

Noah McLeod
Global Impact STEM Academy
Springfield, Ohio
China, Factor 6: Sustainable Agriculture

China: Ditching Pollution for a Brighter Future

Today's world is full of pollutants and contaminants that have the potential for great harm, and in no place is this more evident than in China. Vast cities and mountains are being covered with smog, causing the death of thousands. Once flourishing forests are now memories and the water that allowed life has become a poison to those who need it most. Where a pinnacle of diversity stood, a gray and crowded land stands. It is a destruction that has been occurring since the first Chinese emperors took power, but is only now being truly noticed (Hutchison). It is a disease on the land that, if allowed to go on, will cause even greater tragedy. If this sickness is to be cured before it is too late, China must turn its focus inwards, towards the conservation and sustainability of its natural and agricultural resources.

It is currently estimated that almost 97% of the forests that once covered the Asian East Coast have now been destroyed due to deforestation. ("The Problems of Deforestation in Asia"). One of the most severe problems the country faces, deforestation has been a major part of Chinese history and expansion, typically used to make room for farms and cities. As the number of people grows, more trees are cut for homes, farmland, and resources. Historically, forested lands were also lost through the raising of dikes, which was a common practice for Chinese rulers as it caused the land to flood and become usable for growing water-needy crops. As time progressed, many farmers also raised smaller dikes in hopes of improving their own land. This was illegal, but local leaders were often paid to keep the dikes a secret (Hutchison). This manipulative irrigation often caused areas upstream to be left without water, causing fauna and flora to suffer and creating problems such as soil erosion which had the potential to contaminate other sources of water; essentially producing a snowball effect.

Erosion caused by poor farming choices continues to pollute major water sources today, as do pesticides, waste chemicals from factories, and waste dumped by people using the water. These pollutants are killing fish and other vital organisms living in China's rivers and lakes, making the once flourishing resource a shadow of its once former glory. The water harms the plants and animals, the soil, and the people who depend on it to live. This pollution has caused a cancer epidemic to rival that of the United States; and for the thousands who are dependent on natural water sources, they have no choice but to continue to use the contaminated water even as the death toll continues to rise. Wells are not safe from this pollution either. A recent study done by China's Ministry of Water Resources found that "32.9 percent of wells tested across areas mostly in Northern and Central China [have] Grade 4 quality water, meaning that it [is] fit only for industrial uses... an additional 47.3 percent of wells [are] even worse, Grade 5 (Buckley). The most common chemicals found are manganese, fluoride, and triazoles (a compound used in fungicides). Luckily, for the millions of people living in cities, which use much deeper wells than those in rural areas and the countryside, the water has not yet been found to be contaminated (Brubaker).

Even as they don't have to worry about pollution in the water, residents of Chinese cities have their own problems, specifically in the air. In 2014, burning coal made up over 73% of China's electricity production. The country is currently the world's leader in burning coal, burning more than the rest of the world combined (China Statistical Yearbook-2015). Coal plants densely cover the Asian East Coast,

spewing dust and deadly toxins called PM2.5 into the atmosphere. It is this dust and toxin that, in more days than not, create a gray fog that covers the majority of the country's cities. This fog blocks out sunlight and forces residents to wear masks in an attempt to protect themselves from the harmful vapors.

PM2.5 stands for particulate matter that range in size from 2.5mm or smaller (Eisenberg). These particles can enter humans through the respiratory system, where it then proceeds to clog the throat and lungs. Prolonged exposure can also allow PM2.5 to enter the bloodstream and clog important bodily highways, including the heart. So far, over four million Chinese have been diagnosed with cancer, had heart attacks, reduced lung function, or died due to air pollution ("Particle Pollution (PM)"); and many babies have also experienced birth complications, birth defects, and even death due to pollution entering their bloodstream in the womb from their mothers (Eisenberg). It is a major crisis, especially considering there are no enforced regulations on power plant emissions within the country.

The next largest source of carbon dioxide pollution is car emissions. Over the past decade, the Chinese car industry has exploded. According to the Wall Street Journal, Shanghai alone "...delivered a total of 1.79 million passenger vehicles—sedans, sport-utility vehicles and minivans—to dealers in the world's largest auto market [in May of 2016 alone], up 11% from a year earlier." Unfortunately, a large portion of these cars are not built up to environmental safety regulations, specifically without CO2 filters, causing the vehicle to put out incredible amounts of harmful gases. By itself, a diesel truck without a filter emits 500 times more pollutants into the air than a diesel truck that meets regulatory standards (Eisenberg). Companies are able to do this because they are currently protected by loopholes within Chinese law that keep them safe from the plethora of angry citizens, especially truck drivers, who are looking to sue because of health problems caused by the lack of these filters.

While the loss of forests and pollution in the water and air are easy to see, a deeper and possibly more dangerous problem has been created, one that goes typically unnoticed: an extreme lack of biodiversity within China's ecosystems. Plants and animals alike are dying from the contaminants filling their ecosystems and destroying their homes. Poaching and overhunting are also an issue; as people begin to find that their water is not safe to drink and that their supply of food is dwindling, they turn to poaching as a way to make money (Lallanilla). This leaves only plants and animals capable of adapting to the new, toxic world alive, a population that is frighteningly less diverse than it was before. China originally made up 10% of the world's biodiversity, a vast populace estimated to be losing species at a 50 to 100% higher rate than that of the global average (Patience). While it is still possible to reverse much of the damage that is being done, China does not have much time left before it loses one of its greatest resources. One of the most major potential consequences of losing biodiversity in the country's natural ecosystem is famine. A famine would result in catastrophe for a country already grappling with a malnourished and overcrowded number of almost 1.371 billion people and would not only devastate those living in the country but also people around the world (Age Dependency Ratio (% of Working-Age Population)). Millions would die of starvation.

All of these issues can be connected to a lack of sustainability in China, both in its natural resources and agriculture. Sustainable agriculture is the practice of producing food and other plant/animal products using farming techniques that work to protect the land's natural resources and long term productivity ("Sustainable Agriculture – The Basics"). Without it, the world's natural resources would have run out

years ago due to overuse and abuse. Because of the concept of agricultural sustainability, countries are now able to farm and produce goods efficiently, while protecting the vital resources so that they last for future generations. This concept appears to have been lost in China and the country is beginning to see the direct results of their harmful practices.

The path to achieving agricultural sustainability begins with farming practices, which in this case is due to a lack of education. Chinese farmers, especially poor farmers, are not typically educated in sustainable farming practices, causing them to have poorer crop yields than their educated counterparts (Riesselman). This lack of education also creates an unawareness for those farmers that they are doing such harm to the land. By teaching sustainable practices to these farmers, not only would environmental health increase but also crop yields. An example of one such practice is crop rotating. The farmer rotates the type of crop he or she plants on their land each year. This protects the plants from acquiring diseases, increases nutrients in the soil, and helps in maintaining crop-destroying pests (“Sustainable Agriculture Techniques”). Another technique is the use of natural fertilizers instead of manufactured chemicals. While the rotation of crops helps greatly in replenishing nutrients in the soil, there is still a need for fertilizers to boost the soil and the farm's productivity. Natural fertilizers could be easily created through a compost pile made up of food scraps, animal manure, and dead plants. If treated correctly, human feces would also be an option.

Despite the smell, human feces is a very effective and extremely plentiful fertilizer. The production of human waste fertilizers could be made at sewage plants and then sold at low prices to farmers to use. A waste-to-fertilizer program could have the potential to create hundreds of jobs as production facilities would have to be made and run, pipes installed or updated to transport the raw waste, regulations put in place with officers hired to inspect for and enforce, and drivers hired to ship the fertilizers to farms. This would also benefit farmers, who could either be given subsidies for giving their waste or offered a lower price for the fertilizer. Using human waste fertilizer, or other natural fertilizers, would also decrease the amount of dangerous pesticides and other chemicals entering the waterways, causing overall water quality to improve and the number of people becoming sick and dying from pollutants in the water to also decrease.

Some argue that feces is still unsafe for humans to use even after being treated, but it is important to note that no evidence has been found to support this claim, as well as the fact that people have used human manure as a fertilizer throughout all of history, especially the Chinese (Geiling). Though it caused disease to spread due to the fact that it was untreated, some Chinese farmers were still using human manure to fertilize their fields even up to the mid-1900's. Due to the commonality it has had in China, it's highly likely that the use of human manure would not face the same opposition it has received in the U.S. Overall, starting a program that produces safe human waste fertilizer, as well as encouraging the use of other natural fertilizers, would be extremely beneficial to farmers and China as a whole.

A final sustainable practice is the use of cover crops. Cover crops are crops planted during the off season when normal crops are not able to be grown. These plants help suppress weeds, prevent erosion of the soil, and actually increase the nutrition levels of the field (“Sustainable Agriculture Techniques”). Depending on what is planted, these crops can be used for grazing livestock, harvested for food and animal feed, or tilled into the field for extra fertilizer. Growing these plants could greatly increase the productivity of Chinese farms, as well as help control China's problem of erosion. Less erosion, farming

chemicals, and other waste being dumped into the waterways would allow native plants and animals the ability to survive or possibly be reintroduced in the ecosystem. Regulations on fishing and the use of natural waterways would only be a greater benefit to China, as there are currently no regulations or laws that protect water. As a result of these actions, the overall health of the thousands of people who depend on that water would increase, decreasing the spread of cancer and other diseases.

The next step in solving this environmental crisis is enforced regulation on factories and energy production facilities. China is known for its lax policy on regulation codes, a policy which is hurting both the land and the people. Enforcement and harsh punishment need to be dealt out to those that have caused much of the damage that is being seen today. New regulations are also needed, specifically on farming chemicals and techniques, waste management, and for the use of natural waterways. The U.S has regulations on water usage, waste, and requires training for farmers who want to use pesticides on their crops, only good could come from China doing the same (“Agriculture: Laws and Regulations That Apply to Your Agricultural Operation by Farm Activity”).

A sizable deterrent for change in China is its own governmental focus on the economy. China’s economy skyrocketed in the early 90’s when Jiang Zemin, the country’s leader at the time, privatized much of the country’s economy. Since then, their economy has experienced tremendous growth, growing at an average of 7.8% over the past five years (“China Economy - GDP, Inflation, CPI and Interest Rate”). Increased environmental regulations and enforcement, along with a larger focus on education, has the potential to do great harm to this growth. It is believed that this potential harm to the economy is what has caused so little action to be taken so far. Regulations would start a rise in unemployment and a decrease in wages as companies scramble to meet the new standards. Companies that receive fines would be under an even greater burden and could possibly go out of business. Many businesses may also leave the country in pursuit of greater freedom. It is understandable that the government is hesitant to shift its focus from economy to environment, but it is a change that is necessary. And while focusing on the environment does mean that the economy may not be as powerful, it doesn’t mean that it would have to take a major hit either. Educators, government regulators, environmental advisors, lawyers, construction workers, truck drivers, manufacturers, and law enforcement officer positions would be in higher demand. It would be a give-and-take for the Chinese economy, but well worth the price.

A step in the right direction would be to pursue a greener energy economy. China currently burns more coal than the rest of the world combined. This mass consumption of coal, along with other fossil fuels, is one of the largest contributors to air pollution in China and is greatly responsible for the smog that settles over the country more days per year than not. Efforts have already been made by the Chinese government and other organizations to make the switch from fossil fuels to green alternatives. The Chinese government began hiring contractors to build wind turbines in the wind filled regions of Northern China in 2011. The industry soon exploded, and more turbines were being built per year than anywhere else in the world. Yet China has halted the program on four different occasions. The problem is one of priority. In 2015, the turbines produced over 30 billion kilowatt-hours of electricity, but much of it ended up going to waste because industrial expansion was chosen over building enough power lines to transfer the power (Liu). The country has grown their economy and achieved the goal of becoming a world power; it needs to turn its full priority from further economic power and focus on the environmental problems it has created before it is too late to reverse what has been done.

A final step is to address the growing problem of deforestation, which in turn is a direct result of an overcrowded population. An answer to this loss of natural resource comes in two parts, involving nature reserves and a positive public view of nature. If nature reserves were created, similar to the hundreds that are located within the U.S., China would be able to protect vital ecosystems, create jobs, and give citizens a great recreational resource. While creating a positive view of nature may be a vague goal compared to setting up nature reserves, it is arguably more important and is something that is already deeply integrated in the history of Chinese culture. Chinese art has always expressed the beauty and mystery of nature, and many religions within China are based around nature and its aspects (“Nature in Chinese Culture”). If the government of China propagated this idea and heavily encouraged a naturalistic lifestyle in its citizens, similar to how the Chinese government ran programs to slow its population growth, it could then cause the people to change their views on the environment. People would become more aware of the impact they have as individuals; this awareness can then lead to involvement. Rooftop gardens, recycling, and buying eco-friendly products are but a few examples of ways that individual people can help the environment. If even half of the population in China did one thing to make their lifestyles more eco-friendly, it could have massive positive effects. And in the end, having its citizens onboard with becoming more environmentally and agriculturally stable would make the government’s job easier by a hundredfold. It’s a trail of dominoes; all it needs is the right push.

Unfortunately, even if the government pushes for a greener position it still faces the problem of its skyrocketing population. Asia’s eastern coast has attempted to control its population growth in the past but has not been successful in the long run. As of this time, there is no real solution to this rising issue. One thing is clear though; the resources of space, food, water, and energy must be made sustainable if the population is to be able to thrive. Addressing these resources, the first item is the issue of space. All living things need space to live and grow, especially people. Space within cities and farms need to be maintained efficiently. Taller buildings, the recycling of buildings, and good space management all contribute to this. Food is also affected by space. The increased productivity and sustainability of farms means that farms do not have to be as large, creating more space for forests. Sustainable farms and more forests translate to a healthier ecosystem, which in turn causes the flora and fauna to increase in numbers and health. With a higher crop yield and healthier population of animals, specifically in the water, there is more food for the growing population to then eat. And just as the United States buys food from other countries to help feed its citizens, so too could China to relieve stress on farms and companies. People being close together and efficiently managed means it is also easier to regulate waste as well as decrease the need for personal transportation because everything is very close. This, along with greater sustainability of farms and more regulation on factories, translates to less pollution in the water as well as the air. Lastly, energy can be created by harnessing the massive amounts of wind in China, eliminating a large amount of reliance on toxic fossil fuels and increasing the overall health of the land and those using it.

Pollution is a global issue, one that is felt nowhere else like it is felt in China. If the country cannot accept a policy of conservation and sustainability for its natural and agricultural resources, it could face an ecological crash that may never be able to be recovered from. It is a problem that has snowballed since the first Chinese emperors. Hundreds have already died from cancer and disease, obtained through the same water that they depend on to live. Poor farming practices are washing the soil away, further contaminating the water and killing what was once one of the most vibrant ecosystems in the world. Luckily for China, the damage done is not yet irreversible. The education of farmers on sustainable

agriculture techniques and the reduction of contaminants entering the ecosystem would contribute exponentially to feeding the ever expanding amount of people and make better use of valuable land. With quick and decisive action, the country can sustain its environment, its agriculture, its people, and its economy.

Works Cited

- “Age Dependency Ratio (% of Working-Age Population).” The World Bank, The World Bank Group, data.worldbank.org/indicator/SP.POP.DPND?end=2015&locations=CN&name_desc=false&start=1960.
- “Agriculture: Laws and Regulations That Apply to Your Agricultural Operation by Farm Activity.” EPA, Environmental Protection Agency, www.epa.gov/agriculture/agriculture-laws-and-regulations-apply-your-agricultural-operation-farm-activity.
- Albert, Eleanor, and Beina Xu. “China's Environmental Crisis.” Council on Foreign Relations, Council on Foreign Relations, 18 Jan. 2016, www.cfr.org/china/chinas-environmental-crisis/p12608.
- Brubaker, Richard. “China and Sustainability: Connecting the Dots between Economy and Ecology.” Sustainable Business Blog, Guardian News and Media, 10 Sept. 2012, www.theguardian.com/sustainable-business/blog/china-sustainability-economy-environment-ecology.
- Buckley, Chris, and Vanessa Piao. “Rural Water, Not City Smog, May Be China's Pollution Nightmare.” The New York Times, The New York Times Company, 11 Apr. 2016, www.nytimes.com/2016/04/12/world/asia/china-underground-water-pollution.html?_r=1.
- “China Economy - GDP, Inflation, CPI and Interest Rate.” FocusEconomics | Economic Forecasts from the World's Leading Economists, 15 Nov. 2016, www.focus-economics.com/countries/china.
- “China: Population Control Programs.” Country Studies, U.S. Library of Congress, countrystudies.us/china/34.htm.
- China Statistical Yearbook-2015. National Bureau of Statistics of China, 2015, www.stats.gov.cn/tjsj/ndsj/2015/indexeh.htm.
- Dudek, Dan. “To Understand China's Environmental Solutions, You Have to Think Big.” To Understand China's Environmental Solutions, You Have to Think Big, Environmental Defense Fund, 27 Dec. 2013, www.edf.org/blog/2014/01/03/understand-chinas-environmental-solutions-you-have-think-big.
- Eisenberg, Rebecca. “See It Here: Exclusive English Translation of Powerful Viral Chinese Documentary 'Under the Dome'.” Upworthy, Cloud Tiger Media, 4 Mar. 2015, www.upworthy.com/see-it-unsafe-because-of-pollution. “The Guardian, Guardian News, 12 Apr. 2016, www.theguardian.com/environment/2016/apr/12/four-fifths-of-chinas-water-from-wells-unsafe-because-of-pollution.
- Geiling, Natasha. “The Stink About Human Poop As Fertilizer.” Modern Farmer, Modern Farmer Media, 17 July 2014, modernfarmer.com/2014/07/stink-human-poop-fertilizer/.
- Hutchison, Patrick M. “Environmental Sustainability in China: A Historical

- Perspective.”Inquiries Journal, Inquiries Journal/Student Pulse LLC., 11 Nov. 2009, www.inquiriesjournal.com/articles/68/environmental-sustainability-in-china-a-historical-perspective.
- Lallanilla, Marc. “China's Top 6 Environmental Concerns.” LiveScience, Purch, 15 Mar. 2013, www.livescience.com/27862-china-environmental-problems.html.
- Lelyveld, M. (2016, July 18). China Faces More Air Pollution Deaths. Retrieved March 22, 2017, from http://www.rfa.org/english/commentaries/energy_watch/china-faces-more-air-pollution-deaths-07182016102937.html
- Liu, Coco. “Facing Grid Constraints, China Puts a Chill on New Wind Energy Projects.” InsideClimate News, 28 Mar. 2016, insideclimatenews.org/news/28032016/china-wind-energy-projects-suspends-clean-energy-climate-change.
- “Nature in Chinese Culture.” Heilbrunn Timeline of Art History, The Metropolitan Museum of Art, www.metmuseum.org/toah/hd/cnat/hd_cnat.htm.
- “The Problems of Deforestation in Asia.” GreenPeace, GreenPeace, www.greenpeace.org/eastasia/campaigns/forests/problems/.
- Patience, Martin. “China Wakes up to Biodiversity Threat.” BBC News, BBC, 15 Oct. 2010, www.bbc.com/news/science-environment-11544387.
- “Particle Pollution (PM).” Particle Pollution (PM), 31 Aug. 2016, airnow.gov/index.cfm?action=aqibasics.particle.
- “Sustainable Agriculture - The Basics.” GRACE Communications Foundation, www.sustainabletable.org/246/sustainable-agriculture-the-basics.
- “Sustainable Agriculture Techniques.” Union of Concerned Scientists: Science for a Healthy Planet and Safer World, Union of Concerned Scientists, www.ucsusa.org/food_and_agriculture/solutions/advance-sustainable-agriculture/sustainable-agriculture.html#.WEgg9OYrKMT.
- Riesselman, Adam. “China: Subsistence Farming and the Implications of Environmental Degradation.”
- Yu, Rose. “China Car-Sales Growth Reaches Five-Month High.” The Wall Street Journal, Dow Jones & Company, 13 June 2016, www.wsj.com/articles/china-car-sales-growth-reaches-five-month-high-1465808329.