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THE GEOPOLITICS OF ENERGY TRANSITION

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I declare that this master thesis has been written solely by myself and that it has not submitted, in whole or in part, for any other degree. I also declare that the work contained here is my own except where explicitly stated otherwise, and that all the material deriving from other sources has been appropriately mentioned and cited.

Abstract

With climate change accelerating, the global shift towards renewable energy systems is also reshaping the geopolitical landscapes. The aim of this thesis is to investigate how the energy transition is expected to impact the geopolitical position of the United States and China. As China is emerging as a natural leader in clean energy technologies because of the energy transition, the United States is forced to adapt its strategy in response to the declining importance of fossil fuels. This thesis compares the two aforementioned countries by employing the SWOT framework to assess the key strategic dimension each faces in the context of the transition. The study discovers that China's early investments and industrial policy have enabled it to gain geopolitical leverage, whereas the United States' innovation capacity and institutional strengths remain vital, although challenged by political fragmentation. By attempting to link the energy transition with questions of international influence and strategic repositioning, this work aims to contribute to a more geopolitically informed understanding of energy system change.

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Table of Contents

List of Figures

List of Tables

Chapter 1: Introduction

1.1 Preamble

As climate change progresses and the transition towards more sustainable energy sources becomes a necessity rather than a choice, the implications extend far beyond environmental and economic considerations. For centuries, energy has been at the core of national power and global strategy, enabling some countries to emerge as geopolitical leaders due to their energy advantage while others have remained dependent on external suppliers to meet their energy demands. As the energy transition progresses, and the world shifts towards cleaner forms of energy, these changes are beginning to reshape geopolitical realities. Former energy leaders that built their influence on fossil fuel wealth now face a future where that advantage won't matter anymore, while previously energy dependent nations are presented with the opportunity to achieve not only energy independence but even global energy leadership. In this context, this thesis examines the United States and China as case studies, since China is now emerging as frontrunner in the energy transition while the United States must confront the challenge of adapting its energy strategy as the relevance of fossil fuels declines.

Specifically, this thesis investigates how the energy transition is expected to geopolitically affect the United States and China, two countries positioned at the forefront of this global shift. While China is emerging as a leader in the new energy era, the United States faces the challenge of adapting to a future where fossil fuels may no longer hold any strategic value, or at least the same as before. Given that much of the existing research on energy transition focuses mainly on the technical and environmental dimensions, with limited attention to the geopolitical implications, this study aims to bridge that gap. By employing a comparative SWOT analysis, it identifies some of the strengths, weaknesses, opportunities, and threats each country faces within the emerging energy landscape and attempts to draw conclusions regarding their future geopolitical positioning.

To sum up, this thesis as has already been briefly outlined, seeks to answer the research question: *How will the energy transition affect the geopolitical position of the United States and China?*. The structure is as follows: Chapter 2 presents a review of the relevant literature, aiming to define the concept of energy transition and explore its intersection with geopolitics. Chapter 3 outlines the methodology with particular emphasis on the SWOT analysis framework which serves as the main tool for comparing the two case studies. Chapter 4 presents the comparative analysis of the United States and China and finally, Chapter 5 offers conclusions of the study and discusses its limitations.

Chapter 2: Literature review

2.1. Introduction

The objective of the following chapter is to facilitate the understanding of the interconnection between the energy transition and geopolitics. This goal is considered essential in order to be able to answer the research question of this thesis, which is, how the energy transition will affect geopolitically the United States and China. It is deemed necessary to review the existing academic literature surrounding the three key themes.

In more detail, section 2.1 focuses on the concept of energy transition. It reviews academic literature that outlines the evolution from fossil fuels to low carbon and renewable alternatives, presenting different interpretations of the term energy transition well as the driving forces behind the global shift and finally the challenges and opportunities related with it.

Section 2.2 delves into the concept of geopolitics, with the focus being on classical definitions and intellectual origins, and specifically on the foundational thinkers who helped shaped the field. These thinkers simultaneously introduced key concepts that are considered important for the upcoming SWOT comparison.

Finally, section 2.3 reviews academic literature that connects the two preceding topics by examining the various ways in which the energy transition interacts with geopolitics. Specifically, it highlights how global power structures are being transformed by shifting dependencies and new forms of industrial dominance, while simultaneously generating opportunities and threats within the international system.

2.2 Energy transition

This section reviews several academic contributions as it aims to construct a comprehensive understanding of the term energy transition, since there is not a universally accepted definition. Each of them, besides providing their own interpretation of the term, tries to explore specific dimensions, such as Sovacool (2016) who tries to identify drivers that could accelerate the energy transition or Henderson and Sen (2021) who examines the implications of energy transition for energy companies and market participants in general.

Starting with Smil (2010) who dedicated an entire book on the subject of energy transition in which he mapped its history, requirements, and future prospects. Regarding its definition he acknowledges beforehand that there is no formal or a generally accepted meaning and proceeds to describe it as "*the change in the composition (structure) of primary energy supply, the gradual shift from a specific pattern of energy provision to a new state of an energy system*". Additionally, as mentioned above, this change can occur at different scales ranging from local to global.

Among other insights, Smil identifies two fundamental energy transitions across the centuries:

1. The shift from biomass to fossil fuels
2. The shift from animate to inanimate prime movers, alongside the rise of electricity

He explores when and how these transitions occurred, analyzing energy shifts in Britain, France, the Netherlands, the United States, China, Japan, Russia, and Saudi Arabia. The book also

discusses why moving towards a non fossil future is inevitable yet highly challenging. Finally, he presents notable national transition targets and deconstructs specific plans that outline scenarios for the shift from fossil fuels to renewable energy.

Sovacool (2016) has also contributed to the study energy transition, focusing on the role of time in global and national transitions. He defines the term as "*a change in an energy system, usually to a particular fuel source, technology or prime mover*". (Sovacool, 2016). However, he also acknowledges that there is no standardized or widely accepted definition. A central argument in his paper is that while energy transitions are commonly considered long and protracted affairs, he provides evidence that under certain circumstances, they can occur rapidly. Finally, he identifies three major drivers that could accelerate future energy transitions:

1. Climate change,
2. Resource scarcity,
3. Technological innovation

O'Connor, (2010)'s, contribution towards the energy transition is a scientific paper that historically analyses the energy transition of developed countries, specifically of the United States of America. The aim is to identify valuable lessons for future energy transitions that might or are already occurring in developing countries. In order to do so, the importance of energy is recognized, especially for matters of sustainable development. At the same time, history is used as a guide, arguing that the factors influencing past energy transition in the United States of America could reemerge in developing countries.

As for the energy transition per se, the author introduces a four-stage energy pattern which begins with energy resources such as oil, turned into a carrier, then a converter and finally into a service. Based on that, he defines energy transition as: "*a particular significant set of changes to the patterns of energy use in a society that can affect any or multiple steps of the energy pattern*". (O'Connor, 2010). Additionally, he argues that any changes in resources, services, carriers or converters can constitute an energy transition if it has a substantial impact on society, the economy, or quality of life.

O'Connor (2010) also examines the factors that drive energy transitions, claiming that the demand for energy services is a fundamental precondition. Moreover, he identifies several key determinants that explain why specific combinations of energy sources and technologies become dominant during transitions:

- Supply constraints
- Cost advantages
- Performance benefits
- Policy decisions
- Environmental considerations

According to the author, the forementioned factors even determine which energy sources and converters emerge victorious during an energy transition instead of others.

Finally, the writer compiles a comprehensive list of historical energy transitions, detailing the changes in resources and converters beyond the well-known economy wide-shifts from wood to coal and coal to oil and natural gas. The list includes the year each transition occurred, the key factors that led to the transition and the enabling technological or economic developments that facilitated the shift.

In addition to resource shifts, examines the role of energy services in driving transitions. He categorizes energy services into five categories:

1. Heating
2. Transportation and mechanical power
3. Lighting
4. Cooling
5. Information

According to him, the increasing demand for these services has historically driven energy transitions. For example, the growing demand for lighting initially led to improved oil lamp technology, which later evolved into electric lighting systems.

Araújo (2014) acknowledging that energy transition remains an evolving field, dedicates her paper entirely to exploring and expanding the existing scholarship on the subject. According to the author, energy transition has never had a universally accepted definition, instead over the decades, it has been interpreted through various perspectives. Nevertheless, the author provides her own definition, describing energy transition as *"a shift in the nature or pattern of how energy is utilized within a system",* (Araújo, 2014).

Her definition recognizes that this shift can involve changes in fuel type, access, sourcing, delivery, reliability, end use and the overall orientation of the energy system.

In order to further expand on the concept of energy transition, she introduces three fundamental ideas essential for understanding its nature. She also identifies scale, structure, and quality of change as key analytical indicators, while recognizing population growth, urbanization, and globalization as major megatrends influencing energy system change.

Finally, she presents six different theoretical frameworks, including techno-economic paradigms and socio-technical multi-level perspectives, demonstrating how these approaches are used to analyze the multidisciplinary nature of energy transitions.

Another addition to the literature on energy transition is the paper of Blazquez et al, through which multiple aspects of the energy transition are attempted to be pictured. The term as a general, multidimensional complex phenomenon is defined as "*the switch from an economic system dependent on specific energy sources and technologies to a different economic system".*(Blazquez, Fuentes, & Manzano, 2020).

However, the authors for the ongoing transition towards low carbon sources and electrification adopts IRENA's definition, which describes it as *"a pathway toward transformation of the global*

energy sector from fossil-based to zero-carbon by the second half of this century." (Amin, Ragnar, & Chubais, 2019).

Among other insights, the authors emphasize that electricity is at the epicenter of the transition citing several reasons such as that most clean technologies are designed to produce electricity, the electrification of key factors such as transportation is already underway, and electricity markets are shifting towards decentralized systems driven by technological advancements.

For the analysis of the current energy transition, Blazquez et al. develop a conceptual framework consisting of four fundamental principles and three key consequences emerging from these principles.

The first principle states that policy decisions drive the transition rather than technological advancements alone, and as such energy transitions differ by country, depending on decarbonization policies. The second principle relates to the impact of renewable technologies on liberalized electricity markets. The authors outline three theoretical stages of market evolution where the "the low renewable penetration" being the first, followed by the “high penetration of renewables” and finally the “100% renewable penetration”. They also pinpoint the fact that even though a fully renewable electricity system is technically possible, the political and market-based challenges make it difficult to achieve in liberalized energy markets.

The third principle recognize that a full transition to renewables will never be successful because of the following factors:

1. Difficulties in electrification,
2. The presence of hard-to-abate sectors and
3. The current limitations of renewable technologies.

In addition, political and social preferences for stable energy prices favor the continued usage of fossil fuels.

The fourth and final principal recognizes that the transition demands new business models given the shifting consumer preferences towards renewable energy and the increasing demand for sustainable energy solutions (Blazquez, Fuentes, & Manzano, 2020).

Bridge, Bouzarovski, Bradshaw, & Eyre (2013), contribute to the study of energy transition by examing it through a geographical lens, offering a distinct perspective that focuses on the spatial reconfiguration of existing energy patterns, economic activities, and social structures. Their paper not only describes but also evaluates the geographical implications of the transition to low-carbon energy, using the UK as a case study to illustrate their arguments.

Regarding the terminology of the energy transition, the authors highlight the diverse definitions of energy transition across different regions and sectors:

1. The global South defines it as "*a significant increase in the availability and affordability of modern energy services"*(Bridge, Bouzarovski, Bradshaw, & Eyre, 2013).

2. The transition economies of Central Europe and the former Soviet Union as a "*liberalization of the energy sector with key changes occurring in the structure of ownership and the role of competition"*(Bridge, Bouzarovski, Bradshaw, & Eyre, 2013).

3. The UK Government as "*within government policy as movement towards a secure, low carbon future with a target of 80% reduction in CO2 by 2050*"(Bridge, Bouzarovski, Bradshaw, & Eyre, 2013),

4. And the academic perspective which is also adopted by the authors as "*an analytical way to assess major historical shifts in energy systems at national and global scales"*(Bridge, Bouzarovski, Bradshaw, & Eyre, 2013).

Bridge et al, (2013), emphasize that previous academic studies have largely overlooked the geographical dimensions of energy transition. They argue that examining the energy transition in geographical terms provides critical insights into its spatial dynamics, interconnections, and implications.

Specifically, the authors define "*geographies of energy transition",* as the spatial distribution of different energy activities, the underlying processes that create those patterns and the geographical interconnections and interactions between spaces and other regions. (Bridge, Bouzarovski, Bradshaw, & Eyre, 2013). In order to make the spatial consequences of energy transition visible, a conceptual framework is presented that highlights key spatial elements influencing energy systems.

The framework includes the location, both absolute as well as a relative term (relational proximity of one element in the system to another), the landscape (specifically energy landscape for the purpose of describing *the constellation of activities and socio-technical linkages associated with energy capture, conversion, distribution and consumption*), the territoriality, the spatial differentiation and uneven development, the scaling (describes the different geographical forms in which energy technologies can be deployed), and last but not least the spatial embeddedness and path dependency (Bridge, Bouzarovski, Bradshaw, & Eyre, 2013).

Henderson & Sen (2021) expands the literature on energy transition by considering the implications for energy companies, existing and emerging market participants, and the countries in which they operate. Considering the IPCC report on climate change and the urgent need for emissions reductions, he recognizes that while the transition may pose threats to certain energy companies, it also creates business opportunities for others. Based on this assumption, Henderson et al. identifies key challenges and consequences associated with the energy transition, providing an analysis of why a rapid transition is necessary and how it affects the energy value chain.

As energy transition, the author defines it as: the process of "*shifting the world's socio-technical system away from one based almost exclusively on the production and consumption of fossil fuels, towards a system in which renewable energy sources are dominant"*[1] while he pinpoints as the overall goal the reduction of emissions both from fossil fuel combustion and across energy value chains (Henderson & Sen, 2021).

[1] (Henderson and Sen, 2021)

Regarding the aforementioned consequences, Henderson et al using the latest analysis from the International Energy Agency, compares the outlook for the global energy balance in a Net Zero economy with the IEA's Sustainable Development Scenario highlighting several key insights.

Specifically, according to the Net Zero scenario of IEA, the demand for hydrocarbons is projected to decline faster than in the other pathways. In addition, the decarbonization efforts and outcomes of those will vary across regions. Finally, the electrification is going to play a central role in the energy transition necessitating rapid expansion in renewable energy sources and adaptation of existing energy systems to accommodate intermittent energy supply.

Additionally, the energy transition according to the author is causing significant challenges across the entire energy value chain. Starting with the producing companies and resource rich countries that face the risk of stranded reserves and the dilemma of investing in new hydrocarbons or low carbon business areas. Followed by the energy conversion and supply systems as they have to adapt in balancing intermittent renewable energy, the decentralization and evolving pricing structures. The refining industry also must adapt transitioning to low emission alternatives and finally, the energy delivery infrastructure as the operational security and reliability in response to new energy sources must be also ensured.

Moreover, Henderson & Sen (2021) also highlight challenges that the energy transition will cause in several sectors. Politically, energy market regulations will need to be revised, and governments be more present in order to successfully adopt to the new energy resources. Technologically, the only challenging aspect is the economic feasibility as each new technology must be financially viable for widespread adoption. Financially, significant investments will be required to support both the renewable energy growth and the traditional fuel phase outs. Finally, existing energy networks will require significant investments for modernization and repurposing of the traditional energy systems.

Furthermore, the impact energy transition is going to have on consumers and business models in both the hydrocarbon and the electricity sector is also examined. For starters, consumers are defined as a broad entity that includes industrial companies, households, and small businesses. (Henderson & Sen, 2021). A recognized key impact of the transition is that energy buyers are becoming energy producers, either through decentralized energy plants or demand side management although the reliability of these systems remains uncertain.

This shift is challenging for traditional energy suppliers who must differentiate their products and services to compete with new market participants that emerge in response to the everchanging consumer needs. Furthermore, another issue of equal importance, that could arise because of the energy transition that could have a significant impact on consumers is the exacerbation of inequalities regarding access to clean and affordable energy for those in energy poverty either by imposing costs on poor consumers that cannot afford to pay them or by offshoring pollution from developed to developing countries

Besides consumers, the writer examines the impact of the energy transition on the business models of companies that operate in two different markets, hydrocarbon and electricity. Specifically, for oil and natural gas companies, the energy transition is creating an existential dilemma of either sticking to their core business regardless of the energy future that's coming or diversify into

becoming an integrated energy service company with some of them investing in clean technologies.

However, not all of them have the ease to diversify since their oil products are so vital to the domestic economy that is preferred to become a low-cost producer or reduce the carbon intensity of their output. Nevertheless, the general supply-side trend regarding hydrocarbon output is the focus towards natural gas for its low emissions while the over trend is the focus towards electrification.

In the electricity sector, because of energy transition and the gradual adoption of renewables, the electricity generation is becoming decentralized with reduced marginal costs which questions the value of flexibility and back-up generation. Simultaneously, the provision of services and consumer centric approaches are becoming the epicenter of attention between energy suppliers.

Further along, the author pinpoints the fact that the volatility of the hydrocarbon prices as well as the lack of global consistent carbon pricing system further complicates the energy transition.

According to the writer, another challenge that arises during the progression towards the energy transition is that most regions and countries start from different positions regarding their economic development, current energy mix and carbon emissions. The developing countries prioritize their economic development which results in climate goals being left behind especially if they are not aligned with other socio-economic goals. The hydrocarbon exporting regions such as the Middle East cannot transition towards low carbon forms of energy without fiscal reforms while for regions such as Europe where there is already a more balanced energy portfolio the energy transition is much more effortless. Nevertheless, the required changes in the national energy mixes to meet climate goals will and are already creating reasons for conflict among developing and developed countries

Finally, the sectors of heat and transportation remain the most difficult to decarbonize during the energy transition because of many technical and economic challenges. The sole exception is the power sector as it has been the easiest to decarbonize by displacing hydrocarbon with renewables due to significant emissions reduction.

Thombs (2019) has made an equally important contribution to the literature on energy transition. In his paper, even though a precise definition of what energy transition is, is not included; nevertheless, an array of potential energy futures is presented that might arise during decarbonization and the transition to renewable energy, which is already taking place.

Specifically, he achieves that by providing a typology that envisions them as falling along a two-dimensional model, which is composed of the structural organization of the social on one axis and the scale of the energy system on the other. (Thombs, 2019). The interaction between the two axes produces, according to the author, the aforementioned energy futures.

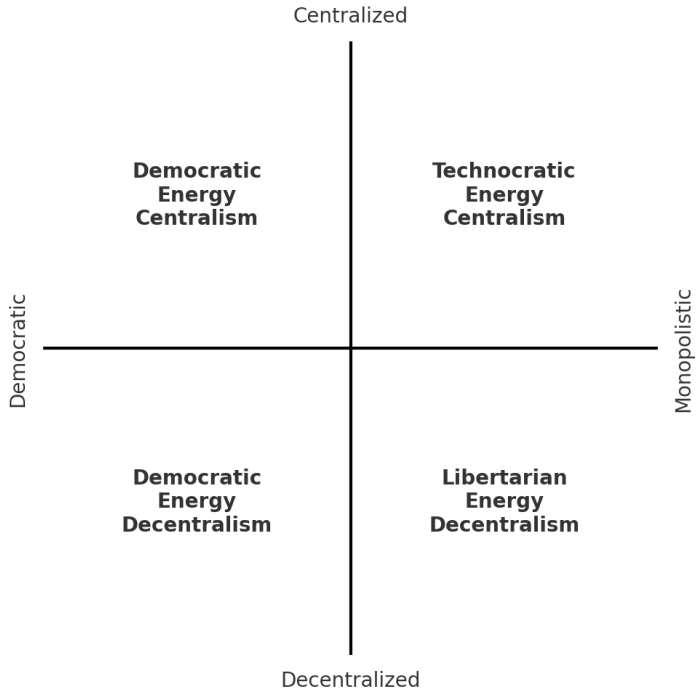

Figure 2.1. Four Potential Energy Futures[2]

For a better visualization of the interaction between them, a 2x2 matrix is employed where the structural organization of the social lies on the x-axis that ranges from democratic to monopolistic on the left and right sides and the energy system on the y-axis that ranges from centralized to decentralized on the top and the bottom side. As is also visible from the figure, the generated futures, according to the author, lay in four quadrants and are the following "*libertarian energy decentralism"*, "*technocratic energy centralism"*, "*democratic energy centralism",* and "*democratic energy decentralism"* (Thombs, 2019).

Subsequently, a more detailed approach follows in which each future is further analyzed. Starting with the *libertarian energy decentralism* where its key characteristics are that it is monopolistic and decentralized. The monopolistic aspect is because of a limited number of wealthy elites that exert control over every aspect of the society and the energy system and decentralized because the distributed energy technologies are primarily owned and operated by certain profit-maximizing private enterprises with limited governmental control and regulation (Thombs, 2019). Additionally, energy is considered a private good and as such, people can only access it by purchasing it as end-users. It is worth mentioning that this particular future is already taking shape in American states such as Nevada and Florida, where politicians from both parties see energy technologies like rooftop solar as an issue of choice and individual liberty.

In comparison, the societies in the *"technocratic energy centralism"* are characterized by monopolistic control over political, economic, and civil institutions that rely on centralized energy systems. (Thombs, 2019) This particular future is similar to many present-day societies that tend to be monopolistic in many aspects while decisions of economic and political nature, including those of the energy system, are taken by a mix of corporations, utility companies and governmental regulatory bodies. Such a future could consist of social and energy-related institutions which are either state-owned, private-owned, or even a mix of both worlds (Thombs, 2019). Furthermore,

[2] (Thombs, 2019)

the energy grid would be centralized, while renewable energy fuels could replace fossil fuels in that future, but they would have to be produced in centralized spaces such as a wind farm and then transmitted as well as distributed across a long distance over to the final consumers.

As for the democratic versions, "democratic energy centralism" pictures a more hypothetical society with democratically controlled political, civil, and economic institutions and a centralized energy system (Thombs, 2019). Democracy in these futures is defined as a multifaceted concept encompassing participatory, associative, deliberative, and material elements that facilitate the notion of a single person, single vote across all society. In addition, the energy technologies and systems in this future are centralized, while a form of a bureaucratic governance system is included. Finally, an example of such a democratic and simultaneously centralized energy system could be a large-scale renewable energy cooperative where the consumers from a large geographical area democratically control the generation, distribution, and transmission system. A board of trustees could be appointed to overlook the procedure, but the board's participants are elected only by the members (Thombs, 2019).

Regardless of lacking a commonly accepted definition for the energy transition as it was stated already, the common denominator of all the approaches is the change of nature that energy is experiencing from one form of energy to another. The table below offers a comprehensive overview of how a majority of researchers have defined energy transition.

Table 2.1. Literature definitions

Smil	*"The change in the composition (structure) of primary energy supply, the gradual shift from a specific pattern of energy provision to a new state of an energy system"*
Sovacool	*"A change in an energy system, usually to a particular fuel source, technology or prime mover*
O Connor	*A particular significant set of changes to the patterns of energy use in a society that can affect any or multiple steps of the energy pattern*
Araujo	*A shift in the nature or pattern of how energy is utilized within a system.*
Blazquez et al	*the switch from an economic system dependent on specific energy sources and technologies to a different economic system*
Irena	*a pathway toward transformation of the global energy sector from fossil-based to zero-carbon by the second half of this century*
Henderson	*shifting the world's socio-technical system away from one based almost exclusively on the production and consumption of fossil fuels, towards a system in which renewable energy sources are dominant*
Bridge et al	1) *a significant increase in the availability and affordability of modern energy services 2) liberalization of the energy sector with key changes occurring in the structure of ownership and the role of competition 3) within government policy as movement towards a secure, low carbon future with a target of 80% reduction in CO2 by 2050*" 4) *an analytical way to assess major historical shifts in energy systems at national and global scales.*

2.3 Geopolitics

Following the literature review of energy transition, it is imperative to also examine the term geopolitics. Besides clarifying the definition of the term and its origins, this section will present major theoretical contributions by key geopolitical scholars who have not only shaped the field but also supply key concepts which are essential for the upcoming SWOT comparison.

For starters, the term geopolitics per se, is composed of two distinct scientific disciplines: geography, and politics. The first term, *"geography*", is not limited to conventional geographic concerns such as Earth's physical surface. Instead, it entails a much broader spatial perspective, including scale, location, boundaries of territories, shape and how territories are socially defined. The second term, *"politics*", relates to subfields of political science, such as international relations,

which focus on states, borders, frontiers, international alliances, the balance and imbalance of global power, war, imperialism, and diplomacy. (Steinmetz, G. 2012).

Defining geopolitics scientifically proves to be a laborious task. This difficulty arises from two main factors: first, the historical legacy of the (mis)use of the ideas of the German school of *Geopolitik* by the Nazi-regime, and second, the profound confusion caused by the multiple meanings and connotations of the term in contemporary discourse. In some cases, these meanings remain implicit, while in others, they contradict each other. (Virginie Mamadouh. 1999).

Nevertheless, a few definitions will be presented, starting with Rudolf Kjellen's definition of geopolitics as the "*impact of geographic factors on a country's foreign policy"* (Whisker, J. B., & Spiker, K. R. 2022). Professor Gerry Kearns defines them as the "*understanding of the inter-relations* between *empires, states, individuals, private companies, and multilateral agencies as these are expressed and shaped spatially*" (Whisker, J. B., & Spiker, K. R. (2022).

Saul Bernard Cohen defines them as the "*interaction between geographical features, patterns, and visions, on the side, and political processes, both local and international ones".* (Whisker, J. B., & Spiker, K. R. (2022). Emil Reich, who coined the English term *geopolitics,* describes it as *"the combined influence of geographical considerations with politics constituting one of the most important tools for the analysis of international relations that might be devised".*

In addition to the forementioned definitions, three deserve special mention because of the clarity they provide in defining geopolitics. The first is by Yves Lacoste, who offers the following meaning: "*The term geopolitics, of which there are many uses nowadays, actually refers to everything related to rivalries of power or influence over territories and the populations living there: rivalries between political powers of all kinds – and not only between states, but also between political movements or armed groups more or less clandestine – rivalries for the control or domination of large or small territories.* (Whisker, J. B., & Spiker, K. R. (2022).

The second one by Van der Wusten and Dijkink is threefold and pictures geopolitics as: 1) "*a type of analysis using data concerning the international position of a country in light of its geographical features"*,

2) *a set of rules applicable in conducting statecraft based on such analyses* and

3) "*a discourse, a specific argument, that describes and evaluates a country's position in the world, possibly based on such analyses and the application of such rules".*

Finally, Zbigniew Brzezinski distinguishes the geopolitical, the strategic and the geostrategic by asserting that "*Geopolitical reflects the combination of geographic and political factors determining the condition of a state or region, and emphasizing the influence of geography on politics, strategic refers to the comprehensive and planned application of measures to achieve a central goal or to vital assets of military significance; and geostrategic merges consideration with geopolitical ones".* (*Venier, P. (2011).*

The existence of so many variants proves that geopolitics has been examined, developed, and interpreted by numerous academics, strategists and even geographers over the years, resulting in a significant variety of hermeneutic lenses.

Regarding the term's origins, long before geopolitics even existed as a term, traces of its foundational ideas could be found in the so called *physiopolitics.* Classical thinkers such as Aristotle, Thucydides, Lucretius, Montesquieu etcetera while researching the laws of nature that influence human life in its natural setting, unknowingly, they were also forming through *physiopolitics* the basis upon which Geopolitics as a research field would later be established (Criekemans, D. (2022).

Specifically, certain historical and scientific developments at the end of the nineteenth century were the touchpaper for the birth of them. During this period, international politics were marked by increasing tensions among aspiring big powers and European colonial empires. These tensions, which were geo-economic, geopolitical, and geostrategic in nature, encompassed the entire globe. In 1890, German Kaiser Wilhelm II ascended into power, and seven years later, he proclaimed that Germany must be taken seriously and the way to achieve that was by possessing its own colonies. However, most of the strategically significant territories in the south were already occupied by other Western powers, especially Britain, leading to heightened geopolitical rivalries among major powers (Criekemans, D. 2022).

Simultaneously, geography had undergone significant advancements, with detailed mapping of the entire world, while in 1859, Charles Darwin introduced his theory of survival of the fittest and the evolution of the species. Certain entities deemed the theory as a suitable conceptual and operational instrument capable to provide a better insight on the latest international political developments (Criekemans, D. 2022).

However, the true ground zero for Geopolitics is considered to be the scientific literature of Friedrich Ratzel, the German founder of modern Political Geography. His work was deeply influenced by the concept of state organicism. As a formal theory, geopolitics came into official existence in 1899, with *Classical Geopolitics* being the first analytic framework intended to help nations navigate the increasingly complex and competitive international environment (Criekemans, D. 2022).

In more detail, Friedrich Ratzel was partly responsible for the establishment of geography as an academic subject, and his writings, such as "*Politische Geographie*" and "*Laws of the Spatial Growth of States*" laid the groundwork for geopolitics. Strongly influenced by Charles Darwin's theory of evolution, Ratzel developed a similar concept for states, viewing them as living organisms that must struggle for space, growth, and, ultimately, survival otherwise, they face decline or extinction. The concept of states as expanding organisms remains visible even in modern geopolitical interpretations. Moreover, he argued that the strength of a state could be measured by two key factors: *Raum* (space) and *Lage* (position) (Criekemans, D. 2022).

The Swedish academic Rudolf Kjellen is widely considered as the successor to Ratzel's work, having adopted and further developed his ideas. He is also the inventor of both, the neologism *geopolitics* and the geopolitical approach in political science. Kjellen re-conceptualized the state as a living organism that operates autonomously, gaining strength naturally rather than being a mere judicial phenomenon.

According to Kjellen, the State consists of five interrelated subsystems (Criekemans, D. 2022).:

1) *The Geopolitik*, it encompasses the conditions and challenges faced by the State that originated from their geographical characteristics.

2) *"the Oekopolitik*, the economic aspects that influenced the position and power of the State."

3) *"the Demopolitik*, the study of the ethnic composition of the State and the problems originating from it."

4) *"the Sociopolitik*, the analysis of the societal groups and diverging classes inside the State and how they affected the State's unity."

5) "*The Kratopolitik,* it included the constitutional legislation as well as the constitutional life of the State such as political parties and interest groups."

Although Kjellen considered each subsystem important, he strongly believed that the geographical foundations and embeddedness are the main sources of state power. As a result, he conceptualized Geopolitics as consisting of three scientific components (Criekemans, D. 2022):

1) "Physiopolitik, the influence originating from the natural as well as physical environmental variables"

2) "Topopolitik, the influence emanating from relative location upon the interstate relations of the Empire"

3) "Morphopolitik, the impact of factors such as territorial width and form in relation to the success or failure of states"

Following in the footsteps of Ratzel and Kjellén, ex-military officer Karl Haushofer played a key role in expanding and advancing classical geopolitics. After Germany's defeat in World War I, he became an academic as he believed that geopolitics could help with his country's postwar challenges. The fundamental concepts of his *Geopolitik* included the organic state, Lebensraum, autarky, pan-regions and the lad-sea power dichotomy.

Haushofer pictured states as powerful living organisms that were born, grew, matured, developed an identity, interacted, clashed with other states and eventually died. He advocated for an anthropomorphized self-sufficient form of state with an organized, top-down societal structure that needed to be ever-present, ready to intervene and constantly ensuring the proper function of itself.

The Lebensraum reflected his opinion that for a state to be able to survive it must actively pursue territorial space as he considered it a form of military protection against hostile neighbors (Criekemans, D. 2022).

Autarky is another key term for Haushofer's *Geopolitik* as he believed that self-sufficiency was a key characteristic for societies, communities, states, and their economies as he predicted that eventually Earth's resources would become insufficient to sustain everyone (Criekemans, D. 2022).

Pan-region was pictured as a geographic region or, a state's sphere of economic, political, and cultural influence beyond its national borders. Simultaneously, the world was divided into three supreme leading states, categorized based on their economies, politics, and cultures (Criekemans,

D. 2022). He also highlighted the tension created by the dichotomy between land and sea powers which was responsible for paradoxes such as land powers seeking to become sea powers through the acquirement of seaports and maritime powers seeking territorial depth.

Finally, it is worth noting Haushofer was among the first geopoliticians to explore geostrategy, a sub-field of geopolitics, to influence foreign policy.

Another significant contributor to classical geopolitics was American naval historian Alfred Thayer Mahan, acknowledged as one of the fathers of the American geostrategic thought. His theory centered on the concept of "*sea power*", arguing that a country's naval advantage would exert global influence. (Criekemans, D. 2022).

After extensively examining the role of sea power in the rise of the British Empire, Mahan formed his theory, arguing that the United States could become the geopolitical successor of Britain. He also considered the sea as a great highway with well-worn trade routes and key strategic choke points that if controlled by any nation they would wield significant power over global commerce. Furthermore, Mahan believed that the military and commercial control of the sea was interconnected, and such dominance could prove decisive in times of war (Criekemans, D. 2022).

Additionally, a nation's sea power could be determined by the following six factors: geographical position, physical conformation, extent of territory, population size, national character, and the most crucial of all, the type and nature of its government (Criekemans, D. 2022).

He also believed that the population growth could play a key role towards the development of a nation's sea power as expanding populations would necessitate oversea expansions in search of new markets and resources. In order for that to be achieved, a strong navy capable of protecting the trade routes and maintain control over distant territories was essential (Criekemans, D. 2022).

Finally, Mahan even recognized the interplay between land and sea power, acknowledging the need for a complementary strategy on land alongside the naval supremacy. In some cases, he even advocated rival nations to be encouraged in building over sized navies to provoke strategic overreach and decline (Criekemans, D. 2022).

Sir Halford Mackinder is also a foundational figure in classical geopolitics, best known for his Heartland Theory. The essence of his geopolitical theory is encapsulated in his famous axiom: "*Who rules East Europe commands the Heartland; who rules the Heartland commands the World-Island; Who rules the World-Island commands the World."* (Criekemans, D. 2022).

In the original 1904 paper, titled "*The Geographical Pivot of History",* Mackinder claimed that Eurasia's central pivot area was crucial for world domination due to its vast resources and strategic advantage of being inaccessible from the sea (Whisker and Spiker, 2022).

In that version, Mackinder warned that technological advancements such as railways and internal combustion engines could be the reason, maritime powers be defeated in the future by land powers. He was especially worried about the construction of the Trans-Siberian Railway as it would enable Russia to fully leverage its vast territory for military and economic power. These developments alongside the access to new resources and the emergence of new economic centers could significantly alter the balance of power between sea and land power (Sloan, 2017).

Mackinder also recognized the emergence for the first time in world history, of a closed political system in international relations where actions in one region from far away would now have direct consequences on other regions of the world rather than going unnoticed. The world would transform into that during the post-Columbian Epoch that was commencing after multiple exploration voyages by european maritime powers during the Columbian epoch (1492-1902) (Sloan, 2017).

The 1919 version was titled as "*Democratic Ideals and Reality"* and was in response to the aftermath of the World War I, the subsequent peace treated, and the possibility of a German – Russian alliance.

In this iteration, the Geographical pivot of history was renamed as the Heartland and its boundaries were expanded including the Baltic Sea, the Middle and Lower Danube, the Black Sea, Persia, Tibet, Asia Minor and Mongolia (Whisker and Spiker, 2022).

Alongside the Heartland, the Crescent zones were introduced, divided into the Outer (North and South America) and the Inner (Continental South, Southeast and East Asia). In this version, the implications of the technological advancements as demonstrated in World War I was reassessed as rivals equipped with transcontinental railways, vehicles and airplanes could easiliy control passages such as the Suez Canal gaining strategic leverage. Additionally, the expanded Heartland retained the characteristics of the Pivot Area such as vast manpower, natural resources, advanced technology, efficient transportation and trained armies.

Finally, as many nations within it had access to the sea, allowing them to defend themselves against traditional sea powers, this justified his axiom which claimed that if a single power controlled the Heartland, it could control the entire world (ibid)

In 1943, the article *"The Round World and the Winning of the Peace"* was the final version of the Heartland Theory (Sloan, 2017). In this iteration, Mackinder foresaw the possibility of the Soviet Union taking under complete control the Eastern Europe and as such the Heartland. As a response to that scenario, Mackinder considered the creation of the Midland Ocean concept through which, sea powers would be able to project power ashore at any time and place in order to counterbalance threats from land powers. He predicted the creation of the NATO alliance six years before its realization. This concept was almost of equal strategic importance to the Heartland and was described as the *North Atlantic and its dependent seas and river basins"* (Whisker and Spiker, 2022). Its members would be France, Britain and the United States alongside Canada.

While Mackinder emphasized the strategic importance of the Heartland, his ideas were later challenged by Nicholas Spykman, who introduced the Rimland Theory.

Nicholas Spykman, a Dutch American political scientist is considered a key figure in American geopolitics, often credited with transferring geopolitical thought from Europe to America. He defined geopolitics as "*the planning of the security of a country in terms of its geographical factors"* (ibid).

Unlike Mackinder, Spykman believed that the focus should be on the Rimland, the coastal fringes of Eurasia as this region, was more important in terms of controlling global power dynamics and in general, essential to America's security.

The reasoning behind the Rimland's importance was multifaceted. This area included Western Europe, the Middle East, Southeast Asia and China, which were geopolitically crucial and simultaneously densely populated, rich in resources and strategically located between sea and land powers. As such, they acted as a buffer zone and provided significant control over trade routes and military movements.

Given these characteristics, Spykman criticized Mackinder for placing undue emphasis on the Heartland, which he saw as an isolated, largely agrarian region, constrained by natural barriers such as mountains and lacking the necessary industrial capacity for global dominance. In contrast, he believed that the Rimland's strategic location and accessibility to both land and sea routes were far more significant. This belief was encapsulated in his famous axiom: "*Who controls the Rimland rules Eurasia, who controls Eurasia control the destinies of the world"* (ibid).

Furthermore, Spykman introduced a broader conflict model which included the traditional conflict between the Heartland and Sea powers and a secondary one between an independent power in the Rimland and the combined forces of the Heartland and the Sea powers.

In general, his ideas influenced heavily the American Strategy during the Cold War, especially the containment strategy. He also advocated for the engagement of the United States in world affairs by forming alliances and military bases across the Rimland, to prevent a single power, such as the Soviet Union from dominating Eurasia (ibid).

In sum, the classical geopolitical theories analyzed in this section, even though not directly applied in this thesis, offer key concepts such as power, resource control and strategic positioning. These are central to the SWOT analysis that follows, which assesses the strengths, weaknesses, opportunities and threats faced by the United States and China during the energy transition. These ideas help frame the geopolitical implications of the energy transition and justify the usage of SWOT for the comparison that will follow.

2.4 Energy transition and geopolitics

This section as well, reviews several academic contributions that combine the terms energy transition and geopolitics together. Many of them address a similar research question as this thesis like the contribution by Stegen (2018) who attempts to identify the "winners" and "losers" of the energy transition based on a set of indicators. However, none of the reviewed articles and book chapters adopt a SWOT comparison between the countries. Thus, the aim of this section is to present as many relative articles as possible which offer valuable insights.

O'Sullivan, Overland and Sandalow (2017) were among the first academics to identify the gap related to the geopolitical consequences of the transition into a new energy status quo where renewable energy use will surpass the consumption of every fossil fuel (O'Sullivan, Overland and Sandalow, 2017). Having as a starting point multiple forecasting and backcasting decarbonization scenarios by IEA, IRENA, BP, Bloomberg, and ExxonMobil that envisioned the energy transition, the authors differentiated seven mechanisms through which renewables could affect geopolitics (O'Sullivan, Overland and Sandalow, 2017).

Starting with the supply chains of critical materials, cartels could develop around materials essential to renewable energy technologies as the transition accelerates. The cartels mentioned above will not generate the same impact as OPEC did with oil, yet they could significantly

influence the consumers of those elements. Among the materials are rare earth metals highly used in clean energy technologies such as wind turbines. Even though these are located in many countries, Russia and China hold around 57% of the world's reserves (O'Sullivan, Overland and Sandalow, 2017). Additionally, they are diluted and often complex and expensive to mine, produce and process. Today, most of those actions take place in China, while rare earth metals mined elsewhere must be exported to China to get processed and re-imported. Something similar occurs with Lithium, Indium and Cobalt, located in specific countries, all essential for renewable technologies such as batteries and electric cars and of limited supply, making them prone to become cartelized (O'Sullivan, Overland and Sandalow, 2017).

As mentioned earlier, a possible realization of the scenario drives the authors to consider technology and finance as the second mechanism through which renewables can affect geopolitics. In such a world, significant investment in renewable technology and infrastructure will be needed if the scenario is to be realized[3]. Moreover, the new energy status quo will considerably increase the importance of intellectual property so that it could become an advantage for countries with research capacities. The writers even consider the possibility of shifting the source of power from securing access to fossil fuels to the strategic positioning of infrastructure and management system efficiency. As a result of that development, investment and technology could become a source of cooperation or a reason for geopolitical rivalry (O'Sullivan, Overland and Sandalow, 2017).

Furthermore, based on that assumption, they present three possible macro trends. First, there may be increased tensions between developing and developed countries over technology transfer. Second, potential competition over renewable energy infrastructure could emerge, especially if asymmetric dependencies between producers and consumers arise (O'Sullivan, Overland and Sandalow, 2017). Finally, it remains unclear whether renewable energy development will lead to decentralized and distributed power generation or evolve into a global race among large companies constantly striving to improve technology and reduce costs (O'Sullivan, Overland and Sandalow, 2017).

Adding to the seven mechanisms, the authors, having as a starting point the dominance of renewables, examine the consequences of their development to the resource curse. For starters, oil and gas will no longer be the most sought-after energy products; the rents associated with their fossil fuel production will considerably decrease. As a result, petro-states will eventually lose that source of income strongly associated with the Dutch disease. Secondly, the prospect of countries that produce large amounts of renewable energy succumbing to the resource curse seems not only unlikely but also possible for the same countries to end up with significantly more diversified economies than before (O'Sullivan, Overland and Sandalow, 2017). The reason for that is the entirely different requirements for producing renewable energy, contrary to oil and gas. Finally, according to the writers, even though a resource curse in its current form is unlikely to happen, there is potential for a new Dutch disease to emerge in countries rich in rare earth metals, which are essential for producing renewable energy.

Among the mechanisms, another aspect that the authors consider because of the renewable energy and its technology is the possibility of greater electric interconnection between states, more widespread energy generation or even both (O'Sullivan, Overland and Sandalow, 2017). The

[3] ibid

realization of such a possibility will not be without any geopolitical implications, which could prove to be a double-edged sword. Starting with the greater electric interconnection, the existence and further development of super grids allow countries lacking renewables to import energy while resource-rich ones to export, yet for the importers, that dependency could prove dangerous. Specifically, in such an interconnected network, the producers could still use energy as a geopolitical weapon by shutting off the supply to importers, the other side of the coin pictures a situation where the risk of regional conflict is significantly reduced because of the interdependence among the grid participants (O'Sullivan, Overland and Sandalow, 2017).

As regards widespread energy generation, it can become a reality through off and micro-grid solutions that can function independently from national or regional grids leading to greater decentralization. Geopolitically, that development could either lead to reduced competition over fossil fuels or reduced incentives to avoid conflict because of the nonexistent dependency on fossil fuels. Lastly, as mentioned earlier, the simultaneous co-existence of both grids is also a prospect, with super grids located in certain places and independent microgrids in others, primarily in poor and remote areas in developing countries. As long as technological limitations constrain the expansion of microgrids to developed parts of the world, it is desirable geopolitically because otherwise, there is significant disruptive potential for such a development.

A more than obvious mechanism that the authors consider as an additional consequence of the increased deployment of renewables is the reduced demand for oil and gas (O'Sullivan, Overland and Sandalow, 2017). Such an occurrence would cause significant geopolitical repercussions for both producers and consumers. On the one side, for producers, the reduced oil revenues could function as a chance for political and economic reform and economic diversification or as a reason for political instability in the short to medium term (O'Sullivan, Overland and Sandalow, 2017). However, despite the outcome, an alteration of that kind to the energy mix would seriously affect the relationships between and among countries and possibly even the balance of power between them. On the other side, for the consuming countries, becoming energy secured would mean regained domestic and international political power, room to maneuver in the global system, and improved trade balances.

The following mechanism is inspired by a global problem, that of climate change and the geopolitical consequences that a changing climate could cause. Specifically, the writers believe that the large-scale exploitation of renewable energy would significantly reduce greenhouse gas emissions far below the otherwise achievable levels[4]. An achievement of that kind would help mitigate climate change and simultaneously avoid the resulting geopolitical consequences such as instability, increased risk of conflict, inter and intra-state violence, and state failure.

Finally, the last method through which renewables can affect geopolitics, according to the authors, is by offering access to modern forms of energy that can be exploited to combat energy poverty (O'Sullivan, Overland and Sandalow, 2017). With its geopolitical implications being manifold ranging from being a threat multiplier to a crucial push factor alongside instability leading to global migration, such access can offer lasting solutions to the consequences mentioned above.

IRENA has published a very interesting report about the geopolitics of the global energy transition. The study begins by not only acknowledging the global energy transformation that is underway

[4] ibid

primarily by a rapid increased usage of renewables but also presenting the trends responsible for this accelerated deployment. Among these trends are the declining costs of renewables, the pollution caused by fossil fuels, the impacts of climate change, and the influence of public opinion.

In addition to these trends, the study emphasizes several key characteristics of renewables, such as the constant availability, zero marginal costs, and the ease of deployment. These features collectively enhance their geopolitical advantage of renewables against fossil fuels.

According to the writers, significant power shifts will occur among the traditional energy exporting and importing states. Countries such as the European Union, the US, Japan and China are expected to benefit significantly, while regions like Russia, the Middle East, and North Africa are anticipated to experience substantial reductions in fossil fuel revenues.

IRENA even categorizes fossil fuel producing countries based on their preparedness for the energy transition into four categories (Amin, Ragnar, & Chubais, 2019):

1. the highly exposed but low resilience countries (Libya, South Sudan, Angola),
2. the highly exposed and highly resilient countries (Gulf states),
3. the moderately exposed and resilient countries (Russia, Iran)
4. the relatively low exposed countries (Norway, Bahrain etc).

Of course, the authors do not overlook the expected rise of renewable energy leaders, specifically, countries that take advantage of the new renewable energy technologies, allowing them to enhance their global influence and reach. Among these leaders are countries with high technical potential for renewable energy generation, which can become significant exporters of renewable energy, mineral rich countries, such as Bolivia, that can play a major part in the global production and value chain and, lastly, leaders in technological innovation, like China, which has managed to improve its geopolitical standing in many aspects.

Simultaneously, bilateral and multilateral state relations, as well as alliances built on fossil fuels, will be weakened and inevitably reconfigured (Amin, Ragnar, & Chubais, 2019). The same applies to energy trade routes as energy can be produced almost anywhere and will no longer be a limited commodity. Consequently, fossil fuel resources will lose much of their geopolitical value.

Furthermore, IRENA presumes that in a world powered by renewables, the geostrategic importance of oil and natural gas as tools of foreign policy will diminish. Meanwhile, the main characters of the new energy status quo (electricity, biofuels etc) are unlikely to acquire the same geopolitical importance. The authors even suggest that the transition could generate a peace dividend as the reduced importance of fossil fuels, often aggravating factors in armed conflicts could ease tensions among states.

Lastly, the publishers are confident that the global energy transformation will positively impact social, economic, and environmental factors which are otherwise root causes of geopolitical instability. In general, the post-energy transition world will be completely different, with numerous geopolitical rearrangements and new challenges. However, it will steer humanity in the right direction against climate change.

Goldthau, Westphal, & Bazilian (2019), have also published an academic paper regarding the geopolitics of the energy transition. Specifically, they have pictured four different scenarios illustrating how the transition could be developed by 2030 based on geopolitics (Goldthau, Westphal, & Bazilian, 2019). The first one is called the Big Green deal and is the best-case scenario where everything goes according to plan. For starters, a global consensus on climate change is reached, and simultaneously, a green fund is created while the markets divest from every fossil fuel asset and reallocate them towards low-carbon projects. Every country reaps the green benefits, even the petrostates, since they get compensated to transition towards a greener economy (ibid).

The second scenario (*Technology breakthrough*) pictures a major technological invention that steers the world toward a different path. The United States and China, the most advanced technological countries, adopt and scale up that invention[5]. A new clean-tech cold war emerges with the technology leaders having all the power while the rest of the world will have to pick a side (ibid). Inevitably, rivalries, and regional blocks, will emerge, while the need to control the rare earth metals supply will only worsen the situation. The fight against climate change will be benefited, but some regions will be left out, which could cause political tensions (ibid).

In the third scenario (*Dirty nationalism*), nations put a premium on self-sufficiency favouring their energy sources over imported ones which drives the development of every energy source (ibid). The zero-sum logic returns while the energy markets fragment due to protectionism, limiting the economies of scale and causing considerable delay towards decarbonization. Finally, the UN becomes marginalized by power rivalries while almost every multilateral institution gets undermined.

The last one (*Muddling on)* is a business-as-usual scenario with almost no cooperation between nations for the mitigation of climate change. Unexpectedly fossil fuels remain dominant while the speed of the energy transition, even though it is not fast enough to combat climate change, is too fast for the fossil fuel industry to adapt (ibid). As a result, several national oil companies go bankrupt, OPEC collapses, revenues falter, and oil-producing countries such as Russia or Saudi Arabia face political turmoil (ibid). Additionally, countries motivated by energy security and climate change have started to pursue diverse energy strategies. Furthermore, economic and geopolitical imbalances and energy inequality are reinforced because of regions' inadequate regulations or inability to benefit from partnerships.

Besides the scenarios mentioned above, the authors also outline three steps that will help place geopolitics at the heart of debates regarding the energy transition (ibid). First, researchers and decision-makers must focus on pathways considering logistics and uncertainties (ibid). Second, policymakers and politicians must draw from past lessons and experiences. Third, the policy must switch focus towards potential conflicts due to failing fossil fuel demand and increased security and economic risks. (ibid)

Blondeel, Bradshaw, Bridge, & Kuzemko, (2021), having as an inspiration an older paper that investigated the geopolitical tensions caused by fossil fuel scarcity while witnessing the change of the energy course, published a review that examines the geopolitical dimensions of the energy transition through a unique approach called 'the whole system. Specifically, the energy system transformation centred on the shift in fuel supply is split into two, the low-carbon energy transition

[5] ibid

in which energy demand is being met by renewables and the high-carbon one that pictures the falling demand for fossil fuels (Blondeel, Bradshaw, Bridge, & Kuzemko, 2021).

First and foremost, the writers begin by defining the context of energy geopolitics, which used to be strongly influenced by conventional geopolitical thinking, as given by Bradshaw and Lehmann: "*the influence of geographical factors, such as the distribution of centers of supply and demand, on state and non-state actions to ensure an adequate, affordable and reliable supply of energy*"(ibid). The competition over fossil fuels has been a significant component of geopolitics since the oil crisis back in the 1970s until today. However, the emergence of energy transition and renewables has made conventional geopolitics inadequate since energy is much more diverse with different geotechnical characteristics and consequences.

A more open-minded approach called *critical geopolitics* has tried to bridge the gap (ibid). It states that geopolitics is best understood as "*a social construction that is iterated through varying and competing discourse of state and non-state actors and as such geopolitics engages the geographical representations and practices that produce spaces of world politics*" (ibid). Although the writers consider the critical approach auspicious, the whole system geopolitics lens that combines both methods is preferred since according to Amineh "*geographic arrangements change over time depending on political, economic, social, technological change and that it does not only happen the other way around"* (ibid). Their preference allows for a much more extensive understanding of the relationship between geography, politics, and energy transition. It is helpful since they believe that politics and policymaking are the forces behind energy system change.

After defining energy geopolitics, the publishers focus on energy transition by outlining it as a "*broad term signaling a structural change in the organization of the energy system and the social and power relations constituted through it*"(ibid). The pace and nature of it are not left out. Specifically, pace matters because total CO2 must be reduced significantly by 2050 and is differentiated into long transitions that take decades to occur and rapid, which can materialize at varying scales. As for the nature of energy transition, according to Sovacool, it represents the switch from a dominant primary energy source and its technologies to other sources. Nevertheless, Sovacool insists that low-carbon sources have yet to replace fossil fuels. They conclude that the transformation of the energy system heralds an entirely new energy order that significantly transforms the geopolitical dimensions of energy supply and demand.

Lastly, the reviewers try to picture the challenges caused by the high as well as the low carbon energy transition. For starters, the high carbon transition alongside new technologies that have increased energy production at a fraction of cost has tilted the balance of power, favoring low-cost producers (ibid). Secondly, the decreased resource rents due to lower demand will cause economic crises, especially in Rentier states. However, for low-cost producers, that development will possibly work in their favour since, in the longer term, they will manage to acquire increased revenues and market shares against states that simply cannot ramp up their production. Thirdly, the reduced energy demand due to the transition and the abidance of the Paris agreement means that a significant amount of fossil fuel must remain unburnt. As a result, the challenge of a "just transition" comes to the surface or the need to create criteria that would allow developing countries to exploit their fossil wealth for a longer period than advanced economy producers.

As for the challenges of the low-carbon energy system, the focus lies mainly on renewables and energy supply (ibid). It is a fact that renewable energy has some unique characteristics that differentiate it from fuels, such as being non-exhaustible or ubiquitous. However, it faces its own risks because it is distributed mainly through electricity. Starting with the existence of interconnected networks, besides all the positive attributes they offer, like symmetrical electricity trading, cut-offs are always an unfortunate possibility, especially when they can become a foreign policy tool and a risk (ibid).

The requirement of minerals, rare earth elements and metals for everything related to renewable energy and technology will also become a challenge (ibid). As the low carbon transition picks up, the demand for those will skyrocket, while the geographically limited supply will only worsen matters. In addition, geopolitical tensions will rise as states compete vigorously to control even a small aspect of the supply chain. China already has a head start in the possession and production of REEs as well as precedent since back in 2008, the sale of Chinese REEs to foreigners was restricted, which caused price hikes (ibid).

Finally, geo-economic competition and conflict can also arise with the emergence of new trade patterns around energy carriers, bioenergy, and low-carbon technologies (smart meters, Evs and solar panels). For example, green hydrogen (low carbon energy carrier) will create new trade patterns because of its usability as a decarbonization method, long-term storage, and a long-distance transportation option for renewables (ibid). Nevertheless, it is a two-edged sword since geopolitical implications such as new dependencies, technological and geo-economic rivalries among states will emerge.

Another approach about geopolitics and energy transition, besides the IRENA report and the article of Goldthau, has been released by Ivleva, (2019). In that paper, they acknowledge that both terms are strongly interconnected, and because of that, they suggest a plan to structure the links between the two concepts. The main goal is to define the geopolitics of decarbonization/energy transition as a field of inquiry.

For starters, they thoroughly examine the term geopolitics, its definition, history, the different approaches, and some critical components. According to Steinmetz, who borrows the definition, geopolitics is *"a field of interest or a specific lens to look at the world that has been evolving and changing over time"* (Ivleva, 2019). According to the publishers, the term started actively being used at the end of the 19th century to reflect how the power relations and vulnerabilities between states depended on their territory and resources (ibid). Through the decades, the interest in the term has had its ups and downs, yet today, that seems not to be the case since the demand for geopolitical explanations has been renewed. In relation to geopolitical approaches, the four presented in this paper (neoclassical, critical, non-geopolitics, and subversive geopolitics) are complemented by Virgin Mamadouh's distinctions of geopolitics, according to *"whether only states are considered important actors and whether a practical or an academic standpoint is taken"* (ibid).

	Practical/applied	Academic
States	Neo-classical geopolitics (Geopolitics, geostrategy, geoeconomics)	Non-geopolitics (Political geography)
Other actors	Subversive geopolitics (Geopolitics 'from below' or activism)	Post-structuralist geopolitics (Critical geopolitics)

Figure 2.2 Four approaches to geopolitics[6]

In more detail, neoclassical geopolitics is defined as a modern and reformed descendent of classical geopolitics, with states being the main actors. Political analysis explaining how resources and geographic locations of states affect their foreign affairs are included. On the other side of the spectrum is critical geopolitics, an academic approach that includes non-state actors originating from a discourse analysis of foreign policy (ibid). The focus is the geopolitical perspectives on international relations and the deconstruction of its concepts that are repeated historically.

The non-geopolitics is among the most unusual approaches used by geographers and peace scholars, and their goal is to stop the usage of geography by states for military purposes. Finally, the subversive lens questions the state monopoly because, according to them, every territorial conflict, even within a state, can be analyzed in geopolitical terms (ibid).

Regarding the critical components mentioned above, the general aim is to isolate the most common ones from the four approaches to define the geopolitics of energy transition as a subject. According to the writers, the reason behind that is that all components can examine decarbonization as a geopolitical issue (ibid). The first one is geography since it is almost impossible to picture a geopolitical development without the relevant impact on geography because of actors' behaviour towards each other. International politics are next since both are connected in terms of conflict and cooperation among actors. The publishers note that it is not necessary for geopolitics to adopt a realistic logic exclusively since it is not always only states-centred however, the importance of institutions, ideas and international cooperation can also be highlighted. Lastly is the strategic significance of natural resources because an individual can either wield enormous power or be significantly constrained by geographical factors, which are exploited in actors' international strategies.

Similarly, decarbonization is also thoroughly examined, regarding its definition, how it unfolds, and three different perspectives about it, with the ulterior motive being to showcase the connection between itself and geopolitics (ibid). First, the writers define the term as *a transition process from a global status quo to a very different, low-emission future* (ibid). Simultaneously the fundamental change caused by decarbonization towards how societies work within a complex set of interacting processes is acknowledged.

Secondly, the term is unfolded into two concurrent processes (ibid):

1) Abandonment of the high-carbon model. (referring to fossil fuels and reduced usage)

[6] (Ivleva, 2019).

2) realization of a new low-carbon model.

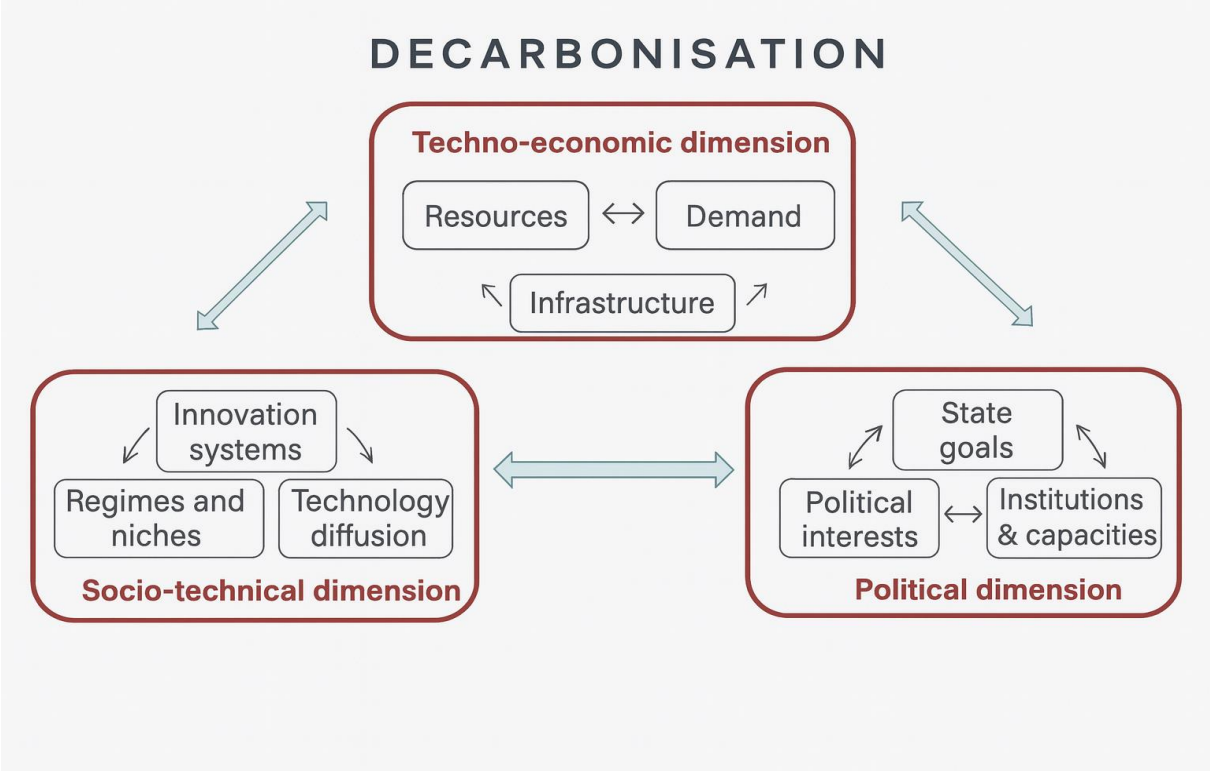

Figure 2.3 Three perspectives on decarbonization[7]

As regards the perspectives, for starters, the authors consider them an essential requirement due to the multidisciplinary changes decarbonization is causing. In addition, they are borrowed by Cherp et al. and can be differentiated into techno-economic, sociotechnical, and political dimensions. Specifically, the techno-economic perspectives are related to resource availability, demand, resulting resource flows, and market dynamics that form transitions (ibid). They are based on geophysical and economic perspectives but do not clarify policy actions since they consider them exogenous, while political economy aspects are less presented. The sociotechnical examines the evolvement and diffusion of new technologies in socio-technological systems and alters them while relying on Science, Technology, Society studies and economics (ibid). Finally, the political focus on policies, interests, ideas, and institutional capacities behind a transition while relying on various aspects of political science and international relations.

Among the perspectives, there is also the *Multi-Level* of Geels et al., a sociotechnical approach that considers the related systems as an interconnected mix of technologies, infrastructures, organizations, markets, regulations, and user practices altogether to deliver societal functions (Ivleva, 2019). This perspective also distinguishes three levels that must be aligned to accelerate the transition. Those are the present sociotechnical system, innovations that lead to changes, and landscape developments external to the system. Last but not least, this particular perspective is considered the most appropriate way to analyze transitions and find ways to promote them.

[7] ibid

Following the thorough examination of both terms, the writers examine how the terms interact with each other by questioning how geopolitics affects decarbonization and vice versa (ibid). The answer to the first part of the equation is supplied by focusing on the three perspectives mentioned earlier and their interaction with geopolitics (ibid). Starting with the techno-economic perspective, it becomes geopolitical when its characteristics, such as the demand, resource flows, markets and infrastructure become part of an international power struggle. For example, the Chinese Belt and Road initiative, a significant infrastructure project, aims to strengthen geopolitically the position of China in the Asian region and beyond. In parallel, the decarbonization plans of countries that are part of the Chinese initiative will be significantly impacted.

The political dimension is not excepted since it gets affected in multiple ways (ibid). For starters, the formulation of state goals may be altered, resulting in decarbonization issues being pushed down as priorities due to geopolitical issues, while proponents or opponents of decarbonization can be empowered. In addition, geopolitical reasons can make it harder or easier to step away from certain high carbon usages by reiterating specific path dependencies and supporting relevant interests.

Finally, in the sociotechnical perspective, geopolitics functions as part of the contextual factors or *sociotechnical landscape* of the Multi-Level approach that can contribute to the decarbonization negatively or positively. For example, the sociotechnical regime that led to Japan's increased usage of nuclear energy was shaped by the geopolitical tensions over energy resources in Asia.

As for the second part of the equation, the answer is equally multifaced as decarbonization influences geopolitics with changes in the value of natural assets through cross-border relations and by its trends (ibid). In relation to natural assets, as decarbonization progresses, a significant amount of fossil fuels will have to remain unexploited while fossil energy demand will plummet. As a result, energy-exporting countries will lose substantial revenue, and their unexploited natural wealth will also be devalued. The consequence could be severe for the exporting developing countries that will be destabilized, affecting respective regions and geopolitics, and for the stabler countries such as Saudi Arabia that will see their international influence decreased. Simultaneously, the increased usage of low-carbon technologies, in accordance with decarbonization, will increase demand for a range of essential metals that only a few countries can provide. The newly formed situation will remind the fossil fuel era, with dependencies and rivalries being formed again.

As regards the influence of cross-border relations on geopolitics, decarbonization achieves that regardless of resources but based upon the geographical position of countries. For example, decarbonizing energy systems endorse cross-border connectivity for optimization reasons, such as an interconnected electricity grid or transboundary hydropower. In such a case, new interdependencies can be created between bordering countries with a positive outcome and vulnerabilities since interconnected systems often become targets for cyber warfare. Finally, decarbonization trends influence geopolitics as many states pursue ambitious projects in this direction. For instance, the EU's power regarding low-carbon innovations such as smart energy systems can be questioned. Moreover, innovation competition in decarbonization projects can prove to be very challenging since it affects the states' foreign policies, alliances, and power.

Conversely, Stegen (2018) having as a given the fact that the energy transition will materialize, and the global energy needs would be met primarily by renewables wrote a chapter where among others, she suggested a way that will allow to single out countries posed to become geopolitical winners using data available today after the transition towards a new energy status quo has materialized (Stegen, 2018). For starters, she makes a case on why the energy transition will come to fruition, presenting arguments such as the threat of climate change that is caused by fossil fuels, the increased support towards renewables and finally, the fact that conventional gas and oil have peaked while the unconventional will eventually peak as well (ibid) Additionally, based upon the basic principles of neorealism and neoliberal institutionalism, in the aftermath of the energy transition, and before presenting the method mentioned above, she states that power and influence will be shifted to countries with significant renewable energy potential since those countries will be able to become self-sufficient and dominant(ibid).

As regards the method, it is composed of three different variables that help assess if a country will remain on the hydrocarbon path or it will transition to renewable energies (ibid). Simultaneously it helps determine if the particular country will be a "winner" the next day or a laggard. The raw renewable energy potential is the first variable, based on data regarding the potential of wind energy, photovoltaic and solar-thermal power. Political receptiveness is the second indicator capturing the socio-political receptiveness to renewables. Lastly, the hydrocarbon lobby is an indicator that shows the possible influence of hydrocarbon industries, actors, and firms against the energy transition of a particular country (ibid).

Her method's results showcase a mixed list of countries, among which smaller and weaker states such as Nicaragua, Uruguay, Kenya, and Costa Rica, not only are included but also appear as winners when the energy transition materializes. Additionally, the author even considers the countries mentioned above as the next contenders to become energy exporters and even apply pressure to their more dependent partners, while former energy powers such as Russia could see their stature and national power decline if the neglection towards renewables continues (ibid).

Mr Guilis (2023), chapter is among the latest contributions regarding the energy transition and geopolitics. Its goal is to try and map the magnitude of the geopolitical change the energy transition will inflict. In order to accomplish that, the writer interprets the geopolitical dimension of the transition as the impact the technically and geographically altered energy systems will have on inter-state relations in terms of cooperation and conflict.

Firstly, a possible depiction of a new energy order is pictured, resulting from the significantly reduced fossil fuel consumption and the vast fossil reserves that will have to remain unburned because of climate change and the transition. In this context, alongside indicators focusing on geopolitical gains and losses, a significant rearrangement in terms of power is due among fossil fuel exporters and importers (Giuli, 2023). Regarding the exporters, the loss of oil revenue, especially for the so-called petrostates, is expected to compromise their legitimacy, destabilize them, and even make them lose their status as a great power, yet this does not apply equally to every oil supplier.

Factors such as cost of extraction, level of export dependence on fossil fuel, and oil's importance for domestic political legitimacy can differentiate them into deeply exposed or prepared for what is foreshadowed. In addition, strategies such as extracting oil at the quickest possible pace ideal

for high-cost producers and producers with high fiscal break-evens, energy re-specialization and export re-orientation of fossil fuel or even diversification of their economy are expected to be followed by petrostates in order to become less vulnerable to the energy transition and geopolitically strong (ibid).

In opposition to exporters, the demise of fossil fuels is expected to considerably benefit large importers whose dependence on oil products affected their economic performance and constrained their policy options. Among the geopolitical winners is the United States, whose oil dependence has always constrained its foreign policy options in favor of its adversaries, such as Russia, post-revolutionary Iran, and Gaddafi's Libya (ibid). Although especially for the US, oil has also been a geopolitical asset since it helped them become hegemons on the international system and dominate the global economy. It must be mentioned, though, that with the transition spurring a new era of fossil fuel abundance, the redefinition of energy security as well as the US reconsidering their hegemonic engagement, a more multipolar international system might emerge as a result of the demise of the oil order. In such a case, the new system most likely will be more mixed, decentralized and deglobalized with less need for a global hegemon which would translate into a less powerful United Stated geopolitically.

In contrast to the US, the European Union can only benefit geopolitically from the transition (ibid). For many decades, European energy insecurity had always been a reason of tension between the buildup of EU actorness in external energy relations and member states' commercial national interests. Decarbonization will not only help the EU become energy secure but also remove a divisive obstacle in crafting a unified European approach towards fuel suppliers and even help improve the relations between the fossil fuel suppliers and the EU.

Finally, important Asian importers will most likely be geopolitically benefited by a reduced centrality of fossil fuel in their economy. The majority of them face significant strategic fragility due to their oil dependence, but because of the energy transition and their carbon neutrality plans for 2050-2060, they are expected to become stronger geopolitically when they fulfil their plans.

Furthermore, the emerging inter-state interdependencies that are expected to rise because of the energy transition, the decarbonization process, and the usage of renewables are analyzed alongside their geopolitical dimension (ibid). Starting with electricity, which is expected to become one of the dominant carriers of renewable energy, and as such, the geopolitical focus is expected to shift towards the availability and control of its infrastructures, storage capacity and cross-border interconnections. The distinctiveness of it in a decarbonized energy system as a carrier of choice is that it can be traded across only relatively short distances. As such, switching to electricity will most likely cause a deglobalization of energy trading since the electricity production units must be close to the centers of consumption.

The author charts three scenarios during electrification, the "regional" or "continental", where inter-state integration occurs among producers, consumers, and transit countries through high voltage cables within a regional dimension (ibid). Since the inter-state cables cause the same geoeconomics implications as inter-state trading of fossil fuels, the scenario mentioned above will not materialize among regions with inter-state tensions. In such a case, a Westphalian approach might take place with states pursuing energy self-sufficiency profiting from the distributed nature of the renewables instead of cross-border integration. Finally, there is the neomedieval where

decentralized self-sufficient communities were the norm instead of cross-border interconnection or national self-sufficiency.

Hydrogen, on the contrary, even though it is considered another energy carrier with very optimistic forecasts regarding its usage, is not of great geopolitical relevance. The reason behind it is the significant production availability since many countries can generate renewable hydrogen and export it by taking advantage of existing infrastructure. The aforementioned availability means that the exporters have limited room for geoeconomics statecraft since the importers can always produce hydrogen domestically, even if it is at a higher cost. It must also be mentioned that hydrogen will have to compete with many other green technologies that could be currently deployed at lower cost and less complex logistics, and because of that, it makes it a less pervasive carrier for energy systems than hydrocarbons.

Additionally, the aforementioned extensive usage of renewables, in general, could cause dependency issues and even geopolitical re-articulations due to the need for critical raw materials that are necessary yet remarkably concentrated in terms of extraction and processing (ibid). Specifically, except copper, tellurium and silicon, most metals and metalloids show a geographical concentration that is almost equal to oil. Because of that, countries such as China, Latin America and Sub-Saharan Africa are among the countries that will gain a strategic advantage. Moreover, North Africa and the Middle East are out of the picture as suppliers and customers, while the EU and Japan, being major buyers, will remain dependent on a third supplier. Lastly, Russia will most likely retain its role as an exporter of critical raw materials.

Furthermore, their concentrated supply nature of them is to blame for specific geopolitical risks that might emerge. Beginning with potential confrontations among major manufacturing powers trying to ensure access to raw materials, the eventuality of flows and systems being manipulated, and the fragility of specific critical raw material exporters.

The existence of specific factors that can mitigate the geopolitical sensibility that is accompanied by their usage must not be ignored (ibid). For starters, most clean technologies do not require the same materials, and as a result, competition might arise between them. For example, a breakthrough in electrical interconnectivity would increase the demand for copper while mitigating the need for storage and, as such, the demand for lithium. Secondly, many elements that are necessary for the transition are not that concentrated and scarce since the production underwent a de-concentration over the last ten years. Furthermore, the available reserves are much more abundant, while any shortage issues in conventional sites would just favour the advancement of alternative mining technologies. Thirdly, the importers of critical raw materials, unlike fossil fuels, do not need a daily flow, and because of flexible logistics and low storage costs, it is easier to deal with any flow manipulation risks (ibid). Fourthly, in the medium and long term, technological innovations will improve the recycling, efficiency and substitutability of critical raw materials. Such progress will help reduce both the environmental as well as the geopolitical criticalities that characterize the CRMs.

Nevertheless, the author considers as a given the fact that the geopolitics of energy transition will eventually be less about accessing resources and more about innovation in processes and products, supply and value chains, integrated infrastructure, and influence on the process of standardization and regulation (ibid). Characteristics such as research, intellectual property, industrial, trade, tax,

and carbon pricing policies, as well as bureaucratic-industrial ecosystems, will gain significant importance when geopolitically, technology becomes a more important determinant of power than having access to resources.

Van de Graaf (2018). having also as a starting point the energy transition and its consequences towards the dominant position of oil, writes a chapter where he examines how a specific set of oil actors would cope with it. Specifically, his attention is directed towards the OPEC producers and how that development will affect them in terms of power.

Table 2.2 Key indicators of top 20 oil exporters[8]

Country	Oil exports (mb/d)	Oil rent (% of GDP)	Oil income per capita	OPEC member?
Saudi Arabia	7.38	37.67	7800	Yes
Russia	4.78	8.46	2080	No
Iraq	2.83	39.87	1780	Yes
UAE	2.50	20.36	14,100	Yes
Canada	2.23	1.16	2530	No
Nigeria	2.11	9.43	370	Yes
Kuwait	2.04	51.95	19,500	Yes
Venezuela	1.81	14.47	2130	Yes
Angola	1.66	28.39	2400	Yes
Iran	1.49	18.44	1600	Yes
Kazakhstan	1.38	10.83	2370	No
Mexico	1.27	3.62	610	No
Norway	1.62	5.24	13,810	No
Oman	0.82	34.38	7950	No
Algeria	0.70	15.24	1780	Yes
Azerbaijan	0.68	20.62	2950	No
Colombia	0.67	4.58	430	No
Brazil	0.60	1.56	240	No
United Kingdom	0.60	0.50	150	No
Qatar	0.56	10.55	24,940	Yes

Notes Oil exports are the averages for the period 2012–2016. Oil rent figures are the averages for 2012–2015, except for Venezuela (2012–2013 average) and Iran (2012–2014 average). Oil income per capita shows the estimated value of oil and gas produced per capita in 2009

It is evident that such a transition will affect all the aforementioned countries, although most likely not on equal terms since not everyone is dependent on their oil rents to the same extent. In more detail, the exporters are divided into three categories starting with the extremely dependent economies that are dependent on oil rents for more than 30%-50% (Kuwait, Saudi Arabia, Oman, Iraq), followed by the highly dependent on a rate of around 15%-20% (United Arab Emirates, Qatar, Kazakhstan). Finally, the medium-dependent economies include countries whose GDP relies on 10% of oil revenues (Van de Graaf, 2018). A key issue for the majority of those countries because of their reliance on oil wealth is the so-called Dutch disease which is associated with incoherent economic policies, declining agriculture and industry production, as well as inadequate governance and is showcased by the oil income per capita index(ibid).

As history has demonstrated, the aforementioned oil producers, especially those that subsume into the rentier state category, do not react well to either oil price drops or reduced demand as it has exposed their economic vulnerability. The transition into a more permanent status where lower oil

[8] (Van de Graaf, 2018)

prices become the norm will cause social-political instability in many of them, especially in the middle eastern countries where their reliance on oil rents is significant. Among the major oil producers, Saudi Arabia is considered a major loser due to its reliance on oil rent and its high oil income per capita index. Despite being less dependent on oil revenues, Russia is also considered a big loser. The reason for that lies in the lack of an industrial base, the existence of corruption as well as autocracy that will render its economy vulnerable once the oil revenue has vanished (ibid).

In contrast, Iran seems better prepared with a broader economic base and a lower fertility rate, and alongside Iraq, their underdeveloped oil production due to the sanctions has already prepared them for a post-oil age.

The United States of America is one of the winners thanks to its shale oil production, reduced domestic demand and significant progress towards energy self-sufficiency. Thanks to the leading position it has assumed as a clean energy producer, China could also be considered among the favored regardless of the increased oil dependency. Finally, Japan and Europe will also be benefitted since their energy import bills will be reduced while also becoming better energy secured (ibid).

The latest article by Scholten, (2024) had to be included in this literature review since it addresses the same research question as this thesis, which is what the geopolitical implications of the energy transition are. The writer recognizes that climate change and energy security concerns necessitate a swift toward renewable energy and decarbonization with this transition being responsible for reshaping energy systems, creating new markets, altering trade flows, and influencing political dynamics.

As a result of that, eight clusters of expectations are presented by Scholten in his attempt to showcase what could happen (Scholten, 2024). He begins with the alteration of traditional dynamics between energy producing and consuming countries, as widespread access to renewable energy allows every nation to become a prosumer which translate as a country capable of both producing and consuming its own energy thereby reducing traditional dependencies (ibid).

Secondly, he acknowledges that electrification will likely lead to the creation of regional communities as well as grid politics in the long term (ibid). The long-distance losses, the strict operational requirements due to expensive storage, and the need for on-the-spot balancing of supply and demand in order to prevent major problems, alongside the abundance of renewable energy, favors the forementioned creation of regional communities rather than global ones. Such a development will likely turn pipeline politics to grid politics, with the emphasis being on where the interconnectors should be built, as well as who owns and controls them.

Thirdly, Scholten expects that access to critical materials and metals will become increasingly more difficult (ibid). Meanwhile, the limitation of supply chain dependencies by moving the processing of those materials closer to them will become a crucial priority since currently the process of those is dominated mostly by China.

Fourthly, energy production will be significantly decentralized since many renewable energy sources are scalable and can be generated closer at home (ibid). As a result, local communities will become autonomous as they will no longer need energy companies or transmission grids. However, separatist areas could also benefit by gaining access to their own energy sources.

Additionally, political and policy challenges may arise for policy makers and grid operators regarding how much energy production and distribution should be centralized or decentralized as well as how much energy demand can be met by electricity or other forms of energy.

Fifthly, the energy transition will lead to a major economic transformation promoting the growth of clean technology industries worldwide with countries such as China leading already in all things electric (ibid). The sixth expectation is that the energy transition will inevitably cause the decline of fossil fuels which in turn will create socio-political instability in exporting countries that rely on these rents for their well-being (ibid). Their anticipated response when that day comes is of particular interest for the writer.

Seventhly, the author believes that for sectors hard to decarbonize, such as steel industries and heavy transport, non-renewable decarbonization technologies such as nuclear energy and carbon capture might offer short-term reductions but risk locking industries into fossil fuel reliance, which, if overused, could delay a complete shift to renewables without proper planning and investment in cleaner alternatives (ibid).

Eighthly, he strongly believes that the energy transition will have uneven effects on different countries, as some will no longer be energy dependent while others will merely replace fossil imports with clean tech imports. Meanwhile, current oil and natural gas exporters will have to diversify. He also highlights the need for energy transition to be fast, otherwise, climate damages will ensue. Finally, although every country needs to cooperate against climate change, they remain more focused on their national strategies that will allow them to win the transition game rather than ensuring a smooth global energy transition.

Besides the author's expectations, attention is also directed toward energy policy, which is viewed as a complex two-level game, operating both, domestically and globally (ibid). In this context, Mr. Scholten (2018) highlights several key trends shaping energy policy and its geopolitical implications.

Starting with the great power rivalry, where bipolarity becomes the new norm with China and the US being the main protagonists, while simultaneously other regional powers such the EU reposition themselves (Scholten, 2024). In this setting, energy becomes not only one of the main areas in which states compete but also an instrument to serve other political purposes. States tend to consider industrial competitiveness and military advantage more important than clean energy, which is why they even consider it as a potential weapon to harm their rivals.

Another key trend is that of the climate change, environmental degradation and resource depletion (ibid). Since the effects caused by the CO2 emissions are increasingly visible, the phase-out of fossil fuels is driven more by these impacts than by their scarcity. In general, the push for energy transition is mostly because of countries and how they perceive climate change.

The third trend is that global energy demand is shifting towards the Global South because of population growth and economic development (ibid). Based on the forementioned trends and the duality that energy policy possesses, the author attempts to picture how different groups of countries are handling the energy transition. Starting with the Global North that sees renewable energy as a means of diversification fossil fuels and a key aspect of industrial policy, while Global South as a way to increase energy access and economic development, exploiting it as a market to

sell resources and materials and advance in the value chain. For fossil fuel exporters though such as Russia or OPEC, the transition is viewed as a threat to their main revenue stream and domestic stability.

Due to the complexity of energy transition as it includes different trends, players as well as uncertainties (great power rivalry, climate urgency) the author describes four possible scenarios to explore how the energy transition might unfold.

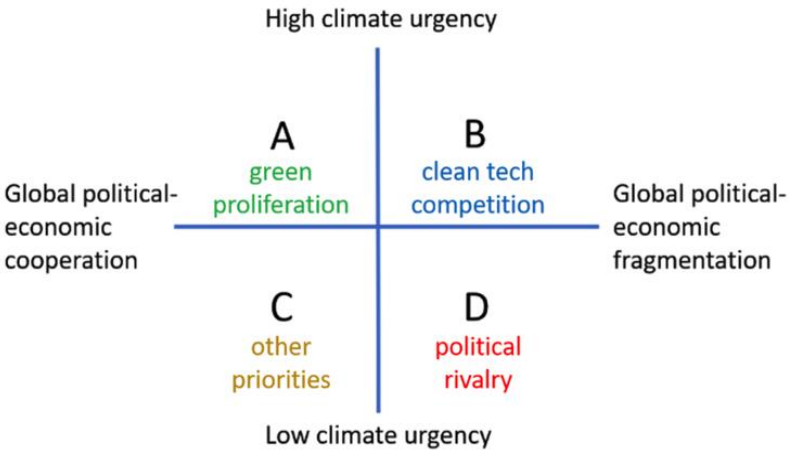

Figure 2.4 Four energy transition scenarios[9]

The first and fourth scenarios represent two extremes. Scenario A, called *Green Proliferation* pictures a world where a renewable energy proliferation treaty is signed against climate change, with global cooperation responsible for joint action, while climate change impacts are felt or perceived as the main policy issue (Scholten, 2024). The complete opposite is pictured in Scenario D *Political Rivalry* where great power rivalry is overshadows climate concerns and countries focus on securing energy by any means necessary (ibid).

The scenario B (*Clean Tech Competition*) is most likely where the world is currently headed. It pictures a world with a strong need for climate action that is increasingly politically fragmented. Rival great powers develop clean energy technology under strong economic competition and through protectionist policies. As a result, the countries leading in clean tech experience a fast uptake of renewable energy while the "losing" countries face a slow fossil fuel phase-out.

Last scenario is Scenario C (*Other Priorities*), according to the writer, represents a future world of economic globalization achieved through cooperation and global institution (ibid). In such a scenario, climate action is not the top priority either because other socioeconomic issues matter more, or because climate impacts are dealt through adaptation. Rivalry is dealt through markets and global institutions, while clean technologies are seen as industrial opportunities.

Finally, the author concludes that global politics will most likely determine the speed and direction of the transition in the short term, while renewable energy sources and technologies will completely reshape energy relations (ibid) He also strongly believes that global politics won't derail the energy transition. However, for a smooth global energy transition, understanding the interplay between energy systems and global politics is crucial, as is finding ways for policymakers

[9] (Scholten, 2024)

to balance national energy security, industrial interests with collective climate and stability concerns (ibid).

Chapter 3: Methodology

3.1 Research Question

Even though energy transition doesn't have a commonly accepted definition in the literature, the critical state of the world makes it a necessity. The ongoing transition from fossil fuels to renewable energy sources is among the most effective pathways against the overheating of our planet. Simultaneously, besides being a crucial life raft, it is also responsible for a complete alteration of energy and trade relations as well as international power structures. While every nation strives to reduce its carbon emissions and prepare for a future where fossil fuels are no longer the norm, this reconfiguration is already triggering significant shifts in geopolitical dynamics with far reaching consequences.

Based on the magnitude such a change is causing, understanding its implications is more crucial than ever. With that fact in mind, this thesis will aim to analyze how the energy transition will affect global stability by examining its effects on two geopolitically key players, the United States of America and China. In order to evaluate the geopolitical consequences of the energy transition for these two countries, this thesis will use a method borrowed from the business sector, called the SWOT analysis framework. By categorizing the key strengths, weaknesses, opportunities and challenges each country is facing during the ongoing energy transition, it will eventually allow us to answer the following research question: How will the energy transition affect China and the United Stated of America geopolitically?

3.2 Research Method

This section aims to present the aforementioned research approach that this thesis will use to answer its research question. Since both energy transition and geopolitics are such complicated and evolving matters, a research framework that allows for a thorough and structured analysis is required. As it was already mentioned this study will use a qualitative comparative approach, with SWOT analysis as the main tool to accomplish that.

In more detail, the qualitative approach was deemed necessary since the nature of the research question requires an analytical and exploratory point of view instead of statistics and numerical data. Energy transition and geopolitics are shaped by factors such as political developments that cannot be captured or represented fully through quantitative methods. Additionally, the qualitative approach is the most appropriate and effective based on the type of material (articles, studies, policy reports) that is analyzed.

A similar rationale lies behind the selection of the comparative approach as well, as it is considered a very effective way to assess the geopolitical implications of the energy transition in two of the world's largest and most influential economies, the United States and China. With both countries having different energy strategies, geopolitical advantages and global influence, examining them as case studies within the context of the energy transition provides valuable insights into how each nation will be affected geopolitically.

Both approaches used in this thesis align with the SWOT analysis framework, which provides a structured method to evaluate the geopolitical positioning of the United States and China in the energy transition. Specifically, by examining both of our case studies, their strengths, weaknesses, opportunities and threats we will gain a comprehensive understanding of where they stand, which nation is better placed and how this translates geopolitically.

Finally, this thesis relies solely on secondary data sources such as academic research, institutional reports, think tank publications, news articles and industry reports. The collection of primary data was deemed unnecessary due to the nature of the research question. The combination and utilization of these sources ensure a comprehensive and balanced perspective.

Chapter 4: Results

4.1: Introduction

As it was already stated in chapter 3, in chapter 4 the SWOT analysis of the United States and China is going to be conducted. In more detail, for each country, the SWOT analysis will focus on two of the most important key points in each category under the aspect of energy transition starting with the United States and then proceeding with China using country specific sources as it deemed necessary for the best evaluation. As for the threat section, the focus will be on how both countries are considered a threat for each other from the perspective of energy transition. Moreover, in chapter 4, a brief comparison between the SWOT results of the United States and China is also going to be performed.

4.2 SWOT analysis of United States

4.2.1 Strengths

4.2.1.1 Technological Innovation

As already stated in the SWOT plan, one of America's strengths in the energy transition that provides an edge, at least for now, against China is the leading position it enjoys in technological innovation. In particular, the United States is a world leader in primary innovation, meaning that they excel in creating and developing new science and cutting-edge technologies (Allan et al., 2025) although they lag significantly in other parts such as commercialization and manufacturing.

Nevertheless, one significant example that proves America's strength in the technology sector is the leading role it enjoys in advanced nuclear technologies such as Small Modular Reactors (SMRs), nuclear research and next generation reactors. According to the International Atomic Energy Agency, SMRs are small reactors taking up one-third of the space of a regular one and have power capacity of up to 300MW(e) per unit with features such as enhanced safety due to design characteristics such as passive cooling systems, flexibility as they can power almost every energy need and modular construction (International Atomic Energy Agency, 2016). American companies are currently at the forefront of SMR innovation. For example, NuScale is developing the VOYGR, which is the first NRC-certified SMR design that offers safe nuclear power with an expected deployment in Idaho by 2029 (Singer, 2023). In addition, Holtec is developing the SMR-300 which is planned to be deployed in Michigan by 2030 with plans to build an approximately 10GW SMR fleet all over North America (Grant, 2025).

Besides the development of the SMRs, the United States is also making progress on the next generation nuclear design reactors such as the Kairos Power's Hermes reactor which uses high-temperature fluoride salt-cooled technology (Harris, 2024).

Another sector that America is a technological leader is in the carbon capture, utilization and storage technology (CCUS). For starters, the United States own approximately 60% of the global operation capacity and almost half of the planed capacity worldwide. Such a high percentage of ownership highlights the scale at which CCUS is being deployed. For this leadership, a very strong research ecosystem consisting of universities, private companies and federal agencies contributes significantly (Sagatelova & Fitzpatrick, 2024). For example, in Louisiana, there is the Air Product's blue hydrogen facility, which is the largest CCUS project worldwide, capturing up to 5 million metric tons of CO2 per year(ibid).

It is worth mentioning that up until now the US government has played a central role in supporting this development through targeted policy incentives and infrastructure developments. For example, the Inflation Reduction Act, the Bipartisan Infrastructure Law, and the CHIPS and Science ACT have provided billions of dollars in production tax aimed to lower the cost of carbon capture, in funding aimed at supporting large scale carbon capture projects and in tax credits aimed to incentivize existing facilities to retool themselves producing clean energy equipment and cleaner manufacturing (ibid). As a result, the number of announced CCUS projects located in the US have rose sharply from 154 in 2023 to 276 by early 2025 proving both the political commitment as well as the confidence of the private sector ("2025 FEDERAL POLICY BLUEPRINT," 2025).

In addition to its leadership in CCUS, and nuclear technology, the Unites States also holds a leading position in low carbon hydrogen. Factors such as abundant natural resources, advanced infrastructures, strong policy support, and substantial federal investments are the main drives behind that. Legislations acts such as the Inflation Reduction ACT (IRA) have allocated over 9.5 billion US dollars towards the development of clean hydrogen while initiatives such as the Department of Energy's "Hydrogen Shot", a $2.6 million competition with sole purpose to foster innovating projects for producing clean hydrogen, and ultimate goal being to reduce the cost of clean hydrogen to $1 per kilogram within this decade (Sagatelova & Fitzpatrick, 2024a), (*U.S. Department of Energy Announces Winners of the First Phase of the Hydrogen Shot Incubator Prize*, 2022).

Furthermore, thanks to United States' extensive renewable energy sources (solar, wind and hydro), the production of green hydrogen via electrolysis powered by clean electricity is benefited significantly. Similarly, the production of blue hydrogen is also benefited by the extensive natural gas reserves America has particularly, in combination with the deployment of CCUS technologies. The existence of hydrogen pipelines and salt cavern storage facilities provide the perfect starting point for the scaled-up hydrogen operations across the country (Jacobs, 2023).

Moreover, the American innovation contributes significantly towards the advancement of fuel cells, electrolyzers and carbon capture systems as proven by the Intermountain Power project in Utah, the renewable powered hydrogen plant of Air products and the AES in Texas ("U.S. National Clean Hydrogen Strategy and Roadmap," 2023). Undoubtedly, the innovative advantage the US enjoy in clean hydrogen, strengthen its position as a global clean energy leader. The funding of hydrogen hubs by federal programs not only are enhancing regional economic growth but also

foster strategic partnerships with other markets which as a result further expand America's technological and political influence (White House, 2023).

4.2.1.2 Ability to form Strategic Alliances

A significant strength of the United States has been the ability to form strategic alliances. Such a capability in the context of the energy transition is key during the transition to low carbon energy sources which is responsible for reshaping the international relations. The formation and maintenance of such alliances is more than valuable as the US can expand their influence, secure critical supply chains and challenge China's growing dominance.

Such an alliance is the Partnership for Global Infrastructure and Investment (PGI), launched in 2022, by the United States and its G7 allies with the purpose being to counter China's Belt and Road Initiative by financing clean energy and infrastructure projects in developing countries. In more detail, the main purpose was to secure vulnerable supply chains and direct crucial funding originating from institutes such as the World Bank with the underlying aim being to strengthen its geopolitical positions in regions such as Africa and Southeast Asia. So far, the PGI managed to deliver only one project, the Lobito Corridor. Nevertheless, according to researchers, the PGI was an innovative first step, that it needs to be broaden and focused, have a clear policy framework and as "*a goal to bring together U.S. foreign tools, bilateral diplomatic initiatives, multilateral partnerships, and international financial institutions into a comprehensive global collaboration" (Allan et al., 2025)*.

An additional example Is the US-ASEAN Comprehensive Strategic Partnership that demonstrates the power of energy diplomacy in the Indo-Pacific. Through the USAID-supported Southeast Asia Smart Power Program, the US promotes regional electricity trade, grid reliability and clean energy deployment across the ASEAN nations. Actions made through this partnership, besides funding billions towards climate financing and regional decarbonization, it also reinforces the American presence in a region where China's BRI traditionally has a dominant role (*The United States-ASEAN Relationship – United States Department of State*, 2023).

Another example is the Mineral Security Partnership, led by the United States in cooperation with countries such as Australia, Japan, Canada, the EU. Its purpose being to diversify supply chains of critical minerals such as lithium and cobalt that are crucial for clean energy technologies and currently China has the advantage. By offering support towards American allied countries rich in critical minerals and rare earth elements in order to improve their processing and extracting capabilities, the United States seeks to reduce its strategic vulnerability and improve its energy security (Fernandez, 2025).

4.2.2 Weaknesses

4.2.2.1 Instability due to the election of President Trump and his different governmental priorities on energy policy

Among the included weaknesses in the conducted SWOT analysis of the United States, the re-election of President Trump and his complete reversal of the country's energy priorities as outlined in his programmatic declarations and already taken actions is one of them.

For starters, his actions are responsible for causing policy volatilities and funding freezes. Among his first actions, was the freezing of key programs such as the Inflation Reduction Act that halted billions intended for clean energy projects. Additionally, directives such as the freeze of the Green New Deal funding created widespread confusions, while agencies such as the Department of Energy were forced to slow down grant disbursements leaving many projects in the air (Friedman & Plumer, 2025).

Moreover, through one of his executive orders, state laws that promote renewables or restrict fossil fuels were challenged by the Justice Department, thereby threating the progress already made by states such as California which have been crucial in driving U.S. renewable energy growth (Reuters, 2025). Furthermore, his decision to withdraw the United States from international agreements such as the Paris Agreement besides damaging the American credibility internationally and letting rivals such as China claim leadership, it also weakened America's ability to form partnerships for critical mineral supply chains or shape international standards (Hunt, 2025). In addition, the caused instability set under jeopardization corporate renewable energy deals and discouraged researchers and start-ups to continue their clean energy research and innovation (Johnson, 2025)

In conclusion, Trump's re-election is justifiably considered a weakness since he is responsible for causing regulatory destabilization, eroding global influence in certain sectors, inciting conflicts between federal and state and in general delaying the transition of United States to a resilient low-carbon economy.

4.2.2.2 Dependency on China for rare earth materials

A major weakness for the United States is the reliance they have on foreign countries, especially China, for the supply of rare earth materials, as the United States is not self-sufficient in many of them. Even though there is domestic production from the Mountain Pass mine in California, the United States are far from self-sufficient, particularly in medium and heavy rare earth metals such as yttrium and samarium (California Curated, 2025), (Richter, 2025).

The extent of this dependency can be proved by the fact that China is able to compromise in a great extent the American national Security as the production of many advanced defense systems such as the F-35 fighter jet require specific rare earth metals that only China can provide. According to the U.S. American Pentagon the level of dependency from China for these materials, reaches a very concerning percentage of 78% (Tucker, 2025).

Furthermore, rare earth metals are essential for the construction of clean energy technologies, such as the production of a wind turbine or a solar panel. Since the United States is an importer of almost all the required rare earth metals from China, with the said dependence exceeding over 72%, China is able to delay the American production of renewables or even inflate their costs (Bearak & Stevens, 2025).

It becomes evident that China holds a significant geopolitical advantage over the United States of America due to the forementioned dependency. It is particularly concerning the fact that this dependency is on a country that doesn't hesitate to weaponize it, as demonstrated already by the rare earth export embargo imposed among others, on the US during the ongoing trade war (Jackson et al., 2025).

4.2.3 Opportunities

4.2.3.1 LNG exports as Strategic leverage

One of the most significant opportunities for the United States during the energy transition is directly associated with its role as an exporter of fossil fuels especially an LNG exporter for reasons to be analyzed.

For starters, it has allowed her to strengthen its geopolitical ties and influence with European Union. Specifically, the American LNG, replaced the gap the Russian gas left, because of the imposed sanctions by the EU hitting record levels in February 2025 where 82% of the cargoes went to European Union (Williams, 2025). In addition, it is the reason for United States to further increase their influence in energy dependent countries of East Asia such as Japan. Even if until recently, their imports were very low, American LNG is becoming gradually more popular as proven by the long term lng contracts signed this year. The reason behind the increased popularity lies at the fact that these countries want to avoid tariff pressures and increase their energy security (Zadeh, 2025).

Additionally, it has offered her a strategic leverage as energy exports can be used either as a bargaining tool during negotiations and trade deals or as a weapon in the form of sanctions to influence the behavior of its allies and adversaries. Simultaneously, with LNG being considered a bridge fuel that can assist countries during their transition away from fossil fuels, the United States is present with the opportunity to act as the supporter of the global decarbonization efforts and increase its geopolitical influence

In conclusion, even if it is a significant opportunity for the United States as it has allowed her to expand its geopolitical influence and position itself as reliable energy partner it is also a time sensitive. During the current transition period while the planet tries to diversify away from fossil fuels, LNG remains a key fuel and as such, the United States is still in possession of the leverages it provides. Over the long-term period though, with renewables becoming more dominant and the importance of fossil fuels declining, the strategic benefits will most likely diminish.

4.2.3.2 Alternative supplier to China in Clean Energy

Another key opportunity for the United States lies in the rising global demand for secure and diversified clean energy supply chains. As the energy transition progresses worldwide, and China maintains a monopolistic position in several key parts of the supply chain, such as certain critical materials or relevant technologies, many countries seek ways to diversify their dependence on China. The United States, have the chance by leveraging its forementioned strength to form alliances, to capitalize on that need and create a viable alternative solution. It should be mentioned though, that such a strategy is more challenging to achieve with President trump in power and his pro-fossil fuel agenda. Regardless, the United States retains the ability to claim such role.

In order to successfully do that, Congress would need to allocate between $20 to $40 billion over the next decade to support critical mineral processing. American companies in the technology and energy sectors must be incentivized to invest in domestic supply chains, while new processing and manufacturing hubs would have to be developed (Camba, 2025). Additionally, the US would have to secure supply contracts with allied countries for critical minerals and components as well as reliable foreign supply chains as a way to reduce risk. Existing partnerships such as the Mineral

Security Partnership (involving Australia, Canada, Japan, EU, South Korea) would have to be strengthen and expanded to jointly invest in mining, refining and processing beyond China's control (ibid).

Furthermore, investments in recycling technologies that allow for the recovery of critical materials would be needed as would dedicate funding towards research and innovation in order to stay ahead of the global competition (ibid).

Lastly, continuous assessment of any economic, competitive or national security risk in each clean energy supply chain would be required along with strict guidelines mandating the usage of only US processed or allied processed critical minerals in any federally funded energy or infrastructure project (ibid).

4.2.4 Threats

4.2.4.1 The expansion of the Belt and Road Initiative

In terms of threats that the United States faces in the energy transition, one of the most significant, especially in geopolitical, economic and strategic terms is China's Belt and Road initiative. The BRI was originally launched in 2013, with the goal of linking East Asia and Europe and eventually became a major geopolitical headache for the United States for reasons to be analyzed.

For starters, as it is already known, China's significant advantage in the energy transition originates from controlling a tremendous percentage of not only the refinement process but also the mining of critical rare earth metals. Such an advantage has been gained primarily but not exclusively by financing related projects in countries rich in metals such as Africa, Latin America and Southeast Asia. For example, thanks to investments backed by the BRI, China has managed to secure 80% of the cobalt supply in the Democratic Republic of Congo (Gregory & Milas, 2024).

Beyond exploiting the BRI to secure rare earth metals, China holds another ace as in some cases the offered loans or the large-scale investments made in certain countries have led to either unsustainable debts or substantial economic leverage that have resulted in China gaining either access or complete control over key ports (Wang, 2022). For example, Sri Lanka had to lease Hambantota Port for 99 years due to debts, Pakistan, granted control of Gwandar Port for 40 years due to economic leverage, while Djibouti allowed the construction of the first Chinese oversea military base following substantial investments as well. All three are considered as strategic strongpoints by Chinese strategists and are seen as affecting the US navy access and its operational flexibility (Russel & Berger, 2020).

Lastly, the BRI has been used also as a method of increasing Chinese influence in traditionally American allies with an illustrative example being the Gulf States. Specifically, the Gulf region in general has been a major recipient of Chinese investments in energy projects and infrastructure with Saudi Arabia alone, receiving over $1.6 billion in BRI backed renewable projects which resulted in improved bilateral relations as well as influence. Additionally, with BRI linked investments in both Saudi Arabia and Iran, China leveraged those and manage to broker a deal between the two parties that led to the normalization of their relation in 2023 showcasing among other China's diplomatic capabilities (Kaddorah, 2024). In conclusion, the expansion that China achieves through the BRI, is unmistakably a threat to the United States. As shown, it not only helps further increase China's dominance in critical materials that USA is far from sufficient but also, it

is becoming the reason for China to gain access in traditional American allies and presence to strategic locations that directly challenge American interests.

4.3 SWOT analysis of China

4.3.2 Strengths

4.3.2.1 Centralized governance

China in comparison with almost every western country is characterized for many years now, from a political peculiarity that in some cases it turns out to be one of its most significant strengths. The peculiarity is its centralized governance that in conjunction with its strategic planning is a tremendous strength.

For starters, the combination of centralized governance with a decentralized economy enables the immediate implementation of ambitious policies, dictated by the central government, without any major financial or administrative delay. Such characteristics, among others, have been instrumental for the swift deployment of renewables and the development of critical infrastructures (Eckardt et al., 2022).

Moreover, the existence of such a governance allows Beijing to stay focused on its long-term strategies and goals without having to respond to short-term political pressures or demands for not showing any immediate results (Abesha & Kebede, 2024). This continuity in policymaking provides the necessary framework for major projects such as the BRI not only to be realized but also to remain on track over the decades.

Lastly, beyond enabling China to achieve tremendous achievements domestically, such as becoming the world's largest producer of solar panels, this governance model provides the ability to project these achievements internationally especially in the energy sector. As a result, Beijing manages to become a point of reference in clean energy technologies and standards.

4.3.2.2 Dominance in renewable energy manufacture, deployment and critical materials

One of the biggest strengths for China is the dominance it enjoys in renewable energy manufacture, deployment and in critical materials for reasons to be analyzed. For starters, thanks to the Chinese renewable energy sector, its economy has managed to transform. Clean energy has contributed over $1,6 trillion to the Chinese economy accounting for all the country's investment growth and 40% of the GDP expansions, simultaneously compensating for slowdowns in other industries such as real estate (Myllyvirta, 2024).

Secondly, with Beijing being the world's largest producer of renewables, it can manipulate global prices for solar and wind technologies and increase its influence in emerging markets by exporting green technologies and infrastructure (Isenberg & Mooney, 2025), (Hilton, 2024). Moreover, thanks to China's centralized governance, which enables the rapid and large-scale deployment of renewables, in conjunction with China's ambitious national targets and policies, continuous growth and market certainty are ensured which contributes significantly to overall stability.

Additionally, by having such dominance, China gains a significant geopolitical leverage, as many countries depend on Chinese technology for their decarbonization, allowing Beijing to influence

global energy transitions. (Zhang Xun & Li, 2025). Simultaneously, it enhances its a soft power by being a provider for cheap and scalable green solutions enabling Beijing to shape international norms and partnerships (Agnieszka Nitza-Makowska, 2025).

Finally, its dominance in critical materials allows China to not only to influence global prices for those products but also make its domestic industries more competitive due to cheap access to them (Zadeh, 2025c). It is worth mentioning also, that this dominance can act as a viable weapon during disputes in the form of an embargo as it happened back in 2010 against Japan (ibid)

4.3.3 Weaknesses

4.3.3.1 Coal Dependency

Even if China has made significant progress in portraying itself as a climate and clean energy leader, it still has to face a "dirty" reality as coal continuously dominates its national energy mix. Such dependency is justifiably considered a weakness for reasons to be analyzed.

To begin with, it is responsible for delaying China's decarbonization process and the achievement of its climate goals. The reason for that lies on the heavy usage of coal for electricity generation (61% in 2022) driven by energy security reasons that make Beijing into one of the largest emitters of CO2 globally (International Energy Agency, n.d.). Moreover, last year's approvements of new coal capacity (66,7GW) along with the start of construction of new plants (94,5GW) contradicts completely the Chinese climate goals and risks prolonging even further the fossil fuel reliance slowing the shift to a cleaner energy mix (CREA, 2025).

Secondly, this reliance undermines China's projected role as a climate leader domestically, Beijing is constantly approving and constructing new coal plants prompting other countries to doubt China's climate commitments. Simultaneously, it confronts Beijing with the possibility that coal assets worth of trillion yuan could become stranded by 2040 if it adheres to its climate pledges (Wu et al., 2025).

Finally, China's soft power gains as an exporter of green technologies and renewables is affected negatively as it comes in contrast with its willingness to fund polluting coal projects in other countries mainly through the BRI project while projecting itself as a champion of climate action and renewable energy.

4.3.3.2 Geopolitical mistrust

Besides coal dependency, China is characterized by another critical weakness, that affects her negatively in terms of global influence. This weakness is the geopolitical distrust that Beijing must deal with, stemming primarily from accusations made from western governments that results in certain consequences that affect Beijing negatively.

Starting with, China has been accused of engaging in "debt trap diplomacy" during which developing countries are provided, through BRI projects, with unsustainable loans that they can't repay. The ulterior motive behind that tactic is so that China eventually seizes their strategic assets in the event of loan default (Himmer & Rod, 2023). Such accusations over the years have led several countries either exiting the BRI like Italy and Panama did in 2023 and 2025 (Mazzocco &

Palazzi, 2023), (AFP, 2025) or completely favor other initiatives instead of China's BRI like Vietnam did (Nguyen, 2023).

Additionally, China has also faced accusations of technological espionage, prompting western governments to take actions, such as the ban of Chinese tech companies (Huawei) due to fears for gaining access to sensitive information (Reuters, 2023).

The forementioned accusations results in economic costs as the restricted market access and tariffs limit China's export ambitions. Also, strategically, with BRI gaining bad publicity, its expansion becomes limited and as a result China's ability to affect global infrastructure reduces as well. Finally, even China's soft power is weakened, as accusations of espionage and debt trapping make Beijing a less attractive partner to cooperate with.

4.3.4 Opportunities

4.3.4.1 Leadership in global green technology standards

For China, a major opportunity that it can take advantage of, is the leadership position it can claim as a standards setter in anything related to green technologies. Even if China is already a leader in renewable products such as solar panels and owns a generous market share while simultaneously controls many supply chain of critical materials and invests in anything related to green technology being able to shape the relative standards, being able to shape the relative standards as well would improve China's role even further.

For starters, as the world's largest producer and exporter of renewables and EVs, gaining the ability to set the technical standards worldwide for all these products combined with the market dominance it enjoys, provides Beijing the ability to pinpoint its own products and relevant technologies as the default choice for any country investing in that kind of technology. For example, China is the first country to release its newer and stricter EV battery safety standards (GB38031-2025) that are going to be set in motion in 2026, much earlier than Europe's or United States (Zadeh, 2025b). As a result, China's new standards are becoming the de facto standards for foreign automakers which they have to adopt to, to be able to export their cars in the Chinese market which is considered the biggest EV market (ibid).

Furthermore, becoming the standards setter, means also that foreign countries, besides the equipment, they will have to adopt to the Chinese standards and as such, become dependent on China for anything related to maintenance, upgrades and service (Lozada et al., 2021). Of course, becoming a necessity, offers geopolitical advantages for Beijing as well, as it eventually, allows to strengthen its ties with them, especially with developing nations and gain more influence as more countries adopt its standards alongside its renewable technology.

To conclude with, if Beijing succeeds to claim the leadership position for green technologies standards, it will not only reinforce its dominance in renewables, but it will also expand its geopolitical influence. By successfully tying other countries especially those in the developing world to its standards, China can shape their energy transitions in ways that serve its interests.

4.3.4.2 Critical mineral partnerships

As it is commonly known, China is considered a global leader in the context of the energy transition as it produces crucial critical minerals such as lithium, graphite but also holds a dominant position as a processor and refiner of almost most of the minerals (Cooper, 2024). With those materials being the next "oil", China's efforts to completely control those supply chains are self-explanatory as they allow Beijing to become as secure as possible and gain a significant geopolitical advantage. In order though, to successfully achieve that, China, must ensure that it has access to every required mineral besides those it owns, and there lies a major opportunity for Xi's country as through the partnerships with the supplying countries, China can gain much more besides the rare earth metals it lacks.

For starters, the most obvious opportunity from forming partnerships with its supplying countries such as Africa, Latin America and Southeast Asia is the supply risk mitigation it achieves. By forming these connections alongside investments in mining projects abroad, China manages to become less vulnerable to supply disruptions and price volatilities (Jiang, 2023). Furthermore, through those partnerships, China manages to deepen its geopolitical and economic ties with its suppliers, as many of them, their economies are highly depended on those exports and with China being the main buyer it allows her to eventually form a favorable relationship with those countries with an example country being Africa (Kalisky, 2024).

In conclusion, China has the opportunity, by forming partnerships with its suppliers, to not only secure access to the critical minerals it lacks, but also to strengthen its geopolitical influence. By ensuring a stable access to those resources while simultaneously deepening ties with supplier countries Beijing manages to sustain its dominant position during the energy transition.

4.3.5 Threats

4.3.5.1 Rivalry against United States and the threat of decoupling

Among a majority of threats that China is facing, one of the most crucial someone can recognize is the rivalry against the United States of America and the threat of decoupling as it is a multidimensional threat. Starting with the economic sector, the rivalry between the two parties have affected significantly the trade relations between them, with historically high tariffs being imposed on Chinese and American products respectively with those reaching over 145% on certain Chinese products and 125% on certain American products (Liu, 2025)..

As a result, Chinese exports towards the US have plummeted by 21% in April 2025 with projections predicting that in the case of a full decoupling China's GDP growth could reduce by 1.1% (ibid). It must be mentioned though, that according to the latest developments, both parties have reached a temporary 90-day truce which have resulted in tariffs being reduced to 30% by United States and 10% by China (Reuters, 2025b). On that front, if the truce holds for more than the 90 days it would favor not only the two countries but the global economy in general.

In the technological sector, the rivalry has resulted into a tech war, with United States proceeding with strict licensing requirements that basically block the sale of the most advanced chips from companies such as Nvidia towards China. In response, Beijing is trying to achieve self-sufficiency, which in certain areas like photoresist stripping they have succeeded but in other parts of the process such as lithography, China is still reliant on foreign suppliers (Hai, 2025).

Finally, the power struggle has also taken a toll on the geopolitical aspect, with the United States intensely trying to convince their allies as well developing nations to reduce their reliance on China as a manufacturing center and look for alternative choices such as India to deprive of Beijing crucial allies, clients and influence (Butts & Bao, 2025). Moreover, in the context of this conflict, the United States have even taken measures to revoke China's developing nation status to deprive Beijing the advantages that accompany that like trade benefits and access to climate financing (Minghao, 2023).

4.4 Country Comparison

Following the conducted SWOT analysis for both of our case studies, a brief comparison between the SWOT results of each country is going to follow.

4.4.1 Comparison of strengths

The energy transition is responsible for the establishment of a new chess game, where the existing international status quo is gradually changing as fossil fuels lose their importance. Nevertheless, both of our case studies as proved by the SWOT analysis have several advantages that once again place them at a pivotal place in the new era.

For starters, China owns a peculiar political system that in conjunction with its decentralized economy model it allows her to promptly implement ambitious politics without any delays or political barriers as it usually happens in western democracies such as the United States. Because of the political continuity and long-term strategic planning, ambitious projects such as the Belt and Road initiative are successfully implemented. On the contrary, the United States have a distinct advantage in the field of technological innovation because of the federal incentives, academic research and its private sector. As a result, the United States are leaders in cutting edge technologies such as Small Modular Reactors (SMRs), carbon capture (CCS) and clean hydrogen in comparison with China that focuses more on producing and exporting their current technologies.

Furthermore, with China being a leader in the supply chains of critical materials the advantage it possesses against the United States is more than obvious. Due to that capability, China enjoys both financial and geopolitical advantages as it can affect their prices in the global market, support its domestic its domestic industries that require rare earth metals and of course use it as a leverage tool. Conversely, United States, balance that strength with their significant diplomatic capital they possess that enables them to form alliances such as the Mineral Security Partnership. Through the formation of those, United States can promote their interests, undermine the influence of China and improve their geological position in key areas.

In conclusion, China surpasses the United States in terms of industrial production, control of supply chains and speedy policy implementation while the United States in technology innovation and alliances. In our case, the energy transition function as a battlefield for both countries and simultaneously as a chance to improve their geopolitical powers through different paths.

4.4.2 Comparison of weaknesses

Unsurprisingly, both China and the United States face major weaknesses within the context of energy transition and as a result their ability to improve or establish their geopolitical powers is

affected. For both countries, the weaknesses differ drastically, yet they represent the peculiarity of each state.

Starting with the United States, where one of its major issues, is the political instability and the lack of political continuity particularly, during leadership transitions as proven by the election of President Trump. During his administration, international agreements have been called off, conflicts between federal and state power are taking place as well as suspension of fundings which results in general confusion and delay of the American energy transition progress. As a result, both the domestic development of renewable energy and the international status quo of America as a energy leader in the new energy era is affected which consequently affect its ability to attract new allies and form international standards.

Moreover, it must deal with its strategic dependency in China for rare earth metals which are crucial for the development of American defense systems and renewable technologies. As a result, that kind of dependency renders the US vulnerable to geoeconomic pressures as it has already happened during the ongoing trade war in the form of restricted exports as a form of retaliation against the American tariffs.

In contrast, China is facing its own internal issues, with one of them being the dependency, it still has on coal. Beside the tremendous progress it has achieved in the development of renewables and as a leader in anything related to the climate, the continuous usage as well as the licensing of new coal plants undermine both its international credibility as a climate leader and its ambitious decarbonization goals. That contradiction is responsible for undermining its influence and its credibility as a leading example for the energy transition.

Furthermore, China must also deal with the geopolitical distrust as it's been accused for technological espionage and usage of dept diplomacy. As a result, multiple countries have either abandon or distance themselves from the BRI initiative while Chinese tech companies have been excluded from western markets. Consequently, the Chinese geopolitical influence in developing countries is affected negative as well as the ability to project its soft power is constrained.

In summary, the United States have to deal with their internal institutional instability as well as their dependency on China, while Beijing is facing its own internal strategic issues in relation to energy as well the international mistrust. For both countries, these threats render difficult the ability to capitalize on their advantages.

4.4.3 Comparison of opportunities

While the energy transition is challenging, it is also full of opportunities for the United States and China as highlighted by the conducted SWOT analysis. Those opportunities can prove helpful in improving their geopolitical influence, although it must be mentioned that those, are based in different foundations and lead each country to pursue different strategies.

For starters, China has the chance to further improve its international influence and power by successfully becoming a global leader in green technology standards. The ability to set its own standards in sectors such as EVs and renewable technologies enhance its geopolitical influence, especially towards developing countries that import Chinese technologies and as such become dependent on those standards.

Moreover, having the opportunity to develop partnerships that allow China to secure its access to critical minerals, further enhance its leadership position in the energy transition supply chain. Through those agreements, China not only mitigates the risk of shortages but also deepen its geopolitical ties with its suppliers. As a result, China is able to increase its influence in the global energy landscape and leverage them as a counterbalance to Western alliances.

The United States have also their own strategic opportunities that can take advantage as shown in the SWOT analysis. Starting with the exportation of LNG towards the European Union and the Southeast Asia that is considered a major geopolitical weapon. The successful replacement of Russia as natural gas supplier for the EU, alongside the formation of long-term agreements, have allowed United States to establish itself as a reliable energy partner. Additionally, with energy exports being able to be used as a bargaining chip or a geopolitical tool further improve the geopolitical importance of the US. Unfortunately, though, that opportunity has a time limit as the world is transitioning towards renewable energy

Furthermore, due to China's dominance in critical material supply chains, the United Sates is presented with a strategic opportunity to become a credible alternative for countries seeking to diversify their source and reduce their reliance on China. By leveraging its ability to form alliances, the US can present themselves as a reliable alternative for both the development of renewable technologies and the processing, recycling of critical materials. In order to achieve that, substantial state funding, generous support towards innovation and partnerships with key countries are going to be needed. The outcome though will be more than beneficial as the United States will be able to reduce the dependence on China while simultaneously increasing their geopolitical influence.

In conclusion, the energy transition offers the opportunity to China to increase its global influence by successfully tying developing nations to its technological standards and supply networks of critical materials. The United States on the other hand, by leveraging the present circumstances they can establish themselves as leaders in the new energy era by offering diversification and energy security. The success of each country will depend on factors such as their time management, their technological advancements and their ability to establish themselves to the evolving energy landscape.

4.4.4 Comparison of threats.

Besides the strengths and opportunities that both case studies can capitalize on during the energy transition, they also have to deal with significant threats. For the purposes of this thesis, the threats focused specifically on how China and the United States perceive and pose threats to one another within the context of the energy transition.

For China, among the many ways the United States can threaten Beijing, the economic and technological decoupling is among the most crucial. In more detail, on the economic front, the escalating trade tensions between China and the US alongside the historically high imposed tariffs have resulted in reduced exports to the US that according to researchers can even affect negatively China's GDP growth.

Technologically, the US have also drastically limited China's access on advanced semiconductors and the related technologies. Even if Beijing is trying to achieve self-sufficiency in key sectors, it remains dependent on foreign suppliers for several crucial components of the production process.

At the same time, Washington is seeking to isolate China geopolitically by not only revoking its developing country status but also attempting to attract traditional Chinese clients and allies.

For United States, China's strategic usage of the Belt and Road Initiative is one of the major treats during the energy transition. As through that, China has successfully managed to expand its access to rare earth materials by financing mining and infrastructure projects in resource rich regions. Additionally, Beijing is taking advantage of its investments in order to gain control over critical infrastructure such as ports in Sri Lanka and Pakistan that not only improve its maritime presence but also restrict the American operational flexibility. Finally, China has been also successfully increasing its influence in traditional American allies such as those in the Gulf region by taking advantage of its BRI linked investments.

In conclusion, China's economy, technological progress and geopolitical position is threatened by the strategic isolation. Meanwhile, the United States has to overcome China's expanding global presence which undermines the American dominance in critical supply chains and key geopolitical areas. For both countries, if those threats are left unaddressed, they could significantly impact their geopolitical standing in the long term.

Chapter 5: Conclusions

5.1. Summary

This thesis, being inspired by the energy transition and the gradual alteration of the global status quo that is responsible for, aimed to answer the research question of *How will the energy transition affect geopolitically the United States and China?* A SWOT analysis was executed for both case studies, allowing for the identification of both the internal factors (strengths and weaknesses) and the external variables (opportunities and threats) in relation to the energy transition and their geopolitical implications.

Based on the comparison between both parties, it can be deduced that China is currently better position to benefit geopolitically from the energy transition, mainly because of its dominance in global supply chains, manufacturing capacity and the ability to execute long term strategic plans such as the Belt and Road Initiative. Regardless of that fact, China still faces vulnerabilities, such as the international mistrust that is affecting Beijing multidimensionally, its own domestic issues and the external containment attempts led by the US and its allies.

The United States on the other hand, despite its internal political instability issues and the dependence on Chinese resources as analyzed already, continues to retain significant strategic advantages such as its technological edge, the ability to form strategic alliances and its influence over global governance frameworks. These assets, if taken advantage, and political continuity is restored, the United States could regain or even surpass China in certain aspects of the energy transition.

Nevertheless, at the current stage of the energy transition, China is more likely to emerge geopolitically stronger by leveraging its industrial policies, the control of critical resources and its initiatives aimed at binding developing countries to its technological and economic model.

Based on the findings originating from the SWOT analysis, while for both countries, energy transition is considered an opportunity, for now, it seems that China has converted its strengths into geopolitical gains much more effectively than the United States. It is worth mentioning though that this lead remains vulnerable and could always be counterbalanced by Western initiatives or even internal disruptions within China.

Finally, in light of the conclusions presented above, it becomes clear that the theoretical discussion developed in the literature review that emphasized the importance of characteristics such as technological leadership, control of energy supply chains for critical materials and the ability to form alliances during the energy transition are consistent. Additionally, it confirms that the energy transition is not merely an environmental or an economic process but that energy itself regardless of its form continues to be a core strategic asset in international relations.

5.2. Limitations

This thesis, has of course, its own limitations even if the SWOT analysis provided a structured framework that allowed assessing the geopolitical implications of the energy transition in the United States and China.

Starting with the fact that, the conducted analysis is based on information that reflect a certain time-period up until today. Since the global energy landscape is constantly evolving as the technology progresses, in conjunction with multiple political and of course geopolitical alterations, the results of this thesis are not long-term forecasts. Future developments of any kind can always either reinforce or undermine the conclusions of this thesis.

An additional limitation is the fact that certain parts of the analysis rely on scenario-based reasoning, especially in the evaluation of future opportunities for each case study. Even if those are plausible scenarios, they are still prone to uncertainty and may not fully materialize. For example, even if the US have the potential to become an alternative to China in clean energy supplies, it remains a scenario that require many parameters to be fulfilled which are not easily guaranteed.

Furthermore, the SWOT analysis itself even if it allowed the comparison between the United States and China, it has its own limitations as it remains a qualitative research method. Because of that, the ability for example, to measure the impact of each factor or conduct accurate predictions is limited as there is no quantitative modeling. For that reason, the provided conclusions and insights of this thesis should be examined under the qualitative spectrum.

Finally, the research was focused exclusively on two countries as it allowed a detailed case study analysis. Because of that exclusivity, other key actors were left out, which if we take in mind the global nature of the energy transition it can be considered a limitation.

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