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China and India's Energy Security in Africa: A Comparative Study

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2018/2019

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Introduction

Energy is so indispensable for human society that it concerns the national security and prosperity of every country. After the crisis in the 1970s, people became all over the world are increasingly aware of the importance of energy security. Many countries formulate energy strategies and carry out a series of diplomatic activities in order to ensure energy supply, transport and consumption, making the issue one of important factors in political and economic arena. The 21st century is most characterized by the emerging countries such as China and India. The Chinese and Indian economies are growing and their quests for energy are increasing over the past few years. However, the energy shortage is so severe that they exert a strong dependency on energy importation. These two giants are turning their eyes on the vast and emerging energy reserves in Africa. At the same time, the global energy market is undergoing major changes as geopolitics, terrorism, and power competitions are intertwined with energy security, making China and India's presence in Africa much more complicated.

Researches on China and India are hot issues in many publications, and many researches have been done on studies on China-India energy security. However, competition dominates the current studies and limits the studies on cooperation between two sides. In addition, many scholars compare the differences between China and India from many perspective such as energy policy and researches on similarities are dwarfed by that on their differences, however. Finally, many studies have been done on China and India's engagement in African region. However, little efforts are made in comparative study on their strengths, weaknesses, objectives,etc. Therefore, there is much room for the study on China and India's energy security in Africa.

The paper aims to give a comprehensive comparison of China and India's energy security in Africa and offer suggestions on China's performance. The first chapter covers research background, literature review and the theoretical study on energy security. The second chapter outlines China and India's energy security from the perspectives of energy supply, energy consumption and energy transport. The third chapter, the most important section of the paper, carries out a comparative study on China and India's energy security in Africa. Objectives, strengths, weaknesses and external threats are on the list of study. Finally, the fourth chapter summarizes the challenges China is faced in Africa and offers proposals to improve its performance in Africa.

Chapter I China, India and Energy Security

1.1 Research Background

One of the most prominent topic in global energy markets in previous years has been China and India's external quest for energy. Their efforts to secure sufficient supplies exert profound implications for international relations. India and China, wildly dubbed as Asian Drivers,[1] undertook economic reforms, thereby putting their economies on a high growth path. Availability of energy resources is a precondition to economic growth as these resources are the prime drivers for all sectors. However, both India and China are energy-scarce countries. The share of total oil proved reserves for China is exclusively 1.5% and India 0.3%.[2] The figure for natural is 2.8% for China and 0.6% for India.[3] Sustenance of economic growth hinges on the ability to procure energy supplies from external sources at affordable rates.[4]

China has quickly risen to the top ranks in global energy demand. Since 1993 China has become a net oil importer and since 2003 it has replaced Japan as the world's second-largest oil importer (Bahgat, 2005).[5] China became the largest global energy consumer in 2011 and is the world's second-largest oil consumer behind the United States. China surpassed the United States at the end of 2013 as the world's largest net importer of petroleum and other liquids, in part because of China's rising oil consumption. China's oil consumption growth accounted for about 43% of the world's oil consumption growth in 2014.[6] In 2017 alone, China consumed 3132 million tonnes oil equivalent, accounting for 23% of global consumption and consumed 12799 thousand barrels oil daily, accounting for 13%.[7] In the next quarter-century, China is expected to account for more than one-fifth of growth in world energy demand.[8]

India, due to economic growth and investment in its energy infrastructure, is also facing the prospect of

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[1] R. Kaplinsky and D. Messner, 2008. Introduction: The Impact of Asian Drivers on the Developing World. *World Development*, Vol.36, No.2, pp. 197-209.
[2] BP Statistical Review of World Energy, 2018. P.12, https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf
[3] P.26.
[4] A. Acharya, 2011. Can Asia Lead? Power Ambitions and Global Governance in the Twenty-first Century, *Int. Affairs*, Vol.87, No.4, pp. 851-869.
[5] Bahgat, G. 2005. Energy partnership: China and the Gulf states. *OPEC Review*, Vol. 29, No.2, pp.115-131.
[6] EIA, 2015. China, International Energy Data and Analysis from U.S. https://www.eia.gov/beta/international/analysis_includes/countries_long/China/china.pdf
[7] BP Statistical Review of World Energy, 2018. pp.8-15, https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf
[8] Zaid Haider, 2005. Oil Fuels Beijing's New Power Game, *Yale Global Online*, https://yaleglobal.yale.edu/content/oil-fuels-beijings-new-power-game

increasing dependence on fuels imports. In 2012, India's dependence on imported fossil fuels rose to 38% and net oil import dependency rose from 43% in 1990 to an estimated 71%. It ranked as the fourth-largest liquefied natural gas(LNG) importer following Japan, South Korea, and China in 2013, and it accounted for nearly 6% of the global market.[9] Currently the country is the fourth-largest consumer of energy in the world, accounting for approximately 5.6% of total global primary energy consumption.[10] India consumes 4690 thousand barrels daily, accounting for 4.8% in global energy market.[11] The figure for natural gas is 54.2 billion cubic meters daily, 1.5% for the global energy market. [12]

Traditionally, both China and India have primarily relied on the Middle Eastern countries for their energy needs. Overtime, in order to diversify their supply base, both the countries have scouted for energy resources in other parts of the world. Although India has diversified its crude oil import slate in the past few years, adding imports from countries in Africa and Latin America, it still relies on Middle Eastern countries for most of these imports (58% in 2015).[13] Predictions indicate that by 2020, India will double its demand for oil, while China will increase its energy consumption by 150%.[14] This means that the two major oil giants will face even more serious energy security challenge.

Africa has large reserves of energy and mineral resources, most of which are yet to be untapped. This wealth resulted in a scramble between European colonial powers in the nineteenth and twentieth century for its riches. Africa's oil reserves is 126500 million barrels, accounting for 7.5% of the global energy market.[15] It also boasts 13.8 billion square meters of natural gas, accounting for 7.1% of the global energy market.[16] Most African countries are very highly dependent on their production and export of fuel for the survival of their economy. Coal and petroleum account for more than 90% of the export earnings of Algeria, Equatorial Guinea, Libya, and Nigeria.[17] Africa represents a vast energy source, especially for rapidly growing economies such as China and India who in return sell their goods, invest in infrastructure, services and

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[9] EIA, 2014. India Is Increasingly Dependent on Imported Fossil Fuels as Demand Continues to Rise, Energy Information Administration, https://www.eia.gov/todayinenergy/detail.php?id=17551

[10] BP Statistical Review of World Energy, 2018. P.8, https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf

[11] P.15.

[12] P.29.

[13] EIA, 2016. India Continues Developing Its Strategic Petroleum Reserve as Its Oil Imports Grow, U.S Energy Information Administration, https://www.eia.gov/todayinenergy/detail.php?id=27132

[14] Roehrig, T. 2009. An Asian Triangle: India's Relationship with China and Japan. *Asian Politics and Policy,* Vol.1, No.2, pp.166.

[15] BP Statistical Review of World Energy, 2018. P.12, https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf

[16] P.26.

[17] Ashutosh Singh, 2017. Strategies of India and China in Africa - A comparison, *Indian Journal of Research*, Vol. 6, No.1, pp.883-887.

development projects. In 2017, Africa exported 82.6 million tons of crude oil to China and 31.7 million tons to India.[18] However, China and India are latecomers compared with European countries and United Stated and they as a result face competition with them.

The ever increasing quest for resources, trade markets and greater influence will be a source of competitive friction between the two countries and one of the likely causes of a conflict in the foreseeable future. Many current researches emphasize a rising competition between the two giants and often conclude that cooperation among these countries is unfeasible. What are the similarities and differences between China and India's energy security in Africa? Furthermore, how China should response to these factors?

1.2 Literature Review

The main content of this study is to compare the energy status of China and India in Africa. At the outset, it is necessary to sketch the literature review of relevant researches. Carmel Davis(2009) holds that Africa is home to China's enormous investment in extractive industries which are capital intensive and create few local jobs.[19] From the perspective of multinational corporations, Chris Alden and Martyn Davies(2006) think that Chinese multinational corporations are revising the landscape of international business and politics. Western firms are now being challenged by emerging country corporations, particularly from China.[20] From the perspective of infrastructures, Ana Cristina Alves(2013) argues that China's infrastructure-for-resources strategy has a mixed impact in Africa. On the one hand, the infrastructure construction contributes to the economic development and the livelihood of millions across Africa. On the other hand, labour practices, debt sustainability and environmental impact may pose a threat to the dire inequality in the receiving countries.[21] In terms of India's presence in Africa, Anusree Paul(2014) thinks that resource is one of important driving force for Indian companies to enter into African market. However, India needs to be cautious of the risks in countries that are not politically stable.[22] As India is faced with challenges in African market, Ruchita Beri(2005) considers that India's quest for African energy market requires more autonomy for oil companies, increasing cooperation with stakeholders such as China or the United States, and diplomatic dialogue with

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[18] BP Statistical Review of World Energy, 2018.P.24, https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf

[19] Carmel Davis, 2009. Africom's Relationship to Oil, Terrorism and China, *Orbis*, Vol. 53, No. 1, pp. 132－133.

[20] Chris Alden and Martyn Davies, 2006. A Profile of the Operations of Chinese Multinationals in Africa, *South African Journal of International Affairs*, Vol.13, No.1, pp.83-96.

[21] Ana Cristina Alves, 2013. China's Win-Win Cooperation: Unpacking the Impact of Infrastructure-for-Resources Deals in Africa, *South African Journal of International Affair*s, Vol. 20, No. 2, pp.207-226.

[22] Anusree Paul, 2014. Indian Foreign Direct Investment: A Way to Africa, *Procedia - Social and Behavioral Sciences*, Vol.157, pp.183-195.

Africa.[23]

Karolina Wysoczanska (2011) observes that securing supplies of energy to meet growing energy demand is a major challenge for both China and India. While they are unlikely to overcome deeply ingrained suspicions, some energy co-operation agreements indicate that they are seeking each other as strategic partner. The study, however, lacks an analysis of their relations and comparison in Africa.[24] Ashutosh Singh (2017)[25] and Vibhuti Hate (2008)[26] maintain that the ever increasing quest for resource will be a source of competition between the two countries and one of the likely causes of a conflict in the foreseeable future. However, study on cooperation in this region is neglected in Ashutosh Singh's work. Vibhuti Hate (2008) thinks that they have both competition and cooperation on energy and India is at a disadvantage in its competition with China. Wioletta Nowak (2016) makes a conclusion that the winner of the trade competition in Africa is China with its total trade with Africa surpassing India's nearly 3 times in the years 2000-2014. But the energy security is excluded in the study.[27]

Different from the studies above, Cheru Fantu and Cyril Obi (2011) make a comparative study from China and India's energy security from the perspective of decision-making efficiency, infrastructure construction and financial resources. China and India, however, have strengthened oil cooperation in Sudan.[28] The authors argue in their co-authored book *The Rise of China and India in Africa: Challenges, Opportunities and Critical Interventions* that their approaches to energy projects include foreign aid and bilateral trade. India is at a disadvantage in the African market, but it still has certain strengths.[29] Therefore, many studies have been done on China and India's engagement in African region. However, little efforts are made in comparative study on their strengths, weaknesses, objectives,etc.

Following scholars compare the differences between China and India from many perspective such as energy policy and researches on similarities are dwarfed by that on their differences, however. In terms of their goals, Chinese scholars Ye Yue and Liu Zongyi (2010) hold that safeguarding energy supply is the priority of

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[23] Ruchita Beri, 2005. Africa's Energy Potential: Prospects for India, Strategic Analysis, Vol.29, No.3, pp.370-394.

[24] Karolina Wysoczanska, 2011. Sino-Indian Cooperation in Africa: Joint Efforts in the Oil Sector, *Journal of Contemporary African Studies*, 29:2, pp.193-201.

[25] Ashutosh Singh, 2017. Strategies of India and China in Africa - A comparison, *Indian Journal of Research*, Vol. 6, No.1, pp.883-887.

[26] Vibhuti Hate, 2008. India in Africa: Moving beyond Oil, *South Asia Monitor*, 119, pp.1-3.

[27] Wioletta Nowak, 2016. China-Africa and India-Africa Trade in the Years 2000-2014, *Procedia Economics and Finance*, 39, pp.140-146.

[28] Cheru Fantu and Cyril Obi, 2011. Chinese and Indian Engagement in Africa: Competitive or Mutually Reinforcing Strategies, *Journal of International Affairs*, Vol.64, No.2, pp.91-110.

[29] Cheru Fantu and Cyril Obi, eds., 2010. *The Rise of China and India in Africa: Challenges, Opportunities and Critical Interventions*, London: Zed Books.

India's agenda while China's energy security is making a shift from energy supply to energy efficiency.[30] However, Zhang Yin (2006) point out that China tends to highlight a macro level energy strategy whereas India prefers to concentrate on particular corporate performance.[31] As for the pipeline projects, Sanket Sudhir Kulkarni and Hippu Salk Kristle Nathan (2016) draw a comparative analysis of Chinese and Indian cross-bordered natural gas pipeline projects in Turkmenistan and Myanmar and conclude that China has performed remarkably better than India.[32] Jairam Ramesh (2006) analyzes their performances from the perspective of oil companies and argues that Indian oil companies are in disadvantage.[33] In terms of dependency on importations, Mike Van Moerkerk and Wina Crijns Graus (2016) point out that both China and India are faced with increasing import dependency. China relies on OPEC for its oil supply, while India on the Middle East.[34] Finally, Dimitrios Pappas (2017)[35] and Raúl Velasco Fernández (2015)[36] present a comparison on energetic metabolism of China and India, both of which experience environmental protection and are required to adopt renewable energy technologies.

In addition, studies on the competition and cooperation are abundant in many publications. Mindful of their colonial pasts and developing economies, India and China have, for the time being, cut-throat competition with each other (Zaid Haider, 2005).[37] In terms of the relations between energy and geopolitics, Stein Tonnesson and Ashild Kolas (2006) argue that competition for energy will result in tension in the South China Sea.[38] From the perspective of maritime routes, Indian Ocean play an important role for India and China and is likely to drive both countries into military race.[39]

Unlike the scholars above whose studies project competition, Zhao Hong(2012) holds that there is

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30 Ye Yue and Liu Zongyi, 2010. Comparative Studies on China and India's Energy Policies(《中印能源政策比较研究》), *South Asian Studies*, 3, pp. 63-74.

31 Zhang Yin, 2006. Comparing the Models of Overseas Expansion of Oil Sectors of China and India（《中印石油行业海外扩张模式比较》）, *South Asian Studies Quarterly,* 3, pp.58-63.

32 Sanket Sudhir Kulkarni and Hippu Salk Kristle Nathan, 2016. The Elephant and the Tiger: Energy Security, Geopolitics and National Strategy in China and India's Cross-border Gas Pipelines, 2016. *Energy Research & Social Science,* 11, pp.183-194.

33 Jairam Ramesh, 2006. *Making Sense of Chindia: Reflections on China and India*, New Delhi: India Research Press.

34 Mike Van Moerkerk and Wina Crijns Graus, 2016. A Comparison of Oil Supply Risks in EU, US, Japan, China and India under Different Climate Scenarios, *Energy Policy*, 88, pp.148-158.

35 Dimitrios Pappas and Konstantinos J. Chalvatzis, 2017. Energy and Industrial Growth in India: The Next Emissions Superpower, *Energy Procedia,* 105, pp.3656-3662.

36 Raúl Velasco Fernández, Jesus Ramos Martín and Mario Giampietro, 2015. The Energy Metabolism of China and India between 1971 and 2010: Studying the Bifurcation, *Renewable and Sustainable Energy Reviews,* 41, pp.1052-1066.

37 Zaid Haider, 2005. Oil Fuels Beijing's New Power Game, *Yale Global Online*, https://yaleglobal.yale.edu/content/oil-fuels-beijings-new-power-game

38 Stein Tonnesson and Ashild Kolas, 2006. *Energy Security in Asia: China, India, Oil and Peace*, Peace Research Institute Oslo (PRIO), http://www.css.ethz.ch/en/services/digital-library/publications/publication.html/38189

39 Devindar Kum, Securing India's Energy Future, 2012. http://www.defence.gov.au/ADC/Publications/Commanders/2012/05_Col%20Devindar%20Kumar%20SPP.pdf

considerable scope for collaboration for these two energy giants and they will not pose a threat to international energy market.[40] Karolina Wysoczanska(2011) argues that both sides can strengthen cooperation in maritime lanes.[41] Many studies have been done by Chinese scholars in this regard. Gong Wei(2011) believes that competition and cooperation coexist in China and India energy relations.[42] In addition, Li Lei(2014) believes that the two countries are fiercely competitive in the international energy market, but two countries have no choice but to cooperate because zero-sum game is out of date.[43] Finally, Peng Nian(2018) believes that competition between them gives way to cooperation in the regions of Africa and Myanmar.[44]

In general, the current studies about China and India's energy security mainly cover the following points. Firstly, many researches have been done on comparative studies on China-India energy security. However, shared similarities like common threats are often neglected in the current researches. Second, many scholars define the relations between China and India in the energy field as competition, thus limiting the study of cooperation. Finally, many studies have been done on China and India's engagement in African region. However, little efforts are made in comparative study on their strengths, weaknesses, objectives,etc. Therefore, there is still much room for comparative study of energy issue in Africa between China and India.

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[40] Zhao Hong, 2012. *China and India: The Quest for Energy Resources in the Twenty-first Century,* New York: Routledge Publisher.

[41] Karolina Wysoczanska, 2011. Sino-Indian Cooperation in Africa: Joint Efforts in the Oil Sector, *Journal of Contemporary African Studies*, 29:2, pp.193-201.

[42] Gong Wei： 2011. India's Energy Diplomacy and Sino-Indian Cooperation（《印度能源外交与中印合作》，*South Asian Studies Quarterly*, No.144(1), pp.29-34.

[43] Li Lei, 2014. China-India Energy Cooperation and Competition in Global Energy Context(《全球能源格局变革下的中印能源竞争与合作》), *South Asian Studies Quarterly,* No. 158(3), pp.63-69.

44 Peng Nian, 2018. China-India Cooperation in Overseas Energy Market-A Case Study of Africa and Myanmar（《中印在海外能源市场的竞合博弈—以非洲和缅甸为例》）, *South Asian Studies Quarterly*，No.173(2), pp. 20-27.

1.3 Energy Security

The theoretical background of this study is energy security whose definition is contextual and dynamic in nature. The scope of energy security has also expanded over time, with a growing emphasis from military, economy to environmental sustainability and energy efficiency.

1.3.1 History of Energy Security

To better grasp the concept of energy security, reviewing its history at the outset is of paramount importance. The importance of oil is first manifested in the military field. As an important source of industrial fuel and power, as early as during the First World War, military strategists and politicians have recognized the importance of oil security. Culminating with World War II, the notion of energy security was closely tied to the supply of fuels for the military. When the British Navy switched from domestic coal to imported oil, it became vulnerable to an enemy's occupation of oil fields or attacks on transportation lines or refineries. The United States switched its coal-powered vessels to be oil-driven, and oil security as a result became a key factor in the the national military strategy. Ensuring adequate oil supply became a basic guarantee for a country's military power. To ensure the energy security of the US military, the fuel reserve was once in the hands of the Navy. In general, energy security during this period was mainly concentrated in military field, using military power to obtain and guarantee oil supply. At this time, energy security has a more traditional meaning namely military than a modern one of economy and sustainable development.

The importance of oil for military power did not decrease in the post-war period, but oil also became vital for industrialization in many other ways. Industrialized nations became increasingly dependent on oil-fueled transportation vehicles, food production, health care, manufacturing, heating, and electricity generation. At the same time, most industrialized countries did not produce enough oil to satisfy their needs. At this point, the economic impact began to stand out. As Yergin (1991) shows in his historical overview of oil politics, during the Cold War, Soviet expansionism brought the Middle East to center stage. The Middle Eastern oil fields had to be preserved and protected on the Western side of the Iron Curtain to assure the economic survival of the entire Western world.[45]

The vulnerability of this system became apparent in 1973 when most Arab members of OPEC along with several non-OPEC Arab countries cut oil supplies to the USA, the Netherlands and later to several other

[45] Yergin, Daniel. 1991. *The Prize: The Epic Quest for Oil, Money, and Power.* New York: Simon and Schuster, p.427.

countries in protest of the US support to Israel. As a result, the price of oil quadrupled triggering an economic crisis and exposing the fragility of the global oil supply system. The International Energy Agency (IEA), established in 1974, proposed a national energy security concept centered on stabilizing crude oil prices. Cooperation such as strategic fuel reserves is put on the top of agenda to prevent the oil embargo in OPEC countries and the impact of prices volatility on the world economy. These measures bore fruit in the 1980s and the 1990s when the price of oil dropped and the fears of a physical supply disruption at least temporarily subsided.

After the 1990s when the Cold War came to an end, the landscape of global security has dramatically changed as well and energy issues have become more complex. It is no longer a bipolar world of the 1970s and the 1980s. Instead, it is shaped by the threat of international terrorism, instability in Africa and the former Soviet Union, the acquisition of nuclear weapons by India and Pakistan and the changing role of China. The fuel has taken an important part in exportation of Russia and Central Asian countries as they use natural gas as a political weapon. Russia is often the case in this regard as energy supply becomes an important leverage to restore its status.

In this period, the new scenario also makes geopolitics become a prospect that must be considered in the energy sector in this region. Energy is a scarce resource and its distribution is uneven. The Middle East, Central Asia, Latin America and Africa boast their enormous fuel reserve. The Caspian Sea region is another region with abundant reserve. These major oil-producing countries with abundant oil resources have become geopolitical actors, most of which are politically unstable and socially unstable bringing insecurity to the energy supplies.

The extensive use of energy resources has caused environmental problems such as acid rain and greenhouse effect, making people reflect the safety of energy consumption. At this time, the relationship between energy security and sustainable development is even closer. In addition to maintaining energy supply at a reasonable price, the impact on the ecological environment generated during energy development and consumption is also an important criterion for measuring a country's energy security. As a result, energy sources is more extensive, and the importance of natural gas, nuclear energy, and renewable energy has been increasing.

In general, history of energy security shows that energy security is constantly changing, expanding to a set of fuels including natural gas, oil and renewable energy. The scope of energy security has also expanded, with a

growing emphasis on dimensions such as environmental sustainability and energy efficiency.

1.3.2 Definition of Energy Security

It is found through the history that the definition of energy security is contextual and dynamic in nature. Energy Security has typically, to those involved in making energy policy, meant mostly securing access to oil and other fossil fuels.[46] Numerous definitions of energy security have been offered by researchers and policy makers, but no consensus has been wildly accepted. Chester(2009) points out that the concept of energy security is inherently slippery because it is polysemic in nature, depending on the country (or continent), time frame or energy source to which it is applied. This 'slipperiness' poses analytical, prediction and policy difficulties.[47]

After the oil crises in the 1970s, many countries paid great attention to the sustained and stable energy supply. The IEA defines energy security as the uninterrupted availability of energy sources at an affordable price. Energy security has many aspects: long-term energy security mainly deals with timely investments to supply energy in line with economic developments and environmental needs. On the other hand, short-term energy security focuses on the ability of the energy system to react promptly to sudden changes in the supply-demand balance.[48] Energy supply dominated enormous publications in this era. Daniel Yergin(1988), author of the widely acclaimed book on the history of oil, *The Prize*, has suggested that the objective of energy security is to assure adequate, reliable supplies of energy at reasonable prices and in ways that do not jeopardize major national values and objectives.[49] The scholar Christian Winzer(2012), however, puts premium on energy supply by narrowing down the concept of energy security to the concept of energy supply continuity.[50] The political stability of supplying and transit countries appears in discussions since uproar could also restrain supply (Jansen et al., 2004).[51] Six types of risk can pose significant threats to the supply of energy, including coercive manipulation of energy supplies, energy competition as a trigger for conflict, supply disruptions due to political instability, attacks on supply infrastructure by transnational

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[46] David Von Hippel, Tatsujiro Suzuki James H.Williams, Timothy Savage and Peter Hayes, 2011.Energy security and sustainability in Northeast Asia, *Energy Policy*, Vol.39, No.11, p.6719.
[47] Lynne Chester,2009. Conceptualising Energy Security and Making Explicit its Polysemic Nature, *Energy Policy*, 38, p.887.
[48] IEA, https://www.iea.org/topics/energysecurity/
[49] Daniel Yergin, 1988. Energy Security in the 1990s, *Foreign Affairs*, Vol.67, No.1, pp.111.
[50] Christian Winzer, 2012. Conceptualizing Energy Security, *Energy Policy*, Vol.46, pp. 36-48.
[51] J.C. Jansen, W.G. van Arkel and M.G. Boots, 2004. Designing Indicators of Long-term Energy Supply Security. file:///C:/Users/pc/Downloads/Designing_indicators_of_long-term_energy%20(1).pdf

actors, market competition, accidents and natural disasters(Michael Wesley, 2007).[52] Components of energy security contains actions that affect the quantity and reliability of indigenous energy supplies and that affect external energy supplies.[53]

Diversification and fuel reserve are two crucial means to solve the problem of supply disruption in many publications. It is recommended to promote energy diversity as the only sensible and practically feasible for sustainable development(Li Xianguo, 2005).[54] Daniel Yergin proposed ten principles of energy security, with diversification the most important means to secure energy supply.[55] Mason Willrich(1975) classifies energy countries as energy importers and exporters. An importing countries is more concerned with the access to sources or energy supplies Diversification serves as desirable measures in this regard.[56] Diversification, however, has not increased for most countries since 1990 , in contrast to the increase in diversification of natural gas supplies.[57]

With increasing transnational problems including climate change, economic, and international considerations, a more comprehensive operating definition including economy and environment is needed, along with a workable framework for analysis. The goal of energy security is to assure adequate, reliable energy services in ways that increase economic competitiveness and decrease environmental degradation (Joseph J. Romn, 1993).[58] United Nations Development Program (UNDP) defines energy security as a term that applies to the availability of energy at all times in various forms, in sufficient quantities, and at affordable prices, without unacceptable or irreversible impact on the environment.[59] In 2007, Asia Pacific Energy Research Centre (APERC) introduced an influential scheme of energy security including availability, accessibility, affordability and acceptability.[60] Similar to this is Hughes's (2012) generic framework of energy security which contains three indicators: availability, affordability and acceptability.[61] Environment, technology,

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[52] Michael Wesley, 2007. Power Plays: Energy and Australia's Security. https://s3-ap-southeast-2.amazonaws.com/ad-aspi/import/1_28_55_PM_power_plays.pdf?eeNv1iF4q.uSy06xBdpoVkBmDBSNmnd5

[53] David A. Deese, 1979-1980. Energy: Economics, Politics, and Security, *International Security*, Vol. 4, No. 3, p.140.

[54] Li Xianguo, 2005. Diversification and Localization of Energy Systems for Sustainable Development and Energy Security. *Energy Policy,* Vol.33, No.17, pp. 2237–2243.

[55] Daniel Yergin, Energy Security and Markets, in Jan H. Kalicki and Goldwyn David L.,2013. *Energy and Security: Strategies for a World in Transition*, Washington, D.C.: Woodrow Wilson Center Press, 2nd edition: 69–87.

[56] Mason Willrich, 1975. *Energy and World Politics*, New York: Simon and Schuster , pp.65-94.

[57] Cohen, Gail, Joutz, Frederick, Loungani, Prakash, 2011. Measuring Energy Security: Trends in the Diversification of Oil and Natural Gas Supplies, *Energy Policy*, Vol.39, No.9, pp.4860–69.

[58] Joseph J. Romn, 1993. *Defining National Security: The Nonmilitary Aspects*, New York: Council on Foreign Relations Press, p.50.

[59] United Nations Development Program (UNDP), 2004. World Energy Assessment, p.42. https://www.undp.org/content/undp/en/home/librarypage/environment-energy/sustainable_energy/world_energy_assessmentoverview2004update.html

[60] Asia Pacific Energy Research Centre, 2007. A Quest for Energy Energy in the 21th Century, https://aperc.ieej.or.jp/file/2010/9/26/APERC_2007_A_Quest_for_Energy_Security.pdf

[61] Larry Hughes, 2012. A generic framework for the description and analysis of energy security in an energy system, *Energy Policy*, Vol. 42, pp. 221-231.

demand-side management and social-cultural factors need to be incorporated into a new concept of energy security (Vlado Vivoda, 2010).[62] Environment, technology, demand-side management, social and cultural factors, military and sustainable development are central components of a new Comprehensive Energy Security Concept (David Von Hippel, et al., 2011).[63] B.W. Ang et al. identifies the following seven major energy security themes or dimensions: Energy availability, infrastructure, energy prices, societal effects, environment, governance, and energy efficiency. [64]

All of the above studies have expanded the traditional concept of energy security, with particular emphasis on the importance of sustainable development. Some scholars have also contribute to this study from other perspectives. Hughes(2009) introduces the "four 'R's of energy security": review (understanding the problem), reduce (using less energy), replace (shifting to secure sources), and restrict (limiting new demand to secure sources).[65] E. Farrell et al. (2004) put a premium on the importance of energy infrastructure.[66] The ability of the system to cope with extreme events, such as hurricanes, strikes and terrorist actions is also mentioned by Chevalier(2005).[67]

In conclusion, the definitions of energy security is complex and have thus widened over time. In defining energy security, some researchers focus primarily on supply security such as energy availability, prices volatility and diversity, while other researchers argue for a more comprehensive definition that includes the impact on economy, environmental protection and sustainable development. With an increase in natural gas use, energy security also covers natural gas.[68]

[62] Vlado Vivoda, 2010. Evaluating Energy Security in the Asia-Pacific Region. *Energy Policy*, Vol.38, pp. 5258-5263.
[63] David Von Hippel, Tatsujiro Suzuki James H.Williams, Timothy Savage and Peter Hayes, 2011. Energy Security and Sustainability in Northeast Asia, *Energy Policy,* Vol.39, No.11, pp.6719-6730.
[64] B.W. Ang, W.L.Choong and T.S.Ng, 2015. Energy Security: Definitions, Dimensions and Indexes, *Renewable and Sustainable Energy Reviews*, Vol.42, pp.1077-1093.
[65] Larry Hughes, 2009. The Four Rs of Energy Security, *Energy Policy*, Vol.37, No.6, pp. 2459-2461.
[66] Alexander E. Farrell, Hisham Zerriffi and Hadi Dowlatabadi, 2004. Energy Infrastructure and Security, *Annual Review*, Vol. 29, pp.421-469.
[67] Chevalier, J.M., 2005. Security of Energy Supply for the European Union. *European Review of Energy Markets,* Vol.1, pp.1-20.
[68] Christian Winzer, 2012. Conceptualizing Energy Security, *Energy Policy*, Vol. 46, pp. 36-48.

Chapter II China and India's Energy Security

China and India have long been beset with the dilemma of economic growth and energy security. Constrained by energy reserves, coal has always been playing an important role in this regard. Air pollution and greenhouse gas emission, coupled with low energy efficiency, have posed enormous threat to two giants' energy sustainability as well as socioeconomic development. For the sake of discussion, energy security in this part composes of energy supply, energy transport and energy consumption.

2.1 China's Energy Security

China was traditionally self-sufficient with its oil reserves, but since 1993 it has been a net oil importer. China's rapid economic growth has led to a dramatic increase in energy consumption which has raised great concern regarding its energy security. In addition, its stagnantly domestic production has also led to a growing hunger for imported oil.

Whole volumes have been written about what energy security means for China. Wenmu Zhang(2003) believes that clean energy and oil shortage are the major problems for China's energy security.[69] Yuyan Zhang(2007) believes that oil supply and transportation security which should be at the top of agenda for China.[70] Xiaoyong Huang(2016) adds energy efficiency and environmental protection factors into his definition.[71] Bambawale (2011) et al. analyzes China's energy security from the perspective of energy users, pointing out the importance of fossil fuel supply and environmental protection.[72] Ren (2015) et al. believe that China should give priority to the development of low-carbon energy to improve the level of energy security.[73] Yan Ma (2016) believes that the investment in energy and environmental protection have become the major barriers of China's energy security.[74]

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[69] Wenmu Zhang, 2003. China's Energy Security and Policy Option (中国能源安全与政策选择). *World Economics and Politics*, 5, pp.11-16.

[70] Yuyan Zhang, Qingyou Guan, 2007. International Energy Landscape and China's Energy Security (世界能源格局与中国的能源安全), *The Journal of World Economy*, 9, pp.17-30.

[71] Xiaoyong Huang, 2016. *Selected Papers on Energy (*能源博弈论集). Beijing: Social sciences Academic Press.

[72] Malavika Jain Bambawale, Benjamin K. Sovacool, 2011. China's Energy Security: the Perspective of Energy Users. *Applied Energy*, Vol.88, No.5, pp.1949-1956.

[73] Jingzheng Ren and Benjamin K. Sovacool, 2015. Prioritizing Low-carbon Energy Sources to Enhance China's Energy Security, *Energy Conversion and Management*, Vol. 92, No.1, pp. 129-136.

[74] Yan Ma, 2016. Global Energy Governance: Challenges and Reforms Tendency (全球能源治理变局：挑战与改革趋势), *Contemporary International Relations*, 11, pp.55-62.

2.1.1 China's Energy Supply

China is rich in coal, poor in oil and natural gas, however. By the end of 2017, China's proved oil reserves were 2.57 billion barrels, accounting for 1.5 percent of the world's oil reserves, with R/P ratio[75] of 18.3 lower than the global average of 50. China's oil production fell 3.8 percent to 3,846 thousand barrels per day, accounting for 4.2 percent of the global total. Oil consumption was 14,277 thousand barrels daily, accounting for 14.5% of global oil consumption. China's total proved natural gas reserve is 5.5 trillion cubic meters, accounting for 2.8% of the global total, and the R/P ratio is 36.7 until 2017. Natural gas consumption increased by 26% to 26.58 billion cubic meters in 2017, accounting for 7.3% of the global total. In addition, natural gas imports totaled 9.2 billion cubic meters in this year. China's proved coal reserves are 138,819 million tons, accounting for 13.4% of the global total, and its R/P ratio is 39 only. Finally, coal consumption in mainland China was 1938 million tons of oil equivalent, with a growth rate of 0.5%.[76]

China's imports of fossil energy have been increasing year by year, so as its dependence on foreign countries in this regard. Since China became a net importer of coal in 2009, its external dependence on coal has reached 10.7% in 2016 with Australia, Indonesia, South Africa and the United States the main sources of imports.[77] China's reliance on coal importation will reach a new height as environmental pressures continue to mount and coal reserves dwindle.

Since it became a net oil importer in 1993, the gap between oil supply and demand has been widened. In 2017, China's oil external dependence ratio was 67%, higher than the international average of 50%.[78] Until 2006, China was completely self-sufficient in natural gas. Over the past few years, a package of policies have been implemented to encourage industrial and residential users to switch away from coal to electricity or gas instead, with the latter being the best choice for the vast majority at the end. The dramatic increase in gas demand was greatly compounded by the switch into gas reaching its zenith as the winter heating demand was augmenting. Though it is unlikely that the surge in gas demand seen last year will be repeated in 2019 and beyond, gas demand continues to increase tremendously this year.

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[75] Reserves-to-production (R/P) ratio–If the reserves remaining at the end of any year are divided by the production in that year, the result is the length of time that those remaining reserves would last if production were to continue at that rate.

[76] The statistics above is based on BP Statistical Review of World Energy, 2018. https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf

[77] Li Qi, 2018. The Current Situation and the Contradictory Transformation of China's Energy Security (中国能源安全现状与矛盾转变), *International Petroleum Economics*, Vol.26, No.4, p.20.

[78] P.21.

The Middle East and North Africa region is both a global energy engine and a powder keg. Many countries in the region is undergoing political turmoil, high unemployment, economic recession, terrorism and religious disputes, making them the most sensitive for energy cooperation, and also threatening China's energy supply security. Such as the Darfur region of Sudan, the reliability of energy supply is relatively low, and it would easily get China involved in humanitarian disputes which embarrasses China's national image in the international communities. Once the region is beset with unrest, it will cause significant economic losses to China. For example, China had no choice but to withdrew its investment from the two large natural gas fields in Iran due to the opposition of the local forces. In addition, there is often a tension between the oil-producing countries such as Venezuela and Iran and the United States. China's relations with these countries will inevitably aggravate the suspicion and hostility from the United States.

China's dependency on the Meddle East is self-evident. However, improvement has been made as for China's energy diversification strategy, and the concentration ratio(CR) has declined as a result. In 2015, 50.7% of China's crude oil was imported from the Middle East. In 2016, however, the figure fell to 48%, and in 2017, to 43.6%. Correspondingly, the imports of crude oil from Russia, the CIS countries and the American countries are rising. Russia and the CIS countries' oil exports to China rose from 14% in 2015 to 15.1% in 2017, while those in the Americas rose from 12.7% in 2015 to 15.8% in 2017. The imports of crude oil from African region has fluctuated in recent years. In 2015, the number stood at 19%, whereas it fell to 16% in 2016. In 2017, however, it rose to 18.4%.[79]

The supply diversification of China's natural gas import sources has witnessed dramatic achievement during the past years. In 2006, Australia boasted the only source of natural gas for China. In 2008, however, there were three countries with Nigeria and Egypt new comers. In 2016, China imported natural gas from more than 20 countries.

Finally, China legs behind in energy reserves. The construction of China's oil reserve base began in 2003. Although the four strategic oil reserve bases are mostly distributed along the coast and have been put into use, their total reserves are only 14 million tons. Together with the domestic commercial oil reserve capacity, the total oil reserve capacity is only 30 days[80]. This is not only far lower than many developed countries such as Japan and the United States, but also far from the 90-day oil reserve level set by the International Energy

[79] The statistics above is based on the BP Statistical Review of World Energy from 2015 to 2018.

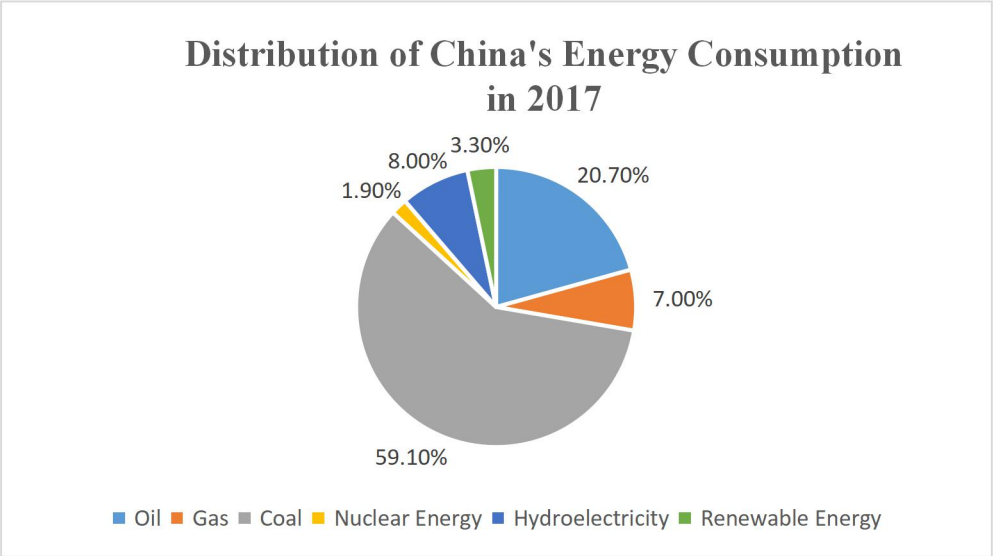
[80] Li Jinye, Jia Rui-qing, 2016. The Influences of Oil Price Fluctuation on China's Energy Diversification Choices (国际油价波动对中国能源多元化选择的影响), *Journal of Xinjiang University*, Vol. 44,No. 2, p.13.

Agency. This will be difficult to cope with international energy supply shocks and oil price volatility.

2.1.2 China's Energy Consumption

The major world energy consumption region has shifted from the traditional western countries to the Asia-Pacific region. Many developed countries in Europe and the United States have entered the stage of post-industrialization. In recent years, the growth of energy consumption demand in OECD countries has been stagnant and their global share has been shrinking. Data from the International Energy Agency (IEA) shows that total energy demand in OECD countries declined by 0.3% in 2015 compared with 2014, and by an annual rate of 0.3% from 2005 to 2015, down from 61% in 1971. Among them, the United States accounted for 16 percent, down by 13% from 29% in 1971.[81]

The growth in the world's energy demand mainly attributes to fast-growing emerging economies, with China and India accounting for half of it. China's energy consumption grew 4.4 percent in 2016 and 3.1 percent in 2017. Although the increase was slight, it reached its peak at 3132 million tons of oil equivalent, ranking first in the world with a high proportion of 23%.[82] China's total energy consumption has surged, and the consumption structure is unbalanced, however. Oil accounts for 20.70% of total consumption, natural gas only 7.00% and new energy only 3.30%. Coal, a traditional energy source for China, accounted for 59.10% of total consumption, although the rate has been declining over the past decades.



Source: Based on BP Statistical Review of World Energy 2018.

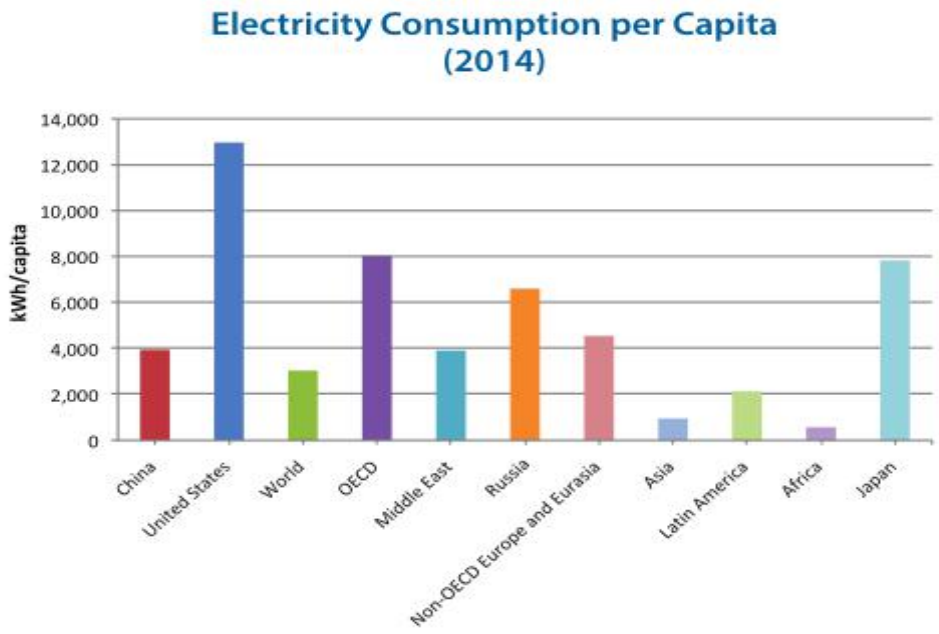
[81] IEA, 2017. World Energy Balances: Overview. https://www.iea.org/publications/freepublications/publication/WorldEnergyBalances2017Overview.pdf
[82] BP Statistical Review of World Energy, 2018. p.8. https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf

https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf

In addition, environmental issue is also on the list of Chinese government's agenda. China's carbon dioxide emissions per unit of GDP are 1.01 kg, higher than the world average rate of 0.43 kg.[83] In 2017, China's total carbon dioxide emissions were 923.2 million tons, accounting for 27.6% of the world's total emissions. China dwarfs major emitters such as the United States (5087 million tons), India (2344 million tons), Russia (1525 million tons) and Japan (1176 million tons).[84] This poses a great threat to environment. Coal contributes more than 34% to the emission of particulate matter (PM2.5). China's unbalanced energy consumption structure, coupled with extensive mining, have seriously affected the economy and ecological environment. In recent years, the pressure to save energy and reduce emissions has been increasing. To build a clean and efficient energy consumption structure has become more urgent.

Finally, China's per capita energy resources is lower than many countries. In 2016, China's per capita hold of oil was 2.54 tons, 8% of the world average. The figure for natural gas is only 3,916 cubic meters, 15% of the world average. The coal consumption per capita is 177 tons, an exception that it reaches the world average level. China's per capita energy consumption in general stands at 2.21 tons of oil equivalent, slightly above the world average.[85] In 2014, China's per capita electricity consumption was 3,927 kilowatt hour, less than half that of OECD countries. According to the International Energy Agency, 33% of Chinese people have no access to clean energy for cooking in 2015.[86]

[83] Xiaoyong Huang, 2016. *Selected Papers on Energy* (能源博弈论集). Beijing: Social sciences Academic Press.
[84] BP Statistical Review of World Energy, 2018. p.49.
https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf
[85] Li Qi, 2018. The Current Situation and the Contradictory Transformation of China's Energy Security (中国能源安全现状与矛盾转变), *International Petroleum Economics*, Vol.26, No.4, p.22.
[86] IEA, 2017. Key World Energy Statistics.
https://www.iea.org/publications/freepublications/publication/KeyWorld2017.pdf



Source: Lawrence Berkeley National Laboratory, 2017.

https://china.lbl.gov/sites/default/files/misc/ced-9-2017-final.pdf

2.1.3 China's Energy Transport

China's imports of crude oil mainly come from the Middle East, Africa and Asia-Pacific, accounting for more than 90% of the total. 77% of oil imports can not been transported into China without passing through the maritime line from the Indian Ocean, the Bay of Bengal, the Straits of Malacca to the South China Sea.[87] The Straits of Malacca is a gateway for the Pacific Ocean and the Indian Ocean. From a military perspective, the Strait of Malacca is vulnerable to military control. The country that puts the Strait of Malacca under control imposes a great threat to China's energy supply.

The Malacca dilemma is formed by a combination of various factors. First, the US Navy controls the entire Pacific Ocean and the Indian Ocean, including the Straits of Malacca. After the Cold War, the United States established a military base in Singapore, and the US Navy fleet can cross the Straits of Malacca within 24 hours. At present, the US military can deploy the Marine Corps to the Straits of Malacca to prevent terrorist attacks. Second, India is strengthening its military presence in the form of naval base in the northwestern part of the Straits of Malacca. Finally, Japan has always attached great importance to the security of the

[87] H.Y. Zhang, Q. Ji, Y. Fan, 2013. An Evaluation Framework for Oil Import Security Based on the Supply Chain with a Case Study Focused on China, *Energy Econ*, 38 , pp. 87-95.

Straits of Malacca. In recent years, with the piracy problem there, it has been involved in the security affairs of Southeast Asia. Obviously, the fundamental reason for the formation of the Malacca dilemma is that China lacks a strong national sea power and cannot provide safe escort for the maritime transport.

In addition, oil resources in the South China Sea have been exploited by neighboring countries. The South China Sea is one of the four ocean oil areas in the world. Economically and strategically important, though, China's oil exploit in minimal in this region, as the Philippines, Malaysia, Brunei, Indonesia and Vietnam have been competing to scramble for oil and gas over the past decades. The importance of the South China Sea is also reflected in the fact that it is an important part of China's oil transport. The transport may be greatly affected by international conflicts caused by resources or other incentives erupts in the South China Sea. Although China has restrained over the dispute, a strong navy is the key to solving the problem.

The search for a reliable overland oil supply will become imperative in the coming decades. China has been transporting oil and gas via two land routes, one from Russia to northeastern part of China, and the other from Kazakhstan to China's Xinjiang autonomous region. As a result, China has stepped up construction of the pipeline. China and Kazakhstan have completed the construction of a 3,088-km oil pipeline. The pipeline can not only transport oil and gas resources from Kazakhstan to China, but also oil and gas from other Caspian countries including Russia and Turkmenistan. The China-Myanmar oil and gas pipeline transports gas to China in 2017. China has officially built four pipelines until now. In addition, countries including China have taken an active part in maintaining the security of maritime energy corridors in recent years, strengthening coastal patrols and joining hands in combating piracy. Therefore, in recent years, the energy transport security pressure has been going down.

2.2 India’s Energy Security

India bears striking similarities to China in terms of development and industry, so as its energy resources and energy consumption structure. Different from China that shifts its task to environmental protection and energy efficiency, India is still struggling to secure its energy supply.[88]

[88] Ye Yue and Liu Zongyi, 2010. Comparative Studies on China and India’s Energy Policies (中印能源政策比较研究), *South Asian Studies*, 3, pp. 63-74.

2.2.1 India's Energy Supply

At present, India is the fourth-largest energy consumer, accounting for nearly 5.6% of global primary energy consumption.[89] A total of 4690 thousand barrels oil is consumed daily, covering 4.8% in global energy market.[90] The figure for natural gas is 54.2 billion cubic meters daily, accounting for 1.5% of the global energy market.[91] According to BP energy report in 2017, the demand gap for oil reached to 154.6 million tons which means that 70%-80% of oil could not be pumped unless expanding its importation. The figure for natural gas is 22.5 billion cubic meters, in which 30%-40% rests on imports.[92] India ranked as the fourth-largest liquefied natural gas(LNG) importer following Japan, South Korea, and China in 2013, with a share of nearly 6% of the global market.[93]

Both India and China are energy-scarce countries. Apart from the abundant coal reserves, its energy oil and gas reserves remain at a low level and oil and natural gas are seriously deficient. There are only two oil and gas reserve bases in India, but India's oil production capacity has stagnated, worsening the contradiction between supply and demand. The total oil proved reserves for India is only 4.5 billion barrels with a global share of 0.3%.[94] The figure for natural gas is 1.2 trillion cubic meters with a global share of 0.6% only.[95] In 2012, the reliance on imported energy jumped to 38% and imported oil dependency increased from 43% in 1990 to 71% in 2012.[96] Its per capita energy consumption is only maintained at between 1/4 and 1/3 of the world average. This means that India has a huge gap between population increase, economic development and energy consumption. This gap will make India a giant Energy Pump that continuously grabs at global energy resources.

According to the International Energy Agency, in the next 20 years, Indian energy demand will grow at a rate of 3.9 per year, which will make India surpass Japan in 2025 and become the world's third largest energy

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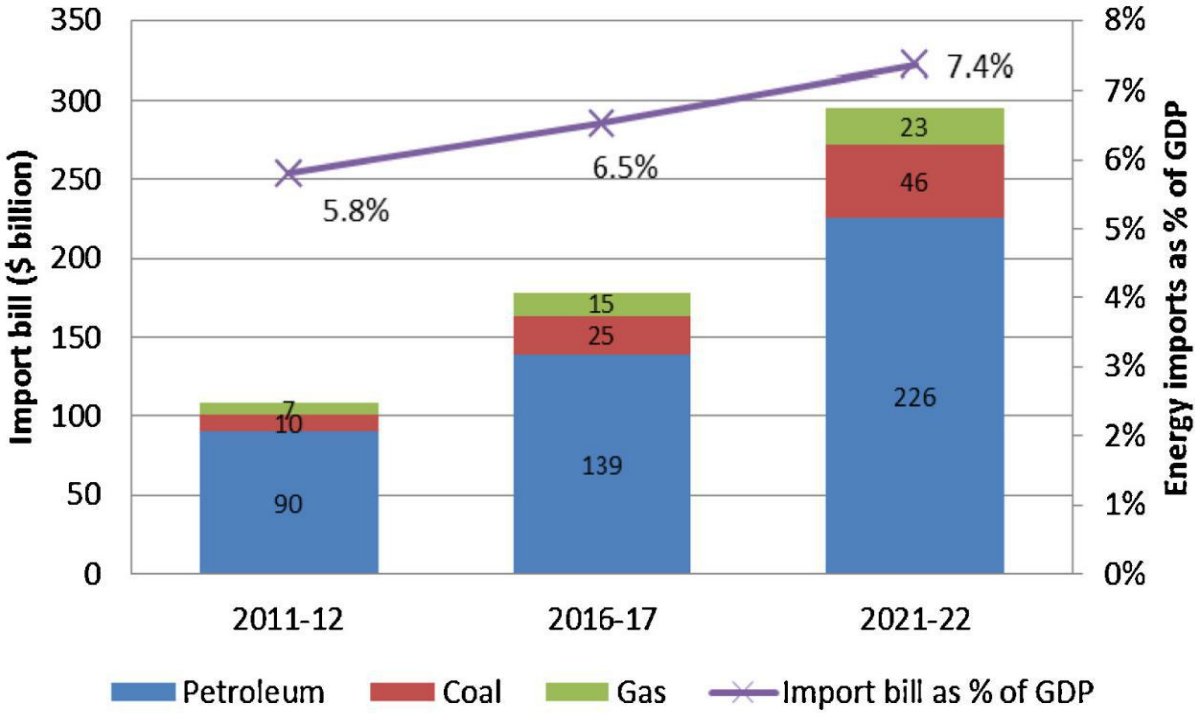
[89] BP Statistical Review of World Energy, 2018. p.8.
https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf
[90] P.15.
[91] P.29.
[92] BP Statistical Review of World Energy, 2017. pp.16－17.
https://www.bp.com/content/dam/bp-country/de_ch/PDF/bp-statistical-review-of-world-energy-2017-full-report.pdf
[93] EIA, 2014. India Is Increasingly Dependent on Imported Fossil Fuels as Demand Continues to Rise,
https://www.eia.gov/todayinenergy/detail.php?id=17551
[94] BP Statistical Review of World Energy, 2018. P.12,
https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf
[95] P.26.
[96] EIA, 2014. India Is Increasingly Dependent on Imported Fossil Fuels as Demand Continues to Rise,
https://www.eia.gov/todayinenergy/detail.php?id=17551

importer. In 2030, its oil imports will reach 6 million barrels per day, and its external dependence will reach 91%.[97] During the past few years, the natural gas supply shortage has exceeded 200 million cubic meters per day as the domestic production can only meet its 50% demand. India's energy import bill will jumps significantly and takes up an increasing share of the GDP by 2021-2022, even though the GDP is expected to increase by roughly 8%. In general, oil and gas supply has become a key stumbling block for Indian economic development.

Projected Indian Energy Imports.



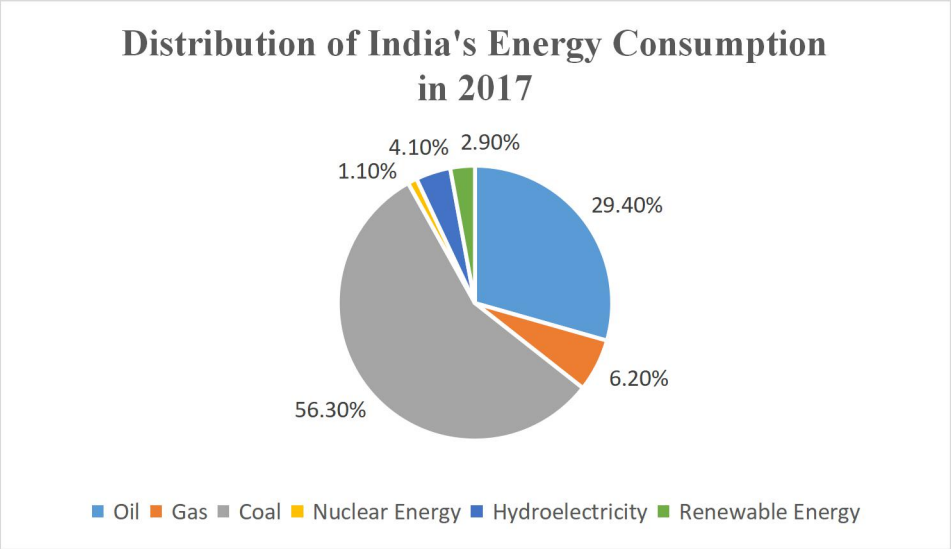
Source: Ashok Sreenivas, 2014. India's Energy Policy Future: Here Be Dragons, https://www.sciencedirect.com/science/article/pii/S0016328713001316

2.2.2 India's Energy Consumption

According to BP energy report, India's energy consumption increased by 4.6% in 2017. Although the growth rate is lower than that of 2016, it still reached 753.7 million tons of oil equivalent. Its total energy consumption ranks third in the world, accounting for 5.6%.[98] China and India have similarities in the

[97] Siddharth Singh, 2015. Can An Oil Importing India Be Energy Secure? https://www.business-standard.com/article/punditry/can-an-oil-importing-india-be-energy-secure-115082500932_1.html
[98] BP Statistical Review of World Energy, 2018. P.8, https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf

structure of energy resources, that is, coal resources and water resources are abundant, and oil and gas are relatively scarce, thus making coal a primary resource during the past years. The proportion of coal in India's total energy consumption in 2017 was 56.30%, slightly lower than China's 59.10%. Oil and gas makes up a small part of total consumption, with oil accounting for 20.70% and natural gas only 7%. Nuclear energy and renewable energy accounted for 4.00% (). Although the growth rate of coal consumption has been declining, the dominant role of coal will be difficult to be erased in recent years, especially taking into account the administrative efficiency of the Indian government. In 2014, for example, India's coal consumption increased by 11.70%, creating the largest incremental record in its history.[99]



Source: Based on BP Statistical Review of World Energy 2018.
https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf

In terms of per capita hold of resources, India is confronted with more grave difficulties than China. Supply and demand of power in China is balanced, and India, however, is at risk of severe power shortage, which greatly slows downs economic and social development. First, India's per capita energy consumption is only 1/4 to 1/3 of the world average.[100] As India's economy grows and so as its population, India's electricity demand will continue to pile up. In the future, great efforts are required to invest in energy infrastructure to meet the power supply. Second, unlike China whose slow population growth throws China into an aging society, population boom remains an important characteristic for discussion of India. Although the urbanization is lower than that in China, a large number of new urban populations will propel the growth of

[99] Chengyu Lao, 2016. A Comparative Study on China-India Energy Development and Cooperation (中印能源发展特征比较与合作前景分析), *Studies on Party and Government*, 4, p.124.
[100] Li Lei, 2014. China-India Energy Cooperation and Competition in Global Energy Context (全球能源格局变革下的中印能源竞争与合作), *South Asian Studies Quarterly*, Vol.158, No.3, p.65.

energy consumption.

India still has a large population of 240 million people who are struggling to grip electricity, and primary bio-energy such as wood remains a crucial resource for 840 million people in rural area.[101] Power outages often occur even in large cities like New Delhi. Although the government encourages the use of bio-renewable alternative fuels in rural areas, such as biogas fueled by cow dung and straw. However, due to the low education development and the lack of practical technology, many people in rural area burns these wastes and the sulfur dioxide causes serious environmental pollution. In addition, the energy efficiency of burning these waste materials is so low that they are exclusively used to make food.

In 2006, China surpassed the United States for the first time to become the world's largest emitter. China's total emissions and per capita amount are about four times that of India.[102] Therefore, China faces much more pressure from higher international on climate issues than India. However, India's exploit technologies are relatively backward and pose serious environmental problems. British scholar Dimitrios Pappas (2017) et al. find that India requires double the amount of energy to produce the same output as China. They also argue that a production transition would result in a dangerous global emissions growth which has to be countered with rapid adoption of innovative energy technologies and policies.[103]

The coal-oriented energy consumption pattern has become the culprit of many environmental problems in India, especially air pollution. India is the third most polluted countries in 2018 where it is home to 22 of the the worst 30 cities for air pollution.[104] Therefore, the Modi administration hopes to alleviate environmental pressures through the promotion of clean energy, especially to reduce greenhouse gas emissions.

Since 2014 when the Modi took office, Indian government has taken a ray of clean energy initiatives. In 2017, the consumption of renewable energy increased by 19.7%, accounting for 4.5% of the world.[105] However, for a long time now and in the future, India still faces many problems that need to be solved urgently. Therefore, clean energy is an inevitable choice for India to meet the mounting challenges of energy issues in the long run. But in the short term, it is a Utopian way to channel large amounts of capital and technology into clean energy rather than on solving the urgent energy problems such as per capita hold of

[101] IEA, 2015. *India Energy Outlook,* Paris: International Energy Outlook, p.11.

[102] Ye Yue and Liu Zongyi, 2010. Comparative Studies on China and India's Energy Policies (中印能源政策比较研究), *South Asian Studies*, 3, p. 67.

[103] Dimitrios Pappas and Konstantinos J. Chalvatzis, 2017. Energy and Industrial Growth in India: The Next Emissions Superpower, *Energy Procedia,* 105, pp.3656-3662.

[104] Air Visual, 2019. 2018 World Air Quality Report, https://www.airvisual.com/world-most-polluted-cities?continent=&country=&state=&page=1&perPage=50&cities=

[105] BP Statistical Review of World Energy, 2018. P.44, https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf

coal and oil.

Take the development of solar energy as an example. As one of the world's largest producers of solar panels, Indian government is popularizing solar energy technology to the general public as it boasts a very long sunshine period of 300 days per year. If this large amount of solar energy is converted into electricity equivalent, it could produce 5 trillion kilowatt hour per year, an enormous power that can meet India's annual electricity demand.[106] consumption. But India's solar panels are so costly that their price is about nine times higher than the cost of the the power generated by coal. Despite the development of energy diversification during the past few years, the pace is too slow as the time being, and sometimes even stagnant.

2.2.3 India's Energy Transport

The Indian regards the Indian Ocean as the "India's ocean" and takes its security issues as the fundamental interests of the country. Indian Prime Minister Nehru once said: "If India wants to become powerful on land, it must first be powerful at sea." The Indian Ocean Control Strategy was proposed as early as in 1970s. Since then, India has steadfastly implemented the strategic goal of full manipulation of the Indian Ocean.

Indian Ocean is one important part of three major oil transport routes: Persian Gulf - Cape of Good Hope - Western Europe and North America; Persian Gulf - Straits of Malacca - Japan; Persian Gulf - Suez Canal - Mediterranean - Western Europe and North America. In 1999 alone, oil shipped through the Indian Ocean accounted for 46.5% of the world's offshore oil shipments. Most of India's imported oil come from the Gulf region, so India puts much premium on the safety of maritime routes from the Gulf to its offshore waters. More than 80% of India's imported oil is transported through the Indian Ocean. The concerns about the Gulf and even the Indian Ocean as a whole stems from the Gulf War of the 1990s and the Iraq War of 2003. Even if the possibility of energy supply disruption by a large-scale naval battle is extremely small, India cannot underestimate the potential dangers that terrorist cataclysm may pose. As a result, India is attaching more importance to the presence of its navy in maintaining the safety of marine channels.

With strong naval power represented by its two aircraft carriers, India can maintain its absolute advantage in the Indian Ocean for a long time to come. India has spared no expense in buying nine power reactors for

[106] Indian Power Sector, 2014.Solar India Info, http://indianpowersector.com/home/renewable-energy/solar_new/solar-power/

aircraft carriers from Russia. At present, it is sparing no expense to build the third aircraft carrier which is the strongest signal for India to speed up its domination in the Indian Ocean.

India is at a disadvantage on onshore channels compared with China whose energy flows back to China through multiple pipelines. Energy from Russia and Central Asia is also playing an important role, but the geopolitical situation in South Asia makes these resources far from the moon. India has a grim relationship with neighboring countries, especially Pakistan because of territorial disputes and terrorism issues. The same barriers are faced by oil pipelines connecting other Central Asian countries such as Turkmenistan. Even if India makes it, is Afghanistan the alternative? This is the same case in the Middle East where a pipeline from Iran to the northwest coast of India has not been built because its sworn enemy stands in its way.

Chapter III A Comparative Study on China and India's

Energy Security in Africa

3.1 Objectives

As China and India, both emerging countries, are facing a shortage of energy and have a high dependence on fossil imports, they share many similarities in quest for energy in Africa. Securing energy supply is on the top of their agenda. Furthermore, energy cooperation serve as a leverage to promote the trade cooperation with Africa. Both China and India hope to shake off dependency on the Middle East and improve resources diversification. However, India's presence in Africa is in its list to be a major power, especially the hope of promoting the reform of the UN Security Council. Finally, India has a strong pursuit of natural gas in Africa.

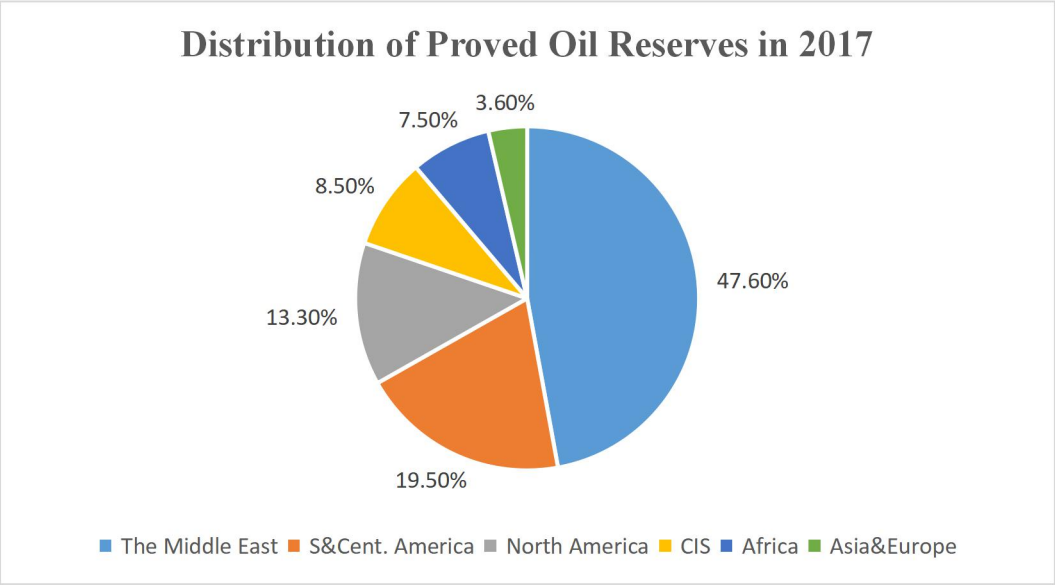
3.1.1 Similarities in Objectives

As discussed above, China and India's energy reserves are too limited to satisfy their enormous demand in recent years. The external dependency is increasingly higher. Since 1993 when China became a net importer of oil, the gap between oil supply and demand has been larger. In 2017, China's dependence on foreign oil was 67%, far exceeding the international warning line of 50%.[107] The status quo for India is much more serious. At present, India is the fourth largest energy consumer in the world, accounting for about 5.6% of the world's total primary energy consumption. India consumes 4.69 million barrels of oil a day, accounting for 4.8% of the global energy market. However, India's oil reserves are only 4.7 billion tons at the end of 2017, only 18% of China's. China and India are more cautious in selecting their partners for energy cooperation. Why India and China turn their eyes on this continent with backward infrastructures, high political and economic risks, and even conflicts and wars?

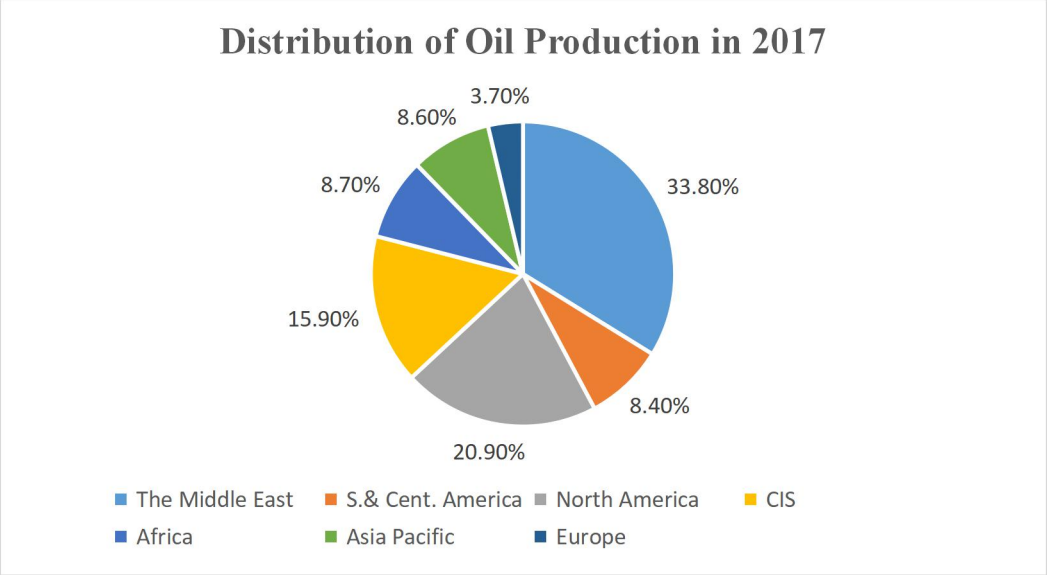
First of all, Africa boasts energy reserve, which makes it more attractive to China and India. In 1997, the oil proved reserves in Africa were 75.3 billion tons, accounting for 6.5% of world total. At the end of 2007, the oil reserves were 119.7 billion tons, accounting for 8.4%. It can be seen from the table that Africa's oil

[107] Li Qi, 2018. The Current Situation and the Contradictory Transformation of China's Energy Security（《中国能源安全现状与矛盾转变》）, International Petroleum Economics, Vol.26, No.4, p.20.

reserves are much lower than those in the Americas and the Middle East. By 2017, the share of Africa has fallen to 7.50% (partly because the oil reserves in the Americas have increased sharply). However, Africa's oil reserves have risen steadily to reach 126.5 billion tons, and 1,768 oil and gas fields have been discovered.[108] In terms of crude oil production, African countries produced 383.3 million tons of oil in 2017, accounting for 8.7% of world total, with a growth rate of 5%.[109]



Source: BP Statistical Review of World Energy 2018, p.24.



Source: BP Statistical Review of World Energy 2018, p.12.

[108] BP Statistical Review of World Energy, 2018. p.12. https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf

[109] P.14.

Angola's oil industry has developed rapidly in recent years. In 2008, Angola surpassed Nigeria and ranked second largest oil producer in Africa. As of 2017, Angola's oil production has reached 81.8 million tons.[110] With the further exploit in sea, Angola which are politically stable and socially stable, will continue to increase its oil production. In addition, countries such as Libya and Congo are enjoying this blessing. In 2017, Libya witnessed the largest growth rate of 103.7%. With the increase in international investment and advances in exploration technology, a surge will be seen in this continent.

Fossil resources is instrumental to national economic growth and social well-being. African countries, which are subject to the shortages of capital and technology, have implemented policies to favor foreign investment and international cooperation in this regard. In practical sense, great efforts are made to introduce many preferential policies, such as establishing investment promotion committees, simplifying investment procedures, deregulating investment restricts in energy sector and providing operation share in companies.

In addition, oil imported from Africa boasts low sulfur and is easy to refine and process. Most importantly, African oil boasts low cost to explore. The oil fields in West Africa and offshore waters is located in shallow surface and therefore, the success rate of drilling is 35%, higher than the world on average.[111] This could greatly reduce the cost of oil exploitation. The cost of oil exploration in Africa is about 3.73 US dollars/barrel, far lower than 13.3 dollars in the US, 8.29 dollars in Europe, 7.17 dollars in Canada, 4.6 dollars in Latin America and the world average of 5.3 dollars.[112] In addition, the success rate of drilling in Africa is high (up to 35% in West Africa), exceeding the world average of 10%. In addition, the main oil fields are located in coastal areas and hold a distance from inland conflicts. These make it much convenient and safer to transport.

It is particularly important to note that Africa is an important part of China's Belt and Road Initiative, which is expected to be the world's largest 'Economic Corridor'. As of 2018, China has invested more than US$34 billion in African energy sector.[113] Sinopec, which began its services to Africa in 1993, has a total asset of more than 20 billion US dollars.[114] Considering that China's oil imports have been rising in recent years, the

[110] BP Statistical Review of World Energy, 2018, p.16. https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf

[111] Li Hui, 2014.The Experience and Implication for Sino-Africa Energy Cooperation(中非能源合作的经验与启示), Pioneering with Science and Technology, No.10, p.50.

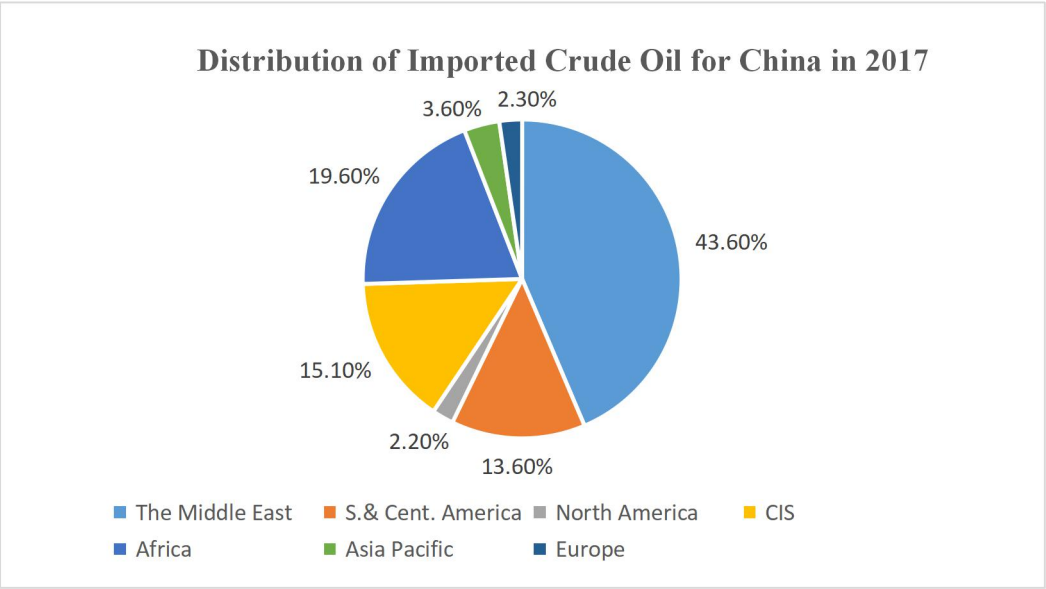
[112] P.50.

[113] Peng Nian, 2018. China-India Cooperation in Overseas Energy Market-A Case Study of Africa and Myanmar (中印在海外能源市场的竞合博弈—以非洲和缅甸为例), South Asian Studies Quarterly，No.173(2), pp. 20-27.

[114] Jin Tao and Yu Haitao, 2018. Thoughts and Suggestions on Expanding and Deepening Sino-Africa Oil and Gas Cooperation under the Belt

cooperation with Africa can secure China's quest for energy and promote the all-round development of China-Africa trade relations as a whole.

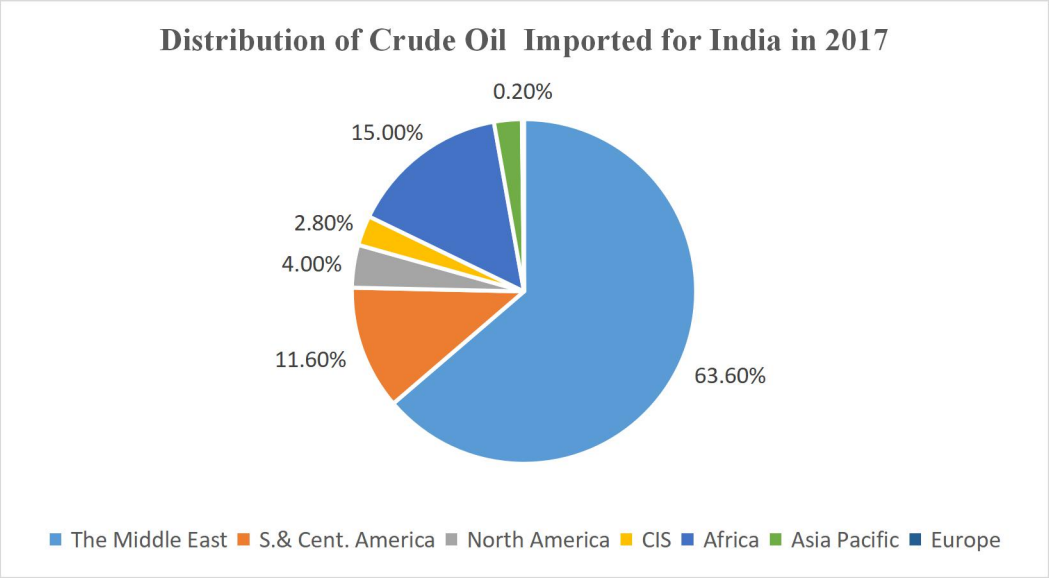
Second, diversification is another factor driving China and India to strengthen energy cooperation with Africa. The Middle East has always been a crucial crude oil provider for China and India. Taking trade movement of the crude oil in 2017 as an example. 43.6% of China's imported crude oil comes from the Middle East, while the situation of India is more serious, with the figure reaching as high as 63.6%.[115] However, the situation in the Middle East is complex as the ethnic, religious and political disputes are cropping up one after another. The involvement of the United States, Europe and Russia has also made the Middle East impossible to establish a stable regional pattern. In addition, Trump has planned to withdraw American troops from the Middle East not long before he kicked America out of Iranian nuclear deal and resumed sanctions against Iran. Iran responded to suspend the implementation of the agreement on May 8, 2019. The Iranian nuclear issue seems to turn the Middle East back into the turbulent era of of sanctions and nuclear blackmail.



Source: BP Statistical Review of World Energy 2018, p.24.

and Road Initiative (一带一路倡议框架下扩大深化中非油气合作的思考与建议), *International Petroleum Economics*, Vol.26, No.11, pp.58-64.

[115] Based on BP Statistical Review of World Energy, 2018. p.24. https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf



Source: BP Statistical Review of World Energy 2018, p.24.

In addition, the turbulent situation has made the Middle East a hotbed of terrorism. In particular, the rise of the IS, even though being defeated during the past years, has set off a new wave of terrorism in the Middle East. Escaping from the coalition airstrike, the terrorists are scattering across Africa, Pakistan, Indonesia. Who knows the time when they take resurgence? The situation culminated after the United States launched the Iraq war and the Afghan war and the supply of crude oil was under greatly threat. This has prompted China and India to diversify energy sources and expand energy imports from Africa.

India has paid much price and learned lessons in the past decades. In 1972, before the outbreak of the first oil crisis, the cost of importing oil was $264 million, and by 1975 it had soared to $1.4 billion, an increase of nearly five times. In 1978, before the outbreak of the second oil crisis, the expenditure stood at $1.8 billion, and by 1981 it had increased to $7.5 billion, an amount that is equivalent to 80% of India's total exports in 1981 and 50% of total imports. By the end of the second oil crisis, India's GDP had shrunk by 5.2%. During the oil crisis of 1990, the cost of oil imports in India increased by 50%. By the end of the 1991 Gulf War, consumption confidence index fell by 74%.[116] Since the beginning of the 21 century, rising prices of oil and natural gas have drained off more than billions of dollars each year. Therefore, African countries especially those are not OPEC members have become the targets of India and China.

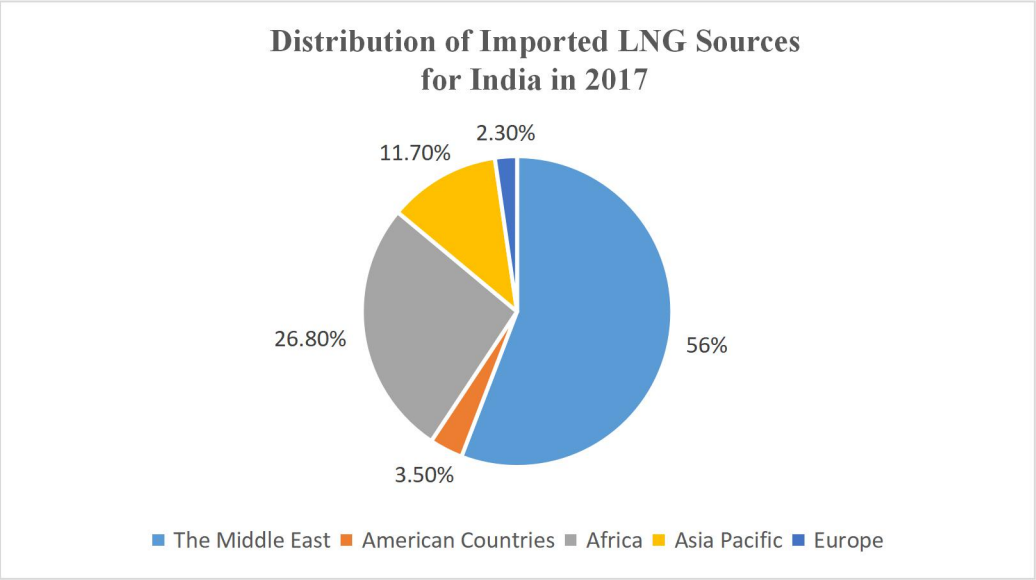
Finally, energy cooperation is an opportunity to promote economic and trade cooperation with Africa. Complementarity plays an important role in cooperation with Africa. India's refining capacity is very strong.

[116] Samir Ranjan Pradhan, 2008. *GCC and the Global Energy Regime*, New Delhi: Academic Foundation, pp.296-297.

On the contrary, Africa's refining capacity is relatively poor. Therefore, energy cooperation can not only to ensure India's energy supply, but also to help African countries improve their refining capacity. China, on the other hand, has witnessed dramatic growth in renewable energy during the past years. However, over-productivity throws this into traps and China needs to tap into new market. Kenya, for example, which boasts large reserves of geothermal power, is struggling to gain investment and technology from China. This complementary demands can open new room for cooperation.

3.1.2 Differences in Objectives

The difference is that India lies in pursuit for natural gas and political pursuit of major powers in international arena. India’s natural gas growth in Africa’s energy trade is staggering, but for China, the number is very small. The imports of liquefied natural gas from Africa reached 6.9 billion cubic meters, accounting for 26.8% of India's total natural gas imports. On the contrary, China's total imports of liquefied natural gas from Africa is only 1.2 billion cubic meters. This is not because China's natural gas cooperation in this region is dwarfed by India, but Asia-Pacific countries such as Australia are major resources for China's LNG. In addition, with the complement of pipeline constructions, Central Asian countries have become the main source of China. In contrast, due to the terrible relations with Pakistan, pipeline constructions is only a vision that is difficult to implement. Therefore, India has to turn its eyes to Africa to fill in the demand gap. This conversion, however, leads to mounting cost on energy.



Source: BP Statistical Review of World Energy 2018, p.34.

The pursuit of major power is another driving force in this regard. This goal is deeply rooted in the mentality

of Indian people when they were free from the British colonialism. In addition, the world today has undergone earth-shaking changes. The main purpose of the United Nations at the beginning of its establishment was to prevent war. The challenges at present have been replaced by non-traditional security issues such as terrorism, climate change and transnational crimes. Institutional overlap, inefficiency and corruption are also on the list of The United Nations reform.

The reform of UN Security Council holds the key of India's resolve. India once won its international clout at the Bandung Conference and the Non-Aligned Movement in last century. However, because the comprehensive national strength is far lower than the world's major powers, the resolve to push forward reform is in vain. Since the 1990s, economic reforms have enabled India's overall national strength to increase rapidly. In 1992, India's appeal for equal representation and increased membership of the Council was adopted by the UN General Assembly. At the 1994 UN General Assembly, India proposed to become a permanent member of the Security Council. In September 2004, India, Japan, Brazil and Germany issued a joint statement to support candidacy for each other. However, the United Nations reform proposed by India in 2005 ended in failure as it failed to receive the support of the African Union, nor did it obtain a majority of the votes of 2/3 of the UN members.

India learned an important lesson from this failure. If India wants to win a permanent seat in the UN Security Council, the proposal must be publicly received by African countries as Africa has 54 votes in the United Nations. In addition, as one of the sponsors of South-South cooperation, India has to promoted reform for the developing countries. With the increasing strength of economy and politics, it has a strong resolve to play an important role in this continent. However, the acquisition of political interests is often achieved by economic means. By increasing investment in energy imports and increasing assistance in African countries, India can continuously strengthen economic ties with Africa, thereby exerting its international influence in Africa.

3.2 Strengths

China and India have certain advantages in energy cooperation with Africa. Relations over the past century play an important role in the energy cooperation for both countries. The difference is that India has a large number of immigrants in Africa, which deepen the emotions and cognition of both sides. In addition, India enjoys a favorable international environment. Geopolitical advantages also results in better energy transport for India. In contrast, China's enormous economic power makes energy projects and commitments with Africa become a reality. China enjoys great advantages in foreign direct investment, infrastructure construction, foreign aid, governmental supports and energy industry chain.

3.2.1 Similarities in Strengths

Historically, China and India have good bilateral and multilateral relations in Africa. As early as the period of British colonialism, a large number of Indian immigrants came to Africa to exploit African resources as of the shortage of labor after many African slaves were tortured to deaths. At the end of the 19th century, Gandhi, the leader of the Indian national movement, exerted his charm and leadership in South Africa, where he worked and fought against racism for 21 years. Gandhi's endeavors to overthrow the South African colonial government left deep impression on the South African people.

After independence of India, when Nehru, the first prime minister and foreign minister, visited Africa in 1962, he said that India and Africa have special feelings and common pursuits. The relationship between Asia and Africa is equivalent to that of sisters. Upon its independence, India quickly established diplomatic relations with Egypt and Ethiopia, two of four sovereign countries in Africa at that times. India also used its special relationship among members of the Commonwealth to tighten its ties with other African countries. Great efforts were made to support the independence movements of these countries to shake off the colonialism. In particular, during the Nehru administration period, India, as a Non-Aligned Pioneer, projected its presence on the international stage and was publicly received by African countries in the mid of last century which recorded the best period in the history of India-Africa relations.

Africa almost faded out of India's vision as it converted its diplomacy to North America, Europe, East Asia and Southeast Asian countries after the end of the Cold War. However, as India pushed forward the

liberalization reform and integration of economic globalization, Africa, a resource-rich and market-wide continent, was put on the list of its agenda. At the same time, due to the lack of support from African countries, India strives to shake off the setbacks in the issue of the UNSC and tightens its relations with Africa.

Since the inception of new century, India has been actively practiced its role and contributed to the maintenance of security and peace in Africa by supporting various UN peacekeeping operations in Africa. The peacekeeping operation of Indian peacekeepers has been well received by the African people as they are diligent and responsible. Furthermore, India copies Chinese model for the African Summit. As the top summit involving Indian and African leader, 2015 witnessed the participation of more than 40 heads of states in the third Summit. India wishes to size the opportunity to deepen its relations with Africa.

China has been enjoying profound relations with Africa through the history. Zheng He, a famous navigator of the Ming Dynasty, went to the Western Pacific seven times, and visited the coastal areas of East Africa for three times. In contemporary history, China-Africa relations can be divided into three stages. The time from 1949 to the 1970s was the first phase of China-Africa relations after establishment of China. During the Bandung Conference in 1955, Chinese Premier Zhou Enlai met a number of African leaders and promoted China-Africa relations to a new height. In 1956, Egypt was the first African country to establish diplomatic relations with China. 1960 witnessed the first visit of African head of state by Guinean President Dürr. Chinese Premier Zhou visited the African countries three times in the 1960s, and the visit to 10 African countries from December 1963 to February 1964 pushed the relations to a new height. The latter visit, on the other hand, marked the new chapter of China's foreign assistance to Africa. In practical sense, China offered substantial material assistance to African countries and built TAZARA railway[117] and port of Mauritania during this period. The relations culminated at the 26th UN General Assembly in 1971 when China received strong support from African countries for the restoration of China's seat in the UN. Of 76 votes that supported China, China received 26 votes from Africa.

Second, 1980s marked a shift from political relations to economic cooperation. Economic relations played an important role in this period as both Africa and China striven to thrive economy and social prosperity. The

[117] The length of the TAZARA railway is 1,860 kilometers. In order to build the grand project, China has shipped nearly 1 million tons of equipment and materials, and has dispatched nearly 50,000 engineering and technical personnel. More than 100,000 people got involved in the construction of this railway. The construction lasted from 1970 to 1976 and cost 455 million US dollars. The geological conditions in the area are so complicated that more than 100 Chinese personnel died in the construction.

third stage in the 21st century is characterized by China's emerging international influence and foreign investment in Africa. China's bilateral trade with Africa reached US$115 billion in 2011, more than two-and-a-half times than that of India's US$45 billion.[118] Chinese investment potentially provides an alternative for African leaders, while providing long-term potential for the development of African economies.[119] On the other hand, after the Iraq war and the war in Afghanistan, African countries became much more interested in China rather than the US and European. China's economic miracle has been making it much appealing to African countries as they are scrambling to learn from China. China-Africa Forum marks China's increasing influence in this regard.

In general, India and China has put much efforts into relations with Africa and both enjoys profound ties historically. However, China performs better in a practical sense with its foreign aid and economic cooperation. on the contrary, political pursuit plays an important in India's relation with Africa.

3.2.2 Differences in Strengths

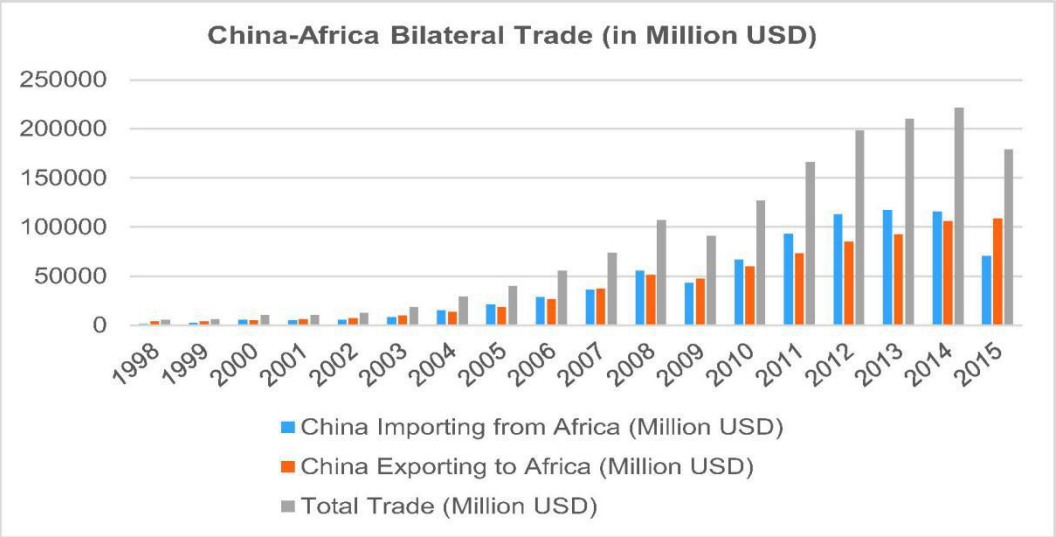
China and India also hold some differences in advantages. China is leading in foreign direct investment(FDI), infrastructure construction attached to the energy projects, financial supports and the energy industry chain. India enjoys its advantages in Indian immigration, international environment and energy transport.

3.2.2.1 Chinese Position

Biggeri and Sanfilippo (2009) believe that China's activities in Africa are driven by strategic interactions such as foreign direct investment and aid.[120] In 2017, China's gross domestic product (GDP) was worth $12.23 trillion, accounting for 19.74% of the world economy.[121] In recent years, due to the continuous expansion of economic volume and rising consumption demand, China needs to expand its external market. The Sino-US relations and the increasing uncertainty in traditional markets, for another, pull up the strategic position of African market. In 2015, China-Africa trade totaled approximately US$179 billion. The increasing demand for natural resources for China's domestic market is so strong that China's imports from

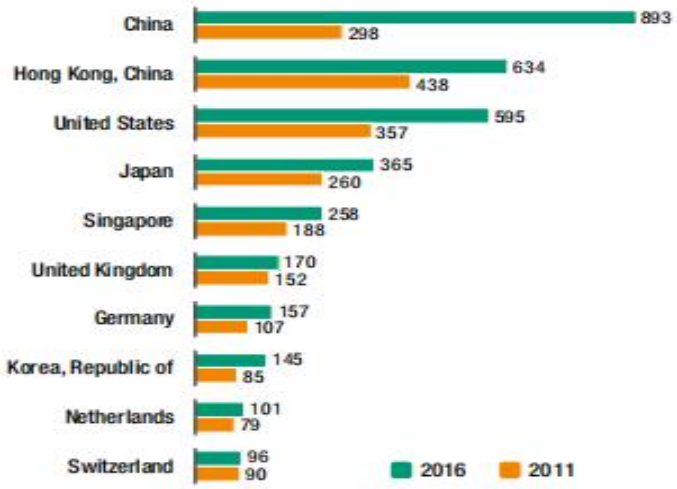
[118] Dhiraj Nayyar, 2011. Manmohan Keeps Investment on Top for Indo-Africa Summit, India Today, https://www.indiatoday.in/magazine/nation/story/20110523-manmohan-to-attend-india-africa-forum-summit-on-may-20-746071-2011-05-14
[119] Horace Campbell, 2008. China in Africa: Challenging US Global Hegemony, Third World Quarterly, Vol. 29, No. 1, pp. 89–105.
[120] Mario Biggeri and Marco Sanfilippo, 2009. Understanding China's Move into Africa: An Empirical Analysis, *Journal of Chinese Economic and Business Studies*, Vol.7, No.1, pp.31-54.
[121] World Bank, https://data.worldbank.org/country/china?view=chart

Africa have exceeded its exports in recent years.



Source: National Bureau of Statistics of China.

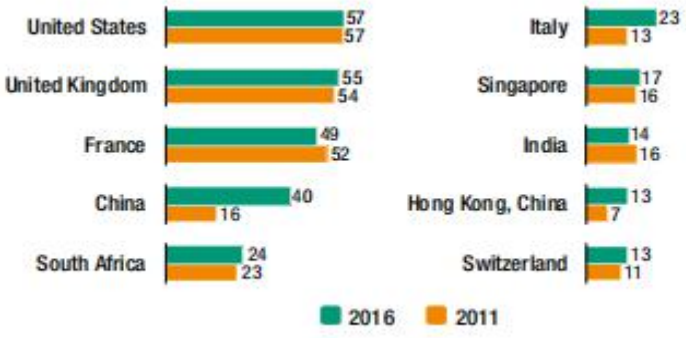
China's total foreign direct investment rose from 29.8 billion U.S. dollars in 2011 to 893 billion U.S. dollars in 2016, ranking first in the world. India fails to be enlisted on the top ten ranking. China's foreign direct investment stock in Africa increased from $16 billion in 2011 to $40 billion in 2016, ranking fourth in the world, next to the United States, the United Kingdom and France. This figure accounted for 4.5% of China's total foreign direct investment. On the contrary, India's foreign direct investment in Africa stood at 14 billion US dollars in 2016, lower than the figure that stood at 16 billion in 2011.[122]



Top 10 Investor Economies by FDI Stock, 2011 and 2016 (Billions of dollars)

Source: UNCTAD.

[122] UNCTAD, 2018. World Investment Report, https://unctad.org/en/PublicationsLibrary/wir2018_en.pdf



Top 10 Investor Economies by FDI Stock in Africa, 2011 and 2016 (Billions of dollars)

Source: UNCTAD

Compared with the European countries and America, China has become the fastest growing country for investment Africa. In 2010-2014, the average annual growth rate of China's investment in Africa reached 25%, while the growth rate of Western countries was only about 10%. Construction, mining and manufacturing investment grew at an average annual rate of more than 10%, making it the fastest growing industry for China-Africa cooperation.[123]

China's investment in Africa becomes more diversified and the dependency for energy-oriented countries has been decreasing over the past years. Before 2007, China's investment in Africa was mainly concentrated in resource-rich countries such as Sudan, Algeria, Nigeria, and Zambia. In 2006, the proportion of investment in these countries was 46.5%. In 2016, the figure fell to 24.4%.[124] China's investment is mainly distributed in South Africa, with the sectors including energy and minerals, auto parts manufacturing, household appliances and financial services. For oil exporters, China's investment is dominated by oil industry mergers and acquisitions. Since 2004, Chinese companies have acquired some of the oil business of Total and Shell in Africa. With the expansion of the investment, the cooperation in energy-rich countries has expanded from oil exploration to automotive equipment, household appliances, textiles and clothing. For the less developed African countries, Chinese investment is dominated by manufacturing. Chinese investment offers the most important external capital for economic development. In countries such as Chad, Democratic Republic of Congo, Ethiopia and Sudan, Chinese investment accounts for more than 70% of its foreign investment.[125]

[123] UNCTAD, 2018. World Investment Report. https://unctad.org/en/PublicationsLibrary/wir2018_en.pdf

[124] Liu Chen and Ge Shunqi, 2018. Chinese Enterprises Investing in Africa: Economic Growth and Structural Transformation(中国企业对非洲投资：经济增长与结构变革). *International Economic Review,* pp.9-31.

[125] UNCTAD, 2018. World Investment Report, https://unctad.org/en/PublicationsLibrary/wir2018_en.pdf

In terms of foreign aid, China's advantage is far greater than that of India. According to the AidData database, China provided approximately $31.5 billion in development assistance to Africa between 2000 and 2013, at approximately $2.25 billion annually.[126] China's foreign aid takes many forms, including technical cooperation, human resource development, medical assistance, humanitarian assistance, volunteer programs, debt relief and financial assistance. It must be pointed out that infrastructure construction is one of the most prominent feature of China's foreign aid in Africa. China has played a big role in improving African infrastructures which have smashed by war and confrontation. African countries are also struggling to receive founds because of unfavorable investment environment. Development assistance, however, can not only re-thrive infrastructures, but also attract more foreign direct investment in exchange for energy exploitation. Many infrastructure projects in African countries are parts of energy cooperation with China which is called "Infrastructure-for-Resources".[127] China and India share similarities in this respect, and they are granted energy mining. According to Yan Dong and Cijun Fan, China succeeded in launching 913 assistance projects in 50 African countries between 2002 and 2013. China's development assistance mainly flows to infrastructure construction.[128]

Infrastructure construction bring enormous benefits to Chinese companies. In recent years, China's steel and machinery equipment companies are faced with overcapacity and are looking for overseas markets. On the other hand, these companies hold many advantages over technology and management. This end could be realized with the support of Chinese government who offers infrastructure constructions in overseas market through energy exchange cooperation. From the perspective of China's foreign policy, this is part of China's "going out" strategy. It aims to encourage and support companies with comparative advantages to invest overseas. The Chinese government introduces a series of practical measures for private investment in Africa, including special tax incentives, credit and loans, and a favorable import and export regulations. However, it has been criticized by many countries as state capitalism and mercantilism. In Paulo Reis Mourao's view, this model is also summarized as governmental efficiency.[129]

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[126] Bradley C. Parks, Mike Tierney, Axel Dreher, Andreas Fuchs and Austin Strange, 2015. Chinese Aid to Africa: Be Careful Comparing Apples and Dragon Fruits, https://www.aiddata.org/blog/chinese-aid-to-africa-be-careful-comparing-apples-and-dragon-fruits

[127] Ana Cristina Alves, 2013. China's Win-Win Cooperation: Unpacking the Impact of Infrastructure-for-Resources Deals in Africa, *South African Journal of International Affairs*, Vol. 20, No. 2, pp..207-226.

[128] Yan Dong and Cijun Fan, 2017. The Effects of China's Aid and Trade on its ODI in African Countries, *Emerging Markets Review*, 33, pp.1-18.

[129] Paulo Reis Mourao, 2018. What is China Seeking from Africa? An Analysis of the Economic and Political Determinants of Chinese Outward Foreign Direct Investment based on Stochastic Frontier Models, *China Economic Review*, 48, pp.258-268.

The energy cooperation between China and Angola is based on Infrastructure-for-Resources. The Export-Import Bank of China provided a large amount of loans to Angola and encouraged Chinese construction companies into the African market. In return, Angola payed its debt with income from Energy cooperation. In addition, Mozambique, with abundant natural resources and a relatively stable political environment, has become one of the most appealing targets for Chinese companies in Africa. Since 2008, China has become Mozambique's second largest investor and the third largest trading partner. Mozambique boasts its exportation to China such as minerals while China offers infrastructure constructions of schools and hospitals. Debt cancellation of 22 billion US dollars and scholarships for training or learning in China are also included in these deals. The Chinese ambassador to Mozambique said that the number stands at 26 for construction projects, 17 for loans and 1100 for training personnel.[130]

Finally, great achievement has been made in energy industry chain. Chinese energy companies that enlarge cooperation with African countries are late comer, but they has developed rapidly over the past decades. The past 20 years his witnessed an emerging presence of China's oil and gas companies throughout Africa and China has become Africa's most important oil and gas partners. In 1995, CNPC (China National Petroleum Corporation) opened its new chapter as its projects in Sudan marked the coming of Chinese oil and gas companies. By the year 2005, CNPC and Sinopec have been engaged in various oil and gas cooperation in exploration, investment and infrastructure construction in Sudan, Chad, Niger and Algeria. From 2005 to 2010, breakthrough was made by Sinopec, CNOOC (China National Offshore Oil Corporation) and CNPC (China National Petroleum Corporation). At the end of September 2013, CNOOC acquired Uganda oil and gas assets, of which the crude oil reserves in the Kingfisher area reached 635 million barrels.

Chinese oil and gas companies have invested about 80 billion US dollars in Africa, forming three major oil project clusters in North Africa, West Africa and East Africa. CNPC's investment amounted to about 40 billion US dollars, Sinopec 25 billion US dollars, CNOOC and private oil and gas companies about 15 US billion.[131] Chinese investment in Africa not only resulted in a huge productivity, but also empowered African countries such as Sudan, South Sudan, Niger and Chad an energy industry system, which ended the humiliating history of energy imports and contributed to African industrialization.

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[130] Fox News, 2014. Trade between China and Mozambique nears $3 billion this year, up from 2013, https://www.foxnews.com/world/trade-between-china-and-mozambique-nears-3-billion-this-year-up-from-2013

[131] Wang Hongyi, 2018.Natural Gas Opens New Chapter for China-Africa Energy Cooperation(天然气引领中非能源合作方向), *Status and Trends*, p.24.

The cooperation with Sudan is an important case for discussion. By the end of 2003, CNPC had invested a total of 2.7 billion U.S. dollars in Sudan, built 1506 kilometers of oil pipelines, and built refinery and chemical projects with an annual production capacity of 2.5 million tons of crude oil. With the help of CNPC, Sudan underwent a shift from a crude oil importer to an exporter and boasted a set of modern petroleum industry covering exploration, production, refining, transportation and sales. In addition, the company has provided tens of millions of dollars in funding to Sudan's education, agriculture, health care and other fields. Large amount of aids were also provided to help Sudan build hospitals, schools, roads, bridges and wells. The energy cooperation with Sudan has benefited as many as 1.5 million people. Having scored great success in Sudan and Angola[132], another partner of Chinese companies' business, Chinese companies are applying their experience to the projects in Kenya, Tanzania and other countries.

3.2.2.2 Indian Position

First, Africa is home to a large number of overseas Indians. As discussed above, Indians went to work in Africa in British colonial era and after its independence. According to statistics from the Indian Ministry of External Affairs in 2018, India has 30.9 million overseas Indians in total, including 13.1 million overseas Indians (NRIs) and 17.8 million Persons of Indian Origin (PIOs). Of this large number of overseas Indians, 3 million Indians are living in 35 African countries. South Africa alone is home to 1.56 million Indians in 2018, accounting for 2.8% of the total population. In Mauritius, there are as many as 894 thousand overseas Indians, accounting for 65% of the total population.[133] Cassam Uteem, former Mauritius president, expressed his strong feeling about India when he described his visit to the land of his ancestors in 1996.[134] Indian PM Narendra Modi hails continental ties with Africa. Talking about the historic ties between India and Africa, "it is said that thousands of years ago, this (India and Africa) was a single land mass. Later, due to the Indian Ocean, it split into two… There are a lot of similarities between us…Around 27 lakh(ten thousand)[135] Indians have been living in Africa for a long time."[136]

These immigrants play an important role in Africa politically, economically and culturally. Narendra Patel was elected the first Speaker of Ugandan Parliament. Anwar Nath Maini became the President of the East

[132] The business in Sudan and Angola witnessed great success between two sides. But the projects in these two countries hold large difference with each other. The loans from the State banks paves the way for projects with Sudan whereas the projects with Angola is based on the infrastructure reconstruction in exchange for oil.
[133] Ministry of External Affairs,2018. Population of Overseas Indians, http://mea.gov.in/images/attach/NRIs-and-PIOs_1.pdf
[134] Indian Council of World Affairs, 2001. Report of the High Level Committee on the Indian Diaspora, p.52.
[135] The total number of overseas Indians stood at 2.7 million in 2015.
[136] The Indian Express, 2015. On India-Africa Summit Eve, PM Narendra Modi Hails Continental Ties with Africa, https://indianexpress.com/article/india/india-news-india/india-africa-summit-is-first-event-of-such-big-scale-pm-narendra-modi/

African Community Joint Parliament. Most of economic and manufacturing sectors of Kenya, Uganda and Tanzania's Tanganyika region are concentrated on Madhvani and Mehta families.[137] At least one Indian immigrant takes his seat in Parliament in Kenya. The largest retailer in Kenya is also an Indian immigrant, and so as the vast majority of the Kenyan middle class.[138] The percentage of 30% to 35% of Kenya's economy is concentrated on overseas Indians.[139]

Africa also treats Indian immigrants as an important factor in cooperation with India. Uganda, for example, has appointed Indian immigrant Nimisha Madhvani as the High Commissioner in India.[140] When former South African President Zuma visited India for the first time in 2010, the majority of the 200-member delegation are overseas Indian.[141] Therefore, the large number of Indians in Africa is conducive to the relations between two sides.

Second, the international environment is more favorable. After the end of the Cold War, India's foreign policy strove for pragmatism and friendly relations with all countries on the premise of safeguarding national interests. Coupled with the increasing economic strength and nuclear programs, India is in a relatively favorable position in the relations between major powers. In the 21st century, relations with India plays an important role in the US strategy. The United States is increasingly worried about the rise of China and its replacement of global power. The United States endeavors to pull India into the same boat in the pursuit of containing China. As Kashish Parpiani(2018) puts it, American government cultivate India as a balancer whilst condemning China's "aspirations" in order to contain it.[142] Therefore, the United States will not impose a threat to the rise of India and even its presence in Africa. This is the same case for the relations with the EU and Japan as their strategic partnership characterizes common values. Therefore, Western countries generally have a moderate attitude toward India's efforts to expand its influence in Africa. For Western countries, India's emergence in Africa not only expands the influence of westernized democracy, but also balances China's influence in Africa.

Finally, India enjoys a relatively safer energy supply in terms of transport. India's energy imports consist of East, West and North part. The west one serves as transport line of India's oil and gas import from Africa and

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[137] Phillip O. Nyinguro, 2014. *India and Africa: Enhancing Mutual Engagement*, New Delhi: Pentagon Press, p.137.
[138] P. 138.
[139] Maria Nzomo, 2014. Foreign Policy and Diplomacy in India-East African Relations, *Insight on Africa*, Vol.6, No.2, p.103.
[140] Sanjukta Banerji Bhattacharya, 2014. *India and Africa: Enhancing Mutual Engagement*, New Delhi: Pentagon Press, p.155.
[141] Ajay Kumar Dubey, 2015. India and Africa's Partnership: A Vision for a New Future, New Delhi: Springer Pvt. Ltd, p.134.
[142] Kashish Parpiani, 2018. China, India, and American Manichaeism, https://www.orfonline.org/research/china-india-and-american-manichaeism/

enables India to increase its strategic deployment in the Western Indian Ocean, especially the Gulf of Aden as it is the gateway from the Indian Ocean to the Red Sea. This is also an important sea route for oil transportation from the Middle East to India. This makes it the most important energy channel of India. In order to maintain energy supply, India has dispatched warships to escort oil tankers and merchant ships, and deployed warships exclusively in the Gulf of Aden. In addition, because India has a good international environment, it has not been seen as a thorn in this region. As the United States has much common interest in Africa, India is tightening its military cooperation with the United States to maintain its dominance in this waters. The Indo-Pacific strategy advocated by Trump administration has increasingly drawn up India's military cooperation in the Indian Ocean, which in turn has contributed to stronger India's control of the Indian Ocean.

3.3 Differences in Weaknesses

China and India also have certain disadvantages in energy cooperation with Africa. China suffers from unsafe energy transport and international criticism. In contrast, it is difficult for India to bring its promises into realities because of limitation in investment, foreign aid and management efficiency.

3.3.1 Chinese Position

First, China suffers from unsafe energy transport. Most of energy imports from Africa to China flow through the Indian Ocean, where India is increasingly strengthening its maritime military presence. India has always regarded the Indian Ocean as one of important spheres of influence. In recent years, China gets involved in the escort mission of the United Nations in Gulf of Aden where is infested with pirates. More importantly, China's surging energy imports raised great concern because China depends on a choke-point, the Strait of Malacca, with roughly 77% of its oil imports flowing through the Strait.[143] The importance of controlling the Strait of Malacca to is self-evident. However, China does not exert much influence here as it has always been under control of America. China Youth Daily, one leading Chinese newspaper, comments that it is no exaggeration to say that whoever controls the Straits of Malacca has a stranglehold on the energy route of China. Although China has been improving its naval power in recent years, the aircraft carrier, for example, American naval presence in this waters remains a threat to China.

[143] Zhang Zhongxiang, 2011. China's Energy Security, the Malacca Dilemma and Responses, *Energy Policy*, 39, pp.7612-7615.

As far as the Indian Ocean is concerned, the stability of the South Asian subcontinent holds the key to the safety of the Indian Ocean. However, the tension between India and Pakistan has been lasting for more than half a century, and there are no signs of a fundamental solution in the foreseeable future. Every time when war or military confrontation break out in this sub-continent, the transport through the Indian Ocean is greatly threatened.

The 2016 South China Sea arbitration saw the tension between China and America in the Pacific. At present, a new round of geopolitical competition is setting off in the Indian Ocean as the United States is pushing forward the Indo-Pacific Strategy, a hard-won strategic opportunity for India to balance China's influence in the region. However, we must see the fact that the Djibouti and Guadal Port, two important strategic points of the Belt and Road Initiative, will help China buffer the geopolitical threat from US and India. In addition, China has been keen to invest in Central Asian and Russian oil and natural gas field development projects and in the construction of pipelines in order to shake off the plight of the Straits of Malacca. Therefore, the energy route of the Chinese Straits of Malacca and Indian Ocean is constantly improving.

In addition, China has always been criticized by the outside world. These views are mainly divided into three categories. First, China is suffering from accusation of new colonialism in pursuit of African resources. In Carmel Davis's view, it is better to say that China promotes a "new colonialism" policy in Africa, rather than provides China with a new development model for Africa. China's investments concerns mining and infrastructure projects which are capital-intensive do not create a large number of jobs. In addition, the energy projects will bring huge damages to the environment and the lives of local people.[144] The growing presence of China in the continent also gives leverages to a few African countries in their negotiations with the EU.[145]

Second, non-interference is always criticized by outside world as irresponsibility. Non-interference is an important practice of China's foreign policy. As early as the 1950s, it became one of the basic principles of the Five Principles of Peaceful Coexistence and has been practiced in the voice of criticism. This principle was appealing in the Bandung Conference and greatly promoted South-South cooperation. In recent years, as China has been improving it comprehensive national strength and global influence, western governments have repeatedly called on China to be a responsible countries in terms of international affairs.

[144] Carmel Davis, 2009. Africom's Relationship to Oil, Terrorism and China, *Orbis*, Vol. 53, No. 1, pp. 132－133.
[145] Maurizio Carbone, 2011. The European Union and China's Rise in Africa: Competing Visions, External Coherence and Trilateral Cooperation, *Journal of Contemporary African Studies,* Vol. 29, No.2, pp. 203-221.

Non-interference in internal affairs is reflected in the documents signed with African countries. Articles such as the political system and human rights, the premise of cooperation between western countries and African countries, are excluded in the China-Africa agreements. In essence, this is because the Western world is constantly trying to promote the reform of democracy, human rights and political systems in the African countries through economic cooperation. Sven Grimm holds that non-interference is presented as a key principle for the official discourse on China–Africa relations and can be regarded as one of the strong selling points to African elites.[146]

The Darfur issue in Sudan, for example, led to a strong sanctions imposed on the Sudanese government in the name of violation of human rights and even genocide. Human rights NGOs are constantly calling Chinese government for sanctions against the Sudanese government in line with the US. China's energy cooperation was criticized as indifference and a gesture of staying from the West. The Chinese government fell to victim on this issue as it suffered overwhelming criticism and potential disruption of energy in Sudan. China's claim is to respect Sudan's territorial sovereignty and not to interfere in internal affairs. Special envoys were sent to mediate with the Sudanese government and rebel leader. The peaceful solution of UN proved that negotiations is the only way out for the Sudan issue, and sanctions will only be counterproductive. It is China that has helped Sudan establish energy industry and became an energy exporter is trustworthy for Sudanese government. In retrospection, will Sudan choose to trust the West whose colossal capitals are withdrawn in the name of no-benefit?

Third, many voices hold that the emerging investment in energy sectors in Africa disrupts the international energy market. Ian Bremmer, the CEO of the Eurasian Group in the United States, believes that the state capitalism of Chinese government results in support and intervention in the business of its State-owned oil companies and runs against an energy market based on transparency. Chinese companies' acquisitions will lead to an increasing prices of oil and gas. In the long term, this practice will result in decreasing benefits of other oil companies and hinder long-term project investments in deep-sea oil exploration and mining.[147]

[146] Sven Grimm, 2014. China-Africa Cooperation: Promises, Practice and Prospects, *Journal of Contemporary China*, Vol. 23, No.90, pp. 993–1011.
[147] Ian Bremmer, 2009. State Capitalism Comes of Age- The End of Free Market, *Foreign Affairs*, pp. 40-55.

3.3.2 Indian Position

Certain achievements are made by India in African investment. The main driver of investment is private enterprises which enjoy a 60% higher return than the investments in other regions.[148] Most of investments of private companies flow to Greenfield Investments or Joint Ventures. In contrast, most of Chines companies in Africa are state-owned enterprises. Indian investments cover agriculture, manufacturing, mineral sector, services and cultural education. In the agricultural sector, India actively spreads Green Revolution, namely its agricultural experience in Africa through personnel training. The energy industry, manufacturing and pharmaceutical industry play an important in industrial investment, which accounted for 27.15% of India's total foreign investment from 2013 to 2015.[149] Education industry is an important service sector for India. India has invested in the Pan African Enetwork, which it can share African students educational resources of Indian universities.

However, India-Africa economic and trade cooperation is limited. China's trade with Africa reached 200 billion U.S. dollars in 2014, while India's trade with Africa was only 70 billion U.S. dollars.[150] According to the statistics of the United Nations Trade and Development Organization (UNCTAD), India's foreign direct investment stock in Africa is only $14 billion, ranking eighth in 2018. In contrast, China's stock reached to $40 billion. India's greenfield investment in African was US$1.12 billion in 2014, while the number for China and the United States reached US$6.13 billion and US$8.03 billion respectively.[151] India's assistance to Africa has been considerable over the decades but has been made in piecemeal ways that have denied it the same impact as China's growing interests in recent times.[152]

In addition, India puts its investment in one basket. In 2015, India's investment in Mauritius was 2.648 billion U.S. dollars, accounting for 9.88% of Indian total investment. India's investment in Mozambique totaled 2.738 billion U.S. dollars, accounting for 10.21% of the total.[153] The investment in countries with regional influence such as Nigeria, Ethiopia and South Africa are limited in few sectors. India boasts its comparative advantages in IT and communications industries, but these are not complementary sectors for

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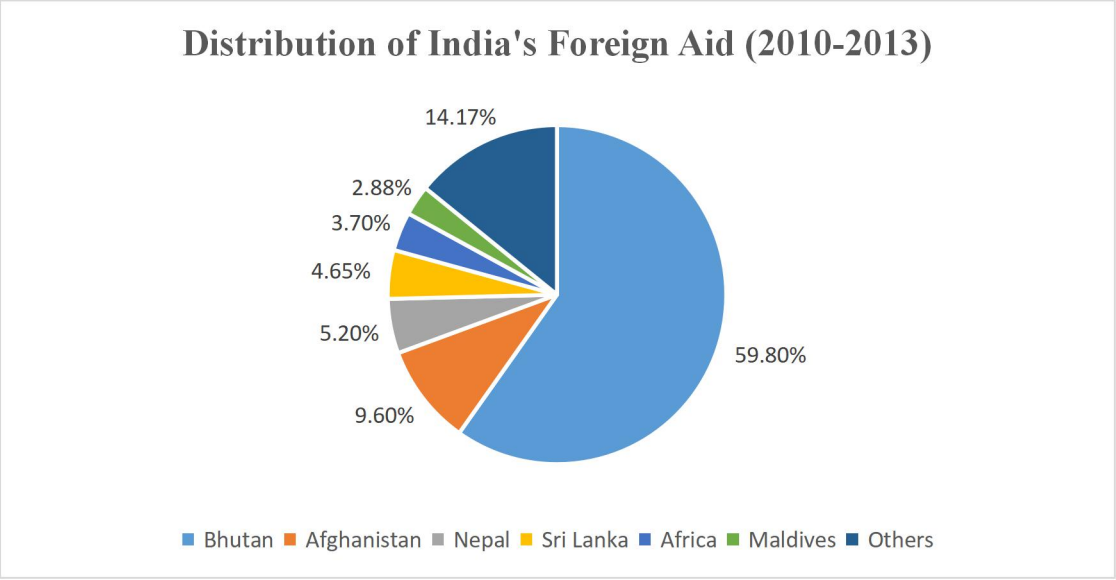
[148] Li Anshan, 2013. Analysis and Outlook of African Economy(非洲经济形势分析与展望), in *Analysis and Outlook* of International Economy 2012-2013(国际经济分析与展望 2012-2013), Beijing: Social Sciences Academic Press, p.86.
[149] Ministry of Finance of India, Overseas Direct Investment data for April, 2013 to January, 2016, p.4.
[150] Saif Mohd. Khana and Karan Arora, 2017.Scope of India's and China's Investment in African Continent, *Procedia Computer Science*, 122, p.692.
[151] UNCTAD,2019. World Investment Report 2018. p.38.
[152] James Lamont, 2010. China Makes Foray into Mauritius, https://www.ft.com/content/492e0c72-095c-11df-ba88-00144feabdc0
[153] Hu Yang and Wang Tao, 2016. An Analysis of India's Investment in Africa(试析印度对非洲的投资). *South Asian Studies Quarterly,* 2, p.62.

Africa. Due to the backwardness of education, it is difficult for Africa to bridge the gap in technology and talent in the short term. India's scientific and technological cooperation with African countries is most characterized by technology transfer. However, agricultural development and infrastructure construction are top priorities for African people. Therefore, India should think twice what Africa needs.

In terms of foreign aid, India provided $50 million in aid to Africa in 2010, while China's generosity reached $1.4 billion.[154] The amount of donations is also limited. From 2000 to 2013, India's contribution increased from US$1 million to US$67 million, but it only accounts for 4% of the annual budget.[155] Financial constraint restricts infrastructure construction of Indian aid. The foreign aid is mainly conducted by state-owned enterprises and covers hospitals, railways, universities, the training for governmental officials, etc. Second, although India offers assistance programs in many countries, its aid allocations are still concentrated in South Asian countries. The aid to Sri Lanka, Bhutan and Nepal alone accounts for 69.7% of India's foreign aid from 2010-2013, while Africa accounts for only 3.70%. India has no choice but to put most of efforts in South Asia rather than Africa and other regions as it pursues its hegemony in South Asia.



Sources: Compiled by the Indian Development Cooperation Research at the Centre for Policy Research, New Delhi, based on Government of India Budget, Grants & Loans to Foreign Governments, Statement 11 of the Expenditure Budget, Ministry of External Affairs Government of India.

From the perspective of bureau management, India is in a state of mismanagement in foreign aid. Ministry of External Affairs (MEA) is the central agency for development assistance and offers 85% of India's aid

[154] Elling N. Tjønneland, 2013. Providing Development Aid to Africa: Comparing South Africa with China, India and Brazil, *SAFPI Policy Brief*, p.3.
[155] Taraporevala, P. and Mullen R., 2013. *India-Africa Brief: Courting Africa through Economic Diplomacy*, New Delhi: Centre for Policy Research.

around the world. The Indian Technical and Economic Cooperation (ITEC) and the Indian Council of Culture Relations (ICCR) are subsidiary sectors of MEA. The budget of ITEC mainly flows to training, whereas exchange programs to promote cultural exchanges between India and foreign countries dominate the budgets of ICCR. Until 2012, the Ministry of Foreign Affairs set up an official aid agency, the Development Partnership Administration (DPA). But this caused more overlap and dilution among these sectors.

This is behind the result of India's domestic economic strength. Given India's fiscal position and poverty, aid operations will mean the transfer of resources. In India, 21.9% of the population lives below the national poverty line in 2011. For every 1,000 babies born in India in 2017, 39 die before their 5th birthday.[156] If aid to African countries does not bring corresponding benefits to India, aid will not be supported by the people. In addition, it should be noted that foreign investment means capital outflows, which will have a negative impact on Indian domestic industry investment and employment opportunities. Once India's domestic economy is in trouble, or if the domestic population is not satisfied with the improvement of their living conditions, the government will reduce aid to Africa in response to domestic needs. Therefore, India's aid to Africa's development is bound to be limited by India's domestic economic situation and the feelings of the people.

India-Africa Summit marks India's increasing promise with African countries. India announced at the summit 2008 that it will provide about 5.4 billion United States Dollars in Lines of Credit to African countries and institutions over the 5-year period. Training program for up to 50 African participants (annually) at the National Institute for Training of Highway Engineers (NITHE) will be provided by India.[157] In the second summit, India promised to offer 5 billion dollars for the next three years under lines of credit to help Africa achieve its development goals," Singh said in his address to heads of states and representatives of 15 African countries. On top of the loan grants, India has also offered an additional $700 million to establish new institutions and training programs in Africa and $300 million support for the new Ethiopia-Djibouti railway line project.[158] In the Third India-Africa Summit 2015, India promised to offer a grant assistance of 600 million U.S. dollars. This will include an India-Africa Development Fund of 100 million U.S. dollars

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[156] Asian Development Bank, 219. Poverty in India, https://www.adb.org/countries/india/poverty

[157] Africa-India Framework for Enhanced Cooperation,2008. https://link.springer.com/content/pdf/bbm%3A978-81-322-2619-2%2F1.pdf

[158] India grant $5 billion in aid and promise to build new institutions in Africa, http://sudantribune.com/spip.php?iframe&page=imprimable&id_article=39008

and an India-Africa Health Fund of 10 million U.S. dollars.[159] It remained a question for India to bring its promise into reality and improve its image in Africa.

India has always been criticized for its efficiency. In the rankings of countries apart from the war areas such as Syria and Iraq, India ranks lowest on the list of more than 100 countries. Indian multinational oil companies have also suffered a lot in this regard. State-owned companies hold a dominant position in India. Private companies are weak and cannot compete with Indian state-owned energy companies. But the autonomy of state-owned companies in India is relatively poor, and it is vulnerable to bureaucracy, especially for foreign investment. Although the Indian government has gradually released its control over state-owned companies and lowered its role in decision-making, their business must be decided by the government. The lack of independent decision-making and the slow approval for projects often make Indian companies miss the opportunity to conduct projects overseas.

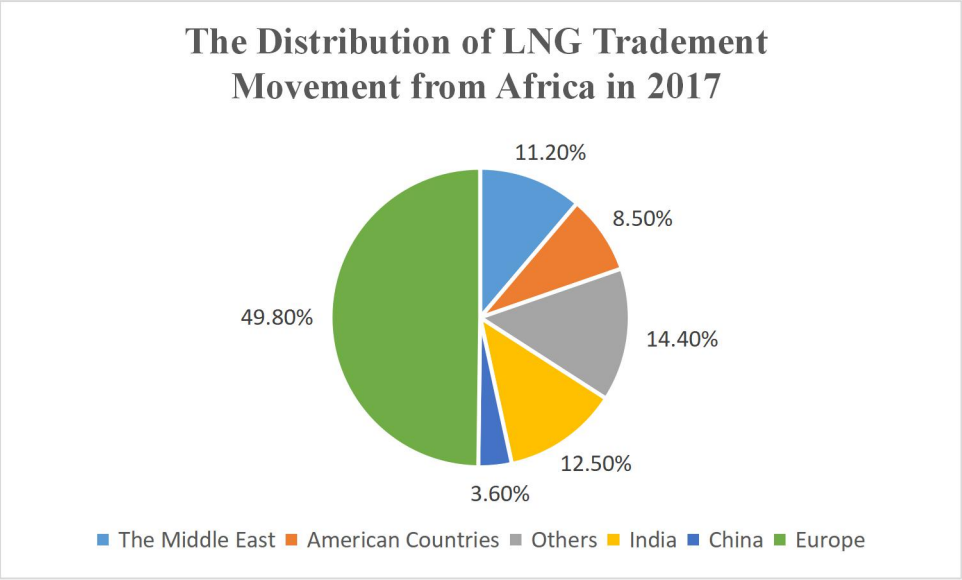
Most of Chinese and Indian energy companies running business in Africa are state-owned enterprises. The institutional constraints from the government saps the efficiency of decision-making and management. Cooperation with Sudan and Angola, for example, begin with the governmental agreements. The implementation become flexible and efficient when energy companies and infrastructure companies are given much autonomy. In contrast, India suffers from terrible bureau sectors as their functions are overlapped and there is no central agency in charge of energy issues. In this regard, Indian companies lose the game.

Finally, India is struggling to expand its projects of the middle and downstream industry. The energy industry includes upstream, midstream and downstream sections. Th upstream industry covers exploration, mining, infrastructure construction, technology research and development, and personnel training. The middle and downstream industries include transportation, refinery, petrochemical production and sales. The ratio of benefits that upper, middle and downstream section contribute to the economy is 1:5:10. This figure shows the importance of the energy industry in the middle and downstream reaches. Compared with China, Europe and the United States, the Indian government fails to invest in midstream and downstream projects such as pipelines, refineries and export terminals. The failure to expand its industry result from the lack of technologies and investments.

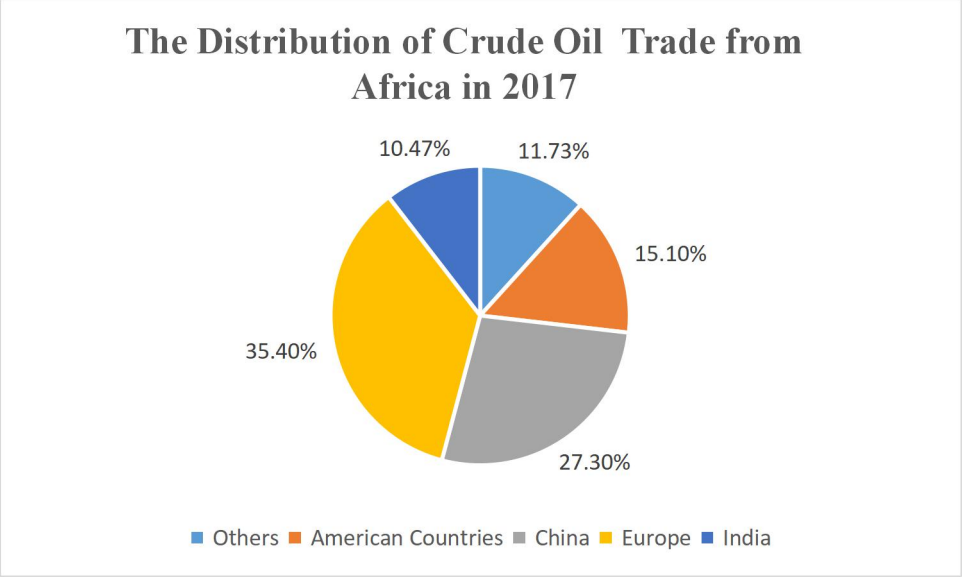
[159] Ministry of External Affairs,2015. Speech by Prime Minister at the Inaugural Ceremony of the Third India-Africa Forum Summit in New Delhi,2015.https://mea.gov.in/Speeches-Statements.htm?dtl/25977/speech+by+prime+minister+at+the+inaugural+ceremony+of+the+third+india africa+forum+summit+in+new+delhi+october+29+2015

3.4 Similarities in Threats

First, China and India will face increasing competition with other countries such as the United States and Europe. With increasing fields being found in Africa, major energy importing countries have turned their eyes to Africa. Skyrocketing discoveries of oil and gas resources in East Africa after 2008 has further exacerbated resource competition. As of 2017, Africa exported 55.4 billion cubic meters of LNG, with China accounting for 3.60%, India for 12.50% and Europe for 49.80%. Of the crude oi Africa exported for 302.8 million tons in 2017, China accounted for 27.30%, India for 10.47% and Europe for 35.40%.



Source: BP Statistical Review of World Energy 2018, p.34.



Source: BP Statistical Review of World Energy 2018, p.24.

In Africa, energy companies from the United States, the United Kingdom, and France are more competitive than their counterparts from China and India. India, for example, not only lags behind in national strength, but also shifted its diplomacy to European and American countries in the pursuit of economic liberalization reforms in the 1990s. Therefore, these factors led to late-coming investment by Indian energy companies. At present, Chevron and Texaco hold a dominant position in Angola. Shell, Exxon Mobil, BP hold their dominant presences in Egypt, Nigeria and other English-speaking countries. Total is standing in the way to the Gulf of Guinea and the Maghreb region of the French-speaking African region.

Geographically speaking, Chinese and Indian investments are mainly concentrated in North Africa and West Africa where are overlapped with EU. In addition, the cooperation in natural gas is at its initial stage for China. On the contrary, EU and India have large cooperation with Africa, with the volume of 27.6 billion cubic meters and 6.9 billion cubic meters.[160] Therefore, India is faced with competition with EU in natural gas.

Apart from the US and European countries, China and India will also face competition from Japan as Japan is the world's largest importer of natural gas. In 2017, Japan imported 113.9 billion cubic meters of liquefied natural gas.[161] Although this number account for only 5.6% of Africa's total exports, it is bound to increase energy development in Africa when taking into consideration its pursuit of major power.

The western world especially the United Stated is increasingly alert at China's emerging Presence. From the United States' view, we have to admit that the game of influence in Africa is changing and so as the environment of influence competition. Africa is facing more choices, more alternatives.[162] National Security Advisor Ambassador John R. Bolton made his remark on the The Trump Administration's New Africa Strategy. In his view, great power competition with China and Russia is an important driving force for America's New Africa Strategy, as they are rapidly expanding financial and political influence across Africa. China and Russia are deliberately and aggressively targeting their investments in the region to gain a competitive advantage over the United States.[163] There is no doubt that India is facing less competition

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[160] BP Statistical Review of World Energy, 2018. p.24, p.34. https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf

[161] P.34.

[162] Deng Xianghui, 2008. The Sino- American Competition for Energy in Africa(中美非洲能源之争), Academic Exploration, No.6, pp.9-14.

[163] White House, 2018. Remarks by National Security Advisor Ambassador John R. Bolton on the The Trump Administration's New Africa Strategy, https://www.whitehouse.gov/briefings-statements/remarks-national-security-advisor-ambassador-john-r-bolton-trump-administrations-new-africa-strategy/

because of the close relations based on common values in political system and ideology with United States and Europe.

Second, Africa is home to unrest and wars. African countries are developing countries that are in a political transition and they are infested with wars and conflicts. In some countries, the domestic political situation is complicated, the energy policies lacks continuity, the legislation for foreign enterprises is changeable, and the contradictions between religion and faction are prominent. The year of 2016 and 2017 witnessed conflicts in Libya, South Sudan, Central Africa, Congo, Mali, Nigeria, and Somalia. Islamic State is also seeking Africa for its resurgence after its defeat by coalition led by America and Russia. Over the past years, terrorists group has formed sphere of influence across West Africa, North Africa and East Africa, posing a huge threat to the exploitation of natural resources. Finally, piracy in the Gulf of Aden and the Gulf of Guinea also exerts negative impact on the energy transport. In 2014, piracy in Africa accounted for 22.4% of the world's total, making it one of the most insecure areas in the world.[164]

Coupled with backward infrastructure, low administrative efficiency and serious corruption, Africa became one of the worst place for investment in the world. In 2015, the World Bank's report stated that it took an average of 257.2 days to obtain reliable electricity supply in Nigeria; 43 governmental procedures were required to approve a contract in Libya; and a company in Equatorial Guinea needed to 135 days. The investment environment of natural gas exporters Algeria, Egypt, Nigeria and Libya is so terrible that they ranked 154, 112, 170, 188 in the report respectively.[165]

At present, China National Offshore Oil Corporation (CNOOC) paid huge price in this regard. In Uganda, CNOOC was granted permit to its projects in the country as early as September 2013, but it had to build roads and pipelines due to the constraints of infrastructure. Coupled with its failure to reach agreement with Uganda government on taxation, exploitation and other issues, the production time had been put off to the end of 2018.[166]

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[164] IMB, 2014. Piracy and Armed Robbery against Ships-2014 Annual Report. London: ICC International Maritime Bureau, P.5.
[165] World Bank Group, 2015. Doing Business 2015: Going Beyond Efficiency, p.4.
http://www.doingbusiness.org/content/dam/doingBusiness/media/Annual-Reports/English/DB15-Full-Report.pdf
[166] Wang Tao, Cao Fengyu, 2005. Sino-African Natural Gas Cooperation in the Context of One Belt and One Road Strategy(一带一路视域下的中非天然气合作), *Journal of Southwest Petroleum University*, Vol.17, No.6, p.7.

Chapter IV China’s Responses to Improve Energy Security

The comparison of last chapter shows that China enjoys good relations with Africa historically. With the economic advantage over India and financial support of the Chinese government and state-owned banks, China's energy companies will not be blocked by funding problem. In addition, China has accumulated a strong technologies in Africa due to its outstanding energy cooperation with China and Angola. Comprehensive factors result in China’s much more successful energy cooperation compared with India. China’s energy projects cover the upper, middle and down reaches, while India is mainly in the upstream stage of energy exploration and mining. Although great efforts have been made by India to break through bottleneck, they are not effective due to economic and technological disadvantages. In terms of weaknesses, China's energy transport is subject to the Indian Ocean and the Straits of Malacca as the United States and India are increasingly strengthening their military presence and cooperation in these two regions. Due to misunderstandings and concerns about China's emergence, Africa echoes with the criticism of China's increasing energy cooperation. Finally, China and India face so many common challenges such as Africa's turmoil and energy competitions that cooperation is required to improve their energy security. Therefore, in order to improve China's energy security, measures should be taken in the following aspects.

4.1 Energy Supply

Poverty and backward development are the main cause for political turmoil and terrorism in Africa. The solution lies in social and economic development. Africa was thrown in European colonialism, but China, India and Africa find their common ground in this regard. During the past years, European countries regard Africa as a backyard and plunder African energy. At the same time, Europe often flaunts itself as a model of democracy and attaches a series of subsidiary conditions in projects such as human rights, democracy and political institutions. In addition, the liberalization market is so unequal that it paralyzes African internal industries.

On the contrary, China and India are the largest developing countries in the world whose economic achievements are shining in African countries. Although China does not spread its development model, African countries have strong desires to learn from China and even copy the Chinese model. In addition, both China and India regard "Non-Interference" as one of the basic principles of foreign policy. These are

the realistic strengths for China and India to strengthen relations in Africa. China and India should make full use of these and expand bilateral economic cooperation with Africa. Specially speaking, efforts can be made to expand cooperation in agriculture which play an important in African exportation. This will not only broaden the cooperation with Africa, but also increase the income of local residents and improve people's livelihood. In this regard, China implements tariff-free policies for agricultural products from African countries and established a trading market in Yiwu, a city in the east of China. Most importantly, China and India should strengthen cooperation in infrastructure construction which is a prerequisite for the development of a country. The fast development of expressways and railways in China in the past decade is a convincing case.

4.2 Energy Transport

In terms of energy transport, China and India need to strengthen cooperation in the Indian Ocean and the Straits of Malacca. For a long time, China and India have lacked mutual trust due to historical issues and it is difficult to cooperate effectively. In particular, the tension between the two countries in the Donglang region in 2016 has contributed to the deterioration of relations between the two countries. Although the incident ended with India’s retreat from the disputed areas, the relations are vulnerable to border issue in recent years. The increasing presence of the sea power of both sides is often seen as a threat to each other. Therefore, mutual trust is required for two countries to dilute the geopolitical factors in the Indian Ocean and the Straits of Malacca, especially.

India's vast majority of overseas oil transportation routes overlaps with China’s and two countries need to strengthen cooperation in the Indian Ocean and the Straits of Malacca to prevent terrorism and pirates. In terms of India’s energy transport, pipelines should be built fro India to demand its energy quest. However, these projects are blocked by the tension with Pakistan. China plays an important role in maintaining friendly relations with Pakistan, Kazakhstan, Myanmar, Bangladesh and other countries for the construction of pipelines, and obtaining Russian resources through China inland. India needs China's support in the planning and implementation of land pipelines. China should weigh the pros and cons and adopt cooperation with India in pipeline construction in exchange for its cooperation and support for the Indian Ocean security. From a practical point of view, the two sides can strengthen cooperation in combating piracy and so on, laying the foundation for a wider range of cooperation.

4.3 International Criticism

There are some reasons behind the criticisms above. The root causes for the criticism of China-Africa energy cooperation should be attributed to the Western countries. The reasons why they raise such criticisms are as following. First, differences in ideology. There are still some people in the Western countries who have not got rid of the Cold War mentality. Therefore, China is always criticized by them no matter how China performs in this continent. Second, differences in foreign diplomacy. Since the late 1980s, especially the collapse of Soviet Union, the United States and Europe have begun to promote global democracy, imposing westernized model of human rights, political system and liberal market in Africa. China has always insisted on Non-Interference, one of basic principle of foreign policies during the past 70 years. This difference has led to the criticism of irresponsibility and energy-oriented exploitation. Third, global influence ranks the top issue for the United States and EU. China's growing economic competitiveness and political influence in Africa are Western countries' concern as Africa has always been regarded as the backyard of Europe. It is inevitable that some of them will not adapt into this new comer. This criticism will persist as long as China enjoys its competitiveness and influence in Africa. In this regard, Chinese scholars play an important role in expounding the historical facts, empirical data and the reality of international politics in a bid to deepen the understanding of China-Africa relations.

Many efforts are also required to improve China's performance in Africa. First, energy bureau should be established in response to the increasing quest for energy and politicized energy issues. At present, energy cooperation falls on the shoulder of many ministries such as economic and social reform committee and commercial ministry. There is no energy bureau in charge of energy, let alone the sector in charge of energy cooperation in Africa. The overlapped management saps the efficiency. Second, companies should improve localization and salary of local workers. Some of Chinese companies hire so many Chinese that they close the door to African workers. The companies that fail to protect environment should be punished by local governments. Third, great efforts should be made to uproot the corruption of African official members. China has offered a large amount of investments attached with foreign aid during the past years. Some funds of foreign aids flow into the official members and stir up discontent. Finally, broadcast and media is conducive to understanding China. At present, these tools are mostly under control of western voices. China is faced with the dilemma between 'low-profiled' and broadcast. How to strike a balance is a challenge for Chinese companies.

4.4 Energy Competition

In the face of competition with the United States, the EU and other countries, China can cooperate with India and other national oil companies to form joint venture companies. This is not a new thing as it has been adopted by many energy companies. In the African energy market, by inviting countries like India that is suffering the common friction with other powers in Africa to form joint investments company, sharing of benefits and risk will be established. Second, this energy community optimizes complementary technologies and resource allocation. African countries do not yet have the capacity to exploit their offshore oil and gas, neither do the Chinese and Indian companies. There are still many technical bottlenecks in offshore exploration, and unconventional oil and gas exploitation. Therefore, energy community with complementary technologies can help each other break through bottlenecks.

Second, Chinese and Indian companies can cooperate through joint bidding and joint development. China and India have not had many joint bids for many years, but there are also many successful cases. In 2005, PetroChina and India Petroleum jointly acquired a 38% stake in Petro-Africa's Afroat oil field for US$573 million. In 2006, Sinopec and Indian Petroleum jointly acquired Colombian oil company Omimex de Colombia 50%. The shares of the two parties was 25%. The first joint acquisition of China and India in Africa took place in 2002. In Sudan, Indian oil and gas companies bought a 25% stake in the Neil oil field operated by China National Petroleum Corporation. China established an oil refinery in the Sudanese capital Khartoum and India established oil pipelines to transport refinery products.

In the long run, these will also help China and India get rid of vicious competition. Take the premium issue as an example. Due to the increasing demand for oil imports, the competition between China and India results inf premiums and even the increasing price of oil and gas in global market. No matter who wins in the fierce competition, it is the guys who earn dollars through premium will be satisfied with the result. For example, China and India competed to acquire mining rights in the Angolan oil field in 2004. The competition was so fierce that Chinese oil company raised the price to 2 billion US dollars. Therefore, whether in Africa or in other parts of the world, the approach of joint bid can reduce costs for both parties.

Conclusion

China and India, as the two largest developing countries in the world, are increasingly in quest for energy, and both turn their eyes on African markets. Comparative study concludes that China enjoys better energy security in Africa. In terms of objective, both sides pursue African markets because of its large energy reserves. In addition, the dependency on the Middle East where has been plagued by conflicts and wars compels both sides to secure resources diversification through cooperation with Africa. From an economic perspective, China and India hope to expand economic and trade cooperation with Africa through energy cooperation. However, great power is another important factor for India to enlarge its influence in Africa as it endeavors to push forward UN Security Council reform. Finally, India also aims to enlarge natural gas cooperation to buffer its failure of onshore natural gas pipeline construction near Pakistan and the Central Asia.

In terms of strengths, China and India boast profound relations with Africa in the history of national liberation and anti-colonial movement. The differences are as following. In general, China's performances are much more practical and successful. China has a huge amount of foreign direct investments and bilateral trade. In terms of foreign aid which is connected with energy projects, the strengths in infrastructure construction help China expand its infrastructure projects through energy cooperation. The financial supports and other preferential measures from Chinese government and the Export-Import Bank accelerate the presence of Chinese companies in African market. China has taken its advantages over capital and technology and showed its strong presence in the upstream, middle and downstream reaches in energy industry chain. More importantly, China’s experience in cooperation with Sudan in Angola has helped it achieve greater achievement. Different from China, a large number of overseas immigrants facilitate the understanding between African countries and India. In addition, India shares great similarities with the United States and Europe in ideology, democracy, and economic model. The United States and Europe regard India as a partner rather than an enemy. The Indo-Pacific Strategy provides India a safer international environment. Therefore, India enjoys safer energy transport.

In terms of weakness, China suffers from criticism in energy cooperation because Europe and the United States are worried about its increasing presence in Africa. Concerns about China's influence make the United States and India increase military presence in the Straits of Malacca and the Indian Ocean. The international

environment, therefore, poses a great threat to China's energy transport. On the contrary, the economic and social development limits Indian energy cooperation in Africa. India’s investment in Africa is small and concentration ratio is too high. Foreign aid related to energy cooperation is limited and not practical. What’s worse, the Indian oil companies suffer from inefficient bureaus and low autonomy. Finally, the Indian energy companies’ businesses are mostly limited to the upstream industry, which makes it less competitive with China.

Finally, both China and India are in great competition with the United States, Europe, Japan, etc. The United States, Japan and Europe accumulate rich experience in energy cooperation and put much pressure on China and India to expand cooperation with Africa. In addition, terrorism and political turmoil have made Africa a terrible destination fro investment, threatening the energy supply and transport for China and India.

Comparative study shows that China is faced with some challenges in Africa. The following measures should be adopted. The root cause of terrorism and political instability lies in poverty. China should strengthen cooperation with India in promoting the development of agriculture, infrastructure construction and industry in Africa. In addition, in terms of energy transport, China can expand its energy pipeline construction in Central Asia, Russia and other regions in exchange for India's support in the Indian Ocean and the Straits of Malacca. In terms of criticism from international community, China should take advantages of medias to make its voice heard by the world. At the same time, enterprise management and soft power construction should be strengthened. Finally, China and India can strengthen cooperation by the means of joint bidding and joint ventures to cope with the competition with other countries.

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A Summary of Thesis Department of Political Science Chair of International Relations

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China and India's Energy Security in Africa: A Comparative Study

The paper aims to give a comprehensive comparison of China and India's energy security in Africa and offer suggestions on China's performance. The first chapter covers research background, literature review and the theoretical study on energy security. The second chapter outlines China and India's energy security in energy supply, energy consumption and energy transport. The third chapter, the most important section of the paper, carries out a comparative study on China and India's energy security in Africa. Objectives, strengths, weaknesses and external threats are on the list of study. Finally, the fourth chapter offers proposals to improve China's performance in Africa.

Chapter I China, India and Energy Security

Energy is so indispensable for human society that it concerns the national security and prosperity of every country. After the crisis in the 1970s, many countries formulate energy strategies and carry out a series of diplomatic activities in order to ensure energy security. One of the most prominent topic in global energy markets in previous years has been China and India's external quest for energy in Africa where has large resources reserves. What are the similarities and differences between China and India's energy security in Africa? Furthermore, how China should response to these factors?

Researches on China and India are hot issues in many publications, and many researches have been done on studies on China-India energy security. However, competition dominates the current studies and limits the studies on cooperation between two sides. In addition, many scholars compare the differences between China and India from many perspective such as energy policy and researches on similarities are dwarfed by that on their differences, however. Finally, many studies have been done on China and India's engagement in African region. However, little efforts are made in comparative study on their strengths, weaknesses, objectives,etc. Therefore, there is much room for the study on China and India's energy security in Africa.

Reviewing the history of energy security at the outset is of paramount importance. From World War I to World War II, the notion of energy security was closely tied to military purposes. In the wake of oil crisis in 1970s, energy security carried the meaning of economy. After the Cold War, the relationship between energy security and sustainable development is even closer.

Numerous definitions of energy security have been offered but no consensus is widely accepted. Chester(2009) points out that the concept of energy security is inherently slippery. This slipperiness poses analytical, prediction and policy difficulties.[1] After the oil crises in the 1970s, many countries stressed the importance of energy supply. The IEA defines energy security as the uninterrupted availability of energy sources at an affordable price.[2] Daniel Yergin (1988) holds that the objective of energy security is to assure adequate, reliable supplies of energy at reasonable prices and in ways that do not jeopardize major national values and objectives.[3] The political stability are also in discussions since uproar could also restrain supply (Jansen et al., 2004).[4] Definition is expanded because of transnational issues such as climate change and terrorism, etc. United Nations Development Program (UNDP) maintains that it should not have an unacceptable or irreversible impact on the environment.[5] The ability of the system to cope with extreme events, such as hurricanes, strikes and terrorist actions is also mentioned by Chevalier(2005).[6] In 2007, Asia Pacific Energy Research Centre introduced an influential scheme of classifying energy security concerns including availability, accessibility, affordability and acceptability.[7]

Chapter II China and India's Energy Security

The second chapter outlines China and India's energy security from the perspectives of energy supply, energy consumption and energy transport.

China's Energy Security

China surpassed the United States at the end of 2013 as the world's largest net importer of petroleum and other liquids. China's oil consumption growth accounted for about 43% of the world's oil consumption

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[1] Lynne Chester,2009. Conceptualising Energy Security and Making Explicit its Polysemic Nature, *Energy Policy*, 38, pp.887-895.
[2] IEA, https://www.iea.org/topics/energysecurity/
[3] Daniel Yergin, 1988. Energy Security in the 1990s, *Foreign Affairs*, Vol.67, No.1, pp.111.
[4] J.C. Jansen, W.G. van Arkel and M.G. Boots, 2004. Designing Indicators of Long-term Energy Supply Security. file:///C:/Users/pc/Downloads/Designing_indicators_of_long-term_energy%20(1).pdf
[5] United Nations Development Program (UNDP), 2004. World Energy Assessment, p.42. https://www.undp.org/content/undp/en/home/librarypage/environment-energy/sustainable_energy/world_energy_assessmentoverview2004update.html
[6] Chevalier, J.M., 2005. Security of Energy Supply for the European Union. *European Review of Energy Markets,* Vol.1, pp.1-20.
[7] Asia Pacific Energy Research Centre, 2007. A Quest for Energy Energy in the 21th Century, https://aperc.ieej.or.jp/file/2010/9/26/APERC_2007_A_Quest_for_Energy_Security.pdf

growth in 2014.[8] In 2017 alone, China consumed 3132 million tonnes oil equivalent, accounting for 23% of global consumption and consumed 12799 thousand barrels oil daily, accounting for 13%.[9] However, China's energy supply relies on external importation. By the end of 2017, China's proved oil reserves were 2.57 billion barrels, accounting for 1.5 percent of the world's oil reserves and the R/P ratio is only 18.3, lower than the global average of 50.[10] China's total proved natural gas reserve is 5.5 trillion cubic meters, accounting for 2.8% of the global total.[11] In 2017, China's oil external dependence ratio was 67%, higher than the international average of 50%.[12] In addition, China is highly dependent on the Middle East and Africa where they are infested with religious issues, terrorism and political turbulence. In order to diversify its energy imports, China expands cooperation with Russia, the Central Asia and Latin America, etc.

China's energy consumption grew 4.4 percent in 2016 and 3.1 percent in 2017. The number reached its peak at 3132 million tons of oil equivalent, ranking first with a high proportion of 23%.[13] However, the consumption structure is unbalanced. Oil accounts for 20.7 percent of total consumption, natural gas only 7 percent and new energy only 3.3 percent. Coal, a traditional energy source for China, accounted for 59.1 percent of total consumption.[14] China's unbalanced energy consumption structure, coupled with extensive mining, seriously affected the economy and ecological environment. In 2017, China's total carbon dioxide emissions were 923.2 million tons, accounting for 27.6% of the world's total emissions.[15] Finally, China's per capita energy resources is lower than many countries. In 2016, China's per capita hold of oil was 2.54 tons, 8% of the world average. The figure for natural gas is only 3,916 cubic meters, 15% of the world average.[16] An amount of 33% Chinese people has no access to clean energy for cooking in 2015.[17]

China is in the Malacca dilemma of energy transport. China's imports of crude oil mainly come from the Middle East, Africa and Asia-Pacific, accounting for more than 90% of the total. 77% of oil imports can not

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[8] EIA, 2015. China, International Energy Data and Analysis from U.S. https://www.eia.gov/beta/international/analysis_includes/countries_long/China/china.pdf
[9] BP Statistical Review of World Energy, 2018. pp.8-15, https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf
[10] P .12.
[11] P.26.
[12] Li Qi, 2018. The Current Situation and the Contradictory Transformation of China's Energy Security（《中国能源安全现状与矛盾转变》）, *International Petroleum Economics*, Vol.26, No.4, p.21.
[13] BP Statistical Review of World Energy, 2018. p.8. https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf
[14] Based on BP Statistical Review of World Energy, 2018.
[15] P.49.
[16] Li Qi, 2018. The Current Situation and the Contradictory Transformation of China's Energy Security (中国能源安全现状与矛盾转变), *International Petroleum Economics*, Vol.26, No.4, p.22.
[17] IEA, 2017. Key World Energy Statistics. https://www.iea.org/publications/freepublications/publication/KeyWorld2017.pdf

been transported into China without passing through the Straits of Malacca[18] that is vulnerable to military control of America, India and Japan. The dilemma lies in the weakness in maritime power. However, recent years witnessed the successful cooperation in onshore pipeline with Russia, Myanmar and the Central Asia and therefore, this alleviates the burden of maritime transport.

India's Energy Security

At present, India is the fourth-largest energy consumer, accounting for nearly 5.6% of global primary energy consumption.[19] A total of 4690 thousand barrels is consumed daily, covering 4.8% in global energy market.[20] The figure for natural gas is 54.2 billion cubic meters daily, accounting for 1.5% of the global energy market.[21] However, both India and China are suffering from the shortage of energy. The total oil proved reserves for India is only 4.5 billion barrels with a global share of 0.3%.[22] The figure for natural gas is 1.2 trillion cubic meters with a share of 0.6%.[23] According to BP energy report 2017, the demand gap for oil reached to 154.6 million tons which means 70%-80% of oil could not be pumped unless expanding its importation.[24] India's energy import bill will jumps significantly and takes up an increasing share of the GDP by 2021-2022, even though the GDP is expected to increase by roughly 8%.[25]

India suffers from terrible energy consumption. India's energy consumption reached 753.7 million tons of oil equivalent with a growth rate of 4.6% in 2017.[26] Both China and India boast large coal reserve, thus making coal a primary resource during the past years. The proportion of coal in India's total energy consumption in 2017 was 56.3%, slightly lower than China's 59.1%. Oil and gas makes up a small part of total consumption, with oil accounting for 20.7% and natural gas only 7%. Nuclear energy and renewable energy accounted for only 4.0%.[27] This structure results in terrible air pollution in India. Among the 30 most polluted cities in the world, there are 22 cities in India.[28] In addition, India is confronted with low per capita hold of resources.

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[18] H.Y. Zhang, Q. Ji, Y. Fan, 2013. An Evaluation Framework for Oil Import Security Based on the Supply Chain with a Case Study Focused on China, *Energy Econ*, 38 , pp. 87-95.
[19] BP Statistical Review of World Energy, 2018. p.8.
https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf
[20] P.15.
[21] P.29.
[22] P.12.
[23] P.26.
[24] BP Statistical Review of World Energy, 2017. pp.16-17.
https://www.bp.com/content/dam/bp-country/de_ch/PDF/bp-statistical-review-of-world-energy-2017-full-report.pdf
[25] Ashok Sreenivas, 2014. India's Energy Policy Future: Here Be Dragons, *Future,* Vol.56, pp.53-61.
[26] BP Statistical Review of World Energy, 2018. p.8.
https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf
[27] Based on BP Statistical Review of World Energy, 2018.
[28] Air Visual, 2019. 2018 World Air Quality Report,
https://www.airvisual.com/world-most-polluted-cities?continent=&country=&state=&page=1&perPage=50&cities=

China's per capita energy consumption in general stands at 2.21 tons of oil equivalent, slightly above the world average. India's per capita energy consumption is only 1/4 to 1/3 of the world average, however.[29] What's worse, India still has a large population of 240 million people who are struggling to grip electricity, and primary bioenergy such as wood remains a crucial resource for 840 million people in rural areas.[30] Power outages often occur even in large cities like New Delhi.

India enjoys a relatively safer maritime transport. The Indian regards the Indian Ocean as the "India's ocean" and enlarges its military presence. The concerns stem from the Gulf War of the 1990s and the Iraq War of 2003. With a strong naval power represented by two aircraft carriers and support of American government, India can maintain its absolute predominance in the Indian Ocean for a long time to come. However, India is at a disadvantage on onshore channels. Energy from Russia and Central Asia is also playing an important role, but the geopolitical situation in South Asia makes these resources far from the moon.

Chapter III A Comparative Study on China and India's Energy Security in Africa

This chapter, the most important section of the paper, carries out a comparative study on China and India's energy security in Africa. Objectives, strengths, weaknesses and external threats are on the list of study.

Similarities in Objectives

Both China and India pursue energy in African markets. First, Africa boasts energy reserve, which makes it more attractive to China and India. At the end of 2007, the oil reserves were 119.7 billion tons, accounting for 8.4% of world total. Africa's oil reserves rose to reach 126.5 billion tons in 2017. In terms of crude oil production, African countries produced 383.3 million tons of oil in 2017, accounting for 8.7% of world total, with a growth rate of 5.0%.[31] In addition, African countries, which are subject to the shortages of capital and technology, have implemented policies to favor foreign investment and international cooperation in this regard. Finally, oil imported from Africa boasts low cost of mining, refinement and processing.

Second, both China and India hope to shake off dependency on the Middle East and improve resources diversification. The Middle East has always been a crucial crude oil provider for China and India. 43.6% of China's imported crude oil comes from the Middle East, while the situation for India is more serious, with

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[29] Lei Li, 2014. China-India Energy Cooperation and Competition in Global Energy Context（全球能源格局变革下的中印能源竞争与合作）, *South Asian Studies Quarterly*, Vol.158, No.3, p.65.
[30] IEA, 2015. *India Energy Outlook,* Paris: International Energy Outlook, p.11.
[31] BP Statistical Review of World Energy, 2018. p.14.
https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf

the figure reaching as high as 63.6%.[32] However, the situation in the Middle East is complex as the ethnic, religious and political disputes are cropping up one after another. India has paid much price and learned lessons in the past decades. India's GDP had shrunk by 5.2% and expenditure for imported energy increased for 3 times because of the disruption in the second oil crisis.[33]

Finally, energy cooperation expands economic and trade cooperation with Africa. India's refining capacity is very strong. On the contrary, Africa's refining capacity is relatively poor. Therefore, energy cooperation can not only ensure India's energy supply, but also help African countries improve their refining capacity. China, on the other hand, has witnessed dramatic growth in renewable energy during the past years. However, over-productivity throws this into traps and China needs to tap into new market. Kenya, for example, which boasts large reserves of geothermal power, is struggling to gain investment and technology from China. These complementary demands open new chapters for cooperation.

Differences in Objectives

India's natural gas growth in Africa's energy trade is mounting, but for China, the number is very small. The imports of liquefied natural gas from Africa reached 6.9 billion cubic meters, accounting for 26.8% of India's total natural gas imports. China's total imports of natural gas from Africa is only 1.2 billion cubic meters.[34] This is because China imported natural gas mainly flows from Asia-Pacific and Central Asian countries. In contrast, the terrible relations with Pakistan makes pipeline projects from India to Iran and the Central Asia remain a mirage. Therefore, India has to turn its eyes to Africa to fill in the demand gap.

In addition, the pursuit of global power is another driving force. India resolves to push forward the reform of UN Security Council. But the failure in 2005 gave India a lesson that the proposal must be publicly received by African countries as Africa has 54 votes in the United Nations. The acquisition of political interests is often achieved by economic means. Increasing investments in African countries help India strengthen diplomatic relations with Africa.

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[32] Based on BP Statistical Review of World Energy, 2018. p.24.
[33] Samir Ranjan Pradhan, 2008. *GCC and the Global Energy Regime*, New Delhi: Academic Foundation, pp.296-297.
[34] BP Statistical Review of World Energy, 2018. p.34.
https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf

Similarities in Strengths

Historically, China and India enjoy sound bilateral relations with Africa. As early as the period of British colonialism, a large number of Indian immigrants came to Africa. At the end of the 19th century, Gandhi exerted his charm and leadership in South Africa, where he worked and fought against racism for 21 years. In particular, during the Nehru administration, Bandung Conference and Non-Aligned Movement made India publicly received by African countries in the mid of last century. In the 21th century, economic liberalization, integration of economic globalization and the United Nations reform drive India to put a premium on the relations with Africa.

China and Africa supported each other in anti-colonialism and national liberation. The Bandung Conference in 1955 promoted China-Africa relations to a new height. Premier Zhou visited the African countries three times in the 1960s which marked China's foreign assistance to Africa. Reform and Opening-up marked a shift from political support to economic cooperation. In the 21th century, China's economic miracle makes it much appealing to African countries and China-Africa Forum marks China's increasing influence in Africa.

Differences in Strengths

China boasts a huge amount of foreign direct investments, foreign aid, the strengths in infrastructure construction, financial supports and strong presence in energy industry chain. In contrast, India boasts a large number of overseas immigrants, a safer international environment and safer energy transports.

Chinese Position

In 2015, China-Africa trade totaled approximately US$179 billion. China's foreign direct investment stock in Africa increased from $16 billion in 2011 to $40 billion in 2016, ranking fourth in the world, next to the United States, the United Kingdom and France. This figure accounted for 4.5% of China's total foreign direct investment.[35] Construction, mining and manufacturing investment grew at an average annual rate of more than 10%, making it the fastest growing industry for China-Africa cooperation.[36] China's investment in Africa becomes more diversified and the dependency for energy-oriented countries has been decreasing over the past years.

In terms of foreign aid, China performs better than India. China provided approximately $31.5 billion in

[35] UNCTAD, 2018. World Investment Report, p.38; p.44. https://unctad.org/en/PublicationsLibrary/wir2018_en.pdf

[36] Liu Chen and Ge Shunqi, 2018. Chinese Enterprises Investing in Africa: Economic Growth and Structural Transformation(中国企业对非洲投资：经济增长与结构变革). *International Economic Review*, pp.9-31.

assistance to Africa between 2000 and 2013, at approximately $2.25 billion annually.[37] Infrastructure construction is one of the most prominent feature of China's foreign aid in Africa. China's steel and machinery equipment companies are faced with overcapacity and are looking for overseas markets. This could be realized with the support of Chinese government who introduces special tax incentives, credit and loans, and a favorable import and export regulations. In Paulo Reis Mourao's view, this model is also summarized as governmental efficiency.[38] China succeeded in launching 913 assistance projects in 50 African countries between 2002 and 2013, most of which flow to infrastructure construction.[39]

Finally, Chinese energy companies in African countries are late comer, but they have developed rapidly over the past decades. Chinese companies have invested about 80 billion US dollars in Africa, forming three major project clusters in North Africa, West Africa and East Africa. CNPC's investment amounted to about 40 billion US dollars, Sinopec about 25 billion US dollars, CNOOC and private companies about 15 US billion.[40] Chinese investment in Africa not only resulted in a huge productivity, but also empowered African countries such as Sudan, South Sudan, Niger and Chad an energy industry system, which ends the humiliating history of energy imports and contributes to African industrialization.

Indian Position

In 2018, India has 30.9 million overseas Indians in total, among which 3 million are living in 35 African countries.[41] These immigrants play an important role in Africa politically, economically and culturally. For example, at least one Indian immigrant takes his seat in Parliament in Kenya. The largest retailer in Kenya is also an Indian immigrant, and so as the vast majority of the Kenyan middle class. Africa also treats Indian immigrants as an important factor in cooperation with India. When former South African President Zuma visited India for the first time in 2010, the majority of the 200-member delegation are overseas Indian.[42]

Second, the international environment is more favorable. The United States is increasingly worried about the rise of China and endeavors to pull India into the same boat in the pursuit of containing China. As Kashish Parpiani(2018) puts it, American government cultivate India as a balancer while condemning China's

[37] Chinese Aid to Africa: Be Careful Comparing Apples and Dragon Fruits, https://www.aiddata.org/blog/chinese-aid-to-africa-be-careful-comparing-apples-and-dragon-fruits

[38] Paulo Reis Mourao, 2018. What is China Seeking from Africa? An Analysis of the Economic and Political Determinants of Chinese Outward Foreign Direct Investment based on Stochastic Frontier Models, *China Economic Review*, 48, pp.258-268.

[39] Yan Dong and Cijun Fan, 2017. The Effects of China's Aid and Trade on its ODI in African Countries, *Emerging Markets Review*, 33, pp.1-18.

[40] Wang Hongyi, 2018. Natural Gas Opens New Chapter for China-Africa Energy Cooperation(天然气引领中非能源合作方向), *Status and Trends*, p.24.

[41] Ministry of External Affairs,2018. Population of Overseas Indians, http://mea.gov.in/images/attach/NRIs-and-PIOs_1.pdf

[42] Ajay Kumar Dubey, 2015. India and Africa's Partnership: A Vision for a New Future, New Delhi: Springer Pvt. Ltd, p.134.

"aspirations" in order to contain it.[43] This is the same case for the relations with the EU and Japan as their strategic partnership characterizes common values. Therefore, Western countries generally have a moderate attitude toward India's presence in Africa. India's emergence in Africa not only expands the influence of westernized democracy, but also balances China's influence in Africa.

Finally, India enjoys a relatively safe energy transport. India's main energy imports from Africa and the Middle East compels it to increase its military deployment in the Indian Ocean, especially the Gulf of Aden. In addition, because India has a good international environment, it has not been seen as a thorn in this region. As the United States has much common interest in Africa, India is tightening its military cooperation with the United States to maintain its dominance in this waters. The Indo-Pacific strategy advocated by Trump administration contributes to stronger control of the Indian Ocean.

Differences in Weaknesses

China suffers from energy transport and international criticism. It is difficult for India to bring promises into realities because of limitation in investment, foreign aids, management efficiency and energy industry chain.

Chinese Position

Most of the energy imports from Africa flow through the Indian Ocean, where India is increasingly strengthening its maritime military presence. More importantly, China's surging energy imports raised great concern about its dependency on a chokepoint, the Strait of Malacca where it bears roughly 77% of China's energy imports.[44] It is no exaggeration to say that whoever controls the Straits of Malacca has a stranglehold on the energy route of China. The 2016 South China Sea arbitration saw the tension between China and America in the Pacific. At present, a new round of geopolitical competition is setting off in the Indian Ocean as the United States is pushing forward the Indo-Pacific Strategy.

China also suffers from criticism from international community. First, colonialism. In Carmel Davis's view, China's investments in resources do not create a large number of jobs and will bring huge damages to the environment and the lives of local people.[45] Second, irresponsibility. Non-interference is always criticized by outside world. Sven Grimm holds that non-interference is presented as a key principle for the official discourse on China-Africa relations and can be regarded as one of the strong selling points to African

[43] Kashish Parpiani, 2018. China, India, and American Manichaeism, https://www.orfonline.org/research/china-india-and-american-manichaeism/

[44] Zhang Zhongxiang, 2011. China's Energy Security, the Malacca Dilemma and Responses, *Energy Policy*, 39, pp.7612-7615.

[45] Carmel Davis, 2009. Africom's Relationship to Oil, Terrorism and China, *Orbis*, Vol. 53, No. 1, pp. 132－133.

elites.[46] Third, disruption of the international energy market. Ian Bremmer believes that Chinese government intervenes the business of its State-owned oil companies and runs against an energy market based on transparency. Chinese companies' acquisitions will lead to an increasing prices of oil and gas.[47]

Indian Position

India-Africa trade is limited. China's trade with Africa reached 200 billion U.S. dollars in 2014, while India's trade with Africa was only 70 billion U.S. dollars.[48] India's foreign direct investment stock in Africa is only $14 billion, ranking eighth in 2018. In contrast, China's stock reached to $40 billion.[49] In addition, India puts its investment in one basket. In 2015, India's investment in Mauritius and Mozambique totaled 5.3 billion U.S. dollars, accounting for 20% of Indian total investment.[50] Finally, India boasts its comparative advantages in IT and communications industries, but these are not complementary sectors for Africa. Agricultural development and infrastructure constructions are top priorities for African people.

In terms of foreign aid, India provided $50 million in aid to Africa in 2010, while China's generosity reached $1.4 billion.[51] From 2000 to 2013, India's contribution increased from US$1 million to US$67 million, but it only accounts for 4% of the annual budget.[52] In addition, projects are concentrated in Sri Lanka, Bhutan and Nepal with a share of 58%, while Africa accounts for only 4.5%.[53] India has no choice but to put most of efforts in South Asia rather than Africa as it pursues its hegemony in South Asia. In addition, India is in a state of bureau mismanagement in foreign aid. Until 2012, the Ministry of Foreign Affairs set up an official aid agency but this caused more overlap and dilution among relevant sectors. In essence, India's aid to Africa's development is bound to be limited by India's domestic economic situation.

In addition, India has always been criticized for its efficiency. The autonomy of state-owned companies in India is relatively poor, and it is vulnerable to bureaucracy. Although the Indian government has gradually released its control over state-owned companies, but it still plays an important role in decision-making.

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[46] Sven Grimm, 2014. China-Africa Cooperation: Promises, Practice and Prospects, *Journal of Contemporary China*, Vol. 23, No.90, pp. 993–1011.
[47] Ian Bremmer, 2009. State Capitalism Comes of Age- The End of Free Market, *Foreign Affairs*, pp. 40-55.
[48] Saif Mohd. Khana and Karan Arora, 2017.Scope of India's and China's Investment in African Continent, *Procedia Computer Science*, 122, p.692.
[49] UNCTAD, 2018. World Investment Report, p.38. https://unctad.org/en/PublicationsLibrary/wir2018_en.pdf
[50] Hu Yang and Wang Tao, 2016. An Analysis of India's Investment in Africa(试析印度对非洲的投资). *South Asian Studies Quarterly,* 2, p.62.
[51] Elling N. Tjønneland, 2013. Providing Development Aid to Africa: Comparing South Africa with China, India and Brazil, *SAFPI Policy Brief*, p.3.
[52] Taraporevala, P. and Mullen R.,2013. *India-Africa Brief: Courting Africa through Economic Diplomacy*, New Delhi: Centre for Policy Research.
[53] Compiled by the Indian Development Cooperation Research at the Centre for Policy Research, New Delhi, based on Government of India Budget, Grants & Loans to Foreign Governments, Statement 11 of the Expenditure Budget, Ministry of External Affairs Government of India.

Finally, India is struggling to expand its projects of the middle and downstream industry. The energy industry consists of upstream, midstream and downstream sections. The Indian companies fail to invest in midstream and downstream projects for the lack of technologies and investments.

Similarities in Threats

First, skyrocketing discoveries of oil and gas resources in East Africa after 2008 has further exacerbated resource competition. As of 2017, Africa exported 55.4 billion cubic meters of LNG, with China accounting for 3.60%, India for 12.50% and Europe for 49.80%.[54] Of the crude oi Africa exported for 302.8 million tons in 2017, China accounted for 27.30%, India for 10.47% and Europe for 35.40%.[55] In Africa, energy companies from the United States, the United Kingdom, and France are more competitive than counterparts from China and India. China and India will also face competition from Japan as Japan is the world's largest importer of natural gas.

Second, Africa is home to unrest and wars. African countries are in a political transition and are infested with wars and conflicts. The year of 2016 and 2017 witnessed conflicts in Libya, South Sudan, Central Africa, Congo, Mali, Nigeria, and Somalia. Islamic State is also seeking Africa for its resurgence after its defeat by coalition led by America and Russia. Piracy in the Gulf of Aden and the Gulf of Guinea also exerts negative impact on energy transport. In 2014, piracy in Africa accounted for 22.4% of the world's total, making it one of the most insecure areas in the world.[56] Coupled with backward infrastructure, low administrative efficiency and serious corruption, Africa has became one of the worst place for investment in the world.

Chapter IV China's Responses to Improve Energy Security

The comparison of last chapter shows that China's energy transport is subject to the Indian Ocean and the Straits of Malacca. In addition, Africa echoes with criticism of China's increasing energy cooperation. Finally, China and India face so many common challenges such as Africa's turmoil and energy competitions that cooperation is required. Therefore, measures should be taken in energy supply, energy transport, international criticism and energy competition to improve China's energy security.

First, solution for safer energy supply lies in development. Poverty and backwardness are main cause for

[54] BP Statistical Review of World Energy, 2018. p.34.
https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf
[55] P.24.
[56] IMB, 2014. Piracy and Armed Robbery against Ships-2014 Annual Report. London: ICC International Maritime Bureau, P.5.

political turmoil and terrorism in Africa. European colonialism threw Africa into slavery and plundered energy. At the same time, Europe often flaunts itself as a model of democracy and mechanically promotes democracy and political institutions in Africa. These does not pay off by paralyze African internal industries. On the contrary, China and India's economic achievements are shining in African countries so much so that African countries have strong desires to learn from their models. In addition, both China and India regard "Non-Interference" as one of the basic principles of foreign policy. China and India should make full use of these and expand bilateral economic cooperation with Africa. Most importantly, China and India should strengthen cooperation in infrastructure construction which is a prerequisite for African development.

In terms of energy transport, China and India need to strengthen cooperation in the Indian Ocean and the Straits of Malacca. China and India lack mutual trust due to historical issues and it is difficult to cooperate effectively. In particular, the tension between the two countries in the Donglang region in 2016 has contributed to the deterioration of relations. China need to strengthen its energy security in the Indian Ocean and the Straits of Malacca. India's pipeline projects are blocked by the tension with Pakistan. China plays an important role in relations with Pakistan and other countries for the construction of pipelines. India needs China's support in this regard. China should weigh the pros and cons and adopt cooperation with India in pipeline construction in exchange for its cooperation and support for the Indian Ocean security.

There are some reasons behind the criticisms above. First, differences in ideology. There are some people who have not got rid of the Cold War mentality. Therefore, China is always criticized by them no matter how China performs in this continent. Second, differences in foreign diplomacy. The United States and Europe impose westernized model on African countries while China has always insisted on Non-Interference. Third, global influence. China's growing economic competitiveness and political influence in Africa are Western countries' concern as Africa has always been regarded as the backyard of Europe. This criticism will persist as long as China enjoys its competitiveness and influence in Africa.

Many efforts are also required to improve China's performance in Africa. First, energy bureau should be established in response to the increasing quest for energy and politicized energy issues. Second, companies should improve localization and salary of local workers. The companies that fail to protect environment should be punished by local governments. Third, great efforts should be made to uproot the corruption of African official members. Some funds of foreign aids flow into the official members and stir up discontent. Finally, broadcast and media is conducive to understanding China. China is faced with the dilemma between

‘low-profiled’ and broadcast. How to strike a balance is a challenge for Chinese companies.

In the face of competition from the other countries, China can cooperate with other national oil companies to form joint venture companies. In the African energy market, by inviting countries to form joint investments company, sharing of benefits and risk will be established. This energy community optimizes complementary technologies and resource allocation. Second, Chinese and Indian companies can cooperate through joint bidding and joint development. The first joint acquisition of China and India in Africa took place in 2002. In Sudan, Indian oil and gas companies bought a 25% stake in the Neil oil field operated by China National Petroleum Corporation. China established an oil refinery in the Sudanese capital Khartoum and India established oil pipelines to transport refinery products. In the long run, these will also help China and India get rid of vicious competition.

Conclusion

Comparative study concludes that China enjoys better energy security in Africa. In terms of objectives, both sides pursue African markets and endeavor to diversify resources in a bid to shake off dependency on the Middle East. They also hope to expand trade cooperation with Africa through energy cooperation. However, India also aims to enlarge its influence in Africa as it pushes forward UN reform. Finally, India enlarges cooperation in natural gas in order to buffer its failure of onshore pipeline constructions.

In terms of strengths, China and India boast profound relations with Africa throughout the history. The differences are as following. China has a huge amount of foreign direct investments and bilateral trade. China holds strengths in infrastructure projects, financial supports and other preferential measures from Chinese government and banks. Finally, China has strong presence in the upstream, middle and downstream reaches in energy industry. In contrast, a large number of overseas immigrants facilitate Africa-India relations. In addition, India enjoys a better international environment and safer energy transports.

In terms of weaknesses, China suffers from criticism from international community. The United States and India’s increasing military presence in the Straits of Malacca and the Indian Ocean poses a great threat to China's energy transport. On the contrary, India’s investment in Africa is small and concentration ratio is too high. Foreign aid is limited and not practical. What’s worse, the Indian oil companies suffer from inefficiency. Finally, Indian energy companies are less competitive as their businesses are mostly limited to the upstream industry.

Finally, both China and India are in great competition with the United States, Europe, Japan, etc. In addition, terrorism and political turmoil have made Africa a terrible destination fro investment, threatening the energy projects for both China and India.

The following measures should be adopted by China to cope with challenges. China should strengthen cooperation with India in promoting the development of agriculture, infrastructure construction and industry in Africa. In addition, in terms of energy transport, China can expand its energy pipeline construction in Pakistan and other regions in exchange for India's support in the Indian Ocean and the Straits of Malacca. In terms of criticism from international community, China should take advantages of medias to make its voice heard by the world. At the same time, enterprise management and soft power construction should be strengthened. Finally, China and India can strengthen cooperation in joint bidding and joint ventures to cope with the competition with other countries.