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China, Climate Action

### **Effects of and Potential Solutions to Climate Change in China**

The People's Republic of China is the most populated country on Earth and possesses one of the fastest growing economies in the world. As a result of China's substantial population and decades of rapid economic growth, the nation requires large amounts of energy to function and is the world's largest consumer of energy. In addition, China emits more carbon into the atmosphere than any other country on Earth. China's use of fossil fuels and nonrenewable energy sources is leading to climate change, pollution, and food insecurity. By investing in renewable energy sources to replace fossil fuel usage, reversing deforestation, and ensuring all citizens have access to clean energy, China can greatly impact climate change and improve the lives of not only its own citizens but the rest of the world.

The majority of Chinese families fall under the nuclear structure, with an average of 2.62 people per household (Li, 2021). In addition to nuclear families, several families in China consist of the linear structure. These households contain three generations or more: typically two adult parents, their children, and their own elderly parents. 61.428% of the population lives in urban areas whereas 38.572% lives in rural towns (World Bank, 2018). In general, those living in urban areas live in apartments, and those in rural areas live in houses. Children are required to attend primary school and the beginning of middle school; these school years are state-funded. However, higher education must be paid for and is a barrier to some Chinese citizens to furthering their education (InterNations, 2022). The typical diet in China usually consists of fresh fruits and vegetables along with meat. Rice and noodles are staple foods and are present in many meals (Lin, 2000). 56.079% of Chinese land is agricultural, and rice, maize, wheat, and potatoes are major crops (World Bank, 2018).

100% of the population in China has access to electricity, the result of years of attempts to completely electrify rural areas (World Bank, 2019). Only 83% of the population has access to safe drinking water. China contains 20% of the world's population but only 7% of the world's water (Facts and Details, 2014). In addition, China has an unemployment rate of 4.2% (Statista, 2020). The average salary for urban employees is 97,379 yuan, or \$15,361.89 USD (Textor, 2020). While only 0.6% of the nation's population is impoverished, the Chinese poverty line is significantly lower than other upper mid income countries at less than \$2.30 per day. To put this figure in context, the World Bank's poverty line for upper mid income countries is \$5.50 per day. According to the World Bank's figure, a total of 24% of Chinese citizens live in poverty (Buchholz, 2021).

The usage of nonrenewable energy sources and carbon emissions is a huge problem in China. China uses more coal than the rest of the world combined, and coal fuels 60% of the Chinese economy. As a result, China is also the largest emitter of carbon dioxide in the world. About 80% of carbon emissions in China are from coal (ChinaPower, 2022).

In addition, the usage of nonrenewable energy sources such as coal and oil in China has caused several Chinese cities to suffer from intense air pollution. In particular, the burning of coal and oil releases sulfur dioxide, a compound that can cause acid rain. Acid rain can contribute to deforestation and is harmful to aquatic ecosystems. Sulfur dioxide exposure is also a risk factor for respiratory illnesses. A 2018 study found that the odds of death are increased by almost 1% with every increase of sulfide dioxide exposure of 10- $\mu\text{g}/\text{m}^3$  (Zhang et al., 2018). Furthermore, 36% of China's population was exposed to harmful emissions from household burning of coal in 2020 (State of Global Air, 2020).

As the globe's average surface temperature rises, the Himalayan mountain range will be significantly impacted. Over 30,000 glaciers are located in the Himalayas (FutureLearn, 2021). Researchers state that a rise in global temperature of four degrees Celsius could cause rapid glacial melting. In the mountainous regions of China, the melting of glacial lakes could cause flooding and mudslides (Chih-Yin Lai, 2009). In addition, the sea level is rapidly rising near the Chinese coast. Millions of Chinese in cities such as Shanghai, Tianjin, and Hong Kong could be displaced by the rising sea level (Chih-Yin Lai, 2009). China has also faced an uptick in natural disasters such as cyclones, droughts, and avalanches (Chih-Yin Lai, 2009).

Furthermore, glacial melting could shift the pattern of the Yangtze River's sources, decreasing the Yangtze's runoff by 25 percent. A decrease in the Yangtze's runoff will potentially harm the wetland ecosystem in Qinghai, one of China's major migratory bird habitats (Chih-Yin Lai, 2009). As more carbon dioxide enters the Earth's atmosphere, coral reefs on China's coast will also be impacted. Carbon dioxide released by fossil fuels reacts with water to form carbonic acid. This will lead to the degradation of coral reefs – home to over 4,000 fish species and other marine organisms – as coral is very sensitive to pH changes. Even a slight decrease in the ocean's pH has the ability to slow coral growth and cause coral calcification (Chih-Yin Lai, 2009).

Climate change will also have a distinct impact on food security in China. Rising average temperatures are decreasing wheat output, and less rainfall is harming the growth of three of China's major crops: maize, wheat, and rice. In addition, the ocean's decrease in pH is causing a loss of biodiversity, including fish. The fishing industry is a large part of China's economy, as China is the world's largest producer of fish (FAO, 2022). If the fishing industry in China collapses, over 14 million people could be at risk of losing their job (FAO, 2022).

The Chinese government is very focused on limiting climate change as much as possible. Currently, China is the world's leading investor in renewable energy, and the nation pledges to be carbon neutral by 2060 (Stalley, 2021). Between 2016 and 2020, China exceeded most of its targets during its Five Year Plan (Stalley, 2021). Furthermore, President Xi Jinping stated that China will stop financing coal plants in other countries in 2021 (Stalley, 2021). While China has exceeded most of its targets for renewable energy, the nation's goals are simply not ambitious enough. Targets set by the Chinese government tend to be too soft to meet the global goal set by the Paris climate agreement of keeping global warming below 2 degrees Celsius (Stalley, 2021).

The first step to solving China's climate change crisis is to replace the usage of coal and other fossil fuels with renewable energy sources. In particular, hydroelectricity, wind power, solar

power, and biomass can be used to phase out the use of nonrenewable energy sources. In addition, deforestation must be reversed. Not only must China protect its current forested land, but more trees need to be planted to restore as much of Chinese forests as possible. Finally, the Chinese government must ensure that those who live in rural areas are provided with clean renewable energy to prevent them from burning their own energy.

For China to be able to be powered completely by renewable energy, a variety of renewable energy sources must be used. In particular, hydroelectricity, wind power, and solar power will be crucial in China. Researchers from Harvard, Tsinghua University, Nankai University, and Renmin University of China have found that solar power alone could account for 43.2% of China's power in 2060 (Burrows, 2021). Solar power has also proven to potentially much cheaper than previously thought – solar power could supply electricity at less than two and a half U.S. cents per kilowatt hour, according to the researchers (Burrows, 2021). Coal, on the other hand, costs from 3.6 to 6.5 cents per kilowatt hour as of 2019 (Burrows, 2021). As the production of solar power costs less than power from coal, the Chinese government should be able to push for more ambitious policies to increase the construction of solar panels and limit coal plants. Furthermore, the costs of hydroelectricity and wind power are even less per kilowatt hour, with hydroelectricity at \$0.04 per kilowatt hour in Asia and onshore wind power at \$0.06 per kilowatt hour (Hydro Review Content Directors, 2018). Therefore, price should not be a large issue in the implementation of renewable energy usage.

Though price of the energy itself ideally should not be a huge obstacle to the usage of renewable energy, solar power, wind power, and hydroelectricity are limited in where they can be harnessed. The majority of sources for renewable energy are located far from China's cities. Unlike coal, renewable energy cannot be transported simply by vehicle. A huge system of powerlines spanning the country would be required to transport the energy. Powerlines from Qinghai, Xinjiang, and Yunnan to Beijing, Chongqing, and Jiangsu hold the energy equivalent of ten power plants, so they must be strung high off the ground. The project would be very expensive in both time and money, costing \$300 billion and 30 years to construct (Bloomberg News, 2021). While the project is expensive, it is completely necessary to accomplish China's renewable energy goals.

Only around 23 percent of China is currently forested, a sharp rise from just 8.6 percent in 1949 (People's Daily Online, 2021). Reforesting China will play a large role in combatting carbon emissions, as forests and plant life reduce carbon dioxide emissions in the atmosphere. The Chinese government has already banned logging in natural forests and has designated \$10 billion for reforestation projects (Facts and Details, 2012). In northern China, a so-called green belt of strips of trees ranging 4,500 kilometers has been planted, as was another green belt in southern China (Facts and Details, 2012). Reforestation is an area China is currently succeeding in, and this success must continue indefinitely to help combat carbon emissions.

A final step in stopping climate change in China is to ensure that all people in rural China have access to clean energy from renewable sources and choose to use renewable sources to prevent the burning of coal. Currently, many rural farmers reject the usage of renewable energy as they are not aware of its advantages (Yang et al., 2015). A potential solution to this is the Chinese government teaching rural farmers about its benefits and publicizing renewable energy's

advantages. In addition, the government should create more strict policies on renewable energy usage in rural areas. Finally, the government must finance rural renewable energy projects (Yang et. al, 2015).

Potential education programs could range from placing more focus on climate change and renewable energy in grade school curriculums to offering free lessons on the benefits of clean energy to adults in rural areas. Renewable energy projects would include installing technologies such as solar panels and wind turbines to power rural areas. This would require a slow change. For instance, first government and public buildings such as schools could be moved to renewable energy sources. As an area grows more used to renewable energy sources, the rest of the town including stores and homes could be added to a power grid running on clean energy. Ultimately, the responsibility of funding such projects would rely on the Chinese government. To acquire the funds, taxes would have to be raised or the government would have to cut spending in other areas.

There are also ways Chinese citizens and organizations can help to reduce the nation's carbon footprint. For normal citizens worldwide, the one of the simplest methods of reducing their carbon footprint is to lessen the use of personal automobiles. In 2021, China had a motor vehicle population of 390 million (Chi, 2021). When possible, carpooling, walking, or public transportation as opposed to driving a personal car will result in contributing less carbon emissions.

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