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Vivan Sharan & Nicole Thiher

OBSERVER RESEARCH FOUNDATION

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NEW DELHI

About the Authors

Vivan Sharan is an Associate Fellow at the Observer Research Foundation, New Delhi. An experienced futures trader, his primary area of interest is the global financial markets,with particular focus on equity and commodity markets.

Nicole Thiher is a graduate student at the University of Wisconsin, Madison and is currently working towards a Masters in International Public Affairs. This paper was written while she was a research intern at the Observer Research Foundation, New Delhi.

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Abstract

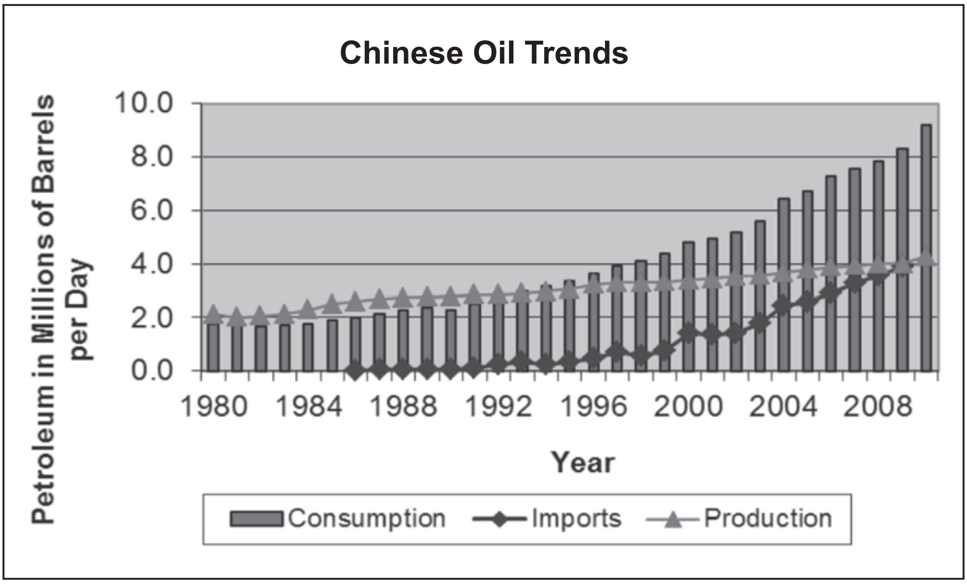
The purpose of this paper is to re-examine the existing critiques of China's oil supply diversification strategies in the Asia Pacific. It deconstructs the growing energy relationship between China and the Middle East that has made the security of the Hormuz Strait and the Malacca Strait vital to China's energy security. It analyses specific geographic and strategic chokepoints in China's oil supply route and concludes that supply diversification motivations are driven by the nation's political economy and military strategy.

Introduction

Energy security forms the backbone of most economic and political policies of nations around the world. China is no exception and is increasingly following a multi-pronged global strategy—one where its economic priorities do not necessarily overlap with its foreign policies. This has enabled China to interface with a wide range of nations and businesses to secure its interests in energy all around the world, particularly in oil.

In 1993, China went from being a net exporter of oil to a net importer. According to the National Development and Reform Commission, China's energy consumption increased by 5.6% annually from 1980-2006[1]. It is the second largest consumer of oil after the United States and is set to overtake it within a decade. Today oil remains a resource without many practical substitutes for many of its end uses. Figure 1 shows the exponential growth in the consumption of oil in China, while oil production remains almost stagnant. This has left a big supply gap which is addressed through increased imports–emphasising the need for the country to ensure secure and efficient supply channels.

Figure 1

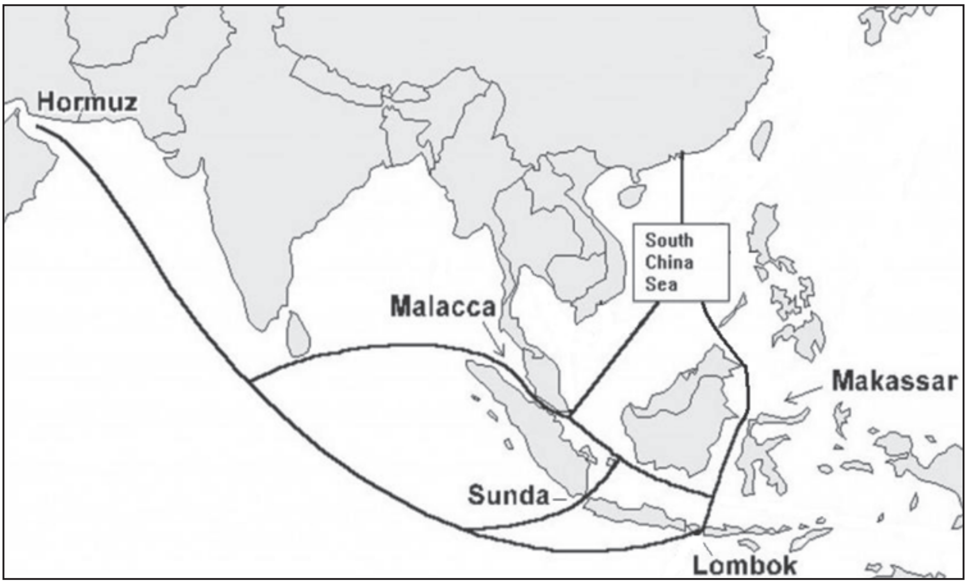


Source: U.S. Energy Information Administration

In 2008, China established the National Energy Administration within the National Development and Reform Commission to strengthen its ability to manage the energy sector and handle energy issues both at home and abroad. China's oil production capabilities are extensive. The China National Petroleum Corporation (CNPC) is the fourth largest national oil corporation in the world in terms of oil reserves and the largest in the country. The China Petrochemical Corporation (Sinopec) is the second largest in China and the China National Offshore Oil Corporation (CNOOC) is the third largest. These three state-owned corporations account for 95% of the crude oil produced in China. They have also become increasingly active in oil trade and investment all over the world, particularly in Africa and Central Asia.

China depends on oil imports to meet over half of its domestic demand. Over 80% of these imports are transported by oil tankers. Approximately half of China's oil imports come from the Persian Gulf via the sea, and the bulk of these imports pass through the Hormuz Strait, lying in the waters between the Arabian Peninsula and Iran. The Hormuz Strait and the Malacca Strait are two narrow sea lanes that are used by the majority of the tankers (since this is the shortest navigable route), carrying oil from the oil rich Persian Gulf to the eastern ports of China (figure 2).

Figure 2: Shipping Routes for Chinese Oil Tankers



Source: Harvard Asia Quarterly

In this paper, we will focus on China's hedging strategies along the 'chokepoints' on the aforementioned route[2]. We also look at the alternative means of transport (pipelines) and alternative routes, and present a quantitative assessment of the costs and benefits involved for the country in reverting to the different options in case of supply disruptions at sea. In the process, we evaluate whether the alternatives are financially and strategically feasible and assess the viability of a truly diversified import supply.

China is indeed over-dependent on its oil supply routes through the seas. The diversification strategies carried out so far have been far from cost effective, compared to the usual routes. Perhaps some of the present day rhetoric generated in Chinese policy making circles about supply security imperatives in the Asia Pacific is deliberately distorted.

A Note about Oil Tankers

Crude oil tankers are primarily divided into five classes as shown in the table below. Ranging from the Panamax–which is the smallest class and is able to go through the Panama Canal, to the Ultra Large Crude Carrier, which is only able to go through wide and deep stretches in the sea. Ultra Large and Very Large Crude Carriers (VLCC) are also called "supertankers" owing to their behemoth size and capacities. In this paper, we use VLCC to benchmark oil transport through the seas; they carry 2 million barrels of oil per day (bpd) and are able to go through both the Hormuz and Malacca Straits.[3]

Categories and Specifications of oil Tankers

Tanker Class	Deadweight Tons	Barrels of Oil
Panamax	60,000-80,000	500,000
Aframax	80,000-120,000	750,000
Suezmax	120,000-200,000	1,000,000
Very Large Crude Carrier (VLCC)	200,000-320,000	2,000,000
Ultra Large Crude Carrier (ULCC)	320,000 +	up to 4,000,000

Source: Pacific L.A. Marine Terminal LLC

Strategic Reserves

Strategic oil reserves are a valuable hedge that oil importing nations can use to try and protect themselves against price volatility and temporary supply disruptions. In 2001, China developed plans to establish its own national strategic petroleum reserve in three phases with a target volume of 90 days of net imports. The first phase was completed in 2009. Four crude oil storage facilities with a combined total capacity of 102 million barrels have been set up. The second phase of the plan is well underway and is expected to be completed in 2012. This will bring China's reserves up to 272 million barrels. By 2020 China plans to have added another 204 million barrels to its strategic reserves; a total of 476 million barrels or approximately 123 days of reserves at 2009 import levels. At this level, China would have the largest strategic reserves of oil relative to the amount it imports in the world. As a result, China will be able to withstand relatively long term supply disruptions.

Chinese Strategic Oil Reserves			
Site	Completion	Million Barrels	Days of Net Imports at 2009 Levels
First Phase:			
Zhenhai, Zhejing	2006	32.7	8.4
Dalian, Liaoning	2008	18.9	4.9
Huangdao, Shandong	2008	18.9	4.9
Zhoushan, Zhejiang	2007	31.4	8.1
Total		101.9	26.3
Second Phase:			
8 Locations	exp. 2012	170	43.8
Total		271.9	70.1
Third Phase:			
Undetermined	exp. 2020	204	52.6
Total		475.9	122.7

Source: Reuters

Global Strategic Oil Reserves			
Country	**Strategic Oil Reserves (millions of barrels)**	**Days of Net Imports at 2009 Levels**	**Days of Consumption at 2009 Levels**
China (2012)	272	70.1	32.7
China (2020)	476	122.7	57.2
United States	727	80.7	38.7
Japan	323	93.8	74.0
Germany	184	93.2	74.9
France	99	68.7	54.2
South Korea	87	37.5	39.8

Source: U.S. Energy Information Administration

The Hormuz Game

The Chokepoint—The narrow Hormuz Strait connects the Gulf of Oman with the Persian Gulf. About 20% of the world's oil demand, 15 million bpd, is supplied through ships that transit in and out of the strait, where navigation is limited to two 3 km wide channels. This restricted navigability and forced convergence of sea traffic flowing through the channels qualifies the strait as a geographic and strategic maritime chokepoint.

For China, the area is of great strategic significance. Its imports in 2010 through the Strait reached 2.4 million bpd or 40% of its total imported oil. Although China's dependence on the region is lower than other high growth developing countries such as India, it is significantly greater than the US or Europe's degree of dependence. Overall, the Persian Gulf region is and will remain one of the main sources of oil for China for decades to come (figure 3). Given the size of reserves in the region, this dependence or vulnerability—depending on which way it is analysed—is unlikely to diminish greatly in the future. Since many of the oil resources across the globe are projected to decrease steadily over the next few decades, the proven reserves in the Middle East are going to remain among the most sought after sources. The Gulf Research Centre has estimated that by 2030, one in every three barrels of oil consumed in China will come from the region[4].

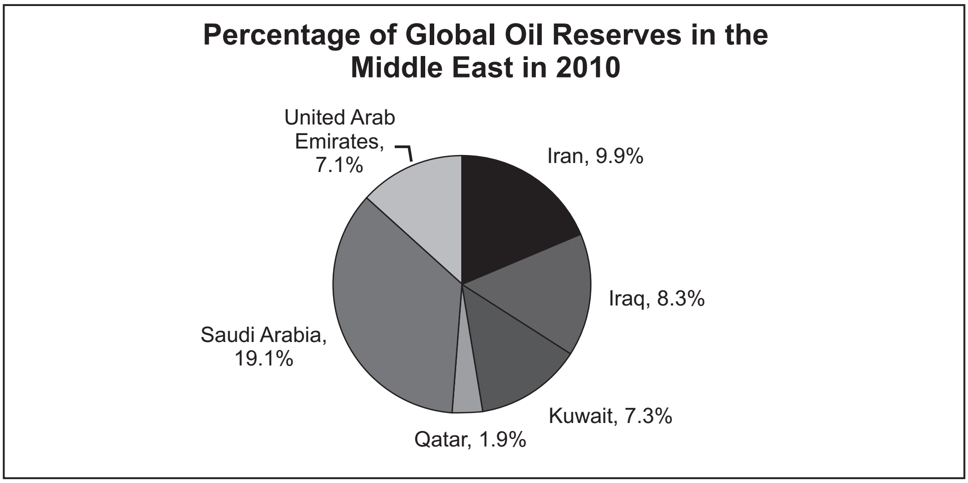
Dependency on Oil Imports from the Middle East -2010

	M.E. Imports (m of bpd)	M.E. Imports as a Percentage of Total Imports
US	1.73	14.8%
Europe	2.36	19.5%
China	2.38	40.0%
India	2.61	72.6%

Source: BP Statistical Review of World Energy 2011

The Suppliers: In 2010, the Middle East region accounted for over 54% of the world's total reserves with Saudi Arabia, Iran, Iraq, Kuwait and the UAE respectively having up the largest proportions (Qatar comes in a distant 6th—nonetheless it is strategically important because it is likely to be a major supplier of natural gas to China in the future). Consequently, these are the countries that are of long term importance to China in terms of its energy supply needs. China's oil imports from these major players have grown rapidly in the last two decades. It can be argued that supply arrangements with other countries in the region are likely to be short term engagements.

Figure 3



Source: BP Statistical Review of World Energy 2011

In 1999, Chinese President Jiang Zemin visited Saudi Arabia on a state visit and pronounced a "strategic oil partnership" between the two countries. In November 2010, China overtook the US as Saudi Arabia's biggest oil customer. It buys more than a million bpd from Saudi Arabia—constituting approximately a fifth of its total imports. China's total imports have doubled since 2005; an indication of the fast pace at which Chinese demand and bilateral ties are growing in what is today perhaps the world's most significant energy relationship. The relationship is enhanced by the fact that China has been granting many downstream projects to Saudi Aramco and Saudi Basic Industries Company in China, and there are about 90 Chinese companies doing business in Saudi Arabia[5]. The Jubail King Fahd Ports, Ras Al Juaymah, Ras Tanura Terminal and Yanbu' Terminal are the major supply hubs in the country (see Appendix, table 1).

The second largest proven oil reserves in the world are in Iran, and China is its biggest customer. According to IRNA (Iran's official news agency), the country supplied over 62 million barrels of crude oil to China in the first four months of 2011[6]. In turn, China has reported to have invested about $40 billion in both upstream and downstream projects in Iran's oil and gas sector—taking advantage of Tehran's open invitation to do so as a result of Western sanctions[7]. The countries have also expanded their overall trade relationship with bilateral trade amounting to about $30 billion in 2010. Iran has three major offshore terminals in the Persian Gulf that can service tankers as large as ULCC class (see Appendix, table 2).

China has been aggressive in pursuing deals to develop Iraq's oil fields and has secured interests in the Al-Ahdab oil field as well as service contracts for the Halfaya and Rumaila oil fields. Iraq exported about 144,000 bpd to China in 2009. Most of the oil exports to China leave the country by ship through the ageing Al-Basrah terminal, 30 miles off Iraq's southern coast (See Appendix, table 3).

Kuwait supplied close to 200,000 bpd of oil to China in 2010. The Kuwait Petroleum Corporation and Sinopec are jointly collaborating on developing a $9 billion petrochemical complex in China's Guangdong province with construction scheduled to begin next year. Following clearances from China's National Development and Reform Commission, the Kuwait Petroleum Corporation is expecting Chinese exports to grow to 500,000 bpd by 2015[8]. Most of the oil exports go through three terminals located in the Persian Gulf—the Mina Ahamdi, Mina Abdullah and Mina Shuaiba terminals.

China imported about 100,000 bpd from UAE in 2010. The Capital, Abu Dhabi, exports the majority of the UAE crude oil from its terminals (a small proportion is also shipped from Dubai). CNPC and the Abu Dhabi National Oil Co. signed a 20-year oil supply deal in July 2011, whereby the latter would export 200,000 bpd to China starting in 2014.

Defining the Threat: In this paper, we define the real and perceived threat without defining the stimuli or the actors. The threat of a blockade of the Hormuz Strait or of a direct rogue attack on any of the major facilities located along the Gulf coastline would have rippling effects throughout the global economy. The consequences of a disruption of supplies from the area would impact on China only if the disruption is very long—lasting over a few weeks (global spot trading prices for oil would shoot up, but countries like China, with sufficient strategic reserves, would be able to release the price pressures in the short term). It is also worth noting that insurance companies would not be ready to insure Chinese ships in war conditions[9].

The Hormuz Hedges: Having effective diversification strategies and plans in the Middle East is very important to China. The Information Office of the State Council of China in its December 2007 report maintained that, "The international community should work collaboratively to maintain stability in oil producing and exporting countries, especially those in the Middle East, to ensure the security of international energy transport routes and avoid geopolitical conflicts that affect the world's energy supply".

There are many estimates for what the United States spends on its military in the Gulf region to keep its oil interests in the area safe—ranging from $44 billion per year on the conservative side to $125 billion[10]. On the other hand, China spends very little on protecting the region[11] even through its relative dependency on oil from the Middle East is twice that of the US.

China instead concentrates a significant amount of economic purchasing power on oil supply diversification. This is carried out through collaborative development of oil infrastructure throughout the region (see appendix, table 4) and establishing long term purchase contracts to hedge against spot price volatility. Further, in the event of a disruption, China and the rest of the countries around the world that are dependent on Persian Gulf oil imports would largely be dependent on the existing pipeline infrastructure in the Middle East.

According to Lloyd's List Intelligence, in 2010, around 5 million bpd of oil could be exported from the Persian Gulf region via pipelines avoiding the strait–this is equal to about a third of the total oil transported by ships through the strait (which is in turn approximately a third of all oil transported by ships globally)[12]. Of all the pipelines that exist on the Middle East peninsula, only the UAE and Saudi Arabia have pipelines that can technically act as bypasses for the strait (all other discussed nations are strictly dependent on the strait for south bound oil exports).

The Habshan–Fujairah Pipeline, owned by Abu Dhabi's International Petroleum Investment Company (an investment arm of the Abu Dhabi government), is a $3 billion project that was jointly executed by the China Petroleum Engineering and Construction Corporation and the China Petroleum Pipeline Bureau. The project, which was completed in November 2010, is currently in its final testing phase. The 400-km long, 48 inch diameter pipeline is expected to have an operational capacity of 1.5 million bpd—a large proportion of UAE's total output. The end point of the pipeline at Fujairah Terminal lies on the Gulf of Oman, providing a hedge against disruptions in the strait.

The East-West Pipeline, owned and operated by oil giant Saudi Aramco, runs from Abqaiq in east Saudi Arabia to Yanbu in the West. The pipeline has an operational capacity of 5 million bpd and accounts for a large portion of Saudi Aramco's total upstream production. The Yanbu Terminal on the Red Sea coast is a veritable alternative for ships in case of disruptions at the Hormuz Strait. Security concerns were a major reason for the pipeline's capacity expansion in 1993[13]. At present, the terminal services ships that are northbound to Europe and America, but in a worst case scenario, it can easily act as a hedge to the Hormuz route and cater to southbound carriers.

While the above mentioned pipelines do allow ships to access Persian Gulf oil at alternative ports, they do not reduce Chinese dependency on the sea routes whatsoever. The pipelines never operate at maximum capacity in any case—since shipping is a cheaper alternative (as shown later in the paper). Furthermore, supply disruptions in the Hormuz Strait could be much more damaging for China than for Western nations because of its higher level of dependence on oil from this region as outlined earlier.

Navigating the Malacca

The Chokepoint—The Malacca Strait is the longest and one of the busiest (about a third of global trade and half of the world's oil flow through it) straits in the world. Connecting the Indian Ocean to the South China Sea, the roughly 800-km long strait lies between the Malay Peninsula and the Indonesian island of Sumatra. The narrowest point in the Philips Channel is 2.7 km wide, with the shallowest part of the navigable area in the strait being less than 30 metres deep. As is the case with the Hormuz Strait, the area is a veritable geographical chokepoint for ships using the route.

Since this is the shortest navigable route (and arguably the safest route, replete with navigational aids) for tankers that transit to and from the Persian Gulf, it is of immense strategic importance to China. According to the US Energy Information Administration, about 60,000 ships transit through the straits yearly[14]. Owing to the constraints on navigability, VLCC is the biggest of the tankers that can use the strait. China's existing energy supply from the Persian Gulf can be catered to by two VLCC tankers going through the Malacca straits daily (or a combination of smaller vessels).

Defining the Threat—Chinese officials have often publicly expressed concern over this chokepoint since most of China's seaborne energy imports transit through the Malacca Strait (about 80% of total imports). In 2003, President Hu Jintao declared that "certain major powers" wanted to control the strait, and China would have to look at diversification and fortification strategies[15]. Indeed the dependence of the country on the route cannot be overstated, and if the energy supply line is stopped at the Malacca, China could be starved within weeks. A study in 2005 by defence contractor Booz Allen Hamilton for the Directorate of Net Assessment in the US titled "Energy Futures in Asia" argued that not only is "China building strategic relationships along the sea lanes from the Middle East to the South China Sea in ways that suggest defensive and offensive positioning to protect China's energy interests, but also to serve broad security objectives"[16].

The Malacca Hedges—The viable alternative routes for tankers are through the Sunda Strait (an extra 1600 km) and through the Lambok Strait (an extra 2960 km). The Sunda Strait, which separates Java from Sumatra, is 3.2 km wide at its narrowest point and only about 18 metres deep. The shallow, narrow strait proves to be a navigational nightmare for larger vessels like VLCCs and hence is not a preferred route.

The Lambok Strait on the other hand, is relatively easy to navigate. Lying between the islands of Bali and Lambok, the narrowest point is around 18km wide, and the strait is about 250 metres deep. Owing to the large dimensions, even ULCCs can use this route (while they cannot navigate the Malacca). However, since using the strait as an alternative to Malacca adds a lot of distance, it is much less frequently used.

Additional Time for One VLCC's Oil to Reach China through Alternative Routes		
Alternative Routes	Extra Days	Total Days per Trip
Malacca Strait	0	11.3
Sunda Strait	2.5	13.8
Lombok Strait	4.8	16.1
1. Estimated at a speed of 14 knots 2. 7000 km between Saudi Arabia and China. Extra 1600 km to go through Sunda Strait. Extra 2960 km to go through Lambok Strait		

At present, there are no viable alternative means for transporting oil supplies from the Middle East. They must transit from the Persian Gulf to China by sea. However, as part of its hedging strategy to counter its "Malacca Dilemma", China is constructing a Sino-Burmese pipeline from Kyaukphyu in Burma to Ruili in the Southern Chinese province of Yunan. The oil pipeline is being constructed in two phases (see table below).

The work for the pipeline is well underway, and there are multiple pipelines being constructed simultaneously (for oil and natural gas). The infrastructure under development comprises of multiple separate projects, the most important of which are a deep water natural gas development project and onshore gas terminal, and onshore oil and natural gas pipelines from Western Burma to China. Also being constructed are a new deep water crude oil unloading port and oil storage facilities on Burma's Maday Island[17].

The pipelines are exclusively to hedge against the risk of a supply disruption at Malacca. CNPC is financing the bulk of the construction costs for the pipelines. The table below estimates the total extra time taken (compared to one VLCC's cargo being shipped through the Malacca Strait) for Persian Gulf oil to reach China:

Time for Oil to Reach China by Sea and the Burma-China Pipeline		
Pipeline Under Construction (In Phases)	Days Exceeding time taken by normal sea route.	Total Days per Trip (Including shipping time to Burma)
Sino-Burmese Pipeline (capacity 0.24m bpd)	6.3	17.6
Sino-Burmese Pipeline (capacity 0.4m bpd)	3.0	14.3
1. Based on VLCC carrying 2,000,000 barrels of oil (Maritime Connector) 2. Estimated at a speed of 14 knots		

The Sino-Burmese pipeline presents an interesting case study for assessing pipeline security issues. Given that Burma has been facing ethnic unrest in regions through which the pipeline passes (especially in the hinterlands), the Chinese will find it difficult to be completely confident of the security of their infrastructure. In any case, Chinese involvement in Burma's political and economic development has been steadily increasing; this will no doubt present some security challenges[18].

Cost Matrix

In this section we analyse the quantitative costs and benefits of China's diversification strategy based on building pipelines[19]. Apart from the strategic Sino-Burmese pipelines, China sources oil (and gas) through pipelines from Kazakhstan and Russia. The oil pipeline from Kazakhstan has been operational since 2006, is 2000 km long and can transport 200,000 bpd at peak operational capacity. However, China has not been able to get enough oil from Kazakhstan to reach this capacity—in 2008 it imported an average of only 115,000 bpd of crude oil.

The Sino-Russian pipeline (a branch of the Eastern Siberia–Pacific Ocean pipeline) run by Russian state owned Transneft was recently completed. A deal on a proposed gas pipeline is yet to be finalized. With a maximum capacity of 0.31 million bpd, the pipeline is a massive 4700 km in length. The pipeline will largely replace railways as a means of transport of Russian oil to China (transporting by rail is by far the most expensive means of transporting oil or gas (see table). According to Reuters, the pipeline has transported about 125,000 bpd to China till June 1st 2011. The table below explicitly illustrates the wide difference in costs between pipeline and other means of transportation.

Sample Oil Transport Costs to China				
Mode	**Route**	**Distance (km)**	**Cost (USD/barrels)**	**Cost (USD/barrels/1000km)**
Tanker	RasTanura-Ningbo	7000	1.25	0.18
Pipeline	Angarsk-Daqing	3200	2.41	0.75
Train	Angarsk-Manzhouli	1000	7.19	7.19

Source: Erickson, A.S., Collins, Gabriel, "China's Oil Security Pipedream: The Reality, and Strategic Consequences, of Seaborne Imports", Naval War College, Newport, 2010

Two important considerations should be noted while examining the cost-benefit tables that follow. The first is that the approximations are based on publicly available estimates and, therefore, should not be treated as exact estimates but rather as secondary estimates. Secondly, the numbers that are represented in the table, while being approximations, give an indicative picture of what the costs involved are, and it is important to focus on the obvious highlights. The first table focuses on the total transport costs for China to import oil from the Middle East, both by using the direct shipping route through the Hormuz and Malacca straits, and by using the shipping route to Burma and then the Sino-Burmese pipeline to reach the end point within Chinese territory. The table below shows that the Sino-Burmese pipeline will more than double the cost of oil transportation from the Persian Gulf.

Transport Cost Comparison for One VLCC's Oil Cargo			
Route	**Cost from Sea Transport**	**Cost from Pipeline Transport**	**Total Transport Costs**
Saudi Arabia to China only by Sea	$2,520,000	n/a	$2,520,000
Pipeline (capacity 0.24m bpd)	$2,071,000	$3,556,000	$5,627,000
Pipeline (capacity 0.4m bpd)	$2,071,000	$3,570,000	$5,641,000

1. Based on VLCC carrying 2,000,000 barrels of oil (Maritime Connector)
2. Shipping costs = $0.18/barrel/km (Erickson & Collins, 2010)
3. Pipeline costs = $0.75/barrel/1000km (Erickson & Collins, 2010)

The next table focuses on costs of construction—ships vs. pipelines. The table helps illustrate the disproportionate costs involved in constructing pipelines vs. buying ships (new and second hand). For instance, at the cost of building the Sino-Burmese pipeline, according to our calculations, 13 new VLCC tankers can be purchased instead. Given that it takes about 11 days for ships to reach Chinese ports from the Persian Gulf (without stopping), we can conservatively estimate that a round trip takes 30 days[20]. This means that a VLCC would be able to transport about 24 million barrels to China yearly. At the cost of building the pipeline with 0.24 million bpd capacity, which will transport about 87 million barrels per year, 13 VLCC tankers would be able to supply 312 million barrels per year at less than half the costs for transportation.

Cost of Building Pipelines vs. Cost of Building Ships				
	Total Cost (USD)	Cost per Km (USD)	Equivalent Number of New VLCC Tankers	Equivalent Number of Used VLCC Tankers
Kazakhstan-China Pipeline	$700,000,000	$730,000	6	8
Burma-China Pipeline	$1,500,000,000	$630,000	13	18
Kazakhstan-China Pipeline	$700,000,000	$730,000	6	8
Russia-China Pipeline	$800,000,000	$660,000	7	9.5

1. Based on VLCC carrying 2,000,000 barrels of oil (Maritime Connector)
2. Cost of new VLCC tankers approximately $116 million and five-year-old tankers approximately $84 million in 2009 (UNCTD, 2010)

Conclusion

The previous section has highlighted the nature of the existing arguments against diversifying energy supply using pipelines. Traditionally, most of the criticism amongst strategists is centred on two aspects—cost and security. As discussed, the costs associated with building pipelines far outweigh the benefits when shipping is possible. The costs, both monetary and in terms of time, of using pipelines are significantly greater than using tanker transportation. Pipelines are also rigid infrastructure, which cannot adjust to long term changes in supply structure.

The modern day tankers that transport oil from one point to the other have advantageous economies of scale not just in the regions discussed in the previous section, but across the world where transport by sea is an option. Furthermore, at the outset, building pipelines as hedges in countries like Burma (and maybe Pakistan in the future), where the threat of non-state actors sabotaging the infrastructure is very palpable, makes little strategic sense.

The international energy market is unbiased, and runs on a completely different model from most other markets—in that the signalling value of stopping supplies even for a day is so strong, that it has long term rippling effects on the perceived commercial reliability of the supplier (This effect was seen when Russian gas giant Gazprom stopped supplies to Ukraine, and its commercial credibility came into question, especially amongst its clients in the EU). Therefore, it can be argued that China is following an outdated policy, which needs to evolve.

However, we would conclude that the arguments against pipelines given in the cost matrix do not address all the relevant motives for building infrastructure—both civilian and military. The build up of infrastructure like ports and military bases to secure energy routes and infrastructure in countries like Pakistan, Myanmar and even the Maldives, seems to be based on geopolitical and strategic considerations of a wider spectrum. The criticisms of China's diversification policy have failed to address the deep rooted relationship between China's energy security concerns and the country's political economy.

Strategically, securing the route along the Indian Ocean and South China Sea, also serves the motive of asserting military dominance in the region. The heavy naval military deployments act as counterpoints to other maritime forces in the region (eg. Indian and US fleets). Furthermore, China has in the past few decades relied heavily upon a model of government spending (especially on infrastructure) to drive economic growth. Today, when China faces military adversaries, especially within the Asia Pacific region, it is rapidly expanding its naval fleet. There is quite strong economic and strategic logic in China continuing to make new avenues for government spending to stimulate economic growth.

In the introduction, we stated that China's stated security imperatives in the Asia Pacific—often highlighting the vulnerabilities along the chokepoints in its oil supply route from the Persian Gulf—are aimed at a specific mass audience. This international audience is given to understand that Chinese policymakers genuinely believe pipelines are real long term alternatives to shipping. However, we feel that policymakers in China are playing a well orchestrated strategic game—and fulfilling dual objectives while pursuing non cost effective pipeline projects. These objectives—the build up of maritime/military infrastructure in order to balance military forces in the Asia-Pacific region, and the use of discretionary government expenditure to support the economy—are largely being fulfilled by the strategy in place. The economic, social and overall policy sustainability of the approach in the long term presents avenues for further research.

Annexures:

Table 1

Major Terminals In Saudi Arabia	DWT Limit	Max Tanker Size
Al Juaymah Terminal	700,000	ULCC
Jiddan Refinery Terminal	100,000	Aframax
Jubail (King Fahad) Ports	500,000	ULCC
Rabigh Terminal	312,000	VLCC
Ras Al Juaymah	700,000	ULCC
RasTanura Terminal	500,000	ULCC
Yanbu' Terminal	500,000	ULCC

Table 2

Major Terminals In Iran	DWT Limit	Max Tanker Size
Bandar Abbas Terminal	100,000	Aframax
RasBahregan Terminal	250,000	VLCC
Kharg Island Terminal	500,000	ULCC
Lavan Island Terminal	300,000	VLCC
Sirri (Shiri Island) Terminal	330,000	VLCC

Table 3

Terminals	Country	DWT	Max Tanker Size
Al Basrah Oil Terminal	Iraq	300,000	VLCC
Mina Abdullah Terminal	Kuwait	276,000	VLCC
Mina Ahmadi Terminal	Kuwait	375,000	ULCC
Mina Shuaiba Terminal	Kuwait	100,000	Aframax
Mina Al Zour (Mina Saud) Terminal	Kuwait	370,000	ULCC
Ruwais Terminal	UAE	330,000	ULCC
Fujairah Terminal	UAE	320,000	VLCC
Jebel Dhanna Terminal	UAE	280,000	VLCC
Das Island Terminal	UAE	410,000	ULCC
Zirku Island Terminal	UAE	320,000	VLCC
Abu Bukhoosh Terminal	UAE	300,000	VLCC
Mubarraz Island Terminal	UAE	250,000	VLCC
Arzanah Island Terminal	UAE	280,000	VLCC
Fateh Terminal	UAE	300,000	VLCC
Hulaylah Terminal	UAE	300,000	VLCC

Table 4

Chinese International Oil Equity			
Country	**Date**	**Company**	**Description**
Algeria	July 2004	CNPC	Signed a product-sharing agreement for 7 yearsof exploration and 25 years of production of Block 438B
Angola	2005	Sinopec	Acquired a 50% stake in the Greater Plutonio offshore development area, produced 200,000 bpd in 2007, equity share 100,000 bpd
Azerbaijan	Jan 2002	CNPC	Signed a product-sharing contract for the K&K Oilfield with 50% equity rights
Azerbaijan	Jan 2003	CNPC	Acquired 50.26% equity in the Gobustan Oilfield
Canada	2005	Sinopec	Signed an agreement with Synenco for a 40% stake in the Northern Lights Oil Sands Project, has a design capacity of 100,000 bpd
Canada	2010	CNPC	Established a 60% stake in the Athabsca Oil Sands Corp. to develop the MacKay River and Dover Oil Sands project, initial target production is 250,000 bpd by 2015
Colombia	2006	Sinopec	Acquired a 50% share of Omimex with India's ONGC, China's equity production 4,500 bpd in 2006
Ecuador	2005	CNPC & Sinopec	Jointly purchased Encana's oil, gas and pipeline assets and rights to continue exploration and development for their 4 blocks, produced 60,000 bpd in 2006
Equatorial Guinea	2006	CNPC	Signed a SPA with Fruitex for a 70% stake in Block M
Indonesia	2004	CNPC	Operates 6 oil and gas blocks, oil output of 8000 bpd & 470,000 cmpd in 2006
Indonesia		Petro China	Owns interest in 7 blocks which produce 36,000 bpd in total
Indonesia	2002	CNOOC	Purchased the assets of Repsol-YPF, produced
Iran	Oct 2004	Sinopec	Signed a 25-year, $70 billion agreement for China to import 10 million tons of Irania oil in exchange for Sinopec developing the Yadavaran oilfield.
Iran	2007	Sinopec	Signed an agreement to develop the Yadavaran Oilfield with a 51% stake in it, under construction now, expected to produce 100,000 bpd when complete
Iran	2009	CNPC	Signed an agreement to develop, transfer operations and acquire a 70% stake in the Azadegan oilfield, production 50,000 bpd in 2010 but hoped to reach 260,000 bpd
Iraq	1997	CNPC	Signed a 22-year production-sharing contract to develop Al-Ahdab field for an estimated cost of $1.3 billion. (postponed by UN sanctions on Iraq and the subsequent war)
Iraq	Nov 2008	CNPC	Secured the right to develop and operate the Al-Ahdab oil field for 23 years and will invest $3 billion there.
Kazakhastan	1997	CNPC	Acquired a 60.3% (now 85.42%) stake in Aktobemunaigas and has since invested $1.5 billion in facilities, Zhanazhol Oilfield produced 140,000 bpd in 2006
Kazakhastan	Oct 2005	CNPC	Acquired PetroKazakhstan, assets in the Turgai Basin produced 150,000 bpd in 2006
Kazakhastan	2003	CNPC	Purchased a 50% holding on the North Buzachi Oilfield along with Lukoil, produced 55,000 bpd in 2009
Kazakhastan	2004	CNPC	Kazakhstan-China Crude Oil Pipeline built jointly with KazMunaiGaz, capacity 200,000 bpd
Kazakhastan	2004	CNPC	Acquired 50% shares in Konys and Bektas Oilfields, produced 8,000 bpd in 2005
Kazakhastan	2005	CNPC	Purchased the rights to the Aryss and Blinov Blocks through the acquisition of ADM, produced 330,000 bpd in 2007

Table 4

Chinese International Oil Equity			
Country	**Date**	**Company**	**Description**
Libya	Dec 2005	CNPC	Signed a exploration and production sharing agreement for Block 17-4 for 5 years of exploration and 25 years of production
Mauritania	2004	CNPC	Signed a production sharing contract for 9 years of exploration and 25 years of development of Blocks Ta13&21 and Block 12
Myanmar	2001	CNPC	Purchased 4 oil producing blocks
Myanmar	2007	CNPC	Acquired oil and gas exploration and exploitation licenses for three offshore blocks
Nigeria	2006	CNOOC	Acquired a 45% share in the Akpo Field
Oman	2002	CNPC	Signed a production sharing agreement with a 50% stake in the Daleel Oilfield, produces 15,000 bpd
Peru	1994	CNPC	Redeveloped and operated the Talara Oilfield, produced 5,000 bpd in 2009
Peru	2004	CNPC	Acquired a 45% share in Block 8 & 1AB, produced 120,000 bpd in 2006, equity 54,000 bpd, 20,000 bpd shipped to China
Russia	2006	Sinopec	49% acquisition of Udmurtneft, produced 120,000 in 2006 (axp. 60,000 equity oil)
Sudan	1996	CNPC	Acquired a 40% stake in the Greater Nile Petroleum Operation Company to develop the Heglig and Unity fields in Block 1/2/4, produced 350,000 bpd in 2006
Sudan	Jan 2000	CNPC	Constructed the Khartoum Refinery and has a 50% holding, processed 130,000 bpd in 2007
Sudan	Jan 2000	CNPC	Acquired a 41% equity in Blocks 3/7 including Adar/Yale fields, 300,000 bpd beginning in 2006
Sudan	1996	CNPC	Acquired the Fula Oilfield, produced 40,000 bpd in 2007
Sudan	2004	CNPC	Discovered new oilfields in their 41% equity Blocks 3/7, 100,000 production level beginning in 2006
Sudan		CNPC	Has a 95% equity in Block 6 which produced 100,000 bpd in 2006
Syria	2005	CNPC	Gained a 37% stake in Syria's Furat Petroleum Company equivalent to 58,000 bpd - Chinese import data suggest not being shipped to China
Uzbekistan	2008	CNPC	Agree to jointly develop the Mingbulak Oilfield with Uzbekneftegaz, estimate will produce 40,000 bpd when complete
Venezuela	2008	CNPC	Entered a joint venture with a 40% stake with Petroleos de Venezuela to drill in the Orinoco belt with a 550,000 bpd target

Source: (Xu, 2007), (Hongtu, 2010), (US-China Economic and Security Review Commission, 2006) & CNPC World Wide

Notes:

1. See: "China's Energy Conditions and Policies", Information Office of the State Council of the People's Republic of China, National Development and Reform Commission, 2007
2. According to the Energy Information Administration, chokepoints are "narrow channels along widely used global sea routes, some so narrow that restrictions are placed on the size of vessel that can navigate through them. They are a critical part of global energy security due to the high volume of oil traded through their narrow straits".
3. According to Investopedia, "The barrels-per-day measure is commonly used in the oil spot markets, as prices are usually quoted in terms of dollars per barrel. One barrel of oil contains approximately 42 U.S. gallons, or 35 imperial gallons, and weighs approximately 0.134 tons".
4. According to "China's Growing Role in the Middle East: Implications for the Middle East and Beyond", The Gulf Research Centre, Dubai and the Nixon Centre, Washington D.C., 2010
5. According to a study by John Sfakianakis-chief economist at Banque Saudi Fransi in Riyadh
6. See: IRNA, "Chinese Oil Imports from Iran up by 32 pct", IRNA, 10 June, 2011
7. See: The Jerusalem Post, "China Invest $40b. in Iran's Oil And Gas", The Jerusalem Post, 31 July, 2010 and Downs, Erica S., "Beijing's Terhran Temptation", The Brookings Institution, 2010
8. The National Development and Reform Commission (NDRC), granted final approval for the project in March 2011, paving the way for Kuwait Petroleum Corporation to achieve its China-bound crude oil export target of 500,000 bpd by 2015.
9. Under normal conditions, hull insurance for a tanker runs between 2.5%-3.75% on an annualized basis. This works out to about $8,900 - $13,300 daily for a VLCC costing $130 million. However, under war conditions, Lloyd's of London, like other insurers, revokes hull insurance in war risk exclusion zones.

10. See: Alterman, John "Fierce or Feeble: Persian Gulf Assessments of U.S. Power', Center for Strategic and International Studies, Washington D.C.

11. See: IISS Strategic Comments, "China's Three-Point Naval Strategy", The International Institute for Strategic Studies, Volume 16, Comment 37, Oct 2010.

12. See Website: http://www.lloydslistintelligence.com/llint/index.htm

13. See Cordesman, Anthony & Nawaf Obaid "Saudi Petroleum Security:Challenges & Responese", Center for Strategic and International Studies, Washington D.C., 2004

14. See EIA, "World Oil Transit Chokepoints", Website: http://www.eia.gov/countries/regions-topics.cfm?fips=WOTC

15. See: Storey, Ian, "China's Malacca Dilemma", The Jamestown Foundation, China Brief, Volume 6, Issue 8.

16. Donahue, A, Danyluk, B., " Energy Futures in Asia", Booz-Allen & Hamilton, 2004

17. See: "The Burma-China Pipelines", Situation Briefer No.1, Earth's Rights International, March 2011.

18. Worse security challenges are envisioned in case of the much discussed Chinese pipeline through Pakistan and we think that it is extremely unlikely that the project will see the light of day in the foreseeable future.

19. All calculations are based on publically available estimates – and should be taken as approximations.

20. The number of tankers that are equivalent to building a pipeline is equal to the total cost of building the pipeline divided by the cost of purchasing a VLCC tanker ($116m for new tankers and $84m for second-hand tankers according to UNCTAD, 2010). The amount of oil these additional VLCCs can transport yearly was calculated as 2m barrels*12 trips*number of tankers. This can be compared to the oil transported through pipelines by multiplying the capacity in bpd by 365 days.

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Observer Research Foundation
20, Rouse Avenue, New Delhi-110 002
Email: orf@orfonline.org
Phone: +91-11-43520020 Fax: +91-11-43520003
www.orfonline.org