

Doctoral Thesis in Land and Water Resources Engineering

# Bending the Curve – the Role and Interplay of Municipal Energy Planning and Municipal Spatial Planning for Climate Change Mitigation in Sweden

VINCENT WRETLING



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## ABSTRACT

The global climate is changing rapidly, which pronounces the need for imminently bending the curve of greenhouse gases emissions. The local authorities have been recognised as key actors in this decarbonisation, due to their wide-ranging responsibilities, including different mandates for local planning. The Swedish municipalities are no exception in this regard. In contrast, they stand out as being especially critical for Sweden's efforts to reach climate neutrality in 2045 and multiple other sustainability objectives, since they are instructed to conduct municipal energy planning regarding supply and distribution of energy, have a monopoly on spatial planning and have been given a veto right for larger wind power establishments. There is, however, limited knowledge regarding the municipalities' planning processes and institutional capacity building for handling climate change mitigation in their municipal planning. The overall aim of this compilation thesis, comprising five scientific papers, is to contribute with new knowledge regarding the role, process and interplay of municipal energy and climate planning, municipal spatial planning and municipal wind power planning for responding to the need for rapid decarbonisation, in order to identify pathways forward for building the municipalities' institutional capacity. The thesis has a mixed methods approach comprising of semi-structured interviews, focus group interviews, participant observation, a survey, statistical analyses, and multiple document analyses of either cross-sectional or longitudinal character that involves elements of both quantitative content analyses and thematic analyses.

When synthesising the findings from Paper I-V, it is evident that the municipalities are responding to the climate crisis in multiple different ways. This includes that a proactive strategic energy and climate planning practice with the aim of reducing climate impact has emerged from the sectoral energy planning tradition. However, the impact assessment practice is deficient within municipal energy and climate planning, especially if the planning is conducted in a non-statutory form, in spite of it being indicated that impact assessment can facilitate the consideration of synergies and conflicts between different sustainability objectives as well as enabling to illuminate local benefits of climate action. Moreover, the municipalities have been integrating numerous different strategies for reduced climate impact into their Comprehensive Plans, relating to energy production, distribution and use, transport, and land use, and the findings suggest that such consideration of energy and climate aspects in the Comprehensive Plans have increased in the recent decades. This integration of climate change considerations into Comprehensive Plans has largely been spurred by the existence of a municipal energy and climate strategy or similar, which has enabled a two-way policy integration between these two policy spheres. The presence of energy and climate strategic competence within the municipal concern is an associated vital feature, since this facilitates the influx of knowledge through the participation in different regional-local and inter-municipal networks, which can then be disseminated internally and utilised in the comprehensive planning process. There is also a need for municipal officials to be given time and resources to interact with politicians in order to mobilise support and create a mandate for action.

Simultaneously, the results illuminate that many municipalities are struggling with building sufficient institutional capacity for addressing climate change mitigation in their energy and climate strategic planning and their strategic spatial planning. This was manifested for example in the form that the adoption of both energy and climate-focused policy documents and wind power plans followed the temporal patterns of the presence of state-funded financial incentives and that more than one-fourth of the municipalities not having adopted an energy and climate-focused policy document during the studied twelve-year time span. This has also rendered in a more reactive municipal decision-making in relation to the municipal veto for wind power

deployment, with implications for its legitimacy and public participation. Given the centrality of the municipalities, it is deemed vital to further promote the process of building institutional capacity for responding to the climate crisis in their municipal planning and decision-making. Increased continuity in the energy and climate strategic planning process, comprehensive planning process and wind power planning process could facilitate building support for integrating different strategies related to climate change mitigation in their planning and contribute to organisational learning. Moreover, the three modes of planning could be further interlinked, for example, by establishing objectives regarding greenhouse gases emissions and renewable electricity production in the energy and climate domain, which brings implications for the strategic spatial planning, and by initiating processes simultaneously and in an integrated fashion. If municipalities come to recognise the potential of a more proactive strategic-thinking SEA process, this could be another vehicle for increased sustainability consideration early in the process, when there is a window of opportunity for influencing the plan's content to the greatest extent. Overall, this can lead to a more sustainability-led municipal planning, which can contribute to bending the curve of greenhouse gases emissions, while simultaneously providing synergies across other sustainability objectives.

Key words: local energy and climate planning, municipal comprehensive planning, wind power planning, climate policy integration, Strategic Environmental Assessment, institutional capacity building.

## SUMMARY IN SWEDISH

Det globala klimatet förändras snabbt, vilket accentuerar behovet av att omedelbart böja utsläppskurvan av växthusgaser nedåt. De lokala myndigheterna har identifierats som nyckelaktörer i klimatomställningen på grund av deras omfattande ansvarsområden, vilket innefattar olika mandat för lokal planering. De svenska kommunerna är inget undantag i detta avseende, utan framstår som särskilt kritiska för Sveriges ambitioner att nå klimatneutralitet år 2045 och flera andra hållbarhetsmål, eftersom de har i uppdrag att bedriva kommunal energiplanering avseende tillförsel och distribution av energi, besitter ett monopol på fysisk planering och har vetorätt för större vindkraftsetableringar. Det finns dock begränsad kunskap om kommunernas planeringsprocesser och institutionella kapacitetsutveckling när det gäller att bemöta klimatförändringarna i sin kommunala planering. Det övergripande syftet med denna sammanläggningsavhandling, som omfattar fem vetenskapliga artiklar, är att bidra med ny kunskap om rollerna och processerna inom kommunal energi- och klimatplanering, kommunal fysisk planering och kommunal vindkraftsplanering, samt samspelet däremellan, för att möta behovet av en skyndsam klimatomställning samt identifiera vägar framåt för att bygga kommunernas institutionella kapacitet. Avhandlingen bygger på ett tillvägagångssätt med mixade metoder, som omfattar semistrukturerade intervjuer, fokusgruppsintervjuer, deltagande observation, enkätundersökning, statistiska analyser, samt multipla dokumentanalyser av både tvärsnitts- och longitudinell karaktär som inkluderar inslag av kvantitativa innehållsanalyser och tematiska analyser.

När man sammanfattar resultaten från artikel I-V är det tydligt att kommunerna bemöter klimatkrisen på flera olika sätt. Detta inbegriper att en proaktiv strategisk energi- och klimatplaneringspraxis med syfte att minska klimatpåverkan har vuxit fram ur den sektoriella energiplaneringstraditionen. Miljöbedömningspraxisen är bristfällig inom kommunal energi- och klimatplanering, särskilt när planeringen bedrivs i en icke lagstadgad form. Resultaten tyder på att miljöbedömning kan underlätta beaktandet av synergier och konflikter mellan olika hållbarhetsmål, vilket därmed även kan bidra till att påvisa den möjliga lokala nyttan med klimatåtgärder. Dessutom har kommunerna integrerat ett flertal olika strategier för minskad klimatpåverkan i sina översiktsplaner, relaterade till energiproduktion, -distribution och -användning, transporter och markanvändning, och resultaten påvisar att sådan hänsyn till energi- och klimataspekter i översiktsplanerna har ökat under de senaste decennierna. Integreringen av klimataspekter i översiktsplaner har till stor del stimulerats av förekomsten av en kommunal energi- och klimatstrategi eller motsvarande policydokument, vilket har möjliggjort en tvåvägs policyintegrering mellan dessa två planeringsdomäner. Förekomsten av energi- och klimatstrategisk kompetens inom den kommunala verksamheten är en annan avgörande faktor, eftersom detta underlättar kunskapsinflödet genom deltagandet i olika regional-lokala och mellankommunala nätverk, som sedan kan spridas internt och nyttjas i översiktsplaneprocesserna. Kommunala tjänstepersoner måste också ges tid och resurser att interagera med politikerna för att mobilisera stöd och skapa handlingsmandat.

Samtidigt visar resultaten att många kommuner kämpar med att utveckla tillräcklig institutionell kapacitet för att hantera aspekter relaterat till minskad klimatpåverkan i sin energi- och klimatstrategiska planering samt i sin strategiska fysiska planering. Detta har till exempel visat sig genom att antagandet av både energi- och klimatfokuserade policydokument och vindbruksplaner följde de tidsmässiga mönstren av förekomsten av statligt finansierade ekonomiska incitament, och att mer än en fjärdedel av kommunerna inte har antagit ett energi- och klimatfokuserat policydokument under den studerade tolvårsperioden. Detta har också lett till ett mer reaktivt kommunalt beslutsfattande i förhållande till det kommunala vetot för

vindkraftsutbyggnad, med konsekvenser för dess legitimitet och allmänhetens deltagande. Givet kommunernas centrala roll bedöms det vara av vikt att ytterligare främja processen att utveckla den institutionella kapaciteten för att bemöta klimatkrisen i deras kommunala planering och beslutsfattande. En mer kontinuerlig planering inom energi- och klimatstrategisk planering, översiktsplanering respektive vindbruksplanering, med tätare intervall mellan varje planeringsprocess, skulle kunna möjliggöra ett ökat politiskt stöd för att integrera och beakta nya aspekter och strategier relaterat till minskad klimatpåverkan i planeringen samt bidra till organisatoriskt lärande. Dessutom skulle de tre planeringsformerna kunna kopplas samman ytterligare, till exempel genom att fastställa mål för utsläpp av växthusgaser och förnybar elproduktion inom energi- och klimatdomänen, vilket medför konsekvenser för den strategiska fysiska planeringen, och genom att initiera processer samtidigt och på ett integrerat sätt. Om kommuner skulle ta tillvara på potentialen i en mer proaktiv strategisk miljöbedömningsprocess kan detta vara ytterligare ett verktyg för ökad hållbarhetskänslighet i processen, där det finns stora möjligheter att påverka planens innehåll. Sammantaget kan detta leda till en mer hållbarhetsinriktad kommunal planering, som kan bidra till att minska utsläppen av växthusgaser, samtidigt som det ger synergier mellan andra hållbarhetsmål.

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Vincent Wretling

Stockholm, February 2022



## TABLE OF CONTENTS

ABSTRACT .....	i
SUMMARY IN SWEDISH.....	iii
ACKNOWLEDGEMENTS.....	v
TABLE OF CONTENTS.....	vii
LIST OF APPENDED PAPERS AND AUTHOR'S CONTRIBUTIONS.....	ix
LIST OF ACRONYMS.....	xi
NOTES ON TERMINOLOGY.....	xiii
1. INTRODUCTION.....	1
2. RESEARCH AIMS AND OBJECTIVES.....	4
2.1 Overall aim.....	4
2.2 Delimitation and contribution .....	4
2.3 Structure of thesis .....	4
3. BACKGROUND.....	6
3.1 Swedish Energy and climate planning .....	6
3.2 Municipal comprehensive planning and integration of climate change mitigation aspects.....	7
3.3 Municipal wind power planning and governance .....	7
3.4 Impact assessment tools in Swedish energy and climate planning.....	8
3.5 The Swedish National Environmental Quality Objectives.....	9
4. THEORETICAL FRAMEWORK.....	10
4.1 Local authorities in a multi-level governance context.....	10
4.2 Moving away from rational planning to more communicative forms of planning.....	11
4.3 Promoting environmental considerations in planning.....	12
4.4 Institutional capacity building and organisational learning.....	13
5. METHODOLOGY, MATERIALS AND METHODS .....	15
5.1 Research projects and research progression .....	15
5.2 Research design.....	17
5.3 Literature review .....	18
5.4 Interviews.....	18
5.5 Focus group interview.....	18
5.6 Survey .....	19
5.7 Participant observation .....	19
5.8 Quantitative content analysis .....	19
5.9 Thematic analysis .....	20
5.10 Statistical analysis .....	20
5.11 Theoretical analysis of results .....	21
6. RESULTS.....	22

6.1	Strategic municipal energy planning in Sweden – Examining current energy planning practice and its influence on comprehensive planning (Paper I) .....	22
	Overview of energy and climate planning practice.....	22
	Relation between municipal energy and climate planning and comprehensive planning ..	23
6.2	SEA screening practice and the inclusion of environmental objectives in Swedish energy and climate planning (Paper II) .....	24
	Screening procedures and execution of impact assessment .....	24
	Inclusion of National Environmental Quality Objectives.....	26
6.3	Building Institutional Capacity to Plan for Climate Neutrality: The Role of Local Co-Operation and Inter-Municipal Networks at the Regional Level (Paper III).....	27
	Current capacities, challenges and opportunities .....	27
	Local Co-Operation in the Comprehensive Planning Process .....	27
	Networks for Inter-Municipal and Regional-Local Co-Operation .....	28
6.4	Are Local Authorities Building Their Capacity to Plan for Reduced Climate Impact? A Longitudinal Analysis of Swedish Comprehensive Plans (Paper IV) .....	29
	Institutional capacity building over time .....	29
6.5	Balancing wind power deployment and sustainability objectives in Swedish planning and permitting (Paper V).....	32
	National overview of municipal wind power planning practice .....	32
	Spatial sustainability considerations in wind power planning and permitting .....	33
	Insights from practitioners on municipal wind power planning .....	36
7.	ANALYSIS .....	38
7.1	A constant need for institutional capacity building.....	38
7.2	Procedures and practices for gaining mobilisation capacity .....	39
7.3	Cross-sectoral collaboration in planning processes and stakeholder involvement .....	40
7.4	Networks and organisational learning.....	41
7.5	Potential implications of statutory local energy and climate planning .....	42
8.	DISCUSSION .....	44
8.1	Municipal energy and climate planning that responds to the emerged challenges .....	44
8.2	Towards strengthened integration into spatial planning .....	46
8.3	Stakeholder involvement for enhanced action and legitimacy .....	47
8.4	Challenges within wind power planning and governance .....	49
8.5	The increasingly vital role of the regional level for institutional capacity building.....	51
8.6	Methodological reflections.....	52
9.	FUTURE RESEARCH.....	55
10.	CONCLUSIONS.....	56
11.	REFERENCES.....	57

## LIST OF APPENDED PAPERS AND AUTHOR'S CONTRIBUTIONS

- I. Wretling, V., Gunnarsson-Östling, U., Hörnberg, C., Balfors, B., 2018. Strategic municipal energy planning in Sweden – Examining current energy planning practice and its influence on comprehensive planning. *Energy Policy* 113, 688–700. <https://doi.org/10.1016/j.enpol.2017.11.006>

As the first author, VW has solely performed the collection and analysis of data and has been the main contributor to the manuscript writing, with supervision and input from co-authors UGÖ, CH and BB. VW participated in concretising the research design and formulating overall aims in co-operation with the co-authors UGÖ, CH and BB, and handled the submission and revision process with support from the co-authors.

- II. Wretling, V., Hörnberg, C., Gunnarsson-Östling, U., Balfors, B., 2021. SEA screening practice and the inclusion of environmental objectives in Swedish energy and climate planning. *Impact Assessment and Project Appraisal* 39, 151–166. <https://doi.org/10.1080/14615517.2021.1893929>

VW is the first author and has solely conducted data collection, data analysis and data visualisation, and has been the main contributor to the manuscript writing, with supervision and input from co-authors CH, UGÖ and BB. VW participated in specifying the research design and formulating overall aims in co-operation with the co-authors CH, UGÖ and BB, and handled the submission and revision process with support from the co-authors.

- III. Wretling, V., Balfors, B., 2021. Building Institutional Capacity to Plan for Climate Neutrality: The Role of Local Co-Operation and Inter-Municipal Networks at the Regional Level. *Sustainability* 13, 2173. <https://doi.org/10.3390/su13042173>

The authors VW and BB jointly conceptualised the research design and the overall aim of the paper. As the first author, VW conducted data collection and data analysis independently and wrote the paper, with supervision and input from BB. VW also handled the submission and revision process with support from BB.

- IV. Wretling, V., Balfors, B., 2021. Are Local Authorities Building Their Capacity to Plan for Reduced Climate Impact? A Longitudinal Analysis of Swedish Comprehensive Plans. *Land* 10, 652. <https://doi.org/10.3390/land10060652>

VW has, as first author, solely collected, analysed and visualised the data. Together with co-author BB, VW has designed the research study and formulated overall aims of the paper. VW has also been the main contributor in terms of writing the paper and handling the submission and revision process, with supervision and support from co-author BB.

- V. Wretling, V., Balfors, B., Mörtberg, U. Balancing wind power deployment and sustainability objectives in Swedish planning and permitting. Submitted to *Energy, Sustainability and Society*.

VW has contributed to conceptualise the research design and overall aim together with the co-authors. Moreover, VW has conducted data collection and data analysis solely, and has written the manuscript with supervision and input from BB and UM. VW has also handled the submission process for the paper, currently being under review.

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## LIST OF ACRONYMS

ANI	Area of National Interest
CAB	County Administrative Board
CP	Comprehensive Plan
EIA	Environmental Impact Assessment
GHG	Greenhouse Gases
MECS	Municipal Energy and Climate Strategy
MEP	Municipal Energy Plan
NEQO	National Environmental Quality Objective
RCES	Regional Climate and Energy Strategy
SEA	Strategic Environmental Assessment



## NOTES ON TERMINOLOGY

*Energy and climate-focused policy document* – term that refers to both statutory Municipal Energy Plans and non-statutory Municipal Energy and Climate Strategies

*Energy Plan and Climate Strategy* – term that refers to statutory Municipal Energy Plans where the title indicates a widened scope

*Environmental analysis* – term that refers to the analysis of the plan’s impact on the environment, health, land and water and other resources that always is legally required for Municipal Energy Plans

*Impact assessment* – term that encompasses both environmental analysis and Strategic Environmental Assessment

*Traditional Energy Plan* – term that refers to statutory Municipal Energy Plans titled only ‘Energy Plan’

*Wind power plan* – term that refers to all municipal policy documents focusing on wind power, e.g. a thematic amendment to a Comprehensive Plan, wind power policy, planning basis for wind power



# 1. INTRODUCTION

Human-induced climate change is becoming increasingly severe as emissions of greenhouse gases (GHGs) continues to rise (IPCC, 2018). The increase in global temperature due to enhanced concentrations of GHGs affects humanity in a variety of ways. It causes sea level rise and brings more extreme weather in the form of storms, flooding, droughts and heat waves (IPCC, 2021). Deadly weather conditions caused by a combination of high humidity and high temperatures are already occurring in parts of the world, and this impact will intensify with continued global warming (Mora et al., 2017). Biodiversity is also affected, for example through habitat disruption as biomes shift to higher latitudes and altitudes (Gonzalez et al., 2010). Furthermore, there is a risk of transgressing climate tipping points, such as loss of ice cover, thawing permafrost, and deforestation, that could, abruptly and non-linearly, further exacerbate global warming and thereby threaten the habitability of our planet for humanity and all other species (Lenton et al., 2019).

In order to tackle climate change, a globally endorsed target within the Paris agreement stipulates that global warming should be restricted to well below 2 °C and that efforts to keep it below 1.5 °C should be pursued (UNFCCC, 2015). As the severity of the aforementioned impacts due to global warming is projected to be substantially worsened if the warming halts at 2 °C rather than 1.5 °C, numerous scholars call for action for not transgressing the lower span of the target (e.g. Hoegh-Guldberg et al., 2019; IPCC, 2018; Steffen et al., 2018). However, the current emissions trajectory is not in line with such rapid decarbonisation. As of 2021, global warming has already reached ~1.1-1.2 °C compared with pre-industrial levels, with temperatures persistently transgressing the 1 °C limit in seven consecutive years (World Meteorological Organization, 2022). Moreover, the Nationally Determined Contributions, i.e. the emission reductions pledges from all nations-states within the Paris Agreement, are forecasted to put us on an emission trajectory in line with global warming scenarios of 2.6–3.1 °C (Rogelj et al., 2016). If there should be a fair chance to meet the 1.5 °C target, the curve of greenhouse gases emissions must start to bend downwards imminently, with a need to reach carbon neutrality around 2040 (Matthews et al., 2021). Additionally, given the larger historical emissions by western nations, there is an argument that this part of the world should curb their emissions more rapidly than other countries if the transition is to be guided by principles of equity and equal access to atmospheric commons (Hickel, 2020). Thus, a variety of state and non-state actors must undertake action at multiple governance levels if the profound societal transformation needed for reaching the 1.5 °C target should be able to occur (Jänicke, 2017; Rockström et al., 2021).

One such actor that has been singled out as a potential key actor in the climate transition are local authorities, also referred to as municipalities (Amundsen et al., 2018; Rincón et al., 2021). A common prevailing argument for this is that they have wide-ranging responsibilities within planning and governance (Betsill and Bulkeley, 2007; Bulkeley and Kern, 2006). Typically, the planning responsibilities include different types of sectoral planning activities such as waste management, wastewater and sewage, as well as local energy and climate planning (Bulkeley, 2010; Melica et al., 2018), with the latter arguably being most directly related with climate change. These could be either of statutory character, i.e. required under national legislation, or adopted voluntarily (Reckien et al., 2018). Moreover, another reason for the local authorities' centrality is that they are the authority closest to the citizens, governing the development of our societies, where transformation ultimately has to come about (van Staden and Musco, 2010). From this perspective, local authorities can also support local energy initiatives from the grassroots level in different ways (Rydin and Turcu, 2019).

Another vital task predominantly governed by local authorities is spatial planning (Bulkeley, 2010). Numerous different aspects can be integrated into spatial planning as a part of the efforts to curb carbon emissions (Stoeglehner, 2020). This concerns energy use in transportation, as the density of urban development, for example, can affect travel needs and preconditions for public

transport, and the mixing of urban functions can also reduce travel distances (Anderson et al., 1996; Dulal et al., 2011). Other approaches commonly applied are prioritising transit-oriented development and promoting active modes of transport, i.e. bicycling and walking, in the transport systems (Ali et al., 2021; Yigitcanlar and Kamruzzaman, 2014). Further, per capita heating requirements can generally be expected to be lower in dense developments due to their relatively lower surface area (Ewing and Rong, 2008). Development patterns can also influence the possibility of utilising district heating and its transmission losses (Stemers, 2003).

Additionally, the production of centralized and decentralized renewable energy and its distribution needs to be spatially planned for, for example, by localising development favourably for rooftop solar power or identifying areas suitable for large-scale wind power or solar power plants (Kaza and Curtis, 2014). This need is accentuated by the fact that renewable energy sources are more distributed and require more surface area for energy production than fossil fuel-based energy systems, thus increasing land-use competition (van Zalk and Behrens, 2018). Wind energy, which is a prime example of such a distributed energy source, has the potential to become one of the key power sources, together with solar energy, when transitioning to a renewable energy system (IEA, 2021). Wind power has an advantage compared to solar especially in Nordic countries, due to the fact that the wind energy resources tend to be the highest during wintertime, when the electricity demand is higher, whereas solar energy resources, in contrast, peak during summertime (Graabak and Korpås, 2016). All in all, the decarbonisation of the energy system puts new demands on the local authorities and emphasises a need for interplay between local energy and climate planning and spatial planning.

Besides the climate crisis, there is a multitude of other ecological and social challenges that need to be addressed simultaneously. Nine planetary boundaries have been identified, which intends to establish a safe operating space for humanity (Rockström et al., 2009). If these boundaries are transgressed, we are at risk of being confronted with non-linear, irreversible impacts that could threaten the liveability of the planet (Steffen et al., 2015). In addition to climate change, the energy system impacts a multitude of these planetary boundaries, such as air pollution, land-use change, and biodiversity (Johansson et al., 2012). Moreover, the United Nations established the 17 Sustainable Development Goals, serving as a framework for sustainable development by addressing a variety of critical social, political and ecological challenges (Boto-Álvarez and García-Fernández, 2020). Renewable electricity generation has been recognised to bring synergies across all Sustainable Development Goals (Fuso Nerini et al., 2019). Nevertheless, local impacts could occur from renewable electricity production, which in the case of wind power includes, e.g. noise, visual impacts on landscape and collision with birds and bats (Köppel et al., 2014; Nazir et al., 2020; Zerrahn, 2017). To sum up, this calls for careful consideration regarding different sustainability concerns in energy planning and wind power planning.

A planning tool that can aid to increase consideration of different environmental aspects in planning is Strategic Environmental Assessment (SEA) (Partidário, 1996). In broad terms, SEA can be defined as a systematic process with the purpose of assessing the environmental impacts of a plan, programme or policy to ensure that such knowledge is integrated into the basis for strategic decision-making (Fischer and Onyango, 2012; Tetlow and Hanusch, 2012). Legal requirements for SEA have been imposed in the European Union through the adoption of what is commonly referred to as the SEA directive (EU Directive 2001/42/EC) and encompasses, amongst others, plans addressing land use and energy. If it is concluded in the initial SEA screening phase that an SEA is required, such an assessment should thus be conducted for a variety of different local plans (Bidstrup, 2017).

Sweden is struggling with the challenge to reach zero net emissions until 2045 (Government Bill 2016/17:146, 2017), while simultaneously reaching other sustainability objectives such as the Sustainable Development Goals and the Swedish National Environmental Quality Objectives (NEQOs). This is a challenge recognised by virtually all other countries, although with differences in the pace of decarbonisation. A stepping stone for Sweden's fulfilment of the objective regarding carbon neutrality is the objective to have 100% renewable electricity

production in 2040, and in a national wind power strategy, a projected wind power planning target of 80 TWh onshore wind power in the same year has been stated (Swedish Energy Agency, 2021a). The fulfilment of the projected wind power planning target would approximately amount to a three-fold increase compared to the current level of annual wind power production (Swedish Energy Agency, 2021b). The 290 Swedish municipalities have been singled out as key actors in the strive towards sustainability and reduced climate impact as they have broad and extensive responsibilities (Granberg and Elander, 2007; Vassileva et al., 2015) that encompass both a monopoly on land-use planning (Persson, 2013) and a mandate to conduct energy planning (Ivner et al., 2010). Moreover, the municipalities' influence for wind power deployment is not only restricted to spatial planning; they must also approve larger wind power installations for a permit to be given (Pettersson and Söderholm, 2011).

In light of these planning and decision-making responsibilities and the ambitious climate targets established by Sweden, ways of strengthening municipal energy and climate planning need to be explored prior to a potential legislative revision of the Act on Municipal Energy Planning (1977:439), which has been proposed by the Swedish Energy Agency (Lundqvist and Kasa, 2016). Further, an important feature for achieving Sweden's energy and climate objectives is different measures for constructing a more energy-efficient society so that modal shifts from car dependency to public transport, cycling and walking can occur (Swedish Transport Administration, 2015). This stresses the need to integrate energy and climate aspects into comprehensive planning, which has been found deficient in previous research (Dovlén and Khakee, 2017; Persson, 2013). Thus, it is vital to investigate whether municipal energy and climate planning could be a tool for integrating energy and climate aspects into comprehensive planning as well as how the process of building institutional capacity for addressing climate change mitigation in spatial planning is progressing. Prior to a substantial expansion of land-based wind power, knowledge regarding how sustainability considerations are made in municipal wind power planning and permitting is another research area of relevance.

Furthermore, decarbonisation of the energy system can occur in a variety of ways, all of them with different environmental impacts and different synergies and conflicts in relation to other NEQOs (Hildingsson and Johansson, 2016). Thus, impact assessment tools such as SEA are important to utilise in municipal energy planning in order to avoid problem-shifting (Ivner and Hjelm, 2009). However, it has been found that when applying impact assessments in municipal energy planning, the focus has primarily been on carbon dioxide emissions, which indicates that the assessments have not been able to fulfil the purpose of highlighting other potential environmental impacts (Ibid.). Previous research has also shown that SEA often is lacking for Municipal Energy Plans (MEPs) (Balfors et al., 2018a). On a related note, Kørnøv and Wejs (2013), call for further research regarding what mechanisms affect the critical SEA screening decision within local energy and climate planning. An examination of the impact assessment practice and their contribution to integrating NEQOs within municipal energy and climate planning is, therefore, an essential element when examining current municipal energy planning and ways of strengthening its practice.

## 2. RESEARCH AIMS AND OBJECTIVES

### 2.1 Overall aim

The overall aim of the thesis is to contribute with new knowledge regarding the role, process and interplay of municipal energy and climate planning, municipal spatial planning and municipal wind power planning for responding to the need for rapid decarbonisation, in order to identify pathways forward for building the municipalities' institutional capacity.

The specific objectives are set to be:

- i) Provide a national overview of the current energy and climate planning practice and municipal wind power planning practice in terms of the prevalence of different types of policy documents in time and space (Paper I and V)
- ii) Explore the process and institutional capacity building for integrating climate change mitigation aspects into municipal spatial planning over time (Paper I, III and IV)
- iii) Analyse the screening procedures and execution of SEA as well as its role in highlighting the interaction of National Environmental Quality Objectives in municipal energy and climate planning (Paper II)
- iv) Investigate how wind power is balanced in relation to different sustainability aspects in wind power planning and permitting (Paper V)
- v) Discuss ways to strengthen the municipal planning for reduced climate impact, including in which ways the regional and national level can support the municipalities in their institutional capacity building (Paper I-V)

### 2.2 Delimitation and contribution

Delimitations can be characterised as limitations that the researcher deliberately has imposed on the scope of the research study (Rudestam and Newton, 2014). A delimitation in this study is that the explicit focus has been on the local administrative level and with Sweden as geographical scope. In terms of addressing climate change in planning, this has been delimited to climate change mitigation, and although being a highly relevant topic, climate change adaptation has not been studied.

The thesis can be considered to make both methodological and scientific contributions. In terms of the methodological contributions, this thesis has further developed the approach of conducting a systematic document analysis in order to investigate Swedish planning practice, which was first applied in SPEAK (Balfors et al., 2018b). Especially, the document analysis conducted in Paper IV keeps building on the branch of research regarding longitudinal document analyses investigating the integration of climate change aspects into spatial planning, to the author's knowledge being second after the paper by Stevens and Senbel (2017). The empirical findings also present novel insights regarding the Swedish municipalities efforts for addressing climate change mitigation in their planning, including critical aspects for strengthening their institutional capacity building in this regard. These findings can be a valuable contribution to the scientific community and can also be relevant for authority officials at different governance levels.

### 2.3 Structure of thesis

This thesis is a compilation thesis, composed of a cover essay, also known as kappa, and five appended research papers. Section 1 in the cover essay introduces the research area, followed by the aims and objectives of the thesis (Section 2). Furthermore, additional background regarding relevant legislation and the preconditions in Sweden is provided in Section 3 before presenting the theoretical concepts utilised (Section 4). Then, the methodology and methods of the thesis

are detailed (Section 5), subsequently followed by results and analysis, Section 6 and 7, respectively. Next, the analysed findings are discussed (Section 8), and suggestions for future research are provided in Section 9. Finally, the thesis is concluded in Section 10.

### 3. BACKGROUND

This section intends to provide more detailed background knowledge on the research context. Firstly, the origin of Swedish municipal energy planning and related legislation is presented. An account of the subsequent preconditional changes that have occurred along with national policy development and related regional activities is also provided. Secondly, the municipal planning monopoly and the relevance of spatial planning to a transition to a carbon-neutral society is detailed. This is followed by descriptions of the different impact assessment tools relevant to Swedish energy and climate planning, with a focus on Strategic Environmental Assessment. Lastly, the Swedish National Environmental Quality Objectives and their relevance to Swedish energy and climate planning are outlined.

#### 3.1 Swedish Energy and climate planning

According to the Act on Municipal Energy Planning (1977:439), which was adopted in 1977, all municipalities are required to have an up-to-date Municipal Energy Plan regarding the supply and distribution of energy. This Act emphasizes rational use of energy and was adopted in response to the oil crisis in the 1970s, with the focus of the national policies at the time being on a reduction in oil dependency (Stenlund Nilsson and Mårtensson, 2003). Initially, the Act had more of an encouraging nature, and the development of Energy Plans was not mandatory, but two revisions of the Act during the following decade made it mandatory and further required the Energy Plan to cover the geographical area of the municipality in its entirety (Olerup, 2000; Stenlund Nilsson and Mårtensson, 2003). Furthermore, after the deregulation of the Swedish electricity market in 1996, many municipalities privatised and, in some instances, also sold their energy companies (Högselius and Kaijser, 2010). Consequently, this has restricted the municipalities' operational influence on the distributional aspects of the energy system (Palm, 2006).

During the 1990s and early 2000s, there was growing recognition within Swedish energy policies of climate change mitigation and the need to transition to renewable energy sources (Nilsson, 2005; Uba, 2010). However, these preconditional changes in terms of limited operational control and a change in focus of national policies have not been reflected in legislation that regulates municipal energy planning. Instead, the latter change has taken the form of multiple government programmes promoting the development of voluntary Municipal Energy and Climate Strategies (MECSs), i.e. local strategies that primarily address climate change mitigation, through financial incentives (Gustafsson et al., 2015). Some of the themes addressed in the MEPs/MECSs prepared within the governmental programme of Sustainable Municipality (Uthållig kommun in Swedish) were i) municipal real estate, housing and premises, ii) municipal travel, transport, and public transport, iii) provision and distribution of renewable energy, and iv) spatial planning (Gustafsson et al., 2011). Thus, it is indicated that the scope of municipal energy planning has broadened from its traditional scope of addressing energy provision.

According to Fenton et al. (2012), the energy-planning process starts with an inventory of the current situation, for example, in terms of energy use, which is used as a basis for establishing visions and targets, followed by decisions on actions and measures as to reach the established targets that are compiled in an action plan. Further, the plan is prepared and subsequently implemented and monitored until it is time to be revised (Ibid.). Stenlund (2006) has pointed out that established goals in MEPs are achieved to a lesser extent when private actors are responsible for their fulfilment. Moreover, it has been argued by Ivner et al. (2010, p. 106) that 'for energy planning to be a tool that actually leads to change of the local energy systems the energy plan needs to be accepted among a broad range of actors, including industry and the public'.

Another emergent actor within Swedish energy planning is the County Administrative Boards (CABs). Within each county, they represent the national government, and their primary task is

to coordinate and supervise activities (Bäck, 2011). Traditionally, the regional level has been relatively passive in the area of strategic energy and climate efforts (Thoresson et al., 2010). However, since 2007, County Administrative Boards have been instructed to prepare Regional Climate and Energy Strategies (RCESS) with the aim of decarbonising the energy system in cooperation with concerned stakeholders, such as the municipalities (Palm, 2009). Therefore, the CABs have a coordinating role in these processes (Palm and Thoresson, 2014).

### 3.2 Municipal comprehensive planning and integration of climate change mitigation aspects

The Swedish municipalities have a so-called planning monopoly, which means that municipalities possess a high level of autonomy and that governments at higher levels have limited possibilities to interfere with spatial planning, other than through legislation, guidance and monitoring (Dovlén and Khakee, 2017). In this context, a vital planning instrument is the statutory Comprehensive Plan (CP), i.e. a strategic plan that should guide developments concerning land use and infrastructure development in the whole municipality over the next 10–20 years (Persson, 2013). Although the Comprehensive Plan is not legally binding, it can be considered to be indicative of future developments, which is then more precisely regulated in another statutory, and regulatory, detailed development plan (Hedström and Lundström, 2013; Högström et al., 2018).

The Planning and Building Act (2010:900), which regulates comprehensive planning, was substantially revised in 2010. Since then, the municipalities are required to indicate in the Comprehensive Plan how they intend to take into account national and regional objectives and programmes relevant to sustainable development and coordinate them with spatial planning. However, in a systematic review of 55 Comprehensive Plans, it has been shown by Persson (2013) that the concept of sustainable development is seldom concretised in comprehensive planning in terms of providing it with tangible content. Instead, the concept is often kept ambiguous and open to interpretation, with seemingly little effect on the planning content (Ibid.). Moreover, a study of 27 Comprehensive Plans by Dovlén and Khakee (2017) concluded that visions and strategies concerning energy and climate are rarely linked to implementation measures. Thus, if spatial planning is to be used as a tool to mitigate climate change, there is a need to further integrate energy and climate considerations into comprehensive planning, a notion which municipal energy and climate planning potentially can facilitate.

Additionally, there is a publicly elected authority at the regional level. Although responsibilities for the Regions (previously referred to as County Councils) vary, they often include providing health care and public transport as well as planning for investments in transport infrastructure and regional development (Gustafsson and Ivner, 2018). Furthermore, as one of few Regions, Region Stockholm are obliged to develop a regional development plan that should reflect the region's long-term vision in terms of development and land use (Högström et al., 2018). This plan is developed in co-operation with relevant regional actors, such as municipalities, and should act as guidance for decisions regarding e.g. municipal comprehensive planning (Ibid.).

### 3.3 Municipal wind power planning and governance

Given the need for careful consideration when identifying suitable locations for wind power, the municipal Comprehensive Plan becomes a vital forum for balancing wind power deployment in relation to other sustainability interests. If there are issues not sufficiently addressed in the adopted Comprehensive Plan, the municipalities have the option to develop thematic amendments to the CP (Balfors et al., 2018a). This was commonly done to address wind power in municipal comprehensive planning during 2007-2010, when a national financial support mechanism was in place for this particular task (Swedish National Board of Housing, Building and Planning, 2012).

In the Comprehensive Plan, different national and local interests should be considered and negotiated, the former often taking its expression in the form of Areas of National Interest (ANIs) (Bjärstig et al., 2018). ANIs regulated in chapter 3 of the environmental code address areas of particular ecological or cultural sensitivity, or areas suitable for specific land uses such as reindeer herding, outdoor recreation, military defence or energy production (e.g. wind power) (Bergek, 2010; Solbär et al., 2019). ANIs regulated in chapter 4 of the environmental code, on the other hand, covers cohesive areas embodying specific landscape and natural values, for example, mountainous areas, coastal areas and areas for tourism and outdoor recreation (Solbär et al., 2019). The ANIs can overlap with each other as well as with more formally protected areas, namely Natura 2000 areas, nature reserves, cultural reserves and national parks (Bjärstig et al., 2018). In case Areas of National Interest or areas of importance for total defence overlap with other ANIs from chapter 3 in the environmental code, the military interest should be given priority (1998:808). The designation of ANI does not give these areas definitive protection, and although the intent is to safeguard the values of the ANI, its formal effect will be determined in permitting processes (Solbär et al., 2019). The CABs have an important role for ANIs as well, since they are responsible for providing descriptions of the protected values for all ANIs in chapter four of the environmental code and ANI for cultural environment, ANI for nature conservation, and ANI for outdoor recreation in chapter three of the environmental code (County Administrative Board of Västra Götaland, 2018).

The Swedish municipalities have been given an additional central decision-making role in relation to wind power deployment. For larger wind parks (i.e. two or more turbines over 150 meters or seven or more turbines over 120 meters), which permissibility is tested according to the environmental code, the municipalities need to give their formal approval for a permit to be given (Rudberg et al., 2013). In effect, the requirement of a formal approval does become a municipal veto, and it is often referred to as such (Larsson et al., 2014). It was introduced in order to maintain local self-government, when legislation for wind power permitting was revised with the intent to streamline the permitting process (Ibid). There are no formal requirements regarding when this approval is to be given and it does not need to be motivated, and has in consequence added an insecurity for developers (Giest, 2018; Rudberg et al., 2013). The County Environmental Appeal Delegation initially handles the permit application for wind power, and if appealed, it may proceed to the Land and Environmental Court, and ultimately, the Land and Environmental Court of Appeal (Rudberg et al., 2013). Court cases decided by the highest instance should become precedential, and thus be indicative of the permitting practice in terms of balancing different interests.

### 3.4 Impact assessment tools in Swedish energy and climate planning

Impact assessments, which broadly can be defined as ‘the process of identifying the future consequences of a current or proposed action’ (Greig and Duinker, 2014, p. 23), must, according to Ivner and Hjelm (2009), be utilised in municipal energy planning to avoid shifting of environmental burdens. The tradition of conducting impact assessments is long. With the growing recognition of the anthropogenic effects on the environment during the 20th century, Environmental Impact Assessment (EIA), a process tool aimed at assessing the environmental impacts of projects, emerged in the 1960s (Caldwell, 1988; Glasson and Therivel, 2012). With EIA alone seemingly being inadequate on its own to pave the way for sustainable development, the notion of Strategic Environmental Assessment started being discussed in the late 1980s (Tetlow and Hanusch, 2012; Wood and Djeddour, 1992). It was promoted to address some perceived deficiencies of EIA and was intended to foster environmental considerations earlier in the decision-making process, bring focus to sustainability issues, and address large-scale and cumulative effects of multiple projects (Tetlow and Hanusch, 2012; Vanclay, 2004). According to the SEA Directive, the findings from the SEA process should be presented in an environmental report (EU Directive 2001/42/EC).

Sweden introduced impact assessment requirements in 1991 (Government Bill 1990/91:90). These requirements encompassed energy planning, and it is as for now required by the Act on Municipal Energy Planning (1977:439) that an analysis of the plan's impact on the environment, health, land and water and other resources (in this thesis referred to as an *environmental analysis*) should always be included for MEPs. It can be seen as an EIA-based impact assessment method with fewer procedural requirements when compared to SEA. Furthermore, due to the passing of the SEA Directive at the EU level (EU Directive 2001/42/EC), a Government Bill was passed in Sweden in 2004 to harmonise the Swedish Environmental Code with the Directive (Chaker et al., 2006). It has been stipulated that an SEA should be conducted for plans and programmes that are prepared or adopted by a national, regional or local authority, and which are required by legislative, regulatory or administrative provisions, if the plan/programme under assessment can be considered to bring significant environmental effects (EU Directive 2001/42/EC, 2001). A plan/programme is considered to bring significant environmental effects if, in turn, it sets the framework for future development consent for projects listed in Annexes I and II of the EIA Directive. The Swedish Environmental Protection Agency (2010) considers that MEPs, in general, fulfil these criteria and should therefore be subject to SEA as a rule of thumb. However, for MECs and RCEs, the impact assessment requirements are less clear as there is no explicit reference to these policy documents in the SEA legislation. However, the County Administrative Boards have been instructed to develop RCEs through the Annual letter of appropriation, which may be seen as administrative provisions, thus raising questions about SEA requirements. Nevertheless, impact assessment tools such as SEA can be employed voluntarily due to their potential benefits in plan-making and decision-making (Jay, 2010).

### 3.5 The Swedish National Environmental Quality Objectives

As previously mentioned, Sweden has adopted 16 NEQOs that describe the desired state of the environment and should lead the way to sustainability (Höjer et al., 2011). The objectives were to be met by 2020, however, only two of them are either achieved or close to being achieved (Swedish Environmental Protection Agency, 2019). In the NEQO system, it has been identified that a variety of synergies and conflicts can occur between the decarbonisation of the energy system and the other set objectives (Hildingsson and Johansson, 2016). Further, it can be highlighted that the NEQO system on its own lacks a way of handling conflicts (Edvardsson, 2004). This makes the NEQOs reliant on local action due to their vast responsibilities and mandates (Jörby, 2002; Larsson and Hanberger, 2016). Thus, there is a need to consider NEQOs and their potential conflicts and synergies in multiple sectors and levels of planning. However, the CABs also plays a role in these strategic environmental efforts, as they have been given the task, within their respective counties, of regionally promoting the achievement of the NEQOs (Swedish Government Official Reports 2015:43).

## 4. THEORETICAL FRAMEWORK

The theoretical framework intends to position the thesis in its theoretical context and presents a synthesis of theoretical concepts that have been used in the appended papers to varying degrees. The concepts are used as a theoretical lens to interpret the summarised results from all appended papers in the analysis section.

### 4.1 Local authorities in a multi-level governance context

In recent decades, scholars have recognised a dispersion of power – upwards, downwards and sideways from the central state (Hooghe and Marks, 2003; Stephenson, 2013). Through the introduction of the supra-national governance level with the European Union, Marks (1993, p. 392) discerned the emergence of multi-level governance, which he conceptualised as a system of continuous negotiation among the supranational, national, regional and local tiers of nested governments, while also recognising ‘the increasing importance of subnational levels of decision-making and their myriad connections with other levels’. Within this new, complex governance setting, due to the vertical and horizontal ‘stretching’ of power, which also includes non-state actors such as private companies, there is a need for increased interaction and collaboration amongst them in planning and decision-making processes (Bache and Flinders, 2004; Betsill and Bulkeley, 2006; Hughes et al., 2018).

Many scholars have emphasised the multi-level dimensions within climate governance, since the emissions originate from a local context but cause global impacts and as the multiple different actors have different complementary responsibilities (Jänicke, 2017; Jørgensen et al., 2015). Moreover, Gupta et al. (2007) envisage three different models for policy interactions within multi-level climate governance. A top-down model, which is characterised by central control and hierarchy, could be based on global climate thresholds that dictate national targets, which in turn are divided into sectoral and regional/local targets. A bottom-up approach, which promotes polycentricity and local voluntary initiatives, could depart from local policy potential that would guide national commitments, which dictates the joint global efforts on an aggregated level. Lastly, elements from the top-down and bottom-up climate governance models could be combined. In such a model, ‘...policy processes at each level seek their own space and equilibrium’ (Gupta et al., 2007, p. 144), for example, as national climate ambitions are shaped by national politics while simultaneously trying to balance and reconcile global ambitions and local needs. Additionally, local-level policies must not necessarily be shaped by national ones, but can evolve due to local dynamics and initiatives. When local governments are able to take their own voluntary initiatives in a bottom-up fashion, they may move beyond national targets and can thus contribute to advance climate ambitions (Kona et al., 2018).

Another common bottom-up feature of multi-level climate governance is the formation of inter-municipal networks, often of trans-national character, which is given high significance within multi-level climate governance in particular (Andonova et al., 2009; Kern and Bulkeley, 2009). It has been claimed that these networks can function as a mechanism for disseminating and exchanging information and knowledge, e.g. of methods and practices (Busch, 2015; Feldman, 2012). Moreover, they can aid to share resources and competencies (Fünfgeld, 2015) and gain a common voice for lobbying and advocating for the interests of the local governments (Haupt and Coppola, 2019).

An approach commonly used to provide top-down guidance to lower-level actors such as local governments within multi-level governance is management by objectives. Although this first emerged in the private sector, it now has a wide array of applications, including environmental policies (Edvardsson, 2004; Edvardsson and Hansson, 2005). Management by objectives can be perceived as a principle for organising the interrelation between policy-making and implementation, where elected representatives formulate broad, long-term objectives which, in

turn, are implemented by authority officials at different levels as they decide on measures and methods applied, often in cooperation with relevant actors (Lundqvist, 2004). Communication can also be needed for the top-down implementation sought for when using management-by-objectives, and Lundqvist (2004) states that the authorities at different levels of governance often decide on measures for reaching the objectives in cooperation with relevant stakeholders.

#### 4.2 Moving away from rational planning to more communicative forms of planning

Considering this development in multi-level governance as a backdrop, planning theory and practice have also taken a communicative turn in the last half-century, as will be elaborated in the following paragraphs. Rational process theories of planning gained wide recognition in the 1960s and early 1970s (Allmendinger, 2017). The rational planning paradigm denotes a positivist epistemology, where the core is to objectively base decisions on scientific knowledge and logic (Sandercock, 1997). According to Healey et al. (1982, p. 8), such processes generally concerns 'the clarification of policy goals, systematic analysis, logical generation of policy alternatives, systematic evaluation of these alternatives and monitoring performance'. In rational planning, this set of predetermined steps is taken sequentially, generally making it a linear process (Taylor, 1998). It is intended that the planners should find optimal solutions to pre-defined objectives set by decision-makers, which was thought to give a more efficient and streamlined governing and decision-making (Allmendinger, 2017). This mode of planning implies that the planning process is of exclusive concern to the authority with the planning mandate, with little involvement of other actors (Fenton et al., 2015).

The school of applying instrumental rationality in planning has gained criticism for various reasons. A general postmodern critique is that truth and knowledge are relative, socially constructed and embedded in a sociohistorical context rather than absolute and objective (Allmendinger, 2017). Sandercock (1997) argues that a plurality of knowledges needs to be accounted for in planning besides scientific and technical knowledge, such as experiential, intuitive and local knowledges expressed in forms other than the quantitative and analytical jargon. Two other criticisms of the rational planning school of thought are that this separation of means from ends cannot be made and that the necessary conditions for applying instrumental rationality in planning does not exist, as planners struggle with poorly defined problems, lack of information as well as limited time, skills and resources (Forester, 1989).

As a response to the rational planning ideal, Habermas (1984) argues that rationality needs to be reclaimed from this narrow, instrumental and analytical form and broadened to communicative rationality. This type of rationality centres around reaching an agreement and consensus between different parties through an open and just dialogue (Ibid.). Thus, planning should provide an arena for different stakeholders to meet and deliberate, which is thought to democratise planning (Allmendinger, 2017). According to Healey (1993), the outcome of the planning process, that is, the plan, shows how competing discourses and wills have been resolved. One of the perceived gains with stakeholder involvement of the kind proclaimed by the communicative school of thought would be gaining legitimacy for the planning outcomes (Larsen and Gunnarsson-Östling, 2009). This gained legitimacy can, in turn, aid the implementation of the plan if the planning proponent and the other involved stakeholders jointly have arrived at common goals (Gustafsson et al., 2015).

A key criticism of communicative planning is that it takes a highly normative stance regarding an idealised state of processes, but provides less tangible instructions for achieving this in practice (Allmendinger, 2017). An issue that can emerge in such communicative processes is that of power, i.e. that more powerful actors can have more influence and even define what is to be seen as rational (Flyvbjerg, 2002; Flyvbjerg and Richardson, 2002). Furthermore, it has been proclaimed that communicative processes do not necessarily lead to more sustainable outcomes (Murray, 2005). In consequence, even though more communicative forms of planning should be able to accommodate aspects of environmental justice, such as recognitive justice and

procedural justice, it is not certain that distributive justice can be gained (Ntiwane and Coetzee, 2018). Finally, Rydin (2007) argues that in a pluralistic process, it is important to differentiate between knowledge claims and other claims, e.g. of aesthetic character, and handle these claims differently.

In response to the need to interact with actors at a variety of levels, municipal comprehensive planning in Sweden has shown a trend of moving from rational planning approaches towards more communicative forms (Fredriksson, 2011). This trend also echoes within energy planning (Fenton et al., 2015; Stenlund Nilsson Ivner, 2009). Because, as highlighted by Fenton et al. (2015), the involvement of actors affect the potential scope of the plan/strategy, since external stakeholders need to be involved in the planning process if their emissions are to be productively and legitimately addressed. Further, the generation of greenhouse gases emissions is caused by a multitude of actors, such as citizens and private corporations, and their individual behaviours and decisions (Bulkeley and Newell, 2015). Thus, there appears to be a need for communicative processes within local and regional energy and climate planning if a broader scope than the authorities' own emissions should be applied.

Within this more complex governance and planning context, so-called soft spaces of planning have also emerged. This means 'informal or semiformal non-statutory spatialities of planning with associations and relations stretching both across formally established boundaries and scalar levels of planning and across previously entrenched sectoral divides' (Metzger and Schmitt, 2012, pp. 265–266). Such emergent soft spaces can both supplement and supplant existing hard, i.e. statutory, planning spaces (Ibid.). These soft spaces can be seen as a response for planning to be more dynamic in a relational and increasingly complex world. However, such soft spaces can also be seen as a diversion to mask planning objectives and outcomes (Allmendinger, 2017). Although flexible, these informal planning spaces bring questions regarding transparency, accountability, and ultimately democracy, if statutory planning systems with their regulatory requirements are side-stepped.

#### 4.3 Promoting environmental considerations in planning

Impact assessments stem from rational, positivist schools of thought, and its theory initially revolved around the conviction that decision-making would be improved by quantifiable and objective analysis of environmental effects (Tetlow and Hanusch, 2012). However, similarly to planning, impact assessment has taken a 'communicative turn' (Richardson, 2005). This could be said to be a part of a broader trend within SEA, i.e. to shift from the so-called Impact assessment-based SEA, in which the focus is to quantitatively and reactively predict environmental impacts (Nilsson and Dalkmann, 2001; Partidário, 2000), towards objectives-based SEA (Pope et al., 2004) or strategic-thinking SEA, which centres around proactively shaping of conditions that enable the formulation and assessment of alternate pathways for achieving some sustainability objectives or a sustainability vision (Noble and Nwanekezie, 2017; Partidário, 2012). In a strategic thinking SEA process, key stakeholders should be continuously engaged to reach consensus and find joint opportunities (Partidário, 2021). Partly through the preparation of the environmental report and partly through fostering stakeholder involvement, SEA is intended to strengthen the transparency of decision-making (Tetlow and Hanusch, 2012; van Doren et al., 2013). A potential benefit of SEA, closely related to the notion of being able to consider environmental aspects in the early stages of planning, is being able to facilitate the consideration of higher-level sustainability objectives (Stinchcombe and Gibson, 2001; White and Noble, 2013). Moreover, if SEAs are conducted regionally, they can aid to steer and direct impact assessments conducted at the local level, a concept referred to as tiering (Therivel, 2010).

#### 4.4 Institutional capacity building and organisational learning

A theoretical concept with clear links to the collaborative planning theory discourse is institutional capacity building. It refers to ‘the ability of administrative and government organizations and agencies to respond to and manage current social and environmental challenges through decision-making, planning and implementation processes’ (Polk, 2011, p. 187). This section elaborates on the institutional capacity building framework described by Healey et al. (2003, 1999) and Healey (1998). In this framework, institutional capacity building is composed of the dynamic and fluid interaction of three dimensions, namely *Knowledge resources*, *Relational resources* and *Mobilisation capacity*, as visualised in Figure 1. The institutional capacity is thus shaped over time by *internal evolutions*, i.e. changes due to ongoing internal efforts and procedures, as well as *external pressures*, for example, manifested in the need to respond to ongoing global warming. A local government needs both a strong institutional capacity and a local *openness* in order to appropriately respond to intense *external pressure*, with a lack of the former leading to *fragmented* responses and a lack of the latter leading to *inertia*. The constituents of the three different dimensions of institutional capacity are elaborated in the following paragraphs.

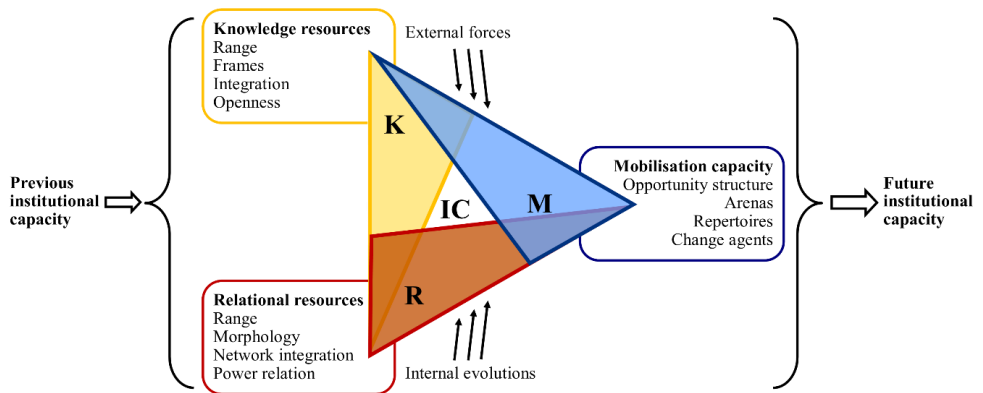


Figure 1. Conceptualisation of the development of institutional capacity. Based on Healey et al. (1999), Healey et al. (2003) and Healey (1998). Abbreviations: IC (Institutional Capacity), K (Knowledge resources), R (Relational resources), M (Mobilisation capacity). (Paper III)

Firstly, *Knowledge resources* encompass the *range* of knowledge resources accessible, including explicit and tacit, systematised and differential. This component emphasises the need for cross-sectoral processes to enhance the different knowledge resources that can be utilised. Another component is the *frames*, i.e. the underlying conceptions that shape how information is given meaning and is being interpreted. Furthermore, *Knowledge resources* include the level of *policy integration* of the range of knowledge and different policy domains. This concerns the incorporation of the aims of a particular policy, such as climate change mitigation, into all steps of policy-making in other sectors, along with a commitment to decreasing contradictions between different policies (Mickwitz et al., 2009). Lastly, the dimension includes the *openness* to new ideas, i.e. how well such novel ideas can be absorbed and meshed with local practices.

The dimension of *Relational resources* refers to the *range* of internal and external stakeholders engaged in local planning and governance; a notion entangled with the range of *knowledge resources* accessible. Further, the *morphology*, in other words, the structure, of the different networks in which these stakeholders are situated, is considered. This is interconnected with the component of the *network integration* of different relational webs that transects a place. Jointly, they affect how information can flow between different actors and how they can be involved in a strategic process. Both of these components relate to the previously mentioned concept of inter-municipal networks. Fourthly, *Relational resources* encompass the *power relations*, which comprises

both how relations are managed and can be accessed (i.e. open and built on trust versus closed and hierarchical) as well as where the resource allocating power is situated within the different networks and whether they can be influenced.

The final dimension of Mobilisation capacity covers an *opportunity structure*, i.e. the perceptions of different stakeholders regarding the desirability, opportunities and constraints for institutional change. A closely related aspect within the literature of local climate governance for gaining local support and legitimacy for climate change mitigation actions is to provide the issue of climate change with a local framing (Ryan, 2015). This means emphasising local problems resulting from climate change or the potential local benefits that climate action could bring (Bulkeley, 2010; Bulkeley and Betsill, 2003). By showing the potential environmental and socio-economic co-benefits that various GHG mitigation measures could bring in the local context, it can facilitate in gaining broader political support, thereby aiding policy implementation (Ryan, 2015). Moreover, *Mobilisation capacity* considers the institutional *arenas* developed and utilised for targeting mobilisation efforts and the *repertoires* of mobilisation techniques and tools used in the process. Finally, the presence of *change agents*, i.e. persons that are critical for the mobilisation efforts, in different key stages is included. This can be either elected or appointed government officials which can advocate and persuade other actors regarding the need for, for example, local climate policies (Bulkeley and Kern, 2006). These persons can however only push efforts to a certain extent until it will be dependent upon a broader institutional capacity 'in order to overcome the constraints of administrative structures...and to survive the loss of particular individuals' (Bulkeley and Kern, 2006, p. 2253).

When discussing the need for a broader institutional capacity to, e.g. cope with the loss of change agents, a closely related concept is that of organisational learning. Organisational learning can be understood as a process where knowledge created by individuals is transformed into institutionalised actions towards organisational objectives (Silva et al., 2013). Thus, it should be recognised as something distinct from the sum of individual learning (Pelling et al., 2008). Storbjörk (2010, p. 239) claims that 'learning-oriented reflexive processes are an important condition for climate change considerations to be made part of the structure, practices and behaviour of actors and organizations and administrative units from different sectors and levels'. Organisational learning can either be of *single-loop* character, i.e. a more technical form of learning by identifying alternative strategies or actions for addressing or improving specific problems or challenges, or have *double-loop* features, which involve questioning and transforming values, norms, and structures (Argyris, 1976; Silva et al., 2013). These different described concepts can jointly contribute to the different responses a local authority may take for climate action, both in strategic planning processes and through their daily practices and routines.

## 5. METHODOLOGY, MATERIALS AND METHODS

This section gives an overview of the research methodology and methods employed. In the next paragraph, the philosophical base of the thesis is detailed. Subsequently, the different research projects that the author have participated in and the progression between them are elucidated. This is followed by a general description of the research design and the methods employed for data collection and analysis.

The conducted research is generally underpinned by the philosophical stance of critical realism. Critical realism acknowledges that an objective reality exists but that the observations are influenced by various social and cultural frames (Mukumbang, 2021; Zachariadis et al., 2013). It is thus a philosophy of science that attempts to bridge the divide between positivism and constructivism (Fletcher, 2017). Critical realism allows for investigating underlying structures and mechanisms, and causal inferences can be made, informed by theories, whilst still recognising that theories may be impartial or incomplete and that interpretations are context-dependent (Shannon-Baker, 2016). It is a stance that recognises that quantitative and qualitative methods can bring complementary insights, and is thereby well-suited for mixed methods research addressing complex and multi-faceted phenomena (Mukumbang, 2021; Shannon-Baker, 2016).

### 5.1 Research projects and research progression

The five appended papers stem from three different research projects funded by the Swedish Energy Agency. The first research project I participated in was STEP - Strengthening the strategic municipal energy planning (project number 41347-1). The project ran from late 2015 until the end of 2018 and aimed to investigate the current municipal energy planning practice and identify challenges for achieving effective municipal energy planning that contributes to Sweden's climate objectives. My first involvement in STEP stems from the master's thesis written together with Gustaf Byström (Byström and Wretling, 2016). These initial findings were then further expanded on both empirically and theoretically throughout the research project. Two key challenges identified were impact assessment and the link between energy planning and comprehensive planning. Within STEP, a cross-sectional document analysis covering all Municipal Energy Plans and Municipal Energy and Climate Strategies, jointly referred to as *energy and climate-focused policy documents*, was conducted in order to obtain a comprehensive overview of the current energy planning practice. This document analysis contained both elements of quantitative content analysis, in order to e.g. classify types of document and types of impact assessment conducted, and thematic analysis, to investigate the link between energy planning and comprehensive planning and elucidate commonalities within SEA screening statements in MEPs/MECSs. Furthermore, interviews were held with practitioners in eight municipalities to complement the quantitative results and gain some insights into their planning and impact assessment processes, as well as their daily work. The interviewees were chosen as they represented municipalities that had either i) conducted an SEA (three municipalities), ii) set ambitious targets (one municipality), iii) applied a broad scope, including consumption or waste perspective (two municipalities), or iv) shown the integration of energy and climate considerations into their CP (three municipalities). Paper I and II originate from this research project.

The two latter projects ran slightly in parallel. One of these projects was ECLIPSE - Energy and climate in spatial planning through local and regional cooperation (project number 47308-1), which lasted from late 2018 until the end of 2020. This was a collaborative project, with the County Administrative Board of Stockholm as project leader. In this project, the focus shifted to the integration of energy and climate aspects into spatial planning, with the aim of contributing towards capacity building on this topic for municipalities and other relevant regional actors in Stockholm County. To gain an understanding of the practitioners' view on the integration of

energy and climate aspects into spatial planning, a survey was sent out to the two target groups of municipal comprehensive planners and municipal energy and climate strategists (or similar).

Moreover, two municipalities, Danderyd and Nykvarn, were selected as pilot municipalities, which meant that interviews were held with their respective comprehensive planners and strategic energy and climate officials and that they were offered external process support through three workshops to facilitate the integration of energy and climate aspects in their comprehensive planning process. I participated in the form of an observer in these workshops. By utilising two case study municipalities, the mechanisms that shaped the institutional capacity building regarding integrating energy and climate aspects into spatial planning could be examined more in-depth. Additionally, with the purpose of investigating whether the integration of energy and climate aspects into spatial planning has developed over time, a longitudinal document analysis of municipal Comprehensive Plans of eight municipalities situated in Stockholm County was carried out. A focus group interview was also held with officials from these eight municipalities to gain their views regarding the institutional capacity building over time for integration of climate change mitigation concerns into spatial planning as complementary input. The findings from this project are presented in Paper III and Paper IV.

The final research project was REWIND – Regional wind power planning (project number 47380-1). This project has run since late 2018 and will finish in 2022. Within the REWIND project, there are two work packages. The first one, in which I have participated, focuses on investigating how sustainability aspects are considered and weighted in relation to wind power deployment within Swedish wind power planning and precedential court cases. The results from this work package then feed into the second one, which develops different scenarios through GIS-based multi-criteria analysis. Together, they contribute to a joint discussion regarding hindrances and opportunities for wind power planning at the regional level. In the first work package, a cross-sectional document analysis covering all municipal policy documents focusing on wind power, in this thesis jointly referred to as *wind power plans*, as well as the Comprehensive Plans, was employed to provide an overview of the wind power planning practice. Moreover, a selection of 37 wind power plans was analysed thematically to investigate how different sustainability concerns are handled in municipal wind power planning, and precedential court cases with spatial considerations linked to key themes identified in the thematic analysis were synthesised. A focus group interview was also arranged with six municipal practitioners representing four municipalities in Västernorrland County to gain insights regarding the practitioners' views regarding their capacities and drivers for municipal wind power planning and the perceived need for inter-municipal and regional-local co-operation. Västernorrland was the county producing the most wind power in 2020, and the interviewed practitioners have thus had the experience of both being involved with planning for proposed wind power developments and subsequently witnessing the associated effects of the deployment. Paper V presents findings from the first work package in REWIND.

In terms of my role in the different research projects, there has been a progression throughout. In the first research project, STEP, the broader research design had been pre-determined through the research application, which I not had been involved in writing. This stands in contrast to ECLIPSE, where I partook in writing up the research application and had great freedom when forming the capacity building part of the project, as well as the research part, in terms of designing the survey, structuring the document analysis and setting up the focus group interview. In the final research project, a new key challenge emerged in the form of including court cases in the document analysis, thereby being required to engage with the intersection of environmental law and planning to a greater extent. Additionally, the coordination of two different work packages relating to different sub-disciplines has been a novel rewarding experience. A stimulating aspect of my research journey has been exploring and combining different methods in different ways throughout the papers. Although document analyses have been applied in numerous papers, the variation between cross-sectional and longitudinal research approaches have given insights regarding how profoundly research design influences the potential research questions that can be explored and the conclusions that can be made. Last but

not least, I have realised how valuable it has been to combine quantitative and qualitative methods to gain a more nuanced and rich depiction of the entity of study.

## 5.2 Research design

This doctoral thesis has employed a mixed methods research design. Mixed methods can be defined as ‘combined elements of qualitative and quantitative research approaches (e.g. use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration’ (Johnson et al., 2007, p. 123). Quantitative methods can be characterized by closed-ended questions and responses, often involving numbers, whereas qualitative methods have open-ended questions and responses, generally dealing with words (Creswell and Creswell, 2017). The quantitative data have been collected and extracted through quantitative content analyses, surveys (closed-ended questions) and statistical analyses, whereas the qualitative data has been gathered through interviews, focus group interviews, participant observation, surveys (open-ended questions) and thematic analyses. The strengths of the different approaches can be exploited through mixed methods, i.e. adding meaning to numbers and vice versa, providing precision to narratives (Johnson and Onwuegbuzie, 2004). Moreover, by studying the same phenomena with a deviating set of methods, this triangulation can strengthen the validity of the conclusions, if convergence and corroboration of the results are gained (Heale and Forbes, 2013). An overview of the different sets of methods applied in each paper is provided in Table 1.

Table 1. Overview of methods applied in the different papers.

Method	Paper I	Paper II	Paper III	Paper IV	Paper V
<i>Literature review</i>	✓	✓	✓	✓	✓
<i>Interviews</i>	✓	✓	✓		
<i>Focus group interview</i>				✓	✓
<i>Survey</i>			✓		
<i>Participant observation</i>			✓		
<i>Quantitative content analysis</i>	✓	✓			✓
<i>Thematic analysis</i>	✓	✓		✓	✓
<i>Statistical analysis</i>	✓	✓		✓	

The document analyses employed in the three different research projects have varied in terms of being either cross-sectional or longitudinal. A cross-sectional research design encompasses ‘the collection of data on *more than one case* (usually quite a lot more than one) and at a *single point in time* in order to collect a body of *quantitative or quantifiable data* in connection with two or more variables (usually many more than two), which are then examined to detect *patterns of association*’ (Bryman, 2012, p. 58, italics in original). As highlighted by de Vaus (2001), a cross-sectional research design is often associated with the use of questionnaires or similar, but could well be utilised through other methods such as document analysis. On the other hand, a longitudinal

research design implies that data is collected in at least two waves, from the same study objects and regarding the same variables (Bryman, 2012). Since the two data sets produced differ temporally, it may allow to make causal inferences and distinguish features regarding the progression over time (Ployhart and Vandenberg, 2010).

### 5.3 Literature review

The literature has been iteratively reviewed along with the conducted research. A literature review is a vital part of any research project, to gain knowledge on the research topic as well as important concepts and theories in the field, and to put the conducted research in context (Bryman, 2012). Therefore, literature reviews have been performed to provide a backdrop in the appended papers as well as in the thesis. As to initiate the literature review, searches of scientific literature were conducted using keywords related to the research study. This procedure was supplemented with forwards and backwards snowballing techniques, i.e. searching for papers cited in the collected journal articles and other papers published subsequently that cite them, as described by Wohlin (2014). Moreover, grey literature in the form of different municipal plans was collected more in a more structured procedure for the conducted research in Paper I, II, IV and V. This enabled the execution of the quantitative content analyses and thematic analyses as described in Section 5.8 and Section 5.9, where the different criteria for collecting the policy documents are briefly described, and with further details provided in each paper.

### 5.4 Interviews

Interviews can be simply defined as a conversation ‘with the purpose of obtaining descriptions of the life world of the interviewee in order to interpret the meaning of the described phenomena’ (Kvale and Brinkmann, 2014, p. 6). Qualitative interviews are more flexible than quantitative research methods and, in this regard, can be more adaptive and flexible in each case (Flick et al., 2004). Further, they can help gain individual perceptions of processes (Amaratunga et al., 2002). Qualitative studies can also offer explanations when interpreting statistical relationships (Flick et al., 2004). Interviews were conducted with municipal practitioners from eight municipalities within the research project STEP, to gain knowledge regarding the municipal energy and climate planning practice, the associated use of impact assessment and integration into Comprehensive Plans. These interview results were reported in both Paper I and Paper II. Additionally, in Paper III, interviews were held with energy and climate strategists or similar and comprehensive planners in the two case study municipalities, Danderyd and Nykvarn. The interviews followed a semi-structured approach, where the conversation departs from an interview guide with open-ended questions, but permits some flexibility in response to the respondents’ answers, in accordance with Kvale and Brinkmann (2014).

### 5.5 Focus group interview

A focus group interview entails data collection through group interaction on a pre-defined subject (Morgan, 1997). Through discussion with a selected group of individuals, this method intends to provide in-depth insights regarding their knowledge, perceptions and attitudes (Dilshad and Latif, 2013). As underlined by Nyumba et al. (2018), the role of the researcher is often to facilitate the discussion between the participants, thereby undertaking a more peripheral role compared to individual interviews. Focus group interviews were utilised in Paper IV, with municipal comprehensive planners representing the municipalities studied in the longitudinal document analysis participating, and in Paper V, targeting municipal officials involved in wind power planning in Västernorrland County.

## 5.6 Survey

Surveys are a cross-sectional research method, in the sense that data are collected on multiple objects, most often at a single point in time, through the use of a questionnaire (Bryman, 2012). A questionnaire is simply a series of questions asked to different individuals to gain their perception of a topic (Roopa and Rani, 2012). It is often recognised as a means to get quantitative or quantifiable data, although open-ended questions allow the gathering of qualitative data as well (Adamson et al., 2004). A survey was used in Paper III, to gain the views held by comprehensive planners and energy and climate strategists regarding the integration of energy and climate aspects into spatial planning.

## 5.7 Participant observation

Participant observation can be defined as a process for learning about the activities of the studied individuals through observing and participating in the undertaken activities in their natural setting (Kawulich, 2005). While participating, the observer must also record the observations, thus making participant observation predominantly generating qualitative data (Iacono et al., 2009). The level of participation and engagement can vary wildly, from taking an active part in the studied environment on near equal terms as the study objects to act as a fly on a wall with next to no interaction (Seim, 2021). Participant observation was utilised in the three workshops arranged for the case study municipalities, respectively, with a low level of engagement and a focus on observing the interaction between the officials and external participants, if any. The findings were reported in Paper III.

## 5.8 Quantitative content analysis

Quantitative content analysis can be defined as ‘the systematic assignment of communication content to categories according to rules, and the analysis of relationships involving those categories using statistical methods’ (Riff et al., 2014, p. 3). The main stages of a quantitative content analysis involve first selecting a sample and then developing a coding scheme, comprising a coding schedule (i.e. what questions should be probed within each document) and a coding manual (i.e. how should these questions be answered) (Bryman, 2012). The material is then analysed according to the coding scheme and the coding manual, sometimes iteratively, to gain sufficient quality in terms of consistency (Krippendorff, 2004).

In Paper I and Paper II, a quantitative content analysis encompassing all energy and climate-focused policy documents adopted by all of Sweden’s 290 municipalities and the Regional Climate and Energy Strategies adopted by the 21 County Administrative Boards during 2004–2015 was chosen as the primary method. This design was deemed fitting as it enabled a broad examination of the current state of the energy-planning practice and accommodated the investigation of relationships between variables. Further, it permitted the further exploration of certain research questions through the subsequent performance of text search and thematic analyses. The municipal policy documents were categorised as either Municipal Energy Plans or Municipal Energy and Climate Strategies. All the MEPs were then further sub-categorised as either a traditional energy plan or an energy plan and climate strategy, the latter if the title indicated that a broader scope than the provision of energy had been utilised. This part of the document analysis was presented in Paper I.

The impact assessment practice was examined partially by classifying any impact assessments (i.e. SEA or environmental analysis) that had been conducted for all municipal and regional policy documents. Further, any SEA screening statements were noted, and the outcome of the screening, i.e. if it was decided to conduct a full-scale SEA or not, was also classified. To investigate the extent to which National Environmental Quality Objectives are incorporated into Swedish energy and climate planning, a text search was conducted on the collected and classified

policy documents. Text searches can be seen as a sub-set of quantitative content analysis. It comprises the scanning of textual databases to find, count, or retrieve text (Krippendorff, 2004). Each NEQO was searched for, and their occurrence was then compared depending on the type of impact assessment. The part of the quantitative content analysis relating to the execution of impact assessment and inclusion of National Environmental Quality Objectives was reported in Paper II.

## 5.9 Thematic analysis

Thematic analysis, in Paper IV and V also referred to as qualitative content analysis, is defined by Braun and Clarke (2006, p. 79) as a ‘method for identifying, analysing and reporting patterns (themes) within data’. It is a flexible method for providing a detailed and nuanced account of the dataset (Vaismoradi Mojtaba et al., 2013). The standard procedure for a thematic analysis is to get familiarised with the data, generate initial codes, search for and review themes, define and name the emerging themes, and lastly, report the results (Braun and Clarke, 2006). Thematic analyses were employed in four instances. Firstly, they were used for a selection of municipalities in which an MEP/MECS had been adopted within three years prior to the adoption of a Comprehensive Plan, in order to investigate the influence of energy planning on comprehensive planning regarding energy and climate-related targets or strategies (reported in Paper I). Secondly, thematic analysis was employed when investigating the SEA screening practice to discern the basis of the decision, i.e. whether a full-scale SEA was necessary or not (reported in Paper II). Moreover, this method was employed in Paper IV to identify the different strategies integrated into the CPs relating to energy, transport and land use, and in Paper V to identify which sustainability concerns were balanced in relation to wind power deployment and how they were weighed against each other, for a selection of 37 wind power plans. Common to these analyses was that relevant text was first selected and then iteratively read in order to identify commonalities among the highlighted text in the different policy documents and to be able to formulate themes regarding the content of the text.

## 5.10 Statistical analysis

Statistical analyses are important in social research as well, since quantitative or quantifiable data is also generated in social science, and because quantitative results can be more pervasive, according to Bryman and Cramer (2005). Statistical methods can be used to test the strength of relationships between different variables (Amaratunga et al., 2002). Different types of statistical analysis include methods for analysing a single variable independently (univariate analysis), relationships between different variables (bivariate analysis), or relationships between three or more variables (multivariate analysis) (Bryman, 2012). Further, a differentiation can be made between descriptive statistics, aiming to summarise or describe the collected data, and inferential statistics, which intends to draw conclusions regarding characteristics of the data, such as the relationship between different variables (Byrne, 2007). All papers have made use of descriptive statistics to summarise different results.

Additionally, some bivariate analyses have been performed in Paper I and II. The relationship between population size and the propagation of municipal energy planning, as well as between population size and the continuity of municipal energy planning, was analysed respectively, the results of which are presented in Paper I. Further, two statistical evaluations were conducted concerning the impact assessment practice, which is reported in Paper II. This encompasses an examination of the relationship between the execution of impact assessment and type of adopted policy document (i.e. statutory MEPs versus voluntarily adopted MECS), along with an evaluation of the relationship between the type of impact assessment conducted and the inclusion of NEQOs in the respective policy documents. Lastly, in Paper IV, it was investigated

whether the median values differed between the set of old Comprehensive Plans, in comparison to the recently adopted Comprehensive Plans.

#### 5.11 Theoretical analysis of results

The findings from Paper I-V, presented in Section 6, are jointly analysed by aid of the theoretical framework, as described in Section 4. By interpreting the results on the basis of the presented theories, the framework assists in positioning the results in a theoretical context and illuminates different parts of the empirical material of particular theoretical relevance.

## 6. RESULTS

The main result of each appended paper is summarised under the respective sub-heading below.

### 6.1 Strategic municipal energy planning in Sweden – Examining current energy planning practice and its influence on comprehensive planning (Paper I)

This paper has established an overall aim to examine the municipal energy planning practice and its influence on comprehensive planning. More specifically, Paper I aimed to investigate the propagation, function and use of energy and climate-focused policy documents during 2004–2015, as well as to analyse the influence of such policy documents on Comprehensive Plans in terms of energy and climate-related targets and strategies. This was achieved through a document analysis comprising elements of both quantitative content analysis and thematic analysis and semi-structured interviews with municipal practitioners from eight municipalities.

#### Overview of energy and climate planning practice

Table 2 highlights that nearly three-fourths of the Swedish municipalities have adopted at least one energy and climate-focused policy document, i.e. a MEP or a MECS, during the studied time span. Moreover, 61% of the municipalities had adopted an Energy Plan as per the Act on Municipal Energy Planning, out of which only 56 had been classified as traditional energy plans. Notably, two MEPs had been produced through inter-municipal co-operation by two and three municipalities, respectively. Two Wilcoxon rank-sum tests illuminated that more populous municipalities were more likely to have adopted an energy and climate-focused policy document, and this adopted policy document was also more probable to be up-to-date.

*Table 2. Number and share of municipalities that have adopted MEPs or MECSs during 2004–2015 (Paper I).*

	Municipalities with MEP	Whereof traditional energy plan	Whereof energy plan and climate strategy	Municipalities with MECS	Municipalities with either MEP or MECS	Municipalities with MEP/MECS adopted 2010–2015
<i>Number</i>	176	56	120	50	213	135
<i>Share</i>	61%	19%	41%	17%	73%	47%

According to Figure 2, two notable trends can be discerned during the studied time period 2004–2015. Firstly, there is a peak in the number of annually adopted policy documents during 2010–2011, followed by a gradual decline in the coming years. Secondly, a gradual shift in the type of policy document adopted can be identified, where the municipalities move away from traditional energy plans in favour of policy documents with a broadened scope, such as a joint energy plan and climate strategy or an energy and climate strategy.

The energy and climate-focused policy document is considered to be vital by the interviewees, since it is politically adopted and should function as a point of reference for municipal officials, including any municipally owned energy and housing companies. If the MEP/MECS retains broad political support and support from different departments, it thus enables officials to push through different measures for climate change mitigation. However, there were different views on the municipality's possibility to influence the total energy use and GHG emissions within the municipal borders. Consequentially, three of the interviewed municipalities only included strategies and measures that the municipality could implement on its own. Three of the interviewed officials also stressed the advantage of having energy and housing companies within the municipal concern, in order to be able to influence, for example, electricity and heating production. In relation to their ability to influence, two interviewees expressed that a lack of co-operation in-between different departments hinders strategic energy and climate planning. The interviewees witness that the Regional Climate and Energy Strategies have been influential for the municipal energy and climate strategic planning process, especially regarding establishing quantitative targets concerning e.g. GHG emissions.

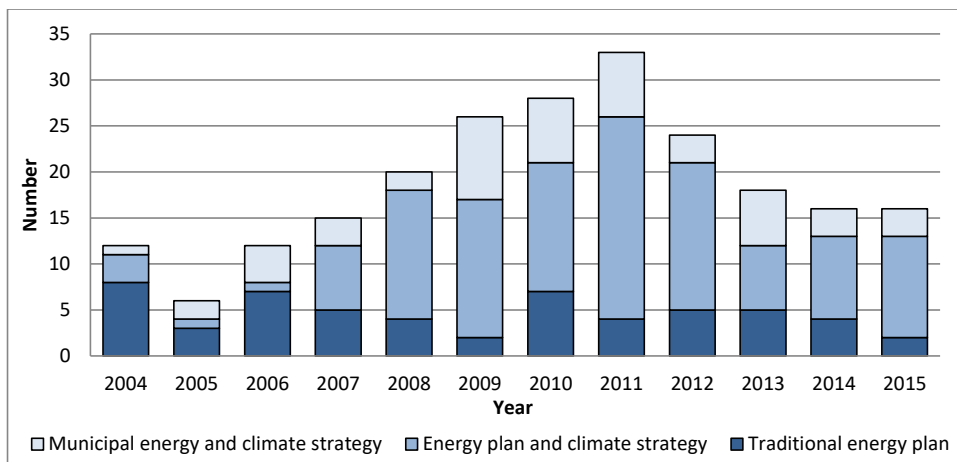


Figure 2. Number and type of adopted municipal policy documents per year (Paper I).

It was considered by all interviewees that the Act on Municipal Energy Planning needs to be revised or that it is outdated, since the sustainability perspective which they focus on in their planning, i.e. reducing climate emissions and other environmental impacts, not are sufficiently reflected in the Act. Two interviewees still recognise the value in that the Act is in place, since it can encourage that energy and climate planning in some form is conducted. Moreover, some interviewees expressed that financial issues are a concern. The municipalities experience a pressure of being cost-efficient and can thus find it challenging to fund different measures without financial support, which needs to be predictable and long-term.

There were different reasons for initiating the energy and climate strategic process in the interviewed municipalities. Most often, it was either for the sake of becoming eligible for state funding or due to political will, whereas the initiative in one of the municipalities came from the interviewee, since the official identified a need for having a tool to implement different measures. Cross-sectoral working groups were formed in all municipalities, and three of the municipalities also had political steering groups. Local energy companies, either municipally or privately owned, and municipal housing companies often participated. Additionally, one of the municipalities had a citizen dialogue, which led to the input of ideas and provided support to parts of the content of the plan. One interviewee expressed that the up-to-dateness of the energy plan should be reviewed each term of office, similar to the CP.

#### Relation between municipal energy and climate planning and comprehensive planning

The analysis of a sub-set of CPs, which had been adopted within a three-year interval after the adoption of an energy and climate-focused policy document, highlighted that energy and climate-related targets or strategies had been integrated into nine-tenths of the studied CPs (Figure 5 in Paper I). Targets or strategies were most often of a qualitative character (91%), with quantitative targets being identified in half of these CPs. Furthermore, as displayed in Figure 5 in Paper I, at least some of these targets and strategies predominantly corresponded to the previously adopted MEP/MECS; this was always the case for quantitative targets. As conveyed by Figure 3, the targets or strategies identified in the CPs most often addressed the theme of renewable energy and reduced greenhouse gases emissions. Moreover, about 70% of the previously adopted MEPs/MECSs included explicit links to spatial planning. Most commonly, it was broadly declared that energy and climate considerations would form the basis for spatial planning (Figure 3).

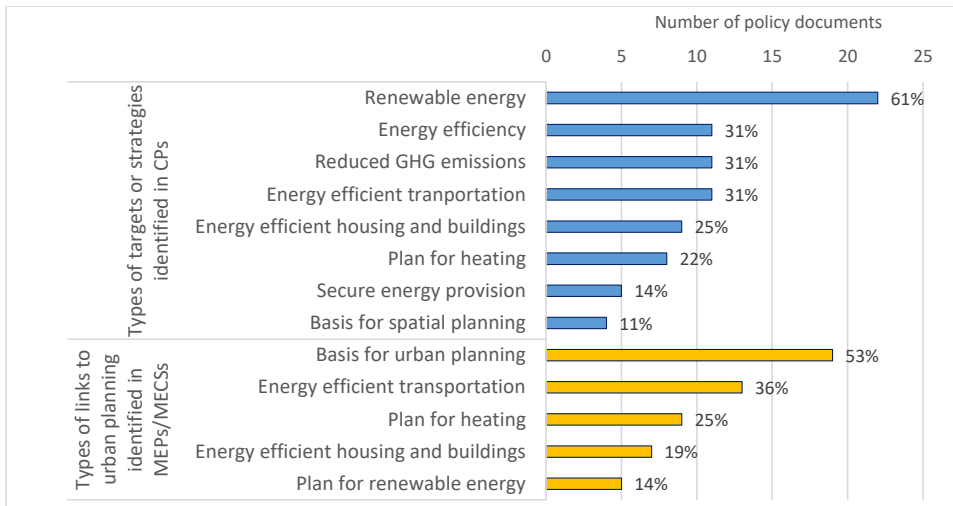


Figure 3. Types of targets or strategies identified in CPs (blue staples) and types of links to urban planning identified in the preceding MEPs/MECSs (yellow staples). The horizontal axis indicates the number of plans that had included a specific type of target or strategy, with the percentage values representing the share of the total number of analysed plans that had included the specific target or strategy. Based on Table 2 and Table 3 in Paper I.

All of the interviewees asserted that strategies or measures relating to spatial planning had been incorporated into their MEP/MECS, with the intent to integrate such standpoints into forthcoming Comprehensive Plans. However, this can create political conflicts, especially in relation to whether housing development only should occur in more dense, urban areas, or whether the demand for more secluded housing should be accommodated as well, with its associated implications for increased transport demand and car dependency. Moreover, all interviewees but one claimed that spatial planners were involved in the energy and climate strategic process to some extent, although the degree of involvement varied. Conversely, five interviewees were or had been involved in the comprehensive planning process to some degree. In one municipality, the comprehensive planning process and energy and climate strategic process were initiated jointly, by identifying suitable areas for densification with the intent to achieve an energy and transport efficient urban form. The outcome of this joint effort then formed the basis for the forthcoming separate comprehensive planning process.

## 6.2 SEA screening practice and the inclusion of environmental objectives in Swedish energy and climate planning (Paper II)

The overall aim of Paper II was to contribute with knowledge regarding the continuing changes within municipal and regional energy and climate planning practice regarding the use of SEA and inclusion of NEQOs. Further, the paper analysed the role of SEA screening and its effects on the impact assessment practice as well as examined the inclusion of National Environmental Quality Objectives in municipal and regional energy and climate-focused policy documents. Similarly to Paper I, document analysis and semi-structured interviews were employed to achieve the aims of the paper.

### Screening procedures and execution of impact assessment

The investigation of the screening practice within municipal energy and climate planning showed that a screening statement had been included in 51 of the 226 studied policy documents. All but two policy documents that had included a screening statement were MEPs, the remaining two stemming from MECSs, and consequentially, no screening statements were identified in the RCESs. Only ten of these 51 statements concluded that an SEA was necessary, with a variety of

arguments given to support this stance, as presented in Figure 4. The view that screening often is lacking in energy and climate planning processes is corroborated by the interviewees.

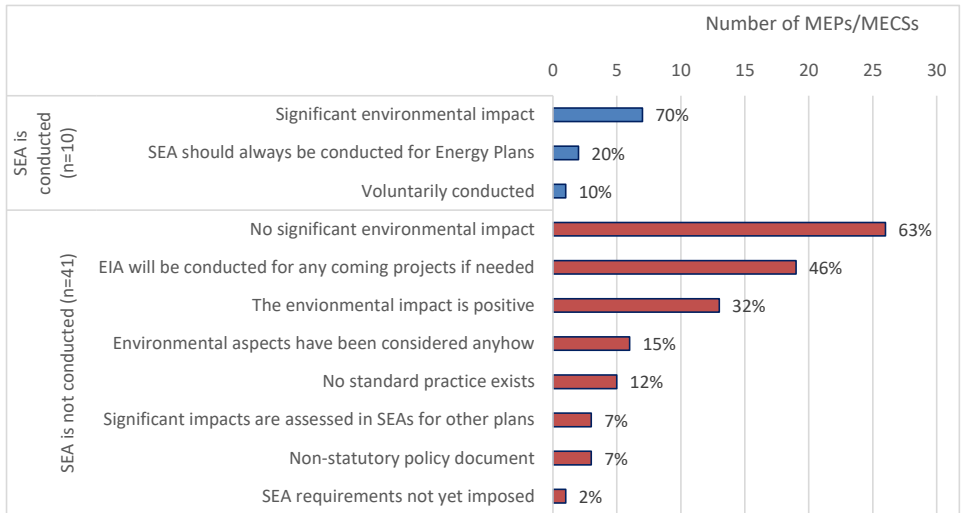


Figure 4. Arguments for conducting/not conducting an SEA in the performed screenings (Paper II). The horizontal axis conveys the number of policy documents that were coded to each argument. The percentage values show the share of plans within each category (i.e. whether SEA should be conducted or not) that included each theme.

The classification of impact assessments shows that SEA only had been conducted for a minor share of the Municipal Energy Plans (Figure 5). Furthermore, about an additional third of the Energy Plans had included an environmental analysis. Although this leaves more than 60% of the Municipal Energy Plans without any impact assessment, they were still significantly more likely to have been subject to some form of impact assessment than the Municipal Energy and Climate Strategies, for which only 12% had included an environmental analysis. Moreover, as shown in Figure 5, no impact assessment of any type could be identified for the Regional Climate and Energy Strategies. Regarding the temporal development for impact assessment within energy and climate planning, no clear trend can be discerned regarding the total shares of impact assessment, although the use of SEA seems to increase in the later time span (see Figure 3 in Paper II).

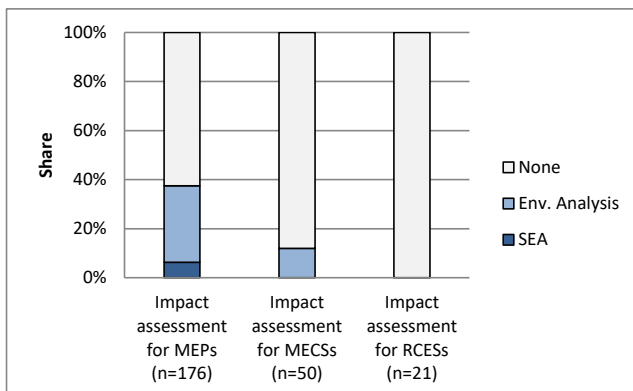


Figure 5. Type of impact assessment per type of policy document (Paper II).

Only one of the interviewed municipalities without an environmental report had conducted an SEA screening. However, this official had merely discussed the necessity of an SEA with their superior, without disclosing this decision in written form. None of these interviewees stated that the CAB had been consulted during screening; nevertheless, one CAB had addressed the lack of an environmental report in their consultation of the draft of the plan, which then made the interviewee initiate the SEA process. All three interviewed officials from municipalities that had conducted an SEA stated that the SEA had been initiated late in the process, and thus did not influence the content to any greater extent.

#### Inclusion of National Environmental Quality Objectives

In Figure 6, the relation between the type of impact assessment carried out and the inclusion of the Swedish National Environmental Quality Objectives in municipal energy and climate-focused policy document and Regional Climate and Energy Strategies is displayed. As can be seen, the Municipal Energy Plans that have conducted an SEA have a higher average inclusion of NEQOs, followed by municipal policy documents with an environmental analysis, and lastly, municipal and regional policy documents without any impact assessment. When comparing the municipal policy documents that have been subject to either SEA or environmental analysis in comparison to the municipal policy documents without impact assessment, a significant difference in the median values of included NEQOs was shown. According to the three interviewees with experience of conducting an SEA, the SEA had not elevated the consideration of NEQOs, since they already had been considered due to other factors, such as the presence of an environmental programme or the involvement of experts earlier in the process. The SEA did, however, reconnect to the NEQOs, and one interviewee emphasised that it was an aid for communicating how different potential conflicts had been addressed in the planning and decision-making process.

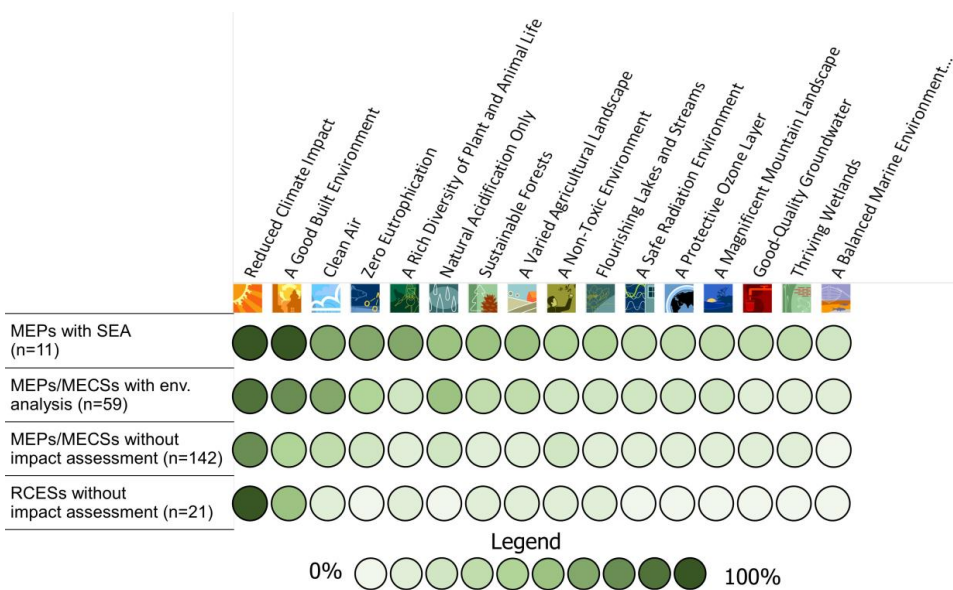


Figure 6. Inclusion of NEQOs in local and regional energy and climate planning (Paper II). The colour of each circle indicates the level of inclusion for the four different categories of policy documents, divided by the type of impact assessment and the administrative level, in relation to each NEQO.

### 6.3 Building Institutional Capacity to Plan for Climate Neutrality: The Role of Local Co-Operation and Inter-Municipal Networks at the Regional Level (Paper III)

In Paper III, the overarching aim was to analyse the process for integrating climate change mitigation aspects into municipal spatial planning. More specifically, the aim was to investigate the current capacities as well as challenges and opportunities for such integration of climate change mitigation aspects into spatial planning, and the demand for local co-operation in the comprehensive planning process as well as inter-municipal network co-operation. The methods utilised were a survey along with a more detailed study of two case study municipalities through semi-structured interviews and participant observation in comprehensive planning workshops.

#### Current capacities, challenges and opportunities

Nearly all survey respondents expressed that their municipality is working to integrate climate change mitigation aspects into spatial planning. However, this is being undertaken to a varying degree, as only one fifth stated that this is done to a large extent (see Figure 3 in Paper III). The survey results reveal that municipal plans and strategies, such as the Comprehensive Plan, the MEP/MECS, and the Environmental programme, were deemed most central for guiding their efforts, followed by the Regional Climate and Energy Strategy and the Regional Development Plan. This is supported by the case study interviewees, who regard the Comprehensive Plan to be most central due to it declaring the current political will concerning the municipality's long-term development. Both case study municipalities are also striving for coherence between the CP and their environmental programme or similar, which then is intended to steer subsequent governance procedures such as detailed development planning and building permits.

Significant challenges identified by survey respondents for integrating climate change mitigation aspects into spatial planning include a lack of knowledge both among internal officials and politicians and among external stakeholders, relating to that it is a complex in which technology and knowledge quickly develop. Moreover, lack of funding for implementing measures and employing dedicated personnel as well as lack of municipal mandate, for example, if the municipality does not own a municipal energy company, is seen as a barrier. Regarding measures for enhancing knowledge, the survey respondents call for exchange of experiences amongst practitioners, learning examples regarding measures, methods and working procedures, as well as continuous knowledge dissemination through seminars.

The two case study municipalities differ in terms of their personnel resources. In Nykvarn, a half-time position is dedicated to all strategic sustainability efforts in the municipality, and the interviewees witness that no structured work regarding climate change integration into spatial planning was carried out at the time. Danderyd, on the other hand, had an energy and climate strategist and an environmental coordinator employed full-time, and they perceived that their efforts were well-coordinated and structured. Neither of the case study municipalities had addressed energy and climate considerations in their previous Comprehensive Plans to any larger extent. Predominantly, their intent is to work with more dense housing development, within proximity to public transport and with suitable preconditions for district heating as well as for cycling and walking. Lack of interest by politicians and municipal administration executives to engage in these matters are seen as a major hurdle by the interviewees. Especially, there has been a reluctance to carry out measures that could obstruct private car use.

#### Local Co-Operation in the Comprehensive Planning Process

The survey results showed that about half of the respondents reported that energy and climate strategists participated actively in the comprehensive planning process, whereas less than one third stated that comprehensive planners participated actively in the energy and climate planning process. Moreover, as highlighted in Figure 7, other municipal administrations and municipal politicians are frequently involved in the comprehensive planning process for addressing strategic energy and climate issues. The involvement of local energy companies and local electricity grid operators were significantly lower, around one fifth, respectively. Citizens were

involved for the sake of deliberating strategic energy and climate issues only according to less than half of the respondents.

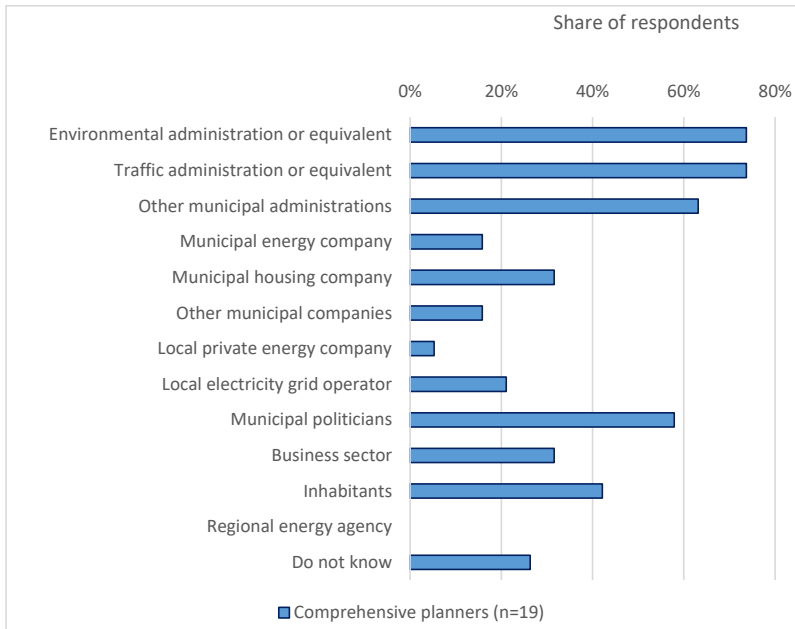


Figure 7. Involvement of stakeholders in the comprehensive planning process for addressing energy and climate strategic issues (Paper III).

In their respective comprehensive planning process, both case study municipalities had formed cross-sectoral working groups with representatives from different relevant municipal departments, including the environmental strategist and also the energy and climate strategist in the Danderyd case. They differed, however, in terms of engaging with politicians and municipal administrative executives. In Danderyd, they often interacted, for example by arranging two workshops addressing the content of both the Comprehensive Plan and an Environmental and Climate Programme. As such, strategic choices in the Comprehensive Plan were deliberated, including how these policy documents would inter-relate, i.e. how to integrate strategies and measures for reduced climate impact into the Comprehensive Plan. In the comprehensive planning process of Nykvarn, contrarily, interaction with politicians was much more restricted due to insufficient allocation of time and resources to engage, which hindered the comprehensive planner from deliberating strategic choices to any greater extent. However, Nykvarn did interact with the electricity grid operator and district heating company present in their municipality. This led to discussions regarding potential grid capacity issues and the identification of suitable sites for densification to which the district heating network could deliver.

#### Networks for Inter-Municipal and Regional-Local Co-Operation

The survey respondents highlight the need for inter-municipal and regional-local co-operation when addressing inter-municipal energy and climate strategic issues, such as inter-municipal transportation and expansion of the regional electricity grid, which suffers from capacity constraints. They also call for deliberating such issues politically and gaining consensus. Additionally, increased collaboration between spatial planners and energy and climate strategists, exchange of knowledge and experiences, and spreading of learning examples were requested.

The case study interviewees recognised two different types of inter-municipal networks deemed relevant in relation to the integration of climate change mitigation into spatial planning. The first type of network is the different regional-local networks administered by the CAB of Stockholm,

primarily targeting different municipal officials, such as a comprehensive planner network as well as another energy and climate network. These networks were recognised to contribute to monitoring vital trends and efforts on a national and global level and spreading learning examples and theoretical knowledge through seminars. The second type is different sub-regional, inter-municipal networks, where each case study municipality co-operates with a handful of adjacent municipalities. These networks also have different sub-networks for different municipal officials such as comprehensive planners and energy and climate strategists, as well as municipal mayors and municipal chief executives. They are thereby recognised as more productive for concretely addressing inter-municipal energy and climate efforts regarding, e.g. transport and energy infrastructure, which had been done in both sub-regional networks. Furthermore, personal relations can be built within these networks, enabling collegial exchange and support of a more practical kind, such as deliberating different ideas, receiving input on drafts of policy documents, et cetera.

#### 6.4 Are Local Authorities Building Their Capacity to Plan for Reduced Climate Impact? A Longitudinal Analysis of Swedish Comprehensive Plans (Paper IV)

The overall aim of Paper IV is to investigate the institutional capacity building over time regarding the integration of climate change mitigation aspects into spatial planning. Moreover, the paper aimed to analyse which aspects were integrated into Comprehensive Plans, whether this integration has led to changes in municipal planning and decision-making, and lastly, whether SEA could contribute to organisational learning in the comprehensive planning processes. The enquiries were conducted through a longitudinal document analysis and a focus group interview with municipal officials representing the municipalities studied in the document analysis.

##### Institutional capacity building over time

All focus group interviewees share the view that the CP can contribute to disseminating knowledge and build support for the suggested strategies and measures to local politicians and other municipal officials at different departments. However, content-wise, it was considered to be addressed more in-depth in an energy and climate plan or similar, or in other, more focused policy documents, revolving around a specific strategy such as a public transport plan. They underlined that there is a dynamic interplay between the Comprehensive Plan and other policy documents, as strategies or planning principles established in a CP can be elaborated and incorporated into a sectoral policy document, or vice versa. One of the focus group interviewees witnessed that municipal officials have recognised the potential added value by allowing the SEA process to be more iterative and intertwined with the planning process, rather than a separate entity that feeds into the planning process at a later stage.

The recently adopted Comprehensive Plans received statistically significantly higher scores, meaning that a larger amount of strategies for climate change mitigation had been integrated into the new CPs, and that these strategies also were more explicitly linked to energy efficiency or climate impact (Figure 8). The interviewees also observed increased integration of climate change mitigation strategies into comprehensive planning during the recent decade. They perceive this development to depend on increased knowledge on the topic and increased political support. As is conveyed by Figure 8, the aggregated scores and their progression over time varies considerably between different strategies. It seems that the increase for some of the strategies, often involving energy production and energy use, relates more clearly to technological innovation and diffusion. In contrast, some other strategies may be more strictly associated with the dissemination of knowledge and exchange of best practices.

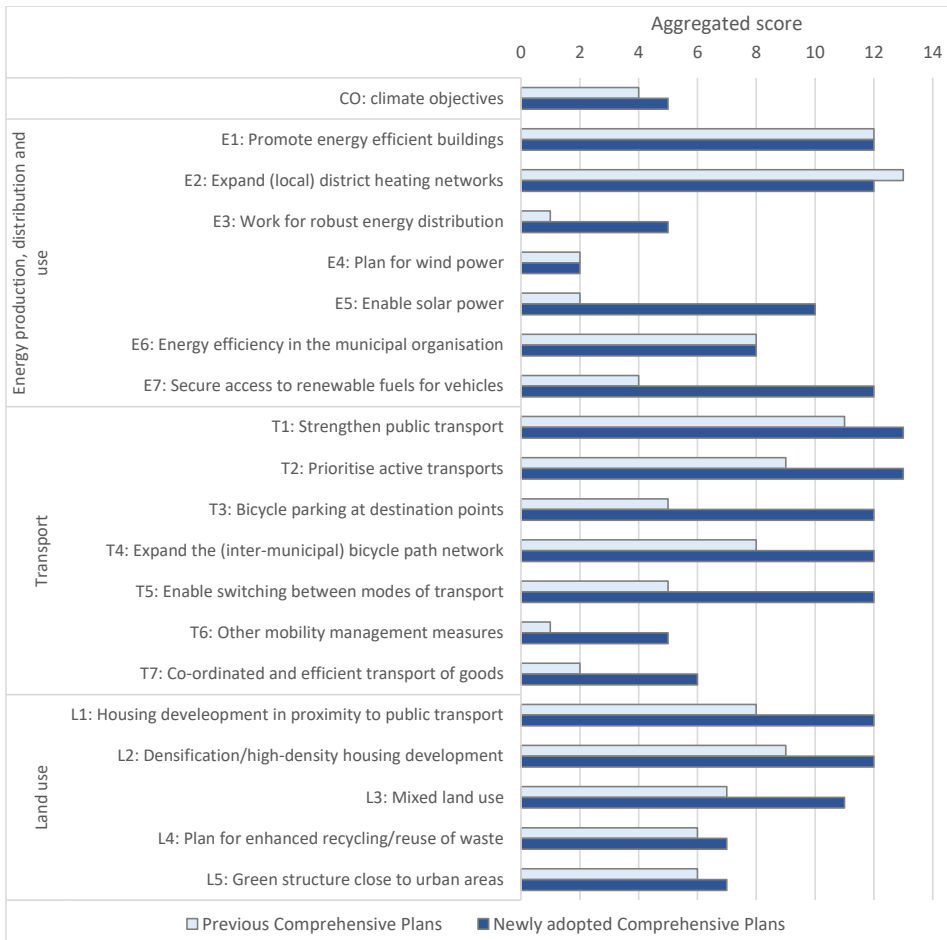


Figure 8. A comparison of the aggregated score for previously adopted Comprehensive Plans and recently adopted Comprehensive Plans for each identified strategy (Paper IV).

When analysing the scores individually for each municipality, which is presented in Figure 9, it is evident that the capital, Stockholm municipality, has gained the highest scores both for the previously adopted CPs and the recently adopted ones. The Stockholm municipality representative stresses the importance of participating in transnational municipal climate networks and different research projects. The four municipalities with a shorter time span in-between their previously adopted CP and the more recent one had, in general, received higher scores in the analysis. These municipalities also had conducted SEA for both their previous and their current CP.

The focus group interviewees provide numerous examples of how the climate change mitigation strategies are put into practice in different ways in relation to municipal planning and decision-making. During the detailed development planning process, these strategies integrated into the Comprehensive Plan and other related steering documents should be considered and conformed with, and the strategies should in this regard influence legally binding land-use decisions. For example, Österåker has, in line with the incorporated strategies of *Housing development in proximity to public transport* and *Densification/high-density housing development*, shifted from providing housing in more secluded locations to concentrate housing and commercial development more densely, within close proximity to stops along a light rail line. Another illustration comes from Vallentuna,

which had developed a separate policy document for the deployment of charging stations for electric vehicles, as a way of expanding on the strategy to *Secure access to renewable fuels for vehicles* included in their CP. In line with this policy document, they have erected charging stations at some strategically selected places.

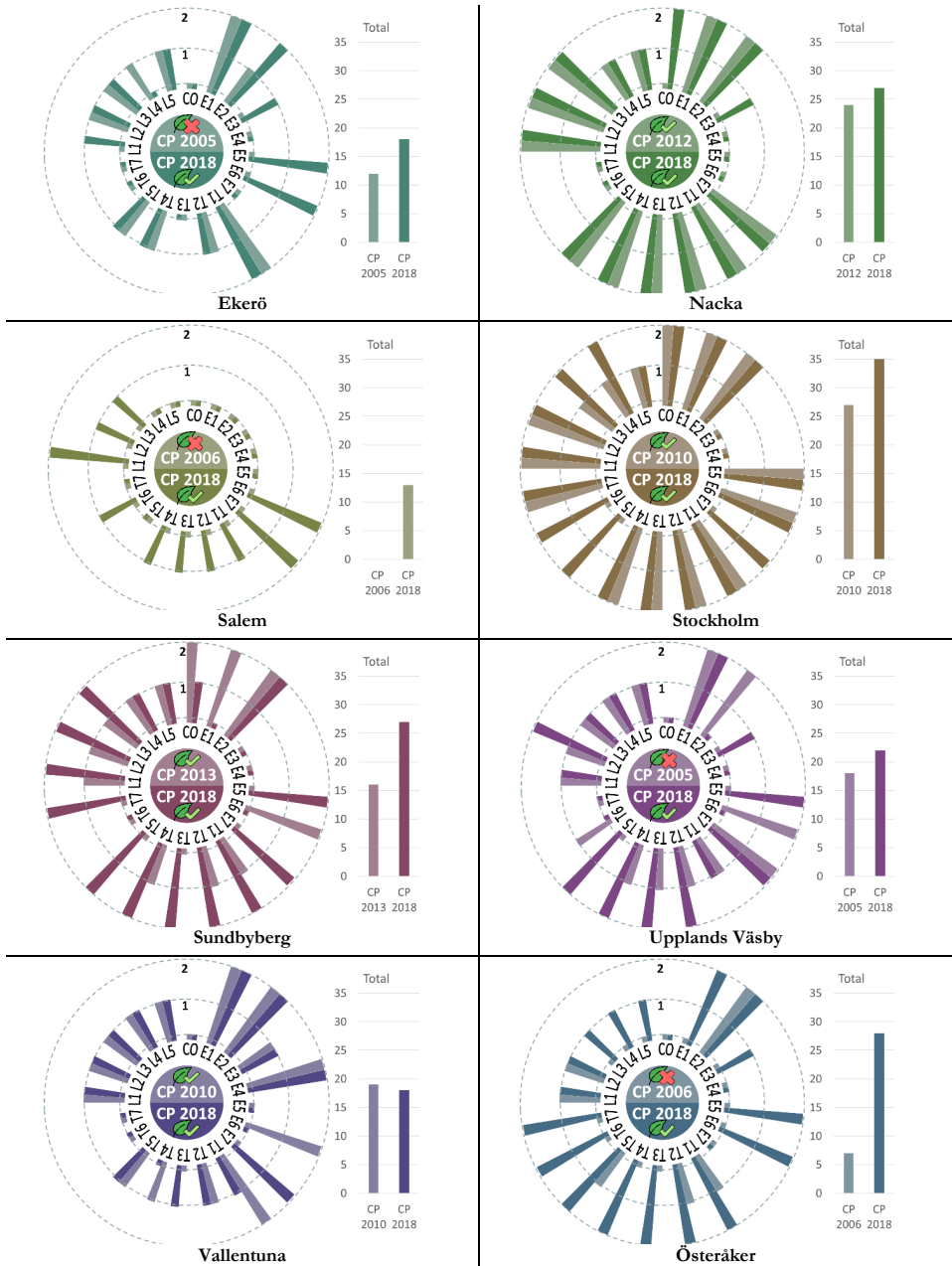


Figure 9. Visualisation of scoring of studied municipal Comprehensive Plans. Explanations of abbreviations are given in Figure 8. The checkmark/cross mark situated adjacent to the year of adoption for each plan indicates whether an environmental report due to the execution of SEA had been identified or not (Paper IV).

## 6.5 Balancing wind power deployment and sustainability objectives in Swedish planning and permitting (Paper V)

Paper V had the aim of investigating the current wind power planning governance. This encompassed presenting an overview of trends regarding the adoption of policy documents, investigating how wind power is balanced in relation to sustainability objectives within municipal planning and precedential court cases, and providing insights regarding challenges and drivers for municipal wind power planning, including the need for co-operation between the regional and local level. A cross-sectional document analysis and a focus group interview were employed to achieve the aims of the paper.

### National overview of municipal wind power planning practice

More than two-thirds of the Swedish municipalities have spatially addressed wind power in their municipal planning, most often through the use of thematic amendments to the Comprehensive Plan. However, as displayed by Figure 10, it is uncommon to conduct a spatial wind power analysis within the realm of the comprehensive planning process (15% of all investigated CPs). Out of the rest, roughly half have not addressed wind power at all (45% of CPs), whereas 40% have declared previously adopted wind power plans to be up-to-date (Figure 10). Two-thirds of the latter CPs that have declared a wind power plan to be up-to-date, results from the spatial analysis have also been integrated into the CP. An apparent spike regarding annually adopted wind power plans during the years 2010-2011 is also visible within this dataset, with a steep downward trend afterwards.

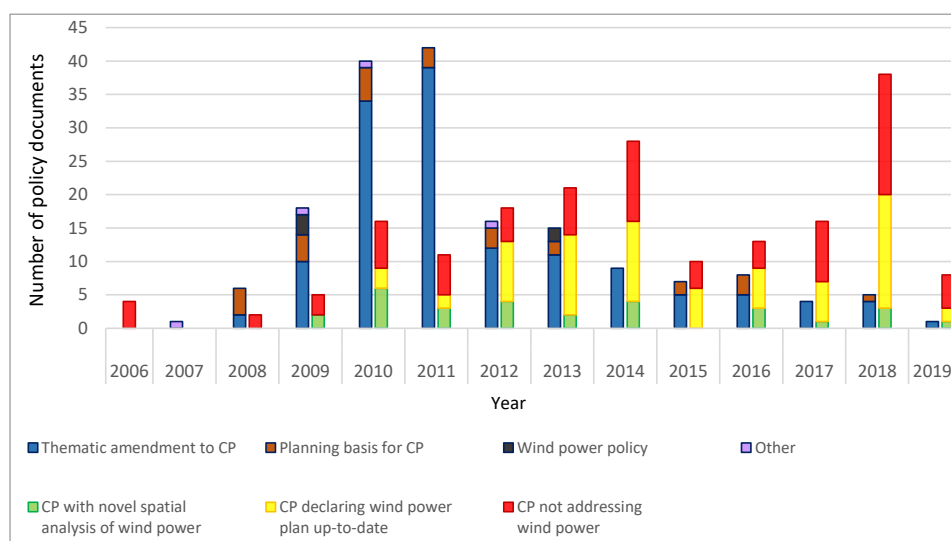


Figure 10. Handling of wind power in municipal Comprehensive Plans and other policy documents per year (Paper V). The left staple for each year conveys the adoption of wind power plans per year and the right staple shows how wind power has been handled in the Comprehensive Plans adopted each year.

As presented in Figure 11, as many as one-fifth of all wind power plans have been produced through inter-municipal co-operation in-between municipalities adjacent to each other. Furthermore, Figure 11 displays considerable regional differences regarding the share of municipalities that have conducted spatial wind power analyses.

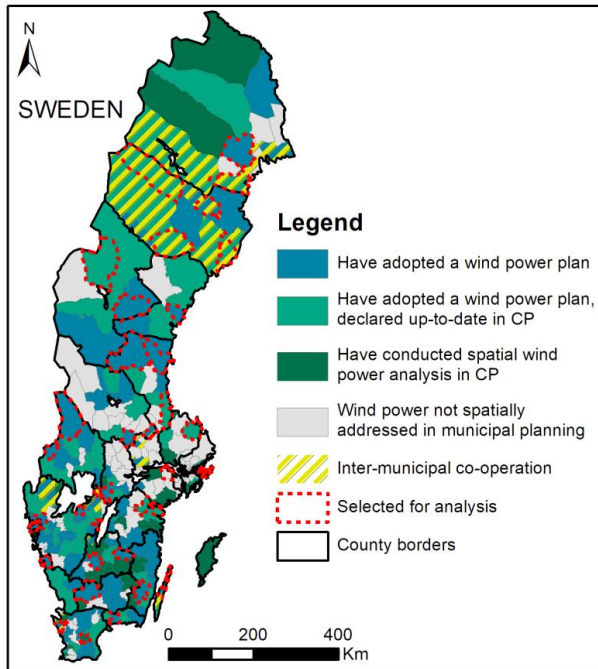


Figure 11. Visualisation of quantitative mapping of wind power planning practice (Paper V).

Spatial sustainability considerations in wind power planning and permitting

The key findings regarding spatial sustainability considerations are summarised in Table 3. Moreover, Figure 12 details how different designated or protected areas relating to nature protection, cultural environment and recreation have been handled in municipal planning. Concerning the handling of ANIs in municipal wind power planning, the focus group interview depicted that they had not conducted individual preliminary assessments regarding possibilities for coexistence for each specific ANI, depending on the specific values that it intends to protect. If such assessments were to be undertaken, they would be aided by getting support from the CABs, which are knowledgeable with regards to the value descriptions, although they emphasised that the initiative for such assessments ought to come from the local level.

Table 3. Summary of spatial sustainability considerations, based on a thematic analysis of 37 wind power plans and synthesis of relevant precedential court cases (Paper V).

Theme	Wind power planning practice	Precedential Court Cases
<i>Distance to housing</i>	29 plans had a static requirement of minimum distance to housing between 500-1 000 meters. Some municipalities had additional requirements for settlements.	There is no general distance to housing established, and it ought to be based on thresholds for local impacts.
<i>Noise</i>	20 plans only required 40 dB(A) at built-up areas. 10 plans either imposed a general requirement of 35 dB(A) or had other additional requirements in addition to a general 40 dB(A) requirement, such as 35 dB(A) in recreational areas. Four plans stated	Noise levels of 40 dB(A) outdoors adjacent to housing have long been considered general practice. An exemption is when an area pointed out as a silent area in the CP, that overlapped with a nature's reserve, received a 35 dB(A) restriction.

	that current guidelines should be followed.	
<i>Shadowing effect</i>	17 plans state that there should not be more than 30 hours of theoretical shadowing time per year, and not more than 8 hours/year or 30 minutes/day of actual shadow flicker near residential properties. Five other plans stated that current guidelines should be followed.	It has been well-established that residential properties not should be exposed to more than eight hours of actual shadow flicker per year. With shadow flicker protection systems, permits can be given even if this criterion would be slightly transgressed.
<i>Nature conservation</i>	Different types of designated or protected areas are most often excluded from the spatial analysis, in some cases with additional buffer (Figure 12). Regarding ANI for nature conservation, 5 municipalities have opened up for considering wind power development also within the ANI on a case-by-case basis, depending on the values that the ANI intends to protect. Two municipalities have addressed ANI for watercourses and deemed this ANI to be compatible with wind power development.	There is an example of a wind power project permitted within a nature reserve, and another case where proximity to nature reserves played a part in rejecting the application. A project application partly located within a Natura 2000-area got rejected. Regarding ANI for nature conservation, there are both cases where ANI for wind power has been prioritised over ANI for nature conservation, and vice versa.
<i>Cultural environment</i>	As displayed in Figure 12, ANI for cultural environment is most commonly excluded, in some cases with additional buffering. Similarly to ANI for nature conservation, five municipalities open up for case-by-case considerations given the specific values that each ANI intends to protect. Two out of four municipalities state that cultural reserves can be considered in a similar way depending on the regulations of the reserve. Additionally, 12 municipalities include buffer zones to churches and other cultural-historically valuable buildings.	In one case, a wind power project located 4 km away from ANI for cultural environment got denied to its impacts on the landscape view. In another older case, however, four turbines were allowed within ANI for cultural environment.
<i>Recreation</i>	Like for other ANIs, most municipalities exclude ANI for recreation, although six municipalities indicate that the possibility of wind power development will be assessed from case to case given the values of the ANI (Figure 12). Moreover, one municipality has assessed beforehand that coexistence with wind power should be possible. Areas of local recreational values should also be	There is an example of a project situated both within ANI for tourism and outdoor recreation and ANI for outdoor recreation, which still got permitted. Another, older project application of four turbines within ANI for tourism and outdoor recreation was also approved.

	considered according to numerous municipalities.	
<i>Reindeer herding</i>	Four municipalities considered ANI for reindeer herding in their planning, two of them excluding such ANIs and one stating that they ought to be avoided. The last municipality designated suitable wind sites where ANI for reindeer herding overlapped with ANI for wind power. Virtually all municipalities addressing reindeer herding detailed that sensitive areas, including migratory routes, calving grounds and areas for grazing, should not be impacted.	There have been numerous cases where either ANI for reindeer herding have been given priority over ANI for wind power, or vice versa. One example of the former is a project application situated within ANI for wind power and located 800 meters away from a migratory route for reindeer herding, that got rejected. An example of the opposite priority is a project that got permitted, where the two ANIs overlapped.
<i>Landscape considerations</i>	Five municipalities require a minimum distance between different wind parks, most often between 3-5 km, although one municipality requires a 20 km distance. Seven municipalities also consider the total height of wind turbines and the associated need for aviation obstruction lights, with two municipalities prohibiting turbines over 150 meters, and other municipalities commonly requiring evaluation on landscape and local inhabitants.	In one case, some project areas situated outside of ANI for wind power got denied, since a village otherwise would have been surrounded by wind turbines, an impact on the landscape view that was deemed unacceptable.
<i>Total defence</i>	17 municipalities addressed ANI for total defence or areas of importance for total defence. These are most often excluded in the municipalities' spatial analysis, except for Minimum Safe Altitude areas around airports. Two municipalities identified suitable areas also within areas of interest for total defence, although clearly stating this detail for these areas in their plans, in case any circumstances regarding the designation of military areas or the prioritisation between total defence and other interests would change.	Both ANI for total defence and areas of importance for total defence have consistently been prioritised in relation to wind power deployment, in agreement with chapter 3 in the environmental code.

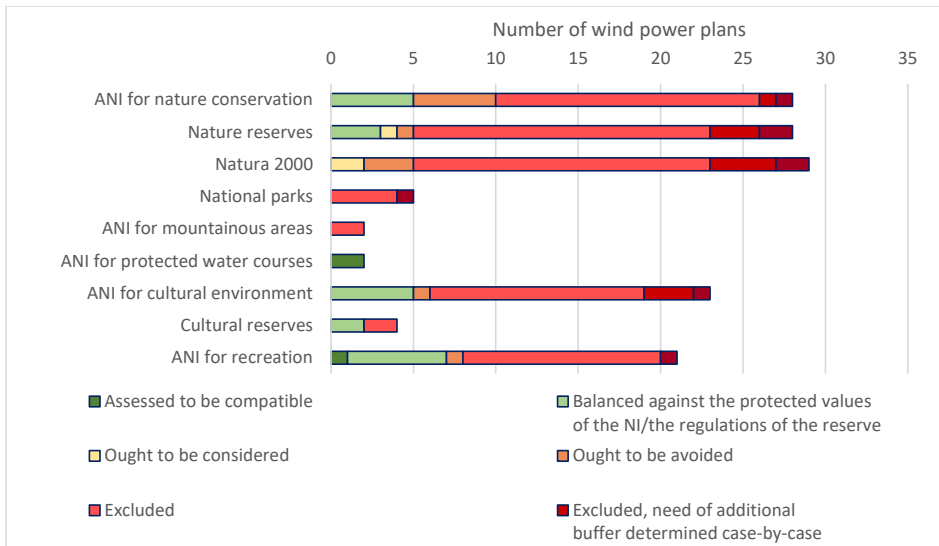


Figure 12. Handling of key types of protected and designated areas relating to nature conservation, cultural environment and recreation in municipal wind power plans (n=37) (Paper V).

### Insights from practitioners on municipal wind power planning

All municipalities represented in the focus group interview had developed a thematic amendment to their Comprehensive Plan for addressing wind power in their planning, supported by the state funds provided in 2007-2010. In line with the content of these plans, project applications located within areas designated as suitable for wind power were initially approved. However, at some point, the municipal decision-making in relation to the veto stopped being consistent with the plans and is now dependent on the current political view on the desirability of new projects. One municipality had also approved wind power deployment in an area not designated as a primary area in their wind power plan. Concerning the suggested revision of the municipal veto legislation, an interviewee highlighted that there is a risk that municipalities will not dare to designate sites as suitable if the CP would become legally binding. The view is that they need more information regarding local impacts prior to being able to inform citizens properly and enabling politicians to make an informed decision. There is also a general perception that it is difficult to inform and anchor planned wind power development with the local public through the Comprehensive Plan.

The contribution to reduced climate impact through renewable electricity generation has partly been a rationale for conducting wind power planning, but the participating municipalities already generate more electricity than they consume themselves, which make them perceive that they already are contributing sufficiently to this objective. Another driver has been to create jobs, but currently, they do not experience that the local benefits are sufficient to motivate further development. The interviewees identify both more well-regulated financial compensation and possibilities for increased electricity outtake to enable localization of electricity-intensive industry as important components for incentivizing wind power development from a local point of view. Moreover, the focus group interviewees concurred that the municipalities do not possess the competencies needed for conducting spatial analyses involving multiple criteria for identifying suitable wind sites, currently making them reliant on external consultants if such analyses are to be undertaken.

If a regional wind power process should be undertaken by the CABs, the interviewees emphasised the necessity of not transgressing the municipal planning monopoly in such a regional process, such as designating suitable areas for wind power. The municipal officials request bottom-up processes that are well-anchored with the local public and that retain local

political support, whereas designation of suitable areas in a regional process would be regarded as too much of a top-down process. Nevertheless, the interviewees recognised that regional forums for capacity building and co-operation with influential actors such as regional electricity grid operators could be fruitful. This could include support by giving access to needed competence and knowledge for conducting multi-criteria GIS analyses for identifying suitable sites for wind power in an informed and well-balanced fashion. A common view held by the interviewees was that there is a need for inter-municipal co-operation, especially for coherently addressing potential wind sites situated at or near the municipal borders in their planning.

## 7. ANALYSIS

This section interprets the findings of the appended papers through the theoretical lens as outlined in Section 4. Numerous reflections and remarks revolve around the dimensions of institutional capacity building and their sub-components (Healey, 1998; Healey et al., 2003, 1999), which was described in Section 4.4. Other elaborations relate to the different concepts relating to planning theory and multi-level governance presented throughout the theoretical framework.

### 7.1A constant need for institutional capacity building

A general notion that can be discerned within all papers, from the perspective of institutional capacity, is that the need to handle climate change mitigation in municipal planning has been, and still is, a strong *external pressure* that puts demands on the municipalities' institutional capacity building. This could likely take its expression in a plethora of forms, for example through the adoption of different energy and climate objectives and policies at the global, national and regional level. The *external pressure* of climate change has in turn led to *internal evolutions* within many municipalities, for example witnessed by that climate change mitigation has become the main objective within local energy and climate planning (Paper I). Further, the focus group interviewees in Paper IV recognised an increased political awareness, and the longitudinal analysis in the same paper illuminated a positive trend regarding the integration of strategies into Comprehensive Plans, thereby suggesting that many municipalities have to some extent, in response, been developing their capacity in this regard. However, there are simultaneously a diverse set of findings indicating that many municipalities are struggling with responding to this *external pressure*. For example, the trends in adopting energy and climate-focused policy documents and wind power plans correspond to the presence of national financial support. Moreover, less populous municipalities were less prone to have adopted an MEP/MECS, and if they had, it was less likely to be up-to-date (Paper I and V). Thus, it is indicated that some municipalities are dependent on such external supportive measures for having sufficient capacity to conduct the respective modes of planning.

As shown by various results in Paper I, Paper III and Paper IV, the MEP/MECS is a critical policy document for enabling a two-way policy integration between strategic energy and climate planning and strategic spatial planning, i.e. where both spatial dimensions are considered in strategic energy and climate planning and strategies for reduced climate impact are incorporated into the CP. This presupposes the existence of an energy and climate strategist or similar, which has been identified as one of two key competencies, alongside the comprehensive planner, for the municipalities' efforts to integrate climate change mitigation aspects into comprehensive planning. There was, for example, no energy and climate strategist employed in one of the case study municipalities in Paper III, and their response for addressing climate change mitigation in planning was also more *fragmented*. The existence of such personnel would strengthen the range of *knowledge resources* in the municipality as well as enhance the *openness* to new ideas by participating in different networks. This could both contribute to more coordinated responses and hinder the local government from being stuck in *inertia*.

The most recent IPCC report conveys that the 1.5 °C global warming target not will be possible to meet without substantial emission cuts in the forthcoming decades (IPCC, 2021). In other words, this *external pressure* will assumingly continue to intensify in the foreseeable future. As highlighted by the respondents in Paper III, there is a fast-paced development regarding technologies and practices for responding to climate change mitigation in municipal planning, which is likely to continue. Given that the municipalities are such influential actors, e.g. with respect to the planning monopoly and their critical decision-making role for wind power deployment, it is pivotal that the municipalities get sufficient support from the national and regional level to be able to evolve their institutional capacity in tandem.

## 7.2 Procedures and practices for gaining mobilisation capacity

Multiple findings from Paper I, III and IV emphasize the centrality of building internal support from politicians and other administrations for different strategies and measures in both the energy and climate strategic planning process and the comprehensive planning process, with an emphasis on the latter. These two planning processes, and the comprehensive planning process, in particular, can thus be recognised as two critical *arenas* for deliberating strategic energy and climate issues and mobilising support for the content of the plans with politicians and other officials. The case study municipalities in Paper III clearly exemplifies that the municipal officials conducting the planning process must be given time and resources to interact with the politicians in order to be able to receive their input and anchor the content of the plan. In other words, the *power relations* within the municipal organisations between politicians and municipal officials ought to be more open and build on dialogue and mutual trust, rather than closed and hierarchical, so that the officials can share their expert knowledge and give the politicians the possibility of making more informed decisions.

Further, there are examples of different *repertoires* for mobilisation. In the case study municipality in Danderyd in Paper III, their two joint workshops for the Comprehensive Plan and the Environmental and Climate Programme seem to have been able to link strategic issues between these two strategic processes and deliberate them with politicians and municipal chief executives. Similarly, municipality H in Paper I had a joint start-up of their comprehensive planning process and energy and climate strategic process by developing different scenarios for densification that were evaluated from the perspectives of energy efficiency and sustainability. This led to the formulation of a vision that underpinned the development of the Comprehensive Plan. All in all, these two examples suggest that if these two strategic processes can be synced, there is a window of opportunity to deliberate their interlinkages and strengthen the two-way policy integration in the start-up of the two processes, which can be achieved by different joint *repertoires* for mobilisation.

The focus group interview in Paper V underlined that there may be an insufficient *opportunity structure* in some municipalities regarding the desirability of wind power deployment, due to the negative local environmental impacts that occur and a perceived lack of positive local benefits. More structured forms of financial compensation, as called for by the practitioners, will likely enhance this *opportunity structure*, due to the positive local effects that the compensation can generate locally. If financial compensation becomes more regulated, it may not only improve the distributive justice in each wind power project, but it could also make the local benefits more similar between different projects, which otherwise potentially could be perceived as unfair in its own right.

Nonetheless, the findings from Paper II convey that more National Environmental Quality Objectives had been included in policy documents that had undergone impact assessment, thus indicating that synergies and conflicts between different environmental objectives could be deliberated when impact assessment had been conducted. As advocated by Ryan (2015), highlighting potential local environmental benefits from climate action could contribute to enhanced support. It has been shown that climate action generates numerous synergies with other NEQOs (Johansson, 2012). This applies to different energy efficiency measures in particular, such as reducing travel demand, which has synergies with virtually all objectives. Renewable electricity production such as wind power can also contribute to the achievement of numerous objectives in addition to the objective of *reduced climate impact*, such as *clean air* and *natural acidification only*, especially if the possibility of electrifying the transport sector is considered.

It is imperative to highlight such interactions at the local level, both because the NEQO system lacks features for addressing internal conflicts and because many of the goal conflicts occur when actions for achieving the objectives are chosen, which predominantly is at the local level. In this regard, SEA can provide a key mechanism for the NEQO system and other similar management

by objectives systems elsewhere. However, it should be noted that the potential benefit of creating legitimacy and support by giving climate change a local framing is likely to depend on the process as well. It could be assumed that the support would be strengthened to a greater extent if the positive impacts are communicated to the stakeholders in the planning process rather than if the communication only goes through the environmental report.

### 7.3 Cross-sectoral collaboration in planning processes and stakeholder involvement

The findings from Paper I and Paper III highlights that cross-sectoral planning processes is standard procedure in both energy and climate strategic planning processes and comprehensive planning processes. From a theoretical perspective, broad cross-sectoral processes contribute to that a broader *range* of internal stakeholders are represented, which enhances the *range* of knowledge that can influence the process. Potentially, the increased *range* of knowledges can be utilised in the sense that additional strategies for reducing climate impact can be explored, given the domains of expertise of the respective administrations. Furthermore, it can provide a vehicle for establishing a common *frame*, i.e. a joint conception of the challenges at hand around which to mobilise and contribute to organisational learning through knowledge exchange. However, it does not seem certain that the key competencies of the spatial planner and the energy and climate strategist participate actively together, e.g. as a part of the working group, in the respective processes. The key competencies could in some instances likely act as *change agents* for the two-way policy *integration*, by embodying their respective policy sphere, and it could thus be assumed that if they were more heavily engaged in both of the respective processes, it could contribute to more substantial knowledge exchange and contribute to learning experiences.

The survey results from Paper III moreover highlight that actors that are influential for the energy system, such as local energy companies and electricity grid operators, seldom are involved in the comprehensive planning process for addressing strategic energy and climate issues. However, the case study municipality of Nykvarn exemplified how the interaction of such influential external actors enabled key strategic issues to be deliberated in a manner that influenced an initial assessment regarding suitable areas for densification. This underlines how a broader *range* of external stakeholders also can contribute to a broader *range* of knowledge and even widen the topics that can be concretely addressed. Previous research has highlighted the benefits of engaging with influential actors such as local energy companies and industry in energy and climate planning processes to utilise local knowledge, which could render in new opportunities, such as recycling industrial waste energy into district heating (Grönkvist and Sandberg, 2006). The Nykvarn case study shows that there is a similar need to involve key influential actors in the comprehensive planning process as well, to explore the interplay between the energy system and strategic spatial planning.

Additionally, in relation to the width of the scope of the municipalities' energy and climate efforts and their established targets, there appears to be an unwillingness to engage with actors outside the municipal concern, such as private companies and citizens. This is potentially due to a recognition that more communicative processes could become more burdensome and complex. For example, only one of the interviewed municipalities in Paper I involved citizens to any larger extent, and 42% of the comprehensive planners stated that citizens were involved for the sake of deliberating energy and climate strategic issues (Paper III). However, there are a plethora of local actors that generate GHG emissions, including private companies and citizens. Thus, more communicative models are required if a broader scope, e.g. with climate objectives covering the geographical area as a whole, is to be successfully applied, since stakeholders need to be engaged in the process if their generated emissions are to be productively addressed, for the sake of building legitimacy. Moreover, from the perspective of procedural justice, it needs to be ensured that all concerned stakeholders have the possibility of influencing planning and decision-making, or at least making their voice heard, which currently seldom is the case for citizens.

There are identified challenges with anchoring municipal wind power planning and decision-making with the public as well, partly relating to the need for additional information for the public to become aware of potential consequences. Nonetheless, the issues also relate to the fact that the decisive decision-making forum of the municipal veto lacks requirements of citizen participation and does not necessarily need to be in agreement with the outcome of the more formalized comprehensive planning process, which are features that can be considered to undermine the procedural justice of wind power planning and governance.

#### 7.4 Networks and organisational learning

Findings from Paper IV suggests that the continuity of the municipal comprehensive planning can be a key factor for institutional capacity building, since three of the four municipalities whose previous Comprehensive Plan dated from 2010-2013 had a higher average score for their most recent Comprehensive Plans, compared with the municipalities whose previous plans dated back to 2005-2006. As elaborated above, the energy and climate planning process and the comprehensive planning process are both found to be an appropriate *arena* for mobilising internal support, and if the planning is conducted in a more continuous fashion, more opportunities for mobilisation around novel climate change mitigation strategies will be provided. The focus group interview from Paper IV also illuminated that besides the planning process, the content of the plan itself can become a vehicle for organisational learning, in the sense that it forms a foundation for the subsequent planning process in terms of strategy and content. Thus, when there are turnover of personnel, climate change mitigation strategies already established in the CP or other related policy documents may well regain their place or be expanded upon with reinvigorated internal support, in spite of that the *change agent* that introduced them in the first place may be absent.

The results from Paper IV regarding the role of SEA also indicate that SEA may be able to contribute to organisational learning, particularly of single-loop character, by altering or suggesting additional strategies and measures. Ideally, as advocated by strategic thinking SEA theory (Partidário, 2021), an SEA process should be initiated already in the early planning stages, to utilise the discerned window of opportunity and be a force for contributing towards enhanced climate and sustainability considerations. However, the findings from Paper II and the fact that neither of the case study municipalities in Paper III had initiated an SEA during the comprehensive planning workshops suggest that Strategic Environmental Assessment still often comes in rather late in relation to the planning process, thereby being more reactive and with fewer possibilities for influencing the content of the plan. Nevertheless, one interviewee from Paper IV witnessed that their organisation constantly improves in coordinating their planning processes with the SEA process, so that the process can interact more and that the SEA process can provide more input from an earlier stage. Such double-loop learning regarding how to interlink the two processes may be a critical step in order to overcome the barrier identified by Fischer et al. (2009), namely that external consultants carrying out the Strategic Environmental Assessment process might make it more separate and detached from the planning process. As such, the SEA process may be given the opportunity to influence the planning process to a higher degree, potentially even leading to double-loop learning regarding key priorities when formulating a vision and planning objectives.

In order to gain access to new knowledge that can enable organisational learning, there appears to be a need for different forms of regional-local co-operation and knowledge exchange. The results from Paper III and Paper V predominantly highlight the need to co-operate regarding inter-municipal matters, such as transport, the electricity grid, and inter-municipal wind sites. However, Paper V also sheds light on that the forms for co-operation should build on voluntary commitments and not should be seen to transgress the municipal autonomy. In other words, too much of a top-down process at the regional level is not likely to provide useful outcomes,

given its mismatch with the Swedish governance structure and the positioning of the decision-making power at the local level.

The interview results from Paper III highlighted the presence of two different types of networks that contributes to institutional capacity building in complementary ways. The regional-local networks administered by the County Administrative Board predominantly seem to enhance the range of knowledge resources by disseminating learning examples of practice and more theoretical knowledge through their seminars. Notably, this network can be seen as an expression of a top-down governance approach, where the CABs intend to steer and coordinate the municipalities' efforts in line with the national ambitions, although in a more collaborative form. The two sub-regional, inter-municipal networks can, on the other hand, be characterised as bottom-up initiatives, since it has originated from voluntary interaction between local authorities. These networks give the impression of having a *morphology* that is suitable for more concrete action for two reasons. Partly, the different sub-networks not only encompass municipal planners and strategists but also the resource and allocating power. Additionally, the handful of municipalities are clustered adjacent to each other, and the co-operation originated from the fact that they strived for a common voice in negotiations for transport infrastructure against national and regional authorities (Rader Olsson and Cars, 2011). As such, the foundation of these forums has been to formulate a shared vision of the sub-regions infrastructure development, which seem to be a suitable *arena* for mobilising around concrete action regarding inter-municipal energy and climate efforts. The sub-regional networks also seem to build stronger relational bonds between officials in the sub-networks, thus enhancing the *range* of knowledge by enabling knowledge transfer of practical knowledge regarding day-to-day issues.

The results from the longitudinal analysis indicate that Stockholm municipality has the strongest institutional capacity within Stockholm County for integrating climate change mitigation concerns into spatial planning. This could be expected, since they have been recognised as a pioneering city for climate action (Holmstedt et al., 2017; Shmelev and Shmeleva, 2018), and as their vastly larger population ought to bring larger financial and personnel resources. Notably, they emphasise their participation in transnational networks rather than regional ones for knowledge exchange and sharing best practices, where they for the most part will engage with other leading cities (Kern, 2019). If they were to participate in different regional networks as well, they could potentially aid knowledge dissemination to other municipalities in the region that could be characterised as *followers* by Kern (2019), thereby acting as a node between transnational and regional networks.

## 7.5 Potential implications of statutory local energy and climate planning

If Swedish municipalities would be legally required to routinely adopt energy and climate-focused policy documents, including objectives regarding reduced climate impact and local renewable electricity production as well as strategies to meet these targets, this could formalise a Swedish multi-level climate governance model where elements of bottom-up and top-down approaches are combined. Although the municipalities clearly already influence and shape Sweden's climate efforts, more formal requirements on all municipalities could enable aggregation and comparison on such key areas, which could feed into national objectives and policy measures. For example, if all municipalities would establish their own objectives on renewable energy production, based on their preconditions and political ambitions, this could inform analysis and discussion regarding the reachability of the national objective and associated regionalised targets of wind power production as well as the need for additional policy mechanisms or alternative technological solutions. In other words, it would enable the tracking of progress and ambitions on reduced climate impact and local electricity production from both a bottom-up and top-down perspective and facilitate an interplay between the local, regional and national levels. Additionally, it would push the local level to address climate change mitigation in their planning

and decision-making in more structured forms, thus conducting complementary efforts in relation to the regional and national level to a further extent.

From a planning theory perspective, legal requirements on local energy and climate planning for climate change mitigation would formalise what can be characterised as an emerging soft space of planning, i.e. the increased use of the non-statutory Municipal Energy and Climate Strategies. Given a more explicit focus of reduced climate impact in such policy documents, it can at first glance be regarded to supplement the existing statutory energy planning, which should centre around supply and distribution of energy. However, Paper I also illuminates that this has become the main objective also when energy and climate strategic planning is conducted within the statutory realm. Furthermore, the quantitative content analysis in Paper I show that few municipalities produce both an energy plan and an energy and climate strategy, indicating that this soft space indeed rather does supplant the pre-existing formal mode of planning.

Moreover, only plans and programmes required by legislative or administrative provisions are currently covered by SEA requirements in Swedish law, although this interpretation of the EU directive has been questioned (Josefsson, 2019). Paper II also highlights that impact assessment is conducted to an even lesser extent when the strategic energy and climate planning is conducted in a non-statutory manner, and that various National Environmental Quality Objectives have been less often considered when impact assessment has not been conducted. Thus, this ongoing shift into more soft spaces of planning can be questioned in terms of potential implications stemming from that the regulatory requirements of impact assessment are sidestepped. A formalisation of the local energy and climate planning could thereby not only contribute towards more widespread and structured energy and climate efforts from the local level, but also the exploration of interactions with other national environmental objectives.

## 8. DISCUSSION

The following sub-sections discuss the presented findings and the accompanying analysis, to put them in a broader context and reflect upon their relation to policy and legislation. Lastly, some methodological reflections are provided.

### 8.1 Municipal energy and climate planning that responds to the emerged challenges

The results in Paper I demonstrate that the Act on Municipal Energy Planning is not fully adhered to, as merely six-tenths of the Swedish municipalities have adopted an MEP during the twelve-year study period, despite legal requirements to have an up-to-date plan for the provision of energy. Moreover, the practitioners consider the act to be outdated, mainly due to their lack of operational influence following the deregulation of the energy system and the shift in focus to reduce climate impact. The fact that many municipalities on their own initiative have started to plan for climate change mitigation can be regarded as a positive sign, since they are willing to act beyond what is required from legal statutes. The energy and climate planning process can provide a vehicle for mobilising internal support, a notion also recognised within local climate governance in Germany (Busch et al., 2018). The produced MEPs/MECSs can also provide guidance to other officials in their daily activities when prioritising between different strategic alternatives or considering implementation of measures.

However, when the local energy and climate planning is conducted within a Municipal Energy and Climate Strategy, it seems to supplant the statutory planning and in that way sidestep legal requirements for SEA. Consequently, without explicit legal requirements, impact assessment is lacking. Additionally, as highlighted by Reckien et al. (2018), the propagation of local energy and climate planning is more widespread in countries with legal requirements. These results corroborate that this form of planning suggestively should be made statutory, as previously suggested by the Swedish Energy Agency (2011). If requirements to assess the up-to-dateness of the MECS each term of office would be imposed, it could also enhance the continuity of municipal energy and climate planning in comparison to how the common practice is depicted in Paper I. According to Gustafsson et al. (2015), a more continuous energy and climate planning could contribute to its effectiveness, since vital actors may recognise their responsibility for the implementation of the plan in comparison with a more project-based planning process. Moreover, if internal support for climate commitments is re-iterated more often within the municipal concern, it may facilitate integration into spatial planning, as elaborated in Section 8.2.

Some municipalities may prefer to conduct their planning in a soft space since they can be more flexible in terms of structuring the process, and without requirements of impact assessment, the process may be perceived as being in less need of resources. Thus, some measures and altered practices may be needed if the municipalities should have sufficient capacity to conduct local energy and climate planning in a more continuous fashion. Inspiration could, for example, be drawn from the municipal wind power planning, where as many as 20% of the wind power plans had been produced through inter-municipal co-operation. This number stands in contrast to the two inter-municipal MEPs, totalling roughly 2% of all energy and climate-related policy documents identified. A planning mode where two to three smaller, adjacent municipalities produces a joint plan could potentially be coupled by a joint employment of an energy and climate strategist by the neighbouring municipalities. Although this would leave the employed official with fewer working hours for each municipality, it would nevertheless ensure that this critical competence is present within their respective organisation and can be involved in their key planning processes. Similar to wind power planning, the joint plan could also be a concrete platform to address inter-municipal energy and climate-related issues, such as inter-municipal transport and energy infrastructure.

Further, the results illuminate that even though impact assessment had been included to a significantly higher degree for the statutory MEPs, the SEA practice is nevertheless deficient also within the statutory domain. SEA screening is often lacking, and when performed, the thematic analysis in Paper II highlights that it is often ill-informed. For example, the second most common argument for no full-scale SEA being required was that an EIA would be performed for subsequent projects if necessary, which is a self-defeating argument as this, in itself, fulfils the criterion for requiring an SEA. Further, some of the screenings show a conviction that because of the positive climate impact, an SEA was regarded as unnecessary. Neither this reasoning is in line with the SEA Directive, since positive impacts should also be assessed. These findings support the claims of Whelan and Fry (2011), namely that plans and programmes with the intent of providing environmental benefits seldom are environmentally assessed, although the positive impacts are not certain to arise, and unintended consequences could be triggered. This notion is troubling since SEA, in a more strategic setting, is better positioned to address other types of environmental issues and deliberate other types of questions, such as cumulative effects from multiple projects and the necessity of different projects, compared to project-level EIA.

Another factor making the lack of SEA problematic within municipal energy and climate planning is the many other kinds of environmental impacts that the energy system could create, in addition to climate change. Many of these are also pressing, and there is a need to address them all to avoid problem-shifting. The quantitative results from Paper II regarding the significant difference in the inclusion of NEQOs depending on the use of impact assessment also indicates that the utilisation of SEA can elevate the consideration of NEQOs in which interactions in the form of synergies or conflicts could occur depending on the chosen pathway for decarbonising the energy system. Although the interviews painted a slightly different picture, as the consideration of NEQOs was taken beforehand in the process, it was nevertheless indicated that SEA could ensure that the NEQOs were taken into account and thus also could cause the NEQOs to be considered if other components would have been missing, such as a previously adopted environmental programme. All in all, SEA could, therefore, potentially help to achieve multiple gains through enhancing synergies and minimising conflicts, or at least highlight them so that they could be deliberated. Larsen et al. (2012) state that SEA reports often lacked assessments regarding synergies between climate change mitigation and other environmental concerns, with missed opportunities of enhancing positive synergies as a consequence, in Danish municipal planning. One reason identified was the lack of co-operation between different silos in the municipal concern, which accentuates the need for inter-sectoral co-operation. Additionally, it was recognised that the SEA practice and consideration of climate change still underwent an institutionalisation process (Ibid.), a notion that could also be discerned in Swedish energy and climate planning practice with regards to execution of SEA.

As highlighted in the analysis, by illuminating such interactions, SEA could also be a vehicle for providing climate change with a local framing, which could aid in mobilizing support and implementation. Thus, capacity building measures for disseminating knowledge regarding legal requirements as well as how SEA can be utilised as a proactive process tool that can shape plan-making ought to be needed, especially within local energy and climate planning but to some extent also within comprehensive planning, if SEA is to deliver on its full potential. However, many of the local benefits are of a more socioeconomic character. For example, if more active modes of transport are promoted, this will not only result in less GHG and particle emissions, but also lead to better physical health and a more equitable transport system (Litman, 2015). In relation to this, it could be argued that if impact assessment would interrelate to an management by objectives system that applies a broader sustainability focus and therefore also includes socioeconomic aspects, such as the Agenda 2030 Sustainable Development Goals, this could help to illuminate such benefits as well in local energy and climate planning, thereby potentially improving the local support and engaging more actors.

The non-statutory local energy and climate planning have been a widespread emerging phenomenon also in the rest of Europe, e.g. in the form of Sustainable Energy and Climate Action Plans under the umbrella of Covenant of Mayors (Reckien et al., 2018). Since the local authorities provide numerous different policy efforts, they can be regarded as a vital companion to national and regional authorities in the efforts for decarbonisation (Kona et al., 2018; Palermo et al., 2020). Nevertheless, there may be similar unclarities regarding legal requirements of impact assessment and a prevailing risk that their environmental effects will not also be assessed in other European countries. In a study by Kørnøv and Wejs (2013), they find similar non-existence of SEA within Danish voluntary local climate plans; however, they argue that these plans still should be considered as covered by the SEA Directive. The results regarding the lack of SEA within voluntary energy and climate planning support the discussion by Geißler et al. (2021) in their review paper, namely that there is no general trend of moving towards voluntary utilisation of SEA due to its potential benefits for planning and decision-making.

## 8.2 Towards strengthened integration into spatial planning

The analysis of the empirical findings has illuminated the importance of having a two-way policy integration between strategic energy and climate planning and spatial planning. More specifically, the results from Paper I shows that for quantitative targets identified in the CP, corresponding targets could be identified in the preceding energy and climate-focused policy document. This indicates that conducting continuous municipal energy and climate planning could be one way of gaining the integration of energy and climate targets into the Comprehensive Plans. The results from Paper IV also illuminates how municipalities increasingly integrate different strategies regarding energy production, distribution and use, transport, and land use in their Comprehensive Plans. It should be underlined that it is not sufficient in itself to include strategies for reduced climate impact into the comprehensive plan; it must also be acted upon in legally binding planning and decision-making, such as in detailed development planning. Nevertheless, Paper IV also provided examples of how these strategies gave the municipal officials a mandate to pursue related efforts and ultimately put them into practice, which shows that the incorporated strategies in the end can lead to concrete outcomes.

Three municipalities that had integrated climate objectives into their CP were also found to be among the municipalities with the highest scores. Thus, it seems that objectives regarding GHG emission reductions can contribute towards infusing the concept of sustainable development, towards which all CPs are instructed to strive, with some more tangible content. This can be a vital feature of the climate policy integration, since, as discussed by Persson (2013), without concretising and specifying its meaning, there is a risk that the sustainability endeavour instead becomes internalised into existing practice without any practical implications for the plan-making. Further, given that an energy system based on renewables need to be more distributed, suitable sites for large-scale renewable energy production is likely to be an aspect that increasingly needs to be considered in comprehensive planning. Thus, it would be desirable if not only quantitative targets for GHG emissions but also for renewable energy production could be established within the realm of a strategic energy and climate planning process and then integrated into the CP. This could become an additional driving force for gaining a spatial planning practice that contributes to the achievement of national energy and climate targets, especially in municipalities still producing small amounts of renewable energy.

The results in paper III suggests that there are a number of critical components for enabling such a two-way policy integration, namely to have a separate energy and climate-focused policy document such as a MEP/MECS, to have the energy and climate strategic competence within the organisation, and for the officials to be given time and resources to interact with politicians in order to mobilise support. These findings are supported by Gustafsson et al. (2018), which argues that there is a need for time and resources for politicians and planners to engage for policy integration to be achieved. Notably, a paper by Trygg and Wenander (2021) published in late

2021, have arrived at similar conclusions, further corroborating these results. This includes the vitality of the Comprehensive Plan and other plans such as the energy and climate plan as knowledge resources to steer their sustainability efforts in relation to planning and decision-making and the need for municipal officials to interact with politicians in order to build support and mandate for strategic initiatives. Since there are local spatial planning instruments of both strategic and regulatory character in place in a majority of European countries according to a comparative analysis of spatial planning and governance (Nadin et al., 2018), the critical components identified in Paper III may be applicable also in other countries. The evident need to consider energy and climate aspects in spatial planning form an additional argument for making the local energy and climate planning statutory, both in Sweden and elsewhere.

Increased continuity in the strategic planning processes stands out as a factor for building institutional capacity for integrating energy and climate aspects into spatial planning, as reflected by the longitudinal analysis and focus group interview in Paper IV, since it can contribute to organisational learning and provide opportunities for mobilising support for novel strategies and measures. From the next municipal election, a legislative revision will require municipalities to adopt what is referred to as *planning strategies* during the first half of the term of office, unless they adopt a novel Comprehensive Plan (Government Bill 2019/20:52, 2019). The planning strategies should reassess the relevance and appropriateness of the current comprehensive plan's overall strategic vision and objectives (Ibid.). In this regard, the planning strategies could become a tool for gaining a more continuous comprehensive planning process and thereby contribute to the institutional capacity building on this front. If a continuous process for deliberating strategic issues relating to energy and climate truly should be gained, in order to disseminate novel knowledge and contribute to broader organisational learning within each municipality, this could potentially be manifested in an internal energy and climate network, where representatives from different administrations engage in exchanging knowledge and discussing different ideas or alternative measures. Such an internal energy and climate network could not only contribute to a more resilient institutional capacity if the organisation would suffer the loss of *change agents*, but could also provide a mechanism for capturing learning outcomes and experiences from different development projects. The latter can, in turn, enable upscaling of best practices, both within their own municipal organisation and externally across different inter-municipal networks.

Even if a transition to a renewable energy system could be accomplished in the coming decades, it should be underlined that all energy production bears environmental consequences, especially if a life cycle perspective is applied (i.e. considering resource extraction, production, operation, dismantling, et cetera). Thus, for a renewable energy system to be as sustainable as possible, energy efficiency is still a vital component. As shown by the results in Paper IV, many of the different strategies utilised in comprehensive planning relate in different ways to creating energy-efficient urban structures, in particular in relation to transportation, e.g. by promoting mixed land use, densification, and facilitating the use of public transport and active transport in different ways. History has shown that the urban forms and structures planned for today can be cemented for centuries to come and dictate preconditions for energy use in terms of transportation and heating and small-scale energy production, such as rooftop PVs. There will thus be a continuous need to integrate energy and climate aspects into spatial planning, also after a transition to a renewable energy system has been achieved, if the generational goal of Swedish environmental policy, namely to solve the major environmental problems without increasing environmental and health issues abroad, is to be met.

### 8.3 Stakeholder involvement for enhanced action and legitimacy

Both within energy and climate strategic planning processes as well as comprehensive planning processes, the standard practice seems to be to have broad cross-sectoral processes with internal stakeholders from different administrations and municipal companies. By utilising cross-sectoral planning processes, there is an opportunity for knowledge exchange between the potential *change*

*agents* of the comprehensive planner and the energy and climate strategist, which can further enhance policy integration and contribute to organisational learning. The need for cross-sectoral planning processes for policy integration is supported by multiple previous studies (e.g. Gustafsson et al., 2018; Lundström, 2018; Ranhagen, 2013; Trygg and Wenander, 2021). However, the findings in Paper III highlight that there often is room for more active participation from the energy and climate strategist in the comprehensive planning process, and vice versa for the comprehensive planner in the energy and climate strategic planning process, suggestively by being engaged in the working group. This would further strengthen this co-operation and should suggestively be promoted from higher governance levels as standard practice. Along a similar line, De Pascali and Bagaini (2019) identifies that necessary cross-sectoral co-operation is lacking in most Italian cities, similar to many other Covenant of Mayor signatories, and that local energy and climate planning still is considered as a sectorial activity, with deficient integration of energy and climate considerations into strategic spatial planning as a consequence.

The issue of insufficient electricity grid capacity in the Stockholm metropolitan region and some other metropolitan regions in southern Sweden (Topel and Grundius, 2020) highlight that supply and distribution of energy yet again have emerged as a key issue for strategic planning and development. Together with the move towards more distributed energy systems, this underlines the need to consider the interactions between the development of the energy system and spatial planning. Besides the need to plan for renewable energy production, this can be manifested in the sense that space must be created for critical energy system infrastructures, such as transmission lines and transformation stations. Moreover, municipalities must be well-informed regarding the current state of the energy system and any hindrances and opportunities it may pose in terms of spatial development. Nevertheless, there generally appears to be a low level of engagement with electricity grid operators and district heating companies in the comprehensive planning process, despite that it could provide such important knowledge at a critical moment of opportunity, as illustrated by the survey and the case study municipalities in Paper III. Increased co-operation between municipalities and such influential actors is thus to be recommended. Furthermore, the forthcoming requirements that the electricity grid operators at a regional and local level should develop network development plans, as a part of the transposition of the internal electricity market directive (Directive (EU) 2019/944), could provide another vital opportunity for such co-operation. However, unless a municipality owns a local energy company, it no longer has any operational influence on the energy system, and in effect, the municipality is assumingly also often lacking the more technical energy system competence within their organisation. It can thus be debated whether the local level is the most suitable arena to maintain an up-to-date planning basis for the development of the energy system or whether it can be more feasibly addressed at a regional level.

As highlighted by the results and the analysis, other local actors such as the general public and smaller local companies and businesses are seldom involved, even though it could bring legitimacy for addressing the total emissions within the municipality. If municipalities would be required to establish climate objectives for their geographical area as a whole, this could act as a motivator for the municipalities to involve their citizens to a higher degree, since this is necessary if they should be able to address the emissions of the citizens in a legitimate way. A tendency of this could be discerned in the case study of Gothenburg, which has adopted climate objectives based on a consumption perspective in their Climate Programme, and has also conducted numerous efforts to engage and communicate with citizens (Hult and Larsson, 2016). On a related note, climate objectives for the municipality as a whole may also motivate municipalities to undertake governing activities that can be characterised as *governing through enabling*, i.e. co-ordinating and facilitating private and community initiatives, for example, through providing information and advice regarding energy efficiency measures and small-scale renewable energy installations (Bulkeley and Kern, 2006; Kern and Alber, 2009).

Thus, if emissions from the citizens are to be addressed, which could be justified in view of the large indirect emissions that stem from the private consumption of goods and services (Isenhour and Feng, 2016; Schmidt et al., 2019), it is important to ensure their participation in the process. In a strategic planning model for comprehensive planning developed by Fredriksson (2011), it has been argued that the issue of justice and unequal power relations are resolved through the formalised steps for public consultation in the regulatory planning system. However, the legislation differs between the Planning and Building Act (2010:900) and the Act on Municipal Energy Planning (1977:439) in terms of consultation requirements. In the latter, no formal mechanisms for consulting the public are enforced, which could be regarded as a deficiency if the process is to be just and legitimacy is to be gained among all concerned stakeholders.

The two different types of networks, i.e. the regional-local network administered by the CABs, and the sub-regional, inter-municipal networks consisting of a smaller number of neighbouring municipalities, seem to provide complementary functions for building institutional capacity in terms of dissemination of knowledge and facilitating inter-municipal co-operation. These findings thereby indicate that what can be characterised as territorial networks (Kern, 2019) can act as a critical complement to the trans-national municipal networks. Previously, the trans-municipal networks have been characterised to be ‘networks of pioneers for pioneers’ by Kern and Bulkeley (2009, p. 329), and there is still a risk that the activities focus too much on leading cities, leaving local authorities with weaker institutional capacity with less to gain (Fünfgeld, 2015; Haupt et al., 2020). Increased interaction and integration between the functional networks, i.e. the comprehensive planning network and the energy and climate strategic network, would assumingly further facilitate addressing energy and climate strategic issues related to spatial planning. Furthermore, since the sub-regional, inter-municipal networks seem to facilitate action by offering possibilities for addressing inter-municipal issues more concretely, they could aid in overcoming the barrier of administrative borders for climate action.

#### 8.4 Challenges within wind power planning and governance

The results from Paper V conveys that more than two-thirds of the municipalities have addressed wind power in their municipal planning, albeit the spatial wind power analyses often dates back a decade. As indicated by the focus group interview, the lack of continuity within wind power planning practice has led to the Comprehensive Plans/wind power plans no longer functioning as a proactive basis for decision-making in relation to the municipal veto (Paper V). This discontinuity within municipal wind power planning mostly seems to depend on an insufficient institutional capacity in terms of competence to conduct spatial multi-criteria analyses and make the associated trade-offs as well as resources for acquiring such competence. However, the current veto legislation allows municipalities to address wind power deployment more reactively, on a case-by-case basis, instead of handling it more proactively through strategic spatial planning. Not only may this cause a strategic overview of potential wind power development to be lost, but it can also be questionable in terms of the legitimacy of the decision-making, since the municipal veto in its current form lacks formal mechanisms to ensure that the local public will be actively involved (Liljenfeldt, 2015). Gartman et al. (2014) underline that public involvement is a vital feature for gaining social acceptance, and a lack thereof may thus be a factor causing local opposition.

As highlighted by Thygesen and Agarwal (2014), when analysing wind power governance informed by impact assessment principles, they call for mandatory regulations to ensure adherence to impact assessment and permitting procedures. However, since the municipal veto in its current form does not have any temporal restrictions, it could be retracted up until the very end of the permitting process. Thus, a proposed wind power development could be denied even if it passes stringent impact assessment and permitting requirements due to a change in political will at a late stage in the process. This seems to not only cause uncertainty for developers but also an inefficiency from a multi-level governance perspective, in that an area that has been

established to be suitable for wind power, and thereby could have contributed to the provision of renewable electricity, ultimately not is being utilised. This provides a case for setting a temporal criterion regarding the municipalities' decisive power for wind power projects, which is in line with the suggestions in Swedish Government Official Report 2021:53 (2021) regarding a potential revision of wind power permitting.

Another reason for not conducting wind power planning seems to be a lack of perceived local benefits. The issue of balancing wind power deployment so that it could provide benefits on a regional, national and global scale in terms of cost-competitive and renewable electricity production (Ram et al., 2018) and at the same time be acceptable for the local inhabitants is complex and critical. For example, recent research by Westlund and Wilhelmsson (2021) indicates that in addition to local environmental impacts such as noise and shadowing effects, wind power development can also negatively affect nearby property values. On the other hand, wind power can provide benefits by creating jobs, thereby contributing to the regional economy in sparsely populated areas, which often can be in decline (Bolin et al., 2021; Ejdemo and Söderholm, 2015). The municipal practitioners interviewed in Paper V calls for more regulated financial compensation, preferably a combination of compensation directed to the municipalities and the nearby inhabitants, the latter, e.g. in the form of community funds. In Norway, financial compensation in the form of property tax directed to the municipalities has been vital for building municipal support (Saglie et al., 2020). This combination of financial compensation could consequently provide additional support at the administrative level central for facilitating wind power deployment, whilst attempting to provide compensation for the inhabitants most affected.

Moreover, the thematic analysis of municipal wind power plans highlights considerable heterogeneity regarding how different municipalities balance wind power deployment in relation to different sustainability concerns. These differences in handling sustainability trade-offs may be an expression of the varying political desire for wind power deployment from the respective municipalities. However, it could also suggest a lack of knowledge regarding standard practice, especially since there is an incoherence between municipal planning and permitting regarding some key themes. One example is landscape considerations, where some municipalities impose stricter guidelines, such as prohibiting wind turbines with a total height of more than 150 meters, and another example is the restrictive position of considering potential co-existence with wind power deployment and other types of ANIs, in spite of numerous court cases where this has been permitted. Although the municipalities, supported by the current veto legislation, are free to make their own judgements regarding balancing these interests, it may influence the possibilities for reaching the 80 TWh wind power target of 2040, given that more than 40% of Sweden's land area is affected only by the ANIs from chapter 3 in the environmental code (Swedish National Board of Housing, Building and Planning, 2020). Even in the instances where municipalities open up for potential co-existence between wind power deployment and other ANIs, the vast majority states that this will be considered on a case-by-case basis. There is thus room for being more precise by making preliminary assessments regarding potential co-existence based on the specific values that each ANI intend to protect. Assumingly, the municipalities will need some support if they would wish to pursue this endeavour.

In the focus group interview in Paper V, a scepticism was expressed in relation to a regional wind power planning process, which is suggested as a subsequent step in order to regionalise the national wind power strategy and elucidate the possibilities of reaching the suggested regional wind power objectives (Swedish Energy Agency, 2021a). In a comparative analysis of the planning and governance conditions between Sweden, Norway and Denmark, Pettersson et al. (2010) mark that Sweden stands out in terms of having the most decentralised planning system, with little room to enforce a vertical integration of designated areas for wind power from a national or a regional planning level into the local plans. It is thus indicated that it may be much more difficult to apply a top-down wind power governance approach in Sweden due to its mismatch with the planning system and the localisation of decision-making power. Nevertheless,

as acknowledged by the municipal officials in Paper V, more co-operative regional processes could be productive for knowledge exchange and addressing inter-municipal issues, such as inter-municipal wind sites.

### 8.5 The increasingly vital role of the regional level for institutional capacity building

The findings of the thesis indicate that the County Administrative Board are vital for the local planning for reduced climate impact in numerous different ways. Firstly, they are found to be influential through their Regional Climate and Energy Strategies, which seem to provide inspiration in terms of objectives and strategies for the municipalities within their county. Thus, the regional strategies seem to aid the CABs in their role as meta-governor, although the structure of their strategizing process is likely to influence the perceived legitimacy of the actors they intend to steer, including municipalities, as illuminated by Palm and Thoresson (2014). This influence makes it regretful that none of the studied RCESSs had utilised SEA in their strategizing process, which otherwise both could have considered interactions between different sustainability objectives in a more strategic regional setting and potentially also facilitated impact assessments at the local level through tiering.

As previously discussed, many municipalities show signs of insufficient institutional capacity to address reduced climate impact comprehensively in their planning. Simultaneously, regional-local networks can function as a source for the dissemination of knowledge and examples of best practices. Given that all CABs have been instructed to develop RCESSs and coordinate regional efforts for decarbonising the energy system, similar networks may have also been utilised in other counties as part of the CABs climate governance. It is thus likely that the CABs have a more prominent role in supporting and facilitating municipal action than what previous research might suggest, although it is occurring outside the EU Covenant of Mayors framework (Melica et al., 2018).

Since a need to address the interplay between energy supply and distribution and strategic spatial planning can be discerned, but with municipalities seemingly neither having sufficient operational influence nor sufficient competence to plan for the supply and distribution of energy, it could be worth exploring whether the CAB could assume a supportive role in this regard. Potentially, the CABs could maintain an up-to-date planning basis regarding the energy system and coordinate dialogue regarding its expansion, which then could assist the municipalities in their strategic spatial planning. The fact that the CABs may be better suited than the municipalities for this task is underlined by the interconnectedness of the energy system, and potential issues or challenges clearly transgress municipal borders, at times even county borders. Moreover, in times of grid capacity issues, the preconditions for the regional electricity system could also change rapidly. Sufficient capacity for a specific initiative may exist one day just to be gone in the next day, due to, for example, some electricity-intensive industry increasing their outtake, and all municipalities may not be able to keep abreast of such rapid developments.

If the CABs were to undertake such an assignment, this could likely provide valuable input in the municipal wind power planning processes and could constitute a cornerstone of a regional co-operative process regarding wind power. Furthermore, many municipalities lack competence and resources for conducting spatial multi-criteria analyses for identifying suitable wind sites. The regional spatial analysis that presumably will be conducted within the realm of regionalising the national wind power strategy may have the most potential for facilitating wind power development if it is utilised as a tool for fostering dialogue among municipalities regarding inter-municipal issues such as inter-municipal wind sites. Further, it could provide a knowledge base to integrate into the municipal planning and decision-making processes, to deliberate and anchor these strategic land-use choices with politicians and inhabitants. Such an approach could potentially enable some municipalities to overcome the challenges for re-iterating their wind power planning process, which presumably would lead to reinvigorated political support for areas designated as suitable for wind power in the Comprehensive Plan, and in this regard

facilitate wind power deployment. If municipalities would wish to investigate possibilities for co-existence between wind power and other ANIs, the CABs could also act as a facilitator for making preliminary assessments regarding potential for co-existence, given their role to provide value description of numerous ANIs. Such an activity could either be undertaken during a regional collaborative process or by engaging in the early stages of each municipality's wind power planning process.

The publicly elected regional government body, i.e. the Regions, may also be important for coordinating energy and climate issues at the regional level. Especially in counties where they have been given a mandate to develop the regional development plans, energy distribution and potentially also large-scale renewable electricity production could be addressed in these regional spatial plans, which are topics of relevance both in co-operative efforts regarding supply and distribution and wind power production. In relation to large-scale wind power projects, they may also be an important actor by strengthening and promoting any associated opportunities for regional industry and business development. However, more research regarding how the CABs and the Regions could act and co-operate to facilitate the municipalities in their climate efforts is needed.

Finally, as previously touched upon, it may be that the municipalities are in need of support from the national level as well, if all municipalities should gain sufficient institutional capacity to conduct more continuous strategic energy and climate planning, that interlinks with and influences strategic spatial planning in numerous ways. This could relate to the need for updated guidelines and dissemination thereof, for example, regarding standard practice for wind power planning and the balancing of interests in permitting as well as requirements of impact assessment and potential process models for conducting SEAs within local energy and climate planning. Further, it could also encompass financial support, especially for municipalities with smaller population size, so that all municipalities can gain sufficient competencies and resources to appropriately and effectively address climate change mitigation in their strategic planning. Further, the County Administrative Boards may also be in need of additional funding for being able to support the municipalities in the different collaborative ways envisaged.

## 8.6 Methodological reflections

Some methodological reflections could be provided regarding the scientific rigour and quality of the conducted research. On a general level, the methodological triangulation employed is assessed to have been able to strengthen the scientific rigour of the research by benefitting from the different advantages of the quantitative and qualitative methods (Johnson and Onwuegbuzie, 2004). The quantitative investigations in the document analyses have been able to present broader trends and relationships between different variables within the studied planning domains. Further, the qualitative data have enriched and nuanced the depiction of the studied practice by illuminating the perceptions held by practitioners and their forms for co-operating in different planning processes and co-operative networks. All in all, this mixing of methods is believed to have been able to provide a more accurate and complete view of the ever-changing and dynamic planning practice. The combination of cross-sectional and longitudinal studies was similarly able to complement each other by allowing for different types of questions to be investigated. The former types of studies allowed for a broad overview in terms of geographical and temporal trends, and the study employing the latter research design was able to explore how matters had developed over time in terms of content.

Zachariadis et al. (2013) outline three broad categories regarding validity that are applicable within both quantitative and qualitative research, although with slightly variations regarding their meaning and nomenclature within the different research strands. These three categories are *design validity*, *measurement validity*, and *inferential validity* (Ibid.). *Design validity* most often comprises *internal* and *external validity* within quantitative research, where the former refers to whether conclusions concerning causal relationships have bearing and the latter concerns whether the findings are

generalizable or not (Venkatesh et al., 2013). Regarding internal validity in the document analyses, many aspects that seem correlated with the production and adoption of different policy documents, such as the correlation between population size and the likelihood of adopting energy and climate-focused policy documents, are likely to be indirectly causally linked. As discussed, the population is likely to affect the financial resources of the municipality and thereby the institutional capacity in different ways. This was also corroborated by the fact that the adoption of MEPs/MECSs and wind power plans follow patterns regarding the presence of national financial incentives. Moreover, the relationship between share of conducted impact assessments and regulatory requirements was supported by the thematic analysis of the SEA screenings, in the sense that SEA seldom was conducted for potential procedural and substantive benefits. A minor question mark might exist regarding the relation between the type of IA and inclusion of NEQOs, where potential confounding factors, such as the overall environmental awareness of a municipality, could cause both the inclusion of NEQOs and execution of SEA. Still, with the interviewees stating that the SEA reconnects to the NEQO, it is, however, indicated that SEA could at least ensure consideration of the NEQOs.

Since many of the quantitative content analyses included all Swedish municipalities, the external validity regarding the applicability of the results for all of Sweden is considered to be high in those instances. Naturally, the planning practice will be dependent on the planning and governance system and legislation in place, and the external validity beyond the Swedish context is naturally more uncertain. However, as discussed, there may be similar preconditions for municipal planning in other countries, and some findings may uphold a more universal value, although this needs to be studied in other contexts. Within qualitative research, *transferability* can be considered a comparable parameter to external validity, which addresses the generalisability of qualitative findings to other settings (Zachariadis et al., 2013). Regarding the longitudinal study in Paper IV, there may be differences in terms of different strategies applied between different regions, for example, regarding wind power deployment. However, the fact that many different strategies show the same positive trend and that the focus group interview attributes this to a general increased societal awareness points toward that the conclusion of a general progression regarding addressing climate change mitigation in comprehensive planning is likely to be similar also in other parts of Sweden, and potentially elsewhere as well. A sub-component to consider in relation to *external validity* is the *ecological validity*, i.e. whether the conditions of the conducted research differs from how the phenomena naturally occur (Frey, 2018). Generally, the different document analyses can be considered to uphold a high level of ecological validity, since it is an unobtrusive method that will not affect the behaviour of the subjects under study (Krippendorff, 2004).

The findings in Paper III regarding the vitality of key competencies is strengthened by the fact that it is corroborated between the case study municipalities and the survey, making it likely that it is dependent more on the municipalities' planning and decision-making responsibilities. Another finding from Paper III that, however, may be more strongly related to the regional characteristics of pertaining in a metropolitan region is the existence of sub-regional, inter-municipal networks, since their initial rationale was to find a common vision when bargaining for transport infrastructure investments. The prevalence of such inter-municipal networks and their added value for institutional capacity building in other parts of Sweden could thus be another route for future research. The experiences from the practitioners in Västernorrland will also presumably be influenced by the rapid wind power expansion that has happened in the recent years within their county and should be interpreted with this in mind.

In quantitative research, the component of *measurement validity* typically includes both *reliability*, i.e. whether the methods applied would provide consistent results if repeated, and *construct validity*, which refers to the accuracy of the operationalisation of the concepts intended to be studied (Venkatesh et al., 2013). In terms of *reliability*, one aspect to contemplate is the role of the researcher. There is always some level of interpretation involved in both the quantitative and qualitative content analyses. A potential remedy could have been to use multiple coders and

assess inter-coder reliability (Belur et al., 2021), had this been practically possible. Nevertheless, the coding schemes utilised in the quantitative content analyses intend to minimise the need for interpretation. Moreover, as revealed by Armstrong et al. (1997), the inherent subjectivity of thematising documents or transcripts prevails even with multiple coders. In part, this deficiency could be considered to be compensated by methodological triangulation. A point worth noting regarding *construct validity* is how the consideration of NEQOs was operationalised, i.e. by performing a text search and noting the textual inclusion of all the objectives in each collected policy document. Although this can be assumed to provide an indication of whether a NEQO has been considered or not, there could have been improved rigour in the findings if the textual context where the NEQOs were included in the policy documents had been investigated as well. The final aspect of *inferential validity* commonly includes to what extent the findings harmonise with theory and current knowledge and could, for the case of quantitative methods, also address the soundness of application of inferential statistics (Zachariadis et al., 2013). In all cases where inferential statistical methods have been applied, the findings have been supported or nuanced by qualitative data. Furthermore, as highlighted by the analysis and discussion, most inferences fit well with existing theory and research, which can be seen to strengthen the conclusions drawn in this thesis.

## 9. FUTURE RESEARCH

- The results gained regarding the lack of SEA for voluntary Municipal Energy and Climate Strategies poses a broader question regarding the dichotomy of statutory and voluntary local climate planning and the utilisation of impact assessment tools in a wider context, for example, within Covenant of Mayors in a European context.
- With the practitioners themselves mentioning a lack of standard practice for carrying out SEA within municipal energy and climate planning, a process model for local energy and climate planning accompanied by strategic thinking SEA could be another topic to explore.
- Given the prominent role of sub-regional inter-municipal networks for building institutional capacity and facilitating concrete climate action at an inter-municipal scale, the prevalence and role of such inter-municipal networks in other parts of Sweden and elsewhere another relevant research area.
- Furthermore, forms for regional-local co-operation, involving both the CABs and the Regions, in order to address strategic inter-municipal issues regarding renewable energy supply and distribution could be further investigated.
- Considering the low amount of longitudinal analyses investigating the integration of climate change mitigation aspects into local spatial plans, additional comparative analyses could increase the generalisability regarding the ongoing institutional capacity building on this front and would provide valuable insights.
- Finally, bearing in mind the challenge to build local acceptance for wind power development, more research for estimating social impacts of wind power deployment, and potential measures to enhance those at a local level, for example, through the use of social life cycle assessments, is another domain for future research.

## 10. CONCLUSIONS

This thesis set out to contribute with new knowledge regarding the role, process and interplay of municipal energy and climate planning, municipal spatial planning and municipal wind power planning for responding to the need for rapid decarbonisation, in order to identify pathways forward for building the municipalities' institutional capacity. When synthesising the findings from Paper I-V, it is evident that the municipalities are responding to the climate crisis in multiple different ways. This includes that a proactive strategic energy and climate planning practice with the aim of reducing climate impact has emerged from the sectoral energy planning tradition, originally intending, and still legally required to, plan for a secure energy supply and distribution of energy. However, the impact assessment practice is deficient within municipal energy and climate planning, especially if the planning is conducted in a non-statutory form, in spite of it being indicated that impact assessment can facilitate the consideration of synergies and conflicts between different sustainability objectives, thereby being able to provide climate action with a local framing. Moreover, the municipalities have been integrating numerous different strategies for reduced climate impact into their Comprehensive Plans, relating to energy production, distribution and use, transport, and land use, and the findings suggest that such consideration of energy and climate aspects in the Comprehensive Plans have increased in the recent decades.

This integration of climate change considerations into Comprehensive Plans has largely been spurred by the existence of an energy and climate-focused policy document, such as a Municipal Energy and Climate Strategy, within the municipal organisation, which has enabled a two-way policy integration between these two policy spheres. Additionally, the existence of an energy and climate strategy or similar presupposes that an energy and climate strategic competence is present within the organisation. This facilitates the influx of knowledge through the participation in different regional-local and inter-municipal networks, which then can be disseminated internally and utilised in the comprehensive planning process. There is also a need for municipal officials to be given time and resources to interact with politicians in order to mobilise support and create a mandate for action. Simultaneously, the results illuminate that many municipalities struggle with building sufficient institutional capacity to address climate change mitigation in their planning. This was manifested, for example, in the form that the adoption of both energy and climate-focused policy documents and wind power plans followed the temporal patterns of the presence of state-funded financial incentives, and that more than one-fourth of the municipalities not having adopted an energy and climate-focused policy document during the studied twelve-year time span. This has also rendered in a more reactive municipal decision-making in relation to the municipal veto for wind power deployment, with implications for its legitimacy and public participation.

Given the municipalities' great autonomy, broad-ranging responsibilities and spatial planning monopoly, it is deemed vital to further promote institutional capacity building for responding to the climate crisis in their municipal planning and decision-making. Increased continuity in the energy and climate strategic planning process, comprehensive planning process and wind power planning process could facilitate building support for integrating different strategies and contribute to organisational learning. Moreover, the three modes of planning could be further interlinked, for example, by establishing objectives regarding reduced climate impact and renewable electricity production in the energy and climate domain, which brings implications for strategic spatial planning, and by initiating processes simultaneously and in an integrated fashion. If municipalities come to recognise the potential of a more proactive strategic-thinking SEA process, this could be another vehicle for increased sustainability consideration early in the process, when there is a window of opportunity for influencing the plan's content to the greatest extent. Overall, this can lead to a more sustainability-led municipal planning, which can contribute to bending the curve of greenhouse gases emissions whilst simultaneously providing synergies across other sustainability objectives.

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