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China and Natural Gas: The Importance of Natural Gas to China with Regard to the South and East China Sea Conflicts

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CHINA AND NATURAL GAS:

The Importance of Natural Gas to China with Regard to the South and East China Sea Conflicts

by

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ABSTRACT

Erin Foelker: CHINA AND NATURAL GAS: The Importance of Natural Gas to China with Regard to the South and East China Sea Conflicts (Under the direction of Dr. David J. Rutherford)

China has a strong interest in natural gas, as it is a resource of which usage can lead to economic growth, energy security, domestic social stability, and reduced climate change impacts. One of the best ways for China to gain easier access to this resource is to obtain legal rights to what they claim is their territory in the South and East China Seas. In this thesis, I review the situations in these two areas and I argue that natural gas is a significant motivator for the conflicts that are occurring.

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ACRONYMS

BCF- Billion Cubic Feet

BRI- Belt & Road Initiative

CCP/CPC- Chinese Communist Party

CSIS Center for Strategic and International Studies

PM- Particulate Matter

SCO-Shanghai Cooperation Organization

SECSR- South and East China Sea Regions

Chapter 1

Introduction

The conflicts over the South and East China Sea regions (I will hereafter refer to these regions collectively as the SECSR) are excellent examples of modern wars. Resources have always been a large reason for conflict, and they will become more so in the future. As climate change and excessive usage of non-renewable resources such as oil and natural gas continue to proliferate, resources will play a bigger part in conflicts between states. The SECSR conflicts have many different factors that agitate all parties involved such as nationalism and power, but this paper will focus on the desire to gain access to natural gas resources in both regions. Although it is not perfect in terms of environmental impacts, natural gas is an ideal resource to have easier access to for various reasons. This paper will specifically focus on various economic values of the resource.

The SECSR conflicts involve China, Japan, and various other Asian nations, and the regions have vast resources and strategic location benefits. China is motivated to grow its economy for reasons that will be discussed later, and gaining legal access to these resources would be very helpful to accomplishing this goal. One of the most abundant resources in the regions is natural gas, a fossil fuel that gives off much less carbon than others. Because China is significantly dependent on regions that face instability for fossil fuel access, and instability leads to price shocks, it would be in China's interest to have stronger energy

security and become more self-sufficient with its energy needs. This paper will go into more detail about how access to the SECSR would give help in China's economic growth.

Chapter 2

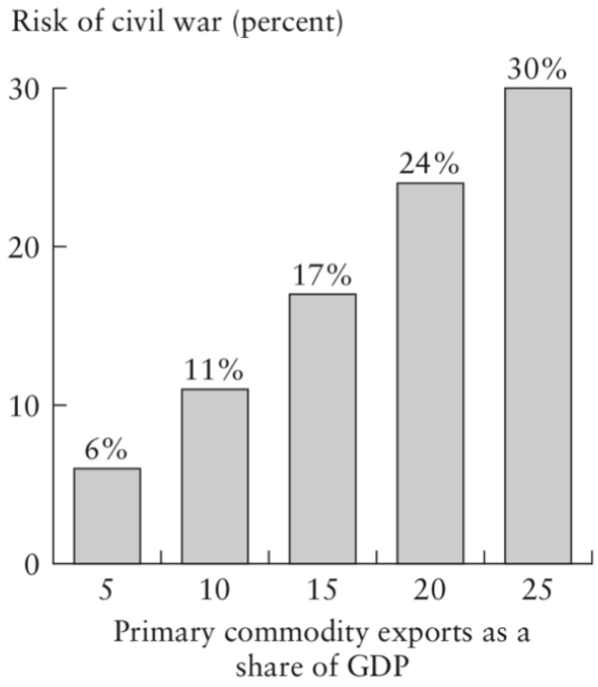
Background

The role of resources in conflict throughout history and in modernity

There are many factors to consider regarding the conflict over the SECSR. Much of the discussion is based on social, historical, political, and economic factors. However, the main goal of this paper is to take a deeper look into how the energy resources in the areas affect the conflict, and a brief overview of the general role that resources play in conflicts is necessary.

According to the Stockholm International Peace Research Institute's Arthur Westing, "Even when natural resources do not figure prominently as the cause of a war, they are often a contributing factor of some significance" (Sharp 2007, 323). Resources play a major part in two types of conflicts. One is the type such as the conflict in the Central African Republic that took place in 2013. According to an investigation conducted by Global Witness, the conflict was fueled by the logging industry, which funded the rebels ("Blood Timber", 2015). This is the type of conflict in which resources are not a core reason, but an added "fuel to the fire" so to speak. These conflicts are sometimes driven by the illicit practice of extracting and trading these natural resources (Harvey and Mooney, 2016). A report published by the World Bank compiled data that expressed that countries whose economies are primarily dependent on resources are more likely to have conflict (see

Figure 2A). The authors hypothesize that this is because rebel groups who lack funding have easy access to resources which can in part bankroll their operations (Bannon et al, 2003). It is important to note, however, that economies dependent on resources are more likely to have economic inequalities (as noted by Peter Lewis in the film (*Time to Choose*, 2016)), which are a source of conflict. The data that the authors compiled is probably illustrative of both of these phenomena.



Source: Based on Collier and others (2003).

Figure 2A. "Natural Resources and Conflict Risk in Low-Income Countries" (Bannon et al 2003, 3)

The second type of conflict in which resources play a role includes those such as the American Civil War, in which much of the conflict was driven by economic demand for cotton (Badkar, 2012). A point raised by Jackson and Morelli is "there must be some

plausible situations in the eyes of the decision makers such that the anticipated gains from a war in terms of resources, power, glory, territory, and so forth exceed the expected costs of conflict, including expected damages to property and life. Thus, for war to occur with rational actors, at least one of the sides involved has to expect that the gains from the conflict will outweigh the costs incurred" (Jackson and Morelli, 2019). It seems unlikely that the Chinese would engage actively in the SECSR if they didn't believe that they would gain enough of a financial return through the resources including those of energy. According to Professor Jin Canrong of Renmin University, in speaking of the East China Sea conflict, "the islands are seen as possessing much more strategic, military and economic value because they are about sea-lane security and they may hold vast stocks of hydrocarbons and fish" (Huang, 2012).

A third type of conflict occurs in cases such as those in the SECSR where there are conflicts between states over resources. Barbieri and Reuveny (2014) note that "Theorists then pose that states, especially major states, maximize their power relative to others and in so doing they compete over resources deemed crucial for power, including by using force. Decline in resources at home thus increases the risk of interstate war (Mearsheimer, 2001). Van Evera (2001) argues states compete in particular over cumulative resources, which he defines as those whose control can ease the acquisition and retention of more resources. This competition can lead to war. Lebow (2010) suggests diminishing resources due to limited stocks and climate-change impacts may increase security concerns and, therefore, the risk of wars in which competition over resources becomes the central objective." (788).

In all of the cases listed above, the resources fuel conflict because they are like a Willy Wonka golden ticket to power and economic growth. Resources have always been a

source of conflict, but because humanity found effective ways to extract said resources, they haven't been a source of conflict as much as they used to be, and in the 20th century conflicts were often related to cultural and political issues. However, as the materials that we extract without replenishing (e.g. water and natural gas) start to diminish and even run out, resources will again become more important in terms of conflicts. Natural gas is going to grow more and more important to all of the countries involved in the SECSR conflicts.

Background on the South and East China Sea

The main purpose of this paper is to illustrate the value of natural gas to China's economy and political system and the important role in that played by the SECSR. Consequently, it is necessary to explain the backgrounds and non-energy factors of the SECSI conflicts. Although there are differences in the two conflicts, they have notable similarities.

The East China Sea islands (called "Diaoyu" islands by China and "Senkaku" islands by Japan), are a small collection of rocks and "islets" (which are small islands) that are located at the edge of Asia's continental shelf where the shelf meets the Okinawa trough. They were claimed (along with the island of Taiwan) by Japan in 1895. After World War II ended, America gained occupation over Okinawa, and this included the East China Sea Islands for a time. For a while, there was not very much interest in the area, but in 1969 a report from the United Nations was published that showed the possibility of the existence of vast hydrocarbon resources in the East China Sea, which sparked interest. Eventually the US designated control over the islands to Japan through the Okinawa Reversion Treaty (1971), and China publicly denounced this action. For a time, the islands belonged to private

Japanese owners, but Japan officially purchased them in 2012, and there were protests in China (EIA, 2014).

China and Japan have been in a power struggle for centuries, and these islands are no exception. However, the recent history of their relationship is more complicated than a simple power struggle. There are many emotional scars left in China from the Japanese war, which makes this issue that much more complicated. Just to add to the complications, as the rest of the world has become more globally connected, so have these two economies. In 2006, China rose to the top of the list of Japan's trading partners (Yoshimatsu, 2011).

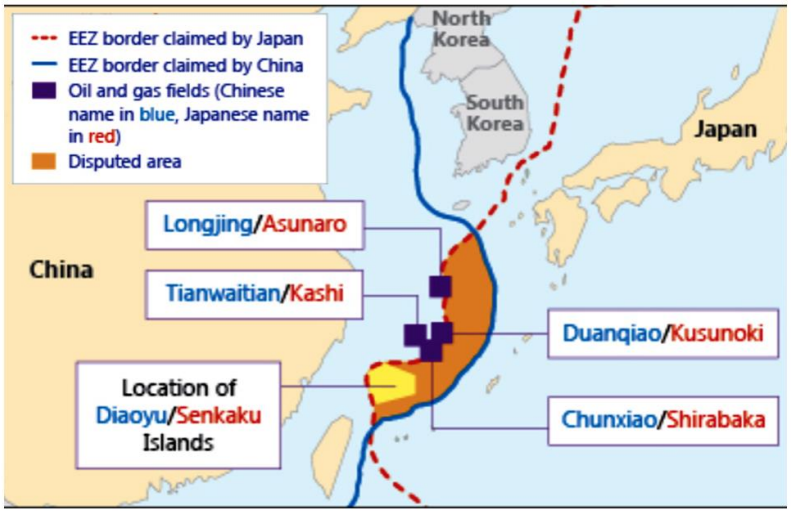


Figure 2B. Map that Displays Locations of EEZ Border Claims, the Islands, and Oil and Gas Fields in the East China Sea Region (Shek, 2019, Edited by David J. Rutherford).

Japan and China have been in conflict over a certain legal convention designated within the United Nations Convention on the Law of the Sea (UNCLOS) called the exclusive economic zone (EEZ) (Roy-Chaudhury, 2018). The EEZ designation would give the winner of the title rights to utilize the resources within the area, and ownership of the

islands would give credence to the legal argument in gaining the desired EEZ entitlement. As can be seen Figure 2B above, there is a large geographical discrepancy between the two versions of the EEZ borders.

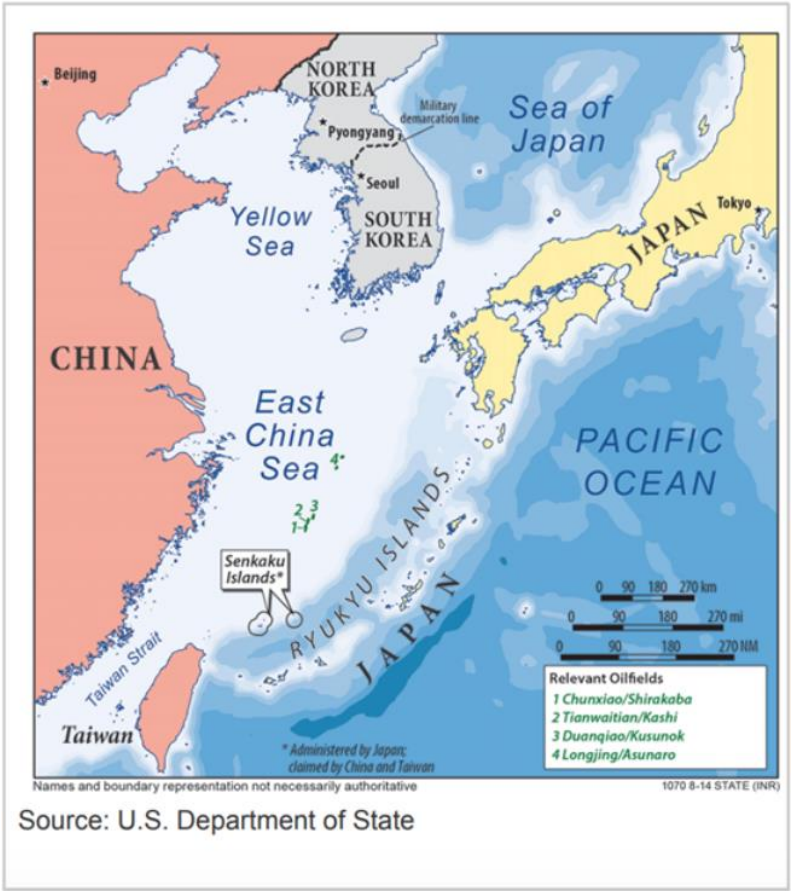
The UNCLOS states that the EEZ can either be determined according to the midpoint that exists between two countries or it can be seen as the point that extends 200 nautical miles from the coast belonging to said country, and the continental shelf also plays a role. The fact that there are two different legal arguments as to how to determine an EEZ has inflamed this particular conflict. China and Japan have conveniently applied the respective arguments that give more validation to their ownership of the islands. As Dr. Sun Shao-cheng, who is an expert in energy in Taiwan's Tamkang University said, "Japan took the median line principle, but China insisted on configuring its EEZ based on the prevailing continental shelf in the shallow East China Sea" (Huang, 2012).

Although there are currently estimates of the potential oil deposits located near the islands, it has been difficult to say with certainty how much there is, due to the fact that the area is known more as a potential natural gas powerhouse and the harsh climate that only allows for a short time period in which it can be tested for resources (Feng, 2012).

According to estimates provided by the EIA (2014), the area most likely contains around "200 million barrels of oil in proved and probable reserves" (2), although certain sources in China believe that there may be anywhere from 70 to 160 billion barrels. The EIA also states in the report that they estimate there is 1-2 trillion cubic feet of natural gas (including proved and unproved), while Chinese sources estimate that there may be 250 trillion cubic feet of natural gas reserves that haven't been discovered yet. The EIA report

cited the Oil & Gas Journal which stated that in January 2014, China had 155,400 billion cubic feet and Japan had 740 billion cubic feet of proven reserves of natural gas (3) (EIA, 2014). It is important to note that the estimates of resources in the East China Sea region may be misleading. Thrall (2013) believes that due to disputes over the EEZ lines, making accurate forecasts of the amount of hydrocarbon resources has been difficult, and makes important distinctions between "resource base", which he defines as "the expected volume of oil present in the ground" and "reserves", which he defines as "the amount of oil that is technically and economically recoverable, which is generally around 10 percent of the estimated resource base in the case of frontier deepwater." (Thrall 2013, 3). Thrall (2013) also states that if Japan had access to the area, building a natural gas pipeline in the East China Sea would be expensive and that said natural gas would probably be sent to a refinery in China to process. Another factor to note is that even though the majority of the hydrocarbon resources are located in uncontested coastal areas, I believe that there would be less legal gray areas and potential for conflict for Japan and China if one side had legal rights to the disputed areas.

The East China Sea hydrocarbon dispute reached a head in 2004 when China began the construction of a pipeline to the Chunxiao (Chunxiao/Shirabaka) field, which contains natural gas (see Figure 2C below). In 2008 they made an agreement to designate a joint development region for hydrocarbons, which is located on a part of the median (according to Japan) line (Watkins, 2008) (Figure 2C).



Source: U.S. Department of State

Figure 2C. Locations of Oil Fields in the East China Sea with Chinese/Japanese Titles (EIA 2014, 2).

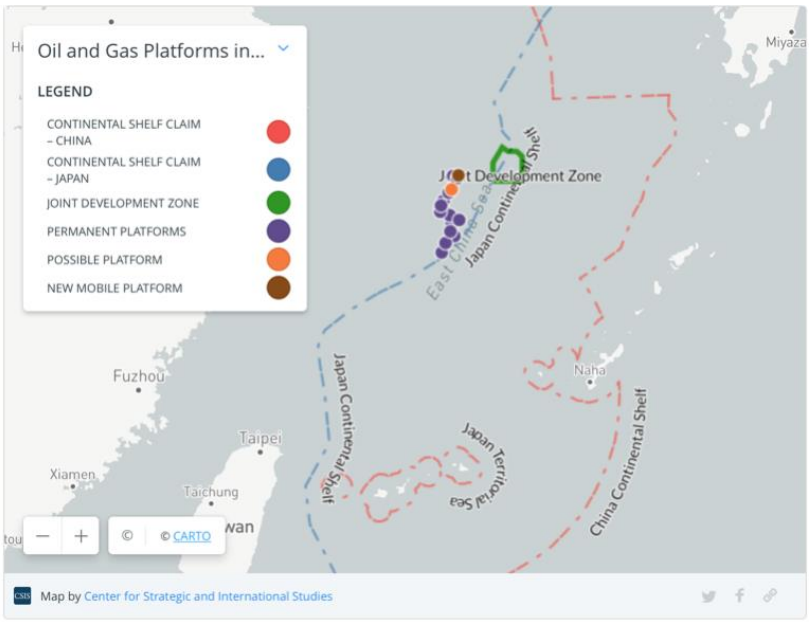


Figure 2D. Map of the Continental Shelf and Oil and Gas Platforms (Last updated August 23, 2018) ("UPDATE: Beijing Keeps Busy in East China Sea Oil and Gas Fields.")

China (as of February 2019) has constructed 16 platforms for oil and gas development, all of which are located not at the joint development zone (shown in Figure 2E below) but close to the (according to Japan) EEZ line. In response to these actions, Yoshihide Suga, the Chief Cabinet Secretary of Japan said that "It's extremely regrettable that China has continued its unilateral development activity" ("Japan Protests Chinese Development Work in East China Sea Gas Field.", 2019). According to a satellite image analysis by Center for Strategic and International Studies (CSIS), the platforms seem to be operational ("UPDATE: Beijing Keeps Busy in East China Sea Oil and Gas Fields.") The Chinese estimates show that the trough basin (Okinawa Trough in Figure 2E below) may contain natural gas resources of around 17.5 trillion cubic feet and about 20 million oil barrels (Chen et al, 2011). I believe that the actions taken by China in this case are most

likely an act of spite against the Japanese government, and the fact that Japan hasn't taken similar actions is telling that China may hold the upper hand.

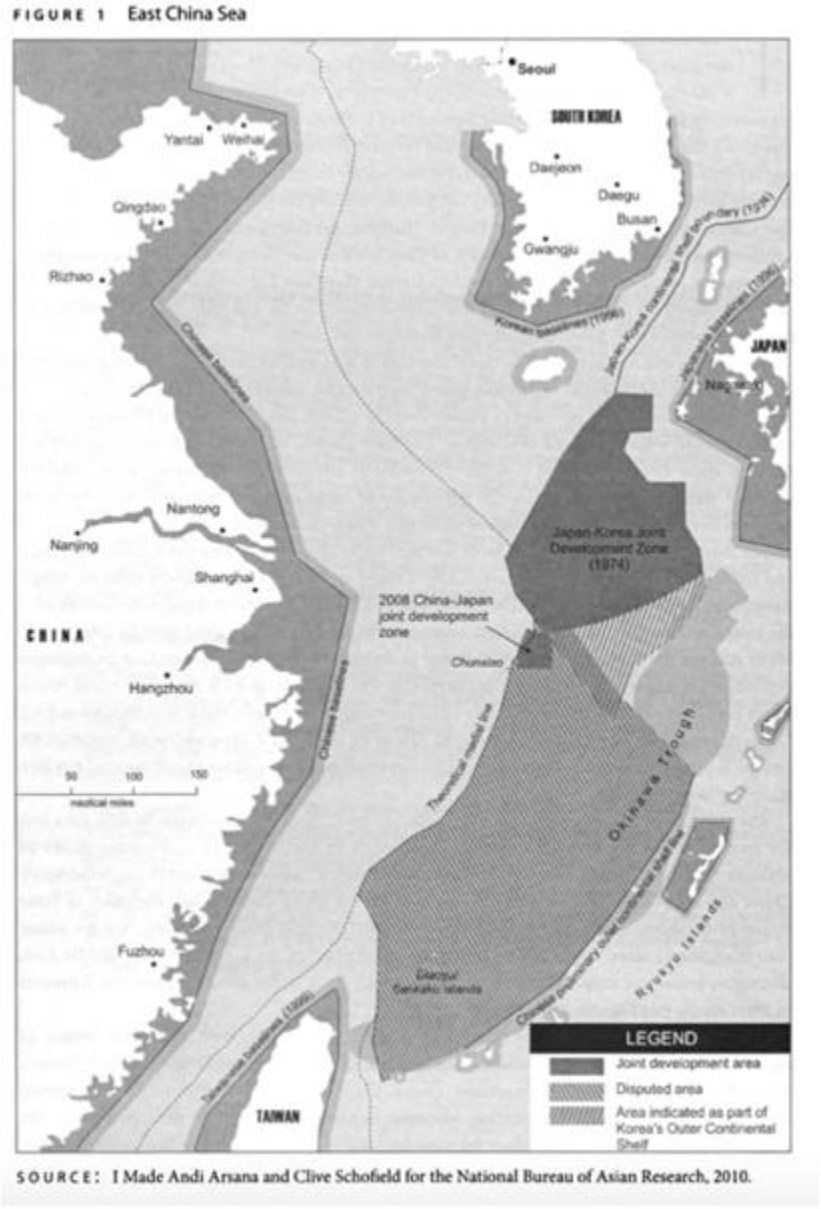


Figure 2E. Map of East China Sea Region Including Joint Development Zone (Schofield 2011, 12)

The South China Sea is an oceanic region between China and a number of Southeast Asian countries. EIA estimated that there is (including both proved and probable speculations) oil reserves of 11 billion barrels and natural gas reserves of 190 trillion cubic feet. However, there was an energy consultancy called Wood Mackenzie that only estimated 2.5 billion barrels of oil equivalent proved reserves of both oil and gas (EIA, 2013). Schofield (2011) makes an important note that "the industry rule of thumb is a 10% recovery rates for frontier provinces" and also that "recovery rates from gas fields tend to be significantly higher than for oil fields (75% vs 10%)" (20). It is also important to note that the area is an important global shipping route, through which one third of commercial thoroughfare passes, and that "about 80 percent of China's oil imports arrive via the Strait of Malacca, in Indonesia, and then sail across the South China Sea to reach China ("Explained: South China Sea Dispute", 2019).

Figure 2F. Map of the South China Sea (Mollman, 2019).

There have been small conflicts within this larger one. Some examples are two incidences of Chinese boats that intimidated survey vessels from Vietnam and the Philippines (Schofield, 2011). US State Department spokesperson Morgan Ortagus made the statement, “China’s actions undermine regional peace and security [and] impose economic costs on Southeast Asian states by blocking their access to an estimated $2.5 trillion in unexploited hydrocarbon resources” (Mollman, 2019). The US, although never making an official alignment with any of the countries on this issue, has ordered “Freedom of Navigation” operations. The Chinese government has spoken out against US involvement in the issue, believing that the US has acted “provocatively” (“Explained: South China Sea Dispute”, 2019).

According to the BBC, “China, Vietnam, the Philippines, Taiwan, Malaysia and Brunei all have competing claims” in the region (“Why Is the South China Sea Contentious?”, 2016). The SECSR conflicts are similar in that both of the areas are likely more valuable due to natural gas resources than oil. However, Thrall (2013) notes that because the relations the countries involved in the South China Sea conflict have with the United States are less strong than between Japan and the US, he implies that being involved in the South China Sea conflict would be less politically dangerous for China than its involvement in the East China Sea conflict. Finally, Thrall (2013) argues in contrast with the main argument given in this paper, that the resources are not a main cause of the conflict, as he cites Victor (2007) in saying that “As a body of resource security research has suggested, resource disputes rarely create conflict where tensions do not already exist, suggesting that resource issues tend to exacerbate existing geopolitical tensions rather than create them independently” and that the “resources are typically divisible, not zero-sum. There are

plenty of established options for dividing the resources" (7). Thrall (2013) believes that the main goal of China is to gain dominance in the region, although resources are a factor of said dominance. I disagree with the argument that the resources are zero-sum and thus are not a main cause of the conflict. It is an unlikely outcome that the two countries (China and Japan) will decide to equally divide the region and its resources, at least in the near future, as this would cause great political and military ramifications (which in effect would also cause economic ramifications). Therefore, whoever gains ultimate political legitimacy over the region would also gain ultimate ownership of the resources. One of the valuable aspects of the hydrocarbon resources are the accessibility and the lowering of transportation costs. Whoever the "winner" of this political battle would have easier access to the potential resources with low transportation costs.

Chapter 3

China's Drive for Natural Resources

China's motivations for economic growth

Many cultural, economic, and political factors exist that motivate the Chinese government to grow their economy, a goal which would be facilitated by the acquisition of natural gas.

The miracle of economic growth in China over the last few decades has been groundbreaking. The economic policies such as that of the state-controlled economy during the Mao Zedong era from the forming of the PRC in 1949 until his death in 1976 were quite damaging, but there still was remarkable effort from the citizens to industrialize the country, and in the 60s and 70s the state heavily invested in human and physical capital. Shortly after the death of Mao Zedong, the government under the leadership of Deng Xiaoping decided to gradually allow more policies in accordance with the market system and allow more foreign investment. These policies allowed China to transform from a low-income economy to an upper-middle-income country in 2010 (according to the World Bank standards). From the time that these economic reforms began in 1979 until 2018, the growth of the economy was an average of 9.5% (Morrison, 2019). Morrison (2019) also states that "economists generally attribute much of China's rapid economic growth to two main factors: large scale

capital investment (financed by large domestic savings and foreign investment) and rapid productivity growth" (pg. 6).

However, Chinese economic growth has slowed down in recent years, and the IMF predicted in the April 2019 World Economic Outlook that in 2024 the Chinese economy will only grow 5.5% (Morrison 2019, 5). The Chinese government has taken actions such as the "Made in China 2025" plan, which aims to modernize 10 important sectors and play a bigger role in the world economy (Morrison, 2019).

Chinese society is largely based on Confucian philosophy, similar to the way that Judeo-Christian philosophy influenced western society. The main philosophies of Confucianism, Buddhism, Legalism, and Taoism have influenced Chinese societies and emphasized the concept of "harmony", a concept which influenced policy throughout Chinese history. The Chinese governmental system, although not a democracy, still requires the approval of its citizens in order to sustain its legitimacy. The term "harmonious society" began to be used very frequently in the late 1980s (Delury, 2008). Delury (2008) also states that "social harmony is a platform for broadening the party's mandate from managing economic growth in the 1980s and 1990s to stewarding socio-economic development for the twenty-first century: and that "the promise of a more harmonious society reaches out to farmers angry about rural poverty and corruption, to the middle classes anxious about social conflict, and to everyone suffering from environmental degradation. It offers an olive branch to critics of authoritarianism while simultaneously indicating to CPC hard-liners a willingness to be tough, brutal even, if "harmony" demands it." According to Liu and Qiu (2008), the Chinese government has three goals in their security and social control policy, two of which are "to ask the CPC to improve Chinese people's standard of living as a

primary tool to solve many other social problems" and to "increase the legitimacy of the Chinese government and law enforcement agencies".

What the authors meant by "legitimacy" is that if the government protects the economic interests of its citizens, there will be "social harmony" (meaning a lack of protests in this context) and the government will hold legitimacy with them. In order to advance the goal of economic growth, it is necessary to ensure both energy security and environmental protection. In 1996 the Chinese government formally stated "sustainable development" is the fundamental factor of the country's development (Hu et al, 2014). In a white paper published in 2012, the Chinese government stated that the usage of fossil fuels has an impact on the ecosystem and that the task of ensuring energy security will grow more and more difficult as China continues to urbanize and industrialize ("China's Energy Policy 2012 White Paper Complete Transcript", 2012).

There are several helpful methods in ensuring the development of the Chinese economy upon which the government has focused. One of the most important steps is the development of infrastructure. According to Geethanjali et al (2010), "direct investment on infrastructure creates (i) production facilities and stimulates economic activities; (ii) reduces transaction costs and trade costs improving competitiveness and (iii) provides employment activities to the poor" (pg. 3), and "the emergence of China as the world factory would not be possible without a range of new economic infrastructure services in place" (pg. 9). In the last century, the central government made significant investments in railway transport infrastructure and heavy industries (which were aided by the railway transport network) (Démurger, 2001).

One of the most challenging problems that the Chinese government currently faces is the startling economic inequality, particularly between the landlocked western regions and the eastern regions that are near the ocean, a phenomenon which has been growing especially severe since the 1990s (Démurger, 2001). The economy has also been transitioning from labor of "low-productivity agriculture to higher-productivity industry and services" (pg. 1669); agriculture's share in the economy lowered from 70% to 45% from 1978-2005 (Holz, 2008). In order to ensure this important transition, it will be critical to ensure both the quality and quantity of infrastructure.

In pursuit of improved infrastructure in all economic sectors, three benefits exist with respect to utilizing natural gas as opposed to more polluting resources: (i) less carbon emissions when using natural gas in the construction process, (ii) less carbon emissions due to using natural gas for the operations of infrastructure and (iii) less damaging impacts from pollution upon infrastructure.

Natural gas can be used in the making of steel instead of "coke," and it has become attractive to U.S. steel production companies. Coke is an energy product which is made from coal (Schlueter, 2016) but prices for coke have risen due to the high usage of coal in building infrastructure in China. Natural gas has become cheaper, especially due to the fracking boom in the U.S. (James, 2012). If China also utilizes natural gas as opposed to coal more in the steel making process, this will be a large step in reducing coal usage, and therefore carbon emissions.

Another important infrastructure project is building railways to make for transportation of humans and products. China is highly dependent on this form of transportation, as opposed to the American dependence on airplanes. There is a form of

railways called high speed lines, in which it is possible to use an electric grid to power the operations, making natural gas an option (as opposed to other higher-carbon options) (Pike, 2019).

When there is high coal and automobile usage, acid rain and pollution get more severe (Nunez, 2019). Acid rain can be detrimental to concrete (Ditao et al, 2017), which is an important element of infrastructure such as dams and bridges. One way to reduce acid rain would be to use electric cars (and use less coal and oil in the electricity grid). China has said that it "wants to phase out gas and diesel vehicles within the next few decades" (Clemente, 2018).

Potential uses for natural gas

Although there has been significant economic growth for China over the years, there have been some areas that are lacking that the government can help improve upon. There is still a significant amount of inequality, and there are also sectors in which China can utilize natural gas to help grow the economy.

The economies of China's large cities' have grown astronomically since the economic reforms began, but there are significant regional inequalities (Démurger, 2001). Many people in rural areas are flocking to the cities, even with the household registration system, which "creates a bond between rural populations and their villages, and without it, rural-urban migration would be on a much larger scale than we are currently witnessing" (Ong 2014, 163). It would be very much in China's interest to develop the rural areas in order to prevent cities from becoming too crowded, which would help both the rural and urban areas. This development will require significant levels of construction, and Crane and

Mao (2015) note that “Coal-burning household furnaces and stoves are difficult to outfit with pollution control equipment, as are boilers used to heat residential and commercial buildings; in most instances, substituting natural gas or propane is the most efficient way to reduce pollution from these sources.” (pg. viii)

One factor that has led to the significant growth besides the globalization of the economy was the heavy investment of infrastructure, which became quite significant in 1998. After the Asian financial crisis, for most East Asian countries, infrastructure investment significantly decreased, but China didn’t take that route. This infrastructure investment was a large factor which made it possible to heavily develop China’s manufacturing sector (Liu, 2005). Fujita et al (2012) make an estimation with a basis on the National Bureau of Statistics (of China) data that “capital investment had contributed to 45% of the annual GDP growth during 2000-2007, whereas household consumption and exports had contributed to 30% and 25%, respectively” (pg. 756). Liu et al (2012) note that investing in infrastructure requires products which require much energy to products such as steel and cement, and that high speed railways, a popular form of transportation, require the electric grid and require energy for the cement and steel production which are materials needed for the construction.

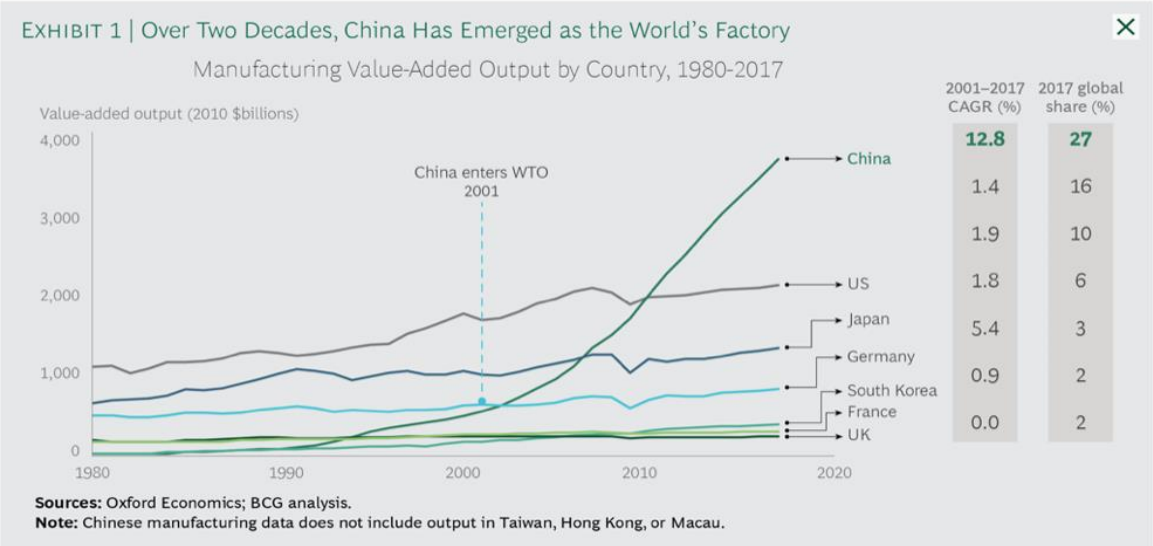


Figure 3A. China's Growth in Manufacturing from 1980-2017 (Colotla et al 2018)

As can be seen in figure 3A above, China's manufacturing industry has become a formidable force in the world economy. Although Chinese leadership wants the economy to be based more significantly on "services and domestic consumption" than manufacturing, China is still an important part of manufacturing in the world. As of 2018, China made up 27% of the global manufacturing sector (Colotla et al 2018) and the country still has much to gain from a more developed manufacturing sector.

One important step to reducing pollution and usage of fossil fuels is the switching over from regular cars to electric vehicles. China has a goal of making electric as well as plug-in hybrid vehicle sales one fifth of total auto sales by the year 2025 (Chen and Munroe 2017).

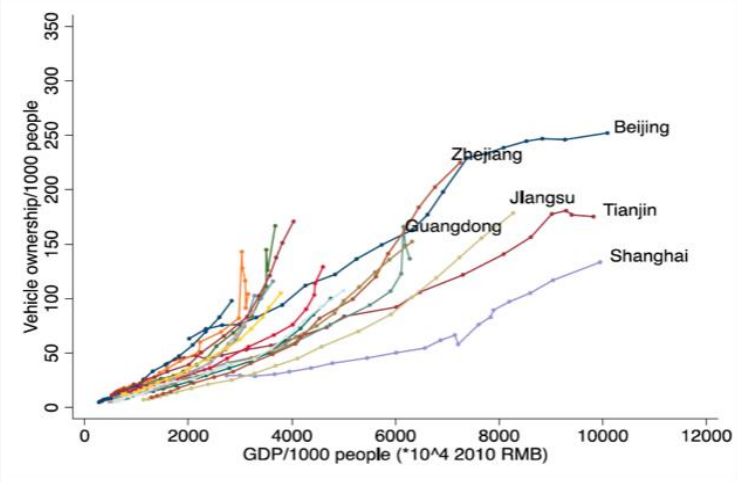


Figure 3. Vehicle ownership per 1000 people versus GDP per 1000 people in China for 1997–2016. Note: GDP data of each province is deflated by the CPI, with 2010 as the base year. All the data here comes from the China Statistical Yearbook (1998–2017).

Figure 3B. "Vehicle ownership per 1000 people versus GDP per 1000 people in China for 1997-2016" (Cai et al 2019, 8)

As can be seen from figure 3B above, as the Chinese economy has grown, so has vehicle ownership in large cities. Ou et al (2014) did a study that predicted that by 2050 there would be 300-463 vehicles per 1000 people (300 would be a low growth and 463 would be a high growth scenario). If these were all electric vehicles the cities would have much less of a pollution problem. As Lin and Wu (2018) note, "concerns of smog are now a powerful motivation for the urban residents to adopt EVs" (pg. 239).

It is important to note that it would be difficult to calculate to what extent a cheaper and easier access to natural gas supply would be helpful in certain industries such as infrastructure and electric cars. However, access to natural gas would be potentially useful in these industries that will grow more and more important in the future to China, so it

would be very helpful to gain access no matter the extent to which the resource would aid in the growth of these industries.

Chapter 4

Natural Gas in China

Natural Gas

Although the SECSR potentially contain a considerable amount of oil, the key resource to pay attention to is the natural gas reserves. Not only do they seem to be more abundant than the oil reserves in both regions, but China has strategic interests for pursuing this specific resource. Most countries wish to reduce their impact on climate change, but China has particular need in this regard due to its high coal usage. Consequently, access to natural gas is a way to quickly resolve this issue and other energy issues that China faces.

According to Shabaz and Solarin (2015), "natural gas consumption emits 50% less environment pollution compared to other fossil fuels" (pg. 835). This factor alone would make it an ideal option for China to use, but there are certain factors of China's geography that make it difficult to obtain natural gas, which makes imported LNG a good option. However, dependence on foreign LNG sources also has its costs, so this makes access to natural gas in the SECSR especially valuable to China.

Natural gas usage is becoming more and more popular all over the world, and China is no different. Although production in China grew over three times from 2003 to 2014,. consumption grew at an even faster rate (see figure 4A below). The growing consumption

for natural gas is evidence that the government has a strong interest in gaining easier access to the resource.

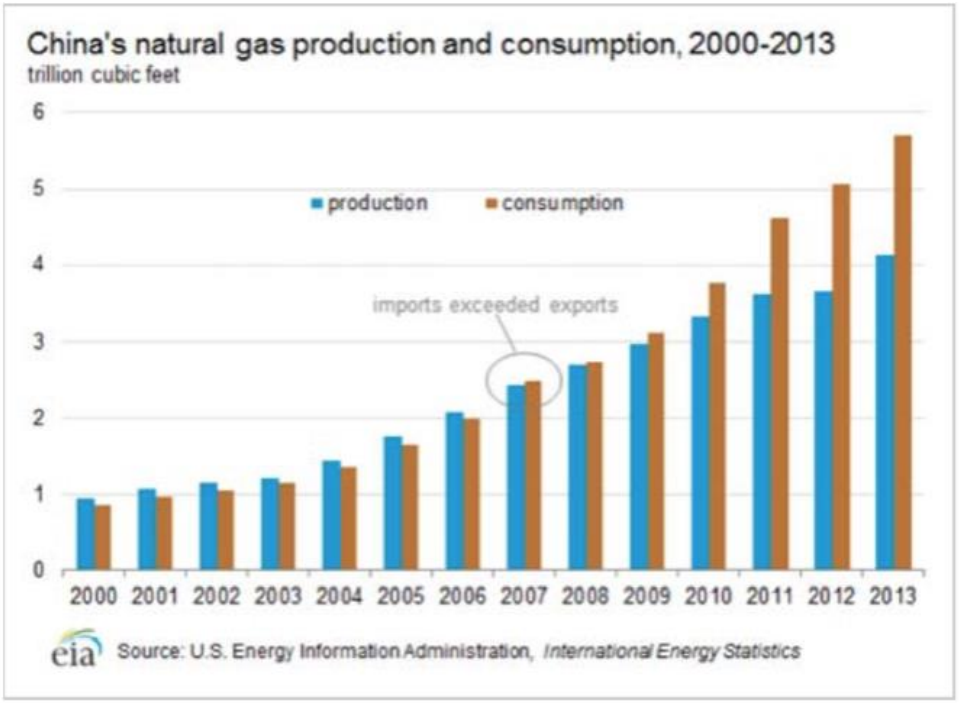


Figure 4A. “China’s natural gas production and consumption, 2000-2013” (EIA 2015, 15)

Natural gas as of 2017 made up around 6 percent of China’s energy mix, but in June 2017 the Chinese government made the goal of ensuring that by 2030 it would rise to 15 percent (VanderKlippe, 2017). In 2018 the consumption in China was about 280 billion cubic meters (BCM) (Aizhu, 2019 (b)), but the China National Petroleum Corporation (CNPC), which is one of the largest energy enterprises in China, estimated that by 2030 the consumption of gas would go up to 440-520 BCM, and that this will require significant updates of infrastructure such as pipelines and underground gas storage (Hove et al, 2017).

There are various methods of developing natural gas, such as extracting from shale, which is a type of rock from which natural gas, oil, or both can be developed (EIA, 2019),

both onshore (which is referred to as “drilling deep holes under the earth’s surface”), and offshore (which is referred to as “drilling underneath the seabed”) (“What is Onshore Drilling Versus Offshore Drilling?”, 2019). In 2018 shale gas made about 7% of China’s gas production. But an optimistic prediction that shale gas production in China by 2035 would make up 23% of gas output was given by Zhao Wenzhi, one of China’s Academy of Engineering’s researchers and higher up at PetroChina (one of the largest energy enterprises in China). China’s president Xi Jinping in 2018 made a call to action to step up natural gas activities in order to make China more energy independent. However, Lin Boqiang of Xiamen University is not as optimistic as Zhao Wenzhi, and believes that “The investment is still too small as only a handful of state-run companies are exploring it ... Technology progress is not fast enough” (Aizhu 2019 (a)).

According to Forbes (2019), although China has a considerably large amount of shale resources, there are a few problems such as mountainous terrain and population density, not to mention that “The geology has experienced multi-stage deformation” and “That makes it much more challenging in terms of the continuity of the layer. Ideally you want to find a horizontal layer that you can drill into continuously and then fracture. In China it is hard to find those continuous layers,” according to Yanpeng Sun, who is a Chinese geologist.

Although natural gas is in many ways an ideal energy source for China to consume, the country is still dependent on importations, which occurs in the form of liquefied natural gas. This is complicated for the heavily regulated and mostly government-controlled energy sector. As can be seen in figure 4B below, many of the regions that China is dependent on

for the resource are somewhat at risk for instability, which will be further discussed later in this paper.

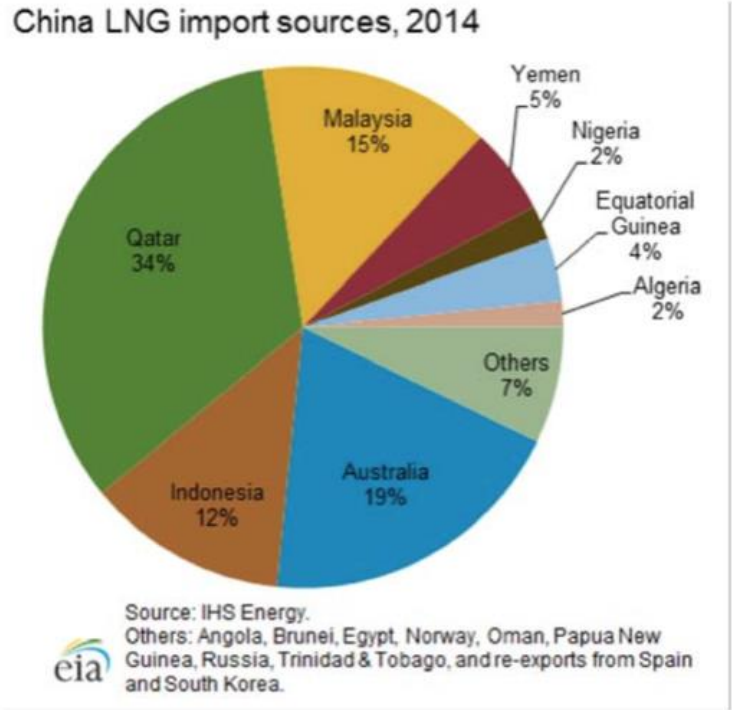


Figure 4B. "China LNG import sources, 2014" (EIA 2015, 26)

In 1964, the first commercial shipping of liquefied natural gas or LNG called the CAMEL project successfully transported gas to France and the UK from Algeria. LNG was a monumental technological development, because before then there was no way to transport natural gas other than through pipelines, and it opened up the natural gas industry to world trade (Jensen, 2004). Due to Panama Canal's expansion, it has become more cost effective for Asian countries to purchase LNG from the US Gulf Coast, although China mainly purchases LNG from Australia and Qatar, as they hold contracts that have extended time periods with these partners (Hove et al, 2017).

According to Hove et al (2017), “In 2016, China’s gas imports were approximately evenly split between pipeline and LNG sources” and those pipelines import natural gas from Turkmenistan, Kazakhstan, Uzbekistan and Myanmar. This is an option that the government seems to favor, as in 2016 it made reforms on pipelines pricing (Hove et al, 2017). However, currently Burma (Myanmar) has discord between the government and the Rohingya minority, and Turkmenistan has an authoritarian regime under which there has been protests due to economic troubles (Stronski, 2017). The potential conflict which may cause natural gas prices to go up makes access to natural gas in the SECSR more advantageous than pipelines (at least for pipelines in conflict-ridden or potentially conflict-ridden regions).

Environmental motivations for searching for natural gas in the region

In addition to economic and geopolitical factors to consider, China has a great interest regarding protecting its environment in acquiring more natural gas. Natural gas in certain factors is much cleaner than traditional energy sources and compared to coal emits 6-55 times less PM (particulate matter) (Kim et al, 2018). China has great interest in reducing its pollution.

China, as is the case with many other developing countries, currently faces many environmental issues. Perhaps the most important and visible of these issues is air pollution. Official data reported that out of the 74 cities that were monitored by China’s Ministry of Environmental Protection, there were only 8 of them that were up to the standards set by the state regarding air pollution (Stanway, 2015). One study found that in 2015, China faced 1.1 million deaths attributed to air pollution (Health Effects Institute, 2017). This problem is

only exacerbated by the fact that the country is currently facing an aging population due to effects of the one-child policy (Chongsheng and Lok-to, 2019). An aging population will be more sensitive to air pollution than a younger one will, and it is expected that the health issues that China faces regarding the air pollution will get more intense by 2030. (Health Effects Institute, 2016) This isn't just a social issue, it is also an economic concern to the government. China doesn't have universal healthcare, but the government still contributes to healthcare costs (Zhou, 2018). As the population ages and there are more people who face health issues due to air pollution, healthcare costs will rise and the government will have less funds to give to economic development.

The Chinese government has many other motivations for reducing the country's pollution levels. In 2014, the Ministry of Environmental Protection monitored 74 cities, and only 8 of those cities passed the state air quality standards (Stanway, 2015). Stanway (2015) notes that researchers in the government warned that "any failure to tackle China's huge pollution problems in the coming years could stoke public discontent and create 'social conflicts'". In order to solve the pollution issues, the government has taken steps such as signing the Paris Climate Accord, and planning out a future where cars that only use fossil fuels will be nonexistent in the country, and as an economist with Societe Generale notes, "Chinese people are very concerned about pollution, so it makes sense for the leading party to respond [because] what's most important to [the party] is social stability" (Shane, 2017). Included in the pledges under the Paris climate agreement is "a determined switch from coal to gas, in heating and electricity" (Forbes, 2019).

Although there are pros and cons to dependence on natural gas, there are many reasons for China to find a way to lessen its dependence on coal, and natural gas seems like

one of the most viable options that exist at the moment. It is important to note that there is cause for concern regarding natural gas, as in the process of production, it leaks a gas called methane, which traps much more heat than carbon dioxide does. It was estimated in a study done in coordination with over a dozen research centers including the Environmental Defense Fund (Allen et al (2018) as cited in Kusnetz (2020)) which estimated that in 2015 the natural gas industry leaked around 2.3 percent of the natural gas (which leaks methane), and one of the scientists involved in the study named Lyon said that "Probably the average national loss rate is low enough that there are immediate climate benefits of replacing coal with gas", and also stating that "it's going to be close". It is important to note that improving technology in the natural gas production process can reduce leakages (Kusnetz, 2020).

Although natural gas has methane issues, coal has many downsides. Fujita el al (2012) notes that China's heavy dependence on coal results in detrimental health and environmental effects, one of which is acid rain. From 2002 to 2010 land that had serious acid rain which had an average yearly pH below 4.5 went up from 4.9% to 6.1% (Niu et al, 2017). Gao et al (2017) believe that acid rain will be a long-term problem as fossil fuel usage continues to increase. Acid rain can damage the surfaces of buildings and statues, and corrode metal, which requires an increase in the costs to maintain such structures. It can also cause harm to plants and wildlife, which has negative effects for the agriculture industry ("Effects of acid rain"). Acid rain is caused by atmospheric water vapor combining with nitrogen oxides and sulphur oxides, which are given off by coal production. However, natural gas production doesn't give off sulphur oxides, and the nitrogen oxides given off in the process are 80% less than those of coal ("Gas Basics").

It was mentioned earlier that coal production emits more particulate matter than natural gas, and PM 2.5 is an example of harmful PM. As can be seen in figure 4C below, reducing dependence on coal would be really beneficial to reducing PM 2.5 emissions.

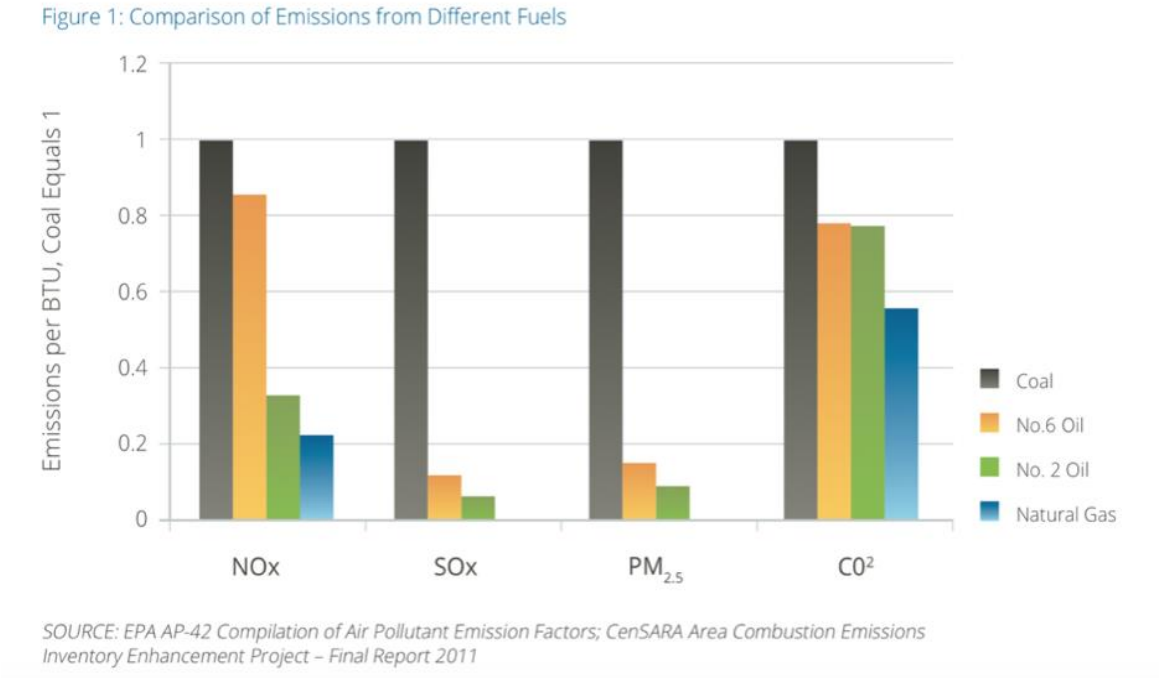


Figure 4C. "Comparison of Emissions from Different Fuels" ("Case Studies in Improving Urban Air Quality.", 7)

PM exposure (especially to PM 2.5) can cause detrimental health effects such as strokes, heart attacks, and possibly asthma ("Our Nation's Air", 2017). Braathen and Roy (2017, pg. 22) estimate that the economic losses due to the costs that result from premature deaths resulting from "ambient particulate matter pollution" was equal to 7.9% of China's GDP that year. Guan et al (2016) make an important estimation regarding the economic loss due to lack of work time because of illness from "particulate air pollution", which the

authors estimated was equal to about 1.1% of the national GDP in 2007, and they note that this loss was about equal to Vietnam's total GDP in 2010!

If China wishes to truly reduce its effects on climate change, switching from coal to natural gas seems to not be the best step in the right direction (as current technology permits). However, pollution seems to be the most important factor in the maintenance of social stability because it affects everyone's health and wellbeing in the short term. In this regard, switching to natural gas is a way to calm the waters in the short term while transitioning out of dependence on fossil fuels in the long term.

Competitive motivations for gaining access to natural gas

In addition to concerns of dependence on resources located in unstable regions or regions that have conflict with China, there are also geopolitical factors that China must consider in the journey towards less dependence on foreign energy sources.

China has begun a policy called the "Belt and Road Initiative" (BRI). According to Jin et al (2018), "In 2013, the B&R initiative was introduced in China, aiming to enhance connectivity and cooperation among participant countries by building infrastructure, increasing cultural exchange and broadening trade" (pg. 336). Farooki (2018) states that the initiative "involves Chinese investment, mainly in infrastructure projects along the old silk route. Hard infrastructure (roads and rail networks) are accompanied by trade and transportation agreements, that President Xi sees China in a leadership role on the global stage, and part of that is delivered through the BRI," and that' BRI is also a tool to cement foreign relations and partnerships" (Farooki 2018, 7). Jin et al (2018) also state that energy security is a key goal in the initiative of this policy, that China will be able to get more

access to natural gas through pipelines with countries involved in the initiative, and that this will allow China to be less dependent on LNG from other countries, and that this initiative will make China's energy supply more diversified.

Many of these countries involved in the BRI have access to valuable resources, both energy and otherwise. For example, Peng Qiming, the head of the China Mining Association states that "Many Chinese mineral companies are cooperating with leading global players to jointly make and process metals in other countries," and Chile's vice-minister of mining Pablo Terrazas believes that demand for lithium would rise due to China's growing development of electric cars powered by the resource (Yukun notes: Chile is the greatest exporter of lithium in the world) (Yukun, 2018).

The BRI is an example of China's journey to becoming a superpower, a goal that is motivated largely by desire for economic growth and stability. If China has more access to resources from the SECSR, they will have more negotiating power with countries involved in the BRI to gain easier access to resources such as valuable minerals. For example, say that there was an African country that had access both to oil and to a mineral resource that was helpful in making semiconductors, and China really wanted some of its firms to have access to that mineral resource. If China already had enough energy supplies through access to natural gas and oil resources in the SECSR, they would have an easier time getting lower prices for the mineral resources in a trade deal with said African country. This mineral resource would help China be more economically competitive, especially in the technology sector.

One important region that China desires to gain influence in is Central Asia. China has a long history of relations with Central Asia through the Silk Road trade that began over 2,000 years ago. The relationship waxed and waned over the centuries, but then in contemporary times, after the disintegration of the Soviet Union, Central Asia became more open, and in 1992 China and five countries in Central Asia established diplomatic relations. It is important to China to have good relations with the Central Asian region to combat the East Turkestan terrorist group and other security threats (Guang 2007). According to Chung (2004), "Pursuing "new regionalism" in Central Asia would also ideally group countries of the SCO into a 'pole' in a 'multi-polar' world, to undermine what the Chinese perceive to be American global domination" (p. 993). From my understanding, "Multi-Polar" refers to China's definition of how the government says that they don't want one global superpower but many powers in the world. China also has good energy relationships with Central Asian countries such as natural gas pipelines from Turkmenistan, Uzbekistan, and Kazakhstan (Jin et al 2018). Jin et al (2018) also state that "with this varied group of suppliers, China is trying to build a network of energy importation involving the Middle East, Central Asia, Africa and other regions to diversify its supplier mix so that the possible failure of any one exporter will not cut off an adequate supply of energy" (p. 341).

China and Pakistan have had a great relationship for a long time, as "Pakistan was one of the first countries to recognize the People's Republic of China in 1950 and remained a steadfast ally during Beijing's period of international isolation in the 1960s and early 1970s", and China has contributed on large infrastructure projects for Pakistan such as power plants and gold mines; Husain Haqqani, the former ambassador of Pakistan to the US, said in 2006, "For China, Pakistan is a low-cost secondary deterrent to India" (Afridi

and Bajora, 2010). Pakistan has faced an energy crisis (Kugelman, 2013), and if China had access to cheap energy sources, they could help Pakistan with such problems. Besides Pakistan, if a country faced a similar crisis and if China had access to energy, this could be a bargaining chip for them to gain access to the region's other resources or simply to bolster better relations.

Russia has about 25% of the world's natural gas reserves ("The World's Biggest Natural Gas Reserves", 2013). Although Russia and China would seem to be allies without any conflict (as they are both distrustful of the west), they have been competitive in their journey to gain influence in Central Asian countries such as Kyrgyzstan. Putin wants to bring states that used to be part of the Soviet Union back under Russian influence, while China wants stability and economic influence in the region, and "in China's view, its economic rise depends on the degree of influence that it can wield over the region that bridges Asia and Europe" (Tan, 2020). If China has access to more natural gas and won't have to be dependent on Russia in the future for this resource, the country will be more able to provoke the relationship with Russia by competing with Russia for power in Central Asia.

It is no secret that China and America have competition regarding many facets. When Bill Maher was interviewing Zambian economist Dambisa Moyo, who wrote a book called "Winner Take All" about China's drive for geopolitical power, Maher noted that "[China] seems to get something we don't- that power, really, in this age is about economics. We seem to be the muscle-bound wrestler, you know. We think power is having a giant army" (Dambisamoyo, 2012). The recent trade war seems indicative that the conflict between the two countries will only grow more and more as economic power, as opposed to ideological/political power, reigns supreme in the modern world. This conflict has also been

influential in the energy sector. In August of 2018, US crude oil exports to China went down to zero (although they eventually rose), and that same month, China decided to impose a 25% tariff on US oil products (Jong Oh et al, 2019). It is really dangerous for China to not have a secure energy supply in the times where trade wars can cause China not to have access to needed energy sources.

One important factor in the conflict between the U.S. and China is the Islamic Republic of Iran. It's no secret that the U.S. and Iran have a shaky relationship. Garver (2013) notes that Iran's biggest foreign investor in its energy sector became China and that "Beijing views Iran as an important partner, current and future, which shares with the People's Republic of China (PRC) many common interests and perspectives, which has substantial comprehensive national capabilities and which offers China good prospects for a long-term partnership as China rises" (p. 70). But also, China must be careful regarding its relationship with Iran not to shake up the U.S. relationship. If China had access to more energy resources, it wouldn't care as much about being dependent on the resources that the U.S. would supply and would be able to strengthen the relationship with Iran.

Chapter 5

Dependence of resources in unstable regions

In 2015, Vice News did a piece on Boko Haram and the fight against the movement. One of the interviewees was a Chadian colonel named Azem Bermandoa, a spokesperson for the army, who was critical of what he believed to be Nigeria's reluctance to attack Boko Haram, as at the time Chad was being very heavily attacked by the terrorist group. He said which was translated by Vice News as "If a fire starts burning down your neighbor's house, you should go help put it out, or else the fire will reach your house" (Vice News, 2015). This is true to China in two senses regarding unstable regions. It is, as all countries are, afraid of instability from other countries reaching their borders. However, the perhaps more prevalent fear regarding instability is the presence of it in regions that contain important resources, specifically energy sources, which can cause the fluctuations of prices (Iyer et al, 2018). This is an important consideration regarding the resources in the islands. If one of the countries doesn't have to depend on resources from unstable regions, or they have a stockpile that will prevent a crisis in case of a destabilizing political event in one or more of the regions, this is a considerable motivator in the struggle to win ownership of the SECSR.

China in particular has two different types of concerns regarding instability in resource-rich regions. One kind is domestic, and the other is foreign. In particular, the western region of Xinjiang, with which the central government has tension ("Why is there

Tension Between China and the Uighurs?", 2014), supplies a large amount of oil to the country. This region has had instances of terrorism from separatist groups, which frightens the central government (Raman, 2002). If the country didn't have to be as dependent on the region for the resource, it would lessen the pressure to the central government on making those in the region act according to its wishes.

Xu et al (2014) notes that China's main oil "import sources are focused on some politically unstable regions, such as the Middle East and Africa" and that "the oil supply is susceptible to emergencies and political sanctions" (pg. 8330). Hove et al (2017) explains that China has been strategizing for a long time to make its natural gas portfolio more diversified, and Qatar, which China is considerably dependent on natural gas for, had "recently faced geopolitical instability".

As Li et al (2018) state, "the effect of uncertainty regarding international oil price movements on economic growth is gradually strengthening. Hence, the stability of energy supply is an increasingly serious issue in China" (pg. 326). As can be seen in the figure below, the oil price often spikes when there is a conflict in a region which produces large amounts of oil supplies, so it would very much be in China's interest to reduce its dependence on natural gas and oil from these politically unstable regions.

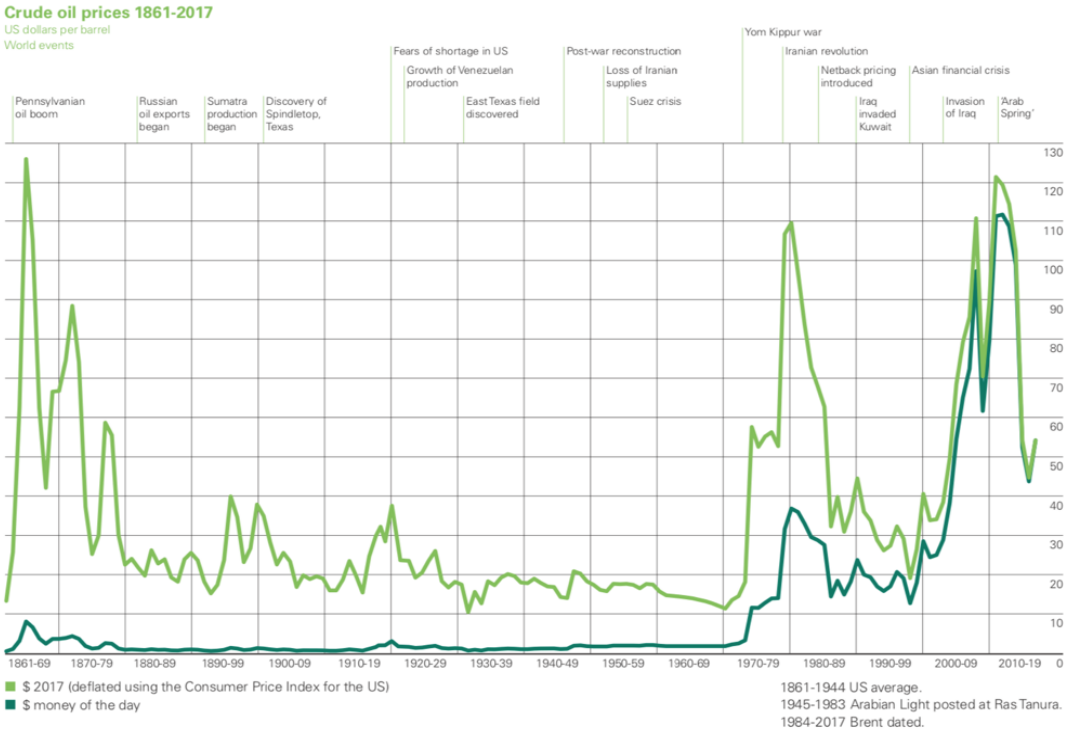


Figure 5A. Variations of the Prices of Crude Oil Corresponding with World Events (BP Statistical Review of World Energy 2018, 20)

The dependence on fossil fuels will likely grow much stronger, and the availability of these resources will decrease. It will be necessary for China to safeguard their economy against the effects of price shocks due to instability.

Chapter 6

Conclusion

It is a safe prediction to say that demand will go up for natural gas in the near future, and it would behoove any country in the age of climate change to consider this resource more seriously. There are several factors which ensure the fact that China has a vested interest in securing access to it, as it will help contribute to economic stability. Some examples are economic competitions such as the trade war with America and the potential economic depression that will come from the Coronavirus pandemic. Every country has an interest in economic growth, but the Chinese government has special reasons for making this a huge priority, and these reasons are unlikely to change in the near future. It is in every country's interest to more closely look into and invest in more environmentally friendly energy sources, and China is no different.

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