Deconstructing Security Discourse in Circular Economy Governance

Towards an Inclusive Approach to Circular Transformation

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Abstract:

Global environmental challenges, coupled with growing material resource consumption, are exacerbated by an increasingly hostile geopolitical environment and the securitisation of politics. The circular economy (CE) proposes a solution to address these challenges by transforming production and consumption systems, which has sparked significant interest in the concept among scholars, policymakers, and businesses. Meanwhile, the directionality of this transformative change depends on political priorities in multiple socio-economic contexts, which can be affected by geopolitical considerations and security concerns.

Drawing on a conceptual background from environmental studies, sustainability transition, innovation, and critical security studies, this thesis explores the role of security discourse in shaping prioritisation among circular solutions to sustainability challenges and explains the connections between security discourse and implications of circular transformation.

Conceptual results include a typology of circular solutions for resource security, a typology of security discourses in CE, and a framework of geopolitical implications of the circular transformation. Furthermore, the thesis provides empirical evidence of the effects of the security discourse on circular transformation at the national, regional, and global levels. These results can help future CE studies relate conceptually to security and broaden the spectrum of applicable solutions. Moreover, the developed frameworks can be used to evaluate the security and geopolitical implications of circular policies and initiatives, inform political debates, and support marginalised circular solutions to ensure an inclusive circular transformation.

Key words: circular economy governance, circular transformation, security discourse, directionality, argumentative discourse analysis, qualitative research.

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Cover image by Eugène Petelin using Bing Image Creator. The image 'Visions of the Future' displays the variability of people's expectations of the Planet's future.

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Table of Contents

Abbreviations

ADA	Argumentative discourse analysis
CE	Circular economy
CRM	Critical raw material
CSS	Critical security studies
EPR	Extended producer responsibility
GHG	Greenhouse gas
IGO	Intergovernmental organisation
IS	Industrial symbiosis
MSW	Municipal solid waste
NGO	Nongovernmental organisation
PPN	Public-private network
PSS	Product-service system
REE	Rare earth element
PV	Photovoltaic
SDG	Sustainable Development Goal
SPI	Science-policy interface
TT	Think tank
WEEE	Waste electrical and electronic equipment

Preface

> *Between what I think, what I mean to say, what I think I say, what I really say, what you want to hear, what you think you hear, what you really hear, what you want to understand, what you think you understand, what you really understand, there are ten possibilities for communication issues. But let's try anyway…*
>
> – Bernard Werber, "The Encyclopaedia of Relative and Absolute Knowledge", 1993

The thesis in front of you is not about the communication issues pitched so well by the science fiction writer Bernard Werber. However, by highlighting the gap between what is intended and what is received, this quote prompts reflection on the numerous steps between the objective and subjective realities that we encounter. It also makes us think about whether anything in this spectrum can be known for sure, which ironically puts a question mark above this entire thesis. Nevertheless, this is, finally, an inspiring quote. Despite being aware of all this potential for misunderstanding, we should continue to try generating ideas, translating them into words, and words into actions, as well as understanding others' ideas and seeing how they could be translated into actions. This thesis is about discursive framings.

Of all possible discursive framings, I chose to discuss the framings of security in environmental governance. Here's why. Since 'security has become a key vector for all EU policies' (European Commission, 2025, p. 4), it will inevitably set priorities even in sectors that were meant to protect only the environment. The issue with setting priorities through the security lens is that we should always ask: 'Who is the enemy?' Interestingly, when it comes to environmental challenges, we already know the answer. 'We have met the enemy and he is us,' proclaims Pogo, a cartoon character from an Earth Day poster by Walt Kelly in 1970 (see Fig. 1). Kelly paraphrased a famous battle report from the War of 1812 and delivered a reflection about the human relationship with the environment: no one else to blame. But if the enemy is us, then we decide on policies that protect us from us.

At the beginning of my research career, as I explored the transformation of China's energy system, I observed corresponding shifts in its political discourse on energy security. Between 2003 and 2006, this transformation was driven by concerns over energy supply as China became increasingly reliant on imports. In 2006, environmental authorities reported the negative impact of environmental degradation and natural resource depletion on economic growth. Another call came from the people who suffer from air pollution caused by the coal-fired power plants. Could it be the human health or the assessed economic losses? Either way, from the mid-2000s, China's energy security discourse began to shift. The 'clean' requirement for energy sources became part of the discourse, which opened opportunities for renewables, nuclear energy, and fossil gas, which is still seen as a 'clean source of energy' in China.

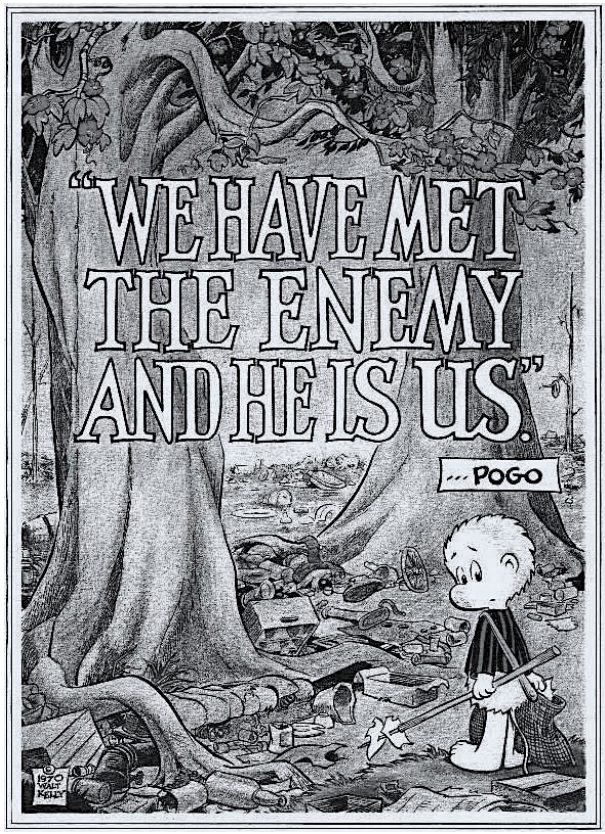

Figure 1. The Earth Day poster by Walt Kelly, 1970.
In 1970, Walt Kelly, an American cartoonist, featured a cartoon character named Pogo on his poster for Earth Day, capturing the core tension of the people's relationship with the environment (Kelly, 1970).

After engaging with the circular economy, these past reflections prompted me to consider that there may be more dimensions to security. Possibly, it is no longer about 'the enemy'. In his discussion of the 2012 Global Environment Outlook's title 'Environment for the future we want' (UNEP, 2012), Simon Dalby writes:

> *No longer is this about economy versus environment. <…> It is now about what kind of environment the economy will produce in the future* (Dalby, 2020, pp. 148–149).

This is a discursive shift from the 1970s, when Pogo proclaimed that 'the enemy <…> is us,' and from the 2000s, when environmental degradation and health risks were measured against economic growth. Let us focus on the solution and the idea of the future we want. If the circular economy is a response to our environmental challenges today, what kind of future does this response imply? Communication issues aside, I hope you'll enjoy my thesis.

Abstract

Global environmental challenges are currently coupled with growing material resource consumption and an increasingly hostile geopolitical environment, as well as the securitisation of politics. The circular economy (CE) proposes a solution to address these challenges by transforming production and consumption systems, which has sparked significant interest in the concept among scholars, policymakers, and businesses. Meanwhile, the directionality of this transformative change depends on political priorities in multiple socio-economic contexts, which can be affected by geopolitical considerations and security concerns.

Drawing on a conceptual background from environmental studies, sustainability transition, innovation, and critical security studies, this thesis explores the role of security discourse in shaping prioritisation among circular solutions to sustainability challenges and explains the implications of circular transformation influenced by security concerns.

Conceptual results include a typology of circular solutions for resource security, a typology of security discourses in CE, and a framework of geopolitical implications of the circular transformation. Furthermore, the thesis provides empirical evidence of the effects of the security discourse on circular transformation at the national, regional, and global levels. These results can help future CE studies relate conceptually to security and broaden the spectrum of applicable solutions. Moreover, the developed frameworks can be used to evaluate the security and geopolitical implications of circular policies and initiatives, inform political debates, and support marginalised circular solutions to ensure an inclusive circular transformation.

Popular science summary

Communities around the world are facing multiple environmental crises, including rapid resource depletion, climate change, and biodiversity loss. Some of these communities lack access to basic resources such as food and water, while others contribute to the ever-growing overconsumption of resources, waste generation and air pollution. These environmental problems are linked to an increasingly hostile geopolitical environment characterised by competition between countries for access to valuable resources, growing disparities and inequalities, and even military conflicts. In this context, the idea of a circular economy is more than just a resource management strategy, as it can offer solutions that minimise resource consumption, address climate impact, and stimulate ecosystem regeneration. Additionally, circular solutions can support access to resources, address disparities and inequalities, and foster resilience.

With an eye on the benefits that the circular economy offers, many countries have implemented their circular strategies. Circularity is promoted at the global level through intergovernmental organisations, networks and NGOs. However, transforming current production and consumption systems is a long-term and complex process. And the problem is not technical, as there are solutions for reducing, reusing, and recycling. The problem is precisely what to reduce, what to reuse, what to recycle, and which social group would benefit from this? For example, why might recycling a wind turbine be more critical than recycling an old sofa? In this study, I examine the various security perspectives associated with the concept of the circular economy and how these perspectives impact the decision-making process. Protecting people's interests is the focus of the human security perspective, which is concerned with people's well-being, access to food, water, energy and material sufficiency. The ecological security perspective focuses on ecosystems and advocates reduced emissions, clean ecosystems and limiting resource extraction. The international security perspective aims to address the differences between the Global South and the Global North, support developing countries, and address inequalities. The national security perspective tends to protect the national economy and large businesses. This perspective prioritises materials of strategic importance, such as rare earth metals from electric batteries and wind turbines, and circular solutions that ensure the secondary supply of these materials, including recycling. Focusing on the secondary supply of materials can indeed stimulate the development of the circular economy. However, this strategy lacks the long-term vision required for the well-being of future generations.

By highlighting different security perspectives in literature, policy documents, reports, position papers and press releases linked to expectations from the circular economy, I show which perspectives are overlooked. The results of this study can be used to evaluate circular policies and create recommendations for a more inclusive approach to the circular economy.

Populärvetenskaplig sammanfattning

Samhällen runt omkring står inför flera miljö kriser, såsom snabb resursutarmning, klimatförändringar och förlust av biologisk mångfald. Vissa av dessa samhällen saknar tillgång till grundläggande resurser som mat och vatten, medan andra bidrar till den ständigt växande överkonsumtionen av resurser, generering av avfall och luftföroreningar. Dessa miljöproblem är kopplade till en alltmer fientlig geopolitisk miljö som kan kännetecknas av konkurrens mellan länder om att få tillgång till värdefulla resurser, växande skillnader och ojämlikheter, och till och med militära konflikter. I detta sammanhang är idén om cirkulär ekonomi mer än bara en resurshanteringsstrategi, eftersom den kan erbjuda lösningar som minimerar resursförbrukning, klimatpåverkan och stimulerar regenerering av ekosystem. Utöver det kan cirkulära lösningar stödja tillgången till resurser, ta itu med skillnader och ojämlikheter och stimulera motståndskraft i människors samhällen.

Med siktet inställt på de fördelar som den cirkulära ekonomin erbjuder har många länder infört sina cirkulära strategier. Att omvandla nuvarande produktions- och konsumtionssystem är dock en långsiktig och komplicerad process. Och problemet är inte tekniskt eftersom det finns lösningar för att minska-återanvända-återvinna. Problemet är exakt vad man ska minska, vad man ska återanvända och vad man ska återvinna, och vilken social grupp skulle dra nytta av detta? Till exempel, varför återvinning av ett vindkraftverk kan vara viktigare än att återanvända en gammal soffa? Jag undersöker vilka olika säkerhetsperspektiv som är kopplade till idén om den cirkulära ekonomin och hur dessa perspektiv påverkar beslutsprocessen. Att skydda människors intressen står i fokus för det mänskliga säkerhetsperspektivet, som bryr sig om människors välbefinnande, tillgång till mat, vatten, energi och materialtillräcklighet. Det ekologiska säkerhetsperspektivet fokuserar på ekosystem och förespråkar minskade utsläpp, rena ekosystem och begränsande resursutvinning. Det internationella säkerhetsperspektivet syftar till att ta itu med skillnader mellan det globala syd och det globala nord, stödja utvecklingsländerna och ta itu med ojämlikheter. Det nationella säkerhetsperspektivet tenderar att skydda den nationella ekonomin och stora företag. Detta perspektiv prioriterar material av strategisk betydelse, såsom sällsynta jordartsmetaller från elektriska batterier och vindkraftverk, och cirkulära lösningar som säkerställer sekundärförsörjning av dessa material, till exempel återvinning. Att fokusera på sekundärförsörjning av material kan säkert stimulera utvecklingen av den cirkulära ekonomin. Denna strategi saknar dock en långsiktig vision som krävs för framtida generationers välbefinnande.

Genom att belysa olika säkerhetsperspektiv i texter kopplade till förväntningar från den cirkulära ekonomin, visar jag vilka perspektiv som förbises. Resultaten av denna studie kan användas för att utvärdera cirkulära policyer och skapa rekommendationer för ett mer inkluderande tillvägagångssätt för den cirkulära ekonomin.

List of papers

Paper I

Petelin, E. (2024). Security priorities in circular economy: a conceptual review. *Sustainable Production and Consumption* 47, 655–669. https://doi.org/10.1016/j.spc.2024.05.004

Paper II

Petelin, E. (2025). Effects of resource security concerns on Nordic countries' approach to the circular economy of metals. *Sustainable Production and Consumption* 55, 420–433. https://doi.org/10.1016/j.spc.2025.03.008

Paper III

Petelin, E. & Khan, J. (manuscript submitted). Deconstructing security discourse in the global circular economy governance.

Paper IV

Petelin, E., Månberger, A., & Johansson, B. (manuscript submitted). Geopolitical implications of circular transformation: a framework for governance evaluation.

Author's contributions to papers

Paper I

I am the sole author of this paper. After identifying a knowledge gap, I formulated research questions, defined and clarified the core ideas and concepts to be explored, and selected appropriate methods. Based on the conceptual background, I collected papers and conducted systematic and critical literature reviews. I synthesised and visualised results, checked their validity, and wrote the original draft. Following the review process, I edited the paper twice, shaping it to its final form.

Paper II

I am the sole author of this paper. The idea originated from Paper I, which suggested a conceptual background. The typology developed in Paper I needed to be tested in a socio-economic context. I selected a context, conducted a context-specific literature review, formulated contextual background and research questions, and defined research methodology. Further, I collected data, conducted a formal analysis, validated results, and wrote the original draft. In the review process, I edited the paper twice before it was published.

Paper III

I am the first author of this paper. I formulated the original idea, suggested the conceptual background and methodology. My co-author, Jamil Khan, brought his expertise in governance research. Together, we defined the scope and research questions, conducted the literature review, collected information and formulated the contextual background. Based on this background, I collected the data and performed a formal analysis. Collaboratively, we validated results and wrote the original draft. My contribution to the text includes the introduction, methods, results sections, equal parts in the conceptual background, discussion, and conclusion.

Paper IV

I am the first author of this paper. The original idea was conceived by co-authors André Månberger and Bengt Johansson, who wrote the first draft. After joining the project, I designed and conducted the literature review, provided conceptual background and methodology for framework development, collected and analysed data, updated the draft, visualised the framework, updated illustrative cases according to the new conceptualisation and data, and validated the results.

Acknowledgements

Reflecting on this five-year journey, I realise that I was never alone. As individual as a PhD project should be, it connected me to several groups of wonderful people.

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Thank you very much to the Mistra Geopolitics Research School and its coordinators, Lisa Dellmuth and Niklas Bremberg, who created a truly unique experience for me and my PhD colleagues, allowing us to develop together in an environment of trust, support, and expertise. Thank you to the fantastic team of PhD students from different parts of Sweden who joined the Mistra Geopolitics program with me: Marie, Malaika, Ebba, Maxine, Rickard, and Tanushree. I miss you guys!

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I am grateful to my family and friends. Thank you so much to Jonathan for becoming my family, supporting me through my writing dramas, and always saying 'You can do this!'. Thank you to my mom and sister Irina for tracking my deadlines (someone had to). Thank you to my friends Daniel, Kash, and Geoff for making these years in Malmö a joy. Thank you to Nathalie, who heroically helped me to finalise my cover for this thesis. I am grateful to have my little community with Sofia, Emma, Tamsin, Lisa, László, Raneal, Alex, Daniel, and Henrik, who make Sweden feel like home.

Finally, I would like to extend my gratitude to the Mistra Geopolitics program, the Stockholm Environment Institute, and the Swedish Foundation for Strategic Environmental Research (Mistra) for funding and support of this PhD project.

1 Introduction

The global society is facing multiple documented environmental challenges. Every year, the intensity of catastrophic climate events, such as extreme heatwaves, wildfires, droughts, and floods, is increasing, presenting more evidence of climate change to the 'non-believers'. What is more difficult to observe is the rapid decline in global biodiversity, the disruption of planetary biochemical flows, and the depletion of finite resources (Richardson et al., 2023). Despite facing these challenges, we, as a society, continue to increase our material footprint at a rate that no longer waits for our population and economic growth (UN, 2024). More than 40 years after the Brundtland Report (UN, 1987) acknowledged the need for sustainable development, we still extract and utilise more finite resources than this generation needs. Then we discard those resources in a manner that renders them unavailable and harmful to future generations.

Addressing these challenges, however, is not the focus of this thesis. Even before the Brundtland Report, science had been highlighting human-induced environmental crises, overconsumption of resources, and widespread misinformation surrounding these issues (e.g. Carson, 1962; Boulding, 1966; Hardin, 1968; Commoner, 1971) as well as proposing solutions (Meadows et al., 1972; Frosch and Gallopoulos, 1989; Pearce and Turner, 1990; Lyle, 1994). Between realising that planetary resources (Boulding, 1966), along with economic growth (Meadows et al., 1972), are limited and trying to find a sustainable solution for humankind to maintain its long-lasting relationship with the ecosphere (Commoner, 1971), the circular economy (CE) concept was born (Pearce and Turner, 1990). Thus, finding a solution is not a problem.

The CE offers a solution to address multiple environmental challenges through a transformation of the current production and consumption systems (see definition and main principles in Section 2.1). These propositions stimulated political interest worldwide. Several countries have introduced national CE strategies and policy instruments targeting specific aspects of the production-consumption systems (Milios, 2021; Hartley et al., 2023). Meanwhile, as promising as the CE concept is, its objectives and forms of implementation remain unclear, inconsistent, and even contested (Homrich et al., 2018; Calisto Friant et al., 2020; Kirchherr et al., 2023b; Eickhoff, 2024). With over 200 recorded definitions (Kirchherr et al., 2023b), the most significant divide between discursive framings of the concept is whether or not the socio-technical innovation brought by the CE can ensure eco-economic

decoupling and, thus, prevent ecological collapse (Calisto Friant et al., 2020). Not all framings imply that it can, and not all suggest that it should. The uncertainty raises concerns regarding the directionality of the circular transformation, specifically whether we design circular policies in a way that addresses the original challenge: the environmental crisis.

The contested nature of the CE concept makes policymaking even more challenging when multiple crises must be addressed simultaneously. In a policy process, the environmental crisis competes for attention with other pressing issues. Over the last two decades, many countries have faced export and import restrictions on industrial raw materials, high-tech products, and waste, as well as information warfare, the SARS-CoV-2 pandemic, and military conflicts. This increasingly hostile geopolitical environment directs the political focus towards addressing security risks (Talebian and Lager, 2025). This notion brings us closer to the focus of this thesis, because those are the same two decades that saw the growing political interest in the CE concept. Since security concerns can influence the way various actors perceive and interpret the goals of sustainability transformations (Bosi-Moreira and Kranke, 2025) and lead to risk-averse policies (O'Neill, 2001) that delay addressing the environmental crisis and achieving the Sustainable Development Goals (Gottenhuber et al., 2023), how do they impact CE governance? Here is the focal problem addressed in this thesis.

1.1 Knowledge gap

The described problem exists in the science-policy interface (SPI) (Van Den Hove, 2007; Wagner et al., 2024), where accumulated scientific knowledge is intended to inform policymaking and support the optimal design for environmental policy. Entering the SPI, this knowledge transforms into a shared understanding between scholars and policymakers, thereby becoming intersubjective. Therefore, it is crucial to examine the academic perspective on the interconnections between CE and security before looking into policies.

Scholars like to refer to both the CE and security. On one hand, researchers working with resilience theory (Sprecher et al., 2017), risk theory (Santillán-Saldivar et al., 2021), material criticality (Graedel et al., 2011; Tercero Espinoza et al., 2020), and resource security (Timmis et al., 2022; Taifouris and Martín, 2023; Nygaard, 2023) point to the CE as a solution to mitigate supply risks. The reason is, understandably, the above-described geopolitical environment, in which science attempts to provide policymakers with an optimal suggestion. For instance, China's export ban on rare earth elements (REEs) in 2010, which targeted Japan but affected many dependent markets worldwide, triggered academic discussions on whether or not metal recycling could support the security of supply (Graedel et al., 2011; Jin et al., 2016;

Salim et al., 2022). This trend indicates the diffusion of CE knowledge to previously unrelated fields through the purposeful selection of circular solutions.

On the other hand, researchers who primarily work with the CE increasingly mention the contribution of suggested circular solutions to resilience (Ferreiro et al., 2021), resource security (Hobson, 2016; Lazarevic and Valve, 2017; Baldassarre, 2025), crisis response (Hartley et al., 2024; Piila and Sarja, 2024), and even growing tensions and insecurities (Schröder et al., 2018; Lucas et al., 2022; Ashraf et al., 2024). This trend suggests a growing social demand for scholars to examine the broader implications of the CE and present more compelling arguments in favour of its implementation.

With those two trends, the literature lacks a systematic understanding of the relationship between the CE and security. Specifically, it is unclear how discursive framings of the CE interact with discursive framings of the security within the SPI. Without this understanding, knowledge production risks upholding *the status quo* (Moe and Müller, 2024) rather than promoting an inclusive circular transformation.

1.2 Research objectives and questions

Based on the knowledge gap, this thesis aimed to address two research objectives related to security discourse in CE governance (see Fig. 2). As illustrated in Fig. 2, the overall research area encompassed the intersection between the CE concept, governance, and implications under the influence of security discourse.

In response to the environmental *challenges* of the Anthropocene era, such as resource scarcity, biochemical flow disruption, climate change, and biodiversity loss, the circular economy concept proposes multiple *circular solutions*, including innovative practices, technologies, and business models based on CE principles. A process of selecting and ranking the features of circular policies is referred to as *prioritisation* (Sovacool and Saunders, 2014; Kivimaa et al., 2022). The prioritisation exists in the SPI (marked as the intersection of the CE concept and governance), where scientific knowledge, in the form of CE hierarchies (e.g. R10 framework) and assessments, meets other forms of justification. The *directionality* within the governance means a selected pathway for transformative change (Schot and Steinmueller, 2018; Kivimaa et al., 2023), while policy *outcomes* represent the direct results of the change, and *impacts* are its broader consequences. Circular policy *outcomes* can be exemplified by increased recycled material content in certain products, which can also *impact* the demand for virgin materials in those products. Finally, a *security discourse* represents ideas aimed at addressing security concerns and legitimising specific circular solutions. The security discourse can, thus, affect the prioritisation among circular solutions and influence the directionality of the circular transformation (Fig. 2).

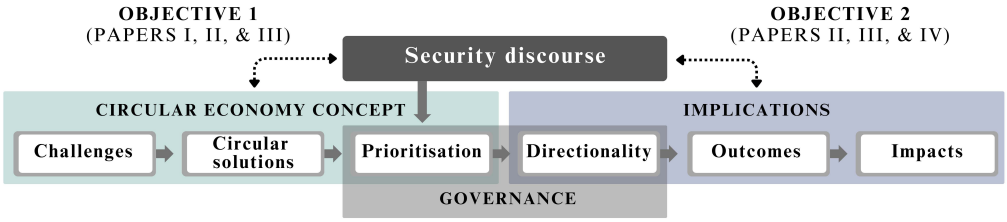

Figure 2. Research objectives.
The security discourse interacts with the governance process during the prioritisation. The research objectives of this thesis capture this interaction before and after the priorities are set.

Objective 1: *to gain a deeper understanding of the role of security discourse in shaping prioritisation among circular solutions to sustainability challenges*. This objective reflects my initial hypothesis that CE governance may be influenced by security discourse, regardless of context. Three research questions elaborate on this objective:

> RQ 1: What circular solutions are suggested to address security challenges by academic literature?
>
> RQ 2: What types of security discourse occur in the literature on the CE?
>
> RQ 3: How can different types of security discourse affect prioritisation among circular solutions?

Objective 2: *to explain the implications of circular transformation influenced by security concerns*. The hypothesis underlying this objective is that the circular transformation stimulated by security discourse has adverse security and geopolitical effects. The research questions included:

> RQ 4: What directionality of circular transformation is implied by the security discourse?
>
> RQ 5: What are the outcomes and impacts of securitised circular policies and practices?

The primary difference between the two objectives lies in their focus on the role of the security discourse before or after prioritisation. Objective 1 interacts with the conceptualisation of the CE and its connection to security concerns, as well as their impact on prioritisation. In contrast, Objective 2 focuses on circular policies and their implications (Fig. 2).

Table 1 demonstrates the overview of the four research papers included in this thesis. With individual research aims for each paper, they collectively contribute to achieving the outlined research objectives. Papers I, II, and III contribute to Objective 1, while Papers II, III, and IV contribute to Objective 2.

Table 1. Overview of research papers.
This table summarises the various research aims, scopes, datasets, methods, and results from the four papers of the thesis in connection with the research objectives.

Paper	I	II	III	IV
Research objective	**1**	**1 & 2**	**1 & 2**	**2**
Research aim	To explore the conceptual connections between circular economy and security.	To explain the effects of resource security concerns on political approaches to the circular economy.	To map the emerging global landscape of circular economy governance and to explain the role of security concerns.	To explain geopolitical implications of circular transformation.
Scope	Academic community	Nordic countries' and metal-based products	Global polycentric circular economy governance	Macro-level circular initiatives
Data	249 research papers	16 policy documents including national circular, waste, and mineral strategies, and action plans	24 documents from eight global-level institutions	102 research papers and reports; six documents
Methods	Systematic review, critical review, two interactive workshops	Argumentative discourse analysis, contextual factor analysis, qualitative coding in NVivo	Argumentative discourse analysis, institutional mapping, qualitative coding in NVivo	Narrative and integrative reviews, meta-ethnography, qualitative content analysis
Results	Typologies of circular solutions for resource security and security discourses in circular economy.	Empirical evidence of the effects of the security discourse on prioritisation on national and regional levels.	Empirical evidence of the effects of the security discourse on prioritisation on global level.	Theoretical framework and empirical evidence of geopolitical implications of the circular transformation.

1.3 Scope and delimitations

The scope of this research is defined through several boundaries. First, this research is problem-oriented and engages with concepts from various theoretical perspectives, rather than being driven by a single theory. Second, I employ a conceptualisation of security from critical security studies (CSS) and focus on environmental security, as the CE is primarily associated with environmental challenges. Subject-wise, this boundary entails that I do not focus on issues related to economic, military, political, or social security (see Buzan et al., 1998). Third, the intersubjective nature of knowledge within the SPI calls for a discursive understanding of the relationships between the CE and security. Therefore, this research focuses on discursive framings and circular practices that they imply. Deconstructing security discourse refers to the notion of differentiating between various discursive framings of security. Finally, this research is primarily a qualitative study, incorporating a quantitative element only through the systematic literature review and the description of contextual factors.

2 Conceptual background

This section outlines the conceptual foundation of the thesis, comprising two main pillars. The first conceptual pillar is the circular transformation, its governance, and intended implications. The second pillar refers to security discourse, its constructions and deconstructions. In this research, I draw on the literature on environmental, innovation, sustainability transitions, and critical security studies.

2.1 Circular economy transformation

In this thesis, the circular transformation refers to socio-technical system change in production and consumption based on CE principles. This transformative change implies technological, social, and behavioural change and entails shifts in regulations, industry structures, infrastructures, skills, products, user preferences, values, and norms (Schot and Steinmueller, 2018; Chizaryfard et al., 2021; Velenturf and Purnell, 2021). Even broader, similar to the energy system transformation (Blondeel et al., 2021), the circular transformation is accompanied by shifts in politics, economics, society, culture, and geopolitics. This subsection presents my understanding of the CE concept and its principles, the issue of directionality in the circular transformation, and the implications of CE as covered in the literature.

2.1.1 Circular economy concept and its implications

In this study, I employ the definition of the CE suggested by Geissdoerfer et al. (2017, p. 759): 'a regenerative system in which resource input and waste, emission, and energy leakage are minimised by slowing, closing, and narrowing material and energy loops'. I preferred this understanding over the other 221 documented in the literature (Kirchherr et al., 2023b) for three main reasons. First, the notion of "a regenerative system" implies that its principles draw inspiration from natural ecosystem processes to create resilient and equitable systems that combine the integrity of nature with the needs of society (Lyle, 1994). Second, this definition specifies minimising both resource input and output within the production and consumption systems. Third, this definition incorporates the 'slowing, closing, and narrowing loops' framework that categorises the full spectrum of circular solutions

(Bocken et al., 2016). The CE literature operates with several frameworks. For instance, the Ellen MacArthur Foundation (2019) suggested separating abiotic and biotic systems. Frameworks within abiotic systems include 'repair, reuse, and recycle', 4R, 9R, 10R (Reike et al., 2018; Kirchherr et al., 2023b). My study required an overarching approach that applies equally to material, water, organic, and energy flows. Therefore, in this study, I decided to lean on the 'slowing, closing, and narrowing loops' framework analytically, connecting the CE and security concepts.

The 'slowing loops' principle aims to extend and intensify the use phase of products, materials and generated energy over time. In material systems, this principle is represented through the repair, refurbishment, repurposing, and remanufacturing of products (Reike et al., 2018), as well as collaborative and shared consumption, and the reuse of products by additional consumers (Williams, 2021; Mendoza et al., 2022). This principle can be applied to food products, implying that the food should remain consumable for a longer period before becoming waste (Al-Khateeb et al., 2021). In both energy and water systems, this principle can involve storing and reusing resources for the same or another purpose (Morseletto et al., 2022; Nadaleti et al., 2020). Focusing on the use phase, this principle implies major shifts in product design, infrastructure, business models, and consumption patterns.

The 'closing loops' principle focuses on reducing the system's output by creating value from resources that have formerly been considered waste. Following this principle, organic, material, and energy flows should constantly return into the system through recovery and recycling (McDonough and Braungart, 2002). For example, organic waste valorisation represents a 'closing loops' solution when biomass residues or by-products from industrial processes, farms, or households are converted into a new product of value (Oosting et al., 2022; Vigneshwar et al., 2022). In material systems, discarded products can be transformed into raw materials through mechanical and chemical recycling (Salim et al., 2022). Another example is re-mining, which involves retrieving materials from landfills, urban mines, or mine waste (Reike et al., 2018; Werner et al., 2018). Consequently, the 'closing loops' principle targets the waste occurring at production, use, and end-of-life phases of the product lifecycle, including discarded materials that never became a product.

Finally, the 'narrowing loops' principle is associated with reducing resource input into production and consumption systems. This principle can be achieved through product design, where the amount of resources per unit is smaller while the level of functionality is similar or higher (Jensen, 2018). It can also imply energy efficiency, loss reduction, dematerialisation of production systems, refusal of certain products (e.g., plastic bags, incandescent lamps) or materials (e.g., hazardous substances), and avoidance of consumption (Chen et al., 2020; Mendoza et al., 2022; Morseletto, 2020). Avoided consumption relates to people's behaviour when they refrain from buying unnecessary products (e.g. cars, tools), limit their demand for energy, water

and food (Du et al., 2022; Rabbi et al., 2022), or choose to live in smaller homes and drive smaller cars (Dominish et al., 2021; Mont et al., 2022). Through reducing the resource input, the 'narrowing loops' principle targets further extraction of natural resources.

Ultimately, these three principles suggest that the outcomes of the circular transformation should include limiting the extraction of natural resources and reducing waste generation, while creating conditions for the environment's regeneration. The impacts of the circular transformation are meant to address the challenges of resource scarcity, biodiversity loss, and climate change. These impacts also encompass social and individual well-being, as well as economic prosperity (Velenturf and Purnell, 2021). The problem arises within governance when the policymaking process must prioritise between different circular solutions, leading to varied outcomes and impacts. For instance, achieving economic prosperity on the national level does not directly imply economic prosperity in other countries. The circular transformation in developed countries might have effects on the economic, social, and environmental conditions in the Global South (Ashraf et al., 2024), where similar CE solutions, technologies and business models might not even be available (Schröder et al., 2018). Depending on the prevailing discursive approach, a policymaking process can aim for material prosperity for all or exclusive geostrategic security (Calisto Friant et al., 2020). Overall, the CE concept has been criticised as contested, overloaded (Calisto Friant et al., 2020; Kirchherr et al., 2023b; Eickhoff, 2024), and developed mainly by practitioners (Korhonen et al., 2018). The notion of contestation within the CE literature opens the door to a discussion about the governance and directionality of the circular transformation.

2.1.2 Directionality in circular economy governance

In this thesis, I refer to governance as purposeful activities employed by social, political, and administrative actors to guide, steer, control, or manage the pursuance of public goods (Kooiman, 1993; Kjaer, 2004; Termeer et al., 2010). This broad understanding encompasses all modes of governing, whether they are developed and enforced by hierarchies, markets, or networks (Kjaer, 2004). Moreover, I employ a multilevel approach to CE governance, which implies that governance occurs at the levels of international organisations, national and local governments, and civil society (Termeer et al., 2010).

Since the CE is a transformative innovation, the CE governance can also be seen as a political process providing room for 'appraising and negotiating the development of a diverse set of pathways as well as making choices for specific ones' (Schot and Steinmueller, 2018, p. 1562). This selective process, aimed at identifying and ranking the features of circular policies, is referred to as prioritisation (Jones and Baumgartner, 2005). In response to occurring challenges, this process not only frames certain challenges as policy problems but also selects the ones that will be

prioritised over others (Lerusse, 2025). The prioritisation implies that some challenges, circular solutions, features of circular policies, and pathways get postponed or completely overlooked. The existence of this process questions the directionality of the circular transformation.

Directionality failure and policy outcomes are two key issues in sustainability transformations (Weber and Rohracher, 2012; Schot and Steinmueller, 2018; Andersson et al., 2021; Nilsson et al., 2021; Kivimaa et al., 2023). Schot and Steinmueller (2018, p. 1562) have referred to directionality failure as the 'lack of means for making social choices over alternative pathways of development'. In this framing, the direction is taken as a premise of governance to set and follow collective priorities. According to Kivimaa et al. (2023), transformative governance should be 'addressing the grand environmental and societal challenges the world is facing'. The failure refers to overlooking essential perspectives in the policy process, which can result in not addressing those challenges. Therefore, a more inclusive approach to the circular transformation should consider directionality.

The notion of directionality failure in circular transformation entails that circular solutions selected through prioritisation should be effective and efficient, as well as contribute to long-term transformative change (Weber and Rohracher, 2012). According to Soete (2013), innovation activities can lead to destructive creation, such as planned obsolescence and unsustainable consumption patterns, which contribute to environmental degradation. Addressing the directionality failure calls for identification of major societal and environmental challenges, collective priority setting (Weber and Rohracher, 2012), and phasing out unsustainable practices (Bergek et al., 2023). The directionality can emerge in the form of missions, visions, and guidance (Mazzucato, 2018) or through experimentation and negotiation among stakeholders (Schot and Steinmueller, 2018).

The collective priority setting is challenging due to the contested expectations from the CE, supported by different coalitions (Lazarevic and Valve, 2017; Calisto Friant et al., 2020), and differing understandings of sustainability (Pel et al., 2020) and its connections to the CE. In this connection, I share Stirling's (2009, 2024) position on the directionality, suggesting that it should look for deeper political potentialities that span pluralities of ends. The idea of CE governance being open to diverse, non-mainstream perspectives is not only connected to the distribution of democratic agency and social equity but also raises the conversation about the environment and its intrinsic value.

Recent studies suggest that various discourses within CE governance can facilitate policy coalition-building (Baekgaard et al., 2024), legitimise or delegitimise circular solutions (Zepa et al., 2024), and even delay transformative change by presenting specific pathways that are undesirable (Palm et al., 2024). Moreover, Johansson and Henriksson (2020) indicated a shift in national approaches to the CE towards weak circularity, where growing resource extraction is not problematised. Exploring the

CE's directionality in the Nordic countries, Wardeberg et al. (2024) concluded that the potential of the adopted strategies to stimulate transition is limited due to low stakeholder inclusiveness, missing perspectives, and weak embeddedness into broader policy mixes. However, the literature lacks a systematic understanding of how security discourse can affect the prioritisation within the CE governance and the directionality of the circular transformation.

2.2 Security discourse

In this thesis, security is understood as the absence of threats (Booth, 1991). This general definition, however, can have an objective and subjective sense, according to international relations realism pioneer Wolfers (1962, p. 150): 'security, in any objective sense, measures the absence of threats to acquired values, in a subjective sense, the absence of fear that such values will be attacked'. In my understanding, the existence of the subjective sense doesn't exclude the reality of threats, but it has a selective power over fears. Consequently, the security discourse is an ensemble of ideas aimed at achieving a state of security by addressing security concerns and legitimising specific solutions. As described by Fierke (2007), 'the meaning and study of security is always political, that is, always defined within a political context and subject to normative debate and change' (p. 15). Even 'defining security is a political process' (p. 32). From this point, the security discourse can represent 'a set of blinders <…> that keep us from seeing clearly and responding to the threats that represent daily dangers to much of the world' (p. 32). Therefore, illuminating those dangers that cannot be seen and security perspectives that are marginalised is essential not only for an inclusive policymaking but also for a secure and more sustainable development.

This theoretical sub-chapter elaborates on the security discourse, its evolution, and deconstruction in critical security studies, examining them in two dimensions. The first dimension is the differentiation in perception of threats. The second dimension is based on the referent object of security, which differentiates security perspectives between entities that require protection.

2.2.1 Perceived security threats

The perception of security threats has evolved. The traditional security thinking that has dominated security studies for almost 50 years has emphasised military security threats, been *status quo*-oriented (focusing on current threats), and centred on nation-states (Buzan, 1983). A broad understanding of security threats stems from critical security studies, where they are associated with challenges to territorial integrity, political autonomy, economic stability or growth, human health and

safety, and ecological stability (Buzan et al., 1998; Oels, 2015). Specifically, the Copenhagen School has broadened the concept of security to encompass various sectors, including military security, political security, economic security, societal security, and environmental security (Buzan et al., 1998). Consequently, each sector faces different existential threats.

The construction of threats has been at the centre of key debates in critical security studies. In particular, studies have addressed the question of how, given the range of threats or risks that exist in the world, some threats come to have priority over others and become the focus of security discourses (Fierke, 2010). The Copenhagen School proposed the theory of securitisation, which explains the invocation of dangers and threats to a referent object of security and the subsequent mobilisation of resources to counter that threat (Buzan et al., 1998). The theory is dedicated to studying how security 'gains new grounds' and widens its scope through discursive practices (Stępka, 2022). Escaping the idea of 'making everything a security', the securitisation theory is linked to the notion of 'exception' as a way of breaking 'normal politics' and entering the realm of security (Buzan et al., 1998; Buzan and Waever, 2003). Exception-driven security introduces a constitutive antagonism that constantly threatens a political community and prepares it for the possibility of introducing exceptional measures. The theory of securitisation allowed a more systematic conversation about a variety of security threats.

Within the expanded security framework, threats to *environmental security* have received more attention. Environmental security refers not only to environmentally induced conflicts and insecurity caused by social and political disruption related to resource shortages and degraded landscapes (Stirling, 2024). The recognition that future environmental conditions are being shaped by economic, urban, forestry and energy planning decisions changes the parameters of environmental security. The scale of land-use changes, loss of biodiversity, decline in fish stocks, growing greenhouse gas concentrations, there-routing of rivers, mining of numerous minerals, covering over of land by concrete and asphalt, and many other transformations have changed the planet's surface so drastically that humanity has in effect become a new force shaping the Earth systems (Richardson et al., 2023). Since the 1990s, the scope of environmental security has broadened to include multiple subsets, including climate security, biosphere security, and resource security (Scott and Thapa, 2015). The environmental security threats (Fig. 3) are in the focus of this thesis, because the primary purpose of the circular transformation is to address the environmental challenges.

The *climate security* is understood here as a subset of the environmental security and the ability to cope with the challenges of global climate change. The issue of global climate change emerged on the international political agenda in the 1980s. The climate change regime that emerged from the UN Conference on Environment and Development in 1992 centred around the UN Framework Convention on Climate Change (UNFCCC), itself based on the scientific assessments of the

Intergovernmental Panel on Climate Change (IPCC). The effects of climate change vary from a rise in sea levels and associated threats to low-lying lands to changing patterns of rainfall, an increase in severe weather phenomena, such as heatwaves, floods, and wildfires, widespread species extinction and damage to vulnerable ecosystems such as coral reefs, and a rise in vector-borne diseases.

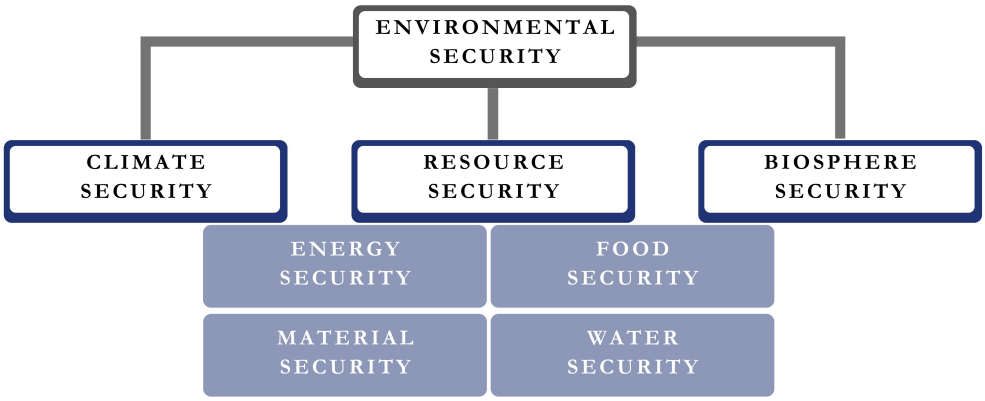

Figure 3. Environmental security and its sub-categories.
The sub-categories of environmental security include climate security, resource security, and biosphere security. Resource security encompasses issues related to energy, food, material, and water security.

Resource security is a subset of environmental security, representing the ability to cope with the challenges associated with the utilisation of natural resources. These challenges include resource scarcity, access restrictions, rising economic costs, ecosystem disruption, health and safety risks, and issues related to equity and justice (see Matthew, 2008; Sovacool and Saunders, 2014; Mohamed Sultan et al., 2017). The resource scarcity challenge is the one most associated with the CE. The scarcity of a resource implies that its amount "available for use is, or will soon be, insufficient" (van der Voet, 2013). Even if the resource is available, accessibility can be limited due to export restrictions or an armed conflict in the exporting region. Increased demand and unequal distribution of resources contribute to rising economic costs (Percival and Homer-Dixon, 1998). The disruptions to ecosystems include climate change, biodiversity loss, changes in biochemical flows, and other environmental factors that may occur from the consumption and production system in focus. Besides representing a threat to ecosystems, various resources and operations can directly pose a threat to human health and safety (e.g., hazardous substances, radioactive waste, operational risks). Equity and justice challenges relate to the fairness of resource dissemination, equal allocation of benefits and costs of resource use, and equal representation in decision-making (Thomas and Twyman, 2005; Sovacool and Dworkin, 2015; van Bommel and Höffken, 2023). In this

context, energy, food, water, and material security are examples of resource security associated with a specific natural resource management system.

Biosphere security is another subset of environmental security, representing the ability to cope with the challenges directly associated with biodiversity loss. The biosphere is recognised here as 'the foundation of all needs and activities in society and the economy' (Rist et al., 2023). The primary biosphere security threat is the depletion of the natural resources that support people's physical surroundings (Rogers, 1997). Same as climate security, this subset emphasises that this threat is caused by human activities (Detraz, 2009).

Finalising this observation, I would like to revisit the previously explained distinction between the objective and subjective senses of security. Now, we can focus on the difference between *security challenges* (threats) and *security concerns*. The challenges exist objectively; however, 'the senses of threat, vulnerability, or (in)security are socially constructed rather than objectively present or absent' (Buzan et al., 1998, p. 57). Thus, the challenges to environmental security might not become a public concern unless they are presented and perceived as a threat. Only the challenges perceived as threatening become security concerns. While based on perception, these concerns can point to the entity under threat (Buzan et al., 1998), which can affect the choice of response (Hajer, 1995).

2.2.2 Referent object of security

The entity under threat represents a referent object of security (Oels, 2015) and answers the question of who should be protected by the response. Within a constructivist approach to security studies, the security discourses have been deconstructed based on a referent object (Brzoska and Scheffran, 2020; Floyd, 2010; Hardt, 2012; McDonald, 2013).

Following Hajer's (1995) conception of a discourse, McDonald (2013, 2021, 2024) distinguished four security discourses: *National Security*, *International Security*, *Human Security*, and *Ecological Security*. The discourse of *National Security* refers to the absence of threats to a nation-state. This discourse emphasises that the nation-state's sovereignty and territorial integrity should be protected from external threats (Walt, 1991). In addition to military threats and the risk of armed conflict, the national security discourse also focuses on concerns such as global demographic changes, population movements, and resource pressures (McDonald, 2013). The *International Security* discourse expands the idea of what needs to be protected to the regional and global levels. The reference object here is the international society, which is being threatened by political, military, economic, environmental, and societal dynamics (Buzan and Waever, 2003). The *Human Security* discourse is built around protecting people's well-being and can be defined as "a condition in which people and communities have the capacity to respond to threats to their basic

needs and rights, so that they can live with dignity" (O'Brien and Barnett, 2013, p. 375). This discourse aims to provide both material sufficiency and "unhindered participation in the life of the community" (Thomas, 2001, p. 162). Finally, the *Ecological Security* discourse refers to the absence of threats to the biosphere. This discourse advocates for systematic structural change in people's relationship with the environment to preserve and restore ecological balance (Pirages and Cousins, 2005; Dalby, 2009; McDonald, 2013). The consequences of a continued imbalance can include global warming, resource depletion, loss of biodiversity, bio-invasions and the rapid global spread of new diseases (Pirages and Cousins, 2005; Steffen et al., 2015).

Although this constructivist framework was developed before to illuminate different agendas in climate security debates, it is a systematic approach to security discourses applicable to environmental security in general. In this thesis, I applied the referent object-based security approach to deconstruct the security discourse in the CE governance, aiming to understand its effects on prioritisation and directionality.

3 Methodology

This section presents methods employed in this thesis and assesses the validity and reliability of the results. Before delving into specific research methods, I would like to outline several key dimensions of my methodological approach that defined the overall research design. The approach in this thesis can be characterised as interdisciplinary, qualitative, abductive, and interpretative.

First, the outline in Section 2 of the conceptual background could already indicate that this research is interdisciplinary. The complexity of my research problem necessitated an interdisciplinary approach (Newell, 2013; Moon and Blackman, 2014), which I understand as both the communication of ideas and the integration of concepts, methodologies, epistemologies, terminologies, and data from different disciplines (Sakao and Brambila-Macias, 2018). Indeed, I draw on concepts and frameworks from environmental studies, innovation studies, sustainability transitions, and critical security studies, which are interdisciplinary fields of knowledge (Zolfagharian et al., 2019; Kirchherr et al., 2023a; Guillaume and Grayson, 2023). Moreover, understanding the academic perspective on the connection between CE and security required engaging with research findings from a broader spectrum of disciplines, such as engineering, economics, and environmental science. This work resulted in typologies of resource security domains and security discourses in the CE for Paper I. This integrative approach not only helps reflect on established ways of addressing research problems, dealing with data, and interpreting results, but also creates a new understanding.

Second, this is primarily a qualitative study that deals with textual data. Both of my research objectives could be addressed using a quantitative approach. In fact, the quantitative elements were incorporated through the systematic literature review in Paper I and the description of contextual factors in the Nordic countries in Paper II. However, my research questions are descriptive (what?) and explanatory (how?), which calls for a qualitative analysis. Moreover, I consider the qualitative approach as more fitting for understanding complex phenomena within policymaking and governance (Creswell and Poth, 2016). Overall, the dataset for this thesis included 351 research papers and 45 policy-related documents (see Table 1). The research papers were analysed using three types of literature reviews (see Section 3.2). Forty policy documents were treated with argumentative discourse analysis (see Section 3.3) in Papers II and III. Additionally, some of the documents were analysed qualitatively using content analysis as part of the illustrative cases in Paper IV.

Third, although most qualitative studies employ deductive or inductive logic of inquiry, my research is driven by an abductive approach. The abductive reasoning represents a creative iterative process where investigation runs between 'empirical observations of a social world' and 'a set of theoretical propositions' (Tavory and Timmermans, 2014, p. 2). The syllogism for abductive logic was first introduced by Charles Pierce (1934) and later elaborated upon by many authors. I find the explanation by Brinkman (2014) the most complete:

> *We observe X,*
>
> *X is unexpected and breaks with our normal understanding,*
>
> *but if Y is the case, then X makes sense,*
>
> *therefore, we are allowed to claim Y, at least provisionally* (Brinkmann, 2014).

The research process begins with a surprising (or 'unexpected') observation that challenges existing theoretical knowledge. At the beginning of my research process, a surprising observation was an emphasis in EU circular policies on recycling as a solution to address criticality, whereas the EU Waste Hierarchy prioritises prevention and reuse over recycling, as well as CE studies suggest the Value Retention Framework (Reike et al., 2018) and multiple other options. From this point, I generated a potential hypothesis that the security discourse interferes with the prioritisation in the CE governance, which could explain the emphasis. Further research steps included iterative refining of the hypothesis by testing it against collected data, existing knowledge about security discourse, and exploring alternative explanations.

Finally, my research can be categorised as interpretive, because its primary focus is on meanings that shape actions and institutions (Wagenaar, 2014). Interpretivism has roots in Max Weber's definition of sociology as 'a science which attempts the interpretative understanding of social action in order to arrive at a causal explanation of its course and effects' (Weber, 1947, p. 88). It contrasts with positivism, as it considers reality to be socially constructed and aims to understand subjective meanings attached to people's actions, rather than observe their objective behaviour (Bryman, 2016). The interpretivist research tradition engages with cultural and linguistic studies, obtaining knowledge through discourses, narratives, storylines, and perceptions, and generating new understandings and worldviews (Zolfagharian et al., 2019). In this tradition, texts become data that craves interpretation. Following this tradition, I view security in this thesis as a social construction, rather than a property (Fierke, 2010), which enables me to explore the security discourse in the context of CE governance.

3.1 Deconstruction as a methodological approach

In this thesis, I step further into the interpretivist approach by employing a deconstructive perspective. Deconstruction is not a research method, but rather an approach to critical thinking. The Cambridge Dictionary (2009) defines it as an 'act of breaking something down into its separate parts in order to understand its meaning, especially when this is different from how it was previously understood'. In social science, this approach is linked to the work "Of Grammatology*"* by the social theorist Jacques Derrida, first published in 1967 (Derrida, 1997), which questioned the fundamental conceptual distinctions (or oppositions) in Western philosophy through a close examination of the language and logic of philosophical and literary texts. In policy studies, deconstruction can be seen as a critical approach to analysing texts that 'problematises critical decisions and distinctions', which are therefore 'marked by undecidability and this undecidability cannot be eradicated or rationalised' (Thomassen, 2010, p. 43). Ultimately, this approach challenges the internal workings of language and conceptual systems in texts (in a broader sense), the relational quality of meanings in those texts, and the assumptions implicit in forms of expression. In this process, a researcher aims to break the conceptual system of the text and distinguish between separate embedded meanings.

The deconstructive approach can be productive for a deeper understanding of the discourses in policy documents and speeches. According to Hansen (2006, p. 17), 'policy discourse is seen as relying upon particular constructions of problems and subjectivities, but that it is also through discourse that these problems and subjectivities are constructed in the first place'. Questioning the underlying reasons for concerns raised within a particular discourse helps reveal those hidden constructs and find a more inclusive solution to the broader challenges. In critical security studies, deconstruction is connected to the concept of emancipation (Booth, 1991) and distinguishes between different security perspectives (Hardt, 2012).

The emancipation is defined as:

> *...an open-ended and ethical conception of politics, the rejection of false necessities in social life, justice as fairness, empowerment and choice, mutual respect of rights, the acceptance of common humanity duties, and the promotion of world-order values such as economic justice, non-violence, humane governance, ecological sustainability, and human rights* (Booth and Vale, 1997, p. 337).

Applying the deconstructive approach in studying a security discourse aims for 'a radical change in the distribution of power, and in how the power is conceived and exercised' (Ryerson, 2010, p. 181). Thus, distinguishing between security discourse perspectives in CE governance should bring an understanding of how power is distributed and what can be done to facilitate a more inclusive allocation.

As shown in Section 2.2, McDonald (2013) deconstructed the climate security discourse into four perspectives: *National Security*, *International Security*, *Human Security*, and *Ecological Security*, drawing on Hajer's (1995) understanding of discourse. Similarly, in this thesis, I draw on Hajer's understanding of discourse, as well as McDonald's interpretation of a security discourse, and apply argumentative discourse analysis as the primary research method (Section 3.3).

3.2 Synthesis of literature

One part of this thesis is to develop a conceptual understanding of the interlinks between the CE and security. With that purpose, I employed two kinds of approaches to writing conceptual papers, described by Jaakkola (2020) as 'typology paper' and 'model papers'. A typology paper aims to develop a categorisation that 'explains the fuzzy nature of many subjects by logically and causally combining different constructs into a coherent and explanatory set of types' (Cornelissen, 2017). First, this approach allowed me to classify circular solutions into four resource security domains and develop a typology of resource security domains in the CE. Second, this approach helped categorise security perspectives in the CE and develop the typology of security discourses in the CE. Another approach is the model paper, which enables the creation of a nomological network around a phenomenon by integrating existing concepts from various disciplines (Meredith, 1993; Jaakkola, 2020; Van Der Waldt, 2020). I employed this approach to develop and test a framework examining the geopolitical implications of circular transformation. In this process, I employed three types of reviews to synthesise the literature: systematic, narrative/critical, and integrative literature reviews.

First, the systematic literature review helps to identify 'constructs' across individual studies (Grant and Booth, 2009). The systematic review method was employed in Paper I to explore a conceptual connection between the CE and security. The review included a systematic literature collection, content analysis, and qualitative review.

Second, the critical (narrative) review is seen as valuable for developing new theoretical perspectives (Calisto Friant et al., 2020; Snyder, 2019). The critical review was employed in Paper I to identify security perspectives in the CE literature based on the referent object, and in Paper VI to derive overarching concepts and corresponding keywords, differentiating between geopolitical implications of sustainability transformation in studies.

Finally, an integrative literature review helps assess, critique, and synthesise the literature on a research topic in a way that enables new theoretical frameworks and perspectives to emerge (Torraco, 2016; Snyder, 2019). This method was employed to develop a framework of geopolitical implications of the circular transformation in paper IV.

3.3 Argumentative discourse analysis

Argumentative discourse analysis (ADA) enables the reconstruction of the belief system underlying justification statements that support a specific directionality of political actions and reject or marginalise others (Hajer, 2006; van Eemeren et al., 2015). The ADA has been applied to explore environmental policy debates (Cotton et al., 2014; von Malmborg, 2023) and discourse coalitions related to the CE (Ortega Alvarado et al., 2021; Baekgaard et al., 2024). The analysis implies generating argumentative storylines and discourses from textual data.

In this thesis, I employed ADA as a primary method to analyse empirical data in Papers II and III. In both papers, textual documents were examined. The analytical process consisted of four main steps: initial *in vivo* coding, interpretation of shared codes into storylines, interpretation of storylines into discourses, and reflection on policy implications. The initial *in vivo* coding (using NVivo software) manually sorted the collected data from documents. Although the coded data were manifest (Nicmanis, 2024), the coding process was informed by the building elements of the typology for security discourses in the CE developed in Paper I. These elements served as sorting categories and included security concerns, suggested circular solutions, and intended outcomes. These codes require further interpretive steps.

The second step was an iterative interpretative process of discursive storyline formation. In this case, the storylines represent overarching argumentative structures (Hajer, 2006, p. 71) that help political actors and institutions to impose their view of reality on others and suggest specific circular solutions. The process of storyline formation included iterative reading through documents and codes, memo-writing, labelling storylines, and screening for additional codes that contribute to the labelled storylines.

3.4 Workshop discussions

Working on this thesis, I recognised the importance of involving a broader practitioner audience in the knowledge generation process. I found a workshop method to be helpful for an in-depth understanding of social issues connected to intersubjective reality. Workshops provide a platform that can aid researchers in identifying and exploring relevant factors in a given domain by providing means for understanding complex work and knowledge processes (Ørngreen and Levinsen, 2017). The approach facilitates the identification of factors that are not immediately apparent to either the participants or the researchers before commencing the workshop process (Nyumba et al., 2018).

Two workshop discussions were organised within this research project. The first workshop, titled 'Circular Economy, Security, and Resilience', was organised in April 2023 together with colleagues from the International Institute for Industrial Environmental Economics (IIIEE) at Lund University and engaged 25 sustainability practitioners from different countries. The participants were presented with the preliminary typology of security discourses in the CE, divided into five mini-groups, and asked to brainstorm and present circular solutions from their areas of knowledge allocated across the typology. I organised the second workshop, titled 'Security Priorities in Circular Economy: Interactive Seminar', during the Lund University PhD Conference on Sustainable Development in September 2024. The workshop engaged 19 PhD students from diverse disciplines who work on sustainability issues. The participants were presented with the preliminary typologies of resource security domains and security discourses in the CE, divided into four mini-groups, provided with a limited pool of natural and secondary resources, and asked to discuss and present meaningful allocation of the limited resources across energy, material, food and water systems with relevant circular solutions. The results from both workshops were photographed, transcribed, and incorporated into conceptual findings in Paper I.

3.5 Addressing validity and reliability

Validity in research refers to the accuracy and truthfulness of scientific findings (Brink, 1993). Reliability is concerned with the consistency, stability and repeatability of the informant's accounts as well as the researcher's ability to collect and record information accurately (Selltiz et al, 1976).

To address the validity and reliability of my findings, I followed three main steps. First, to ensure accuracy, the purposeful data selection was guided by specific criteria related to the research questions. In papers primarily dealing with document analysis (Papers II and III), the selected documents were displayed in the form of tables (see Table 2 'Selected organisations and documents' in Paper III). Second, to ensure transparency and repeatability in data collection and analysis, the data selection criteria and intermediary steps in data analysis were clearly outlined in all papers. For instance, a systematic literature review of academic publications referring to the CE was employed in Paper I. Describing data collection, I displayed the source database, selection and reduction criteria (see Table 1 'Search results in Web of Science on circular economy and security' in Paper I), and the visualised collection results (see Figure 3 'Resource security domains in the circular economy literature' in Paper I) presenting structured and quantified comparison between identified themes in the literature. Furthermore, every paper presents an explanation of intermediary steps in data analysis. For instance, an ADA was employed in Papers II and III, which required generating codes from textual data and then

deriving storylines from these codes. In both papers, the codes were displayed in tables (see Table 4 'Metal-related concerns, circular responses, and intended outcomes in Nordic strategies' in Paper II), presenting categorised codes with source documents. This way, the codes could be traced back to the data and checked by any other scholar. Finally, a significant aspect of the validity principle is data source triangulation, which will be elaborated on separately.

3.5.1 Data source triangulation

Triangulation refers to the use of multiple methods or data sources in qualitative research to develop a comprehensive understanding of phenomena (Patton, 1999). Triangulation has also been viewed as a qualitative research strategy to test validity through the convergence of information from different sources (Carter et al., 2014). The data sources for all four papers were triangulated through additional searches, the inclusion of extra documents, and expert discussions during workshops (Section 3.4) and academic conferences.

3.5.2 Transferability and generalisability

In addition to the validity and reliability, it was essential to address the transferability and generalizability of the findings. The conceptual part of the study (Papers I and IV) was not grounded in any socio-economic context, which means that the conceptual results can be applied in any context and sector. My attempt to demonstrate this broad applicability was presented in Papers II and III, specifically in the Nordic countries' approach to the CE of metals and to global CE governance. At the same time, the selection process in both the systematic review (Paper I) and the critical review (Paper IV) was limited to academic publications in English and a specific set of search words. This approach could exclude some ideas presented in the original languages only, which is a limitation. However, the used database includes CE case studies from all continents, even though it was not a selection criterion. In contrast, the empirical results (Papers II and III) are context-based; they cannot be generalised, and can instead be compared with similar cases in other contexts.

4 Findings

This section presents the main results of the thesis. First, I outline the conceptual results, including a typology of circular solutions addressing resource security challenges (answering RQ 1), a typology of security discourses in the CE as presented in the literature (RQ 2), and a framework outlining the geopolitical implications of circular transformation (RQ 5). Second, I describe the empirical results, including the effects of security discourse on prioritisation among circular solutions (RQ 3), its connection to directionality of circular transformation (RQ 4), and the implications of securitised CE governance (RQ 5).

4.1 Conceptual results

The knowledge gap addressed in this thesis implied the lack of systematic understanding within academia of the relationship between the CE and security, as well as the geopolitical consequences of circular transformation. These conceptual findings are from the systematic, critical, and integrative literature reviews.

4.1.1 Resource security domains in the circular economy

In Paper I, the systematic literature review revealed how the CE literature connects circular solutions to different domains of resource security. Four domains — food, material, energy, and water security — are found to relate to the CE. Fig. 4 illustrates that references to different resource security domains increase over time, with the majority of papers focusing on food security. In Paper I, these domains and CE principles were integrated into a typology of resource security domains in the CE, which included a spectrum of solutions (see Table 2 in Paper I).

Further results indicated interlinks between different natural resource management systems in addressing challenges in these four resource security domains (Fig. 5). Specifically, the same resource flows (e.g. organic waste) can be allocated to support different resource security domains, which requires prioritisation. Another example of interlinks is that some security domains obtain resource flows from multiple systems, e.g., minerals for wind turbines, to ensure energy security.

Fig. 5 suggests that mutual interlinks exist between all the elements. However, researchers and policymakers might consider some interlinks as more essential due to a dominant perception, i.e., the security discourse. These results highlighted the further need to investigate how different security discourses affect prioritisation between circular solutions and resource security domains.

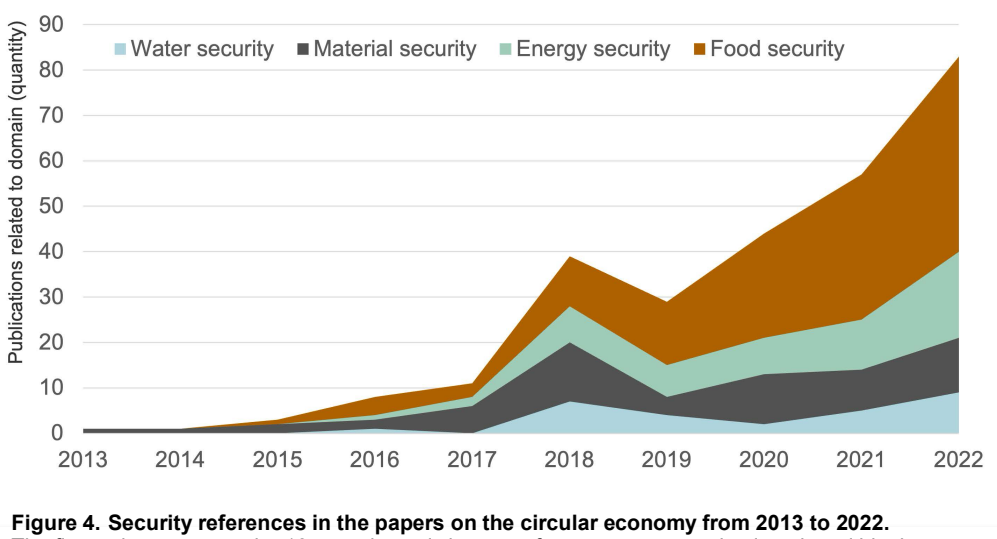

Figure 4. Security references in the papers on the circular economy from 2013 to 2022.
The figure demonstrates the 10-year dynamic between four resource security domains within the literature on the circular economy. Since 2019, references to food security have been the most popular.

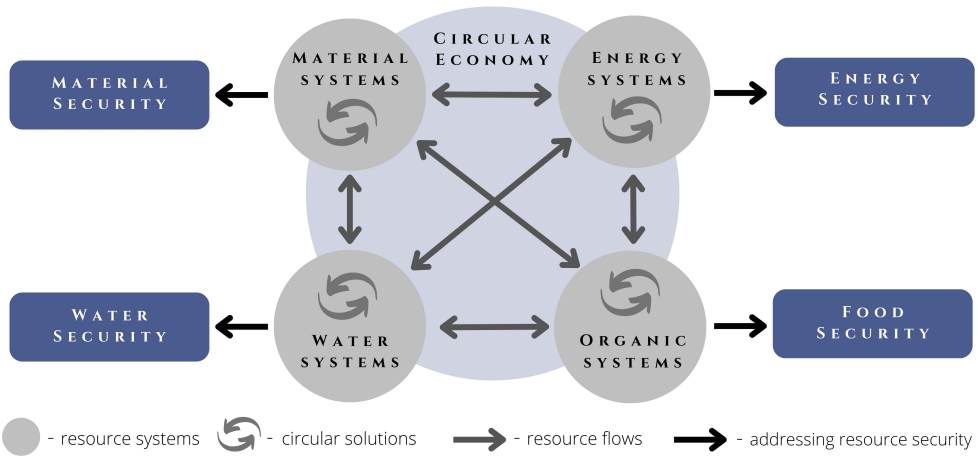

Figure 5. Interlinks between resource systems and security domains.
The figure presents identified interlinks between four natural resource management systems, circular solutions, and resource security domains.

4.1.2 Security discourses in the circular economy

In Paper I, the argumentative discourse analysis resulted in deconstructing the security discourse in CE governance into four perspectives that depart from different security concerns, prioritise different circular solutions, and envision different outcomes. The perspectives include *National Security*, *International Security*, *Human Security*, and *Ecological Security* (see Fig. 6).

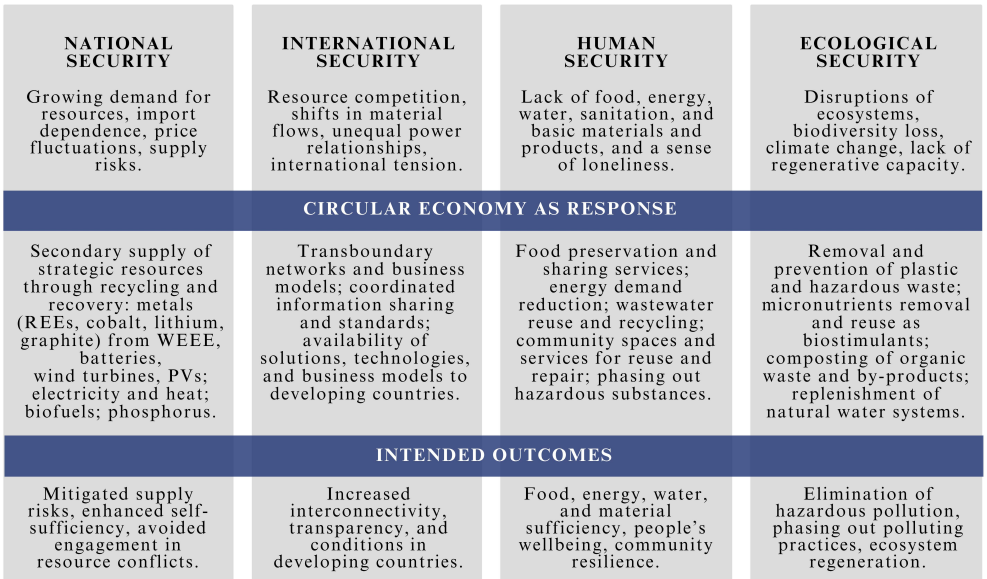

Figure 6. Typology of security discourses in the circular economy.
The figure presents four security discourses in the circular economy based on the referent object of security. Each discourse entails specific security concerns, circular solutions, and intended outcomes.

The *National Security* discourse stands out by focusing on the 'closing loop' principle across different resource systems, due to concerns over supply risks and the secondary supply of resources that this principle offers. In contrast, the *Human Security* prioritises the 'slowing loop' principle, because those solutions can ensure people's resource sufficiency. The *International Security* discourse is focused on large-scale measures that increase transparency and address unequal power relationships in supply chains. Finally, the *Ecological Security* discourse promotes restorative and regenerative aspects of the CE.

The four discourses establish resource flow allocation priorities among resource security domains (Fig. 5). For example, when allocating organic waste flows, the *National Security* discourse would support biofuel production, the *Human Security* discourse would promote food production, and the *Ecological Security* discourse would prioritise soil health. Therefore, these results demonstrate the effects that different security concerns might have on prioritisation between circular solutions.

4.1.3 Geopolitical implications of circular transformation

In Paper IV, critical and integrative literature reviews led to the development of a framework for the geopolitical implications of circular transformation. Six implications were structured in three levels: governance, geopolitical outcomes, and geopolitical impacts (Fig. 7). The governance level focused on shifts in *global governance* (I) as a specific cluster. The outcomes entail the direct results of the initiatives, including global shifts in *market structure* (II) and *resource flows* (III). Finally, impacts are the broader consequences of these initiatives, including shifts in *global leadership* (IV), *North-South disparities* (V), and *global environmental security* (VI).

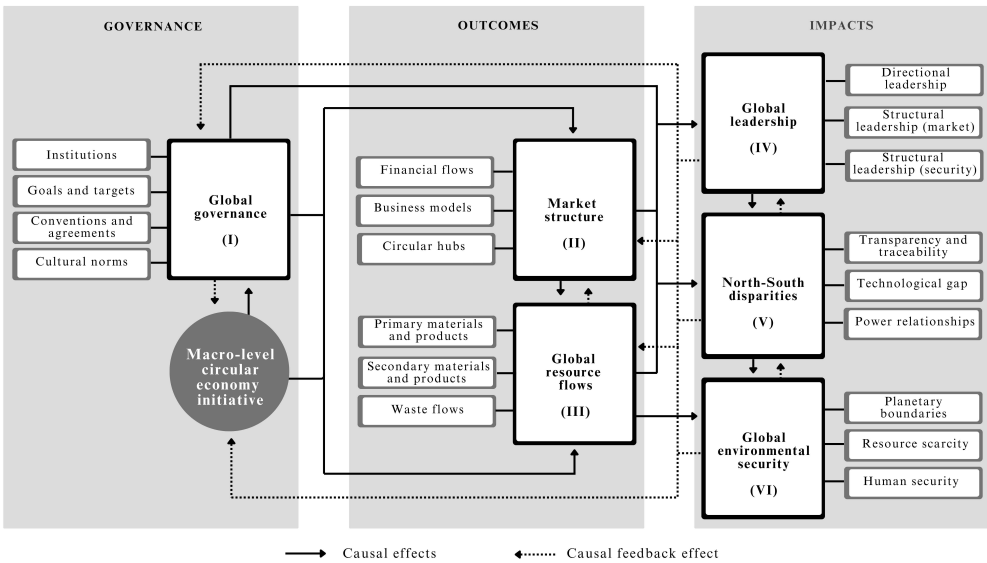

Figure 7. Framework of geopolitical implications of circular transformation.
The figure illustrates six implications, their respective aspects, and the causal relationships between these implications.

The framework indicated that the *global environmental security* (VI) is influenced directly only by changes in resource flows and North-South disparities. This framework is connected to the previous typology of security discourses in the CE, indicating that security concerns triggered by increasing environmental change have a causal feedback effect on governance through prioritisation (Paper I), affecting the directionality of the circular transformation. Moreover, the framework highlights the importance of understanding the *International Security* discourse in the CE, as all its proposed solutions entail geopolitical implications (Fig. 6 & 7).

4.2 Empirical results

In this thesis, I attempted to collect empirical evidence related to the presence of different security discourses in the CE governance and the implications of circular transformation affected by security discourse. These empirical results are based on the argumentative discourse analysis (Papers II and III) and qualitative content analysis (Paper IV).

4.2.1 Effects of security discourse on prioritisation

The typology of security discourses in CE (Fig. 6) was applied to explore the Nordic countries' approach to the CE of metals (Paper II) and to the global CE governance (Paper III). The results demonstrated several security storylines at the regional and global levels that prioritise specific materials, products, and circular solutions due to different security concerns.

The results in Paper II demonstrated the presence of six security storylines in the Nordic approach to the CE of metals (Fig. 8), with the dominating storyline 'Ensuring secondary supply of materials' from the *National Security* discourse. The primary effect of this storyline is the promotion of recycling for critical raw materials (CRMs) and products that contain them as a source of secondary supply.

The Paper III findings revealed the presence of eight security storylines in global CE governance, primarily stemming from *Ecological, Human, and International Security* perspectives. Fig. 9 demonstrates differences between intergovernmental organisations, public-private networks, environmental NGOs, and think tanks in their focus on security concerns. These results contribute to illuminating security perspectives in circular policies and the empirical understanding of diverse security discourses in the CE.

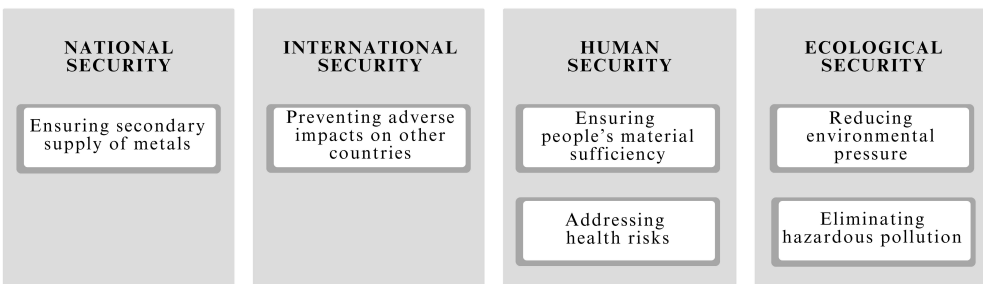

Figure 8. Nordic countries' approach to the circularity of metals.
The figure presents six identified security storylines from the circular, waste management, and mining strategies of Nordic countries, which promote circular solutions for metals and metal-based products.

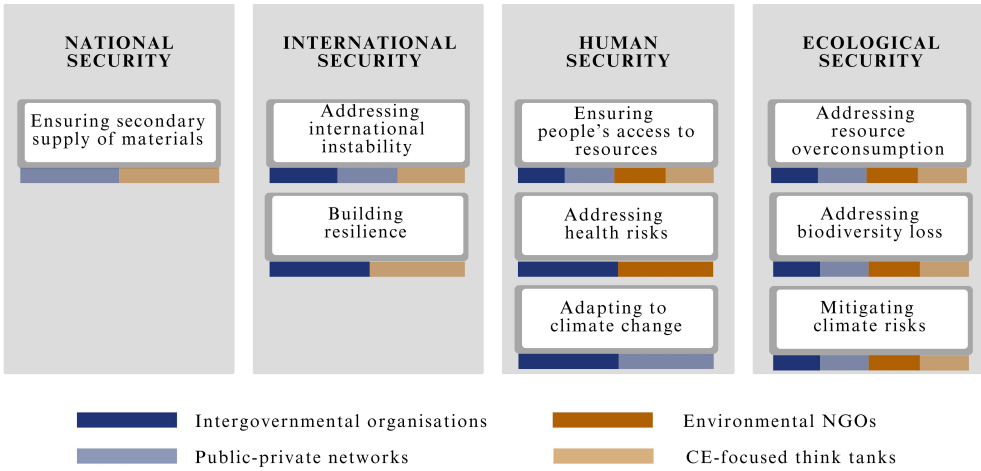

Figure 9. Security storylines in global CE governance.
The figure presents eight security storylines allocated across the security discourse typology. Differences in storyline composition between global institutions are highlighted.

4.2.2 Overlooked directions for transformative change

The results in Papers II, III, and IV suggested that security concerns can influence the directionality of the circular transformation by overlooking perspectives that would contribute most to addressing the environmental crisis.

The results of Paper II show that the *International Security* perspective is marginalised in the Nordic context, lacking solutions to address growing tensions between countries under resource pressure and unequal power relationships in global supply chains. Moreover, the Nordic strategies do not problematise mineral extraction, which limits the *Ecological Security* discourse to clean-up solutions.

The results of Paper III on global governance demonstrate several overlooked solutions. The discourses of *Ecological Security* and *Human Security* lack substance. None of the documents presented ideas about libraries of things and sharing solutions for products and food (e.g., public support for digital food sharing platforms), which could contribute to people's material sufficiency and thus human security. Moreover, reduced waste incineration, prioritising reuse over recycling, and avoiding the risk of future environmental contamination were not mentioned.

In Paper IV, the developed framework of geopolitical implications was tested on the European Battery Alliance and the Circular Plastics Alliance. The results demonstrated that prioritising recycling overlooks policies targeting the production and use phases of the product life cycle and solutions for sustainable consumption. Specifically, both initiatives overlook circular policies for durability, repairability, and repurposing (with mandatory targets), shifts toward smaller products (e.g. vehicles and batteries) or shared consumption.

5 Discussion

5.1 Conceptual contribution

The results of this thesis contribute to a more systematic understanding of the relationship between the CE and security. This study engaged with the CE literature on food, material, energy, and water systems, integrating previous investigations into a systematic overview (4.1.1). This overview can help future CE studies relate conceptually to resource security and broaden the spectrum of applicable solutions. Furthermore, this study contributes to understanding how discursive framings of the CE interact with discursive framings of the security within the science-policy interface (4.1.2). Synthesising the studies on CE with the scholarship on security, resilience, geopolitics, global governance and leadership, and sustainability transitions, this paper provides a systematic vision of the effects of the security discourse on the directionality of circular transformation.

In relation to studies on sustainability transformations, this study examines how security discourse can influence the directionality. Deconstructing security discourse in the CE governance allowed unlocking political potentialities that can span pluralities of ends (Stirling, 2024). At the same time, it demonstrated that focusing on one specific perspective in circular policies can hinder transformation (Soete, 2013).

This thesis contributes to critical security studies by focusing on the CE as a response. This research contributes to redirecting the focus from "Who should be protected from this type of threat, why, and how?" towards "Who should be protected by this type of response, why, and how?". Previous studies emphasised the centrality of threat, e.g. climate change (Hardt, 2012; McDonald, 2013), and distinguished between entities that should be protected from this threat through different responses. This study emphasises the CE as a response, splitting it into perspectives based on the entity. I consider this approach more efficient for policymaking because it informs the evaluation of specialised (in this case, resource-related) policies and strategies.

5.2 Policy implications

The typologies and the framework proposed in this thesis can improve the evaluation of circular policies and initiatives by assessing the security and geopolitical implications of prioritised solutions. Therefore, I suggest these tools to evaluate circular policies, compare perspectives, and develop recommendations.

Illuminating different security perspectives of the CE provides a more informed dialogue in the policy process. A dominating discourse can steer this process towards circular solutions that address specific concerns and marginalise others (Zepa et al., 2024). For example, the risk associated with the *National Security* discourse is that circular policies may favour the interests of the state and capital (Dunlap, 2023), which can lead to an imbalance in the circular transformation. By highlighting the varying security implications between the *National*, *International*, *Human*, and *Ecological Security* discourses, my study provides alternative agendas for the directionality of the circular transformation. Since the purpose of transformative governance is to address the 'grand environmental and societal challenges the world is facing' (Kivimaa et al., 2023), overlooking security perspectives can lead to missed opportunities and even a failed transformation.

5.3 Limitations

This research has several limitations. First, the described security discourses might not be completely cohesive. For instance, one circular solution can fit into different discourses. This limitation, however, is acknowledged among critical discourse analysts (Phillips et al., 2004). Uncertainty between discourses enables a discursive shift to occur, which is needed for a transformative change towards sustainability.

Second, the ADA in this study is applied to analyse strategies, directives, reports, and other textual documents. Although this method applies to documents, its original aim was to explore discourses in interviews. Not conducting the interviews with practitioners was a choice I had to make due to time constraints and growing restrictions regarding personal data collection and processing.

Additionally, this study treats the explored institutions and governments as homogeneous entities (Papers II and III), while their institutional design can vary, and different divisions can engage in advancing different discourses (Gyberg Brodén and Mobjörk, 2021; Bremberg et al., 2022). Section 6.4 provides several options that can address these limitations in future research.

6 Conclusion

Drawing on a conceptual background from environmental studies, sustainability transition, innovation, and critical security studies, this thesis explores the role of security discourse in shaping prioritisation among circular solutions to sustainability challenges and explains the implications of circular transformation influenced by security concerns. In this conclusion, I overview the results in connection to the research objectives and questions (RQ 1-5), provide recommendations for policy and governance, and outline opportunities for future research.

6.1 Shaping prioritisation

Objective 1 of this thesis was *to gain a deeper understanding of the role of security discourse in shaping prioritisation among circular solutions to sustainability challenges*. Achieving Objective 1, this research provided a typology of circular solutions addressing resource security challenges in energy, material, water, and food systems (RQ 1), distinguished national, international, human, and ecological security perspectives in the CE as security discourses occurring in the literature and policy documents (RQ 2), and demonstrated the potential effects of these security perspectives on prioritisation among circular solutions (RQ 3).

These findings suggest a conceptual understanding of the role of the security discourse in the CE governance. At the same time, proving the hypothesis that CE governance is influenced by security discourse requires more evidence connecting a dominant security discourse to circular policies, adopted in a particular context.

6.2 Implied transformation

Objective 2 of this thesis project was *to explain the implications of circular transformation influenced by security concerns.* Achieving Objective 2, this research formulated a description of security storylines, their intended outcomes, and the potential effects on the directionality of circular transformation (RQ 4). It also described the geopolitical implications of this transformation and reflected on the impacts of securitised circular policies (RQ 5).

These findings explain the implications of circular transformation influenced by security concerns. To some extent, these findings suggest that the circular transformation triggered by security discourse can have adverse security and geopolitical consequences. More empirical evidence can be obtained by exploring the connection between the dominant security discourse in a particular context and *ex post* outcomes of circular policies.

6.3 Recommendations for policy and governance

Based on the findings throughout all four papers, several recommendations for circular policy and CE governance can be formulated.

- An evaluation of national and local circular policies should include an assessment of whose specific concerns they address, why these concerns should be prioritised over others, how the suggested solutions address these concerns, and what ensures that adverse impacts on other groups are avoided. This recommendation assumes that all circular policies are responsive, i.e. they are designed to address challenges or security concerns. Among the target groups for circular policies should be small and medium-sized firms, large national businesses, transnational companies, local communities, households, communities in other countries, as well as local, regional or global ecosystems.
- Political debate over circular initiatives at the local, national, or global levels should engage representatives from a broad range of non-governmental institutions, including public-private platforms, environmental NGOs, think tanks, and local communities.
- Transformative CE governance at the national level should ensure that *Human*, *Ecological*, and *International Security* discourses in the CE are institutionalised. The *Human Security* discourse should address material sufficiency and solutions that extend the lifetime of products. The *Ecological Security* discourse should promote policies to limit resource extraction, clean up, restore, and regenerate ecosystems. The *International Security* discourse should address power imbalances in supply chains and disparities between the Global North and the Global South.
- An evaluation of macro-level circular initiatives should include potential implications for global governance, market structure, global resource flows, global leadership, North-South disparities, and global environmental security. This assessment should consider both direct impacts and adverse effects.

6.4 Future research agenda

There are multiple opportunities for future research based on these findings. These options depend on research interests, context, and purpose. Here, I outline four main directions.

First, future research can focus on specific security discourse in the CE governance. For instance, this study demonstrated that *Ecological Security* can be marginalised in the context of national policymaking. Future studies can focus on a deeper conceptual and empirical understanding of this discourse, its coalitions, and agency at local, national, regional, and global levels, as well as its potential to drive transformative change in production and consumption systems.

Second, more empirical evidence is required regarding the connection between a dominant security discourse, adopted circular policies, and *ex post* outcomes of these policies from different contexts. Methodologically, future studies could conduct interviews with practitioners from diverse contexts to further test the developed typologies and frameworks, providing further insights into the effects of the security discourse. Additionally, the research can employ case studies focusing on single institutions and social groups and how perceived security challenges affect their approach to the CE.

Third, a comparative study could explore the balance of security discourses in different contexts and levels of CE governance. Including regional organisations (e.g., the African Circular Economy Alliance or the Coalition for Circular Economy in Latin America) as intermediary institutions between the national and global levels could provide a more comprehensive picture.

Finally, the current geopolitical environment requires a comprehensive understanding of the global consequences of circular policies, initiatives, and programs. The developed framework of geopolitical implications can be applied in future studies to evaluate potential effects.

In summary, the results of this study can help future CE studies relate conceptually to security and broaden the spectrum of applicable solutions. The developed frameworks can be used to evaluate the security and geopolitical implications of circular policies and initiatives, inform political debates, and support marginalised circular solutions to ensure an inclusive circular transformation.

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Deconstructing Security Discourse in Circular Economy Governance

The circular transformation can address global environmental challenges by altering production and consumption systems. Meanwhile, the directionality of this transformative change depends on political priorities in multiple socio-economic contexts, which can be affected by geopolitical considerations and security concerns. Deconstructing security discourse in the governance of the circular economy illuminates diverse perspectives in the policy process. The findings of this thesis can be used to evaluate the security and geopolitical implications of circular policies and initiatives, inform political debates, and support marginalised circular solutions to ensure an inclusive circular transformation.

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