THE POLITICS AND POLICY OF GREEN GDP: A FOCUS ON THE IMPLEMENTATION OF NATURAL CAPITAL ACCOUNTING IN COSTA RICA AND CHINA

by

Victoria Elise Baxter

Thesis Supervisor

_____

Dianne Rahm, Ph.D.
Political Science

Approved:

_____

Heather C. Galloway, Ph.D
Dean, Honors College

THE POLITICS AND POLICY OF GREEN GDP: A FOCUS ON THE IMPLEMENTATION OF NATURAL CAPITAL ACCOUNTING IN COSTA RICA AND CHINA

HONORS THESIS

Presented to the Honors College of
Texas State University
in Partial Fulfillment
of the Requirements

for Graduation in the Honors College

by

Victoria Elise Baxter

San Marcos, Texas
May 2017

TABLE OF CONTENTS

Page

ABSTRACT

The gross domestic product (GDP) is the traditional method of calculating the economic worth of a country. Despite its common usage, it is not a reliable way to evaluate the long-term economic standing of a state. GDP only measures the income portion of a nation's performance and fails to take into account relevant externalities, such as the environmental costs of production. A way to resolve this issue is by using natural capital accounting to acquire green GDP (GGDP). The United Nations System of Environmental Economic Accounting (SEEA) has already developed guidelines for the implementation of GGDP. They have partnered with The Wealth Accounting and Valuation of Ecosystem Services (WAVES) to create sustainable development through widespread natural capital counting. Using information from both SEAA and WAVES, this thesis analyzes the past and current implementation of GGDP in Costa Rica and China. Findings suggest that implementation has been incredibly successful in Costa Rica, which focused primarily on building forest and water accounts. Through these accounts, the economic value of standing forests and clean water has been realized, which has led to the reversal of deforestation, and an increase in carbon sequestration. In China, the GGDP initiative initially failed after overseers realized how degrading the program would be to the nation's GDP and how complicated implementation would be. Fortunately, this realization has led to a new sweep of environmental initiatives that have been successful in reversing environmental

damage throughout the country. In recent years, the Chinese government has attempted to reimplement the program more successfully.

Methodology:

This thesis is based on a comparative case study between Costa Rica and China, as they have done the most to implement natural capital accounting and GGDP programs. Analysis of the two states is beneficial given how successful Costa Rica has been and how unsuccessful China has been. In studying both programs, it is easier to see why the program worked better in some areas than others, and then try to determine why. Although it is difficult to directly compare Costa Rica and China due to the differences in resources, population, industry, and types of government in each country, the analysis of the two is important. In the case of Costa Rica, the data focuses mostly on water and forests. For China, the data focuses only on surface water and air pollution. This thesis compares each country in the following categories: environmental background, history of green gross domestic product implementation, and the results that each country attained. The information used in this thesis was primarily found in resources from the United Nations, the WAVES program, and data from the government agencies of Costa Rica, China, and the United States.

Introduction:

Natural capital provides humans a variety of services, which are sometimes called ecosystem services; these services make human life on Earth possible. Natural capital not only includes natural resources, such as minerals and oil, but also includes land, food, and water. Other important services that natural capital provides include climate regulation, flood protection, carbon storage, and pollination done by insects. These services and more are considered essential to the long-term sustainability of a country's economy.[1] Natural capital accounting is a way of assigning fiscal value to environmental assets so that they are considered in national spending reports. If all countries practiced natural capital accounting, the world economy would be much more sustainable.

Natural capital supports human and financial capital. When climate change, overpopulation, or pollution threatens nature, the economy is threatened as well. In the past, natural capital has been considered "free," which causes nature's benefits to be taken for granted.[2] Currently, the GDP is not a reliable way to look at the long-term economic standing of a country because it does not take into account several factors, thus providing a misleading idea of a country's wealth.

---

[1] "Environmental and Resource Accounts: Frequently Asked Questions." Government of Canada, Statistics Canada. August 21, 2015. Accessed November 20, 2016. http://www.statcan.gc.ca/eng/nea/faq/env.

[2] "Valuing and Accounting for Natural Capital." Conservation International. 2016. Accessed January 1, 2017. http://www.conservation.org/projects/Pages/Valuing-and-Accounting-for-Natural-Capital.aspx.

GGDP calculated through natural capital accounting provides a more informed, and thus a more balanced, idea of a country's economic standing.

Green GDP:

GDP = Consumption + Investment + Government Spending + (Exports-Imports)

Green GDP = GDP - Environmental Costs - Social Costs

GGDP is a measure of economic growth that factors environmental consequences into a country's conventional GDP. Currently, the GPD looks at only the income portion of a nation's performance, meaning that it measures the contribution of the environment to national wealth and treats the depletion of natural resources as current income rather than capital depletion. In other words, GDP often measures the benefits of environmental degradation, but almost never the costs.[3] For example, when a nation exploits its minerals, fresh water, or fisheries, it's actually depleting its wealth; these declining assets are invisible according to the national GDP.[4] Therefore, relying on GDP to independently assess the economy of a country can be misleading, as countries can grow in the

[3] "Environmental and Resource Accounts: Frequently Asked Questions." Government of Canada, Statistics Canada. August 21, 2015. Accessed November 20, 2016. http://www.statcan.gc.ca/eng/nea/faq/env.

[4] "Natural Capital Accounting." The World Bank. March 31, 2016. Accessed November 20, 2016. http://www.worldbank.org/en/topic/environment/brief/environmental-economics-natural-capital-accounting.

short run by using their natural capital, but this endangers their long term ability to thrive economically.[5]

The economic invisibility of large parts of the environment is a leading reason why countries are losing their ecosystem services. Accountants consider ecosystems and biodiversity to be externalities, so they are not apparent within market structures. Public benefits from the environment often go unnoticed and undervalued due to a lack of market prices for them, which leads to actions that result in loss of natural capital. Timber, for instance, is counted in national accounts, but the other services that forests can provide, such as air filtration and carbon sequestration, are uncounted. Businesses' negative externalities must be measured and reported so that they may be managed appropriately. A study done by TRUCOST, a company that provides sustainability data to businesses, estimated that the environmental externalities for the top 3,000 companies were approximately $2.5 trillion per year, which is equivalent to 7% of their turnover and 33% of their profits.[6] None of this is accounted for or managed due to its status as an externality.[7]

---

[5] "Rio 20: Natural Capital Accounting and the Wealth of Countries." World Bank. June 15, 2012. Accessed November 20, 2016. http://www.worldbank.org/en/news/feature/2012/05/30/rio-20-natural-capital-accounting-feature.

[6] Trucost. Accessed November 20, 2016. www.trucost.com

[7] "Our Planet." UNEP. September 2010. Accessed November 20, 2016. http://www.unep.org/pdf/OP_sept/2010/EN/OP-2010-09-EN-FULLVERSION.pdf.

Natural capital accounting would help make the world's growth sustainable by balancing our environmental budget. Natural resources are critical assets, particularly in developing countries where they comprise around 36% of total wealth. Natural capital accounts can help countries that are rich in natural capital design a strategy for resource management that will maximize economic growth while balancing it with environmental tradeoffs.[8] Benefits such as flood protection and groundwater recharge will add to a country's GDP, giving them incentive to protect their natural assets. These incentives would function similarly to how the current carbon emissions market functions. Due to the creation of an emissions market, value has been attached to carbon emissions. Companies can buy and sell them in the market, giving them a reason to become more efficient so they can sell their surplus emissions credits and make a larger profit. Services provided by natural capital could enter the market in a similar way.

A History of GGDP:

The natural capital accounting framework has a global history of over 50 years, but was popularized by William Nordhaus in 1972. Nordhaus, as well as James Toben, argued that gross domestic product was not a reliable indicator of a country's well-being. Their work addressed the assumption that there are no limits to the nonhuman agents of production. Further, they argued that states encourage wasteful behavior in business and should incentivize conservation by

[8] "Natural Capital Accounting." World Bank. May 20, 2015. Accessed November 20, 2016. http://www.worldbank.org/en/topic/environment/brief/environmental-economics-natural-capital-accounting.

promoting natural capital accounting.[9] In 1989, Yusuf Ahmad of the U.N. Environmental Programme, addressed the topic again in a World Bank symposium. He argued that measuring sustainable income was not only a necessity for states, but that the United Nations System of National Accounts should reflect issues of environmental and economic concern.[10] In 1989, Robert Repetto stated that the degradation of natural resources in developing countries stems not only from large projects, but primarily from small agricultural operations that were harder to track. He argued that the best way to prevent these small-scale harmful agricultural operations was for governments to establish economic policies that would incentivize resource conservation.[11]

According to the research done by Nordhaus, Toben, and Ahmad, implementing natural capital accounting around the world would address statistical agencies' concerns for the long-standing environmental criticisms of national accounts.[12] In 2011, the United Kingdom committed to collaborating with the Office for National Statistics to include natural capital into their environmental accounts by 2020 so that environmental costs and benefits would be better recognized. Additionally,

---

[9] Nordhaus, William, and James Toben. "Is Growth Obsolete?" In *Economic Research: Retrospect and Prospect*, 1-80. Vol. 5. Economic Growth. Cambridge, MA: National Bureau of Economic Research, 1972. Accessed January 22, 2017. http://www.nber.org/chapters/c7620.pdf.

[10] Ahmad, Yusuf J., Salah El Serafy, and Ernst Lutz, eds. *Environmental Accounting for Sustainable Development*. Washington, D.C.: The World Bank, 1989.

[11] Repetto, Robert. "Economic Incentives for Sustainable Production." In *Environmental Management and Economic Development*, 69-86. Baltimore, 1989: The Johns Hopkins University Press, 1989.

[12] "Environmental and Resource Accounts: Frequently Asked Questions." Government of Canada, Statistics Canada. August 21, 2015. Accessed November 20, 2016. http://www.statcan.gc.ca/eng/nea/faq/env.

many countries are beginning projects to develop environmental accounts and GGDP.[13]

Introduction to the System of Environmental Economic Accounting:

Regulations and guidelines for natural capital accounting have already been developed by the United Nations, but there is still much more work to be done due to the diverse range of environmental assets that each country has, as well as the prospective benefits that the assets may bring to each country. The System of Environmental Economic Accounting (SEEA) makes up the internationally agreed upon accounting rules for creating internationally comparable statistics on the relationship between the environment and the economy. The SEEA is a flexible system in that each country may adapt its implementation to their specific environmental and economic profiles. Further, it examines how ecosystems contribute to humans in terms of services provided. It also defines the ecosystem as being an asset in and of itself. Ecosystems that generate and provide a continuous flow of services over a period, depending on their condition, have the ability to contribute to the economy and provide services to people living near the ecosystem.[14] For example, an aquifer, depending on what quality it is kept in, provides clean water to communities. Further,

---

[13] Connors, Emily. "UK Ecosystem Accounting." United Nations Stats. October 2015. Accessed November 20, 2015. http://unstats.un.org/unsd/envaccounting/londongroup/meeting21/EEA_Summary_U.K..pdf.

[14] Hein, Lars, Ken Bagstad, Bram Edens, Carl Obst, Rixt de Jong, and Jan Peter Lesschen. 2016. "Defining Ecosystem Assets for Natural Capital Accounting." *Plos ONE* 11, no. 11: 1-25. *Food Science Source*, EBSCO*host* (accessed November 20, 2016).

mangroves, if they are not cut down, provide flood protection to communities. All implementation of the SEEA, as well as continuing work on new methods for environmental economic accounting, is being supervised by the United Nations Committee of Experts on Environmental-Economic Accounting (UNCEEA). The UNCEEA was established by the United Nations Statistical Commission in 2005 with the primary goal of promoting the SEEA internationally.[15]

Introduction to the Wealth Accounting and Valuation of Ecosystem Services:

The SEEA has set up the guidelines for natural capital accounting, but the Wealth Accounting and Valuation of Ecosystem Services (WAVES) is the main force of implementation. It was created in 2010 and is a global partnership with the common goal of creating sustainable development via mainstream natural capital accounting. WAVES provides countries with a platform for reaching this goal by guiding them to implement natural capital accounting based on the agreed upon standards in the SEEA. Additionally, it works to develop standardized ecosystem accounts and promotes the usage of these accounts when actors make decisions that have the potential to affect natural resources.[16] WAVES includes the United Nations Environment Program, the United Nations Development Program, and the United Nations Statistical Commission. Currently the WAVES platform has been implemented in Botswana, Colombia, Costa Rica,

[15] "Environmental-Economic Accounting." United Nations Stats. Accessed November 21, 2016. http://unstats.un.org/unsd/envaccounting/seea.asp.
[16] WAVES Partnership - World Bank.

Guatemala, Indonesia, Madagascar, the Philippines, and Rwanda. It is supported by over 70 countries and 90 corporations, including Australia, Canada, France, Japan, Norway, the United Kingdom, Citi Bank, Nestlé, and Wal-Mart.[17] The above listed countries and corporations claim that they desire to include natural resources and services provided by ecosystems, such as pollination and flood protection, into the national GDP to create GGDP. Additionally, WAVES strives to develop new methods for natural capital accounting, provide guidance on its implementation, and educate individuals and communities on its benefits. In most of the WAVES countries, there is a dedicated agency for implemented natural capital accounting.[18]

Costa Rica:

Introduction

Costa Rica is a small country in Central America that covers approximately 19,730 square miles, which is an area that is slightly smaller than West Virginia. Its climate is a mixture of both tropical and subtropical with a rainy and dry season. It is home to 4.9 million people, over half of which reside in urban areas, with one fifth of the nation's total population residing in the capitol, San Jose. Prior to the global economic crisis of 2008, Costa Rica had experienced stable

[17] "Natural Capital Accounting-List of Supporters." June 3, 2014. Accessed February 15, 2017. http://www.wavespartnership.org/sites/waves/files/documents/NCA%20supporters%20060314.pdf.

[18] "Wealth Accounting and the Valuation of Ecosystem Services." Natural Capital Accounting | Wealth Accounting and the Valuation of Ecosystem Services. Accessed November 20, 2016. https://www.wavespartnership.org/en/natural-capital-accounting.

economic growth. Although its economy contracted in 2009, it experienced 4% growth each year between 2010-2015. Traditionally, Costa Rica's main exports are bananas, coffee, sugar, and beef, but a variety of alternative products have broadened its export base in recent years. Because of its impressive amount of biodiversity, Costa Rica brings in foreign exchange via ecotourism. The state has devoted 37.1% of its land to agriculture, with an additional 51.5% being devoted to forest.[19]

Environmental Background

Costa Rica has experienced decades of tree clearing in order to make room in the small country for agriculture and livestock production. In the 1980s, Costa Rica began implementing protective policies to ensure that reforestation could occur. As of today, it is the first tropical country to have reversed deforestation; today over half of Costa Rica is forest, where as in 1983, only 26% was. Because of its dedication to the environmental sector, Costa Rica has seen significant growth in the ecotourism and hydropower sectors. However, its environmental protection is under new threat. Public budgets for enforcing tree protection have been spread thin. Because of the lack of new timber, many buildings in Costa Rica are being built with cement and metal, both of which have a high carbon footprint. Maintaining Costa Rica's success in protecting and regrowing their

[19] "The World Factbook: COSTA RICA." Central Intelligence Agency. January 12, 2017. Accessed February 26, 2017. https://www.cia.gov/library/publications/resources/the-world-factbook/geos/cs.html.

forests will only be possible if their forests are considered an asset and are accurately reflected in the economy. GGDP is crucial for this to come to fruition.[20]

History of GGDP in Costa Rica

Costa Rica has been working with WAVES since 2011 to develop natural capital accounts. In late November of 2013, a law to incorporate natural capital accounting was introduced by Alfonso Pérez Gómez. The law, which eventually passed, proposed that the Costa Rican government and the private sector would have to include relevant data on natural capital and its economic importance into proposed plans for new projects. The data would make clear the consequences of natural resource depletion, as well as the benefits of natural resource conservation. For example, if a project near a national park or a coastal buffer zone was introduced, the plans for the project would be required to show the economic valuation of the potential positive and/or negative impacts on the area's natural resources. In 2013, Gómez stated that "We do not know how much we are investing annually on the environment. With these real economic values, Costa Rica will have good environmental accounting, make better decisions, and develop better in the future, showing that the environment is also

[20] "Accounting Reveals that Costa Rica's Forest Wealth is Greater than Expected." The World Bank. May 31, 2016. Accessed January 1, 2017. http://www.worldbank.org/en/news/feature/2016/05/31/accounting-reveals-that-costa-ricas-forest-wealth-is-greater-than-expected.

good business."[21] Since then, Costa Rica has continued to work with WAVES to develop environmental accounts.

Currently, two accounts have been developed for natural assets to inform policy decisions. The first account will focus on the nation's water to integrate hydrological, economic, and social data into a consistent framework for analysis. The Central Bank of Costa Rica has produced data in order to develop preliminary water accounts. The bank used a variety of sources to develop the figures provided, including information from other national accounts, water use databases, pollution databases, and many more.

The second account combines physical and monetary values of services that forests provide in order to estimate their economic impact. The Central Bank of Costa Rica is coordinating with the National System of Conservation Areas and the National Forest Financing Fund to interpret the data from the newly developed forest accounts, as well as a carbon dynamics study.[22] The forest accounts provide data on the types of forests found in Costa Rica, how much they are worth, and the changes in these numbers over time. The information from these accounts have posed implications on the way Costa Rica uses forest

[21] "Wealth Accounting and the Valuation of Ecosystem Services." Natural Capital Accounting | Wealth Accounting and the Valuation of Ecosystem Services. Accessed November 20, 2016. https://www.wavespartnership.org/en/natural-capital-accounting.

[22] "Wealth Accounting and the Valuation of Ecosystem Services." Costa Rica | Wealth Accounting and the Valuation of Ecosystem Services. September 20, 2016. Accessed January 1, 2017. http://www.wavespartnership.org/en/costa-rica.

resources. According to these new accounts that consider more of the ecosystem services that forests provide, forests account for 2% of GDP. Previous accounts that only considered the timber that forests produced calculated only 0.2% of GDP. Further, additional forest growth has added 3% to the nation's carbon sequestration. Since Costa Rica's forests are more valuable than expected, it will be crucial for forestry policies to be adjusted to effectively protect and build these resources. Viewing forests as a resource in and of themselves adds appreciation to their value that goes further than being a mere input to the timber industry. In order to expand their usage of natural capital accounting and GGDP, Costa Rica is working on accounts for the other ecosystem services that forests provide, such as water filtration and biodiversity protection. This will assist policy makers in making decisions that will put Costa Rica on a path to long-term sustainable development.[23]

Since 2012, Costa Rica has been coordinating with WAVES to get a more accurate representation of the state's natural resources, particularly water and forests. There has been substantial focus on these resources and how they interact with the economy. Natural capital accounting has provided policymakers with clearer informations about land use and its economic implications as well as economic trade-offs.

---

[23] "Accounting Reveals that Costa Rica's Forest Wealth is Greater than Expected." The World Bank. Accessed January 1, 2017. http://www.worldbank.org/en/news/feature/2016/05/31/accounting-reveals-that-costa-ricas-forest-wealth-is-greater-than-expected.

Results

The implementation of GGDP in Costa Rica has been incredibly successful not only in determining the key environmental services that are important for the Costa Rican economy, but in protecting said environmental services. It is highly likely that government officials will continue to protect the waters and forests of the country.

China:

Introduction

China is a large Asian country that covers approximately 3,705,407 square miles. It has a diverse climate ranging from tropical to subarctic. It produces coal, iron ore, petroleum, natural gas, and many other minerals. It is the world's largest producer of hydroelectric power. It is also a world leader in the agricultural output of rice, wheat, potatoes, and more. China is the world's largest emitter of carbon dioxide from burning fossil fuels and has experienced water shortages, water pollution, deforestation, and extreme air pollution. It has a population of approximately 1.4 billion, with 55.6% of residents living in urban areas. 54.7% of the country is used for agriculture and only 22.3% is forest.[24]

[24] "The World Factbook: CHINA." Central Intelligence Agency. January 12, 2017. Accessed January 1, 2017. https://www.cia.gov/library/publications/resources/the-world-factbook/geos/ch.html.

Environmental Background

China's economy has experienced a miraculous boom in the past few decades, but the state's economic expansion has brought with it a few key problems: air and water pollution, deforestation, land clearing, and species endangerment. During the Great Leap Forward, an economic and social plan begun in the late 1950s, China converted millions of acres of native forest to cropland. China continued to exploit its forests in the following decades without any plan for conservation.[25] Since then, the autocratic government in China has focused so much on economic growth that it has been prioritized over almost every other goal. This is likely due to the fact that the Communist Party gives points to bureaucrats that go towards their promotions and bonuses for meeting economic checkpoints. This causes the environment to be left off of the agenda.[26] Because of this, only about 11 percent of Chinese forests have healthy ecological functioning. The Chinese Academy of Sciences reports that 43 percent of surface water is too polluted to use. According to a 2013 Ministry of Environmental Protection, 57 percent of urban groundwater is polluted, which is the primary source of drinking water for hundreds of millions of people. The soil pollution in

[25] Kelly, B. Rose. "Seeing the forest for the trees: World's largest reforestation program overlooks wildlife." Princeton University. September 07, 2016. Accessed March 10, 2017. https://www.princeton.edu/main/news/archive/S47/22/32G35/index.xml?section=topstories.

[26] Rauch, Jason N., and Ying F. Chi. "The Plight of Green GDP in China." Consilience Journal. Accessed October 10, 2016. https://journals.cdrs.columbia.edu/wp-content/uploads/sites/25/2016/10/112-232-1-PB.pdf.

103

China is so extensive that the government considers data about it to be a state secret.[27]

Since 2000, China has made investments of approximately $150 billion in conservation. In 2012, the Communist Party stated that they intended to integrate nature with people in order to build "the ecological civilization of the 21st century." Because of this goal, China has entered a new phase of investment that involves limiting new development in 49% of China's land area, as well as paying around 200 million residents to get involved in restoration and conservation. Such recent developments are due to the realization that natural capital is necessary for long-term security and economic well-being. Chinese administrators have realized that environmental degradation is causing loss to the economy in the long run, as well as loss to the quality of life experienced by many Chinese citizens.

In 1998, catastrophic flooding occurred along the Yangtze River due to deforestation and erosion; the flood killed approximately four thousand people and left at least an additional 12 million homeless. The floods submerged 21 million acres of land and destroyed 11 million acres of crops.[28] After the floods, China decided to pay the largest sum of money for an ecosystem service program in the world. The program helped to restore grasslands and forests and

[27] "China at Crossroads: Balancing The Economy and Environment." Yale Environment 360. Accessed March 10, 2017. http://e360.yale.edu/features/china_at_crossroads_balancing_the_economy_and_environment.
[28] Hays, Jeffrey. "Yangtze River." Facts and Details. 2009. Accessed March 9, 2017. http://factsanddetails.com/china/cat15/sub99/item460.html.

alleviated homelessness and poverty. Further, China has experienced several pollution catastrophes in which air quality has been so poor that it causes entire cities to shut down. In response to citizen outrage, China has begun to reduce coal output and the number of cars that are allowed to be driven.

Currently, China is taking a drastic approach: the country is re-zoning itself to account for ecosystem services and ecological sensitivity in order to limit human impacts and make more direct and sustainable investments. They have designated five classes of environmental services as priorities: mitigating flooding, securing water supplies for irrigation, hydropower, and drinking water, renewing soil resources, reducing the risk of dust and sandstorms, and conserving biodiversity. These sectors are known as Ecosystem Function Conservation Areas (EFCAs) and are mapped out using environmental data that displays where ecosystem services originate. The EFCAs focus conservation in areas that will provide high return on investment for public benefit; this includes zoning high-impact human activities in areas that are more resistant to damage so as to conserve natural capital value. To do this, the Chinese government identified where the country's most important areas for clean water, stable hydropower, flood control, and biodiversity security were located. Then officials analyzed how many people lived in these areas and whether or not their behavior was harmful to environmental benefits. Finally, they asked what kinds of investments could be made in order to promote sustainability in rural households

in order to develop the most ecological and economic benefits for society as a whole.

Another initiative to save China's environment has been happening since the start of the 21st century. China has implemented the world's largest forest conservation and restoration program. In 2000, the Natural Forest Conservation Program (NFCP) was implemented, banning logging and compensating residents for monitoring illegal timber harvesting. Since implementation, 1.6 percent of China's territory has seen reforestation.[29] The Grain for Green Program (GGP) was implemented in 2002. Its goals are land-use transition, watershed management, and poverty alleviation. The program serves 15 million households and 60 million farmers.[30] So far, 69.2 million acres of cropland and barren scrubland have been turned back into forest which has prevented erosion.[31]

History of GGDP in China:

In March of 2004, GGDP was first endorsed by President Hu Jintao. The Chinese government proposed a new accounting system that would measure economic growth, as well as Chinese environmental and social welfare. In 2005, a pilot

[29] Nichols, Sue. "China's Efforts to Restore Forests Are Working." Research at Michigan State University. Accessed March 7, 2017. http://research.msu.edu/chinas-efforts-to-restore-forests-are-working/.

[30] Zhiyong, Li. "A Policy Review on Watershed Protection and Poverty Alleviation by the Grain for Green Programme in China." FAO. Accessed March 16, 2017. http://www.fao.org/docrep/008/ae537e/ae537e0j.htm.

[31] Kelly, B. Rose. "Seeing the forest for the trees: World's largest reforestation program overlooks wildlife." Princeton University. September 07, 2016. Accessed March 10, 2017. https://www.princeton.edu/main/news/archive/S47/22/32G35/index.xml?section=topstories.

project was tested in ten regions. Although the project only recorded air emissions and surface water, the report from the pilot regions generated by the State Environmental Protection Agency and the National Bureau of Statistics found that losses due to pollution accounted for 3% of national economic output in 2004; this pollution equated to $64 billion in economic losses.[32] This means that the GGDP of China would be 97% of the reported annual GDP. It is likely that the 3% in losses would increase a great deal if other typical factors of GGDP had been accounted for, such as social costs, natural resource depletion, ecological damage, groundwater, and soil pollution. In fact, government officials admitted that the real total of losses must be higher. Wang Jinnan, the vice president of the Chinese Academy for Environmental Planning stated that there were shortcomings in the data and technical approach.[33] The project was officially cancelled in 2009 because of the large amount of unforeseen complexity surrounding the process of assigning a fiscal value to subjective features like biodiversity and carbon sequestration.[34]

Results

[32] Pasternack, Alex. "China Issues World's First 'Green GDP': Pollution Cost $64 Billion in 2004 (At Least)." TreeHugger. September 12, 2006. Accessed February 28, 2017. http://www.treehugger.com/corporate-responsibility/china-issues-worlds-first-green-gdp-pollution-cost-64-billion-in-2004-at-least.html.

[33] Pasternack, Alex. "China Issues World's First 'Green GDP': Pollution Cost $64 Billion in 2004 (At Least)." TreeHugger. September 12, 2006. Accessed February 28, 2017.

[34] Rauch, Jason N., and Ying F. Chi. "The Plight of Green GDP in China." Consilience Journal. Accessed October 10, 2016.

In 2004, China failed at implementing GGDP because of poor governance structure, lack of consistent rules for environmental valuation, and the degree of work that needed to be done in order to complete valuation. Although many central leaders in Beijing would have liked to move forward in protecting the environment, provincial leaders did not see it as a priority because they did not want environmental regulation to hinder business. Another reason why GGDP failed is because China rushed into the program with little experience in environmental studies.[35] Although some research was done, data collection is very expensive and was therefore too costly to continue through the trial and error period.[36] Further, China implemented their program without following the SEEA guidelines that had been previously established.[37] In order for China to implement GGDP again, this time with success, it would need to improve data transparency so that inaccuracies can be prevented and found by having more eyes on the data.[38]

Recently, efforts have been made to reimplement GGDP. In 2010 there was a case study done in the Guizhou Province that estimated the GGDP of the city was 4.3 times the GDP, suggesting that ecosystem services play a helpful role in

[35] Ibid.
[36] The cost of data collection has prevented many countries from entering or developing a GGDP program.
[37] Rauch, Jason N., and Ying F. Chi. "The Plight of Green GDP in China." Consilience Journal. Accessed October 10, 2016.
[38] Ibid.

supporting economic development.[39] Due to new available information from GGDP trials, China has implemented environmental protection programs, such as the NFCP and GGP. Due to these programs, China has seen a large recovery of forest cover and has opened new income streams in order to help pull people out of poverty, although the long-term results have yet to be uncovered. Through the work that China is doing with natural capital accounting, the country can serve as a global example of how natural resources can be restored while simultaneously improving citizen's livelihoods, create better business security, and create more economic sustainability.[40]

Conclusion:

Because GDP writes many environmental costs off as externalities, it alone cannot provide policy makers the information needed to make long-term economic or environmental decisions. Therefore, GGDP calculated with natural capital accounting provides balanced information to assist in the creation of long-term and sustainable policies.

The SEEA and WAVES have done a lot of the groundwork in developing natural capital accounting framework and a platform for implementation, but implementation needs to expand further into and past the WAVES countries.

---

[39] Zhiyun, Ouyang. "Gross ecosystem product: Concept, accounting framework and case study." *Acta Ecol Sin* 33 (2013): 6747-6761.

[40] "Ecosystem Planning in China." Natural Capital Project. Accessed February 1, 2017. http://www.naturalcapitalproject.org/china-case-study/.

Since 2011, Costa Rica has partnered with WAVES to develop its own natural capital accounts, mainly those for the state's water and forests. Thus far, GGDP has been incredibly successful in Costa Rica and has incentivized the protection of the state's natural resources.

In the last few decades, China has faced the problems that come with rapid expansion, such as air and water pollution and deforestation. Since the turn of the century, China has made large efforts to correct its environmental degradation. Although its initial implementation of GGDP was unsuccessful, the information from that attempt has done much to help China's environmental progress, including the initiation of several environmental programs and even a second recent attempt at GGDP. Because of the information China was able to get from its environmental accounts, the state has been able to reforest much of its land.

Through comparing the usage of natural capital accounting in Costa Rica and China, it is clear that GGDP is beneficial for long-term policy making. More research needs to be done before we will know all the ways in which the environment is related to the economy, but it is certain that one cannot be stable without the other.