# 2

# Understanding Security in the Context of Sustainability Transitions

The field of sustainability transitions is relatively new in academic research, with the first publications on the subject appearing in the late 1990s. It has witnessed a rapid expansion since that time, both in terms of number of publications and empirical and conceptual reach. This field can be characterized as having a multidisciplinary social science orientation; extensive conceptual development; a normative focus on real-world environmental (and social) problems; and a transversal and multiscalar approach. Summaries of the field thus far provide a more detailed account of the key features and developments (Köhler et al., 2019; Markard et al., 2012; Truffer et al., 2022).

The term "sustainability transition" refers to whole-system changes and complete reconfigurations of the combinations of technologies, infrastructures, practices, and institutional structures that have formed around the provision of societal services – such as energy, transport, food and agriculture, and water – and industrial production. The energy transition, for example, implies not only substantial change in the technologies used for energy production and consumption but also institutional shifts in energy markets and regulatory structures as well as the practices of producing and consuming energy (Johnstone et al., 2020). Therefore, energy saving has an important role to play in achieving whole-system energy transition, although this aspect is often ignored, perhaps due to its low-tech nature and the fact it inspires little interest within political decision-making.

Sustainability transitions research began with an orientation into how (socio) technical innovations can improve environmental conditions and reduce environmental pollution on the planet by infiltrating dominant sociotechnical systems and substantially changing them. This orientation was complemented by the development of conceptual frameworks to study these processes. After over two decades of development of this field, and as sustainability transitions have begun to advance more concretely in real life, new advances and concerns have become part of transitions research. These include, for example, the broader repercussions

of sustainability transitions (Kanger et al., 2020), considering and alleviating the impacts of transitions on social justice (Kaljonen et al., 2021; Sovacool et al., 2019), and the dynamics at play when transitions cross sectoral boundaries (Geels, 2007; Schot and Kanger, 2018).

This chapter introduces key conceptualizations of sustainability transitions research, and then takes a particular focus on security. The chapter highlights some key transitions terminology and processes that are relevant for discussing the empirical context of energy transitions and security and unpacks the basics of security. It also reviews the limited transitions literature that addresses aspects of security, excluding my work on this topic, which is covered later in the book.

## 2.1 Sustainability Transitions Research: Key Conceptualizations

Sustainability transitions research began with a focus on a set of processes that could result in fundamental shifts in sociotechnical systems. These processes are associated with extensive adjustments to technological, material, organizational, institutional, political, economic, and sociocultural elements (Markard et al., 2012). *Sociotechnical* is the guiding perspective in sustainability transitions research. The key factors of sociotechnical systems are regarded as technologies, actors, and institutions.

*Technology* refers to material or virtual artifacts and knowledge, ranging from minor technical components to entire economic sectors (Kivimaa et al., 2022). In transitions studies, it is understood "with respect to a function embedded in a reasonably complex focal product," such as "a wind turbine that converts wind to electricity" (Andersson et al., 2021, p. 113). Technology has been and is a key focus of transition studies, especially during the first decade of the field's development.

*Actors* comprise those who have specific roles in the established sociotechnical system and in advocating new niche technologies or services. They can be individuals, organizations, networks of individuals and organizations, or even state governments. Some actors advance transitions, while others may actively oppose them. The actor dimension is connected to the power to advance or hinder things (i.e., "power to"), dependencies between actors (i.e., "power over"), and the power of coalitions of actors ("power with") (Avelino, 2021). Thus, transitions are also about shifting power relations between actors (Avelino and Wittmayer, 2015). Actors affecting energy transitions comprise, for example, energy producers and consumers; transmission and distribution network operators; public agencies and officials regulating energy production and supply; scientists and innovators developing new technologies and services, and others who advance them; as well as nongovernmental organizations (NGOs), and individual citizens, residents, and Indigenous communities, who influence and are impacted by energy transitions.

*Institutions* regulate and guide actors' actions and relations, for example, by fear of sanctions or by shaping beliefs or values (Geels et al., 2016; Ghosh and Schot, 2019). Institutions include (semi)permanent formal and informal rules, regulations, standards, and social norms. Regulatory, normative, and cognitive institutions (cf. Scott, 2001) are embedded in sociotechnical systems as the rules that form their deep structure (i.e., regimes) and guide actor perceptions, behavior, and activities (Geels, 2004, 2006; Geels and Schot, 2007). Shared and stabilized rules between regime actors constitute a *sociotechnical regime* manifested in different dimensions, such as market and industry structure, public policy and politics, and symbolic meanings associated with culture. Therefore, sustainability transitions are about changing the underlying rules of the system, not simply the system's technical configurations (Ghosh et al., 2021). Actors can join together to construct supportive institutional structures around new technologies and services (Musiolik et al., 2012).

The early literature on sustainability transitions built four conceptual approaches that all share an orientation in terms of the "sociotechnical" and a normative purpose to advance environmentally sounder transitions. Otherwise, the approaches have somewhat differing starting points and theoretical or empirical influences. The approaches include the multilevel perspective (MLP), strategic niche management (SNM), transition management (TM), and technological innovation systems (TIS) (see, e.g., Markard et al., 2012, for details). This book mainly draws on ideas from the MLP and SNM, but also more generally from broadening transitions research. The research field has fluid boundaries, informed by the shared normative orientation of these four conceptualizations (Kivimaa et al., 2019). It is, moreover, increasingly widening and becoming more open to new conceptualizations from an increasing number of social science fields.

Influenced by the MLP and SNM, "niches" and "regimes" are widely used central concepts in transition studies, albeit not applied in all approaches (e.g., TIS). *Niches* are described as spaces for experimentation and radical innovations, while *sociotechnical regimes* are fairly stable, shared, and dominant configurations of technologies, institutions (i.e., rules), practices, and actor networks (Geels, 2002; Rip and Kemp, 1998).

*Landscape* is a somewhat less used concept, associated only with the MLP. It is seen as the selection environment for niches and regimes, determining the conditions for their operation and exposing them to new pressures once these conditions change (Berkhout et al., 2009). It is a slow-moving and relatively stable heterogeneous collection of issues, such as environmental problems and globalization (Grin et al., 2010), or, more broadly, political and sociocultural contexts (Berkhout et al., 2009). It was first introduced by Arie Rip and René Kemp, in association with technological change, as the social context into which new technologies are

presented; they also suggested that technologies can contribute to the sociotechnical landscape, and provide an example of motorcars influencing broader ideas of freedom and democracy (Rip and Kemp 1998). Geels (2011, p. 27) posits that landscape is a derived concept because it is always defined in relation to the sociotechnical regime "as [an] external environment that influences interaction between niche(s) and regime." Sometimes landscape has been criticized as being a "garbage can" of contextual influences (Geels and Schot, 2007) and difficult to operationalize in practice (Rock et al., 2009). Yet, more recent research has created openings, with a more structured understanding of landscapes (e.g., Antadze and McGowan, 2017; Morone et al., 2016).

A process orientation is central in transitions research. One of the core notions in the unfolding of sustainability transitions is *coevolution*. Analysis of coevolution aims to detect causal interactions between evolving systems or subsystems (Foxon, 2011). Coevolution implies a situation in which two or more (sub)systems are connected so that each affects the development of another (Safarzyńska et al., 2012). In the context of sociotechnical systems change, this refers to the dynamics of change between economic, cultural, technological, ecological, and institutional subsystems that influence the speed and direction of transitions (Grin et al., 2010). The transitions literature also uses process orientation in the more specific context of a coevolving mix of policies with the sociotechnical regime. In this specific context, the sociotechnical regime creates political, administrative, and fiscal feedback to the development of policy mixes, and the changing policy mix affects the resources, interpretations, and institutions of the sociotechnical regime (Edmondson et al., 2019).

Coevolution is also behind the MLP, which describes transitions as resulting from interplay between the three levels – niches, regimes, and landscape. Initially, innovations deviating from the regime are developed as small initiatives in the niches, which can grow larger and break through to the regime level; the success of the breakthrough being dependent on the pressures that the landscape level puts on the regime (Geels, 2005a). A typology of transition pathways identifies differing dynamics between niches, regimes, and the landscape, depending on the timing of interactions by which this coevolution occurs. Geels and Schot (2007) describe *transformation* as a process, where moderate disruptive landscape pressure occurs at a time when niche innovations are not sufficiently developed, and where regime actors respond by guiding the direction of innovation activities. If landscape change is sudden, large, and creates problems for the regime, a *dealignment* of the regime creates space for several niche innovations, one of which eventually gains momentum and becomes *realigned* to a new regime. A third dynamics is *technological substitution* where substantial landscape pressure (a long-term disruption or a sudden shock) happens when niche innovations are well developed but have

been unable to break the regime in the past. We can see elements of dealignment/realignment and technological substitution in the European energy sector's reactions to Russia's invasion of Ukraine in 2022. Finally, *reconfiguration* is described by Geels and Schot as symbiotic niche innovations initially adopted at the regime level to solve local problems, but as triggering further adjustments in the basic regime configuration, resulting in more substantial changes than envisaged.

Subsequently, both transformation and reconfiguration have been defined in multiple ways. Reconfiguration has, in contrast to the Geels and Schot definition, been viewed via the lens of a whole systems approach. It is "used to illustrate how the hierarchies between the niche-regime-landscape relations are becoming blurred and questioned" (Laakso et al., 2020, p. 16). Transformation toward sustainability is used as a concept beyond sustainability transition studies. It is generally understood somewhat similarly to sustainability transitions: as a significant reordering that challenges existing structures to produce fundamental novelty (Blythe et al., 2018).

SNM, which is connected to the MLP, has paid much attention to processes by which niches are created and how they may accelerate and become institutionalized as part of new sociotechnical regimes (e.g., Raven et al., 2010; Schot and Geels, 2008; Van der Laak et al., 2007). In a seminal article, Smith and Raven (2012) described shielding, nurturing, and empowering as key contributions to wider transition processes. Shielding refers to processes that create conditions for niche innovations to develop by protecting them from incumbent interests (Ghosh et al., 2021) and the mainstream selection environment of the sociotechnical regime (Smith and Raven, 2012). Nurturing of niche innovations is articulated as three intertwined processes that take place within a protective space (i.e., the niche) (Hoogma et al., 2002; Schot and Geels, 2008): (1) articulating expectations and visions shown via multiple experimental projects and shared by actors; (2) creating and managing networks where niche actors cooperate and combine resources; and (3) learning in multiple dimensions, aggregating knowledge from experiments, and sharing it forward. Table 2.1 describes these processes in more detail.

Recent research has begun to devote more attention to the processes of accelerating, embedding, and institutionalizing niche innovations. This is a natural follow-up to some advancing real-world processes, and it shows both the need for and progress in accelerating promising niche innovations. The literature posits, for example, that, for accelerating transitions, public policies need to shift from supporting individual innovations to a wider system-change approach and to better acknowledging multisystem interactions (Markard et al., 2020). A system-oriented approach and multisystem interactions connect to the horizontal policy-coherence perspective taken in this book (see Chapter 4).

Table 2.1 *Processes of SNM*

| Niche development process | Grounding in literature |
|---|---|
| Articulating expectations and visions | Various actors engage in niche-building processes, and separate expectations shape into niche actors' shared expectations about future developments and shocks at the landscape level, how sociotechnical regimes will respond to these, and what kind of potential niche innovations offer. These expectations can be unpredictable. Expectations guide learning processes and gain attention from more actors and resources. This process is productive if actors start having similar expectations, and if expectations become more specific (Ghosh et al., 2021; Schot and Geels, 2008; Van der Laak et al., 2007). |
| Building social networks | In the preliminary stages of niche development, social networks are feeble and transitions depend on the collaboration of numerous actors. Networks are formed to create a community behind the niche by enabling interactions and allocating resources. The process is successful if networks are broad and oriented toward deep learning, and if regular interaction is supported (Ghosh et al., 2021; Schot and Geels, 2008; Van der Laak et al., 2007). |
| Learning | Niche development occurs via various forms of learning, for example, technical, market, cultural, and policy learning supported by several experiments. Learning can be described as a perceptive process of knowing, understanding, and reflecting. Deeper learning, which moves from gathering facts and data to changing cognitive frames and assumptions, is important. The process is successful if it combines technological change with societal embedding in local contexts and addresses multiple dimensions (Ghosh et al., 2021; Schot and Geels, 2008; Van der Laak et al., 2007). |

*Source:* Adapted from Kivimaa and Sivonen (2023).

Geels and Schot (2007) have suggested indicators to recognize when niche innovations may be ready to be diffused more widely: first, learning processes in the niche have stabilized into a reasonably dominant design for the innovation; second, powerful actors have joined the support network; third, the price–performance ratio has improved, with strong expectations for future advancement; and, fourth, market niches for the innovation amount to more than 5 percent of market share. A good example of an innovation meeting these indicators is wind power technology.

The acceleration of niche innovations connects to a process of empowerment. Smith and Raven (2012) argue that once niche innovations have become competitive within a conventional regime context, protective shielding becomes redundant and the innovation is empowered and able to be diffused more widely. However, this

kind of empowerment does not necessarily mean that niche innovations will accelerate in a way that alters incumbent sociotechnical regimes substantially. Smith and Raven (2012, p. 1030) distinguish fit-and-conform empowerment, where niche innovations become competitive within unchanged selection environments, from stretch-and-transform empowerment, where "some features of the niche space are institutionalized as new norms and routines in a transformed regime." An example of fit-and-conform empowerment is when biofuels were added to transport fuels without substantially changing the transport regime. Contrarily, solar photovoltaics have stretched and transformed the energy regime in many localities, allowing a more distributed production of electricity, as well as enabling consumers to act as both producers and consumers of electricity.

The literature on acceleration is focused on processes to characterize different forms of niche expansion and embedding, with the aim of depicting how niche experiments or completed niche innovations diffuse and their broader transformative impacts. Naber et al. (2017) proposed a typology of patterns for expanding transition experiments. First, they identified *growing* as either an increase in the number of participants in the experimentation or an increase in the degree to which a new technology is used. Others use the term *upscaling* to describe a similar process (Ghosh et al., 2021; Gorissen et al., 2018). However, Turnheim et al. (2018) proposed that besides expanding the scope and length of an experiment, upscaling can also, for example, be about mainstreaming knowledge and learning or about new practices generated during an experiment. *Replication* was proposed by Naber et al. as an application of the main concept of the experiment in other contexts. Again, a more nuanced interpretation was proposed by Turnheim et al., where replication may also involve the experiment's actor configuration, the technology or service provided, or the diffusion and recontextualization of knowledge. Accumulation is seen as a process where experiments are linked to other initiatives (Naber et al., 2017). This can be connected with *circulation*, which is about the flow of ideas, people, or technologies between experiments or niches (Ghosh et al., 2021; Turnheim et al., 2018). Finally, *institutionalization* is a process where the experiment or niche shapes the regime selection environment (Naber et al., 2017). Knowledge and learning generated in experiments become new rules, practices, and scripts; policy outputs or practices become embedded in formal and informal governance structures; and technologies and services become widely adopted (Ghosh et al., 2021; Turnheim et al., 2018).

The ways in which dominant and established sociotechnical regimes decline to make space for transitioned regimes was hardly discussed in early transitions research. Indeed, many have argued that transitions studies suffer from an "innovation bias" that exaggerates novelty at the cost of undertheorizing decline (Feola et al., 2021). Recently, more attention has been devoted to decline via various

conceptualizations of destabilization (Koretsky et al., 2022; Turnheim and Geels, 2012) and phaseout (Isoaho and Markard, 2020; Rogge and Johnstone, 2017). The research on phaseout has typically oriented to technological decline and discourses, while the destabilization literature has adopted a whole systems perspective (Kivimaa and Sivonen, 2023).

Feola et al. (2021) argue that niche creation is always coupled with a disruptive side, where experimentation meets resistance and propositions are refused. This links to the argument that, essentially, destabilization or decline are necessary conditions for transitions (Kivimaa and Kern, 2016), while "transition" itself can range from disruption (Kivimaa et al., 2021) to more subtle reconfiguration (Laakso et al., 2020). The processes related to decline are likely to face resistance, opposition, and tensions, which may, in extreme cases, become adverse security consequences, such as physical conflicts or riots. Further, in connection to disruptions, the role of actors in transitions has received increasing attention and the old dichotomy between niche and regime actors is being replaced with more nuanced insights. Incumbency is no longer characterized merely as no or slow action; it has been recognized that there are variations in how incumbent actors react to transitions (Sovacool et al., 2020; Stirling, 2019).

The literature on niche development, combined with the idea of destabilizing or dealigning sociotechnical regimes, has led to the development of "transformative outcomes," which describe processes that transition actions should aim to promote. These transformative outcomes, with an aim to "lead to deeper changes in sets of rules that guide actors," are built around three macro-processes of transitions: building and nurturing niches; expanding and mainstreaming niches; and unlocking and opening up regimes (Ghosh et al., 2021, p. 741). These are partly sequential in that expanding and mainstreaming cannot occur before building and nurturing, while the unlocking and opening of regimes can happen in parallel. One of the key associations of this is that how security connects to sustainability transitions looks different in a relatively early phase when new niches are being developed, as opposed to when niches expand and become mainstream, or, especially, when established regimes destabilize. This is further addressed in Chapter 4, which outlines the analytical framework adopted in this book.

Finally, I want to remark that since 2020, transition scholars' interest in the broader repercussions of sustainability transitions has expanded. There is recognition that sustainability transitions are not all about positives but have potentially negative side-effects while transitions unfold. Some of these effects are limited to the duration of the major shift, while others may prevail in the new regimes. Kanger et al. (2020) mention broader repercussions and refer, for instance, to the need for policies to anticipate and alleviate transitions' unintended consequences. Some of these consequences relate to injustice and inequalities that transitions may create

and, hence, many policy efforts are directed at just transitions. Ghosh et al. (2021, p. 741) argue that transitions "involve addressing systemic inequality, injustice, and marginalization of actor groups, including unequal distribution of benefits." Nonetheless, neither security nor reduced security have been mentioned among these broader repercussions and these require further attention.

## 2.2 Conceptualizing the Basics of Security for Sustainability Transitions

Security studies have been argued to be the most widely studied subfield of international relations (Floyd, 2019). Early on, in this context, security was particularly associated with military threats and the protection of states, so the traditional, realist definition of national security was adopted; since then, security has developed into a contested concept for which a variety of meanings exist (Peoples and Vaughan-Williams, 2015). Buzan et al. (1998) described military security as the ability of governments to maintain themselves against internal and external military threats and the use of military power against nonmilitary threats to existence. Huysmans (1998), however, claimed that "security" does not refer to any external objective reality, but, rather, the term establishes the situation. Since the end of the Cold War, the concept of security has been broadened to many other contexts, such as climate change and human security. Nowadays, many governments, when they talk about national security, refer not only to military security but to multiple other things. The Finnish "Government Report on Foreign and Security Policy," for example, mentions a "comprehensive security" approach that acknowledges threats against societal well-being from hybrid influencing, climate change, and pandemics (MoFA, 2020).

One of the key terms in security studies is the "referent object." It means "that which is to be secured" (Peoples and Vaughan-Williams, 2015, p. 4). Traditionally, a key referent object would have been the state. Over time, the conceptualization of security has broadened and deepened, particularly when critical security studies challenged the idea that security should be understood solely in terms of military threats to the state (Peoples and Vaughan-Williams, 2015). Broadening refers to adding new sectors under the analysis of security. Such sectors as energy (Cherp and Jewell, 2011, 2014), food (Prosekov and Ivanova, 2018), the environment (Allenby, 2016), and water (Cook and Bakker, 2012) have been covered under the name of security studies. While security is much more than the absence of military conflict, Floyd (2019) criticizes the broadening literature on security for its nonspecificity regarding why security is valuable as a unit of analysis to these sectors. Environmental security, in particular, links to sustainability transitions, but energy, water, and food security also become relevant, because sustainability

transitions aim to change sociotechnical systems built around these areas – with these changes also impacting their security context.

Deepening means that new referent objects have been added to security studies besides the state. Ecosystems and the natural environment became referent objects for security in public policy, media, and academic settings in the late 1980s (Peoples and Vaughan-Williams, 2015). In 1987, the United Nations published the "Report of the World Commission on Environment and Development: Our Common Future," under the aegis of Gro Harlem Brundtland, which led to worldwide attention being paid to environmental problems. Aiming to securitize the environment, the report referred to security 122 times and stated, for instance, that the "deepening and widening environmental crisis presents a threat to national security – and even survival – that may be greater than well-armed, ill-disposed neighbors and unfriendly alliances" (UN, 1987, p. 23). The report also focused on food security. Since then, environmental security has become its own distinct scholarly subfield (e.g., Dalby, 2002; Trombetta, 2009).

Another deepening of referent objects is humans. The origin of human security goes back to the UN development report in 1994 that recognized the human as a referent object for security (Peoples and Vaughan-Williams, 2015). The report mentioned security over 300 times, referring to "safety from the constant threats of hunger, disease, crime and repression … and protection from sudden and hurtful disruptions in the pattern of our daily lives – whether in our homes, in our jobs, in our communities or in our environment" (UN, 1994, p. 3). Hoogensen Gjørv states that "[h]uman security focuses upon the individual instead of the state as the security referent, which makes the approach appealing for its recognition of individual, 'everyday' security concerns, making individuals relevant and visible, and listening to marginalised voices" (Hoogensen Gjørv, 2012, p. 838). Objective existential threats to human security not only refer to lethal things but also those that threaten basic human needs to live minimally decent lives, such as disabling infectious diseases (Floyd, 2019). Therefore, health pandemics are existential threats to human security alongside the implications of climate change, such as the flooding of human settlements or extreme temperatures. The human security dimension connects to the rapidly growing literature on just sustainability transitions (see Kaljonen et al., 2021; Sovacool et al., 2019) and the actor dimension of sociotechnical systems.

*Securitization* was initially suggested by the Copenhagen School of International Relations as a tool to analyze security and the consequences the use of the term security has for nonmilitary issues or sectors (Peoples and Vaughan-Williams, 2015). It has often been seen as a negative process or phenomenon. Buzan et al. (1998) expressed that, when states or other actors securitize an issue, this is a political act that has consequences. Securitization is emphasized

as a speech act with political implications (Hansen, 2012). Floyd (2019, p. 71) defines securitization as a process whereby "an issue is moved from normal politics to the realm of security politics, where it is addressed by security measures." She further argues that security politics are very different from ordinary politics due to the nature of decision-making; almost always resulting in some negative consequences and, at a minimum, a reduction of democracy. However, this perspective of securitization ignores those countries where democratic decision-making is not the norm (Aradau, 2004). Further, drawing from critical security studies and the Welsh School of Security Studies (Emancipatory Realism), Hoogensen Gjørv (2012) claims that if securitization has a "good" result it can be an example of positive security, although determining "good" is not always easy. This book adopts the latter, more nuanced, Welsh School interpretation of securitization.

According to the Copenhagen School, securitization is connected to an *existential threat* being present or expected. Although some security threats are socially or politically constructed, both Wæver (2011) and Floyd (2019) recognize the presence of objectively pre-existing threats that exist even when they are not labelled as such. Thus, security is not purely a social construction. According to Buzan et al. (1998), an existential threat requires emergency measures and justifies actions outside normal political procedures. Some security threats are caused by human agency, while others can be defined, according to Floyd (2019), as agent-lacking threats. The latter threats might occur, for example, as a result of natural disasters – including those caused by climate change – while, indirectly, they may also be induced by human agency. The securitization theory proposes that three steps are required for securitization to occur. First, a *securitizing move* is a discourse or a speech act where something is presented by a securitizing actor as an existential threat. Second, an *audience* needs to accept this claim; and, third, legitimize (albeit not necessarily adopt) *extraordinary emergency measures* in response (Buzan et al., 1998). Floyd (2019, p. 40) argues that "securitization is morally permissible only in the presence of an objective existential threat." It can, however, be argued that the Copenhagen School is vague about the difference between normal politics and extraordinary measures and who the audience is in the latter case (Heinrich and Szulecki, 2018).

Securitization and desecuritization partly arose as a counterargument to the broadening and deepening of the security concept. In the early 1990s, Ole Wæver, a central figure in the Copenhagen School, argued that security needs to be thought in terms of national security (and not in a broader sense), and that the dynamics of securitization and desecuritization cannot be analyzed if security is assumed to have positive value (Wæver, 1995). Desecuritization has since been used to mean a process whereby issues are shifted out of the "emergency mode" and into the

sphere of normal politics, although the term has also been heavily criticized by many security scholars for being underspecified (Aradau, 2004; Hansen, 2012). Floyd (2019) argues that desecuritization as a process can result in formerly securitized issues being either politicized or depoliticized. Depoliticization has been described as "placing the political character of decision making at one remove from the central state" and delegating "decisions that are usually the responsibility of ministers … to quasi-public bodies that either advise or implement those political decisions, or [where] rules are created constraining ministerial discretion" (Wood, 2017, as cited by Jordan and Hewitt, 2022). It is also connected to the scientization, technization, and economization of issues addressed by closed circles of experts and organizations (Ylönen et al., 2017). Floyd posits that we can see three situations at play: an issue being nonpoliticized and nonsecuritized, an issue being politicized (i.e., a visible part of party political debates), and an issue being securitized. Further, she argues that when environmental issues are desecuritized, the morally right option is for them to be politicized (by an official political authority). Related to this, Trombetta (2009, p. 589) has argued that desecuritizing the environment "can lead to the depoliticization and marginalization of urgent and serious issues, while leaving the practices associated with security unchallenged." Aradau (2004, p. 393) put forward the idea that, if desecuritization is the opposite of securitization, it is then about the "democratic politics of slow procedures which can be contested." Overall, security studies present differing interpretations of the link between securitization and politicization.

Climate change is an example of the extension of securitization to new domains, where the distinction between securitization and politicization proposed by Floyd is not followed so strictly.[1] However, it is commonplace nowadays for environmental and resource issues to be integrated into governmental security strategies. Berling et al. (2021) identified two kinds of connections between climate change and security: first, these issues are "compared" when policymakers identify and prioritize threats; and, second, climate change may trigger new security concerns.[2] Claire Dupont has studied securitization of climate change in the EU in terms of the "speech acts" performed and has concluded that the collective securitization of climate change has been a success (Dupont, 2019). With this, she means that climate change has become the crucial policy agenda issue it needs to be and does not refer to the tight interpretation of securitization as security politics provided by Floyd. In the context of climate change, securitization is perhaps

[1] There are, however, security scholars who want to make a clear distinction between *risks*, that is, the conditions of possibility for harm, and security *threats*, that is, direct causes of harm (Corry, 2011). Floyd (2019, p. 95) states that "threats can be defended against, whereas risks can only be managed."

[2] As a coauthor of the Berling et al. (2021) paper, Ole Wæver has thus acknowledged the reach of securitization beyond traditional national security since the late 1990s.

used more often as a political or policy tool than as part of formal security policy. This is because securitizing the environment is a powerful way to draw attention to otherwise unaddressed issues (Peoples and Vaughan-Williams, 2015). Dupont states that the first attempts to securitize climate change internationally remained at the level of speech acts, because the "audience" of negotiating partners rejected the "securitizing moves" and "extraordinary measures" did not follow the speech acts. Yet, post-2008, several moves resulted in "a new securitized status quo, with climate change firmly embedded in high politics" and measures for mitigating climate change comprising an extraordinary role for the European Council (Dupont, 2019, p. 382).

In the energy context, the volume edited by Kacper Szulecki (2018b) drew a distinction between energy security rhetoric and actual implemented policy measures; extraordinary policies being a rarity and "energy security" rarely being securitized. In the literature on the political economy of energy, extraordinary measures have also been associated with a break from previous political practice (previously such breaks would only have been associated with emergency measures) (Kuzemko, 2014). Heinrich and Szulecki (2018) argued that if extraordinary emergency measures are narrowed down to military interventions, most interesting features of energy securitization would be excluded. However, if such measures refer to removing energy issues from public oversight more interesting analyses emerge. The view of Heinrich and Szulecki about securitization and extraordinary measures connects with the idea of depoliticization. The authors propose three kinds of extraordinary measures in energy policy that would break normal political practices, strengthen the executive powers of selected agencies, or isolate selected decisions and potentially important information from public access: first, breaking norms about "how things are done"; second, shifting power to the agency level; and, third, withholding or limiting information (Heinrich and Szulecki, 2018). Depoliticization is a somewhat less strong process, but it nevertheless removes energy issues from open political debate (Kuzemko, 2014). Interesting questions pertaining to securitization and depoliticization are, for example, who has the power to put such measures in place. In sustainability transition terms, the securitizing actors would normally be sociotechnical regime actors, because niche actors seldom have the power to conduct extraordinary measures until transitions have progressed to a phase whereby a niche is institutionalizing as a result of joint actions between niche and regime actors.

While security often tends to have a negative connotation via a focus on threats, some security scholars (especially from critical security studies) prefer to recognize a positive framing of security; that is, something additional to and not replacing negative security (Hoogensen Gjørv and Bilgic, 2022; Roe, 2008). For example, Ken Booth (2007) emphasizes emancipation, peaceful and positive

relations, and freedom from insecurity as positive historical associations with the term security. Further, he argues that the "[l]anguage of securitisation freezes security in a static framework, forever militarised, zero-sum, and confrontational" (Booth, 2007, p. 165). The idea to conceptualize security in positive terms originates from the concept of human security – inspired by concepts of security and peace (Floyd, 2019). According to Cortright (2017), inclusivity, participation, and capacity to ensure security in governance systems can increase the prospects of peace. The conceptualizations of positive and negative security relate to how security is valued: as a buffer against things we wish to avoid and as security discussed no more than necessary (related to negative security), or as a foundation to a good life (positive security). Hoogensen Gjørv (2012) explores the relationship between negative security and positive security, arguing that positive security covers gaps that negative security as a concept misses, and addresses the epistemological foundations used when talking about security. She views negative security as typically connected to so-called traditional security: an epistemology of fear, identifying threats and justifying the use of force based on danger of death. This also relates to the state as the sole actor for security, with little attention paid to multiple voices even within the "state." Conversely, positive security can be perceived via the lens of human security, focusing on individuals but also societal well-being more broadly. Positive security connects to feelings of safety and stability and to the security of expectations, which enable building future capacity (Hoogensen, 2011). However, the concepts of negative and positive security should not be associated with "bad" and "good" but rather with the different approaches of security; for instance, whereas negative security can be focused on the absence of violence, positive security can emphasize the inclusion of social justice (Hoogensen Gjørv and Bilgic, 2022). They can, therefore, be used in a complementary manner.

McSweeney (1999) mentioned the stable character of routines *enabling* creativity in the context of positive security. Hoogensen Gjørv (2012) used this idea more actively to define positive security in terms of *enabling* people and communities – the central foundation of such enabling being trust. She argued that enabling can be conducted either by external actors, for example NGOs, or created within communities. Roe (2008) suggested that positive and negative security can be distinguished by the values that are pursued, where positive values relate to the advancement of justice. Hoogensen Gjørv (2012) proposed a three-step process for understanding both positive and negative security: first, recognizing actors, practices, and the specific context; second, identifying the epistemological foundation of (i.e., assumptions behind) the practices; and, third, looking at the values, such as justice, associated with those practices. More recently, Hoogensen Gjørv and Bilgic (2022, p. 2) stated: "Positive security finds its meanings in its unfolding.

It is about myriad ways of practicing security in multiple daily encounters with the other(s). It is not predetermined or a certainty, but a possibility."

There are interesting connections between positive security and sustainability transitions, starting with the process of unfolding. One can say that the outcomes of sustainability transitions are, likewise, not predetermined. Moreover, the conceptualization of positive security connects to the elements of justice, actors, practices, and assumptions that are core parts of sustainability transitions. For example, on the one hand, enabling people and communities for positive security – as mentioned above – may take place in connection to new sociotechnical niches. Yet, on the other hand, transitions tend to disrupt routines and practices, which may increase feelings of insecurity and reduce positive security. In the empirical parts of this book, I utilize the conceptualizations of positive and negative security and how these two securities are presented via the assumptions, values, and illustrations of practices provided by expert actors at the interface of security and energy transitions.

In this book, I occasionally use the concept of "stability" as linked to security. This refers to the absence of armed or nonarmed violence but can also be more broadly connected with safe and well-managed societies. Cortright et al. (2017, p. 22) state that the "prevention of armed conflict is linked to stable governance structures that have the capacity to deliver public goods to all stakeholders, provide for public participation and accountability, and manage competing claims to power, resources and territory." One way to define stability is as the capacity to maintain state security and the ability to withstand and avoid political and other shocks; in essence a kind of resilience. On an individual level, it has been noted that routines and a regularizing social life establish cognitive stability, which is connected to positive security (Roe, 2008). From that perspective, sustainability transitions, that is, both the shift in practices and the disruption of existing sociotechnical regimes, may invoke temporary cognitive instability, which may explain some part of the resistance to sustainability transitions.

## 2.3 Security in Transitions Research

Security, either as a force molding sustainability transitions or as something that is affected by evolving transitions, has not gained much attention in sociotechnical transition studies. Phil Johnstone and colleagues were the first scholars to begin to make any explicit connection to security in sustainability transitions. They adopted a rather narrow, realist perception of national security as military security, and claimed that conceptualizations of transitions do not consider the "military establishment," and that states, in pursuit of their energy-focused foreign policies, ignore the role of the military (Johnstone and Newell, 2018). Johnstone

also used the terms "military industrial complex" and "national security state" to discuss the roles played by incumbent actors with vested interest in the established sociotechnical regime, and their potential strategies to impede the acceleration of niche innovations (Johnstone et al., 2017). In this context, *securitization* was understood as altering policy goals in terms of (traditional) national security, while *masking* was where military security interests are disguised as civil energy policy activities. This links perhaps to two views of securitization indicated by security studies: securitization as open security politics and politicization (when, for example, energy policy is openly linked to security policy goals) and securitization as depoliticization where security and exceptional measures are removed from the "public gaze"; the latter matching the definition of securitization by the Copenhagen School.

More generally, before the early 2020s only a few transition studies discussed security. Regarding pathways for electricity sector transitions, Geert Verbong and Frank Geels referred to geopolitical security and energy security as significant landscape threats (Verbong and Geels, 2010). Geels remarked that the military dimension is a part of fossil fuel alliances composed of incumbent firms and policymakers (Geels, 2014). In the early 2020s, security-related aspects have received somewhat more attention in transition studies – albeit associated in particular with negative security. For example, it has been recognized that the interests of the fossil fuel industry have shaped the perceptions of states, such that some may resort to war in order to secure critical resources for their sociotechnical energy regimes (Ford and Newell, 2021). Transition concepts have also been used to study the increase of renewable energy in conflict and postconflict regions (Chaar et al., 2020; Fischhendler et al., 2021). Kester et al. (2020) applied a critical security studies lens to the study of mobility transitions and referred to negative and positive security. They pointed out, for example, how visions or expectations based on negative security or securitization can hinder niche development. A study on food system transitions noted that efforts to transition diets should consider existing injustices in food security "to reduce the overall vulnerability of those groups who are prone to transition-inflicted harms" (Kaljonen et al., 2021, p. 481).

An interesting development is recent research on deep transitions. Deep transitions have been described as the transformative changes of multiple sociotechnical systems in a similar direction. Historically, this directionality has comprised, for example, reliance on fossil fuels and global value chains alongside resource and energy intensity (Schot and Kanger, 2018). In this context, Johnstone and McLeish (2022) have explored the relationship between the world wars and multisystem sociotechnical change. They showed, for example, that World War II helped stabilize and internationalize the supply and use of oil as a key energy source. Further, energy, food, and transport systems were coordinated toward a similar direction to

win the war, resulting in a "consolidation of meta-rules" (Johnstone and McLeish, 2022, p. 12). Also, others have noted the role that militaries have historically had in building new infrastructure systems, such as railroads (Van der Vleuten, 2019). While these new infrastructure developments had elements that linked to positive security, they were largely supporting negative security efforts: "[M]ilitary system builders captured and appropriated the same mobility transition that ought to bring peace, progress, and liberty, only to develop unprecedented warfare capabilities and scales of violence" by entangling the ongoing transport transition with the transformation of the military system (Van der Vleuten, 2019, p. 30). Therefore, we must also exercise some caution with ongoing transitions and not automatically assume they only have benign connotations.

The impacts of the world wars on sociotechnical transitions were long-lasting. In addition to advances in technology and infrastructure, the wars altered the wider cultural context via memories and expectations around the potential for another war, resulting in an "upward" effect on the sociotechnical landscape (Johnstone and McLeish, 2022). While the kind of demand for sociotechnical change resulting from the two world wars is unlikely to be seen as a result of the war in Ukraine, the latter is, nevertheless, creating openings for new niche innovation (e.g., small modular nuclear reactors), the wider expansion of existing niches (e.g., wind power), and the destabilization of dominant technological systems and institutions (e.g., oil) (with cascading effects on global energy and food systems). It is likely to lead to significant changes in European energy regimes.

The rapidly expanding literature that connects justice to sustainability transitions may also be important from the perspective of security, particularly positive security. Jenkins et al. (2018) introduced the concept of energy justice to sustainability transition studies. They argued that calls for transitions need to include concerns for a fair distribution of infrastructure and services, equal access to decision-making, and promoting participation of marginalized groups. To describe justice, they referred to its three tenets: distributive, recognitive, and procedural.

Distributive justice refers to the equal distribution of monetary and nonmonetary costs and benefits of a transition or a policy action. Recognitive justice is focused on how those in more vulnerable or marginal positions in society are impacted or taken into account in decision-making; and procedural justice pays attention to participation opportunities, and the fairness and transparency of policymaking processes (Jenkins et al., 2018).

Addressing such concerns of justice is likely to contribute to positive security in transitions. This can happen by enabling people and communities, as described by Hoogensen Gjørv (2012). Yet tensions and resistance to transitions may arise as a result of experiences or perceptions of injustice or a lack of democratic decision-making (Healy and Barry, 2017; Jenkins et al., 2018). For example, in

Australian coal communities anxiety over employment has led to social and political resistance to phasing-out coal, and to hostility toward the just transition concept itself (MacNeil and Beauman, 2022). Other studies have pointed out connections between right-wing populist politics and resistance to transitions (Abraham, 2019; Żuk and Szulecki, 2020). Further, Abraham (2019) has argued for making just transitions a populist concept due to its ineffectiveness to shield against populism. Therefore, the ways in which justice and injustice are perceived (rather than realized) influences how sustainability transitions unfold – via the absence or presence of tensions that may escalate into conflicts. Nevertheless, despite perceptions, transitions may also result in increased or decreased justice in effect; for example, by advancing solutions that promote peace and stability or by heightening inequalities between different groups of people (Kivimaa et al., 2022).

Geopolitical risks caused both by climate change impacts and by the efforts to mitigate climate change concern questions of justice at different levels. Initially local conflicts, spurred by either of the abovementioned, may cascade into security risks in larger regions or internationally (Carter et al., 2021). Yet research indicates that climate change is likely to induce larger geopolitical risks than its mitigation. For example, energy transitions have been envisaged to reduce the number of large conflicts between countries and regions (Vakulchuk et al., 2020). The research on the geopolitics of the energy transition is addressed in Chapter 3.

Finally, it is pertinent to note that, while transition studies have paid relatively little attention to security connections, it draws from innovation studies that have originated from science and technology studies and the history of the world wars. Science, technology, and innovation (STI) policy was created in the aftermath of World War II. After the war, concerns about future economic recovery initiated STI policies that aimed for growth, mass production, and consumption; these policies expanded the role of the state in advancing scientific research, with the idea of also helping to maintain peace (Schot and Steinmueller, 2018). In the US, postwar STI policy explicitly stated a contribution to national security to be one of the tasks of government STI policy (Lundvall and Borrás, 2005). Later, the Cold War spurred on defence-related research and development (R&D) and contributed to the development of national innovation systems, while the pursuit of economic growth gradually became the dominating goal (Mowery, 2012). The economic growth agenda has subsequently led to multiple severe environmental problems, including climate change, unsustainable levels of resource use, pollution, and overexploitation of natural environments (Kivimaa, 2022b), and hence to the development of the field of sustainability transitions.