

Hollins University

Hollins Digital Commons

Undergraduate Research Awards

Student Scholarship and Creative Works

2024

A Competition Between the Economy and the Environment: An analysis on the impacts of the Olympic Games for host countries

Phuong-Anh Ha
Hollins University

Follow this and additional works at: <https://digitalcommons.hollins.edu/researchawards>



Part of the [Economics Commons](#), and the [Environmental Sciences Commons](#)

Recommended Citation

Ha, Phuong-Anh, "A Competition Between the Economy and the Environment: An analysis on the impacts of the Olympic Games for host countries" (2024). *Undergraduate Research Awards*, Hollins University. 83. <https://digitalcommons.hollins.edu/researchawards/83>

This Article is brought to you for free and open access by the Student Scholarship and Creative Works at Hollins Digital Commons. It has been accepted for inclusion in Undergraduate Research Awards by an authorized administrator of Hollins Digital Commons. For more information, please contact lvillette@hollins.edu, folckil@hollins.edu.

**A Competition between the Economy and the Environment: An analysis on the impacts of
the Olympic Games for host countries**

Phuong-Anh Ha

Department of Economics, Hollins University

ECON 230: Economics and the Environment

Dr. Felicitas Adu-Acheampong

November 28, 2023

Table of Contents

Introduction.....	2
Literature review.....	3
Methodology.....	5
Summary and Results	6
Brazil.....	6
United Kingdom.....	8
China	9
Limitations and Potential Avenues for Future Research	11
References.....	12
Appendix.....	13

Introduction

The Olympic Games have been known as the most celebrated international sporting event. However, the event has also faced countless criticisms regarding its environmental impact and the lack of benefits it brings to the host country's economy. The paper analyzes the trade-offs between the environmental quality of a country and its economic growth that host countries make when deciding to host the Olympics. Specifically, this research seeks to explore how the Olympic Games influence the Gross Domestic Product (GDP) and carbon emissions of the host countries.

I assume

- **Null hypothesis (H0):** The Olympic Games lowers the GDP and raises the national carbon emission of the host country.
- **Alternative hypothesis (H1):** The Olympic Games raises the GDP and lowers the national carbon emission of the host country.

The analysis tackles how the Olympics have impacted the overall trends of the two indicators by analyzing data within 4-year periods before and after hosting the event. The research collects and evaluates data of the Brazil the United Kingdom (UK), and China. The study shows that the host countries align with the **Alternative hypothesis (H1)** as the Games have shown to have positive impacts on the growth of the country's GDP as well as their reduction rate in carbon emission. The paper also addresses the limitations of the analysis and identify potential areas that can be further researched regarding hosting the Olympic Games and other mega-events.

Literature review

The study addresses different literature streams. It engages with literatures on hosting mega-events and sustainability (Müller et al., 2021; Zimbalist 2017; Tolis et al., 2006). In the field of economics, the study takes into consideration literatures about cost-efficiency, tourism, and the labor force (Zimbalist, 2020). Regarding environmental conservation, the research engages with literatures that discusses the environmental damage, as well as technological innovation for environmental protection (Mol, 2010; Müller et al., 2021).

There are currently very few studies that have provided comparison between the sustainability of the Olympic Games. One of those studies was conducted by Müller et al. (2021) whose analysis created a criterion to evaluate the sustainability of the Olympic Games ever since the event in Albertville 1992 up until the Tokyo 2020 event. The authors divided the criterion into three categories of ecological, economic, and social. A scoring system was then created based on those aspects. The researchers then evaluated the different Games based on the data collected in the IOC's Olympic Games Impact (OGI) initiative. The project is a series of reports that are conducted before and after the event with the aim to create a sustainability standard for the hosting countries of the Olympics. The research concluded that despite the International Olympic Committee (IOC) implementing new sustainability agendas, none of the Olympic Games achieved their set out goal of being sustainably organized. Furthermore, the sustainability of hosting the Games demonstrated a declining trend as the years progressed. However, the research had also found that there are Olympic Games that scored highly on certain indicators, meaning that there is a possibility for the Olympics specifically, and other mega-events, to be organized in a sustainable way.

Nonetheless, amidst all the debates regarding the unsustainability of hosting the Olympic Games, it is undeniable that organizing such a big event would bring benefits to the hosting countries.

American economist and author, Andrew Zimbalist, had conducted multiple studies and research regarding the impacts of hosting big, sporting events, with his focus being towards the Olympic Games. Zimbalist (2020) have addressed the varieties of short-term and long-term economic profit of hosting the Olympic Games in “Circus Maximus: The Economic Gamble Behind Hosting the Olympics and the World Cup”. One of the main gains for the hosting countries of the Olympics is the rise in revenues from advertising and tourism. The Olympic television rights fees have accumulated broadcast revenue in the billions of USD for the hosting country since the start of the 21st century. Thanks to the Games, there was a rise in the budget for public goods that were used in the tourism industry, which included roads, public transportation, airports, and more.

While the Olympic Games have been criticized for negatively impacting the environment, it should also be noted that the event had encouraged the innovation and invention of more eco-friendly technology and infrastructure. The Beijing 2008 Games created an opportunity for China to combat the image of being a major polluter of the world (Mol, 2010). The environmental preparations for Beijing to host the Olympics started in 1999, nine years before the actual events. The city experienced a transformation in its infrastructure and energy resources. With a budget of 17.5 billion USD, Beijing implemented new water treatment facilities, and public metro lines in preparation for the Olympic Games. Coal-powered vehicles and factories were swiftly replaced with gas-powered ones (Mol, 2010).

With a variety of advantages and disadvantages of hosting the Olympic Games being identified by previous literatures, the study will participate in the literature streams of economic and environmental sustainability of organizing the Olympic Games specifically, and mega-events in general. The research will also compare multiple Olympic Games to identify how different approaches, organizing methods, and time periods impact the Games' sustainability.

Methodology

The study adopts a quantitative approach that looks at the host countries of the following three Summer Olympic Games Beijing 2008, London 2012, and Rio de Janeiro 2016. Primary data will be collected from the World Development Indicator of the World Bank. The study focuses on the data series of the total carbon dioxide emissions and the Real Gross Domestic Product (GDP) of the host countries. The research uses the time series analysis technique by looking at the trends of data during the 4 years before and after hosting the Olympic Games for the nation.

The quantitative data provides a longitudinal and large-scale perspective on the impact of hosting the Olympic Games on the overall economic and environmental health of the country. The time series analysis technique takes into consideration any potential trends of the CO₂ emissions or GDP of the country before and after hosting the event. Thus, allowing the analysis to evaluate the impact of organizing the Olympic Games more accurately.

The World Bank compiles data collected by a range of different agencies, including national statistical agencies, central banks, and international organizations. The statistics are then presented in the World Development Indicators database (World Bank, n.d.). For the data regarding CO₂ emission, the statistics are collected by Climate Watch. While for national GDP, the source of the data is from the World Bank national accounts data, and the Organization for Economic Co-operation and Development (OECD) National Accounts data files (World Development Indicator, n.d.). Thus, it can be guaranteed that the data comes from reputable sources and has been peer-reviewed. However, it should be noted that different national branches could lead to inconsistencies in the data.

Summary and Results

All countries analyzed show a positive impact on the national GDP and carbon emission, aligning with the **Alternative hypothesis (H1)**. The Olympic Games have given significant benefits to encourage consumption within the host countries during and after the event. In preparation for the Olympics, all the host countries implemented strict regulations on air pollutants, and policies to ensure traffic would not be an issue during the days of the Games. Thus, all three countries displayed a general trend of significantly reducing the national carbon emission.

The Olympic Games have helped to delay and alleviate all three host countries from an economic struggle. Brazil and the UK emerged from their respective recessions after hosting the event. The 2008 Beijing Olympics contributed to how the country was not significantly impacted by the financial crisis that was happening in the same year

With an aim to reach their carbon offset goals, all three countries targeted the issue of traffic and transportation. Brazil and China invested in its infrastructure for traffic. The United Kingdom decided to maximize the use of existing public transportation for the participants of the event. Each host country then has its own unique strategy to reduce its carbon emission during and after the Olympics, such as shutting down coal-powered plants and renting temporary infrastructure.

Brazil

Prior to hosting the Olympics, Brazil economic growth became stagnant, and the country entered a period of recession (Reuters, 2014). Based on the trends in the country's GDP, the growth rate of the indicator became positive after 2016. While the following 4 years manifested an overall declining trend, the rate of recession was much slower in comparison to the 2014-2015 period.

After evaluating the economic impacts of the Rio de Janeiro 2016 Games, the Brazil's Institute for Applied Economic Research found that the city's GDP per capita would have been 7.5% lower if it weren't for the event (Etchells, 2019).

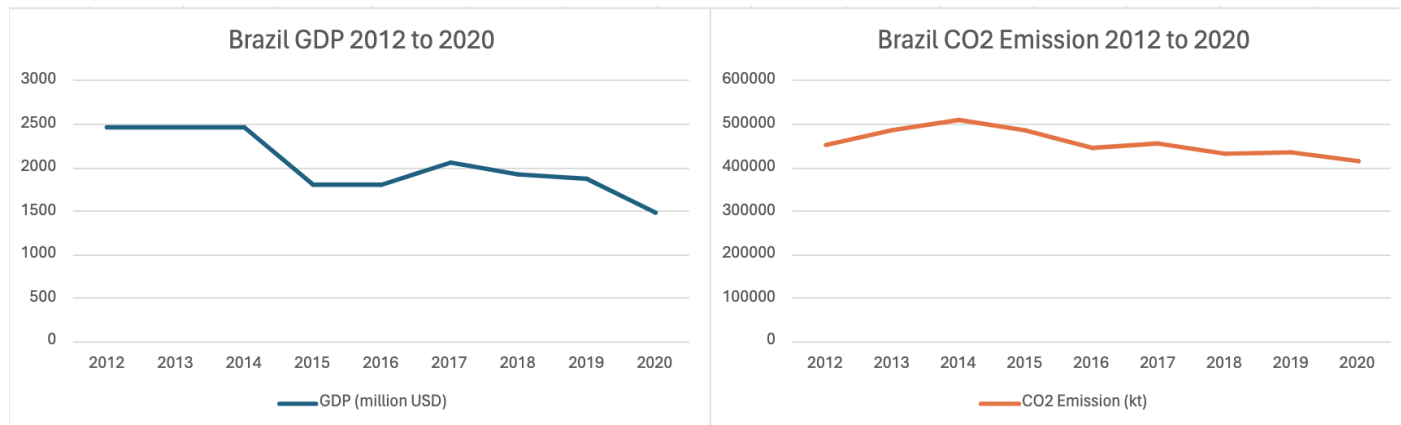


Figure: Brazil GDP and Carbon Emission from 2012 to 2020

It should also be noted that the Republic of Brazil also hosted another mega-sports event in 2014, which was the World Cup soccer tournament. The World Cup proved to be more detrimental to the Brazilian economy as the production rate of the country slowed down to prepare for the event. However, hosting the Olympics stimulated production for Brazil as the income for the impoverished community of the country raised by 29.3% (Etchells, 2019).

Regarding Brazil's carbon emissions, the overall trend reached a stable declining rate in the 4-year period after the country has hosted the Olympic Games. Initially, the organizers estimated a total of 3.6 million tons of carbon dioxide being emitted from the event (Reuters, 2014). However, according to the Post-Games Sustainability Report, the Games offset only 2.2 million tons (The Olympic Studies Centre, 2018). Researchers have also identified that by hosting the event, local governments were encouraged to improve traffic management and urban planning. Which results in a reduction in carbon emission during and after the Olympics (De La Cruz et al., 2019)

United Kingdom

The London 2012 Games contributed greatly to recovering the British economy from recession. The income from the ticket sales alone contributed 20% to the economy expansion of the country in the third quarter of the same year (Guardian, 2012). The net profit Britain earned from the Olympics was reported to be at least 1 billion USD as of 2013 (National Public Radio, 2014).

	GDP (trillion USD)				Mean
4 years before 2012	2.93	2.42	2.49	2.67	2.63
4 years after 2012	2.79	3.07	2.93	2.7	2.87

Figure: Mean of UK's GDP in 4-year periods before and after hosting the Olympic Games

It should be highlighted that organizing the Olympic Games has continued to bring back benefits for the UK. The venue used for the event generated a total of 8 million GBP, or 10 million USD, in 2016 by hosting two additional world-renowned sports events (International Olympics Committee, 2018). The mean GDP of the country rose by 9% in the 4-year period after 2012.

The amount of carbon the UK was emitting had already shown a declining trend from 2008. However, after 2012, the country's total carbon emissions slowed down much more. The Olympic Games emitted 28% less than the initial estimated amount (Reuters, 2012). With the aim to cut carbon emission, the London Organizing Committee of the Olympic Games (LOCOG) decided to rent temporary sitting and other facilities rather than implementing new infrastructures that would reduce floor space at venues. Additionally, transportation for officials, media, and team utilized existing public transport systems (Reuters, 2012).

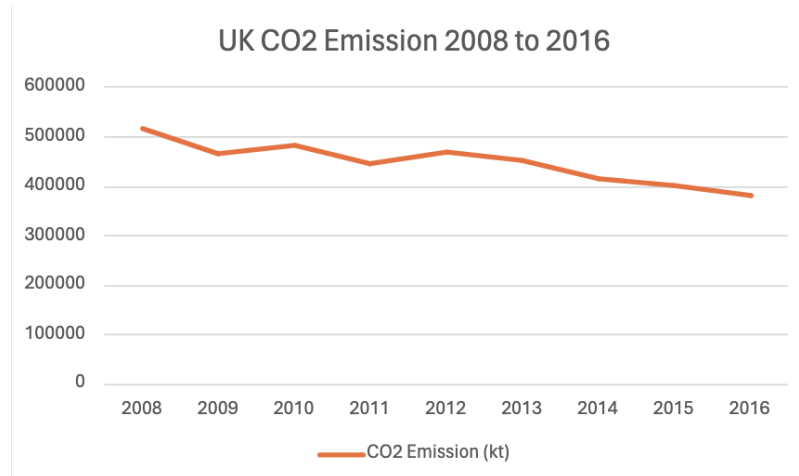


Figure: UK Carbon Emission from 2008 to 2016

It should also be emphasized that the LOCOG made the decision to transform a previously contaminated area in east London into the venue for the event, and eventually for the area to become safe for wildlife to inhabit (Reuters, 2012). The once industrial land is now known as the Queen Elizabeth Olympic Park with grass fields, rivers, and canals. The venue has been redesigned into an urban area that hopes to promote commercial activities. In comparison to other cities that have hosted the Olympics, London has been the only city to clean up a previously contaminated area, preserve its sustainability, and continue to profit from the infrastructure (New York Times, 2018).

China

The Beijing 2008 Summer Games was the People Republic of China's introduction into the global market and to the world. While the global financial crisis in the same year, China remained relatively unaffected (Richburg, 2022). Despite the GDP growth rate of the country decreasing, the indicator had an overall rising trend in both the 4-year periods before and after the event. It

should be emphasized that the preparation for the Olympic Games helped in greatly improving the infrastructure in Beijing and the rest of the country to encourage consumption within the domestic market. Specifically, the rise in the use of credit cards became more popular for convenient purchases (Ren, 2022).

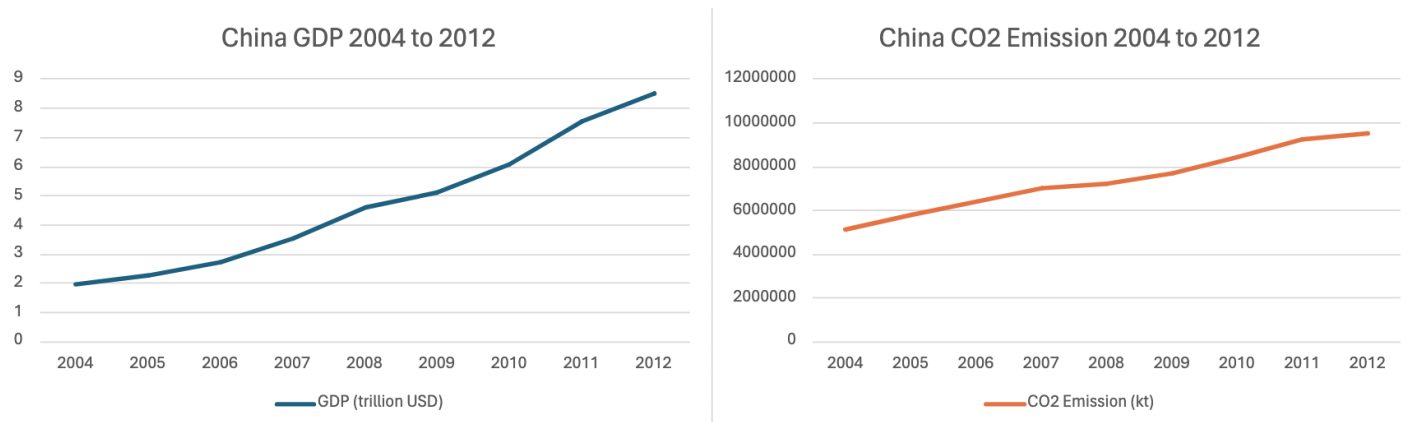


Figure: China GDP and Carbon Emission from 2004 to 2012

One of the biggest successes the Beijing 2008 Games had achieved for the city is the reduction of air pollution for the city. In preparation for the event, the government had enforced a variety of strict measures. The Ministry of Environmental Protection displaced and shut down factories, coal-powered plants, and steel plants in Beijing and nearby cities (Washington Post, 2008). Regulations on fuel and emission standards for vehicles were also tightened (Gronewold, 2009). Hospitals have also reported that during the Olympic Games, the rate of asthma per hospital patient reduced by an impressive 60% (De La Cruz et al., 2019).

Limitations and Potential Avenues for Future Research

As the data analyzed is collected in different year ranges, it is challenging to factor in changing policies or significant events that may impact a country's GDP and the carbon emissions. Another factor that was not sufficiently included in the analysis is the growing scale and popularity of the Olympic Games. The number of athletes, teams and events alone has doubled in size in the past 50 years. For the 2016 Olympics in Rio, an estimated 3.6 billion people worldwide watched the broadcasting of the event (International Monetary Fund, n.d.). Thus, the benefits in terms of global reputation that host countries receive was not taken into consideration.

It should also be noted that certain impacts are not reflected in the two indicators of GDP and total carbon emissions. Hosting the Olympics Games is usually a costly investment for many countries, with the cost totaling up to billions of dollars (International Monetary Fund, n.d.). However, the national GDP would not fully reflect the status of the country's existing debt. Other environmental damage caused by Olympics could not be sufficiently measured with carbon emission alone, such as waste disposal and effluent released into other environmental medias.

As the Olympic Games aim towards becoming more environmentally friendly and are promoting their efforts more often, it is essential for improvements towards evaluating the sustainability of hosting the Olympics. Therefore, existing policies and proposals, such as the Post-Games Sustainability Report, should be further researched, revised, and improved.

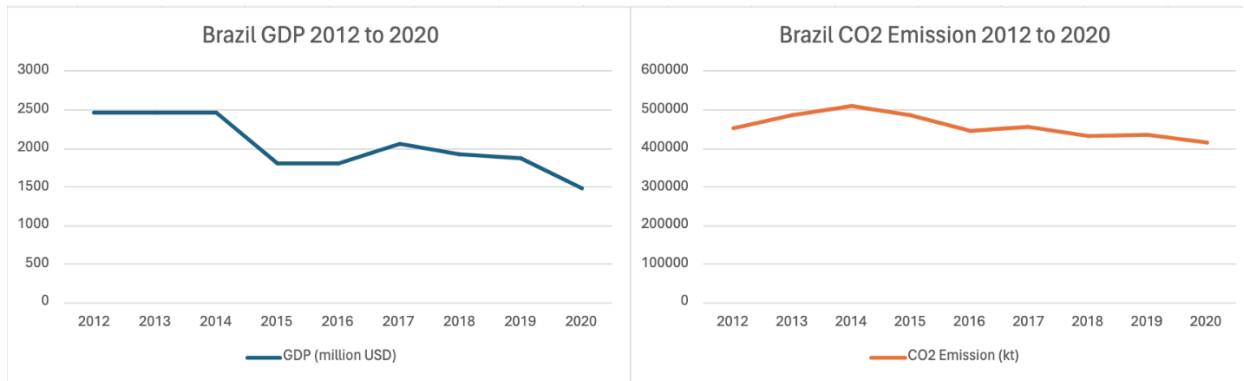
References

- De La Cruz, A. R. H., Calderon, E. R. D., França, B. W., Réquia, W. J., & Gioda, A. (2019). Evaluation of the impact of the Rio 2016 Olympic Games on air quality in the city of Rio de Janeiro, Brazil. *Atmospheric Environment*, *203*, 206–215.
- Etchells, D. (2019, January 15). *New independent study claims Rio 2016 Olympic Games provided significant economic benefit to host city.*
- Fan, M. (2008, August 1). *If that doesn't clear the air . . .* Washington Post
- Gronewold, N. (2013, August 19). *Beijing Olympics met or exceeded green goals.* Scientific American.
- Mol, A. P. (2010). Sustainability as global attractor: the greening of the 2008 Beijing Olympics. *Global Networks-A Journal of Transnational Affairs*, *10*(4), 510–528.
- Müller, M., Wolfe, S. D., Gaffney, C., Gogishvili, D., Hug, M., & Leick, A. (2021, April 19). *An evaluation of the sustainability of the Olympic Games.* Nature Sustainability.
- Post-Games sustainability report Rio 2016 / Organising Committee for the Olympic and Paralympic Games in Rio in 2016.* (2018). Olympic World Library.
- Ren, Z. (2022). The impact of the 2008 Beijing Olympic Games on Beijing's economic growth. *Advances in Economics, Business and Management Research.*
- Rescuing the Olympic Games from Their Own Success - IMF F&D.* (2021, July 22).
- Reuters. (2012, December 12). London Olympics' emissions 28 percent lower than forecast: organizers. *Reuters.*
- Reuters. (2014, August 29). Brazil Fell Into Recession in First Half of Year, as Investments Dropped. *New York Times.*

- Richburg, K. B. (2022, February 3). *From Beijing 2008 to Beijing 2022: fourteen years and a world of difference*, The Strategist.
- Shapiro, A. (2014, February 3). Did London Get An Economic Boost From The 2012 Olympics?
- Stewart, H. (2012, Oct 25). UK emerges from double-dip recession. *The Guardian*.
- Tolis, A. I., Tziralis, G., Tatsiopoulou, I. P., & Aravossis, K. G. (2006). Economic aspects and sustainability impact of the Athens 2004 Olympic Games. *ResearchGate*.
https://www.researchgate.net/publication/258740772_Economic_Aspects_and_Sustainability_Impact_of_the_Athens_2004_Olympic_Games
- Tsang, A. (2018, October 9). In London, Olympic Park's legacy is sustainability.
- WDI - Sources and methods*. (n.d.).
- World Development Indicators / DataBank*. (n.d.). <https://databank.worldbank.org/source/world-development-indicators>
- Zimbalist, A. S. (2016). *Circus maximus : the economic gamble behind hosting the Olympics and the World Cup* (2nd edition.). Brookings Institution Press.
- Zimbalist, A. (2017). Rio 2016 : Olympic Myths, Hard Realities.

Appendix

- (1) Brazil GDP and Carbon Emission from 2012 to 2020



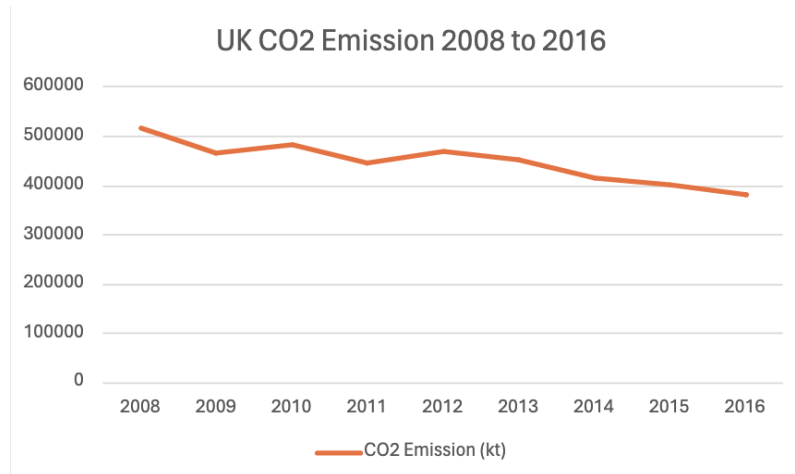
The graph was created using primary data of national GDP based on current USD, which was compiled by the World Development Indicators database. The statistics for carbon emission was based on data collected by the Climate Watch and published to the database of the World Bank.

(2) Mean of UK’s GDP in 4-year periods before and after hosting the Olympic Games

	GDP (trillion USD)				Mean
4 years before 2012	2.93	2.42	2.49	2.67	2.63
4 years after 2012	2.79	3.07	2.93	2.7	2.87

The data used in the table and for the calculation was published by the World Bank. It is stated on the World Development indicator database that national GDP is sourced from the World Bank as well as the OECD.

(3) UK Carbon Emission from 2008 to 2016



The data used in the figure can be located in the World Development Indicator database. It is noted that the amount of carbon emission of a country for the database is collected by the Climate Watch.