3

Energy Security and Geopolitics of Energy Transition

This chapter's objective is to situate this book within current knowledge and past developments in energy security and geopolitics research. Previous accounts of energy security and geopolitics have typically been limited to the energy perspective and have failed to delve into many of the broader questions of security – as outlined in Chapter 2. This chapter starts with a summary of the conceptualization and history of energy security research, which is largely focused on the differing definitions of energy security. The chapter then moves onto the more recent and rapidly increasing literature on the geopolitics of the energy transition and, in particular, the geopolitics of renewable energy. Much of this literature is based on descriptions of potential future trajectories of how the geopolitics of renewable energy or energy transition will unfold, rather than empirical research. However, the literatures on energy security and geopolitics of renewable energy are an important context into which the empirical analysis documented in this book is placed. The chapter ends with a brief account of energy security in Europe.

3.1 Conceptualization and History of Energy Security Research

Energy security research can be divided into conceptual and empirical studies. In this subsection, I briefly review the conceptual development of energy security.

Energy security began to attract political interest as a result of the world wars, as the oil infrastructure was expanded to support oil supply to the military (Johnstone and McLeish, 2022). The use of oil grew in the aftermath of the world wars, leading to an increased reliance on oil in society (Chester, 2010). Academic research on energy security at the time was rare, but some early writings appeared in the 1960s (Lubell, 1961). However, following the 1970s oil crises, energy security emerged as an issue on many states' political agendas. In some states, such as Finland, energy policy became then distinguished as a specific policy domain for the first time.

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In 1976, Willrich provided alternative definitions for the concept of energy security, such as: "the guarantee of sufficient energy supplies to permit a country to function during war"; "the assurance of adequate energy supplies to maintain the national economy at a normal level"; and "the assurance of sufficient energy supplies to permit the national economy to function in a politically acceptable manner" (Willrich, 1976, p. 747). All of these approaches took "the nation," rather than citizens, to be the entity for whom energy was to be secured. Willrich also stated that energy security was, in all approaches, closely linked with economic security. However, even in the 1970s, he acknowledged the importance of addressing the environmental impacts of energy production alongside energy security, as part of energy governance. He discussed accidents, land-use issues, air and water pollution, radioactive waste, climate change (using the term "thermal limit"), and energy conservation. Many issues and mechanisms that are today discussed in conjunction with energy security were mentioned by Willrich. Alongside the environment, these included, for instance, self-sufficiency, stockpiling, and assuring foreign supplies. However, although some academic research emerged in the aftermath of the 1970s (Yergin, 1988), scholarly attention to energy security decreased because of stabilizing oil prices in the 1980s and 1990s (Cherp and Jewell, 2014).

The research field began expanding after 2000, following rising global energy demand, concern over gas supply, and decarbonization pursuits. In particular, the period from 2006 to 2010 saw significant developments in energy security studies (Azzuni and Breyer, 2018). This research was in stark contrast with earlier research, both because it was no longer focused solely on oil and because it began to provide multiple interpretations of energy security in diverse contexts.

In a similar way to the concept of security, there have been multiple definitions of the energy security concept. Drawing from broader security studies, Cherp and Jewell (2014, p. 417, emphasis in original) defined energy security as "*low vulnerability of vital energy systems*." Jewell and Brutschin (2021) later specified this as the absence of threats and the capabilities of states and system operations to respond to threats. Cherp and Jewell (2014) proposed three key questions for energy security: Security for whom (e.g., households, industry, or states)? Security for what values (e.g., political, economic, or social)? And security from what threats (e.g., natural weather events, terrorist and military attacks, or technical disruptions)? They also talked about vulnerability in terms of the diverse nature and origin of risks. Such risks have been divided by Winzer (2012) into technical, human, and natural risk sources. Winzer describes technical risks as infrastructure interdependencies, mechanical/thermal failures, and emissions. Human risks are linked, for example, to geopolitical instability, political instability, and terrorism. Natural risk sources not only refer to natural disasters but also to resource intermittency and depletion. Winzer argued that different risks are not of similar magnitude, but have differing scopes, speeds, durations, and severities of impact. Like the sustainability transitions concept of "landscape," he makes a distinction between "shocks" as short-term disruptions and more longer-term "stresses" (Winzer, 2012).

In the 2000s, extensively cited work introduced the four As of energy security: availability, accessibility, affordability, and acceptability (Kruyt et al., 2009). Cherp and Jewell (2014), however, criticized the perceived importance of the four As and argued that dimensions such as acceptability should not be included in the definition of energy security as they confuse its interpretation. Yet others have elaborated multiple dimensions of this concept. For example, Sovacool and Mukherjee (2011) proposed twenty components of energy security under five dimensions: availability, affordability, technology development and efficiency, environmental and social sustainability, and regulation and governance. Some of these components were more directly related to the supply of energy, such as availability and dependency, while others were connected instead to other societal objectives, such as water, land use, pollution, and greenhouse gas emissions. Systematically reviewing the literature on energy security, Azzuni and Breyer (2018) identified fourteen dimensions and parameters for energy security: availability, diversity, cost, technology and efficiency, location, timeframe, resilience, environment, health, culture, literacy, employment, policy, and the military.

In the 2010s, the energy security literature begun to more extensively include the question of climate change and the need to decarbonize. These connections, however, have mostly been made in terms of empirical studies (Knox-Hayes et al., 2013; Rogers-Hayden et al., 2011; Strambo et al., 2015; Toke and Vezirgiannidou, 2013). The studies did not propose a principled priority of decarbonization over other energy security dimensions and provided few conceptual insights into energy security. Another review of energy security studies, however, showed some change in the emphasis of the concept over time; while energy availability has constantly remained as a key element, energy prices, efficiency, and the environment have increasingly been discussed in association with energy security (Ang et al., 2015).

Chester (2010, p. 887) has accurately remarked that "the concept of energy security is inherently slippery because it is polysemic in nature, capable of holding multiple dimensions and taking on different specificities depending on the country (or continent), timeframe or energy source to which it is applied." He noted that energy security is typically used to refer to unhindered and uninterrupted access to energy sources, a diversity of sources, nondependency on a particular geographical region for energy sources, abundant energy sources, some form of energy self-sufficiency, and/or an energy supply that can withstand external shocks. Overall, energy security has been described as a context-specific political phenomenon (Knox-Hayes et al., 2013; Szulecki, 2018a). For example, Winzer (2012) pointed to political differences between states, where energy security has been associated with energy independence, energy diversity, reliability of supply, or protecting the poor against energy price volatility. Variation in understanding energy security can perhaps be explained by differences in how actors value different parameters, such as the resource sufficiency or import dependency of a country or market-based solutions versus state involvement (Månsson et al., 2014). Most discussions on energy security have tended to debate it from the perspective of states, and the academic literature has frequently ignored energy poverty as a security question. The individual household perspective in terms of energy security did, however, become more visible in discussions around the European energy crisis in late summer and early fall 2022.

These more diverse dimensions to energy security create a challenge for achieving a coherent energy policy, while the simpler framing of energy security – the availability of adequate energy at an acceptable price – matches the purely economic understanding of energy policy and largely ignores the geopolitical dimension (Dyer, 2016). More in-depth discussion on the concept of energy security can be found in a book edited by Szulecki (2018a), which also deliberates the difference between inductive and deductive ways to define the concept.

In summary, the concept of energy security has broadened to new dimensions over time. Doing so, it has become analytically less meaningful or "slippery" as some have described it. Thus, the ways in which energy security has in practice been applied – and what dimensions are emphasized – are contingent on the values guiding policymaking in given contexts. In this book, I adopt the relatively simple definition of energy security by Cherp and Jewell (2014, p. 417, emphasis in original) – "*low vulnerability of vital energy systems*" – but acknowledge its problems in that it does not extend "security" beyond the operational security of the energy system itself. Therefore, drawing on the multitude of dimensions proposed for energy security, I argue that one can in essence talk about "internal energy security," which connects to the definition by Cherp and Jewell and the secure operation of the energy system itself (see Figure 3.1). In addition, this internal energy security can be distinguished from "external energy security," which addresses the broader security implications of the energy system. These include the effects of energy installations and infrastructure on the environment, that is, environmental security, and on human health and well-being, that is, human security. For example, nuclear radiation leakages (accidental or purposefully instigated) can cause both human health and the environment to deteriorate. The 2022 Nord Stream pipeline gas leaks into the waters of Sweden and Denmark show that fossil fuel infrastructure can be used to harm the environment or humans. In addition, renewable energy sources, such as hydropower or wind power, can have negative environmental security implications.

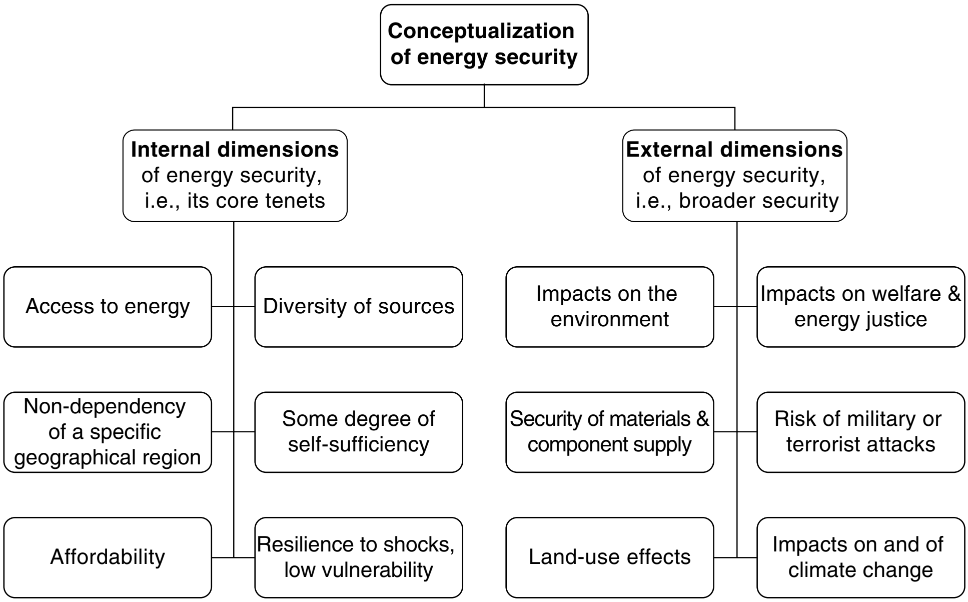

Figure 3.1 Internal and external dimensions related to energy security.

In this book, I use the term energy security to refer to internal energy security, while what falls under the external categories can be addressed in terms of broader security implications. Regarding the former, I propose it be split into several subareas. Drawing from Sovacool and Mukherjee (2011), these include, for example, secure supply of required fuels, minerals, and technical components (typically provided to a large degree via international trade); secure supply of electricity; reliability of production against technical faults and weather-induced disruptions; diversification of energy sources; sufficient domestic energy supply; and stockpiles of fuels or electricity storage for emergency situations. Issues such as military or terrorist attacks on energy infrastructure or the climate and environmental security of energy installations are thus not covered under energy security but under the broader conceptualization of security (see Chapter 2).

3.2 Geopolitics of Renewables

Security as a concept is connected to geopolitics, which can be seen as one dimension related to security. The geopolitics of energy has explored the global energy regime and the ways in which energy relations among producer, transit, and consumer countries advance and impact international relations (Criekemans, 2018). Classical geopolitics defines geopolitics as the effect of geographical factors (e.g., a country's size, position, or resources) on international relations and the power of states (Kelly, 2006; Overland, 2019). It "emphasises the international role of the state in energy in terms of securing supply, engaging in strategic alliances, and exercising military power, with access to energy resources seen as a zero sum game" (Kuzemko et al., 2016, p. 9).[1] An example of a classical assumption is that abundant resources are seen to correlate with geopolitical influence and unequal resource access can spur international conflicts (Pflugmann and De Blasio, 2020). For instance, vast fossil fuel resources have granted Norway greater geopolitical power than a country of this size would otherwise have (see Chapter 7).

Critical geopolitics, however, raises doubts about the pregiven role of geographical factors in international relations and seeks to reveal how geographical beliefs are used in global politics (Kuus, 2017). This strand of the geopolitics literature questions dominant power structures and knowledge (Tuathail, 1999). Critical geopolitics reveals that geopolitical competition over energy resources is socially constructed and at least partly imaginary (Blondeel et al., 2021). This means that not all similarly resource-rich countries are equally powerful. What we can draw from this to apply to the energy transitions context is that geopolitical beliefs have both overt and concealed influence in energy political decisions (Overland, 2019; Vakulchuk et al., 2020), which pertain to how transitions are advanced or hindered by government politics. Geopolitical beliefs and assumptions can either enhance the role of security in energy policymaking, as in Estonia, or emphasize cross-border economic relations, as in Finland prior to 2022 (see Chapters 5 and 6). Moreover, they can influence how the benefits and drawbacks of alternative energy systems based on renewable energy are perceived in security terms.

During the 2010s and early 2020s, much research was undertaken in connection to the geopolitics of renewable energy, and, later, of hydrogen, because of an increasing ambition to mitigate climate change. This was preceded by established research on the geopolitics of hydrocarbons, especially oil (Victor et al., 2006; Yergin, 2009). Oil had become a strategic resource during World Wars I and II and later stabilized as a key factor of the global energy regime (Johnstone and McLeish, 2022). This development was further supported by the diffusion of private cars and growing car ownership, making Western countries dependent on oil imports and oil a key issue within economic stability (Overland, 2019).

Later, natural gas became a hot topic in the geopolitics of energy literature. One stream of this literature addressed EU–Russia energy relations, especially after the 2006 and 2009 gas crises in Ukraine caused by Russia (Sharples, 2016; Siddi, 2018). The literature on the geopolitics of hydrocarbons has typically not considered decarbonization (Van de Graaf, 2018).

[1] Geopolitics of energy connects to the broader research area of the international political economy of energy, which addresses the governance of energy issues from the perspective of altering the balance between state and market activities (Kuzemko et al., 2016).

The literature on the geopolitics of renewables departs from an argument that the geographic plentifulness of renewable energy sources will influence cross-border energy flows. These flows have traditionally been based on hydrocarbon resources, that is, the international supply of oil, gas, and coal. Hence, the expansion of renewable energy changes the ways in which states interact with regard to energy issues, and also presents new challenges for energy trade and energy security (Scholten and Bosman, 2016). In the mid-2010s, issues such as access to technology, power lines, rare earth minerals, patents, storage areas, and dispatch methods were used to formulate the new geopolitics of low-carbon energy sources. Paltsev (2016) also noted that geopolitical power relations are influenced by the timing and stringency of climate policies. Besides decarbonization developments, the geopolitics of energy relations is affected by strengthening Asian economies contributing to globally rising energy and minerals demands that will potentially result in energy scarcities (Criekemans, 2018).

The methods used in the research on the geopolitics of renewables range from hypothetical cases or thought experiments (Scholten and Bosman, 2016) to document analyses (Koch and Tynkkynen, 2021). In rare cases, remote sensing has been applied as the method of choice (Fischhendler et al., 2021). Approaches using critical geopolitics seem rarer (e.g., Koch and Tynkkynen, 2021; Overland, 2019). Yet, many even widely cited pieces from this literature are speculative perspective articles with relatively little conceptual or empirically supported insights. This differs greatly from approaches in sustainability transitions research, which typically require conceptually informed new empirical research. Indeed, international relations scholars themselves have noted that no specific theory has been formulated around the geopolitics of renewable energy (Vakulchuk et al., 2020).

Broadly, scholars looking at the geopolitics of renewables see many *positive outcomes* from the expansion of renewable energy. For example, Scholten et al. (2020) describe a positive disruption that brings forth new challenges for energy security. They point out the benefits of renewable energy resources compared to fossil fuels – continuous and variable as opposed to geographically concentrated and exhaustible, allowing decentralized generation – as well as drawbacks, such as the need for relatively large amounts of critical materials and metals and the fact distribution is mostly via electricity networks. Kuzemko et al. (2016, p. 162) state that "[f]rom a climate perspective, the shift to a low-carbon energy pathway will result in far greater energy security." On the other side of this discussion are the geopolitical implications of the transition on the hydrocarbon sector (Blondeel et al., 2021; Van de Graaf, 2018), which may reduce global stability, at least in the medium term. The literature effectively, therefore, highlights two phases: the *transition phase* and its effects on security, as well as the *later phase* when new systems have formed and stabilized. The transition phase is expected to destabilize global security and cause tensions between winners and losers (Blondeel et al., 2021; Vakulchuk et al., 2020). During the transition phase, established trade relations are likely to break down and new partnerships form (Scholten et al., 2020). The material flows make China an important actor in the new geopolitics of energy. The new stabilized system, in turn, is likely to benefit from the expected positive geopolitical outcomes of renewable energy more fully.

While most of the geopolitics of renewables literature addresses global dynamics, selected studies have focused on patterns of conflict and cooperation in specific geographical contexts. For example, pertaining to the region of Israel and Palestine, Fischhendler et al. (2021) have shown how renewable energy can also diffuse rapidly in conditions of armed conflict. More specifically, they observed that the Gaza Strip became a regional leader in solar energy, but this has required that Israeli policymakers not consider solar energy technology to be a security threat.

Drawing from an idea in a coauthored paper (Kivimaa et al., 2022), I now focus on three (sociotechnical) components via which the geopolitical implications of energy transitions can be addressed: technology, actors, and institutions. I must note, however, that these categories are interconnected and are here discussed separately purely for improved clarity.

3.2.1 Technology

Technological change plays a major role in the geopolitics of energy (Criekemans, 2018). Further, it is well acknowledged that the energy transition based on renewables will bring forth technical and system challenges due to its intermittent nature, affecting "internal" energy-system security. This means, for example, that certain renewable energy sources, solar and wind, cannot be produced to meet demand at any given point in time but depend on the weather (Scholten and Bosman, 2016). Scholten et al. (2020) note that smart technologies, demand-side management, and spatial distribution are vital for balancing the electricity system. On the positive side, when connected to decentralization of production, renewable energy systems are expected to experience a smaller magnitude of harm from disruptions and affect fewer people (Groves et al., 2021). New technical configurations are needed to create new reliable energy systems (Child et al., 2019).

Electricity is the main carrier for many renewable energy technologies, such as solar, wind, and hydropower. This "implies a physically integrated infrastructure that connects producer and consumer countries through a single interconnected grid" (Scholten and Bosman, 2016, p. 227). It also requires electrification to have an increasing role in this transition; this comes with its own share of geopolitical consequences as well as technical security considerations. On the technical side, electricity is not as flexible as solid fuels because demand and supply must meet at any given point; this also gives rise to a rather complex organization of spot and futures markets. Any disturbance to the system may, in the worst case, affect the whole network. Some means for storing electricity exist, such as pumped hydropower storage and batteries, but much technological development is still required (Scholten and Bosman, 2016). It has been argued that the electricity trade based on renewables creates more symmetrical connections between countries, whereby several countries produce renewable electricity but exchange with neighboring countries to balance their grid (Overland, 2019). Even large international "supergrids" have been part of the discussions and plans. These supergrids may improve technical energy security by reducing the supply-related disruptions associated with long-distance shipping of hydrocarbons (Scholten, 2018) and the magnitude of country-specific backup reserves (Blondeel et al., 2021; Scholten et al., 2020). On the other hand, new system vulnerabilities are expected, such as the growing potential of and surface area for cyberattacks (Cornell, 2019).

In the geopolitics of renewables literature, resource-based dependency on critical materials and renewable energy technology has increasingly been discussed. More minerals and metals are needed when renewables-based systems expand. Some critical materials are described as "rare earths" and, even within rare earths, and indeed all critical materials, some are rarer or more valuable than others. Renewable energy technologies need a range of materials, such as cobalt, lithium, aluminum, dysprosium, and neodymium. When demand expands, the cost of the materials and elements is expected to increase (Paltsev, 2016). Lithium has already proved critical and, thus, replacements are increasingly being sought (Greim et al., 2020). Some scholars argue that we do not yet know the scale and scope of the security challenges brought by critical materials (Lee et al., 2020; Scholten et al., 2020). Nevertheless, international actors, such as the International Energy Agency (IEA) and the EU, are increasingly investigating the geopolitical implications and security of supply around critical materials (EC, 2020; IEA, 2021).

The "resource curse" is mentioned as one issue in the energy geopolitics literature. This refers to an illogically slow growth of resource use in resource-rich countries combined with slow economic growth, high income and gender inequalities, a low level of democracy, and negative social, environmental, and economic impacts (Hancock and Sovacool, 2018; Leonard et al., 2022). In the context of renewables, the resource curse has been mentioned in relation to critical materials, metals, and metalloids (Månberger and Johansson, 2019) as well as hydropower (Hancock and Sovacool, 2018). Critical materials are unevenly distributed among countries, but less unevenly than hydrocarbons. These minerals and metals can be found around the world, but countries have dissimilar opportunities to extract them, leading to a range of security and geopolitical consequences (Månberger and Johansson, 2019). With respect to renewable energy sources, such as wind and solar power, this means that even in countries where the local climate and weather conditions are favorable for their expansion, they do not form significant energy sources unless many politicians support their development. Lederer (2022) has described this as politics trumping geography. This connects to the next theme: actors.

3.2.2 Actors

The geopolitics of renewables literature emphasizes the actor dimension via relations between states as actors. Many scholars argue that the expansion of renewable energy changes interstate power relations (Criekemans, 2018; Johansson, 2013; Overland, 2019; Scholten and Bosman, 2016). In addition, some of the literature also addresses intrastate tensions and conflicts.

The energy transition means moving toward less oligopolistic markets and more symmetrical energy relations, as most countries can produce some form(s) of renewable energy. This reduces geopolitical risks for those states that have previously been dependent on hydrocarbon supply from others (Blondeel et al., 2021). In the transition phase, states can make a decision between (inexpensive) imported energy and more secure domestic renewable energy reserves. Scholten et al. (2020) argue that the new global energy system may dilute differences between previous import and export countries, creating a world of "prosumer" countries. While the potential to possess renewable energy exists for all countries, some countries may be "richer" in terms of annual solar radiation or potential areas for wind power. Countries with abundant hydropower reserves, such as Norway, have the benefit of balancing capacity that other countries lack, linking to the technical aspects described in Section 3.2.1.

Countries dependent on exporting fossil fuels may became destabilized or more unstable than they already are (Kuzemko et al., 2016) and have been envisaged as those losing most from the energy transition (Vakulchuk et al., 2020). Van de Graaf (2018) discusses three strategies such petrostates may follow when reacting to the energy transition. The first is that they will "race" to sell oil. This means more oil is extracted from the ground as long as the present demand continues, potentially leading to "price wars" between oil producers. The second strategy is to preserve profits from oil for the future by curtailing production. This strategy opposes the first one and is likely to require agreements among oil-producing countries for specific production quotas. The third strategy concerns domestic economic reform, which means broader transformation in how (instead of oil) revenue is generated for the country in question. If global energy transition succeeds, this will be a necessary strategy for all hydrocarbon states.

Scholten et al. (2020) deliberate whether the decentralization of production via renewables and electrification will lead to an overall reduction in international trade or change the shape of trade from fuels to renewable energy production technologies and energy services. They argue that hydrocarbon-related tensions will dilute, shifting investments into renewables; at the same time, however, globally increasing energy demand may reduce the positive effects of renewables and prevent them becoming a strategic factor because fossil fuels are still needed to meet rising demand. Some have forecast that the number of large conflicts will decrease (Vakulchuk et al., 2020). However, Blondeel et al. (2021) highlight that decentralization does not automatically lead to decreased tensions and, for example, energy self-sufficiency may provide less incentive for countries to avoid conflicts because they are less dependent on each other in energy terms.

At the turn of 2010s, rare earth materials emerged as a significant issue in Asian security policy, especially following China's embargo on the supply of rare earths to Japan in 2010 (Wilson, 2018). As the crisis abated quickly, rare earth materials did not receive similar attention in Europe until about a decade later. In academic research, the issue of critical materials in relation to the energy transition was first identified in the early 2010s (e.g., Smith Stegen, 2015). Yet, in the small countries that are the focus of this book, the issue was rarely addressed in public policy documents until around 2022–2023. Research speculates that, despite critical material deposits being quite widely spread between different countries and continents, China's dominance in producing these materials (as the owner of extraction and processing facilities in China and elsewhere and having control over the supply chains) leads to the risk of geopolitical conflicts. Critical material deposits may be used as a "resource weapon," whereby a producer country ends or limits the sale of materials to another country, or, in the worse cases, may spark "resource wars"; that is, armed conflicts over the control of critical materials (Wilson, 2018). Resource scarcities may also lead to internal conflicts within states, where dissidents in weak states use revenues from rare earths to fund their illegal or violent activities (Månberger and Johansson, 2019).

Linking to the technological aspect, circular economy and alternative materials are being developed to reduce requirements for materials. Some scholars argue that the risk of geopolitical competition over critical materials for renewable energy is limited (Overland, 2019). Yet the current need for materials from the energy sector is still too large, in combination with the demand from manufacturers of other sectors' digital technologies, to ensure critical materials are not a security-of-supply issue. One barrier is created by the renewables industries themselves, who regard alternative material solutions as socio-technical niches (Koese et al., 2022). In the meantime, China is a major player, with circa 90 percent share of the market for rare earth minerals and the most integrated supply chains, despite the fact the geographical area of the country itself holds only 39 percent of the world's rare earth reserves (Smith Stegen, 2015). Nonetheless, China is a mineral-rich country that has also acquired mines elsewhere and has set conditions ensuring foreign companies can only use Chinese minerals in production located in China and in collaboration with Chinese companies (Criekemans, 2018; Freeman, 2018). This is a rapidly developing area and the situation has likely further developed since the writing of this book.

Electrification is deeply connected to a renewables-based transition because electricity is the energy carrier for many renewables; it is addressed here from the actor perspective. Scholars have speculated that a regionalization in energy relations may occur, whereby global energy networks based on hydrocarbons change to regional supergrids (Kuzemko et al., 2016). Scholten et al. (2020, p. 3) describe this as leading to new kinds of trade routes and partners, a potentially "fragmented multipolar electric world," providing the example of the Baltic States' desynchronization from Russia even before the 2022 crisis (see Chapter 5). Whereas the geopolitics literature has described regional "grid communities" as improving security (Pflugmann and De Blasio, 2020; Scholten et al., 2020), the 2022 developments also show that there are security risks involved. For instance, the deliberations of Norway – a key producer in the Nordic electricity trading system Nord Pool – to limit electricity transmission to other countries in order to keep their own prices lower somewhat hampered the stable energy relations between the Nordic countries in 2022, besides being a violation of electricity market rules. This links to a Scholten et al. (2020, p. 4) article that emphasized the "reliability of energy partners and the political economic capability to enforce agreements," because the countries forming "grid communities" differ in terms of their economic wealth and political power. Overland (2019) stated that electricity is not well suited as a geopolitical instrument of power. Consequently, any deliberations of the geopolitics literature will be tested in real-life crisis situations.

From the perspective of the local scale, energy transitions may be broadly beneficial. Decentralized modes of renewable energy can facilitate local empowerment (Scholten et al., 2020) and thereby create positive security (see Chapter 2). Power is seen to become more diffuse among states and people within states (Scholten and Bosman, 2016). Criekemans (2018) described potential for a societal revolution, where local and regional groups can organize independently from the state. However, in the transition phase, tensions and resistance to the transition – especially from those who are losing out but also those spreading populism – may lead to civil unrest and separatism (Scholten et al., 2020). Risks of social conflicts have been described, for example, via reduced demand from Europe for Algerian hydrocarbons (Desmidt, 2021), or via right-wing populist parties opposing decarbonization (Vihma et al., 2021; Żuk and Szulecki, 2020). Indeed, energy issues are prone to tensions. Fuel price-related riots have occurred in over forty countries since 2005, with substantial consequences for ordinary people due to their disruptiveness and the violence involved; subsequent policy dialogue is also thus made more difficult (McCulloch et al., 2022). Tensions and conflicts are also likely around land use, which faces multiple pressures. Alongside renewable energy requiring large land areas, for instance, in Lapland – the home of Europe's Indigenous Sámi people – such land-use pressure occurs together with pressures from the effects of climate change, tourism, and mining. These have a combined negative effect on the cultural livelihoods, such as managing grazing for reindeer herds, and the natural environment. Similar examples of several coinciding land-use pressures can be found elsewhere too.

3.2.3 Institutions

Institutions include public policy and regulatory structures, formal market structures, and informal structures that have over time formed around sociotechnical systems, comprising the "rules" of the regime (Kivimaa et al., 2022). The geopolitics of renewables literature addresses institutional features less than actors, but some insights can also be drawn here. For example, Scholten et al. (2020, p. 3) state that "we are already witnessing a process of creative destruction in global energy markets." This links to the idea of disruption in sustainability transitions, which implies that not only technologies but markets are disrupted too (Johnstone et al., 2020; Kivimaa et al., 2021). Therefore, the transitional phase and the new energy system are likely to be substantially different from the perspective of international market institutions. This means that governments need to adjust to energy transitions by rethinking national tax systems and energy market designs (Scholten et al., 2020). The 2022 energy crisis in Europe showed that countries were largely unprepared for this. During the transition phase, Scholten et al. describe, for example, the need to create shorter-term intraday markets for renewable electricity to handle intermittency, which is likely to impact market design, regulatory structure, and energy policy practices.

Another aspect is how energy transitions shape foreign and security policy institutions and their interplay with energy policy. The energy objectives of foreign policy have traditionally focused on creating and maintaining alliances that secure (fossil) energy flows to import-dependent countries and promote (fossil) energy exports for hydrocarbon-rich countries. Technological advances in renewable energy and the growing importance of climate policy have created a new strategic objective for energy foreign policy: to "exert influence and reap economic benefits in an emerging low-carbon energy landscape" (Quitzow and Thielges, 2022, p. 599). Energy transition has in essence begun to reorient the focus of energy diplomacy as states' energy relations alter (Griffiths, 2019). For instance, Germany has specifically employed energy partnerships as a form of soft power in foreign relations to gain support for the *Energiewende*, the German energy transition (Quitzow and Thielges, 2022). The institutional shift means also that energy security may become defined more in terms of distribution than energy sources, and via cooperation (Scholten et al. 2020). It has already been observed how reduced hydrocarbon dependencies have somewhat shifted the orientation of foreign policy away from energy security (Mata Pérez et al., 2019), although it did, to some extent, shift back again as a result of the events of 2022. The literature also reports examples where renewable energy has facilitated changes in foreign policy institutions to enable improved collaboration and peacebuilding in conflict areas (e.g., Huda, 2020).

The energy transition also affects international and multilateral organizations. For instance, there have been institutional changes in the impact and membership of the Organization of Petroleum Exporting Countries (OPEC) and the IEA (Bazilian et al., 2017). The IEA was set up in 1974 to promote security of supply for oil and oil markets but has changed its mission to "shape a secure and sustainable energy future for all" (IEA 2024) The International Renewable Energy Agency (IRENA) was established in 2019 and has published influential studies, for instance, on the geopolitics of renewables. However, the OPEC states have not yet undergone substantial energy transition developments despite opportunities to exploit renewable energy (Onifade et al., 2021).

Sanctions have a long history and have been used to create pressure on the target countries by impacting economic relations between states, typically including "restricting exports and imports, freezing assets, and depriving states of financial and economic aid" (Fischhendler et al., 2017, p. 62). The energy sector has been an important target area for placing sanctions. Fischhendler et al. (2017), however, found in their review of the use of energy sanctions that electricity was sanctioned in so few instances that they were unable to analyze this. Thus, it is unclear how the energy transition will influence the use of energy sanctions in the future.

3.3 Energy Security in Europe

Before 2006, the energy policies of the EU and its member states had become more and more shaped by market forces and a parting of energy issues from politics, and less influenced by the energy security concern that had emerged in the 1970s (Umbach, 2010). Market liberalization was gradually advanced via the 1998 directive on energy market liberalization and two energy packages in 2003 and 2009, while the energy sector was still organized around national markets (Kuzemko et al., 2016). However, energy security began to attract more attention in Europe as a policy goal in the aftermath of the two natural gas disputes between Russia and Ukraine, in 2006 and 2009. This coincided with the enlargement of the

EU to include Eastern European member states during 2004–2007, which resulted in a larger variance of energy systems (Szulecki, 2018b), and an increase in concern by Eastern European states, particularly the Baltic countries, relating to Europe's dependence on Russian energy sources (Wrange and Bengtsson, 2019). Despite this renewed interest in energy security, the twenty-seven EU member states failed to formulate a coherent strategy for European energy security and energy foreign policy – arguably explained by a lack of political solidarity after the first Russia–Ukraine energy dispute (Umbach, 2010). It was only in 2010 that the EU began to demand member states maintain strategic stocks of natural gas (Kuzemko et al., 2016).

The North Atlantic Treaty Organization (NATO) also began to seriously consider energy security in 2010. It included energy security among its strategic concepts, particularly driven by those Central and Eastern European NATO members that had substantial dependency on Russian energy imports; their gas and energy system development dating back to Soviet times (Bocse, 2020). This was also connected to the EU's energy security debates via the engagement of Central and Eastern European countries and information exchange between NATO and the EU.

A stronger drive for European energy security did not occur until after Russian annexation of Crimea in March 2014 and the lasting armed conflict in Ukraine (Szulecki and Westphal, 2018). After the annexation, Western countries imposed sanctions on the Russian oil sector (Kuzemko et al., 2016). In May 2014, the "Communication from the European Parliament and the Council" published a European Energy Security Strategy. It first and foremost aimed to increase the EU's capacity to overcome a major gas disruption during the winter of 2014–2015, but also included seven other pillars, such as strengthening emergency and solidarity mechanisms, moderating energy demand, increasing energy production in the EU, and diversifying supplies (EC, 2014). Despite this, the EU's energy import dependence grew and peaked five years later, in 2019 (Figure 3.2).

One explanation for the ineffectiveness of European energy security policies may be the lack of coherence between the economic and security policies of the EU and some of its member states. For example, Chapter 6, outlining the Finnish case, shows how energy has been addressed principally in economic terms prior to 2022, ignoring security. The same has occurred, for instance, in Germany, perhaps even in a stronger manner. Another reason is that the EU energy union context is characterized by divergent national energy security interests and differing energy policy strategies, such as strong advancement of renewable energy in Germany and Denmark, active resistance to energy transition in Poland, and lack of favorable conditions for a transition in Hungary and Romania (Mata Pérez et al., 2019). Achieving policy coherence within the EU energy policy domain itself is not easy, which makes coherence between EU energy and security policies even

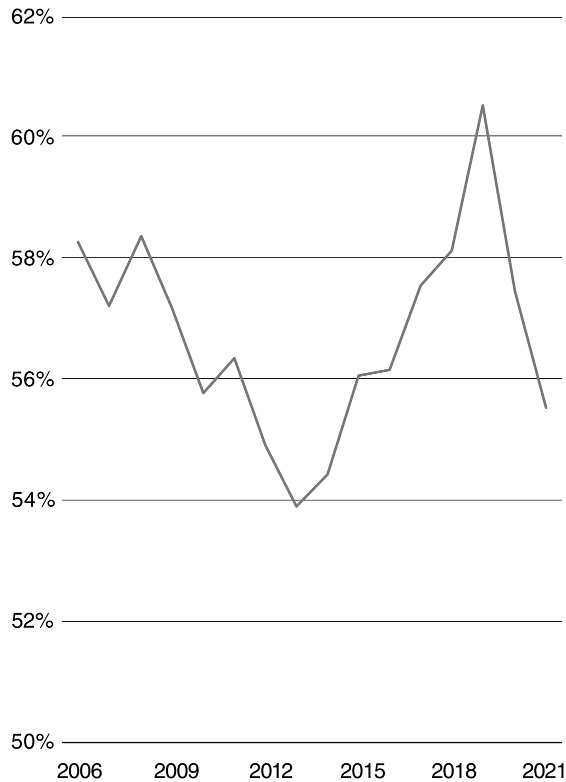

Figure 3.2 EU energy import dependence, 2006–2021.
Source: Eurostat (2023).

more difficult. The EU energy union policy has tried to combine policy goals for security of supply with climate change mitigation and energy market liberalization across the EU with, in hindsight, limited success (Strambo et al., 2015).

Whereas many Eastern European countries have sought to reduce energy dependence on Russia, Germany wanted to construct the Nord Stream pipelines (Bocse, 2020). During 2011–2022, these pipelines supplied natural gas from Russia to Germany via the Baltic seabed, avoiding transit countries. The first construction agreement was signed in 2005, but was strongly opposed by Poland and the Baltic States (Heinrich, 2018). Mata Pérez et al. (2019, p. 1) have effectively described a "multi-speed energy transition," where the Eastern European member states are largely driven by security (of supply) concerns and the Western and Northern states, prior to 2022, by business opportunity and decarbonization.

Considering the events of 2022, it seems that European energy security policy has not been effective enough in preventing natural gas disruptions or developing alternative strategies to produce enough heat and power to overcome any major gas disruptions – such as the one following Russia's attack on Ukraine in

February 2022, the subsequent termination of gas flow via Nord Stream 1 and 2 pipelines, and gas leaks from those pipelines in September 2022 when not in operation. In spring 2022, the European Commission launched the RePowerEU plan to reduce dependence on Russian fossil fuel exports as quickly as possible and fast-forward the energy transition. It outlined both short-term and medium-term measures. The former included, for example, common purchases of gas, liquefied natural gas (LNG), and hydrogen, as well as rapid rollouts of wind and solar projects. The latter comprised, for instance, strengthening industrial decarbonization, increased energy saving ambitions, and a jump in the EU renewables target for 2030 from 40 to 45 percent. The investments made in new LNG infrastructure and related contracts with non-European countries, such as the US, create risks of new path dependencies that are slowing down climate change mitigation, as well as creating new geopolitical and geoeconomic ties. The EU's pursuit of energy security and the aftermath of Russia's attack to Ukraine in 2022 show that energy security cannot simply be regarded as a national issue and that a pan-European approach is needed. This, however, is not an easy task, because European countries have very different approaches to energy policy, as we have already shown through several examples and will further develop in this book via its four country studies.

In Chapter 4, I focus more closely on the analytical approach taken in this book to explore the connection between energy transitions and security. I draw from the literature on policy coherence, alongside the literatures reviewed here and in Chapter 2.