In Pursuit of Sustainable Development Goal 7: China's Domestic Approach Versus China's Approach in Africa

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Abstract

In light of pledges made by Chinese president Xi Jinping to have carbon emissions peak before 2030 and to reach carbon neutrality in 2060, as well as to stop building coal-fired power plants abroad, this research examines China's policies and investments relating to renewable energy. In particular, this thesis focuses on the steps China is taking both domestically and in Africa to reach Sustainable Development Goal 7, 'to ensure access to affordable, reliable, sustainable, and modern energy for all'. This research has found that both domestically and in Africa, China is taking a similar approach. Chinese state-owned enterprises have ramped up investments in the hydropower, wind power, and solar photovoltaic power sectors. As a result, renewable energy has become more affordable and accessible. However, China remains dependent on coal-fired power plants domestically, and additional investments in Africa will be necessary to ensure a green energy transformation on the continent.

Keywords: China, Africa, renewable energy investments, Sustainable Development Goals, green theory

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Abbreviations and Acronyms

Eximbank	Export-Import Bank of China
FOCAC	Forum on China-Africa Cooperation
IEA	International Energy Agency
IR	International Relations
IRENA	International Renewable Energy Agency
LCOE	levelized cost of energy
MDG	Millennium Development Goal
NDRC	National Development and Reform Commission
OECD	Organisation for Economic Cooperation and Development
PV	photovoltaic
SDG	Sustainable Development Goal
SOE	state-owned enterprise
UN	United Nations
UNEP	United Nations Environment Program

Chapter 1: Introduction

1.1 Research Context

In September 2020, Chinese president Xi Jinping announced that China will "aim to have CO2 emissions peak before 2030 and achieve carbon neutrality before 2060". As the world's largest consumer of energy as well as the world's largest emitter of carbon dioxide, the pledge is significant.[1] Indeed, the Chinese government has invested huge amounts of money in the low-carbon and renewable energy sectors in an effort to fight climate change.[2] As a result, China has realized a rapid growth of the hydropower, wind power, and solar photovoltaic (PV) power sectors, and has actively reduced the share of fossil fuels in its primary energy mix.[3]

As for its overseas energy investments, during the 2021 United Nations (UN) Climate Change Conference COP26, held in Glasgow, Xi announced that China will stop building new coal power plants abroad. Instead, Xi said that "China will step up support for other developing countries in developing green and low-carbon energy, and will not build new coal-fired power projects abroad."[4] Research by the International Institute of Green Finance's Green BRI Centre has shown that many Chinese-backed coal projects have in fact been shelved or cancelled over the past few years, while investments in renewables such as solar PV, wind, and hydropower have increased.[5]

1.2 Research Aims and Research Question

For China, a shift from fossil fuels to renewable energy sources is a crucial step not only to limiting global warming to 1.5 degrees Celsius, but also to reaching Sustainable Development Goal (SDG) 7, which is to "ensure access to affordable, reliable, sustainable and modern energy for all". Indeed, the transition from non-renewable energy sources to renewable ones has become increasingly important in fighting climate change and environmental pollution. In tandem with this, China's role in the changing global order has also received attention. This

[1] IEA, *An Energy Sector Roadmap to Carbon Neutrality in China* (IEA Publications, 2021): 3.
[2] Sheng Chunhong, "Not Just the State: The Role of Entrepreneurs in China's Energy Transition," *Energy Research & Social Science*, no. 70 (2020): 101814.
[3] Zhang Sufang and Philip Andrews-Speed, "State Versus Market in China's Low-Carbon Energy Transition: An Institutional Perspective," *Energy Research & Social Science*, no. 66 (2020): 101503.
[4] Valerie Volcovici, David Brunnstrom, and Michelle Nichols, "In Climate Pledge, Xi Says China Will Not Build New Coal-Fired Power Projects Abroad," *Reuters*, September 22, 2021, https://www.reuters.com/world/china/xi-says-china-aims-provide-2-bln-vaccine-doses-by-year-end-2021-09-21/.
[5] Christoph Nedophil Wang, *Coal Phase-Out in the Belt and Road Initiative (BRI): An Analysis of Chinese-Backed Coal Power from 2014-2020* (Beijing: Green BRI Center, International Institute of Green Finance (IIGF), 2021): 3.

thesis aims to find out whether China's domestic approach to reaching SDG 7 differs from its overseas approach, and more specifically its approach on the African continent.

Sub-Saharan Africa was chosen as a focus area for multiple reasons. First, Chinese investments in Africa have increasingly received (media)attention as well as critique over the past couple of decades.[6] Gaining a better understanding of what drives these engagements and what the impacts are will help contextualize the claims made about China-Africa engagements. Second, Africa has currently unused potential when it comes to the development of renewable energy. Shortage of energy supply is a widespread problem, with almost 600 million people without access to electricity.[7] Nonetheless, most parts of Africa show exciting potential for solar energy and wind energy.[8] Third, investments in renewables in Africa are lagging. Between 2000 and 2020, over US$2.8 trillion was invested in renewables worldwide. Yet, only 2% of these investments went to Africa.[9] However, China has emerged as an important investor in Africa's renewable energy sector. By 2016 more than half of Chinese investments in sub-Saharan Africa's energy sector were made in renewables.[10]

Consequently, the research question of this thesis is 'How does China's domestic approach to reaching Sustainable Development Goal 7 differ from its approach in sub-Saharan Africa?

1.3 Research Relevance

The SDGs have been developed to help fight global issues such as poverty, inequality, and climate change. As a UN member state, China has the duty to ensure its policies are actively supporting individuals and companies to help reach that goal. Currently, China is one of the world's largest energy consumers, and with China being the most populous country on earth as well as the fastest growing economy, energy consumption is expected to rise even further. China's energy choices will therefore be very influential in the global effort to fight climate

[6] Deborah Brautigam, *The Dragon's Gift: The Real Story of China in Africa* (Oxford: Oxford University Press, 2009): 2-3.
[7] IEA, *World Energy Outlook 2019* (IEA Publications, 2019): 355.
[8] Ademola A. Adenle, "Assessment of Solar Energy Technologies in Africa: Opportunities and Challenges in Meeting the 2030 Agenda and Sustainable Development Goals," *Energy Policy*, no. 137 (2020): 111180.
[9] IRENA and African Development Bank, *Renewable Energy Market Analysis: Africa and Its Regions* (Abu Dhabi and Abidjan: IRENA and AfDB, 2022): 89.
[10] Padmasai Lakshmi Bhamidipati et al. "Chinese Green Energy Projects in Sub-Saharan Africa: Are There Co-Benefits?" In *Building Innovation Capabilities for Sustainable Industrialisation*, ed. Rasmus Lema, Margrethe Holm Andersen, Rebecca Hanlin, and Charles Nzila (Routledge, 2022): 206.; IEA, *Boosting the Power Sector in Sub-Saharan Africa: China's Involvement* (IEA Publications, 2016): 7.

change.[11] With 2030 nearing rapidly, global temperatures still on the rise, and China's ever-growing role on the global stage, it is important to examine China's role in reaching SDG 7.

Furthermore, an examination of increased Chinese investments in renewables overseas could also provide insights into energy poverty in Africa. Investments in renewables could change this significantly. Not only would this help reach SDG 7, a shift from fossil fuels to renewable energy would also be beneficial to help fight climate change. In addition, investments in renewable energy sources may lead to environmental leapfrogging, where, according to Iizuka, "latecomer countries can skip the 'dirty' stages [of development] by adapting to already-available 'cleaner' technology through technological transfer."[12]

1.4 Research Outline

Part one of this thesis consists of three chapters. Chapter 2 is a literature review outlining current debates on the SDGs, China's engagements with these goals, the implications of these goals for African development, the compatibility of environmental protection and economic growth, and the green growth concept. Chapter 3 outlines green theory as the theoretical framework of this thesis. In chapter 4, the methodology of this thesis will be discussed. Part two of this thesis consists of four chapters. Chapter 5 describes SDG 7, its sub-goals and clauses, and the detailed plans the Chinese government has made to reach this goal. In chapter 6, China's domestic approach to reaching SDG 7, including the policies and investments relating to this goal, will be examined. Chapter 7 is similar, but focuses on the approach China is taking in Africa. In chapter 8, China's domestic approach will be compared to its approach in Africa. Furthermore, how these approaches relate to green theory will be discussed as well.

[11] Bikash Kumar Sahu, "Wind Energy Developments and Policies in China: A Short Review," *Renewable and Sustainable Energy Reviews*, no. 81 (2018): 1395.
[12] Michiko Iizuka, "Diverse and Uneven Pathways Towards Transition to Low Carbon Development: The Case of Solar PV Technology in China," *Innovation and Development* 5, no. 2 (2015): 243.

Chapter 2: Literature Review

2.1 The Sustainable Development Goals

2.1.1 From the Millennium Development Goals to the Sustainable Development Goals

In 2000, the Millennium Development Goals (MDGs) were announced. The eight goals aimed to mobilize the world community to achieve a set of social priorities such as eradicating poverty, reducing child mortality, and fighting gender inequality within 15 years. Although noteworthy progress was made in some areas, the overall progress was highly uneven across goals and countries.[13] At the end of the MDGs era in 2015, the SDGs were announced. The new goals, again spanning 15 years, are not only more focused on sustainability and environmental issues, but also cover a wider range of topics, including for example infrastructure, energy, and access to justice, increasing the number of goals from eight to seventeen.[14]

2.1.2 Praises and Critiques of the Sustainable Development Goals

Although many scholars agree the SDGs were developed better than the MDGs, there have still been forming two schools within the academic world. Scholars who have responded positively to the SDGs have underscored the transformative potential of the goal, the prioritization of sustainable practices, and the inclusion of previously missing topics.[15] Death and Gabay agree that the SDGs have radical potential and underscore that they also provide an opportunity to ensure intergovernmental cooperation on these targets, which can be a challenging task. Furthermore, they argue that the SDGs are formulated as global goals, thus removing the division between developed and developing economies. They also applaud the increased attention for environmental sustainability.[16]

Yet, there is also a notable group of scholars who have expressed concerns and critiques about the SDGs. Critiques most often mentioned include the lack of prioritization and the immeasurability of the targets, but also the fact that they do not devote effort to change structural factors perpetuating poverty.[17] Sexsmith and McMichael argue that the SDGs do not adequately address the causes of inequality and unsustainability. Furthermore, they believe that

[13] Jeffrey D. Sachs, "From Millennium Development Goals to Sustainable Development Goals," *The Lancet* 379, no. 9832 (2012): 2206.
[14] Dorine E. van Norren, "The Sustainable Development Goals Viewed through Gross National Happiness, Ubuntu, and Buen Vivir," *International Environmental Agreements: Politics, Law and Economics* 20, no. 3 (2020): 432.
[15] Ibid.
[16] Carl Death and Clive Gabay, "Doing Biopolitics Differently? Radical Potential in the Post-2015 MDG and SDG Debates," Globalizations 12, no. 4 (2015): 609.
[17] Van Norren, "The Sustainable Development Goals," 432.

the SDGs should not have been designed from a state-centric perspective but should have embraced a more transnational model to accurately accommodate the global dimensions of today's crises.[18]

2.1.3 China's Engagement with the Sustainable Development Goals

China was one of the 193 UN member states that signed on to the SDGs.[19] Its engagement with these goals has received some scholarly attention as well. According to Kuhn, China's engagement with the SDGs has been determined by two factors. First, the SDGs have helped change China's domestic development priorities to a resource-light and low-carbon model, combining economic growth with ecological and social development.[20] Indeed, Xue, Weng, and Yu argue that the Chinese government has played an active role in the development of national strategies for the SDGs as well as the mobilization of resources to reach these goals. According to them, the government uses Five Year Plans to set periodic economic and social development goals and to guide the public and private sectors. This is a highly adaptive model for national strategy as they are reviewed and adjusted every five years.[21] The SDGs are integrated in these plans by breaking them down in smaller, feasible targets.[22]

Yet, scholars have also pointed out some drawbacks. According to Jiang et al., China is still unlikely to achieve all SDGs before 2030.[23] Indeed, when it comes to China's private sector, Yu et al. have found that Chinese companies tend to focus on SDGs related to industry and infrastructure development, economic growth and labour conditions, affordable and clean energy, and peace and justice. However, this is usually at the cost of other SDGs.[24] Furthermore, there are large regional differences in SDG scores in China, especially at the provincial level.[25]

The second factor that has determined China's engagement with the SDGs is, according to Kuhn, that the SDGs allow China to become an active player on the global stage, while

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[18] Kathleen Sexsmith and Philip McMichael, "Formulating the SDGs: Reproducing or Reimagining State-Centered Development?" *Globalizations* 12, no. 4 (2015): 592-593.
[19] Xue Lan, Weng Lingfei, and Yu Hanzhi, "Addressing Policy Challenges in Implementing Sustainable Development Goals Through an Adaptive Governance Approach: A View From Transitional China," *Sustainable Development* 26, no. 2 (2018): 150.
[20] Berthold Kuhn, "Sustainable Development Discourses in China," *Journal of Sustainable Development* 9, no. 6 (2016): 161.
[21] Xue, Weng, and Yu, "Addressing Policy Challenges," 151.
[22] Yu et al., "Adoption and Implementation of Sustainable Development Goals (SDGs) in China – Agenda 2030," *Sustainability*, no. 12 (2020): 6288(3).
[23] Jiang et al., "Decoupling Environmental Impact From Economic Growth to Achieve Sustainable Development Goals in China," *Journal of Environmental Management*, no. 312 (2022): 114978(4).
[24] Yu et al., "Adoption and Implementation," 6288(12-13).
[25] Zhang et al., "Finding Pathways to Synergistic Development of Sustainable Development Goals in China," *Humanities & Social Sciences Communications* 9, no. 21 (2022): 3-6.

subsequently deepening its influence in developing economies.[26] According to Bull and Miklian, the Chinese government and Chinese enterprises tend to favour cooperation regarding the SDGs through China's Belt and Road Initiative, multilateral and/or bilateral agreements, and development banks.[27] Xue, Weng, and Yu argue that as traditional forms of foreign aid by western donors have declined, China has emerged as a new partner for countries in the Global South, and especially in Africa, as they provide development assistance and financial benefits.[28]

2.1.4 The Implications of the Sustainable Development Goals for African Development

Some of the biggest challenges sub-Saharan African countries face in reaching the SDGs include high population growth rates, high levels of inequality, and high levels of fragility. According to the International Monetary Fund, high development outcomes in line with the SDGs can only be reached if countries in sub-Saharan Africa spend an extra 19% on sectors such as healthcare, education, infrastructure, energy, and water. The International Monetary Fund argues these governments must mobilize a wide range of financing sources, both public and private, domestic, and non-domestic.[29]

When it comes to the intersection of the SDGs and the environment in Africa, Omisore has argued that environmental issues such as degradation and climate change are currently undermining development in sub-Saharan Africa, and if tackling these environmental issues is not prioritized, they could undermine reaching the SDGs as well.[30] He goes on to say that "[…] tackling environmental issues will in itself lead to a development spiral that will engulf and promote all aspects of development. With pertinent policies, the environment can be a major catalyst to the attainment of the SDGs."[31]

2.2 The Sustainable Development Goals and Green Growth

2.2.1 The Trade-Offs between Economic Growth and Environmental Sustainability

Another debate relating to the SDGs is the trade-offs that are made between economic, social, and ecological goals. There seems to be a consensus among scholars that the SDGs have shifted

[26] Kuhn, "Sustainable Development Discourses," 161.
[27] Benedicte Bull and Jason Miklian, "Towards Global Business Engagement with Development Goals? Multilateral Institutions and the SDGs in a Changing Global Capitalism," *Business and Politics* 21, no. 4 (2019): 447.
[28] Xue, Wang, and Yu, "Addressing Policy Challenges," 151.
[29] Delphine Prady and Mouhamadou Sy, *The Spending Challenge for Reaching the SDGs in Sub-Saharan Africa* (Washington, D.C.: IMF, 2019), 4-5.
[30] Akinlolu G. Omisore, "Attaining Sustainable Development Goals in Sub-Saharan Africa: The Need to Address Environmental Challenges," Environmental Development, no. 25 (2018): 138.
[31] Ibid., 139.

away from the MDGs-era development theories that viewed poverty and underdevelopment as being separate from environmental issues, and have now recognized that humans can only live prosperous lives on a planet without grave environmental concerns.[32] Indeed, the preamble to the SDGs not only mentions the need to protect the planet from environmental degradation by taking action to halt climate change and managing the earth's natural resources in a sustainable way, but it also states that all economic, social, and technological progress should take place in harmony with nature.[33]

Yet, multiple researchers have questioned whether it is possible to achieve high economic growth rates while at the same time commit to saving the planet from further degradation.[34] As Gupta and Vegelin put it aptly: "Achieving sustainable development has been hampered by trade-offs in favour of economic growth over social well-being and ecological viability, which may also affect the sustainable development goals adopted by the member states of the United Nations".[35] Lorek and Spangenberg argue that politics are likely to favour economic gains over ecological preservation, because the most common interpretations of the concept 'sustainable development' have focused on (economic) growth, innovation, and technological solutions instead of taking a more holistic approach.[36]

2.2.2 The Green Growth Concept and Its Critiques

Some researchers argue that the concept 'green growth' could provide a solution for the incompatibility of economic growth and environmental protection. Green growth was one of the most discussed themes at the Rio+ 20 Conference on Sustainable Development in 2012, and the Organisation for Economic Cooperation and Development (OECD), the United Nations Environment Program (UNEP), and the World Bank are fierce proponents of it.[37] Although the definitions given by these organisations differ slightly, the World Bank defines green growth as "economic growth that is efficient in its use of natural resources, clean in that it minimizes pollution and environmental impacts, and resilient in that it accounts for natural hazards and the role of the environmental management and natural capital in preventing physical

[32] Jason Hickel, "The Contradiction of the Sustainable Development Goals: Growth Versus Ecology on a Finite Planet," *Sustainable Development* (Bradford, West Yorkshire, England) 27, no. 5 (2019): 873.
[33] United Nations, *Transforming Our World: The 2030 Agenda for Sustainable Development* (2015), 2.
[34] Hickel, "The Contradiction," 873-875.
[35] Joyeeta Gupta and Courtney Vegelin, "Sustainable Development Goals and Inclusive Development," *International Environmental Agreements*, no. 16 (2016): 433.
[36] Sylvia Lorek and Joachim H. Spangenberg, "Sustainable Consumption Within a Sustainable Economy – Beyond Green Growth and Green Economies," *Journal of Cleaner Production*, no. 63 (2014): 34.
[37] Jason Hickel and Giorgos Kallis, "Is Green Growth Possible?" *New Political Economy* 25, no. 4 (2020): 469–470.

disasters".[38] The UNEP, in its definition, emphasizes how income growth and reducing environmental risks are two processes that occur simultaneously. [39]

Yet, the green growth concept has also received criticism. The concept assumes there will be ample technological development to utilize technological solutions in achieving green growth. However, as Lorek and Spangenberg point out, this is a cheque drawn on the future, and there is no certainty whatsoever this technological development will actually take place.[40] Furthermore, research by Hickel has shown that SDG 8, 'decent work and economic growth', is not compatible with the sustainability objectives of other SDGs such as SDG 12, 'responsible consumption and production' and SDG 15, 'life on land'.[41] Hickel and Kallis point out that a reduction of 1.5°C to 2.0°C is unlikely to happen while economic growth levels increase, as economic growth goes hand in hand with an increase in the demand for energy, and it increases emissions from industrial processes as well.[42]

2.3 Concluding Remarks

As has become evident from this literature review, the SDGs have been praised for their transformative potential, but have been critiqued for their immeasurability, lack of prioritization, and most importantly their internal contradictions, especially when it comes to achieving economic growth while simultaneously reducing environmental degradation. The SDG preamble underscores that any economic, social, or technological progress should be reached in harmony with nature. This is closely linked to the green growth concept, which states that economic growth and reducing environmental risks can occur simultaneously. However, the concept has been critiqued by scholars who argue that this is not possible, and it will undermine reaching the SDGs. Furthermore, they point out that economic growth will inevitably lead to an increased demand in energy, which is likely to lead to increased carbon emissions.

Domestically, China has implemented a growth model that attempts to combine economic growth and environmental preservation. This is reflected in the targets it sets in its Five Year Plans. Internationally, the SDGs have allowed China to step up its international cooperation, now becoming a development partner for developing countries. Indeed, in Africa

[38] Ibid.
[39] Ibid.
[40] Lorek and Spangenberg, "Sustainable Consumption," 35.
[41] Hickel, "The Contradiction," 874-875.
[42] Hickel and Kallis, "Is Green Growth Possible?" 481.

a lack of finance is severely slowing down the progress of reaching the SDGs. Furthermore, environmental issues in Africa are also undermining the SDGs.

Taking into consideration the existing academic literature on this topic, this thesis further explores debates surrounding the compatibility of economic growth and environmental protection by critically examining the steps China is taking to reach SDG 7 'affordable and clean energy' both domestically and in Africa. This raises questions like: Is an expansion of renewable energy capacity compatible with environmental protection? Is the Chinese growth model adequate for reaching SDG 7? Can Chinese development assistance and finance help reach SDGs in Africa? This research hopes to find whether China's domestic approach to reaching the SDG 7 differs from the approach it is taking in Africa.

Chapter 3: Theoretical Framework: Green Theory

With concerns about climate change on the rise in the 1990s, ecologism and green politics became a popular topic of discussion.[43] International Relations (IR) theorists increasingly became aware of the importance to address questions surrounding global climate and ecology on both a practical and theoretical level.[44]

Green theory, which combines ecologism and green politics, is part of critical IR theory. Contemporary critical approaches to IR theory emerged in the 1970s to challenge the assumptions of realism and liberalism, the two most mainstream IR theories. [45] Devetak has defined critical theory as "the emblem of a philosophy which questions modern social and political life through a method of immanent critique".[46] Critical IR scholars also oppose the state-centricity of IR, and argue that the mainstream understandings of international processes and interstate behaviour stem from a narrow understanding of the international political system.[47] Critical IR theory can also be considered a tool for those excluded from positions of power to advance more equal and equitable types of global relations.[48]

Green theory has helped expose the ecological 'blindness' of IR theory by challenging traditional understandings of topics central to IR such as development, security, and justice and replacing them with new discourses such as sustainable development, ecological security, and environmental justice.[49] Central to green political thought is the interest of nature itself instead of human interest in nature and natural resources.[50] Furthermore, green theory aims to re-examine the relationship between the nation-state, the economy, and the environment.[51]

Green theorists argue that global environmental problems require global solutions, and the traditional IR model where nation-states are the main actors in the global political system is therefore no longer suitable. Instead, non-state actors should play a more prominent role in

[43] Andrew Heywood, *Global Politics* (MacMillan International Higher Education, 2014), 75.
[44] Hugh C. Dyer, "Green Theory," in *International Relations Theory*, ed. Stephen McGlinchey, Rosie Walters, and Christian Scheinpflug (Bristol: E-International Relations Publishing, 2017), 84.
[45] Eric LaFerrière and Peter J. Stoett, *International Relations Theory and Ecological Thought: Towards a Synthesis* (Routledge, 2003), 138.
[46] Robyn Eckersley, *The Green State: Rethinking Democracy and Sovereignty* (MIT Press, 2004), 8.
[47] LaFerriere and Stoett, *International Relations Theory*, 140.
[48] Marcos Farias Ferreira, "Critical Theory," in *International Relations Theory*, ed. Stephen McGlinchey, Rosie Walters, and Christian Scheinpflug (Bristol: E-International Relations Publishing, 2017): 52.
[49] Robyn Eckersley, "Green Theory," in *International Relations Theories: Discipline and Diversity*, ed. Tim Dunne, Milja Kurki, and Steve Smith (Oxford: Oxford University Press, 2007), 248.
[50] Dyer, "Green Theory," 84.
[51] Ibid., 90.

solving these issues.[52] Furthermore, they aim to actively change global patterns of trade, aid, and debt by replacing them with more sustainable patterns of development.[53]

What differentiates green theory from other forms of critical IR theory is the focus on the relationships between humans and the non-human environment, rather than relations within and between human communities.[54] Green theory can therefore be characterized as ecology-centred or 'ecocentric' as opposed to human-centred or 'anthropocentric', as it proposes ideas that curtail human material consumption in the interest of preserving nature and the environment. This does not mean that green theory does not address human needs and desires; it prioritizes a healthy natural environment because this is deemed essential for human wellbeing.[55]

Green theorists, and more specifically 'ecosocialists', argue that the global capitalist system is at the root of today's environmental crisis, as it has commodified nature and natural resources.[56] Indeed, the relationship between the global economy and the environment is one of the concerns of green theory. As became clear from the literature review of this thesis, there are scholars who believe decoupling economic growth and environmental degradation can lead to an environmentally sustainable development path. However, green theorists argue that sustainable development cannot be achieved fully while simultaneously achieving increasing economic growth rates. And while they encourage technological advancements in ecological modernization, they argue that these have not only been overestimated, but also do not reduce aggregate levels of resource use and waste production. Furthermore, they point out that technologically driven ecological modernization does not address the unequal distribution of ecological risks among peoples and regions.[57] This thesis will examine whether Chinese investments in renewable energy, both domestically and abroad, and aimed at reaching SDG 7, are in line with the principles of green theory.

[52] Eckersley, "Green Theory," 255.
[53] Ibid.
[54] Dyer, "Green Theory," 85.
[55] Eckersley, "Green Theory," 251.; Dyer, "Green Theory," 86.
[56] Heywood, *Global Politics*, 75-76.
[57] Eckersley, "Green Theory," 253-254.

Chapter 4: Methodology

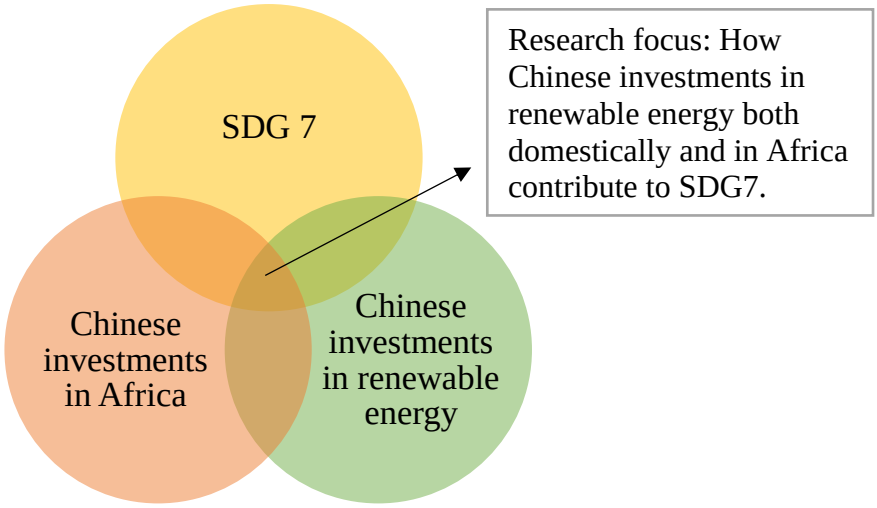

Figure 1 Research focus

The core of this research is located at the intersection of three main topics: SDG 7 'affordable and clean energy', Chinese investments in renewable energy, and Chinese investments in Africa. The main body of this research is centred around two comparative case studies. The first case study examines China's domestic approach for reaching SDG 7. By exploring official government policies, Five Year Plans, and investments in (renewable) energy, this research aims to gain an in-depth understanding of the steps China takes domestically to reach SDG 7. The second case study examines the steps China takes to reaching SDG 7 on an international level, and more specifically in sub-Saharan Africa. By exploring the key drivers for Chinese engagement in sub-Saharan Africa, as well as Chinese investments in the (renewable) energy sector in the region, this research aims to find out whether the investments Chinese companies make in the sub-Saharan Africa energy sector actively contribute to reaching SDG 7. This research tracks policies and investments in the 21st century, with a particular focus on the 2010-2022 period.

In the last section of this research, China's domestic investments and policies will be compared to their investments and policies in Africa. This comparative case study method allows for the identification of similarities and/or differences between the two cases. More specifically, a most similar design case comparison will be used.[58] This method is chosen because the two selected cases have similar characteristics (both study Chinese investments, renewable energy, and policies for achieving SDG 7), however, they also have one independent characteristic, namely the location (China versus Africa). By using the comparative case study

[58] Chiara Ruffa, "Case Study Methods: Case Selection and Case Analysis," In *The SAGE Handbook of Research Methods in Political Science and International Relations*, 1133-47 (London: SAGE Publications Ltd, 2020): 1141.

method, this research will be able to provide a more comprehensive overview of China's policies when it comes to providing clean and affordable energy for everyone, both domestically and abroad, compared to a single case study method.

This research will make use of primary and secondary sources, supplemented by databases and news reports. Primary sources include – but are not limited to – Chinese government press releases and Five Year Plans. In both case studies, qualitative research methods will be supported by quantitative research methods, for example by tracking (renewable) energy investments over time. Databases include the International Renewable Energy Agency's (IRENA) Renewable Energy Statistics, which tracks renewable energy capacity and power generation worldwide, and Boston University Global Development Policy Centre's China's Global Power Database, which tracks Chinese investments in the power and energy sector worldwide.

Both cases and the subsequent comparison will be examined through a critical lens. By taking this approach, all aspects that shape the types of Chinese investments and China's policy for achieving SDG 7 can be taken into consideration, allowing for a more in-depth understanding of China's commitment to the SDGs as well as its investments in renewables. As this thesis engages critical IR theory, this research is exploratory. Furthermore, throughout the entire research green theory will be used as a guiding principle.

Chapter 5: Sustainable Development Goal 7

In the UN 2030 Agenda for Sustainable Development, SDG 7 is titled 'Ensure access to affordable, reliable, sustainable and modern energy for all'. It has been separated into three smaller goals. Goal 7.1 states 'By 2030, ensure universal access to affordable, reliable and modern energy services'. Goal 7.2 states 'By 2030, increase substantially the share of renewable energy in the global energy mix'. Goal 7.3 states 'By 2030, double the global rate of improvement in energy efficiency'. Furthermore, SDG 7 also contains two clauses that emphasize the UN aims to (A) enhance international cooperation in the field of clean energy research and promote investments in energy infrastructure and energy technology, and B) upgrade clean energy technology and sustainable energy infrastructure, especially in (landlocked) developing countries, least developed countries, and small island states.[59]

Shortly after China signed on to the SDGs, in September 2016, the government released *China's National Plan on Implementation of the 2030 Agenda for Sustainable Development*. The document not only contains a review of the achievements of the MDGs era, but also a preview on what China can expect from the SDG era.[60] The document provides a detailed explanation per SDG on how the Chinese government plans on implementing it.[61] For goal 7.1, the government plans on reforming and restructuring the national power grid and ensuring adequate energy development in areas with relatively high poverty rates. For goal 7.2, the government plans to raise the share of non-fossil fuels in the country's primary energy consumption, as well as optimizing the country's energy mix by boosting renewable energy consumption. For goal 7.3, the government plans to reform the energy sector through big data and promoting the development of an energy management system as well as an online energy consumption monitoring system.[62] In the next two chapters, this thesis will take an in-depth look at the steps China is taking both domestically and in Africa to reach these goals.

For clause 7A, the government aims to focus on deepening bilateral and multilateral cooperation through the UN, International Energy Agency (IEA), IRENA, and other organizations, as well as to promote investments in renewable energy infrastructure and renewable energy technology. For clause 7B, the government aims to support sub-Saharan Africa, Asia, and the Pacific by providing countries in these areas with sustainable energy

[59] United Nations, *Transforming Our World*, 19.
[60] Ministry of Foreign Affairs of the People's Republic of China, *China's National Plan on Implementation of the 2030 Agenda for Sustainable Development* (Beijing, September 2016): 1-18. https://www.fmprc.gov.cn/mfa_eng/topics_665678/2030kcxfzyc/ (Accessed May 26, 2022).
[61] Ibid., 19-64.
[62] Ibid., 34-35.

services to increase their renewable energy production and utilization.[63] In chapter 7, this thesis will examine how the Chinese government promotes investments in renewable energy infrastructure overseas and how it provides sustainable energy services in Africa, and to what extent these contribute to reaching SDG 7.

[63] Ibid.

Chapter 6: China's Domestic Approach for Reaching SDG 7

6.1 Economic Reforms and the Shift to Renewable Energy

Since its economic reform era, which started in the late 1970s, China's economy has been growing rapidly. The country has become a global manufacturing hub, which on the one hand has lifted millions of Chinese out of poverty, but on the other hand has led to high levels of pollution and environmental degradation.[64] Indeed, signs of severe air pollution such as smog are a common in China, especially in cities. Rapid industrialization and coal-fired power are at the root of this problem. Chinese citizens are paying the price for years of unchecked economic growth.[65]

So, China has a domestic incentive to make the transition to renewable energy sources. That way, the government can help fight climate change, and reduce air and water pollution.[66] Therefore, the Chinese government has taken active steps towards transforming the national economic growth model to a model in which economic and ecological interests are united. Environmental protection measures have become a more principal element of China's long-term development plans.[67] Furthermore, the expansion of the renewable energy industry is now a key focus of China's policy initiatives. [68]

6.2 China's Domestic Renewable Energy Policies

At the 2014 Asia-Pacific Economic Cooperation summit, President Xi announced China's goal to stop the growth of carbon emissions by 2030 and have 20% of their energy that same year be derived from clean energy sources.[69] In 2018, this goal was raised from 20% to 35%.[70] To reach this goal, the Chinese government has implemented a number of policies. Key policies for guiding economic and social development are documented in Five Year Plans. These Five Year Plans often include binding targets and specific guidance for the implementation of the policies as well.[71]

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[64] Li Yifei and Judith Shapiro, *China Goes Green: Coercive Environmentalism for a Troubled Planet* (Cambridge: Polity Press, 2020): 4.
[65] Björn Conrad, "Environmental Policy: Curtailing Urban Air Pollution," in *China's Political System*, ed. Sebastian Heilmann (Lanham: Rowman & Littlefield, 2016): 356.
[66] Dominic Chiu, "The East is Green: China's Global Leadership in Renewable Energy," *New Perspectives in Foreign Policy*, no. 13 (2017): 4.
[67] Conrad, "Environmental Policy," 356.
[68] Yuan Rong, Paul Behrens, Arnold Tukker, and João F.D. Rodrigues, "Carbon Overhead: The Impact of the Expansion in Low-Carbon Electricity in China 2015-2020," *Energy Policy*, no. 119 (2018): 97.
[69] Chiu, "The East is Green," 5.
[70] Li and Shapiro, *China Goes Green*, 91.; Shen Feifei, "China Steps Up Its Push Into Clean Energy," *Bloomberg*, September 26, 2018, https://www.bloomberg.com/news/articles/2018-09-26/china-sets-out-new-clean-energy-goals-penalties-in-revised-plan.
[71] IEA, *An Energy Sector Roadmap*, 44.

In the 12th Five Year Plan (2011-2015) the renewable energy sector was marked as a strategic emerging sector.[72] The construction of hydropower dams was encouraged, aiming to add over 120 GW, especially in southwest China. The development of wind power bases and solar energy power stations was also promoted. The goal was to reach an additional installed wind power capacity of 70 GW by 2015 and an additional installed solar PV power capacity of 5 GW.[73] Furthermore, the 12th Five Year Plan also included binding targets. For example, by 2015 the non-fossil fuel usage in China's primary energy consumption should reach 11.4%.[74]

The focus of the 13th Five Year Plan (2016-2020) was the accelerated development of the renewable energy sector. Southwest China's hydropower sector was further developed, with the goal of adding 60 GW of hydropower capacity. China's northern and coastal areas became the most important areas for the development of wind energy and solar PV energy.[75] Binding targets to be reached by 2020 included a hydropower capacity of 340 GW, a wind power capacity of 210 GW, and a solar PV capacity of 110 GW.[76]

The 14th and most recent Five Year Plan (2021-2025) focuses on the construction of a modern energy system. A clean, low-carbon, safe, and efficient energy system is promoted. Furthermore, the development of hydropower, wind power, and solar PV power is further encouraged. Special attention is paid to the development of offshore wind power and distributed solar PV energy generation. Furthermore, in 2025 the non-fossil fuel usage of China's primary energy consumption should reach 20%.[77]

In addition to these Five Year Plans, the Chinese government has announced additional policies and incentives to further encourage the development of the renewable energy sector. For example, enterprises who develop renewable energy projects are granted tax benefits.[78] Furthermore, China's National Energy Administration and China's National Development and Reform Commission (NDRC) also announced plans to spend over US$360 billion on the development of renewable energy infrastructure as well as the creation of over 13 million jobs in the renewable energy sector by the end of 2020.[79]

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[72] NDRC, *The 12th Five-Year-Plan for Economic and Social Development of the People's Republic of China* (Beijing, March 2011): 9. https://en.ndrc.gov.cn/policies/index.html (Accessed May 10, 2022).
[73] Ibid., 11-13.
[74] Ibid., 4.
[75] NDRC, *The 13th Five-Year-Plan for Economic and Social Development of the People's Republic of China* (Beijing, March 2016): 86. https://en.ndrc.gov.cn/policies/index.html (Accessed May 10, 2022).
[76] Yuan, Behrens, Tukker, and Rodrigues, "Carbon Overhead," 97.
[77] NDRC, *The 14th Five-Year-Plan for Economic and Social Development and Long-Range Objectives through the Year 2035* (Beijing, March 2021): 34. https://en.ndrc.gov.cn/policies/index.html (Accessed May 10, 2022).
[78] Sahu, "Wind Energy Developments," 1403.
[79] Chiu, "The East is Green," 5.

The *Action Plan for Carbon Dioxide Peaking Before 2030*, released by China's State Council in October 2021, also includes policies relating to renewable energy production. For example, the construction of hydropower projects that have already been approved will no longer be delayed, and the government aims to integrate the hydro, wind, and solar PV power sectors in southwestern China. In addition, large-scale wind power projects are being developed, and special attention is paid to offshore wind power generation. For solar PV power, the development of both concentrated and distributed power generation systems is encouraged.[80] The Chinese government aims to expand the total installed capacity of wind and solar PV power to 1200 GW in 2030.[81] Because of the above-mentioned policies and incentives, the share of renewables in the total installed capacity has been increasing steadily.[82]

6.3 Domestic Development of Renewable Energy

6.3.1 Hydropower

The Chinese government has encouraged the construction of hydropower infrastructure to meet China's ever-growing demand for electricity and to fuel its economic development. Their first large-scale hydropower project in Gezhouba became operational in 1988 and was followed in 2003 by the even larger Three Gorges Dam. The dam reached full operating capacity in 2008, and is still considered the largest hydropower station in the world with a capacity of 22,500 MW.[83] When the dam opened, it was said to be able to produce 3% of China's energy consumption. And, as China is still dependent on coal for over half of its energy but also has many rivers, hydro dams are an obvious choice for renewable energy generation.[84]

The Chinese government has continued to encourage the development of hydro-powered dams.[85] The majority of Chinese rivers now have a hydro dam, and plans to further boost the construction of hydro dams in south-west China could lead to a new 'great leap forward' in hydropower.[86] Indeed, as figure 2 shows, China's hydropower capacity grew from 74 GW in 2000 to 355 GW in 2021.[87]

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[80] NDRC, *Action Plan for Carbon Dioxide Peaking Before 2030* (Beijing, October 2021): 6-7. https://en.ndrc.gov.cn/policies/202110/t20211027_1301020.html (Accessed May 11, 2022).
[81] IEA, *An Energy Sector Roadmap*, 34.; NDRC, *Action Plan*, 6.
[82] Yuan, Behrens, Tukker, and Rodrigues, "Carbon Overhead," 97.
[83] Deborah Brautigam and Hwang Jyhjong, "Great Walls Over African Rivers: Chinese Engagement in African Hydropower Projects," *Development Policy Review*, no. 37 (2019): 314.
[84] Olivia Boyd, "The Birth of Chinese Environmentalism: Key Campaigns," in *China and the Environment: The Green Revolution*, ed. Sam Geall (Zed Books, 2013): 55.
[85] Li and Shapiro, *China Goes Green*, 92.
[86] Boyd, "The Birth of Environmentalism," 56.
[87] IRENA, "Renewable Capacity Statistics 2022," Abu Dhabi: IRENA, https://irena.org/publications/2022/Apr/Renewable-Capacity-Statistics-2022 Accessed May 10, 2022.; IRENA,

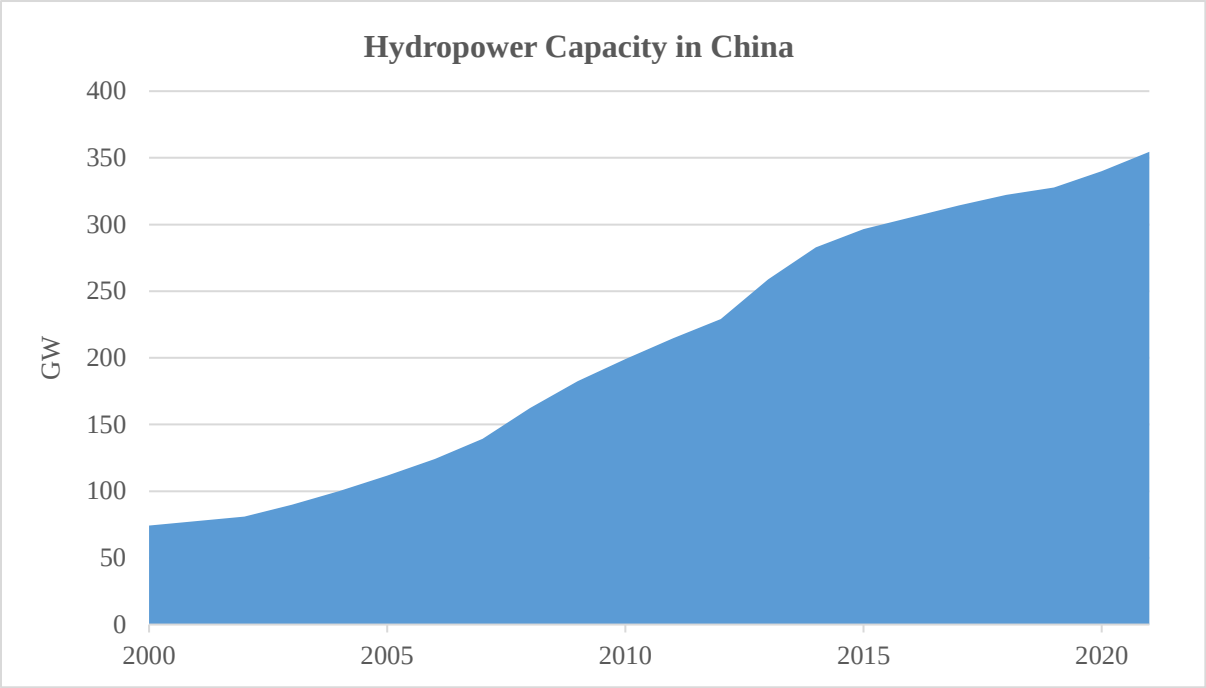

Figure 2 Hydropower Capacity in China, 2000-2021. Data source: IRENA, "Renewable Capacity Statistics 2022" and IRENA, "Renewable Energy Statistics 2021".

China currently already has over a quarter of the world's hydropower capacity. However, installed capacity does not equal the actual use of this renewable energy. In parts of China, there have been issues with overcapacity and, subsequently, curtailment. This prompted the Chinese government to introduce a new renewable energy policy in November 2019, which requires a province-wide minimum consumption of renewable electricity. This way, the Chinese government was able to increase demand, to help solve issues of overcapacity.[88]

6.3.2. Wind Power

China built its first wind farm in 1986, however, large-scale and rapid development of the wind power sector started really taking off in the early 2000s.[89] Currently, China has the largest installed capacity of wind farms worldwide, making the country the world's wind power leader.[90] It is also the world's largest investor in wind energy.[91] China's long coast line and vast land area are suitable for the production of wind energy.[92] Indeed, according to a joint report

"Renewable Energy Statistics 2021," Abu Dhabi: IRENA, https://irena.org/publications/2021/Aug/Renewable-energy-statistics-2021 Accessed May 10, 2022.
[88] Li and Shapiro, *China Goes Green*, 93.
[89] Dai Juchuan, Yang Xin, and Wen Li, "Development of Wind Power Industry in China: A Comprehensive Assessment," *Renewable and Sustainable Energy Reviews*, no. 97 (2018): 157.
[90] Dai, Yang, and Wen, "Development of Wind," 156.
[91] Zhu et al., "The China Wind Paradox: The Role of State-Owned Enterprises in Wind Power Investment Versus Wind Curtailment," *Energy Policy*, no. 127 (2019): 200.
[92] Sahu, "Wind Energy Developments," 1396.

by the IEA and the Energy Research Institute, wind power capacity in China could reach 1000 GW by 2050, meeting over 17% of all domestic electricity demand.[93] Figure 3 shows the growth of China's wind power capacity over the last two decades. The capacity grew from 341 MW in 2000 to 282 GW in 2020. Furthermore, figure 3 also shows that onshore wind power is responsible for the largest part of China's total wind power capacity. Indeed, in 2020, 96% of all wind power came from onshore wind turbines.[94]

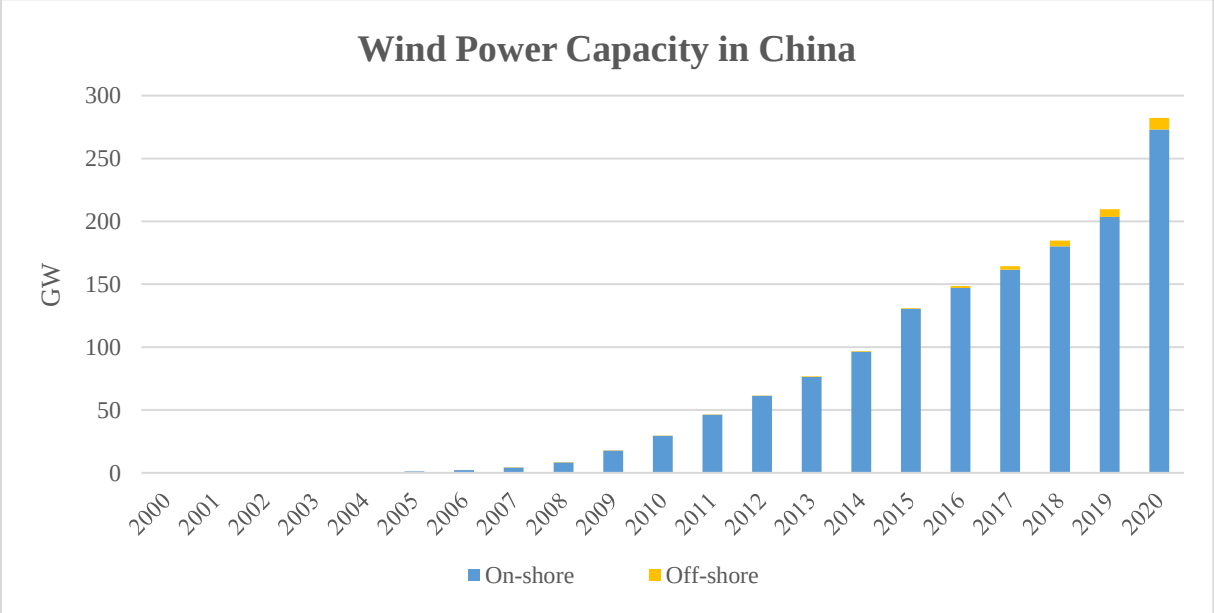

Figure 3 Wind Power Capacity in China, 2000-2020. Data source: IRENA, "Renewable Capacity Statistics 2022" and IRENA "Renewable Energy Statistics 2021".

Multiple internal market drivers support China's wind power industry. These include a wide range of government subsidies, government incentives to create more wind farms, and access to inexpensive raw materials.[95] There are several industry-specific policies. For example, the *Energy Development Strategy Action Plan (2014-2020)*, released by the State Council in 2014, includes policies like "construct 9 large modern wind power bases as well as the matched transmission project" and "increase the installed wind capacity to 200 million kWh and the feed-in-tariff of wind energy will reach as much as that of coal power in 2020".[96] Furthermore, the 12th Five Year Plan (2011-2015) included plans to reach an installed capacity of offshore wind power of 5 GW by 2015 and 30 GW in 2020.[97]

[93] Wang Zhongying, Shi Jingli, and Zhao Yongqiang, *Technology Roadmap: China Wind Energy Development Roadmap 2050* (IEA Publishing, 2011): 7.
[94] IRENA, "Renewable Capacity Statistics 2022."; IRENA "Renewable Energy Statistics 2021".
[95] Sahu, "Wind Energy Developments," 1395.
[96] Niu Dongxiao, Song Zongyun, and Xiao Xinli, "Electric Power Substitution for Coal in China: Status Quo and SWOT Analysis," *Renewable and Sustainable Energy Reviews*, no. 70 (2017): 616.
[97] Zhao Xingang and Ren Lingzhi, "Focus on the Development of Offshore Wind Power in China: Has the Golden Period Come?" *Renewable Energy*, no. 81 (2015): 644.

China's wind power sector also faces some challenges. These include peaking capacity, transmission capacity, and shortages in local consumptive ability.[98] However, the main issue in the development of China's wind power sector is the capacity of the existing power grid.[99] Research by Shi, Fan, and He has found that the development of large-scale wind farms does not match with the existing power grid, which leads to wind power curtailment, which in turn results in low utilization of wind power.[100] According to the National Energy Administration, the total output of abandoned wind reached 41.9 billion kWh in 2017, which is just under 14% of the total generated wind power, and is valued at US$3.352 billion.[101] Needless to say, with both renewable energy losses and economic losses of this scale, a lot of ground can still be gained in China's wind power sector.

6.3.3 Solar PV Power

Solar PV systems have been in use in China since the late 1990s. At first, small-scale off-grid systems were used in rural areas to provide electric power. Later, large-scale on-grid solar PV systems were developed. Compared to the hydropower sector and wind power sector, the rapid development of solar PV took off quite late, starting in 2010.[102] As a result of several supportive policies, including the policies described in the 12th Five Year Plan (2011-2015), the solar PV industry now enjoys rapid development and expansion. [103]

A distinction between two types of solar PV systems can be made. On the one hand, there are ground-mounted, large-scale solar PV installations. These are usually built in China's Western regions. On the other hand, there are distributed solar PV systems, which are small-scale and suitable for placement on, for example, roofs. At first, the development of distributed solar PV was slow, and as the prices for individual consumers are relatively high, many consumers in urban areas do not have access to roof space, and social acceptance was quite low. However, thanks to subsidy programmes, distributed solar PV is now on the rise.[104] Indeed, it

[98] Dai, Yang, and Wen, "Development of Wind," 162.
[99] Ibid., 159.
[100] Shi Ruijing, Fan Xiaochao, and He Ying, "Comprehensive Evaluation Index System for Wind Power Utilization Levels in Wind Farms in China," *Renewable and Sustainable Energy Reviews*, no. 69 (2017): 461.
[101] Dai, Yang, and Wen, "Development of Wind," 159.
[102] Iizuka, "Diverse and Uneven Pathways," 246.
[103] Zou Hongyang et al., "Market Dynamics, Innovation, and Transition in China's Solar Photovoltaic (PV) Industry: A Critical Review," *Renewable and Sustainable Energy Reviews*, no. 69 (2017): 198-200.
[104] Frauke Urban, Sam Geall, and Wang Yu, "Solar PV and Solar Water Heaters in China: Different Pathways to Low Carbon Energy," *Renewable and Sustainable Energy Reviews*, no. 64 (2016): 535-537.

has been reported that the capacity of rooftop solar PV in China was at a record high in 2021, with over half of all newly installed capacity coming from rooftop installations.[105]

As a result of growing investments in both large-scale solar PV installations as well as small-scale, distributed solar PV installations , the cumulative installed solar PV capacity grew from less than 2 GW in 2010 to 28 GW in 2014.[106] It rose to well over 35 GW in 2015, thus easily reaching the target set in the 12th Five Year Plan.[107] Figure 4 shows the rapid growth of solar PV capacity in China. The capacity grew from just 34 MW in 2000 to 306 GW in 2021, far exceeding the initial goal of the 13th Five Year Plan, which was 110 GW.[108] Thanks to these developments, China overtook Germany in 2015 to become the global leader in installed solar PV capacity.[109]

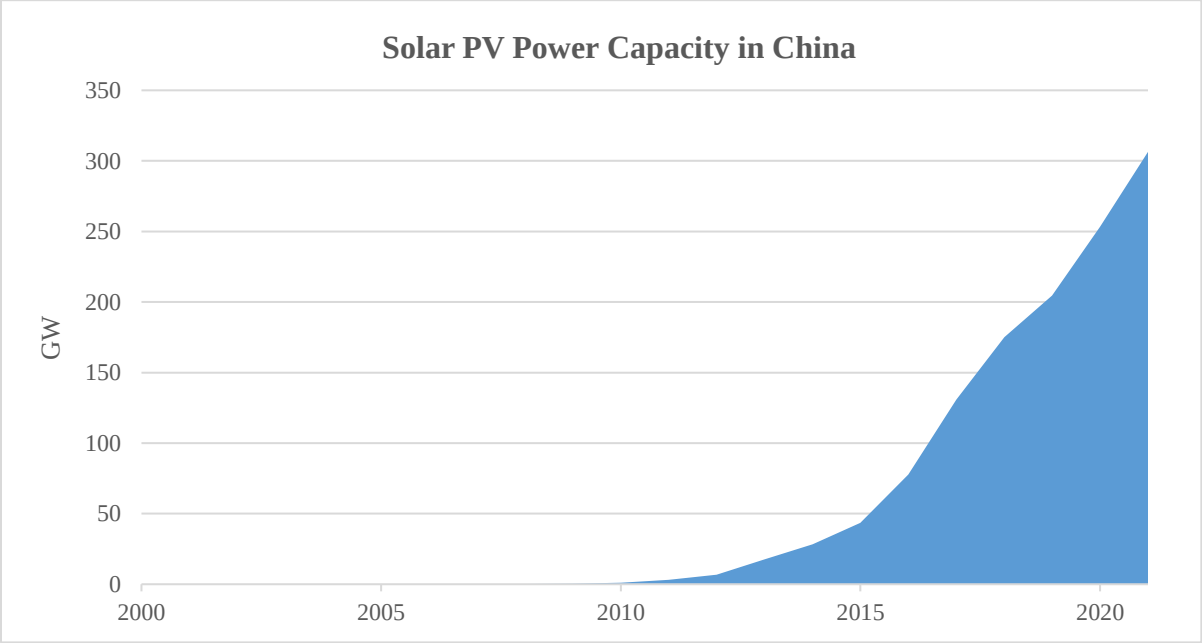

Figure 4 Solar PV Power Capacity in China, 2000-2021. Data source: IRENA, "Renewable Capacity Statistics 2022" and IRENA, "Renewable Energy Statistics 2021".

In line with the hydropower and wind power industries, China's solar PV energy generation industry also faces issues of curtailment, with grid connection being a major bottleneck.[110] As with wind power generation, solar PV is dependent on meteorological factors

[105] Jason Rogers, Luz Ding, and Dan Murtaugh, "China Installed Record Amount of Rooftop Solar in 2021" *Bloomberg*, January 20, 2022 https://www.bloomberg.com/news/articles/2022-01-20/china-put-a-record-number-of-solar-panels-on-rooftops-last-year.
[106] Zou et al., "Market Dynamics," 198-200.
[107] Urban, Geall, and Wang, "Solar PV," 535.
[108] IRENA, "Renewable Energy Capacity Statistics 2022."; IRENA, "Renewable Energy Statistics 2021."; Yuan, Behrens, Tukker, and Rodrigues, "Carbon Overhead," 97.
[109] IRENA, "Renewable Energy Capacity Statistics 2022."; IRENA, "Renewable Energy Statistics 2021."; Adam Rose, "China's Solar Capacity Overtakes Germany in 2015, Industry Data Show," *Reuters*, January 21, 2016 https://www.reuters.com/article/china-solar-idUSL3N15533U.
[110] Urban, Geall, and Wang, "Solar PV," 540.

for its output. Because electricity cannot be adequately stored on a large scale, the renewable energy will have to be curtailed whenever the generated power is too high for the grid.[111]

6.4 Domestic Development of Coal-Fired Power

Despite rapid developments in the renewable energy sector, coal-fired power still accounts for most of China's energy supply. According to a report by IRENA, 62% of all energy in China in 2018 was sourced from coal. Renewables only accounted for 8% that year.[112] China has ample domestic coal resources. In fact, the country is the largest coal producer, responsible for over half of global coal production. About 60% of Chinese coal is used in the electricity generation industry.[113]

With an installed coal-fired power capacity of 1080 GW in 2020, China holds more than half of the total capacity worldwide. Still, new coal-fired power plants continue to be built, with 250 GW currently at various stages of development.[114] According to the *Action Plan for Carbon Dioxide Peaking Before 2030*, newly constructed coal power projects will be placed under severe restrictions. Furthermore, these new power plants will meet international standards and will be used to replace old, outdated ones.[115]

The rapid development of renewables as well as the continued investments in coal-fired power seem paradoxical but has been driven by multiple factors. First, coal is a more reliable energy source, as it can be supplied continuously, unlike electricity, especially electricity from renewable sources.[116] Second, the aftermath of the Covid-19 pandemic and the Russian invasion of Ukraine, bring uncertainties, especially regarding the global economic system as well as the recovery China's domestic economy. As this could negatively affect China's energy demand, coal-fired power is a safe option.[117] Indeed, coal-fired power is necessary for China's energy security. The *Action Plan for Carbon Dioxide Peaking Before 2030* states that "based on China's energy resource conditions of rich in coal but poor in oil and gas, we must insist construction before destruction […]. We must keep national energy security and economic development as the bottom line, strive for time to realize the gradual replacement of new energy, and promote the smooth transition of energy low-carbon transformation."[118]

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[111] Tu Qiang, Regina Betz, Mo Jianlei, and Fan Ying, "The Profitability of Onshore Wind and Solar PV Power Projects in China – A Comparative Study," *Energy Policy*, no. 132 (2019): 405.
[112] IRENA, *Energy Profile China* (Abu Dhabi: IRENA, 2021): 1.
[113] IEA, *An Energy Sector Roadmap*, 23.
[114] Ibid.
[115] NDRC, *Action Plan*, 5.
[116] Niu, Song, and Xiao, "Electric Power Substitution," 618.
[117] IEA, *An Energy Sector Roadmap*, 48.
[118] NDRC, *Action Plan*, 3.

President Xi announced on Earth Day 2021 that "China will strictly control coal-fired power generation projects and strictly limit the increase in coal consumption over the 14th Five Year Period (2021-2025) and phase it down in the 15th Five Year Plan (2026-2030)".[119] It is expected that coal-fired power plants will operate at much lower capacity after 2030, to provide flexibility or act as standby units for when renewable capacity is lacking. By 2060, most coal-fired power plants are expected to have been phased out.[120]

6.5 Accessibility and Affordability

To determine whether China's domestic energy policies and investments actively contribute to reaching Sustainable Development Goal 7, 'affordable and clean energy for everyone', it is important to examine the accessibility and affordability of renewable energy in China. Currently, there is universal access to electricity in China.[121] In 2019 the share of modern renewables in final energy consumption rose to 10.6%.[122] Yet, it remains unclear whether the access to renewable energy is distributed evenly across the country.

Renewable energy is starting to become more affordable. The cost of wind turbines decreased significantly over the past decade, due to government incentives, overcapacity of wind turbine manufacturers, and domestic competition.[123] In 2017, the NDRC introduced a policy that states "By 2020, the electricity price of wind power is equivalent to that of coal-fired power generation".[124] With current developments, wind and solar PV power are expected to undercut the costs of electricity generated by coal-fired power plants between 2025 and 2030.[125] Indeed, the domestic mass production of solar PV panels has led to a decline in solar PV costs.[126]

The main issue relating to both the affordability and the accessibility of renewable energy in China is the inadequate power grid. Hydro dams, wind farms, and large solar PV installations are usually built in areas with optimal conditions for renewable energy generation, which also tend to be sparsely populated and far removed from the country's coastal area. Nonetheless, the coastal area is densely populated, and its electricity demand is high. A suitable

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[119] IEA, *An Energy Sector Roadmap*, 34.
[120] Ibid., 81-82.
[121] IEA et al., *Tracking SDG 7: The Energy Progress Report* (Washington D.C.: World Bank, 2021): 24.; World Bank, "World Bank Global Electrification Database," The World Bank Group. Accessed May 1, 2022, https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS?locations=CN.
[122] IEA, "Renewables Information Database," IEA. Accessed May 5, 2022, https://www.iea.org/fuels-and-technologies/renewables#data-browser.
[123] Sahu, "Wind Energy Developments," 1399.; Zhao and Ren, "Focus on the Development," 652.
[124] Ibid., 161.
[125] IEA, *An Energy Sector Roadmap*, 81.
[126] Zou et al., "Market Dynamics," 198.

power grid would help transmit electricity quickly from one side of the country to the other and would help keep curtailments to a minimum.[127] Fortunately, the 14th Five Year Plan includes the aim to improve the existing grid infrastructure, as well as improve the utilization rate of ultra-high voltage transmission lines.[128]

6.6 China's Domestic Approach from a Green Theory Perspective

When analysing China's domestic approach to reaching SDG 7 from a green theory perspective, several things stand out. First of all, China is taking a state-centred, top-down approach to the development of its domestic renewable energy sector. The Chinese state largely controls the energy sector through its state-owned enterprises (SOEs), which receive substantial amounts of state funding.[129] China's top nine largest power enterprises are all SOEs. SOEs are an important part of China's state capitalist economic model, and because they are government-owned entities, they must actively contribute to the goals set by the Chinese government.[130] Furthermore, as has become clear from this chapter, the Chinese government uses incentives such as tax cuts and subsidies to further develop the renewable energy sector. This is not in line with green theory, as green theory criticizes the traditional, state-centred IR model and prefers a bottom-up model in non-state actors and marginalized peoples are able to significantly influence a decentralized decision-making process.

Second, China is adopting an economic growth model which unites economic and ecological interests. Indeed, the Chinese government aims to realize the further development of the (renewable) energy industry, which is also paired with the creation of new jobs, while at the same time increasing the share of renewable energy in its primary energy mix to fight climate change, reduce air pollution, and help reach SDG 7. However, according to green theorists, sustainable development and environmental protection cannot be achieved whilst economic growth rates keep rising. Furthermore, they argue that the commodification of natural resources is what caused today's climate crisis. Unfortunately, the Chinese government is still actively encouraging this. The hydropower sector stands out here, as damming rivers is a clear case of the commodification of natural resources. In addition, human interests are at the heart of these developments, rather than nature. This also goes against green theory's ecocentrism.

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[127] Ibid.
[128] NDRC, *The 14th Five-Year-Plan*, 34.
[129] Zhang and Andrews-Speed, "State Versus Market," 101503.
[130] Zhu et al., "The China Wind Paradox," 202-203.

Yet, even though the Chinese approach is not in line with green theory, China has realized the rapid development of its renewable energy sector. As a result, clean energy is more widely available, the cost of clean energy is comparable to that of non-renewables, and it allows for a phase-out of coal energy on the long run. At least for now, the Chinese approach to reaching SDG 7 seems to be working. It will be interesting to see what the impacts of this model of combining economic and ecological interests will be in the long run.

Chapter 7: China's Approach for Reaching SDG 7 in Africa

7.1 The African Energy Sector and Chinese Investments

Access to affordable, sustainable, and reliable energy services is a crucial part of human development. However, in sub-Saharan Africa, this remains an issue.[131] In 2019, about 600 million people living in sub-Saharan Africa did not have access to electricity.[132] Yet, these issues have not been the result of a lack of energy resources. Sub-Saharan Africa is endowed with ample fossil energy resources such as oil, coal, and gas, and also has high potential for hydropower, wind power, and solar PV power.[133] According to Dagnachew, Hof, Roelfsema, and van Vuuren, low levels of electricity development have been the result of inadequate governance, institutional problems, and insufficient financial resources.[134] Still, sub-Saharan Africa's electricity demand is estimated to quadruple by 2040, thus necessitating adequate development of the energy sector. For that, countries in sub-Saharan Africa still rely heavily on international development finance.[135]

China has become an important player in sub-Saharan Africa's energy sector, along with traditional (Western) donors and other actors such as international organisations.[136] Increased Chinese investments are the result of China's oversaturated domestic market and its "going global" policy, which helped enterprises enter global markets more easily, so Chinese private firms and SOEs are increasingly taking on international projects.[137] Yet, China-Africa engagements are not solely driven by the Chinese state. Many Chinese private companies choose to invest in Africa in pursuit of commercial objectives.[138]

Research by the IEA has shown that by 2016 Chinese contractors were responsible for about 30% of all new energy capacity added in sub-Saharan Africa, and that they also added almost 30,000 kilometres of energy transmission lines in the region.[139] Chinese enterprises are

[131] Shen Wei and Marcus Power, "Africa and the Export of China's Clean Energy Revolution," *Third World Quarterly* 38, no. 3 (2017): 678.
[132] IEA, *World Energy Outlook 2019*, 433.
[133] Anteneh G. Dagnachew, Andries F. Hof, Mark R. Roelfsema, and Detlef P. van Vuuren, "Actors and Governance in the Transition Toward Universal Electricity Access in Sub-Saharan Africa," *Energy Policy*, no. 143 (2020): 111572(1).; IEA, *Boosting the Power Sector*, 9.
[134] Dagnachew, Hof, Roelfsema, and van Vuuren, "Actors and Governance," 111572(1).
[135] IEA, *World Energy Outlook 2019*, 434.
[136] Shen Wei, "China's Role in Africa's Energy Transition: A Critical Review of Its Intensity, Institutions, and Impacts," *Energy Research & Social Science*, no. 68 (2020): 101578(1).
[137] Chen Yunnan and David Landry, *Capturing the Rains: Comparing Chinese and World Bank Hydropower Projects in Cameroon and Pathways for South-South and North-South Technology Transfer* (Working Paper no. 6, China-Africa Research Initiative, School of Advanced International Studies, Johns Hopkins University, Washington, D.C., 2016): 3.
[138] Shen and Power, "Africa and the Export," 686-687.
[139] IEA, *Boosting the Power Sector*, 14.

involved in almost all parts of the energy production chain, from energy generation to energy transmission and finally to energy distribution.[140] Indeed, a large part of Chinese projects in Africa's energy sector are aimed at increasing access to electricity. Projects by Chinese enterprises comprise nearly the entire energy mix, although hydropower is most prominent.[141] Between 2000 and 2016, Chinese investments in Africa's energy sector, in both renewables and non-renewables, amounted to over US$30 billion.[142] Furthermore, between 2010 and 2020, Chinese contractors added about 17 GW to sub-Saharan Africa's energy grid. This is comparable to 10% of sub-Saharan Africa's existing capacity.[143]

However, Chinese investments in Africa's energy sector have also been critiqued heavily. Chinese engagements have been characterized as exploitative, especially when it comes to coal, oil, and gas, as well as neocolonial for 'grabbing' resources.[144] In addition, the loans financed by Chinese banks are thought to be nearly impossible to repay, the Chinese are undermining efforts to strengthen democracy and human rights in Africa, and it is also implied the Chinese do not comply with local environmental laws and social standards.[145] Yet, as Shen and Power argue, these accusations overlook the revolutionary potential of China's involvement in Africa's energy sector, in particular in the transformation of energy systems on the continent.[146]

7.2 Chinese Investments in Coal in Africa

Throughout the 21st century, China became a global player in the coal industry. Between 2000 and 2019, Chinese policy banks invested US$51.8 billion in coal-fired power projects abroad. The five countries that received most coal-fired power finance were Indonesia, India, Vietnam, Pakistan, and South Africa, with the latter receiving about US$4.5 billion.[147] Indeed, most of the Chinese-built coal-fired power plants in Africa are in the south, as coal resources are high in this region.[148]

[140] Shen, "China's Role," 101578(2).
[141] IEA, *Boosting the Power Sector*, 7.
[142] Rasmus Lema et al., "China's Investments in Renewable Energy in Africa: Creating Co-Benefits or Just Cashing-In?," *World Development*, no. 141 (2021): 105365(5).
[143] IEA, *Boosting the Power Sector*, 13.
[144] Shen and Power, "Africa and the Export," 679.
[145] Brautigam, *The Dragon's Gift*, 273-299.
[146] Shen and Power, "Africa and the Export, 679.
[147] Kelly Sims Gallagher, Rishikesh Bhandary, Baswaran Narassimhan, and Quy Tam Nguyen, "Banking on Coal? Drivers of Demand for Chinese Overseas Investments in Coal in Bangladesh, India, Indonesia, and Vietnam," *Energy Research & Social Science*, no. 71 (2021): 101827(2).
[148] IEA, *Boosting the Power Sector*, 14.

In the early 2010s, as coal-fired power became heavily scrutinized because of its detrimental effect on the climate, the World Bank and the Asian Development Bank virtually stopped investing in coal-fired power plants.[149] The World Bank would only invest in coal "when there are no feasible alternatives to meet basic human needs".[150] Yet, Chinese development banks kept investing in coal-fired power plants. With OECD banking institutions restricting loans, China became an attractive lender to those countries seeking to further develop their coal-fired power supply.[151] Indeed, of all newly constructed coal-fired power plants in sub-Saharan Africa, 27% are constructed by Chinese enterprises.[152]

Figure 5 shows the added coal-fired power capacity by Chinese investments in Africa. Since 2000, Chinese enterprises have added over 11 GW of coal-fired power to Africa.[153] Virtually all projects were funded by Chinese policy banks, of which the large majority was funded by the Chinese Development Bank.[154]

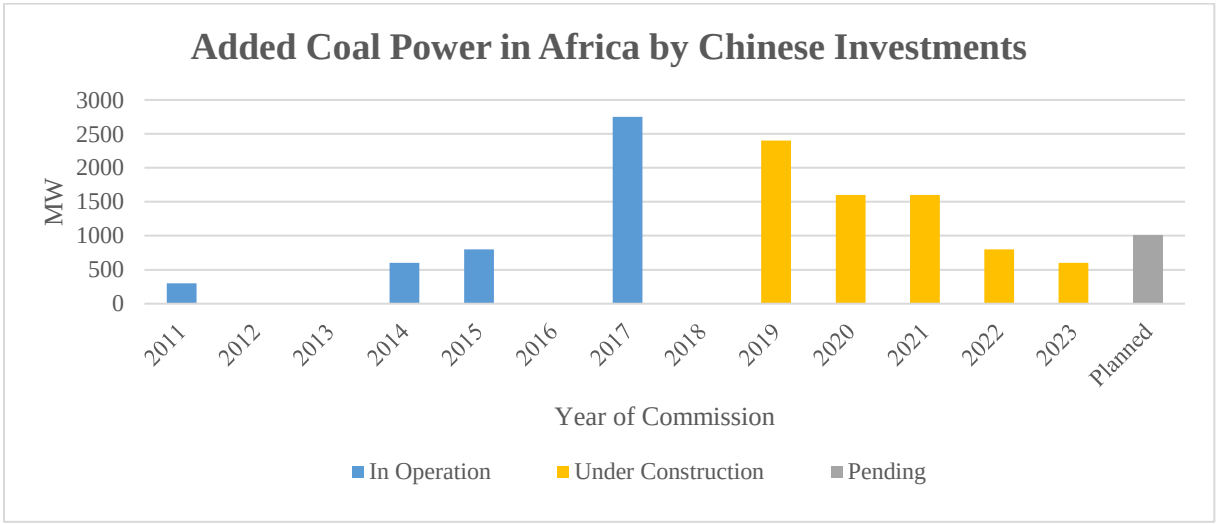

Figure 5 Added coal power capacity in Africa by Chinese investments. Data source: Boston University, "China's Global Power Database 2020."

Yet, as concerns about climate change are growing, investments in coal-fired power plants have increasingly become scrutinized. As a result, Chinese investments in coal have stopped almost entirely over the past couple of years, with new coal-fired projects often mothballed or cancelled.[155] As reported by the Green BRI Centre of the International Institute

[149] Gallagher, Bhandary, Narassimhan, and Nguyen, "Banking on Coal," 101827(2).
[150] Ibid.
[151] Ibid., 101827(2-4).
[152] IEA, *Boosting the Power Sector*, 16.
[153] This includes projects that are still under construction or pending.; Boston University, "China's Global Power Database 2020," Boston University. Accessed June 1, 2022. https://www.bu.edu/gdp/2021/03/12/chinas-global-power-database-2020-data/.
[154] Ibid.
[155] Nedopil Wang, *Coal Phase-Out*, 6.

of Green Finance, there are, in addition to climate-related reasons, also a number of financial reasons for reduced coal investments. First of all, the financing costs for coal-fired power plants are on the rise. Operating costs have also increased significantly, mainly due to volatile coal prices. Second, coal-fired power must compete with low-priced renewable energy. Renewable energy costs have dropped significantly, especially for solar PV. As a result, the levelized cost of energy (LCOE) for solar has now reached approximately US$30 per MWh, whereas the LCOE for new coal-fired power plants has reached US$65 per MWh. Older coal-fired power plants have an even higher LCOE. Third, investors now take climate risk into account in their decision-making process. As carbon-pricing initiatives have become increasingly common, high-emitting coal-fired power plants have become expensive.[156]

Then Xi Jinping gave a speech at the UN General Assembly in September 2021, pledging that "China will step up support for other developing countries in developing green and low-carbon energy, and will not build new coal-fired power projects abroad".[157] So, while coal investments had already dropped significantly, they will now end completely. While much is still unclear, it seems that the projects that are still under construction (marked yellow in figure 5), will be completed.[158] However, the projects that were still in the planning phase (marked grey in figure 5) are likely cancelled. Indeed, as reported by the Centre for Research on Energy and Clean Air, over 15 Chinese-financed coal-fired power plants worldwide have been shelved or cancelled. In Africa, projects in South Africa, Tanzania, and Zimbabwe have been cancelled. In the case of South Africa's Musina-Makhado Special Economic Zone, the planned 4.6 GW coal project will reportedly be replaced by a 1 GW solar plant.[159]

7.3 Chinese Investments in Renewable Energy in Africa

In addition to being the world's largest domestic investor, China is also the world's largest outbound investor in renewable energy.[160] In Africa, these investments in renewables are in part driven by enhanced cooperation between China and African nations. In 2009, at the fourth

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[156] Ibid., 9-12.
[157] Volcovici, Brunnstrom, and Nichols, "In Climate Pledge."
[158] "Power Column Q1 2022", Zimbabwe Power Company, last modified May 6, 2022, https://www.zpc.co.zw/articles/2022/05/06/power-column-q1-2022; "Eskom Medupi's Last Unit Achieves Commercial Operation, Marking Completion of the Project," Eskom, last modified August 2, 2021, https://www.eskom.co.za/eskom-medupis-last-unit-achieves-commercial-operation-marking-completion-of-the-project/; "Kusile Unit 3 Achieves Commercial Operation, Bringing Half the Project to Completion," Eskom, last modified March 31, 2021, https://www.eskom.co.za/kusile-unit-3-achieves-commercial-operation-bringing-half-the-project-to-completion/.
[159] Centre for Research on Energy and Clean Air, *Briefing: 12.8 GW of Chinese Overseas Coal Projects Cancelled, But 19 GW Could Still Go Ahead* (CREA, 2022): 1-6.
[160] Chiu, "The East is Green," 3.

edition of the Forum on China-Africa Cooperation (FOCAC), Chinese premier Wen Jiabao revealed that China planned on investing in 100 clean energy projects across the continent.[161] At the latest FOCAC edition, held in November 2021 in Dakar, the Chinese delegation underscored that they plan on establishing a partnership to fight climate change and they plan on enhancing their collaboration on green development.[162] A declaration published by China's Ministry of Foreign Affairs just after the 2021 FOCAC states that "China will further increase investment in Africa on low-emission projects including photovoltaic, wind and other renewable energies, energy-saving technologies, high-tech industries, and green and low-carbon industries, and will not build new coal-fired power projects abroad."[163]

Most large renewable energy projects in sub-Saharan Africa are constructed by Chinese SOEs, as entry barriers for private enterprises and private capital are still high. In contrast, SOEs are closely connected with Chinese policy makers and large development banks.[164] Research by the IEA has shown that 90% of all projects constructed by the Chinese in sub-Saharan Africa are being contracted by SOEs, while private construction companies make up the remaining 10%.[165]

Renewable energy projects constructed by Chinese companies are usually funded by concessional loans and financing from large Chinese policy banks such as the Chinese Development Bank and the Export-Import Bank of China (Eximbank).[166] These loans are usually disbursed directly to the Chinese company involved, and are later repaid by the host country's government.[167] Investors are usually only eligible for these large loans or export credits if they use equipment and technologies developed and manufactured in China. This also explains why most renewable energy projects constructed by the Chinese are delivered on a turn-key basis and comprise almost solely of Chinese investments, Chinese construction companies, and Chinese technology.[168]

By 2016, more than half of Chinese investments in sub-Saharan Africa's energy sector were made in renewable energy. The hydropower sector remains the largest sector for investment, but significant investments are also made in wind energy and solar energy.[169]

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[161] Shen and Power, "Africa and the Export," 680.
[162] Daniel Large, "China, Africa, and the 2021 FOCAC," *African Affairs* 121, no. 483 (2022): 299-303.
[163] "Declaration on China-Africa Cooperation on Combating Climate Change," Ministry of Foreign Affairs of the People's Republic of China, last modified December 2, 2021, https://www.fmprc.gov.cn/mfa_eng/wjdt_665385/2649_665393/202112/t20211203_10461772.html
[164] Shen and Power, "Africa and the Export," 699.
[165] Bhamidipati et al., "Chinese Green Energy," 208.
[166] Ibid.
[167] IEA, *Boosting the Power Sector*, 31.
[168] Bhamidipati et al., "Chinese Green Energy," 209.
[169] Bhamidipati et al., "Chinese Green Energy," 206.; IEA, *Boosting the Power Sector*, 18.

7.3.1 Hydropower

Hydropower is an increasingly important energy source in sub-Saharan Africa. As power shortages remain a problem in parts of the continent, investments in hydropower have become necessary. Simultaneously, the potential is significant; to some estimates, sub-Saharan Africa has about 300 GW of untapped hydropower capacity.[170] China has emerged as the main investor in hydropower projects in sub-Saharan Africa, accounting for 60% of all investments made in the hydropower sector.[171] Most of these are large-scale projects, averaging about 220 MW, although small-scale projects (<10 MW) are not uncommon. Most Chinese hydropower projects are constructed in East Africa, as this region is most suitable.[172]

As a result of these investments, the export of hydro equipment from China to Africa increased significantly. Between 2006 and 2010, US$ 2.6 million worth of Chinse equipment was exported to Africa, and between 2011 and 2016 this rose to US$ 9.8 million.[173] Figure 6 shows the hydropower capacity added by Chinese investments in Africa. From 2000 onwards, Chinese enterprises have added over 10 GW of hydropower to Africa's grid.[174] The vast majority of these projects were funded by Chinese policy banks, most commonly Eximbank. The most notable hydropower project that is still under construction is the 3 GW Mambilla Hydroelectric Power Station in Nigeria, which upon completion will become one of the biggest dams in Africa.[175]

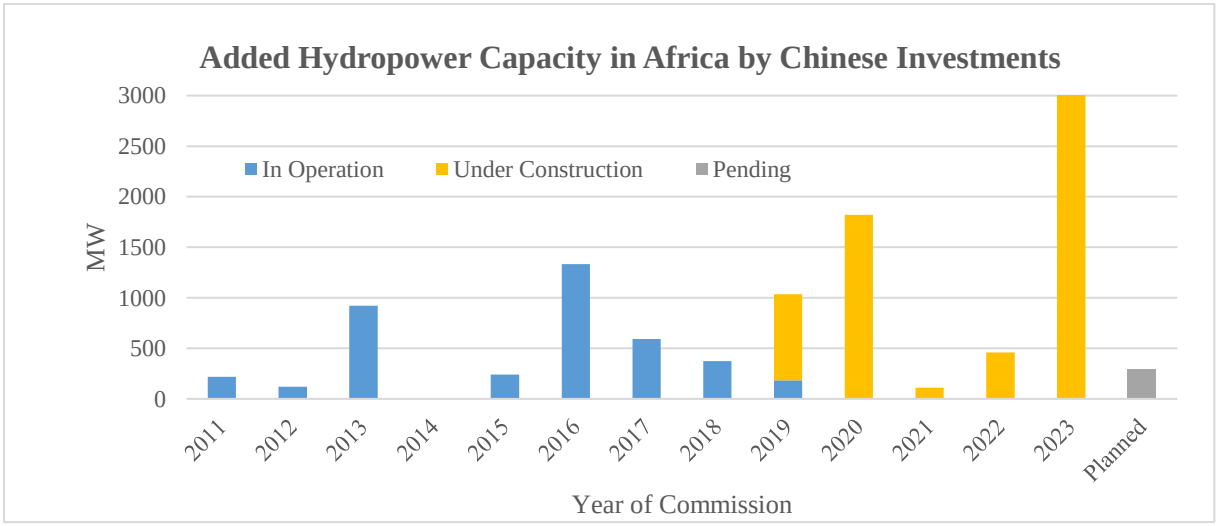

Figure 6 Added hydropower capacity in Africa by Chinese investments. Data source: Boston University, "China's Global Power Database 2020."

[170] Chen and Landry, *Capturing the Rains*, 4-6.
[171] Bhamidipati et al., "Chinese Green Energy," 207.; Lema et al., "China's Investments," 105365(6).
[172] IEA, *Boosting the Power Sector*, 14-15.
[173] Lema et al., "China's Investments," 105365(7).
[174] This includes projects that are still under construction or pending.; Boston University, "China's Global Power Database 2020."
[175] Ibid.

7.3.2 Wind Power

Prior to 2008, Chinese exports of wind turbines accounted for only just over 4% of the total sales of Chinese wind turbine manufacturers. Yet after 2008, when the domestic market started to get saturated and problems with grid connectivity arose, exports grew. Indeed, between 2011 and 2013, the export of Chinese-manufactured wind turbines worldwide more than tripled.[176]. An analysis by Lema et al. shows that Chinese exports of wind power equipment to Africa rose from US$1.8 million between 2006 and 2010 to US$532.2 million between 2011 and 2016.[177]

Figure 7 shows the wind power capacity that was added as a result of Chinese investments in Africa. Since 2000, Chinese enterprises have added 620 MW of capacity to Africa's grid.[178] Most notable are the Ethiopian Adama Wind project and the South-African De Aar project. Two more projects are under planning, namely the Aysha project and the Mesobo-Harena project in Ethiopia. [179]

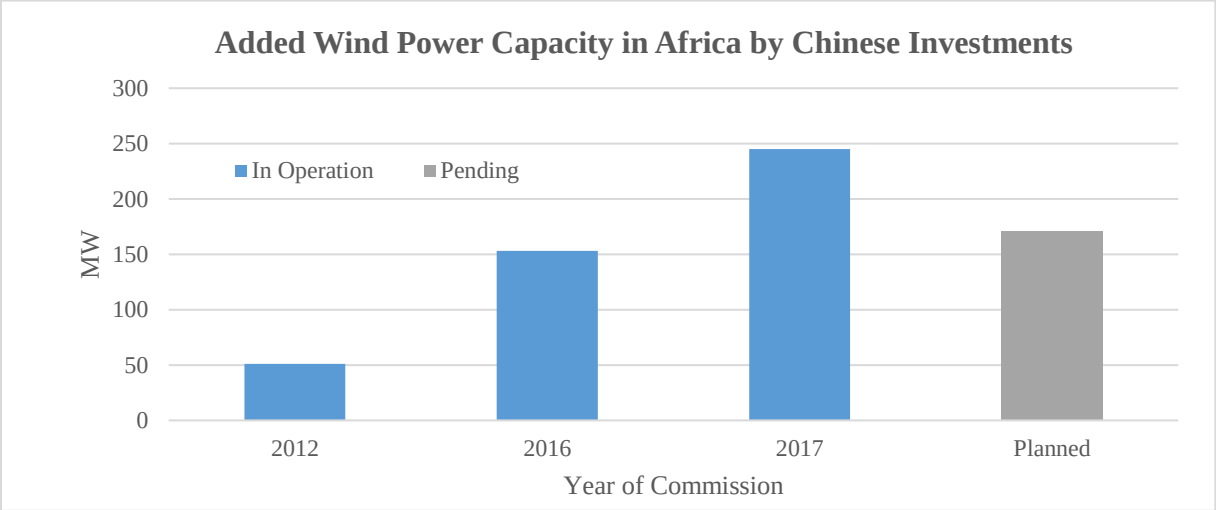

Figure 7 Added wind power capacity in Africa by Chinese Investments. Data source: Boston University, "China's Global Power Database 2020."

7.3.3 Solar PV Power

China's involvement in Africa's solar PV sector has also been on the rise. In 2019, Chinese investments in solar PV exceeded investments in hydropower for the first time.[180] In contrast with China's wind power industry, China's solar PV power industry was much more export-oriented from the beginning. Before 2012, because China's domestic solar PV market was developing slowly, 95% of Chinese-manufactured solar equipment was exported. However, as

[176] Shen and Power, "Africa and the Export," 689-690.
[177] Lema et al., "China's Investments," 105365(7).
[178] This includes projects that are still pending.; Boston University, "China's Global Power Database 2020."
[179] Ibid.
[180] Lema et al., "China's Investments," 105365(6).

Europe and the US started cutting solar subsidies and implementing anti-dumping policies, a large part of the Chinese market became severely restricted. At that point, Chinese firms started exploring the domestic market as well as other overseas markets, such as Africa.[181] This yielded good results, as exports of solar equipment to Africa rose from US$41.7 million between 2006 and 2010 to US$393 million between 2011 and 2016. [182]

Figure 8 shows the solar PV power capacity added as a result of Chinese investments in Africa. Since 2000, Chinese enterprises have added 225 MW to Africa's grid.[183] Apart from the 55 MW Garissa Solar Power Station in Kenya, which was funded by the Eximbank, all other projects have been funded by greenfield investments. Pending projects include the 100 MW Munyati Solar project in Zimbabwe and the 50 MW Poro Solar project in Cote d'Ivoire. [184]

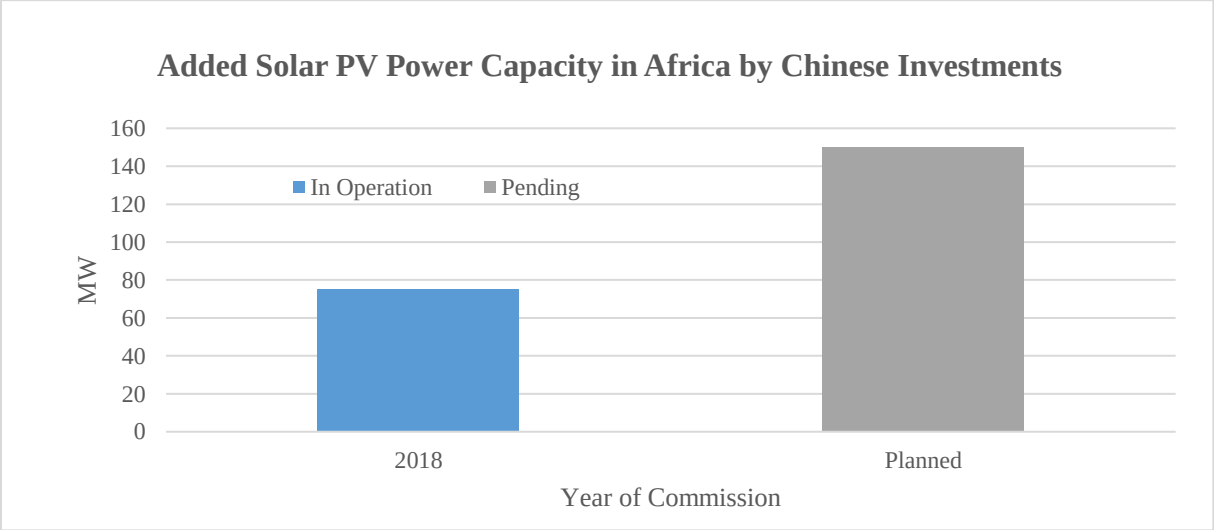

Figure 8 Added solar PV power capacity in Africa by Chinese investments. Data source: Boston University, "China's Global Power Database 2020."

7.4 Accessibility and Affordability

To determine whether China's energy policies and investments actively contribute to reaching SDG 7 'affordable and clean energy for everyone' in Africa it is important to examine how China helped improve the accessibility and affordability of renewable energy in the region.

7.4.1 Accessibility

Access to electricity has improved significantly in several African countries in the past 20 years. In 2000, only 25% of sub-Saharan Africa's population had access to electricity, in 2020 that

[181] Shen and Power, "Africa and the Export," 692.
[182] Lema et al., "China's Investments," 105365(7).
[183] This includes projects that are still pending.; Boston University, "China's Global Power Database 2020."
[184] Ibid.

share rose to 48%.[185] Nonetheless, 600 million people remain without access.[186] In North Africa, over 99% of the population has access to electricity, so most people without access live in sub-Saharan Africa.[187]

The power plants and energy transmission lines built by Chinese contractors in sub-Saharan Africa have actively supported access to energy. Yet, it must be noted that most of these capacity additions have taken place through the main grid, as decentralized, small-scale, and/or off-grid projects are still in the early stages of development and do not provide much added electric capacity per capita.[188] Nonetheless, investments in sub-Saharan Africa's energy sector have allowed 120 million people to gain access to electricity between 2010 and 2020, of which Chinese contractors are responsible for 30%. Chinese investments have also helped establish a more reliable supply of energy.[189]

As a result of a significant increase in investments in renewables such as wind power and solar PV power from 2010 onwards, and the continued investments in hydropower, the Chinese have helped diversify Africa's energy supply and helped people in Africa gain more access to renewable types of energy. Indeed, since 2000 the Chinese have added (or are going to add) a total of 11.3 GW of renewable energy to Africa's energy grid, of which 4.5 GW is already in operation, 6.2 GW is currently under construction, and 600 MW is still in the planning phase.[190] With China's pledge to stop investing in coal-fired power plants abroad, and its continued investments in renewable energy in Africa, China could play an important role in further increasing the share of renewable energy consumption.

Despite the potential renewable energy has in Africa, and the investments that have been made in its renewable energy sector over the last couple of decades, renewables still play a limited role in Africa's power generation mix.[191] In 2019, the share of modern renewables in final energy consumption was only 7.6% in Africa.[192] According to Shen and Power, this is mainly due to limited electricity transmission and distribution infrastructures, as well as inadequate financial and technological support for the maintenance of these large projects.[193]

[185] World Bank, "World Bank Global Electrification Database."
[186] IEA, *World Energy Outlook 2019*, 355.
[187] Ibid., 436.
[188] IEA, *Boosting the Power Sector*, 27.
[189] Ibid., 27-28.
[190] Boston University, "China's Global Power Database 2020."
[191] Shen and Power, "Africa and the Export," 691.
[192] IEA, "Renewables Information Database."
[193] Shen and Power, "Africa and the Export," 691.

7.4.2 Affordability

Over the past decade, the LCOE of renewable energy sources have dropped significantly worldwide. Most notably, between 2010 and 2019 the costs of onshore wind power fell 9% year-on-year, and the costs of utility-scale solar PV feel 13% year-on-year.[194] Furthermore, over half of newly commissioned large-scale renewable energy projects had a lower LCOE than the most affordable fossil fuel-fired power option. Renewables, and in particular onshore wind and solar PV, have become competitive with or cheaper than fossil fuels.[195] As the Chinese have stopped building coal-fired power plants in Africa and have increasingly invested in renewable energy projects and the construction of transmission lines, they have contributed to decreasing energy costs on the continent. Indeed, the turn-key model frequently used by Chinese enterprises allows for a combination of high speed and low costs, making it extremely difficult for other (Western) suppliers to compete with.[196]

Nonetheless, the affordability of electricity remains an issue in Africa, especially as electricity demand is expected to rise quickly.[197] Many sub-Saharan African households are unable to afford the upfront costs of grid connection, which tend to be steep. These costs are even higher for people living in sparsely populated and rural areas, and thus usually further away from the existing grid. Furthermore, for those already connected to the grid it is becoming increasingly difficult to afford basic energy services because of energy tariffs. Although increasing Chinese investments in electricity transmission lines might provide some relief, the biggest changes can be achieved by adequate government policies, subsidies, and tax exemptions by African governments.[198]

Furthermore, to reach SDG 7 in Africa and make (renewable) energy accessible and affordable for everyone, Africa relies heavily on energy investments. Indeed, the IEA reports that energy investments between 2020 and 2030 will need to double to reach Africa's energy and climate goals.[199] As a result of the COVID-19 pandemic, large-scale energy projects have been delayed and materials have become more expensive.[200] Furthermore, due to the Russian invasion in Ukraine and the prices increase of fuel and food have increased significantly as

[194] Frangton Chiyemura, Shen Wei, and Chen Yushi, *Scaling China's Green Energy Investment in Sub-Saharan Africa: Challenges and Prospects* (2021): 6.
[195] IRENA, *Renewable Power Generation Costs 2019* (Abu Dhabi: IRENA, 2020): 23.
[196] Shen and Power, "Africa and the Export," 683-684.
[197] IEA, *Africa Energy Outlook 2022* (IEA Publications, 2022): 16.
[198] IEA, *World Energy Outlook 2019*, 459.
[199] IEA, *Africa Energy Outlook 2022*, 19.
[200] Ibid., 34.

well.[201] Consequently, a growing number of Africans cannot afford to pay their energy bills.[202] These events have negatively contributed to energy access and affordability, but have also underscored the necessity of a green energy transition so as to become less dependent on imported fossil fuels.[203] Therefore, an increase in investments in renewable energy projects, as well as in transmission and distribution networks has become vital for Africa's energy security and SDG 7.[204] China could continue to play an important role in this.

7.5 China's Approach in Africa from a Green Theory Perspective

When analysing China's approach to reaching SDG 7 in Africa from a green theory perspective, several

things stand out. First of all, China is taking a state-centred, top-down approach to the investments in Africa's (renewable) energy sector. Turn-key projects, usually financed by Chinese development banks and constructed by Chinese SOEs, are most commonly used as a Chinese form of investment. Because of the influence and connections SOEs tend to have, it is easier for them to secure funding and enter foreign markets. Still, it would be wrong to assume that the Chinese state completely controls the SOEs active in Africa. The opposite is true, as the Chinese Ministry of Commerce does not have direct authority over the SOEs operating in Africa and overall government control over SOEs is decreasing.[205] This approach, like the Chinese domestic approach, is not in line with green theory, as green theory actively critiques a state-centred IR model and advocates for a bottom-up approach.

Second, China is also adopting an economic growth model in which economic and ecological interests are united in their investments in Africa's (renewable) energy sector. Indeed, through their activities, Chinese financiers and contractors aims to further develop the (renewable) energy industry and make profits while simultaneously increasing the share of renewable energy in Africa's energy mix to fight climate change and help reach SDG 7. Yet, green theorists believe that sustainable development and environmental protection cannot be achieved while economic growth rates continue to rise. Furthermore, they argue that the commodification of natural resources is at the root of today's climate crisis. Unfortunately, the Chinese are still actively contributing to this. In addition to hydropower, the years of Chinese investment in coal-fired power plants have used the commodification of coal to produce energy,

[201] Ibid., 23.
[202] Ibid., 36.
[203] Ibid., 23.
[204] Ibid., 125-126.
[205] Shen and Power, Africa and the Export, 686.

resulting in dangerous carbon emissions. Furthermore, like its domestic approach, the Chinese approach in Africa can be characterized as anthropocentric rather than ecocentric.

Yet, even though the Chinese approach is not in line with green theory, China has actively contributed to Africa's renewable energy sector. Its pledge to stop building coal-fired power plants abroad is a step in the right direction, that hopefully helps redirect investments to renewable alternatives. Indeed, continued investments in Africa's renewable energy sector are necessary to reach SDG 7. Chinese financiers and contractors will likely remain important for Africa's renewable energy sector development. It will be interesting to see what the long-term impacts of Chinese renewable energy projects in Africa are going to be, for both (economic) development as well as the global green energy transition.

Chapter 8: Analysis

8.1 Similarities and Differences in China's Approach

When examining China's domestic approach to reaching SDG 7 and its approach in Africa, there are mainly similarities. First of all, in both cases a top-down approach can be identified. The Chinese government develops policies aimed at the rapid development of the renewable energy sector, and it encourages cooperation in Africa on a state-level through the FOCAC. Non-state actors have little to no say in the policies relating to renewable energy projects. Second, in both cases SOEs play a vital role in the construction of renewable energy projects. As only SOEs are easily able to secure substantial amounts of funding, mainly because of their close ties with the Chinese government and large Chinese development banks, barriers to entry are remarkably high for private Chinese enterprises and financiers. Therefore, the domestic and African markets for investments in renewable energy are dominated by SOEs. Third, in both cases an emphasis is placed on the rapid development of renewable energy projects, resulting in ever-growing renewable energy capacity levels. Hydropower remains most important, but in both cases wind power and solar PV power are growing rapidly. Furthermore, both domestically and in Africa, transmission and distribution lines are developed as well.

However, there are also differences. In contrast to the domestic situation, there are no specific Five Year Plan policies or binding targets that Chinese enterprises in Africa must adhere to. Indeed, the SOEs operating in Africa are not controlled by Chinese ministries, and part of the reason they are operating in Africa is because of commercial objectives.

8.2 The Status of SDG 7

Despite the progress that has been made, the world is not on track to reach SDG 7. The COVID-19 pandemic and the Russian invasion of Ukraine have also slowed down the progress. Nonetheless, outcomes differ significantly per country.[206] In China, a 100% access rate to electricity has already been achieved, and renewable energy prices are dropping. And although domestic investments in renewable energy projects have led to an increase in renewable energy in China's final energy consumption, coal remains the country's main source of energy. Only time will tell if continued investments in renewables and the planned phase-out of coal-fired power will be sufficient to reach SDG 7 in 2030.

When it comes to clauses 7A and 7B of SDG 7, which emphasize the necessity of international cooperation and the promotion of investments in renewables, especially in

[206] IEA et al., *Tracking SDG 7*, 1.

developing and least developed economies, China has tried to do so. This is visible in the case of Chinese investments in Africa; the Chinese government promotes cooperation through initiatives like the FOCAC, and Chinese enterprises have constructed numerous renewable energy projects all over the continent, which has helped increase the share of renewables in the final energy consumption of multiple African countries. Indeed, it has become clear that China is adhering to their *National Plan on Implementation of the 2030 Agenda for Sustainable Development*.

Yet , despite Chinese efforts, hundreds of millions of people in Africa still lack access to electricity. Unfortunately, the COVID-19 pandemic has even reversed some of the progress made.[207] Accessibility and affordability issues remain, and a significant increase in investments in renewable energy will be necessary to make sure African countries reach SDG 7.

8.3 China's Approach from a Green Theory Perspective

As has become clear from chapters 6 and 7, the approach China is taking domestically and in Africa to reach SDG 7 is not in line with green theory. First, in both cases China is using a model that aims to ensure ecological conservation while also achieving economic development. To achieve economic development, SOEs operating domestically and/or abroad are encouraged to secure substantial amounts of funding to develop renewable energy projects. Especially in Africa, commercial objectives are an important pull factor. However, whether China is doing enough to ensure ecological conservation is still hard to determine at this point. The investments in renewables will significantly decrease carbon emissions, especially in the long run, however the reliance on coal will lead to a continuation of high levels of carbon emissions in the short run. Nonetheless, China is taking steps to phase out coal by pledging not to build coal-fired power plants abroad and by pledging to have carbon emissions peak before 2030 and achieving carbon neutrality before 2060. Because green theorists argue that ecological conservation cannot be achieved while simultaneously achieving high levels of economic growth, it will be interesting to see how China's approach plays out in the long run.

Second, green theorists aim to re-examine the relations between the state, the economy, and the environment, as well as to make global patterns of trade more sustainable. However, because China is taking a state-centric approach and Chinese enterprises are operating within the global capitalist economic system, these relations have not been re-examined and these global patterns have not been changed. Furthermore, the policies described in, among others,

[207] Ibid., 169.

the Five Year Plans are based on a narrow understanding of sustainable development, which focuses on economic development and technological innovation instead of taking a more holistic approach.

Arguably, green theory is still too normative, and cannot realistically be applied in today's global political and economic system. Even though they are capitalist in nature and anthropocentric rather than ecocentric, Chinese investments both domestically and in Africa have a revolutionary potential to transform global energy systems. Realistically, large transformations such as the transition to green energy will always come at some cost for the environment. Indeed, shutting down coal-fired power plants immediately, which would be best for the environment, is unattainable. Currently, coal-fired power plants are still essential for energy security. Furthermore, it has become clear that Africa will only be able to reach its climate goals if large investments in its renewable energy sector continue to be made. Considering the role Chinese funding has played in the recent development of Africa's renewable energy sector, investments like these, in addition to other types of financing, should be encouraged rather than shunned.

Chapter 9: Conclusion

9.1 Main Findings

In exploring China's policies and investments relating to renewable energy, this thesis examined China's domestic approach to reaching SDG 7 and compared it to its approach in Africa. As became clear from the literature review, some scholars argue that because economic development and environmental protection cannot occur simultaneously, not all SDGs will be reached. Although some have argued that the green growth concept could provide a solution to this problem, green theorists argue that this is impossible. According to them, traditional understandings of development should be challenged, an ecocentric approach to development should be taken, the relationship between the state, the economy, and the environment should be re-examined, global patterns of trade should become more sustainable, and non-state actors should be able to play a more prominent role in solving global issues such as climate change.

This research has found that in its domestic context, China is quickly increasing investments in renewable energy. Supportive policies and binding targets in Five Year Plans have helped the development of the domestic renewable energy sector. The progress is highly remarkable, with hydropower capacity increasing from 74 GW to 355 GW, wind power capacity increasing from just 341 MW to 282 GW, and solar PV power increasing from a mere 34 MW to 306 GW in just twenty years. As a result, the accessibility and affordability of renewables has improved significantly. However, despite these commitments, China still relies heavily on coal for its energy security, and coal-fired power plants continue to be built.

In the African context, Chinese investments have helped develop the renewable energy sector as well. Although in the past China has built numerous large-scale coal-fired power plants in Africa, new projects will now be cancelled, following the pledge made by Xi Jinping to stop building coal-fired power plants abroad. However, Chinese investments in renewables are on the rise, with hydropower being the most important sector, followed by wind power and solar PV power. Chinese contractors are responsible for 30% of all investments made in renewables on the continent and have therefore played a significant role in improving accessibility and affordability of electricity in Africa.

The research question of this thesis is 'How does China's domestic approach to reaching Sustainable Development Goal 7 differ from its approach in sub-Saharan Africa?'. Considering the aforementioned findings, this thesis argues that China's domestic approach to reaching SDG 7 is similar to the approach they are taking in Africa. The only differences are that the Chinese do not have any specific policies or binding targets for investments made by Chinese enterprises

in Africa. Indeed, cooperation is facilitated through the FOCAC, and Chinese SOEs operating in Africa are not controlled by Chinese ministries. The similarities in China's domestic approach and its approach in Africa are the dominance of SOEs and Chinese development banks in the development of renewable energy projects, the top-down approach China is taking, which rarely allows for input of non-state actors, and the emphasis on rapid development of the hydropower, wind power, and solar PV power sectors both domestically and abroad. Furthermore, this thesis has found that the Chinese approach is not in line with green theory.

9.2 Limitations

This thesis has several limitations. First of all, an assessment of the environmental impact of renewable energy projects, and especially hydropower projects, is beyond the scope of this research. However, an in-depth look into the possible environmental impacts could provide new insights in the debate whether economic development is compatible with environmental protection. Furthermore, this thesis did not allow for an analysis of the development of small-scale renewable energy projects and/or how non-state actors and private companies might try to assert influence over decision-making processes and global patterns of investment in the renewable energy sector. For a more complete analysis, these should be taken into consideration as well. This could be an interesting point for further research.

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