IDENTIFYING HIGH RISK AREAS FOR CONFRONTATION IN THE SOUTH CHINA SEA

By

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To my mother and father

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Uncertainty over territory and resource sovereignty in the South China Sea has led to several confrontations in the South China Sea region. The goal of this project is to identify high-risk areas for future confrontations in the South China Sea. In order to achieve this goal, I will analyze the predicted locations of hydrocarbons and power projection capabilities of China, Malaysia, Philippines and Vietnam. Areas where hydrocarbons are located and multiple power projection zones overlap will be considered as areas for confrontation. I will use GIS to map both the location of hydrocarbons and power projection zones of each state.

CHAPTER 1
INTRODUCTION

Seven states (Brunei, China, Indonesia, Malaysia, Philippines, Taiwan, Vietnam) bordering the South China Sea make significant claims to the ownership of its resources. Each justifies its claims through interpretations of the United Nations Convention of the Law of the Sea (UNCLOS), historical use/events, or a combination of both. Since the method to assert sovereignty differs state by state, many of the claims overlap which makes it difficult to determine who has the rights to what resources.

Over the last few decades, uncertainty over territory and resource sovereignty has led to several confrontations in the South China Sea region. The confrontations have ranged from the destruction of survey cables, to warning shots, to outright military clashes. The most deadly event occurred in 1988, when roughly eighty Vietnamese were killed in an engagement with China over a reef in the Spratly island chain. These confrontations have been unpredictable and have created uncertainty for resource exploration, shipping traffic, and the region as a whole.

The goal of this project is to identify high-risk areas for future confrontations in the South China Sea. The purpose is to provide interested parties with a geographic risk assessment of possible confrontations unfolding in the Sea. My intention is not to predict what might occur in a certain spot, on a certain day. Rather, the scope of the project focuses on a bigger picture. The results will provide interested parties with areas of significant uncertainty. More importantly, they will be able to make better, less risky decisions.

The project is important for several reasons. As the region's demand for energy intensifies, the importance of hydrocarbons in the South China Sea region has grown significantly. During the 1990s, energy consumption for the ten largest economies in East Asia grew at a rate ten times faster than the rest world. By 2020, more than a third of the world's energy consumption is predicted to come from Asia (Klare 2001, 110). The demand for more hydrocarbons will force the littoral states of the South China Sea to seek out the more difficult resources to extract. Since territorial sovereignty remains unsettled, the pursuit of these resources could be a contentious endeavor. With the ability to identify high-risk areas for confrontation, an assurance could be given to many of the private entities pursuing these resources and states may be alert to where confrontation might occur.

The waters of the South China Sea act as a major conduit for international shipping traffic. Forty-five percent of the world's shipping tonnage travels through the sea and the Strait of Malacca "is the world's second busiest international sea lane, second only to the Strait of Hormuz" (Rowan 2005, 415). Iran's early 2012 threat to close the Strait of Hormuz demonstrates how uncertainty over strategic international shipping lanes can influence the global economy. Beyond concerns regarding shipping lanes, any major confrontation involving littoral states in the South China Sea could have a dramatic impact on the regional and global economy.

Also, as China has become a more significant player in geopolitics, their actions and intentions have attracted greater scrutiny. Being able to locate high-risk areas for confrontation in the South China Sea will hopefully elucidate potential Chinese actions in one of their most contentious on-going disputes.

In order to achieve the goal of the project, I will analyze the predicted locations of hydrocarbons and power projection capabilities of the four major players involved in the dispute. Areas where multiple power projection zones overlap will be considered as high-risk areas for confrontation. The location of hydrocarbons will also be considered.

The paper will be organized in the following manner. First, I will provide a historical background to familiarize the reader with the dispute in the South China Sea. Second, I will address the literatures of both conflict involving hydrocarbons and power projection. This theoretical foundation will provide an understanding of how hydrocarbons may impact conflict and how states project military power. Third, I will analyze where the predicted hydrocarbon resources in the South China Sea are located. Fourth, I will create a spatial model for the power projection capabilities of China, Malaysia, Philippines and Vietnam. These four states are chosen, because they have been most active participants in the historical clashes in the South China Sea dispute. Fifth, by juxtaposing the location of hydrocarbons and power projection capabilities, I will be able to identify where high-risk areas for confrontation are most likely to occur

Very little of the hydrocarbon resources in the South China Sea have actually been located, quantified and extracted. In this project, the location and quantity of hydrocarbons in the South China Sea will be drawn from data from the United States Geological Survey (USGS) for undiscovered hydrocarbon resources in the South China Sea (2010). The data used from USGS are risk-assessed at the 5, 50, and 95th percentile. Power projection capabilities will be quantified from data provided by the 2007-2008 edition of Jane's Fighting Ships. The source provides a fleet strength, measured by the total number of ships in the state's fleets. This number is then divided by the total number of ships amongst all four of the analyzed states in the dispute and a ratio is provided. Each fleet's average ship range is then multiplied by the ratio. The resultant is the states' power projection distance. As noted, the identification of high-risk areas for confrontation will then be analyzed in the final chapter of the paper.

CHAPTER 2
HISTORICAL BACKGROUND

Before Hydrocarbon Discovery

At the core of the South China Sea Dispute are the sovereignty rights over the Paracel and Spratly island chains. Six states (Brunei, China, Malaysia, Philippines, Taiwan and Vietnam) claim some or all of the islands, reefs, banks or shoals in the chains. The seventh state in the dispute, Indonesia, only has territorial claims over water in the southwest corner of the South China Sea. Justifications range from historical use, discovery and/or international law. To date, no precedent has been able to establish who truly has the rights to these territories. In this section, the focus will be on historical relationship between the islands and the states involved in the South China Sea Dispute. I will begin with their sovereignty justifications and move on to the contention between states into the late 1990s.

The islands in the South China Sea have been found in Chinese texts dating back to the 13th century (Bennett 1992, 434; Cheng 1975, 272). For the next seven centuries, Chinese fishermen temporarily frequented the small islands (Bennett 1992, 434). The historical use of these islands is the foundation for China's claim to such a large portion of the sea. The only other state claiming to have contact with the islands before the 20th century was Vietnam. They occupied some of the Paracel Islands starting in 1816 (Cheng 1975, 268). The French, while colonizing Indo-China, would eventually use this temporary occupation to justify their claim to the Paracel Islands.

From the beginning of the 1900s into the 1920s, the French expressed interest in both the Paracel and Spratly island chains. By the early 1930s, they were making formal territorial claims (Cheng 1975, 268). China responded to the claims with a written warning to the French Foreign Ministry and a visit to the Paracels by a navy admiral. In 1930, the French occupied its first island in the Spratlys and five more by 1933 (Bennett 1992, 437; Cheng 1975, 268). Japan entered the dispute after France's declaration, pronouncing that the entire Spratly island chain belonged to them. "France retained control over…nine islands until 1939, when the Japanese army swept into the South China Sea and occupied the Spratlys along with most of the other islands in that area" (Bennett 1992, 437). The Japanese would use these islands as military outposts until their eventual surrender of World War Two (WWII) in 1945. After WWII, the Chinese briefly occupied a few islands they had previously claimed, but withdrew by 1950 with the beginning of their own civil war (Bennett 1992, 438). As China tended to its domestic issues, the French essentially removed themselves from the dispute. The 1951 San Francisco Peace Treaty stripped Japan on its rights to the islands, leaving the question of sovereignty unresolved.

After WWII, a few more states began staking claims in the dispute. Filipino explorer, Tomas Clomas *discovered* the Spratly islands in 1956. The Filipino government made no formal sovereignty claim upon the discovery and Clomas left shortly after (Bennett 1992, 438). In the same year, Taiwan occupied Itu Abu (or Taiping Island) and South Vietnam occupied the Spratly Island, an island in the Spratly chain (Bennett 1992, 438-9). Itu Abu is the largest in the South China Sea and Taiwan has maintained a military garrison there since the 1956 occupation. South Vietnam essentially inherited France's claim when France abandoned its major presence in the region.

At the end of the 1950s, four states made claims over islands in the South China Sea -- China, Taiwan, Philippines and South Vietnam. The islands had been used as military outposts in WWII by Japan, but no occupier since had used them for such a strategic purpose. For the most part, fish and guano constituted the only monetary value for the islands (Bennett 1992, 439). Cheng (1972, 270) argues that from WWII to 1967 the islands were for the most part "forgotten". Fish and guano were not valuable enough to put significant efforts into protecting claims.

In the late 1960s, surveys indicated the potential for vast quantities of untapped hydrocarbon reserves beneath the South China Sea (Cheng 1972, 265). The potential for hydrocarbons fundamentally altered the whole dispute. Since no method had been devised or agreed upon to resolve the dispute, states began to aggressively pursue the islands on their own.

Claims Regarding the Paracels and Spratlys

This section, will discuss the pursuit of claims by littoral states of the South China Sea. Garver (1992, 1001) argues that in 1973 China's main concern was not actually the hydrocarbon resources of the sea but rather the likelihood of North Vietnam occupying some of the Paracel Islands. The United States had just withdrawn from South Vietnam and China began to worry about the Soviet Union's increasing interest in North Vietnam affairs. South Vietnam still maintained control of the islands in question, but China feared that with the end of hostilities, Hanoi would be able to occupy these islands with little effort. Then, "Moscow's encirclement of China would be tightened" (Garver 1992, 1001). China decided it must have control of the Paracels in order avoid a Soviet stranglehold.

The preemptive decision led to the 1974 clash between South Vietnam and China in the Paracel Island chain. Eighteen troops from Vietnam were killed and China gained control of the territory (EIA 2008, 5). For the next ten years, the Chinese fortified the Paracel Islands with permanent military structures. Although the Vietnamese still officially claim the island chain, China has remained in physical control since 1974.

The dispute's focus then turned to the Spratlys. Shortly after the hydrocarbon resources were discovered, the Philippines started to claim the islands in the Spratly chain closest to their shores. They "began oil exploration in 1976 and formally announced its annexation of the eastern portion of the Spratlys in 1978" (Bennett 1992, 439). They also demanded that the Taiwanese exit Itu Abu. Taiwan responded by claiming two more islands that neighbored Itu Abu. In 1973, South Vietnam had already awarded oil contracts to Western oil companies to explore for oil in the water off its shores (Guan 2000, 202). But after the 1974 clash, South Vietnam lost all its island holdings in the sea. They responded by occupying six islands in the Spratlys, which were eventually taken over by North Vietnam in 1975 (Garver 1992, 1005). Malaysia occupied one atoll in 1983 and three more in 1991. In the same year, Brunei staked its first claim with no occupation (Bennett 1992, 440). All of the present-day involved states had now officially staked in claims in the sea.

Garver (1992, 1008- 1016) details China's involvement in the Spratly Islands throughout the 1980s. China spent the early 1980s surveying large portions of the sea. From 1980-1983, China had boats patrolling the area, with planes conducting aerial photography. They made their first exploratory mission to James Shoal, near the coast of Malaysia and nearly 1000 miles away from their own shores, in 1983. These missions were almost solely for survey and exploratory purposes. China had always claimed the entire chain, but did not actually occupy a single island in the Spratlys until 1987 (Bennett 1992, 440). From this point forward, China maintained a "major" and "permanent physical presence" in the Spratlys (Garver 1992, 1009).

China's stronger presence led to the most tumultuous decade in the dispute's history. In 1988, China had 17 ships in the Spratlys and began the search for more islands to occupy. In a matter of five years, China went from sending out survey crews to building significant structures. Fiery Cross Reef saw a major renovation.

> For nine days explosives were used to blast channels through coral for ships to pass into the reef. Dredges then entered and pulled up enough coral to form 8,080 square metres of land area…Two oval-shaped reinforced concrete buildings were built on top of these caissons, one serving as the observation station, the other as

> living quarters. In May installation of instruments and equipment began, and the station was declared complete…after six months of intense work (Garver 1992, 1011-2).

When Vietnam took notice of China's major endeavors, tensions increased quickly. Vietnam began to send airplanes and warships to survey Chinese activities. "The repeated confrontations finally produced an armed clash at Johnson Reef" (Garver 1992, 1013). In 1988, the Chinese sunk a Vietnam naval freighter and killed almost 80 (Garver 1992, 1013).

China continued to survey the sea near the Spratlys. In 1989, China declared that the area "contained 25 billion cubic meters of natural gas, 370,00 tons of phosphorous and 105 billion barrels of oil" (Garver 1992, 1015). Chinese building efforts continued with more observation and weather stations and survey ships. "As of 1992 Chinese forces occupied nine features in the Spratlys, including Fiery Cross, Subi, Caurteron, Johnson, Gaven, Eldad and Dongmen reefs. All Chinese holdings reportedly had power generation, cold storage, water storage and recreational facilities" (Garver 1992, 1015). In an exceedingly bold move, China gave the rights to the U.S. Crestone Energy Corporation to explore for oil in the Vanguard Bank and guaranteed their protection with military force. China was the first country to *explore* for resources in the Spratlys (Garver 1992, 1017).

In 1995, China made arguably the most audacious move yet. A Filipino fishing vessel discovered that the Chinese had begun building structures on Mischief Reef. The significance of this development was that Mischief Reef was within the Philippines' EEZ, only 135 off its shores (Storey 1999, 97). The action not only demonstrated a complete disregard for the Philippines' EEZ rights under the Law of the Sea, but also proved China's tenacity towards its sovereignty claims in the sea. Upon the discovery of the structure, the Philippines were militarily incapable of a formidable counter. The two states eventually agreed to a code of conduct, which stated similar actions would not occur in the future (Storey 1999, 97). It was apparent within the year that China would not honor the code of conduct. More structures were appearing and the ones on Mischief Reef were only becoming more sophisticated. A gun battle between the two states ensued in 1996. Storey (1999, 99) outlines China's advancement strategies when it came to building structures on the islands:

> Since 1988, China has…[been] laying down territorial markers and occupying a number of reefs. To consolidate its hold over these reefs, facilities capable of housing military personnel and berthing naval vessels have been constructed. These facilities are built in three stages. The first stage consists of a small hut on stilts. This hut is then upgraded to a more complex structure of three to four octagonal bunkers (such as the kind constructed on Mischief Reef). The final stage involved the construction of a large brick fortress capable of housing more than fifty men.

Storey labels China's approach as a "creeping assertiveness". China continued its development on Mischief Reef until 1998, when Storey (1999, 99) claims the Chinese reached their "third stage" of construction.

China's "creeping assertiveness" from the late 1980s to the late 1990s established a new policy towards the South China Sea. China was not going to yield ground in the territorial dispute and made that clear by increasing their military presence in the region.

In the next chapter, the focus will turn to the how hydrocarbons play a role in conflict. A survey of the topic's literature will allow for a better understanding of how hydrocarbons might play a role in the South China Dispute.

CHAPTER 3
HYDROCARBONS AND CONFLICT

Since the end of the Cold War, a burgeoning literature examining the relationship between natural resources and conflict has developed. Several resources (hydrocarbons, diamonds, water, timber, etc.) have been explored in regards to their role of spurring conflict on multiple scales. A portion of the literature diverges away from interstate conflict towards the developing world, non-hydrocarbon resources, and civil conflict (Humphreys 2005, Homer-Dixon 1994), which is of little consequence to this study. Rather, the main focus of this chapter concentrates on hydrocarbon energy security, emphasizing vulnerability, which might lead to potential interstate conflict. Also, I will provide historical cases to illustrate when hydrocarbons were a factor in conflict. This section will review the literature discussing the relationship between hydrocarbons and conflict. First, I will briefly examine the topic of peak oil, which will in turn lead to a short discussion of resource vulnerability and demand. Second, I will discuss how states gain the right of ownership to hydrocarbons and how it might become problematic. Finally, I will consider states' methods for securing oil and how this behavior might create interstate tension and conflict.

Oil Vulnerability

Peak oil, a concept coined by M. King Hubbert, is thought to be the point at which half the world's oil supply has been produced. From that peak point, the production of oil will never be higher. More importantly, unless demand wanes with extraction levels, production will be unable to meet the demands of the world economy. Although somewhat imperfect, a bell curve is used to model the concept. Most estimates had the predicted the peak between 2006 and 2016 (Hirsch 2005, 9). The event has yet to occur.

As noted in Bardi (2009), there are disagreements about what effect the mid way point of oil production will have on energy markets. Some believe the free market will deal with uneven supply and demand with a rise in prices. Others say the peak will produce no real change on the market at this time since the reserves are so huge (Bardi 2009, 324). What is certain is that the peak discovery of oil happened in the 1960s, making peak production an inevitable event (Bardi 2009, 325). At current production levels, the world's oil supply is sufficient for another 40 years. Klare (2001b, 19) argues that if we take into account the predicted per year 2% increase in oil demand, we will more likely run out of oil in 25 – 30 years. However, technological improvements and new supply discoveries could push this date forward. Regardless of whether the theoretical consequences of peak oil occur, the world will soon consume half of its total oil deposits. The second half will be depleted much quicker than the first. Most importantly, an abundant, reasonably priced, secure supply of oil will be harder to come by for all importing states.

A peak oil scenario will not be the first time states scrambled to protect resources. "Western geopolitical thinking about resources has been dominated by the equation of trade, war and power, at the core of which were overseas resources and maritime navigation" (Le Billon 2004, 2). Timber, for naval ships, became a crucial resource to European powers from the 15th century to 18th century (Le Billon 2004, 3). Without it, the prospects for expansion, economic growth and success at war were slim.

In the early 20th century, one of the first major confrontations for oil occurred. Azerbaijan, who at the time produced half the world's oil supplies, became a hostage to events of World War One (O'Hara 2004, 140). Although production levels decreased significantly leading up to the war, between the years of 1917 and 1918 Azerbaijan had the militaries of Russia, Germany, Turkey and Britain all vying for its oil resources. Britain's occupation of Azerbaijan's oil fields played a crucial role in slowing down Germany's advance (O'Hara 2004, 141).

The fields played a similar role in World War II. After the Russian/Germany Non-Aggression Pact, France and Britain hoped to prevent Hitler's access to Azerbaijan oil (O'Hara 2004, 144). "Hitler is quoted as saying that, if he failed to take the oil fields of the Caucasus, he might as well end the war" (O'Hara 2004, 144). In a separate and probably more infamous WWII incident, the U.S. oil embargo on Japan played a major role in Japanese reasoning behind the attack of Pearl Harbor in 1941. A detailed description of these historical cases is not as important as the generalizations to be drawn from them. In the past, states have taken substantial measures to protect critical resources.

However, there is a component of peak oil that is very different from these (or any) past examples. There are now two challenges for states when it comes to acquisition of the world economy's most important natural resource: competition and the bottom of the barrel. The pressure for states to secure reasonably priced oil will become more difficult than ever. The "second half" of the world's oil supply will be much more difficult to extract than the first. In addition, the world's dependence on oil is increasing.

One of the most important aspects of demand are the barriers to alter it. Hirsch (2005, 5) writes that the world is witnessing its "first forced energy transition" and asserts the pessimism of most energy experts about the world's preparation for it. By 2000, the world consumption was exceeding discoveries by about around 15 billion barrels per year (Hirsch 2005, 7). The largest obstacle to overcome will be to change the world's extremely oil dependent transportation system. From 2009 to 2010, the world saw its second largest year-to-year vehicle increase ever from 980 million to 1.015 billion units (Sousanis 2011). For a sector so slow to change, vast efficiencies will have to be made if states want to decrease demand any time soon. Until this happens, states will need to be able to secure an ever-increasing quantity of oil.

Who Owns What and How Might This Lead to Conflict?

Over the last century as states became well-demarcated entities on maps, the question of oil ownership has spurred several confrontations. As definitive as the lines drawn on paper appear, they are not the most effective tools for determining complicated resource ownership questions.

The past century has provided several ad hoc methods in settling disputes over resource ownership. However, there are still gaps that have left some cases open to interpretation and in some cases, confrontation. When so much is at stake, competing states are not going to easily give up possible oil deposits. When ownership is in question, the stability of area weakens considerably (Klare 2001b). It is important to discuss the ownership of oil resources, because a lack of clarity on this issue can lead to potential conflict. When there is no defined owner of a resource, competition for that resource will escalate quickly.

For the purpose of this study, I will mostly focus on ownership disputes for offshore oil deposits. However, an example of a land-based boundary dispute would be between Saudi Arabia and Yemen, which was mitigated through several renditions of the Treaty of Taif. Although its effectiveness for promoting a peaceful agreement has sometimes been in doubt since its inception in 1932, it remains the basis for resolving the boundary dispute today between the two states (Murphy 2006).

The United Nations Convention of the Law of the Sea (UNCLOS) is the foundation for almost all offshore resource dispute decisions. For the purpose of oil exploration, there are three boundary limits I will discuss. First, a state has exclusive rights to the first 12 miles off its coast. These first 12 miles are essentially viewed as an extension of land from the bordering state.

States practically have complete control over this territory. Second, a state has an Exclusive Economic Zone extending 200 miles offshore. A state has the right to the resources within this zone. If there are less than 400 miles between states, UNCLOS states that an "equitable solution" can settle the dispute (Hsuing 2005, 517). Third, a state has the rights to resources to its continental shelf for up to 350 miles only if the shelf is a natural prolongation from land. The territory between 200 (the EEZ cutoff) and 350 miles only grants permission to resources within the continental shelf itself, most importantly, hydrocarbons.

When mutual agreement cannot be made under UNCLOS, alternative methods have been utilized. One of them being, submitting the dispute to the International Court of Justice (ICJ). The dispute of the Gulf of Maine between the U.S. and Canada or the continental shelf dispute between Libya and Malta are examples of cases submitted to the ICJ (Hsuing 2005, 516). Interstate agreements or treaties have also been established to determine offshore resources. Notable examples would be between the five littoral states over the Caspian Sea and Iran and the United Arab Emirates over Abu Musa Island (Murphy 2006).

Even with a large repertoire of possible settlement processes, there are some disputes that have been quite complex or unsolvable. Following the break up of the USSR, the Caspian Sea, and its supposed vast oil supplies, added three new littoral states: Kazakhstan, Turkmenistan and Azerbaijan. Long before the USSR dissolution, a treaty between the USSR and Iran settled ownership to the rights of resources under the Caspian. The three new states refused to honor this agreement without their own share. With three new states classifying the Caspian as a sea and Iran and Russia classifying it as a lake, tension grew quickly. An eventual state-by-state agreement was made, but not all parties have completely made peace with each other.

To this date, three disputes remain unresolved in Southeast Asia: the East China Sea dispute, the Kuril Islands dispute, and, of course, the South China Sea dispute. All of these have islands involved, which have proven to make a potential agreement very difficult. The East China Sea dispute is exceptionally tricky for a number of reasons. First, the Chinese and Japanese have used different interpretations of the Law of the Sea to explain their case (Hsiung 2005). Second, there are the disputed Senkaku islands, of which both declare ownership. The ownership of these islands, and the inclusion of Taiwan and parts of Okinawa, would alter the division line significantly. Even if they both agreed to the same terms under the Law of the Sea, these islands would complicate matters significantly. Third, the history of conflict between China and Japan adds a nationalistic aspect to the dispute that adds significant tension.

The East China Sea and Caspian Sea are very relevant cases with regards to the South China Sea dispute. Like the South China Sea dispute, neither case has been resolved by international law. In addition, in both cases states began to explore and extract hydrocarbons before a settlement was concluded. The following section will go into more detail about the behavior of states and will hopefully help explain decisions that states make in situations like these.

Before moving on, it is important to touch on when confrontation or conflict might occur given the adjudication methods available to states. From the literature, there are three main ways in which oil disputes can escalate. First, when one state attempts to seize another state's perceived or actual oil resources (e.g. Gulf War I). Second, when the boundary surrounding an oil deposit remains undefined (Saudi v. Yemen or the East China Sea case). Third, when states are unwilling to place the dispute under the jurisdiction of some form international law, whether it be through UNCLOS, ICJ or treaty (East China Sea). The South China Sea dispute possesses all three of these possible exacerbating factors.

State Behavior towards Hydrocarbon Access

Scholars who study the relationship between hydrocarbons and conflict point to the importance of industrialization and economic might when it comes to state strength. In order to maintain and grow these measures of strength, a secure access to oil is a requirement. Therefore, measures are taken by states to protect the free flow of it into their economies. The literature involving hydrocarbons and conflict takes two forms. First, some believe "resource wars" will define the new global order (Russett 1982, Klare 2001a, Klare 2001b). Second, some analyze hydrocarbons as they spur conflict or coercive behavior by states (Peters 2004, Le Billon 2004, O'Hara 2004, Le Billon 2007, Lujala et. al 2007, Ross 2008, Lee and Kim 2008, and Le Billon and Cervantes 2009).

Both Russett and Klare argue that resources are altering the landscape of geopolitics. Although influenced by different events (Russett by the 1973 and 1979 oil embargos and Klare by the first Gulf War and instability in regions with major oil supplies), they have the same conclusion; most major, future world conflicts will be caused by the demand of resources.

Russett (1982) credits the changing global order towards neo-mercantilist behavior caused by burgeoning demand. He points to the run up to WWI has a similar time in world history. Colonial powers were growing quickly and so was there need for resources for their industrializing economies. "[C]ompetition over the few remaining areas became more intense. The acquisition of a new colony by one power increasingly meant the denial of another's ambitions in that region" (Russett 1982, 46). Whether the events in Sarajevo occurred in 1914 or not, Russett believes a war was inevitable due to confrontations over resource procurement (1982, 47). The undefined ownership of these resource-rich lands led to increased tension. With the end of colonialism and the remaining "trading patterns" between ex-colonies and their rulers, he views the 1980s as a turning point. "Self sufficiency [had] vanished" and the need for major powers to acquire resources on their own become increasingly important (Russett 1982, 48). The growing hunger for resources had begun a new world economic order. One that was diverting away from a liberal free-market and moving towards a neo-mercantilist resource grab. Russett argued that both the Soviet Union and U.S. were using similar methods to garner resources and Cold War ideologies did not impact their motives. He asserts that only when "raw materials' suppliers are in someone's sphere of influence…can access be assured" and that "[h]ostilities and suspicions among major powers are likely to be corrosive" (Russett 1982, 50). These tensions will then likely lead to potential conflict.

Although taking on a slightly different approach, Klare also believes tensions around oil will eventually lead to increased likelihood of conflict. Klare (2001b, 27-50) suggests three crucial factors will lead up to oil-based conflict. First, the politics of oil security have created a climate where any oil disruption has now become a major national security issue, most notably for the United States. He traces the historical roots for the securitization of oil by detailing certain events of WWI, WWII, the oil embargos of the 1970s and finally the Gulf War. He concludes that the "Carter Doctrine," which "threaten[s] the use of force against any adversary that might seek to impede the flow of oil from the Persian Gulf," was continually used in U.S. foreign policy throughout the 1990s (Klare 2001b, 33).

Second, Klare labels the next factor behind the rise of oil conflict as the "Dynamics of Global Oil Consumption" (2001b, 35). He points to data discussed above on how supply will be unable to meet demand in the coming decades.

Third, Klare cites the "Inescapable Constraints of Geography" (2001b, 44). He labels the Persian Gulf, the Caucasus, and the South China Sea as the "Strategic Triangle" of oil supplies, because they produce roughly half of world's oil and hold nearly three quarters of the world's identified reserves. More importantly, they are all plagued with confrontation (Klare 2001b, 50).

In addition to these three factors, Klare pays close attention to the disconcerting military build-up in these three regions. From 1990-1997 alone, the U.S. had arms agreements with five Persian Gulf states that equated to roughly US $42 billion (Klare 2001b, 66). In the Caucasus, he discusses the increased military presence by both Russia and the U.S. in order to influence pipeline development in the region (Klare 2001b, 88-97). He begins his book, <u>Resource Wars</u>, with the account of the 1997 U.S. deployment of 500 paratroopers into the mountains of Kazakhstan, with the hopes of creating the peace necessary to build new pipelines out of the Caucasus, bypassing Russia, towards the West. In the South China Sea, Klare details the naval arms race between the sea's littoral states that led to the 13 military clashes taking place between 1988 and 1999 (Klare 2001b, 124). Considering all these factors, Klare makes a convincing argument about the significance of "resource wars" on global scale.

Other scholars who look at hydrocarbons as they relate to conflict and/or coercive behavior focus on the topic on a narrower scale. Conflict over oil does not define a new global order within their arguments. Some scholars discuss oil as it relates to civil conflict. I will attempt to only focus on these authors when they have a notable relevance to international politics.

To begin, I will review the scholarly work that assesses how oil plays a role in conflict. Again, although some of these studies mostly focus on civil conflict, they are relevant on an international level for the same reason as discussed in Klare's work; civil unrest within in an oil producing state or region might lead to supply disruptions to major powers. This is turn, could lead to foreign intervention or increased tension within the region at large. Le Billon and Cervantes (2009, 837) show that since the end of the Cold War, "the proportion of conflict zones over-lapping oil-producing areas increased from about 20 percent to 40 percent". They also note recent studies that point to a correlation between high oil dependence and oil abundance levels to an increased risk of war. Ross (2008, 2) calculates that although in the same period major civil wars have decreased from 17 to 5 and smaller conflict from 33 to 27, "there has been no drop in the number of wars in countries that produce oil." Also, the widely discussed idea of an "oil curse" points to how oil can breed instability within a states interior politics and economy (Le Billon and Cervantes 837). Le Billon (2004) believes most of the conflict on the civil level is not about securing the physical oil itself. Instead of conflict based on supply disruptions of valuable natural resources, he argues these conflicts are more about lust and profiteering for local leaders.

However, some of the scholars above are quick to point out they do not believe there is a direct causation between oil and conflict. "Oil alone cannot create conflict, but it both exacerbates latent tensions and gives governments and their more militant opponents the means to fight them out" (Ross 2008, 4). This indicates a possible indirect relationship between oil and conflict. Le Billon (2004, 164) categorizes the direct link between oil and conflict a "narrow engagement [that] overlooks the multidimensionality of conflicts". He focuses on what he calls a political ecology approach to looking at oil conflict in which special attention is given to the spatial dimensions to the control and access of resources. For the purpose of this study, he would label oil in the South China Sea as "distant and point". This means the oil is far away from the central authorities and the resource extraction method is capital-intensive and concentrated. A spatial organization such as this would most likely spur a secessionist movement (he discusses the topic in relation to civil conflict). When states are "unable or unwilling to secure the control of resources through the existing centre of power, political movements in resource production areas have an interest in asserting secessionist sovereign claims over the lucrative periphery they claim as theirs" (Le Billon 2004, 174). Although he does not make this conclusion, a comparison could be made here to the naval arms race Klare (2001b) describes taking place in the South China Sea.

The next portion of the literature assesses how foreign influence plays a role in oil producing regions. Peters (2004, 187) argues for an increased amount of international resource wars for two reasons: an anticipated supply crisis and "the uneven distribution of these declining resources along the North-South axis". In turn, "the coercive character of traditional US strategies for securing energy will intensify, thus bearing the potential to escalate into further armed conflict" (Peters 2004, 187). She cites the equitable distribution of resources and alternative energy sources as possible solutions to further conflict.

Lee and Kim (2008) do a comparative analysis of the division of seabed resources adjudication process in the Caspian Sea versus East China Sea in order to determine why the former appears to be approaching a resolution and latter is not. Using hegemonic stability theory, they conclude that Kazakhstan, Turkmenistan and Azerbaijan were able to begin exploring the seabed for resources on their own before a resolution with Russia was completed because they had the backing of the U.S. Before the U.S. got involved, it had appeared Russia would have the upper hand due to their relative strength. When the strongest power in the dispute changed, so did the outcome (Lee and Kim 2008, 806). It was this unequal relationship of powers involved that allowed for the more powerful interests to prevail. Rather, in the East China Sea dispute, two seemingly equal powers are pursuing the same goal. Not only that, trust between the two states is poor due to historical engagements (Lee and Kim 2008, 808). In reference to the Caspian Sea dispute, Lee and Kim's argument contrasts directly with Peters, who claims U.S. involvement will only escalate resource conflicts.

Another important consideration is how conflict affects the transportation of oil. O'Hara (2004) details the struggle over pipeline development in the Caucasus. With its vast suspected reserves, Russia, China, Iran, the U.S. and the EU would all like to see oil pipelines take a different route out of the region. The U.S. has tried hard to develop pipelines that go through states that are not hostile to its interests. This explains why the U.S. had paratroopers in Kazakhstan in 1997, as Klare noted. Ironically, before 9/11 the U.S. was also in negotiations with the Taliban to have a pipeline go through Afghanistan. Klare (2001b) also notes the importance of shipping lanes throughout all three of the regions he describes in his "Strategic Triangle" concept. Japan and South Korea in the South China Sea and all major importers from the Persian Gulf have a lot at stake if transport is disrupted due to conflict.

As discussed above, scholars are attempting to answer important questions about how hydrocarbons and conflict are related. The urgency to understand how these two interact is exacerbated by burgeoning demand and the ideas underlying peak oil. Similar to the pre-WWI era, states are behaving aggressively in order to secure the resources their economies require (Russett 1982). When ownership of resources is in doubt, it only raises the likelihood for potential conflict. Keeping the hydrocarbons flowing is the most crucial goal for major powers. Over the coming decades the most important feature to monitor will be the balance between gaining access to hydrocarbon resources, protecting the flow of hydrocarbon supplies, and the increasing tension as a result from these actions.

From this chapter's literature review, I would like to draw three conclusions with relevance to this project. First, competition over resources increases when the ownership is unclear.

Second, one of the only ways to assure access to hydrocarbons is to make sure that it is within the state's sphere of influence (Russett 1982). Third, since the end of the Cold War, there has been a 20 percent increase in the amount of conflict that is related in some way with oil resources (Le Billion and Cervantes 2009).

CHAPTER 4
COMPONENTS OF POWER PROJECTION

The South China Sea covers well over 1,000,000 square miles of the earth's surface. The area created by the relatively small rocks emerging from its depths pales in comparison to the emptiness of the sea's waters. This paper now turns to the question of how states go about controlling "emptiness". In other words, I will focus on the concept of power projection, with special attention to how it is achieved at sea.

As discussed in the previous section, when the ownership of hydrocarbon reserves is left undefined, it breeds a scenario where confrontation or conflict is likely. The ownership of hydrocarbons beneath the South China Sea has clearly not been settled. Therefore, there are no definitive boundary lines for all the perspective claimants. So how does one go about determining which state controls a given area without actual occupation?

The following section examines the literature discussing how area can be controlled without being *occupied*. First, I will begin with discussing the tenets of Boulding's (1962) Theory of Viability, which posits how power relates to the distance. Second, I will look at how these assumptions may help explain to a dispute similar in nature to that in the South China Sea, the Falklands War. Third, I will analyze the most crucial components of military power projection and then conclude with discussing how they relate to Boulding's concepts.

"The Further the Weaker"

Boulding (1962) utilizes economic theory to discuss the likely behavior of rival firms competing over territory or as he calls it, the Theory of Viability. He applies this analysis to international relations and focuses on the two fundamental concepts of power projection: "the further the weaker" and "loss of strength gradient".

The first concept emphasizes where a state's power centers itself, its home base. Theoretically, sovereign states will rarely encounter competition at home. Beyond a state's borders, competition will become stronger. "The general principle applies that each party can be supposed to be at his maximum power at home (this may be an area rather than a point) but that his competitive power, in the sense of his ability to dominate another, declines the farther from home he operates" (Boulding 1962, 78-79). The main justification for the loss in ability is the cost of transport. The further away from a state's borders, the costlier it becomes to conduct operations. Competition becomes more difficult when the costs of achieving one's goals increases. Therefore, the further a state travels from home, the harder it becomes to project its power.

Boulding attaches a quantitative concept to the "the further the weaker" concept by introducing the "loss of strength gradient".

> The amount by which the competitive power of a party diminishes per mile movement away from home is the loss-of-power gradient. If this is high, mutual survival is easy, games of ruin are unlikely, and a large number of parties can exist in a given field. As the loss-of-power gradient falls, conflict is likely to become more acute, games of ruin ensue, and the number of parties decline until there are few enough parties that they can be far enough away from each other to avoid games of ruin; beyond a certain point in the decline of the loss-of-power gradient, only a single party is viable in the field (Boulding 1962, 79).

The loss of strength gradient determines the competition level at in a given area. If no states are able to project power (high loss of strength gradients) in a given area, "games of ruin are unlikely". Their energies are unlikely to conflict with one another. However, if states are able to project power (low loss of strength gradient), conflict will become more likely. Areas of equal strength are unstable and multiple parties are unlikely to exist indefinitely. Loss of strength gradients vary from state to state, so a midpoint would not be effective at demonstrating conflict points.

Boulding's Concepts Applied

Veering away from the loss of strength gradient in the abstract, Webb (2007) discusses how the concept applied to three wars of the 20th century. In addition to discussing the loss of strength gradient, Webb emphasizes the importance of forward basing, which is like having a home away from home. In essence, it is compensating for what is lost from distance by resetting home to a new forward location. States forward base when they build military bases overseas.

Webb details how these concepts worked in the Boer War (1899-1902), the Gulf War (1990-1991), and the Falklands War (1982). For the purpose of this paper, I will mainly focus on his analysis of the Falklands War since it has similarities to dispute in the South China Sea. Webb discusses the advantages the British and U.S. had in the Boer and Gulf Wars because of their ability to source essential supplies from local resources. Without this ability, the British and U.S. would have compromised a significant amount of strength in the perspective wars. In the Falklands War, the British were unable to utilize local resources, because they were required to wage war from the sea. "While [the British] faced an 8,000 mile journey from north western Europe to the South Atlantic, the Falklands were just 400 miles from the Argentine coast" (Webb 2007, 298). In order to make up for the loss in strength from the voyage, the British were forced to become as resourceful as possible. They were scouting abandoned whaling stations, using tractors from Falkland Island farmers and refueling from Ascension Island, almost 4,000 miles away (Webb 2007, 298). Webb asserts, "the British in the Falklands War [were] barely able to get enough supplies to the front line. On the final day of the war, the Argentines were actually superior in munitions and could have halted their opponents advance...If their morale had held they need not have surrendered" (Webb 2007, 304). The British, a former global superpower, faced significant challenges to match the strength of an inferior power due to the lack of forward resources and distance traveled over water. On the other hand, Webb stresses the importance of forward supplies in both the Boer and Gulf Wars. For example, the U.S. drew heavily from resources, especially oil, already stationed in the Middle East. These wars not only reaffirm the continued importance of Boulding's loss of strength gradient, but they also demonstrate the struggles of conducting warfare from sea.

Webb (2007) stresses the significant impact that the sea has on power projection and warfare in general. Again, Webb notes the Falklands war and how transport costs prevented the British from moving supplies to the battlefront quickly. "Airlift is much faster than sealift. The problem is that it costs too much and delivers too little" (Webb 2007, 303). The British were forced to use sealift for almost all of their transportation needs. "Faced with the need to get everything they possibly could to the South Atlantic, the British could not afford the luxury of [airlifting]" (Webb 2007, 303). Not only was airlifting more expensive, but there was really nowhere to land other than Ascension Island (4,000 miles away). While most naval ships can only reliably travel at 20 to 30 knots, it means that the airlift alternative, sealifting, is a slow and arduous process (Webb 2007, 302). As demonstrated by the British in the Falklands war, states lose strength when distance increases and transport costs rise. This is especially true when at sea.

Mearsheimer (2001) also focuses a great deal of attention on "the stopping power of water". He believes navies lack the power projecting capabilities armies possess, because of their difficulties of waging war across bodies of water (Mearsheimer 2001, 114). This leads to one of his main conclusions that no great power can become a true hegemonic global power because of the oceans separating the hemispheres.

Components of Power Projection

Before analyzing the most essential components of power projection, it is important to have a working definition of the concept. The U.S. Department of Defense defines it as:

> The ability of a nation to apply all or some of its elements of national power - political, economic, informational, or military - to rapidly and effectively deploy and sustain forces in and from multiple dispersed locations to respond to crises, to contribute to deterrence, and to enhance regional stability.

M. Taylor Fravel (2008, 134) defines “[f]orce projection [as] the ability to deploy and sustain military forces beyond a country’s borders, especially to conduct offensive operations”[1]. The purpose of this project is to assess what areas of the South China Sea are most at risk for confrontation. I therefore decided to focus on where states’ military power projection capabilities protrude into the sea. Meaning, I will predominately focus on only one of the “national powers” noted in the first quotation, naval power. Therefore, Fravel’s definition of force projection would probably align more accurately with this project.

Attention will now focus on the components of power projection. Given the circumstances involved in the South China Sea dispute, I will concentrate first on the range of fleets. Two of the biggest inhibitors to power projection in the South China Sea are the distance from the homeland and the lack of forward basing opportunities due to the size of the islands. “The islands are too small and boast too few resources to stage major sea-control or power-projection operations” (Yoshihara and Holmes 2011, 51). Therefore, the range of the claimant’s fleets is critical. Necessary capabilities include, “ships able to rearm, refuel, and reprovision men-of-war at sea, thus extending combatants’ cruising radius” (Yoshihara and Holmes 2011, 51). This means “long range naval patrols will be constrained by the number of large replenishment ships” (Fravel 2008, 135). With regards to airpower, in-flight refueling capabilities strengthen power projection abilities as well (Hughes, 91; Fravel, 135).

[1] Force and power are interchangeable in literature.

Hardware is also crucial to power projection capabilities. In a publication issued by RAND, Allen (1992) assesses the *Power Projection Capabilities in the Pacific Region*. He measures several indicators including: the airlift (includes range) and sealift (number of amphibious ships) capabilities, number of surface combatants (includes aircraft carriers), number of submarines, and number of forced entry units (ships or aircraft). When it comes to these indicators, states' capabilities are measured by fleet totals.

Fleets training missions can prove what states are capable of. Exercises involving: "large task forces, advanced ships, missile launches…amphibious landings…radar jamming, night flying, mid-air refueling, and simulated bombing runs" all demonstrate considerable strength (Swaine and Fravel 2011, 6). After the U.S. and South Korea held military exercises in the Yellow Sea in 2010, China quickly responded with exercises of their own in the Yellow and East Sea. "[T]hese actions were interpreted by some observers as…a direct Chinese response to the U.S.-ROK military exercises" (Swaine and Fravel 2011, 12). These training sessions can be viewed as muscle flexing exercises, demonstrating to others the strength of one's respective fleet.

Looking Forward

The ultimate goal of this project is to map the power projection capabilities of major players in the South China Sea dispute. O'Sullivan (1995) puts forth a bare bones model in a similar endeavor with his *Geopolitical Force Fields* project, hoping to spur more interest in the topic. He too focuses attention on how distance and the ability to deploy power impacts the mapping of spheres of influence. However, he ambiguously focuses only on the "spheres of influence" states might possess. He gives no clear definition of what this actually entails. This project's attention will be focused on naval power projection. Therefore, more detail will have to be given to actual naval capabilities.

As noted, according to Fravel (2008, 134) "[f]orce projection is the ability to deploy and sustain military forces beyond a country's borders". To project effectively outside ones borders, distance is a clear impediment. It will become more difficult for a state to project power as it moves further away from its borders. This hindrance was proven to the British in the Falklands War (Webb 2007). Forward basing can make up for lost ground, but in the South China Sea such opportunities are rare. Therefore, states will have to counter the capabilities lost from distance with actual hard power from fleet modernization. The range of fleets will have to be able to respond to the travel requirements of the South China Sea. Also, a state's fleet strength will need to match or better that of its adversaries. These are the capabilities that will be measured later in the paper while mapping state projections of power.

CHAPTER 5
WHERE ARE THE HYDROCARBONS?

As noted in the historical section above, the territorial sovereignty of South China Sea became contentious with the discovery of possible hydrocarbons. Two factors are important when discussing the hydrocarbons of the Sea: location and quantity. The goal of this section is to present both of these factors as they relate to hydrocarbons in the South China Sea.

Empirical Data

While detailing the locations and quantities of hydrocarbons in the South China Sea, it is important to keep in mind that much of the current data is based upon estimations. Much of the hydrocarbon data used in this project comes from the U.S. Energy Information Administration (EIA) and the U.S. Geological Survey (USGS). USGS and EIA data were used due to their analysis of the South China Sea region, rather than each specific country. Their methodology provides a better understanding of both location and quantity for the region's hydrocarbon resources. The unit of analysis for their data is the oil or gas field. The USGS does not provide up-to-date Geographic Information System (GIS) shapefiles of their oil and gas assessments in the region. However, they do furnish a map of where these fields are located that will suffice for this chapter. Actual, site-specific hydrocarbon data used for the analysis were downloaded from the Peace Research Institute Oslo's (PRIO) Centre for the Study of Civil War website. Their Offshore Petrodata shapfile is used to show country specific sites of discovery and production, not just assessments on oil or gas fields. This section also utilizes the Vlaams Instituut Voor De Zee (VLIZ) Maritime Boundaries Database in order to demonstrate where a state's maritime boundary ends, begins, or is contested. The data used with the Environmental Systems Research Institute's (ESRI) ArcGIS software came in a GIS shapefile format; all other data came in a spreadsheet format.

Methodology

Since GIS is a relatively unexplored tool in the International Relations field, I will give detailed attention to the processes and tools used in this section. ESRI's ArcGIS software allows the user to analyze multiple geographically referenced data layers over each other. Generally, each layer is in the shapefile GIS format and has its own data for a given them. The user is able to analyze the geographically referenced data layers using a set of tools provided by the software or through developing an analysis function. The tools and processes used for this analysis will now be explained.

PRIO's Petrodata shapefile was loaded on top of the National Geographic World Base Map. The layer is a comprehensive database of the world's offshore oil and gas discovery and production sites. The WGS_1984 (World Geodetic System) coordinate frame was used to geographically reference all the data for the analysis.

The first step of the analysis is to demonstrate how country-specific, discovery and production sites compare to a state's established maritime boundary. This was done in order to provide a baseline assessment of each country's hydrocarbon interests in the South China Sea. However, this data does not include explorations for oil, which have also occurred and would likely alter the appearance of the map.

When adding the Offshore Petrodata layer to ArcGIS, its unit of analysis is discovery and production site. Each site, which is represented by a dot on the map, is tagged with large quantities of other data (e.g. discovery year, production year, state, type of hydrocarbon reserve, etc.). A detailed description of what data is contained at each site can be found in the codebook (Lujala 2007), metadata and/or attribute table. The "Select by Attribute" tool was used to select and visualize all the sites that belong to each individual state involved in the dispute. The process was completed state-by-state, one at a time. After each state's sites were identified, the data was exported to a new layer and added to the map. The new layer's title became that of the state. The VLIZ Maritime Boundary layer was then added. The disputed areas were titled as "disputed". The map from this process can be found in Figure 5-1 in the results part of this section.

The second and most important step of this section is to analyze the location and quantities of the hydrocarbons in the South China Sea. Due to the lack of GIS data provided by the USGS and EIA, ArcGIS was not used to tabulate this data. Excel spreadsheets were used to prepare and illustrate the data and a map from the EIA provides a spatial representation of the hydrocarbon fields in the region. All of this data can be found in the results part of this section.

Results

A map of each state's hydrocarbon discovery and production sites in relation to its maritime boundary was developed. The maritime boundary is essentially the state's 200 mile EEZ, with exceptions of when treaties or a median lines have been established by the respective states. Although disputed areas are illustrated on the map, these boundaries are *not* the same as the claims made by each state. As one can see from Figure 5-1, states (except China and Philippines) have rarely ventured outside of their EEZs with their hydrocarbon production and discovery sites. China and Taiwan claim Disputed Area A. Vietnam, China and Taiwan claim Disputed Area B. And the Philippines, Vietnam, Malaysia, Taiwan and China claim Disputed Area C. The claims are displayed in Figure 5-2. The figure shows that almost all South China Sea is disputed if China's claim is considered.

The map shown in Figure 5-3 (adopted from the USGS's 2010 *Assessment of Undiscovered Oil and Gas Resources of Southeast Asia)* illustrates all of hydrocarbon fields in Southeast Asia. For the purpose of this analysis, only nine fields will be evaluated (Pearl River Mouth Basin, Song Hong Basin, Phu Khanh Basin, Cuu Long Basin, Nam Con Son Basin, South

China Sea Platform, Greater Sarawak Basin, Baram Delta/Brunei-Sabah Basin, and Palawan Shelf Basin). These nine were chosen because they are located within the disputed areas of the South China Sea.

The USGS's assessment evaluates all of the "Total Undiscovered Resources" in the South China Sea fields. Table 5-1 details their findings. The names of the nine fields in the South China Sea are found in the Field Name column. The Field Type column lists whether the field is oil or gas. There are two separate sections in the table: one for oil, measured in millions of barrels of oil (mmbo); and the other is for gas, measured in billions of cubic feet gas (bcfg). The table shows four different "fully risked estimates" of the amount of oil or gas within the fields. The F95 column indicates a 95% chance of that amount of oil or gas being in the field. The F5 column would then indicate a 5% probability. The former would be considered a more conservative estimate of the amount of undiscovered reserves, while the latter would be a riskier estimate.

As Table 5-1 indicates, there are substantial reserves of both oil and natural gas in the South China Sea. Approximately seventy percent of the hydrocarbon resources in the South China Sea fields are reportedly natural gas (EIA 2008, 4). To put these potential reserves into perspective, in 2010 China consumed 9.189 mmbo a day. That would mean if one were to consider a F50 probability, the *total* amount of oil in the South China Sea would provide China with a little over 3 years of consumption. As for natural gas, at a consumption rate of 10.3 bcf a day in 2010, the natural gas of the South China Sea would provide China roughly 35 years of consumption (CIA World Factbook 2010).

However, the most important field to consider would be the potential oil reserves in the South China Sea Platform field, which includes the Spratly island chain. This is the field that is the most contested due to the islands. Although no hydrocarbons have been officially discovered around the Spratlys, the USGS estimates that this field has the second greatest potential for both oil and gas when looking at the F5 column. The South China Sea Platform field would make up approximately 25% of the potential oil and 20% of potential natural gas in the Sea. Another important detail to note is that three of the biggest hydrocarbon fields are located in the southern portion of the South China Sea.

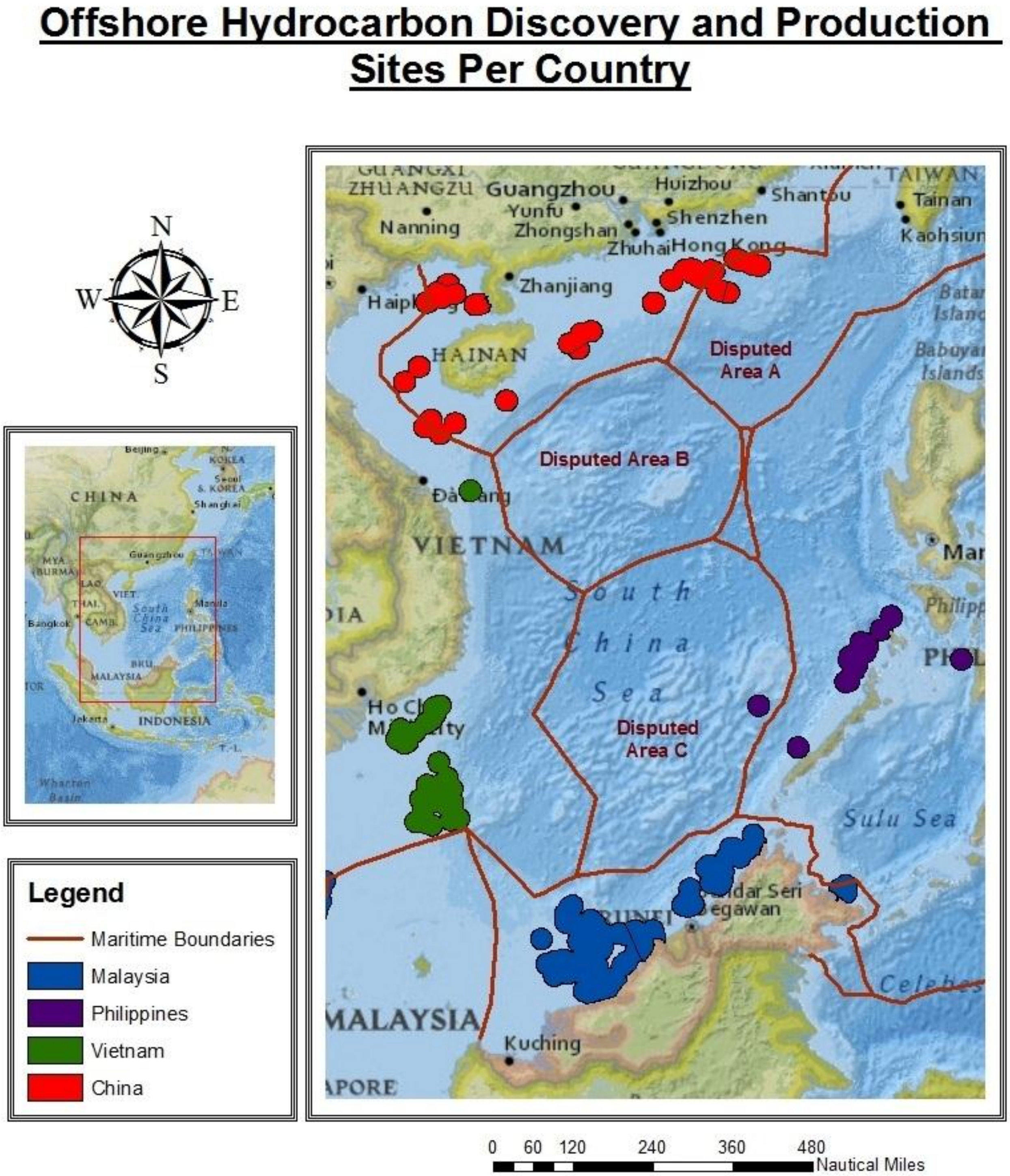

Figure 5-1. Offshore hydrocarbon discovery and production sites per country

Figure 5-2. South China Sea claims. Source: Rosenberg, David

Figure 5-3. Hydrocarbon fields of the South China Sea. Source: United States Geological Survey (USGS). "Assessment of Undiscovered Oil and Gas Resources of Southeast Asia, 2010". *World Petroleum Resources Assessment Project.*Accessed at: http://pubs.usgs.gov/fs/2010/3015/pdf/FS10-3015.pdf

Table 5-1. South China Sea hydrocarbon field data

Field Name	Field Type	Oil (MMBO)				Gas (BCFG)			
		F95	F50	F5	Mean	F95	F50	F5	Mean
Pearl River Mouth Basin	Oil	279	567	1079	608	290	694	1526	773
	Gas					3279	8078	18047	9035
Song Hong Basin	Oil	80	183	399	204	405	945	2112	1061
	Gas					5782	10599	18625	11205
Phu Khanh Basin	Oil	48	166	593	223	244	854	3152	1162
	Gas					4268	10679	23532	11878
Cuu Long Basin	Oil	726	1599	3204	1735	1463	3359	7339	3748
	Gas					112	487	1750	649
Nam Con Son Basin	Oil	321	643	1192	685	1165	2376	4524	2547
	Gas					6196	11488	19899	12053
South China Sea Platform	Oil	764	2192	5380	2522	3058	8889	22683	10370
	Gas					4609	13151	32381	15149
Greater Sarawak Basin	Oil	361	618	1013	643	1435	2529	4233	2641
	Gas					18918	33883	57419	35432
Baram Delta/Brunei-Sabah Basin	Oil	2116	4056	7192	4278	6074	12065	22241	12850
	Gas					6289	12645	23718	13525
Palawan Shelf Basin	Oil	84	226	609	270	54	147	417	179
	Gas					319	984	3035	1229
South China Sea Total		4779	10250	20661	11168	63960	133852	266633	145486

Source: USGS (2008)

CHAPTER 6
MAPPING POWER PROJECTION

Methodology

Since no existing technique was found in the literature to quantify power projection distance at sea, a new method was devised for this project. I selected two sets of criteria based on the literature review on power projection discussed above. Although states can project power with various elements of their entire military, only naval capabilities were considered due to the nature of the dispute in the South China Sea. First, the average range of a fleet was considered. A variable denoting range was used in order to account for the distance from home a navy must be able to travel. Jane's Fighting Ships (2007-2008) provides the range (r) of almost every ship in every fleet[2]. The range (r) for every ship was divided by half (R) in order to account for both directions of their operation. The halved ranges for all the ships in a state's fleet were then averaged in order to come up with an Average Range per Ship in a State's Fleet (R_a).

Second, the fleet strength was considered. Jane's Fighting Ships lists the fleet strength of every state's navy by listing the total number of ships in every fleet. The fleet strengths of the four chosen states for this project were totaled (P_t). This variable measured the total fleet strength within the South China Sea region. Each state's fleet strength was then divided by the total in order to establish a Fleet Strength Ratio (P_r).

A power projection distance (X) for each state was calculated by multiplying the Fleet Strength Ratio (P_r) by the Average Range Per Ship in a State's Fleet (R_a). The results for Power Projection Distance (X) are found in Table 6-1 shown below. Tables 6-2 (China), 6-3 (Malaysia),

[2] If ship ranges were omitted in source, similar ranges from other ships were used. If no similar ship could be found, the average range for the entire state's fleet was used for that ship.

6-4 (Philippines), and 6-5 (Vietnam) denoting the range of all the fleets' ships and Table 6-6 denoting the Fleet Strengths of each state can all be found at the end of this chapter.

Power Projection Variables:

r = Range of Ship

R = Range of Ship / 2

R_a = Average Range per Ship in a State's Fleet

P_t = Total Fleet Strength in Region

P_r = Fleet Strength Ratio

X = Power Projection Distance

$X = R_a * P_r$

Mapping Power Projection

In order to map each state's Power Projection Distance (PPD), ESRI's ArcMap software was used. First, the U.S. National Oceanic and Atmospheric Administration's (NOAA) World Vector Shoreline shapefile was added. This shapefile defines the land boundaries for each state analyzed in the dispute. Next, using data Jane's Fighting Ships, a naval base for each state was chosen. Since each state had multiple naval bases, the base that protruded furthest into the South China Sea was selected. The coordinates for these bases were determined, documented on a Microsoft Excel spreadsheet, imported as a new layer, and were loaded on top of the NOAA land boundary shapefile. In order to map the PPD, these bases were buffered using the Buffer tool in ArcMap with the PPD values listed in Table 6-1 used as the buffer distances. All distances are presented in nautical miles, the unit used in Jane's Fighting Ships. When completed, four power projection zones were mapped as separate shapefiles and loaded onto the map (Figure 6-1).

Figure 6-1 was compared with the hydrocarbon analysis that was completed in Chapter 5. The USGS image (Figure 6-3) of the oil fields of Southeast Asia was overlaid on Figure 6-1 and the Georeference tool was used in order spatially reference the Figure 5-3 image (Figure 6-2). Next, the PRIO Offshore Petrodata and the VLIZ Maritime Boundary shapefiles were added (Figure 6-3).

Results

As shown in Table 6-6, the PPD of Malaysia, Philippines, and Vietnam are a fraction of China's. China's PPD encompasses almost the entire South China Sea. The only area that China is unable to reach is the very southern portion of the South China Sea. China's power projection zone overlaps with power projection zones of Malaysia, Philippines and Vietnam. According to my hypothesis, these would be areas of likely confrontation.

Another important finding to highlight is that the South China Sea Platform field has been essentially untouched by hydrocarbon development. China's power projection zone encompasses the entire field. Even though Malaysia, Philippines and Vietnam's maritime boundaries all would allow for exploration in the South China Sea Platform, they all stop short of development in the field. The only exception is the lone Filipino site. Clearly, these states' power projection zones do no permit them to pursue resources here.

Before moving on to the conclusion, it is critical to address the lone Filipino site in the South China Sea Platform field. The site is located in Reed Bank, the location of the South China's Sea Dispute's latest flare up. The area is claimed by the Philippines, as well as China. Reed Bank is not part of the Spratly chain, but just west of it. In early 2011, when the Philippines were conducting a seismic survey in the area they were harassed by two Chinese patrol boats (Storey 2011, 1). After the incident, Filipino President Aquino decided to "adopt a harder line" with the Chinese over the South China Sea Dispute (Storey 2011, 1). In May of 2011, the *Philippine Star* published that when the Filipino Air Force was conducting a reconnaissance patrol of the area, "Chinese jet fighters reportedly buzzed two [Filipino] planes

(Laude 2011, 1). The *Philippine Star* report also disclosed that, “the [Filipino] pilots wanted to challenge the intruders, [but] they had to back off and maintain their course as their planes do not have the capability to engage the Chinese jets” (Laude 2011, 1). Following this skirmish, the Filipino government began referring to the South China Sea as the West Philippine Sea, a clear indication that these confrontations were raising tension levels between the two states.

The incident confirms two key conclusions from the results above. The Reed Bank, which lies in the South China Sea Platform field and within an area claimed by the Philippines, is actually controlled by China. Chinese power projection capabilities prevented the Philippines from conducting seismic surveys (or hydrocarbon exploration) in the area and later forced the Filipino Air Force out of their own air space. This is not only a confirmation of this project’s assessment of Chinese power projection, but also the lack thereof of the Philippines. The 1995 Mischief Reef incident, already detailed in the historical chapter, is another indication the power projection estimates are reliable. The Chinese had begun building structures on Mischief Reef, only 135 miles off Filipino shores. The data used in this report indicates that the Philippines still cannot project power far enough to protect these interests.

Table 6-1. Power Projection Distances

State	Power Projection Distance (X, in Nautical Miles)
China	799.3115302
Malaysia	72.33219056
Philippines	70.55464433
Vietnam	100.4195375

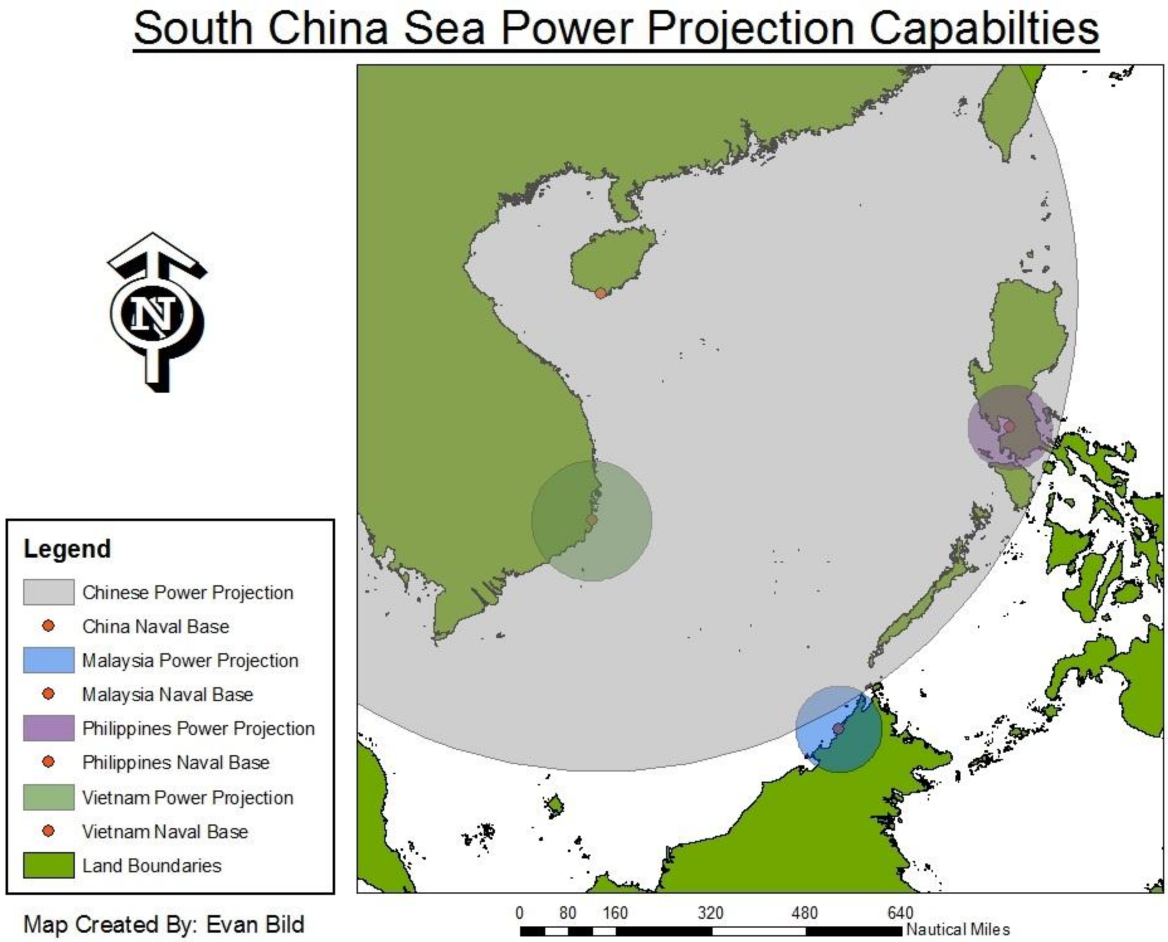

Figure 6-1. South China Sea power projection capabilities

South China Sea Power Projection Capabilities With Hydrocarbon Fields

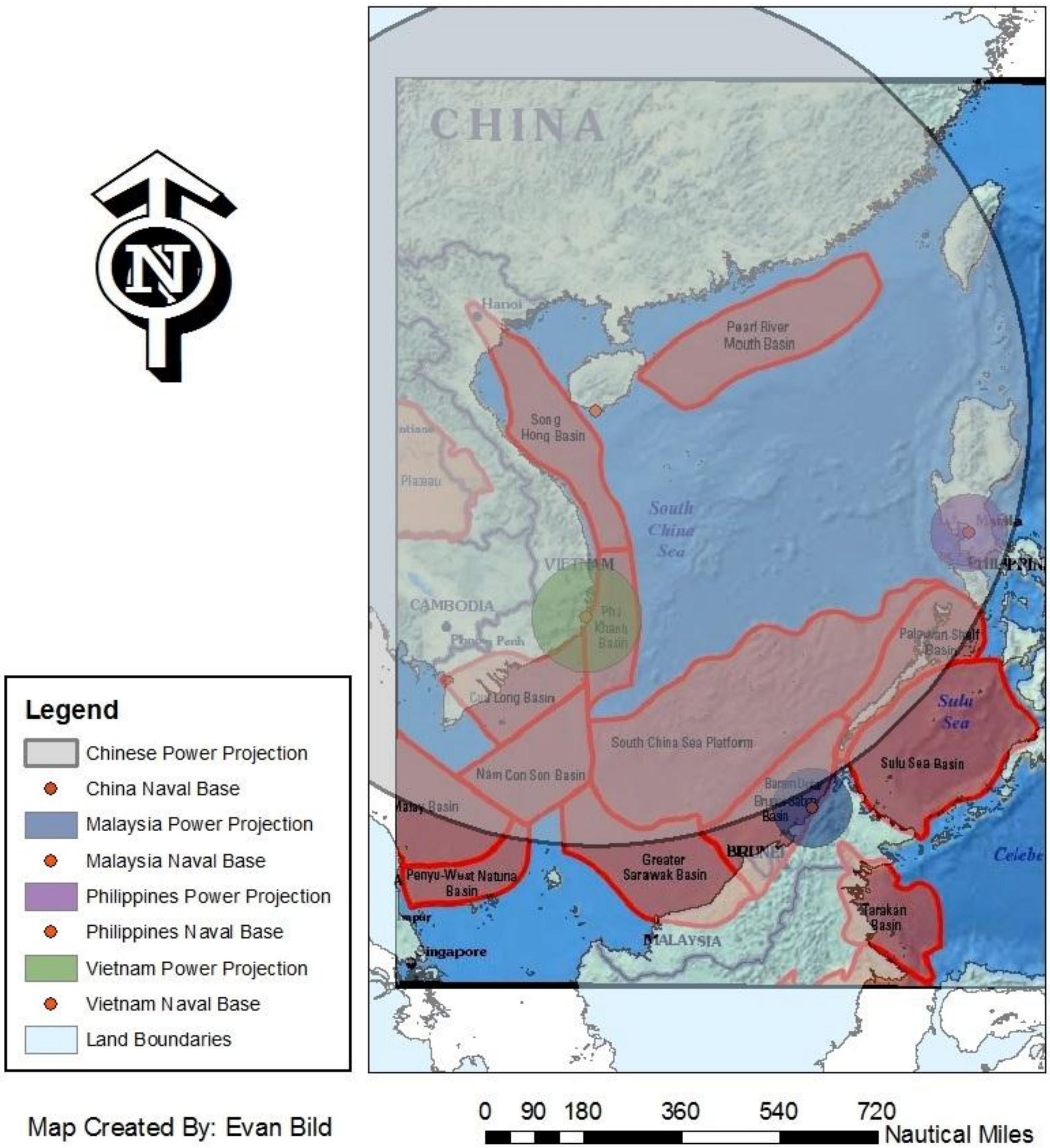

Figure 6-2. South China Sea power projection capabilities with hydrocarbon fields

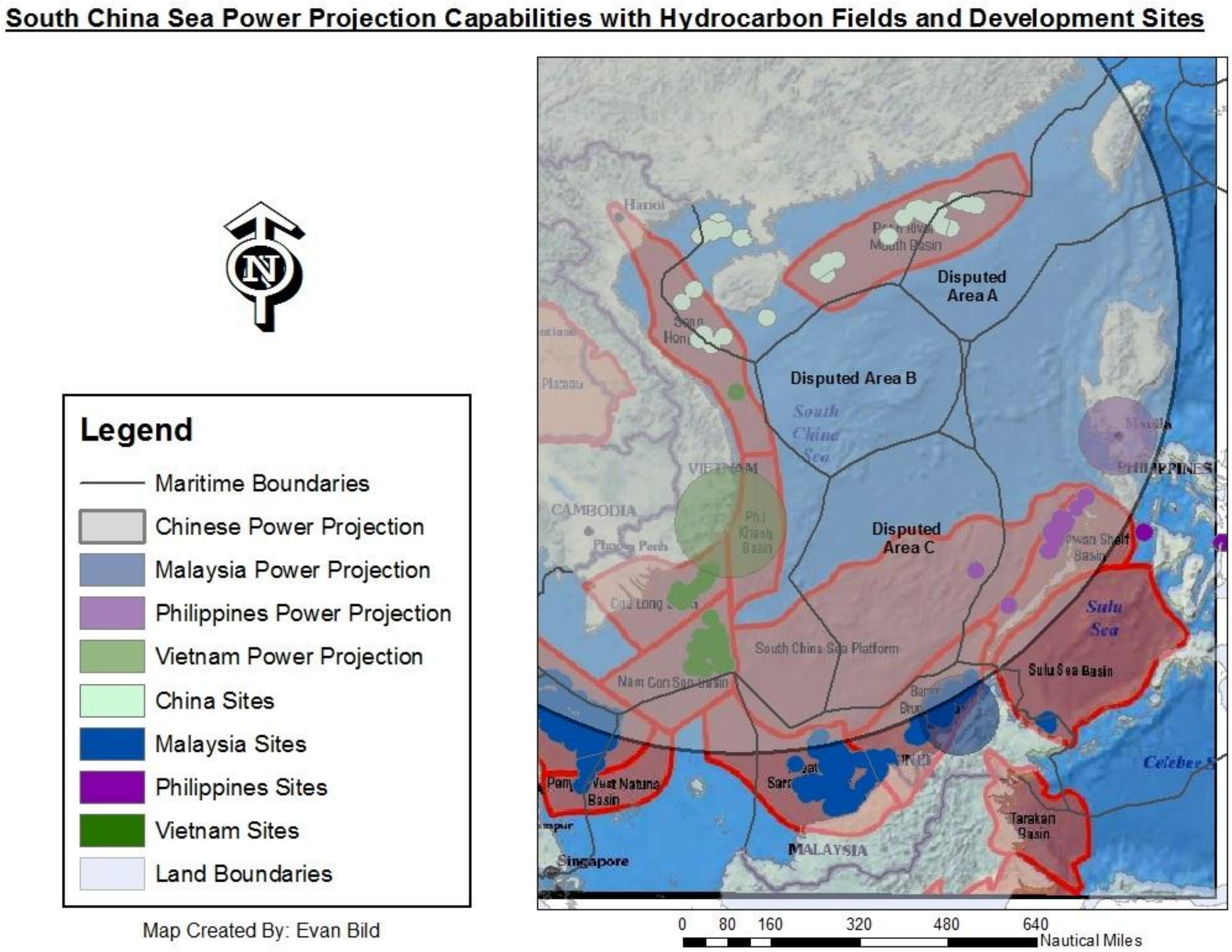

Figure 6-3. South China Sea power projection capabilities with hydrocarbon fields and development sites

Table 6-2. China fleet range

China Fleet Range

Type	Class Type	Range	Speed	#	Range Total Per Class	Notes
Strategic Missile Submarines	Jin Class	6,000	15	4	24000	Range taken from Golf Class
Strategic Missile Submarines	Xia Class	6,000	15	1	6000	Range taken from Golf Class
Strategic Missile Submarines	Golf Class	6,000	15	1	6000	
Attack Submarines	Shang Class	6,000	15	2	12000	Range taken from Golf Class
Attack Submarines	Han Class	6,000	15	4	24000	Range taken from Golf Class
Patrol Submarines	Yuan Class	8,000	8	2	16000	Range taken from Ming Class
Patrol Submarines	Song Class	8,000	8	13	104000	Range taken from Ming Class
Patrol Submarines	Kilo Class	8,000	8	12	96000	Range taken from Ming Class
Patrol Submarines	Ming Class	8,000	8	19	152000	
Patrol Submarines	Modified Romeo Class	9,000	9	1	9000	Range taken from Ming Class
Patrol Submarines	Romeo Class	9,000	9	7	63000	
Aircraft Carriers	Keznetsov Class	8,500	18	1	8500	
Destroyers	Luzhou Class	4,000	14	2	8000	
Destroyers	Sovremenny Class	4,000	14	4	16000	Range taken from Sovremenny Class
Destroyers	Luyang I Class	4,500	15	2	9000	
Destroyers	Luyang II Class	4,500	15	2	9000	
Destroyers	Luhai Class	4,500	14	1	4500	

Table 6-2. Continued

China Fleet Range

Type	Class Type	Range	Speed	#	Range Total Per Class	Notes
Destroyers	Luhu Class	5,000	15	2	10000	
Destroyers	Luda Class	2,970	18	12	35640	
Destroyers	Luda Class II	2,970	18	4	11880	
Frigates	Jiangkai I Class	3,800	18	2	7600	
Frigates	Jiangkai II Clas	3,800	18	4	15200	
Frigates	Jiangwei I Class	4,000	18	4	16000	
Frigates	Jiangwei II Class	4,000	18	10	40000	
Frigates	Jianghu III and IV Classes	4,000	15	3	12000	
Frigates	Jianghu I and V Classes	4,000	15	27	108000	
Frigates	Jianghu II Class	4,000	15	1	4000	
Patrol Forces	Houbei Class	750	18	40	30000	Range taken from Houxin Class
Patrol Forces	Houxin Class	750	18	16	12000	
Patrol Forces	Haijiu Class	750	18	2	1500	
Patrol Forces	Houjian Class	1,800	18	7	12600	
Patrol Forces	Hainan Class	1,300	15	93	120900	
Patrol Forces	Huangfen and Hola Class	800	30	15	12000	
Patrol Forces	Haiqing Class	1,300	15	25	32500	

Table 6-2. Continued

China Fleet Range

Type	Class Type	Range	Speed	#	Range Total Per Class	Notes
Patrol Forces	Haizhui/Shanghai III Class	750	17	18	13500	
Patrol Forces	Harbour Patrol Craft	700	16.5	4	2800	Range taken from Shanghai II Class
Patrol Forces	Shanghai II Class	700	16.5	35	24500	
Amphibious Forces	Yudeng Class	3,000	14	1	3000	Range taken from Yuting II Class
Amphibious Forces	Typle 071 Class	3,000	14	1	3000	Range taken from Yuting II Class
Amphibious Forces	Yuting II Class	3,000	14	10	30000	
Amphibious Forces	Yuting I Class	3,000	14	14	42000	
Amphibious Forces	Yukan Class	3,000	14	7	21000	
Amphibious Forces	Yuliang Class	1,500	14	32	48000	Range taken from Yunshu Class
Amphibious Forces	Yunshu Class	1,500	14	10	15000	
Amphibious Forces	Yubei Class	1,500	14	10	15000	Range taken from Yunshu Class
Amphibious Forces	Yuhai Class	1,500	14	13	19500	Range taken from Yunshu Class
Amphibious Forces	Yunnan Class	500	10	120	60000	
Amphibious Forces	Yudao Class	1,000	16	1	1000	
Amphibious Forces	Yuch'in Class	450	11.5	20	9000	
Amphibious Forces	Jingsah II Class	200	49	10	2000	Range taken from Russian Gus Class hovercraft

Table 6-2. Continued

China Fleet Range

Type	Class Type	Range	Speed	#	Range Total Per Class	Notes
Amphibious Forces	Type 271 Class	500	10	25	12500	Range taken from Yunnan class
Mine Warfare Forces	Wozang Class	3,000	10	1	3000	Range taken from T 43 Class
Mine Warfare Forces	T 43 Class	3,000	10	14	42000	
Mine Warfare Forces	Wochi Class	3,000	10	2	6000	Range taken from T 43 Class
Mine Warfare Forces	Wolei Class	7,000	14	1	7000	
Mine Warfare Forces	Wosao Class	500	15	4	2000	
Mine Warfare Forces	Futi Class	500	15	4	2000	Range taken from Wosao Class
Training Ships	Shichang Class	8,000	17	1	8000	
Training Ships	Daxin Class	5,000	15	1	5000	
Replenishment Ships	Fuqing Class	18,000	14	2	36000	
Replenishment Ships	Nanyun Class	14,000	14	1	14000	Range taken from average of other two classes of replenishment ships
Replenshipment Ships	Fuchi Class	10,000	14	2	20000	
Icebreakers	Yanbing Class			1	0	
Icebreakers	Yanha Class			3	0	
Submarine Support Ships	Dajiang Class	6,000	14	3	18000	Range taken from Dazhi Class
Submarine Support Ships	Dazhi Class	6,000	14	1	6000	

Table 6-2. Continued

China Fleet Range

Type	Class Type	Range	Speed	#	Range Total Per Class	Notes
Submarine Support Ships	Dalang Class	8,000	14	6	48000	
Submarine Support Ships	Dazhou Class	7,000	14	2	14000	Range taken as average from Dazhi and Dalang Classes
Troop Transport	Qiongsha Class	8,000	14	6	48000	Range taken from Dalang Class
Salvage and Repair	Dadong and Dadao Class	8,000	14	2	16000	Range taken from Dalang Class
Salvage and Repair	DSRV	40	2	2	80	
Supply Ships	Yantai Class	3,000	16	2	6000	
Supply Ships	Dayun Class	3,000	16	2	6000	Range taken from Yantai Class
Supply Ships	Dalin Class	2,500	11	13	32500	Range taken from Hongqi Class
Supply Ships	Dandao Class	2,500	11	7	17500	Range taken from Hongqi Class
Supply Ships	Hongqi Class	2,500	11	6	15000	
Supply Ships	Leizhou Class	1,200	10	10	12000	
Supply Ships	Fulin Class	1,500	8	20	30000	
Supply Ships	Shengli Class	2,400	11	2	4800	
Supply Ships	Jinyou Class	4,000	10	3	12000	
Supply Ships	Fuzhou Class	1,500	8	26	39000	Range taken from Fulin Class
Supply Ships	Guangzhou Class	1,500	8	5	7500	Range taken from Fulin Class

Table 6-2. Continued

China Fleet Range						
Type	Class Type	Range	Speed	#	Range Total Per Class	Notes
Supply Ships	Yannan Class	800	15	7	5600	Range taken from Yen Pai Class
Supply Ships	Yen Pai Class	800	15	5	4000	
				r	1857600	
				R	928800	
				R_a	1101.779359	
				Total Ships	843	
Ratio of Power (Pr)	Ave Range (Ra)	Distance (X)				
0.72547332	1101.77936	799.3115302				

Table 6-3. Malaysia fleet range

Malaysia Fleet Range						
Type	Class Type	Range	Speed	#	Range Total Per Class	Notes
Subs	Scorpine Class	6000	8	2		
Frigates	Lekiu Class	5000	14	2	10000	
Corvettes	Kasturi Class	5000	14	2	10000	
Corvettes	Kedah Class	6050	12	6	36300	
Corvettes	Laksamana Class	2300	18	4	9200	
Patrol Forces	Handalan Class	1850	14	4	7400	
Patrol Forces	31 Metre Patrol Craft	1400	14	18	25200	
Patrol Forces	Perdana Class	1800	15	4	7200	
Patrol Forces	Jerong Class	2000	14	6	12000	
Amphibious Forces	Newport Class	14250	14	1	14250	
Mine Warfare Forces	Mahamiru Class	2000	12	4	8000	
Survey Ships	Survey Vessel	6000	10	1	6000	
Survey Ships	Survey Vessel	5250	13	1	5250	
Survey Ships	Survey Vessel	4500	16	1	4500	
Training Ships	Hang Tuah	4800	15	1	4800	Second Training vessel is sail boat. No range
Logistics Support Vessels	Logistical Support Ships	4000	14	2	8000	
				r	168100	
				R	84050	
				R_a	1424.576271	
				Total Ships	59	
Ratio of Power (Pr)	Ave Range (Ra)	Distance (X)				
0.05077453	1424.57627	72.33219056				

Table 6-4. Philippines Fleet Range

Type	Class Type	Range	Speed	#	Range Total Per Class	Notes
Frigate	Cannon Class	6000	14	1	6000	
Corvettes	Jacinto Class	2500	17	3	7500	
Corvettes	Auk Class	5000	14	2	10000	
Corvettes	PCE 827 Class	6600	11	8	52800	
Patrol Forces	Tomas Batilo Class	600	20	8	4800	
Patrol Forces	PCF 65 Class	1200	12	4	4800	Range taken from Jose Andrada Class due to similar characteristics.
Patrol Forces	Cyclone Class	2500	12	1	2500	
Patrol Forces	Jose Andrada Class	1200	12	22	26400	
Patrol Forces	Aguinaldo Class	1100	18	3	3300	
Patrol Forces	Kagitingan Class	1100	18	3	3300	Range taken from Aguinaldo Class Range
Patrol Forces	Conrado Yap Class	290	20	10	2900	
Repair Ship	Achelous Class	669	12	1	669	Range taken from average ship range of Philippines, could not find comparable ship.
Amphibious Forces	LCM	450	11.5	16	7200	Range taken from similar Chinese LCM
Amphibious Forces	LCU	500	10	10	5000	Range taken from similar Chinese LCU
Amphibious Forces	RUC	475	10.75	14	6650	Range taken from average between LCM and LCUs of Philippines in same section
Amphibious Forces	LCVP	475	10.75	2	950	Range taken from average between LCM and LCUs of Philippines in same section
Amphibious Forces	Alamosa Class	6900	15	1	6900	

Table 6-4. Continued

Type	Class Type	Range	Speed	#	Range Total Per Class	Notes
Amphibious Forces	Transport Vessel	6900	15	1	6900	
Amphibious Forces	Bacolod City Class	6000	11	2	12000	
Amphibious Forces	LST 512-1152 Class	6000	11	6	36000	Range taken from Bacolod City Class
Supply	YW Type	3000	10	2	6000	Range taken from Similar Vietnam Tanker
Supply	Yog Type	3000	10	2	6000	Range taken from Similar Vietnam Tanker
				r	170569	
				R	85285	
				R_a	699.0532787	
				Total Ships	122	
Ratio of Power (Pr)	Ave Range (Ra)	Distance (X)				
0.10499139	672.004098	70.55464433				

Table 6-5. Vietnam fleet range

Type	Class Type	Range	Speed	#	Range Total Per Class	Notes
Submarine	Yugo Class	550	10	2	1100	
Frigates	Gepard Glass	5000	10	2	10000	
Frigates	Petya Class	4870	10	5	24350	
Corvettes	BPS 500 Class	2,200	14	2	4400	
Corvettes	Tarantul Class	2000	20	12	24000	
Patrol Forces	Svetlyak Class	2200	13	4	8800	
Patrol Forces	OSA II Class	500	35	8	4000	
Patrol Forces	Turya Class	1450	14	5	7250	
Patrol Forces	Shershen Class	850	30	3	2550	
Patrol Forces	Stolkraft Class	1100	15	4	4400	Range Taken from similar Vietnam vessel (Patrol Force - ZhukClass)
Patrol Forces	Poluchat Class	1500	10	2	3000	
Patrol Forces	Zhuk Class	1100	15	14	15400	
Patrol Forces	Modified Zhuk Class	1100	15	4	4400	Range taken from normal Zhuk Class
Patrol Forces	BP-29-12-01 Patrol Craft	1100	15	3	3300	Range Taken from similar Vietnam vessel (Patrol Force - ZhukClass)
Amphibious Forces	Polnochny Class	1000	18	3	3000	Range taken from Russian Polnochny Class Amphibious Force Vessel
Amphibious Forces	LCM	450	11.5	12	5400	Range taken from similar Chinese LCM vessel
Amphibious Forces	LCU	500	10	15	7500	Range taken from similar Chinese LCU vessel
Amphibious Forces	LCVP	475	10.75	3	1425	Range taken from average between LCM and LCUs of Philippines in same section

Table 6-5. Continued

Type	Class Type	Range	Speed	#	Range Total Per Class	Notes
Amphibious Forces	LST 1-510 / LST 512-1152 Classes	6000	10	3	18000	
Mine Warfare	Yurka Class	1500	12	2	3000	
Mine Warfare	K 8 Class	1500	12	5	7500	Range taken from Yurka Class
Mine Warfare	Sonya Class	3000	10	4	12000	
Mine Warfare	Yevganya Class	300	10	2	600	
Survey	Kamenka Class	4000	10	1	4000	
Supply	Voda Class	3000	10	1	3000	
Supply	Offshore Supply Vessels	3000	10	17	51000	
				r	233375	
				R	116687.5	
				R_a	845.5615942	
				Total Ships	138	
Ratio of Power (Pr)	Ave Range (Ra)	Distance (X)				
0.11876076	845.561594	100.4195375				

Table 6-6. Total fleet strengths

Type	China	Malaysia	Philippines	Vietnam
Patrol Subs	66	2		2
Aircraft Carriers	1			
Destroyers	29			
Corvettes		12	13	14
Frigates	51	2	1	7
Patrol Forces	255	32	51	47
Mine Warfare Forces	26	4		13
Amphibious Forces	274	1	52	36
Training Ships	2	1		
Troop Transports	6			
Submarine Support Ships	12			
Salvage and Repair Ships	4		1	
Supply Ships	108		4	18
Fleet Replenishment Ships	5			
Icebreakers	4			
Survey Ships		3		1
Logistical Support Vessels		2		
Total per Country	843	59	122	138
Total in SCS (Pt)	1162	1162	1162	1162
Fleet Strength Ratio (Pr)	0.725473322	0.050774527	0.104991394	0.118760757

CHAPTER 7
CONCLUSION

From the literature reviews, factors that had to be considered when mapping where confrontation would be most likely to occur in the South China Sea were identified. Competition over resources, especially large quantities of resources, increases when the ownership over the resources is unclear. In order to assure one's access to resources, the resources must be located within the state's power projection zone. Areas where power projection zones overlap are unstable and multiple parties are unlikely to exist indefinitely within them.

According to the hypothesis of this project, high-risk areas for confrontation will be located where two power projection zones overlap. Unfortunately, Malaysia, Philippines, and Vietnam all have Power Projection Distances well within their own EEZs. The locations where these states' power projection zones overlap with China's are considered to be potential conflict areas. However, based on the hydrocarbon development sites of all three of these states, Malaysia, Philippines and Vietnam are clearly avoiding the South China Sea Platform field. Therefore, the evidence suggests that the South China Sea Platform field is the location where confrontation is most likely to occur in the South China Sea. Confrontation would most likely occur under two circumstances. First, if littoral states' power projection zones increase and begin to reach into the South China Sea Platform field. Second, if states, as the Philippines did, begin to explore for resources within this field and venture into China's power projection zone. As hydrocarbon demand increases in Southeast Asia, littoral states might be more likely to pursue this area for development. Especially since the South China Sea Platform field is predicted to hold 25 percent of the oil in the Sea and 20 percent of the natural gas. With that in mind, China would likely also be more willing to defend it with force.

I would also like to offer a few other possible topics for further research and discussion. First, the hydrocarbon development sites of Malaysia, Philippines and Vietnam appear to be heavily influenced by the demarcations of oil field boundaries and/or their maritime boundaries. Why is this the case? In the case of the South China Sea Platform field, this project provides evidence that China's power projection capacity defends against other states' development. And what about Malaysia's strict exploitation of their southwest maritime boundaries and their more conservative exploitation of their other South China Sea boundaries? Upon further investigation, I found that all three borders of Malaysia's southwest South China Sea location are undisputed. Thailand, Vietnam and Indonesia all have agreed upon the maritime boundaries with treaties and median line settlements. In the areas where Malaysia is more conservative with hydrocarbon exploration, their maritime boundaries are disputed. Do disputed boundaries, regardless of EEZs, produce fear in the way states explore for hydrocarbons at sea? The literature review on conflict involving hydrocarbons indicates that conflict is more likely to occur in areas where boundaries are disputed, but do EEZs reduce uncertainties and the potential for conflict?

Second, an exploration of perceived strength based on different types of power would be extremely valuable in this project. For instance, when it comes to decision-making, how does an EEZ sovereignty right relate to a formal territorial claim? Or how do power projection capabilities relate to an EEZ sovereignty right? Will state's actors be more likely to defend an area that is within their formal claim, their EEZ, or their power projection zone? This project suggests that states do need appropriate levels of power projection to protect their EEZ interests, but further research is needed.

Third, in addition to the work completed in this project, another important factor to explore would be the willingness of state actors to instigate confrontation in the South China Sea. Even if Malaysia, Philippines or Vietnam had the ability to actively pursue hydrocarbon resources in the South China Sea Platform field, would they be willing to engage in a likely naval clash with China? What actions are these states willing to take in order to obtain the hydrocarbon resources of the South China Sea?

Fourth, further work on quantifying power projection, especially with regards to a gradient, could go a long way in determining where confrontation might occur. A research project on how power projection declines with distance would be a more sincere exploration of Boulding's concepts. With a power projection gradient, further research might be able to explain why China is able to defend the South China Sea Platform field, but is unable to develop their own hydrocarbon sites. Perhaps they need to increase their power projection capabilities in the area in order to exploit the vast resources that are potentially in this field.

I would also like to acknowledge a few aspects of this project before I conclude. Creating a new methodology to quantify power projection distance at sea was a challenging task. I do acknowledge the methodology used to estimate this variable might suffer from excessive parsimony. However, there exists virtually no established method for quantifying the concept. Kenneth Boulding (1969, 275) does offer a limited attempt to measure the distance militaries might project power over land, but his method suffers when the modernization of today's military powers is taken into account. Other similar attempts are unable to address the distance aspect of the endeavor and simply measure power with a composite indicator. The Correlates of War (C.O.W.) Composite Indicator for National Capabilities is frequently used. A similar project by Buhaug (2010) uses this C.O.W. indicator, but the C.O.W. indicator did not suffice for this project. The logic employed for the methodology used in this project was in part borrowed from the C.O.W., most notably when the Strength of Fleet Ratio was calculated. In order to address the distance aspect of power projection, the range of the fleets had to be considered as well.

Utilizing a buffer zone to express power projection distance could be considered problematic since it is assuming that power projection is constant throughout the area. The buffer does not address a decrease in power over distance. Also, some might argue that a coefficient be employed to account for both the vertical and horizontal directions of power projection. I acknowledge these issues and counter with the argument that some areas at sea are not of interest to any party. The ones that are of interest will be given the appropriate level attention by the projecting state.

Concentrating all of one state's naval power at a single base might be considered problematic as well. However, I wanted to select the bases that would most likely to be used to project power into the South China Sea. Since the average range per ship of a fleet was used, the PPD could be transferred to another state's base and still be applicable if need be.

Using U.S. data for a project involving hydrocarbons in the South China Sea might seem unsuitable. However, the littoral states of the South China Sea do not currently possess the technology to reach the hydrocarbons beneath the Sea and I have not found a single circumstance where a Western company was not partnered with for exploration. I argue that using a Western data resource for oil quantities and locations is not inappropriate since Western energy companies are substantially invested in the region.

In sum, this project demonstrates that hydrocarbon development in the South China Sea Dispute is influenced by power projection and spatial demarcations. Two demarcations appear to act as stopping points for hydrocarbon development: hydrocarbon fields and maritime boundaries. With the ability to map both hydrocarbon locations and power projection, this project was able to identify areas of likely confrontation in the South China Sea.

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