economic aspects of human life thusengrosses an economic decision on how to spend leisure time and savings. In the large picture, effects of tourism span over other economic aspects as well including investments, consumption, exports, employment and government revenue. Tourism is not only modifying the economic structure but also making positive contribution towards country's balance of payment.It has become an important instrument for economic progress and employment generation, particularly in under-developed areas. Looking at this, now many developed and developing countries like U.K, U.S.A, Canada, Sri Lanka, China, Bangladesh, Thailand and the like have also started focusing on the potential of exploring this industry by emphasizing on international tourist arrivals as a novel means to increase their economic growth and revenue. Moreover, this industry now acts as a catalyst to economic as well as regional development for every country.

India is not remained an exception to this. Ithas become one of the popular tourist destinations in the world due to offering different category of tourism. Like, Goa provides the water sports related activities; Kerala offers the houseboats in lagoons; Himachal Pradesh has introduced the adventurous sports etc. Every year, millions of foreigntravelersvisit India for either business, healthcare or holiday purpose. It led the tourism to become the key foreign exchange earner in India. However, in order to sustain this phenomenon forever, still someof the areas call for a proper attention of researchers/policymakers. These are; a) infrastructure that facilitates tourism must be thought upon b) the macroeconomic conditions must be apt for the development of tourism c) the social, political, and the environmental factors need to be conducive enough to make any place an attractive tourist destination. The environmental factor calls for a further special care as CO_2 emissions from activities and operation involved in tourist industry appear to be playing havoc everywhere. India needs to be more attentive to these factors considering that it has to compete with other nations, both neighboring and the rest of the world, which often provide competitive tourism infrastructure, services and environment.

2. INDIAN TOURISM INDUSTRY: SYNOPTIC VIEW

India is among the rapidly growing countries for tourism sector, particularly in the Asian region. It has been estimated in the report of the World Travel and Tourism Council (2015) that India will be a tourism hot spot from 2009 to 2018, having the highest 10-year growth potential(1). Table 1 shows that foreign tourist arrivals have shot up from 2.48 million in 1999 to 8.03 million in 2015 and reached to 4.19 million till June, 2016. Thus, the trend for foreign tourist arrivals in India has been showing upward move, though with a little fluctuations some times as is evident from Table 1.

Table 1
Foreign Tourist Arrivals (FTA) in India

Year	*FTA's in India(Mn)*	*Percentage Growth*
1999	2.48	5.2
2000	2.65	6.7
2001	2.54	-4.2
2002	2.38	-6.0
2003	2.73	14.3
2004	3.46	26.8
2005	3.92	13.3
2006	4.45	13.5

Year	*FTA's in India(Mn)*	*Percentage Growth*
2007	5.08	14.3
2008	5.28	4.0
2009	5.17	-2.2
2010	5.78	11.8
2011	6.31	9.2
2012	6.58	4.3
2013	6.97	5.9
2014	7.68	10.2
2015	8.03	4.5
2016 (till June)	4.19	-

Source: Market Research Division, Ministry of Tourism, India

India is also doing well to reach more countries in the world to attract more tourists. Currently, the tourists coming from top fifteen countries in Indiaaccount for72.62 percent alone in the world. Figure (*a*) demonstrates the region-wise tourist arrival from top 15 countries in India in the year 2015. It shows that United States has the largest percentage of tourists (15.12 percent) coming to India followed by Bangladesh, United Kingdom and Sri Lanka. However, the percentage of tourists coming from China, Singapore, Nepal and Thailand is comparatively very low which might bedue to being neighboring countries.

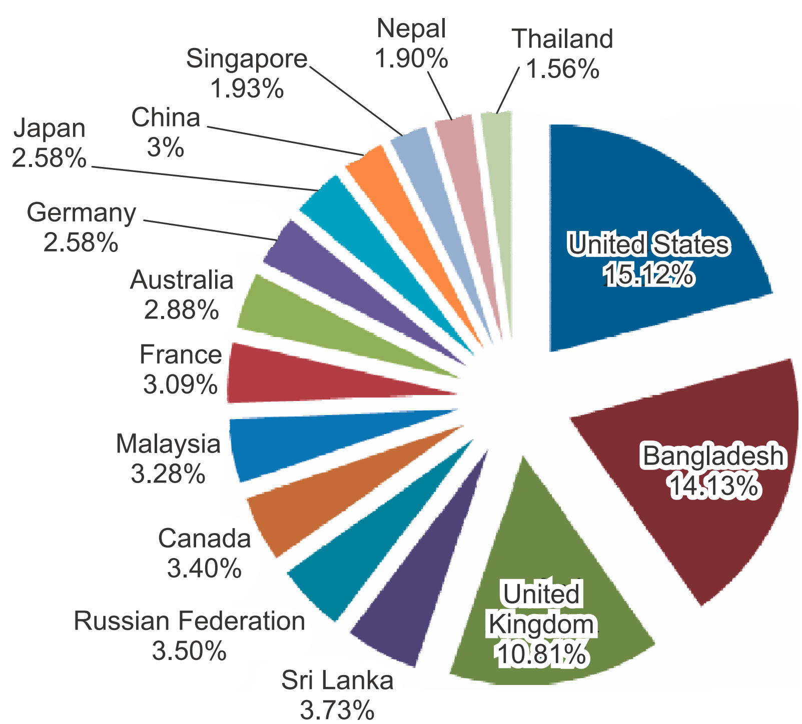

Figure 1: Foreign Tourist Arrival from Top 15 Countries in India (2015): Region-wise Comparison

Source: Market Research Division, Ministry of Tourism, India

3. STATEMENT OF RESEARCH PROBLEM

Way back, the Government of India realized that tourism sector has the potential to contribute significantly to economic growth and development of country. This realization is underscored by the fact that tourism sector was taken as one of the priority sectors by the government of India making it as a key strategic objective in the formulation of the national tourism policy, 2002.The policy focuses on tourism sector which is believed to have direct and indirect linkages to other sectors and hence have the potential to drive economic growth. The contribution of tourism sector to total Gross Domestic Product has been growing consistently. It is forecasted to rise by 7.6 percent by 2026(World Travel and Tourism Council Report, 2015).[(2)]Other than this, there has been a substantial growth over years in the foreign tourist arrivals to India due to various promotional activities made by the ministry of tourism one such being "Incredible India" campaign.

The importance of tourism to an economy in terms of its contribution to GDP, government revenue, employment, foreign exchange earnings and its indirect linkages to the other sectors brings into fore the need to investigate the determinants of tourism growth in India. Studying the determinants that influence the tourism sector in India is crucial to guide policy makers as to which macroeconomic and environmental variables need to be monitored so as to create an enabling domain for the growth of the sector and the economy in general. There is no study of this nature done in India on tourism industry; hence this paper aims at filling the existing gap.

4. SCOPE AND OBJECTIVES OF THE STUDY

This study is geographically restricted to India and covers a period from 1981 to 2014. It focuses primarily on inbound type of tourism. Inbound tourism looks at when a non-resident or foreigner visits the domestic country. Outbound tourism on the other hand means when the resident of the country leaves that country and visits another country. Thus, present research paper is biased towards inbound tourism

4.1. Objectives of the Study

1. To examine the nature of relationship between the selected macroeconomic and environmental variables, and the tourist arrivals in India.
2. To analyse and understand the impact of chosen macroeconomic and environmental variables on the tourists' arrival in India.

4.2. Hypothesis Testing

Hypothesis I

H0: There is no relationship among the RGDP, Infrastructure, CO_2 emissions and tourist arrivals in India.

H1: There is relationship among the RGDP, Infrastructure, CO_2 emissions and tourist arrivals in India.

Hypothesis II

H0: There is no impact of selected macro and environmental variables on tourist arrival in India.

H1: There is a significant impact of selected macro and environmental variables on tourist arrival in India.

5. REVIEW OF LITERATURE

In recent years, research on tourism has been of keen interest for researchers as well as policymakers for the economic growth led tourism or vice versa which is measured by different variables. Theoretically and empirically, tourism services are considered to be normal goods and, subsequently, the analysis of their demand is done under the classical utility maximizing theory. Economic theory predicts the demand for normal goods or services to be dependent upon other things, product's own price, price of substitute products, consumer's income and other similar determinants. In line with economic theory and a body of empirical studies that have been done in tourism economics, this paper tries to present the causal relationship especially between the (inbound) tourist arrivals, infrastructure, Real GDP and CO_2emissions in India which has not been addressed as such by number of researchers yet. Previous studies relating to tourism are based on the following aspects:

5.1. Tourism led Economic Growth (TLG)

Over time, economic policy makers have identified different strategies for economic restructuring. One way is to move the human resources that are employed in traditional sectors such as agriculture to the more flexible service sectors. The tourism sector can be a means for the aforesaid restructuring, thus drawing the attention of economists and strategists alike towards this ever-growing industry. This cognizance has also led to detailed studies and subsequent literature on the subject. Many empirical studies have conducted to analyze the relationship between tourism and economic growth. A Tourism-Led Growth Hypothesis postulates that "an expansion in tourism activities precedes economic growth"

Dritsakis and Athanasiadis (2000) applied the VAR model based causality tests over the period 1960:Q1-2000:Q4 for Greece. Results show that the TLG is supported and there is a co-integrationbetween tourism and economic growth in the long term.[3]

Balaguer and Cantavella-Jorda (2002) have used a standard Granger causality test over the period 1975-1997 in Spain. Results show that international tourism earnings affect positively the Spanish economic growth. Thus they have found empirical support for the TLG hypothesis.[4]

Yildirim and Ocal (2004) investigate the relationship between tourism revenues and economic growth by applying VAR methods for Turkey from 1962 to 2002 period. Results show that the tourism revenues appear to enhance economic growth in the long term, but there is not any relationship between the variables in the short term.[5]

Oh (2005) investigates the causal relationship between tourism and economic expansion by using Engle and Granger two stage approach and bivariate VAR model over the period of 1975:Q1-2001:Q1 for the Korean economy. According to him, there is no long run equilibrium relation between two series. In addition Granger causality test reports supported EDTG hypothesis for Korean economy.[6]

Yavuz (2006) have used standard Granger causality and Toda- Yamamoto approach over the period 1992Q:1-2004Q:4 in Turkey. Results accept that there is no causal relation tourism and economic growth for turkey. [7]

Lee and Chang, (2008) analyse the causal relationship between tourism development and economic growth. Authors find that tourism has a larger impact on GDP in non-OECD countries than in the OECD countries for the 1990-2002 period. They conclude the relationship is unidirectional supported for the TLG especially evidence from OECD countries.[8]

Ozturk and Acaravci (2009) investigate the long-run relationship between the real GDP and international tourism in Turkey during the time period 1987-2007. The results show that thereis no unique long-term or equilibrium relationship between the real GDP and international tourism. Therefore, the TLG hypothesis cannot be inferred for the Turkish economy.[9]

Belloumi (2010) interrogates the causal relationship between tourism and economic growth over the term of 1970-2007 in Tunisia. Results show that no Granger causality in the short run, real tourism Granger cause real GDP in the long run. Accordingly while the NC hypothesis valid for the short run, the TLG hypothesis accepts for the long run.[10]

Aslanturk et al. (2011) analyses the causal link between tourism receipts and GDP for the period 1963-2010 in Turkey. Authors find tourism receipts have positive effects on GDP in early 1980's.[11]

Antonakakis et al. (2013) investigates the relationship between tourism and economic growth for ten selected European countries over the periods of 1995:Q1-2013:Q12 for Germany, Italy, Spain, 1995:Q3-2011:Q12 for Greece, 1996:Q1-2012:Q12 for Austria, 1998:Q1-2010:Q12 for UK, 2000:Q1-2012:Q12 for Cyprus, Netherlands, Portugal and Sweden. Results show the TLG hypothesis is evident for Italy-Netherlands; the EDTG hypothesis observed in Cyprus, Germany, Greece; the BC hypothesis in the cases of Austria, Portugal, Spain and the NC hypothesis can be identified for Sweden and UK.[12]

Albaladejo et al. (2014) analyses the tourism and economic growth relationship over the period 1970-2010 using annual data in Spain. Authors infer that changes in economic growth appear to cause growth in tourist arrivals in the short term. In the long run tourist arrivals, quality of tourism accommodations and foreign GDP have a positive effect on Spanish real GDP.[13]

Kumar et al. (2014), explore the causal relationship between tourism and output per worker using the sample period 1975-2012 in Malaysia. Their causality results indicate that a bidirectional relationship tourism and capital per worker and a unidirectional causality from output per worker to capital per worker. Thus the BC hypothesis is confirmed for Malaysia.[14]

Fawaz and Rahnama (2014), examines the causal relationship between international tourism and economic growth over the period 1975-2010 in six regional classifications and four different income level classification of 144 countries. Their findings reveal that per capita receipts from the tourism industry significantly contribute both to current level of GDP and economic growth, accordingly they have supported the TLG hypothesis.[15]

Suresh and Senthilnathan (2014) have examined the causal relationship between tourism earnings and economic growth for the periodfrom 1977 to 2012 in Sri Lanka. Results reveal that there isuni-directional causality from economic growth to tourism earnings. Thus, the EDTG hypothesis is empirically supported.[16]

Tang and Tan (2015) investigate the causal relationship between tourism and economic growth from 1975 to 2011 for Malaysia. Authors found that economic growth, tourism and other determinants are co-integrated. All this provides the empirical support for the TLG hypothesis in Malaysia.[17]

Ozturk (2015) explores the different factors that affect tourism development in the panel of 34 developed and developing s over the period of 2005–2013. Energy consumption, air pollution, health expenditures, and economic growth played a vital role to change tourism development indicators in the region. The results confirmed the long-run association between the energy, environment, growth, and tourism indicators in the panel of selected 34 countries.[18]

5.2. Tourism and CO_2 Emissions

Specialists in the field have studied the relationship between tourism and CO_2. Environmental impacts of negative tourism are understandable as most activities related to tourism involve consumption of fossil fuel generated energy.

Beckmen and Patarson (2006) in their study about New Zealand use two approaches: bottom-up and top-down analysis, to measure the national CO_2 emission emerging from tourism industry.[19]

Studies of individual countries also testify strong relationship between tourism industry and environmental hazard. Torver and Lockwood (2008) made a study on Australia situation and concluded strong relationship between the two.[20]

Kuo and chen (2009) in a similar study about Penghu island in Taiwan found a strong relationship between tourism industry and the environmental hazards.[21] Similarly, Katircigolu, Feridun, Kilinic did exploit their professional knowledge to undertake similar studies about turkey, china, Taiwan, Cyprus, and Mauritius respectively.[22]

According to Gossling (2010), tourism is one of the key contributors to climate change and the anthropogenic components of global warming. The relationship between tourism activities and CO_2 emissions was relatively unexplored in the literature until the last decade.[23]

5.3. Some Empirical Studies

Some of the empirical studies like Nademi and Najibi (2011) analyzed the relationship between CO_2 emission and international tourism in selected developed countries including Austria, Belgium, Canada, Chile, Denmark, France, Ireland, Japan, South Korea, Sweden and the United States. Using panel data analysis for the period between 2000-2007;it was found that the impacts of CO_2 emission towards international tourism in a few developed countries are significantly negative.[24]

Zaman, Khan and Ahmad (2011) estimated the relationship between indicators of tourism development and Carbon emission in Pakistan over a period of 1991-2010.Results indicated a bi-directional relationship between tourism indicator and Carbon dioxide emissions.[25]

Lee and Brahmasrene (2013) for EU countries and Katiricoglu for Singapore (2014) suggest that the tourism sector adversely affects the CO_2 emissions.[26]

Sudharshan Reddy Paramati, Md Samsul Alam and Ching fu Chen, (2016) examined the dynamic relationship among tourism, economic growth, CO_2 emissions and compared their effects among developed and developing countries. Their results show that tourism has significant impact on economic growth for both developed and developing countries.[27]

5.3. Other Influences on Tourist inflows

Some studies have also accounted for other differentiators that can significantly impact the number of international tourists visiting a destination country. These differentiators include natural beauty, prices, safety, infrastructure and literacy rate of the destination country. Papatheodorou (2001) as quoted in Giacomelli (2006) argues that a particular tourist destination's characteristics can be divided into two categories: attractions and facilities. Attractions include those characteristics whose amount depends on destination's natural and historical features. The facilities component encompasses characteristics originating from human action and effort (*i.e.* tourism infrastructure, entertainment services, etc).[28]

To conclude the above literature review, it is visible that the relationships among tourism, Infrastructure, economic growth and CO_2 emissions are not similar across countries,time periods or estimation methods. In particular, studies examining the relationships among tourism, economic growth, infrastructure and CO_2 emissions based on the level of economic developmentin countries (*e.g.*, developed and developing countries specially India) remain scarce.The current study is thus designed to narrow the research gap, and as a result it contributes to the literature while also providing insights for policy makers.

6. DATABASE DESCRIPTION AND RESEARCH METHODOLOGY

The present research studyis based on the secondary sources of data. It employs the quantitative research techniqueto analyse the impact of chosenvariables on foreign tourist arrivals in India. The annual series data on selected variables (Foreign Tourist Arrival from Top 15 countries, CO_2 emissions (K*t*), Infrastructure (only Air Transport & Passenger Carried) and Real GDP at Constant Prices) are collected from the World Bank's data portaland Ministry of Indian Tourism reports. Our study covers a sample period of 35 years staring from 1981 to 2014. This period is chosen on the basis ofadequate information availability of required data.The top 15 countries for foreign tourists arrival is considered mainly on account of the large percentage of tourists coming from these countries to India every year.

In pursuance of our objectives, this study has applied the Johansen-Juselius Multivariate Co-integration test, Vector Error Correction Model and Granger causality to gauge the relationship among foreign tourist arrivals, CO_2 emissions, Real GDP and infrastructure. E-Views version 8 is used to estimate the results. The identified model is four variables model which specifies the foreign tourist arrivals as dependent variableand Real GDP, CO_2emissions and infrastructure as independent variables which can beshown as:

$$FTA\_15_t = F(RGDP_t, INFRA_t, CO_{2t}) \quad (1)$$

Where FTA_15 = Foreign tourist arrivals from top 15 countries, CO_2 = Carbon dioxide emissions, and RGDP = Real gross domestic product, INFRA= infrastructure in terms of air transport and passengers carried, t= time period.The sample of study consists of 35 years annual time series data.

6.1. Stationary Tests: Augmented Dickey –Fuller and Phillips-Perron Tests

6.1.1. Augmented Dickey –Fuller Test

A test for stationarity or non-stationarity that has been widely used is the **unit root test.** The initial step of unit root test (stochastic process)

$$Yt = pYt-1 + \mu t$$

Where μt is white noise error term,

$$p = -1 \leq p \leq 1.$$

If $p = 1$, this applies there is a unit root and the model is random walk model without drift, which is non stationary stochastic process. We simply regress Y_t on its (one period) lagged value of Y_{t-1} and try to estimate whether p is statistically equal to 1 or not. If it is, then Y_t is supposed to be non-stationary.

Dickey and Fuller have shown under the null hypothesis that series is non-stationary, the estimated value of tof the coefficients Y_{t-1} follows tau statistic. It is said that random walk model may be without drift or with drift or it may have both deterministic and stochastic trends. In conducting dickey fuller test, it is assumed that the error terms are uncorrelated. But in case U_t is correlated, Dickey and Fuller came up with Augmented Dickey Fuller Test (ADF),

$$\Delta Y t = \beta \ddot{u}\ddot{u}+\ddot{u}\beta \; t + (p - \quad) \quad t - \quad + \sum_{i=1}^{m} \alpha i \, \Delta \quad t - \quad + \mu t$$

Where μt = pure white noise term, $\Delta Y t - 1 = (Y t - 1 - Y t - 2)$. The ADF test will use null hypothesis that there is non-stationarity in the series *i.e.* H0: p-1 or $\delta = 0$ and it follows asymptotic distribution, the same tau critical statistics will be used.

6.1.2. Phillips–Perron (PP) Test

This test is another test to check the stationarity in the data. The main difference between ADF test and PP test is that PP test is a non parametric test. It takes care of the serial correlation on the error terms without adding the lagged difference terms.

6.2. Ordinary Least Square (OLS) Method

The relationship between the dependent variable and the independent variable can be represented using a line of best fit, where Y is predicted by X to some extent. If this relationship is linear, it may be appropriately denoted using a straight line of equation:

$$y = \alpha + \beta X + u$$

In the line of best fit, "α" indicates the value of Y when X is zero and "β" represents the slope of the line. This is also known as regression coefficient. β, thus describes that change in Y is related to one unit change in X. The OLS is a method of calculating the unknown parameters which are α, β, and u in the regression model equation. The deviations from the observed and predicted values are known as residuals or error terms. The main focus is of minimizing the sum of square of the differences(error terms) between the observed and the predicted value by the linear function. Thus, predicting the overall fit of model.

6.3. Co-integration Test: Johansen-Juselius Multivariate Co-integration Test

Co-integration of two or more time series means that there is a long run, or equilibrium relationship between them. To check whether there is a co-integration between the variables **Johansen and Juselius** co-integration test is conducted. The Johansen and Juselius test has two types; trace statistics and maximum Eigenvalue.

1. **Trace Test:** The null hypothesis followed in trace test is; there are no co-integrating equations.

   Ho: K = Ko = 0 (K is the number of linear combinations)

   H1: K > Ko

2. **Maximum Eigenvalue Test:** In this test the null hypothesis is same as of the trace statistics, the only difference is of alternate hypothesis.

   Ho: K = Ko = 0

   H1: K = K + 1 (only one possible combination of non stationary variable to yield a stationary process)

   Thus, both the tests address the co-integration presence.

6.4. Error Correction Modeland Granger Causality

6.4.1. Vector Error Correction Model (VECM)

The error correction mechanism shows that at what speed, an economic variable/ system adjusts itself fromthe previous disequilibrium. If co-integration is detected in the time series data then, we apply the VECM to estimate the short run adjustments of co-integrated series.The regression equations for VECM are as follows:

$$\Delta Yt = \alpha 1 + ii1i1 + \sum_{i=0}^{n} \beta \ \Delta Y \ -1 + \sum_{i=0}^{n} \gamma \ Z \ -$$

$$\Delta Xt = \alpha 2 + p2ei - 1 + \sum_{i=0}^{n} \chi i \, Yt - i + \sum_{i=0}^{n} \delta \, \Delta Xt - i + \sum_{i=0}^{n} \eta i \, Zt - i$$

The co-integration rank in the VECM shows the number of co-integrating vectors. For example, a rank of two will show that the two linearly independent combinations of the variables will be stationary and so on. After checking for co-integration, Granger causality test may be used to identify lead and lag variables in model.

6.4.2. Granger Causality Test

A general specification of the Granger causality test in a bivariate (X, Y) context can be expressed as:

$$Y = 0 + 1Yt - 1 + \ldots\ldots + i\,Yt - i + 1Xt - 1 + \ldots\ldots\ldots i\,Xt - i + \mu \ldots\text{Eq 1}$$

$$Xt = 0 + 1Xt - 1 + \ldots\ldots + i\,Xt - i + 1Yt - 1 + \ldots\ldots i\,Yt - \mathrm{i} + \mu \ldots\text{Eq2}$$

In the model, the subscripts denote time periods and μ is a white noise error. We can obtain two tests from this analysis: the first examines the null hypothesis that the X does not Granger-cause Y and the second test examines the null hypothesis that the Y does not Granger-cause X. If we fail to reject the former null hypothesis and reject the latter, then we conclude that X changes are Granger-caused by a change in Y. Unidirectional causality will occur between two variables if either null hypothesis of equation (1) or (2) is rejected. Bidirectional causality exists if both null hypotheses are rejected and no causality exists if neither null hypothesis of equation (1) nor (2) is rejected.

7. MODEL ESTIMATION AND RESULTS

Before conducting the tests, stationary properties of the time series variables to be used in the estimation process are checked.

7.1. Stationary Tests

ADF and PP unit root tests show that the FTA_15 and Infra series are integrated at the first order whereas CO_2 emissions and RGDP are integrated at zero order. The ADF and PP tests at level and differences are represented in table 2 and table 3 respectively. This makes the null hypothesis of being non-stationary to be rejected in favor of alternative that shows the variables to be integrated at I(0) and I(1) series.

Table 2
Unit Root Test Results for Series
Augmented Dickey-Fuller Test

Variables	*Level*	*I (0)*	*I (1)*
FTA	-3.58		-4.18*
RGDP	-3.55	2.93*	
CO2	-3.57	-9.06*	
INFRA	-3.56		-4.87*

**Notes:* Significant at the 5% level.

Table 3
Phillips-Perron Test

Variables	*Level*	*I (0)*	*I (1)*
FTA	-3.55		-3.88*
RGDP	-3.55	2.93*	
CO_2	-3.55	-2.38*	
INFRA	-3.55		-4.60*

**Notes:* Significant at the 5% level.

7.2. OLS Method

The OLS estimate results(given in table 3) show that all the chosen variables are highly significant in their relationship. Results indicate the positive impact of RGDP and Infra on foreign tourists coming to India whereas the negative impact of CO_2 emissions on them. The regression coefficients of RGDP and Infra show that one percent increase in both of them (other things remaining the same) brings about 5.91 percent and 2.10 percent increase respectively in tourist arrivals. Similarly for CO_2 emissions coefficient, if CO_2 emissions increase by one percent in the country, tourist arrivals will fall by 10.8 percent, means by huge amount of percentage. The value of Durban-Watson statistic of 1.67 also shows that there is relatively negligibleevidence of autocorrelation in residual values. More than 60 percent value of R^2 assures us about the fitness of our model.Thus, the estimatedequation model can be writtenas follows:

$$FTA\_15_{t-1} = 267712.39 - 0.108439CO_{2t} + \mathbf{0.059186}RGDP_t + \mathbf{0.021006}INFRA_{t-1} \quad \ldots(1)$$

Table 4
OLS Estimates

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
C	26712.39	39206.89	0.681319*	0.5011
CO_2	-0.108439	0.049725	-2.180780*	0.0375
RGDP	0.059186	0.015854	3.733252*	0.0008
INFRAD1	0.021006	0.005620	3.737672*	0.0008
R-squared	0.669205	Prob(F-statistic)		0.000000
Adjusted R-squared	0.634984	Durbin-Watson stat		1.671729
F-statistic	19.55582			

*Significant at 5% level

7.3. Cointegration Test

The Johansen-Juselius multivariate co-integration technique is conducted to detect the long-runassociation among the chosen variables in the model. Before applying the test, the graphical representation of the variables is looked at to ensure their co-movement.Figure (*b*) suggests that the co-integration exists among few variables thus it becomes imperative to find those co-integrating variables.

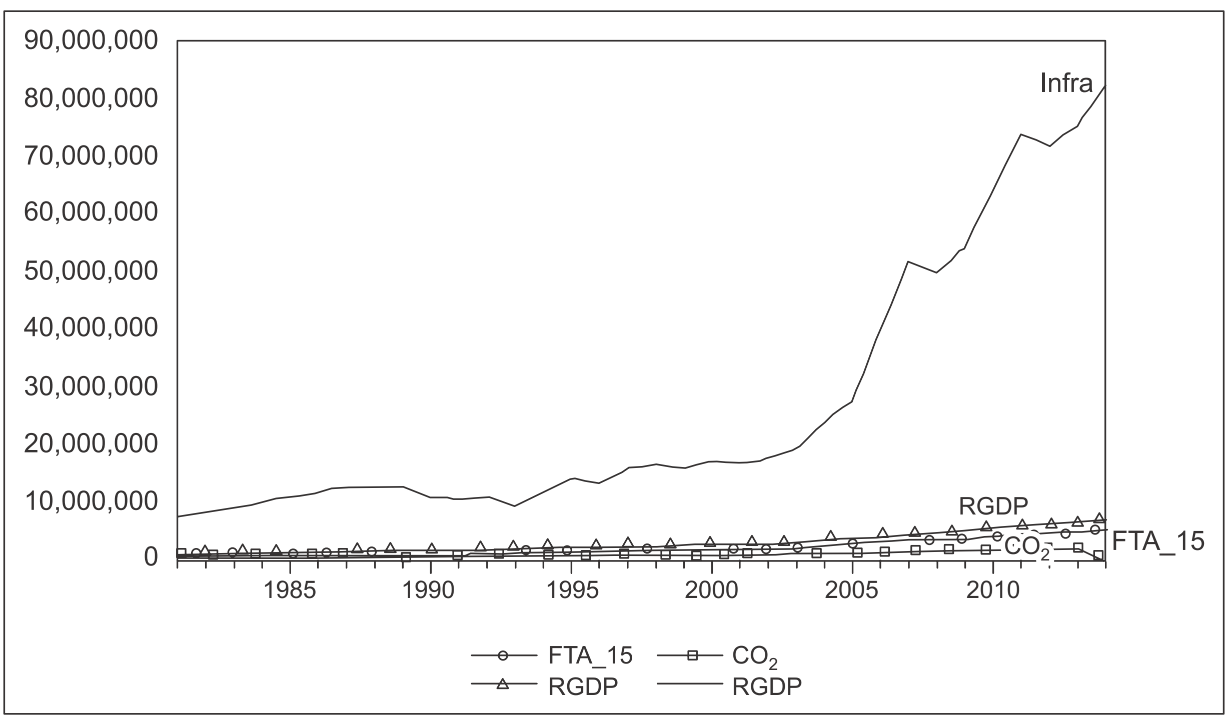

Figure 2: Graphical Presentation of Variables

Table 4
Johansen-Juselius Multivariate Cointegration Test Results

Hypothesized number of co-integrating equations	*Max-Eigen value*	*Trace statistic*	*0.05 Critical Value*	*Probability Value***
r = 0*	0.7423	82.6933	47.8561	0.0000
R = 1*	0.5449	39.2958	29.7970	0.0030
R = 2	0.2931	14.1014	15.4947	0.0802
R = 3	0.0894	2.9976	3.8414	0.0834

Notes: (*) denotes rejection of the hypothesis at the 5%. The letter "R" represents the number of co-integrating equations.

Tests indicate at most 2 integrating equations at 0.05 level.

The critical values are based on Mac Kinnon (1996).

The number of co-integrating vectors/ variables as identified through the Johansen-Juselius multivariate co-integration techniqueindicate (table 4 above) that there are at least two co- integrating equations at 0.05 levels. This implies the existence of common trend in the model, which further suggests proceeding for the estimation of VECM model to look for short-run dynamics of co-integrating variables.

7.4. Vector Error Correction Model

VECM model applies only to the co-integrated series. Itidentifies the speed of short run adjustment among the co-integrating variables towards the equilibrium.Normalized co-integrated equationsas shown in table 5 report that there exist at most two co-integrating equations between FTA_15, RGDP and INFRA, and between CO_2, RGDP and INFRA. Normalized co-integrating coefficients for INFRA and CO_2 (Signs will be reversed) is positive and significant which renders that co-integrating coefficients load on the RGDP and Infra. It shows that 1 percent rise in RGDP and INFRAwill lead to 0.72 percent and 0.004 percent rise respectively in FTA_15.

Table 5
Normalized Co-Integrating Coefficients

FTA_15	*CO_2*	*RGDP*	*INFRA*
1	–	–0.7267 (16.7442)*	–0.00408 (1.4285)**
–	1	–0.18577 (2.3367)*	0.01338 (2.6081)*

*Significant at 5% level** Significant at 10% level

Error correction speed between the FTA_15 and other chosen variables is shown in table 6. It reveals that the lagged error correction term (-1) is positive but not significant thus points out no short run causality among them within one year. Furthermore, the lagged error correction term of (-2), is negative for all chosen variables but significant only for RGDP and INFRA which means that there is an evidence of short-run causality/ adjustment between them within two years. It refers that INFRA and RGDP adjust themselves with the speed of 42.80 percent and 0.69 percent respectively towards FTA_15. The testing of the existence of short-run causality running from RGDP, CO_2 and Infra to FTA from top 15 countries was also evident from Wald test statistic. Granger causality results (table 6) shows that RGDP and CO_2 act as the lead variables in causing change in FTA_15 and Infra (lag variables) which are also significant at 5% level. But, FTA_15 does not granger cause RGDP and CO_2 thus they have only unidirectional causality. Additionally, infra also granger causes CO_2which establishes the bidirectional causality between them (being lead and lag at times). This refers that out of three, two variables cause change in FTA_15.

Table 6
Error-Correction Estimates

Error Correction:	*Δ (FTA_15)*	*Δ (INFRA)*	*Δ (RGDP)*	*Δ (CO_2)*
ECT(-1)	0.521252	54.66141	0.591876	0.785074
	(0.61466)	(18.5254)	(0.41348)	(1.63738)
	[0.84803]	[2.95062]*	[1.43144]	[0.47947]
ECT(-2)	-0.006277	-0.428001	-0.006909	-0.006088
	(0.00464)	(0.13996)	(0.00312)	(0.01237)
	[-1.35180]	[-3.05812]*	[-2.21165]*	[-0.49216]
Δ(FTA_15(-1))	0.059077	-33.90665	-0.387437	-2.506426
	(0.43958)	(13.2485)	(0.29570)	(1.17097)
	[0.13440]	[-2.55929]*	[-1.31022]	[-2.14047]*
Δ (FTA_15(-2))	-0.250363	-10.17642	-0.025826	-0.235595
	(0.31102)	(9.37383)	(0.20922)	(0.82851)
	[-0.80498]	[-1.08562]	[-0.12344]	[-0.28436]
Δ (FTA_15(-3))	0.480704	11.71617	0.244432	-0.059061
	(0.20635)	(6.21930)	(0.13881)	(0.54970)
	[2.32952]#	[1.88384]	[1.76087]#	[-0.10744]
Δ (CO2(-1))	-0.016181	-0.964258	-0.005178	0.029397
	(0.01278)	(0.38518)	(0.00860)	(0.03404)
	[-1.26615]	[-2.50341]*	[-0.60234]	[0.86349]
Δ (CO2(-2))	-0.026656	-1.685426	-0.022952	-0.002186
	(0.01425)	(0.42948)	(0.00959)	(0.03796)
	[-1.87056]#	[-3.92432]*	[-2.39431]*	[-0.05759]
Δ (CO2(-3))	-0.019428	-1.772474	-0.026091	-0.140046
	(0.02054)	(0.61898)	(0.01382)	(0.05471)
	[-0.94597]	[-2.86356]*	[-1.88853]#	[-2.55986]*
Δ (RGDP(-1))	0.791704	29.60894	-0.348504	-0.018175
	(0.54474)	(16.4181)	(0.36645)	(1.45112)
	[1.45335]	[1.80343]#	[-0.95103]	[-0.01252]
Δ (RGDP(-2))	-0.929982	18.70348	-0.243382	2.809285
	(0.53175)	(16.0265)	(0.35771)	(1.41651)
	[-1.74890]#	[1.16703]	[-0.68039]	[1.98324]#
Δ (RGDP(-3))	-1.035914	-25.31041	-1.110975	-2.557369
	(0.63101)	(19.0180)	(0.42448)	(1.68091)

Error Correction:	*Δ (FTA_15)*	*Δ (INFRA)*	*Δ (RGDP)*	*Δ (CO_2)*
	[-1.64168]	[-1.33086]	[-2.61727]*	[-1.52141]
Δ (INFRA(-1))	1.709476	81.17494	2.729006	11.32024
	(1.16803)	(35.2035)	(0.78574)	(3.11147)
	[1.46355]	[2.30588]*	[3.47319]*	[3.63822]*
Δ (INFRA(-2))	-2.295978	-51.90972	-0.256335	0.940030
	(0.87889)	(26.4890)	(0.59123)	(2.34124)
	[-2.61235]	[-1.95967]	[-0.43356]	[0.40151]
Δ (INFRA(-3))	-0.297674	-36.30095	-0.212518	-3.513250
	(0.74545)	(22.4673)	(0.50147)	(1.98578)
	[-0.39932]	[-1.61573]	[-0.42379]	[-1.76920]#

Table 7

Granger Causality	*Probability Value*	*Granger Causality*	*Probability Value*
ΔRGDP causes FTA_15	0.0003*	ΔFTA_15 causes RGDP	0.8582
ΔCO_2 causes FTA_15	0.0053*	ΔCO2 causes RGDP	0.5727
ΔINFRA causes FTA_15	0.0962	ΔINFRA causes RGDP	0.1837
ΔRGDP causes INFRA	0.0014*	ΔFTA_15 causes CO2	0.4525
ΔCO_2 causes INFRA	0.0194*	ΔRGDP causes CO2	0.1702
FTA_15 causes INFRA	0.0544	ΔINFRA causes CO2	0.0313*

* Significant at 5% level # Significant at 10% level, first bracket shows the value of standard error and second bracket [] shows t value.

8. CONCLUSION

We used four variables to analyse the impact and causal relationship between Foreign Tourist Arrival from top 15 countries, CO_2 emissions, Infrastructure (only Air Transport & Passenger Carried) and Real GDP at Constant Prices. OLS model confirms for the impact of selected variables on FTA_15 with 64 percent of variation explained in it.Co-integration and VECM results mark the long-term relationship among them having tendency of adjusting in short-run. Indian tourism ministry, on the lines of results, is suggested to take the suitable measures to cutdown the rising CO_2emissions on immediate basis. Also, the environmental problems arising out of transport infrastructure shall have to be taken care of with seriousness. There is thus a need to design more fuel efficient planes and automobiles that use less fossil fuel. Use of renewable energy as alternative fuel can also ease the situation a great deal.Besides this, it also feels that citizens should be well concerned about the environmental protection to secure country's future.

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