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Trade Liberalization and the Environment: The Case of China

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Abstract

China has been involved in the process of globalization since 1978 through a comprehensive liberalization of its foreign trade and investment regimes. Especially after becoming a member of the World Trade Organization in 2001, CO_2 *emissions in China have increased. China's economy is growing very fast, which is the main cause of China's air pollution. Trade liberalization and increased openness are seen as a means of promoting economic growth for developing countries. However, most studies have revealed that trade liberalization has negative impacts on the environment. Therefore, the aim of this study is to examine how trade liberalization affects the environment in China by examining the literature on the trade-environment debate. The findings indicate that trade liberalization leads to economic development but has had negative impacts on the environment in China.*

Keywords: *Trade Liberalization, Environment, WTO, China.*
JEL Codes: *F18, F64.*

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Özet

Ticaretin Serbestleşmesi ve Çevre: Çin Örneği

Çin, 1978 yılından bu yana dış ticaretin ve yatırımın serbestleşmesiyle küreselleşme sürecinin içinde yer almaktadır. Özellikle 2001 yılında Dünya Ticaret Örgütü'ne üye olduktan sonra, Çin'deki CO_2 emisyonları artmıştır. Çin'in ekonomisi çok hızlı büyümektedir ve bu da Çin'in hava kirliliğine neden olan ana etkeni oluşturmaktadır. Ticaretin serbestleşmesi ve açıklığın artması, gelişmekte olan ülkeler için ekonomik büyümeyi teşvik etmenin bir aracı olarak görülmektedir. Ancak çoğu çalışma, ticaretin serbestleşmesinin çevre üzerinde olumsuz etkileri olduğunu ortaya çıkarmıştır. Bu nedenle, bu çalışmanın amacı, ticaret-çevre tartışması ile ilgili literatürü inceleyerek ticaretin serbestleşmesinin Çin'de çevreyi nasıl etkilediğini incelemektir. Bulgular, Çin'de ticaretin serbestleşmesinin ekonomik kalkınmaya yol açtığını ancak çevre üzerinde olumsuz etkileri olduğunu göstermektedir.

Anahtar Kelimeler: *Ticaretin serbestleşmesi, çevre, DTÖ, Çin.*
JEL Kodları: *F18, F64.*

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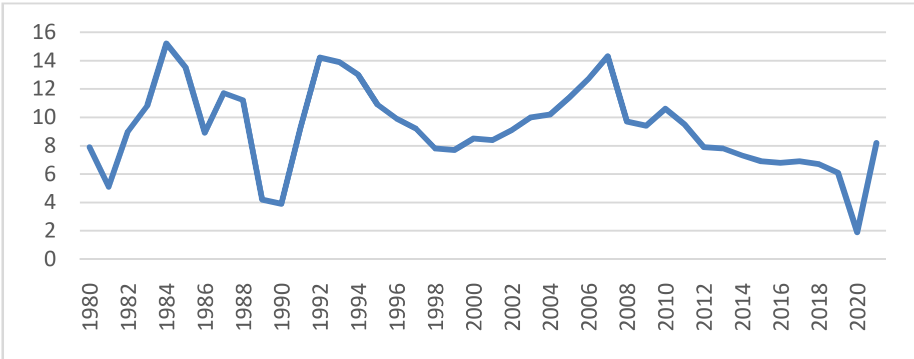
1. Introduction

China is a major pollutant in the world. As of 2019, China is the country that has the most CO_2 emission in the world with 10,17 $MtCO_2$ that constitutes 27.9% of World's total CO_2 emissions[2] (Global Carbon Atlas, 2021). China's economy is growing very fast and this is the main factor causing China's extensive air pollution. Of the twenty cities that have the worst air quality and pollution in the world, seven are located in China, including Beijing (IQAir, 2021). The causes of Beijing's widespread air pollution can be attributed to many factors, such as a massive economic boom, increase in the number of motor vehicles, population growth[3], the consequences of production, and seasonal weather conditions.

[2] World total CO_2 emissions was 36,42 billion tonnes in 2019 (Ritchie & Roser, 2020).
[3] China's population is 1.4 billion people in 2020. China's population is equal to 17.9% of the total World population (Population Reference Bureau, 2021).

China has also experienced a significant increase in Gross Domestic Product (GDP). This increase in wealth can be associated with an increase in pollution. Figure 1 shows the GDP growth in China. In 1960, China's GDP was 59.711 billion dollars. After 1978 that China has embraced the process of globalization, China's GDP was 191.866 billion dollars. While China's GDP was 1.211 trillion in 2000, its GDP has begun to increase significantly (economic boom) after becoming a member of the WTO in 2001 (World Bank, 2019a). As of 2019, China's GDP is 14.401 trillion dollars (International Monetary Fund, 2021a). However, there was a serious decline in real GDP growth with 1.9% decrease in 2020 because of the effect of Covid-19 crisis. This is the biggest drop in its history for China, as illustrated in Figure 1.

Figure 1 Real GDP growth (Annual percent change) in China



Source: International Monetary Fund (2021b).

Before WTO accession, China's vast economic growth was the gradual liberalization of trade and investment policies. Between 1979 and 2000, China's exports of goods and services grew 28-fold, from 1979 to 2000 and China's imports grew 21-fold. Besides, trade generated 39.4% of China's GDP in 2000 (World Bank, 2019b). In the period 1993-2002, China has made extensive trade reforms, causing a large increase in international trade volume (Shen, 2008). Jahiel (2006) said that within the framework of China's "open door" policy, twenty years of economic development before entering the WTO intensified the country's earlier environmental degradation and led to serious pressures on the country's resources and ecosystems. After WTO accession, between 2001 and 2019, China's exports of goods and services grew 9.7-fold, from 272 billion US dollars in 2001 to 2,64 trillion US dollars in 2019 and China's imports grew 10-fold, from 244 billion US dollars to 2,48 trillion US dollars in 2019. Besides, China becomes the largest exporter in the world with 2,64 trillion US dollars in 2019 (World Bank, 2021a). WTO membership brings increases in economic growth, export and import in China and that has a broad impact on its environment both positively and negatively. Environmentalists are concerned that WTO membership will increase China's production of dirty industrial products. The argument is that environmental regulations in rich countries tend to divert dirty industrial production into developing countries. It can speed up the process with China in the WTO. Another concern is the increase in opportunities for the polluting consumption, as the WTO will accelerate economic growth (Vennemo et al., 2005). Recent studies also support this view. Export production has had a significant environmental impact on China. Because WTO membership has produced a measurable increase in greenhouse gases, SOx and NOx through export expansion (Liu et al., 2016). Trade generally has a detrimental effect on China. Because, trade appears to have a detrimental effect on some air quality measures, such as SO_2 and $PM_{2.5}$. Exports and trade in polluted sectors dominate the impact of trade on air pollution. Intermediate imports have a greater impact on air pollution than imports of consumption goods. On the other hand, as technology advances, new technologies with low pollution intensity will emerge. Thus, efficient technology will tend to pollute less in China (Chen et al., 2020).

The aim of this study is to examine how trade liberalization has influenced China's environment by examining the literature on the trade-environment debate. The study consists of five sections. After the introduction section, the second section presents the literature review on the trade-environment debate. Then, the third section examines the global energy outlook and fourth section gives the effects of trade liberalization on China's environment. Fifth section presents current targets for air quality and emissions. Finally, sixth section concludes with a discussion.

2. Trade and Environment Debate

A debate has occurred about the effects of trade liberalization on the environment, especially since 1990s. There are two perspectives which are optimists who are economists and pessimists who are environmentalists. Optimists see free trade primarily as a necessary factor for environmental improvement. According to them, trade liberalization (Jahiel, 2006; Esty, 2001);

- ensures economic growth,
- reduces import costs and thus provides greater access to cleaner production techniques,
- eliminates subsidies and commercial barriers and encourages structural changes in the economy,
- promotes environmental legislative reform.

On the other hand, pessimists see trade liberalization as the opposite of environmental protection. According to them, with the trade liberalization (Jahiel, 2006; Esty, 2001),

- increase in output brings a cost to the environment,
- comparative advantage can negatively affect the environment if a country's industrial structure prefers to specialize in pollution-intensive sectors,
- increasing trade will cause competitive pressures that will reduce environmental standards.

Additionally, there was much concern about whether free trade would cause pollution-intensive sectors to migrate from developed countries to developing countries. There are two hypotheses which are pollution haven hypothesis and factor endowment hypothesis. Pollution haven hypothesis supports the concern that free trade will cause the pollution-intensive sectors to migrate from developed countries to developing countries because economic growth is the main target for developing countries. Besides, free trade can provide a comparative advantage to developing countries in industries associated with relatively large environmental externalities. Factor endowment hypothesis asserts that "relatively capital-abundant countries export pollution-intensive goods since most pollution-intensive goods are capital-intensive. In other words, this hypothesis says that the capital-intensive countries would be 'dirtier' than those without enough capital" (Shen, 2008, p. 997).

There are several papers that examine the effects of trade liberalization on environment. Dean (2000) investigates the effect of trade liberalization on the environment by developing a simultaneous equations model by "directly incorporating the effects of openness on growth of income, and of income growth on environmental damage" (Dean, 2000, p. 1). He tested the model by using data from one country over time. "A two-good trade model with endogenous factor supply is estimated using pooled provincial data on Chinese water pollution from 1987-1995" (Dean, 2000, p. 1). His article "develops an alternative simultaneous equations model which allows for both direct effects of trade liberalization on the growth of environmental damage via changes in relative prices, and indirect effects via the effect of trade liberalization on income growth" (Dean, 2000, p. 21). He found that trade liberalization has both direct and indirect effects on rising emissions. Developments in internal trade cause a rise in emissions. Accordingly, the composition effect of trade liberalization is environmentally hazardous. On the other hand, he also found that the increase in trade openness significantly increases income growth and that income growth has a negative and significant effect on the rise in emissions. Therefore, the technique effect of the trade liberalization is beneficial to the environment. To evaluate the net impact of trade liberalization on environmental damage, various simulations were made by assuming that China did not take on the liberalization of the foreign exchange regime in 1991. The results show that China has a comparative advantage in goods that are heavily polluted and therefore increased openness directly increases the environmental damage.

Antweiler et al. (2001) investigate whether free trade is good for the environment by developing a theoretical model and they use the global environment monitoring system (GEMS) data on sulphur dioxide (SO_2) concentrations to estimate the scale, technique, composition and trade-induced composition effect. Scale effects state increases in the size of an economy stemming from increases caused by trade liberalization in market access. Scale effects are likely to cause more environmental degradation. Technique effects state the changes in production technologies due to trade liberalization. While trade and economic growth cause an increase in income, people with higher incomes will increase the demand for environmental regulations. Therefore, if environmental regulations are strict, companies are encouraged to move towards cleaner production processes. Therefore, the technique effects are likely to be beneficial to the environment. Composition effects show that the industrial structure of an economy that accompanies trade liberalization will change with the increasing specialization of industries in which each country has a comparative advantage. That's why, "the impact of the composition effect on the environment depends on the determinants of a country's comparative advantage" (Shen, 2008, p. 998). Their data consists of 2,555 observations from 290 observation sites in 108 provinces representing 43 countries covering the years 1971-1996. Their study explores how openness to trade opportunities affects pollution concentrations by trying to prove that both environmental regulations and capital-labor endowment are driving comparative advantage. They found that their scale and technical flexibility estimates show that if openness to international markets increases both production and revenue by 1%, pollution concentrations decrease by about 1%. More importantly, they found that while the trade liberalization increases the level of economic activity, its net impact on the environment is beneficial, so free trade is good for the environment.

Frankel and Rose (2005) use the cross-country approach to estimate the impact of trade on the environment for the per capita income level. Frankel and Rose (2005) look at the results for three 1990 measures of air pollution which are

> SO_2, nitrogen dioxide (NO_2), and PM (total suspended particulate matter) and four other measures of environmental quality which are CO_2 (industrial carbon dioxide emissions per capita), deforestation (average annual percentage change, 1990-1995), energy depletion (genuine savings as a percentage of GDP), and rural clean water access as percentage of rural population between 1990 and 1996. (p. 88)

They reached the result that trade tends to reduce three air pollution measures. The statistical significance is high for SO_2 concentrations, medium for NO_2, and none for the PM. There is no strong evidence that trade liberalization has a harmful effect on the environment.

Kirkpatrick and Scrieciu (2008) aim to provide a review of the evidence on the impact of trade and investment on the environment. They reached the conclusion that most of the economic analysis of trade liberalization uses a combination of classical trade and welfare theory to demonstrate that liberalization of trade and investments under ideal market conditions will lead to an increase in economic welfare. In the real world, however, there are externalities and market failure in the market. Therefore, trade liberalization can have significant harmful impacts on the environment. Though trade and investment liberalization has been shown to lead to economic growth, this will not be enough to ensure sustainable development. In order for trade liberalization to contribute to environmental sustainability, there is a need for sound environmental policies at both national and international levels. In order to achieve this, appropriate regulatory and institutional frameworks should be developed and policy coordination in trade, environment and development should be strengthened. If the environment and development policies are not generally compatible with each other, trade liberalization is bad for the environment.

Shen (2008) says that trade liberalization affects the environment by scale, technique and composition effects. In order to prove this, her model is based on the study of

Antweiler et al. (2001), and she uses the data of two air pollutants which are SO_2 and dust fall and three water pollutants which are chemical oxygen demand (COD), arsenic in water and cadmium in water and totally 13 variables[4] from 1993 to 2002 in China's 31 provinces and metropolitan cities. She found that the increase in trade will clearly raise emissions (two air pollutants). For three water pollutants, technique effects both dominate scale and composition effects. The results obtained with respect to per capita income indicate that it tends to emit less emission in a province with relatively higher income. Finally, she reached the result that SO_2 and dust fall increases in trade are bad for the environment in China while COD, arsenic and cadmium trade are good for the environment. This result shows that trade liberalization causes both benefits and costs on the environment in China.

Lin et al. (2014) have established a link between economic emission analysis and atmospheric chemical transport modeling by analyzing the effects of trade-related Chinese air pollutant emissions on the global atmosphere. They found that the rising emissions produced in China are a key reason for global air pollutant emissions to remain high in the period 2000-2009, although emissions from the US, Europe and Japan have been reduced. More specifically, in 2006, 36% of anthropogenic SO_2, 27% of NO_2, 22% of carbon monoxide and 17% of black carbon emitted in China are related to the production of export-related goods. Moreover, almost 21% of export-related emissions in China originate from exports from China to the US.

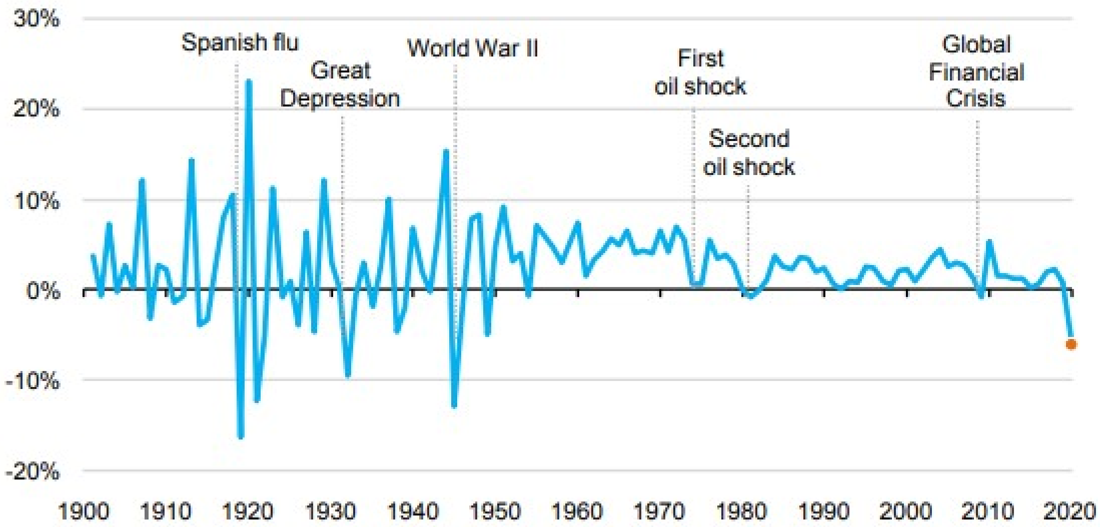
3. Global Energy Outlook

The Covid-19 pandemic, which emerged in China on December 1, 2019, has affected the whole world over time. The pandemic has adversely affected the whole world in terms of health as well as in many areas such as economic, social and environment.

[4] "Per capita SO_2, per capita dust fall, per capita COD, per capita cadmium, per capita arsenic, per capita mercury, capital-labour ratio, one year lagged per capita GDP, trade intensity, World relative (K/L), World relative one year lagged per capital GDP, domestic relative (K/L), and domestic relative per capita GDP" (Shen, 2008, p. 1001).

The serious reduction in global economic activity and mobility in the first quarter of 2020 was occurred[5] that has pulled the global energy demand down by 3,8% compared to the first quarter of 2019. As can be seen from Figure 2, energy demand decreases in events that affect the world such as World War II, epidemics, global economic crises or oil crises. As expected in covid-19, there was a decrease in energy demand after Covid-19 crisis. China has experienced the Covid-19 crisis before other countries, so China experienced the most significant drop in total energy demand, with a decline of over 7% compared to Q1 2019 (International Energy Agency, 2020a).

Figure 2 Global primary energy demand (% change)



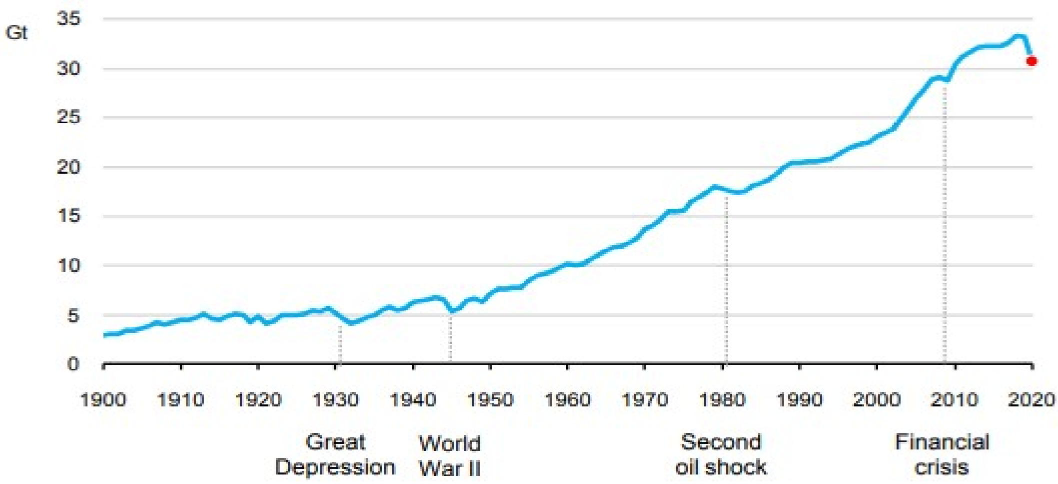
Source: International Energy Agency (2020b).

As economic activity and energy demand are interrelated, carbon emissions also react to economic crises and pandemics as a result of decreasing economic activity, and there is a decrease in carbon emission in parallel with the decrease in energy demand.

[5] World GDP (current prices, billions of US Dollar) decreased by approximately 4% in 2020 compared to 2019. While world GDP was 87552,44 billion dollars in 2019, it was 83844,99 billion dollars in 2020 (IMF, 2021).

Global CO_2 emissions were over 5% lower in the first quarter of 2020 than in the first quarter of 2019; the main reason for this is the 8% decrease in coal emissions, 4.5% from oil and 2.3% from natural gas. CO_2 emissions fell more than energy demand in Q1 2020 as it experienced the biggest declines in demand for the most carbon-intensive fuel. CO_2 emissions decreased most in regions exposed to the earliest and greatest impacts of Covid-19; China (-8%), the European Union (-8%) and the United States (-9%), while milder weather also contributes significantly to emission reductions in the United States (International Energy Agency, 2020a) (Figure 3).

Figure 3 Global energy-related CO_2 emissions

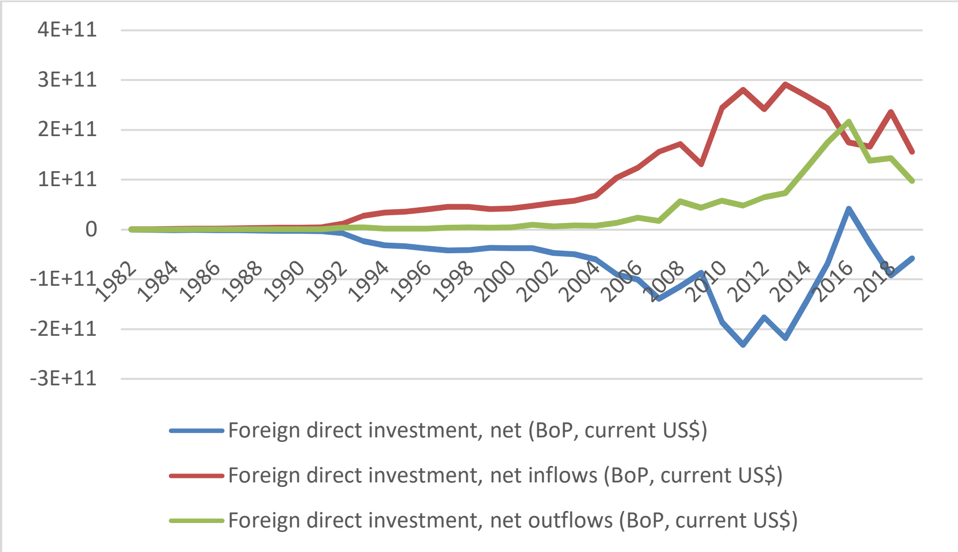


Source: International Energy Agency (2020a).

4. The Effect of Trade Liberalization on China's Environment

China has embraced the process of globalization since 1978 through a comprehensive liberalization of its foreign trade and investment regimes. After WTO accession, between 2001 and 2019, China's exports of goods and services grew 9.7-fold, from 272 billion US dollars in 2001 to 2,64 trillion US dollars in 2019 and China's imports grew 10-fold, from 244 billion US dollars in 1979 to 2,48 trillion US dollars in 2019. Figure 4 shows the development of foreign direct investment (FDI) in China by years. While China's net inflows are increasing rapidly especially after 1992, net outflows are increasing especially after 2004. Within the first three years of WTO accession, FDI-inflows in China grew almost 30% and reached to 68 billion in 2004. China's outflow exceeds its inflow only in 2016. Therefore, China's net FDI has positive sign with 41 billion in 2016. As of 2019, China's FDI-inflows are 155 billion dollars and FDI-outflows are 97 billion dollars. This increase in FDI is one of the most important indicators of trade liberalization.

Figure 4 Foreign direct investment in China (current US dollars)

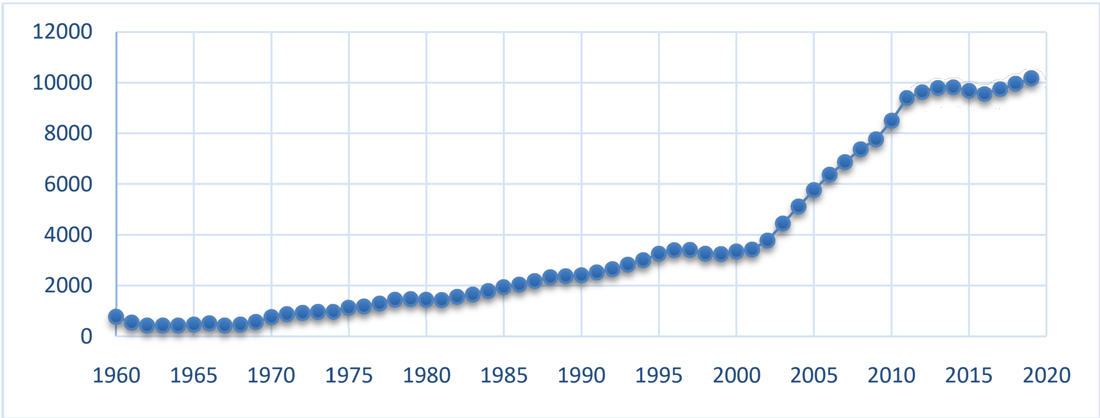


Source: World Bank (2021a).

China's foreign trade and FDI have increased, consequently, its energy consumption has increased from 1067,7 mtep (million tons of oil equivalent) in 2001 to 3367,7 mtep in 2019, and China's energy consumption comes from coal (57.6%), oil (19.6%), and gas (7.8%), totally 85% of its energy consumption comes from fossil fuels that cause carbon emissions (BP, 2020). Therefore, especially after becoming a member of the WTO in 2001, CO_2 emission in China has also increased. In 1970s, CO_2 emission started to increase slightly. Between the years 1980 and 1990, CO_2 emission began to increase rapidly in parallel with the existence of debate over the implications of trade liberalization for the environment, especially since 1990s.

Especially after WTO accession in 2001, CO_2 emission in China has increased from 3426 $MtCO_2$ in 2001 to 10174 $MtCO_2$ in 2014. 2014 is the peak year of CO_2 emission in China with 9820 $MtCO_2$, as illustrated in Figure 5.

Figure 5 CO_2 emissions in China (million tons)

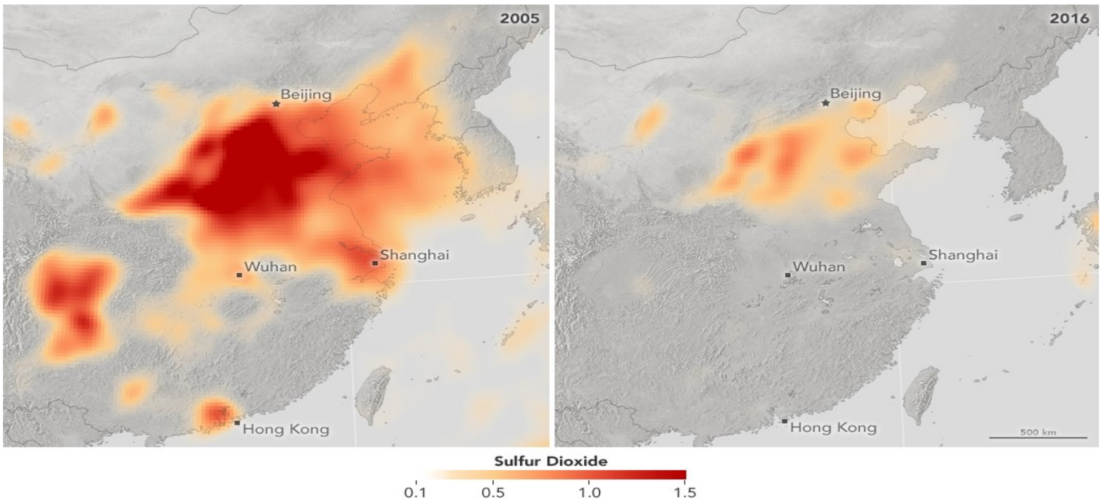


Source: Global Carbon Atlas (2021).

China is the country with the highest carbon emissions in the world with 10174 $MtCO_2$ in 2019. Therefore, it can be said that China is a major pollutant in the world. China is followed by US with 5285 $MtCO_2$, India with 2616 $MtCO_2$, Russia with 1678 $MtCO_2$, and Japan with 1107 $MtCO_2$. Moreover, China's CO_2 emission comes from coal (7236 $MtCO_2$), oil (1518 $MtCO_2$), gas (594 $MtCO_2$), and cement (827 $MtCO_2$) (Global Carbon Atlas, 2021). China's economy is growing very fast, while China's GDP was 1.211 trillion in 2000, its GDP has begun to increase significantly after WTO accession. As of 2019, China's GDP is 14.401 trillion dollars (International Monetary Fund, 2021).[6]

[6] In 2020, China's GDP is 14.860 trillion dollars (IMF, 2021).

Figure 6 Sulfur dioxide concentrations for China



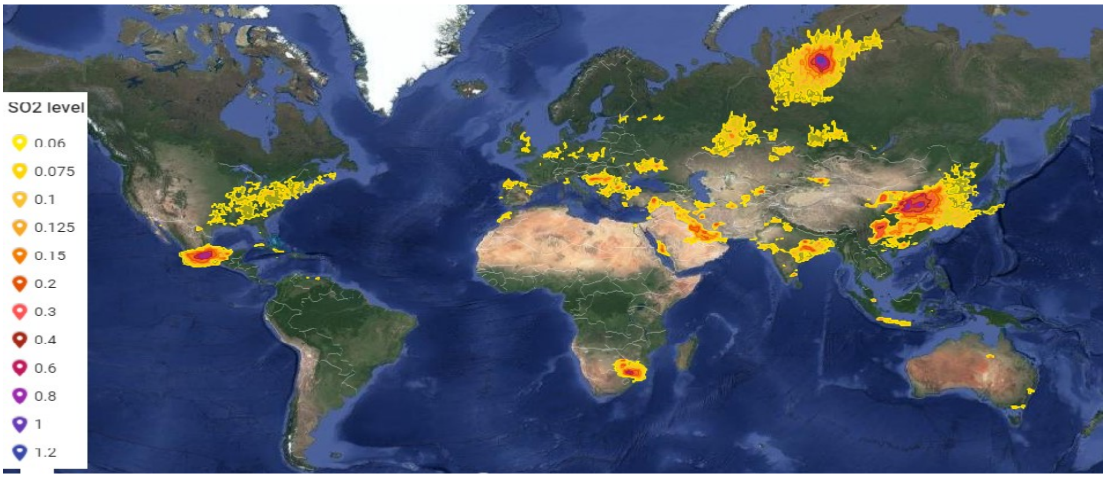
Source: NASA (2017).

SO_2 is derived from the burning of fossil fuels by power plants, industrial facilities, industrial processes such as extracting metal from ore, natural sources such as volcanoes, and vehicles such as ships, locomotives. SO_2 can affect health and environment. In terms of health, short-term exposure to SO_2 can damage the human respiratory system, make breathing difficult, and irritation of the nose, throat, lungs. Long-term exposure to SO_2 can damage health in terms of temporary loss of smell, irritation of lungs, headache, nausea, bronchitis and reduced fertility. In terms of environment, SO_2 can contribute to acid rain that can damage sensitive ecosystems (United States Environmental Protection Agency, 2018; Mohajan, 2014). SO_2 is a major air pollutant. China's rapid economic growth has increased its SO_2, NOx and CO_2 emissions due to the burning of fossil fuels. "These three gases pollute the air and the environment, which increases human morbidity and mortality. Approximately 40% of China's land area is affected by acid rain" (Mohajan, 2014, p. 270). As of 2019, China is the top consumer of coal in the world with 1934,6 mtep, then India comes after China with 429 mtep coal consumption (BP, 2020). The coal contains several percent of sulfur by weight and emits large amounts of SO_2, whose combustion is a toxic air pollutant. In 2017, Li et al. (2017) who are the researchers at

NASA and the University of Maryland made a study and found that while SO_2 emissions in China has decreased by 50%, SO_2 emissions in India has increased by 75% since 2007. Sulfur dioxide concentrations for China have decreased from 2005 to 2016, as shown in Figure 6.

By comparing the maps showed at Figure 7 and 8[7], SO_2 emissions have decreased in China from 2012-13 to 2017-18. China, which has the largest coal-fired power generation capacity in the world, was the largest emitter for SO_2 until about ten years ago. While air quality has improved significantly since it began installing flue-gas desulfurization systems in the electricity generation sector, China remains the world's third largest emitter (Dahiya & Myllyvirta, 2019).

Figure 7 SO_2 emissions hotspots (2012-13)

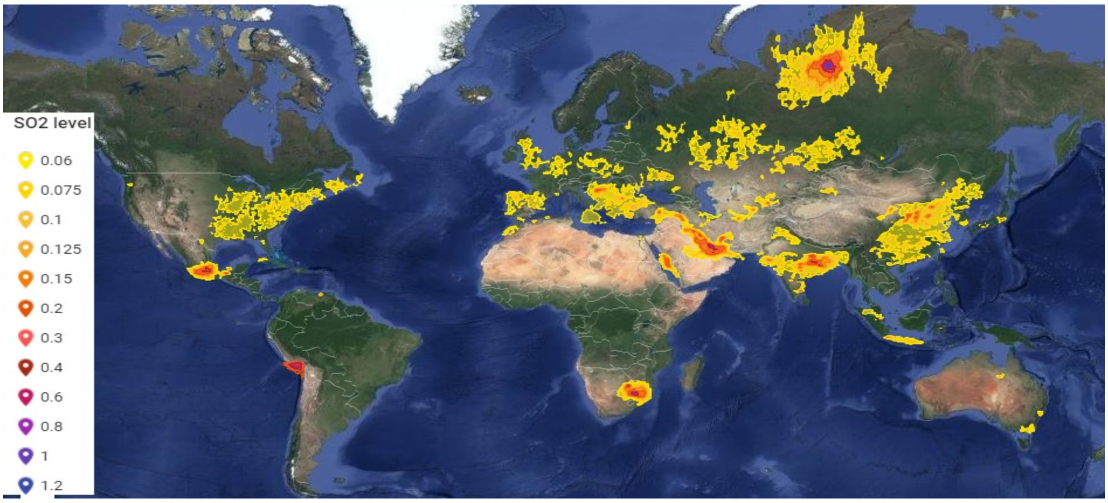


Source: NASA OMI (2021).

As of 2019, sources of worldwide SO_2 emissions are coal combustion with the share of 36%, oil and gas refining or combustion with 21% and smelters for 12% (Dahiya et al., 2020).

[7] Figure 7 and 8 depict a screenshot of the maps from interactive map.

Figure 8 SO_2 emissions hotspots (2017-18)



Source: NASA OMI (2021).

Meng, Yang and Huang (2018)'s article aims to forecast China's sulfur dioxide emissions by using a discrete grey model with fractional operator. Their results show that the amount of SO_2 emissions is continuously decreasing and SO_2 reduction policies in China are effective. Until 2020, the value of China's SO_2 emissions will be only 87% of emissions in 2015.

$PM_{2.5}$ is the fine particles in the air and causes the air pollution. Sources of $PM_{2.5}$ can be categorized in two parts which are primary and secondary emission. Primary emission can be divided into two that are natural resources including forest fires, volcanoes, crustal activities and human activities including exhaust gases from factories and cars. Secondary emission is derived from primary particulates such as SO_2, NO_x, VOC_s. Primary emission sources can be accounted as driving and exposed dust by 23%, road transport by 22.7%, agricultural activities by 13.5%, industry by 9.6%, catering by 8.5%, construction and mining by 7.2%, electricity by 4% and others by 11.4% (PM2.5 Open Data Portal, 2021).

$PM_{2.5}$ pollution has become a serious problem in China due to rapid industrialization and high energy consumption. The China's State Council issued the Air Pollution Prevention and Control Action Plan in 2013. According to Action Plan, "concentrations of $PM_{2.5}$ in the heavily polluted Beijing-Tianjin-Hebei, Yangtze River Delta, and Pearl River Delta regions must fall by around 25%, 20%, and 15%, respectively and $PM_{2.5}$ annual concentrations in Beijing must be controlled below 60 milligrams per cubic meter". As of 2019, $PM_{2.5}$ annual concentrations in Beijing are average 42.6 micrograms. PM2.5 particles per cubic meter value in Beijing have always been below 60 micrograms after 2016 (Textor, 2021).

According to Air Quality Index[8], of the twenty cities that have the worst air pollution in the world, seven are located in China, including Beijing (World Air Quality Index, 2021). Because of this extensive air pollution, China is ranked 120th among 180 countries by Environmental Performance Index (EPI) as of 2020. The top ten countries are Denmark, Luxembourg, Switzerland, United Kingdom, France, Austria, Finland, Sweden, Norway and Germany (Wendling et al., 2020). These countries are in the region of Europe and North America. The countries that have worst EPI score are mostly in the region of Asia and Sub-Saharan Africa. Air quality continues to be one of the most important environmental threats for public health. Air pollution problems are particularly severe in the rapid urbanization and industrialization of countries such as India and China. Additionally, EPI says that there are two fundamental dimensions of sustainable development which are environmental health and ecosystem vitality. Environmental health increases with economic growth and welfare and ecosystem vitality is under pressure of industrialization and urbanization. Environmental health covers four issue categories that are air quality, sanitation and drinking water, heavy metals and waste management while ecosystem vitality covers seven issue categories that are biodiversity and habitat, ecosystem services, fisheries, climate change, pollution emissions, water resources, and agriculture. In terms of two

[8] The Air Quality Index is based on the measurement of particulate matter ($PM_{2.5}$ and PM_{10}), Ozone (O_3), Nitrogen Dioxide (NO_2), Sulfur Dioxide (SO_2) and Carbon Monoxide (CO) emissions.

fundamental dimensions of sustainable development, China's current rank is 96 out of 180 countries in terms of environmental health with 41.8 score, 156 in terms of ecosystem vitality with 34.4 score. Air quality covers 65% of environmental health objective and China's air quality rank is 137. This is the China's worst performance in sustainable development after biodiversity and habitat, as illustrated in Table 1.

Table 1 The Rank of dimensions of sustainable development of China (2020)

Issue Categories	Rank	Score*
Environmental health	**96**	**41.8**
Air Quality	137	27.1
Sanitation & Drinking Water	54	59.4
Heavy Metals	129	37.6
Waste Management	66	51.8
Ecosystem vitality	**156**	**34.4**
Biodiversity & Habitat	172	19
Ecosystem Services	90	34.3
Fisheries	31	18
Climate Change	103	46.3
Pollution Emissions	91	58.6
Water Resources	67	9.4
Agriculture	55	49.5

* 0 = worst and 100 = best

Source: Environmental Performance Index (2021).

5. Current Targets for Air Quality and Emissions

Looking at all these developments, trade liberalization has brought about economic development, but has had negative impacts on the environment in China. Therefore, China made a 13th Five-Year Plan for Economic and Social Development that covers the years of 2016-2020. This plan covers the strong commitments to improve air quality and control emissions. The Plan emphasizes that the consumption from non-fossil fuels will increase from 12% of primary energy consumption in 2015 to 20% in 2020. In terms of air quality, while days of good or excellent air quality in cities at and above the prefectural level was 76.7% of the year in 2015, this ratio will be greater than 80% in 2020. The concentration of fine particulate matter will be reduced by at least 25% in 2020. The Plan describes the country's clean-air action plan as follows (National Development and Reform Commission (NDRC), 2016):

> We will formulate a plan for ensuring air quality standards in cities are met, strictly enforce obligatory targets, see that cities at and above the prefectural level achieve a 25% reduction in the number of days of heavy air pollution, and channel greater effort into reducing fine particulate matter emissions in key regions. We will establish a monitoring system to ensure that environmental protection standards for vehicles, watercraft, and fuel oil are achieved. We will work to increase the proportion of natural gas users in cities. We will strengthen monitoring of windblown dust from unpaved roads and construction sites and prohibit open straw burning. (p. 127)

As of 2019, 85% of China's energy consumption comes from fossil fuels, which clearly shows that the 20% share of non-fossil fuels in its energy consumption has not yet been met.

14th Five-Year Plan was approved on March 2021 that covers the years of 2021-2025. The plan allows peaking carbon dioxide emissions before 2030 and achieving carbon neutrality before 2060. The plan supports low-carbon development and the circular economy with new approaches to transport, power generation and waste management policies. Green development is located markedly in the Plan. The goals set for green development are as follows (Asian Development Bank, 2021):

- Declining of energy and carbon intensity by 13.5% for energy and 18% for carbon intensity per unit of GDP,
- Increasing the share of days with good air quality in cities to 87.5% (from 87% in 2020),

- Increasing the share of surface water at or better than grade III up to 85% (from 83.4% in 2020),
- Increasing the forest coverage up to 24.1% (from 23.2% in 2019),

The ratio of non-fossil fuels in primary energy consumption is adjusted to 20% (from 15% in the previous plan).

6. Conclusion

China is a major pollutant in the world. After WTO accession, China's economy is growing very fast, China's foreign trade and FDI have increased, and China becomes the largest exporter in the world with 2,64 trillion US dollars in 2019, consequently, its energy consumption has increased to 3367,7 mtep in 2019, and China's energy consumption comes from fossil fuels that cause carbon emissions. Therefore, CO_2 emission began to increase rapidly in parallel with the existence of debate over the implications of trade liberalization for the environment, especially since 1990s. Trade liberalization and increased openness are seen as a means of promoting economic growth for developing countries. However, a debate has existed over the implications of trade liberalization for the environment, especially since 1990s. There are two perspectives which are optimists and pessimists. Optimists see free trade primarily as a necessary factor for environmental improvement. According to them, trade liberalization leads to economic growth. On the other hand, pessimists see trade liberalization as the opposite of environmental protection. According to them, with the trade liberalization, increase in output brings a cost to the environment. Besides, comparative advantage can negatively affect the environment if a country's industrial structure prefers to specialize in pollution-intensive sectors. However, most studies found that trade liberalization results in some degree of environmental damage.

After economic boom, carbon emissions have increased and China is the country with the highest carbon emissions in the world with 10174 $MtCO_2$ in 2019. On the other hand, sulfur dioxide concentrations for China have decreased between 2005 and 2016, and according to projections, the amount of sulfur dioxide emissions will be decreased in China. However, the amount of sulfur dioxide emissions is still high. $PM_{2.5}$ pollution has become a serious problem in China due to rapid industrialization and high energy consumption.

According to Air Quality Index, of the twenty cities that have the worst air pollution in the world, seven are located in China, including Beijing. Beijing is one of the most populous cities in China with a population of more than 20 million. Beijing's GDP has increased tenfold in the last 20 years. Beijing's air quality is under enormous pressure from economic development because the consumption of vehicles and energy in the country is growing significantly (Textor, 2021). Because of this extensive air pollution, China is ranked 120th among 180 countries by EPI as of 2020. Air quality is the China’s worst performance in sustainable development after biodiversity and habitat.

As part of the fight against carbon emissions, China officially launched a national carbon trading market on July 2021. In this context, the national emissions trading scheme (ETS)[9] initially targets carbon emissions from the energy sector. With the ETS, China aims to control CO_2 emissions and decarbonize the industry. Besides, China makes strong commitments to improve air quality and control emissions within the framework of its Five-Year Plans.

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[9] An ETS limits the overall level of greenhouse gas emissions and allows low-emission industries to sell their extra allowances for larger emitters. An ETS creates a market price for greenhouse gas emissions by creating supply and demand for emissions allowances. The cap helps ensure that the necessary emissions reductions are achieved to keep emitters (in total) within their pre-allocated carbon budgets (World Bank, 2021b).

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