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### Consumerism, Economic Growth, and Climate Change in China

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# **Consumerism, Economic Growth, and Climate Change in China**

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APS 650: Capstone Project

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## Abstract

The world economy entered the age of high mass consumption as early as the 1920s.<sup>1</sup> Consumption has heavily influenced economic growth; thus, consumerism has become a trend worldwide. With modern financial crises being overcome by increased government spending and the stimulus of consumption, the dependence of economic growth on these factors has been reinforced. Nevertheless, each government faces a dilemma. On one hand, they launch stimulus policies to encourage consumption; on the other hand, the international community has made little progress in emission reduction caused by economic growth. Faced with this impasse and paradox, few scholars address the situation bluntly or fully. This paper examines how consumerism has reshaped post-modern society in complex ways, negatively impacting the environment while catalyzing the economy. Looking at China as a case study, this research looks at the intersection of economics, consumer behavior, and climate change. By situating China globally, we see how consumption simultaneously drives economic growth and carbon emissions; while it is challenging to mitigate the impact of environmental harm, it is crucial that we do so. But how do we maintain economic stability while not harming the environment? There is no good, simple answer to this question. Yet there is still hope. We must act now and reduce carbon emissions by adopting lifestyles that provide low-cost solutions. Our actions—along with governmental intervention and technical innovation—can take us on the right path.

*Keywords:* consumerism, climate crisis, government spending, economic growth, climate change in China, climate solutions

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<sup>1</sup> W. W. Rostow, "The Stages of Economic Growth," *The Economic History Review* 12, no. 1 (1959): 1–16, <https://doi.org/10.2307/2591077>.

## Introduction

Carbon emissions are a global issue and significantly impact the Asia Pacific region and elsewhere, leading to severe consequences that threaten our lives and levels of comfort and safety. Most extreme weather conditions, including torrential rains, unbearable heat, and severe droughts, are the direct consequence of our overconsumption and human activity. Moreover, data shows that even if carbon emissions were stopped immediately, the warming trend will not stop for about 1,000 years, and when the carbon dioxide in the atmosphere reaches its limit, arid weather comparable to sandstorms along with the rise of sea-levels will seriously endanger our survival.<sup>2</sup> Unfortunately, joint actions by the international communities have not had their desired effects, and important measures like the global climate initiative based on the Paris Agreement have suffered setbacks, including the eventual withdrawal of the United States from this agreement under the Trump administration in 2017. All these factors combined demonstrate how difficult it is to quell climate change, move the issue forward, and arrive at solutions.

At the same time, each government promulgates policies to stimulate economic growth, even though they know the consequences of doing so. For example, as a precautionary measure and a way to hedge against the 2008 global financial crisis, China first introduced a comprehensive fiscal and monetary stimulus portfolio named the "CNY 4 trillion program."<sup>3</sup> The huge amount of money invested in the market far exceeded the real market demand. Unfortunately, inflation surged immediately after the stimulus portfolio, but the Chinese government realized their goal to curb the economic downward trend and stimulate domestic

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<sup>2</sup> Susan Solomon et al., "Irreversible Climate Change Due to Carbon Dioxide Emissions," *Proceedings of the National Academy of Sciences* 106, no. 6 (February 10, 2009): 1704–9, <https://doi.org/10.1073/pnas.0812721106>.

<sup>3</sup> Christine Wong, "The Fiscal Stimulus Programme and Public Governance Issues in China," *OECD Journal on Budgeting* 11, no. 3 (October 19, 2011): 1–22, <https://doi.org/10.1787/budget-11-5kg3nhljqrjl>.

consumer demand, which rose extraordinarily. While this is yet another great example of Keynesian economics in action, such measures hardly seem to consider the adverse effects on the environment that will ensue. To be sure, we see little substantial progress in the government and corporate sectors even 100 years later after Keynes brought up his famous doctrine—*The General Theory of Employment, Interest, and Money*.

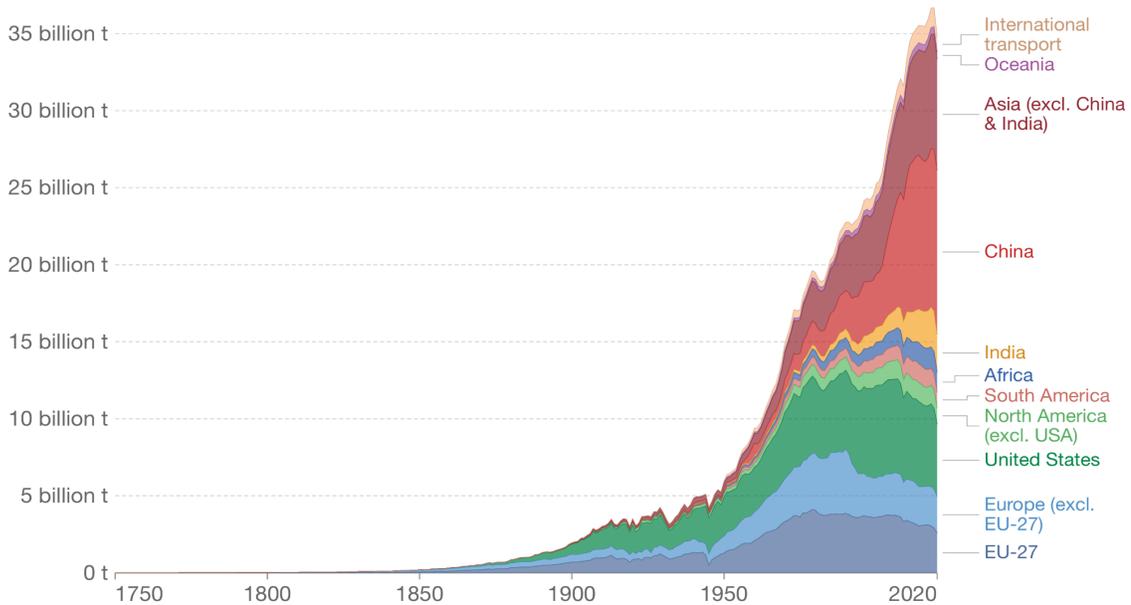
Driven by their desire for economic growth and profit, governments and corporations have successfully given rise to the current consumerism boom. However, despite the positive impact of economic stimulus and growth, these benefits cannot compensate for the damage caused to the environment and the long-term negative effects on our safety, well-being, and ability to survive. Indeed, each government faces a dilemma. On one hand, they launch stimulus policies to encourage consumption; on the other hand, the international community has made little progress in emission reduction caused by economic growth. Faced with this impasse and paradox, few scholars address the situation bluntly or fully. This paper analyzes how consumerism has reshaped post-modern society in complex ways, negatively impacting the environment while catalyzing the economy. Looking closely at China as a case study, this research looks at the intersections of economics, consumer behavior, and climate damage. By situating China within a global perspective, we see how consumption simultaneously drives economic growth and carbon emissions; while it is challenging to mitigate the direct and indirect impact of environmental harm, it is crucial that we do so. But how do we maintain economic stability while not harming the environment? There is no good answer to this intractable question, but there is hope if we act now. Along with more effective government intervention and technical innovation, we must turn toward a new solution, which involves us—in particular, the

positive role we can play in slowing the climate crisis by adjusting our lifestyles and consumption behaviors.

### **Carbon Emission Trends: a Dangerous Slope**

Historically, developed countries have made a remarkable impact on global carbon emissions, which mostly come from industrial production. Meanwhile, the proportion of the types of countries that contribute to carbon emission has undergone a significant change. Almost all developed countries have adopted service-led economies, and low-end manufacturing industries have been transferred to emerging regions and countries in the Asia Pacific region and elsewhere as much as possible. Among all the sources of carbon emissions, energy use in the residential sector and related carbon emissions (direct and indirect) have reshaped economic development patterns. Even worse, the trend keeps rising. As a result, global carbon emission levels exhibit disturbing new patterns as seen in Figure 1.

## Annual CO<sub>2</sub> emissions from fossil fuels, by world region



Source: Global Carbon Project

OurWorldInData.org/co2-and-other-greenhouse-gas-emissions • CC BY

Note: This measures CO<sub>2</sub> emissions from fossil fuels and cement production only – land use change is not included. 'Statistical differences' (included in the GCP dataset) are not included here.

Fig.1 Annual CO<sub>2</sub> emissions from fossil fuels, by world region<sup>4</sup>

By examining Figure 1, we see how the level of carbon emissions in developed countries is flattening or declining, while the emissions level in developing countries is soaring. In a global context, China has the highest level of carbon emissions due to its heavy emphasis on industry and urbanization along with its deep integration into a globalized economy. With China's policy support for exports and infrastructure improvements towards transportation, the manufacturing industry has boomed; the foreign direct invest (FDI) inflow has only strengthened the trend. When China joined the World Trade Organization (WTO) with the inherent advantage of providing labor at a low wage, the country developed even stronger growth momentum. At the same time, as the beneficiaries of globalization, Asian countries like China have opened

<sup>4</sup> Hannah Ritchie and Max Roser, "CO<sub>2</sub> and Greenhouse Gas Emissions," *Our World in Data*, May 11, 2020, <https://ourworldindata.org/co2-emissions>.

themselves up to the severe risks of climate change without fully preparing themselves or acknowledging the devastating consequences. On the contrary, to maximize economic growth, policymakers in China seem to have a mindset that we go down the path of pollution first, then think about cleaning up the mess later. This retroactive pattern might represent the attitudes of most governments globally, which is a deadly strategy that compromises the environment and its sustainability in the name of economic growth and consumer convenience.

### **Case Studies: Manufacturing in China**

One area that has led to major climate change issues in China is manufacturing. With industrial upgrades and the economic restructuring of developed countries, many non-essential industries, especially those in the manufacturing sector, migrated to other countries due to high labor costs while the research and development divisions remained in their home countries. Utilizing this strategy, multinational companies either choose to set up factories overseas run by themselves in order to maintain high-quality standards or purchase their products via an original equipment manufacturer (OEM) procedure that is necessitated by their unfamiliarity with the local investment environment and concerns about weak infrastructure in certain host countries. Take Inventec, headquartered in Taiwan, one of the world's largest manufacturers of notebooks, PCs, and servers. Many of their products are made in mainland China and then affixed with licensed trademarks as products that are sold to Hewlett-Packard and Toshiba. This kind of trade pattern is called OEM, and under this pattern, international trade becomes smoother than ever, because trade barriers can be circumvented. Cellular telephones and mobile music players are also OEM products for other multinational companies by Inventec. Consequently, Inventec's

customers benefit a lot from the factories located in mainland China, but they do not need to bear the energy consumption and environmental pollution generated in the manufacturing process.

To better understand this manufacturing status quo that dominates in East Asia, we can look at an article by Zheng Wang that offers a good case study: Foshan, a prefecture-level city typically focused on manufacturing and located in southern China, has an area of less than 4,000 square kilometers (Shown in Figure 2). More than 9,000 small and medium-sized enterprises are not equipped with advanced machinery and technology. Still, they serve as the main sites of the manufacturing industry there. The GDP output of manufacturing contributes to roughly 60% of the total GDP in this city.<sup>5</sup> Massive carbon emissions and polluted water from all these factories located along the Pearl River are primary pollutants, seriously impacting the local environment and habitats. In addition, a wide range of industrial clouds of dust float in the air, and clear skies are unusually unavailable for most of the year. Respiratory diseases are also very common here.

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<sup>5</sup> Zheng Wang et al., "Manufacturing Industrial Structure and Pollutant Emission: An Empirical Study of China," *Journal of Cleaner Production* 197 (October 1, 2018): 462–71, <https://doi.org/10.1016/j.jclepro.2018.06.092>.

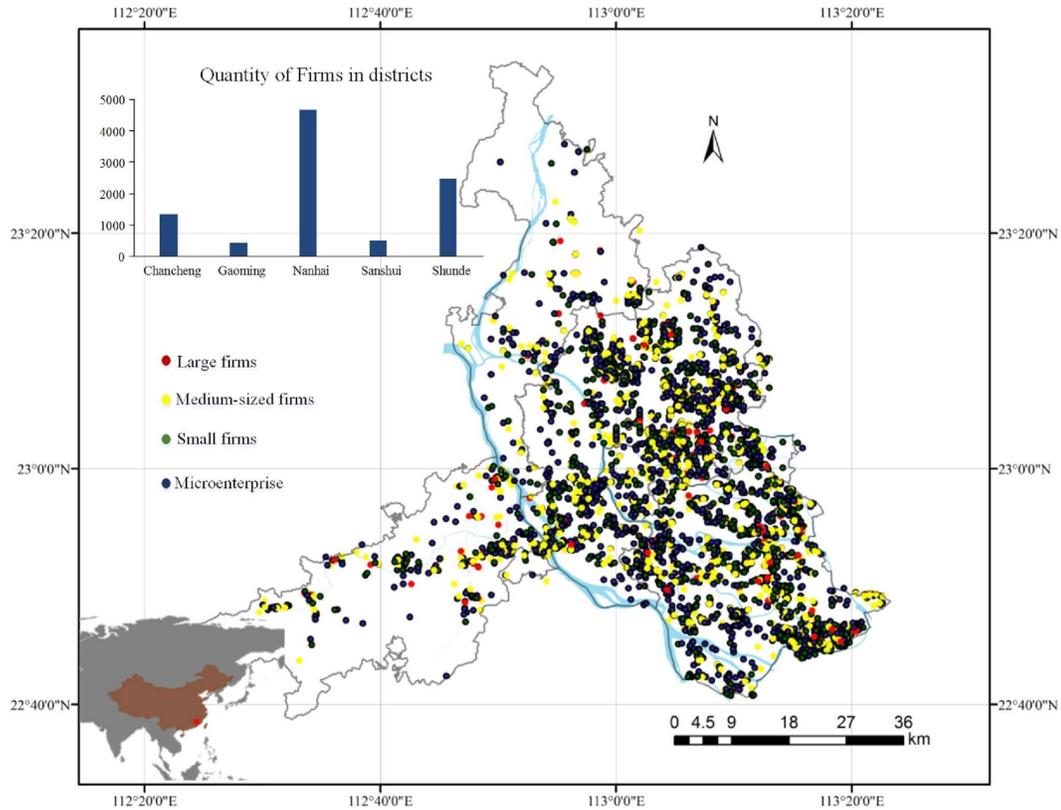


Fig. 2 The location and distribution of manufacturing enterprises in Foshan<sup>6</sup>

## Economic Development Patterns in China: the Threat to Our Climate

By looking at the practices of companies like Inventec, and understanding the level of environmental damage in cities like Foshan, we begin to get a sense of how serious this issue really is. These represent just some examples of companies and cities that are contributing to the climate change problem in China. When we look at the big picture, we can see that China's status as a key player in exports and foreign trade both fosters economic growth yet creates a massive level of emissions. On a global scale, China has been the most significant carbon emitter since

<sup>6</sup> Wang et al., 463.

2008, generating “27% of the global carbon emissions,” as stated by Abeydeera.<sup>7</sup> From his report, what deserves our concern is the accelerating growth rate of these emissions. Moreover, he points out that the carbon emissions of a country are not only a reflection of its domestic development but also a reflection of consumer demand from other countries.<sup>8</sup> East Asia, especially China, has undertaken a large share of commodity production to keep up with international demand since joining the WTO in 2001. Therefore, the rapid growth of carbon emissions is clearly reflected in the growth of China's exports. Quantitative research regarding carbon emissions related to exported products from China to international markets has been conducted; the results reveal that “these emissions accounted for 23% of China's national total in 2004.”<sup>9</sup> However, this figure excludes “the contribution of exports to GDP” and total emissions “by overlooking the indirect impacts of exports on domestic consumption, investment, government expenditures, and imports,”<sup>10</sup> states Justin Lin, the former World Bank Chief Economist. Lin indicates that exports are the focus of manufacturing. Suppose that the indirect impact on domestic consumption, investment, government expenditure, and imports is added to exports. In this case, its importance to the national economy is vital. By having an outstanding share in world trade, China earned its reputation as a world factory but the cost is devastating: tremendous environmental damage that will take years to undo or even begin to reverse.

The boom of foreign trade has been a significant driving force for China's economic growth that has increased at a far higher rate than GDP growth over the past decades, especially

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<sup>7</sup> Lebunu Hewage Udara Willhelm Abeydeera, Jayantha Wadu Mesthrige, and Tharushi Imalka Samarasinghalage, “Global Research on Carbon Emissions: A Scientometric Review,” *Sustainability* 11, no. 14 (January 2019): 3972, <https://doi.org/10.3390/su11143972>.

<sup>8</sup> Udara Willhelm Abeydeera, Wadu Mesthrige, and Samarasinghalage.

<sup>9</sup> TAO WANG and JIM WATSON, “China's Carbon Emissions and International Trade: Implications for Post-2012 Policy,” *Climate Policy* 8, no. 6 (January 1, 2008): 577–87, <https://doi.org/10.3763/cpol.2008.0531>.

<sup>10</sup> Justin Yifu Lin et al., “Export and Economic Growth in China: A Demand-Oriented Analysis,” n.d.

after the “WTO entry.” “Cell phones, LCD screens, and laptops played a critical role” among all the exported products, which are very popular throughout the world, particularly in developed countries.<sup>11</sup> Apparently, the export-oriented economic development pattern, as a typical pattern of most Asian countries, is driven by consumer demands, both domestic and international, in particular the latter. With years of study of the Asian economy, Arindam Bhattacharya delineates Asia's economic framework, asserting that Asian countries position themselves as cogs of global supply chains by undertaking outsourced production of multinational corporations from the US, Japan, and the EU, beginning with light manufacturing product, such as textiles, shoes, and toys.<sup>12</sup> Following this pattern, the four tigers and some other Asian economies consecutively developed into global manufacturing hubs of computer peripherals at the expense of severe environmental damage, which represented the flip side of industrialization.<sup>13</sup> As the first major mover towards industrialization among Asian countries, Japan developed an economy following a pattern that included low processing and outsourcing in textile and chemicals, and then high-tech manufacturing in auto and electronics. All the other countries entered into industrialization by following the same pattern as Japan but much later in the timeline. At the same time, household consumption has risen with the economic growth, which increases the pressure for us to find avenues for environmental protection. Japan, as the first industrialized country in Asia, entered the era of mass consumption much earlier than other Asian countries. Currently, almost all the countries in Asia have entered the age of massive consumption, and

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<sup>11</sup> Brett Berger and Robert F. Martin, “The Growth of Chinese Exports: An Examination of the Detailed Trade Data,” November 1, 2011, <https://www.federalreserve.gov/econres/ifdp/the-growth-of-chinese-exports-an-examination-of-the-detailed-trade-data.htm>.

<sup>12</sup> Young Jo Lee, “Insertion of the Pacific Asian Countries into International Trade: Key Features,” April 15, 2022.

<sup>13</sup> “How Asia Can Win in the New Global Era,” BCG Global, July 18, 2020, <https://www.bcg.com/publications/2017/globalization-winning-in-emerging-markets-how-asia-can-win-new-global-era>.

national economic strength comes from the magnitude of engagement with consumers and the ability to offer products that will satisfy their many desires and needs.

### **Consumerism: Gone Viral in China and Worldwide**

Consumerism, as a byproduct of Keynesian economics, has now grown into an epidemic sweeping throughout the entire world. It is both a cause and consequence of economic development and credited as a positive factor by most economists. Especially after the 1990s, consumerism has been ubiquitous, and consumption does not mean one spends in order to simply survive or live; instead, it has detached from its fundamental meaning and turned into a mode of behavior driven by one's need to live a desired lifestyle, in which one's happiness and well-being are bound to the purchase and possession of goods and services in the market. We can better understand its origin by looking at Keynesian economics, which promoted governmental spending as a measure to overcome economic crisis and encouraged consumer spending as a way to ensure economic growth. From this point of view, consumerism is a positive phenomenon that fuels economic growth.<sup>14</sup> The problem with this interpretation is clear: the core concept of consumerism is spending but this form of economics fails to consider rationality, sustainability, and possible consequences. To get a clear picture, it is necessary for us to analyze the motivations and consequences of consumerism through a multidimensional framework. Keynesian economics did bring European and American economies out of the Great Depression, and due to its great success, its corresponding side effects have been seriously neglected—the

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<sup>14</sup> "Consumerism," Investopedia, accessed February 28, 2022, <https://www.investopedia.com/terms/c/consumerism.asp>.

astronomical amount of carbon emissions and environmental damages caused by massive production, which is fueled by government spending and individual consumption.

These economic policies, which did very well at that time, have done notable harm today. Since Keynesian theories became the guiding principle for economic growth in various countries, large-scale governmental investment has evolved as a routine operation to overcome economic crises. However, large-scale governmental investment worked less effectively due to the negative feedback on individual productivity. Furthermore, Connolly argues in his research that "an increase in public social spending has a significant negative effect on subsequent economic growth."<sup>15</sup> Due to the unsustainability of large-scale governmental investment, economic stimulus policies replaced government spending, which inevitably led to the perception of consumerism as a more viable option for growth. Even though the driving force of economic growth has shifted from governmental spending to consumer spending, carbon emissions have not been reduced and continue to increase to even higher and more astronomical levels. Consumption-driving economic growth is effective, dynamic, and ever shifting. With the upgrade of industrial structures, developed countries transferred most of their manufacturing work to agricultural countries so that they can instead focus on the high-tech and financial service sectors. Enormous environmental damage continues to accumulate, with the highest level of damage not attributed to one place but moving from one country to another with the global industrial shift—from developed to agricultural countries; in other words, from west Europe and North America and North America to East Asia. Through this chain, global carbon emissions continue unabated.

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<sup>15</sup> Michael Connolly and Cheng Li, "Government Spending and Economic Growth in the OECD Countries," *Journal of Economic Policy Reform* 19, no. 4 (October 1, 2016): 386–95, <https://doi.org/10.1080/17487870.2016.1213168>.

Based on the analysis above, it is hard to deny that consumption has been the main driving force behind climate change due to its positive impact on economic growth. The advent of the era of mass consumption was just a matter of time. Rostow provides a detailed delineation of the history of economic development: “the traditional society; the preconditions for take-off; the take-off; the drive for maturity; the age of high mass consumption.”<sup>16</sup> From the perspective of economic growth, our social structures continue to evolve and renew at faster and faster rates. High mass consumption society first emerged in the United States in the 1920s, symbolized by housing, automobiles, and electricity-powered household devices.<sup>17</sup> Furthermore, it quickly spread around the world with the wave of globalization. Trentmann, in his in-depth study of consumption, divided the era of modernity and postmodernity by their levels and types of consumption. Consumption and consumer culture have played a crucial role in our post-modern society, and we benefit from having cars to take us places, computers that process information, the internet that connect us, and luxuries such as travel, vacations, and jewelry. However, consumerism and its complex underlying interrelationship with the environment have been underestimated by many of us.

We can look at history to see how rising consumerism has paralleled a spike in emissions. With the end of industrialization, almost all developed countries have high total carbon emissions and per capita. Canada and Australia have the highest per capita CO2 emissions among developed countries at 15.5 tons, followed by the United States with 15.2 tons per capita.<sup>18</sup> The high carbon emissions per capita in an era of high mass consumption is the key

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<sup>16</sup> Rostow, “The Stages of Economic Growth.”

<sup>17</sup> Rostow.

<sup>18</sup> “CO2 Emissions (Metric Tons per Capita) | Data,” accessed March 15, 2022, [https://data.worldbank.org/indicator/EN.ATM.CO2E.PC?most\\_recent\\_value\\_desc=true](https://data.worldbank.org/indicator/EN.ATM.CO2E.PC?most_recent_value_desc=true).

comparison that allows us to understand how we, as consumers, have a direct impact on the environment.

Indeed, we must step away from the mindset that industry is all to blame. Traditionally, the most influential sector that generates the most significant carbon emissions is the industrial sector for power generation. However, the driving force that has the most significant impact on the carbon emissions has changed substantially. In addition to the EU and North America, many countries in Asia, ever lagging in productivity, are entering the age of high mass consumption. Consumer goods are not only seen by us as necessary for our survival but also feed our dream to get the biggest and best: the most excellent computer, the fanciest car, and the biggest house. These are just a few examples. These durable consumer goods, of course, lead to high carbon emissions overall and per capita, especially in rich countries and cities. For example, carbon emissions per capita in America reached 15.2 tons.<sup>19</sup> Consumer demands, especially the desired lifestyle as fabricated by social media, advertisements, and other forms of media that support commercial behavior are powerful forces that feed the fuel of our current crisis. Nevertheless, Few people realize the problem, and it works in a very subtle way by creating an illusion of what you should be to stimulate non-rational consumption, the driving force behind the production and the stimulant of carbon emission.

### **Personal and Household Consumption: Top Emitters**

When we view consumerism as a whole, the share of household consumption in GDP and the proportion of residential energy use in total energy consumption is a reliable indicator for

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<sup>19</sup> "CO2 Emissions (Metric Tons per Capita) | Data."

quantitative analysis. In the traditional sense, energy use has four sectors: industrial, transportation, commercial, and residential. In recent decades, residential energy consumption, which consists of home energy use and the energy consumption in housing operations, has increased and plays a critical role in all sectors. For example, in the EU, residential energy consumption accounted for 25 percent of all energy consumption in 2016; this figure in the US is about 20%.<sup>20</sup> However, the residential sector only accounts for a small proportion of total energy consumption in less developed countries, but the gap will be filled up soon due to economic development in less developed countries. For example, this figure is 12.4%; in contrast, the industrial sector accounts for more than two-thirds of total energy consumption in China.<sup>21</sup> Nevertheless, this sector-based analysis can only reflect the direct residential energy consumption, such as heating, lighting, and appliance use. As a result, this approach seriously underestimates the indirect impact of residential energy consumption and related environmental damage. If personal and household consumption are calculated, their proportional amount in figures for total energy consumption will be shocking.

Fortunately, personal and household consumption has drawn attention and discussion among academics. “In the late 1980s,” researchers used “the concept of lifestyle” as a way to access household consumption and residential energy use. Based on their work, Bin Shui, from Carnegie Mellon University, together with Hadi Dowlatabadi, developed a customer-oriented analysis framework for household consumption and residential energy use.<sup>22</sup> With this approach,

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<sup>20</sup> Lu Jiang, Xingpeng Chen, and Bing Xue, “Features, Driving Forces and Transition of the Household Energy Consumption in China: A Review,” *Sustainability* 11, no. 4 (January 2019): 1186, <https://doi.org/10.3390/su11041186>.

<sup>21</sup> Jiang, Chen, and Xue, 1186.

<sup>22</sup> Shui Bin and Hadi Dowlatabadi, “Consumer Lifestyle Approach to US Energy Use and the Related CO<sub>2</sub> Emissions,” *Energy Policy* 33, no. 2 (January 1, 2005): 197–208, [https://doi.org/10.1016/S0301-4215\(03\)00210-6](https://doi.org/10.1016/S0301-4215(03)00210-6).

they differentiated “direct and indirect energy consumption.”<sup>23</sup> According to the researchers, “Direct energy consumption refers to the energy consumption”<sup>24</sup> in commodity purchases or use. For instance, if we drive our cars home after work, the car consumes gas, and the gas used and carbon emissions generated are calculated as direct energy consumption. However, the energy consumption required to extract, refine, and transport the gas is calculated as indirect energy consumption. Bin Shui found that indirect energy consumption is about three times more than direct home energy consumption. In a nutshell, “household consumption” accounts “for 45% of GDP, 85% of energy use, and 102% of CO<sub>2</sub> emissions” in the US, an exceedingly high percentage share.<sup>25</sup> More than 100% of carbon emissions are due to the imported products, which are also converted into domestic CO<sub>2</sub> emissions, demonstrating that consumer demands in a considerable number of developed countries cannot be sufficiently met without this steady inflow of imports.

If our consumer demands and the supporting commercial activities behind cannot be curbed effectively, the situation will deteriorate dramatically, in particular when the non-OECD countries join in the club of developed countries. China and India are leading the growth curve of residential energy use, and China has a faster growth rate of energy used in the residential sector than that of the industrial sector. It is expected that by 2015, energy consumption in the residential sector will increase by 6.11%; in comparison, the growth percentage in the industrial sector is only 1.15%, and the rate is still growing.<sup>26</sup>

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<sup>23</sup> Bin and Dowlatabadi, 197.

<sup>24</sup> Bin and Dowlatabadi, 199.

<sup>25</sup> Bin and Dowlatabadi, 204.

<sup>26</sup> Jiang, Chen, and Xue, “Features, Driving Forces and Transition of the Household Energy Consumption in China,” 1186.

It is our responsibility to adapt an energy-efficient lifestyle for a green future. As we can see, total carbon emissions are deeply connected to personal and household consumption, and the amplifying effects of the supply chain. Therefore, small changes in lifestyle matter a lot in energy consumption. For example, we can monitor our home electricity use, which is particularly energy-intensive, because two-thirds of energy consumption for electricity generation occurs during production and transportation before delivery to our homes. According to Shui-Dowlatabadi approach to energy consumption, we use electricity to drive lighting, heating or appliances that consume three times as much energy to produce. Personal travel has the same energy consumption pattern as home electricity use, especially when we take short trips by car. Therefore, in terms of environmental protection or emission reduction, we have much room to adjust our lifestyles, such as reducing our use of cars, decreasing our use of lighting and air conditioning, and lessening our purchases of luxury commodities. Through responsible consumer activities, which are finally hooked with the supply chain, we can slow the commercial activities that drive consumption and help our environment. It isn't easy to achieve it only through the motivation of self-consciousness. The government can help if they tax heavily on luxuries and lift the gas price, which is influential to carbon emissions. Too much use of private vehicles is entirely replaceable by public transport.

### **Curse Befalls**

A cloudburst suddenly hit Xinxiang, Henan province, on July 24, 2021, the most intense rainfall ever recorded, flooding the city completely. Not far from Xinxiang, the capital city of Zhengzhou was submerged as the city drainage system could not cope with the sudden rainfall.

More tragically, the flood poured into the city's highway tunnel located downtown, and about 200 to 300 cars were stranded in the tunnel. The Mayor of Zhengzhou City said in a press conference after the event that all the deaths were due to the flooding, with a total of 292, including 29 who died in the underground garages, parking lots, subway stations, and highway tunnels.<sup>27</sup> According to Kara M. Kockelman, a transportation engineering professor at the University of Texas at Austin, road constructors, such as those designing subway systems or highway tunnels, need to take more into account the new challenge of heavy precipitation due to climate change. A highway tunnel "can really fill like a bathtub in some of these rainstorms," she said, "and it's just going to get worse due to the climate catastrophe."<sup>28</sup>

All the dangers of these types of catastrophes are growing, because climate change is relatively slow but irreversible. According to NASA, the global "temperature has risen about 2 degrees Fahrenheit (1 degree Celsius) since the late 19th century, a change driven largely by increased carbon dioxide emissions into the atmosphere and other human activities."<sup>29</sup> It is well known that if global temperature exceeds 1.5 degrees Celsius of that of the pre-industrial period, extreme weather conditions will emerge as the accumulation of minor changes according to Andrew King, who serves as a lecturer in climate science at the University of Melbourne. NASA data also demonstrate "Most of the warming occurred in the past 35 years, with 16 of the 17 warmest years on record occurring since 2001."<sup>30</sup> For example, just last year, during the

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<sup>27</sup> Sixth Tone, "Officials 'Deliberately' Hid Deaths During Henan Floods, Report Finds," Sixth Tone, January 22, 2022, <https://www.sixthtone.com/news/1009524/https%3A%2F%2Fwww.sixthtone.com%2Fnews%2F1009524%2Fofficials-deliberately-hid-deaths-during-henan-floods%252C-report-finds>.

<sup>28</sup> Keith Bradsher, "Flood Deaths in China Show Road Risks From Climate Change," *The New York Times*, July 24, 2021, sec. World, <https://www.nytimes.com/2021/07/24/world/asia/china-floods-climate-change.html>.

<sup>29</sup> P. D. Jones et al., "Surface Air Temperature and Its Changes over the Past 150 Years," *Reviews of Geophysics* 37, no. 2 (May 1999): 173–99, <https://doi.org/10.1029/1999RG900002>.

<sup>30</sup> «NASA GISS: NASA News & Feature Releases: NASA, NOAA Data Show 2016 Warmest Year on Record Globally».

pandemic, temperatures soared to 117.3 degrees in the city of Montero, Spain, setting a new higher record for Montoro, Spain according to the *Washington Post*,<sup>31</sup> which was confirmed by AEMET, Spain meteorological agency.<sup>32</sup> In addition, it affects other countries in southern Europe and northern Africa too. Strikingly, “the temperature in Syracuse, Sicily, skyrocketed to 120 degrees Wednesday, potentially setting a new all-time heat record for all of Europe.”<sup>33</sup> Countless droughts, hurricanes, floods, and heat waves are hitting the world frequently, and the following secondary disasters seriously threaten our survival.

### **Why not a Hoax?**

Carbon emissions increase Earth's surface air temperature through the greenhouse effect, which was once thought to be a hoax, especially in America. Recently, when examining the stream of Twitter conversation about climate change or global warming, most of the conversation revolved around the idea that the crisis is a hoax.<sup>34</sup> In comparison, scientific opinions about climate change are aligned for the most part. Scientists in the field of climate science generally agree that climate change is an indisputable fact that is fueled by human activities.<sup>35</sup> The United Nations-sponsored Intergovernmental Panel on Climate Change (IPCC) has repeatedly addressed

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<sup>31</sup> “Spain Soared to Record High of 117 Degrees Saturday amid Historic Heat Wave,” *Washington Post*, accessed March 4, 2022, <https://www.washingtonpost.com/weather/2021/08/16/spain-heatwave-europe-middle-east/>.

<sup>32</sup> AEMET, « 🌡️ más alta registrada en España 47,4°C Considerando las estaciones de la red principal y estaciones automáticas modernas, la estación de Montoro-Vega Armijo (Córdoba), registró 47,4 °C el #14 Agosto 2021, superando en 0,1°C su anterior récord #13julio 2021 <http://aemet.es/es/eltiempo/observacion/ultimosdatos?k=and&l=5361X&w=2&datos=img&x=&f=tmax> <https://t.co/wgxBoL1pgX>».

<sup>33</sup> “Spain Soared to Record High of 117 Degrees Saturday amid Historic Heat Wave.”

<sup>34</sup> S. Mo Jang and P. Sol Hart, “Polarized Frames on ‘Climate Change’ and ‘Global Warming’ across Countries and States: Evidence from Twitter Big Data,” *Global Environmental Change* 32 (May 1, 2015): 11–17, <https://doi.org/10.1016/j.gloenvcha.2015.02.010>.

<sup>35</sup> “¿Hay Consenso Científico Sobre El Calentamiento Global?,” *Skeptical Science*, accessed April 3, 2022, <https://skepticalscience.com/translation.php?a=17&l=4>.

the immediate urgency of global warming and the necessity of taking immediate actions to address this challenge promptly.<sup>36</sup> “The consensus among research scientists on anthropogenic global warming has grown to 100%, based on a review of 11,602 peer-reviewed articles on ‘climate change’ and ‘global warming’ published in the first 7 months of 2019.”<sup>37</sup> In any case, scientific opinions are more reliable than public opinion for policy-making, and it is apparent that climate change is real and here to stay.

Although the effects of global warming were slow to appear, they have begun to accelerate exponentially in recent decades due to massive greenhouse gas emissions. Climate change was observed in the early 20th century; NASA's explanation for climate warming is that human activities, especially fossil fuel combustion, led to excessive greenhouse gas concentrated in the Earth's atmosphere. Climate data provide evidence of climate change with observable indicators, “such as global land and ocean temperature increases; rising sea levels; ice loss at Earth's poles and in mountain glaciers; frequency and severity changes in extreme weather such as hurricanes, heatwaves, wildfires, droughts, floods and precipitation; and cloud and vegetation cover changes, to name but a few.”<sup>38</sup>

The earliest research related to greenhouse effects is not focused on its warming effects. It is probably the French Physicist named Fourier who initially found the air warming effects in 1827 by observing the air temperature rising in a container covered beneath a glass panel.<sup>39</sup> His

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<sup>36</sup> Stephen J. Farnsworth and S. Robert Lichter, “The Structure of Scientific Opinion on Climate Change\*,” *International Journal of Public Opinion Research* 24, no. 1 (March 1, 2012): 93–103, <https://doi.org/10.1093/ijpor/edr033>.

<sup>37</sup> James Powell, “Scientists Reach 100% Consensus on Anthropogenic Global Warming,” *Bulletin of Science, Technology & Society* 37, no. 4 (December 1, 2017): 183–84, <https://doi.org/10.1177/0270467619886266>.

<sup>38</sup> Holly Shaftel, “Overview: Weather, Global Warming and Climate Change,” *Climate Change: Vital Signs of the Planet*, accessed March 4, 2022, <https://climate.nasa.gov/resources/global-warming-vs-climate-change>.

<sup>39</sup> “Historyofgreenhousegaseffect.Pdf,” accessed March 4, 2022, <https://www.crcresearch.org/sites/default/files/u11276/historyofgreenhousegaseffect.pdf>.

research has also been given the credit that human activities might influence the climate.<sup>40</sup> His pioneering research has been inherited by future generations and proved right. A huge body of scientific research affirms this fact: climate change is not a hoax.

### **Economic Growth versus Environment Protection**

While we have an urgent responsibility to play a role in halting climate change, we also need our governments to step in and take charge on this issue. The main issue that needs examination is the link between economic growth and environmental protection. East Asian countries exhibit a similar growth pattern, with the exception of Japan, a country that has received direct help from the US institutionally, financially, and economically in order to restore stability. China has a similar growth pattern as Korea. In 1961, when South Korea was under the control of the military government by Park Chung Hee. From the year Park “came to power . . . the state gave priority to economic development.”<sup>41</sup> The combination of government owned enterprises with prominent private entrepreneurs necessitated an export-oriented economic paradigm. Unlike Japan, Korea developed its national economy relatively independently with a strong government and export-led economic system. Compared to Korea, China has an authoritarian government, which creates a homogeneous political environment and pathway to economic take off based on exports and huge investment. Due to the too much emphasis invested in economic growth, carbon emissions in China have ranked first place at the global level over

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<sup>40</sup> V. Ramanathan, “The Greenhouse Theory of Climate Change: A Test by an Inadvertent Global Experiment,” *Science* 240, no. 4850 (April 15, 1988): 293–99, <https://doi.org/10.1126/science.240.4850.293>.

<sup>41</sup> Michael J. Seth, “South Korea’s Economic Development, 1948–1996,” *Oxford Research Encyclopedia of Asian History*, December 19, 2017, <https://doi.org/10.1093/acrefore/9780190277727.013.271>.

the last decade.<sup>42</sup> Industrialized countries like the United States rely heavily on consumption, and industrializing countries like China rely heavily on exports to meet the consumer demands of overseas markets. Until 2020, the United States will remain China's largest trading partner, not including re-exports via Hong Kong.<sup>43</sup>

The United States and the European Union were once the top two in greenhouse gas emissions. However, in the past three decades, China, as an emerging country, experienced rapid economic growth, quickly replacing the top two and jumping to the number one position in greenhouse gas emissions in East Asia and worldwide, with annual emissions still climbing higher and higher. While the United States and the European Union seem to have reached the pinnacle of their carbon emissions; the growth of the manufacturing industry in developing countries such as China has led to their increasing share of global carbon emissions as part of the third global industrial shift as China follows in the footsteps of Japan and Asian Tiger 4.

Export-based manufacturing remains a critical driving force in Asian countries. But such economic growth models are now stagnant in most Asian regions: “In China, exports as a percentage of GDP have declined from 37% in 2006 to less than 20%. In Indonesia, exports have dropped from 31% of GDP to 19% and are projected to account for just 11% in 2030.”<sup>44</sup> Despite the decline in manufacturing activities, significant damage has already happened to the environment. When every government exerts all their efforts to promote national economic growth and national living standards, environmental protection should have the same priority. Among all the measures that can balance these gains and losses is for us to curb our mindless

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<sup>42</sup> WANG and WATSON, “China’s Carbon Emissions and International Trade.”

<sup>43</sup> “China Exports By Country,” accessed February 25, 2022, <https://tradingeconomics.com/china/exports-by-country>.

<sup>44</sup> “How Asia Can Win in the New Global Era.”

consumption, particularly personal and household consumption, which contributes the most to energy use and carbon emissions.

## **Conclusion**

The rapid increase in carbon emissions after the 1990s can be traced to the high economic growth rate and our progressively heavy dependence on consumption. Thus, the paradoxical role of consumerism is seemingly insurmountable, because consumerism impacts economic growth and carbon emissions, and it seems impossible to impact both problems in the same way. While governments and researchers are concerned about how to reduce carbon emissions from the production sector, they keep running into the same problem: if production declines, a stagnant economy ensues—a consequence that no country can afford.

Although developed countries have successfully reduced carbon emissions through industrial shift and off-site emissions in manufacturing, the global carbon emissions are not reduced, on the contrary, it is rising to a higher level. Even more disturbingly, carbon emissions generated from our personal and household consumption are at the edge of out-of-control. In order to realize the goal of industrialization, various Asian countries clogged themselves in the wheels of the global industrial chain proactively. Thus, they have to face dual sources of emission: one from the manufacturing sector based on domestic economic development, and the other from the rapidly increasing sector of personal and household consumption based on the improved living standards. Trapped in this cycle, China has become the world's largest carbon emission source. The prevailing consumerism—especially the intensifying “conspicuous consumption,”<sup>45</sup> coined by Thorstein Veblen, a Norwegian-American economist and socialist and

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<sup>45</sup> Colin Campbell, “Conspicuous Confusion? A Critique of Veblen’s Theory of Conspicuous Consumption,” *Sociological Theory* 13, no. 1 (1995): 37–47, <https://doi.org/10.2307/202004>.

a well-known critic of capitalism—exacerbates this trend. How does each country deal with this challenge? This question has become a significant one in today's world, especially in modern China. The essence of climate change is carbon emission, the essence of carbon emissions is manufacturing and transportation, and the essence of manufacturing and transportation is consumer demand. So, to some extent, climate change is ultimately about consumer demand. Essentially, the issue of carbon emissions can be boiled down to the issue of consumption in China and elsewhere.

The good news is that there is a way out of such a predicament: an energy-efficient lifestyle. By looking at our practices as consumers, by changing our consuming behaviors, and by altering our lifestyle, each one of us can play a small part in this movement. After all, “about 45–55% of total energy use is influenced by consumers’ activities for personal transportation, personal services, and homes,” conclude Lee Schipper et al.<sup>46</sup> When consumers lessen non-essential consumption and transportation, the commercial sector behind them will have to adjust to a more energy-efficient way. Thus, we might force prominent corporations to alter their strategies, and, with that perhaps, we can envision this possibility: that the economic development pattern can be changed as well. One by one, step by step, we can begin to turn things around.

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<sup>46</sup> Lee Schipper et al., “Linking Life-Styles and Energy Use: A Matter of Time?,” *Annual Review of Energy* 14 (1989): 271–320.

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