The impact of economic and environmental factors and tourism policies on the sustainability of tourism growth in China: evidence using novel NARDL model

Qin Chen

Received: 19 May 2022 / Accepted: 3 September 2022 / Published online: 14 October 2022
© The Author(s), under exclusive licence to Springer-Verlag GmbH Germany, part of Springer Nature 2022

Abstract
Recently, sustainability of tourism growth has become an international issue due to environmental and economic uncertainty that needs recent researchers' focus and also requires the policymakers' attention. Therefore, the present research has examined the role of economic and environmental factors and tourism policy related to tourist arrival on the sustainability of tourism growth in China. The economic factor includes the gross domestic product (GDP), national income, and foreign direct investment (FDI), while environmental factors include carbon dioxide (CO₂) emission, greenhouse gas (GHG) emission, and nitrous oxide emission. The study has extracted the data from World Development Indicators (WDI) from 1990 to 2020. The present research has employed nonlinear autoregressive distributed lagged (NARDL) to check the linkage among variables. The current study also examines the unit root using Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. The results revealed that GDP, national income, tourism policy related to tourist arrival, and FDI have a positive linkage with the sustainability of tourism growth. The results also exposed that environmental factors such as CO₂ emission, GHG emission, and nitrous oxide emission have a negative linkage with the sustainability of tourism growth. This study provides the guidelines to the relevant authorities and regulators in developing and implementing the regulators regarding the sustainability of tourism growth by promoting economic and environmental conditions and effective tourism policies in the country.

Keywords Sustainability of tourism growth · Gross domestic product · Tourism policy · National income · CO₂ emission · Greenhouse gas emission · Nitrous oxide emission

Introduction
The sustainability of tourism growth is a significant factor in a country's development as it assures sustainability in social and economic well-being. The tourism industry, with all related activities like transportation, lodging, feeding, and entertainment venues, can be taken as the source of economic development. It in itself provides a complete mechanism to create employment opportunities, increase production levels, and generate income in both the formal and informal economic industries. Sustainability of tourism growth creates sustainability in the foreign exchange earnings that are generated from international trade in goods and sometimes from the act of financing the purchases of capital goods from foreign countries, availability of the goods that are necessary for the manufacturing or service sectors in the economy (Ainou et al. 2022; Streimikiene et al. 2021). The sustainability of tourism growth is also a source of sustainable social growth in the country, which ends with a sustainable rise in economic growth. The sustainability in growth in the tourism industry of the country keeps on attracting many foreign travelers, often businesses travelers, to the country and giving them a chance to get familiar with the businesses operating within countries, their characteristics like their risks and opportunities, and develops social relations among them (Bianchi 2018; Chien et al. 2021). These social relations come to an end with the commercial dealings or contracts among the travelers and the particular firms’ representatives. Moreover, when the travelers meet with the local people, they exchange their ideas and culture, which brings improvement to their lives.
Hence, tourism growth enhances the human capital within the country and provides efficient human resources to the business firms within the country (Chien et al. 2022a; León-Gómez et al. 2021).

Economic growth, environmental quality, and tourism policies are crucial factors in developing sustainability in tourism growth. The sustainability of tourism growth depends on the development of transportation, accommodation, food production and processing, innovative shopping centers, recreational parks, or other sorts of entertainment. For all these tourism practices, financial resources are required in a sufficient amount; it also requires increased and sustainable productivity in other related economic sectors as well and needs improved human capital that not only develops tourism but also sustains this development (Chien et al. 2022b; Kyrylov et al. 2020). Economic growth like the increase in GDP, NNI, and FDI enhances financial resources, increases productivity in all economic sectors, and improves human capital. So, the increase in GDP, NNI, and FDI, along with favorable and effective tourism policies related to tourist arrival, enhances tourism growth and helps to sustain it (Hall 2019). The natural environment provides a setting for tourist destinations; it determines the quality of natural resources, food, and water facilities for the tourists and the work efficiency of human resources performing their services for the tourism industry. If the country is confronted with environmental pollution like CO₂ emissions, GHG emissions, and nitrous oxide (N₂O) emissions, it becomes difficult to develop tourism destinations and other tourism practices there as the quality of natural resources, food, and water facilities for the tourists, and health and work efficiency of human resources. (Huang et al. 2021; Kapera 2018).

In addition, Covid-19 is also a significant factor that affects the tourism growth around the globe. The travelling restrictions due to the Covid-19 had dramatic effects on tourism, but the current study has taken the data from 1990 to 2020; thus, only the year 2020 suffered from this disaster so Covid-19 did not affect the study results.

The tourism policy is the collection of decisions, discourses, and practices driven by governments alone or governments in collaboration with some social or private actors with the motive to achieve objectives regarding tourism. The content of the tourism policy is subject to copyright. The tourism policy provides a collection of rules, regulations, directives, guidelines, development goals, and strategies that offer a framework within which the group, as well as individual, decisions directly influence daily activities within a destination and sustainable tourism development. For instance, if the tourism policy designed by the government declares that the tourism firms must undertake environmentally friendly activities, the quality of the atmosphere, land resources, food products, transportation, and all other things are kept clean and not damage the tourist, employees, or general public health. This ensures a clean tourism environment, healthy labor, social support, and the preference of potential customers. So, the firm can enjoy sustainable tourism development (Adu-Ampong 2019; Kamarudin et al. 2021; Lan et al. 2022).

This study examines the influences of economic factors; GDP, GNI, and FDI; and environmental factors, CO₂ emissions, GHG emissions, and N₂O emissions, on tourism growth in China. The tourist industry in China is one of the fastest-growing sectors of the economy and one of the industries with a particular worldwide competitive advantage. In terms of worldwide tourist competitiveness, China’s tourism industry rose from 71st in 2007 to 13th in 2019 (Li et al. 2021a, b; Scheyvens and Biddulph 2018). China has established itself as a major player in the global tourism industry. Following the formation of the world’s largest domestic tourism market, China has become the state that generates tourists in the largest number in the country for outbound tourism. Moreover, inbound tourism maintains its position as a global leader (Li et al. 2020, 2022a). The domestic tourist industry keeps on growing at a rapid pace. In 2019, there were 6.01 billion domestic tourists, up 8.4% from the previous year; of these, 4.4710 billion were urban people, up 8.5%, and 1535 million were rural people, up to 8.1%. Domestic tourism revenue increased by 11.7% to 5.73 trillion yuan (the US$1.36 trillion). Urban people made have made expenditures of 4.75 trillion yuan (the US$ 1.13 trillion), an 11.6% increase, while rural people made expenditures of 0.97 trillion yuan (the US$ 0.23 trillion), a 12.1% increase (Liu et al. 2022b; Wang and Yotsumoto 2019).

Domestic tourism consumption per capita climbed from 511 yuan (US$ 160.59) in 2008 to 945 yuan (US$ 225.11) in 2019, and it is still growing. The disparity in per capita spending between urban and rural populations is diminishing. In 2019, urban people spent 1062.6 yuan (US$ 253.12) per capita, while rural residents spent 634.7 yuan (US$ 155 33) per capita on domestic tourism. From 574.1 yuan (the US$ 180.42) to 427.9 yuan (the US$ 101.93), the difference between urban and rural populations has decreased (Li et al. 2021a, b; Moslehpour et al. 2022a). China’s outbound tourism industry increased gradually in 2019 as a result of tourism consumption increase and income growth. The number of Chinese people who traveled abroad in 2019 was 155 million, up 3.3% from the previous year. In general, China’s inbound tourist market is gradually growing. As per the 2018 statistics, 47.95 million foreign tourists visited the country. The number of international visitor arrivals in China was steady from 2008 to 2018 (Moslehpour et al. 2021; J. Zhang and Cheng 2019). International tourism receipts totaled the US$127.102 billion, a 3.0% increase from the last year. China rose three times in terms of international tourism.
earnings, and its share of global tourism continues to rise. It can be seen that international tourists’ consumption levels have increased in China, indicating that the country’s tourism market is maturing. Inbound tourism in China has a lot of potentials (Moslehpoor et al. 2022b; Yu et al. 2020). The State Council unveiled a development strategy for the tourism industry during the 14th Five-Year Plan period on January 20 (2021–2025). According to this plan, by 2025, China will have a more robust contemporary tourism system that integrates cultural development and boasts enhanced services and a barrier-free environment. The nation wants to be a global tourism powerhouse by 2035, with a greater range of tourist hotspots, such as national cultural parks, top-notch resorts, and tourist attractions and state-level cities and blocks that cater to tourism and leisure. Many policies for technological advancements, cultural development, infrastructure, and special tourism zones have been made (Haibo et al. 2020; Sadiq et al. 2022a). Some statistics related to the tourism growth in China is given in Fig. 1.

The majority of China’s tourist-generating countries are located in its immediate vicinity. South Korea has been the leading source of tourists to China these years. Despite the fact that Japan is the second most popular tourist destination after China, the visitors’ strength has decreased, which may be because of the China-Japan tension (Gao et al. 2021a, b; Sadiq et al. 2022b). Since China presents a mysterious, unique culture, tourists from America, Russia, Malaysia, Mongolia, Singapore, and other neighboring countries feel interested in China (Sadiq et al. 2022c; Zhang et al. 2021). Though the tourism industry in China has been growing at a significant rate, it is still required that information on the threats which are feared to become a hurdle to getting high tourism growth is acquired, and these threats must be removed. This is the main concern of the present study so that the Chinese tourism industry can be led to sustainable growth. The objective of the study is to explore the influences of three economic factors, GDP, GNI, and FDI; tourism policy; and three environmental factors, CO₂ emissions, GHG emissions, and N₂O emissions, on tourism growth.

This study is a great contribution to the literature on tourism. First, in the past literature, the authors have written about the role of economic conditions and environmental elements in tourism growth. But it is rare in the existing literature that the role of economic and environmental conditions in the sustainability of tourism growth has not been checked through single research. The study of Cave and Dredge (2020) has examined only economic condition impacts on sustainable tourism development and shows the need for environmental factor impacts on sustainable economic development. Moreover, little attention is paid to tourism policies’ impacts on sustainable tourism growth. The present article, which amalgamates the role of economic conditions, environmental conditions, and tourism policies on sustainable tourism growth, makes a contribution to literature. Second, CO₂ emissions and N₂O emissions are hazardous gases that cause GHG effect and degrade the environment. These gases and their impacts on sustainable tourism growth have been examined as GHG emissions like D. Liu et al. (2021). The study, which individually checks CO₂ and N₂O emission impacts on tourism growth with ample detail, adds to the literature. Third, the economy of China significantly relies on tourism practices and earnings from this sector. China is one of the largest countries causing environmental pollution, which is a hurdle to sustainable tourism growth. But little study has been done on sustainable tourism growth for economic conditions, environmental conditions, and tourism policies. The present article adds much to the literature by analyzing the impacts of economic conditions, environmental conditions, and tourism policies on sustainable tourism growth in the context of China.

Fig. 1 Tourism Growth in China
The present paper has several parts: The 2nd one analyzes the relationship between the GDP, GNI, FDI, tourism policy related to tourist arrival, CO₂ emissions, GHG emissions, and N₂O emissions and tourism growth with a review of past literature. The 3rd part is about the process adopted for the collection of data and the analysis of the information in hand for the nexus among the factors under consideration. The analysis provides the study findings of the nature of the relationship among the study constructs. The results after analysis are compared with the relevant findings of previous studies. Thereafter, the conclusion of the study, its implications, and limitations are given.

**Literature review**

In any country, the tourism industry has great significance to economic development and social prosperity. It creates revenues for the country in the form of national currency or foreign exchange from the tourists, generates taxes from tourism, and stimulates the productivity of other related commercial enterprises (Xu and Gu 2018). It can achieve many progressive opportunities from economic growth. For example, with economic growth like the increase in GDP, GNI, FDI, and favorable tourism policies, there is a better financial position, technological development, increased productivity, production quality improvement, and new ways to attract tourists. On the other hand, tourism has some environmental threats, such as CO₂ emissions, GHG emissions, and N₂O emissions. As the environment and its elements provide resources for different economic activities, pollutants like CO₂ emissions, GHG emissions, and N₂O emissions by destroying environmental quality retard tourism growth (Shen et al. 2019; Tan et al. 2021). The relationship between economic factors like GDP, GNI, FDI, and tourism policy and three environmental factors like CO₂ emissions, GHG emissions, and N₂O emissions and tourism growth has frequently been discussed in the existing literature. The present study examines the relation of economic growth like GDP, GNI, and FDI, and tourism policy related to tourist arrival and environmental pollutants like CO₂ emissions, GHG emissions, and N₂O emissions with tourism growth in the light of previously conducted studies.

In a research article, Ben Jebli and Hadhri (2018) wrote about the impacts of real GDP, energy use, and CO₂ emissions from transport on international tourism. A survey was conducted on ten international tourism destinations over the period from 1995 to 2013, with the help of the Granger causality and error correction model, the relationship between the real GDP, energy use, CO₂ emissions from transport, and international tourism. The study implies that real GDP has a positive relation to international tourism growth. With the increase in the GDP, the capacity of the country to arrange for the resources to be used in tourism practices increases as it raises the productivity of the goods and services that are essential in tourism and also assists in improving the quality of tourism resources and services. A study was conducted by Ghosh et al. (2020) to investigate the nexus between a country’s per capita GDP and the growth of marine tourism in the Oceania region, the area of the South Pacific Ocean containing many different collections of islands. A panel of data was acquired from a sample of 11 nations of Oceania spanning the period from 1995 to 2018. The study implies that when it is prosperous with high GDP, marine development is likely to grow within the country as it can invest in the implementation of tourism activities like accommodation, recreation, restaurant, and food services to coasts along with other coastal and marine tourism infrastructure including retail system, transport hubs, activity suppliers, and marinas. Tian et al. (2021) also find a positive link between a country’s GDP and tourism growth as it is the source of investment and essential resources available for tourism. Through an in-depth investigation, León-Gómez et al. (2021) examine the relationship of economic growth measured by GDP with sustainable tourism growth. The authors collected the required information for GDP and sustainable tourism growth from 668 articles on the topic of economic growth and sustainable tourism development published in the Web of Science database. The research states that when a country is making high economic growth, the tourism firms are able to utilize sustainable technologies in tourism practices. This leads the tourism industry towards sustainable growth. Hence, GDP has a positive link with sustainable tourism growth.

Many foreigners with an intention to expand their source of earnings make an investment in domestic business projects, construction, or developmental projects. FDI may be directly in the tourism firms, tourism destination development projects, or tourism construction works. It may also be in the firms engaging in natural development, tourism resource production, and providers of tourism-related facilities like tourism infrastructure, transportation, communication, and information system. So, when the FDI increases, the tourism firms have the chance to add value to the existing tourism destination and services and expand the tourism scope (Paramati et al. 2018; Zhao et al. 2021). The study by Fauzel (2020) analyzes the influences of FDI on tourism growth. By employing a panel vector error correction model (PVECM), the authors analyzed the FDI impacts on tourism development in the selected collection of 17 small island economies for the time from 1995 to 2018. The authors found a positive and direct relation between FDI and tourist arrivals or tourism growth. This study implies that FDI plays a vital role in tourism development. When the countries can successfully attract FDI and grow economically, the tourism sector can grow soon in the future as it depends much on
economic growth. The research by El Menyari (2021) examines the impacts of FDI on international tourism growth. The authors collected data from the economy of Morocco for the period from 1983 to 2018. Using the autoregressive distributed lag (ARDL) approach and causality tests, the authors found a positive relationship between FDI and international tourism growth. The increase in the amount of investment from foreign sources clears the way for the tourism industry to place its feet beyond the state boundaries. The study conducted by Amin et al. (2020) investigates the influences of FDI on sustainable tourism development. The annual time series data for FDI and sustainable tourism development were acquired from Bangladesh for the period 1972–2017. Standard econometric techniques, like ADF, PP, and Zivot-Andrews unit root tests; Granger causality test; Johansen cointegration test; VECM, DOLS, and ARDL estimation methods; and cumulative sum (CUSUM) stability test have been applied to check the relationship among factors. The study results reveal that with the increase in FDI, the technological and managerial capital gets improved in the tourism industry. With the improved technologies and managerial capital, tourism growth can be sustainable. Thus, there is a positive relation between FDI and sustainable tourism development.

The tourism industry is a wide economic sector, and it is based on many other economic practices carried on within the country as it requires a large number of products and services that others produce. It is also dependent on the financial position of the country and its inhabitants. The country’s GNI increase refers to the increase in the production of goods and services within the country and also determines the financial strength of the country and the financial prosperity of the individuals. So, the country’s GNI has a positive link to tourism growth within the country (Razzaq et al. 2021). Empirical research by Zhang and Cheng (2019) analyzes the relation of national income with the sustainability of tourism growth. It highlights that when a country’s national income is high, the economy is stable, and business firms are engaged in their production activities. Because of their stronger financial position, they are able to focus not only on the marketing of existing items but also on the enhancement of product and service quality. In the tourism industry, enterprises’ own concentration on providing high-quality services to visitors, as well as the procurement of high-quality resources and products from other businesses, enables them to match the tourists’ quality expectations. Gao et al. (2021a, b) identify the relationship between economic growth measured by national income, environmental protection, and sustainable tourism development with the evidence through a panel from 18 Mediterranean countries for the period from 1995 to 2010. The study implies that with the rise in the national income, a stronger financial position allows the ecological friendly initiatives on the part of government and individual firms. The improved atmosphere and better quality of natural resources help the growing tourism industry and getting sustainability of tourism firms. The literary article of Umurzakov et al. (2022) throws light on the economic development measured by national income and sustainable tourism growth. The information for national income and sustainable tourism development was acquired from 57 BRI countries for the time from 2000 to 2018, and the GMM estimator was applied to extract results that indicated a positive link between national income and sustainable tourism growth.

Empirical research was conducted by Kapera (2018) to examine the role of tourism policies in developing the sustainability of tourism growth. The standardized questionnaire was applied in this research, and it was distributed to 2500 municipal offices in Poland either through the empirical survey or through electronic ways in order to collect data regarding the tourism policy for providing clean tourism destinations and other tourism facilities and the sustainability in tourism growth. The data were collected from 600 end respondents. The study posits that when the policies regarding the tourism destination and practices are favorable and effectively implemented, it brings improvement in tourism facilities. For instance, if the tourism policy related to tourist arrival improvements is effectively implemented, it maintains the quality of accommodation and recreational destinations established by tourism firms maintain the clean environment for the tourists, and also assists the production of other economic products. So, favorable tourism policies enhance the sustainability of tourism growth. A study presented by Guo et al. (2019) identifies the relationship between tourism policy and the sustainability of tourism growth. The study is based on a previous research review. A total of 515 observations were taken from this literary research survey. The research survey proves that different tourism growth policies were formulated by government authorities and tourism firms for enhancing the social and environmental development of the tourism industry within the country and to develop sustainability in tourism growth. So, tourism policy and sustainable tourism growth are positively linked. The study presented by A. Khan et al. (2020) focuses on tourism policy influences on sustainable tourism growth. It examines the tourism policies regarding capital, investment, energy consumption, and environmental management in developing countries with greater attention to Pakistan. Various econometric techniques and procedures were employed to check the proposed hypotheses. The results convey that positive tourism policies encourage sustainable tourism growth. Likewise, the article by Hall (2019) also affirms that the tourism policy that is a set of specific rules, regulations, practices, strategies, and decisions automatically leads the tourism industry towards sustainable growth.
CO₂ emissions are one of the hazardous gases that could adversely affect the environment’s capacity to produce natural resources, the quality of natural resources, and the health of living creatures, including human beings (Koçak et al. 2020). Tourism is the economic sector that is directly or indirectly linked to the natural environment and its elements. When in a country, because of households or operations of many commercial entities, there are a large amount of CO₂ emissions into the air, the practices of tourism become paralyzed, the tourism services may lose quality, and tourists’ attraction becomes a difficulty. So, there is downward tourism growth as a result of CO₂ emissions, and sustainability of tourism growth becomes difficult (Fethi and Senyucel 2021). Liu et al. (2019) intended to explore the relationship between energy consumption, CO₂ emission, and sustainability of tourism growth with respect to international tourism. The data for the nexus between these factors and tourism growth was taken from the economy of Pakistan over the years from 1980 to 2016 by using the autoregressive distributed lagged (ARDL) model. Furthermore, Granger causality and the DOLS model were applied for robust analysis. The findings show that economic growth and energy consumption are major causes of CO₂ emissions in a country. In this situation, there are adverse changes in the climate balance, weather pattern, soil condition, and ocean level. Consequently, the natural scenery and natural resources that are used as recreation sources or food for tourists are adversely affected and weaken tourism growth. Hence, sustainability in tourism growth is disturbed because of the increase in CO₂ emissions. Dogru et al. (2020) proclaim that the increasing amount of CO₂ emissions into the air pollutes the atmosphere, disturbs the water level, and traps the heat in over quantity. The environmental deterioration can endanger the health of human resources and tourists; thus, it reduces the tourism growth rate and becomes a threat to the sustainability of tourism growth. In a literary workout, Zha et al. (2020) examine the relation between CO₂ emissions and sustainable tourism growth. The nexus among the understudy factors was analyzed in developing economies like China for the period of 2005 to 2016. The results showed a negative relation between CO₂ emissions and sustainable tourism growth. In a literary article, Ozturk et al. (2021) investigates the relationship among economic growth, energy consumption, CO₂ emissions, and sustainable tourism growth. The data was acquired from Saudi Arabia for the period from 1968 to 2017. The DOLS and FMOLS methods were applied to analyze the proposed hypotheses. The study finds that when the huge amount of non-renewable energy is being utilized, the CO₂ gas is emitted in large amount, and it damages the natural parks, islands, and natural beauty serving as tourism destinations. So, the tourism growth is jeopardized as well as the relationship between CO₂ emissions and sustainable tourism growth.

GHG emissions refer to the emissions of toxic gases like H₂O, CO₂, N₂O, methane, ozone, HFCs, HCFCs, and perfluorocarbons, which, whenever they exceed the balanced quantity, destroy the layer protecting the earth from sun heat, and the excessive heat into earth disturbing the weather pattern, soil and water quality, and production capacity directly affects the health of the living creatures. These environmental factors and environmental productivity provide resources for the tourism industry and affect its growth. The lack of environmental quality, adverse quality natural resources produced by the environment, and the weak and inactive labor all create problems in the performance of tourism activities and its future growth. So, sustainability in tourism growth is restricted (Usman et al. 2021). Lasisi et al. (2020) examine the impacts of GHG emissions on the sustainability of tourism growth. It posits that natural resources such as greens, grass, crops, trees, flowers, various plants, marine creatures, animals, and birds all fulfill the tourism industry’s demands for housing, recreation, and feeding. However, as a result of GHG emissions, the quality of these natural resources is projected to deteriorate, putting tourism expansion in jeopardy. Therefore, the increase in GHG emissions creates hurdles to sustainability development in tourism growth. The study of Ahmad et al. (2019) is an investigation of the relation of GHG emissions with the sustainability of tourism growth. According to the authors’ views, the GHG emissions and tourism growth are bound in a reciprocal relationship where when the country is making rapid growth and expansion, there are a large amount of GHG emissions, but on the other side, the increasing GHG emissions by destroying the environments resists the sustainability in tourism growth. A study of Banga et al. (2022) investigates the influences of energy consumption patterns and GHG emissions on sustainable tourism development. The research survey was conducted in 38 OECD countries from 2008 to 2019, and the nexus among the factors was analyzed with the help of a dynamic GMM model. The study finds that GHG emissions because of the excessive use of fossil fuels destroy the natural beauty and put sustainable tourism development in danger.

N₂O is the most significant GHG after CO₂ and methane. It is the biggest human-sourced threat to the ozone layer, gathering heat from the sun into the earth. It destroys the atmospheric quality of the environment, the environment’s capacity to produce natural resources, the quality of natural resources, and the heath of living creatures, including human beings (Zhang et al. 2019). The tourism industry of a country has sound relations to the natural environment and its features. When there is a huge amount of GHG emissions into the air in a country due to households or operations of many commercial entities, tourism practices become stopped thoroughly, tourism services may lose quality, and the number of tourists decreases. As a result of GHG emissions, tourism
growth is declining. In this case, the sustainability of the tourism facilities and their marketing are disturbed (Chien et al. 2022c; Haseeb and Azam 2021). Villanthenkodath et al. (2021) proclaim that the work environment for tourism staff is ruined, and the labor quality is affected as a result in the region where substantial volumes of N2O are released by fuel combustion, agriculture, industrial activities, and wastewater management. The poor performance of human resources, which are critical to total tourist performance, constitutes a roadblock to tourism expansion. Hence, there is a negative relation between N2O emissions and sustainable tourism growth. The literary article of Pan et al. (2018) throws light on the N2O emissions and sustainable tourism development. The study suggests that N2O is a great environmental pollutant that could restrict the undertaking of tourism activities in the future as it is destructive to the natural beauty of destinations and increasing health risks. Hence, there is a negative relation between N2O emissions. Khan et al. (2019) check the nexus among GHG emissions, energy use, financial development, renewable energy, and tourism growth. The authors collected evidence on the relationship among GHG emissions like CO2, N2O, methane, and others; energy use; financial development; renewable energy; and tourism, from 34 high-income developing countries from the continents of Asia, Europe, and America from 1995 to 2017. The results showed that the increase in N2O emission into the air does not allow the tourism industry to grow with sustainability because it deteriorates the natural environment and the natural assets of the industry.

Research gaps

Sustainable tourism growth is not a new topic of research or discussion. It has been discussed and debated by many authors in the previously conducted research articles. Despite this, the current research article secures a distinctive position in the literature by removing several literary gaps. First, in the past literary articles, different authors have presented their views in different directions while analyzing the relationship between economic factors like GDP, FDI, and GNI, environmental factors like CO2 emissions, GHG emissions, and N2O emissions as well as tourism policies with sustainable tourism growth. The present study shows the positive relation of economic factors like GDP, FDI, and GNI and tourism policies with sustainable tourism development while the negative relation of environmental factors CO2 emissions, GHG emissions, and N2O emissions with sustainable tourism growth. Second, the majority of the previous literature has either analyzed the influences of economic factors like GDP, FDI, and GNI or environmental factors like CO2 emissions, GHG emissions, and N2O emissions on sustainable tourism growth. However, the current literary article is about the impacts of economic factors and environmental factors along with tourism policies for sustainable tourism growth. Thus, it adds to the literature. Third, the previous research studies have analyzed the role of GDP, FDI, GNI, CO2 emissions, GHG emissions, and N2O emissions and tourism policies in sustainable tourism growth in different world economies such as Mediterranean countries, the South Ocean Pacific region, Morocco, Poland, small Island economies, Pakistan, Bangladesh, and Bri economies. The current article removes this literary gap and examines these factors’ impacts on sustainable tourism growth in China. In past literature, different statistical and econometric approaches are applied to check the nexus between GDP, FDI, GNI, CO2 emissions, GHG emissions, and N2O emissions and tourism policies in sustainable tourism growth. The present article adds to the literature as it finds data from the WDI and applies the ADF and PP model for analyzing these factors and their relationship.

Research methodology

The research has examined the role of economic and environmental factors and tourism policy related to tourist arrival on the sustainability of tourism growth in China. The economic factor includes the GDP, national income, and FDI, while environmental factors include CO2 emission, GHG emission, and nitrous oxide emission, so there is no need to add further factor of environment. The study has extracted the data from WDI from 1990 to 2020. The present research has employed NARDL to check the linkage among variables. The current study also examines the unit root using ADF and PP tests. The equation is given below:

\[
TG = a_0 + \beta_1 GDP_t + \beta_2 FDI_t + \beta_3 NNI_t + \beta_4 TP_t \\
+ \beta_5 CO2E_t + \beta_6 GHGE_t + \beta_7 NOE_t + \epsilon_t
\]

where

- \( TG \) tourism growth
- \( t \) time period
- \( GDP \) gross domestic product
- \( FDI \) foreign direct investment
- \( NNI \) net national income
- \( TP \) tourism policy
- \( CO2E \) carbon dioxide emission
- \( GHGE \) greenhouse gas emission

\( \epsilon_t \) is the error term.
NOE nitrous oxide emission

The present article has taken sustainability of tourism growth as the main construct of the study and measured the international tourism expenditures (% of total imports). In addition, the current article has taken three economic and three environmental factors and tourism policy related to tourist arrival as predictors. The economic factor includes the GDP measured as GDP growth (annual percentage), NNI measured as NNI (annual % growth), and FDI measured as a net inflow (% of GDP). Moreover, the environmental factors include CO₂ emission measured as CO₂ damage (% of GNI), GHG emission measured as GHG emission (% change from 1990), and nitrous oxide emission measured as NO emission (% change from 1990). Finally, tourism policy related to the tourist arrival is measured as the international tourist, the number of arrivals. The variables with measurement and sources are given in Table 1.

The present research has examined the descriptive statistics that show the standard deviation, total observation used, minimum values, mean values, and maximum values of the constructs. Moreover, the study has also run the year-wise descriptive statistics that show the details of variables with respect to years. In addition, the current article also runs the correlation matrix that exposes the directional linkage among variables. Moreover, the unit root among the variables has also been examined using ADF and PP tests. The equation is given below:

\[ d(Y_t) = \alpha_0 + \beta_t + \gamma_{Y_{t-1}} + d(Y_t(-1)) + \epsilon_t \]  

The ADF and PP tests exposed guidelines for the suitable model for the study. The current study has adopted the NARDL co-integration technique because it is preferable when dealing with variables that are integrated of a different order, I(0), I(1), or a combination of both and robust when there is a single long-run relationship between the underlying variables in a small sample size. In addition, it permits us to examine asymmetries nonlinearly and thus violates linearity assumption. Moreover, the NARDL model examines for the possibility of asymmetric negative and positive impact of the independent variable(s) on the predictive variable in the long and short runs. Finally, the NARDL model also permits to capture co-integration for single equation framework compared with the linear ARDL model. The ARDL equation is mentioned below:

\[
\begin{align*}
\Delta Y_t &= a_0 + \sum \delta_i \Delta Y_{t-i} + \sum \delta_i \Delta X_{t-i} + \varepsilon_t \\
&= a_0 + \sum \delta_i \Delta Y_{t-i} + \sum \delta_i \Delta X_{t-i} + \varepsilon_t \\
&= \sum \xi_i Y_{t-i} + \sum \delta_i \Delta Y_{t-i} + \sum \delta_i \Delta X_{t-i} + \varepsilon_t \\
&= \sum \xi_i Y_{t-i} + \sum \delta_i \Delta Y_{t-i} + \sum \delta_i \Delta X_{t-i} + \varepsilon_t \\
\end{align*}
\]

In addition, the current study has also examined the asymmetric role of GDP, national income, and FDI. For this purpose, the equation is given as

\[
\begin{align*}
TG_t &= a_0 + \beta_t CO_{2} + \beta_t GHGE + \beta_t NOE_t \\
&+ \beta_t GDP_t^+ + \beta_t GDP_t^- + \beta_t NNI_t^+ \\
&+ \beta_t NNI_t^- + \beta_t FDI_t^+ + \beta_t FDI_t^- + \epsilon_t \\
\end{align*}
\]

The current study has estimated the positive and negative role of GDP, national income, and FDI on the sustainability of tourism growth. The individual asymmetric equation is given as below:

\[
\begin{align*}
GDP^+ &= \sum_{i=1}^{t} \Delta GDP_i^+ = \sum_{i=1}^{t} \max(\Delta GDP_0, 0) \\
GDP^- &= \sum_{i=1}^{t} \Delta GDP_i^- = \sum_{i=1}^{t} \min(\Delta GDP_0, 0) \\
n_NNI^+ &= \sum_{i=1}^{t} \Delta NNI_i^+ = \sum_{i=1}^{t} \max(\Delta NNI_0, 0) \\
n_NNI^- &= \sum_{i=1}^{t} \Delta NNI_i^- = \sum_{i=1}^{t} \min(\Delta NNI_0, 0) \\
\end{align*}
\]

| Table 1 Variables with measurements |
|-------------------------------------|
| Variables                          | Measurement                                      | Sources |
|-------------------------------------|--------------------------------------------------|---------|
| Sustainability of tourism growth    | International tourism expenditures (% of total import) | WDI     |
| GDP                                 | GDP growth (annual percentage)                    | WDI     |
| FDI                                 | Net inflow (% of GDP)                            | WDI     |
| National income                     | NNI (annual % growth)                            | WDI     |
| Tourism policy                      | International tourist, number of arrivals         | WDI     |
| CO₂ emission                        | CO₂ damage (% of GNI)                            | WDI     |
| GHG emission                        | GHG emission (% change from 1990)                | WDI     |
| Nitrous oxide emission              | NO emission (% change from 1990)                 | WDI     |
Finally, the positive and negative role of GDP, national income, and FDI on the sustainability of tourism growth have been added to the ARDL model and converted into the NARDL. The equation is given below:

\[ FDI^+ = \sum_{i=1}^{t} \Delta EPC_i^+ - \sum_{i=1}^{t} \max(\Delta EPC_i, 0) \]  \tag{9} \\

\[ FDI^- = \sum_{i=1}^{t} \Delta FDI_i^- - \sum_{i=1}^{t} \min(\Delta FDI_i, 0) \]  \tag{10} \\

Table 2 Descriptive statistics

| Variable | Obs | Mean | Std. Dev | Min | Max |
|----------|-----|------|----------|-----|-----|
| TG       | 31  | 8.978| 4.738    | 2.766| 16.652|
| GDP      | 31  | 9.116| 2.774    | 2.348| 14.231|
| FDI      | 31  | 3.302| 1.400    | 0.966| 6.187 |
| NNI      | 31  | 10.306| 3.083   | 4.631| 15.513|
| TP       | 31  | 97,915,333| 45,000,103| 14,332,500| 1.625e+08|
| CO2E     | 31  | 5.240| 1.841    | 2.984| 9.097 |
| GHGE     | 31  | 85.047| 61.641   | 2.661| 209.922|
| NOE      | 31  | 27.360| 16.263   | −2.036| 67.052|

Findings of the study

The present research has examined the descriptive statistics that show the standard deviation, total observation used, minimum values, mean values, and maximum values of the constructs. The findings indicated that the mean value of TG was 8.978%, and the average value of GDP was 9.116%. In addition, the outcomes also revealed that the mean value of FDI was 3.302%, while the average value of NNI was 10.306%. In addition, the mean value of TP related to the tourist arrivals was 97,915,333 arrivals. Moreover, the output also exposed that the average value of CO2E was 5.240%, while the mean value of GHGE was 85.047, and the average value of NOE was 27.360. Finally, a total of 31 observations were used in the study. Table 2 shows these details.

Moreover, the study has also run the year-wise descriptive statistics that show the details of variables with respect to years. The results exposed that the maximum value of TG was in 2020 (16.652), while the minimum value of TG was in 1990 (2.766). Moreover, the outcomes also exposed that the highest value of GDP was 14.225% in 2014, while the lowest value of GDP was 2.348% in 1990. In addition, the results exposed that the maximum value of FDI was in 2010 (6.187) while the minimum value of FDI was in 2013 (0.966). Moreover, the outcomes also exposed that the highest value of NNI was 15.513% in 2016, while the lowest value of NNI was 4.631% in 2020. The lowest value of TP related to tourism arrivals was 14,332,500 arrivals in 1990, and the maximum value of TP was 162,538,000 arrivals in 2018. The results also exposed that the maximum value of CO2E was in 2012 (8.554), while the minimum value of CO2E was in 1992 (2.984). Moreover, the outcomes also exposed that the highest value of GHGE was 209.922 in 2020, while the lowest value of GHGE was 2.611 in 2013. Finally, the results exposed that the maximum value of NOE was in 2020 (67.052) while the minimum value of NOE was in 2013 (−2.036). Table 3 shows the year-wise descriptive statistics figures.

In addition, the current article also runs the correlation matrix that exposes the directional linkage among variables. The results revealed that GDP, national income, and FDI have a positive linkage with the sustainability of tourism growth. The results also exposed that environmental factors such as CO2 emission, GHG emission, and nitrous oxide emission have a negative linkage with the sustainability of tourism growth. Table 4 shows these outcomes.

Moreover, the unit root among the variables has also been examined using ADF and PP tests. The results exposed that GDP, NNI, TP, GHGE, and NOE have no unit root at the level, but TG, FDI, and CO2E have no unit root at the first difference. Table 5 shows the PP and ADF results.

In addition, the current article has also run the NARDL bound test that shows the cointegration, and the findings exposed that the 5.91 value of f-statistics calculated is larger than the critical value and exposed cointegration exists. Table 6 exposes these outcomes.

The NARDL results revealed that GDP, national income, and FDI have a positive linkage with the sustainability of tourism growth. The results also exposed that environmental factors such as CO2 emission, GHG emission, and nitrous oxide emission have a negative linkage with the sustainability of tourism growth. Finally, the tourism policies related to tourist arrivals have a positive impact on the sustainability of tourism growth. Table 7 shows the NARDL results.

Discussions

The results stated that GDP is in a positive relation to the sustainability of tourism growth. These results are supported by Lee et al. (2021), which show that tourism...
is a combination of multiple activities, including many resources that can be acquired from different other firms, such as the firms which give infrastructure facilities, transportation facilities, and food processing, all things which are available at shopping centers serving the tourists. In the countries having high GDP, the production level in almost all the business enterprises rises. Thus, the availability of different resources to be used in tourism practices accelerates tourism growth and develops sustainability in it. These results are also in line with Scarlett (2021), which examines the GDP’s role in developing sustainability in tourism growth. This study posits that when there is high GDP growth, the firms have economic prosperity and enough resources that they can develop

| Years | TG    | GDP   | FDI   | NNI   | TP    | CO2E  | GHGE  | NOE   |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1990  | 2.766 | 2.348 | 1.443 | 4.963 | 14,332,500 | 2.990 | 163.860 | 31.491 |
| 1991  | 2.874 | 5.950 | 1.311 | 5.082 | 29,169,500 | 2.984 | 143.382 | 30.117 |
| 1992  | 2.983 | 6.750 | 1.694 | 5.200 | 36,587,000 | 3.176 | 122.903 | 28.743 |
| 1993  | 3.109 | 6.947 | 1.556 | 8.538 | 46,387,000 | 3.176 | 112.664 | 28.056 |
| 1994  | 3.243 | 6.849 | 1.349 | 7.927 | 51,128,000 | 3.201 | 102.425 | 27.369 |
| 1995  | 3.398 | 7.041 | 2.192 | 7.958 | 57,588,000 | 3.302 | 92.186  | 26.682 |
| 1996  | 3.583 | 7.426 | 2.559 | 8.849 | 63,478,000 | 3.492 | 82.821  | 25.995 |
| 1997  | 3.672 | 7.766 | 3.040 | 11.385 | 72,796,000 | 3.659 | 81.947  | 25.308 |
| 1998  | 3.729 | 7.846 | 3.749 | 9.591 | 83,444,000 | 5.914 | 82.821  | 25.308 |
| 1999  | 3.858 | 10.114 | 3.484 | 12.239 | 97,908,000 | 5.330 | 82.821  | 25.308 |
| 2000  | 4.076 | 10.038 | 3.487 | 11.938 | 99,013,000 | 5.775 | 69.966  | 24.621 |
| 2001  | 7.971 | 9.134 | 3.609 | 12.239 | 91,662,000 | 5.125 | 32.185  | 23.934 |
| 2002  | 8.306 | 8.336 | 3.513 | 11.651 | 96,162,000 | 5.125 | 32.185  | 23.934 |
| 2003  | 8.792 | 8.490 | 3.475 | 9.591 | 10.90e+08 | 5.283 | 30.561  | 21.644 |
| 2004  | 9.746 | 7.662 | 3.749 | 9.591 | 12.03e+08 | 5.459 | 30.483  | 21.644 |
| 2005  | 10.195 | 7.846 | 4.436 | 8.751 | 12.49e+08 | 5.622 | 32.079  | 21.644 |
| 2006  | 9.436 | 9.237 | 4.725 | 9.520 | 13.19e+08 | 6.044 | 31.367  | 18.565 |
| 2007  | 10.001 | 9.923 | 4.652 | 12.660 | 13.00e+08 | 6.476 | 33.119  | 24.405 |
| 2008  | 10.513 | 10.954 | 4.880 | 12.305 | 13.26e+08 | 7.024 | 29.534  | 19.868 |
| 2009  | 11.024 | 10.037 | 5.987 | 12.645 | 13.33e+08 | 7.952 | 18.517  | 6.748 |
| 2010  | 11.536 | 13.884 | 6.187 | 12.986 | 13.54e+08 | 9.097 | 12.989  | 1.998 |
| 2011  | 12.047 | 14.225 | 2.613 | 13.326 | 13.32e+08 | 8.428 | 7.188   | 3.954 |
| 2012  | 12.559 | 9.263 | 1.139 | 13.667 | 13.29e+08 | 8.554 | 3.662   | 1.420 |
| 2013  | 13.071 | 3.920 | 0.966 | 14.007 | 13.28e+08 | 8.183 | 2.661   | -2.036 |
| 2014  | 13.582 | 12.721 | 4.509 | 14.456 | 13.33e+08 | 5.818 | 120.244 | 40.660 |
| 2015  | 14.094 | 11.395 | 4.554 | 13.030 | 14.18e+08 | 6.036 | 100.467 | 35.275 |
| 2016  | 14.606 | 14.231 | 4.401 | 15.513 | 15.53e+08 | 4.837 | 134.390 | 44.561 |
| 2017  | 15.117 | 9.651 | 3.734 | 7.195 | 1.586e+08 | 4.377 | 157.459 | 47.613 |
| 2018  | 15.629 | 9.399 | 2.569 | 13.385 | 1.625e+08 | 4.096 | 172.750 | 55.014 |
| 2019  | 16.140 | 10.636 | 4.004 | 9.088 | 30.402,000 | 4.134 | 187.304 | 61.637 |
| 2020  | 16.652 | 9.551 | 3.709 | 4.631 | 30.567,200 | 3.877 | 209.922 | 67.052 |

Table 3: Descriptive statistics by years

Table 4: Matrix of correlations

| Variables | TG    | GDP   | FDI   | NNI   | TP    | CO2E  | GHGE  | NOE   |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|
| TG        | 1.000 |       |       |       |       |       |       |       |
| GDP       | 0.556 | 1.000 |       |       |       |       |       |       |
| FDI       | 0.454 | 0.723 | 1.000 |       |       |       |       |       |
| NNI       | 0.464 | 0.614 | 0.374 | 1.000 |       |       |       |       |
| TP        | 0.432 | 0.710 | 0.412 | 0.628 | 1.000 |       |       |       |
| CO2E      | -0.480 | 0.539 | 0.436 | 0.719 | -0.352 | 1.000 |       |       |
| GHGE      | -0.003 | -0.200 | -0.270 | -0.545 | -0.435 | -0.776 | 1.000 |       |
| NOE       | -0.255 | 0.013 | 0.029 | -0.358 | 0.231 | -0.661 | 0.885 | 1.000 |
variety in the tourism practices like improvement in the accommodation facilities on an innovation basis, variety of food items provided at the restaurants, and availability of innovative, quality products at malls and increase in the number of recreational activities. Thus, the increase in GDP successfully adds to sustainability in tourism growth.

The results revealed that FDI has a positive relation to the sustainability of tourism growth. These results agree with Sou and Vinnicombe (2021), which highlight that the investment from persons or firms from abroad in the tourism industry increases the financial resources, economic and physical resources, and regulations and provides efficient management. Thus, the encouragement of FDI for tourism firms enables them to broaden the scope of their business, improve the quality of their services as well, and keep on growing well over time. So, these results match with the past study of Zhuang et al. (2021), which states that when domestic firms accept investment from both domestic and foreign sources, their financial position is strong, and they have considerable funds to utilize in order to keep the tourism services innovative. The use of heavy innovative technologies, technologies, and resources with high quality and novel design attracts more tourists both at the national and international levels. Thus, the tourism industry within the country can grow at a sustainable rate as a result of employing FDI. These results match with Sheng Yin and Hussain (2021), where the authors wrote about the role of FDI in tourism growth. This study shows that the firms which have high investments from foreigners are accountable to them and must disclose their operations and financial position. This motivates them to form and enforce social and environmental regulations, which ultimately improve their overall performance and enable them to grow with high sustainability.

The results indicated that GNI has a positive relation to the sustainability of tourism growth. These results are supported by Eyuboglu and Eyuboglu (2020), which reveals that in case the country has a high national income, there is peace in the economy, and business firms are active in their production practices. Because of their better financial position, they not only focus on the marketing of the existing goods but quality improvement in the products and services. In the tourism industry, the firms’ own focus on the quality services to tourists and the acquisition of quality resources and products from other firms allow them to meet the quality requirements of the tourists. Thus, tourism growth can be sustainable in the country. These results match with Aslan et al. (2021); when the GNI of a country is increasing at a consistent rate, the employment rate is high. When the large population has employment and has high salaries as determined by high production and marketing on the part of employers, their living standard is high, and they can afford

| Table 5 | Unit root test |
|---------|---------------|
| **ADF** | **PP** |
| **Series** | **Level** | **First difference** | **Level** | **First difference** | **Decisions** |
| TG | -1.083 | -5.873 | -1.992 | -5.820 | 1(1) |
| GDP | -2.981 | -7.992 | -2.101 | -6.991 | 1(0) |
| FDI | -1.727 | -4.991 | -1.900 | -5.922 | 1(1) |
| NNI | -4.762 | -8.771 | -3.901 | -7.002 | 1(0) |
| TP | -5.382 | -8.299 | -4.983 | -7.882 | 1(0) |
| CO2E | -1.882 | -3.991 | -1.211 | -4.955 | 1(1) |
| GHGE | -2.191 | -6.883 | -3.192 | -6.997 | 1(0) |
| NOE | -3.221 | -8.929 | -2.227 | -6.001 | 1(0) |

| Table 6 | Bound test of nonlinear ARDL |
|---------|-----------------------------|
| **Model** | **F-statistics** | **Lag** | **Level of significance** | **Bound test critical values** |
| TG/(GDP, FDI, NNI, TP, CO2E, GHGE, NOE) | 5.91 | 4 | 1% | 6.32, 6.91 |
| | | | 5% | 5.12, 5.79 |
| | | | 10% | 4.10, 4.59 |

| Table 7 | Nonlinear ARDL results |
|---------|-------------------------|
| **Variables** | **Coefficients** | **Std. Err** | **t-statistics** |
| C | 1.092 | 0.409 | 2.669 |
| TG (−1) | 0.911 | 0.461 | 1.976 |
| CO2E (−1) | -1.014 | 0.302 | -3.358 |
| GHGE (−1) | -0.810 | 0.291 | -2.784 |
| NOE (−1) | -1.002 | 0.511 | -1.961 |
| TP (−1) | 2.892 | 0.723 | 3.156 |
| GDP-P (−1) | 1.029 | 0.192 | 5.359 |
| GDP-N (−1) | 0.282 | 0.023 | 12.261 |
| NNI-P (−1) | 2.091 | 1.001 | 2.089 |
| NNI-N (−1) | 2.110 | 0.992 | 2.127 |
| FDI-P (−1) | 1.922 | 0.825 | 2.329 |
| FDI-N (−1) | 1.269 | 0.303 | 4.188 |
| Adj. R square | 0.562 | | |
| F-statistics | 47.920 | | |
| Prob.(F-statistics) | 0.025 | | |
big tours. This sustainable demand and marketing for tourism services give rise to sustainability in tourism growth.

The results also showed that tourism policy has a positive relation to the sustainability of tourism growth. These results are supported by Higgins-Desbiolles (2018), which highlights that the positive favorable tourism policies regarding the environmentally friendly quality of tourism, if it is effectively implemented, help improve the quality of the environment to tourists, improve attraction in recreational destinations, and provide healthy diet during the survey. When tourists have a clean and pleasant environment and good quality food and beverages in the tourism destinations, they retain the same industry and also become a mouth of share for the tourism destinations and their services. Thus, tourism firms, with consistency in the marketing of tourism services, can make sustainable environmental and economic growth. These results are in line with Sharpley (2020), which checks the tourism policies for the accommodation and hospitality to tourists and sustainability in tourism growth. If these policies include the terms that accommodation facilities and hospitality must be based on innovation and these policies are effectively implemented, the tourism firms continue to improve its accommodation and hospitality services to tourists and succeed in attracting more tourists from national and international sides. The effective implementation of tourism policies develops sustainability in tourism growth.

These results demonstrated that CO emissions have a negative relation to the sustainability of tourism growth. These results are supported by Teng et al. (2021), which show that the environment of a country is a crucial factor in tourism development within that country. But when the economic activities are smooth and social practices are at their peak and cause CO2 emissions into the air in large amounts, global warming is high, and environmental condition degrades. Environmental degradation as a result of CO2 emissions adversely affects the health of the tourists. In the countries where the CO2 emissions are larger than others, tourists hesitate to visit the destination. The decrease in the marketing of tourism services reduces the rate of the tourism firms’ growth. These results agree with Sghaier et al. (2019), which examine the influences of CO2 emissions on tourism development. The authors argue that the increasing amount of CO2 emissions into the air pollutes the atmosphere, disturbs the water level, and traps the heat in over quantity. Thereby, it destroys the quality of natural resources as well as the living creatures which are found on the land, underwater, and in the sky. All these resources are used in different tourism services like food or water supplies, accommodation, and recreation. Consequently, it becomes difficult for the tourism industry to grow at sustainable rate.

The results indicated that GHG emissions have a negative impact on the sustainability of tourism growth. These results agree with Liu et al. (2021), which ponder the influences of GHG emissions on tourism growth. The study shows that the emissions of GHG like water vapor, CO2, N2O, CFCs, HCFCs, and perfluorocarbons are very harmful to the environment. Because of the excessive heat and suffocation in the environment affect the breathing power and physical health of the people who are the human resources of tourism firms, different service providers, and tourists. So, the lack of healthy and efficient labor in the tourism industry reduces the quality (agility, responsiveness, and level of amusement) of the tourism services, which does not allow the concerned firms to perform effectively and grow hastily as time passes. Similarly, the lack of tourists reduces the marketing level in the tourism industry. Hence, GHG emissions do not allow the tourism firm to grow. These results are also supported by Dube and Nhamo (2021), which highlight that in the tourism industry, natural resources like greenery, grass, trees, flowers, different plants, sea creatures, animals, and birds and the crops and trees used for food all serve the industry for accommodation, recreational, and feeding needs. But as in the existence of GHG emissions, the quality of these natural resources is likely to reduce, and thus, eventually, tourism growth is in danger, and sustainability in tourism growth is not possible.

The results indicated that N2O emissions have a negative impact on the sustainability of tourism growth. These results are supported by Larsson et al. (2018), which state that the N2O is a harmful gas that destroys the ozone layers, contributes to global warming, and brings climate change. It is more damaging to the ecosystem than other GHGs and has fast, destructive influences on the environmental elements, which are part of the resources in the tourism firms. Environmental degradation as a result of N2O reduces tourism growth. These results are in line with Lu et al. (2018), which state that in countries where fuel combustion, agriculture, industrial processes, and wastewater management release N2O in large amounts, the work environment for the tourism employees is destroyed and affects the labor quality. The weak performance of the human resources, who are the key to the overall tourism performance, becomes a hurdle in the way to sustainable tourism growth.

**Implications**

The present study has both theoretical and empirical implications. With the literary contribution, this study gives avenues to authors how they must conduct studies on sustainability in tourism growth. The present study has much theoretical significance because of the contributions it makes to the theory of tourism. This study addresses the global concept of the tourism growth in great detail. It analyzes the influences of three economic factors, GDP, GNI, FDI, and tourism policy, and three environmental factors, CO2 emissions, GHG emissions, and N2O emissions, on tourism growth. In the previous studies, the impacts of both
economic and environmental factors on a country’s tourism growth have been explored. But, a study is scarcely found which have thrown light on both economic and environmental factors for determining tourism growth. The present study, which examines the impacts of both economic and environmental factors on tourism growth, is an extension of the literature. Moreover, the present study seeks the facts and figures regarding the impacts of GDP, GNI, FDI, tourism policy, CO$_2$ emissions, GHG emissions, and N$_2$O emissions on tourism growth in the Chinese economy, which in itself is a great contribution to literature.

The present study carries empirical implications as well, as the tourism industry, which has a lot of social, cultural, and economic significance, is the main concern of this study. This study is not only significant for the Chinese economy but also for the emerging economies which are interested in tourism development through some measures and particular precautions. (1) This study provides the guidelines to the relevant authorities and regulators in developing and implementing the regulators regarding tourism growth by promoting economic and environmental conditions in the country. (2) This study reveals that the government, economists, and other entities involved in providing tourism practices must take benefit from economic factors like GDP, GNI, and FDI, through effective decisions-making and promote the country’s tourism industry. (3) It also guides the audience, which would be government, economists, and tourism firms, that must try to struggle for environmental regulations so that the CO$_2$ emissions, GHG emissions, and N$_2$O emissions can be controlled to gain high tourism growth. (4) It guides the government and tourism firms that they must try to formulate favorable tourism policies to put the tourism industry on the track to sustainable growth. The policies must be formulated to promote sustainable technologies in tourism and relevant industries, force to employ renewable energy sources, to bring improvement in tourism infrastructure, or convert the specific regions into tax-free zones for tourism. The execution of such policies improves the environmental and social performance of tourism and thus develops sustainability in tourism growth.

Conclusions and limitations

China has long been involved in providing tourism practices and takes many social, cultural, and economic benefits from these practices. Though the tourism industry in the country has been making progress over the previous years, still, the progress rate is low, and there are many threats to the sustainable development of this industry. As the authors felt the issue and needed to resolve it, they aimed to explore the measures to grow the tourism industry and the reasons which create hurdles in the way to get high tourism growth. The study was to examine the role of economic factors like GDP, GNI, FDI, and tourism policy in increasing the tourism growth rate and checking the impacts of environmental factors like CO$_2$ emissions, GHG emissions, and N$_2$O emissions on tourism growth. The Chinese tourism industry was sought out to collect information about the influences of GDP, GNI, FDI, tourism policy, CO$_2$ emissions, GHG emissions, and N$_2$O emissions on tourism growth. The results showed a positive relationship between GDP, GNI, FDI, tourism policy, and tourism growth. The results indicated that when a country’s GDP growth rate is high, the tourism firms can acquire quality resources in abundance and an effective and efficient labor force, which brings improvement in the tourism practices and the large marketing for tourism services as well. Similarly, in a country making high GNI, value additions, newness, and creativity can be developed in tourism practices, and marketing also increases. The increase in FDI enhances the financial resources, information, regulations, and marketing which all ultimately improve tourism growth. The results indicated that the careful formation and effective implication of tourism policies regarding different aspects like green tourism, digital tourism, hospitality sector skills, tourism small, micro and medium firms, and destination administration helps to develop sustainability in tourism growth. The results indicated a negative relation among environmental factors like CO$_2$ emissions, GHG emissions, N$_2$O emissions, and tourism growth. These results mean that the sustainable growth of the tourism industry depends on the quality of natural tourism destinations, the quality of the food, the comfort of tourists, and the health of the employees and when there is a rapid increase in CO$_2$ emissions, which destroys the environmental quality, natural resources, and the health of the stakeholders, and sustainability in tourism growth is impossible. Likewise, N$_2$O emissions, a more destructive gas than CO$_2$ emissions, disturb sustainable tourism growth because they affect the natural environment and resources that are the soul of any tourism destination. The results revealed that GHG emissions are hazardous gases that deplete the ozone layers, trap heat into the earth, and raise the environment’s temperature. These gases change the weather pattern and deteriorate the quality of all forms of nature and the health of the living bodies on all which the tourism industry is based.

Some specific limitations are associated with this study. These limitations are required to be removed in future studies. The present study examines a limited number of economic and environmental factors for the analysis of tourism growth within the country. The future authors are recommended to increase the factors which help to enhance tourism growth and the factors which restrict the tourism growth within the country so that a study that could be a better guideline for tourism growth can be presented. Moreover, the present study finds the relations between the GDP, GNI, FDI, tourism policy, CO$_2$ emissions, GHG emissions, and N$_2$O emissions and tourism growth through research on the Chinese economy. China has specific economic policies,
economic conditions, environmental circumstances, and geographical areas separate in nature from those in other countries. So, the reliability of the study may not be equal in different countries, so a general study that is based on the data from multiple countries is required from future authors.

Author contribution Qin Chen: writing — original draft, writing — review and editing, conceptualization, data curation, methodology, visualization, Supervision.

Data availability The data that support the findings of this study are attached.

Declarations

Ethics approval The authors declare no competing interests.

Consent to participate We declare that we have no human participants, human data, or human tissues.

Consent for publication Not applicable.

References

Adu-Ampong EA (2019) Historical trajectories of tourism development policies and planning in Ghana, 1957–2017. Tour Plan Dev 16(2):124–141
Ahmad F, Draz MU, Su L, Rauf A (2019) Taking the bad with the good: the nexus between tourism and environmental degradation in the lower middle-income Southeast Asian economies. J Clean Prod 233:1240–1249. https://doi.org/10.1016/j.jclepro.2019.06.138
Ainou FZ, Ali M, Sadiq M (2022) Green energy security assessment in Morocco: green finance as a step toward sustainable energy transition. Environ Sci Pollut Res. https://doi.org/10.1007/s11356-022-19153-7
Amin S, Al Kabir F, Nihad A, Khan F (2020) An empirical investigation between foreign direct investment (FDI) and tourism in Bangladesh. J T Manag Res 7(1):110–121. https://doi.org/10.18488/journal.31.2020.71.110.121
Aslan A, Altinoz B, Özsolak B (2021) The nexus between economic growth, tourism development, energy consumption, and CO2 emissions in Mediterranean countries. Environ Sci Pollut Res 28(3):3243–3252. https://doi.org/10.1007/s11356-020-10667-6
Banga C, Deka A, Kilic H, Ozturen A, Ozdeser H (2022) The role of clean energy in the development of sustainable tourism: does renewable energy use help mitigate environmental pollution? A panel data analysis. Environ Sci Pollut Res 8:1–11. https://doi.org/10.1007/s11356-022-19991-5
Ben Jebli M, Hadhri W (2018) The dynamic causal links between CO2 emissions from transport, real GDP, energy use and international tourism. Int J Sust Dev World 25(6):568–577. https://doi.org/10.1080/13504509.2018.1434572
Bianchi R (2018) The political economy of tourism development: a critical review. Ann Tour Res 70:88–102. https://doi.org/10.1016/j.anals.2017.08.005
Cave J, Dredge D (2020) Regenerative tourism needs diverse economic practices. Tour Geogr 22(3):503–513
Chien F, Sadiq M, Nawaz MA, Hussain MS, Tran TD, Le Thanh T (2021) A step toward reducing air pollution in top Asian economies: the role of green energy, eco-innovation, and environmental taxes. J Environ Manage. https://doi.org/10.1016/j.jenvman.2021.113420
Chien F, Hsu CC, Ozturk I, Sharif A, Sadiq M (2022a) The role of renewable energy and urbanization towards greenhouse gas emission in top Asian countries: evidence from advance panel estimations. Renewable Energy. https://doi.org/10.1016/j.renene.2021.12.118
Chien F, Zhang Y, Sharif A, Sadiq M, Hieu MV (2022b) Does air pollution affect the tourism industry in the USA? Evidence from the quantile autoregressive distributed lagged approach. Tour Econ. https://doi.org/10.1177/1354166221097021
Chien F, Chau KY, Sadiq M, Hsu CC (2022c) The impact of economic and non-economic determinants on the natural resources commodity prices volatility in China. Resour Policy. https://doi.org/10.1016/j.resourpol.2022.108263
Dogru T, Bulut U, Kocak E, Isik C, Suess C, Sirakaya-Turk E (2020) The nexus between tourism, economic growth, renewable energy consumption, and carbon dioxide emissions: contemporary evidence from OECD countries. Environ Sci Pollut Res 27(32):40930–40948. https://doi.org/10.1007/s11356-020-10110-w
Dube K, Nhamo G (2021) Greenhouse gas emissions and sustainability in Victoria Falls: focus on hotels, tour operators and related attractions. African Geographical Rev 40(2):125–140. https://doi.org/10.1080/19376812.2020.1777437
El Menyari Y (2021) Effect of tourism FDI and international tourism to the economic growth in Morocco: evidence from ARDL bound testing approach. J Policy Res Tour Leisure Events 13(2):222–242. https://doi.org/10.1080/19407963.2020.1771567
Eyuboglu S, Eyuboglu K (2020) Tourism development and economic growth: an asymmetric panel causality test. Curr Issue Tour 23(6):659–665. https://doi.org/10.1080/13683500.2019.1588863
Fauzel S (2020) FDI and tourism futures: a dynamic investigation for a panel of small island economies. J Tour Futures 7(1):98–110. https://doi.org/10.1108/JTF-05-2018-0026
Fethi S, Senyucel E (2021) The role of tourism development on CO2 emission reduction in an extended version of the environmental Kuznets curve: evidence from top 50 tourist destination countries. Environ Dev Sustain 23(2):1499–1524. https://doi.org/10.1007/s10668-020-00633-0
Gao J, Lin H, Zhang C (2021a) Locally situated rights and the ‘doing’ of responsibility for heritage conservation and tourism development at the cultural landscape of Honghe Hani Rice Terraces. China Journal of Sustainable Tourism 29(2–3):193–213. https://doi.org/10.1080/09669582.2020.1727912
Gao J, Xu W, Zhang L (2021b) Tourism, economic growth, and tourism-induced EKC hypothesis: evidence from the Mediterranean region. Empirical Econ 60(3):1507–1529. https://doi.org/10.1007/s00181-019-0787-1
Ghosh C, Liang M, Petrova MT (2020) The effect of fair value method adoption: evidence from real estate firms in the EU. J Real Estate Finance Econ 60(1):205–237. https://doi.org/10.1007/s11082-019-09721-z
Guo Y, Jiang J, Li S (2019) A sustainable tourism policy research review. Sustainability 11(11):3187–3207. https://doi.org/10.3390/su11113187
Haibo C, Ayamba EC, Udimal TB, Agymang AO, Ruth A (2020) Tourism and sustainable development in China: a review. Environ Sci Pollut Res 27(31):39077–39093
Hall CM (2019) Constructing sustainable tourism development: the 2030 agenda and the managerial ecology of sustainable tourism. J Sustain Tour 27(7):1044–1060. https://doi.org/10.1080/09692583.2018.1560456
Haseeb M, Azam M (2021) Dynamic nexus among tourism, corruption, democracy and environmental degradation: a panel data analysis.
Sghaier A, Guizani A, Ben Jabeur S, Nurunnabi M (2019) Tourism development, energy consumption and environmental quality in Tunisia, Egypt and Morocco: a trivariate analysis. Geojournal 84(3):593–609. https://doi.org/10.1007/s10708-018-9878-z

Sharpley R (2020) Tourism, sustainable development and the theoretical divide: 20 years on. J Sustain Tour 28(11):1932–1946. https://doi.org/10.1080/09696598.2020.1779732

Shen W, Liu-Lastres B, Pennington-Gray L, Hu X, Liu J (2019) Industry convergence in rural tourism development: a China-featured term or a new initiative? Curr Issue Tour 22(20):2453–2457. https://doi.org/10.1080/13683500.2018.1532396

Sheng Yin X, Hussain J (2021) The implication of technological innovation and tourism development on FDI-growth-environment nexus in Association of Southeast Asian countries: a simultaneity modeling analysis. Energy Sour Part B 16(9):878–902. https://doi.org/10.1080/15567249.2021.1971801

Sou JPU, Vinnicombe T (2021) Does governance quality matter for FDI-led tourism development? A supply-side perspective. Tour Econ 7:135–149. https://doi.org/10.1177/2F13548166211052814

Streimikiene D, Svyazdien B, Jasinskas E, Simanavicius A (2021) Sustainable tourism development and competitiveness: the systematic literature review. Sustain Dev 29(1):259–271. https://doi.org/10.1002/sd.2133

Tan LP, Sadiq M, Aldeehani TM, Ehsanullah S, Mutira P, Vu HM (2021) How COVID-19 induced panic on stock price and green finance markets: global economic recovery nexus from volatility dynamics. Environ Sci Pollut Res. https://doi.org/10.1007/s11356-021-17774-y

Teng Y, Cox A, Chatziantoniou I (2021) Environmental degradation, economic growth and tourism development in Chinese regions. Environ Sci Pollut Res 28(26):33781–33793. https://doi.org/10.1007/s11356-021-12567-9

Tian X-L, Bélaïd F, Ahmad N (2021) Exploring the nexus between tourism development and environmental quality: role of renewable energy consumption and Income. Struct Chang Econ Dyn 56:53–63. https://doi.org/10.1016/j.strueco.2020.10.003

Umurzakov U, Tosheva S, Salahodjaev R (2022) Tourism and sustainable economic development: evidence from belt and road countries. J Knowl Econ 8:1–14. https://doi.org/10.1007/s13132-021-00872-0

Usman M, Anwar S, Yaseen MR, Makhhum MSA, Kousar R, Jahanger A (2021) Unveiling the dynamic relationship between agriculture value addition, energy utilization, tourism and environmental degradation in South Asia. J Public Aff 8:2712–2729. https://doi.org/10.1002/pa.2712

Villanthenkodath MA, Ansari MA, Shahbaz M, Vo XV (2021) Do tourism development and structural change promote environmental quality? Evidence from India. Environ Dev Sustain 8:1–32. https://doi.org/10.1007/s10668-021-01654-z

Wang L, Yotsumoto Y (2019) Conflict in tourism development in rural China. Tour Manage 70:188–200. https://doi.org/10.1016/j.tourman.2018.08.012

Xu H, Gu H (2018) Gender and tourism development in China. J China Tour Res 14(4):393–404. https://doi.org/10.1080/19388160.2018.1539426

Yu P, Zhang J, Wang Y, Wang C, Zhang H (2020) Can tourism development enhance livelihood capitals of rural households? Evidence from Huangshan National Park adjacent communities, China. Sci Total Environ 748:141–158. https://doi.org/10.1016/j.scitotenv.2020.141099

Zha J, Tan T, Yuan W, Yang X, Zhu Y (2020) Decomposition analysis of tourism CO2 emissions for sustainable development: a case study of China. Sustain Dev 28(1):169–186. https://doi.org/10.1002/sd.1980

Zhang J, Cheng L (2019) Threshold effect of tourism development on economic growth following a disaster shock: evidence from the Wenchuan earthquake PR China. Sustainability 11(2):371–385. https://doi.org/10.3390/su11020371

Zhang M, Zhang G, Liu H (2021) Analysis of the impact of tourism development on the urban-rural income gap: evidence from 248 prefecture-level cities in China. Asia Pacific J Tour Res 26(6):614–625. https://doi.org/10.1080/10941665.2021.1886132

Zhang Y, Khan SAR, Kumar A, Golpíra H, Sharíf A (2019) Is tourism really affected by logistical operations and environmental degradation? An empirical study from the perspective of Thailand. J Clean Prod 227:158–166. https://doi.org/10.1017/s10668-021-01654-z

Zhuang Y, Yang S, Razzaq A, Khan Z (2021) Environmental impact of infrastructure-led Chinese outward FDI, tourism development and technology innovation: a regional country analysis. J Environ Planning Manage 8:1–33. https://doi.org/10.1080/09640568.2021.1989672

Zhao L, Zhang Y, Sadiq M, Hieu VM, Ngo TQ (2021) Testing green fiscal policies for green investment, innovation and green productivity amid the COVID-19 era. Econ Chang Restruct. https://doi.org/10.1007/s10664-021-09367-z

Publisher’s note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Springer Nature or its licensor holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.