China's Comprehensive National Power and Its Implications for the Rise of China: Reassessment and Challenges*

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Abstract

The concept of comprehensive national power (CNP) has been developed by several Chinese scholars and academic institutions in an attempt to assess and rank the CNP of China *vis-à-vis* other major powers. With the concept of the CNP, material capabilities, for example, military might, economic wealth, and natural resources, remain the predominant factors used in the assessment of the CNP. Despite tangibility and measurability, this paper argues that understanding China's CNP by giving more weight to such material capabilities is only one side of the coin and thus begs a lot of questions. While China's CNP paves the way for its rising power status, it has led to the negative consequences which pose many challenges to its long-term stability and sustainable development. This paper asserts that the genuine assessment of China's CNP is supposed to rely not only on the factors from which China would benefit, but also on those of which China would have to pay a price. Analyzing the rise of China through China's CNP must be understood in both quantitative and qualitative terms.

I. Introduction

Since its Open Door policy and economic reforms in the late-1970s, China has experienced the remarkable economic success and rapid social development that have never happened before in Chinese modern history. China's rapid and continued economic growth has lasted for over three decades. China possesses huge land area with world's largest population size. It is also the home of two of the world's longest river, the Yangtze and the Yellow River. Its military might has been growing as the world's second largest military spenders after the U.S. Since 1971, China has gained its global standing through the acquisition of one of the permanent members of the United Nations Security Council (UNSC) and one of the five nuclear powers under the Non-Proliferation Treaty (NPT). In 2015, China became the world's second largest

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economy, but by 2031, projections show that it will be the largest economy in the world with a gross domestic product (GDP) valued over US35 trillion (Soergel 2015).

So, in what way can we understand the growing phenomenon of China's success and achievements which some called the 'rise of China'? Where does China rank in the world? To answer these questions, some Chinese scholars then tried to gain a deep understanding of the 'rise of China' phenomenon and China's global standing by developing the 'comprehensive national power (CNP)' to assess China's national power vis-a-vis other major powers, particularly the U.S.

Although the concept of CNP has been developed and adapted by several Chinese scholars and academic institutions to fulfill the shortcomings of national assessment formulas made by Western scholars, material capabilities, for example, military might, economic wealth, and natural resources, remain the predominant factors used in the CNP assessment. Taking China as a case, this paper argues that understanding China's CNP by giving more weight to such material capabilities is only one side of the coin and thus begs a lot of questions. While China's CNP paves the way for its rising power status, it has led to the negative consequences which pose many challenges to its long-term stability and sustainable development. This paper asserts that the genuine assessment of China's CNP is supposed to rely not only on the factors from which China would benefit, but also on those of which China would have to pay a price. Analyzing the rise of China through China's CNP must be understood in both quantitative and qualitative terms.

This paper contains four sections. The first section will explore the concept of comprehensive national power (CNP) and the shortcomings of CNP assessment formulas, while the second section will examine challenges and negative consequences which lead to economic losses and threaten social stability and sustainable development, but which have not yet been incorporated into the concept of CNP and measured for the CNP assessment. Implications for the rise of China through China's CNP as well as its challenges will be elaborated in the third section and the last section is the conclusion.

II. Comprehensive National Power (CNP): Assessing China's Power

The rise of China on the world stage, particularly after the application of the Open Door policy and economic reforms, led Chinese leaders to focus on its own power assessment to understand the power gap between China and other leading major powers around the world, particularly the U.S.

The concept of comprehensive national power (CNP) or '*zonghe gouli*' was first introduced when China's statesman Deng Xiaoping asked Chinese scholars to

analyze and project the future security environment as a supplement to the study of China's strategic defense in the new millennium (Pillsbury 2000, 225). Earlier, the power assessment formulas were developed by several scholars such as F. Clifford German (1960), J. David Singer, Stuart Bremer and John Stuckey (1972), A.F.K. Organski and Jacek Kugler (1980) or Ray S. Cline (1975). None of them meets the need or falls short of expectations. Besides Cline's formula, it seems that those Western scholars treat their power assessment formulas as a 'resource container' by giving emphasis solely to material or tangible resources (Tellis, et al. 2000, 31-32). Chinese scholars then adapted those formulas and developed their own concept of power assessment – comprehensive national power – with their own understandings. In fact, the CNP is the varying aspects of the comprehensive national strength. It includes territory, population size, natural resources, military might, economic wealth, political power, foreign policy, cultural influence, education, etc. (Pillsbury 2000, 203; Qiu 1998, 16; Mori 2007, 27). From the Chinese perspective, the assessment of CNP has two main objectives: to calculate the relative capabilities of major powers as to who would win or lose if there is a war and to evaluate the potential of its strategic partners as well as adversaries.

Despite the fact that the concept of CNP is widely acknowledged and developed by some Chinese scholars, there is no widely-agreed CNP assessment formula. For Huang Shuofeng of China's Academy of Military Science (AMS) of the People's Liberation Army (PLA), his CNP Index System comprises four major index subsystems, including some sub-indexes in each index subsystem: material or hard power index (such as economic wealth, natural resources, science and technology, military might); spirit or soft power index (such as political power, foreign affairs, culture, education); coordinated power index (such as line of command, leadership in policy decision-making); and finally, environmental index (such as international environment). Moreover, each sub-index has its own sub-subindices or what Huang called 'CNP appraisal index system'. Sub-subindices of political power sub-index, for instance, include national strategy goals, political stability and decision-making capabilities (Golden 2011, 98; Pillsbury 2000, 222-224). Backed by his CNP Index System, Huang argues that the U.S. has been ranked first since 2000 and would remain so until 2020, whereas China was ranked in the fifth place in 2000, third in 2010 and, by 2020, will have been ranked second (Ghosh 2009, 44-45; Golden 2011, 104).

Researchers from Chinese Academy of Social Sciences (CASS) also conducted another assessment of CNP of some major powers in the mid-1990s. They measured eight wide-ranging aspects of CNP with 64 indices: natural resources (such as population size, life expectancy at birth, total land area, energy sources, including coal, oil, natural gas), economic activities (such as GDP per capita, proportion of tertiary sector as a percentage of GDP), foreign economic activities (such as international reserves, gold reserves), science and technology (such as spending on R&D of the GDP, the

number of scientists and engineers), social development (such as spending on education per capita, literacy rate, urbanization rate, expenditure in healthcare per capita, the number of physicians per 1000 population), military might (such as military manpower, military expenditure, the number of nuclear warheads), government regulation and control capacity (such as the proportion of government spending as a percentage of GDP), and finally diplomatic power (Ali 2015, 25; Pillsbury 1999, 111; Pillsbury 2000, 229). The result was, according to the CASS, that in 1990, China's CNP was ranked twelfth after the U.S., Japan, Germany, France, Italy, Britain, Canada, Australia, South Africa, the USSR, and Russia. China would be ranked in the eighth place in 2010, after the U.S., Japan, Germany, France, Italy, Russia and Britain (Ali 2015, 26). By 2020, the CASS forecasts that China's ranking would move to No.7, while Japan be ranked in the first place, followed by the U.S., Germany, France, Italy, South Korea (Golden 2011, 104).

Like the CASS counterpart, researchers from the Chinese Institute of Contemporary International Relations (CICIR) conducted their study by developing their own formula for the CNP assessment of seven major powers in 1998. Measured by the material strengths of economy, science and education, military and resources, the U.S. topped the list while China was ranked seventh (Chen 2015, 276-277).

Apart from Chinese academic institutions, the CNP assessment formula was developed by some Chinese scholars from China's leading university, Tsinghua University. Hu Angang and Men Honghua divided CNP into eight elements with 23 indices: economic resources (GDP, purchasing power parity [PPP]), human capital (population size, the number of the workforce population), natural resources (such as agricultural or arable land area, freshwater consumption, power consumption), capital resources (such as foreign direct investment [FDI], market capitalization), knowledge and technology (such as the number of paper publications in science and technology journals, the number of patents, government spending on R&D), government resource (i.e. government spending), military resources (such as military spending, military manpower), and foreign affairs resources (such as total imports and exports, the royalty and license fee) (Hu and Men 2004, 21). Hu and Men measured the CNP of five major powers: the U.S., China, Japan, India and Russia in 1980, 1985, 1990, 1995 and 1998. The U.S. was at the top in all five periods. In 1998, the CNP of the U.S. accounted for almost a quarter of global CNP, followed by China (7.782 percent), Japan (7.749 percent) and India (4.365 percent) (Hu and Men 2004, 23-24).

Unlike Hu and Men, Yan Xuetong measured the CNP by incorporating three dimensions of power: military power (such as military spending, the number of nuclear warheads, military manpower), political power (such as the status of the permanent member of the United Nations Security Council [UNSC]), and economic power through the GDP. To Yan's assessment, even though China's CNP is still far

Table 1: Comparison of the CNP Index Developed by Chinese Institutions and Scholars

Institutions & Scholars / CNP Index	Huang	CASS	CICIR	Hu and Men	Yan
1. Population e.g. population size, life expectancy at birth, the number of workforce population		✓	✓	✓	
2. Land area e.g. total land area, agricultural or arable land area, forest area		✓	✓	✓	
3. Mineral resources e.g. iron, copper, aluminum	✓	✓	✓		
4. Energy resources e.g. coal, oil, natural gas, hydropower	✓	✓	✓	✓	
5. Economic wealth e.g. GDP per capita, PPP, consumption capability, production capability, etc.	✓	✓	✓	✓	✓
6. Foreign economic activities e.g. total imports and exports, international reserves, gold reserves, FDI		✓		✓	
7. Science and technology e.g. the number of scientists and engineers, spending on R&D	✓	✓	✓	✓	
8. Military might e.g. military manpower, military spending, the number of nuclear warheads, etc.	✓	✓	✓	✓	✓
9. Education and culture e.g. expenditure on education per capita, literacy rate, etc.	✓	✓	✓		
10. Health care e.g. expenditure on health care per capita, the number of physicians per 1000 people, etc.		✓			

Institutions & Scholars / CNP Index	Huang	CASS	CICIR	Hu and Men	Yan
11. Government capacity e.g. government spending		✓		✓	
12. Political power e.g. political stability, national leadership, etc.	✓				
13. Diplomatic power e.g. status and role in international affairs	✓	✓		✓	✓
14. Environment e.g. international environment	✓				

Source: Author compilation

behind the U.S. CNP, China's CNP is relatively strong in all dimensions of power (Yan 2006, 18-21).

As shown in Table 1, most Chinese scholars and institutions give more considerable importance to material capabilities, that is, economic wealth, military might, natural resources and science and technology for the assessment of CNP. Economic wealth and military might lead the group and, in the peacetime, economic wealth through growth and development seems to be the core of CNP. Science and technology, natural resources (mineral and energy resources) and, to a lesser extent, the land area are also incorporated into almost all CNP formulas. The CNP also includes non-material capabilities, for example, education and culture as the sources of soft power which is neglected by most Western power assessment formulas. In general, the CNP seems to be, as its name, 'comprehensive' by covering as many as various aspects of material and non-material resources and capabilities. But we should not take it for granted. If we have a closer look, we will see that, as this paper argues, the CNP is not 'comprehensive' as it should be.

First, despite inclusion, the importance of non-material resources or capabilities in the CNP is often downplayed and remains on the sideline. For example, while the diplomatic power is included as one of the CNP indices in most CNP assessment formulas, its assigned weighting coefficient value for CNP measurement is less than that of material capabilities. The assigned weighting coefficient formula developed by the CASS may illustrate this point. Enlisted by eight elements, the assigned weighting

coefficients to each element is 0.35 for economic activities, 0.20 for science and technology, 0.10 for military might, social development and natural resources respectively, 0.08 for government capacity and 0.07 for diplomatic power (Chen 2015, 277-278). The acquisition of material capabilities may reflect the country's national power and development in a short term. But the achievement in non-material capabilities, for instance, people's wellness and quality of life, clean, safe and healthy environment may reflect the country's national power and development in a longer term and more sustainable way.

Second, I have no doubt that material capabilities, particularly economic growth and development as the core of CNP, have become the key driving forces to China's rising power on the world stage and China deserves it. But it comes to my attention that most CNP indices and CNP assessment formulas developed by respective Chinese scholars and institutions might be more or less to China's advantage. And with such high weighting coefficient value of material capabilities, it is not surprising why the CNP assessment measured by most Chinese scholars and institutions ranked China in a relatively high place. Assessing the CNP through the numbers reflects only one side of the coin. My contention is that assessing the CNP including material capabilities need to be considered or understood in both quantitative and qualitative term. Simply speaking, quantity must come with quality.

Finally, assessing the CNP from the capabilities one country possesses or has achieved is understandable, but it is only half the story. This paper argues that genuine CNP assessment should not be derived only from the capabilities or achievements the country would possesses or benefit from, but also from what it would have to pay the price for. Challenges or negative consequences, either intended or unintended, which stem from unbalanced economic growth, uneven development, environmental degradation, or political instability are all the price and, in some cases, a heavy price.

III. China's CNP: Reassessment and Challenges

This section will examine China's CNP to underline the need for CNP reassessment stressing that the capabilities should be considered in both quantitative and qualitative term, and to illustrate the challenges or negative consequences that have not been incorporated into the CNP assessment and for which China would have to pay the price. Due to time and space constraints, this paper will focus on some core capabilities in the CNP assessment and its challenges or negative consequences which stem from acquisition of or achievement in those capabilities, that is, economic success, military might, science and technology, human resources and natural resources.

Economic Success: Growth with Inequality

According to the CNP developed by most Chinese scholars and institutions mentioned in the previous section, economic growth and development seem to be one of the most predominant components for assessing China's power. In China, economic growth and development are generally attributed to political and social stability (Harris 2004).

With the open door policy and economic reforms under the scheme of Four Modernizations initiated in the era of Deng Xiaoping, China's rapid economic growth has been continuing for over three decades. Thanks to Mao Zedong's strategy of 'encircling the cities from the countryside', several policies and initiatives under the first stage of economic reforms were first implemented in rural areas, for instance, the household responsibility system, township and village enterprises (TVEs), etc. (Xia and Wang 2012, 4-5). However, the focus of the reforms was shifted from rural areas to cities after the CPP stated at the 13th National Congress in 1987 that the socialist market economy was employed, and privately owned firm as well as foreign-funded enterprises would be a necessary element to enhance such a newly-created economic system which later led to privatization and state-owned enterprises (SOEs) reform. Comparing with state-owned enterprises, the proportion of privately owned ones grew continuously from over 90,000 in 1989 to more than 3 million in 2003 in the belief that socialism and economic development are not mutually exclusive, and centrally planned economy can be found not merely in socialist economy (So 2006, 56-57, 64-65). Furthermore, China's economy was substantially more open when 'Three Represents', which embraced private entrepreneurs, was first propounded by Jiang Zemin in 2000 and particularly, after China's entry into the World Trade Organization (WTO) in late-2001. Two laws, namely the Law of Financial Securities and the Law of Corporations, were promulgated in October 2005 to boost private investment. Several months earlier, Chinese government offered an incentive scheme to further develop the stock market by allowing all non-tradable shares held by state agencies to be convertible into tradable ones (Islam 2009, 31). More importantly, the window of opportunity is also wider open to private enterprises for the investment in prescribed 'sensitive sectors' (such as infrastructure, banking, petroleum, airline industry, etc.) which were previously dominated by state-owned monopolies (So 2006, 59).

With the open door policy and the economic reforms both from above (such as the SOEs reform, the establishment of special economic zones [SEZs]) and from below (such as the household responsibility system, the township and village enterprises [TVEs]), China has indubitably experienced rapid and continued economic growth and development, as evidenced by its GDP growth, international reserve, foreign direct investment [FDI], export volume, capital investment and rate of urbanization

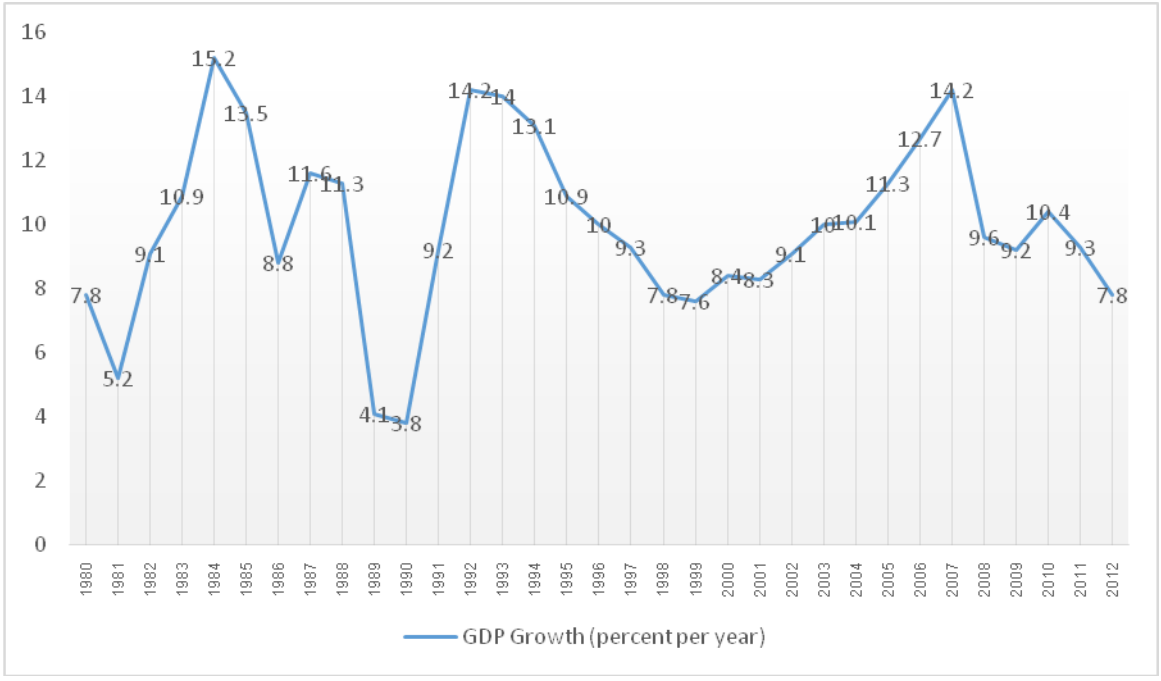
(Kojima 2009, 105). All these are not only key economic indicators, but also predominant components for the CNP assessment.

The GDP growth plays a vital role as one of the main criteria for the CNP assessment calculated by almost all Chinese scholars and institutions, particularly the CASS and scholars of Tsinghua University. As shown in Figure 1, China has experienced an impressively high rate of economic growth for more than three decades. Since February 2011, China has become the world's second largest economy after the U.S. (The British Broadcasting Corporation 2013). For the international reserve, as of December 2012, China had by far the largest international reserve totaling USD3.341 trillion, nearly three times more than the second largest reserve holder, Japan. The U.S. had the reserve of USD150 billion (Central Intelligence Agency 2012). As the world's biggest reserve holder, China has become one of the largest U.S. bondholders as well as one of the major holders of treasury bonds and securities in the U.K., Europe and Japan (Harris 2004, 60).

Foreign direct investment (FDI) is also one of the main criteria for China's rapid economic growth. In the 1990s, China became the world's factory manufacturing from a pair of shoes to semiconductors and electronic parts. As a result, China emerged as the world's second largest FDI recipient after the U.S. After its accession into the WTO, China attracted FDI from Japan, Taiwan, Hong Kong and South Korea, overtaking the U.S. to be the world's largest FDI recipient with more than USD50 billion for the first time in 2002 (Harris 2004, 59; Breslin 2004, 111). China's average export volume between 1983 and 2013 stood at USD450 billion a year. Interestingly, it reached the world's highest with over USD2 trillion in December 2012, amounting to 30 percent of China's total GDP. China's export products are topped by electronic equipment and parts and labor-intensive products such as textile, clothing, footwear, etc. to all corners of the world, particularly the U.S., the European Union, ASEAN countries, Japan and South Korea (Trading Economics 2013).

China's economic growth is also significantly anchored in the capital investments in infrastructure, real estate and property, and machinery. While capital investments in infrastructure, and real estate and property in 2000 accounted for only 29.3 percent of China's total capital investments, those in 2003 remarkably amounted to over 60 percent (Kojima 2009, 107). During 1990-2004, property investment in the urban areas increased more than 22 times, while that in the rural areas increased merely 3.7 times. In 2004 alone, the proportion of property investment in the urban areas accounted for 82 percent of total property investment in China. Over the last two decades, Chinese government has heavily invested in numerous infrastructure megaprojects, including the world's largest 'Three Gorges Dam' construction project, 4,200 km length of Xinjiang-Shanghai national gas pipeline network project, Qinghai-Tibet railway construction project, 1,800 km length of Beijing-Hangzhou Grand Canal project and

Figure 1: China's GDP Growth, 1980-2012



Source: World Bank 2013a

expressway construction project. By 1990, the expressway in China was about 500 km., but in 2004, it dramatically increased to 34,300 km. Contrary to its neighbor, Japan took over 4 decades to complete the 8,000 km length of the expressways (Kojima 2009, 108-109).

The drive for China's economic growth is also reflected by the rate of urbanization. The proportion of the population living in the big cities increases remarkably. In 2004, cities with a population of more than 5 million accounted for 10.4 percent, higher from 7.5 percent in 1994. On the contrary, cities with a population of 100,000-130,000 decreased sharply from 29.6 percent in 1994 to merely 14 percent in 2002 (Kojima 2009, 109).

Despite the fact that China's CNP assessment derived from all those key economic indicators results in a dramatic increase of China's relative power, there are some challenges and concerns over negative consequences of its economic success. Since China is in the stage of country development in all aspects, its rapid and remarkable GDP growth is not a big surprise. Although the U.S. economic growth has reached beyond its saturation point, the U.S. remains the world's largest national economy, roughly accounting for 22 percent of global GDP. The future challenge facing China is how it can maintain its status as one of the world's largest economies when its economic growth reaches the saturation point. Although the large number of population is closely related to economic growth and the size of economy, it is not a

determining factor for a country as to how to gain the status of world's major economies. A case in point is the economies of the G8 and those of Bangladesh, Pakistan or Nigeria. The GDP and the national power are not the same thing. The national power is derived from 'surplus wealth', not 'wealth' itself. According to the purchase power parity (PPP), nominal GDP or income per capita, China is still a relatively poor country (Beckley 2011/2012). And although China holds a leading position in high-technology exports, 83 percent of its high-tech exports in 2009 were attributed to foreign invested firms, not Chinese-owned ones (Beardson 2013, 86).

Income inequality and the urban-rural divide in China are also worrying. The income gap between urban and rural households has widened, especially between coastal and inland parts of the country. The income per capita of the population in coastal areas increased from 1.4 times of national average in 1988 to 1.49-1.5 times in 1993 and 1998, and slightly increased during 2000-2004. Of these areas, the income per capital of three large municipalities –Beijing, Shanghai and Tianjin- increased from 3.08 times of national average in 1993 to 3.29-3.37 times during 2000-2004. By contrast, the proportion of income per capita of those in inland areas decreased from 68 percent of national average in 1988 to 65 percent in 1993 and 59-60 percent during 2000-2004. Such urban-rural divide thus explains the alternative view of the so-called 'Two Chinas': one is the coastal China, which is abound with the world's biggest and busiest ports, heavily foreign invested economic zones and numerous enterprises with corporate governance; the other is the inland China, which is abound with sources of cheap labor and supplies of food and raw materials to meet demand from the coastal neighbor (Petras 2006, 426).

It is no surprise that the income disparity can also be found between the haves in urban areas and the have-nots in rural areas. In 1988, the income per capita of the former was 2.4 times as much as that of the latter, but in 1993 and 2004, there were 2.8 and 5.5 times, respectively. Moreover, the gap between consumption and income among these two groups is as high as 82 percent, that is, 40 percent of the poorest in China do not have enough income to save (Ramstetter, Dai and Sakamoto 2009). According to Gini coefficient, China has one of world's worst records on income inequality. Comparing with 0.28 in 1978 and 0.45 in the late 1990s, China's Gini coefficient in 2012 was 0.474, once reaching its peak at 0.491 in 2008 (The Economist 2013).

Negative consequences also resulted from rapid urbanization. During 1978-2012, the rate of urbanization in China multiplied from 17.9 percent to 52.6 percent (United Nations Development Programme 2013a, iii). Despite the fact that rapid urbanization increases the capital investments to boost China's economic growth, China is losing its workforce and collective-owned land for agricultural production, threatening its food security. It is estimated that during 1996-2004, fast- growing industrialization and rapid urbanization transferred agricultural land at least 150 million mu (10

million hectares) away, accounting for 5 percent of China's total agricultural land. More than 40-50 million Chinese peasants lost their land with small compensation and without social welfare. The high unemployment rate is also found among those peasants aged above 40. They are also known as 'Three-No' peasants (*sanwu nongmin*): no land, no social welfare and no job (Kojima 2009, 110-115; Li 2009, 59; Zhu 2012, 110). Land expropration in Yubei district, Chongqing is a case in point (Lemos 2012, 66).

Due to concerns over insufficient social welfare support, increasing land expropriation and unbalanced urbanization for the sake of economic growth and development, a vast range of social protests have proliferated throughout China. In 2004, over 74,000 protests erupted with more than 3.76 million protesters. The number of social protests rose sharply to 87000, 90000, and 120000 in 2005, 2006 and 2008 respectively (Wong 2009, 76; Yang 2010, 143; Lavin 2013). Even though a large number of protests are still at a manageable and local level, there would be widespread criticism and wide-ranging protests challenging political stability and, to a larger extent, posing a slowdown in economic growth which eventually affects China's CNP if the current regime could not tackle these problems timely and effectively.

Needless to say, costs and budgets set for tackling all challenges and negative consequences derived from economic success have never been seriously calculated or incorporated into the CNP assessment and, definitely, China's CNP.

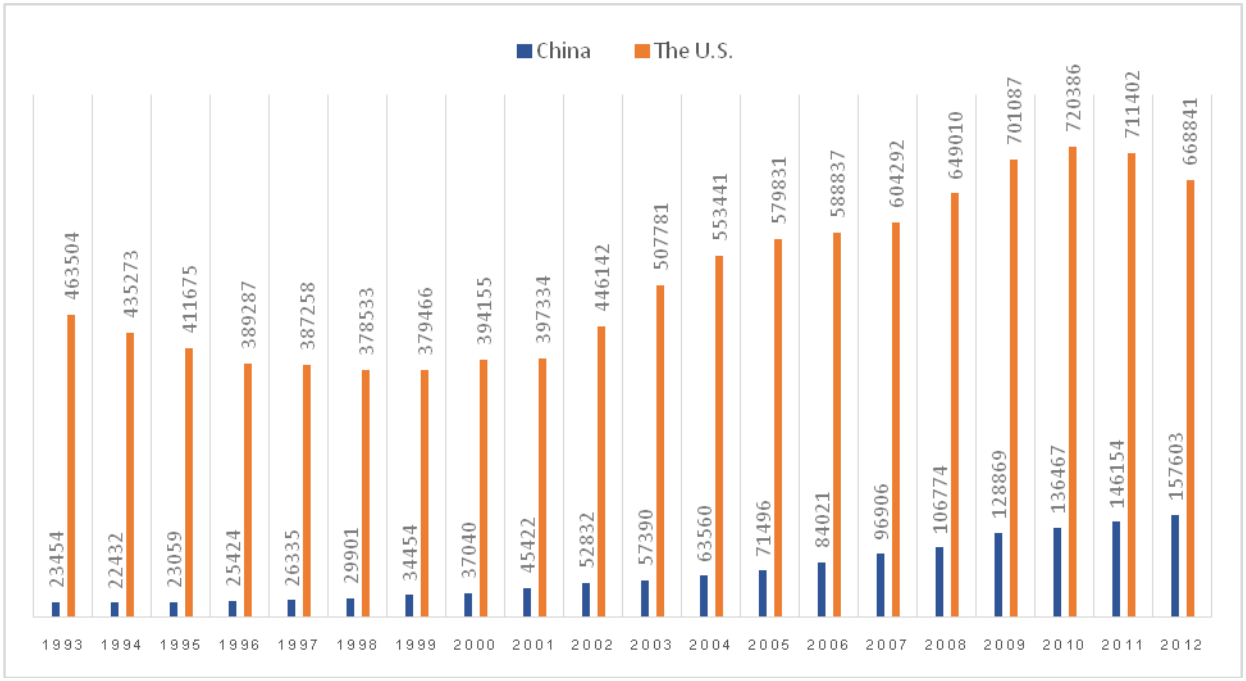
Military Might: Strong, but Still Developing

Apart from the economic growth and development, military capabilities or might is one of the predominant factors in assessing China's CNP. According to the CNP assessment proposed by Huang Shuofeng of the AMS PLA, the CASS or Hu Angang and Men Honghua of Tsinghua University, there are three main components which are taken into consideration: military expenditure, military manpower and the number of nuclear warheads.

Realizing that there is a need for military modernization and force development due to the Four Modernizations and the U.S. vital role in the Persian Gulf War, there was no dramatic increase in China's military expenditure since China had tried to balance economic growth with defense outlay (Mori 2007, 27). Between 1950 and 1980, China's military spending accounted for only 6.35 percent of national income, but significantly reduced to 2.3 and 1.4 percent in the 1980s and 1990s (Shirk 2007, 72). China's military expenditure, however, began to grow after the cross-strait tension and conflicts in the South China Sea in the mid-1990s. The notion of 'Rich Nation, Strong Army' has provided impetus for greater military modernization and force

Figure 2: Military Expenditure of China and the U.S., 1993-2012

Unit: Million USD



Source: Stockholm International Peace Research Institute 2013

development to ensure the regional stability as a precondition for its economic development and, in particular, to protect its core interests or what I call the '2TX interests' (Taiwan, Tibet and Xinjiang).

In spite of the fact that several initiatives, for instance, the New Security Concept in 1996, Jiang Zemin's Five Principles of Peaceful Coexistence and Hu Jintao's Peaceful Development, have been introduced to affirm its stance on pacific dispute settlement and to ensure more stable and peaceful international environment for its development, China's military expenditure, as shown in Figure 2, has been continuously growing more than 10 percent per year in average since 1998. On the Chinese side, it is argued that increasing military spending is in line with the rate of its economic growth. According to the Chinese Defense White Paper, the military budget covers three main categories with an equal proportion of total budget: personnel (such as the salary, food, clothing), operations and maintenance (such as training, construction and maintenance of facilities), and equipment (such as equipment, research and development (R&D), procurement) (Chen and Feffer 2009, 50, 53-54). However, some Chinese experts believed that the priority for militry modenization has been given to relatively weak PLA Navy (PLAN), PLA Air Force (PLAAF) and PLA Second Artillery Force (PLASAF) (Yang 2010, 153; Shirk 2007, 72), as well as to the advancement of its space program as seen in the case of the launch of

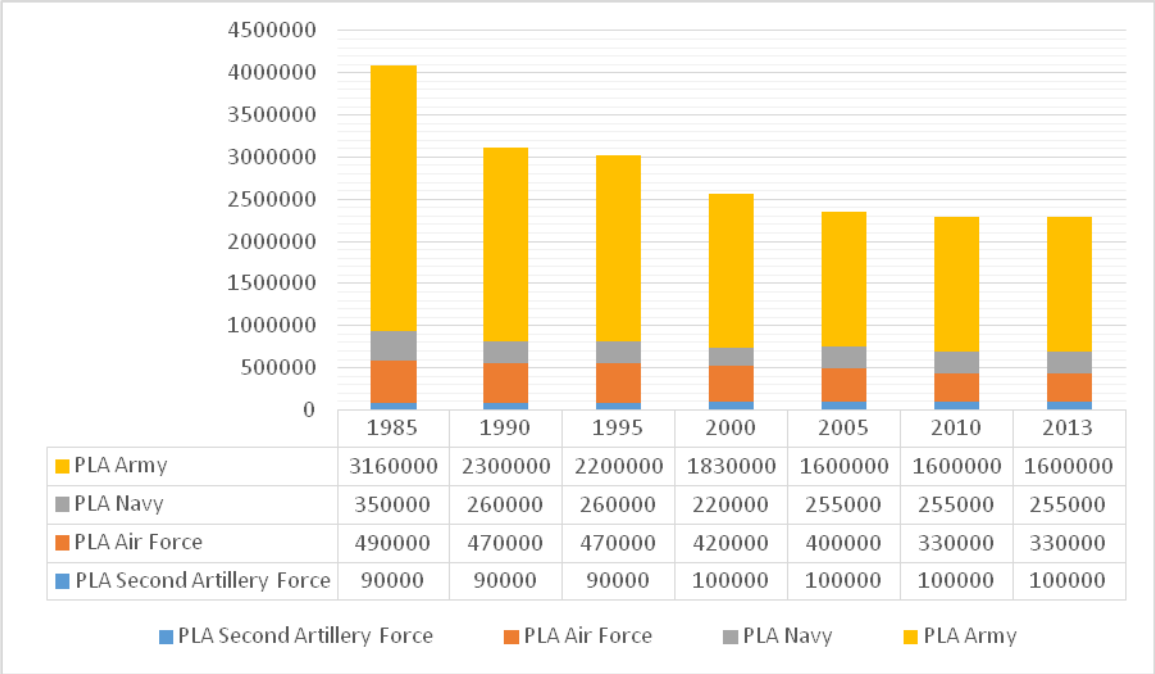
its first lunar orbiter *Chang'e*-1 in 2007 (Chen and Feffer 2009, 57) or the success of the *Chang'e*-3, China's first lunar surface exploration mission in 2013, making it the third country to land a probe on the moon after the Soviet Union and the U.S. In 2007, China destroyed one of its aging weather satellites orbiting 500 miles above the earth by its medium-range ballistic missile, showing its space capabilities during wartime (Zhou 2010, 7).

Despite the high amount of mititary expenditure, outside observers, particularly from the U.S., believe that the figure is underestimated since there are a wide range of military items not typically included in its defense budget as in that of Western countries. Some items are not accounted for in the official military budget, for example, the funds for foreign weapons procurement which are drawn and controlled by the State of Council, not the Ministry of Defense, the People's Armed Police which is partially funded by local governments and the State of Council, or even the provincial spending on military affairs which is not included in the official spending provided by the Ministry of Defense. The RAND Corporation estimates that the total provincial spending on military affairs was approximately USD800 million in 2001. However, China is not the only country where the military expenditure reflects the reality. For the U.S., spending on nuclear weapons fall under the budget of the Department of Energy or the financing of foreign arms sales under that of Department of State, not that of the Pentagon (Chen and Feffer 2009, 54-55).

Whatever the exact figure was for China's military spending, its amount was still far behind the U.S. Chinese force and defense capabilities need to be much modernized and developed. The Chinese PLA Navy (PLAN) is an example. Although China has the largest navy force in Asia, including one *Liaoning* aircraft carrier, 30 destroyers, 79 principal surface combatants, more than 55 submarines, more than 55 medium and large amphibious ships, and 85 missile-equiped small combatants (O'Rourke 2013, 47; Murray, Berglund and Hsu 2013), Chinese navy faces limitations and weaknesses in many areas, including capabilities for sustained operations by larger formations in distant waters, joint operations with other Chinese forces, antisubmarine warfare, mine countermeasures (MCM) (O'Rourke 2013, 3-4).

In contrast with the U.S., China's military spending seems to be not fully allocated for military modernization and force development since a part of it needs to be allocated for maintaining stability and resolving the conflicts within its territory. Xinjiang is a case in point. Due to political instability and conflicts in Xinjiang, some military budget has been allocated by the Chinese central government to maintain the stability and suppress the conflicts in the region, including the support of 120,000 military forces or the *bingtuan* of the Xinjiang Production and Construction Corps (XPCC) and the suppression of the Yining riot in 1995 with more than 20,000 military forces and

Figure 3: The Number of China's Standing Military Manpower, 1985-2003



	1985	1990	1995	2000	2005	2010	2013
PLA Army	3160000	2300000	2200000	1830000	1600000	1600000	1600000
PLA Navy	350000	260000	260000	220000	255000	255000	255000
PLA Air Force	490000	470000	470000	420000	400000	330000	330000
PLA Second Artillery Force	90000	90000	90000	100000	100000	100000	100000

Source: Cordesman, Hess and Yarosh 2013, 84

85,000 rounds of ammunition (Chuwattananurak 2014, 736-737). More importantly, because of the troublesome Xinjiang bordering unstable and conflict-prone Central Asian neighboring countries, the large number of military and police forces seems inevitable. It is believed that the number of PLA Army and People's Armed Police Force (PAP) stations there is around 250,000 to 500,000 (Bachman 2004, 180; Fravel 2007, 724).

Besides the military expenditure, the number of military manpower is incorporated into China's CNP assessment. In 1981, China's standing military manpower stood at 4.5 million (Shirk 2007, 72), but after the Four Modernizations, its manpower was considerably reduced by 1 million in 1987, 500000 in 1997 and 200000 in 2003. As shown in Figure 3, China's military manpower in 2013 stood at 2.285 million, excluding 600,000 People's Armed Police Force and at least 500,000 military reserve forces. Of the total manpower, the PLA Army accounts for more than two-thirds of all PLA forces (around 70 percent) (Cordesman, Hess and Yarosh 2013, 85-86).

With the large number of the military manpower, China's PLA becomes the world's largest military force, accounting for 0.18 percent of the country's total population. However, warfare in the 21st century is changing and will become much more complex. Conventional warfare with the large number of grounded military forces seems outdated. Driven by technological advancement and innovation, robotics, remotely piloted vehicles, artificial intelligence, drones will become key components

shaping the new face of future warfare. One of the greatest challenges for the PLA is not the quantity, but the quality of its manpower. Restructuring of the PLA's personnel system to retain qualified personnel and attract highly-educated recruits is a part of the effort to overcome shortcomings (Cordesman, Hess and Yarosh 2013, 88-89).

Table 2: World Nuclear Forces, 2014

Country	Deployed warheads	Other warheads	Total Inventory
USA	~2 100	5 200	~7 300
Russia	~1 600	~6 400	~8 000
UK	160	~65	~225
France	~290	~10	~300
China	. .	~250	~250
India	. .	90–110	90–110
Pakistan	. .	100–120	100–120
Israel	. .	~80	~80
North Korea	. .	. .	6–8
Total	**~4 150**	**~12 200**	**~16 350**

Source: Stockholm International Peace Research Institute 2014

According to the number of nuclear warheads as one of the key components for China's CNP assessment, as shown in Table 2, it is evident that China's nuclear forces remain far behind other powerful P5 club members, particularly Russia and the U.S. Among the P5 members, China is the only country which possesses none of the deployed warheads, showing its relatively low second-strike capabilities. And most of China's ballistic missiles, including its new long-range strategic intercontinental missiles (ICBMs) DF-5B are liquid-fueled, so it requires several hours to fuel and ready for launch. Also, Chinese missiles, including its new intermediate-range ballistic missiles (IRBMs) DF-26 are not yet precision strike weapons. Assessing one country's true nuclear forces, therefore, comprises at least two, not one, dimensions: one is the possession of a large number of destructive nuclear warheads, the other is the acquisition of precision strike capabilities which can be seen in the improvement of the circular error probability (CEP) of its missiles. For China, its quest for more powerful nuclear power needs to increase both the size and, to a greater extent, sophistication of its strategic missile force. The reasons why Beijing continues to adhere to a 'no first use' (NFU) policy may be derived not only from its defensive nature (Chase 2015), but also from its realization of its nuclear limitaions (Godwin 2000, 18, 23).

Science and Technology: Advanced but not Sophiticated

Apart from being a part of the Four Modernizations, science and technological development is also considered to be one of the major components in the CNP assessment in terms of the proportion of research and development expenditure of the GDP, government expenditure on research and development (R&D), the number of science and technology personnel (such as engineers, scientists, etc.), the number of articles published in science and technology journals and the number of patents.

Science and technology, as Deng Xiaoping once said, are the first productive force (Serger and Breidne 2007, 138). National High-Tech R&D Program or the '863 Program' was therefore initiated in 1986 and has since been on list of priorities in China's Five-Year Plan. With its 10th Five-Year Plan (2001-2005), China aimed to boost its innovation capacity and achieve 'leap-frog' development in six high-tech fields: IT, bio-technology and advanced agricultural technology, advanced materials technology, advanced manufacturing and automation technology, energy technology as well as resource and environment technology (Ministry of Science and Technology of the People's Republic of China 2006). Furthermore, the Guidelines on National Medium- and Long-Term Program for Science and Technology Development (2006-2020), released in 2006, was the first Chinese long-term plan for science and technology development. By 2020, it will have set the proportion of spending on R&D at 2.5 percent of the GDP, 60 percent of science and technology contribution to the country's development, and less than 30 percent of reliance on foreign technology (which later was removed from the plan in 2012) (Bound, et al. 2013, 21). Also, the number of patents issued to Chinese nationals and its academic essays on science and technology are set to be listed as one of the world's top five (The Central People's Government of the People's Republic of China 2006).

Although the pripority was given to spending on R&D or 'R&D intensity' as a component of the CNP assessment, China's expenditure on R&D is still far behind other major powers, especially the U.S. In 2011, China's expenditure on R&D stood at 1.84 percent of the GDP, remarkably less than the U.S. (2.77 percent), Germany (2.68 percent), France (2.24 percent) or its neighbor Japan (3.39 percent) (Beardson 2013, 86). According to the OECD Factbook 2013, although China's average annual real growth in spending on R&D has since 2009 increased close to 20 percent, making it the world's second largest spenders on R&D and ahead of Japan, the U.S. spending on R&D in 2009 remained the top of the world with USD365,994 million, and still higher than that of China and Japan combined (Organization for Economic Co-operation and Development 2013a, 151).

Regarding the number of science and technology personnel, the proportion of the number of China's sci-tech personnel during 2000-2006 increased 9.9 percent per year in average, which is considerably higher than that of the EU (3.1 percent), Japan (1.5

percent), or even the U.S. (1.5 percent). Despite an increase in terms of proportion, the total number of China's sci-tech personnel was only 1.22 million, whereas that of the U.S. and the EU were 1.39 and 1.33 million respectively (European Commission 2008, 51). And while the number of China's scientific publications increased from 3.8 percent of the world's total scientific publications in 2000 to 8.4 percent in 2006, its proportion remained relatively small when compared to that of the EU (37.6 percent) and the U.S. (31.5 percent) (European Commission 2008, 62).

The number of patents is as well incorporated into the CNP assessment. Generally speaking, internationally-recognized high-quality patents need to be filed and registered at all three major patent offices or 'triadic patent families': The European Patent Office (EPO), the Japan Patent Office (JPO) and the United States Patent and Trademark Office (USPTO). Developed by the OECD, the concept of triadic patent families has been designed to improve the international compability and quality of patent-based indicators. According to the OECD concept, China's average growth in the number of triadic patents accounts for more than 15 percent a year between 2000 and 2010. However, the share of triadic patent families originating from China is relatively small. In 2010, there were only 875 triadic patents registered from China, compared to 15,067 from Japan and 13,837 from the U.S. (Organization for Economic Co-operation and Development 2013b, 155).

The increase of spending on R&D, the number of sci-tech personnel, the number of patents and the number of article publications in sci-tech journals, on the one hand, has shown China's impressive success in enhancing science and technology development necessary to evaluate its CNP. On the other hand, China's emerging science and technology advancement is also open to question, notably in qualitative term. Though more than 220 public scientific labs were built in 2008, it is believed that they lacked insufficient funds to conduct research. During 1984-2004, the budget of more than 19 billion Chinese yuan was allocated by the Chinese government to support research activities in scientific labs, but most of it was spent on the salaries and laboratory maintenance. Also, more than 80 percent of spending on R&D was contributed towards product development rather than basic research which accounted for only 5 percent whereas appropriximately 13-19 percent of the expenditure on R&D went towards basic research in the case of Japan, South Korea and the U.S. (Beardson 2013, 90). More interestingly, China's spending on R&D has also been put into question, including the transparency in research funding, the peer review and quality control in scholarly publishing, patron-client relationship and personal connections (Wickham 2012).

The quality of sci-tech personnel also becomes an issue. It is believed that more than half of Chinese engineers are auto mechanics or those who graduate from the two-year vocational education program. Since China stresses quantity over quality, quality in education sacrifices for quantity which eventually leads to a higher

instructor-student ratio and a dramatic decrease in government support for education per one student (Beckley 2011/2012, 64-65). According to the study of Duke University in 2008, it is found that the engineers who graduate from the U.S. are of higher quality than those who graduate from China (Jonquières 2013). The study of the Royal Society of London in 2011 further argued that China faces the brain drain. Between 1978 and 2006, more than 70 percent of all Chinese oversea students or around 1.06 million did not return to China. Despite the 2008 Chinese government-initiated 'One Thousand Talents' scheme, also known as the Recruitment of Global Experts, offering the incentives for the oversea students who return to China by providing residence, health insurance and child welfare education, the problem was partially resolved. More than a half of all Chinese oversea students still seek out work abroad rather than returning to work in their home country (Jonquières 2013). Between 1987 and 2007, around 90 percent of Chinese graduates holding a doctoral degree in science and technology from the U.S. opted to stay and work there. Importantly, they are all Chinese highly-skilled professionals (Beckley 2011/2012, 66).

Questions have also been raised with regard to the number of scientific publications. Despite an increase in the number of publications, China's scientific publications garner 30 percent fewer citations than those from Japan, Hong Kong and Singapore (Beardson 2013, 84). The number of China's scientific publications per 1000 population is still relatively low at 0.2, only 0.05 of which are published in the world's leading scientific journals whereas the U.S. and the U.K. account for 1.6 and 2 respectively, and more than half of which are published in the world's leading scientific journals (Wickham 2012). Importantly, highly intense competition leads to high level of academic plagiarism and misconduct in China. Chinese renowned biochemist Fang Shimin states that in 2007 almost 500 cases of academic plagiarism and misconduct were inspected in China's leading universities (Beardson 2013, 91). Tragically, controversy over academic plagiarism and misconduct results in a bloody attack. Making the list of Chinese academics with faked awards and plagirized publications, including the case of Xiao Chuanguo, a urology professor at Wuhan-based Huanzhong University of Science and Technology, Fang Xuanchang, science editor of *Caijun* Magazine, and Fang Shimin were bloodily attacked by thugs in 2010. Followed by police investigation, Xiao Chuanguo was later identified and sentenced to five and a half months' imprisonment for hiring those thugs to teach both scientists a lesson after they continued to expose his scientific misconduct and question his academic achievements (Geall 2010; Jia and He 2010).

Human Resources: Numbers are Not Enough

Human resources, or what Hu Angang and Men Honghua of Tsinghua University call 'human capital', are one of the predominant factors contributing to the CNP assessment and China's CNP, in particular. Despite differences in assessing the CNP through human resources, there are some human resource indicators commonly used

by Chinese scholars and institutions: population size, total labor force or workforce, life expentancy at birth. In addition, human resources are also related to other indicators incorporated into the concept of the CNP, particularly that developed by the CASS, including level of social development (such as expenditure in education per capita), culture (such as literacy rate), health care (such as health expenditure per capita, the number of physicians per 1000 population) or even economic strength, that is, GDP per capita.

On 16 September 1949, Mao Zedong proclaimed:

> "It is a very good thing that China has a big population … Of all things in the world, people are the most precious. Under the leadership of the Communist Party, as long as there are people, every kind of miracle can be performed … We believe that revolution can change everything, and that before long there will arise a new China with a big population and a great wealth of products, where life will be abundant and culture will flourish." (Mao 1961, 453-454)

While such proclamation does not mean that Mao intended to support population growth or slow down the birth rate (Whyte, Wang and Yong 2015, 147), it is apparent that Mao viewed human resources as the most valuable asset. Combined with the land area of 9.6 million square kilometers and economic prosperity, Mao, as he once said in the Commemoration of Dr. Sun Yat-sen in 1956, believed that China "will have become a powerful socialist industrial country" (Mao 1966, 179-180).

Followed by Mao's strong will and great vision, human resource development has become one of the key priorities for the next generation of Chinese respective leaders. According to the white paper on human resources in 2010, China takes pride in possessing the largest number of the human resources as the world's most populous country. Under the leadership of the CCP, several reforms and policies on human resource development were initiated and formulated. Free nine-year compulsory education is now open to all children throughtout the country to pursue balanced compulsory education and eradication of illiteracy. Funding for rural compulsory education has been financially secured since 2006, and tuition and other related fees have been waived for all urban students undergoing the compulsory education since 2008. In addition, the subsistence allowance system as one of the poverty reduction programs has been implemented, benefiting over 70 million rural and urban residents in 2009. To stabilize the economic growth and development, several laws on human resource development were promulgated such as the 1994 Labor Law of the People's Republic of China to promote employment and create job opportunities, the 2007 Employment Promotion Law of the People's Republic of China resulting in the establishment of the unemployment precaution system and employment aid system, the improvement of public employment service and the promotion of vocational training, or the 2007 Law of the People's Republic of China on Mediation and Arbitration of Labor Disputes to address the labor disputes in a fair, timely and

appropriate manner (Information Office of the State Council of the People's Republic of China 2010).

The success story of China's human resource development can be seen by the statistics provided by the Chinese government. After the nine-year compulsory education program implemented since 2000, the illiteracy among people aged between 20 and 50 was eliminated, while in 2009 the number of senior middle school students amounted to 24.3428 million, and the mean years of schooling of the people aged above 15 years old increased by 8.9 years and that of working population by 9.9 years. In addition, the rural population living in poverty by 2009 were reduced to 35.97 million. Between 2005 and 2009, more than 50 million jobs were created by the government for urban residents, and more than 45 million rural workers were transferred to non-agricultural sectors. By 2009, the unemployment rate was 4.3 percent and the number of registered unemployed urban workforce was around 9.21 million. For the health care, by 2009, there were 289,000 medical institutions throughout China with 5.22 million medical personnel and 3.96 million hospital beds. (Information Office of the State Council of the People's Republic of China 2010). The question is: with the success story of China's reforms and policies on human resource development, to what extent was China's CNP relative to other major powers, including the U.S. in particular?

The U.S. Population Reference Bureau found that in 2012, China was and, definitely, remains the world's most populous country with 1.35 billion people, followed by India with 1.26 billion and the U.S. with 314 million, whereas Russia and Japan ranked ninth and tenth with 143 and 128 million respectively. By 2050, it is estimated that the population size of India with 1.691 billion will surpass that of China with around 1.311 billion, followed by the U.S. with 423 million. It means that China's population size is still among the world's top at least until the year 2050 (Population Reference Bureau 2012).

China also possesses the world's largest number of total workforce. In 2012, China's working population aged between 15 and 64 was 787.6 million, followed by India (677.5 million), while the number of working population in the U.S. and Japan was 158.6 and 65.3 milion respectively. As shown in Table 3, China's workforce (aged between 15 and 64) accounts for 73 percent of total population, while its dependency ratio remains low to the same extent as South Korea. It shows that China has potential workforce as one of the driving forces of its economic growth and development.

However, seeing China' human resource development through numbers is not comprehensive. In fact, China is still far behind other countries, particularly other major powers in qualitative term. According to the Human Development Index (HDI) value (i.e. the components of life expectancy, educational attainment and income)

Table 3: Population Age Composition and Dependency Ratio, 2012

Country	Population Age Composition (%)			Dependency Ratio (% of working-age population)	
	Ages 0-14	Ages 15-64	Ages 65+	Young	Old
China	18	73	9	25	12
The U.S.	20	67	14	29	20
Japan	13	62	24	21	39
South Korea	15	73	12	21	16
Germany	13	66	21	20	32
The U.K.	18	65	17	27	26
India	29	65	5	45	8

Source: World Bank 2013f

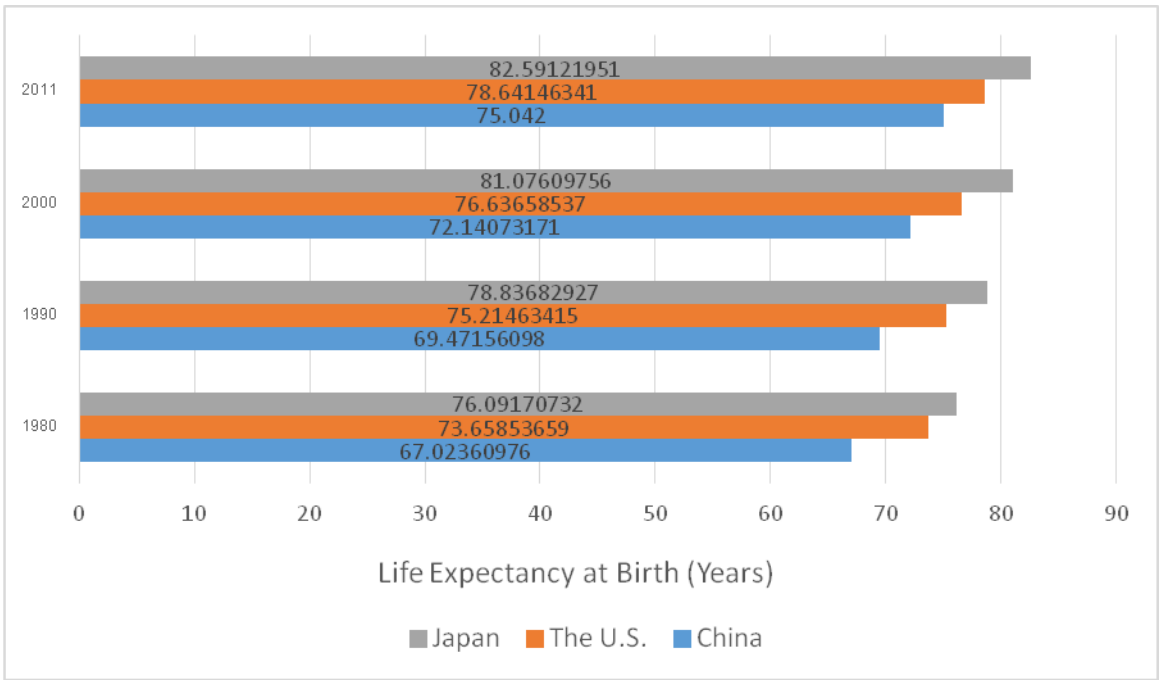
which appeared in the 2013 United Nations Development Programme (UNDP) Human Development Report, in 2012, Norway ranked first as the highest human development in the world, whereas the U.S., Germany and Japan ranked third, fifth and tenth respectively. While South Korea and Hong Kong ranked twelfth and thirteenth, China, in contrast, ranked 101th to the same extent as other developing countries, including Thailand and Maldives (United Nations Development Programme 2013b, 144-145). By the HDI index value, it suggests that China's human resource development remains relatively low.

As mentioned earlier, although the GDP growth makes China become the world's second largest economy, its GDP per capita is another story. China's GDP per capita has tremendously increased over the last two decades from US949 in 2000 to US1,731 in 2005 and US6,091 in 2012 but the GDP per capita of the U.S. in 2012 was US51,748 or nine times higher than that of China (World Bank 2013b). Furthermore, between 2002 and 2011, more than 13.1 percent of total population or around 176 million Chinese people living below the international poverty line with US1.25 a day. Among them, there are around 4.5 percent or 60 million people living in severe poverty (United Nations Development Programme 2013b, 160-161).

For the educational attainment, the proportion of the U.S. population receiving higher education is larger than that of Chinese population. Between 2002 and 2011, the proportion of the U.S. population receiving higher education was 94.8 percent, while that of China was only 25.9 percent. In 2010, 94.5 percent of the U.S. population aged above 25 years old completed the secondary education program, whereas it was 62.7 percent for the Chinese population. The literacy rate of the total Chinese population aged above 15 years old between 2005 and 2010 was 94.3, lower than that of population in some developing countries such as the Philippines, Cuba or Mongolia (United Nations Development Programme 2013b, 170-173). Furthermore,

according to the QS World University Rankings in 2013, it should be noted that most of the top 100 universities in the world were from the U.S., while merely three Chinese universities were ranked among the top 100, that is, Peking University (46th), Tsinghua University (48th) and Fudan University (88th) (Quacquarelli Symonds 2013). Without doubt, the U.S. is still regarded as the best destination for oversea students to further their studies. In 2010, there were more than 684,000 oversea students studying in the U.S. whereas only 71,000 in China, fewer than the U.K., Australia, France, Germany or Japan (United Nations Educational, Scientific and Cultural Organization 2012, 130-132).

Figure 4: Life Expectancy at Birth of China, the U.S. and Japan



Source: World Bank 2013d

Not only is the life expectancy at birth included as one component of the HDI Index developed by the UNDP but also the CNP developed by Chinese scholars and institutions, noticeably the CASS. According to Figure 4, the life expectancy at birth of the Chinese population has continuously risen from 67 years in 1980 to 72 and 75 in 2000 and 2011 respectively, while the life expectancy at birth of the U.S. one is not significantly changing. The life expectancy at birth of Japanese population in 1980 was still higher than that of Chinese counterpart in 2011.

Apart from the life expectancy at birth, the quality of health care can be mirrored by health expenditure per capita and the proportion of physicians per 1000 population. In 2011, China's health expenditure was only 5.2 percent of GDP or US278 per capita,

while the U.S. health expenditure was 17.9 percent of GDP or UD8,608 per capita, making it the highest in the world. Between 2006 and 2011, the proportion of physicians per 1000 population in the U.S. was 2.4, while that of China was 1.8, less than that of some developing countries, including Egypt, Jordan, Kazakhstan, Libya or Mongolia (World Bank 2013g; United Nations Development Programme 2013b, 166-169). Together with the life expectancy at birth, these statistics indicate that China needs to work much harder to improve its health care and extend the quality of life of its population. Comparing to gross domestic savings of the U.S. (14-15 percent) and Japan (20 percent) between 2006 and 2012, China's high gross domestic savings accounted for more than 50 percent of GDP per year in average (World Bank 2013c). However, since more than 60 percent of the Chinese total population must take their own responsibility for financial burden of medical care (Beardson 2013, 148), it is believed that some of their savings portion must be allocated and prepared for this matter.

Access to improved water source and improved sanitary facilities also needs attention. The proportion of Chinese population accessible to improved water source rose from 67 percent in 1990 to 92 percent in 2011. However, its percentage is relatively low when compared to other countries, particularly the developed ones where the whole population is accessible to improved water source since 1990. The proportion of Chinese population accessible to improved sanitary facilities is larger, from 24 percent in 1990 to 65 percent in 2011, but still small as more than 90 percent or all people living in developing and developed countries are able to access to those facilities (World Bank 2013h).

On the one hand, China's human resources have the considerable advantage of the largest number of population size and that of workforce. On the other hand, there are several challenges to its human resource development and, to a greater extent, population, ranging from the education, health care, economic well-being to quality of life. In addition, there are at least two future challenges which need to be addressed among Chinese people and leaders in particular. First, gender imbalance in China is becoming more serious, resulting from the 1979 One-Child Policy and attitudes towards son preference. According to the study in 2009, it found that the sex ratio at birth of boys to girls is 124:100, while the global sex ratio at birth is 103-107 boys to 100 girls (Beardson 2013, 201). Due to this demographic trends, Chinese men, especially uneducated, economically disadvantaged ones, will have more difficulties finding their brides. By 2030, it suggests that more than a quarter of Chinese men in their late 30s will never get married (Lee 2011). Second, if the life expectancy at birth of the Chinese population continues to rise rapidly, China will become an aging society sooner than anticipated. In 2000, the dependency ratio of working population aged 15 to 64 to senior population aged above 65 is 9.1:1 but, by 2030, projection says that the ratio will be decreased to 3.7:1. As long as China maintains its population growth rate as many analysts forecast, the size of Chinese population aged above 65

will be larger than the total population size of the U.S. by 2040 (Beardson 2013, 146-147; Leung and Xu 2015, 46), indicating that China will be getting older before getting rich.

Natural Resources and Environment: High Gain, High Risk?

Natural resources, like many other components, play a vital role in the concept of CNP developed by the CASS, Hu Angang and Men Honghua of Tsinghua University and the CICIR by assessing the total land areas, agricultural or arable land areas, forest areas, mineral resources such as iron, copper, aluminum, as well as energy resources such as coals, crude oil, natural gas and hydro power.

China possesses 9.6 million square km. of total land area, ranked fourth after Russia, Canada and the U.S. (World Bank 2013e). Additionally, according the Chinese official land use survey in 2007, China had 121.7352 million hectares of arable land area, 236.1174 million hectares of forest area, 11.8131 million hectares of garden land, 261.8646 million of pastureland, 26.6742 million hectares of land for residential and industrial/mining sites, 2.4443 million hectares for transportation and communications, 36.286 million hectares of land for water conservation, leaving the land area around 200 million hectares unused (Ministry of Land and Resources of the People's Republic of China 2010).

China is also a country with abundant natural resources. Apart from being the home of the world's most abundant hydro power, China possesses more than 171 kinds of mineral resources, 159 kinds of which have already been identified. Among 159 kinds, 10 are energy resources (such as crude oil, natural gas, coal, uranium), 54 are metallic minerals (such as iron, manganese, copper, aluminum, lead, zinc), 92 are nonmetallic minerals (such as graphite, phosphorous, sulfur), including mineral water and groundwater sources (Ministry of Land and Resources of the People's Republic of China 2010). Also, China may possess the world's largest number of coal with more than 1 trillion tons, accounting for one-sixth of global total (Peng, Pan and Yu 2009, 343). Crude oil reserves with approximately 25.58 billion barrels have been identified, making China in the world's twelfth, whereas the U.S. has around 20.68 billion barrels of crude oil. China is ranked eleventh with a rough estimate of 3.517 trillion cubic meters of natural gas while Russia is ranked first with 47 trillion cubic meters and the U.S. fourth with 9.459 trillion cubic meters (Central Intelligence Agency 2014).

Besides, China has two of the ten longest rivers in the world, the Yangtze and the Yellow River. As the longest river in China and third in the world, the Yangtze River stretches across the country for more than 6,300 km. from the Qinghai-Tibet Plateau to the East China Sea. The prosperous Yangtze River Delta is located in the heart of China Proper including Shanghai and major cities in Zhejiang and Jiangsu Province such as Nanjing, Wuxi, Hangzhou. Importantly, the Yangtze River is the source of the

world's largest hydropower Three Gorges Dam. China is also the home of the world's ancient river valley civilizations – the Yellow River valley civilization. Originated in Qinghai Province, the Yellow River runs through the northern part of China with 5,500 km. in extent. While the Pearl River is the third longest river in China, several robust and dynamic economic zones are located in the Pearl River Delta, including China' first special economic zone – Shenzhen (Dillon 2009, 4-6). As the source of the Mekong River, which runs through mainland Southeast Asia, China could play a dominant and catalytic role in controlling the water source and managing the cooperative mechanisms with other riparian countries by its defined national interests and objectives.

Assessing China's CNP through its abundant natural resources, large land area and sources of main rivers shows that China is second to none. However, there are some weaknesses within its strengths. While the vast land area of China is as much as that of the U.S., its entire population is four times larger than the U.S. The question is whether the resources are sufficient to meet the Chinese entire population's basic needs and sustainable development in the foreseeable future? The answer is simple: 'No'.

According to the 2012 China Ecological Footprint Report made by the World Wide Fund for Nature (WWF), China's total Ecological Footprint accounts for 2.9 billion global hectares (gha), the largest in the world, due to its large population size. However, China's per capita Ecological Footprint in 2008 was merely 2.1 gha, lower than the world's average Ecological Footprint of 2.7 gha per person and considerably lower than the U.S. of 7.2 gha per person. Furthermore, China's demand for renewable resources has long exceeded its ability to meet that demand by its own since the early 1970s because China's per capita Ecological Footprint was 2.5 times higher than its per capita biocapacity of 0.87 gha (World Wide Fund For Nature 2012, 12), causing China's quest for energy sources, raw materials and natural resources around the world to maintain its economic growth and development.

China's energy use is a case in point. China's per capita oil consumption remarkably rose from 767 kg. in 1990 to 2,209 kg. in 2011, resulting in its total oil consumption which increased from 0.87 million metric tons in 1990 to 2.727 million metric tons in 2011 exceeding its production capacity of 2.432 million metric tons in that year (World Bank 2013j). Furthermore, China's total energy consumption between 1978 and 2006 increased 4.3 times from 570 million tons to 2.46 billion tons. In 2006, China's coal consumption accounted for nearly 70 percent of its total energy consumption, noticeably higher than the world's average coal consumption of 25 percent (Peng, Pan and Yu 2009, 345). Not only will China's hunger for energy sources pose a serious challenge in its energy security due to its more dependence on foreign sources of energy, heavy coal consumption also poses serious risks to its environment and people's heath.

Air pollution is one of most serious environmental impacts in China which has not yet been calculated in China's CNP assessment. To some extent, heavy coal consumption in heavy industry sectors and electricity generation causes particulate matter pollution in China. Several major cities in China are facing the particular matter (PM) pollution with the concentration of PM10 (particles 10 micrometres in diameter or less) at dangerous level, particularly iron and steel producing Panzhihua city in Sichuan Province, where the concentration of PM10 reaches a peak of 255 micrograms per cubic meter. Beijing, Chongqing and Shanghai also have the high concentration of PM10 at 150, 140 and 100 micrograms per cubic meter respectively, whereas the concentration of New York City and the City of Los Angeles, the largest and the second largest cities in the U.S., is at 25 and 45 micrograms per cubic meter respectively. Inhaling excessively high concentration of particulate matter can be hazardous to health and leads to decreased lung function, increase respiratory symptoms and aggravated asthma resulting in bronchitis and other pulmonary diseases (Gallagher 2009, 98-99). Although the concentration of PM10 in Beijing, Shanghai and Chongqing reduced to 72, 59 and 98 micrograms per cubic meter in 2010, its concentration level is still at risk and higher than that in other major cities in the world, including Sydney, Paris, London, Chicago or even Bangkok (World Bank 2013i).

Acid rain caused by sulfur dioxide (SO2) emissions from coal-fired power plants also damage crops, threatening China's food security. More than 20 percent of crops grown in Hubei Province has been affected to the same extent as Hunan and Shandong Province. More than 80 percent of affected crops are food crops. In 2001, several cities in China had the relatively high concentration of SO2 at dangerous level, particularly the concentration of SO2 in Guiyang, capital of Guizhou Province, and Chongqing was 424 and 340 micrograms per cubic meter respectively, whereas that in other major cities in the world did not exceed 30 micrograms per cubic meter (World Bank 2013i). There is an estimate that a lot of damage to China's environment and its people's health due to excessive levels of air pollution per se caused an economic loss of around US16 billion a year (Peng, Pan and Yu 2009, 349).

Economic loss is not only incurred by air pollution, but also by soil erosion, serious flooding and decreasing wetland areas. China is facing the problem of soil erosion covering more than 3.56 million square km. or around 37 percent of its total land area. China has also suffered from serious flooding. Since the 1990s, serious flooding has caused an economic loss of over US150 billion. In the year 1998, serious flooding along the Yangtze River resulted in an economic loss of over US37 billion. Decreasing wetland in China is also at risk. Even though China has a large number of wetland areas, its wetland areas have substantially been decreasing over the last few decades, particularly the decrease of the lake areas of 1.3 million hectometers or around 13,000 square km. To put it simply, there are around 20 lakes in China that are about to disappear a year (Peng, Pan and Yu 2009, 341).

Despite the total land area of 9.6 million square km., it should be noted that more than 27 percent of China's total land area or around 2.59 million square km. is covered by deserts, and the effects of desertification has gradually increased. It is believed that more than 3,625-6,500 square km. has been recently swallowed by the encroaching Gobi desert a year and more than 400 million people are suffering from the effects of desertification, including the problem of ecological refugees (Beardson 2013, 173). China's capital, Beijing, with a population of over 20 million, not only suffers from the sandstorms from Gobi desert in the spring every year, it is being gradually threatened by the encroaching desert in the north-west, only 70 km. away from Tian'anmen Square. Although there are many repeated attempts to tackle such challenges, including planting more than 40 billion trees across northern China, only 20-30 percent of those trees survived and will not last long (People's Daily Online 2002; Spencer 2006).

Also, China is facing a serious challenge in addressing growing clean water shortages and land subsidence. Despite its abundant water sources, more than 300 cities out of 668 cities in China are suffering from clean water shortages. Of 300 cities, 80 cities are facing severe clean water shortages and 60 cities are confronting critical shortages of clean water. There is an estimate that clean water shortages caused an economic loss around 3 percent of China's total GDP. By 2030, the average annual water shortage in China is estimated to be 20 billion cubic meters. Furthermore, China has experienced widespread land subsidence in more than 50 cities, including Beijing and Shanghai, due to urban growth, depletion of groundwater and excessive exploitation of underground water. Land subsidence has led to damage of buildings, bridges, underground pipelines and dysfunction of urban drainage system. Beijing has subsided more than 75 centimeters over the last four decades and continues to sink at an average rate of 2 centimeters per year. Land subsidence in Shanghai is much more critical than that in Beijing. Over the last four decades, Shanghai has subsided more than 2 meters. In the year 1985, land subsidence damaged buildings in Shanghai with an estimate of US170 million (Hofstedt 2010, 72-73; China Daily 2012). Needless to say, economic losses or negative consequences incurred by environmental impacts and rapid and unbalanced economic growth and development have never been calculated in the concept of the CNP and China's CNP, in particular.

IV. Implications for the Rise of China

The rise and fall of great powers has been one of the central debates among international relations students and scholars. China is no exception. The rise of China, and whether it can peacefully find its place in regional order or on the world stage, becomes one of the most important issues in today's international politics.

The rise of China can be viewed from different angles of perspectives. Divided into three schools of thought, as Jae Ho Chung (2015, 2-3) states, the first school – the 'Confident School' – asserts that China's rise is inevitable and its ascendancy will challenge the U.S. preponderance both regionally and globally. The question as to whether the U.S. and, to a lesser extent, other states in the region should accommodate, slow down or balance against China then becomes the thematic debate in this school (see Mearsheimer 2001; Kang 2007; Ross and Feng 2008). The second one is the 'Pessimist School', arguing that China is facing both domestic challenges and external constraints which perhaps make it unlikely to compete with or replace the U.S. in this century (see Beardson 2013; Fenby 2012; Islam 2009; Link, Madsen and Pickowicz 2013; Zhou 2010). And the last school is the 'Not-Yet/Uncertain School', positing that although China has immense potentials to be a great power or 'a challenger' to the U.S., its willingness to take the leadership role as a great power is uncertain or seemingly falls short of expectations (see Zhao 2013; Shirk 2007).

I argue that to understand the rise of China through its CNP, together with its challenges and negative consequences, neither school of thought can be neglected. As the first school asserts, China's rise is promising. Its material capabilities in quantitative terms are second to none. China's CNP - continued economic growth and huge size of economy, largest population size, abundant natural resources, advanced science and technology and growing military buildup - makes it worth earning a great power status and, to a greater extent, a would-be challenger to the U.S. While Beijing's challenge to the U.S. global interests is unclear and remains controversial, it is quite certain that Beijing's position in East Asia is rather strong. As a regional power, like David C. Kang (2007, 4) argues, East Asia states, except Taiwan, want to see China strong rather than weak. To them, Beijing is a regional stabilizer. However, perceiving China as a challenger to or a strategic competitor with the U.S. is overstated.

As argued in the previous section, understanding China's CNP through the assessment formulas developed by some Chinese scholars and institutions is only a half story. Its CNP must be calculated not only from what it would benefit, but also from what it would have to pay the price. The 'Pessimist School' can picture this point. Challenges and negative consequences are derived from its unbalanced economic growth, rapid urbanization, uneven development between coastal and inland China such as income equality, rural-urban divide and environmental degradation. Furthermore, China's CNP in qualitative terms is questionable. While its economic growth and GDP is impressively high, its GDP per capita is relatively low. Overreliance on FDI makes China's economy more dependent and vulnerable. For military defense, even though China is a nuclear state, its nuclear force is still far behind other P5 nuclear states in both quantity and quality. Quality in science and technology also becomes an issue in terms of the qualification of sci-tech personnel, the expense of research budget and the low number of sci-tech publications per 1000

population. Human development index (HDI) in China is worrying as shown in terms of educational attainment, the quality of health care and access to freshwater source. These indicate that China, in some aspects, is not strong as much as it is seen. What China would have to pay the price to tackle challenges and negative consequences, either intended or unintended, is suggested to be incorporated into China's CNP assessment.

China's CNP also reflects the assumptions proposed by the last school of thought – the 'Not-Yet/Uncertain School'. As stated in the State Council's white paper on 'China's Peaceful Development' on 6 September 2011, China's core interests include state sovereignty, national security, territorial integrity and national reunification, China's political system established by the Constitution and overall social stability, and the basic safeguards for ensuring sustainable economic and social development (Information Office of the State Council of the People's Republic of China 2011). Above all core interests, the survival of Chinese Communist Party (CCP) regime is both a prerequisite and a priority to pursue the rest, while the continued and peaceful economic development, territorial integrity and national unification including Tibet, Taiwan and Xinjiang are regarded as the foundation of the CCP regime's survival and legitimacy. With such narrowly defined core interests, Chinese leaders are noticeably occupied more with its regime survival and territorial integrity than with its greater global aspirations. China's military might is a case in point. Protecting and pursing its core interests are Beijing's primary priority for military buildup. Unlike the U.S., China's military capabilities, even growing, remain limited into the territorial and near water defense strategy. China's military operations still focus on its coastal and disputed waters, including South China Sea. Realization of its nuclear force with no deployed warheads and the need for improvement of its precision strike capabilities also reflects its limitations when compared to other nuclear powers, especially the P5 members.

Despite limitations of its CNP in various aspects, particularly in qualitative term, it is undeniable that China is now a great power. Wielding veto power as a permanent member of the UNSC, China has since 1971 relied on the UN in promoting its international standing, particularly its stance on the coexistence of different social and political systems with respect to the principle of sovereignty and noninterference. Even though China has not yet taken a broad international responsibility as one of visionary and leading global players, its narrowly defined core interests and domestic challenges are not supposed to be a major rationalization of not taking any crucial and responsible role in the global affairs. Facing environmental degradation and air pollution in its domestic realm, in 2010, China became the world's largest emitter of greenhouse gases, including carbon dioxide, methane and nitrous dioxide (World Bank 2013k). In 2012, China was the world's largest contributor to carbon emissions from fossil fuel and industrial productions, accounting for a quarter of global carbon emissions or equivalent to carbon emissions from both the U.S. and the EU combined

(Zhu 2015). My contention is that China can take a greater and more responsible role in mitigating the climate change with other major powers, including the U.S. China's commitment, together with the U.S., to tackle the climate change as reaffirmed in the U.S.-China Joint Presidential Statement on Climate Change during President Xi's State Visit to Washington, D.C. in September 2015 (Office of the Press Secretary of the White House 2015). This is a good example for China to take such a leading role as a great power.

V. Conclusion

This paper explores the concept of the CNP proposed and developed by Chinese scholars and institutions. Although soft power or non-material capabilities, which had been often neglected by previous Western national power assessment formulas, were incorporated into the concept and the CNP assessment, I argue that such CNP concept, with the different kinds of CNP assessment formulas, is not 'comprehensive' as it should be. Taking China as a case study, challenges and negative consequences derived from what China would benefit for its CNP assessment such as economic growth, rapid urbanization or science and technology development have not been properly taken into account and systematically calculated or measured into the CNP assessment. Economic losses due to those challenges and negative consequences are what China would have to pay the price that we cannot ignore or turn a blind eye. The revision of the CNP concept and the reassessment of China's CNP are then crucial. This paper also examines the implications for the rise of China through China's CNP as well as its challenges and pitfalls. Theoretically speaking, China is not a great power without reservation. With rapid and remarkable economic growth and development, advanced science and technology, growing military power, huge population size and land area and abundant natural resources, China becomes one of the key players in the global affairs, and to a greater extent, a regional stabilizer in East Asia. However, despite its narrowly defined core interests and complex domestic problems and challenges which may restrict its active and visionary role as a great power on the world stage as expected, China should not use these constraints as an excuse to be reluctant in taking a greater responsibility as a rising global power in today's interdependent world with complex and multifaceted problems and challenges.

According to Zhimin Chen, no major CNP assessment has been made since 2010 and he urged Chinese scholars or someone to do an updated systematic assessment in order to measure China's current power status (Chen 2015, 279-280). I totally agree with him and further add that economic losses and negative consequences of which China would have to pay the price should be incorporated into such updated systematic assessment as well.

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