

Emilia Suarez  
La Salle Institute  
Troy, NY, USA  
China, Renewables

## **China: A Sustainable Alternative to Fossil Fuels**

The country of China is a large producer of materials. A large majority of items that most people use on a daily basis are made in China. A large amount of fossil fuels go into the production of these goods. That impacts the air quality of China and the rest of the world. Making the energy in China non fossil fuel based will help decrease the greenhouse gasses emissions.

The population of China is just under one and a half billion(World Population Review). The percentage of people living in rural China is only 38.57%(Trading economics). China is a one-party communist dictatorship. China is separated into 22 provinces, 5 autonomous regions and 4 municipalities(Shivili). 56.8% of land in China is dedicated towards agriculture with its main export being automatic data processing machines. Due to the pandemic China was the lead supplier of personal protective equipment worldwide. They manufactured 224,200,000,000 face masks and 33,000,000,000 protective suits(Ma). The majority of farms in China are less than 2.5 acres. This is one of the smallest average farm sizes across the world (World Population Review). In Northern and Western China it is extremely dry, desert-like conditions. While in the Southern parts of China it is the opposite with a large amount of rainfall. China is two thirds of mountains and high plateaus. Western China has the highest elevation(Ebrey).

A typical household in China has 2.62 people(Textor). This is partially due to the law where a family can only have one child. A typical Chinese diet is low in meat and fish. It is high in vegetables and has a large amount of starch through noodles and rice(Cheung). This food is bought in a variety of ways. The largest amount being e-commerce grocery shopping in China. The growth of e-commerce was enhanced by the state of the global pandemic and the convenience(Hirechina). Due to the rapid industrialization of China there have been major food shortages and food safety issues. There have been a large amount of environmental issues when it comes to producing more food in China. This is due to there simply not being enough(World population Review). There is not enough land, nutrients and the climate is not ideal for growing crops. China is focusing towards service based instead of the previous manufacturing based economy. One of the most popular jobs in China for foreigners is teaching(Meng). China's healthcare is not set through the entire country and is instead based on a three tier system allowing the country, towns and villages to each have a set of rules. This can lead to a large variety of variation throughout the country in price. Education in China is mandatory for all children up until year nine. They have free education in grades one through nine with some additional fees added. Senior secondary school is grades ten through twelve. This is not free or mandatory. The same goes with a college education(Education in China). There is access to clean drinking water, electricity roads and markets throughout the country including the urban areas(Shen).

With China being such a large consumer of the earth's resources and a large manufacturer it is vital to make their energy consumption sustainable (US energy Information). China uses almost enough energy equivalent to 3,300,000,000 tons of oil in 2019 and emits one quarter of the world's greenhouse gas. Due to the incredible severity of this situation there is a push in China to completely cut all coal(Lam). The issue of not using renewable resources is the air pollution that is emitted from coal. This affects every citizen of China no matter the level of economic stability or their location. This is a problem across the world too, not only in China. Air pollution is attributed towards the cause of premature death for 6,700,000 of people each year. 363,000 of those premature deaths were in China. The Air quality index or AQI is scored 0 through 500, 500 being the worst. The AQI in Beijing in 2020 got as high as 262

and in Shenyang as high as 292. To put that into perspective a value over 100 is considered unhealthy to breathe(O'Meara).The life expectancy of each Chinese citizen has decreased one and a quarter years due to the sheer amount of air pollution that each person breathes in each and every day(Air Quality in China).

Xinjiang is where the Uyghyr population in China lives. This is also considered the unhealthiest region of China due to the impacts of the air and water pollution along with the general ecological damage that has been done to the area(Yin). The life expectancy in 2000 was only 67 years old while that same year in the whole of China it was 70.58. The region of Xinjiang also has poor access to healthcare since most health care is in urban areas(O'Neil). The environmentally unsustainable practices are affecting this minority group even more so than other chinese citizens. Since there are so little Uyghur people left they need to be protected instead of harmed. Uyghur's are an ethnic minority that is harmed by Chinese policies.

The solution that can be proposed to put into place is a dual use solar plus agriculture system. This would involve a system of solar panels that rest above a low light crop. There are many varieties of food that can grow with a small amount of sunlight. A good example of this is broccoli. It is native to China and is heat resistant along with the ability to grow in the winter through most regions in China. The next hurdle in this plan is harvesting(Scull). Due to the majority of crops being picked by hand with machine assisted technology there would need to be a way for the harvester to access the crop. For this issue a solution is a raising and lowering system. The panels would be able to go up and down through the poles on the edges of each row. They would be extendable so that a person could go underneath but would also be able to be lowered down in case of a maintenance problem. Irrigation would also be incredibly simple with this system. This is because sprinklers can be attached to the underside of the solar panel. This can also be changed as needed with simple programming of the sprinklers based on the amount of water that is reaching the plants through rain. While robotic harvesting technology may be a solution down the road, since farms are so small it makes sense to change the height of the panels to allow family labor to harvest.

This system could also be used for animals such as sheep or chickens. Sheep solar is already being put into place across the world. It is very easy to do since the sheep do not disturb the solar panels and they get a large amount of space to graze and they have shade from the panels. The chickens would be slightly more complicated as they can slightly fly. It is engraved in their minds that they need a spot to roost during the night time. However the average chicken can only get up around four feet off the ground and their flight time maxes out at ten seconds(Patterson). This means that a very easy solution to this is making the panel higher off the ground. They would also need the ability to go up and down for any possible maintenance issues. Two of the major problems in China are a lack of clean energy and growing industrialism with nothing to back that up. Solving two issues; improving food security while improving the environment through the production of renewable energy would greatly benefit the chinese.

This solution does not take away any farm land and allows the farmer a secondary form of income which after install they have to do little to no work on.This project should be encouraged by the government by giving a form of financial compensation for using green energy. It would be up to individual farmers and organizations to put into place these tactics. Farmers would need to agree to put up these panels on their space and to take care of them and the other crops or animals placed with the panels. Organizations would be able to make a deal and provide these panels then take the energy and get in on the grid to replace coal. China would need to take action to ensure that there was little to no coal being used and little to no fossil fuels being used, which reduces greenhouse gas emissions and also reduces air pollution. Fossil fuels are currently the less expensive option so people are going to choose fossil fuels until renewables are more of an option. That opportunity needs to be taken away in order to lower the AQI. This is a relatively simple solution. The technology in place has been developed. All that is left to

do is to put it together in a way that saves space and ensures continued food production in this over populated country.

A solar and agriculture system is the design of the future. There is only so much land on earth. If land does not become dual use, human civilization will not be able to progress. As China is one of the industrial countries in the world, making the grid green will save millions of lives and help to progress our world.

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